Overview of GHG's Emission, Policies and Modeling in Korea

2002. 11

Seung Jick Yoo

Korea Energy Economics Institute (KEEI)

Contents

- Energy
- Greenhouse Gases
- Policies and Measures
- Top-down Models at KEEI

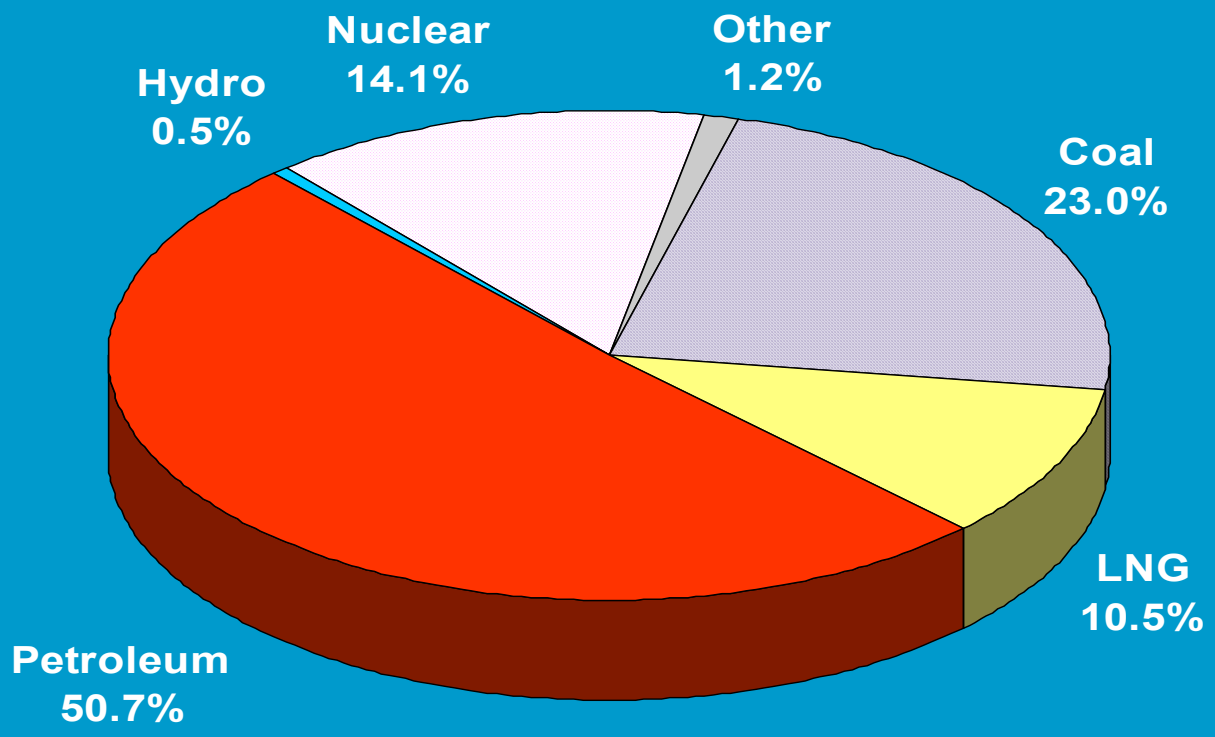
Korea's Position in the world Economy (2001)

- **Land Area:**
  - 99,392㎢ (S.Korea)
- **Population:**
  - 47.3 million persons
- **Economy(2001)**
  - Source : BOK, 2002
  - GDP : US$ 493 billion
  - US$ 9,628 per capita
- **Energy Use (2001):**
  - 198.4 million TOE
  - 97.3 % imported
  - Energy import bill: US$ 33.7 billion
- **Korea ranks(2000)**
  - No. 10 in energy consumption
  - No. 6 in oil consumption
  - No. 4 in oil imports
  - No. 2 in coal and LNG imports

