


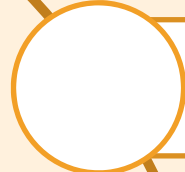
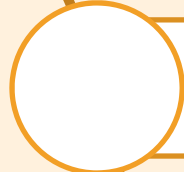
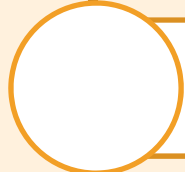
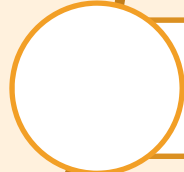
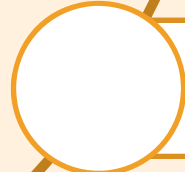
2012 Resilience and Security of Spent Fuel in East Asia
Working Group Meeting
13 April 2012 / Australian Embassy, Seoul, ROK

The ROK Energy System, Energy Policies, and the LEAP-ROK Model

Hoseok Kim

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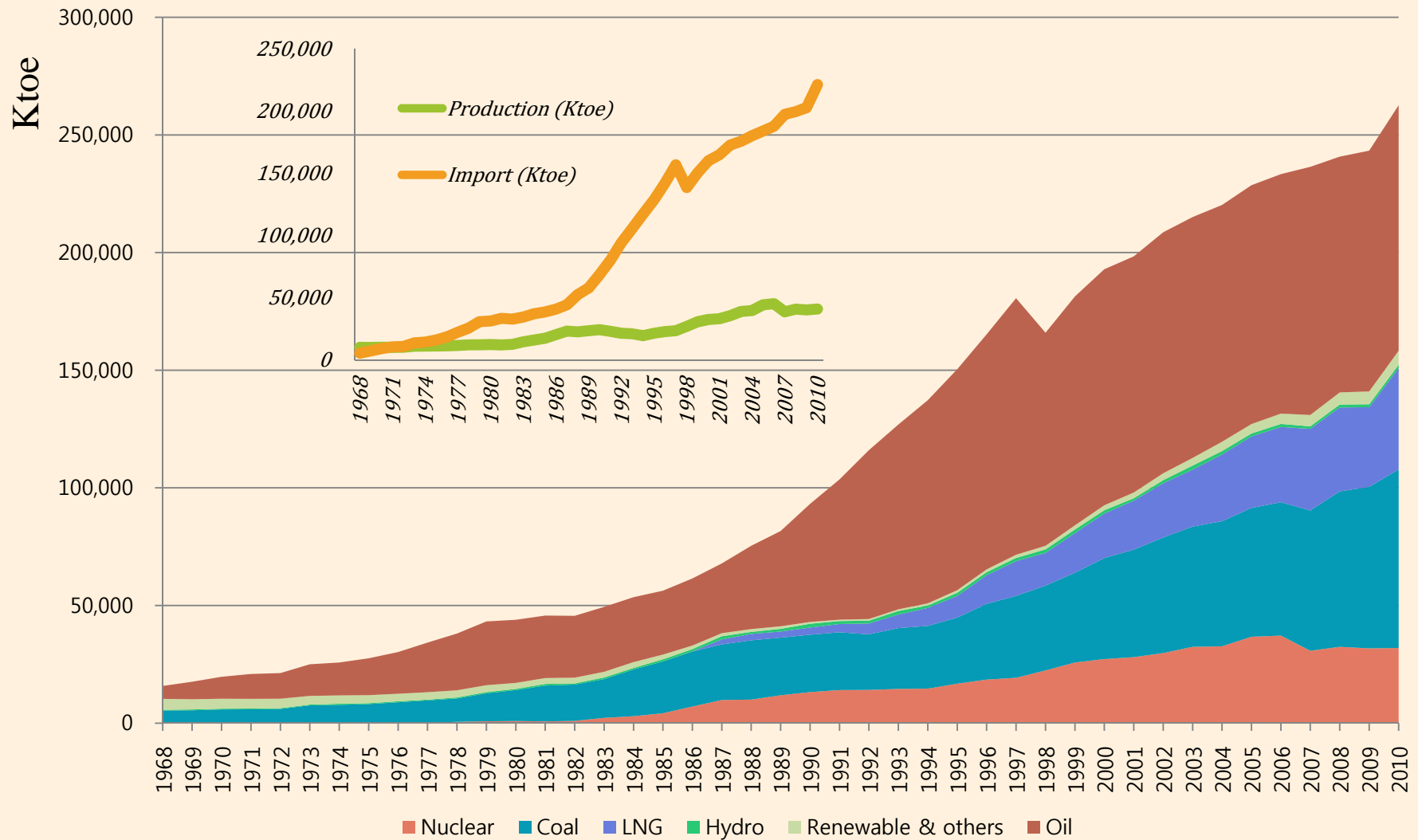
	<i>Energy sector overview</i>
	<i>The LEAP-ROK models</i>
	<i>BAU projections of ROK2010</i>
	<i>The ROK energy policies</i>
	<i>Further work</i>



