

**GUJARAT ELECTRICITY REGULATORY COMMISSION  
AHMEDABAD**

**CORAM**

**Dr. P.K. Mishra, Chairman  
Shri Pravinbhai Patel, Member**

**Order No. 3 of 2010**

**Amendment to Order No.3 of 2006 dated 11<sup>th</sup> August, 2006 in the matter of “Bringing Generating Stations of Gujarat State, Distribution Licensees and other persons under the purview of Intra-State Availability Based Tariff (Intra-State ABT)”.**

1. The Commission had earlier issued its Order No.3 dated 11<sup>th</sup> August, 2006 in the matter of bringing Generating Stations of Gujarat State, Distribution Licensees and other persons under the purview of Intra-State Availability Based Tariff (Intra-State ABT). The order paved the way for introduction of Intra-State ABT in the State for the first time. As provided therein, intra-state ABT was to be operated initially on trial run (as a mock exercise) and based on the feedback received from the mock exercise, the Commission was to review the provisions of the order.
2. Accordingly, the SLDC/GETCO (STU) have been carrying out mock exercises as per the aforesaid order starting from August, 2006.
3. Based on the experiences gained during the mock exercise, Gujarat



Energy Transmission Corporation Ltd. filed Petition No.931 of 2008 for resolving the impediments felt during implementation of Intra-State Availability Based Tariff and to seek further directives from the Commission.

4. The Commission had conducted hearing of the aforesaid petition and considered the submissions made by the parties. During the hearing, some issues regarding participation of M/s. Essar Power Ltd., Torrent Power Ltd., and various steel industries came to the notice of the Commission. The Commission, vide its order dated 08.05.2009 decided to seek advise of an expert on Availability Based Tariff to assess readiness of SLDC and to address other issues.
5. The Commission, thereafter, sought assistance of Shri Bhanu Bhushan, ex-Member, CERC to assess readiness of SLDC in implementation of intra-state ABT and to resolve some of the issues raised by different entities during the hearing of Petition No.931 of 2008. Based on the report of Shri Bhanu Bhushan and meetings with the parties concerned, the Commission hereby decides to operationalise the intra-state ABT in the State of Gujarat in the manner outlined in this order.
6. On the basis of the above consultation process, the Commission observed that there was a need for amendments to its earlier order dated 11<sup>th</sup> August, 2006. The Commission, therefore, makes the amendments to its order No.3 of 2006 dated 11<sup>th</sup> August 2006, as given in **Annexure-I** to this order.



7. The Commission's resolve/decision to implement the Intra-State ABT is already recorded in its order dated 11.8.2006. The present order is to clarify/streamline certain provisions of the earlier order and to decide the date of its actual implementation. This order is to be read along with the earlier order dated 11.8.2006, the contents of which are not being repeated, but are reiterated (to be read along with the amendments listed in Annexure-1).
8. The basic UI rate for intra-State entities in Gujarat shall be in line with the CERC notifications on the matter as amended from time to time. The present UI rates, as per CERC Notification dated 30.03.2009, are included in Annexure-1.
9. In the above referred CERC notification, the UI rate for generating stations using coal, lignite or APM gas, and whose tariff is determined by CERC under clause (a) of sub-section (1) of section 62 of the Act, has been capped at 408 paise per kWh, both for over-generation and under-generation. However, for the intra-State generating stations in Gujarat, we do not propose to specify any such UI rate cap, for reasons given below.
- (i) The UI rate applicable on the periphery of the State has no such cap. When frequency is in the 49.6 – 49.2 Hz range, the State shall have to pay the full UI rate for any over-drawal and it shall get paid at the full UI rate for any under-drawal. It shall, therefore, be in the interest of the State as a whole to encourage all available intra-State generating



stations having variable cost upto the prevailing UI rate to maximize their generation. A UI rate cap would restrict such encouragement, and no entity would gain anything by imposition of such a UI rate cap.

- (ii) CERC has imposed restrictions on over-drawal by the State when frequency falls below 49.5 Hz, and has stipulated an additional UI charge @ 40% of the ceiling UI rate for any over-drawal when frequency falls below 49.2 Hz. The State should therefore, endeavour to avoid getting into over-drawal mode when frequency is below 49.5 Hz. This too requires intra-State generation to be maximized, for which the incentive would be directly provided by paying the full (i.e. uncapped) UI rate to all generating stations.

10. In addition to UI rate corresponding the frequency below 49.22Hz, an additional UI charge shall also be applicable at the rate stipulated by CERC from time to time for overdrawl or under-injection of electricity for each time block when grid frequency is below 49.20 Hz. The present rate of additional UI charge is the rate equivalent to 40% of the UI rate corresponding to frequency below 49.22 Hz. This additional UI amount will also be put up in UI pool account and balancing shall be done including this additional UI amount.

11. The issues regarding implementation of intra-State ABT in the Essar complex at Hazira that have been resolved between the parties are as under:

The Essar Complex at Hazira comprises of:



- (i) A Steel plant of M/s. Essar Steel Limited (ESL) which is an industrial consumer of DGVCL.
- (ii) 515 MW Combined Cycle Power Plant of Essar Power Limited (EPOL) which is an IPP.
- (iii) 505 MW Captive Power Plant of Bhandar Power Limited (BPL)/Essar Group of Companies.

All these entities along with the evacuation lines of GETCO., are connected to a common 220 KV bus system. Treatment of power injection/drawal by these entities shall be as under:-

- (a) The IPP of EPOL have allocation to ESL and GUVNL, and both of them shall be entitled to share the ex-bus availability of EPOL in the ratio of their allocation. Drawal schedules of ESL and GUVNL from EPOL will be as per their requisitions against the above entitlements. Total schedule of IPP will be equal to the sum of these drawal schedules.
- (b) GUVNL shall pay to EPOL on the basis of their scheduled energy.
- (c) ESL shall pay to EPOL, capacity and energy charges for their schedules as per terms of their PPA.
- (d) Net metered injection of EPOL into the 220 KV bus will be compared with the scheduled injection, and the deviation shall be accounted as UI. For all under injection EPOL, shall pay UI charges to the State UI



Pool account @ 105% of the basic UI rate and for all over-injection, it will receive UI charges @ 95% of the basic UI rate.

- (e) Injection by EPOL shall generally be allowed without any restriction, so long as (a) it does not result in over loading in GETCO system, and (b) the actual injection does not exceed its declared availability to an extent that indicates under-declaration (gaming).
- (f) Similarly, the CPP of ESL shall be treated as an independent generator with schedules to both ESL and GUVNL. Injection by the CPP shall be subject to UI charges similar to those discussed above for the IPP.
- (g) The Steel plant of ESL is an industrial consumer of DGVCL. Its actual metered drawal over and above the schedules from the IPP and the CPP, shall be deemed drawal from the DISCOM.
- (h) ESL shall pay to DISCOM as per their existing contract.

