

New problems in Olkiluoto

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The first-of-a-kind EPR-type nuclear reactor that French nuclear company Areva is building in the Finnish municipality of Eurajoki has encountered serious problems during all phases of design and construction. Following the Fukushima nuclear accident, Areva as well as its Finnish client TVO have kept a low profile to avoid attention concerning the problems of the EPR project.

The ailing project has already caused the June 2011 dismissal of the long-time CEO of Areva, Anne Lauvergeon and the two companies are also engaged in legal battle over the extra costs of the project.

According to Finnish investor TVO, Areva increased its claim for damages to €1.9 billion in late June, to cover the skyrocketing cost of the project¹, up from the one billion reported two years ago. Areva was supposed to deliver the reactor on turn-key terms, and to bear the responsibility for cost overruns.

The annual report on regulatory oversight of nuclear safety published, by the Finnish Radiation and Nuclear Safety Authority (STUK), shows that the Olkiluoto 3 project has again been confronted with new problems that give further reason for concern regarding the risks of accident in the prototype reactor. These problems will most likely cause additional delay and costs to a nuclear power plant already four years behind schedule and over three billion over the planned costs. The new problems will most likely imply that the cost and lead time of the project have more than doubled.

Below is a summary of the latest reports by STUK, followed by a compilation of direct quotations. The reports covered are STUK 2010 Annual report on regulatory oversight of nuclear safety² and the STUK quarterly report covering the first three months of 2011³ (only available in Finnish, translations by Greenpeace). Quotations from the latter publication are marked with *.

