

DISCUSSION PAPER
REVISED SCHEME OF INCENTIVE AND DISINCENTIVE FOR
THERMAL GENERATING STATIONS

Single Part Tariff

1. A system of single-part tariff was in vogue in India for pricing of thermal power prior to 1992. The single-part tariff for a station was calculated so as to cover both the fixed cost as well as the variable (energy) cost at a certain (normative) generation level. A sort of incentive and disincentive was inherent in the single-part tariff. If the station was not able to generate up to the normative generation level, it suffered a shortfall in fixed cost recovery corresponding to the shortfall in generation. On the other hand, energy production above the normative generation level yielded additional revenue, i.e., a surplus over the fixed and variable cost of the station. The normative generation level was specified in terms of energy produced in a year, and thereby, the incentive and disincentive got linearly linked to the annual PLF of the generating station, as shown in figure 1. Such a scheme, which directly induced maximisation of generation all the time (in peak-load as well as off-peak hours) was perhaps reasonable in the days of severe power shortage.

Two Part Tariff-K P Rao Committee

2. Finding that the above system of single-part tariff, particularly for Central generating stations, was conducive neither to economic generation of power as per merit-order, nor to satisfactory operation of the regional grids, Government of India adopted in 1992 a two-part tariff formula for NTPC stations based on the recommendations of the KP Rao Committee. Para 3 (V) of the Committee's report (submitted in June 1990), which very clearly explains the basic problem with single-part tariff then in vogue, is enclosed as Annexure 'A'. Further, recognising that there would be no motivation on

the part of NTPC to maintain a high level of efficiency and availability if it was paid the full fixed cost irrespective of level of generation and variable cost for the quantum of energy actually generated, the K.P. Rao Committee had recommended a scheme of incentive/disincentive, as a variant of a simple two-part tariff. This scheme provided incentive for better generation/plant availability, without vitiating the signals for merit order operation, and a disincentive if the generation fell below the specified levels for reasons attributable to NTPC, i.e., other than lack of system demand or system conditions not attributable to NTPC. The scheme of incentive/disincentive recommended by KP Rao Committee and incorporated by GOI in the various project specific tariff notifications for the NTPC stations is enclosed as Annexure 'B', and is shown diagrammatically in figure-2. It can be seen that the scheme provided for linking of incentive and disincentive with PLF plus deemed generation, which in effect is plant availability.

3. The K.P. Rao Committee also called for a shift from undue emphasis on PLF as measure of performance, in para 37 (i) and (ii) of its report, which are reproduced in Annexure 'C'.

Evolution of ABT

4. The serious problems of regional grid operation however continued even after 1992. This was because the K.P. Rao Committee had been able to tackle only one end, the Central generation side. Overdrawals by some SEBs during peak-load hours and under-drawals during off-peak hours continued unabated, causing serious frequency excursions and perpetual operational/commercial disputes. These forced the Government of India to consider further structural reforms in the bulk power and transmission tariff to induce better system operation and grid discipline through a mechanism of commercial incentives and disincentives. M/s ECC of USA were commissioned under a grant from ADB to undertake a comprehensive

study of the Indian power system and recommend a suitable tariff structure. ECC submitted their report in February, 1994, recommending Availability Tariff for generating stations, which was accepted in principle by GOI in November, 1994. A National Task Force (NTF) was constituted by the Ministry of Power in February, 1995 to oversee the implementation of ECC's recommendations. Based on NTF deliberations between 1995 and 1998, Ministry of Power had crystalized the formulation for the so-called Availability Based Tariff (ABT) and a draft notification on the same was ready for issue in April 1999. The draft notification too provided for incentive/disincentive for thermal generating stations linked to plant availability. Its relevant part is enclosed as Annexure 'D' and diagrammatically shown in figure-3.

5. In keeping with the spirit of the Electricity Regulatory Commissions Act 1998 and consequent upon transfer of relevant powers vested under section 43 A (2) of the Electricity (Supply) Act 1948 to the CERC w.e.f 15th May 1999, Government of India forwarded the above draft ABT notification to CERC vide OM dated 31.5.1999 for finalization after due deliberation. The draft notification was then issued through a public notice and comments/objections were invited. The Commission in July 1999 held detailed hearings on the above.

