

To  
The Secretary,  
Central Electricity Regulatory Commission (CERC)  
3rd & 4th Floor, Chanderlok Building,  
36, Janpath, New Delhi – 110 001

Date: 30 April 2015

**Subject: Comments / suggestions on “Proposed Framework on “Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter State Level”**

Dear Sir,

We wish to introduce Wind Independent Power Producers Association (WIPPA), a national level registered body having association of more than 30 Independent Power Producers (IPPs) that have significant investment on ground or in pipeline in wind energy sector across the country. WIPPA is actively engaged in sustenance and promotion of the wind energy sector in India through policy advocacy and presenting independent views / suggestions / comments / analysis to various stakeholders at various forums so as to provide further fillip to the sector.

We are hereby submitting our comments / suggestions on the Proposed Framework on “Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter State Level with reference to publication of notice for on the website of Hon’ble Commission on 31<sup>st</sup> March 2015. Our detailed submission is as per **Annexure 1**. We sincerely request the Hon’ble Commission to consider these suggestions while finalizing the proposed framework.

Yours sincerely,

**For Wind Independent Power Producers Association (WIPPA)**



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**Annexure 1: Comments / suggestions by WIPPA in the matter of “Proposed Framework on “Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter State Level”**

The Hon’ble Commission has proposed a framework on scheduling and forecasting of wind and solar generators connected to the inter-state network. The key features of the proposed framework are:

- Wind / solar generators at the inter-state level whose scheduling is done by RLDCs are to be scheduled like any other generator and paid as per scheduled generation
- An operating band of  $\pm 12\%$  is proposed for such generators

This mechanism is fundamentally different from the earlier proposed RRF mechanism by CERC and still has few aspects to be re-examined before its implementation. The settlement under the framework would be as follows:

Actual Generation	Penalty/Incentive
Between 88% to 100% of schedule	Payment of INR 3 / kWh to DSM Pool and transfer of REC to Buyer
Below 88% of schedule	Payment of INR 4 / kWh to DSM Pool and transfer of REC to Buyer
Between 100% to 112% of schedule	Payment of INR 4 / kWh to Generator and allotment of REC to Generator
Beyond 112% of schedule	Allotment of REC to Generator

We agree with the underlying thought process of the Commission that with the growing integration and penetration of renewable energy in grid, it is important that scheduling and forecasting procedures for these technologies is adopted and embraced gradually with holistic dimensions for all the stakeholders.

At the same time while shaping these procedures, it is also imperative to recognise that the country is on a path to achieve unprecedented capacity addition over next few years that would require huge capital commitment - hence investment sentiments remains preserved.

The following comments on proposed framework are being submitted along with suggested mechanism having a rounded objective for all the stakeholders - that can be adopted by the Hon’ble Commission.

### **Objective of scheduling and forecasting mechanism**

In order to analyse effectiveness of the proposed framework, it is vital to keep in mind the envisaged objective behind its implementation. It is a known fact that the primary objective of the



framework is to **facilitate better grid management in light of the fact that wind / solar power generation is infirm in nature**. Accordingly, the framework has been designed with a goal to induce revelation of schedule of wind and solar power generation as close as possible to actual generation.

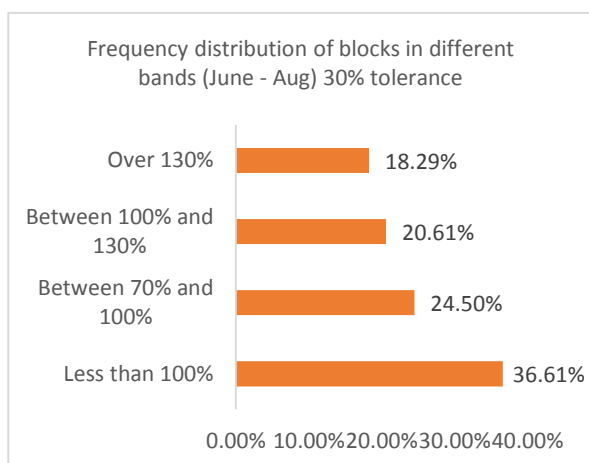
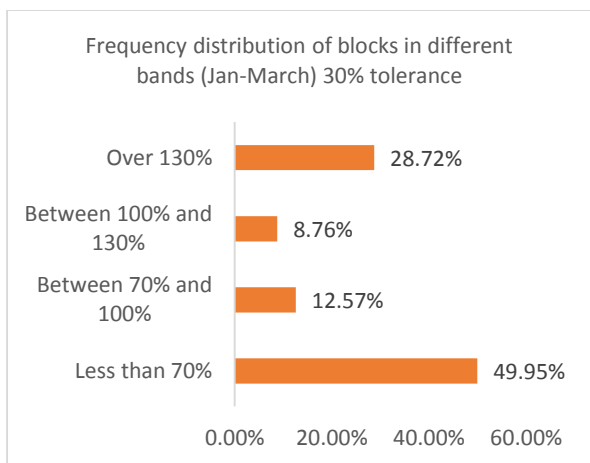
Further, in our mind one of the other key design principles of any scheduling and forecasting framework must be to include all the generators in the mechanism and minimize the financial impact of variable power generation on the host State / Discom as well as the individual generators. However the framework in its current form has several lacunae and fails to meet its overall objective. The key issues with regard to proposed framework are explained hereunder:

