



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/Pig/RES-30/2017

Dated: 14-06-2017

विषय: नवीकरणीय ऊर्जा स्रोतों और संबंधित मुद्दों के ग्रिड में एकीकरण को सुविधाजनक बनाने के लिए विभिन्न प्रकार के ऊर्जा स्रोतों / ऊर्जा भंडारण उपकरणों के अनुकूलतम स्थापन के अध्ययन के लिए सीईए द्वारा गठित तकनीकी समिति की तीसरी बैठक का कार्यवृत्त .

Subject : Minutes of the Third Meeting of the 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 Sources and associated issues – reg.

महोदय/Sir,

Minutes of the Third Meeting of the Technical Committee on the subject held on 5th June, 2017 at Vadodara, under the Chairmanship of Member (Planning), CEA, are enclosed herewith for your kind information and further necessary action.

Copies of the presentations made during the meeting are being sent on emails only.

वदोदरा में 5 जून, 2017 को सदस्य (योजना), के. वि. प्रा. की अध्यक्षता में आयोजित उपरोक्त विषय पर तकनीकी समिति की तीसरी बैठक के मिनट (कार्यवृत्त) आपकी जानकारी और आगे की आवश्यक कार्रवाई हेतु संलग्न हैं।

बैठक के दौरान की गई प्रस्तुतियों की प्रतियां केवल ईमेल पर 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
Email: ceaopmwind@gmail.com

Phone : 011-26714324 /26732257 (M) - 9868202176

सेवा भवन, आर के पुरम, सेक्टर-1, नई दिल्ली-110066 फ़ैक्स: 011-26715402 ई मेल: ceaopmwind@gmail.com वेबसाइट: www.cea.nic.in
Sewa Bhawan, R.K.Puram-1, New Delhi-110066 Telefax: 011-26715402 Email: ceaopmwind@gmail.com Website: www.cea.nic.in

1. Sh. Hanumantharayappa, Chief Engineer, Elecyc, (Planning & Co- ordination), KPTCL
2. Sh. P. Suresh Babu, Chief Engineer, SLDC & Telecom, TSTRANSCO
3. Sh. B.B. Mehta, Chief Engineer, State Load Despatch Centre, Gujarat
4. Sh. A K V Bhaskar, SE, State Load Dispatch Centre, A.P. Transco
5. Sh. P.A.R. Bende, Chief Engineer, SLDC, MPPTCL
6. Sh. Manoj Kumar, General Manager (BD&JV), NHPC Ltd.
7. Sh. Atulya Kumar Naik, AGM (Power Systems), SECI
8. Dr. P.C. Maithani, Adviser and Sh. J. K. Jethani, Scientist-D, MNRE
9. Dr. Subir Sen, COO (CTU-Plg & SG), CTU/Powergrid
10. Sh G. Chakraborty, DGM, NLDC (POSOCO)
11. Sh. S.S. Mishra, AGM (PE-Solar), and Sh. A.K. Sinha, AGM (OS-SIIS), NTPC Limited
12. Chief Engineer (IRP), CEA
13. Chief Engineer (PSP&A-I), CEA
14. Chief Engineer (PSP&A-II), CEA
15. Chief Engineer (HE&TD), CEA
16. Chief Engineer (TE&TD), CEA
17. Chief Engineer (GM), CEA
18. Chief Engineer (FM), CEA
19. Chief Engineer (F&CA), CEA
20. Secretary, CERC, New Delhi.
21. Member-Secretary (NRPC, WRPC, SRPC, ERPC & NERPC)

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 Third Meeting of the Technical Committee held on 5th June, 2017 under the chairmanship of Member (Planning), CEA for study of optimal location of various types of balancing energy sources / energy storage devices to facilitate grid integration of Renewable Energy Sources and associated issues

The third 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 **5th June, 2017 (Monday) at Vadodara, Gujarat**. List of participants is at **Annexure-1**.

Shri B.B. Mehta, C.E. (SLDC, Gujarat) welcomed Member (Planning), CEA and all the participants. He stated that as per Government of Gujarat's policy to provide "Power for all", they are making all possible efforts to provide uninterrupted 24x7 power supply to the consumers in the state. For agricultural consumers, day and night roster is followed, and such consumers are supplied power for 8 hours in a day. To achieve this aim, 'the Feeder Segregation Scheme', i.e. the 11 kV feeders exclusively dedicated to supply the agricultural loads has been implemented in the state. He appreciated the support rendered by WRPC, Central Sector PSUs and the neighboring states which has helped them in maintaining a high standard of power supply in the state. SCADA system has been upgraded by SLDC. Further, installing and maintaining Data acquisition Communication System through RTU, lease line, radio link etc. is being carried out. A lot of data is received by them from the system and IIT Mumbai has also helped them in carrying out analysis of this data. He stated that inspite of these things being in place, there are still a lot of operational issues and challenges, especially in view of the increased RE penetration, on which deliberations will be held in this meeting.

