



## **ENERGY COOPERATION IN NEA: RUSSIA-JAPAN PERSPECTIVES**

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Energy Systems Institute, SB of RAS, Irkutsk***

***Speech at the 3d Russia-Japan dialogue “New prerequisites and economic conditions  
for energy cooperation in Northeast Asia in the Russian Far East”  
May 13, 2010, Khabarovsk***

- 1. State of the art and main indices of the Russian fuel and energy complex (FEC)***
- 2. Eastern vector of Russia’s energy policy (basic concepts)***
- 3. Russia-Japan studies on energy cooperation problems between Russia and NEA countries***
- 4. Prospects and conditions for development of mutually beneficial international energy cooperation between Russia and NEA countries***
- 5. Conclusions***



# **STATE OF THE ART AND MAIN INDICES OF THE RUSSIAN FUEL AND ENERGY COMPLEX**

## ROLE OF FUEL AND ENERGY COMPLEX IN THE ECONOMY OF RUSSIA

| Indices                            | Fuel and energy complex share, % |             |             |             |
|------------------------------------|----------------------------------|-------------|-------------|-------------|
|                                    | Years                            |             |             |             |
|                                    | 1999                             | 2000        | 2005        | 2008        |
| Industrial production volume       | 23.1                             | 29.5        | 31.5        | 31.3        |
| Tax proceeds to the federal budget | 36.0                             | 40.0        | 57.9        | 48.3        |
| <b>Export</b>                      | <b>52.0</b>                      | <b>52.6</b> | <b>63.9</b> | <b>68.1</b> |
| Investments in fixed assets        | 24.0                             | 25.7        | 28.4        | 28.3        |



## RUSSIA’S ROLE IN ENSURING GLOBAL ENERGY SECURITY

- *Russia concentrates 18% of the world proved coal reserves, 27% of the world proved natural gas reserves and 7% of the world proved oil reserves*

- **Russia produces (as of 2008):**

|                      |   |  |
|----------------------|---|--|
| • <b>Electricity</b> | - | <b>1036 billion kW (5%)</b>            |
| - <b>Coal</b>        | - | <b>326 million t (5%)</b>              |
| - <b>Oil</b>         | - | <b>488 million t (12%)</b>             |
| - <b>Natural gas</b> | - | <b>602 billion m<sup>3</sup> (20%)</b> |

( %) – of the world production

- **Russia is the largest exporter of fuel and energy products**



## EXPORT OF RUSSIAN FUEL AND ENERGY RESOURCES (2008)

|                    |                              |
|--------------------|------------------------------|
| <b>Coal</b>        | - 100 million t              |
| <b>Electricity</b> | - 21 billion kWh             |
| <b>Natural gas</b> | - 195 billion m <sup>3</sup> |
| <b>Oil</b>         | - 243 million t              |

### Export to NEA countries (2006)

|                          |                       |
|--------------------------|-----------------------|
| <b>Coal, total</b>       | <b>16.4 million t</b> |
| including:               |                       |
| <b>Japan</b>             | <b>12.3 million t</b> |
| <b>Republic of Korea</b> | <b>4.1 million t</b>  |
| <b>Oil (China)</b>       | <b>14 million t</b>   |



# **EASTERN VECTOR OF RUSSIA'S ENERGY POLICY (BASIC CONCEPTS)**



## **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 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 of timely ensuring the appropriate positions of Russia in this strategically important region of the world**
- **Creation in the East of Russia and in Northeast Asia of a developed energy infrastructure in the form of interstate gas-, oil pipelines and transmission lines will decrease the cost of energy carriers, enhance reliability of energy and fuel supply to consumers in different countries and make easier the solution of 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 principally important problems of federal, interregional and regional levels

## General problems

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

## Energy problems

1. Improvement of **adaptability and reliability** of energy and fuel supply to consumers
2. Increase of **energy security** of the country and regions
3. **Perfection** of territorial and production structure of the fuel and energy complex of the country and particularly its eastern regions
4. **Increase** of environmental security of the energy sector
5. 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**





**RUSSIA-JAPAN STUDIES ON THE  
PROBLEMS OF ENERGY  
COOPERATION BETWEEN RUSSIAN  
AND NEA COUNTRIES**



## MASTER PLAN OF ENERGY DEVELOPMENT IN EAST SIBERIA AND THE FAR EAST TILL 2010-2015 TAKING INTO ACCOUNT THE EXPORT OF RUSSIA'S ENERGY RESOURCES TO THE APR COUNTRIES



- Energy Research Institute, RAS, Moscow
- Siberian Energy Institute, SB of RAS, Irkutsk

- Institute of Energy Economics, Tokyo

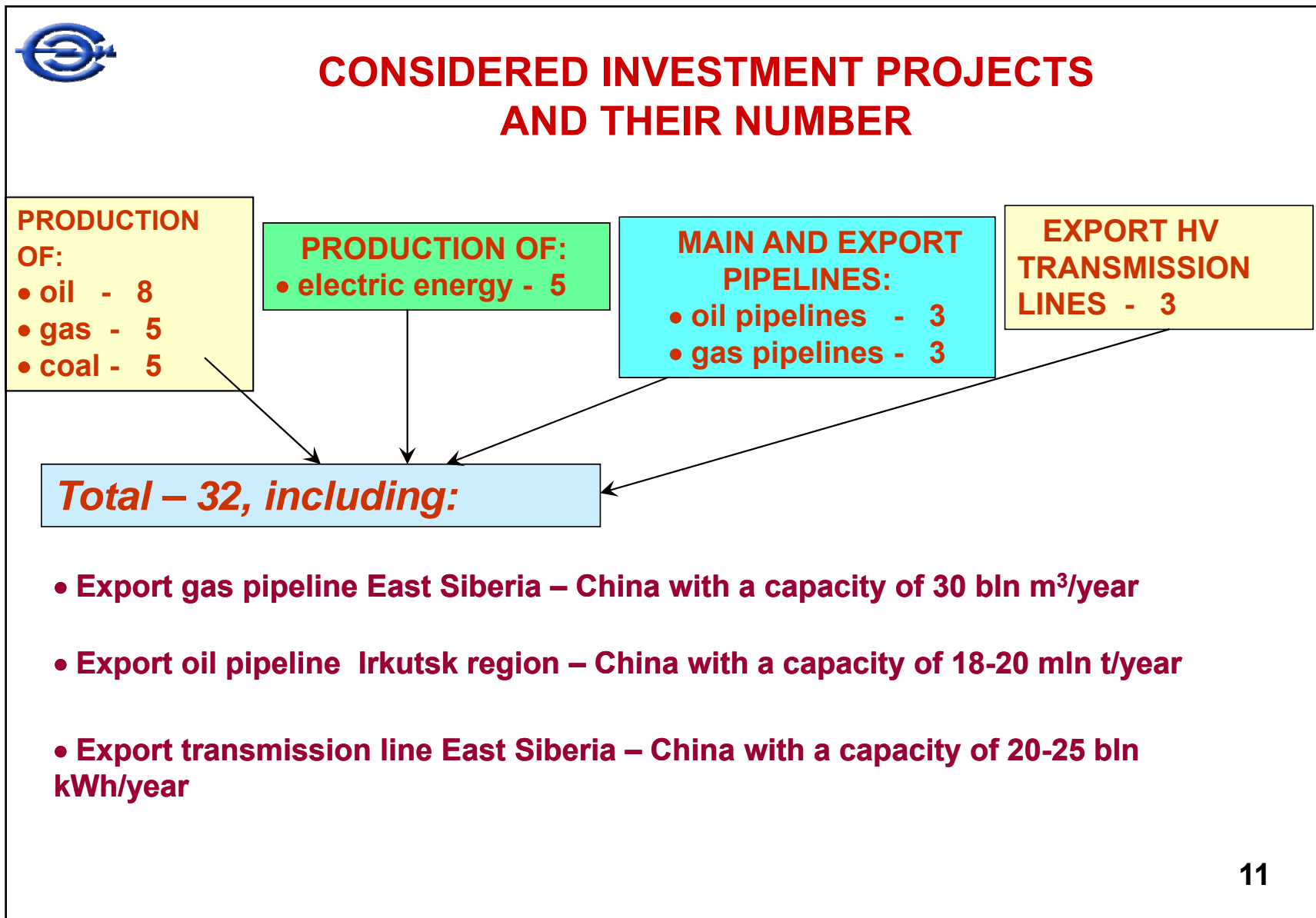
### STAGE 1 (1993-1994)