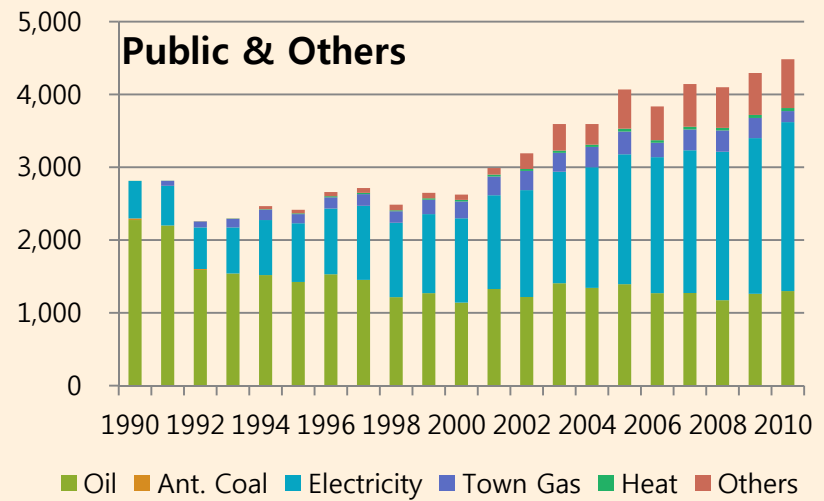
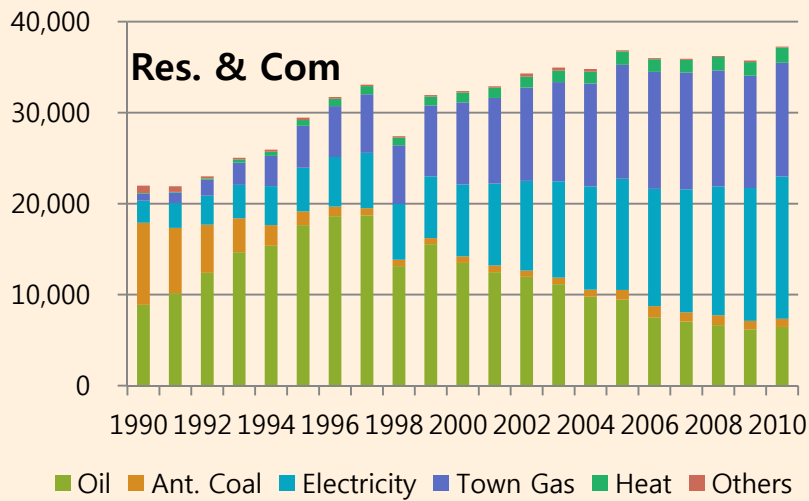
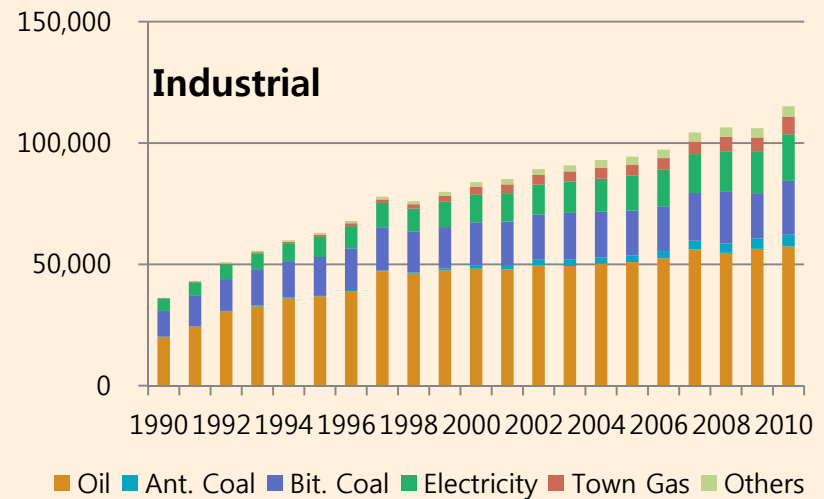
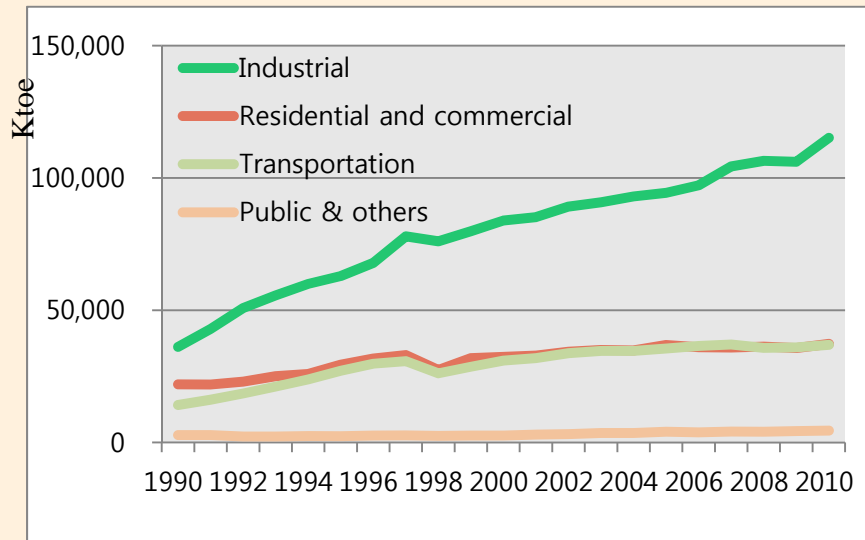
ENERGY SECTOR OVERVIEW