Sh B B Chauhan (MD, GETCO) also welcomed the Chair and the participants. He highlighted the importance of the issues to be presented in the meeting.

Member (Planning), CEA and Chairman of the Committee was requested to address and guide the participants.

Shri Pankaj Batra, Member (Planning), CEA gave a brief background of the constitution of the Technical Committee and holding of the meetings on the subject in renewable rich states. He stated that the Committee has got an important role and it was timely on the part of Ministry of Power to suggest deliberations on this issue. In view of the large scale RE generation and its successful integration in to the grid, it is necessary to consider the potential of existing balancing sources viz. Pumped Storage Power Plants (PSPs), Hydro Power Plants with Pondage and Storage, Gas based Thermal Power Plants and Coal based Thermal Power Plants (TPPs) to some extent, considering that we already substantial stranded capacity of gas and coal based plants. The Committee also has to decide on optimal location of energy storage device like Mega Watt (MW) scale batteries on a pilot basis, for managing the fast ramping requirement in the grid in the scenario of variable nature of large scale renewable generation facilities. There are RE rich states as well states which are not so rich in terms of RE sources. However, since the Ministry of Power has prescribed uniform Renewable Purchase Obligations (RPO) for all states/entities, all need to

pool their efforts and resources for the balancing requirement in the grid. The cost of balancing should be socialized, since the rapid ramp up of the renewable generation to achieve the target of 1,75,000 MW is a national objective. Accordingly, the Technical Committee will look in to all possible options.

The Chair informed that the First meeting of the Technical Committee was held in New Delhi on 23-02-2017. Thereafter, Region wise meetings of the Committee are being held. Second meeting of the committee was held in Chennai on 9.5.2017 for Southern Region states. This is the third meeting of the Committee, especially focusing on the States of Western Region, and Gujarat has been considered to host this meeting, as it has the highest percentage of renewables, both Solar and Wind power in the Western Region, and Gujarat has also been leading the efforts of renewable integration. The fourth meeting of the Committee for Northern Region states is planned in mid-June (13-06-2017). This would be followed by a concluding meeting in Delhi, after which the Report would be submitted to the Ministry of Power. He stated that PGCIL, on Pilot basis, has set up utility/grid level battery storage system in Puducherry, where they are experimenting with '**Advanced Lead Acid**', '**Lithium Ion**' and '**Flow**' batteries. Such large sized batteries could be charged during 'off peak' hours and discharged at fast rate or at controlled rate when required. They can also be used for balancing the variability of renewable generation. Similarly, NETRA (NTPC) is having a pilot battery project using Sodium Sulphur (NaS) batteries at its R&D centre in Greater Noida. Referring to constraints on availability of gas supply for gas based power plants, he stated that a policy regarding supply of gas to the plants is being worked out, which will also help in the balancing need of the grid.

Shri A K Rajput, Member Secretary of the Committee and Chief Engineer (RES), CEA stated that we had been harnessing energy from conventional as well as renewable sources and managing the grid with adequate security and reliability. However, in view of the increasing injection of the Renewables in the grid, the challenges of operating and managing the grid will be more. There will be increased needs of visibility from RE generating sources and communication system for successful operation of the grid. He invited SLDC Gujarat for presentation on the subject.

CE (SLDC), Gujarat stated that out of the total energy supplied in Gujarat (104285 MUs) during 2016-17, the contribution from wind has been 7.40% and that from solar 1.67%. Hourly solar and wind generation pattern during typical days were presented. The data of maximum wind generation day (3517 MW, 72 MU) at 1 minute interval was also presented. In their presentation, they highlighted the break up of generating capacity in the state and also mentioned about the losses suffered by them due to variation of RE generation. On account of must run status of RE Sources, backing down of even cheaper conventional generation sources and reserve shut down are resorted to. The financial losses include losses on account of backing down of conventional generation and also due to Deviation Settlement Mechanism (DSM) because of over-drawl/under-drawl from the grid, beyond the prescribed limits of **± 250 MW**. In view of this, SLDC Gujarat suggested that the relaxation to this limit may be incorporated in the present IEGC. At present, battery storage option is considered to be costly, hence Gujarat is making use of the available gas/hydro stations for balancing purpose. Gujarat suggested that the neighboring states should provide support for balancing needs by offering the balancing capability of their Hydro

Plants. There are no regulations for the intra-state transactions for forecasting and scheduling of wind and solar generation. These need to be formulated. Operational challenges on account of variability and remote location of RE sources like over loading of transmission lines, over voltage, reactive power requirement, increased line losses and instability of the grid faced during system operation were also highlighted.

