Small distributed power system and renewable energy sources in the Sakha Republic (Yakutia)

Presentation by the
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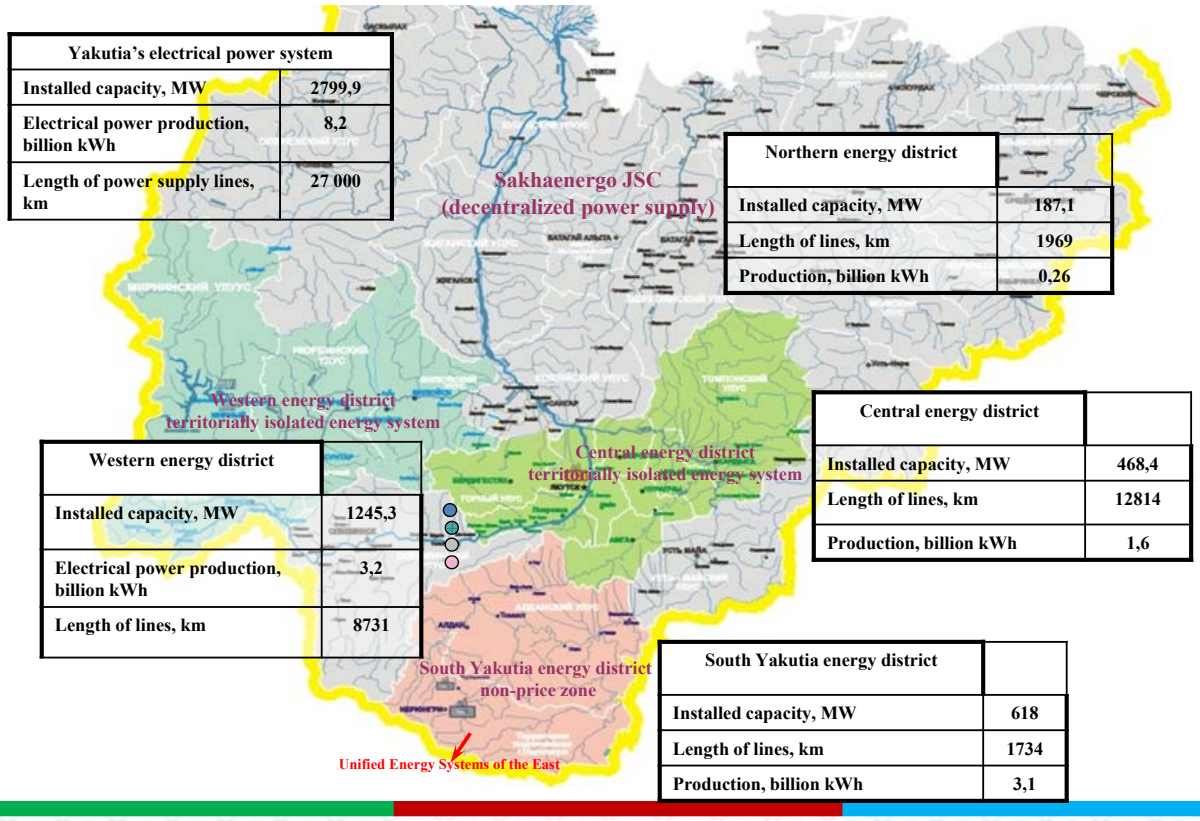
Characteristics of power system of the Sakha Republic (Yakutia)

Yakutia's electrical power system	
Installed capacity, MW	2799,9
Electrical power production, billion kWh	8,2
Length of power supply lines, km	27 000



