

ANDHRA PRADESH CODE OF TECHNICAL INTERFACE

Section 4 OPERATION CODE

Table of Contents

- 4.1 [Demand Forecast](#)
 - 4.1.1 [Introduction](#)
 - 4.1.2 [Objective](#)
 - 4.1.3 [Data Exchange](#)
 - 4.1.4 [Procedures](#)
 - 4.1.5 [Responsibilities](#)
- 4.2 [Outage Planning and Coordination](#)
 - 4.2.1 [Introduction](#)
 - 4.2.2 [Harmonisation of Outage Plan](#)
 - 4.2.3 [Initial Data](#)
 - 4.2.4 [Methodology](#)
 - 4.2.5 [Objective](#)
 - 4.2.6 [Interfaces and Responsibilities](#)
 - 4.2.7 [Generation Outage Planning Process](#)
 - 4.2.8 [Transmission and Distribution Outage Planning](#)
 - 4.2.9 [Final verified overall Outage Plan](#)
 - 4.2.10 [Postponement of Outages](#)
 - 4.2.11 [Release of Circuits and Generating Units Included in](#) [Outage Plan](#)
- 4.3 [Schedule and Dispatch](#)
 - 4.3.1 [Introduction](#)
 - 4.3.2 [Objective](#)
 - 4.3.3 [Generation Scheduling](#)
 - 4.3.4 [Generation Dispatch](#)

- 4.3.5 [Communication with Generators](#)
- 4.3.6 [Action Required by Generators](#)
- 4.3.7 [Enhancement of Schedule and Dispatch Procedure](#)
- 4.3.8 [Frequency Management](#)
- 4.3.9 [Voltage Management](#)
- 4.3.10 [Data Requirements](#)
- 4.4 [Contingency Planning](#)
 - 4.4.1 [Introduction](#)
 - 4.4.2 [Objective](#)
 - 4.4.3 [Load Shedding Schedule](#)
 - 4.4.4 [Restoration](#)
 - 4.4.5 [Black Start Procedures](#)
 - 4.4.6 [Special Considerations](#)
- 4.5 [Operational Coordination with PGCIL, CTU, SRLDC & SREB](#)
 - 4.5.1 [Interface with Southern Regional Electricity Board](#)
 - 4.5.2 [Coordination with SREB and SRLDC](#)
- 4.6 [Protection Committee](#)
- 4.7 [Cross Boundary Responsibility](#)
 - 4.7.1 [Introduction](#)
 - 4.7.2 [Objective](#)
 - 4.7.3 [Safety Coordination](#)
 - 4.7.4 [Procedures](#)
 - 4.7.5 [Site Responsibility Schedule](#)
- 4.8 [Operational Liaison](#)
 - 4.8.1 [Introduction](#)
 - 4.8.2 [Objective](#)
 - 4.8.3 [Definitions](#)
 - 4.8.4 [Notification of Operations](#)
 - 4.8.5 [Nature of notification of operations](#)
 - 4.8.6 [Requirement to notify events](#)
 - 4.8.7 [Significant Incidents](#)
 - 4.8.8 [Warnings](#)

4.8.9 [Incident Reporting](#)

4.8.10 [Accident Reporting](#)

4.9 [Integrity of Transmission System and Continuity of Power flow](#)

4.10 [Coordination between APTRANSCO and DISCOMs at EHT Sub-station](#)

4.11 [Operational Aspects pertaining to Inter-State and Inter-Regional Systems](#)

4.12 [Data Exchange between Entities](#)

Appendix-A [Incident Reporting](#)

Appendix-B [Incident Investigation](#)

Appendix-C [Essential Loads and Priority of Restoration](#)

Appendix-D [Operational Planning Data](#)

4 OPERATION CODE

4.1 Demand Forecast

4.1.1 Introduction

This Section specifies procedures to be followed and data to be exchanged between entities for forecasting demand of the distribution systems by DISCOMs and for forecasting total AP Grid Demand by APTRANSCO through time scales ranging from two years in advance plus the current year through to Control Phase and into real time operation. Long term demand estimation is necessary to ensure generation margin and short-term estimation helps frequency control. Demand Forecast estimates active and reactive power at different points of time in future period and also daily energy requirements for future days.

The maximum active and reactive power at day peak and night peak times and variation in a 24-hour day cycle (load curves) are predetermined by means of sound forecast methodology.

4.1.2 Objective

- (i) To set out the requirement for consumers and to convey to APTRANSCO in advance the active power, reactive power and daily energy draws from the transmission system into the distribution system at various connection points.
- (ii) To set out the requirements for Users to provide demand and generation data to APTRANSCO to enable it to maintain a sufficient margin during Operational Planning Phase and Programming Phase and to know how much generating plant to schedule and to dispatch, to meet demand on the transmission system and to meet the License Standards. DISCOMs and APTRANSCO will take into account the factors specified when conducting Demand Forecast.

4.1.3 Data Exchange

(In general Appendix D of OC is to be followed)

A. From Large Consumers to DISCOMs:

By the end of October each year the HT and EHT consumers, Captive Power Plants and

Cogeneration Units shall provide to the respective DISCOMs in writing details of their Demand (in MW, MVar, MWh) for two years ahead (April to March year) and for the period November to March of the current year. They must clearly indicate the periods of shut down of their plant for overhaul/maintenance or for other reasons, the reduced demand during such periods and the reduced demand during periods of reduced production for any reason foreseen. The EHT consumers and Captive Power Plants and Cogeneration Units shall submit copies of their Demand forecasts to SLDC also

B. From DISCOMs TO APTRANSCO:

- (i) Each DISCOM shall by the end of November each year provide to APTRANSCO in writing the entire demand forecasts for the period covering December to March of the current year and following two years (April to March year is followed), active power, reactive power, daily energy requirements, peak demands, times of day peak and night peak and daily variation during holidays, the months when maximum agriculture load is expected and the months during which agricultural load will be minimum.

The Methodology adopted in demand estimation may be appended to the data.

- (ii) The DISCOMs shall also provide to APTRANSCO estimates of load that may be shed in discrete blocks with details of arrangements of such load shedding.
- (iii) Monthly energy, maximum demand and minimum demand by 15th of the preceding month.

C. From APTRANSCO to other Utilities:

- (i) The demand forecasts submitted by DISCOMS to APTRANSCO are modified and rendered more realistic utilising the facility available under the Southern Region System Coordination and Control Project (SRSC&C) and taking into account holidays and weather forecasts received from meteorological Department. The improved versions of the daily demand forecasts for one week ahead and weekly forecasts for one month ahead for various DISCOM territories are transmitted to DISCOMs for use in the operation of distribution systems
- (ii) To enable Users to be acquainted with the trends in demand growth during the following two years APTRANSCO shall communicate the validated demand estimates to all existing and prospective generators. APTRANSCO may opt to publish a summary of Demand Forecast in any media.
- (iii) Further APTRANSCO shall furnish the information required by any User. APTRANSCO may refuse to furnish any item of data requisitioned by any User if it feels that the particular data is not required by the User for conducting its (the User's) business.
- (iv) APTRANSCO shall furnish to SRLDC the predicted power flows in parts of ISTS relevant to AP System and draws from ISGS corresponding to the forecasted State demand on daily /weekly/monthly basis for the current year in time scales as mutually agreed between APTRANSCO and SRLDC.
- (v) APTRANSCO shall also furnish data to SRLDC for manually feeding the Southern Region System Coordination and Control Project as and when required by SRLDC.

D. From Generator to APTRANSCO:

- (a) The output in MW and MVAR of each Power Station will be monitored. In case of failure of data transmission channel of APTRANSCO at the State Load Despatch Centre an alternative communications facility will be used.
- (b) Loading profiles estimated for each Generating unit for two years ahead shall be furnished in writing by each Generator to APTRANSCO by the end of November each year. Such estimates shall include output in MW for each month in the period.

If the Loading profile of non-centrally dispatched generation materially changes or is expected to change during the Control Phase the Generator must notify SLDC each day, by 10.00 hours, an estimate in writing giving details of the revised estimate of the loading profile for the relevant generating plant for the next schedule day

4.1.4 Procedures

4.1.4.1 Demand Forecast Procedures to be followed by DISCOMS:

DISCOMs shall adopt a sound methodology for carrying out Demand forecast. The load growth as foreseen in the first two/three years as per the long term forecast carried out under the provisions of the Planning Code is considered.

Daily variation of the loads of different categories of consumers (domestic, industrial, agricultural) and Demand Side Management implemented are taken into account.

The load variation of different categories of consumers is determined from historical data and synthesized to obtain the total demand at each Connection Point at different times of the day. Seasonal variations and variations on holidays are taken into account. DISCOMs shall obtain data from EHT consumers, Captive Power Plants, Cogeneration Units, Railways (for traction load), and various other industries. General growth trends in housing, industry and agriculture are obtained from the respective Government departments. The expected agriculture load at different times in different seasons is estimated.

4.1.4.2 Demand Forecast Procedures to be followed by APTRANSCO

(a) Operational Planning and Programming Phase:

APTRANSCO utilises the facility it acquires under SRSC&C Project in estimating the simultaneous maximum Demand of AP State by synthesizing the demand estimates of all DISCOM territories furnished by the DISCOMs.

