Energy Transition in Korea

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Biography

Education

- 1985 : B.S. in Dept. EE, Seoul National University
- 1993 : Ph.D. in Dept. EE, Ohio State University

Experience

- 1993~1997 : Professor, JBNU
- 1997~ : Professor, SNU

Prof. Seung-Il Moon

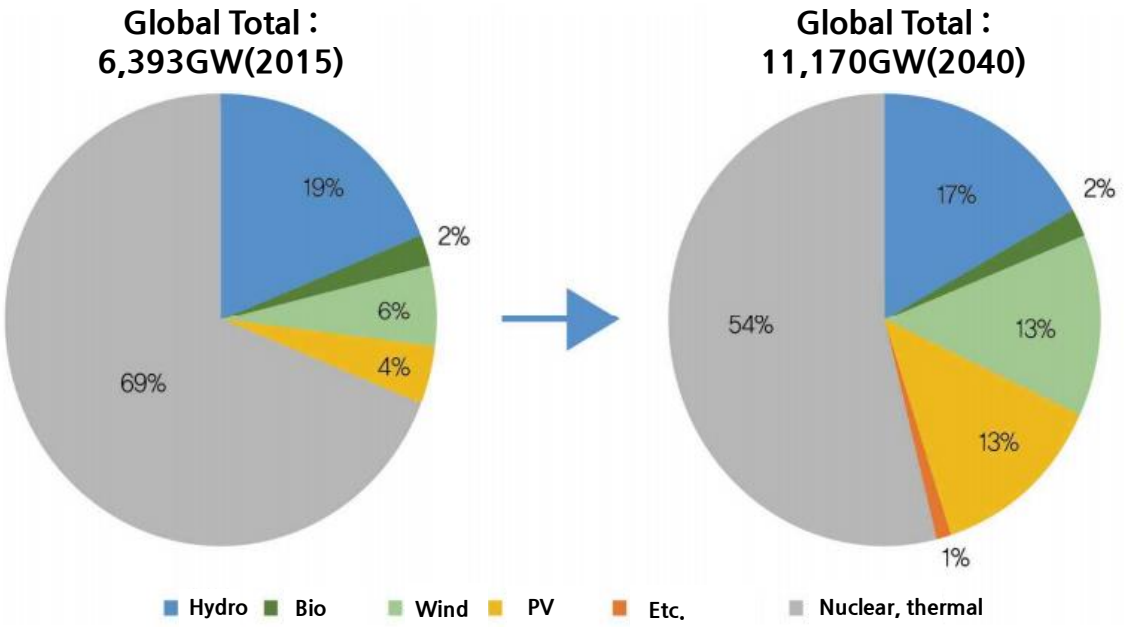
Professional Activities

- 2015~2016 : President, Korea Electrical Engineering & Science Research Institute
- 2013~ : Member, Committee on Green Growth
- 2014~ : Member, National Energy Committee of Korea
- 2015~ : Chairman, Electric Power Policy Committee of Korea
- 2018~ : Senior Member, National Academy of Engineering of Korea
- 2019~ : Director, Seoul National Univ. Electric Power Research Institute

Global Energy Transition Trends

Global Renewable Energy Generation Capacity by 2040 : 5,170GW

- **60% of new power plants are expected to be renewable energy sources in 2014 ~ 2040**



[Proportion of generation facilities in 2040]

[Source : IEA, World Energy Outlook]

Status of Energy Environment in Korea

Low RE generation ratio

PV/Wind generation ratio (‘17)

- Korea : 1.88%
- World average : 6.68%
- OECD average : 9.44%

21st place among 21 major OECD countries

Serious environmental problem

High GHG emission growth rate (‘16 → ‘17)

- Korea : 4.6%
- World average : 2.1%
- OECD average : 1.3%

7th place among 21 major OECD countries

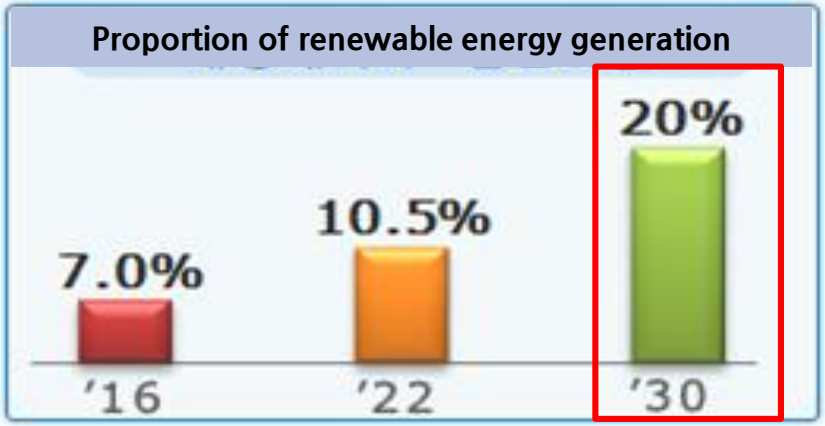
Developing ‘Sustainable’