- Comprehensive study of the current state and prospects for development:
  - energy consumption and energy saving
  - resources
  - Asian energy market

### Main parts of the project

- Development of a comprehensive plan:
  - regional fuel and energy mixes
  - formation of a portfolio of investment projects, including inter-country projects
  - financial and economic assessment of investment projects
  - *formation of measures and initiatives to facilitate implementation of the projects*

### STAGE 2 (1994-1995)





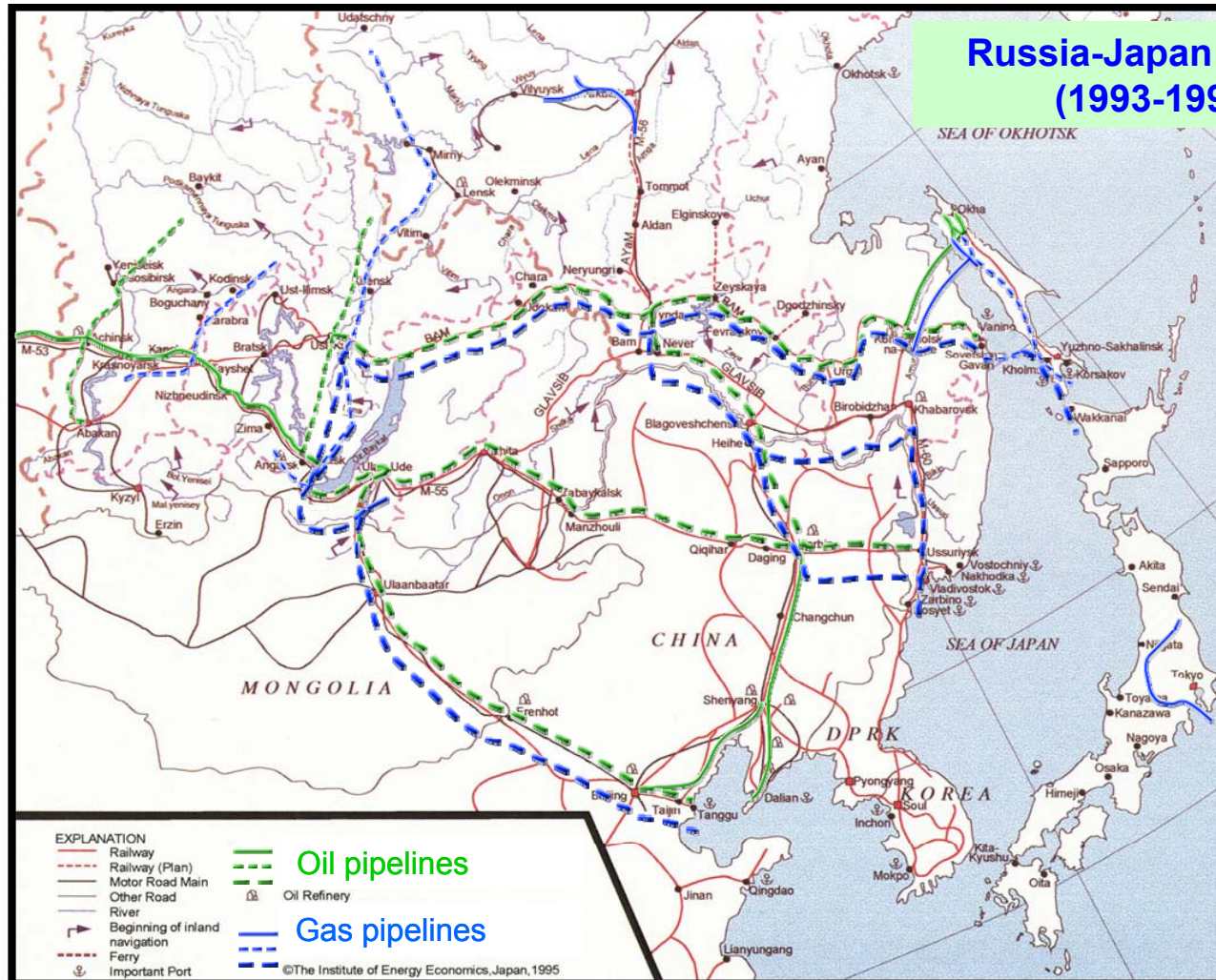
## MAIN RESULTS OF THE RUSSIA-JAPAN PROJECT 1993-1995

1. **Development of oil and gas resources in East Siberia and the Far East to meet internal demands and to supply surplus hydrocarbons to the markets of NEA countries is the strategic priority of socio-economic development of Russia's eastern region and provision of energy security in NEA.**
2. **The fundamental scheme of oil-, gas pipeline network and export oil-, gas pipelines in Russia's East is suggested.**  
*The scheme of the gas pipeline network and export pipeline system in Russia's East was later specified in the framework of joint studies between the Russian research society "Rosaziagaz" and the Northeast Asian Gas and Pipeline Forum, Japan (NAGPF project).*
3. **Promising coal deposits that are attractive for the Japanese market, potential electricity sources for Russian electricity export to Japan, China and other NEA countries are presented.**
4. **The mechanisms for implementation of the suggested measures on strengthening the energy cooperation in NEA are proposed.**

**The results of the Russia-Japan project were discussed in December 1996 in Moscow at the Russia-Japan round table organized by the Ministry of Economy, Ministry of Energy of the RF and Ministry of Foreign Trade and Industry of Japan.**



