EXPERIMENTAL & DESIGN ORGANIZATION
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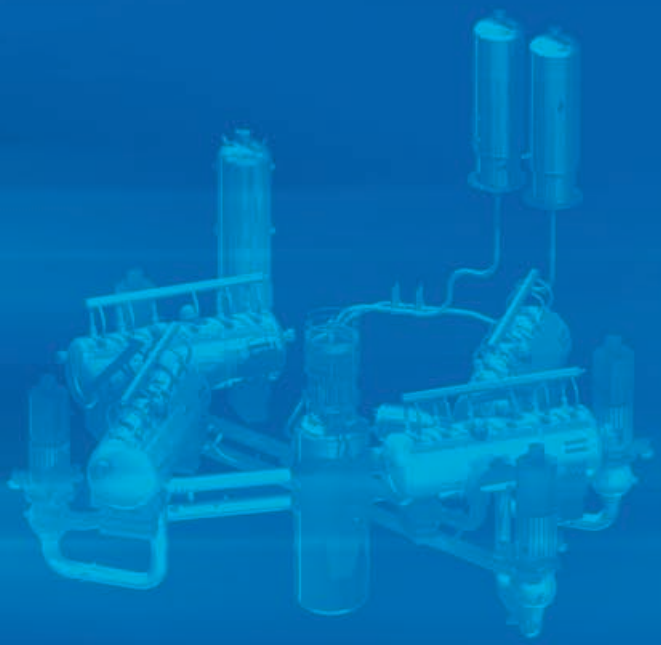


The AES-2006 reactor plant, a strategic choice

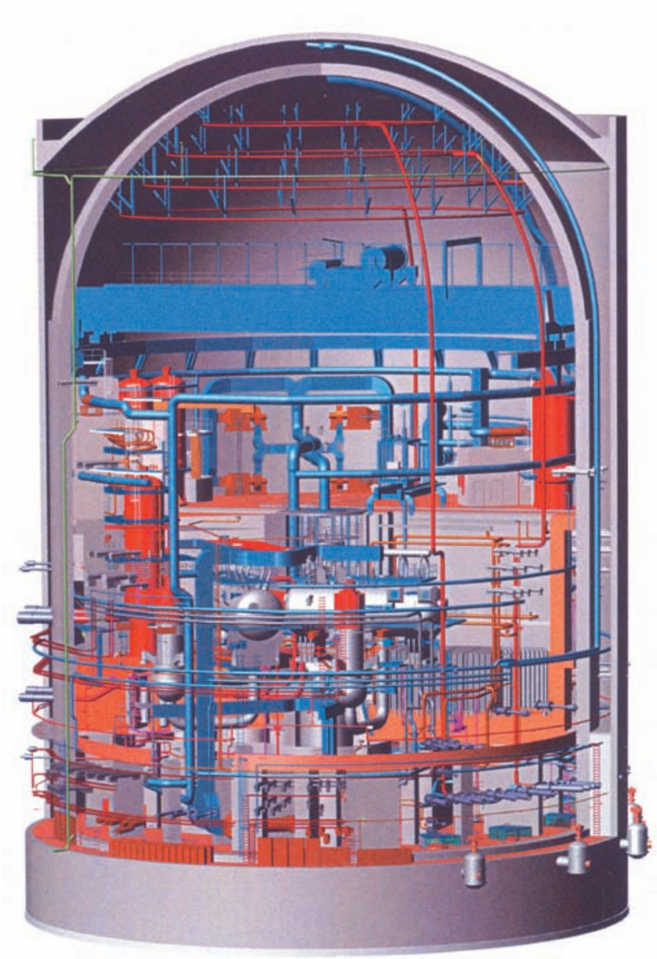
Key assets to support a strategic choice

