



ULAANBAATAR ENERGY CHARTER FORUM

Formation of the Asian Supergrid: Its Impact on the Energy Development in Russia and Mongolia and on the Energy Cooperation between the Two Countries

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Plan of the Presentation

- 1. The Eastern vector - a strategic direction in Russia's energy development in the first half of the 21st century**
- 2. Mongolian energy sector: present state and strategic prospects for development**
- 3. Formation of cross-border transmission lines in NEA: Russia and Mongolia's prospects**
- 4. Necessary conditions and initiatives for successful mutually beneficial energy cooperation among NEA countries**



1. Eastern Vector - a Strategic Direction in Russia's Energy Development in the First Half of the 21st Century



Eastern Vector of Russia's Energy Policy

- **National interests of Russia require intensification of its mutually beneficial cooperation with Japan, China, Korea and other countries in Northeast Asia**
- **Creation of new energy centers in East Siberia and the Far East will increase energy security of Russia, restore and strengthen the broken fuel and energy ties between the regions and solve many important federal, interregional and regional problems**
- **Fast and large-scale development of energy sectors in these regions and penetration to the energy markets in Japan, China, Korea and other countries of Northeast Asia should be considered as a primary means to timely ensure the appropriate positions of Russia in this strategically important region of the world**
- **Creation of a developed energy infrastructure in the form of interstate gas-, oil pipelines and transmission lines in the East of Russia and in Northeast Asia will decrease the cost of energy carriers, enhance reliability of energy and fuel supply to consumers in different countries, and make it easier to solve the environmental problems**



Eastern Energy Policy as an Instrument for Solving Urgent Problems in Russia

Eastern energy policy of Russia, as part of Eastern economic policy, is not an end in itself, but an instrument for solving many crucial federal, interregional and regional problems

Social, economic and other problems

1. **Social** – improvement in comfort, style, quality of people's life in the eastern regions of Russia
2. **Political** – consolidation and integration of the RF entities, strengthening of the unity of the economic and energy space of Russia
3. **Geopolitical** – reinforcement of Russia's positions in the world economic system, in the community of APR, Central and Northeast Asian countries
4. **Economic** – enhancement of economic efficiency and competitiveness in the East of Russia, increase in supply of resources and accessibility to the remote areas of the country, expansion of active economic space of Russia, creation of conditions for attraction of foreign investment and advanced technologies, etc.

Energy problems

1. Improvement **in adaptability and reliability** of energy and fuel supply to consumers
2. Increase **in energy and environmental security** of the country and regions
3. **Perfection** of territorial and production structure of Russia's energy sector and particularly in its eastern regions
4. Formation of **transport and energy infrastructure in Russia's East** – oil and gas pipeline systems, transmission lines– and creation of **common transport and energy space in Russia, etc.**



Policy Documents

Russia has developed a large number of policy documents determining the strategic development of the economy and energy in the East of the country until 2030 in the context of energy cooperation between Russia and East Asian countries:

- "Energy Strategy of Russia until 2030"
- "Program for Creation of Unified Gas Production Transportation and Supply System in East Siberia and the Far East with Potential Gas Export to the Markets of China and other APR Countries" (Eastern Gas Program)
- Strategy of Socioeconomic Development of the Far East and the Baikal region until 2025"
- "Strategy of Socioeconomic Development of Siberia until 2020"
- "Energy Development Strategy of East Siberia and the Far East until 2030"
- "Program for Development of Oil Refining Capacities in East Siberia and the Far East", etc.



Participation of Energy Systems Institute SB RAS in the Projects Ordered by Federal and Regional Authorities in 2007-2014

In the framework of the Energy Strategy of Russia 2030 (ordered by the Ministry of Energy of RF)

- The strategy for energy development in East Siberia and the Far East until 2030
- The study on prospects for electric power industry development in Russia until 2030

Ordered by the regional authorities (Governments of the RF entities)

- The concept of reliable operation of energy facilities and energy security of *Sakhalin region* until 2020 – ordered by Administration of Sakhalin region
- The strategy for energy development in *Amur region* until 2010 and for the time horizon until 2030 – ordered by Administration of Amur region
- The strategy for electric power industry development in *Chukot Autonomous Area* until 2020 – ordered by Administration of Chukot AA and JSC “Chukotenergo”
- The strategy for energy development in *Irkutsk region* until 2015-2020 and for the time horizon until 2030 – ordered by the Government of Irkutsk region
- The energy strategy of *Sakha Republic (Yakutia)* until 2020 and for the time horizon until 2030 – ordered by the Government of Sakha Republic (Yakutia)



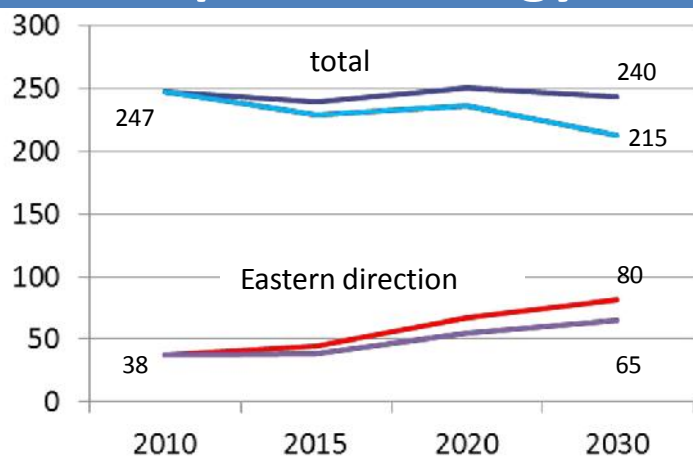


Key Point (1):

