

# **ENERGY SECTOR COMPETITION POLICY:**

## **Australian and International Experiences in Market Policy Design with Implications for the Asian Developing Countries**

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# ENERGY SECTOR COMPETITION POLICY

## INTRODUCTION

Energy policies are viewed in many countries as a matter of national security. Energy is an essential input to manufacturing, agriculture, mining and most of the services. It is also one of the largest sectors in the world economy, with an annual turnover of \$US1.7 to 2 trillion, and projected investment from 1990 to 2020 totalling US\$30 trillion in 1992 prices (UNCTAD (2001a)). Regional disparities in access to energy, especially electricity, are striking, with rural areas disadvantaged the most: as an example, an estimated one billion people in India cannot afford access to commercial energy, with less than a third of rural households having access to electricity. This leaves an estimated four hundred million people in India without access to electricity (UNCTAD (2001b)). In 1999, an estimated 50-100 million Chinese still lack access to electricity, despite the remarkable extension of the generation capacity that has risen from 43GW in 1975 to 200GW in 1995 and further to 300GW in 2000 (Andrews-Speed, Dow *et al.* (1999), Xu (2002), Xie (2002)). Worldwide, there are at least two billion people without access to electricity supply, and about three-quarters of the energy demand by households in the developing countries is met through utilisation of inferior fuels (Zarrilli (2001)).

Because of its strategic importance, there has been a high degree of government involvement in this sector. In most cases, the sector was dominated by state-owned monopolies that combined upstream and downstream activities. Natural resources were also often publicly owned. Over the past decade or so, however, the energy sector has undergone substantial reform in most industrialised countries. Competition, accompanied by liberalisation of the sources of supply as well as price deregulation, restructuring and privatisation are often introduced. In Asia-Pacific developing countries, there are varying degrees of competition in the energy sector, and in many cases (such as China, Indonesia and India) there are large government subsidies for energy products. Escalating fiscal burdens make these subsidies unsustainable in the long run, necessitating changes in energy pricing (Jaffe and Barnes (2000)).

There is greater scope for cross-border trade in services, for example, electricity and gas, between countries that share land borders. Modern technology also makes it possible to lay undersea high-voltage direct current (HVDC) electricity cables and gas pipelines, enabling cross-border trade between countries separated by sea (provided the benefits from trade justify the costs of such links). Interconnection policy is therefore crucial not only in solving technological constraints to ensure compatibility of technical standards within an economy, but also to promote cross-border trade in energy. These changes have added to the sources of available supply in most markets.

Energy trade is of particular importance to the Asian countries that differ in their natural resource endowments. China's self-sufficiency index has traditionally been high, yet over the last decade the country started to increasingly rely upon imported oil, becoming the world's 6<sup>th</sup> largest importer of petroleum products in 1999. Energy self-sufficiency of Japan and Korea is less than 20 per cent, raising the concerns about stability of the energy supply in Northeast Asia, and driving the need to diversify energy sources (Bowditch and Findlay (2002)). Japan is the world's 3<sup>rd</sup> largest importer of petroleum, and the largest importer of coal (Appendix 1-7). The People's Republic of China is the world's largest producer of coal,

and the second largest producer of electricity, representing 8.5% of world electricity generation (Appendix 2 and 3). Almost 80% of electricity in China is generated by coal-powered stations. Indonesia, Malaysia and Australia are exporters of gas (5<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> in the world ranking, respectively). Russian Federation is by far the largest exporter of gas, exporting twice as much as the runner-up, Canada, and five times as much as Indonesia (Appendix 4). Average applied tariffs on primary energy products remain higher in APEC economies than average tariffs in the EU (Appendix 8). Appendix 9 provides data on volume of energy trade in 2000.

The paper will first define the coverage of the energy sector and then discuss general approaches to policy reform in the energy sector. This discussion draws on international experience, in particular that of Australia, while also stressing the implications of the higher levels of tradeability of energy services for the Asian developing countries.

We discuss the removal of barriers to trade through multilateral WTO commitments, which provides an opportunity to lock-in essential domestic policy reform. Barriers to trade can be divided into limits on access to markets by both foreign and domestic suppliers (barriers to market access), and policies which are not only restrictive but also discriminatory against foreigners (limitations on national treatment). Examples include the lack of the right of establishment by any firm other than the designated supplier (a market access issue) and the imposition of special operating conditions on foreign suppliers (a national treatment issue).

*Regulatory frameworks*, if opaque, discriminatory and arbitrary, can also be a barrier to trade in energy services. Market access and national treatment commitments alone may not be sufficient to assure liberalisation for energy services if regulatory practices are too restrictive. Creating a competitive domestic market backed by well-functioning institutions will ensure that opening up to trade will bring further benefits to consumers and to the economy generally through improved efficiency. For example, if there is no mechanism in place to regulate monopoly profits and foster competition, then trade liberalisation (foreign entry) may result in monopoly rents been transferred to a monopoly provider (who now happens to be a foreigner). This example demonstrates why it is important to properly sequence regulatory reform, restructuring and liberalisation.

This paper sets out to:

- a) define the scope of the energy sector,
- b) provide a structure to assess impediments to entry by both domestic and foreign suppliers,
- c) review the design of international competition regimes in energy, including Australia;
- d) draw lessons and implications for the Asian developing countries in designing their energy competition policy; and
- e) comment on how the multilateral liberalisation through the WTO and regional initiatives such as APEC can create opportunities and drivers for policy reforms.

## **DEFINITION OF ENERGY SECTOR**

The entire energy sector combines production of goods and provision of related services. In the WTO context, commitments regarding trade in energy goods must be distinguished from restrictions and limitations to trade in energy-related services. The paper adopts the WTO methodology (1998) regarding the production processes governed by the regulatory principles for goods, and transportation and distribution as pertaining to services.

Debate continues in the WTO about the appropriate scope of coverage of energy services. The energy sector was not the subject of negotiation in the Uruguay Round and there is no unified definition of the energy sector. WTO members define the sector differently (see Appendix 10 for the comparison of definitions according to the EU and the US classifications). The business models now operating in the energy sector suggest a broader coverage is appropriate, including various forms of retailing for example, than 'oil and gas services'. Upstream activities, such as drilling, are included in other proposals. The US views energy services to be "those services involved in the exploration, development, extraction, production, generation, transportation, transmission, distribution, marketing, consumption, management, and efficiency of energy, energy products, and fuels."

### ***Energy products***

The main energy commodities are:

#### **Coal**

This covers extraction of various kinds of coal (hard coal, lignite, peat) and preparatory processes such as cleaning, crushing, screening and sizing.

World coal demand is driven mostly by electricity generation. Trading coal requires well-developed transportation networks, such as rail. Coal is estimated to contribute most to the greenhouse gas effect but remains among the cheapest energy sources in many countries. Competition from natural gas is increasing, however.

#### **Oil/Petroleum**

This covers exploration and extraction of crude oil, drilling; well services; manufacture of refined petroleum products (gasoline, fuel oils, kerosene, lubricants, etc).

The major market players are large vertically integrated multinational companies, engaged in the extraction, refining and distribution of oil products. Measures to introduce competition, especially at the distribution level, are particularly important.

#### **Gas**

Quite often exploration and production of gas is linked to oil production. However, transportation and distribution of gas are technically different from that of oil, but technically similar to electricity. Gas transmission includes bulk purchases of gas from producers (often using long-term contracts); transport over high-pressure pipelines; storage for load-balancing or strategic purposes; and bulk sales. Distribution includes delivery of gas through low-pressure pipelines to final consumers (residential, commercial and industrial), as well as metering, billing and accounting services.

Apart from natural gas supplied through high-pressure pipelines, liquefied natural gas (LNG) can be transported large distances. Within the APEC region, Japan and Korea import most of their gas as LNG from Indonesia, Malaysia and Australia.

Gas markets usually consist of vertically integrated monopolists in production, transmission and distribution. Recent policy developments in the gas sector include unbundling of the gas utilities to separate competitive segments (production and distribution) and establishing rules

on third-party access (TPA) to the distribution grid. Deregulation of the US gas industry occurred in the early 1990s. Privatisation of the UK monopoly, British Gas (BG), in 1986 preceded gas market liberalisation and introduction of competition in production and distribution, and establishment of rules on access to the transmission network.

## **Electricity**

Primary electricity comes from nuclear energy, hydroelectric plants, wind power plants and renewable energy sources (see below). Secondary electricity is produced from combustion of fossil fuels (oil, natural gas and coal).

The major components of the electricity subsector are fuel purchasing; construction of power plants; generation; construction and management of the transmission network (high-voltage and lower-voltage); wholesale trade in electricity; retail supply, metering, billing and customer service. Only the transmission grid has the properties of a natural monopoly. Transmission is transporting electricity through a high-voltage grid to large industrial consumers and distribution companies. Distribution covers delivery of electricity to final (retail) consumers through low voltage wires.

Many countries have successfully introduced competition in electricity generation and distribution, leading to dramatic restructuring of the electricity sector over the 1990s. In most European OECD countries vertically integrated public electricity utilities have been restructured to introduce competition in generation and distribution. US and Japan market structures differed from the beginning allowing greater competition between a large number of regulated private and public utilities that met universal service obligations.

The 1998 US *Comprehensive Electricity Competition Bill* targeted retail competition with choice of supplier. The UK introduced competition in electricity supply, first to large industrial customers, but had extended competition to cover retail customers by 1998.

## **Nuclear energy**

The nuclear energy subsector includes mining of uranium; its purification and enrichment; fabrication of nuclear fuel; production of nuclear energy; and disposal of nuclear fuel waste. The production of nuclear fuel and electricity (or secondary energy) includes a range of activities in the service sector.

The Euratom Treaty of the EU assigns exclusive rights to the European Atomic Agency in the supply, enrichment and procurement of uranium, but not to transformation or processing of nuclear fuels. The latter is subject to strict environmental and safety regulations.

## **Renewable Energy**

This subsector covers energy sources that, unlike fossil fuels, cannot be depleted by their utilisation in energy production, such as electricity, heat or liquid fuels. Wind power, solar energy, hydroelectric power, geothermal energy and biomass are renewable energy sources. Growing environmental concerns and the need to ensure long-term sustainable energy supplies have led to technological innovations in the energy sector (IEA (1996)).

Competition exists between different types of energy. Economies rely on particular types of energy to varying degrees. Availability of natural resources, such as coal, gas or uranium ore, is one important factor that determines a particular country's preference. Thus, of the APEC

economies, the US, Australia and China are relatively rich in coal, while Russia, Malaysia, Indonesia and Brunei are rich in natural gas. In some economies, demand for coal has grown faster than for gas, while in some other cases the opposite occurred. Some economies have experienced balanced growth in demand for gas and coal. A recent APEC study (1999) on competition between coal and natural gas examined their distribution within APEC economies (APEC (1999))<sup>1</sup>. It also analysed relative price movements of coal and gas; outlined environmental concerns surrounding the choice and utilisation of specific energy sources; and discussed technological issues of power generation. In addition, the report addressed the restructuring and privatisation of the power sector of APEC economies, focussing on the impact from these changes on coal and gas competition.

### *Energy services*

The multilateral Services Sectoral Classification List WTO (1991) contains several activities from the energy sector:

#### 1. Business Services category

##### F Other-

- h. Services incidental to mining 883+5115;
- j. Services incidental to energy distribution 887;
- m. Related scientific and technical consulting services 8675;
- n. Maintenance and repair of equipment 633+ 8861-8866;

#### 11. Transport services –

##### G Pipeline transport

- a. Transportation of fuels 7131

In some cases, it is easy to separate the goods and services components of the energy sector. While oil and coal are easily stored and transported over significant distances by road, rail and sea, natural gas must be liquefied and traded as liquefied natural gas (LNG), or alternatively, transported and distributed through pipelines. This makes separating the goods component from the transportation and distribution services difficult.

Similar problems arise with electricity. Electricity cannot be stored like natural gas. The amount of electricity supplied to the network must therefore be continuously balanced with the load – the amount consumed. GATT members debated whether electricity should be classified as a commodity or a service. They agreed to adopt the optional scheduling of electricity used in the World Custom Organization (WCO) Harmonized Commodity Description and Coding System (HS), so that it is not compulsory to classify electricity as a commodity for tariff purposes (WTO (1998)). Electricity therefore has the properties of both

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<sup>1</sup> See also Kemeny (2001) for the analysis of energy market in Asia-Pacific region.

goods and services and it is a matter of choice for each country to decide how it should be treated.

The accepted approach within the WTO is that production of primary and secondary energy, together with related services, are goods subject to the GATT agreements. However, the transportation and distribution of energy constitute services that are covered by the GATS. Other value-added energy services, including construction, engineering, consulting, management and other energy-related services, are usually classified within their generic categories (i.e. 1. Business Services or 3. Construction and Related Engineering Services).

This report concentrates on the services component of the energy sector, especially of natural gas and electricity. These are characterised by natural monopoly market structures, and hence most relevant to competition policy and regulatory issues. Regulatory issues for oil transportation through pipelines are similar to those for natural gas, and are not examined separately. Trade in coal and oil products is covered by standard trade theory and policy analysis and they are not discussed here again. We should also note that liberalisation of trade in energy services is linked to the liberalisation of trade in energy products, for free flow of energy goods requires provision of new energy services, with foreign expertise often called upon.

## **REGULATION OF THE ENERGY SECTOR: WHY AND HOW?**

### ***Why regulate?***

The electricity and gas sectors exhibit natural monopoly characteristics, including economies of scale and scope, presence of network externalities and lumpiness of investment due to technological constraints. Consequently, it is necessary to regulate energy services to prevent utilities from abusing market power. According to Breyer (1982) and Kahn (1988), the types of market failure that require regulatory interventions are:

- Market power;
- Information asymmetry;
- Externalities;
- Social distributive goals (equity).

Economic theory suggests that an unregulated monopolist will price discriminate if possible to collect monopoly rents. The level of output is lower than socially optimal, and the price higher. This translates into monopoly rents and deadweight welfare losses for the economy. The regulator needs to impose conditions to make the monopolist operate at socially optimal outcomes. However, this is not always possible in practice due to problems of information asymmetry and the possibility of regulatory failure.

Market power exists when a firm's unilateral actions change prices. Such a market is not perfectly competitive and the firm is no longer a price-taker, but a price-setter. Firms exercising market power are engaging in anti-competitive conduct. It can be unilateral or multilateral, and also horizontal (within the same market) or vertical (upstream-downstream activities). Anti-competitive practices within the same market include price fixing,

exclusionary practices, predatory pricing and market division. Vertical anti-competitive practices in a supplier-distributor chain include exclusive dealing, price discrimination and full line forcing (the obligation on a buyer to purchase a hole line of products rather than just one particular product).

