State University of Oil and Gas named after IM Gubkin
FACULTY OF INTERNATIONAL ENERGY BUSINESS,
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ARCTIC ENERGY INNOVATIVE POTENTIAL

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IMPORTANCE OF THE RUSSIAN ARCTIC

- 20% of Russian territory
- 1.5 million population
- more than 10% of GDP
- 20% of Russian exports (gas, oil, non-ferrous metals, fish)

Russia still uses no more than 15% of the natural and economic potential of its Arctic zone

ENERGY RESOURCES OF THE RUSSIAN ARCTIC

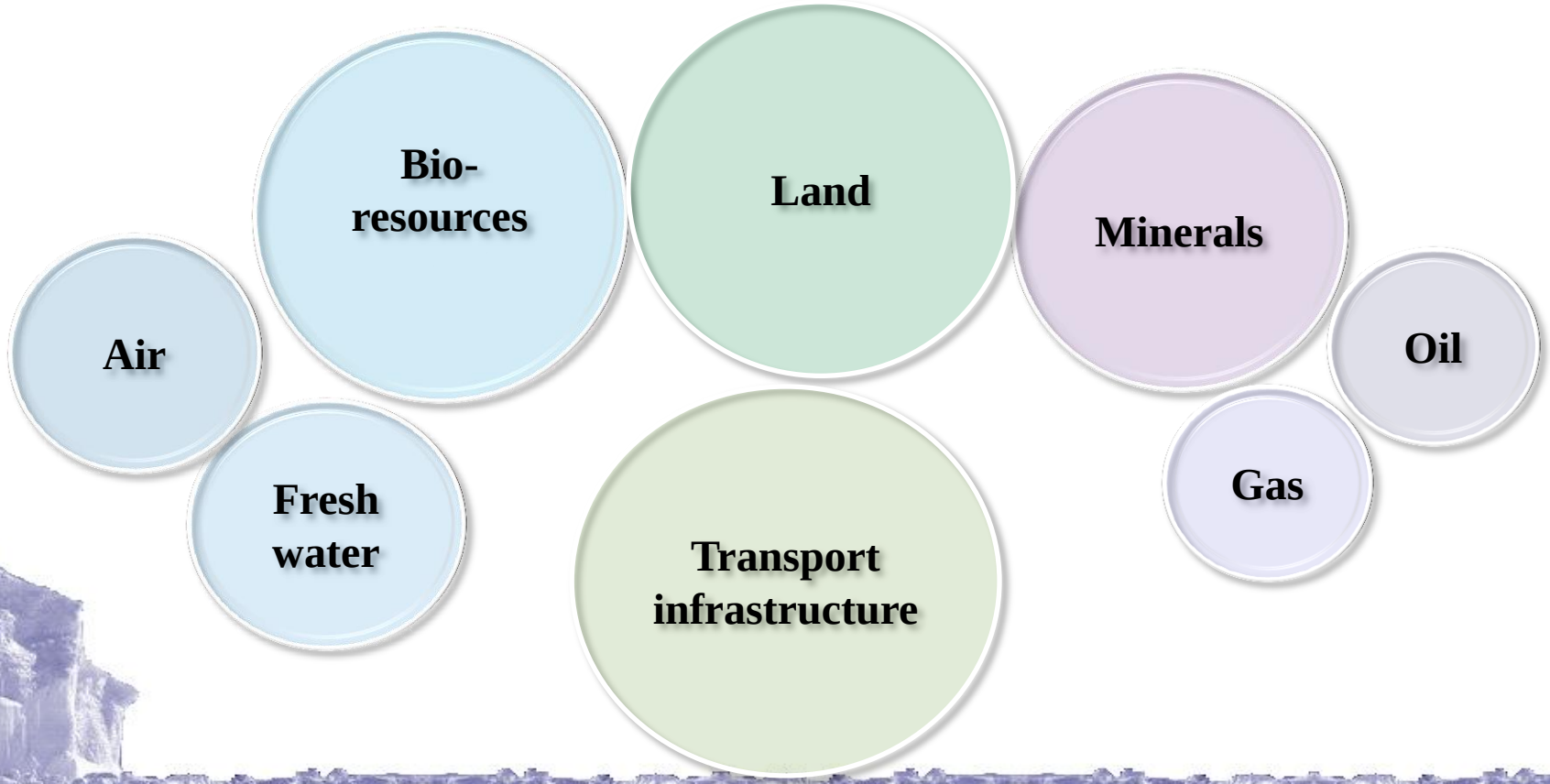
- 70% of all Arctic oil and gas fields
- 90% of the recoverable hydrocarbons of the Russian continental shelf (more than 100 bln t of fuel equivalent)
- up to 24 bln t of oil and 57 trln cm of gas in the Arctic seas;
- 780 bln t of estimated reserves of coal (of which 600 bln t – power coal)
- production of at least 130 bln cm of natural gas and 30 mln tons of oil by 2030

