THE UNIVERSITY OF HULL

Electricity service utilities in the GCC: Steps towards a common regulatory reform

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Abstract

The member states of the Gulf Cooperation Council (GCC), namely; the Kingdom of Bahrain, the State of Kuwait, the Sultanate of Oman, the State of Qatar, the Kingdom of Saudi Arabia and the United Arab Emirates (UAE) have been moving towards more economic integration while taking practical steps in the direction of market opening and liberalisation. Over the past ten years, the GCC has evolved into a more integrated economic zone with agreed common policies that are coordinated through its Secretariat. With respect to service utilities, the GCC Interconnection Grid – nearing completion in 2011 – is considered a milestone in the direction of integrating GCC electricity markets.

The objective of this research is to suggest a GCC-wide policy to support reform of GCC electricity markets. The suggested policy would include new market structure(s) as well as institutional changes supported - when required - by sector specific laws and regulations. Further to the study's academic contributions, the research is primarily intended to advance the further development of the economies of GCC member states. The study presents a model that we believe could contribute to expediting the process of developing the GCC zone as a common market by advising policy makers on the applicable elements of GCC electricity market structure, governance and performance.

This study provides a comprehensive review of the theoretical aspects of electricity sector restructuring and examines different options for reform and restructuring based on worldwide experiences. The study adopts a *case study research method* to analyse the GCC situation in order to arrive at the recommended policy or 'model'. The research specifically emphasises reforms that have already taken place in the Sultanate of Oman – for which an empirical social cost benefit analysis is carried out - and the Emirate of Abu Dhabi (UAE). Oman and Abu Dhabi are believed to be at more advanced stages of electricity market reform compared to other countries within the region.

The study concludes that while some GCC member states have already taken the initial steps to restructure their respective electricity markets, other members are expected to follow. The study recommends a set of common steps or ‘rules’ that are presented in the form of a ‘model’ for restructuring GCC electricity markets. The proposed model for reform takes into consideration the nature of member states’ economies as well as the restrictions imposed by market size limitations and some other considerations that are a feature of prevailing policies in the region - such as commitments to subsidise consumer electricity tariffs. Since not all GCC member states are on an equal footing in terms of economy-size and preparation for structural reform, the suggested model allows for a transition mechanism. The study recommends that the electricity markets are unbundled before embarking on any further privatisation programmes. Further measures of wholesale competition may be then introduced allowing for a mix of both private and state-ownership through the use of a single-buyer model. Subsequently, activities that have natural monopoly characteristics such as transmission and distribution are to be separated and subject to incentive based regulation.

The study recommends that the role of the GCC Interconnection Authority be restricted to transmission and system operations only and that each member state should have its own independent regulator. The study suggests that the GCC Secretariat play a co-ordination role between the different regulators while a separate power-exchange instrument be introduced to facilitate cross-border electricity trading between GCC member states.

Dedication

To His Majesty Sultan Qaboos bin Said, the Sultan of Oman

A great leader for a deserving nation

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Acronym	Description
AADC	Al Ain Distribution Company, UAE
ADDC	Abu Dhabi Distribution Company, UAE
ADWEA	Abu Dhabi Water and Electricity Authority, UAE
ADWEC	Abu Dhabi Water and Electricity Company, UAE
AER	Authority for Electricity Regulation, Oman
AEW	Authority for Water and Electricity, Bahrain
AGCC	Arabian Gulf Cooperation Council
AMPC	Al Mirfa Power Company, UAE
ANEEL	Brazilian Electricity Regulatory Agency, Brazil
APC	Arabian Power Company, UAE
ASEAN	Association of South East Asian Nations
AT&T	American Telephone and Telegraph Company
BETTA	British Electricity Trading & Transmission Arrangements
BOO	Build Own Operate
BOOT	Build Own Operate Transfer
BOT	Build Operate Transfer
BPC	Bainounah Power Company, UAE
CBA	Cost-Benefit Analysis
CCEE	Chamber of Electric Energy Commercialization, Brazil
CDEC	Centro Despacho Económico de Carga, Chile
CEER	Council of European Energy Regulators
CEGB	Central Electricity General Board, UK
CfD	Contract for Difference
CNE	Comsión Nacional de Energía, Chile
CPI	Consumer Price Index
DISCO	Distribution and Supply Company
EC	European Commission
ECPC	Emirates CMS Power Company, UAE
ECRA	Electricity & Co-generation Regulatory Authority, Saudi Arabia

Acronym	Description
EEX	European Energy Exchange
EGAT	Electricity Generating Authority of Thailand, Thailand
Elspot	Norwegian Electricity Spot Market
EPC	Engineering, Procurement and Construction
ESI	Electricity supply industry
ETSO	European transmission system operator
EU	European Union
FERC	Federal Energy Regulatory Commission, USA
GBP	Great Britain Pound
GCC	Gulf Corporation Council
GCCIA	GCC Interconnection Authority
GRF	General Reserve Fund, Kuwait
GTTPC	Gulf Total Tractebel Power Company, UAE
GW	Gigawatt
GWh	Gigawatt-hour
IEA	International Energy Agency
IMF	International Monetary Fund
IPO	Initial Public Offering
IPP	Independent Power Producer
IP(W)P	Independent Power and Water Producer
ISO	Independent System Operator
KSA	Kingdom of Saudi Arabia
kV	Kilovolt (thousands of volts)
kW	Kilowatt (thousands of watts)
kWh	Kilowatt-hour (thousands of watts per hour)
LPG	Liquid Gas
MC	Marginal Cost
MCDA	Multiple Criteria Decision Analysis
MHEW	Ministry of Housing Electricity and Water, Oman (previous name)
MIGD	Million Imperial Gallons per day
MIS	Main Interconnected System

Acronym	**Description**
mmBtu	Million British Thermal Units
MMC	Monopolies and Mergers Commission, UK
Moody’s	Moody’s Investors Service, a USA corporation
MVA	Mega Volt Ampere
MW	Megawatt
MWh	Megawatt-hour (million of watts per hour)
NAO	National Audit Office, UK
NETA	New Electricity Trading Arrangements, UK
NGC	National Grid Company, UK
NIE	New Institutional Economics
Nord Pool	Norwegian electricity market operator (Nordic market)
OECD	Organization for Economic Cooperation and Development
OEHC	Oman Electricity Holding Company SAO, Oman
OFFER	Office of Electricity Regulation, UK
Ofgem	Office of Gas and Electricity Markets, UK
PWP	Oman Power and water Procurement Company SAOC, Oman
PAEW	Public Authority for Electricity and Water, Oman
PETA	Power Exchange and Trading Agreement, GCCIA
PJM	Pennsylvania, New Jersey and Maryland, an electricity pool, USA
PPA	Power Purchase Agreement
PPP	Pool Purchase Price
PSP	Pool Selling Price
PURA	Public Utilities Regulatory Policy Act, USA
PWP	Power and Water Purchaser
PWPA	Power and Water Purchase Agreement
PX	Power Exchange
RASCO	Abu Dhabi Company for Servicing Remote Areas, UAE
RECO	Regional Electricity Company
RETA	Review of Electricity Trading Arrangement
RPI	Retail Price Index
RSB	Regulation and Supervision Bureau, Abu Dhabi, UAE

Acronym	Description
SAOC	Societe Anonyme Omanaise Close
SAOG	Societe Anonyme Omanaise Generale
SCBA	Social Cost-Benefit Analysis
SCIPCO	Shuweihat CMS International Power Company, UAE
SEC	Saudi Electricity Company, Saudi Arabia
SIC	Sistema Interconectado Central, Chile
SING	Sistema Interconectado del Norte, Chile
SMP	System Marginal Price
SO	System Operator
SOMLP	Shuweihat O&M Limited Partnership, UAE
TAPCO	Taweelah Asia Power Company, UAE
TPA	Third party access
TRANSCO	Transmission Company
TSO	Transmission system operator
UAE	United Arab Emirates
UK	United Kingdom
US$	United States of America Dollars
US/USA	United States of America
UWEC	Union Water and Electricity Company, Fujairah, UAE
WTO	World Trade Organisation

Chapter 1 Introduction

1.1 Introduction

The Gulf Cooperation Council (GCC) is an economic zone made up of six sovereign states. Over the last two decades, GCC member states have witnessed strong economic growth capitalising on the revenues from oil and natural gas exports. Moreover, the member states of the Kingdom of Bahrain, the State of Kuwait, the Sultanate of Oman, the State of Qatar, the Kingdom of Saudi Arabia and the United Arab Emirates (UAE) have been moving towards more economic integration while diversifying their hydrocarbon-dependant economies.

According to Rodrigo de Rato, Managing Director of the International Monetary Fund (IMF), 'Significant progress toward regional integration in the GCC has already been achieved through the elimination of barriers to free movement of goods, services, capital and national labour, and a common external tariff. Although some important differences have emerged in members' positions on the progress toward the monetary union, there is considerable momentum among the members to form the union. Deep political commitments provide the necessary environment to pursue an accelerated implementation of the remaining steps, including a formal agreement on the convergence criteria, establishment of a common market and customs union by 2008, and putting in place the necessary institutional framework and infrastructure' (IMF Press Release No. 07/243, 2007).

The GCC has progressed into a Custom Union, however; even with such optimistic views from the IMF, later parts of this research reveal that not all member countries are in favour of a Monetary Union. Further, it is less likely that the GCC economic zone will develop into a fully integrated single market like the Euro zone or a developed common market without the monetary commitments like the European Union. Nevertheless, it is now evident that GCC member states – with some moving faster than others - are choosing to diversify their economies and move towards market liberalisation and service sector reform. Moreover, the current state of economic integration suggests that the GCC is moving towards a more advanced stage of integration than that of the less-binding form of regional integration achieved by the Association of South East Asian Nations (ASEAN).

Greater GCC regional integration among the six member states is also being pursued in the context of their membership of the World Trade Organization (WTO). With Saudi Arabia being the last to join the WTO, members of the GCC are now expected to move faster towards decentralization and privatisation through the adaptation of economic reforms that are usually associated with market opening. Being full members of the WTO, the GCC - as a region - is also expected to undergo a new round of WTO negotiations which is a process that entails more group commitments towards further market opening including increased levels of transparency and economic reforms. Hence, this process should result in more regional market-harmonisation vis-à-vis a unified trading approach with the outside world. Moreover, based on the experience of the EU alone we must realize that the issue of increasing economic integration within a free trade-zone typically leads to more stringent discussions of 'macro-economic' issues. The harmonization of competition policy, environmental law and electricity market rules are good examples of this.

Needless-to-say, greater economic integration has significant microeconomic implications that may include, but are not limited to, structural adjustments required within participating economies to accommodate and respond to greater integration, changes in the level and distribution of welfare and the important question of whether resource allocation can be improved as a result of the policy. In short, the process of economic integration for a given free trade-zone requires an array of macro as well as micro-economic reforms within the participating member states.

A GCC-wide economic reform policy raises important economic issues that can be evaluated at the micro level. The political conditions are necessary (but not sufficient) to allow for the successful implementation of a GCC-wide policy. The economic rationale, particularly for market reforms including privatisation, requires the genuine transfer of certain risks from the public to the private sector. If there is no genuine risk transfer, the allocation of resources may be distorted and the cost of a privatisation policy may outweigh the expected benefits.

This is of course true at the national level as well as for integrated markets such as the GCC. But it is the complexity of such factors in the context of a union such as the GCC that makes the issue so meaningful and interesting from a research point of view. A poorly implemented regulatory infrastructure can damage welfare and leave those participating worse off. For example, deregulation can only work if the conditions or ‘rules of the game’ are understood and properly implemented, particularly by the participating governments. Wamukonya (2003, p.7) believes that ‘reform has been designed to mainly address economic and, in particular, financial concerns, with insufficient consideration for social and environmental issues’. The issue to be discussed is not whether deregulation as a policy works; this has been amply demonstrated elsewhere, but how could the GCC accommodate the economic, social and political constraints within a given reform policy?

GCC electricity markets are suitable candidate for reform. Over the past two decades, many countries have already chosen to liberalise their electricity markets by unbundling the previously viewed vertically integrated natural monopoly. Others that have shown interest in following such reform are driven by expectations that market opening would increase efficiency, promote more competitive use of capital - usually driven by private investments - and may lead to technological advances. Similarly, in the GCC region, some governments have taken practical steps towards liberalising their respective electricity markets. The Sultanate of Oman and the Emirate of Abu Dhabi of the UAE are two good examples of such progressive change. The GCC Interconnection Grid may also be considered as a milestone in bringing closer the integration of GCC electricity markets.

However, in order to establish the basis for genuine GCC-wide economic reforms - including the electricity sector reform - we must first discus a number of political and institutional considerations. Hence, taking into consideration that *‘electricity’* is vital for driving forward development and economic diversification, this research will propose a reform ‘package’ only once the applicability of such change is properly questioned. The research, therefore, needs to answer a set of questions. Could a region-wide electricity-market-policy be implemented under the present GCC mandate? Or, would some degree of institutional change, new protocols or amendments be required? Even in the absence of such mandates, could we introduce the basis for a common GCC utility regulatory framework? More specifically, are the GCC member states in a position to establish a GCC reform-policy including the legislation and institutions required to restructure electricity markets? On the other hand, could sector-specific legislation - already introduced by members like Oman, the Emirate of Abu Dhabi and in part by Saudi Arabia - pave the way for wider GCC-wide electricity reform?

One of the main objectives of this research is to propose a GCC-wide policy in the form of a set of guidelines for reform and restructuring of GCC member state electricity markets.

1.2 Research Problem

The idea of privatisation has been around for many years. In recent years, governments around the world rallied for the transfer of the state-owned assets to the hands of the private sector. Ownership transfer should be accompanied by genuine risk transfer in order for the policy to yield more economic benefits. Most particular to service utilities like electricity, the seemingly straightforward choice to privatise is made more complex by the monopolistic nature of the utility networks (transmission, distribution). Here, the scope for competition and the choices to privatise, regulate or deregulate the different segments of vertically integrated utilities need to be subjected to more scrutiny based on some economic criteria.

This research investigates the possibility of advising a GCC-wide reform policy for member state electricity markets. Here, the key aspect would be the transfer of risk from the public to the private sector in a manner that protects consumer interests, allows for market competition withstanding market power[1], promotes efficiency and attracts investor interest.

Ideally, the intended GCC-wide policy and market structure might be based on – whenever possible - 'limited-interference' by government(s) in the affairs of the reformed service utility. Once an entity is privatised, it must take ownership and control of a previously

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[1] Based on Oxford Dictionary of Economics (Black, 2002, p.292), Market Power is defined as 'An indefinite concept concerned with the strength of the position of the dominant firm in a market. Market power can be regarded as high if the dominant firm has the ability to act as a price leader, if it can dictate the conditions of sale for its products, if it is able to deter entry, or if it can make persistently super-normal profits'.

public-sector entity and accept all the associated risks (and rewards). Subject to the private entity delivering the services to the required standards and quality, the government would be advised not to appropriate profits when the private entity is successful as this would dissuade further private sector participation. On the other hand, the government is not required to provide financial support when profitability (for whatever reason) is poor. The private entity is therefore subject to the disciplines of the market, supported by effective regulation whenever applicable, and it is these disciplines that drive incentives for and expectations of improved efficiency from which many of the benefits of market reforms and privatisation derive. Similarly, government (or governments) must refrain from interfering with activities and functions of the service regulatory authority (or authorities).

This researcher is of the opinion that any study in the field of service-utility reforms should adopt a holistic view, taking into consideration the complexities induced by not only the economic implications of change required but also the expected social welfare change and political environment in which reform is to take place. Later parts of this study (primarily Section 3.5 and Section 3.6) will illustrate that not all *ex ante* measures were implemented (even with relatively good market-design) as politicians and state-representatives intervened with markets in response to political pressures due to non-favourable situations including economic underperformance and natural causes. The key point is that market-design must take into account all possible factors and find the appropriate *ex post* and *ex ante* remedies because once reform is implemented any further state-level intervention may lead to 'disastrous' consequences involving high consumer price-spikes like in the case of California and lost investor interest like in the case of Argentina (to be discussed in detail in Chapter 3). This research needs to take extra care when recommending a model for a GCC-wide market structure. Decision makers would need to understand before embarking on such reforms that reform is a process of change. While decision makers might understand the necessities for change, they must also be prepared to accept that such reforms may require the transfer of their 'powers' to new regulatory authorities with administrative and financial independence. It is only prior to the adaptation of such reforms that policy makers may choose over privatisation, regulation or deregulation. Once those decisions are negotiated, evaluated and finally agreed upon at the national or regional level, going back is like the act of having to demolish a newly constructed multi-storey building. This basic argument with regards to the complexities associated with the undoing of announced reforms should lead us directly to the significance of this chosen research.

1.3 Significance of the Study

By now, we should have established a feel for the complexity of electricity market reform. With respect to the focus of this particular research, there are three areas in which the researcher hopes the present study will make useful contributions.

Firstly, the study is expected to make some contribution to academic study by evaluating the possibilities of establishing common rules for electricity sector reform for the developing economies of the GCC. In the academic arena, there is a variety of meaningful research in relation to the very developed utility markets within advanced economies as well as some good references to the experiences of the developing world. However, it is not yet clear that academic interest has focused on the GCC region. This study should contribute, in academic terms, to the rather limited electricity service utility research in the GCC and may prompt further research for other service utilities within the region and other regions in the developing world.

Secondly, the study may make meaningful contributions to the economic development of the GCC at large. Later parts of the study illustrate that GCC member states have similar economic structures with varying levels of wealth, almost identical weather conditions, are at varying stages of development and face relatively similar economic and social challenges. This research may aid decision makers and the general public alike in realizing the choices available for electricity reforms and market opening, hence, allowing individual states to adopt appropriate measures in this regard.

Thirdly, this research may contribute to the further development of the proposed Common Market of the GCC. While carefully investigating electricity market situations in each member state, the study puts to the test – as case studies – the electricity sector laws in Oman and Abu Dhabi, in order to arrive at a common set of ‘rules’ for reform. By proposing a GCC-wide electricity legislative and adequate market structure, the study is intended to set the rules for enhancing the regional-integration possibilities, and hence, deepening the coherence of the GCC economic zone. Such proposed GCC-wide electricity rules may be further utilized for reforming other network utilities like gas, water, sewage and communications.

1.4 Research Objective

The economies of the GCC are growing at a very rapid rate, fuelled by increased oil and gas revenues. Over the years, each member state was able to plan its economic expansion by means of state funded infrastructure and encouraged private participation through monetary incentives. Member states have learned the importance of reducing their dependence on oil and gas by introducing new long-term plans for diversification and enhanced private sector involvement through market opening and reform. Electricity markets and services are at the heart of economic activity in the Gulf and elsewhere and how they are structured and regulated will influence future economic activity.

As already mentioned, the primary objective for this research is to propose a GCC-wide policy for electricity market reform. In doing so, the study aims for a policy that would be easy to adopt by most of the member states and relevant to the GCC's current and future situation. An advisable GCC-policy would need to be capable of protecting consumer interests, allowing for market competition, promoting efficiency, facilitating cross-border trade among member states while attracting investor interest to this service utility sector. Moreover, the research aims at proposing a market structure that would facilitate a GCC cross-border trading of electricity.

1.5 Research Methodology

In order to arrive at a proposed reform model suitable for GCC member states, the study investigates different options for reform including those already implemented by other countries and economic zones. We acknowledge it will be important to ensure some consistency in the information collection, analysis and composition throughout the research process. Since the choices are various due to the diversity of international experiences including those of the GCC, a case study approach was considered appropriate for our research analysis as discussed next.

The study thus investigates the prospect for a GCC-wide regulatory and institutional framework for electricity market reform based on sound economic principles. Based on Oman and Abu Dhabi case studies, the research proposes a *model policy* for electricity sector reform in the GCC. More precisely, the study investigates possible market liberalisation options available for the GCC member states and whether the electric wholesale segment may be subjected to market competition. While keeping in mind the market size limitations in each member state, this research is also intended to review experiences from around the world with respect to power sector trading arrangements from the 'single-buyer' model to the more advanced wholesale and retail forms. Market size limitations as well as other economic considerations may favour the use of one model over the other. However, it is the researcher's view that all options need to be investigated in order to uphold the consistency of this research. Also, drawing from the work of Jones et al. (1990), Galal et al. (1994), Newbery and Pollitt (1997), Damsgaard and Green (2005) and others, we subject the new market structure in Oman to a detailed social cost-benefit analysis (SCBA). Subsequently, at more advanced stages of electricity market reforms, the GCC member states may consider a more market-based or 'less regulated' trading arrangement like the establishment of a GCC power-exchange or a pool.

1.5.1 Research Approach: Using the Case Study Research Method

Although it is not very common to use case studies for economic research, there are situations where such a method has been used. Alston (2008, p. 103) is among the advocates for the use of case studies in new institutional economics (NIE) as 'they enable us to analyse both the determinants and consequences of institutions and institutional change'.

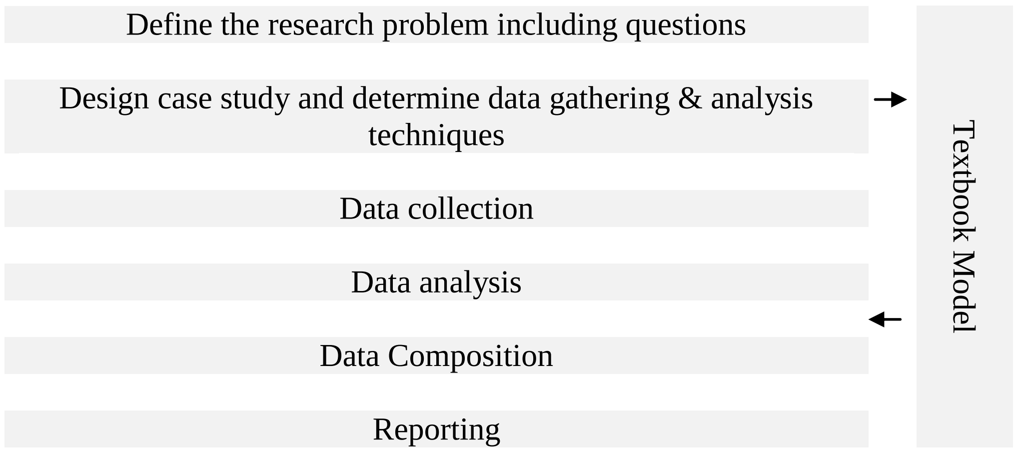
There are several methods used for social science research including surveys, experiments and histories besides the use of case studies. According to Yin (2003a) there are three conditions for choosing a research method or strategy; (1) the kind of question asked, (2) the degree of focus on contemporary rather than historical events and (3) the required control over behavioural events. While, *experiments*, *history* and *case studies* answer the questions of *how* and *why*, only experiments and case studies focus on current events. However, experiments require control over behavioural events where case studies do not. Yin (2003a) cites the topic of 'decisions' as the main focus of case studies drawn from the definition of Schramm (1971) that a case study tries to clarify *why* a decision or a number of decisions were taken and *how* they were implemented leading to a particular outcome. Based on Yin (2003a), other topics include *organisations*, *processes*, *programmes*, *institutions* and *events*. Yin (2003a, p. xiv) describes a case study of any topic to involve 'problem definition, design, data collection, data analysis, and composition and reporting'.

For the purpose of evaluating electricity reform and identifying a suitable policy for the GCC, a study must be undertaken to understand the current situation including some in-depth analysis of already existing reform experiences (decisions) of member states. For the purpose of this study, the case study research method is believed to be the most suitable approach to study electricity market reform in the GCC; *first*, the explanatory nature of this research requires us to address the (how) and (why) questions, *second*, this research focuses on contemporary (not historical) events which should enable the researcher to carry out some observatory activities including interviews with the persons involved in such cases and *third*, during the course of the study the researcher has no control over the events under study.

One of the complexities of qualitative case study research is associated with the setting of the boundaries of the study. According to Stake (1995) social science researchers need to view the case as an object (a system with boundaries and working parts) rather than a process. He suggests that such a definition is more suitable for people and programmes rather than for events and processes. Furthermore, according to Yin (2003, p.23) a descriptive case study - answering the (how) and (why) questions - relies on a descriptive theory that 'covers the scope and depth of the subject (case) being described. If you were to describe an individual, an organisation, or some other possible subject of a case study, where should your description start, and where should it end? What should your description include, and what might it exclude?'

Having already chosen the case study research method for analysing electricity sector reform in the GCC, it is now essential to determine the means for setting the boundaries for this 'case'. Here, a 'market-place functions' related theory may be established to guide the research in its phases of defining the research problem, case study design, data collection, data analysis and then leading to the composition and reporting stages of the research. For such purposes, our study would apply a *Textbook Model* developed by Professor Stephen Littlechild[2] for electricity market structure and reform. The 'Textbook Model' used will be discussed in detail in Chapter 2. The application of this model should help establish the 'boundaries' of the research as well as produce a more uniform set of questions for each case (market) under study, and hence, produce comparable sets of findings (reports). Figure 1 illustrates how a case study research approach is integrated with the *Textbook Model* for the purpose of this research.

Figure 1 Case Study Approach (Using the *Textbook Model*)



1.5.2 Research Questions

The major research questions in this research are:

1. *Is it possible to subject electricity to pure market mechanisms?* In answering this question the study reviews electricity markets and the applicable economic theories while exploring the relationship between the state (assuming responsibility for service availability) and the utility (as a service provider) including reform options available and the relevant regulation where market mechanisms do not apply;
2. *Do existing GCC legislations support a common electricity regulatory and institutional framework?* Here, we view GCC Directives as well as the differences among member states that may affect the common-electricity-policy under investigation;

[2] Professor Stephen Littlechild was the first UK director general of electricity supply and head of the Office of Electricity Regulation (OFFER) from 1989-1998.

3. *What is the current status and structure of electricity markets in the GCC member states?* The answer to this question deals with the status of electricity market developments in each member state giving some emphasis to member states that are already reforming their electricity markets;
4. *How do the Oman and Abu Dhabi electricity reforms laws and market design measure up internationally?* Answering this question will help establish whether such laws may be the basis for a common GCC policy – ultimately - as a GCC Directive; and
5. *Why some features of GCC electricity markets should remain unreformed*? In answering such question by studying the cases of Oman and Abu Dhabi we are able to advise on the most suitable reform policies for member states - including the required regulation and organisational change – in order to sustain common GCC policy.

1.5.3 Research Instrument

The study uses a mix of secondary and primary data. The research is strengthened by valuable meetings and one-on-one interviews with experts and related business executives, and special studies.

Using Secondary Data

There is a considerable amount of theory and experience of electricity market regulatory reforms. Since 1978, the US Public Utility Regulatory Policies Act (PURPA) established the basics for power sector regulatory reforms. The published work on the England and Wales electricity pool, supplemented by the much freer arrangements of the New Electricity Trading Arrangements (NETA) which was introduced in 2001 provide for a practical experience - backed by considerable amount of field research - on how market liberalisation needs to be complemented by appropriate legislations. Moreover, in the context of a GCC like situation, the researcher closely studied the information made available with respect to the electricity markets of the European Union (EU) and the wholesale market of the Nordic countries (Nord Pool) operational since 1996.

The World Bank and the IMF provide information relevant to the economies of the GCC member states. Other information and statistics was obtained from the GCC Secretariat, the

Gulf Organisation for Industrial Consultancy (GOIC) and the GCC Interconnection Authority (GCCIA).

Using Primary Data

Due to the nature of this reforming sector, some information could not be obtained from the above-mentioned resources. It was necessary for the completion of this research to obtain some primary data from various firms and institutions like electricity transmission companies, regulators and responsible authorities. For the purpose of the study, the researcher was able to have meetings with experts, government officials, policy makers, regulatory authorities, and company executives.

According to Zikmund (2003), a well designed questionnaire must be both relevant and accurate. From the start of this research, a fact finding questionnaire was specially devised and carefully distributed to key persons in the GCC region (Appendix 5). Although limited responses were received, the purpose was served as the questionnaire was designed to obtain primary factual information on country specific electricity laws, market structures and regulations. Completed questionnaires as well as related inquires and follow up were very useful in designing more relevant and accurate sets of questions for the interviews and group meetings carried out at the later stages of the research.

Data Compilation and Reporting

A number of tables were devised to incorporate information that was gathered by through the questionnaire and meetings and verified using annual reports and other published materials. The specially devised tables (illustrated in Chapter 8) are intended to formulate a better understanding of electricity market and legislative environments in each member state while they also facilitate cross-country comparisons.

1.6 Limitations

The complexity and challenges associated with utility service reforms make the subject of this research a difficult one. While trying to focus on the main issues, the researcher has encountered a number of limitations:

- There is limited academic research for the GCC region in the area of service utility regulation – in general - and for the electricity sector - in particular;

- Most governments in the region are currently studying the prospects of liberalising network utilities. Countries that have already started the reform process have little experience to share, while others who have commissioned market reform related studies tend to prefer not to part with their plans for the time being. Understanding the economic and political dimensions for such structural reforms, one would only be expected to demonstrate a sympathetic understanding to such secrecy;

- Public domain information is also limited in this area of research. While some of the newly established service utilities continue to be state-owned and are not subjected to detailed public reviews, other newly privatised (mostly public listed companies) while required to publish some information (such as audited financial statements) others prefer to shield certain information (especially that relevant to costs of production, delivery, profit breakdown, technical operation and expansion strategies) on grounds of commercial sensitivity. While we note that the Oman regulator publishes comprehensive annual reports, the two other regulators publish reasonably informative annual reports;

- The researcher is currently a senior public servant in the Omani government with previous and current duties including the planning and implementation of government policy. It is sometimes challenging for others to understand that information gathered by interviews and questionnaires is strictly intended for the purpose of this academic work. Moreover, the researcher needed to take extra care that feedback and findings are not to be influenced or 'biased' by the researcher's own experience;

- While this research is focused on electricity, it is importance to take into account that most GCC regulations tend to combine electricity with water due to the fact that water is simultaneously produced with electricity (through combined cycle electricity generation and water desalinisation plants). This research acknowledges a close relationship between water and electricity regulation in the GCC situation, however; this study is restricted to electricity markets. For a variety of considerations identified in this research, associated water production should have very minimum consequences – if any – on the subject of this research;

- In order to keep this research more focussed to market related reforms, the research does not cover regulations for renewable energy or the environmental aspects of regulatory reform. This must not underestimate the relevance and importance of such issues at both regional and international levels. Accordingly, the research does not cover the aspects and implications of the future of nuclear, although discussions have already started and there may be potential for GCC member states to utilise nuclear energy ((Doukas et al, 2006 and Patlitzianas et al, 2006); and

- Similarly, while the research touches on some existing and future GCC electricity grid-interconnections, the research does not cover the technicalities of interconnections nor does the research investigate any cross-border trades and/or limitations of GCC interconnections.

1.7 Organization of the Thesis

Chapter 1 mainly gives an overall background of the study, introduces related concepts and states the research problem.

Chapter 2 examines the relevant literature and economic theory and discusses the relationship between privatisation and reform, and explores the notion of regulatory reform while providing a comparison between the concepts of *regulation* versus *deregulation*. The chapter also discusses electricity markets and underlines the options for power sector reforms emphasising a specific ‘Textbook Model’ for restructuring and competition.

Chapter 3 represents a ‘gathering’ of worldwide relevant experiences in power sector reforms. The chapter provides an insight into the experiences of England and Wales, the Nordic Market, the European Union (EU), the US market and some relevant experiences from developing countries such as: Thailand, Pakistan, Chile, Argentina and Brazil.

Chapter 4 introduces the GCC by examining the region's overall economic integration legal and institutional framework. This chapter also provides an overview of the respective economies of each member state as well as some indicators and cross-country comparisons. The chapter also looks at the electricity sector situation in the GCC as well as the prospects for the partially completed GCC Interconnection Grid. The chapter also studies the need for GCC power sector reforms and the possibilities of establishing a GCC-wide regulatory framework. More specifically, the chapter examines the necessity for an enlarged market for electricity and the state of readiness for market liberalisation in each member state.

Chapter 5 studies electricity sector reform in the Emirate of Abu Dhabi (of the UAE). Here, the research presents background information on Abu Dhabi's electricity sector, the laws applied and relevant market structure after unbundling.

Chapter 6 is a case study of the Omani electricity sector reforms. The chapter discusses the Omani law, how restructuring was initiated and the limited role of privatisation in the reform process.

Chapter 7 presents a social cost benefit analysis (SCBA) of electricity market reform in Oman. Our SCBA tests whether Oman has benefited from its reforms compared to continuation of the previously government owned, vertically integrated market structure.

Chapter 8 presents the findings and implications of our research. The chapter presents an assessment of the current status of GCC electricity markets, applies the results of the review to a Textbook Model, and undertakes Multi Criteria Decision Analysis (MCDA) to check if four electricity market models are compatible with certain GCC policy consideration.

Chapter 9 concludes the research by presenting the main recommendations. In this chapter, the research proposes the required degree of legislation and institutional changes in the form of a 'model' for reform.

Chapter 2 A Review of Conceptual Literature

2.1 Introduction

This chapter reviews economic theory and related concepts to establish a basis for recommendations for electricity market reform. We start by identifying the properties and assumptions of the ideal market paradigm of perfect competition and investigate the relationship between perfect competition and our preferred standard of social welfare. More specific to electricity market reforms, we compare four possible market structures and subject them to critical scrutiny against the proposed welfare standard. Using the principles of New Institutional Economics (NIE), we consider each of the market structures in terms of their economic properties and the potential behaviour of market players within each market structure. We then present details of a 'textbook model' for restructuring electricity markets and combine its practical guidelines with economic theory to establish a rigorous basis for our recommendations to GCC governments on electricity market reform. The need for on-going regulation of transmission and distribution functions leads on to a discussion of regulation and the required scope of functions and status of regulatory authorities. We also discuss how private ownership raises issues for market design and regulation.

2.2 Economic Considerations

Economic theory identifies a particular market paradigm that can, subject to certain underlying assumptions, maximise total social welfare. Listing the assumptions on which the competitive market paradigm is based will allow us to investigate whether these assumptions would apply in all market structures, and thereby, assess the welfare properties of different market structures.

2.2.1 Perfect Competition and Social Welfare

According to Bailey (1995, p. 18), ‘in perfectly competitive market conditions, firms have to be as competitive as possible, buying all their inputs at lowest possible cost (economy), using them to maximise output (productive efficiency), and selling them for a price that only just allows the firm to remain in business (i.e. ‘normal profits’)’. Moreover, ‘since all consumers purchase those outputs in accordance with their personal preferences and finances, then output is automatically allocated so as to maximise utility. No rearrangement of production or consumption is possible that will increase economic welfare for given sets of production conditions and personal preferences’ (ibid). This is an important point as it highlights the fact that the possibility of Pareto optimum requires markets to be perfectly competitive.

However, having suggested that perfectly competitive markets can maximise welfare (the sum of consumer surplus and producer surplus), we acknowledge that under certain conditions markets may fail. Examples of market failures as identified by Stiglitz (2000) include: (i) failures of competition due to market concentration where some firms can influence price such that prices do not reflect marginal costs or the occurrence of natural monopoly – a situation where a single firm can supply a market at a lower cost than several firms; (ii) externalities (positive or negative), situations where the full costs and benefits of consumption of a good is not reflected in its price; (iii) where the market is incomplete (for example when a market fails to provide a good or service even though the cost of provision is less than what consumers are willing to pay); (iv) imperfect information; (v) pure public goods, these are goods that have a zero marginal cost and where it is impossible to exclude individual consumers from its consumption. Understanding why markets sometimes fail is important as market failures can provide justification for government intervention, something that is particularly important for this research when developing policy recommendations for restructuring GCC electricity markets.

From micro economic theory, we note that there are two elements to an assessment of total welfare: consumer welfare and producer welfare (surplus). In a perfectly competitive market, where price equals marginal cost, total welfare is maximised (as the sum of producer and consumer surplus is maximised). When price does not equal marginal cost (in situations of market failure), however, focussing on consumer surplus alone would overlook the change in producer surplus following a change in price and therefore provide an incomplete assessment of the change in total welfare. There might be pressure to set prices at too low level. Hence, 'it follows that other things being equal, an increase of the price at which goods are sold reduces consumer surplus and increases producer surplus. It turns out, however, that in general as the price increases, the increase in profits made by the firms does not compensate for the reduction in the consumer surplus. Hence, welfare is lowest when the market price equals the monopoly price (the highest price firms might want to charge), and highest when it equals marginal costs of production' (Motta, 2009, p.18).

As one aim of this thesis is to develop recommendations for GCC governments to restructure their electricity markets, it is necessary to establish a clear rationale for our policy proposals. In the context of GCC electricity market restructuring, our recommendation will be to adopt a welfare standard defined as the maximisation of consumer and producer surplus.

2.2.2 The Use of Marginal Cost Pricing

Thus far we have noted the importance of marginal cost pricing. William Vickery explained that 'We can speak of a "rule" that, to produce an optimum allocation of resources, the prices of all goods and services actually being produced must be set uniformly equal to their respective marginal costs'[3] (Arnott et al, 1994, p. 216).

The application of marginal-cost pricing can sometimes be difficult to implement. *First*, if there are decreasing-costs of scale, a choice has to be made whether to operate at high levels of output (which does not mean the lowest marginal costs) or at a subsidised best-level of operations (Arnott et al, 1994). *Second*, demand fluctuations affect marginal costs. Vickery (Arnott et al, 1994) argued that fluctuations in marginal costs over time may result from demand fluctuations for a non-storable service such as electricity. Demand-side fluctuations may arise in three cases: (1) periodical or repetitive fluctuations that may be dealt with by a time-varying tariff called "peak-load pricing"; (2) irregular or not predictable fluctuations which could be dealt with using ex post measures; (3) fluctuations predictable by some buyers but not the sellers, at such case could be handled through "speculators' markets". The

[3] Marginal cost (MC) in power-market analysis is defined as the cost of producing the last unit (Stoft, 2002, pp.61&448). Technically MC is the rate at which cost changes with output at a given output level (MC = dVC/dQ).

third issue relates to difficulties in estimating marginal costs for new entrants (or contracts). Estimating future marginal costs is complex and highly uncertain and historical costs may not be an appropriate basis for future prices.

Marginal cost calculations are of great importance in the case of a single-buyer model (to be discussed later for possible GCC application), as bids are based on load charges (the cost of making power available) and energy charges (the cost of actual power produced). Marginal cost calculations are the basis for energy charges (Hunt and Shuttleworth, 1996).

2.2.3 Analysing Market Behaviour

In his book the Wealth of Nations, Adam Smith uses a definite and sometimes an indefinite article attached to it when referring to *competition*. Blaug (1997) suggested that to Adam Smith 'the competition with private traders' or 'a competition between capitals' was a behavioural activity rather than a state or a situation. It is therefore; a race between two or more individuals to dispose surplus supplies or to acquire limited-quantity goods or services. This implied that 'to compete' would be an exercise of one's 'act of natural liberty' in the absence of restraints or impediments. Blaug (1997, p.42) also argued that 'monopoly did not imply a single seller but a situation of less than perfect factor mobility and hence inelastic supply; and the opposite of competition was not monopoly but cooperation'. In other words, any environment that allows for a collective or 'coordinated' situation by market players – although more than one - should question the reliability of a pure market place mechanism.

It was Coase (1937) who added new dimensions to the understanding of firms in his article the 'Nature of the Firm' that paved the way for further contributions to NIE by other scholars like Williamson (2000) who presented a framework for social or institutional analysis listing four levels. Level 1 is social embeddedness (including informal institutions, norms, traditions and customs); Level 2 is the Institutional Environment, which Williamson (2000, p. 597) also refers to it as 'the formal rules of the game' including political systems, property rights and related legislative, judiciary, and bureaucratic functions of the government; Level 3 is Governance also referred to as the 'play of the game' relating to institutional arrangements governing a given economic environment, also referred to as transaction cost economics; and Level 4 Resource Allocation and Employment (neoclassical economics/ principal-agent theory) which relates to how economies operate and the consequences of market failures like monopoly.

After Coase (1937), many NIE scholars analysed *the firm* in terms of relevant *contractual* and *institutional arrangements*. Garrouste and Saussier (2008) view the firm as a collection of assets and internal incentive mechanisms, where knowledge is built internally or bought on the market (through an exchange of property rights). Understanding the firm is important to this research as it helps highlight the implications of unbundling in terms of transactions costs and the cost implications of introducing new structures and institution and the relationships between market participants (principal-agent relationships). A firm can be assessed in terms of a decision to 'make' or 'buy' goods and services. A firm that chooses to produce its goods and services is described as vertically integrated (González-Díaz and Vázquez 2008). However, a firm would be expected to outsource the required goods and services if the cost of procurement is less than the cost of production. From transaction cost economics we note, however, that outsourcing (or subcontracting) can be costly, for example the costs associated with acquiring information, negotiating terms and enforcing agreements. The magnitude of such costs will depend on the nature of transactions and the effectiveness of governance mechanisms.

Brousseau (2008) defines contracts as coordination tools which allow agents to allocate and transfer rights between one another noting that contracts do not solve all ex ante coordination and organisation issues, and may require ex post adjustments. This is relevant to our research as we will be considering the allocation of risk and property rights and differences in institutional arrangements in different electricity market structures and the need for effective regulation.

Nye (2008) stressed the complexity of institutions and implementing institutional reform, considering the administrative burdens and the ability to agree a common reform as well as a method of transition from one business environment to another. He also stated the role of the government in NIE is to understand the institutions and institutional change.

In a market situation or 'business environment', competitive or 'good' market behaviour ensures that goods or services are exchanged at the lowest possible price – thereby increasing consumer welfare - while manufactures or service providers maximise their profits through improved efficiency – by means of better employment of factors of production. However, in concentrated markets such as monopoly, duopoly, oligopoly and monopsony participants may collude and produce outcomes that reduce total welfare which may require intervention.

John Von Neumann[4] and Oskar Morgenstern (1974, p.13) stated that 'When the number of participants becomes really great, some hope emerges that the influence of every particular participant will become negligible'; this is the classical condition of 'free competition'. However, 'When the number of participants –while greater than 1- is of moderate size … every participant is influenced by the anticipated reactions of the others to his own measures', clearly a typical case of non-favourable market conditions.

By means of game theory applications, economists are able to construct models that rationalise the behavioural aspects of a limited number of market players with conflicting interests (Rubinstein, 1990). Fudenberg and Tirole (1992) illustrated that both cooperative and non-cooperative behaviours in game theory may yield a 'Nash equilibrium'[5] outcome. In a game of two parties (hunters for a stag worth 4 points or 2 hares worth 1 point each) a cooperative behaviour yielded a Nash equilibrium outcome (one half of a stag each) without any of the two having an incentive to unilaterally change his strategy. Similarly, as the two parties suspected the other to act differently, a non-cooperative approach could also result in a Nash equilibrium outcome as both decided to opt for a choice of a strategy that resulted a gain without depriving the other party his share of the gain (a hare each). In the case of limited information on the game played and the expectations of each party, it is difficult to predict the outcome. In game theory, 'Nash equilibrium is a profile of strategies such that each player's strategy is an optimal response to the other players' strategies' (Fudenberg and Tirole, 1992).

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[4] Born in 1903 (in Budapast, Hungary) John Von Neuman is considered as the most important figure in the early development of game theory (Osborne, 2004).

[5] Nash equilibrium is 'a situation in which two or more agents are taking decisions on their strategies, where no agent can gain by any change in their strategy given the strategies currently being pursued by the others. Such a non-cooperative equilibrium is usually not Pareto-optimal, and could be improved on by some form of co-operation' (Black, 2002, p. 313).

Monopsony is also a non-favourable market condition as it concentrates buying power in a single entity. Although it can be avoided, poor market design as well as special limitations of market size may result in situations where a single buyer operates. This is a problem more commonly faced by service providers rather than manufacturers. Based on John F. Nash, Jr. (1996), the economic situations of monopoly versus monopsony may be considered as a *bargaining problem* and therefore; be dealt with in accordingly. However – in predicting the outcome – Nash assumes an ideal situation where the two parties are highly rational, so that each can compare its respective desires precisely, that both have equal bargaining skills and that each has complete knowledge of the preferences of the other party. Martin J. Osborne (2004) explains that Nash equilibrium theory has two components; (1) the players acting according to the theory of rational choice, given their beliefs about the actions of other players, and (2) that such beliefs are correct (Osborne, 2004). However, even if accurate predictions may be made on the above mentioned assumptions, such assumptions are not easily justifiable in the case of service market design.

Relevant to this research, we note that different electricity market structures involving different degrees of horizontal and vertical separation will have different numbers of market participants. The economic benefits (welfare) derived from each market structure will be influenced by the behaviour and performance of market participants. Relationships between market players (firms) and institutions (regulator) are typically governed by contracts that stipulate the obligations of each partly and the degree and nature of coordination between them. Contracts may take the form of regulatory contracts such as licences or commercial contracts such as connection agreements and power purchase agreements.

The way a market is designed and the nature of the contractual relationships assigned to market participants present important challenges to policy makers seeking to ensure a market will operate so as to maximise welfare. NIE provides helpful insights into the 'market design' problem, contracting and the need to articulate and specify incentives that will motivate contract counterparties to act in ways consistent with competitive behaviour and thereby maximise welfare. According to Brousseau (2008, pg 39), 'contracts are embedded because the institutional framework set the endowment of agents in terms of rights of decisions. Not only does it fix the set of assets, of which use may be decided by agents, but it also delimitates these rights of decision (and therefore of contracting)'.

Principal-agent relationships are of particular relevance to market design. In this case, the relationship between the government (principal) and the management of the regulated firm (agent) must be governed by a set of rules. Based on Kay and Vickers (1990), the problem can be better viewed as that of the *principal* which has a set of objectives that could only be achieved by the *agent*. If the firm (the agent) has superior knowledge and different sets of incentives, then how could the regulator (the principal) better accomplish its objectives? The set of solutions to the problem vary; for example, nationalisation - a rather severe solution – would be one choice to eliminate the need for regulation in anticipation that the agent 'a state owned firm' may adopt the objectives of the principal 'the regulator'. This is not a 'fashionable' choice in the economies of today and there is still no guarantee that the agent would adhere to the objectives of the regulator. Further, it is still questionable whether nationalised boards are able to determine the public interest. On the other hand, regulators may not necessarily follow the public interest. Another way to deal with the problem would be the setting up of an independent public agency or an *independent regulator* that is governed by a set of rules of conduct and with specific powers and functions (Kay and Vickers, 1990). Here, the regulator must still be governed by some set of rules or 'safeguards' as will be illustrated in later parts of this research in order to assure that its actions are primarily targeted towards the public interest.

This principal-agent relationship is optimally administered when the principal (a service utility regulator for example) is assumed to have full information about the agent (regulated firm), which is not usually the case. The optimal 'prescribed' *ex ante* policy, therefore, requires that firms have an incentive not to deviate from the policy. Here, more precisely in a case of *price-regulation*, the relationship needs to be guided by some *ex post* observation of the previously agreed sets of prices, and 'if the regulator "finds" that the firm had misrepresented its costs at the time at which prices were set, he can order a refund to consumers' (Baron and Besanko, 1984, p. 447). More practices would usually be introduced to deal with the case of *asymmetric information* between the regulator and regulated firms.

Self-regulation is also a form of dealing with principal-agent relationships, however, the effectiveness of self-regulation would depend on the authority and accountability (given and imposed) by the interested parties. Indeed, the nature of the principal-agent relationship may be challenged by the possible collusion between the regulator and the firm (Vickers and Yarrow, 1988). Assumptions based on public interest theories may be altered due to such collusion. Interest group pressures like shareholders and unions (on the one side) and voters and government demands (on the other side) may produce a multi-layered hierarchy which may distort the principal-agent relationship(s). Based on the UK experience - discussed in Section 3.2 of this research – although the RPI-X method of regulation gives considerable powers to the regulator, however; such power is limited by the possibility of appealing to a well established competition authority.

There may be several principal-agent relationships within a given market situation. In well established democracies, a worthwhile relationship would be where people ‘the general public’ act as the *principal* while the elected government becomes the *agent*. Here, the policy measures of the government ‘the agent’ aim to please a great portion of the voters ‘the principal’ – especially in the short term. Regulation, being a form of government policy, may therefore be greatly influenced by such relationship.

2.3 Electricity Markets: Options for Power Sector Reforms[6]

Many options exist for power sector reforms depending on each country’s economic, political and technical constraints. In recent years, many ambitious electricity market reforms have been successfully implemented, yet some hard lessons have been learned meanwhile. California’s electricity restructuring programme is one of particular interest. Market liberalisation was also accompanied by more, not less, government intervention. Some may argue that these repeated interventions take a good share of the blame for what happened in California as analysed in detail in Section 3.5. Prices in the wholesale electricity market increased by 500% between 1999 and 2000 (Joskow, 2001). First, prices increased to $300/MWh in the first four months of 2001, about 10 times those of 1998. Then, unregulated wholesale suppliers stopped selling power to retailers due to credit problems which required federal court orders and $8 billion of tax payers’ money to avoid blackouts. A mix of political, regulatory and economic factors may have led to the California situation. Lessons learned from this experience bear witness to the fact that market liberalisation does not guarantee lower prices and security of supply. Technical constraints could also hinder the

[6] Much of the literature in this section is drawn from the paper of ‘Electricity Deregulation in the OECD Countries’ by Al-Sunaidy and Green (2006).

progress of electricity market reforms. Although this may not have been applicable to the California crisis, network limitations may be exploited to gain market power (Bunn, 2003).

A market needs to be defined before it is studied. For the electricity market, it is important to decide whether it is local, regional or national (Glynn, 1997). The market may also be characterised in terms of load, highest demand or consumers and their ability to pay for the electricity service. Moreover, a market needs to be questioned in terms of coverage. Does the electricity market cover gas or it is a separate 'distinct' one? Glynn (1997) broadly recites a definition – also used by the US anti-trust authorities - that if a hypothetical monopoly supplier of a product could find it profitable to increase the price, then such product or service constitutes a distinct market.

However, market structure must be carefully studied when planning for new power legislation. A worthwhile study was the work of Andersson and Bergman (1995) in their investigation of the electricity market in Sweden. A model was developed for exploring the relationship of the number and size of firms on the supply side to the prices in the electricity market. The study concluded that on the basis of Swedish electricity market firm structure and high degree of supply side concentration, deregulation was not sufficient to ensure lower equilibrium prices. In fact, due to such concentration on the supply side, deregulation may produce higher prices. Therefore, legislation (most ideally general antimonopoly laws), must make it illegal for a firm with large market share to take advantage of the situation. Furthermore, deregulation with a split of a large company might yield a reduced market price. Andersson and Bergman (1995) found that it was desirable to have at least five similar-size-firms competing in the Swedish market as their possibility to influence prices is greatly reduced. An increase in concentration on demand side of Swedish electricity market may be one method to counterweight the high degree of concentration on the supply side, for example, organized cooperation among consumers or the development of large wholesale firms. They also concluded that the integrating of Sweden and Norway may yield more favourable market conditions.

Based on the analysis of Brunekreeft (2002) of the German experience, market liberalisation has three aspects;

1. Deregulation: is the removal of legal entry barriers
2. Restructuring: is the designing of the industry so that competition may be developed in a sustainable way.
3. Privatisation: is the reduction of government control on the daily operation of the firm or sector.

On the other hand, Paul L. Joskow (2005) specified seven components as the fundamental steps to be taken for electricity market reforms;

1. The vertical separation of competitive elements like generation and retail from the regulated elements of distribution, transmission, and system operations.
2. The horizontal integration of transmission and network operations in order to ensure that wholesale market dealings are performed under the 'governance' of a single and independent system operator (SO), hence ensuring that supply meets demand while frequency, voltage and overall system stability are maintained at all times.
3. Establishing the required institutions for the wholesale market and the operating reserve market for electricity in order to allow for economic trading of electricity (dealings among suppliers, sellers and buyers) while maintaining the requirements of real-time balancing (allowing for a fast and effective reaction to any unexpected shortfalls of the electricity system in place).
4. Establishing the needed institutions for facilitating access to transmission networks supplemented by adequate mechanisms for the efficient allocation of the limited transmission line capacities.
5. The horizontal restructuring of generation, with forward contracts and rules limiting exposure to market power with the wholesale market.
6. Retail tariff separation so that the prices for distribution and transmission (usually regulated monopolies) are distinct from prices of power suppliers and their supporting services.
7. Allowing consumers to get their power requirements directly from competing retail suppliers which are, on the other hand, allowed to procure their requirements from wholesale markets.

In his later work, Paul L. Joskow (2006) introduced a ten-component 'Textbook Architecture' for restructuring and competition. More explicit than his previous work, this Textbook Architecture included the sale of state owned utilities and the introduction of adequate regulation if policy makers decide that market cannot be subjected to a pure competition mechanism. Moreover, the amendments clearly state the need for independent regulatory agencies. Joskow's later additions illustrate that electricity reforms are evolving and that a variety of combinations may exist depending on the market structure (and its anticipated behaviour) for which these reform components are to be applied.

From earlier parts of the research we recall, however, that in order for privatisation to yield meaningful economic gains, such reduction of control by the state must be complemented by a genuine transfer of associated risks.

2.3.1 Electricity Supply Chain Functions

In order to understand the suitability of different electricity market structures to country specific conditions it is important to understand the physical characteristics of each component of the electricity supply chain, including generation, system operations, transmission, distribution and supply.

Wholesaling and retailing are trading functions, while the transmission and distribution functions are transport related (Hunt, 2002a). According to Hunt (2002) generation and distribution are the largest contributors to the final cost of the electricity supply chain. Generation usually accounts between 35-50% of the cost while transmission accounts for 5-15% and distribution for 30-50%.

As explained by Xu Yi-chong (2004); 1) *generation* is the process by which coal, nuclear power, gas, oil, wind, and other forms of energy is converted into electricity, 2) *transmission* consists of two functions; *i*. transporting electricity from a large number of generators via high-voltage lines (voltage is stepped-up to reduce loss over the wires), and *ii*. the balancing of production and consumption simultaneously (which is the responsibility of the System Operator), 3) *distribution* is the transporting of electricity via low-voltage lines (after voltage is stepped-down) to individual end-use consumers, and 4) the *retailing functions* may include making individual connections, meter reading and billing etc.

It is also usual that competition is first introduced in the generation segment filtering through to the wholesaling and retailing segments of the market. However, the functions of transmission and distribution (primarily in small markets) are potentially natural monopolies and most policy makers tend to keep them regulated. The retailing elements of distribution (individual end-use customer connections, metering, billing etc.) are usually competitive and may be easily contracted out even in markets where the electricity service is a state-owned public utility.

Transmission is a special element of the power system. In order to understand the complexity of market design for transmission, we need to understand some technical details about the way electricity 'travels in the wires' (Bautista et al, 2007). Transmission lines carry electric power between two long distance points (at high voltage to reduce power loss over the wires). This operation involves, never-the-less, some power losses (that requires proper compensations and accounting implications), as well as transmission line and voltage limitations (causing congestion and possibly limiting the entry to some local or regional generators). Such physical constraints entail congestion charge to be passed on to sellers or buyers and may sometimes deprive some local or regional generators from entry. The transmission system also requires a balancing mechanism where reserve power is purchased by the System Operator at varying costs to 'top-up' the system as voltage must be kept between operation maximum and minimum limits at all time. If not properly administered, the system may experience a partial or total black-out causing great financial and other undesirable losses. Consequently, transmission remains a concern for market power exploitation and security of supply. It is often observed that transmission remains state-owned – but does not necessarily need to be – or somewhat state-controlled to stop undesirable takeovers – as justified by the government's 'golden shares' of the British National Grid Company – at the early stages of power sector reforms (Robinson, 1996).

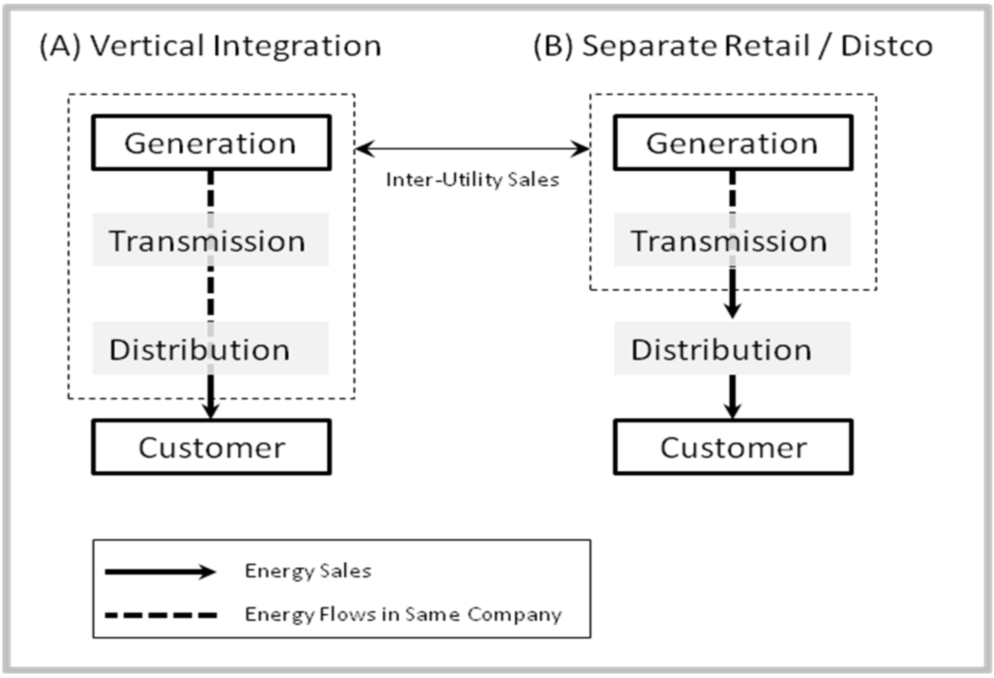
2.3.2 Electricity Market Structure Options

Joskow (2005, p. 34) stated that 'Electricity sectors almost everywhere on earth evolved with (primarily) vertically integrated geographic monopolies that were either publicly owned or subject to public regulation of prices, service obligations, major investments, financing, and expansion into unregulated lines of business'.

Following Hunt (2002) we discuss four distinct *models* of electricity market structure that allow for varying degrees of competition.

1. Vertically integrated monopoly: in this case there is no generation competition while the system is bundled as a state-owned industry or regulated monopoly.

Figure 2 Vertically Integrated Monopoly

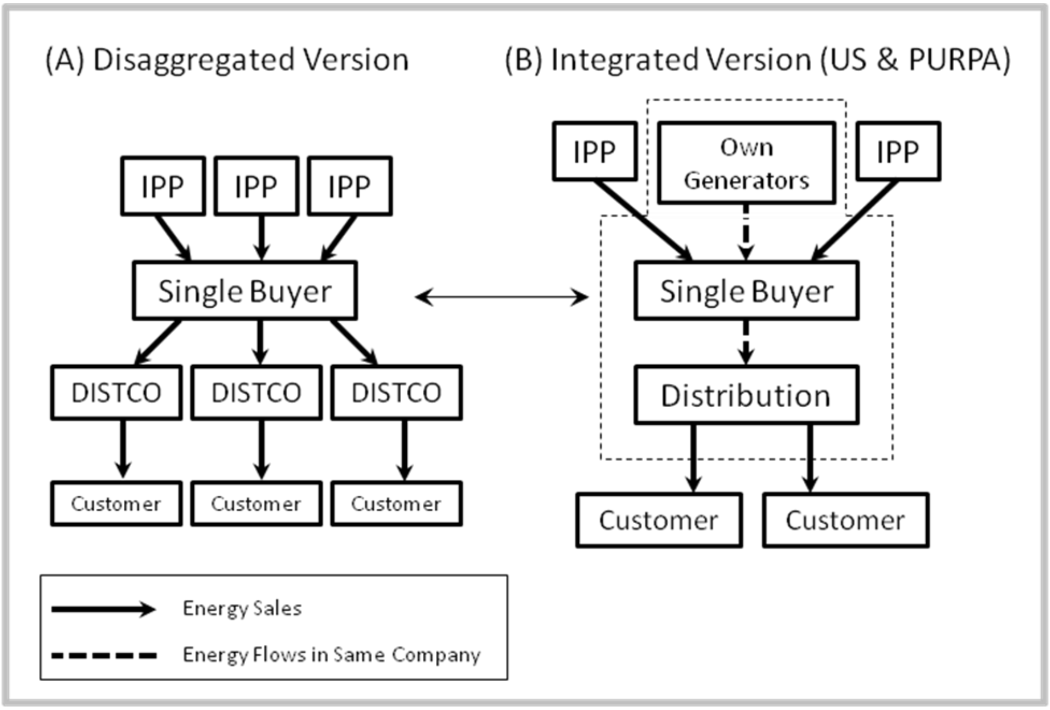


Source: Hunt (2002, p 42)

In this model (as shown in Figure 2), all trading and transport related functions are carried out by a state-owned service utility. Here the entity acts – in a self-regulating capacity under government ownership - as the 'guardian' of customer interests. The market involves a very limited number of institutions and participants and few if any contractual arrangements due to the vertically integrated nature of the electricity functions.

2. **S**ingle-buyer model: where a single-entity acts both as a monopsonist and monopolist and is at the centre of this market structure. In many cases, this has been the first step of market liberalisation involving long-term contractual arrangements between the single-buyer and the various IPPs.

Figure 3 Single-buyer Model

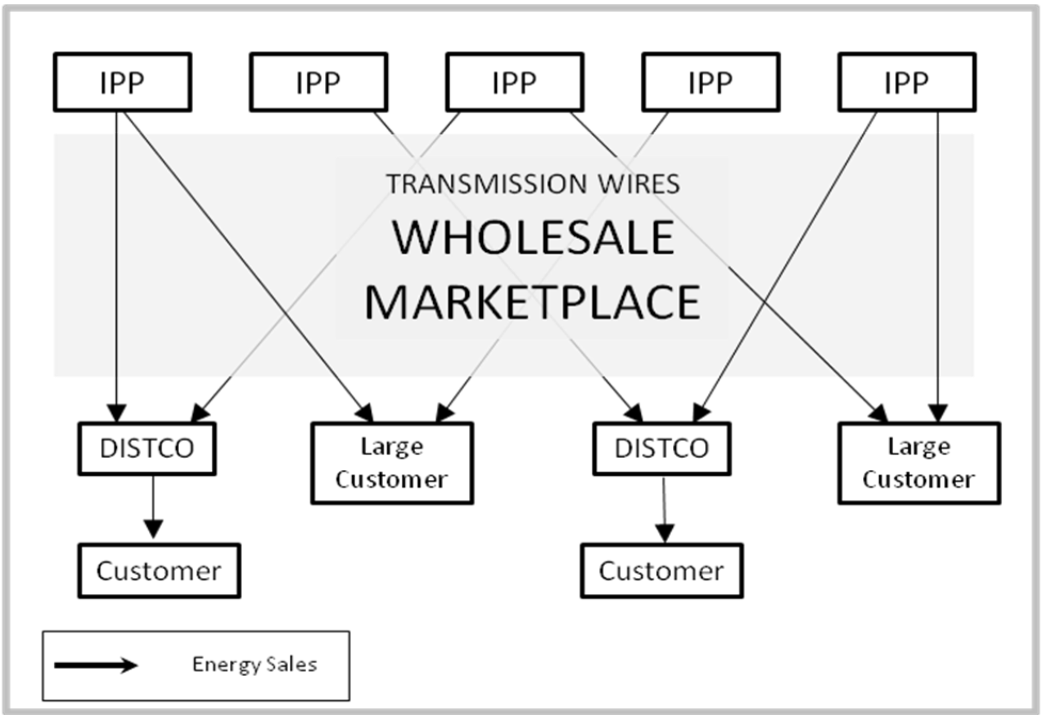


Source: Hunt (2002, p 43)

As shown in Figure 3, this model allows for generator competition 'to enter the market', with generation separated from transmission and distribution. This model requires new arrangements to govern the newly introduced institutional and contractual relationships as the market comprises many private and public sector entities. Furthermore, the participation of private sector entities raises a question about the appropriate form of regulation and its independence.

3**.** Wholesale Competition: allows for full competition in generation and allows a limited number of large customers to choose to be supplied by a generator.

Figure 4 Wholesale Competition

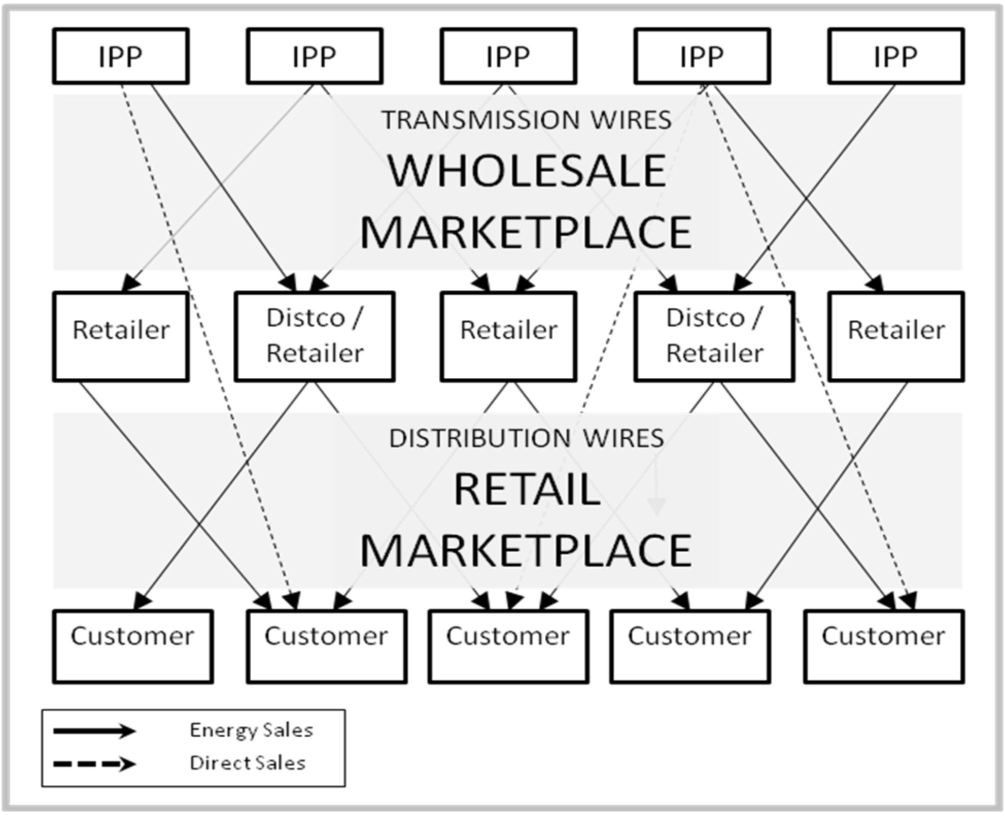


Source: Hunt (2002, p 45)

Figure 4 shows that in this model there is full competition in generation requiring full details of the market rules and regulations to be specified ex-ante. The generation market is subject to higher transaction costs as - unlike the single-buyer model - before making market entry investments IPPs have to search for and contract with a sufficient number of distributors and/or customers to ensure cost recovery. There is also a requirement with this market structure for more extensive regulation to safeguard the interests of customers who can transact with privately owned generators. Moreover, it would be important to ensure that a market subject to wholesale competition was large enough to sustain enough participants to guard against concentration and collusion.

4. Retail Competition: according to Bacon and Besant-Jones (2002) – and as discussed above – while the previous three market structures can be categorised in accordance with increasing degrees of competition, it is only through retail competition that customers are optimally able to choose freely their suppliers.

Figure 5 Retail Competition



Source: Hunt (2002, p 54)

According to Figure 5, there is full competition in the generation and retail activities, and so provided the market is large enough to prevent concentration and collusion, we would expect this model to offer higher economic welfare than the previous three market models.

In principle and following on from the above analysis, generation and supply are two elements of the electricity supply chain that could be subjected to full competition. However, subjecting generation and supply to competition may be constrained by possible market failures, due to market size limitations and concentration. Transmission is a natural monopoly and distribution is widely regarded as having natural monopoly characterises (Hunt, 2002).

Thus far we reviewed a number of possible electricity market structures and noted differences in the scope for competition that will influence each markets potential to improve social welfare. For the purpose of this research we use Multiple Criteria Decision Analysis (MCDA) to select the *model* most suitable for GCC electricity market reform. This method of analysis – drawn from the basis of Value Tree Analysis – can be put to practical use for public policy problems. Through the use of MCDA, policy makers may be informed on adequate decisions after comparing a set of alternative choices (HUT Systems Analysis Laboratory, 2009). More specific to this study, this method of analysis tests each of four *models* of electricity reform on the basis of a number of criteria set by this researcher. Furthermore, in order for us to better understand the practical applications of each *model*, Chapter 3 reviews worldwide experience of implementing IPP, wholesale and retail competition based reforms.

To further support model selection, the research applies social cost-benefit analysis (SCBA) to the Omani case study. According to Brent (2006), SCBA widens the scope of analysis to include other effects of the project on all individuals in the society. More relevant to our research, cost-benefit analysis has been used to evaluate public divestiture policy by evaluating the net gains (loses) as a result of privatisation (or reform) for all parties involved. Our use of SCBA in Chapter 7 draws on work already carried out by Jones et al. (1990), Galal et al. (1994), Newbery and Pollitt (1997), Damsgaard and Green (2005) and Green and McDaniel (1998).

2.3.3 A "Textbook Model" for Restructuring and Competition

Professor Stephen Littlechild, the first UK electricity regulator, has summarised reform in a 'Textbook Model' for Restructuring and Competition which he also referred to as the 'standard model' (Littlechild, 2006). This Textbook Model is made of 10 components for reforming the electricity service utility:

- <u>Privatisation</u> in order to increase performance levels and reduce state intervention,
- <u>Vertical separation</u> to separate the competitive segments of the market (like generation) from the regulated activities (like transmission and distribution),
- <u>Horizontal restructuring</u> so that there are adequate numbers of competing suppliers service providers,

- Designation of an independent system operator (ISO) in order to guarantee network stability and encourage competition,
- Creation of markets and trading arrangements in order to facilitate trade transactions and to provide for system real-time balancing arrangements,
- Application of regulatory rules for transmission network access on a non-discriminatory basis so that all generators are allowed to compete on equal grounds,
- Unbundling of retail tariffs to promote competition at retail level by enabling access to distribution networks,
- Specification of customer supply arrangements in the absence of retail competition,
- Creation of an independent regulatory authority, with enabling powers and adequate human and financial resources in order to be able to administer its primary roles of incentive regulation and the promotion of competition, and,
- Provision of transition mechanisms that facilitate a smooth reform process while responding to any obstructions that might be encountered (after Littlechild, 2006, p. *xvii*).

Littlechild argues that the *Textbook Model* must be complemented by a 'do nothing more' component as government agencies seem to be tempted to over-regulate service utilities.

In comparison to that of Joskow (2005) and Brunekreeft (2002), Littlechild's presentation of the Textbook Model proves to be more elaborate with less overlap between the different components for reform. Therefore, for the purpose of this research, we have used Littlechild's Textbook Model to cross-check the reforms undertaken internationally and to examine the scope for reforming GCC electricity markets, and specifically to inform the case studies of electricity reform and market restructuring in Oman and the Emirate of Abu Dhabi. By applying this model, the researcher aims to obtain higher consistency in this investigation and optimally arrive at a set of applicable regulatory and market reform recommendations for the GCC member states.

2.4 Regulating Electricity Functions

In its simplest forms, *to regulate* – which is a government function – would be to impose some elements of control over the activities and of a given private or public enterprise. Regulation is, therefore, an act of some interference by the state and need not be imposed if it can be replaced effectively by other means of market mechanism. Based on Reiche et al, (2006), there are four basic principles to be followed in order for regulation to be effective. First, is to adopt simple regulations that minimise costs on both regulator and the regulated enterprise. Information requirements should be kept to a minimum while regulatory reviews should be as infrequent as possible; second, regulators should be encouraged to delegate their tasks to other relevant government or non-government organisation whenever possible, for example by subcontracting its original tasks to local regulators if no conflict of interest is envisaged; third, the regulator should be flexible. Legislation should allow regulators to respond as they believe appropriate to situations as they arise; and fourth, regulation must ensure that standards are realistic and affordable and can easily be monitored and enforced. Box 1 lists four important questions relevant to regulatory design.

Box 1 Basic design questions for regulation

1. Jurisdiction: What entities should be regulated?
2. Coverage: What activities or parameters should be regulated?
3. Method: How regulation is implemented?
4. Responsibility: Who should perform regulation?

Source: Reiche et al (2006, p.13)

While too little flexibility may hinder the functionality of a regulator, too much flexibility is not to be given without caution. Depending on the organisational structure of the regulatory authority, too much flexibility may result in excessive use of regulatory power especially if decisions are dominated by an individual rather that a board of directors. Furthermore, some regulators - although established as independent bodies – are not entirely free from political and commercial pressures.

2.4.1 Regulation, Deregulation and Liberalisation

Stoft (2002, pp8-9) argues that ‘Deregulation requires the market not be a strong natural monopoly. If a monopolist can produce power at significantly lower cost than the best competitive market, then deregulation makes little sense. ‘Deregulation means ceasing to regulate’ (Hunt, 2002a, p.15). In the absence of economic justification for reforms, keeping the status quo becomes the inevitable choice for policy makers. In other words, regulated activities continue to be regulated. On the other hand, a prerequisite for choosing deregulation would be the prior examination of the prevailing and expected market mechanisms. Policy makers need to be convinced that the proposed system would have enough elements of competition and transparency so that it is guarded from the possible use of excessive market power. With this regard, we need to investigate two distinct arguments adding to the complexity of making a choice to deregulate. First, due to economies of scale, natural monopolies should be capable of delivering services at the lowest possible cost. Other things being equal, a sensible regulation may in turn yield the best possible value for money. An attempt to deregulate the service utility may produce fierce competition at the start, but soon, much of the awaited benefits of open market reforms may vanish as larger utility service providers may drive the smaller competitors out of business. This may not only result in higher consumer prices, but also act as a natural barrier to entry causing deregulation to loose much of its relevancy and credibility.

Based on Damsgaard and Green (2005), deregulation may be better described as re-regulation or liberalisation. In a more simplistic way of describing the process, it is the increase of market mechanism (competition) in the deregulated sector. It is assumed that within a deregulated market, competing firms will keep costs down as they are not guaranteed a full recovery of their investment, thus yielding lower prices to end-users. Another added feature of liberalisation is the unrestricted new entry to the sector. In order for new market players to survive competition, they must introduce new management styles along with new technologies and hopefully lower market prices.

Cecilia Ugaz (2003, p.83) presented a general, yet a multidimensional view to why regulate? ‘Utility regulation has three main objectives: to protect consumers from monopoly power resulting from lack of competition in the utility markets; to support investment by protecting investors from arbitrary action by government; and to promote economic efficiency’.

