

The 393rd Forum on Research Works

Short-term Energy Supply/Demand Outlook

**Forecast through FY2006 and Analysis on the Effects of
Oil Prices, Economic Growth, and Temperatures**

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The Institute of Energy Economics, Japan

**Shigeru Suehiro, Senior Economist
Energy Data and Modelling Center**

Outline of the Study

Objectives, analytical procedures, model flow

Current Status of Energy Demand

Current Macroeconomic Status and Outlook

Energy Supply/Demand Outlook

Sensitivity Analysis

Effects of crude prices, economic growth, temperatures

Summary

Outline of the Study

Study Objectives:

To forecast energy supply/demand through FY2006 based on current economic environment and oil price trends, and also to evaluate the effects of uncertain factors in addition to a base case forecast.

Forecasting Method:

Econometric models (macroeconomics, energy S/D balance)

⇒ see next slide

Case Settings:

Base Case

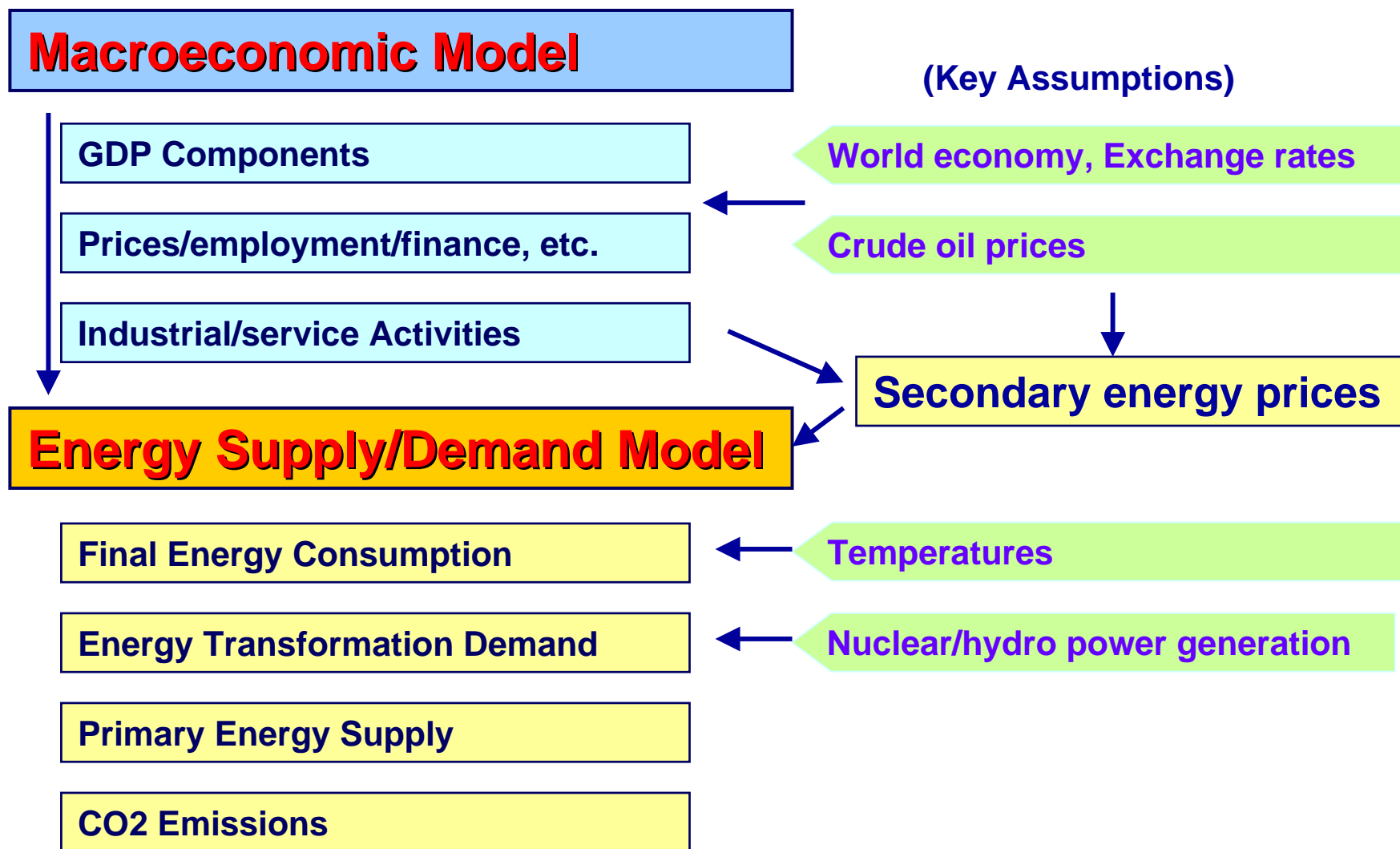
Sensitivity analyses (for FY2006)

Crude prices: High (+\$10/Bbl)/Low (-\$10/Bbl)

Economic growth: High (+1%/Low(-1%)

Effect of temperatures: Summer (+1°C)/Winter (-1°C)

Work Flow for Model Analysis



Factors defining future supply/demand and various causal relationships are captured quantitatively and consistently.

Current Status of Energy Demand

Electricity Sales Volume

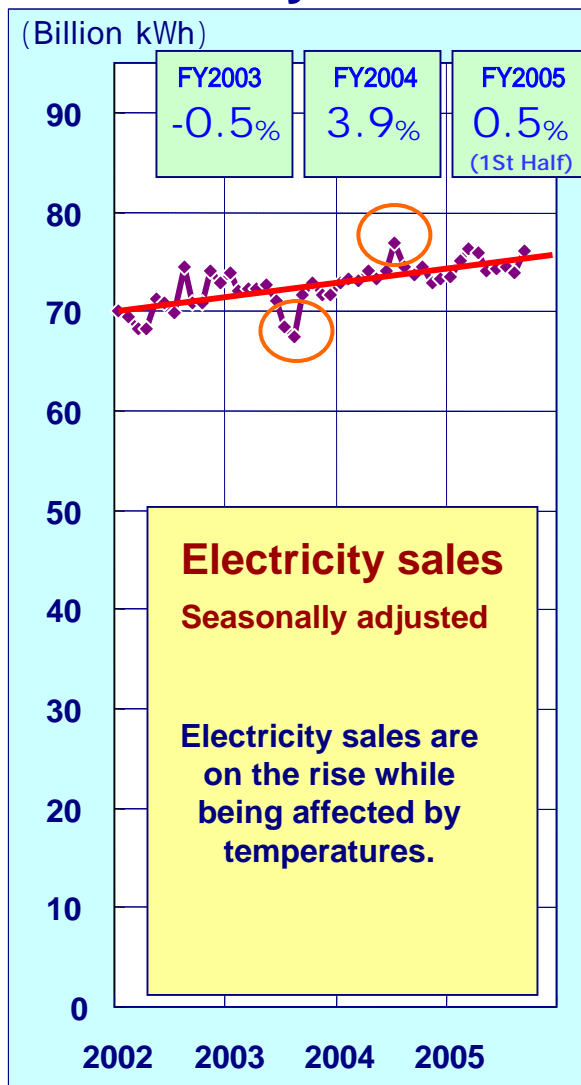
Town Gas Sales Volume

Fuel Oil Sales Volume

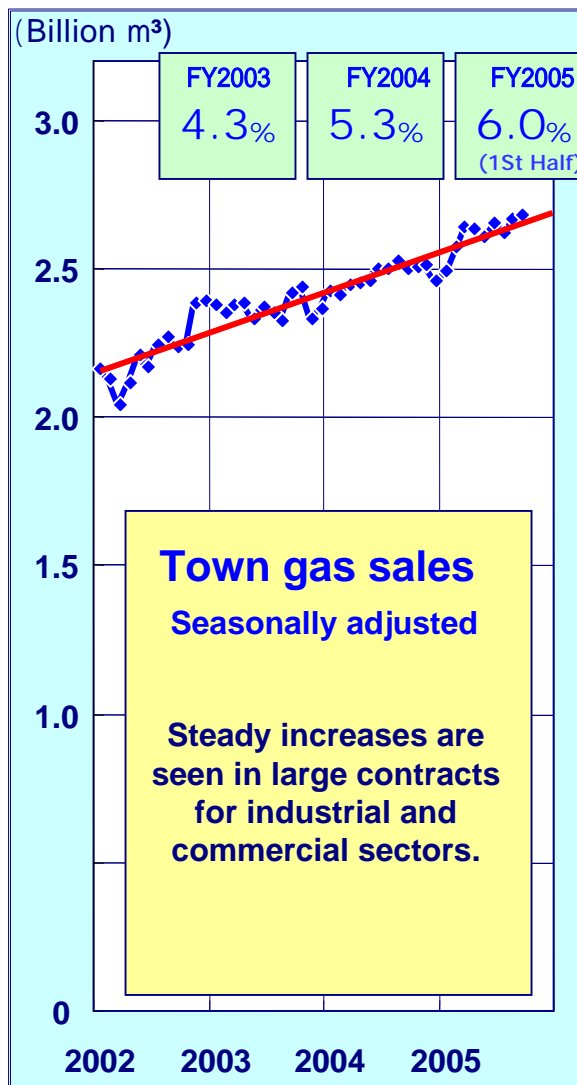
Segments - Industry
- Residential
- Commercial
- Transportation

Energy Sales Trends

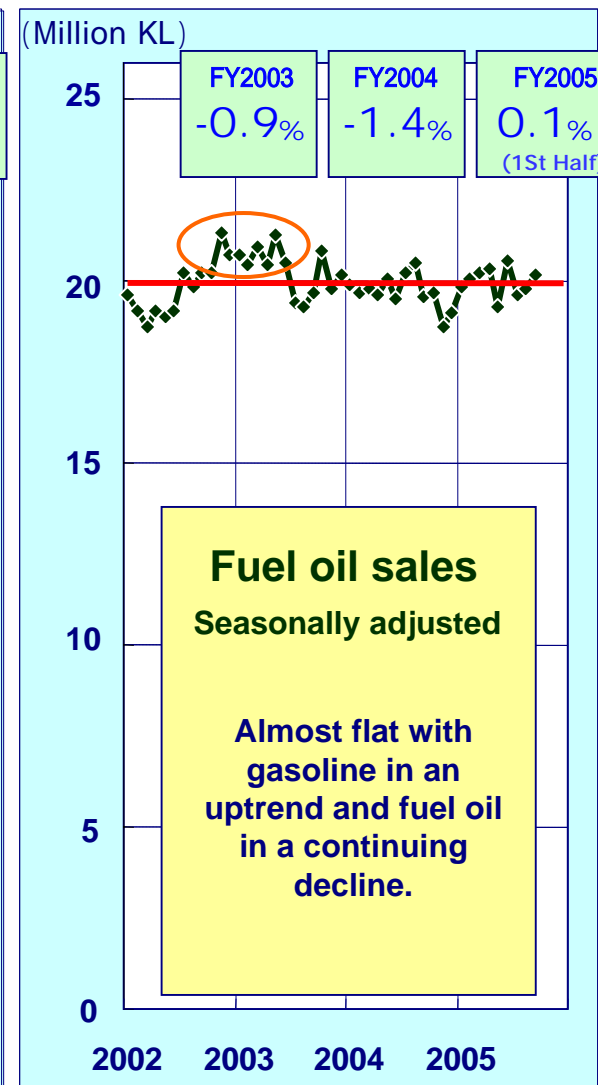
Electricity



Town Gas



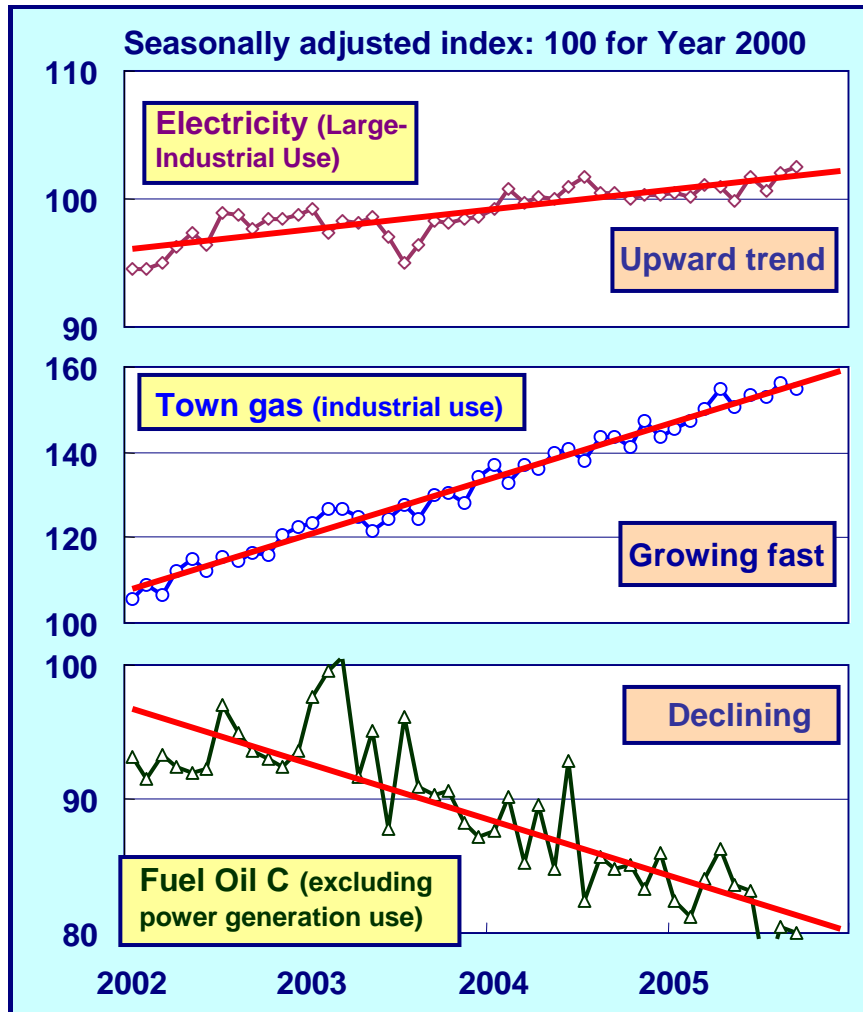
Fuel Oils



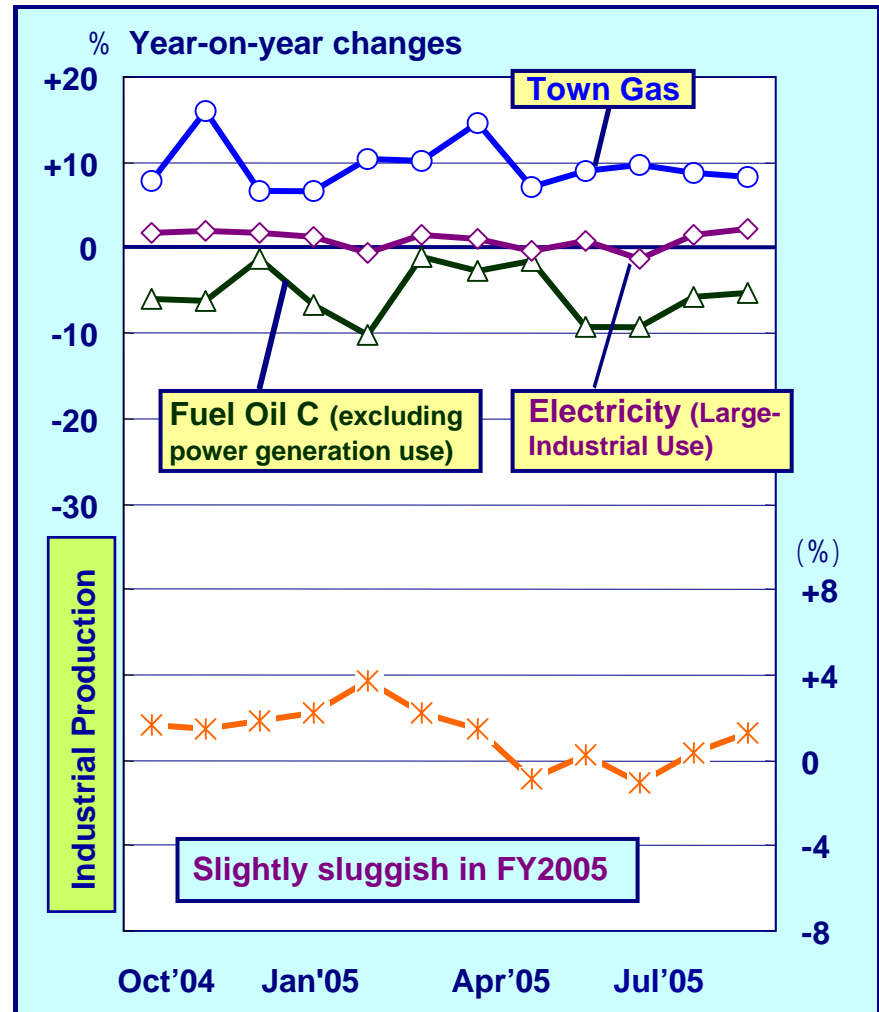
[Industrial Demand]

