



**CEYLON ELECTRICITY
BOARD**

EMERGENCY ACTION MEMORANDUM No: 01

**SRI LANKAN POWER SYSTEM
RESTORATION PLAN
AFTER A TOTAL FAILURE**

System Control Centre

Ceylon Electricity Board

Revision 4.0 - September 2018

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LIST OF ABBREVIATIONS

The restoration procedure after a total system failure requires action by the following personnel on duty at various places, abbreviated as follows.

SCE	-	System Control Engineer
ShCE	-	Shift Change Engineer (Kelanithissa Power Station)
OE	-	Operations Engineer
SES	-	Shift Electrical Superintendent
CRO	-	Control Room Operator
SCC	-	System Control Center
CCCC	-	Colombo City Control Centre
GSS	-	Grid Sub Station
CP	-	Colombo Primary
PS	-	Power Station
LVPS	-	Lakvijaya Power Station
KPS	-	Kelanithissa Power Station
IPP	-	Independent Power Producer
KCCP	-	Kelanithissa Combined Cycle Plant
BMPP	-	Barge Mounted Power Plant
T/F	-	Transformer
GT	-	Gas Turbine
Cct.	-	Circuit
m/c	-	Machine
CB	-	Circuit Breaker

IPPs - All IPPs are termed by their usual names

APPL	-	Asia Power Plant
Sojitz	-	Sojitz Kelanithissa
WCP	-	West Coast Power

Modes of Communication

PSTN - public Switched Telephone Network / SLT

Admin

HotLine

VPN - Virtual Private Network

1.0 INTRODUCTION

The procedure for restoration of supply subsequent to a total failure is prepared by the system Control branch to restore the supply to the country in the shortest possible time giving priority to Colombo City with due consideration to safety of public and the equipment.

Colombo City Control Center should be consulted regarding restoration of supply to Colombo City. (Refer appendix 10 for more details.)

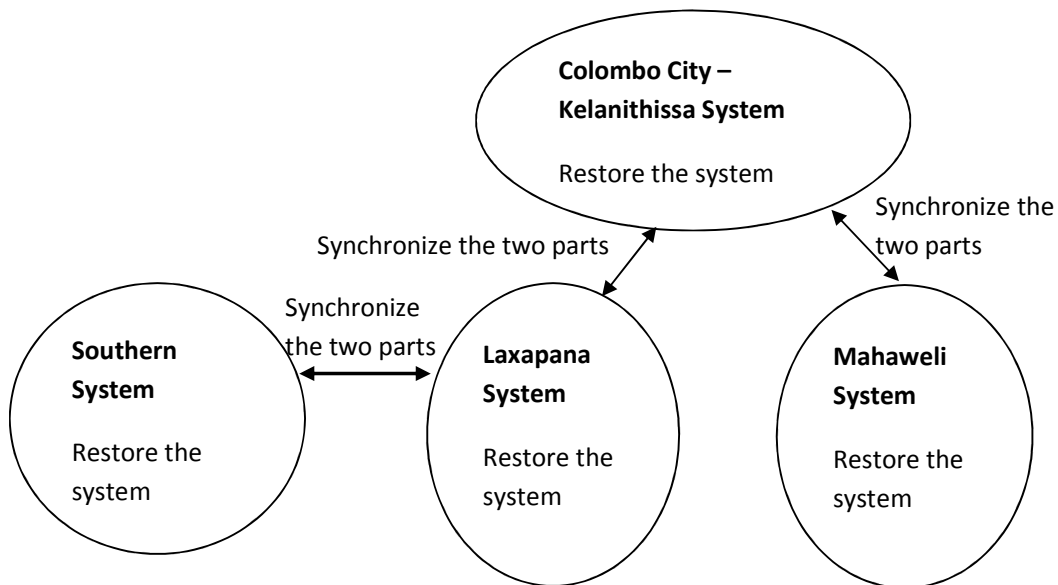
The procedure is based on the assumption that all generators, transmission lines and equipment, which were in operation prior to total failure, remain to be in healthy condition to put back into operation.

The order of priority during restoration is given below.

- I. Safety of Person
- II. Protection of Equipment
- III. Availability of Supply

System Control Engineer is expected to use this procedure as a guideline only. However, action taken in the event of any such emergency must be at the discretion of the System Control Engineer, who will take into account the system configuration, extent of the break down, plant availability and system demand etc. at the time of failure.

Following figure illustrates the overall restoration strategy to follow within each part.



This document is available with

GM (CEB)

AGM (TRANSMISSION)

DGM (SYSTEM CONTROL)

DGM (O & MS)

CE (SYSTEM OPERATION)

SCE (SYSTEM CONTROL)

CE (O&M-CR)

CE (O&M-KR)

CE (O&M-GR)

CE (O&M-AR)

CE (O&MS- C)

CE (OPERATIONS –COLOMBO CITY)

CE(KCCP)

CE (KPS)

CE (SAPUGASKANDA)

CE (LAKVIJAYA POWER STATION)

CE (KOTHMALE)

CE (VICTORIA)

CE (RANDENIGALA)

CE (UKUWELA)

CE (UPPER KOTHMALE)

CE (SAMANALAWEWA)

CE (KUKULE GANGA)

CE (LAXAPANA)

CE(CB)

EE (WPS)

EE (CANYON)

EE (POPLITIYA)

EE (BOWETHENNA)

2.0 LIST OF INSTRUCTIONS

2.1 Standing Instructions to CROs at GSS

- For all incoming failures, CROs at GSS should
 - Inform to System Control Centre immediately.
 - Switch off all 33 kV feeders and Capacitor banks in GSS and PS where applicable.
 - Select T/F AVR-MANUAL mode and adjust tap to nominal position.
 - Switch off Transformers mentioned under 2.2.
 - Note down all the indications clearly.

- In case of Hot Line failure, CROs should contact SCC through ‘Admin’.
- CRO should not call SCC unless there is any Breaker tripping or any abnormal condition.
- Do not keep the ADMIN/Hot Line phone lifted unnecessarily.
- CROs must give priority to calls from the SCC.
- CROs must note down the incoming supply failure and restoring times clearly.

2.2 Standing Instructions to OEs/CROs at PS/ GSS

*

- SWITCH-OFF 132 kV incoming circuit breakers of all the GSS given in the appendix 01.
- SWITCH-OFF all the 132kV and 220 kV incoming / outgoing circuit breakers of the PS and GSS given in Appendix 03 and Appendix 04 respectively, **excluding circuits given below.**
- **Do not** SWITCH – OFF following circuits unless the fault is originated from that particular circuit. Circuits which remain ON are illustrated in the single line diagram given in appendix 05.

