

Grid Code Review Panel

**Annual Summary Report for ROCOF tripping incidents
(1 August 2001 to 31 July 2002)
by Paul Hurlock**

1 Introduction

- 1.1 This report, for the period 1 August 2001 to 31 July 2002, fulfils the requirement to provide the annual summary of the ROCOF information, as endorsed by GCRP 00/16 (September 2000). The notified ROCOF events for the period are reviewed, and consideration given to the need for continued reporting.
- 1.2 Generation trips of 1000 MW or more are reported for the above period.
- 1.3 Attached is the record of notified ROCOF tripping incidents for the 12 month period.

2 Background

- 2.1 The present ROCOF reporting procedure OS123 (Reporting of instantaneous active power losses to DNOs) has been in place since May 1998 and was agreed by Panel representatives.
- 2.2 ILEX have not been involved in the reporting process since the last GCRP meeting.
- 2.3 The origin of the procedure follows National Grids concern that small non centrally despatched generation protected by Rate of Change of Frequency (ROCOF) protection could trip following a large generation loss. The effect of such ROCOF trips could aggravate the resulting frequency change following the loss and have an adverse effect on normal frequency recovery.
- 2.3 In order to increase the knowledge of the behaviour of this ROCOF protected plant and the risk it may present to the system:

National Grid agreed to notify DNOs when an incident occurred likely to lead to ROCOF operation.

Following notification, DNOs inform National Grid of any generation tripping.

- 2.4 Originally, the procedure was triggered for generation losses of 550 MW or more, however this was changed to 1000 MW, and above following the initial review period of May 1998 – July 1999.

3 Summary of notified events during the period of review

- 3.1 Participants have provided the necessary information, in accordance with OS123, to National Grid following notification, including nil returns.
- 3.2 The appendix provides details of each notified incident where a generation trip of 1000 MW or more occurred, together with a summary of any reported embedded generation trips subsequently reported to National Grid.

3.3 During the period there have been four large generation losses, meeting the agreed reporting criteria, and ranging from 1000 to 1170 MW. Two these have resulted in a report of ROCOF trip of 6 MW and 1.8MW respectively.

3.4 For any single event the rate of change of frequency, calculated over a two second period, for these particular incidents has varied from 0.0465 to 0.0865 Hz/second.

4 Summary of reports 1998 to 2002

4.1 Since reporting began there have been 29 incidents where 1000MW or more was lost. Of these, seven resulted in the loss of embedded generation.

4.2 Rates of change of frequency observed in this period range from 0.011 to 0.0865Hz/s.

4.3 Embedded generation was lost for rates of change ranging from 0.04 to 0.0865 Hz/second.

4.4 The most embedded generation lost as a result of a large loss was 22MW on the 18th May 2000. This was a 1200MW loss that caused a rate of change of 0.075 Hz/second.

4.5 Losses of embedded generation during normal system operation have occasionally been reported in the course of normal operational contact.

4.6 The largest loss of embedded generation during routine operation was on the 28th April 2001 when 48MW was lost co-incident with switching at Ratcliffe.

5 Conclusions from the period reported

5.1 This last twelve months have in general been consistent with previous experience.

5.2 The evidence from this years review period supports the conclusion of last year, that ROCOF operation following large losses is not significant for the rates of change of frequency experienced during normal operations and represents little risk to the system.

However, few events have given rise to high rates of change of frequency. As reported last year, the effects of higher rates of change remain unknown.

5.3 The effects of the new electricity market (since March 2001) has not noticeably changed the pattern of large generation losses or ROCOF operation.

5.4 Normal operational contact has revealed occasions that embedded generation have tripped. It is not clear if these are consistently reported however none of those reported have had an adverse effect on the National Grid system.

6 Recommendations

6.1 Members of the Grid Code Review Panel are invited to :-

i) Provide comments on the contents of this report.

ii) Note the summary of incidents of possible ROCOF (appendix 1) was sent to all DNOs on 5 August 2002.

- iii) Discuss the benefits of continuing the OS123 requirements based on the evidence presented above, giving due consideration to the future impact of increasing levels of renewable and embedded generation and any known or anticipated changes in technology used in these applications.
- iv) Note that National Grid will continue to take interest in any ROCOF operation, which is notified, from time to time via normal operational liaison.

Paul Hurlock August 2002

APPENDIX 1

INCIDENTS OF POSSIBLE RoCoF TRIPPINGS during the period 01/08/01-31/07/02

Notified incidents where there are generation losses of 1000MW , or more, which are likely to lead to the tripping of embedded generation

NOTIFICATIONS RECEIVED FROM RECs/Illex AND MW LOST WHERE APPROPRIATE														Loss (MW)	Ref
Date	Time	24Seven	EME	Aquila	SSE	YE	SP Power Systems	NEDL	UU	SEE	WPD	WPD Wales	RoCoF (Hz/Sec)		
25/08/01	14:19	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	0.0575	1000	
26/08/01	16:51	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	0.0575	1000	
16/10/01	06:08	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	0.0675	1174	
22/06/02	17:14	NONE	NONE	NONE	NONE	NONE	NONE	0.5	5.5	NONE	NONE	NONE	0.0865	1170	5
09/07/02	06:29	NONE	NONE	NONE	NONE	NONE	1.8	NONE	NONE	NONE	NONE	NONE	0.0465	1045	6

Notes:-

- 1) RoCoF is calculated by taking the frequency at the time of disturbance, then two seconds later and dividing the difference by two
- 2) Seeboard report multiple trippings of an embedded generator at Kingsnorth between July and September due to over voltages. No evidence of NGC system involmnet
- 3) 24Seven London report that an embedded generator at Landmann Way tripped on the 3rd September at 20:18. No evidence of NGC system involmnet
- 4) On the 30th Septmber, embedded generators at three separate locations report tripping following switching at Drax 400kV substation. IR93/01 and a forthcoming incident report refer
- 5) NEDL report that 0.5MW was lost at Plantation Drive SS. UU report 5.5MW lost at Rochdale.
- 6) SP Power Systems report the loss of 1.8MW at Wylfa