Electricity, Town Gas, Fuel Oil C

Energy demand trends by types



Trends in most recent 12 months

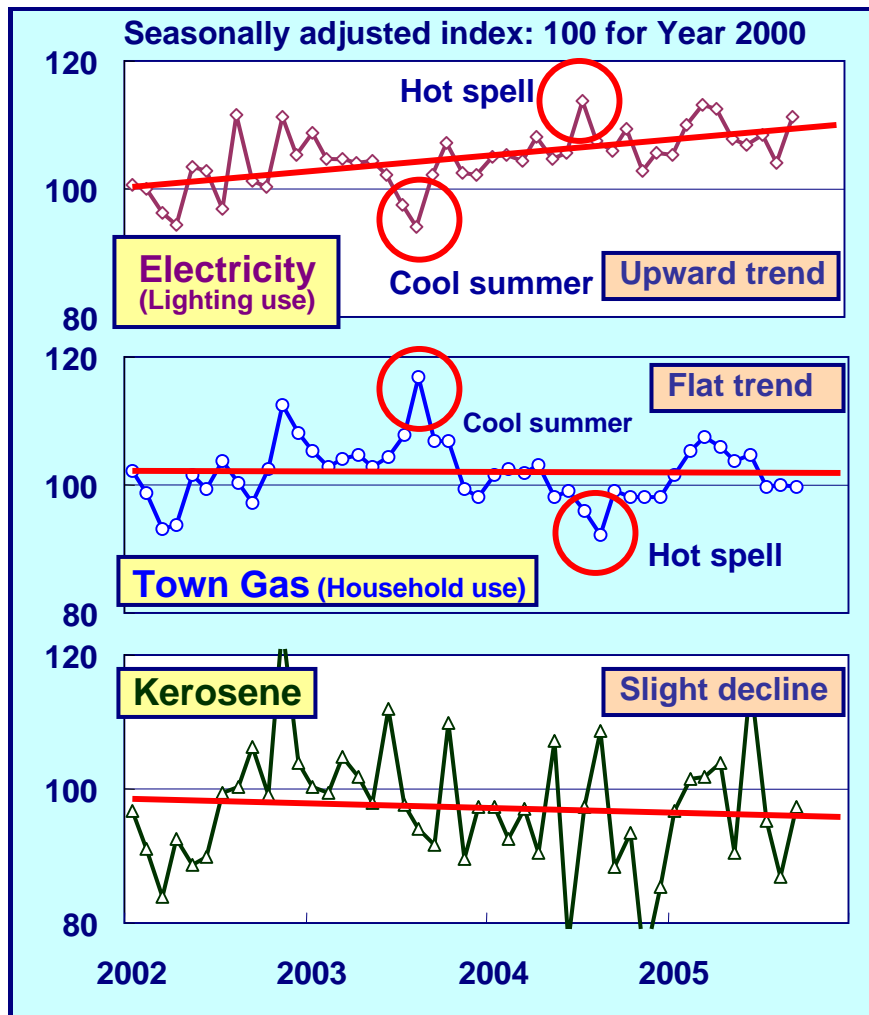


Sources: Those mentioned in previous slide and Petroleum Association of Japan "Monthly Oil Statistics" for energy demand. The Industrial Production chart is prepared from METI "Indices of Industrial Production, Shipment and Inventory".

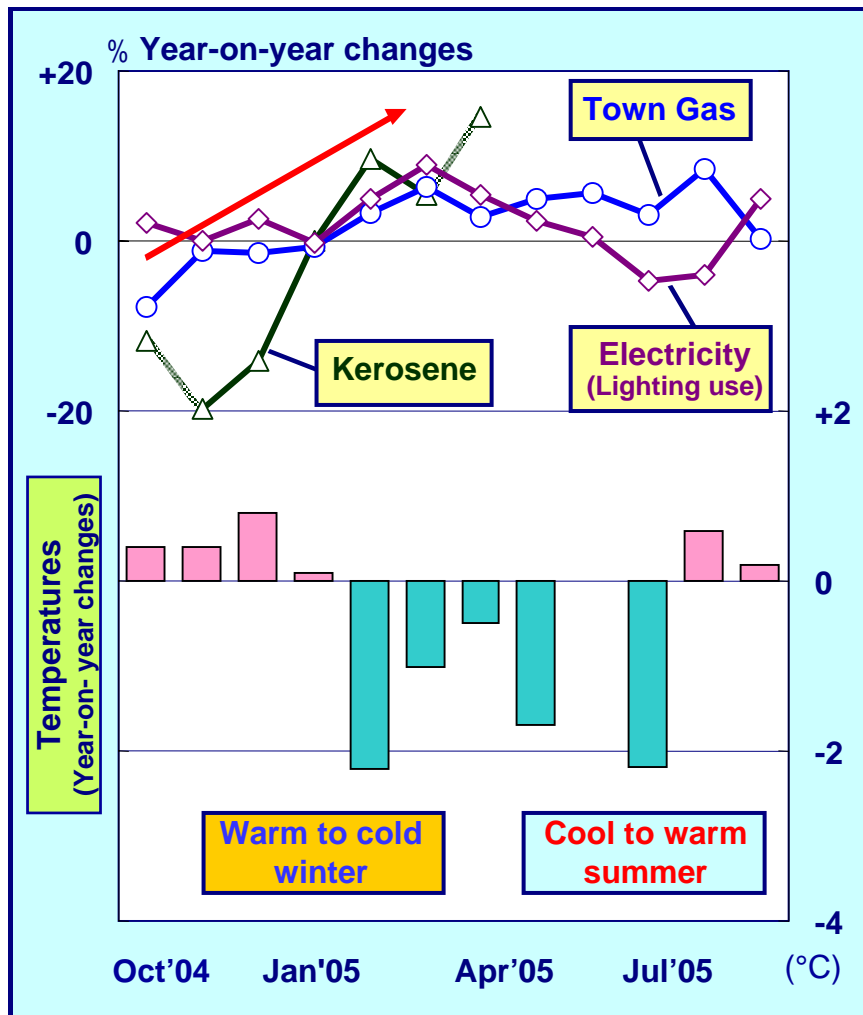
[Residential Demand]

Electricity, Town Gas, Kerosene

Energy demand trends by types



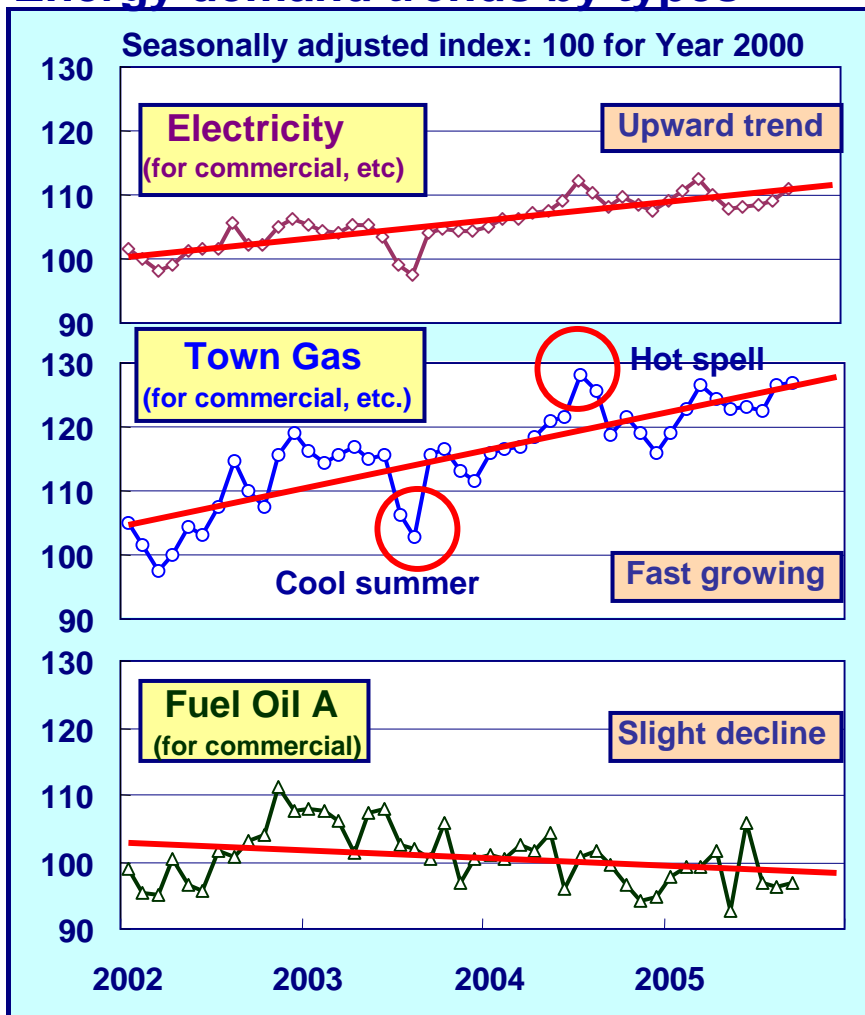
Trends in most recent 12 months



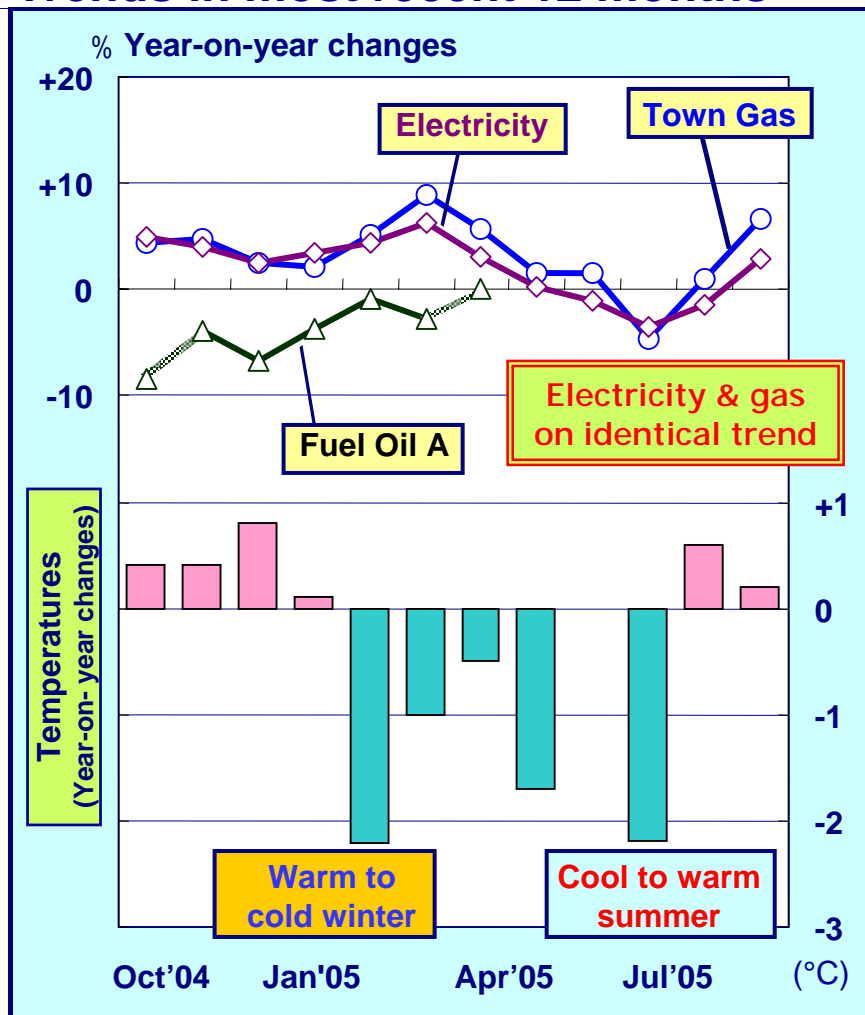
Sources: Those mentioned in previous slides for energy demand. The temperature chart is prepared from Japan Meteorological Agency data.

