# System approach to the Russian energy sector forecasting.

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ИНЭИ РАН

# ERI RAS – experience in system energy studies

Energy Research Institute of the Russian Academy of Sciences (ERI RAS) was established in 1985 for the fundamental studies in the area of national energy policy development and implementation:

✓state level - methodological, modeling and analytical support for the energy policy priorities and implementation mechanisms (incl. macroeconomic, technological, pricing, environmental and other aspects), quantitative elaboration of the economy and energy sector scenarios in the context of Energy Strategy

- ***Ministry of Energy, Ministry of economic development, Ministry of natural resources, Federal Antimonopoly Service***

✓corporate level – capacity building, modeling and information support of the strategic planning system of leading energy companies, justification of investment and market policy under the energy markets transformation processes

- ***Gazprom, Gazexport, NovaTEK, Mezhregiongas, Wintershall, Roneft, TNK-BP, SUEK, RAO EES Rossii, Rosenergoatom, Fortum***

# ERI RAS – experience in system energy studies

1. Addition and revision of the USSR ENERGY PROGRAM – 1986-1989
2. Integrated USSR SCIENTIFIC AND TECHNICAL PROGRESS PROGRAM – 1985-1989
3. CONCEPT OF RUSSIAN ENERGY POLICY under the new economic conditions – RF Government resolution 10.09.1992 №26.
4. ENERGY STRATEGY of Russia – RF Government resolution 13.10.1995 №1006.
5. ENERGY STRATEGY of Russia to 2020 - RF Government resolution 28.09.2003 №1234-p.
6. ENERGY STRATEGY of Russia to 2030. – RF Government resolution 13.11.2009 № 1715-p.

7. Reform of the Russian ELECTRIC POWER SECTOR. World Bank-RF Ministry of economy – RF President decree 28.04.1997 № 426.
8. Reform of GAS DISTRIBUTION sector in Russian Federation. World Bank – RF Ministry of fuel and energy – 1999-2001

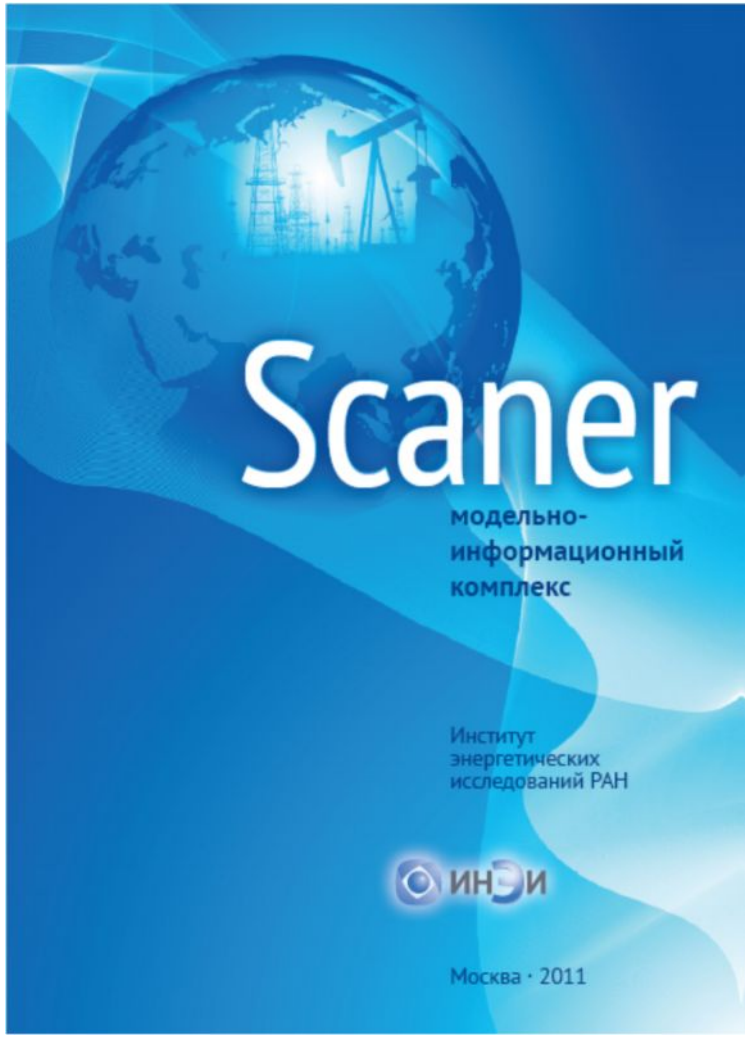
9. GENERAL PLAN for power sector development and distribution to 2020 - RF Government resolution от 22.02.2008 г. 215-p.
10. GENERAL PLAN for power sector development and distribution to 2020 and for 2030 prospect – RF Government protocol 3.06.2010
11. Russian power sector modernization program to 2020 – will be considered by RF Government 27.09.2012

## Actual problems of the energy sector forecasting

At present the understanding and proper accounting of the diversity and dynamics of internal and external relationships of energy industries became more and more important and complicated

- ✓global energy markets
- ✓macroeconomic trends and solvent demand
- ✓new technologies in energy sector and energy consumption
- ✓energy balances
- ✓domestic energy markets: competition and regulation
- ✓financial balances of energy companies and investment resources
- ✓long-term (after-) effects from implementation of investment decisions in energy sector
- ✓environmental and social externalities

# SCANER – multi-functional system of models for the investigation of the global and Russian energy sector development




«SCANER» is a tool for the system analysis of the Russian energy sector development for the mid- and long-term prospects (to 2030-50) as an important part of national economy and global energy markets. Integrating the powerful modeling and informational resources, SCANER provides:

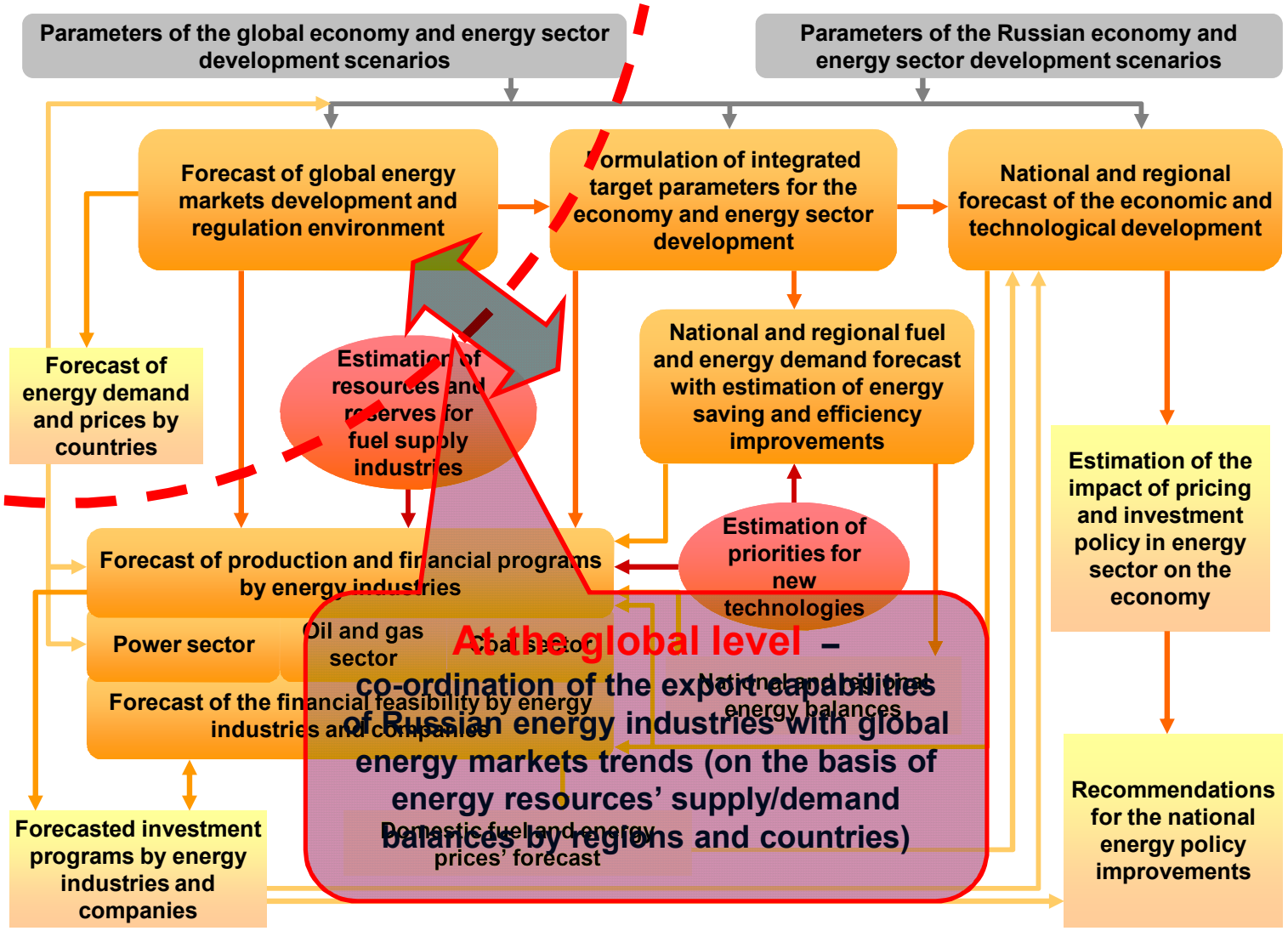
✓Unique informational support to the analysis and forecasts (regularly updated databases on the national and regional economy, energy sector, energy balances and markets)

