4. The current standing of the oil refinery industry in Viet Nam

4.1. Domestic supply of petroleum products

There is one oil refinery in Viet Nam, the Ho Chi Min refinery (a simple topper, with refining capacity of 8,800 B/D), owned by Saigon Petro (under the direct control of the People's Council of Ho Chi Min City), which is fed by Thai-produced condensate. As such, the full component of Viet Nam's petroleum demand is filled through imports. Four state-owned companies have almost exclusive control over the import and sale of fuel oil (gasoline, kerosene, and diesel), namely Petrolimex (in charge of the bulk of petroleum-based product imports, and with the greatest share of imports and sales), Viet Nam Saigon Petro (under the direct control of the People's Council of Ho Chi Min City, and holding a 50% market share in southern Viet Nam), Petrovietnam Trading & Distribution Co. (recently established as a subsidiary of Petrovietnam), and PETEC. Foreign participation in the distribution sector is allowed for only LPG, asphalt, and lubricants.

4.2. Domestic demand for petroleum products

Domestic demand for petroleum products topped 130,000 B/D (around 6.5 Mt/year) in 1999 (based on market predictions). Domestic demand was 85,800 B/D in 1995, 116,080 B/D in 1996, 114,780 B/D in 1997, 121,580 B/D in 1998 and (an estimated) 132,680 B/D in 1999. Demand was thus affected slightly by the economic crisis, but has recovered well since then, and is on the increase. Predictions for future demand from 2000 and on are 150,180 B/D in 2000, 174,480 B/D in 2002, 221,680 B/D in 2005, and 298,700 B/D in 2010. (EWCI: "Asia Pacific Databook: Supply, Demand & Prices, Fall 1999")

Table 4. The balances of petroleum product supply & demand in Viet Nam (1999)

(Unit: 1,000 B/D)

	Domestic production	Imports (I)	Exports	Domestic demand (D)	Import ratio (I/D)
LPG	—	2.9	—	3.1	93.5%
Naphtha	—	—	—	—	—
Gasoline	—	31.4	—	33.0	95.2%
Kerosene	—	15.8	—	16.4	96.3%
Diesel	—	47.1	—	53.4	88.2%
Fuel oil	—	21.6	—	23.4	92.3%
Other product types	—	2.7	—	3.3	81.8%
Total	—	**121.5**	—	**132.6**	**91.6%**

Source: EWCI: "Asia-Pacific Databook: Supply, Demand & Prices (Fall 1999)"

More than half of domestic demand for petroleum products, is for gasoline and middle distillates (diesel and kerosene), with consumption of diesel being particularly high (see Table 4). As such, the market is weighted toward gasoline and diesel, and heavy oil consumption is low. The reason for the popularity of diesel is that, as with other South East Asian countries, diesel trucks are prevalent in Viet Nam, and demand for heavy oil is expected to rise in the future as industrialization gathers momentum.

4.3. Plans for construction of Viet Nam's first oil refinery

The Vietnamese government estimates that the demand for petroleum products will reach 15-17 Mt/year in 2010,[85] and in order to meet this demand increase, the government is now considering a plan to build two large-scale refineries in Viet Nam.[86]

Vietross Refinery, a 25 year-old partnership between Petrovietnam and Zarubezhneft—a Russian state-owned enterprise—is currently building Viet Nam's first large-scale oil refinery in the Dung Quat sector, on the eastern seaboard of Central Viet Nam.[87] The plant is scheduled to come on line in 2004 (although actual completion may be around 2005-2006), and will have a processing capacity of 130,000 B/D (6.5 Mt/year), at expected total cost of USD1.3 billion. This figure covers all plant infrastructure, including 10 km of road to connect the plant to a nearby highway, water supply, electricity, communications, and the preparation of the plant site, most of which is now in place. The basic plant design has been completed by US and French firms, and includes reformer, catalytic reformer and fluid catalytic cracker (FCC) equipment. The planned output of the refinery is 6.5 Mt, of which 0.5 Mt will be channeled back into energy production, leaving 6.0 Mt of petroleum products for general consumption. This will consist principally of more than 2 Mt of diesel and just under 2 Mt of gasoline, with lesser amounts of fuel oil, LPG, jet fuel and kerosene also expected.

EPC (engineering, procurement and construction) contractor tenders have been separated into 7 separate packages (refinery equipment, crude oil tanks, finished product tanks, SPM,[88] wharf, port facilities, and offices/shops), and are expected to be filled by the end of 2000. The tender process for the refinery equipment and SPM was subject to international competition, with emphasis placed on potential for capital procurement in addition to technical expertise. At present, Petrovietnam and Russian concerns[89] are expected to provide USD800M each of the overall plant cost, and it is hoped that the remaining

[85] According to Petrovietnam estimations, the domestic consumption of petroleum products will be 12.4 Mt in 2005, 17.2 Mt in 2010 and 29.8 Mt in 2020 (VIR No. 447, May 8-14 2000).

[86] Based on an interview with Petrovietnam, Oil and Gas Processing Dept. (Sept.,2000), and [Vietnamese Economy and the Current State and the Future of its Petroleum Industry II] by Goto, Hiroki. "Petroleum Policy Quarterly" (Aug. 10., 2000)

[87] The plant was officially approved and land preparation commenced on March 22, 2000, 5 months after which actual plant construction began.

[88] Single point mooring: facilities for a single tanker to berth and unload crude oil. Port facilities will be able to accommodate 80 Kt class tankers from the White Tiger oil field.

[89] "Russian concerns" refers to Vietsovpetro (a joint venture between Zarubezhneft and Petrovietnam producing crude oil at the Bach Ho oil field), which plans to use part of its USD150M/year export revenue to capitalize the plant.

USD500M can be procured through tendering companies.[90] It is difficult to make a firm prediction on the actual construction cost while the tender process is still incomplete, which coupled with fund procurement leaves some question marks as to project viability.

The participation of a foreign company in the construction and running of the refinery is essential, from the viewpoints of capital backing, and sales and technical expertise. However, in order to attract a foreign partner to the project when foreign (Western, Taiwanese and South Korean) companies are pulling out from the area in numbers, requires that disadvantageous economic conditions are removed. For example, provisions such as the following may be appropriate: (1) proper protection of the domestic refinery and sustenance of minimum level profitability through tariff-based protection; (2) allow some form of access to downstream sectors (distribution and marketing); (3) have the government develop local infrastructure, due to the unfavorable positioning of the plant site far from a region of large-scale petroleum consumption; (4) approve 15% or 20% ROA; (5) approve EPC (engineering, procurement, and construction); (6) provide preferential upstream (crude oil, gas) development access. If not all, then some of these sorts of terms must be offered for foreign companies to consider involvement in the refinery project, given the risks associated with it and low profitability. Even if the Vietnamese market were to be open to foreign companies, only through offering favorable conditions guaranteeing a return, could major EPC contractors be attracted to such a project. However, whether downstream operations in Viet Nam remain profitable in the future is uncertain, and deregulation of only the downstream sector may not be sufficient. With rising crude oil prices in 2000, Petrolimex is expected to post a loss of 500-600 billion VND for the year. Taking the case of import tariffs, assuming for the moment that tariffs were maintained at the level they were in 1996 (70% on gasoline and 50% on middle distillates) for a total of 10 years or more, then the costly domestic product could be made competitive. In reality, however, the AFTA/CEPT deadline is coming up in 2006, making it difficult to maintain high-level tariffs on intra-ASEAN trade in the long term. At present, import duties on most products are effectively 0%. This intensifies the need to open up local downstream sectors to foreign companies, in order to generate a stable profit base. Opening up downstream sectors to foreign companies, and nurturing the market based around economic principles, is considered to be desirous. It is possible that Russian concerns participating in the first refinery might as well impose harder conditions considering the present level of duties, the progress of which needs to be followed carefully. The Dung Quat site is far from areas of large-scale consumption and associated with high distribution costs, accentuating the business risk associated with

[90] Capital procurement on the part of Petrovietnam is planned to be achieved through a bond issue of USD300-500M on the New York and other international markets in 2001. Morgan Stanley (a major US securities company) is to underwrite the bond issue, and assuming that fund procurement is successful, the proceeds will be allocated to the construction of the oil refinery and also development of oil fields ("The current standing and future of the Vietnamese economy and oil projects (II)" [Betonamu no keizai to sekiyu-jigyo no genjyo to kongo], H. Goto (ed.) Oil Policy Periodical [Syunkan sekiyu seisaku], August 10, 2000.

the project. Despite this, Petrovietnam is confident that the plant will prove profitable, due to expected shortages in supplies of petroleum products in the Asian market over the long term.[91]

In the feasibility study, an IRR of around 15% is predicted based on Petrovietnam claims, although there are doubts as to the actuality of this claim. Certainly, if the plant is able to operate as planned, then there is the possibility it could be highly profitable due to the heavy weighting of easily marketable gasoline and diesel fuels. None of the preconditions on the feasibility study have been made public and there are a number of areas where the study is unclear, but potential problem areas based on available information include the final construction cost and uncertainties with regard to funding, in addition to the following items. First is the question of assumed import duty levels. The feasibility study was carried out at a time when crude oil prices were low and import duties on petroleum products were around 60-70%, and it is unclear just how things will be changed with present inflated crude oil prices and an effective duty of 0% on most petroleum products. One genuine concern is that the refinery will not be able to compete with imports if import duties are down. Looking down the track of Vietnamese economic development, the price cap on gasoline and diesel fuel is relatively low, and it will not be possible to bump up domestic prices in light of jumps in international crude oil prices. In the case of rising crude oil prices in the year 2000, petroleum product importers such as Petrolimex have had to shoulder losses, which the government is supplementing with export revenue from crude oil, but it is uncertain how things will end up in the future when local refinery operations are in place. Given current predictions of slightly inflated crude oil prices in the future, it is difficult to gauge exactly what margin will be possible in oil refinery operations. There is also the issue of what level of duties will be possible within the AFTA/CEPT framework. There are suggestions that the new refinery will produce only 92 octane premium-grade gasoline, the demand for which is slight in Viet Nam with little potential for future growth, making it difficult to sell it at premium.

There are plans to complement the refinery with an adjacent propylene plant, in order to make good use of the propylene produced as a byproduct of FCC (150 Kt/year) and increase profitability. This would involve extra outlay of USD200M, which is proposed to be shared equally with Russian concerns. Whether Russian concerns would be prepared to make this extra investment or not, remains to be determined.

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91 Petrovietnam predicts that oil refinery margins will rise from 2003 onward, and additionally expects demand for petroleum products to exceed production capacity by around 10-15% by 2010 or 2020, and for global refinery margins to be about USD6/barrel at this time (based on an interview with Petrovietnam, Oil and Gas Processing Dept: September 2000). Analysis of the past 10 years, however, reveals that at no point have refinery margins been at a constant high. Assuming for the moment that the high margins claimed by Petrovietnam do eventuate, then past experience suggests that the major players would seize upon the opportunity and invest heavily in the industry, producing a state of oversupply. If this were to occur, then Viet Nam would be placed at an extreme disadvantage due to its newly built, small-scale operations, as compared to the high percentage of depreciated plants on the part of major players.

Viet Nam claims to have the upper hand over Singapore—the main source of petroleum product imports into Viet Nam—in terms of transportation, labor and utility costs (it costs around USD9/t to transport petroleum products from Singapore to Viet Nam). However, these areas do not impinge greatly on the refining business, and are not indicators of international price competitiveness. The transportation cost from Singapore of USD9/t, for example, converts to a difference of less than USD1.50 on a per barrel basis. More of a concern is Dung Quat's remote location, which could very well lead to a blowout in domestic distribution costs. Labor costs also do not feature highly in oil refinery costs, and do not really put Viet Nam at an advantage. Utility costs also are much higher in Viet Nam than other countries. According to a comparative study on the cost of investment in key Asian cities/regions at the end of 1999,[92] for example, electricity tariffs in Singapore (Singapore), Bangkok (Thailand), Kuala Lumpur (Malaysia) and Jakarta (Indonesia) were found to be USD0.05, USD0.03, USD0.06 and USD0.061-0.0193/Kwh, respectively, each being significantly cheaper than Ho Chi Min City (Viet Nam) on USD0.07/Kwh. Petrovietnam has indicated that it hopes to get around this problem and reduce power costs through in-house power generation, although it is unclear what cost level it will be able to achieve; it can occur that in-house power generation is more expensive than grid electricity. What is certain, however, is that it will be difficult for Viet Nam to compete with Singapore, Asia's most competitive refining nation. It is expected that a certain level of protection will be needed for the refinery to be able to operate at profit.

With all these doubts hanging over the refinery project, it will be interesting to see how the tender process pans out and whether the USD500M finance can be procured under favorable conditions.

A second refinery is planned for construction in Thanh Hoa Province, in Northern Viet Nam, to complement the first refinery (expected completion date 2005-2008).[93] This second project is at a disadvantage in the sense that it is far from both domestic crude oil production centers and consumer areas, but would appear to be well under way, under the direction of Petrovietnam. The processing capacity of this second facility will be 5-7 Mt/year, and rely on sources of both local Vietnamese light crude and Middle East heavy crude. The plant will principally produce products such as LPG, gasoline, kerosene, jet fuel and diesel, as well as feedstock for the petrochemical industry such as asphalt (bitumen), base oil, propylene and BTX. Overall investment is expected to total USD1.8-2.0 billion, although the investment mechanism and means for fund procurement have not yet been fleshed out.

4.4. Local deposits of crude oil

At present, the largest oil field in Viet Nam is Bach Ho ("White Tiger": mine precinct 9-1). Crude oil at Bach Ho is being extracted by Vietsovpetro, a joint venture between the Viet Nam and governments of

[92] 10th Asian key city/region investment cost comparison (March 2000), Japan External Trade Organization

[93] Viet Nam Investment Review, 7-13 Aug., 2000, No. 460 (by Ngoc Mai)

the former Soviet Union. Vietsovpetro commenced commercial crude oil production in 1986, and generated an average output of 220,000-230,000 B/D in 1999. The Rong oil field (mine precinct 9-1) is outputting around 10,000 B/D, with Rong and Bach Ho accounting for the greater proportion of Viet Nam's crude oil production between them.

A distinguished cast of foreign petroleum companies, including Shell, Total, Petro-Canada, Occidental Petroleum Corporation, Mobil, and BHP has already pulled out of petroleum development in Viet Nam. The main reason cited by companies in withdrawing their involvement is that business conditions are not competitive, due to the cost oil limits in the petroleum sharing contract (PSC) being too low, or preferential treatment for foreign companies as laid out in "Prime Minister's Decision No. 216"[94] not applying to companies operating in established mine precincts. Another commonly cited reason is that prospects for subterranean oil and gas reserves were lower than original predictions.

