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Title:

AN ENGLISH TRANSLATION OF THE 50-YEAR
CHRONICLE OF HISTORICAL EVENTS OF THE
STATE SCIENTIFIC CENTER - RUSSIAN
FEDERATION PHYSICO-ENERGETICS INSTITUTE
1946-1996

Author(s):

Gennady Berman, T-13
Waslaw Gudowski, Russian Federation of
Atomic Energy
Gary Doolen, T-13

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**An English Translation of the
50-Year Chronicle of Historical Events
of the State Scientific Center
Russian Federation
Physico-Energetics Institute
1946-1996**

*Translators:
Gennady Berman, Waslaw Gudowski and Gary Doolen*

**State Scientific Center
Russian Federation**

**The Physico-Energetics Institute,
Named in Honor of A. E. Leipunsky**

**Ministry of the Russian Federation of Atomic
Energy**

Chronicle of Historical Events of GNC RF-PEI

(1946-1996)

1942 The State Committee of Defense of the USSR wrote the statement "By which the academy of science is obliged to undertake some works which has their purpose to (in a short time) to give the answer to the question of the possibility or non-possibility to use nuclear energy produced by the fissioning of uranium for practical and for particular military purposes...." The atomic problem is determined to be of primary military-strategic importance.

1943 I. V. Kurchatov is appointed Leader of the Project for utilization of atomic energy. The Laboratory Number 2 is established. (In 1949, it was named LIPAN [Laboratory of the Institute of Problems of Academy of Science.])

1945 The founding of the First Main Department (PGU) under the Council of Ministries of the USSR, which became the center of the development of the atomic sector of industry. The foundation in the system of the PGU, the first NII (Scientific Research Institute) and KB (Construction Bureau) [Laboratory 3, NII-9, OKB "Hydropress" and others). The work of the PGU was headed by B. L Vannikov; his First Deputy Director was A. P. Zavenyagin, who was managing simultaneously the ninth department of MVD (Ministry of Internal Affairs), in which were organized four new scientific centers: Institute "A" and Institute "E" in Suchoomy, Georgia; Laboratory "B" near the Urals (now Snezhinsk); Laboratory "B" near the station Obninsk 105 km from Moscow in the direction of the Moscow-Kiev railroad station.

19.12.1945 The order was issued by CNK (Council of the Folk Commissars) of the USSR concerning the establishment of the scientific research organization of Laboratory B.

27.04.1946 It was announced that L. S. Boyanov would be Head of Laboratory; his Deputy for Scientific Work would be A. K. Krasen (starting 21.11.46)

1946-1949 A. E. Leipunsky worked as a Deputy of A. P. Zavenyagin for scientific work; he was a member of the Scientific-Technical Council of the PGU and managed from the side of department nine of the MVD, in particular, establishing an organization for the scientific work of Laboratory B.

13.05.46 An order for the transfer to Laboratory B of buildings of the Children's Labor Educational Camp with the land belonging to the buildings. (134 hectares).

31.05.1946 The first order was issued by the head of Laboratory B on the hiring of staff members.

24.06.1946 First party meeting of Laboratory B took place.

August 1946 A group of German specialists arrived at Laboratory B, headed by H. Pose, the first Scientific Head of the Laboratory. In 1952, the group was assigned to Suchoomy, Georgia. In 1956, they returned to Obninsk.

21.09.1946 In the notes of the Head of the Laboratory, L. S. Buyanov, addressed to Deputy Minister A. P. Zavenyagin, tasks defining future directions were formulated, including the development of the uranium reactor.

1946 In Laboratory B, six scientific laboratories were organized: nuclear physics, nuclear reactors, radioactive materials and ionizing sources, devices for nuclear investigations, chemical, and theoretical. The Construction Bureau and Workshops were organized: mechanical, electromechanical, and glassblowing. The beginning of the reactor development was initiated.

World's First Atomic Electric Station

Beloyarsk Atomic Electric Station; On The Left The Third Block
With The Reactor BN-600

Atomic Submarine With A Reactor Cooled By Lead-Bismuth
Coolant

Thermoemission Nuclear-Power Device For Cosmic Purposes;
"Topaz-1"

1946 A. E. Leipunsky proposed the idea of constructing a proton ring accelerator (synchrophasotron).

1947 In Laboratory B, the proton ring accelerator model was constructed and the main problems were resolved. The final theory of this accelerator was developed. In 1950, this work was transferred to the Physical Institute of the Academy of Science and Dubna.

25.01.1947 In Laboratory B, the Scientific-Technical Council was organized.

25.05.1947 A decision of the NTS (Scientific-Technical Council) of the PGU at the Council of Ministers of the USSR "...to assign Laboratory B together with Laboratory 2 to Leipunsky to develop reactors using beryllium as a moderator."

14.06.1947 P. E. Zakharov was named Head of Laboratory B and he oversaw its construction.

1947 Three scientific departments were organized: investigation of reactor materials, theoretical, and radiochemical. These Departments combined eight scientific laboratories. Intensive construction of the local community was begun; construction began on the administrative building and a cafeteria; and reconstruction of the main building was begun. In the Laboratory, there were 262 workers (40 engineering-technical workers and 200 laborers).

15.08.1948 Laboratory B was placed under the authority of the First Main Department of the Council of Ministers of the USSR.

1949 At Laboratory B, the Medical Department Number 8 was organized.

27.08.1949 A. E. Leipunsky was announced as Deputy of the Scientific Department of Laboratory B.

October 1949. In their report notes to A. P. Zavenyagin, A. E. Leipunsky, D. I. Blokhintsev, and A. D. Zverev, raised the question of the development in Laboratory B of reactors using fast and intermediate neutrons with liquid metal cooling. The Department of Liquid Metals was organized. (I. I. Novikov).

1949 The group for development and designing of electronic devices was created. (Headed by L. A. Matalen).

Based on this group in 1955, the department of electronics was organized which gave a significant contribution to the development of nuclear investigations, including the development of calculating devices, amplitude and time analyzers, control apparatus for critical assemblies and atomic stations, data acquisition and data processing systems, etc.

1950 Laboratory B started research on liquid-metal coolants.

16.05.1950 Decision of the Council of Ministers of the USSR "On the scientific and experimental activities for peaceful utilization of atomic energy."

This decision foresaw the construction of three types of research reactors (uranium-graphite with water cooling, uranium-graphite with gas cooling and uranium-beryllium with gas or liquid metal cooling). According to the initial plan, the reactors should run sequentially a steam turbine and generator with a power of 5000 kW. In this way, work began on the construction of the first atomic electric station, power installations for atomic submarines, and their land-based prototypes.

BR-10, A Research Reactor Using Fast Neutrons

Reactor Hall Of The Bilibinsk Atomic Heat Electro Central
Bilibinsk ATEC-- First In The North Region

1950 The beginning of research on the possibility of developing reactors based on intermediate energy neutrons.

June 1950 Professor D. I. Blokhinsev was announced as the Director of Laboratory B. He was a Member-Correspondent of the Academy of Science of the Ukraine SSR and Head of the Department at Moscow State University (named for M. B. Lomonosov). Since 1947, he had worked simultaneously as Head of the Theoretical Department of Laboratory B.

July 1950 In the report by A. I. Leipunsky "Fast Neutron Systems" (which was presented in NTS PGU Council of Ministries of the USSR) the possibility was confirmed of breeding in reactors using fast neutrons, and suggestions for the experimental justification of crucial investigations were put forward.

24.08.1950 Laboratory B sent to OKB "Hydropress", the technical request for designing a reactor using a beryllium moderator and helium coolant.

1950 The cascade neutron generator, KG-0.25, was completed.

1950 The Workshop was completed with an area of 1,500 square meters containing 30 metal-modifying machines. In this department, there were 35 workers.

December 1950 At Laboratory B, the Scientific Council was organized for preparation of Scientists with Highest Qualifications. Members of the Council were D. I. Blokhinsev, A. I. Leipunsky, N. V. Ageev, O. D. Kazachkovski, A. K. Kraseen, P. N. Slyuserev, and P. D. Gorbochev.

12.06.1951 The decree of the Council of Ministries of the USSR on the construction on the territory of Laboratory B of the electrical station "Installation B-10" using the enriched uranium utilizing the experimental uranium-graphite reactor with water coolant (aggregate AM) in the second quarter of 1952, and utilizing the experimental uranium-graphite reactor with helium coolant (aggregate ChG) and

experimental uranium-beryllium reactor with liquid metal coolant (aggregate BT) in the second half of 1952.

27.06.1951 By the suggestion of Igor Vasilievich Kurchatov, LIPAN, Laboratory of the Institute of Problems of the Academy of Science, transferred to Laboratory B all the project materials for the uranium graphite reactor with water cooling (according to the reactor First AES).

12.07.1951 Decree of the Council of Ministries of the USSR on the obligation of Laboratory B to the task of the development of the reactor and construction of an AES with water coolant.

September 1951 By the initiative of V. A. Malikh, his laboratory started the design of nuclear fuel elements for the reactor of the first AES.

Some time later, V. A. Malikh announced the developers of the technology of these nuclear fuel elements.

The heads responsible for the fabrication of this project were: Z. I. Ievleva and E. I. Streltsov. They developed the corresponding equipment and experimental facilities.

1951 Creation of the first Liquid Metal Facility (lead-bismuth). Organization of the first Thermo-Physical Laboratory. (C. B. Shikov)

1951 The cascade generator KG-1.2 began research operations with a proton and deuteron energy of 1.2 MeV.

12.07.1951. Announcement of the Director of Laboratory B, V. I. Blokhintsev, as scientific leader of the construction of the reactor and its related equipment. At this time in Laboratory B, 419 people were working, including 4 Doctors of Science, 6 Doctors of Philosophy and 76 Diploma Engineers.

1951 During this time in the Institute, two large departments were organized which determined the direction of the works on the reactor systems: the Department headed by A. I. Leipunsky (fast and intermediate reactors with liquid metal coolant) and the Department headed by A. K. Krasin (thermoreactors with water cooling, the reactor of the first Atomic Electric Station).

