OPERATING PROCEDURES
FOR
ODISHA SYSTEM

[as mandated by the OGC clause 5.1(4)]

[Draft]

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Chapter 1

1. General

1.0. Introduction

In compliance to the OGC (Odisha Grid Code) clause no 6.1(4) this internal system Operating Procedure for State Grid (OPTCL System) is developed in consultation with the users of the State Grid. OPTCL Grid comprises of four numbers of Discom Utilities operating in the State namely CESU, WESCO Utility, NESCO Utility and SOUTHCO Utility and State Generating Stations, IPPs and CGPs and has an operating area of 166,820 sq km, which is about 36.6 % of the total area of Eastern Region and 4.8% of the total area of the country. OPTCL network has interconnections with States like West Bengal, Jharkhand as well as with neighboring Regions like SR and WR.

The OGC brings together the different terms, encompassing all the utilities connected to / or using the Intra-State Transmission System (STS) and provides documentation in regard to relationship between various users of the STS. It lays down the rules and guidelines for planning, development, operation and maintenance of the grid in an efficient, reliable and economical manner.

The internal operating procedure as prepared by SLDC is to clearly specify the roles of each player in the grid i.e., Central Sector Generating and Transmission Utilities, State Utilities, Independent Power Producers, Traders, System Operator and other agencies operating in the power market to facilitate grid operation in efficient, secure, reliable and economic manner.

1.1. Scope

This document describes the role of all agencies connected in the state grid in order to operate the grid in an integrated manner promoting efficiency, reliability and economy in conformation to the desired security standards and to meet the common interests of all the agencies.

1.2. Objective

Objective of this document is to describe the procedures to be adopted for integrated system operation and roles of each agency and their responsibilities in the grid in compliance to the various provisions of OGC/IEGC. This document aims at operation, maintenance and development of regional power system in the most efficient, economic, secure and reliable manner. This document also aims to facilitate beneficial trading opportunities between utilities within as well as outside the state to harness bottled up power

1.3. Maintenance of Operating Procedures

The Operating Procedure shall be maintained by SLDC and reviewed periodically. However, in the event of any specific operational issues/philosophy requiring urgent revision of the procedure, the same may be expeditiously carried out in consultation with the users. Further, whenever amendments are made in the OGC, IEGC, DSM, Open Access, Congestion management and related regulations, the operating procedure would be also be amended accordingly.

1.4. Structure of the Operating Procedure Document

The Operating procedure of the OPTCL system contains the following chapters.

Chapter 1 General
Chapter 2: Frequency Management
Chapter 3 Voltage Management
Chapter 4 Outage Planning
Chapter 5 Switching Coordination
Chapter 6 Periodic Reporting and Event information
Chapter 7 Network Security and Congestion management
Chapter 8 Scheduling and Despatch
Chapter 9 SCADA system operation
Chapter 10 Metering & Settlement System

1.5. List of Annexure(s) and Reference Documents

For the purpose of understanding the operational aspects and issues, there would be a necessity to refer to various data, lists and parameters, external and internal documents/lists, Grid Maps etc. A list of Annexure(s) had been shown at the end of this document.

Chapter 2

2. Frequency Management

2.0. Frequency Standard

IEGC vide its clause 6.2(m) has mandated that all Regional entities shall make all possible efforts to ensure that the grid frequency always remains within the 49.9-50.06 Hz band, Frequency is the most important indicator of the quality of supply and is the global parameter in the grid i.e. it is same throughout an inter-connected power system. The State has very little role to play for frequency management since, the participation of the State in the National Grid is very marginal. However, the state generating stations and Discom utilities shall contribute for control of frequency as per their capabilities. Since frequency is a function of the load-generation balance, it is subject to variation on a continuous basis as either of the two viz. generation or load may vary from time to time. Whenever, the frequency approaches upper/lower limits of the above range, advance action needs to be initiated in order to arrest further rise/fall in frequency; as it takes some time for remedial measures to give desired result.

2.1. High Frequency Conditions

In case the frequency is high (above 50.05Hz) and is in increasing trend then the following actions may be initiated:

2.1.1 SLDC shall ascertain from the ERLDC whether the high frequency condition is due to the heavy under- drawal by any entity within the region or by neighbouring regions.

2.1.2 SLDC shall advise the Discom utilities operating in the State to lift load shedding if any.

2.1.3 SLDC would check the possibility of any backing down of the reservoir based hydro stations within state system.

2.1.4 SLDC before advising any generation reduction at the hydro stations would check back

whether such reduction would cause any adverse change in voltage levels or network loading in the STS. In case any problem is envisaged due to such generation reduction, the same shall be avoided.

2.1.5 SLDC would revise the state's drawal schedule from costly ISGS generation as per merit order by taking adequate support from SCADA. The applicable deviation rate as per CERC (w.e.f 17-02-14) is shown at ***Annexure - I.***

2.1.6 If any SGS (other than must run) is generating more than their schedule, advise the SGS to reduce the over injection.

2.1.7 In case any Discom utility is under drawing, SLDC may advice to maintain the schedule.

2.1.8 If the frequency is still high, and action from under drawing Discom utility is not forthcoming, SLDC shall suo-motto reduce the generation schedule of SGS with corresponding downward revision of schedule of the concerned Discom utility.

2.1.9 The Hydro stations of the State are not covered commercially under ABT mechanism. Backing down advice on account of high frequency conditions may be issued to those stations after all possible remedial measures are exhausted. However, the Hydro stations may be allowed to maintain minimum generation to meet their other obligations such as irrigation, drinking water and technical water requirement.

2.1.10 Backing down of the spilling hydro units or the small hydro units for short duration may also be considered if all other options are exhausted.

2.2. Low Frequency Conditions

If the frequency is less than 49.9 Hz. and has a decreasing trend, the following actions may be taken:

2.2.1 SLDC shall ascertain from the ERLDC whether the low frequency condition is due to the heavy over- drawal by any entity within the region or by neighbouring regions.

2.2.2 SLDC may advise all state generating stations viz. hydro, thermal, IPP etc. to maximize their generation in case margins are available.

2.2.3 Deviation Settlement Mechanism and related matters Regulations, 2014 already lays down appropriate financial and legal penalties for under-generation / over-drawal at low frequency. Nevertheless, if any SGS is under-generating, it may be reminded to generate as per schedule. If such generation increase is not possible due to any technical constraints, the concerned SGS may be advised to reduce its Declared Capability. SLDC would then correspondingly reduce the drawal schedules of all Discom utilities and advise them to maintain their drawal schedule as per their respective revised schedules.

2.2.4 The generation of State Hydro stations may be closely monitored under low frequency conditions. SLDC may instruct to synchronize the units kept under spinning reserve. In case generation is less, because of some technical reasons like low inflow etc., SLDC may suo-motu revise the drawal schedules of the Discoms utilities, considering the actual hydro generation available. Such downward revision shall be duly informed to the Discom utilities with an advice to curtail their drawal.

2.2.5 If the frequency is less than 49.9 Hz and has a falling trend, remind the overdrawing Discom utilities telephonically to maintain the schedule by curtailing over drawal. The

estimation of over-drawal has to be done corresponding to nominal frequency (50.0 Hz) after applying requisite frequency bias correction on the exchange at the prevailing off-nominal frequency.

2.2.6 If the frequency is less than 49.9 Hz and it may appear that practically no Discom utility is as such overdrawing, a general message may be issued to all requesting to estimate their respective actual drawal at 50.0 Hz (after applying necessary frequency correction factor on the existing drawal) and implement load regulation wherever the estimated actual drawal corresponding to 50.0 Hz exceeds the net scheduled drawal.

2.2.7 SLDC may further examine the latest status of State thermal units under outage (forced) and find out when the units are expected to be on bar and take up for expediting the same.

2.2.8 As a long term measure, It may be examined that whether a planned maintenance of any unit can be postponed without much affecting the AMP of other units. Notwithstanding the above as per clauses 6.4(9) of OGC, SLDC may direct the Distribution Licensees / Trading Licensees / Bulk Consumers / SGS/CGP to increase / decrease their drawal / generation in case of contingencies e.g. overloading of lines/transformers, abnormal voltages and threat to system security. Such directions shall immediately be acted upon. In case the situation does not call for very urgent action, and SLDC has some time for analysis, it shall be checked whether the situation has arisen due to deviations from schedules or due to any power flows pursuant to short term open access. These shall be got terminated first, through appropriate measure like opening of feeders, if considered necessary by SLDC / ERLDC, before an action, which would affect the scheduled supplies from SGS / CGP to the long term customers.

2.3. Broad Guidelines for Issue of Over drawal messages

Violation Type and Category			Duration for issuance of Message
Frequency Violation	>50.1 Hz or <49.7 Hz	Emergency	Message will be issued if violation continues for at least 6 minutes
	50.05-50.1 Hz or 49.9 Hz -49.7 Hz	Alert	Message will be issued if violation continues for at least 15 minutes
	49.9 Hz -50.05 Hz	Normal	
Voltage Violation	> 425 kV or <380 kV	Emergency	Message will be issued if violation continues for at least 15 minutes
	415 kV - 425 kV or 390 kV - 380 kV	Alert	Message will be issued if violation continues for at least 15 minutes
	>390 kV to <415 kV	Normal	
Loading Violation	> Thermal Loading under n-1 contingency	Emergency	Message will be issued if violation continues for at least 5 minutes
	= Thermal Loading under n-1 contingency	Alert	Message will be issued if violation continues for at least 15 minutes
	< Thermal Limit under n-1 contingency	Normal	
Zero Crossing Violation	1 Failure (issued 14th time Block)	Emergency	
	Issued in 11th time block if the direction not changed for 10 time blocks	Alert	
	Zero Crossing done within 10 time Blocks	Normal	
Deviation Violation	> 20% or 200 MW (whichever lower)	Emergency	Message will be issued if violation continues for at least 5 minutes
	12%-20% or 100 MW to 200 MW (whichever lower)	Alert	Message will be issued if violation continues for at least 15 minutes
	<12% or 100 MW (whichever lower)	Normal	

Note:

1. General Approach is to issue Alert Message before reaching Critical level
2. Generally every Alert is considered for maximum of 15 Minutes

3. Generally any Emergency considered for maximum of 5 minutes
4. Only after Emergency message, if correction does not effected in say 5 minutes, Non-compliance Message shall be issued separately.

Normal State: All system variables are within the normal range and no equipment is being overloaded.

Alert State: All system variables are within acceptable range, all constraints are satisfied and a further contingency would cause an overloading any equipment.

Emergency State: After the contingency, voltages at many buses are low and/or equipment loadings are exceeds short term emergency ratings.
Format for issuance of violation message to the users within the state is shown in ***Annexure -II.***

2.4. Feeder disconnection in case of over drawl

As per provision 5.5(2) of the OGC the Distribution Licensees and other users shall endeavour to restrict their net drawal from the grid to within their respective drawal schedule. Each user shall make arrangements that will enable manual demand disconnection to take place, as instructed by SLDC, under normal and/or contingent conditions. Further in case of certain contingencies and/or threat to system security, the SLDC may direct a user to decrease its drawal by a certain quantum. Such directions shall immediately be acted upon.

Further as per provisions 5.4.2 (a) & 5.4.2 (b) of the Indian Electricity Grid Code SLDC/ SEB/distribution licensee and bulk consumer shall initiate action to restrict the drawal of its control area from the grid, within the net drawal schedule and the SLDC/ SEB/distribution licensee and bulk consumer shall ensure that requisite load shedding is carried out in its control area so that there is no overdrawl. In order to maintain the frequency within the stipulated band and maintaining the network security, the interruptible loads shall be arranged in four groups for scheduled load shedding, unscheduled load shedding, loads to be shed through UFR / df/dt relays and loads to be shed under SPS identified at RPC level. Further there should not be any overlapping of loads belonging to different groups. In case of certain contingencies and/or threat to system security, the ERLDC may direct any SLDC/ SEB/distribution licensee or bulk consumer connected to the ISTS to decrease drawal of its control area by a certain quantum. In case **r**epeated warning messages from ERLDC to curb over drawal does not yield any results, ERLDC will instruct the defaulting constituents to disconnect identified radial feeders within their respective systems for reduction of over drawl. Concerned constituents should send compliance report to ERLDC in this regard after taking necessary action. List of feeder to be disconnected in case of over drawl is shown in ***Annexure-III***

Chapter 3

3. Voltage Management

3.0. Introduction

In compliance to the OGC (Odisha Grid Code) clause no 6.3(6) all Users shall make all possible efforts to ensure that the grid voltage always remains within the following operating range

Nominal (KV -Rms)	Maximum (KV -Rms)	Minimum (KV -Rms)
765	800	728
400	420	380
220	245	198
132	145	122

Odisha Grid has not a good spatial distribution of generation rendering a fluctuated voltage profile across 220 kV network. In some pockets of the system where radial loads are fed, low voltage is experienced. Normally the 400kV system operates within the prescribed voltage limit as specified in the OGC. However, in the event of low demand in Southern parts and high hydro conditions, 220 kV substations like Jayanagar, Theruvali, Narendrapur etc. experience high voltage. Further fluctuation of 400kV bus Voltage at Jeypore (PG) due to the low fault MVA and connectivity of the HVDC station Gajuwaka is also the reason of high and low 220 kV bus Voltage at southern Grid S/Ss. Any power flow change associated with switching of filter banks operation in Powergrid line render at times wide fluctuations in voltage at 400kV level.

On the other hand, due to high concentration of load in Central & North Odisha, 220 kV voltages at Chandaka, Paradeep and Bhadrak become low, particularly during summer peak.

3.1. AVRs of Generators

As per the provisions of clause 5.3(5)(ix) of OGC, all generating units shall keep their Automatic Voltage Regulators (AVRs) in operation, with appropriate setting and power system stabilizers (PSS) in AVRs be appropriately tuned.

3.2. VAR Exchange by Customers for Voltage and Reactive Control

In line with clause 5.3(6) of OGC Reactive power compensation should ideally be provided locally, by generating reactive power as close to the reactive power consumption The beneficiaries (Distribution utility & other LTOA customers) are therefore expected to provide local VAr compensation / generation such that they do not draw VArs from the EHV grid, particularly under low Voltage condition. The agencies shall take action in regard to VAR exchange with the grid looking at the topology and voltage profile of the exchange point. In general, the regional entities shall endeavour to minimize the VAR drawl at interchange point when the voltage at that point is below the nominal value and shall not inject VARs when the voltage above the nominal value. In fact, the beneficiaries are expected to provide local VAR

compensation so that they do not draw any VARs from the grid during low voltage conditions and do not inject any VARs to the grid during high voltage conditions.

3.3. VAR generation / absorption by generating units

In order to improve the overall voltage profile, the state generators shall run in a manner i.e generate / absorb VAr as per the instruction of SLDC so as to have counter balancing action corresponding to low/high backbone grid voltage and to bring it towards the nominal value. All generators shall generate reactive power during low voltage conditions and absorb reactive power during high voltage conditions as per the capability limit of the respecting generating units without sacrificing on the active power generation required VAr that time. The online tap changers (OLTC) on the generator transformer wherever possible should also be used to achieve this. Off load tap changes should be used to take care of the seasonal variations in the voltage profile. No payment shall be made to the generating companies for such VAr generation/absorption. .

3.4. Transformer Taps

In line with OGC clause 5.3(5), SLDC shall continuously monitor 400/220/132 kV voltage levels at strategic substations. SLDC may coordinate with RLDC for switching in/out of all 400 kV bus and line reactor throughout the state grid. SLDC may coordinate ERLDC for Tap changing of all 400 / 220 kV ICTs connected to CTS. SLDC shall issue instruction to the grid S/Ss for changing of tap position of power transformers to maintain the bus voltage within the allowable limit. A list of tap positions for 400/220kV ICTs and 220/132 kV Auto as on 31.07.15 is enclosed at ***Annexure - IV.***

SLDC shall maintain this list and incorporate due changes and reasons for change of 400/220kV ICT tap positions. Frequent on line tap changing may be avoided to the extent possible. Any measure to maintain the voltage profile within the operating range by way of change of ICT taps may be resorted to through detailed study and observing the real time voltage profile of the concerned station/s. SLDC shall duly examine from the weekly special energy meter data the pattern of VARh drawal by Distribution utilities at various interconnection points at **HIGH/LOW** voltage. Effort shall be made to identify such interconnection points where regular VARh charge payment to State VAr pool takes place. Necessary measure shall be initiated to set optimum Transformer taps so as to minimise such payment to pool.

3.5. Control of Voltage at grid substations/generating stations

Following corrective measures in order of priority shall be taken by SLDC operator for STS system and by Discom utility for Distribution system in the event of voltage going beyond the operating limits as stipulated in OGC/ IEGC.

3.5.1 High Voltage Condition:

In the event of high voltage (e.g. 400 kV /220 kV voltage going beyond 420 / 245 kV and

having a rising trend) following specific steps would be taken by the respective grid substation/generating station at their own, with intimation to SLDC, unless specifically mentioned by ERLDC/SLDCs. Before taking any voltage control action the reason for high voltage as observed /reported be carefully studied The network adjoining to the substation/s experiencing high voltage be also carefully studied and areas/substations /generating stations be identified where voltage control measures need to be taken in the following order of priority

a) The bus reactor be switched in with the system
b) The Generating units on bar at the stations in proximity to high voltage areas, absorb reactive power within the limits of their capability curves.
c) Check the possibility of changing the transformer Tap if one side of ICT is witnessing High voltage while other side is having low voltage.
d) Checking possibility of rerouting /change of power flow on transmission lines so that loading on parallel EHV network can be altered that may result in reduction in voltage.
e) SLDCs shall consider opening one circuit of lightly loaded multi circuit lines around the area /substation where high voltage is reported, ensuring security of the balance network. In case it becomes essential to switch out one of the circuits of inter-state lines to mitigate high voltage at one or more intra-regional sub-stations, due consent would be obtained from the ERLDC.

3.5.2 Low Voltage Condition

In the event of low voltage(e.g. 400 kV/ 220 kV voltage going below 390 kV/ 198 kV and have a declining trend), following specific steps would be taken by the respective grid substation/generating station at their own, with intimation to SLDC, unless specifically mentioned otherwise by SLDC. However, before taking any voltage control action, the reason for low voltage as observed /reported is to be carefully studied. The network adjoining the substation/s experiencing low voltage to be also carefully studied and areas/substations /generating stations to be identified where voltage control measures need to be taken in the following order of priority

a) Close the lines which were opened to control high voltage after obtaining due permission from ERLDC/SLDCs.
b) The bus reactor be switched out from the system
c) All generating units on bar shall generate reactive power up to the limits of their respective capability curves.
d) Check the possibility of changing the transformer Tap if one side of ICT is witnessing Low voltage while other side is having High voltage
e) Operate hydro generator for VAr generation i.e. at lagging p.f.

Chapter 4

4. Outage Planning

4.0. Introduction

In reference to the clause 5.8 of OGC, this chapter sets out the procedure for preparation of outage schedule for the elements of the state grid e.g. generating units and transmission elements of the State in a coordinated and optimal manner keeping in view the state system operating conditions and maintaining load generation balance in the system. Adequate security margins shall be ensured while preparation of the generation and transmission outage programme. SLDC shall be responsible for preparation of the annual outage plan in advance for the financial year and be reviewed on monthly basis.

4.1. Objective

4.1.1 To formulate a coordinated outage programme of transmission lines and generating units for the state grid considering all the available resources and taking into account transmission constraints as well as other requirements.

4.1.2 To minimise surplus or deficit, if any, in the requirement of power and energy and help to operate system within the grid standards.

4.1.3 To optimise the transmission outages of the elements of the state grid that should not affect adversely the state / regional grid operation but take into account the generation outage schedules, outage of Distribution licensees /STU systems thereby maintaining security standards.

4.2. Scope

The scope of this chapter is applicable to all users including SLDC, Distributon Licensees, SGS, IPPss, and CGPs [vide clause 5.8(3) of OGC]. For the purpose of a coordinated maintenance programme, outage programme for the generating stations at Machhakund HEP and its associated transmission system shall also be covered within the scope of outage planning procedure of OPTCL System.

4.3. Outage Planning Procedure:

4.3.1 For the purpose of Load Generation Balance (LGB)/ Outage planning process, PSOC (Power System Operation Coordination Sub Committee) of OPTCL shall, in general, be the forum for reviewing and deciding the outage planning.

4.3.2 It shall be the responsibility of the SLDC to analyse the outage - programmes proposed by all users and, prepare a draft annual outage schedule for finalization of the annual outage plan for the following financial year by 31st January of each year.

4.3.3 All Distribution Licensees / STU, SGS/IPPs and CGPs shall provide SLDC their proposed outage programmes in writing for the next financial year by 1st August of each year. These shall contain identification of each generating unit/ transmission line/ICT & Auto & Power Transformers, the preferred date for each outage and its duration and where there is flexibility, the earliest start date and latest finishing date.

4.3.4 Each load serving control area (constituents of ER) shall be responsible to match its demand with the anticipated availability from its own plant(s) and availability from ISGS / other purchase / sale contracts.

The SLDC/STUs along with the proposed outage programme, therefore, shall also furnish details of the anticipated load generation balance report (LGBR) to ERPC secretariat in order to facilitate preparation of the annual outage plan

4.3.5 ERPC Secretariat after receiving the outage programme will study the following :-

i) Total power and energy availability(for peak and off-peak condition)
ii) Monthwise availability and requirement
iii) In case of both surplus and deficit, proper staggering of generation outage to reduce/ eliminate the deficit.
iv) In case of only deficit efforts to be taken to even out high and low deficit by staggering of generation outage.
v) The anticipated programme for bilateral transaction under STOA or otherwise by state beneficiaries

4.3.6 SLDC shall then come out with a draft load generation balance report (LGBR) and draft outage programme for the next financial year before 30th November of each year for the state grid taking into account the available resources in an optimal manner and to maintain security standards. This will be done after carrying out necessary system studies and, if necessary, the outage programmes shall be rescheduled. Adequate balance between generation and load requirement shall be ensured while finalising outage programmes.

4.3.7 The draft outage plan along with the Load Generation Balance report (LGBR) shall be forwarded to ERLDC by 30th November for each financial year.

4.3.8 SLDC shall interact with all users as necessary to review and optimize the draft plan, agree to any change and prepare an acceptable coordinated generation and transmission outage plan before discussion in ERPC forum by 31st January each year for the next Financial Year.

4.3.9 ERPC shall prepare the draft outage plan by 31st December and final outage plan by 31st January in consultation with NLDC and RLDC and intimated to NLDC, Users, STUs, CTU, other generating stations connected to ISTS and the RLDC for implementation latest by 31st January of each year as mutually decided in ERPC forum.

4.3.10 SLDC shall release the final agreed transmission outage plan, which takes account of regional and user requirements, to all users by 1st March each year.

4.3.11 The above annual outage plan shall be reviewed by SLDC on quarterly and monthly basis in coordination with ERLDC and users who shall be any proposed changes. SLDC shall review the monthly outage plan generation schedule and other operational aspects related to system operation in the monthly Power System Operational Coordination Committee (PSOC) meeting convened by SLDC.

4.3.12 In case of emergency in the system, viz., loss of generation, break down of transmission

line affecting the system, grid disturbances; system isolation SLDC may conduct studies again before clearance of the planned outage.

4.3.13 SLDC is authorized to defer the planned outage in case of any of the following, taking in to account the statutory requirements;

- Major grid disturbance
- System isolation
- Partial Black out in the State
- Any other event in the system that may have an adverse impact on the system security by the proposed outage

4.4. Outage planning not covered under Annual Outage plan

4.4.1 Some of the outages not foreseen while finalising annual outage plan will be considered in monthly PSOC meeting of SLDC.

