

Outlook of Demand and Supply of Petroleum Products in Asia

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1. Introduction of International Working Group of Petroleum Products Demand Estimation Committee

1-1 About the International Working Group

The International Working Group was established directly under the Petroleum Products Demand Estimation Committee*, a private advisory organization of the Director General of the Agency of Natural Resource and Energy. Its objective is to analyze future international petroleum products supply and demand in East Asian region since 1996 and to research into influence of change of petroleum products supply-demand balance in surrounding countries (especially East Asian countries) on Japan.

The working group investigated the supply-demand balance of international petroleum products in 2004 and 2008 regarding the pace of recovering oil demand while the East Asian countries recover from the economic crisis.

*Owing to the ministries-and-government-offices reorganization in January 2001, the International Subcommittee turned into the International Working Group.

1-2 Focused issue in FY2000

- (1) Oil demand hanged low under the influence of an economic crisis, and the export quantity of petroleum products considerably increased in East Asian countries especially in Korea in 1999.
- (2) As economic recovery in East Asian Countries started after the middle of 1999, oil demand slowly started to show a sign of recovery. Furthermore, in China where energy demand is large, the steep increase in oil demand at annual rate of 4 - 5% will be expected till around 2004 from now on.
- (3) On the other hand, about oil refining capacities, the large-sized oil refinery of 500 thousands b/d scale is completed in India of East Asian circumference, and completion of the large-sized oil refinery of 450 thousand b/d scale is expected by 2004 also in Taiwan. It is likely that

reconstruction of oil industry and reinforcement of refining equipment will be steadily carried out also in China, the oil refining capacities of East Asia region will increase largely towards 2004 and 2008.

- (4) Is recovery of the economy of Asian countries full-scale, or does future oil demand show steady recovery? Moreover, about what time will the oil demand of East Asia region recover to the level corresponding to the oil refining capacities?

2. Investigation of International Working Group of Petroleum Products Demand Estimation Committee

2-1 Progress of the International Working Group in 2000

- (1) Four meetings were held since August 2000 to analyze future international petroleum products demand and supply focusing on those in East Asian region.

(Note: In this report, the East Asian region refers to China, Republic of Korea, Chinese Taipei, Hong Kong, Singapore, Brunei, Indonesia, Malaysia, Philippines, Thailand, and Vietnam.)

- (2) The investigation in FY2000 was done with the consciousness of issues as described in the previous page by integrating knowledge of the Working Group members with the help of combined econometric and linear programming models developed by the Energy Data and Modeling Center, the Institute of Energy Economics, Japan. The Working Group has investigated the future world demand and supply of energy and petroleum, and particular interest has been focused on those in East Asia.

- (3) Two cases are set as follows reflecting recovery from Asian monetary crisis.

Base Case (Business As Usual)

In this case, economic growth rate as the premise of petroleum products demand was set basically using economic outlooks of corresponding country's governments, international agencies, or institutions considered as such. The recovery from Asian monetary crisis is also taken into consideration in the assumptions. The average economic growth rate of East Asian region from 1999 to 2004 is set as 6.3%.

And the average economic growth rate of East Asian region from 2004 to 2008 is set as 5.6%. Demand of petroleum products was calculated on these premises.

For the assumption in supply calculation, realistic domestic plans for refining capacity expansion are adopted.

Low GDP Growth Case

Recovery from the Asian monetary crisis is assumed to be slower than in base case, so that economic growth rate is lower by 1.0% after the year 2001 to the year 2008 compared with the growth rate in base case.

The growth rate is assumed to be 5.5% from 1999 to 2004 and 4.6% from 2004 to 2008.

About two cases, assumption of economic growth rate of each country in East Asia by 2008 was shown in Table 1. Supply side assumption is set all the same with the base case.

Table 1 GDP growth rate assumption of each country in East Asia

Unit: Average annual growth rate(%)

	Actual		Base Case		Low GDP Growth Case	
	99/98	2000/99	2004/99	2008/04	2004/99	2008/04
China	7.8	7.1	7.1	6.5	6.3	5.5
Hong Kong	3.1	8.0	5.0	4.0	4.2	3.0
Chinese Taipei	5.4	6.7	5.6	5.0	4.8	4.0
Korea	10.7	8.9	6.5	5.0	5.7	4.0
Singapore	5.4	7.9	6.4	5.0	5.5	4.0
Brunei	2.3	3.0	3.0	3.0	3.0	3.0
Indonesia	0.3	4.0	5.1	5.5	4.3	4.5
Malaysia	5.4	6.0	6.0	5.5	5.2	4.5
Philippines	3.2	3.8	5.0	4.9	4.2	4.0
Thailand	4.2	5.0	4.7	5.0	3.9	4.0
Vietnam	4.8	4.5	6.0	8.0	5.2	7.0
Average East Asia	6.6	7.0	6.3	5.6	5.5	4.6

(source) China : Energy Research Institute, China

Others : The long-term economic plan and prospect of the Institute of Developing Economies, Asian Development Bank, the government of each country, and related organization.

Table 2 Assumption of a crude price (\$/bbl)

	1999	2000	2004	2008	2010	2020
Nominal price (\$/bbl)*	17.08	27.89	25.0	25.0	26.52*	35.64*
DOE/AEO assumption** (Reference)	17.35	27.91	22.90	25.30	26.47	33.19

* In 2008 and afterwards, it is assumed that real price increases at an annual rate of 1%, and inflation rate is 2%.

** Real price increase rate :0.5% per year

Inflation rate :1.8 % per year

2-2 Summary Results of the Working Group

(1) Oil Demand of East Asia region

- Oil demand of East Asia region began to recover in 1999 -

A. Oil demand of East Asia countries

Oil demand of East Asia region where was damaged by economic crisis began to recover in 1999.

Despite the economic crisis in the area, oil demand of China and Chinese Taipei is increasing. That of Philippines is still in decreasing trend, while other countries have started to pick up having hit the bottom in 1998 as compared with 1997. Refer to Fig-1 and Fig-2.

Fig. 1 Oil demand of East Asian Countries

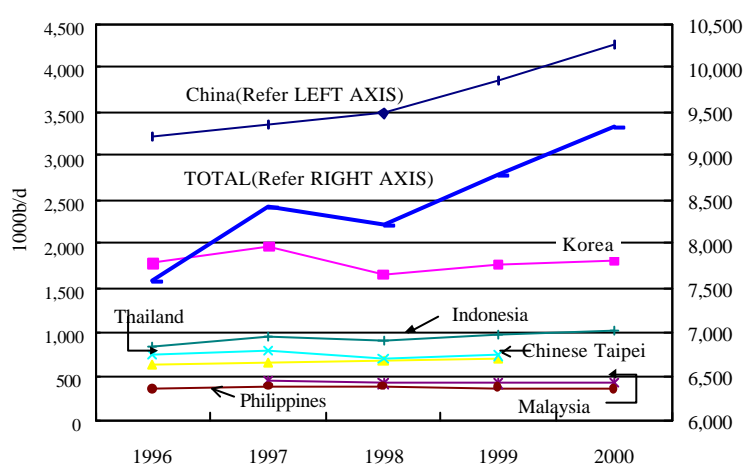
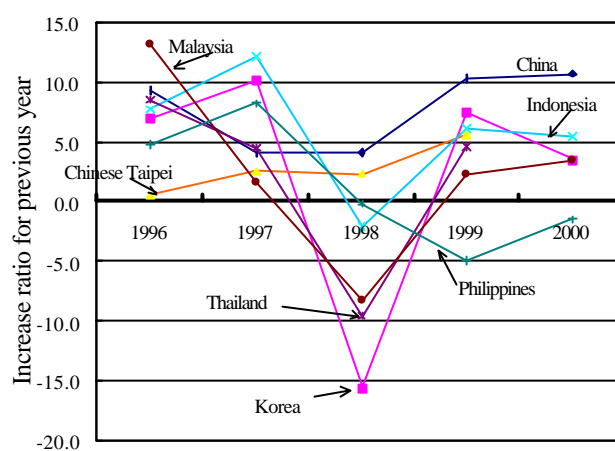


Fig. 2 The rate of increase of oil product demand in East Asian Countries



B. Petroleum products demand forecasting in 2004 and 2008

<Base Case>

It is predicted that demand for petroleum products in the East Asia region except Japan will slowly recover till 2004 (Refer to Fig-3). Based on the demand in 1998 when it decreased, the average annual growth rate of demand by 2004 is 3.1%. After that by 2008, we assume that East Asia region will completely recover from an economic crisis and petroleum products' demand increases at an average annual rate of 3.5%.