ABT and Incentive

6. The Commission too recognised the need for a scheme of incentive/disincentive in order to encourage a high level of efficiency and availability, and in its dispensation, linked disincentive to plant availability in line with concept of Availability Based Tariff mentioned in the previous paragraphs. However, it linked the incentive to PLF, deviating from the recommendations of K.P. Rao Committee as well as of M/s ECC. Commission's observation in its ABT order dated 4.1.2000 in petition No. 2/1999 was as follows:

“A generator cannot be rewarded for merely putting up a generating unit. It is necessary for him to make it available for the beneficiaries to a reasonable extent so that the latter could draw upon that capacity. Any shortfall in available capacity needs to be commercially punished with the denial of fixed cost. Incentive however, stands on a different footing. In regulated tariffs, it is necessary to keep a provision to reward better performance in order to promote efficiency and economy through cost reduction. Such a reward linked to a demonstrably efficient performance level, should be as challenging as possible. Mere availability does not reflect efficiency. At the same time, in order to keep the machine available without break down, the disincentive of denial of fixed charges is adequate enough. What is also required is that the available capacity should also be efficiently used. For this purpose, the entrepreneur generator should demonstrate that his product is competitive enough both in terms of cost and reliability of service so that additional demand would get generated and he will be able to improve his generating station load factor. Any improvement in the generating station load factor (up to sustainable level) indicates efficient performance, for which reward in the form of incentive is appropriate. Mere availability of the generating station without demand cannot justify incentive payment. This conclusion is inevitable from studying the situation in the eastern region. There, though the generator is available, due to lack of demand, he has to back down. In this process, the generator could claim incentive based on mere availability, which is patently unfair to the consumers who are already meeting the full fixed cost. The Commission considers that with the separation of fixed cost from the variable cost, the beneficiaries are bound to view the cost advantage while making their scheduling. Combined with a little more aggressive marketing effort by the generators, it should be possible to create demand for evacuation of power from surplus areas, which is otherwise bottled up. With this situation, the output and consequently the PLF of generating units

is bound to go up. Any incentive which is linked to PLF therefore would be an appropriate reward for cost control through better management of resources and better marketing efforts. There could be other and more effective ways, which the Commission will be considering. But, for the present, and in view of the foregoing argument, the Commission considers it appropriate that any scheme of incentive should be linked to actual performance, i.e., generating station load factor instead of mere availability, though the recovery of fixed charges could be still linked to availability”.

Provisions relating to incentive/incentive as per CERC tariff notification dated 26.3.2001 for the tariff period 2001-2004 are enclosed as Annexure ‘E’.

7. A similar system of incentive/disincentive was proposed in the draft regulation dated 1.1.2004 by the Commission for the period 2004-09 and the Commission observed as follows in the order dated 16.1.2004:

“8.4 This question was debated by the Commission in its order dated 4.1.2000 in petition No 2/1999. After considering different aspects of the matter, the Commission concluded that the payment of incentive cannot be related to mere availability of the generating station and that the incentive should be earned through actual performance.”.

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“8.5 We do not find any justification to deviate from the views earlier recorded by the Commission. We, therefore, hold that performance measure should continue to be based on actual plant load factor and not the availability. The recovery of full fixed charges shall continue to be linked to the target availability as before. However, in so far as generating stations subjected to UI scheme under ABT are concerned, the performance measure shall be the plant load factor

based on the scheduled generation given by the Regional Load Despatch Centre and not the actual generation. This is because deviations from schedule are charged differently under UI scheme, incentivising or penalizing the generator, depending upon the grid frequency”.

8. In response to the above, the generators like NTPC, NLC sought to link the incentive with availability and not the PLF. According to them, generator can only ensure availability of the station whereas generation schedule depends on demand by the customers. Linking incentive with PLF will amount to providing incentive to generators for action of customers/beneficiaries. Most of the beneficiaries were, however, opposed to linking of incentive with availability for reasons not quite clear. As there was no consensus on the subject, and the matter could not be deliberated in detail during the limited time available, the Commission provisionally decided to continue with the prevailing scheme of incentive/disincentive. The relevant provisions in the regulation dated 26.3.2004 on Terms and Conditions of tariff for the period 2004-2009 are enclosed as Annexure ‘F’. However, the Commission also observed as follows at para 145 of its order dated 29.3.2004 -

“The issue of linking the incentive to PLF or availability was not debated threadbare in the recent hearings and as such, we would like to continue with the existing dispensation of incentive based on PLF. The Commission may, however, like to revisit the issue for a more informed debate after evaluating the experience of ABT. ABT has been implemented in all regions only recently. Some more time would be required for evaluating the experience. This should not be construed as regulatory uncertainty. Also, the issue is of much greater significance for the load centre and liquid fuel-based power stations, which may be required to back down regularly due to their higher variable cost. It would be prudent for the State

Electricity Regulatory Commissions, in whose jurisdiction most of such power stations would fall, to examine this issue pragmatically.”

9. Neyveli Lignite Corporation (NLC) in March 2006 filed a Petition No. 19/2006 before the Commission praying for linking of incentive to availability instead of scheduled PLF for the thermal generating stations. During the hearing of the Petition on 6.6.2006 and later on 26.9.2006, NLC as well as NTPC were directed to develop a comprehensive paper on the subject for an informed debate. However, they have not prepared such a paper till date.

