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Proceedings

Northern Regional Capacity Building Workshop

for

State Stakeholders

on

Resilient, Inclusive, & Environmentally Sustainable Power Sector

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Organised by

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(Including Laws, Rules, Guidelines, Regulations related thereto)

Prepared by

Integrated Research & Action for Development

Acknowledgement

We extend our heartfelt gratitude to all who contributed to the success of the two-day **Capacity Building Workshop for the Northern Region Stakeholders on "Resilient, Inclusive, and Environmentally Sustainable Power Sector"** Your dedication and efforts have been pivotal in making this Workshop a remarkable achievement.

We are deeply appreciative of our esteemed Chair and Panelists, whose profound insights and deep understanding have significantly enriched our discussions. Their expertise has been instrumental in shaping the recommendations we present to policymakers and implementers, ensuring they are both practical and impactful.

Our special thanks go to **Shri Ashish Kumar Goel** (IAS), Chairman, UP Power Corporation Limited (UPPCL), **Shri Arvind Kumar,** Chairperson, UP Electricity Regulatory Commission (UPERC), and **Shri Ghanshyam Prasad**, Chairperson, Central Electricity Authority (CEA), for their unwavering support and encouragement. Their keen interest in the workshop has been crucial in refining our approach and advancing our collective objectives.

We also wish to express our sincere gratitude to **Prof. Jyoti Parikh,** Executive Director of IRADe, and **Prof. Kirit Parikh,** Chairman, IRADe, for their invaluable support and guidance throughout the project.

Pankaj Batra

Senior Advisor, IRADe

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Background

In the face of growing energy demands and the urgent need for sustainable development, the role of State stakeholders in the power sector has never been more critical. Most of the laws, policies, and regulations governing the power sector are formulated by the Central Government in consultation with the State Governments, while implementation is primarily conducted at the State level. With new recruitments in the States, the legacy does not necessarily get passed on to the new recruits. Therefore, it is crucial that the principles of the laws, policies, and regulations are informed to these new recruits as well as refreshed for the incumbent State stakeholders. In this direction, IRADe in collaboration with Central Electricity Authority (CEA), Ministry of Power, Government of India, has taken the initiative to organise a series of capacity-building workshops with the following objectives:

- Enhance knowledge and understanding of the State stakeholders regarding national laws, policies, and regulations governing the power sector.
- Deepen expertise in the technical, financial, legal, and regulatory aspects of power sector regulation.
- Equip State stakeholders with skills to analyse and address emerging trends and challenges in the sector.
- Foster best practices in stakeholder engagement and public consultation processes.
- Facilitate networking and knowledge exchange among the Central Electricity Regulatory Commission/ Central Electricity Authority, State, and other power sector stakeholders.

The Workshop on Resilient, Inclusive, and Environmentally Sustainable Power Sector (Including Laws, Rules, Guidelines, Regulations related thereto) was co-organised by IRADe and the Central Electricity Authority, with the intention that most of the Laws, policies, regulations, Guidelines, and Rules are made by the Central Government or the Central Electricity Regulatory Commission, but are to be implemented mainly by the States. Therefore, for the State stakeholders to use these efficiently, they may need to understand the nuances of these documents. The programme of Capacity Building would be through regional 2-day Workshops on important Rules and Regulations. The first of these Workshops was organised for the Northern Region State stakeholders on July 2nd - 3rd, 2024 in Lucknow, Uttar Pradesh. Over 60 representatives from most of the States of the Northern Region, including, the Ministry, Regulators and Renewable Development agencies participated in the Workshop. The list of participants is given in Annexure I. The agenda for the same is attached in Annexure II. The speakers were from the Central Electricity Authority, the Central Electricity Regulatory Commission, the Grid Controller of India, and Indian Energy Exchange.

The Sessions were preceded by the Inaugural Session, with the senior most officers of Uttar Pradesh Electricity Regulatory Commission (UPERC), Uttar Pradesh Power Company Ltd. (UPPCL), and the Central Electricity Authority (CEA) participated.

