

पावर सिस्टम ऑपरेशन कारपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Govt. of India Enterprise)



पंजीकृत एवं केन्द्रीय कार्यालय : प्रथम तल, वी-9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली-110016
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संदर्भ : पोसोको / सीईआरसी/

दिनांक: 31.07.2018

सेवा में,

सचिव

केन्द्रीय विद्युत विनियामक आयोग (सीईआरसी)

तीसरा और चौथा तल, चंद्रलोक बिल्डिंग,

36, जनपथ, नई दिल्ली- 110001

विषय: 1 अप्रैल 2019 से 31 मार्च 2024 की अवधि के लिए टैरिफ की निबंधन एवं शर्तों से सम्बंधित कंसल्टेशन पेपर पर पोसोको के सुझाव

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सादर धन्यवाद

भवदीय

संलग्नक

एस. आर. नरसिम्हन

एस आर नरसिम्हन

31/7/2018

महाप्रबंधक एवं प्रमुख

एनएलडीसी

पावर सिस्टम ऑपरेशन कारपोरेशन लिमिटेड

(भारत सरकार का उद्यम)

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31/7/2018

महाप्रबंधक एवं प्रमुख

एनएलडीसी

**Power System Operation Corporation Limited
New Delhi**

31st July 2018

Sub: Comments on behalf of Regional Load Despatch Centres (RLDCs) and National Load Despatch Centre (NLDC) on the Consultation Paper on Terms and Conditions of Tariff Regulations for the period 1st April 2019 to 31st March 2024

1.0 General observations:

The Consultation paper has focused on the principles of different elements that go towards fixed cost computations; namely

- return on equity (section 18)
- interest on loans (section 19),
- depreciation (section 14),
- Operation & Maintenance (O & M) expenses (section 21) and
- Interest on Working Capital (IWC) (section 20)

On the issue of variable charges, the following aspects have been discussed.

- Fuel sourcing, transportation and handling at power station (sections 22 to 25)
- Operational norms such as Heat Rate & auxiliary consumption (sec 26 to 28)

The general concern expressed in the consultation paper is the need to keep the fixed costs at a manageable level. POSOCO shares this concern and with the increase in Renewable Energy (RE) penetration as well as increase in power demand, need for conventional generation capacity as well as transmission would entail increased fixed costs. The resources would generally operate a low load factor. These factors have already manifested in electricity tariffs at the retail level with the consumer paying substantially higher fixed charges today. Hence the concern expressed in the consultation paper and the discussion centering around reduction in fixed charges is timely and a welcome step.

The limitations in the fuel supply logistics from coal pithead to power plant via railway transport has been articulated well in the consultation paper. These need to be resolved urgently so that the electricity markets operate with minimal constraints.

It is also felt that the consultation paper is silent on various operational aspects which are important from reliability considerations as well as impact on the tariffs. These have found mention in the earlier Terms and Conditions of Tariff Regulations but find no mention in the consultation paper.

POSOCO's comments are therefore in two parts. The comments on the issues raised in the consultation paper are covered in the foregoing paragraphs while the operational aspects impacting reliability of the electricity grids as well as recovery of fixed costs is enclosed as **Annexe-I**.

2.0 Tariff Design: Generation and Transmission (section 7)

In section 7.2.3, a reference has been made to high Annual Fixed Cost (AFC) per unit in case the plant operates at a low load factor. It is felt that the fixed cost is a sunk cost and this has little impact on dispatch of power from the power plant which is generally governed by the variable or fuel cost. Hence AFC per unit should be removed in any tariff design; efforts should be on reducing the absolute value of the fixed cost.

Section 7.2.5 suggests a three part tariff for supply of electricity from a thermal generating station viz. fixed charge (for recovery of fixed cost consisting of the components of debt service obligations allowing depreciation for repayment, interest on loan and guaranteed return to the extent of risk free return and part of operation and maintenance expenses), variable charge (incremental return above guaranteed return and balance operation and maintenance expenses) and energy charges (fuel cost, transportation cost and taxes, duties of fuel). This along with section 10.3 on Annual Contracted Capacity (ACC) provides a convenient way out for generators to participate in the electricity market.

Fig 1 below indicates the price duration curve in the Day Ahead Market (DAM) for six years. If we look at a sample year, say 2017, the DAM prices have stayed above Rs. 3 per unit for more than 50% of the time. Thus a thermal power plant with variable cost of the order of Rs. 2.50 per unit would be able to recover part of its fixed cost for more than 50% of the time through the DAM. This along with the suggestions given in section 7.2.5 and section 10.3 could be formulated as indicated below.

A 1000 MW coal fired power plant could have an ACC for 700 MW (a minimum percentage could be defined by CERC) based on the requests of different beneficiaries. For this 700 MW, the power plant would be admissible for recovery of Fixed Charges and Variable Charges based on availability (section 7.2.5 of the consultation paper) as well as energy charges based on despatch.

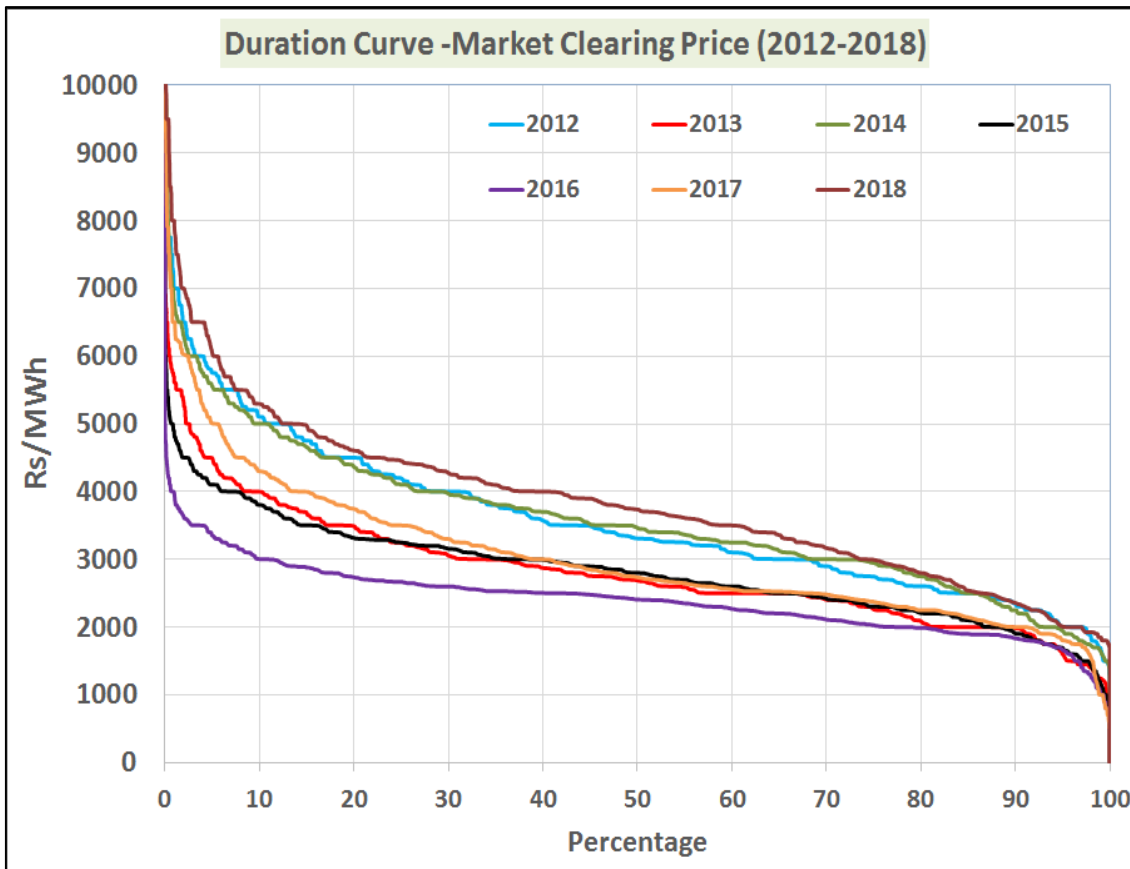


Fig 1 : Day Ahead Market (DAM) Unconstrained Market Clearing Price (UMCP) duration curve

For the balance 300 MW, the generator should be free to participate in the Day Ahead Market and earn the market based return. This would serve the interests of both the generator as well as the beneficiaries as the latter would be spared the burden of fixed cost for the 300 MW in the given example while the generator could get a market based return for the 300 MW. In the long run, the Annual Contracted Capacity (ACC) could be converted suitably to Contracts for Differences (CfD) leaving the entire 700 MW supply to be bid into the DAM.