A series of proposed revisions to the Petroleum and Gas Law, aimed at further promoting petroleum and gas development by foreign companies in undeveloped regions, were approved by parliament in May 2000 and put into effect from 1 July 2000, and there are high hopes that these will induce foreign investment in oil field development.[95] A total of 18 revisions were made, of which the following are expected to be effective in inducing foreign investment:

- Legal documentation of rates of return: There was originally no stipulation on legal documentation of rates of return, and direct negotiation between affected parties was used to settle on a rate of around 35-40% for foreign concerns, which has been replaced by a stipulation of 70% of annual mining output.
- Allowance was made for foreign capital to be managed through a cash account held with a foreign bank, in an attempt to promote the influx of foreign capital
- Off-shore remittance of profits was made tax free
- It was made possible for crude oil exports to be made in quantities agreed upon freely between affected parties and without an export license

[94] "Prime Minister's Decision No. 216" was enacted on November 7, 1998, and offers special dispensations to companies newly entering the Vietnamese market, which are extracting crude oil from below 200m beneath the surface of the sea, in remote locations, or in topographically, geologically, economically or technically hard-to-work mine precincts. Dispensations are in the form of: (1) a reduction in corporate tax from 50% to 32%; (2) a reduction in profit remittance tax from 10% to 5%; (3) the possibility of wavering of sign bonuses* or data purchase costs; (4) an increase in the proportion of PSC Cost Oil, cost recoverable crude oil, (35%-70%); and (5) approval for gas exports. (Note(*): Sign bonuses are a one-off payment to the government by a contractor when making a tender, the amount of which affects the bidding. The cost of such payments is said to be over USD10M, up from what it was in the early 1990's. This cost is not recoverable through cost oil, and must be footed by the company on its own. From the point of view of the Vietnamese government, this money comes at no personal toil, and is generated simply by allowing foreign companies into new mining precincts.

[95] VIR No.447, May 8-14, 2000, No. 449, May 22-28, 2000.

- Significant corporate tax savings were offered for foreign companies operating in areas where oil drilling is particularly difficult, such as off-shore or deep-sea locations (50% → 32%)
- Natural resources tax reduction: Sales of target natural resources are subject to a tax of 6-25%, but reductions are offered for mining in special conditions
- Exports of oil and gas were made exempt from export duties, avoiding double tax payment with the natural resources tax and export duties
- Imports of mining equipment which cannot be procured domestically, is exempt from VAT payments
- Affected parties are solely responsible for resolving conflicts of interest

There are high expectations that the revisions to the Oil and Gas Law, coupled with revisions to the Foreign Capital Law, will catalyze foreign investment. Note that on April 27, 2000 Petrovietnam signed a joint venture agreement[96] with Conoko (of the US) and KNOC (the Korean National Oil Corporation), which is aimed at off-shore oil and gas drilling in mining precinct 16-2, but that with the enactment of the new Oil and Gas Law, there will be further development in that same mining precinct.

Conoco is already involved in mining in precincts 15-1 and 15-2, and that these two areas, in combination with precinct 16-2, are a linear extension of the Bach Ho oil field, Viet Nam's largest oil field. Combined, these three precincts are predicted to hold crude oil reserves totaling 610 million barrels. KNOC is also presently involved in mining operations in precincts 11-2 and 15-1, and has confirmed commercially viable crude oil reserves of 260 million barrels.[97]

The Vietnamese government currently claims that there are still reserves of over 10 billion barrels of crude oil in all Viet Nam, although foreign petroleum companies believe the figure to be much lower. The Bach Ho oil field, which has already produced over 500 million barrels of crude oil, is thought to be an exception, and there is little likelihood of finding reserves of a similar size in the future.

Whether to base refinery operations on low-density locally-produced crude oil or imported crude oil, is thus a matter of considerable economic importance, which must be determined based on thorough consideration of the long-term stability of supplies. It is inadvisable for Viet Nam to develop refinery operations around locally produced crude oil at present, when there is doubt over the extent of local reserves.

96 VIR No .447, May 8-14, 2000

97 [Vietnamese Economy and the Current State and the Future of its Petroleum Industry II] by Goto, Hiroki. "Petroleum Policy Quarterly" (Aug. 10., 2000)

Table 5. Oil production levels

Oil field	Mine precinct	Start of commercial production	Output (forecast for 1999)
Bach Ho	09-1	1986	220,000-230,000 B/D
Rong	09-1	1994	10,000 B/D
Dai Hung	05-1A	October, 1994	< 10,000 B/D
Rang Dong	15-2	August, 1998	45,000 B/D (planned)
Ruby	01	October, 1998	> 25,000 B/D
Bunga Kekwa	PM*3		6,250 B/D

*PM: Peninsula Malaysia (named after the Malaysian mine site)

Furthermore, it is not entirely true to say that Viet Nam needs a local refinery in the interests of energy security. The reasoning behind this statement is that it is inconceivable under the present day economic system that Viet Nam would be unable to import petroleum products, as even at times of emergency affecting key oil producing nations, such as the oil shocks of the 1970's and the Gulf War, it was quite possible to import refined oil. It is particularly hard to imagine a scenario where Viet Nam would be unable to import what is in global terms a tiny 130,000 B/D.

If Viet Nam were genuinely interested in energy security, a much better option would be to assume ownership of an existing Singaporean refinery, or establish a trading office in Singapore.

The policy objectives of job creation and the central region development are of course important, but unless top priority is placed on economic rationality, the construction of the oil refinery may cause Viet Nam to fall flat on its face. A more important objective in economic development terms would be to maintain the cost of fuels such as diesel and gasoline at international levels.

5. Issues relating to AFTA/WTO membership

As detailed above, there is no immediate reason at present why Viet Nam should rush into the construction of an oil refinery, but if it is to establish a local oil refinery industry in the future, then it will need to protect the industry by way of import tariffs for some time after the first refinery comes on line. Import tariffs should not be entered into lightly as they can have serious implications for other industries, but tariffs to a certain level would be acceptable to both AFTA and the WTO.

Under the conditions of AFTA, non-tariff based protection must be removed within 5 years of exports of CEPT items to other AFTA countries being subject to the bound tariff rates. At the very least, it will be possible to protect the local industry through high-level duties at least until the CEPT deadline of 2006, and there may be room to negotiate for the postponement of CEPT at that point. In the case that a postponement is allowed, some form of compensation may have to be paid. Depending on Singapore's response, application for postponement could develop into a serious issue.

The WTO would seek the abolition of all forms of non-tariff based protection, including import quotas, price control, and restrictions on foreign participation in the distribution sector. At the same time, however, the WTO would probably be sympathetic to the imposition of the bound tariff rates, if it were in the interests of replacing non-tariff-based protection. Approval of the bound tariff rates at as high a level as possible, should be sought in negotiations for WTO membership. In order to nurture the local oil refinery industry, a tariff must be applied on imports to bring them up above the price of local products. Once a tariff is in place, Viet Nam should carefully follow developments in other member countries, in order to gauge the possibilities of extending the period for which tariffs may be applied.

6. The medium and long term prospects of the Vietnamese oil refinery industry

In the present day, it is common knowledge that the oil refinery business is, by definition, a low-profit industry, as is apparent from features of the industry, the overall Asian market and international conditions. In addition, it is a highly risky enterprise to build a large-scale refinery in Viet Nam at present, when domestic demand for petroleum products is still underdeveloped. If a refinery were to be built, there is the strong possibility that any benefit gained through substituting imports with the local product would be far outweighed by the burden placed on the national economy. Additionally, the idea of using locally produced crude oil as feedstock for the refinery, is perhaps not the right choice given the uncertain future of production levels. Fortunately, Vietnamese crude oil sells at a premium on the international market due to its high grade, suggesting that it is better for Viet Nam to continue exporting its full production output of crude oil as is.

In the case of the first refinery, large amounts of capital are involved, with USD400M to come from Russian concerns and the same amount from Petrovietnam. Despite doubts over the viability of the project, it should be possible to set up this first refinery, given the size of foreign assistance to the project and assuming that Petrovietnam is able to maintain its current corporate structure. The project is expected to suffer from low profitability, however, and contributions from Petrovietnam to national reserves are expected to drop off as a result. The progress of the first refinery should be followed closely for the first 4-5 years, and construction plans for a second refinery evaluated based on the performance of the first. It is an unrealistic prospect to use a low-profitability refinery as a medium for regional development, and all effort should be made to locate areas of minimum business risk and minimal operational cost in which to establish any subsequent refineries. The medium to long term outlook for the Vietnamese oil refinery industry is to continue exporting all crude oil produced as has been the case until now, and import Viet Nam's full component of diesel and other petroleum products. In order to build and run an oil refinery, Viet Nam must take advantage of the capital backing and technical and marketing prowess of foreign companies in order to minimize the associated risk. For this purpose, it is imperative that Viet Nam wastes no time in creating investment conditions that are attractive to foreign companies. It would be difficult economically to develop an internationally competitive petroleum industry based on the central Viet Nam, and if the government is to push ahead with such a project, then large-scale fiscal assistance, including infrastructure development, will be needed. Additionally, in this case, the government should consider providing whatever assistance it can, and facilitate linkage with profitable upstream operations, in order to keep the price of petroleum products internationally competitive. Only at that point in the future when estimates of domestic crude oil reserves are revised up and the Asian petroleum market is predicted to stay strong over the long term (due to an increase in imports into China, say), would it be economically advisable for the Vietnamese government to embark upon the development of a local oil refining industry.

Thoughts on Promoting the Vietnamese Petrochemical Industry

1. Introduction

Due to the status of the petrochemical industry as a symbol of industrialization, along with steel, Viet Nam has been keen to promote it for a long time, and has considered a number of specific petrochemical projects in the past. When plans were tabled for the establishment of a petroleum refinery in the Dung Quat province (central Viet Nam), there was talk of constructing an ethylene cracker in the nearby area. At one time, there was also talk of building an ethane cracker in southern Viet Nam, drawing on natural gas resources off the Vietnamese coast.

Petrochemical products are wide and varied, and used for a number of purposes. In Viet Nam, petrochemical products are slowly finding a place in the lives of the people, and domestic demand is predicted to increase consistently in the future. However, if an ethylene cracker were to be built while domestic demand is still in its infancy, it would have to depend on exports to absorb a component of its output in the early years of operation. The market for petrochemical commodities is truly international, as a result of which, prices are variable and the risk associated with dependence on exports is great. As such, the best developmental path for a budding petrochemical industry is to make a success of high-demand downstream products such as polyvinyl chloride (PVC), polyethylene (PE), and polypropylene (PP), before gradually moving on to raw fibers, and as domestic demand picks up, establish operations further upstream, culminating in the construction of an ethylene cracker only when sizeable domestic demand for products drawing on ethylene has emerged. As a long-term strategy, support policy to facilitate this path of development should be worked out, conforming to the requirements of the WTO and AFTA.

2. Features of the petrochemical industry

2.1. Features of the upstream petrochemical sector

Upstream petrochemical operations fall into two types: ethylene plants and major resin (polymer) plants. Operational risk in these sectors is high as they are both capital intensive with high scale merit, and are sensitive to international market trends. The construction cost for an ethylene center, for example, is USD1.0-1.5 billion, the construction cost for a diversified petrochemical complex based around an ethylene center is USD2-3 billion, and the construction cost for a major resin facility is USD100-500 million for a monomer plant and USD20-40 million for a polymer plant (around USD50-100 million /10 Kt). At the same time, there have been no significant technological advances within core ethylene plant technologies of late, and there is little difference in cost structure between different plants. As a result, the industry is associated with over-competition, due to little technological discrimination of plants and the high device dependence of the industry pushing the weight of fixed costs up, providing strong incentive to maintain high operating levels.

The ratio of shipment costs to prices for ethylene is extremely high as ethylene must be shipped in special refrigerated vessels, making ethylene unsuited to international distribution. Even if trading of ethylene does take place, viable export destinations tend to be restricted to closely neighboring countries.

There is a strong correlation between the domestic demand for petrochemical products (domestic consumption + indirect exports) and the GDP, and increases in the per capita consumption of petrochemicals are proportional to increases in the per capita GDP. Specifically, growth in domestic consumer industries such as construction materials, daily commodities, textiles, and clothing, and export industries such as textiles, motor vehicles and motor vehicle parts, electrical goods and electronics, all produce growth in the domestic demand for petrochemical products.

As the petrochemical industry generates few jobs and is largely insensitive to the effects of low wages, petrochemical industrialization in ASEAN countries (i.e. moves toward domestic production) has focused on establishing stable domestic demand, attracting foreign investment and fostering a supply system in accordance with government policies to protect and promote the industry. In terms of establishing stable domestic demand, countries have tended to wait until domestic demand reaches a certain level (in general, the bare minimum for building a single ethylene center is demand for ethylene derivative products of 400,000 to 500,000 t/year), before constructing petrochemical complexes founded around ethylene centers (requiring investment of USD1-3billion). In terms of attracting foreign investment, many projects take the form of foreign joint ventures due to the prohibitively high levels of investment required to build a petrochemical facility. Policy to protect and promote the local petrochemical industry is often combined with policy to attract foreign investment, and generally takes the form of suppression of raw material supply costs, government-funded infrastructure development, reductions in corporate tax over a fixed term, and/or the imposition of high duties on imports, in order to enhance the profitability of the local enterprise.

As detailed above, for the upstream petrochemical sector, it is vital that entry into the market is timed prudently, due to the high commercial risk of any such venture.

2.2. Developmental patterns of the petrochemical industry

Demand for petrochemical products is determined by domestic consumption, and both indirect and direct exports. Domestic consumption refers to domestic demand for raw materials to produce consumer goods (e.g. construction materials and daily commodities); indirect exports refers to demand for export goods in downstream industries which rely in part on petrochemical products (e.g. motor vehicles, motor vehicle parts, electrical goods, and electronics); and direct exports refers to exports of petrochemical products in the form of raw materials (monomers, polymers, plastic, and resin), parts and packaging materials, for example. Consequently, "domestic demand" for petrochemical products tends to refer to the combination of domestic consumption and indirect exports.

The weight of indirect imports in domestic demand increases as export industries grow. Additionally, there is a strong correlation between domestic demand for petrochemicals and the GDP, and increases in the per capita consumption of petrochemicals are proportional to increases in the per capita GDP. As a result, the development of the petrochemical industry is considered to be dependent on increases in the per capita GDP and growth in export industries.

On the other hand, development of a supply system for ethylene and other upstream products should be started upon only once domestic demand for downstream petrochemical products has reached a certain level. If an ethylene plant or petrochemical complex is built before domestic demand matures, the facility will have to look to exports and be exposed to cutthroat competition on the international market. In general, the local consumption capacity of upstream products such as ethylene is determined by technological expertise and sales prowess pertaining to downstream derivative products, and has a considerable effect on plant profits.

As a consequence of the above, the developmental pattern of the petrochemical industry in developing countries is to first promote indirect exports of labor-intensive products such as clothing or textiles, or direct exports of low-technology, labor-intensive plastic products (basic plastic packaging or daily commodities such as plastic buckets). The next step is then to wait for domestic demand to expand, and progressively expand the scope of operations up the product stream to major resin plants and ethylene centers.

3. The current standing of the petrochemical industry in South East Asia

3.1. Trends in petrochemical industrialization in ASEAN nations

In response to high levels of growth in demand for petrochemicals, fueled by rapid economic growth, ASEAN nations adopted a national policy of developing local petrochemical production bases in order to achieve petrochemical self sufficiency (see Table 1).

Since the first petrochemical complex started up in Singapore in 1984, the petrochemical industry in ASEAN nations has thrived. In the first half of the 1990's, Thailand, Malaysia, and Indonesia started up one petrochemical complex after another. In the latter half of the 1990's, various projects were proposed, but the pace of development slowed down due to the onset of the East Asian currency/financial crisis in 1997.

In all ASEAN countries, the government has taken the initiative in participating in joint ventures with foreign companies, and various policies have been adopted to protect and promote the local industry, including developing infrastructure (Singapore), providing stable supplies of feedstock (Thailand and

Malaysia), imposing high duties on imports (Thailand and Indonesia), and offering reductions in corporate tax levels (Malaysia and other countries).

