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Report for the APEC
Energy Working Group

Strengthening Operational Aspects of APEC Energy Micro–Economic Reform: Phase II

Manual of Strategic Principles

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Glossary

ACCC	The Australian Competition and Consumer Commission
APEC	Asia Pacific Economic Co-operation
APERC	Asia Pacific Energy Resource Centre
BOO	Build-Own-Operate project
BOT	Build-Operate-Transfer project
Cal PX	California Power Exchange
CERL	Centre for Energy and Resources Law
CPUC	California Public Utility Commission
CSO	Community Service Obligations
DSM	Demand Side Management, which is the planning, implementation, and evaluation of utility-sponsored programs to influence the amount or timing of customers' energy use.
ESI	Electricity Supply Industry
FERC	Federal Energy Regulatory Commission
IEA	International Energy Agency
IPP	Independent Power Producer, which is a private entity that operates a generation facility and sells power to electric utilities for resale to retail customers.
ISO	Independent System Operator, which is a neutral operator responsible for maintaining instantaneous balance of the grid system. The ISO performs its function by controlling the dispatch of flexible plants to ensure that loads match resources available to the system.
LADWP	Los Angeles Department of Water & Power
LRMC	Long Run Marginal Cost
OECD	Organisation for Economic Co-operation and Development
PG&E	Pacific Gas & Electric
PPA	Power Purchase Agreement, which is the agreement under which the generator sells to the customer electricity produced by the power station.
SCE	Southern California Edison
SDG & E	San Diego Gas & Electric
SRMC	Short Run Marginal Cost
SMUD	Sacramento Municipal Utility Department
SOE	State-owned entity
UDC	Utility Distribution Companies

Introductory Summary

In January 2001, the APEC Energy Working Group engaged a consortium of consultants to undertake a study of micro-economic reform of the electricity supply industry (ESI) in APEC economies.

The aim of the study is to promote and implement a regional strategy for institutional strengthening and capability amongst APEC member economies. This *Manual of Strategic Principles* forms part of that study.

The *Manual* sets out a series of high-level “Best Practice” principles for designing, implementing and managing the reform of ESI.

The *Manual* is intended to provide a practical “policy tool kit” to assist economies move towards best practice. It has been designed to aid government leaders and officials who are contemplating or undertaking such reform programmes, and to assist in the planning, management, and implementation of reforms.

As part of the preparation of the *Manual*, the Consortium visited a select group of APEC economies: Thailand, Philippines, Vietnam, China (Shanghai region), South Korea, Malaysia and Australia (Queensland). The issues discussed in the *Manual* reflect the areas and issues highlighted during those visits as the critical areas to be addressed to progress reform programmes.

The Project Team has been mindful that each APEC economy has their own unique circumstances and particular market conditions. The *Manual* takes account of differing conditions and circumstances by addressing generic reform-related issues rather than economy-specific problems.

The *Manual* is divided into eight sections: Policy Objectives; Managing the Reform Process; Industry Structure; Legal and Regulatory Framework; Wholesale Market Mechanisms; Transmission and Distribution; Retail Tariffs and Contestability; and Privatisation. For each of these sections key principles are identified, following by a short discussion outlining the important issues that related to those principles.

Summary of Strategic Principles

Policy Objectives

- Principle 1* *A strong and sustained policy commitment by Government is essential to successful ESI reform.*
- Principle 2* *Government should develop ESI reform policy via a systematic, open, defensible process.*
- Principle 3* *Policies should be publicly available, clear and well articulated in order to generate widespread understanding of, and support for, reform objectives amongst key stakeholders including government agencies, industry participants, consumers, and the community generally.*
- Principle 4* *ESI Reform is not a once-off process, reform objectives should also encompass the government's ongoing policy and regulatory objectives.*
- Principle 5* *ESI reform policy objectives should take into account the linkages with other key policy areas including sustainable development.*
- Principle 6* *ESI reform objectives should be flexible enough to take account of wider community objectives, without compromising the basic reforms.*
- Principle 7* *Reform objectives, goals, and timetables should be challenging but achievable.*
- Principle 8* *Commitment to reform objectives is required at all levels of government.*
- Principle 9* *Government should attempt to generate widespread understanding and acceptance of the reform objectives and process from industry, consumers, and the community generally.*

Managing the Reform Process

- Principle 10* *Managing ESI reform requires the dedication of skilled staff and resources into a core unit or agency to oversee the reform.*
- Principle 11* *Government should ensure that sufficient analysis has been undertaken by the project team prior to reform to provide a credible basis for proceeding.*
- Principle 12* *ESI Reform should have a Champion, a person(or a group of people) who has the profile, competency and commitment to see reform through.*
- Principle 13* *Government needs to ensure that there is sufficient internal capacity to develop and manage the reform process.*

- Principle 14* Government should involve and consult with the private sector as part of ESI reforms but should maintain its independence from vested interests.
- Principle 15* The success of ESI reforms will depend on whether progress has been made in a range of complementary policy areas to provide a sound policy, legal and commercial platform for reform.
- Principle 16* Successful reforms require sustained government support throughout the process.
- Principle 17* The sequencing and phasing of reforms, the use of transitional measures, the establishment of clear milestones and deadlines and the use of pilot programmes can be useful ways in which to progress reforms, manage risks and ease adjustment processes.
- Principle 18* Government should adopt a consistent and integrated approach to reform for efficiency and to provide greater certainty to private sector participants and consumers.

Industry Structure

- Principle 19* Government business activities occurring within government agencies should be commercialised and then corporatised.
- Principle 20* An assessment should be made of the advantages and disadvantages of structural reform options.
- Principle 21* Where possible, government should use separation of generation from transmission, distribution and retail, ie unbundling of vertically integrated business, to engender competition and efficiency into the industry.
- Principle 22* The optimal level of disaggregation will depend on the scale and nature of the industry, the level of development of the economy, the synergies between the different elements of the industry, the potential for effective competition, the nature of the existing structures and arrangements.
- Principle 23* Limited and phased disaggregation of the ESI may suit economies that are small, isolated and at an early stage in their economic and industry development.
- Principle 24* Government needs to ensure that the chosen industry structure can sustain financially viable businesses.

Legal and Regulatory Framework

- Principle 25* Ensure the existence of a robust legal system to complement ESI reform specific legislation, including business laws and enforceable contract and property rights.
- Principle 26* Establish clear competition law, policies and institutions that are applicable to the ESI.
- Principle 27* ESI reform legislation should be clear, transparent, publicly available, and justified based on cost benefit impact assessment.

- Principle 28* *Reform legislation needs to provide sufficient clarity, scope and power to allow the reform process to be undertaken.*
- Principle 29* *Regulatory agencies or bodies should be established to oversee and implement the regulation of the ESI both during and after reform.*
- Principle 30* *The government needs to ensure that the regulator has sufficient resources and develops and maintains the necessary expertise.*
- Principle 31* *The role of the regulatory institutions should be manageable given the staff and skills available.*
- Principle 32* *The regulatory regime should ensure that the regulatory bodies are truly independent of both government and industry.*
- Principle 33* *The regulatory regime must ensure adequate oversight and review of the regulator.*
- Principle 34* *The regime must ensure that the regulators' processes are transparent and that all decisions are based on objective criteria.*

Wholesale Market Mechanisms

- Principle 35* *The establishment of a competitive wholesale market should only be considered in the context of overall market structure and design.*
- Principle 36* *A competitive industry structure with multiple wholesale buyers and sellers is a necessary precondition for the introduction of a competitive wholesale market.*
- Principle 37* *A competitive wholesale market requires a competitive fuel input market.*
- Principle 38* *An efficient competitive wholesale market requires a deep and liquid contract market with effective means of forward price discovery.*
- Principle 39* *A real time balancing market in which there is as much consistency as possible between market prices and the physical dispatch of the power system is a core feature of the competitive market.*
- Principle 40* *Where practicable, spot markets in ancillary services for frequency control and network control should operate in parallel with the energy imbalance market to ensure optimum use of competing resources across all of those markets*
- Principle 41* *Market designers and regulators need to ensure absolute consistency between the responsibilities and accountabilities of market and system operators and transmission operators.*
- Principle 42* *A wholesale market requires a competitive industry structure, independent dispatch with a highly transparent price determination process, a transmission planning and access regime that complements the market for energy trading, and appropriate regulatory supervision.*
- Principle 43* *Consideration must be given to ensuring Power Purchasing Agreements are consistent with facilitating a competitive wholesale market.*

Principle 44 A key success factor in any electricity industry and market reform program is finding politically and commercially acceptable transition strategies that enable the industry to continue to maintain supply reliability and improve power prices while both the electricity industry businesses and the market are transformed.

Transmission and Distribution

Principle 45 The economic regulation of transmission and distribution networks should be designed to:

- i) promote competition in upstream and downstream markets;*
- ii) prevent misuse of market power; and*
- iii) promote the economically efficient use of and investment in the network.*

Principle 46 The economic regulation of transmission and distribution networks should provide market signals to encourage ongoing efficient investment (whether in the form of upgrading or providing new capacity) in the network.

Principle 47 Efficient pricing of transmission services can be achieved, in principle, through pricing at short-run marginal cost (SRMC) combined with mechanisms or incentives that allow for the efficient expansion of the network over time.

Principle 48 Efficient pricing of distribution services is likely to rely on an approach largely based on long-run incremental cost (LRIC).

Principle 49 The role of regulation in transmission pricing and service will depend on whether an efficient energy market design has been achieved.

Principle 50 The design of transmission tariff structures should reflect efficiency objectives but may need to be modified in practice depending on economy specific issues including the degree of sophistication of the market and the availability of information.

Principle 51 Incentive based regulation, which seeks to align the commercial incentives facing the entity with the public interest, should be adopted for the price and service regulation of transmission and distribution networks.

Principle 52 The initial valuation of the existing asset base is a complex and sensitive issue that should be dealt with separately from other pricing issues. Once a valuation of the initial asset base has been made then this should be treated like other costs and the operator should be given a reasonable opportunity to recover these costs over time.

Principle 53 Tariffs should be set so as to provide a reasonable opportunity for operators to recover prudently incurred costs, including the cost of capital, from customers.

Principle 54 Tariffs should be fixed for a period sufficient to provide incentives to the operator to minimise costs, with a review of tariffs back to cost at the start of the next period.

Principle 55 *The price path during a regulatory period should reflect inflation and productivity changes, such as through a CPI-X approach.*

Principle 56 *The incentives on the operator to minimise costs should be continuous throughout the regulatory period, such as under an efficiency carry-over mechanisms.*

Principle 57 *A regulated price only makes sense in the context of some defined level of service. An array of approaches for different service dimensions should be used to ensure that operators have the incentive to deliver the desired service levels.*

Retail Tariffs and Contestability

Principle 58 *Substantial reform of the upstream elements of the ESI is a pre-condition to implementation of retail contestability.*

Principle 59 *Government should continue to play an important role in the regulation of retail competition, including issues of prices control, and market ownership.*

Principle 60 *Government should give detailed consideration to the costs and benefits, as well as the phasing and timing, of implementing retail competition.*

Principle 61 *If contestability is to operate effectively, then government needs to give consideration to subsidies that can aid in the adoption of new metering technology whilst at the same time not distorting the market.*

Privatisation

Principle 62 *The decision whether to privatise a government owned entity in the ESI should be made in the context of the government's broader social goals, the economy's pattern of social organisation and production and wider community aspirations.*

Principle 63 *Governments should undertake a cost-benefit analysis to determine whether the potential benefits of privatisation can be better achieved by other reform options.*

Principle 64 *Privatisation should be seen as the final stage of reform, and should only be undertaken after the necessary regulatory institutions and structural reforms have been established and are demonstrated to be functioning properly.*

Principle 65 *Governments should address each sector of the ESI separately to determine whether it is appropriate to privatise, and if so in what way.*

Principle 66 *Governments should apply relevant and appropriate financial and social risk parameters when evaluating government enterprises and utilities.*

Principle 67 *Government should ensure that an accountable and transparent approach is adopted, and that the objectives, processes and outcomes of privatisation are disseminated and understood by industry, consumers and the community generally.*

Principle 68 *Design incentive structures for regulation and the privatisation process itself that address economic goals, the economy's pattern of*

social organisation and production, and wider community aspirations.

Overview

The Micro-Economic Reform Project

The APEC Energy Working Group is undertaking a three-phase study of micro-economic reform of the electricity supply industry (ESI) in APEC economies to promote and implement a regional strategy for institutional strengthening and capability amongst APEC member economies.

- Phase I examined the progress being made by APEC member economies on the implementation of the fifteen best practice principles for IPPs (the APEC IPP Principles). This phase was completed in 2000 and the final report (the Phase I Study) will be published shortly.
- Phase II involves the preparation of a *Manual of Strategic Principles*. This sets out a series of high level “Best Practice” principles for designing, implementing and managing the reform of ESI. The *Manual* is intended to provide a “policy tool kit” to assist economies move towards best practice.
- Phase III involves a series of workshops aimed at explaining and promoting the *Manual of Strategic Principles* and improving the skills and understanding of regulatory institutions and Government departments responsible for energy sector reform. This phase has yet to be commissioned.

The Manual of Strategic Principles

The *Manual* is divided into eight sections, focussing on the following aspects of the reform process:

- Policy Objectives
- Managing the Reform Process
- Industry Structure
- Legal and Regulatory Framework
- Wholesale Market Mechanisms
- Transmission and Distribution
- Retail Tariffs and Contestability
- Privatisation

For each of the sections there a number of key principles are identified. Following each principle there is a short discussion outlining the important issues that relate to that principle.

The Need for a Manual of Strategic Principles

While there are major benefits to be obtained from electricity sector reforms, there are also significant risks. These include the risk of civil and commercial disturbance, and of creating regulatory uncertainty potentially discouraging investment. It is therefore essential that issues of legal and regulatory governance are adequately addressed as part of the reform process. Reform programs must be thoroughly and sensitively planned, managed and implemented.

In this regard, the *Manual* has been designed to aid government officials and bureaucrats, who are contemplating or undertaking such reform programmes, and to assist in the planning, management, and implementation of reforms.

The purpose of the *Manual* is to identify and explain these high level principles as an aid to policy makers and government officials, who are contemplating or undertaking such reform programmes.

Background material used in the Manual

As part of Phase II, the project team undertook a series of research studies. These studies formed the background material for the *Manual*. The three research studies were:

- Research Study 1 – which identifies the opportunities, barriers and impediments to entry, competition and trade in electricity within and between APEC member economies.
- Research Study 2 – which examines the existing models amongst APEC member economies for structural and regulatory reform of the ESI. The study focuses on structural reform, regulation, and privatisation.
- Research Study 3 – which identifies the key issues and best practices in the development of the policy, regulatory, legal and institutional arrangements necessary to undertake ESI reform.

The Research Studies 1 and 2 are presented in annexes to this *Manual*, while the contents of Research Study 3 was incorporated into this *Manual*.

APEC Economy Visits

The following economies were selected as the focus of this study: Thailand, Philippines, Vietnam, China (Shanghai region), South Korea, Malaysia and Australia (Queensland). As part of the preparation for this study, the Project Team undertook a series of fact-finding missions to each of these economies.

The material obtained from the economy visits forms the basis of the Research Studies, in particular Research Study 3. The key issues discussed in the study reflect the areas and issues, highlighted by interviewees, that the economies most need to address to ensure the progress and success of their reform programmes.

The Project Team has been mindful that each APEC economy has its own unique circumstances and particular market conditions affecting both the manner and timing of the devising and implementation of electricity reform. In accordance with the project brief, the Research Study Reports and this *Manual* have taken into account the differing conditions and circumstances by addressing generic reform-related issues rather than economy-specific problems.

The Manual and Phase III

As stated above, the *Manual* is the product of Phase II of a three-phase project. While the *Manual* is a stand-alone reference document it will also form part of the material to be used as part of Phase III of the project.

The *Manual* will be used to prepare guidance material as part of presentation documentation. This material will then be used in a series of proposed workshops for government officials in the regulatory institutions and government departments in APEC economies. The intention will be to provide a forum for discussion and learning about Best Practice reform, so as to improve the skills and understanding of those responsible for ESI reform.

Project Team

The *Manual of Strategic Principles* was prepared by a consortium of Australian firms and organisations (the Project Team). The members of the consortium are:

- The Allen Consulting Group (economic and public policy advisers);
- Freehills (Australian and regional law firm);
- Blake Dawson Waldron (Australian and regional law firm);
- ACCC (a statutory body responsible for enforcement of competition law and for regulation of the Australian transmission networks); and
- Centre for Energy & Resources Law (CERL), which has been established within the Law Faculty of the University of Melbourne as a specialist centre of learning and teaching in Australian and Asian energy and resources law.

Section 1 Policy Objectives

The fundamental aim of ESI reform should be to improve economic efficiency, including:

- productive efficiency the relationship between inputs and outputs and the adoption of best practice technologies and approaches;
- allocative efficiency the extent to which resources are put to their best use by providing the right signals for consumption and investment; and
- dynamic efficiency the extent to which innovation and productivity gains are encouraged over time.

Principle 1 A strong and sustained policy commitment by Government is essential to successful ESI reform.

To ensure the ESI reform programme meets this aim, the government needs a clear vision, strong commitment and access to a range of skills and expertise both internal and external to government. For APEC economies, the issues that need to be addressed will vary depending on the specific conditions in each economy. As such, reform programmes need to be tailored to suit individual electricity sectors and economy specific needs.

While each economy will face unique challenges, an essential requirement for successful ESI reform is a strong and sustained commitment by government.

Principle 2 Government should develop ESI reform policy via a systematic, open, defensible process.

As an initial step governments should publicly commit to a set of clear objectives and a framework for implementing a reform programme.

In developing ESI reform objectives the government should focus on establishing a strong case for reform. A comprehensive cost-benefit analysis of reform options should be undertaken to inform policy development. Given the complexity and uncertainty involved, such analyses will not be able to qualify all costs/benefits, however, it can provide a clear framework to identify and assess the costs/benefits as well as the risks/uncertainties involved.

Careful consideration needs to be given to the extent of reform desired, the amount of disaggregation needed, and the degree to which markets are likely to be competitive in the shorter, medium, and longer term. This will help in the assessment of the appropriate market structure and in the phasing of the reform programme.

Matters of importance that need to be addressed include assessing the industry structure, the necessary regulatory framework, ownership considerations, market signals, and competition issues. Consideration also needs to be given to the long-term viability of the ESI, the appropriate tariff levels and tariff regulation, the management of key risks and the involvement of key stakeholders in policy development, and processes to ensure transparency throughout the reform process.

In the absence of rigorous objective analysis reform objectives and policies may be easily challenged.

Principle 3 *Policies should be publicly available, clear and well articulated in order to generate widespread understanding of, and support for, reform objectives amongst key stakeholders including government agencies, industry participants, consumers, and the community generally.*

Policy objectives and the need for reform should be publicly available, clear and well articulated to ensure widespread understanding of, and support for, reform amongst key stakeholders government officials, industry participants, consumers, and the wider community. This may involve a full discussion of the drivers of reform, the basic reform processes and plans, regulatory and policy development processes post-reform, and specific issues such as contestability, electrification plans or enhanced generation/capacity plans.

As part of the process of providing information about the reforms, government should clearly set out its roles and responsibilities in the industry and the roles and responsibilities of other organisations, eg the various regulatory agencies, government businesses, the private sector and consumers.

This may involve setting up a national process, developing a communications strategy, undertaking industry and community consultation, seeking input from stakeholders and all interested parties at various stages of policy development, and making public the outcomes of consultation processes.

Principle 4 *ESI Reform is not a once-off process, reform objectives should also encompass the government's ongoing policy and regulatory objectives.*

ESI reform often involves creating a range of roles out of an integrated monopoly, such as those of generator, distributor, retailer, infrastructure developer, protector of consumer welfare, and social policy manager. Reform reallocates some of those roles, such as generation, distribution, and/or retail to the private sector or new government owned businesses, and redefines the way government provides its remaining functions, such as regulation and social policy.

However, it is important to realise that the development of reform objectives is not a static process but a dynamic one. Therefore, along with identifying the immediate reform objectives, government must also identify long-term reform objectives.

Principle 5 *ESI reform policy objectives should take into account the linkages with other key policy areas including sustainable development.*

ESI reform policy objectives should identify and accommodate the important linkages with other public policies such as energy policy, security of supply, social policies, technical issues, public safety, environmental protection, capital market development, industry development and workforce planning.

Sustainable development in particular is a major policy issue for all economies. Consideration needs to be given to strengthening national and regional institutions and arrangements for sustainable development, including: conducting joint studies; enhancing cross border electricity trade, promoting interconnection infrastructure or providing government support for efforts to use environmentally sustainable practices in the supply of electricity, promoting training, understanding and experience; and ensuring the provision of information about sustainable development.

Principle 6 *ESI reform objectives should be flexible enough to take account of wider community objectives, without compromising the basic reforms.*

An important challenge for governments is how best to address the issue of tariff reform and ‘universal service obligations’ following the deregulation of the electricity sector. Tariffs will need to be set and service provided at efficient and sustainable levels, but community expectations may be for common service standards and pricing.

ESI reform can allow for continued assistance to certain groups and regions. Ideally the reform process provides government with the opportunity to provide those subsidies through more transparent instruments, such as carefully structured universal service obligations that may be industry funded, and community service obligations that may be backed by direct government funding.

Principle 7 *Reform objectives, goals, and timetables should be challenging but achievable.*

ESI reform is a large scale and complex undertaking. It requires careful and stepwise management by governments using an array of transitional arrangements.

Given the complexities, reform objectives, goals, and timetables need to be realistic. Too short a timeframe may result in poor policy decisions, which run counter to reform objectives. At the same time, too long a timeframe can result in an unduly prolonged process, which is subject to continuous debate and potential hindrance by vested interests. For example, the ‘fast track’ ESI reform in Victoria, Australia, took 6 years from the initial policy development and disaggregation to full privatisation.

One of the more difficult aspects of ESI reform is the understanding and acceptance of new roles and responsibilities. ESI reform typically involves a major cultural and historical shift in the government’s involvement in the industry and therefore requires governments and businesses to redefine their roles.

Principle 8 Commitment to reform objectives is required at all levels of government.

Electricity reform should be coordinated to ensure consistent development and reform across the whole of the country, and possibly the region. This is particularly important for federal systems where Provinces and States may have significant responsibility for reform.

An important challenge for governments is how best to address the issue of tariff reform and ‘universal service obligation’ following the deregulation of the electricity sector. Tariffs will need to be set and service provided at efficient and sustainable levels, but community expectations may be for common service standards and pricing. ESI reform can allow for continued assistance to certain groups and regions. Ideally the reform process provides government with the opportunity to provide those subsidies through more transparent instruments, such as carefully structured universal service obligations on industry and, community service obligations backed by direct government funding.

