

## What Should India's long term refining strategy be?\*

Dr. Bhamy Shenoy<sup>†</sup> & Dr. Gürcan Gülen<sup>‡</sup>

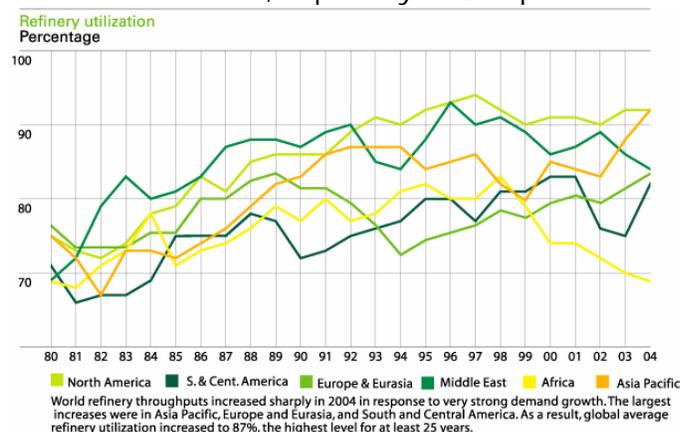
### Setting the global scene for refining

During the last 30 years, with the exception of short periods following the two oil shocks of 73 and 79, investment in refineries has never been attractive in regions where market forces decided the product prices. Yet, the world was awash in excess refining capacity during most of this period. Utilization rates were less than 75% in most regions. Many of these refineries were built either for export purposes or energy security reasons. In 1980, there was 20 million barrels a day (BD), or roughly 30%, more refining capacity than the world demand for products. Starting in the early 1980s, North America and Europe lowered their excess capacity while improving their utilization rates. At the same time, refining capacity continued to expand in the Middle East and Asia.

| Refining Capacity 1965-2004 (million barrels a day) |             |             |             |             |             |             |             |             |             |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|   | 1965        | 1970        | 1975        | 1980        | 1985        | 1990        | 1995        | 2000        | 2004        |
| North America                                       | 11.9        | 14.8        | 18.1        | 22.0        | 18.6        | 19.2        | 18.6        | 19.9        | 20.5        |
| South & Central America                             | 3.6         | 4.8         | 6.9         | 7.4         | 5.8         | 6.0         | 6.2         | 6.5         | 6.6         |
| Europe  | 8.7         | 15.9        | 22.1        | 22.7        | 17.1        | 16.4        | 16.2        | 16.4        |             |
| FSU   | 4.5         | 6.1         | 8.4         | 11.4        | 12.3        | 12.3        | 10.3        | 9.0         | 25.2        |
| Middle East   | 1.7         | 2.5         | 3.1         | 3.8         | 4.3         | 5.0         | 5.7         | 6.4         | 7.1         |
| Africa  | 0.6         | 0.7         | 1.2         | 2.0         | 2.4         | 2.7         | 2.8         | 3.0         | 3.3         |
| China   | 0.2         | 0.6         | 1.2         | 1.8         | 2.2         | 2.9         | 4.0         | 5.4         | 5.8         |
| India   | 0.2         | 0.4         | 0.6         | 0.6         | 0.9         | 1.1         | 1.1         | 2.2         | 2.5         |
| Other Asia  | 3.2         | 5.6         | 9.0         | 10.0        | 9.5         | 9.4         | 12.1        | 13.8        | 13.6        |
| <b>Total Refining Capacity</b>                      | <b>34.5</b> | <b>51.3</b> | <b>70.7</b> | <b>81.6</b> | <b>73.1</b> | <b>74.8</b> | <b>76.9</b> | <b>82.0</b> | <b>84.6</b> |
| <b>Total Oil Consumption</b>                        | <b>31.3</b> | <b>46.1</b> | <b>55.0</b> | <b>61.8</b> | <b>59.0</b> | <b>66.3</b> | <b>69.3</b> | <b>75.8</b> | <b>80.8</b> |

Source: BP Statistical Review of World Energy 2005.

Refiners have been enjoying high margins once again in the last few years. The oil industry had correctly predicted that the world crude oil slate was getting both heavier and sour. At the same time petroleum product specifications have been becoming more stringent in terms of emissions, especially in Europe and the U.S. but also in some developing countries like India. Timely investment by major refiners to process heavy and sour crude oil to meet new product specifications while taking advantage of lower priced heavy and sour crude oil helped to raise margins.



