

**15<sup>th</sup> Northeast Asia Economic Forum**  
**5-7 September 2006, Khabarovsk Russia**

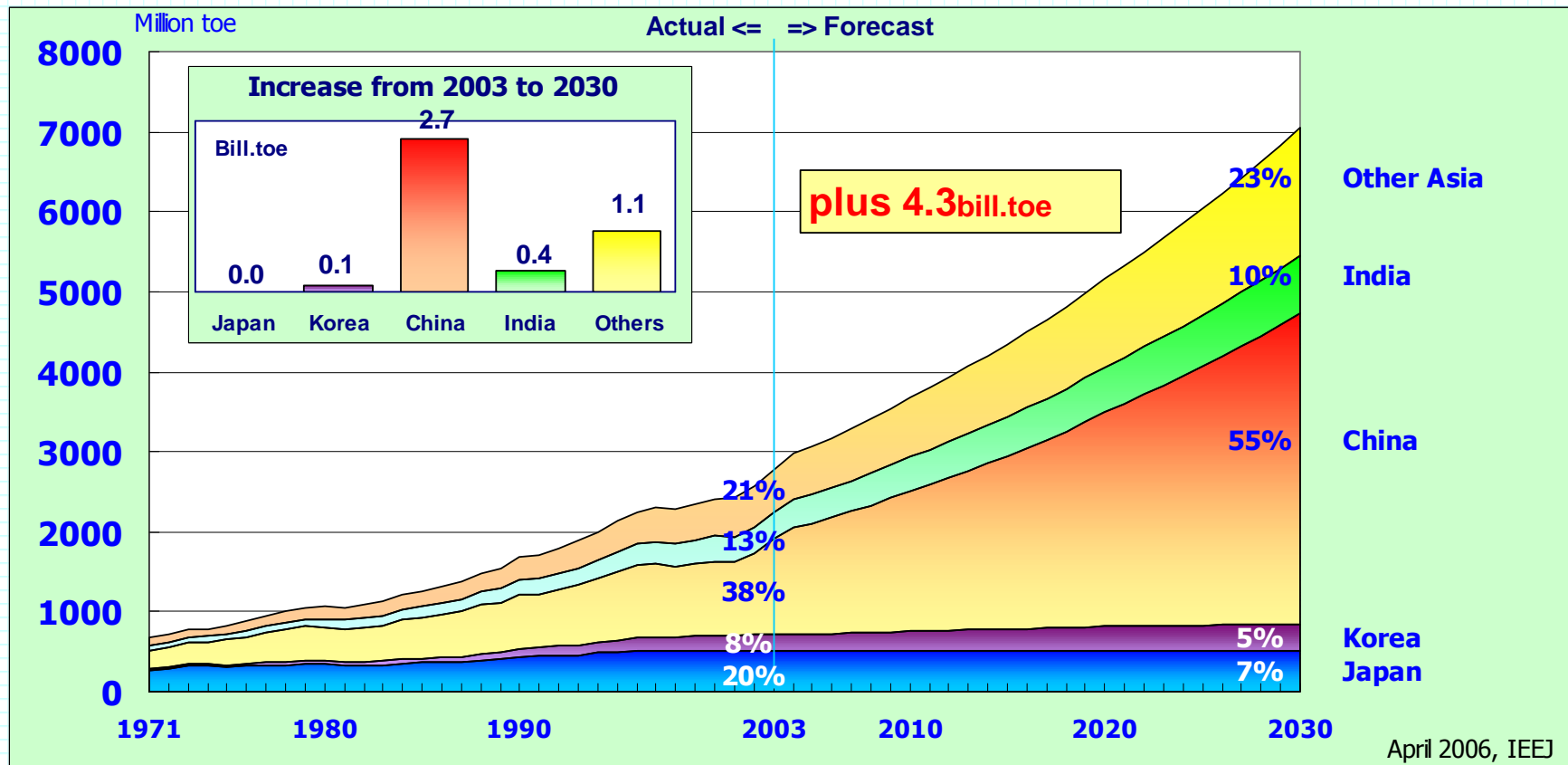
# **Regional Energy Trade and Refining Industry in Northeast Asia**

**Kensuke Kanekiyo**  
**Managing Director**

**The Institute of Energy Economics, Japan**

# 1.1 Energy Outlook of Asia

1. Japan: Leveling off while fossil energy consumption decreases.
2. Developing Asia: More than double by 2030 as China's presence and import dependence greatly increase.