At Old Laxapana Power Station

New Laxapana	both ccts
Popitiya	cct 01

At New Laxapana Power Station

Old Laxapana	both ccts
Popitiya	cct 01

At Polpitiya Power Station

Old Laxapana	cct 01
New Lxapana	cct 01
Seethawaka	cct 01

At Seethawaka Grid Sub Station

Polpitiya	cct 01
Kolonnawa	cct 01

At Wimalasurendra Power Station

Old Laxapana	cct 01
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At Athurugiriya Grid Sub Station

Polpitiya	cct 01
Kolonnawa	cct 01

At Sapugaskanda Grid Sub Station

Biyagama	cct 01
Kelaniya	cct 01

At Kelaniya

Sapugaskanda	cct 01
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At Kelanithissa 132 kV GIS

Kolonnawa	cct 01
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At Aniyakanda Grid Sub Station

Kelaniya	cct 01
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At Katunayaka Grid Sub Station

Kotugoda	both ccts
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At Samanalawewa Power Station

Balangoda cct 01
Embilipitiya cct 01

At Balangoda Grid Substation

Samanalawewa cct 01

At Embilipitiya Grid Substation

Samanalawewa cct 01

At Kothmale Power Station

Biyagama cct 01 (CB 520, CB 530)

At Pannipitiya Grid Sub Station

Biyagama cct 01

Rathmalana cct 01

At Randenigala Power Station

Victoria cct 01

At Rantabe Power Station

Randenigala cct 01

At Upper Kothmale Power Station

Kothmale cct 01

At Deniyaya Grid Sub Station

Balangoda cct 01

At Habarana Grid Sub Station

Ukuwela cct 01

Old Anuradhapura cct 01

At Biyagama Grid Substation

Kothmale cct 01

At Kolonnawa Grid Substation

Seethawaka cct
(cct No.02 can be used as alternative to cct No.01 as mentioned above)

- SWITCH-OFF following T/F s and select T/F AVR-MANUAL mode and adjust tap to nominal position.

At Biyagama GSS	– 220/132/33 kV Both T/Fs
At Kotugoda GSS	– 220/132/33 kV Both T/Fs
At Pannipitiya GSS	– 220/132/33 kV Both T/Fs
At Kelanithissa PS	– 220/132/33 kV Both T/Fs
At New Anuradhapura GSS	– 220/132/33 kV Both T/Fs
At New Chilaw GSS	– 220/132kV Both T/Fs
At Seethawaka GSS	– 132/33 kV All three T/Fs
At Embilipitiya GSS	– 132/33 kV Both T/Fs
At Balangoda GSS	– 132/33 kV All three T/Fs
At Kolonnawa GIS	– 132/33 kV All three T/Fs
At Old Kolonnawa GSS	– 132/33 kV Both T/Fs

- **Do not stop machines, which are running no load at full speed. All power stations having black start facility, except Bowethenna and Canyon, should start or restart (If tripped during the total failure) all their available machines and inform SCC when they are ready to synchronize.** A list of power stations having black start facility is given in the Appendix 06.

Start Bowethenna and Canyon machines only on the request of SCC.

Note:

In case a hydro machine is shut down on the request by third parties, such machines should not be started. (Example: Bowethenna plant shut down for canal repair work downstream of Bowethenna PS, Ukuwela / Polpitiya shut down on request by police to remove dead bodies, etc)

- OEs / EEs at Power Stations should make necessary arrangements, to contact them to SCC within very short time during the restoration period.
- From this stage onwards instructions will have to be awaited from SCC to SWITCH ON any 220 kV, 132 kV, 33 kV or 11 kV incoming / outgoing CBs and T/Fs
- Even after the supply is made available to any GSS it should be clearly understood that the CROs should not SWITCH-ON any of the 33 kV/11 kV CBs. They should await instructions from the SCC, to SWITCH-ON circuit breakers. They should promptly inform the SCC of any abnormal rise in the parameters (ex: Voltage etc)

- **Do not SWITCH-ON** any feeders having AUTOMATIC UNDER FREQUENCY LOAD SHEDDING;Stage I,II,III and NON DISPATCHABLE POWER PLANTS at the initial stage of the restoration. UFLS feeders are given in the Appendix 07. 33 kV feeders having connected Wind plants are given in the Appendix 08.

2.3 Standing Instructions to Colombo City Control Centre

- For All incoming failures in Colombo Subs OE at CCCC should
 - Inform System Control Centre
 - If incoming circuit breaker is in ON position Switch OFF incoming circuit breakers.
 - Switch off all 11 kV Feeders
 - Select T/F AVR-MANUAL mode and adjust tap to nominal position in 132/11 kV Subs.
 - Note down all the indications clearly.
- CROs at Sub B, D, E, and F should inform CCCC after carrying out above steps.
- OE at CCCC should carry out similar operation at Sub A, C, G, H, and I inform SCC through ADMIN (If available) or other means of communication (SLT) after carrying out above steps. They should overhear the conversation between SCC and other stations and should realize whether a TOTAL failure has occurred.
- When incoming supply is available instructions will be issued by the SCE at SCC to OE at CCCC to load Colombo Primaries (CP) in limited block loads (in general 5 MW). It should be clearly understood that the OE / CROO at CCCC / CPs should not switch on any of the 132 kV, 33 kV or 11 kV CBs without instructions from the SCC. They should promptly inform the SCC of any abnormal rise in the parameters (Ex: Voltage etc)
- OE at CCCC should inform SCC once such instructions are carried out.

2.4 Standing instructions to SCE at SCC

SCE should arrange to inform Chairman (CEB), Vice Chairman (CEB), GM (CEB) and AGM (Transmission) through DGM (System Control), CE (System Operation) immediately. Relevant telephone numbers are given in Appendix 09.

- SCE should make endeavor to find out the location and the cause which initiated the total failure.
- SCE should then find out the machines that are running (on full speed- no load).
- **SCE should instruct Power Barge and WCP to start the machines (WCP GTs only) which having black start facility and keep no load full speed until they will be asked to synchronize.**
- SCE at Console 2 should ascertain the followings.
 - Whether all the specified main transmission lines are SWITCHED-OFF. Refer Appendix 01, 03 and 04. Whether all transformers mentioned in Standing instructions 2.2, are SWITCHED-OFF and tap is in nominal position.
 - Whether all 132/33 kV transformer AVR is in manual mode and tap is in nominal position.
 - Whether CCCC has been following the standing instructions referring to 2.3.
 - Whether Tr. O&M branch have made arrangements to deploy ESs to important GSS and other GSS which have switching issues.
- Inform any SCADA/Communication failure to CE (Communication Service) and CE (Communication Systems).
- SCE should start restoration from the point where generation is available.
- All instructions on CB operations at 33/11 kV level in CPs should be delivered to Colombo City Control Centre.
- The top priority is to restore supply to Colombo City. 11kV feeders will be energized by the CCCC depending on the priority given in the appendix 10.
- Ambatale primary substation supply (Water Board supply) must be restored as early as possible (Via Sapugaskanda GSS Feeder 01 or Kolonnawa GSS Feeder 02) to minimize the impact on water supply services. Any significant delay in feeding Ambatale from Sapugaskanda GSS, inform S'Japura CE to arrange the supply to Ambatale from Kolonnawa Feeder 02.

