



EUROPEAN
SPALLATION
SOURCE



Cremlin Connecting
Russian and European Measures
for Large-scale Research Infrastructures



NATIONAL
RESEARCH CENTER
«**KURCHATOV INSTITUTE**»



INNOVATIVE INFRASTRUCTURE OF NATIONAL RESEARCH CENTER “KURCHATOV INSTITUTE”

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projects and investment policy

NRC Kurchatov Institute

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Russian Federation



National Research Center «Kurchatov institute» is one of the leading research centers in the world and the largest interdisciplinary laboratory in Russia. A substantial part of Russian nuclear physics facilities has been consolidated in NRC «Kurchatov institute».



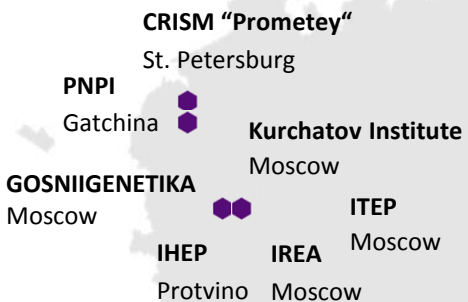
- Has a long glorious history of achievements in nuclear physics: first atomic reactor in Eurasia (1946), first nuclear power plant in the world (1954), first tokamak installation (1955) and etc.
- Taking major part in the compilation of state scientific and technical policies regarding to nuclear and atomic fields including nuclear medicine.

- Has an official status of the Leading Science Institute honored by the Government.
- Has the right to present Russian Federation in international scientific projects.
- Is the center of the breakthrough technologies development in the field of particle physics.

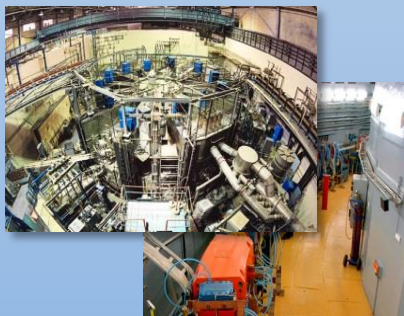


STRUCTURE OF NRC "KURCHATOV INSTITUTE"

NRC "Kurchatov institute" has congregated the research capacities, technological potential and human resources essential for the advancement in new branches of science and technology.



**Kurchatov Institute
(Moscow)**



**Institute for Theoretical and
Experimental Physics
(Moscow)**



**(Institute for Chemical
Reagents and High Purity
Chemical Substances (Moscow))**



**Institute for High Energy
Physics
(Protvino)**



**Petersburg Nuclear Physics
Institute
(Gatchina)**



**Central Research Institute
of Structural Materials
"Prometey" (St. Petersburg)**



**State Research Institute
of Genetics and Selection of
Industrial Microorganisms
(Moscow)**





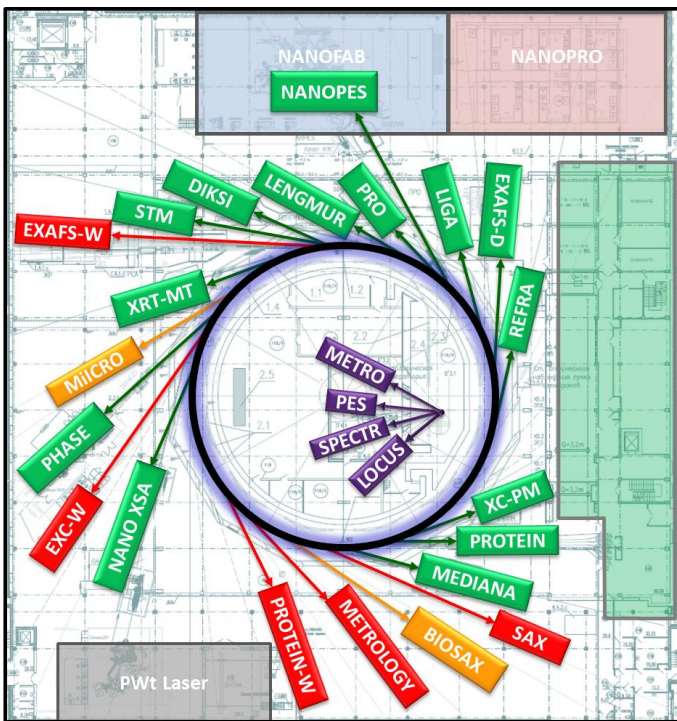
THE KURCHATOV SYNCHROTRON AND NEUTRON SOURCE

The Kurchatov Synchrotron-Neutron Research Complex is one of the few places in the world where a research reactor and a synchrotron are located on a single site.

