MADHYA PRADESH ELECTRICITY REGULATORY COMMISSION

Discussion Paper on Implementation of ABT within the State of Madhya Pradesh

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A1: INTRODUCTION TO ABT

Reason behind Implementation of ABT

1.1 ABT is concerned with the tariff structure for bulk power and is aimed at bringing about more responsibility and accountability in power generation and consumption through a scheme of incentives and disincentives. ABT tries to improve the quality of power and curtail the following disruptive trends:

(a) Unacceptable rapid and high frequency deviations causing damage and disruptions

(b) Frequent grid disturbances resulting in generators tripping, power outages and grid instability.

The Purpose of ABT

1.2 Availability Based Tariffs (ABT) has been implemented in the Western Region since July 1st 2002. One of the main reasons for implementing these tariffs was to encourage grid discipline by making the pricing of power frequency dependent, thereby forcing state participants to improve procedures for forecasting, scheduling and load dispatch.

1.3 The purpose of the introduction of ABT are as under:

(a) Encouragement to grid discipline

(b) Promotion to trade in energy and capacity

(c) Economic load dispatch

(d) Encouragement to higher availability

1.4 ABT has been implemented in all the regional grids in the timetable mentioned below:

- Western Region: 1 July 2002
- Northern Region: 1 December 2002
- Southern Region: 1 January 2003
- Eastern Region: 1 April 2003

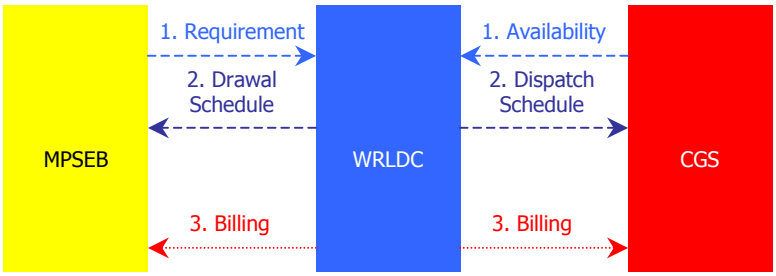
1.5 In the western grid, ABT is currently applicable to all CGS except nuclear stations and to all SEBs.

Description of the ABT Mechanism

1.6 The ABT mechanism is laid out on financial principles, wherein all generators and beneficiaries must declare a schedule for generation and drawal every 15 minutes one day in advance. Any deviation from the schedule is charged at rates, which are dependent on frequency at that point in time.

1.7 In the current scenario, MPSEB presents a 15-minute schedule to the WRLDC on a day-ahead basis. Any deviations from the schedule are charged as per the applicable UI rates for the average frequency prevalent in the grid for that 15-minute block. This mechanism in depicted schematically in Figure 1 below.

Figure 1: *ABT Operation and Billing & Payment Mechanism Prior to Open Access.*



1.8 The Figure 1 above shows the ABT mechanism in a step-by-step process. In the first step, the SEB's give the RLDC its requirement in 15-minute blocks for the next day. At the same time the CGS stations also provide the RLDC their 15-minute availability positions.

1.9 Based on the declared demand and available supply, the WRLDC provides a schedule to the SEB's and the CGS for drawal and generation in 15-minute blocks.

1.10 On the day of operation, as per requirements in the schedule, the WRDLC dispatches the CGS stations in merit order.

1.11 Based on the drawal and generation positions of the SEBs and the CGS stations, the UI bill is computed. The bill may require payment or indicate a receipt. Every billing cycle, the RLDC / REB computes the receivables and payables of all SEBs and CGS stations and raises the UI bill, which each must then settle.

Three-part ABT Tariff

1.12 The ABT mechanism may be described as based on a "three-part tariff" mechanism. The components are:

(a) **Fixed Charge:** This is payable by the beneficiary states based on the capacity allocated to them, and is irrespective of the amount of power they draw or schedule to draw[1].

(b) **Energy Charge:** All the scheduled energy that is drawn is charged as per the variable energy charge of the station from which power is being drawn.

(c) **UI Charge:** The UI (Unscheduled Interchange) charge is levied on those units of energy that are a deviation from the schedule. This UI charge is frequency dependent.

1.13 To illustrate the above, if MPSEB is scheduled to draw 100 MU, but draws 120 MU, then it will have to pay (i) fixed charge based on allocation, (ii) energy charge for the scheduled energy of 100 MU and (iii) UI charge for the 20 MU of over drawal, the charges depending on the rate fixed for the average frequency for the period of over drawal.

1.14 On the other hand, if MPSEB under draws, it will pay the (i) fixed and (ii) variable energy charge for the scheduled units and (iii) will receive UI charge for the units of under drawal. For example, if MPSEB draws 80 MU out of a scheduled 100 MU, it will pay energy rate for 100 MU, and will receive UI charge for 20 MU. The UI charge payable is at the UI rate for the frequency at that time.

Current UI Charges Rates

1.15 The UI charges are governed by the formula mentioned below:

UI Charges	
= 420	for f < 49
= 420-[280*(f-49)]	for 49 < f < 50.5
= 0	for f > 50.5

1.16 It is shown for various frequencies in the figure in the previous page. Thus is can be seen that the UI rate is 140 p/u at 50 Hz frequency, and 238 p/u for 49.65 Hz frequency.

[1] Fixed charges are payable to the generator based on availability.

Proposed UI Charges Rates Applicable from 1 April 2004

1.17 The above rates have been revised by CERC wherein the highest rate shall now be Rs. 6 per unit.

UI Charges	
= 600	for f < 49
= 600-[400*(f-49)]	for 49 < f < 50.5
= 0	for f > 50.5

A2: NEED FOR ABT WITHIN MADHYA PRADESH

Conceptual Framework

The Tragedy of Commons

2.1 The "commons" is any resource which is shared by a group of people. Such things as the air we breathe and the water we drink come from commons. In many parts of the world, new land for farming and grazing land for stock, fish from the sea, and wood for fuel and housing are treated as commons. In the context of UI billing, it will mean that the total UI bill raised to MPPTCL / MPSEB and then passed onto (or "shared") Discoms based on their MW capacity allocation or MU energy drawal can be considered as "commons".