1951 A. I. Leipunsky, O. D. Kazachkovski, and I. I. Bondarenko organized the work on neutron physics in Laboratory B. The processes that were studied included the interaction of neutrons with nucleides in the wide energy spectrum of the fission neutrons. These investigations were in progress for a long time. They played an important role in the founding of the ideas of reconstruction and developing of a data base for description of the uranium-plutonium fuel cycle. In the 1960s, investigations of reaction mechanisms taking place in nuclear reactors were in progress. The structures of potential barriers were investigated, mass and energy distributions of fission products, density of nuclear levels, and equilibrium and non-equilibrium processes in nuclear reactions. In these works, in different years participated many researchers of the Institute.

1951 B. S. Lyashenko was appointed Head of the Materials Department of the Laboratory B. In the following years, the Department investigated:

- @ physico-chemical properties of liquid metal coolants
- @ corrosion of construction materials and mass transport in systems using liquid metal coolants
- @ radiation resistance of construction materials using different fuel compositions
- @ the phenomena of radiation-induced embrittlement and swelling of materials and compatibility of different materials
- @ the influence of oxygen and metallic impurities on the corrosion process in the apparatus using liquid metal coolants.

The department investigated all types of nuclear fuel elements for reactors which were being developed in PEI and recommendations were made on the technical foundation of the justification of the project. The department developed and introduced new construction materials into the technological process.

1951 The beginning of the work on the physics of radiation shielding.

1952 As a result of the project investigating power reactors using fast neutrons with various coolants, the main directions were formulated -- a three-loop scheme with sodium coolant in the first and the second loops. The beginning of work with sodium as the coolant.

17 November 1952 A. I. Leipunsky in his working notes in NTS PGU justified the possibility of creation of nuclear reactors for propulsion using liquid metal coolant.

1952 Work began on the creation and development of the numerical methods for reactor calculations.

1952-1955 Under the leadership of D. I. Blokhintsev, research was carried out on the theory of thermonuclear explosions.

1951-1952 Under the leadership of D. I. Blokhintsev and A. I. Leipunsky, work began on the theory of different types of reactors. L. N. Usachyev developed the basic principles of the theory of reactors using fast neutrons and the first approximate calculations were made, introducing the idea of neutron importance, which appeared to be quite useful for reactor calculations. A. S. Romanovich did work on the theory of reactors using intermediate energy neutrons. Directed by M. E. Minashin, physical calculations were done for a uranium graphite reactor with water cooling -- the reactor of the first AES; the methods of calculation continuously improved.

1952 The creation of the first circulation loop using a centrifugal pump for investigation of lead-bismuth alloy as a coolant.

1953 The Mathematical Department was organized, headed by Doctor of Science, E. S. Kuznetsov.

1953 In Laboratory B, by the initiative of A. I. Leipunsky, the first experimental facilities appeared using circulating sodium and sodium-potassium as the coolants; and the investigations started on their technology and corrosion of construction materials in sodium.

1953 I. I. Bondarenko developed the first multi-group data base (9 group).

April 1953 Decree of the Soviet Minister of the USSR for construction in Laboratory B of Facility Number 27 with nuclear-power installation, 27/BM with water cooling and 27/BT with liquid metal cooling (lead-bismuth) of the nuclear reactors.

9 July 1953 Laboratory B is transferred to the Ministry Medium Machine Construction of the USSR.

August 1953 The Council of Ministries of the USSR allowed Laboratory B to begin the Evening Department of the MIPhI (Moscow Institute of Physical Investigations) and to undertake training of the engineer experts. The Director of the Department was announced as Prof. B. N. Glasanov.

1953 The high pressure water facility was created for testing of the nuclear fuel elements for the first AES.

01.01.1954 In the Institute worked 1395 people, including seven Doctors of Science, eight Candidates of Science and 300 Engineer-Technical workers.

25.02.1954 The Technological Department (No. 6) was organized, with B. A. Malikh as Head. In the following years, by the technological department (and since 1962, technological sector) were developed, tested and transferred to industry, nuclear fuel elements and technological channels for:

- @ the first-in-the-world atomic electric station (AES)

- @ the Beloyarsk AES (1953)

- @ the Bilibinsk ATEC (1974)

- @ the Reactor BR-10 with nitride fuel (1985)

- @ reactors for submarines with coolants of lead-bismuth (1952-1975)

- @ the reactor apparatus "BUK" with thermoelectric conversion (1969)

Antimony-beryllium neutron sources were fabricated for reactor BN-350 and BN-600 (in 1972 and 1979, respectively).

In the technological sector, reactors named "TOPAZ" were developed and produced in the necessary quantity for ground and flying tests of electro-generating channels using reactor conversion.

03.03.1954 In Laboratory B, the self-sustaining chain fission reaction was achieved for the first time in Obninsk in a physical facility using graphite, water and uranium -- a model for the reactor of the first-in-the-world AES. (A.K. Krasin, B. G. Dubovski, E. I. Inyutin, N. N. Lantsov, M. E. Minashin, G. N. Ushakov and others.)

11.03.1954 Criticality was achieved in the critical facility (PNTF) using an intermediate energy neutron spectrum. Research with this critical facility was saddened by an uncontrolled excursion, with the result that several people were exposed, especially A. V. Malishev. In the following years, research on critical facilities was intensified; in the Institute were created more than twenty critical facilities for different objectives. Unfortunately during these years of work, five more uncontrolled reactivity excursions of these critical facilities took place. Of these, two had very severe consequences: in 1962 during one excursion of the critical facility, A. U. Bartilev suffered very severely; in 1977, V. A. Osipov was severely exposed.

The critical facility PNTF was the first in the sequence of the facilities created for the investigation of the characteristics of reactors with intermediate neutrons (facilities "F", "SG", "PF4", "SGO" and others).

26.03.1954 By Decree of the Ministry of MSM, a group was established to commission the AES to start-up and be utilized. This group included E. P. Slavsky (Head of the Commission), B. S. Pozdnyakov, D. I. Blokhintsev, M. A. Dollezhall, A. N. Gregorianyantz, and N. A. Nikoliev.

30.04.1954 In the machine construction plant in Elektrostahl, the first complex of nuclear fuel elements was produced, designed in Laboratory B for the reactor of the first AES.

09.05.1954 In Laboratory B, the loading of the cores of the reactor of the AES with fuel elements began. At the insertion of the 61st fuel rod, the critical condition was reached at 7:40 p.m., a self-sustaining chain reaction of the uranium nuclear fission. The actual physical start-up of the AES occurred.

26.06.1954 Power start-up of the first-in-the-world atomic electric station. The valve for steam transmission was opened to the turbogenerator and electric current was generated from the energy of the atomic boiler (reactor). This event marked a new stage of use of the nuclear energy and was highly regarded by world public opinion.

From 1954 to 1974. During these twenty years, the first-in-the-world AES was visited by 2200 delegations from 85 countries of the world, the total number of visitors reached 60,000 people. Among the first foreign guests visiting the AES and the Institute were Frederick Joliet-Curie, Jawaharlal Nehru, and Indira Ghandi. In the book "The Birth Of The Atoms for Peaceful Uses," D. I. Blockhintsev described his impressions of Jawaharlal Nehru: "Nehru visited our Institute. Before him appeared all coworkers from the Laboratories and Offices; and he, noticing their youth, said 'It seems to be a University.' And when he was told it was a Research Institute, he was impressed by the youthfulness of the organization.

24.07.1954 The Thermophysical Department No. 7 was organized, which included three laboratories. B. I. Subbotin was appointed Head of the Department. Under his leadership, research on thermophysics, hydrodynamics and physical chemistry of liquid metal coolants was organized.

1954 Formation of the Laboratory for Studies of Thermohydraulics of Reactors with mercury as the liquid metal coolant.

1954 The first investigations using the high temperature nuclear facility with liquid metal coolant.

1954 The House of Culture of the Institute was completed.

1955 Together with NIKIET, utilization began of the new graphite water reactor for use in Belayarsk with super heated steam in the reactor channels.

29.04.1955 In Laboratory B, the first experimental reactor using fast neutrons (BR-1) with a power 100 watts was constructed and criticality was achieved.

1955 Under the scientific leadership of Laboratory B, in OKB "Hydropress" the project investigations were completed on the reactors BN-5 and BN-25 using sodium coolant.

1955 G. I. Marchuk was appointed Head of the Mathematical Department. Under his leadership, research was carried out in the areas of computational mathematics, transport theory, and methods of solution of the kinetic equations, methods of calculation of nuclear reactors and radiation shielding, theoretical hydrodynamics and heat transfer, and the problems of calculations of neutron cross sections using theoretical models, and questions of programming and mathematical software support for computers.

October 1955 By the scientists of Laboratory B, the results were reported in the first international conference on peaceful uses of atomic energy in Geneva, on the initiation and utilization of the first-in-the-world AES (by D. I. Blockhintsev).

08.03.1956 Criticality of the surface prototype of nuclear-power reactor installation using water cooling took place (Facility 27/BM).

10.04.1956 Power start-up of this installation. The research and utilization of this reactor formed the foundation for the creation of the water-water atomic power reactors for the Navy. This facility became the unit for training and practice for the personnel of the first generation of nuclear submarines.

15.03.1956 Decree of the Council of Ministries of the USSR on the construction of the Beloyarsk AES in the Urals.

01.06.1956 In connection with the selection of D. I. Blockhintsev as Director of the JINR in Dubna (Joint Institute for Nuclear Research), A. K. Krasin was appointed Director of Laboratory B. At this time 10 Scientific Departments in the Institute were in operation, including 32 Laboratories.

24.07.1956 Declaration of the Presidium of the Supreme Council of the Russian Soviet Federation of Socialistic Republics on changing the name of the village Obninskoye to the City of Obninsk, with regional subordination.

D. V. Timin was elected as the first President of the Executive Committee of the City Council of Working Deputies.

27.08.1956 The first City Party Conference of the City of Obninsk was held which elected the City Party Committee. I. G. Morosov was elected as First Secretary of the City Committee.

11.09.1956 Decree of the Presidium of the Supreme Soviet of the USSR on the awarding of Orders and Metals to the workers of Laboratory B and other organizations for construction of the first-in-the-world AES.