The pattern of solar generation is somewhat stable, but there is lot of variation in case of wind, for example, as on 14-01-2017, the wind generation changed from 2407 MW to 300 MW during a 9 hour time span. As the generation from the wind increases, quantum of under drawl increases and during the low wind scenario, frequent start-stop of wind turbines is experienced. Though the thermal capacity is the backbone for balancing the variable RE in Gujarat, old generating machines of TTPs are not flexible and below a certain, threshold oil support is required. They stated that they got the threshold limit of their generating units tested through CPRI, and it was found that they could reduce generation of their coal based units upto 70% without oil support. The old thermal power plants are not capable of meeting the minimum technical limits of 55% loading operation as given by the CERC for the inter-state plants. System operation cost is high during the wide variation of RE generation. Gujarat has very low amount of hydro capacity for balancing needs. Through the support from Power System Development Fund (PSDF), Gujarat has developed a forecasting mechanism, with the help of M/s REConnect Energy Solutions Pvt Ltd and accuracy level of day ahead forecast varies from 30-80%. **MD (GETCO)**, mentioned that in Germany forecasting accuracy is of the order of 5%, so a lot of things depend upon the weather forecasting. Data availability from RE generating pooling stations is almost 100%. The presentation made by Gujarat is at **Annex-A**.

CE (SLDC), Andhra Pradesh mentioned that the Western World depends on market forces also for balancing, whereas in India, we are dependent on regulating the generation and use of balancing sources. **CE (SLDC, Gujarat)** mentioned that already there is focus of the stakeholders on need of balancing sources, but appropriate Regulations are needed in this regard. He stated that the use of gas plants for balancing would be costly.

The Chair mentioned that through modification of tax structure on gas, and some sacrifices by all stakeholders, cost of gas could be reduced to some extent (Gas is outside GST regime). Inter- state cooperation could be increased for bi-lateral tie ups of balancing power. This had to be done through Regulations. At present, RLDCs are acting as per existing Regulations. If the Committee feels that review of Regulations is required, this could be recommended to CERC/SERC.

CE (SLDC), Gujarat further stated that seasonal efficiency constraints for thermal plants (summer) and for gas plants (winter) are there. Preferable location of balancing plants should be near wind or solar plants of installed capacity of 100 MW and above. System studies should be done to ensure grid security and matching transmission system development and augmentation needs to be taken up.

Gujarat also suggested energy banking arrangement between two or more states, since the variability of wind and solar energy production during different months in different states may be different. **SLDC Gujarat** suggested that CEA/MoP should provide cheaper gas fuel for

balancing, suggest mechanism Automatic Generation Control (AGC) and norms for flexible generation by thermal plants, where feasible.

SLDC Gujarat also suggested pump mode operation of hydro plants as a viable solution to RE variation. Inoperative pumped hydro plants need to be made operational. State owned Kadana Hydro Station already has facilities for pump mode operation; however, the issues of vibration in the plant need to be resolved (through OEM, BHEL). Sardar Sarovar Plant (SSP) of 6X200 MW has the provision of Pump mode operation, for which tail race reservoir work has been awarded. This need to be expedited. SSP units can ramp up from 80 MW to 200 MW in 2 minutes and it has been designed for 6 hours of generating mode and 8 hours of pump mode. In running the hydro Plants, irrigation requirements of the beneficiary entities also play a major role.

The Chair suggested that in case of new Pumped Storage Plants, variable speed turbines should be deployed, as they are more efficient and lead to finer frequency control

CE (SLDC), Maharashtra informed that Koyna Hydro Plant (2000 MW) has the capability of operating in condenser mode, but not in pump mode. Their Ghtaghar plant is operated in pump mode.

CE (SLDC), Gujarat stated that the **GETCO** control center is now equipped with wide Area Monitoring System (WAMS) and new SCADA systems through which SLDC is now handling data of 1750 special energy meters (SEMs). Variation of 1000-1200 MW generation in a day from renewable sources & 2000 MW variation in demand in a day is quite common. Such variation in the system is persistent and is handled by continuously analyzing weather related information, generation regulation etc, and such complexities are managed using advanced power system tools, planning the outages and studying real time data for entire grid.