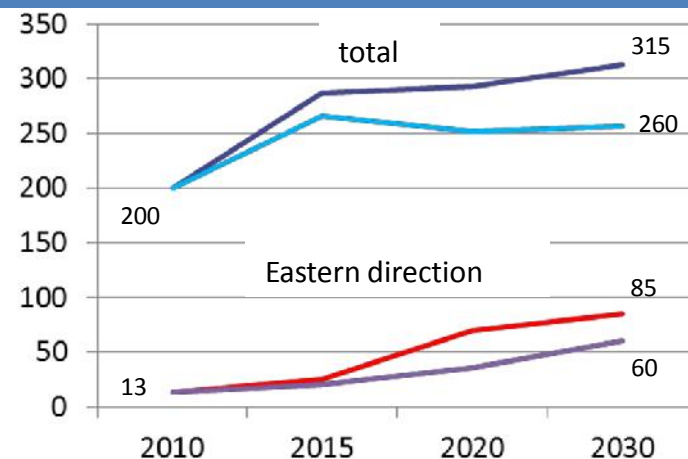
Official policy documents suggest a considerable increase in mutually beneficial supplies of Russian energy resources to the markets of China, Japan, Korea, and other East and Northeast Asian countries



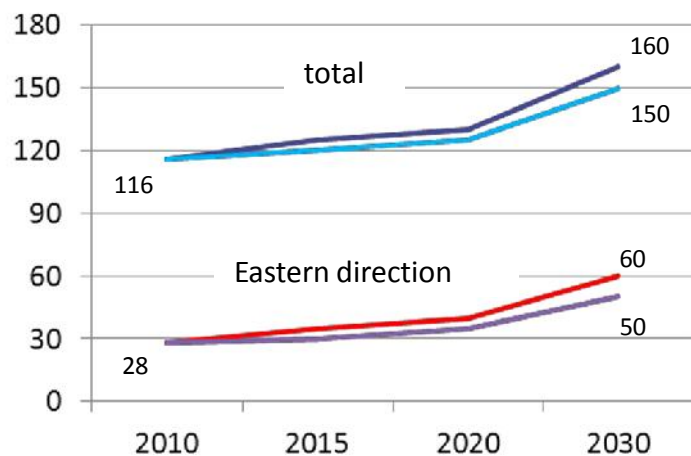
Possible Export of Energy Resources from Russia to NEA Countries



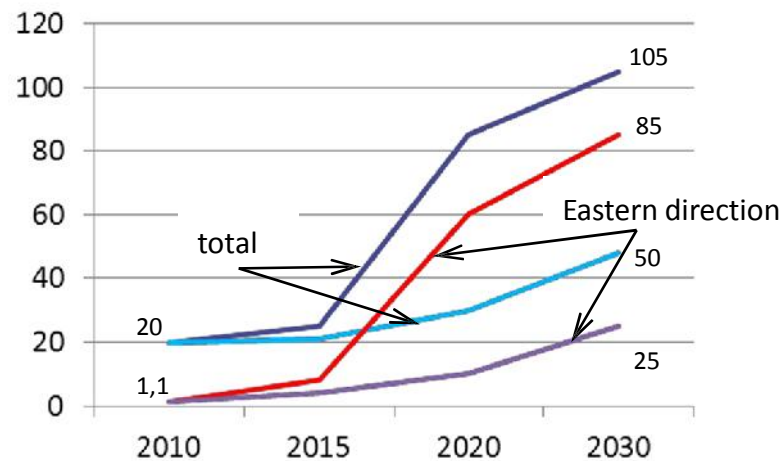
Oil, mln t



Gas, bln m³



Coal, mln t



Electricity, bln kWh



Key Point (2):

The Russian government, regional authorities and companies have started a large-scale development of energy resources in the East of the country



Material Base of the Eastern Vector – Energy Projects

At present the material base of the eastern vector of Russia's energy policy is based on several large fuel and energy projects aimed at the markets of NEA countries:

- **“Gazprom” has elaborated a program on development of natural gas resources in the East of Russia, conversion to gas in Russian regions and natural gas delivery to the markets of China and other NEA countries;**
- **Construction of the oil pipeline “East Siberia – Pacific Ocean” with a capacity of 80 million t per year with a pipeline branch to Skovorodino towards China with a capacity of 15-20 million t of oil per year;**
- **Russian power companies are conducting a study on the possibility of large-scale electricity supply to China, Korea, and Japan, starting in 2018-2022.**

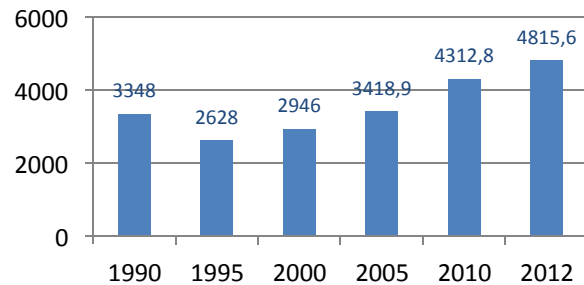


2. Mongolia's Energy Sector: Present State and Strategic Directions for Development



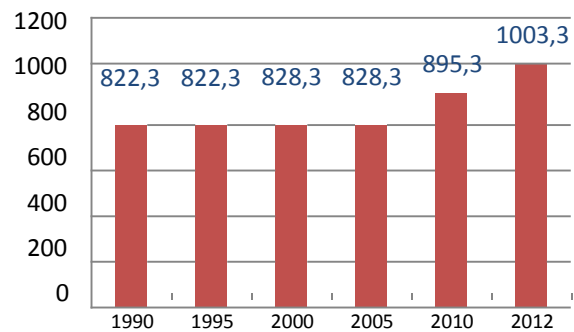
Mongolia Energy Data

Gross Generation GWh



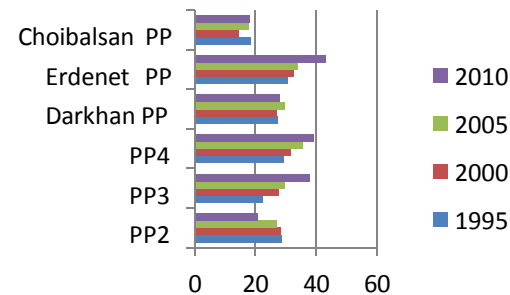
Key Point: Increasing in Generation for last 20 years