The Inaugural Session started with the Welcome Address by **Prof. Jyoti Parikh,** Executive Director, IRADe, followed by a Setting the Context Presentation by **Shri Pankaj Batra**, Senior Advisor, IRADe. This was followed by Introductory Remarks by **Prof. Kirit Parikh**, Chairman, IRADe, the Chairperson of Uttar Pradesh Electricity Regulatory Commission (UPERC), **Shri Arvind Kumar**, the Chairperson of Uttar Pradesh Power Company Ltd. (UPPCL), **Shri Ashish Kumar Goel**, and the Chairperson of the Central Electricity Authority (CEA), **Shri Ghanshyam Prasad**. The Principal Secretary, Energy, Govt. of Uttar Pradesh, **Shri Narendra Bhooshan**, could not attend due to a last moment meeting called by the Chief Minister.

The Inaugural Session concluded with a Vote of Thanks by Dr. Navpreet Saini, Senior Research Analyst.

This was followed by two roundtables of the utilities and regulators/renewable development agencies respectively on the training needs of the State stakeholders.

Then there were technical Sessions on various important topics/regulations, presented by officers of the Central Electricity Authority, the Central Electricity Regulatory Commission, Grid Controller of India and the Indian Energy Exchange.

Day-1, 2nd July 2024

1. Inaugural Session

Prof. Jyoti Parikh, Executive Director of IRADe

Prof. Jyoti Parikh welcomed the senior officers on the dais and all the participants. She stated that the collaborative effort between CEA and IRADe was a significant step towards a resilient, inclusive, and environmentally sustainable power sector. The Workshop was designed to equip stakeholders with the necessary knowledge and skills to meet the challenges of the evolving energy landscape. Moreover, it was expected to build a nationwide consensus with similar workshops in each region.

Mr. Pankaj Batra, Senior Advisor at IRADe and Ex-Chairperson of CEA

Mr. Pankaj Batra emphasised the importance of the initiative, stating that refreshing and deepening the expertise of state stakeholders in the technical, legal, and regulatory aspects of the power sector is crucial. These stakeholders play a pivotal role in navigating the complex landscape of energy governance and ensuring the sustainability of a progressive power sector.

Prof. Kirit Parikh, Chairman, IRADe,

Prof. Kirit Parikh in his introductory remarks, stated that empowering state stakeholders with the right knowledge and skills was essential for navigating the evolving landscape of energy governance. This capacity building programme was a crucial step towards achieving a resilient, inclusive, and sustainable power sector. Various types of energy storage solutions were required, to deal with intermittent energy like wind and solar power, such as pumped storage, off-river pumped storage, and battery storage, although the latter is currently expensive. However, what many state electricity boards, Power Sector, PSUs, and DISCOMs need to focus on was the operation of coal power plants at low load factors, which comes with significant, often unaccounted costs. It's not just about increased specific energy consumption, but also the reduced lifespan of the equipment. Therefore, it needed to be thought on how to operate the system without shutting down and ensure that coal-based power plants maintain a good plant load factor.

Simultaneously, challenges such as increasing temperatures and heatwaves are being faced, leading to a rise in power demand, as seen in Uttar Pradesh, where demand increased by almost 10% over the past year. As global warming intensifies, these issues will become more prevalent, further impacting load factors. Additionally, the spread of electric vehicles (EVs) and varying EV charging patterns will create new challenges for the power sector.

It was crucial that central regulatory bodies address these issues, synthesizing and projecting potential outcomes to provide guidance. However, they must also consider the unique challenges, limitations, and political agendas faced by each state. State governments, electricity boards, and other stakeholders operate within these constraints, so central regulations must be practical, feasible, and generally acceptable to all.

Capacity building was necessary, not just for state governments and offices, but also for central policymakers. This would help develop regulations that are more grounded and widely supported, ultimately solving these challenges and enabling us to move forward successfully.