D. I. Blockhintsev was given the title "Hero of the Socialist Laborers" along with the Order of Lenin.

1956 The experimental fast reactor BR-2 achieved the planned power of 100 kilowatts using mercury coolant and plutonium fuel.

1956 The first experimental reactor achieved criticality, based on fast neutrons BR-5 with sodium coolant and plutonium oxide as a fuel, with a power of 5000 kilowatts.

1955-1956 Under the direction of D. I. Blockhintsev, the theory of pulsed reactors using fast neutrons (IBR) was developed by I. I. Bonderenko and D. Ya. Stavitsky in Laboratory B. It was suggested that this kind of reactor should be constructed.

1956 The two-crystal neutron spectrometer was created, by which important results were achieved and the discovery was made (Number 191) of the phenomena of anomalous ordering of magnetic moments in crystal structures (N. V. Ageev, V. N. Vikov, S. N. Vinogradov, B. S. Golovkin and V. A. Levдик).

1956 On the basis of suggestions of Laboratory B, the decree was issued by the government organizing the project of developing a small-size, high temperature nuclear missile engine (YaRD).

1956 On the basis of suggestions of Laboratory B, the decree was issued by the government on the development of on-board nuclear energy devices (YaEU) for power in space.

1956 The construction of the largest sodium Laboratory in the USSR was completed. (11 reactors).

1956 The Scientific-Design Office headed by N. I. Korobkov was organized. Before this, related research was done by small groups of designers headed by M. S. Koshkin, which in 1955 included 25 workers. In the following years, the department made very significant contributions to the successful work of practically all of the institutes, in the creation of experimental databases.

1956-1959 Decrees of the Government were issued on the development of research on high temperature nuclear reactors and construction of the military reactor facility.

1957 For the construction of the first-in-the-world AES, the Lenin Prize was awarded.

23.09.1957 The Decree of the Soviet Ministers of the USSR on the construction of the mobile AES, TES-3.

1957 The computer "Ural-1" arrived at the Mathematical Department. For its utilization, the Laboratory for Computational Techniques was created (V. V. Boolichev).

1957 Nuclear overheating of the steam occurred in the reactor loop of the first-in-the-world AES.

1957 Research was begun on liquid metal coolants at high temperatures (up to 1000C).

1957-1966 Various reactors for missile propulsion were designed. The strategy for detailed investigations was determined. Together with KB (the Design Bureau) and Chemical Automatics a project of nuclear propulsion with a lifting force of 3.6 tons was proposed.

February 1958 Under the scientific leadership of Laboratory B, the construction of the first block of Beloyarsk AES was started.

1958 By the initiative and order of I. V. Kurchatov, investigations were begun in Laboratory B on nuclear safety in uses of fissile materials.

The Laboratory of Nuclear Safety was created (LYaB) for the investigation of critical parameters of fissile substances and for preparing recommendations for industry. B. G. Dubovski was appointed as the Head of the Laboratory. Later LYaB became a Scientific Department.

Simulations of critical parameters for the system of fission materials were made by a team of mathematicians under the leadership of G. I. Marchuk

1958 In the Mathematical Department, the following numerical programs for the computer were created:

- the first useful computer programs in the country for reactor calculations using the computer "STRELA" or Arrow (B. P. Kocergin and V. E. Kolesov);
- the computer program for calculation of neutron cross sections on the computer "STRELA" using the optical model of the atomic nucleus;
- the computer program for the computer "Ural-1" for calculation of energy levels of atomic nuclei using a variable potential.

September 1958 The Van de Graaf accelerator, (EG-1), began operations with a particle energy of 4.5 MeV and a current of 100 microamperes (B. N. Glazanov, A. N. Serbinov, N. A. Klintsov, V. A. Romanov, B. S. Novikovski).

1957-1958 The sequence of research efforts was completed on the investigation of various types of converters from heat energy into electricity for the on-board cosmic YaEU. The recommendations were accepted for the development of thermoelectric and thermoemission methods for conversion.

1958 Thermophysical and material science investigations on the use of lithium began.

1958 The Hot Laboratory with glove boxes for radiochemical and material-investigations of radioactive materials began operation. (A. P. Smirnov-Averin, G. B. Kostrev, M. F. Sabin).

1958 Under the initiative of I. I. Bondarenko and V. Ya. Pupko work began on the foundation of thermo emissions YaEU with reactor converter "TOPAZ." Under the leadership of V. A. Malikh, work began on the design of an electrogeneration channel for this reactor.

1959-1965 Theoretical and experimental work was completed on the utilization of thermo emission methods for energy conversion. Tests of electrogenerating channels in reactor of the first AES were done.

January 1959 Start-up of the fast reactor BR-5 using a sodium coolant and plutonium oxide fuel. The temperature of the coolant was 500C, the maximum density of the energy output was 500 kilowatts per liter. In June the reactor reached the power of 5 MW.

December 1959 The physical start-up occurred of the surface prototype of nuclear power reactor facilities using intermediate neutrons with beryllium moderator and lead-bismuth coolant (facility 27/VT).

12.03.1959 The power start-up of the facility, 27/VT, which was designed under the scientific leadership of PEI using the facilities of SPMBM "Malachite" and OKB "Hydropress". On the basis of the experience of this installation, the leading prototype of submarine project 645 was created using liquid metal coolant.

1959 In the Hot Laboratory, the experimental facility for the regeneration of spent nuclear fuel began operations.

23.07.1959 Decree of the Presidium of the Supreme Council of the USSR on the government awards to a large group in Laboratory B for the design of new techniques.

02.05.1959 A. I. Leipunsky was appointed Scientific Head of Laboratory B.

14.05.1960 Decree by the Presidium of the Supreme Council of the USSR on the government awards to the workers of PEI for participating in the design of the icebreaker "LENIN."

1960 For the investigation of physics of reactors using fast neutrons, the Lenin Prize was awarded.

23.06.1960 At JINR in Dubna, the initiation of the reactor IBR, developed in PEI.

25.08.1960 Decree of the Soviet Ministry of the USSR, renaming Laboratory B as the Physical-Energetic Institute (PEI). At this time, in the Institute, there were one Academician of the Ukrainian Academy of Science, 6 Doctors of Science, 49 Candidates of Science, and 1100 Scientific and Engineer-Technical workers.

1960 Methods were developed for incomplete factorization for the solution of 2-dimensional and 3-dimensional equations of the elliptic type. Subsequently, the method was improved and received world-wide recognition.

1960 The first issue of the book "Reference on Nuclear Physical Constants for Reactor Calculations" was published.

1960 Together with OKBM and OKB "Hydropress," the project for constructing a reactor using fast neutrons (BN-350) began.

May 1961 The first reactor test of the thermal emission energy converter in the reactor BR-5.

30.06.1961 The facility BFS began operation for the purposes of modeling of cores of fast reactors.

15.08.1961 In the First Party Committee of the PEI, A. P. Belov was elected as Secretary of the Partcom.

13.10.1961 In PEI, the power start-up of the mobile AES TES-3 occurred.

1961 In the Mathematical Department, the computers BESM-2 and M-20 were put into operation. Subsequently, the following computers were installed and utilized: M-20 (1964), M-220A (1968), M-220M (1970), M-222 (1973), ES-1030 (1974); the programs 9M, M-26, and DIOR were developed which were widely used for reactor and shielding calculations.

1961 The electrostatic accelerator EG-2.5 began operation with a voltage of 2.5 MeV and a current up to 100 microamperes.

1961 The Lenin prize was awarded to workers of PEI and other organizations for the design of the facility 27/VT and for carrying out investigations using this facility.

07.03.1962 Decree of the Presidium of the Supreme Council of the USSR on the awarding of orders and medals to a group of workers of PEI.

12.07.1962 By the actions of the members of the Komsomol (youth organization), the construction of recreational camps on the river Oka was completed.

1962 The design of the test model was completed of the double axis spectrometer for slow neutrons in the reactor IBR (for investigations of physics of crystals and condensed matter). In the following years the following set of spectrometers was designed: DIN-1 (1965), DIN-1M (1969), DIN-2PI (1983), spectrometric complex DIN-2K on the basis of reactors IBR-2 in Dubna (1985).

1962 Together with OKB-670 MAP, the project was developed of compact nuclear reactors using fast neutrons for cosmic YaEU "BUK" using semiconductor generators. In PEI, the nuclear fuel elements for this reactor were designed.

1962-1970 Design in the Institute of an experimental complex for developing and testing thermoemission reactor-converters: critical facilities for reactor testing of electro-generating channels (EGC) facilities for full-scale ground propulsion tests at YaEU (Building 224).

The NPO [Scientific Manufacturing Union] "Red Star" and the NPO "Energy" were participating in the design of the experimental facilities.

24.08.1962 In PEI, three scientific sectors were organized, including 14 scientific departments.

December 1962-February 1963 Tests of the experimental submarine of project 645 were carried out successfully using a liquid metal coolant (lead-bismuth).

1959-1963 Construction and start-up of the Cyclotron. The beginning of the work using this cyclotron on the development of methods of production of radioactive isotopes.

1963 Together with TB "EnergoBlock" the development of the project of the Bilibinsk ATEC (Atomic Thermal Electro-Central) began.

1963 Work was completed on the evaluation and validation of group constants and a 26-group data base which reflected all the main features of neutron interactions with materials. (I. I. Bondarenko, M. N. Nikoliev, L. P. Abagyan, N. O. Bazayantz). In 1964 following this work, the book "Group Constants for Nuclear Reactor Calculations" was published.

1963 In the Institute, the Center for Nuclear Data was organized (CND). The Center operates in collaboration with three other centers (Brookhaven in the USA, SACLAY in France, IAEA in Vienna).

28.04.1953 Decree of Presidium of the Supreme Council of the USSR on the awarding of orders and medals to a group of workers at PEI.

1963 Beginning of work on the practical installation of algorithmic languages and automatic programming. Adjusting of operating systems for the computer working in the Mathematical Department.