The detailed procedure in respect of Essar Complex along with the illustrative examples is placed at **Annexure-II**.

12. The above will be a part of the scheme for commercial operationalization of Intra-State ABT in the Essar Hazira Complex.
13. Detailed Procedures on Scheduling and Dispatch for Intra-State ABT is provided as **Annexure-III**.



14. Provisions regarding metering and accounting of injection by Wind Energy Generators by GEDA, shall continue to be in accordance with clauses 17 & 19 of the Order No.3 of 2006.

15. In the conclusion, the Commission directs that the Intra-State ABT in the State of Gujarat shall be fully implemented with all its commercial aspects w.e.f. 5<sup>th</sup> April 2010. The directions and observations made in this order are to be taken as a part of Order No.3 of 2006. In case of any issues which are already under dispute between the parties before any other forums the parties shall not take a plea before such other Forum that the matter has been resolved by the Commission.

16. SLDC is directed to take necessary action for commercial operationalization of Intra State ABT order as stipulated above.

Sd/-

(Dr. P. K. MISHRA)  
CHAIRMAN

Sd/-

(PRAVINBHAI PATEL)  
MEMBER (T)

Place: Ahmedabad

Date : 01.04.2010



**Amendments to Order No. 3 of 2006 dated 11.8.2006**

1. Second sentence of Para 6 “ In the existing ...” shall be amended as below :  
“In the existing Interstate ABT, Gujarat participates as a single unit connected to the Western grid and is liable to **receive or pay UI charges** in case of deviations from schedule.”
  
2. Second and Third sentence of Para 7.C (i), viz. “The Commission has .... GERC Tariff Regulations”, shall stand amended as below:  
  
“The Commission has considered it appropriate and incorporated the UI rates and threshold frequencies for UI rate as determined by CERC in the CERC (Unscheduled Interchange charges and related matters) Regulations.
  
3. Sub-para (v) of para 7.c shall stand amended as follows:  
  
"UI shall be worked out for each 15-minute time block. Charges for all UI transactions shall be based on average frequency of the time block and the basic UI rate for intra-State entities in Gujarat. The basic UI rates for intra-State entities in Gujarat from the date of operationalization of implementation of Intra-state ABT Order shall be in line with the CERC notification dated 30.3.2009 and amendments made in the same from time to time. The present rates, as stipulated in CERC Regulation dated 30<sup>th</sup> March2009, are as given below:





Average frequency of time block (Hz)		UI Rate (paise per kWh)
Below	Not below	
-	50.30	0
50.30	50.28	12
50.28	50.26	24
--	--	--
50.04	50.02	168
50.02	50.00	180
50.00	49.98	192
--	--	--
49.52	49.50	480
49.50	49.48	497
49.48	49.46	514
--	--	--
49.24	49.22	718
49.22	--	735

(Each 0.02 Hz step is equivalent to 12.0 paise/kWh in the 50.3-49.5 Hz frequency range and to 17.0 paise/kWh in the 49.5-49.2 Hz frequency range).

4. A new Sub-Para shall be added in para 7.c as hereunder:

(vii) The UI rates applicable for all deviations from schedule for the Discoms,



licensees and generating stations under ABT shall be the basic UI rates as specified in sub-para (v) above. The UI rates applicable for Essar IPP, and all the CPPs shall be 95% of the basic UI rates for over-injection and 105% of the basic UI rates for under-injection. For industries having CPPs opting for this provision, the UI rates payable to them for any power injection into the grid shall be 95% of the basic UI rates. Injection from Renewable Energy sources like Wind, Solar energy generation into the grid, which is not covered by any other commercial arrangement, shall be paid for at 85% of the prevailing tariff rate determined by the Commission for such generation from time to time.

5. A new Sub-Para shall be added in para 7.c as hereunder:

(viii) In addition to UI Rate corresponding to frequency below 49.22 Hz, as stipulated under Sub para 7.c(v), an Additional Unscheduled Interchange Charge at the rate equivalent to 40% of the UI Rate corresponding to frequency below 49.22 Hz shall be applicable for over-drawal or under-injection of electricity for each time-block when grid frequency is below 49.22 Hz.

Provided that this additional UI amount will also be put up in UI pool account and balancing between receivable and payable shall be done including this additional UI amount.

**Note:** The Additional Unscheduled Interchange Charge shall be reviewed by the Commission from time to time, and revised, if necessary through separate orders.

6. Sub-para (d) of para 8 shall be amended as below:

“d. All CPPs above 15 MW capacity, injecting their generation for wheeling excluding wind, solar and mini hydro generator”

“e. All Distribution licensees specified by the Commission”

“f. All intra-state Open Access Users”

7. Para 9(a) of the order dated 11<sup>th</sup> August’2006 shall be deleted and note should be added after para 9(b) as under:

**Note:** The above shall be introduced in a phased manner as per the readiness



of the SLDC with required infrastructure.

8. In para 10.c, the last sentence, viz. “For any reactive energy charges payable to Regional REC pool account, the same will be pooled with State reactive account and shared by all beneficiaries” shall be deleted.
9. Para 10.f shall stand modified as follows:  
“Switching in/out of all 400 kV and 220 kV lines and bus/line Reactors throughout the State grid shall be carried out according to the instructions of SLDC/RLDC. Tap changing on all 400/220 kV ICTs shall also be done only according to the instructions of SLDC/RLDC subject to technical feasibility and in accordance with mutual consent of the entities concerned”.
10. The second sentence of para 10(g) shall stand amended as follows:  
The generating units for which full annual fixed costs are being borne by the beneficiaries through the capacity charge under ABT shall not get any payment for VAr Generation/ absorption.
11. In Sub para 10 (h), the following statement shall be appended:  
“Provided that reactive charges of wind energy generators and CPPs governed by above said GETCO order, shall be excluded from member of reactive pool account and dealt separately.
12. Para 11 of the order dated 11.8.2006 stands amended as follows:  
  
“The methodology of scheduling shall be according to the provision of Scheduling and Despatch Code, enclosed as Annexure-III”.
13. In para 12.a, “(excluding generating stations having total capacity of not less than 5 MW and upto 15 MW opting for injection under UI)” shall stand replaced by “under ABT (as per para 8)”, and para 12.c shall stand deleted.
14. Para 13.a shall be amended as follows:



“Any generating station under ABT may be required to demonstrate its declared capability as and when asked by the SLDC. In the event of the generating station failing to demonstrate .....