Shri Arvind Kumar, Chairperson UPERC

Shri Arvind Kumar stated that the transition in rules and regulations and challenges are extremely dynamic in these days, therefore here is a need to address at the similar pace. The dynamic nature of changes makes it difficult for functionaries to adopt because many times the language is not clear; therefore, it is essential to have dialogue with those who actual frame policies. The present scenario is much different than the past scenarios. Earlier, it focused on accessibility, availability and affordability. Almost universal access to electricity is achieved, shortage is removed and universal grid is established. In electricity act, private players are playing crucial role in the electricity generation and transmission, but particular participation is focused in the renewable energy (RE) sector. The Govt. of India has established the goal to add 500 GW by 2030 and meet 50% of energy consumption through non- fossil energy only. To increase affordability RE is being promoted through various schemes, such as Suryaghar yojana and kusum yojana, among others. The Govt. is providing other subsidies also. RE is cheap but has issues of intermittency and inconsistency, for backup we need storage or thermal power. However, thermal has its own issues as ramp rate, and other technical issues.

The power sector scenario is different than the other states and three major challenges. First; there is a huge variation in the peak demand, from April to September, the demand goes from 1500 MW to 2400 MW and from October to march it range 1000 MW to 1900 MW during a day. Demand is less during day but higher at night when RE is not available. Therefore, they need more storage capacity or needs to depend on other states for exchange.

Second, Commercial and Industrial (CandI) consumption is low. Only 22% of UP's energy consumption is from CandI, out of which 15% is industrial and 7% is commercial. Domestic sector has 47%. The challenge is how to increase energy demand in CandI. The PM has set the goal of $5 trillion economy and UP is setting goal to become $1 trillion economy. For economic growth, we need to increase the energy consumption as there is direct relation between economic growth and energy consumption, but per capita electricity consumption is less than 50% of India's per capita electricity consumption.

Third, RPO targets; UP targeted 15% of total energy consumption from RE, however GoI targeted to achieve 30% by 2024-25 and 43% by 2030. To follow this trajectory, UP has to double its RE in one

year. With these states has signed long-term PPAs with thermal power plants which they cannot terminate. So, to follow GoI trajectory state have to increase the energy consumption.

Govt of UP has introduced many policies to increase power consumption. Recently, the state hosted Global Investment Summit, where they received proposal of worth Rs. 33 lac crores out of which 22% proposals were related to RE and other energy sector. Almost 8 project of 13000 MW has almost been signed and state will get benefitted particularly with pumped storage. With this we need to focus on demand side management, to shift the load curve and utilise RE.

Shri Ashish Kumar Goel, Chairperson, UPPCL

Shri Ashish Kumar Goel stated that electricity was crucial for economic growth, and that traditionally there was a direct relation between economic growth and power demand. India was at such a cusp of social mobility, economic mobility as well as climate change phenomena. These interrelations did not seem to work this year. As in April, due to severe heatwave average and peak demand was at least 60 to 65% higher than the last year for several days. In 2023, average demand was 15000 to 16000 MW but this year it was around 25000 MW. In June it touched the mark of 30700 MW. This scenario was much higher than the assumption of 7% annual growth rate of electricity demand. He said that they would have to relook at their Resource Adequacy. Along with this, RPO obligations to have 45% of the total demand was challenging. Earlier, UPERC had a rule of only 15% RE, in energy terms, and now the sudden introduction of 47% has put additional pressure on states. However, UP was on track as they have floated bids for solar (2000 MW), Hydro(4000MW) and pump storage (2000 MW).

The other major challenge was related to electrical equipment. The rating of electrical equipment needs to be revised because in severe heatwave and high temperatures old equipment was failing. New kind and class of electrical equipment is needed, that can be used in such scenarios. Also there should be a central depository of critical equipment along with bargaining power with DISCOMs, so that the procurement was made more economical.

He also informed that in UP, they have increased the warranty period of transformers from 5 years to 10 years and got sufficient bids for 5 MVA and 10 MVA transformers. For large orders of distribution equipment, in UP, they had increased the guarantee period from 5 years to 7 years. During severe heat wave, they would have to relook at the specifications of the electrical equipment. They had started a new company, i.e. UP Renewable and EV Infrastructure Ltd., for setting up EV charging infrastructure. One of the major points that needed attention was the sustainability of the DISCOMs.

