

New safety violations revealed in Olkiluoto 3

The French nuclear company Areva is building a prototype European Pressurised Reactor (EPR) in Olkiluoto, Finland. Greenpeace has revealed new violations in the project, some of which the Finnish authorities have failed to detect or address. They show that wholesale neglect of basic construction standards and nuclear safety by Areva and its main subcontractor, the French Bouygues, has gone on for years.

The information in this briefing is based on confidential documents obtained by Greenpeace and on the work by a Finnish Broadcasting Company investigating journalist Juha Granath, who has been working independently on the issue.

Overview of construction violations

- Welders have had no qualified welding procedures to follow during major construction and welding operations for more than a year. This includes the welding of the reactor building's steel framework.
- Required tests were not carried out on the welds.
- Bouygues, the construction company used by Areva, has not employed a qualified welding supervisor at the site for more than a year.

Safety implications

The reinforced concrete is essential for the plant's operation, as the reactor and its cooling system are mounted on it with thousands of attachment plates welded to the steel framework. The quality and durability of this steel framework is now in question.

Greenpeace Nordic commissioned nuclear safety expert, Dr. Helmut Hirsch to evaluate the implications of the safety failures. Dr. Hirsch arrived at the following conclusions in his statement "Potential Significance of Alleged Misconducts at the Welding of the Steel Frame for the Olkiluoto 3 Reactor Building":

- The safety violations constitute "a clear case of bad practice and an indicator of bad safety culture";
- Bad quality of structural welds directly affects the durability of the structure
- Even welds that complied with approved welding procedure, only reached the minimum strength requirement leaving very little margin for error;
- Poor quality of the earthing system can lead to electrochemical corrosion of steel and further to cracking and spalling of concrete

Dr. Helmut Hirsch has about 30 years of experience as nuclear expert. He has worked for the Austrian Federal Government as well as for German State Government and municipal administrations. Since 1990, he has been a member of the Austrian Environment Ministry's Nuclear Advisory Board. Recent work includes technical support for the Austrian monitoring process of the Czech Temelin nuclear

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power plant. He is a member of the Organisation for Economic Co-operation and Development's Nuclear Energy Agency expert group.

Greenpeace demands

The Finnish nuclear safety authority, the STUK, has been reluctant to take measures that would force Areva to address the constant failures and safety violations that have persisted to date. The violation of basic safety procedures, exposed in the documents Greenpeace obtained, clearly show that stricter measures are urgently needed.

At a bare minimum,

- All construction work on Olkiluoto 3 must be stopped and a thorough independent inspection carried out throughout the project to determine the extent and severity of quality and safety breaches. The inspection should not be limited to the construction of the reactor building.
- Work must not be allowed to continue until Areva commits to implementing adequate industry standards.

Details of safety violations

Welding procedure specifications

According to standard industry practice, before any welding work is carried out, a welding procedure specification (WPS) needs to be prepared. The specification defines how a given welding task is to be performed: length and placement of weld, positioning of pieces, heat input, welding position, materials, pre-heating, etc.

Before the welding procedure specification can be used 1) tests need to be carried out to show that the welds meet the specifications; 2) the WPS needs to be approved by the client (Areva) and an independent third party auditor and 3) welders need to pass a test proving their competence.

Documents obtained by Greenpeace prove that all of these requirements have been violated. By comparing the dates on the welding procedure specifications to information publicly available on the website of the Finnish buyer of the reactor, TVO, it can be shown that:

- NONE of the 11 WPSs was finalised when welding of the reactor building was started. Welding work at the construction site began in late-2005, installation of the steel reinforcement of the reactor building began in May or June 2006 and the first WPS was approved earliest in September 2006.
- It is likely no WPS went through the approval process prior to the first layer of concrete being cast over the steel framework inside the reactor building in October 2006. This raises concerns that the reactor cooling system will be mounted on a potentially defective steel framework.

MANUFACTURER  Finnish Branch		DOCUMENT KIND Work Instruction			WORK PACKAGE	
COMPANY CODE BYC		CONFIDENTIALITY RESTRICTED		KKS	PAGE 2	
DOCUMENT TITLE Welding Procedure Specification Load Bearing Tack Weld Reinforcement						
REV	DATE	AUTHOR	CHECKED	APPROVED	MODIFICATIONS / OBSERVATIONS	STATUS
A	13-12-2005	JFP	MSC	WJO	First issue – for Approval	FIN
B	17-02-2006	JFP	LBA	WJO	Calibration chart required by TVO added	FIN
C	12-05-2006	JFP	LBA	WJO	Modified according to letter FGF-BYC-0241	FIN
D	23-08-2006	TKE	JFP	WJO	Updated current values	FIN
E	24-11-2006	TKE	JFP	WJO	Updated according to test results	FIN

An example of a welding procedure specification that could not have been sent for approval earlier than late-November 2006.

