

Deregulating electricity supply industries in north east Asia

Impacts on energy markets

Reform of the electricity sector is a key energy policy priority in Japan, the Republic of Korea and Chinese Taipei

Electricity supply industries in many economies are undergoing a period of quite dramatic change. The reform agenda is being driven by the imperative to deliver electricity services in the most efficient manner possible and at competitive prices while ensuring sufficient financial capacity to invest in system expansion.

The perception of the electricity supply industry as a public utility with the obligation to maintain a reliable power supply is changing to that of a business enterprise providing electricity services to satisfy customer requirements profitably (International Energy Agency 1994).

This fundamental shift in philosophy is leading to new industry structures, ownership patterns and forms of regulation that allow electricity companies to respond to the demands of an increasingly competitive and interconnected power market.

In the three north east Asian economies discussed in this paper — Japan, the Republic of Korea and Chinese Taipei — reform of the electricity sector is a key energy policy priority. The reform models that are being developed differ between the three economies and the implementation of reform plans is at different stages. However, the overriding concerns of the three are the same — to increase efficiency and productivity in the electricity supply industry by introducing competition into what have been largely monopoly structures and to provide appropriate incentives for system expansion (box 1).

More competitive electricity industries have important implications for energy markets and for the economy more broadly in these countries. This is because competition in electricity supply is expected to lead to increased productivity in the industry that can contribute to lower costs of electricity supply. Increased competition can also lead to the provision of a wider range of energy services.

Ensuring that the market power of any operator is minimised in a competitive system is an important objective of market design that will maximise the benefits of deregulation.

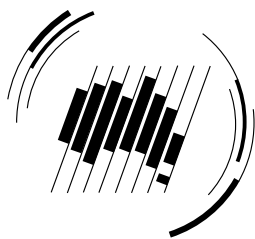
Because electricity is an important input to economic activity, lower electricity prices could provide a significant productivity boost to economies implementing wide ranging deregulation policies and lead to higher economic growth. This, in turn, will have implications for the level of energy consumption.

Increased competition in electricity markets could also influence the mix of fuels used in power generation because it will tend to increase the pressure on fuel prices and to favor the lowest cost generation technologies.

The objective in this paper is to review the regulatory reform programs in the electricity supply industries in Japan, Korea and Chinese Taipei and to examine their implications for economic growth, energy consumption and trade.

Developments in the energy sectors of these economies are important for Australia's energy industries because of the close and mutually beneficial trading

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relationships that have emerged over previous decades.

Japan, Korea and Chinese Taipei together account for a major share of Australia's coal and petroleum exports and Japan is virtually the only market for Australia's exports of natural gas. Conversely, Australia is the major source of energy imports into the north east Asian market.

The quantitative impacts of electricity sector deregulation in the region that are discussed in this paper are based on applications of ABARE's global trade and environment model

(GTEM). The key characteristics of GTEM are summarised in box 2.

Electricity sector in north east Asia

North east Asia's electricity generation has grown rapidly in recent decades (figure A), underpinned by strong economic growth and an expansion in personal disposable incomes (International Energy Agency 2000a,b).

This has been particularly true of Korea and Chinese Taipei where economic growth averaged more than 7 per cent a year between 1980 and

Box 1: The benefits of reform

The broad principle underpinning reform of the electricity supply industry is that there are significant long term efficiency benefits from allowing markets to play a greater role in determining what is produced, consumed and invested. Increasing competition in the electricity industry, for example, can be expected to enhance labor and capital productivity because of the increased pressure for more efficient and cost effective use of all resources in the industry. This can be expected to lead to lower electricity prices in the long run by providing an incentive to reduce costs (International Energy Agency 2001b). These benefits can be delivered in part by improved technical efficiency, including better use of capacity and by lower operation and maintenance costs.

For a number of reasons electricity prices may not always decrease in the short term. These include factors associated with the adjustment of firms and capacity to the new competitive environment, the possible removal of subsidies or cross subsidies for some groups of consumers, or issues associated with the design of reforms that do not eliminate market power. It is also possible that price volatility may be higher in a competitive market than in one with regulated prices. However, reforms are also likely to create environments where electricity suppliers and users can better respond to volatility by, for example, diversification and innovation.

As well as the benefits of enhanced productivity and lower prices, a deregulated environment can deliver savings in investment costs because of

more efficient investment decision making. In a competitive market, investors assume the full risks of their own investments, and incentives to overinvest decline (International Energy Agency 2001b). Conversely, underinvestment can be discouraged in a competitive system compared with the situation where government owned monopolies do not have sufficient funds to allocate to this purpose or make suboptimal investment decisions. Efficient investment in system expansion in these circumstances should enhance the security and reliability of electricity supply.

Increased competition in the electricity industry can also lead to enhanced and more varied customer services. These could include more efficient pricing structures and various energy consulting services (International Energy Agency 1999). Competition can also enhance innovation in service delivery.