10. In the above context, it is now proposed to deliberate the issue afresh from various angles. One aspect, as pointed out by NTPC and NLC, is that incentive/disincentive for a generating station should be linked to parameters, which are under the control of station personnel (e.g. plant availability), and should not be linked to parameters determined by others (e.g. generation schedule). An even more important aspect is the effect of this stipulation on merit-order of the stations, as explained herein. When incentive for Central generating stations is linked to scheduled generation, any increase in the requisition from a Central generating station by a beneficiary increases the payment by the beneficiary on two counts: the energy charges and the incentive. The effective variable cost of the Central station as seen by the beneficiary thus gets jacked up by 25 paise/unit (the present rate of incentive). In turn, this would mean that a beneficiary would ask a Central station to back down during off-peak hours, before backing down its own plants, even if the latter have a variable cost 20-25 paise/unit higher than that of the Central station. This would be against the concept of merit order, and should be avoided. Besides, due to the backing down of Central stations that the beneficiaries would ask for because of the above distortion in merit-order, the Central stations would get deprived of

incentive, and this would be a cause of friction between them and their beneficiaries/customers.

11. PGCIL, as the operator of RLDCs, has also been representing to the Commission that the incentive for generating stations should be linked to plant availability and not to PLF. PGCIL's reasoning, derived from its submissions in Review Petitions 13/2000 and 17/2000 is illustrated by the examples given in Annexure 'G'. There is considerable merit in the reasoning of RLDCs.
12. The main consideration in the Commission's earlier decision to link incentive to PLF was the condition in the Eastern region at that time, of low dispatches because of lack of demand in the region. The power was bottled up in the region due to non-availability of inter-regional links. It has since been brought to our notice that such a situation does not exist any more. Substantial power is now being transmitted from Eastern region to the other regions. This is evident from the performance of thermal generating stations of NTPC and NLC for the year 2006-07 enclosed as Annexure –H. In view of the above, it is felt that the time is ripe for changing over to incentive based on plant availability, which would be in line with the recommendations of K.P. Rao Committee, M/s ECC and the NTF, and incentive scheme for the Ultra Mega Power projects (UMPPs).
13. The next (and associated) issue to be deliberated upon is the shape of relationship between the plant availability and incentive. It would perhaps be reasonable to have a linear relationship on the two sides of the normative availability, so that the revenue loss during a year of below-norm availability may be made up in a year of above-norm availability.
14. It is also desirable to avoid a revenue shock, either to the generating companies or to the beneficiaries while implementing such a change during

a tariff period (2004-2009), as far as possible. This is readily possible in the present case. As of now, the generating companies are entitled to an incentive of 25 paise/kWh for generation above the norms. This translates to Rs.21.9 lakh per MW of improvement in annual average plant availability declaration, as shown by the calculation enclosed in Annexure-I. It is proposed to adopt the same, so that there is no change in total incentive amount to be paid by the beneficiaries, particularly for most of the Central stations, which are normally scheduled to generate all the time to their full available capability.

15. As for the Central stations on liquid firing, which are often not scheduled to generate as per their full available capability, the incentive payable under the proposed dispensation would be much higher than what is presently admissible. In such cases, it would be justifiable for the beneficiaries to refuse to pay incentive for the plant capability which, though available, is not scheduled even during peak – load hours, because of its high energy charge rate. It is, therefore, proposed that in case of such stations, incentives as per the above per MW rate shall be based on the MW **scheduled** day-by-day during the peak load hours (to be specified by the respective RLDC in advance), and not on total **declared** capability.
16. The new dispensation, subject to approval of the Commission after due consultation, is proposed to be implemented with effect from 1.10.2007, for the remaining duration of the present tariff period, which ends on 31.3.2009.

Dispensation for change over in the mid-year

17. The incentive for the period 1.4.2007 to 30.9.2007 shall be payable on the basis of cumulative scheduled PLF for the corresponding period. The incentive for the period starting from 1.10.2007 shall be payable on the basis of cumulative availability for the corresponding period of the year.