✓Multi-level co-ordination system of energy forecasts focused on the formulation of rational variants of the economy, energy sector and energy companies' development

✓Huge flexibility and fast adaptation of the models and their calculation modes under the separate forecasting requirements

*RU&EN versions are available at www.eriras.ru*

# SCANER – multi-level co-ordination of energy forecasts



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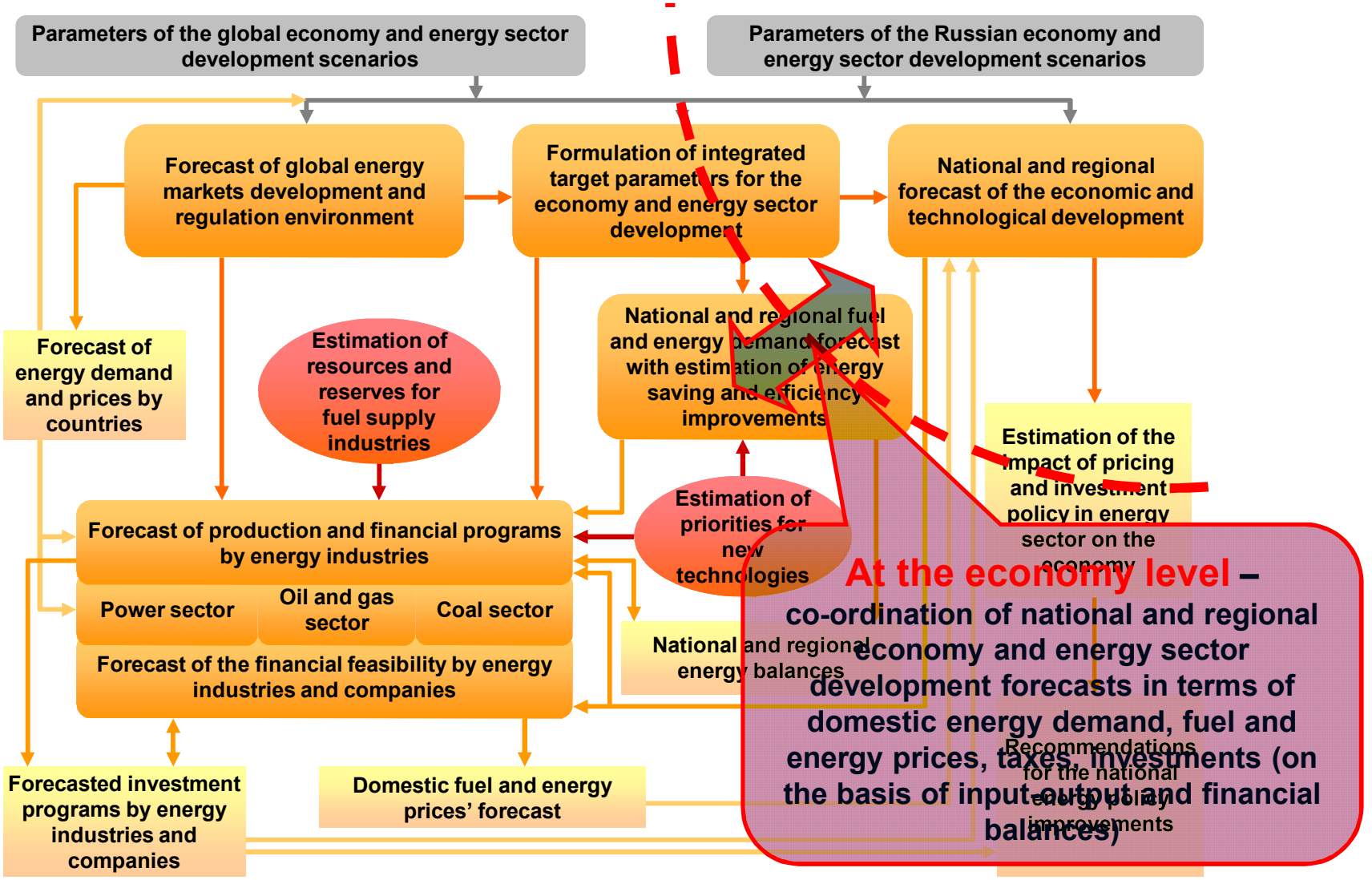

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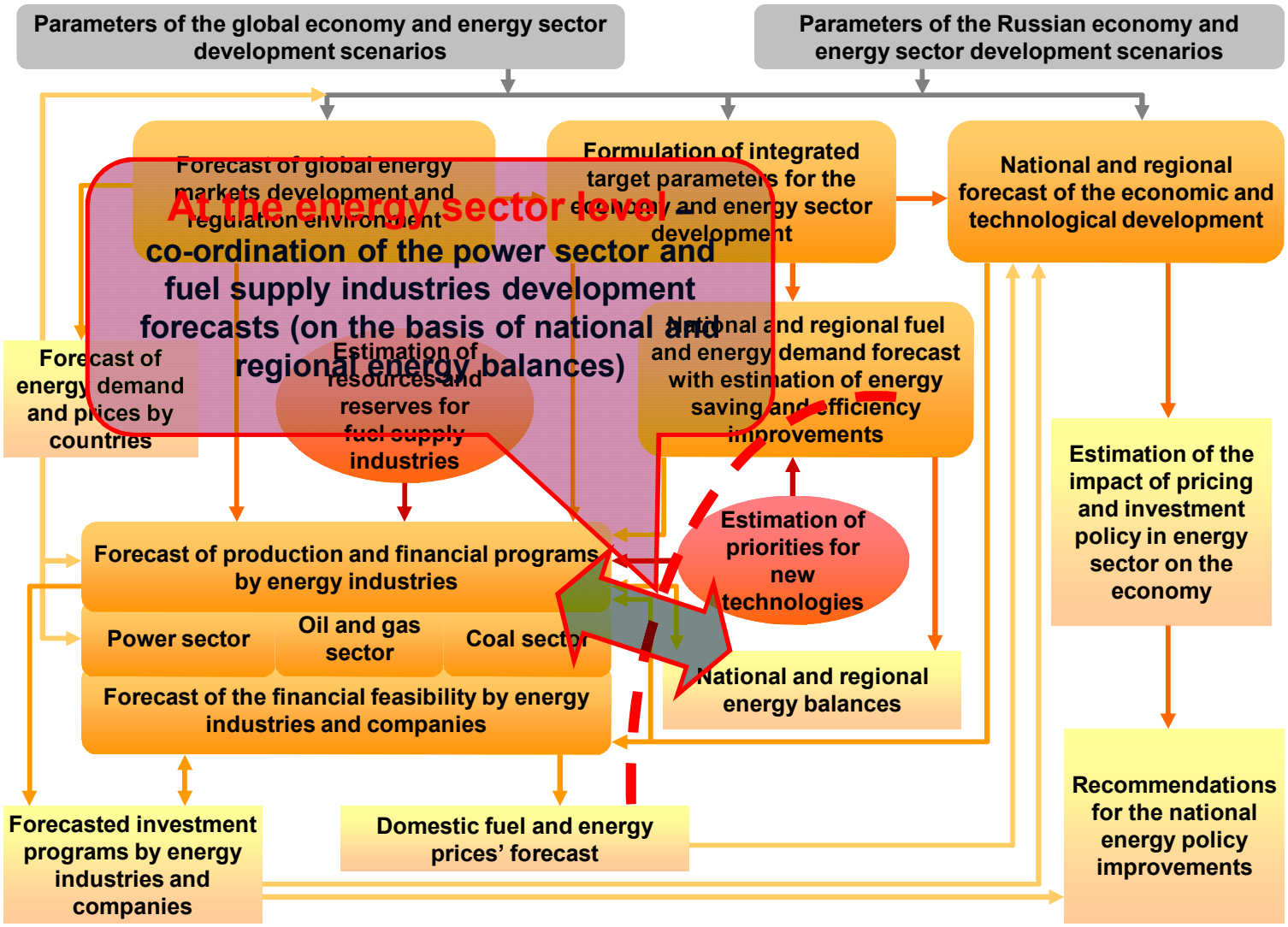