Principle 9 Government should attempt to generate widespread understanding and acceptance of the reform objectives and process from industry, consumers, and the community generally.

Governments should try to generate economy-wide understanding of and support for the proposed reform agenda. This may involve setting up a national process, undertaking community consultation, seeking input from stakeholders and all interested parties at various stages of policy development, and making public the outcomes of consultation processes.

Section 2 Managing the Reform Process

A clear concern apparent during the visits to selected APEC economies, was the fall-out from the Californian electricity crisis.¹ This has significantly dampened enthusiasm for electricity sector reform and is potentially undermining support for existing and potential reform programmes in some economies. The Californian experience has highlighted a general concern that market reform entails large and possibly unforeseeable risks and that even advanced economies can get it badly wrong. This highlights the importance of careful planning and design of reform programmes, incorporating the best advice on lessons from other economies. However, until greater confidence is restored to ESI reforms, it is unlikely that significant progress will be achieved in some economies in the shorter term.

<p><i>Principle 10</i> <i>Managing ESI reform requires the dedication of skilled staff and resources into a core unit or agency to oversee the reform.</i></p>
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The effective management of the reform process is a significant task and requires the dedication of skilled staff and resources and the establishment of a core unit or agency (or a number of units/agencies) to provide a focus for policy planning, coordination, implementation and review of the reform program.

The reform team should use a mix of government officials, seconded industry staff from government businesses and external consultants. Government officials will bring with them detailed institutional and policy knowledge. Industry staff can provide in-depth industry knowledge. Consultants can complement this with relevant specialist or international expertise. Coordination of work through a single team minimises expensive duplication and provides an efficient clearinghouse for issues and information.

The reform team would typically undertake a wide variety of tasks, which may include but is not limited to:

- Commercial reform of existing ESI participants (often government owned vertically integrated monopolies) through corporatisation;
- Policy reform, such as establishing the roles of government, regulators, and industry participants developing the regulatory framework and institutions ;
- Structural reform, such as disaggregation or ring fencing of ESI participants;
- Establish a competitive wholesale market;
- Establish a competitive retail market; and
- The possible introduction of new private sector investment or the privatisation of existing government businesses.

¹ For a detailed description of the Californian electricity crisis see the case study in Appendix 1.

Principle 11 Government should ensure that sufficient analysis has been undertaken by the project team prior to reform to provide a credible basis for proceeding.

Similar to the discussion in Section 1, there are a number of key decisions that need to be addressed prior to the commencement of reform by the reform team including:

- What does the government want to achieve by reforming the electricity industry?
- What are the triggers for reform?
- What are the desired industry structures, market mechanisms and regulatory frameworks to be used to achieve the government's objectives?
- What is the reform problem being addressed and is the proposed reform the best way to address that problem?

Principle 12 ESI Reform should have a Champion, a person (or a group of people) who has the profile, competency and commitment to see reform through.

To successfully implement ESI Reform requires sufficient authority and access to decision makers. A prominent and well-credentialed person is needed to champion the reforms and to lead the reform team. The team will also need committed sponsors among key government decision makers. The reform team must have access at senior level to key agencies and government decision makers.

Principle 13 Government needs to ensure that there is sufficient internal capacity to develop and manage the reform process.

Institutional strengthening is critical to achieving effective reform. That is, government needs to build and maintain an internal capacity to develop and implement reform and then to manage the post-reform environment.

Measures that can be taken to improve competencies include increased education and training and the use of external advisers in support roles. Attracting and retaining the necessary skilled staff may depend on improving remuneration and conditions, providing interesting work and providing viable career paths for government and regulatory officials.

Lack of skilled and experienced staff may result in poor reform design and implementation and costly or ongoing problems that can detract from reform objectives.

Principle 14 Government should involve and consult with the private sector as part of ESI reforms but should maintain its independence from vested interests.

An important component of managing the reform is managing the involvement and expectations of the private sector. Standard contracts, legislation, codes, licences and other instruments should be developed with private sector involvement.

Stakeholder involvement is important, particularly with respect to independent power producers, private sector investors and major consumers. However, there is merit in maintaining the independence of the reform programme and the reform team from potential industry vested interests as well as diversions from other government policies.

Principle 15 The success of ESI reforms will depend on whether progress has been made in a range of complementary policy areas to provide a sound policy, legal and commercial platform for reform.

Government needs to ensure that related policy areas are complementary to the objectives of ESI Reform. Related policies area that may also need to be addressed in conjunction with ESI reform include:

- clearly defined and enforceable property rights;
- the development of mature capital markets;
- consistent and clear regulation of companies;
- comprehensive competition policy and anti-trust measures;
- independence and effectiveness of the judiciary;
- objective policy development and ongoing review;
- facilitation of capital movements in and out of investments/countries;
- sound and well understood environmental policy; and
- well established processes for making legislation and regulations.

Principle 16 Successful reforms require sustained government support throughout the process.

As with developing reform objectives, managing ESI reform requires continued government commitment. Whilst changes in reform direction or specific policies may occur throughout the process (eg taking account of reform issues in California), government should not be swayed from trying to achieve the overall reform objectives.

Government should maintain its focus throughout the reform on the key policy objectives, such as the benefits of reform, efficiency gains, capacity signals, financial instruments, legal structures, new skills and competition, or the value of sale/privatisation. One way to achieve this is to ensure reform processes are transparent, regularly assessed, analysed, and modifications well documented and published.

Where, in the course of a reform program, there is a State-owned utility to be restructured the utility should not control the restructure. Rather this should be the reserve of the Government.

Principle 17 The sequencing and phasing of reforms, the use of transitional measures, the establishment of clear milestones and deadlines and the use of pilot programmes can be useful ways in which to progress reforms, manage risks and ease adjustment processes.

The mapping and sequencing of reform is an important part of the reform programme. Critical paths need to be identified and bottlenecks in the reform programme addressed.

Establishing key milestones and deadlines is a good way to provide focus and impetus to reforms. Targets should be ambitious but achievable to provide for maximum progress while allowing industry participants to understand the reforms and provides sufficient time to adjust to new industry and commercial arrangements. Key milestones and deadlines should not be disregarded lightly, however, some flexibility will be required to adjust these as reforms unfold.

Governments should consider using pilot programmes to test and refine proposed changes, and to gain insights into how best to implement the changes across the whole industry.

Transitional measures should be considered such as for example phased disaggregation of government owned businesses, the development of corporate forms, establishment of vesting contracts, phased introduction of new tariffs, phased removal of subsidies, progressive reductions in the contestability threshold linked to consumer information campaigns, fixing prices for an initial period while allowing for future reviews.

Principle 18 Government should adopt a consistent and integrated approach to reform for efficiency and to provide greater certainty to private sector participants and consumers.

There is a need to ensure co-ordination of reform processes between the government, the industry, government owned businesses, and the regulator. Co-ordination will help eliminate overlap and contradictory actions by the different parts of the reform process. Furthermore, governments need to ensure a consistent approach to regulations and reform by central, provincial, and local governments and agencies. That is, consistency across all jurisdictions of government.

As part of this process, government should consider the full range of policy options that can be used to achieve social objectives. Policies should be targeted and conflicting policy objectives should be eliminated. For example, the issuing of new PPA contracts or subsidising new capacity to ensure adequate supply. Alternatively, the use of community service obligation payments, or consumer subsidies to ensure consumers do not pay excessive prices. Requiring the electricity businesses to operate as businesses as well as achieve community or social objectives will lead to inefficiencies and poor industry outcomes.

Section 3 Industry Structure

The economy visits to the survey APEC economies highlighted that existing market structures in many economies are poorly developed, with some government owned businesses privatised as a single entity rather than disaggregated. Of particular concern though, was that the regulatory and institutional frameworks necessary to ensure a competitive environment were insufficiently empowered, staffed and resourced. For a description of best practice industry structural reform in two APEC economies see Appendix 1 for case studies of Singapore and South Korea.²

Industry Structure

Principle 19 Government business activities occurring within government agencies should be commercialised and then corporatised.

As a precursor to consideration of ESI reform it is necessary to ensure that the government owned monopoly operates on a commercial basis. Commercialisation entails transforming an ‘old style’ statutory authority or departmental body with multiple objectives into an operation with a commercial focus. It is the first stage necessary to implement structural, operational and cultural change within the industry. Examples include the establishment of profit centres or “lines of business” corresponding to particular markets.

A next step in the reform process may involve corporatisation - the conversion of a government department or agency without legal personality into a corporation having separate legal status. Corporatisation of government enterprises will be necessary in order to provide government with the necessary commercial information and legal structure to enable further reform, in particular disaggregation. Corporatisation involves ensuring that the government owned businesses:

- has a commercial objective as its principal focus;
- receives no advantages due to government ownership;
- has clear and non-conflicting objectives;
- is subject to independent and objective performance monitoring;
- is moved from government sector accounting practices to fully audited commercial/accrual accounting practices;
- is able to manage operations and employee relations free from government restraint or direction; and
- has any regulatory and policy functions transferred to an appropriate government department or regulatory agency.

² Also see Appendix 1 for a discussion of the recent issues in electricity reform in California.

Principle 20 An assessment should be made of the advantages and disadvantages of structural reform options.

Prior to undertaking further reform careful analysis needs to be carried out to ascertain whether the benefits of restructuring are likely to exceed the costs, including the loss of any synergies.

Disaggregation, or unbundling the industry, entails significant implementation costs and ongoing transaction costs post reform.

This analysis must also examine the costs of unravelling or addressing the existing arrangements, such as those surrounding existing or planned IPPs.

Principle 21 Where possible, government should use separation of generation from transmission, distribution and retail, ie unbundling of vertically integrated business, to engender competition and efficiency into the industry.

Following corporatisation or even as part of the corporatisation process, government need to consider the appropriate industry structure. ESI reform has usually involved a degree of industry restructuring where disaggregation involves the separation of the government owned monopoly provider of electricity into separate companies, which is often based on the various stages of production:

- generation;
- transmission
- distribution; and
- retail.

Disaggregation initially requires the identification and isolation of the potentially competitive elements of the ESI from the “natural monopoly” elements. The purpose of separating the various stages of production is to be able to introduce competition into those elements of the industry that can potentially provide services on a competitive basis, typically generation and retail. In addition, it will be necessary to regulate those sectors of the ESI that provide services that are most efficiently provided by a (natural) monopoly service provider – primarily the transmission, distribution and system/market operations. Further disaggregation within a stage of production may be necessary in order to promote effective competition (eg in retail and generation) or to provide benchmarks for effective regulation (transmission and distribution).

Disaggregation makes clear the costs between the various stages of production, thus leading to greater transparency and efficiency. It should be noted though, this does not require privatisation, although it is one way to lock in the reform process.

Disaggregation requires the assets and liabilities of the existing integrated utility to be vested in the newly created separated entities. There are various ways of achieving this, one of these being the statutory method whereby an Act of Parliament identifies the assets and liabilities (either in the Act itself or in some subordinate instrument) and vests them by force of law in the successor entities. The main alternative is the transfer, assignment or novation of assets and liabilities by means of private treaty.

Separating out the various functions of the industry means that a complex set of arrangements must be implemented to ensure that the industry can operate properly, as well as to regulate the operation of the market (whether a formal wholesale pool or bilateral sales). Many of these ongoing arrangements will need to be effected by contracts between the new market players. Inevitably the Government will be required to lend support to ensuring the smooth implementation and effectiveness of these arrangements.

Principle 22 The optimal level of disaggregation will depend on the scale and nature of the industry, the level of development of the economy, the synergies between the different elements of the industry, the potential for effective competition, the nature of the existing structures and arrangements.

From an economic perspective, the optimal level of disaggregation for a specific economy will depend on the trade-off between the pro-competitive and regulatory benefits of disaggregation (ie mainly allocative and dynamic efficiency) and the benefits of scale, scope and coordination (mainly technical efficiency).

In deciding on the optimal level of disaggregation for an economy, or whether disaggregation is appropriate at all, a number of factors need to be considered. The factors include the size of the ESI market, as a whole and in its disaggregated parts, the economies of scale, the scope for coordination that may exist between the different elements in the industry, the degree of competition in upstream (eg primary fuel) and downstream (eg key energy consumers) markets and whether disaggregation is likely to create a sufficiently competitive environment or provide for improved regulatory outcomes to sustain better outcomes for consumers.

In assessing the potential for competition or market power in the ESI the following aspects are relevant:

- the definition of the markets or sub-markets, relevant dimensions may be geographic (regional vs national), product (electricity vs energy), functional (wholesale vs retail) and time (spot vs long term contracts);
- the height of barriers to entry that would exist – ie the ease with which new generators or retail businesses can enter and secure a viable market share. This may involve moves to ensure that access to fuel for new generators is not hampered by incumbent generators;
- the number and size distribution of the sellers (eg generators) and buyers (eg retailers);
- the character of ‘vertical relationships’ between the generators, transmission, distribution and retail businesses; and
- the nature of any formal, stable and fundamental arrangements that could be entered into between firms in the various stages of production which restrict their ability to function as independent entities.

Principle 23 Limited and phased disaggregation of the ESI may suit economies that are small, isolated and at an early stage in their economic and industry development.

Policy makers should bear in mind that the level of competition within the industry will be determined by the sophistication of the market as well as the stage of the electricity industry development. Not always will the competitive model be appropriate given the current market state-of-play.

For economies that are small, isolated, and at an early stage in their economic and industry development, rapid disaggregation may not be attractive as this may disperse limited skills and resources and may create complex and high transaction cost structures without the necessary commercial and regulatory capabilities or institutions to allow them to work. For such an economy, a phased approach may be more attractive.

Principle 24 Government needs to ensure that the chosen industry structure can sustain financially viable businesses.

Also of critical importance is the need to ensure that the disaggregated businesses are financially viable over time. This requires government to ensure disaggregated businesses are of sufficient scale and have sufficient management, technical and financial resources. It requires a level of certainty associated with revenue and costs, which may in turn require the unbundling of existing contracts and the creation of new 'vesting' contracts to underpin the ongoing revenue, at least in the shorter term. This is particularly important if privatisation is being considered, as the ability to further restructure the industry and contracts post-sale is more limited than prior to sale. Industry risk, commercial risk, and regulatory risk need to be understood, documented, and addressed as part of the disaggregation process.

Financial viability requires consideration of existing supply contracts and possible creation of vesting contracts. It requires understanding and documentation of the commercial risks faced by the disaggregated businesses. It requires detailed analysis and vetting of model assumptions used to determine the optimal scale of the business, the market, and the necessary commercial and contractual arrangements to sustain the business.

If privatisation is being considered then government must address prior to sale all the commercial arrangements necessary to provide for financial viability. If not, then the scope for reform post-sale is more limited and the transaction costs considerably higher.

Section 4 Legal and Regulatory Framework

Legal Framework

Principle 25 Ensure the existence of a robust legal system to complement ESI reform specific legislation, including business laws and enforceable contract and property rights.

Establishing an effective and transparent legal framework is a fundamental part of ESI reform. In particular, it is a precondition to ensuring private sector confidence in investment in the ESI and facilitating possible privatisation of government ESI businesses, if appropriate.

An investor's preparedness to invest in the ESI will usually have a direct relationship with its perception of legal risk and transaction costs over the life of the investment. Legal systems that reduce risk and the cost of investment will encourage foreign investment. This applies not only where State assets are being privatised in the short term, but also where investment is sought from new entrants into competitive parts of the ESI, such as IPPs. Where privatisation is considered as a medium or long term option, achieving efficient outcomes will certainly depend on ensuring that legal risk is minimised.

Inevitably the establishment of the legal regime will involve balancing the desire for certainty by investors, consumers and owners of electricity assets, with the need for sufficient flexibility for government to shape the reform process, particularly as unforeseen reform issues arise during the process. This will involve establishing clear and published commercial laws supporting a market economy, including contract and property laws, laws relating to water rights, laws relating to the establishment and operation of companies, and bankruptcy and liquidation procedures. It will also involve ensuring that currency is fully convertible and that repatriation of profits and capital is allowed.

Principle 26 Establish clear competition law, policies and institutions that are applicable to the ESI.

Complementing the requirement for general legislative framework is the need to establish competition laws dealing with anti-competitive practices and misuse of market power. Government needs to ensure that such laws apply equally to all entities in the ESI regardless of ownership and that institutions are established with adequate powers and resources to investigate and enforce such laws.

Government needs to consider and resolve the interrelationship between the competition authority and other regulatory institutions (eg fair trading commission; economic regulator).

Principle 27 ESI reform legislation should be clear, transparent, publicly available, and justified based on cost benefit impact assessment.

Specific reform legislation will inevitably be required to underpin the reform program itself. Such legislation is necessary to legitimise the process, as well as establish and define the respective roles and functions of government and private parties, authorise the various parties to carry out their respective tasks, and delineate the process of reform.

This reform legislation will need to establish the legal basis for the reforms, and thus address all aspects of the chosen structural reform measures, which may include, amongst other matters:

- the corporatisation and vertical disaggregation of the government owned elements of the ESI, (e.g. generation, transmission, distribution, and retail supply);
- the disaggregation of generation into separate companies to ensure adequate competition between generators;
- the establishment of the transmission and distribution system operators as separate companies;
- the regulation of natural monopoly elements (such as transmission and distribution) by a regulator who is independent of government;
- establishment of a system operator;
- ring-fencing of the Market and/or System Operator's activities or complete separation into a different company;
- the ring fencing of retailing from the distribution network where these activities have remained in single ownership;
- the introduction of competition in generation and retail supply through the removal of legal barriers to competition; and
- the separation of wholesale electricity tariffs into separate charges for electricity consumed (determined by competition) and the use of electricity networks (regulated).

Principle 28 Reform legislation needs to provide sufficient clarity, scope and power to allow the reform process to be undertaken.

Electricity reform legislation is often a catalyst for the reform process as it highlights genuine political commitment to reform. In fact, sometimes industry structural problems are not realised or addressed until reform legislation is being drafted or has been passed. Therefore, the passage of specific legislation is often a key milestone in the initial phases of reform.

It is important to ensure that there are no conflicting objectives in the reform legislation (eg social development versus efficient industry/government business), or that where there is the possibility of conflict the objectives are clearly and transparently prioritised.

In addition to specific reform legislation, economies embarking on ESI reform must ensure that the reforms are carried out within a robust legal system enshrining the rule of law. Legal rights must be both clearly defined and legally enforceable. A body of business laws will be required to support the emerging market economy, including property rights, contract laws, and laws relating to the formation and operation of companies and bankruptcy and liquidation procedures.

Principle 29 *Regulatory agencies or bodies should be established to oversee and implement the regulation of the ESI both during and after reform.*

Closely allied with the need for clear legislation and a robust legal system is the need for independent and transparent electricity industry regulatory institutions. The establishment of such institutions will be critical to:

- ensure the confidence of domestic and international bodies (including potential investors) in the ESI; and
- remove the potential for conflicts of interest which the government may encounter as both owner and regulator.

The creation of robust independent regulatory oversight is essential for ongoing ESI reform to succeed. While this requires the establishment of independent institutions and expertise, this will only occur if the government genuinely supports and promotes that process. While stepping back from involvement in the operation of regulators, the government will need to take responsibility for the establishment of the necessary institutions with the funding (resources), powers and expertise to be able to effectively regulate the industry. It should be noted though, that the establishment of that entity may involve gradual separation from the government administrative apparatus, to ensure an orderly and smooth transition to full independence.

Principle 30 *The government needs to ensure that the regulator has sufficient resources and develops and maintains the necessary expertise.*

Without sufficient funding, skills and knowledge the regulator is at risk of being dominated by either government or industry players who have superior levels of knowledge and information. In addition, organisations with low levels of industry knowledge and technical skills will tend to ask for more information than would otherwise be necessary, thereby increasing costs, reducing certainty and ultimately increasing the risk of regulatory failure.

To ensure the regulator can satisfactorily fulfil its role, the economic regulator(s) will need a variety of skills, including economic skills; general industry knowledge; a detailed knowledge of the regulatory instruments; and quantitative and analytical skills to carry out cost-benefit analyses.

The skills of the regulator and staff should be developed over time. Ongoing training and skill development should be an integral part of the regulator's actions, including a focus on technical capabilities, financial analysis skills, and commercial knowledge and understanding. Initially this may involve using external skills and consultancies to boost internal competencies. Also the regulator will need to be able to obtain advice from external sources and be able to afford this in its budget.

To attract and retain skilled staff salary structures will need to be competitive with the private sector. Furthermore, the regulator should be able to employ staff free from the traditional public service constraints. However, in some circumstances, particularly where corruption is a major issue there may be merit in employing people on 'traditional' public terms. This might provide a greater level of accountability.

Throughout the reform process, government may need to consider the appropriateness of the current staff of the regulator and change or augment the number of staff as appropriate. This is particularly important if the reform process involves a paradigm shift to self-regulation or self-regulating systems and away from (heavy-handed) regulatory policy.

<p><i>Principle 31 The role of the regulatory institutions should be manageable given the staff and skills available.</i></p>
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The reform of the ESI will require a number of different aspects of the industry to be regulated. These include:

- pricing;
- licensing of operators;
- technical regulation;
- reliability of supply;
- health and safety; and
- environmental regulation.

These different regulatory functions may be carried out by separate entities. However, this can lead to both over-regulation and/or a lack of co-ordination between the regulatory bodies, in turn inhibiting the development of goodwill between industry and regulator. Accordingly, consideration will need to be given to the extent to which these tasks can be brought within a single body or smaller number of institutions.

At the same time though, managing the grid code, distribution code, issuing of licences, the development of the market rules, and pricing regulator is an enormous task and one that would be better managed over time by separate entities.

<p><i>Principle 32 The regulatory regime should ensure that the regulatory bodies are truly independent of both government and industry.</i></p>

The need for predictability and certainty must be balanced with the need for accountability of the regulator. In particular, clear rules for challenging decisions of the regulator need to be developed. The appeal/review mechanisms chosen will largely depend on the legal structures and procedures in the economy concerned, but they must at a minimum be transparent, effective and certain. The regulatory framework must clearly delineate the respective roles of both the government (including different tiers of government) and the regulatory agencies.

Government should not retain regulatory functions that may overlap with or conflict with those conferred by law on the regulator. Also, the regulator should have separate funding autonomous from the government budget thus providing an additional level of independence. However, industry funding (in whole or part) may be an option if conflict of interest issues and concerns about capture can be resolved. However, this does not mean that Government will not play a role in the reform and beyond reform. There will always be the need for ongoing policy making and the devising of some policy safe guards if the reforms fail or falter.

Principle 33 The regulatory regime must ensure adequate oversight and review of the regulator.