Shri Ghanshyam Prasad, Chairperson, CEA

Shri Ghanshyam Prasad stated that the agenda of the Workshop was designed to understand the objective and idea behind every policy, regulations, and law. They had invited people from CEA, CERC, GRID controller of India and IEX. These people were directly dealing with the subject.

As there was a continuous change in the rules and regulations regarding utilities (almost in every 2-3 months) from the last 2 to 3 years, it had been difficult, but not impossible to absorb the same, if the perspective and objective behind it, has been conveyed rightly. For example, the LPSC 2022 for Late Payment Surcharge, was introduced, after seeing that DISCOMs were moving to a zone of high outstanding dues, leading to an unviable power sector, the power sector dues almost gone up to 1lac 35 thousand crores and it was increasing exponentially every month and there was no option other than to take these measures which address these types of issues where power sector was becoming unviable. With these rules, distribution companies faced issues as they were not able to pay and generation companies faced issues because they were not able to buy fuel to supply electricity and transmission was not getting paid. The entire value chain was getting affected and these Rules were opposed by DISCOMs as they needed to pay immediately. However, assistance has been provided to all, with clearance of current dues and liquidation of past payments and some incentives were also given i.e. no late surcharge was imposed. It was utilized quite well by Tamil Nadu, Uttar Pradesh, Rajasthan, and other states with huge amount dues. The net result is that the dues, that were on an increasing path, have reduced considerably to 30-35 thousand crores only, and current dues were being paid on time. There were still some issues with GENCOs, which haven't been addressed in the rule.

To understand the objective and cause behind the rules and laws, these types of Workshops were important, so that the state stakeholders and policy makers were brought together and this would lead to better implementation. The other rule was related to Consumer rights. So far, the Electricity Act did not have any provision of consumer rights. The idea behind that was to have responsible DISCOMs, who need to care for the consumers. The whole structure of the Workshop includes almost all topics i.e. resource adequacy, load forecasting, optimum generation and transmission etc. We need resource adequacy under transmission also. There were no guidelines as of now, but an exercise was being done in three states and their experiences would be formulated into Guidelines. Adequacy was needed from generation, transmission, and distribution, for the seamless flow of electricity from resource to the consumers, and to ensure reliability.

Apart from this, the grid was facing other challenges such as RE integration. This year, there have been around 47 incidences of grid tripping, mostly in Rajasthan and adjoining areas, and due to this tripping, have affected more than 1000 MW at a single point of time, going up as 3500 MW. In this regard, there are CEA regulations, which have to be implemented, particularly with respect to dynamic compensation and harmonics. Grid India gives FTCA only to those who comply with the dynamic compensation and harmonic filter mechanism. States will be facing more challenges, particularly with respect to RE. If SLDCs, DISCOMs and transmission companies were not careful enough, they would face similar challenges which Rajasthan has faced. He also added that the state and utilities should take advantage of the optimization of resources, as particularly GENCOs have adequate resources but were not been able to utilize it and sell it in the market. There is a provision made in Rules where the GENCOs with surplus power can sell power in the market and get rid of fixed price mechanism.

There seems to be some gap in the implementation of the Rules and Regulations that were being framed, and these Workshops would be helpful to reduce that gap.

2. Presentation on Outline of Laws, Rules, Guidelines, Regulations of the Government of India/CERC

The Main Session started with an outline of Workshop on Laws, Rules, Guidelines, Regulations of the Government of India/CERC by Mr. Pankaj Batra, Senior Advisor IRADe. He mentioned that the Sessions would start with two Roundtables of Utilities and Renewable Development Agencies of the Northern Region States and of the Regulators of Northern Region.

This would be followed by enlightening Sessions on various important topics, where the organizations which make these Regulations, Guidelines, etc. would present on the salient points of the documents. The useful thing in a physical Workshop is that there can be healthy discussions on the documents through Questions and Answers, in order to get clarity on certain clauses, and even during informal discussions during lunch time.

