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Overview of New and Renewable Energy In Korea

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Energy Review in Korea

☐ Overview of Energy in Korea

○ Energy consumption of Korea has sharply increased since mid-1970s because of the rapid economic growth propelled by the heavy and chemical industries

○ Gross primary energy consumption : 385.1 billion kWh (2008 est.)
Country comparison to the world : 11th

○ The dependency rate on imported fuel(primary energy) : 96.6% (including nuclear energy)

☐ Annual Electricity Generation by Resources

○ Major portion in electricity generation is held by Nuclear and Coal
- Nuclear and Coal : 83.79% (‘09)

○ NRE generation has increased (Portion : 0.18%(‘05) ⇒ 1.7%(‘09))

(GWh, %)

	2003	2005	2007	2009
Nuclear	122,913	134,083	136,672	149,601
Coal	120,065	132,655	144,559	178,115
Oil	25,854	24,807	25,733	19,555
LNG	43,599	45,638	51,662	30,497
Hydro	4,504	4,504	4,106	4,106
NRE & others	**1,385**	**3,993**	**5,365**	**9,226**
Total	**318,320**	**345,680**	**368,097**	**391,100**

Goal of New & Renewable Energy

Establishing a Sustainable Energy System based on New & Renewable Energy (NRE)

Target 1

Achieve NRE deployment rate of 11% in 2030

Target 2

Industrialize NRE as a new green growth engine of Korea

Facilitate Industrialization

- Reinforce NRE certification system
- Foster export industry

Increase Dissemination

- Deploy 1 million Green Homes
- Reinforce NRE design for building
- Develop integrate technology