[Commercial Demand] Electricity, Town Gas, Fuel Oil A

Energy demand trends by types

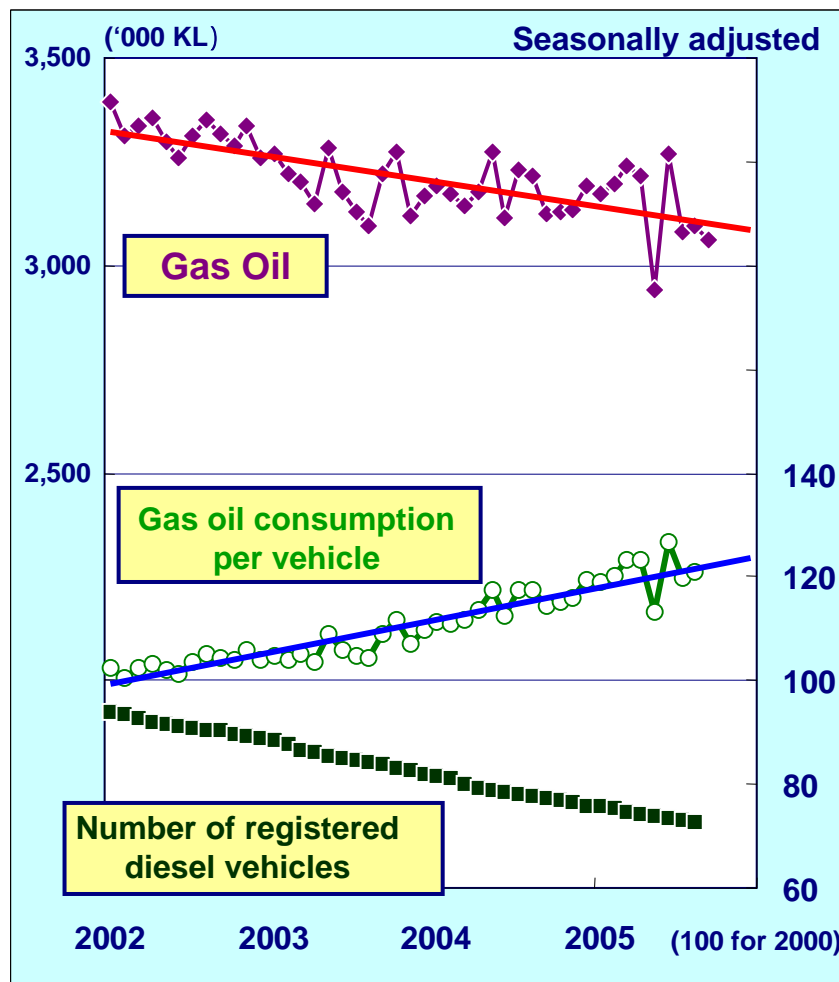
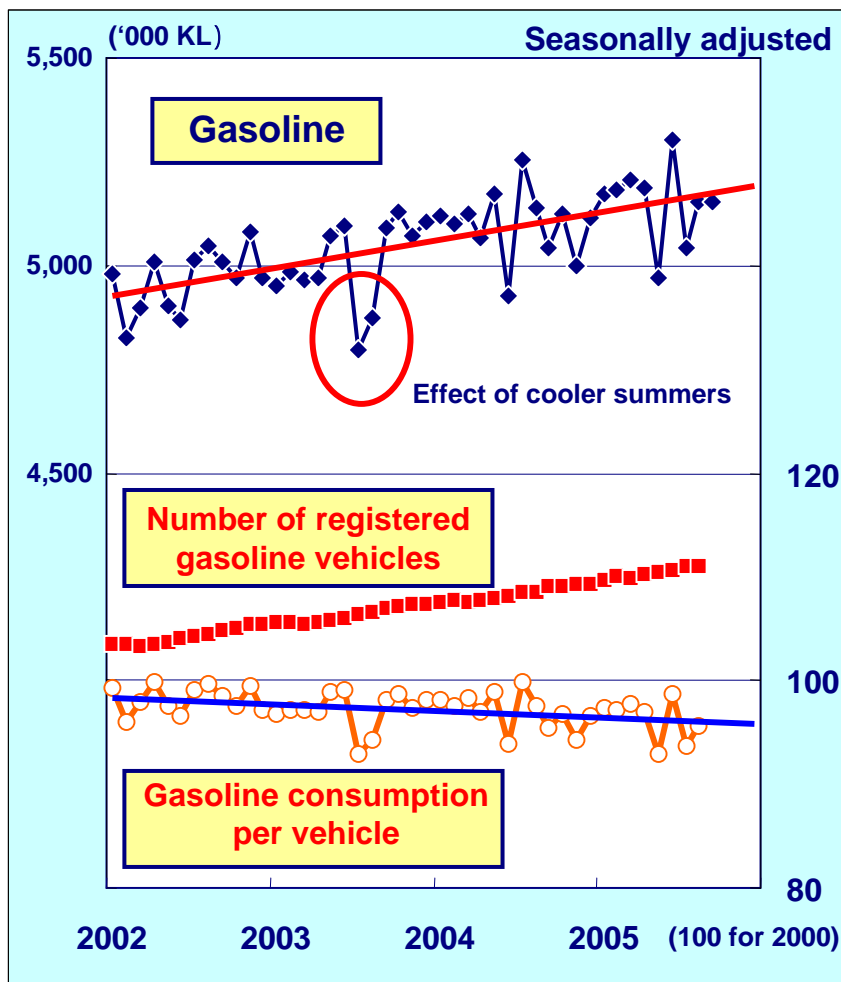


Trends in most recent 12 months



Sources: Those mentioned in previous slides and EDMC (IEEJ) estimates for energy demand, The temperature chart is prepared from Japan Meteorological Agency data. **Note: Electricity data includes demand under the deregulation program.**

[Transportation Demand] Gasoline, Gas Oil



Sources: Prepared from METI "Monthly Resources & Energy Statistics", Automobile Inspection & Registration Association "Number of Registered Automobiles"

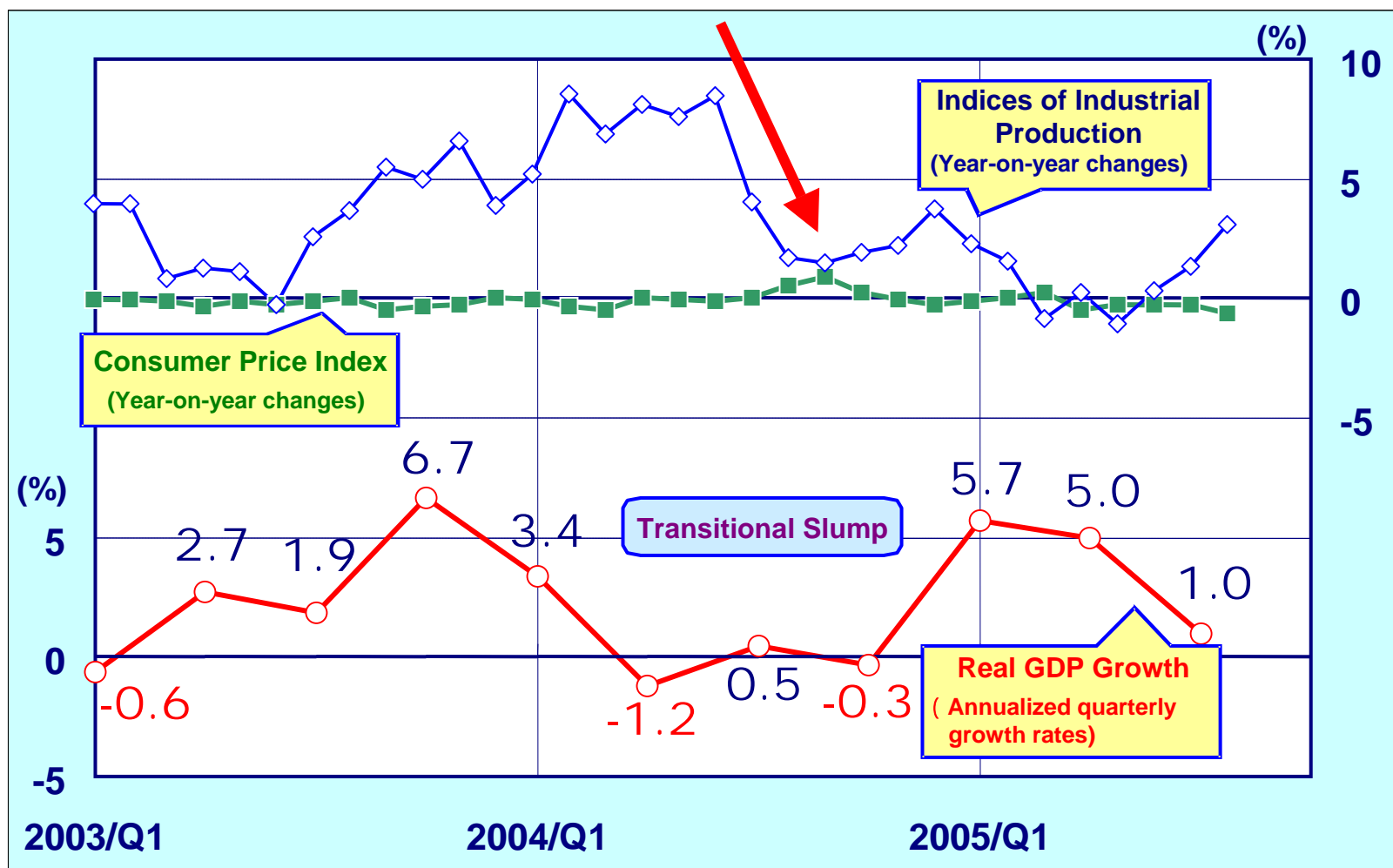
Demands of gasoline and gas oil as automobile fuels coincide with respective numbers of registered vehicles. In terms of unit fuel consumption, however, gasoline has been declining and gas oil increasing.

Current Macroeconomic Status

**General Macroeconomic Indicators
(GDP, Prices, etc.)**

**Industrial Materials Production,
Other Manufacturing Activities, etc.**

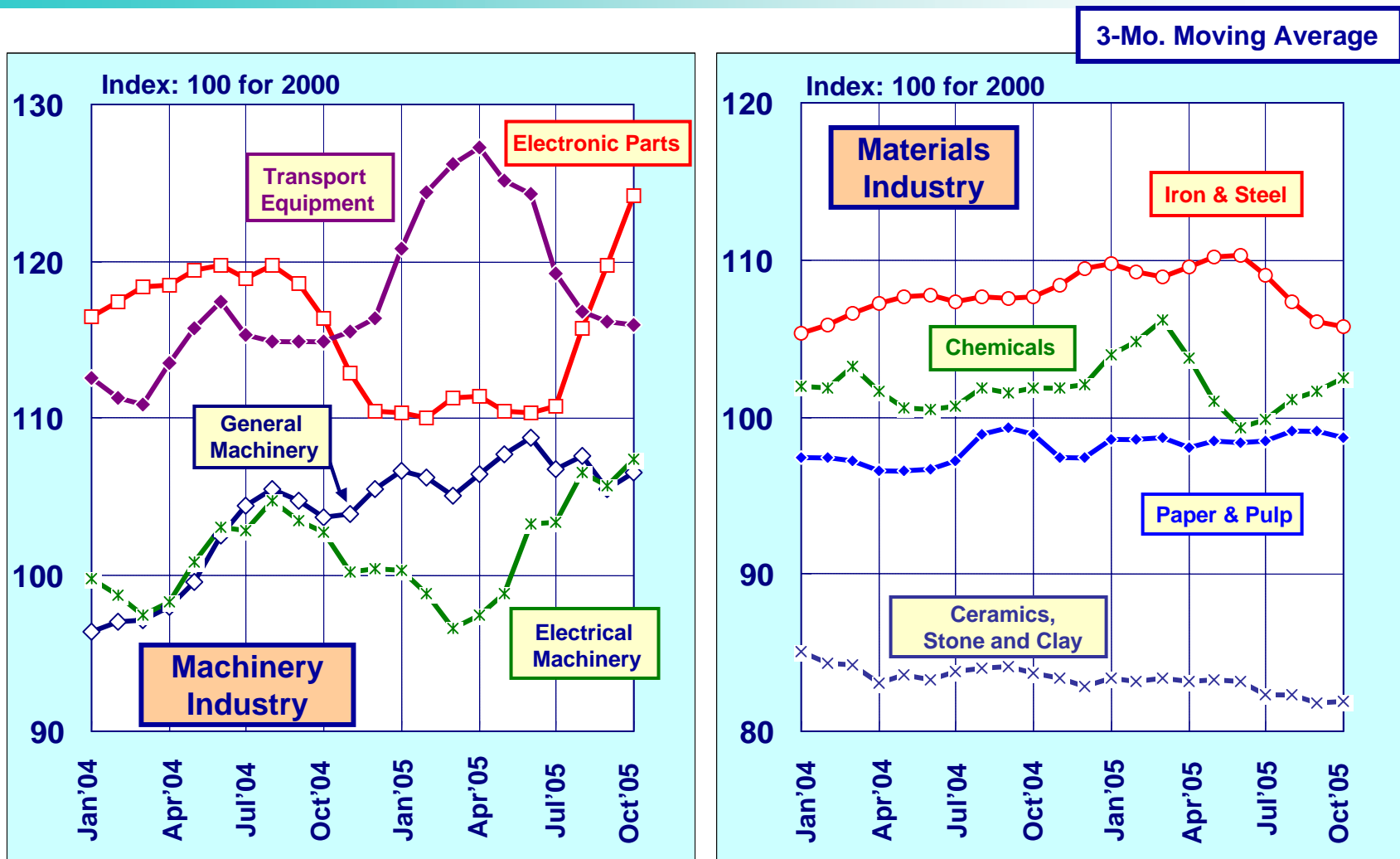
Key Economic Indicator Trends



Sources: Prepared from Cabinet Office "Preliminary National Income Statistics", METI "Indices of Industrial Production, Shipment & Inventory", and Ministry of Internal Affairs & Communication "Consumer Price Index".

Economy is declared to have departed from the transitional slump, moving towards self-sustained recovery.

Indices of Industrial Production by Industry Type

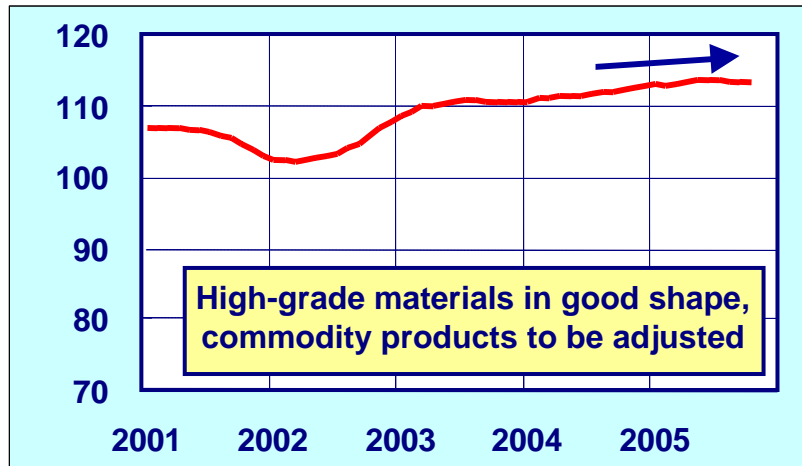


Source: Prepared from METI "Indices of Industrial Production, Shipment & Inventory"

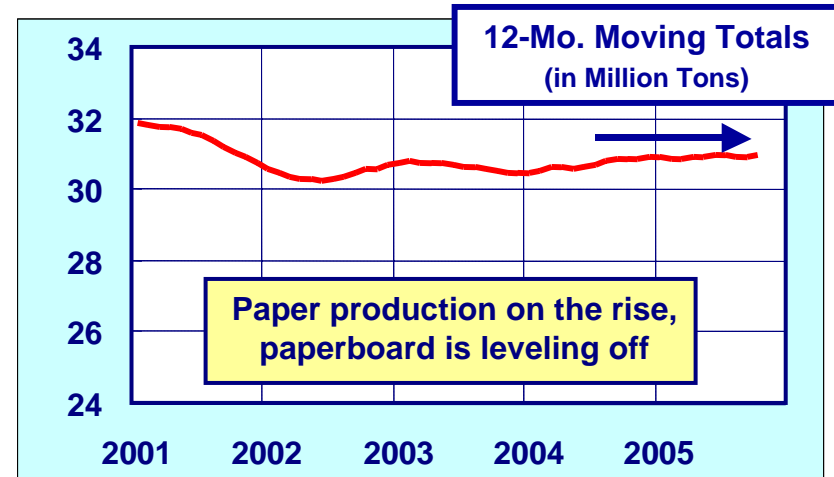
As inventory adjustment completes, electronic parts and devices show rapid recovery.

Electrical machinery is also recovering due to increased exports to China.

