



www.serd.ait.ac.th/eric

How Effective Power Market Reform Depends upon Gas Market Reform in The Asia Pacific Region

Jeffrey Skeer

Asia Pacific Energy Research Centre
1-13-1-16F Kachidoki, Chuo-ku, Tokyo 104-0054
JAPAN

ABSTRACT

Many of the twenty-one economies in the Asia Pacific region have considered or undertaken reforms to boost competition in their natural gas and power markets. Many are also using gas for a significant and growing share of electric power production. Thus, the success of power market reforms in reducing electricity costs often depends on reforms to boost competition and lower costs in markets for gas. This paper summarises relevant conclusions from a recent study by the Asia Pacific Energy Research Centre (APERC) on Natural Gas Market Reform in the Asia Pacific Region [1].

Even in economies where independent power producers account for a major share of electricity generation, competition in the power market may be severely limited by a lack of competition in the gas market. If there is only a single gas producer, offering gas at about the same price to all generators, then generators can compete only on the basis of capital costs and operating efficiency. Since combined cycle gas turbines are produced by only a few manufacturers, again with similar costs likely for all buyers, productive efficiency gains may be further limited to operational efficiencies only. And if gas is offered at a subsidized price, even incentives for operational efficiency may be limited.

But where gas and power market reforms are joined, efficiency improvements and cost reductions are more likely. If there are many competing gas producers, then generators can reduce costs by shopping for the gas that is cheapest. If power market competition is limited to wholesale transactions, with all independent power producers selling their production to a single buyer, regulators will have to be vigilant if they wish the single buyer to pass on the resulting cost savings to consumers. But if there is also retail competition in the power sector, with customers eligible to choose the least-cost power supplier, there is greater certainty that the cost savings will be passed on.

1. CHARACTERISATION OF APEC NATURAL GAS MARKETS

Natural gas markets in the twenty-one economies of the Asia Pacific Economic Cooperation (APEC) may be classified into six groups:

- *Mature Exporters with Vertically Integrated Monopolies:*
Brunei Darussalam, Indonesia, Malaysia
- *Recent Developers with Vertically Integrated Monopolies:*
Papua New Guinea, Peru, Philippines, Viet Nam

- *Dominant Supplier with Competition at the Edges:*
Hong Kong, Mexico, New Zealand, Russia
- *Monopoly or Dominant Supplier with Transport Pricing Issues:*
China, Russia
- *Importers with Wholesale Competition and Single Buyers:*
Japan, Korea, Singapore, Chinese Taipei, Thailand
- *Evolving Retail Competition and Customer Choice:*
Australia, Canada, Chile, United States

More than half of the APEC economies, which are those included in the first four groups, have gas markets that function mainly or entirely as vertically integrated monopolies. These include economies as varied as Brunei Darussalam, China, Hong Kong, Indonesia, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, and Viet Nam. Of these economies, almost all are self-sufficient in gas (China, New Zealand, Papua New Guinea, Peru, Philippines, Viet Nam) or net gas exporters (Brunei Darussalam, Indonesia, Malaysia, Russia); there are only two exceptions (Hong Kong, Mexico). In addition, very few of these economies have a well-developed gas distribution grid.

However, conditions in APEC economies with gas markets that function as vertically integrated monopolies are not altogether analogous. Some economies have a very substantial gas-producing apparatus and have been exporting large amounts of gas for decades. Other economies have much more limited gas reserves and have only started producing gas recently. Quite a few economies have state-owned monopolies whose status is enshrined in constitution or law. Others do not have official monopolies but still have firms that clearly dominate so that competition is significantly constrained. Most economies have regulations that ensure an adequate return on investments in gas transportation infrastructure, but there are a couple of notable exceptions. Because of such distinctions, it is convenient to divide the economies with gas markets that function as vertically integrated monopolies into four groups, each of which is described and analysed separately to account for its particular characteristics.

