

## Profile LFR-62

SGI

RUSSIA

### General information

NAME OF THE FACILITY	Facility "SGI" for studies of thermohydraulic characteristics of atomic power plants.
ACRONYM	SGI
Coolant technology	Water
LOCATION (address)	FSUE "State Scientific Centre of the Russian Federation – Institute for Physics and Power Engineering named after A.I. Leypunsky", State Corporation "Rosatom", Russian Federation
OPERATOR	State Corporation "Rosatom"
CONTACT PERSON (name, address, institute, function, telephone, email):	Mikheev Aleksandr Sergeevich Bondarenko Sq. 1, Obninsk, Kaluga Region, 249033, Russia Head of Laboratory, phone number: +7 484 39 9-84-39, mikheyev@ippe.ru.
STATUS OF THE FACILITY	In operation.
START OF OPERATION (date):	1971. In 1996 SGI facility was registered in the State Register of Measuring Instruments and approved for use in the Russian Federation.

### MAIN RESEARCH FIELD(S)

- Zero power facility for V&V and licensing purposes
- Design basis accidents and beyond the design basis accidents
- Thermohydraulics
- Coolant technology
- Materials
- Systems and equipment
- Scientific instruments

### TECHNICAL DESCRIPTION

#### Description of the facility

The test facility "SGI" is purposed for hydraulic investigations of flowing parts of reactors equipment including design of reactor and heat exchange equipment of NPP in isothermal conditions. The gauge length allows to obtain necessary data on velocity and pressure fields for verification of computer codes.

Facility "SGI" is designed for studies in isothermal conditions of hydraulic characteristics of nuclear reactor models' flow parts, heat-exchange equipment, and other equipment of atomic power plants in order to get the necessary pressure fields and flow rates for design optimization.

The primary equipment of the SGI facility includes: three pumps with engines powered by frequency converters, flow meters of flow meter manifolds, pipeline system with isolation and control valves, pressure and dump tanks, two measuring tanks with a flow switch, four coolers, two heaters, three distillers, and control and instrumentation devices.

The facility has two closed circulation loops. All the assembly units are made from X18H10T stainless steel.

When the facility is in operation, the selected pump takes in water from the 10 m<sup>3</sup> dump tank and feeds it into the cold or hot loop, after which the water passes through the flow meter manifold, the test model, and is discharged back into the dump tank. The facility makes it possible to perform measurements at constant head and flow rate up to 10 m<sup>3</sup>/h using a 7 m<sup>3</sup> pressure tank located at the elevation of 10.8 m. The flow rate can be measured both by flow meters and using the volume-time method. For this purpose, there are two 0.8 m<sup>3</sup> measuring tanks with a flow switch. The flow switch is designed to feed water either to the measuring tanks, or to the dump tank. The changeover time is 25 ms.

Circuit pipelines are manufactured from 1X18H9T steel with the following diameters: Ø106×3; Ø150×3.

The distillers are used for periodic water makeup into the loop.

The measurements are performed using the standard hydrometric methods.

Recording of gage readings is carried out using an automated system of data acquisition and processing and is followed by on-line analysis of the data obtained.

### Acceptance of radioactive materials

No.