- Sapugaskanda Diesel power station supply should also be restored, soon after energizing Biyagama 132 kV bus bars.
- Extending supply from hydro stations towards Biyagama or Kolonnawa should be energizing only one circuit at a time except circuits that are on “SWITCHED ON” under 2.2, while maintaining the voltage levels.
- Do not SWITCH-ON any 33 kV feeders having AUTOMATIC UNDER FREQUENCY LOAD SHEDDING at the initial stage of the restoration.
- Do not SWITCH-ON Capacitor banks and Non dispatchable Plants until system is stabilized.
- Do not SWITCH-ON Kothmale – New Anuradhapura and LVPS – New Anuradhapura lines until system voltage is stabilized.
- After restoring the whole system SCE should go through the attached check list in appendix 11.
- Prepare the “Total failure restoration report” (Appendix 12) and submit to CE (SO).
- ADMIN/ Hot Line phones should be reserved as follows.
 - Console 01 – System restoration via Mahaweli complex.
 - Console 02 – Colombo City restoration and System restoration via Laxapana complex.
 - Console 03 – Check preliminary system conditions prior to system restoring and Southern system restoration via Samanalawewa PS.

3.0 PROCEDURE OF RESTORATION OF SUPPLY

Prime intention should be restore the Colombo City supply as soon as possible. Rest of the system restoration can be started in parallel from Mahaweli, Laxapana and Samanalawewa.

3.1 Restoration of Colombo City Supply

Colombo City restoration procedure involves restoration of Havelock Town(Sub A), Sub B, Sub C, Sub D, Sub E, Sub F, Sub G, Sub H and Sub I(Maradana) CPs. New Laxapana generator 01 and KPS GT 07 should be started simultaneously following the guidelines given below. Then restoration of Colombo City supply could be commenced by energizing Kolonnawa GIS from whoever successfully resumed first. Starting KCCP to energize the Kolonnawa GIS is another option in case of failure of above two options.

** Do not SWITCH ON following cables until system voltage is stabilized.

1. Kolonnawa – Sub C
2. Kolonnawa – Sub E
3. Kelanitissa – Sub C
4. Kelanitissa – Sub F
5. Kolonnawa – Sub I
6. Pannipitiya - Dehiwala

Option 1 – KPS GT 07

➤ At Kelanithissa PS

- Start Frame V GT and energize the 33kV bus bar. SWITCH-ON 33kV feeder 7 (or8) to energize sub H.
- Load the Frame V GT around 5 MW coordinating with the CCCC.
- Then SWITCH-ON IBT 01 and energize the Kelanithissa 132kV GIS.
- Start the GT 07 and synchronized to the 132kV bus bar.
- Load KPS Frame V GT around 15 MW by loading Sub B, Sub D or Sub G coordinating with CCCC after energizing the Kolonnawa GIS.
- (Amount of load need for KPS GT 07)
- As GT 07 synchronized, stabilize the machine adding more loads from Sub B, Sub D, Sub G or Sub H if necessary.
- SWITCH-ON 220/132kV T/F 01 to energize Kelanithissa 220kV GIS.
- If Kelanithissa 132kV voltage is within the acceptable range SWITCH-ON Sub C cable.

➤ At Kolonnawa GIS

SWITCH – ON Kelanithisa line 01.

SWITCH - ON 132/33 kV one transformer (T/F 01, 02 or 03) and adjust the T/F tap manually if necessary and SWITCH - ON D1, D2, B1, and B2.

➤ At Kelanithissa 220kV GIS

SWITCH-ON the KCCP GT and ST Cable after informing to KCCP.

After ensuring the stability of GT 07 start KCCP GT and synchroniz. Total load of Kelanithissa system would be around 50 MW by the time of synchronizing of KCCP GT.

Option 2 – Laxapana Complex

In case of failure of Polpitiya – Seethawaka or Seethawaka – Kolonnawa lines any cct from Polpitiya – Kosgama – Kolonnawa or Polpitiya – Athurugiriya – Kolonnawa lines can be used for line charging.

➤ At New Laxapana PS

Start Generator 01 and energize the 132kV bus bar closing the generator circuit breaker with minimum generating voltage. This will eventually energize the O/Laxapana, Polpitiya, Seethawaka and Kolonnawa GSS.

Start second machine and keep it spinning. (Do not synchronize until machine 01 stabilized)

(New Laxapana generator 01 will absorb approximately 7 MVAr from the energized lines and Kolonnawa voltage should be below 140 kV).

➤ At Seethawaka GSS

SWITCH ON 132/33 kV one transformer and adjust the T/F tap manually if necessary and SWITCH-ON 33 kV feeders one by one slowly, until N/Laxapana machine is loaded up to 5 MW.

SWITCH-ON second T/F

➤ At Kolonnawa GIS

SWITCH – ON Seethawaka cct and energize Kolonnawa GIS.

SWITCH - ON 132/33 kV one transformer (T/F 01, 02 or 03) and adjust the T/F tap manually if necessary and SWITCH - ON D1, D2, B1, and B2.

Inform CCCC to load 10 MW from sub B and D based on their priority.

Synchronize N/lax second generator.

Energize A1 and A2 to energize sub G and inform to CCCC to load another 20 MW collectively from CPs B, D and G.

SWITCH-ON Kelanithissa both ccts. This will eventually energize the Kelanithissa 132 kV GIS.

If 132kV voltage is within the acceptable range SWITCH-ON Sub C cable.

- Energize Polpitiya-Athurugriya-Kolonnawa both lines while maintaining the 132kV Voltage.
- Start Old Laxapana and Polpitiya machines
- Energize Kelanithissa 220kV GIS by energizing the 220/132 kV transformer at Kelanithissa.

At Kelanithissa 220kV GIS

SWITCH-ON the KCCP GT and ST Cable after informing to KCCP. Start the KCCP GT once Laxapana machines are stabilized.

Option 3 – KCCP GT

➤ At Kelanithissa PS

Start Frame V GT and energize the 33kV bus bar. SWITCH-ON 33kV feeder 7 (or 8) to energize sub H.

Load the Frame V GT around 5 MW coordinating with the CCCC.

Then SWITCH-ON IBT 01 and energize the Kelanithissa 132kV GIS.

SWITCH-ON 220/132kV T/F 01 to energize Kelanithissa 220kV GIS.

Load KPS Frame V GT around 15 MW by loading Sub B, Sub D or Sub G coordinating with CCCC after energizing the Kolonnawa GIS.

synchroniz KCCP GT.

