

## REPORT OF THE TASK FORCE ON SCHEDULING, METERING AND SETTLEMENT OF INTRA-STATE OPEN ACCESS TRANSACTIONS

1. An Interactive Session with the Forum of Regulators and State Governments was convened by the Ministry of Power, Govt of India on 5.11.2007 at New Delhi. It was decided therein to constitute a Task Force to examine various issues relating to scheduling, metering and settlement of intra-State open access transactions. The relevant part of the minutes of the above Interactive Session, issued by the Ministry of Power on 13.11.2007, is quoted below.

*“9.0 Member, CERC said that the aspects of scheduling and metering needed special attention in order that open access traffic did not lead to excessive burden on grid management. He said that many other countries have faced difficulties in this regard. CMD, POWERGRID also added that the grid management and training to SLDC staff should be given adequate attention. Chairperson, Maharashtra MERC said that intrastate balancing was already in place in the state and the same can be studied. Chairperson, Gujarat ERC said that they have also started a framework for this purpose on experimental basis. Member, APERC said that the state was already having significant volume of third party sales.*

*9.1 After discussions, it was decided to constitute a Task Force which would be headed by Shri Bhanu Bhushan, Member, CERC and would have following as Members:*

- i) Chairperson, Maharashtra ERC*
- ii) Chairperson, Gujarat ERC*
- iii) Chairperson, Andhra Pradesh ERC*
- iv) Secretary (Energy), Rajasthan*
- v) Secretary (Energy), Haryana*
- vi) Secretary (Energy), Chhattisgarh*
- vii) Shri S.K. Soonee, ED, POWERGRID*

*The Task Force would examine various issues relating to scheduling, metering and settlement of intrastate open access transactions and would give its recommendations by 31<sup>st</sup> December, 2007.”*

2. Pursuant to the above, three meetings of the Task Force have been held at the CERC office in New Delhi on 10.12.2007, 7.2.2008 and 3.3.2008. A gist of deliberations in these meetings and the list of participants is enclosed as Annexure-1.

3. To begin with, it is clarified that the Task Force has confined its deliberations to scheduling, metering and settlement aspects of intra-State open access, specifically leaving out the contentious issues like cross-subsidy surcharge and additional surcharge.

4. For a better appreciation of the issues involved in intra-State open access, it would be useful to retrace the evolution of open access mechanism at the inter-State level. How the energy accounting was being done at the regional level prior to introduction of Availability Tariff (ABT) in 2002-2003 can be illustrated with the following example.

5. Suppose a Region had two Central generating stations – G1 and G2, and three States – A, B and C. Suppose the total energy sent out by the generating stations during a month was  $g_1$  and  $g_2$  MWh respectively, and the total net energy received by the States was  $a, b$  and  $c$  MWh respectively. In the pre-ABT period, G1 was taken to have supplied to State – A during the month  $g_1 \cdot a / (a+b+c)$  MWh, irrespective of anything else. This was a simplistic mechanism, which ignored the quantum of drawal vs. time of drawal (peak-hour and off-peak), as also the schedules and allocations/shares of the States in the different Central generating stations.

6. Because the States were billed only on the basis of their net energy drawal for the whole month, all sort of problems were faced in regional grid operation, e.g. over-drawals, under-drawals, high-frequency, low-frequency, grid collapses, perpetual operational and commercial disputes. Introduction of ABT along with the associated scheduling, metering and settlement system in 2002-2003 has effectively tackled these

problems. In the new system, the generating stations declare their availability in MW on day-by-day basis, States have clear entitlements in the above availability as per their allocations/shares, the States give requisitions out of these entitlements, and the requisitions are added up to arrive at the schedules (in MW) for each generating station and State. Capacity charges are billed according to entitlements, and energy charges are billed according to scheduled energy. Any deviations from schedules, as determined through special energy meters 15-minute wise, are settled through the Unscheduled Interchange (UI) mechanism.

7. It has been possible to introduce “Open access” specified in the Electricity Act 2003 at the inter-State transmission level without any infrastructural problem primarily because the required infrastructure (scheduling, metering and settlement mechanism) was already in place. All open access requests are registered by the concerned RLDCs and SLDCs only in MW (not in terms of energy), and the time from and time upto which a transaction is to be scheduled. The open access schedules are superimposed on the schedules for supply from Central generating stations, to determine the net drawal schedules of the States. Readings of special energy meters on a State’s periphery are netted to determine the actual net drawal of a State, 15-minute wise. The difference between the actual and scheduled drawal is then settled at the UI rate corresponding to the average frequency for that 15-minute time block. The UI settlement is done in a composite manner for each regional constituent. It is not done transaction-wise. However, composite deviation for each State constituent at regional level is required to be divided amongst State participants at the intra-State level. The “open access” parties make/receive payments (buyer to seller) according to the open access schedule and their contract, and to/from the concerned UI pool account for their respective deviations.

8. The above system has operated very successfully at the inter-State level, and there are no significant disputes concerning scheduling, metering and settlement of inter-State open access transactions. The prime factor behind this success is the early recognition of the importance of scheduling, metering, proper energy accounting and settlement of deviations in a scenario of different supplies getting mixed up and passing through the

same energy meter (which has no means to distinguish between different supplies). Intractable disputes can arise in case a proper energy accounting scheme is not in place to bifurcate the supplies, and for accounting and settlement of deviations from schedules.

9. Forum of Indian Regulators (FOIR) had constituted a Committee in March 2005 to make recommendations to FOIR on implementation of ABT in intra-State systems. Para 25 of the Committee's report dated 24.11.2005 is very relevant in the above context, and is reproduced below.