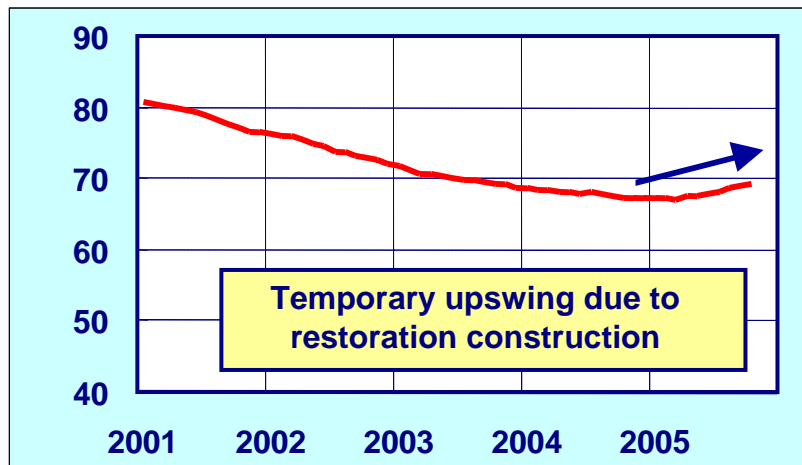
(1) Crude Steel Production



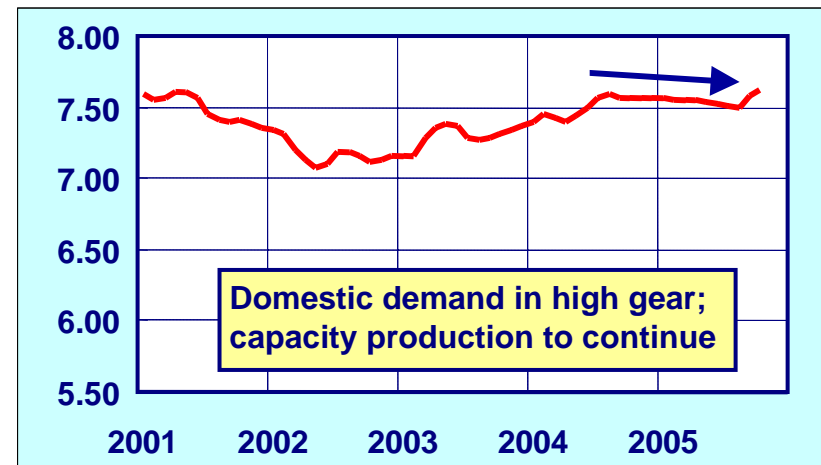
(2) Paper/Paperboard Production



(3) Cement Production



(4) Ethylene Production



Sources: Prepared from METI "Iron and and Steel, Non-ferrous Metal, and Fabricated Metals Statistics", "Ceramics & Building Materials Statistics", "Chemical Industry Statistics", "Paper, Pulp, Plastics Products, and Rubber Products Statistics"

Macroeconomic Outlook

GDP and Demand Parameters, Price Indices

Industrial Materials Production

**IIP, Service Activity Index, Transportation
Indicators**

Outlook on Macroeconomic Indicators

[Base Case]

	Actual FY2004	Forecast		Year-on-year Changes (%)		
		FY2005	FY2006	FY2004	FY2005	FY2006
Nominal GDP (Trillion yen)	496.2	502.2	511.8	0.5	1.2	1.9
Real GDP (Trillion yen)	526.4	539.6	550.9	1.7	2.5	2.1
Private sector demand	393.8	405.5	414.5	[1.5]	[2.2]	[1.7]
Public sector demand	118.7	119.9	120.8	[-0.3]	[0.2]	[0.2]
Overseas demand	13.8	14.4	15.5	[0.5]	[0.1]	[0.2]
IIP (100 for 2000)	100.6	102.3	105.5	4.1	1.7	3.1
Consumer Price Index (100 for 2000)	98.1	98.0	98.1	0.0	0.0	0.0
Crude Oil Price (\$/Bbl)	38.6	53.6	51.0	30.8	38.8	-4.9
Exchange Rate (yen/\$)	107.5	112.2	115.0	-4.9	4.4	2.5

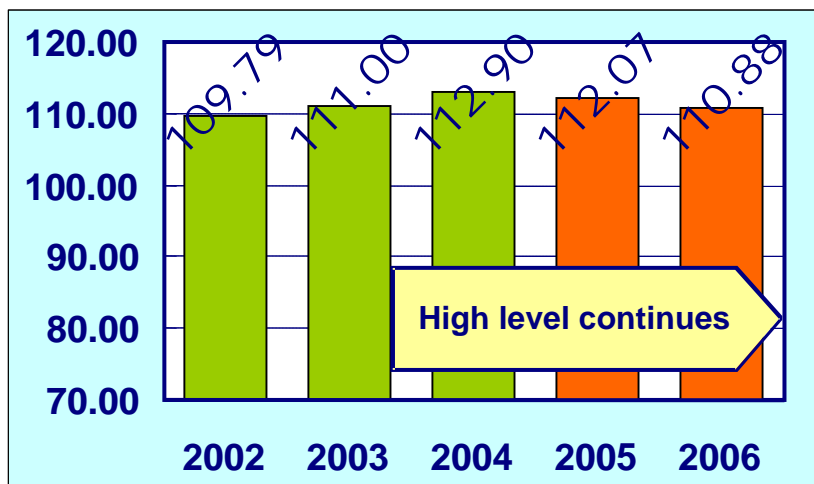
Sources: Actual figures are from Cabinet Office "Preliminary National Income Statistics" and others. Forecasts are by IEEJ.

Note: Bracketed numbers are GDP growth contribution rates. A total of these may not add up due to minor deviations.

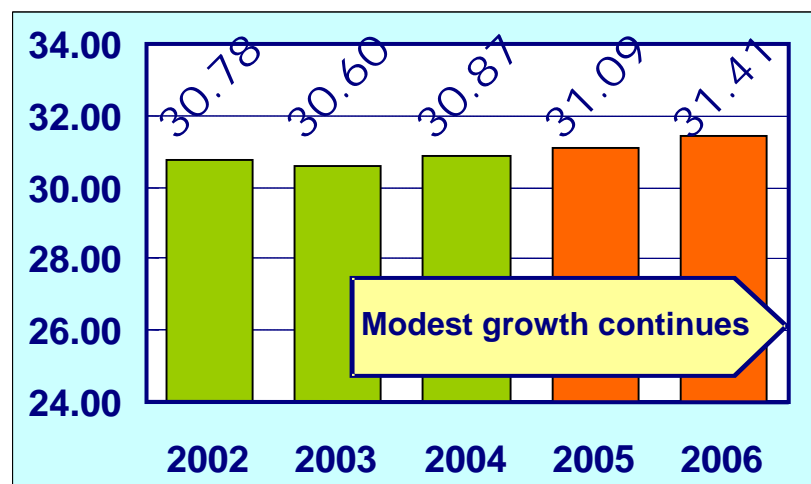
For FY2006, domestic demand will drive the economy to a 2% growth for the second consecutive year.

[Base Case]

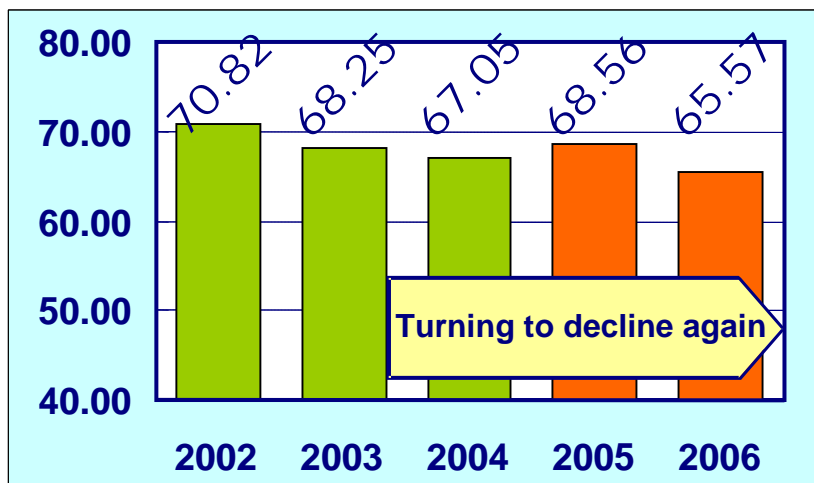
(1) Crude Steel Production, in Million Tons



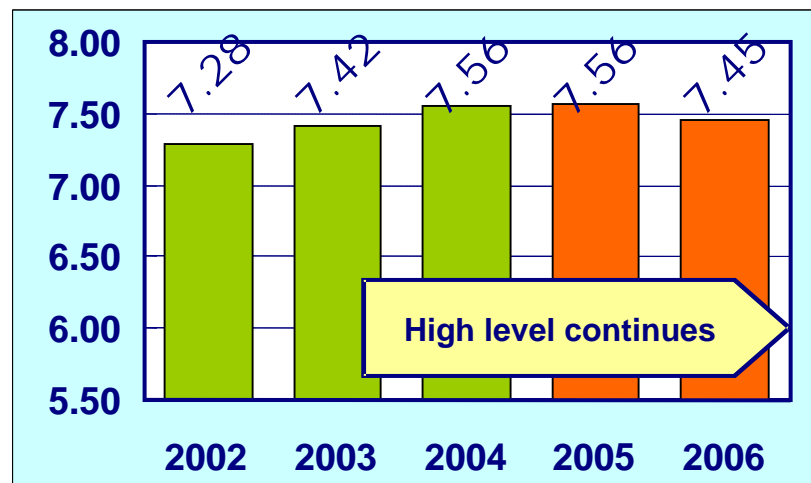
(2) Paper/Paperboard Production, in Million Tons



(3) Cement Production, in Million Tons



(4) Ethylene Production, in Million Tons



Sources: Actual figures as mentioned in previous slide; forecast by IEEJ.

Note: All in fiscal year figures

[Base Case]

Index: 100 for 2000		Actual	Forecast		Year-on-year Changes (%)		
		FY2004	FY2005	FY2006	FY2004	FY2005	FY2006
	Food products	96.0	95.7	95.6	-1.3	-0.3	-0.1
	Non-ferrous metals	97.6	99.4	101.1	0.2	1.8	1.7
	Metals and machinery	105.3	107.8	112.5	7.3	2.4	4.4
	Indices of industrial production	100.6	102.3	105.5	4.1	1.7	3.1
	Tertiary industry activity index	104.8	107.5	109.6	2.3	2.5	2.0
	Gasoline vehicles (in Millions)	65.53	66.68	67.73	2.3	1.8	1.6
	Diesel vehicles (in Millions)	9.06	8.48	7.92	-6.7	-6.5	-6.5

Sources: METI "Indices of Industrial Production, Shipment & Inventory" and other relevant materials. Forecasts are by IEEJ.

For FY2006, as inventory adjustment for IT-related equipment completes, electronic parts and devices, electrical machinery, etc. are in excellent conditions. Registration of gasoline vehicles shows a steady increase.

Energy Supply/Demand Outlook

Primary Energy Supply, Final Consumption

Electricity, Town Gas and Fuel Oils Sales

Assumptions for Nuclear Power Generation

Nuclear power plants whose operation had been suspended since FY2002 are gradually being brought back to operation.

[Latest additions of nuclear power plants]

Jan. '05: Hamaoka No.5 (1.38 Million kW)

Dec. '05: Higashidori No.1 (1.1 Million kW)

[Planned launch of nuclear power plants]

Mar. '06: Shika No.2 (1.36 Million kW)

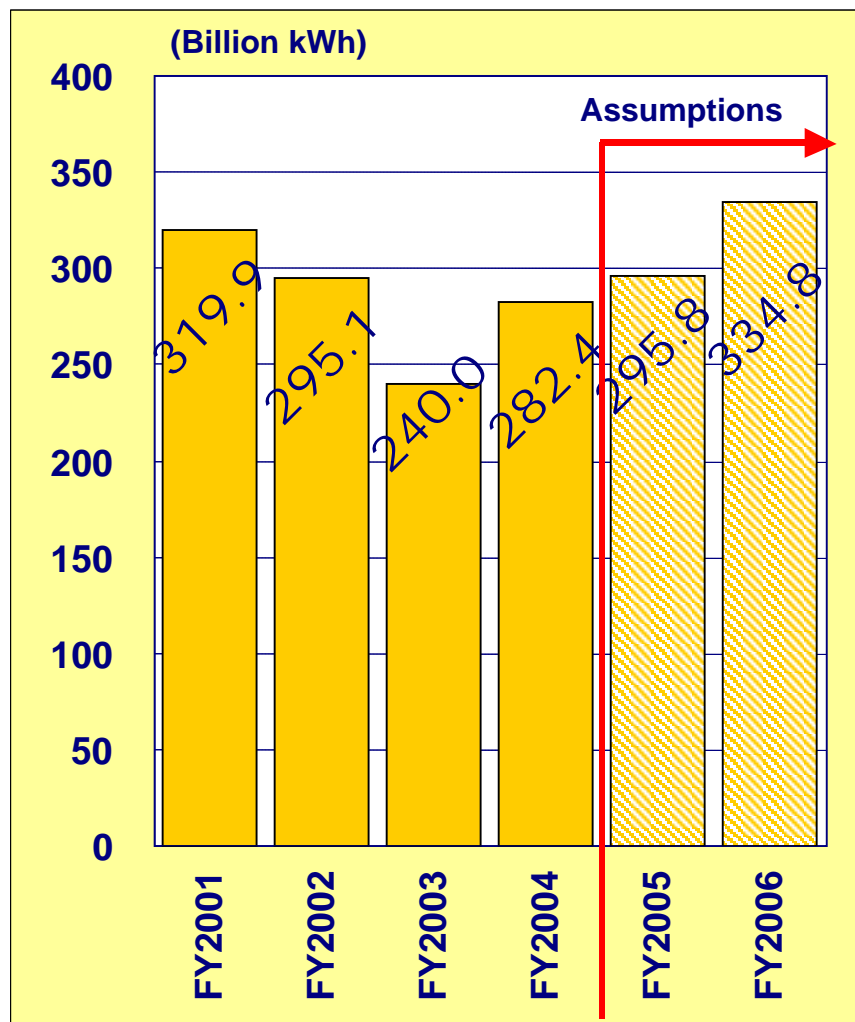
[Nuclear Power Growth Rates]