Extract from K.P. Rao Committee's Report

- “3. V) A very important aspect is that the system of single-part tariff now in vogue for pricing thermal power and the fixed tariff for hydro power have not been conducive to motivate and encourage economic generation of power and its absorption by the Boards, as also in ensuring optimization of integrated operations of the grid system. On the thermal side, there are interminable disputes as to who should back down in the event of the Boards having adequate capacity to meet their own requirement of power, particularly in the off-peak time. On one side, it is argued that generation of power by STPSs located at pit-head would be the most economical way of meeting the demands for power, since the marginal cost to the country of generating the additional power at pit-head location would, generally speaking, be lower than similar costs in a Board. The super thermal plants are also more efficient, having larger size sets and better heat rates. It would, therefore, be in national interest if power generation takes place at these stations to the maximum extent. On the other hand, it is argued by the Boards that they are called upon to pay for each unit of power a composite tariff which is far higher than the incremental cost that the Board has to incur to generate the same quantum of power from its own generating stations. This results in the Boards incurring substantially more expenditure than necessary to meet the demand for power and puts them to substantial commercial losses. Considering the losses that are presently being incurred by the Boards and keeping in view their own commercial interests, Boards can ill afford to buy expensive power from Central Generating Station when they can generate the same at much lower costs to themselves.”

Extract from K.P. Rao Committee's Report

"Principles regarding Regulation of fixed expense and Incentives/dis-incentives related thereto:

14. Keeping in view the above, various alternatives for meeting the fixed expenses and for providing incentives/penalties to central generating stations for performance above/below certain specified limits were considered and the following were agreed to. These would apply from the beginning of the second year of commercial operation, i.e. after the one-year period of stabilization referred to in para 13 above.

(a) Full fixed expenses and the prescribed return are recoverable at a level of 6000 hrs. per annum except in the Eastern Region where the level would be 5500 hrs per annum.

(b) In case the generation at a STPS is below the above levels for reasons of lack of system demand, or other system conditions not attributable to NTPC, the fixed expenses and the return would still be fully payable by the Boards and NTPC will not be adversely affected financially.

(c) On the other hand, in case NTPC is unable to generate the power to the above levels for other reasons, the following will be adopted:

(i) If for any reasons, including those attributable to NTPC, the generation is not less than 5500 hrs. (5000 hrs in the case of Eastern Region), NTPC will receive full reimbursement of fixed expenses. In computing the generation, the extent of backing down as ordered by the REB due to lack of system demand will also be reckoned as generation achieved.

(ii) If for reasons entirely attributable to NTPC the generation as computed above falls below 5500 hrs. (5000 hrs. in the case of Eastern Region), a dis-incentive will be applied. This will be by restricting fixed charges payable, related to generation actually achieved, including deemed generation to the extent of backing down ordered by the REB. The fixed expenses payable will be as at para (f) below.

(d) For generation upto 6000 hrs (5500 hrs. in Eastern Region) computed as outlined above, including “deemed generation” no additional incentive is payable. Thereafter, for each 1% rise in PLF, an incentive of 1 p per kwh is payable for such excess generation above the specified limits of 6000/5500 hrs.

Thus to illustrate if a PLF of 75% is achieved, (including notional generation), at an STPS other than in the Eastern Region the incentive would be 6.51 paise per unit for generation in excess of 6000 kwh/kw per year.

(e) The hours described in paras 11(a)(c), and (d) relate to the period after one year from the date of commencement of commercial operation. The figures for the first year of commercial operation both for calculation of incentive and disincentive would be as under:-

	Elsewhere	Eastern Region
For incentive Calculations	4500 hrs	4000 hrs
For applying Penalty	4000 hrs.	3500 hrs.

(f) The fixed charges payable under para c(ii) and (e) above will be as under:-

<u>Other Regions</u>		<u>Eastern Region</u>		% of fixed charges payable to NTPC
During 1 st year of commercial operation	Thereafter	During 1 st year of commercial operation	Thereafter	
4000 & above	5500 & above	3500 & above	5000 & above	100.00
3500 – 3999	5000 - 5499	3000 – 3499	4500 – 4999	98.00
3000 - 3499	4500 – 4999	2500 – 2999	4000 – 4499	95.50
2500 – 2999	4000 – 4499	2000 – 2499	3500 – 3999	92.50
2000 – 2499	3500 – 3999	1750 – 1999	3000 – 3499	89.00
1500 – 1999	3000 – 3499	1500 – 1749	2500 – 2999	85.00
1250 – 1499	2500 – 2999	1250 – 1499	2000 – 2499	80.50
1000 – 1249	2000 – 2499	1000 – 1249	1500 – 1999	75.50
750 - 999	1500 – 1999	750 - 999	1000 – 1499	70.00
500 - 749	1000 – 1499	500 - 749	500 - 999	64.00
250 - 499	500 - 999	250 - 499	250 - 499	57.50
0 - 249	0 - 499	0 - 249	0 - 249	50.00

(g) NTPC expressed practical difficulties in reckoning the effect of backing down as the REBs were reluctant to certify the ordering of backing down or the actual extent of backing down. Since instructions for backing down are issued by the REB, the Committee sees no difficulty in the REB rendering certification to that effect, - indicating the extent of backing down ordered and the period. Central Electricity Authority should issue suitable instructions to the REBs in this respect. The extent to which backing down has been ordered will be treated as “deemed generation” for computing incentives/disincentives for extra or less generation.