One characteristic of the ASEAN petrochemical industry is that Singapore has been the only country to target exports from the outset, based on its superlative marine distribution infrastructure, and in doing so, has maintained competitiveness within ASEAN nations by supplying products of high quality at low prices. Other countries (Malaysia, Thailand, and Indonesia) have focused on achieving petrochemical self-sufficiency, initially producing a balanced supply-demand structure, although diminishment of local demand due to the currency/financial crisis and new plants coming on line, have meant that of late, these nations even are turning progressively to exports.

Note that all countries other than Singapore timed the construction of ethylene centers to coincide with domestic demand for ethylene derivative products reaching 400-500 Kt/year in ethylene consumption terms, and that major resin plants, which use ethylene derivatives, developed well ahead of other plant types.

Table 1-1. Trends in petrochemical industrialization in South East Asia

	Development of petrochemical plants	Foreign investment	Protective/ furtherance policy	Timing for the construction of ethylene centers
SINGAPORE	`72: SPC* starts producing PVC `84: Petro complex on line (300 Kt/year in SPC stage 1 ⇒ 450 Kt in `89) `93-`01: Plans for construction of a chemical island (3 Mt/year ethylene production) `97: SPC stage 2 (515 Kt/year)	SPC produced in 1984 through a joint venture between Japanese industry (Sumitomo Chemicals) and the Singaporean government, representing the first Petro complex in the country. The Shell Group later bought out the government share in the facility. PCS* is currently jointly run by Shell and Sumitomo Chemicals. Foreign capital is currently being sought to bring ethylene production capacity up to 3 Mt.	EDB* has reduced the size of initial investment and made quick investment recovery possible, by having the government build infrastructure based on a chemical island conception (Jurong Island). Almost no tariff-based protection. The duty on key products as at 2000 is 0%.	`84: PCS* plant (naphtha cracker) starts up (300 Kt/year) `85: Demand for ethylene derivatives 67 Kt/year (Note: ethylene demand in that same year was 320 Kt/year)
THAILAND	**`89: NPC* 1 on line (315 Kt/year ethane)** `95: NPC 2 on line (350 Kt/year naphtha) `97: TPI* on line (350 Kt/year) `98: ROC* on line (600 Kt/year)	Dow Chemical (previously involved in ethylene derivative operations) is looking to involve itself in the construction of a large-scale ethylene center in the future, substituting local capital depleted as a result of the economic crisis.	The NPC plant was founded to tap into offshore natural gas resources in Siam Bay, under the guidance of PTT*. Petro complexes are concentrated in the Rayong and Map-ta-phut areas. Previously, the industry was split up between state-owned (PTT) crackers and private (TPI, ROC, etc.) derivative facilities, but TPI and ROC are moving toward an integrated production system, covering both upstream and downstream operations.	`89: NPC plant (ethane cracker) comes on line (315 Kt/year) `90: Demand for ethylene derivatives 430 Kt

Table 1-2. Trends in petrochemical industrialization in South East Asia (cont.)

	Development of petrochemical plants	Foreign investment	Protective/ furtherance policy	Timing for the construction of ethylene centers
MALAYSIA	`80s: 2 PS and 2 PVC plants on line `90s: 1 PP and 1 ABS plants on line `94: Titan Petrochemical plant on line (230 Kt/year) `95: Ethylene Malaysia plant on line (320 Kt/year) `99: Titan's 2nd plant on line (320 Kt/year)	PETRONAS* is looking to promote petrochemical production based on natural gas-derived ethane and propane, through developing power, steam, industrial water and industrial gas utilities and attracting foreign capital.	PETRONAS has Kertih as its ethylene base and Kuantan as its propylene base, with a railroad linking the two, in an attempt to create an integrated industrial structure. Abundant local reserves of natural gas are used to produce low-price supplies of ethane and propane. Corporate tax reductions are in place	`94: Titan Petrochemical plant (ethane) on line (230 Kt/year) `95: Ethylene Malaysia plant (ethane) on line (320 Kt/year) `94: Demand for ethylene derivatives 26 Kt
INDONESIA	`80s: PVC and PS operations, and PTA operations to meet increases in production of polyester fiber `95: CAPC* olefin center on line (540 Kt/year)	Construction of the TPPI* olefin center (700 Kt/year) has been stalled due to the currency crisis. Capital participation from Pertamina* and overseas are required to get the project back up and running.	Infrastructure and utilities are not integrated, and the development cost to individual plants is high. High duties are imposed on imports of ethylene and other products.	`95: CAPC* olefin center on line (540 Kt/year) `94: Demand for ethylene derivatives 683 Kt

Acronyms (*), in alphabetic order:

CAPC (Chandra Asri Petrochemical), Pertamina (state-owned Indonesian oil company), EDB (Economic Development Board, Singapore), Ethylene Malaysia (joint venture between PETRONAS, Idemitsu Petrochemicals and BP Chemicals), NPC (National Petrochemical Corporation, Thailand), PCS (Petrochemical Corporation of Singapore), PTT (Petroleum Authority of Thailand), PTTI: Trans-Pacific Petrochemical (joint venture between the Tirtamas Group, Siam Cement Group (Thailand), Koch Industries (U.S.), Nissho Iwai, and Itochu Trading), ROC (Rayong Olefins: a subsidiary of Siam Cement, the largest conglomerate in Thailand), PETRONAS (Malaysian petroleum authority), Titan Petrochemical (joint venture between Australian, Taiwanese and Malaysian investment companies), TPI (Thai Petrochemical Industries)

3.2. The South East Asian petrochemical market (the 5 major resins)

After bottoming out in the period August to November 1998, all resins strengthened to return to pre-currency crisis levels. Two key factors contributing to this recovery were a jump in naphtha prices—the base material for petrochemical products—due to a rise in crude oil prices, and recovery in demand for major resins due to economies throughout Asia suddenly picking up pace in 1999, after two years suffering from the effects of currency devaluation and general recession. Later, however, in November 1999, PE and PP prices fell back due to purchases from China dropping off.

South Korea, as Asia's largest exporter of synthetic resins, exerts considerable influence over international price levels, and saw rapid recovery in domestic demand for synthetic resins in 1999, as petrochemical-consumer industries such as motor vehicles and semi-conductors recovered quicker than expected. This caused South Korea to review its policy of cutthroat exports, which is expected to lead to reductions in export volumes in preference for hard profits.

At the same time, China—the biggest importer of synthetic resins in Asia, with 45% of its 7.85 Mt (1998) demand for ethylene filled by imports—is expected to continue increasing imports of synthetic resins in the short term, as a construction plan for a 600 Kt ethylene plant falls behind schedule, with the plant expected to come on line no earlier than 2005.

3.3. The current standing of petrochemicals in Asian nations

SOUTH KOREA: Under IMF guidance, South Korea has been forced into reducing corporate debts and increasing in-house capital, and has no current plans to speak of for the construction or expansion of petrochemical plants until 2004. Recent features of the South Korean petrochemical industry have been a jump in exports in 1998, and increasing numbers of offshore sell-offs of local companies. Large-scale drops in domestic demand (a GDP growth rate of -5.8%) have generated a drive toward exports, with 65% of the total production of synthetic resins being exported. Additionally, sell-offs to reduce debt reached double figures that year. In 1999, as a result of domestic demand returning to near pre-currency crisis levels, exports went on the decline. The economic crisis has triggered a restructuring of the industry, and the domestic industry is progressively being internationalized. It is expected that big Western petrochemical companies will use South Korea as a base for an export push into the Chinese and Japanese markets. A recent trend has been for companies to increase international competitiveness through specialization in a sector of particular strength, such as has been seen in the mutual exchange of polyolefin technologies by Hawha Petrochemicals and Daelim Industrial Co., Ltd.

Domestic demand for ethylene (1998 calendar year): 5.00 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 2.83 Mt

TAIWAN: The 6th Taiwanese naphtha cracker (NC6: a plant complex, centering around a 450Kt/year ethylene plant) came on line in 1999, and in 2000, this will size up to Expanded NC6 (a 900Kt/year ethylene plant). This plant has been built by the Taiwan Plastics Group (FPC: the largest private-sector consortium in Taiwan) on behalf of the China Petroleum Co. (CPC), and its completion brings Taiwan to the point of nearly complete integrated self-sufficiency, from the stage of oil refining; as a result, Taiwan's reliance on imports of basic chemicals has been greatly reduced. Stringent environmental controls and the concerted actions of local residents have made it difficult to locate a site for any new ethylene plant, and CPC has no choice but to maintain operations at their current level. This will allow the ever-expanding

FPC conglomerate to further extend its lead over CPC in the future.

Domestic demand for ethylene (1998 calendar year): 1.14 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 2.53 Mt

SINGAPORE: Singapore is attempting to establish 3 Mt/year ethylene production facilities in the form of a chemical island (Jurong Island). Infrastructure is being developed by the Singaporean Economic Development Board (EDB), reducing the initial investment to companies, and allowing for quick investment recovery. On the other hand, domestic demand is low, forcing operations to be export-dependent. As a result, companies must concentrate on maintaining international competitiveness at all times, and large-scale plants must be built. Singapore is in the direct firing line of self-sufficiency moves by large-scale importer nations such as China and India, and also any change in the Middle Eastern export structure.

Exxon is currently building an 800 Kt/year ethylene cracker, and the government is considering building a further plant.

Domestic demand for ethylene (1998 calendar year): 0.93 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 0.25 Mt

THAILAND: Petrochemical complexes revolving around ethylene centers are being built in the Rayong and Map-ta-phut areas, under the guidance of the Petroleum Authority of Thailand (PTT), and principal production is in ethylene, PVC, and PP. The Thai petrochemical industry grew up through the 1990's. In 1991, PTT founded the National Petrochemical Corporation (NPC), in 1994, Thai Olefins (TOC) was completed, and of late, ethylene centers have been developed by Thai Petrochemical Industries[98] (TPI: 350Kt/year plant, founded in 1997) and the Siam Cement subsidiary Rayong Olefins (ROC: 600Kt/year plant, founded in 1999), all going toward the reinforcement of the local industry.

With the onset of the currency crisis, capital strength has weakened and the pitch of industry restructuring has picked up. Originally, there had been a division of labor between publicly-owned crackers (operated by PTT) and privately-owned derivative plants (operated by TPI and other companies), but with the arrival of the TPI and ROC ethylene centers, a more competitive corporate structure integrating both upstream and downstream production has become increasingly prevalent. Soon after the onset of the financial crisis, Siam Cement—parent company to ROC—embarked upon a course of financial consolidation through shedding non-strategic operations and focusing on petrochemicals, and the ROC olefin center has maintained its position as one of the most competitive plants in the ASEAN forum.

[98] Thai Petrochemicals Industries is a private-sector company, which originated as an ethylene derivative producer.

ROC was originally built at a time of recession, reducing the construction bill and enhancing competitiveness over its rival companies, in stark contrast to TOC, built at the height of the economic bubble and struggling under the burden of high fixed costs; a merger between ROC and TOC is currently being considered. In a context of diminished local capital, Dow Chemical is looking to firm up its downstream derivative production facilities by building an ethylene center. New plants coming on line and plant expansion works over the past few years have resulted in a shift in the petrochemical industry from meeting local demand to relying on exports to absorb production surplus. The PE and PP sectors in particular, where much investment has been focused, now have a 30-50% export ratio.

Domestic demand for ethylene (1998 calendar year): 1.16 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 1.01 Mt

MALAYSIA: The petrochemical industry in Malaysia is controlled by PETRONAS (the Malaysian petroleum authority), with petrochemical hubs utilizing ethane and propane extracted from locally-produced natural gas located in the Kertih (ethylene base) and Kuantan (propylene base) areas. Through PETRONAS, the government has developed utilities and sought to attract foreign capital. The Taiwan-financed Titan Petrochemical & Polymers group is currently building an independent ethylene center utilizing imported naphtha, in the Pasir Gudang area. Fresh capital investment is prolific, with a second ethylene plant (600 Kt/year) to complement the existing Ethylene Malaysia plant (320 Kt/year) in the Kertih area scheduled for completion in 2001, and a second propylene plant (300 Kt/year) to complement the existing plant (80 Kt/year) in the Kuantan area scheduled for completion in 2000, both built by PETRONAS. Titan also built a second naphtha cracker (330 Kt/year) in 1999. Reliance on exports is expected to increase in the future due to the low level of domestic demand. As ethylene is produced from locally produced natural gas (ethane), there is less scope for derivative products than in the case of naphtha. However, as feedstock costs are minimal and plant facilities are compact, price competitiveness is high.

Domestic demand for ethylene (1998 calendar year): 0.50 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 0.56 Mt

INDONESIA: Due to the combined effects of political instability and stagnant domestic demand as a result of the local economic crisis, efforts to attract foreign capital have not been successful, and plant construction/expansion plans have been shelved across the board. Chandra Asri Petrochemical (CAPC: 540 Kt/year ethylene production capacity)—the sole domestic ethylene producer—has been particularly hard hit by the currency crisis, and production has fallen off to around 380 Kt (1998). Downstream ethylene consumers are tending to make use of cheap imports, forcing CAPC into a position of having to rapidly improve its finances and cut costs. CAPC plans to expand ethylene production capacity (from 550 to 650 Kt/year) are currently on ice. As well, the construction of an ethylene center-based petrochemical complex by Trans-Pacific Petrochemical (TPPI: 700 Kt/year ethylene, etc) has been suspended since November 1997 due to a lack of funds, despitethe plant being half finished.

Domestic demand for ethylene (1998 calendar year): 0.64 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 0.39 Mt

CHINA: China was relatively unaffected by the South East Asian currency crisis, with the local economy progressing favorably (GDP growth rate: 8.8% in 1997, 7.8% in 1998) and a solid supply of foreign capital flowing into the country. Having said this, the weighty ethylene production capacity of 4.4 Mt/year is not enough to cover local demand, and overall imports of the 5 major resins are increasing yearly (from 7.4 Mt in 1998 to 8.0 Mt in 1999). Plans are afoot for the construction of an ethylene plant (600 Kt/year), principally instigated by Western companies, but this will not come on line until 2005, such that imports of the major resins are expected to continue growing in the immediate future. Note that in 1998, two Chinese major players were established, in the form of China National Petroleum Corp. (CNPC) and China Petroleum and Chemical Corp. (Sinopec), both of which are to handle all aspects of crude oil and natural gas production, petroleum refining, and petrochemical production. An ethylene plant (approx. 900 Kt/year), a joint venture between Sinopec and BP Amoco, is expected to be completed no earlier than 2007.

Domestic demand for ethylene (1998 calendar year): 4.29 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 7.85 Mt

INDIA: Demand for petrochemical products in India grew at around 15% annually throughout the 1990's, buoyed by the strong local economy, and is expected to continue its stellar course beyond 2000. In 1999, a Gas Authority of India (GAIL) ethane/propane cracker (300 Kt/year), Indian Petrochemical (IPCL) naphtha cracker (300 Kt/year) and Haldia Petrochemicals (HPL) ethylene cracker (420 Kt/year) came on line in rapid succession. These new crackers gave derivative plants a boost, with the major resins in particular shifting across to an export position. The export ratios for PE and PP are 24% and 31%, respectively (1998 figures). Market deregulation policy, introduced incrementally from around 1991, has been maintained by the VAJPAYEE[99] government, as part of which, a move toward privatization has meant that government shares in companies such as GAIL and IPCL will be progressively sold off

[99] Prime Minister: Atal Behari VAJPAYEE (since 19 March 1998); Bharatiya Janata Party (BJP)

from 1999 onward. Major Western petrochemical players see this as their chance to break into the mammoth Indian market, and are fighting tooth and nail for capital participation in the affected companies. The per capita annual consumption of petrochemical products in India amounts to a meager 2.8 kg of resin (about 1/3 the level of China), a figure which is eagerly expected to rise in the future.