4.4.2 Indenting Agency: The agency which gives the requisition for outage of any transmission element shall be called Indenting Agency. Any of the following may request for outage of any transmission elements:

4.4.2.1 Transmission Licensees / State Transmission Utilities

4.4.2.2 Generating Companies

4.4.3 Indenting Agency shall submit the proposed shutdown for the next calendar month latest by 3rd day of the current month to the SLDC.

4.4.4 In case of shutdown of inter-regional lines and intra-regional lines affecting the transfer capability of any inter regional corridor, the Indenting agency shall submit the shutdown proposal to SLDC. SLDC shall forward the proposal in both the concerned RPCs. To facilitate this broad list of such lines is indicated at Annexure II which will be reviewed and updated by NLDC from time to time. SLDC may do an internal screening of its outage plan centrally to avoid multiple outages in the same corridor simultaneously. Bilateral discussion between the agencies involved may also be done to minimize outage duration before submitting the outage plan to RPCs

4.4.5 SLDC shall compile all the received proposals and put up the same on its website by 6th day of the month.

4.4.6 SLDC shall study the impact of these outages and based on its recommendations, SLDC shall discuss proposed outages in the PSOC meeting and prepare a list of approved transmission outages with the precautions to be taken.

4.4.7 While approving the shutdowns it shall be ensured that outages in the same corridor are not to be approved simultaneously. It also needs to be ensured that all other concerned users also complete their maintenance works requiring the same shutdown during the same period so that multiple shutdowns of any particular element for maintenance work by multiple users are avoided. Multiple outages of transmission element for the same work during the year may also be avoided.

4.4.8 SLDC shall send the list of approved transmission outages to the users within 3 days of the PSOC meeting. The same shall also be displayed on SLDC websites.

4.5. Procedure for Availing the Outage in Real Time

4.5.1 The users involved shall ensure availing of outages as per the approved schedule time.

4.5.2 Request for outages which are approved by PSOC must be sent by the owner of the transmission asset at least 3 days in advance to SLDC by 10:00 hours.

4.5.3 In case the owner is not availing the PSOC approved outage, the same shall be intimated to the SLDC at least 3 days in advance.

4.5.4 On the day of outage, the outage availing user shall seek the code for availing outage from SLDC/ERLDC (wherever applicable). The agencies involved shall endeavour to avail the outage within 15 mintues of availing the code but not later than 30 minutes. In case, due to any contingency, the outage could not be availed within 30 minutes, a fresh code needs to be obtained by all concerned agencies stating the reason there of.

4.5.5 The concern user shall intimate the actual time of availing the outage and restoration thereof with details of work done. A record of scheduled and actual time of outage and restoration shall be maintained at SLDC.

4.5.6 SLDC shall prepare a monthly statement of scheduled and actual time of outage and restoration and incorporate the same in the monthly performance report.

4.5.7 As any deviation in the outage from the schedule can affect other planned outages as well as affect reliability and electricity markets, indenting user must strictly adhere to the shutdown timings.

4.5.8 SLDC if required shall conduct further system studies based on the system condition and approve the shutdown at least two day in advance.

4.5.9 Notwithstanding provision in any approved outage plan, no cross boundary circuits or Generating unit of a generator shall be removed from service without specific release from SLDC. This restriction shall not be applicable to individual unit of a CGP.

4.5.10 While issuing clearance of the shutdown SLDC shall clearly mention the following(vide format at ***Annexure-VI***

1. Message no
2. Name of the element /elements which shall remain under outage.
3. Name of the agency /agencies availing the outage.
4. Date and duration of the outage
6. Nature of the outage
6. Reason for availing the shutdown
7. Specific network /system conditions to be maintained including impact of the outage
8. Sequence of switching instruction if any

Chapter-5

5. Switching Coordination

5.0. Introduction

Coordination of switching operations in the grid is important for ensuring safety of personnel and equipment as well as for ensuring adequacy and security of the grid. Before any operation of important elements of the State Grid is carried out by any User / Licensee, the Users, licensee

shall inform SLDC, in case the State grid may, or will experience an operational effect.

5.1. Switching of System Elements for the first time

In line with Regulation 6 (1) of the Central Electricity Authority (Grid Standards) regulations 2010, no entity shall introduce an element in the ISTS of Eastern Grid without the concurrence of ERLDC in the form of an operation code. In case a new power system element in Eastern Regional grid is likely to be connected with the Inter-State Transmission System or is to be energized for the first time, from the ISTS, the applicant User/STU/CTU/licensee shall send a separate request in advance along (at least one week) with the confirmation of the following:

- Acceptance of ERLDC with regards to registration as regional entity
- Signed Connection Agreement if applicable
- Availability of telemetry of station/Element at the ERLDC/SLDC
- Availability of voice communication with the station at ERLDC/SLDC
- Interface meter installed and tested by downloading data and forwarding it to ERLDC
- Single Line Diagram
- Healthiness of Protection System/Protection Setting
- Statutory clearance has already been obtained

5.2. Switching of Important Elements

In line with regulation 5.2(2) (a, b, c), of the OGC no part of the State grid shall be deliberately isolated from the rest of the State grid except under an emergency conditions in which such isolation would prevent a total grid collapse and would enable early restoration of power supply or safety of human life; when serious damage to a costly equipment is imminent and such isolation would prevent it; when such isolation is specifically instructed by ERLDC.

Important elements of the state grid, which have a bearing on the network security, is compiled and shall be issued by SLDC as a separate document [OGC 5.2 (3)]. In case opening/removal of any important element of the grid under an emergency situation, the same shall be communicated to SLDC at the earliest possible time after the event. The users, licensee shall obtain 'operation code' from SLDC before carrying out any switching operation on any of the important elements of the State grid. Shut down of any 220 kV or 400kV bus at substation needs approval of SLDC.

In respect of double main and transfer switching scheme at 400 kV substations, SLDC shall be informed whenever the 400 kV transfer bus at any substation is utilized for switching any line/ICT. In a 400 kV substation/power station switchyard having breaker and a half switching scheme, outage within the substation (say main or tie circuit breaker) not affecting power flow on any line/ICT can be availed by the user/licensee under intimation to SLDC, however switching code must be taken from SLDC control room for every such switching operation. Further, while availing such shutdowns or carrying out switching operations it must be ensured that at least two Dias are complete even after such outage from the view point of network reliability. Any outage not fulfilling the above conditions needs the approval of SLDC.

Whenever any protection system such as Bus Bar protection, LBB protection, Auto reclose etc. at generating station or grid substation is required to be taken out of service for any maintenance work, an operational code would be taken from SLDC/ERLDC. For switching of

any 200/400 kV element, element associated with inter-regional lines.

5.3. Other Precaution to be taken during Switching

In addition to the above, it is necessary that special attention be paid to maintaining the reliability of the system. The following areas need careful implementation by the concerned constituents / stations

i. In case of a two-bus system at any substation it must be ensured that the segregation of feeders on the different buses is uniform. This would help in minimizing the number of elements lost in case of a bus fault. This is assuming the availability of bus-bar protection at such substation(s).
ii. In 400 kV substations having a breaker and a half scheme, it must be ensured that the two buses at such substation remain connected at least by two parallel paths so that any line / bus fault does not result in inadvertent multiple outages. In case any element, say a line or an ICT or a bus reactor, is expected to remain out for a period say beyond two hours at such substation, the main & tie breakers of such elements should be closed after opening the line side isolator. This should be done after taking all suitable precautions to avert inadvertent tripping. This of course assumes that no maintenance is planned on such breakers / isolators.
iii. When the circuit breaker controlling the line is under lockout it is not advisable to interrupt the charging current through an isolator. The following practice is to be adopted in such cases:-
    a. De-energise the bus connecting the line with lockout CB and then open the isolator
    b. If due to some reason it is not possible to open the isolator in above mentioned way, it is to be opened in such a way that no charging current is interrupted through the isolator and the charging current is diverted to other parallel path. Such switching sequence could be possible in case of breaker and half scheme or Double breaker Scheme, which is as follows:
        (i) Open the line from remote end first with direct trip (DT) disabled. With this now line remains charged from the end where CB has problem.
        (ii) In case of breaker and half scheme open the isolator so that charging current is diverted to the parallel path and after that open the CB of parallel path.
        (iii) In case of double breaker scheme open the isolator of the lockout breaker diverting the charging current to other CB and then open the CB.
        (iv) In case of double main and transfer scheme open the isolator of lockout breaker so that divert the charging current through transfer bus coupler and then open the line through TBC circuit breaker.

    It is also recommended that while vacating a bus in such cases, the operators need to check the switching arrangement for individual feeders so as to avoid unintended loss of any feeder.
iv. The substation operators must ensure the above condition even when any lightly loaded

line is opened to control overvoltage. Such opening of lines is generally superimposed over other line outages on account of faults created by adverse weather conditions resulting in reduced security of the system.

v. Single pole auto-reclose facility on 400 kV / 220 kV lines should always be in service. ERLDC's approval would be required for taking this facility out of service. Likewise, in case any transfer breaker at any 400 kV substations having two main and transfer bus scheme is engaged, the same would be informed to ERLDC through SLDC.

vi. All precautions should be taken to avoid switching on to fault particularly in case of Interconnecting Transformers. In order to avoid fault current through costly equipment generally the line shall be charged from the far end, wherever possible.

vii. A transmission line shall preferably be charged from the grid substation. Dead line charging by a generator shall normally be avoided except during system restoration, black start, or in case where both ends of the transmission line are terminating at a generating station.

viii. During test charging of transmission line for the first time, all safety precautions shall be taken and the transmission utility owning/operating the line shall satisfy the substation utility at either ends with regards to statutory/safety clearances. During test charging if the line does not hold even after two attempts, thorough checking of protection settings and line patrolling shall be carried out.

ix. Operation code issued by SLDC/ERLDC for switching shall become invalid if the switching is not completed within half an hour of issue of code. In case the switching operation is not completed within half an hour of the issue of operation code from SLDC/ERLDC, and if there is a probability of further delay same code could be revalidated by SLDC/ERLDC within that half an hour. The utility obtaining at one end shall intimate the other end utility.

5.4. Charging of partly constructed EHV O/H line from one end as an anti-theft measure

A number of EHV AC and HVDC O/H lines that have been planned either as ISTS strengthening schemes or as ATS of identified generation projects are under various stages of construction / commissioning in different regions. Incidents of theft of conductor / tower members of these partly constructed new lines are observed to be on the rise. In view of this, CTU / ISTS licensees are compelled to keep the partly constructed line energised from one end, as an anti-theft measure. Requests for using existing 132kV / 220kV lines for the purpose of anti-theft charging are frequently received at ERLDC.

In this regard, the following guidelines may be followed by all ISTS licensees / CTU / STU:-

a) Efforts to be made to charge the line as far as possible from the nearest distribution line (11kV / 33kV), after obtaining due approval from the concerned SLDC / DISCOM

b) For this purpose, the CTU/ISTS Licensee to approach the concerned SLDC / STU at least 15 days in advance of the tentative date of anti-theft charging, with a detailed plan indicating length proposed to be charged, duration of such charging, height, spacing etc. of the individual phases / conductors, size of the conductor that would remain charged, connection arrangement with exiting distribution line etc.

accompanied by a clear diagram.

c) STU / SLDC after examining the proposal may accord approval, if feasible, with necessary modifications of protection scheme of their distribution system.

d) In the event it is not possible to identify suitable distribution line for the anti-theft charging or obtain approval of the concerned SLDC, the owner of the line under construction shall approach, ERPC appraising the difficulties in charging from distribution line, with a detailed proposal for anti-theft charging from the nearest 132kV line or 220kV line. In general, charging from a line of voltage higher than 132kV should be avoided to the extent possible. On receipt of such request, ERPC to constitute a committee comprising representatives from ERPC, NLDC, ERLDC, owner of the new line, STUs / SLDCs likely to be affected and CTU for a joint study on the effects of such interconnection on the integrated grid.

e) The said committee within 16 days shall recommend the modifications required / actions to be taken for ensuring compliance to CEA Technical Standards on Grid Connectivity, IEGC, Grid Standards and Safety Standards so far as protection, speech and data communication and safety of personnel are concerned, besides reliability of the grid as a whole. However, if the above conditions are not satisfied, the committee may even advise the transmission line owner not to attempt anti-theft charging of the partly constructed line.

On completion of the recommended modifications / precautionary actions, the line may be charged with due consent of the concerned RLDC.

Chapter-6

6. Periodic Reports and Event Information

6.0 Introduction

Timely and accurate reporting and exchange of information plays an important role in grid operation. This assumes more importance during an occurrence/ a disturbance or in crisis. Timely and accurate information flow under such conditions would help operators in making an informed decision and reduces uncertainty. This chapter describes the event information and reporting procedure in writing to SLDC in accordance with the provisions of clause 6.10 of OGC. This section in accordance with clause 5.6 (OGC) describes the different periodic reports to be prepared by RLDC to be sent to all entities of the region and ERPC Secretariat

6.1 Objective

The objective of this chapter is to define the incidents to be reported, the reporting route to be followed and information to be supplied to ensure a consistent approach to the reporting of incidents/events. The Objective of the periodic reports are to highlight performance of the Regional Grid, bring out the system constraints, reasons for not meeting the requirements, if any, of security standards and actions taken.

6.2 Periodic Reports

6.2.1 Weekly Report

As per clause 5.6(1) of OGC, SLDC shall be responsible for issuance of weekly report that shall cover the performance of the State Grid for the previous week. SLDC shall ensure that such weekly report be available at its website. The report shall be sent to all State entities and shall contain the following-

i. Frequency Profile
ii. Voltage profile for selected sub stations
iii. Major Generation and Transmission Outage
iv. Transmission Constraints
v. Instances of persistent/significance non compliance of IEGC
vi. Instances of congestion in transmission system.
vii. Instances of inordinate delays in restoration of transmission elements and Generating units

The format for weekly report is shown at ***Annexure - VII***

6.2.2 Quarterly Reports

The SLDC shall prepare a quarterly report and shall issue to all users, which shall bring out the system constraints, reasons for not meeting the requirements, if any, of security standards and quality of service, along with details of various actions taken by different Users, and the users responsible for causing the constraints.

6.2.3 Under frequency Relay (UFR) Operation Report

In accordance with clause 5.2(n) of IEGC, all distribution licensees / STUs shall provide automatic under-frequency and df/dt relays for load shedding in their respective systems, to arrest frequency decline that could result in a collapse/disintegration of the grid, as per the plan separately finalized by the concerned RPC and shall ensure its effective application to prevent cascade tripping of generating units in case of any contingency. They shall inform (through their respective SLDCs) any UFR operation that has taken place in their system and the areas affected with approximate quantum of load relief obtained. List of feeders in OPTCL system covered for Under Frequency tripping are enclosed as ***Annexure-VIII***

6.3. Reportable Events

6.3.1 Vide clause 5.10 of OGC any of the following events require reporting by SLDC / STU / Users

I) Violation of security standards
II) Grid indiscipline
III) Non compliance of SLDC's instructions
IV) System islanding / system split
V) State blackout / partial system blackout
VII) Protection failure on any element of STS and or any item on the agreed list of the intra-state systems
VIII) Power system instability

IX) Tripping of any element of the regional grid

6.3.2 Any tripping of an element of 132 kV and above of the State grid, whether manual or automatic, shall be intimated by the control centre of the STU to SLDC in a reasonable time say within 10 minutes of the incident. Along with the tripping intimation, the reasons for tripping (to the extent known) and the likely time of restoration shall also be intimated. Such information can be on telephone, fax or e-mail

6.3.3 Any operation planned to be carried by a state entity which may have an impact on the state grid or on any of the important element, shall be reported by the concerned Grid S/S to SLDC in advance

6.3.4 Any operation planned to be carried out on the instructions of SLDC which may have an impact on the system of a user shall be reported by SLDC to the concerned user in advance.

6.3.5 The intimation and the exact time of revival of any element under the category of important events shall be furnished to SLDC as early as possible.

6.4. Reporting system

The details of event reports and periodic reports to be prepared and issued by Users / SLDC are as follows:

6.4.1 In the event of tripping of any important elements, the preliminary event report with possible details shall be promptly reported orally by the users including grid S/S concern to SLDC.

6.4.2 If the reporting incident cannot be classed as minor then the reporting user shall submit an initial written report within two hours to SLDC followed up by the submission of a comprehensive report within 48 hours of submission of the initial written report.

6.4.3 SLDC shall submit a written report to ERLDC / OERC and all concerns, in case the incident occurs in EHV system /and (or) generating station.

6.5. Grid Incidence/Disturbances - Categorization

As per the severity of any events/incidences CEA has formulated the guidelines for categorization of Grid incidences and disturbances. Any event to be reported may therefore need to be categorized as detailed below

6.5.1 Grid Incident

A Grid incident is tripping of one or more power system elements of the Grid like a generator, Transmission line, Transformer, Shunt Reactor, Series capacitor, Static VAR Compensator (SVC) etc, with no loss of grid supply or integrity of the grid at 220 kV and above.

Categorisation of Grid incidents based in increasing order of severity

Category:1 Tripping of one or more power system elements of the grid like a generator , transmission line, transformer, shunt reactor, series capacitor, Static VAR Compensator(SVC) etc which requires rescheduling of generation or load without total loss of supply at a sub-station or loss of integrity of the grid at 220kV

Category:2 Tripping of one or more power system elements of the grid like a generator transmission line, transformer, shunt reactor, series capacitor, Static VAR Compensator(SVC) etc which requires rescheduling of generation or load without total loss of supply at a sub-station or loss of integrity of the grid at 400kV and above

6.5.2 Grid Disturbance

Grid disturbance is defined as tripping of one or more power system elements resulting in total failure of supply at a sub-station or loss of integrity of the grid, at the level of 132kV and above

Categorization of Grid Disturbance in increasing order of severity is described as under.

Category 1: When less than 10% of the antecedent generation or load in a State Grid is lost

Category 2: When 10% to less than 20% of the antecedent generation or load in a State Grid is lost.

Category 3: When 20% to less than 30% of the antecedent generation or load in a State Grid is lost

Category 4: When 30% to less than 40% of the antecedent generation or load in a Statel Grid is lost

Category 5: When 40% or more of the antecedent generation or load in a Regional Grid is lost.

SLDC shall maintain a log of such incidences/disturbances and whenever such incidences/disturbances occur shall report in writing in the format as ***Annexure-IX***

Note: Any forced outage of SGS unit would cause rescheduling of generation and corresponding revision of Discom utility drawal. Therefore, this should be treated as Grid incidence.

Chapter 7

7. Network Security and Congestion Management

7.0. Introduction

This chapter describes the actions required to be undertaken by grid S/S operators to maintain the security of the network at all times against any plausible contingencies /outages within the state network as well as from any contingencies arising out due to incidences occurring in the

rest of the ER / National grid that may have an adverse effect on state system.

7.1. Network Security

7.1.1. Background

The Indian power grid is one synchronous grid viz "NEWS" Grid comprising of Northern, Eastern, North Eastern, Western region and Southern Region grid. With formation of the NEWS Grid, there has been sea change in the operational philosophy in system operation that has already yielded various benefits like peak/off peak demand management through diversity of time, surplus/deficit management due to seasonal resource variations, demand forecast errors, weather variations besides increased economic transactions, improvement in overall system security due to increased stability margin and a higher stiffness to the tune of 4500-5000 MW/Hz. Eastern Region is strategically located with synchronized interconnections with all the other regions of the NEW Grid besides having synchronous integrated operation with Bhutan Power system. Eastern Grid is also connected to Southern Region through two no HVDC interconnections having a total capacity of 3500MW capacity. The large number of synchronous interconnections of Eastern Region with other regions/neighboring country like Bhutan and Nepal in radial mode however has also resulted in evolution of contingencies of critical nature under different despatch/demand scenarios.

As one of the constituent state in the Eastern region, Odisha plays a significant role because of the connectivity of the region with SR & WR through the state network. The operation of state grid has an impact on the regional grid operation.

In addition, system may operate at times beyond the assumptions of the planner in line with various transmission security standards and associated criteria mentioned in section 3.5 of OGC due to following reasons:

a) Planned maintenance programme of the generators and transmission lines. It is imperative to ensure that such maintenance programmes are properly coordinated and do not result in reduced redundancy not envisaged during planning.

b) The events beyond the control of operators such as extreme weather conditions affecting the reliability of transmission system, uneven demand growth or delay in commissioning of generators/transmission elements.

7.1.2. Measures to ensure Network Security and Reliability

In order to maintain the security of the State power system, it is important that the planned outages of generation and transmission system particularly in the corridors of important flow-gates are properly coordinated. A list of important elements [vide clause 5.2(3) of OGC] of the State grid which have a bearing on the network security are shown at ***Anneure-X.*** It is therefore necessary to carry out operational studies in order to assess the grid security and network stability while finalizing the annual outage plan of these important elements. The outage planning should be reviewed on monthly basis in the PSOC forum.

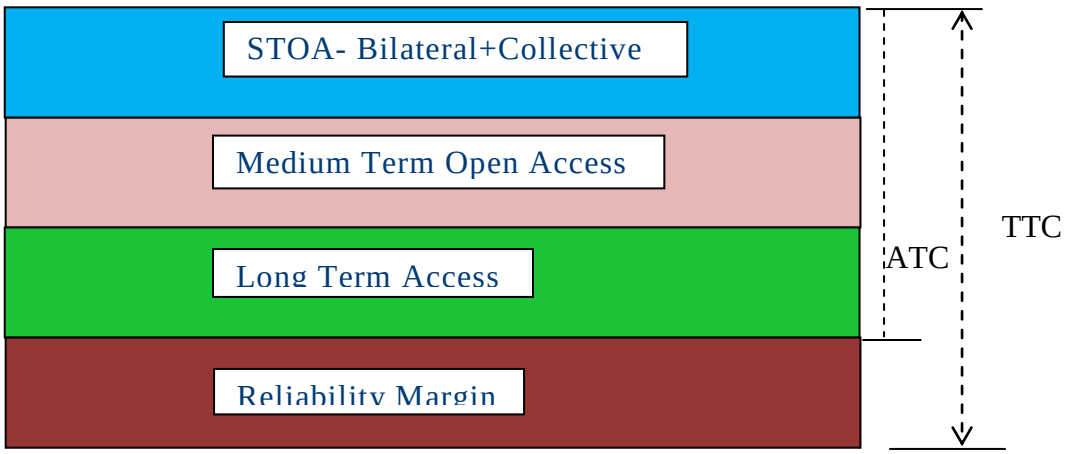
Additionally, opening of any important elements have to be carried out only after prior

Intimation to SLDC as enumerated in the 'Outage planning Procedure'. In the event of tripping of any of the important elements, SLDC need to be informed at the earliest time indicating the likely time of restoration. It is necessary that special attention is paid for maintaining the reliability of the system.

7.1.2.1. Assessment of Transfer Capability (Total Transfer Capability (TTC) and Available Transfer Capability (ATC))

While a Transmission system is built, inherent design margins are kept in order to take care of reliability and security issues, future generation growth, ROW issues, cost optimisation etc. The intra / interstate interconnections as have been planned and over the years had also taken care of such margins. However, since power flow takes place as per the laws of physics and with more and more AC interconnections between Areas/States the transfer between two or more states gets restricted because of factors like generation despatch conditions, loop flows between regions, upstream or downstream network limitations, voltage and angular differences between critical buses etc. Thus the Total transfer capability between areas is equal to or less than the aggregated design capacity of interconnection/s and therefore need to be assessed through power system studies well in advance considering the load / generation balance forecast to a fair degree of accuracy.