## SCHEME OF OIL-, GAS PIPELINE NETWORK AND EXPORT OIL-, GAS PIPELINE IN RUSSIA'S EAST





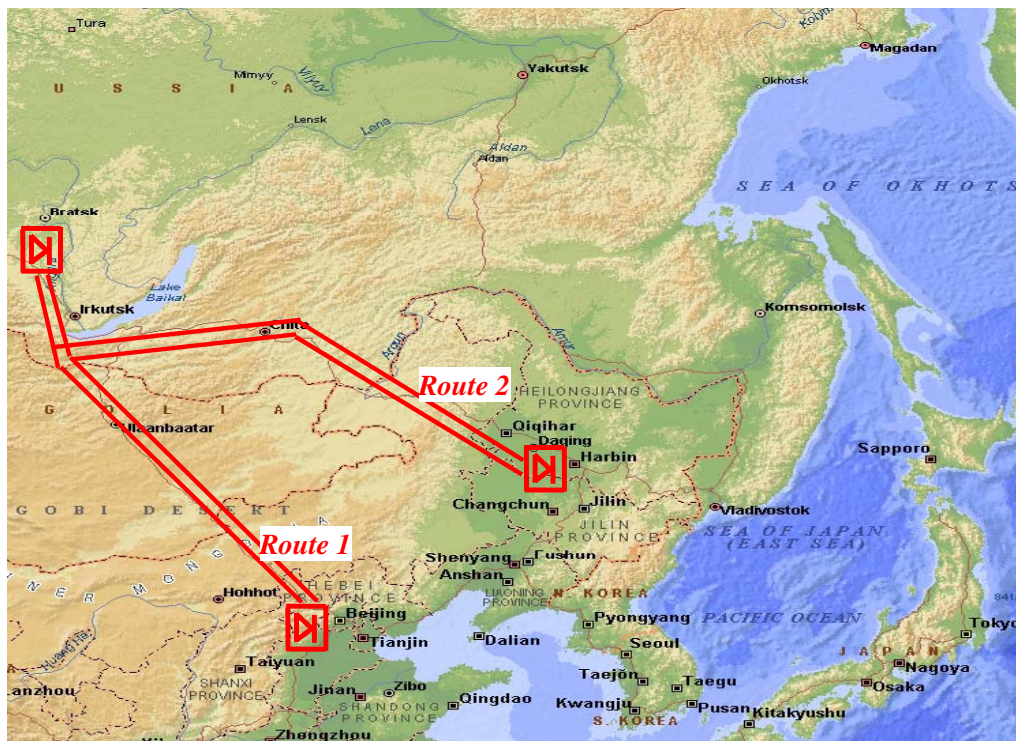
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## EXPORT DC TRANSMISSION LINE EAST SIBERIA – NORTH CHINA

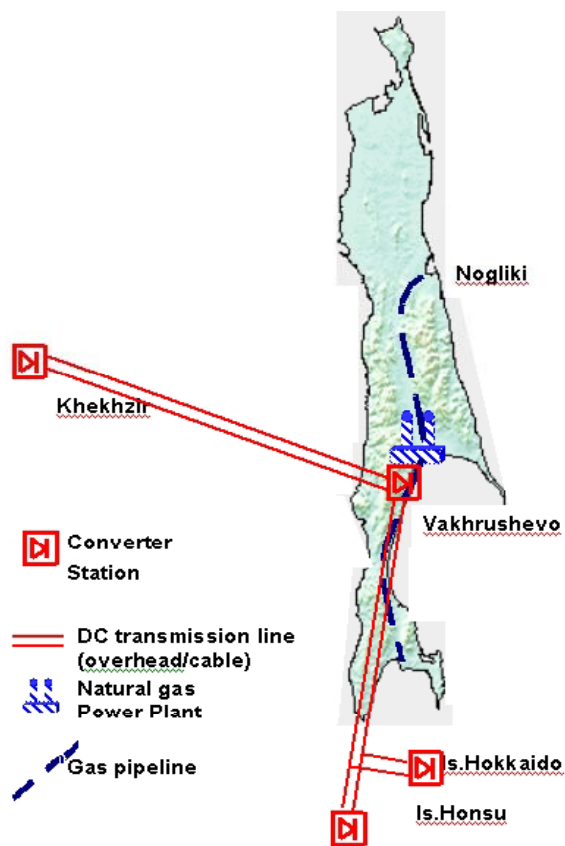


|                                |           |
|--------------------------------|-----------|
| Transmission length, km        | 2600      |
| Capacity, MW                   | 2000-3000 |
| Electricity export, bln kWh    | 15-18     |
| Construction period, years     | 3         |
| Total investments, bln USD     | 1.5       |
| Input electricity price, c/kWh | 2.2-2.4   |

**JSC “Irkutskenergo” and “North China power grid” Feasibility study, 1998**



## CONSTRUCTION OF POWER PLANT AND EXPORT TRANSMISSION LINE SAKHALIN – JAPAN



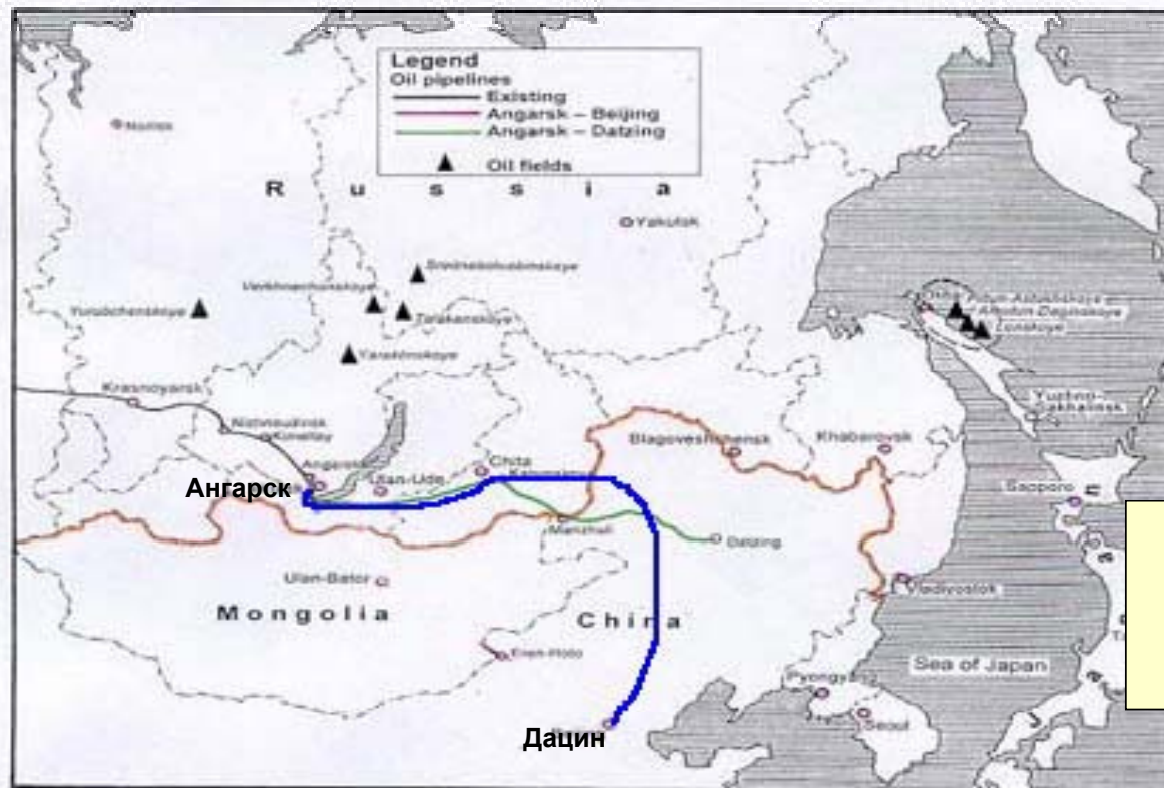
|  |      |
|--|------|
| Installed capacity, MW                   | 4000 |
| Electricity production, bln kWh          | 23   |
| Construction period, years               | 8    |
| Total investments, bln USD               | 9-10 |
| Electricity price at Japan border, c/kWh | 5-6  |

