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# **Short-Term Energy Supply and Demand Outlook**

**– Forecast and Scenario Analysis Up to FY2003 –**

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## ◆ General descriptions of research

- Research objectives, analysis procedures, case-setting

## ◆ Outlook for major economic indicators

## ◆ Energy supply and demand outlook

- Generalization of forecast results
- Energy consumption by sector
- Energy demand by energy industry
- Assessment of impacts of external variables

## ◆ Summary

## ◆ Research objectives

- To simulate energy supply and demand up to FY2003 with account taken of persisting uncertainties over future developments of both the Japanese economy and the crude oil price. To assess the impacts of uncertain factors, in addition to base-case simulation.

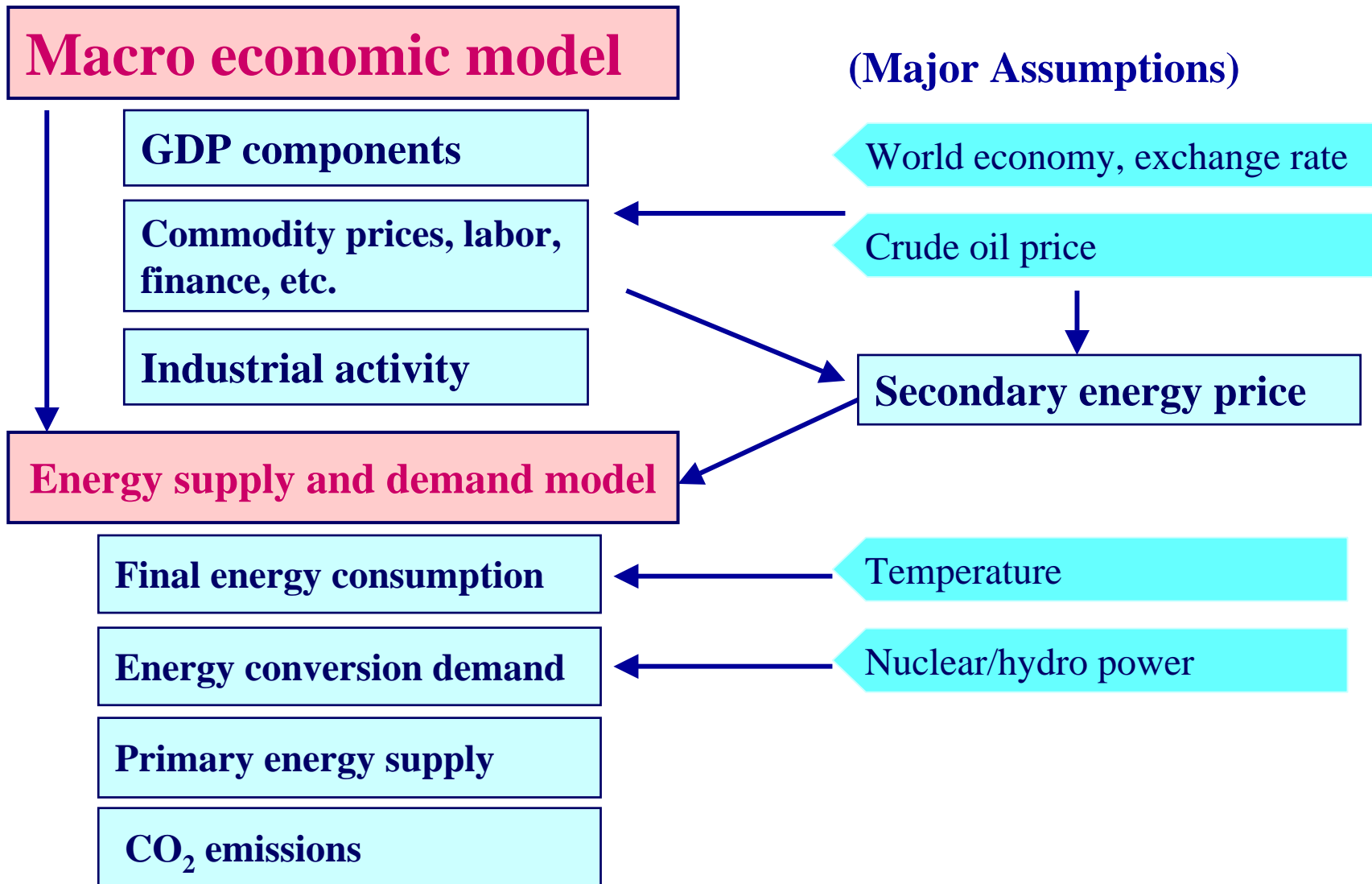
## ◆ Forecast period: FY2002 – FY2003

## ◆ Forecasting method: Econometric model (macro economy, energy supply and demand)

## ◆ Case-setting:

- Base case
- Impact analyses (FY2003)
  - > Higher crude oil price (higher by \$5/bbl)
  - > Lower GDP growth (real GDP growth lower by 0.5 points)
  - > Escalation of Middle East Conflicts  
(crude oil price higher by \$10/bbl, world economy stagnated)

# Flow of Model Analysis

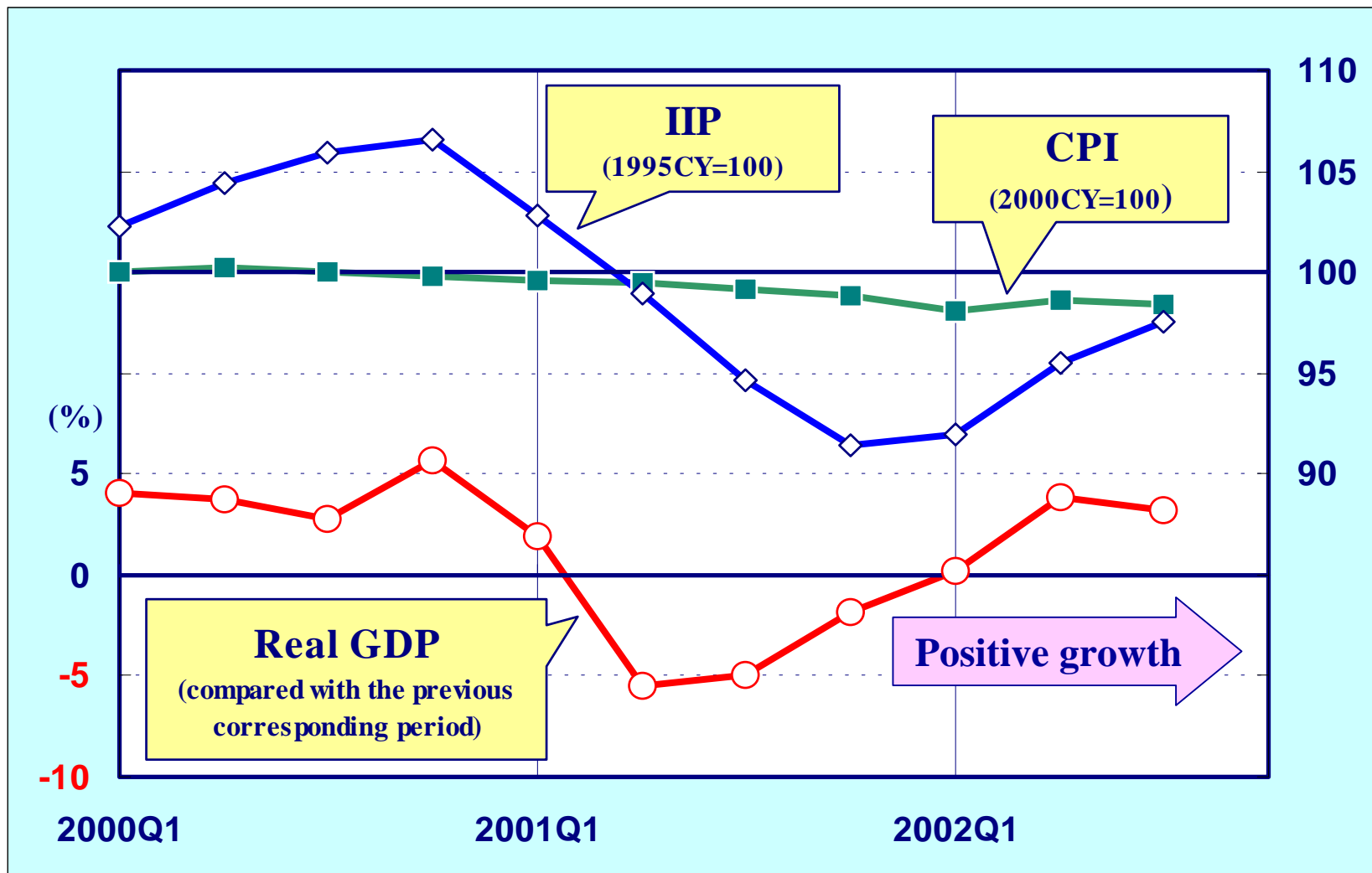


To gain a consistent understanding in econometric terms of the key elements which regulate future supply and demand and a variety of causal relations.

# **Outlook for Major Economic Indicators**

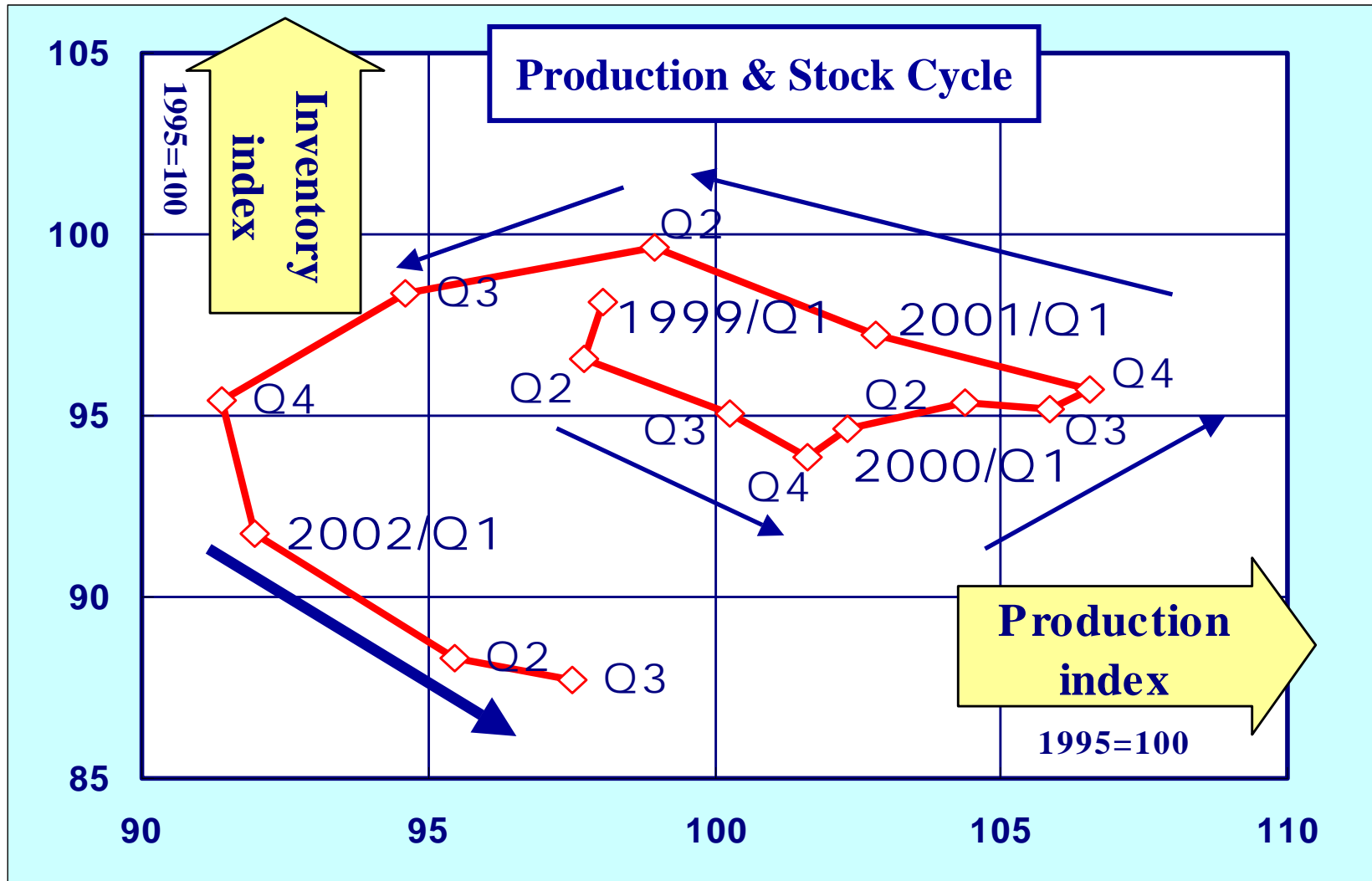
- ◆ **Economic conditions in the immediate future**
- ◆ **Major assumptions**
  - World economy
  - Crude oil price
- ◆ **Macro economic outlook**
  - GDP growth rate, commodity prices
  - Production activities

# Macro Economic Indicators at Present



GDP has grown in real terms for three consecutive quarters. IIP (index of industrial production) has been moving upward as well. However, with CPI (consumer price index) turning downward, deflation is persisting.

# Industrial Production at Present

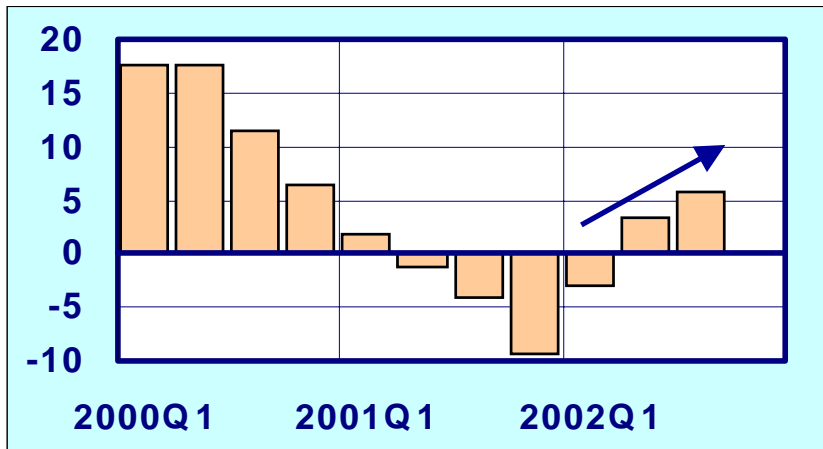


An upturn toward recovery is likely from 2002/Q1 onward.