The Logic of the Commons

2.2 Each household has the right to take resources from and put wastes into the commons. To accumulate wealth, each household believes that it can acquire one unit of resources or dump one unit of waste while distributing one unit of cost across all of the households with whom the commons is shared. Thereby, the gain to the household appears large and the cost very small. Some households accumulate wealth more rapidly than others and this, in turn, gives them the means to access an even larger share of the commons.

2.3 The fallacy in the logic of the commons lies in the failure to recognize that all households are attempting to do the same thing. Thus, on average, one unit of gain for a household actually produces a net one unit of cost for each household. However, selfish households accumulate wealth from the commons by acquiring more than their fair share of the resources and paying less than their fair share of the total costs. Ultimately, as population grows and greed runs rampant, the commons collapses and ends in "the tragedy of the commons".

Tragedy of Commons in Pass-through of UI Bills

2.4 Similarly, if the WREB UI bill is passed onto Discom's and licensees on the basis of their allocation or on the basis of MU-drawal, the marginal cost of each additional MU, chargeable under UI, will be borne by all entities, whereas the entity causing the grid indiscipline will have to pay only a fraction of the cost of the marginal unit.

2.5 To illustrate the situation with an example, assuming the three Discoms are allocated 800 MW, 1200 MW and 1600 MW of power from the CGS stations. Further assuming that the UI rate for a block is found to be Rs. 5.00. Each Discom will find that the cost of each marginal unit will be 5.00 for MPSEB as a whole, but the amount that can be passed-through to it will be as per the table below:

Table 1: *Tragedy of Commons in UI Billing*

UI Rate to MPSEB / MPPTCL	Discom A	Discom B	Discom C
5.00	1.11	1.67	2.22
4.50	1.00	1.50	2.00
4.00	0.89	1.33	1.78
3.50	0.78	1.17	1.56
3.00	0.67	1.00	1.33
2.50	0.56	0.83	1.11

2.6 Thus, if the marginal UI rate is anything above 2.50, which may be considered to be the expected marginal cost of power purchase (from traded sources), it will be beneficial for each Discom individually to overdraw from the grid, because its cost is only partially borne by it and is shared by all others. As a result, there is incentive to overdraw from the grid at all times resulting in grid indiscipline and a heftier UI bill to MPSEB / MPPTCL to the point where the tragedy of commons will strike.

2.7 Yet another key observation is that in the case of UI pass-through based on MW-allocation, the Discom A, gains the maximum for each percentage over drawal above schedule, whereas Discom C, which has a larger allocation has to cross-subsidize it. For example, 100 MW of over drawal is a bigger percentage of deviation for Discom A, which has a smaller allocation; at the same time, the cost passed through to it is always the least, also on account of its smaller allocation. Thus, this system, apart from leading to a tragedy of commons, is also inherently unfair.

Overcoming the Tragedy of Commons

2.8 The ABT mechanism was designed to overcome precisely this tragedy of commons among different SEB's with regard to CGS stations, because the costs of grid indiscipline are levied directly to the entity causing it and is not shared, thereby removing the "commons" factor. It is expected that this mechanism shall also provide for the ideal solution within the state as well in order to ensure grid discipline by each Discom and that the total UI bill of MPSEB / MPPTCL is kept low.

Structural Changes in the Electricity Sector in Madhya Pradesh

Restructuring of MPSEB

2.9 MPSEB is in the process of being restructured into MPPGCL, MPPTCL, three Discoms and holding company MPSEB that shall be the holding company of all successor entities and may operate as a trader of energy buying power on behalf of the Discoms.

2.10 As per statutory requirements under Section 39 of the Electricity Act 2003, the MPPTCL, if declared State Transmission Utility (STU), must not trade and shall be a pure wires company. The role of MPSEB as a single-buyer in the state is not clear when other distribution licenses and open access consumers are considered because whereas it can act as an interface for the state-owned Discoms, other distribution licensees can purchase power independently, thereby making MPSEB only one of several operating traders.

UI Billing to MPPTCL /MPSEB

2.11 Section 40 of the CERC Order on Open Access dated 14 November 2003, states that "ABT has already been implemented in four regional grids and forms basis for accounting for deviations from the schedules. It is high time that the same methodology and procedures for energy accounting are implemented at the State level also. This will facilitate segregation of UI charges among Discoms as well as embedded open access customers on a rational basis… It needs to be emphasized that only when States follow the regional accounting procedures and implement ABT, the intent of the Act in respect of open access shall be completely implemented."

2.12 The Section 40 of the CERC Order also states under that UI bills shall be issued to SEB's or successor Transco along the currently prevalent charging methodology.

Role of MPSEB and MPPTCL

2.13 As mentioned above, while MPSEB's role as holding company for MPPGCL, Discoms and MPPTCL is clear, its operation as the single trader on behalf of the MPPGCL and Discoms is unclear and incomplete.

2.14 The role is unclear because as per the Electricity Act, each Discom is a deemed distribution licensee and can also trade without need for a separate license, thus making it unnecessary for them to use MPSEB as the single trader from which to source power. Similarly, the MPPGCL does not need to necessarily sell power through MPSEB.

2.15 The role is incomplete because whereas the Discoms may be required to use MPSEB services as the single trader this will not apply to other distribution licensees, independent power producers and open access consumers, which are expected to grow in numbers and market share.

2.16 As per the Electricity Act 2003, the MPPTCL, if declared STU, cannot trade – buy or sell power. Therefore, it shall not be responsible for providing schedules for generation and drawals and shall also not be responsible for deviations.

2.17 As a result both the MPSEB and the MPPTCL are not suitable for paying the UI bills raised by the RLDC.

Need for Pass-through of UI Bill to Users of Transmission Capacity

2.18 The distribution licensees, generators and other open access users are the ultimate source where any deviations from schedule actually occur. It is these entities that generate or purchase power and they must be responsible for ensuring that their drawal does not impact the overall ABT UI billing of the state.