In assessing the potential economic benefits of reform in the electricity sector other policy objectives need to be considered. These might encompass environmental objectives and social obligations such as the provision of electricity to all members of society, including the geographically isolated and the poor. Ensuring that such objectives are met in a deregulated setting is more complicated because governments do not determine market outcomes. However, careful design of regulatory mechanisms and the effective use of policy instruments outside the electricity sector can address these issues.

Box 2: Global trade and environment model (GTEM)

GTEM is a dynamic general equilibrium model of the world economy developed at ABARE to address economic and policy issues with global dimensions. GTEM is suitable for analysing the impacts of electricity sector deregulation on economic growth, structural change and energy consumption because of its detailed coverage of regions, countries and sectors, and its detailed modeling of energy markets.

GTEM is able to capture the impacts of policy and other changes on a large number of economic variables including prices, output and trade and investment flows between countries and regions.

In this study the GTEM database has been aggregated to 25 industries in 16 countries and regions. Energy modeling features of GTEM include fuel switching in electricity generation, and differentiated supply responses in fossil fuel markets.

For a detailed description of the features of the model, refer to ABARE's web site (www.abareconomics.com).

1998. In these economies the growth in electricity supply has supported rapid industrialisation and significant improvements in the standard of living.

In Japan, growth in electricity generation has moderated over time because of weaker economic growth and a policy induced decline in energy intensity.

In all three economies the growth in electricity generation was lower following the Asian financial downturn of 1997 but recent trends indicate a return to stronger growth paths. Electricity generation growth in the region is expected to remain firm over the foreseeable future (Energy Information Administration 2001; Asia Pacific Energy Research Centre 1998).

As well as growth in total output of electricity there have been significant shifts in the power generation fuel mix. In 1980, oil was the dominant fuel used for power generation in all three economies and oil fired power generation accounted for 50 per cent of total output at the regional level. This share declined

rapidly to 20 per cent in 1998 as a result of both price and energy security considerations.

Most of the growth in fuel share has been taken up by coal and nuclear power and, more recently, by natural gas. The attractiveness of gas has increased because of its role in diversifying the fuel mix and because of its environmental characteristics.

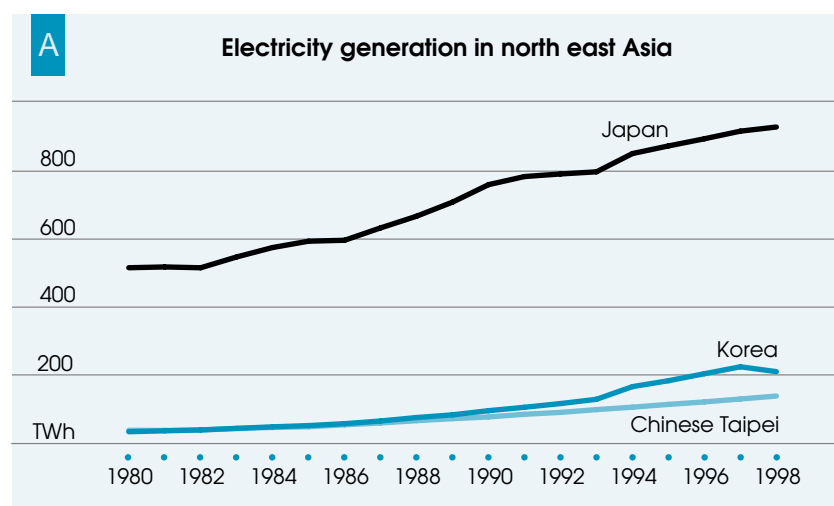
In the absence of significant domestic gas reserves, each of the north east Asian economies has invested heavily in the infrastructure required to import gas in its liquefied form, including regasification facilities and distribution networks.

A characteristic of the electricity supply industry in each of the three economies has been the existence of varying degrees of monopoly power.

In Japan, the industry has been dominated by private, vertically integrated utilities with regional monopolies over defined geographic areas. There are ten such utilities that control all aspects of electricity supply from generation to retail sales. These utilities sell electricity generated by their own plants as well as electricity generated by wholesale power suppliers — the Electric Power Development Company (EPDC) and the Japan Atomic Power Company (JAPC).

In Korea, the Korea Electric Power Corporation (KEPCO) operates around 85 per cent of the generating capacity and has monopoly roles in transmission, purchasing and distribution. KEPCO is more than 50 per cent government owned.