FY2004: +17.7%

FY2005: +4.7%

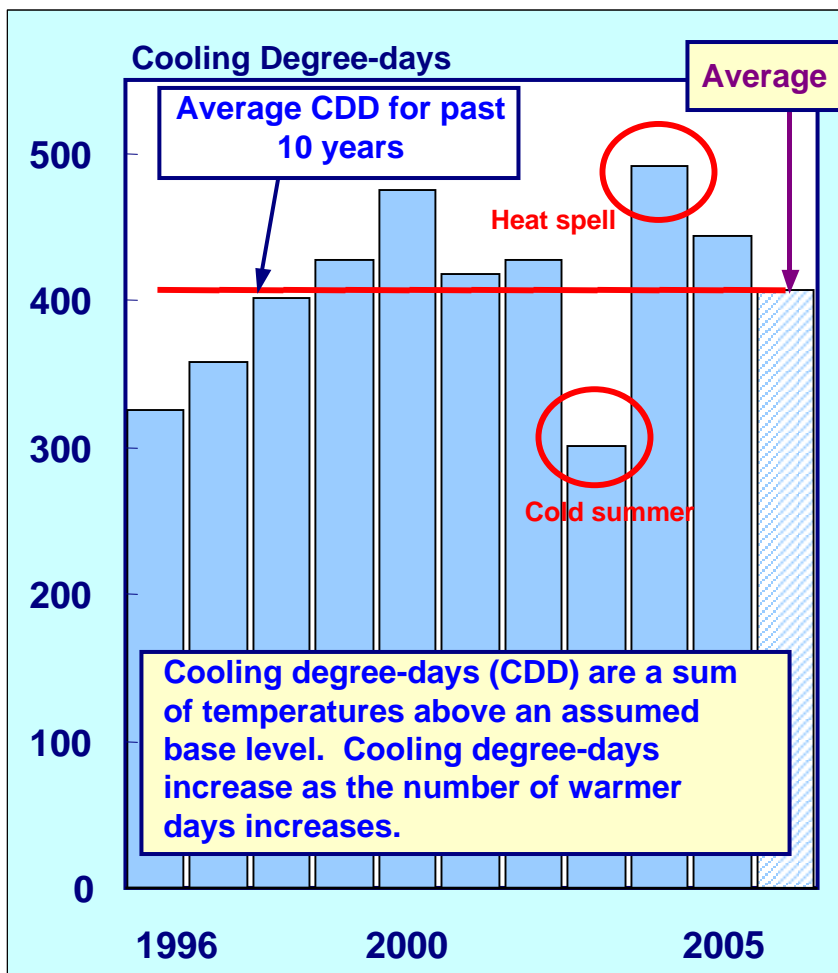
FY2006: +13.2%

Nuclear power output history & assumptions

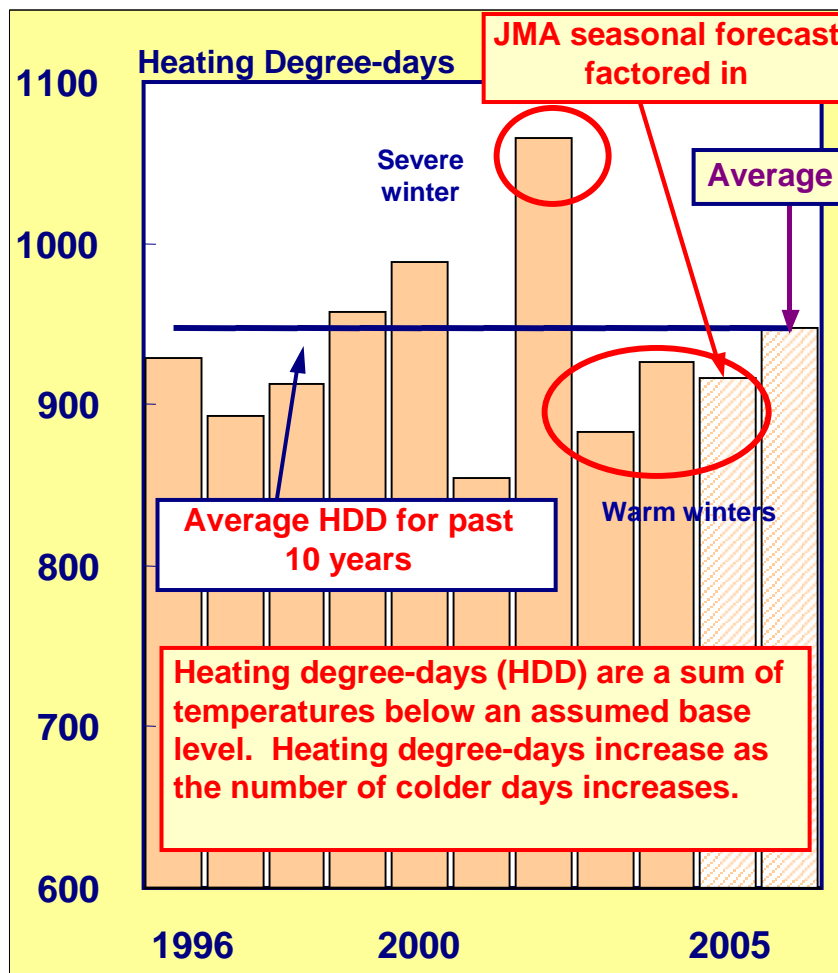


Assumptions for Temperatures (Degree-days)

1st Half (April-September)
Cooling Degree-days



2nd Half (October-March)
Heating Degree-days



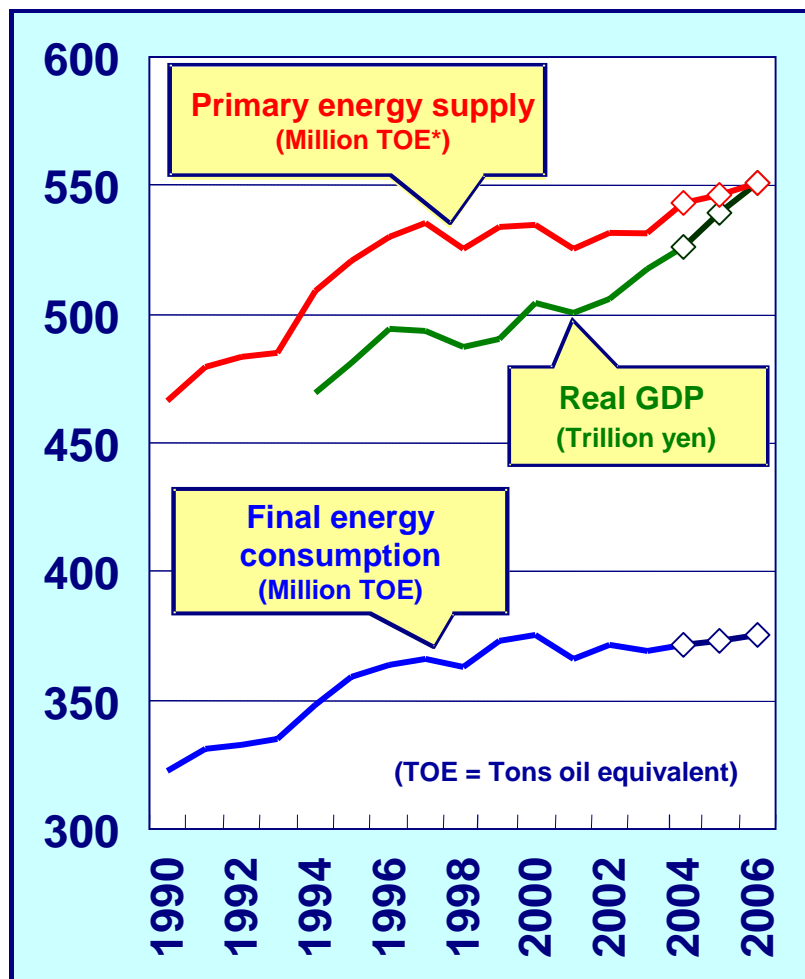
Sources: Prepared from Japan Meteorological Agency data and IEEJ (EDMC) estimates. Actual data is used up to November 2005.

Notes: CDD: The cumulative sum of differences between mean temperatures for the days that were above 24 C and the base level of 22 C.

HDD: The cumulative sum of differences between mean temperatures for the days that were below 14 C and the base level of 14 C.

Outlook on Final Energy Consumption/Primary Supply

[Base Case]



		Actual		Forecast	
		2003	2004	2005	2006
Real GDP	Fiscal Year	2003	2004	2005	2006
	Trillion yen	517	526	540	551
	% change year/year	+2.3	+1.7	+2.5	+2.1
Primary Energy Supply	Million TOE	532	544	546	551
	% change year/year	+0.0	+2.2	+0.5	+0.8
Final Energy Consumption	Million TOE	370	372	373	375
	% change year/year	-0.6	+0.6	+0.4	+0.5

Source: Prepared from Cabinet Office data and EDMC(IEEJ) estimates. Forecasts are by IEEJ.

For FY2006, energy demand will mark a gradual increase due to recovery in production and other economic activities.

Domestic Primary Energy Supply

[Base Case]

(in Million TOE)	Actual	Forecast		Year-on-year changes (%)		
	FY2004	FY2005	FY2006	FY2004	FY2005	FY2006
Coal, etc.	119.9	121.2	118.6	7.3	1.1	-2.2
Oil	256.3	254.7	251.4	-1.7	-0.7	-1.3
Natural gas	78.4	80.3	81.0	-0.7	2.4	0.9
Hydro-power	21.0	18.8	20.1	-1.3	-10.1	6.7
Nuclear	60.7	63.6	72.0	17.7	4.7	13.2
New energies	7.3	7.5	7.6	-2.1	3.4	1.1
Total	543.7	546.1	550.7	2.2	0.5	0.8
CO2 (in Million t-C)	329	331	327	1.4	0.6	-1.3

Source: IEEJ for both actual results and forecasts

For FY2006, coal supplies will decline in both industrial and utilities sectors. Natural gas will increase due to town gas demand. CO2 emissions will fall for factors including additions of nuclear power plants.

Final Energy Consumption by Sector

[Base Case]

(in Million TOE)		Actual	Forecast		Year-on-year changes (%)		
		FY2004	FY2005	FY2006	FY2004	FY2005	FY2006
Industry		177.8	178.1	178.6	-0.5	0.2	0.3
Residential		54.0	54.6	55.1	2.6	1.1	1.0
Commercial		48.2	48.5	49.4	2.0	0.6	1.9
Transportation		91.8	92.1	92.2	0.9	0.4	0.0
Total		371.8	373.3	375.3	0.6	0.4	0.5

Source: IEEJ for both actual results and forecasts

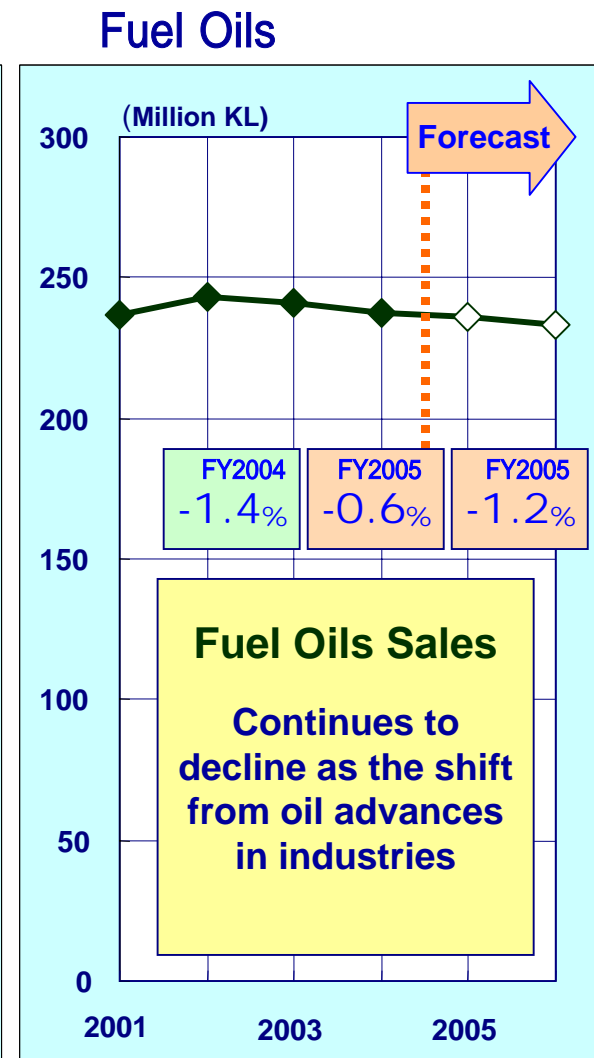
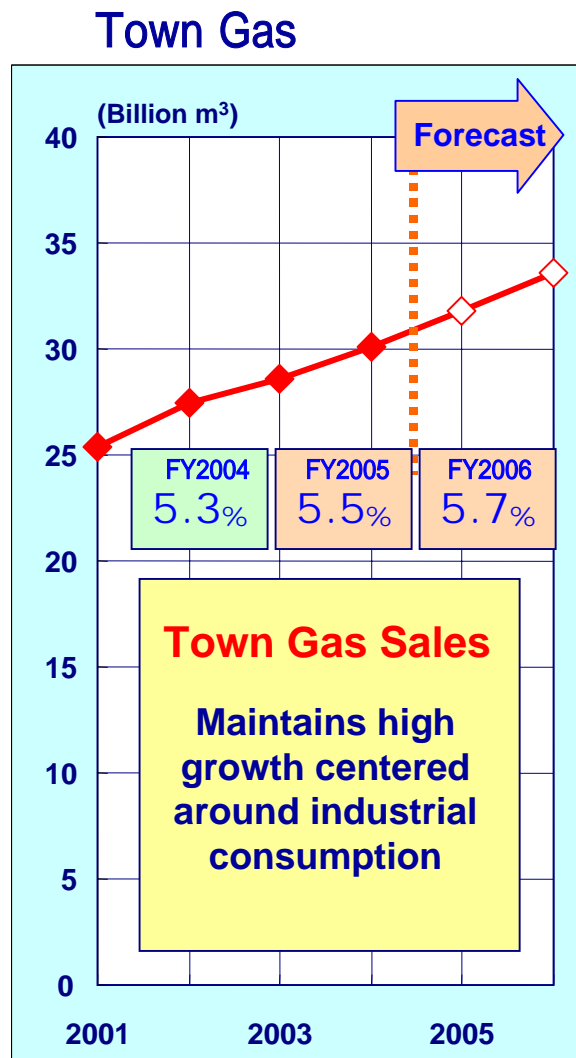
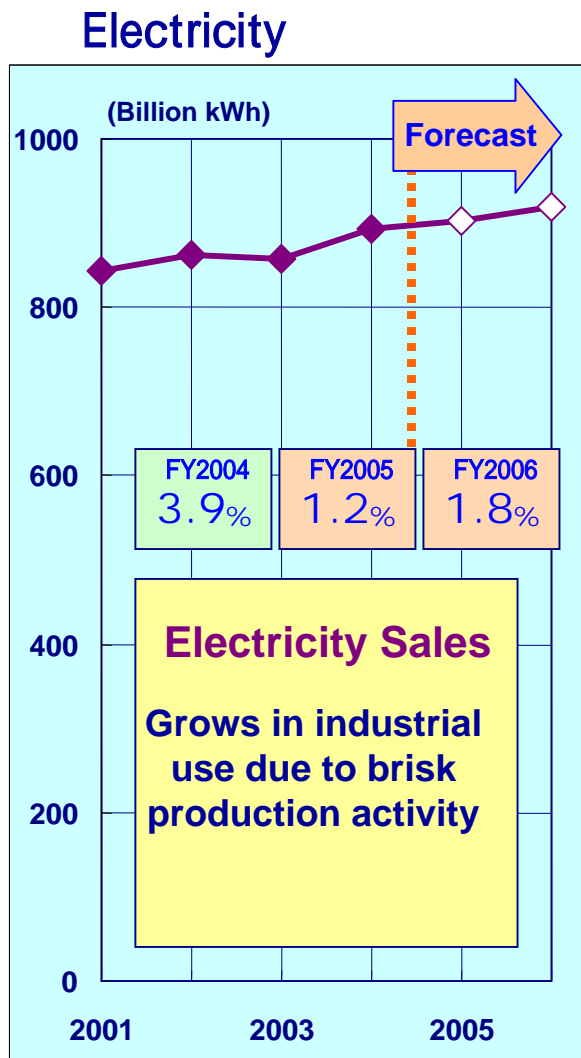
For FY2006: Industry: Machinery production proceeds actively while materials production declines slightly, resulting in a mild increase in energy demand.

Residential: A combined effect of rebounds from higher cooling demand and lower heating demand in FY2005.

Transportation: The increase in passenger vehicle units in operation is offset by reduction in trucks to level off over-all energy demand.