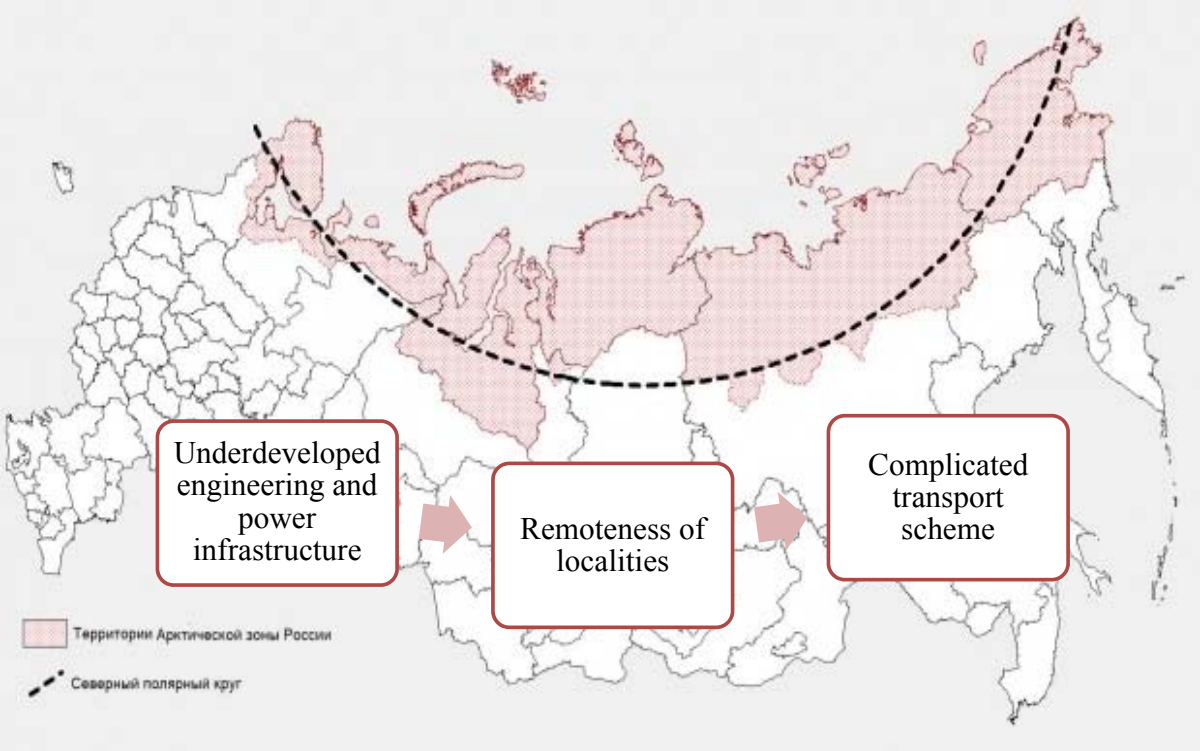
Northern energy district	
Installed capacity, MW	187,1
Length of lines, km	1969
Production, billion kWh	0,26

Western energy district	
Installed capacity, MW	1245,3
Electrical power production, billion kWh	3,2
Length of lines, km	8731

Central energy district	
Installed capacity, MW	468,4
Length of lines, km	12814
Production, billion kWh	1,6

South Yakutia energy district	
Installed capacity, MW	618
Length of lines, km	1734
Production, billion kWh	3,1

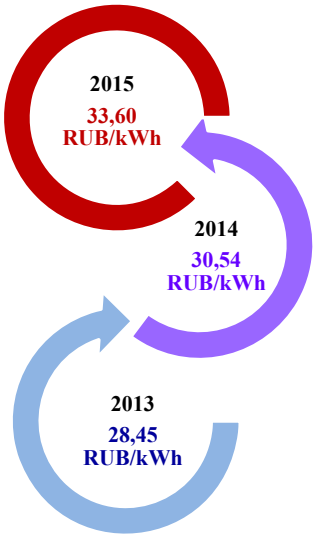
Current development challenges of the Arctic zone of the Sakha Republic (Yakutia)



Problems of localized power industry in the Sakha Republic (Yakutia)

Problem:

High costs of the diesel power industry maintenance and, thus, annual increase in electricity tariffs in the localized power industry zone



Cause:

- technological inaccessibility of power systems;
- high number of energy sources (also isolated within one power system) of various types – HPS, CHP and TPP on coal and natural gas, diesel power sources of small capacity;
- absence of main interregional power grids, most power supply lines are wooden, long and have a high degree of depreciation;
- use of expensive diesel fuel (85% in the fuel balance structure), need for fuel delivery for a season in advance, annual higher-than-anticipated growth of diesel price.
- complicated delivery of fuel and material supplies with intermodal exchange scheme (terms of delivery1,5 to 2,5 years)
- higher requirements to the reliability of power supply under low temperatures and in the climatic and geographical peculiarities of the High North;
- annual amount of loan resources attracted to bring diesel (about RUB 5 bln);
- impossibility of technical upgrade due to lack of own sources formed by the localized power industry.

**Average annual tariffs, no VAT*

Localized power industry optimization program
Major areas

Subprogram # 1. Implementation of the programs of energy resource saving. Funding – RUB 6,9 bln. Economic benefit – RUB 0,1 bln. Payback period – 54 years.

Subprogram # 2. RES development. Funding – RUB 2,2 bln. Economic benefit – RUB 0,3 bln. Payback period – 7,6 years.

Subprogram # 3. Program of micro and mini HPS installment. Funding– RUB 0,7 bln. Economic benefit – RUB 0,1 bln. Payback period – 8,5 years.