Another argument relates to the unnecessarily frequent government interventions or use of regulatory authority. We may probably arrive at a conclusion at a later stage that there is no agreed definition for ‘free service utility market or free electricity utility market’. It will become more evident in the later parts of this research that most market opening reforms ended up with one form of regulation or another. The argument at this point is that once deregulation is chosen over regulation, due to political pressures, governments would find themselves in a difficult position not to interfere with market mechanisms. This would again not only distort the market but also send the wrong long term signals about investment appraisal associated financial risks. In such case, the market may be better off with regulation than having to live with many uncertainties.

Klodt (1997) provides two policy lessons with respect to the choice of regulation over deregulation. In the first, private monopolies require no supervision if the respective markets are ‘contestable’ while in the second; regulation needs to concentrate on ‘monopolistic bottlenecks’ without any interference with non-monopolistic parts of the market. On the basis of such policy, market reforms may separate the different segments of the market; while market design may account for regulation in areas of ‘concern’, it must be left to pure-competition mechanisms to deal with the ‘contestable’ segments of the market. Drawing from the American experience of the breaking up of AT&T (a case of communication network natural-monopoly), Henning Klodt (1997) assumed that ‘markets may be competitive even in the presence of high fixed costs’. Incumbents may be ‘attacked’ by the hit-and-run ‘contestability’ of new entrants. However, Littlechild (1997) suggested that in order to draw such policy from the theory of contestable markets - with the assumption of zero sunk costs - uncertainty arises in identifying such markets, and hence, that very few markets met the assumption of zero sunk costs and would be suitable for this policy to be applied.

Based on the work of Kay and Vickers (1990), market power is a reason for regulation. Even if competition is desirable, the threat of potential market power makes it not feasible to deregulate the market. Illustrated in Figure 6, while the typical case for competition is both feasible and desirable, the three cases of market failure are where competition is:

1. Feasible but not desirable: this is a case where the benefits of economies of scale of limited market player(s) overweigh the choice of induced market competition. A good example would be in the case of a contestable market where sustainability[7] is questionable (Littlechild, 1997). If, in a contestable market, the incumbent's fear of new entrants' competition keeps prices at levels near to costs, then such theory of contestable markets shows how potential entry would discipline the market. However, 'cream-skimming' is a cause of concern that makes deregulation undesirable. In the absence of entry regulation, new entrants may seize certain opportunities to only compete with the incumbent in profitable segments of the market, and hence, regulation may include market entry restrictions;

2. Desirable but not feasible: in which case regulation is necessary to offset market misbehaviours like in the cases of *monopoly, monopsony,* etc.

3. Not-desirable and not feasible: this is the case of natural monopolies where market power exploitation is very likely and market conditions do not support competitive behaviour.

Figure 6 Desirable and Feasible Competition

		Is Competition Desirable?	
		Yes	**No**
Is Competition Feasible?	**Yes**	Typical case	Cream skimming
	No	Dominant incumbent(s) prevents entry	Severe natural monopoly

Source: Kay and Vickers (1990, p. 227)

Natural Monopolies is a case where competition is not feasible and regulation is required. Xu Yi-chong (2004, p.14) assumes at least five products of natural monopoly trends. *First*, the industry or service is capital intensive, and therefore, imposing financial difficulties for new entrants. *Second*, the product or service is recognized as a necessity, and in such a case, any failure may cause a wide spread and non- tolerable impact to the general public. We may assume here that, more than economists, politicians are expected to rally for regulation.

[7] A sustainable natural monopoly is one where there is a set of prices at which the incumbent can meet market demand while covering its costs, and no entrant can cover the cost of meeting part of such demand. An unsustainable natural monopoly is one where no such set of prices exist.

Third, the commodity is non-storable. It is to be noted that this is a common feature among the different service utilities like electricity[8], telephony and railway. However, some elements of such non-storable service industry may be separated and, therefore, be subjected to competition. The later stages of this research show that by vertical disintegration some parts of the electricity service utility can be 'unbundled' and may be subjected to market competition mechanisms. *Fourth*, the service can only be produced in favourable locations. We must add that some situations challenged by environment and geological and geographical constraints. More than any other service, this is very noticeable in the case of electricity transmission. Fifth, the service involves direct connections to customers. Many legal and administrative complexities are associated with this attribute of monopoly trends.

However, deregulation just like regulation has its own cost implications. Some hidden costs of deregulation that are sometimes overlooked by policy makers come from the fact that ‘deregulation’ comes with a new set of bureaucracies. For example, within few years after opening the power utility market in California, rules and rule-makers expanded hugely. The single responsibility of regulation of the Public Utilities Commission (PUC) was shared, after market deregulation, between the PUC, the Independent System Operator (ISO), the California Power Exchange (PX) and a Market Surveillance Committee alongside with other new agencies (Palast et al, 2003). The same scenario was also seen in the United Kingdom (through the England and Wales electricity reforms illustrated in Section 3.2) and may be repeated elsewhere as part of the ‘deregulation evolution’.

Moreover, the existing rules of a particular market are decisive in the level of deregulatory reform. Newbery argued that, most importantly, the ‘rules for market behaviour' should be set out before embarking regulatory reform[9]. Good market design yields less regulation and intervention, if any. It is almost a prerequisite to establish the right market rules and conditions before rushing into the phase of economic reforms. Even so, worldwide experience would bear witness that even with well-debated precautions taken at the stage of market design - usually a feature of the democracies of Europe and America – there would always be teething problems to deal with at the early stages of reform implementation. Russia

[8] Technology to store energy from electricity exists, however it is rather limited in scale while costs are relatively much higher than production costs.

[9] Based on a meeting with Prof. David Newbery, Professor, Faculty of Economics, University of Cambridge on 28 June 2006, Cambridge, UK.

is probably a good example of the possible adverse effects of ‘hurrying’ in the absence of structural and regulatory reform. While some argue that tariffs in Russia were very low – not allowing to even cover the costs – others may argue that tariff increases were too sharp that they imposed constraints on the living standards of people and the economic development in general (Yi-chong, 2004). In any case, regulation must take in account two relevant elements; investment and pricing. Knowing that both elements are the usual responsibilities of a regulator, it is most unadvisable to follow the temptation of expanding on privation before setting the proper relevant market design – an argument well presented by Newbery above. In the case of Russian electricity reform, one hurdle was the non-payment problem. Cash collected over total amount billed was just 80%. The problem was even made worse by ‘non-billed consumption’ (Kennedy, 2003, p. 751). Furthermore, the shock also may come years after the reforms are introduced, as will be observed later, in the case of the Californian power sector reforms. The research suggests, at a later stage, that poor market design as well as frequent government interventions were among the main contributors to market failure in California.

Based on Rothwell and Gómez (2003, p. 78), ‘The economic theory of regulation maintains that the institutional arrangement that eventually is preferable in a regulated industry is the one that maximizes social welfare through minimizing social costs and maximizing social benefits. In some countries, it is possible that government ownership with government oversight maximizes welfare. However, in many countries, private ownership with independent regulation is better able to minimize social costs of providing electricity’. Among other measures, independent regulation must relate to minimising potential exposure to market ‘misbehaviours’ by limiting market concentration.

In order for privatisation to work, the conditions need to be set in advance including post-privatisation regulatory reforms and in order to understand the relationship between privatisation and the subsequent possible regulatory reforms associated with it, we need to establish the ownership characteristics of a private entity. The foremost feature is that shares are exchangeable. Although control in the private entity is a collective act, the rights to trade or 'exchange ownership' may be exercised individually (Ricketts, 2004). This very character of the private entity, if not regulated, allows for the transfer of assets from the diversified hands of the many to the concentrated hands of the few, a case in which there are few firms owning assets or a few controlling shareholders (even if the assets are divided among many firms with common shareholders). If this leads to market concentration, market outcomes may then be influenced by the few, therefore, establishing ground for regulation as part of the reform process in order to minimise possibilities of collective firm actions or measures that may – consequently - lead to market power exploitation. On the other hand, regulation needs to take into consideration certain rules allowing for mergers of assets – which do not necessarily entail added ownership concentration – and are often associated with increasing efficiency or raising productivity levels and other financial and economic gains.

It is then likely to expect post-privatisation regulatory reforms to be concerned with the possibilities of market concentration. In such case, one or a very limited number of firms take possession of the market. Market reforms, therefore, need to be designed in such a way that the incumbent - usually state-owned - is broken up into smaller entities, or separated (unbundled)[10] before ownership is transferred from to privately-owned firms or individuals. Regulatory reforms must also be concerned here with the potentiality of future mergers and acquisitions.[11] Gilardi et al (2006) argued that the time of reform is also a time of regulation. It should, therefore, be reasonable to assume that freer markets imply more rules and regulating agencies. Moreover, a link can also be established between regulation and regional integration. The EU is considered as a good example where an economic zone can rely on the use of common regulation in order to overcome its insufficient human and financial resources that may limit the process of integration and harmonization.

It is vitally important to recognise that privatisation may be carried out successfully only if market conditions are correct and vice-versa an adequate market design would be required in order to embark on a thriving privatisation programme. Proper market design includes proper regulatory reforms. In this section, the research covers a range of terminologies that are most relevant to the market reform in general and regulatory reforms in particular. Regulatory reforms also involve the establishment of independent regulatory authorities. Some argue that such authorities give a good signal to investors. Gilardi et al (2006) explain that ‘this signal conveys the following message: we are serious about private investment and we assure you that we are committed to stable decision making’. Any reversal policies become difficult once such autonomous regulatory authorities are established.

[10] The research covers at a later stage the different forms of unbundling.

[11] The later sections of this research cover *ex post* and *ex ante* forms of electricity regulation.

Based on Yi-chong, (2004), market reforms are usually concerned with three categories, namely; ownership, the structure of the industry and the regulatory framework under which the new market operates. Regulatory reforms are part of a progressive process that aims at promoting competition thorough market mechanisms – whenever possible - along with the adequate regulatory mechanisms. Here, we must find a proper 'recipe' that allows for a market driven mechanism with minimal requirement for regulatory mechanisms.

In the case of deregulated segments of the market, for the service utility business environment to work mainly on the basis of market mechanisms it would require a good amount of reliable and published information, a manageable market concentration, and minimal, if any, politically influenced decisions. (i) Information is the basic ingredient for market efficiency. Consumers and governments alike need to make sure that they are not imperfectly informed. In the case of regulated markets, government intervention is sometimes vital to guarantee the flow of information. State information policies must ensure that market is 'moving towards the full-information equilibrium' (Katz and Rosen, 1998, p.575). Markets are bound to lack efficiency in the case of asymmetric information. To deal with such a deficiency, governments often intervene – on behalf of consumers – by setting up consumer protection commissions (Breyer, 1990) or competition authorities. (ii) The degree of market concentration is an important factor in determining the possibilities for market efficiency. In the case of a market that is made up of one or few firms, such oligopolies would always be tempted to exploit market power. (iii) Reforms are often distorted by excessive government interventions. This is clearly illustrated by the consequences of state interferences in the reforms of California and Argentina reforms to be presented in Chapter 3.

On the other hand, when designing for regulatory mechanisms, they need to aim at increased efficiency while keeping the administrative cost down (Gönenç et al, 2001). One problem that can be envisaged is that of the principal-agent relationship. As information is not readily available to the principal, the *contract* has to include some incentives to the 'agent' in reward for its increased performance or decreased wastage of resources etc. It is then the responsibility of the regulatory body or 'principal' to include such performance-related incentive schemes for the 'agent' so that the agent will 'behave as the principal wishes' (Begg et al, 1997, p. 52).

Over the years, economists were able to test a number of regulation mechanisms on the reforms of various service utilities. For network utilities like power, gas, water and telephony, reforms included the use of three methods: (a) the yardstick method was used at a point in time by regulators in Britain for the electricity and water supply industries. Here, the performance of other firms - for example capital requirement, profitability, costs of technology and other inputs - is used as a benchmark to compare that of the regulated firm (Gönenç et al, 2001). The firm's regulated price is not based on that firm's performance, but the industry's average cost as a whole. While this method was seldom used in a pure form, cost comparisons are frequently made in method (b) incentive regulation as will be see in the following Chapter. Some jurisdictions still use method (c) – the rate of return method.

While prices are the residual in the case of rate of return methods, profits are the residual in the case of incentive regulation. A comparison of these two methods can be found in later parts of this research on the subject of transmission regulation.

Regulation must also take account of externalities both positive and negative. Once again, proper regulation must be designed to deal with such irregularities in the absence of free market mechanisms. Based on Kay and Vickers (1990, p. 226), 'externalities arise when the well-being of one economic agent (consumer or firm) is directly affected by the actions of another'. In the case of a utility-network in rural areas, externalities may arise since high electricity charges might add to pressures to leave the area and move to towns, worsening (undesirable) rural depopulation. Here, some regulation – in the form of subsidies – may be desirable.

One aspect of utility-regulatory reform concerns the relationship between regulation and competition authorities. In the case of developed economies like the UK, the Monopolies and Mergers Commission (MMC) was established in 1948 - long before any steps were taken towards service-utility regulatory reforms. Before the MMC was established, it was the duty of common law to safeguard against any anti-competitive, market exploitation or other abnormal market behaviours. It was sometimes argued that regulation must not be – in the long-term – a replacement for competitive markets. Instead, regulatory bodies should aim at inducing enough competition to a sufficient extent that further involvement would not be required (Lipworth[12], 1993). However, later parts of this research illustrate that natural monopolies like transmission and distribution networks require continuous attention in terms of regulation. Furthermore, 'Careful consideration should be given to the initial restructuring of the sector, as any new structure will tend to create vested interests that may resist or complicate subsequent adjustments to the structure of the sector (Jamasb, 2006).

2.4.2 Regulating the Wires

According to Günter Knieps as cited by Debreu et al (2001, p.275), 'As it turns out, government regulation of interconnection/access conditions (tariffs, quality of access, etc.) is only justified in those parts of networks where market power can be identified ex ante'. Knieps argued that characteristics of network structures are not enough to guarantee market power. Competition can be introduced if all existing and potential suppliers are ensured equal access to the network. However, a market power situation is expected to arise in the case of economies of scale as the relatively huge sunk costs may deter market entry and in such cases, the incumbent may enjoy a comparative advantage over potential entrants.

From previous sections we understand that electricity transmission and distribution are usually considered natural monopolies. While they need not be state owned, as in the case of many OECD countries, they are required to be regulated. In the case of network industries, competition may not safeguard the market from any excessive price increases to consumers. The natural monopoly of electricity networks may also limit entry for small generators.

Governments could choose to privatise the wires; however, regulation would still have to deal with the problems arising from this principal-agent relationship. 'Here the agent, the regulated firm, [is] better informed than the regulatory authority about that firm's costs of production, effects of certain regulatory measures on profitability and, in most cases, future demand forecasts' (Gönenç et al, 2001, p. 30). In dealing with the problem, regulation must provide incentives that would encourage the transmission and distribution regulated-firms to better fulfil their part of the contract or 'relationship'.

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[12] Sir Sydney Lipworth was the Chairman of the UK's Monopolies and Mergers Commission when the paper was presented in 1993.

In deregulated markets transmission requires a system operator (SO) and a mechanism of settling differences between contractual and actual power flows. Hogan (1998) suggested that a bid-based spot market is required in order to ensure an open access system. While a system operator is essential to insure uninterrupted supply, other mechanisms may be established to allow for open access and a minimal level of fair competition.

The System Operator (SO)

The management of electricity systems requires generation to closely and continuously match demand. This is due to the fact that electricity can not easily be stored and needs to be consumed at the rate of which it is produced. The System Operator (SO) or Transmission System Operator (TSO) is therefore responsible for an integral part of the market infrastructure that is inherently a natural monopoly. Due to the special nature of electricity, one single system operator is needed to control the physical operations in each area, balance hourly demand and supply and coordinate with nearby areas. The main role of the SO, therefore, is to predict power demand for a given hour then match such demand with the bids received. While power is wasted by excessive supply, either too much or too little supply could result in a total blackout. Since this particular property of electricity requires that demand has to match supply at all times for the system not to be interrupted, output (both planned and actual) has to match loads. This is called real-time balancing which is the responsibility of the SO.

Based on European Union Legislation (EU Directive 2003/54/EC, 2003), the Transmission System Operations need to be separated with the main tasks including:

(a) ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity; (b) contributing to security of supply: (c) managing the energy flows on the system including considerations for exchanges with other interconnected systems; (d) providing sufficient information to other operators – for the purpose of ensuring secure and efficient operation to other systems with which its system is interconnected; (e) ensuring non-discrimination as between system users; and (f) providing system users with the information they need for efficient access to the system.

Article 10 of the Directive also states that the TSO shall be independent from any activities not relating to transmission - at least in terms of its legal form, organisation and decision making.

Methods of Price Regulation

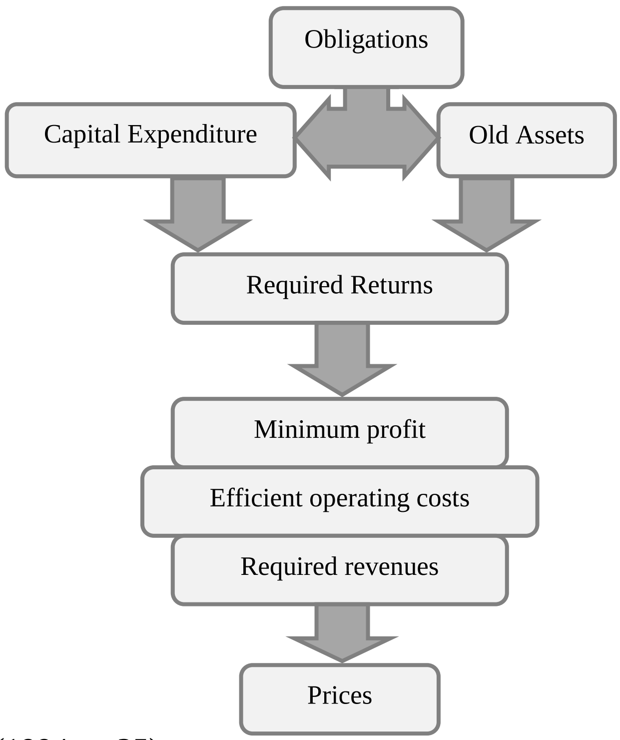
Two methods of price regulation are used to regulate different parts of the industry especially the wires: a price cap and a cost-based or rate-of-return regulation. Different from the cost-based regulation, a price-cap gives an incentive for the transmission network utility to cut cost (Newbery, 1999). In terms of time frame, a price-cap is announced for a specified period of time, allowing firms to benefit from any cost cuttings, whereas rate-of-return regulation is designed to allow for a presumed fair return on investment, raising the price when the returns do not justify the investment (Green, 1997).

Generally speaking, electricity transmission in the OECD is governed by a cost-based regulation. In this case, regulated firms can earn revenues equal to their historical costs including a return on investment corresponding to the cost of capital. Exceptionally, Italy, Norway and the United Kingdom use a price-cap regulation for electricity transmission. The regulator here sets a cap with an incentive factor X, to induce lower costs, for a specified period of time. The complexity of such regulation lies in determining the value of X over each period of time. As the time period between reviews becomes shorter, the 'RPI-X' or Price-cap regulation becomes closer to rate-of-return regulation (Gönenç et al, 2001).

'One the major defects of conventional rate-of-return regulation is that it makes no provision for distinguishing between the different sources of profit: superior performance, monopoly and luck' and therefore, 'superior performance is discouraged, and monopoly power is marked by inefficiency and high costs' (Littlechild, 1983, p. 32). In search of a profit ceiling scheme, Littlechild argued that calculations of an RPI-X price cap regulation are simpler than those associated with rate-of-return calculations while they yield increased efficiency. Here, the cap is set using the simpler price indexes rather than calculating rates of return and undergoing departmental cost separation. Also cited by Armstrong et al (1994), the RPI-X method, according to Littlechild's findings, yields better results in terms of: minimizing monopoly, increasing efficiency and innovation, lowering the load on regulators, encouraging competition while it allowed the firm potential future profits and hence the sales revenue to the treasury.

Price regulation is based on a process that is aimed at delivering the service at an appropriate price – neither too high or too low - so it ensures that customers' interests are protected while allowing privatised entities to cover their costs including a minimum margin for profit. Figure 7 illustrates how prices are arrived at in a regulated service industry. Once standards are set, the price setting exercise then involves the evaluation of capital expenditure required, deciding the rate of return, while studying the financial conditions of the sector and examining the efficient levels of operating expenditure (Mayer, 1994). To add to the complexity of the exercise, cost of capital may not be determined only for the time at which major expenditure was incurred (both for newly installed or privatised assets). Adjustments should be made as cost of investment calculations may be as volatile as interest rates.

Figure 7 Price Regulation



Source: Mayer (1994, p. 25)

A price cap is concerned with the price level but not the price structure (Bruneekreeft, 2003). It is therefore – in many jurisdictions - left to the regulated firm to decide such *price structure,* where the ex-ante commitment of a *price level* is set based on some assumptions until the next review is carried out. As will be seen later, some GCC electricity reforming markets have already chosen to apply an RPI-X price cap regulation for the regulated segments of the electricity service utilities.

In reality, price caps are a product of forecasted costs with an adjustment for efficiency (Kay, 1996). However, regulators would find it difficult – at a later stage – to distinguish whether any savings or 'higher profits' were due to increased efficiency or rising costs. Firms tend to over-estimate their cost projections while regulators may arbitrarily reduce such estimates. In large markets with many players, a *yardstick method* may be used. When asked to give his views on water-company regulations, Professor Littlechild found the RPI-X method would soon yield an outcome much nearer to that of a rate of return regulation –different from the case of the ever changing sector of communications. Littlechild's recommendation was to use a 'yardstick' regulation, where X would then be based on comparative efficiency standards in the industry (Littlechild, 1986). Clearly, this is not an effective tool where markets are small and players are limited.

For developing counties, Parker and Kirkpatrick (2006) argue that a *rate of return* regulation policy may be advantageous when compared to a *price cap* method as the adaptation of rate of return controls offers many advantages to developing countries:

1. Ex-government regulatory staff (assuming it is the case for many developing countries) may be tempted to keep their 'old habits' of setting prices for state-owned entities equal to 'costs' whereas a rate of return policy should economise the industry.
2. Investors may also be more assured since profit margins are expected to be more stable when a rate of return regulation is adopted.
3. A rate of return policy should attract much of the needed international investment since it minimises the risks of regulatory-related uncertainties
4. Clear policy based on actual financial-information as in the case of rate-of-return calculations should be more advantageous to the using price-cap benchmarks or 'yard-sticks'. Forecasts and benchmarks are expected to be more controversial than a

more 'rigged' cost related regulations of a rate of return method (after Parker and Kirkpatrick, 2006, p.201).

2.4.3 Unbundling the Vertically Integrated Utility

As discussed earlier, transmission wires are usually a natural monopoly. Transmission is the technical process of carrying electricity from one side where it is generated to the side where it is consumed, however, limitation of the wires constrain the movement of power and, therefore, could produce different prices at each location in the grid network. Such 'Congestion pricing' would highly influence the overall price within a country and any cross-border dealings. It is therefore a common practice in most OECD[13] countries and elsewhere that early stage reforms start with the separation of the vertically integrated activities of generation and transmission.

Ocaña (2001) presented four approaches to separating transmission and SO activities from generation namely; 'behavioural measures', for the first two approaches, and 'structural measures' for the second two. *First*, accounting separation, by which the service utility is charged the same cost as those connected to the grid while maintaining separate transmission accounts. *Second*, functional separation, keeping transmission related information and staff apart from generation and other activities of the organization. *Third*, operational separation, in which case transmission functions and related activities are totally separated from those of generation, yet the service utility continues to own the two parts of the business. *Fourth*, divestiture or ownership separation (as different legal entities are formed without common owners of major shareholdings).

In the case of the OECD, different countries choose different forms of separation. For example, Denmark requires 'corporate unbundling', in practice similar to accounting separation, by creating separate legal entities for generation and transmission while keeping common ownership (Ocaña, 2001). In Sweden, it is a legal requirement to separate generation

[13] The Member countries of the OECD are: Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States, Japan, Finland, Australia, New Zealand, Mexico, the Czech Republic, Hungary, Poland, Korea, and the Slovak Republic.

from transmission, while in Norway and Finland, accounting and management must be separated (Amundsen and Bergman, 2002).

Until 1991, the electricity sector in Italy was a public legal monopoly. Partly privatized in 1999 (35%), ENEL Spa still dominates the electricity sector. Transmission is now in the hands of an independent system operator with both transmission and distribution regulated by price caps. However, ownership of transmission assets and the bulk of generations were not totally separated. While the SO operates and maintains the national grid, ENEL owned 93% of the low-voltage distribution grid (OECD Report, 2000).

A point of precaution when choosing over the different unbundling scenarios would be to check for any lost economies of scale especially in the case of relatively smaller markets.

The 'Single Buyer' Model as a Trading Arrangement

'The collective term *trading arrangements* denotes legal agreements between traders and the system operator and/or the transmission owners' (Hunt, 2002, p.121). Further, such arrangements may be in the form of voluntary 'pool based' and/or compulsory 'regulated' trading. The Brazilian pool model (presented in Section 3.6) features a combination of both trading arrangements that include 'free pool' and 'regulated' purchases of power. According to Hunt (2002), there are short term and long-term trading arrangements:

1. Short-term trading include (i) operational or *operation codes* arrangements which facilitate for access and short-term operation, (ii) commercial or *power exchange codes* arrangements that administrate the buying and selling of electricity within a particular area and (iii) interconnection arrangements that deal with both operational and commercial arrangements between the different areas.
2. Long-term arrangements including (i) connection agreements which establish the relationship between operators or transmission owners and the other market participants on the basis of fair grounds and optimal levels of efficiency, (ii) transmission control agreements in the case of independent system operators – ISO – (separate from transmission), (iii) and the use-of-the systems agreements specifying the terms and charges. Hunt (2002) also states

that long-term arrangements must also specify the conditions of other ancillary service purchases[14] between market participants as well as any approvals or licences that may be required.

The single buyer model was first introduced in the United States by the Public Utility Regulatory Policy Act (PURPA) with the aim of exerting competitive pressure on integrated utilities. Later, the model was adopted by developing countries with the aim to attract private sector investment into electricity generation especially in cases of expected shortages (Arizu et al, 2006). Similar to many trading arrangements, this method of centralised purchasing has it own potential problems including the lack of transparency and accountability, high tariffs, excess capacity as well as possible misconducts including corruption. Although such problems may have been experienced in the past, the findings of Arizu et al's (2006) study for the World Bank concluded that this model remains a valid option for many countries in the developing world. While single buyer arrangements were chosen by developing countries with financial constraints, other richer countries found the single buyer model more suitable than other wholesale competition arrangements due to market size limitations.

According to Arizu et al (2006), the term of 'single buyer' was misinterpreted in the case of the developing countries and usually refers to 'centralised purchasing arrangements'. According to their study many arrangements existed including the arrangement of a 'pure' single buyer where an independent single entity, generally a state-owned agency or firm, is responsible for the total electricity procurement and then resell to distributors and other retailers.

A case of a vertically integrated single buyer is where a vertically integrated utility is responsible for all electricity purchases while still being responsible for other functions including generation (like in the case of Saudi Arabia to be presented in Chapter 4). Using this model, competition is expected at the stage of building. Bidders have to offer most competitive prices at the stage of tendering or deal negotiation. Here, the buying arrangements are based on long-term power purchase agreements (PPAs) for 15-year terms or more. For countries that fall short of funding while facing increasing demands, such model

[14] Due to the specific nature of electricity, there are certain ancillary services purchases that are required for operating reserves and reactive power etc. (Hunt, 2002).

allows for an alternative source of capital in the form of independent power producers (IPPs). This option was chosen by many countries with unbundled electricity service utilities also in charge of procurement like Pakistan and Thailand (to be presented in Section 3.6).

It is worth mentioning that most IPPs were possible only due to the credibility of a state-owned buying utility. A private wholesale buyer may still not be creditworthy and an IPP would only be possible with some government sovereign guaranties. In effect, while the integrated single buyer option provides for the needed private investment - including some expected efficiency gains by the private generating plants - it does not truly shift the investment risk to the side of the private sector.

Another method is the functional separation of the unbundled single-buyer where generation is separated from the other utility functions including procurement. As illustrated by Arizu et al (2006), unbundling took place by either by means of functional and accounts separation (ring fencing) or by means of corporatisation (establishing separate entities). In such cases, it was more likely that transmission networks would be made available to all generators on a non-discriminatory basis, hence resulting in an increased investor confidence. Moreover, such an unbundled single buyer method should have allowed for smoother transition into further market opening and overall sector reforms. Case studies of Oman and Abu Dhabi presented at later parts of this research also show that the GCC seems to be heading for a similar choice.

Hunt and Shuttleworth (1996) stated that such arrangements of a single-purchasing agency require that it must be credit-worthy since it is required to sign long term contracts with the various generators. On the subject of ownership separation, they think that the single-buyer model ‘makes no substantive difference whether there is a separate transmission company or whether the purchasing agency and the wires are in common ownership’ (Hunt and Shuttleworth, 1996, pp. 47&48). Further, an added feature of this model is its ability to incorporate ‘social policy objectives’ in the generation bids. For example, the buying agency can set certain rules for the bid including the type fuel used (ibid).

Drawing from worldwide experience, to be presented in detail in later parts of this research, we can assume that speedy market opening could result in unbearable consequences.

Politicians and economists alike would have to safeguard their decisions from any potential market failures – like the case of Brazil where insufficient investments caused power shortage crises, Chile where droughts, lack of coordination among generators and other factors attributed to blackouts and the overwhelming price-spike of California due to market failures.

Having established that it would be necessary to regulate the network functions after unbundling we now turn to discuss the required scope of regulation and principles to guide the establishment of effective regulatory authorities.

2.4.4 Regulatory Authorities

The main role of the service utility regulator is to protect consumers against any service monopoly charging unjustifiably high prices. The regulator sets prices at levels that allow investors just enough or 'fair' returns for their investments. This is a power, Green (1999) argues, that needs not be given to one individual or a small regulatory authority without the appropriate checks and balances. 'Effectively, the regulator has the power to confiscate assets belonging to the company's shareholders by setting prices insufficient to cover the supplier's costs and allow a reasonable return on the capital invested' Green (1999, p. 1). It is therefore of great importance that reform legislations include provisions for appealing regulator decisions. Very practically, such appeals could be directed to commercial, administrative, supreme courts or any similar legal institutions. Needless to say, 'a tradition of judicial independence and efficiency opens the governance option of using administrative tribunals to resolve conflicts between the government and the utility within the confines of the existing regulatory system' (Levy and Spiller, 1996).

As outlined by Swift[15] (1995), the missions and objectives of the regulator's office must be: independence, accountability, facilitating reconstruction, control of monopoly abuse, consumer protection and acting fairly. More specifically, the regulator must be judged on the basis of: making the right decisions, through a fair process and connected to each other by

[15] John Swift QC was appointed as the Rail Regulator in 1 December 1993 after almost a year as advisor to the Secretary of Sate for Transport, UK.

means of promoting public interest within a given timetable. Based on Swift's own experience, the regulator had the following principles: a) to secure good incentives so that competitors may plan for better systems, b) to promote competitive structures and practices, c) to aid the restructuring process aiming at privatising the sector and d) to ensure the consumers are protected from market exploitation or market failure.

In a regulated environment, a major role for the regulator is to set tariffs. This is a very important task, as tariffs must be set to reflect cost. In this "game of balance", if tariffs are set too high then consumers are deprived from the awaited benefits of regulatory reforms. On the other hand, if tariffs are set too low then companies are driven out of business which may escalate to a market failure yielding in bankruptcies, limiting market entrants and perhaps resulting in even larger monopolies pressurizing the regulator to set much higher tariffs.

In order for regulators to be effective, they must be independent, transparent, accountable, and credible as well as being equipped with the required expertise (Yi-chong, 2004). First and most important, *independence* is a key element - especially from direct state influence or industry lobbying. It is therefore preferable that regulators are appointed by other than the government department concerned. Second, *transparency* is required so that quality of business conduct and efficiency are assured. Third, *accountability* is equally important so procedures are fair, decisions and arbitrations are in accordance with laws and so that over all decisions are based on economic calculations. Finally, the regulatory body must have capable staff and *expertise* in order for its decisions to be *credible* and respected by the industry.

Many developed utility markets have already established independent regulators with autonomous financial and administrative structures. However, most newly established regulatory infrastructures still use the regulatory powers of related government organizations and anti-monopoly commissions. In the case of the developed market of the OECD, most countries like Italy, Australia, Finland, the UK and the USA, the electricity transmission utility regulator is an independent regulatory agency. For Germany, The Federal Network Agency for Electricity, Gas, Telecommunication, Post and Railway – responsible for many service utilities as the name suggests - operates separately under the scope of the German Ministry of Economics and Technology (Federal Network Agency, 2007). For New Zealand, the competition authority acts as the regulator (OECD, 2001).

In the developing world, regulator independence is not enough. According to Bakovic et al (2003), independent regulators fall short in making balanced decisions due to bad starting conditions, longer than expected transition periods, unwelcome foreign ownership and less firm enforcement of the law. Bakovic et al (2003) recommended that independence should be complemented by regulatory contracts agreed between the government and the private operators. Such contracts need not pre-specify prices but must cover the regulatory treatment in a very transparent mater. Later parts of this research review the experience of regulator independence in the developing countries.

Parker and Kirkpatrick (2006) stated that regulators in the developing countries face challenges of their own. Among other issues, regulators in developing countries are often not able to fulfil their duties due to missing legal codes for appeal, underdeveloped competition policy to protect consumers, weak macroeconomic environments - with high rates of inflation and volatile exchanges rates - and limited regulator independence.

In the absence of competition authorities, regulators are sometimes expected to act as competition 'watch-dogs'. Ideally, competition authorities would be an integral part of any reform process. In a merchant environment, market behaviour is typically overseen by competition authorities to safeguard consumers from any market-power exploitation or any other market-inferiorities. A good example is the UK's Competition Commission, previously known as the Monopolies and Mergers Commission (MMC). However, regulated environments also involve competition authorities to - rightly - play the significant role of appeal bodies - undermining the otherwise unlimited 'powers' of independent regulators. In the absence of a reputable competition authority, proper market designs must offer alternative mechanisms like court referrals and international arbitration to work in congestion with the regulatory authorities. The Omani case study to be presented in Chapter 6 should investigate how the law provides for such measures in the absence of a competition authority.

2.5 Private Ownership and Reform

S. K. Nath as cited by Ng (1983, p. 31) argued that 'If we adopt a series of economic policies which make the richer group richer but have the poorer group at the same absolute level, then according to a Pareto-type social welfare function … we would be necessarily raising the level of social welfare'. However, could we agree that Pareto-type changes yield a positive net effect to the welfare of the society? In which case, economists and politicians alike could use such 'off-the-shelf' arguments to defend privatisation as an 'acceptable' ingredient for market reform. After all, shouldn't the society accept such a change if it makes a few members of the society better off while no single member of the society loses?

We must not be tempted, yet, to answer with a 'yes'. It is not the Pareto-superior principle of allocation (having at least one market player better off without any other player losing) we need to question, but its implications for social welfare and the political burden of dealing with such a proposition. Ng (1983, pp.31-32) argued that such positive change can only be assumed if 'there is no externality in consumption…if there are external effects in consumption, an individual may be made worse off even if his own income stays unchanged, as he may have envy for the increased consumption of others, or find it difficult to keep up with the consumption standard of his neighbours'.

From the above, it may be concluded that change should be acceptable – and may be socially justifiable - if it was a case of a Pareto-superior 'reform'. However, in the case of electricity, a Pareto-superior outcome may only be sustained with proper compensation, which is almost impossible. Therefore, for the applications of developing economies, the compensation principle is expected to be a more relevant 'choice' to take. Accordingly, 'gainers' should be in a position to compensate 'losers' as the advantages or 'expected gains' from reform must be established so that they outweigh the disadvantages and consequently, only in cases of market failure should regulatory interventions be continued (or introduced) to protect the public interest from any potential abuse of market power.

Secondly, we need to deal with the issue of reform from a political dimension. One can argue that politics and economics are two distinct disciplines, but they are not totally separable. Market reform options will involve making choices for the economy of a particular state or nation. However, such choices must not be made in the absence of the political will and consent of that particular state or nation. The later parts of this research will clearly illustrate – from worldwide experiences – that it is almost impossible to reverse reform once it is adopted as a policy without incurring significant costs. Government interventions due to political pressures have often led to unfavourable market reactions and more distortions and price hikes.

Furthermore, in order to increase efficiency and reduce costs, 'restructuring' is often a choice for the stage that leads the way to 'privatisation' but only with a lesser demand for political authority. In the case of electricity, restructuring is related to the commercial activities of trading energy by means of separating integrated structures of the industry while introducing some elements of competition. On the other hand, privatisation requires a genuine change of ownership and management from the state to the private sector. In some cases, as in the experience of the UK, electricity was privatised and restructured at the same time (Hunt and Shuttleworth, 1996)

It is rather simplistic to assume that private ownership will be the answer to problems of economic efficiency and government financial short-fallings. The process is more complex and ‘the effects of privatisation in any particular context will be, therefore, highly dependent upon the wider market, regulatory and institutional environments in which it is implemented' (Vickers and Yarrow, 1991, p.130). Privatisation or ownership reform, in a more generalized form, aims at increasing efficiency and financing government debts. It is however, important to note that while privatisation worked for the very developed market-based economies of the west, developing economies need to carefully study the behaviour of their respective markets as well as the capabilities of their capital markets before embarking on privatisation. Due to political implications of the ownership transfer process, governments often find themselves faced with the need to subsidize prices - at least at the early stages of reform - to end-use customers of the privatized services or entities. While referring here to privatisation[16] as an activity of ownership transfer (from the hands of the state to the hands of private firms and individuals) we need to carefully acknowledge the risk-transfer involved in order for privatisation to be complete. The complexities of such risk-transfers usually make a case for government intervention to continue even after the service sector in question is fully privatized. Furthermore, we need to highlight that as it is not possible to stop monitoring and

[16] Privatisation can be characterized as 1) privatisation of competitive firms: by the transfer of state-owned enterprise operating in competitive markets - with no market failures - to the private sector; 2) privatisation of monopolies: by transferring state-owned enterprise to the private sector where market power existed; and 3) contracting out to the private sector services that were usually performed by public sector entities (Vickers and Yarrow, 1991).

questioning the behaviour of a privatized market, consumers need to be protected from possible market failures. On the other hand, continuous state intervention may distort markets, and hence, may result in some damage that is difficult to repair. In later parts of this research lessons will be drawn in this regard from the California power market crisis of 2000-1 where wholesale prices reached 'unimaginable' levels.

Generally speaking, economic reforms start with a restructuring process that leads to privatisation initiatives, such as Independent Power Projects (IPP) in the case of electricity market reform, with regulation of some market segments. Restructuring - by means of separation or 'unbundling' - is less demanding in terms of politics and regulation alike and is usually a first step towards improved management performance and increased efficiency. According to Hunt and Shuttleworth (1996), the process of restructuring may be split into commercialisation and corporatisation. By *commercialisation*, the state passes the control to an autonomous profit making enterprise. This step usually includes the separation of the different segments of the business from the core business of the commercialised entity. Next, c*orporatisation* is the legal separation of ownership and management. Even though the state remains the owner of such legally separated entities, the state does not interfere with the day to day operations of the corporatised entity. Privatisation takes place only when ownership changes - totally or partially - from the hands of the state to the hands of the private sector.

In the UK, privatisation of service utilities has yielded significant improvements in efficiency. Almost all utilities have become customer oriented while utilities were given more freedom to invest both within and outside their core business (Kay, 1996). Moreover, many economists believe that privatisation yields grater benefits if firms are sold into competitive markets. For the UK, much of the productivity gains of privatising British Telecom and British Gas were realised – at a later stage - only after competition was introduced (Parker, 2006).

One of the fallacies of private sector participation relates to a government's ability to influence the market post reform. It is often assumed that privatisation necessitates the transfer of all decision-making power from government to private sector (Vickers and Yarrow, 1991). On the contrary, firms often want government intervention if it was for the cause, for example, of subsidising losses and providing for tax exemptions.

Nevertheless, government intervention must be kept to minimum once a firm (or sector) is subject to private sector participation. In order for private sector participation to yield positive economic gains, the process must lead to a genuine transfer of risk. Private sector entities should be rewarded for their risk taking initiatives (with some element of efficiency requirements). The RPI-X price control of England and Wales illustrated in Section 2.3 of this research provides for just that when regulating privatised entities. On the other hand, privatised entities should not expect (under normal circumstances) to be compensated for their ‘short fallings’.

Due to political pressures and/or other reasons including lack of confidence in the regulatory environment, countries may choose not to privatise certain segments of the market. However, Irwin and Yamamoto (2004) cite at least two fundamental problems with such a decision: (1) that there are other factors – not the firm’s profitability – that drive the actions of politicians and government officials. Such actions (resulting from social commitments and political pressures) are usually not directed to increasing the overall performance of the firm and may cause distortion to the market in which the firm operates. (2) a state-owned firm already poses a conflict-of-interest concern. State officials may be inclined to opt for certain policy measures that favour state-owned entities. Although privatisation remains the main solution for such concerns, there are measures to improve the corporate governance of state-owned enterprises. Irwin and Yamamoto (2004) listed measures including the application of private-sector company laws to such entities.

2.6 Conclusions

Our review of economic theory identified a strong positive relationship between competitive markets and social welfare (the sum of consumer and producer surplus) and highlighted circumstances in which markets fail. We adopted total social welfare as the preferred welfare standard due to concerns that focusing on consumer welfare only would overlook situations where following a reduction in price, resulting increases in consumer welfare would not fully compensate for the reduction in profits.

We consider how market behaviour might vary with market structure and where the number of market participants is low and noted using principal-agent theory that institutional arrangements and contract specification would be required to promote welfare enhancing behaviour.

We then considered four options for electricity market reform noting the different scope for competition in each and that the highest level of social welfare was offered by the market structure with wholesale and retail competition. As the network functions of transmission and distribution have natural monopoly characteristics they would need to be subject to regulation.

The Textbook Model proposed by Littlechild (2006) provided criteria for our analysis of possible market options for the GCC. A review of relevant literature raised points for consideration on the scope of regulation, possible approaches to regulation and the importance of transparency, consistency and independence when implementing regulatory reform of markets that incorporate both private and government owned companies.

Chapter 3 A Review of Worldwide Experiences

3.1 Introduction

The process of transforming electricity markets from regulated monopolies into competitive markets differs from one place to another. This chapter closely looks at the experience of England and Wales which has certainly been among the best living examples of good market design and a leader of power sector reform within the EU. Outside the EU, Norway may be considered as the leader of electricity market reforms. This chapter covers the Nordic market (Nord-Pool) which may represent an excellent opportunity to examine evolving market designs based on pre-set minimal requirements for entry. The EU case is also presented to illustrate how electricity common rules – once adopted on voluntary basis - may pave the way for more binding reform arrangements and market opening on the regional level.

Furthermore, the diversity of the United States electricity market should provides an insight into how the federal law allows individual states to regulate their individual markets. In the case of the US power market, the chapter illustrates the relationship between federal and state-level regulations while highlighting the California crisis of 2000 and its implications.

This chapter also presents examples of a number of developing countries that have embarked on some forms of electricity sector restructuring like in the case of Thailand using the a single buyer model and Pakistan which choose to hurry privatisation through IPPs. The chapter also presents the experiences of early market designs in Argentina, Chile and Brazil; however, even for such early starters, this research will illustrate how such reforms are far from complete.

Before advancing further, it is important to highlight some milestones in the history of electricity reforms. In the United States, the Pennsylvania-New Jersey-Maryland Interconnection (PJM) dates back to 1927 as a power pool but filed with Federal Energy

Regulatory Commission to be an Independent System Operator in 1997 and evolved as a market for electricity since then (Bowring, 2006). The Public Utility Regulatory Policies Act (PURPA) of 1978 required all utility firms to buy electricity from 'qualifying facilities' of co-generators and small power plants. Chile introduced a law in 1982 allowing large end users to choose their supplier and negotiate their prices freely. In 1990, the England and Wales Electricity Pool was established allowing competition between generators as a major step in defining the first rules for market mechanisms of electricity trading. In 1991, Norway established its electricity pool which was extended in 1996 to incorporate Sweden in what was thereafter called the Nord Pool. The Wholesale Electricity Market of New Zealand was established in 1996. In 1998, the National Electricity Market of Australia was established. This was a result of a merger between the Victoria Pool (since 1994) and the New South Wales Pool (in operation since 1996). The Amsterdam Power Exchange of the Netherlands was setup in 1999 followed by the other pools in Germany and France (Ocaña, 2001).

3.2 Reforms of England and Wales

Up to date, the England and Wales electricity reforms remain – perhaps unchallenged – the most comprehensive model of power sector reform in the world. It is most essential for this research to understand such a model and how it evolved over the years. Although this particular experience has certainly undergone a series of reviews and alternations, the most significant phases of reform are the Pool (1990-2001), NETA (2001-2005) and BETTA (post 2005).

Prior to 1990, the Central Electricity General Board (CEGB) continued to be a public-owned monopoly that provided electricity for England and Wales. CEGB and 12 Area Boards serving a population of 50 million and having nearly 50 GW peak demand was the UK's main power system in 1991. Scotland had a peak demand of 5.6 GW including export while Northern Ireland had a peak demand of 1.5 GW. The Electricity Act 1989 divided the CEGB into three generation companies; National Power owning 40 of the 74 conventional power stations with a total capacity of 30 GW, PowerGen owning 23 plants with a capacity of 20 GW, while 12 nuclear stations of an 8 GW capacity went to Nuclear Electric. This structural reform included that transmission (alongside with 2GW of pumped storage generation) was carried out by National Grid Company, a regulated monopoly, where distribution and supply was carried out by 12 Regional Electricity Companies (RECs) (Bergman et al, 1999). By the end of 1990, the RECs were sold to the public. The share of the state in the generators was PowerGen and National Power was then partially offered to the public - in 1991 - and subsequently disposed of in 1995. By mid 1996, the more modern (high performance) nuclear power generators, then owned by British Energy, were sold to the public (Green, 2005).

Different from Nord Pool reforms (focused primary on efficiency considerations), the Pool of England and Wales (a whole restructuring) was "driven by the aim to privatize the electricity supply industry" (Amundsen and Bergman, 2003). In effect, 1990 was the starting year for reforming the England and Wales electricity service utility. Firstly, a vertical separation of generation from transmission as transmission was privatized through the National Grid Company. Secondly, a horizontal separation as generation went to National Power, PowerGen and Nuclear Electric (privatised later). Finally, vertical and horizontal separations as twelve Regional Electricity Companies were privatized with supply and distribution assets (Yi-chong, 2004). In essence, the vertically integrated electricity utility of England and Wales was almost totally separated 'unbundled' and restructured before it was privatized (Bergman et al, 1999).

The Pool of England and Wales

The main feature of the Pool was that all electricity must be traded at the Pool. Different from the Nord Pool, to be discussed in the next section, the Pool of England and Wales controlled all short-term electricity dealings. Another feature was that supply to the Pool was restricted to the electricity generators only (Amundsen and Bergman, 2003). The spot market, or 'Pool' is aimed at operating as a competitive market of last-price auction, and hence, creating a marketplace for the sale of publicly supplied electricity (Newbery, 1995). Each morning, generators submit next-day's schedules of available sets of supply and the corresponding prices for each set. Based on the received bids, the grid operator determines the lowest cost for meeting the expected demand (ranking the financial offers in ascending order). All generators in each set are then paid the same price - a system marginal price (SMP) – which is the price of the most expensive bid or 'last unit' to make the set run. Here, the Pool acts as a middle-person as it buys from generators and sells to retailers.

Reset by Professor Stephen Littlechild who was the UK's Electricity Regulator at the time, the RPI-X price-cap regulation - a modified rate-of-return – was an important feature of the service utility reforms of England and Wales. While this method for setting transmission charges acted as a price-cap, it also allowed for X as an efficiency incentive. A comparison of price caps versus cost-based regulation was already presented in a Section 2.3.

Contract for differences (CfDs) were an added feature to the Pool market place. Green (2005) reported that 80 to 90% of the spot market dealings were hedged by CfDs. Using the CfDs' mechanism, a price was agreed between sellers and buyers for certain quantities in the Pool. If the Pool clears at a price higher than the agreed price using CfDs, then sellers compensated the buyers with the difference, and vice-versa, if Pool prices fell below the CfDs agreed price, then sellers had to be paid the difference by the buyers.

Thus, with high concentration, mainly two large producers (National Power and PowerGen) as a result of the horizontal separation, there was the risk of influencing the price of the wholesale electricity market by manipulating the pool system operations (OECD, 2002). The larger generators could in effect increase their profits. In 1993, the regulator thought that there was not enough competition in the wholesale market (with pool prise above avoidable costs). The regulator was to commission a study into the two main companies in order to decide if they should be referred to the Monopolies and Mergers Commission (MMC). Early in 1994, National Power and PowerGen agreed to hold prices for two years below prevailing levels and to dispose of 6GW within two years, and accordingly, the regulator decided not to refer the case to the MMC (Green, 2005).

Lessons can be drawn from the reforms of England and Wales for those that worry about the undesirable implications of privatising transmission. As underlined by Professor Littechild long before the floatation of the National Grid Company (NGC) that there were no reasons to question the continuity or security of supply if the RECs were no longer owners of NGC. He argued that transmission and distribution may easily be owned by different entities and that ownership of the NGC by the RECs was just a transitional measure in order to facilitate privatisation (Littlechild, 1995).

Generally, generators had to bid a price-quantity into the Pool the day ahead. The Pool selling prices were then calculated every half-an-hour (48 spot) on the bases shown in Table 1 below.

Table 1 Pool Spot-price Calculations

Variables	Method of calculation
Output for each production Unit	Based on scheduled capacity; reflecting short-run production costs (especially fuel)
System Marginal Price (SMP)	Last unit to be scheduled (marginal unit)
Capacity Payment (CP)	An element reflecting fixed costs of generation CP = loss of load probability (LOLP) x (value of lost load [VOLL]* – SMP)
Pool Purchase Price (PPP)	PPP = SMP+CP
Pool Selling price (PSP)	PSP = PPP + Uplift

Source: Bruneekreeft (2003) *VOLL was set at £ 2 per kWh in 1990

Based on the 1990 reforms, retail was subjected to market competition. At the start, customers with a maximum demand of more than 1 MW (nearly 5000 customers representing 30% of demand) were allowed to switch between retailers for a small charge (corresponding to metering costs). In 1994 further market opening measures were introduced allowing customers of 100 kW (45000 customers representing an extra 20% of demand) to choose their suppliers. By May 1999, all customers were permitted to switch retailers. While large customers switched suppliers to get better prices, only two-fifth of small customers shopped around for a saving of about 10% (Green, 2005). In order to correlate consumers' consumption to the relevant retailers, half-hourly metering was required. Such metering technicalities could have contributed to the 'no-change' attitude of the majority of these customers. It was simply very expensive for each small (domestic) consumer to install a half-hourly meter. Therefore, a system of profiling was introduced to do away with the need for the half-hourly meters.

The Office of Electricity Regulation (Offer), was primarily managed by one single person; the Director General of Electricity Supply (DGES). Offer, being set up as an independent body under the Electricity Act, allowed for criticisms that the job of the DGES may be dominated or heavily influenced by one person (Green et al, 2006). On the other hand, one of the drawbacks the Regulator (DGES) often complained about that the Pool Rules were very rigid and change (to the best interest of the Pool's customers) was a rather lengthy procedure (Green, 2005).

Like in the case of other markets, the Pool had its own economical and political pressures. Due to such pressures, mainly employment-related, regulation was allowed to interfere with – otherwise ordinary market competition – as generators were asked to enter into 3 to 5 year coal purchase agreements in order to safeguard the jobs of mine-workers.

However, the setting up of the Pool for electricity was not sufficient to guarantee free trade of electricity. Although customers taking more than 1 MW of power had a choice over the different suppliers, the regulatory environment had to constantly review the published tariffs of the National Grid Company and those of the Regional Electricity Companies in order to allow for access on a non-discriminatory basis (Yi-chong, 2004).

Some also argued that even after introducing such competitive electricity market mechanisms that price controls were still necessary to protect small consumers (Glynn, 1997). Much of such debate is expected elsewhere to justify regulation in a competitive market. For example, in the California reforms wholesale trading was subjected to *pure-market* competition while end-user retail offerings were *regulated* using a cap-control. Such 'imbalanced' market environment – among other factors – had lead to catastrophic consequences.

The New Electricity Trading Arrangements (NETA and BETTA)

The New Electricity Trading Arrangements (NETA) introduced in March 2001 abolished the pool and replaced it by a new forwards-market and a short-term transmission system balancing and settlement process. These were extended to Scotland in April 2005 via the British Electricity Trading & Transmission Arrangements (BETTA). The main development here was that Britain under BETTA became one integrated market with NGC assuming the responsibility of Britain's entire TSO.

One of the main features of the law enabling NETA was that Ofgem was set up to replace Offer. The regulator is now replaced by five executive and six non-executive members chaired by an independent individual for a set period of time (Green et al, 2006). The authority is, therefore, split where alterations or amendments to the regulation are viewed by the members and then referred to the Competition Commission, previously known as the Monopolies and Mergers Commission (MMC).

The transmission system is owned and operated by the National Grid Company (NGC) which is a publicly traded company which also acts as the TSO. The company, however, is not allowed to perform down or upstream activities. The Electricity Act obliged the NGC to develop, maintain and operate the transmission system in an economic, coordinated and efficient way. Under NETA, generation is no longer centrally dispatched as each plant is self-dispatched and responsible of balancing output with demand where the job of the TSO is only to ensure system stability (OECD, 2002 and Newbery, 2006).

Although NETA comes with substantially higher costs[17], the National Audit Office (NAO) argued that the overall reforms are thought to have proven to be rewarding. According to NAO, NETA has helped lower wholesale prices by over 20% between March 2001 and October 2002 and by 40 per cent since NETA was proposed in the year 1998 (NAO, 2003). Industrial and commercial customers have also benefited from NETA. The NAO report also stated that prices paid by such non-domestic customers have also fallen by 18 per cent since the start of NETA and by 30% since April 1998. Meanwhile prices paid by domestic customers have fallen only by 8 to 17% since April 1998. While customers who stayed with the same supplier obtain a saving of only 8 per cent (about 62% remained with the same suppliers since 1999), consumers who switched suppliers may obtain savings of up to 22%. More specifically, according to the Ofgem Market Review (2004), 51% of domestic customers (in almost all regions of Great Britain, in various social groups, across all incomes and of all age groups) switched supplier while in the north of Scotland, however, only 36% of customers choose to switch suppliers. However, many including Newbery and McDaniel (2003) argue that prices fell primarily due to competition even before introducing NETA. Further, according to energy price analysis between April 1997 and March 2005 by Evans

[17] Ofgem estimated that market participants will spend up to £580 million in order to implement the NETA over the first 5 years of its introduction and £30 million annually thereafter (NAO, 2003).

and Green (2005, p.19), it was concluded that ‘NETA did not have a direct impact upon market prices for electrical energy’.

NETA seems to have introduced a more competitive marketplace which – like in any other ‘commodity’ competitive marketplace – is very responsive to the rules of supply and demand. According to the Ofgem Corporate Strategy (2008), domestic-user electricity tariffs were greatly influenced by the rising gas prices since one third of electricity in Britain is produced from gas-fired power stations. During the second half of 2007, the near doubling of oil prices had a great impact on gas prices which resulted in increase of almost 15 per cent in electricity retail prices by end 2007 and early 2008. With such volatility - and although Ofgem had no strong evidence of market failure - Ofgem still decided to carry out an investigation of gas and electricity supply markets. On 6 October 2008, Ofgem published the Energy Supply Probe – Initial Report summarizing the study findings (Ofgem Supply Probe Report, 2008, p.5). The study found that both domestic gas and electricity sectors have moved – since markets were opened for competition - ‘from pure monopolies to markets where there are now greater levels of competitive activity and consumer switching than almost every other energy market in the world and most other UK consumer services markets’ and that the ‘annual switching rate of 18 per cent also compares well with other retail services in the UK’. However, the study found that ‘Until very recently, the five former incumbent electricity suppliers charged electricity customers in their former monopoly areas an average of over 10 per cent higher prices than comparable “out-of-area” customers’ meanwhile the ‘most recent price changes (which occurred during the Probe) narrowed this differential to around 6 per cent on average’ (Ofgem Supply Probe Report, 2008, p.9).

NETA, different from its predecessor the Pool, is a more demand-responsive mechanism. The Pool's demand-side bidding scheme is no longer a feature of the new arrangements and, therefore, allowing the prices to be more reflective of the actual market and, hence, minimizing exposure to supply-side market power (Green, 2005). Moreover, supply competition increased over the years after NETA was introduced. On the other hand, falling wholesale prices resulted in financial difficulties for some generators (especially for those with uneconomic long term contracts (NAO, 2003)). The government had to intervene by providing a credit facility of £650 million to British Energy (with a 20% market share) in September 2002 due to strategic reasons related to a nuclear-safety international treaty.

One important feature of the NETA market-design is its confidence in ordinary market-mechanism to secure security of supply (the availability of capacity to meet demand). While NETA still kept an annual margin (a gap) of 20 per cent extra capacity over expected demand, a situation of a reduced gap may still occur in the case of a generator's withdrawal before it is replaced in the market. Here, NETA relies on market good 'behaviour' so that generators will enter the market in order to seize the opportunity of rising prices (NAO, 2003). However, such purely market-based measure may be undermined by wholesale prices rising and remaining high for long enough periods that could lead to passing them to household customers (who may then expect government intervention). Meanwhile, the government future energy policy (spelled out in a White Paper) declared that it is not to intervene 'except in extreme circumstances' (NAO, 2003, p. 4). On the other hand a capital-intensive industry is a subjected to a cyclic behaviour which may cause a short to medium term shortage of supply if it was all left for pure market behaviour and that the 'security of supply' gap was not strictly administered.

In summary, there are lessons to be learned from the experience of England and Wales as such market remains the leader in market-based electricity reforms. Green (2005) addressed many of the lessons to be draw from England and Wales, some of which are listed below:

1. The electricity utility better be 'unbundled' and restructured before privatisation.
2. The RPI-X, first introduced in the England and Wales market, is a tested incentive regulation system that allows for an acceptable rate-of-return mechanism while promoting efficiency.
3. To maximize the benefits of reform, the regulator needs to be an independent body with specific terms for the director general (or chairman), a clear mandate and with adequate accountability measures. Here, governance is a key contributor to the success or failure of the undertaken reform. While adequate regulation must be introduced, as part of the reform process, to guard from market 'lobbying' and 'abuse' of regulatory power, it is vital to allow for elements of 'measurable' flexibility that allows for change to take place in a speedy and efficient way.
4. The industry does not necessarily have to sacrifice profits, while consumers reap the benefits of restructuring.

5. The opening of retail to competition does not automatically guarantee that all domestic end-use customers will maximise their benefits from reform by exercising their 'right to choose'.

6. Market power is most likely when the market is concentrated. It is, therefore, important to manage concentration at the very start of market design.

7. Contracts could bring stability for the reformed electricity-market and should be allowed alongside retail competition. While contracts allow for long generator-retailer relationships (and hence reduce the likelihood of market power exploitation), retail competition ensures that large consumers would continuously have a choice over a number of suppliers within the market place.

It is of this researcher’s opinion, however, that only at very advanced stages of reform that the NETA (or BETTA) model may be introduced for establishing a typical commodity market for electricity where power 'electricity' be traded as a commodity based on pure market mechanism. While such ‘responsive’ marketplace promises customers - both domestic and commercial - the benefits of a competitive environment, customers ‘especially domestic ones’ must be prepared to accept sudden price increases when direct cost increases are passed to them by wholesalers.

3.3 Reforms of the Nordic Market (Nord Pool)

The Nordic market or Nord Pool is made up of Denmark, Finland, Norway and Sweden. Norway was the first to opt for electricity deregulatory reforms by issuing the Energy Act effective on 1 January 1991. On 1 June 1995, Finland took similar step then was followed by Sweden on 1 January 1996 forming the Norwegian-Swedish pool (Nord-Pool, ASA) which signalled the start of the unification of the two wholesale markets. Denmark was the last to be included in such an evolving electricity market. The integrated electricity market of the Nord Pool model was built assuming a perfect market competition situation (Amundsen et al, 1999). An important feature of this electricity market is that it is an international one. Nordic economic conditions are not comparable to those of the GCC, however; this research should benefit from studying the Nordic electricity market mechanism from its international perspective.

The Nord Pool is a non-mandatory electricity market – based on voluntary participation – allowing bilateral trade (directly between players) and trading via the Nord Pool Spot AS physical market (Nord-pool-spot, 2007). The Pool also provides a good reference for power derivatives traded in the Nordic Power exchange for financial contracts. The financial market acts as a commercial centre where securities (price securing contracts) are traded. Since this is not a physical market, the financial contracts are settled only after electricity is physically traded. According to Boisseleau and Jansen (2005) we may visualise the Nord Pool operating as a combination of four markets (two for physical delivery and two for the related financial tools);

(i) The Elspot, which is a day-ahead spot market with prices determined in a supply and demand double auctioning for each hour of the day. The price used is a reference for settling financial power contracts as well as a benchmark for bilateral transactions. The Elspot price represents a bid to buy or sell an hourly load of one MWh (NOK/MWh) to be physically delivered the following day. Buyers are obligated to pay the price of firm contracts of load hours purchased. A S*ystem Price* is the balance price of system aggregated demand and supply.

(ii) The Elbas, which is a short-term market for delivery allowing market players to adjust their positions – previously taken on the Elspot – up to two hours before actual delivery takes place.

(iii) The Eltermin, which is the financial part of the market place intended for risk management through trading futures and forward contracts. As mentioned earlier, this market is purely financial and does not involve actual physical delivery of electricity.

(iv) The Eloption, which complements the above mentioned financial tools by providing a market for options.

Norway and Sweden have higher electricity demand per-capita than most EU and OECD countries. In 1998; Norway had an electricity per-capita of 27,285 kWh, Sweden had 16,678 kWh per capita while the figures for the EU and OECD were 6,686 kWh and 8,300 kWh respectively. Both Norwegian and Swedish markets have their own national grid companies, namely Statnett and Svenska Kraftnät (Amundsen and Bergman, 2003). In each country, the two companies are responsible for real-time dispatch and balancing. The two companies are therefore responsible to keep the system operational including voltage and frequency stability. The two companies are entrusted with the transmission capacity allocation and pricing, hence, Statnett uses a Nord Pool mechanism called *regulation market*, while Svenska Kraftnät used a Swedish market tool called the *balance service*. In both cases, individual generators make their bids and the main operator (either company) calls each bidding unit into production on the basis of its rank. The trade on the *regulation* (Norwegian) or *balancing* (Swedish) mechanism is prompted (from the normal day-ahead wholesale market) only by the uncertainties between actual and expected demand and supply situations.

The two grid companies had no direct influence over the dispatches of electricity into the market. The plans for hourly production were determined on the basis of a day-ahead spot market. The Nord Pool, which is an independent company owned by the two grid companies, operated the wholesale (day-ahead) spot market, where sellers and buyers trade electricity based on hourly prices and scheduled deliveries. This is another evolution of the Nord Pool. At its starting stage, buyers and sellers traded only with the Nord Pool (with virtually no payment risks). Now, buyers place their bids by 12 pm the day before the actual dispatch of electricity takes place. It is then the job of Nord Pool to schedule next day's power supplies based on total demand (determined the day ahead). Outside dealings are allowed by the Nord Pool. In reality, only 25% of the traded electricity is done within the trading environment of the Nord Pool wholesale spot market (Amundsen and Bergman, 2003).

For transmission pricing, the Nordic market uses *point-of-connection tariffs*[18]. By such mechanism, there is one unique price to each unit extracted from (or fed into) the system irrelevant to the location of the generator supplying (or end-use customer buying) such unit of power.

Transmission-tariffs differ between Norway and Sweden as well as between the different regions in Norway and are known as *area-prices*, where Nord Pool prices are called *system-prices* (explained above). In the case of Sweden, different from Norway, locational congestion differences were not reflected in transmission costs. Here, any resulting excess in demand a particular region was handled using the 'counter-purchases' by the grid company Svenska Kraftnät. As maybe expected, such 'counter-purchases' are usually carried out at higher costs (from the reserve capacities in these regions) and are passed on (as fixed

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[18] Point-of-connection tariffs reflect two elements of cost: 1. marginal cost of losses, and 2. marginal cost of congestion. In term of nodal pricing, both cost elements are reflected at each node.

charges) to the transmission system users. Nevertheless, based on the study of Damsgaard and Green (2005), there are at least three reasons why Sweden should consider the option of *regional* or *'area'* wholesale prices; 1). Consumers can then be charged the actual cost of their electricity purchases. In the absence of such regional or 'area' prices, some consumers are practically subsidizing cost for others. 2). The use of regional prices allows for a more receptive electricity market. Once a particular region has higher *area-prices*, it is then expected - due to ordinary market mechanism – that new generation capacities would be added to that region. Similarly, no new generation capacity would be added to the regions that are benefiting from the counter-purchases of the grid company. Clearly, these counter-purchases are only distorting the market. 3). This absence of regional pricing causes market fragmentation; Swedish internal market on one side is governed by a single area-price while the Nord-pool on the other uses a system-price mechanism that will split the price into two in the case of cross-border congestion. A grid company like, Svenska Kraftnät – a state-owned public company (Svenska Kraftnät, 2007), may have some incentives to exploit using some *counter-trading* arrangements. Since those purchases, as seen earlier, would be obtained at higher rates, the grid company has an incentive to obtain its purchases through Nord Pool. By simply telling the Nord pool that it had a constraint at its border, the company qualifies for congestion fees for any MWh imported into the country. In a well designed market, this is non-allowable.

Although the Nord Pool membership is based on a set of minimal rules, it allows a good degree of differentiation among the member countries. Ownership is a good example of these important differences. As highlighted by Midttun et al (2003) 'While all four Nordic countries have dominant public ownership in the electricity industry, there is still considerable variation. The Norwegian electricity industry represents the most 'pure' application of the public sector model, while Sweden and Finland, with a larger share of private ownership come closer to a mixed economy model. With is large share of direct consumer ownership, Danish electricity industry represents a special variant of the Nordic model". In 1999, over 50% of the Swedish generation capacity was owned by the state as well as over 30% of the country’s supply. Municipal ownership accounted for nearly 15% and 40% of production and supply accordingly. Industry, institutional and foreign investments were left with nearly 40% and 30% of the country's generation and supply. During the same year a little over 20% of the electricity in Finland was generated by state owned enterprises while the state owned less than 20% of the country’s supply system. Here, municipal ownership amounted to over 10%

and 60% of production and supply accordingly. The industry, institutional and foreign investments were allowed to own a good sum of nearly 70% of the country's total generation capacity and controlled almost 30% of the country's supply ownership. In Norway, the state controlled 40% of the country's total power generation and a very limited stake of the country's supply system, where the municipal ownership exceeded 50% of the country's generation and over 80% of the supply. The industry, institutions and foreign investments were left with negligible stakes in the country's power sector. The Danish generation and supply is almost split 50-50 between municipal and customer ownership. As a result, we can assume a well functioning Nordic market with a diversity of ownership structures.

Another aspect of the Nord Pool is the increased intra-trading between member countries. Based on the calculations of Damsgaard and Green (2005), electricity trade among member countries was clearly rising between 1978 and 2002. It is worth noting that highest trade levels were reached between 1989 and 1990 - as Norway and Sweden had surplus hydro power to export - even before member countries had liberalised their power markets. The experience of the Nordic market reveals that cross-border trading is possible even in the absence of fully liberalised markets.

Effectively, retail competition in the Nordic market was opened during 1998 and 1999 (Littlechild, 2007)[19]. After about 3 years, 18% of residential customers did switch suppliers in Sweden, compared to 15% in Norway and only 5% in Finland. Although these levels are much lower than the 34% in the case of UK, Littlechild (2007) underlined the new form of competition provided the variety of contract types offered to customers in the Nordic market. Accordingly, tariffs may not remain the only means of competition in retail. Suppliers may agree fixed prices with their customers while others offer favourable 'contractual' conditions to stay ahead of competition.

In summary, the Nordic electricity market experience offers some valuable lessons:

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[19] According to (Littlechild, 2007) this is when load profiling was allowed instead of having to install hourly meters.

1. Based on the Nordic Pool market design, the geographical distance between buyers and sellers has no impact on prices. It is then possible to allow for a 'common market' where generators compete on equal terms.
2. On the one hand, the counter-purchase used in the Swedish transmission system allows for a single price for all users across all regions. It is possible for individual customers and regions to, therefore, be able to compete more 'equally'. On the other hand, however, such market design would also imply that electricity in some regions would be sometimes sold at prices below their respective marginal costs. Some valid debate could be expected as customers in other regions would implicitly be deprived from enjoying actual lower prices (costs) for their power purchases. Also, under such market design, extra transmission capacity would be required in order for the counter-purchase system to be efficient.
3. The Nord Pool features a good level of flexibility in market design. First, the wholesale market can sustain more that one set of prices (Nord Pool system prices may differ from area prices in Norway and Sweden, while Sweden opted for a single price for the country). Second, ownership structure may be allowed to differ between member countries. Finally and most importantly, electricity may be freely traded outside the Pool by means of bilateral contracts.
4. Individual markets need not be equally liberalised in order to allow cross-border trading. The different regulatory environments of the Nord Pool member countries, although converging over the years, could still allow considerable amount of electricity trade between the members.
5. In retail, contractual arrangements may induce competition if there was ‘no room’ for price competition.

With respect to cross-border trading, the free access bid-based market has proven to be competitive. However, few issues need to be carefully examined when it comes to dealing with congestion. It is the main responsibility of the system operator (SO) to regulate the transmission limits so that there is no congestion allowing for a much freer cross-border trade of electricity. However, the SO of this integrated market needs to be evaluated in terms of its handling of the financial implications of congestions. The argument here is that the TSO may have an incentive to distort congestion information (Glachant and Pignon, 2004). The potential for distortion, if any, may be due to the System Operator's share of the revenue produced by the congestion pricing mechanism.

Noting that this research does not cover such issues, one important feature of the Nordic Market is that member countries maintain rather a uniform policy towards environmental issues. The member countries are all party to the various protocols and agreements that limit the CO2 and other non-environmentally friendly emissions into the air. Those include; the Geneva Convention and the Geneva protocol of 1991, the Sofia Protocol of 1988, and the Helsinki Protocol of 1995. The member countries confirm to the Toronto Conference of 1988 of a 20% CO2 reduction by 2005 (from the base year of 1989). Moreover, and on voluntarily bases, the members of the Nordic market have set up higher limits for themselves (Amundsen et al, 1999).

3.4 The Experience of the European Union (EU)

The European Union (EU) is made up of twenty-seven countries[20]. Since 1990, members of the EU were required to facilitate the cross border trading or 'transit' of electricity by means of a European directive. Starting from 1992, the Council of Ministers was discussing common rules for electricity markets. The European Commission (EC) issued Directive No. 96/92/EC (EU Directive 96/92EC, 1996) for the creation of internal markets in electricity and gas. All countries were to implement the directive within two years with the exception of Belgium and Ireland (who received a transitional period of an extra year) and Greece (who was given two more years). The primary objective for the directive was the setting up of 'a level playing field' in terms of the three segments of electricity, generation, transmission and distribution, a pre-request for a single European electricity market while the main feature of the directive was to ensure network accessibility (Shuttleworth, 2000). It is to be noted that only 8-10% of the European national consumption originates from cross-border trading as networks are still limited since they were originally built to serve national markets (Boisseleau and Jansen, 2005). The inter-connections between the European countries were made to facilitate cross-border trading for the purpose of system stability. Among other factors, such limitations of the wires still prevail, hence, resulting in individual electricity

[20] Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

markets rather than a common European Electricity market (Haas et al, 2006). For the purpose of this research – and regardless of its status so far - it would be most relevant to explore a regional electricity reform process such as that of the EU.

In the EU, 'privatisation was a decision of individual member states – nothing in EU law obligates member states to privatise any type of undertaking' (Vasconcelos, 2007, p. 65). However, liberalisation was viewed as a necessity for integration at the EU-level. In 1996, a Common rule was adopted for electricity, and like other similar rules, the purpose was to facilitate a single European market. Vasconcelos (2007) reiterated that the European model allows for the coexistence of many types of electricity structures. The main features of the model are (1) open markets for investment and trading among member states, (2) freedom to choose for consumers and (3) the legal unbundling of transmission and distribution from other activities of generation and supply.

Subsequently, in 26 June 2003, a new directive was issued replacing the previous directive of 1996 (EU Directive 2003/54/EC, 2003). The main characteristics of both EU directives are:

1. Network accessibility: Articles 17 and 18 of the earlier Directive stated that member states could choose between (a) allowing third party access (TPA) to national distribution and transmission electricity networks (regulated or negotiated TPA), or alternatively (b) making arrangements for a single buyer model by which the single buyer acquires electricity contracted by eligible customers at the published retail tariff for the customer - minus the published tariff rate for using the network which made both methods very similar. The Directive of 2003 no longer allowed such single-buyer arrangements.
2. Market opening: Article 19 puts a time-table for a three-stage market liberalisation that by the year 2003 allowed consumers with annual consumption over 9GWh to choose between different suppliers while it required member states to open 33% of their national markets for competition. Later, Article 20 of the 2003 Directive stipulated that by 1 July 2007 the EU moved to full retail competition as all customers were allowed to choose between suppliers.
3. Tendering and plant authorisation: In the case of a single buyer model, the 1996 Directive expects member states to use competitive tendering procedures or use a non-discriminatory method licensing power plants when a tendering system is used. Article

7 of the 2003 Directive demands that details of the tendering procedures are published at least six months prior to tendering in the Official Journal.

4. Unbundling: While the directive required separate accounts to be kept for generation, transmission, distribution and other non-related activities, there were no specific requirements for structural unbundling. This was then extended to legal unbundling by Article 10 of the 2003 Directive).
5. Security of Supply: Article 4 of the 2003 Directive clearly makes each member country (through its respective regulators) responsible for assuring the security of supply in its national market.

From July 2004, the EU’s Community Law included the electricity and gas Directives and a regulation on cross-border electricity exchanges.[21] Such regulations are part of EU reforms intended for increasing efficiency in the energy sector, lifting up standards for public sector, raising competition levels and boosting cross border trade (EC, 2004). Very importantly, the directives specify that the Commission must report on a regular basis how the market is functioning and more specifically the status of issues like legal unbundling.

In order for EU Directives to be applicable, member states would have to issue their individual 'national' legislations respectively. The EU secretariat issues, on annual basis, *benchmarking reports* to see who scores 'good' or 'bad'. Based on Green et al (2006), the usual practice is that underperformers are flagged 'red' in these reports' while 'green' is given for best performers. The EU benchmarking reports investigate member-country progress levels in areas like market design (including market opening and type of separation or 'unbundling'), market power (including market share or 'concentration' and possible barriers to entry) and the kind of regulation used (including the power of the regulator and the use of 'ex ante' or 'post ante' regulation).

