

## **CENTRAL ELECTRICITY REGULATORY COMMISSION**

### **EXPLANATORY MEMORANDUM**

**to**

#### **Draft 'Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) Regulations, 2013'**

The Central Electricity Regulatory Commission (Unscheduled Interchange charges and related matters) Regulations, 2009 was amended for the second time vide Notification dated 5.3.2012. The amendments were to come into effect from 2.4.2012 but due to stay granted by the Chennai High court, it came in to effect on 17.9.2012.

2. Meanwhile, there were two major grid failures in the country on consecutive days; one on 30<sup>th</sup> July 2012 and another on 31<sup>st</sup> July 2012. In the wake of these recent grid disturbances, the Government of India had appointed an Enquiry Committee under Chairmanship of Chairman, CEA. The Enquiry Committee in its report submitted to the Government on 16.8.2012 has identified over-drawals as one of the causes of grid disturbance. The Enquiry Committee has inter-alia recommended as under:

"9.2.2 Frequency band needs to be further tightened and brought closer to 50 Hz. POSOCO may file an urgency application in Supreme Court for early resolution of the issue in view of the recent grid disturbances.

9.2.2 A review of UI mechanism should be carried out in view of its impact on recent grid disturbances. Frequency control through UI may be phased out in a time bound manner and generation reserves/ancillary services may be used for frequency control. Appropriate regulatory mechanism needs to be put in place for this purpose. POSOCO should take up the matter with CERC."

3. Consequently, National Load Despatch Centre (NLDC) filed a Petition for amendment of Central Electricity Regulatory Commission (Unscheduled Interchange charges and related matters) Regulations, 2009 and suggested certain changes for incorporation. The Commission, vide order dated 5.12.2012 in the said Petition No. 208/MP/2012, directed that the petition be treated as a proposal of POSOCO for amendment of the UI Regulations and

further directed the staff to examine the proposal and submit to the Commission for consideration.

4. The NLDC has sought in its proposal the following three major changes:
  - (a) Narrowing down frequency band further to 49.9 Hz to 50.1 Hz, so that system operates close to 50 Hz;
  - (b) Imposing limits on UI injection/withdrawal and making its truly inadvertent interchange; and
  - (c) Introduction of locational bias in UI settlement rate.
5. Further, the earlier amendment of the CERC UI Regulations was based on the fuel prices of Jan 2011 to Aug 2011. It has therefore, been decided to review the UI Regulations considering fuel prices from July 2012 to Dec 2012 and considering the suggestion of the NLDC in its proposal.

**Narrowing down frequency band further to 49.9 Hz to 50.1 Hz so that system operates close to 50 Hz:**

6. The NLDC has submitted that there is an urgent need for tightening the frequency band and to restrict over-drawals / under-drawals for secure operation of the grid. The NLDC has proposed that the grid frequency be narrowed down to 49.9 Hz to 50.1 Hz and the UI rate vector between 49.9 Hz to 50.1 Hz may be in steps of 0.01 Hz. It has been stated by the NLDC that a few meters with 0.01 Hz. step size have already been installed.
7. The Commission had in the past narrowed down the permissible frequency range for deviation on 3.5.2010 from 49.2 - 50.3 Hz to 49.5 - 50.2 Hz and thereafter, reduced it further to 49.7 -50.2 Hz with effect from 17.9.2012. Commission is committed to further narrowing of grid frequency range for improved efficiency of industrial equipment and appliances and its effect on consequential industrial output and country's economy.
8. A record capacity of 54,963.9 MW has been added during the 11<sup>th</sup> Plan period. The Installed Capacity at the end of the 11<sup>th</sup> Plan was 1, 99, 877 MW as on 31.3.2012. The 12<sup>th</sup> Plan envisages a capacity addition of another 88537 MW. The Installed capacity as on 31.3.2013 is 2, 23, 344 MW and a capacity of 23, 467 MW has already been added in the year 2012-13 which includes a capacity of 20, 687 MW from conventional sources of energy

against the target of 17, 956 MW. Such rate of capacity additions annually would take care, of concerns of the beneficiaries regarding their inability in meeting the demand or increase in load shedding due to narrowing down of grid frequency range. Further, the average grid frequency, post grid disturbances, is around 50 Hz. The grid frequency profile from April 2012 to Jan 2013 for the NEW grid and the SR grid is annexed as ***Appendix-I***.

**9. In this back drop operating grid frequency range may further be narrowed down close to 50 Hz from 49.95 Hz to 50.05 Hz. Amendment in IEGC is being contemplated to narrow down the grid frequency range to 49.95 Hz to 50.05 Hz.**

10. However, with the narrowing down of grid frequency range to 49.95 - 50.05 Hz, it would be necessary to have step sizes of 0.01 Hz and this would require changing of existing SEMs by the CTU.

**Imposing limits on UI injection/withdrawal and making it truly inadvertent interchange:**

11. NLDC has also suggested that the over-drawal or under-drawal of electricity by any beneficiary or a buyer during a time block should not be allowed to exceed 12% of its scheduled drawal or 150 MW, whichever is lower, and 3% on a daily aggregate basis for all the time blocks, irrespective of grid frequency. Similarly, the under-injection or over-injection of electricity by a generating station or a seller during a time-block should not be allowed to exceed 12% of the scheduled injection of such generating station or seller or 150 MW, whichever is lower, and 3% on daily aggregate basis for all the time blocks, irrespective of grid frequency.

12. NLDC has submitted that the Indian power system is unique in the sense that neither we have flat tie line control, flat frequency control nor tie line bias control. Worldwide, power systems, whether small or large, employ these controls. It is submitted that in a large power system such as ours (and which is ever growing), a widely floating frequency and freedom to deviate from schedules is not sustainable. Large volume of unscheduled interchange increases uncertainty in power flows, consequently making it difficult for ensuring N-1 security of the system all the time, congestion forecast and its management, transmission outage coordination, assessment of transfer capability and available margins for facilitating STOA.

13. NLDC has further suggested that in addition to Unscheduled Interchange Charges, Additional Unscheduled Interchange Charge should also be made applicable for over-drawals or under-injection of electricity in excess of 12% of schedule or 150 MW, whichever is lower, for each time block, irrespective of grid frequency, at the rates to be specified by the Commission.

14. NLDC has also suggested that the charges for the Unscheduled Interchange for the under-drawals by the buyer or the beneficiaries or over-injection by a generating station or seller in a time block in excess of 12% of the schedule or 150 MW whichever is less, should be made '0'(zero) Paisa per kWh, irrespective of grid frequency.

15. At present there is no volume limitation on UI above grid frequency of 49.8 Hz. The UI mechanism acts as market in the grid frequency range above 49.8 Hz. There is a perverse signal for over drawal/under drawal or under injection/over injection without any regard to other grid parameters like transfer capability, voltage level, fault levels, etc., which get ignored. The recent grid failures have made it evident that the grid frequency is not the only parameter to be monitored and controlled for the grid security. Other grid parameters, such as, transfer capability of transmission lines, voltage, etc., are equally important and required to be watched and controlled. Large quantum of unscheduled over drawals/ under drawals even when the frequency is within the normal band can give rise to transmission constraints and jeopardize grid security. 'Frequency is not the only consideration in reliable operation as there can be instances where system frequency is within range and large unscheduled power flows on certain elements can result in catastrophic grid failure.' The Net UI plots of States of UP, Punjab, Rajasthan and Haryana in NR in **Appendix-II** show that just prior to grid failures on 30.7.2012 and 31.3.2012, these States were overdrawing heavily. Similarly, the Net UI Plots of States of MP, Chhattisgarh, Maharashtra and Gujarat in WR in **Appendix-III** show that just prior to grid failures on 30.7.2012 and 31.7.2012, these States were under drawing heavily. The UI data of NR and WR for July 2012 also indicates heavy over drawals to the tune of 50% from the schedules and under drawals as high as 100%.