It is important for government to establish measurable indicators of the regulatory process to measure the performance of the regulator and to provide feedback on the regulatory structure.

Appropriate appeal and/or review mechanisms should be established with respect to decisions made by the regulator. These processes (including grounds of appeal/review) should be precisely defined. A balance must be found between the need for transparency and accountability on the one hand, and the requirements of regulatory certainty and efficient processes on the other.

Effective review is an essential component of the regulatory system. Effective review requires not simply the opportunity to engage in debate, but also the capacity to do so in an efficient and timely manner.

Principle 34 The regime must ensure that the regulators' processes are transparent and that all decisions are based on objective criteria.

The regulator should be required to make decisions in accordance with principles, rules and criteria that are objective and clearly stated in the enabling legislation. Decisions should not be based on loose, arbitrary or obscure reasons or methodologies, or determined by the regulator's personal interpretations of the government's overall objectives. Furthermore, the regulators should be required to explain and sustain and defend – even in the courts - the basis of their decisions.

Section 5 Wholesale Market Mechanisms

Principle 35 The establishment of a competitive wholesale market should only be considered in the context of overall market structure and design.

The competitive wholesale market displaces traditional centralised planning and operation of vertically integrated monopoly power companies with decentralised, market-driven processes. The object is to achieve economically efficient investment in, and operation of, the generation sector of the reformed industry. Under these arrangements, market and technology risks that had previously been borne entirely by consumers are transferred in the first instance to generators.

The wholesale market mechanisms should also be designed to interface properly with the regulatory framework for transmission planning and access so that the combined investment in both generation and transmission delivers the most cost effective supply of power from the wholesale market to the distribution network connection points.

In essence, the competitive wholesale market mechanisms combined with the regulatory arrangements for transmission should provide incentives for all the parties involved (market participants, market and system operators, transmission network service providers, regulators etc.) to deliver the most economically efficient outcome for consumers.

Principle 36 A competitive industry structure with multiple wholesale buyers and sellers is a necessary precondition for the introduction of a competitive wholesale market.

The government will need to make an evaluation about the exact design of the proposed market. Design factors to be considered include: a market design with self-scheduling or centralised scheduling, and whether energy prices should vary by location on an individual power system or whether there should be a single system energy price across the country or region.

In larger countries, or for inter-connected regions, pilot programmes of wholesale competition can be introduced as a way to ease the transition to full wholesale competition. However, care should be taken with such programmes to ensure that they do not provide an undue competitive advantage to those who participate compared to those who do not. The main features of a competitive wholesale power market are discussed below. In each case, the commonly considered options for each of the key characteristics of those features are also canvassed. Given the critical role of the transmission network and its impact on the operation of the wholesale market, it has also been addressed.

Participants in the Market

A developed competitive wholesale market relies on multiple buyers and sellers operating in a highly interactive and competitive market environment. Participants will include “physical” participants (i.e. generators and retailers) but they can and almost always will include financial traders who neither own generation plant nor retail power to final end consumers. These financial traders play a key role in allowing the “physical” participants to manage the very considerable trading risks involved in the market.

The reform process should allow for a transition from a single buyer structure to multiple buyer industry structure where electricity is sold directly to retailers as early as possible in the reform process.

The timing of the introduction of a competitive wholesale market should coincide with the creation of separate multiple buyers and sellers in the wholesale market. If it is necessary to have an interim step with the retention of a single buyer, heavy-handed regulation of the wholesale market will need to be retained during that period.

Principle 37 *A competitive wholesale market requires a competitive fuel input market.*

Primary input fuels can represent as much as 50% of the retail cost of delivered energy to consumers. Without effective competition in the upstream supply of primary fuel sources for the restructured generation sector, there is a risk that much of the benefits of reform could be captured by monopoly fuel suppliers.

A competitive wholesale market should stimulate the development of competitive and efficient practices in the fuel input market. The government should ensure that there are no unnecessary impediments to this process occurring.

Principle 38 *An efficient competitive wholesale market requires a deep and liquid contract market with effective means of forward price discovery.*

The Forward Contract Markets

The vast majority of electricity traded in competitive wholesale power markets is traded in forward markets of various forms well ahead of the time when the power is produced and consumed. The various forms of contract trading are similar to those encountered in most other commodity markets. They can include:

- direct physical bilateral contracts between “physical” participants
- bilateral financial or hedge contracts between “physical” participants
- OTC (Over The Counter) bilateral contracts facilitated by financial traders
- exchange-based futures or forward contract trading where a central market acts as counterparty to all trades.

As markets mature over time, it is to be expected that more forms of contract trading will evolve, each complementing the other and enhancing the overall depth and liquidity of the market.

Principle 39 *A real time balancing market in which there is as much consistency as possible between market prices and the physical dispatch of the power system is a core feature of the competitive market.*

The contract markets are essential to the efficient operation of the restructured and reformed industry because they facilitate the efficient management of risk; provide the incentive for best industry practice in the operation of the power system; and provide the necessary forward price discovery to facilitate new investment in new facilities at the right time, of the right type and in the right location to satisfy projected future growth in demand.

A Separate Capacity Market

Whereas each of the other market features listed is unavoidable, the inclusion of a separate capacity market is optional. Proponents of such markets claim they are necessary to ensure sufficient capacity is available at all times to maintain power system reliability at the desired level. This implies that an “energy only” market will not be able to provide sufficient revenues to the low duty plants that maintain reserves but are rarely called upon to operate.

However, others suggest that separate capacity markets are not needed, provided that:

- There is a reasonable demand side response to high energy prices in the real time market; and
- Prices in the real time market are essentially uncapped.

Given that no competitive markets have yet been able to demonstrate that the above preconditions have been met, opinion is still very much divided on this issue.

A Real Time Energy Balancing Market

In addition to the various forward contract markets, there must also be a real time balancing market to manage trading of the mismatches between the forward contract position of each “physical” participant and their actual generation and/or purchases of electricity in real time.

There are four key elements that together constitute the operation of the real time balancing market. Market designers however have a range of choices when deciding on the important characteristics of each of these key elements:

Scheduling

The scheduling process determines the combination of generation plant and/or demand side actions that will be used to balance electricity supply and demand in real time. The four different approaches to scheduling that can be considered include:

1. self-scheduling of physically matching generation and load;
2. self-scheduling of generation and demand without physical matching;
3. centralised scheduling based on declared marginal costs; and
4. centralised scheduling based on participant determined price bids and offers.

Most of the latest market designs employ a combination of one of the self-scheduling options together with centralised scheduling using participant bids and offers. The combination of (1) & (4) is often referred to as a net pool, while the combination of (2) & (4) or (4) on its own are referred to as a “gross” pool.

In some cases, Options (3) or (4) when used on their own may involve centralised commitment and decommitment of slow start generation. This requires the market operator to decide up to 24 hours ahead of time which base load generation plants (e.g. nuclear and/or black coal fired thermal plants) will be fired up and synchronised with the power system and which ones will be shut down.

The latest market designs however are decentralising these decisions by requiring the plant owners to decide for themselves whether they wish to incur the considerable costs involved. This obviates the need for the market operator to undertake highly complex, inter-temporal optimisation analyses to decide which plants should be synchronised or shut down and when.

Dispatch

The real time dispatch function is the process by which the market operator confirms with each market participant precisely what plant and/or demand side actions will be taken in order to balance supply and demand. The introduction of competitive markets has resulted in some subtle changes to the way this is done.

Issuing of dispatch instructions must now be done using procedures that provide clear audit trails, whereas previously it may have simply been a verbal message to the plant operator. Typically, dispatch instructions are now sent electronically, and preferably using AGC systems that allow automated remote control of a generator’s output level by the market operator.

Market Price Determination

The market operator must set prices to apply to all trading in the imbalance market. Most markets now use a common clearing price approach where the bid based marginal cost of production sets the market-clearing price for all participants. A few markets however are paying participants according to their own individual bid or offer prices for dispatch.

A second important issue is the extent to which real time market prices differentiate between different locations in the network. Some markets reflect the full short run marginal costs of transmission by applying what is often referred to as “full nodal pricing”. Others opt for a single market-clearing price across the entire network so that the costs of neither network losses nor network congestion are signalled in the real time market prices. And others have at least some locational price signals by adopting separate price zones where significant network congestion is likely to occur.

As a general principle, it is highly desirable to ensure absolute consistency between system dispatch and market pricing. Any inconsistencies between the two give rise to market anomalies and perverse market incentives to individual market participants, each of which leads to the introduction of complex counteracting rules to deal with those problems.

Market prices can be determined as often as every 5 minutes (or even more frequently) or as infrequently as every few hours. The vast majority of competitive power markets use a trading interval of 30 minutes or 60 minutes; however, some of these operate a dispatch price setting process at shorter intervals and calculate time- or load-weighted prices over the 30 or 60-minute interval for trading purposes.

Settlements

The settlement process ensures that each of the market participants trading in the imbalance market pays or is paid what they owe or are owed for their physical trades in the imbalance market.

Settlement can occur as frequently as daily, or at the other extreme it may only occur monthly. It may occur very shortly after the end of the settlement period, or alternatively it may be delayed for a few weeks to allow time for metering errors to be corrected and/or any disputes affecting settlement payments to be heard and resolved. The market operator will also need to establish prudential rules to reduce their collection risk to an absolute minimum.

Decisions about the key characteristics of the settlements function will impact on trading risk allocations amongst market participants and on the distribution of working capital requirements of the industry between generators and retailers.

Principle 40 *Where practicable, spot markets in ancillary services for frequency control and network control should operate in parallel with the energy imbalance market to ensure optimum use of competing resources across all of those markets*

Although there is no unique design of the balancing market that is clearly superior to other alternatives available, as discussed above, there are some fundamental economic principles that should be adhered to when deciding on the key attributes of the real time balancing market.

Power System Operations

The system operator is responsible for ensuring that power system security is maintained at all times. This requires power system security standards (relating to power system frequency and voltages) to be complied with and for plant ratings not to be exceeded. The system operator therefore determines the amount of ancillary services that must be available at all times as well as the physical constraints that must be applied to the dispatch process by the market operator.

Ancillary Services

A number of ancillary services are required by the system operator to ensure that power system security is maintained. Some markets rely on a medium to long-term contract-based approach for acquiring these services from service providers (mainly generators). However, in recent years, there has been a trend towards the introduction of competitive daily bid-based markets for certain types of reserves used for frequency control, and also for scheduling and dispatching reactive plant for voltage control around the network.

Principle 41 *Market designers and regulators need to ensure absolute consistency between the responsibilities and accountabilities of market and system operators and transmission operators.*

These daily markets are considered to be more efficient because they allow a more diverse range of participants to provide reserves, and they also allow these reserve markets to be co-optimised with the real time energy market. This is considered highly desirable because the same resources can be, and often are, used in either market.

Transmission Network Operations

As a general rule, the transmission network operations function in competitive power markets is the responsibility of the system operator. Where a single transmission company is the monopoly service provider for the entire market, the system operator role is often allocated to the transmission company.

However, where there are multiple transmission companies and/or some of the transmission network costs are directly reflected in the energy market, it is preferable to establish a separate system operator, in which case it is normally combined with the role of independent market operator.

Even when there is a single transmission company, it may be highly desirable to separate the system operations function from the transmission operations function to avoid potential conflicts of interest between the two.

Principle 42 *A wholesale market requires a competitive industry structure, independent dispatch with a highly transparent price determination process, a transmission planning and access regime that complements the market for energy trading, and appropriate regulatory supervision.*

Transmission Network Planning and Access Arrangements

While it is possible to introduce competition in the generation and retailing sectors of the industry, transmission and distribution are generally considered to be natural monopolies and therefore must be subject to regulatory supervision.

Effective operation of the wholesale market relies on all participants having free and open access to the networks on a non-discriminatory basis. There are various ways of implementing network open access arrangements. The most “light-handed” regulatory approach relies on a bilateral negotiation/arbitration approach between the network service provider and the participant.

While this approach may be impractical at the distribution network level, it is a possibility at the transmission network level where almost all the participants are large, relatively sophisticated market players.

In spite of this, it is normal practice for the access arrangements for most of the competitive power markets to operate in conjunction with standardised network access conditions and very simplistic network access charges. While this may have some cost in terms of loss of economic efficiency, it has the appearance of being more equitable and is therefore often favoured by regulators.

We are beginning to witness an emerging trend towards the introduction of merchant transmission interconnectors in some markets that is casting doubt over the concept of all transmission being a “natural monopoly”. These merchant links in effect compete with generators by arbitraging between separate markets or control areas, or alternatively between separately priced nodes or zones within a single market. This of course is not possible without at least some form of local price signalling in the real time balancing market.

Consistency in Overall Market Design

The experience gained with the design and practical operation of these markets in various parts of the world over the past decade have taught us a number of important lessons about electricity industry and market reform:

- The generation sector must have a reasonable number of participants operating particularly mid-merit and peaking plants in competition with one another for the market to be effective. It also requires new participant access to the market to be relatively easy and non-discriminatory.
- It is not essential to have vertical disaggregation of transmission and generation, and transmission and supply, provided that production and wholesale supply or retailing have been liberalised and an adequate regulatory framework established, in order to prevent discrimination in access to the transmission network.
- Effective competition in the wholesale market does not rely on competition being introduced into the retail market. While it may be preferable to introduce both wholesale and retail competition by allowing end-use consumers to choose their supplier or retailer, it is also possible to have an industry structure with multiple franchise retailers buying in the wholesale market to supply the electricity needs of their franchise retail consumers. It is important however that there be multiple buyers and sellers; i.e. a single buyer model does not create effective competition.
- The centrepiece of an effective competitive trading environment should be an open and highly transparent real time balancing market where, to the maximum extent practicable, consistency should be maintained between physical dispatch and market prices. That is, locational prices in the energy market should reflect the cost of transmission losses and congestion.
- The scheduling and dispatch process that is adopted in conjunction with the operation of the real time balancing market should allocate as much of the responsibility and risk to market participants as possible, and only involve enough central command and control in the hands of the market and system operator(s) to guarantee power system security and orderly operation of the market.

Consideration needs to be given to organising the industry by economic geography rather than through government determined administrative regions.

<p><i>Principles 43</i> <i>Consideration must be given to ensuring Power Purchasing Agreements are consistent with facilitating a competitive wholesale market.</i></p>
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The government needs to ensure that all participants operate in the wholesale market on an equal basis and that government owned businesses are not advantaged due to government backed debt financing or other advantages. Uniform market rules and an open, transparent network access regime, all operating under appropriate regulatory supervision, need to be adopted and implemented.

Retail tariff reform is a necessary component of the overall process. A single point tariff to the end customer does not always send the right market signals through the production chain and therefore it does not provide any incentive to ensure efficient practices. Unbundled tariffs, split by stage of production and transport, allow for tariffs to be determined on a cost basis and should facilitate the elimination of cross subsidies across the industry.

Power Purchasing Agreements

Power Purchase Agreements have been used to varying degrees in the past throughout the APEC economies to supplement the supplies available from government utility owned power plants. The government should ensure that these pre-existing PPAs at the commencement of the competitive wholesale market do not unduly inhibit the development of a free and open competitive market.

Principle 44 *A key success factor in any electricity industry and market reform program is finding politically and commercially acceptable transition strategies that enable the industry to continue to maintain supply reliability and improve power prices while both the electricity industry businesses and the market are transformed.*

Where feasible and cost effective, PPAs should be reformed or renegotiated to ensure existing or at least future PPAs promote competition among generators. The government should ensure that future PPAs permit restructuring to allow for a buy-out of the PPA on a reasonable financial basis or the conversion of the PPA to a contract for differences.

The government should encourage investors and the market to consider IPPs as a long-term investment and not just an asset to be on-sold for profit. The government should ensure that market participants cannot attain a position of market dominance by contractual means as an alternative to asset ownership.

Other Transitional Issues

Moving to a wholesale competitive market will require consideration of transition issues, including:

Participant & Investor Confidence in the Market: The government needs to consider how best to facilitate understanding and confidence in new trading arrangements. This needs to address concerns that some producers may encounter difficulties managing their business risks where the trading arrangements decentralise much of what was previously centralised decision-making.

- *Stranded Costs.* These occur because the asset values that can be supported by market-based revenue streams for some facilities are less than the book value of those assets at the time competition is introduced. Put simply, market prices cannot be expected to cover the costs of past mistakes (including “gold-plating” – over-engineered and unnecessary assets) and social objectives. If policy-makers decide that electricity consumers should bear some or all of the stranded costs brought about by the introduction of competition, there is a range of mechanisms that can be applied to recover those costs accordingly. It is important however that the mechanisms used are applied in a competitively neutral fashion; i.e. they do not distort either the competitive behaviours of market participants or competitive market outcomes.

- *Timetable for introducing retail competition.* It is normal practice for retail competition to be introduced progressively following the implementation of wholesale market reform. Where there will continue to be franchise retail consumers for a transition period, regulatory and or other mechanisms will be needed to manage both the wholesale and retail prices for the franchise market on a fully consistent basis throughout the franchise period.

Section 6 *Transmission and Distribution*

Overview

Principle 45 *The economic regulation of transmission and distribution networks should be designed to:*

- i) promote competition in upstream and downstream markets;*
- ii) prevent misuse of market power; and*
- iii) promote the economically efficient use of and investment in the network.*

Transmission and distribution networks provide the necessary physical linkages to underpin competition in wholesale and retail markets for electricity.

However, competition between transmission and distribution networks is generally not economic as they display strong natural monopoly characteristics. In the absence of price and service regulation, transmission and distribution businesses may have the ability, and the incentive, to monopoly price and/or provide sub-optimal service levels. In the absence of regulated third party access and structural separation or ring-fencing, network businesses may have the ability, and the incentive, to project this market power and to stifle competition in downstream and upstream markets.

As such, regulation of third party access, pricing and service levels is generally necessary in order to ensure an efficient outcome as well as to enhance competition in upstream and downstream markets.

Under some circumstances, direct price and service regulation of transmission lines may not be necessary, such as in the case of ‘unregulated’ interconnects (or merchant links) between markets. Such businesses gain revenue through using their capacity to arbitrage the difference in power prices between the markets they link. The transmission line is acting, in effect, as an additional generator with access to both markets. It is important too that such ‘unregulated’ links may only be possible in the context of a regulated market framework.

Principle 46 *The economic regulation of transmission and distribution networks should provide market signals to encourage ongoing efficient investment (whether in the form of upgrading or providing new capacity) in the network.*

Despite the natural monopoly characteristics associated with the transmission and distribution network, competition can be facilitated for a range of network services. A transmission constraint between two locations could be resolved by upgrading the transmission capacity or by increasing generation supply or reducing the demand at the constrained location. Similarly, a transmission link between two previously separate power grids can remove the need for larger generation reserve margins in each grid. Networks do not only transmit energy, they also provide a range of ancillary services such as various types of reserve (eg spinning, warm, cold, etc), reactive power and black start.

If regulatory interventions are required for network pricing and service, then they should be designed such that they promote economic efficiency. The aim is to provide the right signals for the future efficient operation and use of and investment in the network.

Network costs, prices and efficiency

Transmission Pricing

Principle 47 *Efficient pricing of transmission services can be achieved, in principle, through pricing at short-run marginal cost (SRMC) combined with mechanisms or incentives that allow for the efficient expansion of the network over time.*

Principle 48 *Efficient pricing of distribution services is likely to rely on an approach largely based on long-run incremental cost (LRIC).*

Economic efficiency in pricing is a forward-looking concept. The aim is to provide the right future signals for efficient operation and use of, and investment in, the network. There are two major aspects to efficient pricing of network services:

- Firstly, prices set at short run marginal cost (SRMC) should provide the right signals for operation and use of the network. The SRMC of transmission is equal to the value of marginal transmission line losses and the value of transmission constraints.
- Second, there needs to be a mechanism by which transmission capacity can increase (or decrease) over time in an efficient manner.

Given the large economies of scale and the irreversible (sunk) nature of investment in network assets, prices at SRMC will not allow an operator to recover the total cost of a new investment in capacity. If new investment is to be encouraged, then prices will need to be set so as to recover the long run incremental cost (LRIC) of new investment. LRIC is equivalent to avoidable cost.

However, additional charges on users to recover the total cost of investment that are beyond SRMC will distort usage and thus will reduce economic efficiency. This distortion can be minimised by recovering the additional costs from those consumers who are least likely to change their demand (ie who are price inelastic). This is generally accomplished in practice by offering customers a carefully designed suite of self-selecting two-part tariffs.

If SRMC is the lower limit on efficient prices, then the upper limit is stand-alone cost. Prices should not be set above stand-alone cost for any individual user, otherwise the user would have the incentive to by-pass the network, and this duplicated investment would be inefficient as it does not minimise overall costs.

The above principles apply largely to transmission networks but they also apply, in principle, to distribution networks. However, in practice, there are some important differences between transmission and distribution. The SRMC of line losses are more significant in transmission compared to distribution. Constraints, other than involuntary interruptions, are also less likely in distribution systems as lines are generally designed with higher margins for safety to reflect the very high cost to most users of interruption. Also, in practice, spot prices are virtually never available within a distribution system, so the information to potentially calculate the SRMC of constraints may be absent. As such, pricing for distribution systems at SRMC is not likely to be viable, and it becomes mainly a question of how to recover the total costs in the least distorting fashion (ie a LRIC approach).

The relationship between the energy market and network services

Principle 49 The role of regulation in transmission pricing and service will depend on whether an efficient energy market design has been achieved.

Before the role of transmission pricing can be determined, it is necessary to have a clear view on the ultimate role of the energy market. This is because, if pricing is to be efficient, then the spot price of transmission should correspond to locational differences in efficient spot energy prices. As such, the design of the wholesale market and transmission pricing are closely linked. For example:

- If an efficient system of nodal pricing (or something approximating it) were introduced, transmission prices may not need to include any locational/usage signals as the market itself would reflect SRMC, which is the totality of the signal required.
- Nodal pricing together with transmission rights may also provide some scope for market driven (and funded) capacity expansions rather than the more traditional periodic review of regulated prices and regulated service performance.

The role of regulation in transmission pricing and performance will depend on the extent to which the energy market produces efficient outcomes by itself.

Transmission tariff design

Principle 50 The design of transmission tariff structures should reflect efficiency objectives but may need to be modified in practice depending on economy specific issues including the degree of sophistication of the market and the availability of information.

Within this context, the two main approaches to pricing of transmission services are point tariffs, which are independent of the commercial transactions for electricity, or point-to-point tariffs that depend on the source of each transaction. Within each of these approaches there are a number of further options available:

Point Tariffs:

- nodal – which involves prices being set so as to equate supply and demand for electricity at each node of the transmission grid.
- zonal – which involves setting prices for defined zones that average the cost of congestion of nodes within the zone.
- postage Stamp – which uses a flat rate over specified periods

Point-to-point Tariffs:

- contract path – which involves prices being set for each transmission line in the grid.
- distance-related – which involves prices set as a function of the distance between the buyer and seller.