“25. UI for Open Access

*Open access, as contemplated in the Electricity Act, 2003, means supply of power by entity-A to entity-B through the electricity grid. Power injection by A may not be constant, and may differ from contracted amount, by a varying degree from time to time. Similarly, power drawal by B may also vary and differ from the contracted amount. For example, the contract between the two parties may stipulate that A has to inject 10 MW, and B has to draw 9.5 MW (after accounting for transmission loss in the electricity grid). The actual injection and drawal may however be 9.0 and 10.0 MW respectively. Commercial treatment of such a situation, which is dynamic, could be very complex. The matter, however, becomes fairly simple if it is stipulated that B has still to pay to A for 10 MW at contracted rate, A has to pay at the UI rate to UI pool account for one MW of under-supply, and B has to pay at the UI rate for 0.5 MW of over-drawal to the UI pool account. This has already been specified by CERC for inter-State open access, and the same approach should be stipulated by the SERCs for intra-State open access. This necessarily requires installation of special energy meters for all open access customers, for recording energy 15-minutes block wise.”*

However, the FOIR Committee also acknowledged that its recommendations are not mandatory and the SERCs are fully competent to decide on the subject matter within their respective State jurisdiction. However, it suggested that while introducing ABT mechanism at State level, it needs to be ensured that intra-State

ABT mechanism is not incompatible with the inter-State ABT system. Above recommendations were adopted by the FOIR during its 7th annual general meeting held on June 15, 2006.

10. To recapitulate, we already have a fully-proven and well-established mechanism of scheduling, metering and settlement successfully operating at inter-State level. The same can be totally replicated in the intra-State system to enable simple and dispute-free settlement of intra-State open access transactions also. This would also ensure total compatibility with the inter-State open access, and there would be no problems concerning imbalances which would be inevitable in case a different settlement system is adopted.

11. There was a consensus in the Task Force that all open access schedules must be specified in MW (not in terms of energy), specifying the time from and upto which the transaction is scheduled. This may be taken as the first recommendation of the Task Force. The point or interface at which the MW figure applies should also be made clear, i.e. whether it is at supplier's end or at buyer's end or at some other intermediate point. Losses upstream of that point or interface would be to the supplier's account, and losses downstream to the buyer's account.

12. There was also a consensus that all open access customers should have meters which record energy for each 15-minute time block. All meters should meet the functional requirements specified in Annexure – 2 to Chapter – 6 of the Indian Electricity Grid Code (IEGC), as per clause 22(2) of the CERC (Open Access in Inter-State Transmission) Regulations 2008. This may be taken as the second recommendation of the Task Force.

13. It has been noted that some of the metering requirements specified under CEA (Installation and Operation of Meters) Regulations 2006 go beyond the functional requirements specified in the IEGC by CERC. Many States are procuring meters as per CEA specification, sometimes adding features on their own. This is leading to

procurement of meters with different specifications, though the ultimate functional requirements are the same. The States are thus not able to take or are not taking full advantage of the meter development and proving carried out by POWERGRID for inter-State metering. It is suggested that this aspect may be got examined by CERC, CEA and POWERGRID.

14. Similarly, while CERC has mandated under Regulation 22(1) of its open access regulations referred to above that all Special Energy Meters for intra-State entities should be installed by the State Transmission Utility, it is noted that State utilities are leaving this to the open access customers. In the latter approach, problems of compatibility and overall responsibility for correct energy accounting may arise. It is, therefore, recommended that STU should install the meters in a uniform and compatible manner.

15. We now come to the issue of settlement mechanism, on which the Task Force members had different viewpoints. While the Members representing Gujarat ERC, Govt. of Haryana, Govt. of Chhattisgarh and Shri S.K. Soonee favoured replication (with some minor changes in matters of detail) of the proven inter-State scheme in the intra-State systems, the others do not find the present inter-State mechanism appropriate for intra-State application. Not only this, while the first group wants the present inter-State system to be mandated for intra-State application uniformly in all States, Maharashtra ERC wants their mechanism to be circulated to all States for the latter's consideration for implementation. It favoured that the States should adopt appropriate framework for settlement so long as the same is compatible with regional settlement mechanism.

16. The settlement mechanism for inter-State open access is simple and straight forward. All deviations from schedules, plus or minus, are treated in a reciprocal manner. The scheduled MW constitutes the datum, and all metered deviations are accounted as UI without any tolerance or dead band. The rate applicable for the deviation is tightly linked to frequency, is same for all parties, and is same for over-drawal, under-drawal, over-injection and under-injection. This approach has many outstanding advantages, e.g. (i) a uniform settlement rate for all parties at any particular time, (ii) the rate is known on-line

to all parties through a local frequency meter, (iii) the rate is collectively controlled by load-generation balance in the interconnection, and there is no subjectivity in UI rate determination, (iv) it is a zero-sum game except for metering errors and transmission loss estimation mismatch.

17. Many State utilities and regulatory commissions do not see the deviations of intra-State entities in the same light. Over-drawals are sought to be penalized (being termed as grid indiscipline) and under-drawals (seen as gaming) are not compensated. Similarly, over-injection is seen as gaming and there is no payment for it, whereas any under-injection is seen as grid indiscipline and is sought to be penalised. The Central Commission has tried to curtail such uneven treatment of deviations of intra-State entities, and has specified as follows under Regulation 20 in its recently issued regulations, i.e. the CERC (Open Access in inter-State Transmission) Regulations, 2008.

