

# **Science and Technology Policy Development in Energy in Russia and International Cooperation**

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# Agenda

- The scientific potential, performance and funding of science and technology development in Russia. Key indicators
- Russian science and technology policy analysis and forecasting. Foresight in Russia. Priorities in energy.
- Role of Energy Research Institute (ERI RAS) in energy fundamental and applied scientific activities.
- Energy system research: Results
- High school education in energy
- International cooperation: possible areas of Russian – Korean scientific cooperation in energy

# Science and technology development in Russia. Main indicators

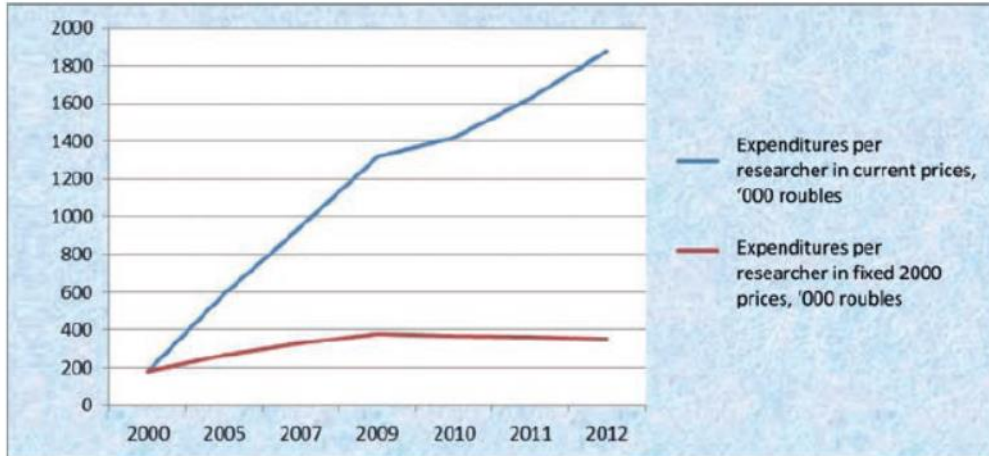


Figure 1. Domestic Research and Development Spending per Researcher, 2000–2012

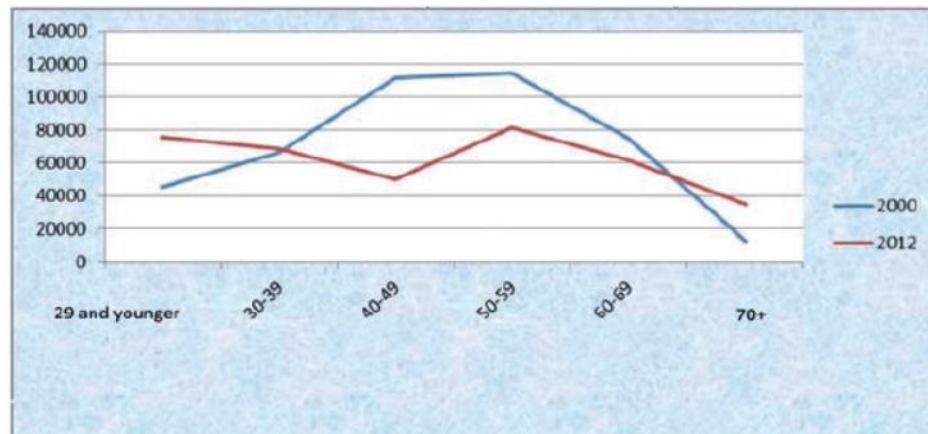
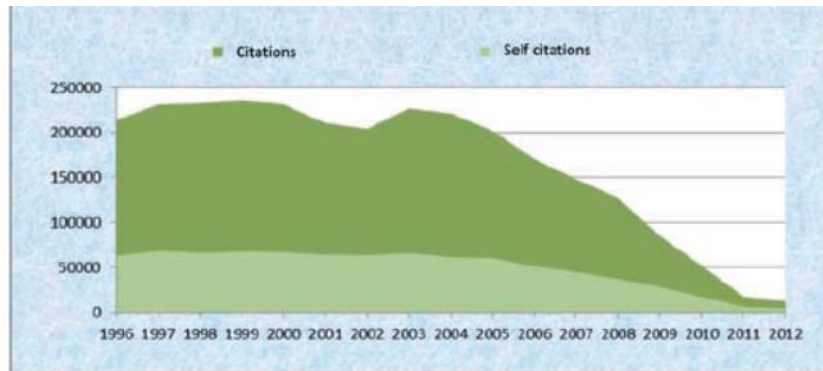
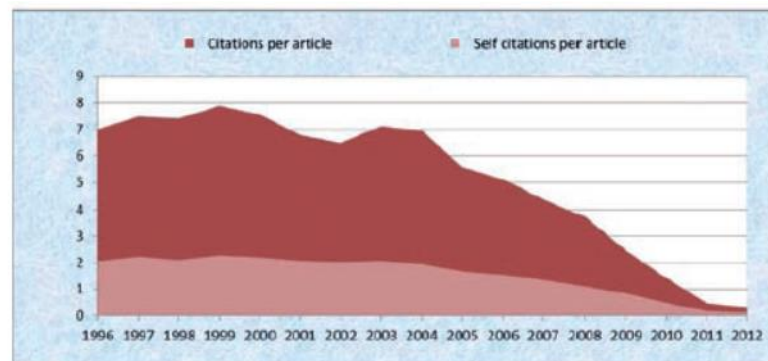


Figure 2. Age Structure of Russian Researchers in 2000 and 2012

# Science and technology development in Russia. Main indicators (2)



*Figure 3. Citation and Self-Citation Dynamics of Articles Published by Russian Scientists in International SCOPUS Peer-Reviewed Scientific Journals*



*Figure 4. Citation and Self-Citation Dynamics per Article Published by Russian Scientists in International SCOPUS Peer-Reviewed Scientific Journals*