As part of the reform process, government will need to consider which of the above pricing methodologies best suits the overall efficiency objectives and the particular circumstances and stage of development of the industry and the economy. Obviously the degree of sophistication of the market, the availability of market information and political considerations may dictate that a simpler approach is adopted. In such cases a phased approach may be optimal.

Types of regulation for network services

Principle 51 Incentive based regulation, which seeks to align the commercial incentives facing the entity with the public interest, should be adopted for the price and service regulation of transmission and distribution networks.

There has been a wide range of approaches to price regulation of network services including the following:

- **Direct government control** — prices set by a Minister or Department.
- **Cost of service** — the business recovers the costs incurred through adjustments to tariffs over time.
- **Price / revenue capping** — the prices that a business can charge, or the revenues that a business can earn, for a given period is capped.
- **Exogenous/Benchmark/Yardstick** — which is the extreme form of price capping/price based/incentive regulation, where prices for the regulated services are set purely with reference to external benchmarks derived from comparable businesses.

There is a wide array of further sub-options under each of these approaches and, in practice, most regimes use elements from a number of the above approaches.

The **direct government control** approach has typically been used where the businesses were government owned. However, such an approach does not deliver regulatory certainty and efficient pricing for the regulated business, consumers and other industry participants. Such an approach is unlikely viable if there is significant privatisation of the industry.

The traditional example of the **cost of service** approach is US 'rate of return regulation'. While costs incurred can generally be identified with a fair degree of accuracy through specific regulatory accounting standards and auditing processes, this approach (in its purest form) provides relatively little incentive to minimise costs or to reduce them over time. A particular criticism is that, faced with little incentive over cost minimisation, the regulator is tasked with trying to determine whether certain levels of expenditure are efficient or prudent, for which regulatory bodies generally are poorly equipped to deal with. The 'rate of return' regimes have also been criticised as generating an adversarial approach and significant administrative and compliance costs, although to some degree this has also been a function of the particular legal practices and constitutional limitations that prevail in the US.

The **price/revenue capping** approach is designed to get around the problems of the cost of service approach by providing an on-going incentive for providers to minimise costs. For this reason, some commentators have described this approach as ‘incentive regulation’. The central feature of all price cap regimes is that prices are de-coupled from costs for a period of time, so that the regulated entity will earn higher profits if it is able to reduce its costs.

Price capping is best known from its application in the UK utility reform in the 1980s and 1990s where ‘RPI-x’ price regulation was applied in the telecommunications, electricity, gas and water industries. The ‘X-factor’ will reflect expected productivity gains, although, depending upon the approach adopted when setting prices, it may also reflect other factors (for example, the phasing out of the benefits from efficiency gains).

The extreme version of price capping regimes is what is referred to here as the **exogenous/benchmark/yardstick** approach. Under this approach, either price levels, or rates of changes of prices over time are set purely with reference to exogenous factors. This implies that, to the extent that a utility is more efficient than the industry average, or is able to achieve higher rates of productivity changes, it will retain these benefits forever. A range of approaches exist for determining efficient price levels for a particular firm, or industry average rates of productivity growth, with estimates of Total Factor Productivity (TFP) normally proposed for the latter.

However, it is very rare for prices for utility industries to be set purely with regard to external factors with no expectation of prices being re-set with recourse to cost at some future review. In most economies, the breadth and depth of information necessary to estimate a TFP X does not exist. In addition, even if a X could be estimated, this approach may provide regulated entities with very little confidence that they could recover the cost of the long lived, irreversible investments required to maintain service levels into the long term (and so require a cost-based price determination in the future), or may permit the utility to earn levels of profits that spark consumer and industry outrage (and so also invite cost-based price determination in the future). External benchmarks do have a valuable use, however, as a part of, or to complement, cost-based price redeterminations.

Types of price capping

Under the general framework of ‘price capping’ there are a number of different forms of price control that can be adopted, each of which imply a different relationship between revenue earned during the period, and sales. The relationship between revenue and sales within the period, in turn, will influence the provider’s incentive to invest to meet growth, and also influence its incentive to set efficient prices. The EPO appears to mandate the use of the revenue yield approach. The key features of this approach, and the other forms of price control in common use, are discussed below.

- **Revenue yield** — the control is on the average revenue, so that marginal revenue is equal to average revenue. This form of control is widely considered to provide incentives to set inefficient prices and, under some circumstances, to invest inefficiently.
- **Revenue capping** — the control is on the total revenue that may be earned for the regulated services, so that once the revenue cap is reached, marginal revenue is zero. Hence, the operator has little incentive to facilitate market growth.

- **Hybrid price control** – this form of control is between a revenue yield and revenue cap control. Part of allowed revenue, effectively, is under a revenue cap, and the remainder, effectively, is under a revenue yield (so that it is dependent upon sales or some other parameter that is considered to reflect costs, like customer numbers). These forms of control typically are designed so that marginal revenue is equal to marginal cost, so that the provider has efficient investment signals. However, as marginal revenue is unrelated to the price charged for a service, the provider may have little incentive to set efficient prices (although it would not have the incentive to set inefficient prices either, and so is normally considered superior to a revenue yield).
- **Tariff basket** — the control is placed upon a weighted average of tariffs, where the weighted may be fixed, or represent forecast quantities (a Paasche index) or lagged quantities (a Laspeyres index). Under this form of control, marginal revenue from a service is equal to the price charged for the service. Under a number of assumptions, this form of control provides an incentive to set efficient prices, and, if achieved, would also imply that the provider has an incentive to invest efficiently over the period.
- **Simple price caps** — the control is placed upon individual prices, implying no ability to rebalance charges between customer groups. Marginal revenue is always equal to price, which gives incentive to the operator to facilitate market growth but may also provide incentives to the operator to understate demand forecasts.

Typically, all of these approaches (apart from the simple price caps) are implemented with a number of rebalancing controls that restrict the rate at which tariffs to one group of customers can be raised (with tariffs to others reduced).

Convergence towards incentive regulation

While the utility regulatory regimes around the world clearly have had different starting points, there has been significant convergence in regimes in recent decades consistent with a unifying principle, which is to increase the extent to which commercial incentives are harnessed to assist in the regulation of utilities.

More generally, incentive regulation can be defined as a regulatory approach whereby the regime seeks to align the *commercial incentives* of the entity with the *public interest*. The adoption of incentive regulation can assist the regulation of utilities in a number of ways.

First, the roles performed by the regulated entity and regulator can change. If an entity has the incentive to act in the public interest, then a regulator can provide it with far more freedom over operational matters, in turn making use of the utility's far greater expertise and information on such issues. Equally, the regulator takes less of a role in assessing the business decisions of the entity – in which regulators inevitably have little expertise or information – and focuses on the design of incentives and the outputs delivered. Because incentive regulation permits the respective parties to specialise in their areas of expertise, and make use of more information, it is likely to result in superior outcomes for customers, as well as providing regulated entities with more freedom, and the ability to improve returns by improving performance.

Secondly, the use of incentive regulation can assist, significantly, in the task of regulating. If the regulated entity has the incentive to minimise cost, then it can be inferred that its actual expenditure levels are efficient. This obviates the need for trying to determine what is an efficient level of expenditure (such as occurs under rate of return regimes, and which was attempted by the Office of the Regulator General in Victoria, Australia). Similarly, if the entity has the incentive to provide the optimal level of service, or to connect only profitable customers, or to design efficient prices, the regulator can infer these results rather than undertaking the detailed investigations and calculations required.

The regimes referred to above can be interpreted as different points on a continuum with respect to the incentives to minimise cost. As implied by the above point, there are a number of other business decisions that well-designed incentive regulation should attempt to influence, which include the incentive to invest (and thus provide desired service levels over time), the incentive to provide optimal service levels, and the incentive to set efficient prices (for both existing customers, and with respect to connecting customers).

For example price/revenue capping approaches generally require a starting point, which usually demands some kind of cost of service assessment. After this, the X-factor can be set, including on the basis of productivity gains measures by TFP analysis. Prices are generally subject to review after a period, where they may be re-based back to cost, although there may be some cross-period incentive mechanisms (eg efficiency carry-over or glide path) to smooth incentives for efficiency gains over time.

Similarly, US rate-of-return regulation can incorporate a range of incentive mechanisms, that effectively operate as price caps over time. As such, there may be little difference in practice between a CPI-x approach that features periodic “re-basing” and a cost-of service approach incorporating incentives mechanisms (often called performance based rate-making or PBR).

The case study on price regulation in Victoria, Australia provided in Appendix 1 provides an excellent example of the debate on incentive regulation, it also illustrates the strong discipline that open and transparent regulatory and appeals processes place on regulatory decision making, especially in a privatised environment.

Key design parameters for incentive regulation

Given the tendency for a number of the broad approaches described above to converge, then the nature of the particular incentive arrangements of an option are more important than the broad approach. The focus should be on the key design parameters that can affect incentives, and these are described below.

Initial Asset Base

Principle 52 *The initial valuation of the existing asset base is a complex and sensitive issue that should be dealt with separately from other pricing issues. Once a valuation of the initial asset base has been made then this should be treated like other costs and the operator should be given a reasonable opportunity to recover these costs over time.*

Where an entirely new economic regulation framework is being introduced, the initial valuation of existing asset base will be the major determinant of the level of tariffs. This is a complex and sensitive issue that should be dealt with separately from other pricing issues going forward.

Economic efficiency provides little guidance as to an appropriate valuation other than a lower bound of scrap value (which may be close to zero) and an upper bound of deprival value or depreciated optimised replacement cost (DORC). Deprival value is equal to the lower of the market value or the DORC. DORC can be seen as the price that a new entrant would pay for second hand assets rather than build a new network to meet the same demand.

Governments should consider the range of reform objectives in deciding on an initial valuation approach within this range. Whether the assets are owned by government or not will be a major factor in the flexibility of the government to revalue assets.

Once a valuation of the initial asset base has been made - on whatever basis - then this should be treated like other costs and the operator should be given a reasonable opportunity to recover these costs over time.

Recovery of Costs

<p><i>Principle 53</i> <i>Tariffs should be set so as to provide a reasonable opportunity for operators to recover prudently incurred costs, including the cost of capital, from customers.</i></p>
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Price regulated natural monopoly businesses with large sunk capital investments are highly susceptible to regulatory decision making. Therefore investors require an acceptable degree of certainty that the utility will have an opportunity to recover costs that are prudently incurred, including the cost of capital. For a given regulatory period, tariffs should be set so as to provide a reasonable opportunity to recover those costs from customers.

Initial Price Level

<p><i>Principle 54</i> <i>Tariffs should be fixed for a period sufficient to provide incentives to the operator to minimise costs, with a review of tariffs back to cost at the start of the next period.</i></p>
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An important issue in establishing incentive based regulation is the question of what should be the initial price for a regulatory period. From the regulator's perspective, an important balance needs to be struck in setting prices of natural monopoly type services. On the one hand, the greatest consumer benefit will arise if prices can be held close to costs. However, on the other hand, it is important to also provide incentive for cost reductions over time by allowing utilities to share in the benefits of cost reductions through incentive mechanisms such as price caps. A balance between these two objectives is to fix prices for a period sufficient to provide the right incentives with a review back to cost at the start of the next period.

From a broader perspective, if price caps lead to very large windfall profits by utilities (eg UK privatisation) or if price regulation settings endangers the very survival of utilities (eg California) then the historical record shows that governments come under very strong pressure to intervene. This would represent a major failure for a regulatory regime. If such interventions are to be avoided, then attention needs to be given to the setting of initial prices and to providing a mechanism to re-base prices closer to costs at some point in time.

Productivity Gains

Principle 55 *The price path during a regulatory period should reflect inflation and productivity changes, such as through a CPI-X approach.*

Once initial price levels have been determined, government needs to consider how these price levels should change over the period to reflect inflation and productivity changes. There are a number of possible approaches to this, including rate of return based regulation and incentive based price caps involving the CPI-X approach. Under the CPI-X approach, the customers bear the inflation risk while the utility bears the risk that productivity gains will meet or exceed the benchmark level (ie the X factor).

Continuous Incentives

Principle 56 *The incentives on the operator to minimise costs should be continuous throughout the regulatory period, such as under an efficiency carry-over mechanisms.*

An important aim of a regulatory regime is to provide a continuous incentive to reduce costs. If a utility is reaching the end of the regulatory period and knows that it is facing a price adjustment commensurate with the efficiency gains it has achieved, then it may have a strong incentive to delay cost reductions until after the adjustment so that it can enjoy the benefits of those savings for say 5 years instead of 1 year. So, in the absence of some other measure, a price adjustment can provide a perverse incentive to delay cost reductions.

One approach to address this issue has been to establish an efficiency carry-over mechanism. Such an approach allows for the value of a cost reduction to be retained by the utility for a similar period regardless of the timing of that cost reduction.

Service performance

Principle 57 *A regulated price only makes sense in the context of some defined level of service. An array of approaches for different service dimensions should be used to ensure that operators have the incentive to deliver the desired service levels.*

A regulated price only makes sense in the context of some defined level of service. In relation to the price regulation of electricity transmission and distribution, the main dimensions of service are as follows:

- **Service reliability** — eg the frequency and duration of interruptions. This is typically the main focus for regulators.

- **Service quality** — the quality of the product delivered, eg frequency and voltage control, etc.
- **Customer service** — eg adequacy of responses to queries and complaints, timeliness at appointments, etc.
- **Amenity** — eg undergrounding of cables to improve visual amenity.
- **Propensity to connect customers** — eg incentives to connect new customers.

There are a number of alternative regulatory approaches that have been used to ensure that operators have the incentive to deliver the desired service levels including:

- **General legal remedies** — such as compensation awarded by courts or complaints handling bodies. This approach is costly and so is only suited to extreme impacts or obvious cases of poor service.
- **Competition by comparison** — comparative benchmarking and reporting against a specific basket of measures. The objective is to encourage operators to meet community expectations by publicly exposing the operator's comparative performance. This approach has obvious limitations in that there is no method to force unwilling operators to improve performance and expressed community expectations may not match their willingness to pay.
- **Minimum standards** — such as minimum standards included in a licence or a qualitative requirement to undertake acceptable or efficient practice, with a penalty for breaches. Such approaches provide a useful fall-back but by their nature cannot provide the right incentives for optimal service performance.
- **Performance incentive schemes** — this more sophisticated approach rewards or penalises depending on the relationship between its measured service and service benchmarks. There is a wide array of possible schemes from simple to very powerful and sophisticated. The more powerful and sophisticated the scheme is, the more important it is that it be carefully integrated with price controls to provide consistent and continuous incentives.

Section 7 Retail Tariffs and Contestability

Principle 58 Substantial reform of the upstream elements of the ESI is a precondition to implementation of retail contestability.

Full retail competition involves consumers being able to choose their supplier, either through direct access to competing generators or through their choice of retailer. There is an effective separation of the competitive elements of generation, wholesaling and retailing from the transmission and distribution networks.

In terms of phasing, retail contestability is generally the final stage of ESI reform, as disaggregation and regulation in the other stages of the industry is necessary to facilitate contestability. As such, the main characteristic of retail contestability is that competition has been introduced into all levels of the industry and therefore that any electricity consumer can purchase from any retail supplier.

Principle 59 Government should continue to play an important role in the regulation of retail competition, including issues of prices control, and market ownership.

To allow for contestability, the network functions of transmission and distribution (natural monopolies) must be separated from the functions of generation and retailing. Dispatch can be handled by the transmission network owner. However, where more than one transmission network exists, this may be best handled by an independent systems operator. It should be noted that retail contestability still requires regulatory oversight by government to ensure competition works. In particular, government plays a role in consumer protection and information, issues of ongoing market structure, access, tariffs, as well as policies involving subsidies of tariffs or the adoption of technology.

Principle 60 Government should give detailed consideration to the costs and benefits as well as the phasing and timing of implementing retail competition.

Due to the complex and expensive nature of the technology required to allow customer switching, the introduction of retail contestability (particularly by small household consumers) needs to be carefully considered to determine whether the costs outweigh the benefits. If the decision is to introduce full retail contestability to all levels of consumption, it should be introduced gradually to spread the cost of the introduction of the necessary metering technology to small customers over time.

Governments should create competition at the retail level by mandating open access to the distribution system, with unbundled prices for network services. Mandating open access to the distribution system allows other retailers to freely compete with the retailer that is affiliated with the local wires business.

The full retail competition model has been implemented in New Zealand, and is soon to be implemented in certain States of Australia. It is expected that retail contestability can:

- optimise economic efficiency, once the regulatory regime has been optimised to minimise any market imperfections and control abuses of market power;
- provide competitive pressure to reduce costs in generation (usually expressed in lower retail tariffs);
- improve the range, quantity, and quality of services offered by electricity retailers; and
- allow for market signals to better match increases in demand with increases in supply, ie new generation capacity.

However, full retail contestability can also lead to:

- transitional costs, including the cost of new metering systems;
- the abuse of market power if the new industry and market structures are poorly designed;
- the need to adapt policy development and regulation to a new environment if government is to achieve its policy/social objectives and goals; and
- more acute stranded costs under this model.

<p><i>Principle 61</i> <i>If contestability is to operate effectively, then government needs to give consideration to subsidies that can aid in the adoption of new metering technology whilst at the same time not distorting the market.</i></p>
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Government needs to consider whether price controls in the retail market are necessary or whether prices should be capped, particularly for those customers who are unable to choose their retailer. There is no reason for Governments to prohibit purchasing of monopoly network assets by the private sector, provided that regulators are given the requisite powers and responsibilities to control investors' market power.

The primary impediment to the introduction of retail competition (to household consumers in particular) is the cost of the 'smart meter' technology required to allow customers to switch between retailers.

Care needs to be exercised in the use of subsidies and cross-subsidies, as they have the potential to distort economically efficient behaviour and pricing. However, if contestability is to be introduced to small consumers, it may be expected that not all small consumers will be willing and/or able to pay for the cost of the metering technology necessary to allow them to switch retailers. In such a case, subsidies may be required to facilitate the purchase of meters and related technology to facilitate switching.

In general, government should aim to reduce or remove cross-subsidies within the electricity business(es) and if desired for policy reasons, consumer subsidies should be transparent and non-distortionary.

Transitional arrangements will need to be developed to allow sufficient time to complete the reforms and for the businesses to adjust to a new operating environment before retail competition is implemented. This may involve the phasing in of retail competition for larger customers, followed by a staged progression to full retail contestability.

Consideration needs to be given to the appropriate institutions required to manage the introduction of retail contestability.

It is reasonable to expect that the government will have a number of important social objectives as part of the ESI reform, such as protecting certain consumers from the impact of tariff and price changes; at least until the reform process is completed. Consideration will be needed as to the manner in which those objectives are met. For example, CSO are an efficient and transparent manner of ensuring that customers are protected from adverse changes to prices resulting from the reform, provided they are properly implemented.

Section 8 Privatisation

Principle 62 The decision whether to privatise a government owned entity in the ESI should be made in the context of the government's broader social goals, the economy's pattern of social organisation and production and wider community aspirations.

Privatisation of government owned businesses may be an integral part of an ESI reform program. However, it should be recognised that privatisation is not essential for a successful market and industry reform program. The industry can be restructured and significant efficiency gains can be made while electricity businesses are still owned by Government. It should also be recognised that privatising entities that have traditionally been government owned has broad social consequences. Consequently, the decision whether to privatise government owned businesses, and if so the extent and nature of such privatisation, must be addressed within the context of the economy's wider social goals.

There are many potential objectives of privatisation, including:

- redirection of government investment from one area of service delivery to another;
- repayment of government debt;
- reduction of government sector initiatives, responsibilities and risk;
- improved business focus and the generation of productivity gains; and
- attracting private sector investment and commercial and technical expertise into the sector.

The benefits to be gained by achieving these objectives must be weighed against the costs that may be incurred in respect of other legitimate social objectives and goals.

In the long term, diversity of ownership in the competitive sectors of the industry can facilitate the development of a vibrant and successful competitive market – therefore, even if the existing industry is not privatised, the reforms should aim to facilitate private sector investment in the industry's expansion, particularly in generation.

Principle 63 Governments should undertake a cost-benefit analysis to determine whether the potential benefits of privatisation can be better achieved by other reform options.

Privatisation is one of a number of tools for achieving greater efficiencies in the ESI. Governments must thus assess whether other options are available for achieving the perceived objectives of privatisation. Examples of other options may include alliances, joint ventures, shared facilities, refinancing, outsourcing of functions, corporatisation (where this has not already taken place), performance monitoring and regulation.

Privatisation of government electricity businesses may not be essential to the establishment of a competitive owned ESI, provided that the government businesses:

- are separate from the government's regulatory activities; and
- are made to compete with other private sector (or government businesses) on an equal footing.

Privatisation may not be appropriate in all circumstances. The choice of ownership will need to be determined on an economy by economy basis.

However, once the desired industry and regulatory structure has been implemented, privatisation does provide a effective way to lock in those reforms. Privatisations are very difficult for governments to reverse. In addition, even a corporatised government owned businesses is unlikely to face the same ongoing commercial pressures and disciplines facing a privately owned company that is subject to effective competition or regulation.

Principle 64 *Privatisation should be seen as the final stage of reform, and should only be undertaken after the necessary regulatory institutions and structural reforms have been established and are demonstrated to be functioning properly.*

In the case of a vertically integrated State-owned monopoly, for commercial and policy reasons it will generally be desirable to delay privatisation until it is clear that new companies resulting from the restructuring are viable, new markets have been tested, the regulatory framework is effective, and appropriate accounts have been established. Establishing the mechanisms to ensure both ongoing competition in the contestable segments of the industry and effective regulation of market power are fundamental to realising the benefits that may be promised by privatisation or other reforms.

For example, in the period following implementation of the new regulatory regime, it will be vitally important for the regulator to establish its credentials in taking an approach that is independent of government, business and sectoral interests, consistent with the established legal and regulatory framework, and in the public interest before privatisation is implemented.

Consequently, if privatisation is considered appropriate, it should generally occur at the end of the process of establishing the restructured market so that there is a minimum amount of uncertainty regarding the regulatory environment and the operation of the market within which the privatised entities are to carry on business.

However, prior to that time, wherever possible, governments should extract whatever efficiency and productivity gains are possible from a business to be privatised before it is offered for sale. Also, businesses to be privatised should be afforded a reasonably high degree of revenue and earnings certainty for the initial years following privatisation (through contracts, tariff orders and/or regulatory determinations) .

