Joint Emergency Stock-holding Scheme for the APEC Oil Importers

*By Keiichi Yokobori, Masao Takagi and Rong-hwa Wu**

Introduction

Despite the recent economic slowdown caused by the Asian financial crisis and the sharp oil price increase in 1999, oil demand in the Asian economies within the Asia Pacific Economic Cooperation (APEC) region is projected to grow substantially in the coming decade (APERC, 1998). The region's oil imports are also expected to increase significantly due to the limited potential for oil production expansion inside the region. The APEC region, particularly the Asian APEC economies, will raise further their reliance on the Middle East, where concerns for political instability exist, and increase supplies passing through the narrow Strait of Malacca. Thus, the Asian APEC region's vulnerability to oil supply disruptions remains high. This requires serious considerations for strengthening oil security policy measures.

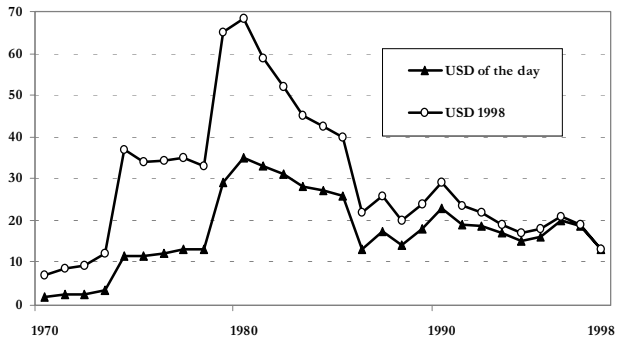
This study intends to present the net economic benefits of expanding emergency oil stocks for differing groupings of APEC economies, and to examine the value of joint oil stockpiling among Asian APEC economies.

Review of Oil Demand and Import Trends

The Asia Pacific Energy Research Centre published its updated Energy Demand and Supply Outlook in September 1998 based on the macro-economic projections provided by the Australian Bureau of Agriculture and Resources Economics (ABARE). Although economic recovery has not yet been confirmed in Japan or Indonesia, Korea, Thailand and other Asian economies, which had been adversely affected by the financial crisis, registered remarkable recovery in 1999, consistent with ABARE's projection. APERC's energy outlook projects a 4 per cent per annum growth in oil demand in Asian economies during the period of 1995 to 2010. Demand will grow from 668 million tons of oil equivalent (Mtoe) in 1995 to 968 Mtoe in 2010 under the baseline scenario. Under this scenario during the same period, imports grow from 406 Mtoe to 657 Mtoe, an increase of 62 per cent, raising import dependence from 61 per cent to 68 per cent.

Oil supply disruptions in 1973 and 1979-80 caused significant economic damage to OECD countries. Growing oil demand and imports by the Asian APEC region means that another serious oil supply disruption could cause serious economic losses to those economies. Further, as shown in Paik et al. (1999), oil supply disruptions would cause economic damage not only to oil importers but also to oil exporters; non-oil sectors account for a significant portion of the whole economy. Sharp oil price rises cause economic damage, including GDP losses and oil import cost increases. Crude oil prices doubled during the Gulf Crisis of 1990-91, although the magnitude of oil price increases was more moderate and its duration was much shorter than in the previous oil crises in 1973 and 1979-1980 (Figure 1). This largely resulted from increased oil production by other oil producers and the activation of the IEA's Contingency Plan, where oil stock release played a key role (Scott, 1994).

Figure 1
Oil Prices (1970-1998)



Source: BP Amoco (1999)

Economic Analysis of Expanded Emergency Oil Stocks

Paik et al. (1999) demonstrated net benefits of about 2.7 billion US dollars (USD) by expanding emergency reserves for the APEC region outside the U.S. by 600 million barrels (Mbbl). Based on the same set of assumptions and using the same methodologies, Leiby and Bowman (1999) ran additional simulations of expanding emergency stocks for the following five APEC economy groupings: All APEC; Asian Group I (China, Japan, Korea, Philippines, Singapore, Chinese Taipei and Thailand); Asian Group II (Asian Group I minus Japan plus Hong Kong, China); Japan alone; Asian Group III (Asian Group I minus China and Japan plus Hong Kong, China).

For these groupings, the study compares the net present values (NPV) of benefits (at an annual discount rate of 7 per cent) arising from the release of stocks in oil supply disruptions and NPV costs of holding emergency stocks by using the DIS-Risk model. The benefits include avoided GDP losses and avoided net import costs.

Figure 2 presents the base case simulation results, including the grouping of APEC minus the U.S. For the first three groupings, the net economic benefits of stock expansion exceed the costs of stockpiling, while the costs are greater than benefits for the remaining three groups. Specifically, the total net benefits for APEC as a whole will be highest at USD 10 billion when the reserve expansion reaches 1,000 Mbbl; it is USD 2.5 billion for APEC minus U.S. at 600 Mbbl; and a little less than USD 1 billion for 400 Mbbl.

