



KTH Electrical Engineering

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**Statement of opinion of the final report by AEG Power supply systems concerning the incident with the UPS systems at Forsmark block 1 on 2006-07-25**

After having read the final report QD 41/06 (and associated documents) submitted by AEG Power supply systems concerning the incident with the UPS systems at Forsmark block 1 on 2006-07-25, the following statements can be made:

1. The report does not fully explain why two of the four UPS systems did not ride through the voltage sag and the overvoltage during the grid fault 2006-07-25. It is reasonable to assume that a UPS system should be able to handle such a fault. Actually, this is one of the most important reasons to why UPS systems are installed at all.
2. Moreover, it is not fully explained why two UPS systems did ride through and why the other two did not. In my opinion it is not likely that differences in voltage magnitude or harmonic content (which is given as the reason in the report) resulted in the two different behaviours of the UPS systems, unless the undervoltage protection systems operated erratically. A 50 % voltage sag during 300 ms should, in my opinion, be detected as an abnormally low voltage. In such a case it seems safer to operate from the batteries than from an abnormal grid. *The final report should therefore explain why the undervoltage protection of two of the UPS systems did detect the undervoltage and why two of the systems did not detect the undervoltage.*
3. The final report suggests that the tripping levels of the UPS systems should be adjusted in order to improve the operation during this kind of faults. It is my opinion that the suggestions are good. However, many other fault scenarios could occur. *It is therefore extremely important to perform a detailed consequence analysis before making any changes in the tripping levels.*
4. In order to obtain the safest possible UPS systems (with the configuration at the site) it is advised to investigate how different combinations of sags and overvoltages, both with respect to magnitude and duration, should be handled by the UPS systems. In my

opinion it is of highest importance that the inverters can operate whatever occurs on the grid side of the rectifiers.

Should there be any questions or any need for clarifications of this statement, please contact me at:

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