# Science and technology development in Russia. Main indicators (3)

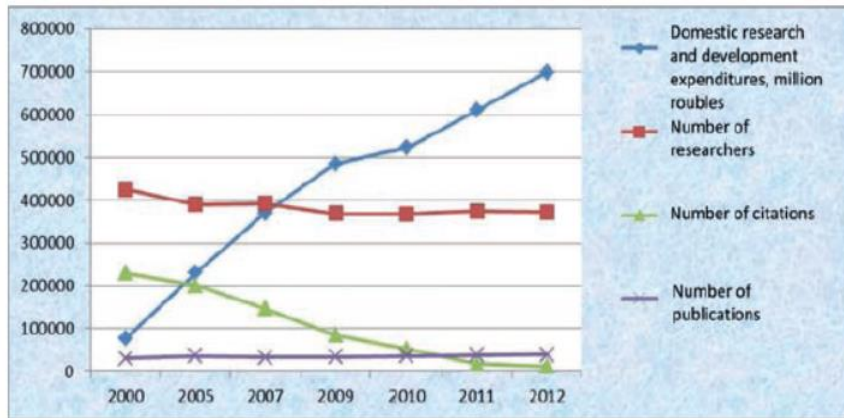


Figure 6. Russian Science Performance Trends

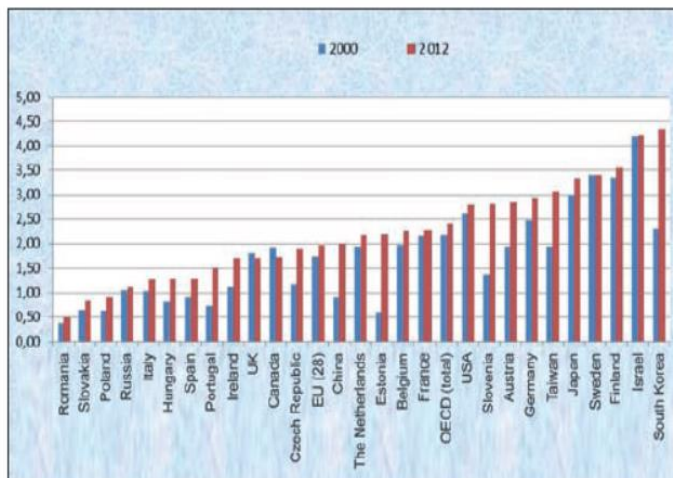


Figure 7. Research and Development Spending as a Percentage of GDP in 2000 and 2012

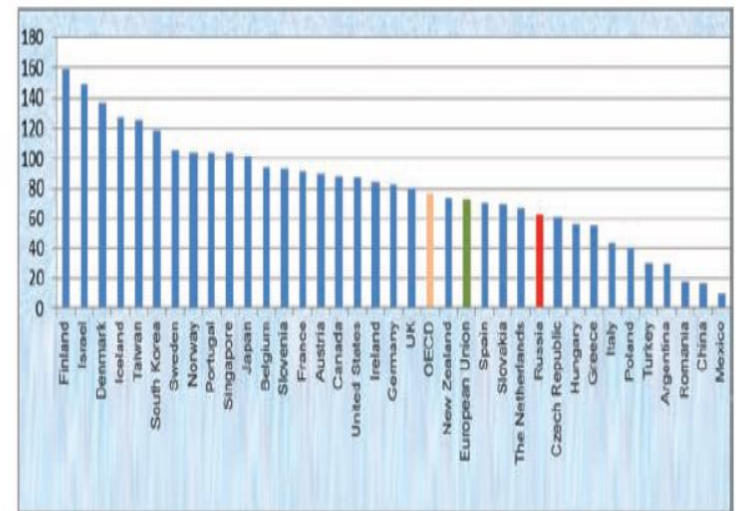


Figure 9. Number of Researchers per 10,000 People Employed by Country (2011<sup>1</sup>)

# Science and technology development in Russia. Main indicators (4)

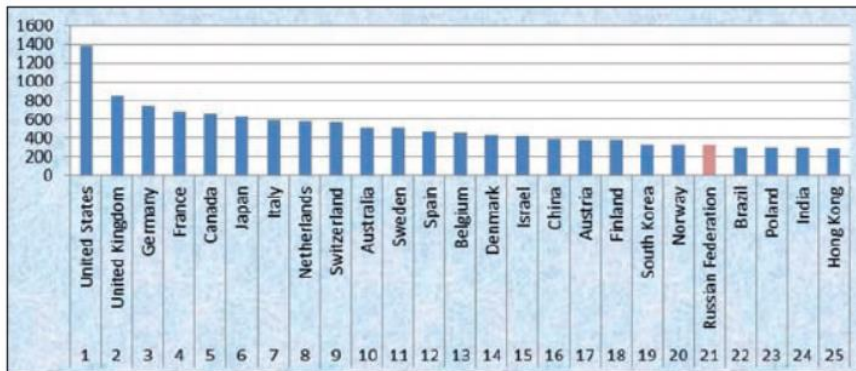


Figure 13. Hirsch Index for Countries Based on Documents published in SCOPUS-indexed Journals, 2012