(h) The above calculations will be carried out on an annual basis, for the station as a whole after taking into account the performance for the period ending 31st March.”

Extract from K.P. Rao Committee's Report

“Need to shift undue emphasis on PLF as measure of performance

37. There are certain aspects which need to be highlighted here:
- (i) The concept of the two-part tariff as outlined above would remove the disincentives against Boards backing down their own generation and let the more economical super thermal power stations operate in preference, wherever the marginal cost of generation of power at the STPS are lower than the variable costs in the Boards. On the other hand there will be a definite motivation towards merit order operation. This is so keeping in view both the economic and commercial considerations. At the same time, there are also certain other consideration for which there is a pressure to improve the PLF of the generating stations. These originate from the existing system of giving undue emphasis on the PLF as a measure of efficient performance of the generating stations, whether of the Board or of the Central Organization. The existing practice of granting incentive awards based on PLF is another factor which, to a large extent, militates against backing down thermal stations when they should, in fact, be doing so on purely economic or commercial considerations. It is necessary to modify the existing incentive schemes to eliminate the undue emphasis on the improvement of PLF, vitiating economic generation of power.
 - (ii) There is already considerable public impression that the Plant Load Factor is an indicator of efficiency. Some publicity to dispel the misconceptions in this respect is called for.”

Extract from draft notification of GoI, April 1999
“Payment of capacity charges for generating stations in commercial operation on the date of this notification

A. Coal Based and Gas/Naptha Based Thermal Power Generating Stations of NTPC and NEEPCO

<u>Availability</u>	<u>Capacity Charge (Annual)</u>
0-30%	$\frac{A \times \text{Availability}}{30}$
30-70%	$A + \frac{\text{RROE}}{100} \times \frac{(\text{Availability}-30)}{40} \times B$
70%	AFC
70-85%	$\text{AFC} + 0.004 \times (\text{Availability}-70) \times B$
85-100%	$\text{AFC} + \{0.06 + 0.003 \times (\text{Availability}-85)\} \times B$

Where,

- A = Fixed Charges per year excluding Return on Equity
B = Equity
RROE = Rate of Return on Equity (in %) at availability level of 70% = 16
AFC = Annual Fixed Charges including 16% Return on Equity = A + 16% of B

In case of prolonged outage of some unit(s) at a Station resulting in Station Availability falling below 30%, Capacity Charges as calculated above, shall be adjusted by adding the following:

First 90 days of outage	NIL
Next 180 days of outage	$\frac{\text{UC} \times \text{A}}{\text{IC} \times 365}$ per day
Next 180 day of outage	$\frac{\text{UC} \times \text{A} \times 0.75}{\text{IC} \times 365}$ per day
thereafter	$\frac{\text{UC} \times \text{A} \times 0.5}{\text{IC} \times 365}$ per day

Where, UC = Capacity of Units under continuous outage

& IC = Installed Capacity of Station

The amount to be added as above shall be restricted in such a way that total Capacity Charge for the Station to be paid during the year does not exceed the value of ‘A’.”

Provisions relating to incentive/dis-incentive as per CERC tariff notification dated 26.3.2001

“2.4. Norms of Operation

(i) Target Availability for recovery of full Capacity (Fixed) charges

- (a) For all thermal Stations except those covered under clause (b) below - 80%
- (b) For NLC (TPS-II, Stage I&II) Stations - 72%

(ii) Plant Load Factor based on scheduled energy beyond which Incentive shall be payable

- (a) For all Thermal Stations except those covered under clause (b) below - 77%
- (b) For NLC (TPS-II, Stage I&II) Stations - 72%”

“2.8. Full Fixed Charges shall be recoverable at "Target Availability" specified in clause 2.4 (i). Recovery of Capacity (Fixed) Charges below the level of Target Availability shall be on pro-rata basis. At zero availability, no Capacity Charge shall be payable.”

“2.11. Incentive

- (i) An incentive shall be allowed to be recovered @ 50% of the fixed cost/kWh at normative PLF for generation between normative PLF and up to 90% PLF, subject to a ceiling of 21.5 paise/kWh.
- (ii) For generation beyond 90% PLF, incentive shall be allowed to be recovered @ 50% of the incentive payable under the preceding clause.”