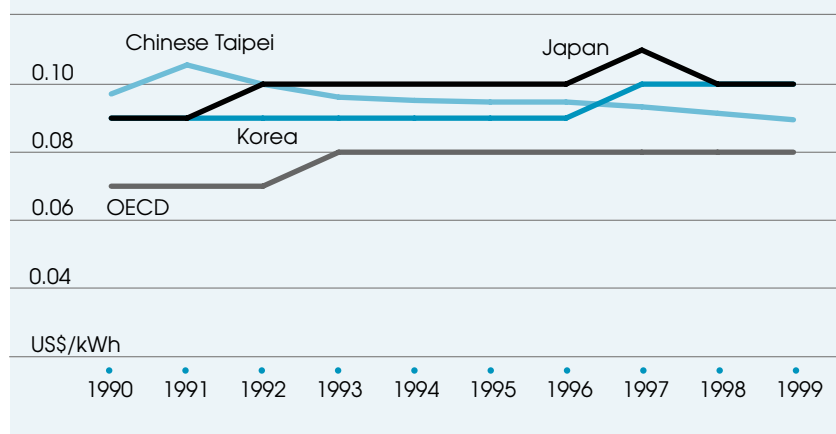
The growth in electricity supply in the three north east Asian economies has supported rapid industrialisation and significant improvements in living standards



B

Industry sector electricity prices

Current prices (ppp)



Uncompetitive industry structures have contributed to electricity prices in Japan, Korea and Chinese Taipei that are higher than the OECD average

In Chinese Taipei, the electricity supply system is also dominated by a vertically integrated, government owned enterprise — the Taiwan Power Company (Taipower). Independent power producers (IPPs) have been encouraged in Chinese Taipei since 1995 and, if all approved projects reached completion, could supply around 20 per cent of the market. All IPP electricity supply is sold to Taipower under power purchase agreements.

In a monopoly industry structure the incentives to reduce costs and raise productivity are limited by the lack of competitive pressures. In the Japanese system, for example, electricity tariffs have, until recently, been set by regulation and have been designed to provide utilities with a set rate of return that covers costs. This has led to productivity levels in the Japanese industry significantly below those of the United States (OECD 1997). It has also contributed to Japan having the highest electricity prices in the OECD (International Energy Agency 2001a).

Uncompetitive industry structures have also contributed to prices in Korea and Chinese Taipei that are higher than the OECD average (figure B).

The reform agenda

Deregulation of the electricity supply industry in Japan is in accord with the government's *New Action Plan for New Economic Growth* of November 2000. The plan includes a blueprint for regulatory reform across the economy and recognises the potential for reform

to help lift Japan out of its current economic malaise. The electricity sector is important in this context because a more productive electricity industry with lower electricity prices could provide a substantial boost to the competitiveness of Japan's industries.

In Korea the first element of competition was introduced into the electricity system with the entry of IPPs in the 1980s. It was not until the late 1990s, however, that Korea developed a comprehensive plan to restructure and privatise the electricity industry. The objectives in this reform program are to increase the efficiency of the power sector by establishing a competitive market structure; to effectively finance future generation capacity; and to expand the range of services and benefits to customers.

Plans for reform are least advanced in Chinese Taipei. Although regulatory reform in the electricity sector has broad bipartisan support and is part of wider economic reform objectives, the change of government in 2000 delayed consideration of the current proposals.

One of the key issues in Chinese Taipei is addressing the very low reserve margin. The current legislation encourages IPPs as a means of overcoming a capacity constraint problem and of introducing some competition into the Taipower dominated system. Amendments to the Electricity Act are being considered that would significantly restructure the industry.

Plans to increase competition in the generation sector are common to all three economies (table 1). In Japan this is being achieved through the introduction of IPPs in the wholesale sector and the introduction of competitive bidding for all new thermal power supply coming on line from 2009. In Korea, competition is being introduced through the restructuring of KEPCO's generation assets into individual companies and their eventual privatisation. Chinese Taipei's current plans include expansion of the IPP program and the privatisation of Taipower. Both Korea and Chinese Taipei propose to introduce a wholesale power pool later in the reform process.

In the transmission sector the three economies propose to increase competition by ensuring open access to the transmission grid. In Japan and Chinese Taipei, the transmission system will be owned by the utilities and regulation will be used to maintain appropriate separation of activities. In Korea the transmission system will continue to be owned by KEPCO.

Similar changes are proposed for the distribution sector, although, in Korea, KEPCO's distribution assets will be privatised. The three economies plan to introduce full retail contestability at the end point of their reform programs. Independent regulatory arrangements to manage different aspects of the system are also proposed.

An additional feature that affects the operation and performance of Japan's existing power companies is the agreement that requires their use of the output of the domestic coal industry.

This policy is implemented by EPDC through the use of domestic coal in several of its power plants. The prices paid for domestic coal are determined by the government and are significantly above international prices. In 1998, for example, domestic steaming coal prices were more than three times average import prices (International Energy Agency 2001a). The higher costs borne by EPDC are passed on to the utilities in proportion to their electricity output and, ultimately, to the final consumer.

The domestic coal procurement policy is being phased out gradually over the period to around 2006 and the regulated price for domestic coal is being reduced at the same time. In 2001, it is expected that EPDC will purchase approximately 3 million tonnes of domestic coal.

Further information on the structure and implementation of reform plans is in box 3.