Total Primary Energy Supply

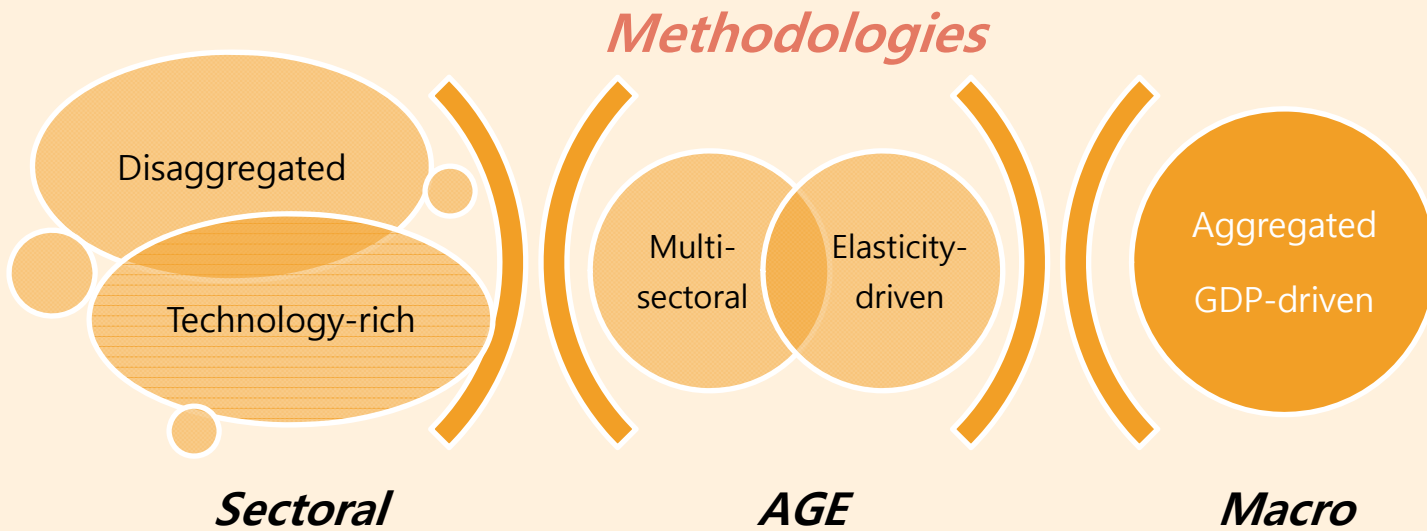
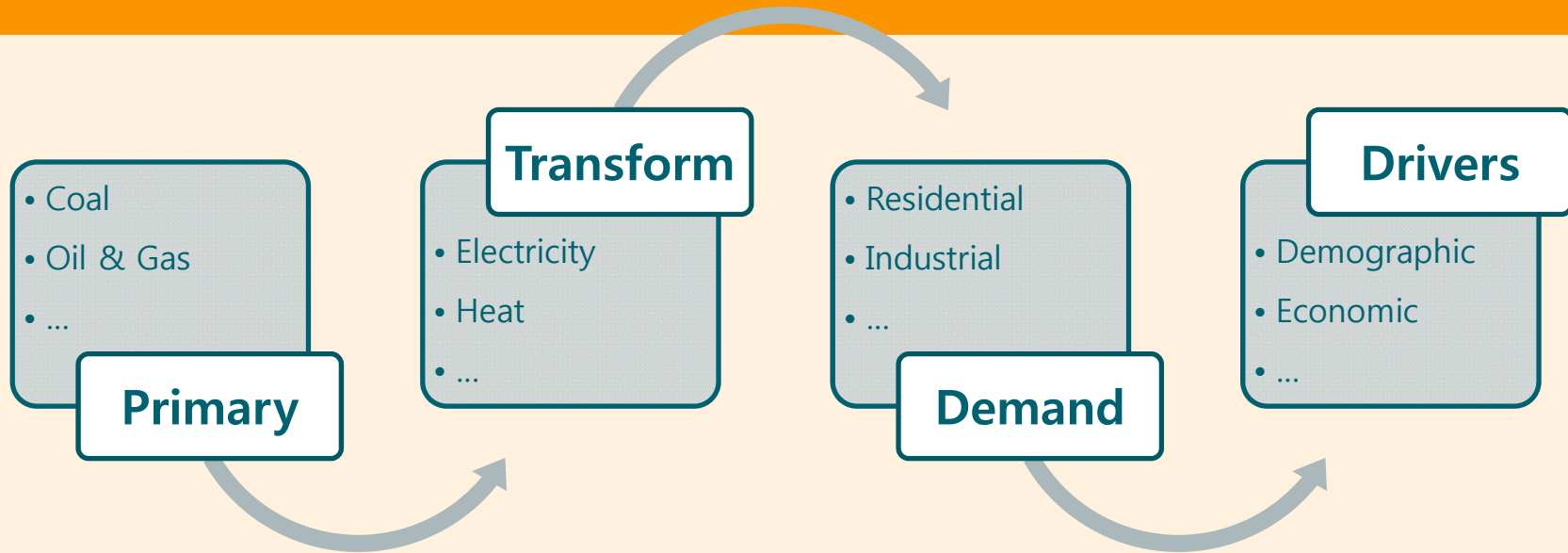