*“(4) Any mismatch between the scheduled and the actual drawal at drawal points and scheduled and the actual injection at injection points for the intra-State entities shall be determined by the concerned State Load Despatch Centre and covered in the intra-State UI accounting scheme.*

*(5) Unless specified otherwise by the concerned State Commission, UI rate for intra-State entity shall be 105% (for over-drawals or under generation) and 95% (for under-drawals or over generation) of UI rate at the periphery of regional entity.*

*(6) In an interconnection (integrated A.C. grid), since MW deviations from schedule of an entity are met from the entire grid, and the local utility is not solely responsible for absorbing these deviations, restrictions regarding magnitude of deviations (except on account of over-stressing of concerned transmission or distribution system), and charges other than those applicable in accordance with these regulation (such as standby charges, grid support charges, parallel operation charges) shall not be imposed by the State utilities on the customers of inter-State open access.”*

18. We recognize that it would take some time for the State utilities and regulatory commissions to fully appreciate the desirability of reciprocal treatment for plus and minus deviations. It is expected that they would gradually move to and adopt, for intra-State open access, the approach specified by the Central Commission for inter-State open access. We therefore do not propose to go into detailed analysis or comparison of the present treatment of deviations by different States. However, we recognise that apart from settlement of 'energy exchange', requirement for settlement of 'capacity exchange' needs to be explored, particularly for the periods during which contracted capacities for open access transactions are under outage (planned or forced) for longer durations.

19. While other States have generally agreed with the concept of frequency-linked UI rate for settlement of deviations, Maharashtra is adopting an "Imbalance Pool" mechanism for intra-State system. It has been described in a note received with the letter dated 10.3.2008 of Chairman, MERC, and enclosed as Annexure-II. The State's decision to adopt this mechanism deviating from the national approach seems to be based on a perceived *"need to develop a suitable mechanism independent of frequency linkage which could operate under current regime of grid frequency excursions and at the same time shall continue to be operational when grid frequency remains close to 50 Hz."*

20. Based on the experience of past decades and the evolving scenario for future, it appears most unlikely that we would ever reach a stage of frequency remaining close to 50 Hz in the country in foreseeable future. Maharashtra can not isolate itself from the rest of the grid, and would therefore experience the same frequency variations, long-term. In such a situation, which can very well be foreseen, the utility of going on a different track, foregoing the benefits of back-to-back working with inter-State mechanism is debatable.

21. Further it is perceived that the generators and utilities in a State adopting the "Imbalance Pool" mechanism would not be contributing directly to frequency improvement, as happens with UI, because the Imbalance Pool mechanism does not provide similar commercial incentives. In fact, the Imbalance Pool mechanism



encourages the participants to seek grid operations at 50 Hz by emphasizing the need for Pool Participants to adequately contract capacity apart from encouraging them to operate within regime of schedules and deviations from schedules. However, the issue is debatable, as perceptions differ.

22. An implication of adopting a settlement mechanism different from regional UI is described below through an example.

Suppose two States A and B have a thermal station each, both having a variable cost of 200 paise/kWh. Suppose both have been scheduled to generate at 90% of their available capability during off-peak hours on a certain day. Also suppose that State-A has adopted UI mechanism totally identical to the regional UI mechanism, but State-B has adopted a different balancing mechanism concept in which the price of balancing power, instead of being a function of frequency, is calculated by the SLDC from time to time. Suppose it is 200 paise/kWh at a certain time, while frequency has moved to 49.9 Hz and corresponding regional UI rate is 240 p/kWh. In State-A, the thermal station would see the frequency and ramp up its generation from 90% to 100% of available capability (say 500 MW), at an incremental expenditure of 200 paise/kWh. The 50 MW over-generation would result in 50 MW of underdrawal by State-A, for which it would receive UI charges @ 240 paise/kWh from regional UI pool account, which would get passed on to the thermal station. There would thus be a saving of 40 paise/kWh on 50 MW for the thermal station of State-A, which would work out to Rs. 20000 per hour. Other utilities in State-A would not have any financial impact on the above account.

The situation in State-B would be more complex. The thermal station may not want to increase its generation, since it would get only 200 paise/kWh, its incremental fuel expenditure, for the additional generation. Since the generating station has no commercial incentive for increasing its generation, it would not do anything on its own and would only keep waiting for SLDC's instructions. In the process, the State as a whole would miss an opportunity for some financial gain. In other words, generally

speaking, State-B may not gain anything by adopting a balancing mechanism differing from regional UI.

23. The Task Force could not come to consensus on the suggestion of adoption by all the States of uniform settlement mechanism on the lines of the mechanism already in place for inter-State scheme. Therefore, the Task Force concludes that it would be preferable that the States adopt the uniform mechanism for settlement. However, the SERC's could adopt alternative mechanisms after fully examining the pros and cons of such options. But such alternative mechanism should definitely be compatible with the inter-State mechanism.