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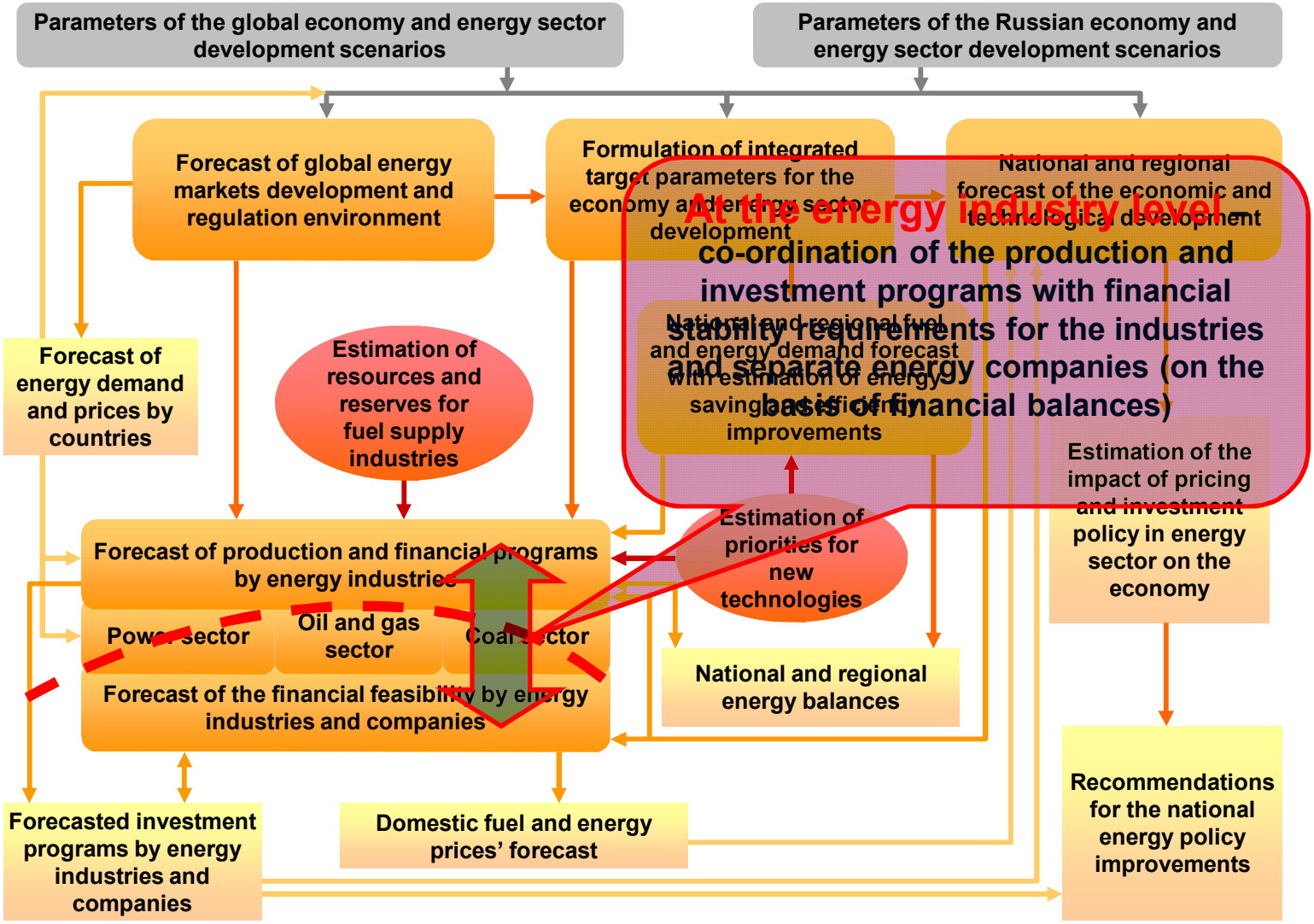

# System of the integrated energy balance forming

***Final form of the energy balance contains all data about production-processing-transportation-final consumption chain for 19 energy carriers***

**RESOURCES**
- Indigenous Production
- Import
- Export
- Intl. Marine Bunkers
- Stock Changes

Statistical differences

Total Primary Energy Supply

**PROCESSING**
- Gas Works
- Oil Refineries
- Stabilization of oil and gas condensate
- Coal transformation
- Coke ovens
- Power plants – total
- Small and distributed generation – total
- Boilers
- Other heat plants
- Own use and losses in energy resources prodution
- Own use and losses in energy resources processing
- Own use and losses in energy resources T&D
- Secondary energy carriers production – total
- Consumption for energy resources processing – total

**FINAL CONSUMPTION**
- Minerals production (C)
- Manufacturing (D)
- Constuction (F)
- Agriculture and forestry (A)
- Transportation and communication (I)
- Other types of economic activity
- Residental
- Raw materials and non-fuel use

Total

- Gas (natural and accompanying gas)
- Oil, incl. gas condensate
- Gasoline
- Diesel fuel
- Fuel oil
- Refinery gas
- LPG
- Other oil products
- Coal – total
- Coke
- Gas coke
- Other solid fuel and waste (wood, peat, shale and solid waste)
- Other secondary (coke oven gas, other gases from metallurgy and other gaseous and liquid waste of energy production and processingи)
- Nuclear power
- Hydropower
- Other renewable resources (solar, wind and geothermal energy)
- Secondary heat resources
- Electricity
- Centralized heat