**JSC “EES Rossii” and Marubeni Corp.  
“Russia-Japan Power Bridge”,  
Feasibility study, 1999**





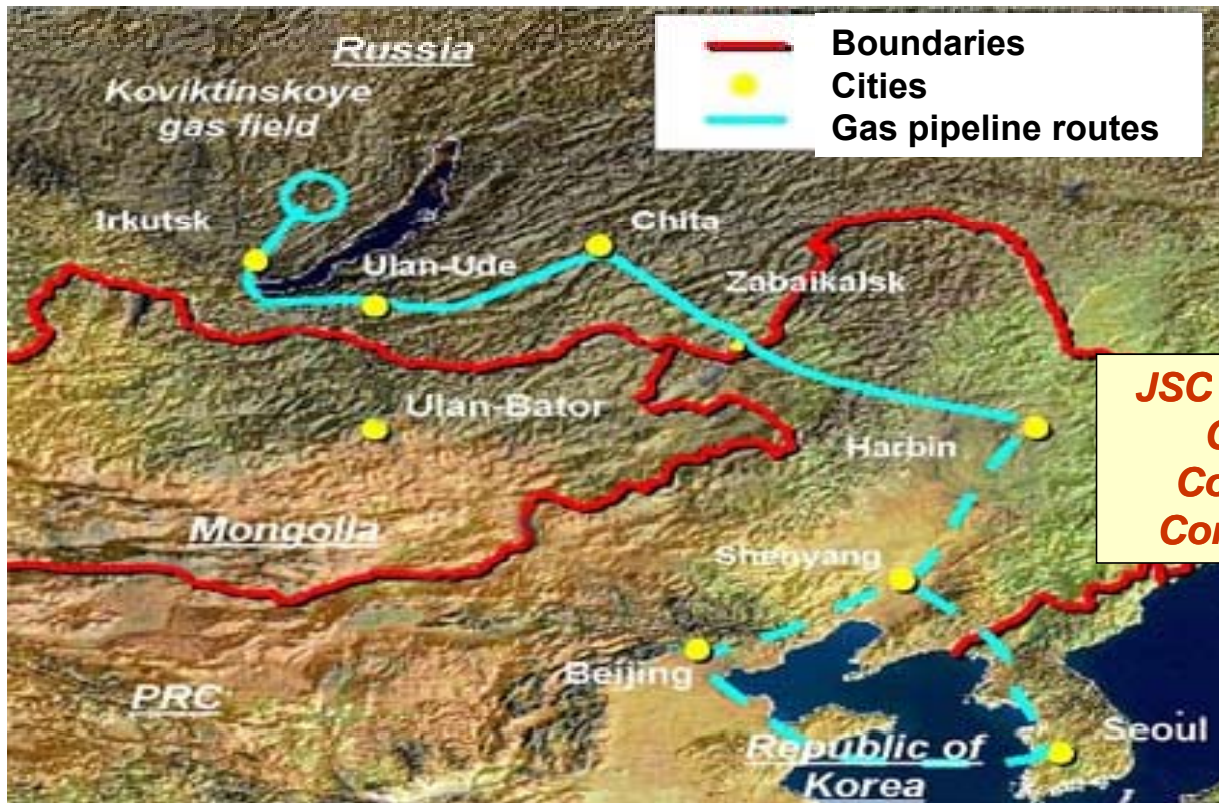
## EXPORT OIL PIPELINE RUSSIA - CHINA



**OC «YuKOS», China  
National Oil Company  
Declaration of Intentions,  
2000**



## EXPORT GAS PIPELINE IRKUTSK REGION – CHINA – KOREA



**JSC «RUSIA Petroleum»,  
China National Oil  
Company, Korea Gas  
Company. Project 2003**





## **RUSSIA-JAPAN STUDIES 1998-2001**

**1. A series of studies on development of master plans for gas supply to large industrial centers in East Siberia and the Far East (the cities of Krasnoyarsk, Irkutsk, Angarsk, Ulan-Ude, Chita, Blagoveshchensk, Khabarovsk, Vladivostok, Petropavlovsk-Kamchatsky)**

### *Developers*

**Energy Systems Institute  
SB RAS**

**Institute of Energy Economics Japan**

### *Financial support and assistance*

**JSC “Irkutskenergo”**

**Toyo Engineering Corporation**

**JSC “Vostokenergo”**



## **RUSSIA-JAPAN STUDIES 2005-2006**

**The study on potential coal production and consumption in East Siberia and the Far East and its export**

*Developers*

**Energy Systems Institute  
SB RAS**

**Institute of Energy Economics Japan**

*Financial support and assistance*

**JSC “SUEK”**

**NEDO**

**JSC “Yakutugol”**

**Japanese Coal Energy Center (“JCOAL”)**

**JSC “Sakhalinugol”**



## BASIC CHARACTERISTICS OF THE TUGNUISK OPEN-PIT MINE (REPUBLIC OF BURYATIA)

**Design capacity – 10 mln t/year**

**Coal:**

- hard of rank **Д**;
- moisture content – **10%**;
- ash content – **18.3%**;
- calorific value – **5200-7600 kcal/kg**;
- sulfur content – **0.3-0.5%**;

**Coal mining in 2006 – 5.4 mln t**

**Coal supplies for export  
in 2006 – 3.5 mln t**





## BASIC CHARACTERISTICS OF THE ELGINSK DEPOSIT (REPUBLIC OF SAKHA (YAKUTIA))

- Estimated resources - 14 bln t
- Proved reserves for surface mining - 2.1 bln t  
(Northwestern section)

### Coal:

- hard of rank 2Ж, 2ГЖ
- moisture content - 7%
- ash content - 22-35%
- calorific value - 6700-6800 kcal/kg

### Potential coal production and consumption:

- Production capacity of open pit-mine - 30 mln t/year
- Export: - concentrate for coking - 5 mln t/year  
(ash content – 9%)
- Steaming coal - 15 mln t/year (ash content – 14-16%)
- Domestic consumption - 3 mln t/year