Still unexplored oil and gas shelf of the Laptev Sea, the East Siberian Sea, Chukchi and Bering Seas

* Assessments of IES

ENERGY POTENTIAL

Arctic Energy combines various types of regional energy potentials



DEVELOPMENT CONDITIONS

Any activity is related to a number of difficulties:

Severe climatic conditions, unique ecosystem, the relative lack of infrastructure and the high cost of works

Creation and implementation of new technology base:

Regional development requires new effective technological solutions

Priority of environmental protection

Arctic - The unique Protection Zone of Russia

International collaboration in the region

Wide range of regional, climate, infrastructural, investment and strategic characteristics requires effective integration and interaction among participants.

INNOVATION DEVELOPMENT

challenges

- Low level of efficiency and coordination in innovation system
- High synergy potential of the region
- The need to coordinate a number of new innovative programs
- Low level of innovation management

goals

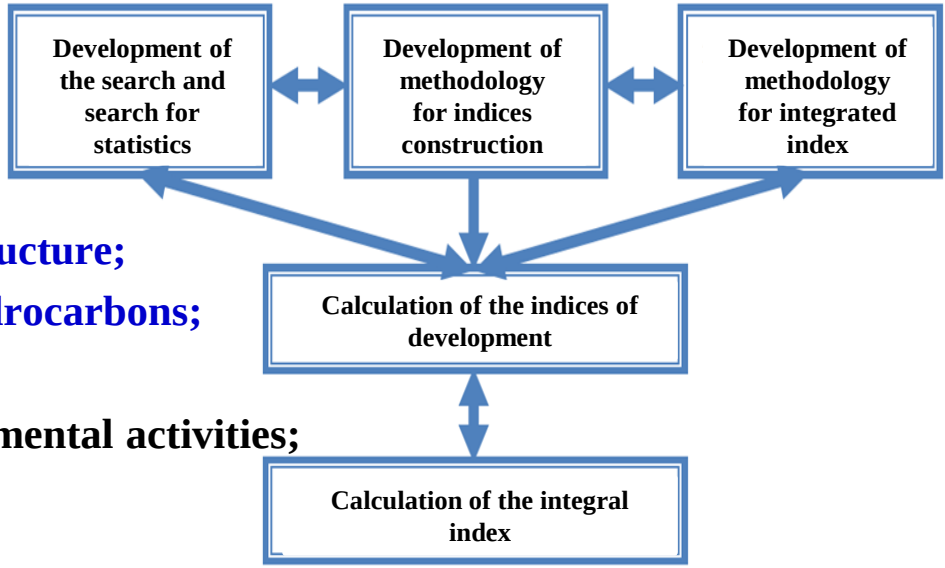
- Transition to qualitatively new level of regional technological development management
- The development of effective methods in the Arctic development analysis area

Arctic Energy Development Index

Creation of a system of International Arctic development indices

Key areas of activity in the Arctic:

- **International activities;**
- **Military and political activity;**
- **Development of energy and transport infrastructure;**
- **Extraction of natural resources, including hydrocarbons;**
- **Socio-economic development of the region;**
- **Environmental monitoring and other environmental activities;**
- **Scientific research on Arctic energy issues.**