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In the transmission sector, the three economies propose to increase competition by ensuring open access to the transmission grid

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1 Regulatory structures before and after reform

	Before reform	Reform proposals				
		Generation	Transmission/distribution	Retail supply	Market design	Regulation
Japan	Private, vertically integrated, regional monopoly	Introduction of competition through IPPs; competitive bidding for new capacity	Open access to networks; ownership by utilities	Full contestability	Bilateral contracts	Independent regulator within METI
Korea	Majority government owned vertically integrated monopoly; limited IPPs	Introduction of competition through restructuring and privatisation of KEPCO assets; IPPs	Open access to networks; transmission system owned by KEPCO; distribution system privatised	Full contestability	Wholesale pool	Independent regulation by Korea Power Exchange (system regulation) and Korea Electricity Commission (market regulation)
Chinese Taipei	Majority government owned vertically integrated monopoly. Limited IPPs.	Introduction of competition through privatisation of Taipower assets; IPPs	Open access to networks; ownership by utilities	Full contestability	Wholesale pool	Independent regulatory organisation to be established

Electricity market reforms are being implemented in Japan and Korea and are under consideration in Chinese Taipei

Box 3: Plans for reform

Japan

The first step toward deregulation of Japan's power sector was an amendment to the Electricity Utilities Industry Law in 1995 that enabled independent power producers (IPPs) to tender for the supply of wholesale power to the ten regional monopolies. The successful IPP tenders should, when on stream, provide around 3 per cent of power to the established companies. The successful tenderers are mainly industrial companies using surplus inhouse generation capacity or who are able to expand generation facilities on existing sites. They are concentrated in the iron and steel, chemicals, cement and pulp and paper sectors.

The IPP tender prices were some 10–40 per cent below the price at which the established utilities could supply electricity from new generating plant. The impact of IPPs alone, however, will be insufficient to introduce real competition into the sector because of the limited scale of IPP operations.

Further reform was introduced in March 2000 with the partial liberalisation of retail sales to large users. This permitted any enterprise registered with the Ministry of Economy, Trade and Industry to retail electricity across existing service areas to large lot customers. As a result, contestable consumers now account for almost 28 per cent of retail electricity sales in Japan.

Possible new entrants on the supply side include IPPs, nonutility industries with power generation facilities, and wholesale power companies such as the EPDC. As of January 2001 only three companies had registered and only one had succeeded in entering the market. Further, only 1 per cent of potentially contestable customers had actually switched supplier.

Some parties have complained that the high cost of access to the transmission facilities of established power companies has restrained new entrants. Conditions of access to these facilities are determined by the utilities and subject to the Anti-monopoly Act and the Electric Utilities Industry Law.

A second liberalisation measure introduced in 2000 was a requirement that all thermal power stations coming on line from Japan fiscal year 2009 will be subject to competitive bidding from all sources. These could include the

established power companies, IPPs and wholesale power providers such as the EPDC. Bids for new thermal power supply will be open to those outside the electric power industry, including to foreign investors.

A review of the effectiveness of the latest measures is due in March 2003 although additional measures could be introduced before that date at the discretion of the Ministry of Economy, Trade and Industry.

Korea

The Base Law for Restructuring the Electricity Supply Industry, announced in 1999, proposes the phased unbundling of generation, transmission and distribution sectors, the privatisation of generation and distribution assets, and the introduction of a competitive wholesale market leading to full retail competition.

The first phase of the plan is currently being implemented. This involves the restructuring of KEPCO's generation assets into five companies, each with non-nuclear capacity of around 8 gigawatts. An additional company will be formed to hold KEPCO's approximately 13 gigawatts of nuclear capacity. KEPCO will continue to control the transmission and distribution sectors in this stage of the reform process.

The second phase of reform involves privatisation of the non-nuclear generating companies and the introduction of wholesale competition. Privatisation is expected to occur gradually from around March 2002, followed by the introduction of wholesale competition from around 2003. The Korea Power Exchange was established recently to undertake wholesale market management and pricing, while market regulation will be undertaken by the Korea Electricity Commission.

In this phase, generators will bid into a mandatory wholesale pool. KEPCO, as a single buyer, will purchase the required electricity on the basis of marginal costs. Independent power producers with existing power purchase contracts will be paid on those terms until contract expiry (World Energy Council 2001).

A further element of this phase is the introduction of competition into the distribution sector and its unbundling from KEPCO. KEPCO's distribution arm

Box 3: Plans for reform *continued*

will initially be split into a number of regional subsidiaries that are later privatised. The transmission system will be operated by KEPCO but serve as a common carrier. Contestable supply for large customers will also be introduced in the second phase.

The final phase of reform will be characterised by the opening and privatisation of the distribution network and the introduction of full retail competition. Competitive bidding will replace cost based prices in the wholesale pool and the range of contestable customers will be widened gradually. Full retail competition is not expected to be in place until after 2009.

Chinese Taipei

Proposed amendments to the Electricity Act in Chinese Taipei would separate the industry into generation, transmission and distribution segments, although Taipower could be permitted to remain as a vertically integrated company. Private investment would be sought in all segments of the market and none would remain a monopoly.

Privatisation of Taipower is also proposed but will be delayed until after

consideration of the Electricity Act. The Ministry of Economic Affairs has set a tentative target date of 2005 for privatisation of Taipower.