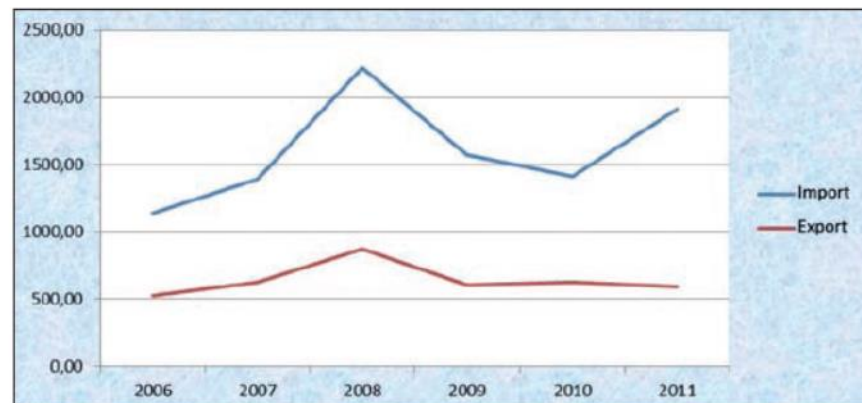
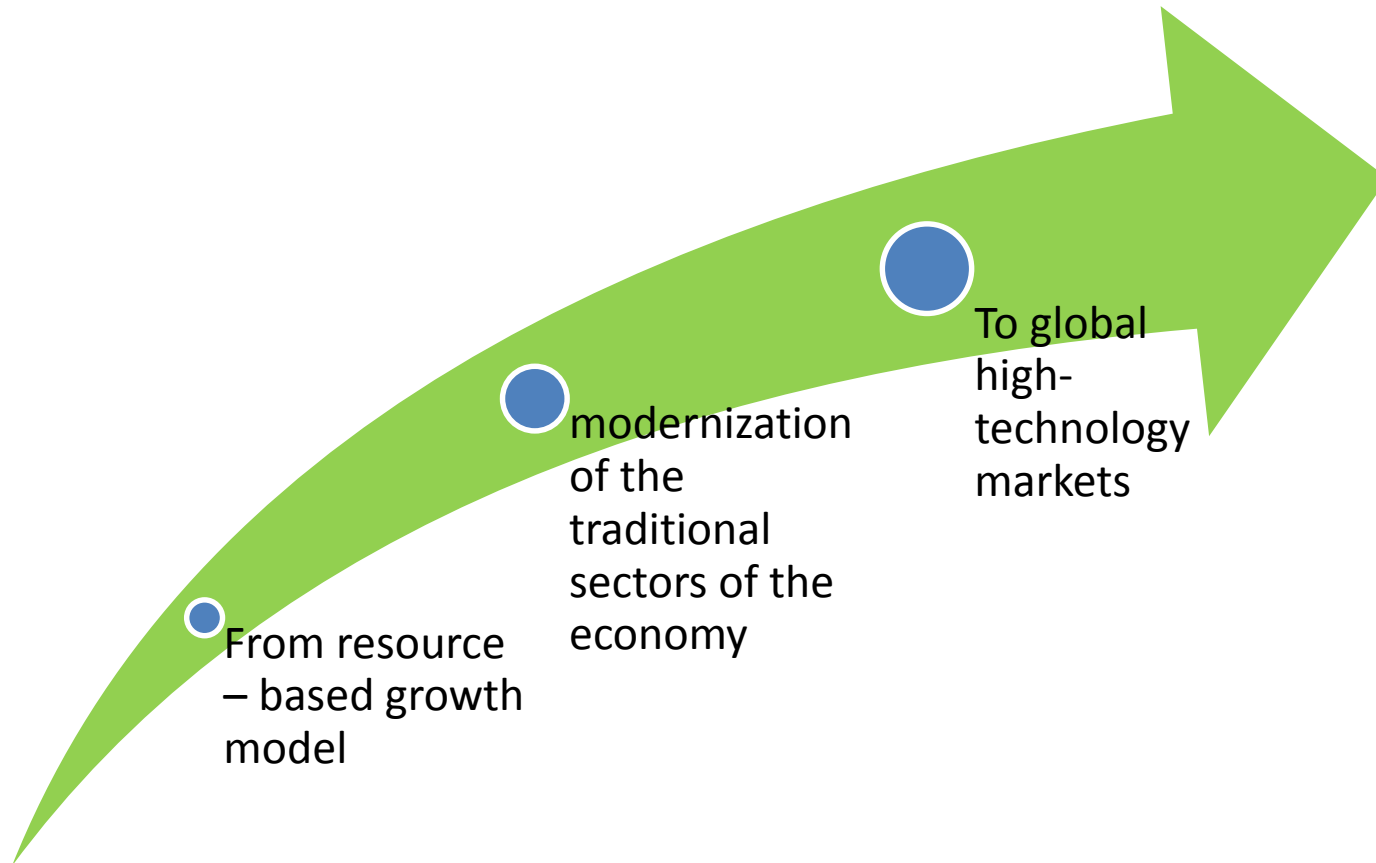