2. MATURE GAS EXPORTERS WITH VERTICALLY INTEGRATED GAS MONOPOLIES

Brunei Darussalam, Indonesia and Malaysia may be described as mature gas exporters with vertically integrated monopolies in their internal gas markets. Each of these economies is a major source of gas supplies for one or more other economies in APEC, and together they dominate gas supply in Japan, Korea, Singapore, and Chinese Taipei. Brunei Darussalam has been exporting gas since 1972, Indonesia since 1977, and Malaysia since 1983. The internal gas market in each of these economies is dominated by a single state-controlled firm that produces gas and transports it to local users. The dominant firm produces all the gas in Indonesia and Malaysia and 90 percent of the gas in Brunei Darussalam. All gas transmission over high-pressure pipelines is controlled by the dominant firm in Brunei Darussalam and Malaysia, while the function is shared with another government-controlled firm in Indonesia.

Each of the mature gas exporters with a vertically integrated internal gas market is also characterized by vertical integration between its internal gas and electricity markets. In each case, a large share of electricity is generated from gas, and electricity generators can only purchase gas from the state-owned gas supplier. Gas fuels very nearly all electricity production in Brunei Darussalam and

more than three quarters in Malaysia, while providing about three-eighths of the electric generating capacity in Indonesia. Thus, inefficiencies in gas production or transportation could be readily passed on to power producers, who have no alternative supplier of gas and little flexibility to shift to other fuels. But in fact, gas prices to power producers in these economies are held substantially below gas export prices. In Brunei Darussalam, where all power is produced and transported by a government agency, it is not clear whether all the savings are passed on to electricity consumers. In Indonesia and Malaysia, there is real wholesale competition in the power sector, with 9 percent of generating capacity owned by independent power producers (IPPs) in the former and 43 percent of electricity generated by IPPs in the latter. But because all the IPPs must purchase gas from the same source, the effective scope for competition among them is limited to capital and non-fuel operating costs. And since there is just a single buyer in the power sector, there is no guarantee that fuel price cost savings will be passed on to power consumers.

The potential for inefficiencies in production of gas is limited, in mature gas exporting economies, through the mechanism of production sharing contracts (PSCs). Various international oil and gas companies have competed for roles in existing PSCs, and several different companies are operating in each of these economies. However, since each PSC provides a defined share of production revenues at a given gas field over a long period of time, in return for production activity over that period of time, there is limited assurance that cooperating companies will not develop inefficiencies in the course of their contracts.

Among the mature exporters, it should be observed, Indonesia has recently taken significant steps toward opening up its gas market to wholesale competition. Pursuant to the Law Concerning Oil and Natural Gas of 2001, the state-owned integrated monopoly, Pertamina, no longer has to be included in production sharing contracts as of late 2003. With respect to new gas field developments and expiring contracts at existing developments, the various gas companies operating in Indonesia will be free to operate as independent producers or consortia. Insofar as the share of competitive gas production in Indonesia grows, so will competition in the economy's gas market.

3. RECENT DEVELOPERS WITH VERTICALLY INTEGRATED GAS MONOPOLIES

Papua New Guinea, Peru, the Philippines and Viet Nam may be described as small or recent gas developers with vertically integrated gas monopolies. Each of these economies is self-sufficient in gas supply, but none yet produces a very large amount of gas, and none is a gas exporter. The Philippines have been producing gas in commercial quantities only since 2001, and Papua New Guinea only since 1992. Viet Nam has been producing some gas since 1981, and Peru since at least the early 1970s, but their production has jumped substantially since the mid-1990s. The gas market in each of these economies is characterised by a single firm that produces and transports gas. In addition, all or most of the gas is used by large industrial firms or power generators that have signed long-term contracts for the gas in conjunction with development of gas supply facilities.

