

NRE Policy of Korea and Cooperative Proposal

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**KOREA ENERGY
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1

Energy Situation & The Green Growth



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Korea's Energy Status

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High Dependence on External Sources of Energy (96.5%)

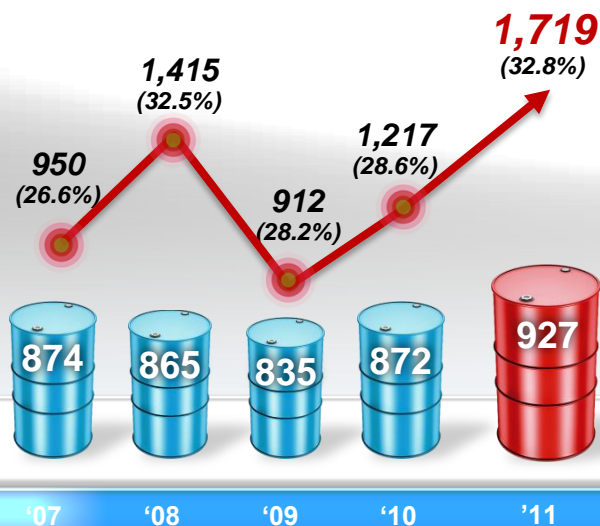
- **Very limited supply of indigenous natural resources**
- **Surge in energy demand driven by high economic growth**
(world's 10th largest energy & 8th oil consuming country)
- **Cost of energy imports reached \$171.9 billion in 2011 (32.8% of total imports)**
(crude oil \$100.8 billion, LNG \$24 billion, coal \$18.5 billion)



Energy Imports (Based on total imports)

crude oil imports
(million bbl)

hundred million \$



\$171.9 billion
(Energy)



\$91.8 billion
(Exports of Car + Semiconductor)

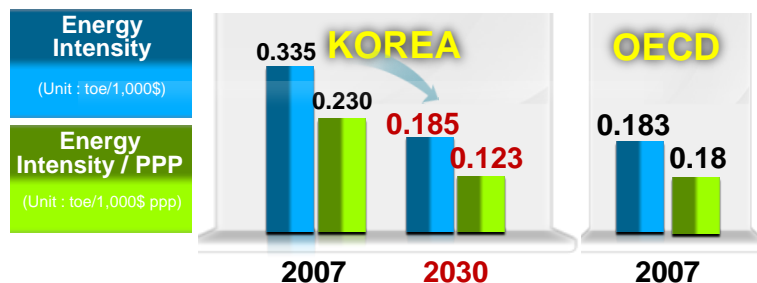


National Energy Plan 2030

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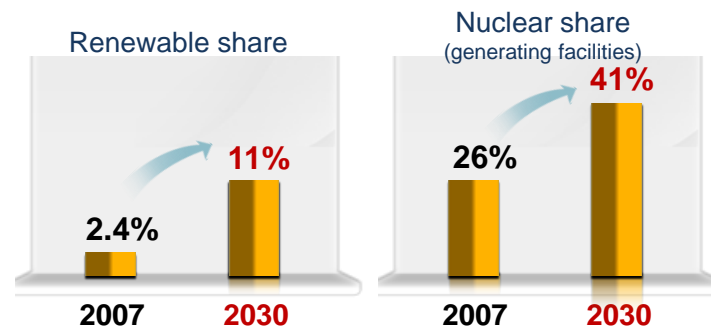
Low Energy Consumption and Low Carbon Society

- Drastically improve energy intensity in Korean economy (Improving 46% by 2030)



Fossil Fuel-free Society

- Moving away from a fossil fuel dependent energy system



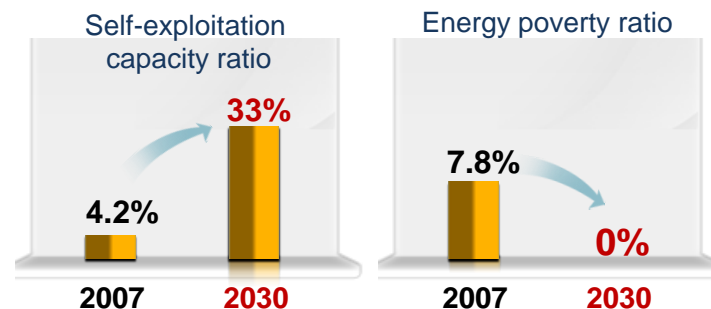
Industrialization for Green Energy

- Promote green energy industry by developing advanced technologies

Competitiveness of core energy technology :