# ERI RAS/REA outlook 2012
# Global energy markets – looking from Russia with your own eyes

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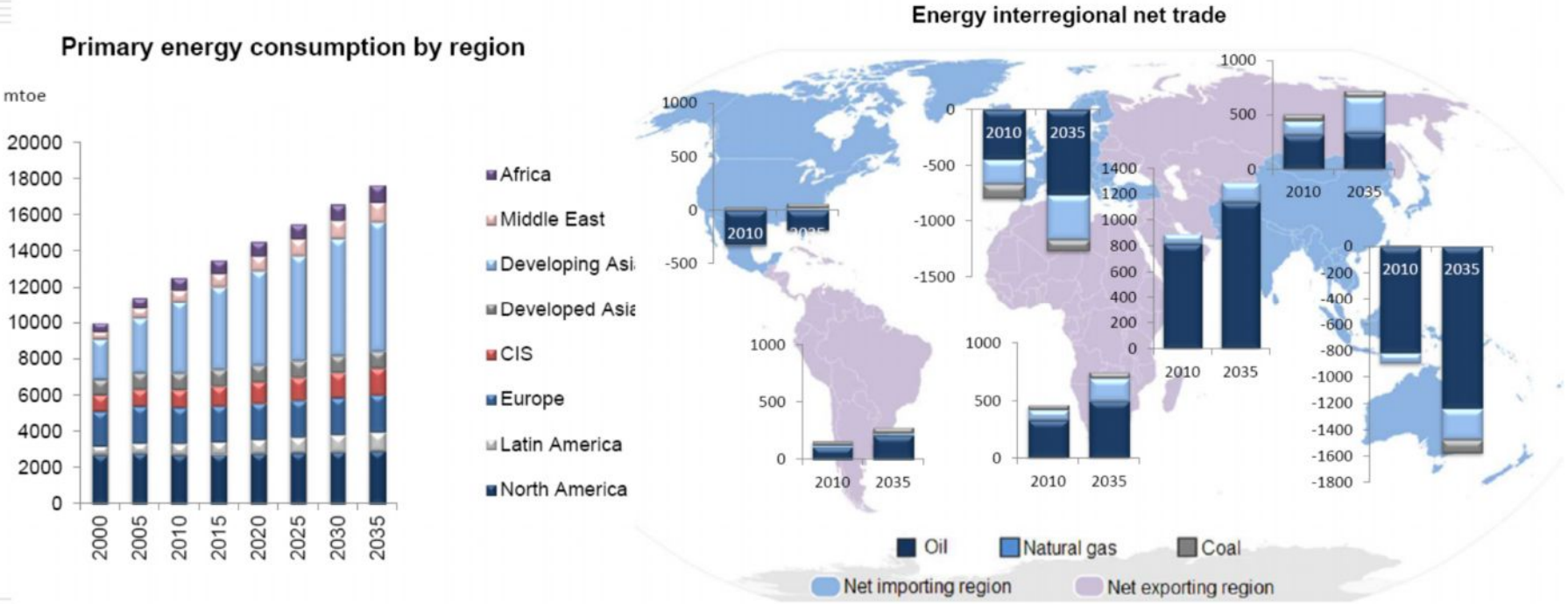
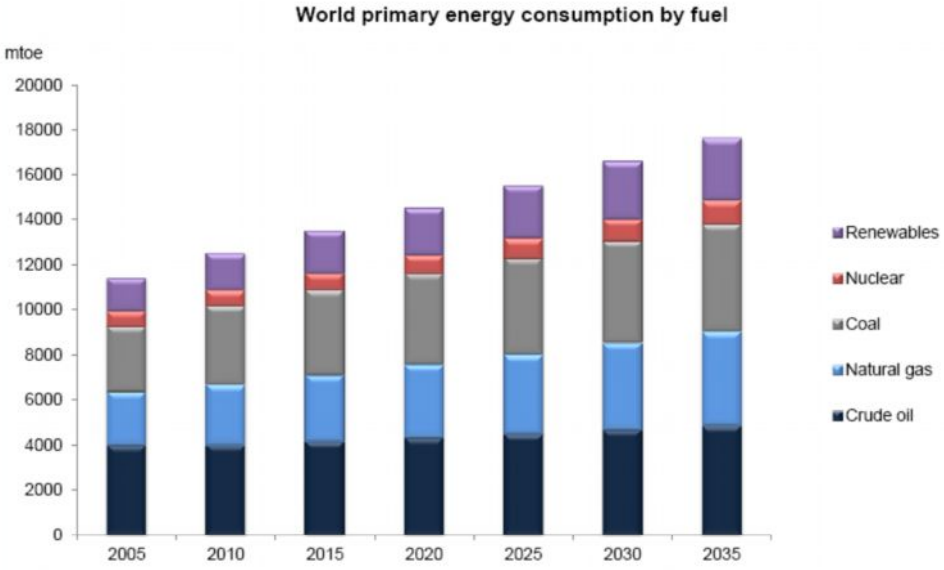


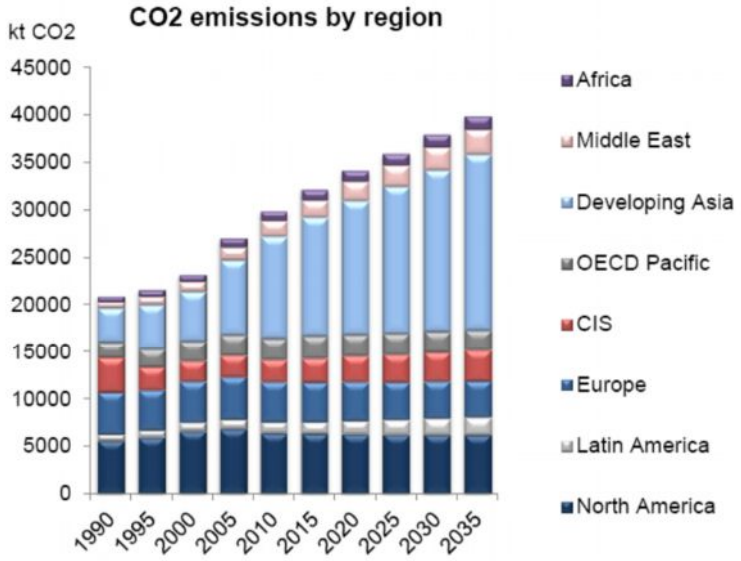

**The primary energy consumption in developing Asia will amount to about 65% (5 billion toe) of the increase of the world consumption in 2010-2035, that will be equal at the 7.6 billion toe**

**It will affect on the main energy export routes in the world. By 2035 net import of oil, gas and coal in the North America will be lower at 50%, but European net import will increase at near 50%. Developing Asia will double net import.**

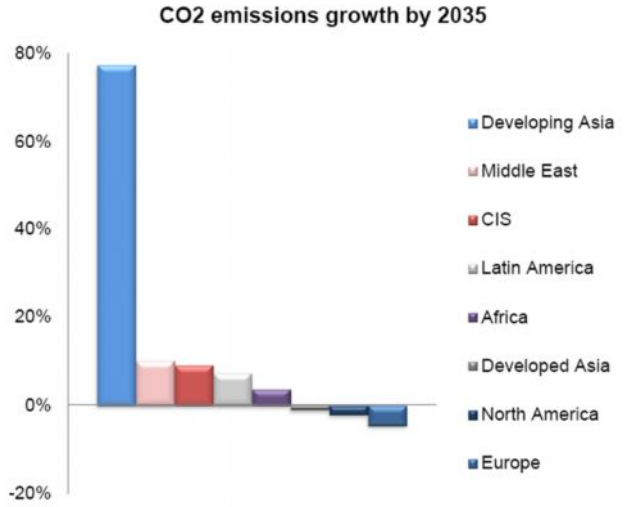
# ERI RAS/REA outlook 2012
# Global energy markets – looking from Russia with your own eyes

**Fossil fuels and hydrocarbons will remain dominate in the global energy mix, although RES will grow intensively**




**The growth of CO2 emissions will continue and it will be driven by the developing countries (mainly in Asia). Although developed countries will be able to stabilize or even reduce their own emissions, it will not change the global trend**