Subprogram # 4. Reduction of the localized power inductry zone. Funding RUB 2,2 bln. Economic benefit – RUB 0,2 bln. Payback period – 12,6 years.

Subprogram # 5. Development of generation objects. Funding - RUB 8,8 bln. Economic benefit – RUB 0,02 bln. No payback period.

The program's funding:

RUB 20,8 bln.
VAT and deflator included

Economic benefit
RUB 0,7 bln

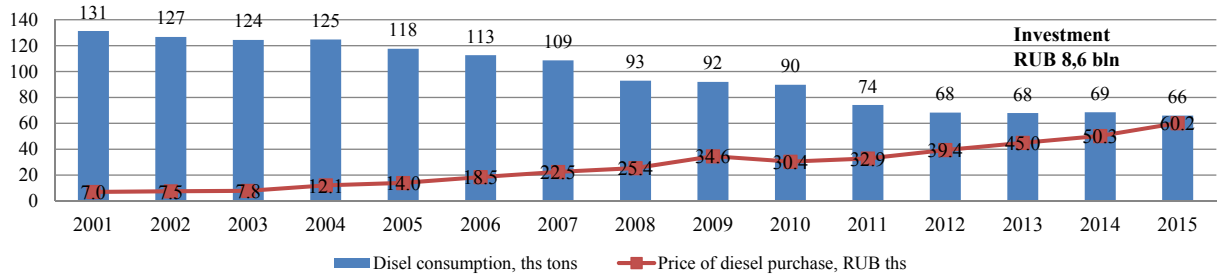
Payback period – 29,0 years

Reduction in expenditure for diesel by 51,6 %.

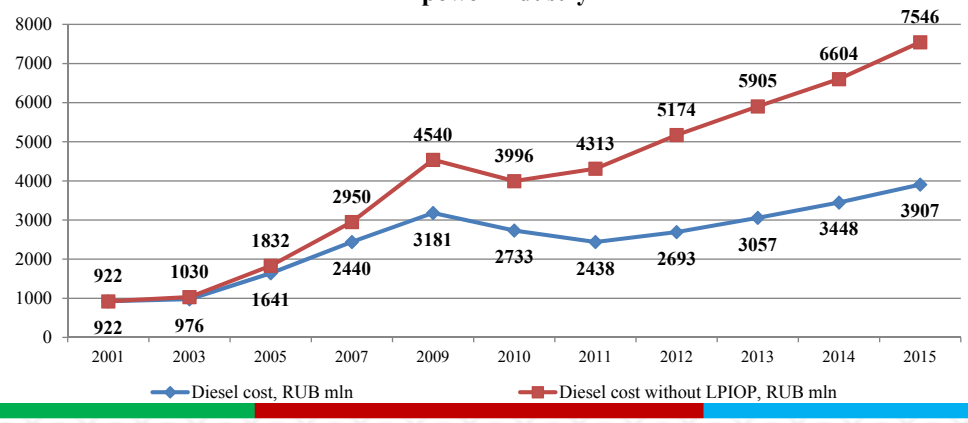
Reduction in expenditure for the localized power industry maintenance by 12,3%

Results of implementation of the Localized Power Industry Optimization Program for 2001-2014

Dynamics of consumption and price of fuel for energy production

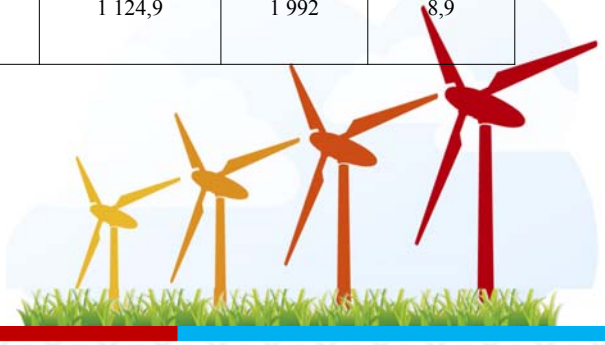


Cost of diesel consumption in relation to the arrangements to reduce expenditure in the localized power industry



Localized Power Industry Optimization Program
Subprogram # 2. Renewable energy sources development

