



भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
नवीकरणीय ऊर्जा उद्भव विकास प्रभाग
Renewable Energy Source Development Division
*** ** ***

No. CEA/Plg/RES-30/2017

Dated: 25-05-2017

विषय : नवीकरणीय ऊर्जा स्रोतों और संबंधित मुद्दों के ग्रिड एकीकरण की सुविधा के लिए विभिन्न प्रकार के ऊर्जा स्रोतों ऊर्जा भंडारण उपकरणों के अनुकूलतम स्थान के अध्ययन के लिए / सीईए द्वारा गठित तकनीकी समिति की दूसरी बैठक का कार्यवृत्त

Subject: Minutes of the Second Meeting of the Technical Committee constituted by CEA for study of optimal location of the various types of balancing energy sources /energy storage devices to facilitate grid integration of Renewable Energy Sources and associated issues – reg.

महोदय/Sir,

Minutes of the Second Meeting of the Technical Committee on the subject held on 09th May, 2017 at Chennai, under the Chairmanship of Member (Planning), CEA, are enclosed herewith for your kind information and further necessary action.

Copies of the presentations are being sent on emails only.

चेन्नई में 09 मई, 2017 को सदस्य (योजना), के. वि. प्रा. की अध्यक्षता में आयोजित उपरोक्त विषय पर तकनीकी समिति की दूसरी बैठक के मिनट (कार्यवृत्त) आपकी जानकारी और आगे की आवश्यक कार्रवाई हेतु संलग्न हैं।

प्रस्तुतियों की प्रतियां केवल ईमेल पर ही भेजी जा रही हैं .

कृपया पत्र की पावती दें/ Kindly acknowledge the receipt of the letter.

भवदीय/Yours faithfully

अशोक कुमार राजपूत/(Ashok Kumar Rajput)

Chief Engineer(RES Dev.)

Convener and Member Secretary

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Copy for kind information to:

1. PPS to Secretary (Power), Ministry of Power, New Delhi.
2. PPS to Secretary (MNRE), New Delhi.
3. PPS to Joint Secretary (Ms Jyoti Arora), Ministry of Power, New Delhi
4. SA to Chairperson, CEA
5. PPS to Member (Planning), CEA

Minutes of the Second Meeting held on 09th May, 2017 of the Technical Committee constituted by CEA for study of optimal location of the various types of balancing energy sources /energy storage devices to facilitate grid integration of Renewable Energy Sources and associated issues

The Second Meeting of the Technical Committee constituted by CEA for study of optimal location of the various types of balancing energy sources /energy storage devices to facilitate grid integration of Renewable Energy Sources (RES) and associated issues, was held under the Chairmanship of **Shri Pankaj Batra, Member (Planning), CEA**, on 09th May, 2017 at Chennai. List of participants is given at Annexure.

Managing Director (MD), TANTRANSCO welcomed **Member (Planning), CEA** and **Chairman of the Committee**. He also welcomed the participants for the meeting.

Initiating the discussions **Managing Director (MD), TANTRANSCO** stated that Tamil Nadu has a huge quantum of wind power and therefore the issue of balancing the variability of generation on account of wind energy was important. He stated that establishment of balancing energy sources /energy storage devices could help in economical generation scheduling as well as optimal planning of the power sources. He mentioned that, in addition to optimization of resources, the establishment of electricity storage facilities and balancing sources/ energy storage devices would prove to be quite useful in meeting the incremental demand at the time of system peak.

Welcoming the participants **Chairman of the Committee Shri Pankaj Batra, Member (Planning), CEA** thanked **TANTRANSCO** for hosting the meeting on the important issue of integration of RES to the grid. RES do have the issue of intermittency of generation, but at the same time, are cleaner sources of energy, so there is a need to harness the RES upto their maximum capacity. Development of RES will be helping in mitigating the impact of climate change as well as it will help in achieving the goal of energy security. **Tamil Nadu in Southern Region** has been especially endowed with a high potential of wind energy and solar energy, and therefore it was decided to hold the meeting so that it could become a model state for other states.