As KCCP GT synchronized, stabilize the machine adding more loads from Sub B, Sub D if necessary.

If Kelanithissa 132kV voltage is within the acceptable range SWITCH-ON Sub C cable once KCCP GT is stabilized.

➤ At Kelanithissa 220kV GIS

SWITCH-ON the KCCP GT and ST Cable after informing to KCCP.

Start KCCP GT and synchronize when GT load is around 15 MW.

➤ At Kolonnawa GIS

SWITCH-ON both Kelanithissa lines and Switch ON 132/33 kV one transformer (T/F 01, 02 or 03) and adjust the T/F tap manually if necessary and energize the D1, D2, B1, and B2.

Inform CCCC to load 10 MW from sub B and D as per the priority basis.

Energize A1 and A2 to energize sub G and inform to CCCC to load another 20 MW collectively from CPs B, D and G as KCCP GT synchronized.

Continue the Colombo Supply restoration process following the guidelines given below after energizing the Kolonnawa 132 kV GIS.

➤ At Sub C CP

As supply receive from Kelanithissa 132 kV GIS SWITCH-ON Kelanithissa line and inform CCCC to load 5 MW slowly.

Note: Check 132 kV voltage regularly. If voltage is high SWITCH ON more feeders and reduce the voltage, adjust generation accordingly.

➤ At Kolonnawa GIS

Energize Maradana 132kV cable and inform CCCC to load Maradana CP to 10 MW.

➤ At Maradana

Energize Havelock Town 132kV cable and inform CCCC to load Havelock Town CP to 10 MW.

➤ Energize Sub F via Kelanithissa 132 kV GIS and inform CCCC to load Sub F to 10 MW.

➤ Energize Sub E via Sub F and inform CCCC to load Sub E to 10 MW.

➤ Synchronize Power Barge whenever it is ready for synchronizing.

➤ If supply to Biyagama is getting delayed from Kothmale, energize Biyagama 220 kV bus and then follow the guidelines given in the section 3.3.

➤ Energize the Kerawalapitiya 220kV GIS via Biyagama – Kotugoda and Kotugoda – Kerawalapitiya one line if 220kV voltage is less than 230kV.

➤ Synchronize Power Barge whenever it is ready for synchronizing.

3.2 Restoration of Southern Supply

Southern supply restoration procedure involves Samanalawewa PS, Embilipitiya, Rathnapura, Balangoda, Matara, Hambanthota, Beliatta, New Galle and Deniyaya GSS.

Samanalawewa Generation

➤ At Samanalawewa PS

Start one machine and change the auxiliary supply to the machine and start second machine.

Energize 132kV bus bar by closing the Generator CB while keeping generator at minimum value.

This will Energize Balangoda line 01 and Embilipitiya line 01

When machine load is around 30 MW synchronize the second machine.

After load Samanalawewa machine to 30 MW energize the Embilipitiya GSS via Samanalawewa – Embilipitiya line and load until Samanalawewa machine load is about 40 MW.

➤ At Balangoda GSS

Switch ON 132/33 kV one transformer and adjust the T/F tap manually if necessary. Then SWITCH-ON 33 kV feeders one by one slowly, until Samanalawewa machine is loaded up to 10 MW. (Maintain the frequency at 50 Hz).

Do not SWITCH-ON feeders connected to mini Hydro plants.

After loading Samanalawewa machine to 10 MW energize the New Galle GSS via Balangoda – Galle line and load until Samanalawewa machine load is about 30 MW.

➤ At Embilipitiya GSS

Switch ON 132/33 kV one transformer and adjust the T/F tap manually if necessary. Then SWITCH-ON 33 kV feeders one by one slowly.

➤ Energize remaining GSS in the southern region while maintaining the system frequency and voltage within the acceptable limits.

3.3 Restoration of Supply except Colombo City and Southern system

G1 and G2 can be carried out in parallel.

G1. Mahaweli Complex

➤ At Kothmale PS

Start one Generator and energize the 220kV bus bar closing the generator circuit breaker with minimum generating voltage. This will energize the Biyagama 220 kV bus bar via Kothmale – Biyagama line 01.

Start second Kothmale machine and keep it spinning.

➤ At Biyagama GSS

Energize one of the 220/132/33 kV main transformer. After adjusting the transformer tap manually if necessary, SWITCH- ON 33 kV feeders one by one until Kothmale machine is loaded to around 15 MW.

SWITCH-ON Sapugaskanda GSS line 01. This will energize Sapugaskanda 132 kV bus.
SWITCH-ON Sapugaskanda PS line 01.

After synchronizing the second Kothmale machine Energize Biyagama – Kotugoda line 01

➤ At Sapugaskanda GSS

SWITCH-ON 33kV Feeder 01 initially (Ambatale Water pump house). Load Kothmale machine to 25 MW by switching more 33 kV feeders one by one.

➤ At Sapugaskanda PS

Instruct to Start Sapugaskanda Station A machines.

Machines are expected to reach No load full speed within 45 minutes

➤ At Kelaniya GSS

SWITCH-ON 33 kV feeders one by one until Kothmale machine is loaded up to around 35 MW.

➤ At Kothmale PS

When machine load is around 30-40 MW synchronize the second machine.

Energize Kothmale – Victoria line 01.

Before energizing the line check from Victoria PS which line could be energized (to Victoria bus bar) depending on the CB availability at Victoria.

➤ At Victoria PS

Energize 220kV bus bar by closing CB 210. Synchronize unit no **02** by closing CB 230.

➤ At Kotugoda GSS

Energize Kotugoda 220 kV bus bar and 220/132/33 kV T/Fs. Make sure T/F taps are at the nominal position and MANUAL mode. Energizing of 132 kV bus bar will energize the Katunayaka GSS.

SWITCH-ON 33 kV feeders one by one while maintaining the stability of the frequency controlling machine.

Energize Kerawalapitiya GSS and then WCP line 01 and 02.

Energize the Aniyakanda and Kelaniya lines.

Extend the supply from Kotugoda to Puttalama.

➤ At Biyagama GSS

Synchronize both Kelanithissa and Mahaweli systems as mentioned in section 3.4.

Energize Pannipitiya 220kV bus through Biyagama – Pannipitiya line 01.

➤ At Pannipitiya GSS

Energize 220/132/33 kV T/Fs. Make sure T/F taps are at the nominal position and MANUAL mode. SWITCH – ON 33 kV feeders one by one.

Two systems can be synchronized from Pannipitiya – Kolonnawa 132kV lines via synchronoscope if synchronism failed in earlier step.

Extend the supply from Pannipitiya to Mathugama.

G2. Laxapana Complex

**** In case of failure of Polpitiya – Seethawaka or Seethawaka – Kolonnawa lines any cct from Polpitiya – Kosgama – Kolonnawa or Polpitiya – Athurugiriya – Kolonnawa lines can be used for line charging.**

➤ At New Laxapana PS

Start Generator 01 and energize the 132kV bus bar closing the generator circuit breaker with minimum generating voltage. This will eventually energize the O/Laxapana, Polpitiya, Seethawaka and Kolonnawa GSS.