Principle 65 *Governments should address each sector of the ESI separately to determine whether it is appropriate to privatise, and if so in what way.*

Privatisation may be appropriate for some parts of the ESI but not for others. Relevant factors to consider are the extent of competition in the sector under consideration, and the role for government:

- Where a competitive wholesale market or full retail market model is adopted, there would appear to be little reason for retaining the competitive elements of the industry in State ownership, except as a transitional measure, until regulatory institutions are well established, interest group opposition addressed, issues of stranded assets have been resolved, and assets have been properly valued.

- Different considerations are likely to apply to municipally-owned utilities than utilities owned by the central (or a major provincial) government. Issues of intergovernmental relations may require regulations to be adapted. Sometimes municipal entities are not compelled to enter into the restructured system (eg as occurred in California, where public utilities were not required to divest themselves of generation capacity nor be subject to dispatch by CAISO).
- The arguments that privatisation is needed in order for competition to be effective and sustainable do not apply to the (regulated) natural monopoly network elements. The main reason for privatising in this case would seem to be the competitive pressures that capital markets can bring to bear on privately-owned entities, together with private sector management disciplines.
- It can be quite acceptable to privatise a monopoly business provided that the regulatory regime can adequately supervise the monopolist's behaviour and performance. For example, many of the Australian privatisations in the energy sector have involved the sale of monopoly wires and pipes businesses.

<p><i>Principle 66</i> <i>Governments should apply relevant and appropriate financial and social risk parameters when evaluating government enterprises and utilities.</i></p>

The government will need to carefully consider the financial and social risk parameters to be applied when evaluating government enterprises. "Social risk" means risks to quality and quantity of service delivery and external consequences such as employment effects and other impacts arising from micro-economic reforms on the wider community, infrastructure and environment.

For example, in valuing these enterprises policy makers may need to take into account retained earnings in the enterprise, not just foregone dividends upon sale, so that a comprehensive comparison can be made between earnings foregone upon privatisation relative to interest saved through repayment of debt from sale proceeds.

<p><i>Principle 67</i> <i>Government should ensure that an accountable and transparent approach is adopted, and that the objectives, processes and outcomes of privatisation are disseminated and understood by industry, consumers and the community generally.</i></p>

Transparency and accountability are key factors to the success of any privatisation in the ESI. As part of a wider program of reforms, successful privatisation requires broad community support, as well as the understanding and acceptance of all stakeholders.

If government wants the private sector to finance a significant proportion of the industry's future expansion needs, then government must develop and implement absolutely clear and transparent policies that assure investors how, where and why the government and/or government owned businesses will continue to invest in the industry (need to minimise the perception of sovereign risk)

Any privatisation process should be conducted in a fair and equitable fashion to assure potential buyers that they are competing on equal terms with other like investors to buy into the industry

If it is government policy to give preferential treatment to any potential group of investors, the reasons for it, and the form of the preferences offered, should be totally transparent in order to preserve the integrity of the sale process

Principle 68 Design incentive structures for regulation and the privatisation process itself that address economic goals, the economy's pattern of social organisation and production, and wider community aspirations.

The design of the privatisation process itself must take adequate account of the range of government policy, the economy's broader pattern of social organisation and wider community aspirations. For example, if privatisation is designed on the basis of maximising returns to the selling government, that may create negative and potentially unsustainable pressure on quality and scope of service delivery at a given price of service. Privatisations will deliver better outcomes for the service provider and the community when market structures and incentives encourage the service provider to innovate (for example interruptible services) so as to improve productive efficiency.

One of the externalities that must be considered is the potential loss of research and development capabilities suited to the needs of a developing economy. There is a risk of such losses where an enterprise is divided into "core" and "non-core" functions prior to sale, or where a new owner implements "off the shelf" infrastructure solutions as part of a cost reduction program.

The appropriate incentives must be built into the regulatory infrastructure upon which the privatisation will occur. For example, it is unreasonable to expect a regulator of a privatised enterprise to take account of wider social goals if the terms of privatisation cement contrary outcomes in place or if the goals are not clearly defined in the regulatory framework.

Appendix 1 Case Studies

South Korea

Prior to 2001

KEPCO was a State-controlled listed electricity utility, which was vertically integrated and included generation, transmission, distribution/supply, and system operations. On 21 January 1999 the Ministry of Commerce, Industry and Energy (MOCIE) published the “Basic Plan for Restructuring of the Electricity Supply Industry” (Restructuring Plan). The Restructuring Plan describes the Government’s broad policy directions over the next ten years and beyond. The Restructuring Plan aims to allow for a phased transition to a competitive industry and market and is essentially structured as a 4-phase program.

On 8 December 2000, the National Assembly of Korea passed three pieces of legislation that have activated the Restructuring Plan and will lead to the eventual privatisation of the vast majority of KEPCO. The most important piece of legislation is the legislation containing the amendments to the Electricity Business Act 2000, which broadly states that:

- the electricity sector will be divided into separate generation, transmission, distribution and retail sectors;
- competition will be introduced into these different sectors to the extent possible;
- an electricity pool market will be established;
- initially, the generation assets of KEPCO will be divided into six generation companies within three months of the passing of the legislation and an independent market and system operator, to be known as the Korean Power Exchange (KPX), will be established at the same time as a non-profit making organisation; and
- a regulatory body called the Electricity Committee will be established within MOCIE and will be responsible for the regulation of the electricity supply industry in Korea. The Electricity Committee will consist of one Chief Commissioner and eight Commissioners (1-3 executive Commissioners and the rest non-executive) to be recommended by the MOCIE Minister and appointed by the President of the Government.

During 2001

On 2 April 2001, 5 non-nuclear generation companies (Kosepco, Komipo, Kewespo, Kospo and Kowepco) and 1 nuclear power generation company were established. The Restructuring Plan indicates that the nuclear generation company is to be retained by the Government, however the Government may consider privatising it at a later stage. The remaining generation companies are to be privatised. In addition KPX was established as an independent market and system operator, which will manage the bidding process and dispatch of the power system. Competition in the generation sector is via participation in a cost-based pool. Generators are required to bid at their audited marginal costs, and are paid a market clearing price for their output. In addition, they receive a regulated capacity payment whenever they are available to generate.

Although the power generation sector has become competitive, consumers will be supplied with power from KEPCO as before.

Industry Regulation

Currently, the body responsible for the regulation of the electricity industry in Korea is MOCIE. Within MOCIE there is one bureau called the Electricity Industry Restructuring Bureau which is divided into 3. These MOCIE divisions are: (a) the Restructuring Policy Division; (b) the Market Creation Division (or KPX); and (c) the Privatisation Policy Division.

Amendments to the Electricity Business Act adopted in December 2000 provided for the creation of a (quasi-independent) regulatory body within MOCIE called the Electricity Committee. The Electricity Committee has now been established within MOCIE and will be responsible for the regulation of the electricity supply industry in Korea. Although the Electricity Committee will not initially be a truly independent regulatory body, the establishment of the Electricity Committee within MOCIE apparently has broad acceptance. It remains to be seen how “independent” the Electricity Committee will prove to be in the future.

KEPCO currently applies a uniform rate for electricity supplied to each class or category of consumer throughout the economy. However, support [in the form of subsidised rates] is given to very large industry, and to regionally based industries such as agriculture and fishing. Accordingly, rates vary amongst industries. At a briefing in the United Kingdom, KEPCO has stated that retail power tariffs are likely to be deregulated in 2003 when the Government restructures and privatises KEPCO’s power distribution operations. Until that time KEPCO has signalled that the Government will adjust retail electricity prices in response to wholesale prices.

Post 2001

The restructuring plan for the power industry operated by the government will be carried out in three further stages.

Stage One: By 2002

- Establishment of a number of separate distribution companies.
- KEPCO to remain as the sole transmission business.
- Contestability of large customers.

Stage Two: 2003-2008

- KEPCO’s power supply and power sales will be carried out through a much improved competitive price-based spot market, called the two-way bidding pool.
- Power tariffs are likely to be deregulated in 2003 i.e. they will be allowed to move in response to changes in wholesale market prices.
- Wholesale competition will commence after the KEPCO distribution businesses have been unbundled into separate subsidiary entities.
- Free and open access to the transmission network will be made available to power supply companies and contestable users.

Stage Three: Post 2009

- All remaining consumers will be able to choose their power company.

- Allowance for the introduction of new types of electricity business entities such as consumer cooperatives or specialised electricity sales businesses.
- Transmission operations will be continued as a monopoly service provided by KEPCO.

After 2009, when the restructuring of the power industry is expected to be finished, all consumers will be able to choose the power company they wish to buy electricity from.

Singapore

Prior to 2001

The Electricity Industry in Singapore was vertically integrated and Government-owned. The Public Utilities Board (PUB) was formed in May 1963 to undertake the functions of the supply of water, electricity and piped gas to Singapore.

On 1 October 1995 the Government corporatised electricity, by vesting the undertakings of PUB in 7 successor companies, namely 3 generation companies (Tuas Power, PowerSenoko and PowerSeraya), 1 transmission and distribution company (PowerGrid), 1 electricity retail company (Power Supply), 1 gas supply company (PowerGas) and 1 holding company (Singapore Power). PowerGrid is both the market and system operator for the industry.

The Government in September 1999 carried out a comprehensive review of the electricity industry. The key objective of the review was to implement an electricity market structure and regulatory framework that would support a competitive electricity industry, while ensuring that system reliability and security were maintained. Following the review, the Government in March 2000, decided to press on with further deregulation.

Singapore Electricity Pool

The Singapore Electricity Pool (SEP) commenced operation on 1 April 1998 as a wholesale electricity market to facilitate the trading of electricity between generation and retail companies. The Pooling and Settlement Agreement (PSA) provides a set of Pool Rules to govern the trading arrangements. The PSA also sets out the governance of the Singapore Electricity Pool and the responsibilities of the generators, retailers, Grid Operators and Pool administrator. The Singapore Electricity Pool Executive Committee (SEPEC) was established under the PSA to take charge of the Pool governance. Both the governance arrangements in the spot market and its detailed functionality closely parallel the original market arrangement introduced in England and Wales in 1991.

In the Pool operation, each generation company has to submit to the SEP a day ahead its half hourly bid prices for electricity to be generated by each of its generating units. PowerGrid as Pool Administrator ranks the bid prices of all the generation companies for each half hourly settlement period in ascending order to determine the market clearing price based on an unconstrained dispatch. The Grid Operator then dispatches the generators based on a constrained dispatch that satisfies the power system security requirements of the power system. The Pool Administrator collects payments from the supply companies and makes payments to the generation companies, including constraint payments where generators were constrained on or off in the real time dispatch process.

New Reforms being implemented progressively from 2001

The contestable parts of the industry (generation and retailing) were separated from the non-contestable parts (transmission and distribution) at the ownership level. Singapore Power divested its two generation companies, PowerSenoko and PowerSeraya to Temasek Holdings, (who already has Tuas Power as a subsidiary). There are now eight generation licensees: PowerSenoko, PowerSeraya, Tuas Power, SembCorp Cogen, Island Power Company, Singapore Syngas, ExxonMobil Asia Pacific and Keppel FELS Utilities.

Power Supply will restrict its involvement to households and small non-domestic consumers (less than 5 MW), and provide support services to retailers operating in the contestable market. Power Supply during the interim period will buy electricity from the pool on behalf of contestable consumers who choose to remain with Power Supply. The Government has awarded electricity supply licences to Tuas Power Supply, Keppel FELS Energy Supply, SembCorp Power, Senoko Energy Supply and Tractebel Asia. PowerSeraya has recently applied to be Singapore's sixth independent electricity retailer to serve the recently liberalised market.

It is intended that spot market participants will have a choice of buying or selling at the spot market or through bilateral contracts. A spot market for reserves will also be established. The spot markets for energy and reserves will be co-optimised, enabling generation companies to bid to sell reserves as well as energy in the same time frame. Full nodal pricing is being implemented for the wholesale market.

Industry Regulation

The energy market was deregulated on 1 April 2001 when the Government restructured PUB into a comprehensive water authority and established a new statutory body called the Energy Market Authority of Singapore (EMA) under the Ministry of Trade and Industry (MTI) to regulate the electricity industry.

A regulatory regime for the electricity industry has been established to ensure that:

- Singapore continues to have a reliable, and adequate supply of electricity;
- the monopoly sectors of the electricity industry maintain independent financial viability; and
- the interests of consumers with regard to pricing, quality and continuity of supply of electricity are safeguarded.

The following controls in the form of licence conditions to prevent anti-competitive practices and support the development of effective competition have also been put in place:

- prohibition of anti-competitive practices;
- prohibition of cross-subsidies;
- prohibition of price discrimination among similar consumers; and
- requirement for licensees to offer fair and reasonable terms.

Prices are regulated where there is no effective competition. The (CPI-X) price regulation was imposed on the respective licensees effective from 1 April 1997 on completion of the initial price correction. Technical regulation is through ensuring compliance with:

- technical and services performance standards that cover areas such as availability, quality and reliability of supply, metering services and customer service; and
- the Transmission Code, which covers system security, connection and access to the transmission and distribution network, and metering.

It is proposed that from 1 July 2001, consumers using more than 2 MW of power will also be able to choose their retailer. By the end of 2001, these ‘contestable’ consumers can also choose to buy electricity from the wholesale electricity pool at wholesale spot prices.

The electricity system and market operation will be transferred from PowerGrid to the EMA and EMA’s subsidiary company the Energy Market Company Ltd (EMC), respectively, by the end 2001. This will ensure independent operation of the market and the power system with fair and open competition in electricity generation.

Post 2001

The retail market will be further liberalised in two phases:

- contestability will be further extended to non-domestic consumers with an annual consumption exceeding 1MW (proposed by early 2002); and finally
- retail competition will be opened to the rest of the one million consumers (proposed by 2003).

California

Prior to 2000

Prior to the enactment of Assembly Bill 1890 (AB1890), most of California was supplied by local utility companies that provided a bundled service including generation, transmission and distribution. The California Public Utilities Commission (CPUC) regulated the investor-owned utilities' (IOUs') generation, distribution and transmission through its control of their retail rates. Municipal-owned utilities and rural cooperatives were, and still are, essentially unregulated and are free to set their own rates. The CPUC also regulated the IOUs' service reliability, their dealings with their customers, and the availability of different types of electric service. The Federal Energy Regulatory Commission (FERC) regulated wholesale transmission rates and cross-border power transactions between utilities. Since the IOUs owned most power plants, and sold power directly to the customer, FERC did not set California power rates. Historically, the CPUC and the FERC had a complementary role in setting wholesale rates for non-utility power producers, called "qualifying facilities".

The California legislature drafted AB 1890 in order to restructure the electricity industry and introduce competition into generation and supply in California. AB 1890 was introduced on 24 February 1994 and was amended several times before being approved by the Governor on 23 September 1996.

AB 1890 mandated a competitive market for the generation of electricity. In summary, the industry and market reforms, as shaped by AB 1890:

- created the power exchange (PX) a centralised market in which all exchanges between electricity generators (sellers) and power supply businesses (buyers) of the IOUs must be governed by an appointed stakeholders board. Private utilities are required to buy and sell all their power through the PX;
- required the IOUs to sell 50% of their fossil fuel fired and hydroelectric generation assets, though environmental review and other problems have bogged down the sale of hydropower facilities;
- provided for the IOUs to recover stranded costs" (investment in plants and alternative energy required under law or policy but which would not be competitive assets in a deregulated market) from the ratepayers through a "competitive transition charge" included in each month's bill;
- mandated a 10% rate cut by all IOUs and froze their rates, with the caps to be lifted for each utility once its stranded costs are paid off, or in 2002 in any event;
- placed utilities' transmission systems under the control of the Independent System Operator (ISO). Though transmission lines are still owned by the utilities, they are managed by the ISO under an appointed stakeholder board similar to that controlling the PX; and
- gave government-owned utilities the option to take part in competition and did not require them to buy and sell power through the PX.

The ISO operates the state-wide transmission system impartially for buyers and sellers of bulk electricity, however, the transmission facilities are owned by the investor-owned utilities. The fee to use these facilities is regulated by the FERC. The role of the ISO is to assure that: the Power Grid is reliable and access to the transmission system is open and non-discriminatory, and electricity markets function efficiently and effectively.

Energy service providers had to either contract directly with ISO or through a scheduling coordinator to gain access to the open market power grid operated by the ISO. As such the ISO establishes protocols to certify parties, including the PX, as Scheduling Coordinators. The PX is the Scheduling Coordinator for the IOU distribution companies. Each participant using the grid is required to designate a Scheduling Coordinator. The Scheduling Coordinators are responsible for submitting all physical schedules and bids for the balancing market to the ISO for all buyers and sellers.

Investor-owned utilities are mandated by AB 1890 to sell all their generated power into and purchase all their generation needs from the newly created PX during a four-year transition period that was planned to end on 31 March 2002.

The new system of buying and selling power, and the rules that govern those sales and purchases, is extraordinarily complex. The rules were deliberately designed to minimise the role of the independent system operator in scheduling and trading.

The law required that California electric utilities, which serve the vast majority of California customers, purchase all of their power through the ISO and the PX. However, individual (usually large) customers and marketers may purchase power outside the PX by signing "bilateral" contracts with marketers or generators. The ISO's centralised system still directs the flow of electricity, but prices and service conditions are established by private contract.

During 2000

The Californian electricity crisis occurred in two phases: (a) during the summer months of 2000 demand rose sharply because the power load from air-conditioners increased under a record-breaking heat wave; and (b) in the winter months of 2000-01 power supply fell sharply under unseasonably low hydropower output and high forced outage rates of the old thermal power units.

California's energy crisis can be grouped broadly into three interrelated problems including (1) precipitous increase in wholesale electricity prices, (2) intermittent power shortages during peak demand periods, and (3) the deterioration of the financial stability of California's three major investor-owned utilities (IOUs)—Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E).

Although there is not universal agreement on the causes of California's problems, there is general agreement among industry leaders on a core set of factors contributing to the energy crisis:

- Investment in new power generation capacity has not kept pace with the increasing demand for electricity. California's generation capability decreased 2 percent from 1990 through 1999, while retail sales increased by 11 percent. Further, virtually no new generation capacity has been constructed in California for over a decade.
- To meet its demand for power, California relies on about 7 to 11 gigawatts of out-of-state generation capability, of which a significant portion is produced by hydroelectric power in the north-western United States. Reduced hydroelectric power generation caused by unusually low water levels in the north-west resulted in a reduction of available imports into northern California.
- During 2000, approximately 10 gigawatts of generation capability was out of operation during some of the high demand times, which contributed to power shortages.

- Path 15, the high voltage transmission line connecting southern California to northern California, became congested at times, reducing the flow of surplus electricity capacity in southern California to meet shortages in northern California.
- Exacerbating the power shortages, many independent power generators were reluctant to sell power to PG&E, and SCE because of their financial troubles, and the uncertainty of receiving payment for the power sold.
- Shortcomings of the wholesale electric market rules established under the State's restructuring plan contributed to the increase in wholesale prices. Specifically, under the market rules, PG&E, SCE, and SDG&E were required to buy all of their power through the PX. They could not enter into forward long-term contracts for energy. When spot market wholesale prices increased because of power shortages and increasing generation costs, the utilities had no option but to purchase the high-priced power.
- An increase in natural gas prices, and the high costs of meeting California's power plant emissions requirements also contributed to the increase in wholesale electricity prices.
- The three IOUs paid high wholesale prices for their power, but were unable to recover their costs because retail electricity prices were frozen. This situation, as noted above, resulted in the three IOUs accumulating enormous debts.

The following actions have been taken by California and Federal Government authorities in response to the energy crisis:

28 June 2000	The CPUC reduced its buy-side price cap to \$500 per megawatt hour for the real-time, ancillary services, and congestion management markets. The CPUC further reduced its price cap to \$250 per megawatt hour on August 1, 2000.
3 August 2000	The CPUC issued a rate stabilisation plan for SDG&E. The plan was designed to provide electricity price relief for some residential and commercial customers served by SDG&E.
30 August 2000	The California legislature passed a law (AB265) that established rate caps of 6.5 cents per kilowatthour for SDG&E customers. The rate cap was retroactive to June 2000, and it will be effective through 2002.
14 December 2000	The Secretary of Energy initiated an order requiring certain generators and power marketers to supply electricity to California's power system operator in order to help avert power outages.
15 December 2000	The FERC ordered remedies for California's wholesale power markets. The order, among other things, eliminated the mandatory requirement that the three IOUs sell and buy all of their power through the PX. The FERC also terminated the PX's wholesale rate schedule that enabled it to continue to operate. PX discontinued operating in January 2001.

Post 2000

4 January 2001	The CPUC granted PG&E and SCE an interim surcharge to raise rates. The temporary surcharge was in effect for 90 days.
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- 1 February 2001 Governor Gray Davis signed into law AB 1X authorising California's Department of Water Resources to purchase power under long-term contracts for sale to PG&E and SCE. This law was passed because, in part, the two utilities were financially strapped and unable to obtain long-term power contracts with power generators. This law is significant in that the State now becomes an active participant in California's power industry. The State is in effect subsidising the cost of power sales to the IOU distribution businesses to the extent of hundreds of millions of dollars through the power purchasing activities of DWR.
- 27 March 2001 The CPUC approved a 3-cents-per-kilowatt-hour average rate increase in an effort to support the financially strapped PG&E and SCE.
- 5 April 2001 Governor Gray Davis released a plan to resolve the State's energy problems and to protect residents from volatile energy markets. The plan contains numerous elements aimed at increasing power supply, improving energy conservation, and stabilising the electricity industry in California.

Davis' specific short-term measures are as follows:

- restructuring the governing boards of the system operators so that they can replace the current advocates for the energy companies with advocates for the public;
- overhauling the bidding process for electricity, which currently guarantees that every generator is paid according to the highest bid, rather than its own bid;
- streamlining the process for utilities to enter into low-cost, long-term contracts for electricity and then apply pressure to the out-of-stage generators to supply that power;
- providing regulatory agencies with authority to order any functioning generating facility down for "unscheduled maintenance" to go back on line;
- giving the CPUC 50 new inspectors to monitor power from the grid – if it results in imminent threat to public health or safety.
- expanding the authority available to the governor under the state of emergency in the event of imminent power outages; and Provide \$4million to the attorney general to investigate and prosecute possible racketeering, market manipulation, price fixing and other potential violations by merchant generators; and
- providing \$4million to the attorney general to investigate and prosecute possible racketeering, market manipulation, price fixing and other potential violations by merchant generators.

Davis' specific long-term measures are as follows:

- having utilities keep generation plants they still own;
- requiring Municipal utilities to sell excess power at reasonable prices;
- taking measures to conserve electricity state-wide; and
- taking measures to expand the supply of electricity in the State.