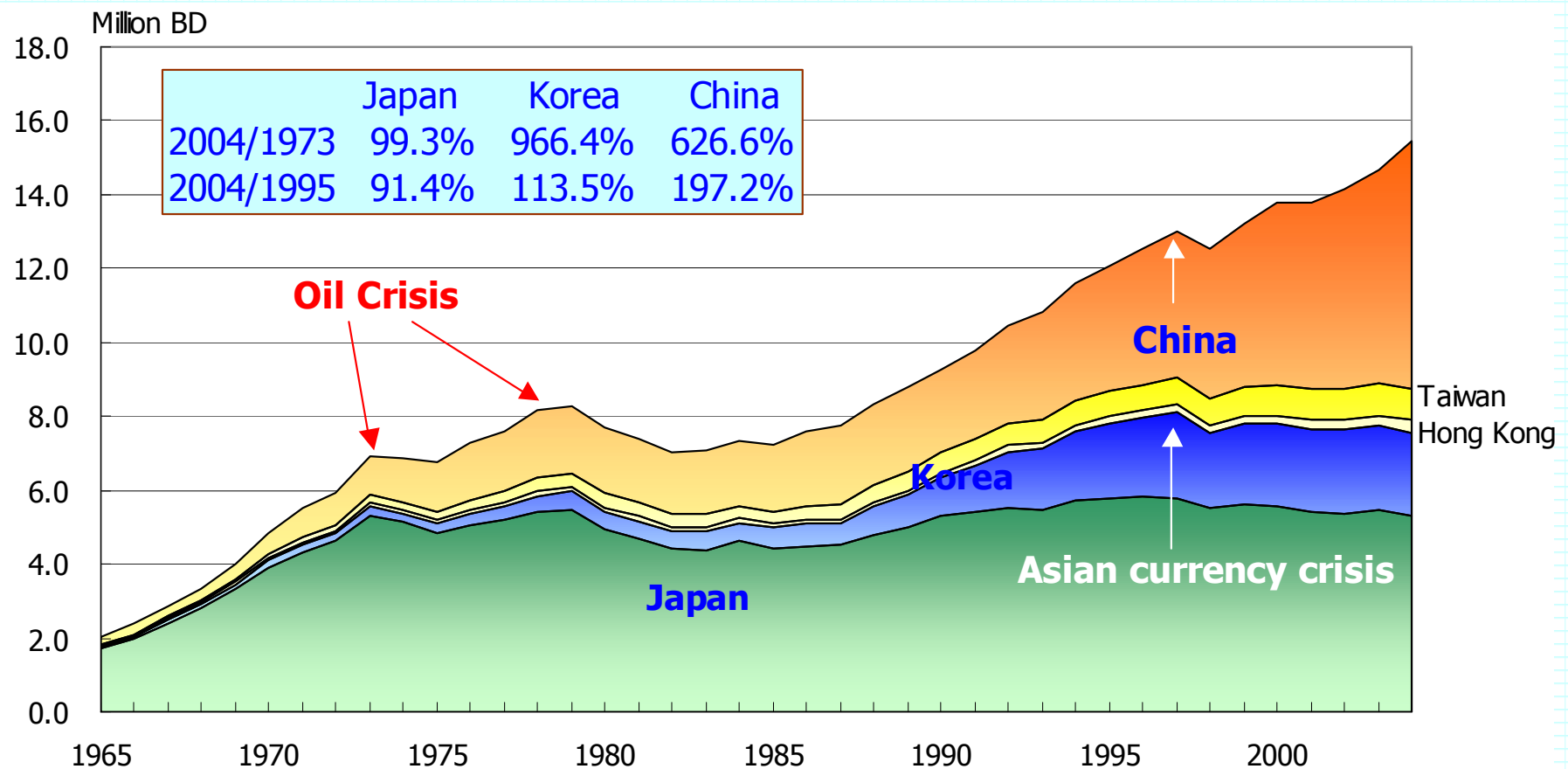


# 1.2 Petroleum Demand of NE Asia

**Japan: Oil demand is on a declining trend**

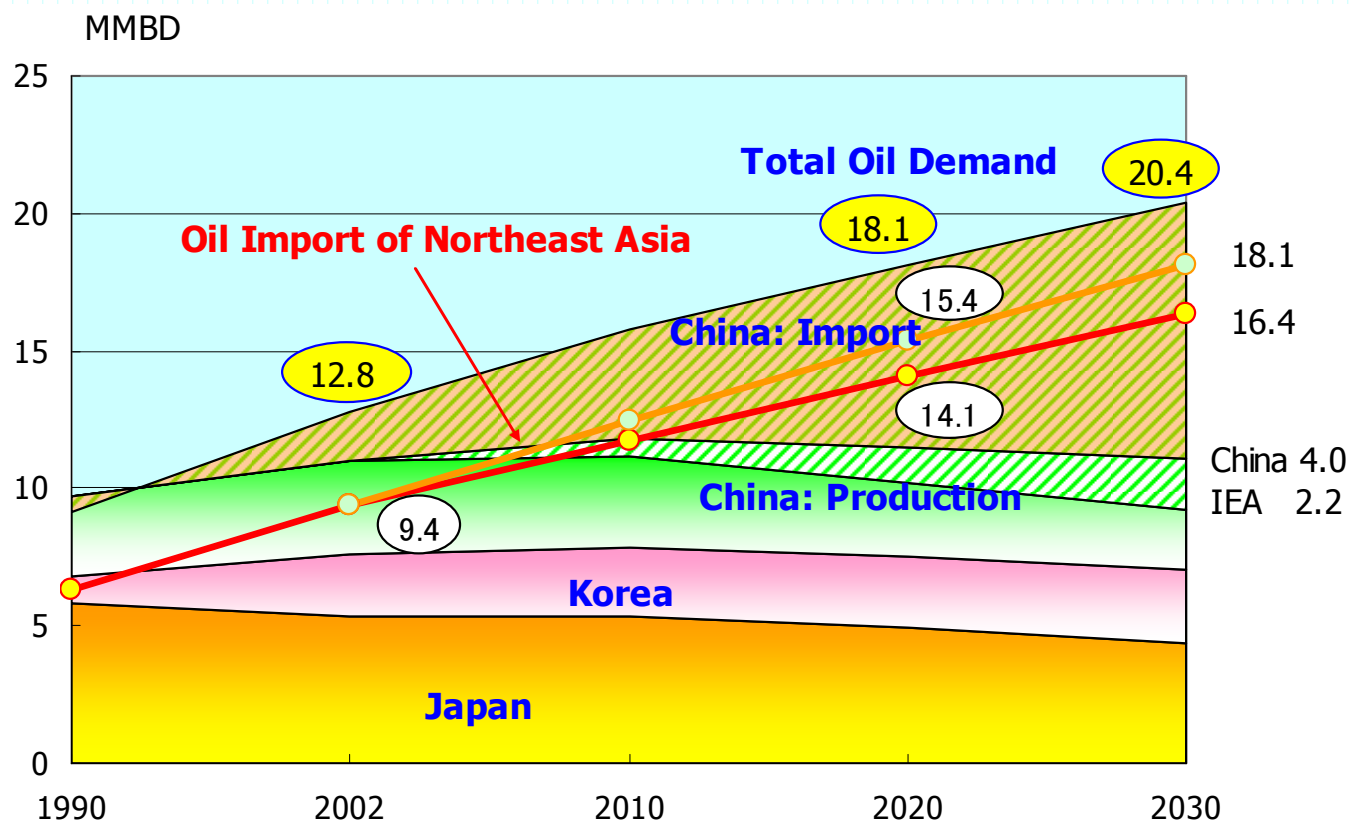
**Korea: Oil demand grows modestly as economy matures.**

**China: Oil demand is increasing vigorously while domestic production is leveling-off.**



# 1.3 Petroleum Outlook of NE Asia

1. Oil consumption of Northeast Asia (13 MMBD in 2005) will increase more than 5 MMBD by 2020.
2. Since China's domestic production would be more or less leveling off, oil import will also increase by 5 MMBD.