16. The Central Commission has stated from time to time that Unscheduled Interchange (UI) should not be used as a route for trading of electricity. The Commission has also brought about substantial changes in the CERC UI Regulations with the objective of driving the distribution utilities to go for planned procurement of electricity and creating an environment for investors to set up new power plants. The Utilities have overlooked the need for planning generation adequacy over a period and have not gone for adequate capacity additions and relied on over-drawal from the grid for meeting their consumer demands. The Commission is of the considered view that the utilities should plan for procurement of power on long-term, medium-term and short-term basis instead of resorting to over-drawals through UI. The Commission has also taken a strict view of the continued grid indiscipline by some State utilities and in many cases, penalties have been imposed. The grid security is of paramount importance and cannot be sacrificed. Further due to integration of regional grids, the economic cost of grid failures is too high and grid failures should be avoided at all costs.

17. In this back drop and in due consideration of the fact that the indiscriminate over-drawals by the NR States and under drawal/ injection by the WR States was one of the contributory factors for the grid failure on 30.7.2012 and 31.7.2012, **it appears necessary to put strict volume limits on over drawal/under drawal and over-injection/under-injection irrespective of the grid frequency.**

18. NLDC has stated in its letter dated 28.6.2012 that in any electricity markets, supply and demand have to be balanced perfectly in real time. Inadvertent imbalance may occur due to error by entities in either forecasting or unforeseen events whereas deliberate imbalance may be classified as a structural deficiency which is being exploited by entities as a part of power procurement. There are high incidences of deliberate imbalances in the Indian regional power system, primarily due to acute shortages. This imbalance poses problems to system integrity, security and frequency management.

19. In view of above, the stakeholders should avail of day ahead trading at the PXs or go through STOA, MTOA or LTA to meet their demand. Since the UI mechanism shall no longer to act as a market mechanism it is also proposed to adopt a new Regulation in place of UI Regulation namely **CERC (Deviation Settlement Mechanism and related matters) Regulations, 2013.**

20. It is proposed to put following volume limits on deviations from the schedules:

- (i) The over-drawal or under-drawal of electricity by any beneficiary or a buyer during a time block should not be allowed to exceed 12% of its scheduled drawal or 150 MW, whichever is lower, and 3% on a daily aggregate basis for all the time blocks, when grid frequency is "49.95 Hz and above".
- (ii) The under-injection or over-injection of electricity by a generating station or a seller during a time-block should not be allowed to exceed 12% of the scheduled injection of such generating station or seller or 150 MW, whichever is lower, and 3% on daily aggregate basis for all the time blocks, when grid frequency is "49.95 Hz and above".
- (iii) Below grid frequency of 49.95 Hz, no beneficiary or buyer is allowed to over-draw and no generating station or seller is allowed to under-inject.

21. In order to ensure compliance, it would be necessary to provide for additional charges for the deviations in addition to the charges for the deviations in the event of breach of above volume limits appropriately linked to the quantum of breach. Following additional charges for the deviations are therefore, proposed:

- (i) For over drawals/under drawals in excess of 12% and up to 15% of the schedule or above 150 MW and up to 200 MW in a time block whichever is lower or in excess of 3% and up to 4% of the schedule over a day -Equivalent to 20% of the Charge for Deviation corresponding to grid frequency "below 49.95 Hz".
- (ii) For over drawals/under drawals in excess of 15 % and up to 20% of the schedule or above 200 MW and up to 250 MW in a time block whichever is lower or in excess of 4% and up to 5% of the schedule over a day -Equivalent to 40% of the Charge for Deviation corresponding to grid frequency "below 49.95 Hz".
- (iii) For over drawals/under drawals in excess of 20 % of the schedule or above 250 MW in a time block whichever is lower or

in excess of 5% of the schedule over a day -Equivalent to 100% of the Charge for Deviation corresponding to grid frequency "below 49.95 Hz".

- (iv) For under injection/ over-injection in excess of 12% and up to 15% of the schedule or above 150 MW and up to 200 MW in a time block whichever is lower or in excess of 3% and up to 4% of the schedule over a day -Equivalent to 20% of the Charge for Deviation corresponding to grid frequency "below 49.95 Hz".
- (v) For under injection/over-injection in excess of 15 % and up to 20% of the schedule and above 200 MW and up to 250 MW in a time block whichever is lower or in excess of 4% and up to 5% of the schedule over a day -Equivalent to 40% of the Charge for Deviation corresponding to grid frequency "below 49.95 Hz".
- (vi) For under injection/over-injection in excess of 20 % of the schedule in a time block or above 250 MW in a time block whichever is lower or in excess of 5% of the schedule over a day -Equivalent to 100% of the Charge for Deviation corresponding to grid frequency "below 49.95 Hz".

22. The additional charges for Deviations for under-injection/over-injection of electricity during the time-block when grid frequency is "49.95 Hz and above" for the generating stations using coal or lignite or gas supplied under Administered Price Mechanism (APM) shall be corresponding to the Deviation Cap Rate.

23. Methodologies for the computation of Charges of Deviation and Additional Charges for deviation for each regional entity for crossing the volume limits specified for the under drawal /over-injection and for overdrawal and under-injection is also provided at **Annexure-II and III** respectively.

24. However, there is a provision for injection of infirm power into the grid by a generating unit of a generating station during the testing, prior to COD of the unit for a period not exceeding 6 months or the extended time allowed by the Commission in the Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access and related matters) Regulations, 2009, as amended from time to time.

Similarly there is also a issue of drawal of power by a generating station during start up activities prior to COD of a unit of a generating station before the Commission and the Commission is in the process of proposing amendment to the Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access and related matters) Regulations, 2009, as amended from time to time. It is therefore, proposed to exempt such drawal of power by a generating station during start up activities prior to COD of a unit of a generating station and injection of infirm power into the grid by a generating unit of a generating station during the testing, prior to COD of the unit for a period not exceeding 6 months or the extended time allowed by the Commission in the Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access and related matters) Regulations, 2009, as amended from time to time.

25. Further, the clause (3), (4) and (5) of Regulation 6 provide as follows:

"(3) Any generation from the generating stations other than hydro generating stations up to 105% of the declared capacity in any time block of 15 minutes and averaging up to 101% of the average declared capacity over a day shall not be considered as gaming, and the generating station shall be entitled to UI charges for such excess generation above the scheduled generation.

(4) For any generation from the generating stations other than hydro generating stations beyond the specified limits, the Regional Load Despatch Centre shall investigate so as to ensure that there is no gaming. Generating stations shall be entitled to recover the Unscheduled Interchange charges only if the investigation establishes that there is no gaming. If gaming is found by the Regional Load Despatch Centre, the corresponding Unscheduled Interchange charges payable to the generating station on account of such extra generation shall be reduced to zero and the amount shall be adjusted in UI pool account of the beneficiaries in the ratio of their capacity share in the generating station.



(5) In response to changes in grid frequency and inflow fluctuations, the hydro generating stations shall be free to deviate from the given schedule, without causing grid constraint, and compensation for the difference between the actual net energy supplied and the scheduled energy (ex-bus) over a day shall be made by the concerned Regional Load Despatch Centre in the day-ahead schedule for the 4th day (day plus 3)."

Since the UI Commercial mechanism is no longer a market and strict volume limits are being imposed, it is proposed to delete these provisions. As such, liberty available to the hydro generating stations for injection of power without any limit is being withdrawn.

26. The additional Charges for the Deviation "below 49.95 Hz" shall be Equivalent to 100% of the Charge for Deviation corresponding to grid frequency "below 49.95 Hz" and would be in addition to the Charges for the Deviation "below 49.95 Hz".

27. In USA the area control error of each control area is mandated to be brought to zero in every 10 minutes. In Indian context it would suffice if it is provided that sign of deviation from schedule is changed in every 6 time blocks. This would call for corrective action in every 6 time blocks and this would help in dissuading each control area from consistent deviation from schedule in one direction over long periods of time.

28. Accordingly, it is proposed to provide that each of the regional entity such as generating station, beneficiary, buyer or the seller shall have to make sign of their deviation from schedule changed, at least once, in every 6 time blocks. To illustrate, if a regional entity has positive deviation from schedule from 07.30 hrs to 08.45 hrs, then it must have negative deviation from schedule in the time block 08.45 hrs to 09.00 hrs.