Evolutionary, safe and innovative design

- The AES-2006 is a WWER type reactor plant of 1200 MW power. Its design is based on experience feedback from several thousand reactor/years of WWER NPP operation, it incorporates the most recent WWER-1000 technologies, applied to Unit 3 of Kalinin NPP, Unit 2 of Balakovo NPP, Unit 1 of Volgodonsk NPP in Russia, “Tianwan” NPP in China, “Kudankulam” NPP in India.
- The AES-2006 RP is currently under development for the sites of Unit 2 of Novovoronezh NPP and Unit 2 of Leningrad NPP.
- The AES-2006 RP design integrates the results of dozens of R&D. The complex of multipurpose design solutions is put in the design basis for implementation of an evolutionary continuity concept to exclude additional extensive R&D.
- The AES-2006 RP has safety systems that allow for reducing the exposure doses of personnel and minimizing the release of radioactive substances into the environment under anticipated operational occurrences, design basis accidents and beyond design-basis accidents. The reactor plant is resistant to external hazards, especially, airplane crashes and earthquakes. Safety is ensured by implementation of a defence-in-depth concept. Design engineering solutions are aimed at application of inherent safety properties of WWER reactors.

Continuity in manufacture and construction technology

- The AES-2006 RP is a direct descendant of the well-proven WWER RPs, guaranteeing fully mastered technology.
- Application of the mastered technology excludes any design, manufacture and operating risks.
- The high level of professional skills of the WWER NPP operating personnel is maintained.
- Experience in designing, manufacturing, construction and operation of WWER NPPs in Russia and abroad and PWR abroad is used.



High quality of engineering solutions and design documentation is based on application of home rules, regulations and standards in the field of nuclear power, recommendations of IAEA, EUR, INSAG, ICRP, IEC and other international recommendations, home rules in the field of quality assurance, ISO 9001-2000 international standards in the scope that ensures competitiveness at the foreign market.

Competitiveness is achieved through:

- Unit electric power is 1200 MW;
- Efficiency factor (gross) is 35,9 %;
- Service life of irreplaceable equipment is at least 60 years;
- Enhanced fuel utilization;
- Operational factor, averaged, for the entire service life of the NPP is 92 %;
- Availability factor, averaged, for the entire service life of the NPP is 90 %;
- Use of up-to-date fuel cycles;
- Period between refuellings is 24 months;
- Specific capital investments in industrial construction of the AES-2006 (WWER-1200) NPP do not exceed 35500 rouble/kW (prices of 2006), being 20 % lower than those for the WWER-1000 NPP;
- The electric power generation prime cost (without tax deductions) does not exceed 0,45 rouble/kWh (prices of 2006).