United States, Canada, Russia, Norway, Denmark (Greenland), as well as Iceland, Sweden, Finland

Representation of chronological and regional aspects of the analysis

STRATEGIC PRIORITIES

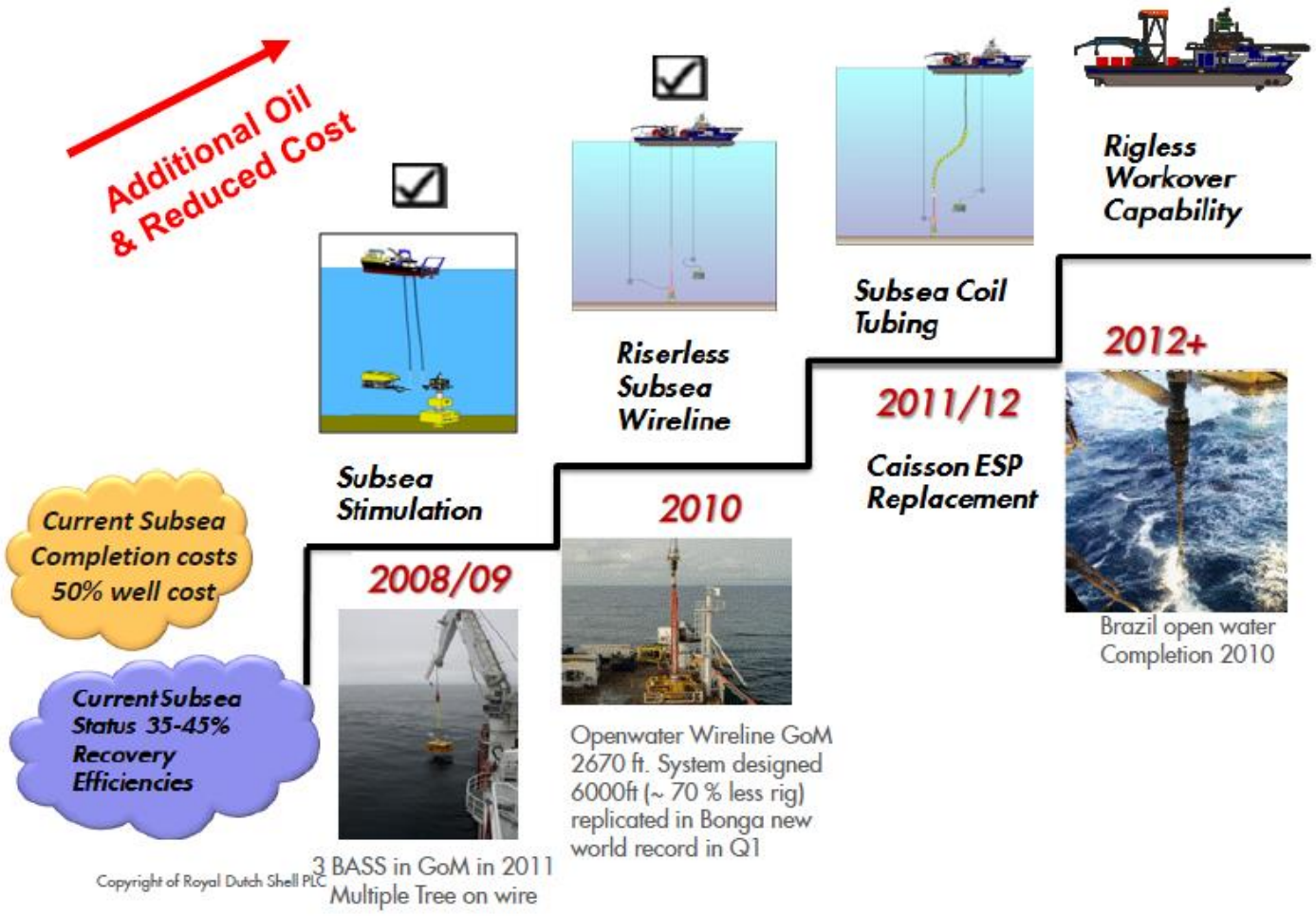
Company	Priority areas of R & D								
	Improvement of existing technologies of the production process, including work on "smart" fields	Technology development of "mature" fields	Eco-efficient technologies	Energy-saving technologies	Nonconventional hydrocarbons	Hydrocarbons heavy climatic conditions	LNG	GTL	RES
ExxonMobil									
PetroChina									
Royal Dutch Shell									
BP									
Ecopetrol									
Petrobras									
Total									
Eni									
Statoil									