## **Linking of UI Charges or Charges for Deviation from schedule with the area clearing prices in the Power Exchanges and Introduction of locational bias in UI settlement rate**

28. The Enquiry Committee on grid disturbances on 30.7.2012 & 31.7.2012 has inter-alia recommended that frequency control through UI may be phased out in a time bound manner and generation reserves/ancillary services may be used for frequency control. The Commission is seized of the matter with regard to introduction of ancillary services. However, this may take some time.

29. NLDC has submitted that pricing Unscheduled Interchange on a geographically differentiated basis gives a signal to despatch high cost generation in downstream of a congested corridor. The present UI rate is unitary and does not recognize the transmission congestion. The UI rate is same throughout the synchronous system. This issue can be addressed to some extent, by introducing locational bias in UI price, based on area clearing prices in the Power Exchanges.

30. NLDC has further submitted that the freedom to inject / withdraw in unscheduled interchange may be one of the reasons for inadequate attention towards load forecasting, adequacy planning and load management by the utilities. The existing market design hardly has any incentive for portfolio management and risk management by the buyers and sellers in the organized market. In the long term, UI is distorting the signals for investment in generation (including peaking generation) and transmission.

31. The matter of linking UI charges with the area clearing prices in the Power Exchanges has been examined.

32. Two separate markets of electricity are operating in the country- the day ahead market at the PXs and a real time UI Market. There is definitely scope for arbitrage. The UI prices were higher than the PXs prices prior to grid disturbances and UI Volume was higher than the PXs volume. UI prices are lower than the PXs prices post grid disturbance and UI volume has also come down. The variation of Volume and Price in Short-term Transactions from Jan 2012 to Jan 2013 is annexed as ***Appendix-IV***.

33. The UI prices as administered by CERC linked to grid frequency are based on energy charges of regulated generating stations which represent marginal cost of generation. Contrary to the PXs, UI market ignores willingness of entities, capacity to pay, value of lost load for entities. On the other hand, prices in PXs are market driven based on supply and demand, reflect time of the day pricing and geographically differentiated pricing.

34. There is merit in the NLDC suggestion of linking UI with area clearing prices in the Power Exchanges. However, the real time grid operation scenario may be significantly different than the day ahead scenario in the PXs due to load crash or major generation outage or any other unforeseen circumstances. Further, the UI mechanism is not to act as real time balancing mechanism. It is now proposed to convert the UI mechanism as a purely grid discipline mechanism as intended ab initio, with strict limits on deviation from the schedules.

35. In view of above, for the present we may continue with the existing arrangement of UI price vector or the deviation price vector based on energy charges of regulated generating stations which represent marginal cost of generation. However, the UI charges or the charges for the deviation should be sufficiently high to persuade the entities to go for scheduled transactions rather than unscheduled deviations. It is therefore, proposed to keep the max UI charges or the charges for Deviation based on liquid fuel (Naphtha) at grid frequency "below 49.95 Hz" instead of "below 49.5 Hz" at present.

#### **Review of UI Price Vector or Deviation Price Vector:**

36. The energy charges of regulated generating stations for the period July to December 2012 are enclosed as *Annexure-I*. Based on these energy charges the position is as follows:

- Median Value of Coal/lignite based Stations -Rs 1.78 /kWh
- Max Energy Charges on liquid fuel -Rs 11.10/kWh\*
- \* Liquid fuel is being used only in Kayamkulam GPS
- Highest Energy charge on RLNG -Rs 8.24 /kWh\*\*
- \*\* For Auraiya GPS

37. Accordingly, the UI price vector or the price vector for Deviations is proposed to be provided as follows:

- Zero at 50.05 Hz and above
- Rs1.78/ kWh at “50 Hz – 50.01 Hz”
- Rs 11.104/kWh “below 49.95 Hz”
- The price vector between these frequency bands shall be in steps of 0.01 Hz
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38. The average energy charges on 100% imported coal in January and February 2013 varied from 232 Paise/kWh to 305 Paise/kWh as per the details of Prices and GCV of imported coal used for the coal based stations of NTPC.

#### **UI Cap Rates or Deviation Cap Rates-**

39. As per the UI or Deviation price vector, following UI/Deviation Cap Rates are being proposed:

- 333.40 Paise/kWh for all generating stations using coal or lignite or gas supplied under Administered Price Mechanism (APM) as fuel
- 333.40 Paise/kWh for the Unscheduled Interchange for the under drawals by a buyer and the over-injection by a seller.
- Zero Paise/kWh for under drawal by a buyer or a beneficiaries in excess of 12% of the schedule or 150 MW whichever is less and 3% over the day.
- Zero Paise/kWh for over injection by a seller or a generating station in excess of 12% of the schedule or 150 MW whichever is less and 3% over the day.
- The provision regarding the injection by a generating station other than the hydro generating stations in excess of 105% of the Declared Capacity of the station in a time block or in excess of 101% of the average Declared Capacity over a day is proposed to be deleted due to imposition of volume limits.
- The provision regarding the injection by a seller in excess of ex-bus generation corresponding to 105% of the Installed Capacity of the station in a time block or 101% of the Installed Capacity over a day is proposed to be deleted due to imposition of volume limits.

## Cap Rates for Infirm Power Injection

40. With the revision of UI/ Deviation price vector or following Cap rates for injection of infirm power for generating units for testing before COD are being proposed:

Domestic coal/Lignite/Hydro	:	Rs. 1.78 /kWh Sent Out
APM gas as fuel	:	Rs. 2.82 /kWh Sent Out
Imported Coal/RLNG	:	Rs. 3.05/kWh Sent Out
Liquid Fuel	:	Rs. 11.104 /kWh Sent Out

41. It has also been seen that generators often reduce generation when the UI prices are lower than the energy charges even if the grid frequency is lower than the 50 Hz, thereby affecting the load generation balance adversely. In order to arrest this tendency of generators, it is proposed to provide that the Charges for the Unscheduled Interchange/Deviation for under-injection by a generating station "below 50.0 Hz" shall be its energy charge of the previous month, if energy charge is higher than the charges for Unscheduled Interchange/Deviation corresponding to the grid frequency of the time block. In case of gas based generating stations, the energy charge for this purpose shall be considered starting from the highest to lower for the respective fuel. Each generating company shall furnish the energy charges of each of its station for the previous month to the respective RPC each month.