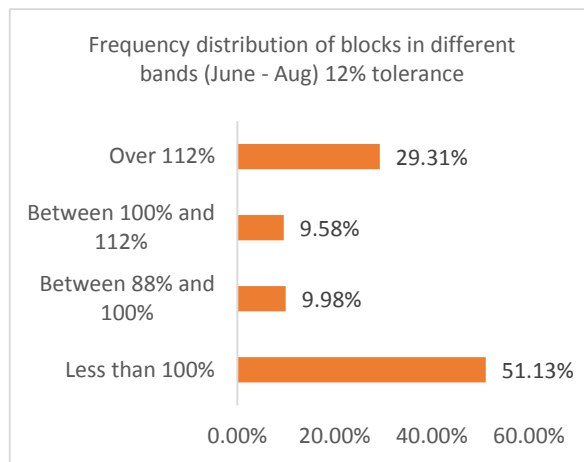
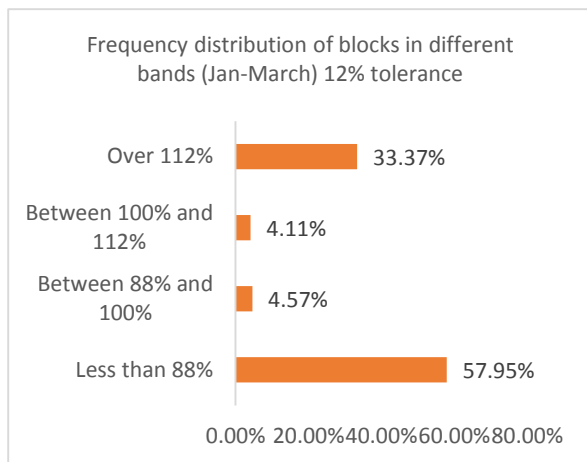
**Key issues**

**Tight tolerance band:** The wind and solar energy is of infirm nature and their generation pattern is subject to change depending on multiple factors of environment which are external to the generator and beyond their control. In such a scenario, mandating the entire responsibility of forecasting and scheduling accurately (for each time block of 15 minutes) on the generators with a tighter tolerance band of  $\pm 12\%$  - against a much relaxed band proposed in the earlier RRF mechanism is unfair and beyond the principles of natural justice.

Some generators have in the past based on the earlier RRF framework proposed by the Hon'ble Commission have done forecasting and scheduling albeit without any commercial impact. Even after diligently following the scheduling and forecasting after bringing on board reputable forecast service providers exercise the generators were not able to maintain generation within the tolerance band of  $\pm 30\%$ .

As an example for a 50 MW plant in Maharashtra for one of the WIPPA members the sample results are as follows:





- in the windy season only in 44% of the time blocks the generation was within the permitted band and;
- in about 21% of time blocks in the non-windy season the generation was within the  $\pm 30\%$  band proposed by the Commission in the erstwhile RRF framework.

Although this data is for a single windfarm but, is representative of a wider data set based on the actual experiences of various farms in last one year. These deviations were after the generators utilised the provision of all 8 revisions in the framework to provide a more accurate schedule. This shows that it is next to impossible for the developers to adhere to such strict guidelines.

In case the strict tolerance band guidelines as proposed by the Hon’ble Commission are implemented in current form there could be **huge commercial liability on the generators** which will create a **negative investor sentiment** and be a dampener in achieving the 160 GW target set by the Central government for renewables.