60% → World Best

Energy Independence and Energy Welfare



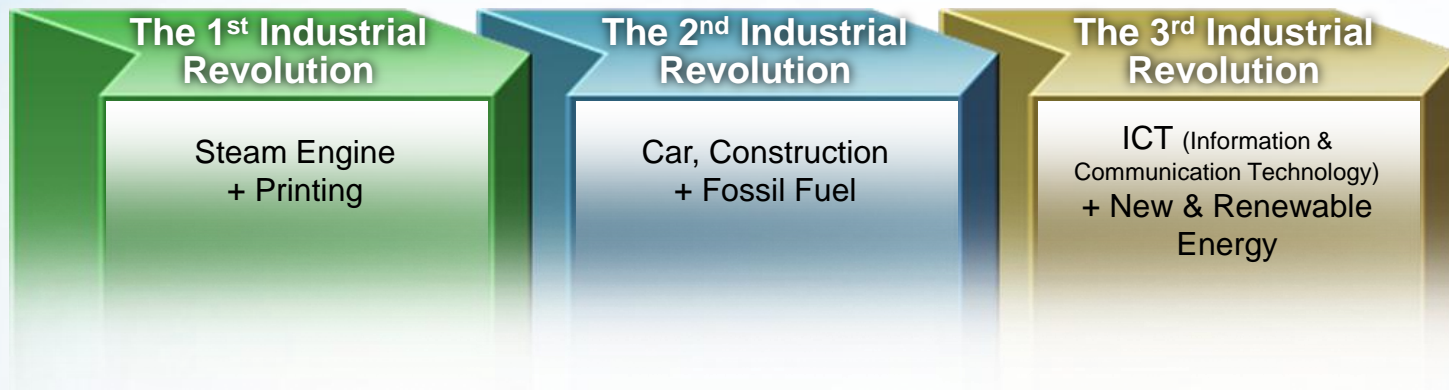
The 3rd Industrial Revolution - Changing Paradigm of Development

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3rd Industrial Revolution

• The Era for Fusion of New & Renewable Energy and ICT

* Ref : Jeremy Rifkin - The Third Industrial Revolution



• 5 Main Topics of the 3rd Industrial Revolution

- Shifting from fossil fuel(oil, coal) to new & renewable energy(PV, Wind etc)
- Generating electricity from all buildings through new & renewable energy
- Saving energy effectively from new & renewable energy via Energy Storage System
- Sharing energy through smart grid system using internet
- Shifting to Fuel Cell Vehicle and Net Metering



2

Korea' s NRE Policy



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Achievements in NRE

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Strong Government
Support

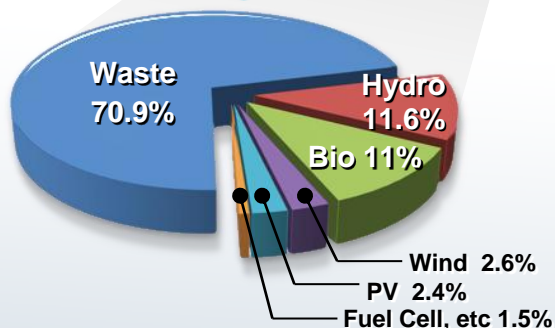
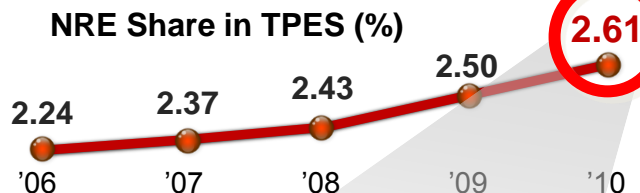
Active Participation
by Manufacturer,
People