15. Para 14.a shall stand amended as follows:

“ABT compatible interface meters according to the Central Electricity Authority (Installation and Operation of Meters) Regulation, 2006 shall be provided by STU at the periphery/terminals of all intra-State entities listed in para 8 above, all open access users, and all entities proposed to be covered by UI mechanism under para 9. All expenses including installation charges and all other charges incurred by STU for providing ABT compatible meters shall be reimbursed to the STU by the entity/consumer concerned”.

16. In para 15.d, the word “private sector and” in sub-para (ii) and also Sub-para iv stands be deleted.

17. Para 16(f) and (g) shall stand deleted.

18. Sub para 16(h) shall be amended as below:

h. The summation of station-wise ex-bus dispatch schedules from each generating station and any bilaterally agreed interchanges of each beneficiary shall be adjusted for pooled transmission losses estimated by SLDC on weekly basis. Such corrected drawal schedule shall be compared with the actual net drawal of the beneficiary for UI charges.

19. In Sub para 16(i), the word “Wednesday” appearing in first sentence shall be replaced by “Friday”.

State pool accounts for (i) payments regarding unscheduled - interchanges (UI Account) and (ii) reactive energy exchanges (Reactive Energy Account), shall be prepared by the SLDC on weekly basis and these shall be issued to all constituents by Friday and Wednesday respectively of the Week following the next Week for the seven-day period ending on the previous Sunday mid-night.



20. In para 16.k, “@ 0.05%” shall stand amended as “@ 0.04%”.

21. Para 16.l shall stand amended as follows:

“If total payment receivable in the State UI pool account, after accounting for the receivables from/payables to the Regional UI pool account, is more or less than the UI payable, UI payable/receivable for the intra-State entities will be proportionately adjusted to make the payable and receivable amounts equal”

22. In para 16.m, “including that to the Regional reactive energy account” shall be inserted after “pay-out of all VA r charges”.

23. In para 17, following para to be added at the end of last statement:

Till installation of ABT compliant meters on each WEGs, SLDC shall work out suitable methodology for the determination of allocation of power (injected into the grid) to each distribution licensee, in each 15 minute base slot. GEDA shall provide a weekly energy injected by each WEGs to SLDC indicating allocation to respective distribution licensee, SLDC shall work out proportionate allocation to each distribution licensee. The energy set off to each distribution licensee thereafter be derived in 15 minute basis by applying allocation on data furnished from ABT meter installed at polling station.



**DETAILED PROCEDURE IN RESPECT OF ESSAR COMPLEX  
ALONGWITH THE ILLUSTRATIVE EXAMPLES.**

- (i) The ESSAR complex at Hazira presently comprises of (i) a steel plant of Essar Steel Limited (ESL), (ii) a 515 MW combined cycle power plant of Essar Power Limited (EPOL), and (iii) a 505 MW captive power plant of Bhandar Power Limited (BPL) /ESL (Essar Group of Companies). All these are connected to a 220KV bus system in such a way that tie lines connected with CPP and the all four lines of GETCO terminate at same bus. Without going into the background and past debates/arguments, the solution agreed for enabling implementation of intra-State ABT is presented below through the following illustration.
- (ii) The 515 MW combined cycle plant of EPOL, an Independent Power Producer (IPP), has two beneficiaries, i.e. GUVNL and ESL, with allocations of 300 MW and 215 MW respectively. Suppose the plant declares as ex-Power Plant (ex-PP) availability of 500 MW for the next day. Entitlements of GUVNL and ESL in the same would be  $500 \times 300/515 = 291$  MW and  $500 \times 215/515 = 209$  MW respectively. Suppose GUVNL gives a requisition of 291 MW during peak load hours and 200 MW during off-peak hours and ESL requisitions 180 MW for the whole day. The schedule for IPP would then be  $291 + 180 = 471$  MW for peak-load hours and  $200 + 180 = 380$  MW for off-peak hours.
- (iii) There is an existing PPA between EPOL and GUVNL, provisions of which



would continue to be applicable except as amended by mutual agreement between the parties and / or as ordered by this Commission. For the present, GUVNL has sought an amendment only to the extent that the payment of energy charges and computation of fixed charges be made for scheduled energy instead of actual energy, and all deviations from schedule be accounted as UI. Such an amendment is considered necessary and appropriate while implementing intra-State ABT. Other amendments to the PPA can be considered by the Commission in due course in consultation with parties to the PPA.

(iv) GUVNL would then pay to EPOL for 5,346 MWh ( $291 \times 6 + 200 \times 18$ ) of energy. Payment will be for fixed as well as variable charges as stipulated in their PPA. ESL would pay to EPOL for 209 MW of plant availability and for  $180 \times 24$  MWh of energy as per terms of their PPA. Further, the net injection of the IPP into the 220 kV bus at Essar complex will be metered by GETCO/SLDC and all deviation from the schedule (471 MW and 380 MW during peak-load hours and off-peak hours respectively) shall be accounted as UI for the IPP. EPOL would pay into State UI pool account for all under-injection @ 105% of the basic UI rate notified by the Commission, and receive payment for all over-injection @ 95% of the basic UI rate.

(v) The above would generally cover the commercial arrangements for the IPP, and nothing further needs to be stipulated except regarding supply/absorption of reactive energy, which will be dealt with separately. Normally, deviations from schedule would be allowed without any restriction, as long as (i) GETCO lines are not getting overloaded, and (ii) the actual injection does not exceed the plant



availability declaration to an extent that indicates deliberate under-declaration (gaming).

(vi) As agreed between Essar Power Limited, Essar Steel Limited, ESSAR CPP/BPL, GUVNL and GETCO in their minutes of meeting dtd. 13th May, 2009 the Day ahead schedule and subsequent revision in scheduling of EPOL, Essar CPP and ESL will be carried out on 15 minutes basis in accordance with the procedure mentioned in Scheduling and Dispatch Code. Requisition of Essar Steel will be reflected in Schedule. However, EPOL and Essar CPP (BPL) will be members under Intra-State ABT whereas ESL will not be a UI Pool Member. The accounting of EPOL, Essar CPP (BPL) and ESL will be carried out on 15 minute basis for calculating deviation from schedule & imbalance energy accounting.

(vii) Suppose the Essar CPP indicates day ahead schedules of 300 MW in each 15 minutes time block to the ESL and of 150 MW to GUVNL in each 15 minutes time block adding up to 450 MW. The actual injection during 15 minute time block will be metered by GETCO / SLDC, and all deviations from the schedule (450 MW) will be accounted as UI for the CPP. All over-injections will be paid for from the State UI pool account to the CPP @ 95% of the basic UI rate, and for any under-injections, CPP will pay @ 105% of the basic UI rate. In addition, CPP will be paid for 150 MW of scheduled supply to GUVNL as per the agreement between them.