***The tolerance band must be relaxed whereby there must be no commercial impact on RE generators***

**Asymmetrical penalty for deviation:** In the proposed mechanism, the generator is getting penalised asymmetrically for deviations from the schedule. For instance, in case of over injection beyond +12% band - the incentive available to the developer is minimal and in the form of RECs only which carries much lower commercial value than its normative value given the situation at REC market.

This would certainly lead to a situation of potential gaming whereby the generator would tend to provide an aggressive forecast so to necessarily be making negative deviation from schedule. This

would defeat the overall objective of the mechanism to induce revelation of schedule of wind and solar energy generation as close to actual.

***The penalty for deviation on either side must be symmetrical as it avoids any potential for speculation and gaming by market participants.***

**Cases of zero schedules / zero generation / low resource period:** We wish to highlight before the Hon'ble Commission strange conundrums resulting from aforementioned scenario:

- During off-peak season, due to sudden gush of wind or clouds over the plant, the percentage deviation from schedule might often cross tolerable band due to low forecast provided – although deviations being small in absolute sense. In absolute term such deviations are going to be very small and are not comparable to the absolute deviations in peak generation months even though having the same % deviation.
- Zero forecasts or zero actual generation might lead to infinite / very high percentage deviation. This is also ironical in the sense that generators would be penalized for deviation which is low in absolute sense during off-peak season (but high % deviation) whereas they might not be penalized for higher deviation in absolute sense during peak season (but low % deviation).

This must be appropriately addressed in final framework for scheduling and forecasting.

***There must be a separate band for measurement of deviation in different seasons, i.e., different tolerance band for windy and non-windy season in case of wind and monsoon and rest of year in case of solar.***

***Alternatively the metrics for measurement of deviation may not be absolute deviations but Root Mean Square Error or Mean Absolute Error with respect to the wind farm capacity.***

**Unpreparedness of the RLDCs/REMCs:** Operationalization of the proposed framework hinges on the instigation of the proposed REMCs and their smooth functioning. In this regard, we would like to highlight that most of the RLDCs do not yet have the expertise to provide real time forecasts / schedules with 16 revisions as is being envisaged under this framework. Thus in order to effectively implement the proposed mechanism and to avoid unfair impact on generators, the need of the hour is:



- Support RLDCs in setting up the required infrastructure including suitable IT platforms for seamless data sharing, updating info etc.
- Facilitate capacity building of the SLDC/RLDC/REMC manpower to operate the infrastructure and to implement any proposed framework

***Any framework must be operationalised after REMCs are fully functional and during such period time is also given to generators to build the necessary infrastructure.***

***Post this period the framework must be run on mock basis for a year with penal provisions only in case of non-participation by any generator.***

***The framework must also come out with clear guidelines and procedure for implementation which must specify the timelines with regards to commercial settlement.***

### Centralised Forecasting is the most accurate method

Centralised forecasting is the best mechanism to achieve the objectives of the proposed framework. The key advantages of centralised forecasting are:

**Improved accuracy levels:** It is known fact that centralized forecasting leads to better accuracy in forecasting results compared to that in case of distributed forecasting at individual project level. This is primarily due to aggregation of deviations over a larger area/ region leading to better accuracy level at the level of the larger area/ region (which could be state level in the Indian context). **Coverage of a wider dataset:** As centralized forecasting may be done by state level entity/ organization and would cover all wind/solar projects in the state, this would provide better forecasts and in turn schedules resulting in a lower commercial impact as well as improved system stability.

**Centralized forecasting is followed internationally:** The table below shows the various aspects of centralized forecasting that is followed in the developed countries.

Item	Denmark	Germany	UK	USA (ERCOT)
Wind penetration in energy terms	30%; target of 52% in 2020	8%; 35% (all renewables) by 2020	6%; 30% (all renewables) by 2020	9%
Markets	Day-ahead. Intra-	Day-ahead.	Bilateral trading, up	Bilateral trading.