2.19 Thus, all distribution licensees and state generating stations must fall within the purview of ABT. As a result, it is required that the ABT regime be extended to cover all distribution and generation entities within the state of Madhya Pradesh. Special exemptions may be made depending on load or nature of source.

Open Access and Related Issues

2.20 The Commission is seized with the issue of phasing of open access. It is envisaged that significant open access will be allowed within the next two-three years. With the imminent introduction of open access within the state, there will be multiple agencies that will be operating in the power sector. As a result there will be several pressures on the grid and other complexities as explained below.

Grid Discipline

2.21 With introduction of open access and a large number of users, there is bound to be complexities as a result of voluntary or involuntary deviations from committed or projected schedules and injection or withdrawal of more or less power than committed. For example, an open access user committed to draw 50 MW may overdraw or under draw from the grid. A large number of such deviants could lead to significant disturbance in the grid and to instability as a result. To ensure that grid discipline is maintained in the regional grid, the ABT mechanism has proved to be extremely successful. It can, therefore be expected that the same will be the case of users within the state.

Accounting of Energy

2.22 Accounting of energy will become complex in the absence of a simple and universally applicable mechanism as provided under ABT. To cite an example, there may be bilateral contracts between two open access users – a generator and a consumer. Whereas both will have contracted for a given MW of power, a deviation by either or both will lead to a high degree of complexity in terms of who will pay for over/underdrawal or over/under-generation and at what rates.

Development of Market

2.23 The Electricity Act 2003 is promotes competition and development of markets and if a Discom or Generator manages better, it should benefit out of it. This makes for a strong argument in favor of segregation of costs and levy on actuals. UI management is also an area wherein efficiency of management is required. Any efficiency on this front must also be rewarded.

Incentives and Penalties to the Generators and Discoms / Open Access Consumers

2.24 Given the proposed high rate for UI charges, the ABT mechanism implemented within the state can provide a suitable incentive-penalty signaling mechanism for the level of generation required. For example, at lower frequencies there will be an incentive to generators to increase output and at higher frequencies there will be incentive to consumers to increase off-take. Similarly at lower frequencies, the consumers will seek to curtail load whereas under high frequency conditions, the generators will attempt back down in merit order.

2.25 Thus, the incentive-penalty structure of ABT provides for suitable real time market signals and an overall increase in efficiency of the industry.

2.26 Based on the above, the need to extend ABT to the intra-state level is strong and the MPERC would like to ensure successful early implementation.

Benefits of UI – Trading and Additional Income

2.27 The UI mechanism helps develop the power market because it can be used as a good basis for trading. Under-drawal at low frequencies by Discoms can result in significant income on account of UI payments. Thus, a Discom, which manages its load efficiently, can trade its power (at a margin) to others by under-drawing from the grid at periods of low frequency. Similarly, a Discom in need of power at a low-frequency period, can purchase this power and benefit by paying a lower rate that the UI rate prevailing in the grid.

Sharing of Benefits

2.28 The management of UI is of vital importance, because while efficient management can save a lot of expense in UI bills, it also presents avenues for short-term trades in power, and income from such trades.

2.29 The credit for efficient management lies with the staff of Discoms, and the Commission is of the opinion that a part of the savings and income may be passed onto the staff, the shareholders and to consumers, and the rest may be used to undertake investments in various upgradation and other works to further improve efficiency of operations.

A3: ROLE OF NEW ENTITIES WITH REGARD TO ABT

Need for Role Definition of Various Entities

3.1 As mentioned above, the MPPTCL and MPSEB are not best suited to pay the regional UI bills and that the ABT mechanism needs to be replicated at the state level. For fulfilling this need it is important that the role of all concerned entities is clearly defined and a suitable mechanism for payment of UI bills is developed to ensure successful implementation of intra-state ABT.

Role of Various Entities

Transmission Company

3.2 In the unbundled scenario, a separate Transmission Company (STU) shall have to be notified under Section 39(1) of the Electricity Act 2003. The STU shall be a pure wires business and shall be responsible for ensuring availability of capacity to users and allowing open access to anyone who desires it subject to availability of spare capacity and approval by the Commission. It is understood that the MPPTCL is likely to be notified as the STU.

3.3 The role of the MPPTCL shall be to ensure that its wires and any available capacity are provided to anyone who asks for use. In this regard, the MPPTCL shall have to plan capacity over the long term and ensure a certain minimum availability to be determined by the Commission. It may also be required to provide technical support to users for availing use of transmission capacity.

3.4 The only source of income for the MPPTCL shall be the wheeling charges that it shall earn from users of its wires, which shall be determined to ensure full cost recovery and required rate of return.

MPSEB / Trader

3.5 With regard to MPSEB, it may either cease to exist as a separate entity, or (a) it may continue as a holding company of the state-owned distribution licensees and also of state owned generation company(s) or (b) it may operate as a trader in electricity buying and selling on behalf of the state-owned discoms and generating companies.

Distribution Licensees

3.6 The distribution licensees shall be in the business of distribution of electricity to end consumers. They shall be responsible to ensure that their consumers are provided with reliable and quality power supply as per the requirements and standards set out by the Commission.

3.7 Since they shall be responsible for the operation of the business, on the basis of which they shall be in a suitable position to forecast demand within their area of supply, they should be responsible for drawing up demand schedules in day-ahead according to ABT and other mechanisms that may develop. Thereafter, they must also ensure that they adhere to their committed schedule, failing which they shall be liable to pay UI penalty.

Generation Company(s)

3.8 MPPGCL, the state-owned generating company, shall have to provide costing details for each stage of each of its stations separately. Each of these stations shall have to compete with central sector generators, IPP's, traded power and among themselves to sell to the distribution licensees which shall abide by merit-order principles. In the interest of grid discipline, merit order dispatch and simpler accounting and billing, generators must also fall within the purview of ABT within the state.