(viii) The steel plant of ESL would remain an industrial consumer of the local





Discom, and supply of power to it from GETCO system will be governed by the relevant tariff of the Discom. Even after implementation of intra-State ABT, the above status of ESL shall continue except as discussed hereunder.

(ix) Suppose the Essar Steel Limited (ESL) is drawing 500 MW of power from the 220 KV bus during a particular 15 minute time block. Out of this, 180 MW is the schedule of ESL in that particular 15 minute time block from EPOL and 300 MW is the schedule of ESL in that particular 15 minute time block from Essar CPP (BPL). However, Commission is not expressing any view for applicability of transmission losses for wheeling of power from Essar Power, Essar CPP to Essar Steel as the matter is subjudice before Hon'ble high court. The drawal of the Essar steel plant (ESL) from DISCOM in that particular time block is then  $(500 - 180 - 300) = 20$  MW. However, since the meters installed on 220 KV feeders to the steel plant (ESL) would record a drawl of 500 MW, it is necessary to deduct 480 MW from meter recording to determine what is payable by steel plant to the DISCOM.

(x) The DISCOM tariff for the steel plant (ESL) has a demand charge component and the ESL has a contract capacity of 44.5 MVA with DISCOM. The tariff also has an energy charge component for actual energy drawn.. The maximum demand on 30 minutes time block and energy drawn by the ESL from DISCOM shall be computed on the basis of what is recorded in ABT meter installed on 220 KV drawl point of ESL. However, the distribution licensee shall issue the bill for the demand charge and energy charges to the ESL based on consumer tariff category under which Essar Steel Limited governed by the tariff order



issued by the Commission from time to time. The demand of ESL shall be worked out on 30 minutes block in the category of consumer tariff approved by the Commission in the Tariff Order while the energy is calculated on the basis of energy recorded in ABT meter in 15 minutes time block minus energy scheduled from EPOL minus energy scheduled from Essar CPP (BPL) during that time block. The maximum of such demand worked out during 30 minutes time block during the month shall be actual demand drawn by ESL from DISCOM and billing of ESL by DISCOM shall be done accordingly. The energy drawn by ESL from DISCOM shall be the sum of such net draws in 15 minutes time block during the month and energy charges shall be billed accordingly.

- (xi) M/s. Essar Power Limited, Essar Steel Limited, GETCO and GUVNL mutually agreed on 13<sup>th</sup> May, 2009 that ESL shall not be a member of UI pool account and therefore, in case the actual drawal of ESL during a 15 minute time block is less than the total scheduled drawal of ESL from EPOL and Essar CPP (BPL), in such case the under-drawal of energy by ESL shall be added in the metered injection of Essar CPP (BPL) during that particular time block for the purpose of determining the UI of Essar CPP (BPL). To illustrate, if total energy drawal of the steel plant (ESL) for a 15 minute time block is 107.5 MWh (against a schedule of 120 MWh for the same 15 minute time block, implying a under-drawal of 12.5 MWh) and the actual injection by Essar CPP (BPL) is 115 MWh (against a schedule of 112.5 MWh for the same 15 minute time block, implying a over injection of 2.5 MWh), the UI for the Essar CPP (BPL) shall be revised to  $(115 + 12.5 - 112.5) = +15.0$  MWh (over injection), for that time block.

- (xii) The treatment specified above would address a major objection of M/s. Essar,



and would enable trouble-free and dispute-free operation of the plants and the commercial scheme in which no party would suffer a loss. Also the captive nature of CPP would be retained. GETCO/SLDC have already installed the special energy meters on 220 kV feeders to the IPP and CPP. They need to install similar meters on the 220kV feeders to the steel plant as well, for applying the UI adjustment proposed in the previous paragraph. The Essar Steel Limited shall not have any direct impact of Unscheduled Interchange (UI).



**SCHEDULING AND DISPATCH CODE**

**1. Introduction**

This annexure sets out the

- a) Demarcation of responsibilities between various intra-State entities and SLDC in scheduling and dispatch
- b) the procedure for scheduling and dispatch
- c) the reactive power and voltage control mechanism
- d) complementary commercial mechanisms (in the **Attachment– 1**).

**2. Objective**

This code deals with the procedures to be adopted for scheduling of the net injection/drawals of the intra-state entities concerned on a daily basis with the modality of the flow of information between the SLDC, ALDCs and intra-state entities. The procedure for submission of capability declaration by each Generating Station and submission of requisition/drawal schedule by other state entities is intended to enable SLDC to prepare the dispatch schedule for each Generating Station and drawal schedule for each state entity. It also provides methodology of issuing real time dispatch/drawal instructions and rescheduling, if required, to intra-state entities along with the commercial arrangement for the deviations from schedules, as well as, mechanism for reactive power pricing. The provisions contained in this annexure are without prejudice to the powers conferred on SLDC under sections 32 and 33 of the Electricity Act, 2003.



### **3. Scope**

This code will be applicable to SLDC, ALDCs and other intra-state entities including Generators/ Captive Generating Plants (CGP)/Independent Power Producers (IPPs)/Discoms/State Transmission Utilities (STUs) and other beneficiaries of the State grid.

### **4. Demarcation of responsibilities**

1. The SLDC shall coordinate the scheduling of all such generating stations located within the State, which are not scheduled by the RLDC in terms of CERC regulations as notified from time to time. The SLDC shall also be responsible for such generating stations for (i) real time monitoring of the station's operation, (ii) checking that there is no gaming in its availability declaration, (iii) revision of availability declaration and injection schedule, (iv) switching instructions, (v) metering and energy accounting, (vi) issuance of UI accounts, (viii) collections/disbursement of UI payments, (viii) outage planning, etc.

2. The State grid shall be operated as loose power pool (with decentralized scheduling and dispatch), in which the Discoms shall have full operational autonomy, and Area Load Dispatch Centers(ALDCs) shall have the total responsibility for (i) regulating the demand of their customers, (ii) scheduling their drawal from the Generating Stations and Inter-State Generating Station (ISGS) (within their share in the respective plant's



expected capability), (iii) arranging any bilateral interchanges, and (iv) regulating their net drawal from the State grid as per following guidelines.