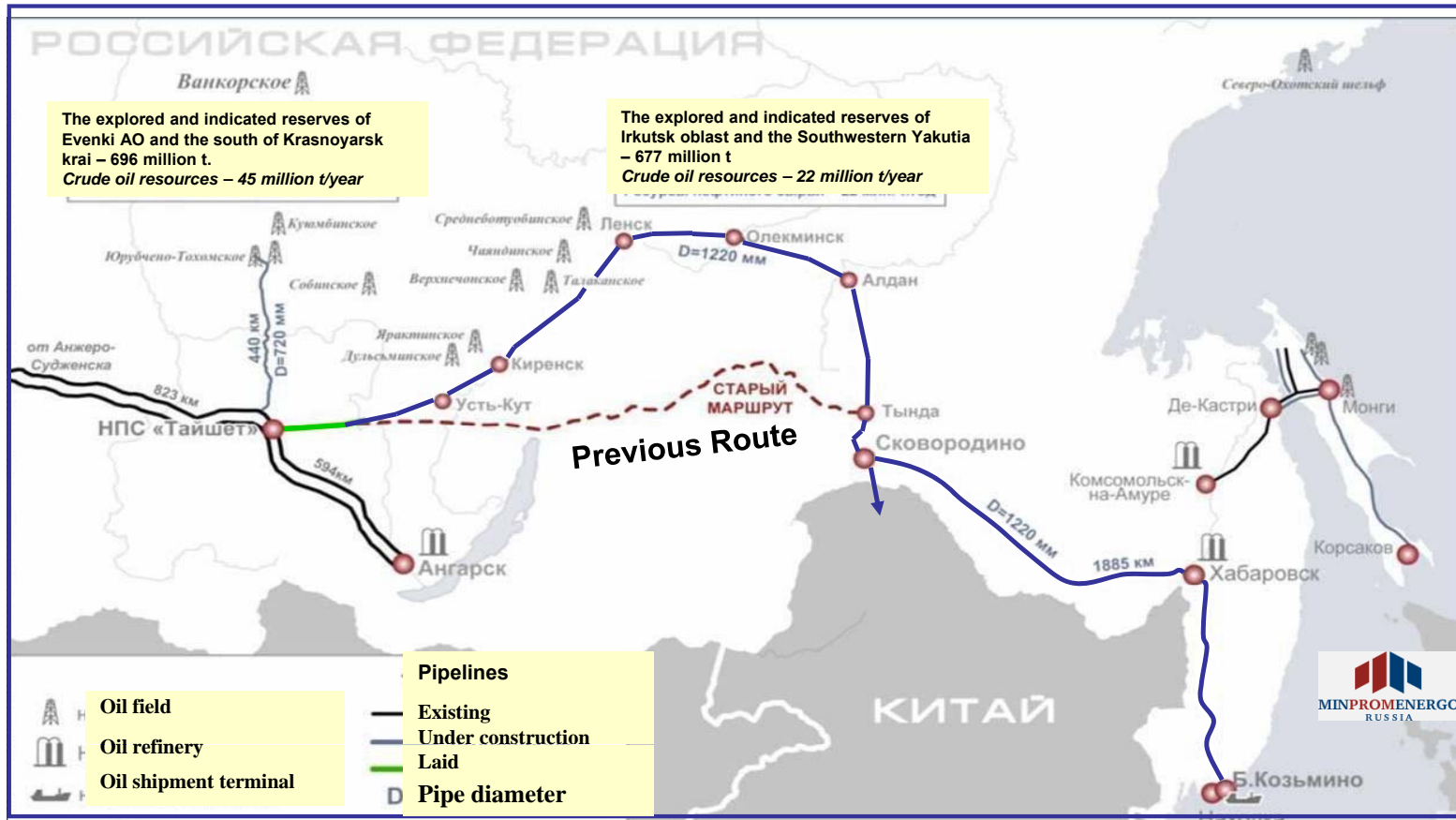
**PROSPECTS AND CONDITIONS FOR  
DEVELOPMENT OF MUTUALLY  
BENEFICIAL INTERNATIONAL  
ENERGY COOPERATION BETWEEN  
RUSSIA AND NEA COUNTRIES**





# CONSTRUCTION OF OIL PIPELINE EAST SIBERIA – THE PACIFIC

Resolution of the RF Government No. 1737-P of 31.12.2004, operator JSC “AK Transneft”



**SCHEME OF OIL FLOWS IN EAST SIBERIA AND THE FAR EAST**

**THE RF GOVERNMENT APPROVED THE PROGRAM FOR CONSTRUCTION OF THE UNIFIED SYSTEM OF GAS PRODUCTION, TRANSPORTATION AND SUPPLY IN EAST SIBERIA AND THE FAR EAST ON THE BASIS OF POTENTIAL GAS EXPORT TO THE MARKETS OF CHINA AND OTHER APR COUNTRIES**

**Developers: Ministry of Industry and Energy of RF, JSC “Gazprom”, approved by the Order of Ministry of Industry and Energy of RF No. 340 of 03.09.2007**

**Natural gas flows in Russia’s East (Variant “Vostok-50”) – export of 50 billion m<sup>3</sup> of natural gas to China and Republic of Korea**