Under the proposed market structure, a transitional, independent organisation would be established to ensure the impartial operation of the grid system (World Energy Council 2001). All power from IPPs would be purchased by Taipower under current power purchase contracts, although large consumers would be able to purchase directly from cogeneration and renewables plants.

Further liberalisation of the market would involve the establishment of a power pool into which generators, including Taipower, would bid to sell their electricity. The role of the independent organisation would be expanded to include the functions of power exchange, system operation and demand forecasting (World Energy Council 2001). Retail contestability would be expanded gradually to a larger number of customers. The ultimate aim is that all customers would have a choice of supplier but no date has been set for the achievement of this or other reform objectives.

How will deregulation affect energy markets?

The modeling framework

Although some of the objectives of deregulation are specific to individual economies, the three reform agendas have in common a desire to enhance competition, increase productivity and through this to reduce electricity prices. Lower electricity prices can be expected in a deregulated environment in the absence of market power because competitive pressures will lead to improvements in both labor and capital productivity.

In this analysis, GTEM is used to examine the impacts of enhanced productivity in the electricity supply industry and of lower electricity prices on a range of economic variables. These variables include gross domestic product (GDP) and investment, sectoral output and energy consumption and trade.

The simulation is based on estimates from the OECD that Japan's electricity deregulation program could lead to

electricity prices that are approximately 12 per cent lower than they would be in the absence of regulatory reform (OECD 1997). This implies improvements in total factor productivity of around 2 per cent a year.

Because it is intended that deregulation of retail electricity supply will not be extended to small consumers immediately, the simulation assumes that the household sector does not reap the same benefits as larger scale industrial and commercial users over the period to 2010. The simulation assumes that end user prices to households in 2010 are 5 per cent lower than their 1995 level. It is also assumed that the productivity and price impacts of deregulation start to be evident in 2001 and are fully realised over the period to 2010.

In the case of Korea and Chinese Taipei, it is assumed that the impacts on productivity and prices in the electricity sector will be lower than in Japan because the deregulation programs in these economies are relatively less advanced.

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In this analysis, ABARE's model of the world economy is used to examine the impacts on a range of economic variables of enhanced productivity in the electricity supply industry and of lower electricity prices in the three economies

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Because the results presented here are based on assumptions, they should be viewed as illustrative only of the general impacts and direction of change that can be expected from deregulation

In Korea, deregulation is assumed to lead to reductions in the price of electricity to industrial and commercial users of 9.4 per cent over the period 2002–10. This is achieved through factor productivity improvements of around 1.3 per cent a year over this period. This reflects estimates from the Korea Institute for Industrial Economics and Trade (1999) of the macroeconomic impacts of regulatory reform in the electricity industry. The price impacts on the household sector are limited to a fall of 3.5 per cent over the same period because full retail contestability is not expected until the final stages of reform.

In Chinese Taipei, the equivalent price assumptions are reductions of 5.9 per cent for industrial and commercial users and 2.5 per cent for the residential sector. The lower assumptions reflect the more formative stage of plans for deregulation in Chinese Taipei than in either Japan or Korea and that no clear reform timetable is yet available. Hence the productivity gains from deregulation are assumed not to have an impact until 2004.

Because the results presented here are based on assumptions, they should be viewed as illustrative only of the general impacts and direction of change that can be expected from deregulation. This is especially true in the case of Chinese Taipei where the final form of deregulation has yet to be approved by the legislature.

Reference case

GTEM requires a reference case or a 'business as usual' simulation, against

which the impacts of different policy scenarios can be measured. In this analysis the reference case projects the growth over the period to 2010 of key variables in Japan, Korea and Chinese Taipei, including economic output and energy consumption, in the absence of electricity sector deregulation.

In the reference case, GDP is assumed to expand by 1.4 per cent a year in Japan and by around 5 per cent a year in Korea and Chinese Taipei. This underpins strong growth in energy and electricity consumption. For the three economies, energy consumption rises from 740 million tonnes of oil equivalent in 1998 to around 900 million tonnes of oil equivalent in 2010. Electricity output in 2010 is 1800 terrawatt hours. Coal remains an important fuel for power generation, especially in Korea and Chinese Taipei.