SLDC

3.9 The following role is defined for the SLDC under the Terms and Conditions for Transmission License Section 5.3:

> *"5.3 The State Load Dispatch Center (SLDC). Till the establishment of the SLDC by the State Government as per Section 31 of the Central Act, the Licensee shall undertake the operations and functions of the SLDC as described below:*
>
> *(a) It shall be the apex body to ensure integrated operation of the power system in a State*
>
> *(b) It shall monitor grid operations*
>
> *(c) It shall keep accounts of the quantity of electricity transmitted through the State grid*
>
> *(d) It shall exercise supervision and control over the intra-state transmission system; and*
>
> *(e) It shall be responsible for carrying out real time operations for grid control and dispatch of electricity within the State through secure and economic operation of the State grid in accordance with the Grid Standards and the State Grid Code*
>
> *5.4 The SLDC shall give such directions and exercise such supervision and control as may be required for ensuring the integrated grid operations and for achieving the maximum economy and efficiency in the operation of power system in that State."*

3.10 The SLDC that has been assigned the responsibility of ensuring economic and efficient operation of the power system. As a consequence, the SLDC shall be responsible for ensuring merit-order dispatch.

3.11 Further, as described above, the SLDC has been assigned the responsibility of exercising supervision and control over the intra-state transmission system and for carrying out real time operations of grid control. Is shall, therefore, have the physical power to supply or disconnect a defaulting consumer.

3.12 The SLDC, therefore, is most suited to assume the responsibility of ensuring that the UI bills raised to the MPSEB or successor MPPTCL, are passed onto individual distribution licensees, MPSEB and any others as per their contribution to the total ABT UI bill, which shall be determined based on intra-state ABT.

3.13 However, given that the possibility of defaults in payment to SLDC creates a risk for it because of outstanding payment to the WREB, a suitable risk mitigation mechanism shall need to be developed.

Open Access Users

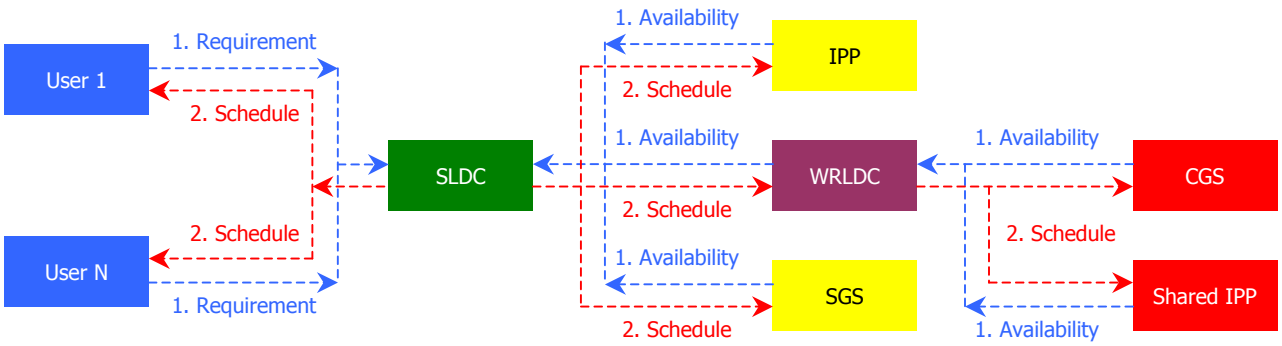
3.14 All open access users shall fall under the ABT regime in order to ensure that they contribute to grid discipline and simplified accounting and billing. However, the Commission feels that some specific users may be exempted from ABT such as wind energy and other renewable sources, and also open access users below a minimum capacity to be determined later.

A4: MECHANISM OF INTRA-STATE ABT

Operational Mechanism

4.1 It is envisaged that all distribution licensees and open access users must draw up the day-ahead schedules and intimate the SLDC of the same. Based on this, the SLDC shall intimate the state generators and within-the-state IPP's of their dispatch schedule on overall merit order (including considering prices of central sector stations) and intimate the RLDC of requirements for merit order dispatch of central generating stations, IPP's, power traders and other bulk power selling entities. The scheduling and dispatch mechanism under the unbundled scenario with open access users is depicted schematically in Figure 2 below.

Figure 2: *Scheduling and Dispatch Under Intra-State ABT*



4.2 As the Figure 2 shows the process for the intra-state ABT mechanism shall be designed so as to seamlessly blend with the current ABT mechanism. In the first stage, the SLDC shall receive requirements in 15-minute blocks from bulk purchasers of power in a day-ahead fashion. The SLDC shall also receive the availability from each of the state generators, IPP's and from the SGS and national IPP's through the WRLDC. Based on the information thus available to the SLDC for all sources of power for input into the state grid, it shall prepare a 15-minute schedule for the drawal by the Users / Consumers and dispatch for all the generating stations in merit order.

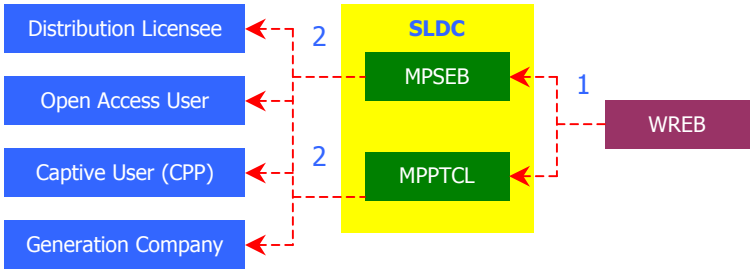
4.3 Thus, SLDC shall be responsible for ensuring that the dispatch instructions and the schedule sent to the RLDC match up to requirements and schedules it has received from the Users (discoms, open access users etc.).

Billing and Collection Mechanism

Description of Proposed Mechanism

4.4 As per the CERC Order, the REB shall raise the UI bill to the SEB or successor MPPTCL. The MPERC feels that the SLDC is best suited to take the responsibility of recovering charges from end-user licensees and open access consumers and making payment to the WREB. This is depicted in the Figure 3 below.