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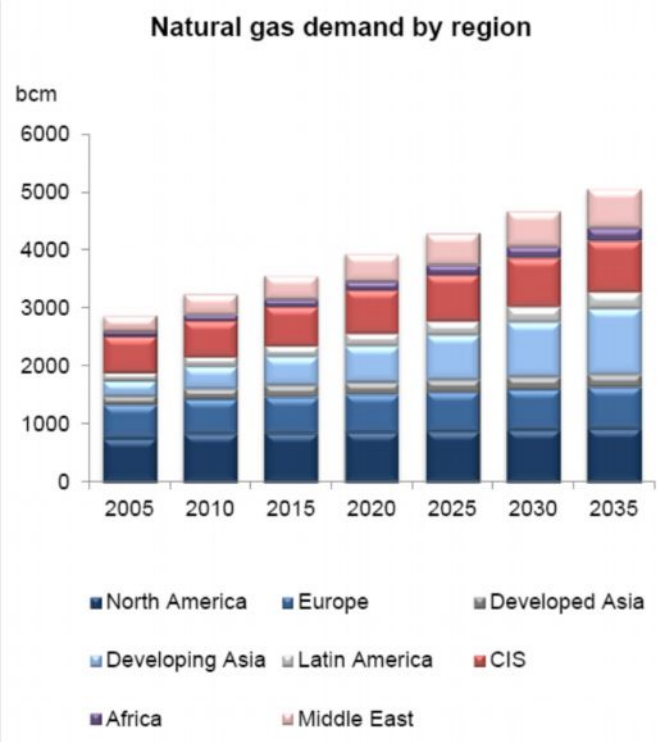
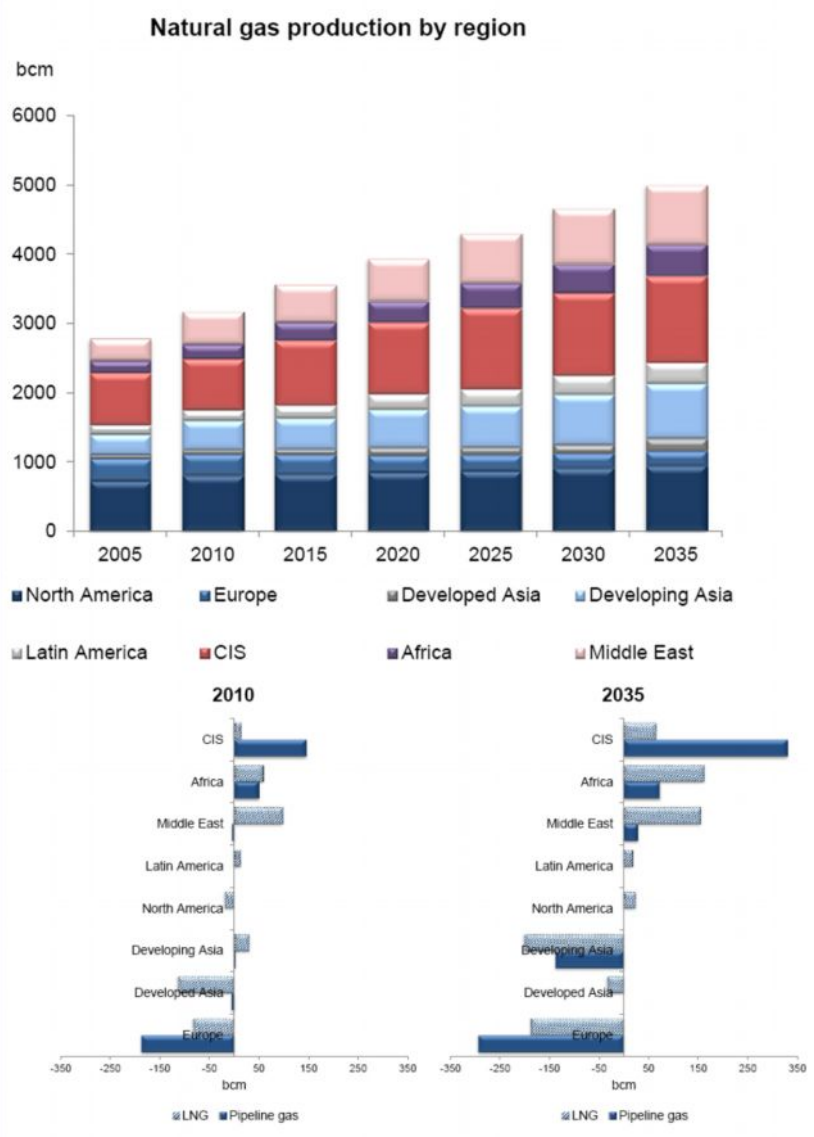
# Global energy markets – looking from Russia with your own eyes



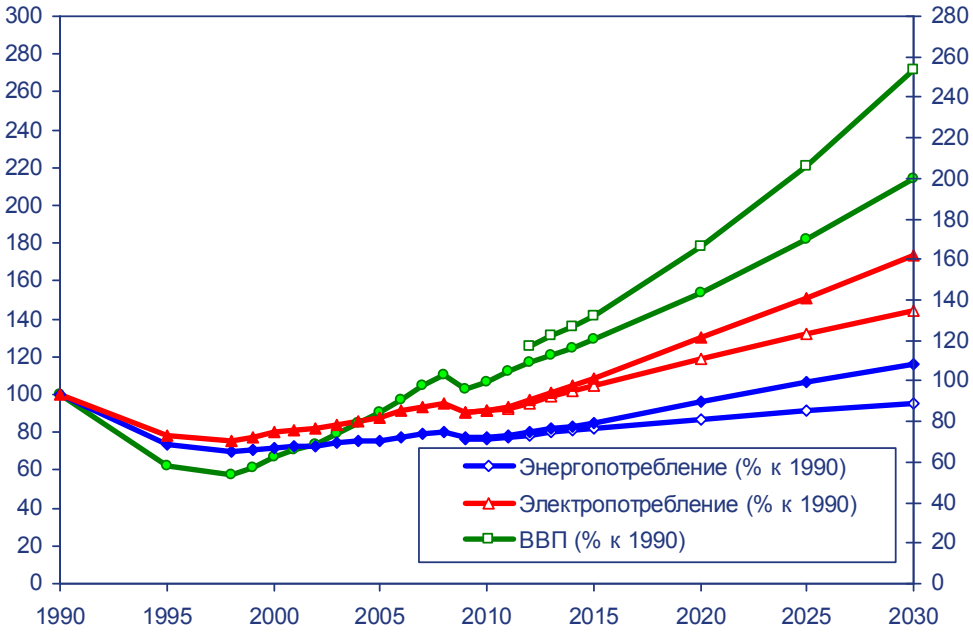




**Developing countries will form the main increase of gas demand**

**Except Europe, all regions will increase gas production and by 2035 unconventional gas will amount to 10% of global supply.**

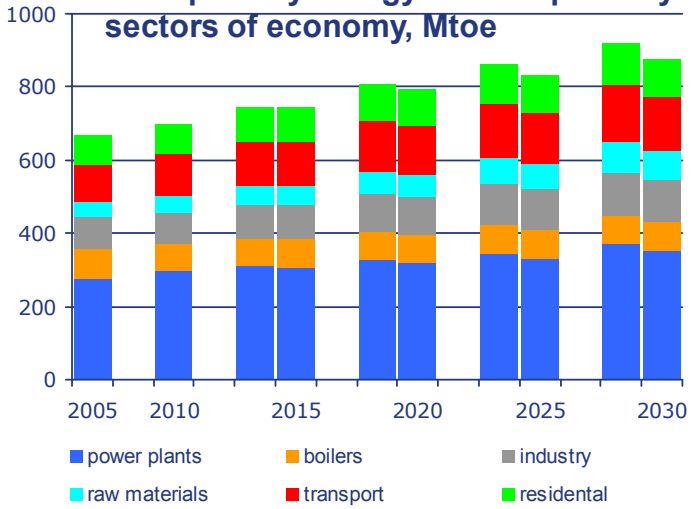
# Russian energy sector outlook.
# Economy and energy demand growth and structure

**Multi-linear optimization models provides detailed forecast of Russian economy development by sectors and regions and forma the strong basis for the energy demand projections**

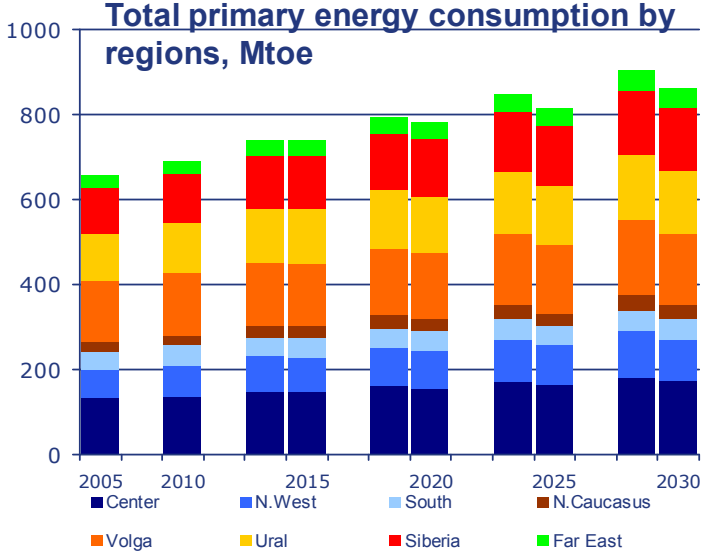



**To 2030 GDP may increase in 2.1-2.5 times (to 1990). Efficiency improvements will limit energy demand growth within 0.9-1.1 to 1990. Power plants will remain to consume near 50% of energy resources.**