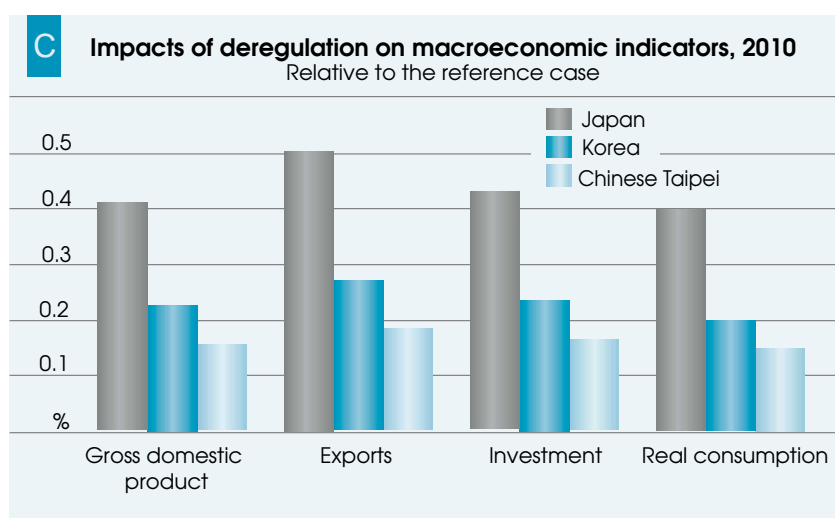
Results of the deregulation simulation reported below are interpreted as percentage deviations from the reference case.

Macroeconomic impacts

As a result of enhanced productivity and lower electricity prices following deregulation, total demand for goods and services expands in the three economies relative to the reference case. This results in GDP rising above reference case levels (figure C). However, the magnitude of the increase in GDP varies across the economies, reflecting the different degree and timing of deregulation that is simulated.

As Japan commenced deregulation earlier than Korea and Chinese Taipei, the consequential productivity and price impacts in Japan are assumed to be larger. As a result of deregulation, GDP in Japan is projected to be 0.4 per cent higher at 2010 than it is in the reference case. In Korea and Chinese Taipei, GDP is 0.2 per cent and 0.16 per cent respectively above reference case levels at 2010.

Underlying the increase in GDP in the three economies are improvements in the competitiveness of industrial and commercial output that result from higher productivity and lower electricity prices. As a result, exports



from the three economies in 2010 are higher than in the reference case. Indeed the increase in exports is larger than the GDP increase because exports use more electricity for a given level of output than the economy in general and, hence, benefit more from the fall in electricity prices that accompany deregulation.

Accelerated export growth makes these economies relatively more attractive destinations for investment and leads to rates of return and investment levels that are above those in the reference case (figure C).

Further, the increased demand for goods and services following deregulation results in increased demand for labor. This pushes up the average wage rate relative to the reference case. In Japan, for example, real wages in 2010 are around 0.5 per cent higher than in the reference case without deregulation. Higher real wages mean higher household income and increased household consumption potential. As a result, real consumption expenditure increases in each of the three economies relative to its reference case level (figure C).

Structural impacts

When the price of electricity falls following deregulation, the competitiveness of the region's electricity intensive sectors improves relative to other sectors of the economy and relative to energy intensive production in other economies. As a result, output of these industries rises above their reference case levels. This results in some reallocation of the economy's resources. In particular, electricity intensive industries together account for a larger share of economic output than in the reference case.

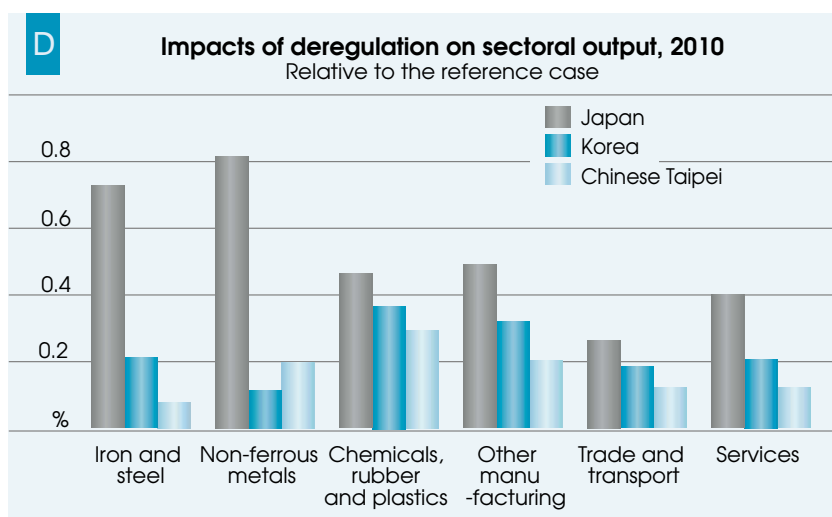
The increase in the output of individual industries varies widely across regions and depends on many factors, including the price elasticity of demand for each industry's products and the electricity intensity of production. The largest impacts on output are projected to occur in Japan where the price effects of deregulation are assumed to be strongest (figure D).

In Japan, increases in the output of iron and steel and nonferrous metals relative to the reference case are stronger than in the other industries because the former are the most electricity intensive sectors in the economy. Deregulation also encourages a small shift toward electric arc furnace technology in the iron and steel sector as the impacts of electricity price falls are greater here than in the less electricity intensive blast furnace component of the industry. Output from the trade and transport sector, which encompasses a large part of services activity and is typically a large user of electricity, also expands relative to the reference case.