Start second machine and keep it spinning. (Do not synchronize until machine 01 stabilizes)

(New Laxapana generator 01 will absorb approximately 7 MVARs from the energized lines and Kolonnawa voltage should be below 140 kV).

➤ At Seethawaka GSS

Switch ON 132/33 kV one transformer and adjust the T/F tap manually if necessary and SWITCH-ON 33 kV feeders one by one slowly, until N/Laxapana machine is loaded up to 5 MW.

SWITCH-ON second T/F

➤ At Kolonnawa GIS

1. If supply is available at Kolonnawa GIS

Two systems can be synchronized at least if one system is in healthy condition (Voltage is in around 135kV and one system must be loaded at least 50-75 MW).

Otherwise do not synchronize until required conditions are satisfied.

2. If supply is not available at Kolonnawa GIS

Continue steps mentioned under the “Colombo City Restoration” option 02.

➤ At Old Laxapana PS

Start Old Laxapana machines and synchronize. SWITCH-ON WPS line01.

➤ At Polpitiya PS

Start Polpitiya machines.

SWITCH-ON Athurugiriya circuit 01. (Which is already ON from Athurugiriya)

SWITCH-ON Kosgama circuit 01.

Extend the supply to Kiribathkumbura, Kurunegala, Ukuwela, Habarana, Old Anuradhapura lines from Polpitiya PS when Laxapana system is stable and energizing all tie lines between Old Laxapana, New Laxapana and Polpitiya.

➤ At Athurugiriya GSS

As 132kV bus bar energized SWITCH-ON 33 kV feeders one by one until GSS is loaded up to 10 MW.

➤ At Kosgama GSS

As 132kV bus bar energized SWITCH-ON 33 kV feeders one by one until GSS is loaded up to 10 MW.

SWITCH ON Kosgama – Kolonnawa line

- SWITCH-ON all tie lines between Old Laxapana, New Laxapana and Polpitiya.

3.4 Synchronization of part systems

Synchronization points in the system are given in the Appendix 13.

Once two systems are synchronized together, assign one station to control frequency and keep other station at a fixed load. Stabilize system frequency at 50 Hz. Do not synchronize two systems unless at least one system is in healthy condition. SCE may select appropriate synchronizing points considering the factors such as voltage, system size, etc.

- Laxapana and Kelanithissa System

At Kolonnawa GIS

If supply available at Kolonnawa from Kelanithissa

Synchronize Laxapana and Kelanithissa system by closing the CB at Kolonnawa of Seethawaka - Kolonnawa 132kV line.

If supply available at Kolonnawa from Laxapana

Synchronize Laxapana and Kelanithissa system by closing the CB at Kolonnawa of Kelanithissa - Kolonnawa 132kV line 01.

- Kelanithissa and Mahaweli System

At Biyagama GSS

Synchronize Kelanithissa and Mahaweli system by closing CB at Biyagama of Biyagama – Kelanithissa 220 kV GIS line 01.

- Laxapana and Southern System

At Balangoda GSS

Synchronize Laxapana and Southern system by closing CB at Balangoda of Balangoda – New Laxapana line.

➤ Laxapana and Mahaweli System

At Biyagama GSS

Synchronize Laxapana and Mahaweli system by closing CB at Biyagama of Biyagama – Kelanithissa 220 kV GIS line 01.

At Pannipitiya GSS

Synchronize Laxapana and Mahaweli system by closing CB at Pannipitiya of Pannipitiya – Kolonnawa line 01.

At Kiribathkumbura GSS

Synchronize Laxapana and Mahaweli system by closing CB at Kiribathkumbura of Ukuwela – Kiribathkumbura line 01.

4.0 CONTINGENCY PLAN

Alternative options must be considered in case of failure of critical GSS and transmission lines at the system restoration path. SCE can select the most reliable path depending on the outage of transmission equipments and condition of the network.

4.1 System Restoration with contingencies

4.1.1 Failure of energizing Kelanithissa 132kV GIS – Kolonnawa lines

After energizing the Kolonnawa 132 kV GIS via Polpitiya – Seethawaka – Kolonnawa load the New Laxapana machines up to 30 MW by loading Seethawaka GSS and Kolonnawa GIS following steps mentioned in the section 3.1 option 2.

- Synchronized the 2nd machine as other machine is stable.
- SWITCH-ON Polpitiya – Athurgiriya –Kolonnawa line 01
- If system voltage is within the range of 132 kV energize Kolonnawa – Maradana cable and load Maradana GSS up to 10 MW.
- Energize Maradana – Havelock Town Cable and load Havelock Town GSS
- Energize S’Japura GSS and load

- Load Laxapana machines to 60-80 MW and keep voltage within the range and energize and load Sub C
- SWITCH-ON Kolonnawa – Sub E cable when system voltage reached around 132 kV. If it is unable to keep 132kV voltage below 135kV do not SWITCH-ON Kolonnawa – Sub E cable.
- Energize Sub F via Sub E – Sub F cable and load up to 10MW.
- Energize Kelanithissa 220kV GIS via Biyagama GSS.

4.1.2 Failure of energizing Kolonnawa 132kV GIS

In case of Failure of Kolonnawa GIS Colombo City Supply could be restored via Biyagama – Pannipitiya – Dehiwala.

- At Biyagama GSS

As supply received from Mahaweli or Kelanithissa extend the supply to Sapugaskanda and Kelaniya GSS as mentioned in the section 3.3; G1.

Load Mahaweli m/cs or KPS GT 07 to 30-40 MW.

SWITCH-ON Pannipitiya line 01 as stabilized the system after loading Sub C.

- At Kelanithissa PS

SWITCH – ON sub C cable.

- At Sub C CP

As supply receive from Kelanithissa 132 kV GIS SWITCH-ON Kelanithissa line and inform CCCC to load 5 MW slowly.

- At Panipitiya GSS

Energize 220/132/33 kV T/Fs. Make sure T/F taps are at the nominal position and MANUAL mode. SWITCH – ON 33 kV feeders one by one.

Energize S'Japura GSS and load.

Note: Check 132 kV voltage regularly. If voltage is high SWITCH ON more feeders and reduce the voltage, adjust generation accordingly.

Load Mahaweli m/cs or KPS GT 07 around 100 MW.

Extend the supply to Maradana via Dehiwala while maintaining the system voltage.

➤ At Kelanithissa PS

SWITCH- ON sub F cable when system voltage remains around 135kV or below.
Energize Sub E via Sub F and load.

- Synchronize Laxapana and Mahaweli Systems as soon as possible from Old Laxapana PS.
- Energize Seethawaka, Kosgama and Athurugura GSS from Laxapana generation. Further extend laxapana supply to Kiribathkumbura, Kurunegala, Ukuwela and Habarana.