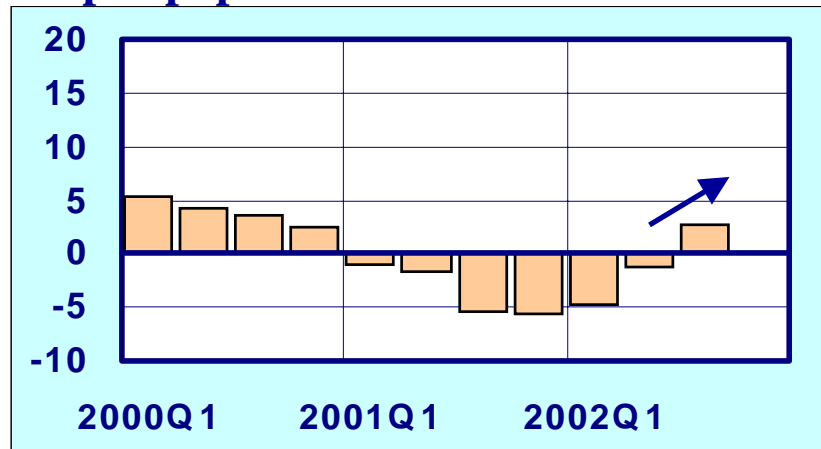
# Production of Basic Materials at Present

(ups/downs % from previous corresponding periods)

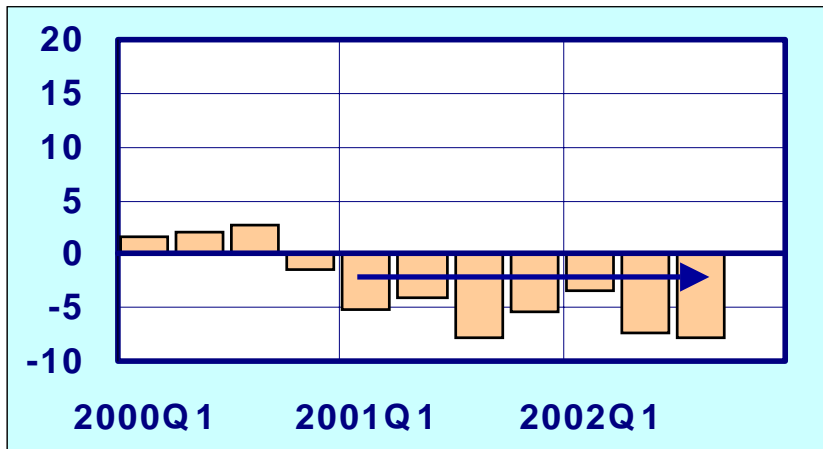
## Steel



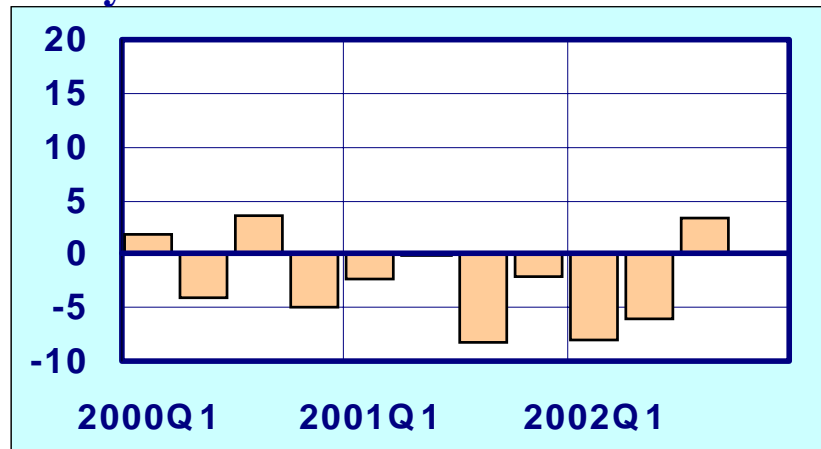
## Paper/paperboard



## Cement



## Ethylene



Underlying trends of steel and paper/paperboard are toward recovery.  
Cement remains sluggish.



## ◆ World economy

- FY2003 likely to register slower growth, notably in the U.S.
  - > GDP growth: up 2.6% in U.S., up 6.3% in Asia\*<sup>1</sup>
- Exchange rate assumed to stay at 125yen/\$.

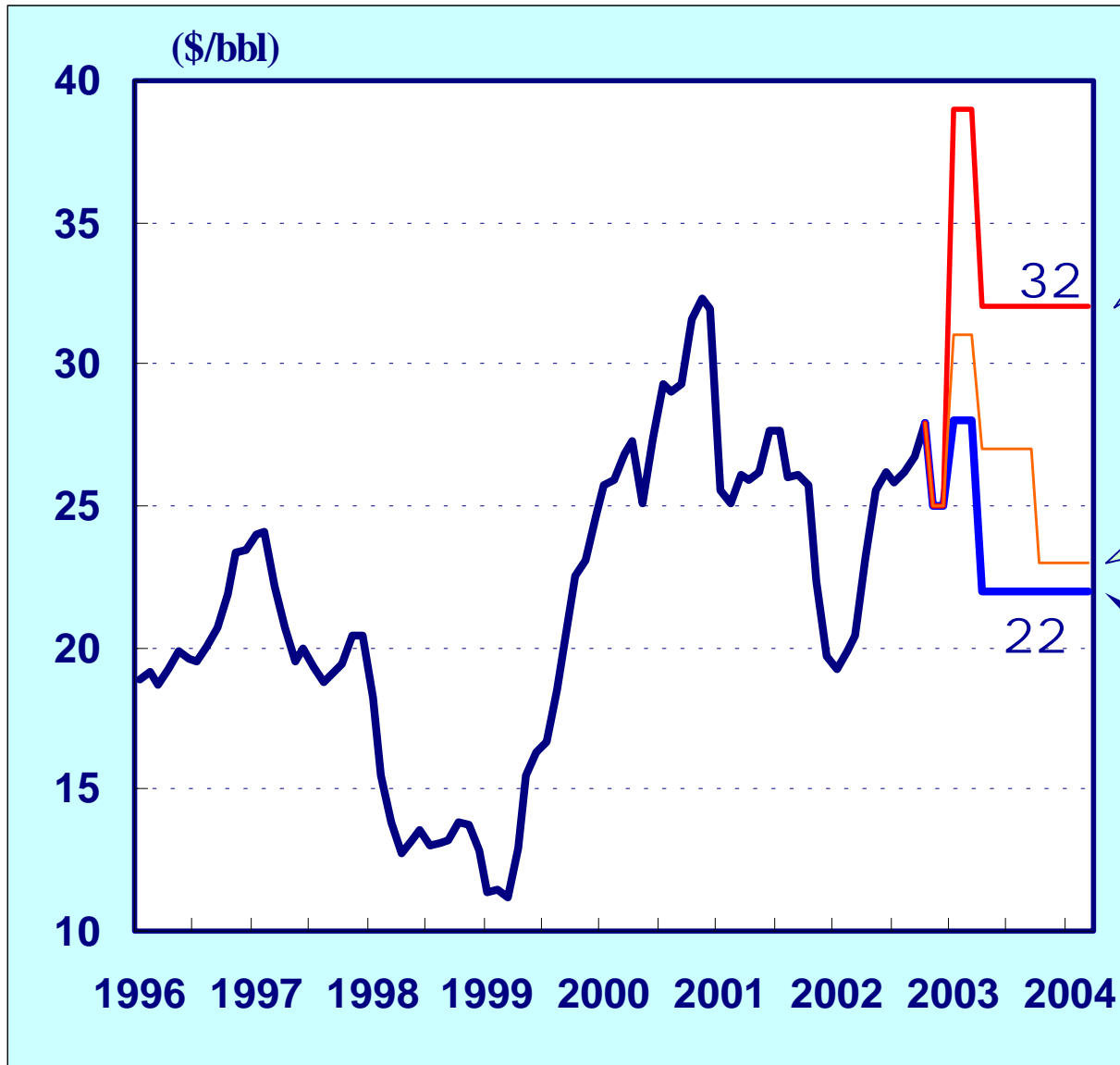
## ◆ Crude oil price (import, CIF)

- Referred to “Iraq Stabilization Scenario” among Iraq-related scenarios\*<sup>2</sup>.
- FY2003 prices assumed to average around \$22/bbl.

\*1 IMF, “World Economic Outlook September 2002”

\*2 IEEJ, “Middle East Crisis Scenario Following a Potential U.S. Attack on Iraq ” (October 2002)

# Assumptions of Crude Oil Price (Imports, CIF)



## Middle East Conflict Spillover

Escalation in areas of conflicts.  
Serious confusion on oil market.

## Iraq Stalemate

Strikes on Iraq last long.  
Oil price becoming extremely volatile at high levels.

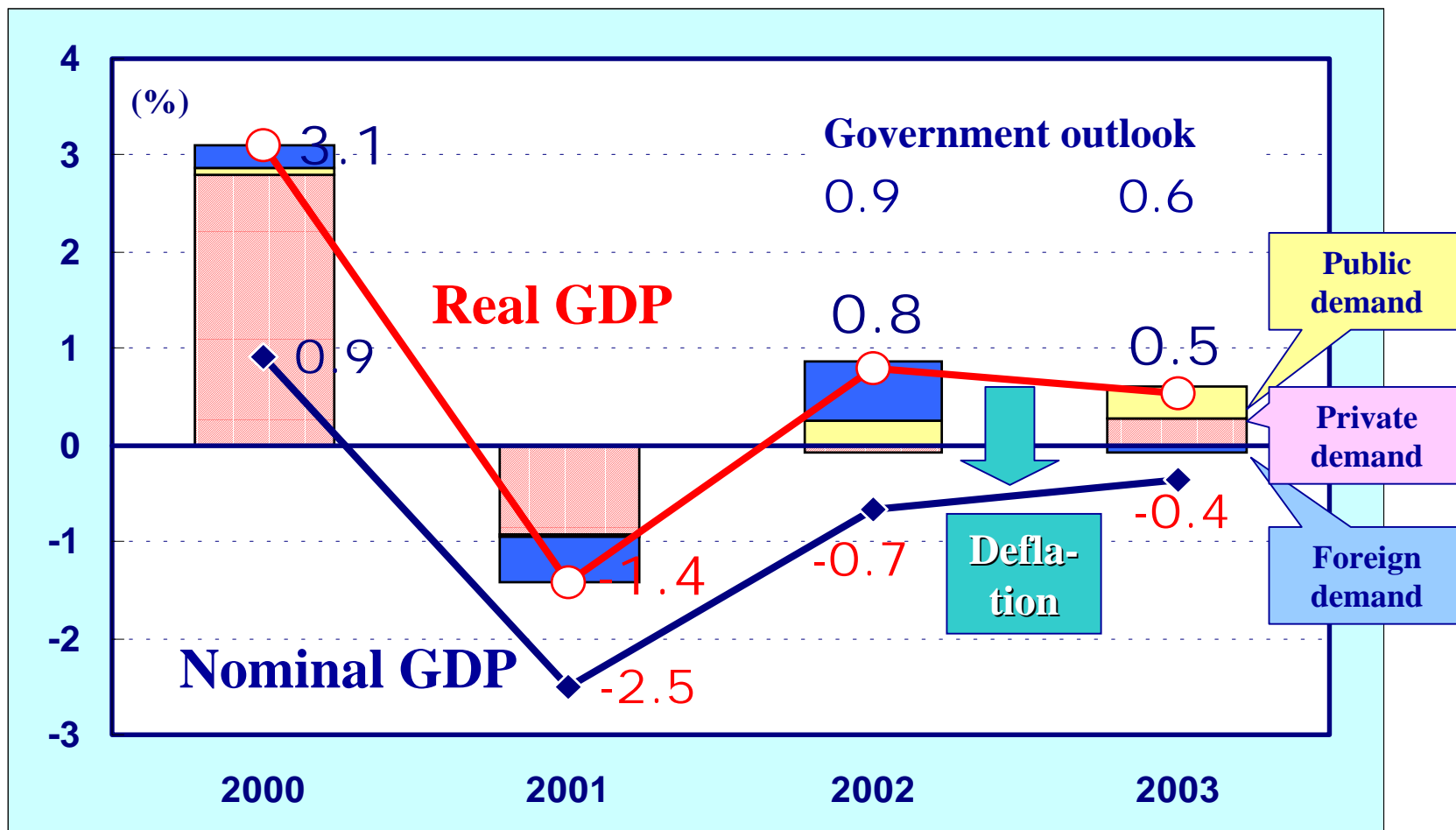
## Iraq Stabilization

Strikes on Iraq to end at a stroke.  
Oil market becoming confused only briefly.

# GDP Growth Outlook [Base Case]

[Base Case]

(Contribution by demand)



In real terms, GDP, having ended with a fall in FY2001, picks up from FY2002 onward. In nominal terms, however, the negative growth continues due to persisting deflation.