3. The system of each Discom shall be treated and operated as a notional control area. The algebraic summation of scheduled drawal from Generating stations and ISGS and any bilateral inter-change shall provide the drawal schedule of each Discom, and this shall be determined in advance on daily basis. While the Discoms would generally be expected to regulate their consumers' load so as to maintain their actual drawal from the State grid close to the above schedules, a tight control is not mandated. The Discoms 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.

4. The above flexibility has been provided in view of the fact that all Discoms do not have all requisite facilities for minute-to-minute on-line monitoring of the actual net drawal from the State grid, as also the fact that the only manner in which a Discom can regulate its net drawal from the State grid is through curtailment of consumer load, which should be avoided. Deviations from net drawal schedule are, however, to be appropriately priced through the Unscheduled Interchange (UI) mechanism.

5. Provided that the Discoms, through their ALDCs, shall always endeavour to restrict their net drawal from the grid to within their respective drawal schedules, whenever the system frequency is below 49.5 Hz. When



the frequency falls below 49.2 Hz, requisite load shedding shall be carried out in the concerned Discom(s) to curtail the over-drawal.

6. The Discoms shall regularly carry out the necessary exercises regarding short-term and long-term demand estimation for their area, to enable them to plan in advance as to how they would meet their consumers' load without overdrawing from the grid.

7. The State Generating Stations (SGS/ IPP/ CGP if scheduled) shall be responsible for power generation according to the daily schedules advised to them by the SLDC on the basis of the requisitions received from the ALDCs, and for proper operation and maintenance of their Generating Station, such that these stations achieve the best possible long-term availability and economy.

8. While the Generating station would normally be expected to generate power according to the daily schedules advised to them, it would not be mandatory to follow the schedules tightly. In line with the flexibility allowed to the Discoms, the Generating Stations may also deviate from the given schedules depending on the plant and system conditions. In particular, they would be allowed / encouraged to generate above the given schedule under deficit conditions. Deviations from the ex-power plant generation schedules shall, however, be appropriately priced through the UI mechanism.

9. Provided that when the frequency is higher than 50.3 Hz, the actual net



injection shall not exceed the scheduled dispatch for that time. Also, while the frequency is above 50.3 Hz, the Generating Stations may (at their discretion) back down without waiting for an advice from SLDC in order to restrict the frequency rise. When the frequency falls below 49.5 Hz, the generation at all Generating Stations shall be maximized, at least upto the level which can be sustained, without waiting for an advice from SLDC.

10. However, notwithstanding the above, the SLDC may direct the ALDCs/ Generating Stations to increase/decrease their drawals/generation in case of contingencies e.g. overloading of lines/transformers, abnormal voltages, threat to system security. Such directions shall be immediately 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 terminated first, in the above sequence, before an action which would affect the scheduled supplies from Generating Station to the long term customers is initiated.

11. For all outages of generation and transmission system, which may have an effect on the State grid, all constituents shall cooperate with each other and coordinate their actions through State Coordination Committee (SCC) for outages foreseen sufficiently in advance and through SLDC (in all other cases), as per procedures finalized separately by SCC. In particular, outages requiring restriction on Generating Station generation and/or restriction of Generating Stations share which a beneficiary can receive (and which may have a commercial implication) shall be planned carefully to achieve the best





optimization.

12. The constituents shall enter into separate joint/bilateral agreement(s) to identify the Discom's shares in the Generating Stations (based on the allocations by the State Government/GUVNL, where applicable), scheduled drawal pattern, tariffs, payment terms etc. All such agreements shall be filed with the SLDC for being considered in scheduling and State energy accounting. Any bilateral agreements between constituents for scheduled interchanges on long-term/short-term basis shall also specify the interchange schedule, which shall be duly filed in advance with the SLDC.

13. All constituents shall abide by the concept of frequency-linked load dispatches and pricing of deviations from schedule, i.e., unscheduled interchanges. All generating units of the constituents, licensees and generating companies should normally be operated according to the standing frequency-linked load dispatch guidelines issued by the SLDC, to the extent possible, unless otherwise advised by the SLDC.

14. It shall be incumbent upon the Generating Stations to declare the plant capabilities faithfully, i.e., according to their best assessment. In case, it is suspected that they have deliberately over/under declared the plant capability contemplating to deviate from the schedules given on the basis of their capability declarations (and thus make money either as undue capacity charge or as the charge for deviations from schedule), the SLDC may ask the Generating Station to explain the situation with necessary backup data.



15. The STU shall install special energy meters on all inter connections between the State constituents and at other identified points for recording of actual net MWh interchanges and MVARh drawals. The type of meters to be installed, metering scheme, metering capability, testing and calibration requirements and the scheme for collection and dissemination of metered data are detailed as **Attachment-2**. All concerned entities (in whose premises the special energy meters are installed) shall fully cooperate with the STU/SLDC and extend the necessary assistance by taking weekly meter readings and transmitting them to the SLDC.

16. The SLDC shall be responsible for computation of actual net MWh injection/drawal of concerned intra-state entity, 15 minute-wise, based on the above meter readings and for preparation of the State Energy Accounts. All computations carried out by SLDC shall be open to all constituents for checking/verifications for a period of 15 days. In case any mistake/omission is detected, the SLDC shall forthwith make a complete check and rectify the same.

17. SLDC shall periodically review the actual deviation from the dispatch and net drawal schedules being issued, to check whether any of the constituents are indulging in unfair gaming or collusion. In case any such practice is detected, the matter shall be reported to the Commission for further investigation/action.



## 5. Scheduling and Dispatch procedures

1. All Intra-State Generating Stations shall be duly listed. The station capacities and allocated/contracted shares of different beneficiaries shall also be listed out.
2. Each Discom shall be entitled to a MW dispatch upto (foreseen ex-power plant MW capability for the day) x (Discom's share in the station's capacity) for all such stations. In case of hydro-electric stations, there would also be a limit on daily MWh dispatch, equal to (MWh generation capacity for the day) x (Discom's share in the station's capacity).
3. By 9 AM every day, the Generating Station shall advise the SLDC, the station-wise ex-power plant MW and MWh capabilities foreseen for the next day, i.e., from 0000 hrs to 2400 hrs of the following day.
4. The above information of the foreseen capabilities of the Generating Stations and ISGS and the corresponding MW and MWh entitlements of each Discom, shall be compiled by the SLDC every day for the next day, and advised to all beneficiaries by 11 AM. The ALDCs shall review it vis-à-vis their foreseen load pattern and advise the SLDC by 2 PM their drawal schedule for each of the Generating Stations and ISGS in which they have shares, long-term bilateral interchanges, approved short-term bilateral interchanges and composite request for day-ahead open access and scheduling of bilateral interchanges.