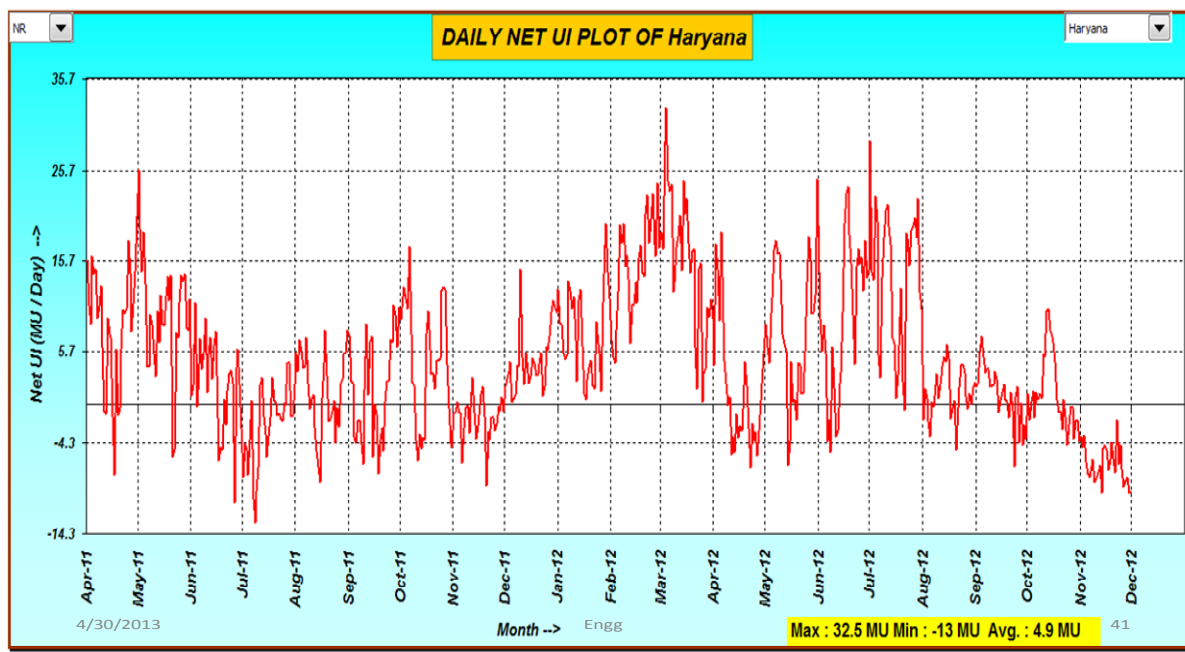
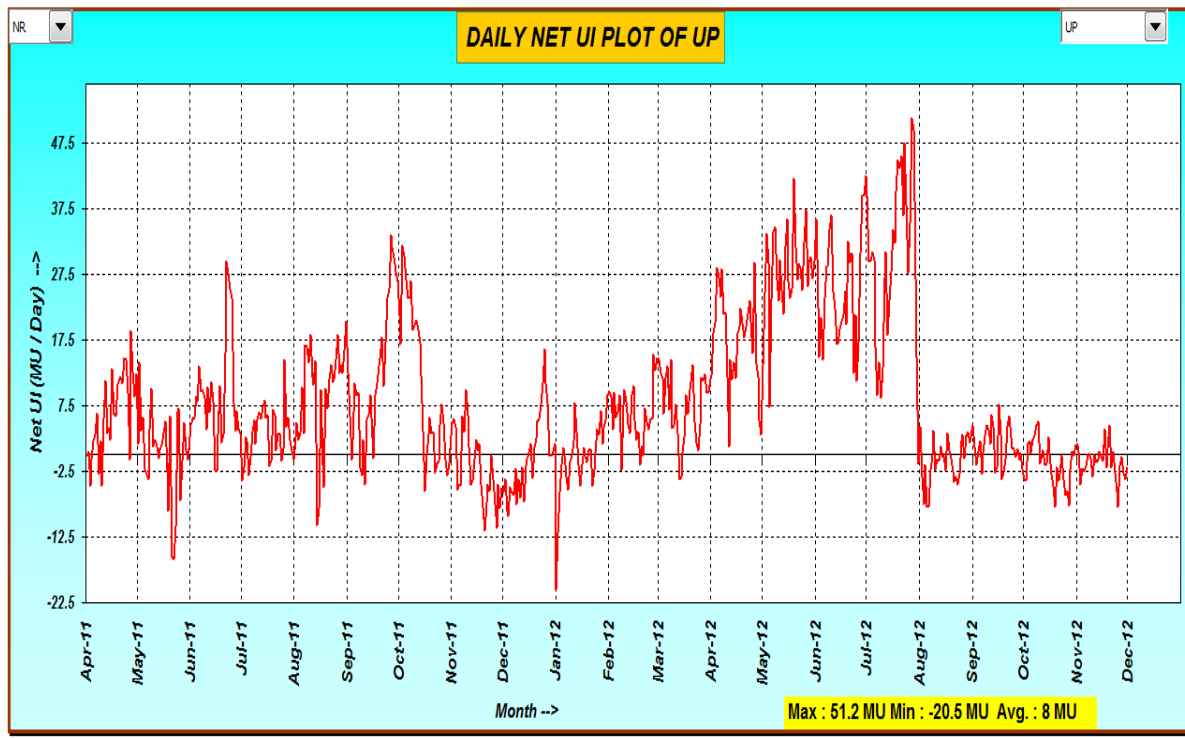
42. As discussed above, it is proposed to adopt a new CERC (Deviation Settlement Mechanism and related matters) Regulation, 2013 as deliberated in the above paragraphs and repealing the existing UI Regulations. Other provisions of the UI Regulations have been incorporated appropriately in the new Regulation except Regulation 11 regarding utilization of UI Pool Account Fund. The utilization of UI Account Fund and now the Regional Deviation Pool Account Fund shall be dealt with appropriately in the Regulations on Power System Development Funds.

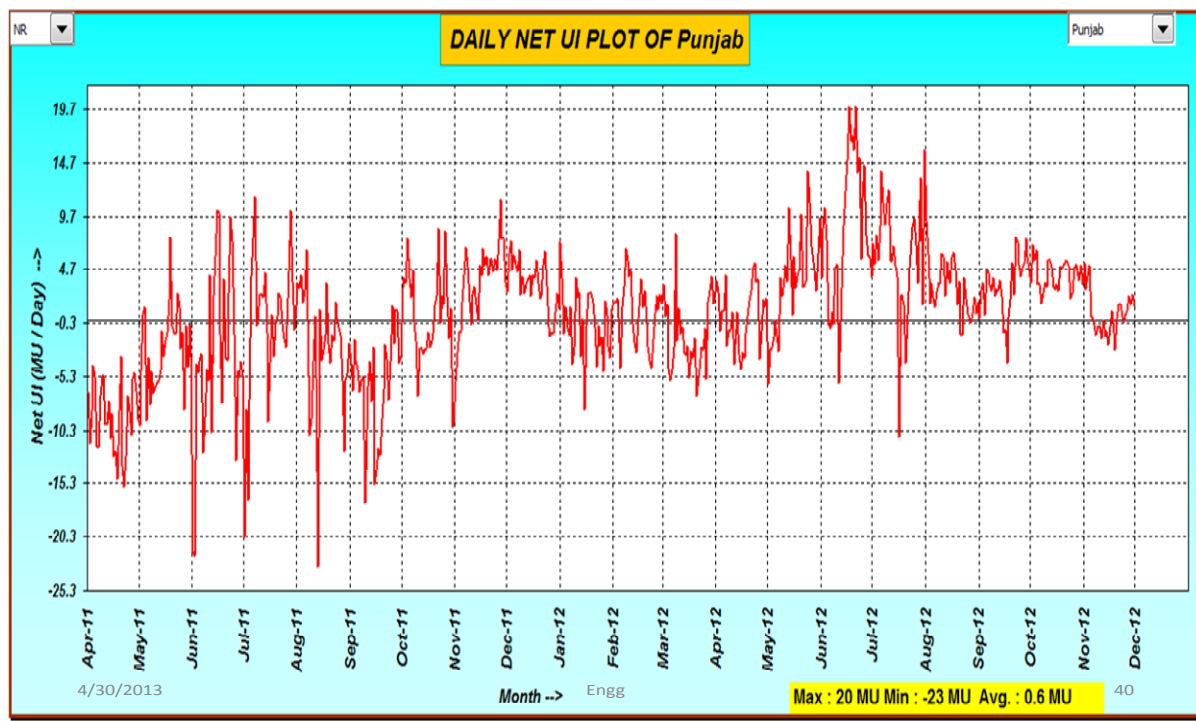
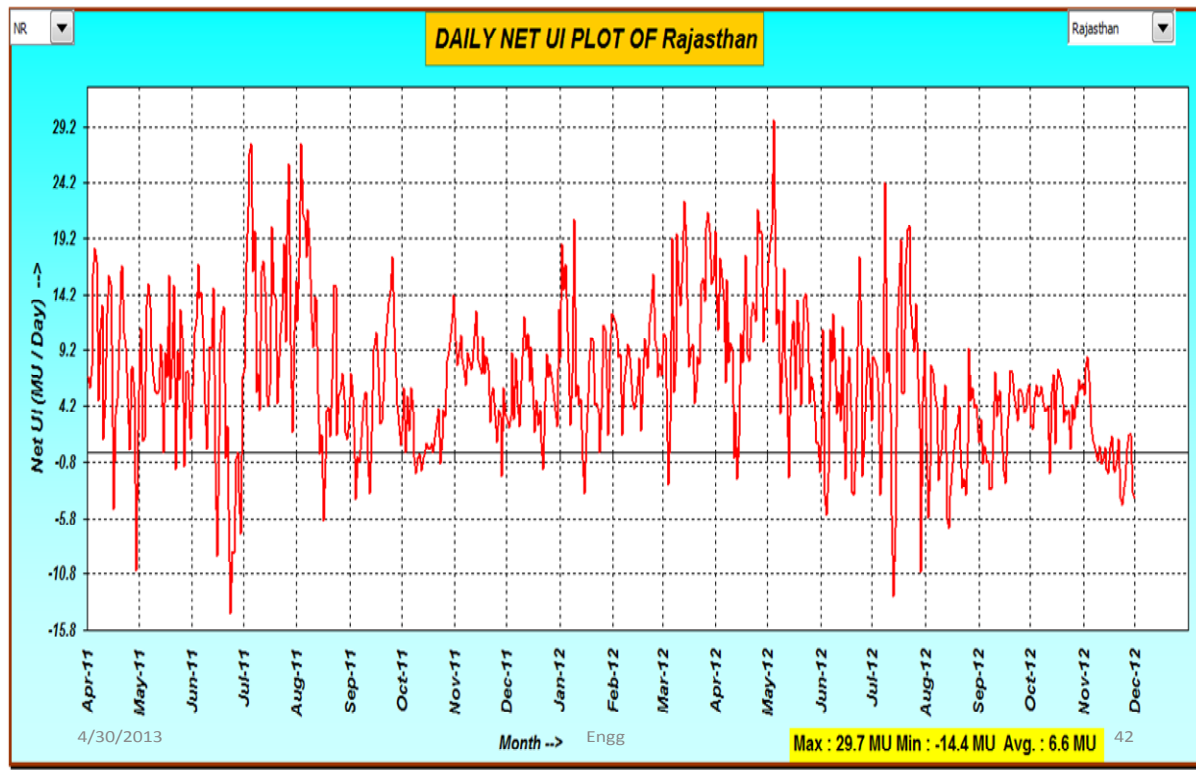
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## Appendix-I