The Third Benchmarking Report on the Implementation of the Internal Electricity and Gas Market issued in Brussels on 1 March 2004 shows that member states have taken good steps towards the implementation of the regulation. However, there is little progress in power cross-trading between the members (EC, 2004). It is evident that by just implementing

[21] This is in reference to Directives 2003/54 and no. 2003/55 & Regulation 1228/2003.

directives, member states can not ensure an increased inter-regional utility trade especially – and as discussed earlier - if transmission networks are limited.

Continuous follow up is required for a regionally integrated market like the EU. The Council of European Energy Regulators (CEER) was established to discuss maters of this sort. The CEER Florence Forum held on 9-10 November 2000 identified, among others, the following important issues that may have hindered cross-border trade of electricity (Shuttleworth, 2000):

1. 'Pancaking'[22]: CEER was led to believe that by the time electricity was crossing borders, the long distance transmission charges were piled so the costs outweighed the competitive generators' marginal costs. The debate now goes on between CEER and the European associates of transmission system operators (ETSOs).
2. Non-uniformity of transmission charges: CEER was of the opinion that some distortion is created by the non-uniformity of transmission charges levied on generators. For example, the portion is 0 in France and Spain while it is 30% in England and was suggested to reach 50% in the case of Greece. While CEER felt such charges must be born by the buyer side of the market, some member states like the UK argues that such charges should be used as an incentive for increased efficiency in plant locations.
3. Congestion[23] costing: High levels of congestion (limitation of the wires) are another factor that hinders cross-border or 'trans-EU' trading. In dealing with the issue, the ETSOs suggested a proposal at the Florence forum to levy a charge 'across the board' on all members of the integrated continental European system. However, not all members were in agreement with the proposed scheme.

In November 2003, the EU set up the European Regulators Group for Electricity and Gas (ERGEG). The primary reason for setting up ERGEG is to facilitate the completion of the energy market through the co-operation and co-ordination among its members. It is objective is to assist the Commission in consolidating the energy market of the EU (ERGEG, 2007).

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[22] Piling up charges is known in the US as 'pancaking' (Shuttleworth, 2000).
[23] 'If a line would be overused if its limit were not enforced, it is congested' (Stoft, 2002, p.392).

Historically, EU individual member states like other countries had their share of cross-subsidies. The electricity industry often was lending a hand to other industries. In the case of France, only locally made equipment was to be used for the construction of power plants. In the UK and Germany, state-owned power generators entered into long term agreements with state-owned coal mining firms (Yi-chong, 2004). However, cross-subsidies do not continue unnoticed and cause continuous political debate. If discovered, the public would reject them as they may contribute to an increase in costs while other market players and competitors would certainly question them as they represent an unfair trading environment. In short, subsidy issues usually cause continuous political debate and may limit free utility cross-border trading.

Nevertheless, EU regional electricity reforms are far from complete as structural market differences still remain within the member countries. Haas et al (2006, p.274) argue that 'In practice, the major area of action within the European liberalisation project was "providing access to the market". Far less attention was paid to the issues of restructuring generation & supply and designing market places as well as ensuring adequate generation and transmission capacity'. With respect to vertical integration, for example, state-owned vertically integrated monopolies have dominated the industry in France, Italy, Poland and Hungary. Meanwhile, Germany had few generators integrated with transmission but partially integrated with supply while the distribution companies in the Netherlands – through upward integration – controlled transmission and generation.

The EU reforms are flexible – when need be – allowing for some compromise for the benefit of members. A good example was the case of the so called 'Gazprom clause'. On October 2008, the EU energy ministers agreed to ease a ban on outside energy providers – allowing mainly Germany to continue importing about 40% of its gas requirements from Russia's Gazprom. The relaxed clause which was – then - agreed stipulated that outside suppliers must open their markets for EU investors and they must meet the 'security of supply' test of the European Commission (International Herald Tribune, 2008).

The EU reforms illustrate that even with such high-level commitments (spelled out in the agreed EU directives) and years of progressive change, a common market (with high levels of trading) and/or common regulatory infrastructure may not be an assured outcome of regional reform. However, most relevantly to this research, the EU example provides the GCC with a good experience for regional cooperation:

1. Regional policies can be spelled out in the form of directives, while individual-states should issue national regulations that are binding and are administrated by local regulators. Although directives must be well negotiated and agreed among member states, they remain non-binding. The success in implementation is totally based on the commitment of individual states by means of individual local regulations.
2. It is most essential - at the early stages of service utility reforms - to establish mechanisms for coordination among regulating bodies.
3. The implementation of regional directives may facilitate - but not automatically guarantee – an increase in intra-regional electricity trade.

From NIE we understand that interest group participation in policy making is unavoidable. Spiller and Liao (2008, p 307) state that ‘No society can be so repressed – nor individual’s power so extreme – that decisions are undertaken by a narrow clique of individuals, without consideration of others’. European Union negotiations provide good case study material on how multi-country agreements are facilitated. Eising (2002, p. 85) states that *elites* in member-states ‘form their preferences on the basis of domestic economic situations or in response to pressure from domestic interest groups. Agreements are then reached on the basis of bargaining power and mutual concessions in a given bargaining space’. Further, in their analysis of environment policymaking, Héritier et al. (1994, p. 181) as quoted by Eising (2002) states that many member states may try to transfer their respective regulations and practices to the EU level so that their adaptation costs are limited, and hence, ‘allowing for solutions based on least common denominators, on mutual exchanges, and on comprehensive package deals’.

After eight years of negotiations, in 1996 minimum requirements for a Directive were agreed by EU members to liberalise member state electricity markets. In summary, the 1st and 2nd electricity Directives in 1996 and 2003 first introduced gradual electricity market integration by opening markets to cross-border exchange and tightening the rules for such exchange. According to Jamasb and Pollitt (2005), the creating of a wider EU electricity market was undertaken by two parallel processes: the Directives required members to liberalise their home markets and abide by certain minimum requirements. Meanwhile the European Commission was effectively driving the advancement of interfaces between markets by improving the rules for cross-border trading. Further, the 2nd Directive set out some specific and more stringent rules - including transition periods - with regards to network access, the requirement for independent regulators, the unbundling of System Operators and the prohibition of a single-buyer-based market structure (that was at the time in place in Italy, Portugal and Northern Ireland). However, this process of regional electricity market integration allowed for a certain levels of flexibility as required by political considerations. State-ownership was allowed to continue unchallenged in certain markets (such as in France), and countries could adopt different approaches to separating the different electricity market segments while the Directives did not require market opening for household consumers until 2007 (ibid). Eising (2002) stated that one of the core elements of negotiating agreements for liberalising EU electricity markets was to prevent cross-subsidies between various activities, which might undermine competition, an issue that will need to be addressed in the GCC.

The EU Commission had to undergo a series of negotiations in order to achieve consensus for agreeing the Directives, negotiations in which positions were influenced by the economic conditions prevailing in each member state and the demands of various interest groups. More broadly, Eising (2002, p. 87) stated that ‘four distinct institutional mechanisms structure EU decision-making processes’, among which ‘decision routines provide standardised mechanisms for resolving conflicts and facilitate policy learning by increasing the amount of information available about policy consequences’. Our review of GCC institutional and legal arrangements presented in Chapter 4 suggests that equivalent mechanisms are not as clearly defined or developed as in the EU. Further, according to Keohane, (1989, p. 163) as quoted by Eising (2002, p. 89) ‘The EU institutions consist of a set of EU organisations and a set of norms, rules and routines that prescribe behavioural roles, constrain activity, and shape expectations’.

3.5 The Experience of the United States

The power sector in the US may be divided into five groups; (1) the privately owned vertically integrated utilities or ‘investor owned utilities’ (IOUs); (2) the federally owned utility service providers which generate and transmit electricity but usually do not sell directly to end user customers[24]; (3) the state municipal, public, district and rural co-operative utilities. Most of those entities in this group are small which mainly buy electricity in small quantities and re-sell it to their communities beside the few state or municipal vertically integrated utilities; (4) the privately owned independent power producers otherwise referred to as 'non-utility generators' (NUGs); and finally (5) is the group of marketing entities like brokerage firms (OECD, 1999b).

Rural areas were expected to face difficulty in supply by privately-owned service providers. Among other state-driven initiatives, The Tennessee Valley Authority (TVA) was specifically established in 1933 to provide farmers, which may have been ignored otherwise by private suppliers, with low cost electricity. In 1935, the congress put in place what was called the Rural Electrification Administration (REA) which main duty was to provide the farmers in the remote areas low interest loans and technical support for forming cooperative distribution companies for their areas (Yi-chong, 2004).

Independent federal and state regulators carry out power sector regulation in the US. Alongside, there is a cluster of public and private voluntary organizations that act as coordinators. While the regulators execute and monitor the implementation of the policy objectives, coordinating organizations strive for overall increased efficiency of the system. In 1978, the US introduced a *single-buyer* method by means of the national regulatory framework, the Public Utilities Regulatory Policy Act. However, it did not work in all states because some utilities, regulators and other interests may have worked in favour of some inefficient form of production like supporting the local sources of coal (Shuttleworth, 2000). Such 'favouritism' needs not to be restricted to the market of the US; nevertheless, it is worth investigating once we look closely into the share of some federal corporations in the US hydropower sector. Based on the OECD report on Regulatory Reform in the United States (OECD, 1999a) it was noticed that among other federal market players; the US Army Corps of Engineers owned and operated some power projects with an estimated share of nearly 25% of the total country's hydropower; the Bureau of Reclamation of the US Department of Interior owned and operated almost 60 similar projects (a share of 17% of the US hydropower); while the Tennessee Valley Authority owned over 70% of coal-fired and a substantial share of the transmission system in the south-eastern part of the country.

[24] For example: the US Army Corps of Engineers owns and operates 75 hydro-power and irrigation plants (24% of the US hydropower – a total capacity of 20 720 MW (OECD, 1999b).

Electricity sector reforms in the United States are different from all others. While federal regulations provide for the minimum requirement for nationwide reforms, each state enjoys a considerable level of flexibility within the boundaries of federal regulations. Accordingly, some states were relatively slower in market opening reforms, while others surpassed the much broader federal laws. Hunt (2002a) argues that the institutional issues are a major concern in the US in that regulation is split between the federal government and the individual states and that no one single entity has the overall authority to decide on what needs to be done. For that reason, each state becomes a learning experience of its own, however; lessons to draw from the California experience should clearly illustrate how split-power alongside with improper-regulation may result in major market failures.

An important lesson to learn, apart from the already established problems with too much state ownership, would be the downsides of excessive state interference within deregulated markets. Economists might have the tendency to deal with it as an isolated situation of market failure; yet, the California price spike situation – briefly introduced in the previous chapter - is probably the most costly lesson to be learned here. In year 2000 California witnessed shortages due to increased demand coupled with an increase of gas prices through out the country (Blumstein and Green, 2002). Many believe - including Littlechild (2006) - that the California power shortage was not mainly due to an inferior wholesale-market but due to the fact that capacity increases were delayed by the necessary approvals. The regulatory framework also contributed as retail suppliers (the incumbent utilities) were not allowed to enter into long-term contract arrangements with generators. As will be seen in the case of Brazil - presented in Section 3.6 below - long-term bilateral contracts may also be intended to act as a hedge against potential volatilities.

Another problem which led to the situation was a mismatch between a wholesale and a retail regulation. While wholesale prices were subjected to ‘free’ market-mechanism, retail prices were *capped* and when wholesale prices rose, the remaining ‘regulated’ low retail prices caused the near bankruptcy of two utilities. The investor-owned utilities (IOUs) – which we know from above are a major player in the United States market – were locked into long-term contacts with fixed (capped) retail prices and short-term wholesale prices. Meanwhile, regulators were not willing to negotiate the raising of such cap levels (Littlechild, 2006). On the other hand, according to Wolak (2005), the regulatory oversight of the Federal Energy

Regulatory Commission (FERC) over the wholesale market also fell short as it did not intervene to curb price increases. Then the situation was in the hand of the multi-layer regulatory infrastructure to add to the crisis.

FERC allowed for a mixed price mechanism in the market. Power could be purchased by a participant at a market price if such participant could demonstrate that it does not have market power (by submitting a sworn testimony). Those market participants failing to do so would only be allowed to obtain power through the cost-based regulated price (Wolak, 2005). In California or elsewhere, the time lag needed to set up a new electric generation capacity may result in a price hike for a considerable period of time. In this particular case, according to (Wolak, 2005) at least eighteen to twenty-four months were required in order to establish a new capacity of 50 MW or more. This period may also be extended due to permit delays. As will be discussed later in the study, in developing economies like the GCC, such periods may be extended to almost four years. Market power exploitation is very possible if demand is incorrectly estimated or the economy witnesses rather unexpected levels of growth. Littlechild (2007) reiterated that economists are still debating whether there was concrete evidence of market power exploitation. Others are of the view that in California, market power was exploited as supply was affected by hydro conditions in the Pacific Northwest while demand had risen in the Southwest leaving California with limited import opportunities from these regions. Meanwhile, FERC was not prepared to take action even when prices reached $300/MWh. During the summer and autumn of 2000, the state of California argued that wholesale prices were unjust and unreasonable but FERC disputed it and only arrived to this conclusion four months later (Wolak, 2005).

In August 2000, FERC ruled out the use of price caps and later on it removed the utility trade from the Power Exchange (PX). Utilities were only allowed to sell in the wholesale market by permission of FERC. Moreover, FERC introduced a soft cap on sales - where those charging above the cap would have to justify their costs – while issuing a notice to generators that any successive overcharging would be subject to refund evaluation. Such a measure, needless to say, would be a good opportunity for factoring in some inflated costs. FERC no longer entrusted the ISO Board with the market and decided to have its own monitoring measures. By December 2000, FERC had a new set of problems to deal with particularly those concerned with the real-time market. In such case, FERC turned to the ISO to establish some outage coordination programmes while establishing a single price-auction in the real-time market and an emergency real-time price mitigation that indeed was fully put to use by June 2001 (Moore, 2002).

The California situation, in effect, produced a temporary return to applying the *single-buyer* model. In 2001, the Governor of California issued an order to the Department of Water Resources (DWR), a state owned utility, to purchase electricity for California's largest three investor-owned utilities in attempt to helping them meet their demands as they were close to their bankruptcy. DWR had to commit to many medium and long-term contracts amounting to US$18 Billion leaving the California taxpayers to pay off such decisions since it was not practical to charge individual customers for the recovery of such extraordinary costs (Arizu et al, 2006).

According to Vries, (2005) other outcomes of a market-design fault in California were the fact that consumers did not react to high electricity prices since tariffs were fixed for the majority of them while not having enough incentives in order to attract the required long term investment levels (a reality only emphasised by the crisis).

Outside the California situation, FERC plays a better role of a coordinator. In 22 December 1999, FERC set up a framework for regional transmission organizations (RTOs) by Order 2000. It was aiming to promote 'interstate' electricity trade through (*i*) facilitating access over the various networks and; (*ii*) increasing overall operational efficiency (Shuttleworth, 2000). The Order combined state grid companies to provide integrated operations which gave birth to many transmission companies (TRANSCOs).

While deregulation initiatives in the US started in the mid-1990s, it must be noted, however, that wholesale power markets for the vertically integrated electric utilities were in existence many years before that allowing for daily and hourly trading. The Public Utility Regulatory Policy Act (PURPA) of 1978 allowed for such trading. In 1992, the Energy Policy Act expanded the authority of FERC in order to facilitate wholesale power dealings (Joskow, 2005). By the time transmission and wholesale market rules and FERC regulatory orders were issued in the mid-90s, power sector policies were already debated within the state of California and some states of the northeast of the United States; Massachusetts, Rhode Island, New York, Pennsylvania, Mane, and New Jersey. By the year 2001, the states in the west and southwest had more reasons to reject the regulatory and competition policies of FERC. Factors adding to the California crisis included the Enron bankruptcy, the financial difficulties faced by generators and trading companies, unstable wholesale prices, accounting abuses and allegations of market power exploitation. As a result, FERC announced on April 28, 2003 that 'it would provide states and regions with more time and flexibility to implement the wholesale market reform' (Joskow, 2005, p.32). Since then, the pace of wholesale and retail competition, restructuring and regulatory reforms has slowed down in the United States as policy makers failed to prove how such power sector reforms could benefit the voting end-use customers.

There is a new set of lessons to learn from the vast experience of US electricity market:

1. Regulatory reforms, although intended for such purposes, may not always succeed in guaranteeing benefits to consumers.
2. While minimum regulations can be set-up at a federal-level (and perhaps applying to regional confederations), individual participating-states must be given good levels of regulatory flexibility without the fear of limited cross-border trading.
3. Inferior market design or speedy implementation could lead to many post-deregulations state interventions yielding further market distortions and failures. A case of market failure or speedy reforms may also cause tremendous delays to market opening in general due to political pressures.
4. Market design must put a priority on adequate incentives for investment in order to guarantee security of supply.

3.6 Experiences from Developing Countries

Many countries in the developing world have already initiated electricity sector reforms. In recent years - and for obvious reasons - developing countries have investigated other than a status quo option. Their growing populations accompanied by relatively fast market expansions have put governments under increased financial pressures. Also, governments sought to generate immediate revenues by disposing of some assets. Even for oil producing countries – with adequate financial resources to fund expansion projects - reform and market opening were essential in order to diversify their economies and increase overall efficiency and competitiveness. Moreover, the level of market opening and economic reform are often the main criteria for attracting foreign investments.

The World Bank carried out a study in the year 2000 analysing the electricity sector and any reforms in 116 developing countries (Bacon and Besant-Jones, 2002). The study concluded that in 17 countries industrial customers had a choice of their electricity supplier, 37 countries had independent regulators and that in 27 countries private finance and ownership was a key player in the electricity service utility. Although some progress has been made with respect to private sector involvement, the study confirms earlier arguments that much of the needed reform the developing world was far from complete.

With respect to overall electricity market restructuring, we have already established that electricity reform 'packages' vary depending on the market situation in which they are applied. Furthermore, developing economies are more likely to have market distortions (including monopolies) making market power an obvious cause for concern leading to more caution with regards to reform and market opening. Accordingly, each participant government viewed the components of restructuring and competition differently. Such 'cautious' transitions have resulted in a variety of experiences to investigate.

As the World Bank continued its efforts to encourage privatisation, 'there was a consensus that private investors would not show up unless the system for settling tariffs – the core regulatory task – was "de-politicized" and "made independent" (Bakovic et al, 2003, p. 13). The World Bank encouraged the establishment of regulatory authorities that could balance consumer and investor interests while setting up tariffs. According to Bakovic et al (2003), however, a 10-year experience shows that many regulators in developing countries never became independent while some were granted limited legal independence. Moreover, tariffs in many cases fell short of covering cost which called for political intervention to recover costs. Among other things, the gaps between actual and expected returns were due to insufficient information at early stages of tariff setting and exaggerated efficiency requirements. In the cases of Georgia and India, the problem was worsened due to lack of support by local authorities to enforce law on the non-paying illegally connected customers. Although this is merely an enforcement issue and should not be viewed as a regulatory concern, it distorts performance of participating firms and challenges the tariff-setting functions of the regulator. Once laws fail to enforce collection of the tariffs already set 'ex ante' by regulators then returns would fall short of fulfilling investments and operational cost requirements leading to further 'ex post' corrective measures. Not only such corrective measures would be unfair to paying consumers but may also send a wrong signal about an inefficient regulator and, hence, weaken the overall regulatory environment. Bakovic et al (2003) recommended an alternative *regulation by contract* - already in place in some Latin American countries – as an alternate to regulatory independence. By means of such contracts a formal agreement is signed with distribution companies underlining the formulas by which prices for distribution are set (including regulatory treatment with respect to cost pass-through). The argument here is that regulation by contract could protect consumers from market exploitation (high prices or inferior service quality) and – at the same time - maintain an attractive environment for investment. In accordance to the terms of the contract, risk can be allocated, and accordingly, distribution companies can manage risks associated with prices to reflect charges, costs envisaged and quantities to be sold. It is worth noting that this approach was not so successful in Brazil due to many factors including uncertainty about pass-through for power-purchase costs, foreign exchange risks, uncertainty in legal framework and lack of respect for contracts.

Thailand: The Choice of a 'Single Buyer Model'

Although the single buyer model purchasing arrangements may result in higher costs and reduced transparency compared to full liberalisation, it was chosen by many developing countries due to shortages in available state funding, market size limitation or worries over consequences of speedy market opening and reform. According to Arizu et al (2006), the experience of Thailand is a typical case of integrated single buyer based reforms. Electricity generation in Thailand was opened for competition in 1992 while keeping the Electricity Generating Authority of Thailand (EGAT) and the two distribution firms in the hands of the state. Since 1992, EGAT, a vertically integrated generation and transmission utility also in charge of procurement, invited small power producers to bid for electricity supply. In 1994, EGAT requested proposals for large capacity IPPs for the period from 1996 to 2002. The bidding resulted in EGAT signing 7 IPP deals with a total capacity of 5,950 MW. The last of these was concluded by 2003 without government guarantees under a 25-year Power Purchase agreement. For the government of Thailand, a single buyer model was the only option to take as utilities and unions opposed a pool system while some uncertainties rose in relation to expected operational complexities. The government has then announced an enhanced single buyer model allowing EGAT to continue being the procurer while requiring accounts separation for EGAT activities and those of the state-owned distribution companies with a view to corporatise and list all entities in the stock exchange. By the early 1990s, just like Thailand, many developing countries including Mexico, Honduras, Nigeria, Jordan, Tanzania and Cambodia introduced the single buyer model as part of their market reform 'packages'. Meanwhile, Brazil - as will be explained later - had developed its own electricity procurement system.

It is worth noting that after the California Crisis, reforms in some countries like Thailand and Mexico seem to have slowed down. Although their regulatory bodies are already in place, 'they do not yet have much of a private or competitive market to regulate' (Littlechild, 2007, p. 8).

Pakistan: Privatisation through IPPs

In 1994, Pakistan adopted a Private Power Policy, with the help of the World Bank, which enabled the country to secure financial close of about 3400 MW through 19 IPPs (4 of which amounting to 435 MW were terminated) in what was then referred to as the Private Power Policy (Fraser, 2005). Pakistan's first private IPP, the US$1.6 billion (1292 MW) Hub Power Project, was so successful in its fundraising that *Euromoney Institutional Investor* announced it, then, the 'Deal of the year'. The Independent Power Producer (IPP) programme was launched two years after Pakistan started unbundling its electricity service utility through the splitting of the Water and Power Development Authority (WAPDA) into generation, transmission, dispatch and distribution.

However, the Hub Power Project did not truly materialise and the speedy reform programme was not so successful after all. In 1998, the government announced a plan to terminate 11 IPPs (about 66% of the privately contracted power) on the basis of technical and corruption related allegations which resulted in a rally of tariff renegotiations and contract cancellations. The view of international investors changed dramatically. Once again, the World Bank was called to the rescue where the primary advice was to separate criminal accusations from commercial disputes. Criminal charges were handled through the courts while commercial disputes were negotiated. Pakistan was able to contract out most of its needed extra capacity through the setting up of a bulk tariff ceiling (rather than open bidding)[25]. Noted by Fraser (2005), one important lesson to learn from Pakistan's experience is that expansion in private sector generation needs to be aligned with the country's state of sector reforms as well as other economic and political considerations including institutional governance. In line with similar mechanisms elsewhere, tariff payments comprised of a *capacity* price (fixed regardless if plants were not actually called to operate) and a variable *energy* price (based on actual power purchased). However, critiques of Pakistan's 1994 Private Power Policy included over-estimated demand leading to unnecessary capacity charges.

A World Bank survey showed that foreign investment in developing country power sectors was growing in the first part of the 1990s - driven by IPPs in East Asia and privatisation in Latin America - until reaching a peak of more than $50 billion in 1997 (Lamech and Saeed, 2003). However, this trend sharply declined once these projects were completed while such projects were becoming less attractive to investors. The survey concluded that the financial crisis like the ones in Argentina and East Asia have contributed to the declining levels of foreign investor interest as they resulted in devaluations of local currencies which led to questioning the sustainability of investments. Other factors may have included specific conditions in these countries and the experiences of investors in them.

Argentina: Early Market Designs and Excessive Interference

Argentina is thought to be a good example of electricity reform in the developing world with utility sector privatisation dating back to 1989 (Chisari et al, 1999). It was in 1992 when the country underwent a complete restructuring programme for its electricity service utilities. Immediately, Argentina's electricity utility reforms resulted in considerable economic gains by lowering both government debt and public spending as well as expanding the size of the stock market. Generation capacity was also expanded while transmission lines were extended (Haselip, 2005). Further, according to a study by Chisari et al (1999), between 1992 and 1995, efficiency gains (reduction in intermediate inputs as a share of sales) were 19.5% and 6.3% in generation and distribution respectively while labour productivity gains in the two

[25] The price was set to US cents 6.1 per kWh as an average for the first ten years then US cents 5.5 per kWh for the life the project. Although, at the time, the price was competitive to those prevailing in Indonesia, Philippines and India, Bangladesh was able to obtain a price of US cents 3 per kWh through an open tender (Fraser, 2005).

segments (increase in as Gigawatt-hours per employee for electricity) were 23.1% and 17.6% accordingly. However, in 2002, the government declared a public emergency when it was forced to abandon the currency fix resulting in the country's currency (the Peso) losing 70% of its value. Until the tariff freeze brought in by the crises, many agree that reforms in Argentina were a success (Haselip, 2005). After this macroeconomic crisis, excessive interferences in Argentina may provide 'lessons in how not to manage energy policy' (Pollitt, 2008, p. 1537).

Like many other reforms, the Argentinean reform 'package' was also based on gradual change. At the start, the restructuring programme involved the break up of the three state-owned vertically integrated companies into 27 generators, 7 transmission companies and few distributors. Transition was guided by legislation. In November 1989, the Pacto Federal Electrico (Federal Electricity Pact) was adopted. The Pact did not have a noticeable impact calling for another attempt of restructuring of the electricity sector with the assistance of the World Bank leading to the issue of Decree 634 in 1991 and, subsequently, the introduction of a new Electricity Law (24065) enforced in April 1992. The Law together with the Decree formed the basis for disintegrating or 'unbundling' the vertically integrated utility and, hence, the privatisation of almost all generators (60-80%), all transmission companies and most distribution (60-70%). Meanwhile, the state continued to own the nuclear plants and two hydro-electric plants. Among other things, the Law also facilitated for the creation of a wholesale electricity market and a separate regulator as well as defining the role of the Secretary of Energy. The main features of the Law included regulatory safeguards for the transmission and distribution monopolies and required third party open-access to transmission and distribution networks on non-discriminatory basis. While generation was open for competition, all generators received the same rate which was determined by the National Load Dispatch mainly on the basis of marginal cost and non-supplied energy. The Law provided for a separate SO in charge of dispatch and an independent regulator - the National Regulator of Electricity (ENRE) - while the wholesale market had a cost based bidding system for scheduling generation plants. The law also allowed for seasonal average prices to be passed through to customers. Meanwhile, the Law established an advisory Federal Energy Council which was also entrusted with administering the National Fund of Electricity for regional subsidies. The main Wholesale Electricity Market (MEM) supplied 93% of the country's requirement while the 6% requirements of the southern - non-interconnected – system was catered for by the (MEMSP) Market with only 1% of

Argentina's electricity requirements met by small isolated systems. Generators placed their hourly bids every six months with prices not exceeding 115% of actual fuel cost with some adjustment mechanism for fuel price fluctuations. The Argentinean wholesale market was based on two parts; a spot market which are determined hourly on the basis of short-term marginal costs and bilateral contracts that are negotiated and freely agreed between the different market agents (Dyner et al, 2006 and Pollitt, 2008).

Spot prices fell considerably between 1992 and 2004 (from an average of little over 75 Argentinean Peso/MWh to around 30 Peso/MWh) partly due to increased competition and an addition of low-cost natural gas (Dyner et al, 2006). Between the years 1998 and 2005 the electricity distribution business environment in Argentina remained non-attractive. According to the return on capital analysis carried out by Rocha et al (2006) for the period, Argentinean distribution firms were not able to provide their shareholders with a return that is consistent with the estimated cost of equity. Many other market participants in Argentina would also await someone to pay for 'the cost of "re-balancing" electricity prices in the wake of the currency collapse' (Haselip, 2005).

Argentinean reforms may have been considered - when introduced – the most elaborate among the developing countries. Pollitt (2008) leads us to some specific lessons from the Argentina case and the subsequent interferences to the energy crisis in 2002:

1. All beneficiaries must pay for their use of electricity. Between 1992 and 2001 they were able to move to a situation where all domestic users were billed. The government assisted (in a form of subsidy) those who could not afford such bills. This is a good lesson for developing countries which still allow non-paying as a way of 'redistributing wealth'. While cross-subsidies distort the market, a proper tax and subsidy scheme may result in higher overall system efficiency.
2. Excessive regulatory interventions due to political pressures may only distort the market leading to even more unjustified interventions. In the case of Argentina, such interferences included keeping distribution access charge low (which lead to payment issues in generation).
3. No other authority should be allowed to play the role of the designated regulator. Since the Argentinean crisis, electricity market issues are in the hands of the Federal Government's Commission for the Renegotiation of Public Contracts (Haselip, 2005).

Moreover, the Secretary of Energy was involved in the setting up of seasonal prices, dispute arbitration and approving regulated tariffs (Pollitt, 2008).

Brazil: Extending the 'Contract-based' Model into a Pool

Even with market orientated reforms, supported by an independent Brazilian Electricity Regulatory Agency (ANEEL) founded in 1996, generation did not match demand as 'capacity' rose by only 28% while demand increased at 45% between 1990 and 1999 (OECD, 2005). Under the reforms, the government initiated a programme in the year 2000 which was only able to deliver 15 plants (amounting to 4 GW) out of the planned 49 gas-fired projects. The programme was intended to lessen the country's heavy reliance on hydropower generation which amounted to 68.2 GW representing 80% of the country's total generation capacity.[26] The insufficient investment may have been attributed to some uncertainties caused by the risk that existing hydropower plants could undercut the gas-fired generators, except in a dry year. This weakness in Brazil's market design meant that these reforms were not able to safeguard the country from an energy shortage crisis between July and December 2001 due to a dry summer as water levels plunged into seriously law levels. Subsequently, the government established an 'emergency' company in order to purchase electricity (financed by newly introduced taxes on electricity consumption) and pass it on directly to distribution companies through a rationalising scheme. The rationing scheme was then lifted by February 2002 thanks to a rainy season and reduced consumption.

Law 8631 marked the start of electricity reform in Brazil in 1993 and even with non-complete rules, privatisation started. While most distribution companies and a few generators were privatised from the start, transmission companies (TRANSCOs) remained state-owned. According to (Araújo, 2006, p. 579) 'the misalignment between reform and divestment processes generated a heavy backlog of ad hoc contracts and measures, and some unpleasant surprises' including the modifications of quality of supply contract clauses after the blackouts of 1997/1998.

Prior to 2004, Brazilian distribution and supply companies (DISCOs) were allowed to negotiate their own purchases directly with suppliers (at least 85% of their requirements

[26] Brazil has the largest water storage capacity in the world (OECD, 2005).

secured by forward contracts of a two-year period or more while the remaining 15% must be purchased through short-term contracts or in the spot-market - calculated on weekly basis)[27]. The 85% bilateral contract requirement (then became 95%) was to hedge against potential volatilities (Araújo, 2006). In 2004, Brazil introduced a pool model (Ambiente de Contratação Regulado, ACR) to replace the procurement system of 'initial contracts' that were also a replacement of the original long-term power supply contracts (OECD, 2005). In the original Brazilian electricity supply industry (ESI), these long-term contracts were initially signed between generators and distributors following the privatisation of generation and distribution by end 1990s and by which generators continued to supply electricity to distributors according to cost-of-service basis.

The new auctioning scheme the 'pool' did not upset the previously signed PPAs. The different DISCOs could only sign new bilateral agreements only on the basis of the new purchasing arrangements. In the new environment, the Chamber of Electric Energy Commercialization (CCEE) - the market administrator – acted as the 'auctioneer' while the role of the government was restricted to being the 'broker'. The new method was considered to be a success although some state-owned generators were criticised for quoting very low prices resulting in below cost contracted deals for some private generators. Another drawback is the lack of international interest in the Brazilian market (Arizu et al, 2006, p. 28).

Therefore, the contract-based Brazilian pool, although not fully subjected to market mechanism, allowed for risk to be shared among market participants (as apposed to being born by a single state-owned agency like in the case of a single-buyer model). The new model aimed at encouraging investment by reducing market risks. This also meant that the government would ultimately remain responsible for capacity planning; and hence lessening ordinary market demand forces to drive supply. In practice - different from the other models of the Nord Pool and England and Wales - the Brazilian pool had two basic features (OECD, 2006):

1. This 'regulated' pool is based on long-term contracts and acted, merely, as a coordinator (not a real-time marketplace). Demand is estimated by distribution companies which are then mandated to contact out their projected demand over a period of 3 to 5 years.

[27] Between September 2000 to June 2001, prices were set on a monthly basis (Araújo, 2006).

2. Parallel to the above pool ran a ‘free’ market pool (Ambiente de Contratação Livre, ACL). This market-based pool allowed distribution companies to purchase their extra requirements (if projected quantities were less than actual demand) or sell off any access capacities (if demand falls short of expectations). However, distribution companies are only allowed to pass through - to their customers - any extra costs incurred up to 5% of the newly contracted (non-projected) requirements.

Through this model, the sixty-four electricity distributors are regulated by a price-cap with a tariff revision every 4 to 5 years. In 2003 and 2004, forty-four of Brazil’s distributors underwent periodic revisions (Rocha et al, 2006). The revisions are aimed at re-establishing two factors; (i) a tariff reporting (TR) corresponding to a fair return on investment and a tariff index factor (X) allowing for some productivity and efficiency gains to be passed to consumers. Based on the analysis of Rocha et al (2006), 2005 was the first year when profitability levels of the distribution segment were shown to be consistent with the cost of equity. The Brazilian model also allowed for an annual tariff adjustment process in order to adjust for the rate of inflation.

Chile: A Cost-based Pool

Chilean electricity reforms dated back to the 1980s before England and Norway. However, with almost three decades of evolving legislation, significant parts of the industry in this reform-leader of the developing world are still regulated. Generation in Chile is subjected to competition, the transmission system is run on non-discriminatory basis with an independent system operator (SO) while distribution monopolies are regulated (Raineri, 2006). According to the law, there are three markets for electricity; (1) generators can sell to distributors who then sell electricity to small consumers at regulated prices, (2) generators and distributors may sell directly to large consumers (with loads above 0.5 MW) at freely negotiated electricity supply contracts and (3) generators can sell *energy* at prices decided by the Economic Load Dispatch Center (Centro Despacho Económico de Carga, CDEC) on the basis of marginal costs (declared by generators) while *power* transfers are charged to small consumers at a ‘capacity charge’ regulated by the National Energy Commission (Comsión Nacional de Energía, CNE). There are four isolated ‘non-connected’ power systems in Chile. The largest are Sistema Interconectado Central, SIC (in the center) and Sistema Interconectado del Norte, SING (in the north). According to the analysis of Rocha et al

(2006) on the Chilean industry between 1998 and 2005, it was observed that - with the exception of 1999 - Chilean distribution companies were able to obtain adequate returns on their investments (since profit levels remained above the envisaged cost of equity).

In the last fifteen years, the Chilean model was challenged at least three times. *First*, during 1998 and 1999, the hydro-dominated power sector was adversely affected by a serious drought situation (Raineri, 2006). The diminishing generating reserves called for government intervention by introducing three Electricity Rationalising Decrees in order to facilitate the work of the DISCOs until the drought crisis was over by mid-year 1999. During this time, technical failures also delayed the introduction of newly installed gas-fired stations. The crisis also caused concerns over the sustainability of the regulatory framework as well as disagreements between generators and distribution companies over energy prices to be paid under such ‘failures’. The *second* challenge was faced in 1999 in the form of <u>blackouts attributed primarily to lack of coordination between the different generators</u>; hence, the regulatory environment was not able to cope with the expansions in gas-fired power generators. *Thirdly*, in 2004 the interruption of gas supply - due to political and economic situations in neighbouring countries – posed a new challenge for the model of Chile. Chile has increasingly depended on the importation of natural gas from Argentina since 1997 and by 2004 the Chilean main systems, SIC and SING, respectively produced 28% and 61% of their electricity from natural gas-fired turbines. The Argentinean natural gas deficit in that year was passed to its importing neighbour Chile forcing the government to once again intervene by instructing market participants so that available gas-fired plants (yielding relatively lower prices than thermal plants) must first supply domestic users, hospitals and small firms before supplying their larger customers.

According to Raineri (2006) there are some valuable lessons for market design drawing from the experience of Chile, among them introducing pricing flexibility that does not segregate end-users from short-term market conditions, avoiding regulatory uncertainties by introducing stable rules that responds to market changes and having adequate coordination among market participants.

3.7 Conclusions

Alongside the other non favourable incidents, the California Crisis would continuously cast a ‘shadow’ over the many – otherwise justifiable – market opening initiatives. After all, ‘How could such a high-tech state lose control over the electricity system to the extent that service could no longer be guaranteed?’ (Vries, 2005, p. 89). Ultimately, governments would have no other choices but to explore - each at its own pace – the possibilities for electricity reform while keeping in mind that there is no one specific practice to be followed. Nevertheless, there are a variety of ‘packages’ to choose from when planning for reform. Worldwide experiences clearly illustrate that electricity market reforms and market opening must be based on careful market designs to avoid future interventions. Purchasing and/or wholesale trading arrangements are at the center of any power sector reform. While the single buyer arrangements through PPAs may deprive consumers from potential savings due to their long term commitments, such transitional arrangements may still yield comparative prices and pave the way for further reforms once are efficiently implemented. Although the single buyer model is not the only form of centralised purchasing, it is used within the Developing World and may be a ‘safer’ transitional arrangement especially in the case of market size limitations.

Chapter 4 A Review of the GCC

4.1 Introduction

This chapter introduces the Gulf Cooperation Council (GCC), outlines its organisational structure and aims and objectives, and describes the legal and institutional framework under which it operates. We identify important similarities and differences across member states that are relevant to our study and examine the GCC Interconnection Grid that could facilitate cross-border electricity trading. We review member state electricity markets and consider how the GCC Interconnection Grid may influence member-state electricity sector reform.

4.2 An Overview of the GCC as a Region

On 25th May 1981, the leaders of the United Arab Emirates, State of Bahrain, Kingdom of Saudi Arabia, Sultanate of Oman, State of Qatar and State of Kuwait met in Abu Dhabi, United Arab Emirates and signed a cooperative framework to effect coordination, integration and inter-connection among the Member States in all fields in order to achieve unity. The GCC meets annually and is chaired on a rotating basis by the heads of state.

As shown in Figure 8 the GCC covers an extensive and contiguous area.

Figure 8   Map of the GCC

Source: University of Texas Libraries (Map of the GCC, 2007)

4.2.1 Institutional Framework

The main authorities of the GCC are the Supreme Council, the Ministerial Council and the Commission for the Settlement of Disputes:

A. *The Supreme Council:* consisting of heads of member states, is the highest authority. The Supreme Council holds a regular session - usually at the end of each year – and may hold extraordinary sessions upon request. The draft agenda for the Supreme Council is prepared by the Ministerial Council;

B. *The Ministerial Council:* acts as the filtering mechanism for the Supreme Council and consists of member state Foreign Minsters or other delegated ministers. The Council holds ordinary sessions once every three months and may hold extraordinary meetings at the request of a member state. Meetings are chaired by the member state that presided over the last ordinary session of the Supreme Council. Unanimous approval of member states present is required to pass a resolution while a majority vote is required for procedural matters; and

C. *The Commission for the Settlement of Disputes:* Article 3 of the Rules of Procedure Commission for Settlement of Disputes states that the commission once installed may only consider the following matters referred to it by the Supreme Council: (1) Disputes between member states, and (2) Differences of opinion with regards to interpretation or implementation of the Cooperation Council Charter (GCC Charter and Procedures, 1991). The Commission selects its chairperson from among its members who are citizens of member states not involved in the dispute and submits its recommendations or opinion to the Supreme Council.

The GCC Charter:

One of the basic objectives of the Cooperation Council is to formulate similar regulations in the fields of (a) economic and financial affairs and (b) commerce, customs and communications (Article 4). The Charter allows for further market opening and economic integration. However, any new regulations must be unanimously approved by the members of the supreme council (heads of member states) as each member has one vote, while only resolutions on procedural issues are carried by majority vote (Article 9).

The Economic Agreement between GCC States:

A further Economic Agreement was approved and signed by the Supreme Council at its 22nd Session during the Muscat Summit on 31 December 2001. More detailed than its 1981 predecessor (which aimed at establishing the GCC as a free trading zone), the new agreement aims - in its preamble - to 'achieve advanced stages of economic integration that would lead to a common market and an Economic and Monetary Union' (GCC Economic Agreement, 2004). The intended level of economic integration between the GCC member countries was reflected in a number of articles in the Agreement:

(i) Establishing a Custom Union through a common external customs tariff of 5%, an agreed set of regulations and procedures, a single entry point, the elimination of trade barriers and the same national treatment of goods produced in the GCC (Article 1);

(ii) Proposing collective international negotiations and economic relations (Article 2);

(iii) Requiring the removal of any differentiation or discrimination among member states in terms of: job opportunities among citizens, real estate ownership, capital movement, tax treatment, stock ownership, and other social services like health and education (Article 3);

(iv) Paving the way for possible Monetary Union by 2010: by streamlining the investment climate so that all related laws and regulations are similar, providing national treatment to GCC investment and through the integration of financial markets (Article 4)[28];

(v) the GCC Agreement stipulates that 'Member States shall adopt integrational policies for the establishment of the infrastructure projects such as seaports, airports, Desalination plants, electric power stations, and roads' (Article 23); and

(vi) Implementing a mechanism for the Settlement of Disputes among member states. When necessary, a specialized judicial commission may be formed to arbitrate disputes arising from the implementation of the agreement (Article 27).

We shall consider below what progress has been made to achieve these objectives.

[28] Although some of these measures were implemented, monetary union has not yet been achieved

4.2.2 Economic Indicators and Comparisons

There are important economic similarities and differences across GCC member states. With the exception of Bahrain, GCC countries are reasonably well endowed with oil and gas reserves although only four countries (Kuwait, Qatar, KSA and the UAE) are members of the Organisation of the Petroleum Exporting Countries (OPEC). Oman has oil and gas resources but is not a member of OPEC. Some comparative statistics are presented in Table 2.

Table 2 Comparison of Economic Indicators Across GCC Countries (2009)

	Bahrain	Oman	Qatar	Saudi	Kuwait	UAE	GCC
GDP at Current Prices (Million US$)	20,595	46,114	98,313	375,766	148,024	230,252	919,064
% of GCC	2%	5%	11%	41%	16%	25%	100%
Popul tion (000's)	792	2,845	1,409	25,391	2,795	4,599	37,831
% of GCC	2%	8%	4%	67%	7%	12%	100%
Per Capita Income GDP (000 US$)	26	16	70	15	53	50	24
Rank (largest = 1)	4	5	1	6	2	3	
Lank Area Sq km	707	309,500	4,200	2,200,000	24,282	83,600	2,622,289
% of GCC	0.03%	12%	0.2%	84%	1%	3%	100%

Source: The World Bank Group (www.worldbank.org)

In terms of economic activity and population, Saudi Arabia accounted for over 40% of total GCC GDP in 2009 and 65% of the GCC's population, but has the lowest GDP per capita of $15,000. The GDP per capita of Qatar ($70,000) Kuwait ($53,000) and the UAE ($50,000) are significantly higher than the GCC average of $24,000 per capita. Bahrain's GDP per capita of $26,000 is just above the GCC average whereas the GDP per capita of Oman and Saudi Arabia are below the average.

The GCC region covers a total land mass of 2,662 thousand square kilometres. Saudi Arabia and Oman account for 96% of this area with other member states accounting for 3% or less.

Most GCC countries are endowed with hydrocarbon resources and some of the world's largest oil and gas reserves are located in the GCC. In 2006, GCC countries produced 5,762 million barrels of oil of which Saudi Arabia accounted for 56%, Kuwait and UAE each accounted for 16% of production, and collectively Bahrain, Oman and Qatar accounted for 11% of total GCC production.

Proven GCC oil reserves in 2006 were an estimated 484,450 million barrels. Saudi Arabia accounts for 55% of these reserves, Kuwait 21% and UAE 20%. Oman and Qatar collectively account for just 4% of total GCC proven reserves with Bahrain accounting for less than one tenth of one per cent.

Table 3 GCC Crude Oil Production and Reserves (Million Barrels)

	Bahrain	Oman	Qatar	Saudi	Kuwait	UAE	GCC
Production per year (2006)	67	288	310	3,252	895	950	5,762
% of GCC	1%	5%	5%	56%	16%	16%	100%
Proven Reserves	120	5,510	15,207	264,310	101,500	97,800	484,447
% of GCC	0.02%	1%	3%	55%	21%	20%	100%
Expected years of Reserve	2	19	49	81	113	103	

Source: GOIC (2007)

Turning to GCC gas production, Saudi Arabia, Qatar and the UAE accounted for 33%, 22% and 22%, respectively, of GCC gas production in 2006. Oman accounted for 11% with Bahrain and Kuwait each accounting for 6%. Total GCC gas reserves were an estimated 41,712 billion cubic meters in 2006 of which Qatar's share is 62%. In terms of 2006 production, Qatar has over 500 years of gas reserves.

Table 4 GCC Natural Gas Production and Reserves (Million Cubic Meters)

	Bahrain	Oman	Qatar	Saudi	Kuwait	UAE	GCC
Production per year (2006)	13,400	25,300	48,300	73,500	12,800	47,600	220,900
% of GCC	6%	11%	22%	33%	6%	22%	100%
Proven Reserve	92,000	900,000	25,783,000	7,037,000	1,600,000	6,300,000	41,712,000
% of GCC	0.22%	2%	62%	17%	4%	15%	100%
Expected years of Reserve	7	36	534	96	125	132	

Source: GOIC (2007)

GCC countries with minimal gas reserves benefit from their proximity to the abundant natural gas reserves of Qatar. The Dolphin pipeline project is a good example of this economic cooperation: the Dolphin project processes natural gas from the Qatari North Field of Ras Laffan (the largest non-associated gas field in the world with 24 wells) and transports it through a pipeline to the UAE and Oman in order to facilitate long term industrial growth (Shemaine, 2008). The 364-kilometre 48-inch sub-sea pipeline was partially completed in August 2006 and serves customers in three UAE Emirates (Dubai, Abu Dhabi (Al Ain) and Fujairah). The project is expected to supply gas to the Abu Dhabi Water & Electricity Authority (ADWEA), Dubai Supply Authority (Dusup), Union Water & Electricity Company (UWEC) and Oman Oil Company (OOC). In October 2008, the final link of the pipeline with Oman was completed and can deliver an average of 200 million standard cubic feet of gas per day for a period of 25 years (Al Dhuhli, 2008 and Observer, 2008).

Table 5 lists some specific characteristics of GCC member states.

Table 5 Specific Characteristics Among GCC Countries

Country	Specific characteristics
Bahrain	* Limited oil and gas reserves could speed up diversification including privatisation of services. * Small size of land could adversely affect the ability for economic expansion especially in power generation. * A strong financial sector with reputable offshore financial institutions.
Kuwait	* Difficulties in reaching political consensus between government and the parliament had, in part, slowed down the implementation of the official strategy on development (IMF Country Report No. 04/186, 2004). * Over the years, surplus oil revenues were channelled through the General Reserve Fund (GRF).
Oman	* According to Vision 2020, crude oil is planned to constitute only 9 % of GDP in 2020 from 40% in 2001.
Qatar	* Financially, Qatar has enjoyed a reasonable budget surplus at a time when other GCC members were running deficits (like for the 2002 due to a drastic drop in oil revenues).
Saudi Arabia	* The last GCC member to join the WTO (December 2005) after lengthy negotiations on market opening.
UAE	* In recent years, the UAE – especially the Emirate of Dubai- has expanded its real-estate sector by further extending foreign ownership rights and developing required financial tools and marketing.

Source: The World Bank Group (www.worldbank.org)

The economies of all six GCC member states are heavily dependent on hydrocarbons but as shown above there are significant differences in member state oil and gas reserves, GDP, populations and GDP per capita. In order to diversify their economies away from hydrocarbons GCC member states have introduced policies focussed on increasing private sector participation and export oriented manufacturing, real estate development and tourism. Table 6 identifies some of the sectors GCC member states are promoting to aid economic diversification.

Table 6 Expected Future Contributors to the Economies of the GCC

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
Main Exports						
Industrial	aluminium			petrochemicals	steel, petro-chemicals	Industrial goods
Agro-based			fish			
Hydrocarbon based	-	oil/gas	gas	gas/oil	oil/gas	oil/gas
Other	-	-	-	-	-	-
Services	tourism & finance	Investment	tourism – nature	tourism – sports	tourism – religious	tourism – shopping
Main contributors of the economy	financial market	int. investment	tourism	gas-based industries	heavy industries	trade & real-estate

Source: Based on GCC Statistical Bulletin (2007), GOIC (2007) and researcher's findings

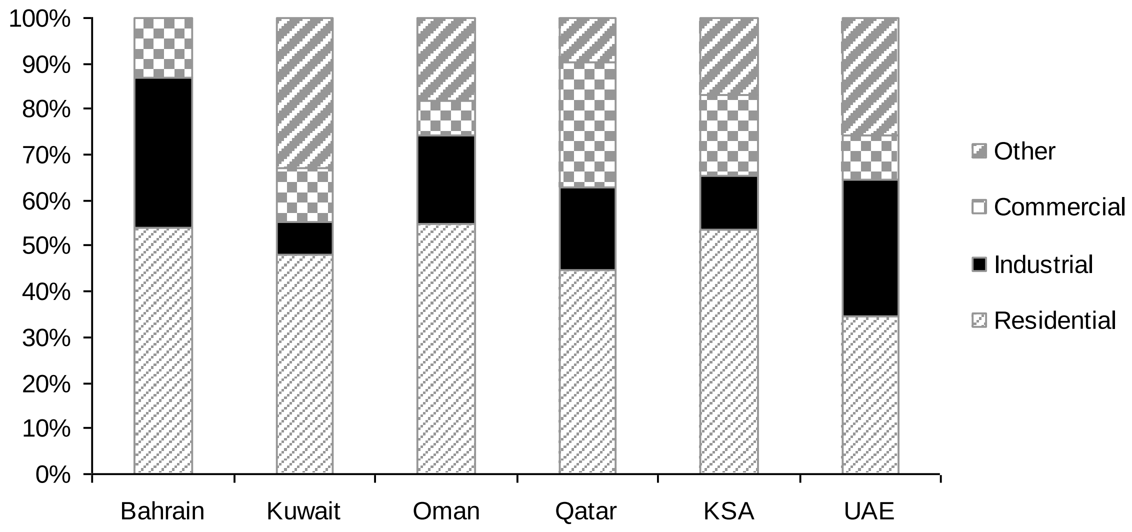
4.3 GCC Electricity Markets

GCC member states are experiencing strong growth in electricity demand. In his presentation to the 9th Middle East Power Generation Conference[29], Mohamed Ayesh Dishdash, Director of Electricity Department at ARAMCO-Saudi Arabia estimated that by 2015 about US$160 billion would be required to meet the electricity demands in the area of the Middle East out of which US$85 billion would be needed for new generating capacity while US$75 billion would be needed to finance the transmission and distribution networks (Al-Shaik, 2004).

[29] The 9th Middle East Power Generation Conference, Dubai, UAE, February 2003.

The structure of 2008 electricity demand in GCC member states is presented in Figure 9: residential 'domestic' consumption accounts for around 50% of total GCC consumption. UAE residential consumers have the lowest share of total consumption at 35%, and Oman the highest at 55%.   In an empirical study on the demand for electricity within the GCC, Al-Faris (2002, p.123) found limited scope for residential customers to switch to alternative energy sources (other than electricity) as the elasticity of price and income results for the member countries were 'notoriously small'. The study concluded that 'the majority of people in these countries consider electricity as a necessity' (ibid). Other users (which available statistics fail to disaggregate) may also include government (mainly administration buildings). This is one possible explanation why demand is seasonable and falls sharply in cooler months as both households and government administrative buildings use less air-conditioning in cooler months of the year.

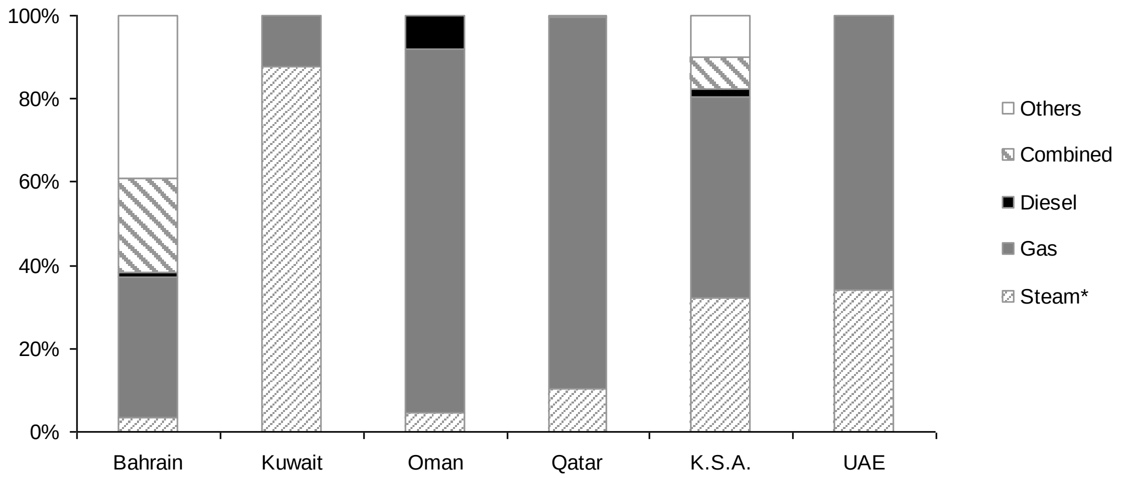
Figure 9   Energy Consumption by Category (2005)



Source: GCC Statistical Bulletin (2008) publication pending

Figure 10 presents a comparison of the fuel used to generate electricity in each member state in 2005.

Figure 10 Electricity Generation by Fuel Type (2005)



Source: GCC-CIGRE Statistical Bulletin (2005) * The source does not provide details on the fuel used for steam generation.

GCC member states are extensive users of fossil fuels for electricity generation. Oman is the most heavily dependent on natural gas for electricity generation and with strong growth in the electricity demands of commercial and industrial customers may need to import gas from gas rich GCC countries (such as Qatar, Saudi Arabia and UAE) in the longer term.

All GCC electricity markets are subsidised with consumer tariffs set by the respective governments of each member state. The case studies of Oman and Abu Dhabi (to be presented in Chapter 6 and Chapter 5, respectively) will show that even in countries that have introduced electricity market reform, consumer prices are not cost reflective. GCC experts and officials like Al-Asaad and Al Mahrouqi share the view that governments will continue subsidising consumer prices[30].

The Kingdom of Bahrain

Electricity in Bahrain remains a vertically integrated utility the Authority of Electricity and Water (AEW). The Authority – Chaired by the Minister of Works - assumed the

[30] Based on personal communications from Hassan K. Al-Asaad, Corporate Services, GCC Interconnection Authority (Saudi Arabia) received on 21 April 2009 and Mohammed Al Mahrouqi, Chairman of Public Authority for Electricity and Water (Oman) received on 20 May 2009.

responsibilities of the Ministry of Electricity and Water according to a Royal Decree in 12 December 2007 (Gulf daily News, 2007b).

The BABCO refinery of Bahrain and the Aluminium Smelter, ALBA, are licensed for self generation and have a negotiated annual agreement to purchase 1200 GWh from ALBA.

According to Al-Mohaisen[31] (Appendix 1) Bahrain was expected to announce reforms through a new regulation in 2007. Hill and Raza (Appendix 1) also stated that Bahrain and Qatar have indicated in a 'verbal and public context that they do not want to be locked into their existing electricity structures' which gave a signal towards change. Bahrain has taken steps to privatise electricity generation. In May 2007, the Parliament voted to delay discussion of a new electricity law (Alwaqt, 2007).

On 23 January 2006, three international firms agreed to acquire the assets of Al Hidd Power Company (producing little over 900 MW of and 30 million gallons of desalinated water) and expand the project on a Build-Own-Operate basis by International Power of the UK (40%), Suez Energy International of Belgium (30%) and Sumitomo Corporation of Japan (30%). The privatisation deal included the expansion of the plant capacity to produce 60 million gallons of desalinated water on the basis of a government 20-year Power and Water Purchase Agreement (PWPA) and a separate 20-year Natural Gas Supply Agreement (International Power, 2007).

On 3 June 2007, Al Ezzel Power Company (AEPC) started commercial production of full capacity of 950 MW (Gulf Daily News, 2007). Awarded in 2004 on the basis of a 20-year PPA signed with the Ministry of Electricity and Water (now the Electricity and Water Authority), Al Ezzel is Bahrain's first independent power producer (IPP) with 45% owned by Suez Energy International (Suez Energy International, 2007), 45% owned by the Kuwaiti based Gulf Investment Company (GIC) and 10% of the shares held by Pension Fund Commission of Bahrain. Al Ezzel accounts for one third of Bahrain's power generation, Al Hidd produces little over one third (962 MW) and the rest (855 MW) is produced by other facilities at Sitra, Riffa and Muharraq (Gulf Daily News, 2007).

[31] Adnan I. Al-Mohaisen was then the CEO of the GCC Interconnection Authority (Saudi Arabia).

It is to be noted that with a 30% and 45% stake in Al Hidd and Al Ezzel - the largest electricity producers in Bahrain account for two thirds of the market - Suez Energy International is the largest owner of power generation in Bahrain. On the demand side, it is estimated that Bahrain needs an additional 300 MW every two years (Ali, 2006). According to Abdullah (Appendix 1), all new power generation in Bahrain will be contracted out through IPPs, however; no plans are finalised to separate the different segments of the industry.

The State of Kuwait

Kuwait has a state-owned vertically integrated power utility. The Kuwaiti Ministry of Electricity and Water manages the utility service as there is no independent regulator. Based on the GCCIA report, electricity tariffs in Kuwait are subsidised by the government and among the lowest in the GCC region. According to Al-Mohaisen (Appendix 1), Kuwait was not one of the early states in declaring specific plans for power sector reforms. In this researcher's view, such delays may have been caused by the Parliament and the government not reaching agreements over some development plans.

Kuwait faces electricity shortages in summer months. The Kuwaiti Ministry of Electricity and Water added an extra 240 MW capacity in during the summer of 2007 to the already existing capacity of 9,100 MW. During summer, the Ministry runs a 'power rationing' campaign which - according to its undersecretary Al-Hajiri – had a positive public response (Kuwait News Agency, 2007).

A significant recent development was the passing of Law No 39/2010 Promulgating The Incorporation of Kuwaiti Joint Stock Companies to Undertake the Building and Execution of Electricity Power and Water Desalination Station in Kuwait. Article 1 of the law (i) restricts government and its affiliates shareholding to no more than 24%, (ii) not less than 26% of the shares shall be placed for sale through public auction, (iii) 50% of the shares shall be allocated to Kuwaiti nationals (Kuwait Electricity Law, 2010).

Law No. 7/2008 introduced a framework for public private partnerships (PPP) and Law No. 39/2010 permits PPP for generation in the form of BOT projects but with no further separation of functions. The Ministry of Electricity and Water remains a vertically integrated entity responsible for system operator and regulatory functions while tariffs are heavily subsidised. When asked if these reforms would lead to the implementation of a cost-reflective tariff, Al Jassar[32] (Appendix 1) said this was unlikely.

The Sultanate of Oman

A full assessment of the Oman electricity market is presented in Chapter 6 and a detailed social cost benefit analysis of the Omani reforms is presented in Chapter 7.

The State of Qatar

Based on The Power of Watt (2006), Qatar maintains the highest per capita installed capacity among all Arab countries in the Middle East and North Africa (MENA) region and significant gas reserves – the largest in the GCC.

Qatar has undertaken steps to privatise its electricity utility sector. According to the International Monetary Fund (IMF), “The privatisation of the power sector in Qatar has advanced rapidly, with most government power generation plants already sold to Qatar Electricity and Water Corporation - which is majority-owned by the local private sector. In addition, construction has already started on the first independent power and water plant in the country, which is majority-owned by a foreign developer” (IMF PIN No.02/99, 2002).

Qatar General Electricity & Water Corporation (QGEWC or KAHRAMA) was established in 1992 to replace the Ministry of Electricity & Water (Qatari Law No- 6/1992, 1992). The Corporation has exclusive rights over the transmission and distribution wires in Qatar but no generation activities. This was the first step of separating of the vertically integrated utility.

Qatar Electricity and Water Company (QEWC) is the country’s main electricity producer. Established in 1990, the state-dominated (little over 57%) monopoly was set up to own and

[32] Undersecretary, Ministry of Electricity and Water, Kuwait

manage power generation and water desalination. With a private Qatari ownership of about 43% (Doha Stock Exchange, 2004), the publicly listed QEWC enjoys a renewable 50-year term licence. Ras-Abu-Funtas B station, started operations in 1999 generating 609 megawatts, Ras-Abu-Funtas A generates 260 megawatts, while Ras-Abu-Abbood and other substations generate 502 megawatts (Qatar Ministry of Foreign Affairs, 2004).

Separately, Ras Laffan Power Company Limited (RLPC) was established in 2001 by the Amiri Decree 44/2001 to operate the power generation facilities at Ras Laffan offshore oil field. 10% of RLPC is owned by Qatar Petroleum, 25% by Qatar General Electricity and Water Corporation, 10% by the Gulf Investment Corporation and the remaining 55% is owned by AES Ras Laffan Holdings. The targeted capacity of the plant is 750 megawatts of electricity and 40 million gallons of water.

Apart from the steps taken to privatise generation, the electricity market remains a vertically integrated structure with no separate regulator. Licensing and many other regulatory functions still remain in the hands of the Ministry of Energy and Industry. Although not clear, there is a view to assign some regulatory authority to Kahrama. Being the country's sole transmission and distribution system operator, this may not prove to be a reasonable choice to take due to possible conflict of interest.

The Kingdom of Saudi Arabia

The Saudi Arabian electricity restructuring programme is third in line, after earlier reforms in the Emirate of Abu Dhabi followed by the Sultanate of Oman. The following parts of this research review in detail, as mentioned earlier, the Saudi electricity sector reforms.

Until 1981, four regional Saudi Consolidated Electricity Companies (SCECOs) operated to cater for consumer needs in different regions of the country. The electricity service utility in Saudi Arabia is mainly in the hands of the state-dominated Saudi Electricity Company (SEC).

Saudi Electricity Company (SEC) was established in 2000 by the Saudi government (74.15%), Saudi ARAMCO[33] (6.89) with a private sector shareholding of 18.96% (Saudi Electricity Company, 2004). The company was established by a Royal Decree as a joint stock company taking over the assets and responsibilities of the General Electricity Corporation (GEC) whose main task was to oversee the main electricity utility, provide electricity in rural areas that fell outside the supply chain of the consolidated companies and look after the government's investment in the independent power producers.

According to Abudullah Al Hussayen, the Saudi Water and Electricity Minister, Saudi Arabia would require an investment of SR340 billion (nearly US$91 billion) fulfilling its electricity requirements over the next 20 years with an annual growth rate of 7%. To meet such demand, the Saudi Water and Electricity Minister also noted that the Supreme Economic Council approved four IWPPs to be built on the basis of BOO, namely; Shuaiba phase-3, Shuqaiq phase-2, Ras AlZour & Jubail phase-3. Based on similar arrangements, Shuaiba phase-3 was the first to be contracted for with a capacity of 900MW and 194 million gallons of desalinated water per day. The project is funded by the Public Investment Fund (32%), the Saudi Electricity Company (8%) and the private sector (60%). The owner, Water and Electricity Company will sell all its produced electricity to the Saudi Electricity Company (Shaikh, 2007).

The Saudi Electricity Law:

On 22 November 2005 the Saudi Electricity Law was issue by Royal Decree No. M/56 (Saudi Electricity Law, 2005). The main features of the Law are summarised as follows;

1. The Law establishes the Electricity & Co-generation Regulatory Authority (ECRA) as a separate regulator for electricity;
2. The Law requires the regulator (ECRA) to periodically review the tariff structure and submit its recommendations to the Council of Ministers (Article 9);
3. The Law allows the Ministry of Electricity and Water to continue being in charge of electricity sector planning, network development and insuring availability of supply including that of non-serviced remote areas. The Ministry is also responsible for

[33] ARAMCO is mainly an oil and company owned by the Saudi Arabian government.

representing the country in any cross-border trade negotiations and agreements (Article 3);

4. The Law makes a reference to promoting competition in the electricity industry - as a joint responsibility of the Ministry and the Regulatory Authority - with a clause prohibiting a licensee with a dominant position to undertake any activity that could restrict competition (Article 10). Although there are no specific limitations on cross-ownership specified by the Law, based on Article 10, licensees are to obtain a prior approval from the ECRA before undertaking any merger or acquisition, and; before purchasing 5% or more of the shares of another licensee.
5. The Law makes it the responsibility of the regulator to guarantee transmission and distribution rights to all licensees on a non-discriminatory basis (Article 11).

The Electricity Regulator:

The Electricity & Co-generation Regulatory Authority (ECRA) is responsible for licensing and compliance, tariff assessments and reviews, developing technical and performance standards as well as other organizational and administrative dirties (ECRA, 2007). According to the Law, the Authority carries out periodical Tariff structure reviews and submits such reviews to the Council of Ministers (Article 9). Although not clear from Article 9, it may be assumed that any Tariff change must be taken at the level of the Council. The ECRA is managed by a board of directors and chaired by the Minister of Water & Electricity.

The Board of ECRA constitutes of 13 members and a secretary including high officials from the Ministries of Finance, Electricity, Economy and Planning and the Ministry of Petroleum and Mineral Resources.

The New Market Structure:

The new electricity sector still remains vertically integrated to a great extent. The Saudi Electricity Company (SEC) – with majority state ownership - remains a vertically integrated system with a majority market share.

Based on Al-Asaad (Appendix 1), a study was concluded on unbundling the other segments of the power sector (i.e. transmission and distribution) which are currently under the jurisdiction of the Saudi Electricity Company (SEC) but was not applied. According to Al-Mohaisen (Appendix 1) a decision has already been taken in early years– at a management level - for the unbundling of the vertically integrated electricity company (SEC).

While SEC remains the dominant producer (a traded company with a majority state-holding), Marafiq Water & Electricity Company remains the only sizable result of the first round of generation privatisation and separation within Saudi Arabia.

For the Kingdom of Saudi Arabia, transmission, distribution and supply remain largely bundled. According to Moussa (2010), Saudi electricity is currently in a transitional stage that may take two years. This stage involves the finalisation of regulatory framework, setting service standards, identifying licensing methods and procedures, and studying the feasibility of separating generation from transmission. A further intermediate stage would then be required to separate transmission from generation, a stage which may require 3-5 more years (ibid). According to Khan (Appendix 1), some actions have already been taken with this regards as a separate transmission company was formed which will also be the system operator effective January 2012. In addition, a principal buyer unit is to be established in the beginning of year 2012 and a separate distribution company will be formed in the year 2013.

The United Arab Emirates (UAE)

The seven UAE Emirates are linked through the Emirates National Grid. Despite this the electricity markets remain mostly vertically integrated systems in each Emirate with the exception of the Emirate of Abu Dhabi which has been involved in sector reforms since 1998 that are discussed in detail in Chapter 5.

The UAE Ministry of Electricity and Water carried out a national plan that would, once fully completed, link the east coast area of Fujairah with the north and west coast Emirates of Ajman, Umm al-Qaiwain and Ras al-Khaimah. New grid interconnections would also link the middle parts of the UAE with the Fujairah in the east. The optimum aim would be to link the UAE national grid to the GCC-Grid (UAE Ministry of Electricity and Water, 2004).

There are four electricity and water authorities in the UAE: Abu Dhabi Water and Electricity Authority (ADWEA), Dubai Electricity and Water Authority (DEWA), Sharjah Electricity and Water Authority (SEWA) and the Federal Electricity and Water Authority (FEWA). By 2007, the UAE had an installed capacity of 16,131 MW with Abu Dhabi (ADWEA), Dubai (DEWA), Sharjah (SEWA), Northern Emirates (FEWA) and Northern Emirates (ADWEA) accounting for 7,811 MW, 4,710 MW, 1,750 MW, 1,200 MW and 660 MW respectively (UK Trade and Investment, 2007).

DEWA (part of the Government of Dubai), SEWA (Part of the Government of Sharjah) and (FEWA) are arms of the Federal Government and operate vertically integrated systems.

The Emirates National Grid is a step forward in integrating the different electricity market segments of the UAE. The Emirates National Grid (ENG) is an arrangement rather than a regulated activity. The ENG Supervision Committee monitors the activities while each entity in the system is responsible for arranging flow between the different Emirates. The ENG made a significant impact as it already owns some assets. The high voltage substation at Al Dhaid is already owned by Abu Dhabi Water and Electricity Authority (ADWEA), the Dubai Water and Electricity Authority (DEWA), the Sharjah Water and Electricity Authority (SEWA) and the Federal Water and Electricity Authority (FEWA).

GCC Interconnection Authority

On 16 June 1999, the GCC member states agreed to establish the GCC Interconnection Authority (GCCIA) as a joint stock company of a US$1.1 billion share capital (GCCIA Articles of Association, 1999). According to Janahi (Appendix 1), the SNC-Lavalin original study of the project had to be revised so that that the implementation would be carried out in two phases instead. It was agreed that the first phase of the interconnection would include Saudi Arabia, Kuwait, Bahrain and Qatar while the second phase would bring in Oman and the United Arab Emirates. Based on Abdulrahman Al Atiya, Secretary General the GCC, the GCC-Grid would have to be owned and managed - on a purely commercial basis - by the independent GCC Interconnection Authority (GCC Ministers Meeting, 2004).

According to the GCCIA Articles of Association (1999), The GCCIA is set up as a joint stock company. Article 3 allocated the authorised shares capital of U$1.1 billion among the member states so that countries with larger connection capacities are allocated larger percentages of the share capital, (see Table 7).

Table 7   GCCIA Interconnection Criteria and Share-capital

	Bahrain	Kuwait	Oman	Qatar	KSA	UAE	Total
Shareholding (Million US$)	99	294	62	129	348	169	1,100
Shareholding (%)	9%	26.7%	5.6%	11.7%	31.6%	15.4%	100%
Interconnection (MW)	600	1,200	400	750	1,200	900*	5,050

Source: GCCIA Annual Report (2006) * the UAE has an added 400 MW interconnection line with Oman

It was subsequently decided to implement the Interconnection Grid in three phases. Contracts for the construction of Phase I were awarded in November 2005 (Al-Mohaisen et al., 2007) and completed in early 2009 (GCCIA, 2009). Since Saudi Arabia has a 60Hz voltage system, the project included an HVDC Back-to-Back frequency converter contracted at US$206 million. But the GCCIA is only responsible for the implementation of Phase I - the North Grid which interconnects Bahrain, Kuwait, Qatar and Saudi Arabia - for which work has already started (please refer to Figure 11). According to Al-Khusaibi, the development of Phase II - the South Grid – will be left for Oman and UAE and once completed; Phase III would interconnect the North Grid with the South Grid (Appendix 1). However, on 1 April 2009, the general assembly of the GCCIA approved expediting the joining of UAE to the grid and raising the share capital to US$ 1,407 Million (GCCIA, 2009).

Al-Mohaisen (Appendix 1) warned that the size of cross-border electricity flows will be small due to connection limitations. He noted that in order to engage in ‘meaningful’ power trade, capacity of the interconnection Grid would have to be extended. According to Al-Mohaisen, the Grid should further enhance GCC regional integration by removing the ‘mental barriers’ to cross-border power trading and hence leading to more cooperative projects between the members.

Figure 11 GCC Interconnection Grid

Source: GCC Interconnection Authority (www.gccia.com.sa)

Stafford Reimers, the Chief Executive of the Bahraini Al Ezzel Power Company (AEPC) backed the GCC interconnection Project in anticipation that such grid would help member states to balance their peaks and accordingly save on generation related investments (Gulf Daily News, 2007).

Al Jassar (Appendix 1) believes the interconnector will provide enhanced system security but only limited power exchanges and therefore have little impact on the domestic market structure, and since Kuwait's is a heavily oil-based economy it is unlikely to be a net exporter of electricity.

A study by Harara (2008) found that once Phase III of the GCC interconnection is completed, Saudi Arabia will be expected to gain the most (41.30%) followed by the UAE (21.68%) despite that fact that UAE has the highest peak load among the member states. Kuwait came third as it will be expected to take 13.90% of the total gains of the interconnection while the expected shares of Bahrain, Oman and Qatar will be 7.83%, 7.67% and 7.62% of the total gains, accordingly.

The Abu Dhabi and Oman interconnector was energised in 2011 and the procurement and transmission system operators licensed by their respective regulators.

Al Hinai and Cleary observed that it is not clear how the GCC-Grid would be regulated (Appendix 1). When asked about the expected role of the GCCIA, Hill and Raza (Appendix 1) expressed concern that it may see itself as a System Operator for all GCC electricity markets. Like in many worldwide experiences, electricity reforms are based on a process of evolution as one step leads to another. Very importantly, in order for the GCC-Grid to become the backbone for electricity trade in the GCC, some ‘new trading arrangements and regulatory framework will need to be designed to support the functioning of this new system’ (Boisseleau and Jansen, 2005, p. 2).

According to Al-Shaikh (2007), the GCC Grid will be governed by three kinds of legal agreements: (i) the General Agreement (GA) between the members for setting the rules and defining regulatory committee and regulatory principles, (ii) the Interconnector Transmission Code (ITC) for setting out the technical provisions for the Authority, the TSOs and procurement agencies, and (iii) the Power Exchange and Trading Agreement (PETA) for setting out other capacity and reserve obligations as well as other trade related issues.

While the GCCIA could promote regional reforms by means of the PETA obligations, Al-Asaad (Appendix 1) argues that the Authority could eventually evolve as a regional regulator. Later parts of this research, however, recommend individual GCC regulators whose efforts may be coordinated through a regional forum, a view also shared by Al-Mohaisen (Appendix 1).

4.4 Framework for GCC Economic Integration

If the GCC is to achieve greater integration of its electricity markets, this will be achieved under the present framework agreements that we turn now to consider. The existing legal framework of the GCC provides a framework for and can facilitate greater economic integration within the GCC zone. The framework includes the GCC Charter, the Economic

Agreement between GCC States and the Common Customs Law. The legal framework of these agreements may facilitate increases in trade and services between GCC member states.