Generating Capacity MW



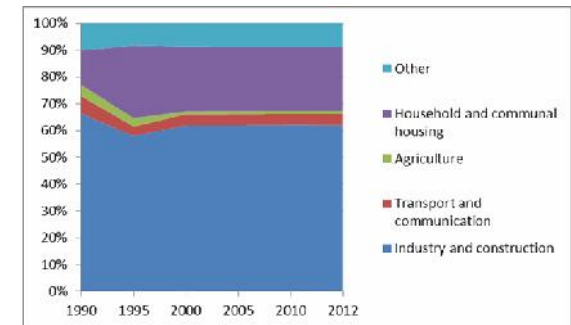
Key Point: New Installed Capacities last 10 years

Trend of Thermal Plant Efficiency of the biggest Power Plants (%)



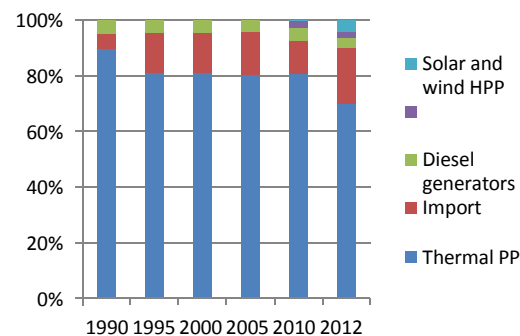
Key Point: Modernization of TPP

Electricity Consumption Structural %



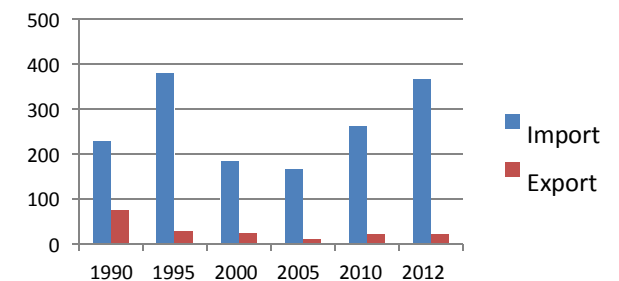
Key Point: A little change in the Structure

Power Consumption Mix %



Key Point: Increase of Import), Introduction of NRE

Electricity import and export (kWh)