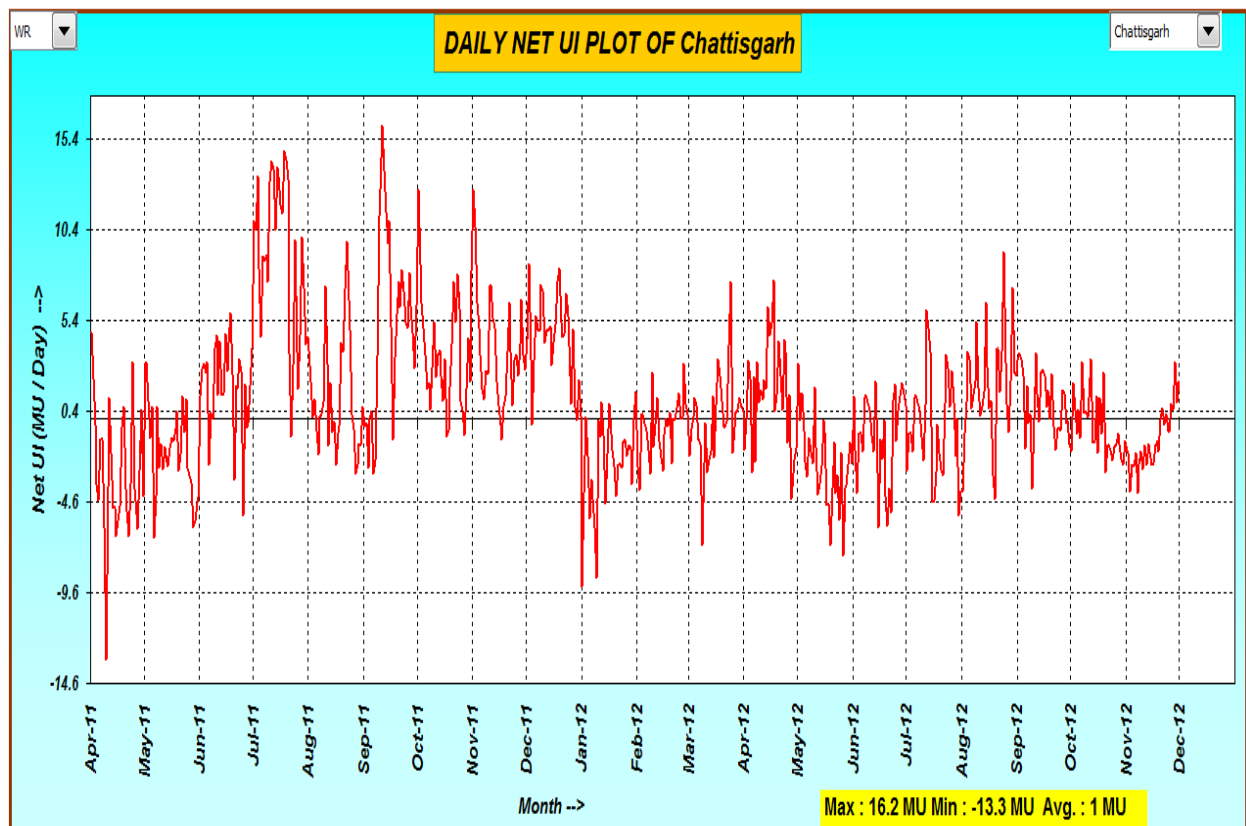
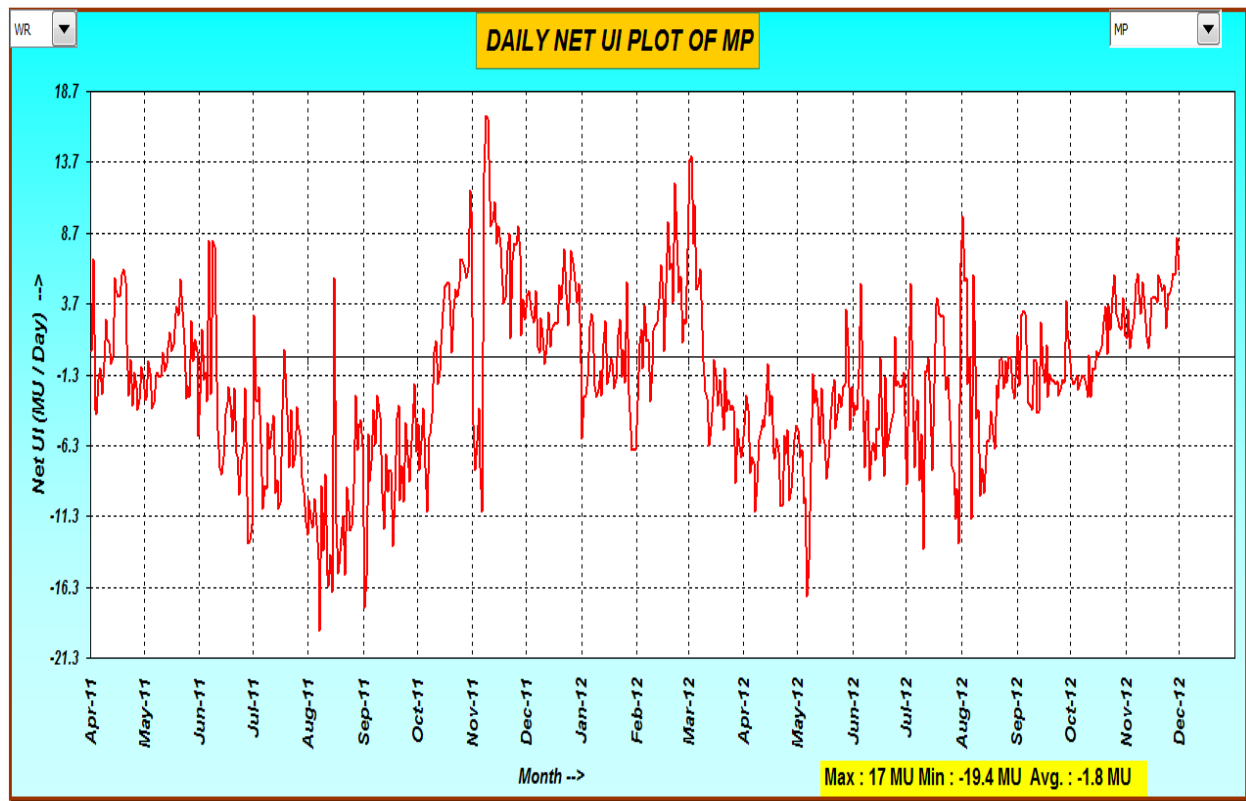
FREQUENCY PROFILE NEW GRID (% Time)								
FREQUENCY PROFILE	< 48.5	48.5 - 49.5	< 49.5	49.5 - 50.2	>50.2	Max. Freq	Min. Freq	Avg. Freq
Apr-12	0.00	2.38	2.38	93.68	3.94	50.66	49.08	49.90
May-12	0.00	10.82	10.82	87.82	1.36	50.75	48.82	49.80
Jun-12	0.00	19.95	19.95	78.66	1.39	50.68	48.75	49.70
Jul-12	0.00	24.38	24.38	73.59	2.03	51.21	49.79	49.68
Aug-12	0.00	1.57	1.57	89.72	8.71	50.65	48.82	49.95
Sep-12*	0.00	0.60	0.60	83.73	15.67	50.65	48.96	50.02
FREQUENCY PROFILE	<49.0	49.0- 49.7	<49.7	49.7- 50.2	>50.2	Max. Freq	Min. Freq	Avg. Freq
Sep-12#	0.00	3.22	3.22	84.09	12.69	50.65	48.96	50.03
Oct-12	0.00	3.33	3.33	90.39	6.28	50.61	49.37	49.98
Nov-12	0.00	0.05	1.79	85.83	12.38	50.63	49.33	50.02
Dec-12	0.00	4.39	4.39	84.1	11.51	50.63	49.25	50.00
Jan-13	0.00	4.63	4.63	80.95	14.42	50.78	49.3	50.01
FREQUENCY PROFILE SR GRID (% Time)								
FREQUENCY PROFILE	< 48.5	48.5 - 49.5	< 49.5	49.5 - 50.2	>50.2	Max. Freq	Min. Freq	Avg. Freq
Apr-12	0.00	7.79	7.79	91.28	0.93	50.66	48.66	49.69
May-12	0.00	5.61	5.61	94.01	0.38	50.63	48.81	49.7
Jun-12	0.00	7.83	7.83	91.03	1.14	50.79	48.86	49.68
Jul-12	0.00	0.00	6.95	92.18	0.87	50.61	48.81	49.69
Aug-12	0.00	3.17	3.17	95.57	1.26	50.55	48.86	49.75
Sep-12*	0.00	1.68	1.68	95.88	2.44	50.58	49.12	49.81
FREQUENCY PROFILE	<49.0	49.0- 49.7	<49.7	49.7- 50.2	>50.2	Max. Freq	Min. Freq	Avg. Freq
Sep-12#	0.00	0.00	18.37	81.43	0.2	50.51	49.12	49.79
Oct-12	0.00	8.26	8.26	89.38	2.36	50.73	49.19	49.86
Nov-12	0.00	0.00	4.16	91.85	3.99	50.69	49.15	49.91
Dec-12	0.00	3.68	3.68	93.4	2.92	50.87	49.28	49.90
Jan-13	0.00	0.00	3.78	91.41	4.81	50.87	49.24	49.94