4.1.3 Outage of Kothmale machines

Upper Kothmale machines can be used to line charging and Biyagama 220kV bus bar can be energized via Kothmale switchyard.

At Kothmale Power Station

SWITCH-ON CB 330 and CB 320 to energize the Upper Kothmale line 01.

At Upper Kothmale Power Station

Start Generator 01 and energize the 220kV bus bar closing the generator circuit breaker with minimum generating voltage. This will eventually energize the Biyagama 220 kV bus bar via Kothmale – Biyagama line 01.

Start second Upper Kothmale machine and keep it spinning depending on the reservoir level.

Then operation can be continued as mentioned in section 3.3; G1.

4.1.4 Failure of Kothmale Switch yard

System restoration may be started from Victoria / Laxapana PSs. Special attention should be paid to Rantabe 220/132 kV coupling T/F loading. Maximum loading should be limited to 100 MW. SCE should not intend to restore the whole system.

4.1.5 Failure of Polpitiya Switch Yard

Start System restoration from Mahaweli Complex. Special attention should be paid to Rantabe 220/132 kV coupling T/F loading. Maximum loading should be limited to 100 MW.

Load GSS up to Kiribathkumbura after synchronizing Ukuwela and/or Bowathanna machines,

4.1.6 Failure to synchronizing Samanalawewa machines

Extend Laxapana supply to southern after satisfying the below conditions

- At least both New Laxapana m/c s have been synchronized.
- Laxapana generation must be around 50 MW.
- SWITCH – OFF Balangoda – Samanalawewa line from Balangoda end.
- SWITCH – OFF Embilipitiya – Samanalawewa line from Samanalawewa end.

Extend Ambalangoda supply to southern after synchronizing Kukuleganga machines.

Note: Check 132 kV voltage regularly. If voltage is high SWITCH ON more feeders and reduce the voltage, adjust generation accordingly.

Appendix 01: Grid Substations having radial feeding arrangement

Switch off all incoming 132 kV Ccts and all outgoing 33kV feeders.

Hot Line No / Admin Nos.

- | | |
|------------------------|------------|
| • Kurunagela | 410 / 7355 |
| • Trincomale | 632 / 6925 |
| • Nuwara Eliya | 515 / 2800 |
| • Oruwala | 542 |
| • Rathmalana | 338 / 4520 |
| • Rathnapura | 514 |
| • Sri Jayawardhanapura | 801 / 2825 |

• Thulhiriya	541 / 2320
• Kegalla	541 / 2320
• Vauniya	640 / 6500
• Kilinochchi	641 / 6520
• Chunnakam	642 / 6525
• Maho	621 / 1730
• Panadura	335 / 4530
• Bolawatta	603 / 1645
• Madampe	605 / 1720
• Hambantota	511 / 2845
• Pallekele	409 / 7350
• Old Anuradhapura	631 / 6920

Appendix 02: Power Stations and IPPS

	Capacity / (MW)	Hot Line / Admin.
• Sojitz - Kelanitissa	163	322 / 1804
• Asia Power	51	315 / 7226
• Bowathenna	40	408 / 6803
• BMPP (Power Barge)	60	326 / 1810
• Canyon	50	504 / 5803
• Kothmale	201	400,401 / 7303
• KCCP	163	321 / 1807
• KPS (Export)	82	319 / 1803
• Kelanitissa (GT 07)	115	323 / 1806
• Kukuleganga	75	341 / 3750
• Lakvijaya Unit 01,02 & 03	900	613,614,615 / 8562
• Nothern Power	24	-
• New Laxapana	116	500 / 2701

• Old Laxapana	53.8	500 / 2701
• Polpitiya	90	501 / 2750
• Randenigala	120	404 / 7103
• Rantabe	50	405 / 7803
• Samanalawewa	120	505 / 5503
• Sapugaskanda - Stn A	80	317 / 7222
• Sapugaskanda - Stn A	72	318 / 7224
• Ukuwela	40	406 / 6703
• Upper Kothmale	150	420,421 / 7315
• Uthrujanani	24	643 / -
• Victoria	210	402 / 7403
• Wimalasurendra PS	50	502 / 2900
• West Coast Power	270	607 / 1635
• ACE(Embilipitiya)	100	2836

Appendix 03: Lines to be switched OFF at the Power Stations

Switch off the circuits mentioned below from the following power stations

- New Laxapana - Balangoda both Ccts
Polpitiya Cct No. 2
Canyon Cct.
- Old Laxapana - Badulla both Ccts.
Wimalasurendra Cct No. 2
Polpitiya Cct No.2
- Wimalasurendra - Old Laxapana Cct No. 2
All 33kV Feeders
- Polpitiya - Kosgama Cct
Athurugiriya both Ccts.
New Laxapana Cct No. 2
Old Laxapanqa Cct No.2

- Kiribathkumbura both Ccts
- Kotmale - Biyagama Ccts No. 2
- Victoria both Ccts
- Upper Kothmale both Ccts
- Upper Kothmale - Kothmale Cct No. 2
- Victoria - Kothmale both Ccts
- Randenigala
- Randenigala - Rantambe Cct.
- Rantabe - Badulla both Ccts
- Mahiyanganaya both Ccts
- Samanalawewa - Embilipitiya Cct No. 2
- Balangoda Cct No. 2
- Sapugaskanda - Biyagama both Ccts
- KPS GIS - Both Transformers
- LVPS GIS - N/Chilaw both Ccts
- N/Anu both Ccts
- 220/33 kV Wind Transformers

Appendix 04: Lines to be switched OFF at the Grid Substations

Switch off the circuits mentioned below from the following Grid Substations.

- | GSS / (ADMIN) | Lines to be Switched OFF |
|----------------------|---|
| • Biyagama / (502) | - Kotugoda both Ccts.
Both Sapugaskanda PS Ccts.
Kothmale Cct-02
Kelanitissa 220kV GIS both Ccts
Pannipitiya both Ccts
Sapugaskanda GSS both Ccts
Both 220/132/33 kV T/Fs
All 33kV feeders |
| • Kotugoda / (612) | - Biyagama both Ccts |

- Kerawalapitiya both Ccts
 - Veyangoda both Ccts
 - Both 220/132/33 kV T/Fs
 - Kelaniya Cct
 - Aniyakanda Cct
 - Katunayaka both Ccts
 - All 33kV Ccts

- Pannipitiya / (705) -
 - Kolonnawa both Ccts.
 - Biyagama both Ccts
 - Mathugama Cct
 - Horana Cct
 - Rathmalana Cct - 02
 - Both 220/132/33 kV T/Fs
 - Dehiwala cable
 - All 33 kV feerers

- Kelanithissa 220kV GIS – / (520)
 - Biyagama both Ccts
 - Both 220/132/33 kV T/Fs
 - Barge cable
 - AES cable
 - KCCP both cables

- New A'pura / (408) -
 - Trincomalee both Ccts
 - Vauniya both Ccts.
 - Anuradhapura both Ccts
 - Kothmale both Ccts
 - LVPS both Ccts

- Veyangoda GSS / (615) -
 - N/Chilaw both Ccts
 - Kotugoda both Ccts

- Kolonnawa GIS / (707) -
 - Kelanitissa both CCts
 - Sub E cable
 - Pannipitiya both Ccts.
 - Athurugiriya both Ccts.
 - Maradana Cable
 - All 33 kV feeders.