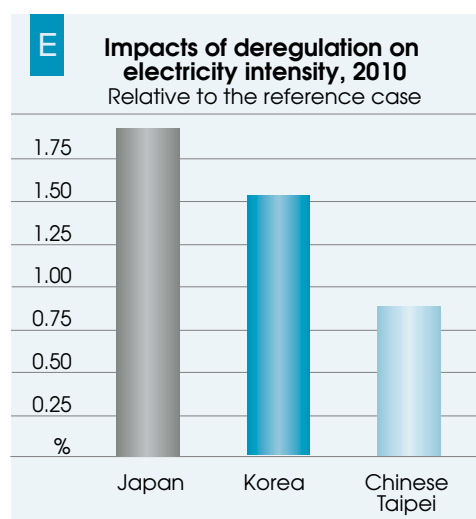
The sectoral impacts of deregulation in Korea and Chinese Taipei are similar to those in Japan although smaller in magnitude (figure D). Although iron and steel is also an electricity intensive sector in these economies it does not expand as significantly as other sectors because its competitiveness declines relative to Japan's. This is because the price and competitiveness impacts of Japan's deregulation agenda are larger than those assumed in Korea and Chinese Taipei. However, the chemicals industry, other manufacturing and services all expand their shares of output in these economies relative to reference case levels.

The net effect of these structural impacts following deregulation is that economic activity in north east Asia at 2010 is more electricity intensive than in the reference case (figure E). That is, the price and other impacts of deregulation

When the price of electricity falls following deregulation, the competitiveness of the region's electricity intensive sectors improves



- Electricity consumption in the three economies is higher after deregulation than in the reference case



mean that more electricity is used to produce a given amount of GDP after deregulation than in the reference case.

Impacts on the electricity sector

Given the increases in economic output and in electricity intensity, it follows that electricity consumption in the three economies will be higher after deregulation than in the reference case. Across the region, electricity demand at 2010 is 37 terrawatt hours above its reference case level. In Japan, this result means that electricity demand is 2.3 per cent higher than in the reference case and in Korea and Chinese Taipei it is 1.8 per cent and 1.0 per cent above the reference case respectively (figure F).

Because deregulation increases the competitive pressures on electricity producers it is also likely to have an impact on the choice of fuels used in the generation sector and on fuel procurement policies. In the current environment, coal fired electricity

generation technologies are the most cost effective.

In Japan, the competitiveness of coal is reinforced by the removal of the requirement to purchase high priced domestic coal. As a result, the share of coal in Japan's electricity fuel mix at 2010 is almost 1 percentage point higher than in the reference case. That is, coal is projected to account for 22.8 per cent of Japan's electricity generation in 2010, following the implementation of regulatory reform.

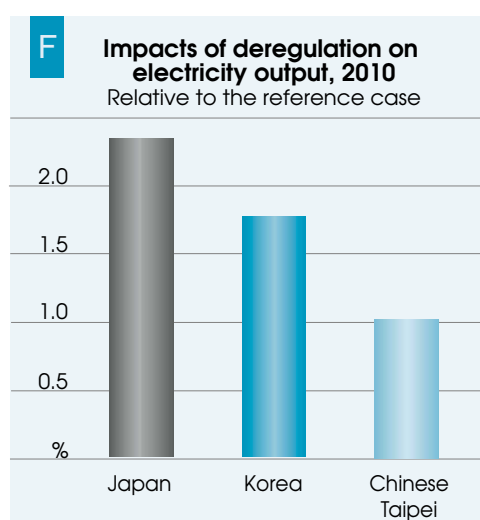
Coal also increases its share of electricity generation in Korea and Chinese Taipei, although to a smaller extent than in Japan. This is partly because the relatively large increase in demand for coal from Japan has an upward impact on world coal prices and limits the shift into coal in the other economies.

It should be noted that these results do not take account of other policies that might be implemented in the three economies at the same time as deregulation of the electricity sector. The simultaneous implementation of stringent environmental policies, for example, could limit the shift to coal if it increased the price of coal fired power generation. This could occur if greenhouse gas restrictions were implemented or if restrictions on emissions of sulfur or other pollutants were used to reduce local and regional pollution problems.

Impacts on fossil fuel imports

The combined impacts of the growth in economic output, structural shifts toward electricity intensive activities and changes in the electricity fuel mix that follow deregulation result in increased demand for coal and gas in each of the north east Asian economies relative to the reference case. And because these economies have no significant domestic energy resources this translates into higher imports at 2010 relative to reference case levels.

Imports of steaming coal rise significantly more than imports of other fuels, reflecting to a large extent the substitution of imports for domestic coal production in Japan. Total steaming coal imports into the region



are almost 6 per cent or 10.5 million tonnes higher in 2010 than in the reference case (figure G). Japan accounts for a significant majority of this increase.

Imports of gas are also higher following deregulation than in the reference case. Most of this increase in demand comes as a result of higher electricity production but some is a result of expanded activity throughout the economy.