Figure 3: *ABT Billing Mechanism to MPSEB/STU to Licensees.*



4.5 The billing and collection mechanism shall have to be aligned with the phasing process of ABT implementation as described later in this paper.

4.6 In Phase – I, the shadow billing shall be done to Discoms and open access users on a fortnightly basis based on 1-hour ABT. This shadow bill will only indicate the UI charges that are leviable on the Users, but they will not have to make payment. This shall be purely for the purpose of ensuring preparedness. MPSEB shall be settling the bills with the central sector.

4.7 In Phase – II, UI billing shall be done based on 30-minute computations given the current lack of preparedness to fully implement ABT. This will be done based on weekly meter readings.

4.8 In Phase – III, complete ABT will be implemented and thereafter there will not be any approximation related issues.

Settlement of Differences

4.9 Because of 30-minute computation instead of 15-minute as in the central sector, there will be differences in the bill raised to MPPTCL / SLDC and the bills passed onto the end users of open access and the amount collected by SLDC. In the interest of simplicity, this difference amount may be pro-rated among Discoms on the basis of their allocation.

ABT Margin

4.10 In the Phase – II, and after, in case of delay in payments, the onus shall lie with MPPTCL / MPSEB for making / receiving payments on UI bills raised to it from the central sector. While it is true that the SLDC shall be in a position to disrupt supply to a non-paying Discom, or stopping dispatch from an erring generating station, there will lie with it the risk that it is not in a position to pay the WREB on account of non-payment by Discoms.

ABT Margin for Discoms

4.11 To hedge this risk, it is proposed that all users pay an advance into an ABT account in the form of ABT margin, from which the SLDC may withdraw and make payments in case of delay. When the margin falls below a minimum threshold level, the Discom / User must replenish the account or else face the risk of being disallowed over drawals by the SLDC.

4.12 The ABT margin shall be determined based on two years past observation of drawal positions of MPSEB, prorated for the Discoms based on their allocation. This margin shall account for the changed rates proposed.

4.13 The past observation shows that the UI bills have been different for different months. Therefore, the ABT margin also may be different for different months.

ABT Margin for Generators

4.14 In the case of generators, it is proposed that any unpaid UI bill shall be recovered from Discom payments due to them for power purchased. For this purpose, there must be a suitable routing mechanism for the power purchase payments.

4.15 Any unpaid bill shall be recovered from the Discoms in the ratio of their allocation of generator share. The Discoms may, thereafter, pay the generators the power purchase bill, adjusted for the UI bill levied by the SLDC on them. For example, assuming that a generator is due to receive 10 crores for power generated but has defaulted on payment of 50 lacs of UI. Also assuming that the generator capacity has been allocated in the ratio of 1:2:2, then the Discoms shall pay 2, 4, 4 crores of energy bill adjusted for 10, 20, 20 lacs. The final payments shall be 1.9, 3.8, 3.8 crores. The Discoms shall pay this amount of 50 lacs deducted from the generators' bills to the SLDC.

4.16 In cases where the generator is due to receive payments, the payment shall be made to the Discoms in ratio of their share. The generators will be informed of this, so that they may recover this amount from the Discoms.

4.17 Since the ABT margin must cover the risk of Discom as well and generator non-payment, the margin should be set at a higher level than what is derived above based on past recorded adjusted for the new rates.

A5: ISSUES IN ABT IMPLEMENTATION

5.1 While it is considered necessary that ABT be implemented in the state, its implementation will have to consider several issues and provide for a solution for the same.

Application of ABT and Exemptions

5.2 Whereas it has been emphasized the ABT must be applied to transmission capacity users within the state, there are practical considerations that must be considered with regard to certain consumers who require exemption or are of very small capacity. This may be either with regard to benefit to the user, or in view of system infeasibility.

Renewables Generator / User

5.3 Renewable energy sources – specifically wind energy generators and mini / micro hydel sets – are largely unreliable because on dependence on wind flow or water released from reservoirs, and energy generation cannot be predicted. In view of this, the generator cannot provide a generation schedule. As a result, the Commission may consider that such sources should be exempted from the ABT regime.

5.4 Renewable sources such as biomass, solid waste etc are controllable and a schedule can be generated day-ahead. However, given the many benefits of renewables, and also in view of the relatively very small capacity of units, biomass and other renewables may also be exempted from ABT.

MW Capacity

5.5 While the Commission shall determine phasing of open access, it is for discussion here what should be the minimum capacity for application of ABT in terms of (a) the effect of deviations by smaller users on overall system and (b) cost of ABT metering and monitoring mechanisms. At the same time it may be mentioned that since the initial open access users shall be of relatively higher capacity (in keeping with phasing), this discussion shall acquire greater relevance at a later stage.

Readiness of MPSEB Successor Entities to Implement ABT

5.6 The readiness of successor Discoms and MPPTCL to implement ABT is a critical requirement for the purpose of implementation of ABT within the State. Whereas the CERC requires that RLDC raise bills to MPSEB or MPPTCL, with unbundling, they will no longer be in an ideal position to undertake payment or collect from discoms, other distribution licensees, generators and open access users. For the SLDC to make such collections it should have a sufficiently comprehensive system that tracks the details of drawal position for each 15-minute block.

5.7 The key conditions for readiness are as mentioned below:

Technical Requirements

- ABT metering of all interface points of each Discom.
- ABT metering of interface points of each state generating station.
- IT system in the SLDC, ALDC and DSOCC to monitor generation and drawal positions and for the SLDC to raise UI bills to discoms, other distribution licensees, generators and open access users.
- System capability of discoms and generators to monitor over/under drawal and take quick action to manage UI bills. This may require formation of ALDC and DSOCC and deployment of SCADA or other solution.
- Identification of interface point – whether LV side or outgoing feeder.

Commercial Requirements

- Fixed cost computation of each stage of each MPPGCL station separately.
- Variable cost computation of each stage of each MPPGCL station separately.