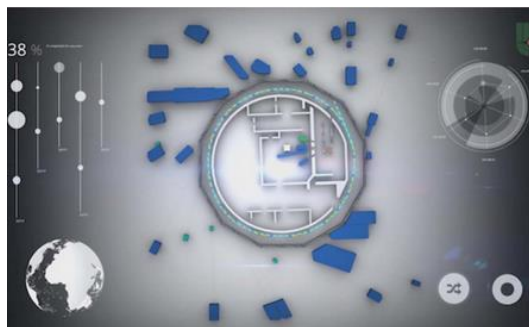


Accelerating-storage complex of the "Kurchatov Institute" is the only specialized synchrotron radiation source in the post-Soviet space.

Accelerating-storage complex is the specialized source of the synchrotron radiation of the Kurchatov Institute. It consists of the three accelerating units: linear electron accelerator (80 MeV), small storage ring (450 MeV) and large storage ring (2.5 GeV). The main source of the synchrotron radiation is the large storage ring.

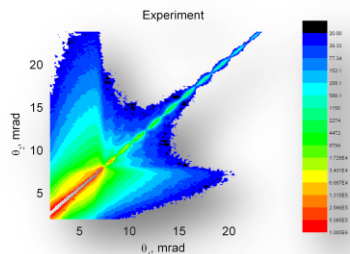


Kurchatov Synchrotron beamlines





Scattering & diffraction



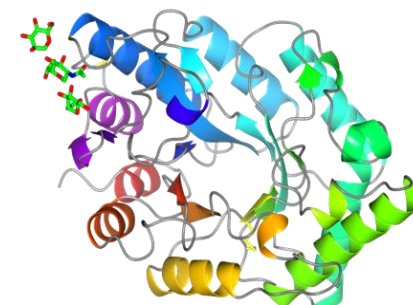
Reciprocal space map

Methods

- Powder diffraction
- XRD
- HR XRD
- GID
- Standing waves
- Reflectivity
- SAXS, WAXS

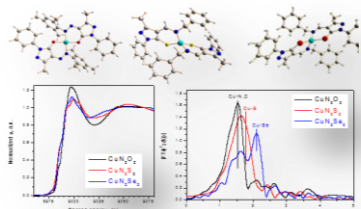
Beamlines

- «Phase»
- «XC-PM»
- «PRO»
- «XCA»
- «Protein»
- «Langmiur»
- «DiXci»



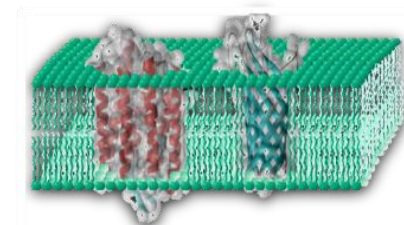
Bacterial xylanase

Spectroscopy

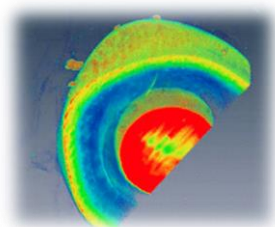


- EXAFS
- XANES
- Fluorescence
- PE-spectroscopy
- UV-spectroscopy

- «SMS»
- «EXAFS-D»
- «Refra»
- «nanoPES»
- «Locus»



Membrane model

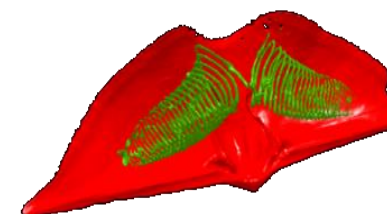


Fuel pellet

Visualization

- Imaging
- Topography
- Tomography

- «Mediana»
- «Liga»
- «XT-MT»