Figure 15. Russian technology export/import ratio in 2006–2011, USD million

# New understanding

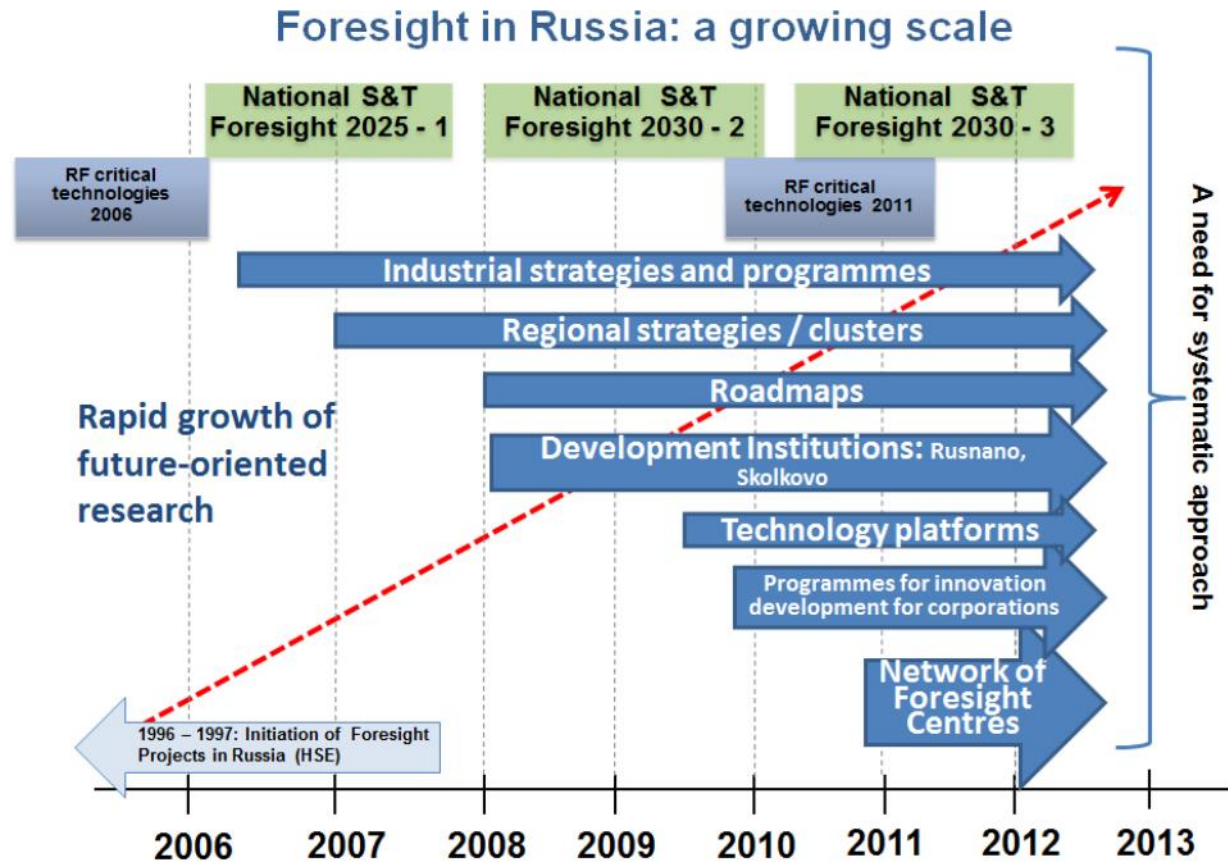


# New approach to science

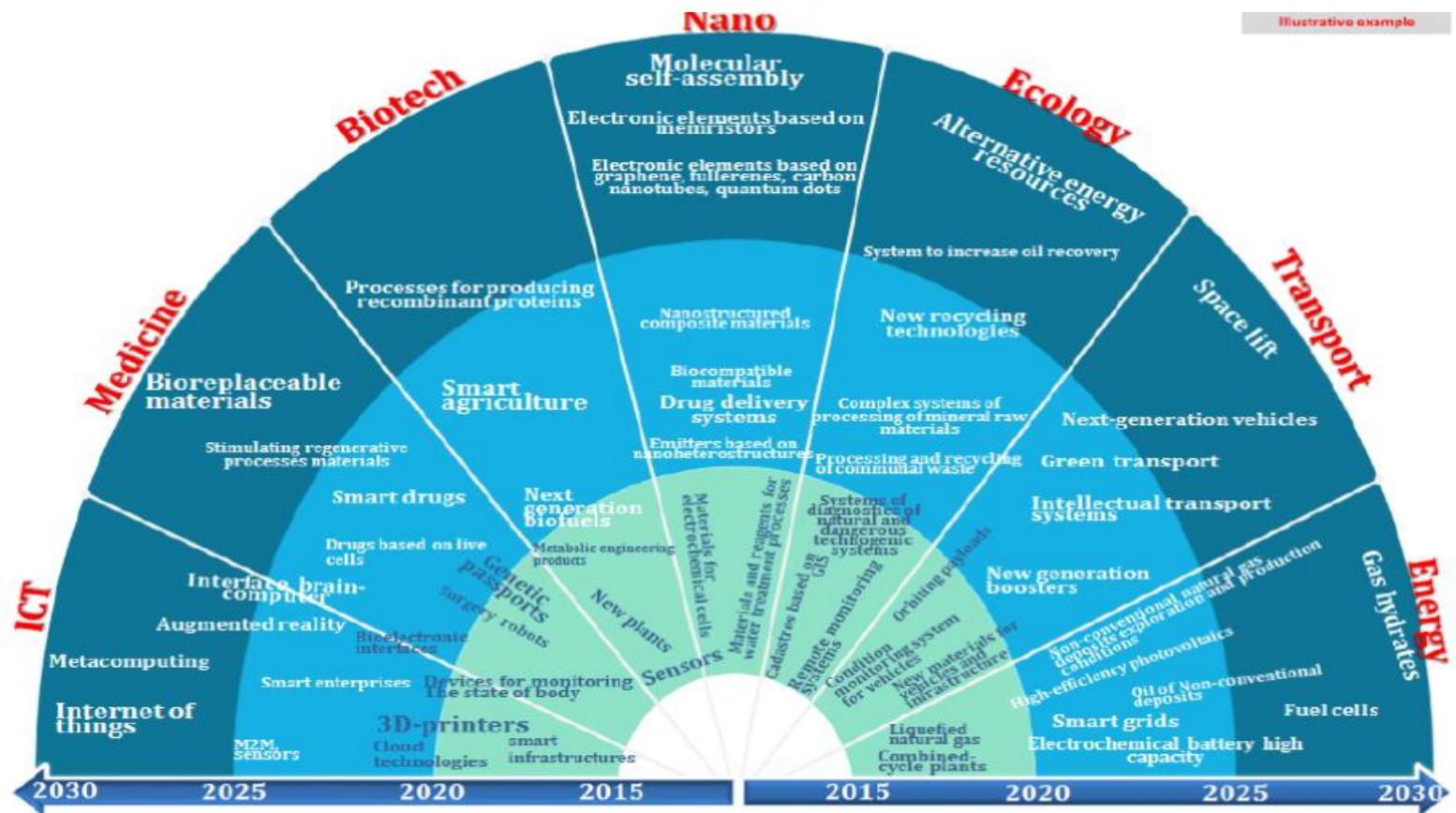
- Reforms of Russian Academy of Sciences
- New innovation institutes
- New role of universities
- Growth of R&D/S&T international cooperation