TFC by sector

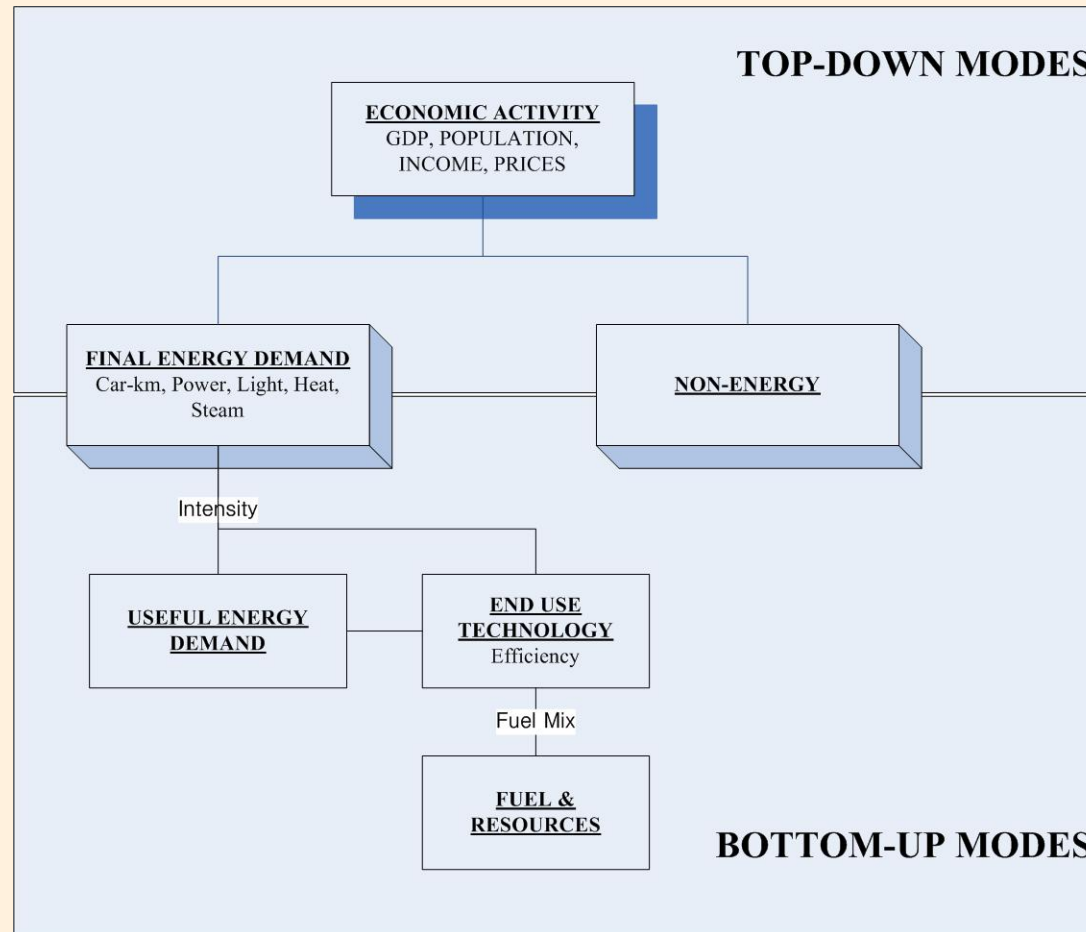


LEAP-ROK MODELS

Energy-economy modeling – structure & methods

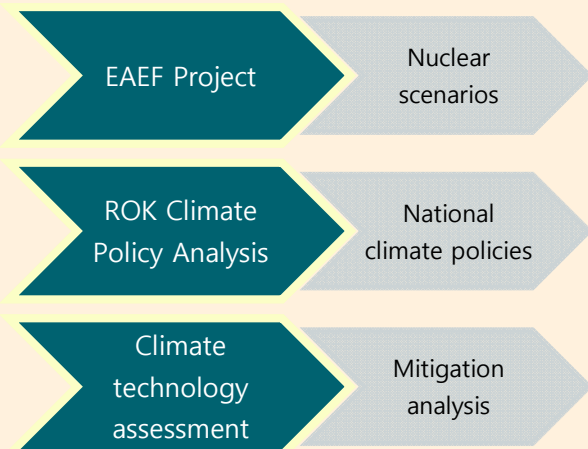


TD v. BU models



Development and Application of the ROK Model

*Application of META-Net
and LEAP for climate
policies in the early 2000s*



ROK2003: 2nd national climate action plan

ROK2004: Integrated Tech Assessment System

ROK2005: 2nd ROK NC to UNFCCC

ROK2008: Long-term energy policy

ROK2009: Decomposition

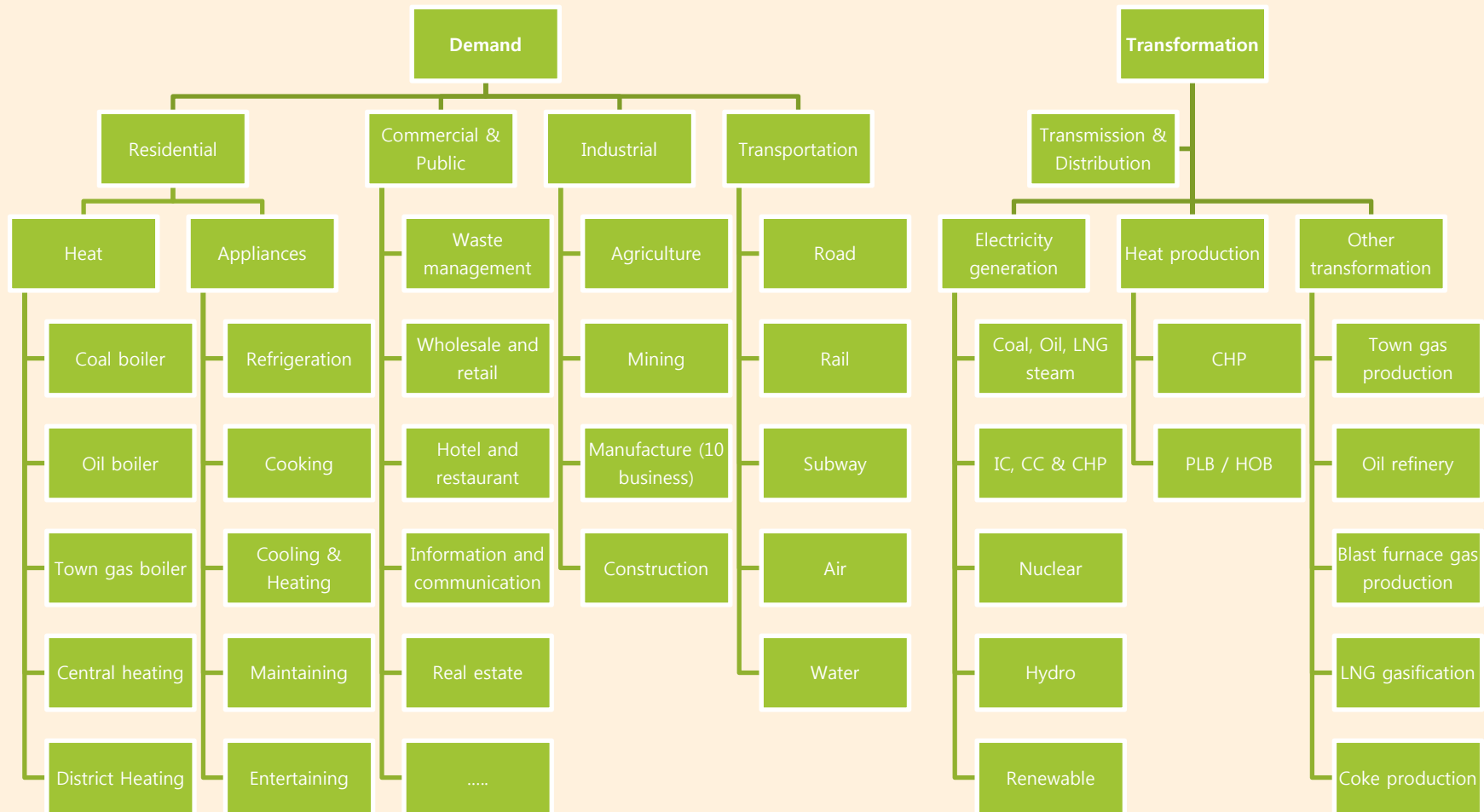
ROK2010: CCS

ROK2012 :
CCS, Nuclear, Natural gas

LEAP-ROK models

	ROK2005	ROK2008	ROK2009	ROK2010
Base year	• 2001	• 2005	• 2007	• 2008
End year	• 2001~2017	• 2005~2030	• 2007~2020	• 2008~2030
Residential	<ul style="list-style-type: none"> • Activity: households • 4 heating types • Electric Appliances 	<ul style="list-style-type: none"> • Activity: households • Aggregate intensity 	<ul style="list-style-type: none"> • Activity: households • 14 regions • 8 heating types • Electric Appliances 	<ul style="list-style-type: none"> • Activity: households • 8 heating types • Electric Appliances
Commercial and public	<ul style="list-style-type: none"> • Activity: Floor space • 10 businesses 	<ul style="list-style-type: none"> • Activity: Floor space • Aggregate intensity 	<ul style="list-style-type: none"> • Activity: Value-added • 24 businesses 	<ul style="list-style-type: none"> • Activity: Floor space • 11 businesses • Uses: Heating, Hot water, Cooling, Cooking, Facilities, generation, Lighting
Industrial	<ul style="list-style-type: none"> • Activity: Value-added • 11 industries • Energy survey data 	<ul style="list-style-type: none"> • Activity: Value-added • 10 industries • Energy balance data 	<ul style="list-style-type: none"> • Activity: Value-added • 12 industries • Non-energy uses • Energy balance data 	<ul style="list-style-type: none"> • Activity: Value-added • 12 industries • Energy Survey data