**RECORD OF DISCUSSIONS OF THE FIRST MEETING OF TASK FORCE ON  
SCHEDULING, METERING AND SETTLEMENT OF INTRA-STATE OPEN  
ACCESS TRANSACTIONS**

1. The first meeting of the above Task Force was held at C.E.R.C. office at New Delhi from 11 AM to 3 PM on 10.12.'07. The list of participants is enclosed.
2. Shri Bhanu Bhushan welcomed the Members/their representatives to the meeting. He referred to the terms of reference of the Task Force, and indicated that the discussions should be confined to scheduling, metering and settlement aspects, specifically leaving out the contentious issues like cross-subsidy surcharge, and additional surcharge.
3. Shri Bhanu Bhushan then retraced the evolution of the open access mechanism at the inter-State level. He explained how the energy accounting was done at the regional level prior to introduction of Availability Tariff (ABT) in 2002-2003, illustrating with the following example.  
Suppose a Region had two Central generating stations – G1 and G2, and three States – A, B and C. Suppose the total energy sent out by the generating stations during a month was  $g_1$  and  $g_2$  MWh respectively, and the total net energy received by the States was  $a$ ,  $b$  and  $c$  MWh respectively. In the pre-ABT period, G1 was taken to have supplied to State – A during the month  $g_1 \cdot a / (a+b+c)$  MWh, irrespective of anything else. This was a simplistic mechanism, which ignored the quantum of drawal vs. time of drawal (peak-hour and off-peak), as also the schedules and allocations/shares of the States in the different Central generating stations.
4. Because the States were billed only on the basis of their net energy drawal for the whole month, all sort of problems were faced in regional grid operation, e.g. over-drawals, under-drawals, high-frequency, low-frequency, grid collapses, perpetual operational and commercial disputes. Introduction of ABT along with the associated scheduling, metering and settlement system in 2002-2003 has effectively tackled these problems. In the new system, the generating stations declare their availability in MW on day-by-day basis, States have clear entitlements in the above availability as per their allocations/shares, the States give requisitions out of these entitlements, and the requisitions are added up to arrive at the schedules (in MW) for each generating station and State. Capacity charges are billed according to entitlements, and energy charges are billed according to scheduled energy. Any deviations from schedules, as determined through special energy meters 15-minute wise, are settled through the Unscheduled Interchange (UI) mechanism.

5. It has been possible to introduce “Open access” specified in the Electricity Act 2003 at the inter-State level without any infrastructural problem primarily because the required infrastructure (scheduling, metering and settlement mechanism) was already in place. All open access requests are registered by the concerned RLDCs and SLDCs only in MW (not in terms of energy), and the time from and time upto which a transaction is to be scheduled. The open access schedules are superimposed on the schedules for supply from Central generating stations, to determine the net drawal schedules of the States. Readings of special energy meters on a State’s periphery are netted to determine the actual net drawal of a State, 15-minute wise. The difference between the actual and scheduled drawal is then settled at the UI rate corresponding to the average frequency for that 15-minute time block. The UI settlement is done in a composite manner for each regional constituent. It is not done transaction-wise. The “open access” parties make/receive payments (buyer to seller) according to the open access schedule and their contract, and to/from the concerned UI pool account for their respective deviations.
6. The above system has operated very successfully at the inter-State level, and there are no significant disputes concerning scheduling, metering and settlement of inter-State open access transactions. Shri Bhushan then took up the specific example described in para 25 of the FOIR Committee report dated 24.11.2005 (already distributed vide his letter dated 29.11.2007), and explained how the intra-State open access transactions can be settled in a simple and dispute-free manner.
7. The States could take advantage of the proven inter-State system by totally replicating it for intra-State open access. This would also ensure total compatibility with the inter-State open access, and there would be no problems concerning imbalances which would be inevitable in case a different system is adopted.
8. The participants readily agreed that all intra-State open access transactions must also be scheduled in MW (not in terms of energy), specifying the time from and upto which the transaction is scheduled.
9. It was also agreed that 15-minute wise energy metering for each open access customer was necessary. In the first place, it would enable the replication of inter-State scheme for intra-State open access. Secondly, even if a State decides to adopt a different settlement mechanism, 15-minute wise energy recording would provide the customer’s injection/drawal pattern, which could be suitably used in the settlement. Besides, as per CERC regulations for inter-State open access, all embedded customers are also required to have special energy meters. The energy accounting and UI determination for such customers is to be carried out by the SLDC. The metering, accounting and

settlement for the same customer cannot be done in different ways simultaneously. This is further explained in the Annexure (to follow).

10. In view of the importance of proper and compatible metering, the following documents were handed over by Shri Bhanu Bhushan to the participants:
  - a) “Technical Specification for Energy Metering System” : which is the standardized specification to which all Powergrid meters procured since 1991-92 for regional energy accounting conform.
  - b) “Meters for Inter-Utility Exchanges” which explains the reasons behind the specific functional requirements included in the above technical specification.
11. Some Members/representatives indicated that a different settlement mechanism has been/is being developed in their respective States. They were requested to provide, by 20.12.'07, a 2-3 page write-up on their schemes, which would be annexed to the Task Force's recommendation (for information). However, there may not be much point in such schemes being discussed by the Task Force, since each State had to ensure the compatibility of its own scheme with the inter-State mechanism (which is already well-established, and is not proposed to be disturbed).
12. During the discussion that followed, Chairman, APERC mentioned that if/when open access is readily available, the industries with captive generation may find it more lucrative to sell the output of their captive generation than use it for running their own industry. This may lead to undesirable impetus to closing down of the industry.
13. Another issue brought up by Chairman, APERC was regarding the back up/standby support provided by the State utility to open access customers. To illustrate this with the example of intra-State open access discussed in the meeting (and described in para 25 of the FOIR Committee report dated 24.11.05), entity – A is under-supplying by 1,0 MW and entity – B is over-drawing 0.5 MW, leading to a total deficit of 1.5 MW in the open access transaction. The shortfall is automatically/necessarily met from the State grid, into which both entity – A and entity – B are connected. The State utilities strongly feel that such a situation must be discouraged/penalized by imposing a heavy charge. It is even stipulated under para 8.5.6 of the Tariff Policy dated 6.1.2006 that in case of outages of generator supplying to a consumer on open access, standby arrangements should be provided by the licensee on the payment of tariff for temporary connection to that consumer category as specified by the Appropriate Commission.
14. It was pointed out by Member, CERC that this is a debatable issue. While the above approach would be fully valid if the licensee had a stand-alone system (in which case the required stand-by capacity/spinning reserve must be available all the time in the licensee's system), it is not so when the licensee's