APTRANSCO shall take into account the following factors in estimating the Grid demand: -

- (i) Local factors such as trade holidays, school holidays, seasonal variations of loads and weather forecasts received from meteorological department.
 - (ii) Anticipated loading profiles submitted by generators and other information furnished by Users.
 - (iii) Customer demand management.
 - (iv) Anticipated transfers across external connections.
- (b) Control Phase

The factors mentioned in Section 4.3 (Schedule and Despatch) shall be taken into account by APTRANSCO /SLDC for conducting Demand Forecast in the Control Phase.

4.1.5 Responsibilities

- (a) DISCOMs are responsible for weekly and monthly estimation of demands for the current year and monthly estimates for the year I and Year II ahead for the total service territory of the respective DISCOM as well as for each connection point.
- (b) APTRANSCO is responsible for estimation of total AP State demand and power flows in various parts of the transmission system, power flows at ISTS connection points and drawals from ISGS on weekly basis for the current year and monthly basis for Year I and Year II ahead.
- (c) Validation of Demand Forecasts prepared by DISCOMS is done by APTRANSCO. APTRANSCO shall independently prepare Demand forecasts using historic data and applying reasonable growth rates. The growth rates are derived from historic growth rates. If the differences between DISCOMs estimates and APTRANSCO projections are small, or if the differences are large but the DISCOMS justify the differences by stating the details of real loads awaiting imminent release of supply (eg. imminent commissioning of new industries or charging of lines supplying new colonies) to the satisfaction of APTRANSCO, the estimates prepared by the DISCOMS are accepted as realistic. Otherwise APTRANSCO shall request DISCOMS to revise the forecasts. If the differences persist, APTRANSCO shall adopt the weighted average of the estimates of DISCOMS and the projection of APTRANSCO. The degree of weightage given to each of the two estimates is decided by APTRANSCO, which is responsible for the consequences of divergence between forecasted demand and actual demand. The decision of APTRANSCO is final.
- (d) DISCOMs shall maintain database of the demand at each connection point and for the total demand of the respective DISCOM territory on an hourly basis.
- (e) APTRANSCO shall maintain database of the State demand on an hourly basis.

4.2 Outage Planning and Coordination

4.2.1 Introduction

This Section sets out procedures for coordinated outage Planning of Generating Units, Transmission Lines, Inter-connecting Transformers and Power Transformers whose LV sides feed 33 kV and 11 kV networks and Distribution Systems for the current year, and two years ahead. April to March is the outage Plan Year.

4.2.2 Harmonisation of Outage Plan

First outage programme of all generating units is evolved so that at any time the total injection into the Grid is adequate to meet the total demand or the deficit is minimum. Priority is given to decide the outage of Generating units because the generating equipment comprises many rotating machines and high temperature systems including furnaces which essentially require shutdown for maintenance, repairs and overhaul for giving good life time performance and enhance availability. Defaulting the maintenance schedules of generating plant may reduce life of the equipment or may reduce the output below MCR. Sometimes postponement of outage may defeat the purpose of postponement by the resulting breakdowns and forced outages. Therefore the generation outage plan is first prepared and basing on this, the outages of transmission elements (including inter-connecting transformers) are decided to correspond the outages of the respective generating units, ensuring that evacuation of the generation from units in service is not affected and the integrity and security of the Grid are maintained. Similarly the

outages of distribution systems and transformers feeding 33 kV and 11 kV networks are planned coordinating, the transmission outages. Optimal utilization of hydel power is made possible by a good generation plan.

4.2.3 Initial Data

All Generators shall furnish the tentative outage plans of their generating units for the current year, year 1 ahead and year 2 ahead to APTRANSCO by 30th November. The generators shall indicate urgency for shutdown of particular units, which may be damaged if not shutdown for repair/ maintenance within a given time. SRLDC shall furnish the data pertaining to ISGS.

4.2.4 Methodology

The methodology to be adopted by **APTRANSCO** in formulating generation and outage planning is as follows:

For arriving at generation capability, consideration is given to the past performance of the thermal units for the previous three years. From this the available generation for the future period is estimated.

Regarding Hydel Stations, the average water inflow into the reservoirs for the last ten years is considered for estimating the average generation. The annual Hydro Generation plan formulated by the High Power Irrigation Power Co-ordination Committee is the main basis for irrigation related hydel generation planning.

Both peak power delivering capability and energy output are considered.

Demand Forecast carried out as per Section 4.1 are utilized in preparing Outage Plans.

4.2.5 Objective

The objective of this procedure is to define operational methods used to assist **SLDC** to produce a coordinated generation outage program considering all the available resources and taking into account the constraints in the transmission system as well as constraints caused by release of water for irrigation or any other purposes.

To minimize surplus or deficits, if any, in the system requirement of power and energy and help operate the system at the desired frequency.

4.2.6 Interfaces and Responsibilities

APTRANSCO shall coordinate all utilities and shall coordinate generation planning.

4.2.6.1 Load Generation Balance

APTRANSCO shall prepare the proposal for the combined Load Generation Balances for the current Year, Year I and Year II, ahead based on the Generation Plan submitted by **APGENCO, IPPs, JVCs, CPPs** and the AP State Entitlements from ISGS.

The proposed Load - Generation Balance shall indicate Power and Energy availability, Generating Units availability, outage periods and demand forecast for the planning period.

In the quarterly review by the APTRANSCO and in further examination of monthly programmes by **APTRANSCO** the proposed Load - Generation Balance Plan prepared by **SLDC** shall be studied and then the Load Generation Balance Plan shall be issued for implementation.

APTRANSCO shall periodically review and prepare proposal for readjusting the Generation Plan to optimise the utilisation of the available resources in co-ordination with the outages of the transmission system.

4.2.7 *Generation Outage Planning Process*

4.2.7.1 *Year I and Year II ahead*

- a) **APTRANSCO** shall utilise data received from **AP GENCO, IPPs, ISGS, JVCs, CPPs** and all other generation stations in the preparation of Generation outage planning for Year I and Year II ahead.
- b) **APTRANSCO**, shall determine the total power and energy availability for each constituent for each month for a period of 2 years with the help of the data submitted by **APGENCO, IPPs, ISGS** and other generating stations.
- c) **APTRANSCO**, shall compile tables depicting month-wise availability vs. requirement of power and energy, along with the associated conditions for all support levels of Thermal Units and release of water for Hydro-stations.
- d) The deficit / surplus rows of the table will indicate periods during which scope exists for raising, reducing generation.
- e) If there are both surplus and deficits over the planned period, the **SLDC** shall provide proposals to suitably co-ordinate and stagger generation outage periods to eliminate or reduce the deficits.
- f) If there are only deficits all through the planned period, the **SLDC** shall endeavor to even out high and low deficits by similar shifting of outage periods. Also **APTRANSCO** shall endeavor to reduce the average deficit by arranging to import power from outside the state and increase drawal from ISGS beyond Andhra Pradesh entitlements.
- g) **APTRANSCO** after having satisfied itself that maximum improvements have been derived, shall prepare a draft generation plan and circulate it among all the constituents, requesting for suggestions.
- h) The **APTRANSCO** shall scrutinise and approve after consulting **SRLDC**, the Generation Outage Plan for current year and Year I.
- i) The Generation Outage Programme after coordinating with ISGS shall form the basis for outage planning cycles.
- j) Generation outage programme shall be harmonised with the Transmission outage planning in 4.2.8 to 4.2.11.
- k) No outage shall be planned for hydel units during the months when overflow of reservoirs and flooding are normally expected.

4.2.7.2 *Current Year*

- a) The Generation Outage Programme approved by the Regulatory Commission shall form the basis of generation outage planning for the current year.
- b) The outage Planning shall be reviewed by **APTRANSCO**, taking into account the system conditions viz. transmission plans, unscheduled outages of transmission lines

and generating units, demand changes, availability of generation in the system.

4.2.7.3 *Amendments to Planned Outages*

In the case of a planned outage which APTRANSCO would like to move

- (a) beyond the period or
- (b) within the period or with less than 7 days notice. APTRANSCO may upon giving a Generator written notice, request that the start date or time of outage be advanced or deferred. If the Generator agrees or APTRANSCO and the Generator agree to some other period/ date the Generator will take the outage in accordance with that agreement.

A Generator may by notice submitted to APTRANSCO in writing at any time during year 'O', request that a CDGU be substituted by another comparable CDGU at the Generator's Power Station having substantially the same contracted capacity or GSDPs (Generation Scheduling and Dispatch Parameters). APTRANSCO shall not unreasonably withhold its consent to such substitution. If APTRANSCO does consent, the final outage programme shall be amended accordingly.

4.2.8 *Transmission and Distribution Outage Planning*

The outage of transmission elements is primarily coordinated with outages of Generating Units and secondarily with Distribution System outages.

APTRANSCO may convene coordination meetings with Generators.

The outage programmes of the Distribution Systems for the current year, year 1 and year 2 shall be informed by all DISCOMs to APTRANSCO by 30th November.

4.2.8.1 SLDC shall prepare a tentative Transmission Outage Plan including Inter connection Transformers (ICTs), coordinating with the Generation Outage Plan and with the Distribution Outage Plan. APTRANSCO shall modify the Distribution Outage Programme following the order of priority, i.e., outage of transmission elements must be coordinated with generation outage plan and outages distribution systems must be adjusted to coordinate with transmission outage. Only minimum changes shall be made to the outage plans prepared by DISCOMs. APTRANSCO shall communicate the tentative transmission plan to SRLDC, DISCOMs and Generators by December 15. The Transmission outage planning shall be done for the following:

1. 400 kV Transmission lines and 400 kV/220 kV Auto Transformers.
2. 220 kV Transmission lines and 220 kV/132 kV Auto Transformers.
3. Identified critical 132 kV grid lines of State System which will affect Transmission System and Grid Operation.
4. Outage planning for 132 kV Radial lines feeding Distribution Systems and 132 kV consumers shall be carried out separately in Consultation with Distribution Companies.