The above postulation is important as in today's scheme of things, status quo or a passive approach favors everyone be it the generator or the beneficiaries. The generator is content with getting full fixed charges (including higher risk based return) based on normative availability without a single MW getting despatched while the beneficiaries have little incentive in granting a No Objection Certificate (NOC) to the generator for selling part of its entitlement in the DAM. More comfort is derived by the market players through the scheduling of Un Requisitioned Surplus (URS) by RLDCs or Ancillary Services dispatch by NLDC. In this connection, the following extracts from the CERC's order dated 4th January 2000 on Availability Based Tariff (ABT) becomes extremely relevant.

*"5.7.3 While on the subject of trading, the Commission anticipates an emerging situation of a surplus on account of the gap between the availability and scheduled generation. This power could go unutilised as the capacity for this generation is blocked because the capacity charges are borne by the beneficiary' states. In order to economise operations, it would be appropriate to make use of this power on firm or non-firm basis with a suitable understanding between the beneficiary states and the generator. It is therefore suggested that the generating company may initiate a dialogue with the beneficiary states for making use of this power for which the terms could be negotiated by themselves. Though, strictly speaking, this tariff also falls within the jurisdiction of the Commission, due to the short term nature of this transaction the **tariff could be freed to be negotiated for which a general exemption could be taken from the Commission. This would provide substantial additional revenue to the generator if he goes about aggressively marketing this surplus power.**"*

It is felt that notwithstanding the provisions in the Tariff Policy, a passive or status quo approach by beneficiaries as well as generators has resulted in diluting the spirit and essence of the above far sighted order of CERC way back in January 2000.

3.0 Two part tariff for renewable (section 7.6.3)

This suggestion is excellent, given the tendency to compare the energy charges of conventional generation with the composite Rs/kWh tariff of RE. However, verification of Declared Capability (DC) is a complex task unless one has all the Wind Turbine Generator (WTG) and/or solar inverter real time data at the Regional Load Despatch Centres (RLDCs).

Further discussion is required on this subject.

4.0 Bundling of RE tariff with conventional generation tariff (section 7.6.4a and 7.6.4b)

The alternative of bundling the tariff of RE with non-RE appears inapt considering the must-run status of RE. Separate tariff for RE and conventional generation as mentioned in section 7.6.4(c) is desirable.

5.0 Optimum utilization of capacity—hydro power stations (section 10.5b)

POSOCO welcomes the proposal of scheduling the hydro power plants under CERC's jurisdiction in an optimized manner at a central level. With the interconnection of the regional grids, there is little need for scheduling on regional basis; rather more scope exists for optimization at an All India level.

However, the suggestion mentioned in the consultation paper of scheduling such hydro resources to beneficiaries through banking facility is not understood. Further, apportioning 10-20% of the fixed charges as reliability charges to all the beneficiaries needs further discussion and a suitable formulation for implementation.

6.0 Optimum utilization of capacity—gas power stations (section 10.7)

It is felt that the gas power stations could be scheduled similar to hydro power stations mentioned above and the benefit of fast ramping and flexibility should be available from gas power stations. Flexibility would also be required as far as the gas supply system is also concerned, which traditionally have been used to a constant pipeline flow regime.

7.0 Depreciation (section 14)

POSOCO agrees with the suggestion in section 14.6a of increasing the useful life of well-maintained plants so as to reduce the depreciation rates. Further increasing the useful life of hydro plants to fifty (50) years and thermal plants to thirty five years (35) with corresponding changes in depreciation rate (section 14.6 e) is in order as it would reduce the fixed charges significantly.

8.0 Return on Equity (section 18)

POSOCO agrees with the suggestion in section 18.7a to review the rate of return on equity considering the present market expectations and risk perception of power sector for new

projects. The formulation suggested in section 2.0 above could be one way out so that the market linked returns are available for comparison.

9.0 Operation & Maintenance expenses (section 21)

It is felt that while the Indian Electricity Grid Code (IEGC) specifies 55% technical minimum for all plants under CERC's jurisdiction, the coal fired units could be offered an incentive to go further below 55% (say 40%). Apart from the Heat Rate and Normative Auxiliary Consumption, higher O &M expenses could be made admissible for such units which have opted to go up to 40%.

10.0 Normative Annual Plant Availability (sections 26.3.11 to 26.3.15)

The normative annual plant availability for full recovery of fixed charges is 85%, with exceptions in some cases. A suggestion has been made to reduce the annual availability to say monthly or quarterly or half yearly and ensure that generators declare higher availability during high demand periods.

In this connection, it is felt that deciding in advance a higher availability target for certain months might be difficult as the same is highly dependent on factors such as the onset and intensity of the south west monsoon from June to September and filling up of hydro reservoirs in the country. In case a high target of availability is decided for these months before the commencement of financial year, a normal or excess rainfall would lead to less demand during these months and vice-versa.

It is therefore proposed that in case the methodology indicated in section 2.0 above is implemented, the generators and beneficiaries would jointly forecast their availability and/or Annual Contracted Quantities to ensure high availability during the high demand months as any spare capacity would ensure a higher return through the Day Ahead Market (DAM).

A more important issue is that the availability calculations are based on day ahead availability which doesn't adequately capture the on-site fuel stocks with its attendant impact on reliability. Generators are allowed interest on working capital corresponding to

- a. 15 days fuel stock for pit head coal/lignite based generators
- b. 30 days fuel stock for non-pit head coal/lignite based generators

- c. 30 days fuel stock for Open-cycle Gas Turbine/Combined Cycle thermal generating stations
- d. 15 days liquid fuel stock for Open-cycle Gas Turbine/Combined Cycle thermal generating stations

It has been observed during real time operation that generators are declaring full availability for the day but not maintaining enough fuel stock as required under the regulations. This becomes evident during periods of continuous high demand where they are not able to generate on sustained basis up to the DC values as illustrated in Fig 2 below for a typical Inter State Generating Station (ISGS).

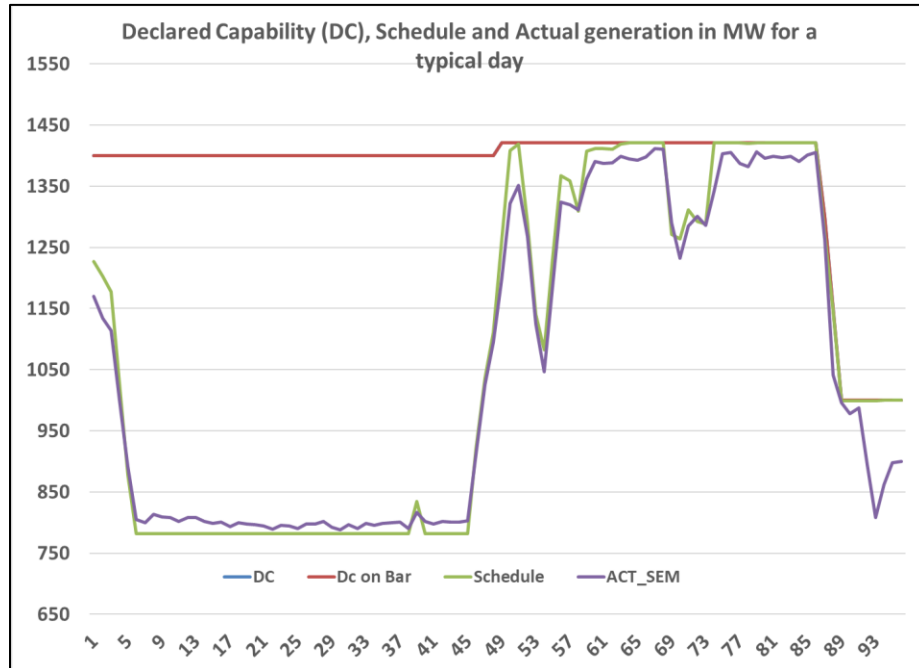


Fig 2: Declared Capability, Schedule and Actual generation for a sample ISGS

The generation output plots of Auraiya Gas for the month of September 2017 is provided in Fig 3 below for kind reference. Here it can be observed that as generation was scheduled as per the availability, the DC declared started coming down over the month.