Many issues must be resolved to determine whether conduct is anti-competitive. Fundamental is defining the relevant market and assessing the degree of competition within this market. The “Small but Significant Non-transitory Increase in Price” (SSNIP) test is used in Australia to test whether the market is effectively competition. Effective competition exists where profits would be expected to fall following a small price increase.

Market dimensions relevant to defining the relevant market are:

- Product (end use and potential substitutes; product characteristics; costs of switching; past consumer behaviour (substitution); costs of switching production and distribution to a close substitute; past behaviour of suppliers (substitution); relative price levels and dynamics versus potential substitutes; degree of product differentiation);
- Geographic (the physical area of competition; access to alternative sources of supply; costs of switching to an alternative supplier; past consumer behaviour (switching); transportation costs; perishability; regulatory constraints and switching costs to supply in different geographic areas; past behaviour of suppliers and relative prices by geographical sources of supply);
- Functional and time dimensions (substitutability of retail products for wholesale, market dynamics and future substitutes; whether there is a cluster market with products traded as a group).

Once determining that particular conduct is anti-competitive, the regulator must take appropriate regulatory action to prevent such conduct and to maintain a competitive market.

Externalities are also important in the energy sector. Many of the extraction, generation and transportation activities pose potential industrial pollution and health hazard problems. Consumer well-being or production by other firms may be directly affected by the public utility’s actions. Such externalities may be dealt with using several instruments, including quotas, taxes or bargaining (that leads to optimal outcomes if property rights are clearly allocated and enforceable - the Coase theorem). Industrial pollution and greenhouse gas emissions present an example of multilateral non-depletable externalities: they have characteristics of a public good (or rather, “bad”) in a sense that one party’s consumption of pollution does not prevent another party from consuming it (or suffering from it). Pollution control instruments include bargaining, tradable or non-tradable permits (licenses to pollute), imposing minimum technology requirements, relocating affected parties, applying emission taxes or abatement subsidies. Governments should facilitate private bargaining by creating appropriate institutions; defining and allocating property rights; conducting environmental monitoring; maintaining an effective legal system; and promoting social responsibility.

Removing distorting duty and tax incentives in sectors from which greenhouse gases are emitted would have a strong effect on reducing emissions. For example, removing global production subsidies alone would reduce total carbon dioxide emissions by an estimated 5%. EU coal producers are heavily subsidised. During the 1990s, the average producer subsidy to the EU coal industry was over one-and-a-half times the coal price. Energy pricing practices

in APEC economies appear however to be changing along with market structures towards reflecting true production costs of energy goods and services (APEREC (2000a)).

### ***Market structure of the energy sector***

Legislation, rules and regulations establishing specific forms of market structure have often impeded competition in this sector. Liberalisation of the energy sector should therefore start with legislative changes to make market restructuring possible.

As energy markets liberalised globally, vertically integrated monopolists were unbundled into generation (production), transmission (transport), distribution and supply (retail). While the transmission network is uneconomical to replicate (natural monopoly properties), smaller scale generation and distribution is possible, such that competition between firms supplying these activities increases efficiency and lowers prices. Nevertheless, it is still necessary to ensure that the incumbent provider cannot exercise market power, and that a suitable access regime is in place to ensure that both independent producers/generators and consumers/retailers have competitive access to the transmission network.

### ***How to regulate the energy sector?***

The regulatory principles need to create a correct set of economic incentives. Rate-of-return or cost-of-service regulation used in the US lead to over-investment and a capital-biased input mix (Averch–Johnson effect, Averch and Johnson (1962), Train (1991), Berg and Tschirhart (1988)). Such a regulatory regime creates perverse incentives regardless of whether the rate of return is set above, equal to, or below the true cost of capital. Other forms of regulation capping revenues are better suited to achieve a correct incentives structure.

An alternative approach is to use incentive-based regulation such as revenue or price caps of the “CPI–X” type, where X could be forward-looking, based on the industry long-term total factor productivity (Vogelsang and Finsinger (1979), Albon (2000), Train (1991)). Price cap regulation allows the utility to raise the weighted average price of a specified basket of services by no more than the increase in the consumer price index (CPI) less a percentage amount, X. Sometimes a retail price index (RPI) is used instead of the CPI, such as in the UK. The X factor creates a strong incentive for the utility to raise productivity, and through a periodic re-assessment ensures these benefits are passed onto consumers. Applying the cap to a basket of products provides an incentive for the utility to remove cross-subsidies and to price discriminate according to the Ramsey-Boiteux rule whereby price-inelastic consumers face higher prices. Setting a price cap requires an appropriate cost of capital and capital base to be determined. Such calculations are usually based on theoretical assumptions that often become major areas of dispute between the regulator and the utility. A depreciated optimised replacement cost (DORC), equal to the cost of replacement of the existing productive capacity of the depreciated capital stock with the best technology available, can be used by regulators as a measure of the capital stock (Albon (2000)). Calculating the Weighted Average Cost of Capital (WACC) requires knowledge of both the expected rate of return on equity and debt of a particular company. Comparison with other utilities, which is called “yardstick competition”, in order to set prices is another incentive-based regulatory mechanism (ACCC (2000)). It provides an incentive for utilities to lower costs, forcing competition between them for cost reductions. Techniques used to assess utility performance are data envelopment analysis (DEA) and stochastic frontier analysis.

Price regulation in this sector is made more complicated by the presence of externalities in the production and consumption processes. Various policy instruments are imposed as a result and their impact must also be taken into account in setting prices for energy products and services.

## **BENEFITS OF COMPETITION AND TRADE LIBERALISATION**

Competitive markets for goods and services induce firms to improve productivity. This generally lowers consumer prices and results in an expanded variety of goods and services. Pressures on firms to minimise production costs to remain competitive encourage technological and managerial innovations that contribute to productivity growth. Such growth improves the economy's overall efficiency.

A flexible and competitive domestic economy integrated into the international economy is better situated to handle the negative effects of any external shocks. Domestic competition requires liberalised markets that enable enhanced access, reduced barriers to entry by foreign suppliers, and a regulatory framework based on competitive provision of goods and services by entities with different ownership structures, aimed at competitive neutrality.

Developing countries are increasingly recognising the importance of competition policies. While the same general principles apply, national differences may need to be taken into account in designing a reform program tailored to individual conditions. Regulatory reform to increase competition should precede or coincide with marketing opening measures to allow the benefits of improved resource allocation and expanded consumption possibilities to be maximised. Ahn (2002) comprehensively surveys the theoretical models on relationships between competition, innovation and productivity growth, and refers to numerous empirical studies in various industries, including infrastructure services.

Recent energy sector reforms have concentrated on four main areas: privatisation (changing public for private ownership), liberalisation (choice of supplier), price deregulation and competition through unbundling of transmission service and introducing wholesale markets (Haas, Auer *et al.* (2000)). Expected benefits from deregulation in terms of increased management and regulatory efficiency (hence, lower cost) and competitive pressures from other suppliers include lower prices, at least for large industrial consumers, and elimination of cross-subsidisation. However, electricity prices in the long run might not go down, and price cap regulation may be necessary even in a "competitive" market (Haas, Auer *et al.* (2000)). Strategic profit-maximising behaviour may make it rational for a firm to enter strategic alliances in order to achieve economies of scale, and to absorb smaller competitive Independent Power Producers.

## **MODELS OF COMPETITION IN ELECTRICITY AND GAS**

Introducing competition in these markets firstly requires preventing the incumbent vertically-integrated utility from exercising its dominant position in transmission. This is usually achieved by separating transmission into an independent entity (a transmission system operator or TSO), and allowing independent generators to enter the electricity supply market, to access the grid operated by the TSO, and to sell electricity to the wholesale market (pool). Large electricity users, such as industrial enterprises, and public utilities (responsible for

distribution of energy to retail clients) can then purchase electricity at wholesale prices, using the same grid. Allowing choice of supplier injects competition into the market, subject to a sufficient number of independent generators supplying electricity to the grid. Another essential component of a competitive market is establishing rules and the terms for accessing the transmission network. Electricity tariffs can be transaction-based (i.e. a bilateral contract between a specific seller and a specific buyer, such as point-to-point tariffs and distance-related pricing), or of a point-of-connection nature (depending on the characteristics of a specific seller/buyer connected to the same part of the network). Energy losses and network congestion require path-dependent pricing schedules; zonal pricing or counter trading can handle network congestion (Shuttleworth (1999)). The EU uses zonal pricing by segmenting the market into zones with distinct prices. England and Wales use a counter-trade system, where the TSO purchases excess electricity supplied by a trader. (Transmission pricing is discussed in greater detail in the section on the Australian experience in electricity deregulation and competition reform).

The role of independent power producers (IPPs) has increased substantially with the privatisation and restructuring of energy markets underway in APEC economies. The IPPs in such countries as Indonesia, Malaysia, Pakistan, Philippines and Thailand operate in effective competition with the incumbent's own generation facilities. Policy issues with a direct impact on IPPs are (APEC (1999): 98):

- vulnerability of long-term take-or-pay contracts for power purchases;
- limited financing of IPPs, due to the shallow domestic capital market;
- cautious approach to privatisation reform.

Engineering a successful privatisation and restructuring program requires the following aspects to be considered (APEC (1999):99) in separating out the generating segment of the monopoly provider:

- the mode of privatisation;
- implications for ownership and firm structure;
- public service obligations carried on by traditional public utilities;
- sharing the benefits between investors and consumers;
- mechanisms for recovering fixed and sunk costs;
- pricing, including through the wholesale pool;
- transmission charges;
- procurement of ancillary services (spinning reserves, reactive power);
- demand-side bidding; and
- risk management through hedging.

Electricity deregulation in APEC economies has been reviewed based on the operational model adopted and the degree of unbundling of services (APEREC (2000b)). Operational models used in the study, ranked by ascending order of competition, are vertically-integrated monopoly; monopsony; wholesale competition; and full retail competition (Table 1). The state of competition in electricity markets in APEC economies is summarised in Table 2.

**Table 1. Description of the operational models for the electricity sector**

Operational Market Structure	Vertically Integrated Monopoly	Monopsony	Wholesale Competition	Retail Competition
Definition	Monopoly at all levels	Monopoly with a single buyer	Competition between power generators, choice for large industrial customers and distributors	Competition between power generators, choice for retail consumers
Competition in Generation	X	✓	✓	✓
Retailer Choice	X	X	✓	✓
Customer Choice	X	X	X	✓

Source: APERC (2000b):39 Table 6

**Table 2. Operational models for the electricity sector in APEC economies**

Economy	Reform Model	Degree of unbundling
Australia	Wholesale competition/National Electricity Market (pool)	Separated transmission and unbundling of distribution
USA (California)	Wholesale competition pool	Unbundling transmission and bundled with supply
Chile	Cooperative generation pools with retail wheeling	Unbundling of distribution
Peru	Wholesale competition (pool)	Unbundling of distribution
New Zealand	Full competition	Full competition with incomplete privatisation
Malaysia	Monopsony/ competitive bidding in generation	Unbundling of distribution and generation discussed
Thailand	Monopsony/ competitive bidding in generation	Unbundling of distribution and generation in process

China	Monopsony/ competitive bidding in generation	Partial unbundling of distribution and transmission
Japan	Monopsony/ competitive bidding in generation	Bundled transmission and distribution
Singapore	Wholesale competition (pool)	Unbundling of generation and supply
Viet Nam	Monopsony/ competitive bidding in generation	Generation and transmission to be run as profit centres
Indonesia	Monopsony/ competitive bidding in generation	Unbundling generation
Russia	Monopsony/ competitive bidding in generation	Vertically integrated/ partial unbundling in generation
Brunei Darussalam	Monopoly	Vertically integrated
Chinese Taipei	Monopsony/ competitive bidding in generation	Vertically integrated/ partial unbundling in generation
Hong Kong (China)	Monopoly	Vertically integrated
Papua New Guinea	Monopoly	Vertically integrated
Mexico	Monopsony/ competitive bidding in generation	Vertically integrated/ Unbundling generation in progress
Philippines	Monopsony	Vertically integrated/ Unbundling generation and supply
Korea	Monopoly	Vertically integrated/ Unbundling generation
Canada	Monopoly	Vertically integrated

Source: APERC (2000b):40 Table 7

Unbundling of electricity generation from transmission, allowing third party access and promoting competition in the wholesale market are significant factors explaining the reduction in electricity prices in OECD countries (Steiner (2001). Hydroelectric power, where economically feasible, may be linked with lower electricity prices and has been empirically found to reduce price volatility compared to fossil fuel-based generation (Wolak (1997)).

Electricity reform in Asia was hampered by the financial crisis of 1997, accompanied by the sharp fall in demand for power. In many cases, power purchase agreements concluded as part of the BOT contracts for electricity generation were dishonoured. Interest of the private sector in energy infrastructure diminished significantly, due to the increased market, currency and regulatory risk. Predictable and transparent regulatory structures are needed to revive

investors' confidence in competing with the incumbent, often in an environment with no independent regulator and no effective arbitration or enforcement mechanism. Policies aimed to increase competition in the energy market, including through the liberalisation of services trade, are the necessary condition to support economic growth in the region. A new round of reform in the power sector has been initiated in eg Philippines, Indonesia and Thailand (Stern (2000)). Recent reform of the Thai electricity market to introduce wholesale competition by 2003 is discussed in Pipattanasomporn, Ongsakul *et al.* (2000). Gupta, Lamech *et al.* (2002) discuss how the World Bank and the Bank Group institutions such as the Multilateral Investment Guarantee Agency and International Finance Corporation can assist in mitigating regulatory and institutional risks in relation to the private investment in energy infrastructure.

Despite comparative advantage in labour and fuel costs, Chinese residential electricity prices are 30% higher than those in the US, suggesting that significant efficiency improvements can be made, including through competition and a genuinely independent regulator (The Economist (2002)). For the discussion of the progress in piecemeal energy sector reforms in China, see Andrews-Speed, Dow *et al.* (1999), Andrews-Speed, Dow *et al.* (2000) and Xu (2002). Saez and Yang (2001) compared deregulation of electricity sector in India and China and found that the speed of implementation of the reforms, especially in corporatisation of public assets, was very slow. However, some positive efficiency gains due to the reform have been found in both economies.

#### **AUSTRALIAN EXPERIENCE IN IMPLEMENTATION OF COMPETITION POLICIES IN GAS AND ELECTRICITY SECTORS**

The Australian experience provides possible lessons and implications for the developing countries in Asia in designing an appropriate energy sector competition policy.