# 1.4 Refinery Capacity of NE Asia

## 1. Refinery Capacity (2004: 12.9 MMBD)

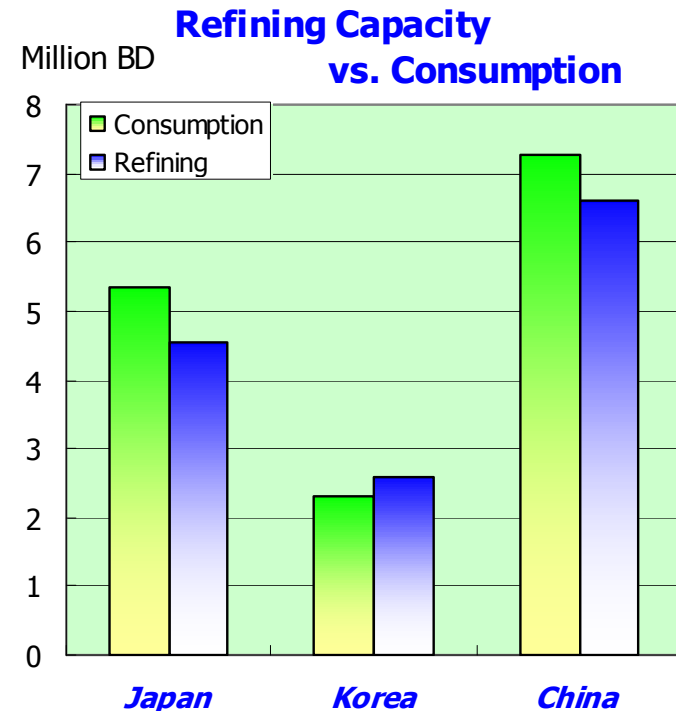
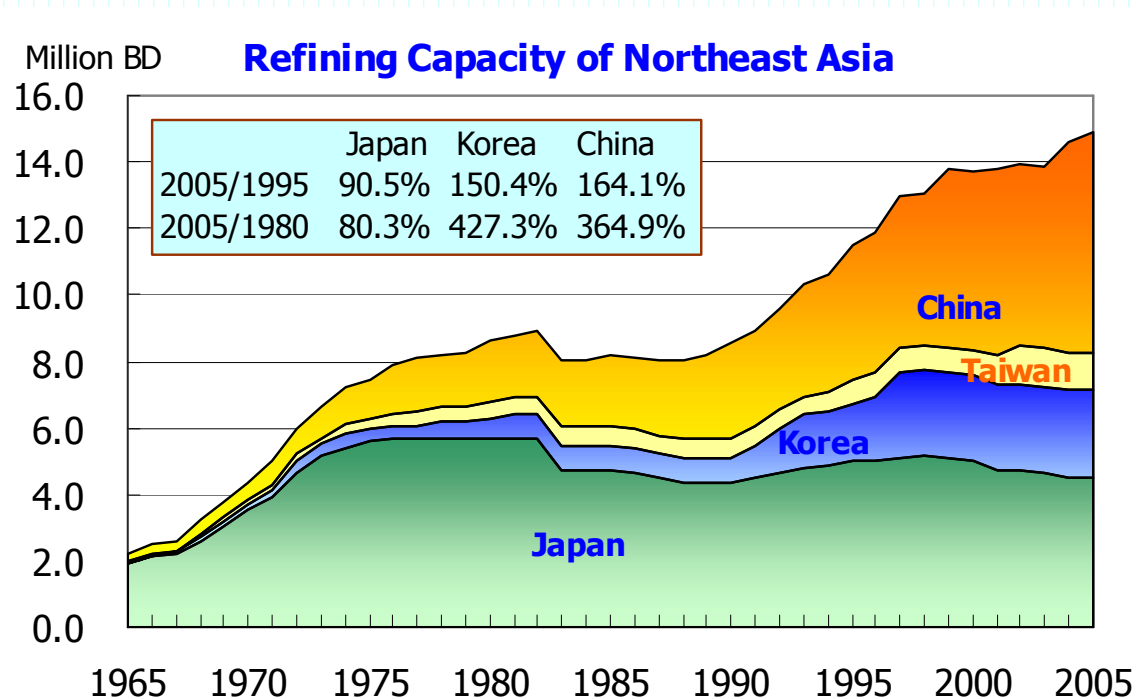
**Japan:** reduced since the second oil crisis.

**Korea:** increased substantially in the 1990s.

**China:** increased but not catching up demand growth

## 2. Petroleum Product Balance

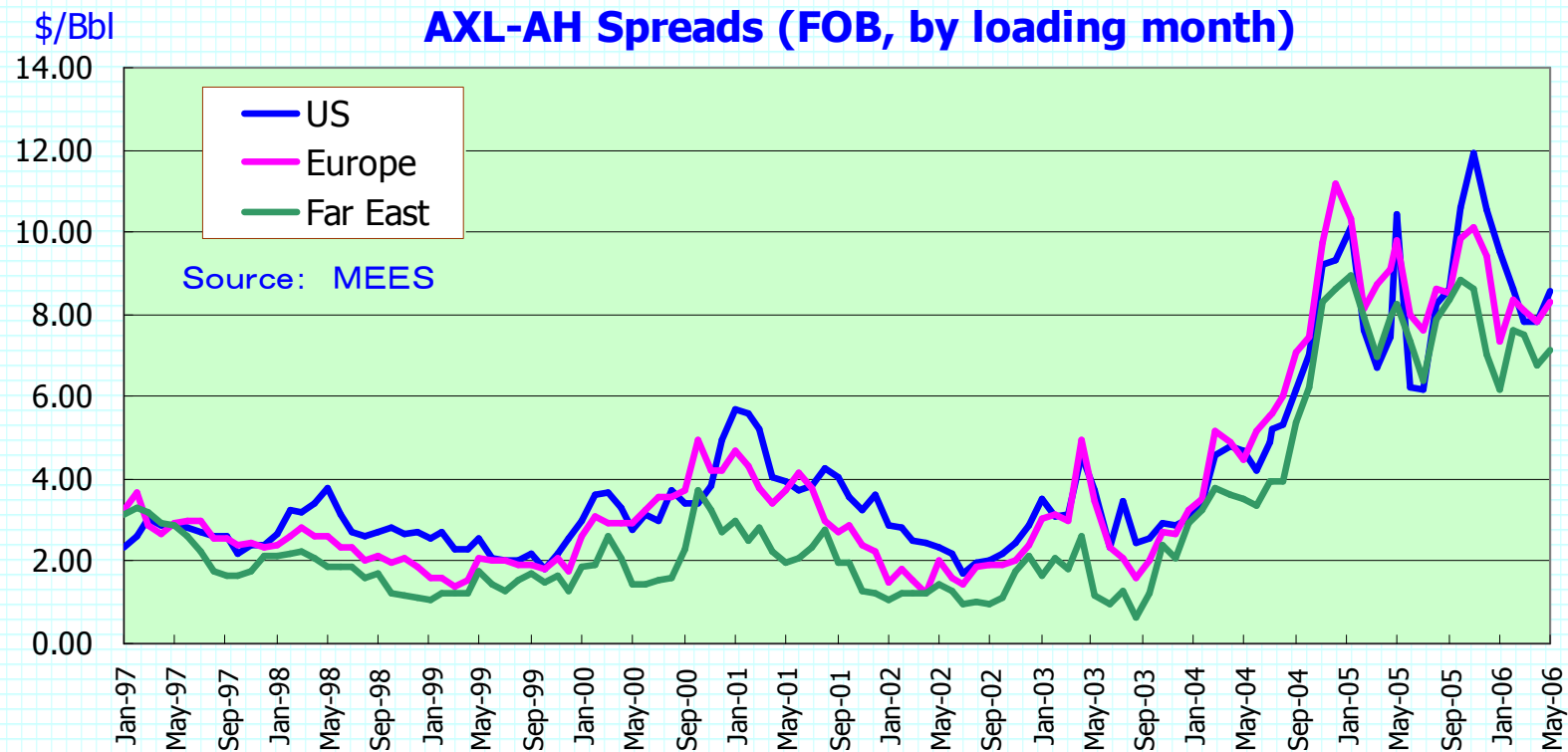
**Japan and China:** import position vs. **Korea:** export position