Nurturing Industrial
Eco-system and
Creating Market

Increasing NRE Share Ratio

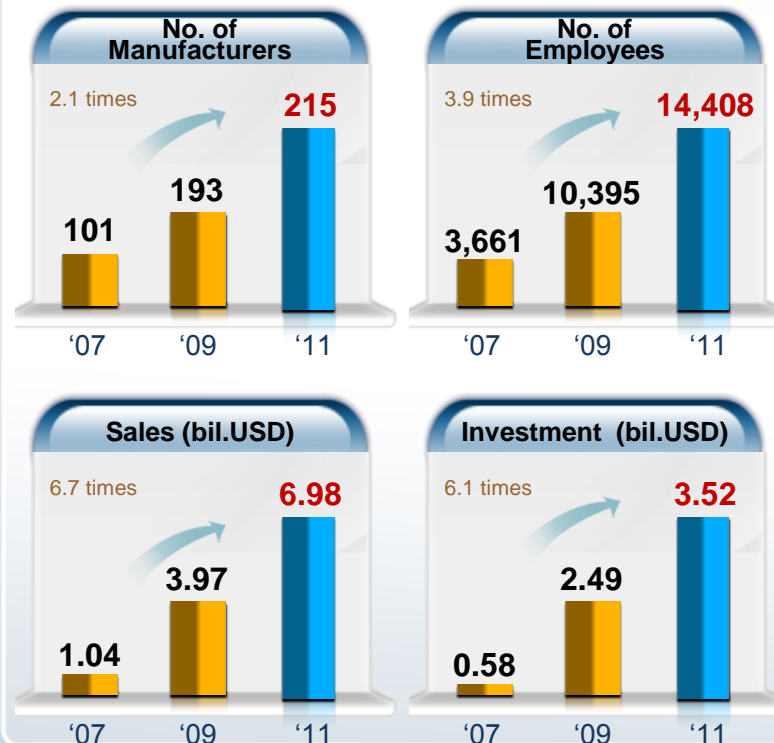
Annual Growth Rate : 7.0% ('06~'10)

NRE Share in TPES (%)



< Breakdown of NRE share (2010) >

NRE Industries Nurturing



NRE Vision in Korea

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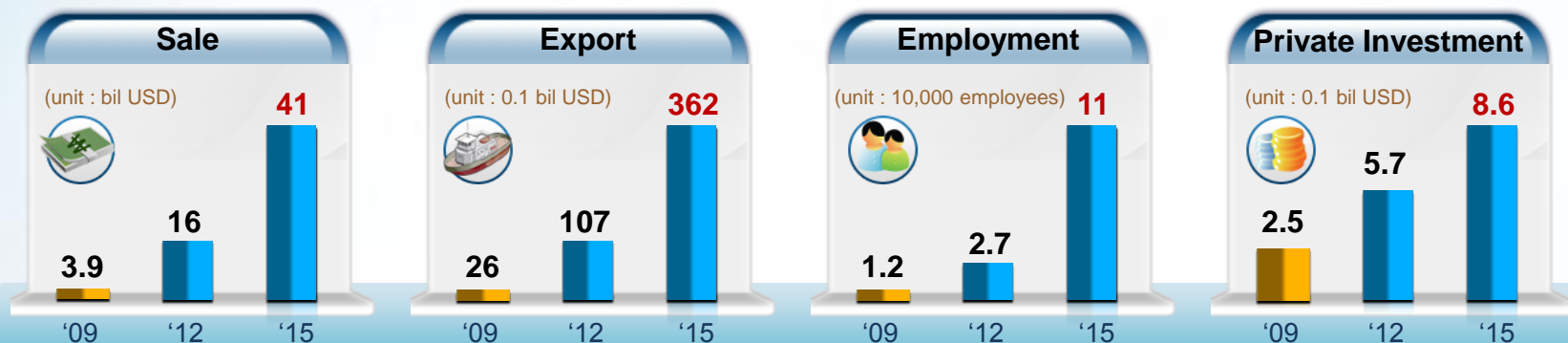