The Distribution Outage Plans revised by SLDC shall also be communicated to DISCOMs

by December 15. Coordination meetings shall be convened by APTRANSCO to discuss and produce coordinated Transmission Outage Plan and to revise Distribution Outage Plan at the Headquarters of SRLDC and SLDC. APTRANSCO's representative shall attend the coordination meetings convened by SRLDC.

4.2.8.2 The ISTS Outage Plan shall be communicated by SRLDC to SLDC by 15th December.

4.2.8.3 SLDC shall revise the State Transmission Outage Plan to coordinate it with ISTS Outage Plan after taking into account the decisions and recommendations of the Operation Coordination Committee of SREB and produce the Draft Transmission Outage Plan. The Draft Plan is communicated to SRLDC and all users by 31st December.

4.2.8.4 Outage of Power Transformers whose LV Voltage is 33 kV and 11 kV.

Although the Transformers are owned by APTRANSCO the operation is to be coordinated with the DISCOMs. The Outage Plan of these transformers shall be harmonized with the outages of DISCOM Systems and with the Transmission Outage Programme. DISCOMs shall communicate the Outage Plan of the Transformers to APTRANSCO before 31st December.

No interruption or minimum interruption to consumers and Distribution Systems shall be aimed at in formulating coordinated outage plan of Transmission elements, Transformers and Distribution lines. Parallel Transformers and alternative line feeding shall be utilized to the extent possible.

4.2.8.5 Verification with Transformer Outage Plan.

APTRANSCO shall ensure the Transformer Outage Plan is consistent with Transmission Outage Plan.

4.2.8.6 APTRANSCO shall ensure there is no evacuation problem in respect of Generating units in service due to Transmission constraints while evolving Transmission Outage Plan.

4.2.9 Final Verified Overall Outage Plan

APTRANSCO shall issue the final Outage Plan comprising outage of Generating Units, Transmission and Distribution System by 31st January and communicate the Plan to SRLDC, all Generators and DISCOMs. The final overall outage plan as agreed by all entities is released by 1st March each year.

4.2.10 Postponement of Outages

The SLDC is authorized to defer any planned shut down where the following events will affect the satisfactory operation of the system.

1. Major grid disturbance and total or partial black-out.
2. Systems Isolation
3. Any other incident on the system that may cause an impact on the system by the proposed outage.

SLDC shall intimate the revised programme as soon as possible to the user concerned.

4.2.11 Release of Circuits and Generating Units Included in Outage Plan

Notwithstanding provisions in any approved outage plan, no cross boundary circuits or unit of a Generator shall be removed from service without specific release from SLDC. This restriction shall not be applicable to an individual generating unit of a CPP.

Once an outage has commenced, if any delay in restoration is anticipated, the SLDC or the User concerned shall inform the other party promptly together with a revised estimate of the restoration time.

4.3 Schedule and Dispatch

4.3.1 Introduction

This Section specifies the procedure to be adopted for the scheduling and dispatch of **Generating Units** to meet demand and allocation requirements and maintain voltage and frequency within an acceptable range, and defines the contributions by Users to help achieve this goal.

4.3.2 Objective

The objective of this Section is to detail the actions and responsibilities of **SLDC** in preparing and issuing a daily generation schedule and the responsibilities of **Users** to supply the necessary data and to comply with this schedule. It also specifies the responsibilities of **SLDC** and **Users** in voltage and frequency management.

4.3.3 Generation Scheduling

APTRANSCO may issue Indicative Running Notification (IRN) informing CDGUs of the generation schedule to be maintained and percentage load it is scheduled during the following Scheduled Day.

APTRANSCO shall use Demand Forecast as the basis for preparing IRN. Outage Plan is also taken into account.

In the absence of IRN all **Generators** shall provide the hourly MW/MVAr availability (00.00 - 24.00 hours) of all **Generating Units**, to **SLDC** on the day ahead basis by 10.00 hours. **CPPs** shall provide the hourly import/export figures on the day ahead basis by 10.00 hours.

In working out the MW/MVAr availability, Hydro Power Stations shall take into account their respective reservoir levels and any other restrictions and shall report the same to **SLDC**.

SLDC shall obtain from **SRLDC**, the hourly MW entitlements from ISGS, by 11.00 hours on a day ahead basis. **SLDC** shall produce a day ahead hourly generation schedule after consolidation of the data provided by the **Generators** and **SRLDC**. It will take into account the hourly demand estimates and latest planned schedule agreed with **SRLDC**. In preparation of the schedule, **SLDC** shall take into account of the relative commercial costs to **APTRANSCO** of the operation of Generation units. Full generation at all Hydel stations will also be included during flooding when reservoirs are full.

SLDC shall intimate the generation schedule/import schedule for the following day to all **Generators / CPPs** (including any **Generating Unit** not required to run) by 16.00 hours.

Generators shall promptly report to **SLDC**, changes of **Generating Unit** availability or capability, or any unexpected situation which could affect its operation. All **CPPs** shall similarly report regarding their export to **APTRANSCO**.

SLDC shall advise **Users** as soon as possible of any necessary rescheduling.

SLDC shall prepare the day ahead generation schedule based on the following:

- i) **Transmission System** constraints.

- ii) Hourly load requirements as estimated by **SLDC**.
- iii) The need to provide operating margins and reserves required to be maintained.
- iv) The availability of generation from **Generators**, Central Sector Generators and **CPPs** together with any constraints in each case.
- v) Overall economy to **APTRANSCO** and Customers.

SLDC shall instruct **Generators** to hold capacity reserves (spinning and/or standby) to the agreed **SREB** guidelines or as determined for local conditions. **SLDC** may also require the **Generators/CPPs** to generate MVA_r within their respective capability limits to hold station bus bar voltages at specified levels. If it is not possible to create reserve, **SLDC** shall request **DISCOMs** to arrange rotational load shedding and create margin.

4.3.4 *Generation Dispatch*

All **Generators** shall regulate generation and **CPPs** shall regulate their export according to the daily generation schedule.

All **Generating Units**, above 30 MW, other than those in a **CPP**, will be subject to central dispatch instructions. **CPPs** will be subject to these instructions as applicable to their respective exports to **APTRANSCO**.

SLDC will dispatch by instruction all generation and imports from **CPPs** according to the hourly day ahead generation schedule, unless rescheduling is required due to unforeseen circumstances.

In the absence of any dispatch instructions by **SLDC**, **Generators** and **CPPs** shall generate/export according to the day ahead generation schedule.

Dispatch instructions shall be in standard format. These instructions will recognise declared availability and other parameters which have been made available by the **Generator** to **SLDC**. These instructions shall include time, **Power Station**, **Generating Units** (total export in the case of **CPP**), name of operators sending and receiving the same.

Dispatch instructions may include:

- i) To switch a **Generator** into or out of service.
- ii) Details of reserve to be carried on a unit.
- iii) To increase or decrease MVA_r generation to assist with voltage profile.
- iv) To begin pre-planned **Black Start** procedures.
- v) To hold spinning reserve.
- vi) To hold **Generating Units** on standby.

4.3.4.1 *Changes in parameters*

In respect of changes in GSDP values the CDGU concerned shall send a GSDP Notice to **SLDC** by 1000 hrs on the day before the Schedule Day in respect of revised values of which the generator is then aware of or after 1000 hrs on the day before the Schedule Day in respect of revised values of which the generator subsequently learns.

4.3.5 *Communication with Generators*

Dispatch instructions shall be issued by E-Mail/telephone, confirmed by exchange of names of operators sending and receiving the same and logging the same at each end. All such oral instructions shall be complied with forthwith and written confirmation shall be issued promptly by Fax, teleprinter or

otherwise.

4.3.6 Action Required by Generators

All **Generators** shall provide hourly generation (MW and MVar) to SLDC on real time basis.

All **Generators** and **CPPs** shall comply promptly with a dispatch instruction issued by **SLDC** unless this action would compromise the safety of plant or personnel.

The **Generator** and **CPPs** shall promptly inform **SLDC** in the event of any unforeseen difficulties in carrying out an instruction.

All **Generating Units** shall have Automatic Voltage Regulator (AVR) in service.

All **Generators** shall promptly transmit OUTAGE NOTICE to APTRANSCO/SLDC intimating all unplanned outages of any generating units/ auxiliaries which reduce the generation contribution to the grid.

All **Generating Units** shall have the governor available and in service and must be capable of automatic increase or decrease in output within the normal declared frequency range and within their respective capability limit.

Generators shall immediately inform **SLDC** by telephone of any loss or change (temporary or otherwise) to the operational capability of any **Generating Unit** which is synchronised to the system or which is being used to maintain system reserve. **Generators** shall inform **SLDC** any removal of AVR and/or governor from service with reasons.

CPPs shall similarly inform any change in status affecting their ability in complying with dispatch instructions.

