Study on the Economic Development Policy in The Transition toward a Market-Oriented Economy in The Socialist Republic of Viet Nam (Phase 3)

Final Report
Vol. 1 General Commentary —Annex

March 2001

Ministry of Planning and Investment
The Socialist Republic of Viet Nam

Japan International
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This annex assembles separate studies on the six industries the summary of which is presented in Chapter 1, 1-1, *Study on the Economic Development Policy in the Transition toward a Market-Oriented Economy in the Socialist Republic of Viet Nam (Phase Three) Final Report.*

Thoughts on the Promotion of Capital Intensive/Infant Industry in Viet Nam

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Thoughts on the Promoting the Vietnamese Iron and Steel Industry

1. Introduction

The level of consumption of steel products in Viet Nam has gradually risen over the years to 2.39 megatons (1999), although this is still the smallest of all the 6 ASEAN nations. Per capita steel product consumption is around 31 kg, quite low when compared to neighboring countries.[2] There would thus appear to be considerable scope for growth, and analysts have bravely predicted that domestic steel product demand will be around 5-6 Million Metric Tons (MT) by 2010. If demand is to reach 6 Million MT, then at current production levels of 300 kilotons (kt) of crude steel and 2 Million MT of rolled steel products, 4 Million MT of steel products and 1.9 Million MT of crude steel will have to be imported, which implies foreign currency imbalances. In order for expanding value added in the steel industry to be kept within the country and to keep up with future rises in demand, the steel supply system will have to be overhauled urgently, including disposing of or updating current aging facilities, and installing new equipment. On the other hand, Viet Nam could aim to make the best use of its local reserves of iron ore, coal, crude oil, and natural gas, by establishing a domestic integrated blast furnace steel plant. In practice, however, the experience of other nations shows that local reserves of natural resources do not guarantee international competitiveness in the steel industry, and the types of iron ore and coal found in Viet Nam are not suited to integrated blast furnace operations. Below, we look at the optimal path for the development of a domestic steel product supply system in Viet Nam, through consideration of the features of the steel industry, the current state of the steel industry in Viet Nam, and the experiences of other countries. Note that while there is no doubt that subsidiaries of the Viet Nam Steel Corp. (VSC) require restructuring, we leave this subject to other studies and concentrate here on other aspects of the local industry. The Industry and Trade Sub-Group has carried out research on the iron and steel industry, which we complement herein by focusing on highly generalized analysis, including features of the industry and external conditions affecting Viet Nam.

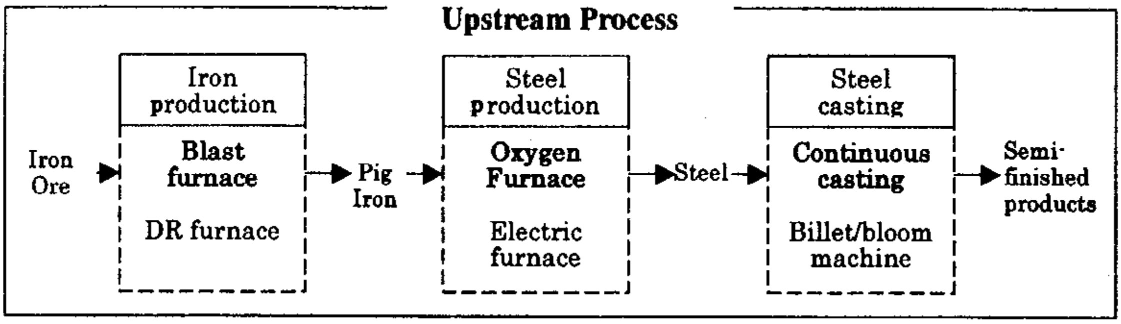
2. Features of the steel industry

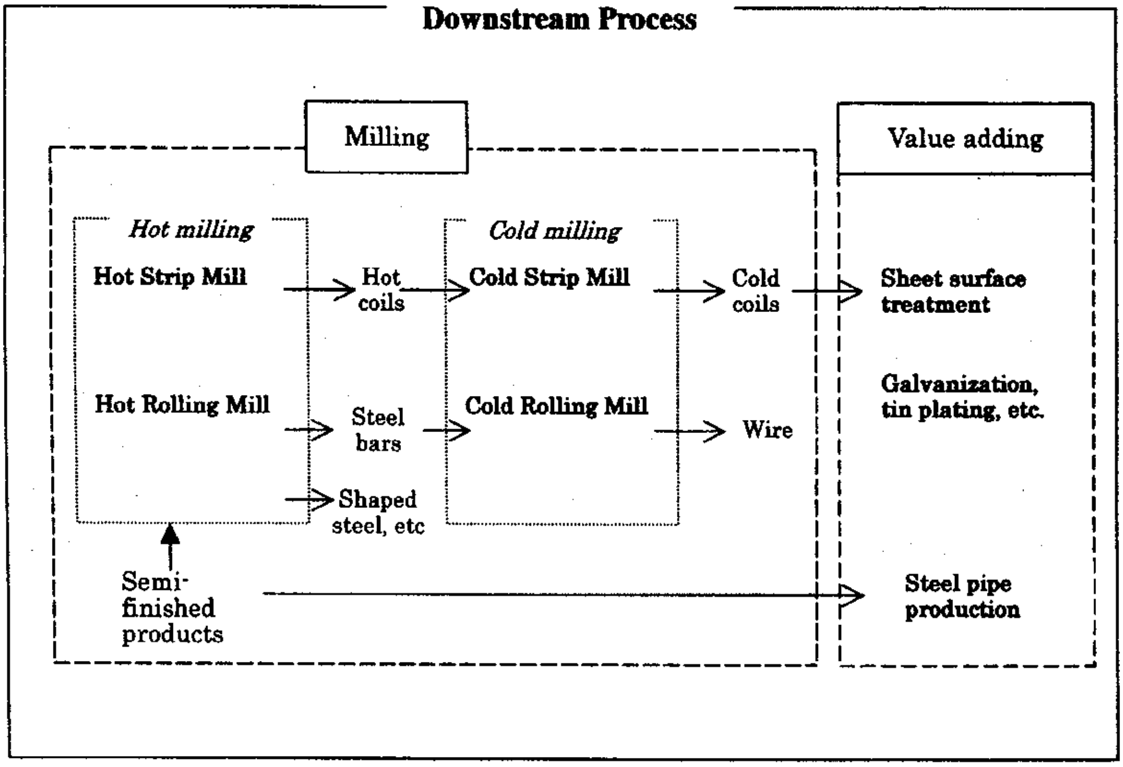
2.1. The steel production process and production systems

Steel production is separated into the upstream and downstream processes, with the upstream process extending from the manufacture of crude steel from base materials (iron ore, etc.) to the production of semi-finished products (slabs, bloom, and billet), and the downstream process involving the fashioning of finished products (rolled steel, etc.) from semi-finished products.

[2] The per capita consumption in the Philippines, China, Thailand and Japan is 70kg, 100 kg, 200 kg and 600 kg, respectively.

2.1.1. Production process





2.1.2. Production systems

The optimal production capacity and level of investment required for each production system differs.

BASIC HOT ROLLING: Hot rolling is used to fashion semi-finished products (billet and bloom) into such products as steel bars, shaped steel, and wire. The optimal size for hot rolling facilities is 200-500 kt/year, and the level of investment required is around USD20-50 million.

ELECTRIC FURNACE-BASED BAR STEEL PRODUCTION: An electric furnace is used to produce semi-finished products (steel ingots) from scrap iron, which is then heat milled into such products as bar steel and shaped steel by hot rolling. This method can be effective when it is cheaper to produce billet in-house with an electric furnace than to buy it. This method can be used to run small-scale, efficient operations, depending on the price of scrap iron and efficiency of the electric furnace, but has the drawback that it is difficult to produce high-quality products, as the composition of scrap iron can be variable. The optimal size for electric furnace-based bar steel production operations is 500-1000 kt/year, and the level of investment required is around USD50-100 million.

DIRECT REDUCING FURNACE AND ELECTRIC FURNACE-BASED BAR STEEL PRODUCTION: Direct reduced iron is made in a direct reducing (DR) furnace from iron ore and natural gas, which is then mixed with scrap iron in the electric furnace to produce steel ingots, and heat milled into such products as bar steel and shaped steel. This method is advantageous when prices for scrap iron imports are high. Additionally, it is most effective when facilities are located close to a natural gas field, as natural gas is used as a reducing agent in the DR furnace, and the price of natural gas has a direct bearing on the cost effectiveness of operations. This method is effective for a small-scale operation, although in general, a profit is returned only if a cheap supply of natural gas is at hand (i.e. the natural gas cannot be used for any other purpose). The optimal size for DR furnace and electric furnace-based bar steel production operations is 500-1000 kt/year, and the level of investment required is USD100-200 million.

COLD COIL MILLING: Cold rolling is used to mill hot coils into cold coils. It is possible to sell the output of this production system at prices higher than imports, through customizing output to the needs of domestic consumers, although it calls for high levels of production, sales and commercial expertise. The optimal size for a cold rolling operation is 250 kt/year or more, and the level of investment required is around USD100 million or more.

BLAST FURNACE-BASED INTEGRATED PRODUCTION: A blast furnace is used in an integrated production system of both upstream and downstream steel production in one site, and a wide variety of products can be produced including steel bars, steel sheets, and surface-treated steel sheets. Blast furnaces represent the pinnacle of present-day iron production technology, and are associated with the disadvantage that once fired, they must be operated constantly above a certain level of reasonable utilization rate. The optimal size for blast furnace-based integrated production operations is 3 Million MT/year or more. In Japan and South Korea, there are blast furnace-base integrated production plants, which have several blast furnaces, with a total production capacity of 10 Million MT/year or more. The level of investment required for this facility type is around USD4 billion or more. Domestic steel demand of 10 Million MT is said to be a yardstick for the viability of blast furnace operations.

2.2. The correlation between the stage of national economic development and growth in steel demand

A nation's demand for steel grows with advances in industrialization and the level of transference of industrial structure. The product life cycle of steel demand can be broken down into the five stages of: rapid growth in demand → slowing growth → maturation → decline → stability. The stage of "rapid growth in demand" extends from the early stages of industrialization until industrialization starts speeding up, and as a rough generalization, steel consumption starts rising sharply around the point when the per capita GDP exceeds USD1,000. Rises in steel demand tend to outstrip the speed of economic growth from when growth in demand starts to rise sharply until the per capita GDP reaches USD10,000. At the onset of industrialization, the industrial structure begins to shift from an agricultural to a manufacturing base, infrastructure development takes off, and demand for steel bars for use in the construction of factories and hotels jumps up. At this stage, large numbers of small-scale operators emerge, which produce steel bars by basic hot rolling or electric furnace-based production.

As industrialization continues, demand for steel sheets for use in the manufacture of cans, electrical appliances, cars, and the like, kicks in to complement the demand for steel bars, further boosting steel demand. At this time, steel producers are made to scale up operations in order to provide stable supplies of steel sheets, buoyed by the burgeoning steel demand and general growth in the local economy. Looking to the history of Asian nations, development at this stage tends to fall into one of two patterns. The first pattern of development is for steel production operations to look further upstream and progressively adopt more capital-intensive production methods, following the path of: basic hot rolling → electric furnace-based bar steel production → steel sheet surface treatment → steel sheet milling → blast furnace-based integrated production. In the second pattern of development, steel operations bypass intermediate steps and progress directly to blast furnace-based integrated production from an early stage. As the initial investment outlay for blast furnaces is immense, their construction hinges around domestic demand being at a level to support mass steel production, there being some means of procuring the necessary capital, and local technological levels being high. Consequently, this second route must be embarked upon in the form of a national project, and the risks are high. At the same, as seen in the case of South Korea, the economic rewards in the case that all hurdles surrounding this second route are cleared, are considerable. Additionally, if technological prowess, equipment, and personnel are sourced from a developed nation, then it is possible to take advantage of economic underdevelopment. It is a well-known fact that the effectiveness of drawing upon the technological expertise of a developed nation is dependent on local technological levels, learning attitudes, and comprehensive backup of the targeted country. Therefore, these conditions must be met in order to make the technology transfer a success. The successful diffusion of technologies from developing nations is conditional on an adequate local technological founding.

It is important that a close eye is kept on scrap prices, since electric furnaces-which can be run efficiently on a relatively small scale-could be considered more economical than blast furnaces when scrap is cheap and abundant in the market. At the same time, one has to take into consideration the quality discrimination that exists between the two production systems, as electric furnaces cannot produce steel sheets of the quality demanded by the automobile industry, for example.

2.3. The induction of new technologies, and their effect on developmental patterns in the steel industry

There is an example in which the US steel industry had once been forced to play second fiddle to technologically advanced nations such as Japan when it had lagged behind other countries in transition from open hearth to blast furnaces. Indeed Viet Nam should keep up with trends in new steel technologies as there may be an opening for it to leapfrog developed countries and big companies that face difficulty in transforming into new technology hastily. There lies the chance for a developing country like Viet Nam to establish itself as an advanced steel-producing nation.

Blast furnaces are known as the ultimate production technology at present, but new processes such as smelting reduction[3] are currently being developed and put into practical use. In an application of this new technology, the direct iron ore smelting (DIOS) reduction process currently under development in Japan, allows relatively low grade iron ore and coal to be used directly as feedstock.[4] Under this method, the production capacity of a single steel plant is expected to be 1-2 Million MT/year,[5] making it noteworthy as facilitating medium-scale steel production, unlike blast furnaces where the optimal size of a single production facility is over 3 Million MT/year. Additionally, in the case of blast furnaces, sintered ore is required as feedstock and coke as a reducing agent, bringing about the need for extra investment in coke ovens and sinter plants. With DIOS, such secondary investment is not necessary and production facilities are more compact, reducing the level of up-front investment to an estimated 30% of that for blast furnaces. Additionally, blast furnaces have the drawback that once lit up, they must continue operating at high levels, whereas DIOS offers greater flexibility in operating levels. There are varying claims as to the relative operating cost of a DIOS facility, some claiming a reduction of 10% or so over a blast furnace, others claiming them to be about the same, and others still claiming that DIOS is slightly more expensive. Based on the analysis of the total cost of setting up an integrated blast furnace-based steel mill, including a coke oven, sinter plant, and blast furnace, however, DIOS is expected to produce overall cost reductions.

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[3] Currently under development in Japan, South Korea, America and South Africa.

[4] N. Kawabata, "The impact of new technologies (I): Interest in smelting reduction technology" (Shin-gijyutsu no impakuto (I) kangentetsu-seizo-gijyutsu e-no shumoku), *Corporate Types and Trade Structures in the East Asian Steel Industry (I) [Higashi-Ajia-tekkogyo no kigyo-ruikei to bokeki-kozo (I)]*, pp. 7-8/20 (http://www.econ.tohoku.ac.jp/-kawabata/asia1.htm)

[5] *Issues Surrounding the International Competitiveness of the Steel Industry [Tekko-gyo no kokusai-kyosoryoku o meguru kadai ni-tusite]*, Japan Development Bank, Study No. 197, March 1995, and also interviews with steel-related companies affiliated with the Japanese Chamber of Commerce and Industry in Malaysia (December2000).

At present, only small-scale experimental DIOS furnaces are in operation, and the technology is by no means fully developed. There is certainly value in following technological developments in the field, however, including methods other than DIOS.

The thin slab continuous casting method[6] is the subject of attention as a new steel hot rolling process. In this method, a thin slab continuous casting mill, that is a mill which continuously casts thin slabs of steel, is connected up to a compact hot strip mill, forming a steel hot rolling process founded on a compact strip production system (CSP[7]). By way of this technology, operators of conventional electric furnaces, which previously had a limited product range comprised basically of steel rods and shaped steel, are able to enter the steel sheeting market with relative ease. Features of the thin slab continuous casting method are:

- The method requires a hot rolling production capacity of around 1 Million MT,[8] leading to a reduction in investment costs over blast furnace-based operations due to the smaller operational scale;
- The possibility of producing stable supplies of standard quality, cost competitive steel sheeting: Depending on the quality of the scrap feedstock, there are limitations on the thickness and quality of steel sheeting that can be produced, restricting production principally to building materials, and to a lesser extent, products such as toys and welding pipes (there have been attempts to enhance the quality of the steel output by adding a component of reduced iron or iron carbide to the feedstock).

So-called mini-mills, such as electric furnace-thin slab casting type operations described above,[9] are generally only economically viable for niche manufacturers in large-scale markets supplied by multiple blast furnaces, and are feasible only if operations are low-energy, low-manpower, and low-cost. With blast furnaces, hot rolling is possible only once the smelted steel has been allowed to harden, therefore the thickness of the slab becomes usually around 230 mm. With electric furnaces, on the other hand, thin slab casting makes it possible to mill slabs of thickness 50mm while still hot, producing savings in energy costs. Also, as the process flows straight on from the electric furnace to the hot rolling mill, the required equipment is more compact than in the case of blast furnaces. The required hot rolling power is also diminished due to the original slabs being thinner. That is, it of course takes less energy to roll a 50 mm slab into 1.2 mm sheeting, than it would for a 230 mm slab. Equipment costs are also much less than with blast furnaces, and there is no need for a coke oven. Manpower requirements are also lesser, and it is easier to adjust production levels dynamically. One drawback of the method is that only certain grades

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6 First implemented at Nucor's Crawfordville plant (U.S.) in 1989, with new plants subsequently being built around the globe.