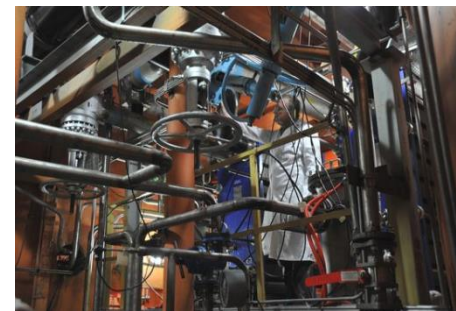
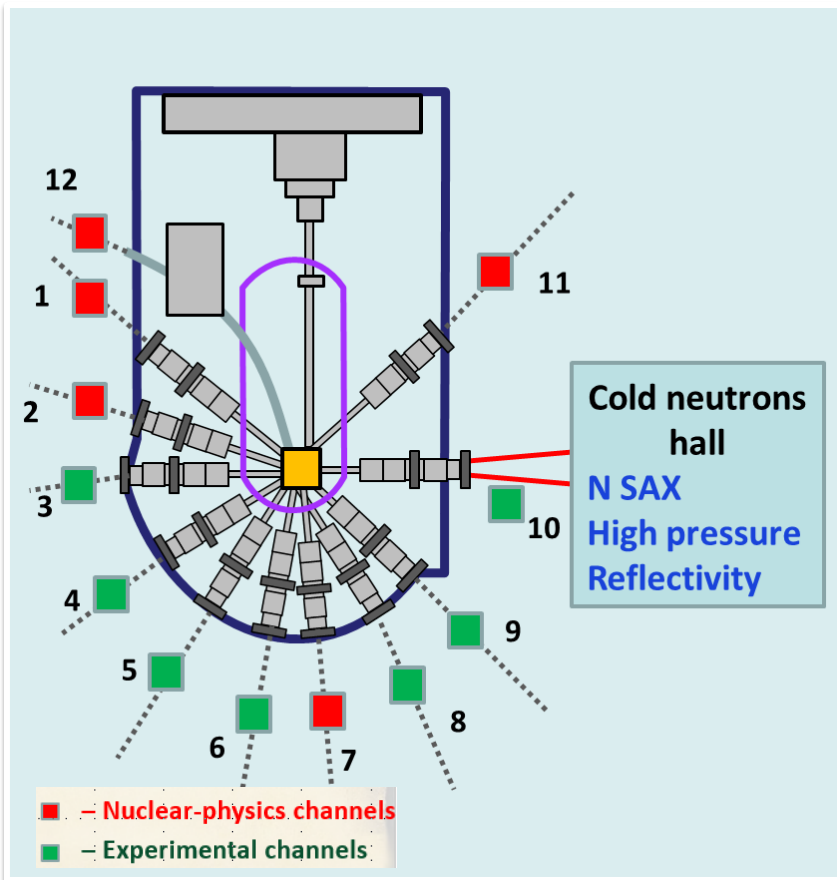
Brachiopod



NEUTRON REACTOR IR-8

The neutron research complex based on the Kurchatov Institute IR-8 reactor is designed for fundamental and applied research in nuclear physics, solid state physics, radiation materials science, nanosystems and nanostructures physics, radiobiology and biophysics.

The reactor has 12 horizontal experimental channels for the output of neutron beams and 29 different vertical channels.

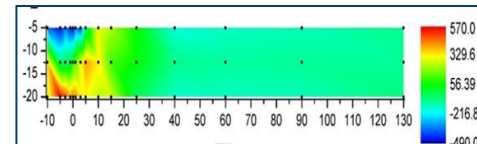




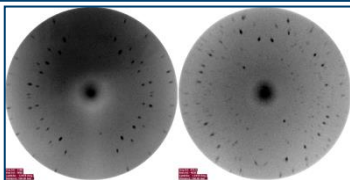
❖ CH3 STRASS



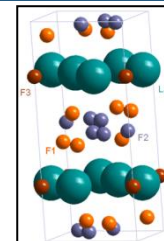
Neutron diffraction Internal stresses in volumetric materials and products: steels and alloys.



❖ CH4 MOND



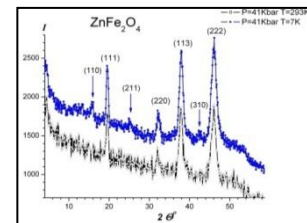
Neutron structural analysis of perspective materials from non-organic crystals to protein crystals.



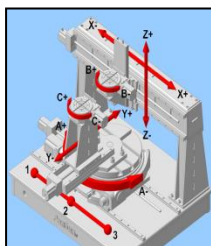
❖ CH6 DISK



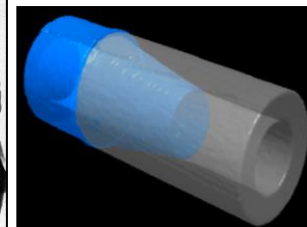
Powder neutron diffraction, phase analysis Structure of matter under extremely condition: high pressure and temperature, phase transitions.



❖ CH7 DRACON



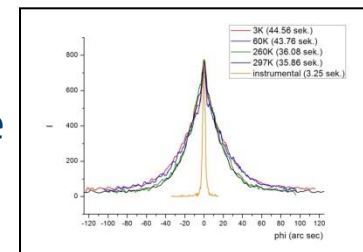
Neutron and gamma radiography and tomography. Internal microstructure of massive and volumetric objects. Cultural heritage.



