



Northeast Asia Energy Interconnection Research

**Global Energy Interconnection Development
and Cooperation Organization**

October 2019

A clean energy-dominant, electric-centric modern energy system that is globally interconnected, jointly constructed and mutually beneficial to all.

Smart Grid



+

UHV Grid



+

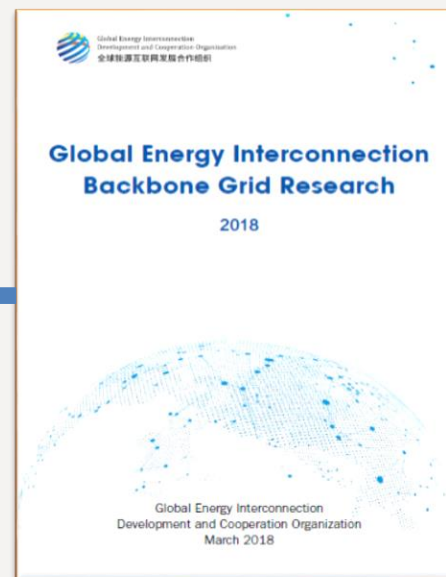
Clean Energy



About GEI and GEIDCO



Global Energy Interconnection
Development and Cooperation Organization
全球能源互联网发展合作组织



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**Northeast Asia Energy
Interconnection Planning
Research Report**



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**Energy Interconnection in ASEAN
for Sustainable and Resilient Societies –
Accelerating the Energy Transition**



ASEAN Centre for Energy
and University for Sustainable Energy

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ESCAP

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**Rapport sur la planification de
l'interconnexion énergétique
en Afrique**



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Septembre 2018

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**Europe Energy Interconnection
Planning Research Report**



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May 2019

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**Research on Asia Energy
Interconnection**



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September 2019

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**Research on North America
Energy Interconnection**