By country, petroleum products' demand of China, Korea, Chinese Taipei, and Malaysia is expected to increase comparatively favorably till 2004. On the other hand, it is expected that the demand of Thailand and Indonesia will make little increase. After that till 2008, Chinese petroleum products' demand is expected to have a slightly lower growth rate, but it is expected that the demand in Thailand and Indonesia which shows slower recovery prior to 2004, makes full recovery in this period.

Fig. 3 Petroleum products demand in East Asia region - excluding Japan-
(Million b/d) (Base Case and Low GDP Growth Case)

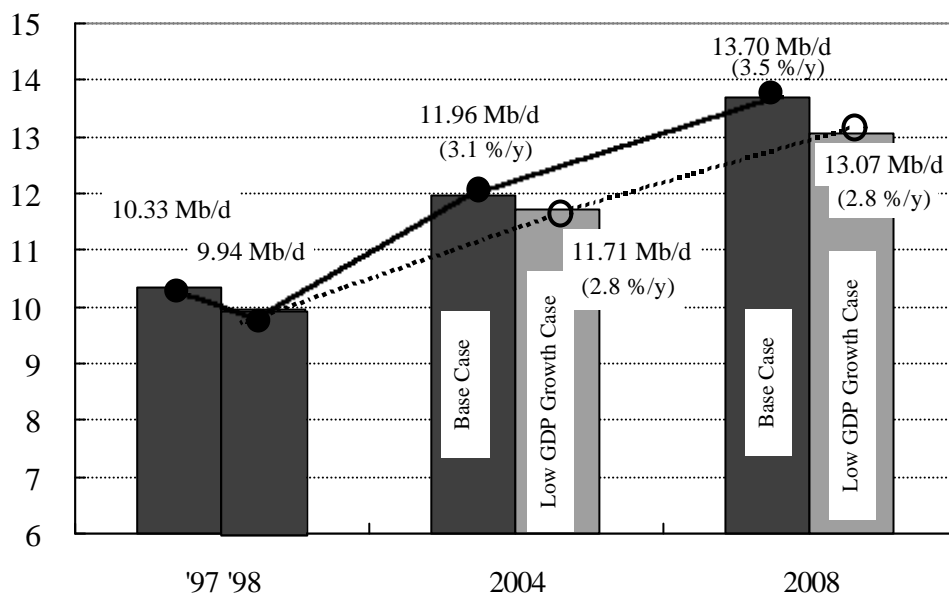


Table 3 Petroleum products demand in East Asia region - excluding Japan-

	Unit: 1,000 b/d			Increase 1,000 b/d		Growth Rate %	
	1998	2004	2008	98-04	04-08	98-04	04-08
China	3,806	4,845	5,541	1,039	696	4.1	3.4
Hong Kong	244	276	297	32	20	2.1	1.8
Chinese Taipei	802	904	1,016	103	112	2.0	3.0
Korea	1,973	2,444	2,760	470	316	3.6	3.1
Singapore	713	792	852	79	61	1.8	1.9
Brunei	11	13	15	2	2	3.3	3.6
Indonesia	889	899	1,000	11	100	0.2	2.7
Malaysia	381	507	647	127	140	4.9	6.3
Philippines	375	389	471	14	82	0.6	4.9
Thailand	612	698	839	87	141	2.2	4.7
Vietnam	132	188	260	56	73	6.1	8.5
East Asia Total	9,937	11,956	13,698	2,019	1,742	3.1	3.5
Low GDP Growth Case	9,937	11,705	13,066	1,768	1,360	2.8	2.8
Refining Capacity	12,252	13,978	14,288	1,726	310	2.2	0.5

<Low GDP growth Case>

In the Low GDP growth case where the economic growth rate in 2001 and afterwards is 1% lower than Base Case, the influence of petroleum products' demand induced by GDP negative growth is comparatively small by 2004. The reduction width is about 250 thousand b/d as compared with Base Case. However, its width is expanded to about 630 thousand b / d in 2008.

(2) Oil refinery capacities in the East Asian region

- There are scheduled large-sized oil refinery completion in Taiwan, and also reinforcement of oil refineries is planned in China. -

Oil refinery capacities in East Asian region are expected to increase by 1,730 thousand b/d from 12,250 thousand b/d at the end of 1998 up to 13,980 thousand b/d in 2004. This assumption reflects the completion of both new refineries with capacities of 450 thousand b/d in Chinese Taipei in 2001 and the restructuring of petroleum industry in China that leads to abolishment of small scale refineries and reinforcement of large ones. After the year 2004, oil refining capacities are expected to increase only by 310 thousand b/d to 14,290 thousand b/d in 2008.

Table 4 Capacities of oil refineries and petroleum products demand
in East Asian region - excluding Japan- (Unit: 1,000b/d)

	1995	1996	1997	1998	2004	2008
(A) Oil Refinery Capacities	10,300	11,030	11,850	12,250	13,980	14,290
(B) Petroleum Product Demand	8,620	9,380	10,330	9,940	11,960	13,700
(A) - (B)	1,680	1,650	1,520	2,310	2,020	590

Fig. 4 Capacities of oil refineries and petroleum products demand
in East Asian region - excluding Japan-