**Total primary energy consumption by sectors of economy, Mtoe**

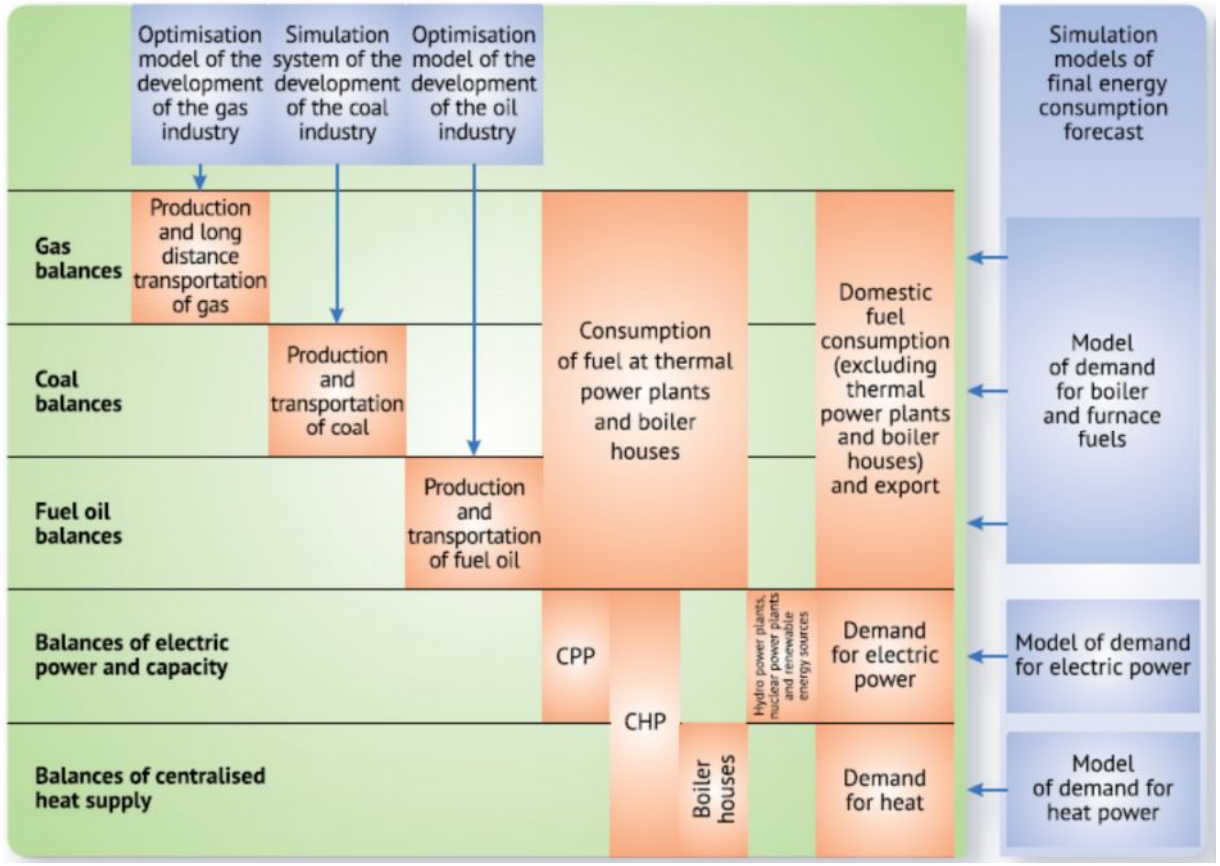



**Total primary energy consumption by regions, Mtoe**



# Russian energy sector outlook.
# Approach to the energy supply and demand balances

**The forecast for each energy industry provides the consistency between the investment and production plans and financial resources and requirements of separate energy companies taking into account evolution of market rules and pricing mechanisms**

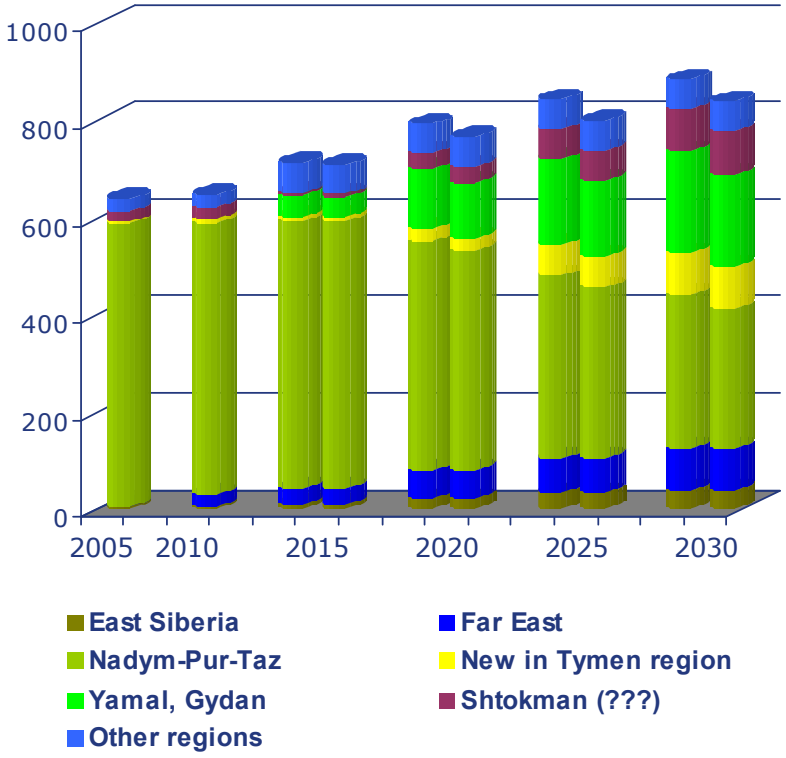



**EPOS model is used for joint optimization of the regional gas, coal, electricity and centralized heat balances that provides the consistency of the key energy industries' development.**

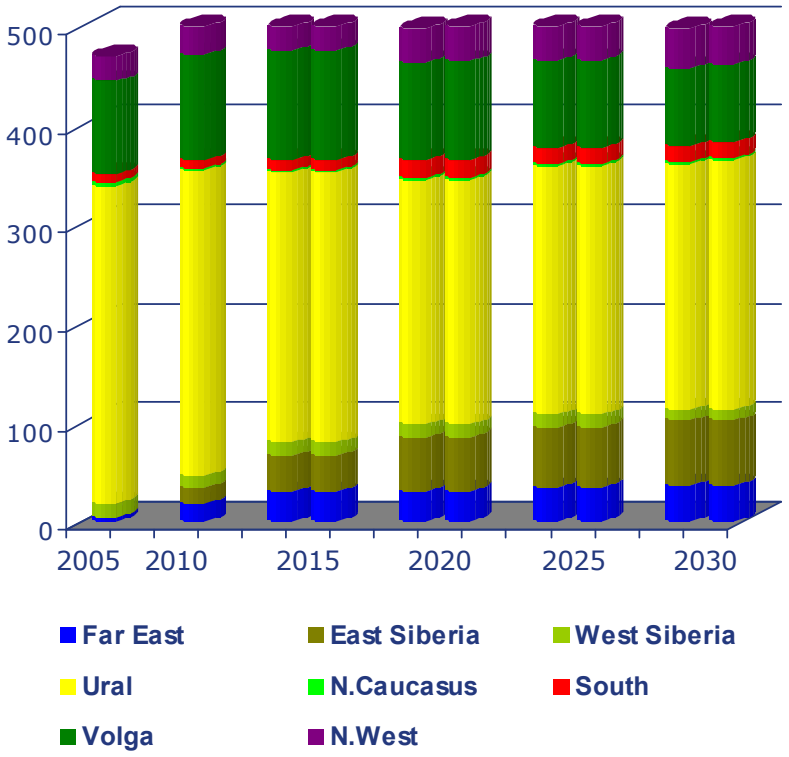
**At this, optimization allows to obtain the system of equilibrium wholesale energy prices by the regions of Russia on the basis of long-term fuel and electricity supply costs**