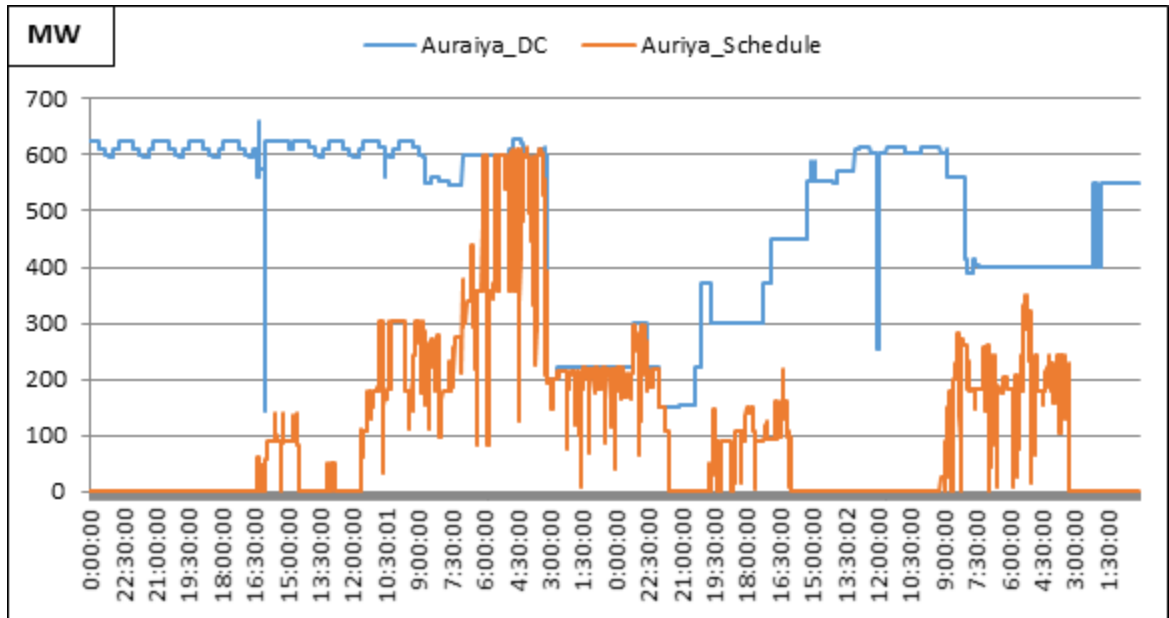


Fig 3: Declared Capability (DC) and schedule in MW for Auraiya power station

The above behavior is within the regulations which specify the day ahead availability declaration and opportunity to revise the same in the course of the day. It raises a false sense of comfort on the generation availability front. The comfort turns into a surprise when the plant actually starts getting despatched and is unable to sustain the high generation level for more than a day and reduces the declared availability.

Therefore, it is proposed that generators declare weekly availability depending on the fuel stock position in addition to the day ahead availability. The weekly availability should factor the fuel stock as well as the anticipated daily fuel receipts as well as fuel consumption. A suitable weightage (say 20%) may be given to this weekly availability figure and the day ahead availability (say 80%) for working out the plant availability. A monthly certificate from auditor in this regard may be made mandatory for fixed charge recovery. This will ensure security and reliability of power supply for DISCOMs. In case of gas power stations where there is no provision of gas storage, any reduction in DC as illustrated above should invite penal consequences such as reduction of availability for the last ten (10) days for every such instance reported by RLDCs.

11.0 Renewable generation by existing thermal generating stations (section 34.1 to 34.3)

The Commission may suitably clarify that in all such cases, the tariff fixation as well as scheduling for such RE plants set up by existing thermal generating stations shall be done separately. Any pooling would lead to confusion as well as probity of accounts.

12.0 Commercial operation or service start date (section 35)

Section 35.2 of the consultation paper mentions that *'There may be a need to specify a methodology of trial operation for generating station and transmission system and ensuring regular use of service in case of transmission system.'* In this connection, it is stated that RLDCs/NLDC already have an elaborate procedure in place since 2014 for start of trial operation of any element. The same is enclosed at Annexe-2 for kind reference which also includes the subsequent addition made for STATCOMs.

It is also pertinent to state that the modalities regarding declaration of commercial operation for a large wind farm or solar park also needs to be specified in the Grid Code so that it leads to a dispute free commissioning of RE resources.

13.0 Principles of Cost recovery-approach towards multi-part tariff (section 37)

The suggestion of fixed cost recovery through pre-identified peak and off-peak periods mentioned in section 37.20 of the consultation paper might be subjective and difficult to implement. This has also been articulated in section 10.0 above. With increasing penetration of RE generation, particularly solar and shifting of agricultural load to high solar periods, the shape of the net load (demand less RE generation) would undergo changes in the coming days, months and years. In this transition phase, declaring peak and off-peak months in advance by RLDCs could lead to loss of flexibility besides being difficult to implement. With the increasing footprint of the Indian electricity grid and its extension to neighbouring countries, a 'regional' approach might be sub-optimal.

14.0 Application for Tariff Determination: Review of process in case of transmission system (section 41)

Suggestions have been invited on simplification of the tariff determination process considering the difficulties in the 'element by element' tariff application and disposal. In this connection section 62(5) of the Electricity Act 2003 is relevant which states that *"The*

Commission may require a licensee or a generating company to comply with such procedures as may be specified for calculating the expected revenues from the tariff and charges which he or it is permitted to recover.” The CERC had notified the Central Electricity Regulatory Commission (Procedures for calculating the expected revenue from tariffs and charges) Regulations, 2010 in April 2010. Generating Companies and transmission licensees have been submitting periodic information to the Commission as per this regulation as available at http://cercind.gov.in/Info_under_Section.html . The spirit of this section of the Electricity Act 2003 and the analogy with the Annual Revenue Requirements (ARRs) in respect of DISCOMs becomes important. In case the Commission proposes to dispense with ‘element by element’ tariff for transmission, then a discussion on this aspect of the Act is required and how the same is being made applicable in respect of State Transmission Utilities (STUs).

15.0 Other relevant issues; Regulated assets versus competitive bidding assets

Since January 2011, competitive bidding for generation and transmission at the inter state level has been introduced. A number of generating companies as well as transmission licensees have started having two types of assets under their control viz. assets under regulated tariff and assets commissioned through Tariff Based Competitive Bidding (TBCB). Though the entities under TBCB are separate legal entities, they are generally a 100% subsidiary of the parent company operating assets under regulated tariff. A clear segregation of costs, be it that of spares, O & M expenses etc. becomes important from the view point of prudence check considering that in respect of TBCB projects, the tariff is simply adopted by the Commission rather than an elaborate scrutiny of various forms filed in respect of regulated assets. It is suggested that the Commission could come out with suitable guidelines in this regard to ensure that distortions in competitive bidding route is minimal.

Consultation Paper on Terms and Conditions of Tariff Regulations for the period 1st April 2019 to 31st March 2024-----Operational aspects impacting reliability of the electricity grids as well as recovery of fixed costs

A. Generation

- 1. Scheduling of Gas Generation:** The availability of domestic gas for the gas power plants is limited and hence its utilization should be optimized considering the power system requirements. This aspect has also been brought out in renewable integration study under Greening the Grid program where it emerged that gas power plants shall be required to provide peaking support instead of flat generation round the clock in high renewable scenario. A study was also conducted by POSOCO on the request of Ministry of Power to look into the possibility of gas generation optimization. This study also recommended optimization of gas generation and scheduling of gas generation connected to gas grid in following manner:
- a. Such generating stations shall declare maximum declared capacity (DC) for the entire plant for 3 hours and MWh capability separately on domestic gas, RLNG and liquid fuel for the next day.
 - b. Such stations shall also declare weekly energy (MWh) quantum on domestic gas, RLNG and liquid based on discussion with the supplier. The week for this purpose would start from Saturday.
 - c. The weekly energy quantum shall be divided into weekdays and weekends with weekend allocation less than the weekday allocation as agreed mutually between the generating station and the gas supplier/transporter and based on the advice of concerned RLDC duly taking into account the constraints of gas transport pipelines.
 - d. RLDCs shall optimally schedule these power plants based on the requisitions received from the beneficiaries and power system requirement and intimate the schedule and allocated quantum to each generating station and beneficiary respectively.
 - e. The schedules so prepared by RLDCs would consider 55% technical minimum schedule for the capacity on bar and higher peaking may necessitate synchronization of additional gas turbines before the peak hours and closing down at night hours on some days.
 - f. In case, any beneficiary surrenders power from the gas power plants, RLDCs shall revise the schedule based on technical feasibility only.

