

Development of the Engineering Infrastructure

The engineering infrastructure of JINR includes a supply system of energy resources like electricity, heat, cold and hot water, liquid nitrogen; cooling and sewage systems, communication and telecommunication systems and safety system.

1. Supply of energy resources

Electricity

The main issue in the development of the JINR power supply system for the next seven years is the reconstruction of GPP-1 and GPP-2 with a capacity of 28 MW. The terms of reconstruction of GPP-1 and GPP-2 are 2021 and 2023 respectively.

The reconstruction of GPP-2 consists in launching the 3rd and 4th transformers, which will allow sorting out the basic JINR facilities into separate groups: IBR-2, U400, U400M, Phasotron, local network and computing clusters. This will considerably decrease the risk of hazardous failure of these facilities due to general city problems.

The reconstruction of GPP-1 within the 3rd transformer will increase the JINR power supply and provide trouble-free operation of the FLNR and VBLHEP laboratories, including the NICA project.

To obtain additional 4 MW power supply from the Moscow Canal in order to increase the reliability of the system, one needs to reconstruct the 3rd and 4th feeders connected to GPP-2, which is financed from Russian tax service funds.

The provision of stand-by electric supplies is also very important. It will be implemented by installing autonomous generators on the sites that are vitally important to the Institute. It is crucial to the telephone station, JINR's safety system, water and sewage systems.

Heat

Working plans for 2017–2023:

- to automate the Eastern heat station;
- to reconstruct and replace the city heat networks;
- to reconstruct and replace the JINR heat networks;
- to replace the outdated commercial accounting blocks at the Central and Eastern heat stations (2017);
- to install modern equipment to organize heat accounting system on the main heat networks and large objects, with automate processing data at the united control station;
- to adjust the heat networks in JINR and the city.

Water and sewage

The main problem of these systems is the networks wear, namely water network, which has been in use for more than 50 years and is outdated. It needs planned replacement with modern technological tubes.

Working plans to provide better conditions for water supply:

- to automate the potable water production at the pump-filter station;
- to install a water accounting system at the pump-filter station;
- to reconstruct and replace the JINR and city water networks.

2. Communication and telecommunication means

Telephone communications

Reconstruction of the JINR digital telephone station is near completion. It has 5600 subscribers with a possibility of increasing capacity at VBLHEP up to 1200 subscribers and more for NICA project needs.

For the reliability of the system, one needs to reconstruct and replace the fiber-optic line channels and local cable network at JINR and city, going to a high-level provider.

Local area emergency alarm system

The JINR local area emergency alarm system should provide alarm signals and information to the leaders and object staff, local population residing within the system local area, and other emergency services and organizations in a 5 km area of nuclear- and radiation-hazardous objects. JINR's modern local area emergency alarm system interconnected with the city's alarm systems is planned to be in use in 2023.

Modern control systems

It is planned to build a unified JINR CCTV system and to develop the present system of automated processing of data of energy resources at the unified control station, which already includes more than 500 accounting blocks.

3. Safety

Labor protection, industrial safety, management of natural resources

To address the tasks in labor protection and industrial safety within the development of the JINR engineering infrastructure in accordance with the federal laws, standards and regulations, the following is planned:

- special assessment of working places for labor conditions;
- replacement on scheduled basis of outdated equipment;
- modernization of the Industrial-Sanitary Laboratory equipment;
- improvement of informational and technical support of staff;
- reviews of performance and professional development of JINR leaders and specialists/

Radiation and nuclear safety

JINR's efficient policy is aimed at minimizing the radiation effect on humans and the environment and comprises provision of increased safety of the operating and planned nuclear physics facilities and provision of safety in handling nuclear materials and radioactive substances.

Working plans of the Radiation Safety Department for 2017–2023:

- to further develop the existing system of the individual dosimetry control at the JINR nuclear physics facilities, its adaptation to the real irradiation fields with corresponding correction coefficients;
- to upgrade the existing radiation control systems of the operating facilities, to elaborate new systems on the planned radiation-hazardous sites of JINR; to develop a high-energy neutron control system; to replace obsolete equipment;
- to transmit for recycle the outdated radioactive substances to prevent their accumulation;
- to supply radiation control metrological devices by own and third-party centres;

- to obtain accreditation for the metrological services and radiation control laboratory;
- to obtain permission of the Rostekhnadzor (Russian Technical Supervisory Authority) for the atmospheric discharge of radioactive substances.

Working plans of the Radioactive Substances and Nuclear Materials Department for 2017–2023:

- to purchase the necessary materials and equipment;
- to prolong the usage of nuclear materials and radioactive substances storage;
- to develop an automatic system of radiation control for the JINR central storage;
- to provide licensing and metrology for nuclear materials and radioactive substances accounting and control;
- to adjust the accounting and control system including computer data base;
- to continuously improve the knowledge by the leaders and staff of the accounting and control system in accordance with standards and regulations;
- to set up a control and methodology group for radiation control, measurements and documentation improvement.

Within the framework of the current seven-year period, it is planned to create the JINR Emergency Technical Center in 2022.

Fire security

It is planned to conduct a stage-by-stage upgrade of the operating systems of automatic fire alarm and fire-fighting, as well as to launch new modern systems involving in the process the specialists from the JINR station of automatic firefighting equipment. For costs optimizations, one should develop a complex of modern systems, which will unify the functions of fire alarm systems and object safety systems. In 2017, the target program “Ensuring fire safety at JINR for 2017–2023” was approved, within the framework of which specialized systems and equipment are being modernized.