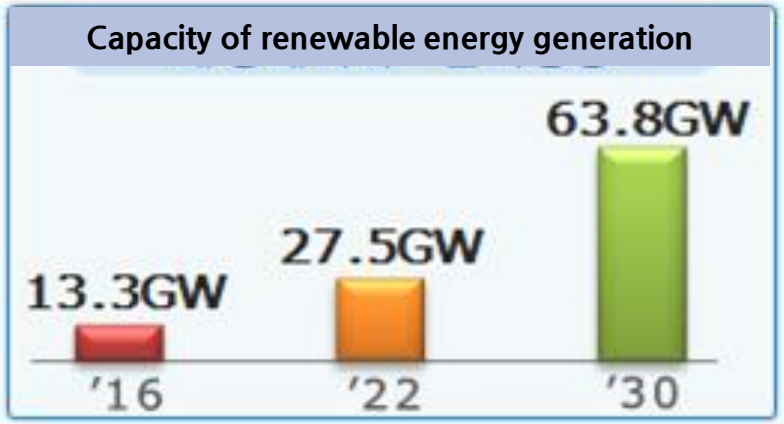
New Energy Infrastructure

[Source : Global Energy Statistical Yearbook 2018]

Renewable Energy 3020 Plan of Korea

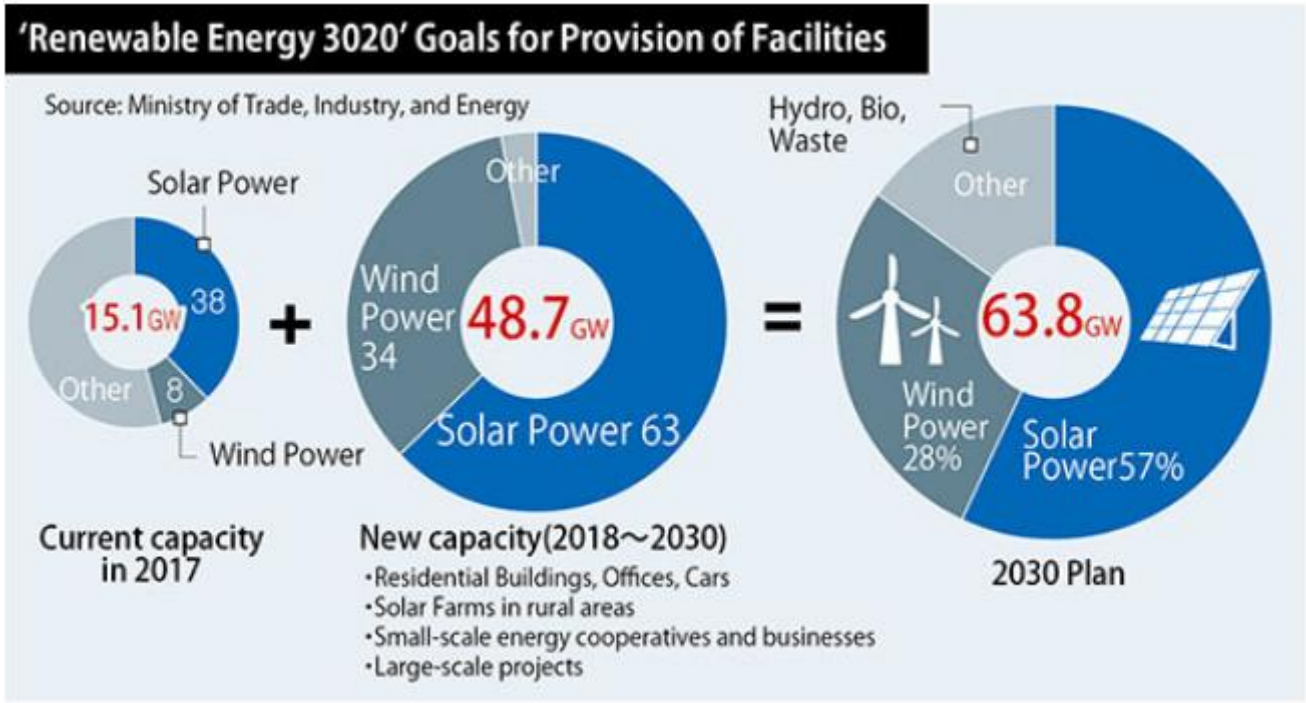
- **National Goal : 20% of Electric Power Generation from Renewable Energy by 2030**





