

A shift in the paradigm of energy cooperation between Russia and Northeast countries in the face of new global and regional challenges: a transition from predominant trade in energy resources to the innovation and technology cooperation

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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. Initial conditions, targets and strategic directions in energy development in the Russian East Siberia and Far East**
- 3. Priority directions of innovation and technology cooperation between Russia and NEA countries in the field of energy**
- 4. Conclusion - Necessary conditions and initiatives for successful mutually beneficial innovation and technology cooperation between Russia and North East Asian countries in the field of energy**



1. EASTERN VECTOR - A STRATEGIC DIRECTION IN RUSSIA'S ENERGY DEVELOPMENT IN THE FIRST HALF OF THE 21ST CENTURY (basic concept)

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EASTERN VECTOR OF RUSSIA'S ENERGY POLICY

- National interests of Russia require intensification of its mutually beneficial cooperation with Mongolia, China, Korea, Japan and other countries in North and Northeast Asia
- Creation of new energy centers in East Siberia and the Far East will increase energy security of Russia, restore and strengthen the fuel and energy ties between the regions and solve many important federal, interregional and regional problems
- Rapid and large-scale energy development in these regions and penetration into the energy markets of NEA countries 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

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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 geopolitical 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. Improvement in territorial and production structure of Russia's energy sector and particularly in the 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.



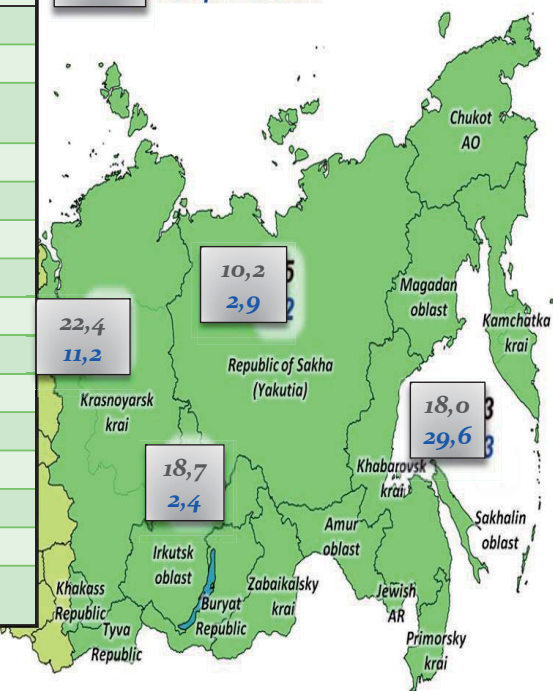
2. INITIAL CONDITIONS, TARGETS AND STRATEGIC DIRECTIONS IN ENERGY DEVELOPMENT IN EAST SIBERIA AND THE FAR EAST



ROLE OF THE ENERGY SECTOR OF EAST SIBERIA AND THE FAR EAST IN RUSSIA (2016)

Indices	Russia	Total for East Siberia and Far East
Territory, mln.km ²	17,1	10,3 (60,2%)
Population, mln. people	146,8	14,4 (9,8%)
Gross regional product*, trln. rub	65,0	6,9 (10,5%)
Potential of resources:		
Hydro, billion kWh	1660	1345 (81%)
Coal, billion t	274	126 (46%)
Oil, million t	19013	2852 (15%)
Natural gas, billion m ³	65825	7899 (12%)
Production of energy resources :		
Electricity, billion kWh	1091	213,0 (19,5%)
Heat, million Gcal	1284	172,2 (13,4%)
Coal, million t	386	134,7 (34,9%)
Oil, million t	548	69,4 (12,7%)
Natural gas, billion m ³	641	46,5 (7,3%)
Oil Refining, million t	258	28,6 (10,0%)

69,4 - Oil production
46,5 - Gas production



* 2015

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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 Northeast Asian countries.

These documents are "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.

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PARTICIPATION OF ENERGY SYSTEMS INSTITUTE SB OF 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)



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



An analysis of energy markets in China, Korea, Japan and other countries in Northeast and East Asia demonstrates that these countries have a niche for Russian energy resources.

Russia's energy potential makes it possible to supply energy resources to these countries on mutually beneficial terms:

oil – from 69 million t in 2016 to 75-80 million t in 2030;

natural gas – from 15 billion m³ in 2016 to 50- 60 billion m³ in 2030;

coal – from 70 million t in 2016 to 75-85 million t in 2030;

electricity – from 3.6 billion kWh in 2016 to 45-50 billion kWh in 2030.

Source : Available forecasts of energy companies, supporting materials of Energy Strategy of Russia 2035, estimates of ESI SB RAS



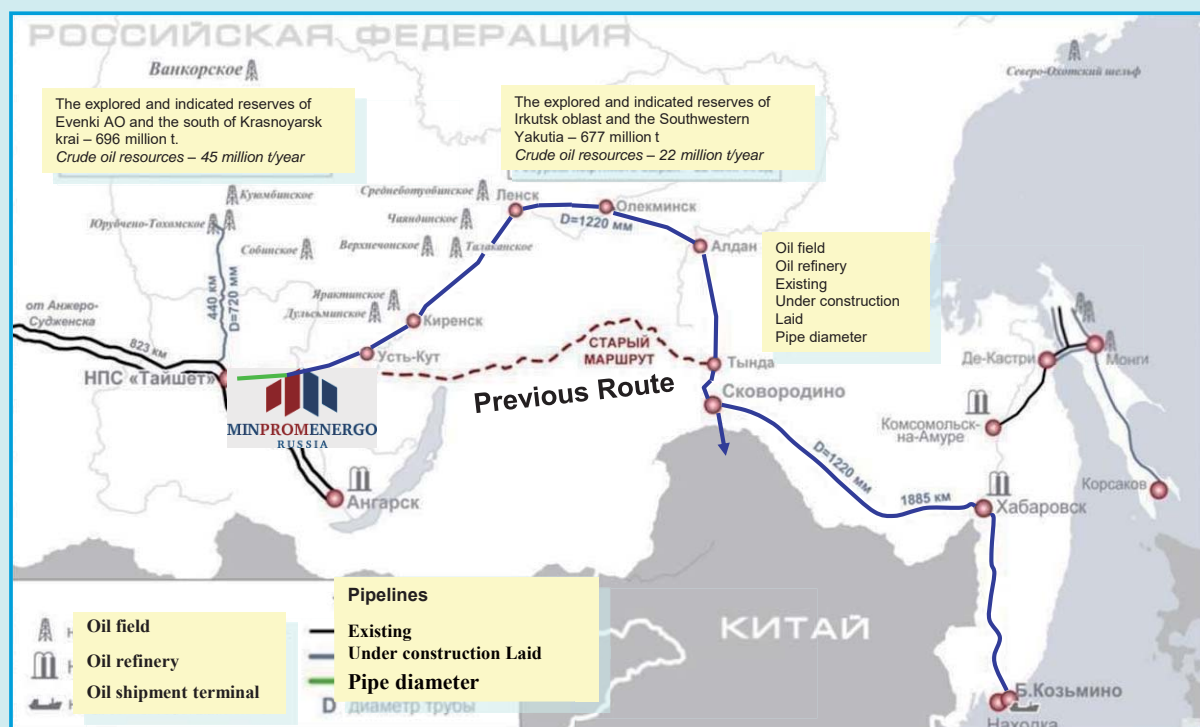
At present the material basis of the eastern vector of Russia's energy policy is based on several large fuel and energy projects aimed at markets of NEA countries:

First, 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 up to 15-20 million t of oil per year

Scheme of the main oil pipelines in the East of RF, including infrastructure for oil refining (next Slide)



SCHEME OF THE MAIN OIL PIPELINES IN THE EAST OF RF, INCLUDING INFRASTRUCTURE FOR OIL REFINING



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

Second, "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

Prospects for Russian natural gas supplies to the market of APR countries (next 2 Slides)

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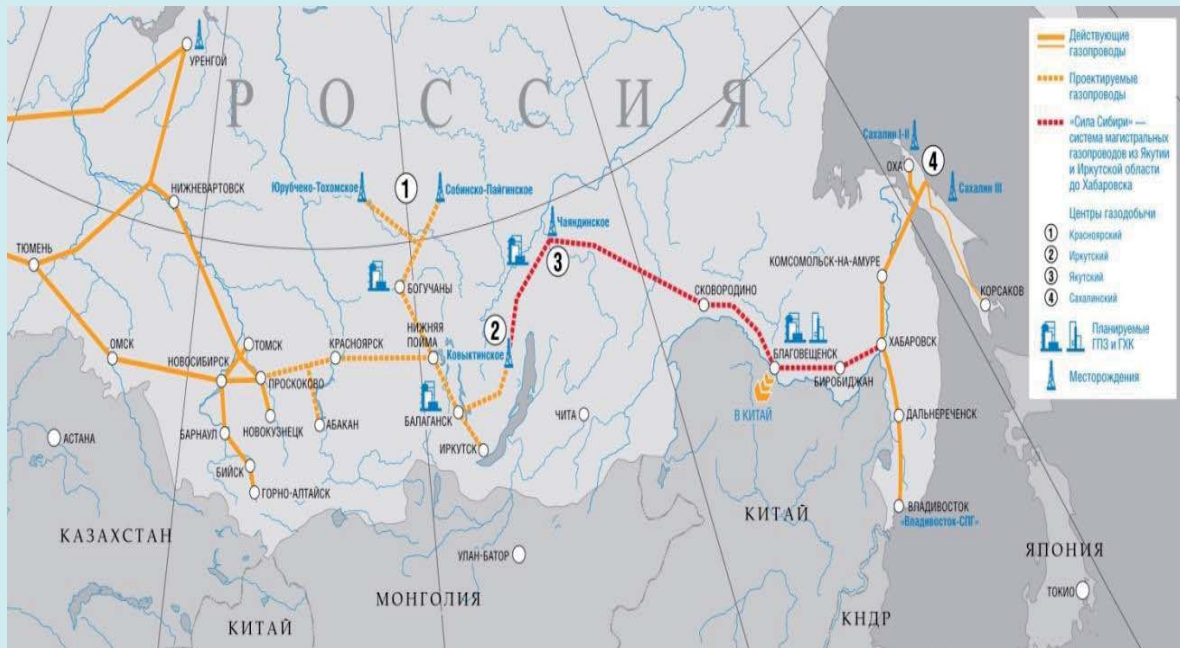
PROSPECTS FOR NATURAL GAS SUPPLIES TO THE MARKET OF APR COUNTRIES



Source: V.P. Timoshilov, FIEF-2011



GTS «POWER OF SIBERIA»



Source: GAZPROM



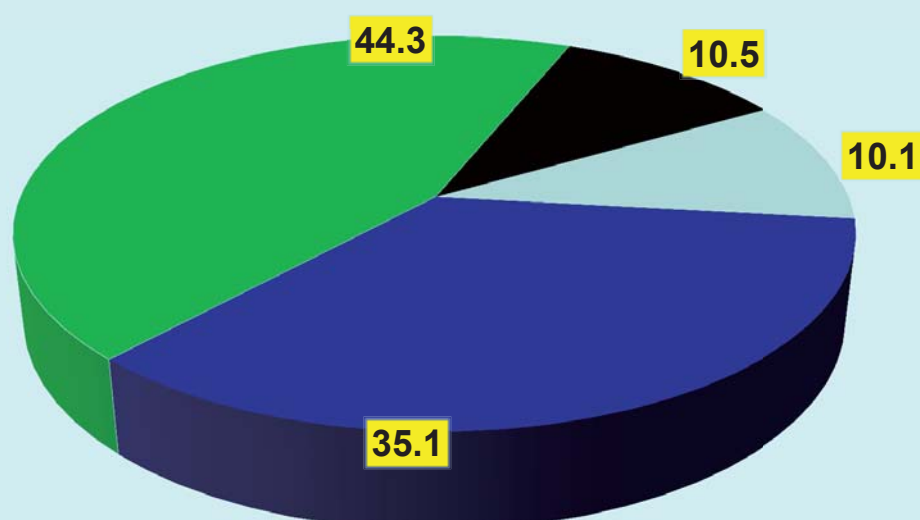
At present the material basis of the eastern vector of Russia's energy policy is based on several large fuel and energy projects aimed at markets of NEA countries:

Third, Russia is going to be an important and active player in the Asian coal markets



DISTRIBUTION OF PROVED COAL RESERVES OVER THE TERRITORY OF RUSSIAN FEDERATION

Proved reserves, total 193.3 bln. t (100 %)



■ European part ■ Eastern Siberia ■ Western Siberia ■ Far East



RETROSPECTIVE DYNAMICS OF RUSSIAN COAL PRODUCTION AND EXPORT, MLN T (IN ROUND FIGURES)

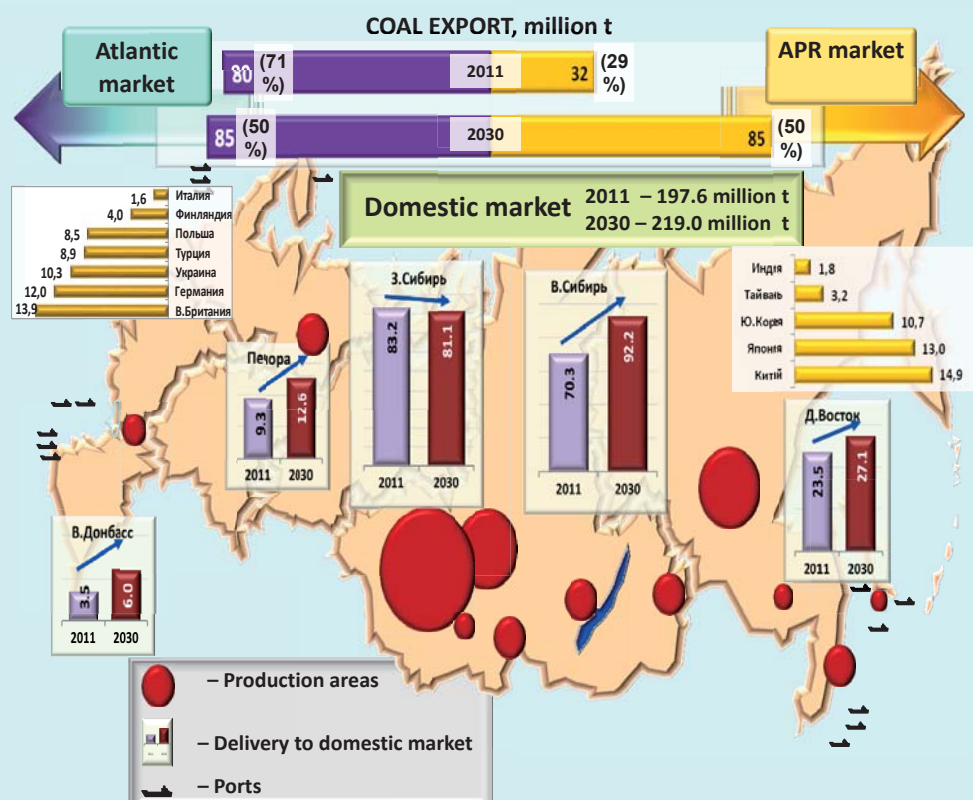
Index	Year				
	2008	2009	2010	2011	2013
Production	329	300	323	355	352
Export, total, including:	102	97	116	132	143
Eastern direction, total	16.6	27.7	28.0	48.9	58.8
including:					
Japan	9.0	9.0	8.9	12.7	12.8
Republic of Korea	6.6	4.0	3.9	12.7	15.3
China	0.1	13.1	14.1	19.2	26.1
Others	0.9	1.4	1.1	4.3	4.6

For information: The supplies of Russian coal to China from January to October 2012 made up 15 million t, including: by sea – 12 million t, by railway – 3 million t.

Source: Saneev B.G., Sokolov D.A. Energy Profile and Policy and Energy Statistics of the Russian Federation // Energy Policy and Statistics in Northeast Asia. Country Report for Mongolia, Korea, Russia, China. / Working Group on Energy Planning and Policy, the Intergovernmental Collaborative Mechanism on Energy Cooperation in Northeast Asia. – Korea Energy Economics Institute, 2011

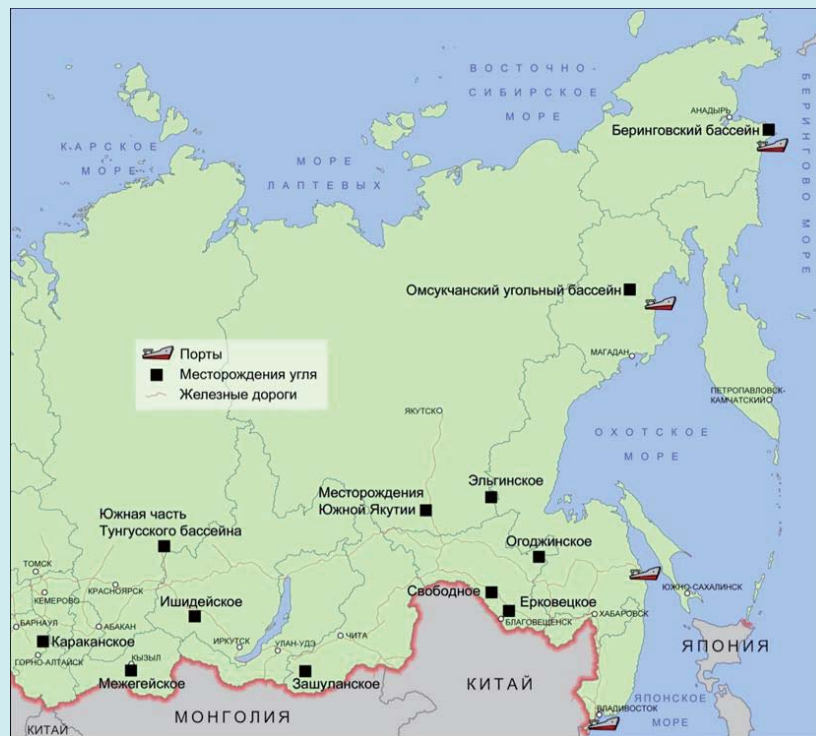


MAIN FLOWS OF RUSSIAN COAL LONG-TERM PROGRAMME FOR DEVELOPMENT OF COAL INDUSTRY, MINISTRY OF ENERGY OF THE RUSSIAN FEDERATION