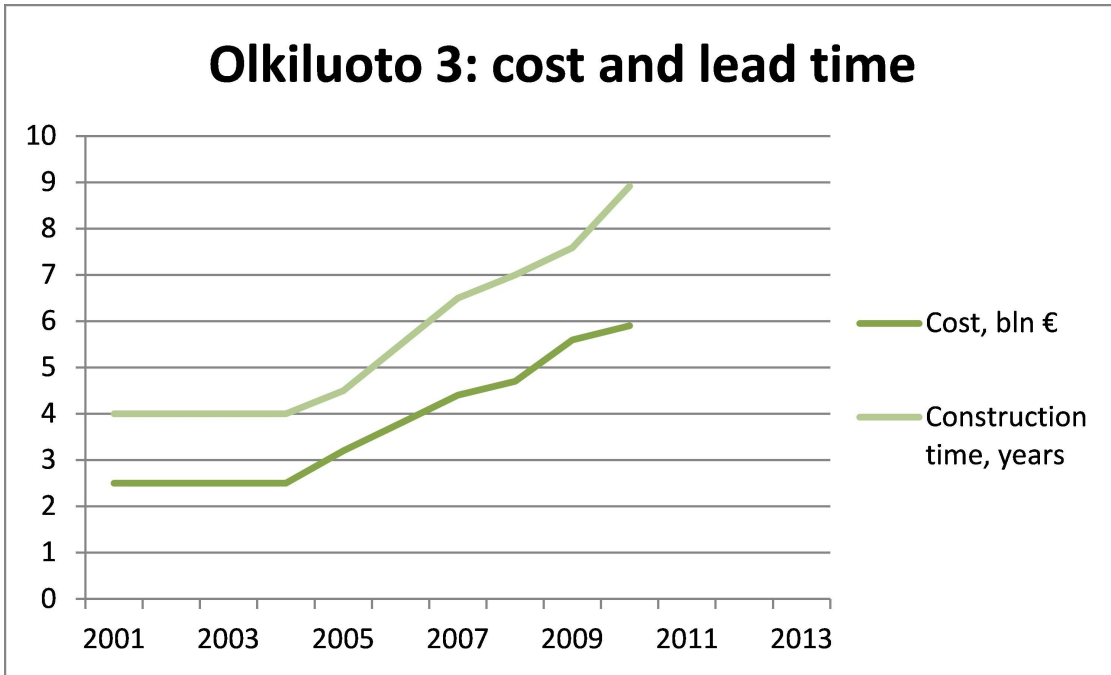
SUMMARY

- There are new design issues, and the finalization of designs and analyses are lagging behind construction. If the design does not pass the pending analyses, expensive and time-consuming modifications may be required.
- Major lapses in quality assurance and safety control, including backup diesels, emergency cooling systems, electric cabling, radioactivity-containing pools, polar crane, reactor building support structures.
- Continuing lack of safety culture: quality requirements not being communicated in the supply chain; carrying out work without required plans and tests; absence of effective supervision.
- Significant new delays have accumulated; timelines for construction, installation and design approvals have not been met.

¹ <http://www.tvo.fi/www/page/3628/>

² http://www.stuk.fi/julkaisut_maaraykset/tiivistelmat/b_sarja/en_GB/stuk-b134/

³ http://www.stuk.fi/ydinturvallisuus/ydinvoimalaitokset/raportointi/fi_FI/nvr1-2011/



DESIGN ISSUES AND MISSING ANALYSES

A significant, new design issue: “Software-based I&C⁴ is often embedded in equipment and devices commonly used in industry; the I&C is used for controlling the device’s functions. TVO has suggested to use this kind of equipment in Olkiluoto 3 systems with significant safety implications. In nuclear power plant applications, it is required that software-based I&C, depending on the safety class of the device, is qualified in compliance with a nuclear standard or other standard intended for safety-critical purposes. However, devices used in industrial applications may not have this kind of qualification, and, on the other hand, according to TVO it is not possible to find on the market devices or equipment manufactured in compliance with nuclear standards. Approval of the issue did not make any significant progress in 2010.”

“Detailed design of the plant systems continued in 2010. To some extent the plans still do not meet the objectives set for them in terms of quality and content, and hence STUK required further clarification of the plans. At the end 2010, design of the systems was still unfinished, especially that of the I&C systems and some individual equipment—for example, the fuel handling equipment. A key area, which requires actions by the licensee and the plant vendor are the failure analyses for the process, electric and I&C systems, which prove the fulfilment of the design bases.”

“Installation of platform and support steel structures inside the buildings has also started. The safety significance of the platforms has increased, because, in contrast to the original designs, pipings and devices with significant safety implications are supported on them. This concerns about 150 steel platforms. STUK has observed several needs for clarifications and supplementing in the design and structural plans of these steel platforms. This has led to a situation in which there are steel platforms on the construction site for which the construction inspections and installation are waiting for the structural plans to be supplemented, and partly also for reinforcement of the structures.”

“STUK continued inspecting the design material of the steel platforms. The steel platforms are technical structures to some of which devices and pipes with significant safety implications will be supported. The plant supplier’s design material has had lacks with considering the loads in accident situations in the design. STUK has requested the improvement of the design materials in this respect.” *

⁴ Instrumentation & Control; software-based I&C refers to computer systems that monitor and control the the reactor during normal operation and under accident conditions.

July 21, 2011

“In 2010, the main part of the final system design of the process, ventilation and electrical systems was reviewed. The most important deficiency found in the review concerned the common cause failure analysis of the systems and their independence from each other.”

“The plant vendor and the power company concluded that flooding caused by a possible rupture in the fire water pipeline in the annulus space between the inner and outer (structural protection against aircraft crash) containment walls threatens plant safety functions.”

QUALITY PROBLEMS

“In the inspections of electric cabling, it was noted that installation had not been performed fully in compliance with principles approved by STUK to separate safety-classified cables from other cables.”

“There have been many quality nonconformances” related to “pools which will contain radioactive substances during future operation (...). Structures have had to be disassembled, work plans revised and procedure qualification tests repeated, and structures repaired before reaching an acceptable result. This work will still continue in 2011.”