❖ CH9 STOIK



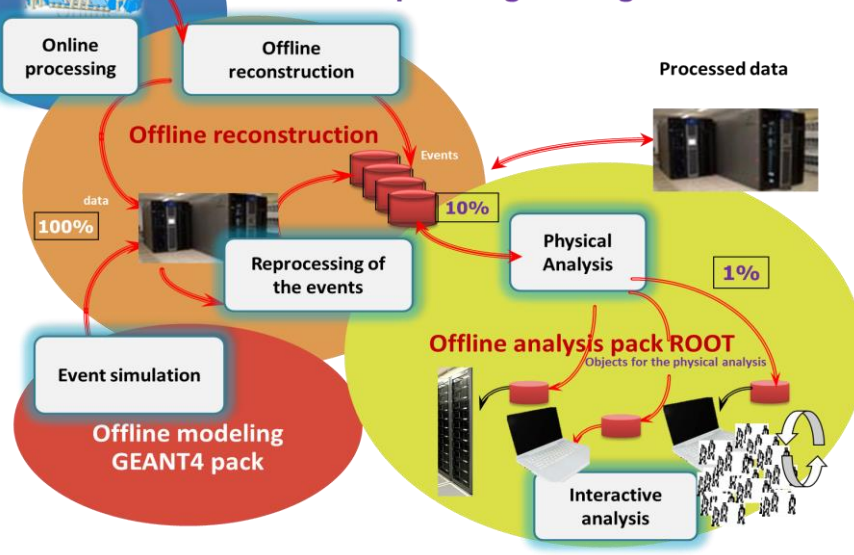
Ultra small angular neutron scattering Studying of inhomogeneities (50nm ÷ 20µm) with the help of refractive and small-angle contrast.





THE KURCHATOV DATA PROCESSING CENTER

Computing in mega-science

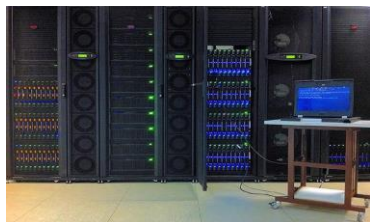
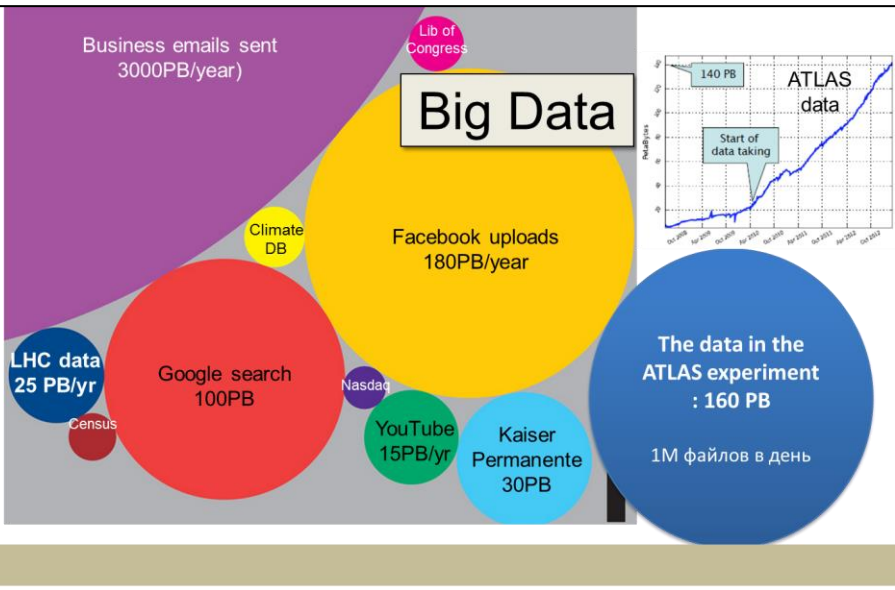


In the Kurchatov Data Center two main areas are developing:

- ❖ high-performance computing that provides the tasks of modeling processes at nuclear power plants and nuclear submarines and engineering calculations to create new materials based on nano- and biotechnologies. Today, the Kurchatov Institute operates clusters whose performance is close to 300 teraflops.

- ❖ High-throughput calculations based on GRID-technologies, aimed at processing and analyzing data from mega-installations. Today, **the Kurchatov Institute receives data (petabytes per year) from experiments performed at the Large Hadron Collider.** In the future it is planned to process the data from other international experiments - XFEL, FAIR, ITER.

In 2014, the Laboratory for Large Data Technologies was established to develop research areas related to mega-science experiments in the analysis, processing and management of extremely large volumes of scientific data.





Resource centers of NRC «Kurchatov institute» are an instrumental component of the innovative infrastructure of NRC “Kurchatov institute”, including equipment for a wide sphere of measurements and innovative research.