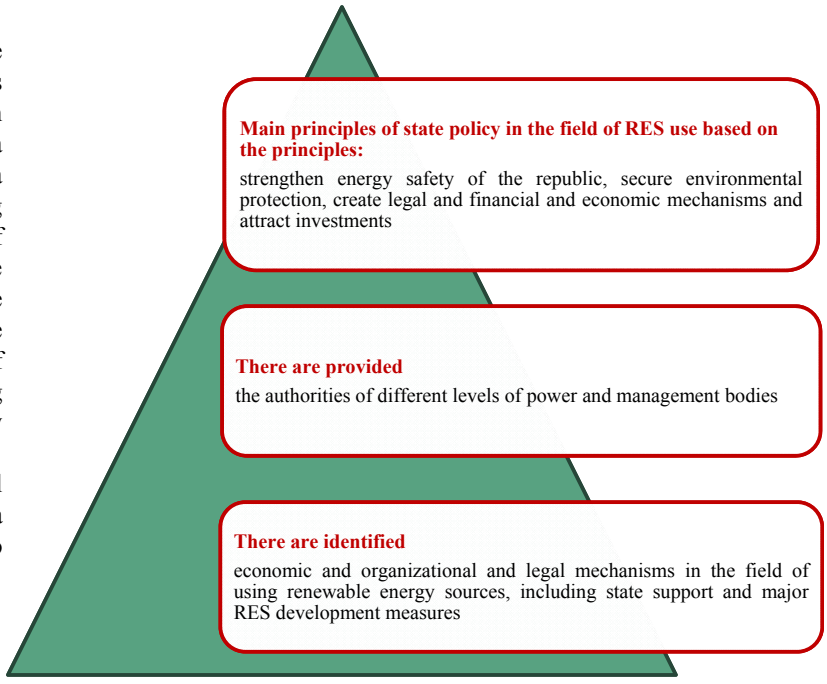
Name	Number of plants, items	Total capacity, MW	Construction cost, RUB mln	Estimated diesel economy, tons	Payback period, years
Total	**72**	**15,52**	**2 238,1**	4 510	7,6
Wind power plants (WPP)	9	3,49	1 113,2	2 518	7,0
Solar power plants (SPP)	63	6,52	1 124,9	1 992	8,9



Law of the Sakha Republic (Yakutia) on renewable energy sources

On November 27, 2014 in the Sakha Republic (Yakutia) there was adopted a Law 1380-3 № 313-V "On renewable energy sources of the Sakha Republic (Yakutia)", which made a major legal framework regulating relationship emerging in the process of activity in the area of RES, to create favorable prerequisites for a priority use of renewable energy sources in the Sakha Republic (Yakutia) for the sake of improving social and ecological living standards and for saving energy resources.

The law contains general provisions of state regulation in the area and a number of concrete legal norms to support the use of RES.



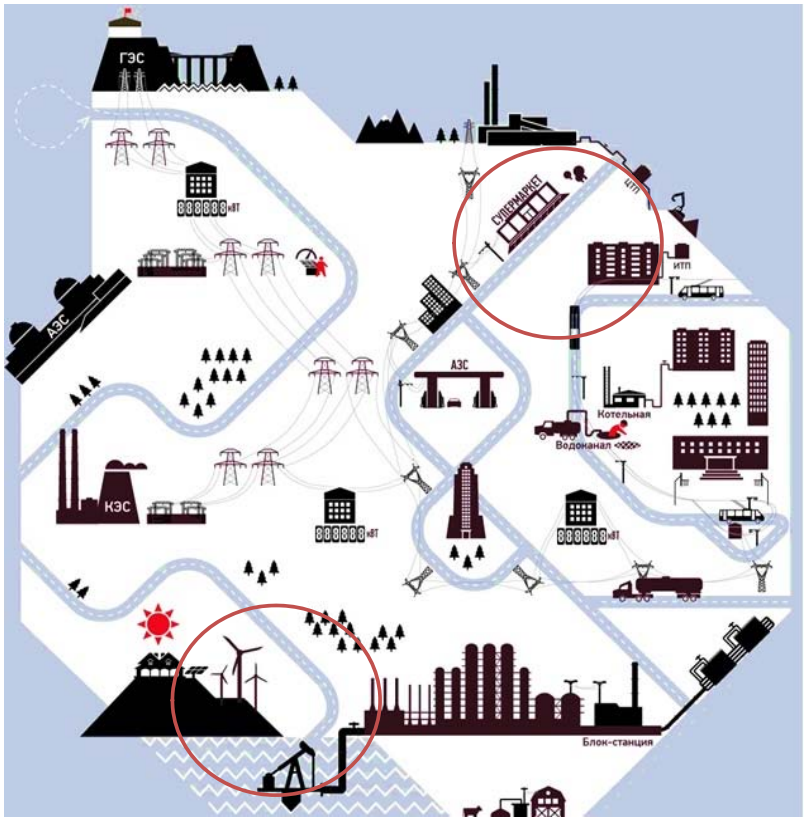
Main strategy of Yakutia's power industry development

Power industry and electrical network economy is upgraded using the latest technologies, including the renewable energy sources.

