ANNEX 2.1: MAJOR SHUTDOWNS AFTER COD

Major Shut Downs after COD- TABLE "A"

S.No.	Date		Major Plant Shut Down		
	From	To	Duration	Shut Down Reason	Repair Work Carried Out
1.	12.9.2008	14.8.2009	43 weeks	**1st. Shut Down:** High vibration in GT due to creep in Hollow Shaft	**Warranty Items:** 1)Replace central hollow shaft with improved heat treatment and material composition to suit site conditions under warranty. 2)Replace turbine 1st.stage blade(80 nos.) under warranty. **Non-Warranty Items:** 1)Replace affected compressor vanes & vane ring stage 2 2)Extensive cleaning of uncoated compressor stages & burner swirlers 3)Replacement of GT and compressor journal bearings and thrust pads 4)Replace/ repair of IGV ring lost support rollers 5) Replace premix burner AVIT fittings 6)Reconditioning of munter dryer
2.	02.11.2009	18.2.2009	14 weeks	**2nd. Shut Down:** Surge in GT caused damages to compressor vanes(2nd. and 3rd. stages) The Grid Frequency drop rate (6.7 Hz/sec), much faster than the PI controller of the GT compressor pressure limiter, which was programmed for a frequency drop of 1 Hz/sec.	1) Siemens sent a fact Finding Team and Boroscopic inspection revealed damages in comp. vanes 3rd. stage. Siemens decided to open the GT. 2) Replaced damaged Compressor 3rd. stage diaphragm with additionally 16 stationary vanes of other stages. 3)Compressor diaphragm, vanes and blades were cleaned with fine grade 600 emery papers by SPK professionals under SAG supervision 4)GT journal bearing white metal was found damaged and therefore replaced the bearing with new one. 5)An up-graded version of the breaker (Thyristor controlled Plug & Play module) for IGV actuator, fast enough to close the inlet guide vanes to prevent overloading of compressor. 6)To cope with the high frequency changes of the 11KV grid, installation of the SIPROTEC 7VE6 multifunction paralleling device, this will isolate DCL from the grid in the event that a high frequency drop is encountered again. 7) To avoid deposits on the compressor blades. Siemens recommended extensive On-Line and Off-Line washing regime for GT which was

					implemented by DCL.
3.	01.05.2010	To date		**3rd. Shut Down:** Surge in GT caused damages to compressor vanes. Compressor degraded due to heavy corrosion and pitting and operates very close to Surge Line.	1)Boroscopic inspection revealed cracks in 2nd.. stage blades and heavy corrosion and pitting on compressor blades/vanes in later stages. 2)Siemens dispatched Fact Finding experts and the reports were submitted. Siemens Plan for the Rehabilitation of GT is as follows: • Install all new Stationary and Rotating blades/Vanes(1-17 stages) of Compressor. • Coat all Compressor Blades 1-4 stages • Change all IGV blades(45 nos.) • Redefine/Revise GT controls as per site conditions. • Major Overhaul of GT with supply of hardware and spare parts including services. • Provide two years Warranty with O&M supervision and 91% availability.

Major Surge Events after COD- TABLE "B"

S.No.	Date		Surge Event:Reason	Corrective Action Taken
	From	To		
1.	24.8.2009	24.8.2009	1ST SURGE EVENT: Grid Frequency dropped. GT was on base load ~83 mw, Tripped on surge protection with a loud bang	Borescopic inspection was carried out and results were sent to Siemens. No major damages were noticed and GT/Plant was restarted.
2.	29.8.2009	29.8.2009	2ND SURGE EVENT: Compressor degraded and when the grid frequency dropped to 49.2 HZ, GT tripped on surge protection with a loud bang.	1)Siemens sent their team to site to investigate. 2)Baroscopic inspection was carried out and results were sent to Siemens. No major damages were noticed. 3) A new IGV position sensor was installed. 4) SIEMENS made the compressor pressure ratio limiter active, so that it would start closing the IGV when the frequency starts decreasing. 5) GT/Plant was restarted.
3.	17.9.2009	17.9.2009	3RD SURGE EVENT : The GT was on load ~74mw, Tripped surge protection	1)Baroscopic inspection was carried out and results were sent to Siemens. No major damages were noticed. 2) A new polygon which means new value for compressor pressure ratio limiter which would allow IGV to close more during low frequency 3)Open cooling air valve during low frequency 4)Reduce OTC to 550 deg C during low frequency, this would additionally, reduce the combustion chamber pressure to prevent pile-up of air in the compressor last stages. 5) These changes were tested during frequencies as low as 48.9 Hz and appear to have with stood the test of providing protection against surge.
4.	2.11.2009	2.11.2009	4TH SURGE EVENT: The GT was on load ~76MW,	Same as in Table 'A" above under item 2.

			Tripped on surge protection with a very loud bang and high vibration was recorded.	
5.	01.05.2010	01.05.2010	5th SURGE EVENT: The GT was on load ~72 MW, Tripped on surge protection with a loud bang and high vibrations were recorded	Same as in Table 'A" above under item 3.