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Energy efficient technologies implementation in Russia

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Development of the Tomsk Region energetics

Fuel and energy complex key targets:

- Increase of oil and gas complex operating efficiency
- Reduction of electricity and capacity deficit
- Efficiency increase of fuel use for heat supply
- Reduction of associated petroleum gas flaring

Priorities:

- Perfection of boiler and furnace fuels balance
- Complex solution for gas-, heat- and electricity supply
- Economy and reliability growth of energy and fuel supply for consumers

Energy intensity of the Tomsk region GRP

Parameters	Years			
	2000	2005	2010	2020
Gross Regional Product, % relatively to 2000	100	130	160	270
Total energy consumption, mln. t.c.e.	7,2	7,96	9,3	10,4
Energy intensity of внутреннего regional product, % relatively to 2000	100	97	89	62

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Energy projects in Tomsk Region

- Energy strategy of Tomsk Region adjustment until 2020 year
- Tomsk region heating and electric capacity development master plan
- Regional target program “Tomsk Region municipal infrastructure modernization in 2006-2010 years”
- Complex energy saving program “Energy efficiency in Tomsk Region in 2004 – 2008 years”
- Energy efficiency demonstration zone creation in Kolpashewo, Tomsk Region
- Program of gas supply and gas distribution facilities construction in Tomsk Region.

Energy saving potential amounts to average 25-30% of total energy consumption, including:

- Industry – 20 – 30%;
- Construction – 20 – 22%
- Transport – 25 – 30%
- Agriculture – 20 – 25%
- Municipal – 40 – 50 %

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Demonstration zone creation project in Kolpashewo, Tomsk Region

Project goals:

- Ensuring of energy safety and reliability of fuel supply for municipal sector and households
- Increase of heating and electric supply system efficiency, due to rational usage of fuel-energy resources as well
- Application of modern technologies, materials and equipments
- Formation of conditions for commercial attractiveness and profitability of energy projects

Kolpashewo city, Tomsk region

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Kolpashewo city, general information

Located on the right bank of Ob' river, 330 km. from Tomsk

City of regional subordination, the center of Kolpashewo district

Connected with Tomsk and other regional cities by river transport, highways and airlines

Population of city (2004 year) – 26,9 thousand people

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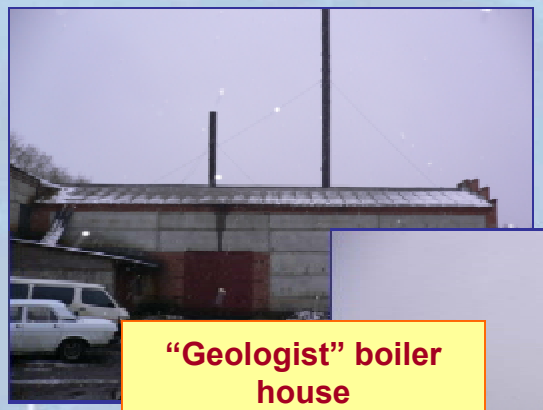
Kolpashewo city, general information



"Geologist" boiler house

"CLH" boiler house

"Central" boiler house (village Togur)

"TGT" boiler house

Housing facilities in total – 640,6 thous. square. m.

Number of flats – 20 839, including private:

- with central heating – 57,5%
- with central hot water supply – 15,9%
- with water supply – 53,3%
- with wastewater disposal system – 49,9%

Number of houses – 5465, including private housing facilities – 4800

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Project business-plan development

	Name	Year, month				
		2007				2008
		09	10	11	12	01
1.	Analysis of energy market in the region of the ‘case study’ municipality					
2.	Model of the natural gas supply to municipality					
3.	Assessment of legal, regulatory, institutional framework					
4.	Preparation of pre-feasibility investment project business plan including detailed cost estimates for engineering works required					
5.	Analysis of the regional/national impact of ‘case study’ municipality for Russian Federation					

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Analysis of fuel balance Heating supply