Source: BP Statistical Review of World Energy

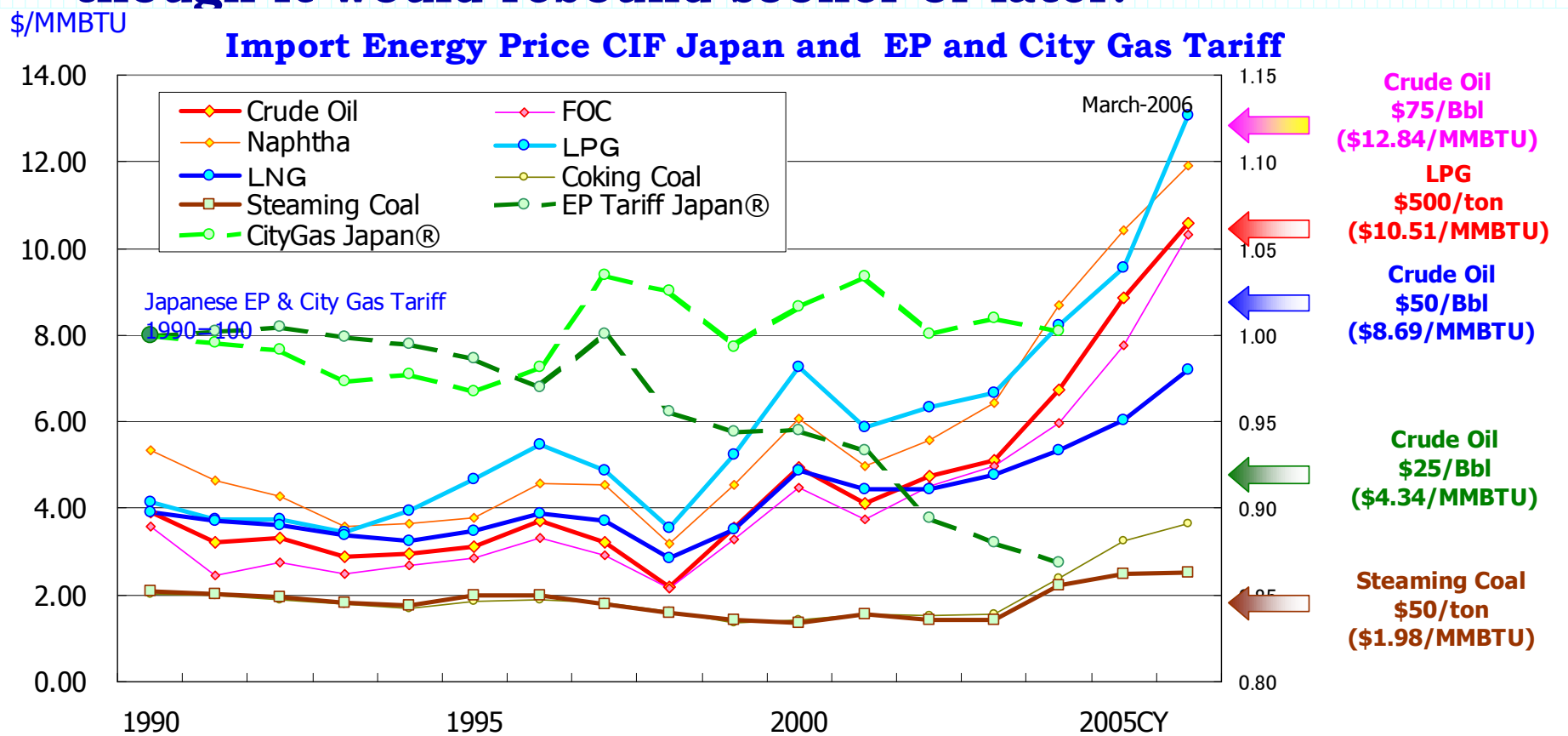
## 2.1 Light-Heavy Spread of Oil Price

1. Quality differential between light and heavy crude oils may be in the range of \$2-4/Bbl technically.
2. The spread expanded abnormally reflects lack of upgrading capacity.  
>> **Cracking, desulfurization, hydro-treating etc.**



# 2.2 Era of High Energy Price

1. Oil price has surpassed LNG price : the gap is widening.
2. Coal price is going up, but still absolutely low.
3. Electricity tariff has decreased reflecting slow investment, though it would rebound sooner or later.



## 2.3 Facts and Concerns

### Facts

1. Petroleum demand of Northeast Asia will increase 5 MMBD by 2020 mainly in China, while it is declining in Japan.
2. Incremental crude oil for processing must be imported, increasing input of heavier and high sulfur crude.
3. Light-heavy price differential among crude oils has been widening, enabling expensive counter measures.

### Concerns

1. Refining capacity should be expanded to satisfy demand.
2. Refineries should prepare for increase of imported crude.
  - x Deep-water ports to receive very large tankers (VLCC)
  - x Sophisticated facilities for cracking and desulfurization
  - x Oil stock piling against import disruptions