### Scheme/Diagram

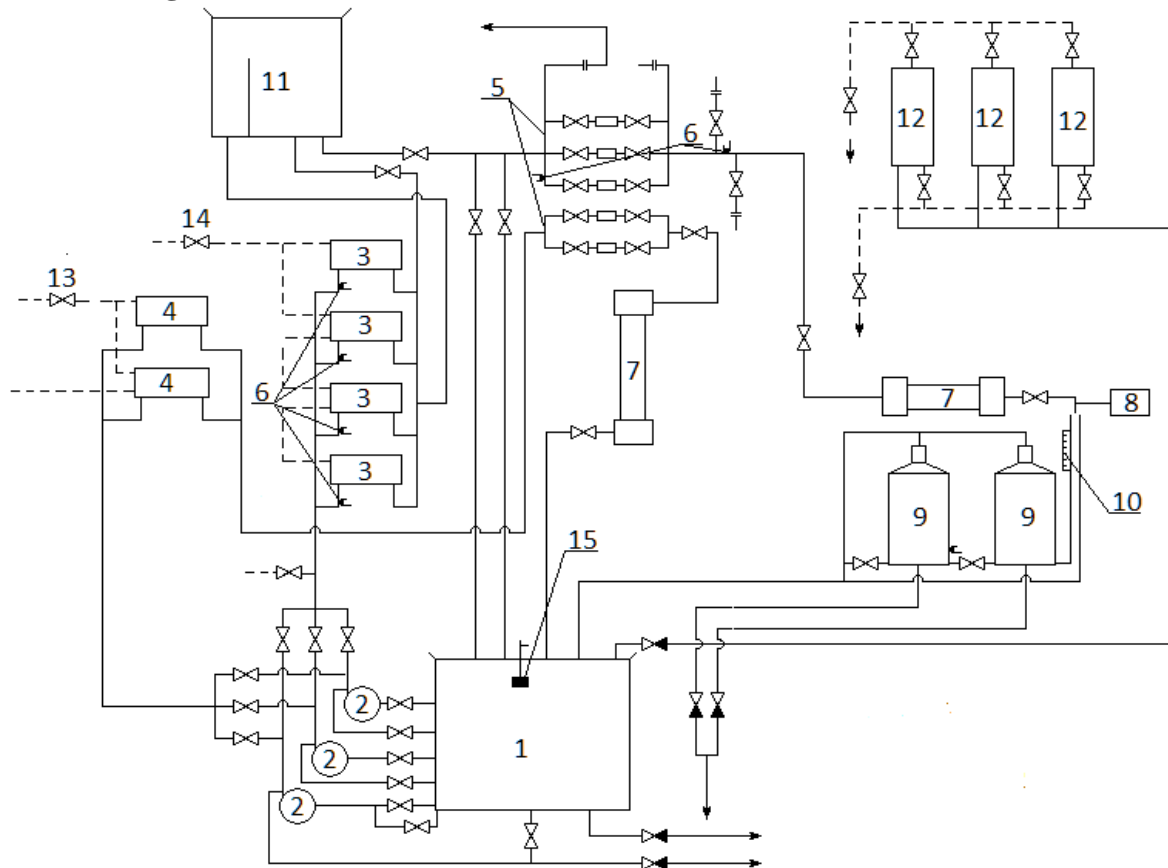


FIG. 1. Technological scheme of the water hydraulic facility "SGI":

1 – dump tanks, 2 – pumps, 3 – coolers, 4 – heaters, 5 – flow meter manifolds, 6 – resistance temperature detector, 7 – working sections, 8 – changeover device, 9 – measuring tanks, 10 – measuring tanks scale, 11 – pressure tank, 12 – distillers, 13 – hot water valve, 14 – cold water valve, 15 – level meter.

### 3D drawing/photo

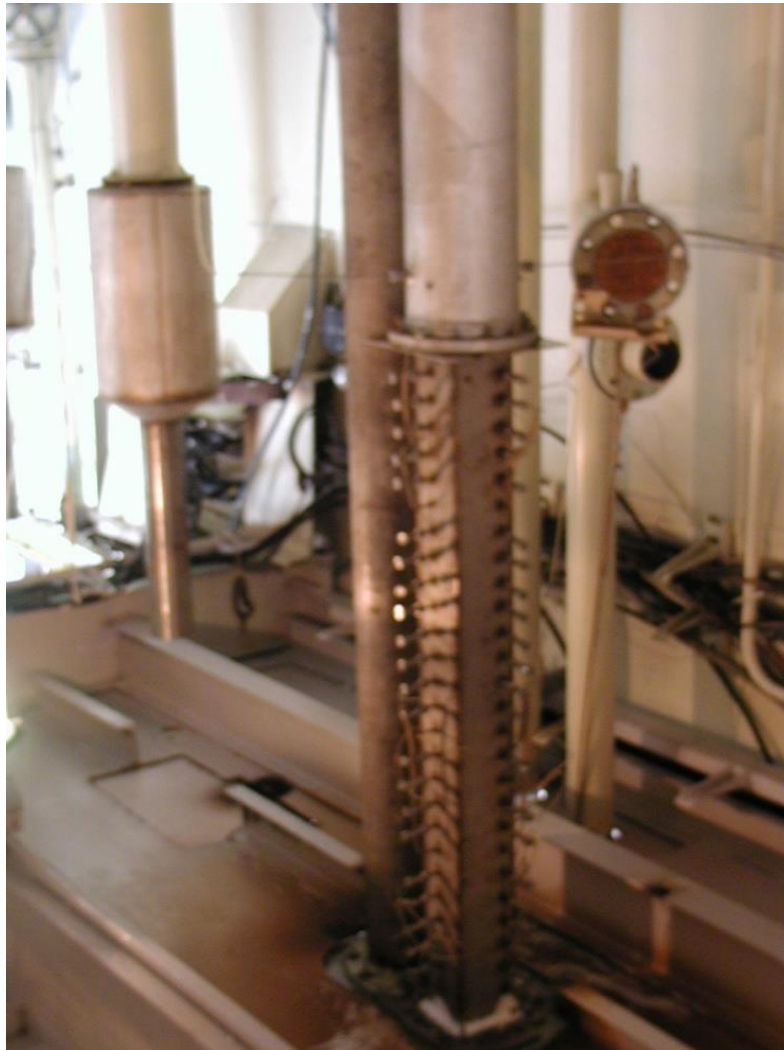


FIG. 2. View of the water hydraulic facility “SGI”