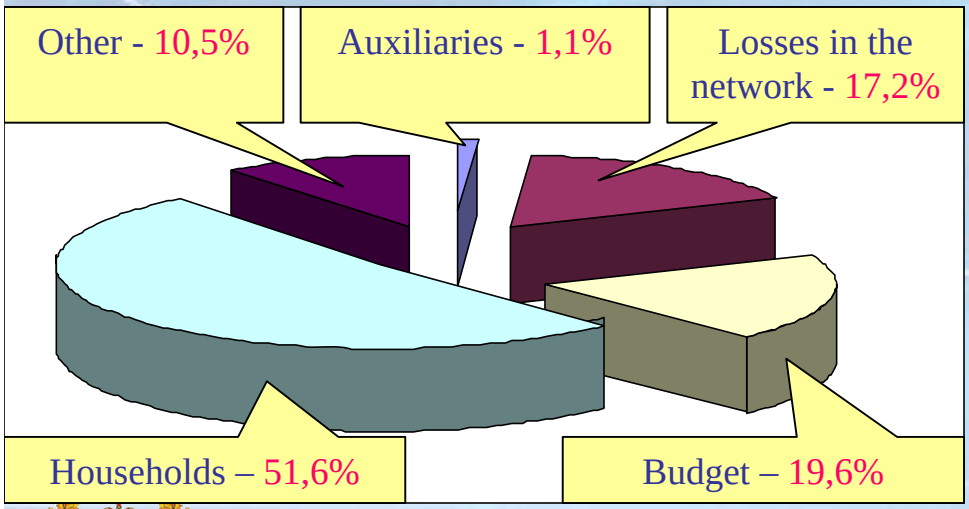
Main sources of heating supply

municipal boiler houses – 39
industrial boiler houses – 27

Total fuel demand – 89,12 thous. t c.e.
including boiler houses – 47,13 thous. t c.e.

Type of used fuel – oil, coal

Heating energy end-use consumption structure, %



Total installed capacity
– 151,42 MW, including

municipal boiler houses – 102,74 MW
industrial boiler houses – 48,6 MW

Efficiency coefficient average rate (value)

coal boiler – 42-62%
oil boiler – 62-70%

Depreciation of boiler houses equipment – 65%

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Analysis of fuel balance

Electric supply

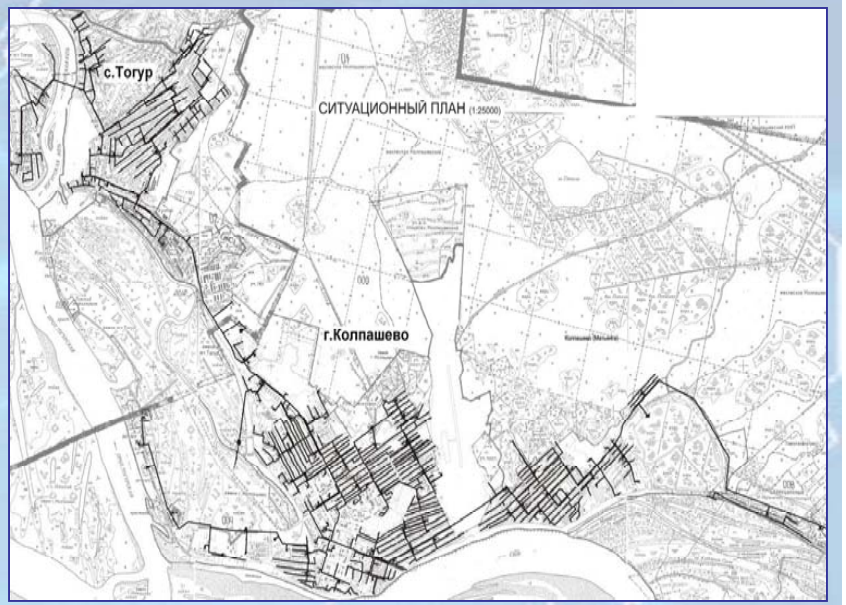
Sources of electric supply
two electric lines by 110 V:
«Bely Yar – Kolpashewo»,
«Chajemto – Kolpashewo»