List of companies is based on the annual energy companies rating PFC Energy, 2013

Source: IES based on open energy companies' data

TECHNOLOGICAL DEVELOPMENT

Indicators of development projects 17 offshore fields in the Arctic region in the period from 2013 to 2017	
14	Shallow-water deposits (<300m)
3	Deep-sea deposits (> 300m)
4815	Shallow-water reserves (million barrels BC)
306	Deep-sea stocks (million barrels BC))
73	Underwater wells
1	FPSO
0	FPS
0	FSO
0	TLP
0	SPAR-platforms
0	Other floating installation
1	Pile constructions
5	Quezon constructions
0	Jack-up constructions
0	Other fixed constructions
4	Gravity constructions
185	Hard pipelines, km
53	Flexible pipelines, km



Sources : Infield System Ltd., Royal Dutch Shell PLC, Offshore Russia mag.

TECHNOLOGICAL DEVELOPMENT

MAIN TRENDS

Geological exploration

Under ice detection

Marine sound
AUV

Oil spill response in ice

Mechanical methods

Dispersants

Operating in ice

Reducing Ice loads on structures

Pipeline protection

Environmental impacts

Unmanned Aircraft

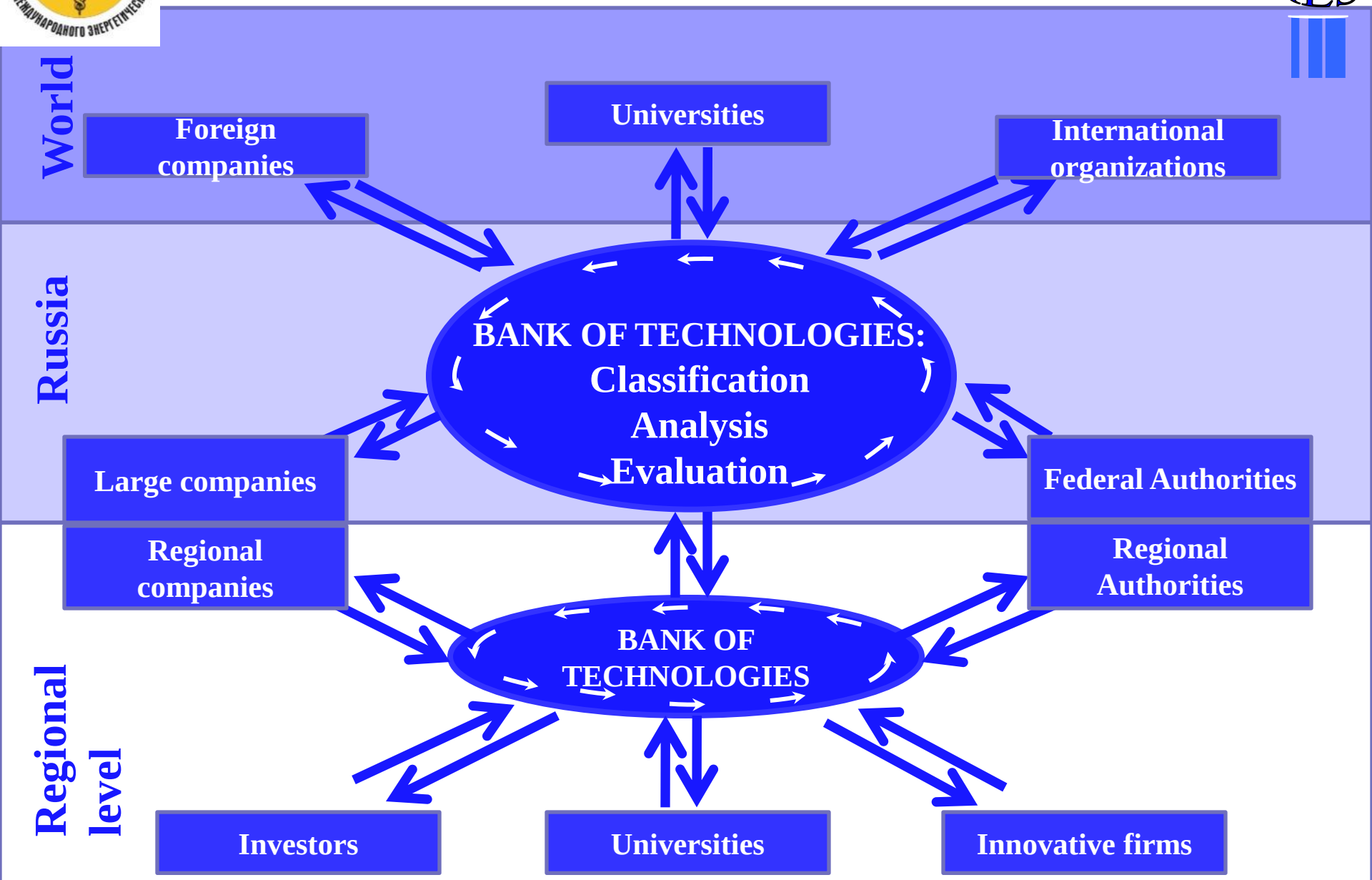
Footprint reduction

CHANGING TRENDS IN ULTRA-DEEP WATER

- Modular and Re-deployable Floating Hosts
  - modular and functional floating host
  - portfolio based EPS (expandable prod'n system)
- Subsea Production City
  - processor intensive & intelligent
  - robust, reliable and low cost
  - modular and standardized
  - Rigless completion and workover
- Quantitative Risk-based & Low Cost Flow Assurance
- Long Offset Oil and Gas Production & Transport
- Infrastructure Integrity & Life Assessment
- Drilling Automation