Resource Adequacy is important to ensure that there are adequate power generation and transmission resources available, so as to be able to meet the electricity demand of all the consumers. This Session would be taken by the Planning Wing of CEA.

For stable grid operation, generation and load have to be balanced at each point of time because otherwise it causes frequency fluctuations. The system operators would know about that. They also have to keep a watch on grid voltage fluctuations, line overloading and angular stability problems which can affect the grid adversely. In fact, it can take down a grid in a matter of milliseconds if you do not plan in advance. So there would be a session on that and that would be taken by the Grid Controller of India. This would be specially so with increasing amount of variable renewable generation like wind and solar power. Another Session would be to talk about long duration storage, since the sun is present only for about 10 hours in a day, and also a Session would be on flexibilizing coal-based power plants to tackle the intermittency, although these plants were initially meant for base load operation.

The second day of the Workshop would commence with the relatively new Grid Code, 2023, which was made effective from the 1st October, 2023. The new Grid Code includes new Chapters on Resource Planning, Protection Code, Commissioning and Commercial Operation Code, Cyber Security Code. Another presentation on Grid Operation would focus on transmission congestion, the concept of Total Transfer Capability and Available Transfer Capability, as well as angular stability.

The next Session would be on the Connectivity Regulations and General Network Access by CERC, the latter being a new concept. This would be followed by a presentation on the Power Exchange by IEX, the dominant power exchange in India, where IEX would be presenting on the various products in the power exchange, the bid matching mechanism, the risk management, etc. Finally, there would

be presentations on the safety aspects of electric supply, an important but sometimes neglected aspect and the recent Communication Regulations, both by CEA.

3. Session 2: Round Table- Utilities and State Renewable Development Agencies

Mr. Pankaj Batra, Senior Advisor at IRADe and Ex-Chairperson of CEA moderated the sessions.

Mr. D.K. Sharma, Chief Engineer, UPRUVNL

Mr. D.K. Sharma stated that presently, UP renewables were facing a lot of challenges regarding flexibilization of units. Most thermal units were not geared for flexibilization. Almost 660 megawatt units were designed for this operation. At the Harduaganj coal-based power plant, they were testing ramp down rate for 660 MW units @3% per minute, which is from 100 to 70% of load But they could not achieve it. They could merely achieve 2.85%. The key challenge is thermal stress due to rapid load changes. The major reason for this is that there is no automation system. RE expansion would cause a huge challenge, because earlier power generation units used to work in the traditional way to meet the energy demand, but introduction of RE would cause fluctuations in the system and they would need to ramp up and ramp down generation accordingly. This causes issues at the operational level for boilers. However, guidelines were there but state systems are not fully prepared yet.

Mr. M.P Singh, Director, Punjab Electricity Development Agency

M.P Singh highlighted that the installed capacity was around 6636 MW, out of which 6140 MW was grid connected, including solar, non-solar, and large hydro in Punjab. Currently, Punjab was meeting their Renewable Purchase Obligations and have about 6000 MW of additional renewable energy projects in various stages. He said that there was a lot of focus on solar and wind power, but focus was needed on biomass and biogas, as the country was blessed with significant potential. One study by MNRE suggested that 9 states has around 15 to 16 thousand MW potential, out of which they have exploited only around 10%. Punjab has 120 MW of IPP-biomass power plants and there was no issue of intermittency. PEDA had floated bids for another 100 to 250 MW biomass-based power plants sited near 66 kv substations.

A lot work was being done in PM Kusum yojana, as the need of the hour was distributed energy, rather than centralised energy, and it could also be a blessing to minimise distribution losses. In Punjab, due to land constraint, they had focused on Solar Rooftops, canal top solar and agri-solar etc. There was

a need to train people about these new areas, particularly agri-solar. Punjab does not have any industry. The state is primarily based on agriculture; therefore, demand was very high in the paddy season and very low in winters. Other than this, quality of solar cells needs to be improved, as it is expected life was 25 years, but it had completed only 7 to 8 years. So, the quality was yet to be ascertained.