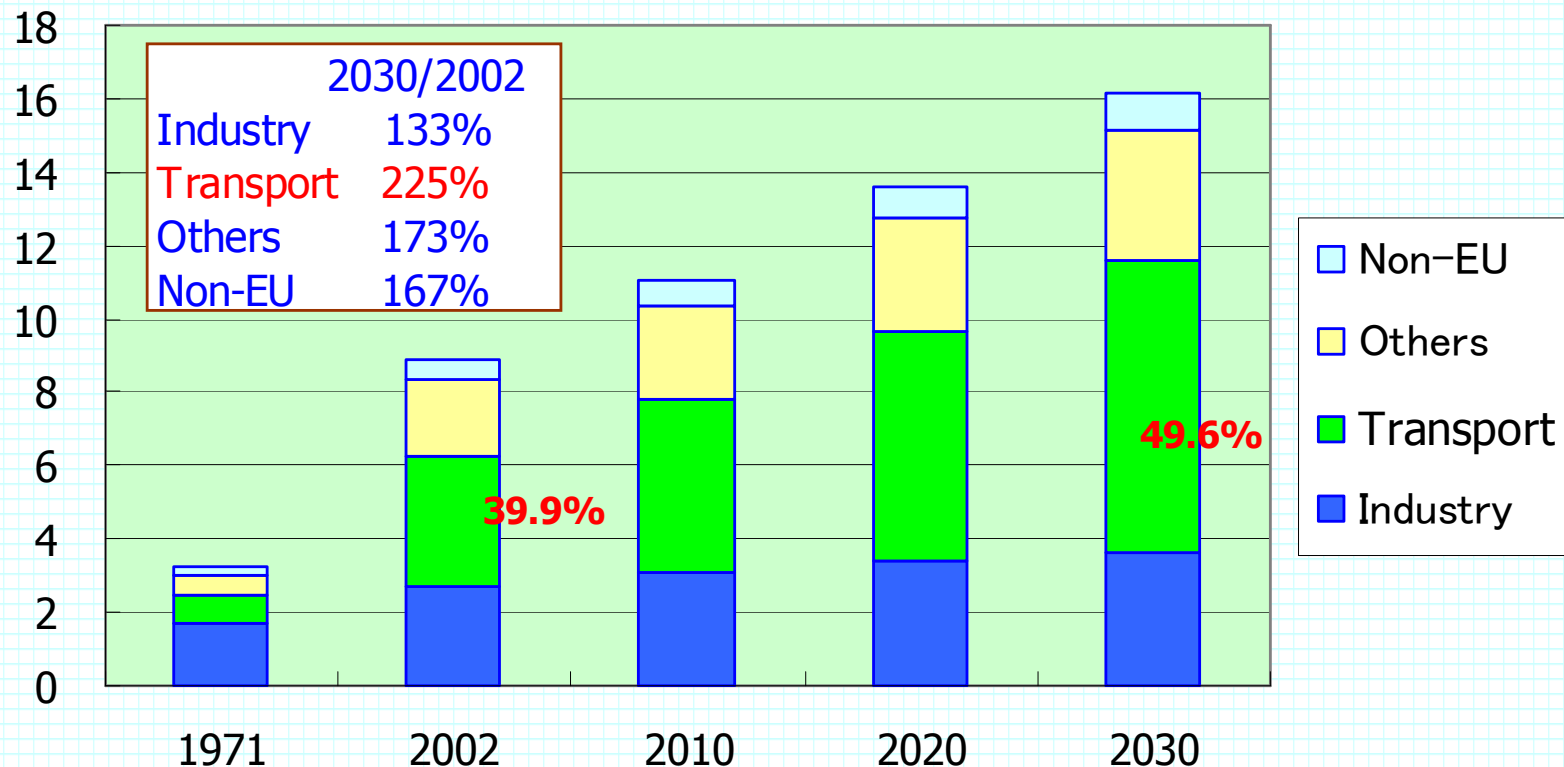


# 3.1 Petroleum Demand Structure

1. IEA forecasts that petroleum demand on Northeast Asia will increase mainly in transport sector.
2. This tendency may be enhanced by diversified energy price increases.

Million Barrels  
per day

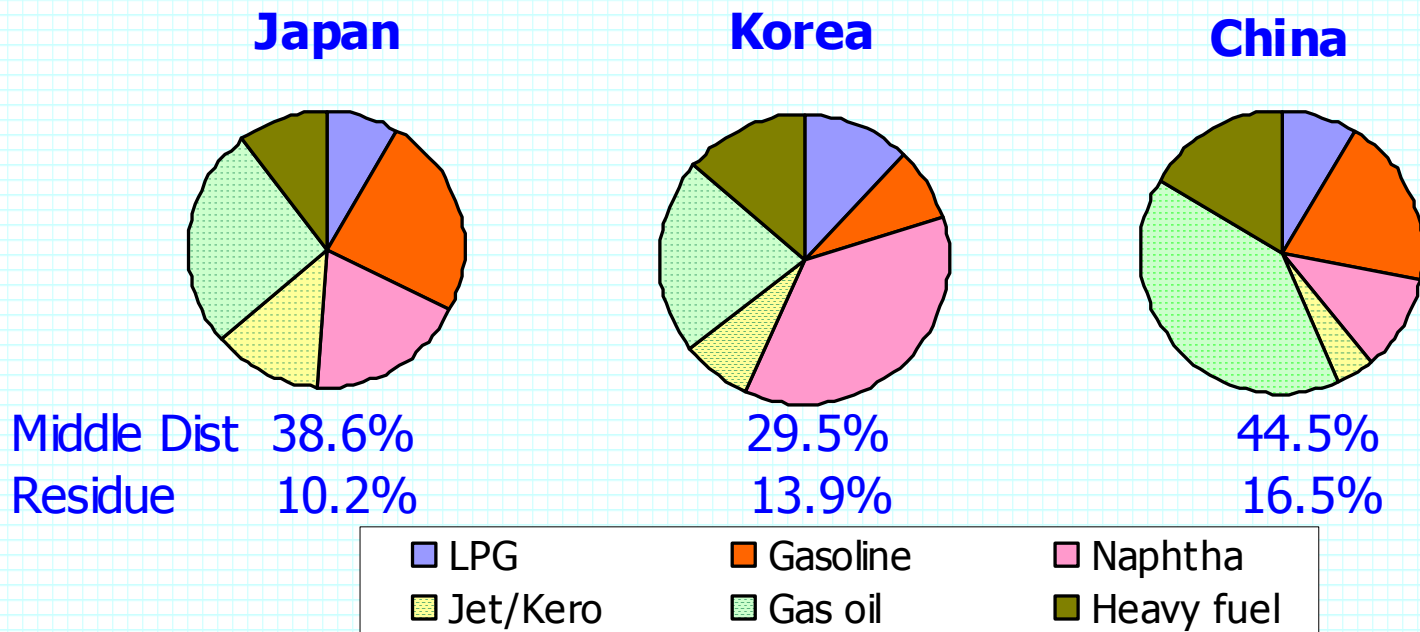
### Oil Demand of Northeast Asia



## 3.2 Heavy Fuel being driven out

1. Share of heavy fuel oil is less than 20% in Northeast Asian market.
2. With higher oil prices driven by rise of transport fuel demand, heavy fuel oil demand shall be further eroded giving way to natural gas, coal and nuclear.

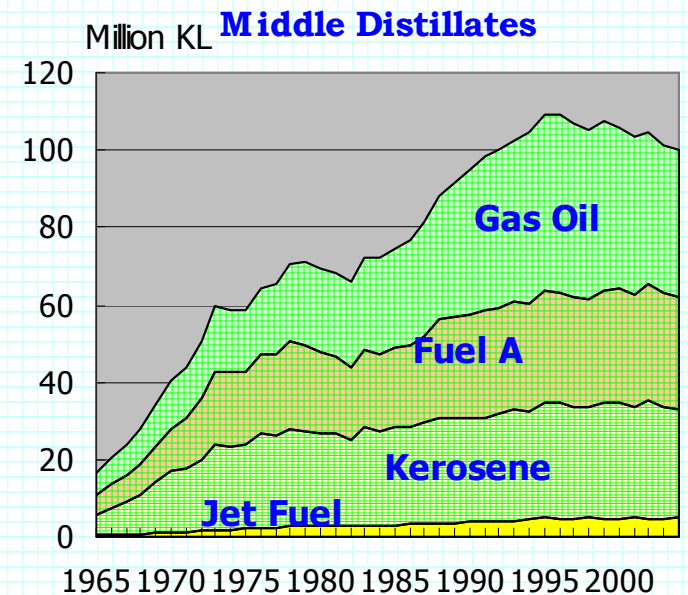
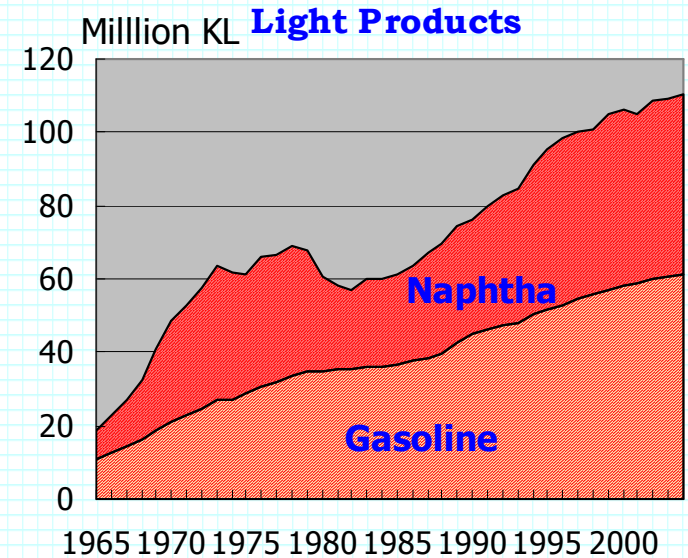
→Oil based IPPs, once burgeoned, are now burdens!