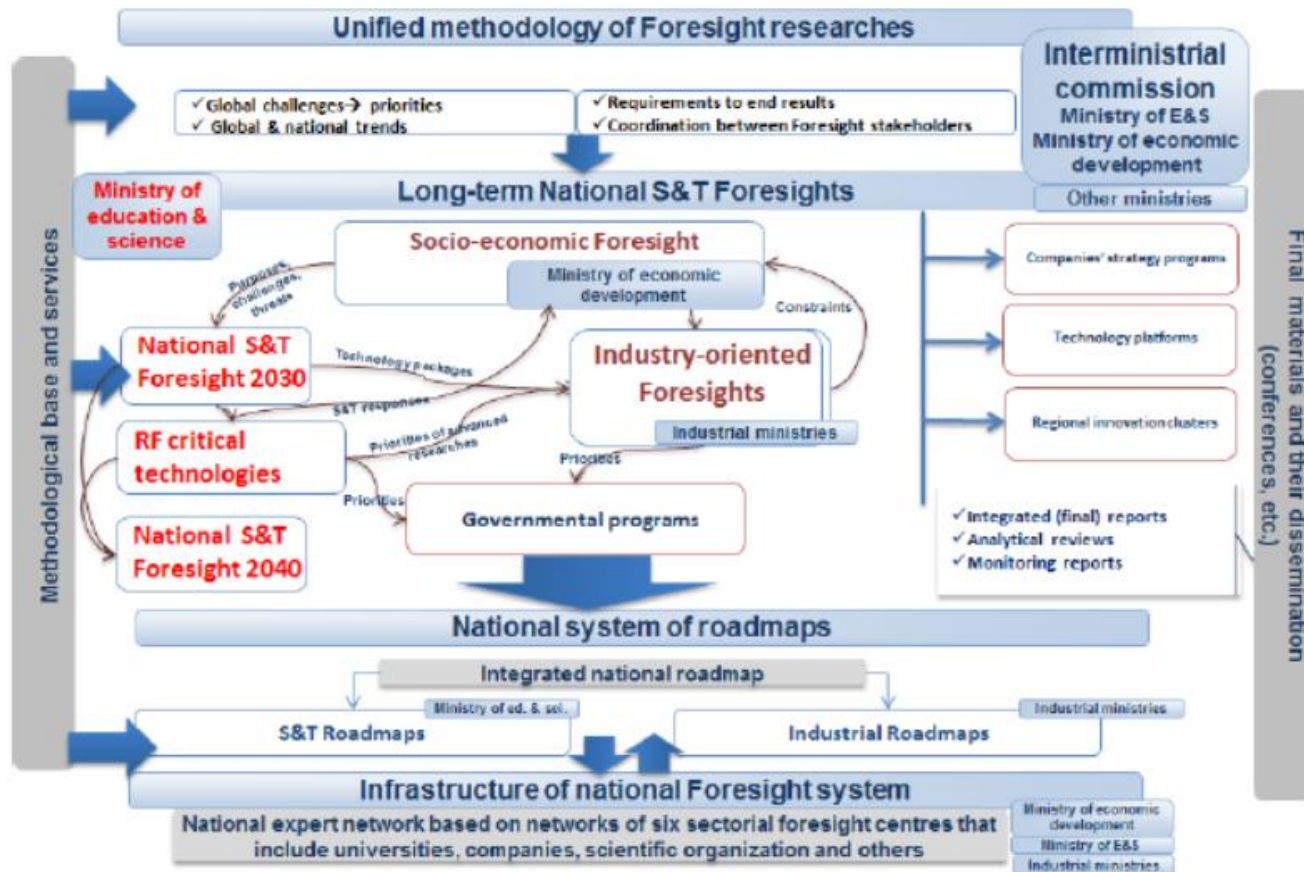
# New approach to S&T development



# Priorities of S&T development



# Organization of S&T



# Breakthrough technologies

- Hydrocarbon production and transportation technologies:
  - Extraction of methane hydrates;
  - Development of specific hydrocarbons sources;
  - Production of liquid fuels from natural gas.
- New energy:
  - Renewable energy, distributed generation;
  - Smart grids;
  - Storage of energy.
- New technologies in energy consumption:
  - Hybrid cars (Hydrogen and electric vehicles);
  - Energy Efficiency in households etc.

# Government Policy in Innovations (RF Ministry of Energy)

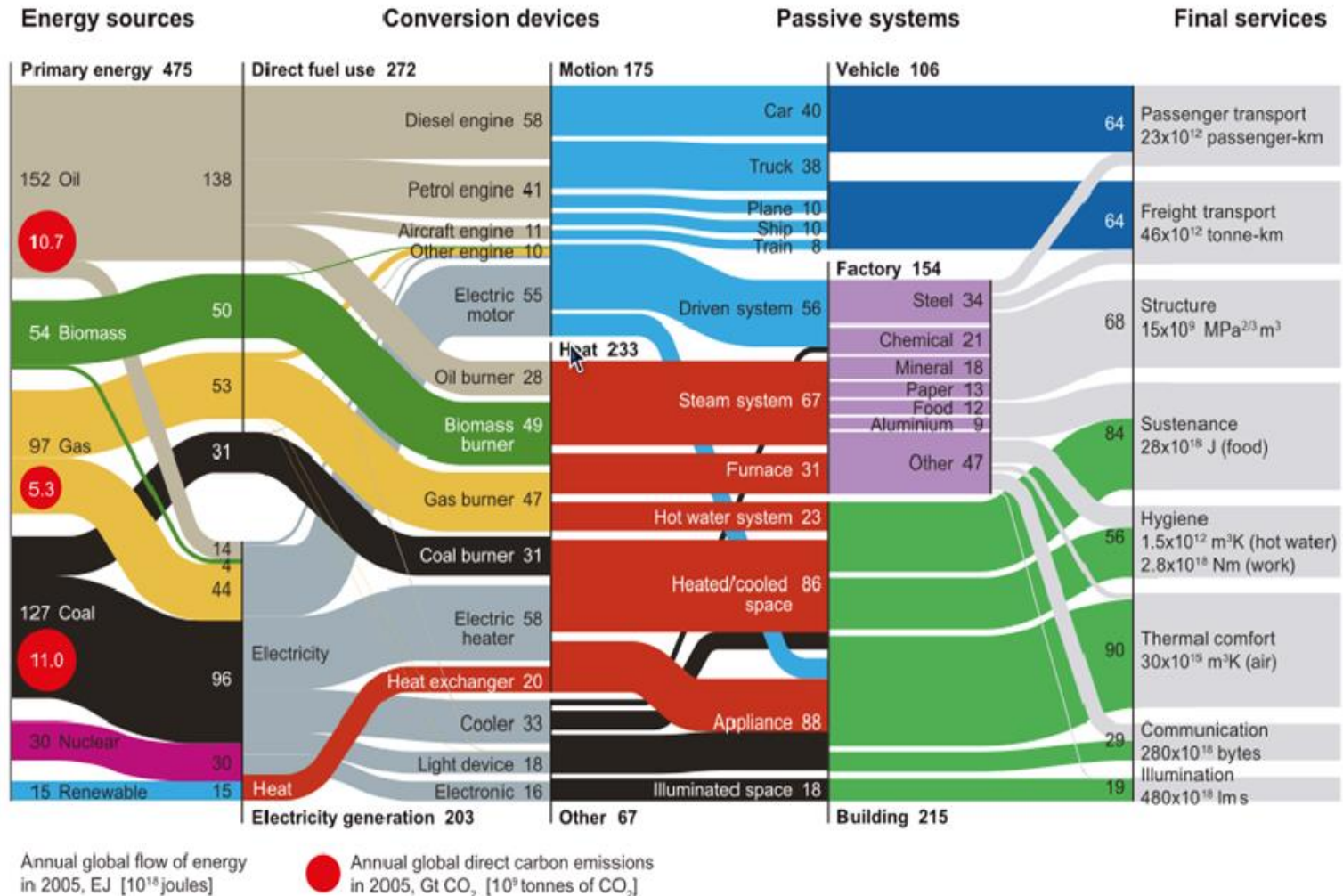
- Road Map for the implementation of innovative technologies and advanced materials in the fuel and energy complex for the period till 2018 (Decree of the Russian Federation from July 3, 2014 No 1217-p)
- Policy of import substitution