Item	Denmark	Germany	UK	USA (ERCOT)
	day market.	Intra-day market (45 minute gate closure)	to gate closure (1 hour)	Wholesale markets (day-ahead and balancing by ERCOT)
<b>Forecasting</b>	TSO responsible. Forecast is published. BRPs may use own forecasts for trading purposes	Forecasting done by energy traders, both independents and TSOs.	Forecasting done by energy traders. TSO has its own forecasting process, for operational purposes.	Forecasting done by energy traders. ERCOT has its own forecasting process, for operational purposes.
<b>Requirement of forecast by individual wind farm</b>	No	No	No	No
<b>Forecasting costs met by</b>	TSO, BRPs (if additional forecast capability is considered useful)	Energy Traders	TSO, Energy Traders	TSO, Energy Traders
<b>Forecast Details</b>	60 minutes for energy trading. TSO uses 5- minute time step for internal short-term forecasts.	15 minutes for energy trading	30 minutes for energy trading	Driven by trading requirements (60-minute time step).

In a welcome move the paper also has enabling provisions for use of centralised forecasting and scheduling activities which shall be undertaken by the proposed REMCs. However the key differentiator in the mechanism proposed by the Hon’ble Commission in its paper and global best practices is that any commercial impact as a result of the deviations resulting from centralised forecasting and scheduling is proposed to be borne by the developer. Germany and California which are mature markets and have systems in place for quite some time socialise the commercial impact on all participants of the system. This impact when socialised on all participants is a moderate amount.

## **Recommended scheduling and forecasting framework**

The Hon'ble Commission has been mindful of the fact that settlement of any deviation with reference to frequency as a metric for commercial settlement would be difficult and poses significant challenges. Linkage with frequency created a scenario where the generator was not aware of their realisation and the Return on Equity as mandated by law would not have accrued to the generator. In this regard the delinking of commercial settlement to frequency and making the settlement on the basis of fixed numbers provides some degree of certainty.

However the proposed mechanism in its current form is still full of implementation challenges as illustrated above in detail. WIPPA humbly submits for consideration before the Hon'ble Commission a suggestive framework which seeks to address the above challenges.

Currently proposed framework intends to make all generators endeavour to come up with the best possible forecast at least one hour in advance. To ensure that generators come up with the best efforts the framework provides a commercial levy on the generators. The same objective can be achieved in a better way by a centralized forecasting system governed by REMCs. REMCs would be able to do a better job provided they have real time data access of all wind farms which may be made mandatory for generators to provide through suitable amendments in Grid Code.

There are two major components to a transaction involving any deviation in green power:

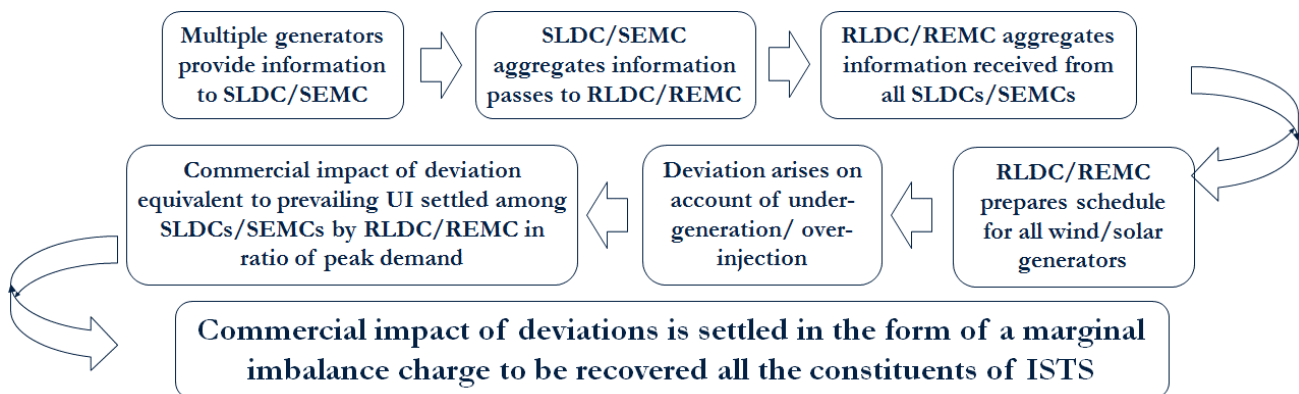
- Commercial settlement resulting from such deviation and
- Adjustment of green power to fulfil the RPO of the obligated entity which is the buyer in such a transaction.

The proposed framework tries to address both these issues with minimal impact on market participants as well as improvement in grid stability.