NANOPROBE
PROBE AND ELECTRON
MICROSCOPY

ELECTROPHYSICS
ELECTROPHYSICAL
METHODS

MOLBIOTECH
MOLECULAR AND CELL
BIOLOGY

OPTICS
OPTICAL MICROSCOPY AND
SPECTROSCOPY

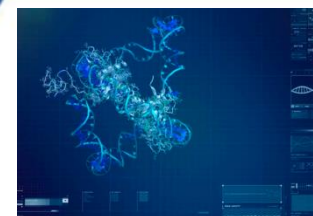
**INNOVATIVE
RESOURCE
CENTERS**

NEURON
NEUROCOGNITIVE
STUDIES

X RAY
LABORATORY X RAY
TECHNIQUES

COGNIMED
NUCLEAR PHYSICAL
METHODS

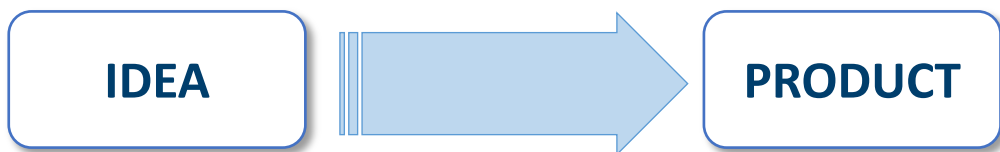
POLYMER
ORGANIC AND HYBRID
MATERIALS





The considerable part of NRC's innovative infrastructure is **TECHNOPARK "Kurchatov institute"**. It's a specialized innovative complex which provides high-technological projects with all conducive conditions for growth and development.

MISSION



MAIN GOALS

1. Formation and launching projects
2. Support in the scientific research, scientific guidance
3. Informational support
4. Attraction of financing
5. Search of final customers (including state corporations)

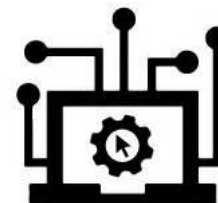
SCIENCE SPHERES



High-technological medicine
(nuclear medicine)



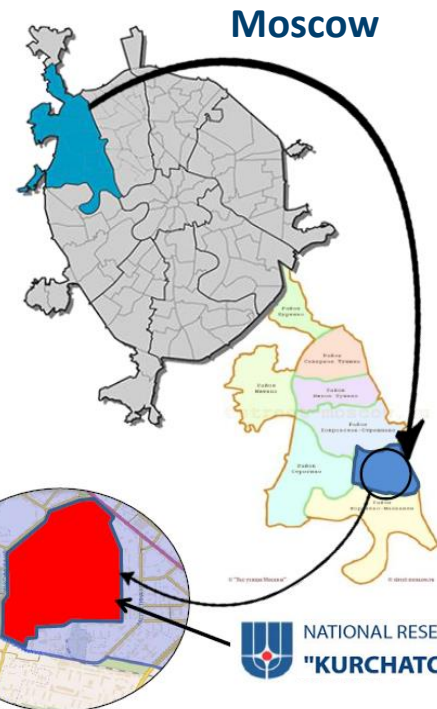
Technologies of energy efficiency



IT-technologies



RESIDENTS PLACEMENT



Moscow

NATIONAL RESEARCH CENTER
"KURCHATOV INSTITUTE"

R&D centers, places for residents inside the perimeter

Industrial zone, places for residents (including foreign companies) outside the perimeter



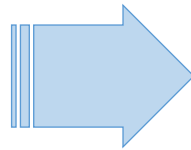
INNOVATIVE INFRASTRUCTURE OF NRC "KURCHATOV INSTITUTE"

INDUSTRIAL PARK NIITFA

SCIENCE

- The synchrotron
- Neutron reactor IR-8
- The data processing center
- Resource centers

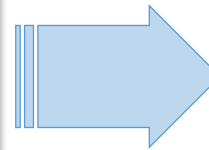
Research and
development



TECHNOPARK

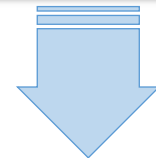
Commercialization,
projects'
development