The Implementation Procedures for the Customs Union:

The GCC Customs Union was approved by the supreme Council in its 23rd Session held in Qatar from 21 to 22 December 2002. According to the GCC Customs Implementation Procedures (2003):

(i) The Customs Union is based on a common external customs tariff, a common law, the unification of internal customs, administrative regulations and procedures for imports, exports and re-exports, the free movement of goods among member countries, and the treatment produced in any GCC member as national products;

(ii) The common customs tariff of the Union is 5%, 417 commodities are exempted from all duties in addition to the exemptions provided for the Customs Regulation Law while certain extra taxes are levied on special products like tobacco;

(iii) Duties are collected at first point of entry of the GCC states where the shares of the member states shall be distributed according to the final destination of the goods for the first three years of establishing the Union; and

(iv) Imports of manufacturing units (i.e. equipment, spare parts, raw materials and other inputs required for production) are exempt from customs duties according to the agreed controls and procedures.

To better understand the significance of a GCC economic zone, it would be helpful to distinguish between market or economic integration and policy (Molle, 2001). Economic integration is, therefore, a two dimensional process. While the first is concerned with activating the free movement of goods and services between the member countries, the second deals with establishing common rules and regulations for the zone. As the process of economic integration evolves, new legal and institutional arrangements are needed.

In its current form the GCC is a “custom union”, at a stage somewhat between a “free-trade zone” and a “Common Market”, subject to the following:

(i) a 0% tariff on products of GCC origin cross-trading within member countries (GCC Economic Agreement, 2004);

(ii) the GCC is already implementing a common import tax of 5% towards the outside world. Based on a revenue sharing system, the import tax- settlement mechanism allows for a free cross-border movement of such imported goods (GCC Accomplishments, 2006);

(iii) the GCC Economic Agreement promotes the free movement of GCC nationals who may work in both private and government institutions without any visa requirements. Although each member state has its own social security system and pension funds, GCC nationals can now move from one country to another and retain the same benefits in their original country of residence (GCC Uniform Insurance Law, 2005). All member states issued legislation to implement the GCC Law in 2006 except Qatar who implemented the GCC uniform law in March 2007 (Qatari Insurance Law, 2007).

(iv) GCC legislation provides for the free movement of capital and investment among the member states. With very limited exceptions[34], the Agreement allows all GCC firms to establish economic and commercial activities within any member country. Moreover, GCC firms and nationals are treated as local investors in terms of shareholding and share purchases of joint stock companies[35];

(v) Finally, GCC member states have similar policy commitments to national health care, free education, taxes exemptions including income tax exemptions, and infrastructure development. This is due in part to similarities in economic activity with most hydrocarbon-based and with development plans and fiscal policies that are based on and sensitive to oil and gas price fluctuations.

Some GCC member states like Bahrain and Oman have entered into tax-free agreements with the USA. If other GCC countries do not do likewise, these agreements may conflict with some obligations of the Custom Union.

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[34] Exceptions are limited to few commercial and economic activities including farming, fishing, newspapers and advertising as well as limits on land size ownership.

[35] Some GCC countries apply certain limitations (for locals only) when offering the shares of the newly privatized entities to the public.

GCC decision makers are discovering that the more economically integrated a region becomes the less control individual member states may have over their own economies. With respect to ‘financial sovereignty’, Oman and the UAE have opted out of the proposed Monetary Union (originally scheduled for 2010) while Kuwait has followed its own interests and discontinued the Dinar - US Dollar peg.

Pelkmans (2006) stated that ‘The higher or more ambitious the stages of economic integration, the closer is their resemblance to economic federalism’. Moreover, whether sovereign states become more or less influential in collective decision making will depend on factors such as the size of their economy, their international relations, and the political influence they have over other member states. The Maastricht Treaty negotiations of the early 1990s (Treaty of the European Union) are a good example of how some countries choose a follow a slower path to economic integration. During treaty discussions about ‘how federal the community may be’ the UK took a clear stand against the federal community option and both Germany and France opposed granting authority to the European Parliament (McDonald and Dearden, 2005). States can be reluctant to hand over ‘sovereign power’ to regional secretariats or parliaments. According to Pelkmans (2006), the European Community has evolved by means of three processes;

i) *Deepening* through economic liberalisation (which included expanding common policies and regulations as well as further developing the commitments and prohibition list of it members;

ii) *Widening* the range of its economic and other powers; and

iii) *Enlargement* (through increasing the membership).

With respect to the GCC we can assume - based on the GCC Charter and the Economic Agreement to be covered in the next section of the research - that the GCC zone has already embarked on the deepening process and the GCC Custom Union has paved the way for a widening process. However, enlargement, such as allowing Yemen and Iraq to join the GCC, appears less likely due to political and economic considerations. At present, Yemen’s relationship with the GCC is limited to coordinating matters with respect to health, education and youth while Iraq’s participation in GCC functions is restricted to sports activities. Without ruling out the future possibilities – as the GCC economies are expected to gain due to market expansion - any enlargement to the GCC remains most unlikely.

Table 8 Phases of Economic Integration and Conditions

Type	Main Criteria	Conditions among members
Free Trade Zone (FTZ)	Consists of a number of countries that agree a set of policies allowing easy cross-border exchange of goods.	■ Removal of barriers to trade (like tariffs and quotas) ■ Similar production cost structures ■ comparable work procedures and economic conditions ■ May retain national tariffs and quotas against non-members
Custom Union (CU)	FTZ with one external tariff	■ One agreed tariff on goods imported including no or same quotas to others ■ An agreed revenue sharing system ■ Compatibility in customs procedures used
Common Market (CM)	CU with free movement of labour and capital (no restrictions on goods and factors movement)	■ Comparable conditions for capital and labour availability and cost ■ Free movement of people and investment
Economic Union (EU)	CM with harmonised economic and social policies eliminating trade distortion and/or discrimination	■ Compatibility of institutions ■ Compatibly of policies ■ Compatibility of decision making forum
Monetary Union (MU)	Economic Union (EU) with common Currency	■ Irrevocable fixed exchange rates ■ Coordinated fiscal policies ■ One single central bank or a unified system of central banks ■ Identical inflation rates ■ Similar levels of economic development
Total economic integration	Unification of monetary, fiscal, and social policies	■ Creating a supranational authority where all decisions are made ■ Decisions taken are binding to all member countries

Source: McDonald and Dearden (2005), Molle (2001), Pelkmans (2006), and Jovanović (1997)

The GCC may learn lessons from the EU experience of enlargement. Based on a study for the Austrian Federal Ministry for Economic Affairs and labour, transition countries[36] seeking to join the EU faced two types of challenges (Buiter, 2003): i) the macroeconomic challenge of aligning fiscal and monetary policies, and ii) microeconomic challenges of implementing required structural reforms necessary to improve competitiveness such as institutional reform of private enterprises, banking and infrastructure management. Table 8 reviews the different phases of regional integration primarily on the basis of economic integration.

[36] The three Baltic countries (Estonia Latvia, Lithuania), Czech Republic, Slovak Republic, Hungary, Poland, Slovenia, Bulgaria and Romania

As it is now, the GCC would still require further steps in terms of deepening the convergence process (including the required reforms in incentives and subsidies) in order for it to move to a stage of an "economic union". However, the GCC economic zone has its own 'teething problems'. For example, although GCC member states had agreed to launch a Common GCC Currency by 2010, Oman has opted out of the "monetary union" option. Based on (Hamood Al-Zadjali[37], 2007), the main arguments against Oman joining are:

1. Monetary union could entail major costs as a result of 'loss of sovereignty in the sphere of macroeconomic policy making (particularly in respect of fiscal, monetary and exchange rate policies) due to binding restrictions imposed by the convergence criteria' (Hamood Al-Zidjali, 2007, p.1). While keeping in mind Oman's limited hydrocarbon resources and its large young population, 'Restrictions on "fiscal deficit" and "debt" can limit the scope for independent use of national budgets to promote growth and development objectives'. In the absence of a strong private sector, this may hinder diversification plans through public spending. Loss of sovereignty in fiscal policy could be 'detrimental to the employment and sustainable growth objectives of Oman';

2. Over time, the oil and gas dependence would vary from one GCC member to another resulting in shifts in macroeconomic requirements and policies among member states. Countries with low hydrocarbon reserves may be required to apply completely different fiscal, monetary and exchange rate polices, while members with higher oil and natural gas reserves may wish to keep their existing policies; and

3. Based on EU experience, the larger Euro-zone economies may decide to impose benchmarks and conditions on smaller countries while larger economies may violate such criteria. Hence, the interests of Oman's relatively smaller economy may be overlooked by group policies of the GCC.

The Currency Union is also challenged by a set of managerial, psychological, and as a result, cultural and political implications. Due to a weakening US Dollar, Kuwait decided to move back to a basket of currencies Dinar-exchange system in the first half of 2007. In defending the timing of such decision, the Governor of Central Bank of Kuwait Sheik Salem Al-A-Sabah said that it had its justification and it would bring down inflation rates (Kuna, 2007). This removal of Kuwaiti-Dinar's peg to the US Dollar complicated matters even further and

[37] CEO of Oman Central Bank

could lead the way for other GCC members to follow (Kerr, 2007) like the UAE which has also been considering the ending its currency's peg to the Dollar (Gulf Times, 2007). Just three years before the agreed date for establishing Union, the UAE Central Bank Governor Sultan Al Suweidi hinted that a single currency was not achievable by 2010 (John, 2007). By May 2009 (less than a year before the agreed date) the UAE officially declared that it will not participate in the GCC Monetary Union after expressing reservations over a decision to base the Monetary Council (the precursor to a GCC central bank) in Riyadh of Saudi Arabia (Subhani, 2009). Although other GCC countries continue to promote a common currency, due to these and other developments there is now doubt if the Monetary Union will be realised.

4.5 Conclusions

The GCC region is now at a stage of a Custom Union, and although there are similarities between the member states, primarily due to their proximity and heavy dependence on income from oil and gas, their economies differ amply. The key conclusions of our review of the GCC are summarised below:

1. The diversities between member states in terms of country area and population (with Saudi Arabia accounting for over 80% and 60% of the total share respectively) and in terms of gas and oil reserves (with Qatar having 62% and Saudi Arabia having 55% of the GCC total share respectively), could yield some imbalances that might influence regional negotiations and slow down more ambitious regional integration and market opening. Accordingly, we must account for possible implications when advising for a policy targeted at regional market reform including electricity sector restructuring;

2. While the GCC Interconnector may play the intended role of providing electricity (cross-border) in cases of emergency, the Interconnector is still limited in size while member country electricity regulations vary and there are no specific trading arrangements to promote cross-border exchange. Unless such constraints are dealt with at the GCC level, we envisage very limited – if any - cross-border electricity exchange in the medium term;

3. The existing GCC institutional framework may promote multi-intergovernmental discussions but would need to be complemented by a sector-specific policy if regional electricity sector restructuring is to be implemented;

4. With the exception of Saudi Arabia, the small size of GCC member state electricity markets will limit the scope of possible market reform. Moreover, there seems to be a consensus within the GCC that a policy of tariff subsidisation will continue and that security of supply is an important policy priority. We consider the constraints imposed by the policy considerations when developing policy recommendation advice for GCC electricity market reform; and

5. On the issue of electricity market design, in the absence of GCC competition law – such as is in place in the EU – special attention is afforded to general competition issues.

Chapter 5 Case Study I – Electricity Sector Reform in Abu Dhabi

5.1 Introduction

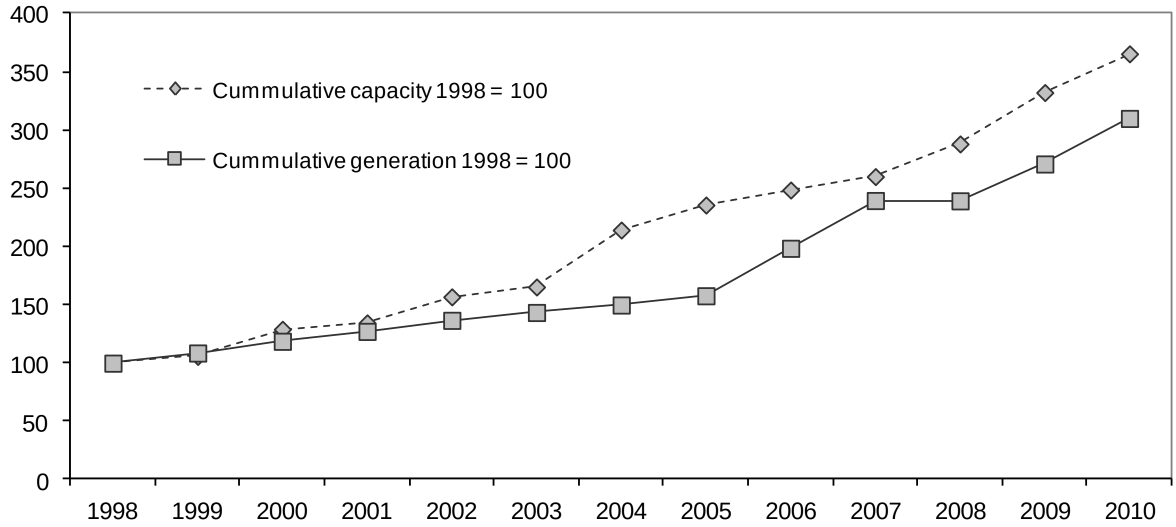
The Emirate of Abu Dhabi of the UAE initiated extensive electricity market reforms on 1 March 1998 with the promulgation of Abu Dhabi law No 2 of 1998. This chapter presents a case study of the Abu Dhabi reforms highlighting some provisions of the Law and its amendments, and describes the new market structure and key market participants. When relevant, we refer to the Omani case study presented in Chapter 6.

5.2 Background and Electricity Market Characteristics

Prior to the issue of the Law the Abu Dhabi electricity market was vertically integrated under the management of the Water and Electricity Department of the Emirate of Abu Dhabi. The reforms passed responsibility for the sector to the Abu Dhabi Water and Electricity Authority (ADWEA) which serves 1.7 million people and is responsible for meeting the electricity requirements of more than 39% of the UAE population covering 87% of the UAE land area (ADWEA Annual Report, 2006).

Between 1998 and 2010, electricity generation in Abu Dhabi increased by 210%, from 16 TWh to 50 TWh, representing annual average growth of 10%. Over the same period installed generating capacity increased from 16.1 GW to 49.9 GW, a 266% increase. Figure 12 presents indices for electricity generation and capacity from 1998 to 2010 with 1998 = 100.

Figure 12 Abu Dhabi Cumulative Generating Capacity & Production (1998-2010)



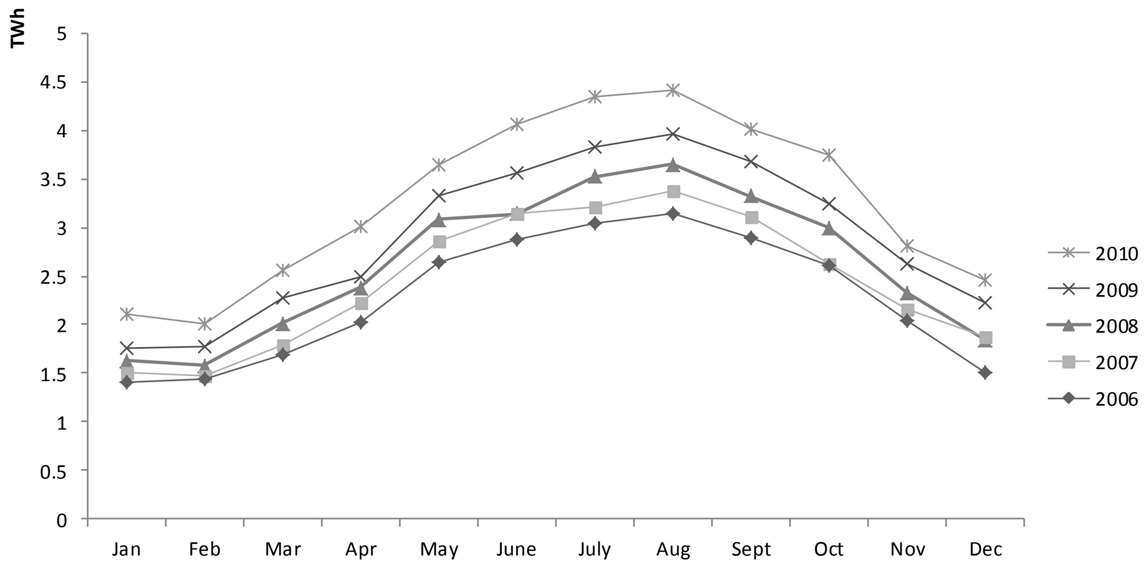
Source: ADWEC Statistical Reports (2008 to 2010)

The characteristics of electricity and system operational requirements give rise to a need for capacity to always exceed demand. It is clear, however, that between 2004 and 2006 growth in capacity significantly exceeded demand and again from 2008 to 2010. Gaps between planned capacity and actual generation are to a degree unavoidable due to the lumpy nature of capacity additions, although excess capacity surpluses can reflect inefficient procurement and give rise to excessive costs. When determining if a system has excess capacity it is important to consider other factors such as, in the case of Abu Dhabi, whether electricity capacity is required to produce desalinated water. A further point is the rate of growth in electricity demand as strong demand growth can reduce the expected duration of surplus capacity.

The post reform increase in capacity might also be explained by an increased focus on security of supply reflected in new statutory based planning obligations, including a generating capacity planning standard of 1 day in 10 years (ADWEC, 2009).

Another feature of the Abu Dhabi electricity system is an established seasonal profile of generation, Figure 13 presents monthly generation for 2006 to 2010.

Figure 13 Abu Dhabi Monthly Gross Energy Demand[38] (2006-2010)



Source: ADWEC Statistical Reports (2010)

Generation is significantly higher in the months of May to October when ambient temperatures are high and declines in other months in line with temperature. Based on CIGRE-GCC (2005), 52% of the electricity in the GCC, UAE included, is consumed by households whose air-conditioning requirements are positively correlated with temperature.

During cooler months of the year, the power system in Abu Dhabi has nearly 50% unavoidable extra capacity. According to Miller et al. (2005), the Abu Dhabi load profile illustrated in Figure 13 is broadly similar to other GCC electricity demand profiles as seen in the Omani case study presented in Chapter 6. Al-Khusaibi observed that cross-border trade may still be viable between Abu Dhabi and Oman even in the summer months and that there are some gains expected from differences between peak months and time zones. He noted that Oman's usual summer peak months are May and June while for Abu Dhabi the peak is after the month of July, suggesting that reserves could be better utilized through trade (Appendix 1).

[38] Gross energy demand for Abu Dhabi is the sum of ADWEA system monthly generation plus net imports from Takreer (in the Emirate of Fujairah)

5.3 Abu Dhabi Electricity Sector Law (Law No (2) of 1998)

The Abu Dhabi electricity sector legislation "Law No (2) of 1998 Concerning the Regulation of the Water & Electricity Sector in the Emirate of Abu Dhabi" was enforced by the State Decree No. 2 issued on 1 March 1998 in the Emirate of Abu Dhabi of the UAE. Based on the Law, the previously vertically integrated electric and water service utilities were unbundled (Abu Dhabi Law No. 2, 1998 and its amendments Abu Dhabi Law No. 19, 2007). The following sections provide a listing of the purpose of the Law – and its amendments – as well as some of the main legislation policies relevant to this research.

First, the purpose of the sector law may be summarised as follows:

(i) To create an independent government agency for the Emirate of Abu Dhabi (Abu Dhabi Water and Electricity Authority) responsible for managing the electricity and water sector in the Emirate (Article 3); and

(ii) That the Authority shall have a separate legal personality (Article 4) and is entitled to retain ownership of all the shares of the Abu Dhabi Power Corporation (Article 7); and

(iii) That all government ownership in area of electricity generation and water production, transmission, supply and other related services would be consolidated through the special investment vehicle (Abu Dhabi Power Corporation) under the full control of the above mentioned government Authority (Article 27); and to

(iv) Establish a sole regulator to the sector (the Regulation & Supervision Bureau (the Bureau)); and to

(v) Set up a single-buyer model (through Abu Dhabi Water and Electricity Company).

Second, the sector law includes a number of important policies:

(i) The law states that government-owned firms in the sector (wholly or partially-owned) be exempted from any taxes or fees including import duties on machines and spare parts (Article18);

(ii) The law provides for a company for servicing remote areas (Article 41) if need be;

(iii) Based on the law (Article 44), the Bureau was established to act as the sole regulator of the water and electricity sector. Later, Water Sewerage was added to the responsibilities of the Bureau (Abu Dhabi Law No. 17, 2005). The law mandates that the RSB issues an annual report – to be made available for the public - on its activities including its investigations during the year (Article 58). The RSB is financed by licence fees while the budget is approved by its members (amended Article 52);

(iv) Based on the law, the regulator (RSB) has a number of obligatory functions and duties (Articles 53 and 54):

- To primarily ensure the continued availability of water for human consumption and electricity for hospitals and disabled, aged and sick.; and to
- Ensure the security of supply of water and electricity in Abu Dhabi. In doing so, the Bureau would be required to oversee the efforts of ADWEC which is entrusted by the law (Article 32) with the capacity planning duty;
- Ensure the connection and supply of water and electricity to all consumers on reasonable demand;
- To provide for health and safety standards; and
- To promote competition and protect consumer interest in terms of conditions and price of supply.

(v) The Board Members of the Bureau (RSB) are appointed by the Chairman of the Executive Council of the Emirate of Abu Dhabi (previously by the Chairman of ADWEA) for a – renewable - term of five years (according to the amended Article 45 of Law No. 19). Moreover, members of the subsidiaries of ADWEA may be appointed by ADWEA, however; based on Article 25 of the law, the management and board of the Authority shall not be involved in the board of the Abu Dhabi Corporation during their term of appointment in ADWEA;

(vi) The Abu Dhabi sector law ensures that the Bureau regulates the prices to be charged to consumers and the methods in which they are to be charged (Article 55);

(vii) The law states that all new capacities are tendered. The tender procedure involves consultation with the Bureau and a requirement that allows only entities with prior experience of developing IPP with appropriate financial and managerial competencies to participate in tender competitions (Article 35); and

(viii) The law prohibits transmission companies – by licence conditions - from undertaking any other activities (Article 93). Further, distribution and supply licensees are not allowed to undertake any other activities while licensees are to refrain from any cross-subsidy between the activities of distribution and supply (Article 94).

2007 Amendments

On 1 July 2007 Abu Dhabi Law No. 19, 2007 made some important amendments to provisions of Law No 2 of 1998. The amendments provided for greater independence for the regulator – especially from ADWEA - and strengthened powers for Bureau board members to reduce the likelihood of the Bureau being dominated or influenced by one person, following criticisms voiced over some decisions of the UK Director General of Electricity Supply as presented by Green et al (2006) in Section 3.2 of this research. Other amendment measures include:

(i) The board members of the Bureau set out and decide its procedures, voting process, meetings as well as the management system which allows for more independency (new Paragraph 1 of Article 45);

(ii) The board members of the Bureau shall be appointed by the Chairman of the Executive Council of the Emirate of Abu Dhabi (amended Paragraph 2 of Article 45);

(iii) Resignation of any board member must be addressed to the Chairman of the Executive Council which allows for less dominance by the Chairman of the Board (amended Article 46). Moreover, the removal from office of any member is now in the hands of the Chairman of the Executive Council of Abu Dhabi (new Article 47);

(iv) The Board Members of the Bureau are appointed by the Chairman of the Executive Council of the ADWEA for a – renewable - term of five years (Article 45); and

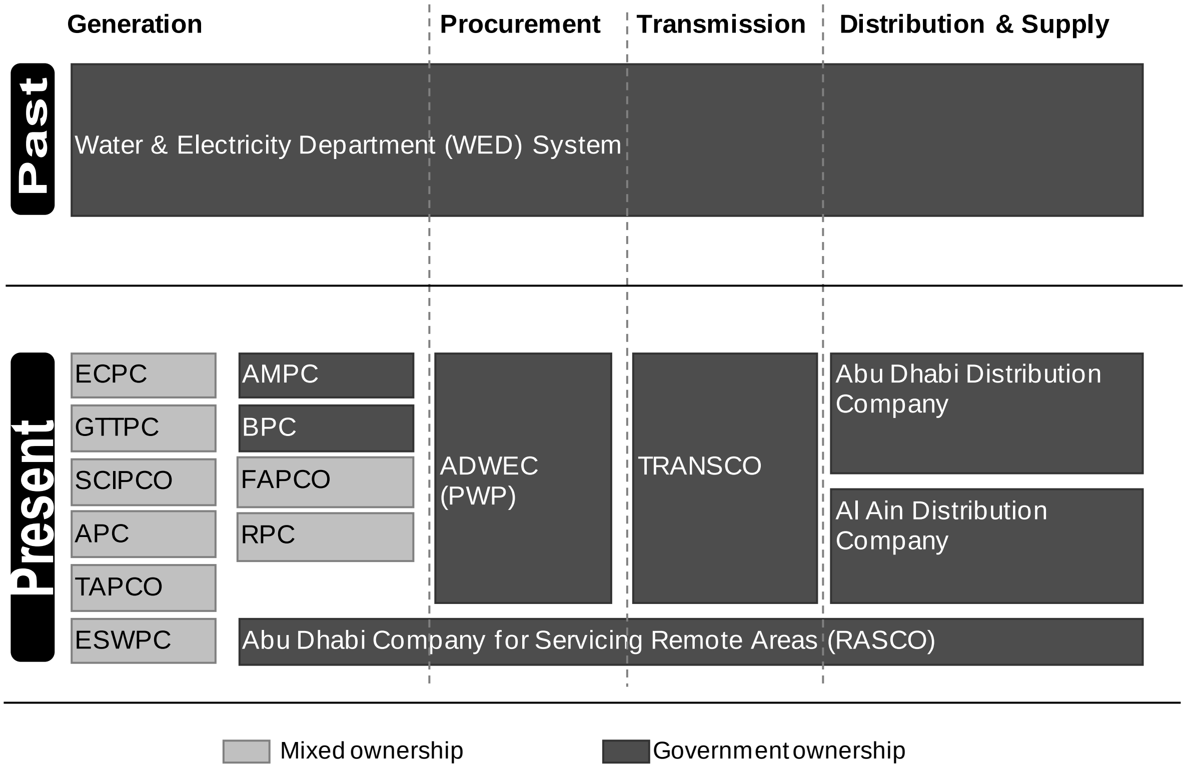
(v) The Bureau must submit annual reports to the Chairman of the Executive Council of Abu Dhabi (amended Article 58) instead of the previous reporting mechanism to the Chairman of ADWEA.

5.3.1 Unbundling and the New Market Structure

Prior to 1998, the Abu Dhabi electricity market comprised a vertically integrated ministry under state control. Figure 14 illustrates the past and present electricity market structures.

The new market structure is characterised by functional separation of generation, transmission and distribution, with distribution and supply undertaken by companies in authorised areas stipulated in their licenses. The new market structure is fully corporatized with extensive government ownership and private sector participation restricted to generation. The government retains a 60% share in IPPs while two generators (IMPC and BPC) are wholly-owned by the government. TRANSCO, the two DISCOS of Al Ain (AADC) and Abu Dhabi (ADDC), the procurement company (ADWEC), and the vertically integrated Abu Dhabi Company for Servicing Remote Areas (RASCO) are companies wholly-owned by the government. All companies operating in the new market structure are regulated by the Bureau.

Figure 14 Unbundling of the Abu Dhabi Electricity Market

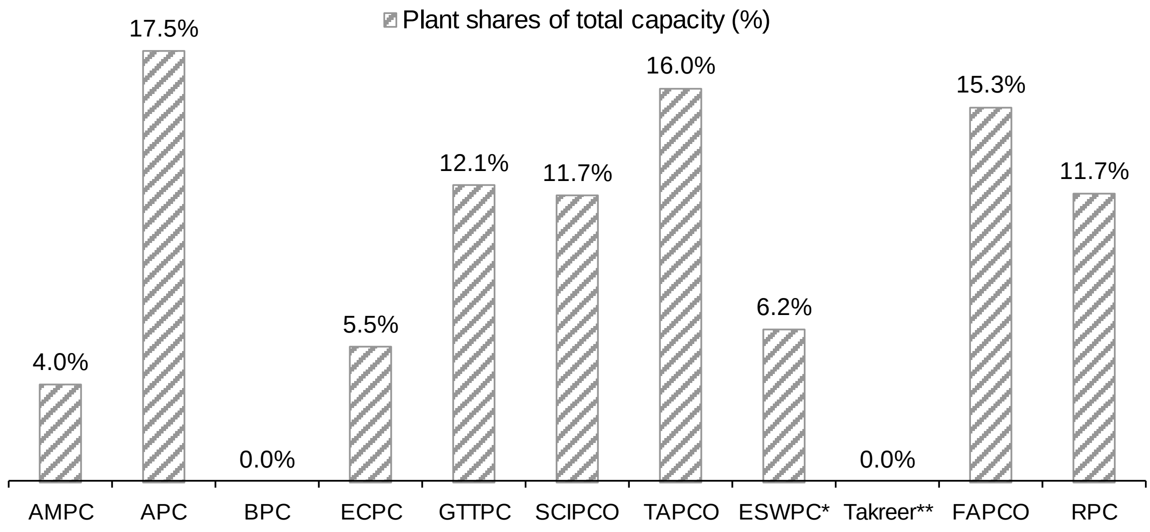


Generation

A feature of the Abu Dhabi electricity sector is that the state continues to own 60% of each power generating company (through ADWEA or TAQA) and 100% of two small plants in remote areas.

It is noticeable from Figure 15 that no plant has more than a 25% share of the total market, although the government's shareholdings in I(W)PP means that the market is heavily concentrated in terms of ownership. Nevertheless, the Abu Dhabi Law does not include any maximum threshold on market share or ownership. As in the case study for Oman, we may recall the findings of Andersson and Bergman (1995) who concluded while investigating the electricity market in Sweden that it would be desirable to have at least five firms of similar size competing in the Swedish market as a safeguard against market concentration.

Figure 15 Abu Dhabi Electricity Capacity Market



Source: ADWEA Statistical Leaflet (2010) * ESWPC produces for ENG ** Contracted

The IPP of Emirates SembCorp Water & Power Company (ESWPC) is a special case company located in the Emirate of Fujairah. Although all desalinated water is committed to Abu Dhabi, the company could play an active role in the promotion of electricity trade within the Emirates National Grid (ENG).

Power & Water Procurement

Abu Dhabi Water and Electricity Company (ADWEC), is a private joint stock company licensed by the Bureau as the single-buyer and seller of water and electricity in Abu Dhabi. This monopoly buyer operates through various Power and Water Purchase Agreements (PWPAs) and this monopsonist sells to the two distribution companies via the bulk supply tariff (BST). According to the Law (Abu Dhabi Law No. 2, 1998), ADWEC is responsible for planning additional water and electricity capacity requirements (Article 32). ADWEC is also entrusted with the tendering process, after consulting with the ADWEA, for any additional capacities of water and electricity (Article 35). The law stipulates that bidders (subject to pre-qualification) are given an equal and fair chance by the single buyer.

In the case of Abu Dhabi, almost all private investors in generation are international firms. Hill and Raza argue strongly that for the time being it would be risky for international firms to accept any arrangements other than the currently used long-term purchase contracts. Investors 'might simply walk away' if asked to compete on more advanced arrangements like a day-ahead–price mechanism (Appendix 1).

Transmission

Abu Dhabi Transmission and Dispatch Company (TRANSCO), is a private joint stock company that owns and manages the 400, 220 and 132 kV transmission lines in Abu Dhabi as well as the 1600 mm to 400 mm water pipeline network. TRANSCO is therefore a natural monopoly, owned by ADWEA, in charge of electricity transmission and water storage and transmission across the Emirate of Abu Dhabi. Based on Article 40 of the Law, transmission tariffs are regulated by the Bureau and either TRANSCO or any other transmission operator 'shall not create a preference in favour of, or unduly discriminate against' any generators or distributors.

Distribution & Supply

There are two distribution and supply companies.

Abu Dhabi Distribution Company (ADDC), is registered as a public joint stock company for electricity and water distribution in the Municipality area of the city of Abu Dhabi selling directly to over 200 thousand customers. The company owns and operates the 33 and 11 kV power lines as well as the 800 to 50 mm water distribution pipelines.

Al Ain Distribution Company (AADC), is based in the city of Al Ain and registered as a public joint stock company responsible for the city's 33 and 11 kV electricity distribution network - serving more than 86 thousand customers - as well as the water distribution network.

The law requires the two DISCOS to keep separate accounts for their distribution and supply businesses.

Remote Area Services

Abu Dhabi Company for Servicing Remote Areas (RASCO) is a vertically integrated company servicing remote areas. RASCO is the only vertically integrated company in the new Abu Dhabi market structure and is licensed to generate, transmit, distribute and supply electricity and desalinated water for remote areas (RSB Annual Report, 2005). As with the Rural Areas Electricity Company in Oman, RASCO's remote systems will eventually be absorbed into the main electricity system as that expands.

Abu Dhabi Water and Electricity Authority

In accordance with the provisions of Law No (2) of 1998 ADEWA has significant responsibilities in the Abu Dhabi electricity sector.

Article 4 of the Law No. 2 gave ADWEA legal, financial and administrative independence in order to carry its responsibilities (Abu Dhabi Law No. 2, 1998). Since it was established in 1998, ADWEA continued to enjoy the powers over the various sector entities through its ownership. It is worth noting that according to the four approaches of Ocaña (2001) already presented in Chapter 2 the Abu Dhabi reforms are incomplete with respect to horizontal unbundling due to a deficiency in ownership separation.

ADWEA is itself wholly-owned by the Abu Dhabi government and wholly-owns seven companies responsible for a variety of activities including power generation, water production, transmission and distribution in the Emirate of Abu Dhabi (ADWEA Statistical Leaflet, 2006, ADWEA Annual Report, 2006 and ADWEC, 2009):

At early stages of restructuring, ADWEA used to own Union Water & Electricity Company (UWEC) located in the Emirate of Fujairah and selling power mainly to the Northern Emirates through the Federal Electricity and Water Authority of the UAE (FEWA). Later, in June 2006, 40% of ADWEA's shares in the 535 MW plant (and 100 MIGD of desalinated water) was sold to private firms. The company then became Emirates SembCorp Water & Power Company (ESWPC).

ADWEA and/or its sister company Abu Dhabi National Energy Company (TAQA) control a majority shareholding in each of the following six independent power and water producers (IWPPs). All joint venture projects are established on the basis of build, own and operate (BOO) arrangements while they sell their produced electricity and water to the single buyer ADWEC through long-term Power and Water Purchase agreements (PWPAs). All the entities are currently registered as private joint stock companies with a majority state ownership;

1. Emirates CMS Power Company (ECPC), which is based on a BOO scheme of the A Taweelah 'A-2' combined cycle power 'electricity and water desalination' plant. ADWA (through its subsidiary Emirates Power Plant) owns 6%, TAQA (still a state-

dominated company to be discussed in detail later) owns 54% while CMC Generation Taweelah Limited (a subsidiary of CMC Generation) owns the 40% remaining shares;

2. Gulf Total Tractebel Power Company (GTTPC), which resulted from a consortium chosen selected in 1999 to implement the Taweelah 'A1' electricity and water production project. The company is owned by ADWEA (6%), TAQA (54%), and the remaining 40% is split evenly between Total Fina Elf (20%) and Tractebel (20%). The company has a licensed capacity of 1350 MW and 84 MIGD of desalinated water;

3. Shuweihat CMS International Power Company (SCIPCO), a company that was based on a BOO scheme to produce 1,500 MW of power and 100 MIGD of desalinated water. The project also included 220kV and 400kV grid stations to be then transferred to the TRANSCO. This joint venture company the owned by ADWEA and TAQA (40%), CMS Generation (20%) and International Power (20%). The operations and maintenance of the plant are undertaken on the basis of a 20 year contract by Shuweihat O&M Limited Partnership (SOMLP) - a company especially formed for this purpose with CMS Energy and International Power owning 50% of the shares;

4. Arabian Power Company (APC), with 60% owned by ADWEA and TAQA, 20% by International Power, 14% by Tokyo Electric Power Company and 6% by Mitsui & Co., Ltd. %). The company owns and manages a variety of new and old units ranging from a 7 MW Diesel plant to a 360 MW steam-turbine plant (Arabian Power Company, 2007);

5. Taweelah Asia Power Company (TAPCO), an other BOO project with 60% state majority share holding out of which ADWEA directly controls 10% and TAQA owns the remainder 90%. The 40 % of private equity is split through a holding company between Marubeni Corporation (35%), the BTU Group[39] (25%), Powertek Berhad[40] (25%) and 15 % for JBC (Taweelah Asia Power Company, 2007);

6. Emirates SembCorp Water & Power Company (ESWPC) is a special case company located in the Emirate of Fujairah. The state (through TAQA) owns 60% while Gulf Holding Company (a subsidiary of SembUtilities) owns 40% of the company. Similar

[39] BTU Group is an investment group focused in energy related industries. With $600 million invested in power generation and water desalination, the BTU Group also includes in it shareholding publicly traded companies, institutional investors and investment banks from the GCC.

[40] Powertek Berhad is an infrastructure company listed in the Malaysian stock exchange.

to other producers, the company signed a 22-year Purchase Agreement with ADWEC for its existing capacity of 535 MW, a 100 million imperial gallons per day (MIGD) and an additional 225 MW to be commissioned by 2009 (SembCorp Industries, 2007 and TAQA, 2007). While all desalinated water is already committed to Abu Dhabi, the company could play an active role in the promotion of electricity trade within the Emirates National Grid (ENG), through its existing connection;

7. Fujairah Asia Power Company (FAPCO) owns the Fujairah F2 Plant a power generation and seawater desalination plant with 2,000 MW of net power capacity and 130 MIGD of net water capacity commissioned in 2010. Located in the Emirate of Fujairah approximately 280 kilometres north east of the city of Abu Dhabi. The Abu Dhabi Water & Electricity Authority holds a 60% equity interest with Marubeni and International Power each holding 20%. The project is funded by a mix of debt and equity; and
8. Ruwais Power Company (RPC) is an IWPP comprising desalination capacity of 100 MIGD, and generation capacity of 1,511 MW.

Interconnections

The Abu Dhabi electricity grid is connected to the Emirates National Grid, allowing electricity to be transmitted from Abu Dhabi (ADWEA) to Dubai (DEWA) amounting to 400 MW in 2006 and expected to increase thereafter. Abu Dhabi is expected to be a net exporter of electricity and is not expected to enter into any long-term trading agreements.

The Abu Dhabi transmission network is also connected to that of Oman by the Al Waseet (Oman) and Al Ouhah (Abu Dhabi) a 220 kV 400MW 52 Kilometre power line. This line is in existence and is said to be the main connection for Phase II of the GCC Grid. According to Gleissner and Miller, the two systems are ready for electricity trading while Abu Dhabi has already proposed an agreement with Oman (Gleissner and Miller, 2007).

In 2011 the Oman and Abu Dhabi procurement companies signed contracts to facilitate the sharing of reserve and minimal exchanges to electricity in emergency situations across the Oman – Abu Dhabi interconnection.

5.3.2 Regulation and Competition in Generation

The Abu Dhabi electricity market comprises a number of statutory monopolists (ADWEC, TRANSCO, AADC, AADC and RASCO) and a statutory monopsonist (ADWEC). These companies are heavily regulated by the Bureau which monitors compliance with the conditions in the respective licenses, and administers RPI-X type price controls that incentivise companies to perform their functions efficiently.

Regulation of generation focuses on ensuring ADWEC competitions to procure new capacity are as competitive as possible. Bidders compete to enter the market and once in the market face no direct competition from other generators but are strongly incentivised to satisfy the performance requirements of their contracts with ADWEC. The main incentive is to maximise availability (particularly in summer months) as availability payments recover a facility's fixed costs, including capital investment costs and returns to providers of capital. Energy charges are typically closely aligned to avoidable costs and in contrast to a situation of wholesale competition, production facilities can be indifferent to despatch as they are not exposed to output (market) risk.

In a highly regulated environment with significant state ownership and controls some might argue that concerns about the exercise of potential market power may be misplaced. However, there are at least three supporting arguments why this research is concerned with exploring market power potentiality. First, the state obtaining shares in each generator - which seems to be the policy so far – may not continue in the future once more TAQA shares are offered to the public, and hence, allowing shares to be passed to the 'private hands of the few'. Accordingly, in the absence of legal thresholds on market share, major private investors could easily become key market players. Secondly, such – justifiable - concerns may deter government plans for further market opening and divesture. Preferably, reforms must be viewed as the best option for expediting development - using proper market design - rather than a 'threat' to policy makers due to some underperformances and market failure potentiality. Thirdly, a level playing field is needed in order to ensure effective competition. Factors like plant size and age could influence the biding process, and hence, depriving or facilitating new entrants to the market in the absence of market share restrictions.

For the time being, just like in the case of Oman, the single-buyer market structure in Abu Dhabi is subject to countervailing forces that may restrict the exercise of market power, the Bureau being one example. However, the absence of market share and economic interest restrictions such as are in place in Oman may harm competitions for new capacity in Abu Dhabi if potential new entrants were to be concerned about potential market dominance. Moreover, the Abu Dhabi Law does not address the issue of mergers which are usually addressed – in more developed markets - by specifically established competition authorities.

5.3.3 Post Reform Developments

The Abu Dhabi National Energy Company PJSC (TAQA) was established as an energy investment company in 2005. Based on the Amiri Decree No. 16/2005, TAQA was founded with a paid up capital of UAE Dhs 4.15 billion (US$ 1.12).[41] The primary objective of the newly established holding company was to finance and acquire shares of different companies operating in the field of energy including electricity and water generation, transmission and distribution (although it has only concentrated on the generation side so far). On 23rd July 2005, TAQA was floated to the public while ADWEA kept 51% of the shares (ADWEA Annual Report, 2006). Based on the latest Amiri Decree, the Authority was required to transfer 90% of its investments in the public and private joint stock companies (holding companies) in favour of the newly established TAQA while the remaining balance equity was paid in cash. Upon the expiry of the 20-year tenure of the PWPAs, the Abu Dhabi National Energy Company would have to look for new means of business in order to sell its plants' output of water and electricity. Out of its original 51% share in TAQA, the state owned ADWEA has already transferred 24.1% to the Fund for the support of Farm Owners 'The Farm Owners Fund'. The Fund is managed by a Board of Trustees appointed by the Executive Council of the Emirate of Abu Dhabi (TAQA, 2007).

When established in June 2005, TAQA was totally owned by ADWEA. By August 2005, 24.9% of TAQA shares were placed for public offering, while 24.1% of the shares were offered through a private offering while ADWEA retained 51% of the shares (TAQA Annual Report, 2007). Although TAQA is dominantly a state owned company, the establishment of

[41] 1 UAE Dirham equals US$0.273

the company may be considered as a step towards further ownership separation and market restructuring. This public joint stock company clearly allows for future divesture of government interest in the water generation and the production of desalinated water, away from the wholly state-owned ADWEA. Further unbundling and increased transparency between generation, transmission and distribution would be expected if more TAQA shares are placed for public offering.

We also note that Article 9 (on Subsidiaries) gives ADWEA power to ‘merge the Abu Dhabi Water and Electricity Company with the Abu Dhabi Transmission and Despatch Company’ (Abu Dhabi Law No. 2, p. 18, 1998). A decision to do so would represent a step back in terms of greater functional re-integration.

5.4 Key Observations

Our review of the electricity market reforms in Abu Dhabi confirms significant functional separation, full corporatisation, and extensive government ownership with private sector participation limited to generation. The electricity market is regulated by a separate regulatory body whose independence was strengthened by amendments to Law No (2) of 1998 implemented in 2007. Our key observations are as follows:

1. While the 2007 amendments to Law No (2) of 1998 have strengthened the independence of the Bureau, this would be further strengthened by requiring the Bureau to report directly to the Council of Ministers;

2. It would be advisable for the state to divest its shareholdings in TAQA and for TAQA to be prohibited from acquiring any interests in ADWEC, TRANSCO, the DISCOS or RASCO. Considering the size of the Abu Dhabi market, TAQA investments should be limited to generation while ADWEA should not be permitted to hold shares in generation companies as it is the sole owner of ADWEC (the contract counterparty to I(W)PP companies) and TRANSCO;

3. Abu Dhabi might consider the introduction of market share and economic interest restriction – that would also apply to TAQA; and

4. Removing the possibility of merging ADWEC and TRANSCO would reduce a possible source of uncertainty going forward and clarify the government's commitment to functional separation.

5.5 Conclusions

This case study confirms the fundamental nature of the reforms implemented in Abu Dhabi. In many respects the Abu Dhabi reforms are a good example for other Emirates to follow.

There are, however, further measures the government might consider to bring the Abu Dhabi model closer to the 'textbook model' and prepare the way for further reform, for example restricting TAQA's role in the market to clarify the roles of public and private sector participation and distinguish its responsibilities from those of ADWEA; improving cost and subsidy transparency by requiring publication of cost subsidy and accounting information; further separation of distribution and supply functions to assist the development of retail tariffs.

The amendments to the Abu Dhabi law in 2007 were required to improve the independence of the regulator, particularly from ADWEA influence, and clarify the relationship between the government (principal) and the regulator (agent).

Chapter 6 Case Study II: Electricity Sector Reform in Oman

6.1 Introduction

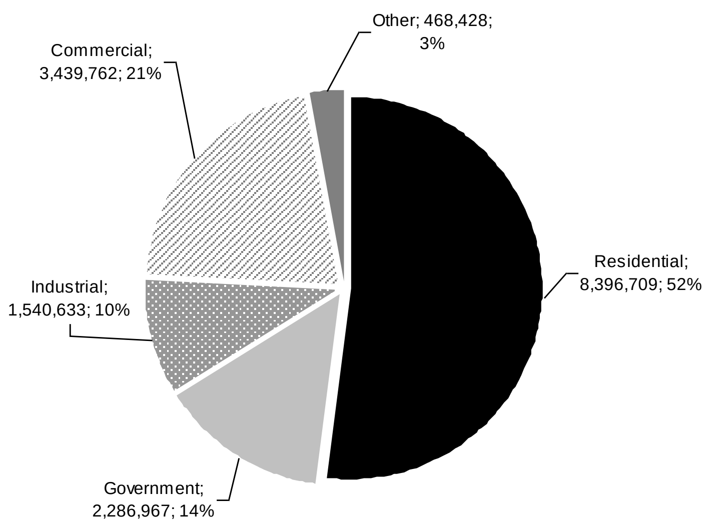
The Sultanate of Oman initiated its electricity market reforms in July 2004 with the promulgation of Royal Decree 2004 issuing the Law for the Regulation and Privatisation of the Electricity and Related Water Sector, also referred to as the Sector Law (Oman Electricity Law, 2004). This chapter presents a case study of Oman's electricity market reforms highlighting some of the major provisions of the Sector Law, and its subsequent amendments, the new electricity market structure and key market participants.

6.2 Background and Electricity Market Characteristics

The Oman electricity market presently comprises three market segments: (i) the Main Interconnected System (MIS) in the north of Oman (87.5% of total supply in 2010), (ii) remote rural systems (2.6% of 2010 supply), and (iii) the vertically integrated Salalah Power System (9.9% of 2010 supply).

As noted in Section 4.3, residential customers account for around 50% of total GCC electricity demand. Figure 16 shows that in 2010, residential customers in Oman accounted for 52% of total supply (55.2% in 2005), commercial customers 21% (16.6% in 2005), industrial customers 10% (6.3% in 2005) and government 14% (20.1% in 2005) (AER Annual Reports, 2010). The increased shares of commercial and industrial customers and the lower share of government consumption reflect the macroeconomic policy of the government that aims to increase the private sector's share of economic activity.

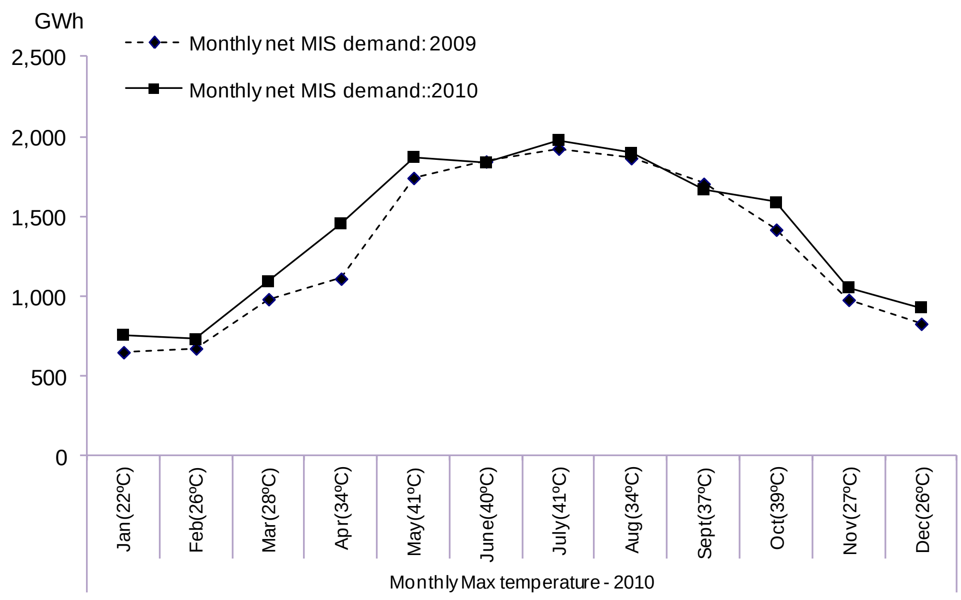
Figure 16 Oman Electricity Supply by Customer Category (2010)



Source: AER Annual Reports (2010)

Electricity demand and generation is significantly higher in the summer months when ambient temperatures are high. Figure 17 shows monthly net MIS generation (excluding rural systems and the Salalah Power System) in 2009 and 2010 and monthly maximum ambient temperatures in 2010.

Figure 17 Monthly MIS Electricity Generation (2009-2010)



Source: AER Annual Reports (2010)

Demand is highest in April, May, June, July, August and September when recorded maximum temperatures are between 34^{o}C and 41^{o}C. CIGRE-GCC (2005), estimated that 52% of electricity demand in the GCC is consumed by households whose air-conditioning requirements are positively correlated with temperature. 2010 MIS system peak demand was 3613 MW in June of that year and was 2495 MW on 25th of June 2005, giving a 45% increase over five years (AER Annual Report, 2010).

The profile of aggregate electricity demand is such that in cooler months of the year there is a significant amount of surplus capacity, a characteristic shared by all GCC member states and one that could give rise to possibilities for electricity trade if there are sufficient variations in the marginal cost of generation in member states and interconnector use of system charges are not prohibitive.

Oman Electricity Market Pre reform

The decision to implement major electricity sector reform was approved by the Council of Ministers in 1999. The structure of Oman's electricity sector at that time centred around a vertically integrated self-regulated ministry (MHEW) which was not subject to published operational planning or performance standards. Tariffs to final customers were approved by the Council of Ministers and, as in other GCC countries, were not cost reflective and were heavily subsidised.

Out of the 50 power-stations then owned by MHEW, 4 used gas-turbines or a combination of gas and steam-turbines with an installed capacity of 1838 Megawatts, out of which the privately-owned Manah Power plant's capacity accounted for 267 Megawatts. The remaining 46 stations ran on diesel engines with a total installed capacity of 427 Megawatts (The Statistics Book, 2002). Three entities owned their own sources of generation: Petroleum Development of Oman (PDO), Oman Mining Company (OMCO), and Oman Cement Company (OCC). These facilities were connected to the national grid and provided periodic support to MHEW.

In 2003, Dhofar Power Company SAOG - in the Southern part of Oman - was privatized as a vertically integrated system of generation, transmission, distribution, supply and collection under a twenty-year BOOT Concession Agreement. The system had an island network primary serving the city of Salalah and nearby cities. This transaction was led by the Ministry of National Economy (MNE) not MHEW as part of the early stages of reform.

In 2003, MNE led the procurement of two new private sector I(W)PP under BOO contracts of 15 year durations. Both companies were established with 100% foreign equity with commitments to offer initial public offerings of 35% within four years. The Al-Kamil IPP was commissioned with capacity of 285 MW, the Barka 1 IWPP had installed capacity of 437 MW and 20 million gallons to be expanded to 40 million gallons. By the end of 2003, MNE led the procurement of a further BOO project and I(W)PP in Sohar in the Al-Batina Region with a planned installed capacity 590 MW and 33 million gallons (AER Annual Reports, 2009).

These MNE-led private sector power projects signalled the first step of separating electricity production from transmission and distribution, and a move towards unbundling Oman's electricity sector. These projects were significant in several important respects. *First*, they tested local and foreign private sector interest in the electricity sector and solicited a strong response from foreign direct investors indicated by the large number of participants in all three tenders. *Second*, although backed by government guarantees, the process of competitive tendering provided a focus of competition to enter the market. This acted to constrain costs and provide for genuine risk transfer. *Third*, they provided estimates of the likely cost of producing one extra MWh based on the tendered out capacity for each location, costs that are lower than the estimated cost of generation by MHEW plant and that may be further reduced by competition.

With the exception of the southern system serviced by Dhofar Power Company SAOG (a vertically integrated private company), MHEW's facilities were managed by private companies through tendered contracts. All new connections and maintenance of the national grid were carried out by private contractors acting – then - on behalf of MHEW. The supply functions of meter reading, billing, and collection were also tendered out to two private collection companies operating on behalf of MHEW.

MHEW was subject to financial constraints and had to negotiate with the Ministry of Finance for funds on a project by project basis. This arrangement and the heavily centralised market structure acted to constrain electricity supply. An important motivation for reform was to ensure plans to diversify Oman's macro economy away from hydrocarbon based activities, by promoting new industrial, commercial, and tourism related activities, would not be constrained by electricity shortages. In 1999 MHEW estimated the electricity related investment required to support macroeconomic growth projections could exceed RO750 million (nearly US$2 billion) by end 2010 (Electricity and Related Water Sector Privatisation Report, 1999).

The government was advised it could either (i) use its own resources to fund electricity infrastructure investment, or (ii) reform the electricity sector so as to attract and utilise international private sector capital to fund future expansion. The SCBA presented in Chapter 7 presents estimates of the welfare benefit of relaxing constraints on electricity supply.

6.3 Oman Electricity Sector Law (Royal Decree 78/2004)

The Sector Law was issued on 20 July 2004 by Royal Decree 78/2004 and implemented the policies for restructuring, privatisation and regulation of Oman's electricity and related water sector approved in 1999.

First, the principal purposes of the Sector Law are as follows:

(i) To implement restructuring of the electricity and related water sector. Operational responsibility for the sector passed from MHEW to a number of newly created successor entities that were initially wholly owned by the government. Restructuring involved the vertical and horizontal unbundling of MHEW whose operational responsibilities passed to: three distribution and supply companies, a transmission company, a power and water procurement company, a company to service the needs of customers in rural areas, two generation companies, and a generation and desalination company. Moreover, a holding company was established to hold the Government's shareholding in the new successor companies (Article 66);

(ii) To facilitate the further privatisation of the electricity and related water sector. In accordance with a timetable of the Government's choosing, state shareholding in certain successor companies would be offered to local and international investors to facilitate the further privatisation of the sector (Cunneen, 2004);

(iii) The sector law established a new regulatory authority (Authority for Electricity Regulation, Oman (AER)) responsible for licensing and regulating all activities stipulated in Article (3) of the law as regulated activities, including: the power and water procurement functions and the generation, transmission, distribution and supply of electricity and the functions of system operation and dispatch. According to the law, the Council of Ministers is responsible for appointing and removing AER members, although AER is otherwise a financially and administratively independent entity (Article 20).

Second, some important Sector Law policies are as follows:

(i) The Sector Law ensures the government remains responsible for important matters of policy, including (a) all matters relating to customer tariffs (Article 9 and Article 11), (b) the timing and extent of the electricity privatisation program (Article 65), (c) the approval of electricity interconnections with neighbouring countries, and (d) the timing and extent of further changes to the structure of the electricity market (Article 31 and Article 32). The provisions of the law on these matters accord with the Cabinet decision concerning the future role of the government in the electricity and related water sector;

(ii) The Sector Law makes provision to protect the rights and interests of electricity customers and requires the regulator to consider the needs of sick and elderly customers, and companies to comply with codes of practice relating to customers with special needs and the disconnection of customers who have difficulty paying their electricity bills;

(iii) The Sector Law protected the rights of Omani employees of companies to be privatized, in accordance with a decision of the Cabinet;

(iv) The Sector Law requires all companies operating in the electricity sector to comply with the Government's policy of Omanisation[42] and with other laws and decisions of the Government insofar as they relate to the electricity sector;

[42] The government has declared a policy of *Omanisation* employing a minimum percentage of Omani

(v) The Sector Law implemented a transfer scheme under which MHEW's electricity and related water sector interests, such as employees, contracts, liabilities, and rights to land, transferred to the new successor companies;

(vi) The Sector Law introduced important measures to safeguard the interests of investors such as a right to challenge all regulatory decisions and a right to refer challenges to international arbitration;

(vii) The Sector Law established an independent regulatory authority and set out its constitution, functions, and its financial and administrative system (Article 19 to Article 62);

(viii) The Sector Law imposes a number of functions and duties on the regulator, including:

- A duty to secure that all reasonable demands for electricity and related water in the Sultanate of Oman are satisfied;
- A duty to protect the interests of customers and safeguard the interests of rural consumers through the continuation of the government's policy of rural area electrification;
- A duty to secure the preparation and application of technical and safety standards with which industry participants must comply;
- A duty to help facilitate the privatisation of the electricity sector and to promote competition where this is conducive to the public interest; and
- The sector law authorizes the regulatory authority to put in place incentives for companies in the sector to operate efficiently. When implementing such measures the regulatory authority has a duty to ensure that companies operating efficiently can also attract sufficient finance to sustain their activities. A further duty of the Authority is to minimize the cost and burden of regulation on industry participants;

(ix) The Sector Law requires AER to report to the government on an annual basis regarding developments in the electricity sector, the past and future subsidy requirement, and to present recommendations for further changes to the electricity market structure in order to facilitate competition and further liberalisation. Each Annual Report must also present AER's audited financial statements; and

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nationals in each economic sector. The percentages for each sector are monitored by the Ministry of Manpower.

(x) The Sector Law includes provisions that ensure the future development of the electricity sector is in accordance with the provisions of the law.

A further element of the restructuring was the establishment of the Public Authority for Electricity and Water (PAEW) by Royal Decree No. 92/2007 on September 9, 2007 to assume the electricity and water responsibilities of its predecessor MHEW (Oman Daily Observer, 2007c). PAEW is responsible for the water sector and coordinates with AER and other government agencies on policy related matters such as subsidy, tariffs and environmental compliance relating to electricity and related water.

Private Sector Participation

Oman has a long history of private sector involvement in its electricity activities. Between 1976 and 2002, the government owned and operated the vertically integrated power sector in Oman, with the exception of the Manah generation and transmission facilities. Even so, maintenance and operation were contracted out. In the eighties, the government started outsourcing money collection to private firms and the two collection companies; Oman International Finance Company and Oman National Electric Company are still active in the sector.

Three schemes allow for the transfer of operational risk and responsibility from government to private sector: operation and maintenance outsourcing, Build Own Operate and Transfer (BOOT) contracts and Build Own Operate (BOO) contracts. The principal difference between BOOT and BOO contracts is that under the former assets return to the public sector. BOOT schemes are an effective way to transfer operational risk to the private sector but not ownership risk as assets are returned.

In 1996, Oman's first IPP, the Manah IPP projects, was a BOOT scheme and involved the listing of shares of the United Power Company (UPC). The project was based on a 20-year Build Own Transfer[43] concession for an initial capacity of 90 MW and a one-hundred and

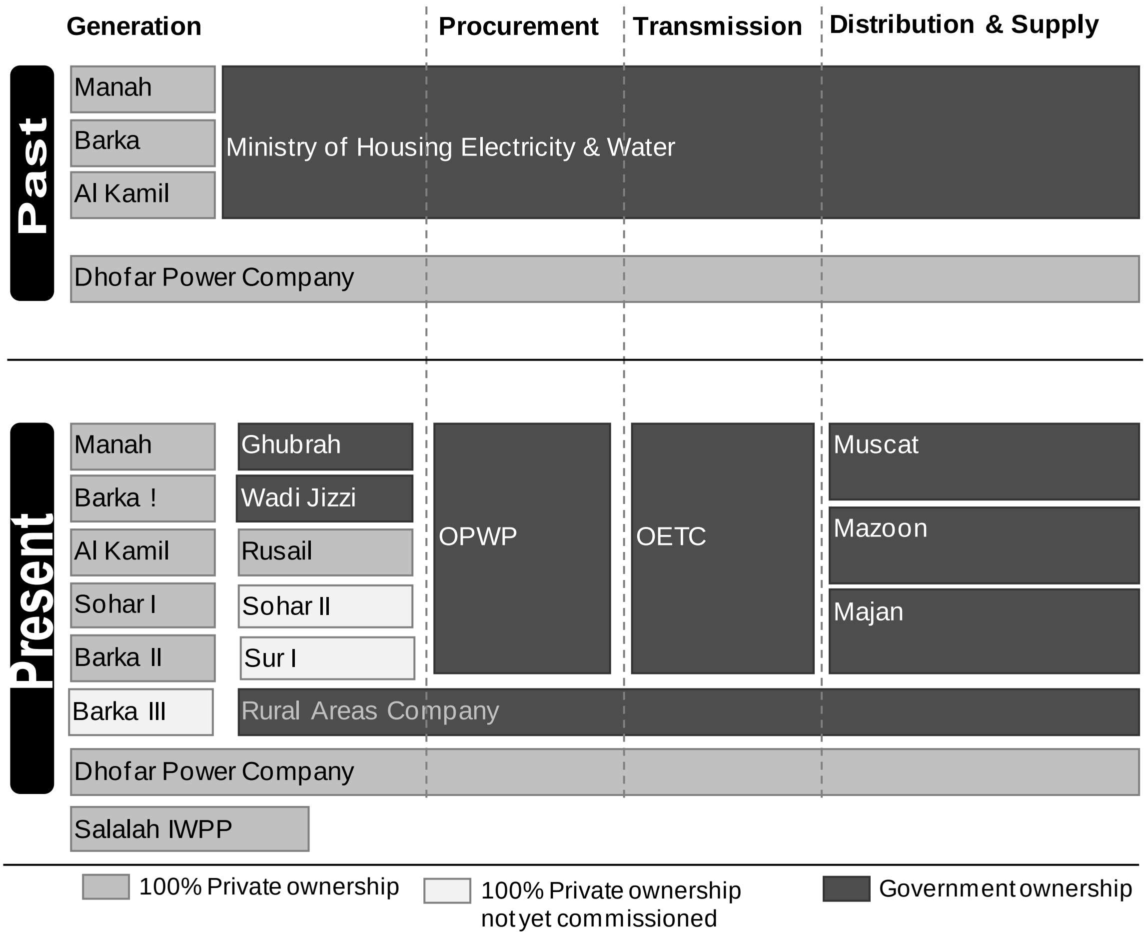
[43] The government explored the BOT (Build Operate Transfer) scheme in order to make use of the then available low interest rate finance while at the same time keeping control over the operations of the transmission line.

eighty-two kilometres of 132 kV transmission line. In 2000, the government negotiated phase-two increasing the capacity of the IPP to 270 MW. Dhofar Power Company SAOG was Oman's second privatisation project under a 20-year vertically integrated BOOT scheme. The gas fired generation included in the project replaced a significant number of diesel generators.

6.3.1 The New Market Structure

The Sector Law stipulated in some detail the new market structure and regulatory framework. Figure 18 presents the past and present structure of the Oman electricity sector.

Figure 18 Unbundling of the Omani Electricity Sector



The Sector Law facilitated the vertical and horizontal unbundling of the vertically integrated MHEW and full corporatisation through the establishment of MHEW successor companies. The Sector Law also established a new regulatory authority and licensing framework and stipulated that any entity undertaking a regulated activity such as generation, transmission, distribution, supply procurement functions and the operation of central dispatch required a licence from the regulator to do so.

Since most MHEW successor companies are de-facto or statutory monopolies, the law provides for their regulation to safeguard against exercise and or abuse of market power.

The government's shareholdings in MHEW successor companies are held by the Electricity Holding Company SAOC (EHC) which is wholly-owned by the Ministry of Finance. EHC owns 99.99% of the shares in each of the subsidiaries; the Ministry of Finance owns the remaining 0.01% (AER Annual Report, 2010). EHC is not authorised to undertake any regulated activities and, when instructed to do so, will sell or dispose of the shares to facilitate privatisation.

With just two exceptions all generation companies are 100% privately owned, six of which have successfully completed initial public offerings of shares through the Muscat Securities Market. The Dhofar Power Company SAOG operates a vertically integrated private 20 year concession. As the concession agreement was completed before the implementation of the Sector Law, the government ensured the property rights of investors were protected by implementing specific provisions in the law to this effect.

Generation

Potential entrants to Oman's generation market have to participate in fair and transparent competitions for the right to sign long-term contracts of typically 15 year durations. Once market entry is attained, there is no direct competition between market participants. Here, competition for initial market entry replaces competition in the market. The payment terms established in PPA and PWPA contracts provide incentives for generators to minimise costs so as to maximise profits, principally by maximising capacity availability.

Table 9 presents net electricity generation in 2009 and 2010 for each of the three market segments.

Table 9 Net Electricity Generation (2009 & 2010)

I. Main Interconnected System				
Facility	*Net MWh 2009*	*% of Oman*	*Net MWh 2010*	*% of Oman*
ACWA Barka SAOG *	2,305,126	12.9%	2,328,323	12.2%
Al Ghubrah SAOC **	2,702,257	15.2%	2,387,547	12.5%
Al Kamil SAOG	1,283,926	7.2%	1,310,227	6.8%
Al Rusail SAOG	3,149,107	17.7%	3,394,319	17.7%
UPC Manah SAOG	1,045,115	5.9%	1,320,830	6.9%
Wadi Jizzi SAOC	741,875	4.2%	910,152	4.8%
Sohar Power Co. SAOG	3,119,457	17.5%	2,668,896	13.9%
SMN Barka SAOG	1,183,338	6.6%	2,232,129	11.7%
PWP Purchases	188,587	1.1%	301,290	1.6%
PWP (Rental)	-	0.0%	1,280	0.0%
MIS sub-total	**15,718,788**	**88.2%**	**16,854,993**	**88.0%**
	Annual increse in generation		*7.2%*	
II. Rural Systems				
RAEC SAOC	**370,232**	**2.1%**	**412,787**	**2.2%**
	Annual increse in generation		*11.5%*	
III. Salalah System				
RAEC SAOC	45,700	0.26%	72,397	0.4%
DPC SAOG	1,688,361	9.5%	1,819,023	9.5%
Salalah system sub-total	**1,734,061**	**9.7%**	**1,891,420**	**9.9%**
	Annual increse in generation		*9.1%*	
Total Oman	**17,823,081**	**100.0%**	**19,159,200**	**100.0%**
	Annual increse in generation		*7.5%*	

* An SAOG is a public open company that has shares listed in the stockmarket
** An SAOC is a public closed company w ith no shares listed in the stock market

Source: AER Annual Report (2010)

Transmission

The main electricity transmission system is owned and operated by the Oman Electricity Transmission Company SAOC (OETC) which is also acts as the System Operator. Article 1 of the Sector Law defines transmission as 132kV and above with all voltages below this being distribution (Sector Law, 2004).

By end 2005, OETC's transmission network comprised of 136 km of 220-300 kV overhead lines, 2,495 km of 110-132 kV of overhead lines and 5 km of underground lines, 23 km of 66 kV overhead lines and 1 km of underground lines, 5,252 km of 33 kV overhead lines and 750 km of underground lines, 10 km of 132 kV underground cables and 496 km of 33 kV underground cables (GCC-GIGRE, 2005).

OETC's transmission system does not cover all of Oman, its loop covers the main regions of Muscat with 27% of the total population, Al-Batina (with 28%), Al-Sharqiyah (with 13.4%), Al-Dakhiliya (with 11.4%), and Al-Dhahirah (with 8.8%).

Transmission functions have natural monopoly characteristics and, irrespective of public or private ownership, are required to be regulated. The transmission and dispatch licence requires OETC to offer access to the transmission system on non-discriminatory terms. Charges for connection and use of the transmission system must be consistent with the terms of OETC's RPI-X price control implemented by AER.

The transmission and dispatch licence provides for the implementation of transmission system planning standards and operating standards and requires OETC to issue and manage a Grid Code. No equivalent standards were in place pre reform. The terms of the transmission and dispatch licence and the price control mechanisms implemented by it are intended to survive the transition from public to private ownership.

On February 2, 2008 Mohammed Al-Khusaibi, the Secretary General of the Ministry of National Economy announced in a statement to the 6th session of the Arab Electricity Regulators Forum held in Muscat, Oman's intention to privatise OETC. The Secretary General added that Oman's privatisation programme would eventually transfer the country's three distribution and supply companies to the private sector. The privatisation initiative was suspended in late 2008 due to the financial crisis.

Distribution & Supply

Three distribution and supply companies, Muscat Electricity Distribution Co. SAOC, Majan Electricity Company SAOC and Mazoon Electricity Company SAOC (collectively the Discos) own and operate licensed distribution systems in defined authorised areas. Discos are required to operate their systems in a safe and efficient manner and provide connections on non discriminatory terms and otherwise comply with the terms of their licenses. Each Disco has a monopoly to supply in the authorised area designated in its licence. In 2010 the Discos supplied 14,121 GWh to 597,070 customer accounts.

Discos are statutory supply monopolists whose distribution systems have natural monopoly characteristics – Discos are therefore subject to regulation and operate under RPI-X price controls implemented by the Authority. Distribution and supply licenses provide for the implementation of distribution system planning standards and supply standards of performance. No equivalent standards were implemented by the self regulating MHEW.

The distribution and supply licence requires each DISCO to offer access to its distribution system on non-discriminatory terms. Charges for connection and use of a distribution system must be consistent with the terms of each Disco's RPI-X price control that, as in the UK system of regulation, provide incentives that act as a proxy for competition.

A feature of the Omani Law, noted by Al Hinai and Cleary (2007), is that it anticipates the future separation of the supply and distribution functions and requires Discos to maintain separate accounts for each separate business (Appendix 1).

The Sector Law includes a number of mechanisms for further market liberalisation, including the removal of supply monopolies to allow competition in supply in all areas, something AER is working to implement (AER Annual Reports, 2010).

Meter reading billing and collection is part of the regulated activity of supply and are the responsibility of Discos who contract out these functions to the two private companies contracted by MHEW (Cunneen, 2004).

Power & Water Procurement

The Omani market structure centres on the Oman Power and Water Procurement Company SAOC (PWP), a single buyer (monopsony) in respect of the procurement of capacity and energy, and a single (monopoly) bulk supplier of electricity to the Discos. Producers are prohibited from selling electricity directly to customers, and must sell all of their capacity and output to the PWP.

Power procurement functions are designated in the Sector Law as regulated activities, and the PWP requires a licence to undertake them. The government no longer provides a direct government guarantee for new IPP as the PWP has secured and retained investment credit ratings by two ratings agencies. In October 2007, Moody's Global Corporate Finance assigned PAP an 'A2' rating as it had 'a stable outlook' and viewed its 'business profile as very low risk, given the tight regulatory limitations on its business activities, its clearly defined mandate and the full pass-through of market risk that it provides under normal circumstances' (Moody's OPWP Report, 2007, pp. 1-2). The absence of direct government guarantees has not impacted the PWP's ability to procure new IPPs and three new facilities with total capacity of 3,500 MW have been successfully procured without direct government guarantees.

PWP is regulated and operates under a licence granted by AER that includes conditions that constrain the exercise of market power and promote good performance:

- PWP is required to satisfy a Generation Security Standard (GSS) of a yearly maximum of 24 loss of load hours (LOLH), and is required to publish each year a statement showing how it proposes to meet the GSS in each of the succeeding seven years;
- PWP is prohibited from discriminating against any person and must not act in a manner inconsistent with the promotion of competition; and
- PWP is required to ensure that its purchases of capacity and output comply with the economic purchase condition of its licence. In its fourth 7-Year Statement covering 2010 to 2016 PWP's central estimate is for MIS demand to grow from 3,424 MW in 2010 to 6,043 MW by 2016, an average annual growth rate of 8.5%. PWP estimates the Salalah Power System will grow from a 297 MW in 2010 to 615 MW by 2016 at an average growth rate of 11% (PWP, 2009).

The Sector Law prohibits PWP from building power plant or owning assets while Article 79 of the law requires PWP to tender all new capacity requirements through fair and transparent competitions open to international bidders if required capacity exceeds 75 MW (Oman Electricity Law, 2004). Only if competition yields no private interest or it is agreed with AER to do otherwise (for example due to excessive costs or fear of market power exploitations) must the PWP ensure supply by establishing a new state-owned power generation company to develop the new required capacity, selling still exclusively to PWP. In such cases, the Ministry of Finance in coordination with the Ministry of National Economy would determine if and when the new company is to be privatised.

PWP operates under an RPI-X price control implemented by the Authority to motivate efficient performance.

Rural (remote) Area Systems

The Rural Areas Electricity Company SAOC (RAEC) is licensed by AER to undertake generation, transmission distribution and supply to small and dispersed rural systems. RAEC has around 54 rural systems of varying size, all of which are supplied by diesel fired generation. RAEC's functions are regulated and the company operates under RPI-X type price controls implemented by the Authority. In 2010, RAEC supplied 420 GWh to 21,662 customer accounts, just 2.6% of the 16,132 GWh of total supply.

The number of RAEC systems is expected to decline over time as its systems are absorbed into the expanding MIS. The government does not propose to privatise the company.

Salalah Power System

Dhofar Power Company SAOG (DPC) operates a 20 year vertically integrated concession in the Southern Region of Oman. DPC is subject to 'regulation by contract' and is required to abide by negotiated performance standards in its Concession Agreement. In 2010 DPC supplied 1,590 GWh to 58,936 customer accounts, accounting for 9.9% and 8.7% of total supply and customer accounts, respectively, in Oman.

Sections of the Salalah Concession Agreement are not available to the public, although Article 26 is and stipulates penalties for non-compliance with Customer Service and Supply Standards.   DPC is required to present a report to PWP (audited by an independent auditor) setting out its performance against the standards, and to pay relevant penalties for each instance in which it failed to achieve the standards. The PWP undertakes its own penalty assessment and in cases of disagreement between the PWP and DPC, of which there have been many, the matter is referred to an expert for determination and then to arbitration.[44]

In 2010 the government invited AER and PWP to formulate proposals to unbundle and restructure the Salalah Power System to align it to the vertically and horizontally unbundled MIS. To assist this process the government had by end 2010 purchased over 99% of the shares of DPC (AER Annual Reports, 2010).