# Outlook for Macro Economic Indicators

[Base Case]

(Trillion yen)

	Actual FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001	FY2002		FY2003	
					1st half	2nd half		
<b>Real GDP</b>	531.6	535.7	538.6	<b>-1.4</b>	0.4	1.2	<b>0.8</b>	<b>0.5</b>
Private demand	396.8	396.3	397.8	* <b>-0.9</b>	*-0.5	* 0.3	* <b>-0.1</b>	* <b>0.3</b>
Public demand	124.3	125.7	127.5	<b>0.0</b>	0.1	0.4	<b>0.3</b>	<b>0.3</b>
Foreign demand	10.5	13.7	13.3	<b>-0.5</b>	0.7	0.5	<b>0.6</b>	<b>-0.1</b>
<b>Nominal GDP</b>	502.6	499.3	497.4	<b>-2.5</b>	-0.9	-0.4	<b>-0.7</b>	<b>-0.4</b>
<b>IP (1995=100)</b>	94.0	96.4	97.2	<b>-10.2</b>	0.0	5.1	<b>2.5</b>	<b>0.8</b>
<b>CPI (2000=100)</b>	98.9	98.4	98.0	<b>-1.0</b>	-0.9	-0.1	<b>-0.5</b>	<b>-0.4</b>

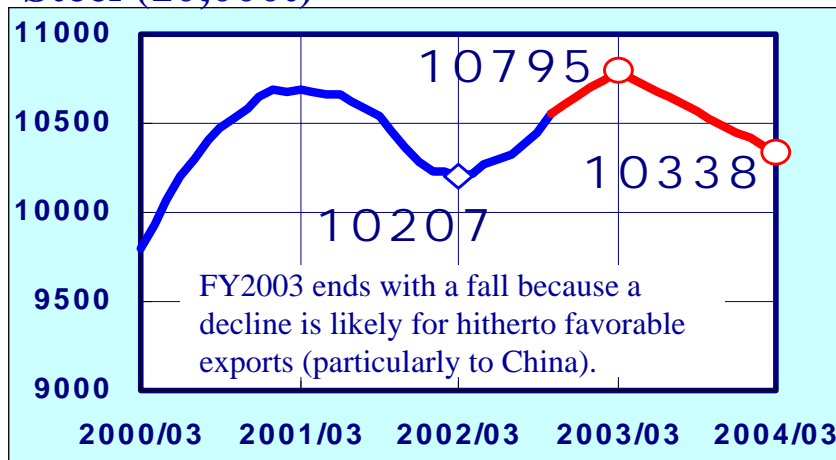
\*Breakdowns of real GDP are in terms of degree of contribution.

Positive growth recorded for two consecutive years. FY2002 growth is foreign demand-led, and FY2003 is bolstered by private demand, notably private consumption. CPI (consumer price index) falls for the fifth straight year.

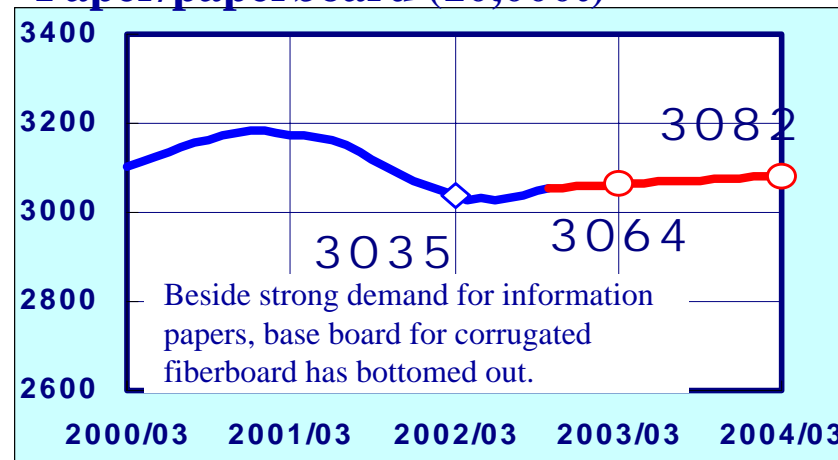
# Outlook for Basic Material Production

[Base Case]

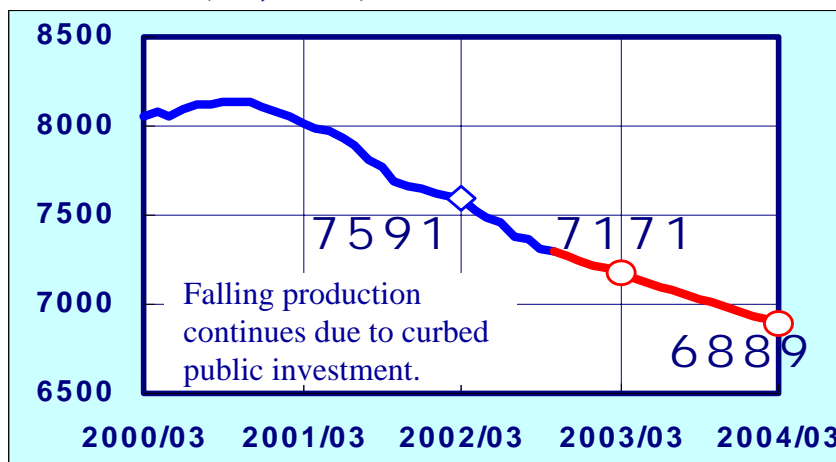
## Steel (10,000t)



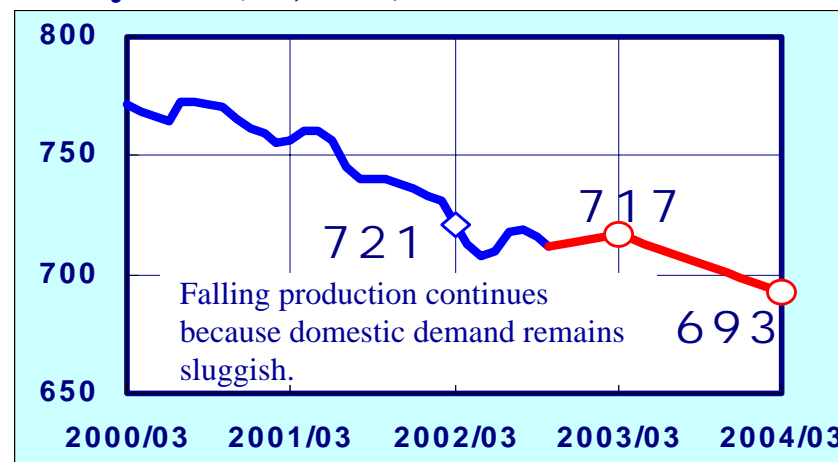
## Paper/paperboard (10,000t)



## Cement (10,000t)



## Ethylene (10,000t)



Note: Numerical figures are in terms of 12-month moving total.

# Outlook for Production Index [Base Case]

(1995=100)

	Actual	Projection		Ups/downs (%) over previous year				
		FY2001	FY2002	FY2003	FY2001	1st half	2nd half	FY2002
	Foods	96.5	96.1	96.0	<b>-2.5</b>	-0.9	0.2	<b>-0.4</b>
Textiles	64.1	58.2	56.5	<b>-9.3</b>	-10.6	-7.9	<b>-9.3</b>	<b>-2.8</b>
Nonferrous metals	104.7	103.8	103.4	<b>-1.1</b>	-2.2	0.5	<b>-0.8</b>	<b>-0.4</b>
Metal machinery	96.4	101.5	104.8	<b>-14.7</b>	0.9	9.9	<b>5.3</b>	<b>3.3</b>
Others	86.1	83.8	81.6	<b>-6.5</b>	-3.3	-1.9	<b>-2.6</b>	<b>-2.6</b>
Mining & manufacturing total	94.0	96.4	97.2	<b>-10.2</b>	0.0	5.1	<b>2.5</b>	<b>0.8</b>

(FY2003)

Machinery industries such as cars and IT-related are relatively favorable. Production activities hit their ceiling due to sluggish domestic demand and slowdown in exports.

# Energy Supply and Demand Outlook

## ◆ Major assumptions

- Temperatures, power sources

## ◆ Generalization of simulation results

- Domestic primary energy supply
- Energy input into power generation
- Final energy consumption
- CO<sub>2</sub> emissions

## ◆ Atmospheric temperatures

(cooling degree days, heating degree days)

- The temperatures in the future are put at the average of the past decade.

## ◆ Nuclear power generation

- Though uncertain, inspection halts are assumed to last by March 2003. (For others, see the electricity supply plan, etc.)

## ◆ Hydropower generation

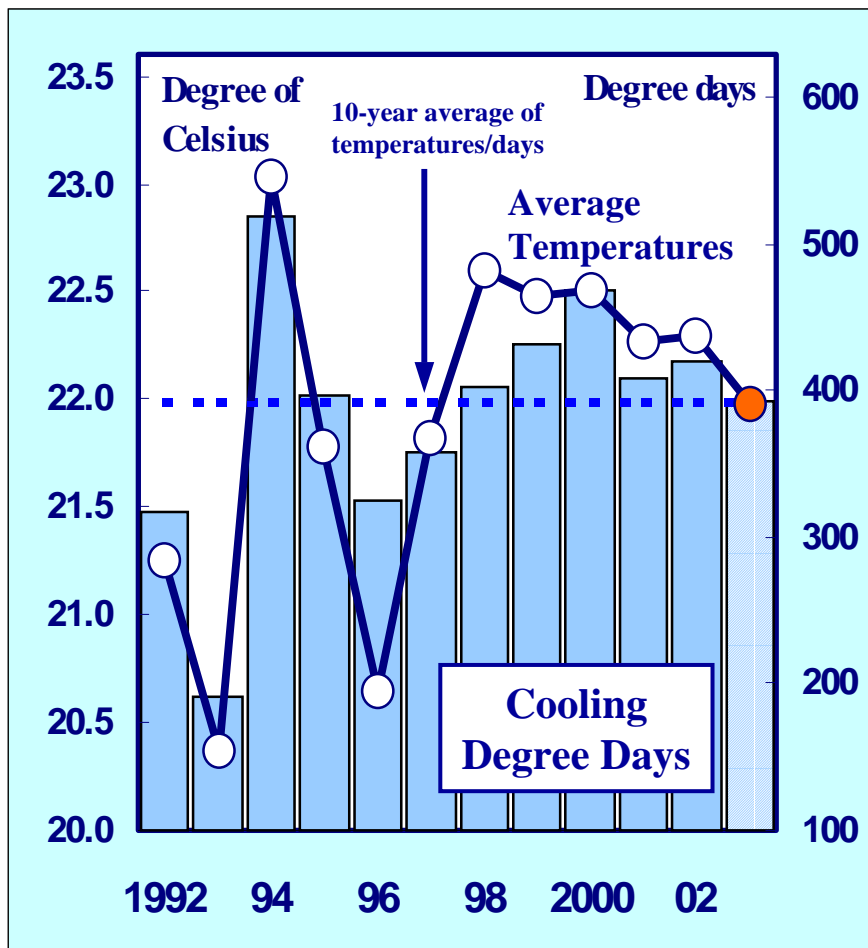
- Water flow rate in FY2003 is put at 100%.



# Assumption of Temperatures

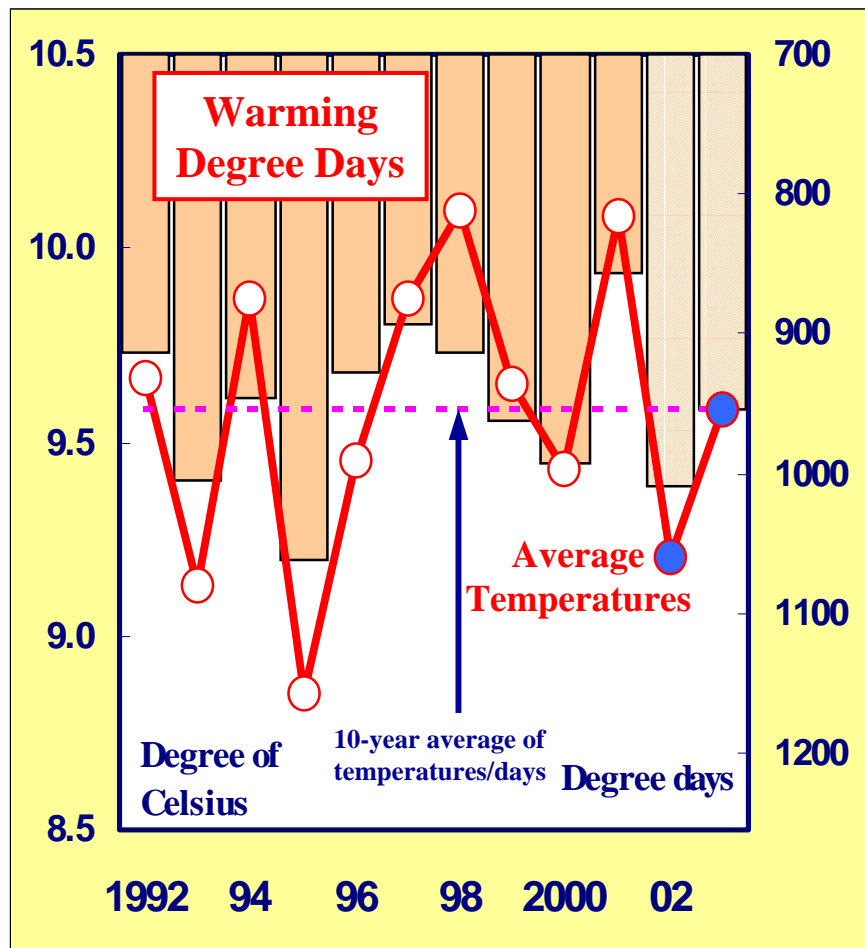
(Cooling/Heating Degree Days)

[Temperatures and cooling degree days (1st Half)]



FY2002 summer is hotter than the previous summer.  
 FY2003 summer is cooler than the previous summer.