Member (Planning), CEA stated that the southern States had been requested to make presentation on the problems faced in increase of renewables to the Grid in their State and how they were tackling the same. This would be followed by presentation from **Madhya Pradesh (MP)** and how they were tackling the same in their region i.e. **Western Region** and a presentation by **PGCIL** on installation of Battery Energy Storage System (**BESS**) on pilot basis in **Puducherry**. This would be followed by presentation by **SRPC** on various issues relating to benefits of balancing on regional basis. Finally, a presentation would also be made by **OrxaGrid**, a company dealing with quick setting up of communication system for transmission of data from wind and solar pooling stations to the SLDC/RLDC using GPRS. The whole system can be set up within two hours for each pooling station. However, CEA is not projecting any company for doing this, and all States were free to look for any of the companies to implement their communication system.

The Chair mentioned that the first meeting of the Committee was held in Delhi. Subsequent to that another meeting was held under the Chairmanship of **Member Secretary, SRPC, at Bengaluru** wherein the participants were from **Southern Region States** and a representative from **Gujarat SLDC** was also invited for sharing their rich experience in the field of RES with the Southern States. **The Chair** further conveyed that such meetings of the Committee are proposed to be held in Northern as well as the Western Regions very soon. *It would also be beneficial for states of all Region if states of one Region share the experience with states of other regions. It is in this context that the states of other regions have also been invited in the meeting of the States of the Southern region as well.* The Committee would submit its Report and recommendations to the Ministry of Power in the development of the renewable energy sector in the country.

The Chair mentioned that the revised **Indian Electricity Grid Code (IEGC)** was brought out by **Central Electricity Regulatory Commission (CERC) in 2010** which first contained provision of forecasting and scheduling of wind and solar power, which has helped the system operators and the stakeholders in maintaining the grid security and reliability even with intermittent generation. Since then, a lot of development have taken place in the Renewable energy sector, which is now picking up very fast. The Government has set a target of RE capacity in the country to be of the order 175 GW by the year 2022, 1,60,000 MW of which is variable generation. Managing this quantum of RES in the grid would be a challenging task. It would need to be seen, that under such circumstances, whether the balancing would take place within the state, within a region or across the country and also which would be the most optimal method.

Member-Secretary SRPC welcomed the Chair and the participants. He mentioned that after the Bengaluru Meeting (held on 23rd March, 2017) further analysis has been carried out at their end to address the related issues. General pattern observed is that during the three months there is a high wind season in **Tamil Nadu** and for the remaining 09 months of the year there is moderate to non-wind season. He mentioned that the deviations, because of the injection of power from various sources of generation need to be analysed control area-wise. He stated the states have to ramp their generation from conventional energy sources to compensate the variability of renewable energy generation so as to stay within the limits of inter-state drawal deviations set out by CERC. He stated that CERC has notified the compensation procedure for the generating sources and from 15th May, 2017 the minimum technical loading limit in respect of coal fired thermal generating units is 55%.

The Chair then requested **CE(RES), CEA and Member Secretary of the Committee** to conduct the proceedings.

CE(RES), CEA requested **TANTRANSCO** to make their presentation. They made their presentation, giving the break up of installed capacity indicating, the quantum of renewable energy generation (RES) capacity in the total installed capacity in the State, the contribution of wind energy and solar energy generation for meeting the power requirement in the State. They also stated that the Plant Load Factor (PLF) of Thermal Power Stations (TPPs) has been falling since the last few years w.e.f. 2012-13, due to increased level of