December 1963 Decree of the Presidium of the Supreme Council of the USSR on awarding to A. I. Leipunsky the Lenin Order and giving him the title of Hero of Socialist Labor. (Gold star).

December 1963 The physical start-up of the First Block of the Beloyarsk AES.

26.04.1964 The First Block of the Beloyarsk AES reached full power operation and its first electricity was produced.

1964 The first fifty continuous days of a self-sustaining underwater trip of an atomic submarine. This trip was done by APL Project 645 with YaEU using lead-bismuth coolant.

June 1964 The Country celebrated, with great solemnity, the tenth anniversary of the first-in-the-world AES. In Obninsk, a Scientific-Technical Conference took place.

1964 Construction began of the AES using reactor BN-350 in the city of Shevchenko on the Caspian Sea. This AES was developed by PEI together with OKBM, OKB "Hydropress," and VNIPIET.

05.08.1964 In PEI, 6 scientific Sectors were organized:

1. Physical (L. N. Usachev)
2. Stationary AES (V.V. Orlov)
3. Naval Atomic Power Facilities (B. F. Gromov)
4. Technological (V. A. Malikh)
5. Cosmic Atomic Power Facility (V. Ya Pupko)
6. Thermophysical (V. I. Subbotin)

1964 Awarding of the Lenin Prize for planning, design and experimental utilization of the atomic submarine project 645.

February 1966 The first printing of the Institute Newspaper "ATOM."

29.07.1966 Decree of the Presidium of the Supreme Council of the USSR on the awarding to PEI the order of the Red Banner of Labor.

1966 The first edition of the publication "Reference Book on Critical Parameters of Fissile Systems and Nuclear Safety."

1966-1974 Surface power tests were completed for the experimental cosmic on-board nuclear power facility "BUK" at the test facility in Litkarino. In 1970-1971, the flight construction tests of the first variant of the facility "BUK" successfully took place

29.07.1966 A large group of workers at PEI was awarded orders and medals for successful completion of plans in 1959-1965 and for the creation of a new type of techniques.

V. A. Malikh was awarded the Lenin Order and he was given the title of Hero of Socialist Labor.

1967 The new mechanical assembly building began operation (Bldg. 140). The Joint Experimental Fabrication Shop (OEM) was organized. The total area of all the mechanical shops included 11,500 square meters and the number of the machines increased to 300 units.

1965-1967 In PEI, together with OKBM and VNIINM, the modern concept of the reactor BN-600 with an integrated first loop was developed.

December 1967 The power start-up of the second block of Beloyarsk AES occurred.

1968 Failures occurred in the second campaign facility 27/VT and reactors of the atomic submarine project 645 (emergency overheating of the core) which showed the necessity of serious investigation of the lead-bismuth coolant technology. The necessary works were organized in PEI and in related organizations. In a few years, a significant experimental base was produced; in the Institute was created the Department of Technology of Coolants.

1968 Construction was completed of the big accelerator complex, which included the recharging electrostatic accelerator EGP/10-M and the high current accelerator based on the cascade generator, KG-2.5.

1968 Together with Dutch Physicists, measurements were made which demonstrated the resonance structure of nuclear fission, associated with the existence of a second potential well of the fission barrier.

1968 The method was developed of the smallest directed divergence of the solution of ill-posed problems. The method is used to analyze experimental data; this method found application abroad to analyze the results derived using the Hubble space telescope.

1969 The second block of Beloyarsk AES named for I. V. Kurchatov reached its designed power.

1969 The physical and power start-up of experimental reactor BOR-60 was achieved in the city of Melekesse using a fast neutron spectrum and sodium coolant. This reactor was developed under the scientific guidance of PEI and OKB "Hydropress."

1969 Construction began on the third block of Belayarsk AES utilizing the fast reactor BN-600.

1969 The technology of extraction and purification of transuranic elements was optimized. Based on this research in the following years, neutron sources ($^{238}\text{PuO}_2\text{-Be}$) were produced for the reactors BN-350 and BN-600.

1969 Utilization began of the main physical construction of TFK-1 in which were completed research on the thermohydraulics of nuclear reactors and the technology of coolants. In 1971, a unique aerodynamical facility was created in this building for the investigation of the hydrodynamics of reactors with flow rates up to 65,000 cubic meters per hour.

1970 Utilization began of the facilities BPS-2 and KOBR. Investigations began of the model reactor BN-600 and other reactors, including plutonium fuel.

1970 Together with OKBM, VNIINM, and VNIPIET, the design began of reactors of the type BN-600 with increased power, later known as the project BN-800. At the same time, preconceptual designs were initiated of fast reactors with electric power in the range 1000 to 1,600 MW.

21.04.1970 In the Institute's Building 224, surface tests began of the nuclear thermoemission facility "TOPAZ" -- a prototype of the on-board cosmic YaEU, developed in NPO "Red Star" under scientific direction of PEI. In the following years, six more facilities were tested: four in 1971 to 1979, a utilization time of the facility reached 5300 hours on account of improving of the materials of construction and design; in 1982-1984 preliminary flight tests were completed on two regular "TOPAZ" facilities. This resource achieved 7350 hours of operation at a power of 7.2 kilowatts.

Electrogenerating channels for cores of all tested facilities were developed and produced in the Technological Department of PEI. The announcement of the facility "TOPAZ" was made at an international conference.

04.10.1970 Experimental tests began of high speed and high maneuverability of the atomic nuclear powered submarine (APL) project 705 cooled by liquid lead-bismuth developed by OKGM under the scientific guidance of PEI.

Three atomic submarines of the project 705 were delivered for utilization during the years 1978-1981 with participation of PEI.

1970 The State Prize of the USSR was awarded to a group of scientists and engineers for the design, start-up and utilization of the first block of the Beloyarsk AES named for I. V. Kurchatov.

1970 For design of new methods of control of nuclear reactors, the State Prize of the USSR was awarded.

1970 In the Hot Laboratory, for the first time in the USSR using the high flux accelerator of heavy ions (ILU-100), an experiment was done simulating the phenomenon of swelling of reactor construction materials under radiation by heavy ions.

1970 The systematic investigation of the angular distribution of fission products was completed, the result of which was a contribution to the development of the model of the two-humped fission barrier.

1954-1970 By scientists of the Council of PEI during this period many dissertations were considered and they awarded 164 candidate degrees and 37 doctors degrees to workers at the Institute.

1971 The solemn celebration took place of the 25th anniversary of the Labor Red Banner Order of the PEI.

The Obninsk newspaper "FORWARD" 28 May 1971 wrote: "If one looks back on what we have achieved, one might say with full confidence: how much was done by the team at the Institute for the development of domestic atomic power."

In 25 years, a large volume of works and fundamental investigations were completed on nuclear physics, on physics of reactors, on thermophysics, material science, and on radiated materials.

The most important achievements of the Institute were:

The first-in-the-world AES,

Design of the biggest industrial reactors using thermal neutrons and their utilization in life -- Beloyarsk AES and Bilibinsk ATE Central,

Design and construction of reactors using fast neutrons BR-1, BR-2, BR-5, BR-10, BOR-60, IBR, with numerous experiments performed on these reactors,

Design of powerful reactors using fast neutrons, BN-350, which was constructed in the city of Shevchenko on the Caspian Sea, and the BN-600 which was constructed as the third block of BAES in the Urals,

and Design of nuclear power facilities for submarines and reactors for cosmic applications.

1971 In the Institute were 21 Doctors of Science, 177 Candidates of Science, and 2233 scientific and engineer-technical workers.

In PEI, there were 4 research reactors, 13 critical assemblies, 15 thermophysical facilities, 9 material science facilities, 5 medium energy accelerators, cyclotrons for isotope production, and a Hot Laboratory.

26.04.1971 Decree of the Presidium of the Supreme Council of the USSR on the awarding of orders and medals to the workers of the Institute for achievements of the Institute in the 8th five-year plan.

1971 Construction of the facility IBR was awarded the State Prize of the USSR.

1971-1975 The Komsomal Team of PEI moved for five consecutive years to Bilibino participating in construction of the ATEC above the Arctic Circle.

1965-1971 The quadrupole component of nuclear photofission was measured and investigated. As a result of this investigation, the discovery (No. 260) was registered. (Involving S. P. Kapitsa, N. S. Rabotnov, G. N. Smirenkin, A. S. Soldatov, L. N. Usachev, and Yu. M. Tsipenyuk.)

1972-1988 Improvements and increase of efficiency of the YaEU "BUK" in the process of exploitation of the Sputnik series "COSMOS." During these years 30 "BUK" reactors were put in orbit.

On 18.04.1977, the Sputnik Cosmos 954 was put in orbit with an on-board nuclear facility "BUK". Defects of the system of engines responsible for stable orbiting caused this system to fall into the Great Slave Lake in Canada on 27.01.1978.

This accident prompted the design of additional systems incorporating radioactive and nuclear safety. These works were done together with NPO "Red Star."

14.08.1972 A. I. Leipunsky, the scientific leader of the PEI, suddenly died.

29.11.1972 The physical start-up of the reactor BN-350 in the city of Shevchenko.

09.05.1973 Power start-up of reactor BR-10. (After reconstruction and increasing of power of the BR-5, it was renamed BR-10).

16.07.1973 Power start-up of reactor BN-350. The main difficulty during the first period of adjusting the power was a leak in the loop of the steam generator caused by failure of construction and control. In 1975 after repairing and substituting other steam generators, the reactor worked and reached a power of 750 MW, providing the energy supply to the region and the possibility of a complex of research works.

1973 For design and construction of the facility "TOPAZ", the State Prize of the USSR was awarded.

1973 On the basis of the accelerator EGP 10M, a neutron spectrometer was designed and systematic investigations of the reactions (p,n) and (n,n') started, which provided experimental information for investigations of the mechanisms of nuclear reactions.

1973 The discovery was made of the anisotropy of ion-electron emission of monocrystals (discovery number 126 by D. D. Odintsov, E. S. Mashova, V. G. Telkovsky, and V. M. Checherov).

