Role of the MBIR Project in achieving SDGs

Consortium Leader of MBIR Reactor International Research Centre, Limited Liability Company

Artem Goncharuk
Head of the International Cooperation Department

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About the Project

**MBIR** — the most high-flux fast neutron research reactor in the world under construction in Dimitrovgrad, Russia

**Milestones**

- **2023** installation of the reactor vessel in the design position
- **2025** turbine unit final assembly
- **2027** first criticality
- **2028** power start-up & commissioning
IRC MBIR Mission and Goals

MISSION

• Creation of an international scientific platform, which will be able to meet topical challenges in the field of innovative nuclear technologies

• Providing the complete cycle of high-tech services: pre-irradiation, in-pile and post-irradiation research of materials and elements

Functioning of the International Research Center MBIR goes in line with the UN Sustainable Development Goals

GOALS

To create a worldwide center of competence for fast-neutron reactors research

To conduct fundamental and applied studies

To launch international scientific research programs

To study technologies of the Generation IV nuclear reactors

To establish the synergy of schools of science and technologies from all over the world

To launch educational programs

To provide remote access to the experimental studies databank

To study new technologies of nuclear waste management and closed nuclear fuel cycle operation

To validate the safety of the operation of nuclear facilities
MBIR contribution to SDGs

3 Good Health and Well-being
4 Quality Education
7 Affordable and Clean Energy
8 Decent Work and Economic Growth
13 Climate Action
11 Sustainable Cities and Communities
17 Partnerships for the Goals
SDG # 3
GOOD HEALTH
AND WELL-BEING
Experimental capabilities

CNFC technologies
Minor actinide burning, fuel reprocessing

Structural materials
Testing of dispersion-hardened materials, ferritic-martensitic and austenitic steels

Isotope production
Mo-99; Co-60; Gd-153; Sr-85,89; I-125,131; Xe-127

Basic and applied research
Including ultracold neutrons

Non-energy applications
Nuclear medicine, radiation technologies

Fuel testing
Different ceramic compositions, metal fuel

Mo-99; Co-60; Gd-153; Sr-85,89; I-125,131; Xe-127
### Non-energy applications

#### Medicine and isotope research at MBIR

<table>
<thead>
<tr>
<th>R&amp;D</th>
<th>Time frame</th>
<th>Purpose of work</th>
<th>Expected result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental research to test the neutron therapy technologies</td>
<td>2033 ÷ 2040</td>
<td>Experimental research and development of the neutron therapy technologies</td>
<td>New neutron therapy technologies and practical use of neutron fluxes for medical purposes</td>
</tr>
<tr>
<td>Testing of trap-type irradiation equipment for the production of different isotopes with low neutron capture cross-sections</td>
<td>2033 ÷ 2040</td>
<td>Development of technologies for the production of radionuclides with low neutron capture cross-sections</td>
<td>Production of radionuclides with low neutron capture cross-sections</td>
</tr>
<tr>
<td>Technological advancement and production of Co-60, Gd-153, Sr-89, Ni-63 in the MBIR side blanket</td>
<td>2033 ÷ 2040</td>
<td>Experimental research and development of technologies for the production of radioisotopes Co-60, Gd-153, Sr-89, Ni-63</td>
<td>Preparation of license agreements for the technologies. Production of radioisotopes Co-60, Gd-153, Sr-89, Ni-63 and based radiation sources</td>
</tr>
</tbody>
</table>
Contribution to SDGs

SDGs # 4 & 17
QUALITY EDUCATION
PARTNERSHIP FOR THE GOALS
IRC MBIR management structure

IRC MBIR Council (Principal Members)
- Strategic management
- Budget approval
- Research program approval

Advisory Board
- Joint research program preparation
- Coordination of the multilateral programs
- 5 Scientific Committees
- 13 members from 15 organizations

Management Committee
- Budgeting and planning
- Control of the compliance with the Consortium rules
- Audit and control

Consortium Leader
- Financing
- Consortium operational management
- Administrative and reporting functions
- Reactor rights allocation

RIAR (reactor operator)
- Consortium R&D management
- Administrative management
- Operation support

Joint research program preparation
Coordination of the multilateral programs
5 Scientific Committees

RIAR (reactor operator)
Advisory Board as a platform for international scientific cooperation

**CHAIRMAN**

Stepan Kalmykov  
Vice-president of the Russian Academy of Science (RAS), academician, scientific director of the Faculty of Chemistry of the LMSU, Doctor of Chemical Science, chairman of the Shenzhen MSU-BIT University's Board of Directors

**DEPUTY CHAIRMAN**

Alexander Tuzov  
First Deputy General Director for technology production and development at JSC “Science and Innovations”  
Director of JSC “SSC RIAR”