Domestic demand for ethylene (1998 calendar year): 1.12 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 2.92 Mt

THE PHILIPPINES: The modernization of the Philippines petrochemical industry is said to have started with the completion of Petrocorp (private-sector JV with foreign companies, such as BASF, TPI, Sumitomo Corporation, and ITOCHU Corporation) PP plant in 1997. Subsequently, JG Summit (Chinese capital) started up PP and PE plants, and Bataan Polyethylene started up a PP plant in 2000. However, development of new ethylene plants is behind schedule, such that in reality, downstream plants have to rely on imports to procure basic chemicals. As current plans for new ethylene plants eventuate, the Philippines will progressively reach a state of self-supply of feedstock needed for domestic production. New ethylene plants are planned for the Limay area, the site of a Petron refinery, and the Batangas area, the site of Shell and Caltex facilities. Both of these will make use of naphtha produced at the nearby refineries. Philippine Olefins (POC) constructed one ethylene center (ethylene: 600 Kt/year; propylene: 300 Kt/year), but the project has run into difficulty due to a breakdown in negotiations between POC and the Garcia group (one of financiers of the project, and one of owners of the Petrocorp PP plant) over prices for raw materials to supply the new plant. The Garcia group has decided to build its own plant, whereas POC is now seeking fresh capital participation, and the original completion date of 2001 is expected to be exceeded by a wide margin. A second ethylene project is being promoted under the lead of the Garcia group, under the name Bataan Olefins & Polymers (BOPC - ethylene: 450 Kt/year; propylene: 230 Kt/year). Despite the project taking time to get off the ground, a number of companies appear to be interested in it. There is the possibility that this second project will be merged with the first. JG Summit Petrochemicals (JGSP) is a third ethylene plant project, headed by JG Summit (ethylene: 350 Kt/year; propylene: 180 Kt/year), which already has PE and PP operations up and running. None of these projects is predicted to come on line any earlier than 2003. As domestic demand for petrochemical products is extremely low, domestic market has to be expanded by stipulating the already existing demand for PE and PP products. As well, product competitiveness has to be enhanced in order to survive on the international ground.

Domestic demand for ethylene (1998 calendar year): 0.05 Mt

Domestic demand for ethylene derivatives (1998 calendar year, on an ethylene consumption basis): 0.274 Mt

4. The current standing of the petrochemical industry in Viet Nam

4.1. Domestic demand for petrochemicals in Viet Nam

Domestic demand for petrochemical products in Viet Nam is still low at around 290 Kt for ethylene derivative products (1998 calendar year, ethylene consumption basis). This figure is expected to grow in the future, in line with increases in the per capita GDP.

Of all ethylene derivative products, PE and PVC have the greatest demand, based on a breakdown of the major resin types. PVC is used primarily as a construction material and as agricultural sheeting, and sees the greatest demand in the early stages of economic development. One feature particular to Viet Nam is that the relative weighting of PP, propylene resins, increases with growth in demand for cement and rice bags, household utensils, and daily commodities.

Table 2: Overview of supply and demand (1998)

(Unit: 10 Kt)

Product	Production capacity*	Production	Imports	Exports	Domestic demand	Import ratio	Balance
LDPE			85		85	100%	-85
HDPE			135		135	100%	-135
PVC	80	10	116		126	92%	-116
Total (ethylene consumption*)	40	5	285		290	98%	-285
PP			162		162	100%	-162
Total (ethylene consumption)			167		167	100%	-167
Benzene			10		10	100%	-10
Toluene			20		20	100%	-20
Xylene			20		20	100%	-20

Note (*): Ethylene: PE 1:1; ethylene : PVC = 26:62

*Capacity current at 1999

Source: Industry estimates

4.2. Domestic supplies of petrochemical products

Only one full-scale resin plant is in current operation (80 Kt/year), and 98% of ethylene derivatives are imported. For the time being, PVC will be manufactured from imported vinyl chloride monomer (VCM), and demand for PE and PP will be met solely through imports.

Of the 10 most feasible resin plant projects tabled prior to the Asian economic crisis, the only one to reach fruition has been the TVPCC PVC plant. All other projects are at a standstill due to a range of factors including the facilitating body pulling out.

4.3. The Mitsui-Vina PVC plant

4.3.1. The current status of the plant

Mitsui Chemicals Co., Ltd. was instrumental in setting up Mitsui Vina Plastics Joint Venture Company (annual production capacity: 80 Kt) in Vung Tau in June 1996. Mitsui Vina Plastics Joint Venture Company built and operates the Mitsui-Vina PVC plant, the first large-scale petrochemical plant in Viet Nam. When the Mitsui-Vina PVC plant first started up in August 1998, there were small-scale resin finishing factories in Viet Nam, but no local producer of the major resins to fuel these factories.

As a result of cheap imports flooding into Viet Nam as a result of a devalued international market, the Mitsui-Vina plant was troubled from the start, producing only around 10 Kt in its first year of operation in 1998, followed by 50 Kt in 1999. Production slumped in 2000, with the operating rate for the first half of the year said to have been around 10%, and production has since halted and production staff been reduced to around one quarter of original numbers. In summer 2000, after 2 years of plant operation, Mitui Chemicals and Mitsui & Co. (owning a combined 46% share in Mitsui-Vina) transferred their stake in Mitsui-Vina to the remaining foreign partner in the joint venture partnership, Thai Plastics and Chemical Corporation (TPC), thereby withdrawing all involvement in PVC production through Mitsui-Vina. Mitsui-Vina's accumulated debt since starting up operations in August 1998 totals USD24M, placing it in a position of near insolvency.[100] The company has been renamed Thai Vina Plastics and Chemical Company (TVPCC) since Mitsui's withdrawal. It acquired an operational license at the end of July 2000, and has since recommenced operations. TVPCC is expected to have produced 20 Kt by the end of 2000.

In June 2000, at the time when production at Mitsui-Vina was halted due to Mitsui negotiating withdrawal of its involvement, Phu My Plastics and Chemical—a joint venture between Petronas (Malaysia), Petrovietnam and Tramatsuco—was granted an operational license, and started work on Viet Nam's second PVC plant. The plant is being built at a cost of USD70M, to be shared 50%, 43% and 7% by Petronas, Petrovietnam and Tramatsuco, respectively. Construction costs are currently low as a result of the currency crisis, meaning that this second PVC plant is associated with lower fixed costs than the TVPCC plant, and thus will be more price competitive.

4.3.2. Background of the Mitsui Vina Plastics Joint Venture Company start-up

In the future when Viet Nam looks to expand its local petrochemicals industry through the induction of foreign capital, it will be valuable for it to analyze the reasons behind the failure of Mitsui Vina. Below, basic details of the corporate structure and problems with international competitiveness are provided.

[100] Mitsui and Thai Plastics are to share this debt, and the local partners of Viet Nam Plastics Corporations and Viet Nam Chemicals Corporation are to accept no liability (Viet Nam Investment Review, Aug 21-27, 2000)

CORPORATE STRUCTURE

The Mitsui-Vina plant had an annual production capacity of 80 Kt, and total capital investment in the project totaled a little over USD70M. As it was a stand-alone plant, all utilities required to run the plant had to be self-provided (power generation, steam, wastewater disposal facilities, etc.), causing a blowout in equipment costs. As the project was put together prior to the 1997 Asian economic crisis, domestic demand predictions were rather optimistic. As a result, the plant site and utilities were sizeable enough to accommodate expanded facilities up to a production capacity of 200 Kt/year.

The entire component of monomer required to fuel the PVC production process was imported, as there is no local production in Viet Nam. Unfortunately, operations started up right at a time when the spread between monomer and polymer was diminished, forcing the plant into a tough operational position from the onset.

Of the USD24M capital, two state-owned Vietnamese companies (VinaPlast and VinaChem)[101] were 30% shareholders (at 15% a piece), and the project was 100% spot financed (based on the present value of land use right at the time). VinaPlast is a resin (plastic) finisher (a downstream company). VinaChem, on the other hand, was originally set up to control the Vietnamese chemical industry, and reigns over 44 member companies. It has reported an annual growth rate of 15-16% each year since FY 1996, although the validity of this claim is questionable, as there are no accounting documents available that have been assessed according to international criteria. Over half of VinaChem's sales are made up of fertilizers, and it also has interests in areas including pesticides, soda, acid and batteries.[102]

The remaining 70% of shares were held by three foreign companies, namely Mitsui Chemicals (36%), Thai Plastics (24%—a PVC company), and Mitsui Corporation (10%). Note that Thai Plastics (based in Thailand) was originally formed as a joint venture between a Japanese and a local Thailand company.

Mitsui Chemicals provided Mitsui-Vina with technological support. As well, the people dispatched from Mitsui Chemical played a key role in running the company. The reason that Thai Plastics took the risk of involving itself in the Vietnamese PVC industry was that, at the time of launch of the project, it identified Viet Nam as an attractive market with potential for future growth, and also that the PVC market was heating up in Thailand and abroad. The PVC project originated in moves to promote the Vietnamese petrochemical industry, and recognition of PVC as being of utmost necessity in developing basic social infrastructure (in the form of sewage and water pipes, housing materials, gas piping, etc.) and a potential growth sector. Noting that demand for PVC is predicted to grow to a reasonable extent in other regions of Asia, Thai Plastics plans to enter the PVC industry in Indonesia

[101] VinaChem: Viet Nam Chemicals Corporation

[102] Based on an interview with a VinaChem representative (September 2000)

as well, again though the medium of a joint venture.

THE INTERNATIONAL COMPETITIVENESS OF MITSUI-VINA PVC PRODUCTS

Financially, Mitsui-Vina had its back against the wall from the very start of operations. Despite the plant having a 80 Kt/year production potential, within the bounds of domestic demand for PVC, the plant produced only around 10 Kt in its first year of operation, and only around 50 Kt in the second year due to disappointing sales. That is, the plant lost out in competition with cheap imports, and was not able to achieve a sufficient market share. Factors contributing to its lack of international price competitiveness include production levels being too low to achieve economy of scale, import duties which would have put the Mitsui-Vina product on an equal footing with cheap imports not being put in place, there being an unresolved clash of interests between the plant and domestic resin finishers, and prices for the VCM needed to produce PVC being high. As a stand-alone facility built on a green-field area, the plant was put in a vulnerable financial position when it first started up, and was cursed by a rise in VCM prices and fall in PVC prices right at this time, narrowing the spread between the two. No effective solution was found to this initial setback.

As scale is all-important in the PVC industry, the plant could be made competitive by expanding operations to 200 Kt/year. In order to put this course of action into practice, a second plant would have to be constructed on the current site. As the infrastructure to drive this second plant (power generation facilities, etc.) is already in place, no fresh investment to speak of would be needed on this front. Consequently, a larger scale plant would enhance cost competitiveness.

Demand for PVC in Viet Nam is optimistically estimated at around 100 Kt (the figure cited by the government), and conservatively estimated at around 80 Kt (the figure cited by industry). Based on this, a plant of 80 Kt/year size should be able to provide the full amount of domestic demand. However, this current market size is smaller than that forecasted at the beginning of the project, and growth in domestic demand is taking time to emerge, partly due to the effects of the 1997 economic crisis.

On the other hand, imports on the part of foreign-owned companies were relatively prolific, and the domestic product was exposed to heated competition with imports (principally from Thailand, Indonesia, and South Korea). In 1999, the Mitsui-Vina plant produced/sold 50 Kt of PVC (i.e. only that amount that could be sold locally was produced). Assuming a domestic demand of 100 Kt, the remaining 50 Kt was made up by imports from overseas.

At the planning stage of the PVC plant, Mitsui-Vina assumed that a 25% import duty would be in place. PVC prices can be highly changeable, but assuming a price somewhere in the range USD400-USD800 per ton, a 25% duty would amount to an extra USD100-200 per ton. In reality, however, at the point that the plant came on line in August 1998, there was no duty on imports. Therefore, Mitsui

Chemicals and other joint venture participants lobbied the government for a duty to be put in place. As a result, a 3% duty was established, on top of which a 10% surcharge was charged (for the duration April to November 1999), making the effective duty on PVC imports 13%. Later however, from December 1, 1999, the surcharge was lowered to 5%, bringing the effective duty level back to only 8%. The difference of 17% between 8% and 25%, equating to USD68-136 per ton, was fatal for Mitsui-Vina. Assuming that a capital outlay of USD70M is to be depreciated over a 10-year period, then annual depreciation of USD7M must be carried out. If the plant is running at its full capacity of 80 Kt/year, then this converts to depreciation of roughly USD88 per ton. Depending on interest rates, equipment costs at start-up can total around USD150/t, when allowing for interest depreciation, a figure which would leap up even higher for deflated production levels. In an attempt to salvage its PVC operations, Mitsui-Vina embarked upon such measures as slashing working hours and bringing the plant operating level right back down in 2000, at the same time as unsuccessfully negotiating with the government for a rise in the import duty on PVC up to 13%.

The level at which duties should be set is an integral component of the Vietnamese petrochemical industry furtherance policy, the appropriate levels of which should be made from the perspectives of both the supply and demand industries. The government can choose to promote the local petrochemical industry, or alternatively to promote the local finishing industry, with the two being incompatible from the standpoint of tariff-based protection. PVC finishers were alarmed at having the duty on PVC imports raised from its original level of 0% to 13%, and having to pay more for the same product. As a result, VinaPlast (a resin finishing company) directly opposed Mitsui-Vina's bid to regain plant profitability in lobbying for the import duty to be lowered, despite its position as 15% shareholder in the joint venture. Additionally, the Ministry of Industry—formed a few years earlier through a merger between the Ministry of Heavy Industry and the Ministry of Light Industry—found it difficult to form a unified policy, and found itself caught between supporting the PVC plant and supporting resin finishers, and was unable to present a unified front. This resulted in the expected level of duty not being imposed on PVC imports, and led to the newly started PVC plant being forced into stiff domestic competition.

One further reason for the difficult position of Mitsui-Vina was the price spread between VCM and PVC. At the time, supplies of VCM, required to produce PVC, were scarce, but PVC (resin) was in a state of oversupply. Both VCM and PVC are internationally marketable products, and the narrow spread between the two products was hurting the profitability of resin producers having to buy VCM.

Since the onset of the Asian economic crisis, demand for PVC has stalled, producing a state of relative oversupply. This has lead to PVC export nations such as South Korea and Indonesia casting marginally priced PVC onto the Vietnamese market, a situation which is expected to continue for a while yet. That is not to say that PVC prices in the South East Asian market are at a record low. Rather, prices for VCM are at a record high, greatly reducing the price spread between the two, and eating away at the profits of PVC producers.