Technological
projects on
early stages



RESEARCH INSTITUTE OF TECHNICAL PHYSICS AND AUTOMATIZATION

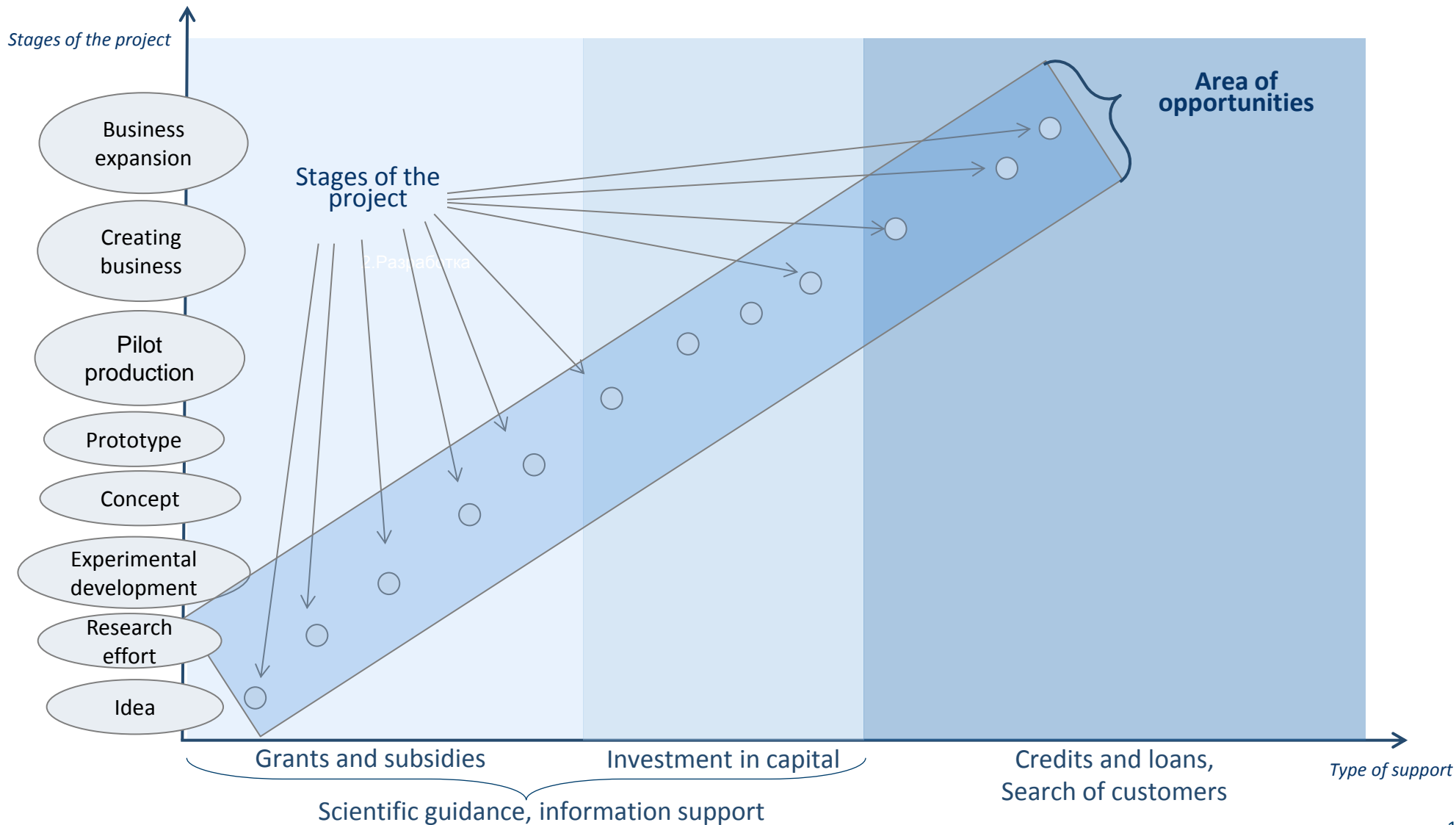
Business scaling,
large-scale production



MARKET



Innovative infrastructure of NRC "Kurchatov institute" provides projects with all necessary technological, informative and financial support from the "idea" stage to the "production" stage.





SYNERGY AND MULTIPLICATIVE EFFECTS

NRC "KURCHATOV INSTITUTE"

- Rise of the internal competitions
- Implementation of technologies in industrial spheres
- Development of the innovative infrastructure
- Royalty
- Rental payments

RESIDENTS OF THE TECHNOPARK

- Access to unique technological infrastructure
- Cooperation with science centers
- Subsidies, investment, soft loans
- Tax credits
- Government/city orders
- Off-take contracts
- Informational support

INDUSTRIAL PARK NIITFA

- ROSATOM business diversification
- Point of the industrial growth
- Development of the infrastructure
- Rental payments

MOSCOW GOVERNMENT

- Attraction of investments
- High-qualified workplaces
- Taxes
- New high-technological products
- Access to the research services of NRC innovative infrastructure