##### ***National Competition Policy Framework and Institutions***

Australia has developed a comprehensive national competition policy that has delivered significant benefits to the economy in terms of GDP growth and improved microeconomic efficiency. Australia's current competition policy is based on the *Trade Practices Act 1974*. Its main objectives are to:

- prevent anti-competitive conduct through competition law; and
- assure fair trade practices, including consumer protection.

The Hilmer Committee established by the Council of Australian Governments (COAG) developed a general approach to competition policy (Report by the Independent Committee of Inquiry on National Competition Policy, 1993). A national competition policy framework was created, covering both public and private companies alike (*Competition Policy Reform Act 1995*). Australia's experience is particularly relevant for federation countries with multiple tiers of government. The main recommendations of the Hilmer Report were:

- Prohibition of anti-competitive conduct that is against the public interest;
- Uniform application of universal competitive conduct rules to all market participants, regardless of the form of business ownership;

- Anti-competitive practices conducted in the public interest to be assessed by an appropriate transparent process, taking into account the full public costs and benefits, and providing for a review mechanism;
- Changes to competition policy to be aimed at developing open domestic markets for goods and services through the removal of unnecessary impediments to trade and competition; and to reduce complexity and to eliminate administrative duplication, in recognition of the increasingly national scope of markets.

The Commonwealth and State Governments signed three intergovernmental agreements on competition policy reforms in 1995. These specified prices oversight; structural reform of government monopolies; review of legislation and regulations to remove anti-competitive restrictions not in the public interest; access to services provided by essential facilities; and the elimination of any net competitive advantages by government due to public ownership.

Testing for anti-competitive conduct first requires the firm's relevant market to be defined and the extent of competitive pressures faced by the firm to be evaluated. Some obviously anti-competitive actions are deemed in the Australian legislation as "per se" prohibitions, such as price-fixing (Section 45), exclusive dealing (section 47), third-line forcing, or supply from a nominated third party (Sections 47(6) and 47(7)) and resale price fixing (Section 48).

Anti-competitive behaviour is that which has the purpose of "substantially lessening competition in a market" (Section 47 TPA). It is necessary to show that the conduct is likely or intended to harm competition or has harmed competition.

The *Competition Policy Reform Act 1995* brought State and local government businesses and corporations under the umbrella of Part IV *TPA 1974*; amended *Price Surveillance Act 1983* to extend price surveillance on government businesses; and created the Australian Competition and Consumer Commission (ACCC) in 1995 and the National Competition Council (NCC). The ACCC focused on abuse of market power; pricing and consumer protection; and monitoring of price performance of organisations and services which have been "declared" as worthy of that attention by the relevant Minister, usually The Treasurer. The NCC advises the designated minister by providing recommendations on applications to have particular services so "declared".<sup>2</sup> It also regulates third party access to essential infrastructure; recommends price surveillance of state government businesses; assesses government progress in implementing competition policy reform; and administers the additional Commonwealth government funding granted to the states that successfully meet their COAG commitments. The quasi-judicial Australian Competition Tribunal (ACT) was created to review appeals from the ACCC and designated Ministers on anti-competitive conduct, mergers and third party infrastructure access. The ACT decisions may be appealed to the Federal Court and the High Court.

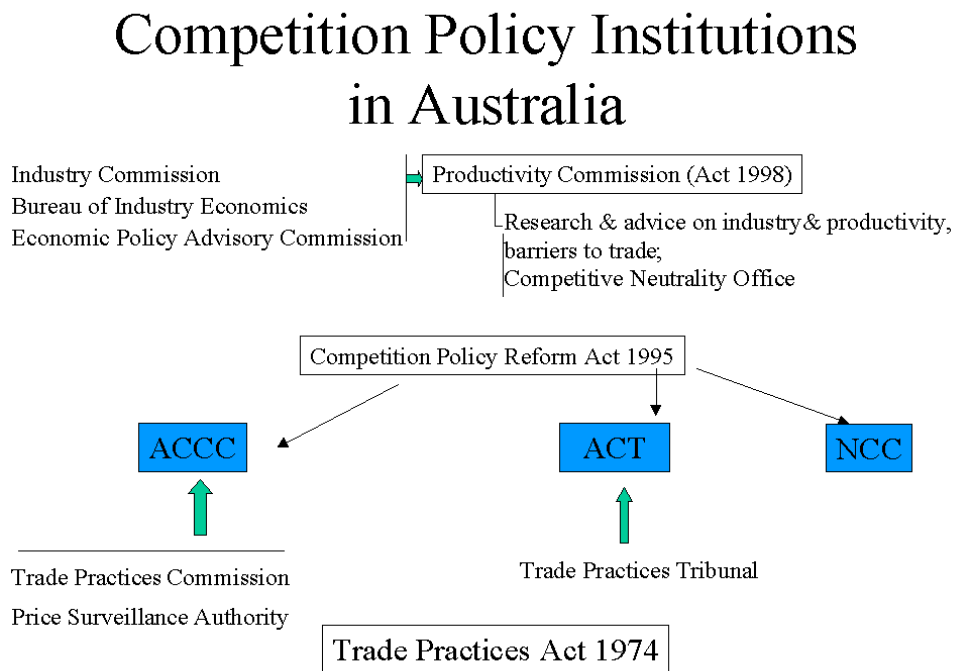
The Productivity Commission, formed in 1998 from its predecessor, the Industries Assistance Commission, conducts public inquiries and research on industry development and productivity, and advises the Commonwealth government on a broad range of industry and other policy matters. Its role in competition policy is to review aspects of the policy and to investigate competitive neutrality complaints against state-owned businesses.

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<sup>2</sup> See [www.ncc.gov.au](http://www.ncc.gov.au)

The structure of the NCP institutions in Australia is illustrated in Figure 1.

**Figure 1. Competition Policy Institutions in Australia**



### Gaining Third Party Access

The National Competition Policy has established access regimes. Part IIIA of the *Trade Practices Act* provides a legal foundation to apply for and gain third party access to services of essential facilities with national significance and natural monopoly characteristics, such as electricity grids, natural gas pipelines or rail lines.

Access regimes can be determined at the state or commonwealth government levels or can be private (i.e. industry-based access codes). A party can apply to the NCC requesting that the service be “declared”. The NCC does so if it is shown that access to the service in question would promote competition in another market; to replicate the essential facility would be uneconomical; it is of national significance; there are no health or safety risks; no effective access regime already exists; and access would not be contrary to the public interest. The relevant commonwealth or state minister, depending on who owns the facility, must approve any such recommendation. The Minister’s decision can be appealed to the ACT.

Private parties may negotiate access arrangements for a declared service, and seek arbitration in cases of dispute. Any such access agreement should be registered with the ACCC, which applies the public interest test. This test takes into account issues of ecologically sustainable development, social welfare and equity (including public service obligation); occupational health and safety; economic and regional development; consumers’ interests; business competitiveness and economic efficiency. Registered contracts are enforceable (Part IIIA).

Where third parties and the provider of the essential service cannot agree, they can notify the ACCC which will make a determination specifying the terms and conditions of access. Any party may request that the ACT review the determination, which is enforceable through the Federal Court.

State governments may exempt certain services from declaration, by applying to the NCC to recommend the existing access regime as “effective”. Such recommendations, if approved by the relevant Commonwealth Minister (the Treasurer), prevent the access regime from being declared under Part IIIA.

An alternative procedure for a non-declared service is for the provider to lodge an access undertaking with the ACCC specifying terms and conditions on which third-party access will be granted. The ACCC may accept or reject an undertaking proposal based on several reasons, including both public interest and economic efficiency. If approved by the ACCC, these services cannot be declared. Such access undertakings are enforceable in the Federal Court.

### ***National Competition Policy-Related Reforms in Energy***

In 1993, the Commonwealth and States of New South Wales, Victoria, Queensland, South Australia and the ACT agreed to form a national electricity market. Deregulation of the gas industry followed a 1994 COAG initiative to provide free trade in gas between the States. Competition principles are most advanced in electricity, followed by natural gas (PC (1999a)).

Electricity and gas reforms were key components of larger infrastructure reforms designed to to implement the National Competition Policy program. The cumulative effects from NCP reform in Australia are estimated at 2.5% of GDP (PC (1999b):298). Electricity and gas reform alone increased real consumption by an estimated 1%. Other non-energy infrastructure reforms included in the NCP program that delivered substantial economic benefits were rail and road transport, telecommunications, water, and elimination of anti-competitive statutory marketing arrangements for agricultural commodities (Table 3).

**Table 3. Macroeconomic effects of NCP reforms, including electricity and gas**

	Electricity& Gas, %	NCP reforms, %
Real GDP	1.1	2.5
Real consumption	1.0	2.8
Real investment	1.0	2.8
Export volumes	2.2	3.4
Import volumes	0.7	2.0
Terms of trade	-0.2	-0.7
Post-tax real wages	1.4	3.4

Source PC (1999a):299 Table 10.5 , PC (1999b):62 Table 3.1

The ACCC has played an important role in these reforms. Its responsibilities in the energy sector include (ACCC (2002):18):

- regulating gas transmission pipelines declared by the NCC and the Minister (conditions for access, arbitration of disputes, overseeing the competitive tendering for new infrastructure projects);
- regulating the electricity transmission grid and the access conditions in the NEM, using CPI-X price caps;
- assessing access undertakings pursuant to Part IIIA of the *Trade Practices Act 1974*;
- authorising gas marketing arrangements (joint ventures in exploration and development, and long-term marketing contracts may be authorised by ACCC if the public benefits exceed the costs of subdued competition);
- authorising changes to the Electricity Code and of anti-competitive practices where public benefits exceed anti-competitive costs;
- assessing the impact of mergers on competition, and assuring compliance with the competitive practices stipulated in the *Trade Practices Act 1974*.

### **Electricity**

Since the reforms, the Australian electricity industry has restructured from a publicly-owned vertically-integrated monopoly to a competitive market. The electricity sector contributed \$9.7 billion in industry value added in 1998-99, with sales of goods and services valued at \$23.2 billion, an increase of 12% over the 1997-98 level (ABS (2000)). The electricity sector's total assets in 1998-99 were \$76.3 billion. It employed 32,701 persons at mid-1999. Significant over-investment had occurred in electricity generating capacity during the 1980s, with substantial inefficiencies in capital and labour productivity.

In 1997-98, electricity prices for commercial/industrial users have fallen to about 85% of the 1991-92 levels in real terms. Retail prices fell much less significantly, partially due to the lack of retail competition and also to retail price regulation. Efficiency improved through downsizing of the industry's labour force in both urban and rural areas, from 80,000 employees in 1985 to 37,000 in 1997. Some regions were particularly hit hard by the reform (PC (1999a):108).

## Box 1. Reform in the Australian Electricity Industry

Reform towards a competitive national electricity market has been implemented throughout the 1990s, based on three *key elements*:

**Structural Change** – the structural separation of vertically integrated entities into competitive (retail and generation) and monopoly (network) components;

**Access to monopoly infrastructure** – a legislated regime of third party access to the transmission and distribution grids;

**Improved interconnections** – creation of a single East Coast market

### Steps Taken by State Governments:

- Competitive electricity generation (merit order dispatch);
- Open access to an interstate electricity transmission network;
- Liberalised wholesale bulk electricity market;
- Disaggregation of generation to promote competition;
- Transmission and distribution grid run by a separate company, with an independent regulator;
- Ring fencing of retailing from the distribution network;
- Removal of regulatory barriers to competition in generation and distribution;
- Two-part wholesale electricity tariffs based on access-usage charges;
- Privatisation of various elements of the industry in some states.

Source: Sayers and Shields (2001): 19

The degree and pace of reform varied across the states. Victoria led with separation and subsequent divestiture of all major generators, distributors and transmission utilities by 1999. The National Electricity Market (NEM) commenced operations in December 1998. This is a common wholesale pool serving interconnected jurisdictions, administered by the National Electricity Code Administrator (NECA). It provided for a single controller to dispatch the output of the generators. It also establishes customer entitlements to purchase electricity either on the spot market or through direct contract with suppliers; and operates a market settlement function for spot and forward trading (PC (1999a):101).

The National Electricity Code (NEC) was designed to provide a regime of “light-handed” regulation of the electricity market to achieve the market objectives (Clause 1.4(1)). It established rules governing market operations, power system security, network connection and access and network services pricing. The ACCC authorised these rules.

The National Electricity Market Management Company Limited (NEMMCO) operates the pool and is responsible for managing the wholesale electricity market. Participants of the NEM pool are electricity generators and contestable customers in the states of NSW,

Victoria, South Australia, Queensland and the ACT<sup>3</sup>. They number about eighty, including also transmission network service providers (TNSPs) – operators of the extra high voltage transmission grid; distribution network service providers (DNSPs) - operators of the lower voltage grid, and market network service providers (MNSPs) that own and operate entrepreneurial interconnections between regions<sup>4</sup>. NEMMCO balances instantaneous demand and supply based on the NEC rules<sup>5</sup>. It also administers billing for all spot transactions. The ACCC and state regulators supervise and regulate both NEM and NEMMCO. The ACCC has regulated NEM's transmission revenues since July 1999, and will be responsible for regulating all transmission networks participating in NEM from 2003. Retail electricity distribution is under state supervision (Outhred (2000)).

NEM uses a simple (or “minimalist”) nodal pricing system, with five regional markets each characterised by a regional reference node (RRN) that has a corresponding regional price. Regional differences exist between RRNs due to energy losses and congestion constraints. Intra-regional prices, however, are based only on energy losses between the RRN and an individual connection point calculated as an average of the marginal loss factor in the previous year (ACCC (1999)). This pricing regime does not reflect the full dynamic cost of transmission within each region (Appendix 11 describes transmission services subject to charges).

The dispatch process, according to the NEC, allows the NEMMCO to use a merit order dispatch system, whereby high cost generators supply electricity at peak time/excess demand periods, and the base load is provided by low cost generators. Unlike in California, the market design for NEM allows generators to enter long-term contracts with retail distributors, or large customers, that effectively hedge against fluctuations of spot prices in half-hour blocks. At the same time, spot price volatility signals potential bottlenecks, and provides essential information for investment decisions.

Benchmarking of Australian retail electricity prices suggests that the market structure is still sub-optimal (Sayers and Shields (2001)). The gross pool approach requires all generators producing at least 30MW to submit bids to the pool market for dispatch. The pool price is that achieved by the marginal generator, and any generators with costs lower than those of the marginal supplier benefit from a price higher than their marginal cost. It is possible that the more concentrated the industry, the greater the incentive for generators with significant market share to strategically withhold capacity to raise the price (ABARE (2002)). Nevertheless, reforms to date – albeit perhaps imperfect – have produced significant net benefits.