Supplies of VCM are expected to rise in the future. A 400Kt/year VCM plant came on line in Malaysia in the latter half of the year 2000 (through a joint venture between PETRONAS and Mitsui Corporation), of which about 150 Kt will be consumed by domestic polymer producers, and the remaining 250 Kt is destined for exports. This is expected to bring relief to international VCM price levels, although it will not resolve the global shortage in VCM. This is symptomatic of global increases in the numbers of PVC plants in operation.

Once the Asian economy has recovered to a certain degree, PVC will be a key resin, indispensable in developing infrastructure in countries like Malaysia, Viet Nam, and the Philippines, and demand for PVC can be expected to greatly exceed that for PE and other resin types. However, as Viet Nam will be unable to domestically produce VCM for the foreseeable future, it will have to remain 100% dependent on imports of the product. International prices for VCM are forecasted to remain tight for some time, and until the PVC market in Viet Nam and throughout Asia recovers, domestic PVC manufacturers are expected to continue to fight an uphill battle.

One additional issue making life difficult for Mitsui-Vina was the lack of independence over local partners to make hard corporate decisions.[103]

In July 2000, Mitsui-Vina was renamed Thai Vina Plastics and Chemical Company (TVPCC) and recommenced operations under the helm of TPC, but under the same basic corporate conditions and in the context of the same basic problems as its predecessor. The plant is left with task of depreciating equipment costs, and overcoming negative factors such as exposure to direct competition with cheap imports and potential rises in material costs. In order for the financial and technical contribution of foreign capital to be maximally effective, it is essential that the government have a consistent industry policy based on a long-term vision for each industry. The government is in the difficult position of having to choose between the furtherance of either the local petrochemical industry or the local resin finishing industry, the two of which cannot co-exist. If it is to opt for petrochemical industry furtherance, then some form of government protection must be offered for the first five or so years of operation, to buffer the local industry from the effects of changing international price levels. Unless such protection is offered, small stand-alone plants have no hope of competing directly with large-scale, highly efficient foreign companies.

[103] Based on an interview with a VinaChem representative (September 2000)

5. Issues relating to AFTA/WTO membership

The capital backing, technological skills, and sales prowess of foreign companies is an essential component of petrochemical industry furtherance. However, with domestic demand as it is in Viet Nam, it is near impossible to attract foreign investors, no matter how much potential the market holds for the future. A wide range of industry protective policies (e.g. corporate tax reductions, import duties, infrastructure development, guaranteed supplies of cheap feedstock, subsidies, etc.) must be adopted to entice foreign companies into the industry.

The Viet Nam government must look out for not only the interests of the petrochemical industry, but also the resin finishing industry. With the impending AFTA/CEPT deadline in 2006, Viet Nam can no longer afford to concentrate efforts on protecting either one of the two industries, and the Ministry of Industry must adopt a policy that balances up the interests of the two.

From the perspective of the PVC finishing industry, the current 0% duty on VCM imports is highly advantageous. On the other hand, the current effective 8% duty on polymer imports makes it difficult for domestic products to compete with cheap imports from neighboring countries. In the case of the Philippines, the Philippines Resins Industries plant which came on line in 1999 (PPII: 70 Kt/year) performed well under the effects of a government duty of 20%, to the degree that an expansion of production capacity (to 140 Kt/year) is being considered. If policy is to be used to promote PVC production, then measures of this type are required.

If, on the other hand, protection of the resin finishing industry is to be prioritized and the duty on resin imports is kept to a minimum, then an immediate benefit could be expansion in resin demand. However, there is only a limited period of grace until the CEPT deadline of 2006, after which point it will be extremely difficult to maintain policy of this type. By 2006, domestic demand for locally made PVC products must be large enough to support the local industry, domestic products must be competitive enough to stand up against imports, and the PVC industry must have matured sufficiently to engage in the export of products. If it is not going to be possible to raise import duty levels in the interests of protecting resin finishers, the only path left open to the government is the implementation of non-tariff trade barriers for a limited time. Given that the WTO has an aversion to non-tariff trade barriers and Viet Nam is currently applying for participation in the organization, however, it would not be easy to adopt this tack.

Throughout Asia, relatively high level duties (up to 40%) have traditionally been applied on PVC imports in order to protect the local industry. Most likely, each country hopes to write off depreciation costs before the CEPT time limit, by way of giving the local petrochemical industry a shot in the arm through duties and other protective measures. In actuality, countries are gradually lowering duty levels as depreciation costs are defrayed and industry performance picks up. Viet Nam is about the only country to have had a 0% duty at the start-up of the local PVC industry, only to raise and then lower the tariff level further down the track.

Having said this, there have been instances of governments protecting the local petrochemical industry through non-tariff-based means, such as the Malaysian import control system on petrochemical products (PE and PP) based on the exceptional measures contained in GATT Article 18C for member countries in the early stages of development.[104] Article 18C permits non-tariff-based protective measures "in the case that government assistance is necessary to raise general living standards for local nationals through the furtherance of infant industries," which the Malaysian government used to good effect in adopting PE and PP import restrictions. Through the application of this article by way of notification to and negotiations with the other WTO member countries, it is possible to adopt all the protective measures forbidden under the WTO rules other than GATT Articles 1 (Most-Favoured-Nation Treatment), 2 (Tariff Rates Bindings) and 13 (Non-discrimination of Quantitative Restrictions). This implies the possible use of trade provisions that breach the principles of National Treatment (GATT Article 3). In Malaysia's case, import restrictions on petrochemical products were allowed despite initial opposition on the part of Singapore, which was eventually revoked before going as far as arbitration by a panel or the WTO executive.

Note that the WTO does not approve of non-tariff trade barriers, but is tolerant of duties. In Viet Nam's case, there is still time left before the AFTA/CEPT time limit (2006) to selectively apply import duties on products originating from both within and outside the ASEAN region (for as long as is possible until the final AFTA/CEPT time limit), to protect and promote local industry.

If import duties are to be enforced and midstream industries such as PVC production are to be prioritized, then measures must simultaneously be adopted to shield downstream industries such as PVC finishing from being disadvantaged, to a degree that will not attract the attention of the WTO. Examples of such measures are reimbursing the equivalent amount of duties applied to a product at the time of export (as happens in Thailand, for example), or indirectly reducing the costs of downstream industries by providing cheap raw materials to midstream industries.

The joint achievement of protection/promotion of the local petrochemical industry and furtherance of export industries, is an essential component of generating additional demand for petrochemical products.

6. The medium and long term outlook of the petrochemical industry

6.1. Major resin operations which can be established between now and 2006

The most effective policy direction for the present is to set the lone PVC plant in current operation back on track, and at the same time form a beachhead for PP and PE production before 2006. Only when downstream sectors have become established and shown signs of growth, should the furtherance of upstream industries be considered. Premature large-scale investment should be avoided at all costs.

[104] Report on WTO Consistency of Trade Policy by Major Trading Partners, Year 2000, Chapter 2 "National Treatment", International Trade Policy Division, Japanese Ministry of International Trade and Industry

PVC: The PVC plant in current operation should be expanded up to a production capacity of 200 Kt.

Other than raising import duties, the PVC plant would benefit from such measures as the preferential allocation of policy-based finances. If, for example, the interest rate on borrowings were reduced from 6% to 0%, a cost saving of USD50/t would be forthcoming, based on simple arithmetic over a production capacity of 200 Kt/year and capital investment of USD70M. Given that the price of PVC is currently USD700-800/t, and the spread over VCM is USD150-160/t (historical average), this cost saving would benefit the plant greatly.

If the second PVC plant were to start up, then large-scale oversupply would result, possibly forcing both plants into bankruptcy. If this were to occur, then companies in developed countries would lose faith in the Vietnamese government, inhibiting future investment in the country. Companies could possibly look to other ASEAN countries where due industry protection was forthcoming, to develop production centers, and use these as export bases to supply the Vietnamese market. The greater the loss of faith in the Vietnamese government, the more foreign companies will look to make only short-term returns in Viet Nam, translating into minimal capital investment and no real technical transfer, such that long-term industry furtherance is not a realistic prospect. The government must work hard to minimize the effects of the bad image created by the Mitsui withdrawal. Assuming for the moment that TVPCC is to flounder due to the emergence of a second PVC plant or similar, then any company looking to invest in Viet Nam is going to lose interest.

PE AND PP: Given the current state of the Vietnamese petrochemical industry, the first step towards beefing up the industry should be to produce supplies of PP resin for cement and rice sacks, and PE resin for plastic products (wash basins, buckets, etc.). While demand for these two resin types is relatively high in volume, there is little demand for high quality resin. Taking things to the extreme, products that would fail quality standards or be classed defective in the stringently regulated motor vehicle parts industry, would be quite adequate as the base material for daily commodities. As such, it makes much more economic sense to purchase defective products from foreign resin producers, than to go to the bother of investing in a local plant. Note that cheap plastic commodities are mass-produced in the millions of tons in China, and there is the danger of contraband products making their way into Viet Nam.

The greatest demand for high quality PP is in the motor vehicle industry for use as bumpers, for example (almost all bumpers are made form PP), followed by the electric appliance industry. Therefore, growth in such industries could lead to the expansion of local supplies of PP. However, if demand is to be focused at low-quality, low-priced PP, and not high-quality, high-priced PP, then the chances of successfully establishing domestic ethylene operations are slim, even if local demand is to reach the quantitative level of 400-500 Kt.

The optimal scale of PP production operations was formerly around 100 Kt, but is now internationally held to be 200 Kt from consideration of economy of scale. In the future, however, this is expected to reach a level of 300 Kt. The optimal scale of PE operations is 200 Kt per plant.

In 1998 (calendar year), domestic demand for PP was 162 Kt, which was filled exclusively through imports. Imports of PE in 1998 (calendar year) totaled 85 Kt of LDPE and 135 Kt of HDPE, again with domestic demand being filled exclusively through imports. Assuming for a moment that these quantities were to be produced locally, it would be difficult to import monomers (propylene and ethylene) in sufficient quantities to fuel production. One inescapable reason why PE and PP plants have not been built locally despite domestic demand being of a reasonable size, is that there is no incentive to go to the lengths of importing ethylene and propylene to use in the production process, due to transportation difficulty[105] (although there are certain levels of distribution of these products within Asia). Additionally, in attempting to attract foreign capital to such an enterprise, there is little merit to building a PE or PP plant in Viet Nam, other than low wage levels. In the Map-ta-phut area of Thailand, a full range of petrochemical facilities exist on the one site, from a naphtha cracker to downstream plants, making the general area amenable to PE or PP production, but Viet Nam is not yet at that stage. If an ethylene cracker is to be built in Viet Nam in the future, due consideration should be given to the efficient linkage of upstream and downstream operations in this manner.

Viet Nam could, of course, take the line that it is better off purchasing PE and PP resin overseas, and fashioning it into commercial products locally. From the perspective of the long-term prospects of the petrochemical industry, however, it would be better off generating incentives for PE and PP facilities to be set up domestically.

If PE and PP production are to be promoted in Viet Nam in the future, then the following sequence of development should be adopted:

(1) Expand domestic demand through the promotion of resin finishing industries (electrical appliances, etc.), relying on imports

(2) Build an internationally competitive resin plant once domestic demand has reached a certain level. Here, it is important that raw materials are procured as cheaply as possible. In Thailand, naphtha is imported and a naphtha cracker used to produce ethylene and propylene.[106] Ethylene and propylene, even, could be imported assuming that there is a cheap, reliable supply route.

If the decision is made to not follow the above sequence and establish a domestic PE production industry relying on ethylene imports before the CEPT 2006 time limit, without waiting for domestic demand to mature, then the government will have to protect domestic products from imports. Over the short term at least, production will be targeted at consumers of low-quality PE (producers of daily

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[105] Ethylene and propylene are gas in normal condition and have to be liquefied to transport. Thus a number of special equipment and carriers are required for transportation.

[106] Presently, the petrochemical industries of most countries (including South Korea and Japan) rely on imports of naphtha.

commodities), and the domestic product will be forced into a price war with cheap imports. Normally, the price of low-quality PE is not high enough to cover the fixed costs of a newly-established plant, and if import duties or similar are not employed to protect the domestic product, domestic producers will not be able to keep their heads above water. For a PE plant of 200 Kt capacity, capital investment would probably amount to around USD50-100M. If depreciation of capital investment can be written off over the medium to long terms, then the plant would become price competitive, but at the outset of operations, it would struggle to survive without public assistance. Eventually, domestic demand for highly value-added, high-grade, high-priced PE is expected to develop, but for the time being, it is not possible to make grand predictions about the future.

The construction of a PE or PP plant takes at least 2 years from planning to completion, and the actual construction time is from 12 to 14 months. Additionally, depending on the site, extra time is sometimes needed to properly prepare the plant foundations. As PE and PP plants are extremely heavy, soft ground must be improved to a certain level of hardness. In the case of Viet Nam, there is the possibility of having to reclaim land and build up soil hardness for certain areas (as the soil tends to be soft in delta areas), which would push the construction time well over 2 years. In this sense, there is very little time at hand before the 2006 deadline.

Apparently, there are plans afoot to build a 150 Kt/year PP plant as part of the Dung Quat No. 1 oil refinery complex, at a cost of USD200M. Material costs would be kept to an absolute minimum due to the plant drawing on gas byproducts produced in the refining process, suggesting that the project has strong potential. However, as it is extremely difficult to recover fixed costs in the Vietnamese market, maximum use must be made of fund sources such as Petrovietnam in order to minimize the level of interest-paying debt. Other outstanding issues include finding a foreign partner to provide technical assistance, and the government offer some form of shock absorber back-up to buffer the plant from price fluctuations at start-up.

RAW TEXTILES: The domestic production of raw textiles is a realizable prospect in the distant future. In South East Asia, as in China, the greatest demand is presently for polyester feedstock. Plants of size around 300 Kt (for a single plant) to produce purified terephthalic acid (PTA), one of the raw materials to produce polyester, have been built by joint ventures in Thailand and Indonesia. Most modern-day PTA plants, however, are in the 600 Kt class. Demand is progressively expanding, but on the supply side also, plans are well underway for the construction of plants in countries including India, Pakistan, Thailand, and Indonesia.

Polyester is the ultimate synthetic textile, and has overtaken nylon to become the most popular textile for standard clothing. If a long-term industry outlook is to be taken, then the case of Thailand[107] suggests the possibility of promoting the raw textile industry in a two step process, progressively developing operations further upstream based on the strength of downstream demand, starting with sewing and finishing operations, then moving into polyester production, before finally promoting production of the base materials needed to produce polyester. However, as Viet Nam currently lacks the expertise needed to achieve this, and given the considerable technological lead of neighboring countries, it is quite possible that even if Viet Nam aims to get into the textile base material production industry in the distant future, there will be no position left for it in the market. It will be a tremendous task to catch up to countries such as Indonesia that have an industry background of over 30 years and a broad technical base.

6.2. The global strategy of foreign investment, and placing of Viet Nam in the big picture

The future course of international capital will be a vital issue in determining the prospects of survival of the Vietnamese petrochemical industry. To take the example of Japanese capital, the place of Viet Nam within the global strategies of Mitsui Chemicals (for the upstream sector), and Toray and Teijin (for the downstream sector) will have a great bearing on the future of the Vietnamese petrochemical industry.

The Japanese petrochemical industry has identified Asia (including Japan) as a strategically important market, more so than Europe, the U.S. or other regions around the world. As trade within the ASEAN forum is freed up under the terms of AFTA and borders are removed, the decision as to which country to locate a production base in will be made based simply on the competitiveness of that nation. As things stand, Viet Nam will find itself in an extremely difficult position given the outdated nature of its industrial structure as compared to neighboring countries.