Other Requirements

- Ability of personnel to provide accurate day-ahead availability and drawal schedule for the MPPGCL and discoms.
- Ability of personnel to undertake load management in real time to manage UI bills.
- Ability of personnel of discoms, MPPGCL and SLDC to manage IT and other systems for ABT management.

5.8 The Commission understands that the above critical requirements must be fulfilled before ABT can be comprehensively implemented within Madhya Pradesh. For this purpose, the Commission shall assign deadlines for compliance to minimum requirements. However, even before ABT can be implemented in its entirety, the SLDC shall have to recover costs from each discom, generator and other users to pay the UI bills served by WREB.

5.9 For this purpose, the SLDC shall have to raise the bills irrespective of whether an individual discom is ABT-ready. Till such time the SLDC may be permitted to estimate deviations for each 15-minute block by each Discom, generator and other user based on current metering levels and extrapolation of their records and raise bills accordingly.

5.10 A suitable mechanism for estimation and timeline for comprehensive implementation of ABT in Madhya Pradesh will be provided by the Commission shortly. However detailed discussion on this issue is provided below.

Application of ABT to Hydel Generation Sources

5.11 With regard to hydel projects it needs to be decided whether they should be included under the ABT regime. There appears to be little reason why hydel stations should not be able to provide a day ahead schedule irrespective of whether it is a multi-purpose project or one for the purpose of power generation alone. It is therefore felt that hydel stations should also come under ABT.

A6: PREPAREDNESS OF MPSEB FOR ABT IMPLEMENTATION WITHIN STATE

6.1 Presently, the preparedness of MPSEB does not allow for complete ABT implementation within the state. As a result a phased implementation of ABT may be called for.

Preparedness of MPPTCL

Metering at Interface Points of MPPTCL and Discoms

6.2 Details of the MPPTCL grid are provided in the Table 2 below.

Table 2: *Technical Details Interface of Transmission System with Discoms*

Voltage Level (kV)	Sub-stations		
	Numbers	Number of Transformers	Total Installed Capacity
400	4	14	2940
220	26	77	6970
132	127	314[2]	8872
66	1	4	20
Total	158	3237	18802

Sources: ([2]Information provided by MPPTCL to MPERC on 10 February 2004).

6.3 It needs to be resolved whether ABT metering needs to be done on the LV side of the 132/33 kV transformers or on the 33 kV or 11 kV outgoing feeders. In this regard it is noted that if the metering is done on the LV side of the 132/33 kV transformers, there shall be a smaller requirement for number of meters, data handling will be simpler and the system can be rolled out faster.

6.4 The disadvantage with this metering scheme is that individual 33 or 11 kV feeders cannot be monitored by the discom for active energy, reactive energy, quality of supply etc. for the purpose of more efficient and effective load management by them. Further, there are transformers where there are feeders going to different Discoms and as a result each needs to be metered separately. In such cases, for faster rollout, feeders of only such transformers may be metered.

6.5 If it is found that it is acceptable to meter only on the LV side of the 132/33 kV transformers, there shall be requirement for 314 meters. If however, it is felt necessary that the metering should be done on the 33 kV or 11 kV outgoing feeders, there shall be a need for 1170 number of meters. In either case, a detailed meter reading system will have to be developed.

6.6 As per information made available by MPPTCL, 0.5 class static trivector meters along with 0.5/1 class CT's and PT's already exist on transmission-distribution interface points (i.e., LV side of 132/33 kV power transformers in the 132 kV sub-stations). Apart from these, similar meters are also available on 33 kV and 11 kV outgoing feeders emanating from 132 kV sub-stations.

6.7 0.5 class static trivector meters have the capability of recording following load survey parameters with 30 minutes integration period and storing the data for 35 days:

- MW (Import)
- MW (Export)
- MVAR (Lag)
- MVAR (Lead)

6.8 All these meters are MRI compatible and can be downloaded through optical port using MRI.

6.9 Since there are meters on all interface points, MPPTCL is fully equipped to implement ABT. However, there will be need for some degree of approximation in case of usage of current meters, which may lead to MPPTCL taking some degree of risk.

6.10 The approximation that will occur in case the current meters are used for ABT implementation is on account of the following reasons:

(a) **Integration Period:** The currently installed meters have a 30-minute integration period as against a required 15-minute integration period in the case of ABT. While to start with a 30-minute integration may be acceptable, however, the bill raised to the MPPTCL / MPSEB shall be based on 15-minute drawal and injection position. As a result, the MPPTCL may get exposed to a certain degree of risk.

(b) **Reactive Energy:** As per the ABT implemented at the central level, net reactive energy is recorded in each 15-minute block when the voltage is above 103% or below 97% of the rated voltage. This is currently billed to the beneficiary SEBs. However, the current meters in the MPPTCL grid do not have this capability. Therefore, any bill raised to MPPTCL on the reactive

energy account cannot be passed through to Users except by means of approximation.

(c) **Accuracy of Meters:** The current meters in the MPPTCL grid are of 0.5 class accuracy. However, the meters on the CTU grid are of 0.2 class accuracy. As a result of this difference, there is potential for difference in the bill raised to the MPPTCL and the bill raised to the Users.

(d) **Time-synchronization:** ABT metering needs time synchronization capability from remote location (SLDC). This facility is not available currently.

(e) **Other Requirements:** These are requirements for efficient operations, though not all are strictly required for the implementation of ABT. Therefore, during change of meters to implement ABT, the following requirements should also be addressed.

- Quality of supply
- Accuracy of reactive energy measurement
- Error and loss compensation feature
- Higher data storage capacity
- Remote or local easy reprogramming
- Self-diagnostic feature
- Harmonics measurement
- Event logging
- Basic SCADA operations
- Availability of communication ports
- Capacity of fixing innovative tariffs such as Time-of-Day, seasonal, holiday tariff etc.