### Parameters table

Coolant inventory	Distilled water
Power	250 kW
Test section No.1	<u>Characteristic dimensions</u> Stainless pipeline 100 mm in diameter
	<u>Static/dynamic experiments</u> Stationary and dynamic experiments
	<u>Temperature range in the test section</u> 10-80°C
	<u>Working pressure</u> 2,5 MPa
	<u>Flow range</u> 1-150 m <sup>3</sup> /h

Sensor equipment	<ul style="list-style-type: none"> <li>• Differential pressure sensors-transducers of Metran-100 and Metran-150 type (manufactured at Chelyabinsk plant);□</li> <li>• electromagnetic and turbine flow meters.</li> </ul>
------------------	---

## COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

- Series of studies on hydrodynamic justification of passive emergency protection assemblies designs with hydraulically weighted rod for BR-10, BN-600, BN-800 reactors;
- Studies of hydraulic characteristics of a fragment of Brest OD-300 reactor facility emergency protection system;
- Studies of heat-exchange equipment for food industry;
- Series of hydrotests of assembly models for prospective reactors;
- Studies are underway on verification and calibration of devices for commercial accounting of energy carriers;

## PLANNED EXPERIMENTS (INCLUDING TIME SCHEDULE)

Studies on hydrotests of models of cores and prospective reactors assemblies.

## TRAINING ACTIVITIES

Training activities for researchers at the SGI facility must be coordinated with Rosatom State Corporation.

## REFERENCES (specification of availability and language)

1. VOZNESENSKIY R.M., VYUNNIKOV N.V., BAGDASAROV YU.E. Passive emergency protection assembly with hydraulically weighted rod for liquid cooled reactors // Patent No. 2069019, 1993. (Rus)
2. BAGDASAROV YU.E., VYUNNIKOV N.V., VOZNESENSKIY R.M. et al. Experimental and calculated justification of hydrodynamics of passive emergency protection (PEP) dummy assemblies with hydraulically weighted rod for the BR-10 reactor and testing experimental PEP assemblies No. 1, No. 2 in it // Proceedings of Institute of Physics and Power Engineering. Obninsk: STID IPPE, 1994. (Rus)
3. BAGDASAROV YU.E., VOZNESENSKI R.M., VYUNNIKOV N.V. et al. Development of passive safety devices for sodium-cooled fast reactor // Proceeding "Absorber materials, control rods and designs of shutdown systems for advanced liquid metal fast reactor", Austria, Vienna: IAEA, 1996, p. 97-106. (Rus)
4. BAGDASAROV YU.E., VYUNNIKOV N.V. et al. Development of passive safety devices for sodium-cooled fast reactor // Proceeding International Topical Meeting "Sodium-Cooled Fast Reactor Safety", Obninsk, IPPE, Russia, October 3-7, 1994. Obninsk: IPPE, 1994, v.4, p. 6-51. (En)
5. BAGDASAROV YU.E., VYUNNIKOV N.V. et al. Development of passive safety devices for sodium-cooled fast reactor // Proceeding "Absorber materials, control rods and designs of shutdown systems for advanced liquid metal fast reactor". Vienna: IAEA, Austria, 1996, p. 97-106. (En)

6. VOZNESENSKIY R.M., VYUNNIKOV N.V., et al. Development and calculation-experimental research of PEP assembly with hydraulically weighted rod for BN-type reactors // Collected selected proceedings of IPPE, Obninsk: IPPE, Russia, 1997. (Rus)
7. VOZNESENSKIY R.M., VYUNNIKOV N.V., GABRIANOVICH B.N. Development and experimental justification of PEP assemblies with hydraulically weighted rod for fast reactors // Collected proceedings "Hydrodynamics and safety of nuclear power facilities". Obninsk: FSUE "SSC RF-IPPE", Russia, 1999, v. 2, ed. 11, p.319-372. (Rus)
8. VYUNNIKOV N.V., GABRIANOVICH B.N. Water-conditions simulation of PEP rod movement in sodium // Collected proceedings "Heat-and-mass transfer and properties of liquid metals". Obninsk: IPPE, Russia, 2002, v.1, p. 264-266. (Rus)
9. VOZNESENSKI R.M., VYUNNIKOV N.V. et al. Development of passive devices for emergency protection of fast reactors // Proceeding of International Conference "Fifty Years of Nuclear Power the Next Fifty Years", Obninsk: IPPE, Russia, 2004, p. 214-215. (En)