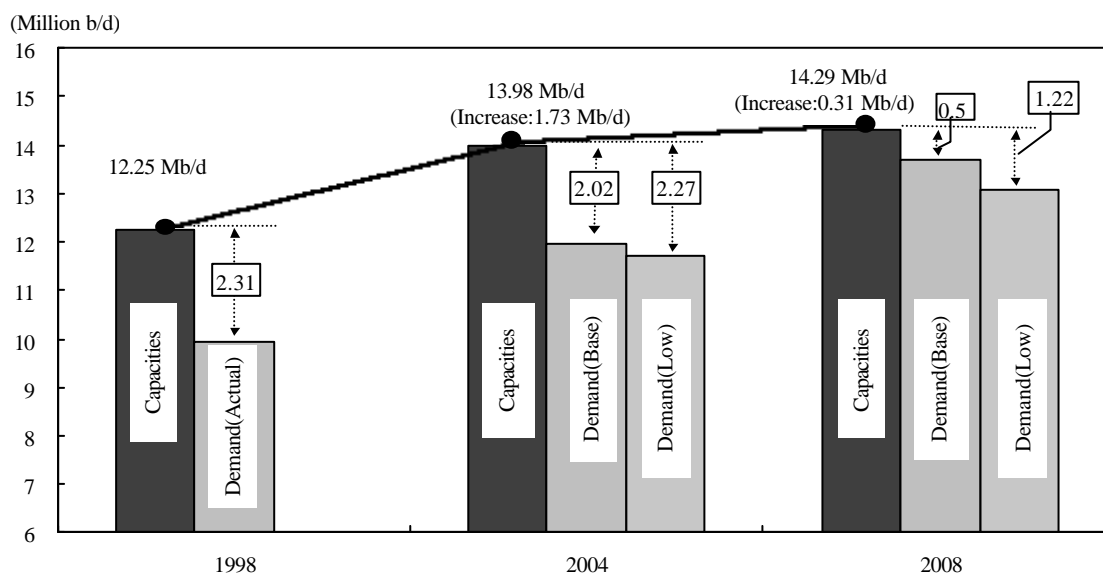


Fig. 5 Capacities of oil refineries and petroleum products demand in China

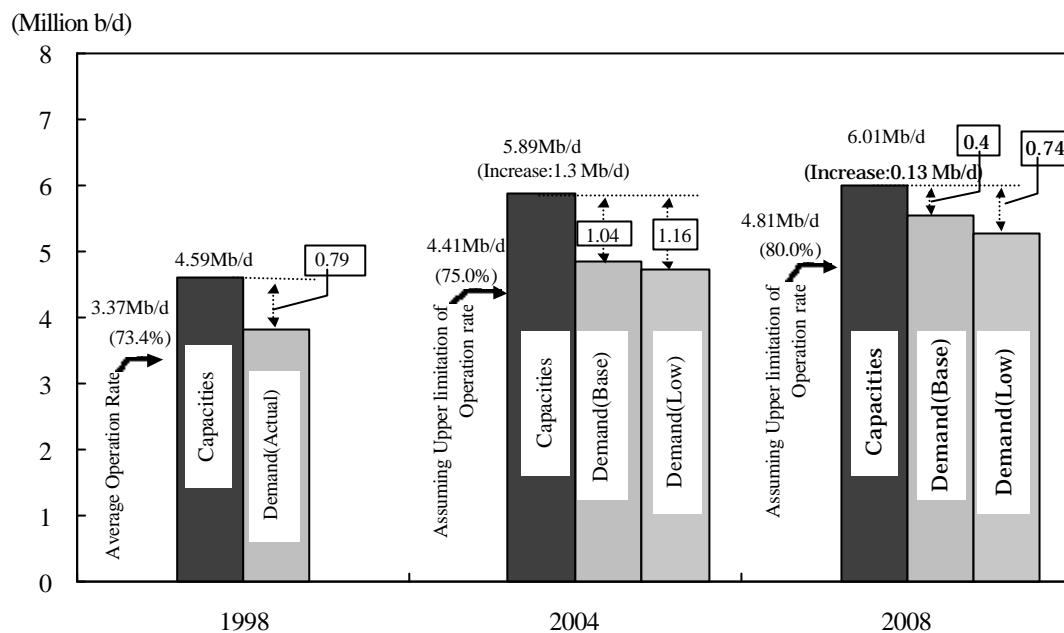
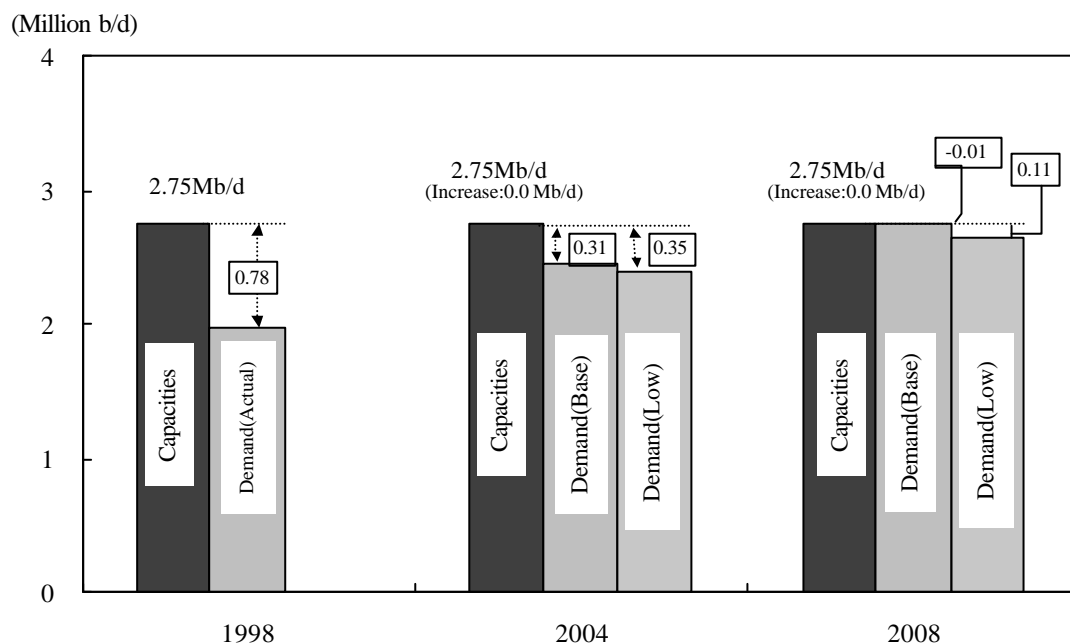


Fig. 6 Capacities of oil refineries and petroleum products demand in Korea



In addition, a new refinery with capacity of approximately 500 thousand b/d has been completed in 1999 in India located nearby East Asia.

The gap between oil refining capacities and demand without operation rates being taken into account (the so-called supply surplus) was 2,310 thousand b/d in 1998, it will decrease to 2,020 thousand b/d in 2004 and further down to 590 thousand b/d in 2008.

In the Low GDP Growth Case where the demand grows more slowly, the reduction tendency of this supply surplus is the same as in Base Case. It will be expected that supply surplus is reduced to 2,273 thousand b/d in 2004, and to 1,220 thousand b/d in 2008. Without any more establishment / reinforcement of oil refinery, it will be expected that refining capacity will fail to meet the demand in East Asia in 2008.

(3) In 2004, fuel oil* Demand-Supply balance of East Asia will become in import position by 110 thousand b/d.

In 2008, the gap will become wider, namely ,540 thousand b/d (in Base Case)

* Fuel oil consists of Gasoline, naphtha, kerosene, jet fuel, gas oil and heavy fuel oil.

In the "Base Case", refining capacity in East Asia is expected to increase by 1,730 thousand b/d though completion of new refinery construction in Taiwan, Chinese refining equipment reinforcement, etc. in 2004 compared with 1998. Refer to Fig-4, 5 and 6.

On the other hand, as compared with 1998, Chinese fuel oil demand increases to 850 thousand b/d, Korean fuel oil demand increase to 420 thousand b/d, and the whole demand increase to 1,750 thousand b/d. The increase in the whole demand is balanced by the increase in oil refining capabilities. However, the oil refinery operating ratio of the East Asia area goes up during period. Therefore, it is expected that fuel oil demand-supply balance in 2004 changes to the import position of 110 thousand b/d - the balance of total petroleum products (i.e. fuel oil plus LPG and other petroleum products) will be in the import position of 350 thousand b/d.

Fig. 7 Demand-Supply Gap of Petroleum Products in East Asia
(Demand-Supply Gap) = (Petroleum Products Production) - (Demand)
Result of Cases Studied in Mar. 2001

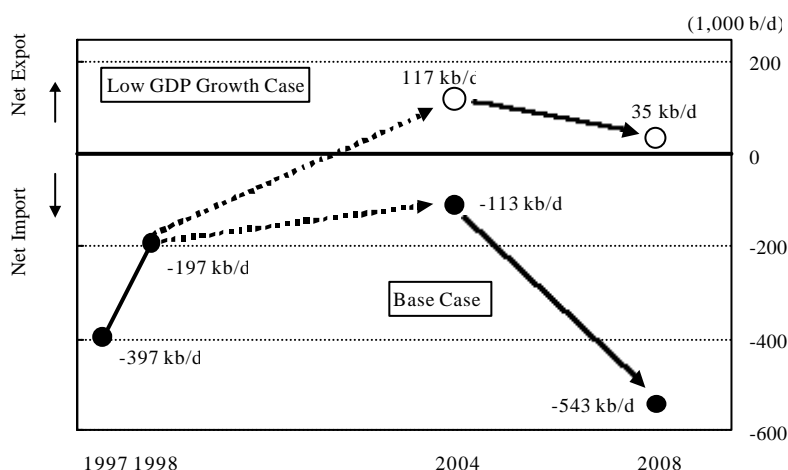
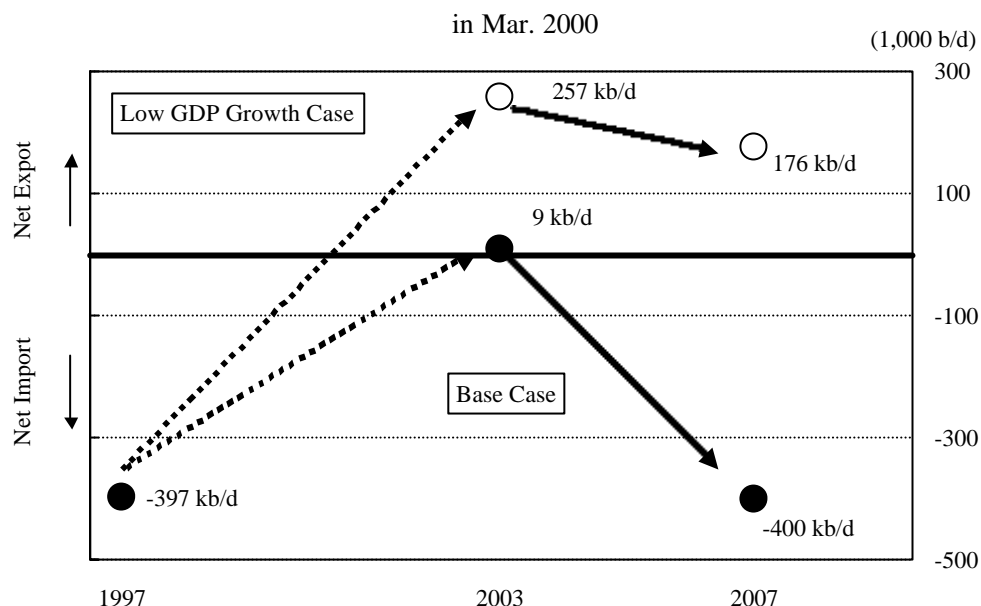