PROSPECTIVE COAL DEPOSITS AND BASINS IN THE EAST OF RUSSIA FOR THEIR DEVELOPMENT WITHIN THE FRAMEWORK OF MUTUALLY BENEFICIAL INTERNATIONAL COOPERATION



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In the face of global and regional challenges it is extremely important for Russia to cooperate with NEA countries not only by trading energy resources but also by carrying out active innovation and technology policy

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3. Priority directions of innovation and technology cooperation between Russia and NEA countries in the field of energy

3.1. Participation in the construction of new Russian oil and gas-chemical clusters and their joint control



Large-scale involvement of oil and natural gas in the turnover of the eastern regions of Russia and mutually beneficial supply of Russian oil and natural gas to the energy markets of NEA countries is a top priority of the socioeconomic development of Russia and its eastern regions.

As to oil and gas cooperation between Russia and NEA countries in the future, we should take into account the following 2 factors:

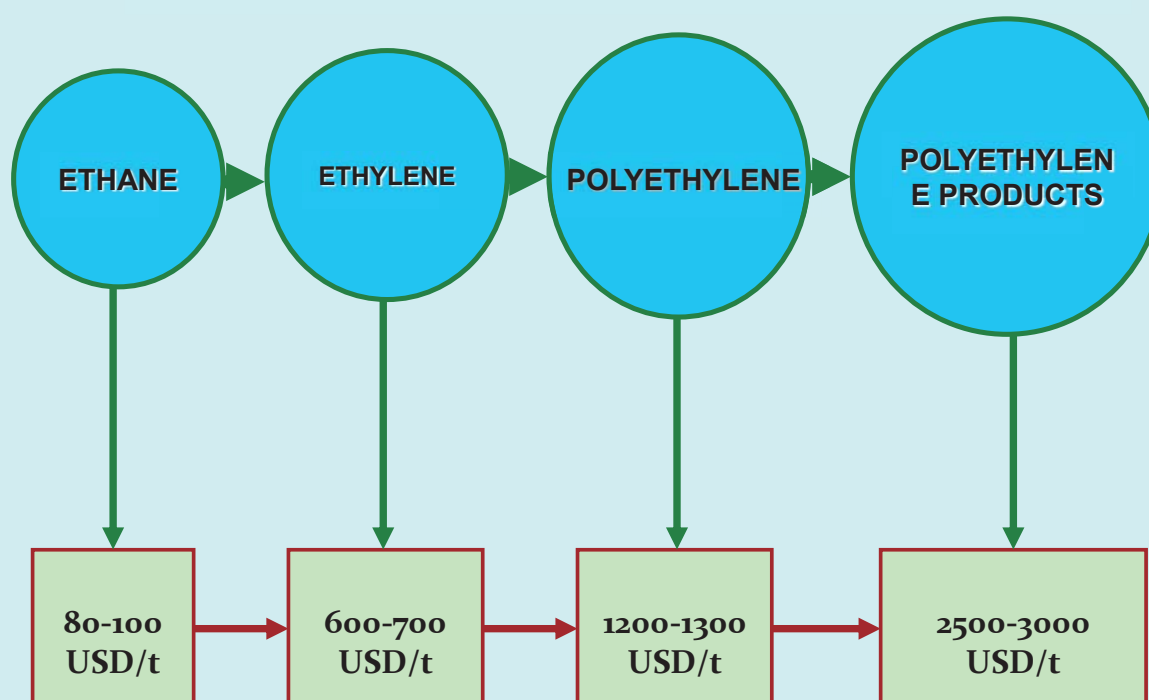


Factor 1

At present the necessity to deliver not only hydrocarbon resources, but high-value-added products of their advanced processing to the international markets is clearly recognized at all levels in Russia. Therefore, it is planned to increase the output of oil products in the eastern regions of Russia and create there a **oil-gas-chemical industry** whose products are in rather high demand in the world, in Russia and in NEA countries



CHANGE IN VALUE ADDED AFTER ETHANE PROCESSING





DYNAMICS OF DEMAND FOR INDIVIDUAL KINDS OF CHEMICAL PRODUCTS, MLN T

Polyethylene

WORLD



by 2.4 times

RUSSIA



by 3.6 times

Polypropylene

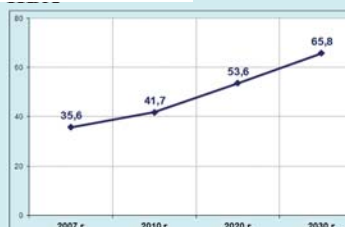


by 2.7 times



by 4.2 times

PVC



by 1.8 times



by 2.5 times

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Factor 2

- Natural gas and oil of the Siberian platform are unique in the content of helium and ethane, which essentially increases their consumer value
- Natural gas of the Siberian platform contains **0.3-0.5%** of helium and **4.6-7.2%** of ethane
- Helium reserves in the gas fields of the Siberian platform are estimated at **9.0 billion m³**, or about **30%** of the world helium reserves
- In the future Russia can be the world largest helium exporter



PLAN OF GAS- AND PETROCHEMICALS IN RUSSIA UNTIL 2030

This plan identifies **six petrochemical clusters in Russia by 2030:**

- Northwest
- Caspian
- Volga
- West Siberian
- **East-Siberian**
- Far Eastern

Construction of two plants in **Irkutsk Region**

Рис. 2. Планируемое расположение нефтехимических кластеров в России к 2030 году



Participation in the construction of new oil- and gas-chemical clusters in Russia and in their joint management is the priority area for innovation and technology cooperation between Russia and NEA countries in the field of energy