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September 2019



1. New Opportunities for Cooperation

2. Research on Power Grid Interconnection

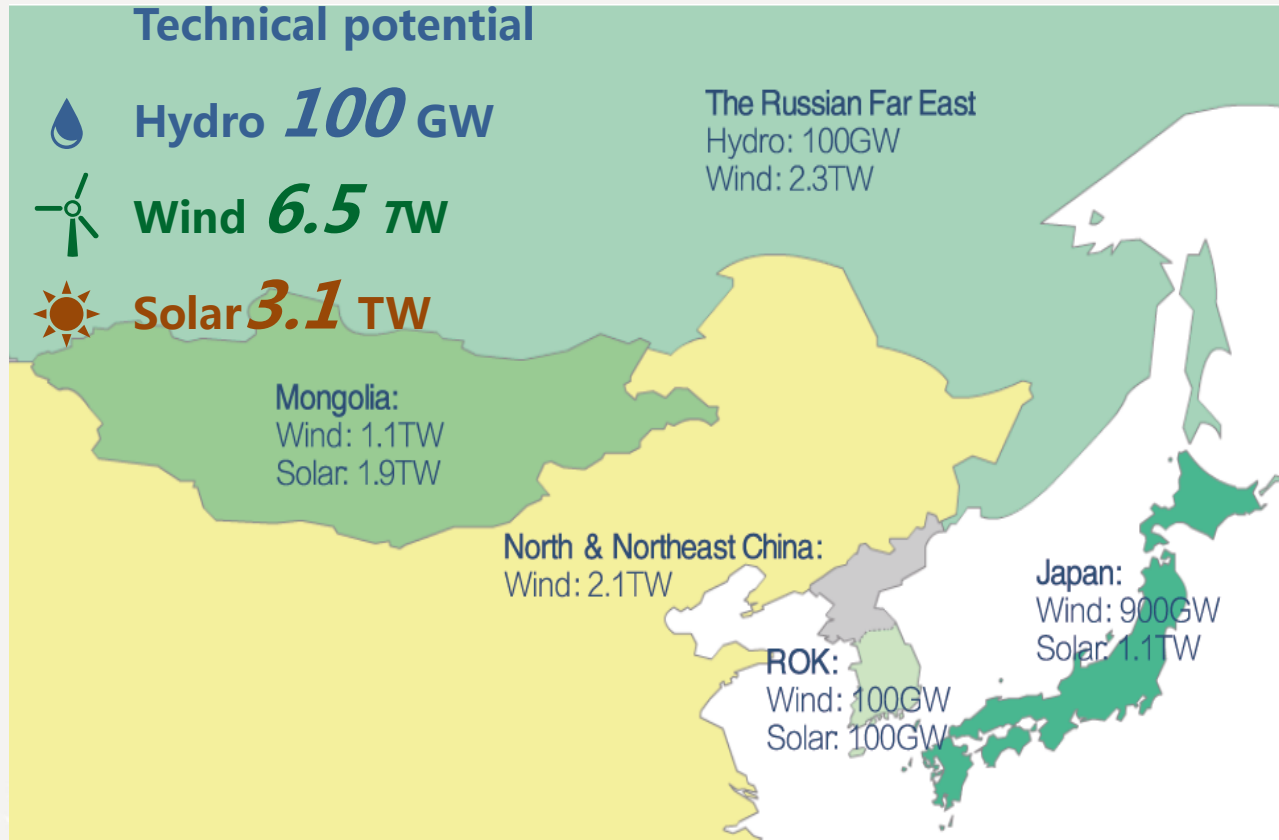
3. Challenges and Initiatives

1.1 Clean Energy in Northeast Asia

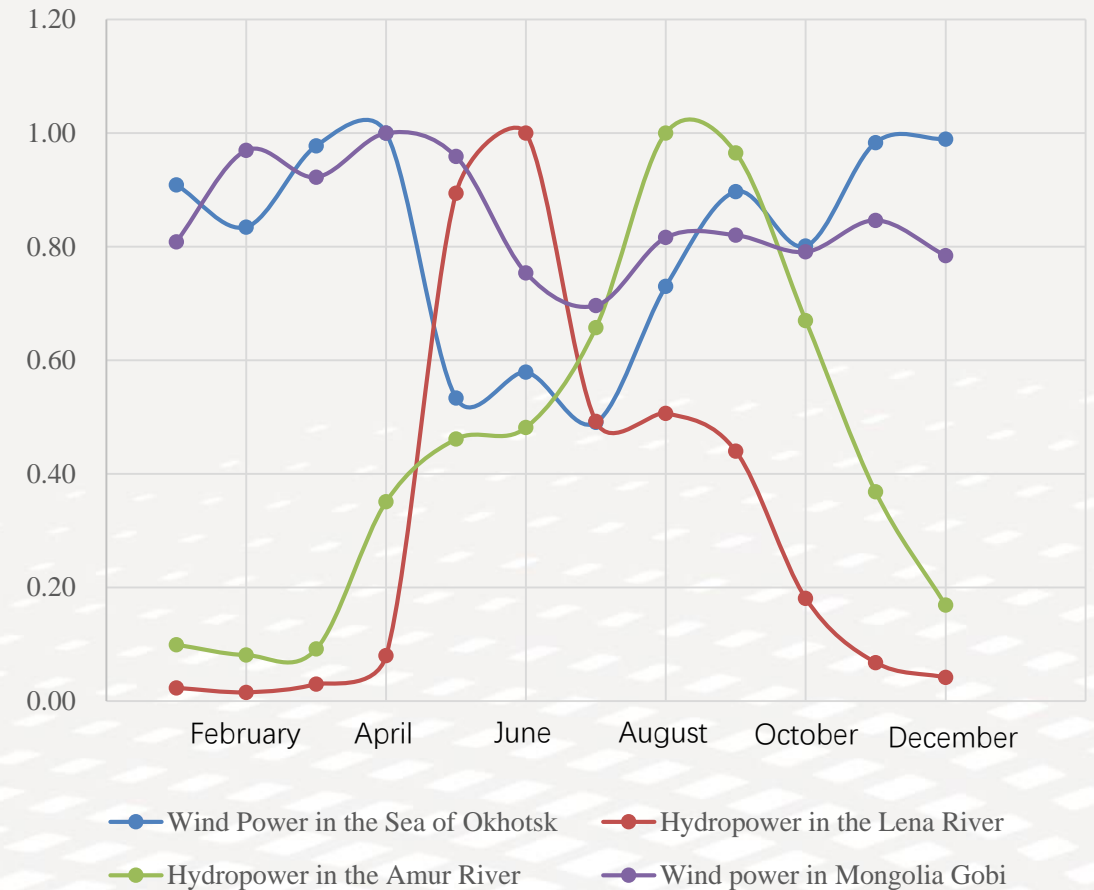


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■ Abundant clean energy resources



■ Strong seasonal complementarity of clean electricity

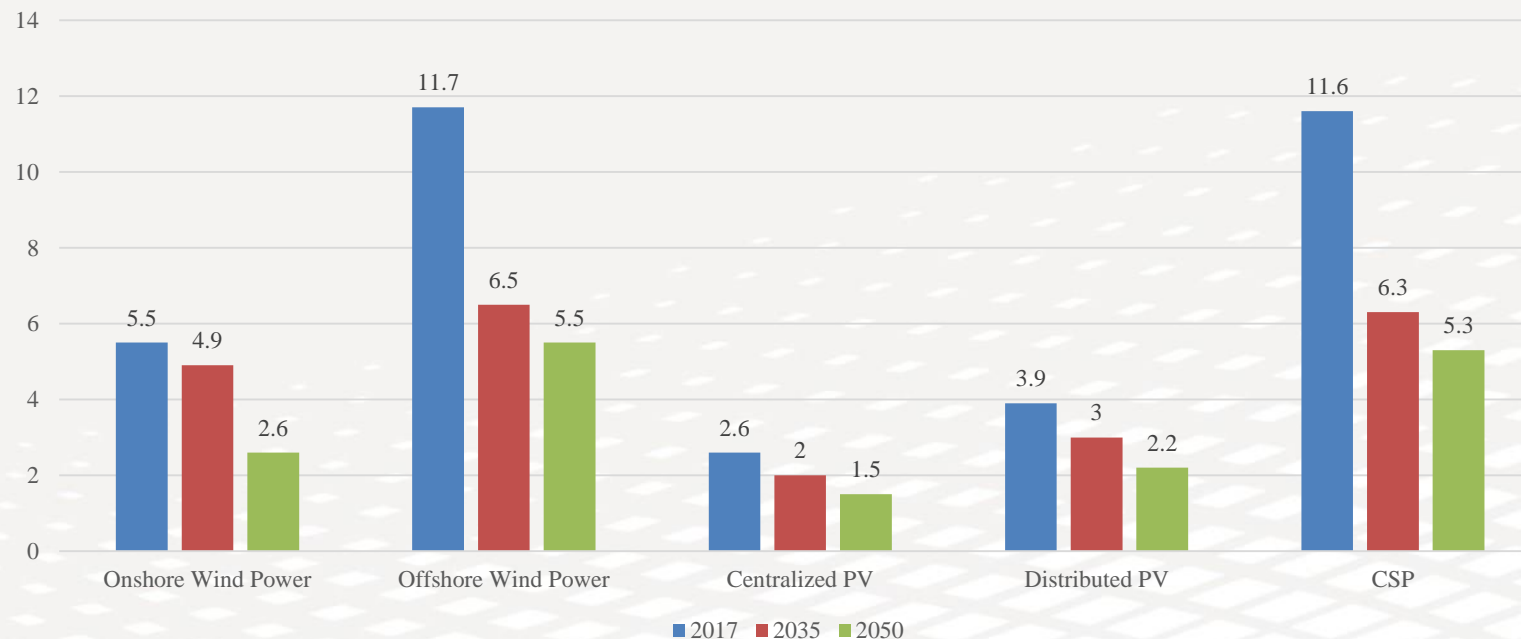


1.2 Rapid Development of Clean Energy



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- **The competitiveness of clean energy in electricity generation is rapidly improving.** 2010~2017, the PV cost in China and Japan decreases 70%, and the onshore wind power cost decreases 20% and 10%, respectively. In 2017, the costs of utility-scale PV and onshore wind power are close to fossil fueled generation, globally. The bid price for some PV projects in China is lower than 5 US cents/kWh. Before 2025, it is predicted PV and onshore wind power will have stronger competitiveness than fossil fuels. The large-scale energy storage technology and the grid operation control technology will develop rapidly, making clean energy the dominant electricity supply.