However, no matter how borderless Asia becomes in economic terms, national borders will of course remain in practice, and there will still be the need to balance up international trade figures. Viet Nam will not be able to keep its head above water by exporting only low value-added products (e.g. agricultural products) and importing its full component of highly value-added products. In considering transportation costs along with any number of other factors, it makes sense for petrochemical products to be produced domestically in the long term. For this purpose, the Vietnamese government must adopt a policy of guiding and promoting the local production of highly value-added petrochemicals. In the case of nearby countries, the various governments have adopted protective/promotional policy through taking a leading role in investing in joint ventures with foreign companies, developing infrastructure (Singapore), providing stable supplies of feedstock (Thailand and Malaysia), imposing high-level import duties (Thailand and

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[107] Teijin and Toray started polyester textile finishing operations in Thailand in the 1970's, and there are also large numbers of local Thai textile finishers. On the strength of the over 20 years of consolidated industry experience of these companies, plants to produce the basic materials needed for polyester production have finally been built in the last few years. Since the economic crisis, Siam Cement—with direct links to the Thai royal family—has turned around its former policy of trying its hand at every industry (including cement, steel and petrochemicals), to focus its core operations on the petrochemical industry by way of aggressive expansion operations.

Malaysia), and offering corporate tax reductions (Malaysia and other countries). However, the Vietnamese government must think seriously about the cost of industry protection and promotion. It is important that the government determines the most efficient way of channeling its limited resources into true economic development, rather than aiming for domestic production at any price. The balance of supply and demand in South East Asia is currently tipped toward oversupply, and if exports are going to be remain cheaper than what the locally-produced product would cost over the long term, then there is little economic sense in working toward domestic production. In addition to keeping an eye on the scale of domestic demand and the balance of supply and demand with other nations, the Vietnamese government must give thought to conformance with the requirements of AFTA/WTO, and provide policy-based support for the realistic, stepwise promotion of the local petrochemical industry.

It is important that Viet Nam realizes that it is vastly inferior to other ASEAN countries as a petrochemical production base, in terms of operational conditions. Negative factors abound in Viet Nam, including the cost of investment being inflated due to underdeveloped infrastructure, utility costs being relatively high, and core user industries being immature and the general market being underdeveloped. As such, there is very little possibility of petrochemical production facilities being developed in Viet Nam even if it were to deregulate the local industry. In order for Viet Nam to tap into the potential of its natural gas, crude oil and other energy resources, it must look hard at its current position, lay out long-term, well-documented industry furtherance policy, and actively seek to attract foreign investment.

Thoughts on Promoting the Vietnamese Urea Fertilizer Industry

1. Introduction

Current imports of urea into Viet Nam amount to 2.3 Mt (for the 1998 calendar year), making Viet Nam almost entirely dependant on imports to fill its domestic demand. The Vietnamese government had previously (at the end of 1997) considered increasing the capacity of an existing urea fertilizer plant (the Habac plant: coal-based, production capacity at the time of 60,000 t/year), or alternatively enter into a consolidated project to build a pipeline, power plant and ammonia/urea plant (800,000 t/year), in the hopes of saving foreign currency through reducing imports, while making effective use of the natural gas being produced in the Southern Con Son Sea. This project was a joint venture between a group of foreign plant engineering companies headed by BHP (an Australian mining company), and a group of state-owned companies including VinaChem (a state-owned chemical company) and Vigecam (a state-owned agricultural resource company), with the respective groups providing 70% and 30% of capital. According to reports, the project is currently on hold due to capital procurement problems and BHP looking to withdraw its involvement.

The international market value of urea is weak, lying at around USD70/tonne at the end of 1999 and expected to stay down around USD100/tonne for the medium term. In this report, we evaluate the feasibility of urea self-sufficiency policy in Viet Nam, through consideration of international supply and demand, and the standing of neighboring countries.

2. Features of the urea fertilizer industry

2.1. Applications of urea fertilizer

The principal application of nitrogen fertilizers such as urea is in rice production, as a primary fertilizer before planting and a topdressing fertilizer later in the growing process. Viet Nam ranks with Thailand and Myanmar as one of the three main rice exporters in the world, and urea is an important additive fertilizer in rice production.

Urea is made up of 46% nitrogen, about 30% of the active component of which is absorbed into the rice grain, and the remaining 70% is flushed away by water. It is difficult to objectively gauge the crop gains availed through the use of urea fertilizer, but leaving aside factors such as rice variety and soil quality, the following is apparent through a rough international comparison of rice yields. The amount of nitrogen fertilizer used in South Korea, Japan and China—countries where top-level rice yields in the realm of 60,000 kg/ha are achieved—is 170 kg/ha, 83 kg/ha and 145 kg/ha, respectively. In comparison, a mere 26 kg/ha of nitrogen fertilizer is used in Viet Nam (IFA 1998), and production is relatively low at 36,000 kg/ha. Given that Viet Nam is blessed with an environment where two or three rice crops are possible a year, and that the rice variety used is a higher consumer of fertilizer than that used in Japan, it would appear that there is significant potential for rice production increases through increasing the amount of fertilizer input.

2.2. Features of urea production

Urea production is generally carried out at an ammonia/urea plant. Ammonia/urea plants use natural gas to produce ammonia, which is then converted into urea. In the urea production process, natural gas (principally methane: CH_4) is first decomposed into ammonia (NH_3) and carbon dioxide (CO_2), and these products of the first reaction are then reacted together to produce urea ($CO(NH_2)_2$) and water (H_2O). As a result, urea plants are generally designed such that the component processes are combined together.

At present technological levels, a 570,000 t/year capacity plant is considered to be the most technically sound and economically efficient (combining a 1,725 t/day capacity urea plant and 1,000 t/day ammonia plant, at an initial outlay of around USD240M including utility development). In building a plant of this size, however, the lead time before the plant can begin operation is estimated to be between 5 and 6 years, including a little under 3 years of construction time. Urea production is therefore a highly capital-intensive industry involving high levels of initial investment, and it takes around 10 to 20 years to recover the total investment amount. As such, it is costly to both enter and get out of the urea industry, and extremely difficult to adjust production capacity dynamically. If there is a surplus of capacity, the temptation is to ignore fixed costs, and continue operating at break-even variable costs.

2.3. The international market for urea

In the drawn-out market depression of the 1980's, the price of urea fluctuated in the range of USD100 to USD150/tonne (marking a low of USD70/tonne), but the market turned around in 1995, reaching around USD200/tonne at the beginning of that year. However, since May 1997 when China—the top urea consumer—adopted import bans in order to reduce foreign expenditure, the market has weakened, and the price of urea was down to around USD70/tonne at the end of 1999.

Demand for urea fertilizer is predicted to rise constantly in the future, centering around the Asia region, but at the same time, marginal profit exports from the Middle East and former member nations of the Soviet Union (FSU) are expected to increase, and the international market for urea is likely to remain weak for the time being.

The principal players in the international urea market are the large-scale exporter nations of the Middle East and FSU (5.56 Mt and 5.70 Mt, respectively, for the 1998 calendar year), and the potentially large-scale importers of India and China. The two agricultural giants of India and China, in particular, have had a large effect on the market, in how much urea they have been prepared to buy internationally. The rise in prices from 1993, for example, is largely due to increases in purchases by these two nations, due to favorable movements in exchange rates. As a result, the price of urea fertilizer exports from Indonesia rose from USD102/tonne in 1993 to USD240/tonne in 1995 (FOB prices). Consequently, analysis of the production capacity and import trends among these four major players is vitally important in predicting future movements in the international urea market. Here, it is worth noting that both India and China are currently in the extraordinary positions of having import restrictions or bans in place. As India and China are currently working toward WTO membership, changes in urea import restrictions can reasonably be expected in the future. In fact, official complaints on the restrictions in force in India and China are being tabled for submission to the WTO, and both countries may be forced to change their urea import policy at some future point.

As detailed in Table 1, projected urea market prices differ a little from what they are at present. Table 1 also lists FOB prices for the main export regions of the Middle East, FSU and Caribbean since 1995, alongside C&F (cost & freight, without insurance) prices for the principal importer of China.

Table 1. Average urea price projections

(current USD/ton bulk price)

	Middle East FOB	FSU FOB	Caribbean FOB	China C&F
1995 average	206	185	200	222
1st Quarter	200-230	178-215	192-225	215-251
2nd Quarter	170-210	145-190	165-220	195-230
3rd Quarter	169-220	148-195	160-210	193-225
4th Quarter	220-232	195-215	210-230	225-245
1996 average	195	180	191	202
1st Quarter	201-215	185-205	185-215	219-230
2nd Quarter	176-200	150-188	170-200	187-206
3rd Quarter	191-203	170-192	180-210	187-206
4th Quarter	182-193	166-183	165-204	180-198
1997 average	133	115	135	142
1st Quarter	156-182	135-173	153-195	160-197
2nd Quarter	128-160	108-137	118-165	132-160
3rd Quarter	100-128	85-105	100-123	120-133
4th Quarter	90-120	85-95	110-115	110-140
1998 average	91	81	97	100 nom
1st Quarter	80-98	75-89	92-102	100-110 nom
2nd Quarter	89-113	85-100	100-110	100-115 nom
3rd Quarter	89-96	75-87	96-110	95-110 nom
4th Quarter	70-93	65-78	68-98	80-90 nom
1999 average	79	67	77	89 nom
1st Quarter	71-86	62-78	68-79	80-95 nom
2nd Quarter	74-84	60-68	68-81	80-90 nom
3rd Quarter	74-81	62-73	75-81	85-95 nom
4th Quarter	77-83	63-70	78-83	90-100 nom
2000	75	65	75	85
2001	75	65	70	85
2002	80	70	75	90
2003	85	75	85	95
2004	80	70	80	90
2005	80	70	80	90
2006	90	80	90	100
2007	100	90	100	110

N.B. The price forecasts are expressed in current dollars including allowance for an average inflation factor of 2%/year.
Source: FERTECON "Urea Outlook Quarterly 1999"

2.3.1. The standing of key nations

FSU: On a bulk FOB basis from the Black Sea region, urea prices in the FSU (former Soviet Union) peaked at between USD195 and USD215/t in the 4th quarter of 1995, before slumping to USD60 to USD68/t in the 2nd quarter of 1999, at which basic level they have remained. As urea fertilizer is an international market commodity, products from the FSU and Middle East closely interact with each other on the international market scene, producing closely corresponding price fluctuations. The competitiveness of FSU-produced urea was boosted by the devaluation of the ruble in 1998, and export volumes have increased by around 30% over what they were before the devaluation. By way of tapping into cheap supplies of natural gas, the FSU is expected to further increase its urea market share in the future.

Middle East: Export volumes from the Middle East have been bumped up by the servicing of new plants in countries such as Saudi Arabia. The urea output for 2000 is predicted to be over 6 Mt, an increase of around 50% over that for 1995. Exports from the Middle East at marginal profit margins are expected to further increase in the future, as the plentiful local supplies of natural gas are put to use.

China: Subsequent to the announcement in May 1997 that a ban was to be placed on imports of nitrogen fertilizers, due to self-sufficiency of urea and nitrogen fertilizers having been achieved, China completely ceased importing nitrogen fertilizers from 1998. This trend looks likely to continue for a few years yet. Annual imports of nitrogen fertilizers prior to the ban were between 3 and 7 Mt. The retail price of urea is currently determined independently of international market prices. Prices quoted in Table 1 are theoretical,[108] and the actual price paid by farmers to purchase urea is higher than this even, estimated at around USD170/t (packed, over the counter). Based on this figure, Chinese farmers are being forced to buy urea fertilizer at a price significantly higher than international market prices, even when allowing for packaging and distribution margins on the international product.

The retail price of urea fertilizer in China is well above international market levels, and one gets the feeling that bans on imports are aimed at protecting the fertilizer industry, rather than their true intent of protecting the agricultural industry. In practice, farmers are not paying for purchases of fertilizer in reaction to their not receiving payment for government grain purchases, such that the inflated price of urea fertilizer is more due to payments for purchases not being forthcoming, than the state-owned enterprise in charge of urea fertilizer supplies being inefficient. It would appear that useless promissory notes are in common circulation, but money is stagnant. While there are large-scale urea plants in operation, there are also large numbers of traditional coal-based urea plants still running, which is a contributing factor to the high price. It is doubtful that whether rice produced using expensive urea fertilizer would be competitive on the international market. Assuming that China achieves WTO membership, however, it is expected that imports will restart and domestic manufacturers will be culled.

India: The India government has total control over the price at which fertilizer is sold to farmers, and fertilizer manufacturers are reimbursed with any discrepancy between cost price and the retail price, in the form of subsidies. As such, indirect protection of the agricultural industry is provided by way of

108 As China has no import record from 1998, the nominal prices given in Table 1 were calculated from the price of urea shipments from the Middle East and Black Sea to Viet Nam, to which freight costs to China were then added and adjustment made for the fact that China would be able to accept imports in lots of around 50,000 t, rather than only 20,000 to 30,000 t in the case of Viet Nam.

subsidizing fertilizer manufacturers to maintain fertilizer prices at a fixed level, rather than subsidies being provided directly to farmers. The government determines the price of fertilizer and also calculates the cost of producing urea fertilizer using domestic reserves of natural gas, and any disparity between the two is made up in the form of subsidies. The setting of fertilizer prices is always a central policy issue in India, and a point of contention in the Indian parliament.

Additionally, in determining the production cost of urea, fixed costs are calculated at an operating rate of 90%, whereas the actual operating rate of urea plants tends to be as high as 110%. This disparity of 20% converts into a profit for the fertilizer company, making the fertilizer industry highly lucrative. While international urea price levels easily fluctuate within 2 months, the domestic retail price of urea in India is set as part of the annual budget (theoretically, based on international market prices), meaning that once set, it remains unchanged for a year.

As the domestic retail price is fixed, there are instances where the retail price ends up higher than international market prices. Even here, farmers are forbidden from directly importing urea from overseas, and only public fertilizer corporations are permitted to import urea. That is, Indian farmers may either be able to buy fertilizer at prices below international market levels, or conversely may be forced into buying fertilizer at inflated prices. The subsidy schema for fertilizer has yet to be finalized for this fiscal year (despite it being April 2000 at the time of writing of this report, and the Indian fiscal year running from April to March), and imports are stalled.

Due to the effects of rainfall, imports of urea into India in 1999 were lower than anticipated. In line with an increase in domestic production capacity, imports are expected to level out around 1 Mt annually.

2.3.2. Past developments in the urea market

Urea prices went into prolonged depression in the 1980's, before jumping up in 1995. The principal reason for this was that the key importer nations of India and China were blessed with favorable currency movements, and made the most of their position in buying in large supplements of urea. Imports into China for 1995 approximately doubled over those for the preceding year, and India incrementally increased imports throughout the first half of the 1990's. A further contributing factor on the supply side was that the former Soviet Union (FSU)—a key urea exporter—was in relative upheaval in the few years immediately proceeding the dismantlement of the Berlin Wall in 1989. Related to this, domestic consumption (agricultural production) in Russia plummeted from 1989, resulting in a huge reduction in fertilizer consumption (current consumption of nitrogen, phosphorous and potassium fertilizers, for example, is one sixth of that up until 1988); this internal turmoil is also thought to have an effect on the international market.