Renewable Energy 3020 Plan of Korea

- **New Plan : 95% of the New Capacity**
  → **Clean Energy(PV, Wind, …)**



The 8th National Plan for Electricity Supply in Korea

Energy Mix Plan (2017~2030)

- **Nuclear**

'17	'22	'30
24Gens(22.5GW)	27Gens(27.5GW)	18Gens(20.4GW)

- **Coal**

'17	'22	'30
61Gens(36.8GW)	61Gens(42GW)	57Gens(39.9GW)

- **Renewable Source**

	'17	'22	'30
Rated Capacity	11.3GW	23.3GW	58.5GW
Effective Capacity	3.1GW	4.8GW	8.8GW

- **LNG**

'17	'22	'30
37.4GW	42GW	44.3GW

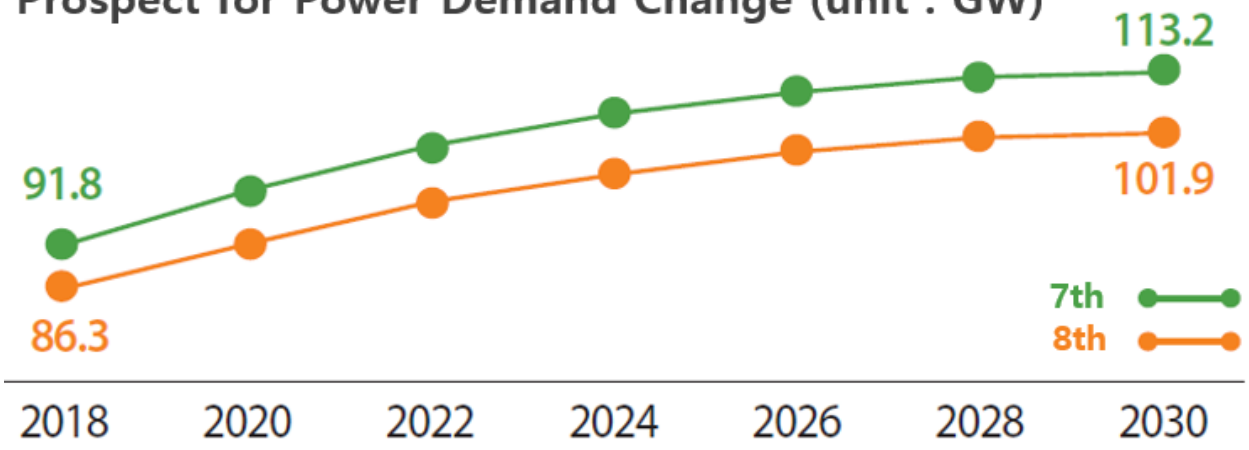
The 8th National Plan for Electricity Supply in Korea

Prospect for Power Demand Change

Prospect for GDP Growth Rate (unit : %)

	2017	2020	2025	2027	2029	2031	Average
7th	4.0	3.7	3.0	2.8	2.5	–	3.4
8th	2.6	3.4	2.3	2.1	1.9	1.6	2.5

Prospect for Power Demand Change (unit : GW)