On receiving Notice to synchronise by SLDC, generators shall synchronise the particular unit to the grid within the time prescribed. Inability to do so shall be intimated to SLDC without loss of time.

Generators shall not de-synchronise **Generating Units**, other than in respect of **CPPs**, without instruction from **SLDC** except on the grounds of safety to plant or personnel which shall be promptly reported to **SLDC**.

Generators and **CPPs** shall report any abnormal voltage and frequency related operation of **Generating Units**/feeders promptly to **SLDC**.

Generators shall not synchronise **Generating Units**, other than in respect of **CPPs**, without instruction from **SLDC**. In emergency situations, the **Generator** may synchronise Units with the grid without prior intimation in the interest of the operation of the grid following standing instructions developed for such purpose under "contingency planning".

Should a **Generator** fail to comply with any of the above provisions, it shall inform **SLDC** promptly of this failure.

SLDC may instruct generators to keep any CDGU as hot standby. The generator shall comply with such instructions. A clause shall be included into the PPA for the charges payable by APTRANSCO to the generator for keeping a CDGU as hot standby.

4.3.7 Enhancement Of Schedule And Dispatch Procedure

Schedule and dispatch procedures shall be suitably enhanced to cater to tariff agreements as soon as any such agreement is reached with **Generators**, **CPPs**, and **IPPs**.

4.3.8 *Frequency Management*

SLDC shall monitor the frequency of the transmission system and take action to ensure that they are within acceptable limits in coordination with **SRLDC**. Corrective action shall be initiated when frequency deviates by 1% from the nominal value. Whenever the frequency tends to fall below 50.0 Hz **SLDC** shall increase the drawals from Generating Stations including **ISGS**, according to a pre-arranged pattern based on economic and merit order despatch. Inter-state drawals also may be increased/ commenced as per agreements in force.

SLDC shall monitor actual drawal against scheduled drawal and regulate internal generation/demand to maintain this schedule. The scheduled drawal shall be intimated by **SLDC** beforehand to all Users (**DISCOMs** and EHT Customers). The scheduled drawal shall be estimated from previous maximum drawal (power as well as daily energy drawal). The **DISCOMs** can exceed the scheduled drawal by 5% without prior approval on any single day provided the frequency is above 49.5 Hz but must obtain prior approval from **SLDC** to continue the excess drawal from the second day onwards. The drawal can be increased without limit with prior approval of **SLDC**. Normally **SLDC** is expected to approve increase in load if the generation margin is deemed sufficient.

Generators and **CPPs** shall follow the despatch instructions issued by **SLDC**.

SLDC shall issue standing instructions to all **DISCOMs** and EHT consumers to reduce load by a given percentage at different low frequencies. **APTRANSCO** may request **SRLDC** to institute similar procedure in other Southern States.

Distribution Companies shall cooperate with **SLDC** in managing load, especially for maintaining the frequency during contingencies such as unexpected generation outage, by reducing the drawal from the transmission system on instruction from **SLDC**.

Whenever the frequency is below 49.5 Hz the drawals shall be restricted to drawal schedules. When the frequency falls below 49.0 Hz requisite load shedding shall be arranged by **SLDC** through the **DISCOMs**.

Frequency indicating meters shall be installed at **ALDC** control rooms, EHT Sub Stations, 33 kV Sub Stations feeding more than 10 MW and in the premises of EHT consumers, captive power plants and cogeneration units. Standing instructions may be given by **SLDC** regarding action to be taken when frequency falls below 50 HZ.

4.3.8.1 *High Frequency Related Emergencies*

When the frequency is tending to increase above the statutory upper limit, **SLDC** shall request the **Generators** to reduce generation and request **SRLDC** to take necessary action at Regional level. While reducing generation, merit order despatch procedure shall be followed by **SLDC**. In order to implement the merit order despatch, the relevant cost data shall be furnished by all **CDGUs** on one-month ahead basis.

The instructions to reduce generation will be issued by **SLDC** by Telephone communication. Failure of a **Generator** to follow the **SLDC** instructions in this context will constitute a violation of the **CTI** and will entail penalties.

During periods of high frequency operation, the **SLDC** telephone instructions to **Generators** shall supercede other provisions of the **CTI**, and all Acts, Rules and Regulations of State and Central Governments. Adequate authority shall be delegated to the duty **Engineers** of **SLDC**

to enable them to take spot decisions for on-line operation of the Grid.

On demand by a generator the SLDC shall confirm its verbal instruction by written instruction after the operation is completed. SLDC is responsible for complying all Codes, Acts, etc and must justify its instructions in the light of Codes, Acts, etc or must be ready to justify any deviation in dealing with an unforeseen emergency threatening the security of the Grid.

4.3.9 Voltage Management

SLDC shall carry out load flow studies from time to time to predict where voltage problems may be encountered and to identify appropriate measures such as changing transformer tap settings or switching in compensation equipment to ensure that voltages remain within the defined limits. On the basis of these studies SLDC may instruct **Generators** and **CPPs** to maintain specified voltage levels at interconnecting points and determine voltage levels at the interconnection points with **Distribution Companies**.

SLDC shall continuously monitor 400/220/132 kV voltage levels at strategic sub-stations and communicate the values to SRLDC as basis of on-line operation.

Generators shall make available to SLDC the up-to-date capability curves for all **Generating Units**, as detailed in the Connection Code, indicating any restrictions, to allow accurate system studies and effective operation of the **Transmission System**. **CPPs** shall similarly furnish the net reactive capability that will be available for export to / import from **Transmission System**. **Generators** and **CPPs** shall inform SLDC of their reactive reserve capability promptly on request. SLDC may instruct **Generating Units** and **CPPs** to regulate MVar generation within their declared parameters and request SRLDC, Bangalore to initiate corresponding action in other Southern States.

Distribution Companies shall participate in voltage management by regulating their drawal and by installing compensaton equipment as may be required.

If acceptable voltage levels still cannot be maintained by these measures, **APTRANSCO** shall take steps to augment the transmission system to meet the required voltage criteria.

4.3.10 Data Requirements

Users shall provide SLDC with data for this Section as specified in Appendix 4D-2 to 4D-5.

4.4 Contingency Planning

4.4.1 Introduction

This **Section** describes the actions to be followed by all **Users** in the event **Load Shedding** is required and the recovery process to be followed by all **Users** in the event of total or partial blackouts occurring in the **Transmission System** or **Regional System**.

4.4.2 Objective

The objective of this **Section** is to define the responsibilities of all **Users** to prevent a **Transmission System** or **Regional System** blackout, and in the event of such an occurrence, to achieve the fastest recovery, taking into account essential loads, **Generator** capabilities and system constraints.

Black start restoration requires a coordinated approach by all participants to ensure a safe and timely return of electric service to the distribution companies. Each participant is required to have procedures in place to facilitate a timely return of electric supply to the entire grid. Some large coal generating plants require start-up power within one hour of a blackout or they will take a minimum of five hours to start up

again. It is imperative that these procedures are coordinated and that the associated control center staff are prepared.

Blackouts disrupt essential services throughout the state. Areas and municipalities will have disaster plans in place to deal with such disruptions and the State Government will be requested by APTRANSCO to set up a Disaster Management Cell with a control room having a twentyfour hours telephone service to assist with these disaster plans. Whenever a large area of the state is in a blackout condition, the **APTRANSCO** would notify the Disaster Services with information pertaining to the extent of the outage, expected duration and a phone number to be used for follow-up. Diesel Generators shall be installed at all hydel stations except those hydel stations like Pochampadu which dry up during summer, of capacities sufficient to allow start-up of one generating unit without need for external power.

4.4.3 Load Shedding Schedule

Under falling frequency conditions, **SLDC** shall take appropriate action to issue instructions, in coordination with **SRLDC**, to arrest the falling frequency and restore it to be within normal range. Such instructions may include instructions to **Users** to reduce load demand by appropriate manual and /or automatic load sheddings.

Users shall provide to **SLDC** estimates of load that may be shed, when required, in discrete blocks with the details of the arrangements of such load sheddings.

4.4.4 Restoration

SLDC shall maintain a record of **Power Station Black Start** capability and associated **Power Station Black Start** plans.

APTRANSCO is responsible for maintaining upto date restoration procedures following total or partial blackout. These procedures shall document the process to be followed by their associated control centre staff to ensure a safe, reliable, coordinated and expedient restoration of the electric supply to the transmission grid.

APTRANSCO shall recognize the need to integrate and coordinate with the restoration activities of other transmission grids. It is especially important that these procedures recognize the need to restore the grid in an organized and efficient manner regardless of ownership of generating plants and obligations to any particular load center.

APTRANSCO shall be responsible for gaining the endorsement of their black start procedures from the other transmission grids.

APTRANSCO shall be responsible for keeping their control centre staff adequately prepared and trained to restore the transmission grid in accordance with procedures defined above.

Users shall agree to **Black Start** procedures of **APTRANSCO** and promptly inform **SLDC** when unable to follow these procedures.

SLDC shall be responsible for directing the overall **Transmission System** restoration process by coordination with all **Users** and **SRLDC**.

DISCOMs shall be responsible for sectionalising the **Distribution System** into discrete, unconnected blocks of demand. They shall advise **SLDC** of the amount of MW likely to be picked up by the synchronising **Generating Unit**.