Key Point: New import from China after 2011



3. Formation of Cross-Boarder Transmission lines in NEA: Russia and Mongolia's Prospects



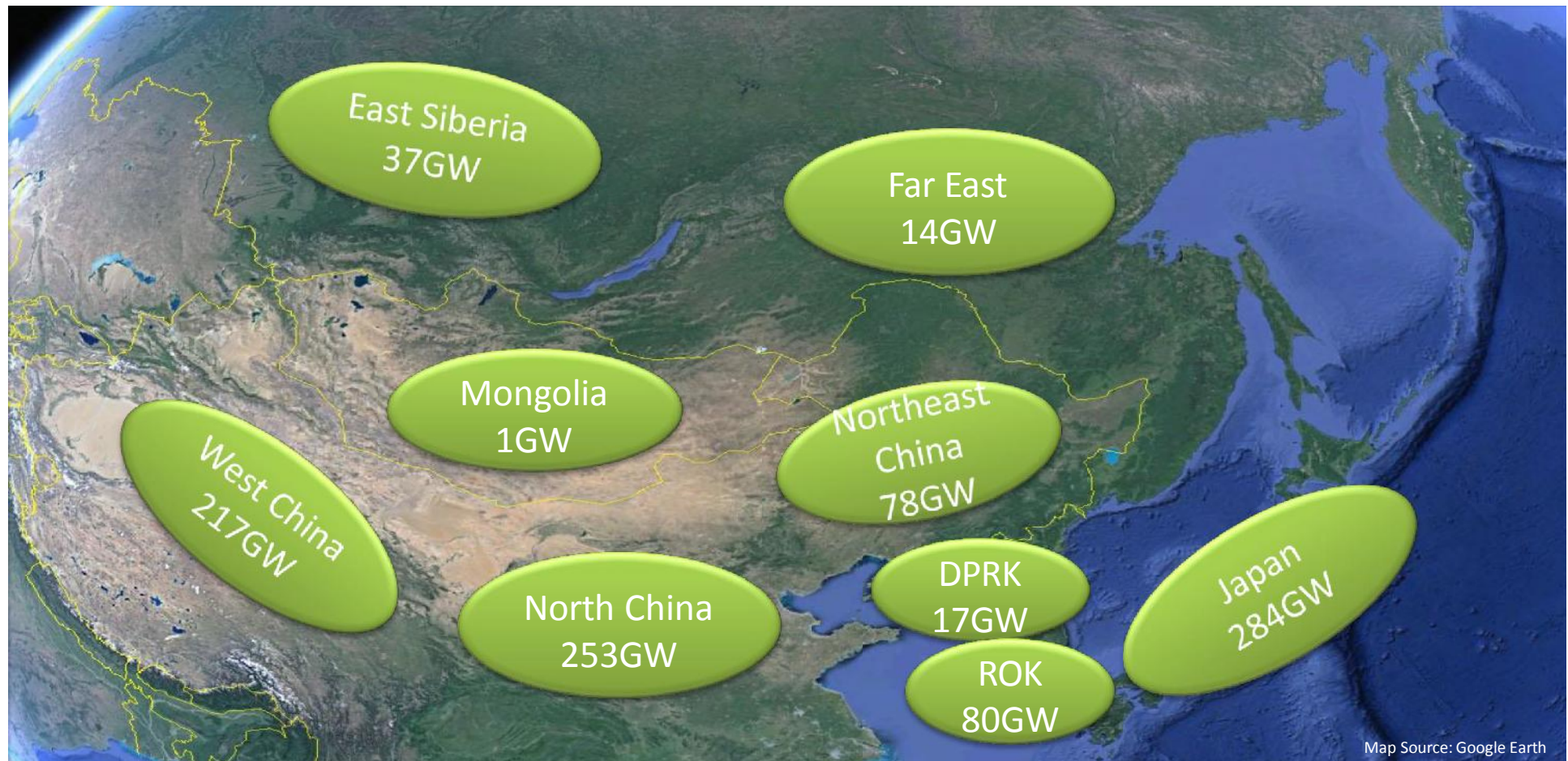
General viewpoint on the problem

This concerns possible interconnection of electric power systems for parallel operation in Russia's East (East Siberia and the Far East), Mongolia, People's Republic of China, North and South Korea and Japan

The operation area of such an interstate power super-interconnection may happen to include different types of power plants (thermal, hydraulic, nuclear, wind, etc.) with a total installed capacity of more than 450-500 million kW



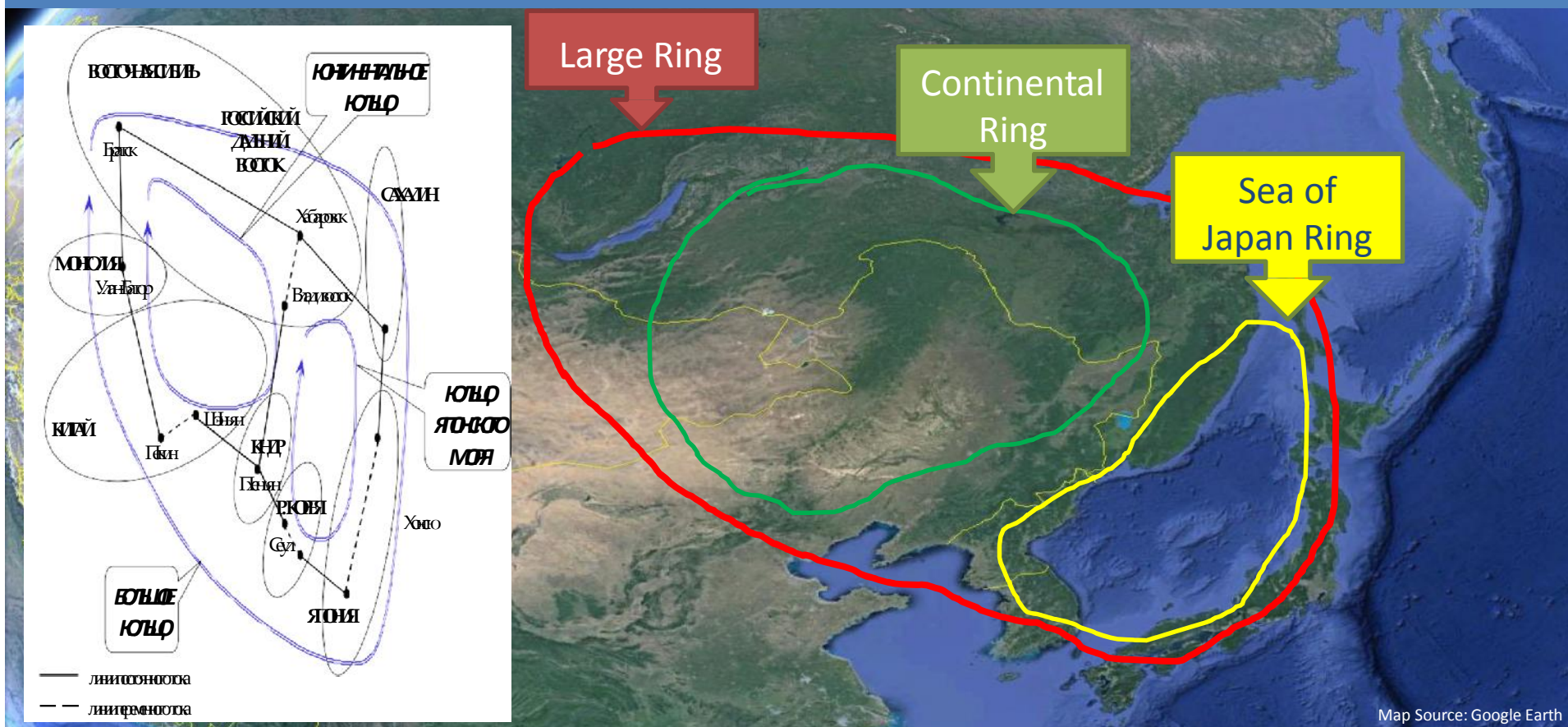
National and Regional Power Grids in Northeast Asia (2010)



Map Source: Google Earth



Possible Scenarios of Interstate Interconnection of Power Systems in NEA Countries



Source: (KERI, ESI) N. Voropaï, S. Podkovalnikov. APERC Annual Conference, Tokyo, February 26-27, 2013