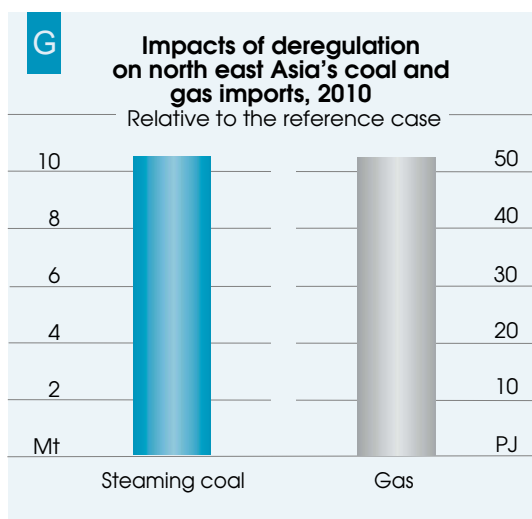
What are the implications for Australia?

Because Japan, Korea and Chinese Taipei are substantially dependent on energy imports, the deregulation of their electricity markets provides significant opportunities for Australian energy exporters.

Australia is already the largest exporter of coal to the region, with a reputation as a reliable, high quality supplier. In a deregulated environment, however, these supply characteristics could be given less weight than currently. The imperative to reduce costs and remain competitive in a deregulated market could induce a higher degree of risk taking by electricity producers, including in their fuel procurement decisions. This outcome is likely to favor lower cost suppliers, including China and Indonesia, over premium producers such as Australia.

The results from the simulation indicate that, following deregulation, Australia gains a large proportion of the increase in north east Asia's imports of steaming coal (figure H). Australia's exports to the region in 2010 are 6.8 million tonnes higher than in the reference case. Exports from China and Indonesia together in 2010 are 2.8 million tonnes above the reference case level.

Australia's gas exports to the region in 2010 are higher than in the reference case by 7.4 petajoules. All of the additional trade is with Japan. Australia does not yet export gas to Korea or Chinese Taipei and the modeling is not structured to capture the potential to break into this possibly significant market. However, given that gas



demand growth in this region is projected to be stronger following deregulation than before, it represents an important market opportunity for the Australian LNG industry.

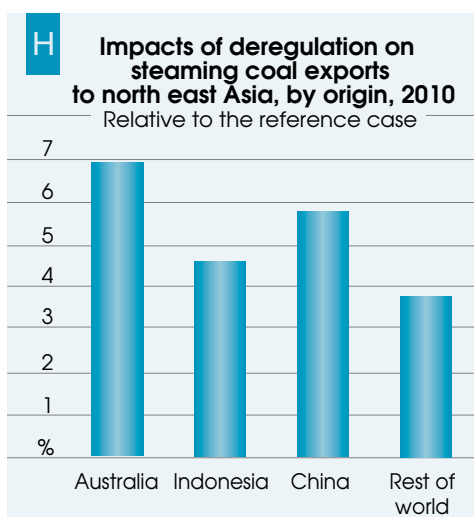
Conclusions

An important message from this analysis is that opportunities exist for competitive Australian energy exporters in the progressively deregulated electricity markets of north east Asia.

Deregulation of the electricity supply industries in Japan, Korea and Chinese Taipei is likely to mean higher economic growth and increased demand for energy — not just from the electricity sector but throughout the economy.

However, competition to supply these markets will intensify. New arrangements in deregulated markets and new entrants such as independent power producers are likely to result in changes in fuel procurement, especially as cost becomes an increasingly

• Opportunities exist in the progressively deregulated electricity markets for competitive energy exporters •



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In north east
Asia's
deregulated
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markets, long
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purchases

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important determinant of market success. Long term contracts may become less attractive in this environment and be replaced by increased use of spot and short term purchases.

Challenges from new low cost suppliers such as China will also be important and point to the ongoing need to address productivity and competitiveness issues in the Australian energy sector. Nevertheless, Australia's quality and reliability as a supplier will remain key attributes.

References

- Asia Pacific Energy Research Centre
1998, *APEC Energy Demand and Supply Outlook*, Tokyo.
- Energy information Administration
2001, *International Energy Outlook 2001*, Washington DC.
- International Energy Agency 1994,
Electricity Supply Industry: Structure, Ownership and Regulation in OECD Countries, OECD, Paris.

- 1999, *Electricity Market Reform – An IEA Handbook*, OECD, Paris.
- 2000a, *Energy Balances of Non-OECD Countries*, OECD, Paris
- 2000b, *Energy Balances of OECD Countries*, OECD, Paris.
- 2001a, *Energy Prices and Taxes Quarterly Statistics: First Quarter*, OECD, Paris.
- 2001b, *Competition in Electricity Markets*, OECD Paris.
- Korea Institute for Industrial Economics and Trade (1999), *The Economy-wide Effects of Regulatory Reform in Korea*, Regulatory Reform Committee, Seoul.
- OECD (Organisation for Economic Cooperation and Development) 1997, *The OECD Report on Regulatory Reform*, vol. II, *Thematic Studies*, Paris.
- World Energy Council 2001, *Electricity Market Design and Regulation in Asia Pacific*, London.

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