Production weld tests

To ensure the actual welding work complied with the WPS, samples of each batch of welding work needed to be prepared and tested. This is basic industry practice. The tests have not been conducted. The STUK only required them in a memo dated 13 August 2007, almost two years after welding work began.

The STUK required "preparing a plan on production weld tests and welder competence tests, fulfilling the requirements of both Finnish building code RakMK B4 and standard EN ISO 17660-1. A log of the tests has to be kept according to the standard EN ISO 17660-1." Greenpeace Nordic has asked the STUK to supply the log or the results of the tests but their answers imply that STUK does not have these results.

Welding personnel

Bouygues has not had competent welding supervisors for more than a year and still doesn't. The STUK required a description of Bouygues' welding organisation in August 2007. Bouygues supplied an organisational chart with empty boxes – there were no names or qualifications. The STUK never demanded an adequate clarification and did not address the clear lack of competent personnel.

Currently, people are being given two weeks' training to qualify them for the position of a welding coordinator, while, according to international standards, a university degree would be needed. Bouygues also told the STUK that a person worked as a welding supervisor when he did not, raising serious concerns over the adequacy of welding supervision.

Failed supervision

Areva, TVO and the STUK have all been aware of the fact that there were no welding procedure specifications and that the required tests have not been being carried out. The lack of qualified welding personnel would have been easy for any of them to detect, but either no one checked or no one cared. This shows that quality control has failed and cannot be fixed by the involved organisations without external intervention.

Why does it matter?

A nuclear power plant is exposed to extreme heat, pressure and radiation for 40-60 years and many key components and structures cannot be changed, leaving no room for error.

- Bad welding can cause an accident or greatly aggravate the consequences should an accident happen.
- The non-existent safety culture has the potential to make the reactor more vulnerable to, e.g. human error, structural problems or such outside forces as an attack. The project is less than halfway to completion, with the most critical safety phases, including the installation of key reactor components and electronic safety systems, still ahead.
- The safety violations concern both the reactor's inner and outer containment building, which can be weakened as a result. This is especially alarming as the reactor cooling system is mounted on a potentially defective steel framework.

The EPR reactor model

The reactor under construction in Olkiluoto is a first prototype of the European Pressurised water Reactor (EPR) model designed and aggressively marketed by the French nuclear company Areva. Another EPR is under construction in Flamanville, France. Both projects run into severe quality problems and delays. Olkiluoto 3 is two to three years behind schedule now that construction has been underway for three-and-a-half years. The project is believed to be about EUR2 billion, or 70%, over budget.

The EPR's high power output and fuel irradiation mean that the nuclear fuel in the core of an operating EPR at any given time is more radioactive and there is more of it compared to nuclear reactors currently operating. This makes the EPR potentially more dangerous, should an accident happen, than almost any operating nuclear reactor. As a result, more stringent construction and quality control is needed for the EPR to be able even to match the risk levels of operating reactors, making the reactor model exceptionally demanding to construct.

Root causes

The following are systemic sources of error:

- The quality standards that TVO has required in contracts with Areva, including for welding personnel, are inadequate.
- Bouygues and Areva repeatedly cut corners to save on swelling construction costs.
- With the new giant reactors, even the risk levels of current reactors are harder to reach.
- The STUK and TVO have failed to tackle clear, easily detectable violations, such as the lack of welding procedure specifications and competent personnel.
- The STUK has failed to take measures to address years of breaches in safety standards, including halting construction.

Many of these problems are inherent in the construction of modern nuclear power plants and should be expected in other current or future reactor construction projects.

Greenpeace warnings not heeded

Greenpeace Nordic has repeatedly drawn attention to crucial underlying weaknesses in the Olkiluoto 3 project, see key instances below:

- 2001, debate in parliament: The construction timetable and price are unrealistic
- 2005, when the construction permit was granted: Plans had not been finalised
- 2006, when the first scandals emerged in Olkiluoto: Greenpeace called for construction to be halted and an independent inspection.
- 2008, when scandals emerged in Flamanville: The worst culprit was Bouygues, the company responsible for construction in Olkiluoto.

More information

Statement by nuclear expert Helmut Hirsch:

www.greenpeace.org/finland/fi/dokumentit/OL3-HirschStatementAug08

News on Olkiluoto 3 project: www.olkiluoto.info

Flamanville scandals:

www.greenpeace.org/raw/content/international/press/reports/flamanville_problems_reactor.pdf

Helmut Hirsch report on OL3 from 2007:

<http://www.greenpeace.org/finland/fi/dokumentit/progress-and-quality-assurance>

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