Fig. 8 Result of Cases Studied



Although petroleum products demand of the Thailand and Indonesia makes little increase till 2004, it is expected that it recovers by 2008. Therefore, it will be expected that fuel oil demand of East Asia except Japan increases to 1,500 thousand b/d in 2008 compared with 2004 - the balance of total petroleum products is in the import position of 1,740 thousand b/d. Although the amounts of excess of imports of fuel oil in 2004 are 110 thousand b/d, it is expected that the amount of it in 2008 is expanded to 540 thousand b/d. At this time, even if it makes refining equipment of its own country operate at full swing, it is predicted in East Asia that there are many countries which cannot satisfy their domestic demand.

(4) When recovery of fuel oil demand of East Asia is slow, the balance of it will become to the export position both in 2004 and 2008. (Low GDP Growth Case)

In the case of the Low-GDP Growth case where GDP growth rate in 2001 and afterwards is 1% lower than that of Base Case, the demand in 2004 will decrease by 230 thousand b/d from Base Case. Therefore, it is expected that the demand-supply balance of total fuel oil becomes the export position of 120 thousand b/d. In Base Case, it is in the import position by 110 thousand b/d.

In Low GDP Growth Case, the total fuel oil demand increases only by 1,150 thousand b/d in 2008 as compared with demand in 2004; It is smaller than Base Case demand of 580 thousand b/d. Therefore, it is expected that the balance of total fuel oil is still in the export position of 40 thousand b/d. In Base Case, it is the import position of 540 thousand b/d.

3. Future schedule

In FY2001, the Working Group will revise the contents of estimates, and will discuss future of the international situations surrounding petroleum products markets including trade balances focusing on those in Asian countries.

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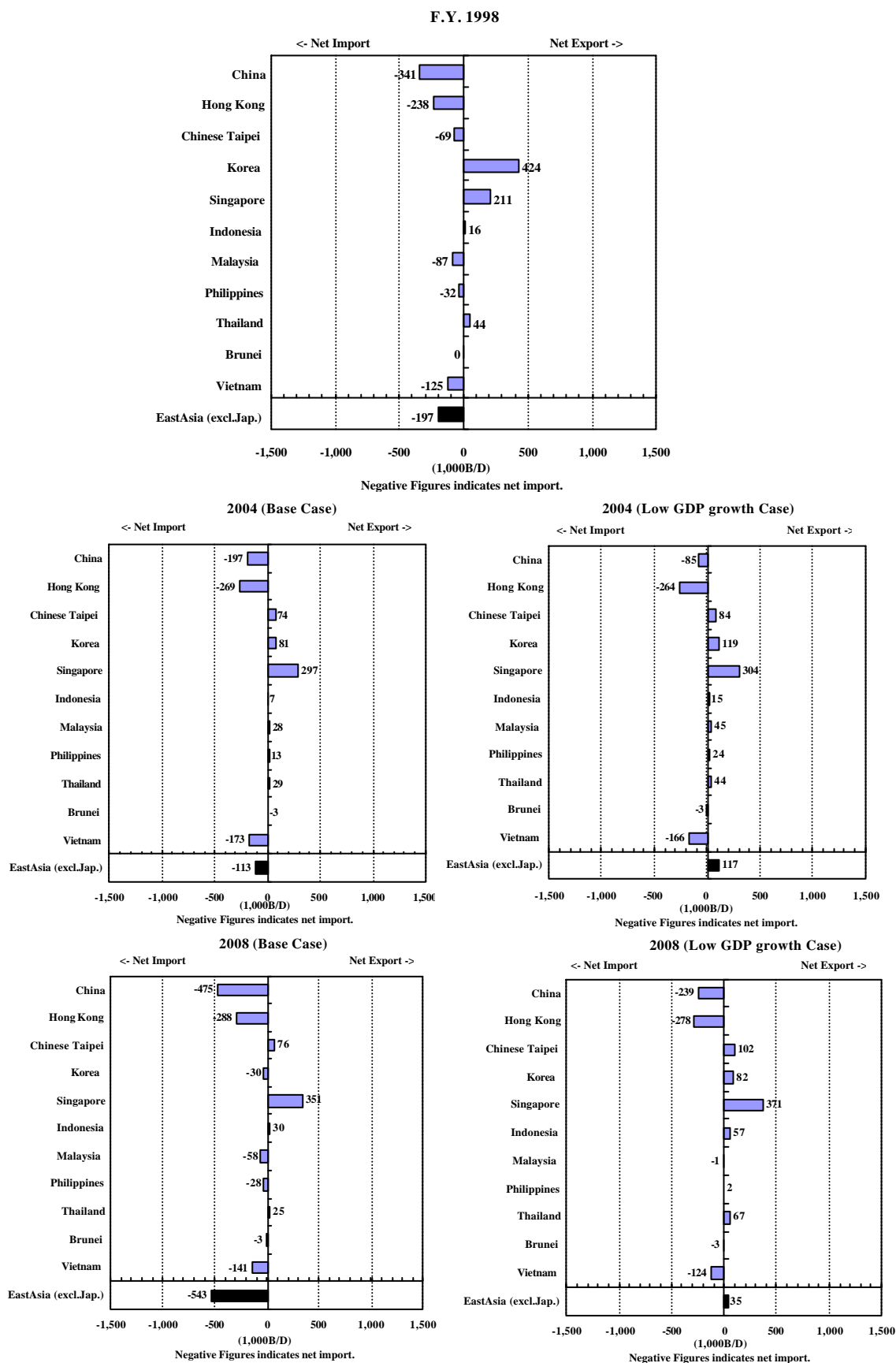
Table 5 Oil demand of main East Asian countries

	Source	Unit	1996	1997	1998	1999	2000
China *1 -excluding Hong Kong-	SINOPEC	k Metric Ton	158,710	165,173	171,900	189,620	210,000
		k b/d *2	3,128	3,349	3,485	3,844	4,258
Korea	KEEI	k bbl	721,065	793,899	670,278	719,657	671,760
		k b/d	1,976	2,175	1,836	1,972	2,011
Chinese Taipei	Energy Commission	1000kL	36,997	37,925	38,808	40,968	
		k b/d *2	638	654	669	706	
Thailand	NEPO	k Metric Ton	36,549	38,177	34,527	36,105	36,105
		k b/d *2	741	774	700	732	732
Malaysia	PETRONAS	k b/d		446	410	419	433
Philippines	DOE	k bbl	127,524	137,946	137,659	130,830	128,824
		k b/d	349	378	377	358	353
Indonesia	MIGAS	k bbl	304,006	340,766	333,534	354,034	373,073
		k b/d *2	833	934	914	970	1,022

(Note) *1: IEEJ estimates the data in 1997 of China.