### **Energy Settlement**

As illustrated above centralised forecasting is one of the best ways to address difficulties posed by the infirm nature of green power. The commercial settlement of the energy in this case shall happen on actuals and the generator shall be paid for the actual quantum of energy injected into the system. The framework shall work in the following manner:





This model is very similar to the practice followed in Germany where the TSO is responsible for balancing, forecasting and paying for the FIT irrespective of its accuracy, and deviations if any are socialized across all customers. A similar practice can be adopted in India where the costs associated with deviation are settled among the respective SLDCs in the ratio of their daily/monthly peak demand which can then be approved by the appropriate commissions in the ARR. Also in case of generators directly connected to RLDC the deviation settlement may either be socialised on all the SLDCs or recovered from constituents of the ISTS.

RPO settlement in case of deviation is not a big challenge as any reconciliation for obligated entities usually happens on annual basis. Also in most cases the generators are able to supply committed power to procurers as per purchase agreement on an annual basis. In case of any deviation the RPO obligation of the procurer shall be taken care of by the contractual agreement between the buyer and the seller and must be left to their discretion

The settlement in case of imbalance shall be as follows:

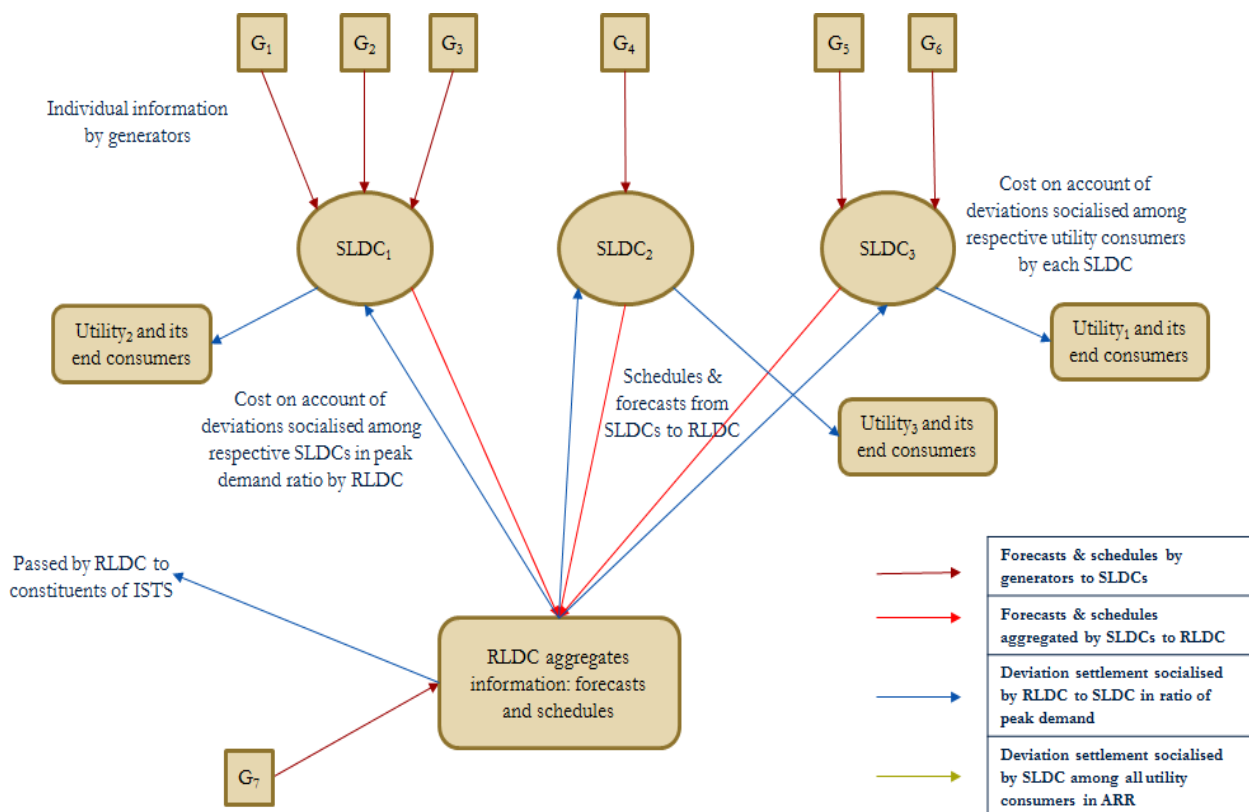
Parameter	Deviation from schedule
<b>Payment to generator</b>	As per actuals
<b>Imbalance settlement</b>	Impact of deviation in the form of UI imbalance socialised among market participants in the form of imbalance charge
<b>RPO settlement</b>	Real time settlement on actuals. Annual commitments as per contractual agreement between the buyer and seller

**Integration at state level**

The previous framework was fraught with operational difficulties as there were jurisdictional challenges in its implementation. However these challenges can be tackled by voluntary acceptance of the proposed model by the state utilities and for the state utilities to accept the proposed model there must be an incentive structure wherein they have some inherent advantage of adopting this framework.