11.01.1974 The first block of Bilibinsk ATEC in the Chukotka region began operation.

25.03.1974 Decree of the Presidium of the Supreme Council of the USSR on the awarding of orders and medals to the workers of PEI for achievements in the work of the Institute on the results in 1973 on the construction and start-up of BN-350.

1974 For design and tests of the facility "BUK," the state prize of the USSR was awarded.

1974 For design and construction of the experimental fast reactor BOR-60, the State Prize of the USSR was awarded to the group of scientists and specialists.

1975 The team of chemists, headed by A. G. Karabash, finished the development of new directions of analysis of materials of high purity -- Chemical spectral methods based on a combination of chemical concentration of a big number of elements -- impurities and

spectral determination of materials in the concentrate. Chemical-spectral methods were incorporated in many laboratories and in the industrial plants of the country.

1975 Together with Kazak specialists, a complex investigation of fragmentation of light nuclei induced by charged particles was started which later gave a significant contribution to the physics of nuclear fission.

1976 Results of investigations on nuclear safety and investigations on technology of reprocessing of spent nuclear fuel, made together with VNIINM, were used in the creation and start-up of the first native reprocessing plant (RT-1) in the "Mayak" complex.

1976 Opening of the Pioneers Camp "Galaxy."

1976-1984 At the special facility of the test site "Baikal" together with Construction Bureau ChemAutomatic, NIITP and PNITI, ground tests were completed of test nuclear reactors for missile engines with a lifting force of 3.6 tons.

29.03.1976 and 08.09.1976 Decrees of the Presidium of the Supreme Council of the USSR on the awarding of orders and medals to workers of PEI for completion of the tasks in the 9th five-year plan and for creation of new techniques for space applications.

04.10.1977 Tests began on a model of high speed and high maneuverability of the nuclear-powered atomic submarine project 705K, cooled by the liquid metal lead-bismuth, designed by OKB "Hydropress" under the scientific leadership of PEI.

During 1977-1980, together with PEI, three atomic submarines of project 705K began operation.

1977 Construction was completed of the Computer Center of the Mathematical Department of the PEI.

In the Computer Center subsequently were placed and given to exploitation the computers: BESM-6 (1977), BESM-6 (1981), ES-1060 (1982), ES-1061 (1986), ES-1061 (1986), ES-1066 (1990): improved programs were developed for reactors and shielding.

1977 PEI was declared Head Organization of the Ministry on Thermophysics of Nuclear Power Facilities. The Coordination Council on Thermophysics was organized.

1978 The power start-up occurred of the full-scale ground prototype of the nuclear power reactor of the atomic submarine project 705 in NITI, in the city of Sosnovi Bor (Pine Forest) in the Leningrad region. This facility allowed accelerated regimes of utilization and power testing of equipment.

1978 The creation of BN-350 was recognized by the State Prize of the USSR.

1978 Complex measurements were made on the cross sections of radiative capture of neutrons by the nuclei in the pulsed accelerator EG-1 using the method of activation of a lead cube.

12.04.1979 Decree of the Presidium of the Supreme Council of the USSR of orders and medals to the workers of PEI for participating in the design and undertaking of complex tests of new techniques for the navy.

26.02.1980 Physical start-up of the reactor BN-600.

08.04.1980 Power start-up of the third block of the BAES using the reactor BN-600; the energy block provided electric current to Sverdlosk Energy. This energy block was developed together with OKBM, OKB "Hydropress" and VNIPIET.

1980 Decree of the Government of the USSR on the construction of fast reactors in Belayarsk and the South Urals region, which organized the work of the Institute and KB on the development of projects and programs of NIOKR.

1980 The conclusion of an important period of many years of investigations in PEI and in other organizations on the technological problems of lead-bismuth coolant. Technological means were developed for supporting the necessary quantity of coolant which provided for future, safe operation of the nuclear-power submarine, APL.

1980 The Center for Thermophysical Data was organized in PEI.

June 1981 Opening of the Sanatorium-Prophylactorium Institute with 300 rooms.

1981 For the scientific leadership of construction of naval power reactors for APL project 705, the State Prize of the USSR was awarded.

1981 Under the leadership of V. Ya. Pupko, investigations began in the field of physics of nuclear-excited plasmas and nuclear-pumped lasers.

1971-1981 Workers at PEI for this period were awarded 166 Candidate and 37 Doctors Degrees.

1981-1995 In the framework of the program of fundamental investigations, many new fission phenomena were discovered involving vibrational resonances: during emission fission, at cold fragmentation, and during fission of light nuclei induced by charged particles.

On the basis of three fast neutron spectrometers, at PEI (accelerator KG-0.3; EGP-10M; cyclotron) a series of works was completed on the measurement and analysis of neutron spectra, produced by the interaction of neutrons, protons, alpha-particles with the nucleus and by nuclear fission. Many results were derived for the first time and

served as the foundation for databases and for testing of theoretical models.

1981-1985 A microscopic theory was developed for collective excitations in excited nuclei.

1982 For the design of BN-600, the Lenin Prize was awarded to the group of scientists and specialists.

19.04.1982 The Scientific Research Sector of the Institute was reorganized as a Scientific Research Department.

1982 The Chemical Laboratory Building of the Institute began operation.

1983 Nuclear fuel elements were developed in the Bilibinsk ATEC using oxide fuel with enhanced burn-up.

Nuclear fuel elements were developed using nitride fuel for the reactor BR-10. Later together with PNITI (in the city of Podolsk), two cores for this reactor were designed.

1983 The exploitation and achievement of full power operation of the third energy block of the Beloyarsk AES (BN-600) was recognized by the award of the State Prize of the USSR.

1984 PEI was awarded the Order of the October Revolution.

1984 The Plant RT-1 began reprocessing fast reactor fuel using technology developed by VNIINM and PEI.

1985 The construction was completed of the spectrometric complex DIN-2K utilizing the reactor IBR-2 in Dubna.

In the following years, research investigations were completed on the physics of condensed matter, classical and quantum liquids, high temperature superconductors, metals and alloys with implanted impurities, liquid metals, and reactor moderators.

31.10.1985 For the construction of the Bilibinsk ATEC, the State Prize of the USSR was awarded to a group of scientists and specialists.

1985 The first version of the database was created, put into the computer and transferred to IAEA and in 1992, the second version of the domestically produced library of evaluated neutron data was given to IAEA.

1975-1985 Methods were developed and two-dimensional measurements of the spectra of delayed neutrons were completed.

1985-1990 Statistical methods were developed describing nuclear reaction cross sections and nuclear level densities.

The theory was developed describing charge-exchange and collective magnetic excitations in nuclei.

02.02.1987 The Thermoemission Nuclear Power Facility "TOPAZ" as a part of the apparatus of "Kosmos 1818" was successfully launched into the predicted orbit with the help of automatic launching at nominal parameters. This facility worked for one-half year, providing an electric power of 6.5 kilowatts.

1987 The issue of the experimental sequence of the isotope molybdenum--99 and beginning of its production sequence.

10.07.1987 The second thermoemission YaEU "TOPAZ" was successfully placed in the desired orbit as a part of the apparatus in "Kosmos-1867." The Facility operated for the estimated time (one year) at a power 7.2 kilowatts, completing the scientific program of the flight.

1987 The concept of laser systems was formulated using pumping from a pulsed nuclear reactor. This was called the Optical Quantum Amplifier with nuclear pumping, OKUYaN.

01.01.1988 The number of workers in PEI reached 9886 people, including in the main activity of 7364 people, the number of scientists was 1418, in which were 56 Doctors and 330 Candidates of Science. The number of workers 3529, included 397 people in experimental efforts.

The assets in the main funds were 203.94 million rubles, with an annual transfer to NIR and OKR of 57.16 million rubles, including 28.25 million rubles for industrial collaborative projects.

1988 The design was completed of a device for measuring activation energy for the control of thermodynamical activity of oxygen in lead-bismuth alloy. With this device, all installations, facilities and loops with lead-bismuth coolant are equipped.

1981-1988 The designs of electrogenerating channels were completed for high-power thermoemission reactors.

1965-1988 A many-year sequence of investigation was completed on hydrides of metals (zirconium, yttrium, and others) and their application as moderators in reactors of various purposes.

1960-1988 A long sequence of investigations and constructions was completed of high-temperature reactor systems for nuclear facilities of various purposes. Experimental facilities and test bases were completed. Currently, these works are stopped.

1988 Beginning of the development of reactor facilities of the evaporating type, working on the principle of the sodium heat pipe.

1989 For the test in Kosmos of thermoemission facility "TOPAZ," a group of scientists was awarded the State Prize of the USSR.

1989 For design of inorganic sorbents of a new type, the State Prize of the USSR was awarded.

1989 Production by the experimental set of generators of technetium-99m, beginning of the series of production for medical purposes.

1990 Beginning of works utilizing lead-bismuth coolant in civilian energy production and the project of blocks of the mobile ATEC "Angstrom."

1990 Construction of the 10 MW water thermo-physical facility for investigations of critical thermal loading of fuel elements of water-cooled reactors.

1990 Creation of the synthesis of biologically active labeled substances utilizing phosphorus; the beginning of serial production.

1990 On the bases of accumulated experience, the design of the demonstration facility "OKUYaN" began. The facility includes the ignition reactor block utilizing a two-core pulsed reactor using fast neutrons of the type "BARS-6" and a laser block, including laser active elements (LAEL), moderator and reflector of neutrons. The technological investigations are in progress of the elements of the basis of the facility.

In 1995, the physical and power start-ups of the ignition reactor of this facility were completed.

1987-1992 Work was completed on the reactor BN-800 for the purpose of increasing safety, developing experience from the projects. Approval was granted of the completed project by the oversite administration.

1992 In the Computer Center the computer Cyber-962 began operation.

1992 By the Decree of the Minister, PEI was named as the Head Organization for Radioactive Material Science and the Physics of Radiation Damage.

1992 Under the scientific leadership of PEI, in OKB "Hydropress" the design was finished of the projects of steam-producing facilities with increased safety using the lead-bismuth coolant for the AES.

December 1992 Under the scientific leadership of PEI, in OKBM the technical project was completed of the reactor facility ABV-67-01 with a thermal power of 38 MW for the floating ATEC "Wave Breaker -3."