Generators shall be responsible for commencing their planned **Black Start** procedure on the

instruction of **SLDC** and steadily increasing their generation according to the demand which **SLDC** is able to make available. Hydel Stations shall maintain the Diesel Generating units in good condition so that the hydel generating units can be started without external power as provided in 4.5.2.

Current copies of black start procedures will be circulated to the appropriate agencies not later than November 15th of each calendar year. Approval by all agencies shall be acquired no later than December 31st of the same calendar year.

4.4.5 Black Start Procedures

The situation prevailing prior to the occurrence of the contingency, e.g. availability of specific Generators, transmission circuits and load demands, will largely determine the restorations process to be adopted in the event of a total blackout. **SRLDC** and **SLDC** shall coordinate to determine the extent of the problem. **SLDC** shall advise all **Users** of the situation and follow the strategy as outlined below for restoration.

Each **User** shall have designated persons authorised for operation and control available for communication and acceptance of all operational communications throughout the contingency. Communication channels shall be restricted to operational communications only till normalcy is restored.

4.4.5.1 Total Regional Blackout

First it is to be ascertained whether AP System is blacked out or the entire Southern Region is blacked out. If the entire Southern Region is blacked out **SLDC** shall play its partial role. If only AP System is blacked out **SLDC** shall direct restoration and obtain assistance from other States and **SRLDC**.

SLDC shall instruct all relevant **Generators** having **Power Stations** with **Black Start** capability to commence their pre-planned **Black Start** procedure. **SLDC** may require **CPPs** to extend start-up power supply to **Generators** as may be feasible.

SLDC shall prepare the **Transmission System** for restoration by creating discrete power islands with no interconnection. Close co-ordination with concerned **Distribution Companies** shall be maintained during the restoration process to arrange for discrete demand blocks becoming available to stabilise **Generating Units**, as these become available in individual islands. **Generators** to whom start up power supply is made available shall sequence their start up to match their auxiliary power demand with the supply available.

Generators shall inform **SLDC** as **Generating Units** become available to take load, in order that the **APTRANSCO** may assess the MW demand which the **Generating Unit** is likely to pick up on circuit breaker closure.

SLDC shall co-ordinate with **Generators** and **Distribution Companies** to:

- i) Form discrete power islands with one **Generating Unit** feeding some local demand.
- ii) Extend islands by adding more **Generating Units** and more demand in a coordinated manner maintaining load generation balance.
- iii) Synchronise islands to form a larger, more stable island.

SLDC shall, taking into account sites where system synchronisers are available, gradually extend the synchronisation until all demand is restored.

SLDC shall utilise any **Regional** or interstate assistance available, if appropriate, at any time to assist in the above process. The procedure developed by SRLDC shall be followed. Also the Indian Electricity Grid Code is to be followed.

4.4.5.2 *Total Transmission System Blackout*

SLDC shall carry out the strategy for total **Regional** blackout.

SLDC shall carry out simultaneous action to utilise radial feeders from the **Southern Region** and neighbouring States.

4.4.5.3 *Partial Transmission System Blackout*

SLDC shall ensure with **Users** that the security of the healthy part of the **Transmission System** is maintained.

SLDC shall gradually extend the healthy system to provide start – up power to appropriate **Generating Units**.

SLDC shall, in close co-ordination with the **Distribution Companies** and **Generators**, gradually restore demand to match generation as it becomes available.

All **users** shall take care to ensure load generation balance is maintained at all times under **SLDC's** direction.

4.4.5.4 *Blackout involving ISTS Elements:*

Where ISTS elements or important elements of AP State system having significant operational impact on ISTS are involved in the black out the recovery procedures provided in the relevant Section of IEGC are to be complied with.

4.4.6 *Special Considerations*

During the restoration process following **Transmission System** or **Regional System** back out conditions, normal standards of voltage and frequency shall not apply.

A list of essential loads and priority of restoration is given in the Appendix C.

Distribution companies with essential loads shall separately identify non-essential components of such loads, which may be kept off during system contingencies. **Distribution Companies** shall draw up an appropriate schedule with corresponding load blocks in each case. The non-essential loads can only be re-energised when system normalcy is restored, and as advised by **SLDC**.

All **Users** shall pay special attention in carrying out the procedures so that a secondary collapse, due to undue haste or inappropriate loading, is avoided.

Despite the urgency of the situation, careful, prompt and complete logging of all operations and operational messages shall be ensured by all **Users** to facilitate subsequent investigation into the incident and the efficiency of the restoration process. Such investigation shall be conducted promptly after the incident.

4.5. Operational Coordination with PGCIL, CTU, SRLDC and SREB

4.5.1 *Interface With Southern Regional Electricity Board*

- a) **The Chief Executive (Chairman and Managing Director)** of **APTRANSCO** shall represent A.P. State power sector in toto in all affairs pertaining to SREB, ISGS, Power Grid Corporation and SRLDC. Similarly one Chief Engineer, or one Superintending Engineer, of **APTRANSCO** shall attend the Bimonthly/Quarterly meetings of SREB and shall represent all other Power Sector entities of A.P. State. In the monthly and quarterly meetings past situations are reviewed and future programmes are chalked out, including any operational modification, Transmission augmentation and commercial issues of inter regional and intra regional energy transactions. **APTRANSCO** represents the interests in general of A.P. State at the SREB.
- b) **APTRANSCO** shall coordinate the day to day operational issues of the A.P Power System and furnish the data required by SRLDC/SREB and participate in smooth integrated operation of Southern Region.
- c) **APTRANSCO** shall depute its experts to the quarterly Protection Committee Meetings (which analyse fault trippings and decides on improvements which may be necessary) and also to Operation Committee meetings of SREB.
- d) **APTRANSCO** will co-ordinate with SREB transmission line outage planning, generation planning and scheduling of generation unit outage planning, demand estimation, system operational improvement transmission augmentation and similar operational and planning programmes of AP Electricity Sector.
- e) **SLDC** shall, in emergency situations, co-ordinate with **SRLDC** with regard to power exchange and service restoration.
- f) All utilities including all Generators and DISCOMs shall comply with the instructions of SLDC and SRLDC to carry out the integrated operation of the Southern Regional Grid of which AP State is a part. To this end the utilities shall follow the CTI (AP Grid Code), the Indian Electricity Grid Code, “Operating Procedures of Southern Region” issued by SRLDC and the Operating Procedures and Manuals formulated by PGCIL and APTRANSCO . All utilities shall comply with the instructions issued by APSLDC and SRLDC in the course of their real time operation and control of the system. If any entity has a grievance or objection to the spot instructions of SLDC or SRLDC, the entity must first comply and then the lack of fairness must be brought to the notice of SLDC/ SRLDC for redressal in subsequent period, failing which the entity may lodge a complaint with APERC /CERC. If any entity cannot immediately implement an instruction of SLDC/ SRLDC due to reasons beyond its control or due to the equipment limitation then the entity must immediately intimate the same (inability to comply) to SLDC/SRLDC and seek a revised instructions which can be implemented under the circumstances.

4.5.2 Coordination with SREB and SRLDC

APTRANSCO shall coordinate with SREB and SRLDC in maintaining the voltage, frequency and security in the Southern Regional Grid. The Transmission lines of PGCIL, Inter – State lines, critical lines of AP System and the entitlements of ISGS are listed in statements 4 –1, 4 –2 and 4 – 3. The updated lists are to be kept with SLDC . Also a list of important elements vital for the operation of Southern Regional Grid as recognised by SRLDC in addition to those listed in statements 4 –1 and 4 – 2, is prepared and kept with SLDC for enabling compliance with sub section 6.2 (c) and (d) of Indian

Electricity Grid Code wherein it is stipulated that no important element of the Regional Grid shall be deliberately opened without prior clearance of SRLDC.

Table 4-1

I. Central Sector Interconnecting Transmission Network in A.P

1.	400kV Cuddapah – Bangalore	AP — Karnataka
2.	400kV Nagarjuna Sagar – Raichur	AP — Karnataka
3.	400kV Gooty – Bangalore	AP — Karnataka
4.	400kV Cuddapah – Sriperambadur	AP — Tamil Nadu
5.	400kV Ramagundam – Chandrapur Double Circuit	AP — Maharashtra
6.	400kV Gazuwaka—Jeypore	AP— Orissa
7.	400kV Ramagundam—Hyderabad Double Circuit	AP
8.	400kV Hyderabad—Nagarjunasagar Single Circuit	AP
9.	400kV Ramagundam—N’sagar Double Circuit	AP
10.	400kV Ramagundam—Khammam Single Circuit	AP
11.	400kV Khammam—Nunna Single Circuit	AP
12.	400kV Nunna—Vishakapatnam Single Circuit	AP
13.	400kV N’Sagar—Cuddapah Double Circuit	AP

II. Interstate Lines Connecting A.P State with Neighbouring States

1.	220kV Gachibowli,Hyd – Sadem,	AP—Karnataka
2.	220kV Gooty—Bellary	AP— Karnataka
3.	220kV Chittor—Tiruvalam	AP— Tamil Nadu
4.	220kV Sulerpet—Gummidipundi	AP— Tamil Nadu
5.	132kV Guntakal—Hampi	AP— Karnataka
6.	66kV Bellary—Adoni	AP— Karnataka
7.	220kV Upper Sileru—Balimela	AP— Orissa
8.	HVDC Lower Sileru—Barsur	AP— Madhya Pradesh