*2: IEEJ changed into 1000 b/d using the data of the upper row.

Fig. 9 Demand-Supply Balance of Fuel Oil in East Asia (excluding Japan) by Country



4. Supply and Demand Analysis of Petroleum Products in East Asian Region

4-1 Method and feature of outlook

The supply and demand outlook was done by combining an econometric model (demand side) and a linear programming model (supply side) developed by the Energy Data and Modelling Center, the Institute of Energy Economics, Japan. The outlook and analysis deal with the demand and supply of world energy and petroleum, and focus on those in East Asian situation.

4-2 Scenarios

Base Case (Business As Usual Case)

In this case, annual growth rate as the premise of petroleum products demand was set basically using economic outlooks of corresponding country's governments, international agencies, or institutions considered as such. Moreover, the recovery from Asian Monetary Crisis is also taken into consideration in the assumptions. The average annual growth rate of East Asian region from 1999 to 2004 is set as 6.3%. And the average annual growth rate of East Asian region from 2004 to 2008 is set as 5.6%. Demand of petroleum products was calculated on these premises.

For the assumption in supply calculation, realistic domestic plans for refineries capacities expansion are adopted.

Low GDP growth Case

Recovery from the Asian monetary crisis is assumed to be slower than in base case, where economic growth rate is lower by 1.0% after the year 2001 to the year 2008 compared with the rate in base case. The growth rate is assumed to be 5.5% from 1999 to 2004 and 4.6% from 2004 to 2008.

Supply side assumptions are set all the same with the base case.

4-3 Simulation results

(1) Primary energy supply

Base Case

Primary energy demand of East Asian region (East Asian Region excluding Japan, India, and others) is estimated to grow at the rate of 3.9% per year up to year of 2004, and 3.4% after the year to 2008. Similarly, the share of East Asia in the world is expected to grow slightly through those years.

Table 6 Outlook of Primary Energy Demand (Base Case)

(Million b/d)	1998	share %	2004	share %	2008	share %	2004/98	2008/04
World	171.74	100%	194.34	100%	212.26	100%	2.1 %/y	2.2 %/y
Asia	44.31	26%	55.06	28%	63.41	30%	3.7 %/y	3.6 %/y
East Asia	26.37	15%	33.09	17%	37.82	18%	3.9 %/y	3.4 %/y

Note: East Asia excludes Japan, India, and others.

Low GDP growth Case

Since depression in Asia caused by the Monetary Crisis is considered in this case, primary energy demand is lower by 0.2 to 0.4 % compared with that of the Base Case. Nonetheless, the share of East Asia in the world grows.

Table 7 Outlook of Primary Energy Demand (Low GDP Growth Case)

(Million b/d)	1998	Share %	2004	share %	2008	Share%	2004/98	2008/04
World	171.74	100%	193.60	100%	210.10	100%	2.0 %/y	2.1 %/y
Asia	44.31	26%	54.33	28%	61.25	29%	3.5 %/y	3.0 %/y
East Asia	26.37	15%	32.58	17%	36.41	17%	3.6 %/y	2.8 %/y

Note: East Asia excludes Japan, India, and others.

(2) Petroleum products demand

Base Case

While the demand of world petroleum products grows by 2.1% per year from 1998 to 2004, 2.2% from 2004 to 2008, East Asian region's demand for oil products grows by 3.1% per year from 1998 to 2004, and 3.5% from 2004 to 2008. Meanwhile, the share of East Asia in the world grows by about 1%.

Table 8 Outlook of Petroleum Products Demand (Base Case)

(Million b/d)	1998	Share %	2004	Share %	2008	share %	2004/98	2008/04
World	66.02	100.0%	74.84	100.0%	81.22	100.0%	2.1%	2.1%
Asia	17.48	26.5%	20.14	26.9%	22.62	27.8%	2.4%	2.9%
Other Asia	2.34	3.6%	2.93	3.9%	3.66	4.5%	3.8%	5.7%
East Asia	15.14	22.9%	17.21	23.0%	18.96	23.3%	2.2%	2.5%
Japan	5.20	7.9%	5.25	7.0%	5.26	6.5%	0.2%	0.0%
Except Japan	9.94	15.1%	11.96	16.0%	13.70	16.9%	3.1%	3.5%
China	3.81	5.8%	4.85	6.5%	5.54	6.8%	4.1%	3.4%
Hong Kong	2.4	0.4%	0.28	0.4%	0.30	0.4%	2.1%	1.8%
Chinese Taipei	0.80	1.2%	0.90	1.2%	1.02	1.3%	2.0%	3.0%
Korea	1.97	3.0%	2.44	3.3%	2.76	3.4%	3.6%	3.1%
Singapore	0.71	1.1%	0.79	1.1%	0.85	1.0%	1.8%	1.9%
Brunei	0.01	0.0%	0.01	0.0%	0.02	0.0%	3.3%	3.6%
Indonesia	0.89	1.3%	0.90	1.2%	1.00	1.2%	0.2%	2.7%
Malaysia	0.38	0.6%	0.51	0.7%	0.65	0.8%	4.9%	6.3%
Philippines	0.37	0.6%	0.39	0.5%	0.47	0.6%	0.6%	4.9%
Thailand	0.61	0.9%	0.70	0.9%	0.84	1.0%	2.2%	4.7%

	Vietnam	0.13	0.2%	0.19	0.3%	0.26	0.3%	6.1%	8.5%
Low GDP growth Case									

In this case, growth rate of petroleum products demand in East Asian region is lower than that in Base Case by 0.3% per year from 1998 to 2004, 0.5% from 2004 to 2008. Though the share of Asia in the world remains unchanged at the level of 26.6% from 1998 to 2004, it increases a little from 26.6% to 27.1% from 2004 to 2008.

Table 9 Outlook of Petroleum Products Demand in Low GDP Growth Case

(Million b/d)	1998	Share %	2004	Share %	2008	share %	2004/98	2008/04
World	66.02	100.0%	74.53	100.0%	80.42	100.0%	2.0%	1.9%
Asia	17.48	26.5%	19.83	26.6%	21.82	27.1%	2.1%	2.4%
Other Asia	2.34	3.6%	2.88	3.9%	3.49	4.3%	3.5%	5.0%
East Asia	15.14	22.9%	16.96	22.8%	18.33	22.8%	1.9%	2.0%
Japan	5.20	7.9%	5.25	7.0%	5.26	6.5%	0.2%	0.0%
Except Japan	9.94	15.1%	11.71	15.7%	13.07	16.2%	2.8%	2.8%
China	3.81	5.8%	4.72	6.3%	5.27	6.6%	3.7%	2.8%
Hong Kong	0.24	0.4%	0.27	0.4%	0.29	0.4%	1.8%	1.3%
Chinese Taipei	0.80	1.2%	0.89	1.2%	0.99	1.2%	1.8%	2.5%
Korea	1.97	3.0%	2.40	3.2%	2.64	3.3%	3.3%	2.4%
Singapore	0.71	1.1%	0.78	1.1%	0.83	1.0%	1.6%	1.5%
Brunei	0.01	0.0%	0.01	0.0%	0.02	0.0%	3.3%	3.6%
Indonesia	0.89	1.3%	0.89	1.2%	0.97	1.2%	0.0%	2.2%
Malaysia	0.38	0.6%	0.49	0.7%	0.59	0.7%	4.2%	4.6%
Philippines	0.37	0.6%	0.38	0.5%	0.44	0.5%	0.1%	3.9%
Thailand	0.61	0.9%	0.68	0.9%	0.79	1.0%	1.8%	3.8%
Vietnam	0.13	0.2%	0.18	0.2%	0.24	0.3%	5.4%	7.4%

(3) Petroleum products supply and CDU (Crude Distillation Unit) operation rate

CDU capacities in East Asia will be reinforced by 1,730 thousand b/d from 1998 to 2004, so that the production of petroleum products is estimated to grow at the annual rate of 3.6%, which is greater than that of demand. Reinforcement amount from 2004 to 2008 will be cut down to 310 thousand b/d, and the CDU operation rate will rise to an average of 90.0%, and the growth rate of production will settle at 2.6% per year.