- g. Depending upon power system requirement, such gas generating stations shall have the flexibility to consume more or less domestic gas during the day. The maximum allowable deviation quantum on daily basis would be intimated by GAIL which shall be compensated within the same week by RLDCs in the schedule.
- h. A mechanism may be identified for recording the consumption of Gas/APM/RLNG/Liquid by plant so that actual fuel used may be accounted.
- i. Suitable compensation for loss in efficiency during above cyclic operation may be determined by Hon'ble commission.

Considering the above, it is proposed that the above provisions may be included in the Indian Electricity Grid Code (IEGC) for scheduling of gas based generation connected to gas grid. This would mean that such gas generators would submit max DC for 3 hours for the entire plant and MWh capability separately on domestic gas, RLNG and liquid fuel for the next day for the entire plant. The monthly availability may be calculated based on the max DC given for 3 hours for the entire plant.

- 2. Availability of Tandem Hydro:** The generation of downstream generator in a tandem hydro setup is dependent upon the generation of upstream generator. Hence the availability of downstream and upstream generator cannot be viewed separately. To illustrate this further, consider a case where the downstream generator is fully available but upstream generator is not fully available. In this case downstream generator would not be able to generate fully as the upstream generator would release less water depending upon the availability of its machines. In the reverse scenario, even with full discharge of upstream generator, downstream generator would not be able to generate fully.

Therefore, it is proposed that suitable provisions regarding the combined availability declaration of tandem hydro considering minimum spillage may be suitably incorporated in the tariff regulations.

- 3. Startup time of generators:** Generator startup and shutdown time is an important parameter of flexibility. Generators are providing the cold/warm/hot startup time in Format AS-3 under Reserves Regulation Ancillary Services (RRAS) regulations. Considering the large scale renewable integration in India, it is important that the generators coming out of cold reserve must be on bar in accordance with the declaration under format AS-3 of RRAS regulations.

It is therefore proposed that necessary penal provisions such as reduction in availability for the past seven days may be introduced in the tariff regulations in case a plant fails to come on bar within declared startup time.

4. **Incentives for Flexibility:** Considering the large scale integration of renewables in the system, flexibility of conventional generation becomes an important aspect. This has already been emphasized in many reports. Extracts from some of the reports are given below:

Report of the Technical Committee on Large Scale Integration of Renewable Energy, Need for Balancing, Deviation Settlement Mechanism and Associated Issues, MoP, GoI
“8. Harnessing and Incentivizing Flexibility: Flexibility in existing fleet of conventional generation as well as Pumped Storage Plants, Demand Side Management may be utilized for meeting changing load profile and maintaining system stability. Regulatory intervention is required to incentivize flexibility of conventional generation. Flexibility requirements should encompass the minimum and maximum generation level as well as the ramp up / down rates. The introduction of Flexible Generation Planning and Flexible Generation Obligation may be explored in the future.”

GREENING THE GRID: Pathways to Integrate 175 Gigawatts of Renewable Energy into India’s Electric Grid, Vol. I—National Study

“6. Compensating Flexibility

Create a model tariff contract that can be used for contracts that are new and up for renewal based on economics of coal plants with lower plant load factors. For existing contracts, explore options used in other countries to renegotiate contracts. Develop a new tariff structure that moves away from focusing on energy delivery. Agreements can specify various performance criteria, such as ramping, specified start-up or shutdown times, minimum generation levels, along with notification times and performance objectives that achieve flexibility goals. The tariff structure should allow for full cost recovery, be applicable to both renegotiated contracts and new contracts, and be effective both during the transition to a high-RE future and after the high-RE future has been reached.”

It is therefore proposed to include following provisions related to incentivizing flexibility:

- i. **Incentive for fast ramping:** CEA standards mandates generators to provide 3% ramp rate. Incentives for exceeding this standard may be provided to the generators in terms of additional Return on Equity (ROE) for some period.
- ii. **Incentive for lower minimum level:** The 4th amendment to IEGC provides for 55% technical minimum for thermal generating units. Any generator declaring technical minimum less than 55% may be provided incentive in terms of additional Return on Equity (ROE) and/or higher O & M expenses.

Implementation details for the same can be worked out suitably.

B. Transmission

- Operational Vs Deemed availability:** NLDC records the outage of elements under NLDC Jurisdiction on monthly basis which simply calculates the time when element is under outage. The month wise plot for the FY 2016-17 is plotted below in bar chart. The duration calculated in NLDC calculation gives an idea of time when element was actually available, however it has been observed that the final availability after approval from RPCs becomes much higher. Major transmission licensee, in its annual report mentions availability of 99.79%(shown as horizontal dark line) for FY 2016-17, which makes licensee eligible for incentive apart from receiving fixed charge. This becomes important to mention that difference between operational availability and actual availability is wide (shown by vertical arrow). The difference is on account of the relaxation provided under different heads, for reliable operation of the system, this difference needs to be minimized.

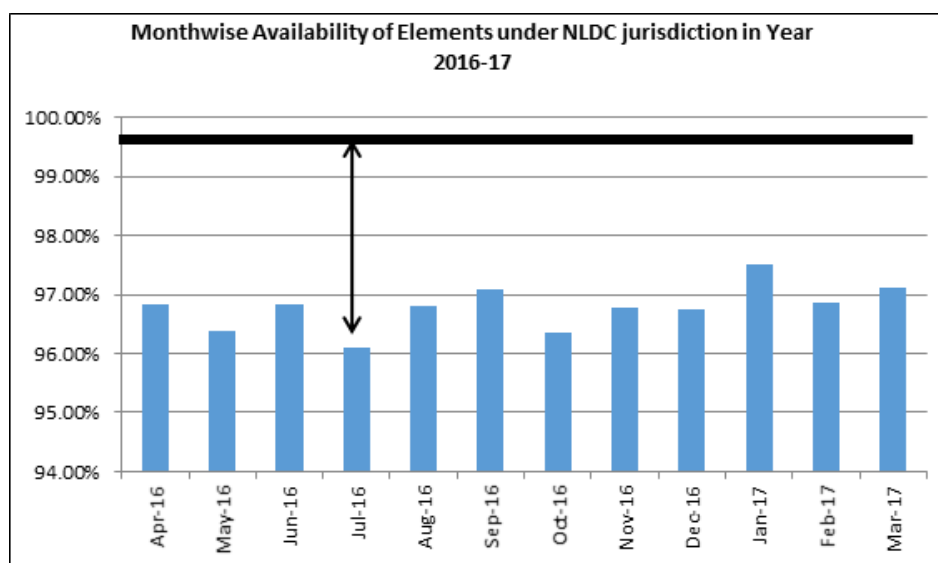


Fig 1 : Monthwise Availability of Elements under NLDC jurisdiction in Year 2016-17

Based on this principle, further inputs are provided below.