Most of the recent gas developers with vertically integrated gas market have a significant degree of vertical integration between their internal gas and electricity markets. In each case, electricity generators can only purchase gas from the state-owned gas supplier. However, the extent of integration varies with the proportion of power generated from gas, which is high at 58 percent in PNG and substantial at 16 percent in the Philippines and 18 percent in Viet Nam, but a much lower 4 percent in Peru. In the three economies with larger gas fuel shares in electricity generation, inefficiencies in gas production or transportation can be readily passed on to power producers, who have nowhere else to turn for their gas and have limited flexibility to shift from gas to other fuels. Moreover, each has a single monopoly or dominant electricity supplier which can pass on any additional gas costs to electricity consumers. While the Philippines have introduced power sector competition and Viet Nam may do so

too, competing power producers will have to buy gas from the same source, so the effective scope for competition among them will be somewhat curtailed.

Among the recent developers, it is worth noting that the Philippines are seriously considering how to move their gas market towards competition as gas production expands. A government circular issued in 2002 envisions requiring that access to spare capacity at gas pipelines and LNG facilities be made available to all competing gas suppliers on a non-discriminatory basis. Spare capacity is that which the owner or operator does not need to serve its own customers or to honour third-party contracts for gas transportation. While the owner or operator would still be privileged, the scope for competition would expand as new pipelines and LNG facilities are built.

4. DOMINANT GAS SUPPLIER WITH COMPETITION AT THE EDGES

Hong Kong, Mexico, New Zealand and Russia are economies in which the gas market is dominated by a single firm but a minor portion of gas is produced by competing firms. There is no general pattern in this group with respect to export-import balances; Hong Kong imports all its gas, Mexico imports a small percentage, New Zealand is self-sufficient, and Russia is a major exporter. In the case of Hong Kong, a single company imports natural gas from a single producer in mainland China, but residential and commercial customers are served by town gas and LPG suppliers. Mexico has a constitutionally mandated monopoly on domestic gas production, but allows competition from gas imports, which are growing. New Zealand's gas market is legally deregulated, with eight different gas producers, but 94 percent of its gas is produced by the largest two, which often operate in partnership, and 76 percent is produced by the top firm alone. In Russia, several competing firms together produce about one-eighth of total gas output, but the remaining seven-eighths are still produced by Gazprom, even though it is no longer a legal monopoly and even though a substantial percentage of its shares are now privately owned.

Most of the economies with a dominant gas firm have a significant degree of vertical integration between their gas and electricity markets, inasmuch as a major portion of power is generated from gas and most gas must be purchased, as a practical matter, from the dominant gas firm. In Hong Kong, where about a quarter of the power is generated from gas, all the gas-fired power plants are owned by a single power producer. In Russia, where more than half of the electricity is generated from gas, four-fifths of the power is produced by the state-owned electric utility. In such cases, inefficiencies in gas production are readily passed on to power producers, who have limited flexibility to shift to other fuels, and power producers can pass on increased gas prices in their rates to electricity consumers, who usually have no alternative source of power.

5. MONOPOLY OR DOMINANT GAS SUPPLIER WITH TRANSPORT PRICING ISSUES

Russia (described in the preceding section) and China have gas markets in which the prices of gas to domestic consumers may not fully cover the costs of gas production and transportation. Consequently, the incentives for construction of transportation infrastructure to bring gas to such consumers appear to be weak. By contrast, incentives for construction of transportation pipelines to serve gas export markets, where prices of gas are market-determined, appear to be adequate.

In Russia, domestic gas prices have been regulated at levels far below those that would obtain from the interplay of supply and demand in a competitive marketplace. The regulated domestic gas prices paid by Russian industry have rarely been as high as 60 percent of the market-determined prices for exportation of gas to Europe, and they have often been far lower. More importantly, it would

seem that domestic gas prices have often fallen well below costs of production. In such a situation, it is hard to see how private capital might be attracted to pipeline construction. However, the government intends to bring domestic gas prices in line with export gas prices by 2007.