Transport	<ul style="list-style-type: none"> • By mode, ownership, type, size and fuel 	<ul style="list-style-type: none"> • By mode, ownership, type, size and fuel 	<ul style="list-style-type: none"> • By mode, ownership, type, size and fuel • 3 ownerships, 3 types, 24 size, 4 fuels 	<ul style="list-style-type: none"> • By mode, ownership, type, size and fuel • Travel distances, fuel economies
Scenarios	<ul style="list-style-type: none"> • 3rh National climate action plan 	<ul style="list-style-type: none"> • "7%" high growth scenario 	<ul style="list-style-type: none"> • Sectoral mitigation measures 	<ul style="list-style-type: none"> • BAU: Trend • Alternative: Mitigation measures

ROK2012: The Structure



Demand

Sector	Sub-sector	Activity Parameters	Fuels
Residential	HEAT: Space heating & cooling APPLIANCES: Lighting, refrigeration,	Households Dwelling types Saturation of end uses (%)	electricity, LPG, heat, coal, kerosene, town gas
Industrial	Agriculture & Fishery Mining Manufacturing Construction	GDP in industrial sector (Korean Won, or KRW) Shares of each sub-sector Energy intensity (E/KRW) Fuel share	coal, gasoline, kerosene, diesel, fuel oil, LPG, town gas, heat, electricity, naphtha
Commercial & Public	Wholesale, hotel, restaurant, ...	Floor space (m ²) Energy intensity (E/m ²) Fuel share (%)	electricity, LPG, fuel oil, heat, diesel, kerosene, town gas
Transportation	Households vehicles Mass Transit & freight	Vehicle population Shares of each vehicle type Energy Intensity (E/vehicle)	gasoline, diesel, LPG, natural gas, electricity, fuel oil