- 9 April 2001 Governor Gray Davis announced an agreement with SCE, and Edison International, SCE's parent company. In the agreement, SCE will sell their transmission system to the State of California for \$2.76 billion. The sale is designed to help SCE recover from its financial difficulties. It must be approved by the State Legislature to be completed.
- 25 April 2001 The FERC announced a plan to bring more stability, better control, and price relief to California's energy market. Among other things the plan gives the ISO more control of power plant outages, establishes price mitigation measures based on market principles, and requires new reporting obligations that will allow the FERC to better monitor the energy market in California.
- 14 May 2001 The FERC announced regulatory actions to increase reliable energy supplies in California and other Western States. The FERC streamlined regulatory procedures for wholesale power sales and for certification of natural gas projects. It also urged all hydroelectric licensees to assess the potential for increased generation capacity at their respective facilities.
- 15 May 2001 In March the California Public Utility Commission (CPUC) agreed to raise retail electricity prices to customers of PG&E and SCE. On this day, the CPUC released a rate structure indicating exactly which customer classes will have their rates increased and by how much. Overall retail rates were increased an average of 19 percent, but low-income customers, medical baseline customers, and residential customers using power below 130 percent of baseline usage amounts were not increased.
- 16 May 2001 Governor Gray Davis signed Senate Bill 6X creating the California Consumer Power and Conservation Financing Authority. The California Power Authority will have broad powers to construct, own, and operate electric power facilities, and finance energy conservation projects.
- 22 May 2001 Governor Davis signed another emergency bill, Senate Bill 28X, designed to shorten the times for reviewing an application for a new power plant, and re-powering (i.e. upgrading) an existing power plant. The new law also allows new owners to pay emission mitigation fees in lieu of obtaining actual emission offsets when the new owner can show that emission offsets are not available.
- 28 May 2001 U.S. Department of Energy Secretary Abraham ordered the Western Area Power Administration (WAPA), a 15 State power marketing arm of the U.S. DOE, to complete planning and to seek outside financing for increasing California's transmission capacity. This action aims at reducing power transmission bottlenecks on Path 15, a high-voltage power line connecting northern and southern California.

In summary, the crisis has resulted in supply interruptions, retail price hikes and financial chaos for some of the largest privately owned power companies in the US. It has also prompted a breath-taking range of measures by both State and Federal Governments and regulatory authorities which have provided very little short-term relief, but which have created considerable uncertainty about the long-term future of the market. Ironically, in spite of the current supply shortages and very high market prices, the generators currently making massive profits are not investing in new plant in California. Their first-hand experience with the handling of the crisis has convinced them to look elsewhere to expand their generation businesses. It appears that for the purposes of investment in generation plant and infrastructure in California these businesses consider the risks associated with increased government and regulatory intervention to be prohibitive.

Victoria, Australia

*Price Based Regulation and the Regulatory Process in Victoria, Australia.*³

Prior to 1994, the electricity industry in Victoria, Australia, was the responsibility of the State Electricity Commission of Victoria (SECV). In that year, the State Government decided to restructure and privatise the SECV. The Government disaggregated the industry, formed new companies to operate the various SECV activities, and then progressively sold those businesses over the period 1995-97.

As part of ESI reform and the privatisation process, an independent regulator, the Office of the Regulator-General, was established, *inter alia*, to regulate prices in respect of services supplied by regulated businesses such as the privately owned transmission and distribution businesses.

In 1995, the Government made an order prescribing the tariffs, charges and fees that could be charged by electricity distribution companies for the first 5 year period and fixed a range of principles concerning the review of these prices by the Regulator-General at the end of the period. These principles included:

- fixing prices for 5 years with prices only increasing annually by the general inflation rate, as measured by the consumer price index (CPI) less an adjustment factor of X; ie CPI-X regulation;
- fixing the X factor for 5 years based on forecast changes in industry demand, costs and underlying industry efficiency; and
- establishing a review process and methodology which is subject to public scrutiny and, if necessary, judicial appeal for the set prices for the next regulatory period by the independent regulator.

The order also required the Regulator-General to utilise “price-based regulation adopting a CPI-X approach and not rate of return regulation”.

In 1998, the Office of the Regulator-General commenced the process to determine the prices that could be charged by the distribution businesses for the next regulatory period (2001-2005). The Regulator-General interpreted price-based and CPI-X regulation to require him to adopt an incentive regulation approach. The key features of this approach are:

- It provides incentives for the electricity businesses to pursue efficiency savings or demand growth within the price cap period. This requires the price caps to be fixed until the end of the regulatory period. If electricity transmission or distribution companies are able to reduce costs and/or increase demand during the period of the price cap, then they are entitled to keep the profits brought about by the efficient conduct of the business.
- It also provides for dynamic incentives via an ‘efficiency carry-over’ where a diminishing proportion of the efficiency gains made by companies are allowed to be carried over to the next regulatory period. The benefits are not enshrined in perpetuity but rather the cost savings or the benefits from demand growth are increasingly shared over time with consumers, via lower prices.

³ The case study is drawn from the decision in *TXU Electricity Limited (formerly known as Eastern Energy Ltd) v Office of the Regulator-General & Ors [2001] VSC 153 (17 May 2001)*.

Following the determination by the Regulator-General in September 2000, three of the four distribution companies appealed to the Appeal Panel. One of the main issues of dispute was a belief by the distribution companies that the Regulator-General had erred in his decision by determining prices based on a rate of return rather than a CPI-X approach to regulation.

In October 2000, the Appeal Panel rejected the grounds for appeal and affirmed that price-based regulation utilising CPI-X had been used. Subsequently, TXU, one of the distribution businesses, further appealed the decision to the Supreme Court of Victoria. In May 2001, the Supreme Court upheld the Appeal Court's decision that the CPI-X regulatory approach adopted by the Regulator-General was in fact price-based regulation and not rate of return regulation.

The prices set by the Regulator-General in September 2000 are now in place and are set until the next review in 2005. However, in June 2001, TXU announced that it planned to further appeal the Supreme Court's decision.

Appendix 2: Research Study 1

Electricity Reform in APEC Economies

Introduction

For Research Study 1, the terms of reference required the project team to:

Identify the opportunities, barriers and impediments to entry, competition and trade in electricity within and between APEC member economies.

This appendix presents the project teams' findings on these issues. The study consisted of:

- an analysis of the Phase I Study to identify trends and similarities between economies with respect to barriers to, and opportunities for, competition and trade in electricity; and
- a literature review of related publicly available information, including reports and other publications produced by the APERC.

The primary source for Research Study 1 was the Phase I Study, which contained observations and conclusions about the implementation of the APEC IPP Best Practice Principles in the target economies. A number of those principles are concerned with ensuring that barriers to competition and trade in electricity, both within and between economies, are eliminated to the greatest extent possible. The Phase 1 Study identifies impediments in the target economies to the elimination of those barriers, and draws conclusions as to general trends and similarities.

In addition, a general literature search has been conducted. While literature has been reviewed addressing these issues in APEC economies generally, in keeping with the nature of the project in carrying out this study, the focus has been on the target economies of Southeast Asia: Australia, China (Shanghai region), South Korea, Malaysia, Philippines, Thailand, Vietnam, and Indonesia.

The findings of the study are presented under the following headings:

- market structure
- regulatory environment; and
- commercial and financing conditions.

Research Study 1 was carried out in the period 1 March 2001 to 30 April 2001.

A list of the sources that have been identified or referred to in executing this study is set out at the end of Appendix 3.

Section 1: Trade and competition in electricity in and between APEC economies

Background

The APERC has estimated that, notwithstanding the economic crisis of 1997, demand for electricity across the APEC region is growing rapidly, outstripping demand for other types of energy. Electricity consumption is now projected to increase by 52% (2.8% per annum) from 1995 to 2010, compared to a pre-crisis estimate of 60% (3.2% per annum).⁴ The fastest growth is expected in the Southeast and East Asia regions (7.8% per annum and 5.2% per annum respectively). Total installed generation capacity in the APEC region is expected to increase by 38% between 2000 and 2010 in response to increased demand.⁵ Transmission and distribution infrastructure will also need to be enhanced to enable the transport of increased volumes of electricity and delivery to previously undeveloped regions.

Constrained by limited budgets, governments across the region are looking to attract private investment into both new capacity and expansion of downstream infrastructure in order to ensure that these increases in demand can be met. At the same time, there is an increasing acceptance that energy supply systems are likely to operate most efficiently when delivered by competitive markets.

As a result, “competition is being introduced into elements of the sector and international investors are being encouraged to enter many liberalised markets to provide much needed capital for infrastructure growth”.⁶

The purpose of this study is to identify those areas where barriers or impediments exist, to the introduction of such competition and the entry of new investment in ESIs across the region, and where opportunities exist for improving new entry, competition and trade.

To facilitate competition it is widely recognised that APEC member economies need to introduce and implement policies to restructure electricity markets to create optimal opportunities for competition where that is feasible. Most importantly, this will require unravelling the vertical integration experienced by most traditional power suppliers. These policies need to address the issue of downstream bottlenecks to satisfy the increasing demand for power. Also, they must recognise that it is important that the sector is driven by market forces so as to enhance its commercial operations and efficiency. Pro-competitive market mechanisms and a regulatory framework administered by an independent regulator will be required. Privatisation would be an option.

In relation to each of these reform issues, governments will be required to achieve an acceptable balance between often conflicting objectives. For example achieving an efficient market design will need to be balanced against other objectives, such as –

- attracting private sector investment;
- freedom to develop and implement social policies; and
- freedom to develop and implement environmental policies.

⁴ APERC (2000) p25

⁵ Ibid p14.

⁶ Ibid p17.

Section 2: Market Structure

Introduction

While recognising that the extent and manner of implementation of market restructuring is likely to vary from economy to economy, there are potentially different stages and types of market restructuring and reform.

The first phase of reform commonly involves the commercialisation of government departments and ministries responsible for power generation and supply, and possibly their corporatisation into distinct legal entities. This is usually a precursor to the vertical disaggregation of assets and businesses into separate generation, transmission, distribution and retail businesses. Horizontal disaggregation of the existing monopoly may also be appropriate, such as the creation of multiple generation and/or distribution companies.

The degree and type of disaggregation depends on the balance between retaining important economies of scale and scope in operations and providing for a number of entities to promote competition (in contestable sectors and supply) or to allow for benchmark competition (in regulated, non-contestable sectors such as transmission and distribution).

Where a previously integrated government utility is disaggregated and several generation entities are split off, in conjunction with the establishment of a wholesale pool system, it may be necessary to establish vesting (or transitional) contracts in order to ensure a smooth transition to competition, to avoid possible misuse of market power and to provide stable cash flows for privatisation. This will especially be the case where there is a delicate balance between supply and demand. Such contracts essentially constitute financial one-way pool price hedges, while at the same time providing appropriate price signals for efficient new investment in new generation capacity. However, vesting contracts need to be carefully designed and limited if they are not themselves to impact adversely on competition.

All of the target economies have in one form or another adopted policies for the reform of the ESI. For one of the economies, it can only be said that its policies are in the planning stage with no positive steps yet taken with regard to actual restructuring of the sector. For example, this economy has not taken steps towards commercialising or corporatising the current vertically integrated government utility. The remainder have implemented policies for restructuring and some are well advanced in implementation.

Integration of generation and transmission functions

Few economies have yet introduced substantial separation between generation and transmission functions, and some economies have not adopted any policies at all concerning such separation. Until that occurs, real competition in the ESI in those economies will be extremely limited.

Lack of development of transmission grids

While most economies have developed policies directed at the extension, expansion or interconnection of transmission grids, few have policies or legal frameworks that will enable or attract private sector investment in downstream infrastructure. This is likely to result in bottlenecks impeding efficient supply of electricity.

State-owned entities not operating on commercial basis

Where SOEs retain ownership or operation of key parts of the electricity sector supply chain, it will be necessary, to ensure that the market operates efficiently, that competition is promoted, and that principles of competitive neutrality are appropriately respected. Amongst other things, this means that they ought to operate autonomously and commercially albeit in single, State ownership.

The evidence to date suggests mixed experience in this respect. Most economies seem to have introduced a degree of independence and accountability for SOEs in the ESI. Only one economy has corporatised all of its government utilities, requiring them to meet commercial targets and making them accountable to shareholders. In some economies, policies have been introduced to advance this further, but financial, social or political circumstances or a combination thereof are slowing the progress of implementation.

A related issue concerns the principles and mechanisms for setting wholesale tariffs. It is strongly arguable that commercial tariffs reflecting true supply costs are essential to a properly functioning competitive market. Ideally, these should be established by means of competitive market conditions. These are clearly issues of concern in most economies contemplating or planning market reforms. There is a wide range of mechanisms adopted in PPAs entered into in the surveyed economies with respect to the determination of wholesale tariffs. Some economies use a cost-plus pricing method, some rely on normal market forces and others incorporate a multi-faceted system whereby capacity and supply are taken into consideration. Several economies are currently developing policies for the reform of wholesale tariffs under PPAs. Two economies have introduced spot market mechanisms that to some extent displace the setting of tariffs under PPAs.

Lack of competitive wholesale market

A competitive wholesale market is a key ingredient in a competitive electricity sector.

The Phase I Study finds that overall the surveyed economies have not yet introduced substantial or effective competition into either the production (generation) or wholesale supply sectors.

In those economies where there is some competition between (independent) generators, the benefits of competition are reduced by either barriers to new entry, pricing that does not represent marginal costs of supply, or the absence of real wholesale competition. Only two of the target economies had, as at July 2000, implemented a competitive spot market in electricity.

An essential aspect of a competitive wholesale market is an effective regime for third party access to the natural monopoly transmission and distribution grids. This can be by way of access to the vertically integrated grid, or the introduction of some form of wholesale pool market.

Lack of competition at the retail level

Only one economy has introduced, or is contemplating introduction of, full retail contestability. Although lack of a competitive retail market is not in itself an impediment to competition in the other economies, as other reforms would be required before this could be contemplated as practical or effective, in the longer term it may be necessary to consider the (phased) introduction of consumer contestability.

Lack of cost-reflective retail tariffs

There are clear economic benefits in moving to more cost-reflective tariffs. Cross-subsidies can burden segments of the economy with high prices that can distort demand and deter investment, especially in energy intensive industries. Where essential services are required to be subsidised for social objectives, this is most efficiently achieved through transparent CSO. Where cross-subsidies cannot be avoided, they should be limited to the natural monopoly elements of the industry (ie the transmission and distribution sectors) rather than the potentially contestable elements (generation and supply).

A significant issue in several economies is transparency, particularly in relation to subsidies. In order to introduce reforms in this area it will be essential for these economies to create improved procedures achieving clarity and public scrutiny of retail pricing principles. A significant improvement would be to ensure that retail prices are set, reviewed and monitored by an independent pricing regulator that acts according to clear, transparent and non-discriminatory principles – preferably entrenched by legislation.

The transparency of retail tariffs is also likely to be improved by increased vertical separation of electricity utilities. In those economies where there is little or no separation, retail prices are calculated on a bundled basis. This does not allow for prices to adequately reflect costs or provide incentives for improved efficiencies.

Adjustment of tariffs to properly reflect efficient costs is likely to have difficult political ramifications. This poses a significant barrier to the introduction of cost-reflective pricing and is likely to be the greatest difficulty in achieving that objective in the region at the present time. One way of dealing with this problem is to introduce commercially based (cost-reflective) retail tariffs gradually over time. Even this has its own difficulties that would need to be addressed on an economy-by-economy basis.

Lack of cross-border interconnection

Governments in the surveyed economies are taking a range of approaches to cross-border interconnections. This would appear to be due to the widely differing geographical circumstances and maturity of infrastructure in each economy. In a number of economies, there are domestic policies to interconnect grids within their own international borders with apparently no plans to interconnect with other economies. Other economies have either considered international interconnection but have not implemented it or have no such plans at all.

In addition, there are technological impediments to be resolved before interconnection can be fully developed in and between several economies.

Impediments to Transition

Resources

It is apparent that a number of economies face constraints on their capacity to adequately resource the institutions and other mechanisms required to plan, implement and manage a program of ESI reform, however limited. Unless these constraints can be overcome, introduction of an environment conducive to effective competition will be very difficult.

Stranded costs

A number of economies face significant difficulties in addressing the problem of stranded costs in moving towards a more competitive market. This is an issue particularly facing those economies where IPPs have played a major role in the generation sector to date, and where competitive reforms are contemplated in the short to medium term. The issue is an extremely complex one that does not admit of simple solutions or solutions that will fit all economies. The factors likely to affect the choice of mechanisms to resolve this issue are varied, including:

- the nature and extent of the financial rights and obligations of the IPPs and off-takers respectively, and in particular, the impact of recent exchange rate fluctuations on the respective parties' positions;
- the number and nature of IPPs in the economy; and
- the applicable legal regime.

It will probably be necessary to establish a means for ensuring an equitable and transparent funding of the stranded costs. This may include the introduction of a "competition transition charge" to customers based on the expected revenues required to meet the stranded costs. A number of different variants of this construction could be suitable in different circumstances. This could vary from one economy to another.

Vesting contracts may also be necessary in dealing with either or both of the price under the PPA and/or the introduction of a competitive pricing mechanism.

In most cases PPA pricing would tend to be at a level higher than retail pricing. The gap represents an issue to be dealt with.

Social and political constraints

It is apparent that most economies face the need to balance the objectives of an efficient, competitive ESI against competing social and political pressures.

Governments require a broad base of community support in order to be able to implement significant market-orientated reforms. This may not always be forthcoming. Where private ownership is contemplated public reaction may be strongest.

APERC has observed:

Even in developed economies with sophisticated capital markets and widespread private ownership of many goods and services important to the well-being of the nation, the public can respond quite negatively to the prospect of public assets being sold to private investors. One issue is a concern over the loss of strategic public assets, another is the prospect of job losses and potential loss of socially oriented services. Quite another, and difficult problem, is public reaction to the price governments are likely to receive at auction. If assets are sold cheaply (either because the capital value has long ago been written off, or it is difficult to assess the commercial viability when privatised) the public reaction can be quite negative, especially when the assets are revalued by the new owners, and given much higher valuations. If the assets are sold at too high a price, the new investors may struggle to make reasonable terms, potentially damaging the viability of the newly emerging markets.⁷

Conclusions

The existing market structures and institutional frameworks in most economies at present restrict or inhibit competition and trade in electricity. While it is noted that most economies have taken far-reaching steps to introduce pro-competitive reforms, in most cases these policies have not yet been fully developed or implemented.

It would appear that the recent financial crisis has had a clear impact in complicating the task of governments to implement reforms, and in reducing the immediate demand for IPP's.⁸ Similarly, the recent problems in California have created some alarm in the region, and have led a number of economies to slow the pace of reform, and even, in some cases, retreat from proposed reforms.

The relative immaturity of physical infrastructure and networks in a number of economies places real constraints on the level of potential competition. A major task faces those economies in attracting sufficient private capital to develop and expand capacity – both upstream and downstream – to meet growing demand. The development of a stable legal environment that promotes competition in generation, supply and retail activities will be essential for that purpose.

A number of major obstacles appear to face most governments when attempting to establish reforms:

- many of the difficulties facing some governments relate to the social, political and economic climate in the individual economies. These can only be resolved on an economy-by-economy basis.
- governments are usually the owners of major business enterprises in these sectors as well being as the reformer and the regulator.
- the management of stranded costs in the transition to competition is one of the key challenges for governments.
- many economies face difficulties in procuring expertise and injecting significant resources and expertise into the reform planning and implementation process.

⁷ APERC op cit p 20

⁸ This is not universally the case. In Korea, IPPs are still encouraged. There is an issue with regard to future generation capacity and the appetite for public sector participation in generation expansion in the face of an immature market.

Section 3 Regulatory Environment

Policy framework

The APEC IPP Principles emphasise the importance of a clear, transparent and stable policy framework for attracting investment and creating a competitive environment. Transparency of the regulatory and policy framework for the ESI presents an obstacle to competition in several of the surveyed economies. The level of transparency in the political structure of the economy was found to be positively related to the clarity of its energy sector policy. Conversely, the extent to which an economy has complex political structures and relationships was found to be negatively related to the clarity of its energy sector policy. Clarity and transparency were also found to be negatively related to the extent to which the ESI policy of an economy is in a state of flux or being restructured.

Another difficulty faced in a number of economies is the lack of consistency of policies both within the ESI and between sectors of the economy as a whole.

Legislative framework

An established regulatory framework, clearly setting out the relationship and responsibilities of both government-owned and private industry participants, is a key ingredient to a competitive market. All economies, with the exception of one, have implemented a legislative regime to promote private sector participation in the generation, transmission and supply of power in the ESI. Of course, the nature of these regimes is dependent on a wide range of domestic factors within the economy.

Only two economies have what could properly be considered as fully implemented legislative frameworks where comprehensive and coherent regimes are in place to regulate the relationship of participants in the ESI. Many of the other economies have taken steps to improve their legislative regimes. Many are in the process of drafting bills and policies that will, if passed, regulate the relationship between IPPs and governments and their agencies or bureaus.

The less well-developed the legislative framework, the more difficult it is to promote ESI reform.

Regulatory institutions

To help ensure predictability and consistency of regulation and fair and equal treatment of both private sector and public sector entities, independent regulatory agencies should be established for the purpose of separating the regulatory and commercial functions of the government. Alternatively, the same result could be achieved through appropriate laws and transparent and separate accounting. A regulatory agency with statutory independence from the government and the electricity utilities is desirable in the longer term for ensuring the consistent, fair and equal treatment of all market participants.

A number of problems are common to most economies in the region:

- failure to separate the commercial, policy and regulatory functions within government departments or branches;
- lack of transparency of regulations and regulatory practices;
- failure to properly establish and adequately fund an independent regulator; and

- lack of internal consistency as between regulatory structures and decisions.

A properly functioning electricity market will require the establishment of regulatory institutions – such as a general or industry-specific competition authority - equipped with adequate powers and resources to understand and monitor the market and ensure that market power is not abused or other anti-competitive practices are carried out.

Conclusions

Most of the economies have made significant progress in developing more transparent and accountable, legal and regulatory frameworks. While some reduction in transparency is understandable when analysing and constructing complex reform packages, key parts of some economies' policy and regulatory processes do not currently meet this objective.

If the benefits of reform are to be realised some economies may need to commit greater resources to the promotion of:

- transparent policy objectives and processes; and
- robust and independent legal and regulatory frameworks and institutions.

Progress will only be achieved in some economies through more tangible commitment by governments combined with adequate resourcing to implement the changes.

Economies planning or implementing market reform strategies may also need to consider the development of new mechanisms or institutions whose function is to ensure that policies are published and made transparent.