Trend of cost variation of Global clean energy (cent/kWh)

1.3 Blueprint of NEAEI



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The sustainable development and energy cooperation in Northeast Asia require us to follow the concept of GEI, accelerate the construction of the NEAEI, and support the regional energy and electricity demands in a clean and green way.

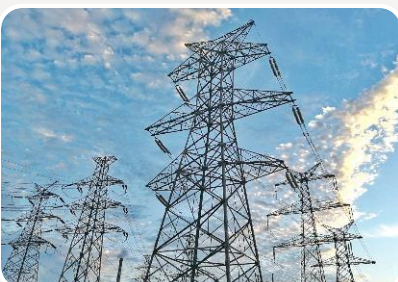
■ Development Strategy of the NEAEI:



Accelerating the clean energy utilization, and ensuring the regional energy security based on green development.



Improving the electrification, and realizing the low-carbon and efficient development relying on electricity.



Enhancing the optimal allocation of clean energy, and building a win-win cooperation via grid interconnection.



1. New Opportunities for Cooperation

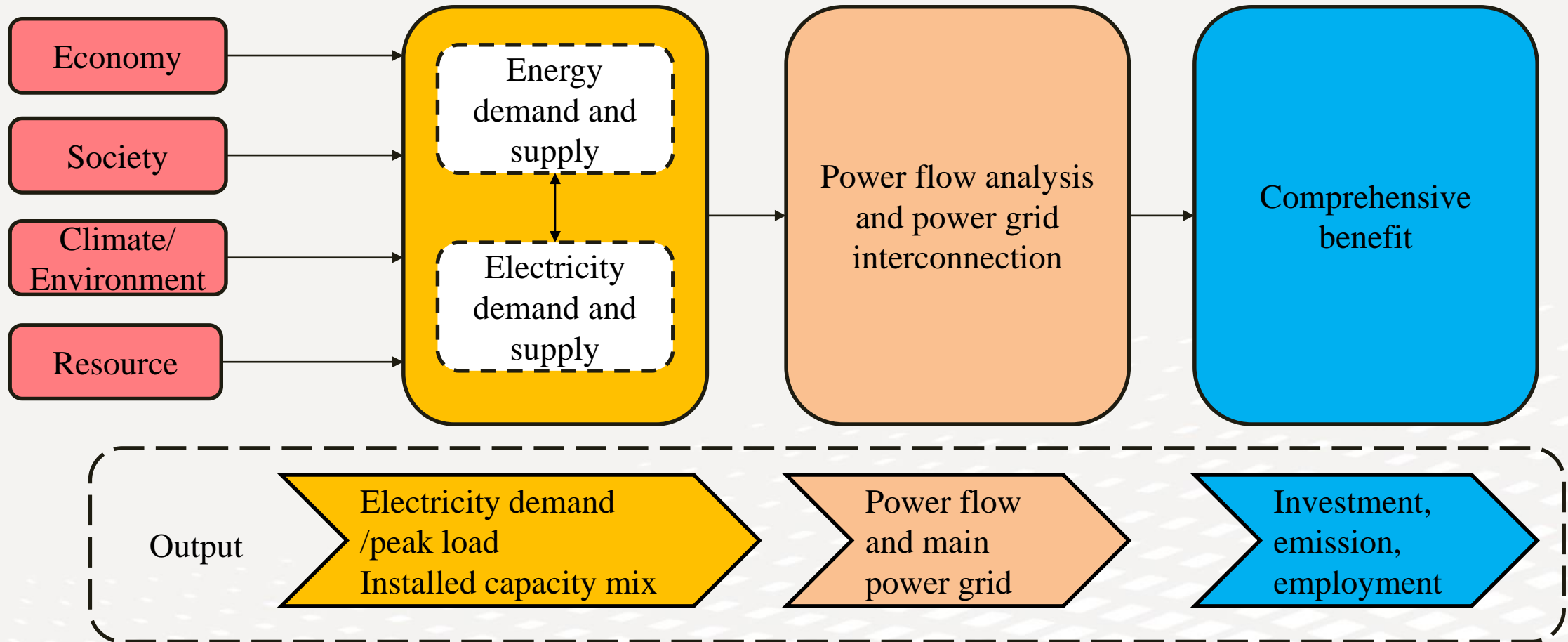
2. Research on Power Grid Interconnection