Price of large scale solar has dropped significantly, but for small projects from 1 to 2 MW, prices had not dropped as much. There was need to have tariff structure for low scale and high scale projects. Also, training was required in techno-commercials, to understand the regulatory regime, tariff calculations as per CERC norms and project specific tariff mechanism.

Mr. Deepak Raizada, Chief Engineer, UPPCL

Mr. Deepak Raizada, stated that the tasks of utilities have escalated and all the tasks were being done in a different manner. Major training was required at forecasting demand. Decision making model of DISCOMs was going to be very different to the traditional models for utilities. There was need to develop new forecasting methodologies to address these issues. Apart from this, CEA has given resource adequacy plan to states with all necessary elements and choice of resources between solar, wind, pump storage etc. Importance had to be given towards careful decision-making in adding new energy capacity over the next seven years. The resource adequacy plan suggests adding 20,000 megawatts, and the choice of energy sources (such as solar, wind, hybrid systems, pump storage, or battery storage) must be carefully considered. The decision would have long-term implications, potentially locking in a specific energy source for 12-25 years. Therefore, selecting the right mix of energy sources was crucial to ensure flexibility and cost-effectiveness in meeting future energy demands.

States were expected to move away from fossil fuels, but with economic development, it would be a difficult task, because under resource adequacy report, UP would have to add around 1000MW of fossil fuels. The other major issue was related to EV infrastructure. According to CEA, by 2030 around 30% of the vehicles would be EVs and by 2042, 100% vehicles would be electric. For this purpose, state utilities would need to have robust EV charging infrastructure. UPPCL had created a 100% subsidiary company UP Renewables and EV infrastructure ltd. With increase in EVs, forecasting of demand was going to be different, therefore demand forecasting model would need to be improved and, in this regard, utilities needed to be trained and empowered. In recent years, rules and regulations of CERC and MoP have been constantly changing. For better interpretation and implementation, Workshops like this should be organised more frequently.

Mr. Amrendra Kumar, Superintending Engineer, UPPTCL

Mr. Amrendra Kumar stated that the challenge of transmitting a large amount of power from generation sites to the load centers, particularly with the constraints of the transmission corridor capacity, needed to be tackled. To alleviate this issue, it was suggested that renewable energy generation facilities, such as solar, wind, or other suitable types, should be distributed across various locations. This decentralised approach would reduce the burden on the transmission system and ensure a more balanced distribution of power generation and consumption. The main point was to strategically place RE sources in a way to optimise the transmission infrastructure and enhance system reliability.

Er. Dipanjit Singh, ASE/RPO, Punjab State Power Corporation Ltd. (PSPCL)

Er. Dipanjit Singh stated that Punjab has already commissioned a capacity of 6,200 megawatts (MW) of renewable energy and has recently tied up a new project of 2,000 MW in solar energy. Additionally, Punjab has commissioned 825 MW of non-solar energy and 3,200 MW of hydropower projects.

Their ongoing projects include a new 500 MW KUSUM scheme and 3,000 MW Round-The-Clock (RTC) renewable energy initiative. Punjab has also recently tied up Power Purchase Agreements (PPAs) for 2,300 MW of solar energy, 40 MW of non-solar energy, and 431 MW of hydropower projects. These efforts highlight their commitment to renewable energy development.

He also reported that Punjab achieved RPO targets of 29% for the 2023-24 period, exceeding the set target of 27%. Looking ahead, they remain committed to furthering RE development in Punjab.

It is important to note that Punjab's fertile land poses a unique challenge for solar energy installations. Due to the agricultural value of our land, it would not be feasible to install solar panels everywhere in Punjab. They need to explore other options, such as rooftop installations and RTC projects, to meet their renewable energy targets. Therefore, the PSERC and the central government should consider their geographical context when drafting future renewable energy targets.