Map Source: Google Earth



3.1. Formation of Cross-Boarder Transmission lines in NEA: Russia's Prospects

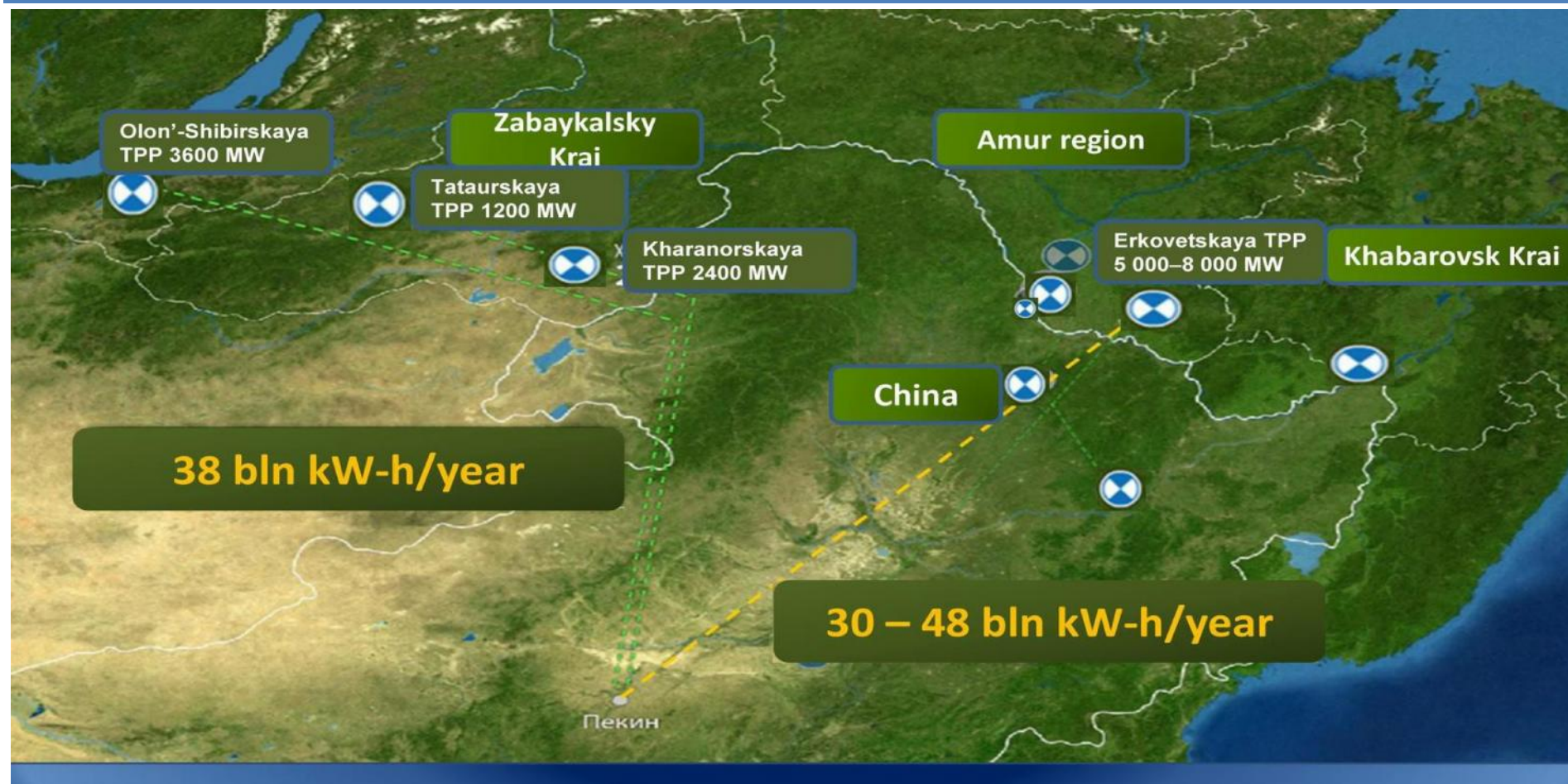


Export-Oriented Power Plants in East Siberia and the Far East

Power plant	Capacity , MW
<i>East Siberia</i>	
Lenskaya condensing power plant (CPP)	800-1000
Berezovskaya CPP-2	3000
Gusinozerskaya CPP (expansion)	1200
Kharanorskaya CPP (expansion)	900-2100
<i>Far East</i>	
Urgalskaya CPP	400-600
Erkovetskaya CPP	1200
Elginskaya CPP	1800
Sredne-Uchurskaya HPP	3300
Uchurskaya HPP	365