In 2014-19 regulations lot of provisions exist for complementing reliability. However, the provisions for excluding outage hours attributable to the transmission licensee give lot of scope for circumventing the provisions. The lacuna in information dissemination by Regional Power Committees (RPCs) further compounds this problem. Transparency can be achieved by timely publishing of information by RPCs on their respective websites. The areas where scope of improvement is there are provided below:

- a. **Outage on account of construction related works:** Regulations provide for Member Secretary, RPCs to restrict the deemed availability period to that considered reasonable by him/her for the work involved. To enhance the transparency in the whole process, it is suggested that as a part of before the fact exercise, planned outages are discussed and approved in Operational Coordination Committee (OCC) meetings of respective RPC. OCC should focus more on outages which the transmission licensee would ultimately attribute to other players or under deemed outage. In the post facto handling of the issue, RPC may distinctly mention the supporting facts.
- b. **Construction Vs Operation & Maintenance (O&M) outage :** There are many areas which strictly fall in the category of O&M works but gets claimed under construction head e.g.
- Replacement with polymer insulators, Controlled Switching Devices (CSD) relay commissioning etc. should come under O&M Head instead of construction Head.
 - Element Outages due to modification work, like tower design strengthening and isolator & circuit breaker replacement for purpose of remote operation should come under O&M head.
 - After declaration of commercial operation of new elements, elements are taken out for like tightening of nut, bolt and jumpers etc. in line should come under O&M head but claims being done under construction head.
- c. **Elements that need to be kept out to control high voltage:** If a transmission line could not be revived after instruction of RLDC/NLDC on account of high voltage and line reactor of the same line is under outage then line may be considered unavailable for availability calculations. This will ensure the availability of line reactor and high voltage scenario will be under check. Prolonged outage of line on high voltage impacts reliability and leads to substantial delay in charging of that element when code is issued in the real time. It is proposed that in case the licensee is not able to energize the line within one hour from the time of issuance of code by RLDC/NLDC then availability of that element would be considered zero for last seven days.
- d. **Generation Evacuation Lines:** In the present regulations *“in case of outage of a transmission element affecting evacuation of power from a generating station, outage hour shall be multiplied by a factor of 2”*. This may be extended to all cases of curtailment of Long Term Access (LTA)/Medium Term Open Access (MTOA) transactions. But in case of construction related outages, there is no impact on the transmission licensee. This

aspect needs to be further made more stringent to cover construction related outages. Many a times the line under outage on account of construction related works are restored late and since no outage hour is attributed to them hence penalty increase by factor of 2 also becomes immaterial.

- e. **DR/EL record provision:** As per CEA Grid Standards *“All operational data, including disturbance recorder and event logger reports, for analysing the grid incidents and grid disturbance and any other data which in its view can be of help for analysing grid incident or grid disturbance shall be furnished by the Entities within twenty four hours to the Regional Load Despatch Centre and concerned Regional Power Committee. Whether any tripping is attributable to licensee or not depends on event analysis outcome. Generally licensees include several tripping of lines due to over voltage or direct trip received from far end and by mentioning such reason, such type of outages get attributed to other agency. Further, spurious tripping can be identified only after confirming with DR/EL. In this regard it is suggested that onus will lie on transmission licensee to submit all operational data regarding disturbance on time. In case DR/EL is not received in time, the outage must be attributed to the licensee for availability calculations.*

2. Requirement of additional provisions in the Terms and Conditions of Tariff Regulations:

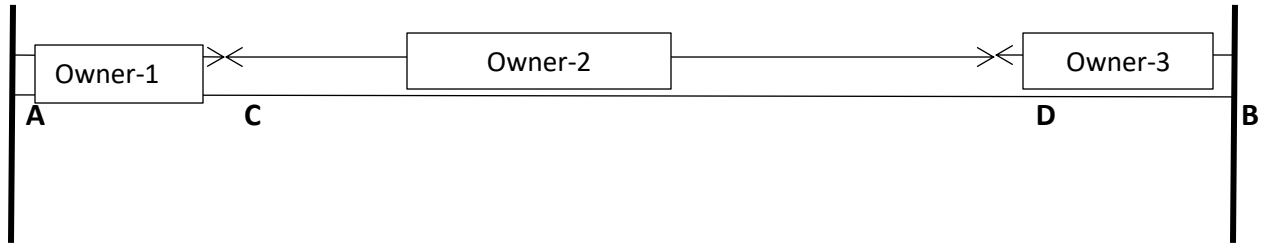
In addition to existing provisions of 2014-19 regulations, there are certain sections which need to be added from reliability considerations and clear accountability. The sections to be added are summarized below:

a. Lines owned by one transmission licensee and both end bays owned by other transmission licensee or STU

For many lines owned by transmission licensees, either one or both end bays are owned by other transmission licensee or STU. Any tripping of the lines due to protection maloperation or incorrect settings or Direct Trip (DT) received without fault, the outage is not attributable to licensee and claimed under other category. Therefore, the availability claimed for such lines are close to 100% and actual availability is much less than that. More than 2 tripping in a year (with additional 12 hours outage for each such tripping) must be attributed to the transmission licensee so that the maintenance and protection issues will be taken up regularly with bay owner.

- b. **Mutiple transmission licensees or equipment owners involved:** There has been an increase in Tariff Based Competitive Bidding (TBCB) lines and cases where bays are not

owned by transmission licensee. Maintenance of such bays is done by substation owner as a deposit work and availability of bay owner as well as transmission licensee does not get affected much. The case may be illustrated by an example as given below:



Let us assume there is a line AB where different sections are owned by different players. The yearly transmission charges of all three owners and yearly outage duration attributable to each section is tabulated below:

S.No.	Section	Owner	Outage hours
1	AC	Owner-1	80
2	CD	Owner-2	80
3	DB	Owner-3	80

Under present regulations, the section wise availability will be 99.08% which is incentivized in current regulations, however if we consider availability of complete line it comes out to be 97.26%. The system as a whole is impacted but the individual transmission licensees become eligible for incentive!

- c. **No of trippings more than 2 in a year:** As per current regulations” additional 12 hours outage shall be considered in addition to the actual outage for more than 2 trippings in a year”. However no such provision is there for HVDC system. In current scenario, when HVDC integration in the grid is increasing the same need to be enforced as part of the transmission availability calculation procedure.
- d. **Reduced Voltage Operation (RVO) of HVDC :** This should also be suitably factored in the availability verification process. There is no bar in the CERC Regulations (though explicit formula has been removed in the 2014-19 Regulations) for reducing availability on this

account. HVDC has to declare in advance its maximum power carrying capability and if on instruction of RLDCs/NLDC, HVDC is unable to ramp its power up to that value then availability may be reduced for such period.

- e. **Notional breakup in case of HVDC:** With the operationalization of Multi-terminal HVDC systems, it is important that availability of DC line for different sections and HVDC terminals at different stations be factored separately so that multi-terminal operation flexibility is captured in the availability calculations.
- f. **Timely restoration of outages:** The element taken out for O&M related works should be brought back within scheduled time. Any delay from scheduled time shall double the outage hours and shall be attributed to transmission licensee. This will ensure the timely restoration of element and in-line with revised scheduled and ATC/TTC values.
- g. **Additional Elements to be added:** In forthcoming tariff regulations, additional elements like, Fixed Series Capacitors (FSCs), FACT devices , HVDC filters etc. to be added for the availability verification as they influence the availability of main asset.
- h. **No risk approach:** It is observed that transmission licensees generally claim 'attributable to others' for tripping on account of lightning strokes, kite flying, farm fires, pollution related flashovers, storms etc. These are part of normal business risks that the transmission licensee should cover else it leads to an inflated value of availability which is misleading.
- i. **Restoration time for Gas Insulated Substation (GIS):** With commissioning of large number of gas insulated substations in the grid, it is necessary that restoration time post outage of switchyard elements is specifically mentioned in the terms and condition of tariff as well as the Performance Standards of Transmission Licensees.

-----X-----X-----X-----

पावर सिस्टम ऑपरेशन कॉरपोरेशन लिमिटेड
(पावरग्रिड की पूर्ण स्वामित्व प्राप्त सहायक कंपनी)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A wholly owned subsidiary of POWERGRID)



पंजीकृत एवं केन्द्रीय कार्यालय: बी-9, प्रथम तल, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली-110 016
Registered & Corporate Office : B - 9, 1st Floor, Qutub Institutional Area, Katwaria Sarai, New Delhi - 110 016
Website : www.posoco.in, www.nldc.in, Tel: 011-26536832, 26524522, Fax: 011-26524525, 26536901

To,

Dated: 26th May 2014

- 1) All Regional Load Despatch Centres (RLDCs)
- 2) All the inter-state transmission licensees (as per list attached)

Sub: Procedure for integration of a new network element of a transmission licensee into the grid and issuance of certificate by Regional Load Despatch Centre (RLDC) for successful trial operation of a transmission element

Sir,

As per section 5.2 of the grid related to System Security Aspects, each Regional Load Despatch Centre (RLDC) is required to maintain a list of important grid elements. Generally, the following categories of elements fall in the category of important grid elements (please refer to the RLDC documents for the exact listing):

- All transmission lines of 400 kV and above
- All inter-state and inter-regional transmission lines irrespective of the voltage level.
- Generating units over and above a particular capacity.