Provisions relating to incentive/dis-incentive as per CERC tariff notification dated 26.3.2004

“16. Norms of Operation

(i) Target Availability for recovery of full Capacity (Fixed) Charges

- | | | | |
|-----|---|---|-----|
| (a) | All thermal power generating stations, except Those covered under clauses (b) and (c) below | - | 80% |
| (b) | Thermal power generating stations of Neyveli Lignite Corporation Ltd (TPS-I, TPS-II, Stage I&II and TPS-I Expansion) and Talchar Thermal Power Station of National Thermal Power Corporation Ltd. | - | 75% |
| (c) | Tanda Thermal Power Station of National Thermal Power Corporation Ltd. | - | 60% |

Note Recovery of capacity (fixed) charges below the level of target availability shall be on *pro rata* basis. At zero availability, no capacity charges shall be payable.

(ii) Target Plant Load Factor for Incentive

- | | | | |
|-----|--|---|------|
| (a) | All thermal power generating stations, except those covered under clauses (b) and (c) below | - | 80% |
| (b) | Thermal power generating stations of Neyveli Lignite Corporation Ltd(TPS-I, TPS-II, Stage I&II and TPS I Expansion) and Talcher Thermal Power Station of National Thermal Power Corporation Ltd. | - | 75% |
| (c) | Tanda Thermal Power Station of National Thermal Power Corporation Ltd. | - | 60%” |

“ 23. Incentive: Incentive shall be payable at a flat rate of 25.0 paise/kWh for ex-bus scheduled energy corresponding to scheduled generation in excess of ex-bus energy corresponding to target Plant Load Factor.”

PGCIL Reasoning

1. Suppose both Ramagundam and Farakka power plants of NTPC achieve an annual availability of 84%. Ramagundam, being in a region with perpetual power shortage, would also achieve a scheduled PLF of 84% automatically. Farakka, on the other hand, may be able to achieve a scheduled PLF of only 78% or so, being located in a power-surplus region where backing down may be required every night. With the present dispensation, Ramagundam would get an incentive corresponding to 4% excess PLF, whereas Farakka would not get any incentive. This would be unfair, since Farakka's performance is really more credit-worthy, for having achieved equally high plant availability in the more onerous operating pattern of daily backing down.

2. In the present dispensation, the energy charge of the Central generating stations, as seen by the beneficiaries, gets artificially jacked up by the rate at which incentive is to be paid for PLF above 80% (75% for NLC). For example, suppose a pit-head station of NTPC has a fuel cost of 50 p/kWh, which would get reflected as an energy charge rate of 50 p/kWh in its tariff. This would give the station a favourable place in merit-order, enabling it to be despatched as a base-load station. Once it crosses the PLF of 80%, its incremental cost, as seen by the beneficiaries, would increase to 75 p/kWh, and the station may no longer be favourably placed in merit-order. The beneficiaries (at least some of them) may want it to be backed down during the off-peak hours in favour of their own plants having an actual incremental cost in the 50-75 p/kWh range. This would not be in the overall interest, and would directly conflict with the basic objective of optimization through merit order operation and overall economy of regional grid.

3. Suppose a generating unit logs in an availability of 292 days by 10th March (which is possible), at an average of $292/344 = 84.9\%$ availability between 1st April and 10th March. As it would have already achieved the annual availability of 80%, any further availability declaration or operation of the plant between 11th March and 31st March would not get any additional capacity charge to the generating company.

Let us also suppose that during the period up to 10th March, the generating unit had to work at part-load during off-peak hours (due to reduced customer demand which is normal), and the average daily load factor has been 92% (with 6447 kWh/kW generated during 292 days the generating unit was available). This effectively means that for the first 561 kWh/kW generated between 11th and 31st March, the generating company would not get any incentive at all. On the other hand, the maximum possible generation between 11th and 31st March (with 100% plant availability and PLF) is only 504 kWh/kW.

The above illustrative calculation shows that the generating company would get only the energy charge for operation of the plant between 11th and 31st March, leading to a situation where it has absolutely no incentive to keep the plant in operation. From the angle of grid operation, such a situation is far from optimal, as the generating unit is required to be in operation during this period, as much as during any other period of the financial year.

Performance of Thermal Power Stations of NTPC, NLC for the year 2006-07

No.	Station	Plant Availability (%)	PLF (%)
Coal/Lignite Based			
Northern Region			
1	Singrauli	83.93	83.53
2	Rihand-I	88.62	88.11
3	Rihand-II	97.45	96.92
4	Dadri	98.12	96.05
5	Unchahar-I	100.00	99.03
6	Unchahar-II	92.94	91.62
7.	Unchahar-III	92.62	90.86
Southern Region			
8	Ramagundam -I & II	93.98	91.56
9	Ramagundam -III	81.68	79.62
10	Talchar-II	95.75	95.03
11	NLC-I	57.42	56.64
12	NLC-II	73.69	72.41
13	NLC-I Expn.	91.09	89.13
Western Region			
14	Korba	90.65	90.65
15	Vindhyachal-I	91.18	90.74
16	Vindhyachal-II	96.82	96.61
17	Vindhyachal-III	93.50	93.50
Eastern Region			
18	Farrakka	84.92	80.65
19	Kahalgaon	91.70	88.42
20	Talchar-I	84.53	83.86