Another concern is the determination of the transmission charge. The ACCC, based on a study by London Economics (1999),<sup>6</sup> is developing a new analytical approach to efficiently price transmission services (ACCC (1999)). Other changes are occurring at the retail level. NSW introduced retail competition in electricity distribution from 2002 and Victoria in January 2002. South Australia plans to introduce full retail competition in 2003.

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<sup>3</sup> Contestable consumer can choose the supplier of electricity, and the price is established by negotiation with the generator. Tasmania, Western Australia and the Northern Territory are not currently in the pool.

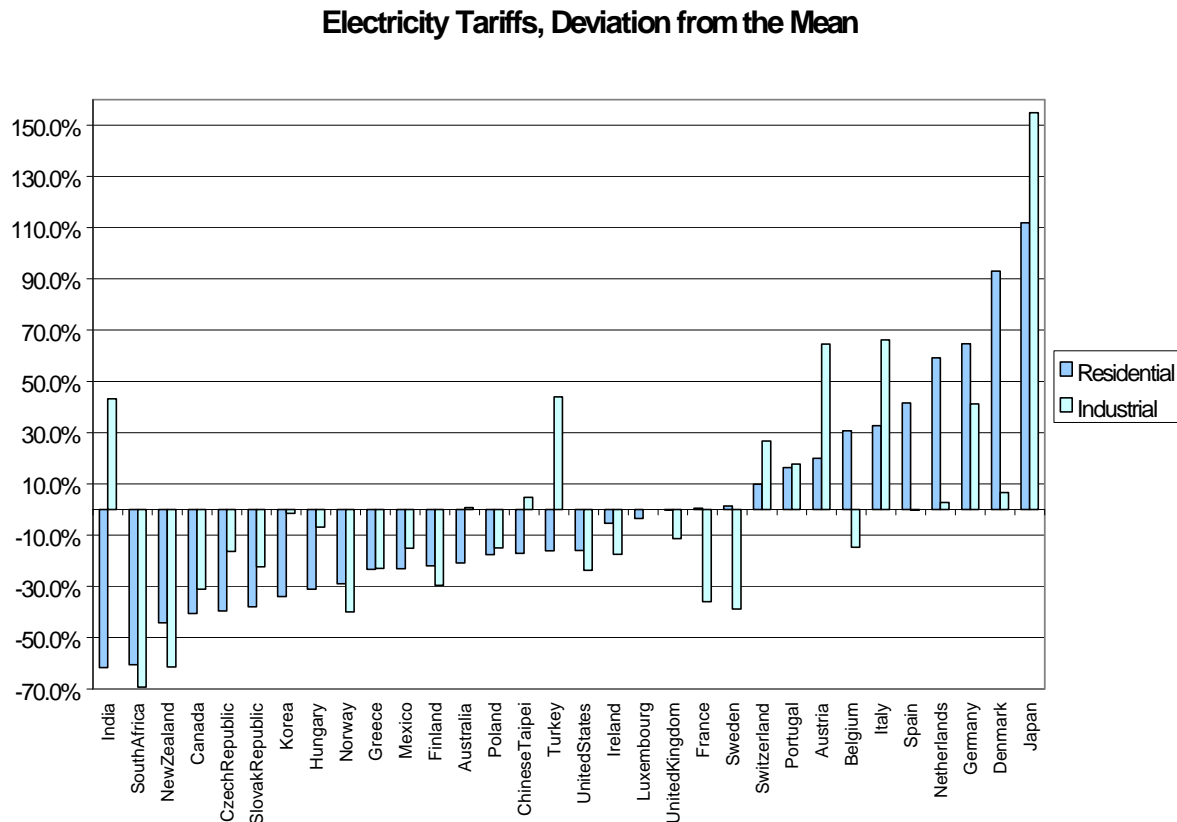
<sup>4</sup> <http://www.nemmco.com.au/publications/whitebook/participants.htm>

<sup>5</sup> <http://www.neca.com.au/files/necacode/>

<sup>6</sup> <http://www.accc.gov.au/electric/fs-elec.htm>

Reforms have contributed to the relatively low Australian residential electricity prices (Figure 2), with industrial prices of US 5.6 c/kWh being about the average in the sample.

**Figure 2. Electricity prices – International Comparison, 4Q 2001**



Source: International Energy Agency, Prices are for the 4th Quarter of 2001 or latest available.  
[http://www.iea.org/statist/keyworld2002/key2002/p\\_0505.htm](http://www.iea.org/statist/keyworld2002/key2002/p_0505.htm)

### Natural Gas

Natural gas revenues rose by 22% from \$4.1 billion in 1997-98 to \$5.0 billion in 1998-99 (ABS (2000)). The gas industry's value added was \$1.4 billion in 1998-99, and total assets amounted to \$8.3 billion. Employment increased to 3,073, due to restructuring, and total wages and salaries rose to \$183 million in 1998-99. Although the natural gas sector is much smaller than electricity, it is growing fast. By 2010, gas is projected to account for around 28% of Australia's the primary energy.

The traditional Australian model was a single vertically integrated company providing exploration, production, transmission and distribution of natural gas within each State. Interstate trade in natural gas was explicitly prohibited in some jurisdictions (PC (1999a):119). Impediments to trading gas also included lack of physical interconnections and no mechanism for third party access to pipelines.

In 1991, policies were adopted to create a nationally integrated natural gas pipeline and to make inter-State trade in gas possible, as well as to establish an access regime to the pipeline. COAG decided on the following steps in gas reform to be fulfilled by 1996 (PC, 1999 #22]:119)

- removal of regulatory and legal impediments to trade in gas;
- development of a third-party access regime to the natural gas transmission pipelines;
- corporatisation of public gas utilities;
- “ring fencing” (structural separation) of the publicly- and privately-owned vertically integrated transmission and distribution activities; and
- reform of gas franchise arrangements.

### **Box 2. Reform in the Australian Gas Industry**

Reform towards a competitive national gas market has been implemented throughout the 1990s, based on three *key elements*:

*Structural Change* – the structural separation of vertically integrated entities into competitive (retail and generation) and monopoly (network) components;

*Access to monopoly infrastructure* – a legislated regime for third party access to the pipelines;

*Removal of legislative and regulatory barriers to competition*

#### **Steps Taken by the State Governments:**

- Legislation passed by the states to adopt the National Access Code;
- Applications to the NCC to approve access regimes;
- Privatisation of pipelines (SA, QLD, WA)
- Corporatisation and privatisation of public gas utilities in some states (Victoria), “ring fencing” of transmission and distribution activities.

Since reforms began, the gas pipeline network has significantly expanded, including in regional Australia. National average residential and industrial gas prices fell by an estimated 22% from 1994 to 1998. Industrial tariffs fell more substantially than residential charges. Employment dropped substantially between 1992 and 1997, with six major utilities cutting about 40% of their workforce (approximately 3,400 jobs).

## ***Introducing competition in the Australian energy sector***

Overall, the Australian experience of regulatory reform is a positive one. Significant benefits are apparent, not only in terms of the efficiency of each sector but also the contribution to environmental policy objectives, and to regional development. Two major issues remain. One is the design of the regulation of the transmission systems for both electricity and gas. The other is the architecture of the regulatory system, including the number of bodies involved and the links between them. More specific results for particular sectors or activities include the following (ACCC (2002):15):

### **Wholesale electricity market**

#### ***Conclusions***

- Reforms have benefited the economy through more efficient pricing, improved quality of services and higher investment;
- Reforms are yet to capture the full potential benefits from liberalisation. Inter-connection needs to be improved, and end users' responsiveness to price changes increased;

#### ***Recommendations***

- Remove impediments to the entry of new generators and to further unbundling;
- Commit to full retail contestability and introduction of interval-based meters;
- Encourage efficient investment in transmission infrastructure through a new transmission planning body to replace the nodal/zonal pricing mechanism;
- Increase the wholesale price cap (and implement the commitment to remove it in future);

### **Upstream gas market**

#### ***Conclusions***

- Reforms in the gas sector have benefited the economy in transforming the vertically integrated monopoly to a more competitive structure;
- Competition can be enhanced by facilitating entry into production, improving interconnections and phasing out existing contractual agreements;

### **Transmission and Distribution Infrastructure**

#### ***Conclusions***

- Electricity and gas transmission and distribution have natural monopoly properties;
- Regulation of the natural monopoly segment is needed to promote economic efficiency, stimulate investment in downstream industries and increase domestic and international competitiveness;

- Regulation of the gas sector has a direct impact on electricity prices, due to the large number of gas turbines generating electricity. Lower gas prices benefit retail gas consumers and reduce electricity prices for residential and industrial users;
- Incentive regulations for pricing monopoly services (price caps of CPI-X type) are appropriate;

### ***Recommendations***

- Develop mechanisms for regulating transmission pricing and creating a national gas distribution system;

## **Governance**

### ***Recommendations***

- Continue to review options for changes in the regulatory institutions, including moving to a single national regulator; co-operation between regulators; and consolidation of activities of the regulatory bodies (NECA, NEMMCO and the ACCC).

## **Environment**

### ***Conclusions***

- Efficient gas and electricity pricing has important implications for greenhouse gas emissions, including through the incentives created to substitute gas for other fuels in the generation of electricity

## **Regional development**

### ***Conclusions***

- Liberalising energy markets significantly effects downstream regional investment;
- Anti-competitive cross-subsidies should be eliminated and more transparent regimes for meeting commitments on services established.

## **INTERNATIONAL COMPETITION REGIMES IN ENERGY**

In this section, we review features of a number of international agreements, for the purpose of starting a discussion about how international commitments might help support domestic reform.

### ***EU***

Markets in oil and petroleum products are generally competitive. In Europe, gas and electricity markets have recently been liberalised and sources of gas diversified. The coal sector however continues to receive large state subsidies.

The EU Directive on the internal electricity market (*Electricity Directive 96/92/EC*<sup>7</sup>) became effective in February 1999<sup>8</sup>. It established the following menu of options for rules on accessing the transmission network, based on Articles 16-18 of the Directive (EC (2001):6):

- *Negotiated third party access* based on the agreement between eligible customer and the transmission system operator (TSO);
- *Regulated third party access* – published and regulated network usage prices;
- *Single buyer* procedure, where the TSO acting as an agent purchases all electricity for all the network or its part, with remaining eligible consumers getting access on either a negotiated or regulated basis.

The Directive also includes important provisions on unbundling of the transmission network from generation and distribution; establishing a dispute settlement mechanism to control anti-competitive practices; regulation transparency; providing public service obligations; and encouraging electricity trade.

The degree of progress on electricity reforms varies across EU members (EC (2002b)). Countries such as Finland, Sweden, England and Wales have among the lowest electricity tariffs in Europe and have unbundled ownership in their competitive electricity sectors. Other countries have not gone so far, with transmission networks having been separated from other components either in terms of organisational structures (as in Austria, Belgium, Italy and Spain) or operationally at management level (as in France, Germany and Greece). Work has started on quantifying the effects of the energy market integration in the EU (EC - DG TREN (2001)).

The European Parliament and Council Directive 98/30/EC (22 June 1998) on the gas market (*Gas Directive*) became operative in August 1998. It provided a framework for liberalising the natural gas market<sup>9</sup>. Not all member countries have passed the required domestic legislation to implement the *Gas Directive*, but the actual process of market opening has been encouraging, reaching around 80% of total EU gas demand in 2000 (EC (2001)).

As with the electricity sector, the *Gas Directive* proposed a choice of third party access regimes to the natural monopoly segment of the sector (negotiated TPA, regulated access or a combination of both). The Madrid Forum of gas regulators plays a major role in promoting competition in the gas sector. The access regime applies to the large final customers and to gas-fired electricity generators. The degree of unbundling in the gas industry is less than in electricity, although most EU members pursue at least accounting separation of activities. Public service obligations differ across economies. The *Gas Directive* requires that any such obligations be transparent and non-discriminatory. Other aspects covered in the Directive include access to upstream pipeline networks, technical requirements (of importance mostly to the gas producing countries such as the UK, the Netherlands and Denmark), and access to storage capacity.

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<sup>7</sup> [http://europa.eu.int/comm/energy/en/elec\\_single\\_market/harm\\_rep/cb\\_harmo2\\_en.pdf](http://europa.eu.int/comm/energy/en/elec_single_market/harm_rep/cb_harmo2_en.pdf)

<sup>8</sup> Luxembourg later derogated from the Electricity Directive.

<sup>9</sup> Finland, Portugal and Greece derogated from the Gas Directive.

## *Energy Charter Treaty*

The Energy Charter is an inter-governmental organisation comprising 51 states (all of the European countries, Russia and other CIS states, Australia, Japan and Mongolia). Created to promote cooperation on energy issues, the Charter is based on the principles of openness, transparency and non-discrimination. The Energy Charter Treaty (ECT), signed in Lisbon in December 1994, is the main legal instrument, complemented with the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects. The ECT was amended in April 1998 with Amendment to the Trade-Related Provisions of the Energy Charter Treaty<sup>10</sup>.

The ECT has legally binding rules on cooperation in investment protection; trade in energy materials and products; transit and dispute settlement. Australia, Belarus, Iceland, Norway and the Russian Federation have not yet ratified the ECT<sup>11</sup>. Rules on foreign investment are based on the more favourable of either the most favoured nation principle or the treatment accorded to domestic investors (Article 10). WTO rules are applied to trade in energy materials and products between all Contracting Parties, even if a non-WTO member. If a dispute arises between individual foreign investors and the state, the investor may use international arbitration procedures. An arbitration mechanism can be used to settle disputes between states, if usual diplomatic channels cannot resolve it. Arbitration results are binding.

ECT signatories are to facilitate transit of energy materials and products without distinguishing between the origin, destination or ownership of such products or price discriminating on the basis of such distinctions. Any unreasonable delays, restrictions or charges should be avoided. Energy materials and products in transit are to be treated no less favourably than domestic materials, unless an international agreement provides otherwise. In case of transit disputes, no interruption or reduction in the flow of energy materials and products should occur prior to the dispute resolution procedure.

ECT signatories are required to alleviate market distortions and barriers to competition in energy activities, and to improve legislative framework to address anti-competitive conduct in the energy sector. Other major principles upon which the ECT is based are transparency (establishing enquiry points on laws, regulations, judicial decisions and administrative rulings); sovereignty over members' energy resources and management; and environmental soundness. The ECT incorporates the "polluter pays" principle to ensure that social costs of pollution are fully reflected in the product's market price.