If the states are sheltered from the overall 150 MW limit to the extent of their deviations of renewable energy they will have incentive enough to adopt the framework. The costs of such deviation may be socialised among all the consumers and resultantly the huge impact on host discom gets reduced to a large extent. The states may find this incentive attractive enough to adopt the central commission guideline/framework of imbalance settlement for infirm power. This will result in much wider coverage of renewable energy plants. Providing states an option to come to this framework by providing incentive is the best way to manage the problem of variability of infirm power from renewables.

The operational framework of the proposed mechanism will have the following data and commercial flows:



### Advantages of the recommended framework

The framework has several inherent advantages and tries to address the gaps of the framework proposed by the Hon'ble Commission. We have reproduced the same below:

Improvement in grid stability with more accurate forecasts	✓
Settlement of energy balance with minimal impact on market participants	✓
Reduced costs of the forecasting and scheduling exercise	✓
Protection to small embedded generators from the huge costs associated with forecasting and scheduling	✓
Ease of adoption by all parties and replicability in states	✓

### Requirements of the recommended framework

As described in details above the recommended mechanism will have the following key features:

- Forecasting and scheduling would be the job of a notified nodal agency which shall also be the REMC within the RLDC or as a separate body.
- Individual project owners shall in real-time be responsible for providing their project information including outage details etc. which shall be aggregated by the REMC and used as it is and/or in conjunction with their own schedules as per the centralised forecasts available with them.

In such a case all the deviations in forecasts shall be socialised among all the consumers within the RLDC boundary. In order to operationalise this system effectively there are certain requirements that will have to be met. We shall take up each one of them separately as under:

1. The REMCs are one of the most important entities for successful implementation of the framework. Any commercial implication is dependent on their forecast quality and accuracy. REMCs shall be handling real time information from numerous projects within their geographical boundary which is critical to accurate forecasts. As per industry estimates, to make the REMCs fully functional it shall take atleast 24-30 months, given the requirement of infrastructure building via a bidding process and training of human resources. Thus they must be operationalised with the necessary infrastructure and human capabilities before any such framework is initiated with commercial impacts.

2. The generators will have to put necessary infrastructure in place by which they shall transmit real-time information regarding generation, outage, project site information etc. to the REMCs. It is important that till such time the REMCs are functional the
3. The Central Commission must specify the guidelines for connectivity for generating stations which shall include communication facilities, Scada infrastructure, metering and connectivity infrastructure, timelines for update on change in operating parameters etc. so that they are able to transmit real-time information to the notified nodal agency. The generators must compulsorily comply with such guidelines and in case of noncompliance heavy penal clauses may be imposed on them.
4. A mock exercise with compulsory participation of all generators must be conducted for one year. In case of non-participation huge penalties may be imposed on the defaulting parties. This shall help as a learning curve and experiences gained during such period may be incorporated in the final framework which shall have commercial settlement
5. The socialisation costs are important from the perspective of a balanced approach where no single party is over-burdened. The Central Commission must initiate a study while the REMCs and the other requirements are being put in place to understand socialisation impact. The scope of the study can take into account under different scenarios the proposed capacity addition programs. In our view the overall marginal cost of socialisation with growing integration of renewables will be miniscule and in such a scenario focus must not be on commercial impact of such imbalances but on improving the grid integration.

This recommended mechanism takes a holistic view and addresses the concerns of all the market participants and at the same time minimizing the commercial impact on any single generator or any single state. It is important that this is a very critical juncture for development of renewable energy in the country. Any mechanism which hampers the growth of the sector will create a barrier for achieving the aggressive targets set by the Central Government. The renewable energy sector globally is looking at India with expectations and we have to promote the sector with an enabling framework. Thus it is requested that the Commission considers our humble submission before finalising the provisions of the same.