Metering at Interface Points of MPPTCL and Generators

6.11 It is clear that each station of the MPPGCL should be considered as a separate source. It is a point for discussion whether different stages of the same station (for example, Birsinghpur Stage I and Stage II) should be considered as separate sources given a difference in their fixed and variable costs. Prima facie there appears to be merit in considering each stage as separate. This will require independent ABT metering for each stage.

Table 3: *Technical Details Interface of Transmission System with Generators*

Voltage Level (kV)	Number of Interface Points
400	4
220	24
132	22
33	9
11	2
Total	61
Source: Data provided by SLDC to MPERC on 10 February 04	

6.12 While all outgoing feeders of the generating stations are metered with 0.5 class static trivector meters, the Commission requires that each stage must be separately metered.

6.13 The metering of interface points of the MPPTCL with the MPPGCL stations shall need to be in accordance with requirements in the previous section.

Meter Reading and Data Collection Arrangements

6.14 As of today there is no system whereby the SLDC may remotely retrieve data from the interface meters at required time intervals in order to raise UI bills. The establishment of such a system will require implementation of technologies such as an online system or a simple emailing system. In the current scenario there is no online system for reading meters at the interface points. Further, with very few 132 kV sub-stations having computers or an Internet or other network connection, email is also difficult to implement in the immediate term.

6.15 In this regard a suitable mechanism for regular meter reading needs to be devised. This must be done by 1 April 04 when the first Phase of ABT implementation starts.

6.16 MPPTCL has proposed that they have planned to compile billing data at a central place (SLDC) through email rather than an online system as is being done at the central level. In this regard MPPTCL has proposed the purchase of one computer with Internet facility for each interface sub-station to undertake this exercise. This requirement is appreciated; however, it is important to verify the availability, reliability, accuracy and correctness of such emailing facility at sub-stations that are located in remote areas that do not have Internet or email connectivity.

6.17 At the central level readings are taken every week and bill raised accordingly. The same periodicity of meter reading and billing for the state-level should be followed.

Preparedness of Discoms

Preparation of Schedules by Discoms

6.18 Each Discom will be required to prepare their drawal schedule for each 15-minute block for a day on a day-ahead basis. The schedule shall be prepared with due consideration to various factors like recent past load requirements (e.g. last day, last week, last month), historical load pattern, seasonal effects, weather forecasts, specialty of day (e.g. Sunday, national holiday etc.), availability of generation etc. A methodology for the same has been proposed in the Power Procurement Guidelines of the MPERC as well as in the Distribution Code.

6.19 The Discoms must record complete information at each 33 kV sub-station with regard to load pattern for different times of the day for the smallest time-block technically possible (say 15-minutes, 30-minutes, 1-hour or other). They must then send this information to a central cell in the Discom headquarter for compilation and analysis to derive the Discom load profile.

Ability of Discoms to Control Load

6.20 As of today, the Discoms are not in a position to monitor and control load in real time due to lack of adequate technical infrastructure and trained human resource. The Distribution Code requires establishment of a DSOCC (Distribution System Operation Control Center) to undertake load monitoring and control.

> *"7.5.1 (c) All Licensees shall identify important 33kV Sub-stations which is are strategically located near the geographic center and load centers of each Licensee's supply area to act as Distribution System Operations Control Center (DSOCC) having adequate communication facilities. The DSOCC shall be manned round the clock with additional shift staff during emergency periods.*
>
> *The action to be taken as a response to the Grid Warnings from STU as decided by the Managers of the Distribution Licensee is conveyed to the operation staff by the DSOCC. Standing instructions may also be followed spontaneously by DSOCC by conveying remedial actions and standard responses to various stations and Officers in various situations.*
>
> *DSOCC shall be responsible to coordinate with SLDC for blackout management, emergency operating instructions, restoration etc."*

Preparedness of Generators

6.21 Each generator will be required to prepare their availability for each 15-minute block for a day on a day-ahead basis for each stage of its stations. Based on this availability and Discom schedules, SLDC will provide the final day-ahead schedule to each generator stage for each block of 15 minutes. Prima facie, the generators are in a position to provide such availability information and also have all necessary ability to adhere to the final schedule intimated by the SLDC.

Preparedness of SLDC

6.22 The SLDC is a nodal entity for the purpose of overall coordination for implementation of ABT and operation there under.

Need for System Strengthening of SLDC

6.23 The SLDC will need substantial strengthening in terms of infrastructure as well as manpower requirements. It will need to monitor drawal and injection in real time to ensure grid safety. For this purpose expansion of the existing SCADA system will be required.

6.24 For the purpose of billing and settlement of all charges that the SLDC has been entrusted with, the MPPTCL has intimated the MPERC of complexity of the process and the necessity of hardware and software, and intensive training of SLDC staff. The MPPTCL shall submit to the Commission details of requirements and their plan for capacity building by 31 March 2004.

Establishment of ALDC

6.25 Under the ULDC scheme, the formation of Area Load Dispatch Center is proposed. The ALDC will help in focused monitoring and control in the area of operation because the SLDC shall need to co-ordinate with the ALDC instead of the Discoms directly. The ALDCs will coordinate with the DSOCCs and the SLDC. Implementation of this arrangement shall streamline the operation and enhance ease of operation and efficiency.

6.26 The LDC at Bhopal and Indore shall be fully operational by December 2005 as per information provided by MPPTCL.

Action Plan

6.27 Given the current state of lack of preparedness on the part of most of the entities to be effectively operate under the ABT mechanism, there may be need for a phased approach towards full implementation.