**MEMBERS**

- CHINA  
- INDIA  
- RUSSIA  
- FRANCE  
- UZBEKISTAN  
- BELARUS  
- SOUTH KOREA  
- KAZAKHSTAN  
- VIETNAM  
- ARMENIA  
- ALGERIA  
- JINR  
- AFCONE

**FUNCTIONS**

- Consolidation and prioritization of the participants’ scientific proposals and applications  
- Coordination of the multilateral programs  
- Joint research program preparation

July 12-13, 2022, RIAR, Dimitrovgrad, Russia – First meeting of the Advisory Board Committee. Participants: **56 expert from 13 foreign and international organizations**

September 2023, Saint Peterburg – Second meeting of the Advisory Board Committee
Advisory Board Committees

CODE VALIDATION
- Process simulation
- Transition and emergency modes
- Calculation codes

Chairman: Mosunova N.
IBRAE RAS

SAFE USE OF NUCLEAR TECHNOLOGIES
- Justification of reliability and operability

Chairman: Strizhov V.
IBRAE RAS

NFC CLOSING
- Minor actinides burning
- Multiple reuse
- SNF and RAW reprocessing

Chairman: Petrov V.
LMSU

MATERIALS AND FUEL RESEARCH
- MOX, Metal, CER-MET, UAl, Nitride, Thorium, UN, UC, UMo, CER-CER

Chairman: Karpyuk L.
VNIINM, JSC

NON-POWER APPLICATIONS OF NUCLEAR TECHNOLOGIES
- Nuclear medicine and isotope production
- Nuclear education
- Radiation technologies
- Nuclear unit engineering

Chairman: Bespala E.
TPU
Activities of the Committee on non-power applications

16 December 2022, Tomsk, Russia
First meeting of the Committee on non-power applications of nuclear technologies

Participants: 24 experts
Representatives of 6 foreign and international organizations

26 May 2023, Tashkent, Uzbekistan
Second meeting of the Committee on non-power applications of nuclear technologies

Participants: 40 experts
Representatives of 10 foreign and international organizations

Autumn 2023, Dubna, Russia
Third meeting of the Committee on non-power applications of nuclear technologies

Event scheduled
Specific time frame and the meeting agenda is being developed
Contribution to SDGs

SDGs # 7 & 13
AFFORDABLE AND CLEAN ENERGY
CLIMATE ACTION
Reactor layout and key parameters

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal power, MWe</td>
<td>150</td>
</tr>
<tr>
<td>Electric power, MWe</td>
<td>55</td>
</tr>
<tr>
<td>Max / average neutron flux density in the core, n*cm^{-2}s^{-1}</td>
<td>5.3 x 10^{15} / 3.1 x 10^{15}</td>
</tr>
<tr>
<td>Fuel</td>
<td>MOX</td>
</tr>
<tr>
<td>Reactor fuel campaign, no less than, days</td>
<td>100</td>
</tr>
<tr>
<td>Reactor configuration</td>
<td>Loop-type</td>
</tr>
<tr>
<td>Number of loops for heat transfer</td>
<td>2</td>
</tr>
<tr>
<td>Number of heat removal circuits</td>
<td>3</td>
</tr>
<tr>
<td>Coolant Flow</td>
<td>Bottom – up</td>
</tr>
<tr>
<td>Coolant: I and II circuits / III circuit</td>
<td>Sodium / Water</td>
</tr>
<tr>
<td>Pressure in the I circuit, MPa</td>
<td>Up to 0.6</td>
</tr>
<tr>
<td>Coolant temperature of the I circuit, °C</td>
<td>330-512</td>
</tr>
<tr>
<td>Capacity utilization coefficient</td>
<td>0.65</td>
</tr>
<tr>
<td>Designed lifetime, years</td>
<td>50</td>
</tr>
<tr>
<td>Commissioning, year</td>
<td>2028</td>
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</table>

As per the Technical assignment, MBIR is planned as both research and electricity generating unit that will provide Ulyanovsk region with clean sustainable energy.
Contribution to SDGs

SDGs # 8 & 11
DECENT WORK AND ECONOMIC GROWTH
SUSTAINABLE CITIES AND COMMUNITIES
Expected contribution to the region development

Dimitrovgrad is the Russian city in the Ulyanovsk region located **almost 1000 km away** from the Russian capital.

- **INTERNATIONAL RESEARCH CENTRE**
- **HOTEL**
- **SOCIAL AND SPORTS FACILITIES**

Currently, more than **1400** people are involved in the construction process.
Thank you for your attention!

Artem Goncharuk
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August 2023