\* (till 16 sep)    # (17 Sep onwards)

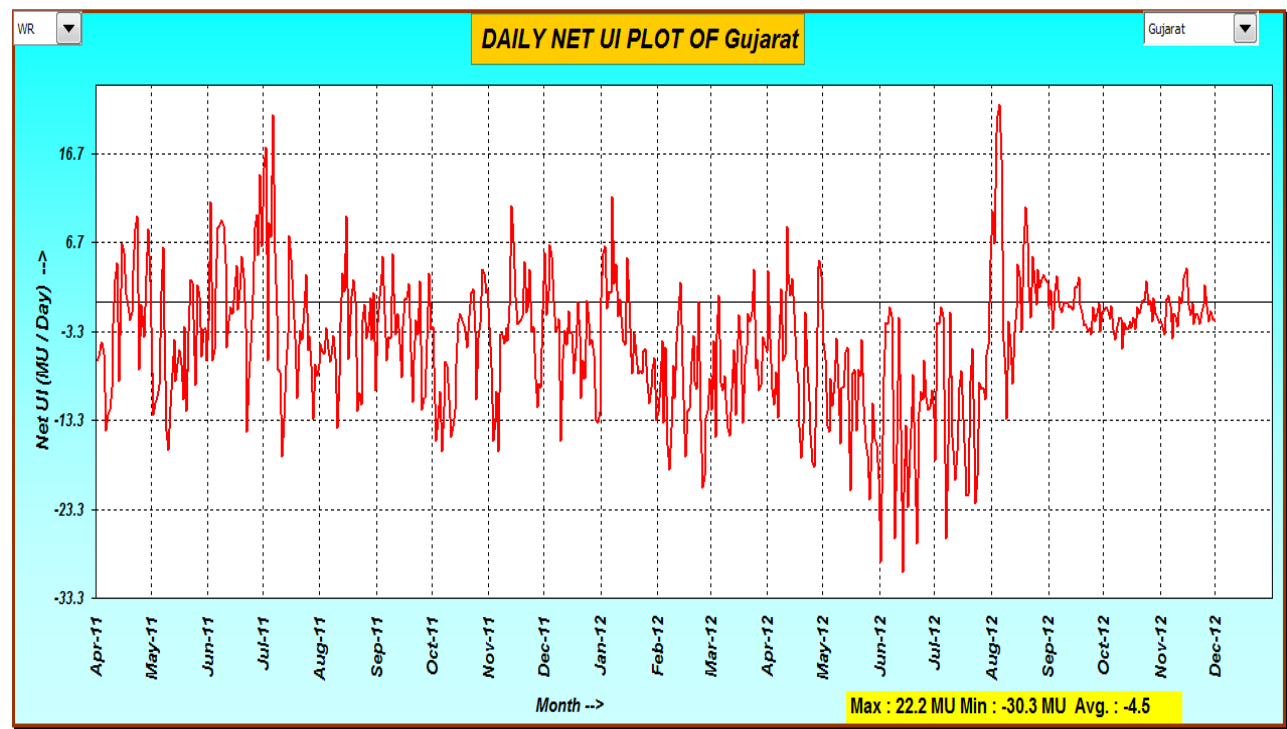
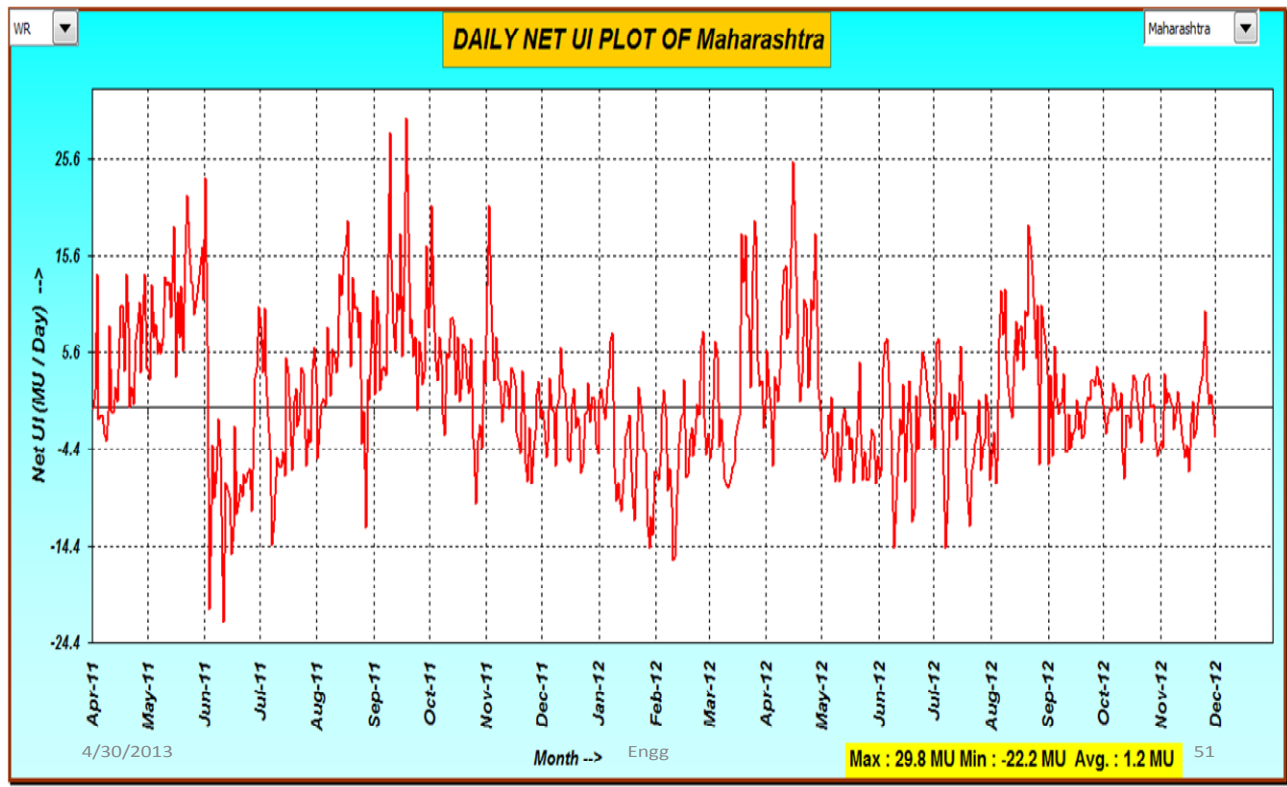