In China, gas transportation projects in principle receive a generous rate of return which would appear to provide an adequate incentive for construction of those projects that receive government approval. However, city gate gas prices are often capped at levels significantly below the total costs of production and transportation, on the basis of an "affordability" criterion which seeks to limit overall residential gas bills to 6 percent of average income. Production of gas is shared by three state-owned firms with separate service territories, which are fully compensated for their costs. So in practice, city-gate price caps have been sufficient to fully cover production costs but not always to fully cover transportation costs. Hence, it may be difficult for many pipeline projects to recover their costs, especially where the distances from wellhead to city gate are great. Incentives for investment in pipeline projects may thus be weak, making it hard to meet growing gas demand.

6. APEC ECONOMIES WITH WHOLESALE COMPETITION IN GAS MARKETS

A number of APEC economies have a significant degree of wholesale competition in their gas markets, with a single buyer in each geographical area buying gas from competing producers. These economies include Japan, Korea, Singapore, Chinese Taipei and Thailand. In Japan, Korea and Singapore, all gas is imported from competing producers abroad, and in Chinese Taipei, 95 percent of gas is imported. In Thailand, however, only about a fifth of gas is imported, so that the wholesale market encompasses a number of competing domestic gas producers. Most of the economies in this group have well-developed local gas distribution grids, but Thailand does not.

Within APEC, Asian gas-importing economies are highly reliant on supplies from Asian gas exporters, namely Brunei Darussalam, Indonesia and Malaysia, which have had vertically integrated gas markets. The total share of LNG from these three exporting economies is 47 percent in Korea, 62 percent in Japan and 100 percent in Chinese Taipei. By contrast, only 3 percent of LNG in Korea and 14 percent of LNG in Japan is imported from Australia or the United States, which are at a fairly advanced stage of reforming their gas markets. Hence, the gas prices paid by consumers in APEC gas-importing economies are dependent not only on the design of domestic gas markets, but also on gas market design in Asian APEC gas-exporting economies.

However, the Asian gas-importing economies have differed in the extent to which they have diversified supply sources. Thailand imports gas only from Myanmar, while Singapore and Chinese Taipei import gas only from Indonesia and Malaysia. Japan and Korea, however, import gas not only from Indonesia and Malaysia, but also from Brunei Darussalam and Qatar. In addition, Korea imports some gas from Oman, while Japan imports a portion of its gas from Australia, the United States, Abu Dhabi and the United Arab Emirates.

Most Asian gas importers have a significant degree of vertical integration between their gas and electricity markets, since a major share of power is generated from gas and all gas-fired power plants must obtain fuel through a single gas buyer. The gas share of generating capacity ranged in 1999 from a very high 42 percent in Thailand to 26 percent in Korea, 22 percent in Japan, 15 percent in Singapore and 14 percent in Chinese Taipei. There is growing competition from independent power producers (IPPs), which accounted for 14 percent of generating capacity in Korea in 2000, 15 percent in Chinese Taipei in 2002, and 27 percent in Thailand in 2001. But all power producers must buy gas from the same supplier. So the scope for competition among gas-fired plants, which account for a very large share of new generating capacity, is limited to capital and non-fuel operating costs. Moreover, with the large share of capacity that is gas-fired, power producers have limited flexibility to shift to other fuels in response to higher prices. Thus, the single gas supplier has significant market power to

pass on inefficiencies in gas procurement, shipping and processing, as well as in the construction and operation of LNG facilities and pipelines, in higher gas prices to power producers.

The Japanese case is somewhat particular in that there is a dual buyer for gas in most regions rather than a single buyer. Electric utilities import their own gas through their own LNG terminals, while gas utilities import gas for industrial, commercial and residential consumers through separate LNG terminals. Moreover, there is little competition in wholesale power markets, where IPPs account for less than 1 percent of generation and generating capacity. In the retail power market, only large industrial firms, representing about a quarter of electricity demand, have a choice of suppliers. So with respect to the power sector, the electric utility in each region is in effect the single gas supplier to itself. It can often pass on inefficiencies in procurement, shipping and processing, as well as in the construction and operation of LNG facilities, in higher prices to electricity consumers, most of whom who have few alternative power sources.