The main reason for the bottom falling out of the market between 1996 and 1998 is that China announced a cessation of all imports in May 1997, and India imposed import restrictions around that same time. Up until that point, China had been annually procuring around 6-7 Mt of urea from overseas, but once the last 3.3-3.4 Mt of urea contracted at the time of the import ban announcement were imported during that same year, imports stopped altogether. As a result of these effects, 7 Mt of demand, or the equivalent output of 10 standard-sized plants, evaporated in only 2 years. In 1997, India was the second largest importer of urea (surpassed only by China), importing between 2.5 and 3.0 Mt annually. Through 1998 and 1999, however, imports dropped back to less than 1.0 Mt per year, representing a depreciation in demand of around 1.5 to 2.0 Mt, or the equivalent output of about 3 plants. India's reason for severely restricting imports was that it hoped to achieved self-sufficiency of urea, with new plants scheduled to commence operation and existing plants increasing operating rates. Additionally, India is in the special situation of food policy taking precedence over other policies, and fertilizer being subject to direct government control.

Note that there are no cartels in the urea industry. In the past, Middle East countries had combined to form a league, and held negotiations with their principal clients of India and China to determine prices, which then acted as the standard for other markets. However, since the imposition of import restrictions by India and China, market conditions have altered radically, with the Indian and Chinese markets effectively disappearing altogether, and there is no longer any real common forum for price negotiation.

3. The industry standing in South-East Asia

Indonesia and Malaysia are the main urea suppliers for the Asian area. Based on 1998 (calendar year) figures, Indonesia provided 1.56 Mt and Malaysia 0.38 Mt of the total 2.50 Mt output from Asia. Also, whereas Bangladesh exported 0.42 Mt in 1998, it now relies on imports. This is due to natural gas production levels not being stable and urea plants being unreliable, meaning that levels of imports and exports are variable.

As a result of an improving economic climate and a drop in urea prices, demand in the region has been increasing, and future growth in demand is expected in Thailand, the Philippines, Sri Lanka and South Korea in particular.

Indonesia: Indonesia is the largest producer of urea in South East Asia. It has abundant supplies of natural gas, drawing on gas fields 20 to 30 km off coast, such that the cost of establishing a pipeline link is cheap, and the basic cost is low. There are presently 12 urea plants in operation, with another 3 plants planned for construction. These would bring the annual production capacity up to 1.71 Mt and place Indonesia in the league of the mega-exporters.

Future advances are expected in privatization in the urea industry, but at present, most urea companies are state owned. Additionally, as part of policy to protect the local agricultural industry, domestic supplies of urea must more than cover domestic demand at all times. Pricing of urea is deregulated, and geared to emulate international market movements; there are no restrictions on imports. In no way does the government control or subsidize the urea market.

There are two urea plants in Lhokseumawe, Northern Sumatra: the 627,000 t/year capacity AAF plant (ASEAN Ache Fertilizer, founded in 1984: an ASEAN project, 60% financed by the Indonesian government, 13% financed by each of the Thailand, Philippine and Malaysian governments, and 1% financed by the Singaporean government), and its twin, the 570,000 t/year capacity PIM plant (Pupuk Iskandar Muda, founded in 1985: 100% owned by the Indonesian government). Palembang, in Southern Sumatra and the birthplace of the Indonesian urea industry, is home to 4 PUSRI plants (P-II: 570,000 t/year capacity, founded in 1974; P-III: 570,000 t/year, founded in 1976; P-IV: 570,000 t/year, founded in 1977; and P-IB: 570,000t/year, founded in 1994). Cikampek, near Jakarta in Western Java, is home to the 570,000 t/year KUJANG plant (founded in 1978), and Gresik, in Surabaya, Western Java is home to the 460,000 t/year PKG plant (founded in 1994). There are also 4 KALTIM plants in Bontang, Borneo (K-I: approx. 700,000 t/year capacity, founded in 1987; K-II: 627,000 t/year, founded in 1985; K-III: 570,000 t/year, founded in 1989; and POPKA: 570,000 t/year, founded in 1999). From this, it is evident that Indonesia has 8 urea plants of 570,000 t/year capacity.[109]

Plants planned for future construction which have received official approval from the central government are P-II (PIM), KUJANG-B (relocation and expansion) and K-IV (KALTIM), although little progress is being made on any of these. There is no problem with securing supplies of natural gas, but independent cash flow is limited. PIM-II and KALTIM-IV have both attained financing from the Japan Bank for International Cooperation (JBIC), and Toyo Engineering (TEC) is involved in the construction of the former, and Mitsubishi Heavy Industries the latter.

Myanmar: According to a production expansion plan tabled at the end of 1997, a 570,000 t/year (1,500 t/day) urea plant is planned for construction in 2000. This project is named "Three in One", and involves the construction of a pipeline, power plant, and ammonia/urea plant, under the direction of Mitsui & Co., LTD., and involving TEC and a number of gas companies. The project is currently on hold due to doubts over its economic viability. The natural gas field in located off the southern coast of Myanmar, and the original plan was to build a pipeline joining the gas field to neighboring Thailand, and then build a land-based pipeline link as far as Yangong. The gas is due to come on line soon, but Thailand is not in a position to make use of it, as the project planned to tap into the gas supply (probably a power plant) is on the rocks due to the effects of the local economic crisis.

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[109] 570,000 t /year (1,500 t/day) is reckoned to be the optimal size for a urea plant at current production technology levels, although 2,000 t/day plants are coming into operation in the Middle East.

Thailand: As Thailand has no local reserves of natural gas, it has no urea fertilizer plants, and mainly produces compound fertilizers. In terms of NPK[110] production plants, Thailand boasts the TFC plant (0.6 Mt/year), NFC plant (1.0 Mt/y) and TCCC[111] plant (1.2 Mt/y), all built in 1997. Thailand also has a number of B/B plants in current operation, namely the TCCC plants (0.2 Mt/y and 0.5 Mt/y) and Cargil plant (0.5 Mt/y), which were again all built in 1997. In addition, Thai Cargo manufactures ammonia sulfate (A-S), a nitrogen fertilizer.

In the early stages of industrialization in the 1970's, during the restructuring of the Thai economy from an agricultural to an industrial base, fertilizer was available only through imports, and a large number of companies were involved in the import and retail of fertilizer. In 1972, a joint venture company was formed with private Thai funds and capital from Japanese trading companies, with the intent to mix and retail fertilizer locally; production and retail operations were initiated in 1975. In 1982, the Thai government founded a state-owned fertilizer company to manufacture urea fertilizer locally, in an attempt to make use of natural gas resources and promote import substitution. Plant construction plans were scrapped, however, for reasons of low profitability, attributable to the following reasons: (a) lower international prices for urea; (b) investment risk and the length of the investment recovery period, due to the size of investment required; and (c) the high cost of building a long natural gas pipeline.

Malaysia: All urea plants in Malaysia are state-owned and natural gas-based. As production capacity exceeds domestic demand, Malaysia exports a component of its urea output. Urea production plants currently in operation are the 600,000 t/year Petronas plant (founded in 1999) and approximately 500,000 t/year Bintulu plant (founded in 1983-4: an ASEAN project 60% financed by the Malaysian government, 13% financed by each of the Thailand, Philippine and Indonesian governments, and 1% financed by the Singaporean government). In the case of the Bintulu plant, each subscribing nation has the right to avail itself of a proportion of the output commensurate with its share, but the actual trading volume of each government is determined individually according to market movements and local consumption.

Fertilizer companies in Malaysia are government owned, and run under the same basic policy as employed in Indonesia. Neither Malaysia nor Indonesia exercises control over fertilizer prices, and domestic prices basically follow international market trends; there are also no restrictions on imports, and no form of subsidization.

The Philippines: No domestic production of fertilizer is in operation in the Philippines, and, naturally, domestic prices are geared to international market prices. Imports in 1998 (calendar year) totaled 690,000 t, and are expected to remain around the 800,000 t mark in the future.

[110] NPK: Nitrogen, phosphorus, and potassium

[111] TCCC: Thai Central Chemical Corp.

4. The current position in Viet Nam

4.1. Urea fertilizer demand

Demand for urea fertilizer shot up in the 1990's due to its use as a principal additive in rice production, with imports growing from 760,000 t in 1990 to 2,310,000 t in 1998. In response to the rapid expansion of domestic demand, VinaChem's coal-based Habac plant (current production capacity: 130,000 t/year) operated at high production rates at one time, but the remainder and bulk of Viet Nam's urea intake has being covered through imports. Note that Viet Nam is the second largest importer of urea in the world, at 2.3 Mt to America's top-ranking figure of 3.4 Mt. The main proportion of imports into Viet Nam originates in Indonesia, accounting for 44% of total imports at 1.02 Mt. From the perspective of Indonesia, a remarkable 65% of the total export volume of 1.56 Mt finds its way to Viet Nam. (All figures given in this section are based on the 1998 calendar year, and taken from FERTECON materials.)

4.2. Urea fertilizer supply

Import agencies in Viet Nam are Vigecam, a public import/export corporation under the direct control of the central government, VinaFood, and VinaCafe, a public coffee corporation, each of which is allocated an import quota by the central government. Each province is also allocated an import quota by the central government, and province-based public trade corporations (around 2 or 3 in each province) are given the job of importing the urea. This bipartite structure was employed up until last year (1999), but is due to change from the beginning of 2000, with import quotas disappearing altogether. Urea import rights will be restricted to organizations that have facilitated imports until now, namely Vigecam, VinaFood, and companies with trading rights in each province. Under the previous system, import quotas allocated by the government took the form of a stipulation of how many tons of urea fertilizer or DAP[112] could be imported for the calendar year, but under the new system, import volumes are to be determined at the discretion of each individual company. Note that no foreign trading company has been given import rights.

In practice, Vigecam-affiliated companies (public corporations linked to the central government, which have been allocated import quotas directly by the central government) account for almost half of all imports. The remaining half of imports is carried out by public trading companies authorized by provincial governments or with import rights.

Northern, Central and Southern Viet Nam account for 25%, 15% and 60%, respectively, of overall imports (estimated for 2000), and the discharging ports in each respective area are Hai Phong in Northern Viet Nam, Da Nang and Qui Nhong in Central Viet Nam, and HCMC and Cantho in Southern Viet Nam.

Retail prices for all fertilizer types in Viet Nam are fully open to market competition, such that the

[112] DAP: Diammonium Phosphate

price of urea follows international market trends.

The sole urea production facility in Viet Nam is the Habac plant, located in the metropolitan area of Ha Noi, Northern Viet Nam and operated by VinaChem, a state-owned chemical company. Due to a lack of local natural gas reserves, this plant is coal-based and operates at extremely high production costs, such that it is reliant on government subsidies to sell its product. The Habac plant has an annual production capacity of 130,000 t (current September 2000), but this is expected to be increased to 150,000 t as a result of technical assistance from China.[113] Since Habac plant is currently not operating due to the sharp drop in the international urea price, the plant is scheduled for refurbishment in an attempt to bring the production cost down by around USD40 per ton, at a total cost of USD35 million. China is anticipated to provide USD31 million of the required capital (of which two thirds will be in the form of a 30 year interest-free loan, with a 10 year grace period, and the remaining third will be a gift from the Chinese government), such that the bill on the Viet Nam side will be a mere USD4 million. The IRR for this retooling investment is expected to be around 5-7%.

There was also a plan to construct a urea fertilizer plant (production capacity: 800,000 t/year) by 2000 in Southern Viet Nam, utilizing the offshore natural gas reserves. This project was a joint venture between a group of foreign companies headed by BHP (an Australian mining company), and a group of state-owned companies (the VinaChem chemical company and Vigecam agricultural resource company). The project reached the stage of a feasibility study being carried out on the possibility of building a pipeline, power plant, and ammonia/urea plant as a combined facility, but no progress has been made since. There are no immediate plans for the furtherance of the project, due to BHP looking to opt out and there being problems in procuring capital.

There are a total of 4 natural gas pipeline construction projects currently underway (see Table 2 for full details): ① a 400 km (375 km sea- and 25 km land-based) pipeline from mining sector 06-2 (BP-Amoco), scheduled to come on line in 2002; ② a 60 km connecting pipe from mining sector 15-2 (JVPC) to the pipeline from mining sector 09-2; ③ a 260 km pipeline from mining sector MP3 (a joint development with Malaysia) to the Ca Mau region, scheduled for completion in 2005; and ④ a 230 km pipeline from Block B to Ca Mau. Of these, ③ and ④ are expected to in part supply urea plants.[114]

[113] Based on an interview with a VinaChem representative (September 2000)

[114] Based on interviews with the Planning Dept. and Oil and Gas Processing Dept. of Petrovietnam (September 2000).

Table 2. Natural gas pipeline construction projects (as of September 2000)

Project	*Project details*	*Usage/supply conditions*	*Future projection*
① **Nam Con Son Sea Basin Gas Project** 400 km (375 sea- and 25 km land-based) pipeline from mining sector 06-2 (BP-Amoco)	A 5 year joint project between Petrovietnam (15%), BP Amoco (40%) and ONGC-Videsh Ltd. (45%), at total investment outlay of USD1.5 billion. The source gas fields are Lan Tay and Lan Do, developed in 1993 by BP-Statoil, with reserves reputedly in excess of 57.0 billion m^3. Annual production capacity: 5-6 billion m^3	Gas intended for use at power plants in the Phu My region. The annual gas supply for 2002, 2003 and 2004 is expected to be 2.1, 2.6 and 2.7 billion m^3 respectively. The initial gas cost will be USD1.8/Mbtu, and initial piping cost will be USD0.9/Mbtu, both of which will be increased by 2% annually from the commencement of operation in 2002.	Expected to be in service for 20 years from startup in 2002. Investment IRR is estimated to be around 15%. Chance of the pipeline startup being delayed due to the investors taking time to resolve a conflict in respective interests.
② **60 km pipeline from mining sector 15-2 (JVPC) to mining sector 09-2**	A project run solely by Petrovietnam, at a cost of around USD40 million. Due for completion in 2001	No charge will be made for the gas for the first 3 years of operation	It is expected that the pipeline will supply an annual gas volume of 300 million m^3 for more than a decade
③ **260 km pipeline from mining sector MP3 (joint development with Malaysia) to the Ca Mau region**	To be jointly owned by Malaysia interests and Petrovietnam (50% apiece). Estimated gas reserve of 56 billion m^3. Expected total investment of around USD200 million.	The gas is intended principally for a 720 MW power station and an 800 kt/year urea fertilizer plant. The gas charge will be variable from USD0.46 to a maximum of USD1.50/Mbtu, and the piping charge will be around USD0.80/Mbtu.	It is expected that the pipeline will supply an annual gas volume of 1.3-1.5 billion m^3, from 2005
④ **Pipeline from mining block B to Ca Mau (230 km) and O Mon (200 km over land)**	The 230 km pipeline to Ca Mau is expected for completion in 2006, at an overall investment of around USD200 million. The 200 km land-based pipeline will be built at an additional investment of USD140 million.	The gas is intended for power plants, urea fertilizer plants and the like in the Ca Mau industrial zone and O Mon region	It is expected that the pipeline will supply an annual gas volume of 2.5 billion m^3

Source: An interview with Petrovietnam, Vietnam Investment Review No.460, 7~13Aug, 2000.

5. The possibilities of constructing urea production facilities in Viet Nam

5.1. The profitability of urea production facilities

Below, we review natural gas prices required to make a urea production plant profitable.