7 The brand name of a method developed by the German SMS Co. (analogous technologies have been developed by other companies).

8 The maximum annual steel production is 2 Million MT, by Han Bo Steel Co., Ltd.

9 Small-scale (1 Million MT/year or smaller) steelworks using scrap as the principal source of feedstock.

of steel can be produced. The use of HBI (reduced iron) in an attempt to enhance quality levels would produce an unjustifiable blowout in cost levels. Thin slab casting type operations take scrap as the principal source of feedstock, and it is not possible to produce high-grade products such as steel plating for the car industry, due to difficulties in removing tramp elements such as nickel and copper. Also, as a result of nitrogen levels in the final product being higher than for blast furnaces, there are aging problems. In the case of a blast furnace, a steel converter can be used to filter off in a form of NO_2, which is not possible with an electric furnace. In America even, where mini-mills have seen the greatest successes, there has been no instance of cold rolling being coupled with an electric furnace in thin slab casting.

As a result of new developments and new technologies being applied in the field, the conventional development pattern of the steel industry that have been observed in developing countries to date is expected to change. Assuming for instance that smelting reduction technology is put into practical use, then the entry barriers into the crude-steel producing becomes smaller, which enables a country that intend to develop a steel industry earlier entry into upstream operations. On the other hand, if the thin slab casting method is used, then it will enable sheets (although limited to lower grade sheeting) production without investing on blast furnaces, which implies steel/rolling operators running electric furnaces easier entry into the steel sheeting market. The Megasteel plant that came on line in October 2000 represents an instance of exactly this type of electric furnace/thin slab casting plant, although it would appear to be having a hard time overcoming the problems associated with a mini-mill. Mini-mills can only be expected to operate successfully in large-scale markets supplying a niche product type, and it can be difficult to cover this failing if they are established in small-scale markets. There is no guarantee that a technology developed in a developed country will succeed in an ASEAN country, and the underlying essence of that technology must first be studied thoroughly before transferring it across to a different market environment from that it was designed for.

3. The Asian steel market

3.1. The Asian market

The traded price of hot coils in the Asian market has been gradually rising since January 1999, and jumped up even further in 2000. Prices in the East Asian market are indicative of market movements, and were USD265/t (in centralized areas, including transportation costs) in March 2000, an increase of 20% or USD45/t over the previous year. The reason for the rise in hot coil prices is that recovery in demand in the Asian region has been extraordinarily fast. Demand for steel sheets for use in the automobile industry has rocketed up in South Korea in particular, to the degree that key operators such as POSCO (Pohang Steel Corp.) are unable to keep up, even at full production levels. One other factor pushing up demand for hot coils is that new cold coil plants (fueled by hot coils) have come on line from companies such as Hyundai Pipe Co., Ltd. and Dong Bu Steel Co., Ltd. On the other hand, China imposed an import restriction on steel in January 1999,[10] in order to streamline the operations of domestic steel operators. On February 28, 2000, the primary plant of China's largest steel producer, the Shanghai Baosteel Group Corp., was damaged by a fire, causing a halt in its supplies of hot coils. At the time, it was predicted that China would have to import an emergency supply of around 100 kt of hot coils. However, falloff in domestic supply was kept to a minimum because the second plant of that same company increased production by about 30%, and the damaged plant came back on line earlier than expectedin about a month.

Viet Nam currently imports the full extent of its 700,000-800,000 t/year cold coil requirement. If it were to build a cold coil plant, it would have to purchase hot coils to fuel production, and should closely follow movements in the hot coil market to gauge the economic viability of such an endeavor. Viet Nam is not going to require large volumes of high-quality steel products at any time in the near future, and can avail itself of lower-grade imports from Eastern European countries, Russia, and China, countries with which it has established trade routes. High-quality imports (e.g., surface-treated steel sheets), on the other hand, are expected to come from countries like Japan, South Korea, Taiwan, and Brazil.

3.2. The local standing in individual countries

At present, the 10 main steel producers in East Asia[11] account for more than one third of global steel demand and production,[12] and are also seen as having the greatest potential for future growth. The

[10] China made receipt of "key industrial import registration certificates" compulsory (i.e. introduced an import license system) in January 1999, and in October of that same year, created an "assurance ledger system" to tax raw materials for finished products.

[11] Japan, China, South Korea, Taiwan and the 6 ASEAN nations.

[12] The 10 producers accounted for 36% of global crude steel output in 1999 (282.42 Million MT), and 35.9% of global apparent steel consumption.

combined ASEAN economy is finally now showing signs of recovery two years after the Asian currency/ economic crisis, and the South Korean economy is also making great strides toward recovery under the guidance of the IMF. Under the effects of the Asian economic crisis from 1997 onward and due to the resulting decline in demand for steel in the area, moves were made toward restructuring and merging steel companies in East Asia, and despite the current upturn in the industry, signs of change in the competitive balance are appearing, in response to restructuring efforts in the car industry—a major consumer of steel products—due to corporate acquisitions. Nissan Motors, for example, reduced the number of companies it purchases steel sheeting from, from 5 to 2, and demanded heavy discounts of the remaining two companies, the effects of which are propagating to other companies. Thus, even in formerly lucrative markets such as high-grade sheeting, price competition is starting to heat up. On August 2, 2000, the two major crude steel producers POSCO (South Korea) and Nippon Steel (Japan) announced a strategic operational link-up, in an attempt to maintain staying power in price negotiations with large-scale customers and also to gain control over the Asian market.[13] Nippon Steel has also announced its intention to strengthen ties with Shanghai Baoshan Iron & Steel of China and the China Steel Corp. of Taiwan in a similar fashion. Assuming for the moment that this link-up of what are said to be the 4 key Asian steel players is to take place, then there is the possibility that a reorganization of the steel industry in Asia will occur.

Russia and Ukraine have a considerable influence on the South East Asian steel market. Steel from Russia and Ukraine is highly price competitive, and is exported in large quantities to Asia in the form of low value-added products (such as semi-finished products, hot coils, and steel rods), where a low price is of maximum importance. Russia and Ukraine are the main suppliers of semi-finished products to countries such as Thailand, Indonesia, the Philippines, China, and Taiwan.[14] They also supply large quantities of other products to China, Taiwan, and the Philippines, including extruded and hot milled steel products.[15] Exports to Viet Nam are also sizeable. Note that whereas steel product exports from Russia and Ukraine are primarily low value-added products, one cannot ignore their influence on high value-added products in the market. India also has its sights set on the South East Asian market, and ESSAR—an Indian steel company—has established operations in Indonesia, targeted at the South East Asian market.

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[13] Article in Nihon Keizai Shinbun, August 3, 2000

[14] The market share of semi-finished steel products from Russia and Ukraine in Thailand, Indonesia, the Philippines, China, and Taiwan is, respectively, 59%, 51%, 48%, 76%, and 61% (figures from the first half of 1999, or the 1998 calendar year in the case of the Philippines; source: Steel Club "Tekkou jyukyuu no ugoki: kikan No. 195" [Trends in Steel Demand: Fall Edition, No. 195], November 1999)

[15] Russian and Ukrainian products account for 61% of China's bar steel imports, 34% of Taiwan's hot coil imports (both figures from the first half of 1999), and 42% and 26%, respectively, of the Philippines' hot coil and bar steel imports (1998 calendar year, same source as above).

Table 1 Global ranking of crude steel-producing nations

(Unit: Million MT)

Steel-producing nation	1999		1998	
	Rank	Tonnage	Rank	Tonnage
China	1	123.7	1	114.6
USA	2	97.3	2	98.7
Japan	3	94.2	3	93.5
Russia	4	51.5	5	43.8
Germany	5	42.1	4	44.0
South Korea	6	41.0	6	39.9
Ukraine	7	27.5	9	24.4
Brazil	8	25.0	7	25.8
Italy	9	24.9	8	25.7
India	10	24.3	10	23.5
France	11	20.2	11	20.1
UK	12	16.3	12	17.3
Canada	13	16.2	14	15.9
Taiwan ROC	14	15.4	13	16.9
Mexico	15	15.3	16	14.2
Spain	16	14.9	15	14.8
Turkey	17	14.3	17	14.1
Belgium	18	10.9	18	11.4
Poland	19	8.8	19	9.9
Australia	20	8.2	20	8.9
South Africa	21	7.3	21	8.0
Netherlands	22	6.1	24	6.4
Iran	23	6.1	25	5.6
Czech Republic	24	5.6	22	6.5
Austria	25	5.2	26	5.3
Sweden	26	5.1	27	5.2
Romania	27	4.4	23	6.4
Kazakhstan	28	4.1	32	3.1
Finland	29	4.0	29	4.0
Argentina	30	3.8	28	4.2
Slovenia	31	3.6	31	3.4
Venezuela	32	3.2	30	3.7
Indonesia (E)	33	2.8	34	2.7
Egypt	34	2.6	33	2.9
Saudi Arabia	35	2.6	36	2.4
Luxemburg	36	2.6	35	2.5
Other countries		26.7		27.6
Global total		**787.7**		**777.4**

Source: International Iron and Steel Institute, 1999 World Crude Steel Production Data, available from http://www.worldsteel.org/trends_indicators/countries.html

JAPAN: Japan's total crude steel production is 94.2 Million MT, placing it as the third largest steel producer in the world, after China and USA (1999 data). The domestic market share of the top 5 steel companies with integrated blast furnace operations, is over 40% for Nippon Steel Corp., 18% for NKK, 16% for each of Kawasaki Steel and Sumitomo Metals, and 9% for Kobe Steel,[16] with the relative shares of these companies having been almost constant for around a quarter century, from the mid-1970's. There have been suggestions that part of the reason for this is that the top 6 blast furnace-operating steel

[16] US Trade Ministry report

companies (the 5 companies listed above and Nisshin Steel) have worked together to control levels of steel production, allowing them to maintain consistent, high-level steel prices for their main customers (the construction and car industries). However, based on the observation that Japanese car manufacturers, principal steel consumers, have managed to maintain export competitiveness over the years, it would appear not to be the case that domestic steel prices in Japan are markedly high. It can also be said that the reason that large-scale consumers of steel in Japan put up with price control, is that they benefit from stable supplies of high-quality steel products and thorough after-service. Japanese steel companies are well known as being unsurpassed technologically and also as having high labor productivity, part of which is attributable to investment in steel-related R&D by Japanese steel manufactures accounting for around 40% of the global total, about half of which (around 20% of the global total) is due to Nippon Steel.[17] The profits from a stable domestic market are therefore being actively reinvested back into R&D, in turn contributing to an increase in the competitiveness of each company. Claims by countries such as the US that the Japanese steel market is to some extent closed, are certainly true, but it is also true that the constant pressure put on the Japanese steel market by large-scale consumers in industries such as cars and electrical goods which compete in truly international markets, is forcing Japanese steel companies to work toward the enhancement of product quality and reductions in cost levels, and hence maintain a level of competitiveness in the top echelon globally.

Steel production in Japan suffered as a result of depressed steel demand throughout Asia, attributable to the Asian currency crisis from 1997. Crude steel production in Japan dropped from 104.5 Million MT in 1997 to 93.5 Million MT in 1998 (around 80% of that from 1997). Taking the period April-June 1997 as 100.0%, the volume of steel exports to NIEs and ASEAN countries bottomed out at 77.2% in the period January-March 1998 (a reduction of 15.8% over the same period in the previous year).[18] Note that the combined impact of the currency crisis on steel exports from Japan to NIEs and ASEAN nations is estimated at around 4.8 Million MT, resulting from such effects as a drop in private sector consumption and the postponement/freezing of large-scale projects (e.g. the construction of chemical and power plants) in ASEAN countries, and drastic drops in exports of commodities such as cars and electrical appliances.[19] Economic recovery in NIEs and ASEAN countries since the latter half of 1998, have meant that steel exports from Japan are recovering. Through local companies (e.g. car and electrical appliance companies) increasing operating levels and inventory adjustments, exports for NIEs and the ASEAN forum for the period April-June 1999 were 117.5% of those for the period April-June 1997, a

[17] US Trade Ministry report, and an interview with Prof. Hiroyuki Itami of Hitotsubashi University.

[18] Japanese Ministry of International Trade and Industry

[19] By using export figures for the first half of FY 1997 as a reference point, the (Japanese) Steel Club estimates the loss in direct exports (all steel types) to have been around 2.5 Million MT, and indirect exports (conventional steel products) to have been around 2.3 Million MT up to the end of 1998 ("Tekkou jyukyuu no ugoki, No. 194" [Trends in Steel Demand, No. 194], August 1999)

rise of 17.5 percentage points. This represents a significant recovery over the figure of 77.2% for the period January-March 1998, when exports were at rock bottom.[20]

In August, Nippon Steel (Japan's largest steel company) finalized details of a strategic operational link-up with POSCO of South Korean, in an attempt to maintain staying power in price negotiations with large-scale customers and also to gain control over the Asian market. Top officials at Nippon Steel have also announced an intention to broaden the scope of corporate ties to include Shanghai Baoshan Iron & Steel of China and the China Steel Corp. of Taiwan, putting the affected companies very much in the spotlight.

SOUTH KOREA: The South Korean economy picked up remarkably in 1999, and steady growth in demand for steel products has been generated within the manufacturing sector (e.g. automobiles, ship building, and machinery) and construction sector (centering around private construction). This led to apparent steel product consumption of around 32.10 Million MT (up 29% on the previous year) and crude steel production of 41.04 Million MT (up 2.9% on the previous year) for that year, both of which are equivalent to pre-economic crisis levels.

POSCO, a blast furnace-integrated steel producer, has the greatest share of the domestic market at 64% (1998). Other key players include Inchon Iron and Steel Co., Ltd., Dongkuk Steel Mill Co., Ltd., Kangwon Industries, Ltd., and Han Bo Steel Co., Ltd., most of which operate electric furnaces and produce steel bars. Key steel companies without steel plants include Dong Bu Steel (cold coils and surface-treated steel sheets), Union Steel Manufacturing Co., Ltd. (part of the Dongkuk steel group, and producing cold coils and surface-treated steel sheets), and Hyundai Pipe Co., Ltd. (cold spring operations started in 1999).

POSCO recorded a crude steel output of 25.57 Million MT in 1998, placing it as the world's largest steel producer, ahead of Nippon Steel Co., Ltd. The privatization of POSCO began that same year, as part of the South Korean government's general privatization policy, and a capital link-up (i.e. by mutual share holding) was entered into with Nippon Steel. In addition, the POSCO group is progressively being integrated and restructured through such means as making a surface-treated steel production company into a full subsidiary. A number of smaller steel plants in the east went bankrupt during the economic crisis; many of them have been integrated into the POSCO conglomerate and are undergoing reorganization at the hands of POSCO management. POSCO has invested heavily and expanded production capacity in a short period of time, but only as would appear to be commensurate with domestic demand.

Inchon Iron and Steel, the largest electric furnace operator, has been severed from the Hyundai group through Hyundai pulling out of the steel industry, and is currently considering a merger with Kangwon Industries. If this merger goes ahead, then the combined company will become the world's leading

[20] "Tekkou jyukyuu no ugoki, No. 194" [Trends in Steel Demand, No. 194] (August 1999)

electric furnace operator, with a crude steel production capacity of just under 8 Million MT.

A series of cold coil plants came on line in 1999 (Hyundai Pipe: 1.80 Million MT/year, and Dong Bu Steel: 1.30 Million MT/year), leading to concerns over the widening gap between the supply and demand of cold coils.

CHINA: China boasts the world's largest crude steel production capacity, a position it has held since 1996, with the current production capacity amassing to more than 130 Million MT/year. Equipment modernization has not kept pace with growth in the industry, however, and China has over 1,000 small-scale blast furnaces of capacity 100 m^3, as well as large numbers of outdated open-hearth furnaces, which no longer remain in commission in Japan, South Korea, or Taiwan.