1993 The electrostatic accelerator EGP-15, developed in PEI began operation, anticipating the possibility of accelerating many types of heavy ions.

1993 Investigations began on the problem of developing liquid metal targets using lead-bismuth coolant in electronuclear systems.

January 1994 Together with NIKIET the technological project of the reactor facility of the second series of the Bilibinsk AES was developed.

29.03.1994 By Decree of the Government of the Russian Federation, PEI was given the status of a State Scientific Center of the Russian Federation. (GNC, RF-PEI).

27.06.1994 The solemn celebration of the 40th anniversary of the first in the world AES. In Obninsk, the Scientific Conference of the Nuclear Society took place titled "Nuclear Power and Industry."

1995 Together with GNC, RF-PEI designed the concept and the program for developing nuclear space power in Russia for the period up to the year 2015.

1995 The technological system of radiation of film materials for production of track membranes on the accelerator EGP-15 began operation.

1995 Isotope production at PEI including 20 different isotopes.

1993-1996 Investigations of the ways to more effectively utilize power and weapons plutonium. Investigations of different variants of nuclear fuel cycle, investigations into the possibility of transmutation of actinides and long-lived fission products.

22 March 1996 GNC-RP PEI was named in honor of A. I. Leipunsky.

1996 In the Institute were 71 Doctors of Science, 370 Candidates of Science, and 3285 Scientific and Engineering-Technical Workers.

1996 Currently, AES and reactors developed under the supervision of the PEI continue to work successfully: the third block of Beloyarsk AES with the reactor BN-600 is working reliably at full power; the reactor BN-350 in Kazakhstan provided the energy needs of the region; in the reactor BOR-60, new nuclear fuel elements and equipment are being tested; Bilibinsk ATEC reliably supplies the needs of the city and industry; the reactor of the first in the world AES is used intensively as experimental reactor.

1946-1996 For 50 years, since the moment of founding until the present time, PEI closely collaborates with many institutes, organizations and enterprises of the country. Especially productive were collaborations with OKBM and Nizhnee Novgorod, OKB "Hydropress" in Podolsk, RNC-Kurchatov Institute, GNC RF-VNIINM, GNC RF-NIIAR, PNITI, NIKIET, NPO "Red Star", MIPhI, VNIPIET, LOAEP, GSPI, Machine Construction Plants in cities of Elektrostahl, St. Petersburg, Severodvinsk, Podolsk, and Nizhnee Novgorod.

During these 50 years, the Institute established very broad international connections; the Institute currently collaborates with many scientific organizations abroad.

For all of these 50 years, the Institute worked with the Obninsk administrative government which built the Institute and the city of Obninsk. In the Obninsk Building Organization, experienced and devoted to this business were the Leaders: D. S. Zakharov, N. G. Chukreev, I. S. Liuby, N. V. Kotov, K. N. Moskvina, and Yu. A. Oos, who made many successful and balanced buildings of the Institute and city. Directly in the Institute, people who devoted many efforts to the main construction were D. M. Obechkin, I. T. Tabulevich, V. V. Matveev, V. I. Puchkov, V. N. Silaev, E. M. Malomud, and A. T. Nenachov.

Since the organization of the Institute, much attention to its development was devoted by the leaders of the field: I. V. Kurchatov, A. I. Churin, A. M. Petrosyansk, N. A. Semyonov, A. D. Zverev, I. D. Morokov, N. A. Nikolaev, N. M. Sinev, A. G. Meshkov, L. D. Ryabev, V. F. Konvalov, V. N. Michaelov and others. Much attention was especially devoted to the Institute and city by E. P. Slavskaya.

The City Party Committee energetically contributed to the development of the Institute and the City, (I. G. Morozov, N. I. Borzov, E. E. Fedorov, I. V. Novikov) and City Council Peoples' Deputies (N. S. Antonyenko, P. I. Napreenko).

1996

**THE MAIN DIRECTIONS OF THE ACTIVITIES OF THE
INSTITUTE AT THE PRESENT TIME:**

1. NUCLEAR POWER

Reactors using fast neutrons; water-water and water-graphite reactors; reactors with liquid metal cooling for mobile and stationary purposes; on-board power facilities for space applications; lasers with nuclear pumping.

2. FUNDAMENTAL AND APPLIED INVESTIGATIONS

The physics of reactors and reactor shielding; nuclear and neutron physics; physics of nuclear pumping of lasers; physics of direct transformation and low-temperature plasmas; solid state physics ; thermophysics and hydrodynamics; technology of coolants, corrosion and mass transport; technology of reactor materials, fuel elements, and cores; radioactive material science; radiochemistry; applied analytical chemistry; computational applied mathematics.

**3. NUCLEAR TECHNOLOGIES -- FOR CIVILIAN
INDUSTRY**

Isotopes for medicine and scientific investigations; devices for medicine, industry, scientific investigations and ecological control; non-traditional sources of energy; methods of high purification of metals from impurities; methods and tools of filtration and cleaning of different media.

LAUREATES OF THE LENIN AND STATE PRIZES OF THE USSR -- TO COLLABORATORS OF GNC RF-PEI

LENIN PRIZES

1957 The Lenin Prize was awarded to **D. I. Blokhintsev, N. A. Dollezhal, A. K. Krasin, and V. A. Malikh** for design and construction of the first-in-the-world AES.

1960 For investigations into the physics of reactors using fast neutrons, the Lenin Prize was awarded to scientists of Laboratory "B." The Prize was awarded to **I. I. Bondarenko, O. D. Kazachkovski, A. I. Leipunsky, and L. N. Usachev.**

1961 The Lenin Prize was awarded to collaborators of PEI and other organizations for the construction of the facility 27/VT and for completing a sequence of investigations. In PEI, the Lenin Prizes were awarded to **B. F. Gromov, I. M. Gusakov, K. I. Karich, V. A. Kuznetsov, and G. I. Marchuk.**

1964 The Lenin Prize was awarded for design, construction, and experimental exploitation of the APL Project 645. In PEI, the Prize was given to: **D. M. Ovechkin, V. I. Subbotin, and A. P. Trephonov.**

1982 For design and construction of the facility, BN-600, the group of scientists and specialists were awarded the Lenin Prize, including **V. V. Orlov and M. F. Troyanov.**

STATE PRIZES

1970 For design, initiation and exploitation of the first block of the Beloyarsk AES, named in honor of I. V. Kurchatov, to the group of scientists and engineers was awarded the State Prize of the USSR, including the collaborators of the PEI, **L. A. Kochetkov and M. E. Minashin.**

1970 For design of a new method for regulation of nuclear reactors, the State Prize of the USSR was awarded. In PEI, the Prize was given to **A. A. Bakulevski and V. V. Orlov.**

1971 For design of the Impulse Fast Reactor, IBR, the State Prize of the USSR was awarded in PEI to **I. I. Bondarenko** (posthumously) and **F. I. Ukraintsev.**

1973 For design and construction of the facility for thermoemission conversion of nuclear energy into electrical energy -- "TOPAZ," the State Prize of the USSR was awarded. In PEI, the Prize was awarded to **A. I. Yeltsov, I. P. Zasorin, D. M. Ovechkin, and V. Ya. Pupko.**

1974 For design and testing of the facility "BUK," the State Prize was awarded to the following in PEI: **V. D. Bankrashkov and V. A. Kushnetsov.**

1974 For design and construction of the experimental on-board reactor BOR-60, the State Prize of the USSR was awarded. In PEI, the Prize was awarded to **A. V. Karpov and F. A. Kozlov.**

1978 For design, initiation and exploitation of the reactor BN-350, the State Prize of the USSR was awarded. In PEI, the Prize was awarded to **Yu. E. Bagdasarov and M. F. Troyanov.**

1981 For scientific leadership in construction of naval power facilities for the APL Project 705, the State Prize of the USSR was awarded to **B. F. Gromov.**

1983 Putting into action and adjusting the projected power of the third energy block of the Beloyarsk AES (BN-600) were awarded the State Prize of the USSR. In PEI, the Prize was conferred upon **L. A. Kochetkov.**

1985 For construction of the Bilibinsk ATEC, the group of scientists and specialists were awarded the State Prize of the USSR, including the collaborators in PEI, **V. V. Dolgov, V. D. Petrov, and V. N. Sharapov.**

1989 For providing flight-construction tests of thermal emission nuclear-energetic facility "TOPAZ" in the set of Sputniks, Cosmos-1818 and Cosmos-1867, to a group of scientists and specialists the State Prize of the USSR was awarded, including the collaborators in PEI, **P. N. Bologov and M. N. Ivanovski.**

1989 By the State Prize of the USSR, the design of the inorganic sorbent of a new type was awarded for the purification of water coolants. In PEI, the Prize was awarded to **M. I. Bugreev.**

**Laureates of the Lenin Prize for the Design Of New Techniques
And The Completion Of Special Tasks Of The Government,
who were given this title before they were employed in PEI.**

**A. A. Ovchinnikov
M. P. Rodionov
A. E. Romanchenko**

**Laureates of the State Prize of the USSR for Design Of New
Techniques And Completion Of Special Tasks of the
Government, who were given this title before they were
employed in PEI**

**V. P. Gregoriev
B. G. Dubovsky (twice)
R. V. Yegorov
I. V. Morosov
A. F. Popov
M. P. Rodionov (twice)
M. N. Tiranov**

1996 For research on providing safe exploitation of elements of stationary and on-board nuclear energetic facilities, the prize of the Government of the Russian Federation was awarded. Among laureates of the prize the collaborator in GNC RF-PEI was **E. K. Pilchenkov.**

ACADEMICIANS, COLLABORATORS OF GNC RF-PEI AT VARIOUS TIMES WHO WORKED OR ARE IN THE INSTITUTE

N. V. Ageev, Academician ACADEMY OF SCIENCES USSR
D. I. Blokhintsev, Member-Correspondent ACADEMY OF
SCIENCES USSR and ACADEMY OF SCIENCES Ukrainian
SSR