4. Session 2-Roundtable of State Electricity Regulatory Commission:

Mr. Anil Jain, Executive Director, DERC

Mr. Anil Jain stated that resource adequacy had become a constraint, particularly with targets to have 50% share of RE in the total electricity consumption. The electricity demand in Delhi on 19th June 2024 had reached 8652 MW, the highest ever, and in UP it reached 30000 MW. Both the states have signed long-term power purchase agreement, but due to need of increasing RE share, it was getting difficult. With RPO obligations presently 29%, and its likely increase to 50%, may create problems. There were multiple exchanges in the market, which was causing issues in the scheduling and creating a burden on state grid operators. He emphasised the lack of uniformity in policies for compensating excess RE power across different states in India. In Delhi, the Delhi Solar Policy was offering incentives for rooftop solar installations, and excess power was compensated at an annual procurement price. However, in states like Haryana, excess power fed into the grid was not paid for, resulting in zero-cost benefits to distribution companies (DISCOMs). This inconsistency discourages Rooftop solar power installations in areas like Haryana. The need of national-level guidelines was to standardise these practices and address disparities, promoting a balanced approach to RE generation and compensation.

Mr. Randheer Gupta, Deputy Director (Generation Division) UPERC

Mr. Randheer Gupta discussed the rapidly increasing power demand in Uttar Pradesh (UP), which had risen from 28 gigawatts last year to over 30 gigawatts in the current year. This surge was attributed to both economic activities and climate change. UPPCL had proactively planned for power procurement, including proposals for hydro and pumped storage projects, and wind power. As a regulator, Mr. Gupta emphasised promoting renewable energy to mitigate climate degradation and stressed the need for a coordinated approach to achieve environmental and energy security goals. Although they had good power procurement plans, they also needed to support Rooftop Solar PV to meet their demand.

Session on Resource Adequacy

Ms. Ammi Ruhama Toppo, Chief Engineer, CEA

The presentation by Ms. Ammi Ruhama Toppo discussed the framework and responsibilities related to resource adequacy in India's electricity sector, as outlined in the Electricity (Amendment) Rules, 2022. It emphasised the development of Resource Adequacy Guidelines by the Central Government and the role of State Commissions in establishing regulations. The Central Electricity Authority (CEA) is tasked with creating a Long-Term National Resource Adequacy Plan, while the National Load Dispatch Centre (NLDC) is responsible for a Short Term Plan. Distribution utilities are required to ensure their resource plans meet projected demands with appropriate contracting. The presentation also covers the importance of timely procurement, integrated resource planning, and accurate demand forecasting. The presentation included a case study of Uttar Pradesh, highlighting the state's strategies to manage peak demand and to ensure stable electricity supply through diverse energy sources.

Session on Grid Stability and Balancing due to Intermittent Generation and Ancillary Services

Mr. Priyam Jain, Chief Manager (SO), NLDC, Grid-India

The presentation "Grid Stability and Balancing due to Intermittent Generation" by Mr. Priyam Jain addressed the challenges and initiatives related to integrating renewable energy sources into India's power grid. It highlighted India's rapid growth in renewable energy capacity and the resulting operational challenges, such as frequency and voltage support, system strength concerns, power quality issues, and the need for resource adequacy. The presentation discussed the increasing need for flexibility in the grid to handle variations in renewable energy output and emphasised the importance of robust regulatory frameworks, innovative solutions like HVDC interconnections, storage systems, and comprehensive planning to ensure reliable renewable integration. Initiatives for enhancing grid stability include technical standards for renewable plants, flexibility initiatives for thermal power plants, and the establishment of dedicated Renewable Energy Management Centres.

Session on Tackling intermittency, Long duration storage, Flexibilizing thermal power plants

Mr. Sharvan Kumar, Chief Engineer, CEA

The presentation by Mr. Sharvan Kumar on Closed Loop Pumped Hydro Storage (PSP) highlighted the current power scenario in India, the projected capacity of 900 GW by March 2032, with significant contributions from renewable energy sources. It emphasised the storage requirements as outlined in the National Electricity Plan, noting the advantages of PSP over battery storage, such as longer lifespan, no replacement needs, and minimal environmental impact. The presentation outlined various types of PSPs, including off-stream closed loop, off-stream open loop, and on-stream conventional PSPs. It detailed the status and development of PSP projects across the country, with an ambitious plan to add 70 GW of capacity by 2032, requiring an investment of approximately Rs. 4,00,000 crores. To boost PSP development, the Ministry of Power had initiated several administrative, financial, and regulatory measures, including streamlined approval processes and incentives for infrastructure development.