Source: BP Statistical Review of World Energy 2005

If history were any guide, with high refining margin and increasing global demand pushing global refinery utilization rate close to 90% (see chart), there would be enough capital flowing into building refining capacity worldwide perhaps with the exception of Western Europe. In fact, according to industry

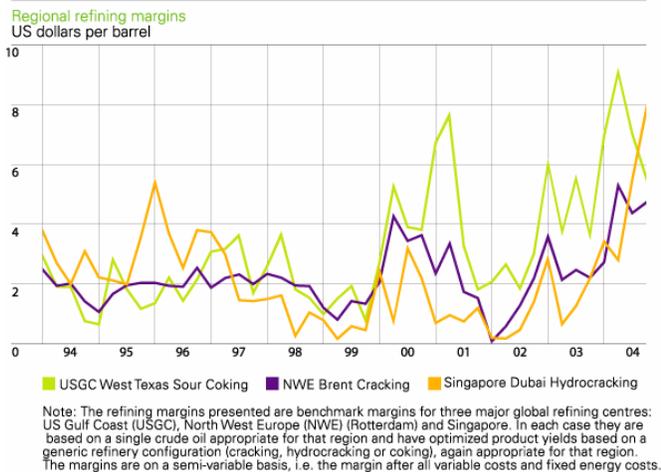
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<sup>†</sup> Dr. Shenoy is an independent energy industry consultant.

<sup>‡</sup> Dr. Gülen is Senior Energy Economist at the Center for Energy Economics, Bureau of Economic Geology, University of Texas at Austin.

consultants \$150 billion dollars in real terms are expected to be invested between 2003 until 2015, most of it in North America (~\$40 billion) and Asia (~\$50 billion) and mostly for hydro processing and coking to handle heavier and sourer crude oils. According to the 2003 World Energy Investment Outlook of the International Energy Agency (IEA), the world needs to invest \$412 billion in real terms between 2001 and 2030 in the refining sector to meet expected growth in demand. The IEA expects that Asia will attract the largest portion of this investment at \$120 billion; the Middle East follows with about \$100 billion.

In the US, the Congress has taken steps to promote the construction of new refineries. Besides, brown field investment has been keeping the US refining capacity expanding and this is expected to continue. Current US refining capacity is about 17 million BD, operating pretty consistently at 92-93% over the last 10 years. The demand for petroleum products in Western Europe has been more or less stagnant around 15.5 million BD during the last few years. Environmental regulations are stringent and public opposition to green field refineries is strong. Accordingly, any refinery expansion or green field refinery is likely to be built in former Soviet republics and Eastern European countries, especially those on the Black Sea. Crude oil is readily available in the region and oil flow from the Caspian is expected to increase. Also, environmental regulations in the region, though perhaps as stringent as those in Western Europe, are not as strictly implemented. Nevertheless, the investment in refining capacity by 2015 is expected to be only about \$20-25 billion in all of Europe and former Soviet republics. This is probably not surprising given that refinery utilization in 2004 was only 83% in Europe & Eurasia despite rising from a low of 72-73% in 1994.



Source: BP Statistical Review of World Energy 2005

### How does India fit into the global picture?

Indian refining capacity as of the beginning of 2005 was about 2.5 million BD which is just about enough to meet the current Indian demand. However based on expansion of the existing refineries and two new green field refineries under construction (Essar's 210,000 BD and Nagarjuna Oil's 120,000 BD), 0.73 million BD of new capacity will be added, bringing the total capacity to 3.23 million BD.

In comparison to more sophisticated refineries in the US and Europe, Indian refineries have less upgrading capacities as well as less ability to handle extra heavy and sour crude oil. Still Indian refineries are able to meet the light product requirement and are net exporters of gasoline, diesel, naphtha and kerosene. But this has come at a cost because they have to depend upon processing light or medium heavy crude oil, whose prices have been rising. The Indian government has come to the rescue of the refining industry through protective customs duties. India is a net importer of crude oil (about 1.8 to 2.0 million BD) and customs duty on crude oil is only 5%. On the other hand customs duty on products is 10%.

If a level playing field is given for refiners and importers of products, Indian refineries may be utilized less. Singapore and the Middle East have built export refineries, which have ready access to crude oil. The utilization rate in the Middle East was below 85% in 2004. As

such, there is no special advantage to India in constructing new refineries for export. On the other hand, new refining capacity may be needed if India wants to meet its oil demand domestically. Private refining companies like Reliance and Essar have entered the Indian refining sector and they have a strong lobbying power. Any attempt to create a level playing field by equalizing customs duty on crude oil and products is likely to be strongly opposed.