Electricity Subsidy

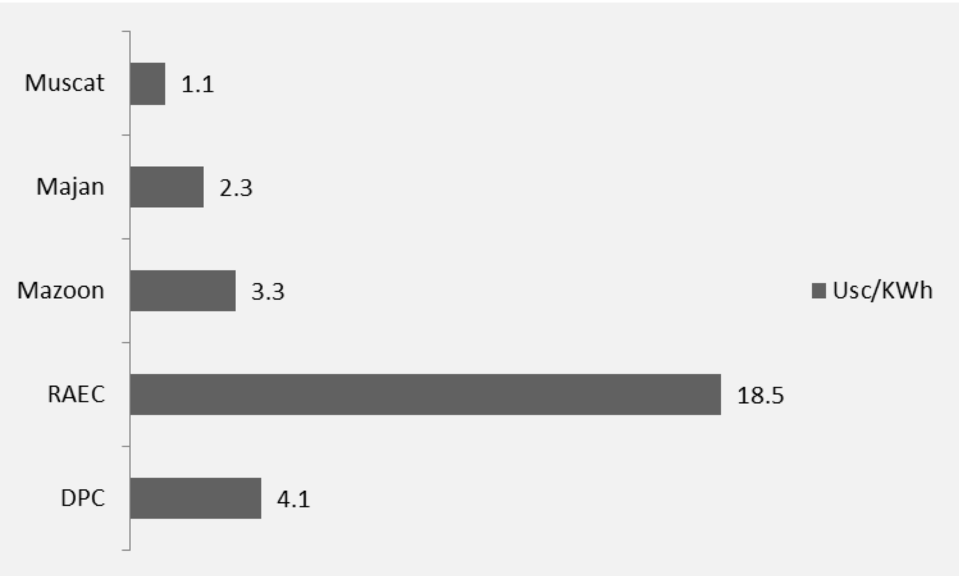
The government retains full control over customer tariffs while AER is responsible for intra-company charges such as charges for use of system and connection. This is in line with policies in other GCC member states where consumer prices are not cost-reflective. Customers can be reassured that tariffs will not be determined by private sector entities, although the costs (benefits) of sector inefficiency will be reflected in a higher (lower) subsidy requirement (Cunneen, 2004). Just like other GCC countries, the government continues to subsidise prices. According to Al Mahrouqi (Appendix 1) - Chairman of the Public Authority for Electricity and Water (PAEW) - if Oman considers the introduction of

[44] Based on personal communications from John Cunneen, Executive Director and Member of AER-Oman received on February 21, 2009.

cost-reflective tariffs, it will be only to large consumers (industrial, commercial and government entities).

In 2010 government subsidy amounted to RO167.7 million (US 436 million) of which the MIS accounted for 67%, RAEC 18% and DPC 15%. Figure 19 presents 2010 subsidy by company per kWh and highlights that RAEC's rural systems that run on diesel fuel require significantly higher subsidy per kWh than the MIS companies and DPC which benefit from natural gas fired generation.[45]

Figure 19 Subsidy Comparisons Between Systems (2010)



Source: AER Annual Report (2010)

In 2009 AER initiated consultation on cost-reflective tariffs for large industrial and commercial users of electricity. According to the PAEW Chairman, such tariffs may be applied to other customer categories in the future but subsidies will continue for 'vulnerable' consumers.[46]

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[45] Subsidy is defined by AER as 'the difference between the economic cost of supply (including finance charges) [which are derived from the sum of Maximum Allowed Revenues (MAR)] and Permitted Tariff (and other) revenue' (AER Annual Reports, 2007, p. 29).

[46] Based on a personal communication with Mohammed Al Mahrouqi, Chairman of PAEW, received on 20 May 2009.

6.3.2 Regulation and Competition in Generation

AER's focus for the regulation of generation is ensuring PWP conducts fair and transparent competitions for new capacity and output and enforcing market share and economic interest restrictions. Article 112 of the Sector Law requires the implementation of market share thresholds to prevent market concentration. AER enforces market share thresholds of 25% of contracted capacity with prior regulatory approval required to exceed the threshold. The purpose of the market share threshold is not to automatically disallow interests in excess of it, but to recognise that while an investor with a market share below the threshold is unlikely to have market power, this might not be so in the case of a market share above the threshold. In applying these concepts to the Oman electricity sector, AER considers a range of factors including the structure of the market, demand growth and expected additions of new capacity, and how investor shareholdings (market shares) will change following initial public offerings.

Certain features of the market structure are relevant to such deliberations:

- Licensed generators are prohibited from selling directly to final consumers, and so are not able to directly influence prices to customers. Generators are required to sell all of their capacity and output to the PWP. Monopsony provides the PWP with significant countervailing buyer power although AER works to ensure the PWP does not abuse its position as this may deter potential new entrants from participating in competitions for new capacity; and
- The terms on which the PWP purchases capacity and output are, in most cases, determined by fair and transparent competition. Once determined, payment terms are incorporated in PPA/PWPA contracts that remain unchanged for the duration of the agreements - other than pre-agreed indexation of certain costs, and exchange rate or other adjustments. Sellers therefore have little scope to increase prices irrespective of their market share.

This is not to suggest that in the context of the new market structure a high market share would be without risk. There are several ways in which market power might be exercised. For example, a licensed generator/declinator may attempt to use its market power to reduce the quality of its contracted outputs (and therefore secure an effective price increase).

Moreover, a company with a high market share may seek to influence the timing of scheduled outages to its advantage, or it may seek to influence dispatch arrangements in ways that would be advantageous to it but have the effect of increasing total system costs.

A further reason not to disregard the market share thresholds is that to do so might not be conducive to competition if it delayed the introduction of further market liberalisation. For example, a high market share might not in itself be a cause of concern in the context of the 'single buyer' market structure. But the same market shares or concentration may be considered unacceptable in, for example, a pool arrangement. The introduction of a pool, or other forms of competition, might have to be delayed until market shares declined to acceptable levels (this could be achieved by requiring divestment of interests, but such measures may increase investor uncertainty and are not without cost). A general point that further supports the application of some constraint on market share in the context of the single-buyer market structure is the potential for financial instability. An investor with a high market share could, if it encountered financial difficulties, transmit instability throughout the market. The potential for such instability will be positively correlated with market share (Cunneen, 2004).

The strategy of the government for the privatisation of the Al Rusail Power Company was to offer the company to investors with an obligation to build, own and operate a new I(W)PP (Barka 2), resulting in a combined capacity (of Rusail and Barka 2) in excess of 1,000 MW (over 30% of the total market size). Interest in the Rusail privatisation and Barka 2 IWPP included Suez Energy International who already had economic interests in the Manah production facility and a new IWPP in Sohar. The Authority determined that Suez could participate in the competition for Rusail and Barka 2 on condition that should they be the preferred bidder, they fully divest their interest in the Manah production facility and accept economic restrictions stipulated by the Authority to constrain their share of the generation market to within the 25% threshold. According to Cunneen (2008), AER demonstrated how it proposed to promote competition for new capacity while ensuring the market share and economic interest restrictions are properly enforced. This issue was an important test of the new regulatory regime that has been overcome to the satisfaction of all concerned. After detailed discussions, Suez accepted these conditions and went on to successfully bid for the Rusail and Barka 2 project.

On 27 February 2007, AER proposed market share restrictions and economic interest restrictions for the Salalah Power System consistent with those applied for the MIS. 'The restrictions would limit the scope for persons with economic interests in entities undertaking regulated activities in the Salalah Concession Area securing economic interests in other authorised entities. The restrictions would also limit the scope of persons with economic interests in existing licensees securing an economic interest in entities undertaking regulated activities in Salalah Concession Area' (Oman Daily Observer, 2007a, p. 21). The restrictions provide regulatory protection against excessive concentration and possible market power exploitation and safeguards from vertical reintegration of the already unbundled market.

Independent assessment of benefits of reform

In 2007 the Ministry of National Economy commissioned London Economics in association with Herbert Smith LLP and London Power Associated Ltd. to assess whether Oman had benefited from the electricity sector reforms.

The advisors found that reform had resulted in a higher monetary cost base but actually yielded lower costs in terms of 'true' economic costs of electricity. Indeed, 'the PWP managed to reduce average energy costs from the main generation plants from a planned RO 7.4 [US$ 19.24] per MWh to an actual RO 7.1 [US$ 18.46] per MWh, and a Disco's tariff revenues were 10% higher than anticipated due to tighter management of the meter reading and billing contract'. Further, 'total electricity system losses fell from 23.9% to 21.1%. While the losses are still high by international standards (losses in the range of 10% to 11% is typically considered as normal), the 11.7-per-cent reduction in 2006 shows that the sector is moving into the right direction and the sector reform is having a definite impact' (London Economics, 2007, p.23).

The report also highlighted the increased level of financial transparency. 'The various government-owned electricity sector companies now pay taxes and duties and, since 2006, land usufruct charges', whereas prior to the restructuring, 'no such taxes, duties and land usufruct charges were paid' (London Economics, 2007, p.26).

The consultants concluded, 'The electricity sector reform undertaken by Oman is ambitious and comprehensive, and should lead over time to considerable benefits for Omanies and the Oman economy' (London Economics Report, 2007, p.8).

6.4 Conclusions

The Sector Law and single buyer market structure implemented in Oman has been beneficial, as noted in the London Economics Report (2007), and might therefore provide a basis for recommendations for GCC wide electricity market reform. However, to confirm this we present in Chapter 7 a full social cost-benefit analysis of the reforms to provide a robust basis for our recommendations.

While some characteristics of the Oman and Abu Dhabi laws are similar, some features of the Oman Sector Law and market structure are rather more advanced than in Abu Dhabi – especially with regards to safeguards against market concentration whilst promoting private sector participation, regulatory independence and providing international investors a right to international arbitration.

A particular feature of the Omani case is the comprehensive and detailed nature of the Sector law that sets out in detail the new market structure and the regulatory regime under which it operates. This is in line with Newbery who, as noted in Chapter 2, stated that the rules governing market behaviour must be set out correctly before embarking on sector reforms. We will argue in Chapter 8 that the Oman Sector and the regulatory framework it contains has proved effective in regulating the behaviour and performance of electricity sector companies and may inform recommendations for GCC electricity market reform.

Chapter 7 Social Cost-Benefit Analysis of Omani Reforms

7.1 Introduction

The Omani government identified a number of expected benefits from the electricity reform programme, including: improved financial and cost transparency, better security of supply; increased electricity sector efficiency; adopting an Independent Power Plant (IPP) model that allowed investors a right to own 100% of the project company with an obligation to make initial public offerings of shares (of no less than 35% typically within three years of starting commercial operations), would assist the development of Oman's capital market and contribute to wider share ownership; a positive impact on the State's finances as investment in new generation would be funded by the private sector; better services to electricity users; improved employment and training opportunities for Omani nationals, and improved environmental compliance as electricity companies would be required to comply with environmental laws and regulations (London Economics Report, 2007).

Unlike most electricity reform programmes discussed in the literature, electricity reform in Oman has to date resulted in just one privatisation transaction: this was the sale of the government's entire shareholding in the Al Rusail Power Company in 2006 for a consideration of RO 50 million (US$ 130 million) according to Times of Oman (2006). Generation capacity is provided by privately funded IPPs under long term (typically 15 year) power purchase agreements. The privatisation of three generating stations commissioned under MHEW management was planned but only the Rusail plant has been privatised. A second distinction from reform programmes discussed in the literature is that electricity tariffs in Oman post-reform remained unchanged at their pre-reform levels and heavily subsidised. It is therefore not possible to evaluate changes in consumer and producer welfare resulting from price changes (customer tariffs) as there have been no price changes. Our analysis therefore focuses on assessing the benefits derived from moving from a state owned vertically integrated monopoly to a fully unbundled and corporatized (single-buyer) electricity market structure supervised by an independent regulatory authority.

This chapter presents an empirical examination of Oman's electricity reforms using principles of social cost-benefit analysis (SCBA) to assess whether Oman has benefited (in terms of increased social welfare) from the electricity reforms implemented in 2005. The analysis framework compares the changes in welfare due to reform (the actual scenario) compared to a scenario in which assumptions about the electricity sector's performance pre-reform are applied to the period 2005 to 2015 assuming the reforms had not been implemented (the counterfactual scenario).

This chapter sets out the applied SCBA methodology drawing on relevant literature and economic research and highlights assumptions specific to Oman's electricity sector under study.

7.2 Methodology

Social cost-benefit analysis (SCBA) differs from private CBA. According to Stiglitz (2000, p. 275), SCBA 'takes into account a wider range of impacts, not just profits' and that in SCBA 'market prices may not exist for many benefits and costs, and market prices may not be used because of market failures' (ibid).

Stiglitz (2000) also suggests that the discount rate used in public sector SCBA analyses may be lower than that used for private CBA. For our SCBA of the Oman reforms, we use a real discount rate of 5%, reflecting the government's social rate of time preference (STP)[47]. To check the robustness of our results, we perform sensitivity analysis that applies (a) a lower rate of 3% that might be more in line with pure time preference and (b) a higher rate of 7% that might be closer to a private 'opportunity cost' rate used in commercial project finance assessments.

[47] Given data limitations, we consider the margin between the average lending rate (6-7%) and the Government bond rate (2-3%).

Drawing from Section 2.2 of this thesis, we apply SCBA ex-post to determine the social gains (losses) that have resulted from the policy decision to reform Oman's electricity sector. For the purpose of our study, we review the work of Jones et al. (1990), Galal et al. (1994) and Newbery and Pollitt (1997), Green and McDaniel (1998) and Damsgaard and Green (2005).

While most of the above mentioned SCBA studied welfare change as a result of primarily public asset divesture (privatisation with treasury gains from public enterprise proceeds), Green and McDaniel (1998) analysed a situation in which England and Wales opened the market to full competition (with the introduction of retail competition where consumers have a choice of supplier) with a counterfactual scenario in which the market was not open to retail competition. Here, the study did not focus on the welfare effects of electricity privatisation, already introduced in the UK since 1989, but sought to measure changes in the welfare of agents due to a change in policy, and summing the welfare changes to see if the policy increased or reduced welfare (ibid). Similarly, the Damsgaard and Green (2005) analysis of Swedish electricity regulatory reform focused on welfare changes from deregulation - with privatisation not an issue of study.

For the Omani case under study (and other GCC countries for that matter), SCBA may also be used to evaluate changes in social welfare due to reform and corporatisation, bearing in mind the limited (or sometimes non-existent) divestures involved in GCC member states. In this case, SCBA could measure the net change to welfare in terms of consumer welfare change, industry operations and administrative costs. More specifically, SCBA can facilitate analysis of the net effects of electricity market restructuring (including expanding the rate of investment in new generation capacity through more transparent competitions and long term IPP single-buyer contracts), efficiency (gains or losses) as a result of corporatisation while factoring in all possible costs associated with the new market arrangements (such as unbundling MHEW and undertaking new regulatory functions). Accordingly, in order to carry out our SCBA of the Oman reforms (from 2005), we have established two scenarios:

A. The actual scenario: based on actual data reflecting the overall post-reform performance of the sector between 2005 and 2010 and projections through to 2015. Here, we examine whether the policy of restructuring and unbundling Oman's electricity sector has brought about any significant changes in social welfare, even though the divesture of state owned assets is limited to the Al Rusail privatisation as previously noted in the Omani case study of Chapter 6; and

B. The counterfactual scenario: that assumes that the electricity sector continued to be self regulated, state-owned and state-managed by the Ministry of Housing, Electricity and Water (MHEW). To construct this scenario we assessed MHEW's performance prior to 2005 and made output projections through to 2015 that reflect pre-reform trends.

We denote (ΔW) as the net change in social welfare resulting from a policy change, with ΔW calculated as the sum of changes in welfare of affected economic agents:

$\Delta W = \Delta$ Consumers + Δ Producers + Δ Government + Δ Employees + Δ Competitors

Where ΔW is the net change in social welfare resulting from a policy decision;

ΔS is the change in welfare of Consumers;

ΔP is the change in welfare of Producers;

ΔG is the change in welfare of the Government;

ΔE is the change in welfare of Employees affected by a policy decision or reform programme; and

ΔC is the welfare change to competitor industries and suppliers.

Galal et al. (1994, Equation 1-1), present a welfare equation in the following form:

$$\Delta W = \Delta S + \Delta \Pi + \Delta L + \Delta C$$

Where ΔS reflects the welfare effect for consumers (consumer surplus), $\Delta \Pi$ denotes the effect on enterprise profits (including buyers, government and other shareholders), ΔL reflects effects primarily on labour (employees) and any other providers of inputs (like credit, permits, intermediate goods etc.), and ΔC accounts for welfare change with respect to competitors.

Another version of the welfare change equation, relevant when there are privatisation proceeds, is presented by Jones et al. (1990, Equation 2-2):

$$\Delta W = Vsp - Vsg + (\lambda g - \lambda p)Z$$

Where ΔW denotes the net change in social welfare, Vsp is the social value of the enterprise under private operation (actual), Vsg is the social value of the enterprise under continued government operation (counterfactual), with Z indicating the privatization sale proceeds while λg and λp are shadow multipliers for government and private revenues respectively. This equation suggests welfare would be increased following a divestment if the value of the government expenditure multiplier λg is higher than the private sector expenditure multiplier λp. According to Domah and Pollitt (2001), this may not be the case for a developed economy like the UK, in which case the shadow value of public funds was assumed equivalent to that for private funds, and so $\lambda g \approx \lambda p \approx 1$. An increase in welfare from $\lambda g > \lambda p$ would also require that (Vsp – Vsg) was not negative and large enough to outweigh the λ effect as sale proceeds would also increase welfare.

There are strong theoretical reasons to believe $\lambda g > 1$, for example, social welfare losses of (i) taxes on goods and services (that raise prices and reduce consumption and profits) and (ii) income taxes that distort choices of allocation between work and leisure. Taxes that improve social welfare, such as taxes that bring prices closer to the social cost of consumption, i.e. correcting for externalities, do not feature in social cost benefit analysis as it can reasonably be assumed that if the government received additional income it would not change welfare enhancing taxes (Jones et al, 1990).

Government expenditures will also influence the value of λg, although arguments can be made to support values greater or less than 1. Government expenditure on pure public goods such as defence and civil order will generally increase welfare, as would expenditure on goods and services with strong positive externalities such as transport infrastructure, health and education. On the other hand, government expenditure may reduce welfare if it displaces or 'crowds out' private sector provision and if public sector efficiency is less than that of the private sector (Jones et al, 1990).

Prudent macroeconomic policies have allowed Oman to maintain a high credit rating by international standards (A1 stable[48] as at November 2011), and avoid significant budget-constraints. Moreover, taxes and fee revenue account for a very small proportion of the country's revenue budget: in the 2011 revenue budget taxes and fee revenue accounts for just 2.3% of total revenue (MOF Budget, 2011). There is no income tax in Oman and corporation tax is set at a uniform rate of 12%. These factors suggest it would be reasonable to assume the shadow value of public funds in Oman may be close to 1. As already noted, Oman's electricity reforms have included just one privatisation transaction, and given our assumption that $\lambda g \approx 1$ we do not adjust Rusail privatisation proceeds to reflect differences in λg and λp.

Newbery and Pollitt (1997) used SCBA to determine the change in social welfare due to efficiency gains from restructuring and privatisation measured by the difference in costs between actual and counterfactual scenarios.

It is important to note, however, that a privatised entity will behave in a certain manner and will seek to set prices and output to maximise profits which may not maximise social welfare. It would therefore be legitimate for a government not to privatise an entity expected to have market power post divestment as this may be to the detriment of consumers (Jones et al, 1990, p 12). An alternative would be privatisation with adequate regulation which some countries might find difficult to achieve.

Our SCBA of Oman's electricity sector reform utilises an equation that reflects the following considerations (i) limited privatisation proceeds; (ii) that customer tariffs remain unchanged and heavily subsidised post reform; (iii) increased post-reform infrastructure investment and output, and (iv) higher employment post reform. Our SCBA applies the following equation:

[48] Moody's Investor Service, November 2011

$$\Delta W = \Delta S + \Delta P + \Delta G + \Delta L - R\&C$$

Where ΔW is the net change in social welfare resulting from electricity sector reform measured as the change in welfare between the actual scenario (the implementation of the reforms) and the counterfactual scenario (assuming the reforms were not implemented);

ΔS corresponds to welfare benefits (consumer surplus) resulting from increased supply to customers;

ΔP corresponds to the welfare change to Omani private investors (share ownership dividends minus share purchase costs). Since our SCBA is concerned with welfare changes in Oman we exclude benefits associated with dividends remitted to foreign investors;

ΔG corresponds to the welfare change to government (the change in corporation tax income, dividends to government, changes in subsidy and privatisation proceeds (Rusail));

ΔL corresponds to the welfare change to labour (due to changes in employment and income); and

R&C reflects the costs of restructuring and corporatizing the electricity sector prior to 2005 and the subsequent regulation of the sector from 2005 to 2015.

We note that the Omani electricity supply industry has no competitors and so we do not need to include a term for the effects on them.

In order to confirm that Oman's electricity sector reforms increased social welfare, our SCBA must verify that the costs of reform are outweighed by its benefits. Following the discussion in Chapter 2, our equation is based on a welfare standard that considers changes in total welfare (consumer and producer surplus).

7.3 Analysis

The Main Interconnected System (MIS) accounts for about 90% of the Omani electricity sector. Our analysis, therefore, focuses on the costs and benefits of MIS electricity supply.

We recall that Oman's electricity sector reforms introduced new and important statutory obligations that require electricity sector companies to meet all reasonable demands for electricity and comply with performance and security standards, obligations that had no counterpart pre-reform and that underpin improved security of supply. The regulator is responsible for ensuring companies comply with security of supply obligations and does so by enforcing: (1) the Generation Security Planning Standard (GSPS) that requires the PWP to ensure the probability of loss of load hours in any year does not exceed[49] 24 loss of load hours, (2) Transmission System Security Standards (TSSS), (3) Distribution System Security Standards (DSSS) and (4) quality of supply standards (Cunneen, 2004). It is difficult to quantify the difference in security of supply pre and post reform as MHEW did not collect or publish relevant data.

Reform has brought changes to the electricity supply industry: (1) relaxation of a constraint on electricity supply, (2) new IPPs with larger unit sets have lower unit costs yielding operational efficiencies that combined with lower network losses has helped reduce per unit government subsidy, (3) the industry now employs more workers with better salaries, (4) some IPP shares have been successfully floated in the Muscat Security Market providing dividends to private Omani investors and wider share ownership, and (5) new costs associated with market unbundling and the establishment and implementation of new regulatory arrangements.

The researcher acknowledges that some of the input data and assumptions used in the SCBA were provided by AER in cooperation with the researcher in an agreed format that allowed what would otherwise have been confidential information to be used in the analysis.

[49] It is stipulated by the Omani Law and implemented through the PWP licence (Condition 5 of the Licence requires the PWP to publish a 7-year statement presenting its electricity demand forecast and the source and amount of capacity required to satisfy demand and comply with the GSPS).

7.3.1 Effects on Consumer Welfare ($\triangle$S):

Among others, the Galal et al. (1994) case studies concluded that consumers are usually affected by policy change. Our analysis of the Oman reforms will show that even without significant divestures and with unchanged and subsidised tariffs, market restructuring and introduction of an independent regulatory function has been of direct benefit to consumers and to social welfare generally.

There had been significant pent-up demand from consumers and firms which had been unable to get a connection to the grid in the pre-reform period. Following the reforms, demand growth accelerated from 6.5% a year (1997-2004) to 11% a year (2005-2010), an increase we attribute to the reforms, and helped to raise non-oil GDP.

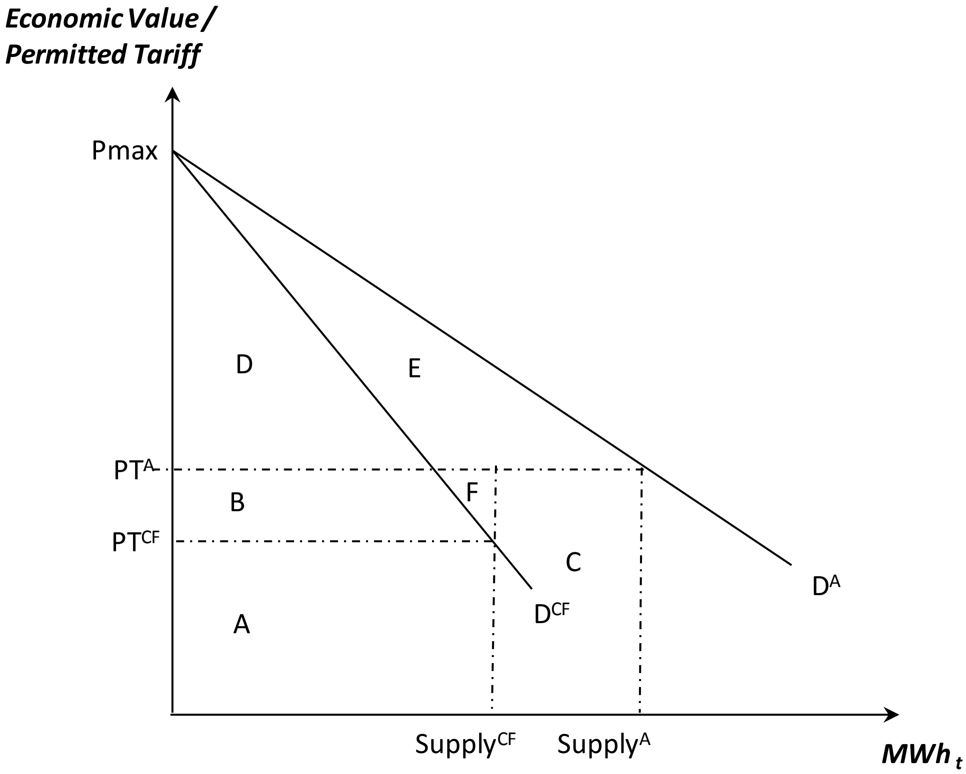
Between 1997 and 2004 non-oil GDP increased at an annual average rate of 3%, growth then accelerated to 16.7% per annum from 2005 to 2010. The increased growth in non-oil GDP would be expected to drive higher demand for electricity, and as a result of the reforms the increase in growth of electricity supply helped to facilitate higher GDP growth.

For our SCBA in the actual case we assume growth in supply between 2011 and 2015 of 11% per annum and in the counter-factual we assume growth in supply of 7% per annum from 2005 to 2015.

To estimate the change in consumer welfare resulting from the electricity sector reforms, we estimate the difference in benefits in the actual case (in which electricity supply is higher and economic costs are lower) and the counterfactual case. There is an extensive economic literature examining the relationship between economic growth and electricity supply, but very few analyses of GCC countries. Analysis by Squalli and Wilson (2006) identified a significant and positive long run income to electricity relationship for Oman and other GCC countries. Our estimate of consumer welfare reflects the increase in consumer surplus captured by increasing the growth rate of electricity supply in response to increased growth in non-oil GDP. In the counterfactual case electricity supply growth is lower than post reform supply growth and consumer welfare is correspondingly lower.

Figure 20 shows the ‘building blocks’ used to calculate the change in consumer welfare in year *t* in the actual and counterfactual scenarios. Since price schedules did not change, and the extra growth was due to the sector’s ability to connect more customers, this needs to be analysed by a shift in the demand curve rather than simply a movement along it.

Figure 20 Example Calculations of Consumer Surplus



The net present value of consumer welfare benefits presented in our results is the present value of consumer welfare from 2005 to 2015, discounted using a real rate of 5%. Each of the variables in the calculations is described below:

Telson (1975) proposed a methodology for deriving an upper bound estimate of the value of electricity. Following this approach, in our analysis GDPR is the ratio of average non-oil GDP (between 1999 and 2010 but excluding 2005 and 2008 due to large changes in non-oil GDP in these two years) and MWh supply. These demand schedules represent the non-oil sector’s willingness to pay for electricity for the actual and counterfactual cases. GDPR represents the maximum amount the non-oil sector of the economy would pay for 1 MWh of electricity; and some of the newly connected customers may not be willing to pay anything near this amount. Our calculation of consumer welfare in both the actual and counterfactual scenarios uses a weighted average 'maximum willingness to pay' of electricity derived as follows:

$$Pmax = (GDPR * \alpha) + (PT * (1 - \alpha)), \text{ where } \alpha \text{ is a weighting}$$

GDPR is the ratio of non-oil GDP per MWh indicating the non-oil sector's willingness to pay for electricity - following the upper bond following from (Telson, 1975). The variable α is weighting factor to restrict consumer welfare to a particular category of demand (in this analysis the demand of Industrial and Commercial consumers) and PT is the demand weighted Permitted Tariff reflecting the aggregate demand weighted tariffs of each customer category. In the base case, we assume a value for α of 20%, but subject this to sensitivity analysis. PT is defined for both actual (PT^A) and counterfactual (PT^{CF}) scenarios as follows:

PT^A represents the demand weighted average tariff revenue per MWh (for MIS customers) in the actual case in year *t*. Electricity supply projections from 2011 to 2015 reflect higher growth in supply to commercial and industrial customers, customers that pay higher tariffs (52 US$/MWh and 44 US$/MWh on average, respectively) than residential customers, 70% of whom pay 26 US$ /MWh for all of their power. In addition to changes in the composition of demand, following reform electricity suppliers are incentivized to improve revenue collection rates and revenue collection has improved since 2005. For these reasons the average demand weighted revenue per kWh supplied under Permitted Tariffs rises year on year in the actual case (due to higher growth in demand of energy intensive customers), even though the nominal value of Permitted Tariffs for all customers remain unchanged;

PT^{CF} represents the demand weighted average revenue per MWh supplied in year *t*, in the counterfactual case, with the composition of demand unchanged through to 2015;

The schedule PMax – D^{CF} represents electricity demand in the counterfactual case;

The schedule PMax – D^A represents electricity demand in the actual case;

$Supply^{CF}$ means MWh supplied in year *t* in the counterfactual case; and

$Supply^{A}$ means MWh supplied in year *t* in the actual case.

Calculations of ΔS:

Using as example the consumer welfare calculation for 2010 (2005 prices): GDPR is US$ 1,756/MWh, PT^{CF} is 32.8 US$/MWh and PT^{A} 33.0 US$/MWh. Counterfactual supply in 2010 is an estimated 11.7 TWh and actual electricity supply in 2010 is 14.1 TWh.

(1) Consumer surplus in the counterfactual case is represented by areas B + D, calculated as follows:

$$B + D = [(GDPR * \alpha + PT^{CF} *(1 - \alpha)) - PT^{CF}] * Supply^{CF} / 2$$

$$= [(1,756 * .2) + (32.8 * .8) - 32.8] * 11.\ 7 / 2$$

$$= US\$\ 2,015.8 \text{ million}$$

(2) Consumer surplus in the actual case is represented by areas D + E, calculated as follows:

$$D + E = [(GDPR * \alpha + PT^{A} *(1 - \alpha)) - PT^{A}] * Supply^{A} / 2$$

$$= [((1,756 * .2) + (33.0 * .8)) - 33.0] * 14.1 / 2$$

$$= US\$\ 2,432.3 \text{ million}$$

(3) Change in consumer welfare is area E – B, that is equivalent to: [(D+E) – (B + D)]

$$(D + E) - (B + D) = 2,432.3 - 2,015.8$$

$$= US\$\ 416.5 \text{ million}$$

(4) Repeating these calculations for 2005 to 2015 inclusive, and discounting using a 5% real discount rate, returns our central case estimate of the change in consumer welfare:

NPV of the change in consumer welfare (at 2005 prices) = US$ 3,577.4 million

7.3.2 Effects on Private Omani Investors (ΔP):

A specific objective of Oman's electricity sector reforms was to facilitate international private sector investment and participation. Article (15) of the Oman electricity sector law provides an exception from the Foreign Capital Investment Law allowing non-Omani shareholders in companies undertaking regulated activities to own up to 100 per cent of the shares of such companies. However, each I(W)PP project company is required to offer a minimum of 35% of its shares in an Initial Public Offering through the Muscat Securities Market. This obligation ensures Omani investors have the opportunity to share in the benefits of electricity privatisation and contributes directly to the government's objective of wider share ownership.

Calculation of ΔP benefits to private Omani investors

To calculate benefits to private Omani investors we identified from financial statements amounts investors paid for direct equity shareholdings in IPPs and amounts paid for shares purchased from initial public offerings. We then extracted dividends distributed to international and Omani private sector investors from the audited financial statements of each company for 1999 to 2010 inclusive. In the actual case for 2011 to 2015 we assume annual dividend distributions equal average distributions between 2007 and 2010. For SMN Barka Holding Company who hold shares in two IPPs (Al Rusail and SMN Barka) and whose IPO was completed in October 2011, expected dividend distributions for 2011 to 2015 are taken from the published prospectus (SMN Prospectus, 2011). For all IPP we assume dividends continue in perpetuity by dividing dividends in 2016 by the discount rate and discounting the result back to 2005. We have excluded dividends remitted to foreign investors as the focus of our analysis is the change in social welfare in Oman.

In the counterfactual case, we assume the policy of requiring I(W)PPs to offer 35% of shares to the Muscat Securities Market would apply, and that MHEW would have been able to procure privately funded I(W)PPs sufficient to meet counterfactual supply growth of 7% per annum. Reflecting these and other considerations (such as the absence of a requirement to hold fair and transparent competitions), we assume counterfactual dividend distributions are half the value of dividends distributed in the actual case. Details of our calculation of the benefits to private Omani investors between 2005 and 2015 (taking account of dividends and share purchases before 2005) are presented in Table 10.

NPV of the change in Omani investor benefits (at 2005 prices) = US$ 131.5 million

Table 10 Dividends to Omani Private Investors

Dividends (Omani & Foreign)	Pre Electricity Market Reform						Post Electricity Market Reform						Forecast Values					
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Future
Current prices	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	Value
United Power Company SAOG	11.427	24.578	16.934	17.241	14.375	10.187	5.723	7.410	6.877	5.712	6.178	8.135	6.73	6.726	6.726	6.726	6.726	
Al Kamil Power Company SAOG	0.000	0.000	0.000	0.000	0.000	0.000	5.005	4.506	5.005	4.755	2.002	3.003	3.69	3.691	3.691	3.691	3.691	
ACWA Barka Power Company SAOG						38.688	19.968	20.800	7.072	10.400	8.788	2.912	7.29	7.293	7.293	7.293	7.293	
Sohar Power Company SAOG										8.679	5.782	5.782	6.75	6.748	6.748	6.748	6.748	
Al Rusayl Power Company SAOC																		
SMN Barka Power Company SAOC																		
SMN Power Holding SAOG													10.01	22.828	19.708	19.708	19.708	
Total Dividends Paid	*11.427*	*24.578*	*16.934*	*17.241*	*14.375*	*48.875*	*30.696*	*32.716*	*18.954*	*29.546*	*22.750*	*19.833*	*34.468*	*47.286*	*44.166*	*44.166*	*44.166*	
Dividends to Omani shareholders	6.673	14.353	9.889	10.069	8.395	20.387	12.542	19.389	10.143	15.433	10.743	9.942	16.058	20.961	19.767	19.767	19.767	395.344
Dividends to Foreign shareholders	4.754	10.224	7.044	7.172	5.980	28.487	18.153	18.511	10.293	15.895	12.637	9.891	18.410	26.325	24.399	24.399	24.399	487.971
Dividends: 1999-2015 in 2005 prices																		
Dividends to Omani shareholders	17.071	34.152	21.886	20.726	16.125	10.514	12.542	18.267	8.883	12.199	9.023	8.107	12.713	16.111	14.752	14.322	13.905	269.997
Dividends to Foreign shareholders							18.153	17.440	9.014	12.564	10.614	8.066	14.576	20.235	18.208	17.678	17.163	333.256

Share Purchase costs	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	mill US$	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*
Share purchases costs: current prices	0.000	0.000	0.000	0.000	0.000	0.000	98.457	0.000	0.000	34.658	0.000	0.000	63.947	0.000	0.000	0.000	0.000
Share purchases costs: 2005 prices							98.457	0.000	0.000	27.396	0.000	0.000	50.628	0.000	0.000	0.000	0.000

Actual case: mill US$	3% discount rate	5% discount rate	7% discount rate
NPV Omani net Dividends (2005 prices)	305.4	262.9	229.9

PV Dividend benefit : mill US$		3% discount rate	5% discount rate	7% discount rate
Omani net Dividends (2005 prices)				
where Counterfactual % of Actual is	25%	229.1	197.2	172.4
where Counterfactual % of Actual is	50%	152.7	131.5	114.9
where Counterfactual % of Actual is	75%	76.4	65.7	57.5

Sources & Assumptions: 1: Tax & Dividend information for 1999 to 2010 from company published audited financial statements, AER assumptions thereafter.
2: SMN Power Holding is the holding company for Al Rusail and SMN Barka project companies. Dividends for 2011 to 2015 from Prospectus.
3: for UPC, Al Kamil, ACWA Barka 2011 dividends based on previous four year average, remaing constant thereafter.
4: for Sohar Power Company 2011 dividends based on previous three year average, remaing constant thereafter.
5: UPC, Al Kamil, ACWA Barka and Sohar Power Company dividends from 2011 split 50:50 between Omani and international investors (the 2010 split).
6: SMN Power Holding dividends from 2011 between Omani and international investors based on shareholdings stated in Prospectus.

7.3.3 Effects on Government Welfare (ΔG):

For the Oman SCBA, the government is included as it contributes to consumer welfare through the provision of electricity subsidy and to producer welfare through the ownership of electricity sector companies. The effects of reform on government welfare are assessed by considering (i) corporate tax payments by private and government owned electricity sector companies between 2005 and 2015; (ii) dividends received by government through its shareholdings in government owned MHEW successor companies; (iii) privatisation proceeds from the sale of Al Rusail, and (iv) differences in actual and counterfactual electricity subsidy. Our assessment of each of these variables is discussed in turn.

We find that the industry's actual measured costs declined relative to the pre-reform trend, even though these post-reform costs include taxes and dividends that were not paid before the reform. Post-reform subsidy payments reflect the cost estimates which include tax and dividend payments – if they were excluded, the true trend in underlying costs would show even more reductions. The counter-factual subsidy estimates are based on cost trends which did not allow for any tax or dividend payments and we assume there would have continued to be no such payments, had reform not taken place.

(i) Corporate Tax Receipts

The reforms transformed a vertically integrated ministry (MHEW) into a fully corporatized sector comprising a mix of privately owned companies I(W)PPs, and companies wholly owned by government. All companies are liable to corporation tax that in Oman is presently at a rate of 12%. In the actual case we calculate the present value of tax payments from all electricity companies irrespective of whether they are owned by the government or international private investors. In the counterfactual case, the government receives tax payments from I(W)PP companies, but as the sector is assumed to remain under MHEW's management, there would be no government owned companies and no corresponding tax receipts from them and fewer I(W)PPs. We calculate the tax benefit as the difference in actual and counterfactual tax payments.

Calculation of ∆Tax receipts to Government

Scrutiny of each company's audited financial statements confirms that while all (private and government owned) electricity sector companies are profitable (in terms of pre tax profit) the application of accelerated depreciation allowances significantly reduces tax receipts in the period under study[50]. We note, therefore, that future tax receipts can be expected to rise significantly once accelerated depreciation allowances are exhausted (we assume conservatively this will happen after 2015 and is not therefore reflected in our analysis) and particularly so for government owned transmission and distribution companies which are implementing significant capital expenditure programmes. The tax calculations for government owned and private companies are presented in Table 11.

[50] Actual tax payments of US$ 4.4 m derived from audited financial statements correspond to a gross tax liability of US$ 78 m (2005 to 2010).

Table 11 Change in Tax paid by Government Owned and Private Sector Companies

Taxes paid by Government Owned Companies[1]

Tax Paid	*Pre Electricity Market Reform*						*Post Electricity Market Reform*						*Forecast Values*				
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Current prices	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*
Muscat (MEDC) SAOC							0.000	0.528	0.000	0.000	0.000	0.000					
Majan (MJEC) SAOC							0.000	0.000	0.260	0.000	0.000	0.000					
Mazoon (MZEC) SAOC							0.000	0.000	0.000	0.000	0.000	0.000					
OETC SAOC							0.000	1.776	0.000	0.000	0.000	0.000					
PWP SAOC							0.000	0.296	0.146	0.447	0.369	0.569					
Tax Payments to government							*0.000*	*2.600*	*0.406*	*0.447*	*0.369*	*0.569*	*0.448*	*0.448*	*0.448*	*0.448*	*0.448*
Total taxes paid (2005 prices)							0.000	2.450	0.355	0.353	0.310	0.464	0.355	0.344	0.334	0.324	0.315

Taxes paid by government owned companies : mill RO 2005 prices	3% discount rate	5% discount rate	7% discount rate
Actual	4.9	4.5	4.1
Counterfactual	0.0	0.0	0.0

Sources & Assumptions: 1: Tax payments for 2005 to 2010 from company published audited financial statements, AER assumptions thereafter.

Taxes paid by Privately Owned I(W)PP Project Companies

Tax Paid	*Pre Electricity Market Reform*						*Post Electricity Market Reform*						*Forecast Values*				
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Current prices	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*
Tax Paid as per Cash Flow statements	0	0	0	0	0	0	0	1.435	1.898	1.851	2.907	2.070	2.181	2.181	2.181	2.181	2.181
Tax payments (2005 prices)							0	1.352	1.662	1.463	2.442	1.688	1.727	1.677	1.628	1.580	1.534

Actual case: mill OR		3% discount rate	5% discount rate	7% discount rate
Actual NPV tax receipts (2005 prices)		13.9	12.3	11.0
PV tax receipt benefit (2005 prices)				
where Counterfactual % of Actual is	25%	10.4	9.2	8.2
where Counterfactual % of Actual is	50%	6.9	6.2	5.5
where Counterfactual % of Actual is	75%	3.5	3.1	2.7

1: Tax & Dividend information for 1999 to 2010 from company published audited finalcial statements, AER assumptions thereafter.

(ii) Dividends to EHC from government owned successor companies

The Ministry of Finance holds (directly and indirectly) 100% of the shares of MHEW successor companies – these are the companies that emerged from the unbundling of MHEW to undertake activities previously undertaken by the ministry. The government is therefore the ultimate beneficiary of dividends distributed by government owned successor companies (dividends are paid directly to the Electricity Holding Company SAOC that is 100% owned by the Ministry of Finance). There are no dividends in the counterfactual case due to our assumption that MHEW remains intact and responsible for electricity sector operations and is based on cost trends which did not allow for any such payments.

Calculation of ∆Dividends to EHC from government successor owned companies

For 2006 to 2010 actual dividends to EHC are as presented in each company's audited financial statements. For 2011 to 2015 we assume dividends reflect average dividends distributed in previous years. EHC dividends calculations are presented in Table 12.

NPV of ∆ in Dividends paid by government owned companies (at 2005 prices)
= US$ 444.4 million

Table 12 Change in Dividends to Government from Government Owned Companies

Dividends to EHC SAOC	*Pre Electricity Market Reform*						*Post Electricity Market Reform*						*Forecast Values*				
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Current prices	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*	*mill US$*
Muscat (MEDC) SAOC							0.000	12.709	16.991	9.945	9.862	30.282	12.38	12.377	12.377	12.377	12.377
Majan (MJEC) SAOC							0.000	7.496	12.584	9.594	6.258	16.523	8.98	8.983	8.983	8.983	8.983
Mazoon (MZEC) SAOC							0.000	9.103	16.726	16.653	11.687	42.281	13.54	13.542	13.542	13.542	13.542
OETC SAOC							0.000	35.708	28.220	25.662	19.175	74.911	27.19	27.191	27.191	27.191	27.191
PWP SAOC							0.000	2.020	1.056	2.639	2.785	0.000	2.12	2.125	2.125	2.125	2.125
Total Dividends Paid							*0.000*	*67.036*	*75.577*	*64.493*	*49.767*	*#######*	*64.218*	*64.218*	*64.218*	*64.218*	*64.218*
Total Dividends paid (2005 prices)							0.000	63.158	66.188	50.979	41.801	133.735	50.842	49.362	47.924	46.528	45.173

Dividends to EHC SAOC from government owned companies : mill US$ 2005 prices	3% discount rate	5% discount rate	7% discount rate
Actual	497.7	444.4	398.6
Counterfactual	0.0	0.0	0.0

Sources & Assumptions: 1: Dividend payments for 2005 to 2010 from company published audited financial statements, AER assumptions thereafter.

(iii) Privatisation proceeds

An already mentioned the government sold its entire shareholding in the 668MW Al Rusail power station for a consideration of RO 50 million in 2006. To derive the net benefit to government it would appropriate to subtract the present value of dividends Al Rusail would have been expected to distribute had it not been privatised. Al Rusail did not distribute any dividend prior to its privatisation and, as before, we assume that this would have continued to be the case in the counterfactual. Our estimate of net privatisation proceeds is therefore the gross figure:

NPV of Al Rusail privatisation proceeds (at 2005 prices) = US$ 123.8 million

(iv) Electricity subsidy (MIS)

Article (18) of the Oman electricity sector law requires the Ministry of Finance to pay electricity subsidy calculated by AER to licensed electricity suppliers. AER calculates the annual electricity subsidy required by the three main electricity market segments (the MIS, RAEC rural systems, and the Salalah system). The MIS is by far the largest segment and accounted for around 88% of total electricity supply and 72% of total subsidy in 2010 (AER Annual Reports, 2010). Accordingly, we focus on the change in actual and counterfactual MIS subsidy between 2005 and 2015.

Calculation of ∆MIS Electricity subsidy

AER calculates electricity subsidy in each year as: economic costs minus customer tariff revenue. To calculate the change in subsidy from the government’s perspective we first multiply the economic cost of actual supply (US$/MWh) by actual MWh supply and subtract actual customer tariff revenue to derive the actual subsidy in each year. For the counterfactual scenario we multiply counter-factual supply by counterfactual economic costs (US$/MWh) and subtract counterfactual customer tariff revenue to derive counterfactual subsidy.

The difference in actual and counterfactual government subsidy is sensitive to changes in production cost efficiency. Two sources of efficiency are important to our estimate of actual subsidy and so merit further explanation (i) *procurement cost efficiencies* and (ii) *reductions in technical and non-technical losses*. The following section describes the calculation methodologies for both of these variables.

(i) *Procurement cost efficiencies*: post reform the electricity sector is subject to a generation security planning standard (of 24 LOLH[51]) and rules that require all new I(W)PP to be procured through fair and transparent competitions open to international investors and supervised by the regulator. More efficient procurement of new privately funded generation capacity has helped the sector attain a higher rate of growth in electricity supply compared to the pre-reform period. Growth in system size has allowed the connection of facilities with larger unit set sizes (gaining economies of scale in capital costs) and lower heat rates (with improved gas use efficiency). In addition to supporting demand growth, new more efficient generating capacity has displaced older less efficient plant in the merit order and reduced the average gas use per MWh supplied. Post reform the functions of the system operator, including economic dispatch, are subject to periodic audit and scrutiny to ensure production facilities are operated efficiently and in a manner consistent with minimising short run system costs. The combination of these factors has helped the PWP attain lower procurement costs (in US$/MWh) than would have been possible without reform.

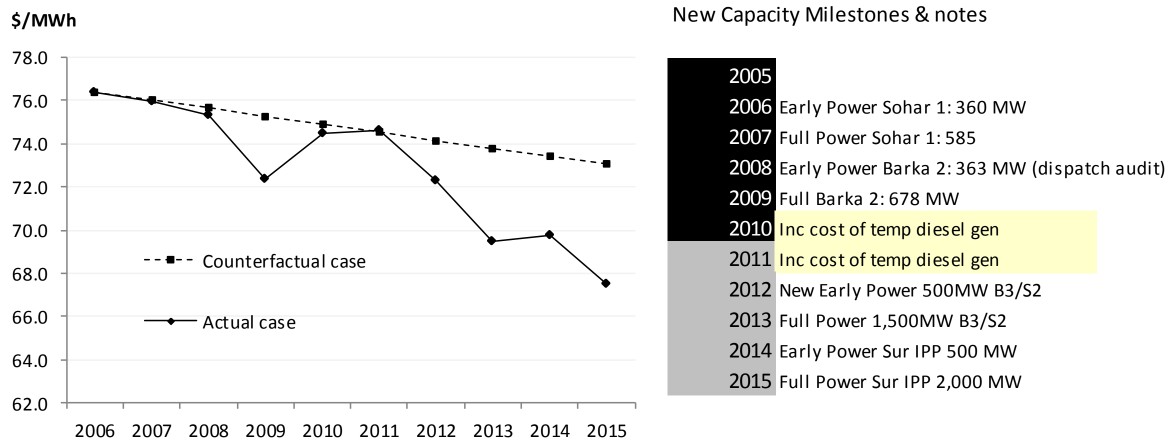
Calculation of Δ *MIS Procurement cost efficiencies*:

To estimate the benefit of improved procurement cost efficiencies we first adjust all our data to use an opportunity cost of gas, US$ 5 per mmBtu in 2005, escalating at 2% per annum, rather than the price paid by the industry, which was only US$ 1.5 per mmBtu. We then compile the actual cost of PWP

[51] Loss of Load Hours

purchases (in US$/MWh) between 2006[52] and 2010 and make projections of costs through to 2015 - noting that between 2012 and 2015 some 3,500MW of new CCGT IPP capacity will connect to the MIS (AER Note, 2011). In the counterfactual scenario, we assume MHEW procurement costs in 2006 are the same as the actual scenario but thereafter reduce at a rate of 0.5% per annum. This approach acknowledges that while MHEW would have been expected to benefit from scale economies and improved efficiencies as the system grew in size, this would be at a lesser rate than the actual case.

Figure 21 MIS Procurement Costs: counterfactual and actual



As illustrated in Figure 21, actual PWP procurement costs decline between 2005 and 2009, increase sharply in 2010, and decline thereafter through to 2015 due to the addition of new highly efficient CCGT capacity. 2010 and 2011 were years in which no new MIS capacity was commissioned due to weaknesses in the PWP's performance of its procurement functions (AER Note, 2011). To safeguard security of supply the PWP was required by AER to contract for around 300MW of temporary diesel generation in both years. Diesel generation is considerably more expensive than gas generation and procurement costs per MWh in 2010 and 2011 were significantly higher than would have been the case had the procurement of new capacity not been delayed.

[52] The new market structure was implemented on 1 May 2005 and PWP information is available from that date. MIS purchase costs in both scenarios start from 2006 (the first full year post reform).

Following regulatory intervention and changes to the Board and management of the PWP the procurement of new capacity is now back on track with 3,500MW of contracted capacity scheduled to be commissioned between 2012 and 2015. This new and more efficient capacity will help meet demand growth and allow older less efficient plant to be withdrawn from service.

The procurement cost calculations presented in Table 13 show actual and counterfactual purchase costs between 2005 and 2015 and the estimated benefit (gain) from improved procurement and operational efficiencies (including economies of scale and improved dispatch). We note that by 2015 procurement efficiency improvements return cost savings of 7.6%, representing real savings of US$ 112 million in that year.

Our estimate of the present value of improved procurement efficiency benefits, in 2005 prices discounted using a 5% discount rate, is;

NPV of procurement efficiency benefits (at 2005 prices) = US$ 221.6 million

Table 13 MIS Procurement Cost Efficiency Benefits

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Units Purchased (Actual)	GWh	9,770.8	11,764.8	12,480.0	14,017.0	15,721.0	16,855.0	18,550.2	20,469.7	22,588.4	24,927.4	27,509.5
Sm3 per MWh		377.5	379.1	369.0	355.8	328.9	325.4	323.9	304.1	279.1	275.4	255.0
million Sm3 of natural gas		3,688.7	4,459.7	4,605.4	4,987.0	5,170.2	5,484.5	6,008.3	6,224.4	6,305.1	6,864.4	7,014.9
Gas costs @ $1.5 mmBtu		187.2	226.4	233.8	253.1	262.4	278.4	305.0	316.0	320.0	348.4	356.1
Gas costs @ $5 mmBtu + 2% pa escalation		636.6	769.7	810.7	895.4	946.9	1,024.6	1,144.9	1,209.8	1,250.0	1,388.0	1,446.9
Total Purchase Costs ($1.5 mmBtu)	US$ m	280.8	355.7	370.7	413.1	452.8	508.8	545.0	585.4	640.2	700.0	765.3
Total Purchase Cost per Unit	$/MWh	28.7	30.2	29.7	29.5	28.8	30.2	29.4	28.6	28.3	28.1	27.8
Unit cost Index 2005 = 100		*100*	*105*	*103*	*103*	*100*	*105*	*102*	*100*	*99*	*98*	*97*
Assumptions: gas cost$/annual escalation%		*5/0.02*										
Gas cost assumptions	*$US mmBtu*	*5*										
	Annual escalation	*2.0%*										
Gas Costs ($ mmBtu + 2% pa esc)	*$US mmBtu*	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.9	6.0	6.1
Total Cost ($ mmBtu + 2% pa esc)	US$ m	730.2	899.0	947.6	1,055.4	1,137.3	1,255.0	1,384.9	1,479.2	1,570.1	1,739.6	1,856.1
Total Purchase Cost per Unit	$/MWh	74.7	76.4	75.9	75.3	72.3	74.5	74.7	72.3	69.5	69.8	67.5
Unit cost Index 2005 = 100			*100*	*99*	*99*	*95*	*97*	*98*	*95*	*91*	*91*	*88*

Source: OPWP Annual Reports & Regulatory Accounts, AER assumptions

Economic cost of gas ($5 mmBtu & 2% annual escalation)

Change in Procurement Costs		0.50%	per annum C'factual reduction									
Counterfactual unit Purchase Cost	$/MWh		76.413	76.031	75.650	75.272	74.896	74.5	74.1	73.8	73.4	73.0
Counterfactual costs	US$ m		899.0	948.9	1060.4	1183.4	1262.4	1,382.4	1,517.8	1,666.5	1,829.9	2,009.3
Cost saving (current prices)	US$ m		0.00	1.2	4.9	46.1	7.4	-2.5	38.6	96.5	90.3	153.3
Cost reduction	%		0.0%	-0.1%	-0.5%	-3.9%	-0.6%	0.2%	-2.5%	-5.8%	-4.9%	-7.6%
Cost saving (2005 prices)	US$ m		0.00	1.1	4.3	36.4	6.2	-2.0	30.5	74.2	67.4	111.0
NPV of savings (5%)	US$ m	221.6	*US$ mill 2005 prices*									

(ii) L*osses reductions*: Technical and non-technical losses are an important element of our study and we compare and then value the difference in total losses under the actual and counterfactual scenarios. Drawing from Chapter 5 the Omani electricity sector law requires greater transparency of losses reporting by market participants.

Scrutiny of MHEW Annual Reports (1997-2004) indicates that total (MIS equivalent) system losses under MHEW management increased from 17.4% in 1997 to 24.6% in 2004. In the counterfactual case we assume total losses remain constant at the 2004 rate of 24.6% between 2005 through to 2015. Post reform total losses have declined in response to losses reduction incentives in company price controls: by 2010 MIS losses had reduced to 16.2% (AER Annual Report, 2010). In the actual case we apply AER's predicted losses benchmarks that are expected to see MIS losses reduce from 15.5% in 2011 to 13.5% in 2015.

Calculation of ∆ MIS Losses reductions benefits:

To calculate the benefit of total losses reductions we derive, for the actual and counterfactual cases, the number of lost units in each year. We multiply actual and counterfactual losses by the estimated avoidable cost of electricity in that year (reflecting a gas cost of US$ 5 mmBtu in 2005 increasing by 2% per annum thereafter. Our estimate of losses reduction benefits does not include any allowance for the cost of additional capacity required to support higher levels of total generation (due to higher losses) in the counterfactual case. Our calculation of the benefit of losses reductions is presented in Table 14.

NPV of losses reduction benefits (at 2005 prices) = US$ 627.2 million

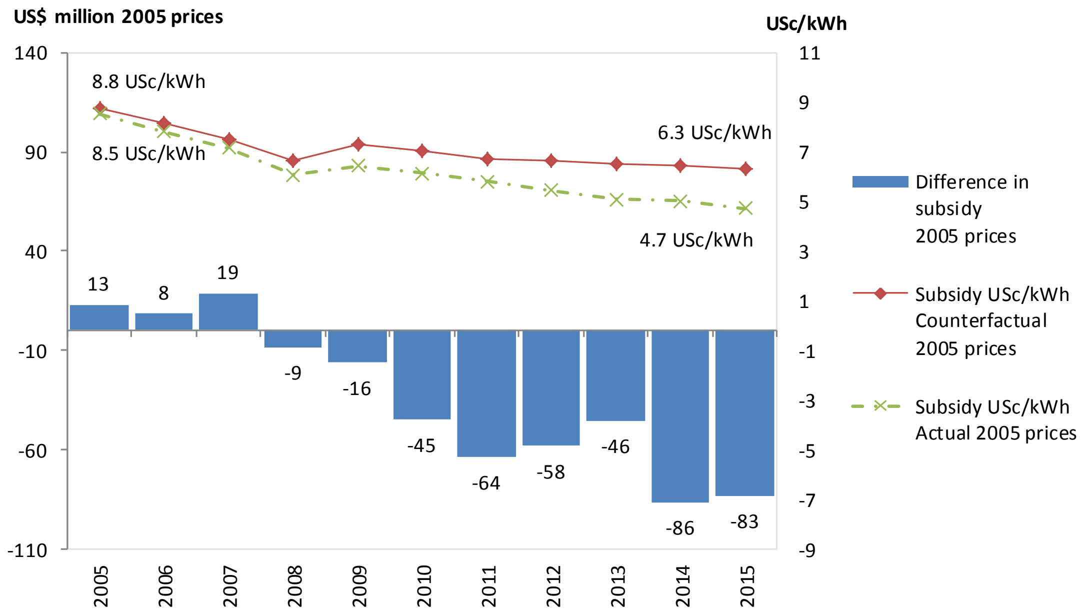
Table 14 Estimates of Savings in Technical & Non-technical Losses (MIS)

		Actual Data - Pre Electricity Market Reform								*Actual & Counterfactual - Post Reform*						*Forecast Values*				
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1: Actual & Forecast Supply	TWh	5.024	5.586	5.831	6.083	6.527	6.900	7.174	7.797	8.402	9.220	9.755	11.317	12.714	14.122	15.675	17.399	19.313	21.438	23.796
2: Actual MIS losses	TWh	1.055	1.081	1.619	1.800	1.846	1.979	2.194	2.537	2.495	2.562	2.702	2.717	3.005	2.733	2.875	3.070	3.275	3.490	3.714
3: Actual MIS Purchases	TWh	6.080	6.667	7.450	7.884	8.372	8.879	9.367	10.334	10.897	11.782	12.457	14.034	15.719	16.855	18.550	20.470	22.588	24.927	27.509
4: Actual MIS losses as % Purchases	%	17.4%	16.2%	21.7%	22.8%	22.0%	22.3%	23.4%	24.6%	22.9%	21.7%	21.7%	19.4%	19.1%	16.2%	15.5%	15.0%	14.5%	14.0%	13.5%
5: Cost of 1 MWh lost	$/MWh									65.155	65.422	64.962	63.883	60.232	60.786	61.717	59.100	55.336	55.684	52.595
6: Cost of Actual MIS losses	US$ m									162.5	167.6	175.5	173.5	181.0	166.2	177.5	181.5	181.2	194.3	195.3
7: Counterfactual (2004) Losses	%	17.4%	16.2%	21.7%	22.8%	22.0%	22.3%	23.4%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%	24.6%
8: Counterfactual MIS Losses	TWh	1.055	1.081	1.619	1.800	1.846	1.979	2.194	2.537	2.734	3.000	3.175	3.683	4.137	4.596	5.101	5.662	6.285	6.977	7.744
9: Counterfactual MIS purchases	TWh	6.080	6.667	7.450	7.884	8.372	8.879	9.367	10.334	11.137	12.220	12.929	15.000	16.851	18.717	20.776	23.061	25.598	28.414	31.540
10: Cost of 1 MWh lost	$/MWh									65.155	65.422	64.962	63.883	60.232	60.786	61.717	59.100	55.336	55.684	52.595
11: Cost of Counterfactual MIS losses	US$ m									178.2	196.3	206.2	235.3	249.2	279.4	314.8	334.6	347.8	388.5	407.3
12: MIS losses savings (current prices)	US$ m									15.6	28.7	30.7	61.7	68.2	113.2	137.4	153.2	166.6	194.2	212.0
11: Savings (2005 prices)	US$ m									15.6	27.0	26.9	48.8	57.3	92.3	108.8	117.7	124.3	140.7	149.1
12: PV of Savings (@ 5%, 2005 prices)	627.2	*m US$*																		
13: PV of Savings (@ 3%, 2005 prices)	724.3	*m US$*																		
14: PV of Savings (@ 7%, 2005 prices)	545.9	*m US$*																		

Sources: 1: Actual & Forecast Supply: 1997 to 2014 AER from MHEW annual reports; 2005 to 2010 AER Annual Reports, 2011 to 2015 assumed annual growth in Supply of 10.9%
2: Actual MIS losses: 1997 to 2014 AER from MHEW annual reports; 2005 to 2010 AER Annual Reports, 2011 to 2015 AER projections
3: Actual MIS Purchases: 1997 to 2014 AER from MHEW annual reports; 2005 to 2010 AER Annual Reports, 2011 to 2015 AER projections
4: Actual MIS losses as % Purchases: 1997 to 2014 AER from MHEW annual reports; 2005 to 2010 AER Annual Reports, 2011 to 2015 AER projections
5: Cost of 1 MWh lost : is the avoidable cost of 1 MWh (Gas prices @ 5$ mmBtu and 2% escalation) reflecting the average system heat rate in each year.
6: Cost of Actual MIS losses : costed using the avoidable cost per MWh in 5;
7: Counterfactual (2004) Losses: derived from MHEW annual reports; 1997 to 2004
8: Counterfactual MIS Losses: Losses derived by dividing Actual supply by (1 - 0.246) and multiplying the result by 24.6%
9: Counterfactual MIS purchases: 1997 to 2004 AER from MHEW annual reports, Actual MWh Supply (1) + Counterfactual losses (8)
10: Cost of 1 MWh lost : same as (5)
11: Cost of Counterfactual MIS losses: (10) multiplied by (8)
12: MIS losses savings (current prices): (11) minus (6)
11: Savings (2005 prices): line 10 adjusted to the CPI deflator with 2005 = 100

Figure 22 presents the difference in actual and counterfactual subsidy from 2005 to 2015 (2005 prices) calculated as actual **minus** counterfactual subsidy.

Figure 22 Differences in Actual & Counterfactual MIS Subsidy



The calculations highlight increasing and significant differences in subsidy: for our central case subsidy in the actual scenario is increasingly higher than counterfactual subsidy indicating an increasing cost to the government as a result of increased supply. However, in both cases subsidy per kWh in 2015 (2005 prices) is lower than in 2005, but actual subsidy of 4.7 USc/kWh is around 26% lower than counterfactual subsidy of 6.3 USc/kWh in that year.

NPV difference in subsidy (at 2005 prices) = - US$ 233.9 million

Table 15 Calculation of Difference in MIS Subsidy

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Conterfactual subsidy	*US$ m current prices*	730.9	771.9	818.7	856.4	953.4	1,006.5	1,065.5	1,154.7	1,252.7	1,360.1	1,478.1
	US$ m 2005 prices	730.9	727.3	717.0	677.0	800.8	820.7	843.6	887.5	934.8	985.4	1,039.7
	US c/kWh 2005 prices	8.8	8.1	7.5	6.6	7.3	7.0	6.7	6.6	6.5	6.4	6.3
Counterfactual Supply	*GWh*	8,342.8	8,926.8	9,551.7	10,220.3	10,935.7	11,701.2	12,520.3	13,396.7	14,334.5	15,337.9	16,411.5
Actual subsidy	*US$ m current prices*	718.1	763.1	797.4	867.4	972.9	1,061.8	1,146.1	1,230.6	1,313.8	1,479.4	1,596.7
	US$ m 2005 prices	718.1	719.0	698.4	685.6	817.2	865.9	907.4	945.9	980.4	1,071.9	1,123.1
	US c/kWh 2005 prices	8.5	7.8	7.2	6.1	6.4	6.1	5.8	5.4	5.1	5.0	4.7
Actual Supply	*GWh*	8,402.2	9,219.8	9,754.7	11,317.4	12,713.6	14,121.6	15,675.0	17,399.2	19,313.1	21,437.6	23,795.7
Difference in Subsidy												
Counterfactual - Actual	*RO m 2005 prices*	12.7	8.3	18.7	-8.6	-16.4	-45.2	-63.8	-58.4	-45.6	-86.5	-83.4
NPV change in subsidy	*RO m, 2005 prices @ 5%*	-233.9										

7.3.4 Effects on Labour (ΔL):

The Omani government took deliberate and specific steps to safeguard the employment of Omani nationals who may be affected by the restructuring. Omani national MHEW employees engaged in electricity related activities were able to choose between moving to a successor company or remaining with the MHEW in a water or housing related position. Moreover, the Oman electricity sector law includes specific provisions that safeguard the employment rights and pension entitlements of Omani national MHEW employees transferring to successor companies (AER Note, 2011).

Nearly all contractors who supplied goods and services to MHEW pre reform had their contracts transferred to MHEW successor companies thereby ensuring continuity of business and employment. This was important as MHEW contracted out a large element of its operational responsibilities and a significant number of Omani nationals were employed by contractors retained by MHEW.

As a result of these measures the restructuring did not result in any forced redundancies and other than Omani national MHEW employees who opted for early retirement, electricity related employment did not reduce as a consequence of reform.

In fact, acceleration in the growth of electricity supply and new requirements to comply with statutory obligations relating to security of supply, planning and operating standards and stricter enforcement of health and safety obligations led to an increase in the demand for labour (for both direct employees and contractors). Higher employment is therefore a direct benefit of reform. Another benefit is that Omani nationals of MHEW successor companies are now paid significantly more than MHEW employees. Our calculation of labour benefits focuses on the difference in labour income in the actual case and the counterfactual cases.

Calculation of ∆Labour Welfare

In order to estimate the difference in employee income in the actual case and counterfactual case, we require estimates of: (i) the number of employees in the actual case and counterfactual case, and (ii) average salary per employee in the actual and counterfactual cases.

For the actual case we focus on direct employees of three distribution and supply companies, a transmission and dispatch company and the PWP who collectively provide electricity services to MIS connected customers (we exclude production facilities from our analysis due to difficulties in estimating the number of full time equivalent employees during the construction and commissioning phases). To provide a projection of employees for 2011 to 2015 we derived a relationship between employees and supply between 2006 and 2010 and applied this relationship to the actual supply projection in 2011 to 2015. The weighted average salary of all MIS companies in 2010 was increased by 5% per annum in line with prevailing wage settlements for commercial companies and remuneration in 2011 to 2015 was derived by multiplying annual salary by annual employment.

For the counterfactual case, we derived the ratio of MWh supplied per employee in 2005 and applied this to counterfactual supply from 2006 to 2015 to estimate counterfactual employment. The average salary in 2005 was 'deflated' by 17% to reverse the uplift in salaries granted to MHEW employees joining successor companies. The adjusted salary was then increased by 4% per annum in line with prevailing public sector wage settlements and then multiplied by counterfactual employment in each year to derive estimates of counterfactual remuneration from 2006 to 2015.

A further component of the calculation deducts an estimate of the income of the additional 142 staff in the actual case compared to the counterfactual might be expected to earn from alternative employment as it would not be reasonable to assume these workers would not be able to find employment. Our estimate of alternative income is based on twice the minimum wage[53] increased by 5% per annum from 2005 in line with private sector wage escalation (our reasoning is that these workers would have found productive employment that would justify more than minimum wage remuneration (that typically applies to unskilled workers)).

Further details of the change in labour welfare calculations are presented in Table 16.

Our estimate of the present value of the change in labour welfare between 2005 and 2015, discounted using a real 5% discount rate is:

NPV of labour benefits (at 2005 prices) = US$ 62.7 million

[53] Minimum wage in Oman is approximately US$ 520 per month.

Table 16 Change in Labour Welfare Calculations

A *Actual & Counterfactual Employment*

Direct Staff No.		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Distribution and Supply	#	573	674	799	904	934	1,012					
PWP (MIS)	#	31	29	29	33	36	37					
OETC	#	86	104	119	140	165	177					
Total	#	*690*	*807*	*947*	*1,077*	*1,135*	*1,226*					
Actual Supply	GWh	8,402	9,220	9,755	11,317	12,714	14,122	15,675.0	17,399.2	19,313.1	21,437.6	23,795.7
Employee per GWh	#/GWh		0.088	0.097	0.095	0.089	0.087	0.083	0.079	0.076	0.072	0.068
Actual MIS Employees	#	690	807	947	1,077	1,135	1,226	1,299.7	1,378.8	1,459.7	1,541.6	1,623.9
Counterfactual Supply	GWh	8,343	8,927	9,552	10,220	10,936	11,701	12,520.3	13,396.7	14,334.5	15,337.9	16,411.5
GWh per Employee 2006	GWh/employee		11.1									
Counterfactual MIS Employees	#		807	863	924	989	1,058	1,131.9	1,211.1	1,295.9	1,386.6	1,483.6

B *Actual & Counterfactual Labour Remuneration*

Staff Cost (Nominal US$ million)		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Distribution and Supply	*US$ m current prices*	48.5	18.7	21.5	28.4	33.0	40.0					
PWP (MIS)	*US$ m current prices*	1.7	1.7	1.7	2.0	3.1	3.8					
OETC	*US$ m current prices*	2.9	2.9	4.2	5.8	7.4	9.5					
Total	*US$ m current prices*		*23.3*	*27.5*	*36.2*	*43.5*	*53.4*					

Average annual salaries			2006	2007	2008	2009	2010					
Distribution and Supply	*US$ current prices*		27,690	26,954	31,425	35,318	39,551					
PWP (MIS)	*US$ current prices*		57,738	60,117	60,197	84,915	103,560					
OETC	*US$ current prices*		28,200	35,439	41,526	45,098	53,807					
Weighted average for all companies	*US$ current prices*		*28,835.3*	*29,035.5*	*33,619.8*	*38,313.3*	*43,540.9*	*45,718*	*48,004*	*50,404*	*52,924*	*55,570*

			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Actual Salary per GWh Supply	*US$ current prices*		3.13	2.98	2.97	3.01	3.08	3.034	3.034	3.034	3.034	3.034
Actual Employee remuneration	*US$ m current prices*		23.3	27.5	36.2	43.5	53.4	59.42	66.19	73.57	81.59	90.24
Actual Employee remuneration	*US$ m 2005 prices*		23.3	25.9	31.7	34.4	44.8	48.45	52.40	56.55	60.89	65.38
Counterfactual Salary scalar	1.17		2.68	2.55	2.55	2.59	2.65	2.605	2.605	2.605	2.605	2.605
Counterfactual Employee remuneration	*US$ m current prices*		24.2	26.9	30.0	33.3	37.1	41.30	45.96	51.14	56.91	63.33
Counterfactual Employee remuneration	*US$ m 2005 prices*		24.2	25.4	26.2	26.4	31.2	33.68	36.38	39.31	42.47	45.88
Opportunity cost of additional Labour	*US$ m 2005 prices*		0.00	1.15	2.21	2.22	2.68	2.81	2.95	3.02	3.00	2.85
Actual - Counterfactual - OP Cost	*US$ m 2005 prices*		-0.9	-0.6	3.3	5.8	11.0	11.97	13.07	14.22	15.42	16.65
NPV change Employee welfare	*US$ m, 2005 prices @ 5%*	62.7										

Sources: AER Reports (2005 - 2010), : Annual reports of MEDC, MJEC, MZEC, OETC & PWP (2006 – 2010)

7.3.5 Costs Associated with Regulation and Corporatisation ($\triangle$R&C):

Implementing electricity market reform gives rise to certain costs that need to be accounted for in our SCBA. We analyse two categories of cost: first is the cost of retaining consultants and advisors to implement the new market structure and establish a new regulatory function. Second, is the cost of regulating the new market structure, through the introduction of the independent regulator, whose functions have no obvious counterpart pre-reform. Our calculations of these costs are presented in Table 17.

First, estimates of corporatisation costs incurred between 1999 and 2004 include the cost of preparing the phase I & II Report policy document, Phase II implementation, and the cost of Ministry of National Economy special advisors and others consultancy services. Details of these costs are confidential, but total corporatisation costs are estimated in present value terms (2005 prices) at US$ 13.4 million (AER Note, 2011).

NPV of corporatisation costs (in 2005 prices) = US$ 13.4 million

AER Annual Reports (2005-2010), provide regulatory costs for the years 2005 to 2011 while AER also provided estimates of its expected costs from 2012 to 2015 (AER Note, 2011). Accordingly, we can calculate the present value of regulatory costs between 2005 and 2011 in 2005 prices;

NPV of regulatory costs (in 2005 prices) = US$ 31.7 million

The combined total cost of corporatisation and regulation (R&C) used in our SCBA (in 2005 prices) is therefore;

NPV of R&C costs (at 2005 prices) = US$ 45.1 million

Table 17 Regulation and Corporatisation Costs

A Costs of Regulation

								Post Electricity Market Reform						***Forecast Values***				
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
AER Licence Fees	US$ m current prices							2.2	2.0	2.9	3.6	6.4	3.6	4.0				
	USc/kWh current prices							26.3	22.1	29.6	31.7	50.1	25.3	25.8	33.0	33.3	33.5	33.8
	US$ m 2005 prices							2.2	1.9	2.5	2.8	5.4	2.9	4.2	4.7	5.2	5.9	6.6
	USc/kWh 2005 prices							26.3	20.8	25.9	25.1	42.1	20.6	26.5	26.9	27.1	27.4	27.6
PV Regulatory Costs (@ 5%)								***31.7***										

Source: AER Annual Report for 2005 to 2011, AER estimates thereafter.

B Corporatization Costs

		Pre Electricity Market Reform																
	%	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	US$ mill current prices	0.390	0.338	2.172	4.643	1.716	1.976											
	US$ mill 2005 prices	0.457	0.386	2.425	5.063	1.833	2.040											
PV of Savings (5%)								***13.4***	*US$ mill*									
Disount Factors:	5%	*1.2763*	*1.2155*	*1.1576*	*1.1025*	*1.0500*	*1.0000*	*0.9524*	*0.9070*	*0.8638*	*0.8227*	*0.7835*	*0.7462*	*0.7107*	*0.6768*	*0.6446*	*0.6139*	*0.5847*
Discounted R&C Costs (US$ mill 2005 prices)		*0.5826*	*0.4697*	*2.8076*	*5.5817*	*1.9249*	*2.0396*	*2.1048*	*1.7398*	*2.1847*	*2.3354*	*4.1922*	*2.1749*	*2.9524*	*3.1710*	*3.3786*	*3.5996*	*3.8348*
PV R & C Costs (@ 5%)	US$ mill 2005 prices							***45.1***	*US$ mill*									

Source: AER. Costs include Consortium advisory fees, MNE Unbundling Advisor and Regulatory Specialist, and other sundry consultancy costs.

7.4 Results

Table 18 presents the results of the welfare calculations.