Apparent steel consumption in 1999 topped 125 Million MT, up 11 Million MT over the previous year, on the strength of healthy gains in the manufacturing industry (automobiles, electrical appliances, etc.) and solid performance in the construction industry, with further growth predicted for the future. Crude steel production in that same year was 123.3 Million MT, up 8 Million MT over the previous year. While quantitative demand for steel has been rising since 1996, the Chinese steel industry is in a position of structural oversupply, and profits of steel companies are dropping each year. The reason for this is that China relies on imports for supplies of highly value-added steels such as steel sheets for automobiles and cold coils for electrical appliances, and over-saturated domestic production is restricted to steel bars and low-grade steel plates. In response to this, the Chinese government called for a 10% reduction in combined production of steel plates in January 1999, although this has not been fully enforced. It has also put in place import restrictions and policy to put outdated equipment out of service. The government announced in January 1999 that all blast furnaces below 50 m^3 in capacity, all steel converters below 10 m^3 in capacity and all old-type facilities (e.g. open-hearth furnaces) were to be put out of service. As a result, 120 small-scale blast furnaces, 220 small-scale electric furnaces, and 100 old-fashioned steel mills were decommissioned in the first half of 1999. This process of decommissioning outdated equipment is to continue in the future in concert with the restructuring of underperforming companies.

In April 2000, the Chinese government provisionally deemed that dumping of stainless cold coils from Japan and South Korea had occurred.

The most active companies in China at present are Wuhan Iron & Steel Co., Ltd. and Baoshan Iron & Steel. Wuhan Iron & Steel merged with special steel producing and iron & steel companies in 1997, expanding its annual crude steel production capacity to 8 Million MT in the process. On the other hand, Baoshan Iron & Steel acquired Shanghai Metallurgical Holding Corp. and Meishan Iron & Steel Corp. in 1998, reforming itself into Shanghai Baoshan Iron & Steel in the process, and emerging as a large-scale steel group with a crude steel production capacity of 15 Million MT/year. Wuhan Iron & Steel is currently working on a project to build a second hot strip mill (producing wide steel sheets), scheduled for completion in 2004.

TAIWAN: The 1999 apparent steel consumption in Taiwan was around 20.3 Million MT, roughly the same as for the previous year. This figure was the result of a falloff in steel demand in the construction industry, but a rise in the machinery industry, due to growth in exports of electronic and communications equipment.

Taiwan was the only country in East Asia to record a fall in crude steel production for 1999, by 1.53 Million MT to 15.38 Million MT. This was due to a power cut in July 1999 (causing devastating effects for electric furnaces), the September earthquake, and also the ill-timing of repair work on China Steel Corp's 3rd blast furnace in the latter half of 1999.

Taiwan's current annual crude steel production capacity is 16.39 Million MT, 8.21 Million MT of which is from steel converters and 8.18 Million MT from electric furnaces. China Steel Corp. (CSC) is the only integrated blast furnace operator in the country, with a 1998 crude steel production capacity of 10.07 Million MT, well above its nominal production capacity of 8.21 Million MT. Given that total crude steel production for Taiwan in 1998 was 16.91 Million MT, China Steel holds a market share of around 60%. China Steel is a solid commercial performer, and is aggressively expanding its production capacity through capital investment. There was talk at one stage of it starting up a cold rolling mill in Viet Nam as its first foreign joint venture, but the project was shelved due to a breakdown in negotiations.

In stark contrast to China Steel, Taiwan's primary hot steel sheets manufacturers, An Feng Steel Co., Ltd. and Yieh Loong Enterprise Co., Ltd., both recorded losses in 1998. The main reason for the poor standing of these companies as compared to China Steel's strong position is the disparity in cost competitiveness due to their relying on slab imports; China Steel supplies raw materials for its own hot rolling mills. To rectify this situation, Yieh Loong Enterprise successfully applied to the government for permission to build a blast furnace-based integrated plant, to generate stable supplies of base materials and enhance cost performance. The buyout of Yieh Loong Enterprise by China Steel at the end of 1999, however, means that the blast furnace-based integrated plant construction project (2 blast furnaces, 5.0 Million MT production capacity) is to be directed by China Steel, bumping up China Steel into the hallowed ranks of 15 Million MT. capacity crude steel producers.

Despite strong domestic performance to date, China Steel has missed a number of business opportunities, with little scope for future domestic growth due to the imposition of environmental restrictions, and offshore production plans in Viet Nam, Malaysia (Megasteel), and Thailand all having fallen through. At the same time, it faces stiffening competition both at home and abroad in the future, partly due to a number of middle-range blast furnaces owned by other companies coming on line domestically.

ASEAN COUNTRIES: Crude steel production is well below the level of apparent crude steel consumption in ASEAN countries, and the demand structure is heavily geared toward imports. The import ratio for steel products in 1998 was 62.8% overall in the ASEAN forum, with Singapore (97.1%), Malaysia (70.5%), and Thailand (64.1%) being particularly dependent on imports. One reason for this marked dependence on imports is burgeoning demand for high-quality steel sheets in the motor vehicle and machinery (electronic and electrical) industries in Thailand and Malaysia, and difficulty in establishing local production facilities for steel products of this type. In the case of Singapore, the limited national land size has obstructed attempts to locate a domestic steel plant site, and the mammoth demand for steel has had to be filled almost entirely by imports.

The difference in degree of dependence on steel product imports among countries is largely due to the differing weight of steel-intensive industries (construction, machinery, motor vehicles, etc.) in each country. That is, in Indonesia, the Philippines, and Viet Nam, the relative immaturity of the local machinery and motor vehicle industries means that around 70-80% of steel product demand is within the construction industry, i.e. for low-quality steel as can be readily produced locally. In Thailand and Malaysia, on the other hand, steel product demand within the construction industry accounts for only 50-60% of total demand, and 20-30% of demand is for high-quality steel which cannot be produced locally as easily. In Singapore, the construction industry similarly accounts for 50-60% of demand, and the machinery and shipbuilding industries 20%.

Thailand and Malaysia, in particular, are actively working toward the establishment of local steel sheet production facilities. A number of projects were either abandoned or postponed as a result of the economic crisis. In Thailand, one large-scale cold rolling mill came on line in 1997 and another in 1998 (each 1.0 Million MT/year), through joint ventures with Japanese blast furnace manufacturers, and a hot rolling mill came on line in 1999 (1.5 Million MT/year). Similarly in Malaysia, the first local hot rolling mill came on line in 1999 (2.5 Million MT/year).

Economic recovery in the ASEAN forum has been underway since 1999, and demand for steel is also recovering. The combined ASEAN crude steel production for 1999 was around 8.5 Million MT (up 5% on the previous year).

Indonesia: The state-owned PT Krakatau Steel is Indonesia's largest steel producer, with a formidable production capacity of 2.0 Million MT. The company runs integrated hot coil, cold coil, and surface treatment operations, with upstream operations using DR furnaces based on electric furnaces, taking advantage of natural gas supplied by the national government at next to nothing. There has been talk of privatizing the company, but it would probably run at a considerable loss if it had to purchase natural gas at the same levels as other private companies,casting doubts on this scenario.

Malaysia: Perwaja Steel (state-owned) produces only reduced iron, with a DR furnace tapping into local reserves of natural gas. However, similar to the case of Indonesia, a rise in natural gas prices caused the company to brink on bankruptcy. At present, it is back up operating at marginal profit levels after having weathered the storm by way of privatization, although it still faces imminent difficulties through plant location problems, including its steel and steel milling operations being located at the east and west verges of the Malay Peninsular, respectively.

If reserves of natural gas are to be used in steel production, then prices must be minimal to make ends meet. Also, natural gas reserves must be so abundant or it must be so difficult to sell natural gas that the steel industry is the only avenue of consumption left open to it. Outside of these conditions, operations can get difficult further down the track when prices are normalized, as has occurred in Indonesia and Malaysia. There is no guarantee of the success of reduced iron operations, unless they are established under favorable conditions and are large scale, as in the case of countries such as Venezuela, India, and Egypt.

Megasteel is a domestic steel producer that runs electric furnaces, and bases its operations around supplies of scrap, HBI (hot briquetted iron: a form of reduced iron) and pig iron. Megasteel's operations currently extend as far downstream as hot coils. Megasteel originally planned to establish a multi-megaton cold rolling plant, but plans were scaled down with the onset of the currency crisis, and the company is now looking at the feasibility of a mill of scale 200-300 kt.

The Malaysian government introduced import restrictions in the form of an AP (approved permit) scheme in March 1999, to coincide with the commencement of operations of the country's first hot rolling mill, Megasteel's electric furnace-thin slab rolling type mill (annual production capacity 2.5 Million MT). As a result, domestic users were forced into buying low-quality, expensive Megasteel steel plates. There practically is a ban on imports of hot rolling products that can be produced by Megasteel. The government has also greatly increased the import duty on hot-rolled steel plates (from 5% to 25%). The only steel imports currently permitted are acid-washed products, which Megasteel is unable to produce, and it is almost impossible to import surface-as-forged products (products that have been rolled but not acid washed).[21]

The AP scheme would appear to be part of protective policy aimed at saving Megasteel and its parent company, the Lion Group, and has the potential to bring about a diminishment of international competitiveness for export-geared manufacturers. In reality, dissatisfaction at being forced to buy steel plates at inflated prices is rife among users,[22] and there are fears that this could adversely affect future direct investment and technical transfer by foreign companies into Malaysia.

Note that Megasteel is a min-mill operator, but not aimed at a niche market as with the mini-mill operators that have seen success in the US. The 2.5 Million MT annual production capacity of Megasteel

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[21] Based on interviews with steel-related companies affiliated with the Japanese Chamber of Commerce and Industry, Malaysia (October 2000)

outstrips domestic demand for hot coils, and places it in a position to export.[23] Scrap is not abundant in Malaysia, and reduced iron must be transported across from East Malaysia at significant cost. The inland location of the Megasteel plant is not advantageous. Based on the above, it is evident that the timing of production of a facility such as the Megasteel plant was premature, up to 10 years or so according to some sources. The government is expected to have no option but to maintain protective policy in the future, and it will be interesting to see how this position impinges on relations with AFTA and the WTO.

Thailand: Thailand's SHAHAVIRIYA (partly financed by Japan's NKK) has hot and cold rolling facilities of 2.0 Million MT capacity each. SUS (Siam United Steel-directed by Nippon Steel, POSCO, and Kawasaki Steel) has a 1.0 Million MT cold rolling mill, but must buy raw materials from Japan, South Korea, and neighboring countries as it lacks upstream operations. SISCOS (The Siam Iron and Steel Co., Ltd.) was in the process of building a 250 kt cold rolling mill when the economic crisis hit, at which point construction was discontinued, and the plant is still not finished.

The Philippines: After being bought out by a group headed by Malaysian interests, the Philippine's NASCOR was not operated in the manner agreed upon at the time of sale, and the Philippine government is currently taking the matter up with the owners. The current owners originally agreed to continue developing the company until it reached maturity, a promise which has not been kept and which current court proceedings relate to. There have been rumors of Western companies acquiring and restructuring the company, although nothing has come of them at present. NASCOR has electric furnace and hot rolling process on Iligan Island, and has around 20-30 small-scale companies (each with 10-20 kt cold rolling and surface treatment facilities) on the main Luzon island.

RUSSIA: Russia's output of crude steel reached 163 Million MT in 1988, accounting for 21% of the

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[22] For example, Megasteel cannot produce acid-washed steel products due it not possessing surface treatment facilities, such that theoretically imports of acid-washed steel should be possible under the AP scheme. However, due to acid-washed imports being around 30% cheaper than surface-as-forged Megasteel products, and the potential for imports to therefore undermine sales of the local product, the government is taking a hard line in ordering companies which can use surface-as-forged products to use only Megasteel steel, leading to cases of contraband imports, even amongst ethnic operators. (Based on interviews with steel-related companies affiliated with the Japanese Chamber of Commerce and Industry, Malaysia: October 2000)

[23] There is doubt as to whether the size of domestic demand in Malaysia is sufficient to absorb the full production output of Megasteel. In Kuala Lumpur alone, for example, there have been more than 100 instances of construction projects being abandoned midway, and the general pace of recovery in the construction sector is slow. Recently, highway construction projects have started up through public investment, but otherwise the sector is stagnant. Malaysia's economic recovery is being led by exports, including semiconductors and electrical appliances (AV devices), and has little to do with demand for Megasteel products. (Based on interviews with steel-related companies affiliated with the Japanese Chamber of Commerce and Industry, Malaysia: October 2000)

global output, but with reductions in production capacity largely due to the closing down of open hearth furnaces, production dropped back to 100 Million MT in 1990 and 84 Million MT in 1998. Crude steel production for 1999 totaled 51.5 Million MT, placing Russia fourth in the world as a crude steel producer. Three companies (Seversral, Magnitogorsk and Novolipetsk) generate over 50% of domestic production, and a further 40% or so is generated by 6 medium-sized steel companies (Mechel, Oskol, Nizhny, Tagil, Nosta, Zapadno-Sibicsky (ZapSib) and Kuznetsk). There are nearly 100 more small-scale steel producers making up the remainder of Russia's steel output, which in the main operate open hearth furnaces. The top 9 companies operate integrated blast furnace-based plants to some degree, although one of the top three companies still operates open-hearth furnaces. All companies suffer from pitifully low productivity, estimated by the US Ministry of Trade as 60%, around 40% and 21% that of in the American steel industry, for big, medium and small steel companies, respectively. The quality of Russian steel is not high, and price competitiveness is achieved through producing principally low-grade steel products (semi-finished products, hot rolled plates, steel rods, etc) where price is the main concern.

Prior to the collapse of the Soviet Union (in 1991), Russia had the largest domestic steel consumption in the world. Steel consumption per capita was 565 kg in 1990 (equivalent to that in the EU and North America, but around three times the global average), and around 12 Million MT of steel had to be imported annually in order to cover shortfalls in domestic production. With the collapse of the Soviet Union in 1991, however, domestic steel consumption plummeted, and by 1998 had fallen to less than 70% of the 1988 peak, at which point, domestic steel production had reached 224% of domestic steel consumption. As a result, Russia has exported more than 20 Million MT of surplus steel each year since 1994.[24]

The Russian steel industry is subsidized by government price control of items such as natural gas, power costs, transportation costs and coal. In August 1998, for example, the government offered a 50% reduction on gas and electricity tariffs for cash payments, and railway transportation was reduced by an average of 18% that same year; coal also benefits from government subsidies, at a level second only to agriculture.[25] In addition to government-subsidized low costs, factors such as large-scale production well above levels of domestic demand, a depressed local market and a lack of foreign currency, are driving steel producers to export their products, which has led to large-scale exports of cheap Russian steel having an increasingly large impact on international trade. Since 1995, Russia steel imports have been the target of more than 40 anti-dumping cases (8 in 1995, 13 in 1996, 6 in 1997 and 13 in 1998), covering almost all steel product types, from semi-finished products to cold rolled products.[27]

[24] The average export ratio is a high 60%. Steel boasts the third highest rate of foreign earnings (at around 10%), behind oil and gas.

[25] Without these subsidies, at least one of the medium and most of the small steel producers would flounder, and an estimated 100,000 workers would lose their job (US Trade Ministry, "Global Steel Trade: Structural Problems and Future Solutions" July 26, 2000)

UKRAINE: Ukraine's output of crude steel in 1999 was 27 Million MT, placing it 8th in the world. In Ukraine's case, however, the relative weighting of the steel industry in total production for all industries is high at 23% (1998), and the Ukraine government has earmarked steel as a means of earning foreign revenue and inducing economic growth, and is pulling out all stops to promote steel exports.[27] Since the collapse of the Soviet Union, the Ukrainian steel industry has been troubled by problems such as bad loans, shortfalls in operating capital, low productivity and accumulated debt, but the government has balked at establishing restructuring policy through such means as laying off surplus workers or modernizing equipment. In 1998, domestic consumption fell even further, triggered by the Russian crisis, and exports to the key Russian export market dropped drastically. Despite this, the government provided assistance to companies involved in the steel industry, in the form of tax breaks, debt waivers, special import duties and low-interest loans, in order to maintain steel production levels at normal levels. It also provided support for the preservation of non-liquid companies through such provisions as permitting bartering (the exchange of feedstock and energy for products) and providing bankruptcy protection.