# 3.3 Demand Trends among Products

Japanese oil demand is on a declining trend. Among others,

1. Heavy fuel oil demand is decreasing faster. Especially, oil based IPPs are being knocked down.
2. Light products (gasoline & naphtha) demand is relatively steady.
3. Middle distillates demand is turning downward.
  - 1) Energy conservation campaign in freighter business.
  - 2) Inferior price competition in heating sector.



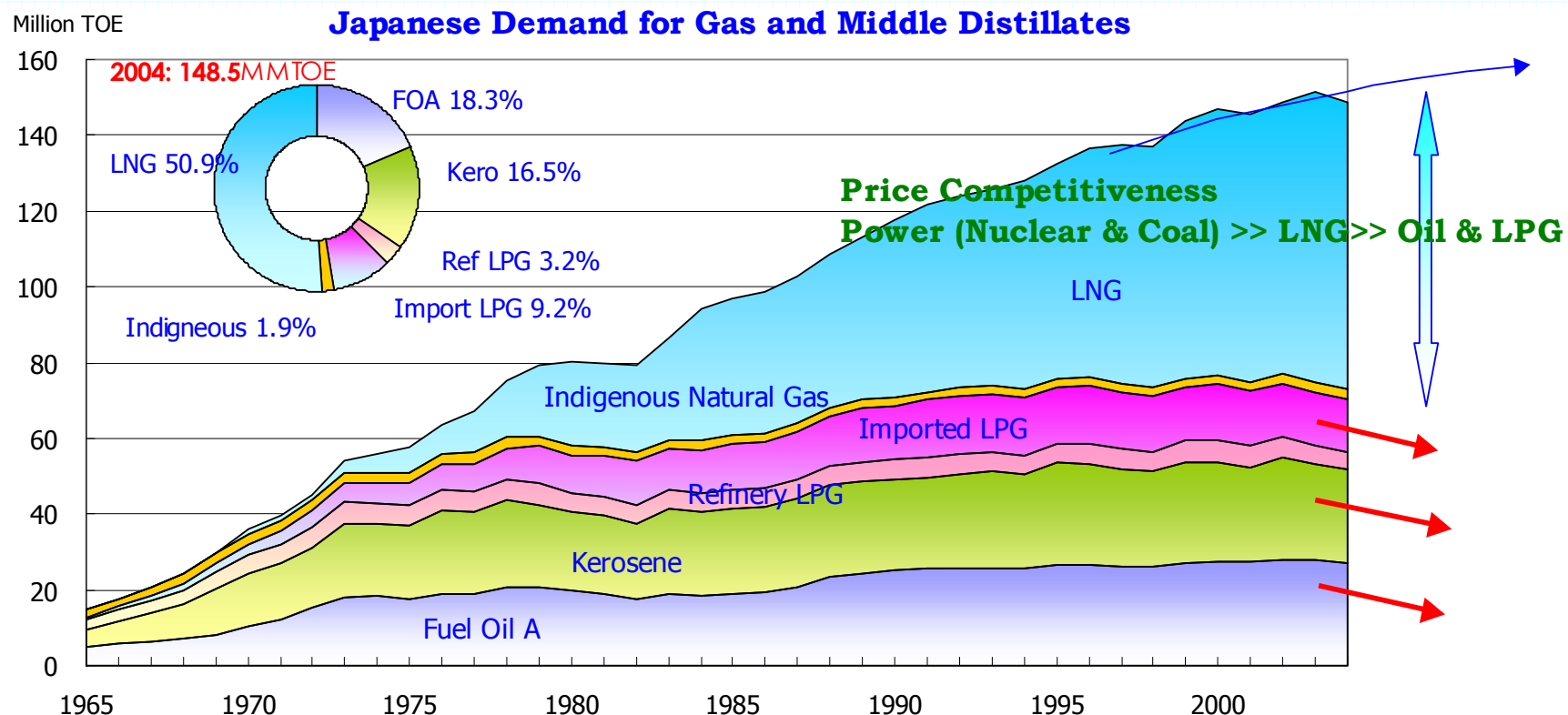
# 3.4 Middle Distillates being driven out

Higher energy price will

1. Enhance energy conservation in general.
2. Intensify price competition among fuel sources outside the transportation sector.