## *North America*

The USA electricity and natural gas industries have been regulated on price and entry for almost a century, with anti-competitive behaviour prosecuted under the antitrust law. Government intervention in oil and coal markets declined substantially in the 1990s after price controls and usage restrictions imposed during the oil crisis of the 1970s were lifted (Joskow (2001)). The Energy Reform Act of 1992 changed the Federal Power Act and the Public Utility Holding Company Act to allow restructuring of the electricity sector and

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<sup>10</sup> <http://www.encharter.org/upload/1/TreatyBook-en.pdf>

<sup>11</sup> The Upper House of the Japanese parliament approved Japan's acceptance of the Energy Charter Treaty (ECT) on July 5, 2002, making it the 46th Contracting Party to the Treaty.

<http://www.encharter.org/index.jsp?psk=040101&ptp=tDetail.jsp&pci=167&pti=44>

competition. In 1992, provisions introduced for third party access to the pipelines, unbundling of retail and transportation activities, and other changes making the market more contestable laid the foundations for a more competitive natural gas market (Order 636 of the Federal Energy Regulatory Commission).

The North American Free Trade Agreement (NAFTA) covers measures related to trade in energy goods, investment and cross-border trade of services (Chapter Six on “Energy and Basic Petrochemicals”). Article 603 on Import and Export Restrictions recognises the provisions of the General Agreement on Tariffs and Trade (GATT) on prohibitions or restrictions on trade in energy and basic petrochemical goods. Article 604 on Export Taxes prohibits any tax, duty, or charge on the export of any energy product, unless such a measure is also applied on such products for domestic consumption. Article 606(a), Energy Regulatory Measures, stipulates national treatment, and prescribes that energy regulatory bodies should perform their functions without disrupting contractual relationships. Services associated with energy and basic petrochemical goods are excluded from the scope of NAFTA Chapter Twelve on Cross-Border Trade in Services (Article 1201(2)(b)).

NAFTA (Chapter Fifteen on Competition Policy, Monopolies and State Enterprises) requires countries to preclude anti-competitive business conduct, and to cooperate on issues of competition law enforcement, including mutual legal assistance, notification, consultation and exchange of information. Dispute settlement bodies cannot consider competition issue (Article 1501). Designated monopolies, regulated transparently to prevent exercise of monopoly power, are allowed provided they grant non-discriminatory treatment to investors, goods and service providers of other parties.

### **Lessons from the California energy crisis**

Deregulation of the Californian electricity market offers insights into the importance of market design when implement reforms. California’s electricity industry commenced restructuring in 1994, and in 1996 restructuring plans for three large public investor-owned utilities (IOUs)<sup>12</sup> were introduced. The IOUs divested most of their generating capacity and transferred control over the transmission grid to a newly created non-profit company, California Independent System Operator (CAISO). The California Power Exchange (PX), operational in 1998, conducted a day-ahead hourly auction wholesale electricity trade. Supply and demand were balanced by CAISO conducting hourly auctions for operating reserves and for generation capacity to manage congestion. Retail consumer prices were frozen until 2002, or until the utilities achieved appropriate cost recovery, whichever occurred first.

Following some two years of relatively smooth operation, wholesale electricity prices jumped alarmingly, with average wholesale electricity prices during the summer of 2000 being almost 500% higher than those during the previous two summers. The price hike reflected higher natural gas prices, increased consumer demand, decreased power imports from neighbouring states (both due to the hot summer weather in 2000), and increased prices of tradeable NO<sub>x</sub> emission permits (Joskow and Kahn (2001)). The market design had also allowed generators to exercise market power by strategically withholding capacity (see also report of the US General Accounting Office (GAO (2002))).

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<sup>12</sup> Three IOUs are Pacific Gas and Electric, Southern California Edison, and San Diego Gas and Electric.

Tariffs on sales to final consumers were capped in California. Power utilities were prevented from entering into long-term supply contracts to hedge price risks, due to the regulatory design. They had to purchase electricity in the wholesale market at a much higher price than the regulated selling price. Public utilities went bankrupt. Large blackouts followed, and the Californian Government provided a rescue package involving long-term electricity purchase agreements at prices that now significantly exceed spot prices.

The California energy crisis highlighted the importance of managing the risks of price increases, and the mistake of not allowing long-term supply contracts to hedge this risk, especially given the retail price cap (Congressional Budget Office (2001)). The end-user must face cost-based tariffs so that they adjust their power purchases when prices rise. Technical challenges in a move to time metering of electricity consumed at the retail level, and equipping households and industrial users with new metering systems is an additional cost.

## ***APEC***

APEC initiatives on energy occur within the Energy Working Group<sup>13</sup>. Areas of cooperation include power infrastructure, natural gas, interconnection, energy standards and efficiency. The Energy Regulator's Forum (ERF)<sup>14</sup> was established in 1996 to assist the Group in summarising and reviewing regulatory experiences and developing best practice regulatory approaches to facilitate efficient energy markets. The ERF is currently focused on assessment of the regulatory component of reports prepared by other groups within APEC; advising on the Group's activities in the regulatory area; and reporting to the Group on regulatory aspects of electricity and gas developments in APEC economies<sup>15</sup>.

Energy ministers agreed in 1996 to fourteen non-binding energy policy principles, including opening of the energy markets (Principle 3) and the progressive reduction in energy subsidies and implementation of pricing practices which reflect the economic cost of supplying and using energy across the full energy cycle, having regard to environmental costs (Principle 5)<sup>16</sup>. APEC's Natural Gas Initiative aims at promoting investment in natural gas infrastructure and trading networks across the region, through identifying best practices for minimising investor risk<sup>17</sup>.

The *Manual of Best Practice Principles for IPPs*<sup>18</sup> emphasised transparency, predictability, reduced risk and encouraging competition as crucial factors for successfully operating independent power producers (IPPs). Best practices in institutional and regulatory structures, tender/bid process, power purchase agreements and tariff structures, and financing were assessed (Box 3).

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<sup>13</sup> <http://www.apecenergy.org.au/welcome/index.html>

<sup>14</sup> <http://www.apecenergy.org.au/welcome/background/regulators/erf-activities.html>

<sup>15</sup> <http://www.apecenergy.org.au/welcome/background/regulators/ERF7.pdf>

<sup>16</sup> APEC (1996), <http://www.apecenergy.org.au/welcome/assets/EMM1.pdf>

<sup>17</sup> APEC (1996)

<sup>18</sup> <http://www.apecenergy.org.au/welcome/ippmanual.pdf>

### Box 3. Best Regulatory Practices for IPPs (APEC)

#### INSTITUTIONAL AND REGULATORY STRUCTURES

- ◆ Established legislative framework
- ◆ Clear energy sector policies and framework for policy-making
- ◆ Separation between regulator and utility
- ◆ Separation between generation and natural monopoly transmission functions
- ◆ Competitive market in electricity generation and energy supply
- ◆ Competitive development of the transmission grid, including through private investment
- ◆ Transparency of environmental or other social objectives

The APEC Group on Services identified the following steps in designing deregulation/privatization programs (APEC (2001b)):

Assessment of the costs and benefits of regulation

As the costs of regulation may exceed the benefits, new and changed regulatory measures should be assessed through a “regulatory impact analysis”.

*a. Creation of a competitive market*

Deregulation/privatization should be accompanied by competition, maintained through effective competition policies and laws.

*b. Transparency*

The regulatory reform process should be transparent.

*c. Sequencing of reforms*

The correct sequencing of economic and regulatory reforms should reflect each given situation and desired objective.

Sequencing of reforms can crucially determine their success. Privatising activities before deregulating the sector risks establishing powerful private lobbies against future deregulation. The optimal sequence for deregulating the energy sector is, according to a World Bank study of developing and transition economies (Bacon and Jones (2002)):

- (i) introduce privatisation/liberalisation campaign;
- (ii) enact electricity law to permit unbundling and divestiture;

- (iii) establish an independent regulatory authority;
- (iv) approve new market structure;
- (v) unbundle the power utility;
- (vi) privatise or grant concession on private distribution;
- (vii) privatise generators.

In this approach, independent power producers (IPPs) may enter throughout the reform process. Based on this framework, the Study ranked countries on a scale from 0 (perfect sequencing) to 100 (reverse order sequencing). India (Orissa) project scored 2, compared to the score of 39 for Thailand, and 75 for Kazakhstan. The APEC Energy Working Group has also agreed that privatisation should come last following the establishment of a legal framework and the institutions needed for a properly functioning market (APEC (2001a):43).

#### **TRADE IN ENERGY IN THE WTO FRAMEWORK: ASSESSING IMPEDIMENTS TO ENTRY BY BOTH DOMESTIC AND FOREIGN SUPPLIERS**

We have emphasised the complexity of defining energy sector and distinguishing between its goods and services components. Multilateral obligations in relation to trade in energy goods are covered by the World Trade Organization (WTO) General Agreement on Tariffs and Trade (GATT). Commitments on trade in energy related services are made under the General Agreement on Trade in Services (GATS).

GATT Article XX(g), *General Exceptions*, allows for implementation of the measures relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption. Article XXI(b)(I), *Security Exceptions*, allows the member to take any action which it considers necessary for the protection of its essential security interests relating to fissionable materials or the materials from which they are derived. Energy products become increasingly covered by the GATT provision since the pressures of high oil prices somewhat eased.

#### ***Trade in energy goods***

Coal and oil are traded world-wide, due to the ease of its transportation. Trade in gas requires special transmission infrastructure (pipelines). Trade in electricity, like natural gas, requires interconnected transmission grids, and also harmonisation of technical standards such as frequency and voltage. Special ancillary services are necessary to transform characteristics of electricity to comply with different standards.

The EU exchanges significant amounts of electricity with Norway and Switzerland. Countries applying for membership, such as Poland, Czech Republic and Slovakia, are now linked up to the EU grid. Interconnection in North America allows for trade to occur between the United States, Canada and Mexico.

## **Interconnection in APEC**

Regional interconnection of high voltage transmission grids depends on a range of technical and regulatory factors. Difference in physical characteristics of the network such as operating frequency (60 Hz in Japan, Canada, USA and 50 Hz in Australia, EU and most Asian economies) makes it necessary to use intermediate frequency conversion facilities that adds significantly to interconnection costs. Operating different voltage levels requires an additional transformation step, which is less of an impediment than different frequencies (APEC (2002):26).

The benefits of grid interconnection include enabling electricity trade between regions having different peak periods; increased generation efficiency; greater competition; economies of scale in ancillary services (eg spinning reserve); and enhanced reliability of energy supply. Transmission grids and lack of interconnection between them often represent the largest impediment to cross-border and regional trade in electricity.

In Europe technical interconnection of the national electricity grids is achieved through the Union for the Co-ordination of Transmission of Electricity (UCTE). UCTE is the industry association of transmission system operators that has operated for five decades, ensuring quality of synchronous operation of interconnected high-voltage power grids at 50 Hz frequency.

Transmission pricing methods have to be compatible within an interconnected system. If not, interconnection can be impeded. Supply of power by the vertically integrated monopolist is often priced using “postage stamp tariffs” equal to the average network costs, with customers buying similar baskets of product (measured in size, location and voltage) paying similar tariffs. If a similar approach is used along the transit line when electricity is traded through the interconnected network, a “pancaking” of the transmission charges occurs, resulting in high tariffs for the final consumer (APEC (2002):28). Loop flows, network losses and congestion are other physical aspects of the interconnected grid that have to be accounted for in setting the transmission tariff. Where significant congestion rents exist, they can be channelled to finance new interconnecting capacity, and should not be left for the TSOs to collect in an unregulated manner. Various transmission pricing approaches include short run marginal cost, congestion costing, and full nodal pricing.

It has been emphasised in a number of studies that the transmission system operators have to be independent from other participants in the energy market to ensure impartiality in setting the access regime (Arizu, Dunn *et al.* (2001), Arizu, Dunn *et al.* (2002)). Even if competition is introduced in generation, a monopsony (or single buyer) market structure, as happens in the case of a wholesale pool controlled by a government entity, may present challenges in developing countries by inviting corruption and imposing significant fiscal obligations if non-payments persist at the retail level (Lovei (2000)).

Dramatic changes are happening in the regulation, structure and ownership of the Asian electricity sector. With demand for electricity growing, imports of energy by Asian economies are likely to increase. Most of the countries in the region have turned to the private sector in supplying electricity, mostly by allowing private and foreign participation in Independent Power Production (IPP). Private investment in the infrastructure sector, including energy, in the East Asia region was hit hard by the Asian crisis, with private activity in the energy sector during 1998-99 in countries such as Malaysia, Thailand and the Philippines accounting for only around a quarter of 1993-94 levels (Izaguirre (2000)).

Liberalisation of the local energy market along and restructuring of incumbent public utilities to withstand the competitive pressures from the new independent providers have accompanied private sector involvement.

Development of a stable regulatory framework for the network component of the sector and promoting competition in other activities, along with effective institutions needed to formulate and implement these policies, are a major challenge for many developing and transitional economies. Serving the community through universal service obligations (USO) or some other form of public service obligation (PSO) further complicates regulation, especially where there are large regional disparities. With electricity services often heavily cross-subsidised, an efficient way of bringing tariffs closer to supply costs is needed, and the targeted programs to compensate those hurt by the reform implemented.

### ***Trade in energy services:***

Trade barriers can be divided into limits on market access and national treatment, and restrictive or discriminatory regulations (WTO (2000)):

- *Market access* and *national treatment* restrictions are similar to those faced by many services providers and include lack of a right of establishment, an inability to provide cross-border service, discriminatory treatment between foreign and domestic service providers, among others.
- *Regulatory frameworks* can often be opaque, discriminatory, and arbitrary. Without a regulatory network that provides a basis for genuine competition, new energy services companies are often at a disadvantage to a favoured competitor, usually the incumbent, as in the case of procurement practices. As in the case of basic telecommunications and financial services, market access and national treatment commitments, while necessary, may not be sufficient to assure liberalisation for energy services.
- Energy service providers often face barriers in obtaining *personnel* and *equipment*.

Commitments in international trade of energy services are included in the scope of the General Agreement on Trade in Services (GATS). It does not specify energy services as a whole. GATS Article XIV bis, *Security Exceptions*, para 1(b)(ii) recognises as essential security interests those “relating to fissionable and fusionable materials or the materials from which they are derived”, and allows Members to take any actions deemed necessary to protect those interests.

Proposals were tabled during the Services 2000 negotiations to use cluster approaches to energy services, that is, to define the sector and negotiate a package of commitments in all activities.

### ***Energy services commitments in the GATS.***

The GATS covers four modes of supply: cross-border (mode 1), consumption abroad (mode 2), commercial presence (mode 3) and temporary movement of natural people (mode 4). GATS commitments in energy by WTO members are given in Appendix 12.