The four main players in the Ukrainian steel industry, namely Kryvorizhstal (production capacity 10.6 Million MT/year), Mariupol (production capacity 7.2 Million MT/year), Azovstal (production capacity 7 Million MT/year) and Zaporozhstal (production capacity 4.8 Million MT/year) together produce more than 50% of Ukraine's total crude steel output of 56 Million MT. Traditionally, these companies had operated under favorable conditions, such as locating plants near sites of feedstock (e.g., iron ore) production or on the Black Sea so as to allow for easy export access. Since 1994, however, factors such as the government revoking power tariff subsidies and Russia raising natural gas and electricity prices, combined to produce a sharp hike in production costs, leading to even higher levels of accumulated debt on the part of the individual companies. Additionally, open-hearth furnaces are still in wide use,[28] plant-operating rates are relatively low at 50% or under, and the industry is essentially state run with market principles not operating. All these combine to make the modernization of equipment and privatization of the industry absolutely crucial for future industry growth. The Ukrainian government has embarked on a plan to abolish and modernize outdated equipment by 2010, reduce total production capacity and increase productivity.[29] Additionally, in July 1999, the government enacted a law stipulating a support package for the steel industry, aimed at putting a stop to the bartering of steel for vital basic resources

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[26] Russian steel has been the target of countervailing duties ranging from 9% to 82%. Countries activating anti-dumping provisions against Russian imports have been Argentina, Brazil, Canada, Chile, China, Colombia, the EU, India, Indonesia, Malaysia, Mexico, Peru, South Africa, Taiwan ROC, Turkey, US, Venezuela and Viet Nam (US Trade Ministry Report: July 26, 2000)

[27] Over 60% of domestic steel production is exported (US Trade Ministry Report, August 26, 2000)

[28] Around 55% of the 1998 crude steel output (27.5 Million MT) originated from open hearth furnaces, 34% from basic oxygen furnaces and less than 2% from electric furnaces. Additionally, continuous casting plants account for only 18% of total production (US Trade Ministry Report: July 26, 2000)

(gas and energy), and the resolving the situation of steel producers not being able to renew production facilities due to capital shortages.[30] Specifically, this law prescribes special provisions such as extensive tax breaks for 7 of the country's 15 integrated steel plants, the scratching of debts incurred up to July 1, 1999 from the national budget, and a 3 year period of grace for repayments to government.[31] Also in 1999, the Ukrainian parliament passed a resolution to provide tax breaks and the waiver of substantial public debts to Kryvorizhstal, a key Ukrainian steel producer.

In light of these public assistance provisions, the depressed local steel market and overproduction, Ukraine is expected to keep aggressively exporting low value-added, low-grade steel products such as semi-finished and hot rolled products to Asia (particularly China and Turkey) for a while to come. At the same time, if the government's modernization project is to proceed on course, then by 2010, big Ukrainian steel companies able to produce competitively priced high-grade steel products, in addition to low-grade products, might as well start to emerge.

INDIA: India's current steel production places it as the 10th ranked steel-producing nation in the world (1999). From 1948 through to 1990, India's steel industry has shown consistent growth, recording an annual growth in crude steel production and steel commodity production of 6.1% and 6.8%, respectively.[32] At the same time, steel product consumption per capita has grown from 5 kg in 1950 to 24 kg in 1998 (global average: 140 kg), and is still at a fairly modest level. The Indian steel industry has traditionally benefited from long-term protection, in the form of high import duties, government subsidies, government price/distribution control, resource allocation and 100% government capitalization. Since 1991, however, under a program of economic deregulation, provisions such as price/distribution control, trade regulation and licensing regulation have all been abolished, and industry participation by private capital has become possible. The government has been actively promoting new capital investment by private companies and the expansion/modernization of existing facilities through public capital, as a result of accelerated economic growth due to deregulation, and also predictions that domestic demand for steel will have reached more than 32 Million MT by 2000.[33] Counter to government predictions, however, domestic

[29] In the 5 years from 2001 to 2005, 4 small-scale blast furnaces (production capacity 3.3 Million MT/year), 15 open hearth furnaces (production capacity 5.5 Million MT/year) and 3 old-fashioned rolling mills (production capacity 1.5 Million MT) are due to be shut down, and in the 5 years from 2006 to 2010, a further 1 blast furnace, 2 open hearth furnaces and 4 blooming mills (combined production capacity 14.5 Million MT/year) are due to be shut down. According to government estimations, the total cost of this project will be as high as USD1-1.5 billion (InfoMine, Market Analysis Research of the Ukraine Steel Industry, 17 (1999))

[30] "Ukraine-Steel and Mining Sector-an Overview", international Market Insight Reports, Financial Times Asia Intelligence Wire, February 11, 2000

[31] Metal Bulletin Research Ltd. and InfoMine, "A Profile of the Steel Raw Materials Sector in the Ukraine (London and Moscow, December 1999)

[32] http://www.allindia.com/gov/ministry/steel/scenario.htm

consumption has been stagnant since the mid-1990s, with the 1998 steel consumption of 24 Million MT falling well short of production capacity of 32 Million MT. Falling price levels due to import deregulation,[24] surplus production capacity due to aggressive capital investment in the 1990's and the falling off of domestic consumption, have all led to Indian steel companies becoming increasingly keen to export, in an attempt to redress low operating rates and high levels of accumulated debt.[35]

India's largest steel manufacturer is the state-owned SAIL (Steel Authority of India, Limited), which has a crude steel production capacity of around 10.6 Million MT (FY 1997). It holds a 65% share of the domestic hot rolled product market. TISCO is the second largest steel company, and has the greatest production capacity of the private Indian steel companies, at around 3.1 Million MT (FY 1998). During the 1990's, it made a successful technological transfer across from open hearth furnaces to blast furnaces, as well as following the lead of competitive start-up companies such as Jindal, Essar and Ispat in enhancing its product composition (from a strong weighting of hot rolled products to high value-added sheeting), and developing marketing and distribution networks. A cold rolling mill (production capacity: 1.2 Million MT/year) is scheduled to come on line in 2002.[36] In addition to these two market giants, there were also thousands of private SMEs, including hot rolling operators, cold rolling operators, surface processors and electric furnace-based producers, most of which were forced out of the industry after the 1991 market deregulation. The few electric furnace-based steel producers that survived deregulation are facing rising power costs and difficulties in attaining scrap of the right quality and in the right quantities. SAIL and TISCO are both overstaffed,[37] with production per worker amounting to 49 MT and 52 MT, respectively (FY 1998). This is hurting labor productivity, and the existence of strong labor unions is hindering any attempt at corporate rationalization. Most integrated steel producers which have been in the industry for some time, including SAIL and TISCO, still possess large numbers of open hearth furnaces,[38] and face further modernization in order to enhance productivity.

In the future, either the abolition of outdated equipment and reduction of production surpluses must take place, or domestic steel demand must be brought up to a level commensurate with local production capacity. India's per capita steel consumption is still very low, and consumption of steel for items such as truck chassis and construction materials is still undeveloped,[39] such that future increases in demand are

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[33] US Trade Ministry report: "Global Steel Trade: Structural Problems and Future Solutions" July 26, 2000

[34] The domestic price of hot coils fell from an average of over USD330/MT to less than USD195/MT within the duration of 1998 ("Customized Market Analysis of the Indian Steel Industry" (India Infoline, Mumbai, India, Feb-May 2000) Table IV: PriceMovements)

[35] Steel exports from India are estimated to have increased by more than 500% in the period 1991-1998 ("Customized Market Analysis of the Indian Steel Industry" (India Infoline, Mumbai, India, Feb-May 2000) Table III: Total Exports)

[36] US Trade Ministry report: "Global Steel Trade: Structural Problems and Future Solutions" July 26, 2000

[37] SAIL has a payroll of 175,000, and TISCO 60,000 (1999)

[38] Open hearth furnaces account for 26% of steel production (Government of India,Joint Plant Committee, Performance Review - Iron & Steel 1998-1999)

anticipated.

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

4.1. Current and future directions

4.1.1. Reform of TISCO

Thai Nguyen Iron & Steel Corp. (TISCO) is a state-owned company which commenced steel production in 1963. It owns three extremely small-sized blast furnaces (100 m^3 apiece), as well as one comprehensive pre-processing facility performing such roles as providing feedstock for the blast furnaces. Due to the blast furnaces being outdated, however, only one is currently in operation. TISCO has an annual crude steel output of 100 kt (annual production capacity: 150 kt), an annual rolling output of 170 kt (annual rolling capacity: 250 kt), and a payroll of 11,000 (1999). It is plagued by problems including aging equipment and overstaffing (as a consequence of having a bloated corporate structure), and is in need of enhancements to productivity, cost competitiveness and product quality, as well as needing to improve its environmental record.

In order for TISCO to improve its present situation posthaste and work toward revamping its corporate structure, the following provisions are currently being considered/implemented:

- Reduction of workforce surpluses: TISCO is considering reducing its payroll to around 6,000 by 2004, principally through not replacing retiring workers, but also through such means as encouraging staff employed at hospitals, schools and the like to relocate to regional government or retrain and change jobs (around 700 employees are currently undergoing retraining).
- Resolution of the imbalance between crude steel production and steel rolling capacity: Upgrade and expand ($100m^3 \rightarrow 120m^3$) the single blast furnace currently in operation, and at the same time, install a new electric furnace (30 t EAF), to generate an annual crude steel production capacity of 250 kt. In this way, attempt to reach a level of billet (rolling feedstock) self-sufficiency.

Overstaffing at TISCO is a serious problem. At the Oita steelworks of Nippon Steel, for example, 5,000-6,000 workers produce 10 Million MT/year, as compared to TISCO's payroll of just under 10,000, producing only 200 kt/year. Naive comparison of the annual output per worker reveals that TISCO is between one fiftieth and one hundredth as productive as Nippon Steel Oita. TISCO must act ruthlessly in pushing forward with its plans for staff cuts, and be prepared for difficulties in the lay-off process.

[39] Ispat, Essar, Jinal and Lloyds (all private companies) have combined to form "Idofer", a representative organization for the promotion of consumption in undeveloped sectors.

4.1.2. Local production of billet

Viet Nam currently imports around 1 Million MT/year of billet for use in the production of steel bars. In order to reduce this weighty reliance on imports and make billet procurable locally, the government is considering building an electric furnace in southern Viet Nam. A feasibility study for the construction of a DRI (direct reduced iron) plant (bar steel production using direct reduction and electric furnaces) was carried out through U.S. public finances, which simply pointed out that the risk associated with such a project was high. According to this feasibility study, the economic viability of such a project is determined almost exclusively by the level of natural gas and power charges set by the government, and that the project would only return a profit if the cost of natural gas was much cheaper than that charged to power generation concerns.

An alternative means of procuring billet domestically would be to either increase the production capacity of TISCO from 100 t/day to 200 t/day, or have VinaKyoei build an electric furnace, and channel to the domestic market any output in excess of the 500 kt for in-house purposes.[40]

Note that the proposal put forward by Japan for establishing molten steel operations by installing a new electric furnace, is likely to get off the ground through technical cooperation and fund appropriation of 50% (USD7M gratis, and USD16M in the form of an interest-free loan) of the total outlay of USD46M, on the part of China.[41] Viet Nam will have to procure the remainder of capital through such means as government funds, low-interest loans from policy-based financial institutions (DAF), and loans from industrial banks (BIDV, etc), the details of which are yet to be finalized.

Construction of the plant commenced in September 2000, and both the plant renovation and installation of the new electric furnace (30 t EAF) are expected to be completed within 12 months. Once this work is done, TISCO will achieve its objective of billet self-sufficiency.[42]

Possible sources of the scrap to feed the electric furnace include the US (annual scrap exports of 8 Million MT) and Japan (annual scrap exports of 2-3 Million MT). At the same time, in order to hedge the risk associated with fluctuating international market prices for scrap, thought should be given filling around 50% of the feedstock requirements of the furnace through reduced iron made from domestically-produced iron ore. Vietnamese iron ore is said to be incompatible with blast furnace-based operations, due to a zinc content around 5 times[43] the allowed level, but Vietnamese reserves of

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[40] At present, both Vinakyoei and TSC are purchasing billet from countries such as China and Turkey, and seem to have given up on plans to build an electric furnace due to problems with electricity costs (based on an interview with a JICA expert).

[41] Information based on an interview with the Project Investment Bureau of the Viet Nam Steel Corporation (VSC), September 6, 2000.

[42] Information based on an interview with the Project Investment Bureau of the Viet Nam Steel Corporation (VSC), September 6, 200.

[43] Master Plan Study (1998)

both iron ore and coal could be put to good use in producing reduced iron for use with the electric furnace.

4.2. Cold rolling mill construction project

4.2.1. Developments to date

The JICA-sponsored steel industry furtherance project in Viet Nam is partitioned into steps 1 and 2. In step 1, research into the master plan[44] is being carried out, and possibilities and recommendations for the optimal structure for the steel industry of the future (2010) made. Three years have elapsed since the submission of the final report for step 1. Since the completion of step 1, technical assistance from Japan has been maintained at the behest of the Vietnamese government, and work has begun on step 2, in which a "feasibility study on small-scale steel sheet plants" is being carried out. A study group of around 11 people has been in Viet Nam conducting research since the end of February 2000, which submitted its draft final report[45] in September.

The feasibility study on small-scale steel sheet plants has been further broken into two phases, with the submitted draft final report corresponding to phase 1, and involving investigation of the feasibility of a cold rolling mill. Additionally, the Vietnamese government will stipulate the location, size, and cost of a new hot rolling mill before the completion of phase 1 (around October), upon which the feasibility of the proposed plant will be studied in phase 2.[46] In the September draft final report, detailed results of the study into a cold rolling mill are presented, as well as recommendations for the construction of the hot rolling mill.

The cold rolling mill (250 kt) was originally included in the master plan of three years ago, in the hopes of covering some component of local demand. At the behest of the Vietnamese government, the plant was treated as an existing project within the master plan, and planned as a joint venture with Taiwan.

Companies involved in the joint venture include China Steel (Taiwan), Yodogawa Steel Works, Ltd. ("Yodoko", Japan), SYSCO (Sheng Yu Steel Co., Ltd. - a Taiwanese joint venture with Yodoko), a number of other Taiwanese companies, and the Viet Nam Steel Corp. (VSC). The joint venture had reached the point of having the government's approval, being fully funded and being at the final stage of negotiations between participating parties, when things turned sour.

The Taiwanese companies were after (1) the plant being located on an industrial estate developed by Taiwanese companies, and (2) protection for the company through high tariffs, the first of which

[44] "Master Plan Study on Steel Industry Furtherance in the Socialist Republic of Viet Nam (Final Report)" [Vietonamu-shakai-shugi-kyowakoku tekko-sangyo-sinko masuta puran chosa (saishu-houkokusho)], Nippon Steel, March 1998

[45] "Draft Final Report on Construction Plans for a National Vietnamese Steel Rolling Plant (Phase 1)" [Vietonamu-koku tekko-attei-kojyo kensetsu-keikaku chosa (fezu 1) dorafuto fainanru repoto], Nippon Steel, September 2000

[46] The schedule and other details of phase 2 are not fixed, and need checking.

the Vietnamese government refused for a number of reasons, and second of which the government refused to undertake due to it not wanting to go against the terms of CEPT, pending for initiation in 2006. Negotiations relating to the joint venture finally broke down in the summer of 1999, after which VSC and MPI indicated that they wished to develop cold rolling operations independently, culminating in the request to JICA for a feasibility study to be carried out. Prior to negotiations with Taiwan breaking down, an unofficial pre-feasibility study was carried out, although this was of limited applicability to the successor national project due to it being based around the original terms of the joint venture. In order to promote the plant plan as a national project, the approval of parliament must be sought, international tenders called for, and in some cases, a portion of the national budget must be allocated to the project, making it essential that any feasibility study is carried out by a trustworthy third party.

4.2.2. Plant location

According to the original plan, the cold rolling mill (annual production capacity: 250 kt) is to be built in the suburbs of Ho Chi Min City, in southern Viet Nam, at a total expected cost of around USD100M.[47] For the subsequent construction of the hot rolling mill, however, the Vietnamese government is not keen on both plants being concentrated in the south of the country, and would like the north to get a show in as well. For this reason, with the hot rolling mill, time will be spent in considering the possibility of having the plant located in northern or central Viet Nam. At the time of research into the master plan (two years ago), 60% of demand for steel was concentrated in southern Viet Nam, with 35% in northern Viet Nam, and 5% in central Viet Nam. This suggested a fair amount of demand in the north of the country and opened the possibility for the plant to be located in line with the government's industrial policy. If this approach were to be taken, the problem would remain of how to transport hot sheets 1,800 km from the northern hot rolling mill to the southern cold rolling mill.[48] In Viet Nam's case, under-developed port facilities make sea transport difficult and under-developed road infrastructure makes land transport difficult. Additionally, from the perspective of distribution, it would be extremely uneconomical for the hot and cold rolling mills to be located far apart. As the semi-finished output of the hot rolling mill forms the input for the cold rolling mill, a conveyor belt or similar device should ideally be used to transport the former to the latter, and hot and cold rolling mills are generally located right next to each other. If the distance between them were to be great, then cost competitiveness would drop noticeably due to extra distribution overhead. It is of course logical to situate the plants where there is the greatest demand, although it should be possible

[47] Based on an exchange rate of USD1=¥100.

[48] In Japan's case, port facilities and general distribution infrastructure is highly developed, and there are actual cases of transporting hot sheets the roughly 1,000 km from Tokyo to Kitakyushu by sea.

to fit in with the government's industrial policy in locating the hot rolling mill in northern Viet Nam due to significant levels of demand in the area. In the feasibility study candidate sites considered for the construction of the cold rolling mill are the AMATA Industrial Zone 30 km from Ho Chi Min City (developed through a joint venture principally with the Thai government), the Nhon Trach Industrial Zone 60 km from Ho Chi Min City (Dong Nai Province), and the Phu My Industrial Zone 68 km from Ho Chi Min City (Ba ria- Vung tau Province). The feasibility study concluded that there was no real fault with any of these three locations as the site for a cold rolling mill. The Phu My Industrial Zone is suggested to be the most suitable site for a cold rolling mill, despite it being the greatest distance from the area of demand (Ho Chi Min City), as it would facilitate cheap hot coil transportation costs due to its proximity (1.5 km) to the Phu My harbor, it is tenable with heavy industrialization,[49] and it has the greatest scope for expansion.