"Total Transfer Capability (TTC)" means the amount of electric power that can be transferred reliably over the inter-control area transmission system under a given set of operating conditions considering the effect of occurrence of the worst credible contingency.
"Transmission Reliability Margin (TRM)" means the amount of margin kept in the total transfer capability necessary to ensure that the interconnected transmission network is secure under a reasonable range of uncertainties in
"Available Transfer Capability (ATC)" means the transfer capability of the inter-control area transmission system available for scheduling commercial transactions (through long term access, medium term open access and short term open access) in a specific direction, taking into account the network security. Mathematically ATC is the Total Transfer Capability less Transmission Reliability Margin.



It is therefore imperative that the power exchanges of the state contained to a level of ATC and in no case exceed the TTC of the state. All the users of state network and / or neighbouring state(s) will adhere to their levels of net interchanges as advised by SLDC/ERLDC whenever such breach in TTC level among the states takes place to ensure the grid security irrespective of frequency and schedule.

Assessment of Total Transfer Capability (TTC), Transmission Reliability Margin (TRM) and Available Transfer Capability (ATC) for import and export of power by the state as required for reliable system operation and for facilitating non-discriminatory open access in transmission shall be carried out by SLDC in coordination with Eastern Regional Load Despatch Centre. The 'Detailed Procedure for Relieving Congestion in Real Time Operation' as approved by the CERC vide order dated 22.04.2013 may be referred for further details. The assessed TTC, TRM and ATC shall be posted on SLDC website.

The detailed procedure for assessment of TTC, monitoring and invoking congestion conditions in real-time, application of Congestion Charge and Congestion Charge accounting and settlement shall be as per the regulation / procedure issued / approved by CERC

7.1.2.2. Flow gates and Congestion Management

The state of Odisha being strategically located, it is connected to SR & WR and states like WB, DVC & Jharkhanda. In the state, most of the major hydro stations are located in the southern part, while all the thermal stations are located in the central and western part, which is the load center as well. During monsoon period there is a need to maximize hydro generation resulting large quantum of power flow from the southern part to the load center. In these periods some of the transmission lines are critically loaded. Similarly, during summer season the hydro potential in the state reduces considerably causing power flow from the central part to the southern part of the state.

The typical generation dispatch pattern during monsoon and summer, demand scenarios within the state as well as of the neighboring states results in congestion in some corridors of the State Network. These congestions are well identified. The anticipated power flow pattern along these flow gates has a direct impact on the Total Transfer Capability in different seasons. While carrying out the system studies for arriving at the TTC and ATC figures anticipated flow pattern along these flow gates need to be checked under and in real time require to be monitored for a secured operation. The various flow gates and their characteristics and actions required to be taken by the system operators during congestions in these flow gates are described below:

7.1.2.3 Critical Flow gates

The following transmission elements of OPTCL system are prone to became congested at different power generation scenarios and considered as critical, which need to be monitored.

i. 220 kV Budhipadar-Tarkera D/C:
ii. 220 kV Meramundali-Bhanjanagar DC
iii. 220 kV Mendhasal- Bhanjanagar DC

II. 400/220 kV ICT at Mendhasal
III. 220 kV Mendhasal-Narendrapur SC.
IV. 220 kV Jayanagar-Jeypore (PG) DC

7.1.2.4. Message for controlling congestion

In case of violation of TTC/Flow Gate limit/ overloading of any line / ICT a message is to be issued to the grid S/S operator of the concerned grid / User responsible for immediate remedial action.

7.1.2.5. Monitoring of Congestion

Real time data for monitoring Congestion shall be displayed on the SLDC website in the formats as enclosed in.

7.1.2.6. Generation Rescheduling

SLDC may revise the interchange schedule of SGS and Users as allowed by OGC regulation 6.4(9). Further details may be seen in the chapter on scheduling.

7.1.2.7. Curtailment of Scheduled Transactions

The Intra state open access transactions already scheduled may be curtailed by SLDC in the event of transmission constraints; congestion in the grid, or in the interest of grid security. In line with regulations 6.4(9), of OGC the transactions shall generally be curtailed in the following sequence for deviation from schedule

a. Short term bilateral transactions
b. Long-term transactions

Amongst the customers of a particular category, curtailment shall be carried out on pro rata basis. SLDC would curtail a transaction at the periphery of state entities.

7.1.2.8. Procedure for Relieving Congestion

Congestion Management shall be as per the detailed procedure for relieving congestion in real time operations approved by CERC vide its order dated 22.04.2013. It is important to note that the congestion charge could be applied both upstream and downstream of the congested corridor irrespective of the frequency. Whenever actual flow on inter/ intra regional link/ corridor exceeds Available Transfer Capability and security criteria are violated for continuously two time blocks, the National Load Despatch Centre may issue a warning notice. In case SLDC observes congestion within the Intra State grid it shall take appropriate action and inform the respective RLDC which in turn shall inform the NLDC. The notice for congestion shall be communicated to all the Regional entities telephonically or through fax/voice message/ e-mail and through postings on website and making the same available on the common screen at NLDC/ RLDCs/ SLDCs. The various formats may be referred in the detailed procedure for relieving congestion in real time operation under regulation 4 (2) of the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009.

Accordingly SLDC shall take all measures to avoid congestion charges payable by the state.

7.1.2.9. Defense Mechanism

Despite utmost caution exercised during operational planning and implementing all the above steps to improve the network security and reliability, the possibility of a contingent situation cannot be totally ruled out. It calls for suitable defence mechanism to be available in the system to take care of such contingencies. Following are the minimum schemes which should be operational in Eastern Region to ensure safe and secure grid operation.

i) Automatic Under Frequency Load Shedding Scheme.

In line with clause 5.2(n) of IEGC, all regional entities shall provide Automatic Under Frequency Load Shedding in their respective system to arrest frequency decline that could result in a collapse / disintegration of the grid as per the scheme formulated by ERPC forum and shall ensure its effective application and functionality at all times to prevent cascade tripping of generating units in case of any contingency. As per the above provision, UF Relays have been installed in various Grid S/Ss of the state network.

ii) Islanding Scheme

To avoid total black out of the grid during system disturbances and for early normalisation, islanding scheme for islanding of systems and major generating stations with associated loads need to be developed. At present islanding scheme for Ib TPS unit has been developed.

7.1.2.10. Switching Diagram

The switching diagrams of all generating stations (100 MW and above), 400kV, important 220kV and 132kV substations especially those involved in the evacuation of generation shall be made available to SLDC system operator at SCADA Desk. The selection of such diagrams is described at Chapter 8. The same shall be updated from time to time.

7.1.2.11. Operational Areas of Importance

The following areas needs careful implementation by the concerned constituents / stations:-

i. In case of a 2 main & transfer bus system at any sub-station, it must be ensured that the segregation of feeders on the different buses is uniform. It would help in minimizing the effect on the system in case of a bus fault.
ii. In 400kV substations having one and half breaker scheme, it must be ensured that each feeder remains connected to both the buses so that any bus fault does not result in inadvertent outage of feeders. In case any element, say a line or an ICT or a bus reactor, is expected to remain out for a prolonged period at such substation, the main and tie breakers of such elements should be closed after opening the line side isolator. This should be done after taking all suitable precautions to avert inadvertent tripping.
iii. The substation operators must ensure the above condition even when any lightly loaded line is opened to control over voltage. Such opening of lines is generally superimposed over other line outages on account of faults created by adverse weather conditions resulting in reduced security of the system.
iv. Single pole auto reclose facility on 400kV lines should always be in service. Approval of SLDC/ERLDC would be required for taking this facility out of service. Likewise, in case any transfer breaker at any 400kV substations having two main and transfer bus scheme is engaged, the same would be informed to ERLDC through SLDC.

v. In order to damp out the low frequency oscillations in the system, the power system stabilizers on the generating units would be tuned as per the programme drawn at ERPC forum in consultation with the constituents.

vi. All users would endeavor to operate the connected generation and reactive power management devices such as Capacitors, Reactors, Synchronous Condensers, Fixed Series Capacitors (FSCs), Static Var Compensators (SVCs) etc in a manner which enables stable voltage behavior at various points of the grid under different operating conditions.

vii. All regional entities would also maintain in good operating conditions of all control measures such as defense mechanism, SPS, U/F & U/V load shedding, AVRs, PSS, FGMO, Operating reserves, emergency back-up power supplies etc., and ensure that the operational security standards are maintained for reliable and secured operation of the interconnected system.

viii. In line with sections 5.2(5) of the OGC, the generating units should ensure free governor operation.

7.1.2.12. Recording Instruments, Voice and Communication Facilities

i) The recording instruments such data acquisition system, disturbance recorder event logger, fault locator, time synchronization equipment voice recorder and any other such equipment in each generating station / sub-station / control centre / SLDCs shall be kept in good working condition in order to record the events and sequence. All such places shall have a common time reference whose authenticity shall be ensured by periodic verification and validation procedure to be developed and monitored by SLDC.

ii) Each user shall provide adequate and reliable communication facility internally and with SLDC/ ERLDC to ensure exchange of data / information necessary to maintain reliability and security of the grid. All the agencies shall provide systems to telemeter power system parameters such as power flow, voltage and status of switches/transformer taps etc., in line with interface requirements and other guidelines made available to RLDC / SLDCs at least before the date of commercial operation of the generating stations or substation/line being connected to the STS.

iii) In line with Central Electricity Authority (Technical Standards for Connectivity to Grid) Regulations 2007, the requester and user shall provide necessary facilities for voice and data communication and transfer of online operational data such as voltage, frequency, line flows and status of breaker and isolator position and other parameters as prescribed by the appropriate Load Despatch Centre and agree to maintain the communication system in good condition.

iv) In line with Central Electricity Authority (Technical Standards for Connectivity to Grid) Regulations 2007, every generating station and substation connected to the grid at 220kV or above shall be provided with disturbance recording (DR) and event logging facilities. All such equipment shall be provided with time synchronization facility for common time reference.

v) For a high degree of service reliability under normal and emergency operation, at least one main telecommunication channel with an alternate backup channel shall be provided

7.1.2.13. Monitoring of System States (Grid Health)

As a corollary to the provisions laid down in the OGC chapter on Operating Code for State Grid, SLDC has the responsibility of monitoring the state of the State grid at all times. The state of the grid has been classified as either NORMAL or ALERT or EMERGENCY, depending on whether certain security criteria are violated or not, as stated below. The display system in control room has been accordingly modified to alert the operator, in case the state of the grid passes to either to ALERT mode or EMERGENCY mode. The Boolean conditions for various modes are as follows:

NORMAL mode - (50.05 Hz >Grid frequency > 49.9 Hz) AND (No Flow gate limit, as specified by operator violated)

ALERT mode - Actual flow through Flowgate-1 > Limit specified by operator
OR Actual flow through Flowgate-2 > Limit specified by operator
OR Grid Frequency < 49.9 Hz & > 49.7 Hz
OR Grid Frequency > 50.2 Hz

EMERGENCY mode - (Resultant output of ALERT mode) AND (Grid Frequency < 49.7 Hz)

7.2. Periodic auditing of protection system

With a view to ensuring security of the integrated grid at all times, the Task Force on "Power System Analysis Under Contingencies" in its report recommended periodic auditing of the protection system of every region.

Accordingly, auditing of all sub-stations / power stations of ER grid is to be carried out every year. For this purpose, one or two teams comprising representatives from ERPC Secretariat, POWERGRID, ERLDC and an STU (other than the one being audited) would be constituted by PCC and the team would visit the substations to be audited as per a schedule chalked out by PCC.

All substations / power stations of the region that are of 220kV and above would be covered within the scope of the audit.

For the purpose of audit, the team would follow a checklist which has been finalised in ERPC forum. The same is given in Annexure. The checklist by and large encompasses all the points as mentioned in the report of the Task Force on "Power System Analysis Under Contingencies".
On completion of audit, the teams would submit their observations and recommendations on the corrective actions to be taken, if any, by the concerned STU/ GENCO or CTU. If there is any scope for improving the existing protection infrastructure, the audit team may also recommend the same. Action plan for implementing the recommendations of the protection audit would be prepared in RPC forum and the same would be regularly monitored/ reviewed in monthly PCC meetings.

Chapter 8

8. Scheduling and Despatch Procedure

8.0. Introduction

The broad principles and guide lines to be followed for scheduling and despatch of power in the State Transmission System (STS) and the demarcation of responsibilities for this purpose are in accordance with of OGC.

8.1 Scope

This procedure will be applicable to SLDC, all the Thermal and Hydro Stations of the State (SGS) including TTPS (NTPC) whose generation is dedicated for the State and Captive Generating Stations of the State, intended to sale their surplus power to the State on execution of agreement with Gridco, the State designated utility for purchase and sale power on behalf of the State.

8.2 Objective

Procedure to be adopted for scheduling of State Generating Stations (SGS) including ISGS so far as injection to grid and net drawals of concerned Users on a daily basis with the modality of the flow of information between the SGS / SLDC/ Beneficiaries of the State Grid (Discoms). The procedure for submission of capability declaration by each SGS and submission of Drawal schedule by each Beneficiary is intended to enable SLDC to prepare the Despatch Schedule for each SGS and drawal Schedule for each Beneficiary. It also provides a methodology of issuing real time despatch / drawal instructions and rescheduling, if required, to SGS and Benificiaries along with the commercial arrangement for the deviations from schedules, as well as, mechanism for reactive power pricing.

8.3 Demarcation of Responsibility

The Regional Grid shall be operated as loose power pools (with decentralized scheduling and despatch), in which the States shall have full operational autonomy, and SLDC shall have the total responsibility for

(i) scheduling/despatching their own generation (including generation of their embedded licensees),
(ii) regulating the demand of their customers,
(iii) scheduling their drawal from the ISGS (within their share in respective plants expected capability),
(iv) arranging any bilateral interchanges and
(v) regulating their net drawal from the regional grid.

The system of each State shall be treated and operated as a notional control area. The algebraic summation of scheduled drawal from ISGS / SGS /CGP and any bilateral interchange shall provide the drawal schedule of each State, and this shall be determined in advance on daily basis. While the States would generally be expected to regulate their generation and/or consumers' load so as to maintain their actual drawal from the regional grid close to the above schedule, a tight control is not mandated. The States may, at their discretion, deviate from the

drawal schedule, as long as such deviations do not cause system parameters to deteriorate beyond permissible limits and/or do not lead to unacceptable line loading.

However, the SLDC may direct the Distribution licensees / Bulk consumers /CGPs to increase / decrease their drawal/generation in case of contingencies. Such directions shall immediately be acted upon.

8.4. Description of the procedure

On introduction of Intra- State ABT Regulations by the Hon'ble OERC, the scheduling and despatch mechanism has been further extended to the SGS including the CGPs and the Beneficiary Discoms of the State. The Discoms of the State shall schedule their drawal from the ISGS, SGS including CGPs within their share in the respective plants expected capability. In absence of share allocation to the Discoms from individual generation sources by the GoO, the quantum of energy approved in the ARR for the FY shall be treated as their respective shares considering the sum total allocation as 100 %.

The scheduling and despatch mechanism has further evolved the framework for developing other power markets such as Short term open access transactions and collective transactions that can fit in with the scheduling and dispatch procedure. The procedures as issued by the CTU and STU for inter-state and intra-state open access respectively may be referred separately as a part of this procedure. In order to understand the procedure and bring in more clarity the scheduling and despatch procedure has been prepared in the form of flow chart as described below.

(a) Day ahead scheduling
(b) Revision of schedules
(c) Implementation of Final schedules

8.5. Day ahead scheduling

8.5.1 Schedule of Entitlement for Discoms

The SGSs shall provide their expected generation capability to SLDC for the following day in 16 minute block periods by 10:00 hrs.

All CGPs shall provide their respected injection schedule to SLDC for the following day in 16 minute block period by 10:00 hrs.

SLDC shall obtain from ERLDC the States' entitlement schedule from ISGS for the following day in 16 minute block periods by 11:00 hrs.

The algebraic sum of all the above will be the generation availability for the following day.

SLDC shall prepare the entitlement schedule for the Beneficiary Discoms apportioning the generation availability in accordance to their percentage share in the approved ARR for the current FY considering the total allocation as 100 %.

While preparing the entitlement schedule for Discoms, the long term bilateral interchanges,

approved short term open access transactions and request for day ahead open access transactions of their embedded consumers shall be taken in to consideration and incorporated to the entitlement schedule of the respective Discoms.

While SLDC would generally be expected to regulate the entitlement schedule of discoms so as to maintain the daily energy entitlement, limiting to the quantum of energy allocated in the ARR (apportioned for a day), a tight control is not mandated since, the allocation is on yearly basis. However the cumulate drawal of each discom shall be periodically monitored by SLDC.

SLDC shall provide the day ahead entitlement schedule to all discoms (R-0) in Format-B by 11:30 hrs.

8.5.2 Schedule of Requisition by Discoms

The Discoms shall prepare their respective requisition of drawal schedule for the following day basing the following guide lines.

a) The block/hourly requisition quantum should be limited to the entitlement quantum for the respective block / hour
b) The block/hourly requisition schedule should match with estimated day ahead drawal schedule at their interconnection points
(b) While preparing the requisition schedule, the approved energy as per ARR apportioned for a day shall be taken into consideration. There should not be a wide deviation between these two, unless otherwise there is a specific reason for deviation. However, the reasons may be specified in the format.

The Discoms shall forward the day ahead Requisition of drawal schedule to SLDC by 12:00 hrs in Format- C. In absence of the requisition schedule within the schedule time the entitlement schedule shall be deemed to be the requisition schedule for the Discoms.

8.5.3 Schedule of drawal for Discoms

SLDC shall prepare the day ahead Schedule of drawal by Discoms considering the followings

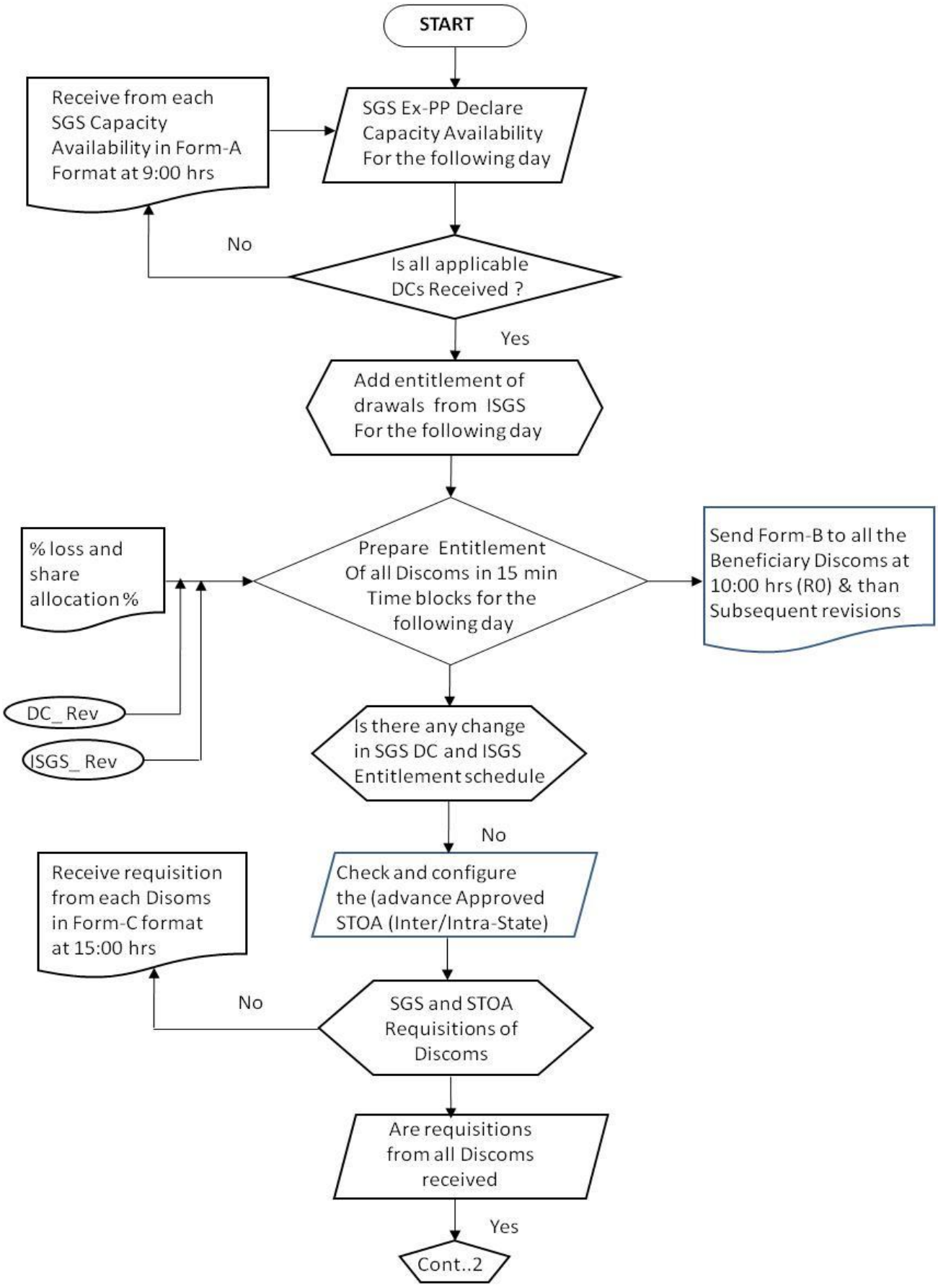
(a) The block/hourly requisition schedule furnished by the Discoms for the following day.
(b) The block/hourly implemented drawal schedule from ISGS for the following day from ERLDC.
(c) The approved short term open access transactions, if any.
(d) The request for day ahead open access transactions, if any.