5. The ALDCs may also give standing instructions to the SLDC such that the SLDC itself may decide the drawal schedules for the Discoms.
6. By 7 PM each day, the SLDC shall convey:
- i) the ex-power plant “dispatch schedule” to each of the Generating Station, in MW for different hours, for the next day. The summation of the ex-power plant drawal schedules advised by all beneficiaries shall constitute the ex-power plant station-wise dispatch schedule.
  - ii) The “net drawal schedule” to each intra-state entity, in MW for different time blocks, for the next day. The summation of the station-wise ex-power plant drawal schedules for all Generating Stations and ISGS and drawal schedules consequent to bilateral interchanges, after deducting the transmission losses (estimated), shall constitute the entity-wise drawal schedule.
7. While finalizing the above daily dispatch schedules for the Generating Stations, SLDC shall ensure that the same are operationally reasonable, particularly in terms of ramping-up/ramping-down rates and the ratio between minimum and maximum generation levels. A ramping rate of upto 20% of the capacity on bars per hour should generally be acceptable for Generating Station except for hydro-electric Generating Station which may be able to ramp up/ramp down at a faster rate.



8. The ALDCs/Generating Station may inform any modifications/changes to be made in station-wise drawal schedule & bilateral interchanges /foreseen capabilities, if any, to SLDC by 10 PM.

9. Upon receipt of such information, the SLDC after taking into account any advise received from RLDC and after consulting the concerned constituents, shall issue the final 'drawal schedule' to each intra-state entity and the final 'dispatch schedule' to each Generating Stations by 11.30 PM.

10. While finalizing the drawal and dispatch schedules as above, the SLDC shall also check that the resulting power flows do not give rise to any transmission constraints. In case any constraints are foreseen, the SLDC shall moderate the schedules to the required extent, under intimation to the concerned constituents. Any changes in the scheduled quantum of power which are too fast or involve unacceptably large steps, may be converted into suitable ramps by the SLDC.

11. In case of forced outage of a unit, the SLDC shall revise the schedules on the basis of revised declared capability. The revised declared capability and the revised schedules shall become effective from the 4th time block, counting the time block in which the revision is advised by the Generating Station to be the first one.

12. In the event of bottleneck in evacuation of power due to any constraint, outage, failure or limitation in the transmission system, associated switchyard



and sub- stations owned by the State Transmission Utility or any other transmission licensee involved in Intra-State transmission (as certified by the SLDC) necessitating reduction in generation, the SLDC shall revise the schedules which shall become effective from the 4th time block, counting the time block in which the bottleneck in evacuation of power has taken place to be the first one. Also, during the first, second and third time blocks of such an event, the scheduled generation of the Generating Stations shall be deemed to have been revised to be equal to actual generation, and the scheduled drawals of the beneficiaries shall be deemed to have been revised to be equal to their actual drawals.

13. In case of any grid disturbance, scheduled generation of all the Generating Station and scheduled drawal of all the intra-state entities shall be deemed to have been revised to be equal to their actual generation/drawal for all the time blocks affected by the grid disturbance. Certification of grid disturbance and its duration shall be done by the SLDC.

14. Revision of declared capability by the Generating Station(s) and requisition by beneficiary(ies) for the remaining period of the day shall also be permitted with advance notice, but only in case of a contingency. Revised schedules/declared capability in such cases shall become effective from the 6th time block, counting the time block in which the request for revision has been received in the SLDC to be the first one.

15. If, at any point of time, the SLDC observes that there is need for revision of the schedules in the interest of better system operation, it may do



so on its own, and in such cases, the revised schedules shall become effective from the 4th time block, counting the time block in which the revised schedule is issued by the SLDC to be the first one.

16. To discourage frivolous revisions, the SLDC may, at its sole discretion, refuse to accept schedule/capability changes of less than two (2) percent of the previous schedule/capability.

17. After the operating day is over at 2400 hours, the schedule finally implemented during the day (taking into account all before-the-fact changes in dispatch schedule of Generating Station and drawal schedule of the beneficiaries) shall be issued by SLDC. These schedules shall be the datum for commercial accounting. The average ex-bus capability for each Generating Station shall also be worked out based on all before-the-fact advise to SLDC.

18. SLDC shall properly document all above information i.e. station-wise foreseen ex-power plant capabilities advised by the Generating Station, the drawal schedules advised by beneficiaries, all schedules issued by the SLDC, and all revisions/updating of the above.

19. The procedure for scheduling and the final schedules issued by SLDC, shall be open to all constituents for any checking/verification, for a period of 7 days. In case any mistake/omission is detected, the SLDC shall forthwith make a complete check and rectify the same.



20. While availability declaration by Generating Station may have a resolution of one (1) MW and one (1) MWh, all entitlements, requisitions and schedules shall be rounded off to the nearest second decimal, to have a resolution of 0.01 MW and 0.01 MWh..

## **6. Reactive Power and Voltage Control**

1. Reactive power compensation should ideally be provided locally, by generating reactive power as close to the reactive power consumption as possible. The beneficiaries are therefore expected to provide local VAR compensation/generation such that they do not draw VARs from the State grid, particularly under low-voltage condition. However, considering the present limitations, this is not being insisted upon. Instead, to discourage VAR drawls by Beneficiaries, VAR exchanges with Intra-State Transmission System shall be priced as follows:

- The Beneficiary pays for VAR drawal when voltage at the metering point is below 97%
- The Beneficiary gets paid for VAR return when voltage is below 97%
- The Beneficiary gets paid for VAR drawal when voltage is above 103%
- The Beneficiary pays for VAR return when voltage is above 103%

2. The charge/payment for VARs, shall be at a nominal paise/kVARh rate as may be specified by the Central Electricity Regulatory Commission (CERC) from time to time, and will be between the Beneficiary and the State





pool account for VAr interchanges.

3. Notwithstanding the above, SLDC may direct a beneficiary to curtail its VAr drawal/injection in case the security of grid or safety of any equipment is endangered.

4. In general, the Beneficiaries shall endeavour to minimize the VAr drawal at an interchange point when the voltage at that point is below 95% of rated, and shall not return VAr when the voltage is above 105%. Transformer taps at the respective drawal points may be changed to control the VAr interchange as per a Beneficiary's request to the SLDC, but only at reasonable intervals. A beneficiary may also request the SLDC for increase/decrease of VAr generation at a Generating Station for addressing a voltage problem.

5. Switching in/out of all bus and line Reactors throughout the State grid shall be carried out as per instructions of SLDC. Tap changing on all transformers in STU system shall also be done as per SLDCs instructions only.