Still, India has several advantages in attracting refinery investment. The Indian petroleum market is forecast to grow at the average annual rate of about 4.5% according to the latest planning commission's draft report on Integrated Energy Policy. At this rate, India's demand for petroleum demand will be about 4.1 million BD by 2015. This implies a need for an additional refining capacity of 0.9 million BD, or nine refineries with an average capacity to process about 100,000 BD. Even if we assume that India will be as dependent on imports as the US or OECD Europe (12 to 15% of their total consumption), the country will need at least three new refineries or to expand the capacity of existing refineries by roughly 300,000 BD.

Investors who are interested in constructing refineries in India may not face as many environmental restrictions as they are likely to face in Europe or the US. However they may face far more restrictive environmental restrictions in comparison to the Middle East and Singapore or any other South East Asian country. But India has advantages over these countries in terms of getting qualified technicians and engineers to operate these refineries at considerably lower cost and also in a far more sophisticated manner using the latest refinery optimization models.

Most of the older refineries which are all in the public sector do not have adequate upgrading capacity to increase the higher valued product nor do they have the capacity to process heavier or sourer crude to take advantage of their lower prices. New refineries should be configured to overcome these problems. Also in the case of the older refineries many have catalytic crackers which were bought more for political reasons rather than economic reasons. Since Indian product demand has greater percentage of diesel and light diesel oil fraction than gasoline, new refineries should have hydrocrackers to maximize the yields of middle distillate products.

Soon after nationalization of oil industry in 1974, India introduced a very complex system to determine prices for petroleum products and thus profits for various companies involved in oil and gas sector called Administered Price Mechanism (APM). This was done with the good intention of helping the poor buy first kerosene and later LPG at affordable prices. Another reason was to prevent profiteering by multinational oil companies. However APM implementation provided ample opportunities for politicians to exploit the oil and gas sector. Subsidies meant for the poor went into the pockets of middlemen and irrational pricing mechanism gave rise to skewed petroleum demand.

The APM was finally dismantled in 2002 as India was moving towards free markets in several sectors. This was short lived. When international crude oil prices started to increase within two years, the government started to control petroleum product prices again in an ad hoc and non-transparent manner. Upstream was forced to compensate the downstream for the losses as a result of not allowing final consumer prices to reflect the international prices. This kind of arbitrary decision making on the part of government will make any downstream including refining investment risky.

Skewed product demand will introduce another layer of uncertainty to the design of any new refinery or upgrade. The same product is sold at different prices giving ample scope for black marketers to collect huge rents. For example, LPG is sold at three different prices and

kerosene at two different prices. LPG and kerosene meant for cooking is diverted to automotive market. It is difficult to predict what will happen when and if prices are allowed to reflect costs.

If these market distortions were removed in the 1990s, India could have developed into an oil marketing hub overshadowing the Singapore market, using its location between oil exporters in the Middle East and Asian consumers. With India's vast coastline, it would have been easy to locate exporting refineries to accept large crude oil ships to reduce cost. However now that Dubai crude oil traded in the Singapore market is accepted by oil traders as the marker crude for determining the oil prices for the Asian market (West Texas Intermediate is the marker for North America and Brent is the marker for Europe), it is a little late in the game for India to play a dominant role. Still, India can develop international trading activities based on its growing demand that is mostly met by crude oil imports (more than 75%), provided that market distortions are eliminated.

As India adds to refining capacity, it should simultaneously pay more attention to improve infrastructure to import crude oil and transport petroleum products as much as possible using the far cheaper and safer alternative of pipelines. Many Indian ports do not have the required capacity to unload from large crude tankers to minimize the transportation cost. Where pipelines are not possible, the railway system needs to be improved to move products with minimum delays and also adequate storage tanks need to be constructed to receive these products.

India has been discussing various strategies to improve energy security in recent years. The policy finally adapted by the government will have an impact on the refinery sector too. Unlike Europe and Japan where refiners are also expected to have minimum amount of crude oil or products stored to meet mandatory inventory requirement, Indian refineries do not have any such need today. In the future if this is changed, it will add to the capital needs of the investors.

In conclusion, India offers attractive opportunities to construct new refineries or expand the capacity of its existing refineries. In current world refinery scenario, margins are very attractive and are likely to remain so for at least some more years. In this background, properly designed refineries with ability to process heavy and sour crude to maximize middle distillate products to meet Indian needs will get above average returns even if the government removes the tax advantage by equalizing customs duty on crude oil and petroleum products. However, note that the current attractive environment will disappear as more upgrading facilities are built globally to process heavy and sour crude into light products. This will eventually push the price of the heavy and sour crude up, squeezing the refining margins. A coincident decline in demand, if it occurs, will certainly collapse the margins to dismal levels of the late 1990s. We have seen this picture before.