system is an integral part of a large interconnected grid. In the latter case, the required support comes from the total grid, with the licensee/local utility providing only a small part of such support (and only wheeling the support coming from rest of the grid). We also have the UI mechanism which ensures equitable compensation to all utilities who contribute in providing the required support. The local utility/licensee would automatically get paid (at the prevailing UI rate, which is also the system marginal price at that time) for the support it provides, when entities – A and B pay at the UI rate for the shortfall. As such, in an interconnected grid, it would not be fair for the local utility/licensee to impose temporary connection charges on entities – A and B for the entire support drawn while most of the support comes from the rest of the grid.

15. It was decided that a draft recommendation of the Task Force would be circulated to the Members by about 28.12.'07 and second meeting of the Task Force would be scheduled thereafter to finalise the recommendation.

**List of participants in the 1<sup>st</sup> meeting of Task Force on Scheduling, Metering and Settlement of intra-State Open Access Transactions held on 10.12.2007**

1. Shri Bhanu Bhushan, Member, CERC
2. Shri K. Swaminathan, Chairman, APERC
3. Shri A. Velayutham, Member, MERC
4. Shri Man Mohan, Member, GERC
5. Shri Ashok Lavasa, Principal Secretary (Power), Govt. of Haryana
6. Shri Debasish Das, Spl. Secretary (Energy), Govt. of Chhattisgarh
7. Shri Y.K. Raizada, Director (Tech), RRVPNL
8. Shri Sunil Agrawal, AGM (SO), POWERGRID
9. Shri Rajiv Porwal, Manager, NRLDC, POWERGRID
10. Shri B.K. Ashta, Xen/Open Access & Comp., HVPNL
11. Shri Ajay Talegaonkar, Dy.Chief(Engg), CERC
12. Shri Naresh Bhandari, Dy.Chief(Engg), CERC
13. Smt.Navneeta Verma, Asstt.Chief(Engg), CERC

**Second Meeting of the Task Force was held on 7.2.2008 at New Delhi. It was decided to hold another meeting of the Task Force sometime in early March, 2008 to finalise its recommendations.**

**List of participants in the 2<sup>nd</sup> Meeting of the Task Force**

1. Shri Bhanu Bhushan, Member, CERC
2. Shri Man Mohan, Member, GERC
3. Shri A. Velayutham, Member, MERC
4. Shri Yaduvendra Mathur, Secretary, Energy, Govt. of Rajasthan
5. Shri Debasish Das, Spl.Secretary, Govt. of Chhattisgarh
6. Shri A.S. Chugh, Adv.,Sys.Plng, HVPNL
7. Shri Raj Singh, Adv., CSEB
8. Shri S.K. Soonee, ED(Sys Op.), PowerGrid
9. B.K. Ashta, Exe.Engineer(Open Access & Comm.), HVPNL





**PRAMOD DEO**  
Chairman

Annex - II  
**Maharashtra Electricity  
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MERC/LEG/FOR/2008/561

March 10, 2008

**Sub :** Task Force on scheduling, metering and settlement of intra-State open access transactions

- Ref :** (i) Your letter no. D.O.No. M(E)1/(TF) dated November 29, 2007  
(ii) Minutes of first Task Force Meeting held on December 10, 2007.  
(iii) Your letter no. M(E)1/TF dated December 14, 2007  
(iv) Our letter no. MERC/LEG/FOR/2007/2643 dated December 19, 2007  
(v) Your letter no. D.O.No. M(E)1/(TF) dated December 24, 2007  
(vi) Our letter no. MERC/LEG/FOR/2008/125 dated January 2, 2008  
(vii) Task Force Meeting held on 7<sup>th</sup> February, 2008  
(viii) Our letter MERC/LEG/FOR/2008/431 dated February 15, 2008  
(ix) Task Force Meeting held on March 3, 2008

Dear Shri Bhanu Bhushan,

With reference to the Task Force meeting held on March 3, 2008, I have been apprised by Shri A. Velayutham, who has participated in the said meeting. I understand that you have requested us to develop a detailed Note on 'Intra-State Open Access - Maharashtra Model' to be covered as part of Task Force recommendations. I am pleased to enclose a detailed note on the subject as desired.

Kindly let me know if you need any additional information or further clarification in the matter. I now look forward to circulation of Draft Recommendations of the Task Force, at the earliest.