Consumers electric supply:
substation 110/35/10 kV «Kolpashewo»,
substation 35/10 kV «Togur»

City electric network – 10 kV

Extent:
overhead transmission lines – 122,5 km
cable lines – 22,1 km

Site plan, Kolpashewo and Togur village



Insufficient reliability level of feed and distribution lines determines the necessity of their development:

- second 10 kV line construction,
- 35/10 kV substation construction,
- 35/10 kV “Togur” substation conversion into 110/10 kV voltage

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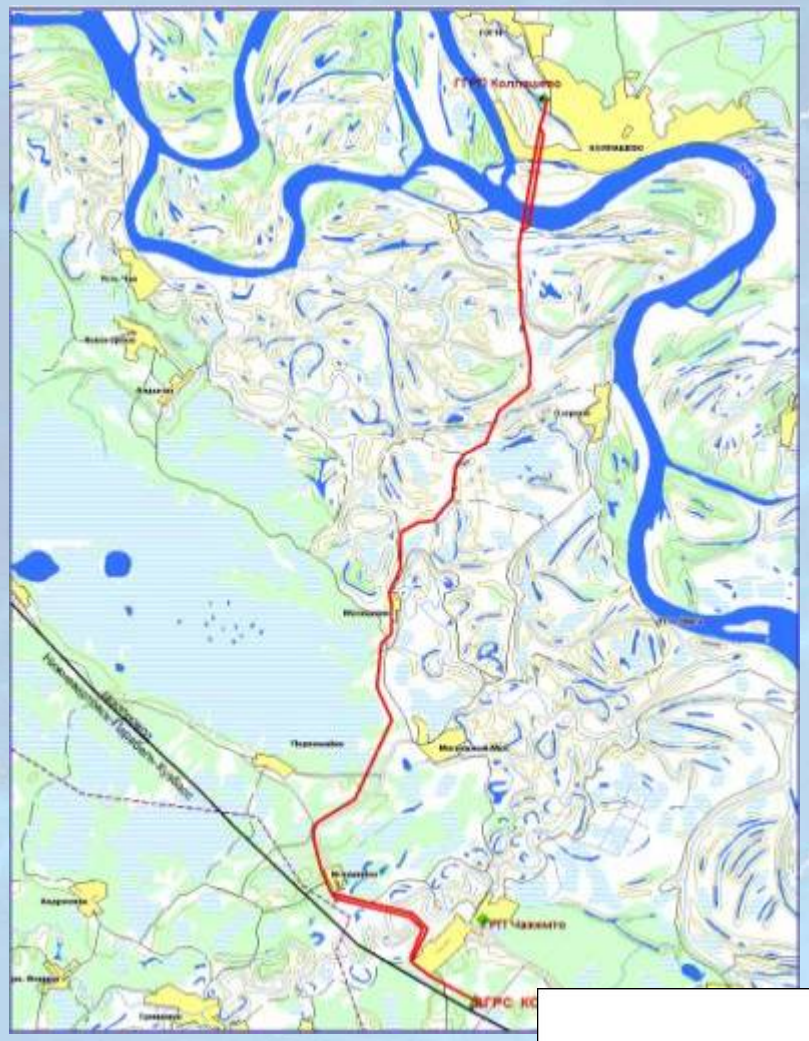
Gas supply network



- inter-community gas pipeline with pressure 1,2MPa Ø 377x7, length 49 km (single train) end of construction – September, 2007
- reconstruction of existing siphon Ø 219mm with technology of German firm «Rädlinger Primus Line GmbH» using flexible polymeric-tissue hose Primus Line nominal Ø 150mm, internal Ø 135mm
- high pressure distribution gas pipelines (approximate length of 58,24 км, average nominal Ø 100 mm), low pressure distribution gas pipelines (approximate length 255,18 km, average nominal Ø 50mm) and input gas pipelines – 65,7 km
- gas supply to households and boiler-houses
- gas consumption volume – 139,6mln.m^3/year

Gas supply scheme of Kolpashewo and Togur

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Legal framework of the project