1st EXAMPLE OF THE SUCCESSFUL PROJECT

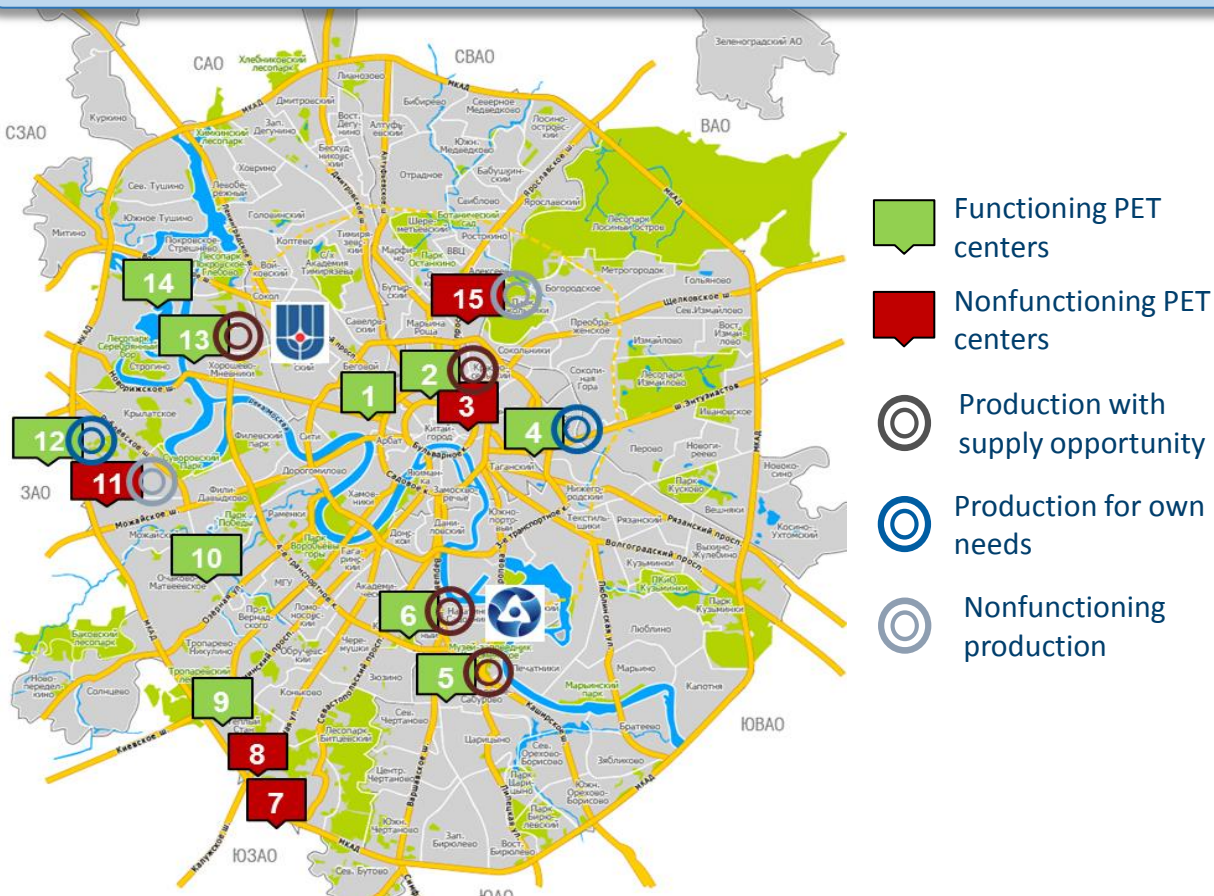
Center of Development of Nuclear Medicine is the NRC spinoff project which manufactures and sells short-lived PET radiopharmaceuticals (RPs) and provides PET diagnostic services in Moscow.

Description

CDNM business:

- Manufacturing of short-lived PET RPs (FDG, NaF*, F-choline*, FES*, FET*) with NRC "Kurchatov institute" technology in accordance with GMP
- Operating a PET diagnostic facility in Kurchatov Institute
- Integration in Moscow region medical infrastructure
- Providing PET scanner services in Moscow with short-lived RPs

PET centers location in Moscow



CDNM not only provides a PET-imaging service but also runs a radiopharmaceuticals manufacturing center in accordance with GMP



Center of Development of Nuclear Medicine: 4 PET diagnostic facilities and 1 RP manufacturing site in Moscow.

1. PET facility at Kurchatov Institute:
 - ✓ Medical Center
 - PET-CT camera
 - MRI
 - ✓ Full production and quality control of products for PET-diagnostics according to GMP:
 - Cyclotron (11 MeV)
 - RP synthesis unit
 - RP quality control unit
2. PET facility of «Medicina» JSC:
 - 2 PET-CT cameras
3. PET facility at P. Herzen Moscow oncology research institute*:
 - PET-CT camera
4. PET facility at Central hospital of Russian Academy of Science*:
 - PET-CT camera



MRI Magnetom Verio (Siemens)



PET-CT BIOGRAPH mCT (Siemens)



Protective cabinets with automatic synthesis module FastLab (GE)