Table 18 SCBA Results

	US$ million, NPV for 2005 to 2015, 2005 prices	3% discount rate	5% discount rate	7% discount rate
1	**Change in consumer welfare (ΔS)**	**4,203.9**	**3,577.4**	**3,059.3**
2	**Change private Omani investor welfare (ΔP)**	**152.7**	**131.5**	**114.9**
3	**Change in government welfare (ΔG)**			
	(i) Government tax receipts			
	from government owned companies	**4.9**	**4.5**	**4.1**
	from private I(W)PP companies	**6.9**	**6.2**	**5.5**
	(ii) Dividends to government			
	from government owned companies	**497.7**	**444.4**	**398.6**
	(iii) Privatisation proceeds (Rusail)	**126.2**	**123.8**	**121.5**
	(iv) Change in subsidy benefit	**-279.8**	**-233.9**	**-196.1**
	Total ΔG	**355.9**	**344.9**	**333.7**
4	**Change in Labour welfare (ΔL)**	**72.2**	**62.7**	**54.7**
5	**Regulation & Corporatisation Costs (C&R)**			
	Regulatory costs	**-36.0**	**-31.7**	**-28.0**
	Corporatisation (unbundling costs)	**-12.9**	**-13.4**	**-13.9**
6	**Net change in Benefits minus Costs**	**4,735.8**	**4,071.4**	**3,520.7**

Source: author's research

Our analysis indicates Oman's electricity sector reforms delivered a net increase in social welfare of US$ 4,071.4 million with consumer welfare contributing US$ 3,577.4 million, or 87% of the welfare change.

7.5 Sensitivity Analysis

We tested the sensitivity of the SCBA results presented above to changes in key input assumptions, the results are presented in Table 19.

Table 19 SCBA Sensitivity Analysis

US$ million, 2005 prices

Central Case results		3% discount rate	5% discount rate	7% discount rate	Central case assumptions:
	ΔS	*4,203.9*	*3,577.4*	*3,059.3*	1. Value of α = 20%
	ΔP	*152.7*	*131.5*	*114.9*	2. Counterfactual Supply (2005 to 2015) 7% p.a.
	ΔG	*355.9*	*344.9*	*333.7*	3. Actual Supply (2011 to 2015) 11% p.a.
	ΔL	*72.2*	*62.7*	*54.7*	4. Procurement cost efficiency 0.5% p.a. reduction
	ΔC&R	*-49.0*	*-45.1*	*-41.9*	5. Counterfactual losses 24.6% 2005 - 2015
	ΔW	***4,735.8***	***4,071.4***	***3,520.7***	6. Gas costs US $5 per mMBTu & 2% annual escalation

		3%	5%	7%			3%	5%	7%
C'factual Supply 9%	ΔS	*1,819.6*	*1,530.6*	*1,292.7*	C'factual Supply 5%	ΔS	*6,298.3*	*5,379.8*	*4,618.8*
	ΔP	*152.7*	*131.5*	*114.9*		ΔP	*152.7*	*131.5*	*114.9*
	ΔG	*1,282.3*	*1,142.5*	*1,024.2*		ΔG	*-460.1*	*-359.6*	*-277.9*
	ΔL	*61.6*	*53.6*	*46.7*		ΔL	*81.8*	*71.1*	*62.0*
	ΔC&R	*-49.0*	*-45.1*	*-41.9*		ΔC&R	*-49.0*	*-45.1*	*-41.9*
	ΔW	***3,267.3***	***2,813.0***	***2,436.6***		**ΔW**	***6,023.8***	***5,177.7***	***4,476.0***
Actual Supply 13%	ΔS	*4,950.4*	*4,195.9*	*3,573.8*	Actual Supply 9%	ΔS	*3,493.9*	*2,988.9*	*2,569.4*
	ΔP	*152.7*	*131.5*	*114.9*		ΔP	*152.7*	*131.5*	*114.9*
	ΔG	*148.7*	*173.0*	*190.5*		ΔG	*556.0*	*510.9*	*472.0*
	ΔL	*78.7*	*68.3*	*59.4*		ΔL	*66.0*	*57.5*	*50.3*
	ΔC&R	*-49.0*	*-45.1*	*-41.9*		ΔC&R	*-49.0*	*-45.1*	*-41.9*
	ΔW	***5,281.6***	***4,523.6***	***3,896.8***		**ΔW**	***4,219.7***	***3,643.6***	***3,164.7***
α = 30%	ΔS	*6,305.9*	*5,366.1*	*4,588.9*	α = 10%	ΔS	*2,102.0*	*1,788.7*	*1,529.6*
	ΔP	*152.7*	*131.5*	*114.9*		ΔP	*152.7*	*131.5*	*114.9*
	ΔG	*355.9*	*344.9*	*333.7*		ΔG	*355.9*	*344.9*	*333.7*
	ΔL	*72.2*	*62.7*	*54.7*		ΔL	*72.2*	*62.7*	*54.7*
	ΔC&R	*-49.0*	*-45.1*	*-41.9*		ΔC&R	*-49.0*	*-45.1*	*-41.9*
	ΔW	***6,837.8***	***5,860.2***	***5,050.3***		**ΔW**	***2,633.9***	***2,282.7***	***1,991.1***
Counterfactual Procurement	ΔS	*4,203.9*	*3,577.4*	*3,059.3*	Counterfactual Procurement	ΔS	*4,203.9*	*3,577.4*	*3,059.3*
Cost efficiency 1% p.a.	ΔP	*152.7*	*131.5*	*114.9*	Cost efficiency 0% p.a.	ΔP	*152.7*	*131.5*	*114.9*
	ΔG	*178.2*	*193.4*	*203.9*		ΔG	*538.5*	*500.4*	*466.8*
	ΔL	*72.2*	*62.7*	*54.7*		ΔL	*72.2*	*62.7*	*54.7*
	ΔC&R	*-49.0*	*-45.1*	*-41.9*		ΔC&R	*-49.0*	*-45.1*	*-41.9*
	ΔW	***4,558.1***	***3,920.0***	***3,391.0***		**ΔW**	***4,918.4***	***4,227.0***	***3,653.8***
Counterfactual MIS	ΔS	*4,203.9*	*3,577.4*	*3,059.3*	Counterfactual MIS	ΔS	*4,203.9*	*3,577.4*	*3,059.3*
Losses reductions 1% p.a.	ΔP	*152.7*	*131.5*	*114.9*	Losses reductions 0.5% p.a.	ΔP	*152.7*	*131.5*	*114.9*
	ΔG	*-275.1*	*-200.9*	*-141.0*		ΔG	*191.5*	*59.2*	*-80.7*
	ΔL	*72.2*	*62.7*	*54.7*		ΔL	*72.2*	*62.7*	*54.7*
	ΔC&R	*-49.0*	*-45.1*	*-41.9*		ΔC&R	*-49.0*	*-45.1*	*-41.9*
	ΔW	***4,104.8***	***3,525.7***	***3,046.1***		**ΔW**	***4,571.4***	***3,785.7***	***3,106.3***
Actual & Counterfactual	ΔS	*4,203.9*	*3,577.4*	*3,059.3*	Actual & Counterfactual	ΔS	*4,203.9*	*3,577.4*	*3,059.3*
Gas costs: US $7 per mMBTu	ΔP	*152.7*	*131.5*	*114.9*	Gas costs: US $3 per mMBTu	ΔP	*152.7*	*131.5*	*114.9*
and 2% p.a. escalation	ΔG	*253.7*	*258.9*	*261.1*	and 2% p.a. escalation	ΔG	*474.6*	*430.9*	*406.2*
	ΔL	*72.2*	*62.7*	*54.7*		ΔL	*72.2*	*62.7*	*54.7*
	ΔC&R	*-49.0*	*-45.1*	*-41.9*		ΔC&R	*-49.0*	*-45.1*	*-41.9*
	ΔW	***4,633.6***	***3,985.4***	***3,448.1***		**ΔW**	***4,854.5***	***4,157.5***	***3,593.3***

Note: ΔP and ΔC&R are assumed to remain constant in all scenarios for simplicity

The principal results are as follows:

(i) The change in total welfare (ΔW) is most sensitive to changes in consumer welfare Vis-à-vis the value of α, that determines the weights of Pmax and Permitted Tariffs in the consumer welfare calculation. In the central case α = 20%, when α = 30% the change in total welfare increases by US$ 1,789 million (44%) whereas when α = 10% the change in total welfare is reduced by US$ 1,789 million (-44%);

(ii) The second key sensitivity is the assumed annual growth in counterfactual supply. In the central case we assume counterfactual growth of 7% per annum (based on pre reform data). Assuming counterfactual growth of 9% per annum reduces the change in total welfare by US$ 1,258 million (-31%) while counterfactual growth of 5% increases the change in total welfare by US$ 1,106 million (27%);

(iii) Total welfare is less sensitive to changes in the assumed rate of growth in actual supply between 2011 and 2015. In the central case we assume actual supply grows at 11% per annum over this period (the actual annual rate of growth between 2005 and 2010). Assuming actual supply growth of 13% increases the change in total welfare by US$ 452 million (11.1 %) whereas actual growth of 9% reduces the change in total welfare by US$428 million (-10.5%);

(iv) In the central case we assume counterfactual losses of 24.6% in each year (the observed rate of losses in 2004). Assuming counterfactual losses reduce by 1 percentage point per annum reduces the change in total welfare by US$ 546 million (-13%), assuming a reduction of 0.5 percentage point per annum reduces the change in total welfare by US$ 286 million (-7%); and

(v) Total welfare is less sensitive to changes in the assumed rate of improved counterfactual procurement efficiency and changes in gas costs, changes in the central case assumptions for these items returns adjustments to the change in total welfare of less than 4%.

7.6 Conclusions

Our SCBA objective was to test whether Oman benefited, in terms of increased total welfare, from the major electricity market reforms introduced in 2004 that are based around a single buyer market structure supervised by an independent regulatory authority. Our conclusions are:

1. The reforms have significantly increased total welfare, in the central case total welfare increases by US$ 4,071 million, principally due to an increase in consumer welfare of US$ 3,577 million. The increase in consumer welfare is in response to higher growth in electricity supply that increased from a pre reform growth rate of 7% to around 11% per annum post reform;

2. The reforms have delivered both consumer and producer welfare gains with most producer welfare gains reflected in changes in government welfare as improved efficiency contributes to reductions in electricity subsidy. For example: the natural gas required to generate 1 MWh declines from 377 standard cubic meters in 2005 to 255 standard cubic meters in 2015, a 32% reduction; MIS losses decline from 24.6% in 2004 to 13.5% in 2015; in the central case the per-unit subsidy (based on the opportunity cost of gas) declines from 8.6 USc/kWh in 2005 to 4.7 USc/kWh in 2015;

3. Although there has been only one privatisation transaction and electricity tariffs have remained unchanged and heavily subsidised, excluding consumer welfare we estimate reform benefits of US$ 494 million comprising benefits to Omani investors of US$ 131 million, government benefits of US$ 345 million (including privatisation proceeds US$ 124 million) and labour benefits of US$ 63 million; and

4. The SCBA identifies significant net benefits of reform between 2005 and 2015. However, as the electricity sector grows beyond our analysis horizon we expect Oman to secure further welfare benefits provided the efficiency improvements introduced by the reforms are not reversed.

Chapter 8 Findings and Implications

8.1 Introduction

The chapter reviews the current status of GCC electricity markets, in terms of functional separation, corporatisation, public and private sector ownership, interconnections with GCC member states, and regulation. We also provide indications gathered from survey work of expected trends in policy and electricity market reform. The research findings are presented in tables to facilitate cross-country comparisons of the present status of electricity market reform in each member state.

The results of the review are supplemented by MCDA and applied to the Textbook Model criteria, both discussed in Chapter 2, to provide a robust basis for our recommendations for GCC electricity market reform. The results of the SCBA presented in Chapter 7 provide further support and justification for our recommendations.

8.2 Survey Review of GCC Electricity Markets

Information on the structure and status of GCC electricity markets was derived using a survey questionnaire designed for this purpose with follow up discussions and meetings with officials in each member state and further supplemented by document reviews (including country specific laws, regulations, and policy proposals). The GCC survey questionnaire is included as Appendix 5 to the thesis and summary notes of meetings are presented in Appendix 1. We now present the results derived from the survey, document review and meetings to establish the present status of GCC electricity markets.

(i) Functional Separation

According to the Textbook Model (Littlechild, 2006), vertical separation is a fundamental part of the reform process. Table 20 shows there are significant differences in the extent of vertical separation across GCC electricity markets.

Table 20 GCC Electricity Market Structures – Functional Separation

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE (Abu Dhabi)
Generation separate from Transmission	in some cases	pending	✓	in some cases	✓ in some cases	✓
Transmission separate from Distribution	×	×	✓	×	×	✓
Distribution separate from Supply	×	×	× the Law states separate licences	×	×	× the Law states only one licence
Independent System Operator (ISO)	×	×	✓ by the transmission company	×	×	✓ by the transmission company

Source: author’s research

Oman and Abu Dhabi are the only two cases in the GCC where the functions of generation, transmission and distribution are fully separated. However, the functions of distribution and supply while separate from generation and transmission are still not fully separate. A feature of the Omani electricity law is that separate licences are required for each activity. This legal requirement will assist further unbundling and the introduction of retail competition.

Other than the deployment of IPPs the electricity markets in Kuwait, Bahrain and Qatar have not undergone any functional separation, although, from previous parts of the research it is understood that Qatar and Bahrain are moving in that direction. For Saudi Arabia, the market remains bundled for most activities with the exception of some IPP generation.

Transmission and system operations are separate from the functions of generation, distribution and supply in Oman and Abu Dhabi although system operator functions are undertaken by the transmission company and are separate from all other electricity functions.

The distribution and supply functions remain integrated even in the reformed electricity markets of Oman and Abu Dhabi. Our Oman case study noted that state-owned entities carrying out the still ‘bundled’ activities of distribution and supply are required by law to keep separate accounts for each activity. Moreover, the Omani regulator has implemented separate distribution and supply price controls to further separate the distribution and supply functions and prepare for retail competition.

Remote areas in both Oman and Abu Dhabi are serviced by small vertically integrated companies using diesel-fired-generators to supply small networks serving limited populations. These relatively small systems are serviced by state-owned companies. Saudi Arabia may also face a similar situation in remote areas to that faced in Oman and Abu Dhabi, and may introduce a similar vertically integrated rural areas entity. This is less likely to be required in the geographically smaller countries of Bahrain, Qatar and Kuwait.

(ii) Corporatisation

For the GCC, this research found that corporatisation of generation functions is more prevalent than other segments of GCC electricity markets. In Table 21, the symbol 🅒 refers to the corporatised segments in each GCC member state.

Table 21 GCC Electricity Market Structures – Corporatisation

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE (Abu Dhabi)
Generation by corporate including state owned	🅒	*Pending*	🅒	🅒	🅒	🅒
Transmission by corporate including state owned		*N/A*	🅒		🅒	🅒
Distribution and supply by corporate including state owned		*N/A*	🅒 including accounts separation		🅒	🅒 including accounts separation
Power procurement by corporate including state owned		*N/A*	🅒 by an independent procurer		🅒 by the TRANSCO	🅒 by an independent procurer

Source: author’s research

Most segments of the electricity market are corporatised in Oman, Abu Dhabi and Saudi Arabia. Similar initiatives have been taken for generation in Bahrain and Qatar. On the other hand, Kuwait lags behind other GCC member states as with one pending IPP its electricity utility remains vertically integrated and state-owned. Further, Oman and Abu Dhabi have designated independent corporate procurement companies while Saudi's TRANSCO company acts as the single-buyer.

Corporatisation may be the way of transforming a 'state-run' working situation into an 'enterprise culture' working environment with the much needed transparency and performance auditing. The reforms in Oman and Abu Dhabi provide evidence of increased transparency through the requirement for companies to provide annual audited financial statements.

(iii) Public & Private Sector Ownership

Table 22 identifies the scope of public and private sector ownership by function in GCC electricity markets.

Table 22 GCC Electricity Market Structures – Public & Private Ownership

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE (Abu Dhabi)
Generation	*G&P*	*G & one IPP pending*	*P**	*G&P*	*G&P*	*G&P*
Transmission		*N/A*	*G***		*G&P*	*G*
Distribution and supply		*N/A*	*G*		*G&P*	*G*
Generation planning and power procurement		*N/A*	*G*		*G*	*G*

* Almost all generation is privatised while new requirements are floated through IPPs.
** Oman declared plans to privatise its main TRANSCO. *G* : government *P* : private

Source: author's research

Our research found that private sector ownership is progressing faster in Oman and particularly in generation where most generation companies are privately-owned and publicly listed. For Abu Dhabi, divesture in generation have taken a norm of 60% (state-ownership) and 40% (private-ownership). Similarly, Qatar has a combination of private and state ownership in generation. Qatar has privatised some parts of generation by introducing independent power producers (IPPs). Bahrain seems to follow by successfully introducing its first IPP and announcing further steps with this regard. Recent developments indicate that there is a tendency to reduce shares of state-ownership in power generation.

Kuwait is in the process of contracting as its first IPP, a significant development as now all GCC member states have implemented (both BOO and/or BOOT) vehicles for privatising electricity generation.

We were surprised that the research identified some degree of transmission privatisation in GCC member states. For example in Saudi Arabia, some shares of the mainly state-owned transmission and distribution company are held by private sector parties. In Oman the vertically integrated Salalah concession agreement was initially owned by private sector investors but has been acquired by government to assist the future restructuring of the vertically integrated concession (AER Annual Reports, 2010).

While we find only limited examples of privatisation in GCC electricity markets, other than generation, the extent of corporatisation may pave the way for future privatisations. Privatisation may be expected to grow as GCC economies expand. In addition, member states' WTO accession agreements – with Saudi Arabia being the last to sign – require service utilities such as electricity to be open to international private investment.

(iv) Regulation

Regulation and regulatory bodies are both very important elements in any restructuring programme. According to Mustafa (2002), regulatory bodies need to be autonomous for them to function effectively and in order for regulators to be credible, they must be kept away from political pressures.

Drawn from the case studies, Table 23 indicates that only Oman, the Emirate of Abu Dhabi and Saudi Arabia have already established independent regulators. In all three cases, regulatory bodies are managed by appointed board members. However, as discussed earlier, regulator independence in the case of Saudi Arabia is still questionable.

In Oman, members of the regulator are appointed by the Council of Ministers and for 3 year terms and must not be government employees and are prohibited (with their immediate family) from having economic interests in electricity sector.

The Board of Abu Dhabi regulatory non-government officers were initially appointed by the chairman of Abu Dhabi Water & Electricity Authority for a term of service. More appropriately, the subsequent amendments to the original law have given the powers of appointment and removal of the chairman and board members to the Executive Council of the Emirate of Abu Dhabi, a decision taken to secure regulatory independence. Both regulators are financially and administratively independent and are expected - to a great extent – to operate free from political and commercial pressures.

Table 23 GCC Electricity Market Structures – Regulation

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE (Abu Dhabi)
Separate entity responsible for electricity regulation Ⓡ			Ⓡ		Ⓡ	Ⓡ
Legislation specifies regulator's responsibilities in detail			✓		×	✓
Board appointment and membership	N/A	N/A	Independent members appointed by the Cabinet	N/A	Chaired by Minister of Electricity and Water	Independent members appointed by Executive Council
Government officials are involved in the management of the regulator			×		✓	×
Regulatory decisions could be appealed			✓ Commercial court and international arbitration			✓ three arbitrators
Has an enforcement power			✓		✓	✓
Regulator is separated from political & business interests from (1), and (5) is highest			4		1	4

Source: author's research

In the case of Saudi Arabia, the regulatory authority is chaired by the Minister of Electricity and Water with members representing some other government organisations and agencies. It is therefore questionable whether such regulator can demonstrate any independence from political pressures. Regulator independence is required in order to minimise state interferences and allow more credibility and accountability within both state-owned and private-owned market participants.

Oman is the only case where - by law – the regulator's decisions may be referred to the commercial courts. An added feature is that the law provides for international arbitration which is an added value for the country's much needed foreign investment.

According to electricity sector laws prevailing in Oman and Abu Dhabi, all market participants are guaranteed access to transmission and distribution networks on a non-discriminatory basis. The charges for connection and use of distribution system are subject to regulatory approval and must be consistent with the terms of RPI-X price controls imposed by their respective licenses.

(v) GCC Interconnections

One of the objectives of this research was to identify drivers for GCC electricity market reforms including possibilities for cross-border trading between member states. The GCC Interconnection Grid will provide opportunities for cross-border electricity trading, shown in Table 24.

Table 24 GCC Electricity Market Structures – Member State Interconnections

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE (Abu Dhabi)
Interconnections exist with neighbouring countries	600 MW*	1200 MW*	✓ with UAE (one 220kv & three 33kv for imports) 400 MW*	750 MW*	1200 MW*	✓ one existing 220kv with Oman 900 MW*
Trading electricity with neighbouring countries			✗			✗
Restrictions exist on the use of the interconnections			✓ 25% import restriction			

Source: author's research * refers to the GCC-Grid capacities under construction

Once completed, the GCC Grid will facilitate sharing of reserve and other ancillary services. The interconnector may facilitate electricity trading between member states. The Omani electricity law stipulates that only persons licensed by the regulator can operate international interconnections and participate in cross-border trading.

(vi) Future Policy & Trends

Most GCC member states are expected to undergo further economic liberalisation and market opening due to many factors including their membership obligations to the WTO. With some degree of differences, membership terms and conditions clearly specify market opening actions to be taken by members in a variety of services. Another reason for market opening and liberalisation relates to the increasing need for international private sector investment. Private sector participation is increasingly evident in electricity and related water. Delays in market opening may result in increased costs of private capital since doubts about the market rules usually yield legal and administrative uncertainties which are usually matched by increased costs resulting in higher prices. Hence, governments will be only adding to their burden by having to accept new demands for sovereign guarantees instead of seizing the opportunity of reducing them. It is for this reason and others already reiterated in earlier chapters that a number of GCC states are already restructuring their electricity service utilities.

Table 25 Future Policy and Trends

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE (Abu Dhabi)
Further electricity reforms are expected	✓	×	✓	✓	✓	✓
Regulator freed from government interference			✓		✓ to coincide with further market opining	✓
Actions already taken may lead to uniform GCC-wide electricity regulation	× reforms are delayed	× no firm plans announced yet	✓ reform has already introduced price transparency	✓ officially placed a request to import electricity	✓ currently working towards further reforms	✓ Abu-Dhabi is exporting to other Emirates
Direction of long-term trade (exporting ↑ importing ⇩)	⇩	⇩	⇩	↑	↑	↑

Source: author's research

Drawn from our analysis of the GCC electricity markets already presented in Chapter 4 and the various meetings conducted with GCC officials and company representatives, Table 25 provides a summary of expected future policy and trends of the electricity service utility in the GCC region.

The case studies of Oman and Abu Dhabi concluded that the two markets are already reaping the economic benefits of their progressive reforms. Hence, it can be assumed that most GCC countries are expected to take further steps in the direction of electricity sector restructuring resulting in a trans-GCC wave of reforms.

While Saudi Arabia is currently working towards further reforms - but has not announced any specific plans with regards to its regulatory policy - it is suggested that any future market opening must also entail that the regulator becomes more independent as in Oman and Abu Dhabi. For Bahrain and Qatar, we have seen nothing that suggests independent regulators are being considered, while Kuwait is falling behind in electricity sector reforms.

8.3 Textbook Model - Restated

In chapter 2 we noted the 10 components for reforming electricity markets proposed by Littlechild (2006). We now bring together the results of our survey review to see how GCC electricity markets in their present form compare to the textbook model components. Each of the 10 components is discussed in turn:

1. Vertical separation to separate the competitive segments of the market (like generation) from the regulated activities (like transmission and distribution), and
2. Horizontal restructuring so that there adequate numbers of competing suppliers service providers,

Table 20 highlighted significant differences in the extent of vertical separation across GCC electricity markets. Oman and Abu Dhabi are the only two markets in the GCC where the functions of generation, transmission and distribution are fully separated, although distribution and supply while separate from generation and transmission are still not fully separate.

The electricity markets in Kuwait, Bahrain and Qatar have not undergone any functional separation. For Saudi Arabia, the market remains bundled for most activities with the exception of some generation that is separate from transmission.

3. Designation of an independent system operator (ISO) in order to guarantee network stability and encourage competition,

For Oman and Abu Dhabi, the transmission companies (TRANSCOs) play the role of the system operator (SO). The TRANSCOs in both markets are not permitted - by law - to engage in any generation, distribution, supply or power purchasing activities. Therefore, since the role of each company is restricted to transmission, it is reasonable to assume that each company – in each market – acts as an independent system operator.

In the case of Saudi Arabia, the vertically integrated Saudi Electricity Company acts as the system operator for the Kingdom, and therefore, does not act as an independent system operator. For Bahrain, Qatar, and Kuwait there are no independent system operators. Such activities and part of the many unbundled functions of state agencies responsible for electricity (see Table 20).

4. Specification of customer supply arrangements in the absence of retail competition,

With the exception of the limited references within the Omani and Abu Dhabi electricity laws, GCC laws do not yet address customer supply arrangements. Since the Omani government has already made a reference to privatising distribution (with the exception of some limited systems), we believe it would be desirable for the regulator to insist on specific customer supply arrangements being place before privatisation. With further amendments to its current legislation, Abu Dhabi should be in a good position to privatise its DISCOs and, similarly, needs to specify customer supply arrangements. On the other hand, the laws in other GCC states are less likely to ‘spell out’ such arrangements for their state-owned entities (or corporations).

5. Privatisation in order to increase performance levels and reduce state intervention,

In the short term, privatisation may lead to higher prices – especially at the stage of introduction - and/or may include some consumer price increases and layoffs. In a usual case of privatisation, some market participants (primarily consumers and workers) may be negatively affected and might hope to be compensated for their losses. However, the trend already reveals that GCC governments are reluctant to subject electricity markets to pure competition; therefore no requirement for compensation (to market participants) is envisaged as a result of reform at this stage. Also, in such fast growing markets, layoffs may be minimised as staff can be reassigned to new projects. Yet governments must still be prepared to give back some of the savings and/or earnings through privatisation in the form of workforce termination remuneration as well as other forms of settlement to workers presumably affected by privatisation. It is worth noting that, regardless of the intention, in practice it would be most difficult to compensate all of those affected by privatisation. Governments must properly explain the intentions for reform and the overall long term gains expected from privatisation well in advance.

Notably, from the two case studies in particular, private ownership in generation tends to be dominated by foreign equity and international debt. Further, local investors as in the case of Oman's IPP initial public offerings seem to show greater interest to acquire the publicly traded shares of power plants whose major shareholdings are controlled by experienced international firms. Earlier chapters demonstrate that privatisation is a process by which ownership and associated risks are transferred from the state to the private sector.

In privatising GCC generation, other factors contributing to genuine risk transfer need to be addressed. A total risk transfer requires much more developed markets with clearer indicators of expected growth rates. Otherwise, private owners and debt providers would have to factor in more uncertainties, hence, yielding extra charges. Some uncertainties related to the socio-political environment in the GCC are associated with regional demand calculations and government spending. For this and many other reasons – demonstrated in other parts of this chapter – a GCC member state may choose a single buyer model.

6. <u>Creation of markets and trading arrangements in order to facilitate trade transactions and to provide for system real-time balancing arrangements,</u>

From Arizu et al (2006) the *single buyer* is often used in the case of many developing countries and usually refers to 'centralised purchasing arrangements'. For Oman and Abu Dhabi, the two PWPs are already acting as a single buyer and seller in each market. Even for a larger market like Saudi Arabia, the study does not envisage a wholesale market place for electricity since with double digit growth in electricity demand the government will need to afford careful consideration to any new market structure as market mechanisms alone may not ensure (a) that electricity supply keeps pace with demand, and (b) at reasonably competitive costs.

Once prices rise in a trading environment, the market sends signals to investors that new capacities are profitable. Meanwhile, increments in capital-intensive industries (where electricity is potentially one) come in cycles. The lack of coordination among competitors may result in extra capacities causing some adverse affects on the investment side (Green, 2006). For small electricity markets - like the ones in the GCC - coupled with potential asymmetry of information, investors may choose to be extra careful (causing markets to fall short of capacity) or take a more ambitious path by adding capacity (resulting in unfavourable investment conditions). This research has already established how in the case of Abu Dhabi state-dominated investments (less profit oriented) resulted in extra capacities, while Section 3.6 illustrated how uncertainties lead to shortages in Brazil as private investors (in gas-fired generators) did not keep up with demand due to concerns about being undercut by hydropower producers which resulted in supply falling short of demand calling for state intervention including the introduction of a rationing scheme. Another investment-related concern here with a market-based policy is that without any government guarantees, international investors would be expected to increase risk premiums in response to increased uncertainty.

Moreover, a pool option works well when other market conditions are in favour. Market derivatives (like hedges and futures) would need to be introduced to GCC financial markets in order to complement pool mechanisms. Even by allowing long-term contracts to act as hedges, only state-backed long-term contracts (usually through single-buyer models) could yield less volatile prices. Meanwhile – due to social and political considerations – GCC governments would not be expected to tolerate volatile retail markets. A California or Argentina-like situation of power supply shortage or lost investor interest (presented in Chapter 3) would certainly not be taken easily by the hydrocarbon-rich economies of the GCC. In response to volatile prices, GCC governments would have two choices; one, to increase subsidies and two, to re-regulate. Subsidisation is already a burden while we have already established from worldwide experiences how government intervention leads to an undesirable chain reaction. Therefore, the single-buyer model may act as a safeguard from any market power exploitation and spare such growing economies any potential market failure situations.

This is, perhaps, why Oman, Abu Dhabi and Saudi Arabia have already made their choices of a state-owned single-buyer mechanism over the pool model. Accordingly, it is expected that Oman Power & Water Procurement Company SAOC would continue to act as the sole buyer and seller of electricity and water in Oman subject to an RPI-X price control while Abu Dhabi Water & Electricity Company would act as the sole PWP for the Emirate of Abu Dhabi.

Similarly, the Saudi Electricity Company (SEC) – still an integrated system – will continue to act as a single buyer although procurement, trading and system operation would not be independent. More appropriate trading arrangements are needed to advance Saudi market reforms given the fact that the single-buyer is involved in procurement, wholesale and retail functions.

Meanwhile, the current drive in Bahrain and Qatar to introduce IPPs suggest that both countries are well placed to introduce a single-buyer model.

For the GCC limited-size markets, competition may be envisaged mainly in the wholesale segment of the market. The IPP dominated sector must act as a level playing field for local and international firms. Although limited, initial findings from the case studies on Oman and Abu Dhabi reported above suggest that both markets are benefiting from IPP-based reforms.

7. Creation of an independent regulatory authority, with enabling powers and adequate human and financial resources in order to be able to administer its primary roles of incentive regulation and the promotion of competition.

   Regulation and regulatory bodies are both very important elements in any restructuring programme. According to Mustafa (2002), regulatory bodies need to be autonomous for them to function effectively and that in order for regulators to be credible, they must be kept away from political pressures. Given the evidence by Pollitt (2008) on the Argentinean experience presented in Section 3.6, no other authority should be allowed to play the role of the designated regulator once reforms are adopted.

   Drawn from the case studies, Table 23 indicates that only Oman, the Emirate of Abu Dhabi and Saudi Arabia have already established independent regulators. In all three markets, regulatory bodies are managed appointed by board members. However, as discussed earlier, regulator independence in the case of Saudi Arabia is still questionable.

8. Application of regulatory rules for transmission network access on a non-discriminatory basis so that all generators are allowed to compete on equal grounds.

   According to electricity sector laws prevailing in Omani and Abu Dhabi, all market participants are guaranteed access to transmission and distribution networks on a non-discriminatory basis. The charges for connection and use of distribution system must be consistent with the terms of the RPI-X price control imposed by licence.

   Access rules in other member states are less clear and possibly non-existent. The introduction of non-discriminatory rules for network access would be a necessary and significant development

9. Unbundling of retail tariff to promote competition at retail level by enabling access to distribution networks.

In all GCC countries, governments retain control over customer tariffs. This research clearly establishes (mainly from reforms in Oman, Abu Dhabi and Saudi Arabia) that tariffs will not be allowed to be determined by the market while governments will continue to subsidise electricity especially for household consumers. However, accounts separation paves the way for retail tariff unbundling and overall sector transparency. From our two case studies – but more so in the case of Oman – it can be established that electricity laws in the region are already moving towards separate book keeping for the retail functions of distribution and supply.

Unbundling of retail tariffs is also important from a GCC perspective. The research review in Chapter 4 suggests that in order for the GCC region to advance as a common market or an economic union, many conditions - including the removal of subsidies that distort costs of production in each country - are needed. Improving cost transparency for electricity and other services would help to resolve some of the disputes over cross-border trading of goods and services that are of GCC origin. This may, subsequently, lead to more economic coherence in the region.

The research also suggests - as illustrated in Table 25 - that actions already taken by Oman, Abu Dhabi, Saudi Arabia and Qatar may lead to more uniform (common) GCC-wide electricity market reforms. For Oman, reform has already introduced price transparency. This is a good example for GCC member states to follow. Such transparency should lead to a better understanding of cost structures (especially for GCC exportable goods) and, hence, may reduce disputes over members' subsidy programmes. The Emirate of Abu Dhabi is already exporting to other UAE Emirates which could prompt other Emirates to follow suit. Already, the State of Qatar has put a request to import electricity even though the GCC Grid is not yet completed. Such initiatives (import or export) should strengthen the case for more GCC-wide electricity market reforms in order to facilitate cross-country trade. Meanwhile, available information suggests that Saudi Arabia is already working towards more reforms, which could narrow the differences between its electricity market and those of Oman and Abu Dhabi.

10. <u>Provision of transition mechanisms</u> that facilitate a smooth reform process while responding to any obstructions that might be encountered (after Littlechild, 2006, p. xvii).

Electricity sector reforms in Oman and Abu Dhabi have provided for relatively good transition mechanisms. One important step was the corporatisation of all market participants including generators (both privatised and state owned), transmission companies, distributions and supply firms, and the single Power and Water Purchaser for each market. Much of the transparency required for market opening may be obtained by vertical unbundling and corporatisation. Such measures allow for an easier transition from totally state-owned utilities to mostly private-owned utilities.

Another aspect of providing for transition was the establishment of independent regulators in each of the two cases. It can be argued that independence of the regulator is less questioned from the start of reform in the case of Oman (appointed by the Cabinet) whereas in Abu Dhabi the original law was amended to allow the appointment of the Chairman of the regulatory authority by the Executive Council rather than previously by the ADWEA Chairman. However, both laws in Oman and Abu Dhabi allow regulator independence so that further reforms can be driven by the regulator (as an independent agency) separate from the concerned ministry or authority responsible for overall sector planning and oversight. In the case of Saudi Arabia, there is less regulatory independence as the regulator is chaired by the Minister for Electricity and Water.

Trading arrangements for Abu Dhabi, Oman and Saudi Arabia also provide for a smooth transition from a state-dominated to a mixed-ownership electricity sector. The single-buyer model, also used in many other developing countries, contributed to the easy adaptation of the reform packages in the three countries. Without such arrangements of a single-buyer, decision makers in these countries would have to deal with the ambiguities that are usually associated with other wholesale market arrangements especially in cases of smaller markets like Abu Dhabi and Oman. Lessons learned from California and Chile (although for a different set of reasons) bear witness to the extent of damage that may be caused by market misbehaviour.

8.4 Choices for Reform (GCC Related Implications)

When advising on GCC electricity market restructuring, this research considers a variety of criteria that influence our choices. For the purpose of this study, the method of Multiple Criteria Decision Analysis (MCDA) is used to assess the four models or 'choices' available as summarised by Hunt (2002) in Section 2.4.1. Based on this method of investigation this research subjects the different alternatives for market design namely;

Alternative 1: State-owned monopolist: a market structure comprising a single vertically integrated monopolist (in terms of generation, transmission, distribution and supply), that is a self regulated provider of electricity, typically a ministry or government owned company;

Alternative 2: Single-buyer model: a market structure in which there is horizontal separation of generation and vertical separation of generation from transmission, distribution and supply, with a 'single buyer' procurement entity responsible for procuring capacity and output from I(W)PP and providing bulk supplies of electricity to electricity suppliers;

Alternative 3: Wholesale market: a market structure in which there is horizontal separation of generation and vertical separation of generation, transmission and distribution and supply, and with direct competition between generators to sell capacity and output to electricity suppliers, and to a limited extent directly to large consumers; and

Alternative 4: Retail competition, a market structure in which there is direct competition to supply electricity to consumers at fully cost reflective prices.

The researcher has assigned weights to each criterion from 1 to 4 based on the information gathered on the GCC (as presented in Chapter 4) while incorporating the outcomes of the case studies (on Oman and Abu Dhabi) and the various meetings (presented in the Appendices). A value for each criterion was then attributed to each model or 'choice' for reform. The main categories to be analysed are listed below in, roughly, a descending order according to their importance with respect to the GCC policy considerations;

1. Ensuring security of supply. This is a critical policy consideration to the reform of GCC electricity markets. A full discussion of security of supply would consider generation, transmission and distribution security. However, we focus on generation security and the need to ensure sufficient generation capacity is available to meet demand and satisfy system reserve requirements. Due to the 'public good' nature of security of supply and the technical characteristics of electricity, we consider it appropriate to afford special attention to ensuring adequate capacity is available. We assign this criterion a weighting of 4 (maximum);

2. Attracting private investment. This has been an important objective of electricity market reform in developing countries. As shown from Chapter 4, the hydrocarbon-dependant economies of the GCC can have budget deficits when oil prices fall. Funding electricity infrastructure through private sector participation can help mitigate uncertainty arising from oil price volatility. We assign this criterion a weighting of 3;

3. Improved efficiency. This is a major driver of privatisation and reform based on the belief that private sector efficiency and performance is generally better than that of public sector entities. We assign this criterion a weighting of 3; and

4. Subsidy policy compatibility. In Chapter 4 on the GCC, Chapter 5 on the Abu Dhabi case study, and Chapter 6 on the Omani case study we noted that currently governments are either not 'willing' or not 'able' to allow full retail competition as this has implications for maintaining the present policy of subsidising electricity tariffs for final consumers. However, while there is a clear commitment to provide subsidy to residential customers, it is not altogether clear that the commitment extends to other customer categories. GCC member states will therefore seek market structures that can promote efficiency whilst allowing subsidy to continue. We assign this criterion a lower weighting of 1 due to the implications of this policy for economic efficiency, the fact that subsidy could be provided by means other than through tariffs, and as the commitment to provide subsidy may not continue to apply to all customer categories.

We assign scores to each of the four criteria outlined above with scores ranging from 1 to 10, these are summarised in Table 26 below. The scores reflect the researcher's assessment of worldwide experiences of each of the four models discussed in Chapter 3 and policies specific to the GCC.

A. State-owned monopolist:

(1) *Ensuring security of supply*: one might argue a state-owned monopoly would score highly in this category as the state has a public interest obligation to provide an essential utility. However, one might also expect a state-owned monopoly to exhibit the same deficiencies as a standard monopolist, including a tendency to undersupply which clearly has implications for security of supply. Kuwait, as illustrated in Chapter 4, is an example of a vertically integrated state-owned monopoly facing electricity shortages due to planning inefficiencies. On balance we assign a score of 5 due to our concerns about monopoly performance;

(2) *Attracting private investment*: private investors sometimes seek government guarantees that are implicit when contracting with a state-owned monopolist. However, we expect investors to be concerned about contracting with a counter-party that has unrestricted monopoly power, a concern that has supported the introduction of an independent regulatory function. Accordingly, we assign a score of 5;

(3) *Improved efficiency*: we assign a score of 2 to a state-owned monopolist given the limited prospect for improved efficiency due to the absence of competition; and

(4) *Subsidy policy compatibility*: state-owned monopolists in the GCC can easily and directly implement a policy of subsidising electricity tariffs, and we assign a high score of 8.

B. Single-buyer model:

(1) *Ensuring security of supply:* in this model the single-buyer procurer usually has a statutory obligation to plan and contract for sufficient generating capacity to ensure security of supply. Accordingly, we assign a high score of 8;

(2) *Attracting private investment:* the single-buyer model as implemented in Oman and Abu Dhabi has a proven track record of attracting significant international and local private investment in I(W)PPs, and we therefore assign the maximum score of 10;

(3) *Improved efficiency:* being a statutory monopolist the efficiency of the single-buyer will be sensitive to the effectiveness of the regulatory regime under which it operates, as the model itself does not ensure efficient performance. In light of these considerations we assign a score of 6; and

(4) *Subsidy policy compatibility:* the single-buyer model is compatible with a policy of subsidised electricity tariffs as the procurement functions do not extend to final consumers. We assign the single-buyer model score of 8.

C. Wholesale competition:

(1) *Ensuring security of supply:* there may be a risk with wholesale competition that if a single entity is not responsible for ensuring compliance with a generation security planning standard, risk-averse investors may be less willing to enter the market. This would make it more difficult to ensure security of supply. We assign this model 6, a slightly higher score than the state-owned monopolist yet a much lower score than the single-buyer model;

(2) *Attracting private investment:* while investment in GCC electricity markets without a government counterparty or a fixed term power purchase agreement involves market risk, there are market entry opportunities to sell power to licensed suppliers and to a limited degree final consumers. This is reflected in a score of 7;

(3) *Improved efficiency:* the scope for competition in this model will promote efficiency amongst generators competing to sell electricity on a daily or hourly basis. Accordingly, we assign a score of 8; and

(4) *Subsidy policy compatibility;* as with the single-buyer model, there is an intermediary between the wholesale market and final consumers – except where large customers are supplied directly by generators. We assign a score of 8.

D. Retail competition:

(1) *Ensuring security of supply:* noting that there is no national or GCC wide competition policy, this model exposes investors to a higher degree of market risk and transactions costs. Generators would need to find and enter supply agreements with retailers or final consumers and retain those consumers. This may deter the level of generation capacity investment needed to ensure security of supply. These concerns are reflected in a score of 4;

(2) *Attracting private investment*: similar to the comments made in relation to security of supply above, private investors may view investment in GCC electricity markets as high risk and may be unwilling to enter. Accordingly, we assign a score of just 4;

(3) *Improved efficiency:* full competition offers the best prospect of improved efficiency and we therefore assign the maximum score of 10; and

(4) *Subsidy policy compatibility:* retail competition would make it extremely difficult for GGC governments to implement a policy of subsidised electricity tariffs as competition would require the introduction of fully cost-reflective tariffs. For this reason we assign the lowest score of 2.

Table 26 Multiple Criteria Decision Analysis for GCC Options

Criteria	Weight	State-owned Monopolist	Single-buyer model	Wholesale market	Retail competition
Ensuring security of supply	4	5	8	6	4
Attracting private investment	3	5	10	7	4
Improved efficiency	3	2	6	8	10
Subsidy policy compatibility	1	8	8	8	2
Score (high is good)		3.3	5.9	5.1	4.0
Rank		4	1	2	3

Source: author's research

The results of the MCDA scores summarised in Table 26 suggest the single-buyer model is the preferred market structure for GCC electricity markets. We know from economic theory that fully competitive markets (retail competition) are generally best at achieving economic efficiency and maximising social welfare. However, in the context of the GCC and as reflected in the MCDA criteria, ensuring security of supply, attracting private sector investment and compatibility with subsidy policy, are very important considerations for GCC member states that we believe would be best addressed by adopting a single–buyer model, of the form presently in place in Oman and Abu Dhabi.

The results of the SCBA presented in Chapter 7 support the proposed implementation of a single buyer electricity market structure. Conducting such a detailed SCBA confirmed that Oman's electricity market restructuring (actual scenario) delivered positive net benefits compared to the continued performance of the state owned vertically integrated monopoly (counterfactual scenario). It is worth noting that net benefits were achieved with only minimal privatisation proceeds and no change to subsidised electricity tariffs. Under the single-buyer model implemented in Oman we believe benefits would have been even higher had there been more privatisation transactions and some move to more cost reflective tariffs.

As already noted the single-buyer model we recommend in Chapter 9 differs from that discussed by Hunt (2002). In our proposed model, as in Oman and Abu Dhabi, transmission and system operation will be entirely separate from generation and procurement, which is not the case in Saudi Arabia. Separating transmission and system operation from the single buyer procurement function ensures that system operation decisions (such as the despatch of individual plant) are taken by the system operator and not by the IPP's contract counterparty. This contrasts with the view of Hunt and Shuttleworth (1996) who see no difference between a separate transmission function and combining the transmission and procurement functions.

8.5 Implications at the GCC-level

Our study finds that neither the GCC Charter nor the Agreement provide for a sector-specific GCC-wide electricity reform. This implies that any GCC-wide reform policy for electricity would have to be agreed by all member states. Otherwise, restructuring at this stage may only be introduced in the form of guidelines to be implemented on a voluntary basis.

One other reality is that it is not conceivable for the GCC governments – at least presently – to allow consumer prices to reflect actual costs. While the Omani Regulator clearly includes the level of subsidies in its annual report, prevailing post-reform legislation in Abu Dhabi and Saudi Arabia also stipulate that consumer prices are not subjected to pure market mechanisms. Similarly, all the meetings and personal communications carried out for the purpose of this research do not suggest any intention to allow a cost-reflective pricing in any of the six member states. The proposed model for reform, would accordingly, be based on some amendments to the original Textbook Model presented in Section 2.3.3 of this research.

Further, one of the objectives of this research was to review the drivers for GCC electricity reforms including the possibilities for cross-border trading between member states. In the absence of the GCC Interconnection Grid under construction – and as presented in Chapter 4 - there are limited opportunities for cross-border electricity trading. However, once completed, the GCC Grid would provide for electricity trade between member states. This implies that some amendments to legislation in each country would be required before actual cross-border trade takes place. We note that even with the limitation of the wires between Oman and UAE, the two markets could have traded - but did not - due to delays in agreeing the bilateral utility-specific agreements which presumably may have been delayed due to the on-going legal and structural changes in both electricity markets.

8.6 Conclusions

In conclusion, the Sultanate of Oman and the Emirate of Abu Dhabi (of the UAE) have already established a considerable degree of electricity structural-reform based around single-buyer type market structures and independent regulation. The two cases may nevertheless be used as catalysts for a GCC-wide electricity restructuring and regulatory reform. Current GCC Directives do not support electricity sector reforms. Any further market opening for the GCC would need to be based on collectively agreed sector-specific regulations which – thanks to potential macroeconomic gains - could be smoothly rallied by the GCC secretariat.

The Textbook Model for electricity reform may not yet be applicable to the GCC situation due to the limited market size and, most importantly, the lack of political will to apply prices that reflect actual costs. In order for the study to propose an applicable reform policy, the Textbook Model under consideration would have to be amended mainly to incorporate the use of the preferred single-buyer model.

Chapter 9 Conclusions and Recommendations

9.1 Introduction

This chapter presents the analysis conclusions and our recommendations for common regulatory reform of GCC electricity markets.

The recommendations reflect conclusions drawn from the analysis of previous chapters, including the welfare benefits of competition and the welfare implications of market failure discussed in Chapter 2, the review of electricity reform experience worldwide in Chapter 3 including EU experience of collaborative policy formation and the role of institutions, the assessment of GCC institutional arrangements in Chapter 4, reform case studies for Abu Dhabi in Chapter 5 and Oman in Chapter 6, SCBA of the Oman reforms in Chapter 7 that identified significant welfare benefits, and our review of the status and structure of GCC electricity markets and the MCDA in Chapter 8.

Developing a region-wide policy for electricity reform is a complex task that requires consideration of the extent of, and appetite for, regional integration, political and economic differences, and the effectiveness and objectives of interest groups in each GCC member state. Our recommendations reflect a transitional approach to reform based around a single-buyer market structure that, in the first instance, aims to harmonise the extent of functional separation, corporatisation, private sector participation and regulatory arrangements across member states. Subsequent stages of reform would involve increased intra-regional electricity trade leading to wholesale competition and eventually full retail competition.

A combination of effective regulation (of network monopolies) and competition in wholesale and retail functions is, we believe, necessary to maximising total welfare.

9.2 Conclusions

The first conclusion of the research is that no GCC member state is presently in a position to adopt the Textbook model for electricity reform (presented in Section 2.3.3). Instead, the research suggests that an amended version of the textbook model is required for GCC reform given the significant differences in GCC electricity market structure. Table 27 presents a comparison of GCC electricity market characteristics against each criteria of the textbook model.

Table 27 Application of the Textbook Model to the GCC

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE (Abu Dhabi)
Privatisation * *P* private *G* government-owned	*G&P*	*G*	*P ***	*G&P*	*G&P*	*G&P*
Vertical separation	generation only	generation only	✓	✗	in limited cases	✓
Horizontal separation	generation only	generation only	✓ in most cases	✗	in limited cases	✓ in most cases
Independent system operator (ISO)	✗	✗	✓ by transmission company	✗	✗ by an integrated company	✓ by transmission company
Trading arrangements	Monopoly	monopoly	single-buyer	Monopoly	single-buyer	single-buyer
Rules for transmission	✗	✗	non-discretionary	✗	✗	non-discretionary
Unbundling of tariffs	✗	✗	✓ including retail accounts separation	✗	Limited	✓
Specification of supply arrangements	✗	✗	limited specification	✗	✗	limited specification
Independent regulator	✗	✗	✓	✗	✓ chaired by Minister	✓
Transition mechanisms	✗	✗	limited	✗	✗	limited

* Privatisation mainly refers to generation while Oman declared plans to privatise its main TRANSCO.
** Almost all generation in Oman is privatised.
Source: author's research

In terms of functional separation, corporatisation, privatisation and regulation, a research conclusion is that electricity reform in Oman and Abu Dhabi is more advanced than in other GCC member states, although neither country's electricity market conforms fully to the Textbook Model. While Saudi Arabia has taken some initial steps towards electricity market reform such as limited unbundling and the establishment of a regulator, other essential elements of reform are limited, such as the extent of horizontal and vertical separation and regulatory independence. There is very limited functional separation in Bahrain, Qatar and Kuwait, with no corporatisation (other than for individual I(W)PP) and no separate regulatory function.

This research concludes that due to political and social considerations, electricity tariffs in GCC member states are and will continue to be heavily subsidised. Consequently, in the absence of cost reflective prices along with market opening precautions resulting from network size limitations and security of supply concerns, the Textbook Model will be amended only to the degree that it allows for a minimum level of ‘applicable’ reform.

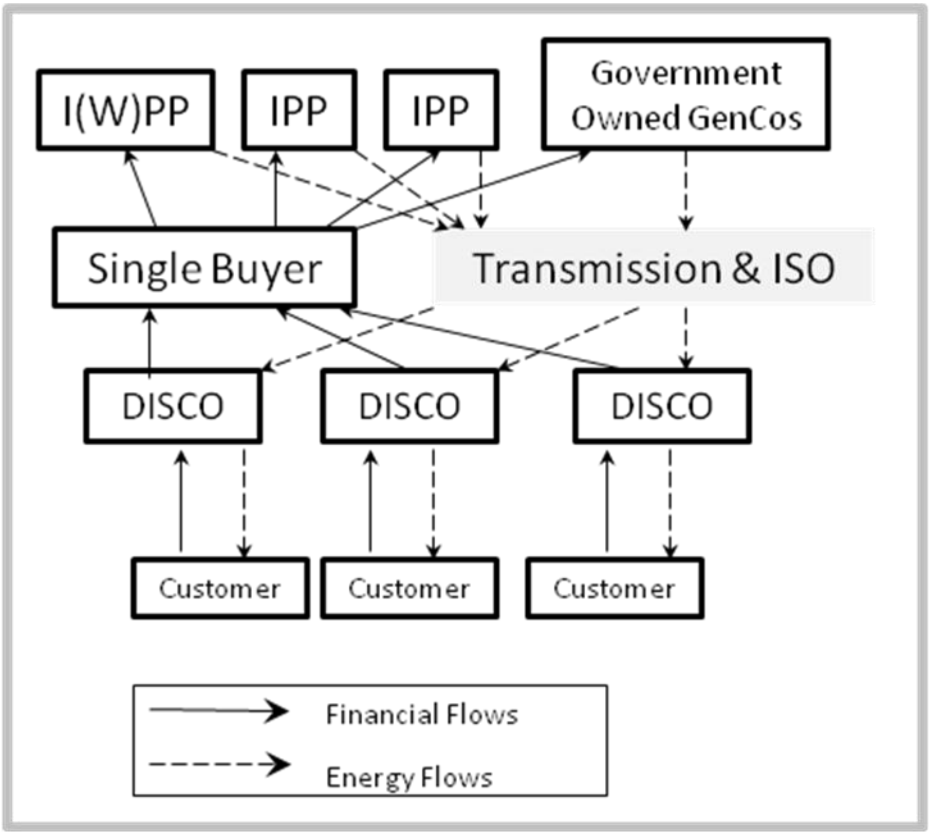
9.3 Recommendations

In order to arrive at an applicable policy for reform, the proposed model consists of a set of measures that are based on the findings in Chapter 8. The research recommendations and supporting justification are presented below.

9.3.1 Recommendation 1: Single Buyer Market Structure

Our first recommendation is that for electricity markets in each member to be aligned to the market structure shown in Figure 23, a recommendation consistent with the results of the Multiple Criteria Decision Analysis presented in Table 26.

Figure 23 Recommended GCC Electricity Market Structure



Functional separation

Our recommendation requires Qatar, Bahrain and Kuwait to unbundle their state-owned vertically integrated electricity ministries (authorities) and implement horizontal separation of generation and vertical separation of generation, transmission, distribution and supply with responsibility for system operations assigned to the transmission company. Saudi Arabia has less restructuring to do, but we recommend it unbundle the vertically integrated Saudi Electricity Company to provide for full functional separation.

An important element of the functional separation to be applied in Qatar, Bahrain, Kuwait and Saudi Arabia is the establishment of single buyer procurement entities responsible for (i) the procurement of new capacity and output from I(W)PP and (ii) the bulk supply of electricity sufficient to allow Discos to meet their customer requirements. These procurement entities will be assigned important security of supply responsibilities that are highlighted below.

Abu Dhabi and Oman have already implemented the functional separation required by our recommendation.

Corporatisation

In the recommended market structure all entities undertaking electricity generation, transmission, distribution, supply, system operator and procurement functions are commercial companies (we discuss the issue of ownership below).

As with functional separation, Qatar, Bahrain and Kuwait have most to do and are required to establish new corporate entities from the unbundled state-owned vertically integrated electricity ministries. Saudi Arabia, through the Saudi Electricity Company already has a corporate presence in generation, transmission, distribution and supply but our recommendation requires it to establish new companies by unbundling Saudi Electricity Company's functions. Abu Dhabi and Oman have already implemented full corporatisation of electricity functions.

Ownership

To accord with the Textbook Model all companies in our recommended market structure would be privately owned. However, it is clear from the MCDA analysis that implementing the degree of private sector ownership required by the Textbook Model will take time and therefore remains a longer-term objective. For practical purposes and to allow GCC governments to retain the control they believe is a necessary component of electricity market reform, our recommendation is for full private sector ownership of generation with companies performing other functions either wholly-owned or majority-owned by government. In the longer term, when the new market structures are established and operating satisfactorily we recommend governments divest their interests in companies to reduce state interference in the electricity sector and promote private sector driven efficiency improvements. We return to this recommendation below when discussing the regulation recommendations. The choice over privatisation or corporatisation is a basic element in this model:

1. Corporatisation and privatisation would introduce required accounting transparency and assist the unbundling of component elements of electricity supply tariffs and provide for greater transparency of subsidy (both with regard to levels and distribution). The recommended market structure facilitates the continued provision of electricity subsidy and we expect improved transparency to inform government considerations of subsidy objectives and thereby prompt consideration of tariff reform;

2. Corporatisation and privatisation would produce improved transparency of **<u>all</u>** costs as companies would be required to disclose all costs incurred in undertaking electricity activities including government taxes and duties, land usufruct costs, the cost of funding investment and working capital; and

3. We strongly recommend that before implementing further privatisation and corporatisation, issues concerning employee salaries and termination benefits are agreed and clarified prior to reform.

Comments on recommendation 1

While a fully independent system operator is consistent with the Textbook Model we are recommending, based on our research, that in each member state system operator functions are undertaken by the transmission company, for the following reasons:

a. Since most GCC systems are isolated linear (not meshed) networks, there is less justification for independent system operators. Some of the systems are small and the associated costs and administrative requirements of an ISO might only be justified in the case of larger more complex networks; and

b. Although member states are linked through the GCC Interconnection Grid, import and export volumes are expected to be relatively small due to the limited size of the interconnections. Regional system operations may be easily coordinated among the different transmission companies and the GCC Interconnection Authority.

The full functional separation required by the recommended market structure would provide for cost transparency for each element of the electricity supply chain and assist the unbundling of tariffs irrespective of ownership. The Oman and Abu Dhabi case studies demonstrate the benefits of improved cost transparency even where final tariffs are not cost reflective.

We recognise that a single-buyer monopolist and monopsonist is not an optimal structure in terms of its efficiency properties. However, this need not be a permanent arrangement as a further recommendation is that in the long-term the single buyer procurement functions are replaced by wholesale competition when markets satisfy minimum efficient scale requirements and there are sufficient players to avoid market concentration.

Security of supply was identified in our MCDA as a high priority for GCC member states, and provides justification for the single-buyer market structure we recommend.

GCC member states have registered a commitment to continue to subsidise electricity tariffs and we note that the recommended market structure can accommodate this important policy objective.

Finally, our recommendations do not extend to the separate and integrated electricity systems serving the oil and gas-industry and non-civilian (security and military) power systems, although arrangements should be established to allow these systems to connect to licensed systems to secure short-term imports and exports of electricity in cases of emergency.

9.3.2 Recommendation 2: Regulation

As our recommended market structure incorporates both statutory and natural monopolies, an important and critical recommendation is the establishment of independent regulatory authorities in each member state. We recommend independent regulators to minimise the scope for political interference and to safeguard against government conflicts of interest arising from government ownership of electricity sector companies. Independent regulation may enhance the credibility of reform, increase the likelihood of GCC electricity trade and help attract private sector investment.

We also recommend, however, that legislation in each member state specify the powers and obligations of the regulator and drawing from the Omani and Abu Dhabi case studies we include the following provisions:

1. Regulators in each member state should be administratively and financially independent entities financed by licence fees;
2. the powers and obligations of the regulator must allow for full oversight over the electricity sector and such powers must not be shared with any local electricity authorities;
3. The board of directors of each regulator must be appointed by the Council of Ministers for terms of 3 to 6 years (depending on the contractual norms in each country) with renewals not exceeding 10 years;
4. No government officials must be involved in the board and management of the regulator while all board members must refrain from any business related to the

sector. Annually, board members must declare to the Cabinet any related business of their immediate family members;

5. Regulatory decisions should be subject to appeal to both local commercial courts and international arbitration where in order to stimulate foreign capital participation; and
6. Full disclosure of the licensing regime to be implemented by regulators to ensure transparency of licensing requirements are fully disclosed to market participants, and to reduce the scope for regulatory discretion in terms of the licensing framework. In this regard, legislation should instruct regulators to comply with requirements not to discriminate, to disclose reasons for its decisions, to consult with relevant persons on important regulatory decisions and to minimise the burden and cost of regulation.

We make recommendations for the regulation of the different electricity activities as follows:

1. The different functions of electricity generation, transmission, distribution, supply system operator and procurement functions should be licensed separately with license holders required to maintain separate accounts for separate businesses (this is to ensure financial transparency should a licensed company undertake unregulated activities, and to provide for accounting separation of distribution and supply);
2. The naturally monopolistic activities of distribution and transmission should be subject to incentive based regulation with the precise form of control left to regulators to determine. That said, the form of regulation in all member states should seek to proxy the welfare maximising properties of fully competitive markets identified in Section 2.2.1 and motivate monopoly companies to provide welfare maximising levels of output charged at cost reflective prices (noting however it will be difficult to ensure prices reflect marginal costs due to natural monopoly activity cost structures);
3. Member states may continue to allow vertically integrated companies to service remote areas but these companies should be licensed, their activities regulated and subject to full accounting separation; and
4. Market power concerns in generation are by some degree offset by the countervailing power of the single-buyer procurement companies. However, we consider it important to implemented safeguards against potential exploitation of market power for a number of reasons. Firstly, in the absence of well-established competition authorities, like in the case of England and Wales (see Section 3.2), market power exploitation may be a concern when tendering long-term contracts as an incumbent

with a large market share may deter new entrants. We also recommend investor-interest thresholds to limit unfavourable mergers that in the absence of general competition law may increase market concentration. Thirdly, capacity market-share thresholds would safeguard against horizontal reintegration of generation through ownership that might delay the introduction of wholesale competition. We therefore recommend 25% thresholds on market share and investor interest – in line with the thresholds in place in Oman. In the longer term these thresholds may be supplemented or even replaced by general competition law. It will be important that regulators have discretion to relax the thresholds for limited periods, up to 5 to 7 years. Such 'grace' periods should be adequate to minimise market concentration, considering the prevailing annual growth rates of electricity demand of around 8% - 10% and an average four-year lead time for IPP implementation (like in the case of Abu Dhabi presented in Chapter 5).

9.3.3 Recommendation 3: Transitional Measures

It may be concluded from this research that in order for the region to arrive at a more harmonised electricity sector policy (by means of a GCC legislation), each member state must be allowed the required time to undergo the transformation from a fully integrated system (like in the case of Kuwait) to a restructured power sector (like in the case of Saudi Arabia) or more unbundled electricity service utilities (like in the case of Oman and the Emirate of Abu Dhabi).

Drawing from worldwide experiences (see Chapter 3), different countries have opted for different options of reform at their various stages of development. It is therefore understandable that our suggested model for GCC electricity sector reforms allows for some transitional measures:

1. Although the optimal goal for our proposed model is to arrive at an agreed region-wide policy, member states may still use our model for electricity reform as a guideline for restructuring their respective industries during their various stages of development. During this observatory period, member states not fulfilling the requirements of this model may still use the GCC Interconnection Grid for balancing requirements or for some short to medium-term exchange contracts.

2. While certain parts of the electricity supply chain - other than wholesale - may continue to be integrated, member states must be encouraged to keep separate tariff structures (though proper accounts separation of retail functions).

3. GCC members must be encouraged, but not mandated, to dispose of state-shareholding in generation as long as generation is separated from transmission and retail.

4. In cases of vertically integrated systems at early stages of reform, separate accounts must be kept for all activities of generation, transmission, distribution and supply. This should encourage further functional and legal separation of the three segments while introducing reasonable level of transparency among market participants.

5. In the absence of an independent regulator, an electricity ministry (or authority) may represent the regulator in GCC coordination meetings until such independent agency is put in place.

9.3.4 Recommendation 4: Institutional & Administrative Arrangements

It is recommended that a set of administrative arrangements be established in order to accelerate electricity reform at the GCC level. Both the GCC Secretariat and Interconnection Authority may influence a speedy adaptation of reforms at a ‘national’ and ‘regional’ level.

The Role of the GCC Secretariat

The GCC Secretariat is in a strong position to play a vital role in bringing together the members’ views over the necessity for a sector specific GCC Directive on electricity.

1. The Secretariat should cordially call for meetings and group discussions to review experiences of reforms in members like Oman, Abu Dhabi and Saudi Arabia in order to arrive at a common level of understanding of the benefits of reform. According to the current institutional arrangements (see Section 4.2.1) such meetings may be conducted as part of the workings of the ministers of electricity.

2. The Secretariat may enforce such workings by formally establishing (through the Ministerial Council) a GCC Regulators’ Forum to be elaborated on later in this Chapter.

3. The Secretariat should also establish (through the Ministers of Commerce & Industry) common rules governing the relationship between regulators, stock market authorities and consumer protection authorities (when available) especially in cases of power sector mergers and acquisition.

The Role of the GCCIA

The GCC Interconnection Authority (GCCIA) would own and manage the regional transmission system (the GCC Grid). It is anticipated that the Authority would face many challenges if it decides to take on the complex coordinating roles of; the GCC Secretariat, System Operators, GCC regulators or even the role of the electricity ministries (authorities). Such tendency to expand its role (already sensed through this research) is perhaps justifiable by the absence of sector specific directives in either the Charter of the GCC or the Economic Agreement between the GCC States. Another reason may be the absence of a GCC regulators' forum. This model, however, clearly and distinctly designates the role of the GCCIA in accordance to the following:

1. The GCCIA will be a non-profit GCC organization (owned by the member states) with a board of directors appointed by the GCC Ministerial Council for a term of five years and one renewal. The term of five years should be sufficient to attract the required expertise while any term of more than ten years may cause a concern with regards to the Authority's independence from any political pressures.
2. The GCCIA will act as the transmission company (TRANSCO) and a system operator (SO) of the GCC Grid, and,
3. The GCCIA will act as a coordinator – among the different TRANSCOs - for all cross-border system operations
4. The GCCIA must refrain from any trading activities with the exception of those related to system requirements 'network balancing' purchases and sales.
5. GCCIA Charges will be subjected to a CPI-X price control (using a GCC weighted average) to be agreed periodically by a panel of member state representatives and approved by the Ministerial Council.
6. For emergency relief at early stages of project development, the GCCIA may facilitate cross-border transmission through the Power Exchange and Trading Agreement (PETA), and subsequently;

7. The GCCIA will facilitate the establishment of a GCC power exchange to be both administrated and financed independently.

8. The GCCIA will propose and monitor the implementation of all regional transmission access related designs and codes of conduct, meanwhile, different regulators remain responsible for the same in each country in liaison with their respective system operators.

9. The GCCIA will be granted separate licences in each country allowing it to export (or import) electricity to (or from) any member state through the PWP in each country.

10. A sector specific dispute settlement mechanism must be devised so that any disputes not settled at the GCCIA (or with it) may be clearly referred to the proper GCC authorities.

Establishing a GCC Regulators' Forum

The already in place meetings between the GCC regulatory authorities (including ministries) – although not formal – must be encouraged. It is highly advisable that the GCC Secretariat establishes and recognises the proceedings of a Regulators' Form (in line with the experience of the EU already described in Section 3.4) to act as a catalyst for reform in coordination with the Interconnection Authority. The outcome of such meetings, discussions and consultations need not be officially binding to any participating member. Moreover, such non-binding dialogue may be open for public and academic research in order to raise overall awareness and expedite the process of electricity reforms within the region. Gradually, the GCC Regulators' Forum should expand its proceedings into more technical and commercial issues involving systems reliability, Grid expandability, transmission charges, congestion and security of supply concerns. Over time, the Forum could be recognised as the most essential contributor to electricity policy within the GCC (and naturally taking the coordinating roles of the ministries of electricity).

9.4 Concluding Remarks

With some basic amendments, the single-buyer market structure - already in place in Oman and Abu Dhabi – may be used for a regional reform at the GCC level. Although not the ultimate goal of reform, the single-buyer market structure is expected to yield significant welfare benefits as already seen from the SCBA of reforms in Oman and lead to further market restructuring

Our worldwide review shows that reform needs to be tailored to local conditions, which can evolve over time. This thesis concludes that the single-buyer arrangement is best adapted to the current GCC conditions.

Bibliography

Abdala, M. A. (2001) ‘Institutions, Contracts and Regulation Infrastructure in Argentina’, *Journal of Applied Economics*, Vol. IV, No. 2, November 2001, pp. 217-254.

Aburas, R. (2002) The Key Factors for Creation of an Efficient and Reliable Electricity Markets, presented at the Expert Group Meeting on Capacity Building and Regional Integration for Developing a Sustainable Energy Sector, Beirut, 15-16 October 2002, Economic and Social Commission for Western Asia, United Nations Economic and Social Council, 2 October 2002, E/ESCWA/ENR/2002/WG.2/9.

Abu Dhabi Law No. 2 (1998) Law No. (2) of 1998 Concerning the Regulation of the Water & Electricity Sector in the Emirate of Abu Dhabi issued on 1st of March 1998, The Government of Abu Dhabi, Abu Dhabi

Abu Dhabi Law No. 17 (2005) Law No. (17) of 2005 Concerning the Establishment of Abu Dhabi Sewerage Services Company issued 21 June 2005, The Government of Abu Dhabi, Abu Dhabi: (Electronic Format)

Abdullah, A. (2011) Personal communications from Abdulla Ahmad Abdullah, PhD., Legal Advisor, Electricity and water Authority, Bahrain, Phone call on 22 November 2o11.

Abu Dhabi Law No. 19 (2007) Law No. (19) of 2007 Amendment of Some Provisions of Law No. (2) of 1998 Concerning the Regulation of Water and Electricity Sector in the Emirate of Abu Dhabi issued on 1 July 2007, The Government of Abu Dhabi, Abu Dhabi: (Electronic Format).

ADWEA (2004) Abu Dhabi Water and Electricity Authority Website, United Arab Emirates, http://www.adwea.ae/default.htm [Accessed on 30/09/04]

ADWEA (2009) Abu Dhabi Water and Electricity Authority Website, United Arab Emirates, http://www.adwea.ae/en/report/Capacity.pdf [Accessed on 11/02/09]

ADWEA Annual Report (2006) Annual Report 2006, Abu Dhabi Water and Electricity Authority, Abu Dhabi

ADWEA Statistical Leaflet (2006) Statistical Leaflet 2006, Abu Dhabi Water & Electricity Authority, Abu Dhabi

ADWEC (2010) Statistical Reports 1998 – 2010, Abu Dhabi Water and Electricity Company, Abu Dhabi, UAE, also available electronically from www.adwec.ae/Report2010.html [Accessed on 1/11/2010].

ADWEC (2009) Abu Dhabi Water and Electricity Company, Abu Dhabi, UAE, http://www.adwec.ae/ [Accessed on 01/03/09]

AER (2007) Authority for Electricity Regulation-Oman, http://www.aer-oman.org/ [Accessed on 20/06/07]

AER Annual Reports (2005-2010) Annual Reports 2005 to 2010, Authority for Electricity Regulation-Oman, Muscat.

AER Consultation Paper (2007) Consultation Paper 1/2007: Investor Participation in Salalah IWPP, February 2007, pp. 1-13.

AER Regulatory Decision (2007) Investor Participation in the Salalah IWPP: Responses to Consultation and Regulatory Decision, June 2007, Authority for Electricity Regulation-Oman, Muscat: pp. 1-17.

AER Note (2011) Note from John Cunneen, AER Executive Director and Member of the Board, 11 April 2011.

Al-Alawi, J. (1998) 'Specific privatisation issues applicable to water and electricity utilities in the Gulf Cooperation Council States', *Desalination*, Elsevier ltd. Vol. 120, pp. 129-136.

Al-Asaad, H., Al-Mohaisen, A. and Sud, S. (2006) GCC Power Grid: Transforming the GCC Power Sector into a Major Trading Market, GCC-CIGRE Conference 28-30 November 2006, Abu Dhabi, United Arab Emirates.

Al Dhuhli, A. (2008) 'Dolphin to import natural gas', *Oman Daily Observer*, Vol. 27, No. 300, September 9, 2008, p. 3.

Al-Faris, A. (2002) 'The Demand for Electricity in the GCC countries', *Energy Policy*, Elsevier Ltd, Vol. 30, pp. 117-124.

Al-Mohaisen, A., Chausse, L and Sud, S. (2007) Progress Report on the GCC Electricity Grid Interconnection in the Middle East, IEEE Power Engineering Society, Panel Session, Tampa, 24-28 June 2007, Presentation.

Ali, J (2006) 'Pushing privatisation to attract foreign investors', *Gulf News*, Friday, September 8, 2006, Al Nisr Publishing LLC., Dubai, UAE, http://archive.gulfnews.com/articles/06/09/08/10065731.html or http://www.gulfnews.com/business/Shipping/10065731.html [Accessed on 07/07/07].

Al Ittihad (2004) 'GCC Electrical Interconnection Starts Next Year and the Study of Water Connection', *Al Ittihad* Newspaper (in Arabic), United Arab Emirates, 2 February 2004, p. 15

Al Ittihad (2009) ‘Taqa Sells Share in Shuwaihat Power to a Japanese Company’, *Al Ittihad* Newspaper (in Arabic), United Arab Emirates, 5 September 2008, http://www.alittihad.ae/details.php?id=36942 [Accessed on 05/09/08].

Al-Shaik, I. (2004) ‘Saudi Expert: Power Sector in the Area Requires Investments of Up-to US$160 in Ten Years’, *Al Sharq Al Awsat*, London, 16 February 2004, p. 13.

Al-Shaik, M. (2007) ‘The GCC Interconnection Grid’, presentation to the 7th Power Transmission and Distribution Forum, Kingdom of Bahrain, 28-30 October 2007 (electronic format), http://www.gccia.com.sa/articles/PTDF.pps#256,1,Slide 1 [Accessed on 20/05/09].

Alston, L. F. (2008) ‘The Case for Case Studies in New Institutional Economics’, New Institutional Economics: A Guidebook, Edited by Éric Brousseau and Jean-Michel Glachant, Cambridge, UK: Cambridge University Press, pp.103-121.

Al-Sunaidy, A. and Green, R. (2006) 'Electricity deregulation in OECD (Organization for Economic Cooperation and Development) countries', *Energy*, Elsevier ltd, Vol. 31, pp. 769-787.

Al-Uraimi, S. (2007) Personal Communication by Saleh Al Uraimi, Director General, the Public Authority for Social Insurance - Oman, 18 June 2007, Muscat, Sultanate of Oman.

Alwaqt (2007) “Fairoos Delays the ‘Electricity Law’ over concerns related to its privatisation”, Issue 464, 30 May, 2007, *Alwaqt* - daily Arabic newspaper, Bahrain (in Arabic).

Al-Zidjali, H. (2007) Personal communication by His Excellency Hamood Sangour Al-Zidjali, CEO of Oman Central Bank, Received on 17 June 2007, Muscat, Sultanate of Oman.

Amundsen, E., Nesse, A. and Tjøtta, S. (1999) 'Deregulation of the Nordic power market and environmental policy', *Energy Economics,* Vol. 21, No. 5, October1999, pp. 417-434.

Amundsen E. S. and Bergman L. (2002) ‘Will Cross-Ownership Re-Establish Market Power in the Nordic Power Market?’, *Energy Journal*, Vol.23, No. 2.

Amundsen, E. and Bergman, L. (2003) 'The deregulated electricity markets in Norway and Sweden: a tentative assessment', *Competition in European Electricity Markets: A Cress-country Comparison*, edited by Jean-Michael Glachant and Dominique Finon, Edward Elgar Publishing Limited, Cornwall: MPG Books Ltd, pp. 110-132.

Andersson, B. and Bergman, L. (1995) ‘Market Structure and the Price of Electricity: An ex ante analysis of the deregulated Swedish electricity market’, *Energy Journal*, 1995, Vol. 16 Issue 2.

Andrews-Speed, P., Dow, S., Oberheitmann, A., Ramsay, B., Smith, V., and Wei, B. (2003) ‘First steps in power sector reform: the case of China’s Guangdong Province’, *Utilities Policy* 11 (2003), Elsevier Science Ltd, pp. 169-183.

Arabian Power Company (2007) Arabian Power Company, Abu Dhabi, UAE, http://www.arabianpower.ae/ [Accessed on 19/07/07].