intermittent type of generation from RES. They stated that during the high wind energy season they were resorting to sale of power outside the State. They stated that they had contacted National Institute of Wind energy (**NIWE**) to carry out the wind forecasting for them on pooling station basis, as well as the State as a whole, and they were also plotting the actual wind generation against the schedule and assessing the deviations of forecasted figures vis-a-vis the actual generation. They stated that banking of wind energy allowed by **TANTRANSCO** results in loss of revenue to them. The balance energy as on 31st March of each year after the banking transactions, is encashed @ 75% of the respective applicable wind energy tariff, or 75% of the pooled power purchase cost, as notified by **TNERC** under the Renewable Energy Certificate (REC) mechanism, as the case may be. They stated that **TANTRANSCO** has developed 400 kV transmission corridors for accommodating wind energy including the system for inter-State transfer of power. They have one pump storage plant (PSP) for taking care of wind variability, but three more pump storage projects amounting to 3000 MW, are in the pipeline and are expected to come up by the year 2020-21 or beyond. They stated that in some cases intra-State generators are asked to back down to technical minimum level. Also short-term open access contracts are not allowed to be revised earlier than three days. They suggested that storage technology could be for storing renewable energy, but has to be cost-effective. Further, reliability of forecasting would help in scheduling of renewable energy accurately. They stated that they should be compensated for low PLF operation of thermal units, expenditure on increased transmission corridors etc. They stated that whenever they have excess generation from wind power they provide 24 hours power supply to agricultural consumers. They further stated that the introduction of Time of Use (ToU) tariff would help in the matter of demand response.

Director (Operations) from **TANTRANSCO** stated that wind and solar power generation enjoys a must run status, so for accommodating these conditions, introduction of time of use tariff would be of great advantage. Incentive needs to be offered to the consumers for utilizing the electricity when high amount of generation is available from the Renewable Sources. Presentation is at **Annex-A**.

CE(RES), CEA, then invited **Telangana** to give their presentation. They stated that in their State impressive capacity increase of wind and solar generation in the last one year has taken place. Solar capacity increased from 599 MW as on April, 2016 to 1321 MW as on March, 2017, whereas wind electricity generation capacity increased from 77 MW to 100 MW. They gave district-wise break up of RES installed capacity. They stated that they were tackling the increased generation on account of solar during day time by giving agricultural supply during the day time. They also undertake forecasting exercise. They stated that the agriculture demand increased by 25% in a year. Agricultural sector demand depends on the monsoon. In case the rainfall during the monsoon is low, the demand of agricultural sector increase. They stated that they have a plan to set up two pump storage projects and also build storage capacity for hydro projects. The existing pump storage plants are very limited in operation and need augmentation. The wear Dam, in Srisailem Left Bank Power House, is under renovation whereas for Nagarjuna Sagar Power House, Tailpond works are in progress. Presentation is at **Annex-B**.

CE(RES), CEA then invited **KPTCL (Karnataka)** to give their presentation. They gave their presentation on break up of generation capacity, including the component of renewable energy projects. Out of total of 18,098 MW of total installed capacity, they have 6,972 MW of renewable capacity, mostly comprising wind power and solar-power. They stated that there are works in progress towards construction of transmission system under the Green Energy Corridor. They proposed to utilise the State's own hydro power stations viz: Sharavathy (1035 MW), Nagjhari (885 MW), Varahi (460 MW), Tail race and other projects (674 MW) for balancing needs. They stated that they have planned 2000 MW pumped storage plant in Sharavathy River Basin, which is expected to be completed in 2021-22. They stated that with the help of well-established Supervisory Control and Data Acquisition (SCADA) system in the State's grid, data flow from wind and solar plants to the State Load Dispatch Centre (SLDC) on Real Time Basis, is satisfactory. They stated that steps are being taken for providing schedules from pooling stations. Presentation is at **Annex-C**.

CE(RES), CEA then requested **Madhya Pradesh (MP) SLDC** to make their presentation. **SLDC, Jabalpur** gave a presentation on the rapid increase in the installed capacity of wind from 844 MW as on March, 2015 to 2,427 MW as on March, 2017 and increase in solar capacity from 421 MW as on March, 2015 to 835 MW as on March, 2017. They further stated that forecasting at pooling station level for wind and solar generation is being done. However, there is no Regulatory frame work for imbalance settlement of RE generators. They stated that they are regulating hydro and thermal generation for balancing of variability of wind and solar power injection. Their schemes of implementation of transmission system for evacuation of power from RE sources as well as Green Energy Corridor Scheme is in progress. They stated that the maximum generation from the Wind is during the night time. Presentation is at **Annex-D**.