The above process would start with the first time charging of a new transmission element and its integration in to the grid. A new transmission asset by any transmission licensee needs to be carefully integrated, observing all provisions of the CERC Regulations and CEA Standards. Regulation 5(2) of CERC (Terms and Conditions of Tariff) Regulations, 2014 further provides for certification of successful trial operation of new transmission assets by RLDC. In line with the above provisions, a procedure has been formulated to enable RLDCs to facilitate integration of a new transmission element. On the basis of this procedure, a successful trial operation certificate would also be issued to all ISTS Licensees covered under the CERC (Terms and Conditions of Tariff) Regulations, 2014. This procedure would also be followed for all dedicated transmission lines also. For new generators under the jurisdiction of RLDCs, additional requirements would be specified separately.

All concerned are requested to follow these procedures for the smooth operation of the All India electricity grid. RLDCs may circulate the procedure to all the State Transmission Utilities (STUs) and State Load Despatch Centres (SLDCs) in their region.

Thanking you,

Encl: as above

Yours faithfully,

(K V S Baba)
General Manager

Procedure for interconnection of a new transmission element belonging to any transmission licensee and issue of certificate of successful trial operation by Regional Load Despatch Centres (RLDCs)

Indian Electricity Grid Code provides for formulation of operating procedure by RLDC /NLDC. The same is quoted below:

“A set of detailed operating procedures for the National grid shall be developed and maintained by the NLDC in consultation with the RLDCs, for guidance of the staff of the NLDC and it shall be consistent with IEGC to enable compliance with the requirement of this IEGC.”

A set of detailed operating procedures for each regional grid shall be developed and maintained by the respective RLDC in consultation with the regional entities for guidance of the staff of RLDC. and shall be consistent with IEGC to enable compliance with the requirement of this IEGC.”

In accordance with the above provisions and as a part of NLDC/RLDC operating procedure, procedure for interconnection of a new transmission element belonging to any transmission licensee has been formulated to enable RLDCs / NLDC for secure and reliable interconnection of new elements. The details of the same are as follows:

1. All the Transmission Licensees intending to commission any transmission element, which is a part of inter-state transmission system, shall intimate the concerned RLDC the details as given below, **generally (10) days** prior to the anticipated date of first test charging.
 - a. **Annexure A1:** Intimation regarding anticipated charging of the line along with the list of the desired documents being submitted as per **Format I**.
 - b. **Annexure A2 :** List of elements to be charged and Element Rating details as per **Format IA**
 - c. **Annexure A3 :** Single line diagram of the concerned sub stations, along with status of completion of each dia/bus/breakers clearly indicating which elements are proposed to be charged.
 - d. **Annexure A4 :** List of SCADA points to be made available (as per standard requirement, RLDC would need all MW and MVA_r data, voltage and frequency of all the buses, all the breaker and isolator positions, OLTC tap positions, Main-1/Main-2 protection operated signals)
 - e. **Annexure A5 :** Location of Energy meters as per relevant CEA regulations

f. **Annexure A6** : Connection Agreement, wherever applicable along with all annexures.

In additions to these documents, charging instructions, details of approval of the transmission scheme from the Standing Committee / CTU, availability of line reactors as per approved scheme, approval for changes in the approved scheme, technical parameters of the transmission element required for network modeling shall be made available by CTU/STU, as the case may be, to RLDCs/NLDC.

2. Within 3 days of submission of above information by the Transmission Licensee, concerned RLDC shall acknowledge the receipt of the same, as per Format II, and seek clarifications, if any. The transmission licensee shall submit the desired information/documents to the concerned RLDC within next three days.
3. The request for charging of new transmission element and towards start of the trial operation as per Format III shall be submitted by the Transmission Licensee to the concerned RLDC, **generally three (3) days** prior to the date of first time charging. There could be a separate schedule for test charging and the final schedule for trial operation, which may be mentioned in the Format-I itself. The Transmission Licensee shall also submit the following documents in this regard :
 - a. **Annexure B1**: Request for charging of the new transmission element along with the summary of the undertakings being submitted as per **Format III**
 - b. **Annexure B2**: Undertaking in respect of Protective systems as per **Format III A**
 - c. **Annexure B3**: Undertaking in respect of Telemetry and communication as per **Format III B**
 - d. **Annexure B4**: Undertaking in respect of Energy metering as per **Format III C**
 - e. **Annexure B5**: Undertaking in respect of Statutory clearances as per **Format III D**
4. On satisfying itself with the submitted information as stated above under Para 3, the RLDC would issue a provisional approval for charging to the Transmission Licensee as per **Format IV** within two days of receipt of above documents. On the designated day, the transmission licensee shall charge the transmission line and do trial operation as per the timeline mentioned in Format III, after obtaining the real time code from RLDC. All attempts would be made by the real time operating personnel at the concerned RLDC to facilitate charging and commissioning of the new element at the earliest, subject to availability of real time data and favourable system conditions.

5. Regulation 5(2) of CERC (Terms and Conditions of Tariff), 2014 provides for certification of successful trial operation of new transmission assets by RLDC. The same is quoted below:

“Trial operation in relation to a transmission system or an element thereof shall mean successful charging of the transmission system or an element thereof for 24 hours at continuous flow of power, and communication signal from sending end to receiving end and with requisite metering system, telemetry and protection system in service enclosing certificate to that effect from concerned Regional Load Dispatch Centre”

Post successful trial operation, following documents shall be submitted by the Transmission Licensee:

- a. **Annexure C1** : Request for issuance of successful trial operation certificate as per **Format V**
 - b. **Annexure C2**: Values of the concerned line flows and related voltages as per local SCADA just before and after charging of the element.
 - c. **Annexure C3** : Special Energy meter (SEM) Reading corresponding to the trial run
 - d. **Annexure C4** : Output of Disturbance Recorders / Event Loggers
6. Within three (3) working days of submission of the information mentioned above, RLDC concerned shall issue the certificate for successful completion of trial run of the transmission element as per **Format VI**.
 7. In case of an inter-regional element, both the respective RLDCs would be involved and a copy of the communications may be forwarded to NLDC also in such cases.

X-----X-----X

Documents to be submitted by Transmission Licensee to RLDCs

Annexure	Subject	Remarks
Annexure A1	Intimation regarding anticipated charging of the line along with other documents	As per Format I
Annexure A2	List of elements to be charged and Element Rating details	As per Format I A
Annexure A3	Single line diagram of the concerned sub stations, along with status of completion of each dia/bus/breakers	
Annexure A4	List of SCADA points to be made available (as per standard requirement, RLDC would need all MW and MVAR data, voltage and frequency of all the buses, all the breaker and isolator positions, OLTC tap positions, Main-1/Main-2 protection operated signals)	
Annexure A5	Type and Location of Energy meters as per relevant CEA regulations	
Annexure A6	Connection Agreement, wherever applicable along with all annexures	
Annexure B1	Request for charging of the new transmission element along with the summary of the undertakings being submitted	As per Format III
Annexure B2	Undertaking in respect of Protective systems	As per Format III A
Annexure B3	Undertaking in respect of Telemetry and communication	As per Format III B
Annexure B4	Undertaking in respect of Energy metering	As per Format III C
Annexure B5	Undertaking in respect of Statutory clearances	As per Format III D
Annexure C1	Request for issuance of successful trial operation certificate	As per Format V
Annexure C2	Values of the concerned line flows and related voltages just before and after charging of the element	
Annexure C3	Special Energy meter (SEM) Reading for the trial	
Annexure C4	Output of Disturbance Recorders / Event Loggers	

Format I

Intimation by Transmission Licensee regarding anticipated charging of new elements

<Name of Transmission Licensee>

Name of the transmission element :

Type of Transmission Element : Transmission Line / ICT / Bus Reactor / Line Reactor / Bus / Bay/Series Capacitor/Series Reactor

Voltage Level : AC/DC kV

Owner of the Transmission Asset :

Likely Date and time of Charging :

Likely Date and time of start of Trial Operation :

Place:

Date:

(Name and Designation of the authorized person with official seal)

Encl: Please provide full details.