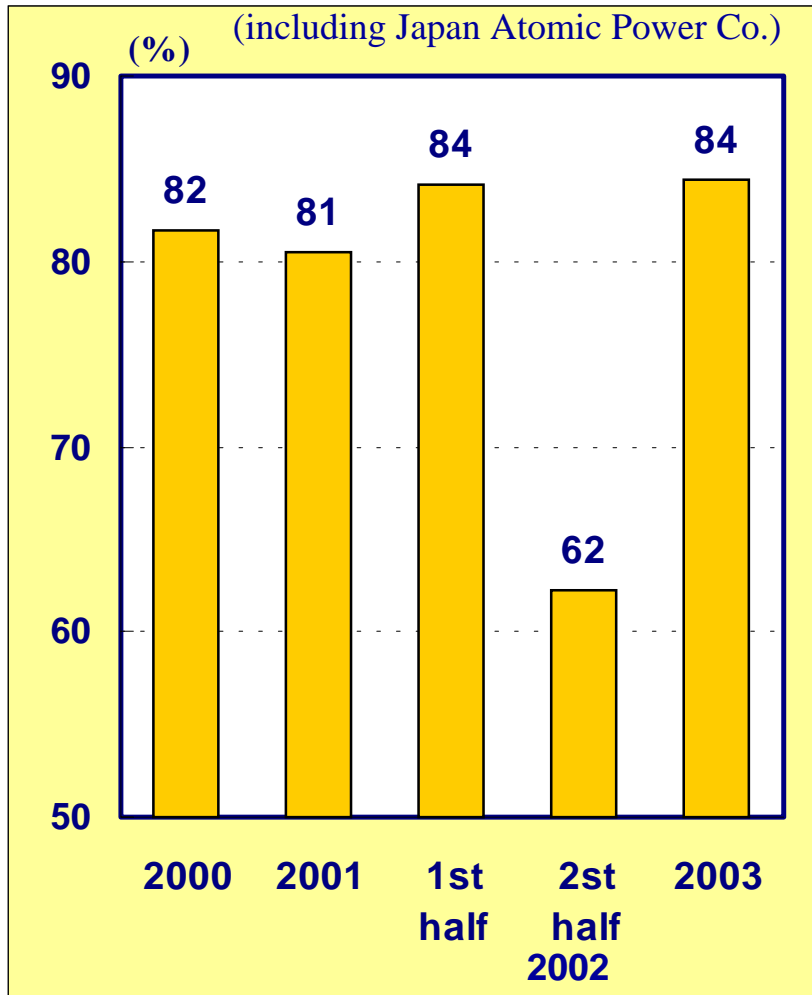
[Temperatures and heating degree days (2nd Half)]



FY2002 winter is severer than the previous winter.  
 FY2003 winter is milder than the previous winter.

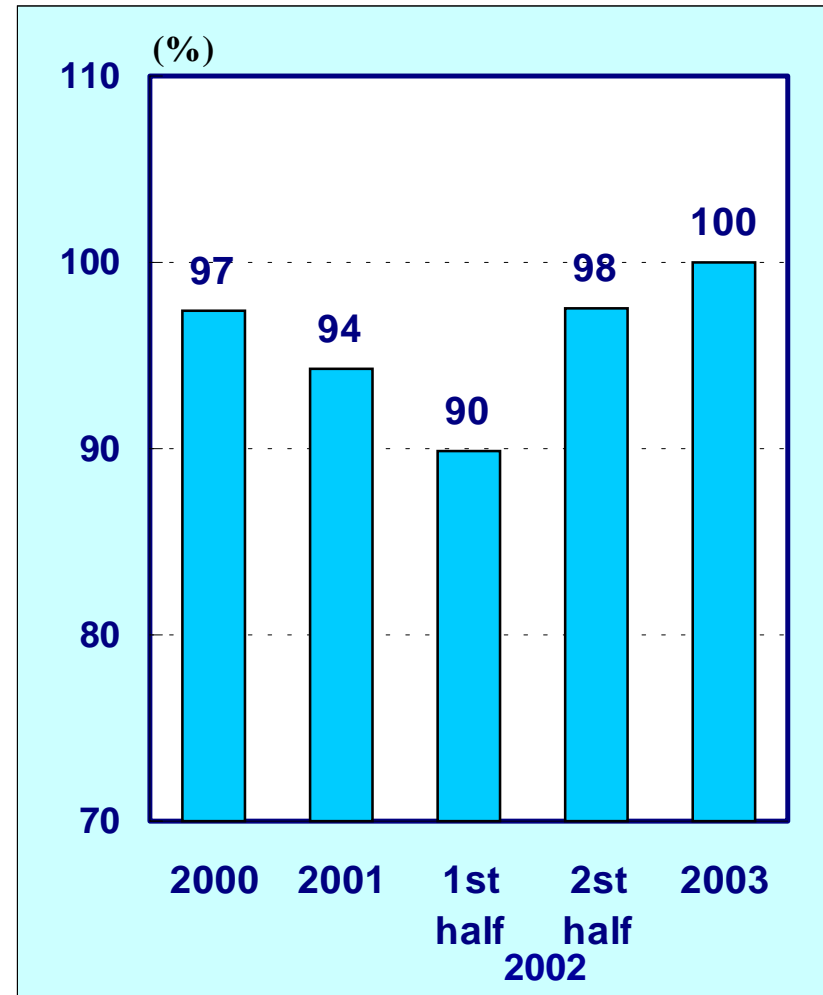
# Assumption of Nuclear Plant Utilization Rate and Water Flow Rate

## Nuclear Plant Utilization Rate



Plunged sharply in the 2nd half of FY2002 due to inspection halts.

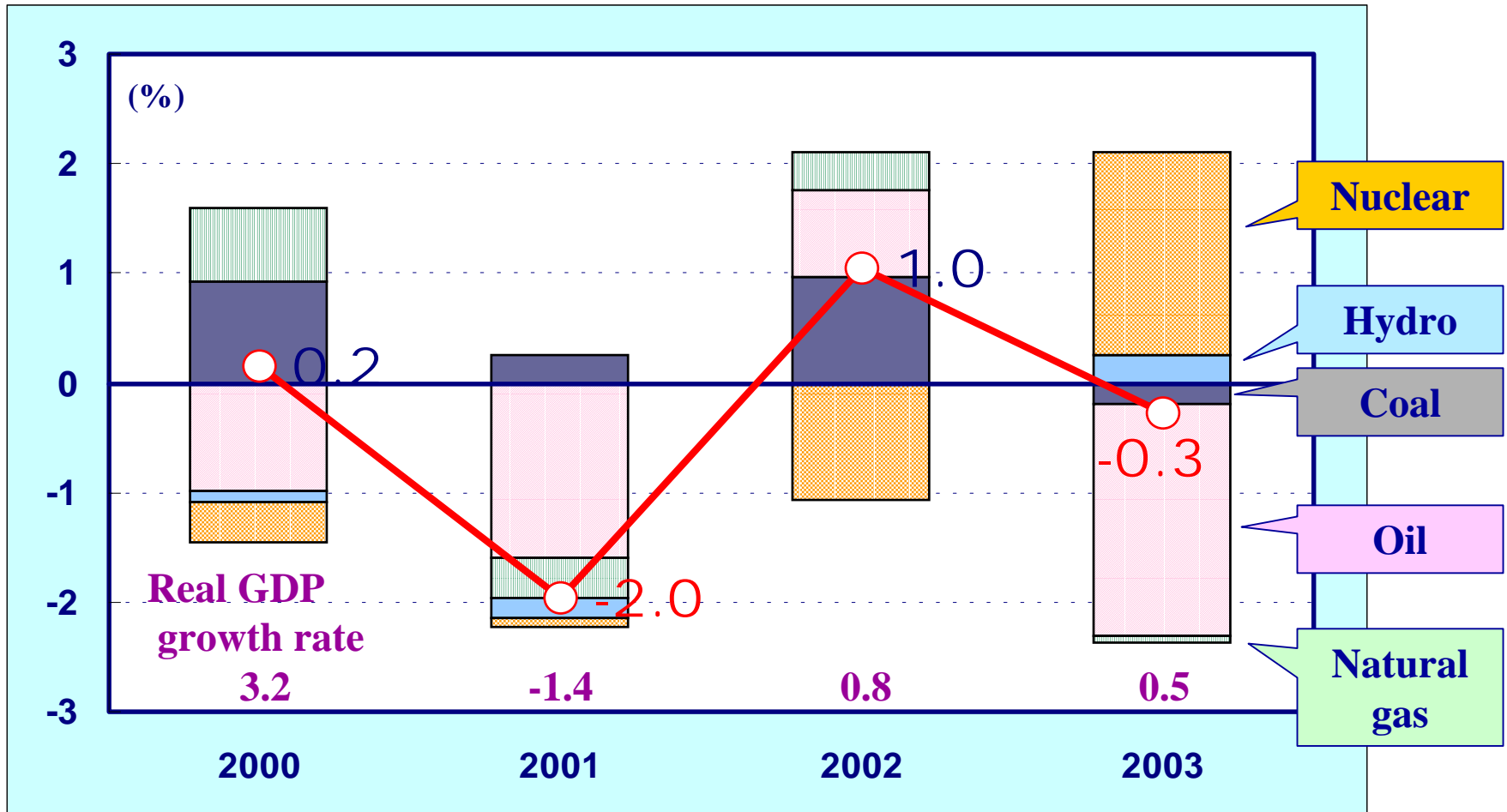
## Water Flow Rate (10 electric utilities)



Water flow rate falls below 100% in FY2002 for the second straight year. It is put at 100% for FY2003.

# Domestic Primary Energy Supply [Base Case]

(Degree of contribution by energy source)



An upturn is likely in FY2002 given factors such as an economic recovery, and a slight decline in FY2003 due to factors such as a slower economic growth.

# Domestic Primary Energy Supply [Base Case]

(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001			FY2002	FY2003
					1st half	2nd half		
Coal/others	100.0	105.0	104.0	1.4	3.1	7.0	5.0	-1.0
Oil	258.7	262.9	251.7	-3.2	-2.7	5.5	1.6	-4.3
Natural gas	71.4	73.1	72.8	-2.8	-1.8	7.0	2.4	-0.5
Hydro	18.6	18.7	20.0	-3.2	2.7	-3.4	0.1	7.2
Nuclear	68.8	63.2	73.0	-0.7	6.4	-22.5	-8.1	15.5
New energies	7.0	7.1	7.1	-4.2	0.3	1.1	0.7	0.5
<b>Total</b>	524.5	530.0	528.5	-2.0	0.0	2.0	1.0	-0.3
<b>GDP</b> (trillion yen)	531.6	535.7	538.6	-1.4	0.4	1.2	0.8	0.5

(FY2003)

Coal, oil and natural gas all start declining, thus showing reactionary falls to larger fossil fuel supplies in FY2002 due to prolonged shutdowns of nuclear plants.

Hydropower shoots up as a reaction to poor water availability continuing until FY2002

# Fuel Requirement (by Electric Utilities)

[Base Case]

(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001			FY2002	FY2003
					1st half	2nd half		
Coal/others	44.2	47.9	48.0	<b>6.8</b>	4.8	12.1	<b>8.4</b>	<b>0.1</b>
Oil	13.3	15.2	7.4	<b>-31.5</b>	-46.5	103.5	<b>14.4</b>	<b>-51.3</b>
Natural gas	50.7	51.5	50.9	<b>-0.4</b>	-3.9	7.3	<b>1.7</b>	<b>-1.1</b>
Nuclear	68.7	63.2	73.0	<b>-0.5</b>	6.6	-22.5	<b>-8.0</b>	<b>15.5</b>
Hydro	17.6	17.6	18.9	<b>-3.4</b>	2.9	-3.6	<b>0.1</b>	<b>7.6</b>
New energies	1.2	1.2	1.2	<b>3.4</b>	0.0	0.0	<b>0.0</b>	<b>0.0</b>
<b>Total</b>	195.6	196.6	199.4	<b>-2.2</b>	-1.1	2.2	<b>0.5</b>	<b>1.4</b>

(FY2003)

Oil and natural gas start falling in a reaction to larger fossil fuel supplies in FY2002 due to prolonged shutdowns of nuclear plants. Coal levels off with new coal-fired plants commissioned.

# Major New Power Source Projects

Coal			Natural gas			Oil			Hydro					
<b>FY2001 yearend total</b>			<b>2,924</b>			<b>5,819</b>			<b>4,963</b>			<b>4,488</b>		
	Plant name	10MW		Plant name	10MW		Plant name	10MW		Plant name	10MW			
Apr	Isogo coal-fired plant new unit No. 1	60	Apr	Gas & Power	14									
Apr	Nippon Steel Corp. Oita Steelworks	30	Jun	Kawasaki Steel Chiba	39									
Apr	Shinko Kobe Power Plant No. 1	66		Clean Power Station										
Jun	Tomatoh Atsuma No. 4	70												
Nov	Hekinan No. 5	100												
<b>Newly on stream total</b>		<b>326</b>			<b>53</b>			<b>0</b>			<b>8</b>			
<b>FY2002 yearend total</b>			<b>3,250</b>			<b>5,872</b>			<b>4,963</b>			<b>4,496</b>		
May	Kin No. 2	22	Nov	Shinagawa No. 1 unit affiliated	38	Apr	Cosmo Oil	22	Jun	Okutadami (capa. expansion)	20			
Jul	Reihoku No. 2	70				Jun	Nisseki Mitsubishi Refining	34	Jun	Otori (capa. expansion)	9			
Dec	Hitachi Naka No. 1	100				Jun	Towa Oil	24						
Mar	UBE Power Center	20												
<b>Newly on stream total</b>		<b>216</b>			<b>38</b>			<b>80</b>			<b>32</b>			
<b>FY2003 yearend total</b>			<b>3,465</b>			<b>5,910</b>			<b>5,043</b>			<b>4,528</b>		