CE (SLDC), Maharashtra (MAHATransco) in their presentation indicated a presence of many windy locations where solar projects can be integrated into existing wind power projects, Hybrid Projects will reduce infrastructure cost and increase its utilization. RE potential in the state is 114 GW (Solar + Wind + Bagasse). Maharashtra stated that they **have about 2600 MW Hydro capacity as balancing power. However, with large scale RE, the balancing need of the state shall be around 4500 MW.** Sources and locations for balancing capacity requirement need to be worked out. Solar based agriculture feeder is proposed to be implemented in the state, to reduce subsidy burden on state Discoms. Solar agricultural feeder based projects near existing sub-stations are being planned to reduce the infrastructure cost. Evacuation infrastructure for RE is in place and planned under STU plan. Steps have been taken to bring up the accuracy of forecasting by establishing REMC (Renewable Energy Management Centre).

The State of Maharashtra catered to the highest ever demand of 22571 MW without any constraints on 30-03-2017. Lowering the technical minimum limit of 55% in respect of TPPs will increase the cost of production and to mitigate this, the CAPEX needed for retrofitting needs to be compensated. Ancillary services and other balancing power requirements need to be addressed through Regulatory intervention. Demand side management to minimize

impact of RE variability is necessary. They stated that wind power injection is maximum during monsoon season from June to September – However, its contribution to under drawl and backing down cannot be established or quantified as it is not separately accounted for. Maharashtra suggested that there is a need to strengthen the existing SLDC in respect of Information Technology, Manpower and Cyber Security alongwith establishment of REMC. Maharashtra has opted for solar run irrigation pumps. Existing 60 RE injection STU pooling stations are covered in real time visibility, and out of these, 10 pooling stations are reporting data to SLDC, for the other, efforts are on. They suggested that the cost of balancing need not be borne by the RE rich states only. Ramping down/up capability of conventional Thermal plants needs to be enhanced by operation at lower technical minimum level. Demand side management of agricultural supply needs to be correlated with availability of solar power. More pumped storage capacity needs to be developed to the tune of 1500 MW. The presentation made by Maharashtra is at **Annex-B**.

SLDC MPPTCL, Jabalpur, in their presentation, highlighted that balancing potential is different from time to time in the system and it depends on - Conventional Plant Availability and technical capabilities (Plants on bar, Technical Minimum, start up and down time), Reservoir Level of Hydel Power Stations and dispatchability. Thermal Generation in large quantity and 3261 MW capacity of hydro for balancing of RE during real time operation is available. Gestation period of Solar plants is low (3-6 months) and that of transmission projects is high (18-30 months) so there is a need to develop matching transmission system simultaneously.

The problem faced by them due to RE is that large scale integration introduces new patterns of power flow during different times of the day which causes congestion in transmission system. Also RE developers are applying for connectivity without PPA (Power Purchase Agreement). Distribution Companies are allowing connectivity on 33 kV without assessing the transformation capacity of the substation which is causing overloading of Transformers. They stated that at present 5 Substations of MPPTCL i.e. Agar, Susner, Daloda, Delchi and Barod are facing overloading problem of transformer and resulting in frequent tripping of these transformers due to large scale of RE commissioned at these sub stations. Large number of RE projects coming up in same area may also cause congestion in communication path for real time data transmission

The difficulties being experienced by them were indicated as - RE Generators not submitting proper forecasting and not revising the forecast during real time of operation due to absence of state regulation on forecasting, Scheduling and Deviation settlement. They experience difficulty to manage DSM within limit of **± 250 MW** as per Hon'ble CERC, Deviation Settlement Mechanism (DSM) regulation. Surrendering of cheaper power from SSGS/Central Generating Stations during sudden increase in Wind Injection. Scheduling of costlier power during sudden withdrawal of wind generation. Generation to technical minimum, On bar / Off bar issue - inefficient / Uneconomical operation, increased capital and maintenance costs. Underutilization of EHV network during less RE Injection. High voltage scenario during less RE injection. Very high or low RE generation resulting in over / under loading in associated transmission elements.

SLDC Jabalpur stated that Renewable Energy Management Centre (REMC) is being established. 11 Wind Power Projects and 1 Solar Power Project have also submitted the LVRT capabilities status.