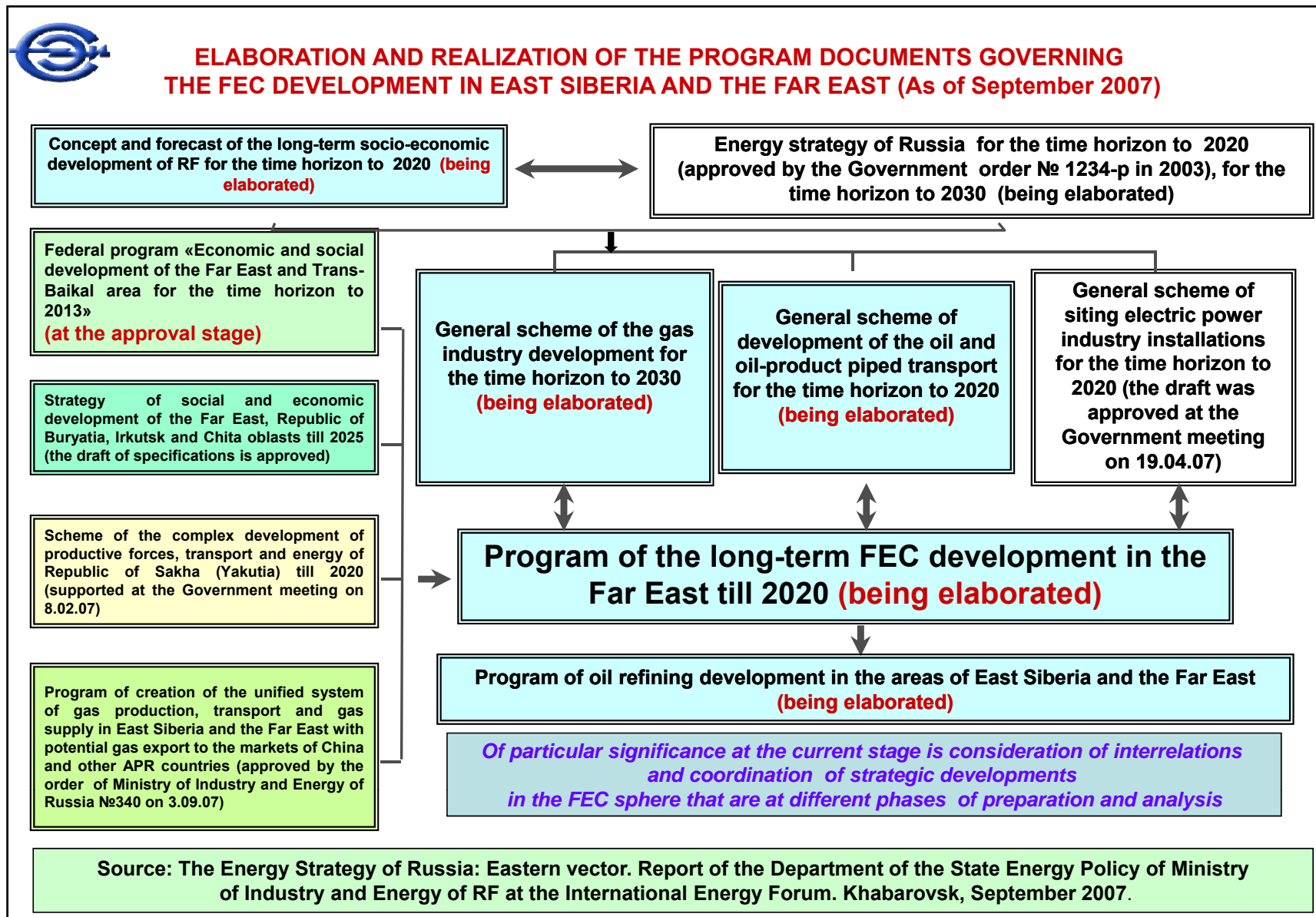


## FEASIBILITY STUDY TO SUBSTANTIATE THE MOST PREFERABLE VARIANT OF LARGE-SCALE CONTINENTAL ELECTRICITY EXPORT FROM EAST SIBERIA AND THE FAR EAST TO CHINA

Customer: JSC RAO “EES ROSSII”, Developers: Research and Design Institutes

**Export electricity supplies from Russia’s eastern regions to China – 60-70 billion kWh in 2020**







## **BASIC STUDIES ON EASTERN ENERGY POLICY OF RUSSIA, CONDUCTED BY ENERGY SYSTEMS INSTITUTE, SB OF RAS, IN 2006-2008**

### **In the framework of the Energy Strategy of Russia 2030**

- The strategy for FEC development in East Siberia and the Far East up to 2030
- The study on prospects for electric power industry development in Russia up to 2030
- Development of heat engineering and heat supply systems in Russia up to 2030

### **Ordered by the regional authorities**

- The concept of providing stable operation of FEC facilities and energy security of Sakhalin region up to 2020 – ordered by Administration of Sakhalin region
- The strategy for FEC development in Amur region up to 2010 and for the time horizon up to 2030 – ordered by Administration of Amur region
- The strategy for electric power industry development in Chukot Autonomous Area up to 2020 – ordered by Administration of Chukot AA and JSC “Chukotenergo”
- The strategy for FEC development in Irkutsk region up to 2010 and for the time horizon up to 2030 – ordered by Administration of Irkutsk region



## **INSTITUTIONS INVOLVED IN THE STUDIES:**

### **Design institutions:**

- Institute JSC “DalvostNIIproektugol” (Vladivostok)
- Institute JSC “Dalenergasetproekt” (Vladivostok)
- JSC “Gidroenergoprom” (Saint-Peteresburg)
- Institute “RN-SakhalinNIPIImorneft” LTD (Yuzhno-Sakhalinsk)
- JSC “Siberian Energy Center” (Irkutsk)

### **Research Institutes:**

- Institute of Economics and Industrial Production, SB of RAS (Novosibirsk)
- Trofimuk Institute of Oil and Gas Geology and Geophysics, SB of RAS (Novosibirsk)
- Institute of Physical and Technical Problems of the North, SB of RAS (Yakutsk)
- Institute of Economic Research, FEB RAS (Khabarovsk)
- Institute of Geology and Nature Management, FEB of RAS (Blagoveshchensk)



## EXPORT OF ENERGY RESOURCES FROM RUSSIA

| Index                                     | 2005<br>fact. | Forecast     |                |                |
|---|---------------|--------------|----------------|----------------|
|   |               | 2010-2012    | 2020           | 2030           |
| Export, million tce, total                | 770           | 860-870      | 910-950        | 900-950        |
| including:                                |               |              |                |                |
| <i>Oil and oil products, million t</i>    | <i>327</i>    | <i>356</i>   | <i>330-325</i> | <i>300-290</i> |
| of which oil:                             | 265           | 285          | 266-259        | 243-240        |
| Western direction                         | 249           | 247          | 195-197        | 170-172        |
| <i>Eastern direction</i>                  | <i>16</i>     | <i>38</i>    | <i>71-62</i>   | <i>73-68</i>   |
| <i>Natural gas, billion m<sup>3</sup></i> | <i>207</i>    | <i>240</i>   | <i>290-320</i> | <i>315-330</i> |
| Western direction                         | 207           | 218          | 225-230        | 237-240        |
| <i>Eastern direction</i>                  | <i>-</i>      | <i>14-15</i> | <i>65-90</i>   | <i>78-90</i>   |
| Coal, million t                           | 77            | 100-110      | 110-120        | 125-130        |
| Electricity, billion kWh                  | 13            | 21-25        | 30-85          | 48-105         |
| Western direction                         | 12.3          | 17           | 20-25          | 23-25          |
| <i>Eastern direction</i>                  | <i>0.7</i>    | <i>4-8</i>   | <i>10-60</i>   | <i>15-80</i>   |

Source: Substantiating materials to “The Energy Strategy of Russia up to 2030”; authors’ estimates