- Law No. 69-FZ of 31 March 1999 «About natural gas industry»
  Law No. 35-FZ of 6 March 2003 «About power industry»
- Resolution No.1021 of 29 December 2000 «About state regulation of gas prices and tariffs for it`s transportation services in the territory of RF»
- Law No. 41-FZ of 14 April 1995 «About state regulation of tariffs for electric and heat power in RF»
- Law of Tomsk Region No. 400 of 28 January 1997 «About fundamentals for energy saving in the territory of Tomsk Region»
- Law of Tomsk Region No.103 of 02 July 1998 «About electric and heat supply of consumers of Tomsk Region»
- Law of Tomsk Region No. 679 of 20 November 2000 «About utilization of local unconventional renewable sources of energy in Tomsk Region»
- **Law of Tomsk Region No. 96 of 27 April 2007 «About stimulation of energy saving projects` realization in the territory of of Tomsk Region»**
- Draft Law of Tomsk Region «About energy services in the territory of Tomsk Region»

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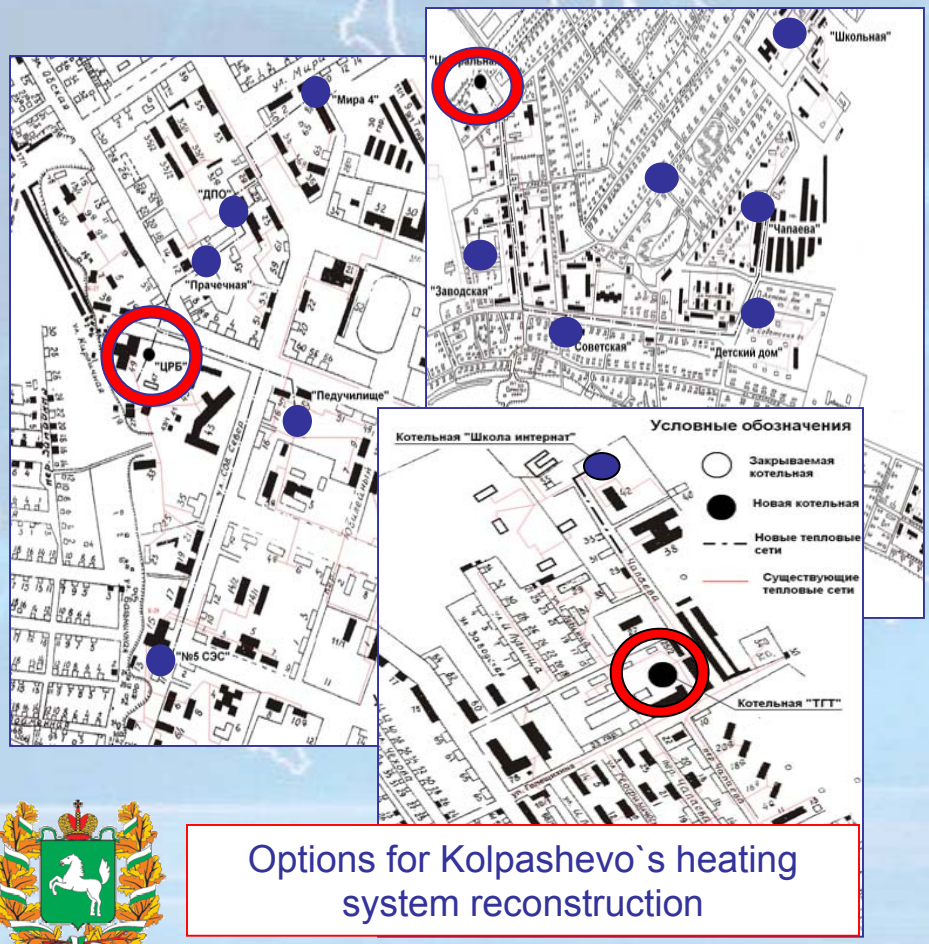
Main concept (principles) of reconstruction

- reconstruction by means of new efficient gas boiler-houses with different thermal output and self-sufficient plants for heat energy production
- reconstruction with enlargeable number of boiler-houses to increase capacity level of heat sources