CE (RES), CEA then requested **SRPC** to make their presentation. They gave their presentation of ramp rates of all the States individually and Southern Region as a whole and stated that ramp rates for the Southern Region as a whole was less than the sum of the ramp rates of the individual States. This indicates that the States can collaborate for balancing on regional basis. They also showed the anticipated generation of wind and solar energy for the year 2021-22 for individual States of the Southern Region as well as for Southern Region as a whole and also the ramp up/ramp down rates for the year 2021-22 for the States as well as the Region. They proposed that the costliest generators may be partially loaded whereas the cheaper generators may run on higher load. They stated that additional margins may be required in reserve generation in accordance with the deviation settlement mechanism (DSM). They also stated that the contingency market and trading mechanism can be used for selling and buying power across the States, depending on load generation balances. They stated that mechanism to deploy reserves including the demand side mechanism should be made by CERC/SERC. Presentation is at **Annex-E**.

The Chair suggested that storage /pondage type hydro stations need to be used optimally for balancing. In this respect pump storage hydro stations are ideal and need to be established. Where, felt appropriate, the energy storage

devices should be installed at pooling stations as a group of pooling stations, for optimum utilization.

PGCIL made a presentation on **Battery Energy Storage System (BESS)** which they are implementing in **Puducherry**. **PGCIL** indicated that in order to share the experience from different technologies they are experimenting with various battery technologies in their pilot installation using '**Advanced Lead Acid**', '**Lithium Ion**' and '**Flow**' batteries. Such large sized batteries could be charged during off peak hours. In the installation under consideration the batteries operate at 433 volts and the system is connected to a 22/0.433 kV, 2 MVA transformer being fed from 22 kV feeder. Presentation is at **Annex-E**.

The salient points mentioned in the **PGCIL** presentation are: that the battery technologies are available which can deliver the full power even in the milliseconds range; the batteries are modular in construction and have a high ramp rate for discharge which is controllable. The data in respect of charging rate, DC-DC round trip efficiency, service life, life cycle was also provided for the three technologies.

Orxa Grid made a presentation and highlighted that using the Internet of Things (IOT) they have developed devices which can be installed within 2 hours at a particular location and those would be ready for communication of data from individual RES generation point to the desired destination. The arrangement is cloud based and does not require Data Concentrator Unit (DCU) or services of leased line for data communication. The data from the individual generation point is transferred in real time mode using the GPRS system to the Load Dispatch Centre. GPS time stamping and Geo location tagging with in-built memory for data loss prevention are some of the features of the solution developed by them. Features of data security are also there. Data base provides the flexibility for different queries. There is a secured login, with two step certification of customer accounts and Cloud Enabled Access feature of data provides the flexibility of viewing the data from anywhere.

NHPC made a query that if they focus on the development of pumped storage hydro-electric projects (PSPs), then would they be getting certain concessions? They also mentioned that the establishment of hydro generating sources are limited on account of geographical considerations and gestation period is also high. They mentioned that in the state of **Karnataka** some pumped storage projects could be constructed by developing the secondary reservoir for the purpose.

TANTRANSCO was requested to propose optimum location of placement of MW scale battery near to two adjacent pooling stations, with a view that it would relieve transmission congestion. The real time data of generation pattern in these two pooling stations may be made available to CEA, so as to decide the optimal sizing of battery. This information may be supplied within a week.

The Meeting with the vote of thanks to the chair.

Annex-I

Second meeting of Technical Committee constituted by CEA for study of optimal location of various types of balancing energy sources/energy storage devices to facilitate grid integration of Renewable Energy Source (RES) on 09/05/2017

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Chief Engineers of CEA, {IRP, SP&PA – I &II, HETD, TETD, GM, FM, F&CA}

Co- opted Members from Regional Power Committees and CERC

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