Transformation

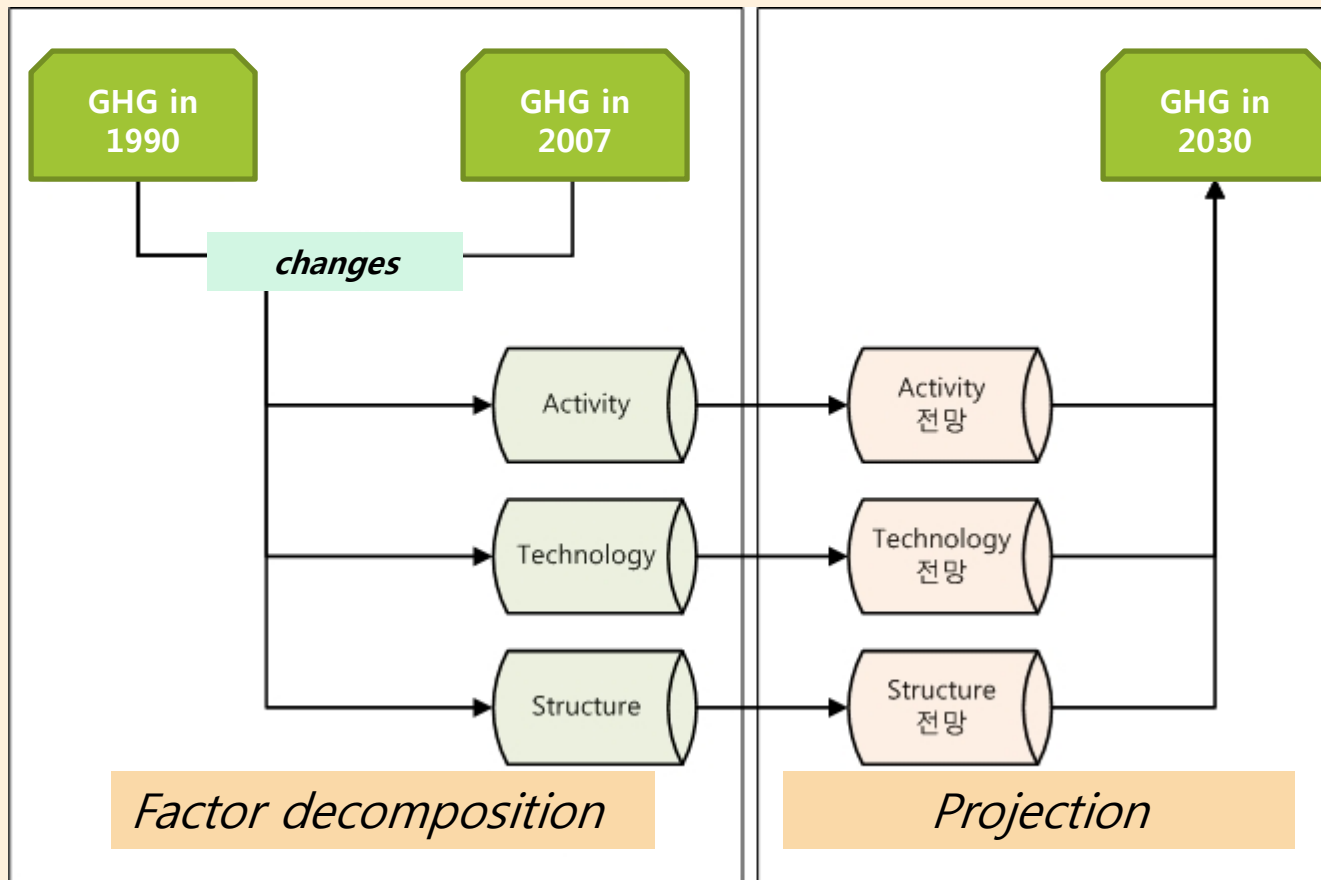
Electricity Transmission & Distribution		Losses (%)	Fuels
Electricity Generation	Coal steam	System load factor (%)	Coal
	Oil steam	Process shares (%)	Fuel oil
	LNG steam	Efficiency (%)	Natural gas
	Combined cycle	Base year output	Diesel
	CHP	Exogenous capacity	Nuclear
	Internal combustion	Merit order (base, inter mediate, peak)	Hydro
	Nuclear		
	Hydro	Fuel share (%)	
District Heating	Heat only boiler (HOB)	Efficiency (%)	Natural gas, fuel oil, town gas
Town Gas Production		Efficiency (%)	Natural gas, LPG
LNG Gasification		Efficiency (%)	LNG
Oil Refining		Efficiency (%)	Crude oil

Data sources

Sectors	Sources
Residential	Energy: Energy Consumption Survey (MKE), Survey on Electricity Consumption Characteristics of Home Appliances (KPX) Activities: National Demographic Survey (NSO)
Industrial	Energy: Energy Consumption Survey (MKE), Yearbook of Energy Statistics (MKE & KEEI) Activities: Economic Statistics System (http://ecos.bok.or.kr)
Commercial	Energy: Energy Consumption Survey (MKE), Yearbook of Energy Statistics (MKE & KEEI) Activities: Sectoral floor space information from <i>Wholesale & Retail Survey</i> and <i>Service Industry Survey</i>
Transportation	Energy: Energy Consumption Survey (MKE), Yearbook of Energy Statistics (MKE & KEEI) Activities: Fuel Economy & car sales data from KEMCO, Travel distance from Road Safety Corporation, Yearbook of Construction & Transportation Statistics (http://www.mke.go.kr)
Transformation	Yearbook of Energy Statistics (MKE & KEEI), Korea Electric Power Corporation (http://www.kepco.co.kr), Korea Gas Corporation (http://www.kogas.or.kr), Korea Coal Corporation (http://www.kocoal.or.kr), Korea District Heating Corporation (http://www.kdhc.co.kr)
Socioeconomic	Statistics Korea (http://kostat.go.kr), Bank of Korea (http://www.bok.or.kr)