However, Japan's Gas Utility Industry Law was amended in June 2003 to require that the owners of LNG facilities make public the amount of capacity at such facilities that is not being utilised, negotiate for use of such capacity by third parties, and explain why access to spare capacity is denied, if that is the case. The amended law will gradually extend access to natural gas pipelines to all customers, rather than just large industrial and utility customers, and to provide access to all pipelines, rather than just those owned by gas companies. As the amendments are implemented, Japan will have negotiated third-party access for LNG facilities and regulated third-party access for gas pipelines, expanding opportunities for competing gas retailers and power producers to enter the marketplace. Moreover, parallel amendments to the Electric Utility Industry Law will expand retail choice in the power market to customers accounting for over 60 percent of demand, so enhanced competition in gas will be carried over to a significant extent into power.

In Korea, open access is to be provided to the electric transmission network after 2004, giving large customers a choice of power suppliers, and to electric distribution grids after 2009, giving small customers a choice of power suppliers as well. But in view of the large share of gas in electricity generation, the impact of open access to power grids may depend in part upon the fate of an official proposal, first made in 1999, for KOGAS to provide open access to all LNG, pipeline and storage facilities. To ensure that competing suppliers are treated in a non-discriminatory fashion, the proposal would divest KOGAS of most functions that do not relate to gas transportation. At a later stage, open access would be extended to gas distribution, with regional distribution monopolies unbundled into separate distribution and retail supply firms. Competing suppliers would then be able to use the distribution grid on non-discriminatory terms to bring gas to small residential and commercial customers. This would be a significant step since small consumers constitute two-fifths of Korea's gas market. However, it is not clear at what point or to what extent the reform proposal will be implemented.

7. APEC ECONOMIES WITH CUSTOMER CHOICE IN GAS MARKETS

A few APEC economies have provided most of their larger gas consumers and a growing number of smaller gas consumers with a choice of suppliers. These include Australia, Canada, Chile and the United States. Of these economies, Australia and Canada are net gas exporters while the United States has substantial domestic gas supply and Chile is highly reliant on gas imports. All but Chile have well-developed gas distribution grids in most urban population centers.

Under the federal systems of government in Australia, Canada and the United States, regulatory authority over the transmission system of high-pressure gas pipelines resides with the federal government while regulatory authority over local distribution grids resides with the states, provinces or territories. In each of these economies, the federal government has provided for open and non-discriminatory access to the transmission network. As a result, large industrial firms and electricity

generators, which can directly link to the network of high-pressure pipelines, have all obtained a choice of gas suppliers. However, while some states, provinces and territories have provided for open access to local distribution grids, others have not. Thus, residential and commercial customers, who must buy gas from low-pressure pipelines, do not all have a choice of suppliers. In the United States, for example, twenty-two of the fifty states have given such customers a choice of retail suppliers and another ten are considering doing so. In Canada, small customers have been granted a choice of suppliers in seven out of eight provinces. In Australia, all gas users in five out of seven states and territories will be able to choose their suppliers as of late 2003.

Among the economies providing for customer choice of suppliers in retail gas markets, there are differing degrees of competition in gas production and retail supply. In Chile, while domestic gas production is reserved for the state (as in Mexico), most natural gas is purchased from several competing producers in neighboring Argentina (whereas Mexico's import share is currently very small), and there is also competition from town gas and LPG. In Australia, there are several competing domestic gas suppliers, and most states and territories have two or more competing gas retailers. In Canada and the United States, whose gas markets are closely linked by an extensive pipeline transmission network, there are literally hundreds of competing gas producers, among whom competition in many places is quite intense. Most states and provinces that have provided for retail choice in North America have at least two competing retail suppliers, while a few have several and New York actually has had as many as fifty.