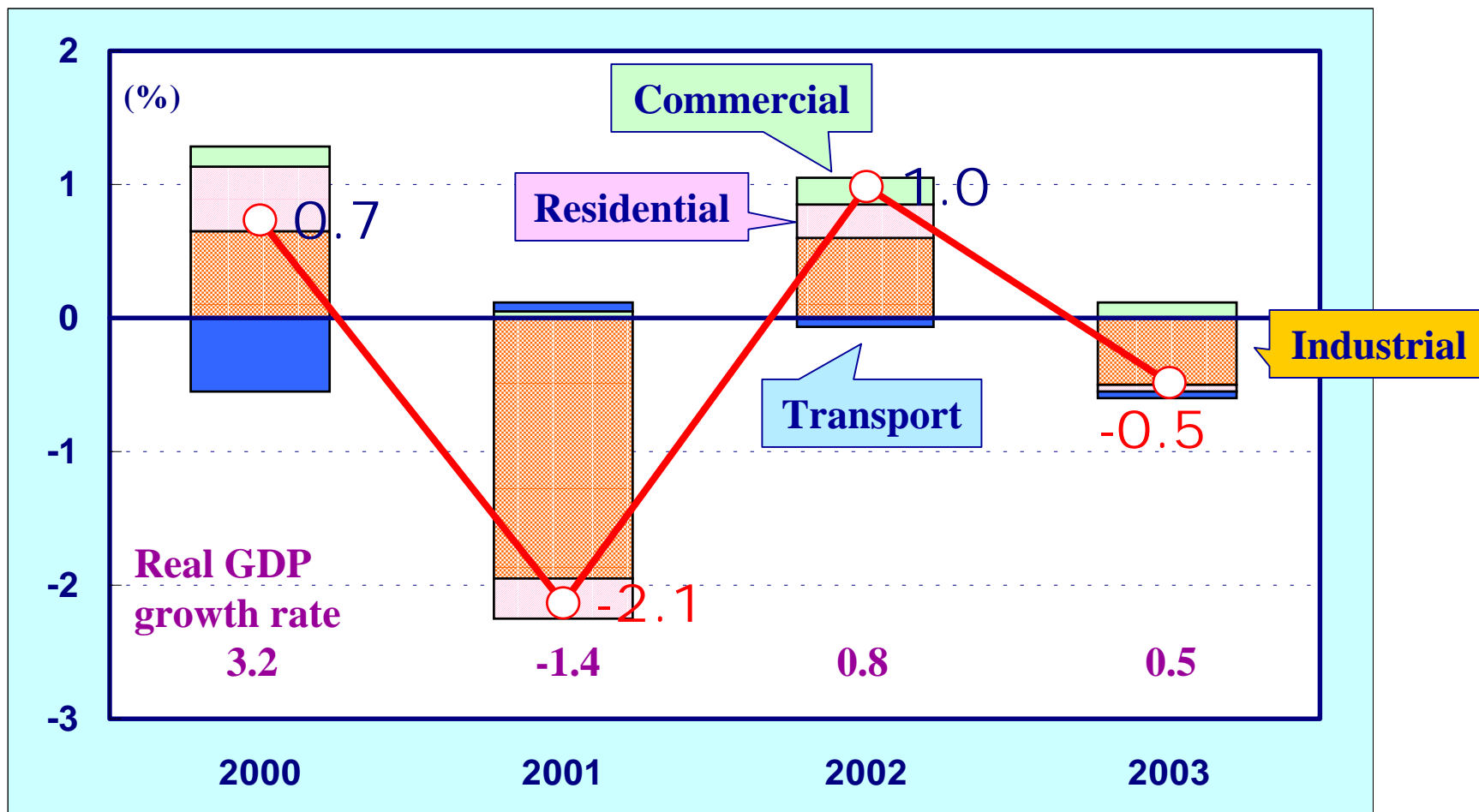
Prepared by IEEJ on the basis of the Agency for Resources and Energy, "Outline of FY2002 Electricity Supply Plan," March 2002.

**New power sources, largely coal-fired, are slated for commissioning.**

# Final Energy Consumption

[Base Case]

(Contribution by sector)



FY2002 marks an upturn in reflection of an economic recovery, greater space heating demand, etc. FY2003 returns to decline due to slower economic growth, shrinking basic material production, etc.

# Final Energy Consumption by Sector

[Base Case]

(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001			FY2002	FY2003
					1st half	2nd half		
<b>Industrial</b>	171.1	173.2	171.4	<b>-3.9</b>	0.7	1.8	<b>1.3</b>	<b>-1.1</b>
<b>Res. &amp; Com.</b>	98.7	100.4	100.6	<b>-1.0</b>	-0.1	3.1	<b>1.7</b>	<b>0.2</b>
<b>Residential</b>	52.2	53.1	52.9	<b>-2.2</b>	-0.6	3.3	<b>1.7</b>	<b>-0.4</b>
<b>Commercial</b>	46.5	47.3	47.7	<b>0.4</b>	0.3	2.8	<b>1.6</b>	<b>0.9</b>
<b>Transport</b>	91.0	90.8	90.6	<b>0.3</b>	-0.4	-0.1	<b>-0.3</b>	<b>-0.2</b>
<b>Total</b>	367.7	371.3	369.5	<b>-2.1</b>	0.2	1.7	<b>1.0</b>	<b>-0.5</b>
<b>GDP</b> (trillion yen)	531.6	535.7	538.6	<b>-1.4</b>	0.4	1.2	<b>0.8</b>	<b>0.5</b>

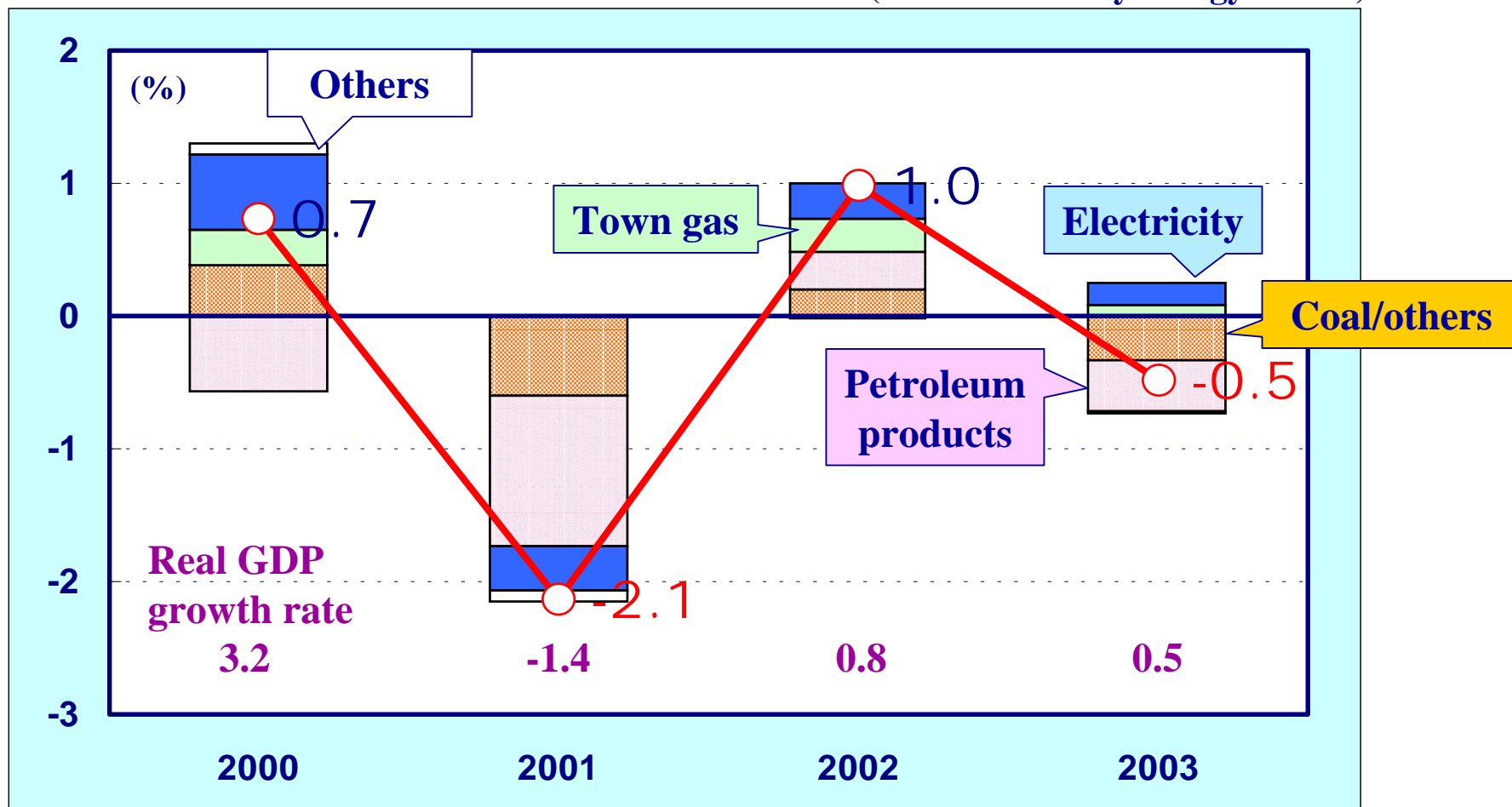
(FY2003)

Industrial sector starts falling due to shrinking basic material production, residential & commercial sectors grow more slowly due in part to a reactionary decline in space heating demand, and transport sector continues falling in reflection of sluggish freight transport energy use.



# Final Energy Consumption [Base Case]

(Contribution by energy source)



In FY2002, coal, petroleum products, town gas and electricity all rise. In FY2003, coal goes down due to falling production of crude steel and cement, among others, and oil is down in reflection of outdoor temperatures and industrial activities. Town gas and electricity continue growing.

# Final Energy Consumption by Source

[Base Case]

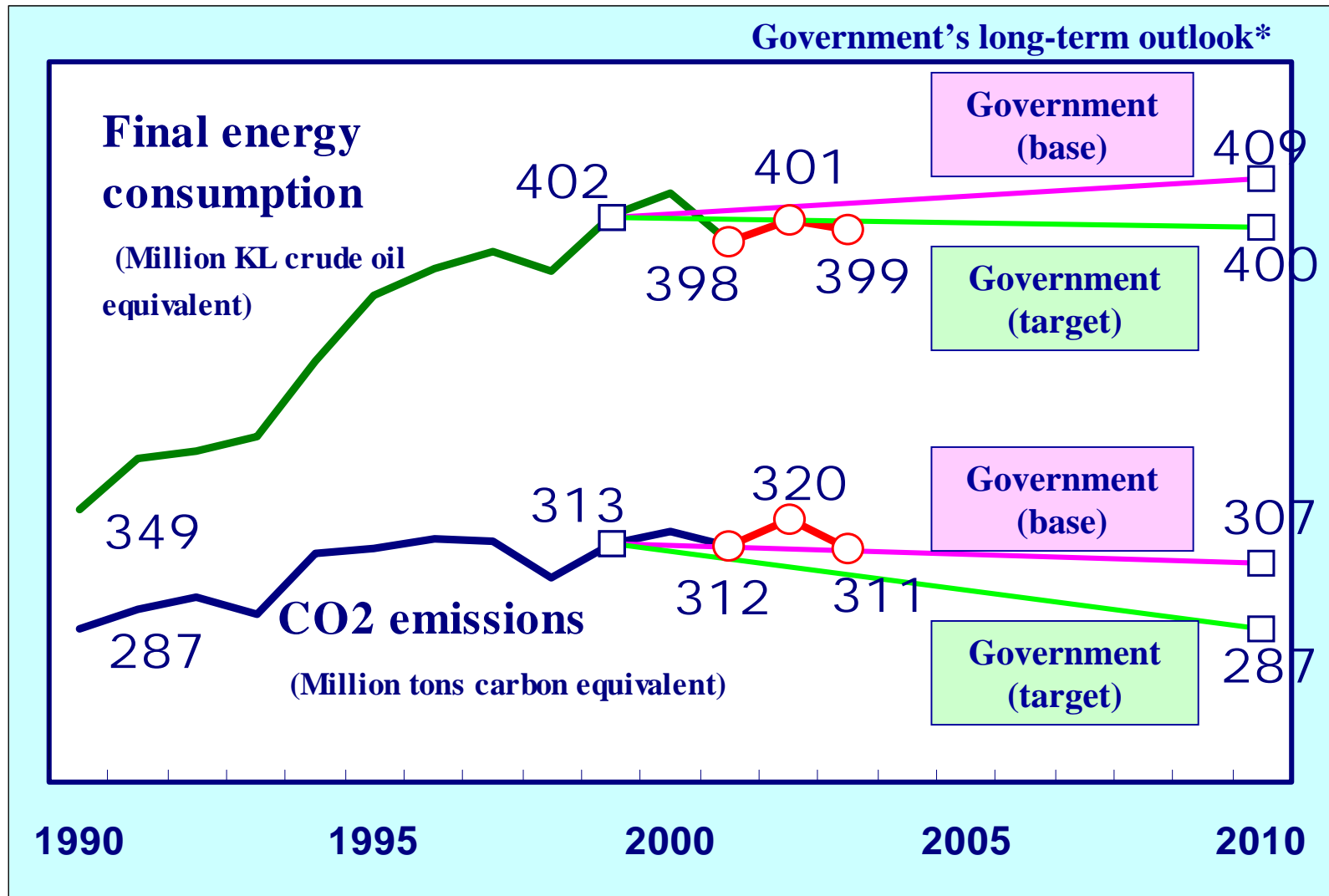
(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001			FY2002	FY2003
					1st half	2nd half		
Coal/others	39.1	39.9	38.6	<b>-5.4</b>	1.4	2.4	<b>1.9</b>	<b>-3.1</b>
Petroleum	217.6	218.7	217.2	<b>-1.9</b>	-0.3	1.1	<b>0.5</b>	<b>-0.7</b>
Town gas	24.7	25.6	25.9	<b>0.1</b>	2.9	4.4	<b>3.7</b>	<b>1.3</b>
Electricity	82.0	83.0	83.6	<b>-1.5</b>	0.2	2.3	<b>1.2</b>	<b>0.7</b>
Others	4.3	4.2	4.1	<b>-7.1</b>	-2.5	-0.5	<b>-1.5</b>	<b>-1.3</b>
<b>Total</b>	<b>367.7</b>	<b>371.3</b>	<b>369.5</b>	<b>-2.1</b>	<b>0.2</b>	<b>1.7</b>	<b>1.0</b>	<b>-0.5</b>
<b>GDP (trillion yen)</b>	<b>531.6</b>	<b>535.7</b>	<b>538.6</b>	<b>-1.4</b>	<b>0.4</b>	<b>1.2</b>	<b>0.8</b>	<b>0.5</b>

(FY2003)

Coal starts falling due to shrinking production of crude steel and cement. Oil levels off, though affected by outdoor temperatures and industrial activities. Town gas and electricity continue growing.