- Annexure A2** : Format IA: List of elements to be charged and Element Rating details
- Annexure A3** : Single line diagram of the concerned sub stations, alongwith status of completion of each dia/bus/breakers
- Annexure A4**: List of SCADA points to be made available
- Annexure A5**: Location of installation of Energy meters as per relevant CEA regulations
- Annexure A6**: Connection Agreement, if applicable along with all annexures

Format I A

List of elements to be charged and Element Rating details

I. List of Elements to be charged:

II. Element Ratings
a. Transmission Line

1	From Substation	
2	To Substation	
3	Voltage Level (kV)	
4	Line Length (km)	
5	Conductor Type	
6	No of sub Conductors	

b. ICT

1	Voltage (HV kV / LV kV)	
2	Capacity (MVA)	
3	Transformer Vector group	
4	Total no of taps	
5	Nominal Tap Position	
6	Present Tap Position	
9	Tertiary Winding Rating and Ratio	
10	% Impedance	

c. Shunt / Series Reactor

1	Substation Name / Line Name	
2	Voltage	
3	MVAR Rating	
4	Switchable / Non Switchable	
5	In case of Bus Reactor, whether it can be taken as line reactor	

(Name and Designation of the authorized person with official seal)

Format II

<Name of RLDC>

Acknowledgement of Receipt by RLDC

This is to acknowledge that the intimation of likely charging of (Name of the transmission element) has been received from (Name of the owner of the transmission asset) on (Date).

Kindly complete the technical formalities in connection with energy metering, protection and real time data and communication facilities and inform us of the same three (3) days before charging of the above transmission element as per Formats III, IIIA, IIIB, IIIC and IIID.

Or

The intimation is incomplete and the following information may be submitted within three (3) days of issue of this acknowledgment receipt.

- 1. _____ -
- 2. _____
- 3. _____

.....

Date

Signature

Name:

Designation:

RLDC

Format III

<Name of Transmission Licensee>

**Request by Transmission Licensee for first time charging and
start of Trial Operation**

Past references: :

Name of the transmission element :

Type of Transmission Element : Transmission Line / ICT / Bus Reactor / Line
Reactor / Bus / Bay

Voltage Level :

Owner of the Transmission Asset :

Proposed Date and time of first time Charging :

Proposed Date and time of Trial Operation :

Place:

Date:

(Name and Designation of the authorized person with official seal)

Encl:

Annexure B2 : Undertaking in respect of Protective systems as per Format IIIA

Annexure B3 : Undertaking in respect of Telemetry and communication as per Format IIIB

Annexure B4: Undertaking in respect of Energy metering as per Format IIIC

Annexure B5: Undertaking in respect of Statutory clearances as per Format IIID

Format IIIA

< Name and Address of Transmission Licensee>

Undertaking by Transmission Licensee in respect of Protective systems

The following transmission element is proposed to be charged on _____<date> tentatively around ____ hours.

S no and Name of transmission element

- 1.0 It is certified that all the systems as stipulated in Part-III of the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 (as amended from time to time) have been tested and commissioned and would be in position when the element is taken into service.

- 2.0 The protective relay settings have been done as per the guidelines of the Regional Power Committee (RPC) as per section 5.2 I of the Indian Electricity Grid Code (IEGC). The necessary changes have also been made/would be made appropriately for the following lines at the following substations:

Sl No:	Name of the substation	Name of the line

Place:
Date:

(Name and Designation of the authorized person with official seal)

Format IIIB

< Name and Address of Transmission Licensee>

Undertaking by Transmission Licensee in respect of Telemetry and communication

The following transmission element is proposed to be charged on _____<date> tentatively around ____ hours.

S no and Name of transmission element:

The list of data points that would be made available to RLDC in real time had been indicated vide communication dated _____. It is certified that the following data points have been mapped and real time data would flow to RLDC immediately as the element is charged and commissioned.

S no	Name of substation	Data point (analog as well as digital) identified in earlier Communication dated	Point to point checking done jointly with RLDC (Y/N)	Data would be available at RLDC (Y/N)	Remarks (path may be specified)
1	Sending end	Analog			
		Digital			
		SoE			
		Main Channel			
		Standby Channel			
		Voice Communication (Specify:)			
2	Receiving end	Analog			
		Digital			
		SoE			
		Main Channel			
		Standby Channel			
		Voice Communication (Specify:)			

It is also certified that the data through main channel is made available to RLDC as well as alternate communication channel is available for data transfer to RLDC to ensure reliable and redundant data as per IEGC (as amended from time to time). Also, Voice communication is established as per IEGC. The arrangements are of permanent nature. In case of any interruption in data in real time, the undersigned undertakes to get the same restored at the earliest.

Place:

Date:

(Name and Designation of the authorized person with official seal)

Annexure B4

Format IIIC

< Name and Address of Transmission Licensee >

Undertaking by Transmission Licensee in respect of Energy metering

The following transmission element is proposed to be charged on _____ <date> tentatively around ____ hours.

S no and Name of transmission element:

Special Energy Meters (SEMs) conforming to CEA (Installation and Operation of Meters) Regulations, 2006 have been installed and commissioned. The SEMs are calibrated in compliance of regulation 9 of Part-I of CEA (Technical Standard for Grid Connectivity) Regulations 2007 as per the following details:

S no	Name of substation	Feeder name	Make of meter	Meter no	CT Ratio	PT/CVT Ratio
1	Sending end					
2	Receiving end					

Data Format Conformity: Yes / No

Polarity as per Convention: Yes / No

Time Drift Correction carried out: Yes/No

The data from the above meters would be forwarded on weekly basis to the RLDC as per section 6.4.21 of the Indian Electricity Grid Code (IEGC) (as amended from time to time) and also as and when requested by the RLDC.

(RLDC to indicate the email ids where the data has to be forwarded).

Place:

Date:

(Name and Designation of the authorized person with official seal)

Format III D

< Name and Address of Transmission Licensee >

Undertaking by transmission licensee in respect of statutory clearances

It is hereby certified that all statutory clearances in accordance with relevant CERC Regulations / CEA standards / CEA regulations and PTCC route approval for charging of _____ have been obtained from the concerned authorities.

Place:

Date:

(Name and Designation of the authorized person with official seal)

Format IV

Approval for charging and trial run

<Name of RLDC>

Approval no:

To,

The Transmission Licensee,

Sub: Charging and trial run of <Name of Transmission element>----Provisional approval

**Ref: 1) Your application dated in Format-I
2) RLDC response dated in Format-II
3) Your request and details forwarded on dated in Format III, IIIA, IIIB IIIC and IIID**

Madam/Sir,

- 1) The above documents have been examined by RLDC and permission for charging of <Name of Transmission element> on or after _____ is hereby accorded. This approval is provisional and in the intervening period, if any of the conditions given in the undertakings submitted by you are found to be violated, the approval stands cancelled. Kindly obtain a real time code from the appropriate RLDC for each element switching as well as commencement of trial operation.
- 2) The following shortcomings have been observed in the documents at S no 3) above.
 - a.
 - b.
 - c.

Please rectify the above shortcomings at the earliest to enable RLDC to issue the provisional approval for test charging, commissioning and trial operation of <Name of transmission element>.

Thanking you,

Yours faithfully,

(Name and designation of authorized personnel with seal)

Format-V

Transmission Licensee request for issuance of successful trial operation certificate

<Name of transmission licensee>

To,

<Name of RLDC>

Sub: Successful trial operation of <Name of Transmission element>---request for issue of certificate.