Let us consider a typical Central thermal plant with an installed capacity of 1000 MW. With a normative auxiliary consumption of 7.5%, its annual sent out energy at normative PLF of 80% would be

$$1000 \times 0.925 \times 365 \times 24 \times 0.80 = 6482,400 \text{ MWh.}$$

Now, if the PLF increases to 82%, the annual sent out energy would be

$$1000 \times 0.925 \times 365 \times 24 \times 0.82 = 6644,460 \text{ MWh}$$

The generation in excess of the normative PLF ($6644,460 - 6482,400 = 162060$ MWh) would fetch an incentive @ 25 pasie/kWh, which would be

$$\text{Rs.}162060 \times 250 = \text{Rs.}405.15 \text{ lakh}$$

In case of most Central thermal plants, there is little backing down, and scheduled PLF is equal to the declared availability. Consequently, in the example considered here, the plant availability also would have gone up from 80% to 82%. In annual average terms, the declared ex-bus availability would have gone up from the normative level of 740 MW to 758.5 MW, an increase of 18.5 MW. The incentive calculated above (Rs.405.15 lakh) can therefore be related to the plant availability by specifying it @ Rs.21.9 lakh per MW of enhancement in annual average declared plant availability.

FIGURE-1: SINGLE-PART TARIFF

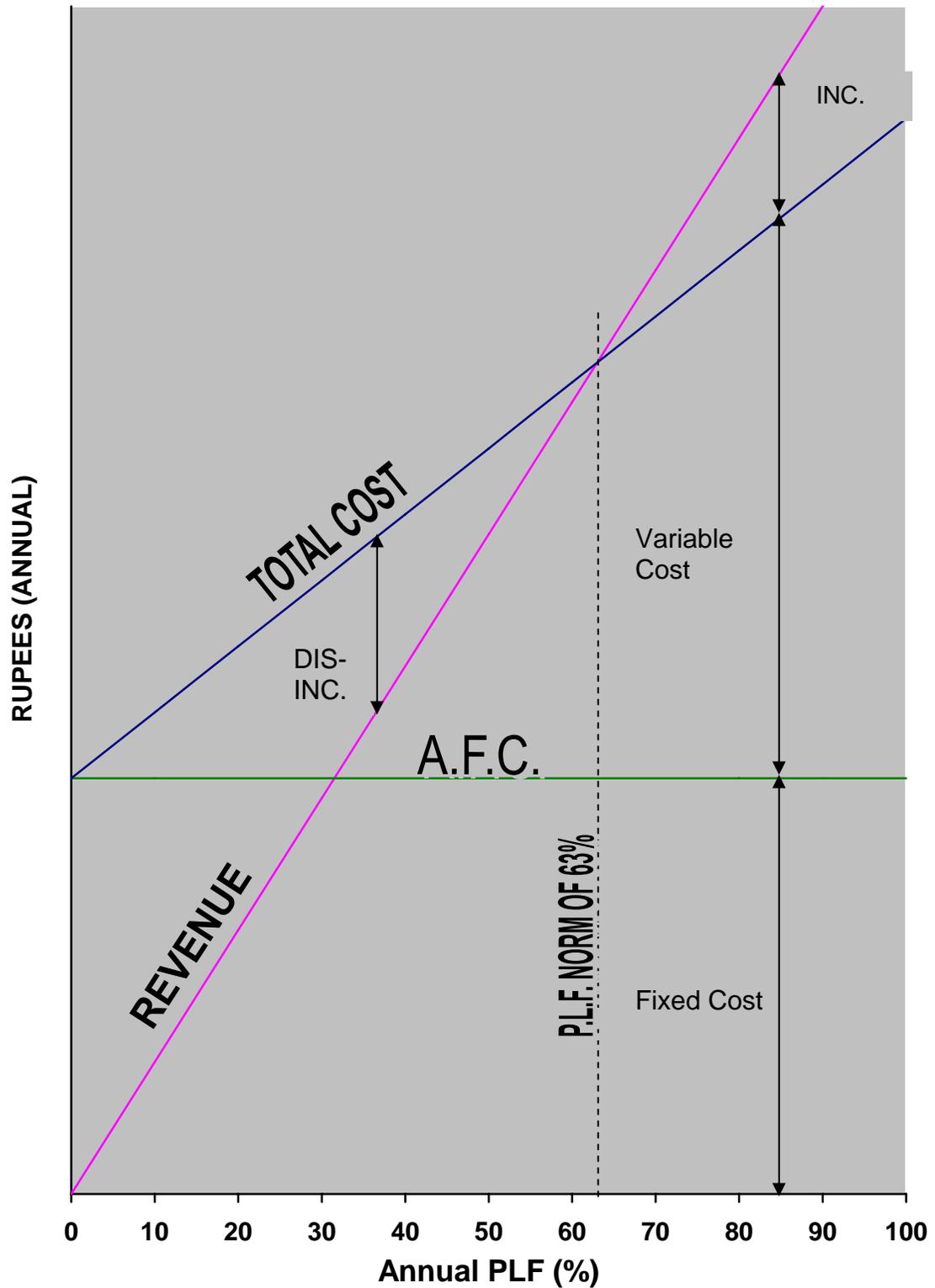


FIGURE- 2: K.P.RAO COMMITTEE

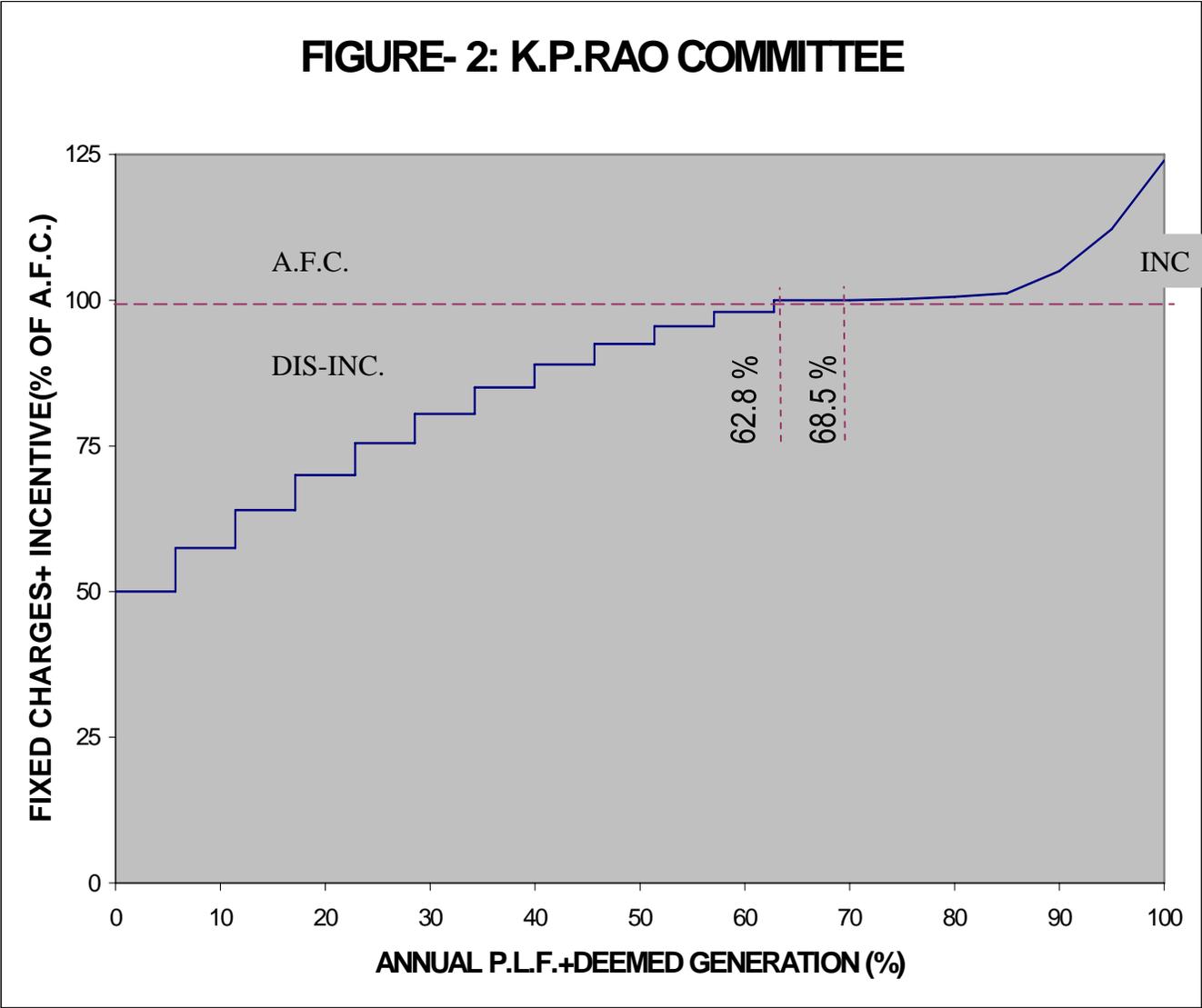


FIGURE-3: DRAFT NOTIFICATION OF MOP