3. Priority directions of innovation and technology cooperation between Russia and NEA countries in the field of energy

3.2. Participation in the formation of cross-border transmission lines in NEA



(1) A general view on the problem



Cross-border transmission lines in NEA are a top priority for innovation and technology cooperation between Russia and NEA countries in the field of energy

The Eastern energy strategy of Russia suggests the development of interstate electric ties between the Russian eastern regions and “neighboring” NEA countries

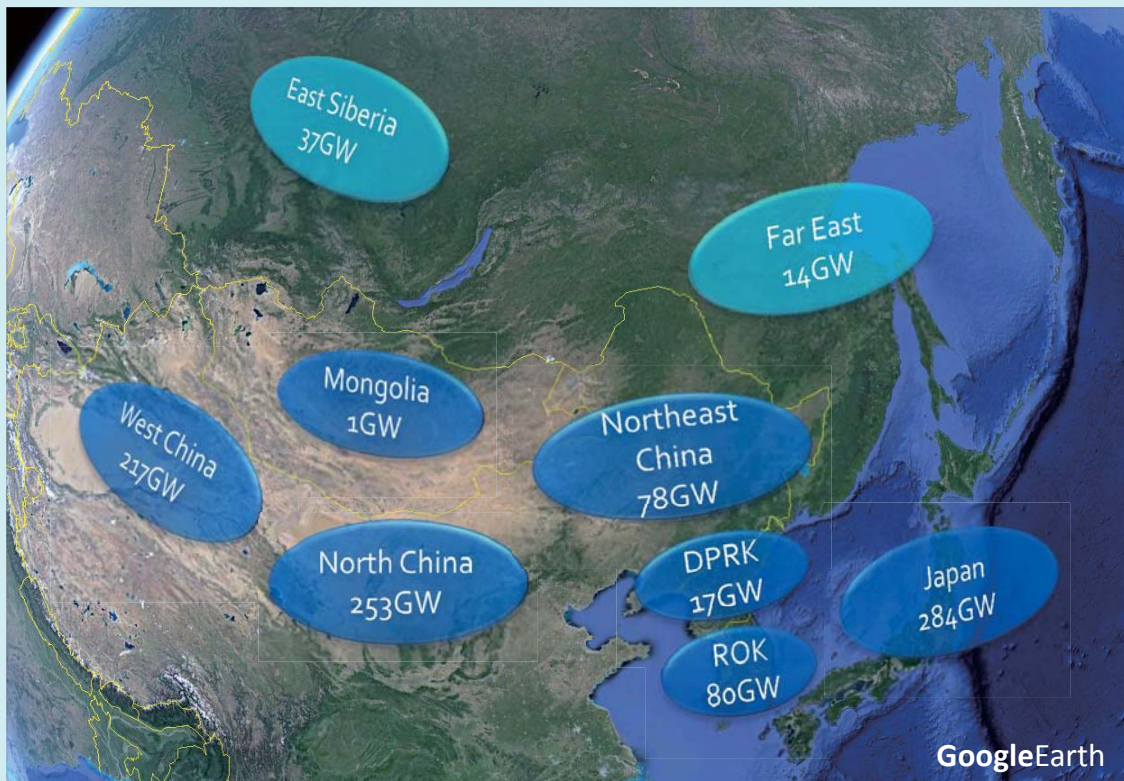


This concerns possible interconnection of electric power systems for parallel operation in Russia’s East (East Siberia and the Far East), Mongolia, People’s Republic of China, North and South Korea and Japan

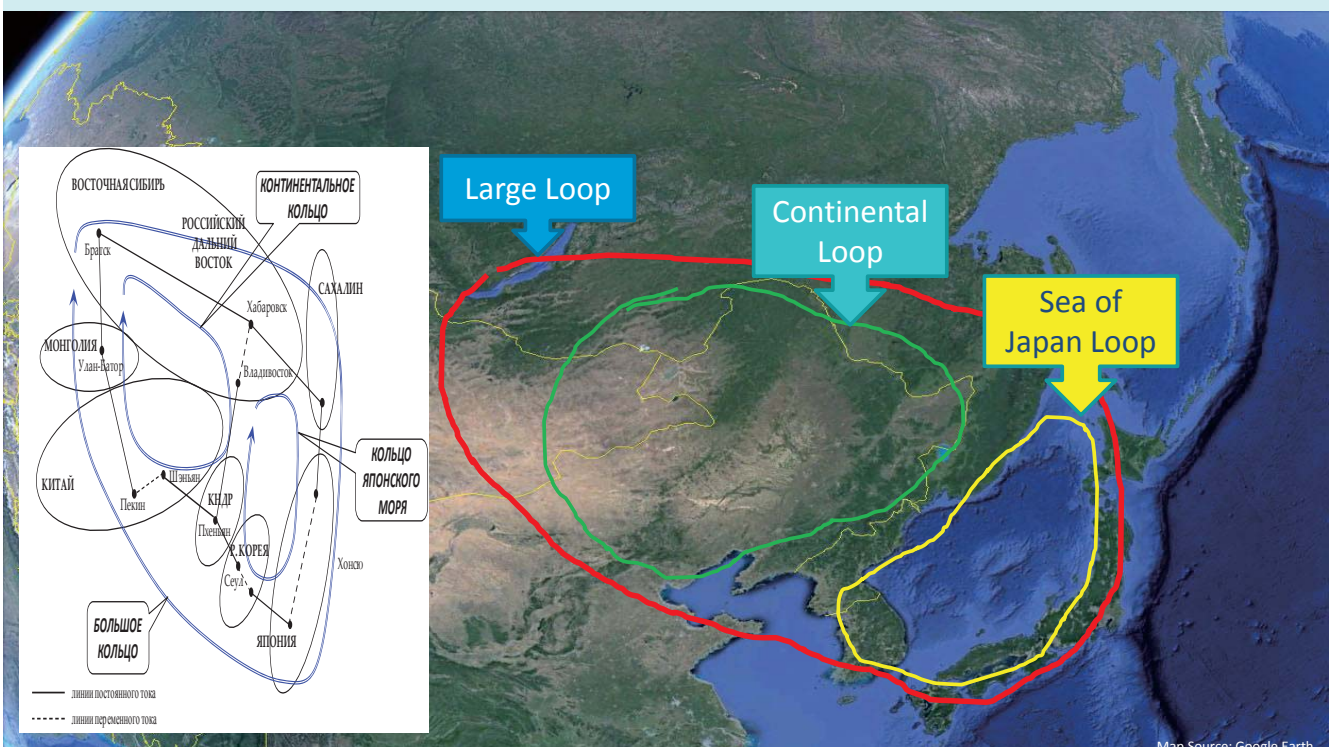
The operation area of such an interstate power super-interconnection may embrace different types of power plants (thermal, hydraulic, nuclear, wind, etc.) with a total installed capacity of above 450-500 million kW