3. Challenges and Initiatives

2.1 Methodology



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Schematic of research progress

2.2 Interconnection Structure



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■ West-to-east and north-to-south power transmission, multiple energy resources complementation



- Develop hydropower in Russian Far East, wind energy in Okhotsk Sea, Sakhalin Island, Northeast China, North China, Mongolia, and solar energy in Gobi desert in Mongolia.
- Construct the **"Three Rings and One Line"** for cross-border interconnection channels.
- By 2050, the cross-border power transmission capacity will exceed **100 GW**.

Overall Structure of the NEAEI

2.3 NEAEI Schematic



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2.4 Suggested Projects



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■ Weihai-Incheon

- 366km
- $\pm 500\text{kV}$, 2GW
- 1.4 billion USD, 1.7 US cent/kWh

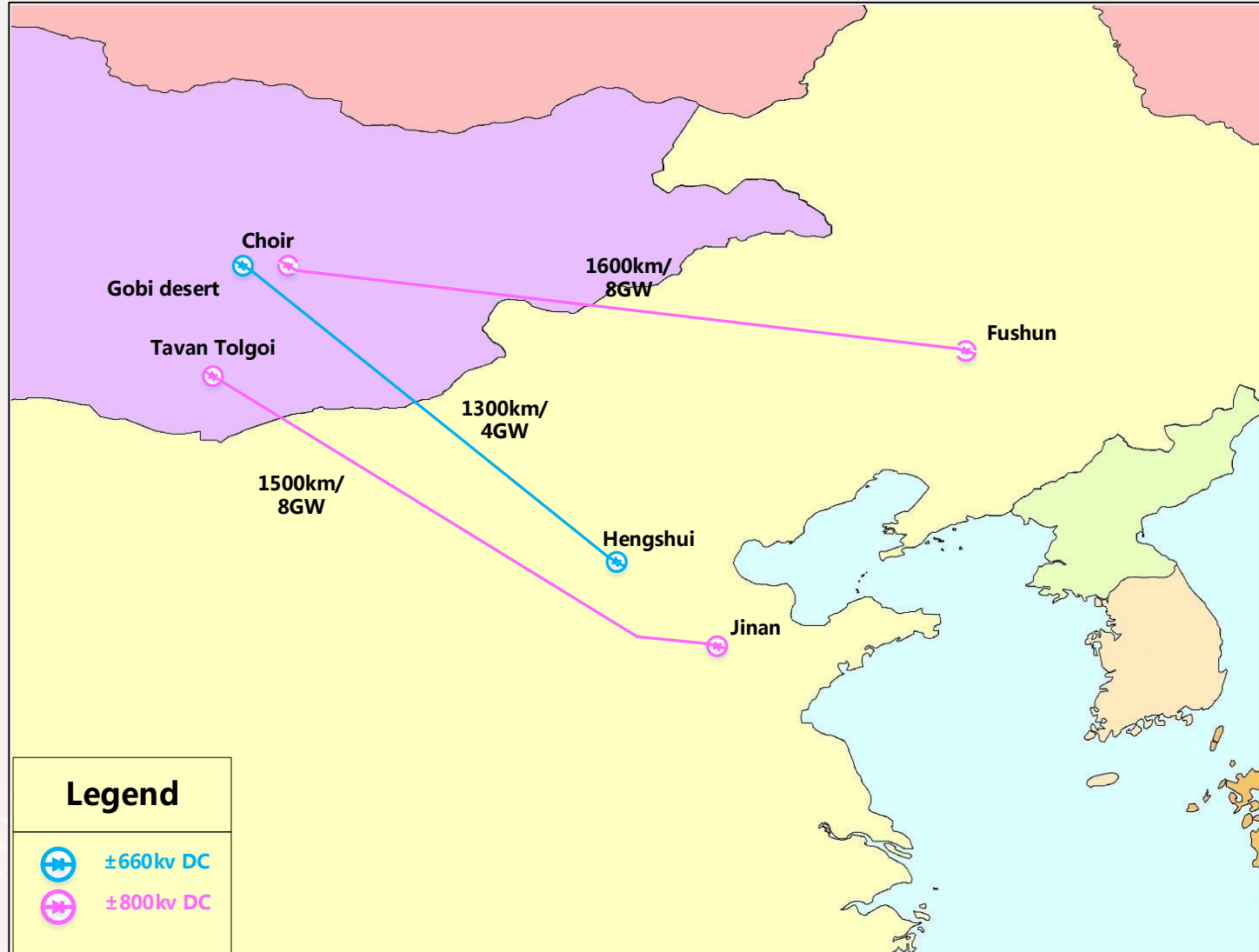
■ Goseung-Matsue

- 460km
- $\pm 500\text{kV}$, 2GW
- 1.6 billion USD, 1.9 US cent/kWh

2.4 Suggested Projects



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■ Choir-Hengshui

- 1300km
- $\pm 660\text{kV}$, 4GW
- 1.6 billion USD, 0.97 US cent/kWh

■ Choir-Fushun

- 1600km
- $\pm 800\text{kV}$, 8GW
- 3.5 billion USD, 1.04 US cent/kWh

■ Tavan Tolgoi-Jinan

- 1500km
- $\pm 800\text{kV}$, 8GW
- 3.4 billion USD, 1.01 US cent/kWh



1. New Opportunities for Cooperation

2. Research on Power Grid Interconnection

3. Challenges and Initiatives

3.1 Challenges



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Electricity is an inherently strategic commodity and the efforts to engage in deep integrated trading thus faces political, regulatory, technical, and economic/financial challenges

Energy policy

Under the condition of regional power grid interconnection, how to promote each government to formulate energy policies in line with the overall trend of the region development and combining with the characteristics of energy development in each country.

Regulatory system