Ref: i) Our application dated in Format-I
ii) Your acknowledgement dated in Format-II
iii) Our application dated ---- in Format-III along with Format IIIA, IIIB IIIC and IIID
iv) Provisional approval dated ---- issued by your office.
v) Real time codes from RLDC on

Madam/Sir,

Referring to the above correspondence, this is to inform you the successful charging and trial operation of <Name of Transmission element> from ---- to ---- (time & date). Please find enclosed the following :

1. A plot of the MW/MVAr power flow during the 24 hour trial operation based on the substation SCADA is enclosed at Annexure-B1.
2. The Energy Meter readings have already been mailed to your office on _____. The 15-minute time block wise readings for the trial operation period is enclosed at Annexure-B2
3. Event Logger and Numerical Relay or Disturbance Recorder outputs at Annexure-B3 indicating all the switching operations related to the element. It is further to certify that the time synchronization of numerical relay, event logger and disturbance recorder has been established.

It is requested that a certificate of successful trial operation may kindly be issued at the earliest.

Thanking you,

Yours faithfully,

()
<Name and Designation of authorized person with official seal>

- Encl: Annexure C2: Plot of MW/MVAr flow during 24 hour trial operation.
Annexure C3: Energy Meter
Annexure-C4: Reading Numerical relay or Disturbance Recorder (DR) output and Event Logger output.

<Name and Address of the Load Despatch Centre>



Certificate Number:

Date:

Certificate of completion of Trial Operation of Transmission Element

Reference:

- i. Communication dated _____ from Transmission Licensee to RLDC in Format-I and IA.
- ii. Communication from RLDC dated _____ to Transmission Licensee in Format-II.
- iii. Communication from Transmission Licensee to RLDC dated _____ in Format III, IIIA, IIIB, IIIC and IIID.
- iv. Provisional approval dated _____ from RLDC to Transmission Licensee for charging in real time in Format-IV.
- v. Real time code issued by RLDC on _____
- vi. Communication dated _____ from Transmission Licensee in Format-V after trial operation.

Based on the above reference, it is hereby certified that the following Transmission element has successfully completed the trial operation:

Name of the Transmission Asset:	
Owner of the Transmission Asset :	
Date and Time of Energization for commencement of successful trial run operation	
Date/time of completion of successful trial run operation	

This certificate is being issued in accordance with Regulation 5 of CERC (Terms and Condition of Tariff) Regulations, 2014 to certify successful completion of trial operation of transmission element. Usage of this certificate for any other purpose is prohibited.

Signature

**Name and Designation of the
issuing Officer with official seal**

Place

Copy to:

- I. Transmission System Owner
- II. Member Secretary, RPC
- III. Head, NLDC
- IV. Any other agency, if required

पावर सिस्टम ऑपरेशन कारपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Govt. of India Enterprise)



पंजीकृत एवं केन्द्रीय कार्यालय : प्रथम तल, बी-9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली-110016
Registered & Corporate Office : 1st Floor, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016
CIN : U40105DL2009GOI188682, Website : www.posoco.in, E-mail : posococc@posoco.in, Tel.: 011-41035696, Fax : 011-26536901

Ref: POSOCO/NLDC/System Operation

Date: 19th April 2018

To,

- 1) All ISTS Licensees
- 2) Executive Director WRLDC/ERLDC/NERLDC
General Manager NRLDC/SRLDC

Sub: Procedure for first time charging of STATCOM

Sir,

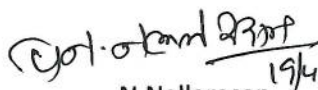
NLDC and RLDCs have been entrusted with the responsibility of issuing successful trial operation completion certificate as per CERC (Terms and Conditions of Tariff), Regulations 2014. Accordingly, a procedure was circulated by NLDC vide letter dated 26th May 2014 in this regard. A copy of the same is attached.

Thirteen (13) STATCOMs have been planned by CEA/CTU at various locations for dynamic compensation in the grid. Out of this, three STATCOMs (one in ER and two in WR) have already been put in operation. In this regard, a procedure for first time charging of STATCOM has been prepared for issuing successful trial operation completion. A copy of the same is attached as Annexure II.

All concerned are requested to follow this procedure for smooth operation of All India Grid. RLDCs may circulate the attached procedure to all the State Transmission Utilities (STUs) and State Load Despatch Centre (SLDCs) in their region.

Thanking you,

Encl: As above


N Nallarasana
DGM, System Operation
NLDC

Copy to : CMD, POSOCO

Guidelines for first time charging of STATCOM

1. Pre Charging Activities

- a. The procedure in place for first time charging of transmission elements shall be followed for STATCOM as well and all the timelines & formats mentioned in that procedure shall be applicable to STATCOM as well.
- b. Approval of first time charging of STATCOM shall be provided by respective RLDC in line with these guidelines and the procedure for facilitating first time charging of new transmission elements already in place.
- c. Following information shall be provided by the owners of STATCOM before first time charging of STATCOM
 - i. Number of Blocks and rating of each block
 - ii. Detailed Single Line Diagram of STATCOM
 - iii. V/I Characteristics
 - iv. Coupling Transfer HV /LV rating
 - v. Coupling Transformer Rating / Impedance
 - vi. MSR and MSC design parameters
 - vii. Different Operating Modes
 - viii. IEEE Standard Dynamic Model
 - ix. Whether POD is enabled and tuned. If No, then reasons for the same.
 - x. Any other information as required by RLDC
- d. Owners of the STATCOM shall submit a detailed proposal for testing at least 10 days in advance along with intimation of first time charging (Format A).
- e. The auxiliary consumption of STATCOM is generally drawn from the tertiary of the 400/220/33 kV transformer at the substation. The meter reading of this transformer would include the auxiliary consumption of STATCOM as well. Therefore, a No Objection Certificate (NOC) from the local DISCOM and SLDC would also be provided by the owner of the STATCOM.
- f. Special Energy Meter shall be installed by CTU at the coupling transformer as well in consultation with concerned RLDC. The dummy meter readings shall be sent to respective RLDC along with B type formats.

2. Data Telemetry Requirements

- a. Following SCADA points shall be made available to the NLDC/RLDC control room
 - i. Q_{Stat} : Reactive power exchange with STATCOM
 - ii. Q_{MSR} & Q_{MSC} : Reactive power exchange with Mechanically switched Reactor and Mechanically Switched capacitor
 - iii. V_{HV} & V_{MV} : Voltage of high voltage bus and Medium Voltage bus where STATCOM is connected
 - iv. Q_{Tra} : Reactive power through the coupling transformer

- v. P_{aux} & Q_{aux} : Active and reactive power through the auxiliary supply
- vi. Circuit Breaker and Isolator Status
- vii. Tap position of coupling transformer
- viii. Power Oscillation damping setting
- ix. STATCOM modes

An indicative SLD specifying these parameters are enclosed as Annexure I.

3. Trial Operation of STATCOM

- a. The trial operation of STATCOM shall start only after all the units/blocks are in operation and telemetry of the points as defined above are available at RLDC/NLDC.
- b. The trial operation for the purpose of STATCOM shall be continuous operation for 72 hrs.
- c. During the trial operation, performance of MSR, MSC and STATCOM shall be verified. Hence, MSR and MSC shall be operated continuously for 24 hours one by one
- d. The continuous of operation of MSR, MSC and the operating range test of STATCOM shall be demonstrated during the trial operation.
- e. RLDCs in coordination with NLDC shall ensure that the STATCOM is operated at least once in Voltage Control Mode (by changing V_{ref}) and once in Constant Reactive Power Control Mode. If required, bus reactors at that substation may be switched for this purpose.

4. Post Charging Activities

- a. Successful Trial Operation completion certificate for STATCOM shall be issued by RLDC in accordance with procedure in place for first time charging of transmission elements.
- b. Following data shall be provided by the owner of STATCOM post successful trial operation for issuance of successful trial operation completion certificate:
 - i. Coupling transformer meter reading for the period of trial operation
 - ii. SCADA readings/plot of reactive power injected or absorbed during the trial operation
 - iii. SCADA readings/plot of current drawn by STATCOM
 - iv. SCADA readings/plot of STATCOM HV bus
 - v. Event log indicating closing of STATCOM breaker
 - vi. Output of Disturbance Recorder for the period of trial operation
 - vii. Any other data as required by RLDC to ascertain effective operation of STATCOM

Annexure I

