

QUALITY MANAGEMENT SYSTEM	POWER GRID COMPANY OF BANGLADESH LTD.					QUALITY PROCEDURES			
	TITLE: WORK INSTRUCTION FOR POWER SYSTEM RESTORATION FROM GRID FAIL								
Document No:	WI-PSO-6	Revision No.:	00	Effective Date:	22/02/06	Page:	1	of	6

1. Scope: Applies to the whole of Power System Network of POWER GRID COMPANY OF BANGLADESH LTD.					
2. Purpose: To ensure minimum interruption in quality power supply to the consumers in case of failure of national grid by means of efficient restoration management.					
SL. No.	Activity (including check points)	Ref. Doc.	Responsibility	Freq./ Time	Output
1.0	System Restoration from Partial Grid failure:		GMSO	As required	
1.1	Partial Grid Fail is apprehended:				
1.1.1	In case of partial grid failure following things happens <ul style="list-style-type: none"> One or more zones get full power interruption Almost all generating units in concerned zone gets tripped One or more transmission lines trips isolating zones from national grid All power station in the concerned zone lacks auxiliary power supply. 				
1.1.2	Partial grid failure may be apprehended, depending on generation & load condition in the concerned area, when one or more of the following lines trips <ul style="list-style-type: none"> Ashuganj - Shahjibazar 132kV double circuit line Ashuganj - Kishoreganj 132kV double circuit line Ishurdi - Bheramara 132kV double circuit line Comilla(N) - Hathazari 230 kV double circuit line and Comilla(N) - Baroaulia 132 kV single circuit line Ghorasal - Ishurdi 230 kV double circuit line (East West Interconnector) No load flow is indicated in those lines in the SCADA / telemetering mimic board or console.		SCE (DM/AM LDC)	As required	
1.1.3	Partial grid failure may also be apprehended, depending on generation, load condition and load flow through associated lines in the concerned area, when major generators in those area trips resulting in tripping of associated lines mentioned in clause 1.1.2. No load flow is indicated in lines in the SCADA/ telemetering mimic board or console.		SCE (DM/AM LDC)	As required	
1.1.4	Despatcher will be immediately informed by the concerned grid sub-station and/or power stations where tripping has occurred, otherwise he will contact himself with them.		SCE (DM/AM LDC)	As required	Information gathered

Reviewed by (GMSO):

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Approved by (DT)

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SL. No.	Activity (including check points)	Ref. Doc.	Responsibility	Freq./ Time	Output
1.2	<u>Action to be taken:</u>				
1.2.1	Immediate action to be taken when it is apprehended that partial grid failure has occurred: <ul style="list-style-type: none"> Despatcher will collect information conforming partial grid failure before stepping ahead for next action He will inform all concerned high officials about the partial grid fail. (Refer to the list of persons to be informed in case of <i>Partial Grid Fail</i>) 	QF-LDC-14	SCE (DM/AM LDC) SCE (DM/AM LDC)	As required As required	Partial grid failure is conformed. Concerned persons are informed.
1.2.2	The despatcher will consult with MLDD, DGMLDC and concerned officials about the way of restoration process.		DGMLDC, MLDD & SCE (DM/AM LDC)	As required	Restoration process is identified.
1.2.3	Actions will be taken to <ul style="list-style-type: none"> Start & synchronize the generator tripped. Perform switching operations in association with the JAM on duty in grid sub-station to resume the service of transmission lines and/or substation equipment tripped. Unification of grid zones running under island mode with whole grid. 		SCE (DM/AM LDC)	As required	
1.2.4	Accordingly despatcher, along with his assistants will start restoration process following the method devised earlier with the consultation of concerned officials.		DGMLDC	As required	System is restored
1.2.5	If restoration of power is not possible in any one of the above mentioned areas in that case power in that particular area will be restored from nearby area where power is available.		SCE (DM/AM LDC)	As required	System is restored
1.2.6	WI-PSO-01 and/or WI-PSO-02 will be followed (If necessary).		SCE (DM/AM LDC)	As required	Frequency, voltage & load control
1.2.7	After power is restored in all affected areas under island mode, following operations are carried out as necessary to unify the whole Grid. <ol style="list-style-type: none"> Unification of Khulna area (including Barisal area) with Rajshahi area through Ishurdi-Bheramara 132 kV Ckts. Unification of Mymensingh & Sylhet area through Ashuganj 132 kV Bus. Unification of Chittagong area through Comilla(N) 230 kV and 132 kV bus. Unification of East Grid with West Grid through 230 kV East-West Inter connector. (Ishurdi-Ghorasal 230kV line) 		MLDD & SCE (DM/AM LDC)	As required	Restoration process is identified.