In this group of economies, there is little integration between natural gas and power markets. Although a growing share of electricity is generated from natural gas, there are many competing electricity generators, and each electricity generator has a choice among many gas suppliers. Because of the competitive pressures in both sectors, productive efficiencies and cost savings in the gas sector should be largely passed on to consumers in the electricity sector.

8. THE GROWING ELECTRIC POWER SHARE OF GAS DEMAND

Sales to electricity generators account for a large and growing share of gas demand. As a result, gas market reforms that make gas supply more competitive will have a greater impact if competitive power markets oblige electricity generators to vie for the lowest-cost gas. The chart below indicates the share of domestic natural gas supply that was used to generate electricity in APEC economies in 2000, along with the share that is projected to be used for power production in 2010 [2]. As the chart shows, four economies devote virtually all of their gas supply to power generation, while another five use more than half their gas to produce electricity. While the share of electricity in gas demand is projected to decline by ten percentage points or more in three economies (Philippines, Singapore, Peru), it is projected to grow by ten percentage points or more in eight (Chinese Taipei, Mexico, New Zealand, United States, Chile, Australia, Indonesia, China).

Among major gas exporters that have had vertically integrated monopolies in their gas markets, it can be observed that the electricity sector's share of gas demand exceeds 50 percent in Malaysia, 40 percent in Russia, 30 percent in Brunei Darussalam and 20 percent (growing to 30 percent) in Indonesia. Thus, with respect to the internal markets in these economies, the impact of any reforms in the gas market would be significantly enhanced if there were parallel reforms in the electric power market. While independent power producers account for 43 percent of electricity production in Malaysia and about 9 percent in Indonesia, each economy retains a single buyer-retailer in its power market which may not pass on to consumers all cost reductions from a more competitive gas market just as it may not fully pass on savings from subsidized gas prices offered by the gas monopoly today.

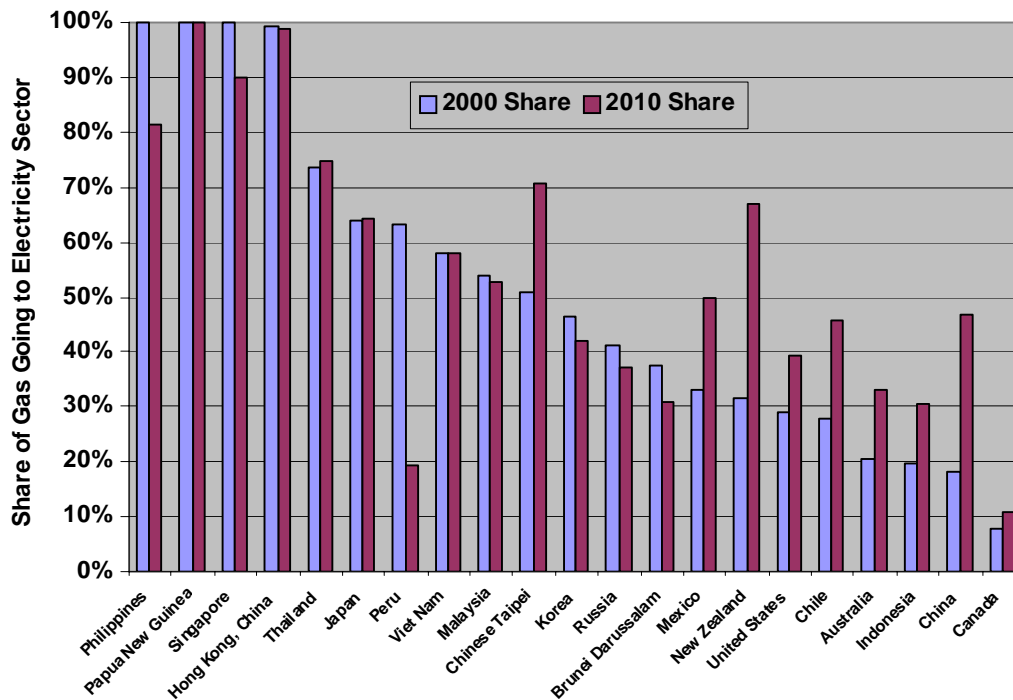


Fig. 1 Electric Power Sector Share of Gas Demand in APEC Economies (Source: APERC 2002)