NATIONAL AND REGIONAL POWER GRIDS IN NORTHEAST ASIA (2010)



POSSIBLE SCENARIOS OF INTERSTATE INTERCONNECTION OF POWER SYSTEMS IN NEA COUNTRIES





(2) Formation of cross-border 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



THE FIRST STAGE OF RUSSIAN ELECTRICITY EXPORT TO CHINA (current status)



Source: Mikhail Shashmurin, Eastern Energy Company (INTER RAO UES Group) APEF, Vladivostok, May, 2013

LARGE-SCALE ELECTRICITY EXPORT FROM RUSSIA TO CHINA



Source: Mikhail Shashmurin, Eastern Energy Company (INTER RAO UES Group) APEF, Vladivostok, May, 2013



BREAKTHROUGH OF INTER-STATE E. TRANSPORTATION IN NEA

Korea-Russia Electricity Network Interconnection

- 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



PROPOSED SCOPE OF RUSSIA-JAPAN POWER BRIDGE PROJECT

	Delivery	Cost	Funding
Stage 1. Project implementation within the framework of existing plans on development of power system in the Sakhalin region	~ 0.5 – 0.6 GW	US\$ 610 m*	US\$ 300 m – FTP FE and BR until 2018 US\$ 310 m - investor funds/project funding
Stage 2. Construction of large-scale export-oriented generation on Sakhalin island	~ 1.3 – 1.4 GW	US\$ 4.7 m	Investor funds/project funding
Stage 3. Connection of the electric power system of Sakhalin region to the interconnected power system of the East	~ 2 – 4 GW	US\$ 370 m	Investor funds/project funding

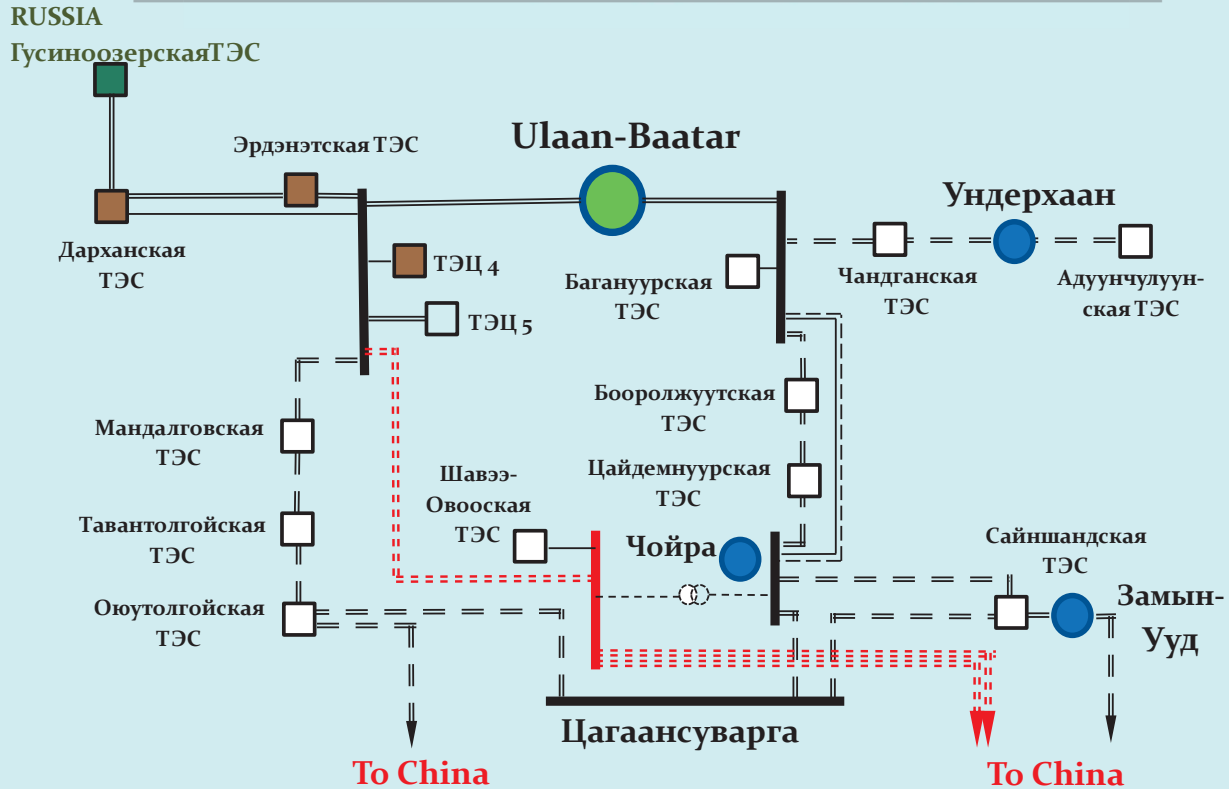
Electricity export can make up 2 - 4 GW
Preliminary investment is estimated at US\$ 5.7 billion

* - costs of network development and construction of submarine cable lines, excluding costs of generation facilities

Source: A.Kaplun (RAO "UES of Russia") Prospective directions of power industry development in FED, APEF, Vladivostok, May, 2013