The AES-2006 RP: safety and technological innovations

Proven and safe design

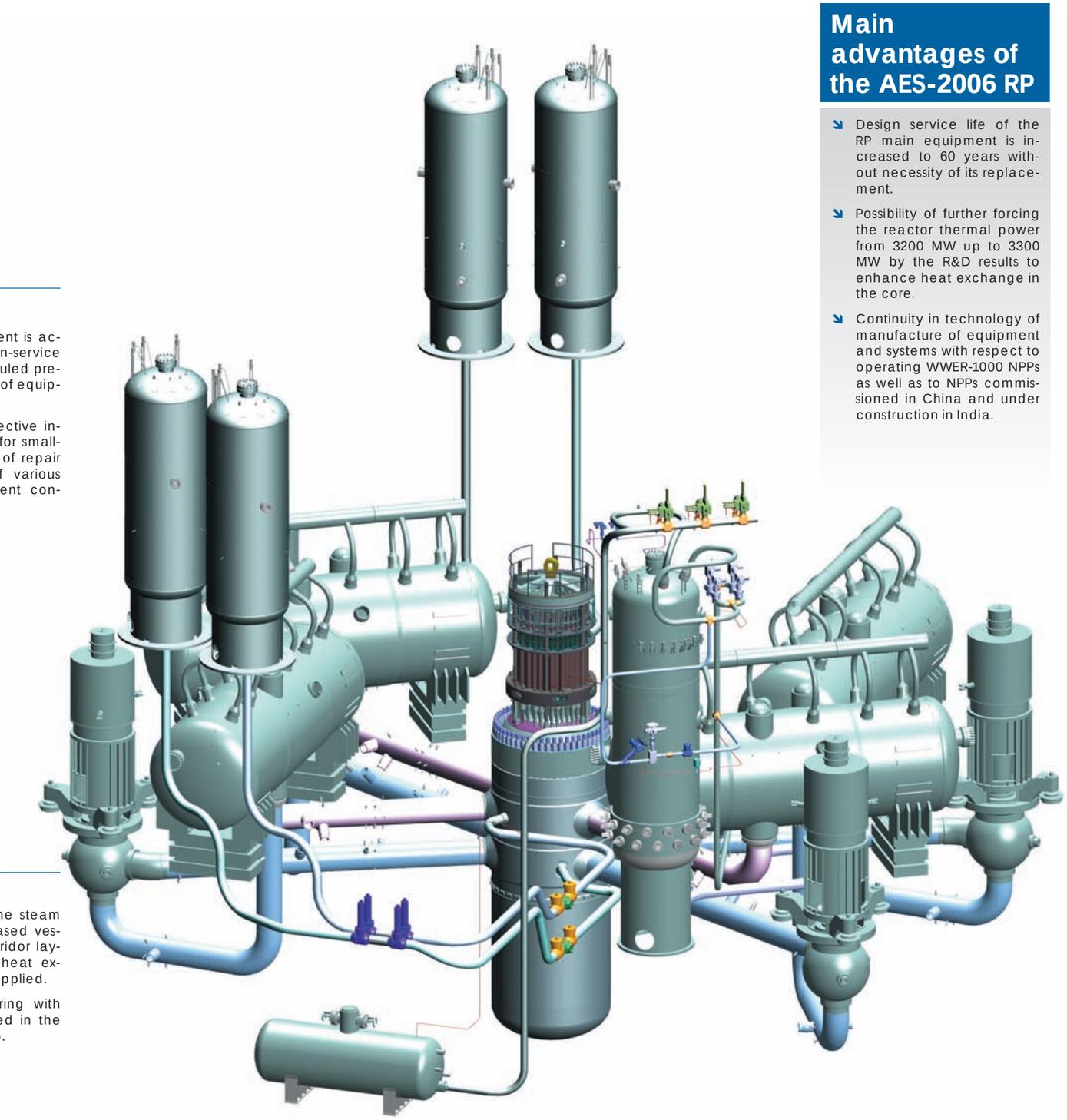
The design of the AES-2006 RP meets the high level of safety required worldwide for future nuclear power plants.

- One of the AES-2006 RP main features is its simple design, the reactor plant comprises the reactor and four circulation loops, which includes circulation pipelines, reactor coolant pumps and horizontal steam generators.
- Multi-train concept of safety systems is implemented in the design. One safety train can be always laid up for a long-term repair.
- Internal passive safety of the reactor plant, based on the inherent safety concept, plays the essential role in NPP safety assurance. In comparison with PWR, high indices of usage of the inherent safety concept, incorporated in design bases of systems and equipment, refer to a distinctive feature of the AES-2006 RP. It is expressed in RP ability to limit and localize development of initiating events and their consequences within the boundaries of design safety criteria in case of accidents for a long time, first of all due to properties of WWER reactor passive safety.
- The RP main equipment is accessible to carry out in-service inspection and scheduled preventive maintenance of equipment in due time.
- RP lay-out allows effective introduction of means for small-scale mechanization of repair work, automation of various methods for equipment control.

Technological innovations

In addition to the innovative features associated with its reinforced level of safety, the design of the AES-2006 RP benefits from many technological innovations.

- The internal diameter of the reactor vessel is increased by 100 mm in the core area to reduce neutron flux on the reactor vessel.
- The reactor core is compact and practically free from xenon vibrations and has a smooth distribution of neutron flux. Thermal intensity of the reactor core is low, that provides for a significant DNBR of fuel rod heat exchange under various transients, including accidents.
- The new design of the steam generator with increased vessel diameter and corridor lay-out of tubes in the heat exchanging bundles is applied.
- The radial-axial bearing with water lubricant is used in the reactor coolant pump.



Main advantages of the AES-2006 RP

- Design service life of the RP main equipment is increased to 60 years without necessity of its replacement.
- Possibility of further forcing the reactor thermal power from 3200 MW up to 3300 MW by the R&D results to enhance heat exchange in the core.
- Continuity in technology of manufacture of equipment and systems with respect to operating WWER-1000 NPPs as well as to NPPs commissioned in China and under construction in India.