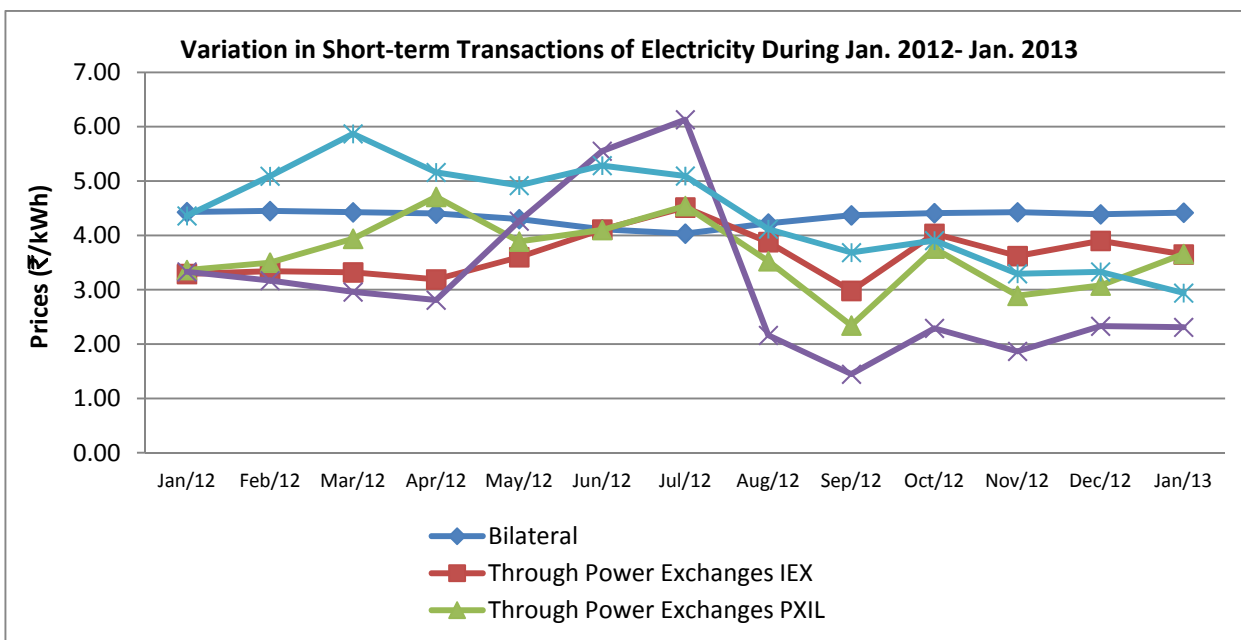
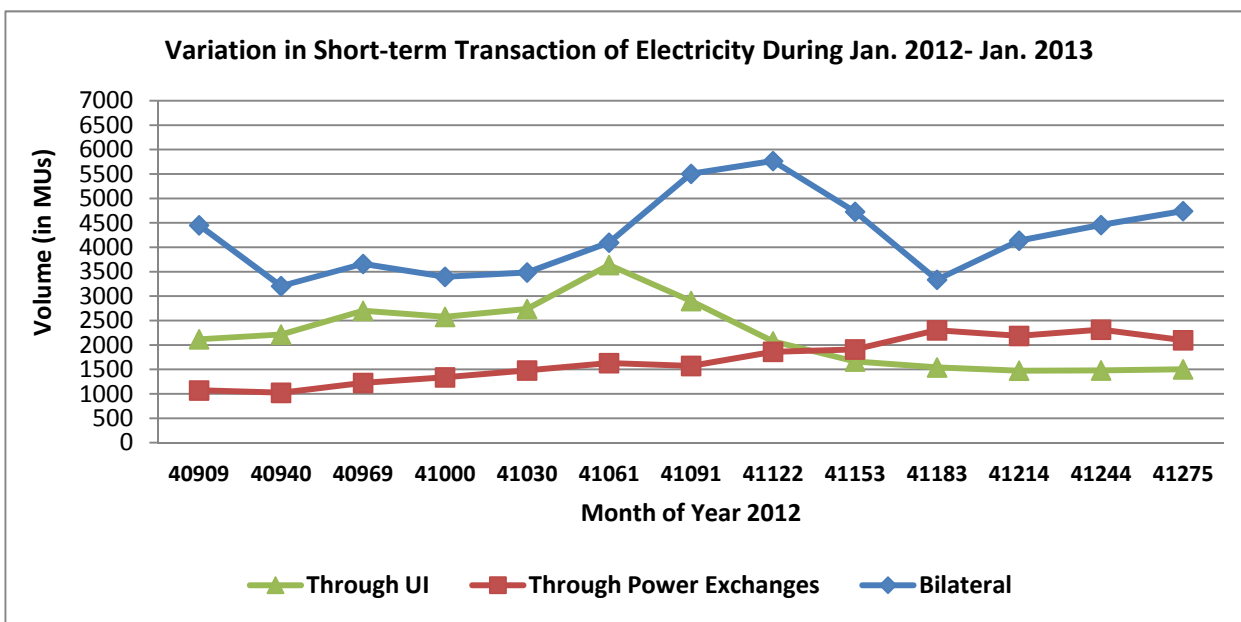






## Appendix-III Sh 2/2





Sl. No.	<b>Variable Charges of NTPC/NLC Coal Stations during July'12 to Dec'12</b>							
	Name of Station	EC Per Unit(Rs/Kwh)						
	Month	July 2012	August 2012	September 2012	October 2012	November 2012	December 2012	Avg (July12-Dec.-12)
1	Rihand Super Therm Pwr Stn 3	X	X	X	X	0.91	0.82	<b>0.87</b>
2	Korba STPS Stage-3	0.94	1.11	1.30	0.92	0.74	0.89	<b>0.98</b>
3	Korba Super Thermal Power Station 1	0.95	1.12	1.29	0.92	0.75	0.91	<b>0.99</b>
4	NLC - Barsingsar TPS 250 MW	0.99	1.04	1.09	1.06	1.04	1.02	<b>1.04</b>
5	Rihand Super Therm Pwr Stn 1	1.21	1.14	1.21	1.17	0.83	0.82	<b>1.06</b>
6	Rihand Super Therm Pwr Stn 2	1.19	1.13	1.25	1.26	0.88	0.84	<b>1.09</b>
7	Talcher Thermal Power Station	1.11	1.07	1.04	1.07	1.13	1.14	<b>1.09</b>
8	Singrauli Super Thermal Power Station	1.29	1.28	1.28	1.18	0.88	0.82	<b>1.12</b>
9	Vindhyach Super Thermal Power Station 2	1.50	1.59	1.50	1.48	1.00	0.78	<b>1.31</b>
10	Vindhyach Super Thermal Power Station 3	1.50	1.59	1.50	1.48	1.00	0.78	<b>1.31</b>
11	Sipat Super Thermal Power Station 2	1.34	1.45	1.37	1.02	1.38	1.44	<b>1.33</b>
12	Vindhyachal Super Thermal Power Stn 1	1.59	1.68	1.59	1.56	1.06	0.83	<b>1.39</b>
13	Talcher STPS 2	1.60	1.22	1.14	1.53	1.58	1.32	<b>1.40</b>
14	Talcher Super Thermal Power Station 1	1.68	1.22	1.14	1.53	1.58	1.32	<b>1.41</b>
15	Sipat Thermal Power Stn 1	1.57	1.52	1.79	1.12	1.40	1.33	<b>1.46</b>
16	Ramagundam Super Thermal Power Stn 1	1.52	1.46	1.37	1.73	1.62	1.69	<b>1.57</b>
17	Ramagundam Super Thermal Power Stn 3	1.61	X	1.68	1.92	2.40	2.38	<b>1.67</b>
18	Simhadri Super Thermal Power Station 1	1.81	1.53	1.87	1.74	1.74	1.97	<b>1.78</b>
19	Simhadri Super Thermal Power Station 2	1.80	1.53	1.89	1.75	1.73	1.96	<b>1.78</b>
20	NLC TPS-I Expansion 420 MW	1.81	1.83	1.87	1.91	1.84	1.84	<b>1.85</b>
21	NLC TPS-II Stage-II 840MW	1.98	1.99	1.91	1.99	1.99	1.99	<b>1.97</b>
22	NLC TPS-II Stage-I 630MW	1.98	1.99	1.99	2.00	1.99	1.99	<b>1.99</b>
23	Kahalgaon STPS- 2	2.67	2.14	2.16	1.94	1.63	1.60	<b>2.02</b>