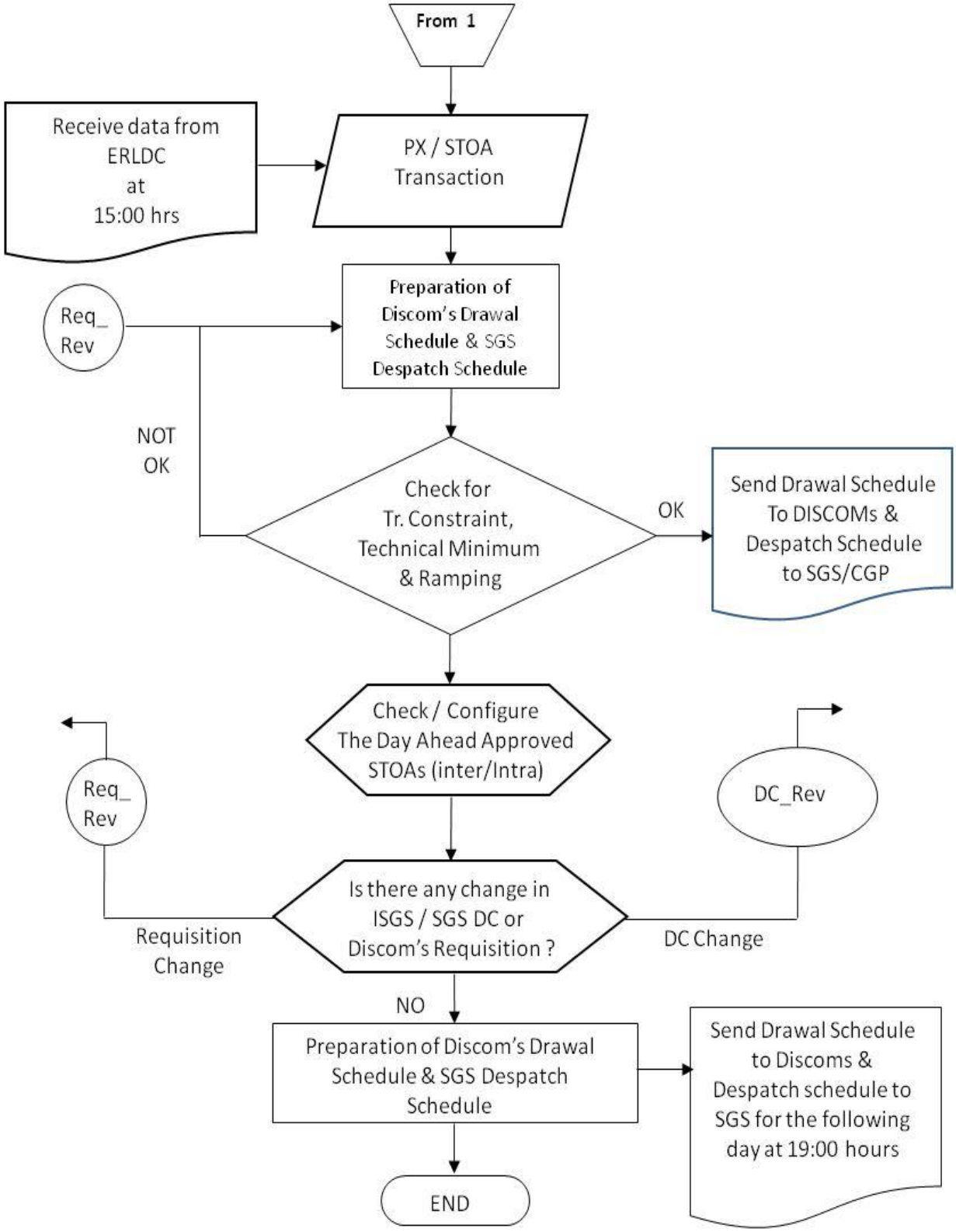
SLDC shall forward the implemented day ahead drawal schedule for the Discoms by 17:00 hrs (R-0)

SLDC shall forward the subsequent revision of drawal schedule on real time basis, if required. In absence of the revised schedule, the implemented drawal schedule shall be deemed as the implemented final drawal schedule for Discoms.

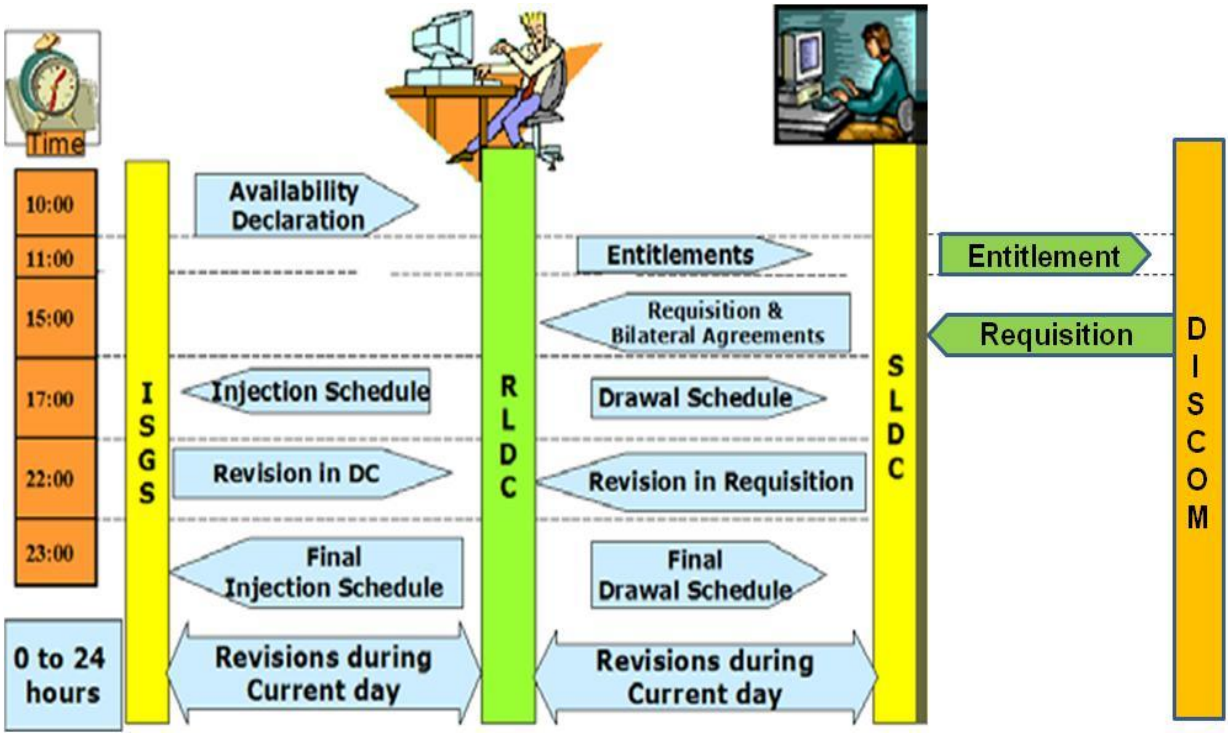
The Flow chart and Formats are enclosed.

Name of the Activity : SCHEDULING FOR DAY AHEAD

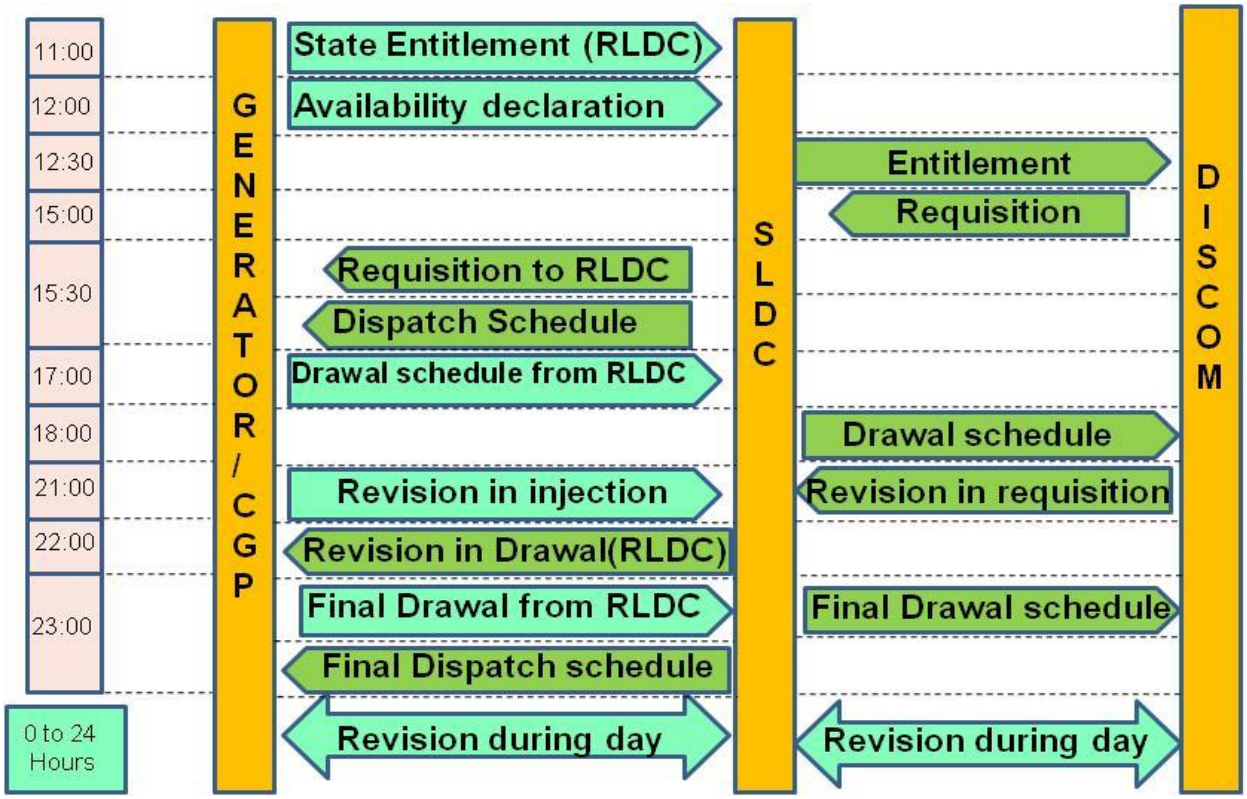



From 1
Receive data from ERLDC at 15:00 hrs
PX / STOA Transaction
Req_ Rev
Preparation of Discom's Drawal Schedule & SGS Despatch Schedule
NOT OK
Check for Tr. Constraint, Technical Minimum & Ramping
OK
Send Drawal Schedule To DISCOMs & Despatch Schedule to SGS/CGP
Check / Configure The Day Ahead Approved STOAs (inter/Intra)
Req_ Rev
DC_Rev
Is there any change in ISGS / SGS DC or Discom's Requisition ?
Requisition Change
DC Change
NO
Preparation of Discom's Drawal Schedule & SGS Despatch Schedule
Send Drawal Schedule to Discoms & Despatch schedule to SGS for the following day at 19:00 hours
END

DAY A HEAD ENTITLEMENT



ISGS DRAWAL & DISCOM DRAWAL SCHEDULE



Chapter 9

9. SCADA System Operation

9.0. SCADA / EMS System Operation

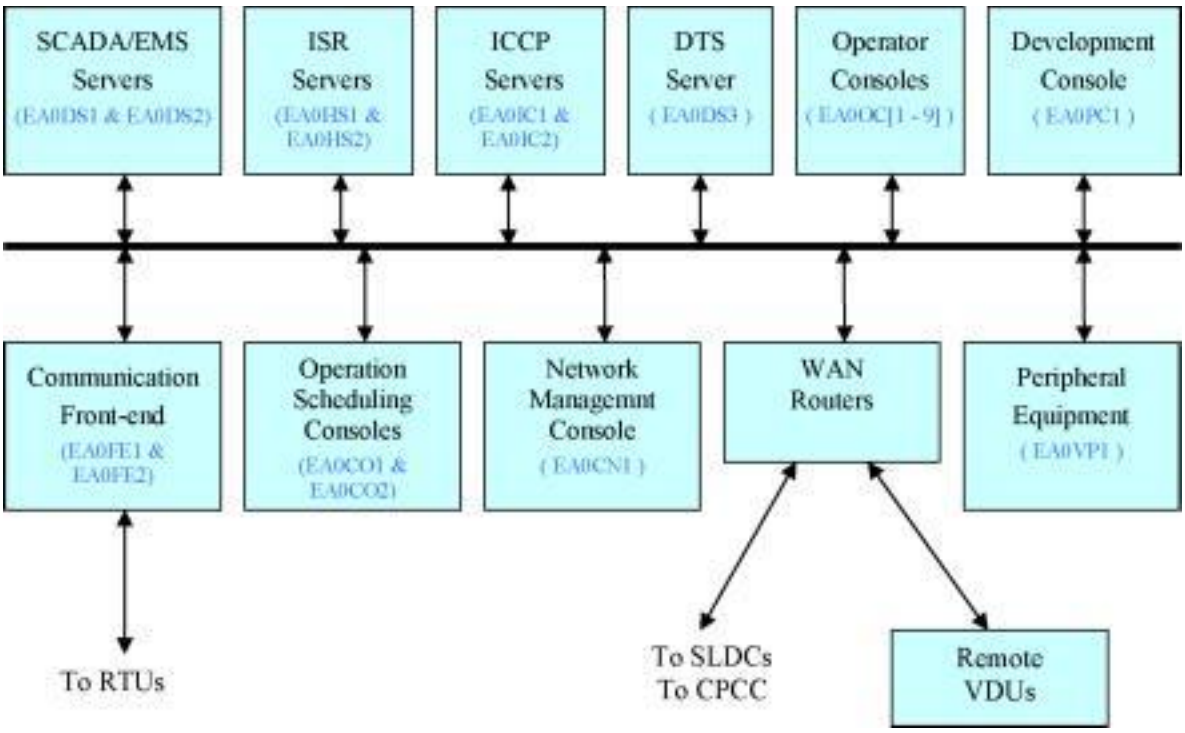
This manual prepared for the use of them who intend to operate the SCADA / EMS system installed at SLDC / ERLDC to help them with real time information pertaining to ER power system grid and to facilitate system study with information available from the real time system.

9.1. System Configuration

This section gives only a brief description of the hardware. The intent is to have an idea about the type of hardware components available not the quantity and the detailed technical specifications.

The RSCC system hardware architecture is represented below:

RSCC Hardware Architecture



The equipment Ids are marked as blue in the above mentioned diagram. The details of networking equipments and printers / loggers are not included.

9.2. Starting up an operator console

Before starting a operator console check the availability of power to the monitor and the server machine. On switching on the power supply, the machine will start up and the login prompt shall be displayed for operator log in.

Username for operator console:

supervis Password: supervis

The following display shall be available to the user for interacting with the SCADA/EMS system

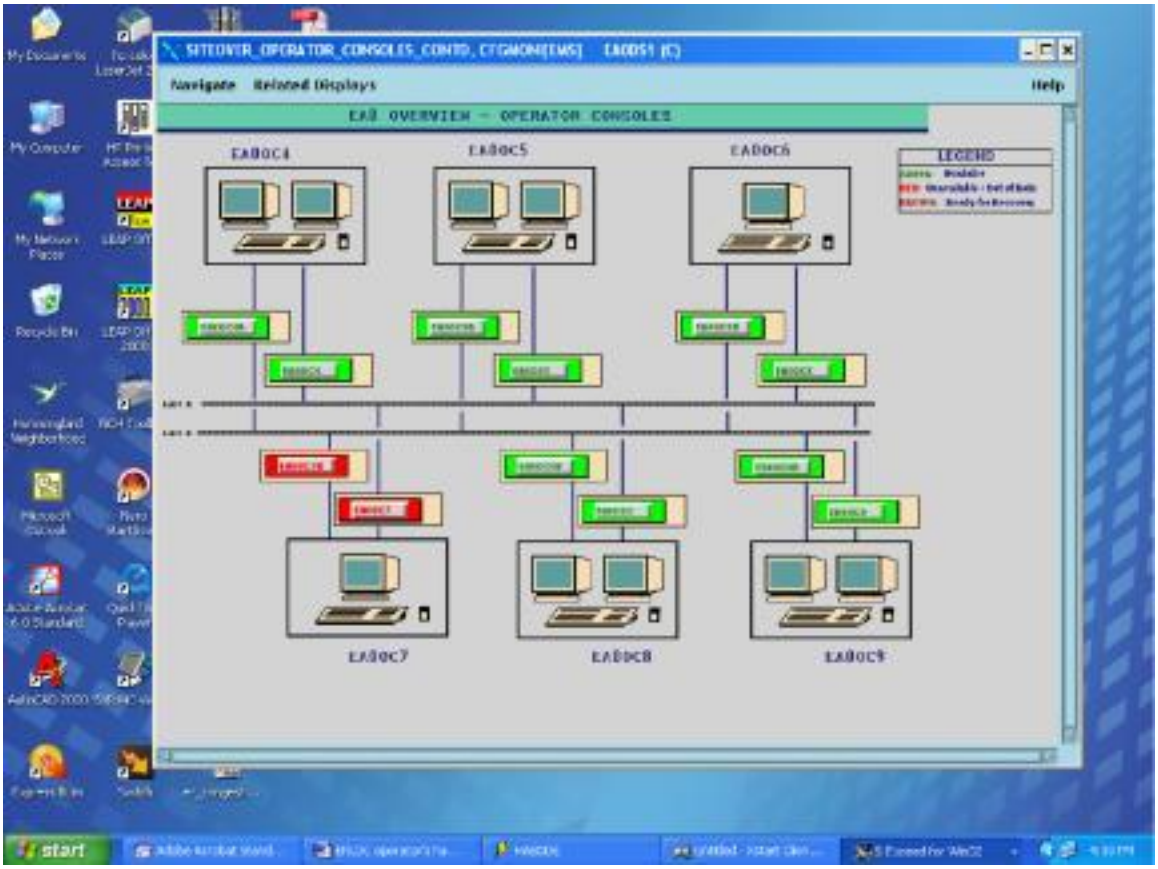
9.3. Identifying the failed node

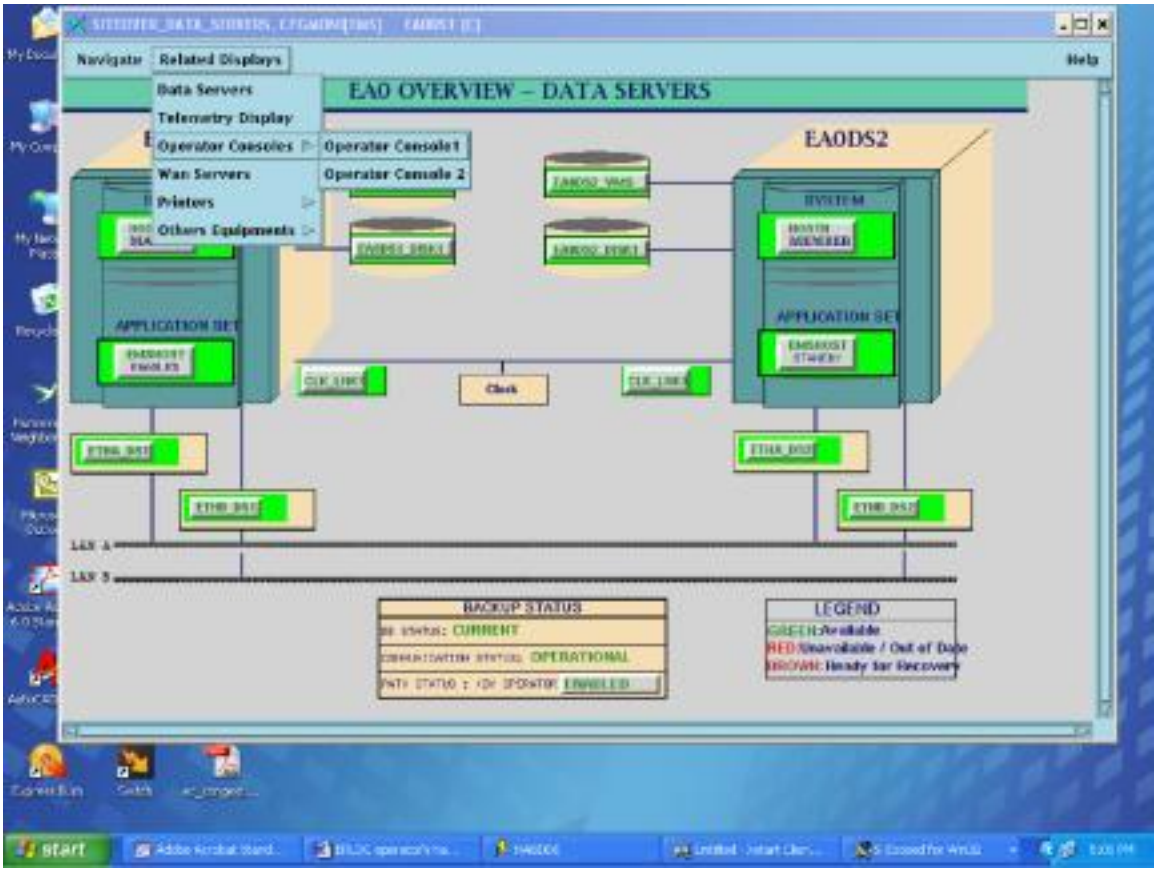
The status of the equipment connected in the network is available on the following display. The colour of a healthy node is green. The colour code used for the display is given below:

Green : Available
Red : unavailable / out of date
Brown : Ready for recovery
There are ten different displays are available for showing the status of all the nodes available on the SCADA LAN. To call the displays from EMS panel, follow the following navigation path :

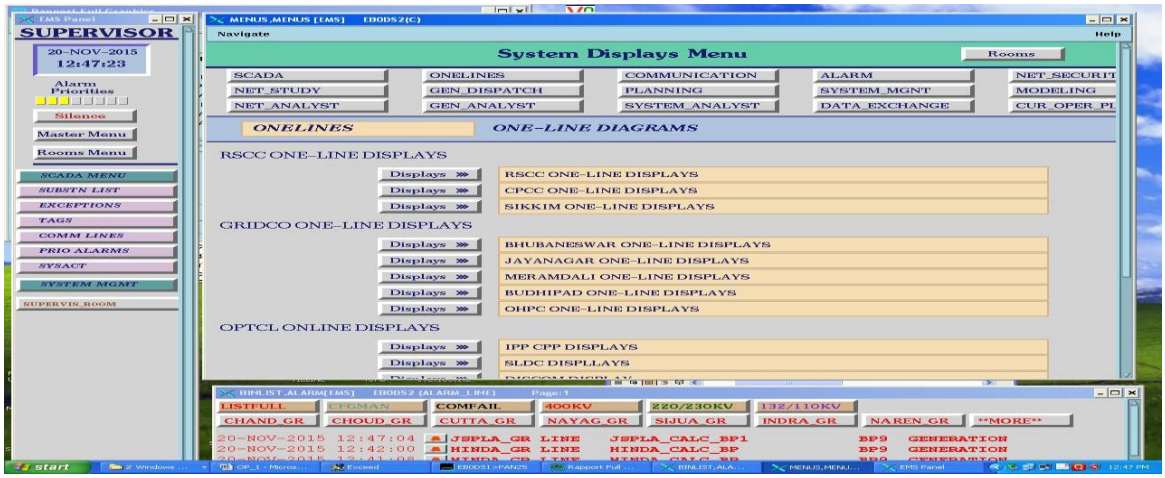
Click on "SYSTEM MGMT "button to call up "System Management Display"
Click on "Displays" button against "COMPUTER STATE AND CONTROL"
Click on "SITE OVERVIEW: DATA SERVERS" BUTTON

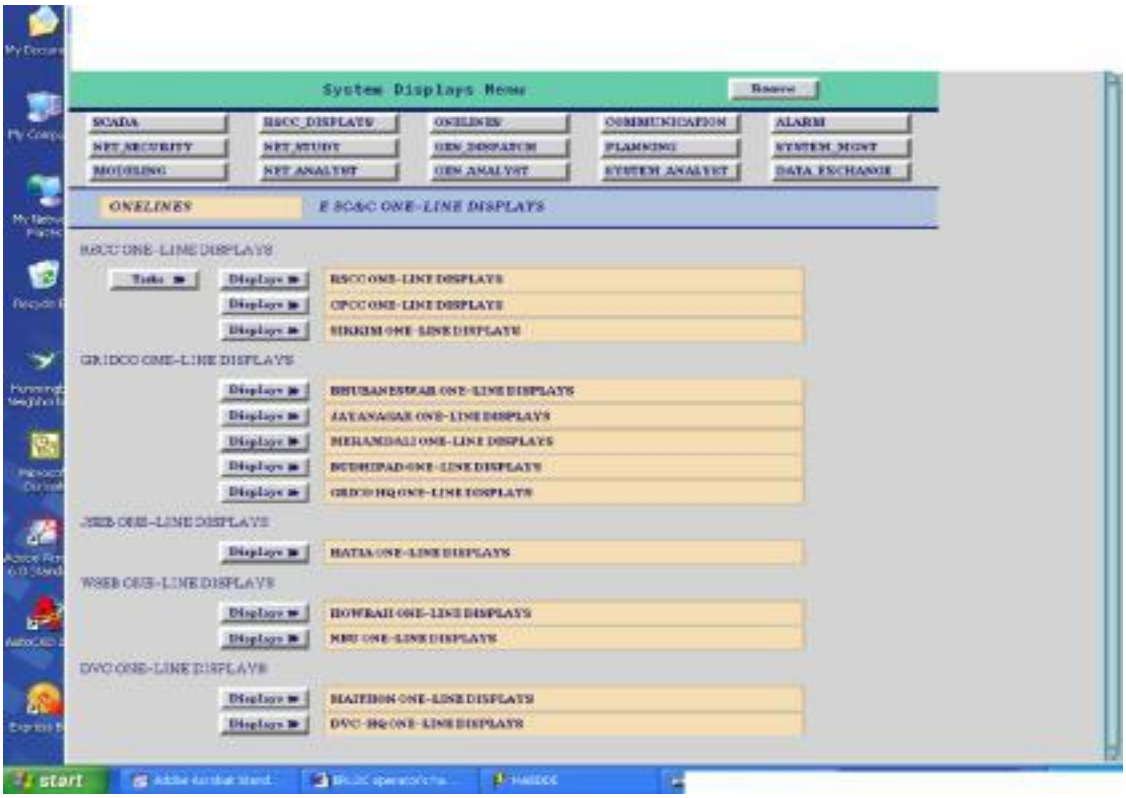
The status of Data Server nodes shall be available





For other displays : from related display pull down menu call up the displays.