BAU PROJECTION

Projection methodology



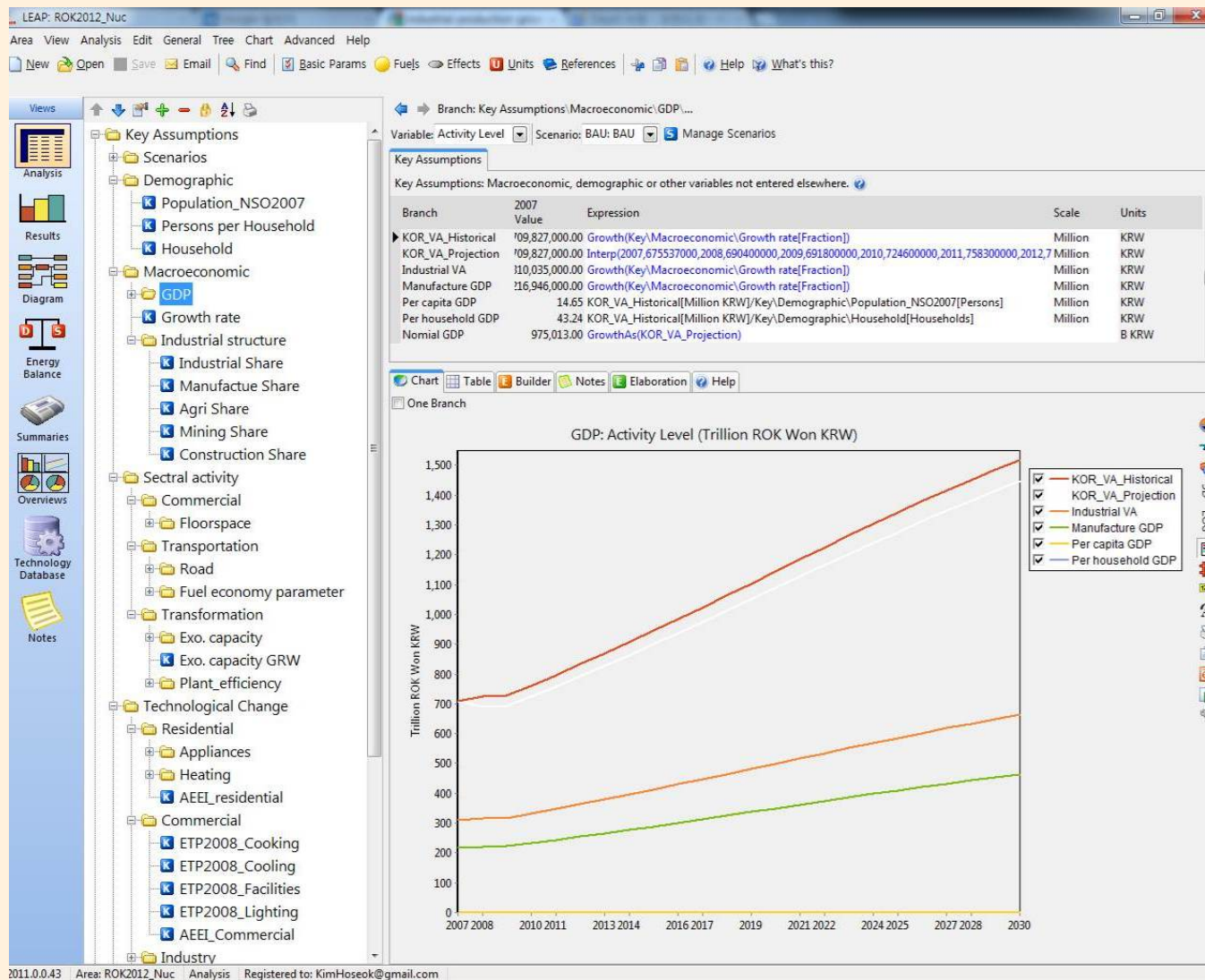
BAU Assumptions for ROK2010

	Activity	Structure	Fuel	Efficiency
Residential	<i>Trend</i> <i>KPX (appliances)</i>	<i>Trend</i> <i>KPX (appliances)</i>	<i>Trend</i>	<i>ETP2010 / AEEI</i> <i>KPX (appliances)</i>
Commercial & public	<i>Trend</i>	<i>Trend</i>	<i>Trend</i>	<i>ETP2010 / AEEI</i>
Industrial	<i>Industrial product</i> <i>ion growth rate</i> <i>5% → 2%</i>	<i>Trend</i>		<i>ETP2010</i>
Transport	<i>Trend</i>	<i>Trend</i>	<i>Trend</i>	
Generation		<i>NP</i>	<i>NP</i>	<i>ETP2010</i>
Heat		<i>NP</i>	<i>NP</i>	<i>ETP2010</i>

Note:

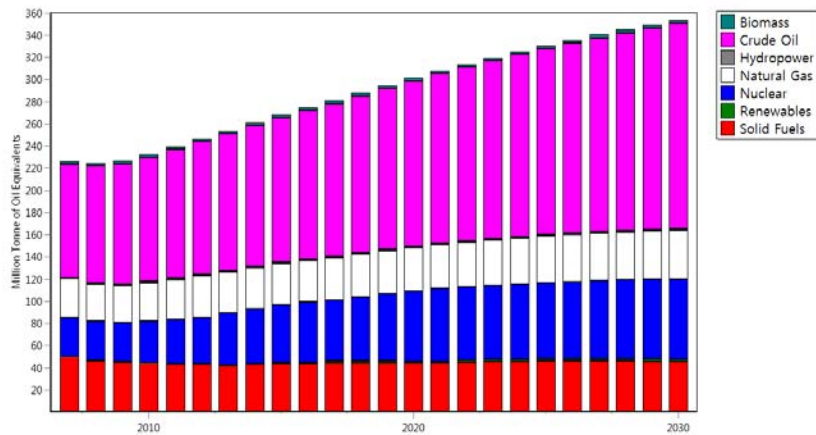
AEEI(autonomous energy efficiency improvement), ETP2010(Energy Technology Perspectives 2010), NP(national plans), KPX(Korea Power Exchange)