The following conclusions could be drawn from this result:

- The larger the economy (or economy groupings), the larger the economic benefit. The net economic benefit is calculated on the basis of the impact of oil stock release on global oil price and the magnitude of economic benefits are roughly proportional to the size of GDP;
- The benefits of stock draw, or lower oil prices, through its effects on the world oil market, are shared by all oil consuming economies, although the cost of stockpiling is borne only by the economy that does stockpile. This is due

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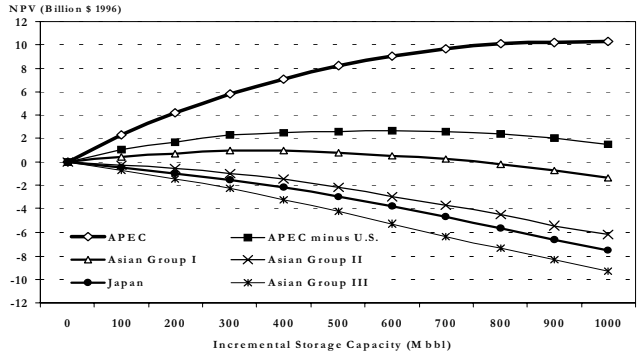
Figure 2
Net Economic Benefits of APEC Stock Expansion (DIS-Risk Model, ORNL)



Source: Leiby and Bowman (1999)

to the public good nature of emergency oil stocks;

- Figure 2 presents the result of the base case scenario. Under a more severe disruption scenario, the economic benefits would be larger. Even those three groupings of economies with negative net economic benefits might gain net benefits in such circumstances;
- The coordinated stock build and drawdowns would maximise the collective economic benefits and at the same time reduce the costs.

Coordinated Oil Emergency Stock Drawdowns as International Public Goods

Coordination of emergency response measures, as demonstrated by IEA countries and producers during the Gulf crisis in 1990-1991, constitutes international public goods, benefiting also those economies not holding emergency stocks. Many Asian APEC oil importing economies which did not participate in this response action benefited from the shorter and more moderated oil price increases resulting from the IEA coordinated stockdraw and other responses. However, continued free riding would cause the erosion of the effectiveness of such an oil supply security regime in an oil crisis.

The oil import coverage of IEA emergency stocks has been declining from a peak in 1986, while spare oil production capacity in oil producing economies is declining (Figure 3). The share of IEA countries in the world oil market is shrinking due to the growing share of non-IEA economies, particularly those in Asia. Many of these do not hold emergency stocks. Besides the U.S. and Japan who are holding significant oil emergency reserves to comply with their obligations to IEA, only Korea and Chinese Taipei have emergency reserves of oil. China and Thailand plan to create emergency oil stocks. But other oil importing economies in the APEC region do not maintain emergency stocks despite their growing oil demand and import dependence.

The expansion of oil emergency stocks by Asian APEC oil importing economies would prevent the weakening of the oil supply security scheme in an oil crisis, and would enhance the oil supply security of regional economies.

Illustrative Cases of Joint Stockpiling among APEC Economie

For smaller Asian economies particularly, emergency oil stock expansion through a joint oil stock-holding scheme with other economies would achieve an economy of scale, lower the cost of building and holding stocks and provide better stock management.

The earlier economic analysis suggests that stock size expansion by 30 to 40 days of net imports envisaged in 2010 under the APERC Outlook Baseline Scenario would result in net benefits for the APEC region. The size of 1000 Mbbl for APEC as a whole would correspond to 37 days of net imports in 2010; 600 Mbbl for APEC minus U.S. would correspond to 42 days; and 400 Mbbl for 7 Asian economies to 29 days. Considering the level of working stocks ranging from 30 to 40 days of demand (almost identical to days of imports in many import dependent economies), this level would correspond to 60 to 70 days of oil imports, namely the earlier mandatory stock levels for IEA countries. Considering fur-