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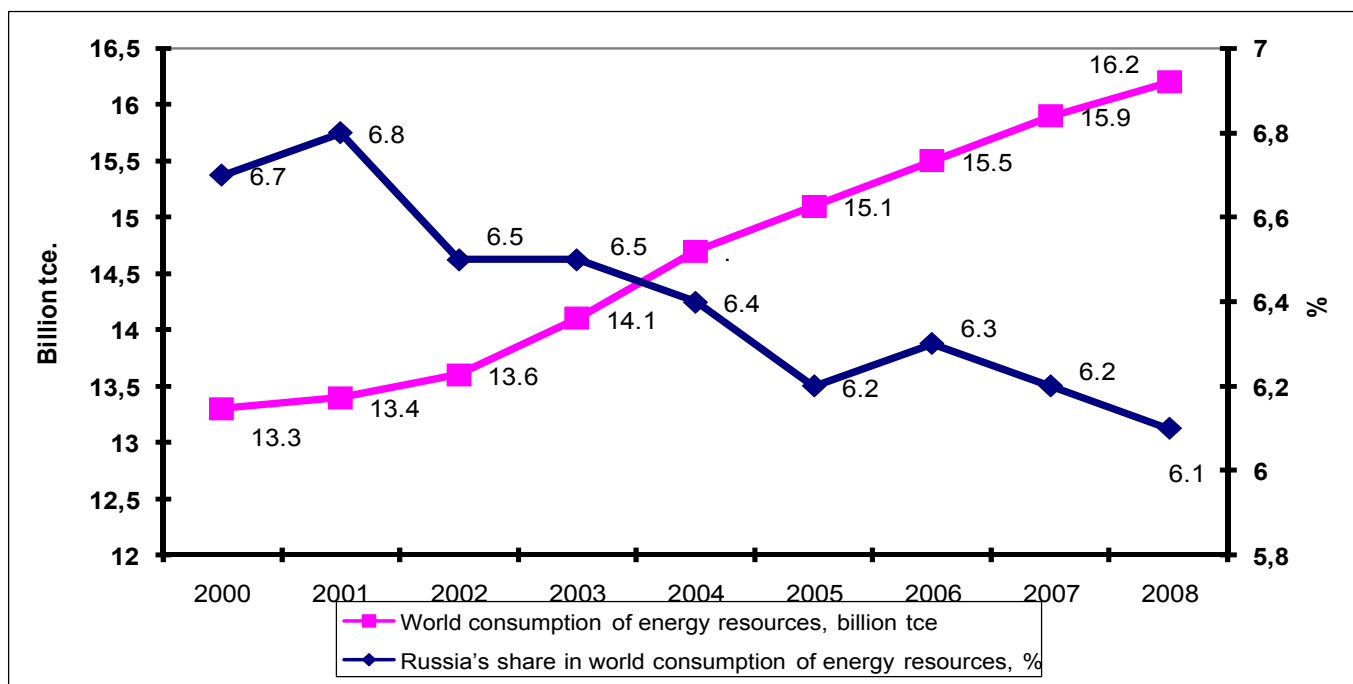
## **RUSSIA – A MAJOR POTENTIAL EXPORTER OF HELIUM**

- Natural gas of the Siberian platform is unique in the content of helium and ethane, which essentially increases *its consumer value*
- Natural gas of the Siberian platform contains more than 0.3% of helium and 5-7% of ethane
- The helium reserves in the gas fields of the Siberian platform are estimated at 8.6 billion m<sup>3</sup>, or above 30% of the world helium reserves
- In the future Russia can be the world largest helium exporter





## CONSUMPTION OF PRIMARY ENERGY RESOURCES IN THE WORLD AND RUSSIA, 2000-2008

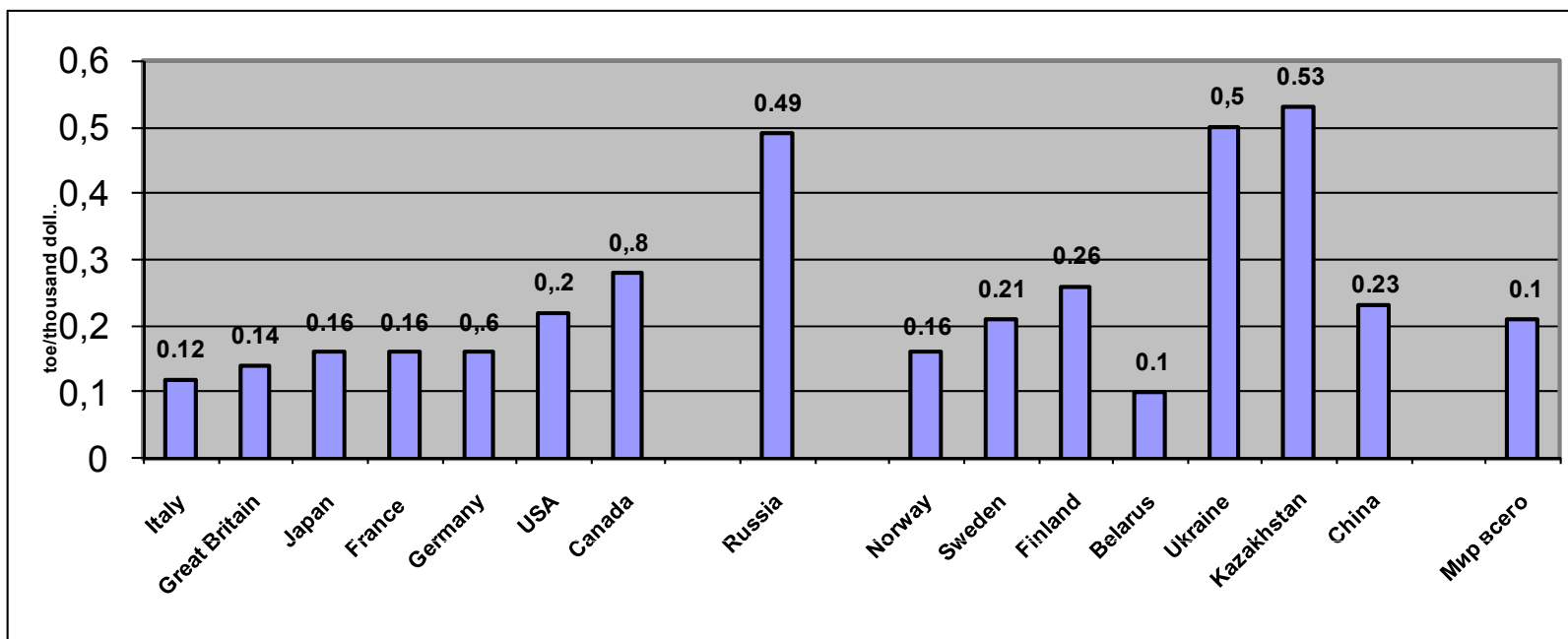


**Consumption of primary energy resources in Russia makes up 970-980 million tce per year or 6.1-6.2 % of consumption of energy resources in the world**

Source: BP Statistical Review of World Energy, June 2009; Russia's FEC 2000-2008



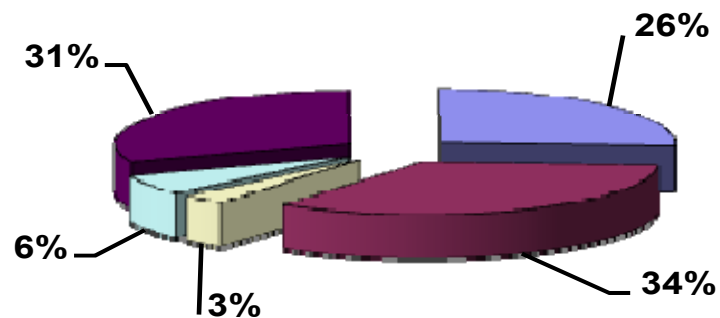
## ENERGY-GDP RATIO FOR WORLD'S COUNTRIES (by the purchasing power parity)



Source: Energy Strategy Institute (Moscow), by the data of Rosstat



## ENERGY SAVING POTENTIAL IN RUSSIA'S ECONOMY



■ Housing and public utilities ■ Fuel and energy complex ■ Agriculture  
■ Transport ■ Industry and construction