9.4. Calling up a substation displays

Individual substation displays are available for all the stations for which telemetry is available. The displays are arranged control center-wise which may be called up using pull down menu as follows:

Navigate => Master Menu: to call up system displays menu

Click on "ONLINE" button to call up E SC&C ONE-LINE displays

The corresponding displays are available on the respective “Displays” button.

9.5. Bringing-up Video Projection Display (VPS)

The VPS is driven by a P-III window based machine connected to on-line network. This is machine is communicating to the data servers through "Exceed" software. A station for VPS has been configured on both the data servers which is called through a "PC-Rapport" program.

A desktop icon “PCRAPPORT.BAT” is available on the desktop of the VPS machine. On double clicking on this icon, VPS station will be started with the pre-defined room. Subsequently, the required rooms may be called from the PC-Rapport menu.

It may be mentioned here that the trending displays cannot be saved as a room and the trend displays are to be called up separately through separate desktop icon "trend_ea0ds2"

9.6. Configuring data Trends

Any analog value (telemetered or calculated) can be plotted against time in real time to see the trend of the selected value. To call up a trend display go to session manager

Go to pull down menu ER SC&C tab and select Start program. The trend display shall be started with the default trend.

To add particular point on the trend display, first select the point and then click on the value. A pop- window shall be available. Select trend & display and then done button. The point shall be added to the trend. Then to configure the trend navigate

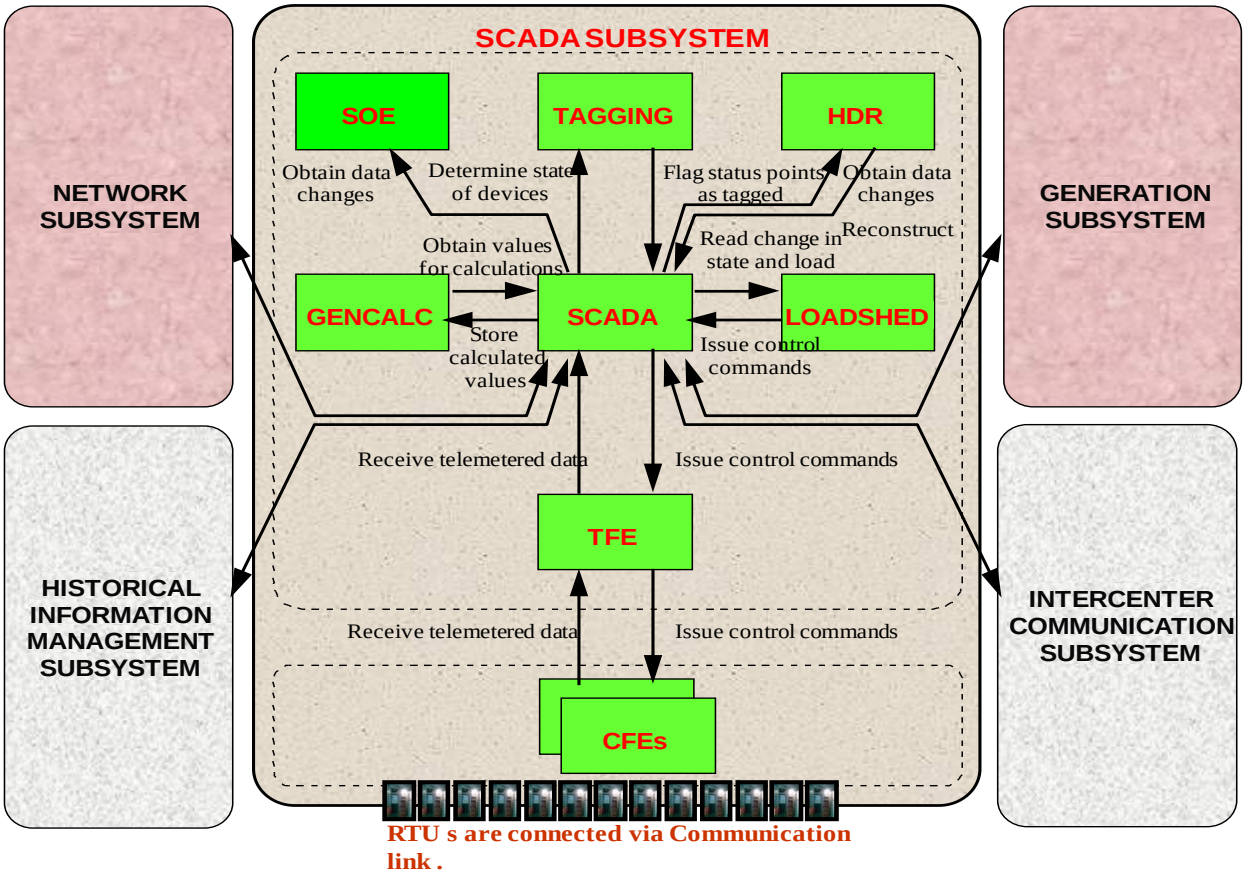
Master menu => SCADA =>Trend => Point Assignment

Then in the point assignment window, Select Track / Add New Track and assign point from available point list.
The scale, zoom, history can be configured from the PM pull down menu.

NOTE : In case the value is available in the available point list, the same point should not be added additionally to save buffer space.

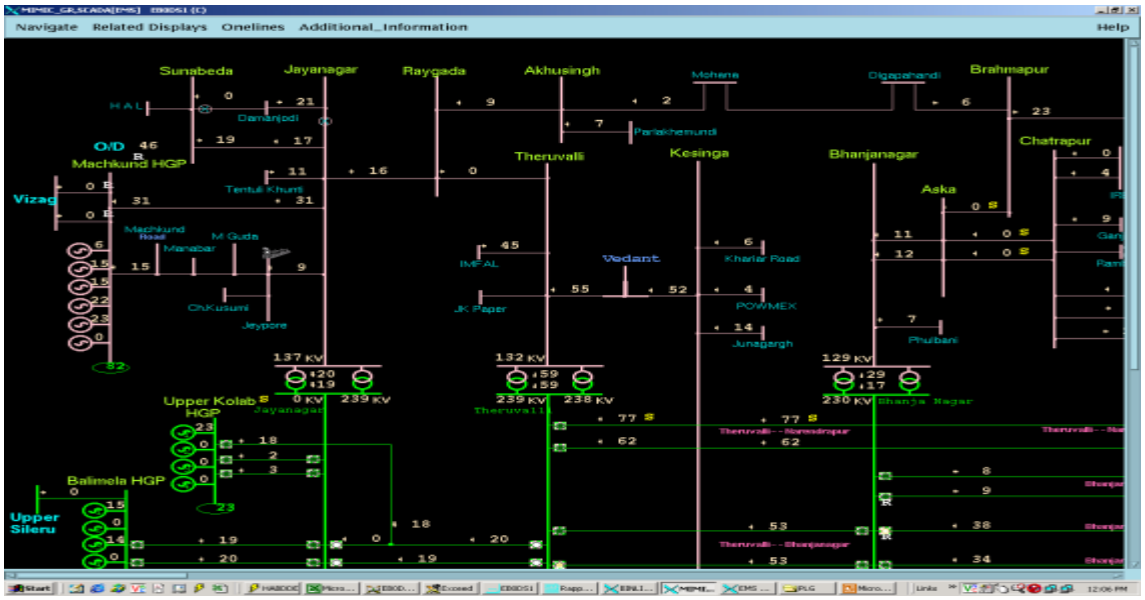
Data Processing in SCADA System

SCADA Function & Application



SCADA Functions :

- Information display
- Supervisory control
- Alarm processing & Tagging
- Information storage and reports
- SOE acquisition
- Data calculation (Derivative Data)
- Special RTU processing control

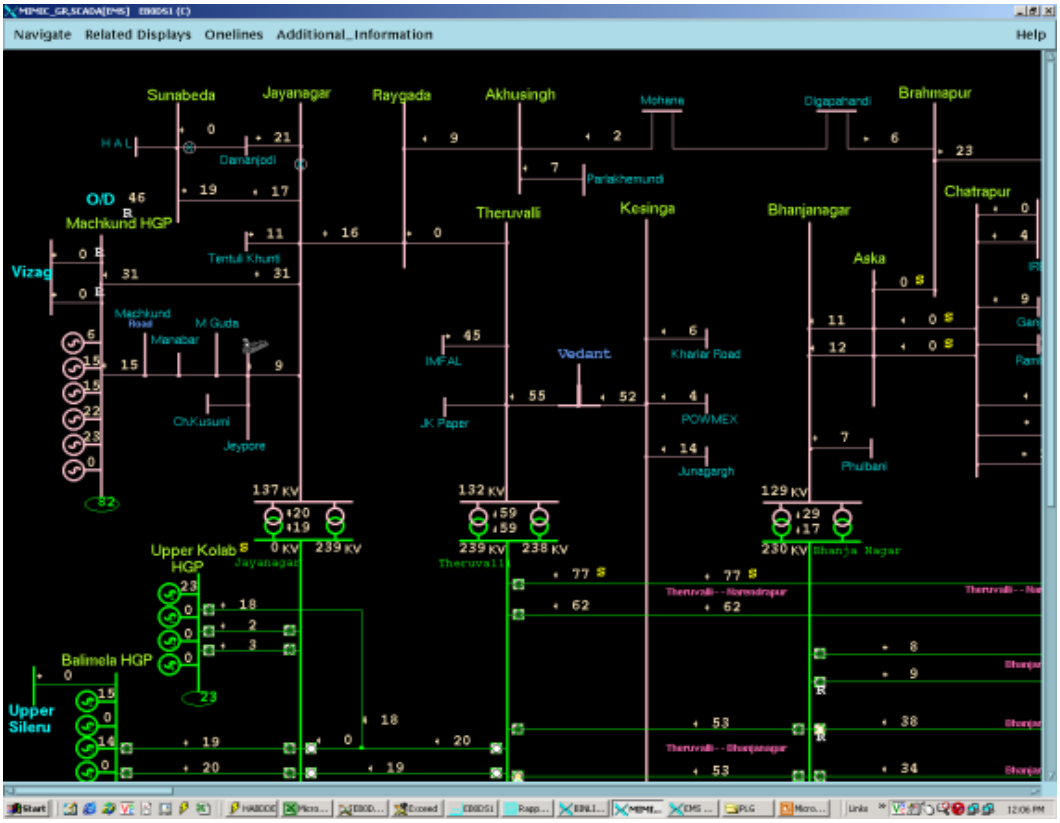


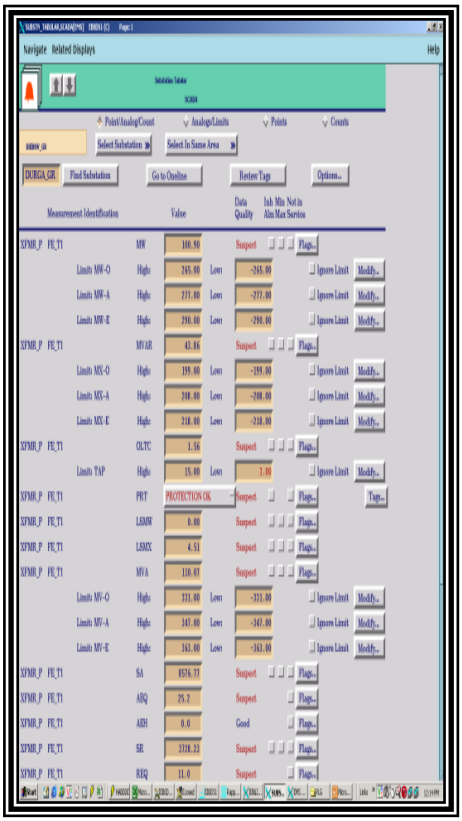
OPTCL MIMIC Network Diagram Display is SCADA System

Go to ONE Lines in SCADA Master Menu

Click Navigate -> SCADA ->One Lines

Click SLDC Displays->OPTCL MIMIC

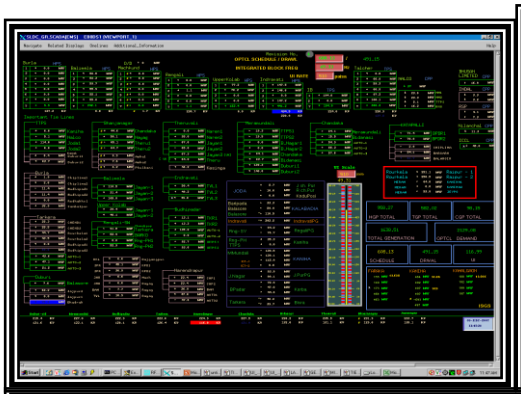


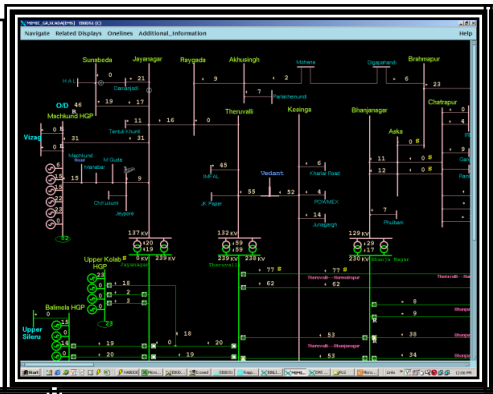


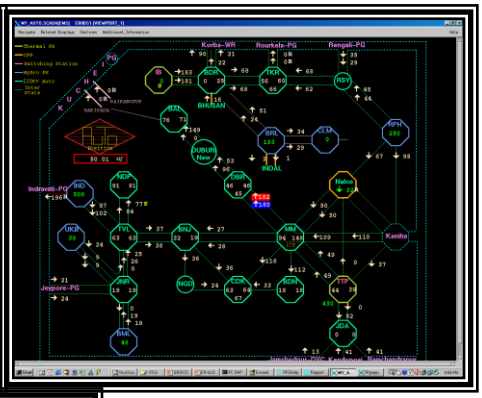
SCADA applications:

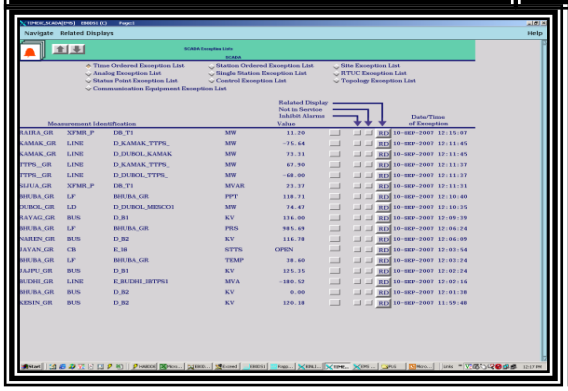
- Power system information in real time.
- Trend curves,reports and other methods for information presentation.
- Network status including islanding if any
- Reduction in number of grid disturbances
- Faster restoration
- Supervisory controls for load shedding
- Power system snapshot data for off line studies
- Synchronized time at all locations
- Disturbance analysis information
- SOE features of RTU can be utilized for analysis of operation of protection system
- Maintenance planning- number of breaker operations,Generator,transformer, reactor tripping etc.

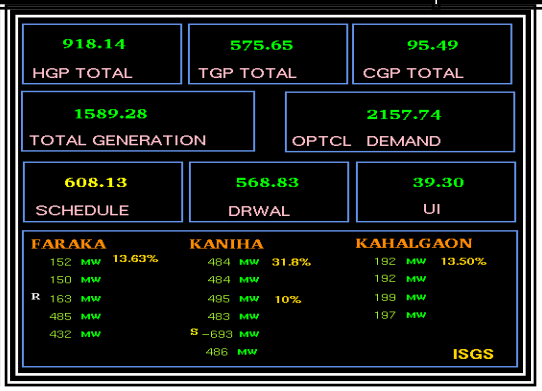
INFORMATION DISPLAY

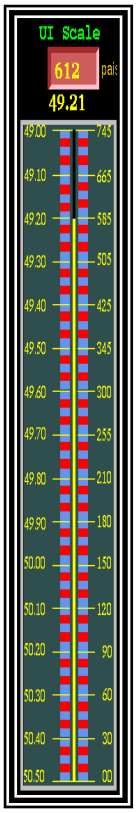


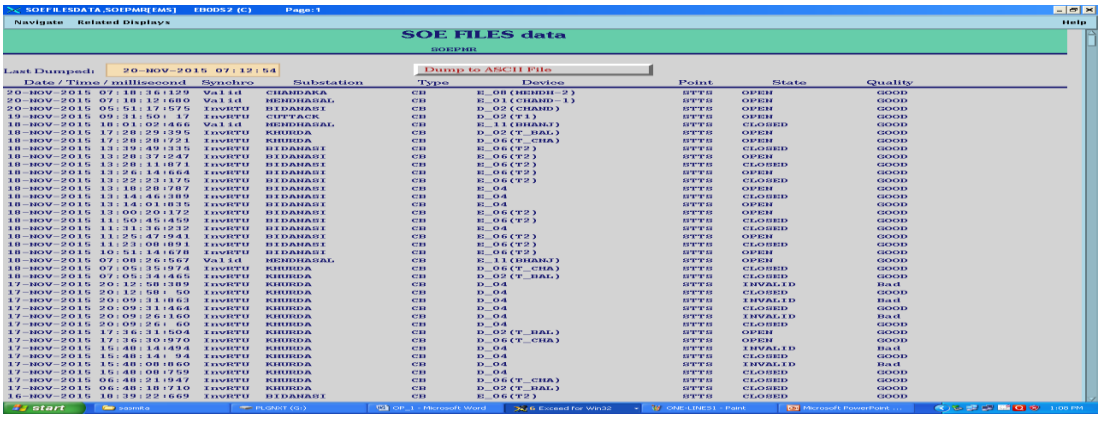












Chapter 10

10. Metering and Settlement System

10.0. Introduction

The settlement system is an important part in implementation of Availability Based Tariff (ABT). The system involves metering, data collection and processing, energy accounting and raising of bills of the state entities including . This chapter indicates the roles and responsibilities of the different regional entities in making the settlement system operative in most efficient manner.

10.1. Metering and Data Collection

10.1.1 As per Chapter-6 clause 6.4(13) of OGC, the STU shall install Special Energy Meters on all inter connections between the Users / Beneficiaries and other identified points for recording of actual MWh inter-changes and MVArh drawals as per relevant CEA Regulation on metering.

10.1.2 The type of meters to be installed, metering scheme, metering capability, testing and calibration requirements and scheme for collection and dissemination of meter data shall be as per Chapter-10 of OGC.

10.1.3 All concerned entities having SEMs installed in their premises shall fully cooperate with the STU / SLDC and extend necessary assistance by taking weekly meter readings by STU and transmitting them to SLDC in time.

10.1.4 All concerned entities having SEMs shall also carry out necessary time adjustments in the meter as per the procedure already in place.

10.1.6 In the event of any reported problem of SEMs as noticed by SLDC during processing in the matter data shall be reported to the STU / concerned owner of the meter for necessary replacement /repair.

10.2. Data Processing

10.2.1 As mentioned in section 6.4(14), the SLDC shall be responsible for computation of net MWh injection of each SGS / CGP/ ISGS and actual net drawal of each Beneficiary, 15 minute wise based on the above meter reading. The data shall be processed by SLDC to prepare monthly energy account, weekly UI account & reactive energy account.

10.2.2 The processed statement shall be forwarded to Gridco / STU to prepare and issue invoice.

10.2.3 All computations carried out by SLDC / Gridco / STU shall be open to all state entities for checking / verification for a period of fifteen days and mistakes/omissions, if any, would be rectified by SLDC.

10.3 Monthly State Energy Account for the purpose of billing

a) Energy charges payable by each beneficiary to Gridco.

b) Energy scheduled for each Open Access customers for preparation of monthly bill by Discoms.

10.3.1. Weekly Deviation Account

Weekly Deviation charges shall be settled as per deviation calculation for each 16 minute block. The deviation charges payable/receivable shall be calculated with respect to deviation Pool. The Pool Account shall be maintained by SLDC. The deviation account as prepared by SLDC shall have the following components

a) Deviation charges payable by benificiaries (Discoms)/SGSs/IPPs/CGPs to Pool
b) Deviation charges receivable by the beneficiaries(Discom)/SGSs/IPPs/CGPs from the pool
c) Additional Deviation charges payable by beneficiaries (Discoms) /SGSs/ IPPs/ CGPs to Pool
d) Pool balance amount due to capping of deviation rate for Thermal SGSs.

Since the hydro stations within the State is not covered under deviation settlement mechanism, the accounting for drawal from these stations shall be as per the Monthly energy account as per the agreed principles. However, deviations of injections from these stations shall be accounted for and duly apportioning the deviations amongst its beneficiaries.

10.3.2. Weekly VARh Account

The VARh account as prepared by SLDC shall have two distinct components.

a) VARh charges payable/receivable for VARh exchange between STU systems
b) VARh charges payable by Beneficiaries for low VARh drawal or High VARh injection between STU and Discom interface points.

The VARh account for low VARh drawal and High VARh injection between STU and Discom interface points shall be maintained by SLDC. Any payment to be made from VARh account shall be discussed beforehand in appropriate forum.

10.3.3 Pool Account Operation

In line with the direction of OERC, from the date of issue of weekly deviation account and Reactive Energy Charge Account by SLDC, within 10-days, the concerned state entity ***shall pay on priority*** the indicated amount into state deviation and Reactive Energy charges accounts operated by SLDC. The agencies that have to receive the money from pool accounts would then be paid within 2 working days. These pool accounts are to be reconciled once in periodic intervals (i.e quarterly).