Table 10 CDU Capacities (Both in Base Case and Low GDP growth Case)

(Million b/d)	1998	share(%)	2004	share(%)	2008	share(%)	2004/98	2008/04
World	81.45	100%	85.64	100%	87.48	100%	0.8%/y	0.5%/y
Asia	19.17	24%	21.49	25%	22.57	26%	1.9%/y	1.2%/y
East Asia	12.25	15%	13.98	16%	14.29	16%	2.2%/y	0.5%/y

Note: East Asia excludes Japan, India, and others. World excludes other region.

Table 11 CDU Operation Rate (Both in Base Case and Low GDP growth Case)

(%)	1998	2004	2008	2004/98	2008/04
World	83.3	85.8	91.1	0.5%/y	1.5%/y

Asia	81.9	85.3	89.4	0.7%/y	1.2%/y
East Asia	78.8	83.1	90.0	0.9%/y	2.0%/y

Table 12 Petroleum Products Production (Base Case)

(Million b/d)	1998	share(%)	2004	Share(%)	2008	share(%)	2004/98	2008/04
World	67.88	100%	73.48	100%	79.71	100%	1.3%/y	2.1%/y
Asia	15.69	23%	18.32	25%	20.18	25%	2.6%/y	2.4%/y
East Asia	9.66	14%	11.61	16%	12.86	16%	3.1%/y	2.6%/y

Note: East Asia excludes Japan, India, and others. World excludes other region.

(4) Light and middle distillate share in products demand

Light and middle distillate (gasoline, naphtha, kerosene, jet, and diesel oil) share in fuel oil demand in East Asia will rise rapidly from 71.0% in 1998 to 74.6% in 2008.

In the low GDP growth case, the share is almost the same compared with the Base Case.

Table 13 Light and middle distillate Share in Fuel Oil Total (Base Case)

(%)	1998	2004	2008	2004/98	2008/04
World	80.0%	80.7%	81.0%	0.1%/y	0.1%/y
Asia	75.2%	76.3%	76.8%	0.2%/y	0.2%/y
East Asia	71.0%	73.4%	74.6%	0.5%/y	0.4%/y

Table 14 Light and middle distillate Share in Fuel Oil Total (low GDP growth Case)

(%)	1998	2004	2008	2004/98	2008/04
World	80.0%	80.7%	81.1%	0.1%/y	0.1%/y
Asia	75.2%	76.4%	77.1%	0.3%/y	0.2%/y
East Asia	71.0%	73.3%	74.7%	0.5%/y	0.5%/y

Note: (Light and middle distillate share) = {(gasoline + naphtha + kerosene/jet + diesel oil)/(fuel oil total)} * 100

(5) Demand-supply balance of petroleum products

Base Case

By 2004, abolition of small-scale oil refineries and reinforcement of large-scale oil refineries in China, and capacity reinforcement of 450 thousand b/d of Taiwan are expected. In total, the refining capacity of East Asia except Japan will increase by 1,730 thousand b/d compared with 1998. However, quick recovery of oil demand after 1999 is likely to the total petroleum products balance to the import position by 350 thousand b/d in 2004. Therefore, compared to 1998 when there was an over supply owing to sluggish demand, supply-demand balance will become a little tighter. The supply-demand balance of fuel oil total (i.e. gasoline, naphtha, kerosene, jet fuel, diesel, and heavy fuel oil) will settle in the import position of about 110 thousand b/d.

By 2008, demand recovers favorably while the volume of additional CDU capacity diminishes. Therefore, operating ratio goes up to about 90%, and petroleum products balance turns to the import

position of 830 thousand b/d. In terms of total fuel oil, the balance will be in import position of about 540 thousand b/d.

Low GDP growth Case

Demand in East Asian region up to 2004 is estimated to be lower than that of the Base Case by 2%. But, since the CDU capacity and operation rate are assumed to keep the same values as in the Base Case, all petroleum products will be on the net export position by 100 thousand b/d, while demand-supply of petroleum products will be on the net import position by 350 in the base case. The demand-supply balance of fuel oil total (i.e. gasoline, naphtha, kerosene, jet fuel, diesel, and heavy fuel oil) will settle in the export position of about 120 thousand b/d.

Demand in the period of 2004-2008 is lower by 5% than that of the Base Case. But, since the CDU capacity and operation rates are almost same as in the Base Case, almost all kinds of petroleum products other than naphtha, heavy fuel oil and LPG will be on the net export position by 200 thousand b/d, while all petroleum products will be on the net import position by 40 thousand b/d in the low GDP growth case.

Table 15 Demand-supply balance of petroleum products (East Asia, excluding Japan)

(1,000b/d)	1998	2004		2008	
	Historical	Base	Low	Base	Low
Total Products	-282	-347	-96	-834	-202
Gasoline	34	2	71	7	155
Naphtha	-109	-38	-34	-191	-179
Kerosene/Jet	120	122	145	-134	192
Diesel Oil	183	0	76	-61	135
Heavy Oil	-424	-199	-141	-432	-268
Total fuel Oil	-197	-113	117	534	35
LPG	-164	-279	-271	-350	-324
Other Products	79	46	58	59	87

Note: East Asian region include China, Hong Kong, Chinese Taipei, Korea, Singapore, Brunei, Indonesia, Malaysia, Philippines, Thailand, and Vietnam (11 countries).

4. Assumptions

4-1 Crude oil price

Table 16 Assumptions of crude oil prices

(Unit : \$/Bbl)	1999	2004	2008
Constant Price in 1999	18.71	20.30	20.70
(Nominal Price)	(18.71)	(23.50)	(26.00)

Note: 2% inflation is assumed for nominal price.

4-2 GDP growth rate towards 2004,2008(Base Case)

Table 17 Assumptions of GDP growth rate (Base Case)

	Actual			Forecast (Base Case)		
(Unit : %)	97/96	98/97	99/98	04/98	08/04	08/98
U.S.A.	5.3	3.9	4.2	3.7	3.1	3.4
Canada	3.7	3.0	3.6	2.7	2.3	2.6
Mexico	6.8	4.8	3.0	4.2	4.7	4.4
Chile	7.6	3.4	-0.4	3.9	3.8	3.8
Other America	4.6	1.3	-0.6	2.7	2.5	3.0
U.K.	3.5	2.1	2.3	2.5	2.5	2.5
Germany	2.2	2.7	1.6	2.3	2.3	2.3
France	2.3	3.2	2.6	2.4	2.2	2.3
Italy	1.5	1.4	1.1	2.0	2.1	2.1
Other W. Europe	3.7	3.4	3.3	2.9	2.5	2.8
F.USSR	1.3	-3.1	-8.3	0.1	2.7	1.2
Eastern Europe	0.7	0.8	4.0	3.7	3.5	3.6
Africa	3.0	3.0	3.1	3.0	3.0	3.0
Middle East	2.4	1.3	1.8	2.5	3.0	3.2
Japan	1.4	-2.8	0.5	1.9	1.7	1.8
China	8.8	7.8	7.8	7.2	6.5	6.9
Hong Kong	5.2	-5.1	3.1	2.5	4.0	4.4
Chinese Taipei	5.2	4.7	5.4	5.6	5.0	5.3
Korea	5.5	-5.8	10.7	7.2	5.0	6.3
Singapore	7.8	0.3	5.4	6.2	5.0	5.7
Brunei	4.0	1.8	2.3	2.5	3.0	2.9
Indonesia	4.9	-13.2	0.3	4.3	5.5	4.8
Malaysia	7.8	-7.5	5.4	5.9	5.5	5.7
Philippines	5.2	-0.5	3.2	4.7	5.5	4.8
Thailand	-0.4	-10.0	4.2	4.6	5.0	7.8
Vietnam	8.8	4.0	4.8	2.5	8.0	6.7
India	5.2	5.8	6.4	6.5	6.5	6.5
Other Asia	3.3	5.0	5.0	5.0	5.0	5.0
Australia	3.8	5.1	4.0	2.5	2.2	2.4
New Zealand	2.0	-0.8	3.0	3.0	3.0	3.0