Outlook on Energy Sales

[Base Case]



Sources: METI "Monthly Electricity Survey", "Monthly Gas Industry Statistics", and "Monthly Resources & Energy Statistics". Forecasts by IEEJ

Electricity Demand by Use

[Base Case]

(Billion kWh)	Actual	Forecast		Year-on-year changes (%)		
	FY2004	FY2005	FY2006	FY2004	FY2004	FY2004
Lighting use	272.6	274.8	277.7	5.0	0.8	1.1
Non-lighting use	619.6	627.9	641.4	3.5	1.3	2.2
Total	892.1	902.6	919.1	3.9	1.2	1.8
Large-industrial use	288.6	292.4	298.0	2.4	1.3	1.9
Chemical	28.6	29.2	29.6	3.6	2.4	1.3
Iron & steel	53.6	53.1	52.6	1.6	-0.9	-0.9
Machinery and Equipment	72.0	74.0	76.9	5.1	2.8	3.9

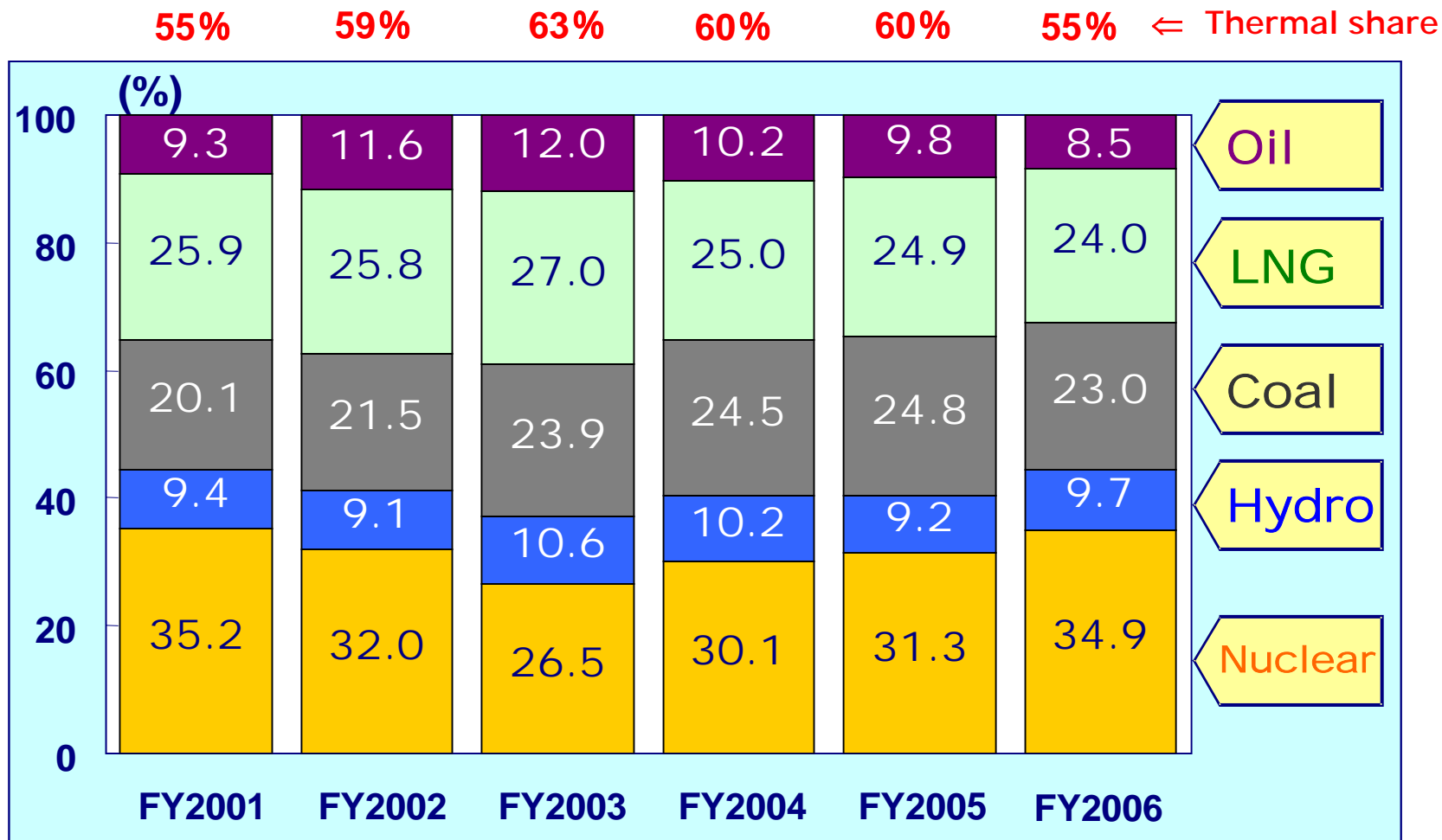
Sources: Actual results from METI "Monthly Electricity Survey & Statistics". Forecasts are by IEEJ.

For FY2006: Residential: A combined effect of rebounds from higher cooling demand and lower heating demand in FY2005.

Industry: Steel production declines mainly in electric furnace, while machinery production goes on actively

Power Generation Mix (Power Utilities: Input basis)

[Base Case]



Source: IEEJ for both actual results and forecasts

For FY2006, the share of nuclear power will rise due to comebacks of previously suspended plants and newly added plants, while the share of thermal power drops to 55% as coal, LNG, and oil-fired power lose ground.

Town Gas Sales by Use

[Base Case]

(Billion m ³)	Actual	Forecast		Year-on-year changes (%)		
	FY2004	FY2005	FY2006	FY2004	FY2005	FY2006
Households	9.46	9.61	9.83	-2.5	1.6	2.3
Commercial	4.71	4.80	4.92	6.4	1.9	2.5
Industry	13.29	14.62	16.01	10.4	10.1	9.5
Others	2.68	2.75	2.84	9.3	2.6	3.3
Total	30.14	31.79	33.60	5.3	5.5	5.7

Sources: Actual results from METI "Monthly Statistics on Gas Utility Industry". Forecasts by IEEJ.

For FY2006: Households: Demands for heating and hot water supply to rise in comparison with warmer-than-normal winter of the previous year.

Commercial & others: Demands for air-conditioning to decline in comparison with cooler-than-normal summer of the previous year, while demands for heating and hot water supply to rise for the same reason as above.

Industry: Substantial upswing due to vigorous production activities in addition to increased fresh demands.

Fuel Oil Sales by Product

[Base Case]

(Million KL)	Actual	Forecast		Year-on-year changes (%)		
	FY2004	FY2005	FY2006	FY2004	FY2004	FY2004
Gasoline	61.5	61.9	62.5	1.5	0.7	0.9
Naphtha	49.0	49.3	48.8	1.1	0.7	-1.1
Kerosene	28.0	28.3	28.2	-3.9	1.1	-0.4
Gas oil	38.2	37.6	37.0	0.2	-1.5	-1.6
Fuel oil A	29.1	28.4	27.9	-2.2	-2.4	-1.8
Fuel oil B/C	26.6	25.2	23.5	-12.0	-5.1	-6.6
Power generation use	9.8	9.7	8.7	-21.5	-1.6	-10.3
Total	237.2	235.8	233.1	-1.4	-0.6	-1.2

Source: METI "Monthly Resources & Energy Statistics". Forecasts by IEEJ.

For FY2006: Gasoline: A steady increase in passenger vehicle units in operation contributes to a mild growth.
 Gas oil: Demand to decline due to the continuing downtrend in number of trucks in operation.
 Fuel oil B/C: Demand for power generation to drop substantially due to the shift to nuclear power.

Sensitivity Analysis on Factors Affecting Energy Supply/Demand

Effects of Crude Oil Price Changes

Effects of Economic Growth Changes

Effects of Temperature Changes

Base Case

FY2006: GDP growth = **2.1%**; Crude oil CIF price(*) \cong **\$51/Bbl**

(*) Based on "Prospects for the World Oil Market and Crude Oil Prices for 2006" by Ken Koyama, Dec. 16, 2005

Crude
Prices

High

· Crude Price \cong **\$61/Bbl** (Base + \$10)

Low

· Crude Price \cong **\$41/Bbl** (Base - \$10)

Effects of Economic
Growth Changes

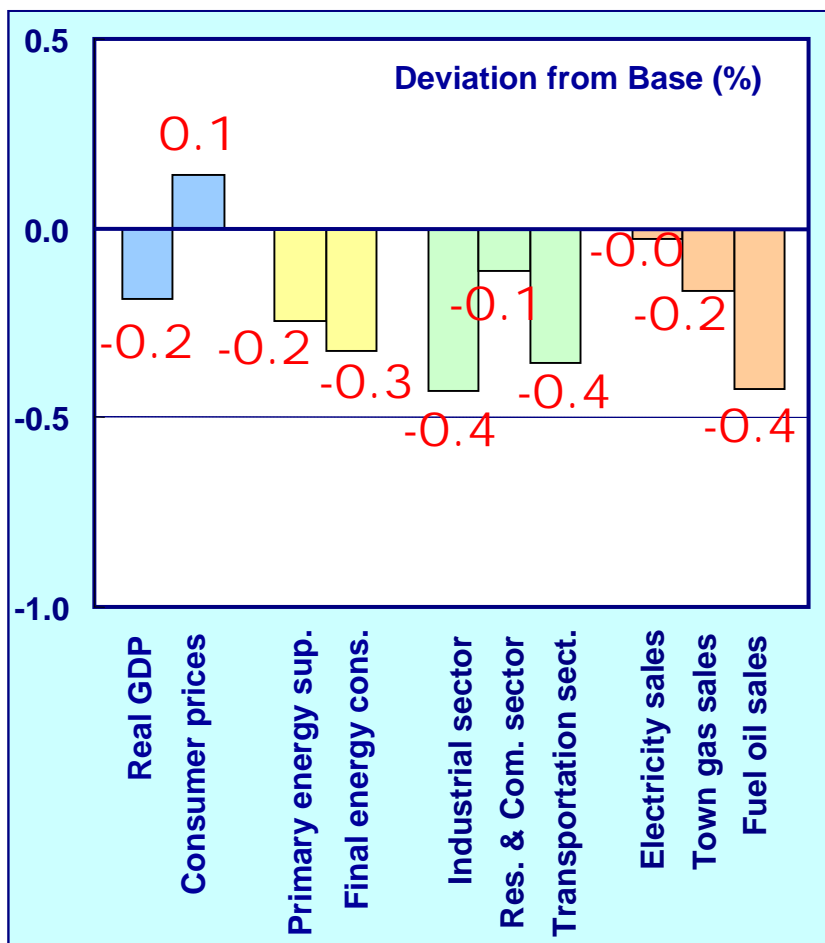
· GDP growth: Base + **1.0% point**
Base - **1.0% point**

Effects of Temperature
Changes

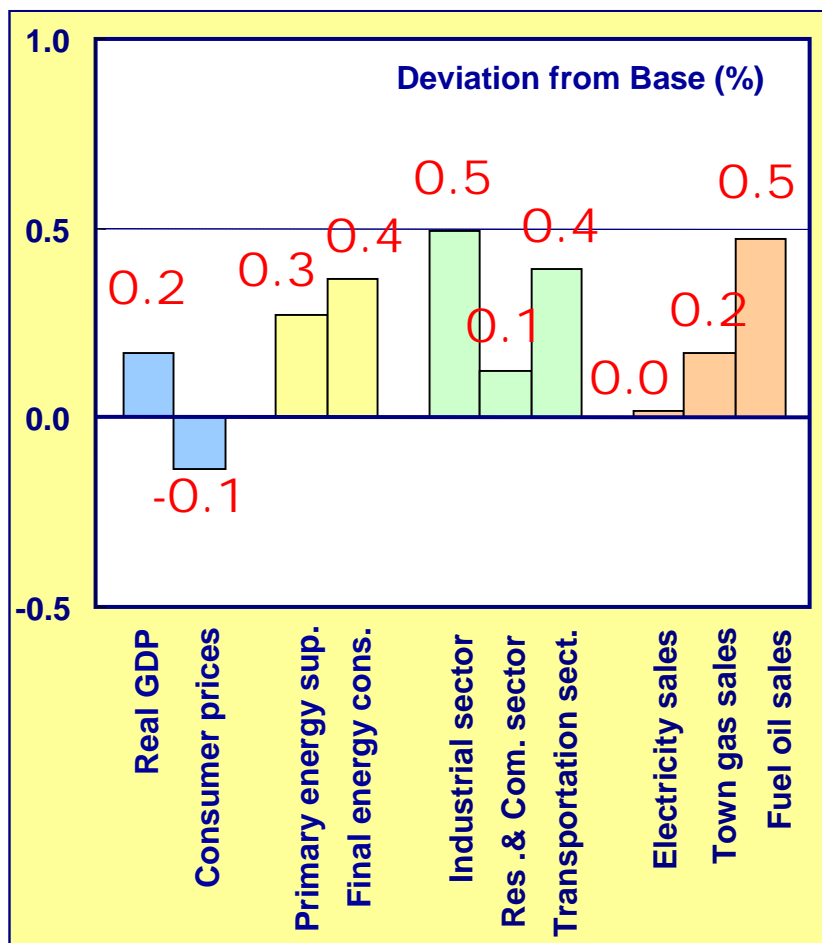
· Warm summer(Jul.-Sep.): Up **1°C**
Cold winter(Jan.-Mar.): Down **1°C**

Effects of Crude Oil Price Changes

High Price Case (Base plus \$10)



Low Price Case (Base minus \$10)



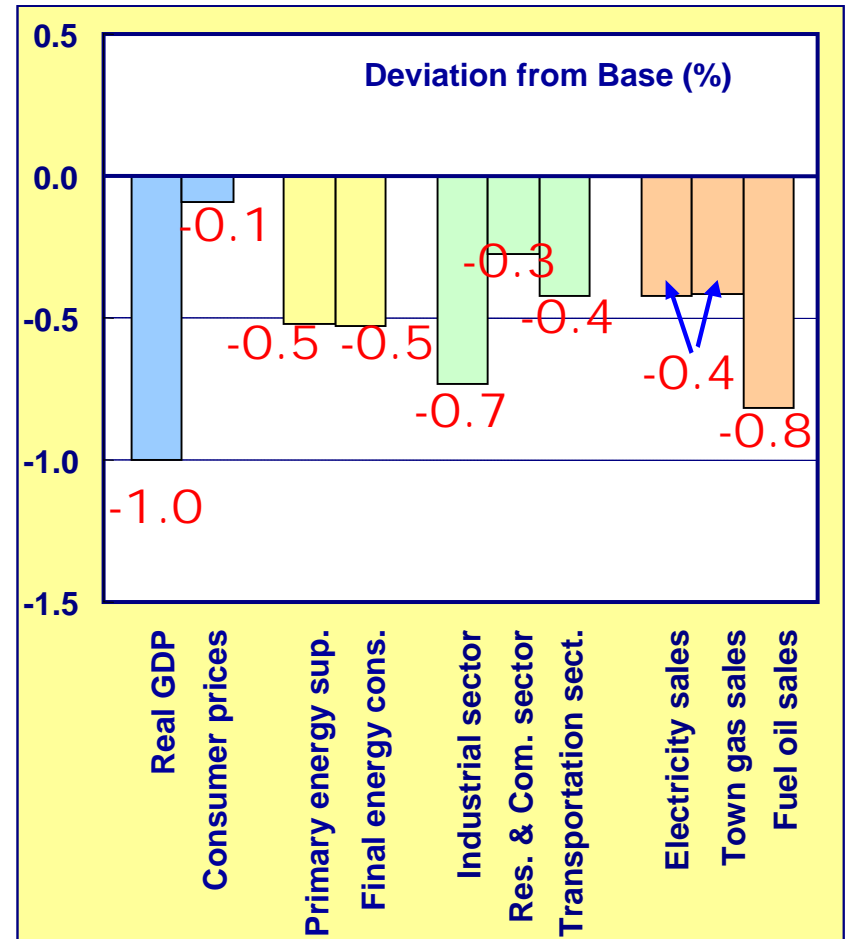
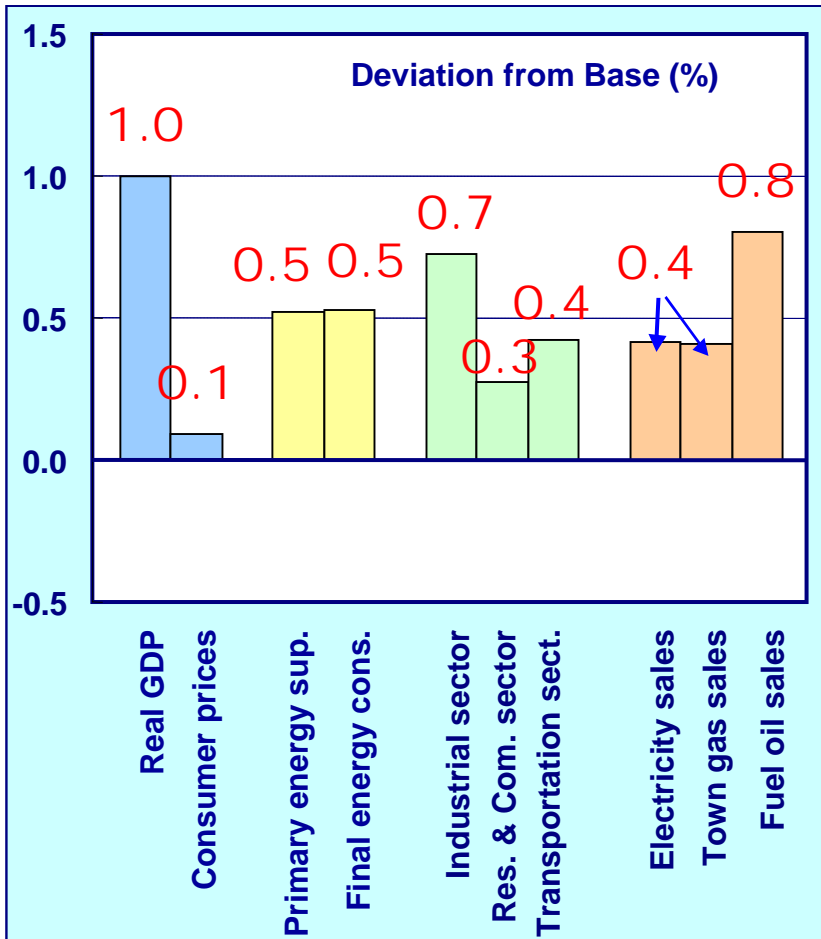
Greater impact is seen in industries and transportation (especially cargo transport) sectors that are sensitive to economic conditions and price changes. Fuel oil sales, being directly impacted by crude oil prices, show wider fluctuations.