# CO<sub>2</sub> Emissions Outlook [Base Case]



**To meet the government's CO<sub>2</sub> reduction target requires an average cut of 1%/year from now on.**

\*The Advisory Committee for Resources and Energy, "Long-term Energy Supply and Demand Outlook" (July 2001)

## ◆ **Energy Consumption Outlooks by Sector**

- Manufacturing sector
- Residential sector
- Commercial sector
- Transport sector

## ◆ **Energy Demand Outlooks by Energy Industry**

- Electricity demand
- Town gas demand
- Petroleum product demand

# Manufacturing Sector

[Base Case]

(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001			FY2002	FY2003
					1st half	2nd half		
Coal/others	38.1	38.9	37.6	<b>-5.6</b>	1.4	2.5	<b>2.0</b>	<b>-3.2</b>
Petroleum	71.4	72.0	71.1	<b>-3.5</b>	0.8	0.9	<b>0.9</b>	<b>-1.3</b>
Naphtha	36.1	36.5	35.5	<b>-6.0</b>	2.4	0.3	<b>1.3</b>	<b>-2.9</b>
Heavy fuel oil	15.4	15.2	15.1	<b>-0.2</b>	-2.7	0.2	<b>-1.2</b>	<b>-0.7</b>
Town gas	9.3	9.8	10.0	<b>0.7</b>	5.4	4.8	<b>5.1</b>	<b>2.4</b>
Electricity	34.7	35.0	35.1	<b>-3.7</b>	0.0	2.3	<b>1.1</b>	<b>0.3</b>
<b>Total</b>	156.1	158.3	156.5	<b>-4.0</b>	1.0	1.8	<b>1.4</b>	<b>-1.1</b>
<b>IIP<sub>(1995=100)</sub></b>	94.0	96.4	97.2	<b>-10.2</b>	0.0	5.1	<b>2.5</b>	<b>0.8</b>

(FY2003)

Coal falls due to decreases in crude steel and cement output, etc., and oil drops due to ethylene production cuts, etc. Electricity also lags due to slower growth of manufacturing sector-wide. Town gas continues to grow.

# Residential Sector

[Base Case]

(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001	FY2002		FY2003	
					1st half	2nd half		
<b>Petroleum</b>	19.3	19.7	19.4	<b>-4.5</b>	-3.0	4.1	<b>2.1</b>	<b>-1.3</b>
Kerosene	12.9	13.3	13.1	<b>-7.0</b>	-3.2	4.6	<b>2.9</b>	<b>-1.3</b>
LPG	6.4	6.4	6.3	<b>1.1</b>	-2.7	2.8	<b>0.4</b>	<b>-1.5</b>
<b>Town gas</b>	9.4	9.6	9.6	<b>-1.4</b>	-0.4	4.0	<b>2.3</b>	<b>-0.2</b>
<b>Electricity</b>	22.8	23.1	23.3	<b>-0.2</b>	0.9	2.3	<b>1.6</b>	<b>0.6</b>
<b>Total</b>	52.2	53.1	52.9	<b>-2.2</b>	-0.6	3.3	<b>1.7</b>	<b>-0.4</b>
Cooling Degree Days	410	422	395	<b>-12.7</b>	2.6	-	<b>3.1</b>	<b>-6.5</b>
Warming Degree Days	902	1,031	997	<b>-12.9</b>	-49.9	17.7	<b>14.4</b>	<b>-3.3</b>

(FY2003)

Petroleum products and town gas decline due to reactionary falls in space heating and water heating demand. The growth of electricity also slows down.

# Commercial Sector

[Base Case]

(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001	FY2002		FY2003	
					1st half	2nd half		
<b>Petroleum</b>	16.7	17.0	16.9	<b>-1.0</b>	-0.3	3.0	<b>1.6</b>	<b>-0.3</b>
Heavy fuel oil	11.0	11.2	11.2	<b>-0.5</b>	-0.6	3.6	<b>1.7</b>	<b>-0.1</b>
LPG	3.0	3.0	3.0	<b>2.9</b>	1.5	2.3	<b>1.9</b>	<b>0.6</b>
<b>Town gas</b>	6.0	6.3	6.4	<b>1.7</b>	3.0	4.2	<b>3.6</b>	<b>1.8</b>
<b>Electricity</b>	22.1	22.4	22.7	<b>0.9</b>	0.0	2.5	<b>1.2</b>	<b>1.6</b>
<b>Total</b>	46.5	47.3	47.7	<b>0.4</b>	0.3	2.8	<b>1.6</b>	<b>0.9</b>
<b>GDP</b> (trillion yen)	531.6	535.7	538.6	<b>-1.4</b>	0.4	1.2	<b>0.8</b>	<b>0.5</b>

(FY2003)

Petroleum products grow slower due to reactionary falls in space heating and water heating demand, etc. Town gas and electricity keep growing in reflection of penetration and expansion of air-conditioning demand.

# Transport Sector

[Base Case]

(Million tons oil equivalent)

	Actual (estimated) FY2001	Projection		Ups/downs (%) over previous year				
		FY2002	FY2003	FY2001	FY2001		FY2002	FY2003
					1st half	2nd half		
<b>Petroleum</b>	88.9	89.2	88.9	<b>0.3</b>	-0.4	-0.2	<b>-0.3</b>	<b>-0.2</b>
Gasoline	48.1	48.4	49.1	<b>0.8</b>	1.8	0.8	<b>1.3</b>	<b>1.0</b>
Jet fuel	4.0	4.4	4.2	<b>8.4</b>	-5.3	-2.1	<b>-3.7</b>	<b>1.9</b>
Diesel	30.1	29.6	28.9	<b>-1.4</b>	-3.4	-1.8	<b>-2.6</b>	<b>-2.5</b>
Heavy fuel oil	5.3	5.3	5.3	<b>-0.6</b>	-0.8	1.6	<b>0.4</b>	<b>-0.3</b>
<b>Electricity</b>	1.9	1.9	1.9	<b>-1.1</b>	-0.9	1.2	<b>0.1</b>	<b>1.0</b>
<b>Total</b>	90.7	91.0	90.8	<b>0.3</b>	-0.4	-0.1	<b>-0.3</b>	<b>-0.2</b>
<b>GDP (trillion yen)</b>	539.2	531.6	535.7	<b>-1.4</b>	0.4	1.2	<b>0.8</b>	<b>0.5</b>

(FY2003)

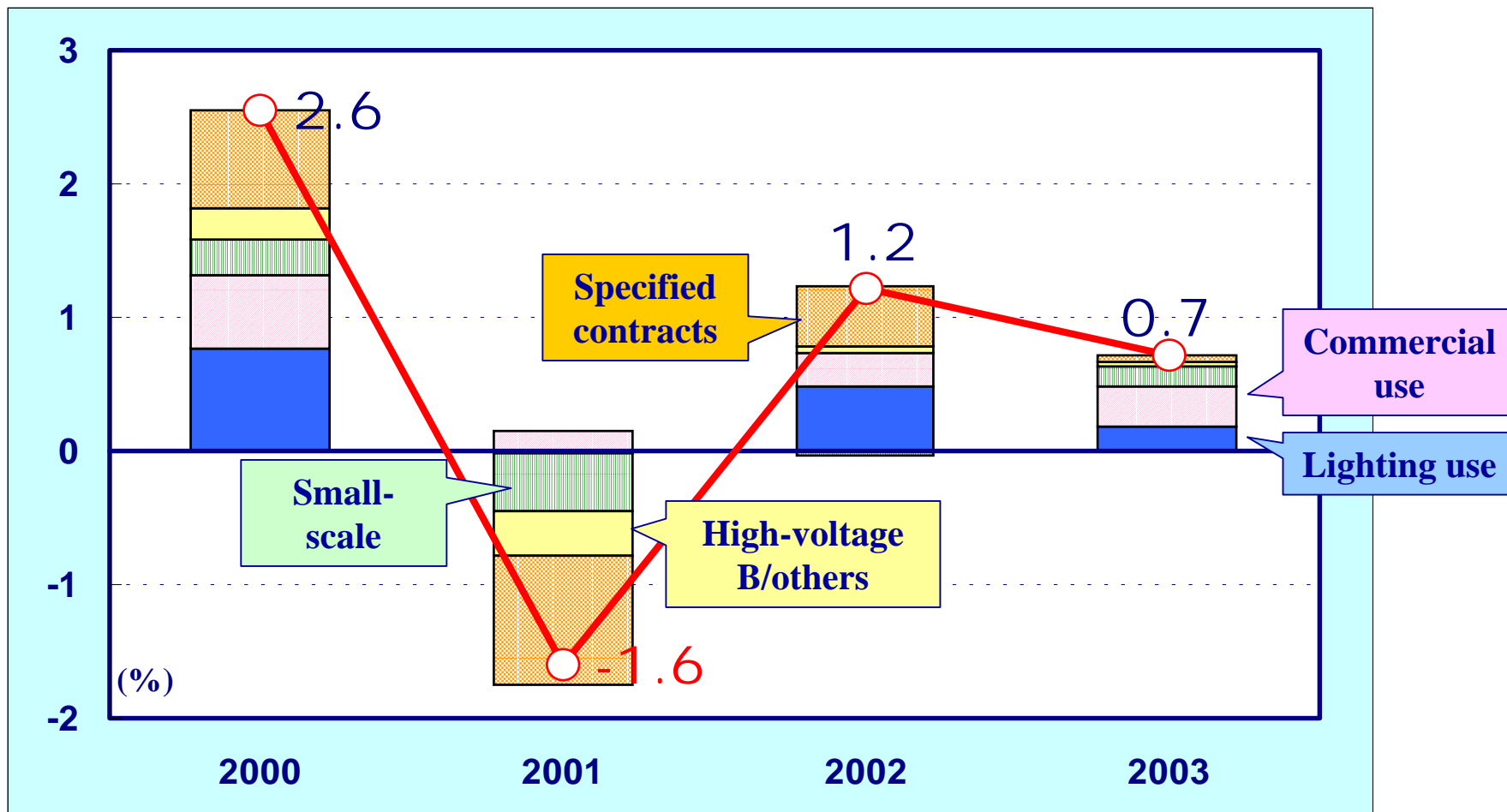
Gasoline continues growing thanks to larger passenger transport demand, notably passenger cars, but despite positive GDP growth, diesel continues to shrink due to sluggishness in freight transport, etc.



# Electricity Demand Outlook

[Base Case]

(Contribution by use)



FY2002 marks an upturn centering on industrial use, particularly machinery.  
FY2003 registers slower growth due to slowdown in industrial activities.

# Electricity Demand by Use

[Base Case]

(TWh)

	Actual	Projection		Ups/downs (%) over previous year				
		FY2001	FY2002	FY2003	FY2001	1st half	2nd half	FY2002
	<b>Lighting use</b>	254.5	258.6	260.1	<b>0.0</b>	0.9	2.3	<b>1.6</b>
<b>Power use</b>	358.3	360.5	364.7	<b>-1.5</b>	-0.8	2.2	<b>0.6</b>	<b>1.2</b>
<b>Commercial use</b>	159.2	161.2	163.9	<b>0.8</b>	0.3	2.4	<b>1.3</b>	<b>1.6</b>
<b>Small-scale use</b>	112.0	111.8	113.0	<b>-3.2</b>	-1.9	1.7	<b>-0.2</b>	<b>1.1</b>
<b>High-voltage B/others</b>	87.1	87.5	87.8	<b>-3.1</b>	-1.3	2.3	<b>0.5</b>	<b>0.3</b>
<b>Specified contracts</b>	231.6	235.5	235.9	<b>-3.5</b>	0.8	2.6	<b>1.7</b>	<b>0.2</b>
<b>Total</b>	844.4	854.6	860.8	<b>-1.6</b>	0.1	2.3	<b>1.2</b>	<b>0.7</b>

(FY2003)

The growth of lighting use slows down in reflection of outside temperatures.