The 3rd National Energy Plan of Korea

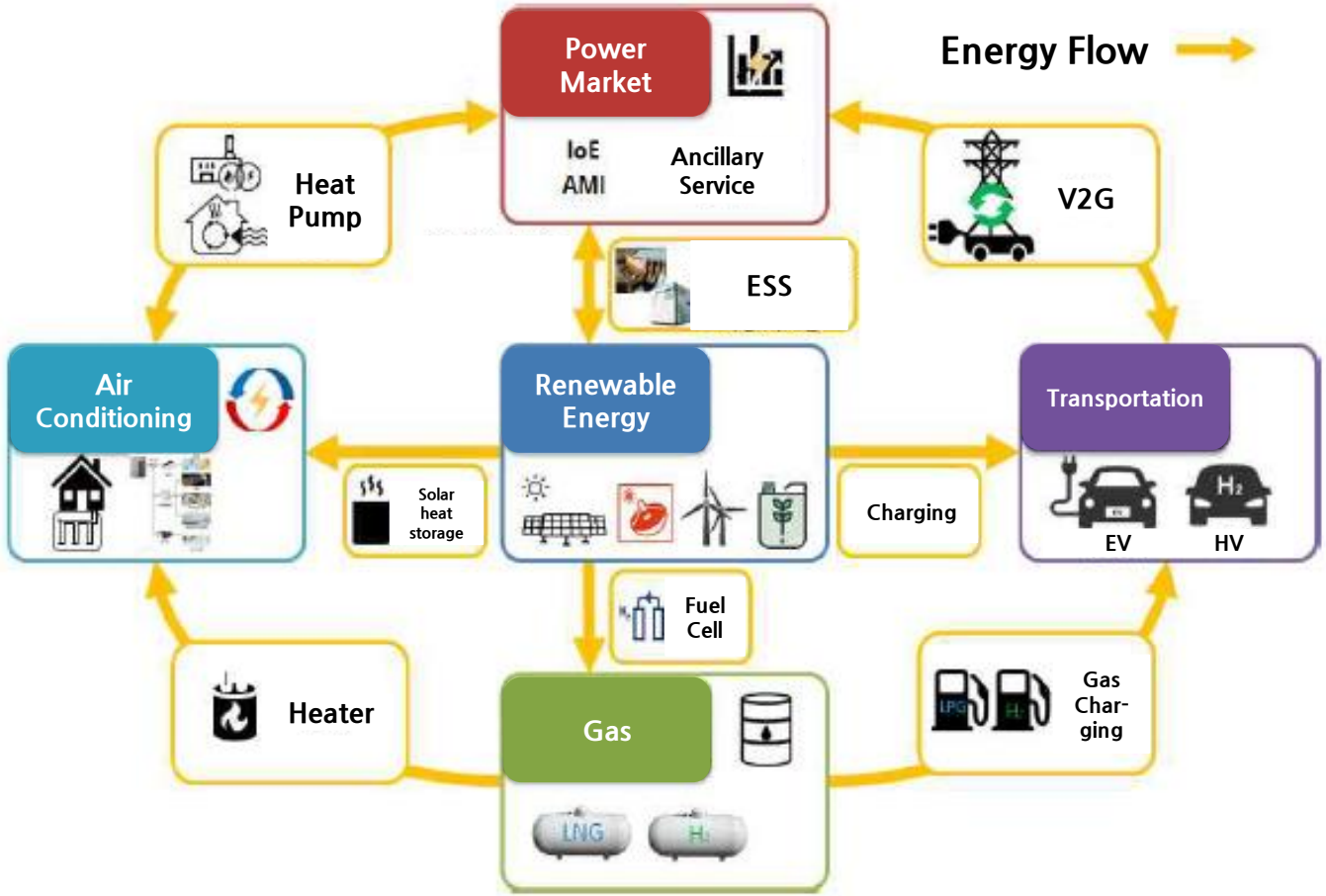
The Energy Vision 2040 for Sustainable Prosperity

Cleaner and safer energy system

Stability	Stable energy supply through energy transition
Safety	Guarantee of safe life for people
Envir.	Reduction of fine dust & greenhouse gases
Coexist.	Realization of communication and decentralized energy ecosystem
Growth	Creation of innovative growth engine

The 3rd National Energy Plan of Korea

Establishing the Integrated Smart Energy System Focused on Renewable Energy



The 3rd National Energy Plan of Korea

Main Policy Plans

#1 : Realizing high efficiency energy society through innovation of energy demand management

#2 : Establishing the smart energy system focused on renewable energy

#3 : Developing future energy industry to create new markets and jobs

#4 : Implementing people-oriented and decentralized energy governance

#5 : Energy cooperation with foreign countries for energy security enhancement

#6 : Expanding the infrastructure for the 4th industrial revolution and the energy transition period