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Sl. No.	Activity (including check points)	Ref. Doc.	Responsibility	Freq. /Time	Output
1.3	Safety measures to be taken:				
1.3.1	Before charging any equipment and/or transmission line, necessary checks are done to find out suitability of the equipment for charging and safety		SCE (DM/AM LDC), JAMGMD	As required	Security and sustainability of equipment is ensured.
1.3.2	Defective line and/or equipment will be isolated from the system (If any).		JAMGMD	As required	Isolation of faulty section
1.4	Actions described in 1.2.3 to 1.2.11 to normalize the system will be carried out with the help of grid sub station and / or power station operator.		SCE (DM/AM LDC), JAMGMD, Power station operator	As required	
1.5	After completion of total system restoration, Despatcher writes the details of tripping and restoration process in the shift registers.		SCE (DM/AM LDC)	As required	QF-LDC-06
2.0	System Restoration from Full Grid failure:		GMSO	As required	
2.1	Full Grid Fail is apprehended:				
2.1.1	In case of full grid failure following things happens <ul style="list-style-type: none"> All zones get full power interruption Almost all generating units gets tripped One or more transmission lines are tripped All power station lacks auxiliary power supply. 				
2.1.2	Full grid fail is apprehended when <ul style="list-style-type: none"> Abnormal change and high swing in system frequency is observed in frequency meter. The frequency finally bogs down to zero. No load flow indication is observed in any lines in the SCADA/ Telemetry board or console. All generation display in mimic board shows zero reading 		SCE (DM/AM LDC)	As required	Grid failure is recognized
2.1.3	Despatcher will be immediately informed by the concerned grid sub-station and/or power stations where tripping has occurred, otherwise he will contact himself with them.		SCE (DM/AM LDC)	As required	Information gathered

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Sl. No.	Activity (including check points)	Ref. Doc.	Responsibility	Freq. /Time	Output
2.2	Action to be taken immediately:				
2.2.1	Immediate action to be taken when it is apprehended that full grid failure has occurred: <ul style="list-style-type: none"> Despatcher will collect information conforming total grid failure before stepping ahead for the next stage of action He will inform all concerned high officials about the total grid fail. (Refer to the list of persons to be informed in case of <i>Full Grid Fail</i>) 	QF-LDC-14	SCE (DM/AM LDC)	As required As required	Grid failure is conformed Concerned persons are informed
2.2.2	The despatcher will consult with MLDD, DGMLDC and concerned officials about the way of restoration process.		SCE (DM/AM LDC)	As required	Restoration process is identified.
2.2.3	Actions will be taken to <ul style="list-style-type: none"> Start & synchronize the generator tripped. Perform switching operations in association with the JAM on duty in grid sub-station to resume the service of transmission lines and/or substation equipment tripped. ensure Isolation of defective section from the system (If any) Unification of grid zones, running under island mode, with whole grid. 		SCE (DM/AM LDC)	As required	System will be restored
2.2.4	If restoration of power is not possible in any one of the above mentioned areas in that case power in that particular area will be restored from nearby area where power is available.		SCE (DM/AM LDC)	As required	
2.2.5	WI-PSO-01 and/or WI-PSO-02 will be followed (If and when necessary).		SCE (DM/AM LDC)	As required	Voltage frequency & load control
2.2.6	Accordingly despatcher, along with his assistants will start restoration process following the method devised earlier with the consultation of concerned officials.		SCE (DM/AM LDC)	As required	
2.3	Black Start Restoration Process: <ul style="list-style-type: none"> ❖ In almost all cases of full grid fail it is required to implement black start restoration process, as all power station lacks auxiliary power supply from grid. 		GMSO, DGMLDC, MLDD & SCE (DM/AM LDC)	As required	Restoration process is identified.
2.3.1	A master list of power plants with black start facilities is maintained in LDC control room, for reference and immediate action, as shown in clause 2.3.2 & 2.3.3.		DGMLDC MLDD	As planned	