Mode 1 – cross-border supply – is feasible in transmission of electricity, and in transporting gas by pipeline. Some consulting energy-related services can also be traded across the border,

using information and communications technologies. Impediments to cross-border trade in energy goods include tariff and non-tariff measures, as well as restrictive business practices (such as vertical foreclosure of transmission and distribution networks in the importing country). Disciplining restrictive business practices (RBPs) is beyond the current scope of GATT/WTO for goods. However, for energy services, RBPs should be listed as limitations to market access or national treatment for those sectors on which commitments were scheduled under GATS. Disciplines for domestic regulation are imposed in Article VI.

The Telecommunications Services Reference Paper (24 April 1996) imposed disciplines on domestic regulatory practices in telecommunications. The competition principles of the Reference Paper could be extended to other network services by ensuring that any major supplier of essential facilities provided access to all suppliers, national and foreign, at cost-based rates. Network services subject to natural monopoly properties include transport (terminals and infrastructure), environment (sewage) and energy services (distribution networks). Measures in the Reference Paper that could be extended to the oil/gas/electricity transport networks are:

- Competitive safeguards, designed to prevent anti-competitive conduct (such as anti-competitive cross-subsidisation; use of information obtained from competitors with anti-competitive results; denying information about and access to essential facilities);
- Interconnection guarantees (interconnection with a major supplier at any feasible point in the network should be provided on non-discriminatory terms and conditions; conditions of access have to be publicly available; interconnection arrangements are to be transparent; an independent dispute settlement body is to be established);
- Universal service obligations (have to be administered in a transparent, non-discriminatory and competitively neutral manner; not more burdensome than necessary);
- Public availability of licensing criteria (time frame, terms and conditions, the reasons for the denial);
- Independent regulators; and
- Allocation of scarce resources (should be performed in an objective, timely, non-discriminatory and transparent manner).

GATS Mode 3 of supply – commercial presence – involves foreign direct investment into energy infrastructure, often as a joint venture with the local company. It is the major vehicle for international trade in energy services. Trade in goods through commercial presence is currently beyond the scope of GATT, although this may change in future. Attempts to introduce a Multilateral Agreement on Investment among OECD countries failed.

Mode 4 supply – movement of individual providers – is significant for professional consulting services linked to the energy sector, and also to movement of skilled personnel. Commitments in mode 2 of supply of energy - consumption abroad – are insignificant in the general context of trade in energy services.

As we have already stressed, a priority in the multilateral process is further work on classification energy sector as a potential candidate for sectoral negotiations (Appendix 13).

## CONCLUSIONS

Market imperfections in the energy sector have a direct impact on trade. At the same time, the energy sector is politically sensitive, and security of the domestic supply of energy is essential for political stability. Social policy objectives have to be addressed in order to secure support for the liberalisation of this sector and for broader economic reforms.

Developing countries in Asia differ in their energy endowments: some are energy-rich, and some are energy-poor. Energy rich countries attach high priority to gaining access to foreign energy markets. However, foreign markets are only of use for those countries if they can export competitively, and hence domestic energy sector should be efficient. At the same time, international commitments can reinforce domestic reforms, with trade liberalisation and domestic restructuring going hand in hand.

Net importers of energy benefit from lower energy tariffs and competition in the local and international markets. Facilitation of trade in energy products and services becomes a priority, including removal of technical and regulatory barriers to such trade.

Implementing domestic energy reforms require building an institutional framework for regulating natural monopoly components of the energy sector. Corruption and “red tape” barriers have been the major problem in a number of Asian developing countries, hence it is even more important to base regulatory rules on the principles of transparency and necessity.

Priorities in the energy sector can be grouped according to the three major objectives:

- making the market work;
  - strengthening of corporate governance; and
  - addressing social policy concerns.
- **To make the market work**, old anti-competitive practices based on state intervention in providing energy services and price controls should be replaced by internationally accepted rules and principles. Energy prices should reflect their true economic cost. Subsidies in the energy sector should be gradually removed. Any social policy objectives should be administered in a transparent and predictable manner. Chronic non-payments by industrial and residential consumers should be eliminated to make services viable. Measures to promote efficient energy markets include unbundling of vertically integrated monopolies; separating the competitive segment of the industry and fostering competition; legal and operational independence of the transmission component; independent regulator; and ensuring transparent mechanisms for competitive third party access. Attention is also required to the design of systems to meet service obligations to those parts of the markets which might otherwise not receive stable or sufficient high quality supplies.
- **Strengthening of corporate governance** starts with establishing legislation to improve the investment climate and producer’s motivation; creation of transparent and accountable regulatory institutions; and participation in the international trade liberalisation activities using multilateral and regional fora (WTO, APEC, ASEAN, ECT etc).

- **Social policy concerns** should be given full consideration in order to ensure continuing support to the broader agenda. Attention to environmental and safety aspects of the sector, especially in nuclear energy, is critical.

International experiences in deregulating energy markets have demonstrated that substantial efficiency gains are possible. However, evidence also indicates that there are traps in this process which if not avoided, can generate problems with the reforms. Due to the special role that the energy sector plays in national economies, these problems are likely to be felt at all levels of downstream economic activity, and will directly impact on final consumers. The lessons from other countries' experiences, as highlighted in this report, are as follows:

- **Lessons in privatisation and designing the restructuring program:**

- Cautious approach to choosing the mode of privatisation;
- Careful consideration of ownership and firm structure;
- The need to finance public service obligations carried on by traditional public utilities increasingly through private-public sector partnerships;
- Regulatory mechanisms for sharing the benefits between investors and consumers;
- Pricing mechanisms that allow to recover fixed and sunk costs;
- Choice of the most appropriate rule for determining transmission charges;
- Actions to ensure systemic stability of the network, including procurement of ancillary services;
- Avoid creation of demand-side distortions; facilitate price responsiveness of demand;
- Avoid regulation that prevents firms from managing risks (eg through hedging).

- **Lessons in sequencing of the energy sector reform:**

- Start with building up public support for the reform, if necessary, leveraging upon the international commitments;
- Create legislative framework allowing changes in the market structure towards a model that fosters competition (including through unbundling and divestiture);
- Establish institutions with powers and responsibilities in fostering competition in the energy sector; establish an independent regulatory authority;
- Following the approval of a new market structure, proceed with actual unbundling of the power utility, then liberalise distribution through privatisation or concessions, and only then privatise generators.

- **Lessons in choosing the market design:**

- Avoid models that create wrong incentives for the market participants. Take into account existing distortions such as retail price controls when designing rules for the

wholesale competition. Lessons from the Californian experience suggest that flaws in market design create incentives for generators to exercise their market power. Short-term price fluctuations could have been smoothed if the utilities were allowed to hedge their risks by purchasing electricity through the longer-term forward contracts.

- Monopsony (a single buyer) wholesale market structure controlled by the government entity may present challenges in the developing and transitional economies, through regulatory capture and a weak payment discipline.

## APPENDIX 1. PRODUCERS, EXPORTERS AND IMPORTERS OF PETROLEUM PRODUCTS

Source: IEA <http://www.iea.org/statist/key2001/key2001/keystats.htm>

Producers	Mt	% of World total	Exporters	Mt	Importers	Mt
United States	808	23.8	Netherlands	60	United States	61
Japan	208	6.1	Russia	48	Germany	51
People's Rep. of China	176	5.2	Singapore	45	Japan	41
Russia	163	4.8	United States	41	Netherlands	40
Korea	120	3.5	Saudi Arabia	39	Singapore	37
Germany	115	3.4	Korea	37	People's Rep. of China	27
Italy	94	2.8	Venezuela	37	France	25
Canada	92	2.7	Kuwait	36	Italy	21
United Kingdom	88	2.6	United Kingdom	22	India	20
France	85	2.5	Italy	20	Hong Kong (China)	17
Rest of the World	1 442	42.5	Rest of the World	328	Rest of the World	317
<b>World</b>	<b>3 391</b>	<b>100.0</b>	<b>World</b>	<b>713</b>	<b>World</b>	<b>657</b>
1999 data			1999 data		1999 data	

Sources: Energy Statistics and Balances of non-OECD Countries; Oil Information.

## APPENDIX 2. ELECTRICITY PRODUCTION FROM FOSSIL FUELS

Source: IEA <http://www.iea.org/statist/key2001/key2001/keystats.htm>

Coal	TWh	Oil	TWh	Gas	TWh
United States	2 024	Japan	176	United States	613
People's Republic of China	964	United States	121	Russia	359
India	397	Italy	91	Japan	234
Germany	286	Mexico	91	United Kingdom	141
Japan	224	Saudi Arabia	77	Italy	87
South Africa	187	People's Republic of China	49	Islamic Republic of Iran	86
Russia	161	Russia	41	Germany	55
Australia	158	Chinese Taipei	40	Thailand	53
Poland	135	Iraq	29	Malaysia	51
Canada	109	Spain	24	Netherlands	49
Rest of the World	982	Rest of the World	510	Rest of the World	803
<b>World</b>	<b>5 627</b>	<b>World</b>	<b>1 249</b>	<b>World</b>	<b>2 531</b>
	1999 Data		1999 Data		1999 Data

Sources: Energy Statistics and Balances of non-OECD Countries; Electricity Information.

### APPENDIX 3. PRODUCERS, EXPORTERS AND IMPORTERS OF ELECTRICITY

Source: IEA <http://www.iea.org/statist/key2001/key2001/keystats.htm>

Producers*	TWh	% of World total	Exporters**	TWh	Importers**	TWh
United States	3 910	26.5	France	68	United States	43
People's Republic of China	1 239	8.4	Paraguay	46	Italy	43
Japan	1 057	7.2	Canada	45	Germany	41
Russia	845	5.7	Germany	40	Brazil	40
Canada	577	3.9	Switzerland	32	Netherlands	22
Germany	551	3.7	Russia	23	Switzerland	22
India	527	3.6	Sweden	16	Canada	16
France	520	3.5	United States	14	United Kingdom	15
United Kingdom	364	2.5	Austria	14	Spain	12
Brazil	332	2.2	Czech Republic	12	Austria	12
Rest of the World	4 842	32.8	Rest of the World	135	Rest of the World	185
<b>World</b>	<b>14 764</b>	<b>100.0</b>	<b>World</b>	<b>445</b>	<b>World</b>	<b>451</b>
	1999 Data			1999 Data		1999 Data

\*Gross production less production from pumped storage plants.

\*\*Total exports and imports.

Sources: Energy Statistics and Balances of non-OECD Countries; Electricity Information.

#### APPENDIX 4. PRODUCERS, EXPORTERS AND IMPORTERS\* OF NATURAL GAS

Source: IEA <http://www.iea.org/statist/key2001/key2001/keystats.htm>

Producers	Mm <sup>3</sup>	% of World total	Exporters	Mm <sup>3</sup>	Importers	Mm <sup>3</sup>
Russia	584 200	23.0	Russia	205 354	United States	101 530
United States	548 044	21.6	Canada	94 966	Germany	76 761
Canada	180 618	7.1	Algeria	63 763	Japan	72 154
United Kingdom	115 065	4.5	Norway	45 499	Ukraine	60 313
Algeria	89 348	3.5	Indonesia	39 032	Italy	49 484
Netherlands	72 864	2.9	Netherlands	38 106	France	40 625
Indonesia	67 830	2.7	Malaysia	18 359	Korea	16 940
Iran	63 744	2.5	Australia	9 804	Belarus	16 565
Uzbekistan	56 001	2.2	Turkmenistan	9 723	Belgium	15 805
Saudi Arabia	52 811	2.1	Qatar	8 036	Spain	15 222
Rest of the World	706 341	27.8	Rest of the World	61 491	Rest of the World	125 631
<b>World</b>	<b>2 536 866</b>	<b>100.0</b>	<b>World**</b>	<b>594 133</b>	<b>World**</b>	<b>591 030</b>
2000 Data			1999 Data		1999 Data	

\*Exports and Imports include pipeline gas and LNG.

\*\*World trade includes intra trade of Former USSR.

Sources: Energy Statistics and Balances of non-OECD Countries; Natural Gas Information.

## APPENDIX 5. PRODUCERS, EXPORTERS AND IMPORTERS OF COAL

Source: IEA <http://www.iea.org/statist/key2001/key2001/keystats.htm>

Producers	Hard Coal (Mt)	Brown Coal (Mt)	Exporters	Hard Coal (Mt)	Coal Importers	Hard Coal (Mt)
People's Rep. of China	1171	*	Australia	170	Japan	133
United States	899	77	South Africa	66	Korea	55
India	310	22	United States	57	Chinese Taipei	41
Australia	238	68	Indonesia	55	Germany	22
Russia	169	86	People's Rep. of China	37	United Kingdom	21
South Africa	225	0	Canada	34	Spain	20
Germany	37	168	Colombia	30	Netherlands	19
Poland	101	59	Russia	28	India	18
DPR of Korea	67	24	Poland	24	France	17
Ukraine	81	1	Kazakhstan	16	Italy	17
Rest of the World	338	390	Rest of the World	30	Rest of the World	176
<b>World</b>	<b>3637</b>	<b>895</b>	<b>World</b>	<b>547</b>	<b>World</b>	<b>539</b>
2000 Data			2000 Data		2000 Data	

\*Included in Hard Coal.

\*\*Excludes intra Former USSR trade.

Sources: Energy Statistics and Balances of non-OECD Countries; Coal Information.

## APPENDIX 6. PRODUCERS OF NUCLEAR ELECTRICITY

Source: IEA <http://www.iea.org/statist/key2001/key2001/keystats.htm>

Producers	TWh	% of World total	Installed Capacity GW	Country <sup>19</sup>	% of nuclear <sup>20</sup>	
United States	778	30.7	United States	98	France	76
France	394	15.5	France	63	Sweden	47
Japan	317	12.5	Japan	44	Ukraine	42
Germany	170	6.7	Germany	22	Korea	39
Russia	122	4.8	Russia	20	Germany	31
Korea	103	4.1	Canada	15	Japan	30
United Kingdom	96	3.8	Korea	13	United Kingdom	26
Canada	73	2.9	United Kingdom	13	United States	20
Sweden	73	2.9	Ukraine	12	Russia	14
Ukraine	72	2.8	Sweden	9	Canada	13
Rest of the World	340	13.4	Rest of the World	48	Rest of the World*	9
<b>World</b>	<b>2 538</b>	<b>100.0</b>	<b>World</b>	<b>357</b>	<b>World</b>	<b>17</b>

1999 data

1999 Data  
Source: Commissariat à l'Energie Atomique (France).

1999 data

\* Countries with nuclear production only.

Sources: Energy Statistics and Balances of non-OECD Countries; Electricity Information.