In the case of the Indonesian KALTIM-IV plant, a feasibility study was carried out by a Japanese company based around combined 1,725 t/day urea and 1,000 t/day ammonia production facilities, at an initial investment outlay of USD240M including utility, 70% foreign financed, with depreciation calculated by the straight line method over 20 years, and after-tax IRR of 14%. Based on these conditions, break-even urea prices for pre-determined gas prices were estimated to be USD146/t for gas priced at USD1/mmBtu, USD170/t for gas priced at USD2/mmBtu, and USD193/t for gas priced at USD3/mmBtu.

In contrast, according to the feasibility study carried out by BHP on the 800,000 t/year urea fertilizer plant project in Viet Nam, the plant would return a profit only if an FOB selling price for urea of around USD160/t could be attained (presumably, based on the premise of a gas price around USD2/mmBtu).

Also, for one 570,000 t/year urea plant in operation and a second under construction in Hainan, China, the breakeven urea retail price is said to be between USD175 and USD180/t for gas priced at USD2.3/mmBtu.[115] Here, however, the plant ships only pre-packed fertilizer,[116] and this price calculation is presumed to include packing costs.

Packing expenses are currently between USD11.50 and USD12/t in Indonesia. This breaks down into around USD6/t for labor and USD6/t for the sacks. In the past in Viet Nam, port facilities were not adequate to accept bulk shipments, and most imported urea was pre-packaged, but of late, bulk shipments have become more and more common, with packaging taking place locally after receipt of the shipment. Here, the unloading process consists of lifting lots of fertilizer out of the ship with a grab, dropping the fertilizer into a hopper, packing it using a packing machine placed below the hopper, and loading it directly onto a truck. Packing costs in this basic case are around USD3/t, with sacks being slightly cheaper in Viet Nam than in Indonesia. As a result, the total saving in packing costs through receiving shipments in bulk rather than pre-packaged is approximately USD7-8/t. Recently, the trend has been for Viet Nam to buy large lots of 20,000 t to 30,000 t from FSU countries and the Middle East, and smaller lots of 5,000 to 10,000 t from Indonesia.

Given the present weakened nature of the urea market, it is possible to gauge at what level a urea plant will be able to maintain operations through analysis of cash cost levels. In the case of Russia, for example, it was possible to cover cash costs of USD54/t in 1999, and USD57/t in 2000 (both figures FOB in bulk), as evidenced in Table 2; in the case of Ukraine, cash costs in 1999 and 2000 were USD63/t (FOB in bulk). Here, plants should theoretically be able to continue operating as long as market prices do not drop below these levels. The reason that plants in Russia and Ukraine are able to operate at such low cash cost levels is that gas is cheap in the area, and also because of the devaluation of the ruble over the past few years. As gas costs are paid in rubles, the competitiveness of the urea industry in FSU countries has been enhanced by the devaluation of the ruble. In price terms, gas in Russia has dropped appreciably from USD1.80/mmBtu in 1996 to USD0.40/mmBtu in 1999, and in Ukraine from USD2.60/mmBtu in 1996 to USD1.30/mmBtu in 1999. Additionally, the book value of depreciation is calculated in ruble,

[115] Needs verification.

[116] Fertilizer is sold in relatively large lots of either 5,000 t or 10,000 t, and is shipped either pre-packed in 50-kg sacks, or in bulk, in which case it is loaded directly onto the ship in the same manner as grain exports.

meaning that fixed costs are negligible.

In the feasibility study for the KALTIM-IV plant in Indonesia, the minimum selling price of urea given a gas price of USD2/mmBtu was USD170/t, but despite this being higher than urea prices offered by Russia and the Middle East, the Indonesian product can still compete. In Indonesia, there are operating plants that have been fully amortized, and fixed expenses can be defrayed against these plants to some degree. Additionally, in Indonesia, urea fertilizer production is essentially managed as a national project, and national policy stipulates that domestic production should be able to more than cover a steady annual growth rate in domestic demand of 3-5%.

At the same time, however, gas prices in Indonesia are expected to be brought up to international market levels in the future, in response to diminishing energy supplies. Gas supplies to the KALTIM and PIM plants are currently priced at around USD1/mmBtu (and the AAF plant is lower still), but upcoming price negotiations with PERTAMINA are expected to result in a price level around USD1.85/mmBtu. At this stage, it is not certain whether this will be enforced in small price increments, or whether a single interim price of USD1.50/mmBtu will be applied for a period, before urea plants are forced to face the full brunt of the price increase.

Based on modern production technology, the KALTIM-IV feasibility study predicts the gas consumption per ton of urea production to be 23.5 mmBtu. Assuming that the price of natural gas is to rise by USD1/mmBtu, the price per ton of urea will rise by USD23.50/t. This is the founding of the urea price estimations of USD146/t for gas priced at USD1/mmBtu, USD170/t for gas priced at USD2/mmBtu, and USD193/t for gas priced at USD3/mmBtu. Note that existing urea plants in Indonesia are able to operate at a urea price as low as USD60/t (FOB in bulk), without allowing for fixed costs.

If the market were to further weaken in the future, then supplier countries which could be expected to survive until the market picked up again are those with plentiful supplies of cheap gas (which cannot be used for any purpose other than urea production), such as Russia and the Middle East.

Table 3. Russian producers' cash costs of urea supply

(current USD/ton FOB in bulk)

	1995	1996	1997	1998	1999	2000	2005
Gas cost (USD/mm Btu)	1.4	1.8	1.5	1.0	0.4	0.5	1.0
Gas consumption (mm Btu/t urea)	28	28	28	28	28	28	28
Total gas cost (USD/t urea)	39	50	42	28	11	14	28
Other cash costs	38	39	40	30	20	20	30
Total cash cost (FOB plant)	**77**	**90**	**82**	**58**	**31**	**34**	**58**
Freight & loading cost	25	27	29	30	23	23	30
Total supply cost (FOB port)	**102**	**117**	**111**	**88**	**54**	**57**	**88**

Source: FERTECON, 1999

Table 4. Ukrainian producers' cash costs of urea supply

(current USD/ton FOB in bulk)

	1995	1996	1997	1998	1999	2000	2005
Gas cost (USD/mm Btu)	2.6	2.6	2.0	1.5	1.3	1.3	1.8
Gas consumption (mm Btu/t urea)	27	27	27	27	27	27	27
Total gas cost (USD/t urea)	70	70	54	41	35	35	49
Other cash costs	38	39	40	30	20	20	30
Total cash cost (FOB plant)	**108**	**109**	**94**	**71**	**55**	**55**	**79**
Freight & loading cost	10	10	10	10	8	8	10
Total supply cost (FOB port)	**128**	**119**	**104**	**81**	**63**	**63**	**89**

Source: FERTECON, 1999

5.2. The potential for construction plans for Vietnamese urea facilities to reach fruition

There were plans at one stage for BHP (Australia) and TOMEN to build an offshore natural gas-based urea fertilizer plant (800,000 t/year) in Southern Viet Nam in 2000. Below, we discuss the economic viability of this project.

The actual construction of the plant is viable. Machinery companies and plant manufacturers are simply interested in getting a full payment from any loan taken out to build the plant, a need which would be satisfied if the plant was financed through foreign public finances or similar. In reality, however, the plant would need the participation of foreign chemical companies financially, technically, and also in running the plant. For this purpose, Viet Nam would have to adopt tariff-based protective policy on imports so as to protect domestic urea from imports, or alternatively emulate India in adopting industry protective policy to maintain retail prices at a fixed level through price control. Here, it would be difficult to attract foreign capital to a project with no hope of returning an operational return.

As a case in point, the JAPAN VIET NAM plant (founded in 1998 as a joint venture with foreign investors, and manufacturing NPK[117] fertilizer at 240,000 t/year) originally applied for tariff-based protective measures to be introduced to level the playing field for its products with imports. The government complied with the wishes of the newly started domestic plant, and initially banned all imports of NPK and revoked all existing import quotas. However, the import ban was removed due to supply not being able to keep up with momentary seasonal leaps in demand, and also a consumer preference for more familiar imported products. As a result, demand switched across to imported products, and the domestic product has fallen on hard times.

In tandem with this year's revision of the import system to abolish import quotas and allow companies with import rights to import fertilizer freely, the government announced that import duties were to rise. This rise is not to the level desired by the domestic NPK plant (20%), however, and is said to be around 10%. If the NPK plant continues to struggle financially, the incentive for foreign investment in the Vietnamese fertilizer industry may well be diminished.

[117] Compound fertilizer in this case refers not to simply combining component fertilizers in a mixer, but rather the more complex process of crushing up the component chemicals and fusing the mixture into beads.

6. The medium and long term prospects of the urea industry

Even if the Vietnamese government were able to attract foreign investors to participate in its urea plant construction plans, the plant would have a difficult time operating under current international market conditions. According to calculations made as part of plans in 1998 and 1999 to establish an ammonia/urea plant in Australia, for example, a gas price of under USD1/mmBtu, at around USD0.70/mmBtu, would be necessary for the plant to make both ends meet. Similarly, for a joint venture project between the Oman government and a state-owned Indian fertilizer company based on the use of Oman gas reserves, the price of gas is around USD0.50/mmBtu. However, even given such low gas prices, it is difficult for plants to return a profit when consideration is made of depreciation. At current international market prices, and assuming a competitively-priced supply of natural gas, guaranteed sales of urea at USD160/t (FOB in bulk) would be required for between 10 and 15 years to return a profit on investment, allowing for depreciation.

In the case of Viet Nam, a gas pipeline is to be built as far as the outskirts of Ho Chi Min City, such that the gas supplier would have scope to choose the buyer for its gas, and may well opt to sell the gas to power stations at a higher price than the USD0.50-0.60/mmBtu that a urea plant would be prepared to pay. Indeed, the pipeline owners would appear to have signed a contract with a power station to supply gas at around USD2.70/mmBtu. Normally, in locations of high population density, there is demand for gas supplies directly to households and also as a fuel in electricity generation, either of which would produce a higher return than a urea plant. Conversely, natural gas-based urea production projects are viable only in unpopulated locations where urea production represents the only avenue for natural gas use. Consequently, the proposal to build a natural gas pipeline as far as the outskirts of a large consumer area such as Ho Chi Min City, in order to build a urea plant, would be overshadowed by any project to build a power plant or equivalent.

It is difficult to imagine any economic justification for pushing through a urea production plan under such bad conditions. Granted, there is the thinking that by building an 800,000 t/year plant domestically, the current import level of 2,300,000 t will be reduced by that amount. However, comparison of the actual cost of producing 800,000 t/year domestically over importing that same amount, points to imports as the more economically rational approach. There is also the argument that the extra cost is justifiable in the pursuit for food self-sufficiency, and that the project should go ahead. However, even if a war were to break out, it is hard to imagine a scenario in which Viet Nam would not be able to import urea fertilizer from any producing country, added to which, urea is not an essential component of rice production. In this sense, this line of argumentation is not very rational.

As Viet Nam is a major rice producing nation and relies heavily on rice exports to procure foreign currency, any further increases in rice production or the amount of fertilizer added to the rice crop, may in fact produce negative consequences. That is, it is certainly the case that current levels of fertilizer usage are low and an increase could bump up rice production, but this may simply result in a drop in international rice prices, acting to Viet Nam's disadvantage. The other two principal rice producing nations of Thailand and Myanmar are in the same position, and if they combined with Viet Nam to increase levels of fertilizer usage, rice output would increase, leading to extra exports from each of the countries, and potentially leaving them as large-scale producers of an underpriced commodity. For Viet Nam in particular, if precedence is to be placed on earning export currency through rice production, then producing rice using fertilizer priced above international market levels is not advisable, as it will simply diminish its international competitiveness as a rice producer. When China will reopen its doors to urea imports, is a crucial factor in predicting future movements in international urea prices. At the same time, however, the amount of nitrogen fertilizer used in rice production in China is huge at 145 kg/ha, in order to achieve yields of 60,000 kg/ha. The same goes for wheat, where 120 kg/ha of nitrogen fertilizer is used to achieve a yield of 35,000 t/ha. This level of nitrogen fertilizer usage is extremely high when compared to other countries, and if fertilizer input is to be increased in the future so as to increase production, then it would be more effective to increase the relative input of other fertilizer types such as phosphorous and potassium. Based on this line of thinking, it is unlikely that China will import large volumes of urea fertilizer in the future.

The largest provider of urea imports to Viet Nam is Indonesia, accounting for 1.0 Mt out of the 2.3 Mt import total for 1998 (calendar year). In that (calendar) year, Indonesia produced a total of 6.5 Mt of urea fertilizer, of which about 4.5 Mt supplied domestic demand, and the remaining 2.0 Mt was exported. However, if internal demand is to increase at 5% annually, then within 4 or 5 years, an additional 1.0 Mt will be absorbed by domestic demand, and plans are already afoot for the production of new urea plants to meet this extra domestic demand. (Note that it takes nearly 3 years from the start of construction to completion of a urea plant, or around 5 to 6 years from the planning stage to completion of construction.) In this sense, we can realistically expect Indonesia to maintain its 2.0 Mt export potential for the foreseeable future. Additionally, Viet Nam is Indonesia's best customer for urea, and is expected to be able to procure stable supplies of urea from Indonesia for the foreseeable future.

In conclusion, while some may argue that the construction of a urea plant is justifiable in the interests of pursuing food self-subsistence: (1) it will be difficult to guarantee the profitability of the plant given current international price levels; (2) the natural gas required in the production of urea could be put to better use (e.g. power production); (3) placing a burden on agriculture to protect a urea plant (increasing fertilizer prices) is a case of putting the cart before the horse; and (4) it is difficult to image a future scenario where Viet Nam would not be able to import urea. In light of these reasons, the economically rational path is to continue procuring low-priced urea from the international market.

If now is not the right time to build a urea plant, then when in the long-term industrial plan of Viet Nam is going to be right time? Assuming that Viet Nam is not to follow the lead of China in banning imports and artificially inflating urea prices, or follow the lead of India in keeping down the price of urea by subsidizing urea production (neither of which course is advisable, of course), then the correct setting for the construction of a urea plant requires the following three conditions:

(1) Reserves of natural gas are found at a location far from consumer areas (big cities such as Ho Chi Min City), in quantities not large enough to convert into liquid natural gas (LNG). Here, the options for use of the natural gas are limited, and it becomes possible for a urea plant to avail itself of the natural gas at cheap prices. This is the situation with the Indonesian urea plants.

(2) A situation arises where the international price level for urea is expected to remain high over the long term. Given the global trend for population growth, food consumption is certain to rise in the future, which will be associated with an increased demand for urea. Determination of the optimal time to be getting into urea production is possible through careful observation of the international demand for urea fertilizer and urea plant construction/expansion plans.

(3) Sufficient capital can be secured from foreign sources, Petrovietnam or similar, and the relative proportion of debt subject to interest must be kept down as much as possible. Given that there is little hope of urea fertilizer prices reaching and staying at levels where fixed costs can be recovered, urea plants must be able to survive at subsistence levels. In practice, this equates to keeping interest-paying debt to a bare minimum, establishing a basic corporate structure, and cementing links with private corporations which will be able to stand up to low urea price levels around USD70/t over a prolonged period.

Any premature entry into urea fertilizer production in the absence of these pre-conditions must be made with due regard for the serious consequences it will most likely have for the Vietnamese economy as a whole, and should not be entered into lightly.