Options for Kolpashevo`s heating system reconstruction

- development of energy supply schemes by switching boiler-houses to gas and constructing mini-combined heat power plant
- rational level of centralization of existing heat systems with new equipment (module and block gas boiler-houses with efficiency output = 92 %, mini-combined heat power plant, modern heating network with losses less than 2-4%)
- application of energy saving technologies (automated heat units, accounting and adjustment systems, high efficiency burner systems and other)

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Evaluation of the project`s realization effectiveness

Expected energy-efficiency figures:

- Increase of boiler-houses` efficiency when switched to gas from 40-60% to 90-92%
- Increase of heat and fuel utilization effectiveness when mini-power plants constructed up to 74 – 80%
- Reduction of heat transportation losses from 15-20 % to 8-10 %
- Reduction of specific fuel consumption rate to 170 kg c.e./Gcal (comparing to the present 275 kg c.e./Gcal)
- Implementation of new technologies and heat generating equipment (co-generation)
- Implementation of energy saving technologies

Total annual volume of emissions to the atmosphere from stationary sources

Municipal entity	Fact, ton/year	Forecast, t/year
City Kolpashevo	7337,65	146,35
City Togur	642,8	21,93
Total:	7980,45	168,0

Environmental effect due to:

- Modernization of boiler-houses` equipment
- Changes in fuel balance structure
- Utilization of coal slag and petroleum wax

Total energy saving potential in Kolpashewo is 35 – 40 %

Fuel economy is about 15 mln. of t.c.e.

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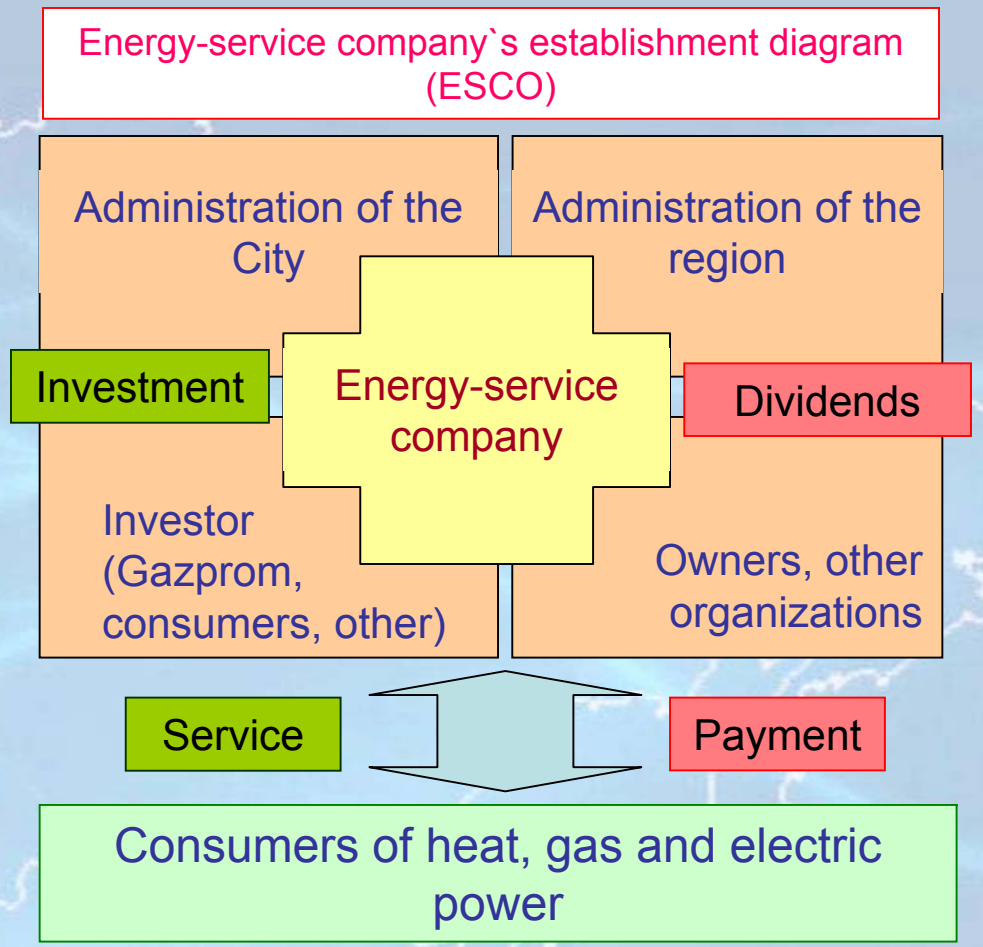
Realization of the project