**Total energy saving potential makes up 360...430 million tce**



## ENERGY SAVING POTENTIAL OF RUSSIA'S FUEL AND ENERGY COMPLEX

| Industry       | Gas, billion m <sup>3</sup> | Oil, million t | Electric energy, billion kWh | Thermal energy, million Gcal | Coal, million t | Total potential, million tce | Cost estimate of the potential, billion doll. |
|----------------|-----------------------------|----------------|------------------------------|------------------------------|-----------------|------------------------------|---|
| Gas            | 18.1                        | -              | 2.1                          | 6.4                          | -               | 20.8                         | 4.16  |
| Oil            | 12.0                        | 30.3           | 28.3                         | 21.3                         | -               | 55.5                         | 11.65   |
| Coal           | 20.0                        | -              | 1.5                          | -                            | -               | 30                           | 1.55  |
| Electric power | 17.0                        | -              | 31.8                         | 13.2                         | 12.8            | 42                           | 8.4   |
| <b>TOTAL</b>   | <b>67.1</b>                 | <b>30.3</b>    | <b>63.7</b>                  | <b>40.9</b>                  | <b>12.8</b>     | <b>148.3</b>                 | <b>25.8</b>                                   |

Bushuev V.V., Sorokin V.P. Energy saving, energy efficiency and environment. Russia in the context of "G8"  
//Energeticheskaya politika, 2007. – Issue 1. – P.18-25



## INDICATORS OF ENERGY EFFICIENCY OF RUSSIA'S ECONOMY IN ENERGY STRATEGY OF RUSSIA 2030

| <i>Stages of development and indicators of their implementation</i>  |   |   |
|--|---|---|
| <b>Stage 1</b>   | <b>Stage 2</b>                                    | <b>Stage 3</b>                                    |
| <i>Energy-GDP ratio (in percent of 2005):</i>  |   |   |
| <i>no more than 78%</i>  | <i>no more than 57%</i>                           | <i>no more than 44%</i>                           |
| <b><i>Decrease of specific fuel consumption for heat production<br/>by boiler plants (in percent of 2005):</i></b> |   |   |
| <i>no less than 2%</i>   | <i>no less than 6%</i>                            | <i>no less than 10%</i>                           |
| <b><i>Decrease of specific fuel consumption at thermal power plants:</i></b>                                       |   |   |
| <i>up to 15 g ce/kWh<br/>(94% of 2005 level)</i>   | <i>up to 300 g ce/kWh<br/>(90% of 2005 level)</i> | <i>up to 270 g ce/kWh<br/>(80% of 2005 level)</i> |
| <b><i>Decrease of losses and auxiliary consumption at FEC enterprises<br/>( in percent of previous year) :</i></b> |   |   |
| <i>no less than 1%</i>   | <i>no less than 1%</i>                            | <i>no less than 0.5%</i>                          |

Source: Energy Strategy of Russia 2030 (approved by the Resolution No. 1715-p of the RF Government of November 13, 2009)



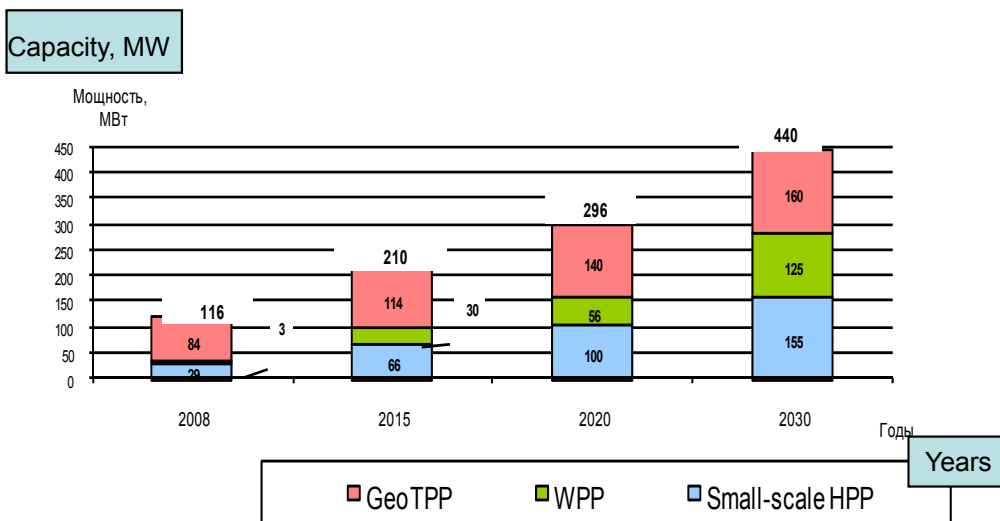
## **MAIN DIRECTIONS OF ENERGY EFFICIENCY INCREASE IN RUSSIA:**

- **structural changes in the industry with a decreasing share of energy-intensive sectors and an increasing share of machine building;**
- **rational allocation of productive forces by region of the country;**
- **technical reconstruction and renewal of fixed assets;**
- **large-scale utilization of renewable energy sources;**
- **promotion of energy saving, etc.**



## THE RF ENERGY STRATEGY TARGET UP TO 2030 – INCREASE IN THE SHARE OF RENEWABLE ENERGY SOURCES IN THE TOTAL ELECTRICITY PRODUCTION FROM 0.5% TO 4.5%

Installed capacity of RES for decentralized consumers in the eastern regions will increase by 3.8 times



Fuel substitution  
300-450 thousand tce/year

Annual saving  
\$ 6-8 million



# CONCLUSIONS





## **FIVE REQUIREMENTS FOR MUTUALLY BENEFICIAL COOPERATION IN THE FIELD OF ENERGY**

- 1. Political will and serious intentions of participants to implement a specific energy project mutually beneficial for each country.***
- 2. Coordination of economic and energy policy between the central, regional authorities and business of the countries in development of inter-country energy projects.***
- 3. Comprehensive and system estimation of consequences (effects) of implementation of large-scale inter-country energy projects, particularly under high uncertainty of future development, economic risks and global challenges for the countries, regions and energy companies.***
- 4. Generation of mutually acceptable mechanisms for implementation of inter-country energy projects (organizational, economic, legal and other mechanisms).***
- 5. Development and implementation of the inter-country projects by the international team ( at all the stages: from feasibility study and design works to their realization).***



## CONCLUSIONS

- 1. Elaboration of the science-based strategy of energy cooperation in NEA countries became a necessity.**
- 2. Currently the main outlines of the energy cooperation in NEA are clear enough. The resource base of countries supplying energy resources and the energy markets of consuming countries have been properly studied. Intensive attention should be paid to the implementation mechanisms of coordinated actions of participants (countries, regions, companies) in terms of economic, legislative and other initiatives aiming to implement large-scale inter-country energy projects.**
- 3. The research societies and energy companies of Russia and Japan should stimulate the work in this direction in order to make an appropriate contribution to solution of the problem significant for all the countries of the world.**



**Thank you for your kind  
attention!**