

Modernization and safety improvements at Novovoronezh nuclear power plant -3 and -4



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The project to provide equipment for short-term safety improvements of Novovoronezh nuclear power plant was first identified in the draft first six month work program of the NSA (Nuclear Safety Account) of 1993, managed by the EBRD.

The measures proposed were justified by the safety review and recommendations of the IAEA, expressed in the project review meeting II on the VVER-440/230 safety program (Oct.–Nov.'91) and in the Tecdoc-640 (February '92).

The tasks also called for consultant services for management and engineering support, as well as services for public information to explain the proposed improvements.

Rosenergoatom (REA) and GAN (Russian Safety Authorities) approved the project proposal, and following this, a grant agreement was concluded with the Russian federation in June '95, under which the NSA made grant funds available for both Novovoronezh and Kola nuclear power plants for implementation of a number of operational and near-term technical safety improvements.

The NSA funds were administered by the EBRD and the plant itself retained the ul-

timite responsibility for the whole nuclear safety account project.

Following selective tendering, an agreement was signed in July '95, between Novovoronezh nuclear power plant and the ENAC (European Nuclear Assistance Consortium) to act as consultant to manage and support the Project Management Unit (PMU). The services for public information were not included in the contract. After fulfillment of the conditions of contract, to be realized by the Russian parties, it became effective in November '95. For engineering services to support the safety improvements, REA and Novovoronezh nuclear power plant signed a contract end of October '95 with Moht-Otzigh (Russian engineering consortium). This contract was completed shortly after with a sub-contract concluded by Belgatom with Moht and Atomenergoexport. This arrangement allowed sharing, at 50% level each, the funding of the engineering services activities between the NSA and the Tacis '91 project 1.5 – re-orientation. These contracts became effective in the second half of 1996.

Project teams

The main executors of the works were Atomenergoprojekt (AEP) and Hidropress engineering offices from Moscow. The management and coordination of these contracts was also the PMU's responsibility.

ENAC was in charge of the overall management of the NSA project and the ENAC member companies participating in the project were: Belgatom (BA) from Belgium as leader, Empresarios Agrupados (EA) from Spain as technical advisor and NNC from England as procurement and contractual advisor.

As requested in the contract, a PMU was established at Novovoronezh from the beginning of 1996 for the duration of the project and consisted of an integrated team of Russian specialists from the plant and of ENAC personnel from the member companies, permanently based at site.

The number of specialists involved in the PMU activities during the peak period

were seven Russian specialists and three ENAC consultants. This team was seconded by Novovoronezh nuclear power plant specialists and by a team of ENAC project engineers, eight specialists from the participating member companies, to be called upon on an as-needed basis.

The main responsibilities of the PMU were preparation of the project procedures (QA, engineering, procurement and project instructions); management of the office administration and of the design, technical, contractual and procurement activities for supply of equipment; training and transfer of know-how in the administrative, procurement and engineering fields.

Quality assurance

The QA Program to be followed during the project implementation was defined in the early stages in accordance with ISO Standards.

The technical specifications for the operational safety improvements were produced by Novovoronezh nuclear power plant and the PMU and approved by REA and GAN.

The technical specifications for the near-term technical safety improvements were prepared by AEP and Hidropress. They were reviewed and approved by Novovoronezh, the PMU and REA and finally by GAN for compliance with the Russian Federation regulatory requirements.

The detailed design, using the technical information of the suppliers, was carried out by AEP and Hidropress, reviewed and approved by Novovoronezh and GAN.

The engineering manual of the PMU detailed the instructions for tasks to be carried out.

Procurement

The procurement manual of the PMU set the procedures to follow through the procurement process and ensured that the EBRD's procurement policies and rules were strictly followed.

Invitations for tenders on the 14 items of supply equipment were published in the

EBRD's "Procurement Opportunities", by REA in Russia and where appropriate, pre-tender site visits were organized.

All tenderers were requested to produce evidence of compliance of their QA System with ISO 9000. The suppliers' quality aspects of manufacturing were monitored. Following the formal opening of tenders, the evaluation process was coordinated by the PMU with the participation of REA, GAN, the design institutes and Novovoronezh nuclear power plant. The evaluation reports were submitted to the EBRD for approval, after which the PMU prepared the contracts, which were concluded between Novovoronezh and the suppliers.

During contract execution, regular contract progress meetings were organized with the suppliers.

The licensing procedure of GAN required that the suppliers obtain the permission to manufacture after review of their design documentation. In some cases, suppliers experienced difficulties in demonstrating that their design based on Western standards complied with those of the Russian Federation. These were resolved by reviews of the suppliers' design, substantiated by engineering reports, carried out by Russian institutes accredited by GAN.

Factory acceptance tests were carried out at the suppliers' works and witnessed by representatives of Novovoronezh nuclear power plant, PMU, REA and GAN as appropriate.

Equipment

Training of Novovoronezh nuclear power plant personnel for the operation and maintenance of the equipment was provided by all suppliers.

The majority of the equipment purchased for the near-term technical safety improvements required additional materials for installation, which originally were supposed to be acquired by Novovoronezh. But due to the financial difficulties of the plant, the NSA budget was amended after the August '98 financial crisis in Russia, to cover the payment of these additional materials.

Erection and commissioning

The erection of equipment not requiring a unit outage proceeded normally.

At unit-3, the equipment installation (batteries) was completed in '98.

The erection of equipment for unit 4 necessitating an outage was supposed to begin in November '98, but due to an unscheduled extended shut-down of unit 5 during the winter period, it had to be postponed until March '99. This delay was a force majeure that pushed back the project schedule by about 6 months.

Before starting the erection process, GAN's licensing agreement had to be obtained for installation of the equipment.

The erection of major equipment for unit-4, i.e. valves, safety valves and instrumentation, lasted from end of March to beginning of July '99. Additional works were performed afterwards on the instrumenta-

tion side with the unit already in service. All installation, testing and commissioning was carried out by Novovoronezh nuclear power plant, with the technical support of the suppliers. The role of the PMU was mainly administrative support.

At the conclusion of erection period, GAN issued the operating license for unit 4 in July '99.

After the installation of all equipment, both units restarted without any problem.

Conclusions

Some delays occurred during the performance of the project, but they were mainly due to the difficulties encountered early at the start of the project and at the time of establishment of the technical specifications. The 6 months delay at the time of erection was due to unforeseen circumstances.

The objectives of the NSA project were fully achieved by implementing operational and near-term technical safety upgrades at Novovoronezh. Overall it took longer than initially planned, but it was completed well below the scheduled budget.

The EBRD, REA and Novovoronezh nuclear power plant expressed their full satisfaction at the conclusion of the project.

The undeniable success of the project was mainly due to the fact that ENAC's consultant team performed the maximum activities on site in close collaboration with Russian and foreign participants.

Further details of Novovoronezh nuclear power plant can be obtained on the web at www.nvnnpp.vrn.ru ●