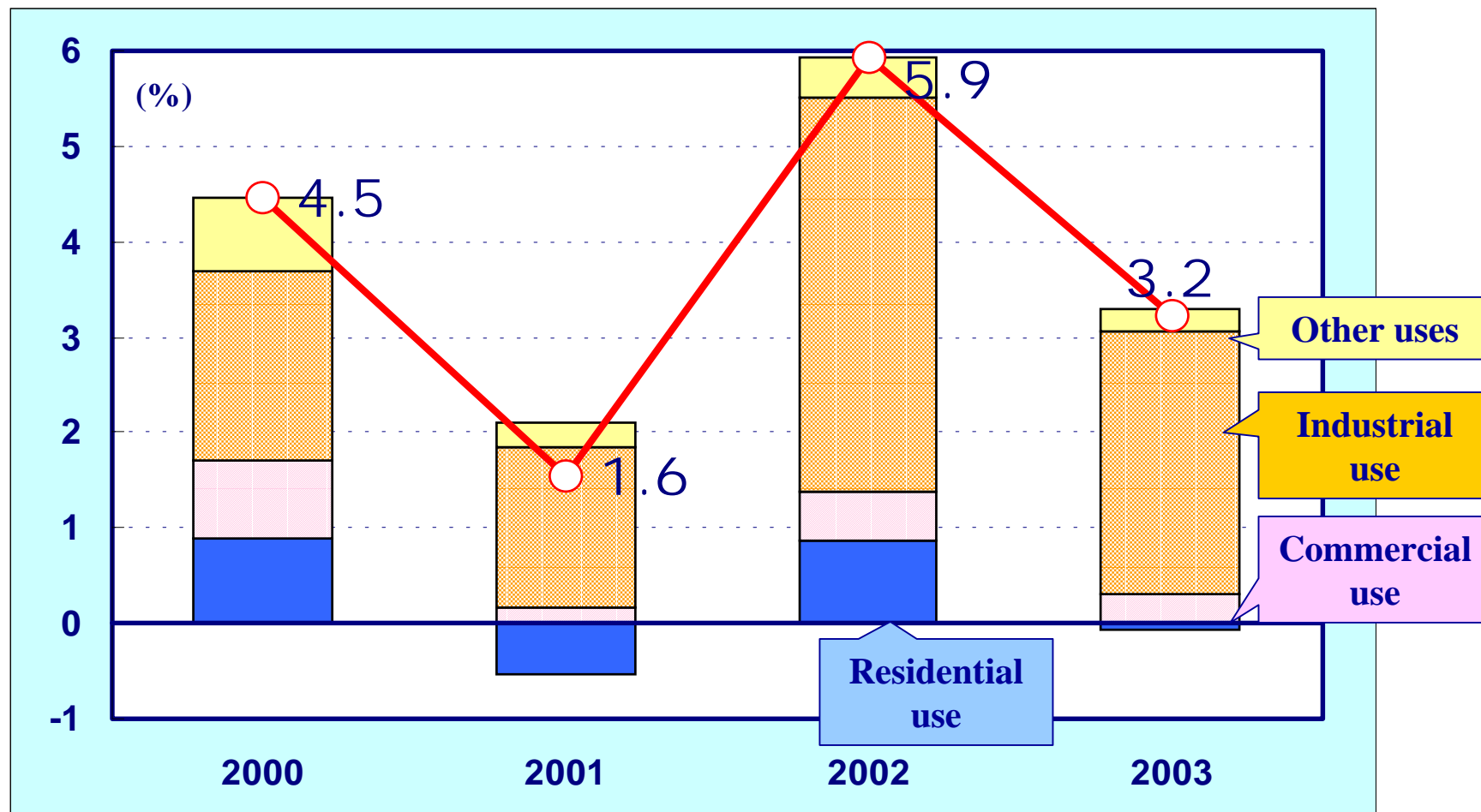
The growth of commercial use remains low due to sluggish economy, etc.

Demand eligible for specified contracts grows only slightly.

# Town Gas Demand Outlook

[Base Case]

(Contribution by use)



FY2002 records a high growth centering on industrial use, largely power production. The growth is sustainable into FY2003 backed by growing industrial use.

# Town Gas Demand by Use

[Base Case]

(100 million m<sup>3</sup>)

	Actual	Projection		Ups/downs (%) over previous year				
		FY2001	FY2002	FY2003	FY2001	1st half	2nd half	FY2002
	<b>Residential use</b>	93.6	95.7	95.6	<b>-1.4</b>	-0.4	4.1	<b>2.3</b>
<b>Commercial use</b>	41.0	42.3	43.1	<b>1.1</b>	2.3	4.1	<b>3.2</b>	<b>1.9</b>
<b>Industrial use</b>	97.6	108.2	115.6	<b>4.5</b>	10.5	11.0	<b>10.8</b>	<b>6.9</b>
<b>Other uses</b>	21.8	22.9	23.5	<b>3.0</b>	4.1	5.6	<b>4.9</b>	<b>2.6</b>
<b>Total</b>	254.1	269.1	277.8	<b>1.6</b>	5.0	6.7	<b>5.9</b>	<b>3.2</b>

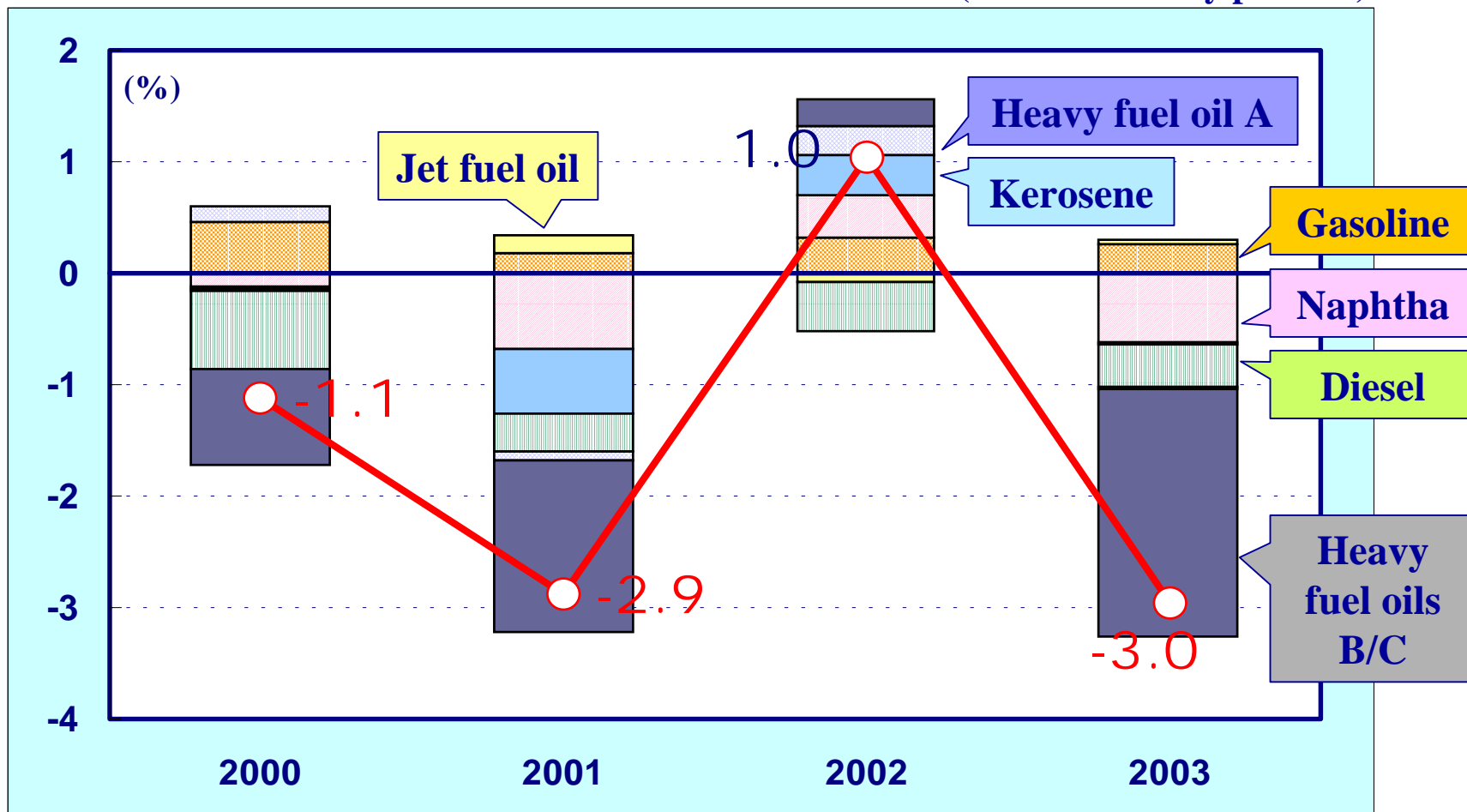
(FY2003)

Residential use marks a reactionary fall to the previous year. Commercial and other uses continue to grow with penetration of gas-powered air-conditioning. Industrial use maintains high growth, reflecting strong demand from power producers.

# Petroleum Product Demand Outlook

[Base Case]

(Contribution by product)



FY2002 marks the first increase in three years, reflecting upturns in heavy fuel oils B/C, naphtha, kerosene and heavy fuel oil A. In FY2003, gasoline increases but petroleum products as a whole end in a reactionary fall.

# Petroleum Product Demand by Product

[Base Case]

(100 million KL)

	Actual	Projection		Ups/downs (%) over previous year				
		FY2001	FY2002	FY2003	FY2001	1st half	2nd half	FY2002
	<b>Gasoline</b>	58.8	59.6	60.2	<b>0.8</b>	1.8	0.8	<b>1.3</b>
<b>Naphtha</b>	46.0	47.0	45.5	<b>-3.4</b>	3.8	0.3	<b>2.0</b>	<b>-3.2</b>
<b>Kerosene</b>	28.5	29.4	29.3	<b>-4.7</b>	-1.6	4.6	<b>3.0</b>	<b>-0.2</b>
<b>Diesel</b>	40.9	39.9	39.0	<b>-2.0</b>	-3.5	-1.6	<b>-2.5</b>	<b>-2.2</b>
<b>Heavy fuel oil A</b>	29.3	29.9	29.8	<b>-0.7</b>	1.1	2.7	<b>2.0</b>	<b>-0.1</b>
<b>Heavy fuel oils B/C</b>	27.6	28.2	22.9	<b>-12.0</b>	-16.5	22.5	<b>2.2</b>	<b>-18.8</b>
<b>Power production use</b>	8.7	9.7	5.0	<b>-25.4</b>	-39.2	87.9	<b>12.1</b>	<b>-48.6</b>
<b>Total</b>	236.2	238.7	231.6	<b>-2.9</b>	-1.7	3.4	<b>1.0</b>	<b>-3.0</b>

(FY2003)

Gasoline continues growing, but heavy fuel oils B/C and naphtha fall. As a result, petroleum products as a whole turn downward again.

# **Impact Assessment of Changing External Variables**

- ◆ Higher crude oil price
- ◆ Lower GDP growth
- ◆ Escalation of the Middle East conflicts

# Assessment of Impacts of External Variables

## Base Case

FY2003: GDP growth = 0.5%, crude oil price = \$22/bbl

### Higher Crude Oil Price Case

Crude oil price = \$27/bbl (base case + \$5)

### Lower GDP Growth Case

GDP growth = 0.0% (base case - 0.5 points)

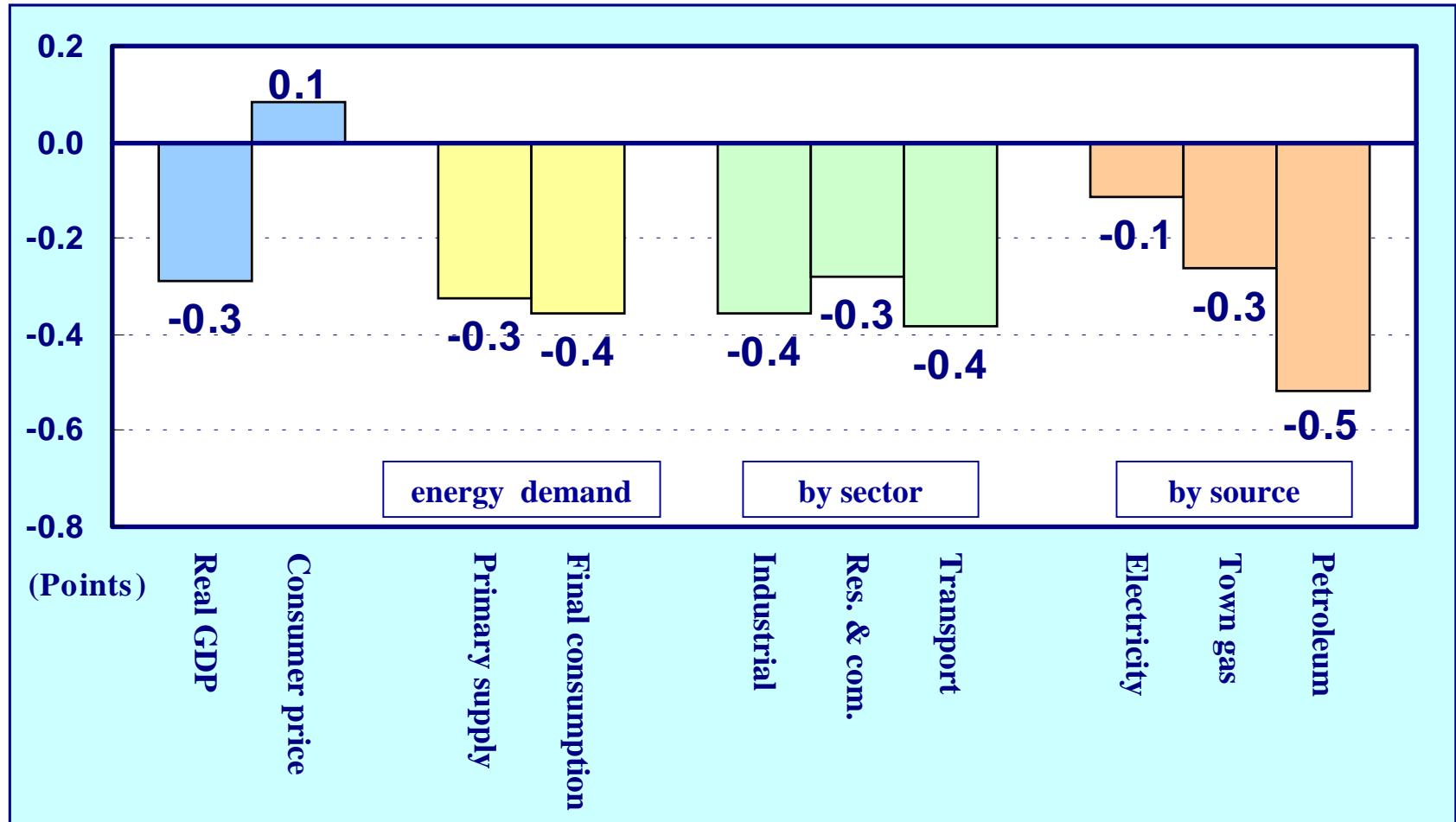
### Escalation of Middle East Conflicts Scenario

Crude oil price = \$32/bbl (base case + \$10)  
Slowdown in the world economy  
(e.g. US GDP down 0.5 points from the base case)