# Russian energy sector outlook. Hydrocarbon development forecast

## Gas production, blm cubic meters




## Oil production, mln tons

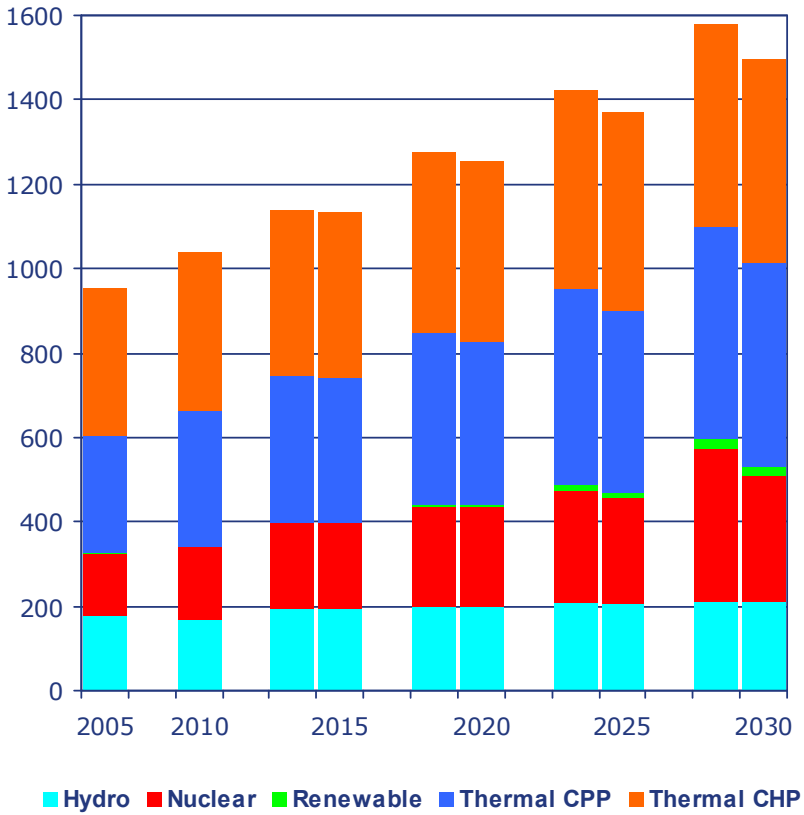



**Efficient gas production will grow by 25-30% due to the development of fields in the Yamal-Gydan area, East Siberia and the Far East. At the same time, gas output in the developed regions will decrease at 35%.**

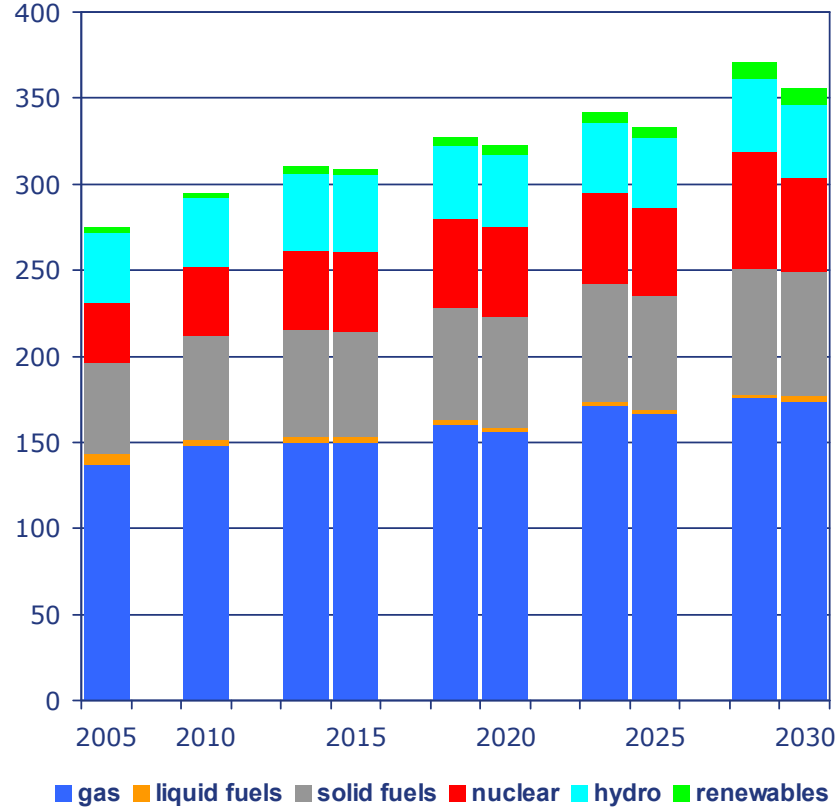
**Efficient oil production will stabilize in the next 2 decades. Oil from eastern Russia will compensate the -25% decrease in developed regions (Ural and Volga)**

# Russian energy sector outlook.
# Power sector development forecast

## Electricity production, TWh



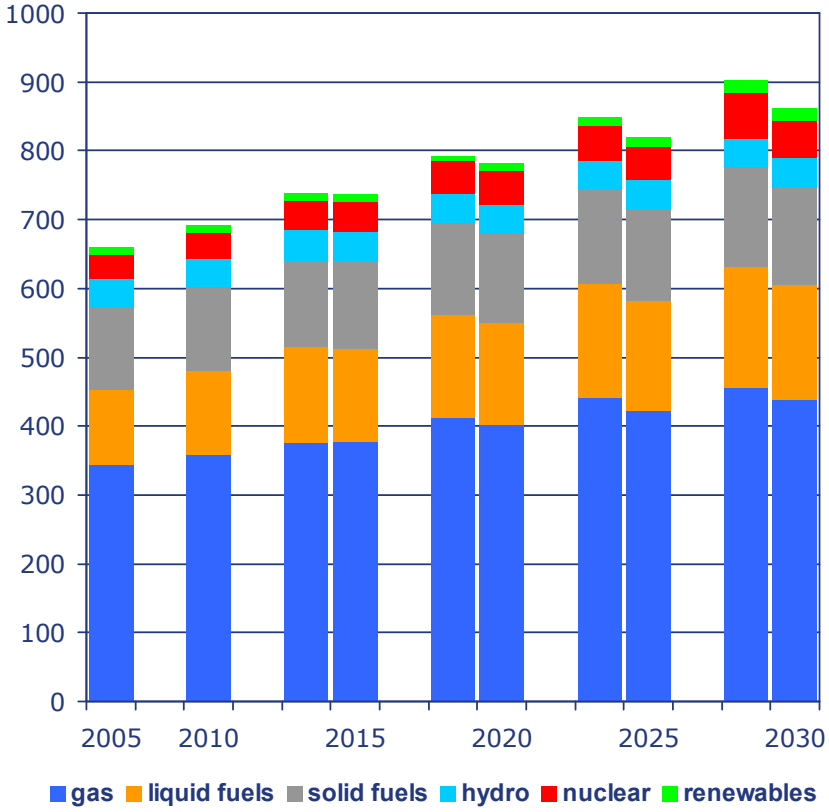

## Primary energy consumption by power plants, Mtoe



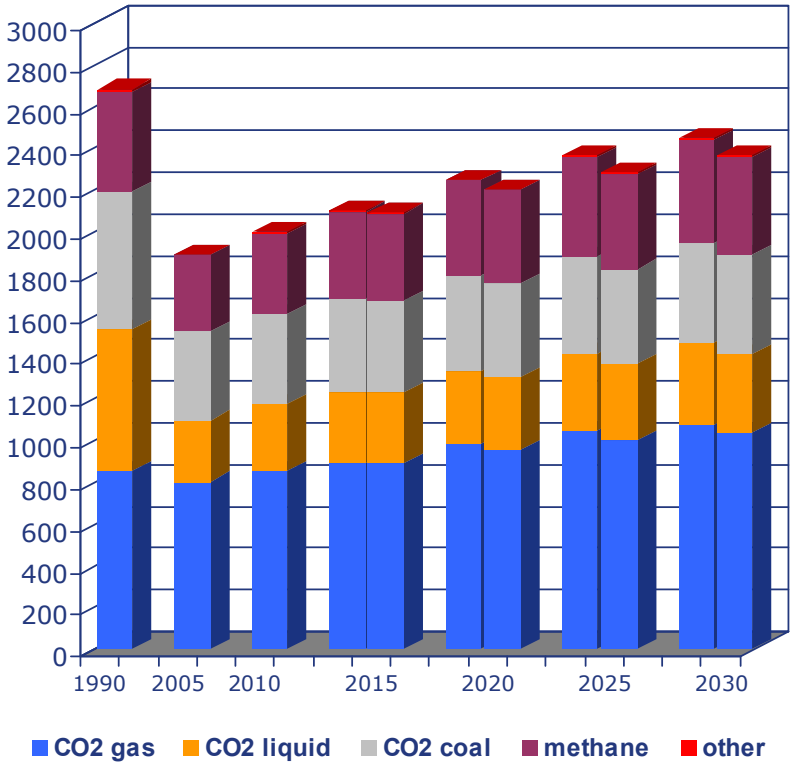

**Power sector will ensure the domestic energy needs and increase the electricity production at 57-65%. The sector will remain the main area of inter-fuel (resources) competition and may stabilize the gas share in the energy demand for electricity and heat at 50% due to the modernization of gas-fired generation and involvement of nuclear and RES (+35-50%)**