Large Scale Electricity Export from Russia to China





Large Scale Electricity Export from Russia to Korea

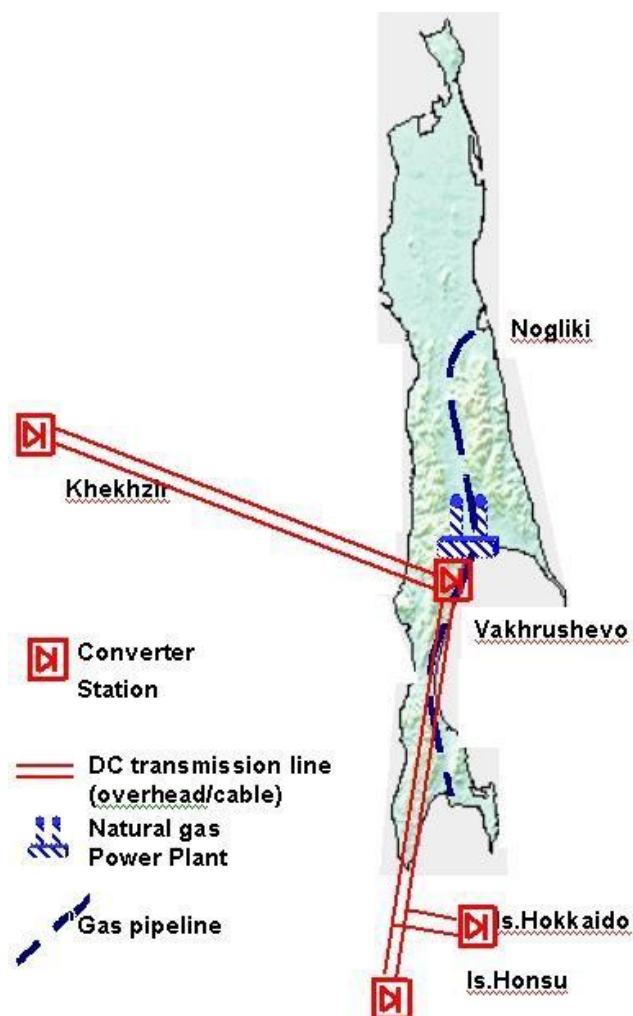
- 1,200km HVDC interconnection passing through DPRK
 - Kraskino-Cheungjin: 150km
 - Kraskino-Seoul: 1,200km
- S. Korea-Russia Summit (September 2008)
 - Construction of 800kV HVDC transmission line passing through DPR Korea
 - Maximum 4,000MW per year
- Ministry Level Action Plan (August 2009)
 - Feasibility study by KEPCO and Inter RAO (2009-2010)
 - Contact and discussion with DPR Korea
- Negotiation with DPRK is ongoing



Source: Kyung Sool Kim Trans-Boundary Energy Transportation in North-East Asia, KEEI-ESI Workshop – 2011



Construction of Power Plant and Export Transmission Sakhalin-Japan



Installed capacity, MW	4000
Electricity production, bln kWh	23-25
Construction period, years	8
Total investments, bln USD	6-8

*JSC "EES Rossii" and Marubeni Corp.
"Russia-Japan Power Bridge",
Feasibility study ,1999
(participation of ESI SB RAS)*



Asian Ringed Network (Asian Super-Grid)

The huge energy potential of Russia, including renewable energy sources, is the real basis for the international energy union construction in Asia



Objectives of the project:

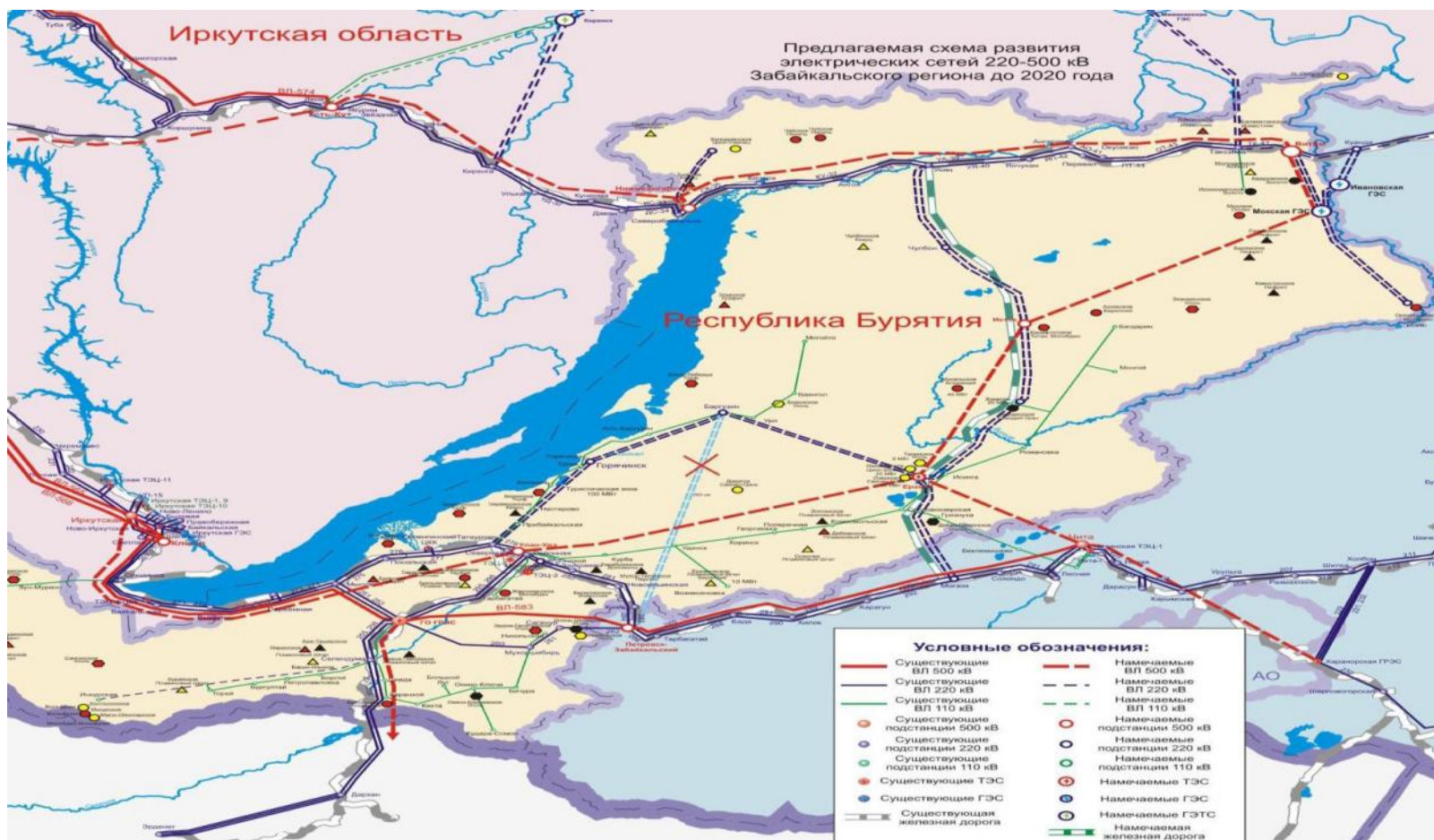
- To create conditions for economic growth in the Asia-Pacific region by improving the access to energy resources.
- To improve the reliability of the national power systems of the Asia-Pacific region through the integration and the renewable energy sources involvement.