With Warm Regards,

Yours sincerely,

(Dr. Pramod Deo)  
Chairman, MERC

✓ Shri Bhanu Bhushan  
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  2. Shri K. Swaminathan, Chairman, Andhra Pradesh Electricity Regulatory Commission, 4<sup>th</sup> & 5<sup>th</sup> Floor, 11-4-660, Singareni Bhawan, Red Hills, Hyderabad-500004
  3. Shri Yaduvendra Mathur, Secretary (Energy) Government of Rajasthan, Jaipur-302 001
  4. Shri Ashok Lavasa, Principle Secretary (Energy), Govt. of Haryana, Chandigarh-160019
  5. Shri Vivek Dhand, Principle Secretary (Energy), Govt. of Chhattisgarh, Room No. 303, Mantralaya, DKS Bhawan, Raipur-492 001
- Shri S.K. Soonee, Executive Director, Power Grid Corporation of India Ltd., New Delhi-110016

## **INTRA-STATE OPEN ACCESS - MAHARASHTRA MODEL**

### **1 BACKGROUND**

In view of distinct characteristic features and specific requirements of open access transactions at transmission or distribution network, distinct mechanism and treatment need to be operationalised in case of transmission open access transactions (TOAU) and distribution open access transactions (DOAU). In order to devise appropriate 'energy accounting and settlement' mechanism for OA transactions, some of the key aspects that need to be considered are:

- Need for provisioning of default service to open access consumers,
- Visibility and control of open access load/consumer at SLDC level
- Prioritization sequence in case of curtailment
- Requirement of energy banking facility for open access transactions.

Various mechanisms are possible to undertake 'energy accounting and settlement' of OA transactions at transmission level such as UI mechanism or Imbalance Pool mechanism. Frequency linked UI pricing mechanism represents only one amongst various mechanisms available for balancing and settlement purposes. In the recent past, frequency linked UI mechanism has worked very well at regional level and served the purpose of balancing and undertaking commercial settlement of energy transactions across States. It has also facilitated in reducing the divergence of grid frequency and the same has been limited to a band of 49 Hz to 50.5 Hz. While it is appreciated that electricity market should operate within a narrow band of frequency, the design and development of electricity market should aid such process rather than treating the same as a constraint.

Thus, there is an urgent need to develop a suitable mechanism independent of frequency linkage which could operate under current regime of grid frequency excursions and at the same time shall continue to be operational when grid frequency remains close to 50 Hz. The Imbalance Pool mechanism as prevalent in Maharashtra addresses above requirements and encourages the participants to seek grid operations at 50 Hz.

### **2 SALIENT FEATURES OF MAHARASHTRA MODEL (IMBALANCE POOL MECHANISM)**

The imbalance pool mechanism is different in concept from that of frequency linked UI operations on two key aspects. Firstly, the imbalance pool mechanism emphasizes the need for Pool Participants to adequately contract capacity apart from encouraging them to operate within regime of schedules and deviations from schedules. Under imbalance pool regime, the deviations or variations of drawal/injection by the Pool participants are tracked vis-a-vis their contra entitlement based on actual generated quantities rather than scheduled quantities. Secondly, price for settlement is based on marginal cost of the procurement incurred by contributing pool participant rather than any pre-determined notional price stipulated under UI regime. Thus, the marginal prices represented under imbalance pool regime are representative of the costs actually incurred by the participant as per contracts entered by them.

In view of above, the adoption of Imbalance Pool mechanism based on marginal cost principles delinked from frequency for the purposes of 'balancing and settlement' of intra-State open access transactions at the transmission level is preferred. As regards distribution open access transactions, the concerned distribution licensees where open access /consumers are located should be obliged to provide balancing or banking service, as may be necessary. The settlement of energy transactions of open access consumers at distribution level can be undertaken on time-of-day (ToD) basis without necessitating installation of additional communication equipment, metering infrastructure arrangements or scheduling requirements. The settlements of such DOA transactions can be undertaken on monthly basis compatible with their existing monthly energy billing cycle.

### **2.1 Compatibility with regional framework**

The issue of compatibility needs to be seen in the context of operational compatibility and commercial compatibility of the State level ABT mechanism with that of regional ABT and UI mechanism. The proposed imbalance pool mechanism recognises the need to undertake energy accounting and settlement for each time block of 15 minute duration on weekly basis. The State's contribution/liability towards energy accounting and settlement of regional UI pool has been well recognised and addressed under Imbalance Pool mechanism thereby ensuring commercial compatibility of the State level ABT framework with that of regional ABT framework. As regards operational compatibility, the scheduling and despatch process recognises the requirements of regional day-ahead scheduling process and timelines thereof, and the intra-State scheduling and despatch process and timelines have been accordingly

dovetailed to address the regional compatibility requirements. Thus, Maharashtra Model of imbalance pool mechanism is fully compatible with the regional UI mechanism.

## **2.2 Improvement in Grid Frequency**

As the varying Grid Frequency is the reflection of the shortage prevalent within power system network, basic issue of power shortages and availability need to be addressed apart from tapping available generation capacity to the maximum extent feasible. The UI mechanism addresses this requirement from generator's perspective to maximize output from online capacity available from existing generating stations. However, from long term perspective of encouraging market participants to contract for adequate capacity needs to be explored. The Imbalance Pool mechanism as prevalent in Maharashtra, addresses above requirements and encourages the participants to seek grid operations at 50 Hz. Due to adequate contracted capacity requirement under imbalance pool mechanism, it is expected that Grid operations within narrow frequency band can be achieved, thereby ensuring desired frequency profile.

## **2.3 Availability of Information on Day-ahead basis**

Just as in frequency linked UI mechanism, the load-generation balance is finalized on day-ahead basis based on target despatch schedule for generating stations and target drawal schedule to utilities, under imbalance pool mechanism as well the load-generation balance is finalised on day ahead basis. The Imbalance pool mechanism provides information about 'imbalance pool volume' and 'imbalance pool value' with quantum of increment and decrement in respect of each pool participant for each 15-minute time-block on day ahead basis. The imbalance pool rate indicates the settlement rate to be applicable on day-ahead basis. Actual rate for settlement shall vary depending on real time operations just as actual UI rate for settlement for particular time block varies depending on prevalent frequency during real time operations under frequency linked UI mechanisms.