Among economies with recently developed vertically integrated gas markets, the electricity sector's share of gas demand ranges from 100 percent in the Philippines and Papua New Guinea to around 60 percent in Peru and Viet Nam. Because electricity's share of gas demand is so high, the impact of gas market reforms in these economies on the energy bills paid by final consumers would be severely limited in the absence of power market reforms. Without competition in the power market, competition in the gas market could reduce operating costs and raise profits for monopoly electric utilities, but the utilities would not necessarily pass on their cost savings to consumers. The Philippines are in fact implementing legislation that aims to make power markets more competitive.

Among gas-importing economies with single buyers of gas in their wholesale markets, the portion of gas supply devoted to power production ranges from about 100 percent in Singapore and Hong Kong to over 70 percent in Thailand, 60 percent in Japan, 50 percent in Chinese Taipei, and 40 percent in Korea. So in these economies, too, the impact of gas market reforms would be limited without competition in the power sector. While IPPs hold 14 percent of Korea's generating capacity, 15 percent of Chinese Taipei's, and 36 percent of Thailand's, they sell to a single buyer that may not pass on all savings from gas market competition to consumers. In Singapore, with four IPPs competing for retail sales, a larger share of the savings from gas market reforms might be passed on.

9. THE KEY ROLE OF GAS IN ELECTRICITY SUPPLY

At the same time, gas accounts for a large and growing share of electricity generation. Therefore, reforms aimed at encouraging greater competition in power markets will have a greater impact if there are also gas market reforms that make it possible to buy gas from the cheapest supplier. The following chart shows the share of electricity that was generated from natural gas in 2000 and the

share that is projected to come from natural gas in 2010 [2, 3]. Five economies generated more than half of their power from gas in 2000. The share of gas in power production is projected to decline substantially in Malaysia, Papua New Guinea and Russia, but should increase by more than 20 percentage points in three economies (Singapore, Mexico and Philippines) and by 8 percentage points or more in another five (Chile, United States, Australia, Chinese Taipei and China).