The main parameters of the project:

- Term - **12 years**
- The length of the high voltage DC line - **2350 km**
- The wind power plants capacity - **1.5 GW**
- The gas-fired plants capacity - **2.2 GW**
- The hydroelectric power capacity - **2 GW**
- The solar power plants capacity - **0.5 GW**



Expansion of Electric Power System in Trans-Baikal Region in Terms of Strengthening the Ties with Mongolia





3.2. Formation of Cross-Boarder Transmission lines in NEA: Mongolia's Prospects



Participation of Mongolia in the Formation of the interstate electric power system in Northeast Asia

Currently Mongolia considers **two principally different approaches** to the construction of interstate power interconnections with a large-scale involvement of the electric energy potential of the entire country in this process.

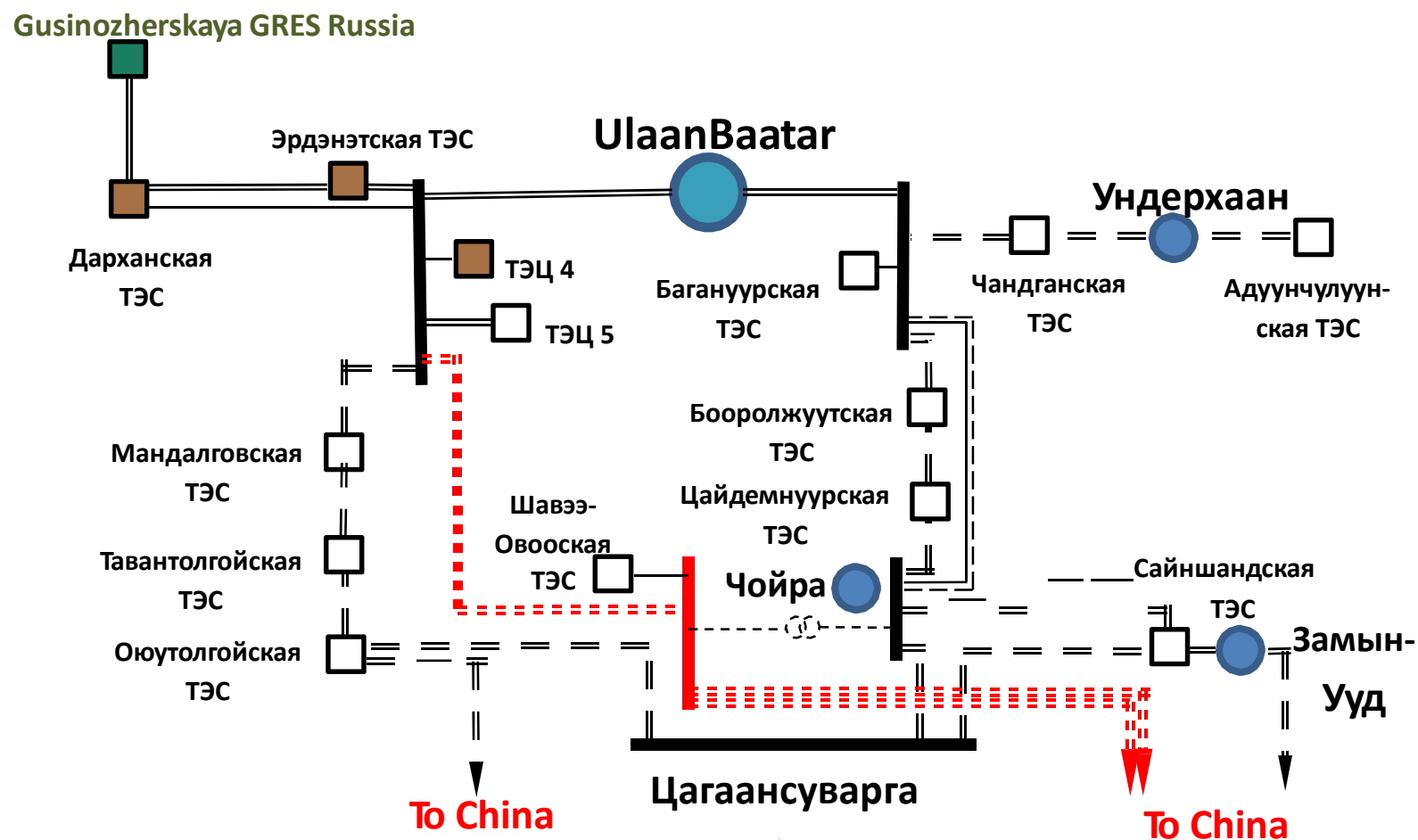
The first approach is related to the construction of a number of large thermal power plants with a total installed capacity of more than 6 million kW, including an export power plant at the Shivee Ovoo coal mine with an installed capacity of 4800 MW.

Russia can actively and effectively cooperate with Mongolia in the development of the interstate power system Russia-Mongolia –China.