Section 4 Commercial and financing conditions

Foreign ownership and control

A legal framework enabling foreign ownership and control of ESI entities reduces the perceived “country risk” assessment associated with private projects, hence enhancing financing, reducing financing costs and leading to improvements in the competitiveness of the sector.

In several economies, foreign investment in certain parts of the ESI (primarily production) is permitted under the laws of those economies. However, the foreign investor is not allowed to have majority control, by acquiring the greatest volume of shares, or may have its voting rights curtailed so that its majority control is not put into effect.

Perceptions of sovereign risk need to be dispelled or, at best, explained with a view to providing sufficient incentives for investment in the sector.

Taxation and foreign exchange regimes

Most economies seem to have transparent and reliable regimes governing the availability and transferability of foreign exchange. However in a number of economies difficulties exist in relation to one or more of the following issues:

- limited availability of hard currency; and
- extreme exchange rate fluctuations.

The need to ensure the creditworthiness of off-takers is likely to remain a significant issue even as economies move towards more open and competitive markets. The challenge will be to develop transparent and objective mechanisms and procedures for assessing and policing such prudential requirements.

Capital markets

Most of the economies still do not have a sufficiently developed legal, regulatory and commercial infrastructure that is necessary in order to grow and sustain strong domestic capital markets.

Some of the key issues that need to be addressed in order to develop domestic capital markets are:

- a robust legal system;
- well developed corporate governance laws and regulations;
- availability of associated legal, financial and accounting services;
- for debt providers: suitable prudential regulation framework and independent regulation;
- for equity markets: a transparent and accountable stock market operation;
- for both equity and debt markets: sufficient scale to provide liquidity; and
- absence of Government intervention or control.

Section 5 Overall Conclusions

Existing market structures and ill-developed or non-existent regulatory and institutional frameworks present the greatest impediments to competition and trade in electricity in the surveyed APEC economies.

These structures and frameworks will only be changed, and those changes will only be sustainable, where there is both the political will to do so, as well as broader community and stakeholder support for the reforms. In a number of economies such support appears to be lacking at present. Similarly, several economies appear to have difficulties in funding the institutions and mechanisms necessary for the planning, implementation and management of an extensive market reform program.

More fundamentally, ESI markets will only be possible where the underlying social, legal and political infrastructure is securely in place to support them. This presents challenges and opportunities in several economies across the region.

It has become apparent that the fall-out of the Californian electricity crisis is having a chilling, or at least, dampening effect on electricity sector reform in the APEC economies surveyed. There appears to be a general perception that market reform entails large and possibly unforeseeable risks: “if they have got it so wrong, how are we supposed to achieve greater success?” Whether or not those perceptions are correct, until greater confidence is restored it is unlikely that significant progress on reform will be achieved in the short term.

On the other hand, at least one major economy surveyed is proceeding with substantial ESI reform and is adopting appropriate policies to ensure that reform continues and delivers the anticipated results to participants in the ESI and its customers and consumers.

It is not so much the issue of whether or not to reform but the adoption of a reform model which will deliver the most appropriate results for that economy.

The Californian crisis was not precipitated by the fact of reform itself but rather other factors such as:

- the market design chosen;
- the history of the ESI in California and its neighbouring States; and
- regulatory constraints on generation capacity augmentation in California.

Appendix 3: Research Study 2

Models for Structural and Regulatory Reform

Introduction

This Report presents the consultants' findings from the Research Study 2:

Based upon existing experience amongst APEC member economies identify and assess alternative models for structural and regulatory reform of the electricity sector industry in order to remove barriers to entry, competition and trade and promote improved competition, efficiency and growth in energy supply to end-users, both within and between APEC member economies. This study is to focus on (a) structural reform, (b) regulation, and (c) privatisation.

The study consisted of:

- a literature review; and
- interviews in select economies (Philippines, Vietnam, Malaysia, South Korea, China, Thailand and Australia) carried out in the period 1 March 2001 to 30 April 2001.

A list of the literature sources that have been identified or referred to in executing this study is set out at the end of this appendix.

ESI reform in APEC economies

The restructuring of the ESI in the Asia Pacific region began in the mid to late 1980s in some economies. Although progress differs between economies, the introduction of competition has provided a strong platform for private investors to participate in power development in the region. Many governments have attempted to attract private capital to their electricity industry through Build–Own–Operate (BOO) and Build–Operate–Transfer (BOT) projects. Examples are the Independent Power Producers (IPPs) established in Indonesia, Malaysia and other economies. Many frameworks continue to emphasise public ownership and control, as well as regulated tariffs and markets. However, some have established joint venture companies which operate commercially (usually with State majority ownership, in collaboration with private investors).

Almost all APEC economies have embarked upon or considered restructuring and reform of their electricity supply industries (ESI) in the last decade. The forces driving the liberalisation and restructuring of the ESI amongst APEC economies have been identified as including:

- demand for greater economic efficiency in the use of and investment in infrastructure;
- a shortage of capital in rapidly industrialising nations;
- recent technological and information management innovations, including the ability to provide for transnational transmission of electricity;
- emerging global competition in energy supply; and
- consumer demand for more sophisticated and diversified products and services.

The increasing international dimension of ESIs has played a significant role in stimulating ESI reform throughout the APEC region. Increased international marketing of electricity means that electricity generated in one country is increasingly sold in another country. The increased demand for foreign investment in the ESI is compelling governments to look at best practice in regulatory reform in order to attract capital. In addition, the requirements of international economic groupings are compelling some economies with a strong tradition of public ownership of public utilities to liberalise their electricity (and other) sectors: for example in Europe as a result of the European Union Electricity Directive, and in Canada as a requirement to continue trading with the United States.

The main public policy objectives underlying ESI reform in APEC economies have been:

- the introduction of competition into the generation and supply sub-sectors of the electricity sector;
- the promotion of private sector investment;
- improving efficiency of production and supply of electricity;
- improving the quality of service and range of consumer choice;
- ensuring security of supply;
- securing environmental performance; and
- achieving social principles (eg. social equity).

2.3 Operational models for organisation of the ESI

Governments are required to consider three broad categories of issues when undertaking a review of the organisation of the ESI:

(a) changes in management and ownership, through mechanisms such as –

- commercialisation — the process of attempting to introduce commercial incentives into a State department. This is often a precursor to selling a potentially commercial activity;
- corporatisation — the process of turning a State trading department into a State-Owned Enterprise forced to operate under normal business laws (with greater commercially driven accountability) and compete on a level playing field with private firms. This may or may not lead to privatisation; and
- privatisation — the selling of government State-owned assets and transfer of ownership to the private sector.

(b) changes in structure, including the introduction of competition — through processes such as:

- restructuring — the process of changing the structure of the ESI from one of guaranteed monopoly over service territories, to one where the competitive elements of the sector are exposed to open competition, preferably across the whole economy;
- deregulation or liberalisation — the process of relaxing previous tight regulatory control over either State or private monopolies, and opting for more light-handed, performance-oriented regulations to control both natural monopoly and competitive elements of the sector;

(c) Regulatory institutions, practice and principles.

The role of the government in ESI reform is critical, given the traditional existence of natural monopoly conditions in the industry, the public good characteristics of electricity supply and network externalities. When undertaking reforms the state has a significant role to play in harmonising varying technological systems used by different industry players; maintaining national interests and direction; attaining ideals of equity; ensuring the availability of power to all parts of the country; and controlling the environmental impacts of the electricity industry. It should be responsible for implementing a regulatory system that:

- ensures the efficient provision of services to consumers at the lowest necessary price; and
- supports private investment and competition.

In addressing these issues it is useful to have a theoretical framework for considering the options for industry restructuring and reform. A number of different methodologies can be used for identifying various models for ESI reform. The methodologies used depend largely on the purposes for which they are employed. We have found it helpful for the purposes of this study to adopt the models identified and described by Hunt and Shuttleworth. This approach was largely adopted by APERC in its recent study on electricity sector deregulation in the APEC region. While not being the only possible representation of the approaches to ESI reform being adopted in APEC economies, and while there are many possible variants of each model, the classification set out by Hunt and Shuttleworth does provide a useful methodology for thinking about structural reform of the ESI.

Hunt and Shuttleworth suggest that, conceptually and in practice, there are essentially four main models for the organisation of the ESI. These (or some variant of them) can be found amongst APEC economies. These models —

“represent varying degrees of monopoly, competition and choice in the industry. The models are abstractions and do not describe particular systems. Although they correspond broadly to real electric systems, we have tried to explain the essential nature of the structures; particular systems may vary in their actual arrangements ...”.

The models are:

- (a) vertically integrated monopoly model;
- (b) purchasing agency (or monopsony) model;
- (c) wholesale competition; and
- (d) full customer choice (retail competition).

The defining characteristics which distinguishes the models from each other are competition and choice. The question which defines each model is: “who may an independent generator sell to”?

The IEA observes that this classification can be reduced to two models: the vertically integrated monopoly model and the retail competition model. “Most other approaches to reform can be described as constrained versions of retail competition.”

The descriptions of models of reform in this report focus on issues of market structure. Structural reform is of course intricately intertwined with issues of regulation and ownership/privatisation. Accordingly, the models discuss issues of regulation and ownership, albeit in general terms. For each model there are different possible scenarios for public and/or private ownership of the entities or facilities being used.

The models have quite different trading arrangements. They require different sorts of contracting arrangements and have different regulatory requirements. They also have different implications for stranded assets.

Similarly, for each model there are complex regulatory issues that need to be addressed in determining whether a particular model is applicable in a given economy, and if so, how it is to be implemented.

The purpose of this report is to describe and analyse the models at a fairly high level of abstraction. The complexities of implementation — surrounding such issues as contractual and trading mechanisms, financial markets, and transmission pricing — are considered in general terms only. These are matters of implementation of the models, and are more appropriate for discussion in subsequent phases of this project.

The models may be viewed as representing sequential phases towards full competition, with the final model (full retail competition) representing the ultimate state of competition. However, in practice, the introduction of ESI reforms is unlikely to follow such a clear path. Close consideration will need to be given to the costs and benefits of each model in the context of each economy when planning reforms. These issues are discussed more fully below.

Before examining the models in detail, it is useful to make some general remarks about structural reform of the ESI.

Key Issues in Market Restructuring

The ESI consists of four distinct activities: generation, high-tension transmission, lower-voltage local distribution, and supply (ie contracting for and billing final consumers, which can be by way of wholesale or resale supply). Market reform in APEC economies has generally proceeded on the widely-accepted basis that the two elements in the chain most conducive to competition are generation and supply. Transmission and distribution are regarded as natural monopolies.

The discussion of restructuring, regulation and privatisation of the ESI is predicated on the (widely accepted) view that competition is more effective than regulation at cutting costs to improve productive efficiency, and aligning prices with costs to improve allocative efficiency. This view has been expressed as follows:

“If prices have to be held down by a regulator or set by the public owner, then there is an inevitable tension between incentives to improve efficiency and the credibility of the commitment not to claw back those efficiency gains. The ideal solution is for competition to provide both the incentive for efficiency and the means to transfer the gains to consumers. That leaves no rents for renegotiation, and hence no threat to the credibility of the arrangement. The most effective place to introduce competition is for the services provided over the network. The aim of liberalisation and restructuring is to confine regulation to the core network and thereby minimise the effect of regulatory inefficiency.”

However, this does not necessarily mean that there is universal consensus amongst policy-makers and economists that private utilities are inherently more efficient than public utilities. Although international organisations such as the International Monetary Fund and the World Bank encourage privatisation as part of the restructuring process, a number of studies suggest that private electricity utilities may not be more efficient than their public counterparts.

The experience of a number of economies with liberalisation of the ESI (ie the removal of legal monopolies or exclusive rights for the provision of services) and privatisation of ESI entities have “demonstrated the importance of structural reforms that either allow entrants to compete with the incumbent integrated utility or separate the potentially competitive parts from the natural monopoly core of the network utility”. However the starting point for reform may vary between economies. Sometimes the issue is whether to consolidate some parts of the ESI, but mostly it is whether to break up a sector that is too concentrated. Economies must consider different forms of disaggregation: vertical (breaking up the supply chain), horizontal (increasing the number of entities at each level of the supply chain), or a combination of both.

Broadly, the models discussed below reflect two main methods for introducing competition into network utilities:

- unbundling or separating out the competitive activities from the natural monopoly or “core” network; and
- liberalizing access to a vertically integrated utility.

Steiner observes that, at its core, ‘regulatory reform is focused on functional separation of generation and transmission, introduction of competition in generation, and expanded network access. More advanced stages of reform tend to include the formation of electricity spot markets for electricity price determination and trade, and unconstrained choice of supplier. The final stages of reform may also include a shift from (cost-based) rate of return regulation of transmission pricing to price caps.’

Structural reforms fundamentally alter the operation of the ESI. Amongst other things, they are likely to affect distribution of rents, the distribution of risks, the rate and direction of technical progress, the choice of investment and the forms of regulation required. The choice of approach to restructuring and the methodologies applied will depend on an assessment of the costs and benefits of the various options in light of the particular circumstances facing each economy.

The costs of restructuring are considerable. These include the costs of planning, managing and implementing a reform process. Restructuring will only be worth undertaking if the gains are larger than the associated costs.

In particular, the design of structural reforms will have a considerable impact on both the costs and benefits of market liberalisation. The costs will increase with the amount of restructuring, while the benefits (both long and short term) are likely to depend on such issues as the speed of introduction and effectiveness of competition, the robustness and appropriateness of the market design, as well as the existence of an effective regulatory environment.

Market restructuring, and the concomitant introduction of regulation to meet market failure, introduces considerable complexities and potential costs. Newbery comments as follows:

Regulation is inevitably inefficient, suggesting that it be confined to the core natural monopoly of the network. Provided that competition is effective, it can replace regulation for network services and thereby increase efficiency. But liberalization also redistributes rents and raises new regulatory problems in managing the interface between the regulated and competitive parts of the utility.

Stern and Holder contend that a regulatory agency will continue to play an important role in a deregulated electricity market, but that its role will change. In order for regulatory agencies to operate successfully, governments need to (a) provide and sustain a legal framework under which the regulator operates; and (b) support the enforcement of the regulatory framework. The regulatory framework in different economies may evolve differently: some electricity industries will be regulated through an independent regulatory institutions; others may be regulated through long-term concession contracts.

In examining each alternative option for structural reform consideration will need to be given to whether there are alternatives that are likely to meet less resistance or be less costly.

A key aspect in consideration of these models is the degree of vertical integration between the elements of the supply chain. Dismantling the monopoly requires that the potentially competitive areas (generation, wholesaling, retailing) be separated from the natural monopolies (transmission and distribution). There are various possible different forms of “unbundling” or separation:

- Full structural separation (see Victoria and UK). Here, separate legal entities are created to carry out the different functions, and no (or limited) cross-ownership is allowed.
- Functional unbundling (for example California). Here, investors may take stakes in generation and transmission, but strictly separate entities operate the grid system, thereby guaranteeing non-discriminatory grid access. An Independent System Operator (or ISO, who has no position in the market nor any economic interest in any load or generation) may be responsible for short-term co-ordination, and setting prices for use of the transmission grid.
- Unbundling of accounts. The accounts of the businesses that make up different elements of the ESI supply chain are “ring-fenced”, even though one vertically integrated entity may control all elements of the supply chain. This is difficult to achieve in practice, as the process requires complete transparency from the relevant company. The opportunity for discriminatory access to information remains (especially if the businesses are operated with common workforce or information systems).

The form of unbundling that a government chooses will largely depend on the models thought to be appropriate to that economy. Where proposed reforms include the phased adoption of more than one model (eg interim adoption of the single buyer model as a step towards a competitive wholesale market), a phased approach to unbundling may also be appropriate.

Regardless of which option is ultimately adopted, close consideration will have to be paid to the interface between unbundling (restructuring) and the introduction of liberalised access to the transmission and distribution networks. Newbery cautions that reforms should be delayed until problems of access, including pricing, have been resolved and the effectiveness of the regulatory regime has been demonstrated in practice.

The way the ESI is regulated will change in a restructured market. Regulation will cover issues such as pricing, investments and costs of service, quality (including service standards and service obligations) and the rate or return on assets. Some degree of economic regulation of the ESI is necessary for the following reasons: (a) utility services are consumed by all households and businesses, and are intermediate inputs for other sectors of the economy; (b) the ESI is highly capital intensive, using long-lived 'sunk' assets; and (c) the ESI is characterised by significant economies of scale, limiting the number of players in the market.

An independent regulatory agency (that is, an agency independent from government, the regulated companies and populist consumer pressures) is a central feature of a deregulated electricity market.

The four models for restructuring the ESI are discussed in the following four sections. The first of these is the vertically integrated monopoly model.

Vertically Integrated Monopoly Model

Description

Under this model there is no competition in the supply of electricity. Typically, a single, vertically-integrated State-owned entity owns and operates all generation plants and the transmission and distribution networks, as well as supplying all consumers in a particular region. While the entity may be under an obligation to supply customers, consumers have no choice of supplier.

Main Characteristics

The ESI can be serviced by one vertically and horizontally integrated system. Alternatively, there may be within one economy several vertically integrated utilities, each serving a single region or town.

A variant on the model occurs where there are a number of vertically-integrated monopolies with separate franchises of operation, but which can only purchase from a single generating/transmission company. Because it does not result in competition at the generation or retail levels, and the distributors are monopolised by the generator, this is sometimes referred to as "vertical integration by contract".

The utility is usually tightly regulated - usually through price control.

In the typical case the monopoly will be wholly or majority owned by the State. An obvious exception is the United States, where, until the late 1970s, investor-owned utilities served most of the country and had a monopoly from generation to the final consumer.

Examples

The vertically integrated model was the typical model in almost all economies throughout the world until the 1980s, and is still particularly common amongst developing economies. Of the economies studied in detail in this project, it is the model currently applicable in Indonesia.

Assessment

Historically, a number of advantages have been perceived in a vertically-integrated utility. Perhaps the most significant are the coordination efficiencies. Taking into account the unique characteristics of electricity supply (in particular the fact that electricity cannot be stored and that transmission of electrons requires split-second control to coordinate supply and demand at any moment), this is the most economic method of dispatching plant since it minimises cost. The transmission system operator can command and control the operation of plant. This ensures that the transmission system remains stable, but also that plants are dispatched economically: ie they are run in merit order, from lowest to highest marginal cost.

Vertical integration is more likely to allow for the construction of large-scale generation plants and transmission systems, as the full costs incurred in such projects can be passed on to consumers.

This model, more than any other, permits governments to use direct subsidies and cross-subsidies to pursue social policy objectives, as well as to invest in public goods.

Under this model, subject to State-permitted subsidies, the costs of production are passed through to customers, who thus bear most risk. In these circumstances, disadvantages of the vertical integration model include:

- Lack of incentives to improve services and lower costs. This can be — at least in part — overcome by introducing “incentive regulation” to shift some risk;
- Lack of transparency — as all costs can be passed on to the consumer;
- Utilities tend not to operate in a commercial way — the model permits the maintenance of high tariffs (and high returns) for incumbents;
- As a result the model is likely to lead to inefficient investment decisions; and
- Substantial scope for political interference.

Transitional issues

This model begins to face pressure for reform where there is increasing threat of new entry, and the marginal cost of competitive generation is less than the charge paid by the utility. According to Hunt and Shuttleworth, this price may be higher than the price that competitors would charge for a number of reasons, including:

- The depreciation policies of the regulatory regime do not adequately capture technical progress;
- Past capacity expansions have been unduly expensive;
- The incumbent faces social policy obligations, the cost of which are reflected in the price; and
- New technology or cheaper fuel sources have reduced the cost of new entry.

Substantial difficulties may arise in disaggregating an industry which is largely privately owned and operated — see the discussion in section 2.9 below on stranded costs.

Where the sector is publicly owned and operated, it is generally agreed that the separation/disaggregation process should be achieved and an adequate regulatory structure put in place before privatisation occurs.

Purchasing Agency (or single buyer) Model

Description

This model allows competition in generation from a number of different producers, including State-owned entities and IPPs. Generation and transmission are separated, and third party access is encouraged. The IPPs compete to construct and operate power plants and carry the construction and operating risks (this distinguishes it from the vertically integrated model, where the monopolist retains production risk even when contracting for new capacity). The State-owned entities may be vertically integrated.

Under this model the producers sell their output to a single buyer or purchasing agent (usually a State-owned entity) who sells electricity to distributors with regional monopolies. Retail consumers remain captive (ie, have no choice of supplier).

Main characteristics

The main characteristics include:

- One or several vertically-integrated monopolies control the sector, but some private investment is made possible by licensing IPPs to build generation capacity.
- There may be head-to-head competition in generation, with a single buyer purchasing the wholesale electricity. This could be by way of a mandatory competitive pool. Alternatively, each IPP might negotiate a separate long-term power purchasing agreement (PPA) with the government entity.
- The vertically-integrated utility controls transmission and distribution.
- Retail consumers are still captive.

This model is sometimes referred to as a “portfolio manager model” .

Examples

Versions of the single buyer (monopsony) model are currently applicable in many APEC economies, including Korea, Malaysia, Thailand, Vietnam, Indonesia, Philippines, Mexico and Japan.

Assessment

There are a number of advantages with the single buyer model:

- it allows for direct investment by private investors — this allows investment to be shared;
- it allows for a degree of competition and thus potential improvements in efficiencies in the ESI; and
- it permits governments to use the ESI to meet social policy objectives (such as an ‘obligation to supply’) and create public goods.

The disadvantages of this model that are sometimes cited include:

- as there is only limited competition in the market, it is unlikely to result in maximising the efficient supply of electricity; and
- the single buyer may be able to (and have incentives to) discriminate unfairly between generators;
- the government may assume too much risk, including the risk that the state-owned transmission company is unable to honour its obligations;
- the mode responds poorly when electricity demands fall short of projections (prices tend to rise rather than fall);

- the model hampers cross-border trade; and
- adoption of this model may increase the likelihood that governments will not progress to the next stage of reform.

Transitional issues

The purchasing agent should be independent of the owners of generation — but this is not usually the case with this model. Where the single buyer also has an interest in generation it may have incentives to discriminate between generators.

A regulated third party access system may be required to prevent discrimination between generators. Under this transitional system the single buyer is obliged to provide network access under non-discriminatory conditions. Without regulation, potential entrants face substantial “hold-up costs” that prevent actual entry. Independent System Operators (ISOs) can be used to manage the dispatching function (for the whole transmission system). ISOs are typically responsible for coordinating and operating the transmission grid and for setting prices for use of the grid. They occupy no position in the market, nor do they have an economic interest in generation. Introduction of an ISO may be able to overcome the problems that potentially arise where a utility is also the system operator and responsible for the dispatch of contracts.