4-3 GDP growth rate of Asian countries (Base Case and Low GDP growth Case)

Table 18 Assumptions of GDP growth rate (Low GDP growth Case)

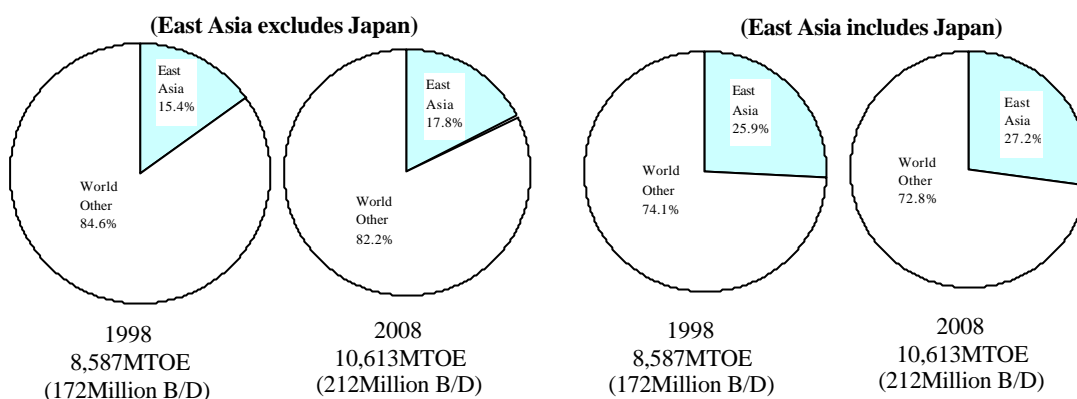
	Actual		Base Case		Low GDP Growth Case	
(Unit : %)	99/98	2000/99	20003/99	2008/04	2004/99	2008/04
China	7.8	7.1	7.1	6.5	6.3	5.5
Hong Kong	3.1	8.0	5.0	4.0	4.2	3.0
Chinese Taipei	5.4	6.7	5.6	5.0	4.8	4.0
Korea	10.7	8.9	6.5	5.0	5.7	4.0
Singapore	5.4	7.9	6.4	5.0	5.5	4.0
Brunei	2.3	3.0	3.0	3.0	3.0	3.0
Indonesia	0.3	4.0	5.1	5.5	4.3	4.5
Malaysia	5.4	6.0	6.0	5.5	5.2	4.5
Philippines	3.2	3.8	5.0	4.9	4.2	4.0
Thailand	4.2	5.0	4.7	5.0	3.9	4.0
Vietnam	4.8	4.5	6.0	8.0	5.2	7.0
Total East Asia	6.6	7.0	6.3	5.6	5.5	4.6
India	6.4	6.7	6.4	6.5	5.4	5.5

4-4 Outlook of World CDU (Crude Distillation Unit) capacity

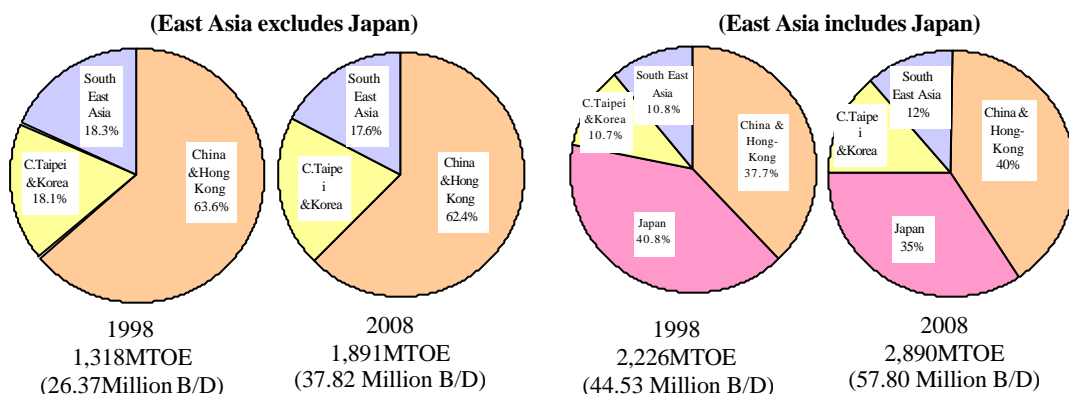
Table 19 Out of World CDU Capacity (Unit:1,000b/cd)

	1998	1999	2004 (Outlook)	2008 (Outlook)	1998-2004 Increase	1999-2004 Increase	2004-2008 Increase
China	4,594	5,410	5,886	6,011	1,292	476	125
Hong Kong	0	0	0	0	0	0	0
Chinese Taipei	775	775	1,225	1,225	450	450	0
Korea	2,750	2,750	2,750	2,750	0	0	0
Singapore	1,254	1,254	1,254	1,254	0	0	0
Brunei	9	9	9	9	0	0	0
Indonesia	1,084	1,065	1,065	1,065	-19	0	0
Malaysia	516	516	516	571	0	0	55
Philippines	422	422	422	422	0	1	0
Thailand	840	842	842	842	2	0	0
Vietnam	9	9	9	139	0	0	130
East Asia Total	12,252	13,051	13,978	14,288	1,726	926	310
Japan	5,355	5,355	4,953	4,953	-402	-402	0
India	1,232	1,857	2,204	2,965	972	347	761
Other Asia	331	345	354	360	23	10	6
Asia Total	19,169	20,607	21,489	22,566	2,320	882	1,077
Australia	848	848	848	848	1	1	0
New Zealand	91	98	98	98	7	0	0
Papua New Guinea	0	0	0	0	0	0	0
U.S.A.	16,423	16,541	17,400	17,800	977	859	400
Canada	1,873	1,912	2,011	2,057	138	99	46
Mexico	1,525	1,525	1,525	1,525	0	0	0
Chile	205	205	224	224	19	19	0
Other Latin America	5,867	6,025	6,057	6,135	190	32	79
U.K.	1,854	1,785	1,821	1,850	-33	36	29
Germany	2,246	2,275	2,321	2,358	75	46	37
France	1,947	1,902	1,940	1,972	-7	38	31
Italy	2,446	2,341	2,388	2,427	-58	47	38
Other W. Europe	6,079	6,131	6,255	6,355	176	124	101
F.USSR	9,749	9,762	9,762	9,762	13	0	0
Other E. Europe	2,365	2,287	2,287	2,287	-78	0	0
Africa	3,006	3,044	3,134	3,134	128	90	0
Middle East	5,756	5,953	6,081	6,081	325	128	0
TOTAL	81,448	83,241	85,640	87,479	4,192	2,400	1,839

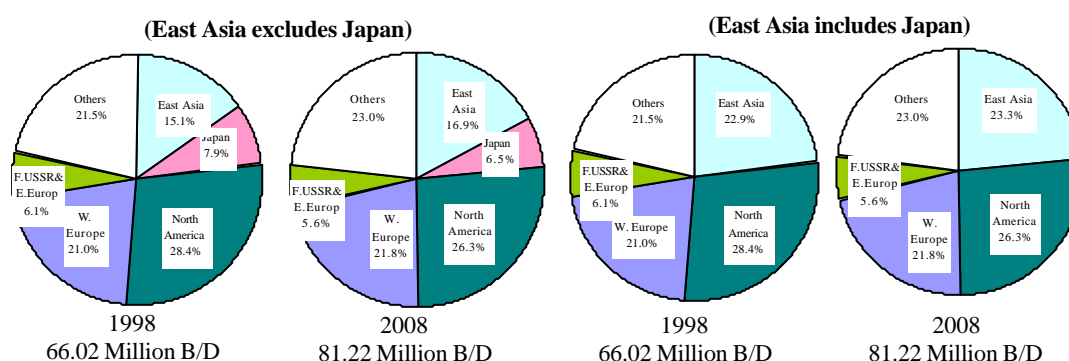
World and East Asian Primary Energy Consumption (Base Case)