INTERSTATE ELECTRIC POWER SYSTEM RUSSIA – MONGOLIA – CHINA

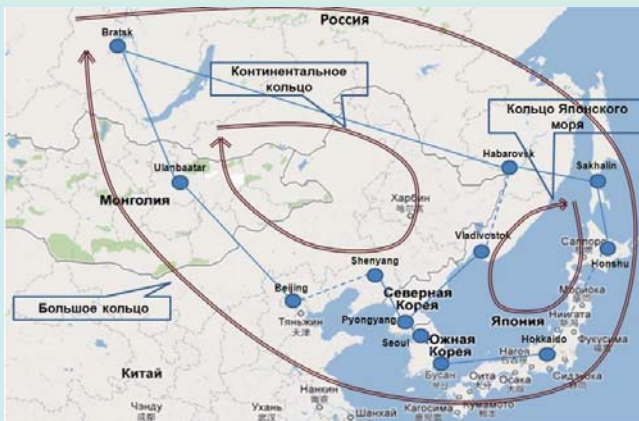


Source: Kh. Enkhjargal, S Batkhuyag – Russia-Mongolia project (ASM (MUS&T)-SB RAS (ESI)), 2013



ASIAN RINGED NETWORK (ASIAN SUPER-GRID)

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

Source: I.Dzhurko (OJSC Far East Energy Management Company), APEF, Vladivostok, May, 2013



3. Priority directions of innovation and technology cooperation between Russia and NEA countries in the field of energy

3.3. Joint construction of "green energy" in the eastern regions of Russia in order to ensure reliable power supply isolated and hard to reach consumers

Role of the renewable energy sources



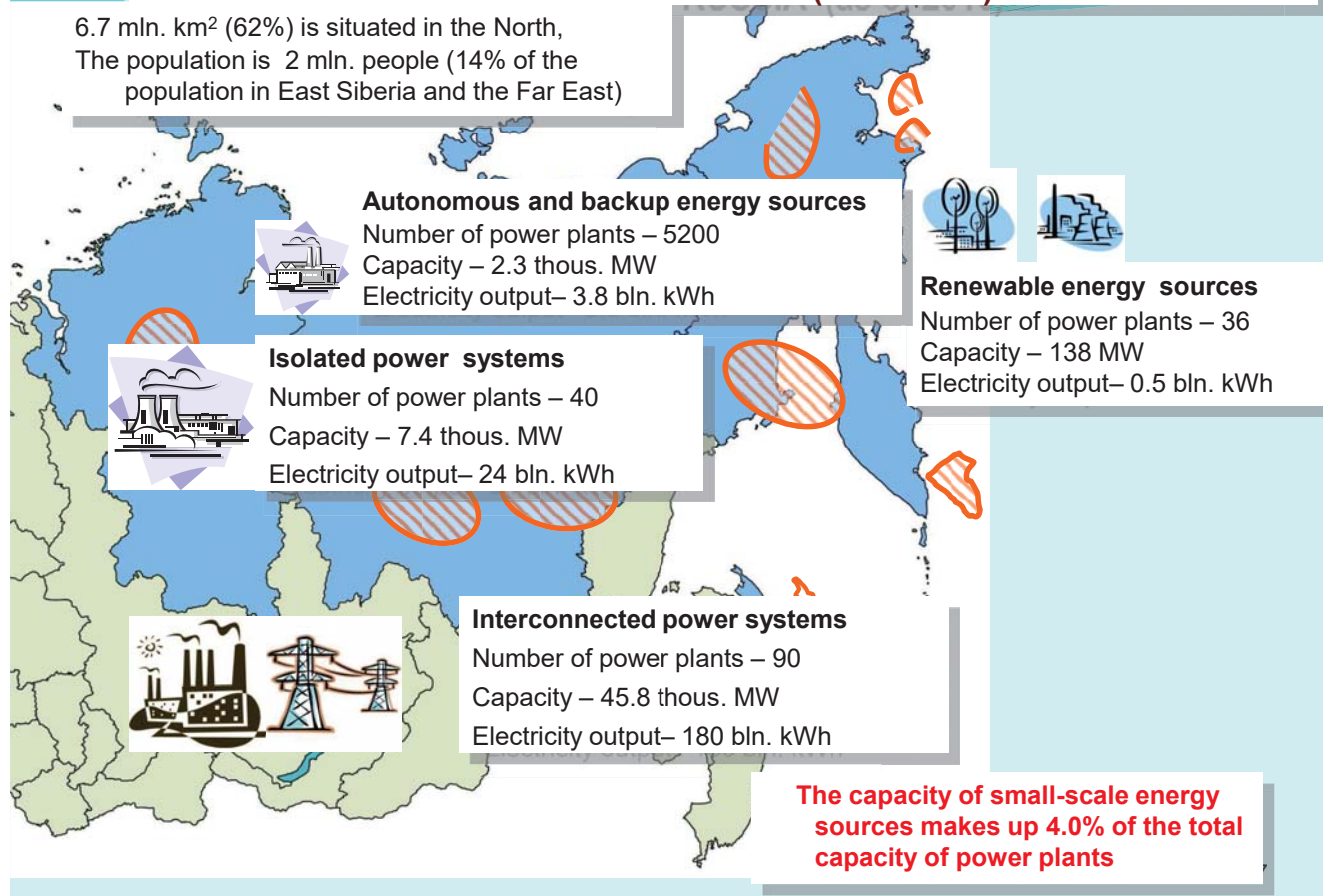
The Energy Strategy of Russia - 2035 and General Scheme of the Electric Power Industry Development until 2030 suggest large-scale adoption of renewable energy sources: the share of RES in the total electricity production is expected to increase from current 0.5% to 2.5-4.5% in 2030-2035.

This is particularly important for the economy and energy of the eastern regions.