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2.3.2	IPP Power plant with Black start facility		DGMLDC MLDD	As capable																			
	<table border="1"> <tr> <td>Name of power plant</td> <td>Installed capacity (MW)</td> </tr> <tr> <td>RPCL Mymensingh</td> <td>140</td> </tr> </table>	Name of power plant	Installed capacity (MW)	RPCL Mymensingh	140																		
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2.3.3	BPDB owned Power plants with Black start facility		DGMLDC MLDD	As capable																			
	<table border="1"> <tr> <td>Name of power plant</td> <td>Installed capacity (MW)</td> </tr> <tr> <td>Kaptai HPS</td> <td>230</td> </tr> <tr> <td>Haripur GT SBU</td> <td>100</td> </tr> <tr> <td>Shahjibajar 70 MW</td> <td>70</td> </tr> <tr> <td>Fenchuganj CCP</td> <td>90</td> </tr> <tr> <td>Khulna BMPP</td> <td>56</td> </tr> <tr> <td>Bheramara GT</td> <td>60</td> </tr> <tr> <td>Bagabari GT1</td> <td>71</td> </tr> <tr> <td>Saidpur GT</td> <td>20</td> </tr> </table>	Name of power plant	Installed capacity (MW)	Kaptai HPS	230	Haripur GT SBU	100	Shahjibajar 70 MW	70	Fenchuganj CCP	90	Khulna BMPP	56	Bheramara GT	60	Bagabari GT1	71	Saidpur GT	20				
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Bagabari GT1	71																						
Saidpur GT	20																						
2.3.4	Primary Action For Power Station: <ul style="list-style-type: none"> ❖ All generating units which have black start facilities will be started immediately & LDC will be informed ❖ All Diesel generator units will be started immediately and LDC will be informed accordingly. 		DGMLDC, MLDD & SCE (DM/AM LDC)	As required	Actual restoration process																		
2.3.5	Primary Action For Grid Sub-Station: <ul style="list-style-type: none"> ❖ All 33kV and 11kV outgoing feeders will be switch off immediately. ❖ All switching in 132kV & 230kV should be Implemented as per existing guideline of LDC & LDC should be informed. 		MGMD DM/AM GMD JAMGMD	As required	Actual restoration process																		
2.3.6	Primary Action For LDC control room: <ul style="list-style-type: none"> ❖ Switch off <ul style="list-style-type: none"> ○ 230 kV East-West Interconnector ○ Ishurdi-Bheramara both ckt ○ Ashuganj-Shahjibazar both ckt ○ Ashuganj-Kishorganj both ckt. ○ Bheramara-Faridpur both ckt ○ Goalpara-Bagerhat ckt & ○ All 230/132 kV AutoTransformers ❖ All switching operations performed in Grid Sub-stations will be validated for conformity with the prescribed guidelines of LDC. ❖ Restoration process will be started in context with Grid Sub-station & Power station in island mode of grid. ❖ CARE SHOULD BE TAKEN THAT GRID VOLTAGE DOES NOT EXCEED 145 KV IN CASE OF 132 KV SYSTEM & 253 KV IN CASE OF 230 KV SYSTEM. 		DGMLDC, MLDD & SCE (DM/AM LDC)	As required	Actual restoration process																		

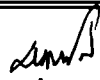
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2.3.7	When Power is restored in all areas under island mode, following operations are carried out to unify the whole Grid. 1. Unification of Khulna and Barisal areas. 2. Unification of Khulna area (including Barisal area) with Rajshahi area through Ishurdi-Bheramara 132 kV Ckts. 3. Unification of Mymensingh & Sylhet area through Ashuganj 132 kV Bus. 4. Unification of East Grid with West Grid through 230 kV East-West Inter connector.		DGMLDC, MLDD & SCE (DM/AM LDC)	As required	Actual restoration process
2.4	<u>Safety measures to be taken:</u>				
2.4.1	Before charging any equipment and/or transmission line, necessary checks are done to find out suitability of the equipment for charging and safety		SCE (DM/AM LDC) JAMGMD	As required	Security and sustainability of equipment is ensured.
2.4.2	Defective line and/or equipment will be isolated from the system (If any).		JAMGMD	As required	Isolation of faulty section
2.5	Actions described in 1.2.3 to 1.2.11 to normalize the system will be carried out with the help of grid sub station and / or power station operator.		SCE (DM/AM LDC), JAMGMD, Power station operator	As required	
2.6	After completion of total system restoration, Despatcher writes the details of restoration process in the shift registers.		Shift in charge (LDC)	As required	QF-LDC-06
3.0	The effectiveness of the work instruction for "Power System Restoration from Grid Fail" will be evaluated and reviewed during internal audits.		Management Review Committee, MR.	During internal audit	Review of review system
4.0	The Management will take actions on the basis of the evaluation.		MD, DT, MR.	At least 1 time in a year	Improvement

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