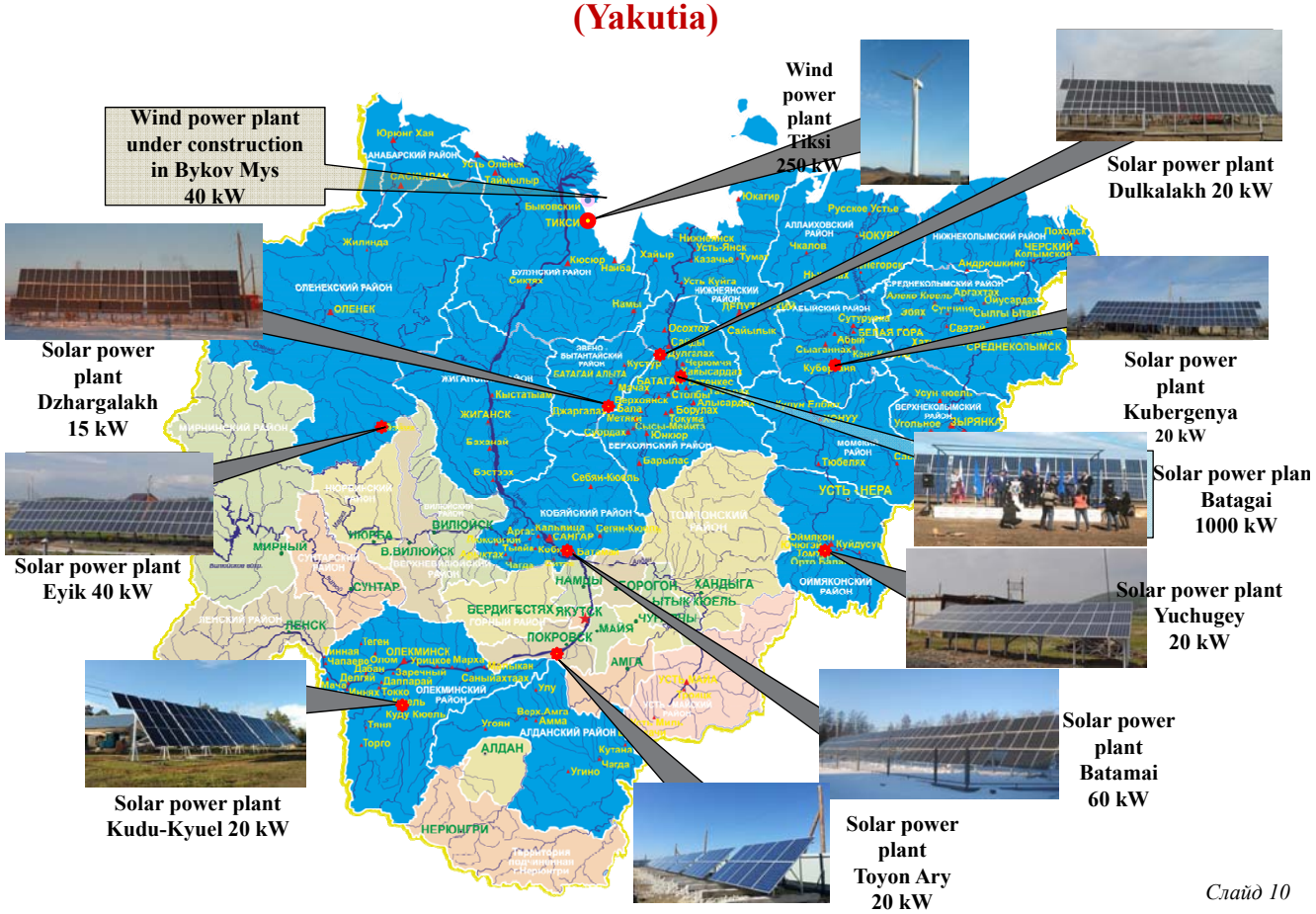
Construction of combined power stations on the traditional fuel and the renewable energy sources.

The practice of RES implementation in the Sakha Republic (Yakutia):
9 solar power plants and 1 wind power plant

For the whole period since RES implementation, diesel economy made over 230 tons



Current situation with the renewable energy in the Sakha Republic (Yakutia)



Regular international conferences “Renewable energy generation in the isolated systems of the Russian Far East” in Yakutsk

Thank you for your attention!