Considering each country condition, how to propose appropriate legal framework and regulatory system to meet the needs of regional power supervision, and promote the coordination among the national electricity regulatory.

Electricity market

How to study and propose schemes of an unified electricity market from aspects of the organization, mechanism and regime in order to form a harmonious cross-boundary electricity market pattern in a region.

Technical standard

How to establish GEI specification and standard based on power grid interconnection safety and operation efficiency, which will be used to guide technology from power grid planning to operation in the future.

3.2 Initiatives



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Jointly Promoting planning coordination

Give full play to the leading role of the government, to strengthen policy support, jointly conduct planning studies, incorporate planning results into sustainable energy development plans of various countries, promoting and accelerating cross-border energy and power interconnection.

Jointly Promoting Technological Innovation

Give full play to the advantages of universities and scientific research institutions, to strengthen cooperation in areas such as large-capacity submarine cables, VSC-HVDC, high-efficiency clean power generation technology, fostering innovative breakthroughs.

Jointly Promoting Project Implementation

Give full play to the role of energy enterprises and financial institutions to innovate business models, and promote the construction of a number of clean energy and cross-border interconnection projects with high economic efficiency and good demonstration effect, so as to bring project implementation as soon as possible.

Jointly Promoting Mechanism Construction

Give full play to the coordination role of international and regional organizations, to promote greater cooperation among countries, establish bilateral and multilateral cooperation mechanisms such as project development, electricity market and power grid operation, achieving coordinated development.



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Thank you!