4.2.3. Plant construction details

The Vietnamese government's steel industry furtherance policy of 1998 is aimed at the establishment of a steel production framework including a 600,000 MT/year hot rolling mill and a 250,000 MT/year cold rolling mill. There is doubt here as to whether the 250,000 MT annual production capacity of the cold rolling mill is truly optimal. Normally, with a single reverse-type cold rolling mill, an annual production capacity of 250,000 MT is quite possible. With two such mills, therefore, a production capacity of 500,000 MT becomes possible. For a production capacity of 1-2 Million MT/year, on the other hand, a (tandem-type) continuous rolling mill must be installed, which allows for the efficient production of high-grade cold coils. The production cost is estimated at around USD100-120 million in the former case, but around USD300-500 million in the latter case.[50] Consequently, assuming that a production capacity of 0.5-1.0 Million MT/year is desired, then in order to accommodate future growth in demand, there would be a choice between a continuous rolling mill and two 250,000 MT/year reverse-type cold rolling mills.

Note that in the draft final report for the cold rolling project, the plant is planned to come on line in 2004, at which point the demand for cold rolled products is estimated at around 500,000 MT meaning that a 250,000 MT/year plant would be the appropriate size to be able to absorb certain levels of fluctuation in demand. In the cold rolling plant construction plans, the recommendation is for the use of a combination-type single stand reverse roller-of the type commonly used in 250,000 MT/year cold rolling mills-as the central rolling device. With this type of rolling device, a single roller is positioned at the center of the device, and the objects being milled is rolled left and right through the roller the

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[49] The Phu My Industrial Zone has a power stations and natural gas station, and is also the site of Vina Kyoei operations. Most companies in the AMATA and Nhon Trach Industrial Zones, on the other hand, are light industrial.

[50] Based on an exchange rate of USD1=¥100.

required number of times. The production capacity of such a device is relatively small at 100-300,000 MT/year, but it has the advantage of being usable for both cold rolling and Skin-pass mill, and also costs around USD15-25 million, a reduction in up-front investment of one third over a tandem-type roller.

Viet Nam should take the conservative line of starting with a small-scale 250,000 MT facility. After accumulating expertise as the production level of the first plant reaches a certain level and demand increases, the next consideration should be made whether the same small-scale 250,000 MT facility or a 1 Million MT plant should be added. The decision as to which is the best choice should be made based on consideration of compatibility between the plant type and make-up of demand, and also determination of the step-wise implementation which is going to have the most economic effect.

The greatest future sources of demand for steel sheets will most likely be the car and electrical appliance industries, and the results of the feasibility study suggest that it will only be from 2005 onward that these two industries produce enough demand to be able to absorb the output of a new cold rolling mill. At present in the car industry, most car companies simply import knockdown parts and assemble them into cars locally, and are not yet at the stage of press processing parts. Looking 10 years down the track, there is little hope for much progress from this point. The demand for steel in the car industry is estimated at 3,000 MT in 2005 and 8,000 MT in 2010, but due to each individual car plant being of only limited size, there is no possibility of huge growth in demand. At the very least, there is not expected to be demand for a domestic cold rolling mill in 2005, and there is a high likelihood that the same will apply for 2010. Looking to the electrical appliance industry now, current production levels are extremely low, and individual plants do not possess coating facilities. Demand is thus for imported pre-coated steel and not cold-rolled steel sheets. In general, appliance factories must reach a 1 million unit/year production capacity to be able to have in-house coating facilities. As such, there is not expected to be demand for a cold rolling mill in 2005. The feasibility study estimates that demand for steel in the electrical appliance industry will be 5,500 MT in 2005, and only 13,000 MT in 2010 even.

As such, cold rolled products of greatest demand in 2004 expected to be general-purpose commercial sheets, cold coils and sheets for use in the construction industry, and surface-treated sheets. In practice, general-purpose commercial sheets have applications in domestic industry, in the production of a wide range of sheet-based products. The quality called for by such applications is not that high, and the production equipment required producing sheeting of this type is not that expensive. Some types of general-purpose commercial sheeting, such as surface-treated sheeting, require high levels of quality depending on the end application; this is the case with surface-treated sheeting used in electrical appliances. There are reasonably high levels of demand for galvanized sheeting in the Vietnamese construction industry. Galvanized sheets used for steel cans (around 0.18 mm thick) have high demand as construction materials (for roofing, etc.) in South East Asian countries such as Viet Nam and Thailand. The table given below details the expected demand for steel from a cold rolling mill from each sector, based on the results of the feasibility study. Inspection of the table reveals that general-purpose and galvanized steel sheeting have an expected demand of 511,000 MT, 563,000 MT and 1,046,000 MT in 2004, 2005 and 2010, respectively. These two product types represent 94%, 98% and 93%, respectively, of total demand in the three years. Demand for high-grade cold-rolled steel sheets in the motorbike, car and electrical appliance industries accounts for only a very small proportion of overall demand.

Table 2 Expected demand for steel from the new cold rolling mill

(Unit: kt)

	1999	2000	2003	2004	2005	2010
Cold-rolled steel sheets for the manufacturing industry	189	206	283	315	350	621
General-purpose* steel sheets	172	187	257	286	318	545
High-grade steel sheets	17	19	26	29	32	76
Motorbikes	3	3	6	7	8	14
Cars	-	-	-	-	-	8
Electrical appliances	-	-	-	-	-	13
Other applications**	14	16	20	22	24	41
Galvanized sheeting	102	119	179	196	213	425
Total demand for steel from the new cold rolling mill	291	325	462	511	563	1,046

Source: "Draft Final Report: The Feasibility Study on Steel Flat Product Mills in The Socialist Republic of Viet Nam" (hereafter, DFR) Chapter III, Page III-2-4, Table III-2-7

Notes: * General-purpose = pipe manufacturers, manufacturers of furniture for the domestic market, bicycle manufacturers, bicycle repairers, etc

** Manufacturers of furniture for export, circuit board manufacturers, etc

Another matter that must be decided upon is whether the plant should be able to produce tin-plated steel, a product that is currently in high demand. This steel type is used for cans,[51] with the can being punched out of a sheet of steel. As a result, the steel must be of a high grade, well milled, and fairly rigid. Additionally, it is becoming common to print a design directly on the steel sheet rather than on paper, meaning that the steel surface must be fairly consistent. Tin-plated steel cannot be produced with only one device, and the required equipment level is around 1.7 times that of a single rolling mill. Its narrow width means that problems arise such as efficient use not being made of rolling machines, which is probably the cause of it not being considered as part of the cold rolling mill feasibility study.

One additional issue is whether an electrical cleaning line (ECL) should be included in the cold rolling process. Grease is applied to products as part of the rolling process, meaning that finished products (coils, etc.) come off the production line covered in grease. The question of whether the

[51] Of late in South East Asia, 2-piece cans have become the mainstream, replacing 3-piece cans. As 2-piece cans are produced through punching, the steel must be of a certain grade.

grease should be removed at the plant through a second acid wash, may turn into an important aspect of product competitiveness in the ASEAN region. Large-scale consumers in countries such as South Korea and Japan (e.g. car companies and electrical appliance manufacturers) tend to have their own cleaning equipment. Medium and small-scale consumers in countries such as Thailand, on the other hand, do not have acid washing facilities, and require that the product is clean (free of grease) at the time of delivery. There are plants in the ASEAN region, however, that employ ECL equipment, including the ESSAR reverse-type cold rolling mill in Indonesia (a local subsidiary of India's ESSAR). ECL equipment costs are around USD10 million per unit and such equipment should perhaps be overlooked in the interests of minimizing up-front investment, although the Vietnamese government fears that it will be at a disadvantage in direct competition with ESSAR if it does not have ECL facilities. The most important issue here is how to build a cold rolling mill that will be both economically sound and competitive with other ASEAN countries.

In the feasibility study, cold rolling production facilities based on the three product types of high-grade cold-rolled steel sheeting, galvanized iron sheeting (both FULL HARD: FH and Commercial Quality: CQ)) are suggested to be maximally profitable, based on domestic market forecasts for 2004. As ECL equipment is necessary for the treatment of galvanized iron (FH, in the removal of grease from the surface of the steel), it must be included in original equipment plans.

Based on this product composition, the annual production capacity of the cold rolling mill based on demand forecasts for 2004,[52] the year the plant is scheduled to come on line, is estimated to be slightly down on the original figure of 250,000 MT, at just under 210,000 MT.[53] This breaks down into 21,000 MT of high-gradecold-rolled steel sheets, 120,000 MT of FH galvanized iron and 64,000 MT of CQ.

Realistic investment in the first rolling mill means to set plant specifications at a just-affordable level, and invest in higher specification machinery when building the second plant. What is needed is a balance between demand and capital investment, with the plant composition aimed at cheaply manufacturing products that will produce maximum efficiency and profit stability, in light of the make-up of domestic Vietnamese demand. In order to win out over competition with ASEAN nations, a high efficiency plant must be built at minimum levels of investment. In the case of the cold rolling mill, it will be very difficult to build a plant which meets all of the above criteria for under USD100

52 In the feasibility study, the plan is for plant operations to start up 24 months after the commencement of civil works. Additionally, based on the actual performance of similarly sized plants at start-up, production in the first year of operation is estimated at around 60% of full production capacity (123 kt/year), that in the second year of operation 90% (184 kt/year), and full production levels (205 kt/year) are then reached from the third year onward. (DFR: V-9-2 - V-10-1)

53 This figure is derived by setting the production level of high-grade products to 21 kt based on a safe sales rate in line with 2004 demand predictions, determining the production time taken to produce this quantity and devoting the remainder of production time to galvanized iron, both FH and CQ. Figures for FH and CQ are calculated with the relative levels of FH and CQ production estimated at 64.9% and 35.1%, respectively, based on the results of a market survey. (DFR: Chapter IV, Page IV-1-1 - IV-3-2)

million.[54]

Based on the results of the feasibility study, the total construction cost to develop facilities to produce the above three product types is estimated to be USD125.8 million,[55] of which USD57.9 million is the cost of production and incidental equipment (the total cost of equipment, including transportation, insurance, and installation work is USD78.1 million), USD22.2 million goes toward civil works, andUSD11.8 million is interest accrued on loans during the term of construction.

Note that up until the CEPT deadline of 2006, VSC is able to nurture the local steel industry by imposing duties[56] as a provisional measure, but after that, it must abide with the rules of CEPT. There is therefore not the financial leeway to carry out superfluous capital investment aimed at future production.

In building the cold rolling mill, hardware (construction materials and parts) will have to be imported from overseas.[57] In constructing the plant, however, all effort should be made to help out the local construction industry in any way possible. By way of involving local operators in the construction process, it should be possible both to develop local skills and save money for the project. Rolling machinery must be fitted in place with quite deep foundations, and requires that the plant site is both flat and firm enough to rigidly support a 100-200 t machine. In order to achieve this level of precision, stringent specifications are applied to civil engineering work, pointing to the need for advice and possibly technical cooperation from offshore general contractors.

In building a 250,000 MT/year cold rolling mill, an equivalent quantity (i.e. 250,000 MT/year) of hot coils is needed to fuel the plant. Additionally, about 100,000 MT can be shipped unmilled, through simply cleaning hot coils of surface grease and dirt.[58] As a result, a total of 350,000 MT of hot coils will be processed by the cold coil plant, made up of 250,000 MT to be processed into cold coils, and 100,000 MT simply requiring washing.

4.2.4. Sources of fund procurement

If Viet Nam is to build the plant itself, it must procure that capital in some way, in the following

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[54] Based on an exchange rate of USD1 = ¥100.

[55] Based on an exchange rate of USD1 = 14,080 dong. (DFR: Chapter V, page V-11-1)

[56] VSC desires an across-the-board tariff of 20% for 7-10 years on all steel products (cold coils, hot coils, billet, slag and steel rods), but in consideration of the effects of such as measure on domestic demand and potential problems with AFTA and WTO membership, it would be difficult to impose a duty on all products, pointing instead to the need to apply import duties in select products. (Source: an interview with Nguyen Kim Son, president of VSC, August 2000).

[57] It is not possible to have construction hardware produced locally, as each component is too bulky for local producers to manufacture. Only about 10 companies in the world are capable of producing the necessary items, including Hitachi and Mitsubishi Heavy Industries.

[58] Prior to the milling process, hot coils are washed in acid. As steel rusts easily, it is shipped coated with grease, hot coils must go through the process even if they are to be shipped out again as in their basic original form.

manner, for example:

(1) *Call upon European capital.* Three or four European-based players (including Austria's Voest-Alpine Stahl) have approached the Vietnamese government about the possibilities of building a plant, since the breakdown of the Taiwanese joint venture. These companies would appear to have prepared a variety of back-up measures above and beyond joint venture facilitation, including means of providing capital.

(2) *Acquire funds from an international institution.* If Viet Nam is to enter into the project without foreign capital, then it should give consideration to loans from the Japan Bank for International Cooperation (JBIC) or World Bank (IBRD) Group.

Based on a request by the Vietnamese government, in the feasibility study, it was assumed that no foreign capital would be involved, thus excluding the possibility of fund procurement via a joint venture. With regard to the second option of calling upon assistance (with ODA) from the World Bank Group or Asia Development Bank, no recommendations were made in the feasibility study leaving the matter in the hands of the Vietnamese government. The fund procurement method that has been recommend is funding by Vietnamese state-owned enterprises such as VSC, and also the use of low-interest loans from Development Assistance Fund (DAF). In this latter case, if it is possible to get preferential loan conditions such as low interest rates or an extension in the loan term, then it may be possible to loan money under more favorable conditions than would be possible through an off-shore export finance institution. However, with the still weak domestic financial system, and it is uncertain whether it will be possible to procure the required capital, and reconsideration of the fund procurement method may be necessary.

4.2.5. The plant construction schedule and timing of the construction of the hot rolling plant

The most sensible schedule for the construction of the mills would be to build the cold rolling mill first, and embark on the construction of the hot rolling mill only once the first plant has generated a certain cash flow. It will take at least three to four years for the cold rolling mill to find its feet and generate surplus in its cash flow, and construction of the hot rolling mill should be started another year or two after that. As a result, construction of the hot rolling mill will commence in five to six years at the earliest.

Note that in the feasibility study, recommendations are given as to the location of the hot rolling mill. Based on consideration of port facilities (allowing for ships up to 60 kt to berth), product transportation (the distance to areas of consumption) and the ease of access to utilities, southern Viet Nam, and specifically, the Phu My Industrial Zone is suggested as the best location for the plant. Additionally, the merits of establishing the hot rolling mill adjacent to the cold rolling mill are given as:[59]

- Information exchange with the cold rolling mill
- Technical exchange between rolling engineers/pooling of know-how
- Reductions in staff levels through the sharing of infrastructure
- Sharing of spare parts
- Sharing of spare processing machinery
- Sharing of material analysis/product inspection devices, etc.

4.3. The sequence of steel industry furtherance - from downstream to upstream operations

As touched upon in the section relating to patterns of growth in steel demand, there is a general trend for demand for steel bars to jump up during the early stages of economic development and industrialization, and for demand for steel sheets to grow as industrialization gains momentum. Steel bars for the construction industry are standardized goods subject to international price competition based around economies of scale. Steel sheeting, as used in the motor vehicle industry for instance, is generally produced in limited quantities and a wide variety of types, according to individual orders. It is highly value added, and calls for high technological levels and large-scale production facilities. Additionally, as production technology is fairly well established and only certain companies are able to manufacture the latest production equipment types, the optimal plant size and the amount of capital investment required, is basically pre-determined for each production method. As the optimal production capacity and risk associated with blast furnace-based upstream operations are large, entry into the steel industry tends to be from the more accessible downstream sectors. Sales and technical expertise, and capital earned in downstream operations are then used to expand operations progressively upstream. Given the highly liberated nature of trade in the present day and little scope for the imposition of tariff-based protection, the latest proven equipment types should be procured at each stage of development, and international competitiveness gained through scale merit. In order to compete with countries where depreciation is well advanced, protection of some form may be required.

The next step for Viet Nam is ideally to build a 200-250,000 MT/year cold rolling mill. Reasons motivating this recommendation are the small size of such a plant, relatively high level of value added,[60] relative robustness of the cash flow of a cold rolling mill, and fact that Viet Nam's full component of cold rolling sheets is presently imported, despite comparatively high levels of demand (see Table 3).