- Administrative and technical measures (formation of a working-group (coordination) to implement the project, agreement on mutual intentions, informational support, development of a staff potential)
- Economic stimulation (implementation of economically sound costs, price and tax conditions forming)
- Regulatory and legal framework (group of actions to modernize facilities, normalization)
- Organizational supply (establishment of management companies for public utility services, as well as energy-service and energy audit companies)



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Analysis of the project`s impact on the situation in the region

- Energy security and energy supply of a city with rigorous climate situated in unfavorable geographical zone
- Demonstration of use of modern technologies and equipment for heating production and energy generating
- Demonstration of economic incentives, ensuring the energy facilities` upgrade and energy saving projects` realization
- Example of legal measures stimulating consumers and energy-saving companies to increase efficiency in fuel and energy consumption
- Realization of the Program of energy-saving in Tomsk Region

Energy-saving potential in domestic households of Tomsk Region

Energy supply	Value
Electrical power	30 – 35%
Heating power	40-45%
Fuel	40-45%

Losses in heating systems, %

Scenario	2000	2005	2010	20200
Optimistic	10	9	7	5
Pessimistic	10	9	8	7

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Analysis of the project`s impact on the situation in Russia

- Organizational, legal and economical models` replication in Russia
- Replication and demonstration of implementing the modern methods and technologies in heat and power engineering
- Energy security and reliability of fuel supply of small and medium cities in Russia
- Diminishing of power intensity in economy of Russian regions
- Environment improvement and other aspects

Energy saving potential in heat-and-power engineering of Russia

Municipal and departmental boiler-houses: number – about 70 thousands; production – 600 mln. Gcal; average efficiency output – 67 %.

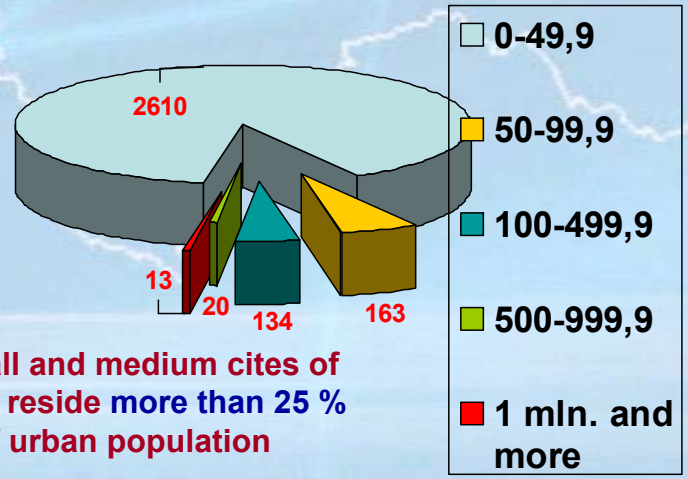
Fuel saving potential due to better efficiency output of boiler-houses – 41 mln. t.c.e.

Energy saving potential – 13 mlrd kilowatt-hour

Heating system: length – 184 thousands of km., average age – more than 13 years, deterioration – 65 %, average loss – 10%

Energy saving potential in heating systems – 250 Gcal (50 mln. t.c.e.)

Number of cities in Russia with population data, thousands of people



In small and medium cites of Russia reside more than 25 % of urban population

Perspective projects

High efficiency demonstration zone in Gorno-Altaysk city, Republic of Altai

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Thank you for attention!

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