Change in South-North Relations

Panmunjeom Declaration

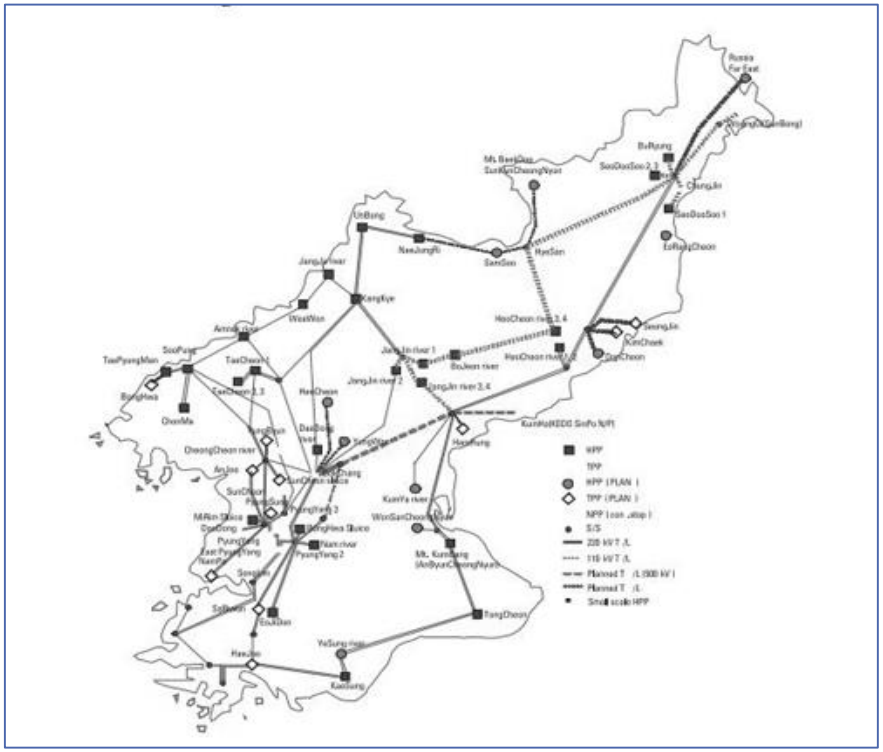
- Commitment to exchanges and cooperation in many fields
- Common prosperity, independent unification

[Source : OhmyNews]

Power System in North Korea

Poor Energy Infrastructure of North Korea

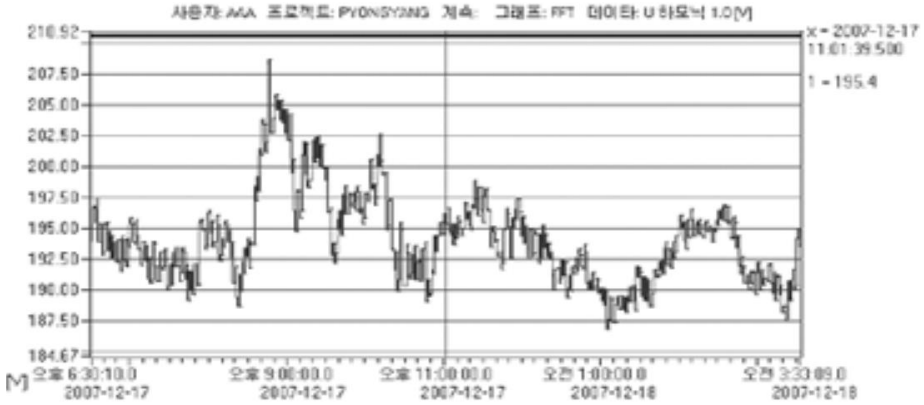
- Low power factor, frequent equipment failure and blackout
- Damaged transmission, and distribution facilities
- Serious unbalance between demand and supply