Action Plan Proposed by MPPTCL

6.28 The following table indicates the action plan as proposed by MPPTCL to implement ABT keeping in view the limitation of physical infrastructure, institutional capability etc.:

Table 4: *Time Schedule for ABT Implementation in State*

Sr. No.	Activity	Time limit proposed by MPPTCL	MPERC Date
1.	Submission of detailed Action Plan for building infrastructure and institutional capability within SLDC to implement ABT	31 March 04	31 March 04
2.	Computation of cost of SLDC: • Operation and maintenance expenses • Depreciation • Interest costs • Administrative and general expenses • Employee costs • 3% return on NFA	31 March 04	31 March 04
3.	Finalization of point of interface metering between generator-transmission and transmission-distribution for all settlement purposes with approval of the MPERC	Not mentioned	31 March 04
4.	ABT implementation using existing boundary meters with certain approximations (Shadow billing)	1 April 04	1 April 04
5.	Commissioning of ALDCs at Bhopal and Indore under ULDC Scheme	31 December 05	31 December 05
6.	Establishment of DSOCC's and operate under instructions from SLDC	To be furnished by Discoms	30 September 04
7.	Monitoring and Control System (SCADA) for 33 kV sub-stations	To be furnished by Discoms	31 March 06
8.	Procurement of ABT compliant meters, new 0.2 class CTs and PTs and computers	31 December 05	To be ruled by MPERC
9.	Installation of meters, CTs and PTs and computer	30 June 06	To be ruled by MPERC
10.	Customization of ABT billing software	30 June 06	To be ruled by MPERC
11.	Full implementation of ABT	01 July 06	To be ruled by MPERC

6.29 The Commission shall review each of the above items and rule on the target date for completion taking into account objections and explanations from MPPTCL, MPPGCL, MPSED and Discoms.

MPERC Proposed Timeline for the Proposed Action Plan

6.30 The Action Plan as proposed by MPPTCL is being review by the Commission. It is well understood that sufficient time is required for procurement, installation and commissioning of establishments, equipment and IT systems.

6.31 However, the Commission would like to begin implementation of ABT even if with approximations at the earliest date because of reasons mentioned in detail above. In this regard the following time frame for ABT billing is envisaged:

Phase – I: Mock / shadow billing to discoms: 1 April 2004 to 31 May 2004.

(a) Discom Activities:

- Hourly scheduling by discoms.
- Recording of actual drawals of discoms in 1-hour intervals based on hourly log-sheet data of sub-stations, compilation of the same and dispatch to SLDC.

(b) Generator Activities:

- Hourly availability declaration by generators.
- Recording of actual generation of each station in 1-hour intervals, compilation of the same and dispatch to SLDC.

(c) SLDC Activities:

- Preparation of final hourly schedules for state generators and CGS on overall merit order and communication of the same to discom headquarters.
- Dispatch state generators based on schedules and grid conditions.
- Intimate discoms of significant deviations in real time.
- Training of discom staff to handle ABT.
- Shadow UI bill to discoms and generators on hourly basis.

Phase – II: 1 June 2004 to 30 June 2005.

(a) Discom Activities:

- 30-minute scheduling by discoms.

(b) Generator Activities:

– 30-minute availability declaration by generators.

(c) MPPTCL Activities:

– Implement MRI based data downloading, collection and collation system.

– Computation of actual 30-minute generation based on MRI data downloaded from existing meters for each stage of each station, compilation of the same and dispatch to SLDC.

– Computation of actual 30-minute drawal based on MRI data downloaded from existing meters for each discom, compilation of the same and dispatch to SLDC.

(d) SLDC Activities:

– Preparation of final schedules for state generators and CGS on overall merit order and communication of the same to discom headquarters.

– Dispatch state generators based on schedules and grid conditions.

– Intimate discoms of significant deviations in real time until 30 September 2004. Thereafter, it shall intimate DSOCC of any significant deviations.

– Training of discom staff to handle ABT.

– Raising actual approximate UI bill to discoms and generators on 30-minute basis.

(e) DSOCC Activities

– DSOCC to begin operation on 1 October 2004. It shall thereafter, undertake suitable load management and curtailment.

Phase III: 1 July 2005 onwards.

(a) This is the final stage for implementation of intra-state ABT wherein 15-minute ABT shall be in place with all necessary systems and control systems.

A7: ANNEXURE I: SUGGESTED MECHANISM FOR IMPLEMENTATION OF ABT WITH CURRENTLY AVAILABLE METERING ARRANGEMENT

7.1 It is appreciated that implementation of ABT to all entities in the state can happen only over a certain minimum time frame. However, once the Electricity Act 2003 is in full force from 10 June 2004 and the STU / RLDC is separated from the MPSEB, and when the individual discoms and MPPGCL begin operation as independent commercially operated entities, there shall be a very strong need for ABT implementation within the state as explained in previous sections.

7.2 In this regard, the Commission proposed the following methodology for early implementation of ABT, with acceptable approximations. The MPSEB, MPPTCL, MPPGCL and Discoms are welcome to propose alternative solutions or to enhance this proposal for early implementation of ABT.

Suggested Interim ABT Mechanism

7.3 The MPPTCL should work out a time-bound action plan to implement MRI based data downloading, collection, collation and settlement system, which shall include following major activities.

Requirements for Interim ABT Mechanism

Logistics and General

(a) Identification of meter readers' routes based on road/rail route, administrative jurisdiction, number of meters to be read, distance between each sub-stations, etc.

(b) Procurement of MRI kits based on above detailed route studies

(c) Identification of suitable Meter Reader for each route

(d) Comprehensive training to Meter Readers about operation of MRIs including field training, troubleshooting etc.

(e) Procurement of Computer Kits and associated accessories, communication channel, e-mail facility (if required)

Data Downloading, Communication and Compilation

(f) Data downloading from all interface meters located in sub-stations under identified route by meter reader on monthly basis

(g) Downloading of MRI data in to Base Computer

(h) Sending of raw data from remote location to central location (e.g. Jabalpur) by respective meter readers (MPSEB may propose suitable methodology for this)

(i) Compilation of raw data at central location

(j) Converting of raw files in to standard format (e.g. .csv, .prn)

(k) Uploading standard format files into database

Settlement and Bill Preparation

(l) Computation of simultaneous demands in each 30 minutes block using application software

(m) Preparation of energy bill based on energy computed from demand schedule

(n) Preparation of UI bill based on day-ahead schedule and actual drawal on 30 minutes basis

(o) Agreed dispute resolution procedure (e.g. dispute in computation of consumption during failure of meter etc.)