# **ERI RAS: More than 30 years of fundamental research**

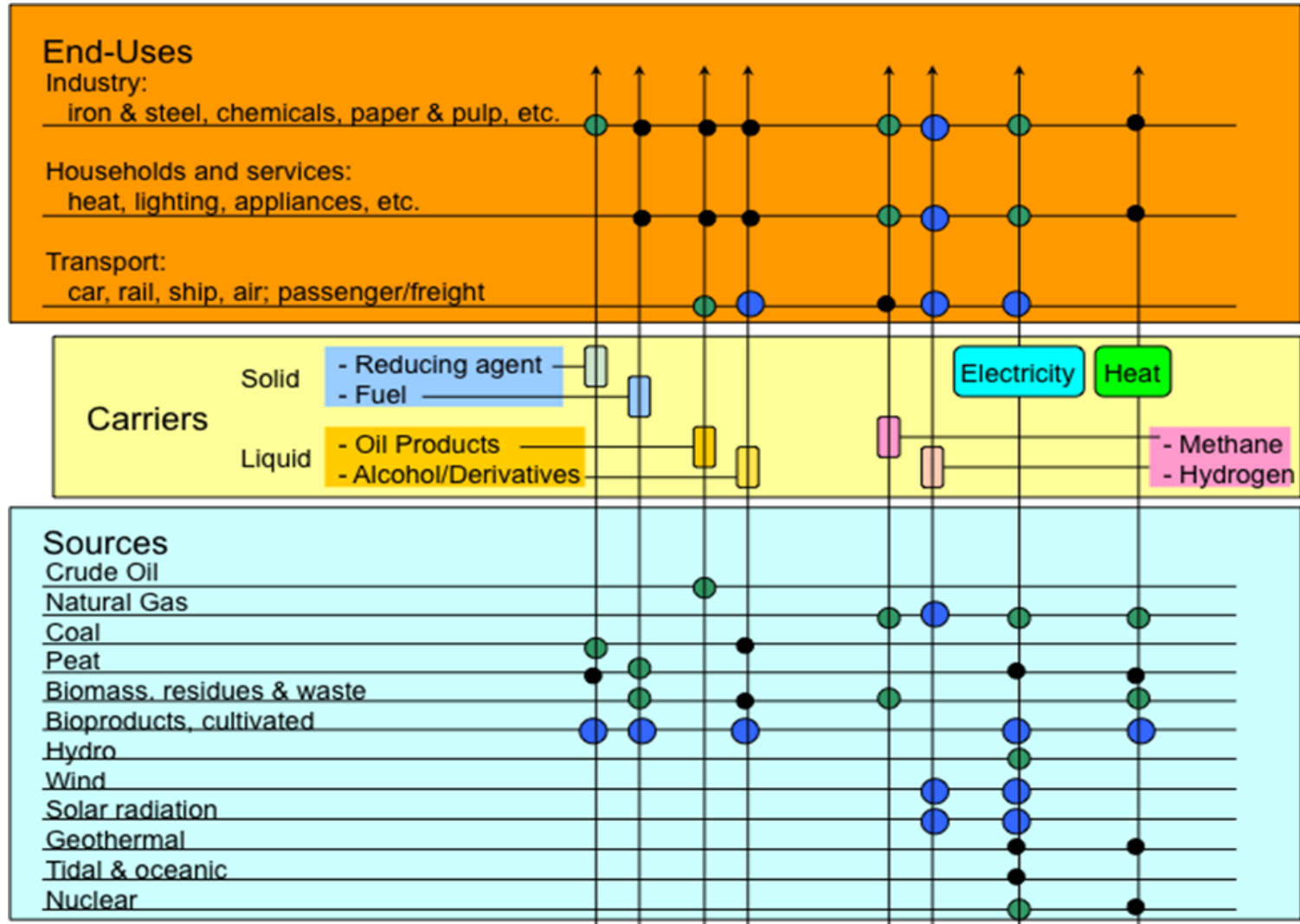
- World Energy Outlook
- Energy strategy of Russian Federation
- Strategies of sustainable development of different branches of Russian energy complex (electricity, gas, oil, coal)
- Energy Efficiency and Renewables system analysis
- International energy markets analysis (Europe, Asia, former Soviet Union)