Dissemination
Target (2030)

NRE Shares in TPES by **11%** (2.6% in 2010)

Industrialization
Target (2015)

To be the world's **top 5 powerhouse** in NRE market



Implementing strategies

- 1** Strategic R&D & Commercialization
- 2** Market Creation to stimulate Industrialization
- 3** Facilitating Export-oriented Industrialization
- 4** Strengthening Growth potential

Investment of 40trillion KRW(36.3 bil USD) will be invested in NRE by public(7tril) and private(33tril) sectors until 2015

Major Renewable Energy Policies

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Market Creation Programs through Generation, Heat and Transportation

Generation

RPS (Renewable Portfolio Standards, 2012)

- To realize national target, 11% of NRE share in TPES, launched in '12
- 13 Mandatory power companies with capacity of more than 500MW
- 2% ~ 10% of total power generation must be generated by NRE, expecting market creating about 41 bil USD

Heat

RHO (Renewable Heat Obligation, 2015 ~)

- Newly built buildings' (total floor area more than 10,000m²) energy demand should be met by renewable heat sources.
- Solar thermal, Geo thermal and Bio etc (Multiple sources are under consideration)

Transport

RFS (Renewable Fuel Standards, 2014)

- Bio fuel mix obligation with gasoline and diesel fuel for transportation
- BD2 is in operation from 2012

Renewable Energy Support Program

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- **[One million Green Homes]** Renewable energy supply for domestic housing
- **[General Deployment]** Installation subsidies for new technology and commercialization
- **[Local Deployment]** Establishment of eco-friendly local supply system
- **[Soft Loans]** Support installation and manufacturing companies

**Subsidy
& Loans**

- **[Certification]** Renewable equipments certification standards for durability and efficiency
- **[Test-bed]** Providing testing types and infrastructure
- **[Overseas]** Market investigation, project excavation, and training & education

**Foster
Infrastructure**

- **[Mandatory Scheme for Public Buildings]**
Public buildings newly built or renovated (floor area 1,000m²) should invest in NRE facilities

**Market
Growth**

3

Energy Fusion Future Plan



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Energy Fusion Future Plan

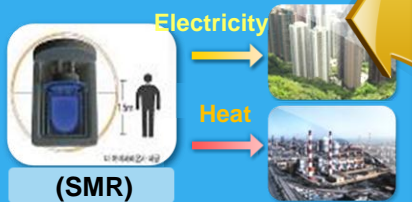
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Concept of Energy Fusion

**“Combining the advantages of Nuclear Energy and NRE
and mitigating their disadvantages (Creates synergy effect)”**

Conducting the Community
Energy Supply System (CES)
project via Small Modular
Nuclear Reactor (SMR)

→ SMR is a tenth of the size of
that of typical nuclear reactor



Nuclear Energy

Advantage

- Little greenhouse gas emission
(Nuclear power: 10g/kWh)
- Beneficial to energy security
(Nuclear power market is relatively stable)
- High economic feasibility
(Power generation unit cost: \$29–82/MWh)

Disadvantage

- **May be risky**
(Safety problem)
- **Concerns about waste disposal**
- Expensive construction

NRE

Advantage

- Low greenhouse gas emission
(Solar power: 57g/kWh, wind power 14g/kWh)
- Eco-friendly, small-scale adoption
- Expected to rapidly grow in world market

Disadvantage

- **Low economic feasibility**
(Power generation unit cost: \$48–600/MWh)
- Intermittent operation caused by weather conditions
- Expensive construction

Introducing large offshore
wind power that can secure
economic feasibility

* About 2.5 GW (~2019)



* Note: Unit cost of power generation by energy source (\$/kWh)

Nuclear Power	Coal	Natural Gas	Wind Power	Solar Power
0.03–0.08	0.05–0.12	0.07–0.10	0.05–0.16 (Land), 0.1–0.18 (Offshore)	0.21–0.60

※ Reference: Projected Costs of Generation Electricity (2010), IEA

What's the solution to minimize disadvantages?