The proportion of cold rolled sheets in steel imports was 500-600,000 MT out of a total 800,000 MT

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[59] DFR: Chapter IX, Page IX-1-1

[60] To take a very rough estimate of cold coil market prices of USD450, and a price for slabs to produce hot coils of USD220, value added in the hot spring production process is +USD80, and that in the cold coil production process in +USD150.

in 1997, 700,000 MT out of a total 900,000 MT in 1998, and 700-800,000 MT out of a total 1,110,000 MT in 1999. Given these high levels of demand, it would appear plausible to cover 200-250,000 MT of demand through domestic production, although it is difficult to gauge the potential for such a project from simple figures alone, and details of equipment types and the required amount of investment will differ according to the plant composition.

Table 3 The balance of supply and demand for steel 1997-2000

(Unit: t)

	1997	1998	1999 (estimated)	2000 (estimated)
Period-initial stocks	269,079	231,000	159,440	180,000
Domestic production	976,324	1,150,064	1,300,000	1,400,000
Imports	807,171	906,321	1,100,000	1,100,000
Total consumption	1,821,574	2,127,945	2,379,440	2,500,000
Period-final stocks	231,000	159,440	180,000	180,000

Source: Industry estimates (November 1999)

As there is no hot rolling mill[61] in Viet Nam to provide hot coils to the cold rolling mill, hot coils would have to be procured through imports for the foreseeable future. The next step after the cold rolling mill is up and running, and demand for hot coils has stabilized at relatively high level (expected to take 5-6 years), will be to build a hot rolling mill.

Hot coils provide the feedstock for cold rolling production, but there is also reasonable demand for them as they are (i.e. as plates) in developing countries. Example applications are for shipbuilding, guardrails, and pipes and braces that are easily cut and joined with the aid of an electric welder. Demand for steel sheets and plates in Viet Nam is expected to be 1.76 Million MT in 2005 (1.02 Million MT of hot-rolled products and 0.74 Million MT of cold-rolled products; 45% of total steel demand), 3.00 Million MT in 2010 (1.74 Million MT of hot-rolled products and 1.36 Million MT of cold-rolled products; 50% of total steel demand), 4.40 Million MT in 2015 (2.50 Million MT of hot-rolled products and 1.90 Million MT of cold-rolled products; 50% of total steel demand), and 6.20 Million MT in 2020 (3.60 Million MT of hot-rolled products and 2.60 Million MT of cold-rolled products; 50% of total steel demand - see Table 4).

61 Hot coils are, on average, between 2 mm and 15 mm thick, although they can sometimes be 20 mm thick.

Table 4 Estimated future demand for steel

(Unit: kt)

			2000	2005	2010	2015*	2020
Steel demand	Long products	Steel rods, wire, small sections	1,400	1,940	2,600	3,800	5,400
		Large sections, etc	100	200	400	600	800
		Sub-total	1,500	2,140	3,000	4,400	6,200
	Steel plates	Hot-rolled products	620	1,020	1,740	2,500	3,600
		Cold-rolled products	375	740	1,360	1,900	2,600
		Sub-total	1,000	1,760	3,000	4,400	6,200
	Total demand		2,500	3,900	6,000	8,800	12,400

(source) N.Tanaka; JICA Expert (Sept.2000)

* It is estimated that the total demand of steel reaches 10,000 kt by 2017.

The feasibility research team is expected to announce its findings on the optimal size (as well as feedstock quality, amount of investment, location, etc.) of the hot rolling mill at the end of phase 1 (October 2000); this figure is expected to be somewhere between 500-600 kt and 1,000 kt.[62]

One issue in designing a hot rolling mill of capacity 500-700 kt/year is whether to use a single stand Steckel rolling machine, or a multi-stand continuous rolling machine. Steckel rolling machines have a production capacity of 200-500 kt/year, but are not able to produce high-quality plates. The amount of initial investment differs according to the number of plate types to be produced, but is generally in the range USD70-200 million.[63] In order to produce 500-700 kt, two units are needed. Continuous rolling machines, on the other hand, have a production capacity of up to 1-2 Million MT, and are able to produce high-quality sheets. Generally, a full production line comprising 6 stands with 2 coil winders each on the front and back, and 2 furnaces to heat the produced coils, requires initial investment of the order USD220-USD350 million.[64] In order to initiate production at a capacity of 500-600 kt, it is possible to cut down the initial investment by reducing the number of stands, and limiting the number of furnaces to 1, for example.

There are around 20 surface treatment plants currently in operation in Viet Nam, including POSVINA and SSSC (both joint ventures with Southern Steel Corp.), and Maruviena (a joint venture with Marubeni Corporation, Japan), each with a production capacity of around 50 kt/year. It would make economic sense for the cold rolling mill to supply cold rolling sheets to these surface treatment plants.

There are also plans to build a billet center in Phu My centering around a 500 kt/year electric furnace, at a cost of around USD140 million. The underlying objective of the project is to resolve the unbalance that exists between Viet Nam's rolling and crude steel production capacities, which is an admirable pursuit, but there are still a number of issues to be resolved, including accessing a power supply and locating a scrap supply route, as well as doubts as to the general profitability of the project. A 1 GW

[62] These figures concerning the hot rolling mill are not confirmed yet, therefore subject to further verification.

[63] Based on an exchange rate of USD1 = ¥100.

[64] Based on an exchange rate of USD1 = ¥100.

power plant is scheduled for completion in the Phu My area at the first half of 2001, but even when including the output of this new power plant, there is not enough electricity on line to be able to power a 500 kt electric furnace. Indeed a 500 kt electric furnace would be a viable prospect only if all power plant construction projects planned for the area are to reach fruition, and also that approval is given for a sizeable reduction in electricity tariffs. It is also doubtful whether a stable supply route for scrap could be located, with stable price levels guaranteed over the long term. There always is a risk in which the plant operation becomes impossible due to a jump in scrap prices. If both the billet center and cold rolling mill are to be built, then VSC must find some way of procuring capital totaling nearly USD300 million, which would not be an easy task. Assuming for the moment that the capital can be procured, a worsening of financial terms surrounding the capital can be expected. Only when all of these concerns have been thoroughly resolved will the electric furnace become a realistic proposition.

5. Issues relating to AFTA/WTO membership

Slightly before the economic crisis of 1997, an import restriction was imposed on steel bars in order to save the troubled VSC. This has resulted in all bar steel joint ventures between VSC and foreign companies operating at profit. Both VSC-POSCO and VinaKyoei have adequately returned profits under tariff-based protection. Under the current system, a tariff of 0-5% is applied to billet, 10-40% to steel bars, and 0% to steel sheets, which intends to assist domestic steel bar production. Although Viet Nam still has some time up its sleeve before AFTA comes into effect in 2006, it obviously cannot go to the extreme of applying a tariff on all steel products, and at the same time, it is committed to removing non-tariff-based trade barriers. It could, however, raise the tariff on steel sheets in return for lowering the tariff on steel bars, once the cold rolling mill comes on line. Having said this, it is possible that such measures will not be approved, as after AFTA comes into effect, any adjustment of import duties must be in a downward direction. If provisions are adopted such as implementing import duties of around 10% for the first few years of operation of the plant when the burden of interest payments and depreciation is the highest, then the plant should be able to gain a foothold in the market.[65]

In line with joining the WTO, Viet Nam must first dissolve dismantle all non-tariff-based trade barriers, and transfer any protection of domestic products across to duties. For the steel industry also, therefore, current quantity restrictions must be abolished, and industry protection focused at the single medium of import duties. In the future, the combined use of a local consumption tax and subsidies may become necessary to buffer the steel industry from international competition.

Recently, there has been a jump in the number of cases of countries protecting their local steel industry through the application of anti-dumping (AD), safeguard and other measures. In the case of AD suits, for

[65] Based on an interview with a JICA expert (September 2000)

example, irrespective of the outcome of the suit, is effective in restricting imports as well as placing direct economic and personnel loads on the exporter in defending the claims filed against them, once the suit has been officially filed and investigations have begun. As a result, there is the real danger that companies can misuse anti-dumping suits to protect the local product. In actuality, the number of AD suits being filed and investigations being made over the past few years have leapt up. As a case in point, looking at the numbers of countries filing AD suits for each steel product type since 1996 (see Table 5), it is apparent that the core component of AD suits has focused on untreated plates including hot-rolled products, cold-rolled products and thick plates, and that the number of suits being filed shot up in 1998. Russia and Ukraine were the target of many such AD suits, due to a high weighting of untreated products, accounting for around 40% (40/102) of the total number of suits filed. This has been the result of these two countries aggressively importing their steel products since the collapse of the Soviet Union (in 1991) in order to raise the export ratio of steel products and earn foreign revenue.[66] In Russia's case this has combined with a shift away from the Asian market to the US from 1998—when the Asian currency crisis led to the Asian market shrinking—which has seen the number of AD suits filed against it by the US go through the roof.[67] The size of reduction in hot-rolled product exports from Russia to Asia in 1998 (Thailand, Malaysia, South Korea, etc), for example, is almost exactly equaled by the size of growth of exports of that same product type into the US for that same year.[68] A further cause of the growth in numbers of AD suits has been a crash in international steel prices since 1998,[69] which has resulted in steel importers taking up a defensive position.

In this way, at the same time as removing non-tariff-based trade barriers on steel products, countries have been implementing what correspond to legal import restrictions, through the application of AD and safeguard measures approved by the WTO. Under the recent phenomenon of legal protective measures being put to effect with growing frequency, even a most internationally competitive company can be in danger of losing their business. Current international conditions put the steel industries of developing countries such as Viet Nam in an even more vulnerable position, and make it extremely difficult to survive. Viet Nam must join other countries, therefore, in steeling itself to meet such a situation by putting itself in a position to be able to call on AD stipulations.

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66 Russia, for example, increased its export ratio from around 10% in 1992 to over 40% in 1993, and over 60% in 1994, at which level it has remained. "Global Steel Trade: Structural Problems and Future Solutions" 3]1 "Russia", US Trade Ministry (July 26, 2000)

67 Comparison of export figures in 1996 and 1998, before and after the Asian currency crisis, reveals a drop of around 64%, from 2.8 Million MT to a little over 1 Million MT (Source as above).

68 "Global Steel Trade: Structural Problems and Future Solutions" 3]1 "Russia", US Trade Ministry (July 26, 2000)

69 A stark drop in the international scrap and the crude oil prices after the Asian economic crisis, US dollars strengthened over the years, and the drastic devaluation of the Russian rubles in August 1998, all added up to the cause of the crash in the international steel prices. (Source: Steel Club "Tekkou jyukyuu no ugoki: kikan No. 197[Trends in Steel Demand: Fall Edition, No. 197], May 2000)

Table 5 The number of countries filing anti-dumping (AD) suits, and the total number of AD suits for different steel product types since 1996

Steel product type		1996	1997	1998	1999	AD suits	
Untreated metal plates	Hot-rolled sheeting	Thailand (2) Indonesia (4)	India (3)	US (3) Canada (4) Chile (2) Venezuela (3) Argentina (3) S Africa (2)	Philippines (1) Poland (3) EU (6) Mexico (2) Ecuador (1)*	39	
	Thick plates	US (4)	Canada (4) Mexico (2)	None	Taiwan (3), EU (3) US (8), Canada (6)	30	
	Cold-rolled plates	None	None	Philippines (3) Mexico (3) Colombia (3) Venezuela (3)	US (12) Canada (6) Ecuador (1)* Argentina (2)	33	
Surface-treated steel					Poland (5)	5	
Galvanized iron			Philippines (1)	Indonesia (4)	US (1)	6	
Electromagnetic steel					China (1)	1	
Pipes	Seamless pipes (s) Welded pipes (WP)	EU(5)-s None	None Israel (1)-WP	EU (2)-s Brazil (1)-s None	India (5)-s Mexico (1)-s Venezuela (1)-s US (6)-s Indonesia (4) Venezuela (1)	27	
Wire/rods	Steel rods	US (1)	Singapore (2) Israel (2) Egypt (5)		Canada (3), Chile (1) Venezuela (1) Egypt (1)	16	40
	Structural rods	S Korea (1) Taiwan (4) Thailand (1)	Thailand (1)	Taiwan (1) Indonesia (2)	US (4)	14	
	Wire	None	Indonesia (2) US (4) Colombia (1)	None	EU (1) Mexico (1) Colombia (1)	10	
Stainless steel	Wire/rods	None	EU (1) US (7) Canada (9)	EU (2) US (6) Canada (1)		26	58
	Steel plates	None	None	US (14) Brazil (10)	China (2)	26	
	Steel pipes	None	None	S Africa (3)	US (1) Brazil (2)	6	
Billet					Philippines (1) Colombia (2)*	3	
Countries filing suits		8	17	23	36	Total suits: 242	
Countries with suits filed against them		22	49	75	100		
(Instances of Russia and Ukraine having suits filed against them)		(6)	(4)	(12)	(16)		

Produced based on Fig. 1 and Table 2 of Steel Club "Tekkou jyukyuu no ugoki: kikan No. 197" [Trends in Steel Demand: No. 197], May 2000. Data extracted from newspaper and other sources, and not exhaustive.

Notes: * Needs checking, ** March 2000

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

6.1. Steel industry furtherance policy

The following points can be made regarding the medium and long-term furtherance of the Vietnamese steel industry.

First, local production of downstream operations should be established as a first step (cold coil operations → hot coil operations), and industry development should then gradually progress upstream as local demand for the output of that sector is established.

Second, at each stage of development, the proven latest facilities should be installed at the optimal size, and tailored to local needs. There is no point in spending large amounts of money on equipment that will output a higher-grade product than is needed domestically, but the size of facilities should be determined in consideration of international competitiveness. At each stage of development, the scale of operations and price should be balanced up to produce an optimally competitive facility. It should be possible to protect the industry through tariffs to some extent in the future, but tariffs should not be imposed inconsiderately as they can hurt the international competitiveness of the consumer, steel processors.

Third, in deciding on the location for downstream operations, thought should be given to the construction of an efficient blast furnace-based integrated steel plant. If such a steel plant is to be built in the future, it should be located on the same site as downstream operations to maximize economic efficiency. If hot rolling facilities are displaced from upstream operations, then heat and transport efficiency will be diminished greatly, and overall operations will lose competitiveness. Slabs (the semi-finished products of plates and hot strips, weighing 30-40 t a lot) must be processed and rolled straight from the previous process while they are still hot. It would be inefficient and undermine competitiveness to produce slabs in Northern Viet Nam, let them cool and harden, and transport them 1,800 km to the hot rolling mill in southern Viet Nam. At the very least, slabs should flow straight on to the hot rolling mill for transformation into hot coils, and the two facilities should adjoin one another for this to take place. There are also similar advantages in building the hot rolling mill on the same site as the cold rolling mill. The latter pattern may be desirable from the point of minimizing risks and attaching importance to know-how accumulation through down stream operation. If the timing of construction between hot rolling facilities and a blast furnace differ considerably, then hot rolling facilities should be located near other preceding facilities if that choice is economically justifiable.

Lastly, effective use should be made of foreign technical expertise and capital backing. Due to heavy capital regulation in Viet Nam, it is imperative that foreign capital is availed through the medium of a joint venture or similar. Here, the joint venture agreement should facilitate the smooth passage of technical transfer, while providing foreign interests with a cut of profits.

6.2. The possibility of constructing a blast furnace-based integrated steel facility

The risks associated with building a large-scale blast furnace-based integrated steel facility are great and national leadership is indispensable for furtherance of the construction. Such a venture should be entered into only when demand in industries requiring high-priced, high-quality steel sheets (e.g. the motor vehicle and electrical appliance industries) has developed sufficiently, and domestic demand for steel products is around 10 Million MT/year. This would suggest that it is much too early to be thinking of building a blast furnace-based integrated steel plant at this point, which is perhaps not strictly true, as countries such as South Korea have historically been able to successfully establish such large-scale steelworks well before the domestic demand had reached 10 Million MT. It might be possible for Viet Nam to justify building an integrated steel plant when domestic demand is at a lower level (e.g. 6 Million MT in 2010), if steel demand has a high component of highly value added products such as whitegoods (washing machines and refrigerators), and also steel sheets for electrical appliances and cars. Conversely, even if domestic demand reaches 10 Million MT, it may not be feasible to build a blast furnace if the car and other industries requiring high-grade steel have not matured sufficiently. Just how far demand in these areas grows, is likely to have a strong bearing on things. Given the increasingly globalized economic climate that Viet Nam currently faces, it will most likely be difficult to recreate the South Korean experience.