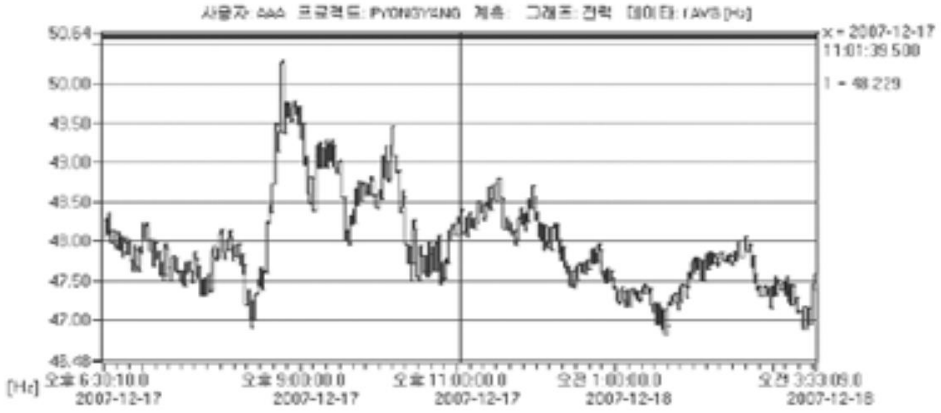
Power System in North Korea

Poor Power Quality of North Korea

- Nominal voltage : 220V
- Nominal frequency : 60Hz



- Measured voltage in Pyongyang
  - 186 ~ 209 V



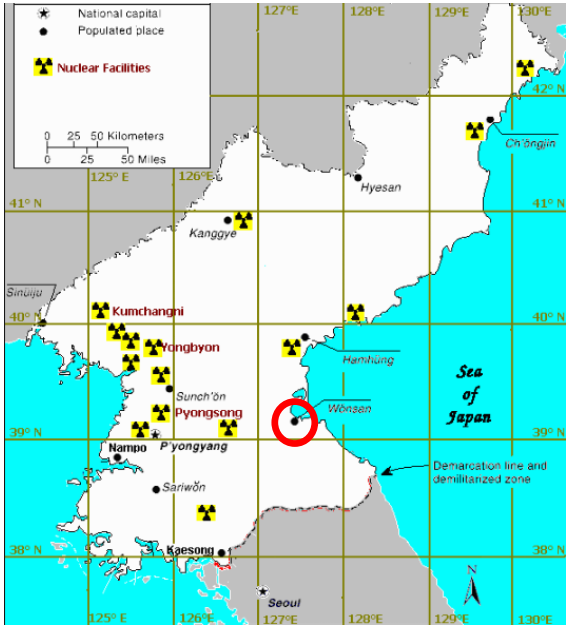
- Measured frequency in Pyongyang
  - 47 ~ 51 Hz

Electricity : The Key of Unification

Energy Solutions for Unification

A Smart City Candidate : Wonsan

- Suitable for inter Korea exchange and cooperation
- Geo-economical potential of development
  - — Diamond mountain and Wonsan beach
- International resort city



[Nuclear facilities]

[Wonsan financial hub project]

Energy Solutions for Unification

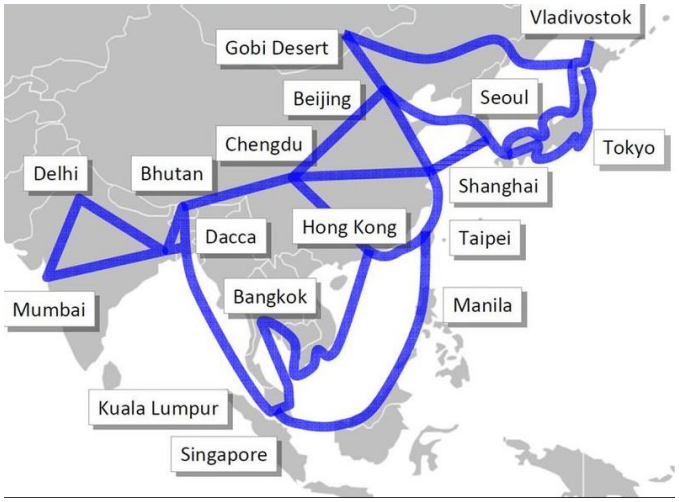
Connecting with North Korea's Power System : HVDC

- Power outages caused by aged facilities and insufficient supply
- Connecting method to North Korea
  - (HV)AC : Operating with single frequency & need for stability analysis considering unstable North Korea's power system
  - (HV)DC : Possible to minimize the effect between two systems & suitable for long distance transmission considering East Asia Super Grid

Energy Solutions for Unification

East Asian Super Grid : Solution to Isolated Power System

- Technical limits
  - — Overcoming the geographical limit of 'Isolated System' by sharing reserve with neighboring countries
  - — Decrease of inertial due to increase of renewable energy & isolated system
  - — Response to system instability caused by renewable energy
- Social & Economical limits
  - — Avoid installation of additional power facilities with low social acceptance
  - — Economic feasibility by utilizing the interests of each country



Energy Solutions for Unification

East Asian Super Grid

- **Unification and Super Grid - the key is up to us**

Thank You