Managing socio-economic & tech. assumptions

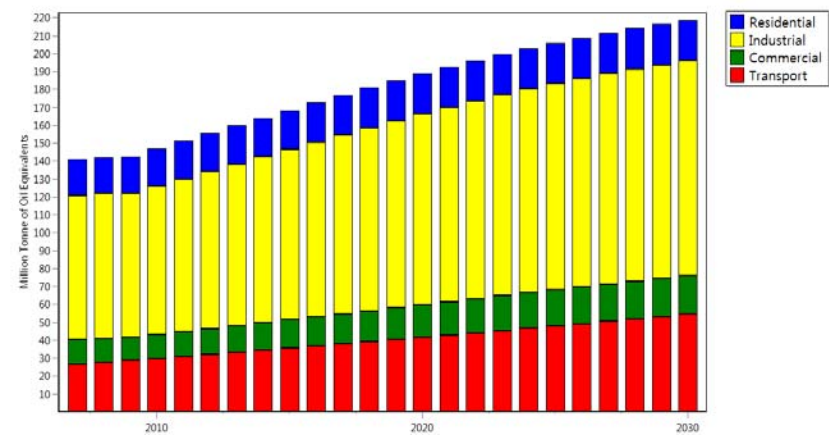


BAU projections

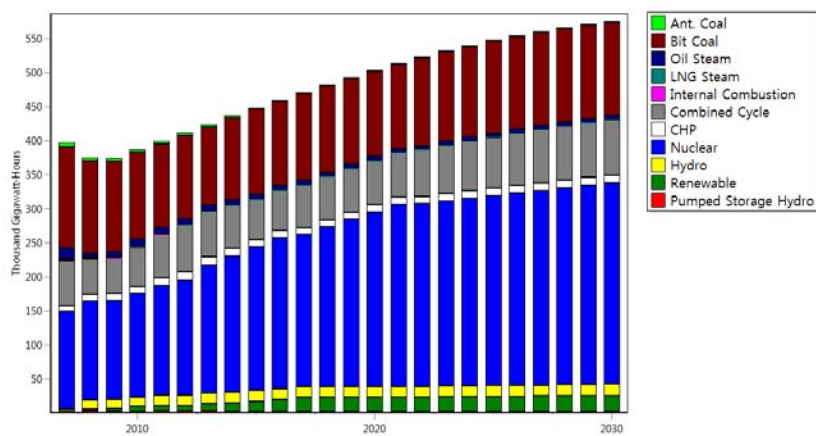
Resources: Primary Requirements
Scenario: BAU



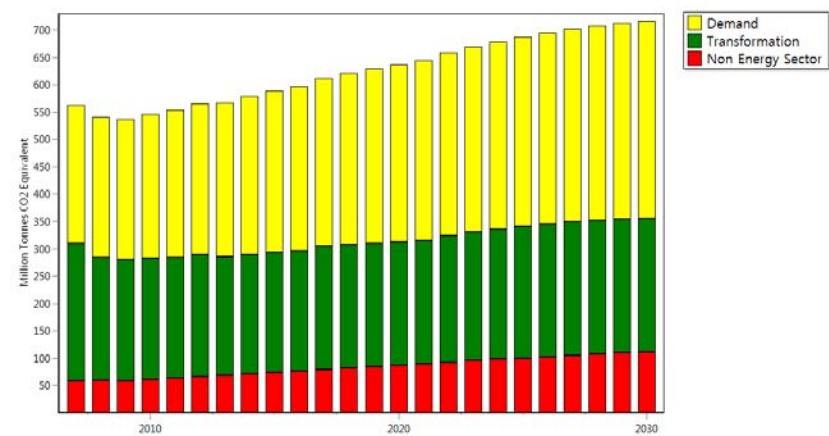
Demand: Energy Demand Final Units
Scenario: BAU, Fuel: All Fuels



Transformation: Outputs
Scenario: BAU, Fuel: All Fuels



Environment: Global Warming Potential
Scenario: BAU, Fuel: All Fuels, GHG: All GHGs



ROK ENERGY POLICIES

Overview

Energy system

- The world's tenth largest energy consumer in 2008, and with its lack of domestic reserves, one of the top energy importers in the world.
- The fifth largest importer of crude oil, the third largest importer of coal, and the second largest importer of liquefied natural gas (LNG).
- ROK has no international oil or natural gas pipelines, and relies exclusively on tanker shipments of LNG and crude oil.

Energy policy

- Energy policies in Korea have been focused on stable energy supply and demand in order to support high economic growth and improve the quality of life.
- In 1970s, energy supply policies were focused on oil while policies for establishing a stable supply and demand system, such as diversifying energy sources and expanding the energy supply infrastructure, were promoted after the second oil crisis in 1980s.
- The security of energy supply and stabilisation of prices have played central roles in the ROK energy policies.

National policy direction

Due to the increasing demand for energy and concerns on the environment, energy policies are now aimed towards ensuring sustainable development, which considers both economic growth and environmental protection.

In the future, energy supply & demand and energy prices will be initiated by privatisation and liberalisation trends and restructuring results.

The determination of energy supply & demand and energy prices in which the government previously intervened directly will be turned over to the market so that it can be controlled by the competitive market.

The government will carry out supporting roles such as taking care of outside influencing factors which the market cannot solve, including environmental protection, energy conservation and energy crises through measures such as taxes and finances.

Policy Strategies

*Energy System for
Sustainable
Development*

- Environment-friendly energy system
- Disseminating renewable energy

*Competitive Energy
Industry with
Activated Market*

- Restructuring and privatising energy industry
- Activating the function of energy price

*A leap towards a
strong country with
advanced energy
technology*

- Infrastructure for energy technology development
- Fostering energy technology-related manpower
- Promoting energy technology exports
- Strengthening financial support for energy technology development

*Energy hub in
northeast Asia with
open system*

- Strategic use of International Energy Cooperation
- Network building for energy collaboration in northeast Asia

ROK national strategy for green growth

In January 2009, the Government of the ROK responded to the deepening recession with an economic stimulus package equivalent to US\$ 38.1 billion of which 80 per cent was allocated to *more efficient use of resources such as freshwater, waste, energy-efficient buildings, renewable energies, low-carbon vehicles, and the rail network.*

In 2009, the Republic of Korea announced a *Five-Year Plan for Green Growth* to serve as a medium-term plan for implementing the *National Strategy for Green Growth* over the period 2009-2013.

With total funding of US\$ 83.6 billion, representing 2 per cent of GDP, this Five-Year Plan intends to turn the strategy into concrete and operational policy initiatives towards achieving green growth.

GG: Energy strategies and policy directions

Measures for climate change and securing energy independence

- Reduce carbon emissions → *reducing usage of coal & oil*
- Decrease energy dependence and enhance energy self-sufficiency → *lowering oil & gas prices*
- Support adaptation to climate change impacts

Creation of new growth engines

- Develop green technologies as future growth engines → *expanding renewable energy*
- Greening of industry → *improving energy efficiency*
- Develop cutting-edge industries
- Set up policy infrastructure for green growth

Improving quality of life and strengthening the status of the Country

- Green city and green transport
- Green revolution in lifestyle
- Enhance global cooperation on green growth

FURTHER WORK

Further work

*Future
work
will
focus
on*

update of the model's base year to 2010 and calibrating parameters/intensities of technology branches

developing a set of BAU scenarios of future energy system evolution

revising the socio-economic and technological assumptions for BAU projection

the analysis of the impacts of energy policy changes

Q & A