<sup>19</sup> based on first 10 producers

<sup>20</sup> in total domestic electricity generation

## APPENDIX 7. PRODUCERS OF HYDRO ELECTRICITY

Source: IEA <http://www.iea.org/statist/key2001/key2001/keystats.htm>

Producers	TWh	% of World total	Installed (based on production)	Capacity GW	Country (based on first producers)	% of hydro <sup>21</sup>
Canada	346	13.0	United States *	99	Norway	99.3
United States	319	12.0	Canada *	67	Brazil	88.1
Brazil	293	11.0	Brazil*	59	Canada	59.9
People's Rep. of China	204	7.7	People's Rep. of China	53	Sweden	46.2
Russia	161	6.1	Japan *	46	Russia	19.1
Norway	122	4.6	Russia*	44	China	16.1
Japan	96	3.6	Norway *	28	India	15.4
India	81	3.0	France *	25	France	14.7
France	77	2.9	India*	22	Japan	9.0
Sweden	72	2.7	Sweden*	16	United States	8.1
Rest of the World	888	33.4	Rest of the World	262	Rest of the World	16.5
<b>World</b>	<b>2659</b>	<b>100.0</b>	<b>World</b>	<b>721</b>	<b>World</b>	<b>17.9</b>

1999 Data

1998 Data except 1997 for World and rest of the World  
\*1999 update  
Sources: United Nations, IEA

1999 Data

<sup>21</sup> in total domestic electricity generation

## APPENDIX 8. AVERAGE APPLIED TARIFFS ON PRIMARY ENERGY PRODUCTS

Country/region	Category of products	Year			
		1995	1997	1999	2000
APEC	Coal & Coal Products	4.09	3.01	2.90	3.34
	Gas & Products	5.00	3.40	3.50	3.58
	Natural Gas	4.50	3.78	4.03	4.22
	Oil & Products	6.10	5.60	5.29	5.70
	Other oil products	5.03	3.56	3.43	3.96
OECD	Coal & Coal Products	2.51	1.81	1.67	1.68
	Gas & Products	2.49	1.57	1.78	1.41
	Natural Gas	2.20	2.02	2.06	1.64
	Oil & Products	4.45	2.63	3.00	2.93
	Other oil products	2.90	2.28	2.10	2.10
EU17	Coal & Coal Products	0.00	0.00	0.00	0.00
	Gas & Products	0.00	0.00	0.00	0.00
	Natural Gas	0.00	0.00	0.00	0.00
	Oil & Products	7.00	0.17	0.17	0.17
	Other oil products	0.00	0.00	0.00	0.00
WORLD	Coal & Coal Products	8.60	6.14	6.27	6.67
	Gas & Products	8.31	5.25	4.57	6.03
	Natural Gas	8.03	5.40	4.32	5.69
	Oil & Products	10.21	7.97	7.12	8.38
	Other oil products	9.42	7.57	7.03	7.75

## APPENDIX 9. TRADE IN ENERGY IN ASIA, 2000<sup>22</sup>

### Exports of Coal (HS Code 2701), US\$'000

	APEC-21	ASEAN-10	China	Indonesia	Malaysia	ROW	World
REPORTER							
AUSTRALIA	3,531,498	82,293	67,595	3,179	25,728	1,865,574	5,397,072
CHINA	1,344,027	47,534	.	188	5,816	116,174	1,460,201
INDONESIA	1,030,804	201,802	5,289	.	41,385	265,041	1,295,845
JAPAN	393	369	24	135	39	60	453
KOREA, REP	325	165	54	10	23	35	360
MALAYSIA	133	133	.	.	.	0	133
NEW ZEALAND	0	.	.	.	.	1	1
PHILIPPINES	1	.	.	.	.	0	1
SINGAPORE	30	29	.	.	6	3	33
THAILAND	27	15	.	.	.	15	42

### Imports of Coal (HS Code 2701), US\$'000

	APEC-21	ASEAN-10	Australia	China	Indonesia	Malaysia	Russia	ROW	World
AUSTRALIA	2,188	1,301	.	.	7	.	.	283	2471
CHINA	62,423	9,924	42,227	.	8,175	.	.	6175	68598
HONG KONG	134,544	67,694	6,538	58,664	67,684	.	1,604	18076	152620
INDONESIA	5,733	647	4,571	186	.	5	.	342	6075
JAPAN	5,329,423	503,921	3,189,512	590,146	453,592	.	198,318	80203	5409626
KOREA, REP	2,074,056	136,592	824,634	698,113	132,036	.	78,608	82527	2156583
MALAYSIA	98,132	55,784	29,460	11,417	53,344	.	.	1135	99267
NEPAL	0	.	.	.	.	.	.	7428	7428
NEW ZEALAND	772	.	745	27	.	.	.	0	772
PNG	1	.	1	.	.	.	.	0	1
PHILIPPINES	129,691	100,397	4,874	22,723	88,590	7	.	0	129691
SINGAPORE	85	1	18	.	.	.	.	15	100
THAILAND	104,811	110,758	3,687	1,990	76,002	.	.	12281	117092

<sup>22</sup> Source: Data supplied by the International Economic Data Bank (IEDB), <http://iedb.anu.edu.au>

### Exports of Crude Oil (HS Code 2709), US\$'000

	APEC-21	ASEAN-10	Australia	China	Indonesia	Malaysia	Row	World
REPORTER								
AUSTRALIA	4,317,424	1,073,115	.	241,065	13	14,906	50,143	4367567
CHINA	2,063,198	411,364	46,848	.	203,233	.	68,835	2132033
INDONESIA	6,066,968	745,723	564,845	927,566	.	121,897	23,087	6090055
JAPAN	7	.	.	7	.	.	0	7
MALAYSIA	3,194,851	1,387,917	396,319	166,663	260,009	.	709,825	3904676
NEW ZEALAND	219,480	9,380	207,907	.	.	.	0	219480
PAPUA NEW GUINEA	1	.	1	.	.	.	692,138	692139
THAILAND	383,400	165,149	94,722	61,622	77,358	.	5,082	388482

### Imports of Crude Oil (HS Code 2709), US\$'000

	APEC-21	ASEAN-10	Australia	China	Indonesia	Malaysia	Russia	ROW	World
REPORTER									
AUSTRALIA	3,183,022	2,387,049	.	40,594	544,828	432,295	.	1309823	4492845
CHINA	2,712,145	2,007,147	269,798	.	966,152	184,479	320,132	12148512	14860657
INDONESIA	862,474	662,639	14	199,770	.	307,805	.	1662421	2524895
JAPAN	5,850,763	3,419,117	741,757	1,095,708	2,217,700	293,283	.	38703005	44553768
KOREA, REP	3,569,227	1,876,201	1,050,957	109,346	1,067,234	534,881	304,757	21646402	25215629
MALAYSIA	296,384	286,166	10,199	.	48,741	.	.	1019505	1315889
NEW ZEALAND	200,022	84,376	98,678	.	3,900	80,476	.	797328	997350
PNG	3	.	3	.	.	.	.	0	3
PHILIPPINES	228,740	154,647	60,403	.	32,177	113,531	.	2942066	3170806
SINGAPORE	1,865,622	924,940	784,207	117,789	.	168,615	.	6871992	8737614
THAILAND	1,019,525	885,421	70,584	63,520	62,021	305,030	.	5088941	6108466

## Exports of Refined Petroleum (HS Code 2710), US\$'000

	APEC-21	ASEAN-10	Australia	China	Indonesia	Malaysia	Russia	ROW	World
REPORTER									
AUSTRALIA	438,696	165	.	71,022	162	.	.	1426418	1865114
CHINA	218,505	661	.	.	.	.	.	2959	221464
HONG KONG	1	.	.	1	.	.	.	0	1
INDONESIA	6,624,400	28,044	10,887	61,809	.	1,659	.	514	6624914
JAPAN	13,791	397	.	64	.	37	.	63	13854
KOREA, REP	201,678	3,675	7	151,884	33	.	238	632	202310
MALAYSIA	3,586,106	294,331	.	134,200	23,849	.	.	29345	3615451
NEW ZEALAND	8,386	1	1,912	6,151	.	.	.	8775	17161
PHILIPPINES	59,030	12,005	958	30,060	1,757	8,060	.	8920	67950
SINGAPORE	228,517	170,320	387	45,458	.	155,371	.	31371	259888
THAILAND	268,237	32,023	8,995	220,947	.	5,390	.	5352	273589

## Imports of Refined Petroleum (HS Code 2710), US\$'000

	APEC-21	ASEAN-10	Australia	China	Indonesia	Malaysia	Russia	ROW	World
REPORTER									
AUSTRALIA	699,067	457,568	.	60,385	24,121	40,940	.	413332	1112399
CHINA	3,360,823	911,703	8,463	.	3,138	48,128	444,463	296237	3657060
HONG KONG	3,284,566	1,645,474	52,008	282,776	29	7,785	81,961	120553	3405119
INDONESIA	2,157,988	1,735,009	31,151	73,508	.	111,611	.	1296671	3454659
JAPAN	5,454,168	1,446,605	94,435	206,896	545,024	334,600	71,197	3214947	8669115
KOREA, REP	2,104,271	1,188,027	26,991	309,981	601,636	158,024	137,727	2758902	4863173
MALAYSIA	1,915,631	1,835,063	4,640	603	23,482	.	.	280676	2196307
NEPAL	41,839	41,595	.	17	.	28	.	184314	226153
NEW ZEALAND	340,438	2,324	318,960	20	.	.	.	58551	398989
PNG	223,995	2,075	210,107	45	71	85	10,460	333	224328
PHILIPPINES	458,704	286,881	5,713	1,860	41	15,127	13,068	25027	483731
SINGAPORE	2,776,945	1,201,071	256,404	456,960	.	603,829	82,019	4675227	7452172
THAILAND	529,291	429,600	2,013	2,812	104,606	136,539	25,543	565483	1094774

## Exports of Gas (HS Code 2711), US\$'000

	APEC-21	ASEAN-10	Australia	China	Indonesia	Malaysia	Russia	ROW	World
REPORTER									
AUSTRALIA		438,696	165	.	71,022	162	.	.	1426418 1865114
CHINA		218,505	661	.	.	.	.	.	2959 221464
HONG KONG		1	.	.	1	.	.	.	0 1
INDONESIA		6,624,400	28,044	10,887	61,809	.	1,659	.	514 6624914
JAPAN		13,791	397	.	64	.	37	.	63 13854
KOREA, REP		201,678	3,675	7	151,884	33	.	238	632 202310
MALAYSIA		3,586,106	294,331	.	134,200	23,849	.	.	29345 3615451
NEW ZEALAND		8,386	1	1,912	6,151	.	.	.	8775 17161
PHILIPPINES		59,030	12,005	958	30,060	1,757	8,060	.	8920 67950
SINGAPORE		228,517	170,320	387	45,458	.	155,371	.	31371 259888
THAILAND		268,237	32,023	8,995	220,947	.	5,390	.	5352 273589

## Imports of Gas (HS Code 2711), US\$'000

	APEC-21	ASEAN-10	Australia	China	Indonesia	Malaysia	Russia	ROW	World
REPORTER									
AUSTRALIA		18,414	13,496	.	1	11,570	.	.	100620 119034
CHINA		796,233	469,711	67,075	.	89,055	125,973	45	744660 1540893
HONG KONG		341,842	46,516	.	285,599	1,221	3,559	.	0 341842
INDONESIA		3,471	3,195	27	.	.	1,181	.	51 3522
JAPAN		11,370,891	9,027,692	2,007,524	3,322	5,147,657	2,623,800	.	6571986 17942877
KOREA, REP		2,678,444	2,588,780	48,029	.	1,757,068	627,635	.	2676748 5355192
MALAYSIA		146,773	145,292	.	2	2,729	.	.	3381 150154
NEPAL		209	15	.	19	.	.	.	1 210
NEW ZEALAND		226	.	42	.	.	.	.	75 301
PAPUA NEW GUINEA		2,754	153	237	.	32	.	.	191 2945
PHILIPPINES		103,896	78,260	5,957	9,232	8,484	57,580	.	173715 277611
SINGAPORE		676	35	9	.	.	22	.	335 1011
THAILAND		431	108,879	1	69	.	271	.	108684 109115

**Exports of Electricity (HS Code 2716), US\$'000**

	APEC-21	ASEAN-10	CHINA	ROW	WORLD
REPORTER					
CHINA	583,188	30	.	5,884	589,072
HONG KONG	80,508	.	80,508	0	80,508
MALAYSIA	777	777	.	0	777

**Imports of Electricity (HS Code 2716), US\$'000**

	APEC-21	ASEAN-10	CHINA	RUSSIA	ROW	WORLD
REPORTER						
CHINA	96,267	0	0	2,348	0	96,267
HONG KONG	582,178	0	582,178	0	0	582,178
INDONESIA	0	0	0	0	1	1
MALAYSIA	49	49	0	0	0	49

## APPENDIX 10: DEFINITION OF ENERGY SECTOR – EU, USA

The *European Commission* Regulation No 586/2001 of 26 March 2001 defines aggregate energy category as follows<sup>23</sup>:

NACE:

- 10 Mining of coal and lignite; extraction of peat;
- 11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying;
- 12 Mining of uranium and thorium ores;
- 23 Manufacture of coke, refined petroleum products and nuclear fuel;
- 40 Electricity, gas, steam and hot water supply;
- 41 Collection, purification and distribution of water.