MP SLDC on the following issues concluded as:

- **State Regulatory Framework :-** MPERC has notified draft Regulation on “Forecasting, Scheduling and Deviation Settlement of Wind and Solar Generators in the State level”. The public hearing has already been completed and Regulations are yet to be notified by the MPERC.
- **Transmission system development:-** The Connectivity to the RE generators should be provided by STU and MP Discoms only after ascertaining loading of network involved for power evacuation of RE generation.
- **Telemetry :** - SLDC issues the injection code to RE generators only after compliance of regulatory requirement (Telemetry, Metering etc.). The RE Generators provides the telemetry facility at the time of commissioning of RE generators, however the communication channels are down due to improper maintenance by the RE generators. SLDC proposes to impose a penalty on RE generators, in case of outage of telemetry. At present telemetry/observability in respect of RE generators in Madhya Pradesh is 84% .

The presentation made by **Madhya Pradesh** is at **Annex-C**.

NHPC stated that there is a need for evolving a suitable policy for development of Pump storage plants for balancing purpose as a long term perspective. They viewed that there need to be buyers for costly power generated from PSP and there should be availability of cheap power for pumping operation. PSP should be treated as a grid element and must run status may be granted to such plants, when these are participating in balancing operation. NHPC is in touch with several states but issue of costly power comes in the way of development. Tariff policy should be such that the money saved on account of cheaper RE power could be pooled for development of Pump storage plants.

The Chair mentioned that Hydro Policy is being formulated to encourage setting up of Hydro Power Plants. Pumping can sometimes be done more than once a day, if it is planned that way. If there are two cycles of pump operation per day, the cost per unit of electricity generation will come down. Also, the long life of hydro power plant would result in a lower levelized tariff.

NTPC, in their presentation, highlighted the impact on system and plants due to variable RE generation. They mentioned that in last five years, conventional generation capacity was added rapidly, but the electricity demand did not rise in the same proportion, which caused lower PLF and lower peak to installed capacity ratio. Thus the existing plants are already running at low PLF and the same is expected to fall even more due to rapid addition of RE. In 2022 scenario, NTPC plants are expected to ramp down from 29 GW to 12 GW during the afternoon, when the solar generation increases, at a ramp down rate of 55 MW/minute and ramp up from 12 GW to 37 GW at a ramp up rate of 57 MW/minute, when the sun goes down.

NTPC stated that there is Cost of cycling to Generating Companies and proper mechanism to recover these costs is necessary to maintain the financial sustainability of the Generating Companies.

To get an impression of integrating costs, the German experience was taken as an example which included balancing costs, grid augmentation costs, etc. Initiatives for flexibilisation study have been taken by **NTPC** through a pilot study which includes demonstration of technical and economic feasibility, analysis of legal framework and conduction of training programmes and seminars.

NTPC stated that to overcome the various issues at system level transmission system improvement in interconnection of grids has to be done at the regional, national and international level to increase grid balancing capabilities, reliability and stability. Also grid technologies and protocols have to be upgraded. Time of Day metering would be a good way to promote consumption during high RE scenario. There is a need to incentivize storage like Pumped storage, Battery, Molten salt, etc. Balancing capacity charges for units earmarked for Flexibilisation need to be promoted.

NTPC stated that their 200 MW units are more flexible as compared to 500 MW units. Ramp rate of 1-2% per minute is attainable in 200 MW category whereas in 500 MW group it is 1-1.5%. In case of 660 MW units there are issues of ramping.

NTPC is also engaging an international consultant to study the cost and impact of cyclic loading. They stated that policy should be oriented towards minimising levelised system cost of electricity rather than looking at RE tariff in isolation, on thermal units. The presentation made by **NTPC** is at **Annex-D**.

WRPC made a presentation highlighting the following:

1. General Overview of RES in Western Region.
2. Grid Challenges on Integration of RES in WR
3. Telemetry Requirements/issues.
4. Low Voltage Ride Through (LVRT) requirement and issues.
5. Forecasting of Wind RES in Western Region.

Installed Capacity of RES in WR is - Wind: 11523 MW and Solar: 2287 MW, Visibility/Observability of RES at WRLDC is 60%. WRPC is monitoring the Compliance of CEA's Standards with respect to Low Voltage Ride Through (LVRT) capability. WRPC also spoke about the operationalisation of pump mode operation of Sardar Sarovar Project and need of a regional cooperative approach for balancing need of the grid. The presentation made by **WRPC** is at **Annex-E**.

NLDC, POSOCO gave a presentation on the variation of renewable generation with demand in various seasons and also the variation of renewable generation with demand on month to month basis. During the month of April-June & July-September in Western Region (WR), the renewable (Wind+Solar) generation supports the WR demand for whole day except evening

ramp-up period. RES generation helps in morning ramp up and reaches at its peak when demand is high. It is also supporting the ramp down in the system.