The regular checks show the inconsistency of the JINR objects to actual fire security laws, standards and regulations. According to the proposed system approach of JINR accreditations within all licensing fire protection works, it is planned to improve and maintain the proper level of the fire security on the Institute's sites.

Financing schedule (k\$)

| Budget items | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Engineering support and labor safety (infrastructure) | 26.0 | 29.5 | 36.5 | 31.9 | 44.2 | 45.6 | 49.5 | 263.2 |
| conducting a special assessment of working conditions | 1.2 | 0.6 | 3.4 | 3.1 | 1.0 | 1.1 | 1.2 | 11.6 |
| - <i>infrastructure</i> | 0.0 | 0.1 | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 | 0.9 |
| - <i>laboratory budget</i> * | 1.2 | 0.5 | 3.2 | 2.8 | 0.9 | 1.0 | 1.1 | 10.7 |
| Industrial Safety | 12.0 | 14.8 | 15.2 | 16.3 | 18.4 | 19.5 | 20.4 | 116.6 |
| - <i>infrastructure</i> | 1.5 | 1.2 | 4.5 | 1.3 | 1.3 | 1.5 | 2.0 | 13.3 |
| - <i>laboratory budget</i> * | 10.5 | 13.6 | 10.7 | 15.0 | 17.1 | 18.0 | 18.4 | 103.3 |
| Overhaul and maintenance of buildings, structures, equipment | 7.9 | 3.8 | 6.0 | 11.1 | 51.0 | 15.5 | 15.6 | 110.9 |
| repair of buildings and structures | 2.1 | 2.2 | 2.3 | 2.5 | 2.7 | 2.8 | 2.9 | 17.5 |
| modernization of automatic telephone exchange-6 | 0.5 | 0.3 | 0.5 | 0.2 | 0.3 | 0.3 | 0.3 | 2.4 |

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|--|-------------|-------------|-------------|--------------|--------------|--------------|--------------|----------------|
| replacement of low-current cable lines | 1.3 | 1.3 | 3.2 | 8.4 | 18.0 | 2.5 | 2.5 | 37.2 |
| replacement of main water supply networks of DLNP | 1.6 | 3.3 | 6.0 | 1.6 | 10.0 | 5.2 | 5.2 | 32.9 |
| - <i>infrastructure</i> | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 5.2 | 5.2 | 20.4 |
| - <i>laboratory budget</i> * | 1.6 | 3.3 | 6.0 | 1.6 | 0.0 | 0.0 | 0.0 | 12.5 |
| replacement of main heating networks of DLNP | 1.9 | 7.2 | 1.4 | 9.3 | 20.0 | 4.7 | 4.7 | 49.2 |
| - <i>infrastructure</i> | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 | 4.7 | 4.7 | 29.4 |
| - <i>laboratory budget</i> * | 1.9 | 7.2 | 1.4 | 9.3 | 0.0 | 0.0 | 0.0 | 19.8 |
| replacement of street lighting DLNP | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 |
| Construction of buildings and technological systems | 0.0 | 12.2 | 41.9 | 137.2 | 544.9 | 326.9 | 358.3 | 1 421.4 |
| dispatching and video surveillance system | 3.0 | 0.5 | 0.7 | 2.3 | 1.5 | 2.0 | 2.0 | 12.0 |
| - <i>infrastructure</i> | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| - <i>laboratory budget</i> * | 3.0 | 0.5 | 0.7 | 2.3 | 1.5 | 2.0 | 2.0 | 12.0 |
| reconstruction of the GPP | 0.0 | 12.2 | 24.8 | 88.5 | 467.0 | 302.0 | 358.0 | 1 252.5 |
| local warning system | 0.0 | 0.0 | 0.0 | 4.0 | 1.7 | 0.3 | 0.3 | 6.3 |
| JINR emergency technical center | 0.0 | 0.0 | 9.9 | 26.6 | 40.0 | 15.6 | 0.0 | 92.1 |
| JINR geosystem | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 9.0 | 0.0 | 16.0 |
| building 133 (modernization of the ORDV storage facility and the ITSO complex) | 0.0 | 0.0 | 7.2 | 18.1 | 12.0 | 0.0 | 0.0 | 37.3 |
| reconstruction of highly hazardous facilities and documentation to extend the life of nuclear facilities | 0.0 | 0.0 | 23.4 | 21.0 | 33.6 | 0.0 | 0.0 | 78.0 |
| - <i>infrastructure</i> | 0.0 | 0.0 | 0.0 | 0.0 | 5.2 | 0.0 | 0.0 | 5.2 |
| - <i>laboratory budget</i> * | 0.0 | 0.0 | 23.4 | 21.0 | 28.4 | 0.0 | 0.0 | 72.8 |
| pumping and filtering station of the second stage of construction | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 0.0 | 0.0 | 12.0 |
| Total ** | 33.9 | 45.5 | 84.4 | 180.2 | 640.1 | 388.0 | 423.4 | 1 795.5 |
| * funded from laboratory budgets | 18.2 | 25.1 | 45.4 | 52.0 | 47.9 | 21.0 | 21.5 | 231.1 |
| ** funded from the JINR infrastructure | | | | | GPP-2 | 302.0 | 358.0 | 660.0 |