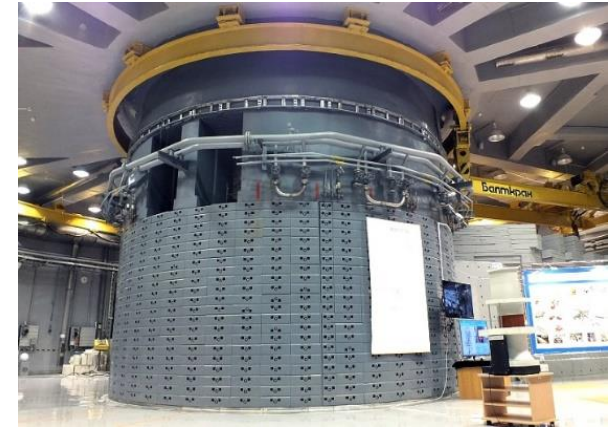
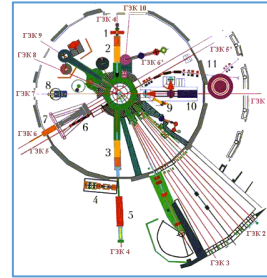
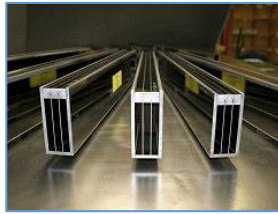
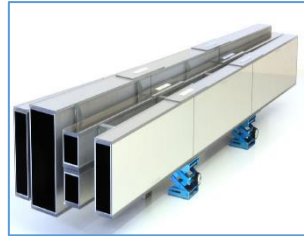
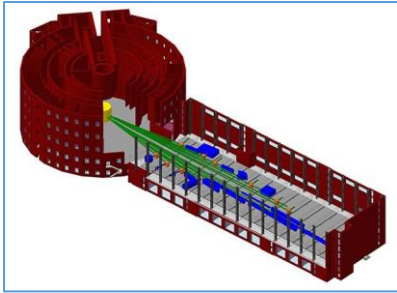


Cyclotron for the production of medical isotopes Eclipse HP

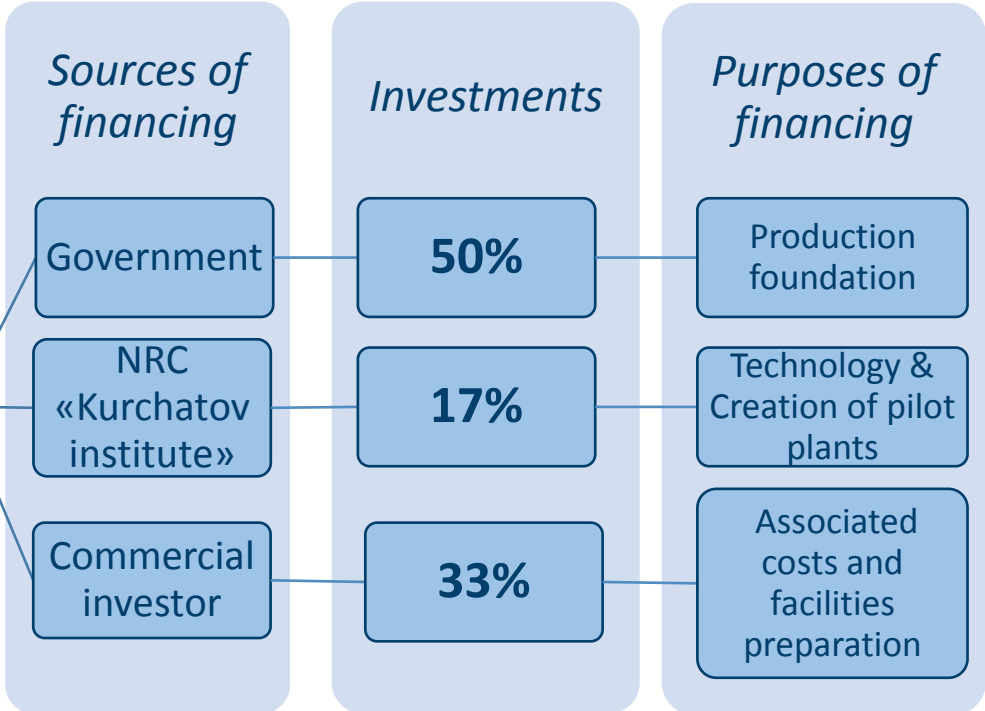


2nd EXAMPLE OF THE SUCCESSFUL PROJECT

Production of nanostructured coatings of neutron-optical components by precision methods for **NEUTRON TRACK SYSTEM** for the construction of **PIK Reactor (Mega Science Project)**



Attracted financing in terms of **Public-private partnership**



The high flux research reactor **PIK at the NRC «Kurchatov institute» - Petersburg Institute of Nuclear Physics** is a continuous flow type reactor and is intended for research in the field of condensed matter physics, nuclear physics and the physics of weak interactions, structural and radiation biology and biophysics, radiation physics and chemistry. By its parameters PIK reactor will be one of the best research reactors in the world.



NATIONAL RESEARCH CENTER
"KURCHATOV INSTITUTE"

THANK YOU FOR YOUR ATTENTION