The second approach, which represents a subject of our discussion, is connected with the creation of Gobitec and implementation of its solar and wind potential, as well as water resources, for the formation of Asian Super-Grid



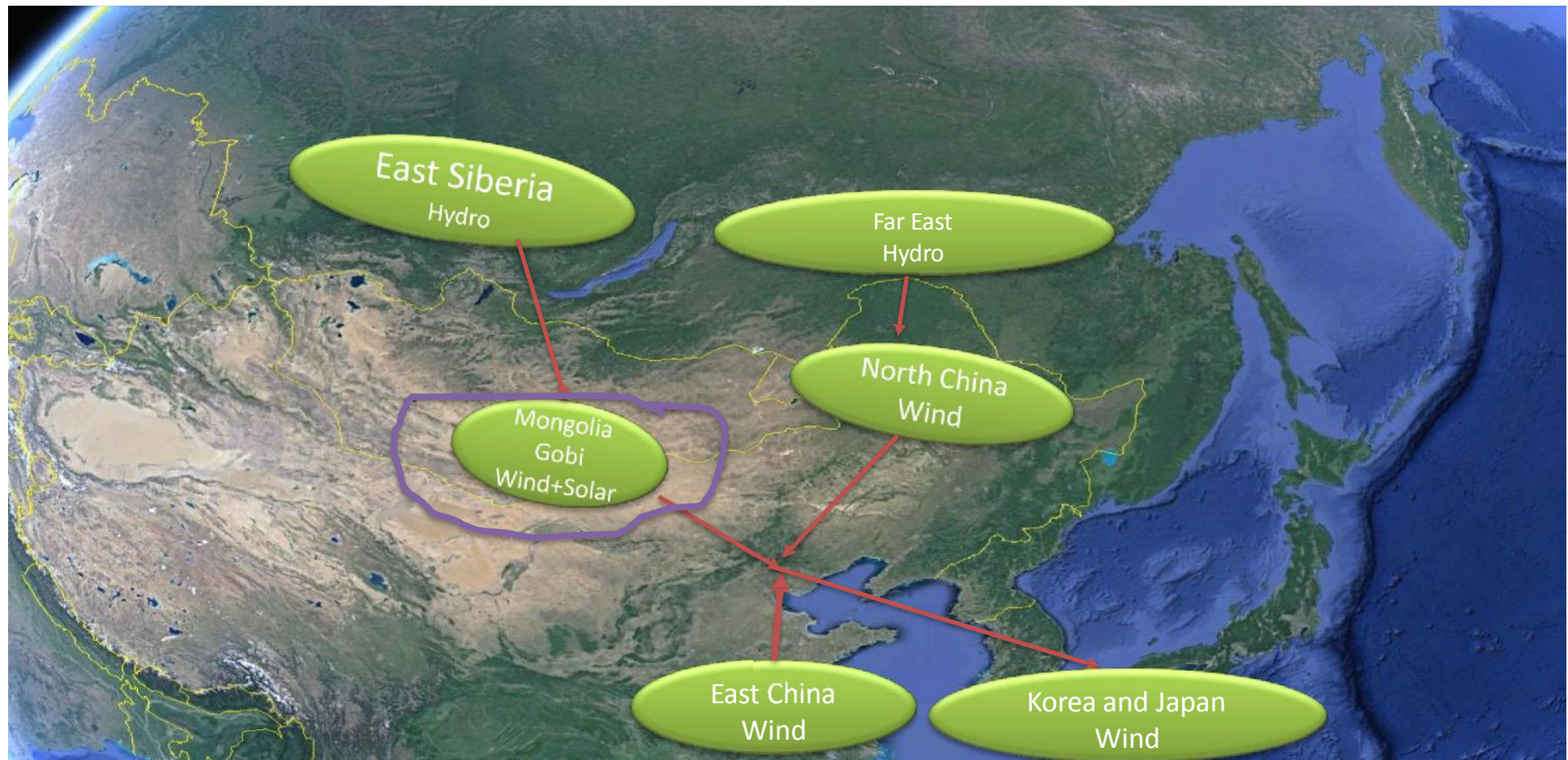
Interstate Electric Power System Russia-Mongolia-China



Source: Kh. Enkhjargal, S Batkhuyag – Russia-Mongolia project (ASM (MUS&T)-SB RAS (ESI)), 2013



Gobitec Project and Asian Super-Grid





4. Necessary Conditions and Initiatives for Successful Mutually Beneficial Energy Cooperation among NEA Countries



Key Point (3):

- *Formation of the Asian Supergrid is a very difficult task. This is explained by the fact that the Super-Grid is being introduced across vast territories, and a large number of participants from many different countries are involved. Moreover, the measures to implement this global project require considerable investment and close international energy cooperation*



CONCLUSIONS

- Currently the main outlines of the energy cooperation in NEA are clear enough. The resource base of the countries supplying energy resources and the energy markets of consuming countries have been properly studied. Special attention should be paid to the implementation mechanisms of coordinated actions of participants (countries, regions, companies) in terms of economic, legislative and other initiatives aimed at implementing the large-scale interstate energy projects.
- Gobitec Project and Formation of the Asian Supergrid is the possible large-scale interstate energy project with great impact on the energy development in Russia and Mongolia and other NEA countries.
- Energy companies and their research Institutions in Russia and in the NEA countries should stimulate the work in this direction in order to make an appropriate contribution to solving the problem significant for all the countries in the regions.
- There is an urgent necessity to develop a scientifically grounded **road map/strategy of Asian Supergrid with Gobitec Project** between Russia and Northeast Asia countries.
- Such a road map can be developed only on the basis of close cooperation between our Institute – ESI SB RAS, our Mongolia colleagues, teams of our partners, participated in JS on Gobitec in 2013 with an active support of Governments and regional authorities.
- ESI SB RAS is ready take an active part in solving this complex problem, which is very important for all Northeast Asia countries.



**Thank you very much for
your kind attention!**