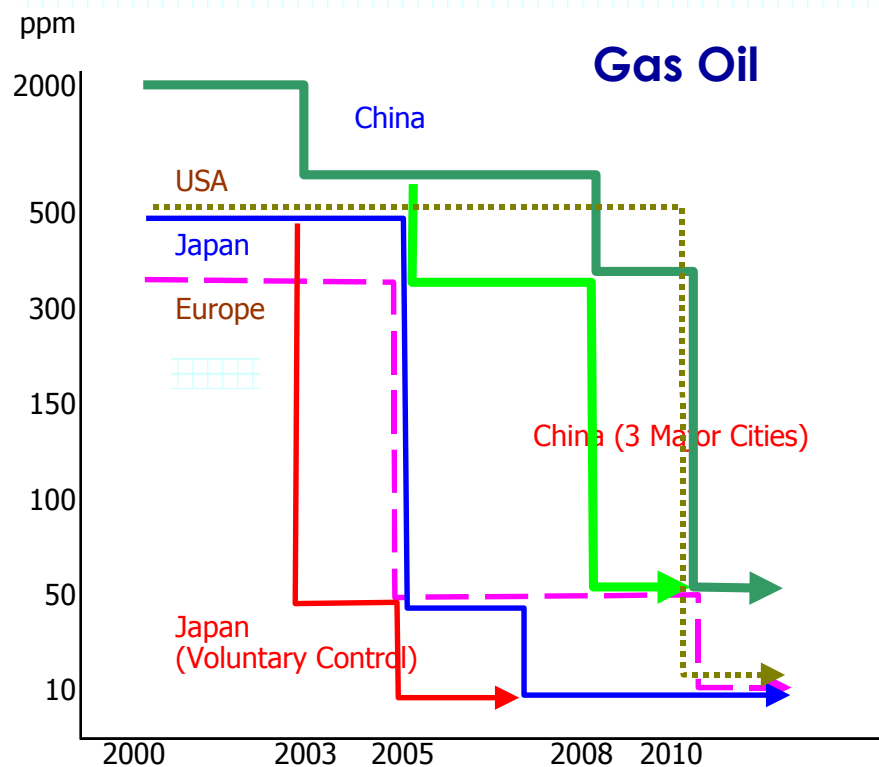
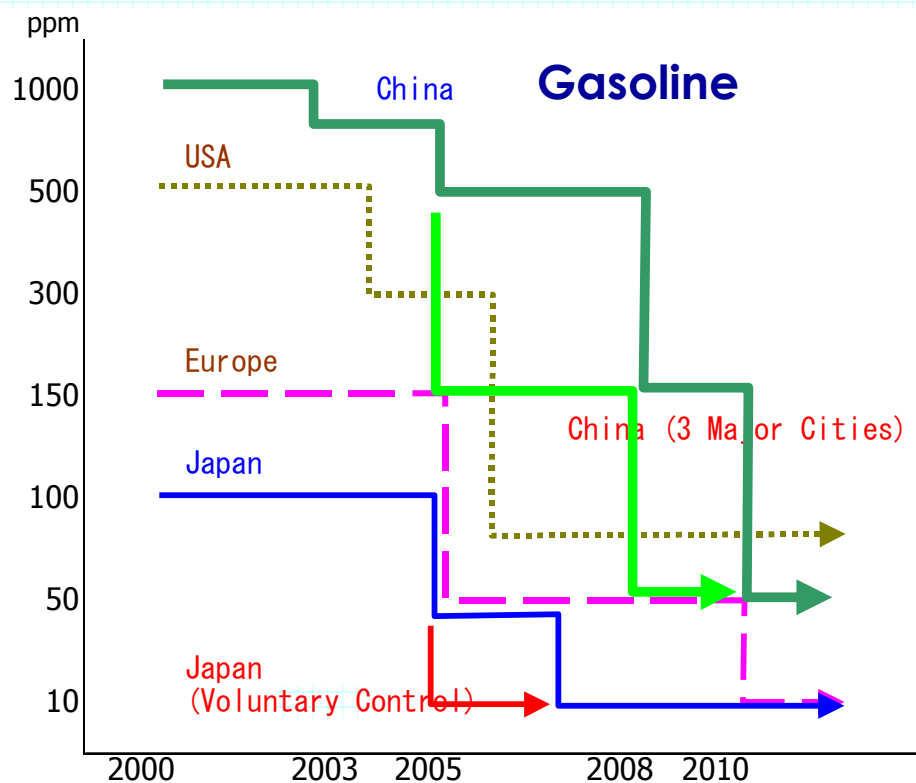
**Power (coal & nuclear) >> Natural Gas**

**>> LPG & Middle Distillates**



# 3.5 Motor Fuel Quality Regulation

1. The Japanese oil industry realized “Sulfur Free(<10ppm)” for both gasoline and gas oil as of January 1, 2005.
2. With worsening metropolitan environment, China is going to improve motor fuel quality abruptly.



## 3.6 Refining Facility: China/Japan

1. In China, cost effective cracking methods such as FCC are mainly used.
2. Desulfurization and hydro-treating capacity is extremely small, which are necessary to upgrade motor fuel quality.

	China	Japan
	1000BD	1000BD
Topping Unit	4528	4897
Vacuum Distillation	40	1708
Coking/ Residue Cracking	306	147
FCC	892	966
Reformer	157	782
Hydro Cracking	122	143
Hydro Treating / Desulfurization	355	4622
	%	%
Cracking Ratio	29.2	25.6
Desulfurization Ratio	7.8	94.4
Reforming Ratio	3.5	16.0

# 3.7 Challenges: Asia and Japan

## 1. Issues for Asia

- 1) **Petroleum demand in China and India will grow fast.**  
**Securing stable oil product supply is essential for sustainable development.**
- 2) **Improving motor fuel quality is urgent environmental requirement.**

→ **Huge investment and sophisticated technologies!!**

## 2. Issues for Japan

- 1) **Total demand continues to decline**  
**Heavy fuel oil & IPP use: declines fast**  
**Middle distillates: continues to decline**
- 2) **Core demand : Transport Fuel and Petrochemical Feedstock**

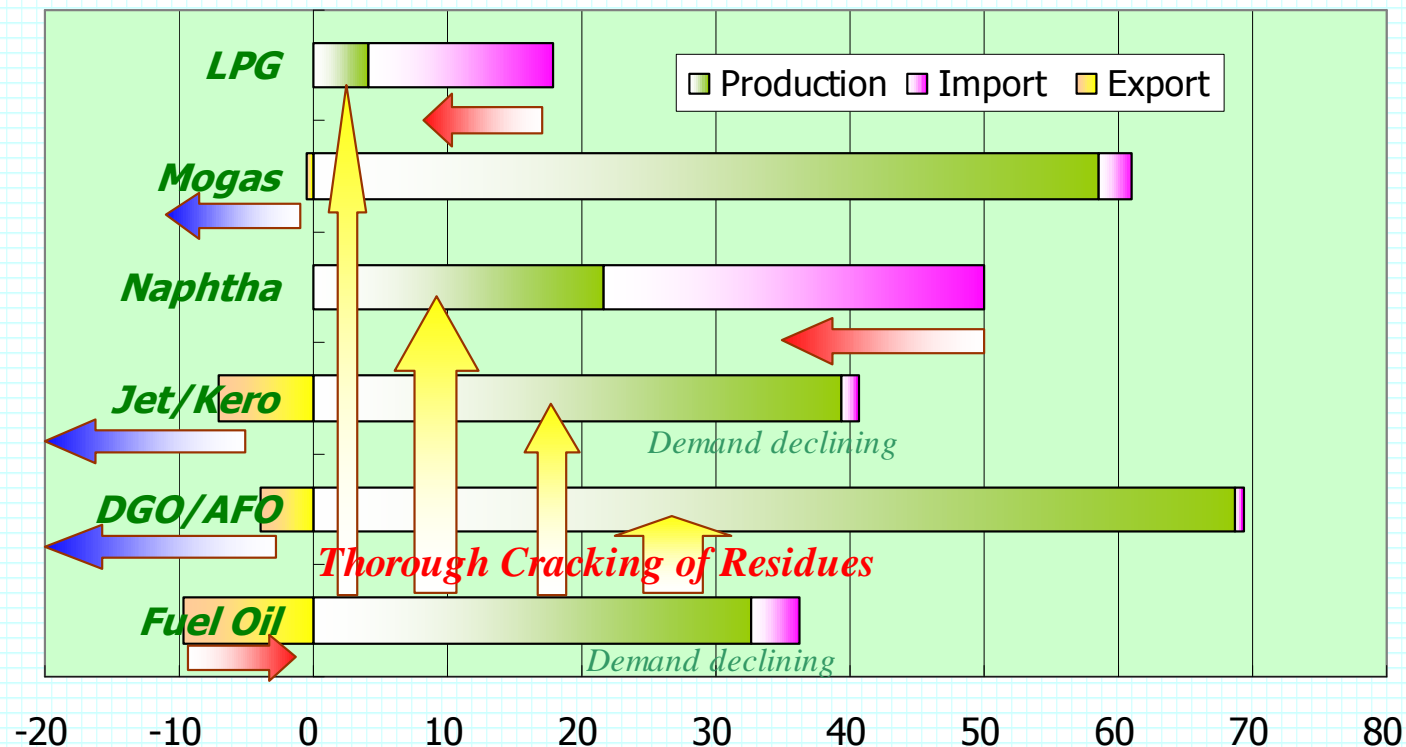
- **Increasing idle capacities**
- **Thorough cracking of residue**
- **Excessive supply of middle distillates**