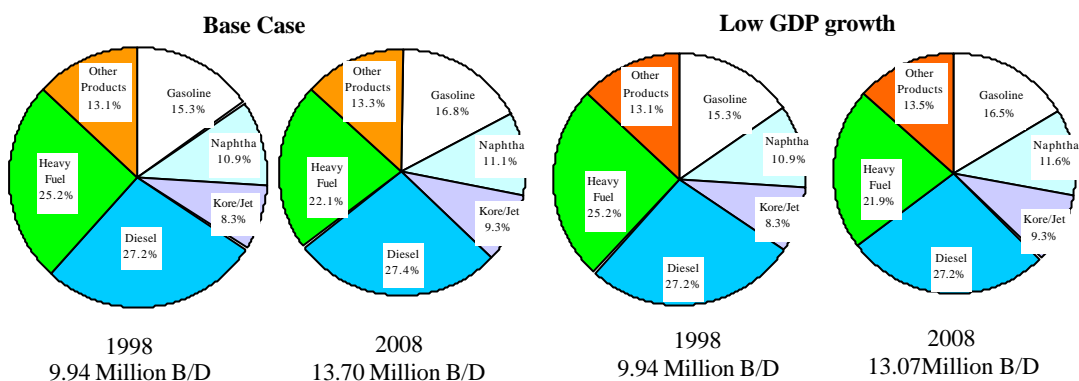
Primary Energy Consumption in East Asia (Base Case)



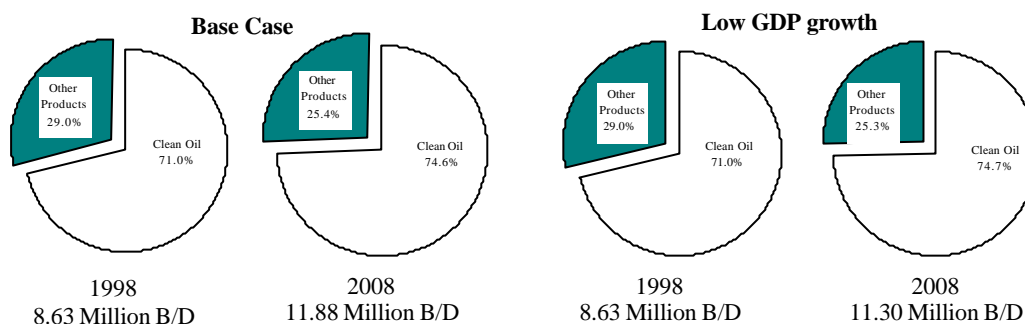
World and East Asian Petroleum Products Consumption (Base Case)



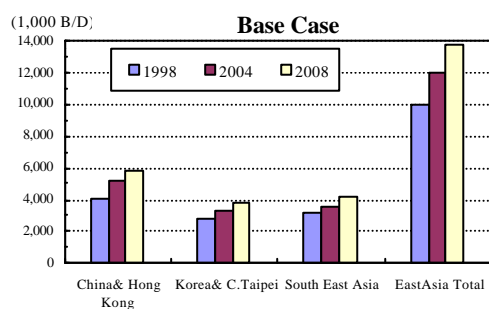
Demand by Products in East Asia (excluding Japan)



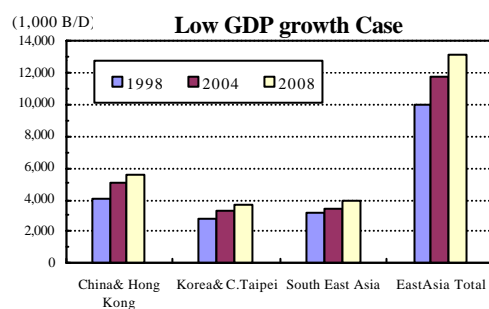
Clean Oil Share in Fuel Oil Demand in East Asia(excluding Japan)



Petroleum Products Demand in East Asia by Country (excluding Japan)

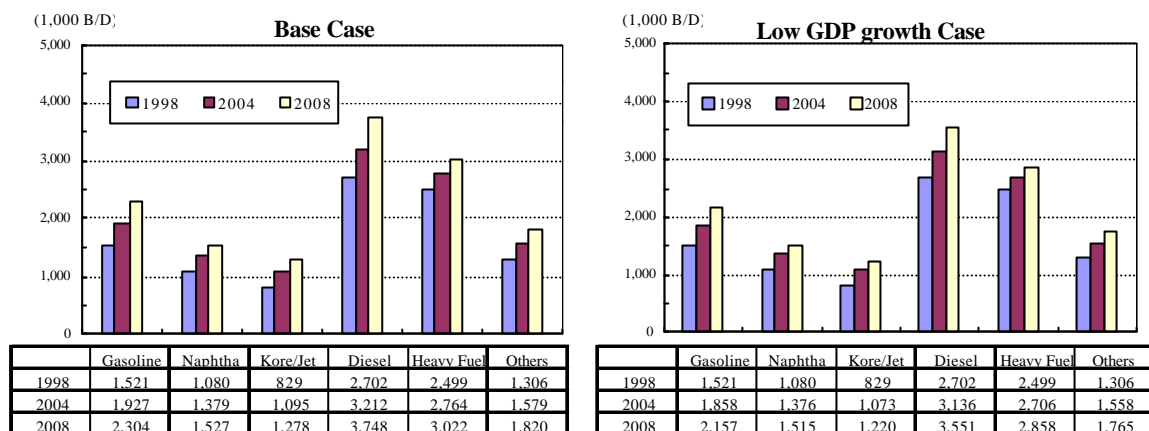


	China& Hong Kong	Korea& C.Taipei	South East Asia	EastAsia Total
1998	4,050	2,775	3,112	9,937
2004	5,121	3,348	3,487	11,956
2008	5,837	3,776	4,085	13,698

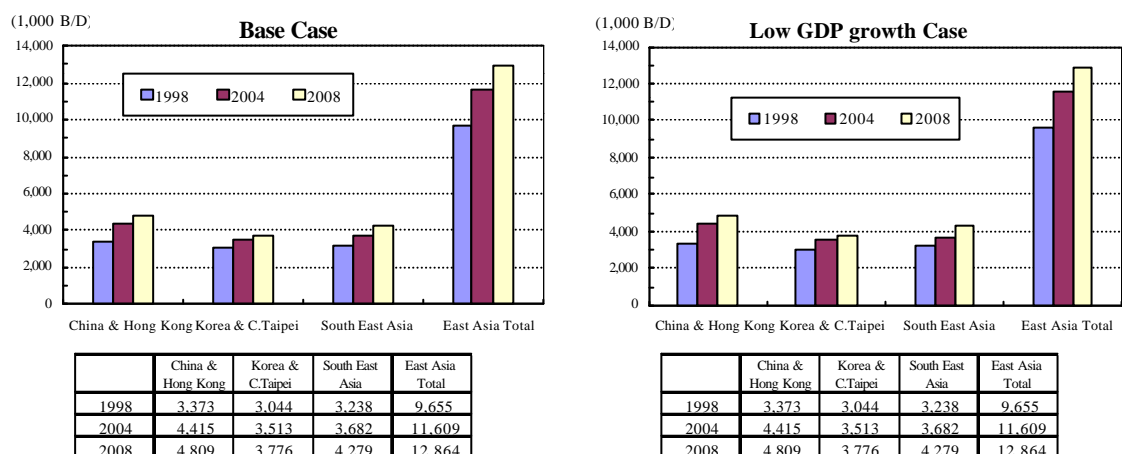


	China& Hong Kong	Korea& C.Taipei	South East Asia	EastAsia Total
1998	4,050	2,775	3,112	9,937
2004	4,992	3,296	3,417	11,705
2008	5,561	3,627	3,878	13,066

Petroleum Products Demand in East Asia by Product (excluding Japan)



Production of Petroleum Products by Country in East Asia (excluding Japan)



Production of Petroleum Products by Product in East Asia (excluding Japan)