Major Energy/Economic Indicators

	1981	1990	1995	2000	Annual Growth Rate(%)	
					81- 90	90- 00
Energy Consumption (million toe)	45.7	93.2	150.4	192.9	8.2	7.5
Energy/GDP Ratio (toe/1,000$)	0.37	0.35	0.40	0.40	-0.6	1.4
Per Capita Energy Consumption (toe)	1.18	2.17	3.34	4.08	7.0	6.5
GDP(bil. won)	122.4	263.4	377.4	476.3	8.9	6.1
Population (million)	38.7	42.9	45.1	47.3	1.2	1.0

Consumption of Energy by Source (2001)



- Total Energy
  198.4 million toe

	Petroleum	Coal	Nuclear	LNG	Hydro
1990	53.8%	26.1%	14.2%	3.2%	1.7%

Projection of Major Energy Indicator

	2000	2010	2020	AAGR (%)
GDP (T. Won)	476	794	1,170.3	4.6
Primary Energy (MTOE)	192.9	263.6	311.8	2.4
Per Capita Energy (TOE)	4.07	5.43	6.16	2.1
Energy/GDP (TOE/M Won)	0.41	0.35	0.27	–2.1

Source: KEEI, Sept. 2001

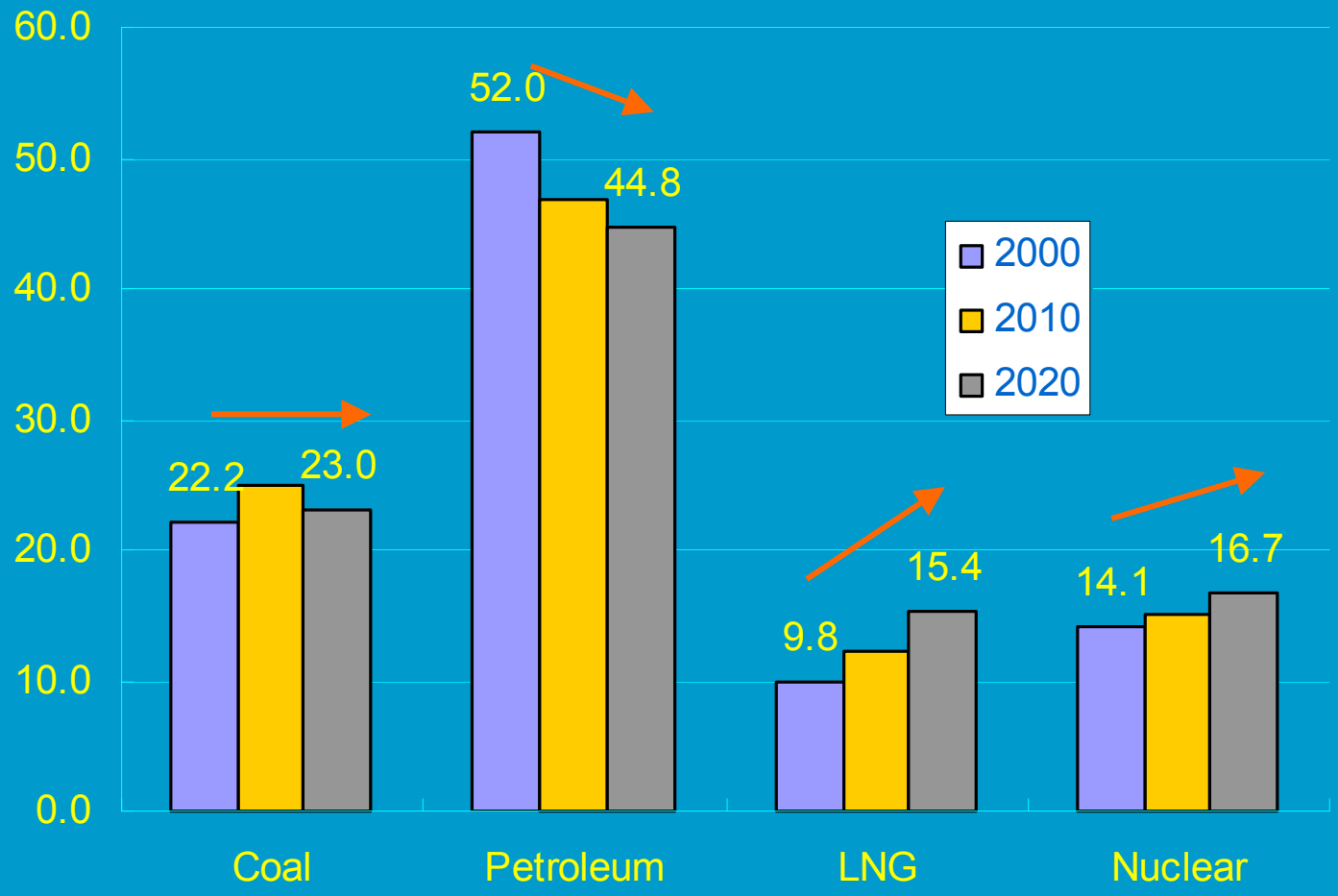
- Energy demand will grow steadily, but at a slower pace