ANNEXURES

Annexure: I	**Applicable deviation rate**
Annexure-II	**Violation message to user**
Annexure- III	**List of feeders identified for disconnection during over drawal**
Annexure- IV	**List of ICT & Auto Transformers & Tap changer details**
Annexure-V	**Bus reactors /line reactors available at OPTCL grid**
Annexure-VI	**Format for issue of outage clearance**
Annexure-VII	**Format for weekly report**
Annexure-VIII	**List of feeders covered for Under Frequency tripping**
Annexure-IX	**Format for incident Reporting**
Annexure-X	**Inter connection points for Discom Metering.**
Annexure-XI	**Inter state metering points**
Annexure-XII	**Discom control area for real time drawal monitoring through SCADA**
Annexure-XIII	**Installed Generation Capacity & State's ISGS share**
Annexure-XIV	**Single Line Diagram of OPTCL network**

Annexure-I

Deviation charge rate

Average Frequency of the time block		Charges for Deviation
Below	Not below	Paise/kWh
-	50.05	0.00
50.05	50.04	35.60
50.04	50.03	71.20
50.03	50.02	106.80
50.02	50.01	142.40
50.01	50.00	178.00
50.00	49.99	198.84
49.99	49.98	219.68
49.98	49.97	240.52
49.97	49.96	261.36
49.96	49.95	282.20
49.95	49.94	303.04
49.94	49.93	323.88
49.93	49.92	344.72
49.92	49.91	365.56
49.91	49.90	386.40
49.90	49.89	407.24
49.89	49.88	428.08
49.88	49.87	448.92
49.87	49.86	469.76
49.86	49.85	490.60
49.85	49.84	511.44
49.84	49.83	532.28
49.83	49.82	553.12
49.82	49.81	573.96
49.81	49.80	594.80
49.80	49.79	615.64
49.79	49.78	636.48
49.78	49.77	657.32
49.77	49.76	678.16
49.76	49.75	699.00
49.75	49.74	719.84
49.74	49.73	740.68
49.73	49.72	761.52
49.72	49.71	782.36
49.71	49.70	803.20
49.70	-	824.04
-	-	-

Annexure-II

Message for non compliance of drawal schedule

Message No./Dt Time

FROM: SCE, SLDC, BHUBANESWAR

TO: SCE, ABT CELL, (Discom Name)

CC: Managing Di Managing Director, CESU
Member Secretary, OERC
DIRECTOR(COMMERCIAL), GRIDCO

Sub: Request to restrict the over/ under drawl within Schedule.

Sir,

With reference to subject, the over drawl by (Discom name) is as under:

TIME:-
SCHEDULE in MW:-
PRESENT DRAWAL in MW:-
OVER DRAWAL in MW
YOU are over drawing since ___hrs of date till time.
Please keep your drawl within schedule irrespective of frequency to maintain grid security.
You may ask for revision of drawl schedule.

Signature
SCE, SLDC, BBSR

Annexure-III

SCOPE FOR DEMAND REGULATION DURING CONTINGENCY CONDITION

DISCOM	SL. No	Name of Sub-station	Demand in MW	
			Evening peak	Morning peak
CESU	1	Balugaon	31.90	22.33
	2	Banki	8.90	6.23
	3	Chandpur	14.00	9.80
	4	Dhenkanal	60.70	42.49
	5	Jagatsingpur	40.20	28.14
	6	Kendrapara	48.40	33.88
	7	Konark	11.80	8.26
	8	Nimapara	46.00	32.20
	9	Patamundei	34.30	24.01
	10	Salipur	29.20	20.44
		Total	**325.40**	**227.78**
WESCO	1	Baragarh	89.40	62.58
	2	Barpali	38.00	26.60
	3	Bhawanipatna	14.20	9.94
	4	Chhend	65.80	46.06
	5	Junagarh	28.50	19.95
	6	Kesinga	43.00	30.10
	7	Khariar	34.80	24.36
	8	Patnagarh	41.70	29.19
	9	Sambalpur	75.60	52.92
	10	Sonepur	39.70	27.79
	11	Sundargarh	34.00	23.80
		Total	**504.70**	**353.29**
NESCO	1	Anandpur	20.00	14.00
	2	Basta	19.20	13.44
	3	Chandikhol	36.70	25.69
	4	Jajpur Town	49.00	34.30
	5	Karanjia	17.80	12.46
	6	Polasponga	46.00	32.20
	7	Rairangapur	30.40	21.28
	8	Soro	47.80	33.46
		Total	**266.90**	**186.83**
Southco	1	Aska	72.80	50.96
	2	Barhampur	60.50	42.35
	3	Boudh	9.10	6.37
	4	Chhatrapur	27.00	18.90
	5	Digapahandi	40.40	28.28
	6	Mohana	8.20	5.74
	7	Purusottampur	16.00	11.20
	8	Phulabani	26.90	18.83
	9	Tentulikhunti	23.70	16.59
	10	Umarkote	14.10	9.87
		Total	**298.70**	**209.09**
		Grand Total	**1395.70**	**976.99**

Annexure-IV

List of ICT & Auto Transformers

Sl. No	Sub-station	Transformer Description	Type	Rated MVA	Rated KV	Taps
1	Meramundali	ICT - 1	ICT	315	400/220	17
	Meramundali	ICT - II	ICT	315	400/220	17
2	Mendhasala	ICT - I	ICT	315	400/220	17
	Mendhasala	ICT - II	ICT	315	400/220	17
3	New Duburi	ICT-I	ICT	315	400/200	17
	New Duburi	ICT-II	ICT	315	400/200	17
4	Narendrapur	AUTO - I	AUTO	160	220/132	17
	Narendrapur	AUTO - II	AUTO	160	220/132	17
	Narendrapur	AUTO - III	AUTO	100	220/132	17
5	Bhanjanagar	AUTO - I	AUTO	160	220/132	17
	Bhanjanagar	AUTO - II	AUTO	160	220/132	17
6	New Bolangir	AUTO - I	AUTO	160	220/132	17
	New Bolangir	AUTO - II	AUTO	160	220/132/33	17
7	Budhipadar	AUTO - I	AUTO	160	220/132	
	Budhipadar	AUTO - II	AUTO	160	220/132	
8	Katapali	AUTO - I	AUTO	100	220/132	17
	Katapali	AUTO - II	AUTO	100	220/132	17
9	Lapanga	TFR - I	AUTO	160	220/132/33	17
	Lapanga	TFR - II	AUTO	160	220/132/33	17
10	Tarkera	AUTO - I	AUTO	100	220/132	17
	Tarkera	AUTO - II	AUTO	100	220/132	17
	Tarkera	AUTO - III	AUTO	100	220/132	17
	Tarkera	AUTO - IV	AUTO	100	220/132	17
11	Meramundali	AUTO - I	AUTO	100	220/132	17
	Meramundali	AUTO - II	AUTO	100	220/132	17
	Meramundali	AUTO - III	AUTO	100	220/132	17
12	Chandaka	AUTO - I	AUTO	100	220/132/33	17
	Chandaka	AUTO - II	AUTO	160	220/132/33	17
	Chandaka	AUTO - III	AUTO	100	220/132	17
	Chandaka	AUTO - IV	AUTO	160	220/132/33	17
13	Mendhasala	AUTO-I	AUTO	100	220/132	
14	Samagara	AUTO - II	AUTO	160	220/132	
15	Bidanasi	AUTO - I	AUTO	100	220/132	17
	Bidanasi	AUTO - II	AUTO	100	220/132	17
	Bidanasi	AUTO - III	AUTO	160	220/132	17
16	Paradeep	AUTO - I	AUTO	100	220/132	
	Paradeep	AUTO - II	AUTO	160	220/132	17
	Paradeep	AUTO - III	AUTO	50	220/132	17
17	Balasore	AUTO - I	AUTO	160	220/132	17
	Balasore	AUTO - II	AUTO	160	220/132	17
18	Bhadrak	AUTO - I	AUTO	100	220/132/33	17
	Bhadrak	AUTO - II	AUTO	100	220/132/33	17
	Bhadrak	AUTO - III	AUTO	100	220/132/33	
19	Duburi	AUTO - I	AUTO	100	220/132	
	Duburi	AUTO - II	AUTO	100	220/132	
	Duburi	AUTO - III	AUTO	100	220/132	
20	Joda	AUTO - I	AUTO	100	220/132	
	Joda	AUTO - II	AUTO	100	220/132	
	Joda	AUTO - III	AUTO	100	220/132	
21	Jayanagar	AUTO - I	AUTO	160	220/132/33	17
	Jayanagar	AUTO - II	AUTO	160	220/132/34	17
22	Therubali	AUTO - I	AUTO	100	220/132	17
	Therubali	AUTO - II	AUTO	100	220/132	17

Annexure-V

List of Bus/Line reactors installed at OPTCL network

Capacity in MVAr

Sl. No.	Name of Grid S/S	Voltage level	Bus	Line
1	Meramundali	400 kV		1x80+2x60
2	Mendhasal	400 kV		2x63
3	New Duburi	400 kV	1x80	

Annexure-VI

Format for issue of outage clearance

STATE LOAD DESPATCH CENTER

BHUBANESWAR-751017
TEL NO.: 0674-2748961, 2748417, Fax No.-0674-2748509, 2748218
e-mail id: sldc_shutdown@yahoo.com, sldc_orissa@sldcorissa.org.in

Message No.:	Date:	Time of Origin:
Reference No.:	Date:	Time of Origin:

FROM: G.M.(G.O), SLDC TO:
Bhubaneswar
R/T: (SDO, in charge of the transmission element)
R/T: (G.M., E.H.T. (O&M), CIRCLE)

Message
Shutdown Clearance

1. NAME OF ELEMENT:
2. DATE:
3. PERIOD:
4. REASON:
5. LOAD ARRANGEMENT:
6. LOAD LIMITATION:
7. REMARKS:

R/T: C.G.M., (O&M), OPTCL, Bhubaneswar
R/T: Senior G.M., (O&M)

Signature
Name
Designation

Annexure-VII

Format for Weekly Performance Report

STATE LOAD DESPATCH CENTRE
ORISSA POWER TRANSMISSION CORPORATION LTD
WEEKLY REPORT
(As per OGC Chapter/Paragraph 5.6(1))

Year:2015/Week No:- **Period:** From 03.01.2015 To:

A. FREQUENCY PROFILE:

DATE	MAXIMUM	MINIMUM	AVERAGE	REMARKS

B. VOLTAGE PROFILE

DATE	JAYANAGAR				THERUVALI				BHANJANAGAR				NARENDRPUR				CHANDAKA				BIDANASI				NAYAGARH		SAMANGARA			
	220kV		132kV		220kV		132kV		220kV		132kV		220kV		132kV		220kV		132kV		220kV		132kV		220kV		220kV		132kV	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN

DATE	TARKERA				BUDHIPADAR				DUBURI				BALASORE				JODA				MERAMUNDALI						BHADRAK			
	220kV		132kV		220kV		132kV		220kV		132kV		220kV		132kV		220kV		132kV		400kV		220kV		132kV		220kV		132kV	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN

C. MAJOR GENERATION OUTAGE

SL NO.	PLANT & UNIT No.	MW CAPACITY	OUTAGE		RESTORATION		REASON/ REMARK
			TIME	DATE	TIME	DATE	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
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20							
21							
22							
23							
24							
25							
26							
27							
28							

D. MAJOR TRANSMISSION ELEMENT OUTAGE

SL NO.	LINE/AUTO	KV /MVA	OUTAGE		RESTORATION		REASON/ REMARK
			TIME	DATE	TIME	DATE	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

E. MAJOR GRID DISTURBANCES

G.M.(SS)
O/o.Sr.G.M.(PS)
SLDC,Mancheswar Rly. Colony,Bhubaneswar

No. - Dt.

Forwarded to:
1. C.G.M.(O&M), OPTCL
2. G.M., ERLDC, Kolkata
3. DIRECTOR (Operation), OHPC
4. C.E.O., CESU, Bhubaneswar
5. C.O.O., NESCO Utility, Balasore
6. C.O.O., WESCO Utility, Burla
7. C.O.O.,SOUTHCO Utility, Berhampur
8. G.M. (Electrical), IBTPS, Banharpali
9. G.M.(O&M), NTPC, TTPS, Talcher
10. G.M. (O&M), CPP, NALCO, Angul
11. G.M.(Power Distribution), CPP, RSP, Rourkela
12. Secretary, Confederation of CPPs, IMFA Building, Bomikhal, Rasulgarh, Bhubaneswar

Annexure-VIII

List of feeders for under frequency tripping

Feeder wise Automatic under frequency load shedding of OPTCL				
State / Utilitry	**Stage / Frequency**	**Name of Grid / Sub-Station**	**Name of Feeder**	**Load in MW**
OPTCL	Stage-I, 49.2 Hz	Kesinga	33kV Naria Feeder	11.00
		Junagarh	33kV Charbahalpur Feeder	10.00
		Bhanjanagar	33kV KB Pur Feeder	7.00
		Aska	33kV Buguda Feeder	11.00
		Berhampur	33kV Chikiti Feeder	11.00
		Balugoan	33kV Khalikote Feeder	16.00
		Khurda	Banki Feeder	13.00
		Nayagarh	33kV Khandapada Feeder	8.50
		Jagatsinghpur	33kV Balikuda Feeder	11.00
		Boinda	33kV Jharpada Feeder	12.00
		Bhadrak	33kV Dhamnagar Feeder	16.00
		Balasore	33kV Srijang Feeder	6.50
		Bolangir (Old)	33kV Dumarbahal Feeder	10.50
		Bargarh	33kV Dunguri Feeder	15.00
		Rourkela	33kV Lathikata Feeder	8.00
		Khariar	33kV Khariar RE	15.00
			Total	**181.50**
OPTCL	Stage-II, 49.0 Hz	Jayanagar	33kV Boriguma Feeder	10.00
		Sunabeda	33kV Laxmipur Feeder	8.00
		Therubali	33kV Bissm Katak Feeder	8.00
		Phulbani	33kV Kalinga Feeder	8.00
		Kendrapara	33kV Luna Feeder	15.00
		Pattamundai	33kV Rajnagar Feeder	8.00
		Chatrapur	33kV Rambha Feeder	14.00
		Chandikhole	33kV Kabatabandaha Feeder	15.00
		Nimapara	33kV Kakatpur Feeder	13.00
		Khurda	33kV Delanga Feeder	12.00
		Dhenkanal	33kV Hindol RD Feeder	12.00
		Chainpal	33kV Banarpal Feeder	15.00
		Jajpur Road	33kV Panikoili Feeder	12.00
		Bhanjanagar	33kV Belaguntha Feeder	12.00
		Sundargarh	33kV Bargoan Feeder	6.50
		Aska	33kV Budamba Feeder	15.00
			Total	**183.50**
OPTCL	Stage-III, 48.8Hz	Bhadrak	33kV Chandabali Feeder	16.00
		Dhenkanal	33kV Gondia Feeder	13.00
		Sambalpur	33kV Rengali Feeder	15.00
		Bargarh	33kV Turung Feeder	22.00
		Nayagarh	33kV Binodpara Feeder	12.00
		Brajarajnagar	33kV Sargipali Feeder	15.00
		Patnagarh	33kV Khaparakhol Feeder	8.00
		Palasponga	33kV Remuli Feeder	18.00
		Boinda	33kV Athamalik Feeder	5.00
		Chainpal	33kV Parjang Feeder	13.00
		Kalarangi	33kV Goda Feeder	10.00
		Kesinga	33kV Titilagarh Feeder	12.00
		Nimapara	33kV Konark Feeder	7.00
		Aska	33kV Nuagaon Feeder	10.00
		Jajpur Road	33kV Kuakhia Feeder	8.00
			Total	**184.00**
OPTCL	Stage-IV, 48.6Hz	Khariar	33kV Khariar Feeder-II	7.00
		Sunabedha	33kV Nandapur Feeder	7.00
		Barkote	33kV Mahuldhia Feeder	9.00
		Polaponga	33kV Keonjhar Feeder	17.00
		Aska	33kV Kabisuryanagar Feeder	13.00
		Sundargarh	33kV Subdega Feeder	5.00
		Bhanjanagar	132kV Phulbani Feeder	22.00
		Kendrapara	33kV Pattamundai Feeder	24.00
		Jajpur Road	132kV Anandapur Feeder	30.00
		Bolangir (New)	132kV Patanagarh Feeder	22.00
		Jayanagar	132kV Tentulikhunti Feeder	30.00
			Total	**186.00**
		Total Load relief under UFR Scheme		**735.00**

Annexure- IX

SYSTEM DISTURBANCES REPORT
(Detail Report)

(1) Date & Time of Occurrence:
(2) Name of the Sub Station/ Generating Station:
(3) Details of Occurrence:

(4) 400 kV one and half breaker scheme status

Diameter	Bus I	Bus II	Tie-breaker (ON/OFF)

(5) Bus Disposition of 220 kV feeders at

220 KV MAIN BUS-I	**220 KV MAIN BUS -II**

(6) Sequence of tripping

Time	Details of tripping

(7) Weather Condition:
(8) PLCC counter readings: Restoration:
(9) Load Loss-
(10) Analysis:
(11) Schematic Diagram

G.M (System Support), SLDC
OPTCL, Bhubaneswar

Letter No-SGM(PS)/MIS/237-_____ Date

Copy Forwarded to the

1. Director (Engg), OERC, Bhubaneswar
2. SDO/ DGM, (I/C of S/S)
3. G.M EHT (O&M) Circle, (concern circle)
6. Member Secretary, GCC
6. Sr. GM (O&M), (concern zone), OPTCL
7. CGM (RT& C), OPTCL, Bhubaneswar
8. CGM (O&M), OPTCL, Bhubaneswar
9. GM, ERLDC, Kolkata
10. Member Secretary, ERPC, Kolkata
11. EA to CMD, OPTCL, Bhubaneswar.

Annexure-X (a)

CESU Metering points

SL. NO.	SUBSTATION	METERING POINT	SL. NO.	SUBSTATION	METERING POINT
1	Angul	MCL Feeder1 132kV (C)	62	Kamakhyanagar	Trf1-20MVA 132/33kV
2	Angul	MCL Feeder2 132kV (C)	63	Kamakhyanagar	Trf2-12.5MVA 132/33kV
3	Angul	Trf1-40MVA 132/33kV	64	Kendrapada	Trf1-12.5MVA 132/33kV
4	Angul	Trf2-40MVA 132/33kV	65	Kendrapada	Trf2-40MVA 132/33kV
5	Arati Steel	Arati Steel 132kV	66	Kendrapada	Trf4-40MVA 132/33kV
6	Argul	Trf2-40MVA 132/33kV	67	Khurda	Kaipadar Traction Feeder
7	Argul	Trf3-20MVA 132/33kV	68	Khurda	Trf1-40MVA 132/33kV
8	Badagada	Trf1-40MVA 132/33kV	69	Khurda	Trf2-40MVA 132/33kV
9	Badagada	Trf2-63MVA 132/33kV	70	Khurda	Trf3-40MVA 132/33kV
10	Balugaon	Khallikote Feeder 33kV	71	Konark	Trf2-20MVA 132/33kV
11	Balugaon	SOLARI Traction 132kV	72	Mendhasal	Trf1-20MVA 132/33kV
12	Balugaon	Trf1-40MVA 132/33kV	73	Meramundali	GKEL Feeder 400kV
13	Balugaon	Trf2-20MVA 132/33kV	74	Meramundali	Bhusan Feeder1 220kV (C)
14	Balugaon	Trf3-12.5MVA 132/33kV	75	Meramundali	Bhusan Feeder2 220kV (C)
15	Banki	Trf1-20MVA 132/33kV	76	Meramundali	BRG Feeder 132kV
16	Banki	Trf2-20MVA 132/33kV	77	Meramundali	JSPL Feeder1 400kV
17	Baranga	S.N. Mohanty(Solar) 11kV	78	Meramundali	JSPL Feeder2 400kV
18	Bhubaneswar	Trf1-63MVA 132/33kV	79	Meramundali	RUNGTA Feeder 132kV
19	Bhubaneswar	Trf2-63MVA 132/33kV	80	Nayagarh	Trf1-40MVA 220/33kV
20	Bhubaneswar	Trf3-63MVA 132/33kV	81	Nayagarh	Trf2-20MVA 220/33kV
21	Bidanasi	Trf1-63MVA 132/33kV	82	Nayagarh	Trf3-20MVA 220/33kV
22	Bidanasi	Trf2-63MVA 132/33kV	83	Nimapara	Trf1-12.5MVA 132/33kV
23	Bidanasi	Trf3-40MVA 132/33kV	84	Nimapara	Trf2-40MVA 132/33kV
24	Boinda	Trf1-12.5MVA 132/33kV	85	Nimapara	Trf3-40MVA 132/33kV
25	Boinda	Trf2-12.5MVA 132/33kV	86	Nuapatana	Trf1-20MVA 132/33kV
26	Boinda	Trf3-12.5MVA 132/33kV	87	Nuapatana	Trf2-40MVA 132/33kV
27	Chainpal	FCI Feeder1 132kV	88	Nuapatana	Trf3-12.5MVA 132/33kV
28	Chainpal	Trf1-40MVA 132/33kV	89	Pallhara	Pallhara Feeder 33kV
29	Chainpal	Trf2-40MVA 132/33kV	90	Paradeep	Essar Steel Feeder1 220kV
30	Chainpal	Trf3-20MVA 132/33kV	91	Paradeep	Essar Steel Feeder2 220kV
31	Chandaka	Trf1-40MVA 132/33kV	92	Paradeep	IFFCO Feeder1 132kV
32	Chandaka	Trf2-63MVA 132/33kV	93	Paradeep	IFFCO Feeder2 132kV
33	Chandaka	Trf3-63MVA 132/33kV	94	Paradeep	IOCL Feeder 220kV
34	Chandikhole	Badachana Feeder 33kV	95	Paradeep	PPL Feeder1 132kV
35	Chandpur	Trf1-12.5MVA 132/33kV	96	Paradeep	PPL Feeder2 132kV
36	Chandpur	Trf1-12.5MVA 132/33kV	97	Paradeep	PPT Feeder1 132kV
37	Chandpur(Solar)	PAN Time Finance (Solar)	98	Paradeep	PPT Feeder2 132kV
38	Choudwar	Choudwar Traction Feeder	99	Paradeep	Trf1-20MVA 132/33kV
39	Choudwar	RAWMET Feeder 132kV	100	Paradeep	Trf2-20MVA 132/33kV
40	Choudwar	Trf2-40MVA 132/33kV	101	Paradeep	Trf3-12.5MVA 132/33kV
41	Choudwar	Trf3-20MVA 132/33kV	102	Patrapada(Tangi)	MGM Solar 11kV
42	Choudwar	Trf4-40MVA 132/33kV	103	Pattamundai	Trf1-20MVA 132/33kV
43	Cuttack	Trf1-40MVA 132/33kV	104	Pattamundai	Trf2-20MVA 132/33kV
44	Cuttack	Trf2-40MVA 132/33kV	105	Pattamundai	Trf3-12.5MVA 132/33kV
45	Cuttack	Trf3-40MVA 132/33kV	106	Phulnakhara	Trf1-20MVA 132/33kV
46	Dhenkanal	Joranda Traction Feeder 132kV	107	Phulnakhara	Trf2-20MVA 132/33kV
47	Dhenkanal	Narveram Feeder 33kV	108	Puri	Trf1-40MVA 132/33kV
48	Dhenkanal	Trf1-40MVA 132/33kV	109	Puri	Trf2-40MVA 132/33kV
49	Dhenkanal	Trf2-40MVA 132/33kV	110	Puri	Trf3-40MVA 132/33kV
50	Dhenkanal	Trf3-40MVA 132/33kV	111	Rairakhol	Bamur Feeder 33kV
51	Hind Metalics	MGM 132kV Feeder	112	Ranasinghpur	Trf1-63MVA 132/33kV
52	Hind Metalics	Navabharat Feeder1 132kV	113	Ranasinghpur	Trf2-63MVA 132/33kV
53	Hind Metalics	Navabharat Feeder2 132kV	114	Ranasinghpur	Trf3-40MVA 132/33kV
54	Hind Metalics	SGEL 132kV Fdr	115	Rengali	Trf1-20MVA 220/33kV
55	Hind Metalics	Traction Feeder 132kV	116	Rengali	Trf2-20MVA 220/33kV
56	Jagatsinghpur	Traction Feeder 132kV	117	Salipur	OCL Feeder 132kV
57	Jagatsinghpur	Trf1-20MVA 132/33kV	118	Salipur	Trf1-20MVA 132/33kV
58	Jagatsinghpur	Trf2-20MVA 132/33kV	119	Salipur	Trf2-20MVA 132/33kV
59	Jagatsinghpur	Trf3-40MVA 132/33kV	120	Salipur	Trf3-12.5MVA 132/33kV
60	Kalarangi	Trf1-12.5MVA 132/33kV	121	Shamuka	Trf1-31.5MVA 132/33kV
61	Kalarangi	Trf2-12.5MVA 132/33kV	122	Shamuka	Trf2-31.5MVA 132/33kV