Effects of Economic Growth Changes



[High Growth Case: 1% above Base]

[Low Growth Case: 1% below Base]



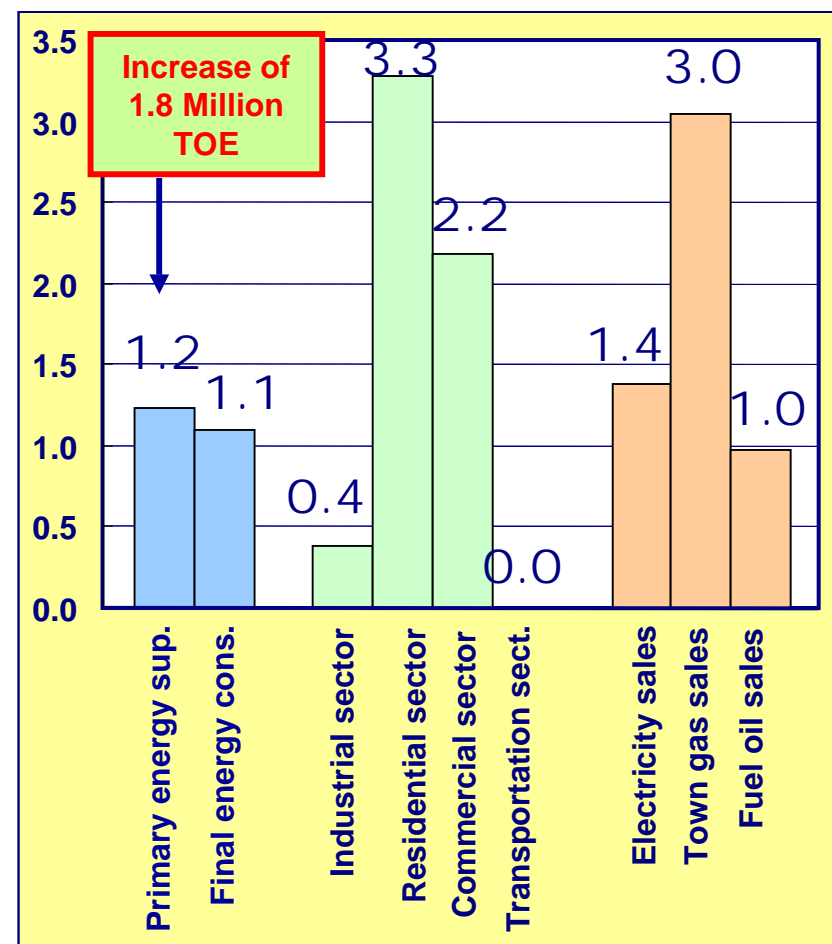
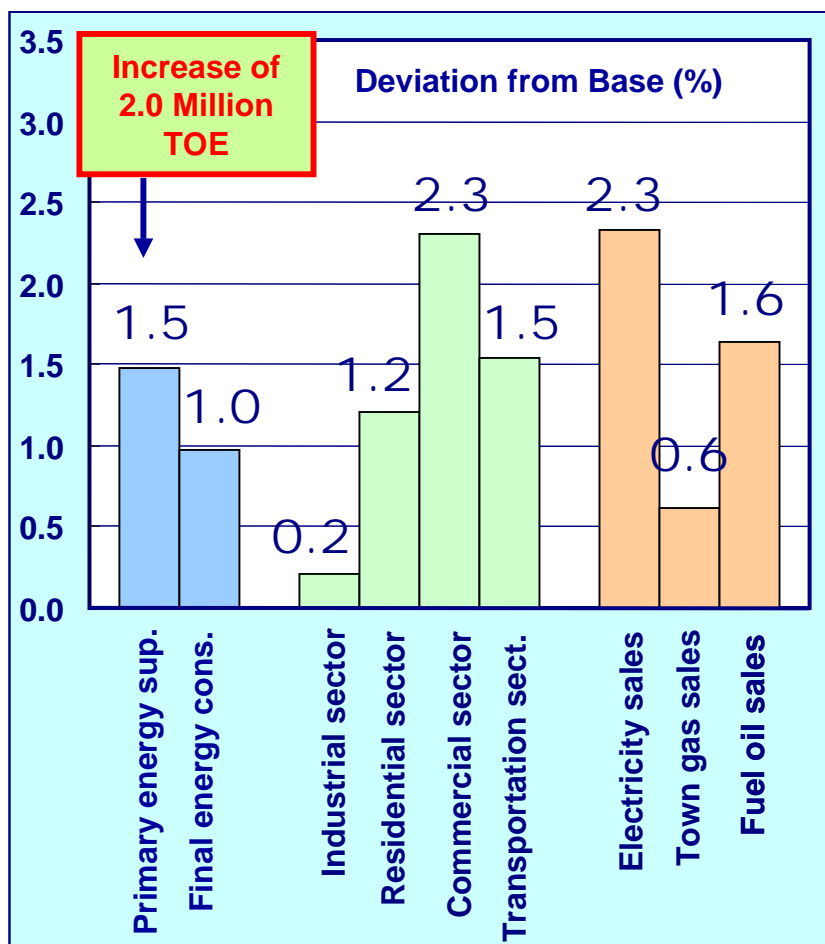
Energy consumption does not change in proportion to GDP changes.

Greater effects are seen for fuel oil for industrial and cargo transport sectors and electricity sales for industrial sector.

Effects of Temperature Changes

[1°C Temperature rise in summer (Jul.-Sep.)]

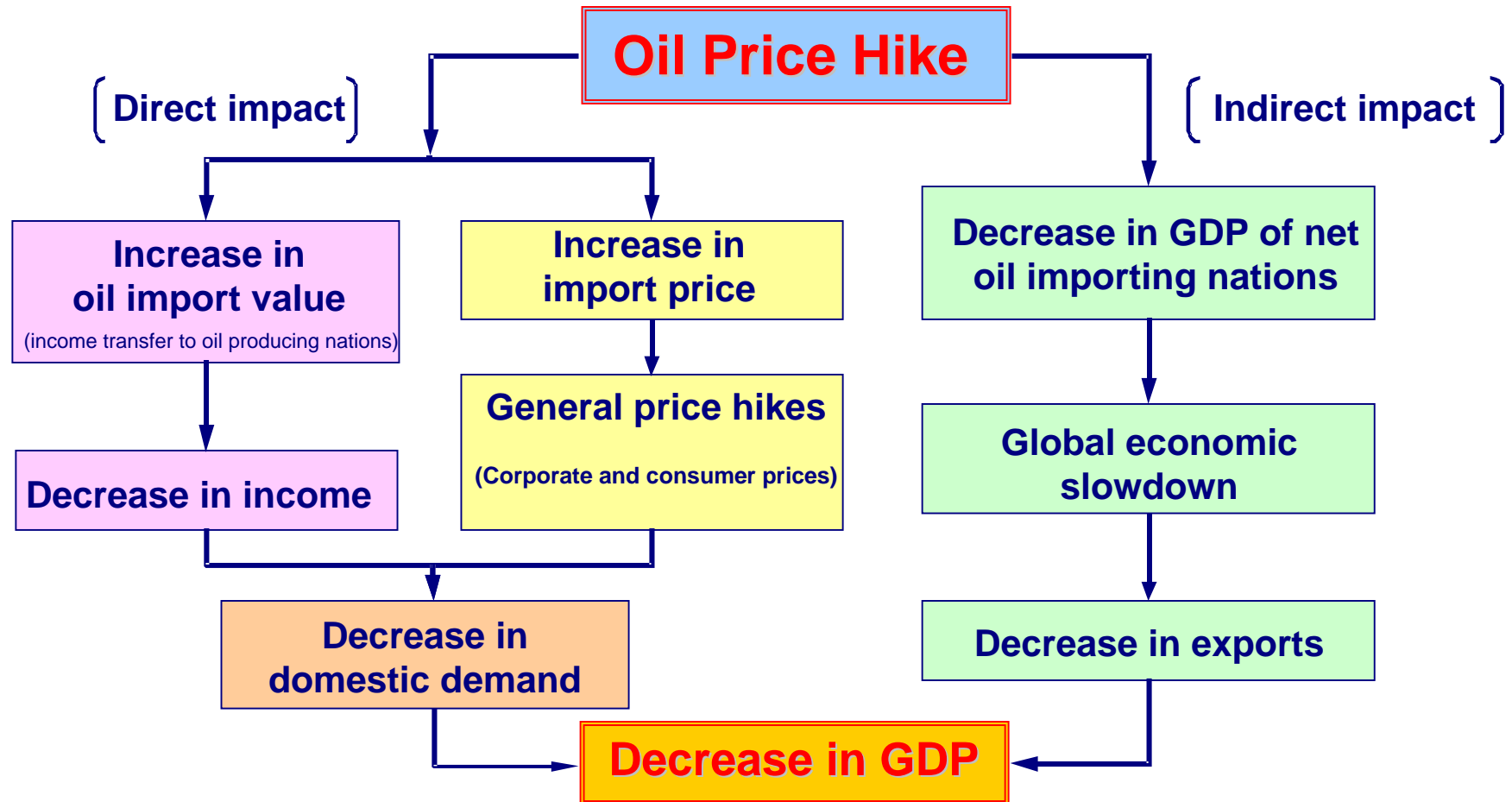
[1°C Temperature fall in winter (Jan.-Mar.)]



Summer months: Electricity demand increases sharply on cooling demand. For residential, cooling demand and hot water demand cancel out each other.

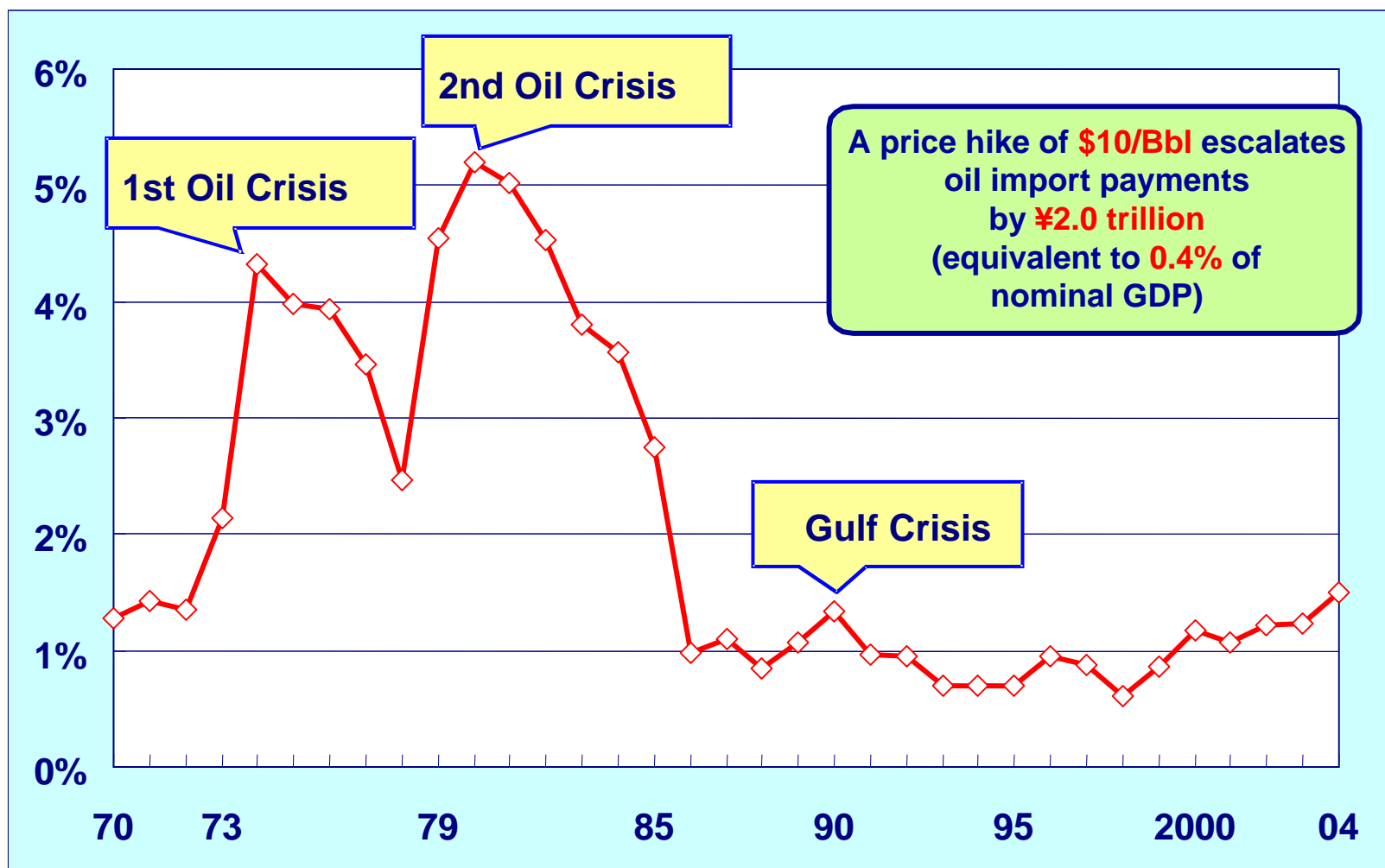
Winter months: Town gas demand increases sharply on heating and hot water demand.

Effects of Oil Price Hike on Economy



The effects on the Japanese economy are two fold; (a) direct impact via income transfer to oil-producing nations and price hikes, and (b) indirect impact via global economic slowdown .