If, on the other hand, a blast furnace-based integrated steel plant is to be built before local demand has matured sufficiently, then slabs and other products will have to be exported. Here, Viet Nam would be placing itself at the mercy of market forces, which could have dire consequences as has occurred with Indonesia and Malaysia. In the past, Ukraine, and countries in Eastern Europe and the Middle East have exported steel as slabs in large volumes, but they are now changing direction to export steel as hot coils, due to its greater demand and value added. At the same time, demand in countries such as the U.S. for imported slabs is expected to remain high in the future, pointing to the possibility of exporting Vietnamese slabs to the U.S. This would not reduce the risk associated with the construction of a large-scale steel plant, however, as Viet Nam would have no guaranteed export volume or price that it would be able to sell its steel at. If Viet Nam is to aim to export its steel, then it would be better off exporting it in the form of finished hot coils, due to their higher price levels and growing demand. There is still considerable competition in the hot coil market, of course, and Viet Nam would face rivalry from South Korea, Taiwan, Brazil, Japan, Eastern European countries, and Russia. Steel production should be targeted at a particular product or set of products in particular industries, and geared toward particular grades based thereupon. If production is geared toward exports rather than supplying the local market, then there is absolutely no guarantee of recovering the initial huge investment. In this respect, the movements of CSC (Taiwan) are noteworthy. Crude steel production in Taiwan is much lower than rolling capacity, and slab imports total around 7 Million MT. It is difficult to establish a blast furnace in Taiwan due to environmental restrictions, and Taiwan is looking elsewhere for a foreign site to construct a blast furnace. If the project can be enticed to Viet Nam in such a way that CSC shoulders all risk and technical transfer into Viet Nam takes place, then Viet Nam would benefit greatly from in having the blast furnace built locally to supply steel slabs principally to CSC. If the project were accompanied by Taiwan assistance capital that could be directed toward infrastructure development, then the project would be even more attractive. Having said this, Viet Nam must exercise caution in inducing investment of this type, to avoid simply becoming a slab supply center, with neither value added nor technical expertise but only pollution remaining in Viet Nam. If the induction of foreign investment is to be considered, then thorough perusal must be made of the contract details.

Based on the above, the conclusion must be drawn that Viet Nam would be hard put to base its entry into the steel industry around blast furnace operations. In terms of funding, the annual cash flow of VSC is a mere USD10-15 million, and the company does not have the corporate strength to be able to withstand the mammoth investment required to build a blast furnace, in the order of USD6 billion. This figure is greater even than the annual fiscal expenditure of the Vietnamese government,[70] and well beyond the reach of Viet Nam at present. Projects where interest-paying loans account for the greater part of debt, have little chance of getting off the ground given the harsh market conditions of today, and VSC would be unable to withstand even minor price fluctuations with its present corporate base. Even if Viet Nam were to opt to nurture the steel industry from upstream operations and got as far as establishing a hot rolling mill, it would not be catering to the local demand structure of cold coils having greater weight than hot coils. A more appropriate approach, thus, would be to start with small-scale, low initial investment downstream operations, and progressively increase industry investment in developing operations back upstream, as the cash flow of existing operations grows, retained earnings increase, and domestic demand develops.

Viet Nam should first concentrate on getting a cold rolling mill up and running, and then start up a billet center as soon as possible, in time for 2006. Industry protection in the form of tariffs or similar will be vital when the plants first come on line and are cash strapped. Viet Nam is committed to focusing industry protection solely around tariffs by 2006. If the level of up-front investment is kept down, a cold rolling mill may be able to survive ably under tariff levels down to 10% or lower. This leaves the question of whether Vietnamese workers would be able to make full use of the plant equipment (and whether an operating rate of 100% would be achievable), but the Vietnamese people have high technical standards and are highly proficient at producing good results. It is believed that it will be difficult to maintain tariff-based industry protection within the ASEAN region after 2006, and other measures such as policy-based finance may become necessary.

70 Viet Nam's total fiscal expenditure for 1998 was USD5,348 million, and capital expenditure was a mere USD1,675 million. (Viet Nam Public Expenditure Review)

When, in 10 to 20 years, domestic demand shifts toward higher quality products, blast furnace products will become more suitable than electric furnace products made from scrap. It is possible that at that time countries such as Malaysia, Thailand, and Indonesia will not have built blast furnaces, due to capital and national leadership shortages, for example. In this event, it is possible to envisage a scenario where Viet Nam would be able to take the initiative in building a blast furnace and supplying the whole of the ASEAN region. As a guide to the timing of the construction of a large-size blast furnace as big as 4-4.5 Million MT/year, one can plan to aim for 2017 when the total steel demand is expected to reach 10 Million MT, for the purpose of which the construction has to begin by 2010 taking into account the lead time of 7-8 years required. Naturally, in the instance that demand grows faster than predicted, the timing for the construction of the blast furnace may have to be pushed forward, and in the instance that demand grows slower than predicted, the timing for construction may have to be pushed back. It is vitally important, though, to realize that it does not work to build a blast furnace rapidly at a stage when there are capital, technological and/or corporate inadequacies in the project. Prior to giving the go-ahead to start actual construction of the blast furnace, infrastructure such as port facilities and electricity must be put in place at a cost of billions of dollars, and technical personnel trained in the thousands. Also, before committing to the construction of an integrated blast furnace-based steel plant, alternative production methods (e.g. reduced smelting, or coal-based direct reduction) should be seriously reconsidered as replacement options. In order to avoid missing the boat in terms of global technological developments, proven leading-edge technologies with maximal cost performance should be installed. Effective use should be made of foreign capital on both the financial and technological fronts. It is impossible to transfer the technical expertise required to operate a blast furnace in one installment, and continuous technical transfer from a partner with solid technical backing should take place over a period of more than 10 years, pointing to the importance of linking up with a reliable partner.

Thoughts on Promoting the Vietnamese Petroleum Refinery Industry

1. Introduction

Viet Nam exports its full production output of crude oil, and imports its full requirement of petroleum products. The Vietnamese government has been on the constant lookout to make better use of local resources, by constructing an oil refinery and substituting petroleum imports with the local product. Expected benefits of substituting imports with local petroleum products are many and varied, including: (1) an improvement in the trade balance, (2) local retention of value added, (3) energy security (provision of a petroleum product supply base), (4) job creation, and (5) provision of stable supplies of feedstock for the local petrochemical industry in the future. These will have considerable ramifications over the long term if substitution of imports is carried out with economic efficiency. At the same time, however, the oil refinery industry requires phenomenal amounts of investment,[71] is highly competitive on a global scale, and is associated with great risk. Additionally, relative increases in gasoline and diesel prices, for example, due to the failure of oil refinery operations, would inhibit the growth of the Vietnamese economy. The government must therefore tread carefully in involving the country in the oil refinery industry. The Vietnamese government has outlined a long-term plan for the construction of Viet Nam's first oil refinery in Dung Quat, Central Viet Nam, in the interests of the comprehensive development of the entire country; this oil refinery would later form the core of a petrochemical complex in the area. Below, we analyze the feasibility of this project, based on observation of trends in the oil refinery industry in neighboring countries.

2. Features of the oil refinery industry

Low profitability and the necessity for close proximity to large-scale consumer precincts characterize oil refineries. They are highly capital intensive, calling for extraordinarily high levels of up-front investment. Additionally, they are intrinsically linked to economy of scale,[72] and it is difficult to generate product discrimination, in terms of product quality or otherwise. This makes for stiff price competition and means that oil refineries tend to operate at near breakeven levels. Governments are occasionally called upon to fashion policy to suppress prices of essential petroleum commodities such as gasoline, diesel, and kerosene. Consequently, oil refineries tend to operate at low profit levels, and are unable to recoup fixed costs through oil refinery operations alone. This has led large numbers of oil companies to supplement profits through direct involvement in the upstream and distribution sectors.[73] While actual oil refinery margins in the past

[71] The initial investment required building an oil refinery of size 130,000 B/D (barrels/day) is said to be between USD1 and USD1.5 billion.

[72] In order to be internationally competitive, an oil refinery must have a capacity of at least 300,000 B/D.

[73] In the distribution sector even, unless competition is regulated in some way, profits are not huge. The greatest profits are in upstream operations such as oil production.

have shown momentary highs, they have tended to be around USD1 per barrel on the whole, enough to cover running costs but making it extremely difficult to recover fixed costs. It is certainly true that margins vary greatly between regions and different refinery types, and also across time. The margin for a cracking refinery incorporating expensive cracking equipment was, in the case of Singapore, as high as USD3-4 per barrel in the mid 1990's, for example, but dropped below USD1 in 1999. For the same plant type in the US, however, the margin was around USD1 throughout the 1990's. For a hydroskimming refinery (the type of refinery called for in Viet Nam given the composition of petroleum product types in the local market), the margin was around USD1 in Singapore in the mid 1990's, but negative from 1998 to 2000. For a 130,000 B/D refinery costing USD1.3 billion to build, annual depreciation totals USD87M assuming depreciation over a 15-year period. If a sale was around 6 Mt annually, then a margin of USD14 per ton, or USD2.30 per barrel, is necessary simply to cover the cost of depreciation. One gets an idea of just how tight the accounts of a refinery are when additional costs such as interest, repair costs, labor costs, electricity and indirect costs, are factored into calculations. Looking at the profit structure of major players such as BP-Amoco or Exxon Mobil, almost 70% of profits come in upstream sectors, with the profit contribution of downstream sectors such as refinery operations and gasoline sales being a mere 30%.

Oil refinery can be profitable assuming that petroleum product prices are kept high by government-imposed entry barriers on the industry, as well as due to the general difficulty in breaking into the market due to the high up-front investment costs. The price for such measures, however, is high, as artificially inflated energy prices erode corporate competitiveness in today's cutthroat global market. In general, crude oil can be transported in larger shipments and at lower cost than petroleum products, meaning that oil refineries tend to be located near areas of large-scale consumption.[74] The shorter transportation distances from the oil refinery to consumers are, the more competitive the product becomes. This effect is particularly pertinent in countries like Viet Nam where road and port infrastructure is underdeveloped. In order to be able to cater to regional differences in demand pertaining to local environmental conditions, Middle Eastern oil companies have on occasion established their own local distribution operations in oil-consuming countries.

Recently, growth in demand for low-density transport fuels such as gasoline and diesel has far outstripped growth in demand for fuel oils, and the stepping up of local environmental provisions has lead to gasoline containing progressively less sulfur and being of progressively higher grade. As a result, oil refinery equipment has had to be upgraded in order to refine Middle Eastern crude oil. That is, secondary equipment such as hydrogenation and desulfurization devices have had to be fitted, incurring extra capital investment in the order of hundreds of millions of dollars, and lengthening even further the term required to recover the total investment.

In this regard, ASEAN-produced low-sulfur, low-density crude oil, typified by Malaysian-produced Tapis crude oil and Indonesian-produced Sumatra Light (Minas, etc.) requires only relatively simple refinery

[74] Large-scale consumption areas may not be in the country of production, but just across the border in a second country.

equipment, such as standard-pressure distilling units, vacuum flashers and reformers. In addition, crude oil from ASEAN countries sells at higher prices than Dubai crude oil, as it generates higher proportions of gasoline and diesel, which can be sold for greater profit.

Bach Ho (White Tiger) crude oil, the most prominent brand of Vietnamese crude oil, has a low sulfur content and is low density (40.5 degrees API, sulfur content 0.03%, relative gravity 0.823), and sells for more than Minas crude oil. Crude oil prices fluctuate wildly making it difficult to analyze premium spreads, but according to past data, Minas sells at an average of around USD1.50/barrel more than higher-density Dubai crude oil, and White Tiger at an average of around USD0.50-USD0.90/barrel more than Minas. That is, the price spread over Dubai crude is around USD2/barrel.

In this way, the composition of crude oil can affect feedstock costs, equipment composition, and the production output, as well as levels of investment and refining costs. Consequently, a choice has to be made in planning an oil refinery, as to whether domestically produced crude oil or imported crude oil should be used, or equivalently, whether low-density ASEAN or higher-density Middle Eastern crude oil should be imported.

Viet Nam's crude oil output at the end of 1999 was over 300,000 B/D, ranking it third in South East Asia. However, Bach Ho, Viet Nam's main oil field, is said to have peaked out, and levels of development/production at other oil fields are not what they could be. This makes it difficult to predict the size of reserves and future levels of production of domestic crude oil. If an oil refinery is to be built without a clear view of what lies ahead for local reserves, but enters into operation geared toward domestic crude oil, then there is the possibility that, at some stage in the future, the refinery will have to switch across to using imported crude oil, and foot a huge re-equipment bill in the process.

3. The state of the oil refinery industry in South East Asia

3.1. Petroleum demand in Asia

Demand for petroleum in Asia showed an average growth of 800,000 B/D over the decade from 1988 to 1997,[75] and accounted for over 90% of global growth in demand for petroleum from 1990 to 1997. During this period, growth in demand in South Korea and China was particularly strong. Under the effects of the Asian economic crisis in 1997, however, 1998 demand fell by 490,000 B/D over the previous year (down 2.7% to 18.17 million B/D).[76] Countries particularly hard hit by the economic crisis were Thailand and South Korea, where annual drops of 14.4% and 8.9%, respectively, were observed. The combined effect of the 1998 crash in demand is said to have been around 1.3 million B/D, due to the average annual growth of 800,000 B/D until that point not eventuating, and a drop of around 500,000 B/

[75] Source: Annual issues of the "BP Amoco Statistical Review of World Energy"

[76] Source: Annual issues of the "BP Amoco Statistical Review of World Energy"

D arising. The trend for growth in demand returned in 1999, with a rise of 700,000-800,000 B/D for the year, bringing petroleum demand in the Asian region back to pre-economic crisis levels, and putting the market back on track, 2 years behind the stage it would have been at if the crisis had not occurred.

Demand for petroleum in Asia is predicted to rise by 1.79 million B/D in the period 1996 to 2002.[77] This is made up of a fall off in demand in South Korea, more than made up for by solid annual rises of 4-5% in China, India, and Taiwan. Moreover, in the period 2002 to 2006, additional demand of 2.06 million B/D is expected in Asia, a large component of which will come from China and India.

3.2. Refining capacity of Asia

In terms of refining capacity, Asia is in a state of vast overcapacity. Despite demand having dropped in 1998, refining capacity rose by around 620,000 B/D to 18.48 million B/D.[78] In the term 1996 to 2002 also, growth in production capacity of 2.6 million B/D is expected, exceeding growth in demand. The combined refining capacity of new refineries planned to come on line in 2000 alone, largely in India, Taiwan, and China, is around 2 million B/D (see Tables 1 and 2). From this it is apparent that the countries with the greatest prospects of growth in demand, are also those which are expanding refining capacity most avidly.

3.3. The balance of supply and demand in Asia

Inspection of the outlook for the balance of supply and demand in Asia (Table 3), reveals that for Asia as a whole, demand will exceed supply by 250,000 B/D in 2002, but that in East Asia (including the ASEAN forum), supply will exceed demand by a massive 700,000 B/D.

[77] Source: The Institute of Energy Economics, Japan, "International Outlook of Demand & Supply of Petroleum Products in Asia, April 1999"

[78] Source: Annual issues of the "BP Amoco Statistical Review of World Energy"

Table 1. Outlook of refining capacity In Asia

(Unit: 1,000 B/D)

	Refining Capacity			Growth	
	1996 (actual)	2002(outlook)	2006(outlook)	02/96	06/02
China	4,050	4,887	5,016	+837	+129
Hong Kong	0	0	0	+0	+0
Taiwan	770	1,075	1,225	+305	+150
Korea	2,712	2,748	2,748	+36	+0
Singapore	1,217	1,254	1,312	+37	+58
Indonesia	1,035	1,054	1,054	+19	+0
Malaysia	365	513	513	+148	+0
Philippine	377	422	422	+45	+0
Thailand	814	835	835	+21	+0
Viet Nam	9	9	139	+0	+130
Brunei	9	9	9	+0	+0
East Asia Total	**11,358**	**12,806**	**13,273**	**+1,448**	**+467**
India	1,096	2,062	2,520	+966	+458
Other Asia	328	516	646	+188	+130
Japan	5,269	5,289	5,289	+20	+0
Grand Total	**18,051**	**20,673**	**21,728**	**+2,622**	**+1,055**

Source: The Energy Data & Modeling Center, The Institute of Energy Economics, Japan, "International Outlook of Demand & Supply of Petroleum Products in Asia, April 1999"

Table 2. Details of expansion plans in China, Taiwan, Malaysia and India

(Unit: 1,000 B/D)

	Company	Refinery	02/96	06/02
China	Sinopec & CNPC	—	+837	+129
Taiwan	Formosa Plastics Corp.	Yunlin	+300	+150
Malaysia	Shell Refining	Port Dikson	+45	—
	Malaysia Refining	Malacca-2	+100	—
India	Indian Oil Co., Ltd.	Panipat	+120	—
		Koyali	+60	—
		Burauni	+30	—
	Reliance Petroleum Ltd.	Jamnagar	+300	+300
	Essar Oil	Jamnagar	+210	—
	Mangalore R&P Ltd.	Mangalore	+100	—
	TCG	Halida	-129	—
	Eastern Refineries Ltd.	—	+180	—
	Madras Refineries Ltd.	Chennai	—	+60

Source: The Energy Data & Modeling Center, The Institute of Energy Economics, Japan, "International Outlook of Demand & Supply of Petroleum Products in Asia, April 1999"

The hiccup in 1998 when refining capacity increased despite a momentary fall in petroleum demand caused a widening of the gap between supply and demand. This translated across to a worsening of refining profit margins in the Asian petroleum market, and forced refineries into dropping operating rates.[79] Demand for petroleum bounced back in 1999 as the Asian economy showed strong signs of recovery. However, Chinese bans on imports of diesel and gasoline,[80] and burgeoning exports from countries with a refining capacity surplus, such as Thailand, helped to buffer increases in demand.