## **2.4 Availability of Real Time Information**

Availability of the real time information is a technology issue rather than 'operating model' design issue. With the proliferation of the communicator technology and advancement in technology for real time metering and monitoring purposes, the availability of infrastructure facilities for real time information is no longer a constraint. The software systems and

metering arrangements are being developed to address the requirements of real time information availability including rate for settlements. While implementation issues need to be addressed in terms of adequate timelines, ensuring pilot testing and trial operations, the 'operating market models' should be developed which can make best use of available technological solutions.

#### **2.4 Incentives for Generator to participate**

Without arguing whether there exists incentive/disincentive in any mechanism, a need for incentive for generator needs to be first ascertained under balancing framework. It needs to be noted that contractual conditions under long term PPA provide for recovery of entire fixed charges linked to availability. In addition, generators are covered for incentive payment for generation beyond threshold PLF/threshold availability. In view of above, there is no need for further motivation at the cost of distribution licensees.

### **3 OPERATING FRAMEWORK FOR IMBALANCE POOL MECHANISM**

Key aspects in respect of Open Access Transactions to be addressed are:

- Scheduling
- Measurement, Metering and Energy Accounting
- Mechanism for Settlement

A mechanism for treatment of open access transactions (TOAU and DOAU) dealing with above aspects has been elaborated under following paragraphs:

#### **3.1 SCHEDULING AND DESPATCH**

3.1.1 Presently, as per IEGC 2005 and State Grid Code Regulations, all generators above 50 MW need to be monitored and despatched by SLDC and subjected to despatch instructions issued by SLDC. Further, SLDC is required to monitor the drawal at 440/220/132 kV strategic substations and as per clause 4.8.4 (d), SLDC is required to monitor operations of all elements at 132 kV and above.

3.1.2 Thus, at present it is not possible for SLDC to monitor, schedule, and/or despatch any OA transaction involving OA generation below 50 MW and any load connected

below 132 kV. Even in case of OA users connected at 132 kV, necessary communication, metering and monitoring facilities need to be installed to offer visibility at SLDC to enable them 'monitor, schedule, verify and effect appropriate adjustments to the wheeling schedules.

3.1.3 Scheduling shall be undertaken on 'MW' basis for each timeblock on '15- minute' basis.

3.1.4 As per Section 32 of EA 2003, SLDC shall be responsible for optimum scheduling and despatch of electricity within a State, in accordance with the contracts entered into with the licensees or generating companies operating in that State. Accordingly, for a State like Maharashtra, where multiple distribution licensees exist, SLDC is already undertaking such scheduling and despatch activities and achieving the load-generation balancing to that effect.

#### **TOAU (or Direct Customers)**

- Open access transactions of TOAUs shall be governed by 'scheduling and despatch' code.
- TOAUs will have to furnish their day ahead schedules to SLDC. **DOAU (or**

#### **Embedded Customers)**

- Distribution licensees while furnishing their schedules to SLDC shall take into consideration the 'schedule requirement' of DOAUs in their area.

### **3.2 MEASUREMENT, METERING AND ENERGY ACCOUNTING**

3.2.1 For the purpose of energy accounting and settlement, TOAUs shall be treated on par with the 'distribution licensees'. In fact, TOAUs will have to become member of the 'State Imbalance Power Pool' and the settlement of their OA transactions shall be made in accordance with the 'Balancing and Settlement Code', as applicable to distribution licensees. Further, all TOA-Generators wishing to sell power outside State, will become members of the State power pool and required to share imbalance costs. However, such membership will be subject to the acceptance of the following conditions by the TOAUs:

- The TOAUs shall share the imbalance costs in accordance with principles

outlined under balancing and settlement code.

- The TOAUs availing supply from their generating sources will have to demonstrate that they have contracted for the necessary capacity (MW) and energy (MU) with the generators and TOA-Generators wishing to supply power outside State will have to demonstrate that they have contracted for necessary capacity (MW) and energy (MU) in order to schedule such OA transactions.
- The TOAUs shall provide copies of their contracts to MSLDC so as to enable the MSLDC to draw the appropriate despatch schedule.

#### *TOAU (or Direct Customers)*

- Installation of Special Energy Meters with measurement capability at 15-minute interval and availability of meter readings shall be 'pre-requisite' for the purpose of energy accounting.
- MSLDC- Commercial Division, in its capacity as 'Market Operator' shall be responsible for the purpose of Energy Accounting and preparation of settlement statements for TOA transactions.
- MSPC (Maharashtra State Power Committee) will be the governing body to facilitate settlement of transactions.
- All TOAUs fulfilling conditions will have to become member of the 'State Imbalance Pool' and agree to share imbalance costs/earn revenues, in accordance with principles outlined under 'balancing and settlement' code to be formulated by MSPC and to be approved by MERC.

#### *DOAU (or Embedded Customers)*

- The settlement of DOA transactions is envisaged to take place in accordance with ToD slots on monthly basis instead of 15-minutes basis. Accordingly, installation of SEMs is not pre-requisite. In fact, OA transactions of DOAU can be settled using ToD meters.
- The concerned distribution licensee where DOAUs are located shall be Responsible undertaking settlement of DOA transactions on monthly basis.



### 3.3 MECHANISM FOR SETTLEMENT

3.3.1 Mechanism for Settlement of TOAU will have to be same as that applicable for settlement of energy exchange (over-drawal/under-drawal) amongst distribution licensees. In fact, principles for 'Imbalance Pool' settlement shall be applicable for TOAUs on par with that applicable for distribution licensees.