# Energy System Analysis



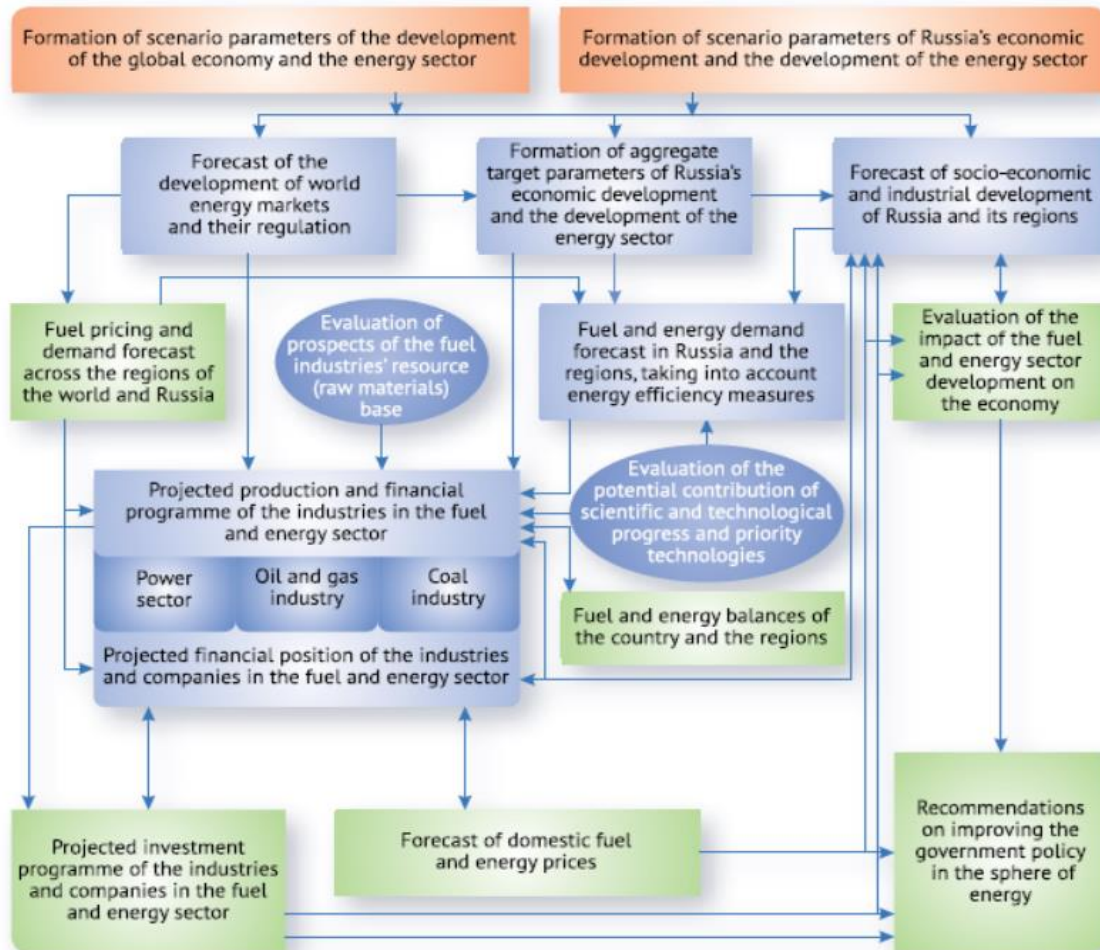
# Energy System Analysis (2)





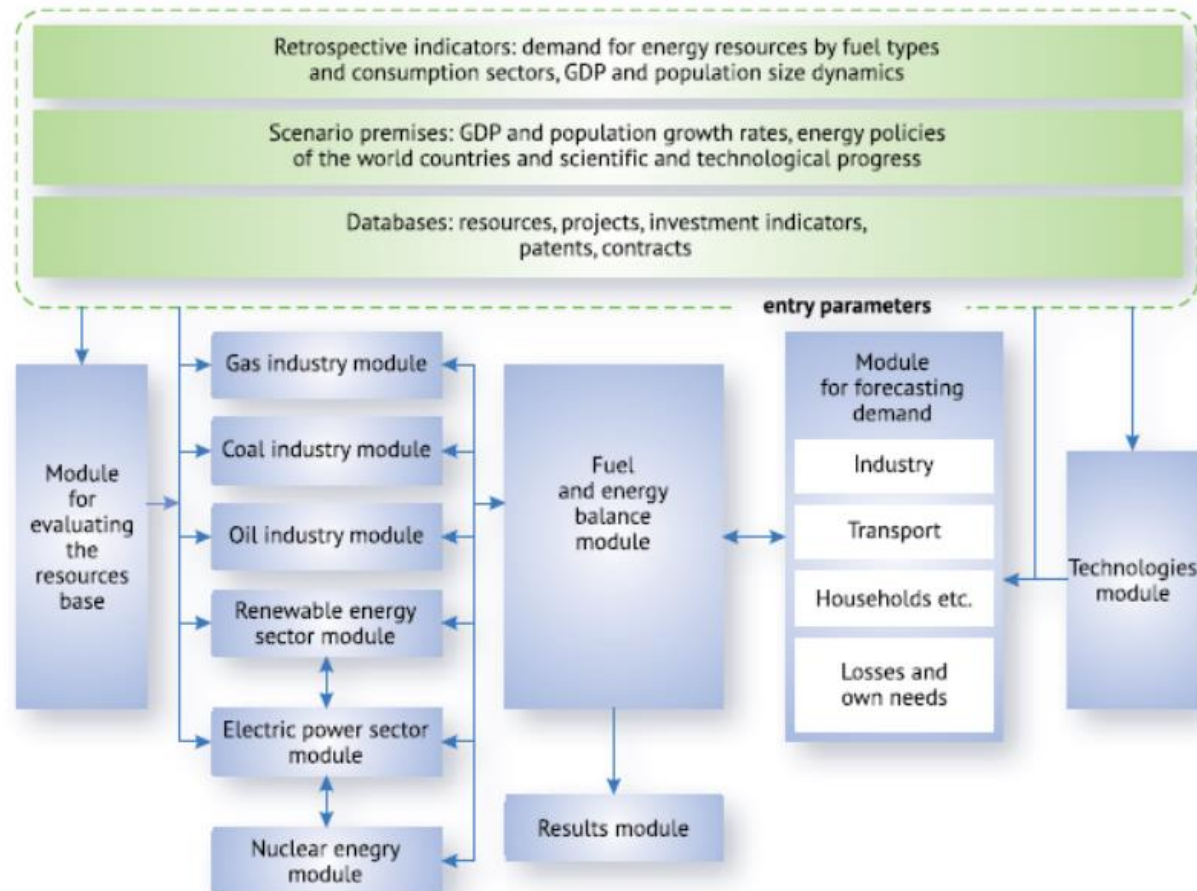
# SCANNER modelling and information complex