- Ukuwela / (303) –
 - Habarana Cct
 - Naula Cct
 - Bowatenna Cct.
 - Kiribathkubura both Ccts
 - Pallekelle both Ccts
 - All 33kV feeders

- Badulla / (208) –
 - Rantambe both Ccts

- Monaragala Cct
Old Laxapana both Ccts.
All 33 kV feeders
- Balangoda / (104) - New Laxapana both Ccts.
N/Galle Cct
Deniyaya Cct
Rathnapura both Ccts
Samanalawewa Cct No. 2
 - Anuradhapura / (401) - New Anuradhapura both Ccts.
Puttalam both Ccts.
Habarana both Ccts
All 33kV feeders
 - Puttalam / (409) - Anuradhapura both Ccts.
Maho both Cct
N/Chilaw both Cct
All 33kV feeders
 - Matugama / (766) - Kukule both Ccts
Pannipitiya Cct.
Horana Cct.
Ambalangoda both Ccts
All 33kV Feeders
 - Habarana / (403) - Anuradhapura Cct No. 2
Valachchena Cct
Polonnaruwa Cct
Naula Cct
All 33kV Feeders
 - Horana / (714) - Pannipitiya Cct.
Matugama Cct.
All 33kV Feeders
 - Kiribathkumbura / (308) - Polpitiya both Ccts(Kotmale Ccts.)
Kurunagela both Ccts.
Ukuwela both Ccts.
All 33kV Feeders
 - Sapugaskanda / (518) - Biyagama Cct No. 2
Kelaniya Cct No. 2
All 33kV Feeders
 - Athurugiriya / (307) - Kolonnawa Cct No. 2
Polpitiya Cct No. 2

- Oruwala both Ccts.
- Kosgama / (709) – Polpitiya Cct
Kolonnawa CCT
All 33kV Feeders
 - Seethawaka / (703) – Both 132/33 kV T/Fs
All 33kV Feeders
 - Embilipitiya / (112) – Samanalawewa Cct No. 2
Ace Embilipitiya both Ccts
Hambantota both Ccts
Matara Cct
Beliattha Cct
 - Kelaniya / (601) – Kotugoda Cct
Kolonnawa both Ccts
Aniyakanda Cct
Sapugaskanda both Ccts
Both Asia Power Ccts
 - Katunayaka / (613) – Pannala Cct
N/Chilaw Cct
All 33kV Feeders
 - Aniyakanda / (609) - Kotugoda Cct
 - Ampara / (202) - Monaragala Cct
Mahiyanganaya Cct
Vavunathivu Cct
 - N/Chilaw / (626) - LVPS both Ccts
Veyangoda Both Ccts
Katunayake Cct
Pannala Cct
Puttlam both Ccts
Madampe both Ccts
Both 220/132 kV T/Fs
 - N/Galle / (121) - Balangoda Cct
Deniyaya CCT
Ambalangoda both Ccts
Matara both Ccts

Appendix 05: Single Line diagram

Appendix 06: Power Stations having black start facility

Hydro

Kothmale

Victoria

Randenigala

Rantabe

Ukuwela

Wimalasurendra

Old Laxapana

New Laxapana

Samanalawewa

Kukule

Bowethenna **

Canyon **

Upper Kothmale

** Cannot run full speed no load for extended period without synchronizing.

Thermal

Kelanithissa Gas Turbines (small)

Sapugaskanda Diesel

Appendix 07: Automatic Under Frequency Load Shedding Scheme

GSS	Feeder No	Stage
Athurugiriya	3	I
	6	I
	8	I
Rathnapura	1	I
Mathugama	1	I
	8	I
	5	II
	10	II
	6	III
	9	III
Kotugoda	13	I
	11	I
	3	II
	9	IV
	12	V or df/dt
Sapugaskanda	9	I
	11	I
	2	II
	4	II
	7	II
	6	III
	3	IV
	8	IV
Kosgama	1	I
	8	I
	2	II
	7	IV
Ukuwela	10	I
	3	II
	12	df/dt
	1	II
Habarana	3	I
	1	II
	6	II
	7	II
	2	V or df/dt
	4	V or df/dt
Galle	2	I
	5	II
	1	df/dt
	6	df/dt

	4	df/dt
Thulhiriya	5	I
	6	I
	4	III
	1	III
	2	IV
Matara	6	I
	4	III
	8	III
	2	df/dt
	7	df/dt
	1	df/dt
Badulla	6	I
	3	III
	5	III
	1	IV
Biyagama	1	I
	3	III
	5	III
	6	III
	4	IV
	7	V or df/dt
	8	V or df/dt
Kelaniya	3	I
	2	I
	1	df/dt
Belliatta	4	II
	5	II
	6	II
Ambalangoda	2	II
	3	II
	4	II
	6	II
Kiribathkumbura	6	II
	13	II
	7	III
	2	III
	3	III
	4	IV
Dehiwala	7	II
	6	III
	8	III
	1	IV
	3	IV
Rathmalana	F7	II

	F9	II
	F6	IV
	F2	df/dt
	F3	df/dt
Veyangoda	7	II
	3	III
	4	IV
	6	IV
	8	V
Panadura	3	II
	2	V or df/dt
	4	V or df/dt
	5	V or df/dt
N/Anu	Trinco 1 & 2	III
Kilinochchi	2	III
	4	III
	5	III
Aniyakanda	3	III
	7	III
	1	IV
	5	df/dt
Pannipitiya	3	III
	6	III
	9	III
	10	III
	2	IV
	4	IV
	7	IV
	8	IV
	5	V
Madampe	4	III
	7	III
	1	V or df/dt
	2	V or df/dt
	3	V or df/dt
Ampara	3	IV
	5	IV
Sub C		IV
Sub A	1137	IV
	14	IV
	22	IV
	1011	IV

