
Czechs safely putting Temelin new nuclear power plant into operation *by Václav Hanus (Temelin)*

The Czech Republic's Temelin two-reactor power plant is going through commissioning tests, with reactor No. 1 due to start commercial operation in spring 2001 and No. 2 in August 2002.

The two reactors – totalling 2000 megawatts generating capacity – will replace old coal-fired power stations phased out during 1990-98.

The deadline to start up Temelin plant has been delayed several times to radically change the design to strengthen safety and reliability.

At the same time, the construction has been taking place amid the country's period of transformation of economics and legislation.

Improvement of the design

The original nuclear safety concept for Temelin nuclear power station is based on the standard Russian VVER-1000 design (1000-megawatt pressurised water reactor – PWR).

In the course of constructing the Temelin station, the owner-operator company CEZ has improved the design so that both units, at the time of their commissioning, are on a level comparable to the most advanced nuclear power plants in Western Europe and the US. The improvements made were based on comprehensive evaluations and recommendations by the UN International Atomic Energy Agency (IAEA) missions representing about 9000 man-hours by experts from around the world. Owner CEZ also used an independent project assessment by engineering consultants Colenco (Switzerland) and technical inspectors TÜV Bayern (Germany) in 1990 and an audit by Halliburton NUS in 1991-92 totalling over 7000 expert man-hours.

Based on the above evaluations and recommendations, the Czechs improved the existing design and the nuclear safety and operating reliability of Temelin nuclear power station. Most advantages of the Russian VVER design compared to the Western PWR have been kept and were strengthened by the changes.

Major modifications

Instrumentation & control (I&C) systems in both units have been replaced by a digital system based on the same Westinghouse technology used in Britain's most modern nuclear power station: Sizewell-B in south-eastern England.

The reactor core design (fuel) has been modernised.

Fire-proof cabling has been installed.

The technical monitoring and diagnostic system has been replaced or upgraded.

A number of mechanical and electrical components have been replaced.

The radiation monitoring system has been replaced by the most advanced system in the world.

Operator training has been enhanced, including provision of a full-scale simulator.

The plant physical protection system has been replaced.

Safety assessment has been revised and extended.

In case of accident, symptom-based emergency operating procedures and severe management guidelines have been prepared.

East-West technology

The Temelin nuclear power station project combines the Russian design's safety concepts with a Westinghouse advanced instrumentation & control system.

In many respects, this combination improves the safety parameters of the power plant, as also stated in the IAEA mission conclusions 1996 and in the report by independent consultants (Enconet).

Combinations of technologies are common in worldwide nuclear engineering. One prime example: Finland's Loviisa nuclear power plant has two Soviet-designed VVER-440 reactors run by Siemens (Germany) instrumentation & control. Loviisa has been operating those reactors for more than 20 years; their reliability and safety are among the best in the world.

Temelin nuclear power station construction and commissioning	Unit 1	Unit 2
Reactor containment integrity testing (leak-proof test and strength test)	completed 01/1999	12/2000
Control room technology testing	started 06/1999	01/2001
Primary circuit integrated hydro-testing	03-04/2000	07/2001
Fuel loading into the reactor (start of physical commissioning)	completed 07/2000	11/2001
Connection to grid at 30% power	10-11/2000	
Start commercial operation after complex testing and successful 144-hour test	spring 2001	08/2002

Long commissioning

Temelin nuclear power station is going through a long, planned and controlled process of commissioning, in which the functionality of all systems of the plant and their interaction is being verified. It is possible to continue only with a safety certificate for each stage. Everything is done under the supervision of the state regulatory body and organisations such as the Nuclear Research Institute near Prague and the Research Institute of Nuclear Plants at Trnava in Slovakia.

Temelin safety and commissioning is discussed professionally on the international level. The Council of Scientific Start-up Management is equivalent to a safety commission; its regular meetings evaluate owner CEZ's approach to putting the nuclear power station into operation. The Council also includes representatives from neighbours Austria, Germany and Slovakia, as well as France, UK and US.

Another example of such cooperation is that the State Office for Nuclear Safety, together with Temelin power station owner CEZ, provides Germany's GRS safety body with detailed information for assessment of the most important safety issues.

Regulatory standards proven

Are German and Austrian questions about Czech regulatory standards technically reasonable?

Czech chief nuclear regulator Dana Drabova responds: "I feel that the main problem is that, in many cases, political decisions are taken or called upon in the name of safety, but are not based on sound safety analyses.

"Moreover, the conclusions of generally positive reviews are sometimes ignored for political reasons.

"Results of the first evaluating meeting of the parties to the Convention on Nuclear Safety are a typical example, and the Convention is currently the only tool for nuclear safety evaluation on an international multilateral scale."

Dana Drabova says evidence of Temelin nuclear power station's safety is in the results of 12 missions from the International Atomic Energy Agency and in the results of other bodies.

She urges the European Commission and Member States to consult these results, which answer the nuclear safety questions being put to the Czech Republic as it bids to join the European Union.

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