The *North American Industry Classification System* (NAICS), replacing the U.S. Standard Industrial Classification (SIC) system, has listed the following energy-related sectors<sup>24</sup>:

- 21 Mining Sectors
  - 211, Oil and Gas Extraction
  - 212, Mining (Except Oil and Gas)
  - 213, Support Activities for Mining
- 22 Utilities
  - 221 Utilities
    - 2211 Electric Power Generation, Transmission and Distribution
      - 22111 Electric Power Generation
        - 221111 Hydroelectric Power Generation
        - 221112 Fossil Fuel Electric Power Generation
        - 221113 Nuclear Electric Power Generation
        - 221119 Other Electric Power Generation
      - 22112 Electric Power Transmission, Control, and Distribution
      - 221121 Electric Bulk Power Transmission and Control

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<sup>23</sup> Based on the definitions adopted by the Committee on the statistical classification of economic activities in the European Community (NACE), [http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/l\\_086/l\\_08620010327en00110014.pdf](http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/l_086/l_08620010327en00110014.pdf)

<sup>24</sup> <http://www.census.gov/epcd/naics/naicscod.txt>

221122 Electric Power Distribution

2212 Natural Gas Distribution

22121 Natural Gas Distribution

2213 Water, Sewage and Other Systems

22131 Water Supply and Irrigation Systems

22132 Sewage Treatment Facilities

22133 Steam and Air-Conditioning Supply

48-49 Transportation and Warehousing

486 Pipeline Transportation

4861 Pipeline Transportation of Crude Oil

48611 Pipeline Transportation of Crude Oil

4862 Pipeline Transportation of Natural Gas

48621 Pipeline Transportation of Natural Gas

4869 Other Pipeline Transportation

48691 Pipeline Transportation of Refined Petroleum Products

48699 All Other Pipeline Transportation

## APPENDIX 11. CLASSES OF TRANSMISSION NETWORK SERVICES, AUSTRALIA

Source: ACCC (1999)

1. **Entry services** — provided to *generators* at a single connection point;
  - a) a generator's connection service charges may be specifically allocated in a contract;
  - b) if not, a generator's entry service charges are recovered by:
    - i) allocating amongst all the generators at a particular connection point, the revenue needed to cover the entry assets at that connection point (plus an equitable amount for assets that jointly provide entry and exit services);
    - ii) a fixed annual charge;
2. **Exit services** — provided to transmission network *customers* at a single connection point;
  - a) a customer's connection service charges may be specifically allocated in a contract;
  - b) if not, a customer's exit service charges are recovered by
    - i) allocating amongst all the customers at a particular connection point, the revenue needed to cover the exit assets at that connection point (plus an equitable amount for assets which jointly provide exit and entry services);
    - ii) a fixed annual charge;
3. **Transmission use of system services** — provided to either generators or customers which can be allocated on a locational basis;
  - a) in a connection agreement, generators may consent to pay some of the TUOS costs;
  - b) 50 per cent of the TUOS service costs are allocated to customer connection points;
  - i) the revenue requirement is generated by cost reflective network prices;
  - ii) the variable price is determined at the discretion of the NSP but must reflect the investment conditions in the network and may include any combination of: demand based charges; energy based charges; or fixed charge.
  - iii) the charge may relate to either the actual (metered) use or an agreed use.
  - iv) the demand based charge is to be calculated on a customer's maximum demand as averaged over a metered half hour period;
  - c) any remaining anticipated revenue shortfall is allocated to customer connection points on a postage stamp basis and recovered from customers through a variable common service charge (the annual rate is the common service cost divided by the network energy delivered);
4. **Common Services** — provided to *customers* which cannot be allocated on a location basis (eg services to maintain power system security);

- a) all of the revenue needed to provide such services is allocated to connection points and customers are charged on a postage stamp basis;
  - b) the revenue is recovered through a variable common service charge (the annual rate is the common service cost divided by the network energy delivered);
5. Generator Access services — is the risk premium for generators with connection agreements that include firm access compensation arrangements where the revenue is recovered from each generator in accordance with the connection agreement.

**APPENDIX 12. OVERVIEW OF THE GATS COMMITMENTS IN ENERGY, BY MODE OF SUPPLY<sup>25</sup>**

***Overview of the GATS commitments in energy-specific services subsectors: Commercial presence***

<b><i>Horizontal commitments (affecting all industries)</i></b>	
<p><i>Bulgaria</i> - for services relating to the use of nuclear energy for peaceful purposes. No commitment for services relating to the exploration, extraction and processing of fissionable and fusionable materials or the materials from which they are derived, as well as to trade therein, to the maintenance and repair of equipment and systems in nuclear energy production facilities, to the transportation of such materials and the refuse and waste matter from their processing, to the use of ionizing radiation, and to all other services relating to the use of nuclear energy for peaceful purposes ( e.g. engineering and consulting services and services relating to software). Full national treatment granted in this area.</p> <p>In <i>Iceland</i> non-residents are excluded from obtaining full property rights in respect of real estate if unusual rights are linked to it, such as exploitation rights relating to waterfalls, geothermal energy etc.</p> <p>In <i>Peru</i>, within 50 kilometres of the border foreigners may not under any circumstances directly or indirectly purchase or own mines, land, woodland, water resources, or fuel or energy sources, whether individually or as a company, on penalty of transfer of the rights thus acquired to the State.</p>	
<b><i>Transportation via pipeline of crude oil or refined petroleum and petroleum products and of natural gas</i></b>	
No sector-specific restrictions (bound as "None")	<i>Australia, Croatia, Kyrgyzstan, New Zealand</i>
Some sector-specific restrictions or coverage of a limited scope:	<p><i>Hungary</i> -services may be provided through a contract of concession granted by the State or the local authority</p> <p><i>Brazil</i> - excludes fuels and hydrocarbon products.</p>
<b><i>Services incidental to energy distribution: transmission and distribution services, on a fee or contract basis, of gaseous fuels to households, industrial, commercial and other users.</i></b>	
No sector-specific restrictions (bound as "None")	<i>Croatia, Georgia, Latvia, Nicaragua, Oman, United States</i>
Some sector-specific restrictions or coverage of a limited scope:	<p><i>Australia</i> and <i>Hungary</i> -limited to consultancy services.</p> <p><i>Colombia</i> – design, construction, operation and maintenance of oil and gas pipelines.</p> <p><i>Dominican Republic</i> –national treatment may not be granted.</p> <p><i>Gambia</i> -conditions for market access are not specified, except that individuals/companies must be certified and registered by the professional associations or by the Registrar General's Office; subject to payment of fee and tax deposit, and to professional qualification of the individual.</p> <p><i>Kyrgyzstan</i> -excludes electrical energy distribution.</p>

<sup>25</sup> Source: UNCTAD (2001)

	<p><i>Sierra Leone</i> -through joint venture only.</p> <p><i>Slovenia</i> -for gas only.</p>
<b><i>Services incidental to mining rendered on a fee or contract basis at oil and gas fields</i></b>	
No sector-specific restrictions (bound as “None”)	<p><i>Albania, Argentina, Canada, Colombia</i> (broader coverage), <i>Ecuador, Georgia, Israel, Kyrgyzstan, Latvia, Malawi, Mongolia, Nicaragua, Oman, Pakistan, Panama, South Africa, Turkey, United States, Venezuela, Zambia</i></p>
Some sector-specific restrictions or coverage of a limited scope:	<p><i>Australia, Austria, European Union</i> (Spain and Portugal restrict access for mining engineers to natural persons), <i>Finland, Hungary, Republic of Korea, Singapore, Sweden</i> –for consulting services only.</p> <p><i>Poland</i> –excluding exploitation of natural resources.</p> <p><i>Switzerland, Liechtenstein</i> –excluding exploration, exploitation, prospecting and surveying services.</p> <p><i>Dominican Republic</i> -national treatment may not be granted.</p> <p><i>Thailand</i> -49 per cent limit on foreign equity participation</p>

***Overview of the GATS commitments in energy-specific services sectors: Cross-border supply***

<b><i>Horizontal commitments (affecting all industries)</i></b>	
<p><i>Bulgaria</i> -for services relating to the use of nuclear energy for peaceful purposes. No commitment for services relating to the exploration, extraction and processing of fissionable and fusionable materials or the materials from which they are derived, as well as to trade therein, to the maintenance and repair of equipment and systems in nuclear energy production facilities, to the transportation of such materials and the refuse and waste matter from their processing, to the use of ionizing radiation, and to all other services relating to the use of nuclear energy for peaceful purposes ( e.g. engineering and consulting services and services relating to software). Full national treatment granted in this area.</p> <p><i>Canada, Alberta</i> -First consideration may be given to service suppliers from within Alberta or Canada where these are competitive in terms of price and quality in the case of all large-scale energy projects needing industrial development, forest management, oil sands, power plant or gas plant and coal development permits.</p>	
<b><i>Transportation via pipeline of crude oil or refined petroleum and petroleum products and of natural gas</i></b>	
No sector-specific restrictions (bound as “None”)	<p><i>Australia, Croatia, Kyrgyzstan, New Zealand</i></p>
Some sector-specific restrictions or coverage of a limited scope:	<p><i>Hungary</i> – conditions for market access not defined</p>

<b><i>Services incidental to energy distribution: transmission and distribution services, on a fee or contract basis, of gaseous fuels to households, industrial, commercial and other users.</i></b>	
No sector-specific restrictions (bound as “None”)	<i>Gambia, Georgia, Latvia, Nicaragua, Oman, Sierra Leone, United States</i>
Some sector-specific restrictions or coverage of a limited scope:	<p><i>Australia</i> -limited to consultancy</p> <p><i>Colombia</i> - design, construction, operation and maintenance of oil and gas pipelines.</p> <p><i>Cote d'Ivoire</i>, for energy generation -Enterprises must receive government approval. The criteria that must be satisfied in order to obtain approval may include the preferential use of local services if available under conditions of quality, price and delivery equivalent to those of like products of foreign origin. The employment and training of local executives and supervisors.</p> <p><i>Croatia</i> commercial presence required in order to access the market.</p> <p><i>Dominican Republic</i> -national treatment may not be granted.</p> <p><i>Hungary</i> –limited to consultancy</p> <p><i>Slovenia</i> –for gas only.</p> <p><i>Malaysia</i> advisory, guidance and operational assistance services concerning management of the transmission of non-conventional energy, through a locally incorporated joint-venture corporation with Malaysian individuals or Malaysian-controlled corporations, or both, and Bumiputra (i.e. indigenous Malay) shareholding in the joint-venture corporation of at least 30 per cent.</p>
<b><i>Services incidental to mining rendered on a fee or contract basis at oil and gas fields</i></b>	
No sector-specific restrictions (bound as “None”)	<i>Albania, Argentina, Canada, Colombia (broader coverage), Georgia, Kyrgyzstan, Latvia, Malawi, Mongolia, Nicaragua, Oman, Panama, United States, Zambia</i>
Some sector-specific restrictions or coverage of a limited scope:	<p><i>Australia, Austria, European Union, Finland, Hungary, Republic of Korea, Singapore, Sweden</i> -for consulting services only.</p> <p><i>Poland</i> –excluding natural resources.</p> <p><i>Dominican Republic</i> -national treatment may not be granted.</p> <p><i>Switzerland, Liechtenstein</i> -excluding exploration, exploitation, prospection and survey services.</p> <p><i>Turkey</i>- requires establishment; nationality for real persons.</p>

***Most-favoured-nation exemption in energy services***

<p><i>United States of America</i></p> <p>With respect to pipeline transport, due to lack of reciprocity</p>	<p>Pursuant to the Mineral Lands Leasing Act of 1920, aliens and foreign corporations may not acquire rights-of-way for oil or gas pipelines, or pipelines carrying products refined from oil and gas, across onshore federal lands or acquire leases or interests in certain minerals on onshore federal lands, such as coal or oil. Non-United States citizens may own a 100 per cent interest in a domestic corporation that acquires a right of way for oil or gas pipelines across onshore federal lands, or that acquires a lease to develop mineral resources on onshore federal lands, unless the foreign investors' home country denies similar or like privileges for the mineral or access in question to United States citizens or corporations, as compared with the privileges it accords to its own citizens or corporations or to the citizens or corporations of other countries. Nationalization is not considered to be a denial of similar or like privileges. Foreign citizens, or corporations controlled by them, are prohibited from obtaining access to federal leases on Naval Petroleum Reserves if the laws, customs or regulations of their country deny United States citizens or corporations the privilege of leasing public lands. Applies to all countries.</p>
<p><i>Venezuela</i></p> <p>With respect to petroleum-related services</p>	<p>Bilateral agreement services relating to the distribution and marketing of petroleum and petroleum products, advisory services and exchange of technology , in which preferences are granted.</p> <p>Applies to Germany, France, Brazil, and Central American and Caribbean countries.</p>

Based on a review of 131 schedules of GATS specific commitments. Where commitment for market access and national treatment is "unbound", it is excluded from the table. This also concerns a horizontal commitment by Bulgaria on nuclear energy.

Commitments for the GATS movement of natural persons were mostly made at the horizontal level and only for a few categories of persons, mainly intra-corporate transferees and business persons. For detailed discussion of Mode 4 commitments, see Positive Agenda and Future Trade Negotiations, UNCTAD/ITCD/TSB/IO, July 2000, pp. 193-207. At the sector-specific level as included in these tables, none of the countries have made provision for market access by specialists in any of the relevant categories for supply of the energy services (except Turkey for mining services).

The following measure in the European Communities for Italy has expired: for a period of five years, the acquisition of large equity stakes of companies operating in the field energy may be subject to the approval of the Ministry of the Treasury.

### APPENDIX 13. PROPOSED INDEX FOR CLASSIFICATION OF ENERGY SERVICES - USA

Source: WTO (2000)

<b>W/120 Classification</b>	<b>Prov. CPC Numbers</b>	<b>Provisional CPC Heading</b>
1.A Professional Services	8612, 8619	Legal advisory and representation services in statutory procedures of quasi-judicial tribunals, boards, etc.; and Other legal advisory and information services.
	8671	Architectural services
	8672	Engineering services
	8673	Integrated engineering services
1.B. Computer and Related Services	84	Computer and Related Services
1.C. Research and Development Services	851	Research and experimental development services on natural sciences and engineering
1.E. Rental and Leasing Services, without Operator	83107, 83109	Rental and leasing services without operators relating to construction machinery and equipment or other machinery and equipment, without operator (note: rental of equipment <i>with</i> operator is classified under construction services, CPC 518).
1.F. Other Business Services	865	Management consulting services
	866	Services related to management consulting
	8676	Technical testing and analysis services
	883	Services incidental to mining
	884, 885	Services incidental to manufacturing
	887	Services incidental to energy distribution
	8675	Related scientific and technical consulting services
	886	Maintenance and repair of equipment
	8790	Other Business Services
3. Construction and Related Engineering Services	511	Pre-erection work at construction sites
	512	Construction work for buildings

		513	Construction work for civil engineering
		515	Special trade construction work
		516	Installation work
		518	Renting services related to equipment for construction or demolition of buildings or civil engineering works, with operator
4.	Distribution Services	621	Commission agents' services
		622	Wholesale trade services
		632	Non-food retailing services
		6111, 6113, 6121	Sales of motor vehicles, motorcycles and snowmobiles, and related parts and accessories
		613 <sup>26</sup>	Retail sales of motor fuel
5.	Educational Services	924, 929	Adult education and other education services
6.	Environmental Services <sup>27</sup>	940	Sewage and refuse disposal, sanitation and other environmental protection services
7.B.	Financial Services <sup>2</sup>	8112	Financial leasing services
		8113	Other credit granting services
		81199	Intermediation services not elsewhere classified
		8132	Services related to securities markets
		81339	Other services auxiliary to financial intermediation not elsewhere classified
11.	Transportation Services including	7112	Freight transportation by railway
		7123	Freight transportation by road
		713	Transport services via pipeline

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<sup>26</sup> CPC 613, retail sales of motor fuel, was omitted from W/120.

<sup>27</sup> The relationship between environmental and financial services and energy activities is still under discussion.

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