	571	IV
Sub F	116	IV
	54	IV
	624	IV
	43	IV
	9	IV
Sub I	18	IV
	45	IV
	1240	IV
	1130	IV
	602	IV
Sub E	981	IV
	10	IV
	609	IV
	335	IV
Kolonnawa GIS	B1	IV
	B2	IV
	G1	IV
	G2	IV
Horana	5	IV
	2	df/dt
	3	df/dt
	4	df/dt
Pannala	3	V
	5	V
	7	V
	2	df/dt
	4	df/dt
	6	df/dt
Kurunegala	6	V
	5	V or df/dt
	2	df/dt
	3	df/dt
	4	df/dt
S'Japura	1	df/dt
	2	df/dt
	4	df/dt
	5	df/dt
	6	df/dt
	8	df/dt
Bolawatta	2	df/dt
	3	df/dt
	4	df/dt
	5	df/dt
	8	df/dt

Katunayaka	1	df/dt
	2	df/dt
	7	df/dt
	8	df/dt
Deniyaya	1	df/dt
	2	df/dt
Mahiyangane	2	df/dt
	5	df/dt

Appendix 08: Wind and Solar Plant connected 33 kV feeders

Puttalam GSS	-	Feeder 01, Feeder 03
Kilinochchi GSS	-	Feeder 05
Norochhole GSS	-	Feeder 01
Balngoda GSS	-	Feeder 01
Nuwara Eliya	-	Feeder 04
Hambanthota	-	Feeder 09 and 12
Valaichchenai	-	Feeder 05
Vavuniya	-	Feeder 05

Appendix 09: Contact Numbers

System Control Centre	Office	-	0112787944, 0112787950
	Hot Line Nos	-	301, 302,303 & 304
	Admin	-	3602
	Mobile (VPN)	-	0714053924
General Manager (CEB)	Office	-	0112320953, 0112325340
	DCN	-	2233
	Residence	-	
	Mobile	-	0777 - 320832
AGM (Transmission)	Office	-	0112395735
	DCN	-	2240
	Residence	-	
	Mobile	-	071 - 6862177
DGM (System Control)	Office	-	0112685105
	DCN	-	2681
	Residence	-	
	Mobile	-	071 - 4115637
CE (System Operation)	Office	-	0112685106
	DCN	-	2683
	Residence	-	
	Mobile	-	071 - 8731103
CE (Operation Colombo City)	Office	-	25859261
	DCN	-	
	Residence	-	
	Mobile	-	071- 4240211
CE (O&MS/CR)	Office	-	0112693675
	DCN	-	2689
	Residence	-	033-2234183
	Mobile	-	0714053920
CE (Comm: Systems)	Office	-	0112424582
	DCN	-	2463
	Residence	-	
	Mobile	-	071 4150628
CEB Call Centre	Office	-	0112481251, 1987

DCN	-	2244
Mobile	-	

Appendix 10: Operation Procedure for Colombo City Network Operations during Total Failure

OE shall verify with the System Control Center, the power failure is a total system failure or partial failure. Mean time CROs at primary substations should verify with CCCC, the power failure is total system failure or partial failure. OE should communicate the status of the power failure to DGM (Colombo City) through CE (Operation). In case of power failure to primary substations, following standing instructions have to be followed.

Standing Instructions to Operation Engineer (OE) to be carried out by themselves or issued to CROO depending on the situation

Following steps have to be taken by the CRO or OE at the CCCC in case CRO is not available in Colombo Primaries

- Inform System Control Centre
- If supply is failed and incoming circuit breaker is in ON position Switched OFF incoming circuit breakers.
- Switch off all 11 kV Feeders.
- Select T/F AVR-MANUAL mode and adjust the transformer tap to nominal position in 132/11 kV and 33/11 kV T/Fs.
- CRO at Primary Substation should communicate the completion of preliminary actions to CCCC.
- OE at CCCC should communicate the completion of preliminary actions to System Control center and CE (operation)

In case of total system failure following actions have to be followed in addition to the above steps.

System Control Center shall instruct to OE (CCCC) to switch ON incoming CBs and limit of block load (in general 5 MW) to be connected. OE (CCCC) or CRO shall SWITCH ON incoming CB of 132kV or 33kV level with consent of CE (Operation). The ring connection detailed in figure 1 is to be operated in Open-ring form as per the current practice.

OE (CCCC) or via CRO shall SWITCH ON 132kV and 33 kV bus couplers as required.

OE (CCCC) or via CRO shall SWITCH ON 11kV feeders in the priority order given in section following table such that loading is within the MW limit.

OE (CCCC) shall inform to SCC on completion of above switching operations and await instructions from CC for further loading.

After Completion of supply restoration

OE (CCCC) shall confirm that power supply has been restored in all 11 kV feeders.

OE (CCCC) shall confirm transformer tap control is set to Auto in case there are no any other restrictions.

OE (CCCC) shall confirm that 132 kV and 33 kV CBS are in normal operation positions otherwise check with the SCC for confirmation.

Completion of restoration is to be informed to CE (Operation) and SCC by OE (CCCC). CE (Operation) shall communicate the same to DGM (Colombo City).

Priority order of 11 kV feeders

Priority of PSS	Priority 1	Priority 1I	Priority 1II
Sub E	586 (F3), 881 (F5), 885 (F6), 20 (F11), 405 (F10), 8 (F15)	21(F4)	372 (F8), 337 (F10), 365 (F14), , 847(F1)
Sub I	76 (F7), 620 (F9), 420 (F13)	19 (F16)	1024 (F4), 343 (F17), 11 (F2)
Sub F		83 (F2), 405 (F10), 986-1(F4), 986- 2(F6) 703-1(F7), 703-2(F8), 54(F5)	405 (F10), 351 (F11) 252 (F18)
Sub H		38-1(F6), 38-2(F8), 368 (F10)	
Sub A	1453-2 (F15), 1453-1 (F2), 1441 (F1), 571(F16)- Alternative feeder for 24(F4)	200 (F4)	77(F7), 122 (F11), 1023 (F12), 13 (F17)
Sub B	465 (F6)		106 (F7)
Sub C			
Sub D	66 (F5), 16 (F4), 15(F7), 1160(F0)		
Sub G	24(F4)	1023-1 (F2)	1023-1(F2) 23(F5)

11 kV feeders of primary substations have been assigned with a grouped priority as per the below table. Primary Substations E, I and F are having higher order of priority among nine numbers of primary substations in Colombo City.

Appendix 11: Check List

Appendix 12: Total Failure Report

Appendix 13: Synchronization points in the Transmission Network

Colombo Region

Kotugoda GSS	Athurugiriya GSS
Kelnitissa GSS	Aniyanakda GSS
Veyangoda GSS	Sapugaskanda GSS
Katunayake GSS	Pannipitiya GSS
Kerawalapitiya GSS	

Anuradhapura Region

New Anuradhapura GSS
Puttam GSS

Kandy Region

Kiribathkumbura GSS	Kothmale PS
Polpitiya PS	Ukuwela GSS
Maliboda GSS	Naula GSS
Badulla GSS	

Galle Region

Balangoda GSS
Matara
Embilipitiya
Ambalngoda
Beliatta