Oil Import Value's Ratio to Nominal GDP

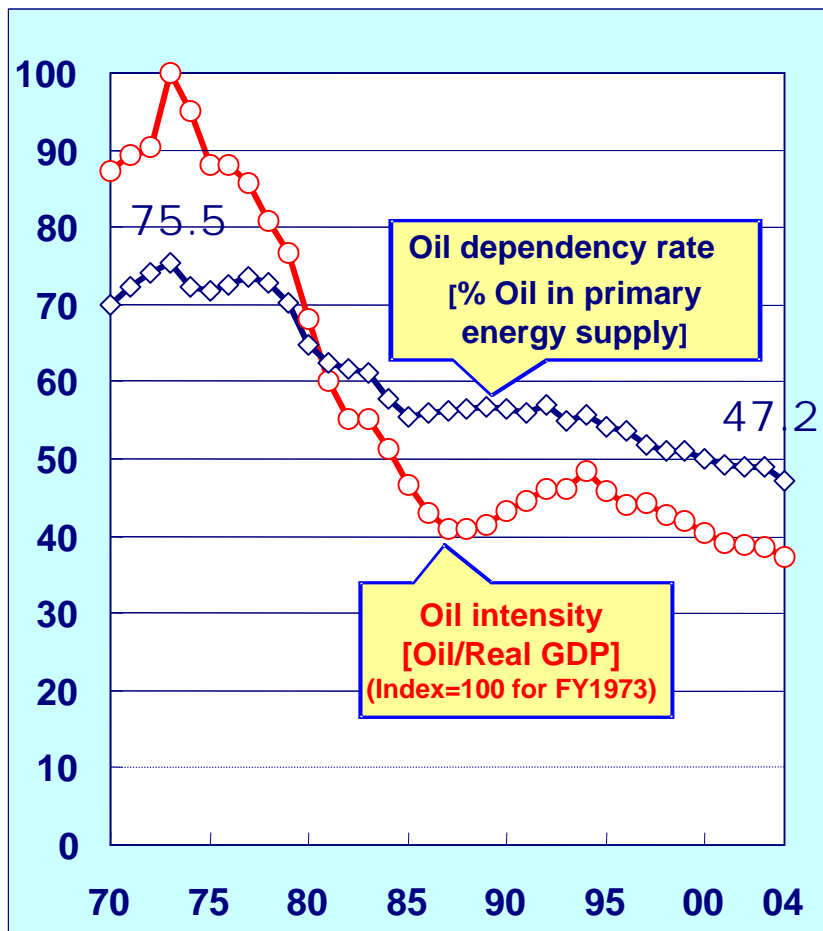


Sources: Prepared from Ministry of Finance "Japan Trade Monthly Table", Cabinet Office "National Accounts".

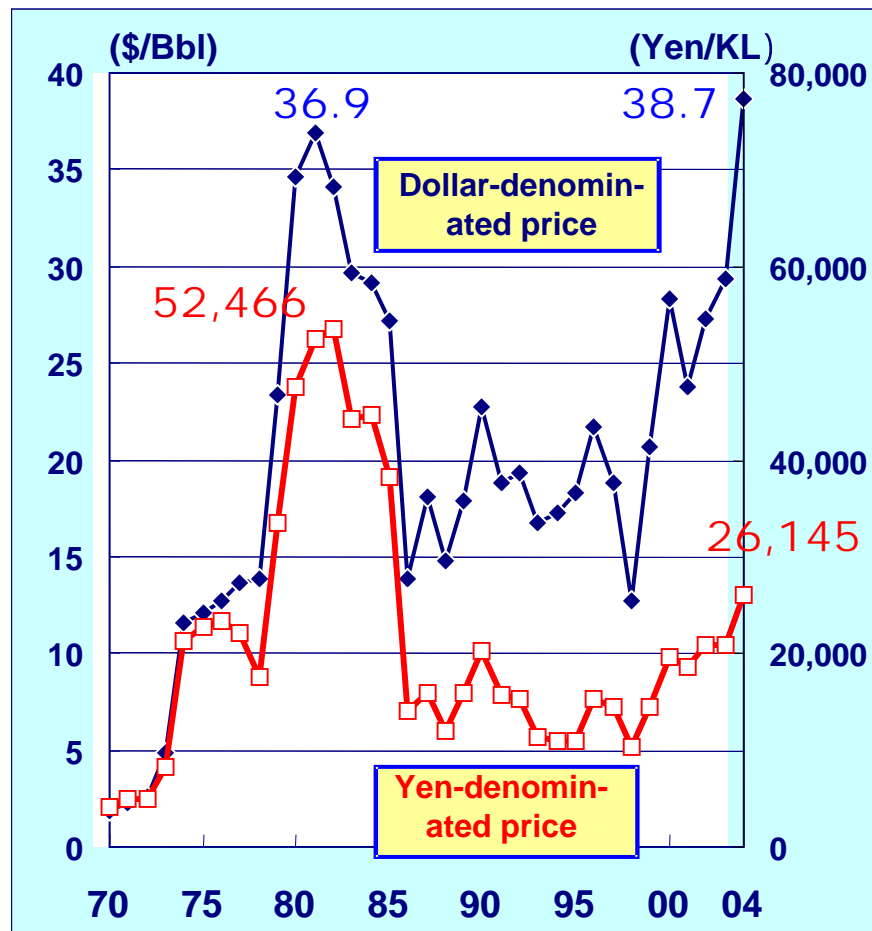
The ratio of oil import value to nominal GDP has remained around 1% since late 1980s.

Oil Dependency and Oil Import Prices

Evolution of oil dependency rate and oil intensity



Historical CIF Crude Oil Import Prices



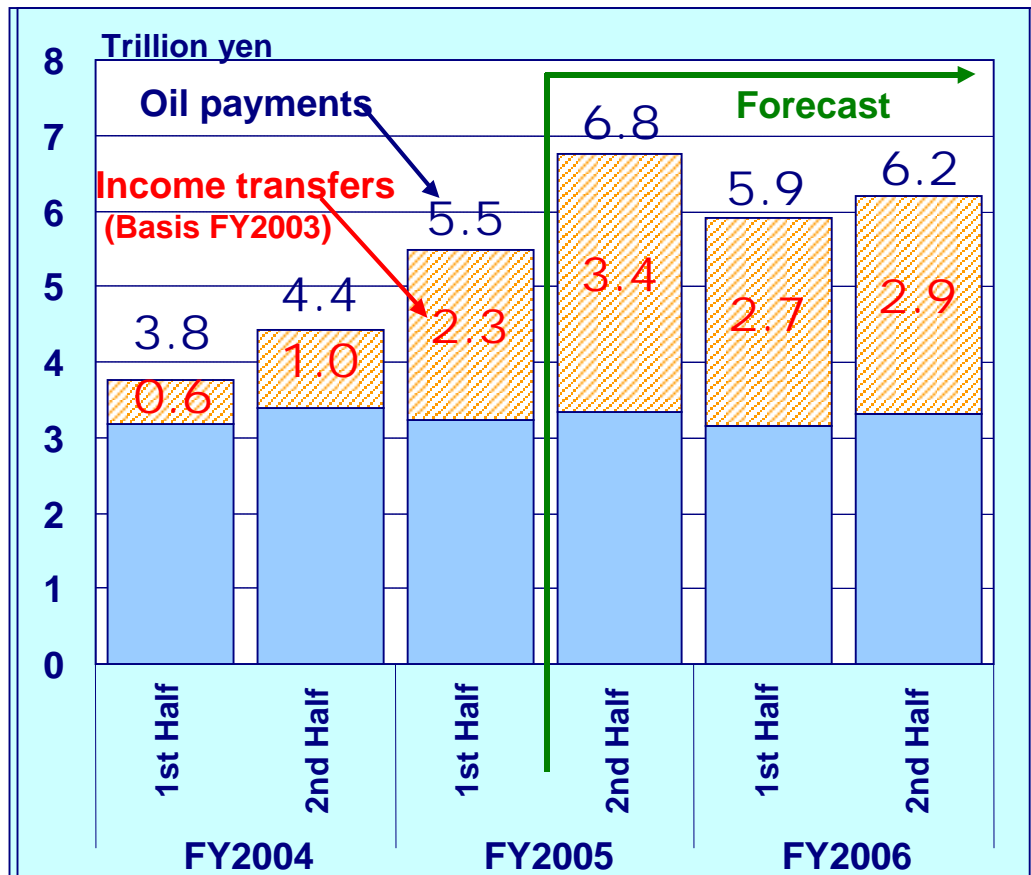
Sources: Prepared from Ministry of Finance "Japan Trade Monthly Table", Cabinet Office "National Accounts", IEEJ-EDMC "Handbook of Energy & Economic Statistics", etc.

Energy conservation and shift from oil have significantly progressed since the last two oil crises. Due to the yen's appreciation, yen-denominated crude oil prices have not reached the high levels experienced in the past.

Oil Import Value and Income Transfers

	Crude Price (per bbl)	Income Transfers (Tril. Yen)	Ratio to nominal GDP
FY2003	\$30	NA	NA
FY2004	\$39 (+\$9)	1.6	0.30%
FY2005	\$54 (+\$24)	5.7	1.10%
FY2006	\$51 (+\$21)	5.6	1.10%

Cumulative sum: **12.9**
(Basis FY2003)

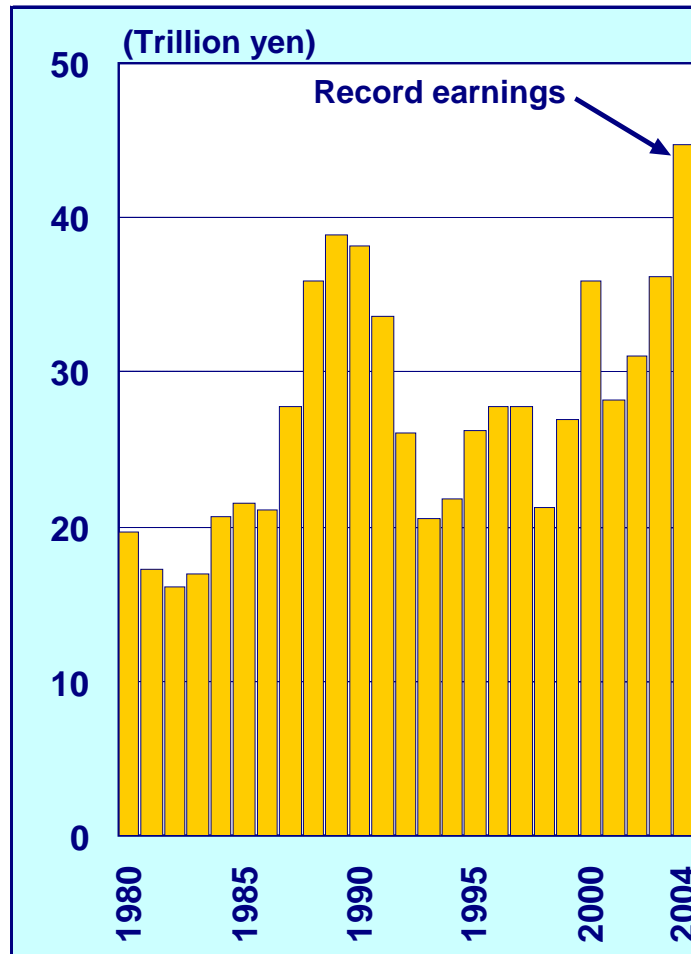


Sources: Prepared from IEEJ-EDMC "Energy Trend", PAJ "Monthly Oil Statistics". Forecasts are by IEEJ.

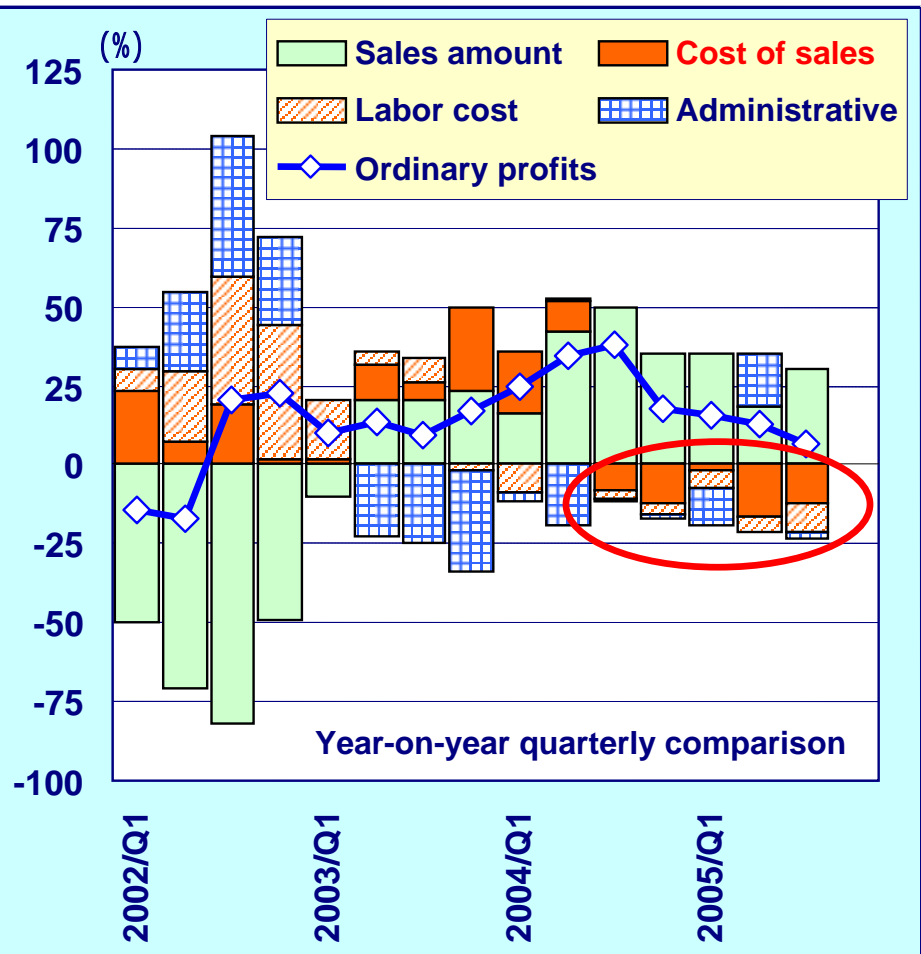
Income transfers are on the rise, with the 3-year drainage via income transfers amounting to nearly 13 trillion yen for FY2004 through FY2006.

Corporate Earnings Trend & Factors Breakdown

Trend on Ordinary Profits



Breakdown of Ordinary Profit Factors



Source: Prepared from Ministry of Finance "Financial Statements Statistics of Corporations by Industry"

While the greatest earnings ever were recorded, the impact of high oil prices is currently taking effect.

Effects of Income Transfers on Various Economies

(in the case of a \$10/Bbl oil price hike)

	1981		2004	
	Billion US\$	Ratio to nominal GDP	Billion US\$	Ratio to nominal GDP
North America	20	0.6%	40	0.3%
Latin America	7	0.8%	15	0.7%
Europe (Note)	35	1.1%	38	0.3%
Former USSR	-	-	24	2.9%
Middle East	53	13.2%	72	9.6%
Africa	12	2.2%	22	2.7%
Japan	16	1.4%	19	0.4%
Asia-Pacific	-	-	38	0.8%
[China as part of AP]	-	-	[11]	[0.7%]

Source: Estimated from BP "Statistical Review of World Energy", World Bank/WDI data

Notes: Excludes Eastern Europe countries for Europe in 1981. The symbol "-" denotes negative values.

With fast-growing oil imports in recent years, the Asian Region is affected significantly by income transfers in terms of the ratio of an oil import value increment to GDP for a \$10/Bbl oil price hike.

Summary

The long term trend in energy demand will be significantly affected by the advancement of energy-saving technologies and other factors. On the other hand, the **short-term trend is largely impacted by factors like production activities or temperatures.**

The **Japanese economy in FY2006 will proceed along a healthy trend, but the growth in energy demand will remain modest:**

- Residential: steady; industries: creeping up; transportation: flat
- Electricity and town gas to grow; oil to decline

While energy demand will increase, **CO2 emissions will tend to decline** due to factors including new additions of nuclear power plants or increased use of natural gas:

- Energy-conserving efforts to be fortified towards 2010

(to continue)

Summary (continued)

The **effects of temperature changes** on energy demand are **significant** particularly in the following areas:

- For summer months: commercial sector and electricity demand
- For winter months: residential sector and town gas demand

The effects of **soaring crude oil prices** on economy and energy demand **will be minor in the short-term view.**

- In the long run, fuel switching involving facility modifications or further energy saving measures may be promoted,

Contact: report@tky.ieej.or.jp