

Potential Significance of Alleged Misconducts at the Welding of the Steel Frame for the Olkiluoto 3 Reactor Building

Statement for Greenpeace Nordic

Dr. Helmut Hirsch, Hanover, August 06, 2008

According to allegations of Greenpeace Nordic, Welding Procedure Specifications for the steel framework of the OL3 reactor building have been prepared after the work had started. Furthermore, it is alleged that specifications were approved and used without approval of a third party, and preliminary Welding Procedure Specifications were used in the construction.

It was not the task of the author to check those allegations. (It has to be noted, however, that publicly available information strongly indicates that indeed none of the Welding Procedure Specifications had gone through tests and were approved before welding was started.) In any case, the author was asked by Greenpeace Nordic solely to briefly summarize the potential significance of such misconducts, should they occur or have occurred.

11 documents with Welding Procedure Specifications for OL3 as well as, in most cases, other records concerning tests and material composition, were made available to the author by Greenpeace Nordic. For the purpose of this statement, it is assumed by the author that those Specifications concern the outer shell of the OL3 reactor building, as stated by Greenpeace.

Performing welding work at the reactor building before the final version of Welding Procedure Specifications, approved by a third party, was prepared would be a clear case of bad practice and in indicator of bad safety culture.

Such bad practice could only be remedied by thoroughly checking all the welding work performed under those conditions, identifying all deviations from Specifications, evaluating the significance of the deviations and performing comprehensive repair work in all cases where the deviations have not been proven acceptable by careful analysis.

If such bad practice should occur and is not remedied, it can give rise to poor quality of welds and hence, have significance for the safety of the plant. The potential significance depends on the type of welds concerned and varies for the different types which are treated in the documents made available to the author as mentioned above.

In the case of structural welds of reinforcing steel bars, bad quality will directly affect the strength of the reinforced concrete. The resistance of the concrete structure against external loads like earthquakes or aircraft impact will be reduced; the hazard of severe radioactive releases in case of an external event will be increased.

It is noteworthy that even according to the records for the tests performed by Innova, the tensile strengths of structural welds was found to be only slightly above requirements in some cases. This gives rise to the question which safety factors, if any, are allowed for in the requirements. Furthermore, the fracture location at the test was at the fusion line of the weld, indicating a potential weakness.

No bending tests were required in case of structural welds. This presupposes that equivalent stresses have been determined which cover all relevant multiaxial stress loads.

In the case of welds which are part of the earthing system, bad quality can lead to defective earthing and thus, to a degradation of the dissipation of stray currents in the steel/concrete structure. Stray currents in reinforced concrete can under certain circumstances lead to electrochemical corrosion of the steel - if they are persisting over a longer period of time, or if there is ingress of chlorides or carbonation in the concrete.

Corrosion will lead to weakening of the steel bars and possibly also, since the volume of corrosion products is larger than that of steel, to cracking and spalling of the concrete. The resistance of the concrete structure against external loads will thus be reduced, with consequences as mentioned above.

Ordinary tack welds between steel bars etc., on the other hand, are not necessarily particularly critical. To the extent that their main function is to keep the bars together until the concrete has been poured and has solidified, their long-term quality is of somewhat smaller relevance.

Conclusion:

Should the allegations of Greenpeace Nordic be correct (and there are strong indications that they are), there would be reason for serious concern regarding the resistance of the reactor building of OL3 against external loads. There is the possibility that this resistance will be lower than assumed in safety studies, and hence, the risk associated with external events like earthquakes, blast waves from explosions or missile impact higher than expected.