Annexure-X (b)

WESCO Metering points

SL. NO.	SUBSTATION	METERING POINT	SL. NO.	SUBSTATION	METERING POINT
1	Acme Solar	Acme Solar	61	Junagarah	Trf2-20MVA 132/33kV
2	Aryan Ispat	Aryan Ispat Feeder 132kV	62	Katapali	Rathi Steel 33kV
3	Aryan-Viraj S/W	Aryan-Viraj 132kV	63	Katapali	Trf1-20MVA 132/33kV
4	Bamra	Bamra Traction Feeder 132kV	64	Katapali	Trf2-20MVA 132/33kV
5	Bamra Solar	Joy Iron Steel Ltd(Solar)	65	Katapali	Trf3-40MVA 132/33kV
6	Barapalli	Trf1-40MVA 132/33kV	66	Kesinga	POWMEX Feeder 132kV
7	Barapalli	Trf2-20MVA 132/33kV	67	Kesinga	Trf1-20MVA 132/33kV
8	Bargarh	ACC Feeder2 132kV	68	Kesinga	Trf2-40MVA 132/33kV
9	Bargarh	Trf1-40MVA 132/33kV	69	Kesinga	Trf3-20MVA 132/33kV
10	Bargarh	Trf2-40MVA 132/33kV	70	Khariar	Trf1-40MVA 132/33kV
11	Bargarh	Trf3-40MVA 132/33kV	71	Khariar	Trf2-40MVA 132/33kV
12	Barkote	Trf1-40MVA 220/33kV	72	Kuchinda	Trf1-20MVA 132/33kV
13	Barkote	Trf2-40MVA 220/33kV	73	Kuchinda	Trf2-20MVA 132/33kV
14	Barkote SOLAR	Molisati Solar 11kV	74	Kalunga	Trf1-40MVA 132/33kV
15	BGR-OPGC	BGR Energy Ltd. 33kV Fdr	75	Lapanga	Trf1-20MVA 132/33kV
16	Bhalulata	Bhalulata Traction Feeder	76	Mahavir s/s	Mahavir Ferro Alloys 33kV
17	Bhawanipatna	Trf1-12.5MVA 132/33kV	77	Mahavir s/s	Solar Power 33kV
18	Bhawanipatna	Trf2-12.5MVA 132/33kV	78	Nuapada	Trf1-20MVA 132/33kV
19	Bolangir	Trf1-40MVA 132/33kV	79	Nuapada	Trf2-20MVA 132/33kV
20	Bolangir	Trf2-40MVA 132/33kV	80	Pallhara	Pallhara Feeder 33kV
21	Bolangir	Trf3-12.5MVA 132/33kV	81	Patnagarh	Alex Solar Pvt. Ltd
22	Brajarajnagar	Trf1-20MVA 132/33kV	82	Patnagarh	Trf1-40MVA 132/33kV
23	Brajarajnagar	Trf2-12.5MVA 132/11kV	83	Patnagarh	Trf2-20MVA 132/33kV
24	Brajarajnagar	Trf3-20MVA 132/33kV	84	Patnagarh	Trf3-20MVA 132/33kV
25	Brajarajnagar	Trf4-40MVA 132/33kV	85	Rairakhol	Bamur Feeder 33kV
26	Brajarajnagar	Trf5-20MVA 132/33kV	86	Rairakhol	Trf1-12.5MVA 132/33kV
27	Budhipadar	AAL Feeder-I 220kV	87	Rairakhol	Trf2-12.5MVA 132/33kV
28	Budhipadar	AAL Feeder-II 220kV	88	Rajgangpur	OCL Feeder 132kV
29	Budhipadar	Basundhara Feeder-II 220kV	89	Rajgangpur	Traction Feeder 132kV
30	Budhipadar	BHUSAN Power Feeder1 220kV	90	Rajgangpur	Trf1-40MVA 132/33kV
31	Budhipadar	BHUSAN Power Feeder2 220kV	91	Rajgangpur	Trf2-40MVA 132/33kV
32	Budhipadar	MCL Feeder1 132kV (W)	92	Rajgangpur	Trf3-40MVA 132/33kV
33	Budhipadar	MCL Feeder2 132kV (W)	93	Rourkela	Traction Trf-12.5MVA
34	Budhipadar	MSP Feeder 132kV	94	Rourkela	Trf1-35MVA 132/33kV
35	Budhipadar	SPS Feeder 220kV	95	Rourkela	Trf2-35MVA 132/33kV
36	Budhipadar	Trf1-20MVA 132/33kV	96	Rourkela	Trf3-35MVA 132/33kV
37	Budhipadar	Trf2-12.5MVA 132/33kV	97	Rourkela	Trf4-35MVA 132/33kV
38	Budhipadar	VAL(2) Feeder-I 400kV	98	Sadeipali	REHPL(Solar) 11kV
39	Budhipadar	VAL(2) Feeder-II 400kV	99	Saintala	ORDNANCE Feeder 132kV
40	Budhipadar	VAL(2) Feeder-III 400kV	100	Sambalpur	Trf1-31.5MVA 132/33kV
41	Burla P.H.	FRP Feeder 132kV	101	Sambalpur	Trf2-31.5MVA 132/33kV
42	Burla P.H.	HINDALCO Feeder2 132kV	102	Sambalpur	Trf3-40MVA 132/33kV
43	Burla P.H.	Island Feeder 11kV	103	Sarsamal	Trf1-40MVA 132/33kV
44	Chandiposh	Chandiposh Traction 220kV	104	Shyam Metallics	Shyam DRI Feeder 132kV
45	Chend	Adhunik Metallic Feeder 132kV	105	Sonepur	Manamunda Feeder 33kV
46	Chend	Nuagaon Traction Feeder	106	Sonepur	Trf1-20MVA 132/33kV
47	Chend	SriGanesh Metallics 132kV	107	Sonepur	Trf2-20MVA 132/33kV
48	Chend	Trf1-40MVA 132/33kV	108	Sonepur	Trf3-20MVA 132/33kV
49	Chend	Trf2-40MVA 132/33kV	109	Sonepur Solar	ABACUS HOLDINGS Solar
50	Chend	Trf3-40MVA 132/33kV	110	STERLITE ENERGY LTD	SEL FEEDER-I 220kV
51	Chipilima P.H.	Trf1-20MVA 132/33kV	111	STERLITE ENERGY LTD	SEL FEEDER-II 220kV
52	Chipilima P.H.	Trf2-12.5MVA 132/33kV	112	Sundargarah	Trf1-40MVA 132/33kV
53	Jharsuguda	Action Ispat 132kV	113	Sundargarah	Trf2-20MVA 132/33kV
54	Jharsuguda	CEMCO Feeder 132kV	114	Tarkera	RSP Feeder1 132kV
55	Jharsuguda	SMC Power 132kV	115	Tarkera	RSP Feeder1 220kV
56	Jharsuguda	Traction Feeder 132kV	116	Tarkera	RSP Feeder2 132kV
57	Jharsuguda	Trf1-20MVA 132/11kV	117	Tarkera	RSP Feeder2 220kV
58	Jharsuguda	Trf2-12.5MVA 132/11kV	118	VAL Lanjigarh	Vedanta Al. Trf1 132kV
59	Joda	Joda-Tensa Feeder 33kV	119	VAL Lanjigarh	Vedanta Al. Trf2 132kV
60	Junagarah	Trf1-20MVA 132/33kV			

Annexure-X(c)

NESCO Metering points

SL. NO.	SUBSTATION	METERING POINT	SL. NO.	SUBSTATION	METERING POINT
1	Anandpur	Trf1-12.5MVA 132/33kV	48	Duburi-New	TATA Steel Ltd 220kV Fdr-1
2	Anandpur	Trf2-12.5MVA 132/33kV	49	Duburi-New	TATA Steel Ltd 220kV Fdr-2
3	Arya Ispat Switching Stn	ARYA Steel 132kV	50	Duburi-New	VISA Steel 220kV
4	Arya Ispat Switching Stn	BRPL Feeder	51	Jajpur Road	Trf1-40MVA 132/33kV
5	Arya Ispat Switching Stn	IMTCPL Feeder	52	Jajpur Road	Trf2-40MVA 132/33kV
6	Balasore	BIRLA Tyre Feeder 132kV	53	Jajpur Road	Trf3-20MVA 132/33kV
7	Balasore	ISPAT Feeder 132kV	54	Jajpur Road	Yazdani Feeder 33kV
8	Balasore	Traction Feeder 132kV	55	Jajpur Town	Trf1-40MVA 132/33kV
9	Balasore	Trf1-63MVA 132/33kV	56	Jajpur Town	Trf2-20MVA 132/33kV
10	Balasore	Trf2-63MVA 132/33kV	57	Jajpur Town	Trf3-40MVA 132/33kV
11	Balasore	Trf3-40MVA 132/33kV	58	Jaleswar	Traction Feeder 132kV
12	Barbil	Trf1-12.5MVA 132/33kV	59	Jaleswar	Trf1-20MVA 132/33kV
13	Barbil	Trf2-12.5MVA 132/33kV	60	Jaleswar	Trf2-20MVA 132/33kV
14	Baripada	Trf1-31.5MVA 132/33kV	61	Jaleswar	Trf3-12.5MVA 132/33kV
15	Baripada	Trf2-40MVA 132/33kV	62	Joda	Beekay Steel Feeder 132kV
16	Baripada	Trf3-40MVA 132/33kV	63	Joda	FAP Feeder 132kV
17	Barjamunda	Traction Feeder 132kV	64	Joda	Joda-Tensa Feeder 33kV
18	Basta	Trf1-12.5MVA 132/33kV	65	Joda	JSPL TRF-1 50MVA 220/33kV
19	Basta	Trf2-12.5MVA 132/33kV	66	Joda	JSPL TRF-2 50MVA 220/33kV
20	BC Mohanty Switching Stn	Bamnipal(New) Feeder 132kV	67	Joda	JSPL TRF-3 20MVA 220/33kV
21	BC Mohanty Switching Stn	TOMKA Traction Feeder 132kV	68	Joda	TATA Sponge Iron 220kV
22	Bhadrak	Dhamra Port Feeder1 132kV	69	Joda	Trf2-20MVA 132/33kV
23	Bhadrak	Dhamra Port Feeder2 132kV	70	Joda	Trf4-20MVA 132/33kV
24	Bhadrak	FACOR Feeder 132kV	71	Joda	Trf5-20MVA 132/33kV
25	Bhadrak	FACOR Power 132kV	72	Joda	Trf6-40MVA 132/33kV
26	Bhadrak	Traction Feeder 132kV	73	Joda	Trf7-15MVA 220/33kV
27	Bhadrak	Trf1-63MVA 132/33kV	74	Karanjia	Trf1-12.5MVA 132/33kV
28	Bhadrak	Trf2-63MVA 132/33kV	75	Karanjia	Trf2-12.5MVA 132/33kV
29	Bhadrak	Trf3-40MVA 132/33kV	76	Karanjia	Trf3-20MVA 132/33kV
30	Bolani	Trf1-10MVA 132/11kV	77	Keonjhar	Bansapani Traction Fdr 132kV
31	Bolani	Trf2-10MVA 132/11kV	78	Polasponga	ESIL Feeder 132kV
32	BRPL Switching	BRPL Feeder 132kV	79	Polasponga	MSP Feeder 132kV
33	BRPL Switching	Mesco Feeder 132kV	80	Polasponga	OSISL Feeder 33kV
34	Chandikhole	Badachana Feeder 33kV	81	Polasponga	Patnaik Steel 33kV
35	Chandikhole	Trf1-20MVA 132/33kV	82	Polasponga	Traction Feeder 132kV
36	Chandikhole	Trf2-20MVA 132/33kV	83	Polasponga	Trf1-20MVA 132/33kV
37	Chandikhole	Trf3-20MVA 132/33kV	84	Polasponga	Trf2-20MVA 132/33kV
38	Duburi	Jakhapura Traction Fdr 132kV	85	Polasponga	Trf3-40MVA 132/33kV
39	Duburi	JFAL Feeder 132kV	86	Rairangpur	Trf1-20MVA 132/33kV
40	Duburi	Mishrilal Feeder 132kV	87	Rairangpur	Trf2-12.5MVA 132/33kV
41	Duburi	NINL Feeder 220kV	88	Rairangpur	Trf3-20MVA 132/33kV
42	Duburi	Trf1-40MVA 220/33kV	89	Somanathpur	IMAMI Feeder 132kV
43	Duburi	Trf2-40MVA 220/33kV	90	Somanathpur	Stork Feeder 132kV
44	Duburi-New	Jindal Feeder1 220kV	91	Soro	Trf1-20MVA 132/33kV
45	Duburi-New	Jindal Feeder2 220kV	92	Soro	Trf2-20MVA 132/33kV
46	Duburi-New	Maithan Feeder 220kV	93	Soro	Trf3-40MVA 132/33kV
47	Duburi-New	Rohit Ferrotech 220kV			

Annexure-X (d)

SOUTHCO Metering points

Sl No.	SUBSTATION	METERING POINT	Sl No.	SUBSTATION	METERING POINT
1	Akhusingi	Trf1-12.5MVA 132/33kV	31	Laxmipur	ADITYA Feeder-II 220kV
2	Akhusingi	Trf2-12.5MVA 132/33kV	32	Laxmipur	Trf-1 20MVA 220/33kV
3	Aska	Trf1-40MVA 132/33kV	33	Mohana	Trf1-12.5MVA 132/33kV
4	Aska	Trf2-40MVA 132/33kV	34	Mohana	Trf2-12.5MVA 132/33kV
5	Aska	Trf3-40MVA 132/33kV	35	Narendrapur	Narendrapur Traction 132kV
6	Boudh	Trf1-20MVA 132/33kV	36	Narendrapur	Trf1-20MVA 132/33kV
7	Balimela	Trf1-20MVA 220/33kV	37	Narendrapur	Trf2-40MVA 132/33kV
8	Balimela	Trf2-20MVA 220/33kV	38	Narendrapur	Trf3-40MVA 132/33kV
9	Balugaon	Khallikote Feeder 33kV	39	Paralakhemendi	Trf1-12.5MVA 132/33kV
10	Berhampur	Trf1-40MVA 132/33kV	40	Paralakhemendi	Trf2-12.5MVA 132/33kV
11	Berhampur	Trf2-20MVA 132/33kV	41	Phulbani	Trf1-40MVA 132/33kV
12	Berhampur	Trf3-40MVA 132/33kV	42	Phulbani	Trf2-12.5MVA 132/33kV
13	Bhanjanagar	Trf1-40MVA 132/33kV	43	Phulbani	Trf3-12.5MVA 132/33kV
14	Bhanjanagar	Trf2-16MVA 132/33kV	44	Purushhottampur	Trf1-12.5MVA 132/33kV
15	Chatrapur	IRE Feeder1 132kV	45	Purushhottampur	Trf2-12.5MVA 132/33kV
16	Chatrapur	IRE Feeder2 132kV	46	Rayagada	Trf1-12.5MVA 132/33kV
17	Chatrapur	Rambha Traction Feeder 132kV	47	Rayagada	Trf2-12.5MVA 132/33kV
18	Chatrapur	Trf1-20MVA 132/33kV	48	Sonepur	Manamunda Feeder 33kV
19	Chatrapur	Trf2-20MVA 132/33kV	49	Sunabeda	HAL Feeder 132kV
20	Chatrapur	Trf3-20MVA 132/33kV	50	Sunabeda	Trf2-12.5MVA 132/11kV
21	Dabugaon	Trf2-12.5MVA 132/33kV	51	Sunabeda	Trf3-12.5MVA 132/33kV
22	Digapahandi	Trf1-20MVA 132/33kV	52	Sunabeda	Trf4-12.5MVA 132/33kV
23	Digapahandi	Trf2-20MVA 132/33kV	53	Tentulikhunti	Trf1-12.5MVA 132/33kV
24	Digapahandi	Trf3-12.5MVA 132/33kV	54	Tentulikhunti	Trf2-20MVA 132/33kV
25	Ganjam	Jayashree Chemicals 132kV	55	Tentulikhunti	Trf3-12.5MVA 132/33kV
26	Jayanagar	Traction Feeder 132kV	56	Therubali	JK Feeder 132kV
27	Jayanagar	Trf1-12.5MVA 132/33kV	57	Therubali	Trf1-12.5MVA 132/33kV
28	Jayanagar	Trf2-20MVA 132/33kV	58	Therubali	Trf2-12.5MVA 132/33kV
29	Jayanagar	Trf3-20MVA 132/33kV	59	Umerkote	Trf1-20MVA 132/33kV
30	Laxmipur	ADITYA Feeder-I 220kV	60	Umerkote	Trf1-20MVA 132/33kV

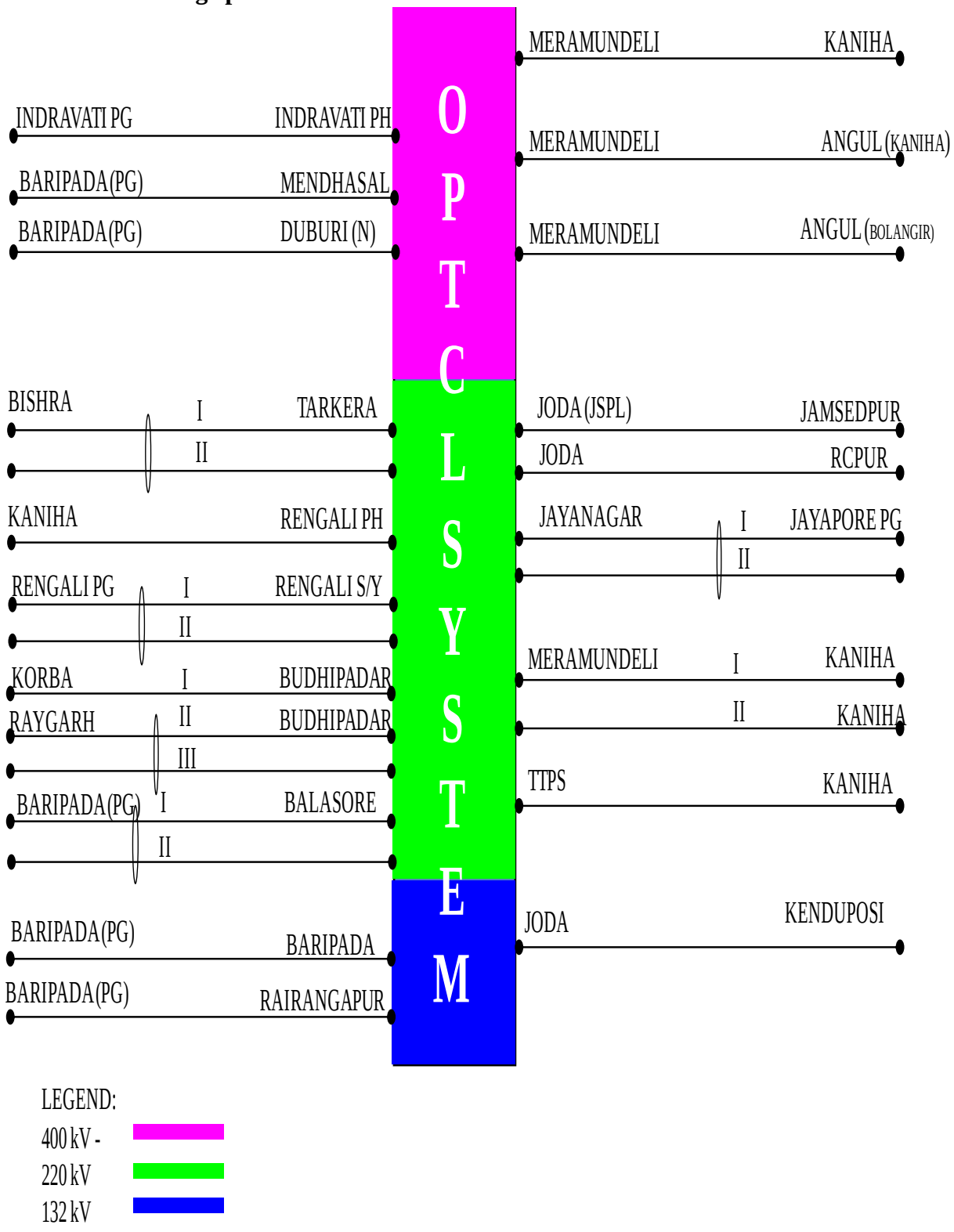
Annexure-X (e)

METERING LOCATIONS FOR GENERATING STATIONS

Sl. No.	Power House Name	Feeder	Sl. No.	Power House Name	Feeder
1	Chipilima	132 kV Burla feeder-1	26	Upper Indravati	220 kV Theruvali ckt-2
2		132 kV Burla feeder-2	27		220 kV Theruvali ckt-3
3		132 kVBus Coupler	28		220 kV Theruvali ckt-4
4		132 kV Katapali	29		400/220 kV, ICT-1
5		132/33 kV Tfr- 1	30		400/220 kV, ICT-2
6		132/33 kV Tfr- 2	31	Rengali	220 kV Kaniha ckt
7	Burla	132 kV Chipilima ckt-1	32		220 kV Rengali Sw.
8		132 kV Chipilima ckt-2	33		220 kV Rengali Sw.
9		132 kV Budhipadar ckt -1	34		220 kV TTPS ckt
10		132 kV Budhipadar ckt. -2	35		220 kV Bus coupler
11		132 kV Sambalpur Fdr.	36	TTPS	220 kV Meramundali-1
12		132 kV Katapali Feeder.	37		220 kV Meramundali-2
13		132 kV ALCO feeder.- 1	38		220 kV Rengali ckt
14		132 kV ALCO feeder - 2	39		220 kV Joda ckt –1
15	Upper Kolab	220 kV Jayanagar ckt-1	40		220 kV Joda ckt –2
16		221 kV Jayanagar ckt-2	41		220 kV Kaniha ckt
17		222 kV Jayanagar ckt-3	42		132 kV Duburi ckt – I
18		220 kV Bus Coupler	43		132 kV Duburi ckt – II
19	Balimela	220 kV Jayanagar ckt-1	44		132 kV Chainpal – 1
20		221 kV Jayanagar ckt-2	45		133 kV Chainpal –2
21		222 kV Jayanagar ckt-3	46		132 kV Angul
22		BY PASS	47	Budhipadar	220 kV IbTPS ckt-I
23		220 kV Upper Sileru	48		221 kV IbTPS ckt-II
24		220 kV Balimela Grid S/S	49		222 kV IbTPS ckt-III
25	Upper Indravati	220 kV Theruvali ckt-1	50		223 kV IbTPS ckt-IV