**Annexure-I Sh2/3**

	Name of Station	EC Per Unit(Rs/Kwh)						
	Month	July 2012	August 2012	September 2012	October 2012	November 2012	December 2012	Avg (July12-Dec.-12)
24	Kahalgaon STPS 1	2.88	2.27	2.29	2.05	1.40	1.69	<b>2.10</b>
25	TANDA Thermal Power Station	2.38	2.41	2.10	2.42	2.02	2.00	<b>2.22</b>
26	Feroze Gandhi Thermal Power Station 1	2.65	2.55	2.55	2.23	2.20	2.03	<b>2.37</b>
27	Feroze Gandhi Thermal Power Stn 2	2.65	2.54	2.55	2.23	2.20	2.03	<b>2.37</b>
28	Feroze Gandhi Unchahar TPS 3	2.65	2.55	2.54	2.23	2.20	2.03	<b>2.37</b>
29	NLC TPS-I 600MW	2.371	2.389	2.391	2.376	2.39	2.40	<b>2.39</b>
30	Farakka Super Thermal Stn 3	3.10	3.06	2.94	2.23	1.78	1.62	<b>2.46</b>
31	Farakka Super Thermal Power Station 1	3.08	3.08	2.97	2.25	1.91	1.63	<b>2.49</b>
32	National Capital Therm Pw 2	2.88	2.51	2.56	2.79	2.90	3.00	<b>2.77</b>
33	National Capital Thermal Power Stn 1	2.89	2.65	2.78	2.89	2.96	2.93	<b>2.85</b>
34	Badarpur Thermal Power Station	3.76	4.00	3.73	3.31	3.27	3.25	<b>3.55</b>

**Variable Charges of NTPC Gas Stations during July'12 to Dec'12**

Calendar Year/Month	July 2012	August 2012	September 2012	October 2012	November 2012	December 2012	Avg (July12-Dec.-12)
	INR	INR	INR	INR	INR	INR	INR
<b>Energy Charges on Gas (Rs. /kWh)</b>							
Kawas Gas Pwr Stn	2.34	2.32	2.32	2.28	2.22	2.29	<b>2.30</b>
Jhanor_Gandhar Gas Stn	2.34	2.33	2.35	2.30	2.23	2.29	<b>2.31</b>
Faridabad Gas Power Station	2.55	2.41	2.43	2.38	2.33	2.34	<b>2.41</b>
Anta GAs Power Station	2.66	2.84	2.77	2.81	2.67	2.77	<b>2.75</b>
Dadri Gas Power Station	2.86	2.80	2.84	2.77	2.71	2.88	<b>2.81</b>
Auraiya Gas Power Station	2.95	2.79	2.83	2.76	2.75	2.83	<b>2.82</b>
<b>Energy Charges on LNG (Rs. /kWh)</b>							
Faridabad Gas Power Station	6.81	6.69	6.01	6.25	6.51	6.51	<b>6.46</b>
Kawas Gas Pwr Stn	8.54	8.46	7.52	7.30	X	7.30	<b>6.52</b>
Jhanor_Gandhar Gas Stn	8.57	8.22	7.59	7.13	X	9.55	<b>6.84</b>
Anta GAs Power Station	7.47	7.10	6.30	6.52	6.76	7.00	<b>6.86</b>
Dadri Gas Power Station	8.67	8.50	7.56	7.83	8.19	8.16	<b>8.15</b>
Auraiya Gas Power Station	9.03	8.36	7.63	7.98	8.11	8.32	<b>8.24</b>
<b>Energy Charges on Liquid Fuel Naphtha (Rs. /kWh)</b>							
Rajiv Gandhi Pwr Stn	10.60	10.63	11.63	11.36	11.17	11.22	<b>11.10</b>
<b>Energy Charges on Non APM Gas (Rs. /kWh)</b>							
Jhanor_Gandhar Gas Stn	3.09	3.07	3.07	3.03	2.95	3.03	<b>3.04</b>
Kawas Gas Pwr Stn	3.15	3.13	3.13	3.08	3.00	3.09	<b>3.10</b>

**Methodologies for the computation of Charges of Deviation and Additional Charges for deviation for each regional entity for crossing the volume limits specified for the under-drawal /over-injection**

(i)  $D_{tb}$  (Deviation in a time block)  $> (+/-)12\%$  of the schedule or 150 MW in each time block to be separated as  $D_{12/150}$

(ii)  $D_{tb} = D_0 + D_{12/150}$

Where  $D_0 = \text{Min} (D_a, (+/-)12\% \text{ of SG or } 150 \text{ MW Whichever is lower}),$

(iii)  $D_{12/150} = D_{tb} - D_0$

(iv)  $D' = \sum D_0$ ; if  $D' \leq 0.03$  of SG, no further adjustments required

(v)  $D_0$  to be receivable by the regional entity at normal Charges of Deviation or the ceiling rate whichever is lower;  $D_{12/150}$  be at zero rate; Additional Charges for the Deviation  $D_{12/150}$  shall be payable by the regional entity corresponding to specified limit

(vi) If  $D' > 0.03$  of SG,  $(D' - 0.03 \text{ of SG})$  to be paid @ zero rate; Additional Charges for the Deviation  $(D' - 0.03 \text{ of SG})$  shall be payable by the regional entity corresponding to specified limit

(vii)  $(D' - 0.03 \text{ of SG})$  can be distributed in various time blocks where  $D_{tb} > 0.03$  of SG on Pro-rata basis

**Methodologies for the computation of Charges of Deviation and Additional Charges for deviation for each regional entity for crossing the volume limits specified for the Over-drawal /under-injection**

- (i)  $D_{tb}$  (Deviation in a time block) > (+/-)12% of the schedule or 150 MW in each time block to be separated as  $D_{12/150}$
- (ii)  $D_{tb} = D_0 + D_{12/150}$   
  
Where  $D_0 = \text{Min} (D_a, (+/-)12\% \text{ of SG or } 150 \text{ MW Whichever is lower}),$
- (iii)  $D_{12/150} = D_{tb} - D_0$
- (iv)  $D' = \sum D_0$ ; if  $D' \leq 0.03$  of SG, no further adjustments required
- (v)  $D_0$  and  $D_{12/150}$  to be payable by the regional entity at normal Charges of Deviation; Additional Charges for the Deviation ( $D_{12/150}$ ) shall be payable by the regional entity corresponding to specified limit
- (vi) If  $D' > 0.03$  of SG,  $(D' - 0.03 \text{ of SG})$  to be paid @ zero rate; Additional Charges for the Deviation  $(D' - 0.03 \text{ of SG})$  shall be payable corresponding to specified limit
- (vii)  $(D' - 0.03 \text{ of SG})$  can be distributed in various time blocks where  $D_{tb} > 0.03$  of SG on Pro-rata basis