6. The Generating Station shall change generator- transformer taps and generate/absorb reactive power as per instructions of SLDC, within capability limits of the respective generating units, that is without sacrificing on the active generation required at that time. No payments shall be made to the generating companies for such VAr generation/absorption at the generating



stations full annual fixed cost of which are being borne by the beneficiaries through capacity charge.

7. VAr exchange directly between two Beneficiaries on the interconnecting lines owned by them (singly or jointly) generally address or cause a local voltage problem, and generally do not have an impact on the voltage profile of the State grid. Accordingly, the management/control and commercial handling of the VAr exchanges on such lines shall be as per following provisions, on case-by-case basis:

- iv) The two concerned beneficiaries may mutually agree not to have any charge/payment for Var exchanges between them on an interconnecting line.
- v) The two concerned Beneficiaries may mutually agree to adopt a payment rate/scheme for Var exchanges between them identical to or at variance from that specified by GERC for Var exchanges with State Transmission System. If the agreed scheme requires any additional metering, the same shall be arranged by the concerned Beneficiaries.
- vi) In case of a disagreement between the concerned Beneficiaries (e.g. one party wanting to have the charge/payment for Var exchanges, and the other party refusing to have the scheme), the scheme as specified in **Attachment-3** shall be applied.
- vii) The computation and payments for such Var exchanges shall be effected as mutually agreed between the two Beneficiaries.



## ATTACHMENT – 1

### COMPLEMENTARY COMMERCIAL MECHANISMS

1. The beneficiaries shall pay to the respective Generating Stations Capacity charges corresponding to plant availability and Energy charges for the scheduled dispatch, as per the relevant notifications and orders of GERC. The bills for these charges shall be issued by the respective Generating Station to each beneficiary on monthly basis.
2. The sum of the above two charges from all beneficiaries shall fully reimburse the Generating Station for generation according to the given dispatch schedule. In case of a deviation from the dispatch schedule, the concerned Generating Station shall be additionally paid for excess generation through the UI mechanism approved by CERC. In case of actual generation being below the given dispatch schedule, the concerned Generating Station shall pay back through the UI mechanism for the shortfall in generation.
3. The summation of station-wise ex-power plant dispatch schedules from each Generating Station and any bilaterally agreed interchanges of each beneficiary shall be adjusted for transmission losses, and the net drawal schedule so calculated shall be compared with the actual net drawal of the beneficiary. In case of excess drawal, the beneficiary shall be required to pay through the UI mechanism for the excess energy. In case of under-drawal, the



beneficiary shall be paid back through the UI mechanism, for the energy not drawn.

4. When requested by a constituent, SLDC shall assist the constituent in locating a buyer/seller and arranging a scheduled interchange within the Region or across the regional boundary. The SLDC shall act only as a facilitator (not a trader / broker), and shall assume no liabilities under the agreement between the two parties, except (i) ascertaining that no component of the power system of any other constituent shall be over-stressed by such interchange/trade, and (ii) incorporating the agreed interchange/trade in the net interchange schedules for the concerned constituents.
5. Monthly Energy Accounts and weekly statement of UI charges shall be prepared by the SLDC. The weekly statement of UI charges and shall be issued to all constituents by Thursday for the seven-day period ending on the penultimate Sunday mid-night. Payment of UI charges shall have a high priority and the concerned constituents shall pay the indicated amounts within 10 (ten) days of the statement issue into a state UI pool account operated by the SLDC. The agencies who have to receive the money on account of UI charges would then be paid out from the state UI pool account, within three (3) working days.
6. The SLDC shall also issue the weekly statement for VAr charges, to all constituents who have a net drawal / injection of reactive energy under low/high voltage conditions. These payment shall also have a high priority



and the concerned constituents shall pay the indicated amounts into the state reactive account operated by the SLDC within 10 (ten) days of statement issue. The constituents who have to receive the money on account of VAr charges would then be paid out from the -state reactive account, within three (3) working days.

7. If payments against the above UI and VAr charges are delayed by more than two days, i.e., beyond twelve (12) days from statement issue, the defaulting constituent shall have to pay simple interest @ 0.04% for each day of delay. The interest so collected shall be paid to the constituents who had to receive the amount, payment of which got delayed. Persistent payment defaults, if any, shall be reported by the SLDC to the Commission, for initiating remedial action.
8. The money remaining in the state reactive account after pay-out of all VAr charges upto 31<sup>st</sup> March of every year shall be utilized for training of the SLDC operators, and other similar purposes which would help in improving/streamlining the operation of the respective regional grids, as decided by the SPC from time to time.
9. In case the voltage profile of the grid improves to an extent that the total pay-out from the VAr charges account for a week exceeds the total amount being paid-in for that week, and if the reactive account has no balance to meet the deficit, the pay-outs shall be proportionately reduced according to the total money available in the above account.



10. The SLDC shall prepare the complete statement of the state UI account and the state Reactive Energy account, on a quarterly basis and circulate the same to all the pool members for verification.
11. All 15-minute energy figures (net scheduled, actually metered and UI) shall be rounded off to the nearest 0.01 MWh.

## **ATTACHMENT – 2**

### **REGULATORY REQUIREMENTS OF SPECIAL ENERGY METERS**

1. Special energy meters of a uniform technical specification shall be provided on the electrical periphery of each state constituent, to determine its actual net interchange with the state grid. Each interconnection shall have one (1) Main meter. In addition, Standby/check meters shall be provided such that correct computation of net interchange of a constituent is possible even when a Main meter, a CT or a VT has a problem.
2. The Special energy meters shall be static type, composite meters, installed circuit-wise, as self-contained devices for measurement of active and reactive energy, and certain other parameters as described in the following paragraphs. The meters shall be suitable for being connected directly to voltage transformers (VTs) having a rated secondary line-to-line voltage of 110 V, and to current transformers (CTs) having a rated secondary current of 1A (model-A) or 5A (model-B). The reference frequency shall be 50 Hz.
3. The meters shall have a non-volatile memory in which the following shall be automatically stored:
  - i) Average frequency for each successive 15-minute block, as a two digit code (00 to 99 for frequency from 49.0 to 51.0 Hz).
  - ii) Net Wh transmittal during each successive 15-minute block, upto second decimal, with plus/minus sign.