“The first control rod drive mechanisms were assembled for functional tests during 2010. The functional tests revealed, however, that the control rod drive mechanisms were scratched in the tests and the tests were postponed until 2011.”

“The most serious quality problems in the Olkiluoto 3 project related to quality management in the manufacture of the Polar crane and ensuring its conformance, communicating and managing the quality requirements for the emergency diesel generators (EDG) in a long supply chain, and quality management of the manufacturer and manufacturing of the low pressure emergency cooling system (JNG).”

NEGLIGENT SAFETY CULTURE

“Several non-conformances were detected in the manufacture of mechanical equipment in 2010. In the background of the manufacture quality problems one can find several deficiencies in the flow of information between organisations, familiarity with nuclear industry requirements and their communication, and in follow-up of procedures relating to quality management.”

“As a rule, no effort is made to identify the deficiencies which lie behind technical non-conformance and relate to quality management, operations or safety culture of the organisation involved in the supply. As a result of this, corrective or preventive actions which are necessary in terms of development and conformance are neither defined nor implemented.”

“Design and manufacturing of the auxiliary equipment of the emergency diesel generators continued in 2010. Towards the end of 2010, STUK observed deficiencies in the functioning and control of the supply chain of the plant vendor, the diesel generator supplier and its subcontractors. Based on the inspection observations, it was also reasonable to assume that the requirements concerning the emergency diesel generators had not been appropriately passed on in a long and complicated supply chain.”

“STUK’s construction inspections, intended to ensure that the manufacture of components conforms with requirements, still revealed issues preventing the inspections from being carried out as planned. The most serious of these issues concerned the equipment’s readiness for inspection and open issues related to construction plans.”

“The plant vendor detected significant quality non-conformances in the manufacturer’s welds of the low pressure emergency cooling system (JNG) and transferred the equipment

July 21, 2011

to another manufacturer for repair. The plant vendor started the repair work without a repair plan approved by STUK.”

“While conducting a daily supervision in the construction site in January, STUK observed that the approved welding instructions were not followed while welding pipes with significant safety implications. The welding work was stopped until the welding contractor clarified the deficiencies with the welding work. Due to the incident, TVO and the plant supplier increased monitoring of the welding work.” *

“STUK observed that procedures differing from the project instructions have been introduced in the Olkiluoto 3 project while inspecting the quality assurance. TVO was required to define the principles and instructions for introducing such procedures and estimating their significance for safety. *

DELAYS

“The deficiencies in the work of different parties and in product quality have resulted in additional work to assess and solve the problems. This has had an impact on the progress of the project.”

“Several deficiencies had been detected already earlier in the construction plans of the auxiliary equipment of the emergency diesel generators. Problems with the design and manufacturing of the auxiliary equipment delayed installation work in the diesel buildings. Installation of the emergency diesel generators started, but the plant vendor interrupted the installation as a result of confusions about the design and manufacture. STUK set up an investigation group to untangle the problems with the design, manufacturing and supervision of the auxiliary equipment of the emergency diesel generators. The investigation group’s report will be completed in the spring of 2011.”

“In 2010, crack-like surface defects were observed in the bent pipe sections at the bend area in final inspections performed after the pickling treatment of the reactor coolant pipes. The work for establishing the mechanism creating them and eliminating it delayed the delivery of pipes and their installation. It was assessed that the faults had developed in connection with the induction bending process as a result of deformations in the bent area and linear machined surfaces. The defects were removed by final grind.”

“During 2010, audits were postponed because the project and related work were implemented on a schedule which is slower than anticipated.”

“Structures have had to be disassembled, work plans revised and procedure qualification tests repeated, and structures repaired before reaching an acceptable result. This work will still continue in 2011.”

“According to TVO it is not possible to find on the market devices or equipment manufactured in compliance with nuclear standards. Approval of the issue did not make any significant progress in 2010.”

“The functional tests revealed, however, that the control rod drive mechanisms were scratched in the tests and the tests were postponed until 2011.”

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