- **Moderate economic growth**
- **Improving energy efficiency**
- **Economic growth by less energy-intensive industry**

Energy Outlook in Korea

- **Primary Energy Demand by Sources (Share)**

Unit: %

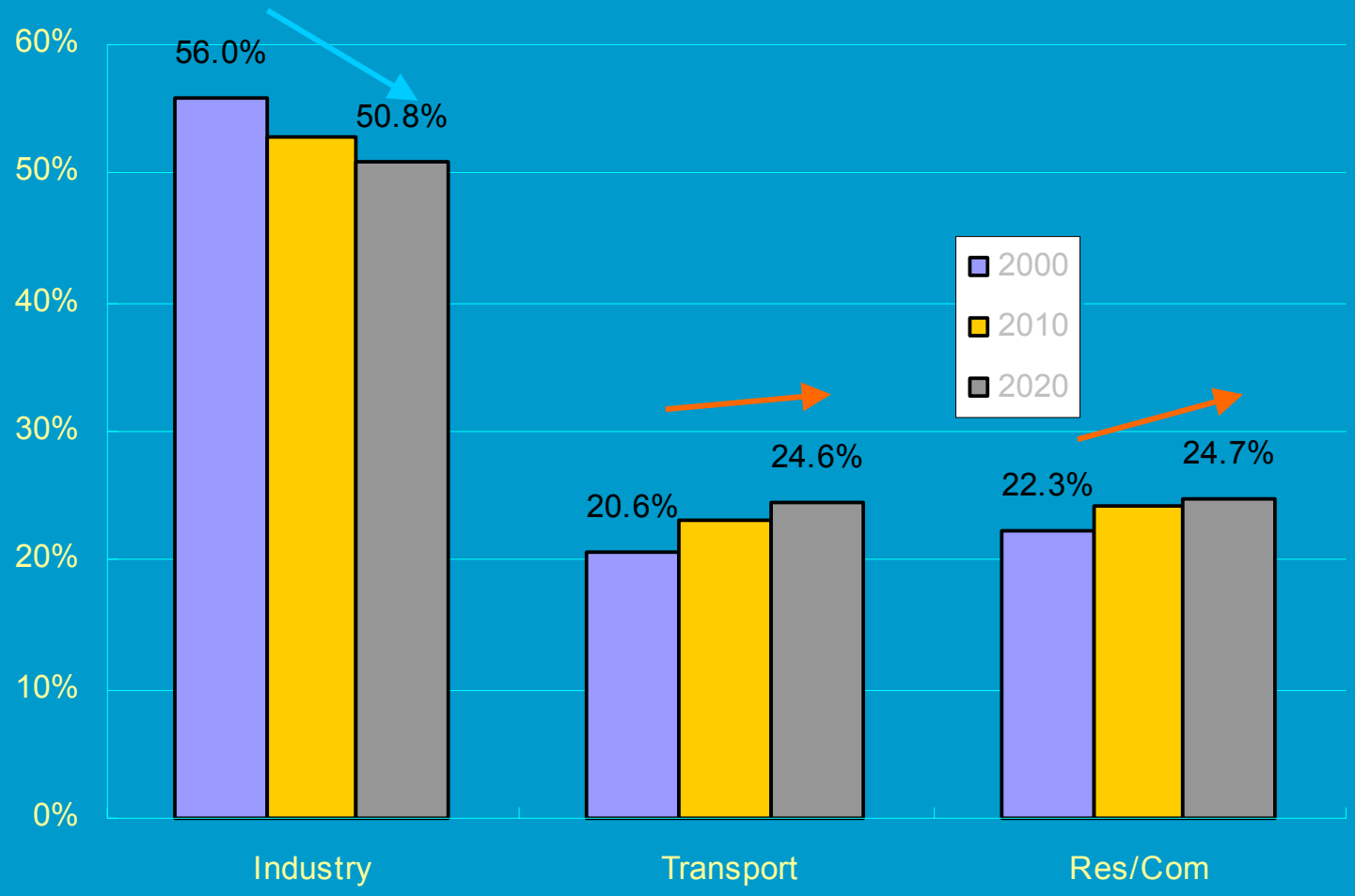


Source: KEEI, Sept. 2002

Energy Outlook in Korea

Energy demand by Sector (Share)

●Unit: %



● Source: KEEI, Sept. 2002

Future Energy Demand in Korea

■ Economic Growth & Industry Structure

-Economic growth rate will slow down over time.

-The GDP share of energy intensive industries will be lower.

-The GDP share of service sector will be higher

■Energy Market and Policies

- Policy push toward more competitive energy market
- Privatization of public energy companies (electricity and natural gas)

■External Factors

- International pressure on environment through Climate
- Change Treaty(UNFCCC)

-→ affect the environment regulations and energy prices & tax

Forecast of Major Indices of GHG's Emission from Energy Sector