A. I. Leipunsky, Academician ACADEMY OF SCIENCES
USSR

G. I. Marchuk, Academician ACADEMY OF SCIENCES USSR,
now Academician RUSSIAN ACADEMY OF SCIENCES

V. I. Subbotin, Academician ACADEMY OF SCIENCES USSR,
now Academician RUSSIAN ACADEMY OF SCIENCES

A. K. Drasin, Academician ACADEMY OF SCIENCES
BELORUSSIAN SSR

P. L. Kirillov, Academician of the Russian Academy of Engineering
Sciences

P. P. Dyachenko, Member-Correspondent of the Russian Academy
of Natural Sciences

N. S. Rabotnov, Member-Correspondent of the Russian Academy
of Natural Sciences

DISTINGUISHED FIGURES OF SCIENCE AND TECHNIQUES OF THE RUSSIAN FEDERATION, COLLABORATORS OF THE GNC RF-PEI

V. N. Bikov
N. I. Buleev
B. F. Gromov
M. N. Ivanovsky
O. D. Kazachkovsky
P. L. Kirillov
Yu. V. Konobeev
Yu. I. Likhachev
M. E. Minashin

V. Ya. Pupko
M. P. Rodionov
A. N. Rizhkov
G. N. Smirenkin
V. N. Stepanov
G. I. Toshinsky
M. F. Troyanov
V. N. Sharapov

**DISTINGUISHED PEOPLE RESPONSIBLE FOR ENERGY
IN THE RUSSIAN FEDERATION, COLLABORATORS OF
GNC RF-PEI**

**Yu. E. Bagdasarov
V. V. Dolgov
V. P. Kotin**

**L. A. Kochetkov
A. G. Pertsovsky
Yu. A. Sergeev**

**DOCTORS OF SCIENCES, COLLABORATORS OF GNC
RF PEI WHICH WERE OR ARE WORKING IN THE
INSTITUTE**

**A. A. Abaryan
N. V. Ageev
V. M. Agranovich
P. A. Androsenko
V. B. Anufrienko
M. N. Arnoldov
Yu. E. Bagdasarov
Yu. S. Belomitchev
D. I. Blochintsev
V. P. Bobkov
V. K. Boratirev
P. M. Bologov**

**G. I. Gushin
A. S. Davidov
A. N. Deryugin
V. M. Dmitriev
B. G. Dubovsky
V. A. Dulin
P. P. Dyachenko
E. I. Efimov
V. A. Zherebtsov
A. V. Zhukov
I. P. Zasorin
V. G. Zolotukhin
A. V. Zrodnikov
M. X. Ibragimov**

**I. I. Bondarenko
D. L. Broder
N. I. Buleev
V. N. Bikov
A. A. Vankov
Yu. V. Volkov
B. N. Gabrianovich
E. V. Gai
V. N. Glazanov
I. N. Gorelov
B. F. Gromov
I. M. Gusakov**

**Yu. D. Levchenko
A. I. Leipunsky
Yu. I. Likachev
N. I. Loginov
V. S. Lyashenko
B. P. Maksiutenko
V. A. Malikh
V. N. Manokhin
P. N. Martinov
G. I. Marchuk
L. A. Matalin
E. S. Matusevich
M. E. Minashin
A. I. Mogilner**

Sh. Sh. Ibragimov
M. N. Ivanovsky
A. V. Ignatiuk
I. V. Istomin
Yu. A. Kazansky
O. D. Kazachkovsky
S. P. Kaznovsky
S. P. Kamerdzhiev
A. G. Karabash
P. L. Kirillov
V. P. Kovalev
F. A. Kozlov
Yu. V. Konobeev
V. N. Kononov
A. K. Krasin
N. N. Krasnov
V. A. Kuznetsov
B. D. Kuzminov
I. M. Kurbatov
V. I. Kukhtevich
M. A. Lebedev
S. Ya. Lebedev

V. M. Selivanov
V. P. Semenov
A. N. Serbinov
G. N. Smirenkin
A. P. Sorokin
V. S. Stravinsky
Yu. Ya. Stravinsky
O. V. Starkov
E. A. Stumbur
V. I. Subbotin
V. A. Tolstikov
G. I. Toshinsky
M. G. Troyanov

V. M. Murogov
B. A. Nevzorov
M. N. Nikolaev
A. G. Novikov
G. M. Obaturov
L. N. Ovander
V. V. Orlov
Yu. I. Orlov
D. V. Pankratov
V. P. Paschenko
Sh. I. Peizulaev
E. E. Petrov
V. M. Poplavsky
Yu. A. Prokhorov
V. Ya. Pupko
N. S. Rabotnov
A. A. Rineisky
V. A. Romanov
G. Ya. Rumyantsev
V. A. Ryabov
O. A. Salnikov
I. P. Sviridenko

A. S. Trofimov
L. A. Trikov
L. N. Usachev
P. A. Ushakov
V. S. Fedotovskiy
V. V. Frolov
S. G. Tsipin
V. M. Chernov
B. A. Shmatko
Yu. N. Shubin
G. L. Yudin
Yu. S. Yurev

**DISTINGUISHED INVENTORS OF RUSSIA,
COLLABORATORS WITH GNC RF-PEI**

**Yu. I. Gribanov
B. G. Dubovsky
A. G. Karabash**

**LEADERS OF THE COLLECTIVE OF THE FIRST IN THE
WORLD AES**

**N. A. Nikolaev
A. N. Grigoryants
G. N. Ushakov**

**V. S. Severyanov
Yu. A. Stuzhnev**

**SCIENTIFIC AND ADMINISTRATIVE LEADERS OF THE
INSTITUTE FOR THE PAST 50 YEARS
(1946-1996)**

L. S. Buyanov, Head of Laboratory "B"
from 21.04.1946 to 14.06.1947

P. I. Zakharov, Head of Laboratory "B"
from 24.07.1947 to 13.06.1950

D. I. Blokhintsev, Director of Laboratory "B"
from 13.06.1950 to 02.04.1956

A. K. Krasin, Director of Laboratory "B"
from 04.04.1956 to 04.01.1960

M. P. Rodionov, Director of PEI
from 04.01.1960 to 11.04.1968

V. A. Kuznetsov, Director of PEI
from 15.04.1968 to 29.08.1973

O. D. Kazachkovsky, Director of PEI
from 29.08.1973 to 10.08.1987

M. F. Troyanov, Director of PEI
from 10.08.1987 to 22.06.1992

V. M. Murogov, Director of PEI
from 23.06.1992 to 09.01.1996

A. V. Zrodnikov, DIRECTOR GNC RF-PEI
FROM 10.01.1996 TO THE PRESENT

A. I. LEIPUNSKY, SCIENTIFIC LEADER OF PEI,
from 27.05.1959 to 14.08.1972

V. I. SUBBOTIN, SCIENTIFIC LEADER OF PEI
from 03.07.1991 to 07.10.1993

In different periods of time, in the position of Head Engineer of the Laboratory "B" were: **N. I. Korobkov and D. M. Obechkin.**

In different periods of time, in the position of Deputy Director-Head Engineer of PEI were: **D. M. Ovechkin and V. N. Silaev.**

In different periods of time, in the position of Deputy Director of the Institute for scientific work were: **A. K. Krasin, V. N. Glazanov, I. I. Bondarenko, O. D. Kazachkovsky, V. A. Malikh, V. I. Subbotin, M. F. Troyanov, I. P. Zasorin, L. A. Kochetkov, A. V. Zrodnikov.**

In the position of Deputy Director for General Problems and Capital Construction were: **P. I. Zakharov, I. T. Tabulevich, V. N. Silaev, A. T. Nenakhov, Yu. A. Kalinin.**

In the position of Deputy Director for Capital Construction was: **V. I. Puchkov.**

In the position of Deputy Director for Management and Maintenance: **S. E. Borisjuk and A. V. Lukyanov.**

In the position of Deputy Director for Regime were: **I. I. Leitan, A. G. Sokolov, M. Ya. Pushkarev, Yu. P. Mazerkin.**

In the position of Assistant Director for Staff were: **P. A. Morozov, I. S. Burlaka, G. V. Levchenko.**

In the position of Scientific Secretary of the Institute were: **G. A. Lazarev, V. B. Anufrienko, V. M. Murogov.**

In the position of Head of Accounting were: **I. D. Gamanov, S. M. Pletenets, G. I. Kozlov, Yu. A. Lebedev.**

In the position of Head of Sector or (after 1982) Director of the Department of the Institute were: **B. F. Gromov, V. A. Malikh, V. V. Orlov, V. I. Subbotin, L. N. Usachev, later I. P. Zasorin, P. L. Kirillov, L. A. Kochetkov, V. N. Stepanov, M. F. Troyanov.**

In the Jubilee of 1996 the Administration of PEI are working in the following positions:

A. V. Zrodnikov	Director, GNC RF-PEI
V. V. Kuzin	First Deputy Director --
	Head Engineer GNC RF-PEI
V. B. Anufrienko	Deputy Director for Scientific Work
B. F. Gromov	Deputy Director for Scientific Work
V. V. Dolgov	Deputy Director for Scientific Work
V. M. Poplavsky	Deputy Director for Scientific Work
N. S. Rabotnov	Deputy Director for Scientific Work
A. N. Rizhkov	Deputy Director for Scientific Work
V. A. Bessudnov	Deputy Director for Staff
A. E. Besspalov	Deputy Director for Finance
V. G. Kochkarev	Deputy Director for Management and Maintenance
G. P. Khoptinsky	Deputy Director for Capital Construction
V. M. Kupriyanov	Scientific Secretary
T. V. Kuznetsova	Main Accountant
K. G. Savina	Secretary of the Director (since 1953)

Directors of the Scientific-Research Departments of the Institute

Department 1	B. D. Kuzminov
Department 2	V. M. Poplavsky
Department 3	G. I. Toshinsky
Department 4	A. N. Rizhkov
Department 5	V. Ya. Pupko
Department 6	A. D. Efanov
Department 7	V. V. Dolgov
Department 8	P. P. Dyachenko

**Buyanov
Leonid
Sergeevich**
(1911-1949)

From April 1946 to June 1947 Head
of Laboratory "B"

**Zakharov
Peter
Ivanovich**
(1907-1965)

Graduate of the
Dnieperpetrovsky Engineering-
Technical Institute

From July 1947 to June 1950

Head of Laboratory "B"

For leadership in the construction
of the First AES, he was awarded
the Order of Lenin. Awarded the
Order of the Red Banner and
medals "For the Defense of
Stalingrad," and "Partisan of the
Great Patriotic War of the First
Degree."