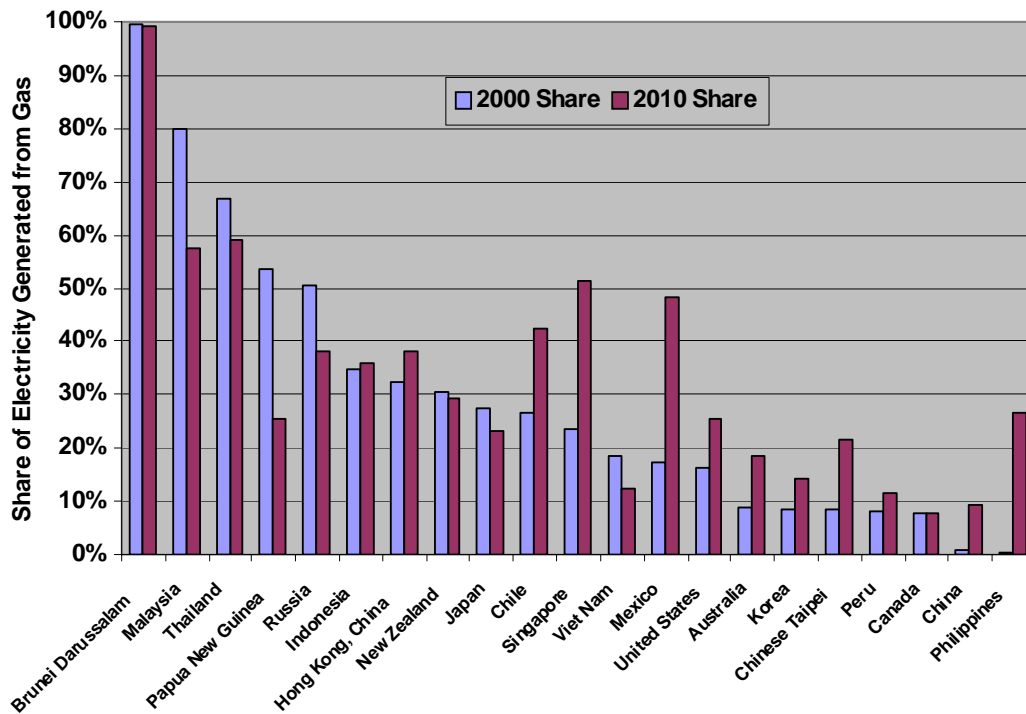


Fig. 2 Share of Electricity Generated from Gas in APEC Economies (Sources: APEC Energy Working Group 2002, Asia Pacific Energy Research Centre 2002)

Looking at major gas exporting economies with vertically integrated gas markets, it can be seen that the share of gas in electricity generation is nearly 100 percent in Brunei, around 80 percent in Malaysia, over 50 percent in Russia and more than 30 percent in Indonesia. It follows that power market reforms would have extremely little effect in Brunei and Malaysia and a significantly curtailed impact in Russia and Indonesia unless gas market reforms were also implemented. Since Malaysia and Indonesia have in fact liberalised their wholesale power sectors, with 43 percent of electricity in the former and 9 percent in the latter generated by independent power producers, this is of more than theoretical significance. As long as all IPPs must buy gas from the same source, they will only be able to compete with respect to capital costs and non-fuel operating costs.

Turning to economies with vertically integrated gas markets that have recently developed their gas resources, the share of gas in power production is generally quite low. While gas is used for about half of power production in Papua New Guinea, it accounts for less than 20 percent of electricity generation in Viet Nam, less than 10 percent in Peru and a very small percentage in the Philippines, where the share is expected to grow rapidly over the next ten years. In these economies, the benefits of electricity market reform would be only modestly curtailed by a failure to reform natural gas markets. However, gas market reform could still be of value to these economies in limiting the fuel costs of gas-fired power plants and in making the gas industry more efficient.

Among gas-importing economies with a single buyer in their wholesale markets, several generate a large share of their electricity from gas. The gas share of power production exceeds 60 percent in Thailand, 30 percent in Hong Kong, 25 percent in Japan and 20 percent in Singapore, where it may expand to 50 percent over the next ten years. Although the gas share of generation is below 10 percent in Korea and Chinese Taipei, it is expected to grow substantially and is far exceeded by the gas share of generating capacity, which will soon be approaching 30 percent.

Since all power producers in these economies must obtain gas from the single buyer, their fuel costs will not differ much and the effective scope for competition among them will be limited to capital and operating costs. Moreover, insofar as the share of gas-fired generating capacity is large, power producers will have limited flexibility to shift to other fuels in response to higher prices. Thus, the single buyer may be able to pass on many inefficiencies in gas procurement, shipping and processing, as well as in the construction and operation of LNG facilities and pipelines, in higher gas prices to power producers. It follows that further gas market reform, with competition at retail level and the ability of all power producers to shop directly for the lowest-cost gas or import their own gas, would significantly enhance the impacts of electricity market reform in such economies.

10. REFERENCES

- [1] Asia Pacific Energy Research Centre. 2003. Natural Gas Market Reform in the Asia Pacific Region. Tokyo, Asia Pacific Energy Research Centre.
- [2] Asia Pacific Energy Research Centre. 2002. APEC Energy Demand and Supply Outlook 2002. Tokyo, Asia Pacific Energy Research Centre.
- [3] APEC Energy Working Group. 2002. APEC Energy Statistics 2000. Singapore, APEC Energy Working Group.