CHARACTERISTIC OF THE ENERGY SOURCES IN THE EASTERN REGIONS OF RUSSIA (as of 2015)

6.7 mln. km² (62%) is situated in the North,
The population is 2 mln. people (14% of the
population in East Siberia and the Far East)



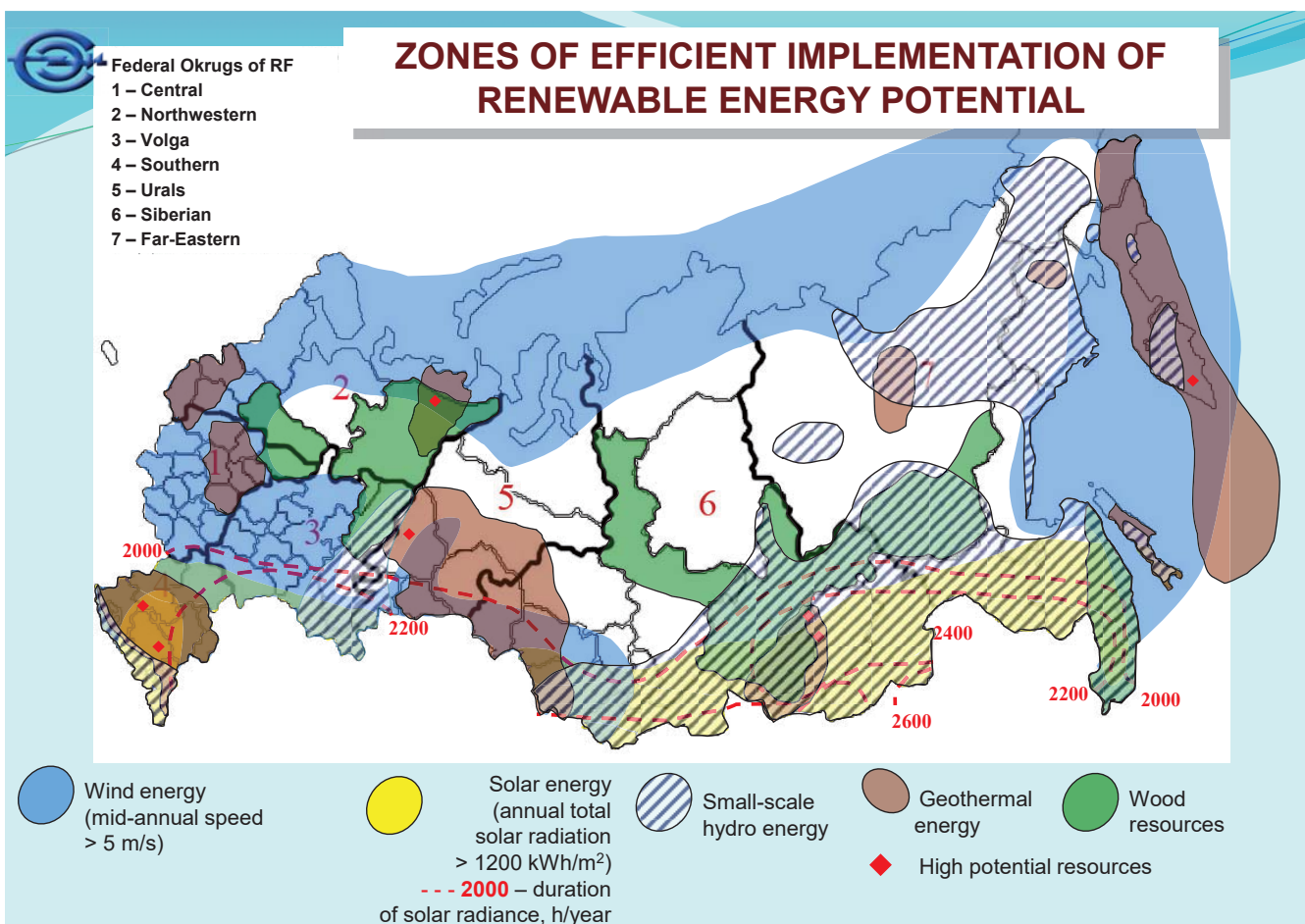
The use of renewable energy sources (mini-HPP, GeoTPP, WPP and others) is a strategic priority of energy development in the northern and hard-to-reach territories in the East of Russia



An extensive utilization of renewable energy sources is an important priority to develop local systems of energy supply to consumers in the northern regions.

Renewable energy sources make it possible to:

- **reduce consumption of expensive fuel in the energy balance of the northern regions;**
- **improve comfort and quality of life for population;**
- **decrease an adverse energy impact on the natural environment.**





ALLOCATION OF NEW SMALL-CAPACITY ENERGY SOURCES OF DIFFERENT TYPES IN EAST SIBERIA AND THE FAR EAST (AS OF 2050)



Total new capacities

	Connection to centralized electricity supply
	Mini cogeneration plant (CP) - 70 MW
	Conversion of DPP to gas - 17 MW
	Small NPP - 108 MW
	Small HPP - 170-350 MW
	WPP - 160-300 MW
	GEO TPP - 45-95 MW
	SOLPP - 440-470 MW
TOTAL-1000-1400 MW	

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DIRECTIONS IN COOPERATION BETWEEN RUSSIA AND NEA COUNTRIES IN THE FIELD OF RENEWABLE ENERGY SOURCES

Legislative framework

System of state stimulation

System of preferential taxes and crediting

Mutually beneficial deliveries of equipment

Joint investment in projects

Information exchange

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A NEEDFUL LIST OF INNOVATIVE ELECTRICAL EQUIPMENT INTENDED FOR ARCTIC CONDITIONS

- Cogeneration power plants (mini CHP) operating on coal and gas with a capacity of 3-6 MW**
- Nuclear power plant units with a capacity of 6-12 and 50-100 MW**
- Wind turbines (WT) with a unit capacity of 50-100 kW**
- Photovoltaic modules**



4. Conclusion - NECESSARY CONDITIONS AND INITIATIVES FOR SUCCESSFUL MUTUALLY BENEFICIAL INNOVATION AND TECHNOLOGY COOPERATION BETWEEN RUSSIA AND NORTHEAST ASIAN COUNTRIES IN THE FIELD OF ENERGY



1. It is necessary to elaborate a scientifically grounded strategy (road map) for innovation and technology cooperation between Russia and NEA countries in the field of energy

2. Such a strategy can be worked out only on the basis of international cooperation among research and design institutions, companies, banks, etc. of the countries concerned, and active support of Governments and regional authorities

3. ESI SB RAS is ready to take an active part in solving this very important problem for Russia and all Northeast Asian countries.



Goseite arigato godzaimasita!

СПАСИБО ЗА ВНИМАНИЕ!

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