# 4.1 Product Supply Structure

**Cracking the residue thoroughly shall result in:**

- 1. Decrease of LPG and Naphtha import**
- 2. Increase of Middle Distillates export**
- 3. Decrease of Heavy Fuel export for deeper processing**

**Japan's Product Supply Structure (2005): Million KL**



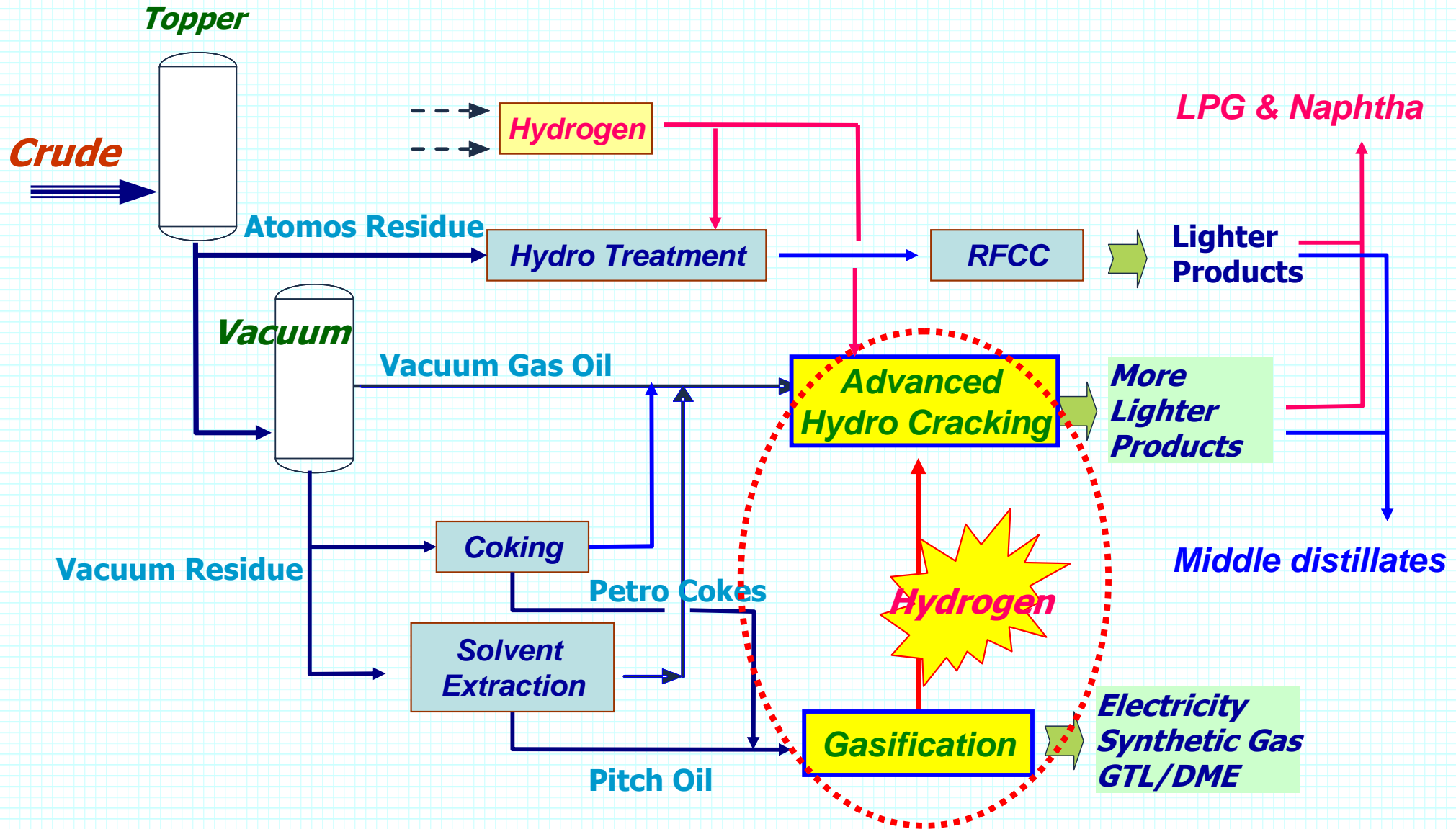


## 4.2 Refining Business Trend

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- 1. Oil demand will converge to lighter products**
  - Noble use of conventional oil
  - Reflecting price spread among energy sources subject to difficulties of producing light petroleum products (ex. GTL, Coal liquefaction, bio-diesel, etc.)
- 2. More FCC with advanced hydro treating will be introduced**
  - FCC gasoline
  - Olefins for petrochemicals
  - Middle distillates with wide range of property (ex. Sulfur content, Cetane number, Viscosity, etc.)
- 3. In the Asian market, wide range of middle distillates will become available from Japan and Korea. This will**
  - Mitigate investment requirements in emerging market
  - Require standardized grades for smart trading
  - Require segregated tanks for handling

# 4.3 Advanced Residue Conversion



## 4.4 Noble Use of Middle Distillates

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1. **Deep cracking of residue**, reflecting petroleum product demand tendency, **will produce wide range of middle distillates with different characteristics.**
2. **Minimizing quality give-away** after costly cracking, standard specifications should be defined corresponding to quality groups.
3. Two or three standard grades may be set. For example,
  - 1) **High quality diesel** for high speed motor vehicles.  
**Extra LS (50ppm max) and high cetane number (50+)**
  - 2) **Regular gas oil** for low duty engines.  
**Regular sulfur ( 500ppm max) and cetane number (45+)**
  - 3) **Heating oil: Low sulfur but low cetane number**

**Thank you  
for  
your kind attention**

The Institute of Energy Economics, Japan

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