The single buyer model may represent a good transitional step towards a more competitive market structure because it permits competition to occur and encourages governments to develop a regulatory structure for at least that part of the process. The general industry trend is to encourage private ownership in generation, both from the active program of privatisation that some countries have undertaken, and from the entry of privately-owned firms as generation opens to competition.

Wholesale Competition Model

Description

This model departs radically from the preceding models. It allows competition in generation and wholesale supply, as the separate distribution companies are permitted to purchase electricity from any competing generator. The distribution companies maintain a monopoly over energy sales to the final customers. Market and technology risks are in the first instance borne by the generators, who have open access to the transmission network. This model may, but does not necessarily, include a power pool arrangement, where electricity is purchased at regular intervals (eg, half-hourly) at market-priced rates through pool-based transactions. If not, the transmission owner will have to be regulated to ensure open and fair access to the network.

Main characteristics:

The main characteristics include:

- There is competition in both generation and wholesale supply. Generators have open access to the regulated monopoly transmission network.
- Vertical disaggregation of transmission and generation, and transmission and supply, is not essential, provided that production and wholesale supply/distribution have been liberalised and an adequate regulatory framework established, in order to prevent discrimination in access.

- Access is regulated either by means of a power pool (see variation 2 below) or wholesale power market (see variation 1 below), which can be competitive or operated through ‘wheeling’ contracts (where distribution customers and generators make bilateral contracts to move power over the regulated transmission network).
- Separate distribution companies purchase electricity from any competing IPP generator. The distribution companies maintain a monopoly over energy sales to the final customers. Final consumers thus still have no choice of supplier.
- Certain public goods can be delivered at the retail level, and some subsidies can be maintained.

It has been argued that the key trading arrangements necessary to operate a competitive wholesale market are :

- A dispatch function, which should be independent of traders. The job of the “system operator” is to keep the frequency and voltage of the system stable;
- A spot market or power exchange for electricity into which buyers and sellers bid to establish a spot price for electricity (on an hourly or half-hourly basis);
- Transmission prices which reflect the marginal cost of transmission, and which prioritise and manage the use of congested paths in an economically rational manner;
- A forward market in which the parties can contract bilaterally with each other; and
- Freedom of entry into and exit from the market, ie, the freedom to open and close plant in response to market forces.

Because the grid remains a natural monopoly (and it would be inefficient to construct a competing grid), it is necessary to ensure that competitors have clear and open access to the system. There are essentially two models that have been developed to ensure non-discriminatory access: the “grid access model” and the “competitive pool model”.

Variation 1: The grid access model

Under the grid access (or “wheeling”) model, the grid owner/operator must allow competitors to use the grid for the purpose of supplying to customers. Under this variant of the model, vertical separation is not necessary. There are different possibilities for establishing terms and conditions of access to the grid. The basic models include a negotiate/arbitrate model, or a system whereby an independent regulator sets the terms and conditions (particularly price) of access. The methodology used for pricing is crucial to the success of this model. Set correctly, the price for transmission services will enable competitors, including new entrants, to enter the market, while encouraging efficient investment in infrastructure.

Variation 2: The competitive pool model

The competitive pool model is a combination of grid access rules and a competitive spot market for wholesale electricity. The access rules ensure that competing generators can reach ultimate customers, while the pool is a short term, multilateral market for power exchange.

Essential conditions for the operation of this variant are:

- vertical separation of generation and transmission and of generation and supply (a certain degree of integration between generation and distribution may be feasible, under certain conditions);

- adequate competition in generation to avoid the pool price being set above competitive levels;
- an independent system operator; and
- a robust but preferably “light-handed” regulatory framework.

A distinction can be drawn between “full cost” and “partial cost” pools. Full cost pooling is so-called because all generators’ costs could, at least in theory, be recovered at the pool’s spot prices. The generators’ costs include capacity costs, and the market price is allowed to rise to levels sufficient to signal the need for new capacity. Under partial cost pricing, in contrast, certain customers bear the fixed costs, a specific level of reserves is required to be held by all customers, and trades are made at avoidable cost only.

Pools may be mandatory or voluntary. Under a mandatory pool generators may not contract directly with other market players for the physical supply of electricity. “There is a growing consensus that electricity trade should be allowed to take place outside organised markets. Bilateral contracting is expected to be efficient since it is a standard, if not the unique, way of trading in many markets. Bilateral trading is, by definition, more flexible than centralised pool trading since it may co-exist, and it does in practice, with a non-mandatory pool. A non-mandatory pool also lessens concerns about discrimination and is a necessary condition for individualised pricing and provision of security and reliability, adapted to individual consumer needs”.

Because pool prices can vary, pools are generally supplemented in practice by bilateral contracting arrangements, such as contracts for differences or other financial contracts, between customers and generators to hedge the price risks of operating in the spot market alone.

Examples

Examples of a competitive wholesale market model have been implemented in Australia, USA (California), Peru, and Chile.

Assessment

Adoption of a competitive wholesale market indicates that policy-makers have taken the philosophical step of rejecting (usually heavy-handed) regulation and favouring the market as a means for achieving efficient outcomes.

Assessing the relative merits of the grid access and pool model variants is a complex issue, and is likely to vary from economy to economy. A key issue is security of supply, and in particular whether the pricing mechanisms of the pool model are likely to provide sufficient signals for long term investment in generation capacity. On the other hand, commentators tend to agree that a pool model with a spot market provides greater incentives for efficient investment in, and use of, plant. The IEA suggests that a number of factors indicate that the competitive pool model is more likely than the grid access model to promote short term efficiency :

- the pool model better permits pricing that reflects costs;
- the grid access model cannot guarantee that all power is dispatched throughout the entire market;
- the pool market is more transparent; and
- where there is still some vertical integration, the grid access model may not be able to constrain the grid company’s incentives to discriminate against competitors.

The ability of generators to accommodate social policy obligations connected with generation virtually disappears under this model. Inputs will only be sustainable if they are efficient; inefficient or uneconomic production will not be possible unless direct subsidies are made. On the other hand, non-generation-related social policies (such as discrimination in favour of large customers) may still be allowable, as under this model the customers are not allowed to resell their low-cost power.

Transitional Issues

A number of transition issues arise, including:

- The issue of stranded costs becomes most significant under this model, as market prices are more likely to reflect asset valuations lower than those that can be recovered in a non-competitive environment. Put simply, market prices cannot be expected to cover the costs of past mistakes (including “gold-plating” – over-engineered and unnecessary assets) and social objectives. However, because there is limited competition in supply, the market provides a potential solution — at least in part — to the stranded costs issue, as they may be able to be passed on to customers.
- End consumers are still captive under this model. The question is where the boundary is drawn between those customers that are allowed to choose their supplier and those that are not. This is the issue that distinguishes this model from the next model, the competitive retail model. According to Hunt and Shuttleworth, the difficulties arising from defining and maintaining the distinction between “captive” and “liberalised” consumers is likely to mean in practice that this model will generally be “unstable” and operate as a “waystation” to the ultimate full retail competition model.

Full Customer Choice (retail competition)

Description

In this model there is full retail competition and all consumers are permitted to choose their supplier, either through direct access to competing generators or through their choice of retailer. There is complete separation of the competitive elements of generation, wholesaling and retailing, from the transmission and distribution networks. Like the previous model, the distribution lines provide open access or common carriage. A key feature of this model is the creation of a wholesale market, or pool. There is no single buyer, and the pool is not a purchasing agent. Another common feature of this model is the establishment of an independent system operator (ISO) with the responsibility for short-term co-ordination and price setting for use of the transmission grid.. Dispatch can be carried out by the ISO, the company that owns the transmission network, or a separate entity.

It is usually recognised that deregulation or liberalisation of the industry is not sufficient to realise the gains of full retail competition; regulation of the network activities will also be an essential aspect of the reforms. In most (but not all) economies where retail competition has been introduced, such regulation has involved ex ante (as opposed to ex post) control over the market power of the network owners and operators.

Main characteristics:

The main characteristics are:

- Competition has been introduced into all levels of the industry.

- If the right regulatory structure is in place, any electricity consumer can purchase from any retail supplier, who in turn purchases electricity from a competitive wholesale market.
- The network functions of transmission and distribution (natural monopolies) are completely separated from the functions of generation and retailing. Dispatch can be handled by the transmission network owner, but where more than one transmission network exists, this is best handled by an independent system operator (ISO).
- There is free entry into generation.

Examples

The full retail competition model has been implemented in New Zealand, and is soon to be implemented in certain States of Australia.

Assessment

It is generally agreed that this model provides the following advantages:

- The model optimises economic efficiency, once the regulatory regime has been established to minimise any market imperfections and control abuses of market power (ie the ability of market participants to set prices above competitive levels on a sustained basis).
- Costs in the generation sector are driven down substantially (usually expressed in lower retail tariffs).
- Prices become increasingly transparent.
- The range of goods and services offered by electricity retailers increases in both quantity and quality.
- Planning is better optimised to match incremental increases in demand — particularly in generation.

Steiner concludes that '[u]nbundling of generation and transmission and private ownership each serve to improve the utilisation of capacity in electricity generation' and should bring the ability of generators to handle peak load demands closer to an optimal level.

On the other hand, the fully competitive retail model may, in particular circumstances, give rise to the following disadvantages. Some of these may require careful assessment of the transition to retail competition, including:

- The ability to use the electricity sector as a tool to deliver social policy obligations disappears.
- Transitional costs are not negligible — although they can be outweighed by the benefits of full electricity market competition.
- Although market liberalisation is usually accompanied initially by falling prices, price volatility usually follows.
- Many of the gains depend on the effectiveness of the regulatory regime, especially in relation to access to the transmission and distribution grids. The absence of sophisticated and effective regulatory institutions will potentially undermine the efficiency gains that might otherwise be made.

- If the initial market conditions are sub-optimal after reform, firms may engage in significant restructuring, including vertical and/or horizontal re-integration. For example, retail competition will usually require effective unbundling of distribution and retail functions. Regulators must ensure that individual firms (particularly former incumbents possessing market advantages by virtue of their history, and larger firms which enjoy significant economies of scale) do not acquire excessive market power, or engage in anti-competitive behaviour.
- Demand Side Management and other energy efficiency policies and measures may be negatively impacted by the introduction of competition.
- Policy-makers must devise new ways of dealing with long-term R&D and environmental issues.
- The introduction of metering is likely to be an extremely complex and expensive exercise.
- The stranded costs problem becomes much more acute under this model.
- Large industrial consumers may benefit disproportionately in contrast to small business and domestic consumers.
- The management of utilities under the new market structure will become more complicated, requiring players, including regulators, to develop new skills and systems.

The introduction of full retail contestability, and the timing and management of that introduction, will depend very much on the particular characteristics of each economy. Newbery observes that ‘competition ... may not be sustainable in every utility, nor in all circumstances.’ This necessitates careful analysis of the implications of restructuring the ESI, as ‘[o]pportunities for restructuring are rare and hard to reverse, so such choices need to be well informed.’

Market structure is critical to successful implementation of retail competition. The success of the retail competition model depends to a large extent on a market structure that promotes competition rather than market power. This may include the following elements:

- an adequate number of balanced independent sellers and buyers, in order to maintain a procompetitive industry structure;
- no significant barriers to market entry or exit;
- no ability for sellers to set and maintain prices to consumers above competitive levels;
- protections for consumers; and
- easily available market information.

In a deregulated ESI the regulatory agency becomes a specialist competition agency. It is often responsible for promoting effective competition between entities in the electricity industry and for protecting the interests of consumers.

General Transition Issues

A number of specific issues may arise when considering which model (or models) is applicable to a given economy, when developing plans to move from one model to another.

Ownership

Restructuring a publicly-owned network raises the inevitable issue of privatisation. On the basis of current literature, the following observations can be made:

- In the case of a vertically integrated State-owned monopoly, there are likely to be good reasons for delaying privatisation until it is clear that new companies resulting from the restructuring are viable, new markets have been tested, the regulatory framework is effective, and appropriate accounts have been established.
- Where the wholesale market or full retail market model is adopted, there would appear to be little reason for retaining the competitive elements of the industry in State hands, except as a transitional measure until regulatory institutions are well established, interest group opposition overcome, issues of stranded assets have been resolved, and assets have been properly valued.
- Different considerations are likely to apply to municipally owned utilities than utilities owned by the central government. Issues of intergovernmental relations may require regulations to be adapted. Sometimes municipal entities are not compelled to enter into the restructured system (eg as occurred in California, where public utilities were not required to divest themselves of generation capacity).
- The arguments that privatisation is needed in order for competition to be effective and sustainable do not apply to the (regulated) natural monopoly network. The main reason for privatising in this case would seem to be the competitive pressures that capital markets can bring to bear on privately-owned entities.

Implications of Reforms for Incumbents

Regulatory reforms should take into account the transitional issues that affect incumbent utilities. With the introduction of competition, incumbents are under pressure to reduce costs, reconsider their strategies and even to look for new markets to supply. Restructured industries will introduce new risks for incumbents, including financial, regulatory and political risks, as well as new opportunities.

Generators face competition from alternative power suppliers and, as the electricity grid expands, from interstate or international generators. In addition, incumbents who are smaller and less efficient players may seek to merge with larger rivals who enjoy significant economies of scale. This has further implications for competition in the electricity market.

Gebhard notes that governments must focus on promoting competition and not try to manage the outcome of competition by handicapping incumbent utilities. Transition rules should:

- guarantee open access for all firms to transmission networks on a non-discriminatory basis;
- be impartial and non-discriminatory (eg, to protect against cross-subsidisation between the competitive and regulated operations of an integrated utility); and
- be forward-looking, by disregarding historical market conditions that are irrelevant to future competition.

Stranded Costs

Stranded costs are the costs utilities have incurred historically (eg through construction of generation plants), but may not be able to recover in the prices they are able to charge as a result of the shift to competitive markets. They include the unamortised costs of prior investments made by utilities that are scheduled for recovery through regulated monopoly rates but cannot be recovered under the new competitive market conditions.

Stranded costs represent a significant policy problem, especially where attempts have been made to recover these costs over the short-term by allowing retail electricity prices to rise significantly above marginal costs — this is unsustainable in a competitive market. As has been seen in a number of economies, the stranded costs issue thus arises primarily in the introduction of the wholesale competition and full retail competition models.

Types of stranded costs

There are four types of stranded costs:

- (1) Increased competition and technology development bring in new competitors with cheaper electricity production capacities than existing plants. These new competitors could put old plants out of business by charging customers less for the electricity generated.
- (2) Competition provides lower cost alternatives to long-term fuel or power purchasing contracts with governments to which regulated utilities are committed. Utilities tied to uneconomic obligations have higher input costs, resulting in loss of earnings, which makes cost recovery difficult.
- (3) Utilities may be obliged to invest in ‘regulatory assets’ (and are compensated by regulator-approved ‘extended payment plans’) — but if the regulatory regime changes, utilities may not be able to amortise their costs completely, due to deregulation-induced low prices.
- (4) Investment in miscellaneous public-policy programs (eg, Demand Side Management (DSM) programs paid for by all customers, and support for energy R&D) is stranded as their cost recovery becomes impossible after deregulation.

Who should bear stranded costs?

Most experts suggest that some compensation is payable by governments to utilities, but there is no guarantee of full recovery for the investment made under regulation.

It is generally accepted that the size of the recoverable costs should be determined on a case-by-case basis, depending on the specific attributes of each utility, and without discouraging cost saving efforts by those who want compensation.

Possibilities for dealing with stranded costs

Governments may adopt a number of strategies to deal with the issue of stranded costs. These include the following:

Transaction-Related Recovery Devices

- Access charge tied directly to continued transmission or distribution service.
- Exit fees charged to departing customers but unrelated to costs incurred on behalf of those customers.
- Exit fees charged to departing customers and calculated to recover costs incurred on behalf of those customers.
- A share of net generation savings realized by departing customers over time.

Non-Transaction-Related Recovery Devices

- Shifting costs to captive customers.

- Charging ratepayers above-cost prices where market exceeds cost.
- Accelerated and decelerated depreciation.
- Price cap on performance-based rates.

Broader Bases

- Entrance fees charged to new generation.
- All sellers pay a per-kWh tax on generation.
- Taxes to include credits for financial write-downs or trust funds to subsidize buyout of contracts from non-utility generators.

All of these options require a detailed consideration of static and dynamic efficiency, consistency with evolution to a competitive market, consistency with regulatory quid pro quo, and difficulties in implementation.

Security of Supply

Two main aspects of security of supply must be addressed in planning and implementing a transition to competitive markets :

- securing long-term supplies of generation fuels at affordable prices; and
- reliability of the electricity system (including the maintenance of adequate generation reserve capacity).

Long Term Investment

The introduction of competition in generation results in pressure to reduce investment and operating costs.

It is important to ensure that restructuring and regulation of the market are adequate to ensure that appropriate signals are given about the need for additional generation capacity or network upgrading.

Reliability in Deregulated Power Markets

The key change is that reliability is no longer defined by 'community service obligations' (as is usually the case under a vertically-integrated scheme), but rather by a contractual scheme involving generators, distributors and customers. The emphasis is shifting from technical system reliability to economical system reliability.

Accordingly, the structure of contractual relations among the parties should be designed to ensure that all participating entities in the restructured system meet the appropriate level of reliability.

Reforming pricing practices

Pricing mechanisms differ according to the extent to which markets are deregulated and unbundled:

- natural monopolies are compatible with a usual cost-of-service pricing practice; and
- deregulated markets require more complex pricing mechanisms.

Governments are required to balance the need not to distort the market against the need to regulate pricing where there is market failure.

Transparency

Transparency is an essential element in all pricing mechanisms:

- Where there is a monopoly, electricity prices can be subsidised to fill social policy obligations — these costs are born by the consumer.
- In a deregulated market consumers should be able to choose their retail supplier — as a result, they need good price and service information.

Pricing mechanisms

A variety of pricing mechanisms may be used in a competitive electricity market:

- Generation prices are usually set by supply and demand, while governments or regulators “control” transmission and distribution prices.
- Transmission prices can be regulated using a number of different mechanisms, ranging from the traditional “rate of return”-based pricing mechanism to a performance-based Price Cap approach.
 - The Price Cap approach offers more incentives for cost reduction, but may fail to reflect true costs in prices if insufficient information is available to the regulator. In addition, the price cap may over-shoot or under-shoot the optimal price level.
 - The challenge is to balance equity and efficiency (explained further below).
 - During the transition phase price caps are particularly well suited to the transition to competitive markets .
 - Effective application of price caps depends on the regulatory regime implementing the cap. For example, for efficiency gains to be realised, the regulator must be able to enforce the regulatory compact, and the State must be able to ensure that the regulator’s decisions are not unreasonably overruled or set aside.

Social Policy

Restructuring requires governments to redefine their role:

- Social policy remains a responsibility and burden of the State.
- However, governments should avoid the temptation of addressing social policy through energy policy.
- New instruments must be designed and put in place to implement social policy.
- A new regulatory framework and the redesign of adequate instruments to pursue social objectives provide the structure in which governments can harmonise private and public objectives.

Equity

- One challenge for governments is the maintenance of a ‘universal service obligation’ following the deregulation of the electricity sector.
- Under a restructured electricity sector governments may no longer be able to apply subsidies, eg, for low-income or rural consumers.
- Assistance to special needs consumers will have to come from other sources — such as direct government funding.
- The financing of funds for investment must also come from the State budget.

Consumer Protection

Governments are required to provide appropriate regulation (both under general competition laws and specific to the electricity sector) to protect consumers, as the benefits of reform may not be spread evenly among consumers. Steiner notes that industrial customers benefit disproportionately from the introduction of competition, while residential and small business consumers are left behind. Some regulatory measures may include, for example:

- keeping certain entities under State control;
- limiting the percentage that private companies can have in its ownership (including cross-ownership of other ESI entities); and
- imposing open access and clear pricing mechanisms.

Regulation must clearly state the quality standards that companies must comply with.

Government must ensure both enforcement capacity and the clear determination of liabilities.

Transitional Pricing Issues

Governments are required to manage pricing issues during the transition from one model to another. Some of these issues include the following:

- Price increases — different approaches by governments to deal with this include:
 - gradual increase in price levels;
 - maintaining focused subsidies, but financed by the State;
 - pricing systems that incorporate efficiency gains that will translate into price reductions over time;
 - enhancement of competition where applicable; and
 - information campaigns, etc.
- Reduction in employment levels — the strategies that governments will use to face these issues will depend on their particular circumstances .

ESI reform and the Environment

Deregulation can lead to environmentally harmful practices. As the wholesale electricity market is driven by costs of production, the lowest cost generators will invariably be called first. If these plants happen to run on the least environmentally friendly fuels, then, in the absence of any mechanisms to limit emissions, overall emissions of environmentally harmful substances are bound to increase. Accordingly, it is important that environmental policy be developed in tandem with economic and social policy. It may be necessary to take specific action to safeguard the environment, as the market is unable to internalise effectively the environmental externalities. Some examples include:

- taxes and fees;
- energy subsidies;
- tradeable emissions permits; and
- energy efficiency programmes.

Regulatory Principles, Practices and Institutions

As already noted, the regulatory environment affects the market structure of the ESI. Deregulation alone is not sufficient. The central issue is to ensure that regulatory regimes are established to constrain potential use of market power. Steiner notes that: ‘Regulatory reforms may not be met with synchronous performance improvements if residual market power remains’.

The following elements affect whether economies’ regulatory frameworks provide an effective institutional design:

- the degree of judicial independence;
- the long-term credibility of legislation;
- transparency of regulatory regimes, institutions and administrative decision-making;
- the scope for flexibility without arbitrariness in the regulatory process; and
- the level of administrative competence.

The following characteristics are important for creating effective regulatory institutions:

- clarity of roles and objectives — regulation is separated from policy-making and commercial management of electricity companies;
- autonomy — the regulator operates under a primary law which sets out key powers and duties and is protected from political intervention;
- accountability — the regulator’s decisions can be challenged in an effective way if thought to be unfair or incompetent;
- participation — relevant parties can contribute effectively to the regulatory process;
- transparency — the regulatory process is open and subject to good political practice, and regulators are required to explain their decisions and processes; and
- predictability — the regulator establishes a reputation for making fair and justifiable decisions, and participants may be confident that the “rules of the game” will not change suddenly.

The circumstances of each APEC economy present unique issues and problems in designing regulatory aspects of market reforms. What has succeeded in other economies may not be appropriate in a particular economy in Asia. Holder and Stern conclude that “it remains unclear whether Asian economies should adopt the institutional regulatory framework associated with current international ‘best practice’ or whether they will produce new variants on regulatory practice, but with different types of institution.”

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