There are those who claim that the current state of demand being more than satisfied in the Asian petroleum product market is a temporary effect, attributable to the economic crisis. However, if countries such as China and India are to continue increasing their refining capacity, then the Asian region will most likely stay in a state of oversupply for a long time to come. Associated with this, refining margins in the Asian petroleum market are expected to stay low for some time, forcing refineries to operate at reduced levels.

In predicting the outlook for the international petroleum market in the medium to long terms, the movements of China and India—the two largest consumers—on the demand side, and South Korea on the supply side must be followed closely.

Table 3. Outlook of Supply/Demand Balance in Asia

(Unit: 1,000 B/D)

	1996 (actual)	02/96	2002 (outlook)	06/02	2006 (outlook)
China	-390	-60	-450	-210	-660
Taiwan	-40	+100	+60	+20	+80
Korea	+120	+700	+820	-120	+700
Singapore	+420	-230	+190	+250	+440
Other East Asia	-310	+390	+80	-190	-110
East Asia Total	**-200**	**+900**	**+700**	**-250**	**+450**
India	-390	+80	-310	-30	-340
Other Asia	-270	-60	-330	-120	-450
Japan	-140	-170	-310	-80	-390
Grand Total	**-1,000**	**+750**	**-250**	**-480**	**-730**

Source: The Energy Data & Modeling Center, The Institute of Energy Economics, Japan, "International Outlook of Demand & Supply of Petroleum Products in Asia, April 1999"

3.4. The current standing of individual Asian nations

The business climate in the Asian petroleum industry is extremely tight, due to the market being in a state of oversupply. Individual countries are working toward streamlining their local industry by way of privatizing state-owned companies, restructuring companies, and reorganizing and deregulating the local industry.

3.4.1. The current standing of key nations

The petroleum product market and sales of petroleum products in China are fundamentally controlled

[79] Both cracking and non-cracking (hydro-skimming) refineries reported negative margins in August 1998. Additionally, oil refineries in Singapore, Asia's swing refiner, were operating at an average operation rate of 80% in the first half of 1999, but this dropped to between 60 and 70% in July 1999, due to the Reliance topper (270,000 B/D) coming on line in India.

[80] The weakening of the Asian petroleum product market due to the economic crisis exacerbated the disparity between domestic and international price levels in China, leading to an increase in imports of diesel in particular and also of contraband products. In response, the government announced the incremental imposition of import restrictions from 1998, in order to normalize the domestic supply/demand balance, culminating in a total ban on diesel and gasoline imports in September of that year, and a clamping down on illegal imports.

by state-owned organizations, operating within the constraints of government plans and regulation. China plans to expand its refining capacity considerably in the future, but is anticipated to not be able to keep up with growth in demand, and remain reliant on imports to a large degree. Imports into China are not expected, however, to be sizeable enough to absorb the full component of East Asia's production capacity surplus.

Until now, Taiwan has had only one state-owned petroleum company, namely CPC (China Petroleum Co.) and has had a supply deficiency, but by 2002, is anticipated to be in a position to export, through starting up a new private petroleum company.

Since the Asian economic crisis, South Korea has been operating its oil refineries at breakeven levels, and aggressively channeling its production surplus into cheap exports, against which other countries cannot compete. In terms of domestic sales, the four main petroleum companies of South Korea have conspired to keep the domestic prices high so as to guarantee a profit (a process which the South Korean government seems to have tacitly approved).

A handful of state-owned companies have an oligopoly over almost all petroleum products in the Indian market. The local refining capacity will be boosted by 1.0 million B/D by 2002, as a series of new oil refinery come on stream. Industry protection in India consists of such measures as exclusively selling local products by restricting imports.

Singapore is the only ASEAN nation to have a petroleum industry that operates under truly free competition, from production all the way through to distribution. Singapore is Asia's largest exporter of petroleum products, although, since the economic crisis, refinery operating rates have been in the mid-60s as a percentage, due to the weakened Asian market, dumping on the part of South Korea, and the establishment of new plants throughout the region. Because Singapore operates under free competition, it has a clear advantage over its competitors in terms of price. The production cost for petroleum in Japan, for example, is said to be over twice that in Singapore, at around USD40/Kl (the price per barrel is about one sixth of this).[81] Despite this, Singaporean companies are finding it hard to produce a profit due to the weakened market and being unable to compete on an even footing with local companies in countries such as South Korea. Key Western players with operations in Singapore are rumored to be considering pulling out. Exxon-Mobil, for example, owns two oil refineries in Singapore, but is thinking of focusing its operations on just one plant, partly due to the merger of the parent companies (Exxon and Mobil). Shell has a stronger Asian presence than Exxon and Mobil combined even, and still holds Singapore as its Asian mainstay, but is in the process of rationalizing operations to survive, by adjusting production output and enhancing cost performance through a merger with Caltex. On another front, Caltex and BP are considering selling out their stakes in SRC

[81] The production cost of USD40/Kl corresponds to a barrel price of USD6.40; the refining margin in the Singaporean market has traditionally been around USD1 per barrel.

(Singapore Refining Company)-a joint venture between Caltex, BP Amoco, and SPC (the Singapore Petroleum Company).

In Thailand, a number of new refineries came on line in 1997 (including on the parts of Shell and Caltex) straight into the face of hard times due to the currency crisis. The Shell and Caltex refineries streamlined their operations through a pipeline connection, built in a remarkable 2 years. Meanwhile, Thailand's biggest petroleum company is being forced to default on loans.

Traditionally, major petroleum companies were structured such that 70-80% of profits came from upstream sectors, and oil refining and other sectors made up the remaining 20-30%. This tendency has been accentuated over recent years, with the upstream market faring very well and generating large stocks of retained earnings for all companies, while the market in downstream sectors has soured, and accounts worsened. Because of this lay of the land, plans for new operations are being made not in the downstream refinery business, but in upstream sectors such as gas development.

3.4.2. Policies of key nations to enhance competitiveness

Other than China that restricts petroleum imports, all countries are moving toward the liberalization or deregulation of their local petroleum market.

CHINA: In China, the financial stability of the newly-restructured CNPC and SINOPEC companies is of maximum priority, and the government is working toward this end by inducing relatively high domestic price levels through restriction of petroleum product imports and clamping down on illegal imports. In the future, however, as China aims for WTO membership, it must attempt to generate full international competitiveness by reducing local crude oil production and oil refining costs. To date, this has taken the form of the following policies:

(1) *Large-scale amalgamation and streamlining of administrative organizations*: The Petroleum and Chemical Industry Agency was formed as part of the State Economic and Trade Council in order to supervise the entire petroleum industry.

(2) *Reform of state-owned companies*: State-owned petroleum companies were reorganized in 1998 with the intent of enhancing international competitiveness. The China National Petroleum Corp. (CNPC) and China National Petrochemical Corp. (SINOPEC) were established to form a vertically integrated petroleum group that runs all aspects of the industry from the upstream to downstream sectors. CNPC and SINOPEC were each allocated with a region to control,[82] and are pushing ahead with corporate restructuring through such means as the aggregation of equipment.

[82] CNPC has control over 11 provinces in Northwest China and Chongqing, and SINOPEC has control over 9 provinces in Southeast China, as well as the 3 cities of Beijing, Tianjin, and Shanghai.

(3) *The liquidation/amalgamation of small-scale, inefficient refineries*: The Chinese government has earmarked for abolishment 50 refineries operating illegally, and 60-70 small-scale refineries operating at under 40% of capacity, out of the 160 facilities under 1 Mt/year (around 20,000 B/D) in size (a total of 110-120 refineries). The remaining 40-50 small-scale refineries are to be amalgamated with CNPC and SINOPEC.

(4) *Firming up of sales management*: In the past, 86% of the sales sector (around 90,000 service stations) was occupied by independent retail agents, and CNPC and SINOPRC had only a minor share of the market. In order to expand the roles of CNPC and SINOPEC in sales, all refineries were banned from selling petroleum products directly to independent retail agents, and the two companies were placed in charge of distribution. This has resulted in both wholesalers and retailers coming under the control of CNPC and SINOPEC, associated with which, any fresh retail involvement on the part of foreign companies has been restricted to service stations situated on highways.

(5) *Relaxation of price control*: A system of price indices was introduced from June 1998. Under the new system, price indices are first stipulated by the State Development Planning Council based on market prices for crude oil and petroleum products in Singapore, which CNPC and SINOPEC then use in determining actual domestic market prices. In this way, government control of local prices has been diluted and local prices have been allowed to follow international market trends more closely, although there is still a disparity between domestic Chinese and international prices due to import restrictions.

SOUTH KOREA: The restructuring of the South Korean petroleum industry received a shot in the arm when restrictions on the foreign ownership of South Korean petroleum companies were revoked in October 1998, since when the following acquisitions of domestic petroleum company shares have taken place:

(1) September 1998: Hyundai Oil Co., Ltd. announces a takeover of Han Wha Energy Co., Ltd., with the actual takeover occurring in April 1999.

(2) October 1999: Hyundai Oil agrees to sell 50% of its stock to UAE's IPIC (International Petroleum Investment) for USD500M. As a result of this deal, IPIC takes over control of Hyundai Oil.

(3) October 1999: The Ssangyong Group sells off its 28.4% stake in Ssangyong Oil Refining Co., Ltd., and in the process announces hand-over of the control of the company to a consortium made up of Paribas (France), Saudi Aramco, and a foreign subsidiary of Ssangyong Oil.

In this way, local petroleum companies were sold off to offshore interests in rapid succession, in the interests of liquidating conglomerate assets. This was part of the South Korean government obligation to, by the end of 1999, reduce the debt ratio of local conglomerates to within 200% of capital holdings, under the terms of the IMF-imposed "Big Deal" in place from 1997. South Korea's refining capacity is geared very much toward exports at present, but worsening export conditions are likely to push efforts toward industry reorganization to heat up further in the future, through the liquidation, amalgamation, and streamlining of refinery operations. Competition in the Asian market is getting fiercer as time goes by, due to the Chinese ban on gasoline and diesel imports, two Reliance Industries toppers (270,000 B/D) coming on line in 1999 in India, and Formosa Plastics scheduled to start up a new refinery in Taiwan in 2000 (450,000 B/D).

TAIWAN: Taiwan has been progressively deregulating its local petroleum industry, including relaxing foreign ownership regulations on retail operations in 1995 and refinery operations in 1996. However, little progress has been made in this direction in practice, due to foreign companies having to get the approval of both national and regional governments. Formosa Plastics' foray into the petroleum industry, however, has broken the deadlock of the state-owned CPC on the market. Formosa is in the process of building a new refinery complex in Yunlin (Central Taiwan) to principally manufacture naphtha (3 x 150,000 B/D toppers), generating 450,000 B/D extra production capacity as the toppers come on line in succession from 2000. These will push Taiwan's petroleum trade into an export position, which is expected to have a significant impact on the already over-equipped Asian market. Both CPC and Formosa intend to export their petroleum production surplus across to neighboring China, in which market they hold an advantage over countries like South Korea and Singapore in terms of transportation costs. For the present, however, Taiwan will have to look elsewhere to sell its products, as China has a ban on all gasoline and diesel imports.

SINGAPORE: In order to cope with diminishing refining margins in the sluggish Asian petroleum market, Singapore—Asia's main petroleum exporter—has restructured its petroleum companies by cutting staff, and liquidating assets. In the face of continuing lackluster market conditions, however, the major Western players with local operations are planning to step up corporate amelioration attempts. As a result, Singapore is expected to become even more cost competitive in the medium to long-term future.

THE PHILIPPINES: The Philippines "Big Three" refining and petroleum retail companies (Petron, Shell, and Caltex) have control of over 90% of the local petroleum market. However, all three companies rely on imports to fill most of their crude oil requirement, and have faced a recent jump in crude oil procurement costs due to rises in international crude oil prices after April 1999, and the devaluation of the peso. In a further salvo on the Big Three, the fresh round of deregulation provisions in March 1998 has paved the way for petroleum companies to set their own prices, enticing newcomer petroleum import companies such as Total (France) and The Coastal Corp. (U.S.) to go on the offensive in offering their product cheaply.

THAILAND: Thailand was plunged into economic crisis in July 1997 due to the collapse of the baht, leading to a weakening in petroleum demand, overcapacity, and fierce local sales competition. Petroleum companies have attempted to enhance their profitability through corporate restructuring efforts:

(1) *The privatization and streamlining of PTT*[83]: As part of the privatization of PTT, there were plans to liquidate assets by selling shares held in 5 refinery companies jointly owned by PTT and the Thailand government (Bangchak, Thai Oil, Shell, Star Petroleum Refining, and Esso), although a downturn in the performance of these companies has put the scheme on hold. In another plan to generate revenue by severing 4 PTT subsidiaries from the parent company, and having PTT act as a holding company in selling off 30% of the stock, some stock in one of the subsidiaries (PTTEP - PTT Exploration and Production) was sold in June 1998.

(2) *Corporate regeneration of Thai Oil*: Thai Oil—owner of Thailand's largest refinery (220,000 B/D)—is currently undergoing corporate regeneration as part of a debt restructuring proposal made by PTT (a 49% shareholder in Thai Oil) in September 1999.

(3) *Joint management of the Shell Rayong refinery and Caltex Star refinery*: Shell and Caltex formed a joint venture in August 1999 to jointly run the Shell Rayong refinery (145,000 B/D) and Caltex Star refinery (124,000 B/D), in order to save costs. The Rayong refinery is targeted exclusively at middle distillates, whereas the Star refinery principally manufactures gasoline, meaning that the two refineries are not in direct competition and can successfully complement each other's operations, reducing costs greatly.

(4) *Reorganization of the retail sector*: Over 20 companies, including 5 refinery companies, are in competition in the retail sector, and margins are diminishing. As a result, BP Amoco announced its withdrawal from the sector in November 1997, and sold off all of its 47 service stations to Caltex. PTT and Exxon are in the process of closing down 300 service stations each.

INDONESIA: Following the withdrawal from politics of President Suharto in May 1998, Indonesia, under the helm of President Habibie, has been involved in sweeping reforms, including structurally reforming the state-owned PERTAMINA[84] petroleum company, releasing PERTAMINA's iron grip on the petroleum and gas markets, and abolishing regulations on petroleum deals, refinery construction, and the retail and distribution sectors. As part of this process, a new petroleum and gas bill was put

[83] PTT: Petroleum Authority of Thailand

[84] PERTAMINA: Perusahaan Pertambangan Minyak dan Gas Bumi Negara

before parliament in October 1998. This bill was rejected in September 1999, however, due to stiff opposition from PERTAMINA, and the Wahid government that came to power at the end of that October is now working on a new bill.

The main details of reform considered under the original new petroleum and gas bill were:

(1) *Abolishment of PERTAMINA's monopoly in the petroleum and gas markets*: Restructure PERTAMINA into 4 SBUs (strategic business units), each operating under independent finances, and have PERTAMINA oversee the operations of each as a holding company.

(2) *Direct government control of new contracts and tenders*: Transfer control of new PSCs (product sharing contracts) and new mine site tenders, from PERTAMINA to the government.

(3) *Reduce/abolish fuel subsidies*: Fuel subsidies are to be incrementally abolished by 2003 as part of the terms of IMF finance. However, as any rise in fuel prices would directly hit low-income earners, full abolishment is expected to be postponed, and the IMF officially agreed to such postponement in June 1998. Ideally, subsidies should be abolished as quickly as possible due to the burden they place on national finances, but in practice, the government has chosen to prioritize social, political, and economic stability in leaving them in place.

(4) *Fair distribution of petroleum and gas revenue between the central and regional governments*: Independence movements in oil-bearing provinces such as Ache are rapidly gathering support. If such provinces get their way in achieving independence, however, Indonesia would face financial devastation, as petroleum and gas revenue from such provinces accounts for around 30% of the national budget. The government must therefore aim to keep the country as one, by fitting in with the demands of the provinces as much as possible.

The Indonesian government is keen to attract foreign capital to its shores, in order to search for and develop new oil fields, and reform inefficient refineries currently in operation. One prerequisite on foreign capital participation in the refining industry is the immediate freeing up of PERTAMINA's stranglehold on petroleum sales, and removal of fuel subsidies.

As detailed above, the overall Asian market is expected to remain in a state of oversupply for a time to come, and refinery margins are expected to stay low. As a result, there are very few commercial opportunities for refinery operations in the Asian region, and prudence should be exercised in any fresh market participation.