	2000	2005	2010	2015	2020	Annual Growth Rate(%)		
						2000-2010	2010-2020	2000-2020
GHG's Emission (MMTC)	118.5	144.3	163.3	172.2	185.6	3.3	1.3	2.3
Per Capital Emission (TC)	2.52	2.98	3.29	3.42	3.66	2.7	1.1	1.9
GHG's Emission/GDP (TC/'95 price, M won)	0.25	0.24	0.21	0.18	0.16	-1.8	-2.7	-2.2
GHG's Emission/Energy (TC/TOE)	0.61	0.62	0.62	0.60	0.60	0.1	-0.4	0.2

Forecast of Emission from Energy Sector by Gases (Unit: Thousand TC, %)

GHG's	2000	2005	2010	2015	2020	Annual Growth Rate(%)		
						2000-2010	2010-2020	2000-2020
CO_2	117,985 (99.6)	143,626 (99.5)	162,521 (99.5)	171,460 (99.5)	184,728 (99.6)	3.3	1.3	2.3
CH_4	243 (0.2)	256 (0.2)	258 (0.2)	271 (0.2)	282 (0.2)	0.6	0.9	0.7
N_2O	279 (0.2)	435 (0.3)	506 (0.3)	514 (0.3)	552 (0.3)	6.1	0.9	3.5
Total	118,507 (100.0)	144,316 (100.0)	163,286 (100.0)	172,245 (100.0)	185,561 (100.0)	4.0	1.9	3.0

Footnote : Excluding fugitive gas

Forecast of CO2 Emission by Sector (Unit : MMTC, %)