During October-December and January-March the renewable generation supports ramp up during high demand period but it opposes the ramp down in demand in the evening. Wind generation starts reducing after rainy season and it reaches at its minimum during Oct-Dec. During this period, solar picks up and achieves its peak during March month. The peak reflected in RES gen curves is basically the solar peak around 12-13 hrs because the wind generation during this time remains lean. It reaches at its minimum value at 18-19 hrs. when solar becomes zero.

They further stated that the dispatch decisions are taken based on the real time data. Various steps are required to be taken to improve the visibility of data telemetry of renewable generation at SLDC/RLDC level so that the dispatch decisions can be taken easily. Also the forecasting for wind and solar generation at pooling station level is to be increased and there should be Regulatory frame work for imbalance settlement of RE generators in the states as mentioned in the SAMAST report of CERC.

So far as the balancing is concerned, **POSOCO** representative stated that pumped storage hydro stations need to be used optimally. As an alternative, the energy storage devices could also be installed.

Ancillary services have provided a good tool for ramp management. With increasing penetration of renewables, ramping would be a critical requirement, especially during peak hours and hence, higher ramp rates may be required to be provided by the generators. The ramp rates during peak hours have been observed to touch 500-600 MW/minute for about 40-45 minutes. Earlier, the ramp management was being done by moderating the schedule of some generating stations especially hydro stations by the concerned States. Implementation of ancillary services has provided an additional tool for ramp management during peak hours. The role of ramp management would become more important with the large scale integration of renewables in near future.

The presentation made by **NLDC** is at **Annex-F**.

The Meeting with the vote of thanks to the chair.

Annex-I

List of Participants- Third Meeting of the Technical Committee held on 5th June, 2017 under the chairmanship of Member (Planning), 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

Sr. No	Participants Name	Designation	Organisation	Contact No	E-Mail Id
1	Shri Pankaj Batra	Member (Plg), CEA	CEA	9350981062	pan-batra@hotmail.com ,
2	Shri B.B. Chauhan	MD, GETCO	GETCO	9925208081	md.getco@gebmil.com ,
3	Shri A. Balan	Member, Secretary	WRPC	9483540528	ms-wrpc@nic.in ,
4	Shri.B.B. Mehta	CE,SLDC	GETCO	9879200736	bbm@gebmil.com ,
5	Shri Ashok Kumar Rajput	CE,CEA	CEA	9868202176	rajput.ashok@gmail.com ,
6	Shri J.K.Rathod	SE,WRPC,Mumbai	WRPC	9987910799	jkrathod77@yahoo.com ,
7	Sh. L.K.S.Rathod	AS WRPC	WRPC	9833371844	lksr_ies@nic.in ,
8	Sh.R.C.Sharma	EE,Sub-LDC,	MPPTCL	9425804970	eesubhldcind@gmail.com ,
9	Shankar Chakraborty	EE MPPTCL	MPPTCL	9425805249	s.chakraborty.jbp@gmail.com ,
10	Sh. Roop Singh	AEN (REMC)	RRVPL	9414014364	se.remc@rvpo.co.in ,
11	Sh. Sandeep Malik	DD,CEA	CEA	9868888834	malik_pec@rediffmail.com ,
12	Kanti Bhuva	Dy Director	GERC	9925212841	kanti.bhuva@gmail.com
13	Sh. Praevlla Varhade	Director	MERC	9920043884	psvarhade@gmail.com ,
14	Sh. Sanjay S. Kulkarni	CE (SLDC) Maharashtra	MSETCL	9819363329	drsanhaykulkarni@gmail.com , /cesladc@mahasldc.in ,
15	Sh.C.P.Jain	Director,CEA	CEA	9871305009	cpj60@rediffmail.com ,
16	Sh. N Bhaskar	CE/SLDC/Telangana	TSTRANSCO	9440811105	cesldctelangana@gmail.com ,
17	Sh. Shilpa Agarmal	Jt.Chief (Engineer)	CERC	9650972680	shilpadce@yahoo.com ,
18	Sh. Vikram Singh	Director ,GM Div	CEA	9868893051	vikramsinghfms@gmail.com ,
19	Sh. Manoj Kumar	GM (RE&C)	NHPC Ltd.	7579455850	mangnhpc59@gmail.com ,
20	Sh. U.K.Nand	CE(E) DEM,	NHPC Ltd.	9810603804	uknand@gmail.com ,
21	G. Chakraborty	Dy.GM,NLDC	POSO	9433041815	gchakraborty@posoco.in ,
22	Sh. A.K.Sinha	AGM,NTPC Ltd	NTPC Ltd.	9650992971	anjansinha01@ntpc.co.in ,
23	Sh. AKV Bhaskar	SE/SLDC/AP	AP Transco	9490153116	akvbhaskar@gmail.in ,
24	Sh. Rajesh Kumar	Asst.G.M	Power Grid	9811397471	rajeshkumar@powergridindia.com ,
25	Sh. B.M Shah	D.E	GETCO	9925212836	bms_0072@yahoo.co.in ,