Table 4-2

Critical 220 kV Lines Owned By AP State

- (1) Kothagudem – Shapurnagar
- (2) Lower Sileru – KTPS Double Circuit

- (3) KTPS – Miryalaguda Single Circuit
- (4) Visakhapatnam – Bommur – Nidadavolu – Bhimadolu – Vijayawada – Double Circuit
- (5) VTS – Tallapalli – Double Circuit
- (6) Srisailam – Somayajulapalli – Gooty Double Circuit
- (7) Srisailam – Mydukur-Cuddapah-Chinakampally.
- (8) Srisailam – Chandrayanagutta Double Circuit
- (9) VTS--Tadikonda Double Circuit
- (10) Tadikonda--Ongole Single Circuit
- (11) Ongole--Podili Double Circuit
- (12) VTS—Podili Double Circuit
- (13) Podili—Srisailam Double Circuit
- (14) Tallapalli—Srisailam Double Circuit
- (15) Nagarjunasagar—Tallapalli Double Circuit
- (16) Nagarjunasagar—Tallapalli Single Circuit
- (17) VTS—Malkaram Double Circuit (Via Narketpalli and Chilakallu)
- (18) KTS V—Khammam Double Circuit
- (19) Khammam— Wadde Kothapalli

Table 4-3**National Power Stations With AP Entitlements**

	TOTAL CAPACITY (MW)	AP SHARE (MW)
1.Ramagundam Super Thermal Station (NTPC)	2100	580
2. Madras Atomic Power Project (MAPP)	340	28
3. National Lignite Corporation (NLC)		
Mine cut II , Stage I	580	97
Mine Cut II, Stage II	790	180
TOTALS	3810	885
Approximate AP Share of unallocated Capacity		115
Total Approximate AP Entitlement from National Power Stations		1000

4.6 Protection Committee

Protection committee shall be formed with following composition:-

Chairman	Deputee from APTRANSCO
Secretary	Deputee from APTRANSCO
Member	APGENCO (Thermal) Protection in Charge
Member	Protection Engineer of any IPP, Deputed by all IPPs to represent all IPPs, CPPs and JVCs
Member	Protection of APGENCO (Hydro)
Member	SREB
Four Members	One from each of the four DISCOMs

(The Chairman and Secretary who are from **APTRANSCO** and the Representative of **SREB** shall represent the interests of **SRLDC**, **PGCIL** and **ISGS** also).

The Committee shall hold a meeting at least once quarterly and also after every major incident in the AP Grid. All trippings and incidents shall be discussed at the Meetings and any remedial measures including modification to protection schemes, change of relay setting etc. shall be resolved at these meetings.

Revisions to the parts of the CTI dealing with protection issues shall be proposed and initiated by the Protection Committee. When such revisions are contemplated, the protection committee shall send its representative to CTI review meetings for placing the issues and committee's recommendations before the Panel.

The Protection Committee may invite experts from relay manufacturers, consultants and representatives of other power sector organizations for participation in the meetings without voting rights.

The Chairman of the Protection Committee is ex-officio member of the CTI Review Panel and he or his representative shall attend all CTI Review Panel Meetings whenever protection matters are discussed.

4.7 Cross Boundary Responsibility

4.7.1 Introduction

This Section sets down the requirements for maintaining safe working practices associated with cross boundary operations. It lays down the procedures to be followed when work is required to be carried out on electrical equipment that is connected to another User's system.

4.7.2 Objective

The objective of this Section is to achieve agreement and consistency on the principles of safety as prescribed in Indian Electricity Rules when working across a control boundary between **APTRANSCO** and another User.

4.7.3 Safety Coordinator

APTRANSCO and all Users shall nominate suitably authorised persons to be responsible for the co-ordination of safety across **APTRANSCO**/User interfaces and boundaries. These persons shall be referred to as **Safety Coordinators**.

4.7.4 Procedures

4.7.4.1 *General*

- (i) **APTRANSCO** shall issue a list of Safety Coordinators (names, designations and telephone numbers) to all Users who have a direct control boundary with **APTRANSCO**. The jurisdiction of each Safety Coordinator shall be clearly indicated in the list. This list shall be updated promptly whenever there is change of name, designation or telephone number.
- (ii) All Users with a direct control boundary with the **APTRANSCO** shall issue a similar list of their Safety Coordinators to the **APTRANSCO**, which shall be updated promptly whenever there is a change to the Safety Coordinators list.
- (iii) Whenever work across a control boundary is to be carried out, the Safety Coordinator of the party wishing to carry out work shall directly contact the other relevant Safety Coordinator. Code words will be agreed at the time of work to ensure correct identification of both parties.
- (iv) Contact between the Safety Coordinators shall normally be by direct telephone. Should the work extend over more than one shift the Safety Coordinator shall ensure that the relief Safety Coordinator is fully briefed on the nature of the work and the code words in operation.
- (v) The Safety Coordinators shall co-operate to establish and maintain the precautions necessary for the required work to be carried out in a safe manner. Both the established isolation and the established earth shall be locked in position, where such facilities exist, and shall be clearly identified preferably with easily visible signs.
- (vi) Work shall not commence until the Safety Coordinator of the party wishing to carry out the work is satisfied that all the safety precautions have been established. This Safety Coordinator shall issue agreed safety documentation to the working party to allow work to commence.
- (vii) When work is completed and safety precautions are no longer required, the Safety Coordinator who has been responsible for the work being carried out shall make direct contact with the other Safety Coordinator to request removal of those safety precautions.
- (viii) The equipment shall only be considered as suitable for return to service when all safety precautions are confirmed as removed, by direct communication using code word contact between the two Safety Coordinators, and return of agreed safety documentation from the working party has taken place.
 - i) **APTRANSCO** shall develop an agreed written procedure for cross boundary safety and continually update it.
 - ii) Users shall also develop written procedure for crossboundary safety at each connection point.
 - iii) Any dispute concerning Cross Boundary Safety shall be resolved at an appropriate higher level of authority.

4.7.4.2 *Special Considerations*

- (i) For cross boundary circuits, all Users shall comply with the agreed safety rules which

must be in accordance with IE Rules.

- (ii) All equipment on cross boundary circuits which may be used for the purpose of safety coordination and establishment of isolation and earthing, shall be permanently and clearly marked with an identification number or name, that number or name being unique in that sub-station. This equipment shall be regularly inspected and maintained in accordance with manufacturer's specification. Each Safety Coordinator shall maintain a legibly written safety log, in chronological order, of all operations and messages relating to safety coordination sent and received by himself. All safety logs shall be retained for a period of not less than 10 years.

4.7.5 Site Responsibility Schedule:

The Safety Coordinator and working party at a connection site shall refer to the Site Responsibility Schedule for that site and follow the safety rules pertaining to that site. These safety rules shall be recorded on the Site Responsibility Schedule.

4.8 Operational Liaison

4.8.1 Introduction

Operational Liaison details the requirement for exchange of information relating to operations and/or events on the total system including the Southern Regional System which may have an operational effect on:

- a) The **APTRANSCO** System in the case of an Operation and/or Event occurring on a User system.
- b) A User System in the case of an Operation and/ or Event occurring in the **APTRANSCO** System.

The procedure for issue of warnings in the event of a risk of serious and widespread disturbances on the whole or part of the **APTRANSCO** system are set out in the following sections.

4.8.2 Objective

The objective of this section is to specify the information to be exchanged between Users in order to identify the potential impact of an operation and/or event and to assess the possible risk arising therefrom, so that appropriate action is taken by the relevant party to maintain the integrity of the **APTRANSCO** system. Also in the case of an Operation in the system of one User the execution of associated, corresponding and coordinating operations by other Users and/or **APTRANSCO** in the correct sequence and with the required promptness are to be ensured through a Operational Liaison (O.L) process to safeguard the integrity and healthy operating condition of the **APTRANSCO** System as well as the systems of the Users concerned.

4.8.3 Definitions

Operation: means scheduled or planned actions relating to the operation of a system.

Event means an unscheduled or unplanned occurrence on a system including faults, incidents and breakdowns.

Operational Effect shall mean any effect on the operation of the relevant system which may cause the

system of **APTRANSCO** or the other Users to operate differently from the way in which they would have operated in the absence of that effect.

4.8.4 Notification of Operations

- a) **APTRANSCO:** In the case of an operation or an unplanned event in the **APTRANSCO** system which may have an operational effect on a User system, **APTRANSCO** will notify the User whose system may, in the opinion of **APTRANSCO**, be affected.
- b) **User:** In the case of an operation or an unplanned event on a User system which may have an operational effect on the **APTRANSCO** system, the Users will notify **APTRANSCO** who will in turn notify other Users on whose systems the operations may have an operational effect in the opinion of **APTRANSCO**.
- c) The following are examples of scheduled or planned actions for which notification in advance will be required under 4.8.4 if they may have an operational effect.
 - Planned operation of any circuit breaker or isolator or any sequence or combination of the two other than at the instruction of **APTRANSCO**.
 - Voltage Control
- d) All operations on elements of 132 kV or higher voltage or on lines and equipment having impact on the Regional Grid, must be notified by SLDC to SRLDC.

These examples are by way of illustration and do not in any way limit the general requirement to notify in advance.