# Russian energy sector outlook.
# Energy consumption and GHG emission

## Domestic primary energy consumption, Mtoe

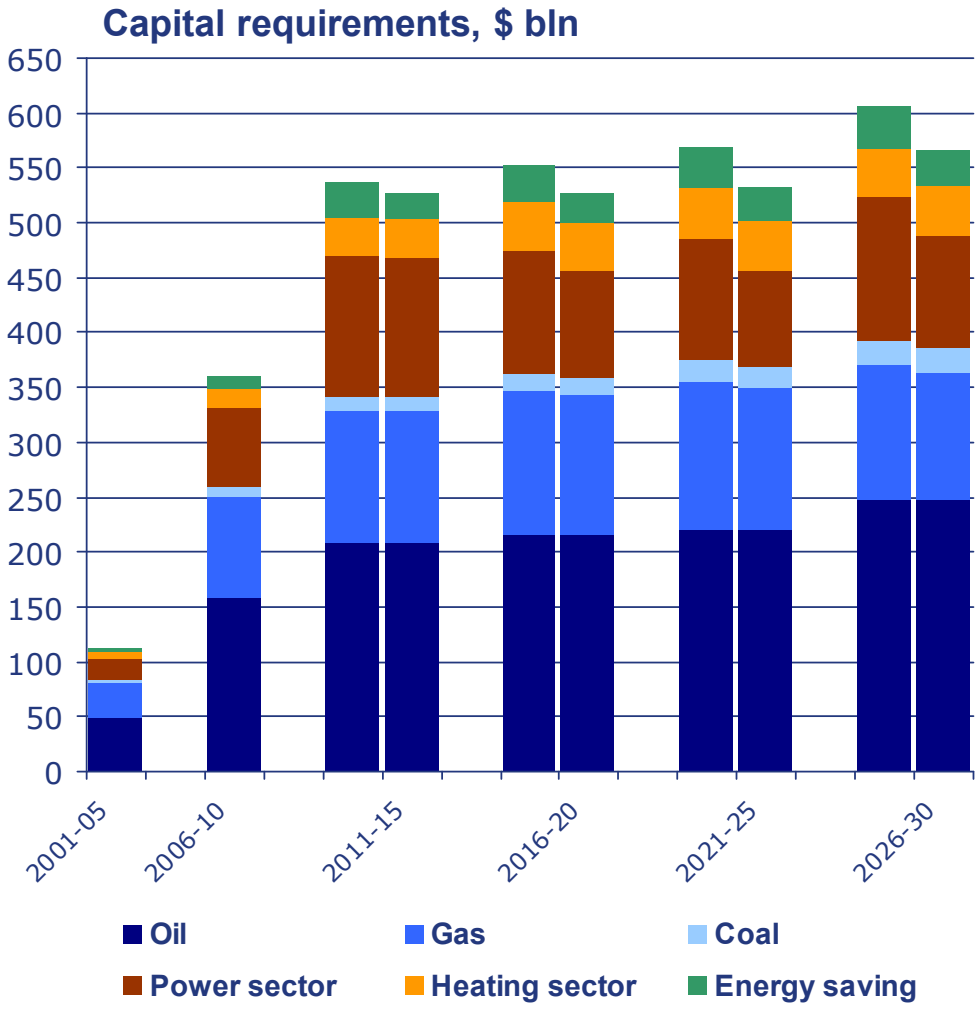



## Energy-related GHG emissions, mln t $CO_2$




**The share of natural gas in TPEC will fall from 52% to 50-51% in 2030; liquid fuel will increase from 17% to 19-20%. The total share of non-carbon resources will not exceed 14%. With these energy consumption trends GHG emissions will continue to grow up to 2030, although will remain 10-12% lower 1990. Stabilization is expected after 2035-40.**

# Russian energy sector outlook. Investment requirements




**Increase of production capacities together with substitution or wide-scale modernization of existing energy infrastructure already resulted to the growth of capital needs**

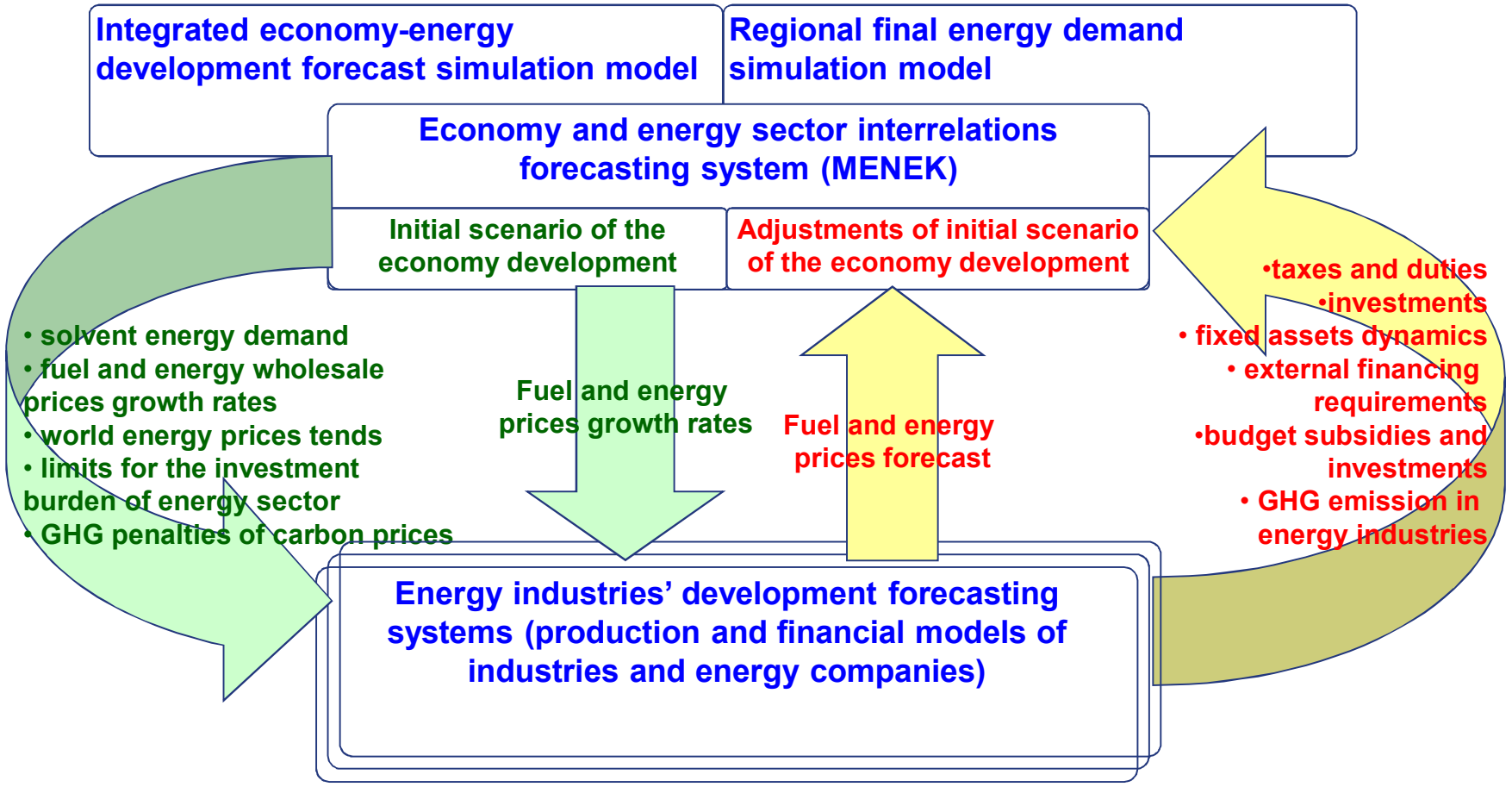
**More than 60% of all energy-related investments will be concentrated in the gas and oil industries (70-73% nowadays)**

**Energy infrastructure will maintain an extremely high investment pressure in the Russian economy - up to 5% of GDP before 2020 and with decrease to 3,5-4% in 2030.**

**However, worldwide the burden of the energy sector on the economy (1.5% of GDP) will be 2.5 times less**

# Russian energy sector outlook.
# Harmonization of the economy and energy sector development

## Russian economy and energy sector development indicators must be iteratively harmonized in the context of Energy Strategy elaboration



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# Thanks for attention