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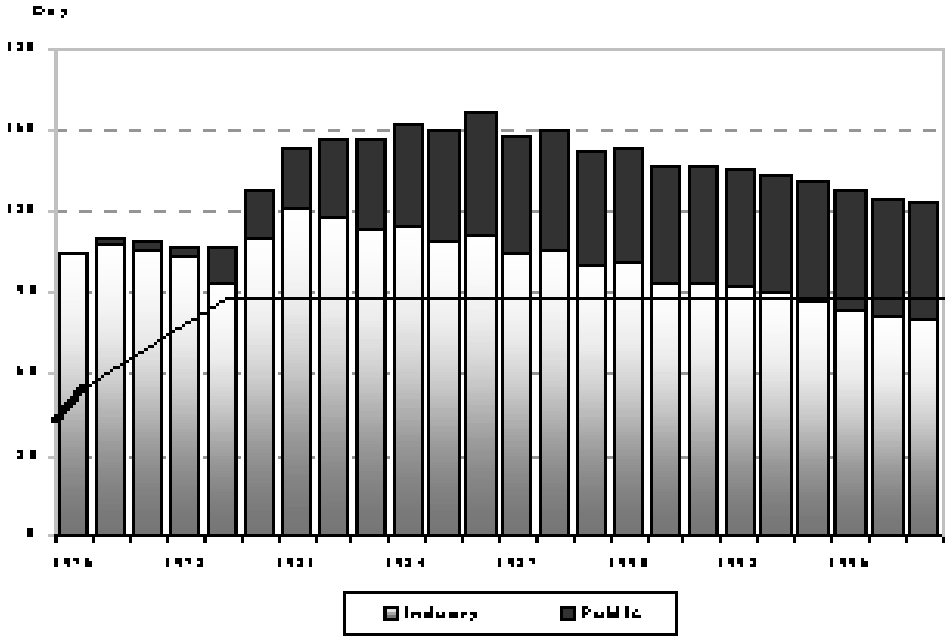
Figure 3
IEA Net Importers Stocks (Days of Net Imports)



Source: IEA (1999)

Stock-holding Scheme *(continued from page 21)*

ther the current IEA obligation level (encompassing both commercial and emergency stocks) of 90 days of net oil imports, the range of a 30 to 60 day level of oil imports for emergency stocks does not seem unreasonable for consideration by some Asian APEC economies.

This range of required oil stocks for smaller Asian APEC economies, encompassing Hong Kong, China; Philippines; Singapore; Chinese Taipei and Thailand (Asian Group IV); would amount to roughly 100 Mbbl to 200 Mbbl, or one to two units of large scale salt cavern storage, which offers the most economic facility studied by PB-KBB Inc., an expert engineering firm. The total capital costs would range from USD 551 million to 1102 million. According to data available from the Japan National Oil Corporation (JNOC), the corresponding capital costs of above ground storage, generally used in commercial storage, would range from nearly USD 2500 million to 5000 million (Table 1). The potential sites of appropriate salt caverns could be found in Thailand, Australia and other APEC economies.

Table 1
Emergency Oil Stocks, Import Coverage and Capital Costs (Asian Group IV)

Days of Net Import	**30 Days**	**60 Days**
Required stock level (Mbbl)	95.7	191.4
Salt Cavern		
Storage Capacity (Mbbl/unit x unit)	100 x 1	100 x 2
Capital Cost (Million USD)	551	1102
Above Ground Storage		
Storage Capacity (Mbbl/unit x unit)	0.7 x 137	0.7 x 274
Capital Cost (Million USD)	2493.4	4986.8

Source: PB-KBB (1998), APERC

An option, which might be more economic than building a new storage facility for jointly stockpiling emergency oil, would be to lease existing excess storage facilities within the APEC region. This arrangement would allow the deferral of the large construction cost associated with building new facilities. Oil sector restructuring may produce excess storage capacity as envisaged in Japan (Table 2).

Table 2
Oil Storage Capacity in Japan

	Tank Capacity
Refinery Owned Capacity (1,000 bbls) (Crude)	370,066
(Products)	277,364
Subtotal	647,430
JNOC Affiliated Capacity (Crude)	251,600
Total	899,030
Net Oil Imports In 2010(Base Case) (1,000 bbls/d)	5,617
Tank Capacity for the days of Net Oil Imports in 2010	160

Sources: Petroleum Association of Japan, Japan National Oil Corp., and APERC (1998).

The benefits would be further enhanced by cooperating with other oil importing countries (such as IEA countries) especially learning from IEA or EU experience and oil exporters who have the potential of surge production and would find common interest in development of such supply logistics as pipelines and storage facilities.

Naturally, the analysis of the benefits of expanding emergency stocks could be further advanced with the improved availability of information on stock building and holding, including their costs, more in-depth analysis with improved analytical tools and data, and incorporation of policy experience with the emergency response measures.

Conclusions

The economic analysis of the cost and benefits of emergency oil stock expansion suggests the benefits of enlarging the stock size by larger groupings of APEC economies in a coordinated manner. Such expansion would prevent the erosion of the effectiveness of the current oil emergency scheme as an international public good. Joint stockpiling by APEC oil importers would achieve an economy of scale and thus reduce the cost of stock holding and improve the efficiency of management of the stocks. An expansion of 30 days of net imports in oil stocks is suggested as a first step toward joint stockpiling by small Asian APEC economies.

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