	2001	2006	2011	2015	2020	Annual Growth Rate (%)	
						'01-'11	'11-'20
Industry	41,411	47,189	50,812	52,912	55,423	2.1	1.0
	(33.6)	(31.9)	(31.2)	(30.9)	(30.0)		
Transportation	25,985	32,563	37,992	42,331	46,861	3.9	2.4
	(21.1)	(22.0)	(23.3)	(24.7)	(25.4)		
Residential/Commercial	18,787	20,416	22,064	23,390	24,796	1.6	1.3
	(15.2)	(13.8)	(13.5)	(13.6)	(13.4)		
Transformation	37,089	47,599	52,060	52,827	57,648	3.4	1.1
	(30.1)	(32.2)	(32.0)	(30.8)	(31.2)		
Total	123,273	147,766	162,928	171,460	184,728	2.8	1.4
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)		

GHG's Emission by Sector (Unit :MMTC)

Sector	1990	1995	2000	Annual Growth(%)
Energy	67.6 (75.5)	101.5 (81.0)	118.5 (82.5)	5.9
┌ Industry ┌ Transformation ┌ Transportation ┌ Residential/Commercial ┌ Public Sector/Etc ┌ Fugitive	(35.4) (15.3) (17.1) (27.1) (2.8) (2.2)	(35.9) (22.4) (20.7) (18.9) (1.3) (0.9)	(35.1) (28.5) (19.9) (14.6) (0.9) (1.0)	
Industrial Process	5.2 (5.8)	12.0 (9.6)	15.0 (10.3)	11.3
Wastes	11.9 (13.3)	6.8 (5.4)	5.9 (4.1)	-6.8
Agricultural/Livestock	4.8 (5.4)	4.9 (3.9)	4.5 (3.1)	-0.8
Forestry (Sink)	-6.5 (-7.2)	-5.8 (-4.6)	-10.2 (-7.0)	4.7

Forecast of Emission of GHG's by Sector (%)

Sector	2000	2010	2020
Energy	82.5	81.0	76.6
┌ Industry	35.1	29.8	28.4
┌ Transformation	28.5	31.7	33.1
┌ Transportation	19.9	22.6	23.3
┌ Residential/Commercial	14.6	14.9	14.4
┌ Public Sector/Etc	1.9	0.9	0.9
Industrial Process	10.3	13.4	17.5
Wastes	4.1	3.7	4.3
Agricultural/Livestock	3.1	1.9	1.6
Forestry (Sink)	-7.0	-3.1	-2.5

Forecast of Emission by GHG's (%)

Gas	2000	2010	2020
CO_2	86.4	85.7	81.4
CH_4	6.7	3.9	3.7
N_2O	2.7	3.3	4.4
HFC, PFC, SF_6	4.2	7.1	10.5

2nd Comprehensive Action Plan for Climate Change Policy

- Basic Aims
  - Less Energy Intensive Economic Structure
    - By Stimulating Energy Conservation in all Sectors
    - By Accelerating the Development of Less Energy-Intensive Industries
  - Contributing to the Global Efforts to Mitigate Climate Change, given the Existing Trends in Domestic Energy Consumption
- Policies and Measures
  - Promoting R&D on GHG Reduction Technology (Renewable Energy)
  - Integrated Management System for Energy Conservation
  - Preparation for and Utilization of the Kyoto Mechanism
  - Promoting Public Participation through Raising Public Awareness

Top-Down Modeling Effort in 2002 at KEEI

- Introducing Endogenous Technology Development
  - Modeling Interaction Between Policy Change and Technological Change
  - Integrate Competitive Technology and non-rival Technology
- Non-CO2 Gas Emission Regulation
  - To Investigate the Economic Impact of Strengthening Fuel Quality Regulation
  - To Minimize the Economic Loss through Various Measures

Thank you for your attention!

Seung Jick Yoo

sjyoo@keei.re.kr

Korea Energy Economics Institute