Expand Infrastructure

- Create NRE Fund
- Reduce regulatory barriers
- Sophisticate statistical system

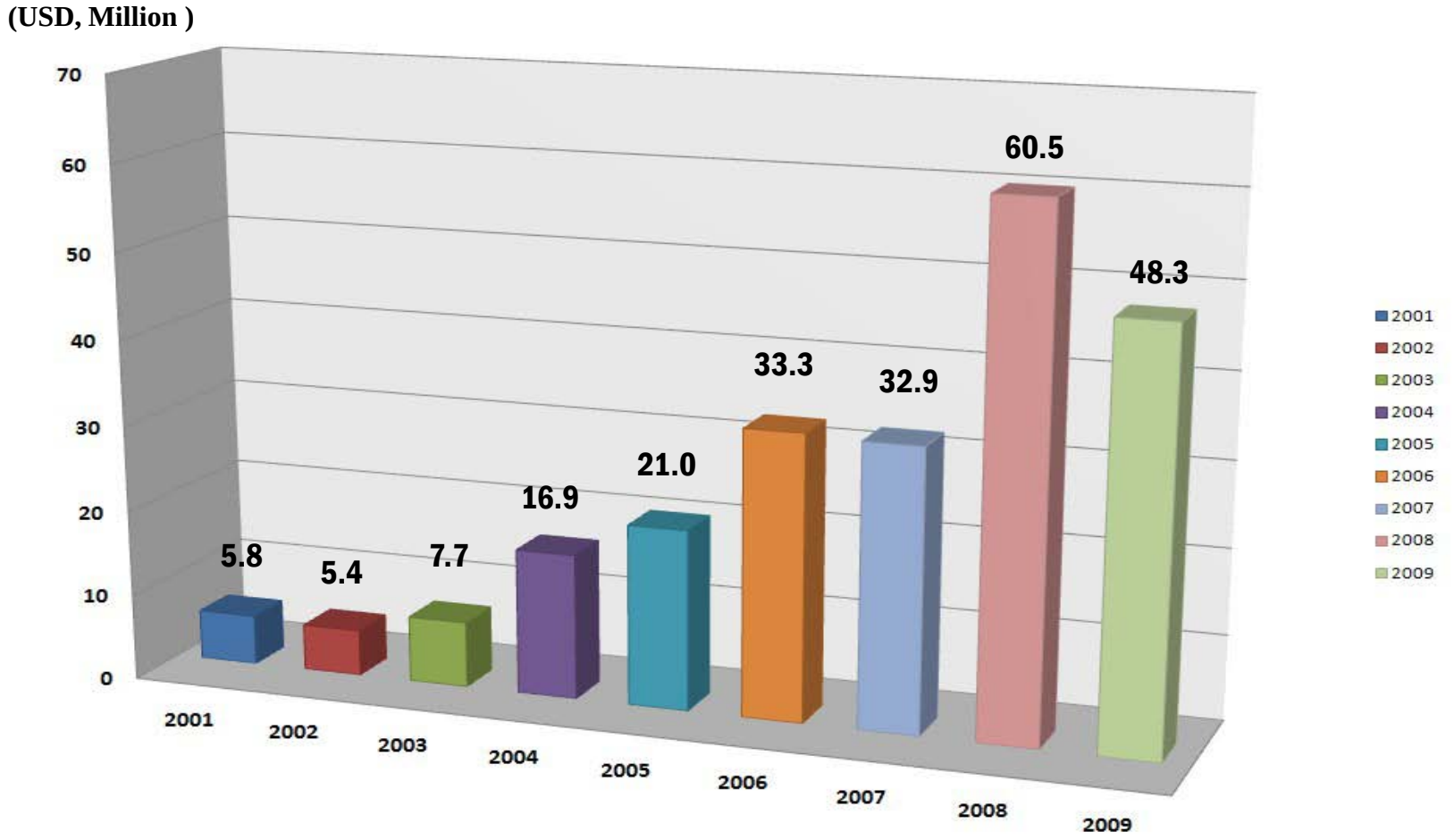
Introduce Market-Functions

- RPS
- Green Pricing
- Integrated deployment policy

Research & Development in NRE

☐ Current Status of Fuel Cell Technology R&D Support

⇒ Total $260 million support (35% of New & Renewable Energy Budget) until '09



NRE Deployment Promoting Program

☐ Million Green-Houses Distribution Policy

○ To create a million homes that use of new and renewable energy until 2020

○ Korean government has adopted fuel cell into NRE resource in 2009

☐ Regional Deployment Subsidy Program

○ To support NRE projects carried out by local governments

<Subsidy for regional deployment> **(Unit: Million USD)**

Year	'96~'01	'02	'03	'04	'05	'06	'07	'08
Subsidy	32.75	17.37	21.23	26.59	26.69	31.67	32.21	146.38

○ **10MW** of fuel cell power plant will be installed in **Makok** area, **Seoul city** in 2012 (by **Local NRE Program**)

☐ Mandatory NRE Use in Public Sector

○ Strengthen mandatory NRE use in public buildings

○ Applied to the Building built by public institutions (or enterprise)
- Regulated area : Larger than 3,000m^2
- Regulated capacity : More than 5% of total construction cost

○ Fuel cell is appropriate NRE to apply public buildings like school, city hall, and hospital etc.

☐ Loans and Tax Incentive Program

○ Long-term, Low-interest Loans for the customers or manufacturers of commercialized Fuel cell (NRE)

○ Tax deduction system for invest fuel cell power plant (as energy saving plant)
- Corporate tax is refunded up to 20% of total investment amount when a company

○ Tariff reduction on the imported Fuel cell (classified into New & Renewable Energy)

Local Plan for Promoting NRE

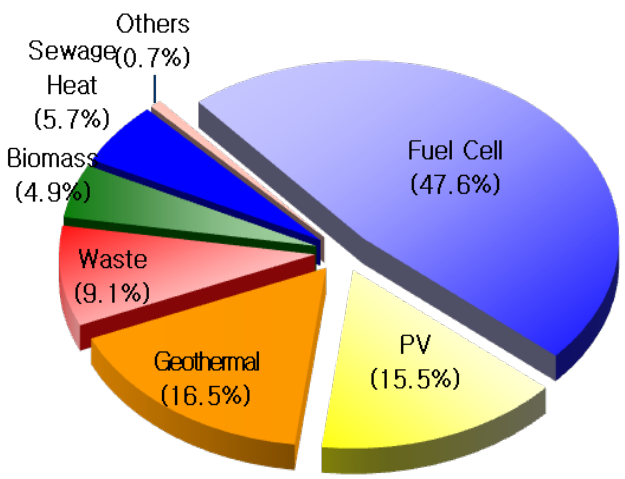
☐ Seoul City, 『Seoul Low Carbon • Green Growth Master Plan』 (Jul '09)

- Mission : Aggressive Dissemination of Metropolitan Clean Energy

Vision — Global Leader City for Green Growth 'Seoul'

Major Goals — Enviro-Friendly | Green Growth | High Flexibility

[Clean Energy Use by 2030]



[Summary & Methodology]

- **Install FC Power Plant of 600MW for Apartment, Buildings, District Heating**
  - 100MW to Apart/Build, 500MW to CHP
- **Enhance current Regulatory Frameworks**
  - Require FC installation within Newtown
  - Place quota to heavy energy consumers
  - Mandatory Installation of FC in Public Building