Araújo, J.L. (2006) ‘The Case of Brazil: Reform by Trial and Error?’, *Electricity Market Reform: An International Perspective*, Edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Oxford: Elsevier Ltd., pp. 565-594.

Arizu, B., Gencer, D. and Maurer, L. (2006) Centralized Purchasing Arrangements: International Practices and Lessons Learned on Variations to the Single Buyer Model, Energy and Mining Sector Board Discussion Paper, Paper No. 16, March 2006, The World Bank Group, Washington D.C., pp. 1-40.

Armstrong, M., Cowan, S., and Vickers, J. (1994) *Regulatory Reform: Economic Analysis and British Experience*. Cambridge, Massachusetts: The MIT Press.

Arnott, R., Arrow, K., Atkinson, A. and Drèze, J. (1994) *Public Economics: Selected Papers* by William Vickrey. Cambridge: the University Press, pp. 189- 238.

Askari, H., Bazzari, M and Tyler, W. (1998) 'Policies and Economic Potential in the Countries of the Gulf Cooperation Council', *Economic Challenges Facing Middle Eastern and North African Countries: Alternative Futures,* Edited by Nemat Shafik in association with Economic Research Forum for the Arab Countries, Iran and Turkey, London: Macmillan Press Ltd, pp. 225-255.

Bacon, R. and Besant-Jones, J. (2002) 'Global Electric Power Reform, Privatisation and Liberalisation of the Electric Power Industry in Developing Countries', World Bank Working Paper No. 2, June 2002, The Energy and Mining Sector Board, The World Bank, Washington, D.C.

Bahrain Data Profile (2008) The World Bank Group, http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=&REPORT_ID=9147&REQUEST_TYPE=VIEWADVANCED&HF=N/CPProfile.asp&WSP=N [Accessed on 10/10/08]

Bahrain Ministry of Finance & National Economy (2004), http://www.mofne.gov.bh/English/Economy/indic5.asp

Bahrain National Accounts (2004), Ministry of Finance & National Economy http://www.mofne.gov.bh/English/economy.asp [Accessed on 01/09/04]

Bahrain National Accounts (2007) Kingdom of Bahrain Consolidated Revenue/Expense Statement for the Year Ended 31 December 2006, Ministry of Finance & National Economy http://www.mofne.gov.bh/ShowDataFile.asp?rid=989 [Accessed on 22/07/07]

Bahrain State Budget (2004), Financial Position, Ministry of Finance & National Economy, http://www.mofne.gov.bh/English/money/money_first.asp [Accessed on 01/09/04].

Bailey, S. J. (1995) *Public Sector Economics, Theory, Policy and Practice*, London: Macmillan Press Ltd., pp. 16-41.

Bakovic, T., Tenenbaum, B. and Woolf, F. (2003) 'Regulation by Contract: A New Way to Privatize Distribution', Energy and Mining Sector Board Discussion Paper No. 7, May 2003, The Energy and Mining Sector Board, The World Bank, Washington, D.C.

Baron, D. and Besanko D. (1984) Regulation, asymmetric information, and auditing, *Rand Journal of Economics*, Vol. 15, No. 4, Winter 1984, Pennsylvania: The Rand Corporation, pp. 447-470.

Baumol, W. (1977) *Economic Theory and Operations Analysis*: *Fourth Edition*, Englewood Cliffs, N.J.: Prentice-Hall, Inc., pp.21-41.

Bautista, G., Anjos, M. and Vannelli, A. (2007) 'Modeling Market Power in Electricity Markets: Is the Devil Only in Details', *the Electricity Journal*, Volume 20, Issue 1, January/February 2007, Elsevier Inc., New York: pp.82-92.

Begg, D., Fischer, S. and Dornbusch, R. (1997) *Economics: Fifth Edition*. Maidenhead, Berkshire: McGRAW-HILL BOOK COMPANY EUROPE.

Bergman, L., Brunekreeft, G., Von der Fehr, Nils-Henrik, Newbery, D. and Régibeau, P. (1999) 'The UK Experience: Privatisation with Market Power', *A European Market for Electricity; Monitoring European Deregulation 2, Part 2; Country Studies*, edited by Romesh Vaitilingam, Centre for Economic Policy Studies, London: pp. 89-115.

Besanko, D. and Braeutigam R. (2002) *Microeconomic: an Integrated Approach*. New York: John Wiley & Sons, Inc.

Beesley, M. (1994) 'Abuse of Monopoly Power', *Regulating Utilities: The Way Forward*, edited by M E Bessley, The Institute of Economic Affairs in association with the London Business School, IEA Readings 41, Bournemouth, Dorset: Bourne Press, pp. 139-155.

Bialek, J. (2004) Recent Blackouts in US and Continental Europe: Is Liberalisation to Blame?, Cambridge Working papers in Economics CWPE 0407, University of Cambridge, Department of Applied Economics, CMI Working paper 34, 16 January 2004, http://www.eprg.group.cam.ac.uk/wp-content/uploads/2008/11/ep34.pdf [Accessed on 16/02/09].

Black, J. (2002) *Oxford Dictionary of Economics: Second Edition*, Oxford: Oxford University Press.

Blaug, M. (1997) *Economic theory in retrospect: Fifth edition*, Cambridge: The Cambridge University Press.

Bloor, M., Frankland, J., Thomas, M. and Robson, K. (2001) *Focus Groups in Social Research*, London: SAGE Publications Ltd.

Blumstein, C. and Green, R. (2002) 'The California Electricity Crisis: Editors' Introduction' *Journal of Industry, Competition and Trade*, 2:1/2, Netherlands: Kluwer Academic Publishers, pp. 5-8.

Bogradus, E. S. (2003) 'Methods of Interviewing', pp 84-89 in Fielding, N. (ed.) *Interviewing*, Volume I, London: SAGE Publications Ltd.

Boisseleau, F. and Jansen, J. (2005) Interconnecting the Electricity Grids of the Gulf Region Countries: Beyond Technical Consideration, Conference proceedings, GCC Power 2005 Conference and Exhibition, 27-29 November 2005, Doha, Qatar.

Boisseleau, F. and Jansen, J. (2006) The Creation of a Regional Market and Regulatory Issues in the GCC Countries, 15th GCC Cigre Seminar, 29-30 November 2006, United Arab Emirates.

Bowring, J. (2006) 'The PJM Market', *Electricity Market Reform: An International Perspective*, Edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Oxford: Elsevier Limited, pp. 452-477.

Brent, R. J. (2006) *Applied Cost-Benefit Analysis*, Second Edition, Cheltenham: Edward Elgar Publishing Limited.

Breyer, S. (1990) 'Regulation and Deregulation in the United States: Airlines, Telecomunications and Antitrust', *Regulation or Re-regulation? Regulatory Reform in Europe and the United States*, Edited by Giandomenico Majone, London: Printer Publishers Limited, pp. 7-58.

Brousseau, É. (2008) 'Contracts: From Bilateral Sets of Incentives to the Multi-Level Governance of Relations', A Guidebook, edited by Éric Brousseau and Jean-Michel Glachant, New York: Cambridge University Press, pp. 37-66.

Bruneekreeft, G. (2003) *Regulation and Competition Policy in the Electricity Market; Economic Analysis and German Experience*, Baden-Baden: Nomos Verlagsgesellschaft.

Bryman, A. (1988) *Quantity and Quality in Social Research,* London: Unwin Hyman.

Buiter, W. (2003) 'Structural Reform Needs in the Candidate Countries', *Structural Reforms in the Candidate Countries and the European Union*, edited by Heinz Handler, Austrian Ministry for Economic Affairs and Labour – Economic Policy Center, Vienna: Austrian Federal Ministry for Economic Affairs and Labour, Economic Policy Section, pp. 14-27.

Bunn, D. W. and Oliveira, F. S. (2003) 'Evaluating Individual Market Power in Electricity Markets via Agent-Based Simulation', *Annals of Operation Research* 121, pp. 57-77.

Census Horizons (2004) February/ March 14th Edition, Ministry of National Economy, Sultanate of Oman.

Central Bank of Kuwait Economic Report (2003), http://www.cbk.gov.kw/www/index.html [Accessed on 02/09/04].

CBO Reports (2001-2010) Central Bank of Oman, http://www.cbo-oman.org/pub_annual.htm [Accessed on 12/09/11].

Chisari, O., Estache, A. and Romero, C. (1999) 'Winners and Losers from the Privatisation and Regulation of Utilities: Lessons from a General Equilibrium Model of Argentina' *The World Bank Economic Review*, Vol. 13, No. 2, pp. 357-378, The International Bank for Reconstruction and Development, the World bank.

Coase, R (1937) 'The Nature of the Firm', *Economica*, New Series, Vol. 4, No. 16 "Nov., 1937" pp 386 – 405.

Cunneen, J. (2003) Meeting with John Cunneen, Regulatory Specialist, Ministry of National Economy, 7 December 2003, Muscat, Sultanate of Oman.

Cunneen, J. (2004) Meeting with John Cunneen, Regulatory Specialist, Ministry of National Economy, 14 April 2004.Muscat, Oman.

Cunneen, J. (2007) Meeting with John Cunneen, Executive Director and Board Member, Authority for Electricity Regulation (AER) – Oman, 20 June, 2007, AER Office, Muscat, Sultanate of Oman.

Cunneen, J. (2008) Based on personal communications from John Cunneen - Executive Director, AER-Oman, received on 26 January 2008

Damsgaard N. and Green. R. (2005) Regulatory Reform in the Swedish Electricity Industry – Good or Bad?, Studieförbundet Näringsliv och Samhalle (the Swedish Center for Business and Policy Studies), Stockholm: Elanders Gotab.

Damsgaard N. and Green. R. (2005) Regulatory Reform in the Swedish Electricity Industry – Good or Bad?, Studieförbundet Näringsliv och Samhalle (the Swedish Center for Business and Policy Studies), Stockholm: Elanders Gotab.

Debreu, G., Neuefeind, W. and Trockel, W. (2001) *Economics Essays: A Festschrift for Werner Hildenbrand*, 'The Economics for Network Industries' by Günter Knieps. New York: Springer-Verlag Berlin Heidelberg, pp. 275-293.

DEWA (2007) Dubai Electricity and Water, UAE, http://www.dewa.gov.ae/ [Accessed on 27/07/07].

Doha Stock Exchange (2004), AME Info, Qatar Electricity and Water, http://www.ameinfo.com/financial_markets/Qatar/Company_QA0007 [Accessed on 30/08/04].

Domah, P. and Pollitt, M. (2001) 'The Restructuring and Privatisation of Electricity Distribution and Wales: A Social Cost-Benefit Analysis', Fiscal *Studies*, vol. 22, no. 1, Institute for Fiscal Studies, pp. 107-146.

Doukas, H., Patlitzianas, K., Kagiannas, A. and Psarras, J. (2006), 'Renewable energy sources and rationale use of energy development in the countries of GCC: Myth or reality?', *Renewable Energy*, Vol. 31, Elsevier Ltd., pp. 775-770.

Dyner, I., Arango, S. and Larsen, E. (2006) 'Understanding the Argentinean and Colombian Electricity Markets', *Electricity Market Reform: An International Perspective*, Edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Oxford: Elsevier Limited, pp. 595-616.

ECRA (2007) The Electricity & Co-generation Regulatory Authority of Saudi Arabia, http://www.ecra.gov.sa/english/links.htm# [Accessed on 05/07/07]

ECRA Annual Report (2007) 2006 Annual Report, Electricity & Cogeneration Regulatory Authority-Saudi Arabia, June 2007, Riyadh: King Fahad Library.

Economist.com (2004) Country Briefings-Saudi Arabia, Economic Data, http://www.economist.com/countries/SaudiArabia/profile.cfm?folder=folder%2DEconomic%20Data [Accessed on 30/08/04].

EIA (2007) Energy Information Administration: Official Energy Statistics from US. Government, Country Analysis Briefs, http://www.eia.doe.gov/emeu/cabs/contents.html [Accessed on 17/07/08].

Eising, R. (2002) 'Policy Learning in Embedded Negotiations: Explaining EU Electricity Libralisation' *International Organisation*, Vol. 56, No. 1 (Winter 2002), Cambridge, Massachusetts: The MIT Press, pp. 85-118.

Electricity and Related Water Sector Privatisation Report (1999), Phase I/II report, Submitted to the Ministry of National Economy, Government of Oman by the consortium of: ABN-AMRO Bank, DENTON HALL, Mott MacDonald, September 1999.

Elhiraika, A. and Hamed, A. (2007) ‘Explaining Growth in an Oil-Dependent Economy: The Case of the United Arab Emirates, *Explaining Growth in the Middle East*, Edited by Jeffery B. Nugent and M. Hashem Pesaran, Oxford: Elsevier, pp. 359-411.

ERGEG (2007) European Regulators Group for Electricity and Gas, http://www.ergeg.org/portal/page/portal/ERGEG_HOME/ERGEG [Accessed on 27/07/07]

European Commission (2004) Third benchmarking report on the implementation of the internal electricity and gas market, Brussels: Commission of the European Communications, 1 March 2004.

EU Directive 96/92/EC (1996) EU Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity, Official Journal L 27, 30 January, 1997, Brussels: EC, pp.20-29.

EU Directive 2003/54/EC (2003) EU Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, Official Journal L 176 , 15 July 2003, Brussels: EC, pp. 37-56.

Evans, J. and Green, R. (2005) Why Did British Electricity Prices Fall After 1998?, Institute for Energy Research and Policy, University of Birmingham, Jully 2005, http://www.hks.harvard.edu/hepg/papers/Green.Evans.British.Electricity.Prices.Fall.1998.pdf [Accessed on 07/02/09]

Facts & Figures (2003) Facts & Figures, Information & Publication Center, Ministry of National Economy (Oman), May 2003, Muscat, Sultanate of Oman.

Facts & Figures (2002) Facts & Figures, Ministry of Housing, Electricity and Water -Oman, Muscat, Sultanate of Oman.

Fasano U. and Iqbal Z. (2002) 'Common Currency: GCC Countries Face Fundamental choices as they head for monetary union', Finance Development, International Monetary Fund, December 2002, Volume 39, Number 4, http://www.imf.org/external/pubs/ft/fandd/2002/12/fasano.htm [Accessed on 01/09/04]

Federal Network Agency (2007) Federal Network Agency for Electricity, Gas, Telecommunication, Post and Railway - Germany, http://www.bundesnetzagentur.de/enid/2.html [Accessed on 26/07/07].

Fraser, J. (2005) Lessons from the Independent Private Power Experience in Pakistan, May 2005, Energy and Mining Sector Board Discussion Paper No. 14, May 2005, the World Bank Group, Washington, DC.

Fudenberg, D. and Tirole, J. (1992) *Game Theory*, Cambridge, Massachusetts: The MIT Press.

Garrouste, P. and Saussier, S. (2008) 'The Theories of the Firm', A Guidebook, edited by Éric Brousseau and Jean-Michel Glachant, New York: Cambridge University Press, pp. 23-36.

GCC Accomplishments (2006) "Movement and accomplishments after 25 years", GCC Secretariat General, Riyadh: G.C.C. Printing Press (in Arabic).

GCC Charter and Procedures (1991) The Cooperation Council – Charter, the Supreme Council – Rules of Procedure, the Ministerial Council – Rules of Procedure, and the Commission for the Settlement of Disputes – Rules of Procedure, GCC Secretariat General, Riyadh: G.C.C. Printing Press.

GCC-CIGRE (2005) GCC-CIGRE Statistical Bulletin 2005, GCC Regional Committee for Large Electric Systems: Doha (Qatar).

GCC Common Custom Law (2003) Common Custom Law of the GCC States Rules of the Implementation and Explanatory Notes Thereof, GCC Secretariat General, Riyadh: G.C.C. Printing Press.

GCC Economic Agreement (2004) The Economic Agreement Between the GCC States: Adopted by the GCC Supreme Council (22nd Session; 31 December 2001) in the City of Muscat, Sultanate of Oman, GCC Secretariat General, Riyadh: G.C.C. Printing Press

GCC Customs Implementation Procedures (2003) Implementation Procedures For the Customs Union of the Cooperation Council for the Arab States of the Gulf (The GCC Customs Union), GCC Secretariat General, Riyadh: G.C.C. Printing Press.

GCCIA Articles of Association (1999) GCC Interconnection Authority Articles of Incorporation: Articles of Association of the GCC Interconnection Authority – The Bylaws of the GCC Interconnection Authority, 16 June 1999, Al Riyadh, Saudi Arabia (in Arabic).

GCCIA (2003) 'GCC Electrical Interconnection Grid: Market Study Report', Gulf Cooperation Interconnection Authority – GCCIA, Gulf Investment Corporation, SNC-Lavalin and WHITE & CASE, October 2003.

GCCIA (2006) GCC Interconnection Authority Annual Report 2006, GCC Interconnection Authority, Saudi Arabia (in Arabic).

GCCIA (2009) GCC Interconnection Authority News and Events, http://www.gccia.com.sa/ [Accessed on 20/05/09].

GCC Ministers Meeting (2004) 'US$1.1 Billion cost of GCC electricity Interconnection' *Oman* Newspaper, issue 8377, 9 May 2004, p. 13.

GCC Statistical Bulletin (2006) The Cooperation Council for the Arab States of the Gulf (GCC), Information Canter – Statistical Department, Volume-Fifteen, September 2006, Riyadh, Saudi Arabia.

GCC Statistical Bulletin (2007) The Cooperation Council for the Arab States of the Gulf (GCC), Information Center – Statistical Department, Volume-Sixteen, October 2007, Riyadh, Saudi Arabia.

GCC Statistical Bulletin (2008) The Cooperation Council for the Arab States of the Gulf (GCC), Information Center – Statistical Department, publication pending, Riyadh, Saudi Arabia.

GCC Uniform Insurance Law (2005) "Uniform Law for Extending Insurance Protection for GCC Nationals Working in Other GCC member countries", GCC Secretariat General, Riyadh: G.C.C. Printing Press (in Arabic).

Gilardi, F., Jordana, J. and Levi-Faur, D. (2006) 'Regulation in the age of globalisation: the diffusion of regulatory agencies across Europe and Latin America', *Privatisation and Market Development: Global Movements in Public Policy Ideas*, Edited by Graeme Hodge, Cheltenham: Edward Elgar Publishing Limited, pp. 127-143.

Gilbert, N. (ed.) (1993) *Researching Social Life*. London: SAGE Publications Ltd.

Gillham, B. (2000) *The Research Interview*, London: Continuum.

Glachant J. and Pignon V. (2004) 'Nordic Electricity Congestion's Arrangement as a model for Europe: Physical Constraints or Operators' Opportunism', The Cambridge-MIT Institute, CMI Working Paper 20.

Glachant, J. and Leveque, F. (2006) 'Electricity Internal Market in the European Uninion: What to do Next?', Cambridge Working Paper (CWPE 0623 and EPRG 0605), Cambridge: University of Cambridge.

Glessner G., Miller, K. and Al Nassay, A. (2007) ADWEC (Winter 2006/2007): Electricity Demand Forecast 2007-2020, Presented at Power-Gen Middle East 2007, 22-24 January 2007, Bahrain International Exhibition Centre. Manamah, Bahrain.

Glynn, D. (1997) 'Electricity: Competition for Small Accounts After 1998', *Regulating Utilities: Broadening the Debate*, Introduced and edited by Professor M. E. Beesley, Readings 46, The Institute of Economic Affairs in association with the London Business School, Trowbridge, Wiltshire: Redwood Books, pp.133-152.

GOIC (2003) The Economies of the Gulf Cooperation Council Member States: Performance and Future Outlook, Gulf Organization for Industrial Consultancy, Doha, Qatar

GOIC (2006) GOIC Gulf Statistics Profile: the Knowledge you Need, Gulf Organisation for Industrial Consultancy, August 2006, Doha, Qatar.

GOIC (2007) GOIC Gulf Statistics Profile: the Knowledge you Need, Gulf Organisation for Industrial Consultancy, August 2007, Doha, Qatar.

Gönenç R., Maher M. and Nicoletti G. (2001) 'The Implementation and the Effects of Regulatory Reform: Past Experience and Current Issues', *OECD Economic Studies* No. 32, 2001/I.

González-Díaz, M. and Vázquez, L. (2008) 'Make-or-Buy Decisions: A New Institutional Economics Approach', A Guidebook, edited by Éric Brousseau and Jean-Michel Glachant, New York: Cambridge University Press, pp. 255-271.

Graham, C. (2000) *Regulating Public Utilities: A constitutional Approach*, Oxford: Hart Publishing Ltd.

Green, R. (2006) ‘Investment and generation capacity’, *Competitive Electricity Markets and Sustainability*, Edited by François Lévêque, Edward Elgar, Cheltenham: pp. 21-53.

Green, R. (1997) ‘Utility Regulation- A Critical Path for Revising Price Controls’, Viewpoint, the World Bank Group. Finance, Private Sector, and Infrastructure Network, Note No. 133.

Green, R. (1998) ‘England and Wales–A Competitive Electricity Market?’, PWO-060, Part of the working papers series of the Program on Workable Energy Regulation (POWER), Berkeley: University of California Energy Institute.

Green, R. (1999) ‘Checks and Balances in Utility Regulation-The U.K. Experience’, Viewpoint, the World Bank Group. Finance, Private Sector, and Infrastructure Network, Note No. 185.

Green, R. (2000) ‘Trading Electricity between Regions’, *the Utilities Journal*, pp.40-41

Green, R. (2001) ‘Markets for Electricity in Europe’. *Oxford Review of Economic Policy*, Vol. 17, No. 3, Oxford: Oxford University Press, pp. 329-345.

Green, R. (2005) 'Restructuring the Electricity Industry in England and Wales', *Electricity Deregulation: Choices and Challenges*, edited by Griffin, J. and Puller, S., The University of Chicago Press, Chicago: pp. 98-141

Green, R., Lorenzoni, A., Perez Y. and Pollitt, M. (2006) 'Benchmarking Electricity Liberalisation in Europe', Cambridge Working Paper (CWPE 0629 and EPRG), Cambridge: University of Cambridge.

Green, R. and McDaniel, T. (1998) 'Competition in the Electricity Supply: Will '1998' Be Worth It?', *Fiscal Studies*, Vol. 19, non. 3, pp. 273-293.

Green, R. and Newbery, D. M.(1997) 'Competition in the Electricity Industry in England and Wales', *Oxford Review of Economic Policy*, Oxford: Oxford University Press, Vol. 13, No. 1, pp. 27-46.

Green, R. and Trotter, SD. (2003) 'Electricity Regulation', *Regulatory Review 2002/2003*, Centre for the Study of Regulated Industries (CRI), Edited by Peter Vass, Compiled by Jan Marchant, Bath: the University of Bath, pp.21-53.

Griffin, J. and Puller, S. (2005), *Electricity Deregulation*, the University of Chicago Press, Chicago.

Gulf Daily News (2007) 'Al Ezzel plant set to meet Bahrain's power needs', *Gulf Daily News: the Voice of Bahrain*, Friday 22 June 2007, Vol. No. 94: Manama (Bahrain), http://www.gulf-daily-news.com/1yr_arc_Articles.asp?Article=185811&Sn=BUSI&IssueID=30094&date=6/22/2007 [Accessed on 23/06/07].

Gulf Daily News (2007a) 'Consortium completes Jubail project resource financing', *Gulf Daily News: the Voice of Bahrain*, Friday, 22 June 2007, Vol. No. 94: Manama (Bahrain), http://www.gulf-daily-news.com/1yr_arc_Articles.asp?Article=185820&Sn=BUSI&IssueID=30094&date=6/22/2007 [Accessed on 23/06/07].

Gulf Daily News (2007b) 'New authority for electricity and water', *Daily News: the Voice of Bahrain*, Friday, 22 June 2007, Vol. No. 267: Manama (Bahrain), http://www.gulf-daily-news.com/ArchiveNewsDetails.aspx?date=12/12/2007&storyid=202672 [Accessed on 10/10/08].

Gulf News (2008) Soaring food prices and rents spur Oman inflation to fresh record, 16 June, 2008, http://www.gulfnews.com/business/Economy/10221603.html [Accessed on 28/10/08]

Gulf Time (2007) ‘UAE may be next to end dollar peg, forwards indicate’, Wednesday, 6 June, 2007, Doha, Qatar, http://www.gulf-times.com/site/topics/article.asp?cu_no=2&item_no=153452&version=1&template_id=48&parent_id=28 [Accessed on 14/07/07]

Haas, R., Glachant, J., Keseric, N. and Perez, Y. (2006) ‘Competition in the Continental European Electricity Market: Despair or Work in Progress?’ *Electricity Market Reform: An International Perspective*, Edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Oxford: Elsevier Limited, pp. 265-315.

Hasan, M. and Alogeel, K. (2008) ‘Understanding the Inflationary Process in the GCC Region: The Case of Saudi Arabia and Kuwait’, IMF Working Paper (WP/08,193), International Monetary Fund, Authorised for distribution by Klaus Enders on August 2008 (electronic format).

Harara, H. (2009) 'Restructuring the Electricity Supply Industry in the Kingdom of Bahrain and its implications for a Unified GCC Structure', PhD Thesis, University of Hull.

Harris, C. (2006) *Electricity markets: Prising, Structure and Economics*, Chichester, West Sussex: John Wiley & Sons Ltd.

Haselip, J. (2005) ‘Renegotiating Electricity Contracts after an Economic Crisis and Currency Devaluation: The Case of Argentina’, *the Electricity Journal*, Vol. 18, Issue 3, April 2005, Elsevier Inc., New York: pp. 78-88.

Hogan, W. W. (1998) ‘Competitive Electricity Markets: A Wholesale Primer’, Center for Business and Government, John F. Kennedy School of Government, Harvard University, Cambridge, Massachusetts.

Hunt, S. (2002) *Making Competition Work in electricity*, John Wiley & Sons, Inc., New York.

Hunt, S. (2002a) ‘The State of U.S. Electricity Restructuring’, *the Electricity Journal*; June 2002, Elsevier Inc., New York: pp. 11-19.

Hunt, S and Shuttleworth, G. (1996) *Competition and Choice in Electricity*, John Wiley & Sons Ltd, West Sussex: Bookcraft (Bath) Ltd.

Husain, S. (2007) ‘Abu Dhabi signs energy deal with Japan-UK group’, 2 August 2007, GULFNEWS.COM, UAE, http://archive.gulfnews.com/articles/07/08/03/10143818.html [Accessed on 5/08/07]

HUT Systems Analysis Laboratory (2009) ‘Decision making’, Helsinki University of Technology, Systems Analysis Laboratory, Multiple Criteria Decision Analysis E-learning Site, http://www.mcda.hut.fi/ [Accessed on 16/02/09]

IMF Country Report No. 04/186 (2004) ‘Kuwait: 2003 Article IV Consultation-Staff Report; Public Information Notice on the Executive Board Discussion; and statement by the Executive Director for Kuwait’, International Monetary Fund, June 2004, http://www.imf.org/external/pubs/ft/scr/2004/cr04186.pdf [Accessed on 03/09/04]

IMF Country Report No. 09/120 (2009) ‘United Arab Emirates: Statistical Appendix’, International Monetary Fund, April 200, http://www.imf.org/external/pubs/ft/scr/2009/cr09120.pdf [Accessed on 10/06/09]

IMF Press Release No. 07/243 (2007) IMF Managing Director Rato Commends on GCC Countries' Domestic Policies and Calls for an Accelerated Implementation of the Remaining Steps Towards Achieving Monetary Union, International Monetary Fund, October 27, 2007, http://www.imf.org/external/np/sec/pr/2007/pr07243.htm, [Accessed on 16/11/07].

IMF PIN No.02/99 (2002) 'IMF Concludes 2002 Article IV Consultation with Qatar', Public Information Notice (PIN) No.02/99, September 10, 2002, http://www.imf.org/external/np/sec/pn/2002/pn0299.htm [Accessed on 01/09/04]

International Herald Tribune (2008) 'EU governments compromise energy deregulation', International Herald Tribune: The Global Edition of the New York Times, 10 October 2008, http://www.iht.com/articles/ap/2008/10/10/business/EU-EU-Energy-Markets.php [Accessed on 12/11/08]

International Power (2007) International Power Consortium signs Power and Water Purchase Agreement for Al Hidd project, Bahrain, http://production.investis.com/ipplc/media/newsreleases/2006/2006-01-23a/ [Accessed on 07/07/07]

Irwin, T. and Yamamoto, C. (2004) Some Options for Improving the Governance of State-owned Electricity Utilities, Energy and Mining Sector Board Discussion Paper No. 11, February 2004, The Energy and Mining Sector Board, The World Bank.

Jamasb, T. (2006) 'Between the state and market: Electricity sector reform in developing countries', *Utilities Policy*, Vol. 14, Elsevier Ltd., pp.14-30.

Jamasb, T., Mota, R., Newbery, D. and Pollitt, M. (2005) 'Electricity Sector Reform in Developing Countries: A Survey of Empirical Evidence on Determinants and Performance', World Bank Policy Research Working Paper 3549, March 2005 (electronic format).

Jamasb, T, and Pollitt, M. (2005) 'Electricity Market Reform in the European Union: Review of Progress toward Liberalisation & Integration, The Energy Journal, European Energy Liberalisation Special Issue, IAEE, pp. 11-41.

John, S. (2007) 'Single Gulf currency faces delay', *Khaleej Times Online,* 8 June 2007, http://www.khaleejtimes.com/DisplayArticleNew.asp?section=business&xfile=data/business/2007/june/business_june219.xml [Accessed on 14/07/07]

Jones, L., Tandon, P. and Vogelsang, I. (1990) Selling Public Enterprises: A Cost-Benefit Methodology, Cambridge, Massachusetts: The MIT Press.

Joskow, P. L. (2001) 'California's Electricity Crisis', *Oxford Review of Economic Policy*, Vol. 17, No. 3, Oxford: Oxford University Press, pp. 365-388

Joskow, P. L. (2005) 'The Difficult Transition to Competitive Electricity Markets in the United States', *Electricity Deregulation* edited by James M. Griffin and Steven L. Puller, Volume IV in the Bush School Series in the Economics of Public Policy, the University of Chicago Press, Chicago: pp. 31-93.

Joskow, P. L. (2006) 'Electricity Sector Liberalization: Lessons Learned from Cross-Country Studies', *Electricity Market Reform: An International Perspective*, Edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Oxford: Elsevier Limited, pp. 1-48.

Jovanović, M. (1997) *European economic integration: Limits and prospects*, London: Routledge.

Katz, M. L. and Rosen, H. S. (1998) *Microeconomics, Third Edition*. Massachusetts, Boston: Irwin McGraw-Hill.

Kay, J. (1996) ‘The future of UK Utility Regulation’, *Regulating Utilities: A Time For Change?*, Edited by M E Beesley, The Institute of Economic Affairs in association with the London Business School, IEA Readings 44, Bournemouth: Bourne Press, pp.145-175.

Kay, J. and Vickers, J. (1990) ‘Regulatory Reform: An Appraisal’, *Regulation or Re-regulation? Regulatory Reform in Europe and the United States*, Edited by Giandomenico Majone, London: Printer Publishers Limited, pp. 223-251.

Kennedy, D. (2003) ‘Liberalisation of the Russian power sector’, *Energy Policy*, Elsevier ltd, Vol. 31, pp. 745-758.

Kerr, S. (2007) ‘Kuwait abandons US dollar peg’, FT.com Friday July 13, 2007, http://www.ft.com/cms/s/9d84e376-06ef-11dc-93e1-000b5df10621.htm [Accessed on 14/07/07]

Khaleej Times (2009) ‘Riyadh Wants to Know Reasons for UAE’s Reservation over GCC Central Bank HQ’, *Khaleej Times Online*, 14 May 2009, http://www.khaleejtimes.com/DisplayArticleNew.asp?col=&section=middleeast&xfile=data/middleeast/2009/May/middleeast_May247.xml [Accessed on 14/05/09]

Klodt, H. (1997) ‘Regulation of Privatised Networks: The Case of Telecommunication’, *Privatisation at the End of the Century*, Edited by Herbert Giersch, Heidelberg: Springer-Verlag Berlin, pp. 297-321.

Kuna (2007) ‘CBK Governor: Unpegging Dinar to US Dollar was not over-due’, Kuwait News Agency (KUNA), 1 July 2007, http://www.kuna.net.kw/NewsAgenciesPublicSite/ArticleDetails.aspx?id=1759045&Language=en&searchtext=dinar%20peg [Accessed on 03/07/07]

Krueger, R. (1994, 2nd ed.) *Focus Groups: A Practical Guide for Applied Research*, Thousand Oaks, California: SAGE Publications, Inc.

Kuwait Data Profile (2008) The World Bank Group, http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=&REPORT_ID=9147&REQUEST_TYPE=VIEWADVANCED&HF=N/CPProfile.asp&WSP=N [Accessed on 10/10/08]

Kuwait Electricity Law (2010) Law No. 39 of 2010 Promulgating the Incorporation of Kuwaiti Joint Stock Companies to Undertake the Building and Execution of Electricity Power and Water Desalination Stations in Kuwait issued on 20 June 2010.

Kuwait News Agency (2007) 'More power to cope with extra summer demand', *Kuwait Times*, 1 July, 2007, available on website: www.kuwaitimes.com. [Accessed on 6/08/07]

Lamech, R. and Saeed, K. (2003) What International Investors Look For When Investing In Developing Countries, Results from a Survey of International Investors in the Power Sector, Energy and Mining Sector Board Discussion paper No.6, May (2003), The Energy and Mining Sector, The World Bank: Washington, DC.

Levy, B. and Spiller, P. (1996) 'the regulatory problem: A framework', *Regulations, Institutions, and Commitment*, Edited by Brian Levy and Pablo T. Spiller, pp. 1-35, Cambridge: Cambridge University Press.

Littlechild, S. (1983) Regulation of British Telecommunications' Profitability: report to the secretary of state, February (1983), London: Department of Industry.

Littlechild, S. (1986) Economic Regulation of Privatised Water Authorities: A report submitted to the Department of the Environment, 25 January 1986, London: Her Majesty's Stationery Office, pp. 1-40.

Littlechild, S. (1995) 'Competition in Electricity: Retrospect and Prospect', *Utility Regulation: Challenges and Response*, Edited by M E Beesley, The Institute of Economic

Affairs in association with the London Business School, IEA Readings 42, Bournemouth: Bourne Press, pp. 101-122.

Littlechild, S. (1997) 'Comment on the Regulation of Privatised Networks: The case of Electricity Industry', *Privatisation at the End of the Century*, Edited by Herbert Giersch, Heidelberg: Springer-Verlag Berlin, pp. 323-327.

Littlechild, S. (2006) 'Forward: The Market versus Regulation', *Electricity Market Reform: An International Perspective*, Edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Oxford: Elsevier Ltd., pp. xvii-xxix.

Littlechild, S. (2007) 'Beyond Regulation', *Utility Regulation in Competitive Markets: Problems and Progress*, edited by Colin Robinson, Cheltenham: Edward Elger Publishing Inc., pp. 7-36.

Lipworth, S. (1993) 'Utility Regulation and the Monopolies an Mergers Commission: Rertospect and Prospect', Major Issues in Regulation, Discussed by Professor John Kay, Introduced and edited by M.E. Beesley, Institute of Economics Affairs in association with London Business School, Bournemouth, Dorset: Bourne Press, pp. 39-61.

London Economics Report (2007) Assessment of Electricity Sector Reform in Oman, Report for the Ministry of National Economy - Sultanate of Oman, Prepared by London Economics in association with Herbret Smith LLP and London Power Associates Ltd, June 2007 (electronic format).

Map of the GCC (2007) Middle East Reference Map, Perry-Castanea Library Map Collection, University of Texas at Austin, http://www.lib.utexas.edu/maps/middle_east_and_asia/middle_east_ref04.jpg [Accessed on 14/07/07]

Marafiq (2007) Power and Water Utility Company for Jubail and Yanbu, http://www.marafiq.com.sa/e_profile.htm [Accessed on 04/07/07]

Mayer, C. (1994) ‘The Regulation of the Water Industry: An Interim Assessment’, *The Way Forward*, edited by M E Bessley, The Institute of Economic Affairs in association with the London Business School, IEA Readings 41, Bournemouth, Dorset: Bourne Press, pp. 23-35.

McDonald, F. and Dearden, S. (2005) ‘The origins and development of the European Union’, *European Economic Integration,* edited by Frank McDonald Harlow: Pearson Education Limited, pp. 1-35.

McDonald F. (2005) ‘Market integration in the European Union’, *European Economic Integration*, edited by Frank McDonald Harlow: Pearson Education Limited, pp. 39-74.

MHEW Annual Reports (1997-2004) Ministry of Housing, Electricity and Water, Reports 1997-2004, MHEW, Sultanate of Oman.

Midtun, A., Handeland, J. and Omland, T. (2003) 'The Nordic public ownership model under transition to market economy: the case of electricity', *Competition in European Electricity Markets: A Cress-country Comparison*, edited by Jean-Michael Glachant and Dominique Finon, Edward Elgar Publishing Limited, Cornwall: MPG Books Ltd, pp. 133-166.

Miller, K., Akhtar M. and Fakhar, N. (2005) The Prospects for Electricity Trade Between the GCC Countries, Power Transmission & Distribution Forum, 6-7 March 2005, Dubai International Exhibition Centre, Dubai, UAE.

MOF Budget (2011) The State General Budget for the Financial Year – 2011, Ministry of Finance, Directorate General of Budget and Contracts, Sultanate of Oman (also available electronically from www.mof.gov.om).

Molle, W. (2001) *The Economics of European Integration: Theory, Practice, Policy*, Aldershot: Ashgate Publishing Limited.

Moody's PWP Report (2007) Oman Power and Water Procurement Co. SAOC.: Sultanate of Oman, Analysis, Moody's Investment Service, Moody's Global Corporate Finance, October 2007 (electronic format), available at www.moodys.com.

Moore, M. C. (2002) 'The Issue of Governance and the Role of the Regulator: Lessons from the California Deregulation Experiment', *Journal of Industry,* Competition and Trade, 2:1/2, Netherlands: Kluwer Academic Publishers, pp. 75-90.

Morgan, D.L. (1997, 2nd ed.) *Focus Groups as Qualitative Research*, London: Sage.

Motta, M. (2009) *Competition Policy, Theory and Practice,* New York: Cambridge University Press.

Moussa, A. (2010) Sector Report, Power Saudi Arabia, Produced by Sharif Moussa, Senior Trade & Investment Officer, British Trade Office, March 2010 (also available in electronic format from http://www.ukti.gov.uk).

Mustafa, M. (2002) Benchmarking Regulators: Making Telecom Regulators More Effective in the Middle East, Public Policy for the 'private sector', the World Bank Group Private Sector and Infrastructure Network, Note Number 247, June 2002, the World Bank Group, Washington, DC.

NAO (2003) 'The New Electricity Trading Arrangements in England and Wales', Report by the Comptroller and Auditor General, HC 624 Session 2002-2003: 9 May 2003, The Stationary Office, London.

Nash, J. F., Jr. (1996) *Essays on Game Theory*, Cheltenham: Edward Elgar Publishing Limited, pp. 1-8.

Neumann, J. and Morgenstern, O. (1974) *Theory of Games and Economic Behaviour,* Eleventh printing, Princeton, N. J.: Princeton University Press.

Newbery, D. (1995) 'Power Markets and Market Power', *The Energy Journal*, Vol. 16, No. 3, pp. 39-61.

Newbery, D. (1999) *Privatisation, Restructuring, and Regulation of Network Utilities: the Walras-Pareto Lectures*, at the Ecole des Haudes Etudes Commerciales, Universite de Lausanne. Cambridge, Massachusetts: The MIT Press.

Newbery, D. (2006) 'Electricity Liberalization in Britain and the Evolution of Market Design', *Electricity Market Reform: An International Perspective*, edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Elsevier Ltd., Oxford: pp. 109-143.

Newbery, D. and McDaniel, T. (2003) 'Auctions and trading in energy markets – an economic analysis', *Regulatory Review 2002/2003,* Centre for the Study of Regulated Industries (CRI), Edited by Peter Vass, Compiled by Jan Marchant, Bath: the University of Bath, pp. 195-234.

Newbery, D. and Pollitt, M. (1997) 'The Restructuring and Privatisation of Britains's CEGB-Was it Worth it?' *The Journal of Industrial Economics*, Volume 45, September 1997, No. 3, Oxford: Blackwell Publishing, pp. 269-303.

Ng, Yew-Kwang (1983) *Welfare Economics: Introduction and Development of Basic Concepts*, London: The Macmillan Press Ltd.

Nord-pool-spot (2007) The Nordic model; Nord Pool Spot AS physical markets play a number of important roles, http://www.nordpoolspot.com/PowerMaket/ [Accessed on 26/07/07]

Nugent, J., Pesaran, M. (2007) 'Introduction: Explaining Growth in the Midle East', *Explaining Growth in the Mildle East*, Edited by Jeffery B. Nugent and M. Hashem Pesaran, Oxford: Elsevier, pp. 1-27.

Nye, J. (2008) 'Institutions and Institutional Environment', A Guidebook, edited by Éric Brousseau and Jean-Michel Glachant, New York: Cambridge University Press, pp. 67-80.

Ocaña, C. (2001) 'Competition in Electricity Markets', Paris: OECD and the International Energy Agency.

Observer (2008) 'Dolphin Energy set to supply gas to Oman next month', *Observer* Newspaper, Vol. 27, No. 315, Wednesday, September 24, 2008, Muscat: pp.21-23.

OECD (1999a) 'Regulatory Reform in Japan: Regulatory Reform in the Electricity Industry', Paris: OECD Publications.

OECD (1999b) 'Regulatory Reform in the United States: Regulatory reform in the Electricity Industry', Paris: OECD Publications.

OECD Report (2000) 'Background Report on Regulatory Reform in Electricity, Gas and Railroads', OECD's Division for Competition Law and Policy.

OECD Report (2001a) 'Background Report on Regulatory Reform in Electricity, Gas, Road and Rail Freight', Paris: OECD Publications.

OECD (2001b) 'Energy Policies of IEA Countries', IEA Review.

OECD (2001c) 'Regulatory Reform in Italy: Regulatory Reform in Electricity, Gas, and Railroads'.

OECD (2002) 'United Kingdom Reviews of Regulatory Reform: Challenges at the Cutting Edge', Paris: Organisation for Economic Co-operation and Development (OECD) Publications.

OECD (2005) 'OECD Economic Survey of Brazil 2005: Regulation of the Electricity Sector', Chapter 3, Paris: Organisation for Economic Co-operation and Development (OECD) Publications (also available in electronic format from www.oecd.org).

OETC Annual Report (2005) Oman Electricity Transmission Company SAOC Annual Report 2005, Muscat: pp. 1-32.

Ofgem Corporate Stratagy (2008) Corporate Stategy and Plan 2008-2013, Decision Document Ref: 34/08, 31 March 2008 (electronic format), http://www.ofgem.gov.uk [Accessed on 10/04/08]

Ofgem Market Review (2004) Domestic Competitive Market Review 2004, Office of gas and Electricity Markets, United Kingdom, 9 April 2004 (electronic format), http://www.ofgem.gov.uk [Accessed on 10/04/08]

Ofgem Supply Probe Report (2008) 'Energy Supply Probe – Initial Findings Report', Office of gas and Electricity Markets, United Kingdom, 6 October 2008 (electronic format), http://www.ofgem.gov.uk/Markets/RetMkts/ensuppro/Documents1/Energy%20Supply%20Probe%20-%20Initial%20Findings%20Report.pdf [Accessed on 07/10/08]

Okley, A. (1981) 'Interviewing woman: a contradiction in terms', in Roberts, H. (ed) *Doing Feminist Research,* London: Routledge, pp. 30-61.

Oman Daily Observer (2007a) 'Proposals for market share restrictions in Salalah concession' *Oman Daily Observer*, Vol. 26, No. 105, Muscat: pp.21-22.

Oman Daily Observer (2007b) 'PWP floats tender for 400-MW Salalah IWPP' *Oman Daily Observer*, Vol. 26, No. 105, Muscat: pp.1-3.

Oman Daily Observer (2007c) 'Royal Decrees set up new ministries, name ministers' *Oman Daily Observer*, Vol. 26, No. 300, Muscat: p.1.

Oman Daily Observer (2008) 'Arab Electricity Regulation Forum: Al Ghubrah Power, Oman Electricity Transmission set for privatisation', *Oman Daily Observer*, Sunday, February 3, 2008, http://www.omanobserver.com/03/index.htm [Accessed on 05/02/08].

Oman Data Profile (2008) The World Bank Group, http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=&REPORT_ID=9147&REQUEST_TYPE=VIEWADVANCED&HF=N/CPProfile.asp&WSP=N [Accessed on 10/10/08]

Oman Economic Report (2003) Oman: The Development Experience and Investment Climate, 4th Edition -2003, Ministry of National Economy (Oman), Muscat, Sultanate of Oman.

Omani Electricity Law (2004), Royal Decree 78/2004 issued on 20 July 2004'Law for the Regulation and Privatisation of the Electricity & Related Water Sector', Official Gazette Issue 772 on 1st August 2004, Ministry of Legal Affairs of the Sultanate of Oman, Al Wataya: Al Nahdha Printers.

Oman Fifth Five-Year Plan (1996) Royal Decree No. (1/96), Ratification of the Fifth Five-Year Development Plan (1996-2000), Official Gazette, issued 1st January, 1996, Ministry of National Economy Information & Documentation Center, Sultanate of Oman, http://www.moneoman.gov.om/vision2020.htm [Accessed on 01/09/04]

Oman Statistical Yearbook (2006) *Oman Statistical Yearbook*, Information and Publication Center, Ministry of National Economy, Thirty Fourth Issue, October 2006, Muscat, Sultanate of Oman.

Oman-UAE Electricity Memorandum (2001), The Memorandum of Understanding for the electrical connection between the two Oman and UAE signed by H.E. Sheikh Suhail Bin Mustahail Shamas, Minister of Housing and Electricity & Water in Sultanate of Oman and by H.E. Humaid Bin Naser Al Owais, Minister of Electricity & Water in United Arab Emirates, 23/12/200, Abu Dhabi, UAE. http://www.uae.gov.ae/moew/ [Accessed on 03/09/04]

PWP (2007) PWP's 7-year Statement for the Years (2007-2013), Approved by the Authority for Electricity Regulation, Oman, Oman Power and Water Procurement Co. (SAOC), December 2006.

http://www.omanpwp.co.om/OPWP_7-Year_Statement_english.pdf [Accessed on 11/07/07]

Osborne, M. (2004) *an introduction to Game Theory*, New York: Oxford University Press Inc.

Outlook of Power Sector in Oman (2002) Outlook of Power Sector in Oman, Ministry of Housing, Electricity and Water (Sultanate of Oman).

Oxford Dictionary of Economics (2002) *Oxford Dictionary of Economics*, New York: Oxford University Press Inc.

Palast, G., Oppenheim, J. and MacGregor, T. (2003) *Democracy and Regulation: How the Public can Govern Essential Services*. London: Pluto Press.

Parker, D. (2006) 'Enterprise sales: Thatcher leads the change', *Privatisation and Market Development: Global Movements in Public Policy Ideas*, Edited by Graeme Hodge, Cheltenham: Edward Elgar Publishing Limited, pp. 9-35.

Parker, D. and Kirkpatrick, C. (2006) ‘Privatisation and regulation in developing countries’, *Regulating Utilities and Promoting Competition*, edited by Colin Robinson, Cheltenham: Edward Elgar Publishing Limited, pp. 187-210.

Patlitzianas, K., Doukas, H. and Psarras, J. (2006) ‘Enhancing renewable energy in the Arab States of the Gulf: Constrains & efforts’, *Energy Policy*, Elsevier Ltd., Vol. 34, pp. 3719-3726.

Pelkmans, J. (2006) *European Integration: Methods and Economic Analysis, Third Edition*, Harlow: Pearson Education Limited.

Pfeifer, K. (2004) ‘Defining boundaries: Kuwait’s economic reconstruction, 1991-201’, *Trade Policy and Economic Integration in the Middle East and North Africa: Economic boundaries in flux*, Edited by Hassan Hakimian and Jeffrey B. Nugent. London: Routledge Curzon, pp. 207-230.

Platt, G. (2008) ‘Inflation Stalks The Gulf, Regional Report: GCC’, Global Finance, Jul/Aug 2008, Vol.22 Issue 7, pp. 26-28 (available in electronic format), http://web.ebscohost.com/ehost/pdf?vid=7&hid=117&sid=f3a634e8-1e55-4ad4-b3a6-fdd76447bab2%40sessionmgr107 [Accessed on 01/11/08]

Pollitt, M. (2008) Electricity Reform in Argentina: Lessons for developing countries, *Energy Economics*, Vol. 30, Elsevier Ltd, pp. 1536-1567.

Pollitt, M. and Smith, A. (2002) ‘The Restructuring and Privatisation of British Rail: Was It Really That Bad?’, *Fiscal Studies*, Institute for Fiscal Studies, Vol. 23, no. 4, pp. 463-502.

Qatar Electricity Statistics (2008) Electricity and Water Statistics, Annual Abstract 2006, Secretariat for development Planning, the government of Qatar, http://www.planning.gov.qa/annabs/2006/second-section/electricity-and-water/elect_water.htm [Accessed on 02/11/08]

Qatar Ministry of Economy and Commerce (2004) Qatar’s Economy, http://www.mec.gov.qa/topics/index.asp?level=1&temp_id=1&temp_type=44 [Accessed on 01/09/04]

Qatar Ministry of Foreign Affairs (2004) Economic Status, http://english.mofa.gov.qa [Accessed on 01/09/04]

Qatar Data Profile (2008) The World Bank Group, http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=&REPORT_ID=9147&REQUEST_TYPE=VIEWADVANCED&HF=N/CPProfile.asp&WSP=N [Accessed on 10/10/08]

Qatari Law No- 6/1992, 1992, Qatar Electricity and Water Corporation, http://kahramaa.com/en/ [Accessed on 30/08/04]

Qatari Insurance Law (2007) “Law No. 4 of 2007 issuing the Uniform Law for Extending Insurance Protection for GCC Nationals Working in Other GCC member countries”, 14 March 2007, Amiri Diwan, Doha, the State of Qatar (in Arabic).

QFC (2007) Qatar Financial Centre, Doha, Qatar, http://www.qfc.com.qa [Accessed on 23/07/07]

QFCRA (2007) Qatar Financial Centre Regulatory Authority, Doha, Qatar, http://www.qfcra.com/ [Accessed on 23/07/07]

RASCO Licence (1999) Abu Dhabi Company for Servicing Remote Areas (RASCO): Licence for The Generation of Electricity, Desalination of Water, and Distribution and Supply of Water and Electricity, The Regulation and Supervision Bureau for the Water and Electricity Sector in the Emirate of Abu Dhabi, 1 January 1999, Abu Dhabi, United Arab Emirates.

Raineri, R. (2006) ‘Chile: Where It All Started’, *Electricity Market Reform: An International Perspective*, edited by Fereidoon P. Sioshansi and Wolfgang Pfaffenberger, Elsevier Ltd., Oxford: pp. 77-108.

Rassenti, S. J., Smith, V. L., and Wilson, B. J. (2003) ‘Discriminatory Price Auctions in Electricity Markets: Low Volatility at the Expense of High Price Levels’, *Journal of Regulatory Economics*; 23:2, Kluwer Academic Publishers, pp. 109-123.

Reiche, K., Tenenbaum, B. and Torres de Mästle, C. (2006) Electrification and Regulation: Principles and a Model Law, Energy and Mining Sector Board Discussion Paper No. 18, July 2006, the World Bank Group, Washington D.C., pp. 1-44.

Request for proposals (2003) Tender 150/2003, Tender Board, Muscat, Sultanate of Oman.

RSB (2007) Regulation and Supervision Bureau for the water, wastewater and electricity sector in the Emirate of Abu Dhabi, http://www.rsb.gov.ae [Accessed on 20/07/07]

RSB Annual Report (2005) Annual Report 2005, Regulation and Supervision Bureau: For the water, wastewater and electricity sector in the Emirate of Abu Dhabi, Publication Number ER/P02/012, Abu Dhabi: pp.1-45.

RSB Annual Work Plan (2007) Annual Work Plan 2007, Regulation and Supervision Bureau (RSB), Abu Dhabi: pp.1-13.

RSB Review (2003) Review of Economic Regulation of RASCO from 2004: Final Proposals, Regulation and Supervision Bureau, Document No. CR/E02/019, 17 November 2003, Abu Dhabi: pp.1-73 (Electronic Format).

Ricketts, M. (2004) 'Future Lessons from Privatisation', IEA *Economic Affairs*, September 2004, Institute of Economic Affairs, Oxford: Blackwell Publishing, pp.9-14.

Robinson, C. (1996) ‘Profit, Discovery and the Rôle of Entry: The Case of Electricity’, *Regulating Utilities: A Time For Change?*, Edited by M E Beesley, The Institute of Economic Affairs in association with the London Business School, IEA Readings 44. Bournemouth: Bourne Press, pp.109-140.

Rocha, K., Camacho, F. and Bragança, G. (2007) ‘Return on Capital of Brazilian electricity distributors: A comparative analysis’, *Energy Policy,* Elsevier Ltd, Vol. 35, pp. 2526-2537.

Rochery A. and Perrin-Houdon, O. (2004) ‘UAE gets ready for interconnection’ Middle East Energy, December 2004, *Power Engineering*, http://pepei.pennnet.com/articles/article_display.cfm?article_id=218102 [Accessed on 2/08/07]

Rothwell, G. and Gómez, T. (2003) *Electricity Economics: Regulation and Deregulation*, John Wiley & Son Publication, Piscataway, New Jersey: IEEE Press.

Rubinstein, A. (1990) ‘Introduction’, *Game Theory in Economics*, Edited by Ariel Rubinstein, Hants: Edward Elgar Publishing Limited, pp. xi-xviii.

SAMA Annual Reports (2004), Saudi Arabian Monetary Agency, Annual Reports (Statistical Table), Section 5: Public Finance Statistics, Annual Government Revenues and Expenditures, http://sama.gov.sa/newreports/pdf/annual/en/section5/tab5-1.pdf [Accessed on 01/09/04]

SAMA Reports (2007) Saudi Arabian Monetary Agency, Annual Reports (Statistical Tables), Public Finance Statistics, Annual Government Revenues and Expenditure, http://www.sama.gov.sa/newreports/annual/en/section5/files/tab5-2.pdf [Accessed on 25/07/07]

Saudi Arabia Data Profile (2008) The World Bank Group, http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=&REPORT_ID=9147&REQUEST_TYPE=VIEWADVANCED&HF=N/CPProfile.asp&WSP=N [Accessed on 10/10/08]

Saudi Electricity Company (2004) 'Your Guide into investing in SEC Projects', SESCO http://www.se.com.sa/English/index.htm [Accessed on 30/08/09]

Saudi Electricity Law (2005) Electricity Law issued by Royal Decree Number M/56, 22 November 2005, Saudi Arabia (Electronic Format).

Saudi National Accounts (2004), Central Department of Statistics, Ministry of Economy and Planning, SAMA Annual Reports (Statistical Tables), Section 9: National Account.

Schramm, W. (1971) 'Notes on case studies of instructional media projects', Working paper for the Academy for Educational Development, December 1971, Washington, DC.

Shuttleworth, G. (2000) 'Opening European Electricity and Gas Markets', National Economic Research Associates; www.nera.com

SembCorp Industries (2007) 'SembUtilities acquires 40% interest in Fujairah Independent Water and Power Plant in UAE', Media Relations, SembCorp Industries, 5 July 2006, http://www.sembcorp.com.sg/AttachmentDisplay?file=/MediaRelation/Utilities/200607061.html [Accessed on 29/07/07]

Shaikh, H. (2007) 'Saudi needs SR350b investment in water and electricity sectors', Khaleej Times Online, 3 April 2007, http://www.khaleejtimes.com/DisplayArticleNew.asp?xfile=data/business/2007/April/business_April63.xml&section=business [Accessed on 12/08/07]

Shemaine, B. (2008) 'All you need to know about the GCC's first cross-border refined gas transmission project', MEED: Middle East Business Intelligence, published 19 August 2008, http://www.meed.com/feature/fast_facts/2008/08/dolphin_pipeline_fast_facts.html [Accessed on 09/09/08]

SMN Prospectus (2011) Prospectus, SMN Power Holing SAOG (Under Transformation), Sultanate of Oman, Initial Public Offering of 6,987,246 shares, September 11, 2011.

Spiller, P. and Sanny, L. (2008) 'Buy, Lobby or Sue: Interest Groups' Participation in Policy Making: A Selective Survey', New Institutional Economics: A Guidebook, edited by Éric Brousseau and Jean-Michel Glachant, New York: Cambridge University Press, pp. 307—327.

Squalli, J. and Wilson, K. (2006) 'A Bounds Analysis of Electricity Consumption and Economic Growth in the GCC', Working Paper No. 06-09, June 2006, Working Paper Series, Economic Policy Research Unit, Zayed University, UAE.

Statistics, http://www.sama.gov.sa/newreports/pdf/annual/en/section9/indexe.pdf [Accessed on 01/09/04]

Stake, R. (1995) *The Art of Case Study Research*. Thousand Oaks, California: Sage Publications.

Statistical Year Book of Oman (2006) Statistical Yearbook: 2005 - Oman, Ministry of National Economy, Sultanate of Oman, Thirty Fourth Issue - October 2006.

Stiglitz, J. E. (2000) *Economics of the Public Sector*, third edition, New York, N.Y: W.W. Norton & Company, Inc.

Stoft, S. (2002) *Power System Economics: Designing Markets for Electricity*, Piscataway, NJ: IEEE Press.

Suez Al Rusail Acquisition (2007) 'Oman-SUEZ Energy International closes financing for Barka 2 and Al-Rusail', Press Release, Suez Energy International, www.suez.com/document/?f=presse/en/2007022_Barka_financing_en.pdf [Accessed on 20/06/07].

Suez Energy International (2007) Activities around the world; Gulf States, http://www.suezenergyint.com/content/activities/middleeastasia/gulfstates.asp [Accessed on 25/06/07]

Subhani, O. (2009) 'UAE Walks Out on GCC Monetary Union', Khaleej Times Online, 20 May 2009, http://www.khaleejtimes.com/DisplayArticle08.asp?xfile=data/theuae/2009/May/theuae_May507.xml&section=theuae [Accessed on 21/05/09]

Svenska Kraftnät (2007) Svenska Kraftnät; Serving the Community, http://www.svk.se/start.aspx?id=5208 [Accessed on 26/07/07]

Swift, J. (1995) 'Regulatory Relationships Between Key Players in the Restructured Rail Industry', *Utility Regulation: Challenges and Response*, Edited by M E Beesley, The Institute of Economic Affairs in association with the London Business School, IEA Readings 42, Bournemouth, Dorset: Bourne Press, pp. 65-79.

TAQA (2007) Abu Dhabi National Energy Company PJSC (Taqa), Abu Dhabi, UAE, http://www.taqa.ae/ [Accessed on 21/07/07]

TAQA Annual Report (2007) Abu Dhabi National Energy Company (TAQA) PJSC Annual Report 2007 (electronic format), http://www.taqa.ae.assetsmanager/files/annual_reports/TAQA_Annual%20Report_2007.pdf [Accessed on 10/02/09]

Taweelah Asia Power Company (2007) Taweelah Asia Power Company (TAPCO), Abu Dhabi, UAE, http://www.tapco.ae/ [Accessed on 20/07/07]

Telson, M. (1975) ‘The Economics of Alternative Levels of Reliability for Electric Power Generation Systems’, *The Bell Journal of Economics*, Vol. 6, No. 2 (Autumn, 19975), The RAND Corporation, pp. 679-694.

The Power of Watt (2006) The Power of Watt Industry Insight; A look Into the Power Sector in the MENA Region, Produced by zawaya, Sponsored by Abu Dhabi Water & Electricity Authority, September 2006, Abu Dhabi: ADWEA/ABQZawaya, pp. 1-20.

The Statistics Book (2002) Statistics Section at the Planning & Statistics Department of the Ministry of Housing, Electricity and Water of the Sultanate of Oman. Muscat, Al-Anan Printing Press.

Times of Oman (2006) ‘Pacts on Rusayl and Barka power projects signed’, Times of Oman, 12 December 2006, http://www.timesofoman.com/archivesdetails.asp?detail=1087 [Accessed on 20/09/11]

Turvey, R. (2005) ‘Electricity regulation’, Regulatory Review 2004/2005, Centre for the Study of Regulated Industries (CRI), Edited by Peter Vass, Compiled by Jan Marchant, Bath: the University of Bath, pp. 11-40.

UAE Data Profile (2008) The World Bank Group, http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=&REPORT_ID=9147&REQUEST_TYPE=VIEWADVANCED&HF=N/CPProfile.asp&WSP=N [Accessed on 10/10/08]

UAE Ministry of Electricity and Water, 2004, http://www.uae.gov.ae/moew/ [Accessed on 03/09/04]

UAE National Accounts (2004), Ministry of Planning of the UAE, http//www.uae.gov.ae/mop/reserch/res17_tab.htm [Accessed on 30/08/04]

UAE Year Book (2004) Economic Development, pp 79-163, http://www.uaeinteract.com/uaeint_misc/pdf/English/Economic_Development.pdf [Accessed on 30/08/04]

Ugaz, C. (2003) 'Consumer participation and pro-poor regulation in Latin America', *Utility privatisation and Regulation: A fair Deal for Consumers?*, Edited by Cecilia Ugaz and Catherine Waddams Price in association with UNU World Institute for Development Economic Research (UNU/WIDER), Cheltenham: Edward Elgar, pp. 80-98.

UK Trade and Investment (2007) United Arab Emirates (UAE) Potential business opportunities in Power & Water Sector for UK companies - Status Report, UK Trade & Investment - Power Group, May 2007, http://www.eeegr.com/uploads/DOCS/67-20071122130147.pdf [Accessed on 1/03/09]

UNCTAD (2004) GDP Growth in Selected Developing and Transition Economies, 1990-2004, Trade and Development Report, 2004, United Nations Conference on Trade and Development, United Nations, http://www.unctad.org/en/docs/tdr2004_en.pdf [Accessed on 02/09/04]

Utilities Middle East (2007) 'Grid expectation: Joint GCC transmission system could save billions', *Utilities – Middle East*, June 2007, Volume I, Issue 3, pp. 20-22.

Vasconcelos, J. (2007) 'European energy liberalisation: progress and problems', *Utility Regulation in Competitive Markets, Problems and Progress*, edited by Colin Robinson, Cheltenham: Edward Elgar Publishing Limited, pp. 62-81.

Vickers, J. and Yarrow, G. (1991), "Economic Prospects on Privatisation", *The Journal of Economic Perspectives*, Vol. 5, No. 2 (Spring, 1991), 111-131.

Vickers, J. and Yarrow, G. (1997) *Privatisation: An Economic Analysis*. Cambridge, Massachusetts: The MIT Press.

Vickers, J. and Yarrow, G. (1988) *Privatisation: An Economic Analysis*, London: The MIT Press.

Vries, L. (2006) ‘The California Electricity Crisis: A Unique Combination of Circumstances or Symptom of a Structural Flaw?’, *Institutional Reform, Regulation and Privatisation, Process and Outcomes in infrastructure Industries*, Edited by Rolf W. Künnekee, Aad F. Correljé and John P. M. Groenewegen, Cheltenham: Edward Elger Publishing Limited, pp. 89-113.

Wamukonya, N. (2003) ‘Power sector reform in developing countries: Mismatched agendas’, *Electricity reform social and environmental challenges,* edited by Njeri Wamukonya, United Nations Environment Programme: Denmark, pp 7-47.

Wenner, A. (2006) ‘New Rules Would Require Independent Generators to help Maintain Grid Reliability’, Project Finance NewsWire, Chadbourne & Parke LLP, November 2006, New York: pp. 29-31.

Williamson, O. (2000) ‘The New Institutional Economics: Taking Stock, Looking Ahead, Journal of Economics Literature, Vol. 38, No.3 (Sep., 2000), American Economic Association, pp. 595-613.

Wolak, Frank A. (2005) "Lessons from the California Electricity Crisis", *Electricity Deregulation: Choices and Challenges*, edited by Griffin, J. and Puller, S., Chicago: The University of Chicago Press, pp. 145-180.

World Bank Indicators Data Base (2007) The World Bank: World Development Indicators (WDI)-2007,
http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:2129

8138~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html [Accessed on 20/07/07]

WTO-Saudi Arabia Accession (2005) Report of the Working Party on the Accession of the Kingdom of Saudi Arabia, WT/ACC/SAU/61/Add.2, 1 November 2005, World Trade Organisation (electronic format).

Yin, R. K. (2003) *Applications of Case Study Research (2nd ed.)* Thousand Oaks, California: Sage.

Yin, R. K. (2003a) Case Study Research: Design and Methods (3rd ed.) Thousand Oaks, California: Sage.

Yi-chong, X. (2004) *Electricity Reform in China, India and Russia*, Edward Elgar Publishing Limited, Cornwall: MPG Books Ltd.

Zikmund, W. (2003) *Business Research Method (7th ed.)*. Mason, Ohio: Thomson South-Western.

Appendices

Appendix 1 Key findings of meetings & Communications

A. Meeting with Yousef Janahi
B. Meeting with Hassan Al-Asaad
C. Meeting with Adnan Al-Mohaisen
D. Meeting with Al Hinai & Cleary
E. Meeting with Thani Al-Khusaibi
F. Meeting with Gleissner & Miller
G. Meeting with Hill & Raza
H. Personal Communications from Mohammad Al Mahrouqi
I. Personal Communications fro Ahmad Al Jassar
J. Phone Call with Abdullah Ahmad Abdullah
K. Personal Communications from Tariq Khan

<u>Meeting with Yousef Janahi</u>

<u>Participant</u>	<u>Date</u>
Yousef Janahi[54], Director of Planning and Development,	11 February 2004
<u>Organisation</u>	<u>Location</u>
KAHRAMAA, Qatar	Head office, Doha, Qatar

- The SNC-Lavalin is the first study for the GCC Interconnection Grid project which was revised at some point of time to take into account the first phase participants (Saudi Arabia, Qatar, Kuwait and Bahrain) while Oman and UAE would join at the second phase. Finance is based on 35%of share capital and 65% loan GCC Interconnection project is progressing well.
- KAHARAMAA acts as a single-buyer which is also in charge of transmission and supply.
- We can envisage some ‘barriers’ to trade across the GCC as electricity subsidies vary from one country to another.
- Generally speaking, governments in the GCC are the monopolist owner of power generation, transmission and distribution systems with no real competition from the private sector.
- A challenge to reform is that, if electricity is opened for privatization, people would be afraid that prices will rise to reflect real costs.
- The GCC market is rather small for establishing real competition. Governments would have to continue taking the electricity-sector investment risks.
- GCC electricity demand is very seasonal (about one-third in winter and two-thirds in summer). The total consumption for large projects is about 25% and we do not expect it to go more than 40%. With such relatively low-base loads, summer-winter load variations will continue.
- Since there is no different time zone between neighbours like Oman and UAE or Saudi and Kuwait, there might be less favourable conditions for cross-border trade.
- Only a TRANS-ARAB Grid - if established - would make it possible to benefit from the different time zone and weather conditions that exist among the Arab countries. However, uplift cost is rather high and such a project would be burdened by many financial issues.

- End of findings -

[54] Yousif Janahi later also became Chairman of GCC Interconnection Authority (Saudi Arabia).

Meeting with Hassan Al-Asaad

Participant	Date
Hassan K. Al-Asaad, Corporate Services	3 July 2007
Organisation	Location
GCC Interconnection Authority, Dammam, Saudi Arabia	Manama, Bahrain

- For the GCC region, the seasons and the timings are similar which makes it less endurable for actual power trade than other regions. Unlike power trading between Poland and Sweden which is based on weather conditions or like in other countries where trade is based on the differences in time zones. Nevertheless, there are opportunities to engage in significant electricity trade with other neighbouring and distant regions like North Africa and Europe.
- GCC reforms vary. Oman is most advanced in GCC reforms while Abu Dhabi has also gone a long way with respect to electricity reform. With respect to Saudi Arabia, a study was concluded on unbundling the other segments of the power sector (i.e. transmission and distribution currently under the jurisdiction of the Saudi Electricity Company), but was not applied. Saudi Arabia is expected to improve on its new law. The current load demand for the Kingdom (approximately 28, 000 MW) is expected to double by 2020. Qatar and Bahrain have begun promoting private ownership. Kuwait has shown no intention for initiating reforms but it is expected to - eventually – restructure its power sector in the near future.
- It is rather difficult to see at the near future a uniform GCC electricity regulation. We might expect improvements to existing regulations (like in the case of Saudi Arabia which has taken some internal decision with this regard) Also, Bahrain seems to be moving in the direction of a new regulation. Until all countries have established new regulatory rules there will be no unified regulation between them.
- The GCCIA will act as a catalyst for reform by influencing the member states to establishing a unified regulation or eventually evolve into a regional regulator instead.
- The GCC Grid will primary allow for the sharing of generation reserves and emergency assistance (as initially perceived). Power cross-border trading is promising with the availability of the interconnection backbone. . It is envisaged that the Authority will play a major role in cross-border trade but it is not decided who would be managing the trading table. Also, GCCIA can lease out a fibre optic line to telecommunication operators
- The Grid was initially intended to provide generation reserve sharing and emergency assistance but after realizing the potential of what this US$1 billion asset can provide, the Authority has ever since been keen on engaging in power trading within and beyond the GCC region.
- It is not agreed how the Grid would be regulated, but perhaps the member states along with the GCCIA can form a committee strictly for regulatory issues.

\- *End of findings* -

Meeting with Adnan Al-Mohaisen

Participant	Date
Adnan I. Al-Mohaisen, Chief Executive Officer	4 July 2007
Organisation	**Location**
GCC Interconnection Authority, Dammam, Saudi Arabia	Manama, Bahrain

- The GCC Interconnection project is progressing well and member states have been undergoing detailed discussions over the required agreements and will soon agree final draft.
- GCC cross-border electricity trading is expected to be small due to connector limitation. In order to engage in 'meaningful' power trade, the interconnection would have to be enhanced to accommodate more capacity transfers. For example; the GCC-Grid is initially designed to provide for 1200 MW while the Saudi Arabia existing load in the Eastern Province of KSA is over 9000 MW.
- The project has already worked by removing the 'mental barrier' to cross-border power trading. This could lead to more cooperative projects between the member states.
- In order to increase electricity trading between members, country-to-country connections (i.e.) inter and outer the GCC region must be expanded.
- A country can be a major net-importer due to the limited hydrocarbon (gas) reserves; environmental constraints due the relatively smaller are size and the high capital investment required for power projects in general.
- The diversity that now exists among members does not allow for a unified GCC regulatory framework. A good step would be to establish a forum for GCC electricity regulators.
- Saudi Arabia is moving ahead with reform. A decision has already been taken at a management level to restructure the vertically bundled state-owned Saudi Electricity Company.
- Oman is moving and has a very good Law as well as a knowledgeable regulator.
- The Emirate of Abu Dhabi is leading reform within the UAE.
- Qatar is also moving forward by allowing private participation in the generation sector. Qatar has also introduced very qualified young staff to lead power sector reforms and we should expect good contribution from them.
- Bahrain is expected to announce a new legislation for reform.
- Kuwait has not presented any regulatory reform plans yet.

- End of findings -

Meeting with Al Hinai & Cleary

Participants	Date
Kevin Cleary, Director of Technical Regulation	10 July 2007
Abdulwahab Al Hinai, Legal Advisor – Licensing Section	
Organisation	**Location**
Authority for Electricity Regulation (AER), Oman	Head office, Muscat, Oman

- The Omani Market In the case of the Omani Law, the purchase agreements are set for many years under the obligation of the PWP while the market share constraint of 25% for capacity as well as the economic interest restrictions (between generators and between generates and the TRANSCO) which should minimise any possible market exploitation.
- An important feature of the Omani reform is that there are restrictions for market share which act as safeguards against market exploitation.
- Regulator decisions are independent from the government. Regulator independency is enhanced by the three-year-tenure while the members of the board are not government employees.
- The Omni Law facilitates for the separation between supply and distribution. For the three companies, licenses for each activity are granted separately, each activity must have separate accounts while no cross subsidy is allowed.
- The regulator is funded through License Fees. The licence fee for each company depends on the work involved in regulating that company. Thus fees paid by generators are relatively low since there is probably only technical regulation (including Health & Safety etc) involved.
- There is difficulty in establishing a GCC market for electricity, unless there is transparency in cost structures.
- It is not clear at this stage who will regulate the GCC Grid.
- It is possible for Oman and Abu Dhabi to start trading since they have similar regulator setups while electricity costs are relatively transparent. In Oman and the UAE, electricity purchasing is done on the basis of (capacity + actual generation). Therefore, we can anticipate some savings from the economic use of the system by better production scheduling in both sides.
- There are immediate benefits envisaged for cross-border electricity exchanges between Oman and Abu Dhabi: (a) reducing the burden of spinning reserve (for Oman the spinning reserve stands at 200 MW), (b) the possible reduction of load shedding (as most cases occurred in Oman during the summer of 2007 were due to breakdowns) taking advantage of Abu Dhabi's access capacity during that time, and (c) the system can be run more economically by planning production so that it maximizes the use of least costly units to in each country
- A license has been issued for three smaller connections of 33kv at Khasab in the north for the Regional Electricity Company (Oman) to be connected to the northern Federal Electricity and Water Authority (UAE). However, no trading took place between Oman and UAE because other licensing requirements are

not completed yet. The Regulator would issue the license for Oman Transmission Company (OTC) only after receiving and reviewing the related power system studies and the operational procedures agreed with the Abu Dhabi TRANSCO. Also, the OTC is required to obtain an import export license which is granted only after studying the commercial agreement between Oman Power and Water Procurement Company (PWP) and Abu Dhabi Water and Electricity Company (ADWEC). If these licenses are sorted, Oman and UAE can start trading immediately.

- It is unlikely that the GCCIA will be willing to rent transmission capacity. Oman has to go through UAE Grids for any use of the GCC Grid, therefore; transmission rates have to be agreed with the UAE.
- Leaving political risks aside, GCC there may be possibilities to agree capacity contracts between member starts – with at least 4 years lead time for construction.
- There may be no clear incentives for a country like Oman - that has corporations with private ownership – in funding the GCC Interconnection
- Even in the absence of transparency, GCC electricity trading can be established on the basis of bilateral contracts.
- The GCCIA is expected to act as a facilitator for cross-border trading using a bulletin board where demand and supply is announced for each member state. Trade would then be based on bilateral contracts facilitated by the GCCIA.
- The Saudi 60Hz voltage situation may have some implications from a load shedding dimension (technically a 50 Hz network goes first). However, such technicalities may be dealt with.
- GCC electricity trading should start on pure trading or ‘market oriented’ with no long term commitments in order to minimise political risks. On the other hand, a capacity agreement with Abu Dhabi is possible while accepting possible risks.
- A more ‘realistic’ approach would be to: first, to get GCC connected, second, to share reserve and third, to establish further trading. Only once bilateral trade starts between member states, an exchange can be setup for the six members.
- There is concern weather the GCCIA - as a company yet being owned by the six states – will be able to balance commercial and political interests.
- Private discussions suggest that no major reforms are anticipated for Bahrain in the near future.