Technology and Development Research

Nuclear Power Energy

- Develop future technology and expand research base
- Technology research to improve safety of nuclear power plants
- Research on nuclear fuel and waste disposal (for low- and intermediate-level waste)



NRE

- Research on NRE materials/parts and R&D technologies
- Research on cooperation link between NRE test bed (photovoltaic power / wind power) and demonstration complex



Energy Fusion

- Technology research on hydrogen generation and process (fuel cell) of nuclear power by using ultra high-temperature reactor
- Research on nuclear power plant related technologies and energy fusion in various ways (such as NRE, BT, NT, and IT)
- Research on smart grid

International Cooperation Activity

Int'l Technology Exchange

- Promote int'l joint research on improving nuclear power plant safety and reprocessing radioactive soil
- Research on joint certification system in NRE field and Northeast energy network

Strengthen Manpower

- Build network to foster professionals in energy fusion
- Foster experts in nuclear power plant and NRE fields

Promotion of Int'l Cooperation

- Promote int'l cooperation according to the cooperation agreement on nuclear energy
- Hold conferences with multilateral bodies (e.g. IEA, WB, ADB, UNEP)
- Support peer review of nuclear power plants via international organizations such as the IAEA

Movement for Global Green Industrialization

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“Evolution of civilization depend on cheap energy,
so we need to get to net **zero CO2**, not only low carbon.

- Bill Gates -



Investment renewables for ‘**own electricity procurement**’

- 1 Getting To Zero : efficiency of Google Data Centers and offices
- 2 Beyond Zero : Invest and support to renewable energy



Movement for Global Green Industrialization

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“Renewable energy will get synergistic effect with IT business. So, we need a **long term investment for renewable energy**.

-Masayoshi Son, CEO of SoftBank -



- Devoting 1 billion yen to establish ‘Natural Energy Foundation’
 - 80billion yen investment plan for national PV plants in Japan
 - Mongolia natural energy development business based on Korea-Japan partnership
 - Hanhwa, entering Japan PV market to supply PV module to SoftBank
- ➡ **Asia Super Grid**

4

Asia Super-Grid



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Necessity for Super Grid Interconnection

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Northeast Asia 6 countries would get complementary advantages in economic, financial, and energy resources technology sectors

- Rich resources(Russia, China) vs. Poor resources(Korea, Japan)
- High demand for electricity(China, Korea) vs. Surplus electricity (Russia)
- New power plants approval issue(Korea, Japan)
- Large-scale energy resources availability(Russia, China)

Expected Results

Economy

Effective use of natural resources, flexible selected power generation's location

Environment

Utilization of eco-friendly resources, new NRE power plants development

Reliability

Mutual power management for blackout and power qualities control

International Cooperation

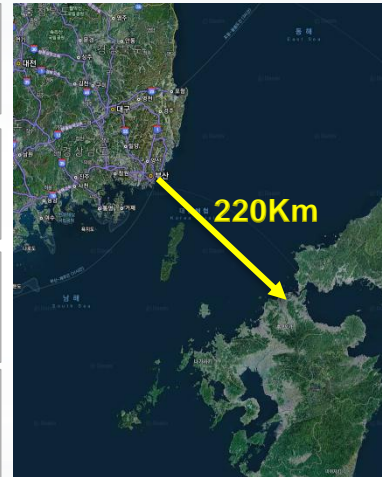
Expanding South and North's exchanges and possible cooperation

Korea-Japan Grid Connection Project (tentative)

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Based on the international undersea cable network, Super Grid project would be able to expand from renewable energy to other resources.

Length of Track	220km (Busan ~ Fukuoka)
Operation	500kV, 3GW (about 5 years for construct)
Investment	200million \$ (50 million \$ for transfer, 150 million \$ for cable)
Business Promotion	SPC foundation (private investor 60%, Korea-Japan each 20%)



Sharing electricity demand peak, developing HDVC technology, and creating profits by trading electricity power has both advantages and barriers

* Political issues, critical public , financial procurement etc.

Priorities are exchanging opinions and forming consultative group before business promotion

Thank you very much

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