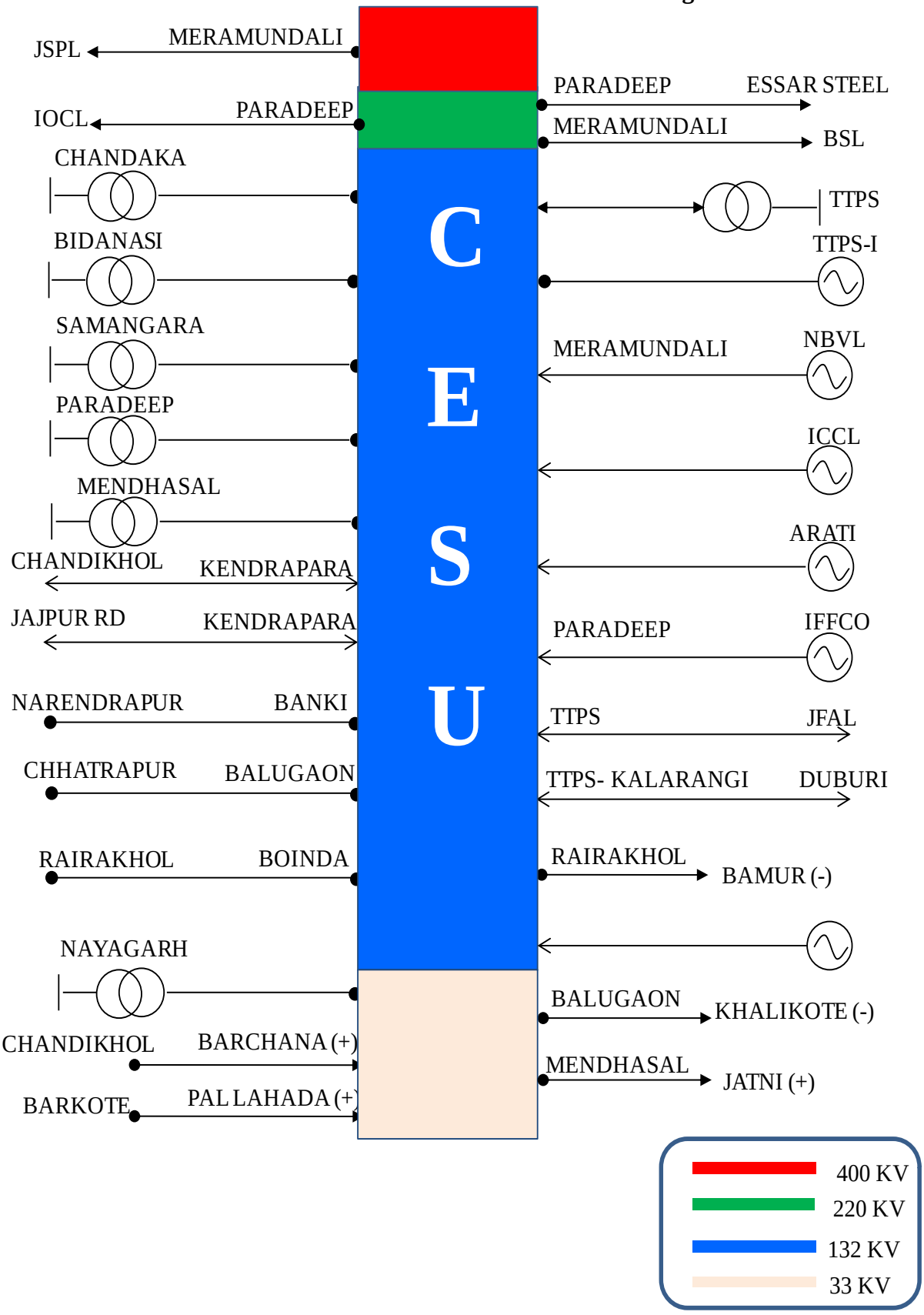
Annexure-XI

Inter State Exchange points



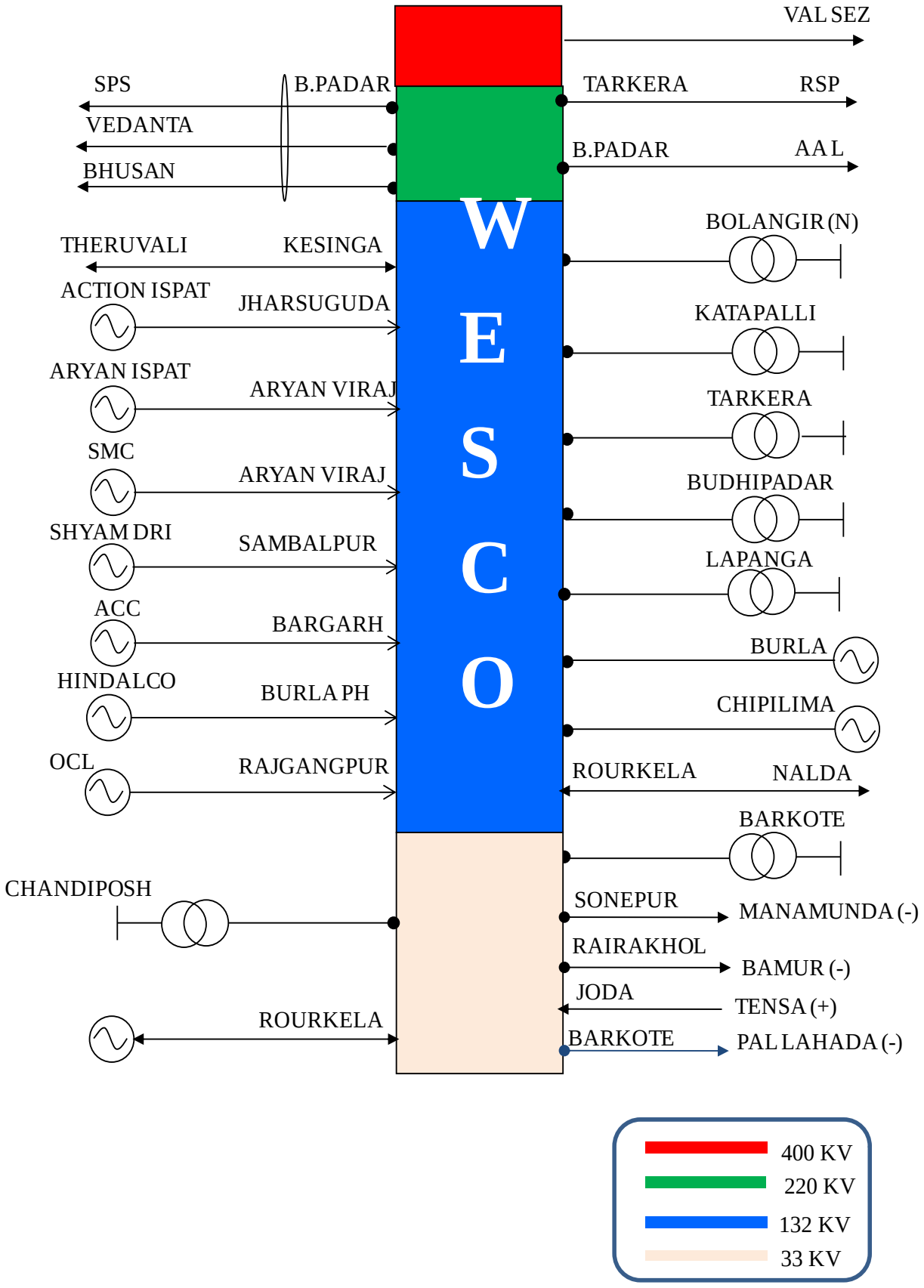
Annexure-XII(a)

CESU Control Area for drawal monitoring



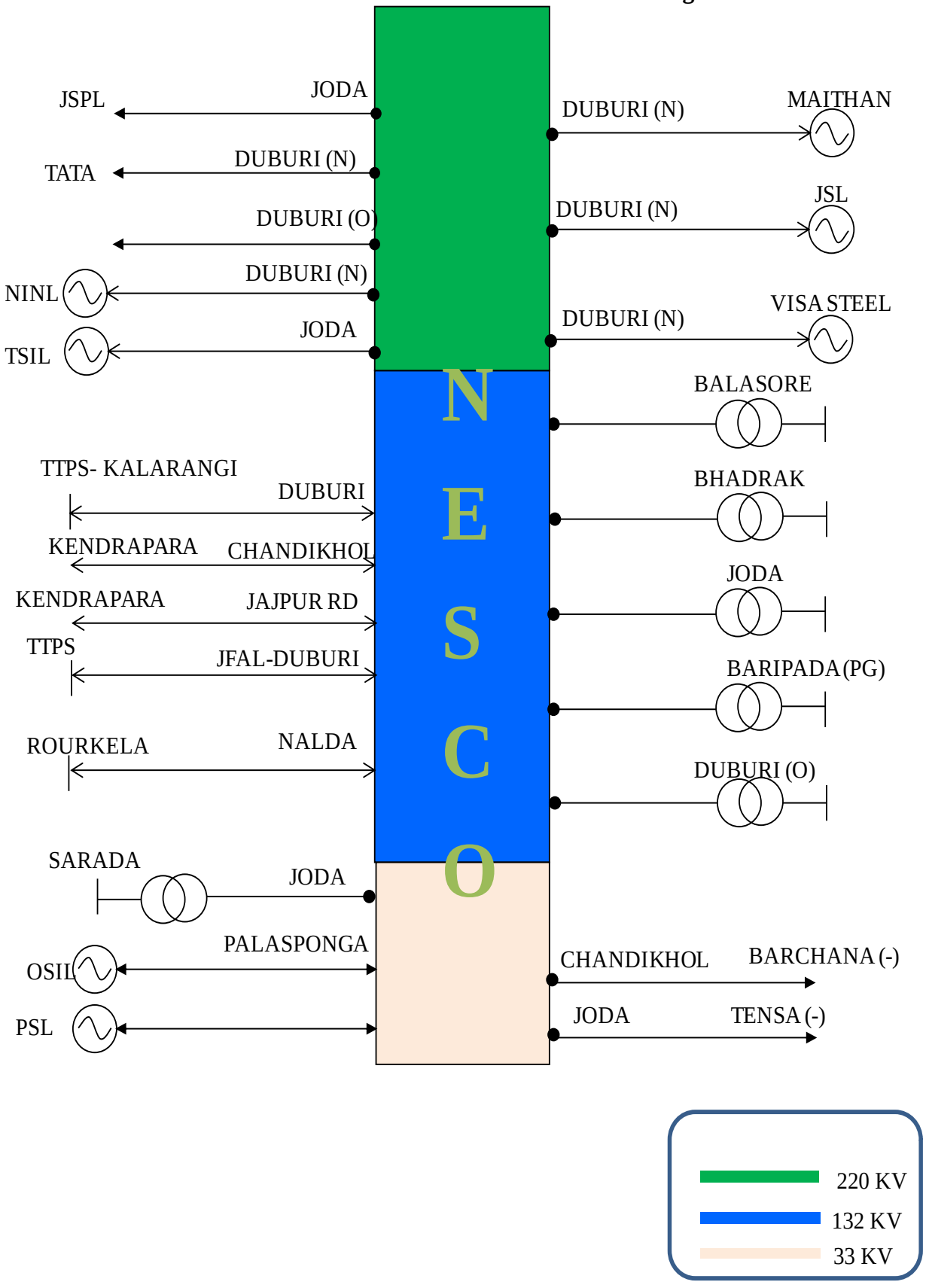
Annexure-XII (b)

WESCO Control Area for drawal Monitoring



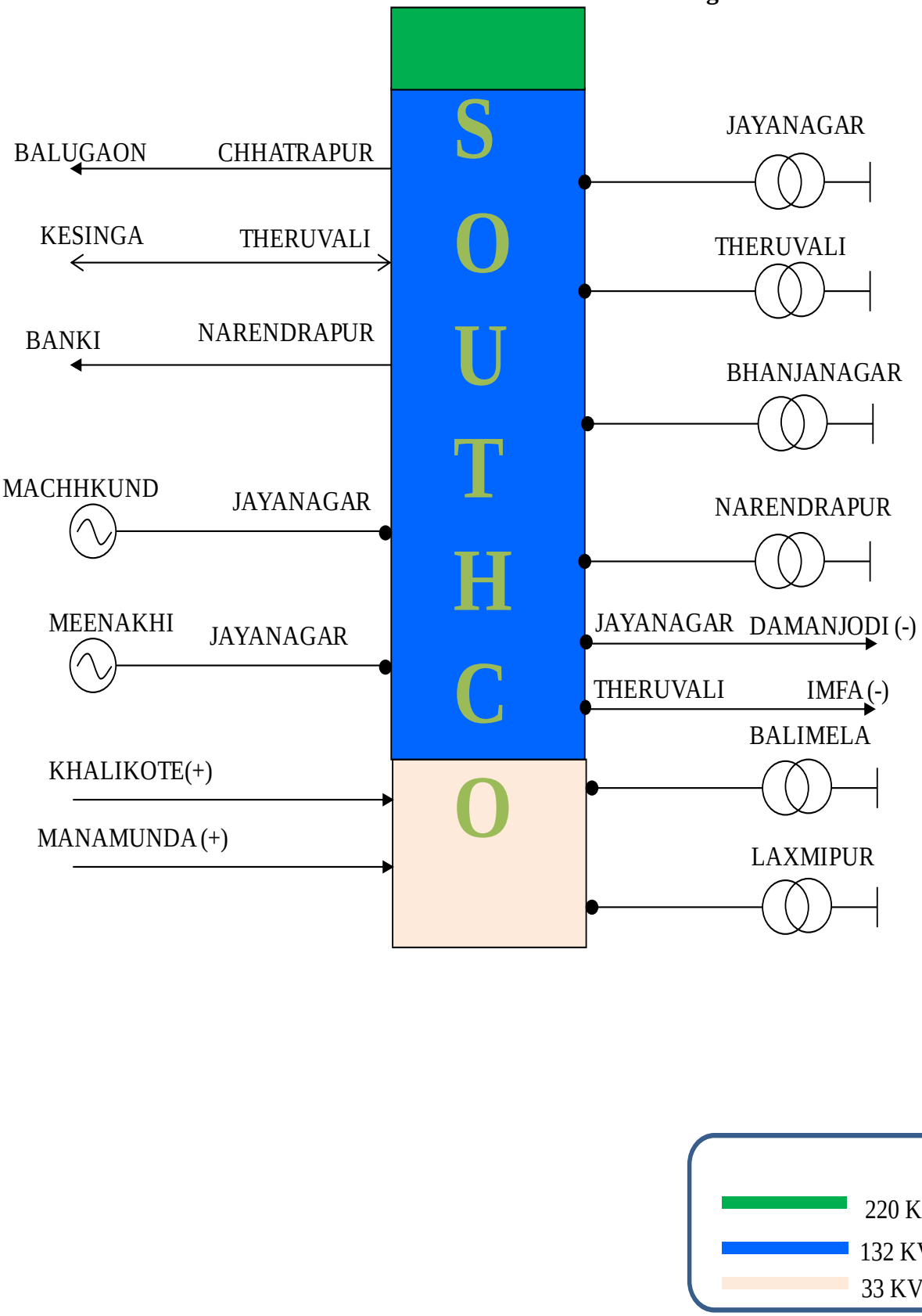
Annexure-XII (c)

NESCO Control Area for Drawal Monitoring



Annexure-XII (d)

Southco Control Area for Drawal Monitoring



Annexure-XIII (a)

State Sector Generation installed capacity

Hydro & Thermal

All Figures in MW

SL.NO.	NAME OF POWER STATION	INSTALLED CAPACITY		FIRM POWER (MW)
1	O.H.P.C.			
	HIRAKUD POWER STATION			
	(a)BURLA	2x49.5 = 99 2x32 = 64 20+1x37.5 = 57.5	220.5	134 Combined capacity of # 5&6 has been derated to 20 MW as per OERC order
	(b)CHIPLIMA	3x24	72	
	BALIMELA POWER HOUSE	6x60 + 2x75	510	135
	RENGALI POWER HOUSE	5x50	250	60
	UPPER KOLAB POWER HOUSE	4x80	320	95
	INDRAVATI POWER HOUSE	4x150	600	224
	MACHHKUND POWER HOUSE (Orissa Share 30%, Purchase upto 20% extra)	3x17 = 51.00 3x23= 69	36	30
	TOTAL HYDRO (A)	**2008.5**		
2	N.T.P.C.(TAKEN OVER)			
	TTPS STAGE-I	4x60 = 240	160.2 (Auxilliary 10.5 %, Avalability 80%)	160.2 (Auxilliary 10.5 %, Avalability 80%)
	TTPS STAGE - II	2x110 = 220	146.85 (Auxilliary	146.85 (Auxilliary 10.5 %, Avalability 80%)
	TOTAL TTPS	= 460		
3	O.P.G.C.			
	IB TPS	2x210 = 420	342.09 (Auxilliary	342.09 (Auxilliary 9.5 %, Avalability 90%)
	TOTAL THERMAL (B)	**880**		

IPP & Small Hydro

Sl.No	POWER STATION	INSTALLED CAPACITY	TOTAL	TYPE	VOLTAGE LEVEL
IPP & SMALL HYDRO					
1	MEENAKSHI POWER LTD.	3X4 + 2X12.5	37	SMALL HYDRO	132 kV
2	ORISSA POWER CONSORTIUM LTD.	4 X 5	20	SMALL HYDRO	132 kV
3	STERLITE ENERGY LTD.,	4 x 600	2400	THERMAL	400kV
4	GMR KAMALANGA ENERGY LTD.	3x350	1050	THERMAL	400kV
		TOTAL	**3507**		

Renewable Projects

Sl.No	POWER STATION	INSTALLED CAPACITY	TOTAL	TYPE	CONNECTIVITY VOLTAGE
1	ABACUS HOLDINGS PVT. LTD	1 MW	1	SOLAR	11 KV
2	AFTAAB SOLAR PVT. LTD.	5 MW	5	SOLAR	33 KV
3	ALEX GREEN ENERGY PVT LTD.	5 MW	5	SOLAR	33 kV
3	JAY IRON & STEEL	1 MW	1	SOLAR	11 KV
4	J.K. PAPER LTD.	5 MW	5	BIOMASS	132 KV
4	M.G.M. MINERALS LTD.	1 MW	1	SOLAR	11 KV
5	MOLISATI VINIMAY PVT. LTD.	1 MW	1	SOLAR	11 KV
6	PANTIME FINANCE COMPANY PVT. LTD.	1 MW	1	SOLAR	11 KV
7	RAAJRATNA ENERGY PVT. LTD.	1 MW	1	SOLAR	11 KV
8	S. N. MOHANTY	1 MW	1	SOLAR	11 KV
9	SHALIVAHAN GREEN ENERGY LTD.	20 MW	20	BIOMASS	132 KV
10	MAHAVIR FERRO ALLOYS PVT. LTD.(SO	1 MW	1	SOLAR	33 KV
11	MCL, BURLA	2 MW	2	SOLAR	11 kV
12	ACME SOLAR, MURSING, BOLANGIR	25 MW	25	SOLAR	132 kV
		TOTAL	**70**		

Annexure-XIII (b)

Central Sector Installed capacity & State's share

SL.NO.	NAME OF POWER STATION	INSTALLED CAPACITY	OPTCL'S SHARE OF INSTALLED CAPACITY 0N REALTIME BASIS.		AUX. CONS.	% AGE AVAILABILITY (excluding UA)
			% age	MW	%	%
1	CHUKHA (BHUTAN)	4 x 84 = 336 (Considering 270 MW, total availability)	15.19	41.00		85
2	TALA(BHUTAN)	6 x 170 = 1020	4.25	43.40		
3	FARAKKA (WEST BENGAL)	3 x 200 = 600 2 x 500 = 1000	14.09	225.40	7.5	77.91
		1 x 500 = 500	17.06	85.30		85
4	KAHALGAON (BIHAR)	4 x 210 = 840	15.24	128.00	9	53.98
		3 x 500 = 1500	2.05	31.00	9	62.11
5	TSTPP, KANIHA (ORISSA)	2 x 500 = 1000	32.26	322.60	7.5	85
		4 x 500 = 2000	10	200.00	7.5	
6	TISTA	3 x 170 = 510	20.59	105.00		85
7	BARH	1x660	12.57	82.96		
		TOTAL ISGS		**1264.66**		

CGP Installed Capacity

1	AARATI STEEL GHANTIKHAL	1 X 40 + 1 X 50	90	THERMAL	132 kV
2	ACC, BARGARH	1 x 30	30	THERMAL	132 kV
3	ACTION ISPAT & POWER PVT. LTD.	1 X 12 + 1 X 25 + 1 X 43	80	THERMAL	132 kV
4	ARYAN ISPAT & POWER PVT. LTD.	1 X 18	18	THERMAL	132 kV
5	ADITYA ALUMINIUM Ltd	3x150	450	THERMAL	220 kV
6	BHUSAN STEEL	1 X 33+1 X 77+ 2 X 150	410	THERMAL	220 kV
7	BHUSAN POWER & STEEL LTD,	1X60 + 1X40 + 2X130 + 2 X 8	376	THERMAL	220 kV
8	EMAMI PAPER MILLS.	1 X 15 + 1 x 5	20	THERMAL	132 kV
9	FACOR POWER	1 X 45	45	THERMAL	132 kV
10	HPCL(HINDALCO),(HIRAKUD)	1 X 67.5 + 3 x 100	367.5	THERMAL	132 kV
11	IMFA(CHOUDWAR)	2 X 54 + 1 X 30 + 2 X 60	258	THERMAL	132 kV
12	IFFCO (PARADEEP)	2 X 55	110	THERMAL	132 kV
13	JINDAL STAINLESS LTD., DUBURI	2 X 125 + 1 X 13	263	THERMAL	220 kV
14	JINDAL STEEL & POWER LTD.,	6 X 135	810	THERMAL	220 kV
15	NINL (DUBURI)	2 X 19.25 + 1 X 24	62.5	THERMAL	220 kV
16	MAHAVIR FERRO ALLOYS PVT. LTD.	1 X 12	12	THERMAL	33 kV
17	MAITHAN ISPAT NIGAM LTD., Jajpur	1 x 30	30	THERMAL	220 kV
18	MSP METTALLICS LTD.	1 x 25	25	THERMAL	132 kV
19	NALCO(ANGUL)	10 X 120	1200	THERMAL	220 kV
20	NALCO(DAMANJODI)	18.5x4	74	THERMAL	132 kV
21	NARBHERAM POWER & STEEL PVT.	1 x 8	8	THERMAL	132 kV
22	NBVL (MERAMUNDALI)	1 X 30 + 1X 65	95	THERMAL	132 kV
23	OCL INDIA LTD., RAJGANGPUR	2 X 27	54	THERMAL	132 kV
24	ORISSA SPONGE IRON & STEEL LTD.	1 X 24	24	THERMAL	132 kV
25	PATTANAIK STEEL, (KEONJHAR)	1 X 15	15	THERMAL	33 kV
26	RATHI STEEL & POWER LTD.	1 X 20	20	THERMAL	33 kV
27	RSP(ROURKELA)	2 X 60 + 4 X 25	220	THERMAL	220 kV
28	SEVEN STAR STEELS LTD.	1 X 8	8	THERMAL	33 kV
29	SHYAM DRI, (PANDOLI,	1 X 30	30	THERMAL	132 kV
30	SMC POWER GENERATION LTD.	1 X 8 + 1 X 25	33	THERMAL	132 kV
31	SREE GANESH	1 X 32	32	THERMAL	132 kV
32	TATA SPONGE IRON (JODA)	1 X 18.5 + 1 X 7.5	26	THERMAL	220 kV
33	VEDANTA (JHARSUGUDA))	9 X 135	1215	THERMAL	220 kV
34	VEDANTA (LANJIGARH)	3 X 30	90	THERMAL	132 kV
35	VISA STEEL LTD., (NEW DUBURI)	3 X 25	75	THERMAL	220 kV
36	YAZDANI STEEL & POWER.	1 X 10	10	THERMAL	33 kV
		TOTAL	**6686**		

Annexure-XIV

Schematic diagram of OPTCL network