List of Addresses - Members of the Technical Committee and other concerned

Sl. No.	State/Utility	Name of the Nominated Officer	Designation, Address & Contact details	Mobile No.
1.	Karnataka	Sh. Hanumantharayappa	Chief Engineer, Elec, (Planning & Co- ordination),Karnataka Power Transmission Corporation Ltd. (KPTCL), Room No.209, 2 nd Floor, Kaveri Bhavan, Bengaluru-560009. Email: ceepnc@gmail.com , Fax.No.080-22292204. Ph.: 080-22210416	9448363092
2.	Telangana	Sh. P. Suresh Babu	Chief Engineer, SLDC & Telecom, Room No:611, A Block , TSTRANSCO, Vidyut Soudha, Khairatabad, Hyderabad- 500 082. Email : cesldctelangana@gmail.com , Ph. : 040-23317645	9440679432
3.	Gujarat	Sh. B.B. Mehta	Chief Engineer ,State Load Despatch Centre, Gujarat Energy Transmission Corporation Limited, 132 kV Gotri Sub Station Compound, Near T.B. Hospital, Gotri Road, Vadodara – 390 021 Email : celd@gebmail.com , Tel.No.0265-2353171	9879200736
4.	Andhra Pradesh	Sh. A K V Bhaskar.	SE, State Load Dispatch Centre, A. P. TRANSCO, Hyderabad Email: akvbhaskar@gmail.com , Ph:040-66175195 Fax: 040-66175194	9490153116
5.	Madhya Pradesh	Sh. P.A. R. Bende	CHIEF ENGINEER (LD) STATE LOAD DESPATCH CENTRE, OFFICE OF MPPTCL, NAYAGAON, RAMPUR, JABALPUR – 482 008 (M.P.) (0761)2970089 Fax: (0761) 2664343/2970119 sldcmpjbp@gmail.com , parbende@gmail.com ,	9425805264
6.	Rajasthan	Sh. A.K. Sharma	Addl. Chief Engineer (LD), Rajasthan Rajya Vidyut Prasaran Nigam Ltd., Heerapura GSS, Ajmer Road, Jaipur Email: ce.ld@rvpn.co.in , aks40aks@gmail.com , Tel. No. 0141-2251601	9414061519
7.	Maharashtra	Dr. S.S. Kulkarni	Chief Engineer (SLDC), Maharashtra State Electricity Transmission Co. Ltd., Mumbai Email: cesldc@mahasldc.in , Tel. No. 022-27601931	9819363329
8.	Tamil Nadu	Er. A. Axilium Jayamary,	Director /Operation,	044-28521088

			TANTRANSCO directoropn@tnebnnet.org ,	
		Sh. P.R. Muralidharan	Superintending Engineer, Renewable Energy Management Centre, SLDC, Chennai-260002 Email: seremc@tnebnnet.org ,	9445377059
		Sh. P. Rajagunanidhi	P.RAJAGUNANIDHI,, Executive Engineer, Grid, SLDC, TANTRANSCO,CHENNAI. eegrid@tnebnnet.org , rajagunanidhi@yahoo.co.in , Chennai-260002	9445857186, 04428586433
		Ms. S. Gomathi	Executive Engineer, Renewable Energy Management Centre, SLDC, Chennai Email: aeeremc@tnebnnet.org ,	9444203708
9.	NHPC	Sh. Manoj Kumar	General Manager (BD&JV), NHPC Ltd., NHPC Office Complex, Sector-33, Faridabad-121003. Email : mkumar@nhpc.nic.in , Ph. : 0129-2278430	7579455850
10.	SECI	Sh. Atulya Kumar Naik	AGM(Power Systems) Email: aknaik@seci.co.in , Fax No.011-71989235 Ph.No. 011-71989214	9717954896
11.	MNRE	Dr P C Maithani, Adviser & Sh. J.K. Jethani, Scientist-D	Ministry of New and Renewable Energy, 14 th Block, CGO Complex, Lodhi Road, New Delhi-110001 pcmaithani@nic.in , jethani.jk@nic.in , Tel./Fax. 011-24368911	9891184867
12.	Power Grid/CTU	Dr. Subir Sen,	COO (CTU-Plg & SG) Power Grid Corporation of India Limited (PGCIL) Saudamini, Plot No.2, Sector 29, Near IFFCO Chowk, Gurgaon (Haryana) - 122001, INDIA Fax 0124-2571990 Tel: 0124-2571700-719 / 011-26560072 subir@powergridindia.com ,	9650293185
13.	POSOCO	Sh. G Chakraborty	DGM, National Load Despatch Centre (NLDC), B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi-110016 gchakraborty@posoco.in , c.goutam62@gmail.com ,	9433041815
14.	NTPC	Sh. S.S. Mishra	AGM (PE-Solar), NTPC Limited, EOC, Sector-24, Noida ssmishra@ntpc.co.in ,	9650991145
		Sh. A.K. Sinha	AGM (OS-SIIS), NTPC Limited, Core-7, Scope Complex, Lodhi Road, New Delhi	9650992971