3.3.2 However, as regards overdrawal by partial TOAU and DOAUs beyond their contract demand shall be settled at retail tariff rate of the DISCOMs for temporary supply to such category of consumers to which OA user may belong. For this purpose, settlements on a TOD basis will have to be looked into. Besides providing adequate compensation, this will keep the system simple and be equitable with other consumers of the distribution licensees.

3.3.3 Principles for Settlement for TOUAs and DOAUs shall be as under:

#### **TOAU (or Direct Customers),**

- Increment (or under-drawal vis-a-vis contract) by TOAU to Imbalance Pool if,
  - a. Actual drawal of TOAU < Contracted capacity by TOAU
  - b. Increment Volume = Contracted Capacity - Actual Drawal Capacity
  - c. TOAU receives payment = Increment Volume x Increment Price
  - d. Increment Price = Marginal Price of Contracted capacity by TOAUs
  - e. Increment Value =  $\Sigma$  Increment Volume x Increment Price
- Decrement (or over-drawal vis-a-vis contract) by TOAU from Imbalance Pool if,
  - a. Actual drawal of TOAU > Contracted capacity by TOAU
  - b. Decrement Volume = Actual Drawal Capacity - Contracted Capacity
  - c. TOAU need to pay = Decrement Volume x Imbalance Pool Price
  - d. Imbalance Pool Price = Wt. Avg. Imbalance Pool Price of all Incrementers
    - i.e. 
$$\text{Imbalance Pool Price} = \frac{\Sigma \text{Increment Volume} \times \text{Increment Price}}{\Sigma \text{Increment Volume}}$$
  - e. Decrement Value -  $\Sigma$  Decrement Volume x Imbalance Pool Price

f.  $\Sigma$  Increment Volume =  $\Sigma$  Decrement Volume

g.  $\Sigma$  Increment Value =  $\Sigma$  Decrement Value

3.3.4 Following table summarises a sample illustration of Imbalance Pool computation for a sample trading period of 15-minute timeblock as elaborated further. The distribution licensees D1, D2 and Open access User (TOA-1) are incrementing into imbalance pool whereas distribution licensees D3, D4 and open access user (TOA-2) are decrementing into imbalance pool. Further, overdrawal from regional pool (i.e. +ve UI energy) is indicated as increment to imbalance pool. The imbalance pool is balanced in energy terms (or volume terms). The increment price of each contributing participant (i.e. Rs 4.50/kWh for D1, Rs 6.00/kWh for D2 and Rs5.00/kWh for TOA-1) represents their respective marginal cost of power procurement as per their contracts. Imbalance pool accounts for UI energy at weighted average contracted price of scheduled energy (say, Rs 1.50/kWh).

Imbalance Pool Participants	Imbalance Pool Volume		Imbalance	Imbalance Pool Value	
	Increment	Decrement	Pool Rate	Increment	Decrement
	(MWh)	(MWh)	Rs./KWh	000 Rs.	000 Rs.
	(a)	(b)	(c)	(d)= (a) x (c)	(e) = (b) Imbalance Pool Rate
D1	100		4.50	450	0
D2	50		6.00	300	0
D3		(90)		0	(403)
D4		(100)		0	(448)
TOA-1	20		5.00	100	0
TOA-2		(10)		0	(45)
UI	30		1.50	45	0
TOTAL	200	(200)	4.48	895	(895)

3.3.5 In addition, net UI cost is passed onto the Pool Participants responsible for such deviations. While Gross UI rate for said timeblock is Rs 7.00/kWh, imbalance pool accounts for UI energy at weighted average contracted price of scheduled energy (say, Rs 1.50/kWh). The Net UI cost i.e. difference of Gross UI cost and UI cost

accounted within imbalance pool (Net UI Rate = Gross UI rate - wt. avg. scheduled energy rate, i.e. Rs 5.50/kWh = Rs 7.00/kWh - Rs 1.50/kWh) is allocated amongst State pool participants in proportion to their deviation from their schedules.

3.3.6 Above principles of imbalance pool settlement for 'Energy Exchange' amongst State Pool Participants can also be applied for 'Capacity Exchange' amongst 'State Pool Participants'. Accordingly, the Fixed Cost Pool Settlement shall address the issue of 'capacity exchange' by State participants. The increments or decrements in the 'capacity pool' (or fixed cost reconciliation pool) shall be derived based on over-drawal (decrement) or under-drawal (increment) vis-a-vis 'available capacity' as contracted by the State Pool Participant (incl. TOAUs).

**DOAU (or Embedded Customers)**

- Credit for actual energy wheeled by DOAU shall be provided by concerned distribution licensee in its monthly energy bills on TOD basis.
- Actual energy units wheeled upon adjustment of applicable loss shall be first adjusted against supply by distribution licensee and balance units shall be construed as that supplied by concerned distribution licensee at the applicable retail tariff rate.
- In case, drawal by DOAU exceeds its contract demand, retail tariff rate applicable for temporary supply to that category shall be applicable for such supply.
- In case, the wheeled energy units in particular month exceed the energy units drawn by DOAU, the surplus energy units shall be treated as 'banked' energy during that month. The banked units shall be adjusted against respective ToD time-slots in the subsequent months. Further, adjustment of banked energy under higher ToD slots against consumption in lower ToD slots shall be permitted, however, reverse shall not be permissible. Un-utilised surplus banked energy shall lapse at the end of the year.