ONR Follow up Report

CR Number: 1322044	Location: Torness	INF1 Ref: 3067
Event Title: R2 UNPLANNED TRIP FOLLOWING GRID DISTURBANCE		
INES rating: 0	Event Date: 12/06/23	
EDF Category: NPE 11A	ONR Category: NS 07	

Description of Incident:

On the 12th June 2023 at 03:29, the 'TG Under-Excitation limit raised' alarm initiated. The 23.5kV voltage steadily dropped on site along with the generator reactive power becoming increasingly leading. Several 11kV boards fed from the generator output alarmed on low volts a few seconds later. Shortly following this the 'Generator 2 Excitation Fail' trip occurred which trips the 400kV mesh breaker then inter-trips to the generator load switch. Turbine trip block solenoids also operated tripping the turbine governor valves and activating a TG2 turbine trip.

The TG2 trip was coincident with a ~8Hz Sub-Synchronous Oscillation (SSO) being present on the grid system.

TG1 was off load at the time of the incident.

Safety Significance: *(including actual and potential consequence)*

Unplanned reactor trip. Minimum post trip cooling was met. There was one post trip WR 02071958 - R2 A QUAD B2AY-WF-0122 FAILED TO CLOSE ON TRIP; this was resolved by an adjustment to the actuator torque setting.

Investigation Findings: *(include direct and root causes, and lessons learned)*

The initiating event was an 8Hz Sub-Synchronous grid Oscillation. While the Torness Automatic Voltage Regulator (AVR) is grid code compliant the reaction of the AVR / Power System Stabiliser (PSS) has been shown drive the generator MVAR output down (leading) and through the under excitation limit when subjected to the 8Hz SSO event.

A modification to the AVR / PSS following a previous grid 8Hz SSO event had been implemented on the AVR but the response to this event was not as predicted from the revised AVR/PSS model. Further investigation by the OEM identified a limit in the AVR coding that was limiting the AVR response and not allowing it to react as modelled to the SSO event.

Actions taken/proposed: *(include timescales and responsibilities)*

Technical Fault Finding concluded that the event did not damage plant items or adversely impact the AVR, Turbine Generator and no plant motors tripped or entered alarm levels due to the drop in voltage. The decision was taken to return Unit 2 to service with TG2 successfully synchronised at 20:19 on 13th June 2023.

The limit within the AVR coding has been investigated and modified to allow a better response to a grid SSO event. This change has been modelled and tested by the OEM. The testing was set up with the revised PLC code installed on the same hardware that is used for the Torness AVR, connected to a simulated grid and generator. An EC was authored and approved to implement the changes on TG2 during the recent ODR. This was successfully completed.

An EC has been prepared to install the same changes on TG1 when it is next off line (currently planned for September 2023

National Grid continue to investigate the cause of the 8Hz SSO and have identified a windfarm as the probable source. The windfarm is currently disconnected from the grid while they develop a solution to the problem.

How has this been shared with other locations/utilities:

Yes, however no other EDF stations in the UK have the same AVR.
We have been working with the OEM and they are fully aware of the problem.

Details of other Government/Regulator reporting carried out:

Contact:	[redacted]	Telephone:	[redacted]
Report Date:	07/08/23		