			anjansinha01@ntpc.co.in	
--	--	--	--	--

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

Co- opted Members from Regional Power Committees and CERC

<p>Representative from CERC C/o Secretary, CERC Central Electricity Regulatory Commission (CERC), Chanderlok Bldg., 3rd & 4th Floors, West Wing, 36, Janpath, New Delhi – 110 001 (Phone: 011-23753915) Fax No.011-23753923 secy@cercind.gov.in, cerc.ra@gmail.com,</p>	<p>Sh S R Bhatt Member Secretary Southern Regional Power Committee, No. 29 Race Course Cross Road Bangalore-560 009 Tel: 080-22269012 Mob.: 09620184649 Fax : 080-22259343/ 22352616 mssrpc@yahoo.com,</p>
<p>Sh M A K P Singh Member Secretary Northern Regional Power Committee 18-A, Qutab Institutional Area, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110 016 Tel: 011-26511211 Mob.: 9968667741 PABX No. 26967842/26868681 Fax : 011-26865206 PABX No. 26967842/26868681 #101 Fax : 011-26865206 msnrpc1@yahoo.com, ms-nrpc@nic.in,</p>	<p>Sh P K Mishra Member Secretary North Eastern Regional Power Committee NERPC complex Dong Parmaw, Lapalang Shilling-793006 Meghalaya Ph: 0364-2534039 Fax:0364-2534040 Mob:9436163419 email: nerpc@ymail.com, b_lyngkhai@yahoo.com,</p>
<p>Sh A Balan Member Secretary Western Regional Power Committee, F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai - 400 093 Mob.: 9483540528 Tel: 022-28221636 Epabx: 022-28200194-95-96#210 Fax:022-2837 0193 ms-wrpc@nic.in, ma_balan@hotmail.com,</p>	<p>Shri A.K. Bandopadhyay Member Secretary EASTERN REGIONAL POWER COMMITTEE 14, Golf Club Road, Kolkata -700 033 Tel: 033-24235016 (direct) Mob.: 9433068533 Fax: 033 24221802, 24171358 mserpc-power@nic.in,</p>

Addresses of SERCs/JERC

<p>Joint Chief (Regulatory Affairs), Forum of Regulators (FOR) C/O Central Electricity Regulatory Commission (CERC) 4th Floor, Chanderlok Building 36, Janpath, New Delhi 110 001 Tel: 91-11-23353503 Fax: 91-11-23753923 , dcra@cercind.gov.in,</p>	<p>Secretary, Gujarat Electricity Regulatory Commission, 6th Floor, GIFT ONE Road 5 C, Zone 5, GIFT City, Gandhinagar – 382355 (Phone: 079 23602000, /9909943568 Fax No.079-23602054/23602055 gerc@gercin.org, chairman@gercin.org,</p>
<p>Secretary, Madhya Pradesh Electricity Regulatory Commission 4th & 5th Floors, Metro Plaza, E-5, Arera Colony, Bittan Market, Bhopal 462 016 Ph: 0755-2464643/9425005834/2430158(fax) Secretary.mperc@gmail.com,</p>	<p>Secretary, Maharashtra Electricity Regulatory Commission 13th Floor, World Trade Centre No. 1 Cuffe Parade Colaba, Mumbai 400 005 Ph:.022-22163975 / 22163976 (Fax) secretary@mercindia.org.in,</p>