4.8.5 Nature of notification of operations

- a) A notification under 4.8.4 must contain sufficient details to describe the operation to enable the recipient to consider and assess the implications and risks existing and will include the name of the individual reporting the operation on behalf of **APTRANSCO** or the User. The notification needs to state the cause, but the recipient may ask questions to clarify the notification and the notifying party shall provide the necessary information using its reasonable efforts.
- b) A notification shall indicate that operation on the Total System or any part of the Total System is likely, the general nature of the Operation and if associated power supplies are likely to be affected the estimated time of the interruption and return to service. The notification need not state the cause of the operation.
- c) **Timing:-** A notification under 4.8.4 must be given as far in advance as practicable as will reasonably allow the recipient to assess the implication and risks arising.
- d) **Recording:-** The notification shall be given orally or in writing. The oral notification is to be confirmed in writing if required either by the sender or the recipient but response actions shall be taken by the parties based on the oral notification.

4.8.6 Requirement to notify events

- a) **APTRANSCO:-** An event or a planned operation on the **APTRANSCO** System which has an operational effect on a User system will be notified by **APTRANSCO** to the Users whose systems have been affected.
- b) **User:-** An event or a planned operation on a User system which has an operational effect on the

APTRANSCO System shall be notified by the User to the **APTRANSCO** who will in turn notify the other Users on whose systems the event may have an operational effect.

- c) An event or a planned operation of APTRANSCO system which has an operational effect on the Regional Grid shall be notified by APTRANSCO to SRLDC.
- d) The following are examples of situations where notification will be required if they have an operational effect.
 - (i) Where plant and/ or apparatus being operated in excess of its capability or may present a hazard to personnel
 - (ii) Activation of any alarm or indication of any abnormal operating conditions.
 - (iii) Adverse weather conditions being experienced or forecast. Breakdowns of, or faults in or temporary changes in, the capability of plant and/or apparatus.
 - (iv) Breakdown of, or faults on, control, communication or metering equipment.
 - (v) Increased risks of protection operations.
 - (vi) Breakdown or fault in the **APTRANSCO** System.
 - (vii) Opening and closing of Isolators and Circuit Breakers.

These examples are illustrative only and in no way limit the general requirement to notify.

4.8.7 *Significant Incidents*

A significant incident is an event with a significant effect on either the **APTRANSCO** system or a **User's** system and usually entails one or more of the following operational effects:

- Tripping of plant and/ or apparatus manually or automatically.
- Voltage outside statutory limits.
- System frequency outside statutory limits.
- System instability
- System overloads.

Where a User notifies an event which **APTRANSCO** considers to have had a significant effect on the **APTRANSCO** system, **APTRANSCO** may require the User to report the event in writing within one Business Day. **APTRANSCO** will then advise the User accordingly.

Where **APTRANSCO** notifies a User of an event which the User considers to have had a significant effect on its system, the User may require **APTRANSCO** to report the event in writing in which case it will be within one Business Day. The User will then notify **APTRANSCO** accordingly.

4.8.8 *Warnings*

- a) A warning will be issued by **APTRANSCO**, confirmed in writing to Users who may be affected when **APTRANSCO** knows there is a risk of wide spread and serious disturbances to the whole or part of the Total System.
- b) Where sufficient time is available, the warning will contain such information as **APTRANSCO** considers reasonable to explain the nature and extent of the anticipated disturbance to the User, provided that such information is available to **APTRANSCO**.
- c) Each User on receipt of the warning shall take steps to warn its operational staff and maintain its plant and apparatus in the condition in which it is best able to withstand the anticipated disturbance for the duration of the warning.

- d) Scheduling and Dispatch may be affected during the period covered by a warning.

4.8.9 Incident Reporting

4.8.9.1 Introduction

This **Section** describes the requirements for reporting, in writing, incidents which were initially reported orally by/to other **Users**.

Incidents occurring in a User's system shall be promptly reported to SLDC/ APTRANSCO and to other affected Users. Incidents occurring in the transmission system shall be promptly reported by APTRANSCO to the affected Users. All incidents occurring in elements of 132 kV or higher voltage shall be reported by SLDC/ APTRANSCO to SRLDC/ SREB.

4.8.9.2 Objective

The objective of this **Section** is to define the incidents to be reported, the reporting route to be followed and the information to be supplied to ensure a consistent approach to the reporting of incidents and accidents on the **Transmission System**.

4.8.9.3 Reportable Incidents

Typical examples of reportable incidents that could affect the **Transmission System** are the following:

- (i) Exceptionally high/low system voltage or frequency.
- (ii) Serious equipment problem, e.g. major circuit, transformer or bus-bar.
- (iii) Loss of major **Generating Unit**.
- (iv) System islanding, split, **Transmission System** breakaway or **Black Start**.
- (v) Major fire incidents.
- (vi) Major failure of protection.
- (vii) Equipment and transmission line overload.
- (viii) Excessive Drawal deviations.
- (ix) Violation of security standards.
- (x) Grid Indiscipline.
- (xi) Non-Compliance of instructions of RLDC and SLDC.
- (xii) Tripping of any important element of State Grid or Southern Regional Grid.
- (xiii) Loss of stability.
- (xiv) Minor equipment alarms. (minor means not having cross-boundary impact)

The last two reportable incidents are typical examples of those which are of lesser consequence but which can still affect the **Transmission System**. They may require corrective action but may not warrant a management report until a later, more reasonable time.

4.8.9.4 Reporting Procedure

a) General

- i. All reportable incidents occurring in lines and equipment of 11 kV and above [at grid sub-stations] shall promptly be reported orally by the **User** whose equipment has experienced the incident to any other significantly affected **Users** and to

APTRANSCO.

- ii. Within 1 (one) hour of being informed by the Reporting **User**, **APTRANSCO** may ask for a written report on any incident.
 - iii. If the reporting incident cannot be classed as minor then the reporting **User** shall submit an initial written report within two hours of the request for a written report by **APTRANSCO**. This shall be further followed up by the submission of a comprehensive report within 48 hours of the submission of the initial written report. (if the incident does not have any impact on the system of any other **User** or **APTRANSCO**'s system the incident shall be treated as minor.
 - iv. In other cases the reporting **User** shall submit a report within 5 (five) working days to **APTRANSCO**.
- b) **SLDC** may call for a report from any other **Users** affected by a reportable incident, or **APTRANSCO** in case the same is not reported by such **User** whose equipment might have been the source of the incident.
 - c) The above shall not relieve any **User** from the obligation to report events in accordance with the **IE Rules**.
 - d) The format of such a report will be as agreed at the **CTI Review Panel**, but will typically contain the following information:
 - (i) Location of incident and antecedent conditions
 - (ii) Date and time of incident.
 - (iii) Plant or equipment involved,
 - (iv) Supplies interrupted and duration if applicable.
 - (v) Amount of generation lost if applicable.
 - (vi) Brief description of incident.
 - (vii) Estimate of time to return to service.
 - (viii) Name of originator.
 - (ix) Safety interlocks/instruction violated.
 - (x) Damage to plant/equipment.
 - (xi) Details of Relay Operation / Indications.
 - (xii) Sequence of Trippings.

4.8.9.5 Reporting Form

The standard reporting form other than for accidents, shall be as approved by the **CTI Review Panel**, and is included as an Appendix to this Section.

4.8.9.6 Major Failure

Following a major failure, **APTRANSCO** and **Users** shall co-operate to inquire and establish the cause of such failure and produce appropriate recommendations. **APTRANSCO** shall report the major failure to the **Commission** within 15 days for information and shall submit a full report to the **Commission** within two months of the incident.

4.8.9.7 Investigation of User's premises by APTRANSCO :- APTRANSCO is entitled to inspect any User's equipment and the procedure is governed by Appendix B to this OC.

4.8.10 Accident Reporting

Reporting of accidents shall be in accordance with the **IE Rules, 1956**, Rule 44-A. In both fatal and non-fatal accidents, the report shall be sent to the Electrical Inspector in the prescribed form.

4.9 Integrity of Transmission System and Continuity of power Flow

The EHT bus bars are owned and operated by the generating stations in accordance with the present demarcation of inter-corporate boundaries. However, from the standpoint of Grid network power flow, they (the EHT bus bars) form essential parts of the Grid circuits. The flexibility of power flow and continuity of the Grid System are achieved physically by means of the bus bars at the generating stations, therefore **APTRANSCO** shall have operational control of them. Any operational or developmental work on the bus bars or the terminal equipment of EHT feeders shall be carried out by the generating station on request from, or with the approval of, **APTRANSCO**. **Generators** are bound to promptly carry out any requisition of **APTRANSCO** pertaining to the bus bars, terminal equipment of feeders or providing new outlets. Personnel of **APTRANSCO** shall have timely access to the switchyard for inspection of bus-bars and the terminal equipment of all EHT Feeders. **Generators** shall be responsible for maintaining the EHT bus bars and the terminal equipment of the EHT Feeders in good condition. The cost of the operational and developmental works carried out by Generators for the requirements of the **APTRANSCO** system shall generally be reimbursed by **APTRANSCO** to the **Generators** and any apportionment shall be subject to the approval of the **APERC**.