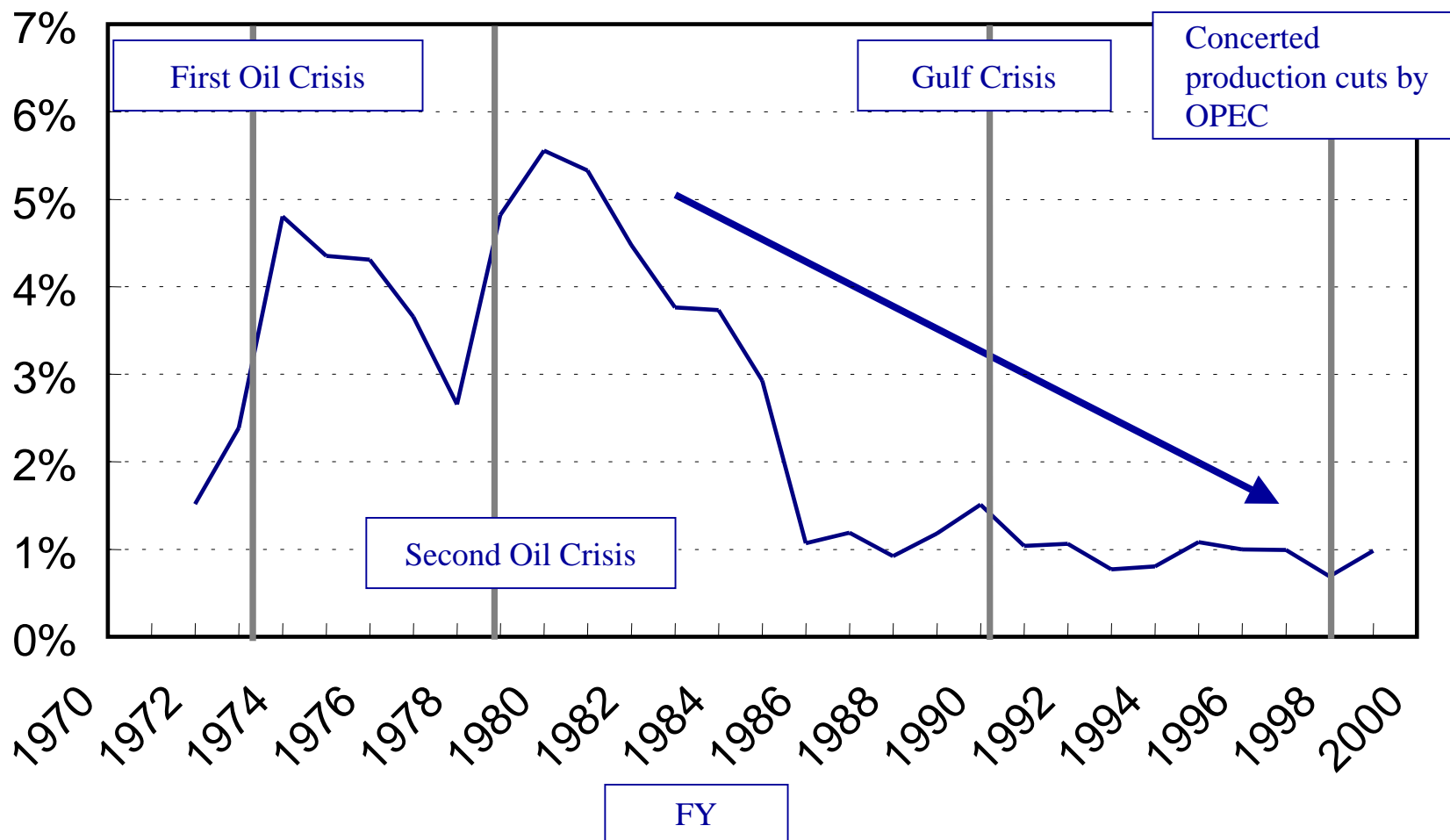
# Higher Crude Oil Price – Impacts of \$5 Higher Crude Oil Price

(Changes in growth rate from the base case)



Real GDP falls by 0.3 points. A combination of income and price effects sends energy demand down. By energy source, greater impacts are produced on oil, town gas and electricity, in that order.

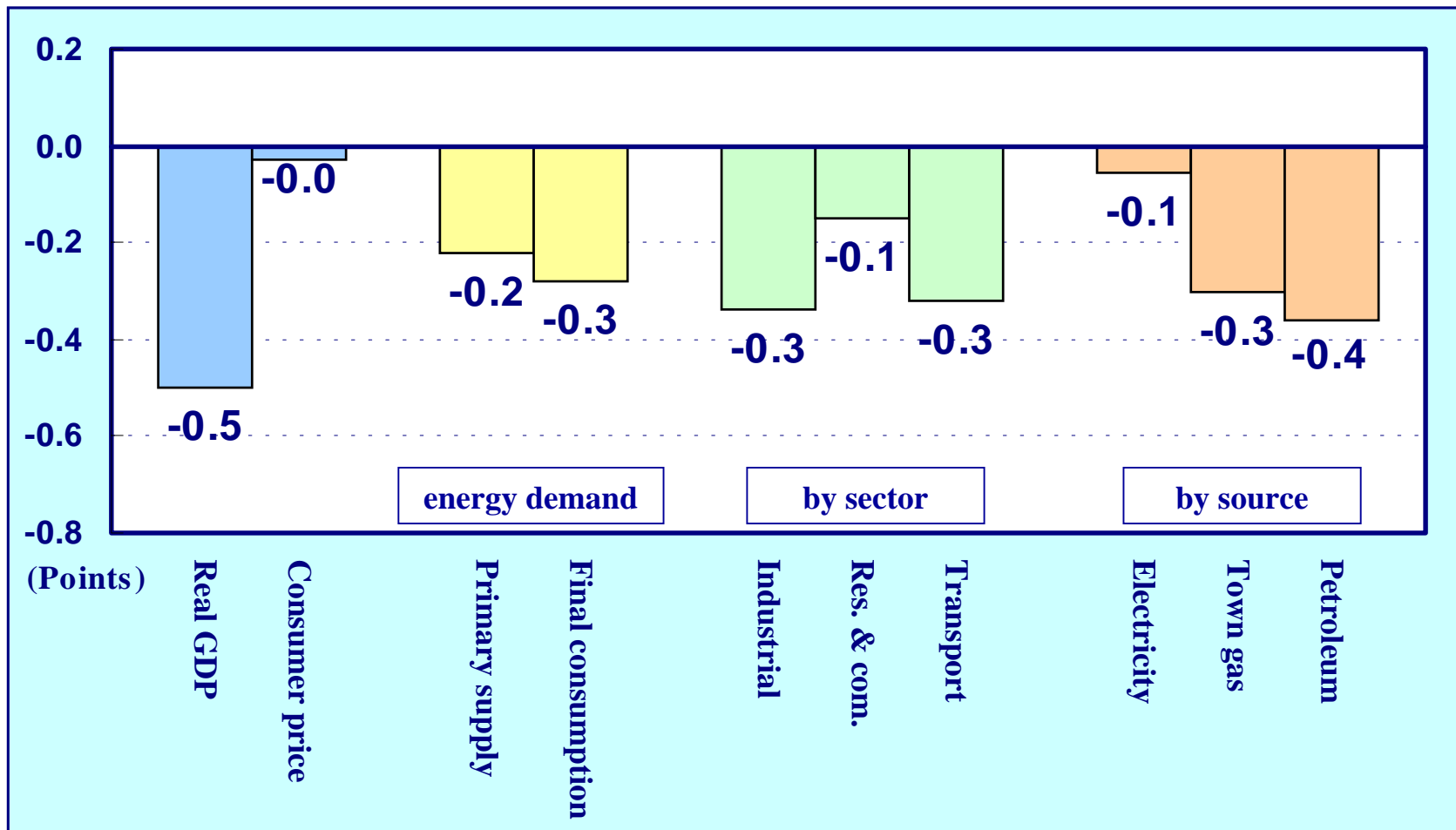
# Shares of Oil Import Value in Nominal GDP



(Source) Petroleum Data

# Lower GDP Growth – Impacts of Lower GDP Growth by 0.5 Points –

(Changes in growth rate from the base case)

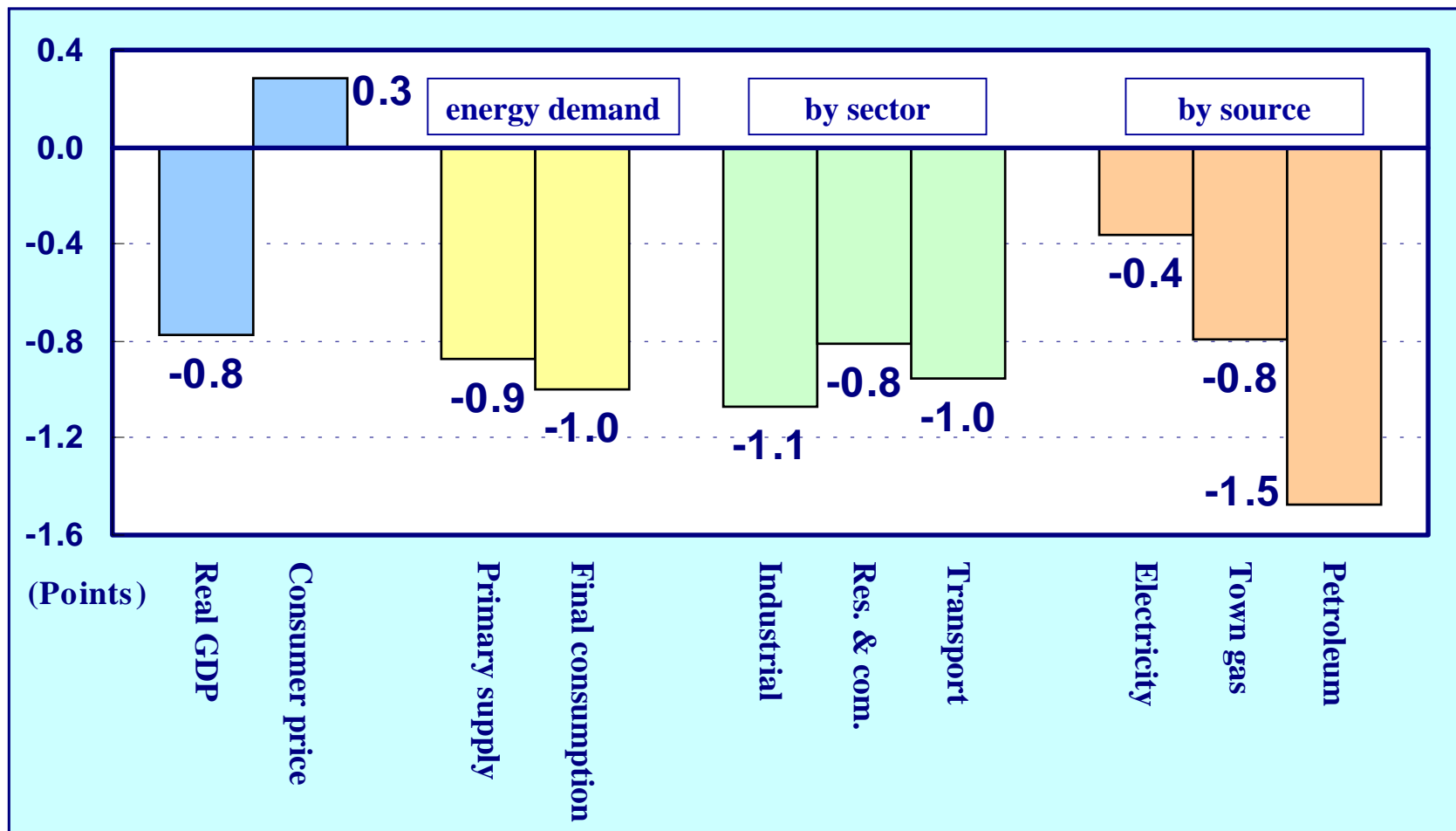


Energy consumption falls less than does GDP.

# Escalation of Middle East Conflicts

– Impacts of \$10 Higher Crude Oil Price and World Economic Slowdown –

(Changes in growth rate from the base case)



Crude oil price may even reach \$40 briefly. Back to negative growth, with GDP down by 0.8 points. Energy demand shrinks by around 1.0 point.

# Impacts of Extended Shutdowns of Nuclear Plant Operation

Impacts are calculated on the assumption that the nuclear power plants currently undergoing inspection shutdowns will remain out of operation six months longer (until September 2003) than in the base case.

(FY2003)	Nuclear-generated output (100 GWh)	Nuclear utilization factor (%)	Input of fossil fuels (10,000 kl heavy fuel oil C equivalent)	CO2 emissions (Million tons carbon equivalent)
<b>Base Case</b> (ups/downs from previous year)	<b>3,394</b> (15.5)	<b>84.4</b>	<b>10,671</b> (-7.3)	<b>311</b> (-2.9)
<b>Extended Shutdowns Case</b> (ups/downs from previous year)	<b>2,999</b> (2.0)	<b>74.6</b>	<b>11,521</b> (0.1)	<b>318</b> (-0.8)
<b>Gaps between the cases</b>	<b>-395</b>	<b>-9.8</b>	<b>851</b>	<b>7</b>

Fuel use in fossil-fired power generation increases by about 8.51 million kl in terms of heavy fuel oil C equivalent.

# Summary

Ups/downs from previous year (%)	Results of Base Case		Escalation of Middle East Conflicts Scenario	
	FY2002	FY2003	FY2003	(gaps from the base)
Real GDP growth	0.8	0.5	-0.3	<b>(-0.8)</b>
Consumer price index	-0.5	-0.4	-0.1	<b>(+0.3)</b>
Primary energy domestic supply	1.0	-0.3	-1.2	<b>(-0.9)</b>
Final energy consumption	1.0	-0.5	-1.5	<b>(-1.0)</b>
Electricity demand	1.2	0.7	0.3	<b>(-0.4)</b>
Town gas demand	5.9	3.2	2.4	<b>(-0.8)</b>
Petroleum product demand	1.0	-3.0	-4.5	<b>(-1.5)</b>