

GRID CODE REVIEW PANEL

CC.6.3.3 Working Group

Progress Report

August 2001

The Ofgem consultation paper issued in May 2000 included a proposal for a revision to CC.6.3.3(b) for frequencies below 49.5Hz as follows:

“Maintaining its active power output at a level not lower than the figure determined by the linear relationship shown in Figure 1 (not included this report) for system frequency changes within the range 49.5Hz to 47Hz, such that if the system frequency drops the active power occurring does not decrease with system frequency by a ratio of more than 5:1”

Following discussion of paper GCRP 00/31 at the meeting of the Grid Code Review Panel in November 2000, a Working Group was formed to review CC.6.3.3 requirements for frequencies below 49.5Hz. This Working Group met on 22 March 2001, and the GCRP members were informed of the agreed draft Terms of Reference in May 2001. The Working Group met again on 27th June to discuss the results of the initial analysis outlined below and a further meeting has been arranged for 8th November 2001, by which time a derogation may have been issued by Ofgem. In this event, it is proposed that the new generator be invited to attend Working Group meetings.

Analysis work

Initial studies were carried out based on the above proposed power/frequency ratio K equal to 5 (and also for $K=3$ and $K=1$ where $K=1$ represents the existing Grid Code requirement). These studies were based on the formulation of algebraic equations to calculate:

- a) additional response requirements over $K=1$ for a 1320MW generation loss at system demands of 20GW, 35GW and 50GW using $K=3$ and 5; and
- b) additional demand disconnection requirements over $K=1$ against the settings of the automatic low frequency demand disconnection (LFDD) scheme for different amount of generation deficits using $K=3$ and 5.

For a) above, the generation constituted the responsive plant and the unresponsive plant; the unresponsive plant was further assumed to contain a compliant component (satisfies $K=1$) and non-compliant component ($K>1$). The worst case results with respect to additional response requirement were for 100% non-compliant generation at 50GW system demand with $K=5$. As the non-compliant component reduced, the additional response requirements also reduced. The additional response requirements also reduced as K reduced from 5 to 3. Generally, as system demand increased from 20GW to 50GW, the additional response requirements also increased.

For b) above, the generation constituted only the unresponsive plant (case of a generation deficit island). The results showed that up to 2 more stages of demand disconnection would be required as K increased from 1 to 5. With the existing LFDD scheme, K=1 would allow, in theory, up to 60% generation deficit before total island collapse, while with K=5 a reduced generation deficit of 54% would be allowed.

As part of the above work, recommendations were made to undertake dynamic studies to identify the additional response and demand disconnection requirements more accurately. In this context, generic dynamic system equivalent models for responsive and unresponsive plants including the model for the revised power/frequency characteristics have been constructed, and transient simulation studies are at hand for calculation of the additional response requirements. Studies to calculate the additional demand disconnection requirements will also be done.

Research on overseas equivalent of CC.6.3.3

Team members are also carrying out some research to find out information equivalent to the CC.6.3.3 from overseas utilities. Information has been received from 10 countries: Canada, Finland, Germany, Northern Ireland, Philippines, Latvia, Orissa, Netherlands, New England and Australia.

Key features pertaining to power/frequency characteristics of some of these utilities are:

Canada (Ontario Hydro) – full output between 99%-100% (49.5Hz-50Hz), full output for a limited time between 99%-98% (49.5Hz-49Hz).

Finland – full output between 49Hz-51Hz, 30 minutes operation at full output between 49Hz-47.5Hz followed by 15% power output change between 49Hz-47.5Hz.

Germany – full output between 49.5Hz-50Hz, time-limited operation between 49.5Hz-48.5Hz allowing 5% change in power output

Northern Ireland – full output between 49.5Hz-50Hz, 5% power output change between 49.5Hz-47Hz.

Philippines - full output between 49.5Hz-50Hz, 5% power output change between 49.5Hz-47Hz.

Power/frequency characteristics of Northern Ireland and Philippines resemble with CC.6.6.3. There is lack of details from other utilities. This research will, however, continue.