4.10 Coordination between APTRANSCO and DISCOMs at EHT Sub-station

According to the present demarcation of boundaries, the jurisdiction of the **DISCOMs** starts from the outgoing terminals of the line isolator of 33 kV or 11 kV feeders, and the equipment in EHT Substation, including the isolator itself, is owned and operated by **APTRANSCO**. From the consideration of continuity of power flow, the 33 kV bus bars form part of the integral network of the **DISCOM**, especially when a 33 kV ring feeder is formed by the **DISCOM**. So although **APTRANSCO** owns the substation equipment, it shall promptly comply with requests of the **DISCOM** concerned in operations pertaining to the 33 kV bus and terminal equipment of feeders, or providing new outlets from the 33 kV bus, or issuing line clear permits to the **DISCOM**. Cross-boundary safety rules shall be complied with by both entities. Representatives of the **DISCOM** shall have timely access to EHT substations for purposes like ensuring safety precautions, personal guarding of the line isolator during line clear permits, studying the system in EHT substations and taking check readings of the tariff and operational meters etc. **APTRANSCO** shall maintain in good condition all 33 kV and 11 kV breakers, Power Transformers, 33 kV and 11 kV bus-bars which affect the system of the **DISCOM** concerned and shall promptly carry out all O&M works to ensure reliable and stable operation of the distribution system. Apportionment of costs between **APTRANSCO** and the **DISCOM** concerned for operational and development work shall be subject to the approval of the Regulatory Commission. **APTRANSCO** and the **DISCOM** concerned shall jointly prepare written procedures and protocols for smooth coordinated operation and maintenance for each EHT substation. This provision applies in addition to the provisions made in the Planning Code, Operation Code and Metering Code.

4.11 Operational Aspects pertaining to Inter-State and Inter-regional systems:

In all operational matters pertaining to Inter-State and Inter-regional Transmission Lines and National Generating Stations the Indian Electricity Grid Code prepared by PGCIL and approved by CERC is to be followed by SLDC and APTRANSCO. All such operations are carried out in coordination with SRLDC and PGCIL (CTU).

4.12 Data Exchange between Entities:

Data as provided in Planning Code and Connection Code is expected to be available with APTRANSCO and Users. If at any time data already exchanged falls short of the data prescribed in Planning Code and Connection Code as found in Operational processes any entity is entitled to requisition and acquire the data from APTRANSCO and vice versa. If additional data over and above what is provided in Planning Code and Connection Code is found to be necessary for operational purposes the required data shall be supplied by Users to APTRANSCO and vice versa. For example, any entity may undertake to update studies of fault levels at various points of system in operation and for this purpose the other entities shall provide data for determination of short-circuit currents based on the actual parameters of lines and equipment in operation. The data furnished by one utility to another in order to comply the Grid Code (APCTI) should be used only for the purpose for which the data is supplied i.e., to discharge the functions and responsibilities by each utility. The data should be kept confidential.

Section 4 Appendix A

INCIDENT REPORTING

FIRST REPORT _____ **Date** _____ **Time** _____

1. Date and time of incident:
2. Location of incident:
3. Type of incident:
4. System parameters before the incident (Voltage, Frequency, Flows, Generation, etc.)
5. System parameters after the incident:
6. Network configuration before the incident :
7. Relay indications observed and performance of protection:
8. Damage to equipment:
9. Supplies interrupted and duration, if applicable:
10. Amount of Generation lost, if applicable:
11. Estimate of time to return to service:
12. Cause of incident:
13. Any other relevant information [and remedial action taken]:
14. Recommendations for future improvement/repeat incident:

15. Name of the Organisation :

Place

Time

Date

Signature and Designation of the Officer Reporting
the Incident

Section 4 Appendix B

Incident Investigation

-
APTRANSCO may upon giving reasonable notice (which shall not be less than two days) send representatives to a **Power Station** or a **User site** in order to **Investigate** any equipment or operational procedure at such **Power Station** or **User's Site**, including without limitations:

- (i) the compliance by **Generators** with **Dispatch Instructions** issued by SLDC in respect of CDGUs; and
- (ii) the compliance by **Generators** and other Users with design and operating requirements in relation to their **Generating Units** and **User's Equipment**.
 - (a). The Investigation can only take place in furtherance of **System** operational matters and may not take place immediately. In addition, after a period of **Monitoring** a **Test** may be required. **APTRANSCO** will give written notice, indicating reasons to the **Generator** why it wishes to carry out Investigation.
 - (b). The User must allow **APTRANSCO** representatives access to all relevant parts of its **Power Station** or **User Site**, in order to conduct Investigation.
 - (c). The procedure for the Investigation will be as determined by **APTRANSCO** acting reasonably and as notified to the Generator or User. The Generator/User will comply with all reasonable instructions of **APTRANSCO** in carrying out the Investigation.
 - (d). The purpose of an Investigation is to enable **APTRANSCO** to obtain information concerning equipment and operational procedures. Consequently the carrying out of an Investigation by **APTRANSCO** shall have no direct consequence under either the CTI or the relevant **PPA**.

Section 4 Appendix C

Essential Loads And Priority Of Restoration

Priority**Type of Load****Name of Sub-station****1. Mining****2. Railways****3. Ports & Important Industrial Loads****4. Important Cities****5. Hospitals, Water Works, TV and Radio Stations****6. Process Industries****7. Defence Establishments****Section 4 Appendix D****Operational Planning Data**

4D.1 Outage Planning Data**4D.1.1 Demand Estimates****Item****To be Submitted By**

- | | |
|---|--|
| i. Estimated aggregate annual sales of energy in million units and peak and lean demand in MW & MVAR at each Connection point for the period from April of next year to March of following year. | 30 th November of the preceding year. |
| ii. Estimated aggregate monthly sales of energy in million units and peak and lean demand in MW & MVAR at each Connection point for the next month. | 15 th of current month |
| iii. Hourly demand estimates for the day ahead. | 10.00 Hours every day |

4D.1.2 Estimates of Load Shedding**Item****To be Submitted By**

- | | |
|---|--------------------------------|
| i. Details of discrete load blocks that may be shed to comply | Soon after connection is made. |
|---|--------------------------------|

with instructions issued by **SLDC** when required, from each **Connection** point.

4D.1.3 Year ahead Outage Programme

(For the period April to March)

4D.1.3.1 Generators' Outage Programme

Item	To be Submitted By
i. Identification of Generating Unit .	30 th November each year
ii. MW which will not be available as a result of Outage .	30 th November each year
iii. Preferred start* of outage date and start* of outage time, or range of start dates and start times and period of Outage .	30 th November each year
iv. If outages are required to meet statutory requirements, then the latest date by which Outage must be taken. * Start of Outage	30 th November each year

4D.1.3.2 Year ahead SRLDC's Outage Programme (affecting **Transmission System**)

Item	To be Submitted By
MW which will not be available as a result of Outage from Imports through external Connections .	31 st December each year
ii. Start date and start time and period of Outage .	31 st December each year

4D.1.3.3 Year ahead CPP's Outage Programme

Item	To be Submitted By
i. MW which will not be available as a result of Outage . Start date and start time and period of Outage .	30 th November each year 30 th November each year

4D.1.3.4 Year ahead Distribution Company's Outage Programme

Item	To be Submitted By
i. Loads in MW not available from any Connection point.	30 th November each year
ii. Identification of Connection point.	30 th November each year
iii. Period of suspension of drawal with start date and start time.	30 th November each year

4D.1.3.5 The ¹[APTRANSCO's] overall Outage Programme

Item	To be Submitted By
i. Report on proposed Outage programme to SRLDC .	31 st January each year
ii. Release of finally agreed Outage plan.	1 st March each year

4D.2 Generation Scheduling Data

Item	To be Submitted By
i. Day ahead hourly MW & MVAR availability (00.00 - 24.00 Hours) of all Generating Units.	10.00 Hours every day.
ii. Day ahead hourly MW import/export from CPP's.	10.00 Hours every day.
iii. Status of Generating Unit excitation AVR in service (Yes/No).	10.00 Hours every day.
iv. Status of Generating Unit speed control system Governor in service (Yes/No).	10.00 Hours every day.
v. Spinning reserve capability (MW)	10.00 Hours every day.
vi. Backing down capability with/without oil support (MW)	10.00 Hours every day.
Hydro reservoir levels and restrictions	10.00 Hours every day.
Generating Units hourly summation outputs (MW)	10.00 Hours every day.
Day ahead hourly MW entitlements from Central Sector Generating Stations from SRLDC.	11.00 Hours every day.
Day ahead hourly MW entitlements of Hydel Stations from APGENCO	11.00 hours every day.

4D.3 Capability Data

Item	To be Submitted By
i. Generators shall submit to the APTRANSCO up-to-date capability curves for all Generating Units .	On receipt of request by the APTRANSCO
ii. CPPs shall submit to the APTRANSCO net return capability that shall be available for export/import to/from Transmission System .	On receipt of request by the APTRANSCO

4D.4 Response to Frequency Change

- i. Primary response in MW at different levels of loads ranging from minimum generation to registered capacity for frequency changes resulting in fully opening of governor valve(Droop Setting).
- ii. Secondary response in MW to frequency changes.

4D.5 Monitoring of Generation

Item	To be Submitted By
i. Generators shall provide hourly generation summation to SLDC .	To be submitted on real time basis
ii. CPPs shall provide hourly export/ import MW to SLDC .	To be submitted on by real time basis
iii. Logged readings of Generator— Generators to SLDC .	As required

- iv. Detailed report of **Generating Unit** trippings on In the first week of the monthly basis. succeeding month

4D.6 Essential and Non-Essential Load Data

- | Item | To be Submitted By |
|---|---|
| i. Schedule of essential and non-essential loads on each discrete load block for purposes of load shedding. | As soon as possible after Connection |