Main interoperations of the SCANNER modelling and information complex



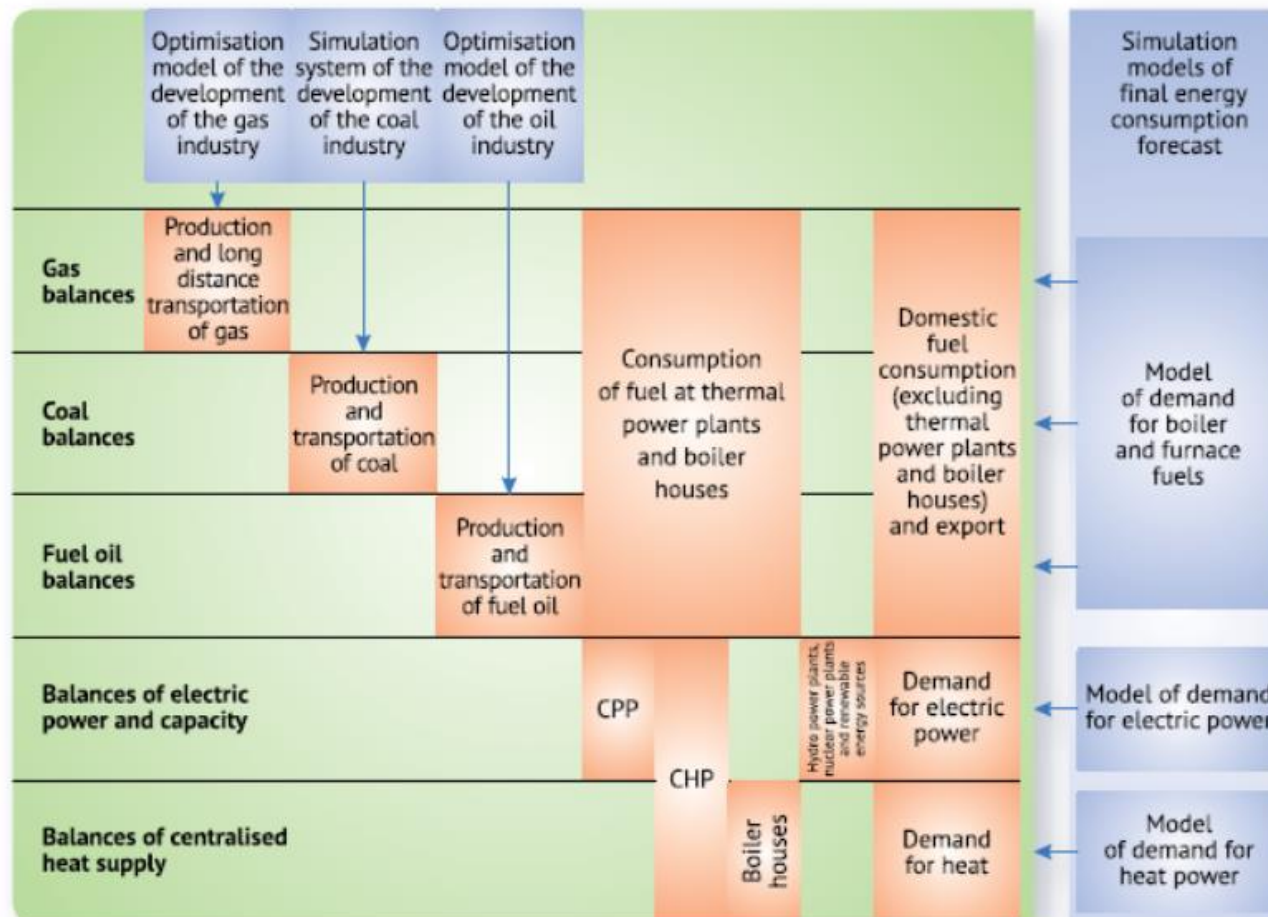
# Scanner: Global Energy Forecast Model

Structure of the unit for global energy forecasts



# Scanner: Integration Model

The system of balance conditions within the EPOS optimisation model and integration with other modules of the ERI RAS modelling complex



# High School Education Activities



Magister Program “Energy Markets System Research”

# High School Education Activities (2)



НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ  
УНИВЕРСИТЕТ

Joint Network Master  
Program “Strategic  
Management in Fuel and  
Energy Complex”



**ПОЛИТЕХ**  
Санкт-Петербургский  
Политехнический Университет  
Петра Великого



**Уральский  
федеральный  
университет**  
имени первого Президента  
России Б.Н.Ельцина

# Possible areas of Russian – Korean scientific cooperation in energy.

- Exchange of information and best practices on energy system and technology research between research centres;
- specialized technology exhibitions, seminars, and presentations;
- information and analytical support to activities involving the transfer and commercialization of technologies;
- Support for international science and technology and investment projects;
- Collaboration in education programs (exchange of students, exchange of professors, joint programs, education networks)

**THANK YOU FOR YOUR ATTENTION!**

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