WWER-1200 reactor features

The WWER-1200 reactor design version is evolutionary in comparison to WWER-1000 reactors. The main distinctions, aimed at extension of design service life of the reactor vessel up to 60 years considering increase of reactor thermal power up to 3200 MW, consist in the following:

- The internal diameter of the reactor vessel is increased by 100 mm in the core area to reduce neutron flux on the reactor vessel;
- The number of CPS control rods is increased up to 121 pcs.;
- A new programme for surveillance specimens is envisaged (arrangement of irradiated surveillance specimens directly on the reactor vessel wall);
- Core cooling conditions in loss-of-coolant accidents are improved (due to increase in the reactor coolant inventory);
- Radiation doses of personnel are reduced due to application of structural materials with the minimum cobalt content;
- Nickel content in reactor vessel shrouds is reduced.

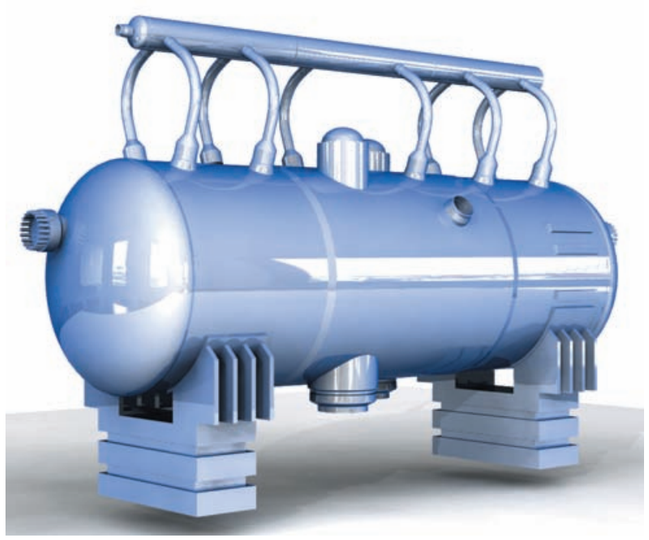
Features of the WWER-1200 reactor core and fuel cycle

- The reactor core design ensures operation in flexible fuel cycles lengths from 12 up to 24 months;
- The core provides possibility for extension of a fuel cycle due to use of temperature and power effects of reactivity for a term up to 60 days;
- The core provides RP enhanced safety by absorber overlapping the fuel after reactor scram;
- The core provides increased fuel burn-up at the level of 70 MW day/kgU, on average, at the maximum burnt out FA;
- The FA structure is repairable and provides possibility of remote withdrawal and replacement of a defective fuel rod using simple repair tools;
- Uranium fuel UO_2 is used, application of uranium-gadolinium fuel UO_2-Gd_2O_3 is also possible;
- Temperature of recriticality is less than 100°C;
- The mass of fuel, loaded into the reactor, is increased due to improvement of fuel rods.

Steam generator features in the AES-2006 design

To enhance operating reliability of steam generators a new design of the steam generator is used with the following basic design features:

- Spaced out corridor lay-out of tubes is applied to heat exchanging bundles;
- Sealing of all joints of the primary and secondary side is provided by expanded graphite gaskets;
- Easy access to piping from below is ensured by means of specially provided nozzles. Thus, the SG design is adapted to the maximum for application of automatic means of inspection and maintenance, both from the primary and secondary side. Presence of special nozzles at the SG vessel lower generatrix allows a row of process procedures for examination and washing of the tube bundle without the personnel inside SG;
- Except for pipe sleeves of blow-down from the "pockets", on the coolant collector reducer there are pipe sleeves available for installation of washing devices to ensure cleanness of "pocket" space due to periodic washings within preventive maintenance. Simultaneously, the form of collector-to-vessel welding joint is optimized to decrease the level of operational stresses.



Features of the reactor coolant pump set in the AES-2006 RP design

GCNA-1391, used in the design, is a reactor coolant pump with the following features:

- The torsion bar with a plate clutch, instead of the gear clutch, is used;
- The main radial-axial bearing with water lubricant is used;
- Under a standby mode heat removal from the lower radial bearing is provided by natural circulation;
- The spherical form of welded-stamped vessel is used;

The motor has the following advantages:

- Individual system of lubrication;
- Start-up of the motor up to 750 rpm is provided at the beginning, and then changing over to rated speed of rotation 1000 rpm is ensured;
- Oil cooling system due to fire risk is replaced by water cooling.

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