Sources: IES, Royal Dutch Shell PLC

NEW TOOL



Project of Institute of Energy Strategy, Russia

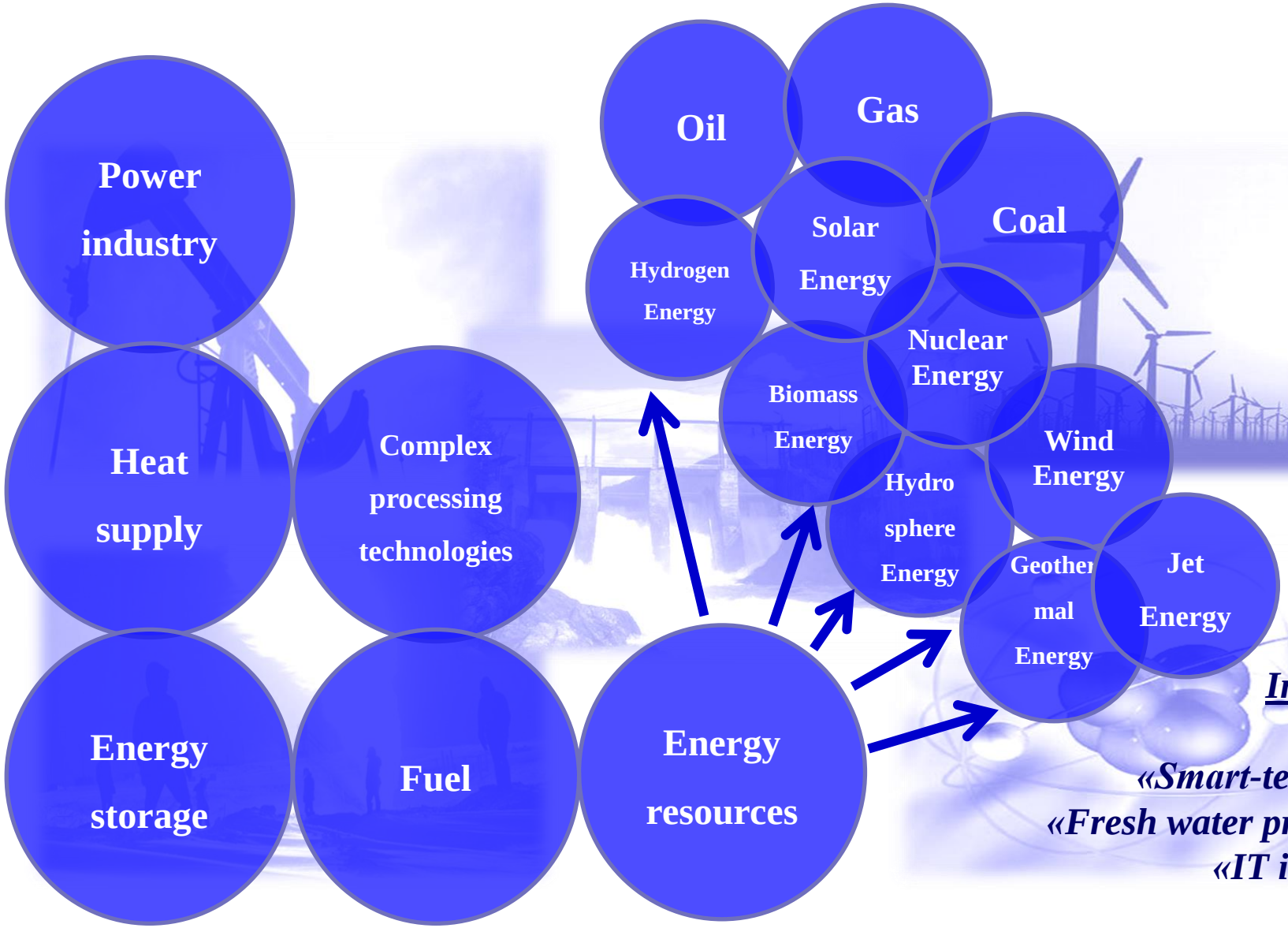
UNIQUE FEATURES

- Integrated inter-branch approach
- Structuring, the ability to embed in and analysis of any design or technology solution
- The possibility of effective integration of the project in the NIS
- The possibility of a competitive analysis of developments, identifying optimal solutions

The project allows to

- **Give complex evaluation of all technological features**
- **Identify appropriate technologies**
- **Create a regional, branch and corporate analogues using BET on the basis of a unified methodology taking into account their specific features**
- **Improve NIS' level of organization**
- **Move from introduction of specific technologies to management of technology systems**

MONITORING FIELDS



In addition:

«Smart-technology»
«Fresh water production»
«IT in Energy»
...

RISKS OF THE ARCTIC DEVELOPMENT

The destruction of unique natural environment

industrial and urban pollution of soil, air and water (for example - Norilsk), rapid depletion of biological resources, the invasion in established ecosystems

Transformation to a zone of geopolitical conflict

Extinction and assimilation of indigenous peoples, damage to the environment

Arctic is vulnerable and sensitive to human impact

PRIORITIES OF THE ARCTIC DEVELOPMENT

Integrated regional development
(transport communications, natural and environmental resources, human settlements)

Restoration and construction of cities in the North
the use of innovative approaches to Energy and Logistics, hight quality buildings and communications, the development of urban environment

Conservation and development of human resources,

reservation of the social and economic status of indigenous peoples

Arctic is an advanced research laboratory for environmental and climate security, resource efficiency, wasteless production

THANK YOU FOR YOUR ATTENTION!

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