- End of findings -

Meeting with Thani Al-Khusaibi

Participant	Date
Thani Al-Khusaibi[55], General Manager	12 July 2007
Organisation	**Location**
Oman Electricity Transmission Company SAOC	Head office, Muscat, Oman

- The GCC Electricity Interconnection project is divided into two distinct phases. While the GCCIA is responsible for Phase-I which has already started (namely the North Grid which interconnects Bahrain, Kuwait, Qatar and Saudi Arabia), the development of Phase II is left for Oman and UAE. It is only in Phase III that the North Grid will be connected to the South Grid.
- The significance of the GCC Grid draws from the basic feasibility study carried out in 1990 which had an objective that GCC countries would be able to assist each other in cases of emergency. The Grid was not meant for trade.
- Electricity trade may still be viable. From an economic point of view, there are some gains expected from differences between peak months and time zones. For example, Oman's summer peak months are May and June, for UAE it is after July. Therefore, reserves could be better utilized. The one-hour difference between some GCC countries is also a plus point. Although, some studies with this regard were not encouraging, spinning reserves will be reduced.
- Once electricity reforms take place in all member states then they can look at cross-border trading to reduce costs.
- Reforms, however, may also yield a negative impact. In countries which went into reform, 'companies would load their assets to the maximum [no new installations] in order to maximize their profits. Almost all blackouts are related to restructuring and unbundling'. This means that reforms could increase the risks of outages as well as reduce reliability due to a profit-maximization effort that leads to insufficient supplies.
- Northern countries with limited space - and Bahrain in particular – are expected to try to benefit from the link. Kuwait may benefit from the Grid due to the already witnessed shortage of capacity. Kuwait has started a consumption saving programme and may take five to ten years to get actual generation to match the country's electricity requirements. Qatar is expected to have surplus in the near future.
- It will take some time until GCC countries agree similar electricity regulatory frameworks. At present, there are differences in policies. For example, the IPP's in Oman are owned by the private sector while in Abu Dhabi 60% it owned by the government. The Saudi regulator has few challenges to deal with due to the vertically integrated situation of the Saudi Electricity Company.
- Countries should trade through mutual (bilateral) agreements. The GCCIA is very close to finalizing sets of trade and legal agreements as well as a technical agreement which includes transmission codes and metering codes. The Shareholders Agreement (a legal and trade related) would be signed –

[55] Thani Al-Khusaibi is also a member of the Board of the GCCIA

once finalised - between each member and the GCCIA and between each member state and another.

- GCC reforms are at variant stages while Oman seems to be leading GCC reforms with more transparency.
- There is potential for GCC cross-border trading. Qatar has already applied for 600MW of import from the Grid as they expect shortage by 2009. They sent an official notification, as there are no forms or application procedures established yet. Bahrain has already shown interest as well. The UAE could also demand imports due to large real-estate expansion.
- The current mechanisms for power exchange now being discussed in the trading agreement include emergency assistance for 30 minutes free of cost but trading arrangements – via the Power Exchange Trading Agreement (PETA) - are not yet concluded. In the future, it could be part of the GCCIA to manage trade on the basis of monthly or yearly declarations. Countries will be obligated to declare capacity while penalties or compensations would need to be in place for any shortfalls.
- There are benefits expected from Oman-UAE electricity trading agreement. Once the system is synchronized, the two systems would have an increased reliability if maintained properly. Disturbances would be minimized. Considering Oman's peak of 3000 MW - and once the two systems are in-sink - we can expect economies of scale due to better scheduling. In winter (October to February) demand reduces all over the GCC which allows for maintenance and replacement at very comfortable time. This is very crucial as many plants have completed their life span. With the interconnection, costs of replacement could be brought down due to flexibility and better planning. Another benefit is that Oman can stop the less economical plants [diesel units].
- The Oman PWP agreements are based on capacity charge (agreed load) then capacities are called on merit order set by PWP based on capacity from each unit.
- The expected role of the GCCIA would be to stimulate cross-border trading by managing the grid and the exchange. It could act as a system operator until all regulators are at sink.
- The Omani electricity sector, when compared to Abu Dhabi and Saudi Arabia laws is more liberalized, more transparent and the regulator is more independent from government influences.
- Although private companies are the actual beneficiaries of the GCC Interconnection project, the Omani government took a decision to fund it in order to minimize the costs and increase the efficiency of the sector until reaching a situation of a self-finance-sector.
- In Oman subsidy is minimal and all sectors are billed clearly and separately. There is a chance that Oman will reach a stage were there will be no need to subsidize electricity, which may not be the case in other GCC countries.

- End of findings -

Meeting with Gleissner & Miller

Participants	Date
Gerhardt Gleissner, Managing Director	15 July 2007
Keith Miller, Director of planning and Studies	
Organisation	Location
Abu Dhabi Water and Electricity Company (ADWEC)	Head office, Abu Dhabi, UAE

- The GCC Interconnection Grid was not designed for trading when it started. It was established to deal with emergency cases. A much larger capacity would be required if the project was to boost cross-border trade of electricity.
- In practice, DEWA-SEWA interconnection has already brought a lot of stability to the whole system. At a point of time, 800 MW was suddenly lost, but the integrated system was stable as it was able to absorb the drop.
- Shortages of capacity that are now experienced by some GCC members would induce trade among the member countries.
- Countries must plan for extending their capacity. Member states must not rely on cross-border trading to fulfil their normal requirements.
- With respect to trading with Oman, 'The towers are all in place, tests are being carried out for the interlocking of the two systems'. Further, the Omani Procurer (PWP) has already been sent a proposed agreement.
- Two of the four countries already in the GCC-Grid have expressed interest to get into a trade agreement by 2009.
- Projects now need more lead time than before. EPC contractors are busy and might cause delays to some of the electricity IPPs. Also, gas turbines and related EPC works now have a lead time of almost four years from a previous lead time of two-years.
- Kuwait would want to import power soon due to its current shortage problems, Bahrain should be able to use the eastern grid with Saudi Arabia while Qatar in 2009 might have spare capacity to export.
- The GCCIA seems to present itself as the regulator of the Interconnection Grid. Also, the Authority may end up playing a commercial role by selling rights, auctioning, placing penalties and developing as a fully commercialized entity.
- There is a concern of potential capacity shortages caused by reform itself. In an enlarged and more liberalised GCC market, short-term electricity surpluses may result in miscalculated long-term capacity deficits. 'GCCIA electricity trade agreements should reflect such concerns and must penalise countries if they do not plan for their own capacity requirements'.
- The Abu Dhabi Law is a good step in the right direction. There is enough transparency as it is clear which parts are subsidised by government.
- From the Abu Dhabi reforms, evidence show that availability is now more reliable. 'System trips are down', 'outages are lower'. This should mean increased system availability and enhanced overall reliability.

- ‘When new IPPs are designed, they look at all these issues. They [the investors] want more effective use of the new capacities. Maintenance shutdowns were reduced by about 50% since generators are now paid on the basis of capacity-availability according to the conditions set by the PWP Agreements’.
- ‘IPPs are becoming more productive as they use less people. A 100-MW plant now employs only 150 persons compared to a previous total of almost 600 persons’.
- New projects are now associated with new costs. IPPs are not cheaper to construct since private sector investments demand profits. While government projects are built on a 30-year basis, privately owned IPPs are financed on the basis of 20 years.
- Further separation between supply and distribution may be expected as the regulator (although not stated by Law) has asked that accounts are to be separated.
- It is not yet clear who would regulate the Emirates National Grid however there is a body that collects information.
- UAE-GCC Interconnection Grid is expected to result in more reliability and stability to the system. Two main benefits envisaged; for the short term, the grid brings about savings on spinning reserve while with respect to long term planning the Grid allows for reducing capacity requirements.
- For the short-term there is exportable power in the Abu Dhabi system, but it is not planned for long term exports. The ENG allowed for transmission of electricity from Abu Dhabi (ADWEA) to Dubai (DEWA) amounting to 400 MW in 2006. This is expected to grow for 2008. By 2009, however; Abu Dhabi’s peak demand is expected to match available capacity, and hence, affecting exports from Abu Dhabi.

- End of findings -

Meeting with Hill & Raza

Participants	Date
Lindsay Hill, Director of Power of Production	15 July 2007
Aftab Raza, Senior Economist	
Organisation	Location
Regulator & Supervision Bureau (RSB), Abu Dhabi	Head office, Abu Dhabi, UAE

- Abu Dhabi reform was intended to stimulate investment in order to facilitate growth. For the GCC, another reason for choosing reform would be to improve economic efficiency as subsidies could be brought down. Abu Dhabi experience may lead other Emirates to follow as demand grows (i.e. Dubai is already showing interest in the IPP concept).
- Emirates National Grid (ENG) has made a significant impact allowing other Emirates (other than Abu Dhabi) to reconsider their views over the project which means a bigger role for the ENG to act as a legal entity in its right and as a TRANSCO for the Emirates.
- Abu Dhabi is exporting 900 MW on the ENG to other Emirates. The ENG is believed to have started to change people's and governments' attitude towards reform in a more positive way. The GCC Interconnection may also be looked at as a similar instrument of commencing change in the GCC as a whole.
- Bahrain and Qatar 'have warned us in a verbal and public context that they do not want to be locked into their existing electricity structures' which signals a move towards change.
- GCC electricity trade would be induced by desperate search for capacity as well as spinning reserve. Currently, only Abu Dhabi has access capacity, most GCC members are falling short of demand while Oman is 'at the line'.
- Fuel costs may become an issue when considering exports (as feed gas capacity may be a constraint in some cases and would be restricted to local consumption).
- The GCC must put a framework for penalising countries that are not meeting their demands. Countries would be expected to plan for their own demands.
- The progress of electricity sector reform is not very rapid, but it is not always good to progress so fast. Reform must be introduced in consideration with market 'maturity'.
- The initial arrangement for the GCC Grid was targeted to increase system stability, but recent discussions include trade.
- The GCCIA seems to view its role as a System Operator. This needs special treatment (licence) according to the Law of Abu Dhabi.
- For the ENG, volume of traded electricity is quarterly disclosed but prices remain non-disclosed.
- The regulator requires accounts separation in the case of distribution and supply. Different from Oman, the Abu Dhabi Regulator is responsible for both water and electricity.

- The GCC members are expected to continue funding the GCCIA since governments continue to own all the TRANSCOs. Once there would be a private TRANSCO, a question may be asked if governments may still continue to own and fund the GCC Grid.
- The Emirates National Grid (ENG) is an arrangement rather than a regulated activity. The ENG Supervision Committee monitors the activities while each entity in the system is responsible for arranging flow between them. Different from the GCCIA funding arrangements, in the case of the ENG each Emirate funds the lines up to its border. ADWEA and DEWA have a bilateral trading contract but the Committee does not have to know the price of traded electricity. Each company has a transmission control room which does the arrangements. The role of the committee may change from monitoring to coordination to control. Existing laws state that this is the responsibility of the individual systems in each Emirate.
- RASCO was an island system and not connected to the Abu Dhabi grid. When the system grew, it was slowly diluted. The Government decided that the transmission part would be transferred to the TRANSCO and relevant DISCO, while the generation side was to remain as part of the RASCO but operations are outsourced to a the DISCO through a management contract. These are very small generators. So RASCO is now ‘a company on paper’. RASCO is regulated by the Bureau through a price control. RASCO sells electricity to the DISCOs like a small PWP with a quantity of about 250 MW (made up of small generators of mostly 1 MW each).
- The Union Water and Electricity Company (UWEC) – located in the Emirate of Fujaira (now called ESWEC is not regulated). It is partially licensed by the Bureau for the water production since 90% of its capacity is coming to Abu Dhabi. The regulation applies for the price and quality of water supplied into Abu Dhabi. No regulation applies to the electricity side of the company as it is intended for the Emirate of Fujairah (with no electricity is exported to Abu Dhabi).
- The economic environment has to create the mind set for further reforms. Companies are not yet ready for real time market (like the day-ahead market place). Risks would be too high while international companies seem to be reluctant to take greater risks. The prevailing economic situation still requires the remainder of long term contracts. If generators are subjected to pure market competition, investors ‘might simply walk away’.
- The GCC Interconnection Grid should yield increased security of supply, availability of spinning, reserves and more stable networks. These were the previous reasons for establishing the Grid but recently trading discussions came into the picture.
- While demand is growing at a steady load, investment is coming in big jumps (increments of usually 1500 MW). The GCC market would allow for immediate returns based on the some trading arrangements. A sizable facility of 1500 MW could be better absorbed if cross-border trading was available to take one third of such capacity in the first year. Trading will take a lot of the risks as it would result in a smoother supply curve.
- For the long run, there is good scope for cross-border trading of electricity. For the short run, availability of fuel may become a bottleneck (in the form a temporary gas restriction caused by some circumstances).

- For the short term, Abu Dhabi has a surplus of 900 MW which is being exported to the other Emirates (for a period of two years). If gas restrictions continue, the costs will then be higher if such exports were to continue.
- The regulator decisions may be appealed to a group of three arbitrators. One arbitrator is appointed by the regulator, one buy the appealing company and the third is chosen by the previous two arbitrators.
- The chairman of ADWEA appointed the members of the board of the regulator [this was changed according to a subsequent legislative]. They members are non-government officials and they are not allowed to have any related business.

- End of findings -

<u>Communications from</u>	<u>Date</u>
Mohammad Al Mahrouqi, Chairman	18 November 2011
<u>Organisation</u>	<u>Method</u>
Public Authority for Electricity and Water, Oman	Personal Communications

- *Oman Has already corporatised all generation, transmission, distribution and supply businesses since 2005.*
- Oman is *considering different forms of private sector participation i.e. Management Contract or IPO for some companies.*
- *Oman, Saudi Arabia and Abu Dhabi have already developed regulatory frameworks and functions. The Emirate of Dubai (of UAE) is also considering the development of a separate regulatory body for the Emirate. However, the degree of independency may vary from a country to another.*
- *The GCC Interconnector could drive reform in the long term. For the short and mid terms, all GCC countries will continue to face similar challenges as high growth and similarity on the load profile and characteristics.*
- *Currently Oman depends on gas availability to generate power. I would not envisage that Oman will have access gas to be used for electricity export. Oman has potential renewable resources and as these become more economically viable then Oman could be an exporter for the electricity.*
- *GCC will be more sensitive to import electricity for reliability reasons. All domestic markets in GCC countries have similar challenges which could affect the reliability of imported electricity.*
- *If Oman considers the introduction of cost reflective tariff it will be only to large customers (Industrial, commercial and government)*
- *Also considering policies to improve energy efficiency.*

- End of findings -

<u>Communications from</u>	<u>Date</u>
Ahmad Al Jassar, Undersecretary	23 November 2011
<u>Organisation</u>	<u>Method</u>
Ministry of Electricity and Water, Kuwait	Personal Communications

- As yet there are no firm plans for further separation but ultimately this law is capable of separating transmission, distribution but intent is that the system operator/ regulator will remain a public entity, which in this case, is the Ministry of Electricity and Water.
- In Kuwait there are no intensions for intermediate state corporatization.
- Framework, organization and methods for privatization have been introduced under the Public Private Partnership (PPP) Law No 7/2008 and Law 39/2010.
- The process involves competition and award of contracts to private investors under Build Operate and Transfer (BOT) arrangements.
- The certain implication of this process is that all new generation will be by PPP's. This process is just beginning and the implementation of the first, IPP tender for Az Zour North Phase 1 is now in progress and subsequent phases of Az Zour N and some Renewable Energy projects are being planned.
- Privatization of all infrastructure other than new plant is still under consideration. There are no formal plans yet.
- With regards to the GCC Interconnector, in its present role of system security and very limited power exchange (up to 1.2 MVA); the GCC Interconnector has little effect on the domestic market structure. Supply tightness and similar demand patterns in all GCC countries limits expansion of the role but in principle, in the long term the interconnector could widen a merchant power market.
- Kuwait's economy is oil resource dependent therefore we wish to minimize domestic consumption and are becoming increasingly dependent on LNG imports. We cannot therefore be a power exporter.
- Tariff increase is obviously the most powerful demand control measure. It is our constant objective and ultimately inevitable. The timescale depends on matters beyond our control.

- End of findings -

Communications from	Date
Abdullah Ahmad Abdullah, PhD., Legal Advisor	23 November 2011
Organisation	Method
Electricity and Water Authority, Bahrain	Phone Call (in Arabic)

- All new electricity generation in Bahrain will be contracted out through IPPs.
- Other than the IPPs, no plans are finalised yet for the further separation of the different segments.
- The GCC Interconnector might assist in minimising the reserve requirements. Perhaps in the future, it could be a catalyst for further market reforms. Also, the Interconnector might provide for exporting electricity from the GCC to other regions (like Europe) utilising some spare capacities during cooler months in the GCC.
- Current social and political environment may not support the further restructuring of the electricity sector.
- Due to the nature of the GCC, electricity prices will continue to be subsidised in Bahrain. The government is under pressure to continue with such non-cost reflective policy. However, there might be another away in the future - other than subsidising electricity prices- to assist the [less fortunate people] so that prices will be more cost reflective.

- *End of findings* -

Communications from	Date
Tariq Khan, Electricity Advisor	27 November 2011
Organisation	Method
Electricity Cogeneration Regulatory Authority, Saudi Arabia	Personal Communications

- Plans are already under way to unbundle the main vertically integrated electricity company currently operating in Saudi Arabia (the Saudi Electricity Company). A separate Transmission Company has already been formed which will be the system operator effective January 2012. In addition, a principal buyer unit is going to be established in the beginning of year 2012. In 2013 a separate Distribution Company will be formed, along with four generation companies which will adopt the current SEC owned power stations in the Kingdom (around 50 plants). In addition, there are currently nine other companies, other than SEC, that are licensed to generate power, ranging from small industry-based plants to large IWPP stations.

- Interconnection of Saudi Arabia's electricity networks with other countries will not be the main driver for reform; however, it will play a complementary role to the strategy of moving towards a more competitive market. This introduces the possibility of a greater variety of electricity trading arrangements between industry players, both within the country as well as internationally.

- As further developments take place in international electricity connections, such as the GCC grid, there will clearly be more opportunities for new electricity trading arrangements between countries. In the case of the GCC interconnection the initial benefit and justification of the project was based on sharing of capacity reserves and mutual support of the countries' networks in the case of unplanned outages. However, there is likely to be further economic benefits in exchange of power at times of peak demand, since these peaks would not occur simultaneously. For KSA there would be expected to be import and export at different times of the day or year, but it is difficult to determine at this stage if the net for the year would be import or export.

- It can be expected that any country would be sensitive to any permanent reliance on imported electricity, particularly since the impact of a loss or reduction of power can be dramatic, especially in the summer months. The currently established interconnections between countries are based on benefits resulting from sharing of capacity reserves during unplanned outages, but not on any permanent power transfers or reliance on capacity. It is conceivable that in the future there could be permanent power transfer arrangements based on special cases such as emerging technologies (e.g. solar power and other renewable).

- A number of issues are being considered related to the escalating demand growth in the electricity sector. Changes to tariff structures are already being considered and the influence of low tariffs on energy conservation efforts is an on-going concern. Time-of-day tariffs have been recently introduced for the commercial and industrial sectors (with a cost reflective rate for the peak hours). The options for wide scale deployment of smart meters are also under investigation, as this would allow variable tariff structures to be offered for all customers, plus other benefits such as demand control. Other issues are related to the need to comply with environmental standards which will both effect the cost of electricity production and promotion of renewable energy resources

- End of findings -

Appendix 2 Key Provisions of the Omani Law

Royal Decree No. 78/2004 promulgating The Law for the Regulation and Privatisation of the Electricity and Related Water Sector in the Sultanate of Oman issued on 20 July 2004 (Oman Electricity Law, 2004).

Article (3) each of the following activities shall be subject to regulation and the provisions of this Law shall apply to them;

(a) Generation, Transmission, Distribution, Export, Import or Supply of electricity;

(b) Generation of electricity related with Desalination of Water;

(c) Generation of electricity co-located with Desalination of Water in the same site;

(d) Operation of central Dispatch system;

(e) The development and/or operation of International Interconnections; and

(f) The functions assigned to the Oman Power and Water Procurement Company provided for in this Law.

Article (9) The Minister of Housing, Electricity and Water shall issue Permitted Tariff regulations which are to be implemented in the Sultanate of Oman including tariffs for Supply and Connection of electricity, and the use of the system of the Salalah Project Company, and such tariffs shall be published in the Official Gazette.

Article (10) The Minister of Housing, Electricity and Water before issuing the regulations mentioned in the preceding article shall:

(1) Take the opinion of the Authority, which is bound to coordinate with Licensed Suppliers, and Licensed Distribution System Operators, and the Rural Areas Electricity Company, and the Oman Power and Water Procurement Company;

(2) Submit such proposed regulations to the Council of Ministers for approval.

The amendment or modification of tariffs shall be in the same way.

Article (11) Permitted Tariff regulations may include the following:

(a) The provision for the payment of Permitted Tariffs by commercial, industrial, and residential and other categories of Customers or specific groups of Customers in the manner provided for in the regulations;
(b) A provision for the non-application of Permitted Tariffs to specific categories of Customers;
(c) To distinguish between different categories of Customers on the basis of the level of consumption or the time or geographic location;
(d) The determination of different structures, levels and times relating to the Permitted Tariffs to be applied as between different categories or groups of Customers or at different times or according to other bases specified by the regulations including the negotiation of Permitted Tariffs in each case with specific categories of Customers;
(e) All that is related to the cost of providing Connection;
(f) Exemption of specific categories or groups of Customers from the total or partial payment of Permitted Tariffs;
(g) Other provisions in respect of Supply and Connection Permitted Tariffs as the Ministry of Housing, Electricity and Water deem to be appropriate.

Article (18) The Ministry of Finance shall pay the value of the annual financial subsidy to Licensed Suppliers after the calculation of such subsidy in accordance with the following:

(a) The Authority shall assess the level of allowed revenue in the relevant year the earning of which was available to each Licensed Supplier where he has effectively discharged his obligations specified in this Law and his Licence;
(b) The Authority shall determine the value of revenue represented by the amounts, which have to be collected by the Licensed Supplier in the relevant year where he has effectively discharged his obligations specified in this Law and his Licence;
(c) The Authority shall calculate the difference between the assessments specified pursuant to paragraph (a) and (b) and approve such difference in its Annual Report, and if the assessed value pursuant to paragraph (b) (representing the revenue collected from customers and others) is less than the assessed value pursuant to paragraph (a) (representing the allowed revenue) the Ministry of Finance shall be obliged to pay such difference to the Licensed Supplier and this Ministry shall specify the time and the manner of such payment which shall be, at least, every three months during the relevant year;
(d) The Authority shall calculate any differences between the assessments being prepared for the preceding year and what has been actually available for collection by the licensee in such

year in the light of relevant circumstances, and the Authority shall notify the Ministry Of Finance about the methodology of calculating the differences pursuant to the provisions of this Article and shall include such methodology in the Annual Report mentioned in Article (29) of this Law.

Article (19) there shall be established pursuant to this Law an Authority to regulate the electricity and Related Water sector. The headquarters of the Authority shall be located in the Governorate of Muscat.

Article (20) The Authority shall have legal personality and financial and administrative autonomy and shall have the right to own the necessary moveable and immovable properties required to achieve its objectives and its property shall be considered as public property.

Article (22) The Authority shall:

(1) Secure the provision of electricity and Related Water services in all parts of the Sultanate of Oman and protect the interests of Customers particularly Customers who have limited income, the sick and elderly;

(2) Encourage the promotion of competition in the interest of the public in the electricity and Related Water sector conducive to the achievement of public interest;

(3) Secure and develop the safe, effective and economic operation of the electricity and Related Water sector in the Sultanate of Oman and to enhance the safety of the public;

(4) Secure the Security of Supply in the Sultanate of Oman;

(5) Secure that Licensees are undertaking to meet all reasonable demands relating to Connection to the Total System and Supply;

(6) Secure compliance with the policies of the government in relation to Omanisation and training of Omani content leading to the creation of technical staff capable of undertaking the responsibility;

(7) Facilitate the privatisation of the electricity and Related Water sector in the Sultanate of Oman;

(8) Secure the protection of Rural Customers and encourage Supply of electricity to them through Connection or RAEC Connections in accordance with the provisions of Article (85) of this Law;

(9) Take the necessary measures to enable Licensees to undertake the regulated activities pursuant to this Law and secure the effective operation of their activities in order to attract finance for their licensed activities in an economic manner;

(10) Ensure the financial and technical capability of Licensees;

(11) Secure the necessity for taking into consideration the protection of the Environment;

(12) To meet its obligations regarding the procurement and sale of Imports and Exports of electricity and International Interconnection in accordance with the provisions of Articles (114) and (115) of this Law;

(13) Secure the conduct of fair and transparent competitions for New Capacity and Output by the Oman Power and Water Procurement Company;

(14) Undertake not to unduly discriminate without legal justification between Persons and to act consistently in like cases;

(15) Secure the minimization of regulatory burdens on Licence Holders or Exemptions Holders;

(16) Secure the preparation of technical specifications and criteria, and Performance Security Standards, for the electricity and Related Water sector, to maintain and review them in accordance with the relevant exigencies of the public interest;

(17) Prepare a Public Register containing all that relates to Licenses and Exemptions and any modifications made therein, and papers and documents relating to any of the above, and the certificates in respect of any Member of the Authority, and to maintain such Public Register;

(18) The preparation of objective criteria to ensure that Licenses and Exemptions are granted to Appropriate Persons and to review, implement, and comply with such criteria and to make them available to relevant Persons to obtain them on request;

(19) Secure the preparation of criteria relating to the welfare of the Customer and to amend, maintain, follow up compliance and implement such criteria;

(20) Monitor the development of the electricity and Related Water market in the Sultanate of Oman;

(21) Provide advice to Ministries in relation to the financing of RAEC Connection and Electrification Funding and the calculation of financial subsidy and tariffs and other functions assigned to it in accordance with the provisions of this Law;

(22) Review the situation of the electricity market in order to assess the scope for further Liberalization and submit reports in this regard, and to assist in the development of criteria to be applied pursuant to the Salalah Project Agreements. The Authority shall take into consideration the provisions of the agreements concluded before the promulgation of this Law in respect of electricity and Related Water sector projects.

Article (29) The Authority shall prepare an Annual Report that shall contain:

(a) Detailed information relating to its activities and the developments that occurred in the electricity and Related Water sector, and the extent to which the electricity market is prepared for further Liberalisation, and the volume of Imports and Exports of electricity, and the proposals of the Authority in this respect;
(b) The proposals of the Authority in relation to Permitted Tariff regulations and government financial subsidy;
(c) A detailed statement of the achievements in the area of providing electricity to Rural Premises through RAEC Connection or other Licensed Distribution Companies and the possibility of achieving further Connection and the plan of the Authority in respect of RAEC Connection and Electrification Funding;
(d) A statement of the audited financial accounts of the Authority for each financial year in accordance with international accounting standards;
(e) The method of calculating the value of financial subsidy in accordance with the provisions of Article (18) of this Law;
(f) Any other matters the Authority considers should be included in this report. The Authority shall prepare this report within a period not exceeding 6 months of the end of the relevant Financial year and shall furnish a copy of this report to the Ministry of Housing Electricity and Water, and a sufficient number of copies shall be furnished to the Ministry of National Economy to allow the later to submit the report to the Council of Ministers.

Article (31) if the Authority, in coordination with the Ministry of National Economy, concludes that the market is not so ready for further Liberalisation, the Authority shall include in its Annual Report the following:

(a) A statement of the conditions which the Authority believes shall be realized, and the measures to be taken by the Authority or by other Persons to realize such conditions, in order that the market could be ready for further Liberalisation, and state the period the Authority deems required during which such measures may be taken, after which the Authority expects the market to be ready for further Liberalisation;
(b) A statement of the kind of Liberalisation that the Authority believes eligible for implementation after the completion of the above mentioned.

Article (32) if the Authority, in coordination with the Ministry of National Economy, concludes that the market is ready for further Liberalisation, it shall include in its Annual Report the following:

(a) The nature and extent of the proposed Liberalisation and the amendments which it deems necessary to be made to this Law, the licenses issued pursuant to its provisions, and the rules of the Grid Code and Distribution Code, and other rules and regulations, and the timing of the proposed Liberalisation, before the Liberalisation could be made;

(b) The outcome of the coordination, which the Authority shall make with Industry Participants and other relevant Persons relating to such proposals;

(c) The Ministry of National Economy shall, after consultation with the Electricity Holding Company, have the right to submit to the Council of Ministers a recommendation to take what it deems necessary to implement the Authority's proposals in respect of further Liberalisation;

(d) The Ministry of National Economy, after the approval of the Council of Ministers, shall issue a decision to implement the abovementioned proposals;

(e) The nature of the Liberalisation its extent and timing shall be in accordance with the resolution of the Council of Ministers.

Article (40) The Authority shall be constituted of 3 or 5 Members appointed by a decision of the Council of Ministers, in accordance with recommendations of the Ministry of Housing, Electricity and Water in coordination with the Ministry of National Economy for a period of three years which may be renewed, and the decision of the Council of Ministers appointing the Members or renewing the appointment shall be published in the first issue of the Official Gazette directly following the appointment or renewal, as the case may be.

The Members shall elect from among themselves a Chairman of the Authority within a period not exceeding 10 days from the date of the publication of the decision of the Council of Ministers in the Official Gazette.

Article (41) The Executive Director of the Authority, determined by the Council of Ministers from among the Members, shall undertake to implement the decisions of the Authority and to represent it before the Judiciary and in its relations with others, and his other functions shall be specified in regulations issued by the Authority.

Article (42) A Person appointed as a Member of the Authority shall meet the following conditions:

(i) (S)he must be academically and practically qualified and shall enjoy high competence in the field of his specialization;

(ii) (S)he shall not be a shareholder and neither he nor any of his relative of the first degree shall have an interest in any Industry Participant;

(iii) (S)he and shall not be a government employee in any capacity or an employee of an Industry Participant;

(iv) To provide an annual declaration of any interest of any relatives up to the third degree and to refrain from considering any question in which a relative has an interest in;

(v) (S)he shall not have been given a punishment restricting freedom in crimes involving indecency or dishonesty unless rehabilitated.

The Members shall be responsible for the performance by the Authority of its functions.

Article (65) Subject to the provisions of Article (13), the Electricity Holding Company shall undertake to implement the policies of the government approved by the Council of Ministers in respect of the privatisation of the electricity and Related Water sector and shall encourage electricity or electricity and Related Water projects in the Sultanate of Oman, to be financed from private sources. The Electricity Holding Company shall in particular undertake the following:

(a) To perform the functions assigned to it pursuant to the provisions of this Law;

(b) To implement the policy of the government in respect of the financing of companies Wholly-owned by the Government in the electricity and Related Water sector and to safeguard and maintain the interest of the government in these companies;

(c) To hold or dispose of the shares of the government in the companies stipulated in Article (66) of this Law and also the companies referred to in paragraph (e) of this Article, and to take measures and conclude contracts and agreements required in respect thereof;

(d) To take necessary measures to achieve its objectives or measures connected to these objectives;

(e) To establish new companies, or appoint existing companies undertaking activities relating to, or complimentary to, its activities, particularly for the purposes of securing New Capacity pursuant to this Law, and also to establish a new company or entrust an existing company whether to undertake ownership, operation and maintenance of any of the assets or operation of any Electric Plants, Systems, or Production Facilities whenever it reverts to the Oman Power and Water Procurement Company, or to undertake the ownership, operation and maintenance of any of the assets that revert to the government in accordance with Article (122) of this Law;

(f) To provide central accounting services for the companies Wholly-owned by the Government operating in the electricity and Related Water sector.

It shall be prohibited for the Electricity Holding Company to undertake any of the regulated activities or any activity not provided for in this Law.

Article (66) The Electricity Holding Company shall undertake to hold the shares of the government in the following companies:

(a) The Oman Power and Water Procurement Company SAOC;

(b) The Oman Electricity Transmission Company SAOC;

(c) The Al-Rusail Power Company SAOC;

(d) The Wadi Al Jizzi Power Company SAOC;
(e) The Al Ghubrah Power and Desalination Company SAOC;
(f) The Mazoon Electricity Company SAOC;
(g) The Majan Electricity Company SAOC;
(h) The Muscat Electricity Distribution Company SAOC; and
(I) The Rural Areas Electricity Company SAOC.

Article (67) The companies stipulated in Article (66) of this Law shall take the form of Omani closed joint stock companies, and the Ministry of Finance in coordination with the Ministry of National Economy shall have the right to modify the legal form of any such companies, and the Ministry of Finance shall secure the availability of adequate finance to enable such companies to undertake the activity assigned to them pursuant to this Law whether such Finance is from the Ministry of Finance or from any other source, provided the Ministry of Finance approves such finance, all being for as long as the companies are Wholly-owned by the Government.

Article (79) The Oman Power and Water Procurement Company shall, where New Capacity is needed according to the preceding two Articles, and such New Capacity is in excess of:

(i) 75 MegaWatts in the case of electricity Production Capacity;

(ii) 27,300 cubic meters per day in the case of Desalinated water capacity;

(iii) Or a higher threshold specified by the Authority in such cases from time to time;

undertake to contract for the provision of required New Capacity after the conduct of a fair and transparent competition in accordance with the following procedures:

Open the competition for all local and foreign investors who have suitable expertise and to all owners and/or operators of existing Production Facilities;

(b) Determine its strategy for the procurement for New Capacity, such strategy which shall be approved by the Authority shall take into consideration:

- The size and most appropriate location of the New Capacity, and the time of its procurement;
- Imports that may be secured;
- New Capacity that can be secured from existing Production Facilities;
- A statement of all tender invitation procedures, and the manner of evaluation, and the stages of negotiation with the bidders;

- The necessity for consultation with each Licensed Transmission System Operator or Licensed Distribution System Operator in relation to the location, Connection, and Ancillary Services;
- Preparation of all documents, papers and data required for the conduct of competition.

(c) If the Ministry of National Economy agrees that there is a need for New Capacity for Desalinated water as determined by the Ministry of Housing, Electricity and Water, and it appears to the Ministry of National Economy that it is not possible for such capacity to be procured by the Rural Areas Electricity Company, then such company shall coordinate with the Ministry of Housing, Electricity and Water on the best manner to meet the company's obligations to provide such New Capacity, whether by securing all or part of it in connection with electricity capacity, or not.

The company shall, if it has been decided to procure new Desalinated water capacity or part of it with electricity Generation Capacity, follow the procedures provided for in this Article in the aforementioned manner;

(d) The Bulk Supply Tariff prescribed pursuant to Article (135) of this Law shall include the reasonable cost relating to the procurement of Desalinated water Capacity and Output;

(e) If it has been decided to procure New Capacity for Desalinated water only, the Oman Power and Water Procurement Company shall not be bound by that.

Article (112) Without prejudice to the provisions of the two preceding Articles:

(1) The Oman Power and Water Procurement Company Licence shall contain the following conditions:
  (a) A provision for a prohibition on the company not to undertake any regulated activity except those specified in its Licence;
  (b) A provision for the calculation of the Bulk Supply Tariff and its review from time to time;
  (c) A provision to oblige the company to cooperate with the Licensed Suppliers who contract on its behalf with Autogenerators in relation to Output in regard to the conditions of such agency contracts and other contract conditions relating to Supply.

(2) The Generation Licence and Generation/Desalination Licence shall contain the following conditions:
  (a) A provision to oblige the Licensee to ensure that his Production Facilities meet all reasonable requirements for central scheduling and Dispatch;
  (b) A provision to oblige the Licensee to offer terms for securing Ancillary Services and to restrict the powers

granted pursuant to the Licence to specified Production Facilities and/or specific Production Capacity;

(c) A provision to permit the imposition of restrictions on the percentage of total market share for Generation and/or Generation/Desalination whether in respect of the Licensee and its affiliates and related commercial projects.

Article (114) The Authority shall when granting a Licence for the Import or Export of electricity observe the following:

(a) The Authority shall not be permitted to grant a Licence to Import and/or Export electricity, or modify an existing Licence in order to include any such Import and/or Export across an International Interconnector with a capacity of 33 kV or more, or such other limit decided by the Council of Ministers, unless after obtaining the approval of the Council in respect of such Import and/or Export based on the recommendation of the Ministry of Housing, Electricity and Water;

(b) The Licence shall exclusively be granted to the Oman Power and Water Procurement Company or the Rural Areas Electricity Company;

(c) The Licence shall contain those conditions (if any) which have to be included pursuant to a recommendation made by the Ministry of Housing, Electricity and Water and approved by the Council of Ministers;

(d) The aforesaid Licence may include other conditions specified by the Authority to deal with the manner in which the Licensee shall observe the relevant arrangements in respect of the performance of his duties pursuant to this Law;

(e) The Authority shall consider the following:

(i) The proposed conditions for Import and Export as to the price and other matters and the creditworthiness of the Person to whom Export of electricity is intended to be made;

(ii) Whether any contracting for Import or Export pursuant to a Licence shall be on an interruptible basis;

(iii) The extent of the effect which the Import or Export may have on the ability of the Oman Power and Water Procurement Company to fulfil its obligations particularly those in respect of ensuring that reasonable demand for electricity is met, and the effect on the fuel supply market in the Sultanate of Oman;

(g) The Ministry of Housing, Electricity and Water shall consult with each of the Authority and the Electricity Holding Company before submitting its recommendations stipulated in paragraphs (a) and (c) to the Council of Ministers.

Article (115) The Authority shall before granting a Licence to make an International Interconnection, consider the following:

(a) The Authority shall not be permitted to grant a Licence to make a new International Interconnection or modify an existing Licence where the proposed International Interconnection will have a capacity of 33 kV or more, or such other limit decided by the Council of Ministers, without the approval of the Council of Ministers for the Import or Export of electricity across means of an International Interconnection pursuant to the provisions of the preceding Article;

(b) The Licence shall exclusively be granted to a Licensed Transmission System Operator, a Licensed Distribution System Operator, or the Rural Areas Electricity Company;

(c) A Licence to develop and/or operate an International Interconnection shall contain such conditions that have been approved by the Council of Ministers on the basis of the recommendation of the Ministry of Housing, Electricity and Water which Ministry shall have consulted with the Authority and the Electricity Holding Company before making and submitting such recommendation to the Council of Ministers;

(d) The aforesaid Licence may include other conditions specified by the Authority to deal with the manner in which the Licensee shall observe the relevant arrangements in respect of his performance of his duties pursuant to this Law;

(e) The Authority shall, when granting the aforesaid Licence, observe the possible effects on the Total System and on the ability of the Licence Holder to fulfil his duties prescribed pursuant to this Law.

Appendix 3 Key Provisions of the Abu Dhabi Law

Abu Dhabi Law No (2) of 1998 Concerning the Regulation of the Water & Electricity Sector in the Emirate of Abu Dhabi" issued by the State Decree No. 2 on 1 March 1998 in the Emirate of Abu Dhabi of the United Arab Emirates (Abu Dhabi law No. 2, 1998) and the subsequent amendments by Law No. (19) of 2007 issued on 1 July 2007 (Abu Dhabi Law No. 19, 2007).

Article (3) *Establishment as Government Authority*: There is hereby established as a public organisation, wholly owned by the Government, the Abu Dhabi Water and Electricity Authority for the purpose of carrying out the duties given to it under this Law.

Article (4) *Independence*: The Authority shall have a separate legal personality and shall have the capacity to act as such in accordance with this Law and shall have financial and administrative independence in carrying out its affairs.

Article (7) *Holding company ownership*: The Authority shall be entitled to retain ownership of all of the share capital of the Abu Dhabi Power Corporation.

Article (18) *Taxes, duties etc*: The Authority, the Abu Dhabi Power Corporation, all companies or entities wholly or partly owned by either of them and companies established pursuant to Article (134) of this Law shall be exempt from all taxes, fees including custom duties in relation to goods, machinery, equipment and spare parts imported for the purposes of achieving its objectives. Such exemption shall not apply to fees to be collected by the Regulation and Supervision Bureau pursuant to this Law or any licence issued under this Law.

Article (27) *Power to establish and dispose of sector entities*: The Abu Dhabi Power Corporation shall, in such manner as the Authority may from time to time direct in each case, for the purposes of the restructuring and privatisation of the water and electricity sector in the Emirate or promoting the introduction of privately funded water and electricity projects and shall have the power to—

(1) dispose of its interest, in whole or in part, in those entities established pursuant to Article (21) of this Law;
(2) require the disposal by any of the entities referred to in Article (21) of this Law of all or any of its assets; and
(3) enter into contracts, including contracts for the management of production, transmission, distribution and services companies wholly owned by Government and the operation of the relevant facilities wholly owned by those companies and contracts for the lending or borrowing of money.

Article (28) *Notice of disposal to the Regulation and Supervision Bureau*: The Abu Dhabi Power Corporation may sell all or any of its shares in the Abu Dhabi Transmission and Despatch Company or the Abu Dhabi Company for Servicing Remote Areas only after six months from the date of notifying the Regulation and Supervision Bureau of its intention and grant the Regulation and Supervision Bureau's approval of such sale. The Regulation and Supervision Bureau may shorten the period in consultation with the relevant bodies operating in the water and electricity sector (introduced by Law No. 17 replacing the previous Article 28 of Law No. 2).

Article (32) *Capacity planning duty*: The Abu Dhabi Water and Electricity Company shall, for the purpose of ensuring the long term security of the supply of water and electricity in the Emirate, determine annually in respect of each year and the next five years, the requirement for the provision of—

(1) new or additional capacity for water desalination; and
(2) new or additional electricity generation capacity; and
(3) new or additional water storage capacity, in order to perform its obligations in Article (30) of this Law and in any case where such requirement exists, the Abu Dhabi Water and Electricity Company shall contract for the provision of such new or additional production capacity with those persons operating existing production facilities or persons wishing to provide new such facilities.

Article (35) *Competition for new production capacity*:

(1) *Invitation to tender*: Unless the Authority otherwise directs, each person who is to be— the provider of new or additional production capacity; or is to be awarded a contract for the provision of existing production capacity, shall be selected by the Abu Dhabi Water and Electricity Company from among those entities (or their subsidiaries) that submit tenders in response to an invitation to tender for the right to provide production capacity.

(2) *Competence of tenderers*: In coordination with the Authority and the Regulation and Supervision Bureau and after the Executive Council [the Executive Council of the Emirate of Abu Dhabi] has granted its approval to the Authority, the Abu Dhabi Water and Electricity Company shall prepare any such invitation to such persons who have the financial capacity and technical and managerial competence to provide such production capacity (introduced by Law No. 17 replacing the previous Paragraph in Law No. 2).

(3) *Tender criteria*: The Abu Dhabi Water and Electricity Company shall prepare, develop and apply evaluation criteria for the purposes of identifying persons who will be—the providers of new or additional production capacity; and awarded contracts for the provision of existing production capacity, and such criteria will include a methodology for determining the economic advantages of tenders in response to an invitation issued under this Article, but shall otherwise be entitled to accept or reject any such tender as it thinks fit.

Article (38) *Regulated bulk supply tariff*: The Abu Dhabi Water and Electricity Company shall charge each licensed distribution operator a bulk supply tariff in respect of supplies of water and electricity made to it. Such tariff shall be calculated in respect of each calendar year on a basis prescribed by the Regulation and Supervision Bureau in the licence granted to the Abu Dhabi Water and Electricity Company.

Article (39) *Transmission duties*: It shall be the duty of the Abu Dhabi Transmission and Despatch Company and any other licensed transmission operator to—

(1) *Safety systems*: develop, maintain and operate safe, efficient and economical water and electricity transmission systems;

(2) *Connection duty*: comply with any reasonable request to connect to such transmission systems— facilities for water desalination storage and electricity generation; and systems for water and electricity distribution and supply;

(3) *Transmission codes, despatch and settlement*: develop, maintain, review and modify—

- (a) separate transmission codes for the transmission of water and electricity;
- (b) procedures for the economic and technical despatch of production facilities; and
- (c) a system for the settlement of payments due to and from the providers of— production capacity; delivered water and electricity output; and ancillary services; and

(4) *Regulated transmission tariffs*: charge licensed distribution operators in respect of connection to and use of its national transmission systems, a cost-reflective tariff. Such tariff shall be calculated in the manner prescribed by the Regulation and Supervision Bureau in the licence granted to the Abu Dhabi Transmission and Despatch Company or other licensed transmission operator.

Article (40) *Non-discrimination*: The Abu Dhabi Transmission and Despatch Company or any other licensed transmission operator shall not unduly create a preference in favour of, or unduly discriminate against, any person or class of persons in the connection of any— water desalination and electricity generation facilities; or systems for water and electricity distribution and supply; or terms on which it undertakes the transmission of water and electricity in such systems.

Article (41) *General function*: The Abu Dhabi Company for Servicing Remote Areas shall be responsible for the provision of water desalination and electricity generation capacity, the transmission, distribution and supply of water and electricity to those persons and premises not connected to the water and electricity transmission and distribution systems.

Article (44) *Establishment of the Regulation and Supervision Bureau*: There is hereby established a bureau called the Regulation and Supervision Bureau for the Water and Electricity Sector in the Emirate of Abu Dhabi and it shall have separate legal personality and full legal capacity to act as such in accordance with this Law (amended by Law No. 17 replacing the previous Article 44 of Law No. 2).

Article (45) Regulatory Board Members (amended by Law No. 17 replacing the previous Article 45 of Law No. 2):

(1) *Appointment*: The Regulation and Supervision Bureau shall be managed by no less than three and not more than seven members, including the Chairman. The Board shall be headed by the Chairman of the Regulation & Supervision Bureau. The Board members shall set out and determine its procedures, voting process, meetings and management system,

(2) The Chairman of the Board and the Board members shall be appointed by the Chairman of the Executive Council[56] [previously the Chairman of the Board appointed the members of the Bureau], and such members shall be persons of appropriate competency and experience.

(3) *Term and re-appointment*: The period of appointment of a member of the Board shall be for a period of five years and may be renewed.

Article (46) *Tenure of Regulatory Board Members*: [Law No. 19 replaced the words of ‘Chairman of Abu Dhabi Water and Electricity Authority’ previously stated in Law No. 2 by ‘Chairman of Executive Council’]:

(1) *Resignation*: A Regulation and Supervision Bureau Member may at any time resign his office by giving not less than 30 days reasonable notice to the Chairman of Executive Council.

(2) *Deemed resignation*: A Regulation and Supervision Bureau Member shall be deemed to have given the required notice

[56] Chairman of the Executive Council of the Emirate of Abu Dhabi

referred to in paragraph (1) of this Article if he fails to attend the meetings of the Regulation and Supervision Bureau for three consecutive months without giving a reason or an acceptable explanation for his absence.

Article (47) *Removal from office*: Only the Chairman of the Executive Council [Law No. 17 replaced the words of ‘Chairman of Abu Dhabi Water and Electricity Authority’ previously stated in Law No. 2 by ‘Chairman of Executive Council] may, and may only, remove any person from acting as a Regulation and Supervision Bureau Member on the grounds of—

(1) physical or mental incapacity which prevents that member from carrying out his duties;
(2) conviction of a criminal offence;
(3) proved maladministration of that member; or
(4) proved serious misconduct of that member.

Article (52) *Funding*: The Regulation and Supervision Bureau shall have an independent budget to be approved by its members [Law No. 19 deleted –here- ‘after consultation with the Chairman of the Board of Management of the Authority’] and shall be funded by the payment of fees by those persons awarded licences pursuant to this Law.

Article (53) *Primary duties*: It shall be the first duty of the Regulation and Supervision Bureau, in exercising its functions under this Law, to ensure, so far as it is practicable for it to do so, the continued availability of potable water for human consumption and electricity for use in hospitals and centres for the disabled, aged and sick.

Article (54) *General duties*: The Regulation and Supervision Bureau when performing its functions under this law shall have a duty to exercise its functions in manner which is best calculated to [this was amended by Law No. 17 replacing the previous Article 54 of Law No. 2 mainly to provide for wastewater services]:

(1) ensure the security of the supply of water and electricity and provide sewerage services in the Emirate;
(2) ensure the connection and supply of water and electricity and the connection to sewerage network for all customers;
(3) ensure the provision of special health and safety regulations related to supply of water, wastewater services and electricity to the general public;
(4) publish information relating to the standards of performance by licensed operators;
(5) take into account national and international environmental standards as they affect the water, wastewater and electricity sector and consult with relevant bodies in the Emirate and the state when necessary and expedient to do so in interest of the consumer and sector;

(6) have special regard to the interests of those persons whose lives may be endangered by the lack of potable water, sewerage services or electricity and others with special needs in connection with the cost and method of supply of water and/or electricity, or through the use of appliances and fittings;

(7) promote competition in the water, wastewater and electricity sector;

(8) ensure the operation and development of a safe, efficient and economic water, wastewater and electricity sector in the Emirate;

(9) protect the interest of consumers of water and electricity as to terms and conditions and price of supply (whether consumption is are domestic, commercial or industrial);

(10) protect the interests of users of sewerage services in the Emirate.

Article (55) *Functions of the Regulation and Supervision Bureau for the Water and Electricity Sector: General functions*: [Paragraphs 1,4,6,7 and 8 were amended by Law No. 19 mainly to provide for wastewater services]. The powers of the Regulation and Supervision Bureau shall include —

(1) reviewing the provision of water and electricity supplies and sewerage services in the Emirate;

(2) the issue, monitoring, and enforcement of compliance with licences pursuant to this Law;

(3) the establishment, maintenance, review and amendment as appropriate of technical and performance standards for the water and electricity sector and the monitoring and enforcement of compliance with such technical standards;

(4) the establishment, maintenance, review and monitoring of safety standards for the water, electricity and sewerage services sector and monitoring and enforcing compliance with such safety standards;

(5) the establishment, maintenance, review, monitoring, and amendment, as appropriate, of customer care standards;

(6) the regulation of prices charged to consumers of water and electricity and users of sewerage services and the method by which they are charged;

(7) approving, modifying, monitoring and the enforcement of terms and conditions for the supply of water and electricity, and the provision of sewerage services to domestic consumers;

(8) approving and proposing modifications to transmission and distribution codes and operating codes in respect of sewerage services, and

(9) making regulations and orders as provided elsewhere in this Law.

Article (58) *Reporting*:

(1) *Annual report*: The Regulation and Supervision Bureau shall as soon as possible after the end of each calendar year make to the Chairman of

the Executive Council [previously the Chairman of the Authority under the previous Article 58 of Law No. 19] a report—

(a) of its activities during that year;

(b) of developments during that year in respect of matters which fall within the scope of the Regulation and Supervision Bureau's functions;

(c) of matters investigated under Article (61) of this Law; and

(d) as to the matters referred to in sub-paragraph (3) of Article (76) of this Law.

(2) *Copies of the report*: The Regulation and Supervision Bureau shall make a copy of each such report available to any person who may request such, upon payment of such fees as the Regulation and Supervision Bureau shall determine.

Article (59) *Licensing criteria*: The Regulation and Supervision Bureau shall establish (and keep under review) specified objective criteria for the purposes of ensuring that all prospective licensed operators are fit and proper persons to be issued with a licence or exemption and shall make a copy of the criteria, applying from time to time, available to any interested person who may request such.

Article (62) *Powers to make regulation*: The Regulation and Supervision Bureau may, in consultation with whom it sees fit [previously 'in consultation with the Authority' before the amendments of Law No. 19], make such regulations as it sees fit for the purposes set out in Articles (63) and (68) of this Law.

Article (63) *Supply regulations*: Regulations made pursuant to Article (62) of this Law may be made for the following purposes [Paragraphs 1,2 were amended by Law No. 19 to account for wastewater services], namely to—

(1) secure regular and efficient supplies of water, electricity and provide sewerage services;

(2) protect the general public from danger related to water, electricity and sewerage works and installation;

(3) eliminate or reduce the risk of personal injury;

(4) require licensees to take all prescribed steps to secure compliance with quality standards;

(5) ensure that water in mains pipelines is not contaminated and is of potable quality;

(6) ensure that any water in trunk mains pipelines connected to mains pipelines is not contaminated;

(7) prevent the waste and over-consumption of any water after it has left the pipelines of a licensed operator to be supplied to premises;

(8) ensure that the water and electricity fittings installed and used by persons to whom water and electricity are to be supplied are safe; and

(9) promote the conservation of water and the efficient use of water and electricity.

(10) ensure sewerage network fittings comply with the standards determined by the Regulation and Supervision Bureau.

Article (67) *Regulations disputes*: The court with the appropriate jurisdiction shall hear disputes relating to regulations made under Article (62) of this Law.

Article (68) *Streetworks and access regulations*:

(1) *Purpose of regulations*: Regulations made pursuant to Article (62) of this Law may be made for the following further purposes, namely to enable a licensed transmission operator, a licensed distribution operator or any other licensed operator to the extent that its licence so provides to—

(a) carry out streetworks; and

(b) enter into or onto premises belonging to, or occupied by, any person for the purposes of carrying out streetworks;

(2) *Application of streetworks and access regulations*: for the purposes of this Article such regulations shall be binding on such persons, to such an extent and in such manner as may be set out in such regulations.

Article (93) *Conditions of transmission/despatch licences*: Without prejudice to the generality of Article (89) of this Law, licences issued to any person authorising the conduct of a transmission and despatch business shall include conditions—

(1) requiring the licensed transmission operator to engage in the economic purchase of goods and services;

(2) prohibiting the licensed transmission operator from engaging in designated activities other than the business of a transmission and/or despatch operator;

(3) prescribing how the licensed transmission operator shall perform the functions assigned to it in this Law;

(4) requiring the maintenance of separate accounts in respect of distinct parts of the licensed transmission operator undertaking and prohibiting cross subsidy between those parts;

(5) providing for the calculation from time to time of the tariff referred to in Article (39) of this Law;

(6) requiring the licensed transmission operator to implement and maintain a settlements system; and

(7) requiring the licensed transmission operator to offer terms for connection to, and use of, the licensee's transmission system.

Article (94) *Conditions of distribution and supply licences*: Without prejudice to the provisions of Article (89) of this Law, a licence authorising the conduct of a distribution and supply business shall include conditions—

(1) requiring the licensed distribution operator to engage in the economic purchase of water, electricity and other goods and services;

(2) prohibiting the licensed distribution operator from engaging in designated activities other than the distribution and supply of water and electricity;

(3) relating to the establishment of tariffs which the licensed distribution operator may charge consumers of water and electricity and their calculation from time to time;

(4) requiring the licensed distribution operator to maintain separate accounts in respect of distinct parts of its business and prohibiting cross subsidy between those parts;

(5) requiring the licensed distribution operator to offer terms to persons requiring a supply of water or electricity;

(6) requiring the licensed distribution operator to publish codes of practice in relation to the payment of bills by consumers, the disconnection of consumers, the provision of services to the elderly and disabled, the efficient use of water and electricity by consumers and the handling of complaints; and

(7) requiring the preparation and maintenance of a distribution code.

Appendix 4 Oman SCBA Sensitivity Tables

Table 1: Sensitivity analysis: Δ PV ***Consumer Welfare*** following:

(i) Δ Anchor level price US$/MWh +/- 10%, +/- 20%
(ii) Δ Ratio between anchor & price
(iii) Δ Discount rate: 3%, 5% and 7%

PV US$m, 3% d/rate & 2005 prices		Anchor level of non-GDP/MWh (2005 prices)				
		-20%	-10%		10%	20%
		540	*608*	*675*	*743*	*891*
Ratio between anchor & price	*1.0%*	*167.2*	*188.7*	*210.2*	*231.7*	*278.9*
	5.0%	*836.2*	*943.6*	*1,051.0*	*1,158.4*	*1,394.6*
	10.0%	*1,672.4*	*1,887.2*	*2,102.0*	*2,316.7*	*2,789.2*
	12.5%	*2,090.5*	*2,359.0*	*2,627.5*	*2,895.9*	*3,486.5*
	15.0%	*2,508.6*	*2,830.8*	*3,152.9*	*3,475.1*	*4,183.8*
	17.5%	*2,926.7*	*3,302.6*	*3,678.4*	*4,054.3*	*4,881.2*
	20.0%	*3,344.8*	*3,774.4*	*4,203.9*	*4,633.5*	*5,578.5*
	22.5%	*3,762.9*	*4,246.2*	*4,729.4*	*5,212.7*	*6,275.8*
	25.0%	*4,181.1*	*4,718.0*	*5,254.9*	*5,791.8*	*6,973.1*
	30.0%	*5,017.3*	*5,661.6*	*6,305.9*	*6,950.2*	*8,367.7*

PV US$m, 5% d/rate & 2005 prices		Anchor level of non-GDP/MWh (2005 prices)				
		-20%	-10%		10%	20%
		540	*608*	*675*	*743*	*891*
Ratio between anchor & price	*1.0%*	*142.3*	*160.6*	*178.9*	*197.1*	*237.4*
	5.0%	*711.6*	*803.0*	*894.4*	*985.7*	*1,186.8*
	10.0%	*1,423.2*	*1,606.0*	*1,788.7*	*1,971.5*	*2,373.5*
	12.5%	*1,779.0*	*2,007.4*	*2,235.9*	*2,464.3*	*2,966.9*
	15.0%	*2,134.8*	*2,408.9*	*2,683.1*	*2,957.2*	*3,560.3*
	17.5%	*2,490.6*	*2,810.4*	*3,130.2*	*3,450.1*	*4,153.7*
	20.0%	*2,846.4*	*3,211.9*	*3,577.4*	*3,942.9*	*4,747.1*
	22.5%	*3,202.2*	*3,613.4*	*4,024.6*	*4,435.8*	*5,340.5*
	25.0%	*3,558.0*	*4,014.9*	*4,471.8*	*4,928.7*	*5,933.9*
	30.0%	*4,269.6*	*4,817.9*	*5,366.1*	*5,914.4*	*7,120.6*

PV US$m, 7% d/rate & 2005 prices		Anchor level of non-GDP/MWh (2005 prices)				
		-20%	-10%		10%	20%
		540	*608*	*675*	*743*	*891*
Ratio between anchor & price	*1.0%*	*121.7*	*137.3*	*153.0*	*168.6*	*203.0*
	5.0%	*608.5*	*686.7*	*764.8*	*843.0*	*1,014.9*
	10.0%	*1,217.1*	*1,373.3*	*1,529.6*	*1,685.9*	*2,029.7*
	12.5%	*1,521.3*	*1,716.7*	*1,912.0*	*2,107.4*	*2,537.2*
	15.0%	*1,825.6*	*2,060.0*	*2,294.4*	*2,528.9*	*3,044.6*
	17.5%	*2,129.8*	*2,403.3*	*2,676.9*	*2,950.4*	*3,552.1*
	20.0%	*2,434.1*	*2,746.7*	*3,059.3*	*3,371.8*	*4,059.5*
	22.5%	*2,738.4*	*3,090.0*	*3,441.7*	*3,793.3*	*4,566.9*
	25.0%	*3,042.6*	*3,433.4*	*3,824.1*	*4,214.8*	*5,074.4*
	30.0%	*3,651.2*	*4,120.0*	*4,588.9*	*5,057.7*	*6,089.2*

Table 2: Sensitivity analysis: Δ PV ***consumer welfare*** following:

(i) Δ counterfactual supply growth (2005 - 2015)

(ii) Δ actual supply growth (2011 - 2015)

(ii) Δ discount rate

		Counterfactual annual growth in Supply: 2005 to 2015		
PV US$ m, 3% d/rate & 2005 prices		*5%*	*7%*	*9%*
Assumed growth in Actual Supply: From 2011 to 2015	*9%*	5,588.3	3,493.9	1,109.6
	11%	6,298.3	4,203.9	1,819.6
	13%	7,044.8	4,950.4	2,566.1
PV US$ m, 5% d/rate & 2005 prices		*5%*	*7%*	*9%*
Assumed growth in Actual Supply: From 2011 to 2015	*9%*	4,791.3	2,988.9	942.0
	11%	5,379.8	3,577.4	1,530.6
	13%	5,998.3	4,195.9	2,149.1
PV US$ m, 7% d/rate & 2005 prices		*5%*	*7%*	*9%*
Assumed growth in Actual Supply: From 2011 to 2015	*9%*	4,128.9	2,569.4	802.8
	11%	4,618.8	3,059.3	1,292.7
	13%	5,133.3	3,573.8	1,807.2

Table 3: Sensitivity analysis: Δ PV ***electricity subsidy*** following:

(i) Δ counterfactual supply growth (2005 - 2015)

(ii) Δ counterfactual losses percentage point reduction per annum

(ii) Δ discount rate

		Counterfactual annual growth in Supply: 2005 to 2015		
PV US$ m, 3% d/rate & 2005 prices		*5%*	*7%*	*9%*
Counterfactual MIS losses:	*0.00%*	-1,095.9	-279.8	646.5
	0.25%	-1,242.6	-449.2	451.0
% point reduction p.a. from 2004	*0.50%*	-1,382.4	-610.5	265.0
	0.75%	-1,515.7	-764.2	87.9
	1.00%	-1,643.2	-910.9	-81.1
PV US$ m, 5% d/rate & 2005 prices		*5%*	*7%*	*9%*
Counterfactual MIS losses:	*0.00%*	-938.4	-233.9	563.7
	0.25%	-1,065.5	-380.3	395.2
% point reduction p.a. from 2004	*0.50%*	-1,186.7	-519.6	234.8
	0.75%	-1,302.4	-652.6	82.0
	1.00%	-1,413.1	-779.7	-64.0
PV US$ m, 7% d/rate & 2005 prices		*5%*	*7%*	*9%*
Counterfactual MIS losses:	*0.00%*	-807.6	-196.1	494.4
	0.25%	-918.2	-323.1	348.5
% point reduction p.a. from 2004	*0.50%*	-1,023.8	-444.3	209.5
	0.75%	-1,124.8	-560.0	76.8
	1.00%	-1,221.4	-670.7	-49.9

Table 4: Sensitivity analysis: Δ PV ***electricity subsidy*** following:

(i) Δ counterfactual supply growth (2005 - 2015)
(ii) Δ Actual growth in Supply (2011 - 2015)
(ii) Δ discount rate

PV US$ m, 3% d/rate & 2005 prices		Counterfactual annual growth in Supply: 2005 to 2015: 5%	7%	9%
Assumed growth in Actual Supply: From 2011 to 2015	*9.00%*	-899.4	-79.8	850.7
	11.00%	-1,095.9	-279.8	646.5
	13.00%	-1,299.7	-487.1	435.3

PV US$ m, 5% d/rate & 2005 prices		*5%*	*7%*	*9%*
Assumed growth in Actual Supply: From 2011 to 2015	*9.00%*	-775.4	-67.9	733.1
	11.00%	-938.4	-233.9	563.7
	13.00%	-1,107.5	-405.8	388.4

PV US$ m, 7% d/rate & 2005 prices		*5%*	*7%*	*9%*
Assumed growth in Actual Supply: From 2011 to 2015	*9.00%*	-671.7	-57.7	635.7
	11.00%	-807.6	-196.1	494.4
	13.00%	-948.3	-339.2	348.5

Table 5: Sensitivity analysis: Δ PV **Labour benefit** following:

(i) Δ counterfactual supply growth (2005 - 2015)
(ii) Δ Actual growth in Supply (2011 - 2015)
(ii) Δ discount rate

PV US$ m, 3% d/rate & 2005 prices		Counterfactual annual growth in Supply: 2005 to 2015: 5%	7%	9%
Assumed growth in Actual Supply: From 2011 to 2015	*9.00%*	75.5	66.0	55.4
	11.00%	81.8	72.2	61.6
	13.00%	88.3	78.7	68.2

PV US$ m, 5% d/rate & 2005 prices		*5%*	*7%*	*9%*
Assumed growth in Actual Supply: From 2011 to 2015	*9.00%*	65.8	57.5	48.3
	11.00%	71.1	62.7	53.6
	13.00%	76.6	68.3	59.1

PV US$ m, 7% d/rate & 2005 prices		*5%*	*7%*	*9%*
Assumed growth in Actual Supply: From 2011 to 2015	*9.00%*	57.5	50.3	42.3
	11.00%	62.0	54.7	46.7
	13.00%	66.7	59.4	51.4

Table 6: Senestivity analysis: Δ PV ***procurement costs*** following:

(i) Δ in gas costs

(ii) Δ counterfactual procurement efficiency

		Gas cost US$ mmBtu/annual escalation from 2005			
PV US$ m, 3% d/rate & 2005 prices		*1.5/0.00*	*3/0.02*	*5/0.02*	*7/0.02*
Counterfactual annual % reduction in MIS purchase costs	*0.0%*	155.5	191.8	485.4	778.9
	0.5%	65.8	42.8	258.7	474.7
	1.0%	-21.4	-102.2	38.3	178.7
PV US$ m, 5% d/rate & 2005 prices		*1.5/0.00*	*3/0.02*	*5/0.02*	*7/0.02*
Counterfactual annual % reduction in MIS purchase costs	*0.0%*	134.8	164.9	417.9	671.0
	0.5%	57.2	35.8	221.6	407.4
	1.0%	-18.4	-89.8	30.6	151.0
PV US$ m, 7% d/rate & 2005 prices		*1.5/0.00*	*3/0.02*	*5/0.02*	*7/0.02*
Counterfactual annual % reduction in MIS purchase costs	*0.0%*	117.5	142.4	361.5	580.5
	0.5%	49.9	30.1	190.7	351.3
	1.0%	-15.9	-79.2	24.4	128.1

Table 7: Senestivity analysis: Δ PV ***electricity subsidy*** following:

(i) Δ in gas costs

(ii) Δ counterfactual procurement efficiency

		Gas cost US$ mmBtu/annual escalation from 2005			
PV US$ m, 3% d/rate & 2005 prices		*1.5/0.0*	*3/0.02*	*5/0.02*	*7/0.02*
Counterfactual annual % reduction in MIS purchase costs	*0.0%*	150.4	-57.6	-97.3	-137.0
	0.5%	78.2	-177.6	-279.8	-382.1
	1.0%	7.9	-294.5	-457.6	-620.7
PV US$ m, 5% d/rate & 2005 prices		*1.5/0.0*	*3/0.02*	*5/0.02*	*7/0.02*
Counterfactual annual % reduction in MIS purchase costs	*0.0%*	130.8	-45.7	-78.4	-111.2
	0.5%	69.2	-147.9	-233.9	-320.0
	1.0%	9.3	-247.5	-385.4	-523.3
PV US$ m, 7% d/rate & 2005 prices		*1.5/0.0*	*3/0.02*	*5/0.02*	*7/0.02*
Counterfactual annual % reduction in MIS purchase costs	*0.0%*	114.4	-35.9	-62.9	-89.9
	0.5%	61.7	-123.5	-196.1	-268.6
	1.0%	10.4	-208.8	-325.8	-442.8

Appendix 5 GCC Questionnaire

A. Covering letter
B. Synopsis
C. Questionnaire

Name:
Designation:
Organization:
Address:
Country

30 June 2007

Dear Sir,

<u>Subject: Doctoral Research in Electricity Regulation</u>.

We are carrying out research in the University of Hull, United Kingdom concerning 'electricity sector regulation' in the Gulf Cooperation Council (GCC) countries. The research will examine the possible introduction of a common set of regulatory principles to govern the regulation of member State electricity markets and their interconnections.

We are seeking information on the electricity sector arrangements in your country to assist this research. The first section of this questionnaire is a synopsis of the research objectives. The second section is the questionnaire, and is divided into four sub-sections, namely:

- Market structure and ownership,
- Regulation,
- Future policy, and
- Other comments.

We value your contribution and assistance in this research and would highly appreciate if you could have the completed questionnaire returned to us by 15th March 2006. The completed questionnaire should be forwarded to the corresponding researcher (details given below).

We thank you in advance for your kind cooperation and assistance in providing information to support our research.

Best regards,

Ali Masoud Al-Sunaidy
Researcher, Department of Economics, University of Hull, UK

Synopsis

Topic: Reforming the Electricity Service Utility in the Gulf Cooperation Council Countries (GCC): Prospects for regulatory reform

The current research will propose a GCC-wide **institutional and regulatory reform for the regulation of electricity markets.**

Experience suggests that effective regulation requires the regulatory framework to clearly define the role and status of the regulatory body. Of particular importance is the extent to which the regulator can operate autonomously and free from external intervention. Enabling legislation that establishes a regulator should clarify to investors, customers and the Government the scope of the regulator's powers, the mechanism of appeal against regulatory decisions, and the basis on which the regulator's board of management is appointed.

Some GCC member States have established, or are in the process of establishing independent regulatory bodies (with no Government representation) to regulate their electricity markets. Other members States are considering the introduction of a regulatory function where none presently exits.

Our research will consider the prospect of implementing a common set of regulatory principles that, if adopted by member State regulators, would provide a basis for further (economic and electricity market) integration and enhance the credibility of electricity regulation in the GCC.

The objective of the research is to promote further academic research in this area and to inform GCC future policy.

Research Questions

The research will address the following questions:

1. Are all GCC member States prepared to introduce the reforms necessary to implement common principles for the regulation of electricity markets and their interconnections?
2. What degree of organizational and legal reform would be required of member States to implement common principles for the regulation of electricity markets?
3. What are the prospects for effective GCC cooperation for the implementation of a unified approach to electricity regulation?

Questionnaire

You are kindly requested to provide the following information:

A. Market Structure & Ownership

Please provide details of the current structure of the electricity market in your country, identifying the extent of horizontal/vertical integration or separation of generation, transmission, distribution and supply by completing the questions below.

Please feel free to provide in section D (Other comments), a summary of the present market structure, ownership arrangements and degree of private sector participation, and any additional information relevant to the research.

A	***Functional separation***			
A-1	Is Generation separate from Transmission?	☐Yes	☐No	☐In some cases
A-2	Is Transmission separate from Distribution?	☐Yes	☐No	☐In some cases
A-3	Is Distribution separate from Supply?	☐Yes	☐No	☐In some cases
A-5	Is Generation separate from Distribution?	☐Yes	☐No	☐In some cases
A-6	Is Generation separate from Supply	☐Yes	☐No	☐In some cases
A-7	Is Transmission separate from Supply?	☐Yes	☐No	☐In some cases
A-8	Is the function of generation capacity and output procurement separate from System operation?	☐Yes	☐No	☐In some cases

	Corporatisation		
A-9	Is electricity Generation undertaken by?	☐ Ministry	☐ Corporate entity (including state owned)
A-10	Is electricity Transmission undertaken by?	☐ Ministry	☐ Corporate entity (including state owned)
A-11	Is electricity Distribution undertaken by?	☐ Ministry	☐ Corporate entity (including state owned)
A-12	Is electricity Supply undertaken by?	☐ Ministry	☐ Corporate entity (including state owned)
A-13	Is generation capacity and output procurement undertaken by?	☐ Ministry	☐ Corporate entity (including state owned)

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Definitions for activities referred in questionnaire:

Generation: power production

Transmission: High voltage grid (132KV or higher) including co-ordination, system operation, grid control & dispatch

Distribution: Low voltage grid (lower than 132KV)

Supply: Connection and provision to end user

Ownership

A-14	Is Generation wholly owned by government?	☐Yes	☐No	If no, what % of capacity is private owned?	%
A-15	Is Transmission wholly owned by government?	☐Yes	☐No	If no, what % of line is private owned?	%
A-16	Is Distribution wholly owned by government?	☐Yes	☐No	If no, what % of line is private owned?	%
A-17	Is Supply wholly owned by government?	☐Yes	☐No	If no, what % of supply is private owned?	%
A-18	Is the entity responsible for planning of generation capacity and output procurement wholly owned by government?	☐Yes	☐No	If no, what % of this entity is private owned?	%

International Interconnections

A-19	Are there Interconnections between your country and neighbouring countries?	☐Yes	☐No	If yes, how many interconnections?	
A-20	How many MWh were exported **<u>from</u>** your country across an international interconnection in 2004		MWh		
A-21	How many MWh were imported **<u>to</u>** your country across an international interconnection in 2004		MWh		
A-22	Has the interconnector been used to share reserve?	☐Yes	☐No		
A-23	Are there any restrictions on the use of international interconnections (e.g. limits to the amount of energy exchanges, restrictions on who can participate in cross border transactions etc?)	☐Yes	☐No		

If you answered yes to A-23 please clarify:

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B. *Regulation*

Please provide details of the current arrangements governing the regulation of the electricity market in your country, by completing the questionnaire below.

Please provide copies of legislation and statutory instruments establishing the regulatory framework.

Please feel free to provide any additional information you think would be relevant to the research in section D (Other comments).

1: Basis of Regulation

B-1 Who is responsible for electricity regulation: ☐ Ministry ☐ Independent Regulator ☐ Other

If other, please explain:

2: Regulatory Authority

B-2	Was the Regulator established by legislation?	☐Yes ☐No	If yes, law number:	
B-3	Does legislation specify regulator's responsibilities in detail?	☐Yes ☐No		
B-4	Scope of regulator's responsibilities:	☐ Electricity only ☐ Electricity & other responsibilities		
B-5	What kind of governing body does the regulator have?	☐ Board of Members ☐ Individual regulator ☐ Other		

If other, please explain:

B-6	Are Ministers or government officials directly involved in the management of the regulator?	☐ Yes ☐ No		
B-7	Can regulatory decisions be appealed?	☐ Yes ☐ No	If yes, to whom	
B-8	Does the regulator have enforcement powers (for example cancellation of license, levying fines, etc)?	☐ Yes ☐ No		
B-9	Who appoints regulator/ Board of Members?			

B-10	Is the regulator/ Board Members appointed for a fixed tenure?	☐ Yes	☐ No	If yes, for how long:	
B-11	Do clear rules exist on the circumstances in which regulator/Members can be dismissed?	☐ Yes	☐ No		

B-12	How is the regulator funded?	☐ Government	☐ License fee	☐ Government funding & license fees	☐ Other

If other, please specify:

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C. Future Policy

Please provide details of the direction of future policy by completing the questionnaire below.

Please provide, in section D (Other comments), any additional information you think would be relevant to the research.

We are particularly interested in knowing if your country would implement an independent regulator in the future and if so, would the new regulatory framework be established by law?

C-1 Are you expecting changes to the structure and regulation of your electricity sector? ☐ Yes ☐ No

If Yes, please explain:

C-2 Do you think your Government would allow an independent regulator to regulate the electricity sector free from government intervention? ☐ Yes ☐ No

C-3 Do you think your Government would allow some elements of electricity sector policy to be determined at a regional level by a body such as the GCC? ☐ Yes ☐ No

If No, please explain:

If Yes, which elements and why:

C-4 To what extent do you think your Government would use imported electricity to meet local demand requirements:

- ☐ 0%
- ☐ Between 0% and 25%
- ☐ Between 25% and 50%
- ☐ Between 50% and 75%
- ☐ More than 75%

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D. Other comments:

Please feel free to provide any further comments on market structure and ownership, regulation and future policy, or any areas related to these:

You may use addition sheets or attach additional material that you believe is relevant to the research.