**Blokhintsev
Dimitry
Ivanovich**
(1908-1979)

Graduated from Moscow State
University
From 1950 until 1956,
Director of Laboratory "B"
One of the Founders of the PEI.
Headed Design and Construction
of the First AES.
Corresponding Member of the
Academy of Sciences of the
USSR
Hero of Socialist Labor
Laureate of Lenin and twice
awarded State Prizes.

**Krasin
Andrei
Kapitonovich**
(1911-1981)

Graduated from Tomsk State
University
From 1956 to 1960 Director of
Laboratory "B". One of the
founders of the PEI and creators of
the first in the world AES.
Head of Development of the Heat
Reactors. Academician of the
Academy of Sciences of the
Belorussian SSR.
Laureate of the Lenin Prize

**Leipunsky
Alexander
Ilich**

(1903-1972)

Graduated from the Leningrad Polytechnical Institute.

From 1959 to 1972 Scientific Head of the PEI. One of the Founders of the Institute. Academician of the Academy of Sciences of the Ukrainian SSR. Hero of Socialist Labor.

Laureate of the Lenin Prize

**Rodionov
Michael
Petrovich**

(1904-1976)

Graduated from the Ural Polytechnic Institute

From 1960 to 1968, Director of the PEI. Laureate of the Lenin and twice State Prizes, Distinguished figure of Science and Techniques of the Russian Soviet Federated Soviet Republics.

**Kusnetsov
Vyachaslav
Alekseevich**
(1926-1994)

Graduated from Moscow Energetic
Institute
From 1968 to 1973 Director of PEI.
Doctor of Physico-Mathematical
Sciences
Laureate of Lenin and State Prizes

**Kazachkovsky
Oleg
Dimitriyevich**

Graduated Dnieperpetrovsk State
University
From 1973 to 1987 Director of
PEI
Doctor of Physico-Mathematical
Sciences, Professor
Laureate of Lenin Prize
Distinguished figure of Science
and Techniques RSFSR.

**Troyanov
Michael
Fedotov**

Graduated from Moscow
Engineering Physical Institute
From 1987 to 1992, Director of PEI.
Doctor Physico-Mathematical
Sciences, Professor.
Laureate of Lenin and State Prizes.
Distinguished Figure of Science and
Techniques RSFSR

**Subbotin
Valery
Ivanovich**

Graduated Azerbaijan Industrial
Institute
From March 1969 to June 1975 Deputy
Director for Scientific Work, From July
1991 to October 1993 Scientific Leader
of the PEI
Academician of the Russian Academy
of Sciences
Laureate of the Lenin Prize

Murogov
Victor
Michaelovich
Graduated from Moscow
Engineering Physical Institute
(MIFI)
From June 1992 to December
1995 Director GNC RF-PEI
Doctor of Technical Sciences
Professor

Zrodnikov
Anatoly
Vasilevich
Graduated from Moscow Energetic
Institute
From January 1996 Director of
GNC RF-PEI
Doctor of Physico-Mathematical
Sciences

Bondarenko

Igor

Ilich

(1926-1964)

Graduated from Moscow State University

From March 1962 to May 1964

Deputy Director of Scientific Work of the Institute.

Doctor of Physico-Mathematical Sciences

Professor

Laureate of the Lenin and State Prizes

Gromov

Boris

Fedorovich

Graduated from Moscow Energetic Institute

Since 1974 Deputy Director of the Institute for Scientific Work.

Doctor of Technical Sciences, Professor. Laureate of Lenin and State Prizes, Distinguished Scientist and Technical Worker by the RF, Member of the New York Academy of Sciences

**Kirillov
Pavel
Leonidovich**
Graduated from Moscow
Energetic Institute
Worked in PEI since 1950
Director of the Thermo-Physical
Department until 1995
Doctor of Technical Sciences,
Professor,
Academician of the International
Engineering Academy and
Russian Academy of
Engineering Sciences.
Distinguished Scientist and
Technical Worker of the Russian
Federation

**Lyashenko
Vasily
Savvich**
(1908-1961)
Graduated from Leningrad
Metallurgical Institute
Worked at the Institute from 1950 to
1961. Head of the Department of
Material Sciences
Doctor of Chemical Sciences,
Professor

**Malikh
Vladimir
Aleksandrovich**
(1923-1973)

Worked in the Institute from 1949 to 1970. From March 1962 to April 1969 Deputy Director of the Institute for Scientific Work
Doctor of Technical Sciences, Professor. Hero of Socialist Labor, Laureate of the Lenin and State Prizes

**Marchuk
Gury
Ivanovich**

Graduated from Leningrad State University. Worked in PEI from 1953 to 1962.

Russian Academy of Sciences of the USSR from 1986 to 1991
Laureate of Lenin and State Prizes, Hero of Socialist Labor

**Minashin
Michael
Igorovich**

(1921-1995)

Graduated from Moscow
Energetic Institute

Worked in PEI since 1951.

Doctor of Technical Sciences,
Professor. Laureate of the State
Prize, Deputy Director of Science
and Technology RF.

**Ovechkin
Demyan
Michaelovich**
(1912-1982)

Graduated from the Kharkov
Mechanical Machine Construction
Institute.

Worked in the Institute from 1950 to
1980. Head Engineer of the Institute.
Candidate of Technical Sciences.
Laureate of the Lenin and State
Prize

**Orlov
Victor
Vladimirovich**

Graduated from Moscow State University

Worked in the Institute from 1953 to 1974. Russian Academy of Natural Sciences, Laureate of Lenin and State Prizes.

**Pupko
Victor
Yakovlevich**

Graduated from Moscow Energy Institute, Worked in PEI since 1950. Since 1964 Head of Sector, Department Director of PEI. Doctor of Physico-Mathematical Sciences,

Professor. Laureate of the State Prize, Deputy Director of Science and Techniques RF, Member of the New York Academy of Sciences

**Tabulevich
Joseph
Titovich**

(1906-1994).

Graduate of the Dneprovsky
Engineering-Construction
Institute. From 1951 to 1969
Deputy Deputy Director of PEI
for General Problems and
Construction.

Laureate of the Prize of the
Soviet Ministry for Design and
Construction of the city of
Obninsk

**Usachev
Lev
Nikolievich**
(1926-1983)

Graduated from Moscow State
University. Worked in the Institute
from 1948 to 1983. Director of the
Department of Nuclear and Neutron
Physics. Doctor of Physico-
Mathematical Sciences, Professor,
Laureate of the Lenin Prize.

**Group of Participants in the Construction of the First in the
World AES**
(from left to right):
V. A. Malikh, L. A. Gerasova, M. E. Minashin, D. M. Ovechkin,
A. I. Leipunsky, I. T. Tabulevich, E. I. Drabkina,
D. I. Blokhintsev, A. K. Krasin.
(1957)

Sources:

1. Documents from the Archives of GNC RF-PEI
2. History of the Development of PEI (Two Volumes), responsible editors: O. D. Kazachkovsky, V. A. Kuznetsov, Layout editors: V. B. Anuphrienko, L. I. Kudinova. Publications of PEI in 1972 and 1986. Archives of GNC RF-PEI.
3. To the History of Peaceful Uses of Atomic Energy in the USSR. 1944-1951. Documents and Materials. MINATOM of Russia. GNC-PEI; responsible editor: V. A. Sidorenko. Compilers: L. I. Kudinova, A. V. Schegelskay. Obninsk, 1994.
4. Short Essay on the History of the PEI and its Party Organization from 1946 to 1980 in three volumes. PEI. Compilers: P. N. Slusarev, P. A. Belichenkov, V. S. Belinsky, A. V. Kamaev, Obninsk, 1982.
5. Private Communications: B. F. Gromov, M. F. Troyanov, P. M. Bologov, P. P. Dyachenko, I. N. Gorelov, P. L. Kirillov, V. E. Kolesov, L. A. Kochetkov, B. D. Kuzminov, F. P. Raskacha, V. A. Romanov, E. Ya. Smetanin, V. N. Sharapov, V. V. Chekunov.

The materials in this brochure were selected and prepared for publications by:

A. V. Kamaev, N. I. Ermolaev, R. G. Sidorova, A. N. Ulaev

AES = Atomic Energy Facility
 APL = the atomic nuclear powered submarine
 ATEC = Atomic Heat and Electric Center
 BUK = Russian name for the beech tree
 CND = the Center for Nuclear Data.
 CNK = Council of the Folk Commissars
 ECM = Electronic Calculation Machine = computer
 ETR = engineering-technical workers
 FMD = First Main Department (PGU in Russian)
 JINR = Joint Institute for Nuclear Research, in Dubna
 KB = Construction Bureau
 LAEL = laser active elements
 LYaB = Laboratory of Nuclear Safety
 LIPAN = Laboratory of the Institute of Problems of the Academy of Science
 MAGATE = IAEA (International Atomic Energy Agency, with headquarters in Vienna)
 MVD = Ministry of Internal Affairs
 MCM = Ministry of Medium Machine Construction
 MIPhI = Moscow Institute of Physics and Engineering

 NII = Scientific Research Institute
 NTS = Scientific-Technical Council of the PGU
 NIKIET = Research Investigation for Construction ...
 NPO = Scientific Manufacturing Union
 OKUYaN = the Optical Quantum Amplifier with Nuclear Pumping,
 PEI = Physico Energetic Institute
 PGU = First Main Department
 TVEL = nuclear fuel elements
 STRELA (Russian for Arrow) = one of the early computers used for reactor design
 YaRD = a small-size, high temperature nuclear missile engine

Photographs: A. M. Pavliutkin and the Archives of PEI

Cover: N. A. Yaroslavsky

Design and Layout: P. Yu. Penkov and T. V. S. 1996