- iii) Cumulative Wh transmittal at each midnight, in six digits including one decimal.
  - iv) Cumulative VARh transmittal for voltage high condition, at each midnight, in six digits including one decimal.
  - v) Cumulative VARh transmittal for voltage low condition, at each midnight, in six digits including one decimal.
  - vi) Date and time blocks of failure of VT supply on any phase, as a star (\*) mark.
4. The meters shall store all the above listed data in their memories for a period of ten (10) days. The data older than (10) days shall get erased automatically. Each meter shall have an optical port on its front for tapping all data stored in its memory using a hand held data collection device.
5. The active energy (Wh) measurement shall be carried out on 3-phase, 4-wire principle, with an accuracy as per class 0.2 S of IEC-687/IEC-62053-22. In model-A, the energy shall be computed directly in CT and VT secondary quantities, and indicated in watt-hours. In model-B, the energy display and recording shall be one fifth of the Wh computed in CT and VT secondary quantities.
6. The VAR and reactive energy measurement shall also be on 3-phase, 4-wire principle, with an accuracy as per class 2 of IEC-62053-23 or better. In model-A, the VAR and VARh computation shall be directly in CT and VT secondary quantities. In model-B, these shall be displayed and recorded as one-fifth of those in CT and VT secondary quantities. There shall be two reactive energy registers, one for the period when average RMS voltage is above 103% and the other for the period the voltage is below 97%.
7. The 15-minute Wh shall have a +ve sign when there is a net Wh export from substation busbars, and a -ve sign when there is a net Wh import. The integrating (cumulative) registers for Wh and VARh shall move forward when there is Wh/VARh export from substation busbars, and backward when there is an import.



8. The meters shall also display (on demand), by turn, the following parameters:
  - i) Unique identification number of the meter
  - ii) Date
  - iii) Time
  - iv) Cumulative Wh register reading
  - v) Average frequency of the previous 15-minute block
  - vi) Net Wh transmittal in the previous 15-minute block, with +/- sign
  - vii) Average percentage voltage
  - viii) Reactive power, with +/- sign
  - ix) Voltage-high VArh register reading
  - x) Voltage-low VArh register reading
9. The three line-to-neutral voltages shall be continuously monitored, and in case any of these falls below 70%, the condition shall be suitably indicated and recorded. The meters shall operate with the power drawn from the VT secondary circuits, without the need for any auxiliary power supply. Each meter shall have a built-in calendar and clock, having an accuracy of 30 seconds per month or better.
10. The meters shall be totally sealed and tamper-proof, with no possibility of any adjustment at site, except for a restricted clock correction. The harmonics shall preferably be filtered out while measuring Wh, VAr and VArh, and only fundamental frequency quantities shall be measured/computed.
11. All metering equipment shall be of proven quality, fully type-tested, individually tested and accepted by the State Transmission Utility (STU) before dispatch from manufacturer's work.
12. In-situ functional checking and rough testing of accuracy shall be carried out for all meters once a year by the STU, with portable test equipment complying with IEC-60736, for type and acceptance testing of energy meters of 1.0 class.
13. Full testing for accuracy for every meter shall be carried out by the STU at an accredited laboratory, once every five (5) years.
14. The current and voltage transformers to which the above special energy meters are connected shall have a measurement accuracy class of 0.5 or





better. Main and Standby/check meters shall be connected to different sets of CTs and VTs, wherever available.

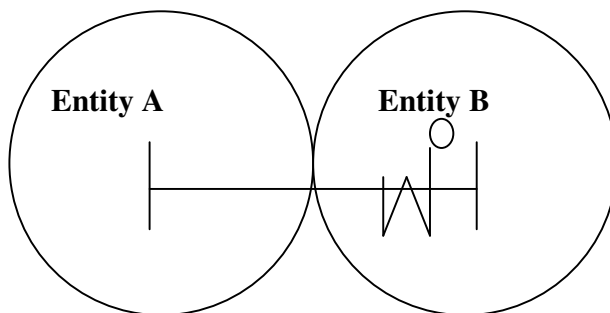
15. Only functional requirements from regulatory perspective are given in this code. Detailed specifications for the meters, their accessories and testing, and procedures for collecting their weekly readings shall be finalized by the STU with the approval of the Commission.

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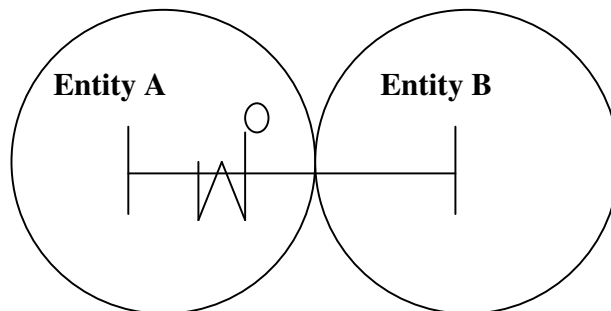


**PAYMENT FOR REACTIVE ENERGY EXCHANGES ON LINES OWNED BY INDIVIDUAL ENTITIES.**

**Case- 1:** Interconnecting line owned by Entity – A  
Metering Point: Substation of Entity – B



**Case- 2:** Interconnecting line owned by Entity – B  
Metering Point: Substation of Entity – A



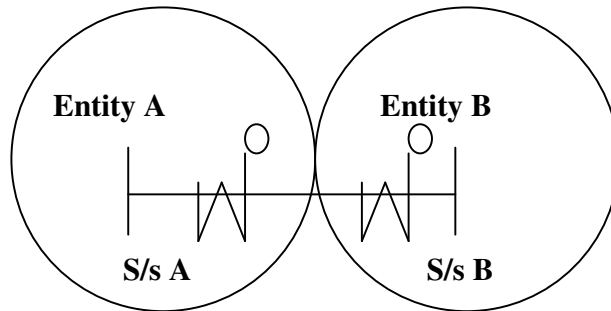
Entity B pays to Entity A for

- (i) Net VARh received from Entity A while voltage is below 97%
- (ii) Net VARh supplied to Entity A while voltage is above 103%



Note: Net VARh and net payment may be positive or negative

**Case- 3:** Interconnecting line jointly owned by Entity – A & B  
Metering Point: Substations of Entity - A & Entity - B



Net VARh exported from S/s-A, while voltage  $< 97\% = X_1$   
Net VARh exported from S/s-A, while voltage  $< 103\% = X_2$   
Net VARh exported from S/s-B, while voltage  $< 97\% = X_3$   
Net VARh exported from S/s-B, while voltage  $< 103\% = X_4$

- (i) Entity B pays to Entity A for  $X_1$  or  $X_3$ , whichever is smaller in magnitude, and
- (ii) Entity A pays to Entity B for  $X_2$  or  $X_4$ , whichever is smaller in magnitude.

**Note:**

- 1. Net VARh and net payment may be positive or negative
- 2. In case  $X_1$  is positive and  $X_3$  is negative, or vice-versa, there would be no payment under (i) above.
- 3. In case  $X_2$  is positive and  $X_4$  is negative, or vice-versa, there would be no payment under (ii) above.