※ **Seoul would be the first city to select & focus Fuel Cell Power Plant for Metropolitan as the Clean & Low Carbon Energy Solution**

NRE Utilization Promotion Program

□ Feed-in Tariffs (FIT)

○ To compensate for differences between the electricity generation costs of NRE and SMP (system marginal price) to promote the production and use of NRE

○ The standard prices for NRE, initially formulated in 2002

○ In FIT, **50MW**capacity is allocated to Fuel cell until '11 (before RPS)

- FIT support period : 15 years

※ Korea govn't subsidize gross amount of $1,395 million for 15yrs in fuel cell FIT

< Standard Prices of Power Source >

	Applicable Capacity	Fuel Classification	Standard Price (US cents /kWh)	Remarks
			Fixed	
Fuel Cell	Over 200kW	Biogas	19.5	Decremented annually by 3%
		Other fuels	23.5	
Wind Power	Over 10kW	-	9.12	Decremented annually by 2%
Solar PV	-	-	30kW Under(Over) : 47.2 (42.7)	Announced every year

< Total Subsidy Amount of Fuel Cell > **(USD, Million)**

Year	FIT (US cents/kWh)	Applied Capacity (MW)	Average SMP (US cents/kWh)	FIT-SMP(α) (US cents/kWh)	Annual Subsidy
2008	23.55	8.05	10.23	13.32	8.5
2009	22.84	12.0	9.45	13.39	12.6
2010	22.15	14.0	8.00	14.15	15.6
2011	21.49	16.0	8.42	13.07	10.6

□ Renewable Portfolio Standard (RPS)

○ Korea's RPS is enacted in 2012

○ From 2% of total generation in '12, weight of New & Renewable Energy will be expanded

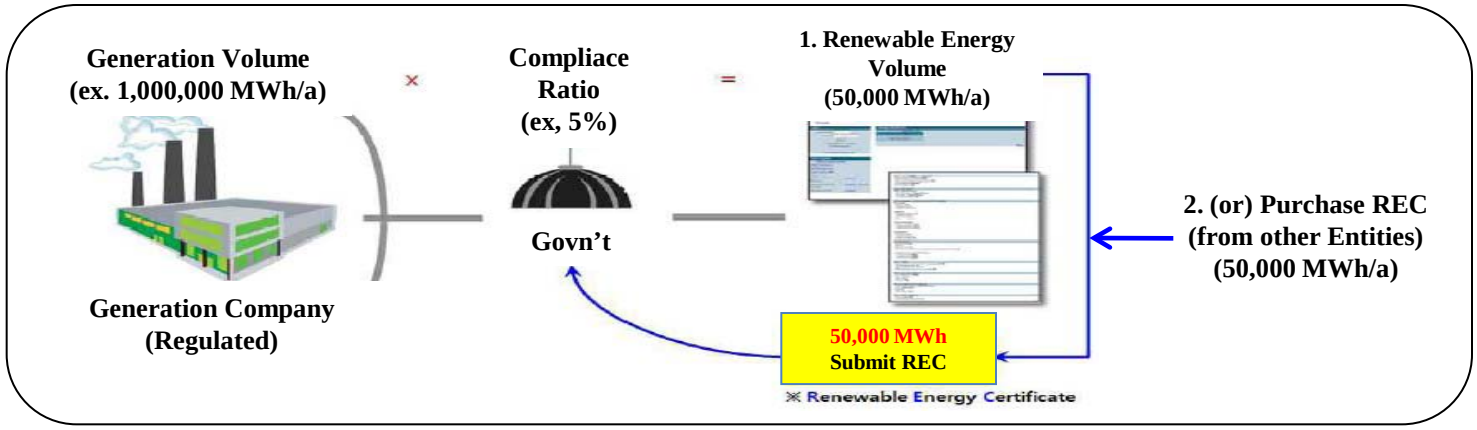
※ Gross NRE Compliance Ratio: 2%('12) ⇒ 4%('16) ⇒ 7%('19) ⇒ 10%('22)

○ Each resource has its own multipliers

- Multiplier will mitigate the gap of economics among the all NRE resources.
- NRE Generators (not regulated) are able to sell REC times resources' own multiplier

Type		Multiplier	Resources
New and Renewables	Tier 1	0.25	IGCC
	Tier 2	1.0	Tidal, RDF, Hydro, Wind(on land)
	Tier 3	**2.0**	**Fuel Cell**

○ Compare to other countries' RPS resources, Korea adopt fuel cell and grant highest multiplier



< Basic Concept of Korean RPS >