Mr. B. C. Mallick, Principal Chief Engineer, CEA

The presentation titled "Flexible Operation of Coal-Based Generating Units" by Mr. B. C. Mallick focused on the need for coal-fired power plants to adapt to the increasing integration of renewable energy sources like solar and wind into the grid. The variability and intermittency of renewable energy require other power generation sources to be more flexible to ensure grid stability. Key strategies discussed include lowering the technical minimum load of coal-fired plants to 40%, implementing a ramp rate of 2% per minute, and utilising older plants for two-shift operations. The presentation outlined potential flexible power contributions, emphasising that by 2030, coal plants could provide up to 46 GW of flexible power, aiding in the grid's balancing act during peak renewable energy production periods

Day-2, 3rd July 2024

The second day's Workshop started with recapitulation of the first day's proceedings by **Mr. Pankaj Batra**, Senior Advisor, IRADe. This was followed by the second day's presentations.

Mr. Awdhesh Kumar Yadav, Chief Engineering, CERC

The presentation by Mr. Awdhesh Kumar Yadav, on the relatively new Indian Electricity Grid Code (IEGC) 2023, outlined significant updates and provisions aimed at enhancing the operational efficiency and reliability of the Indian power grid. The IEGC 2023 introduced a more comprehensive structure compared to the 2010 version, including new chapters on resource planning, protection, and cybersecurity, among others. The Resource Planning Code mandates integrated planning for demand forecasting, generation adequacy, and transmission assessments, with specified timelines and responsibilities for various entities. The Protection Code ensures uniform protection protocols and audits, aiming for reliable and secure grid operation. Lastly, the Commissioning and Commercial Operation Code outlines the processes for startup power drawl, trial runs, and the declaration of commercial operation dates, ensuring that all generating and transmission elements are adequately tested and compliant before full operation.

Mr. Priyam Jain, Chief Manager (SO), NLDC, Grid-India

The presentation by Priyam Jain, Chief Manager (SO) at NLDC, covers the topic of transmission congestion and transfer capability within India's power grid. It explained the concept of transfer capability, distinguishing it from transmission capacity, and details the regulatory framework that governs its assessment and declaration. The presentation outlined the methodologies used to assess transfer capability, taking into account factors like thermal, stability, and voltage limits, as well as the need for contingency planning. It also discusses real-time operational challenges, such as congestion in specific transmission corridors during peak periods and the importance of continuous monitoring and adjustments. The presentation emphasised the dynamic nature of power flow, the impact of renewable energy integration, and the necessity for precise forecasting and coordination among various grid operators to maintain grid stability and efficiency.

Mr. Awdhesh Kumar Yadav, Chief Engineering, CERC

The presentation by Mr. Awdhesh Kumar Yadav on "Connectivity and General Network Access" delved into the intricacies of the transmission system in India's power sector. It began by highlighting the importance of the transmission system in linking various generation facilities to the growing demand for electricity. The Electricity Act of 2003, which promotes non-discriminatory open access to the transmission system, was discussed, emphasising the challenges posed by the increasing number of players and the rapid growth of renewable energy projects. The presentation outlined the statutory responsibilities of the Central and State Transmission Utilities (CTU/STU) and the provisions in the National Electricity Policy (NEP) and Tariff Policy aimed at ensuring efficient transmission infrastructure development. It also highlighted key regulations by the Central Electricity Regulatory Commission (CERC) concerning open access and connectivity, stressing the need for changes to address procurement realities and inflexibilities in current systems. Additionally, the presentation introduced the concept of General Network Access (GNA) and its temporary counterpart (T-GNA), providing detailed guidelines on application procedures, eligibility, and associated charges, thereby aiming to streamline and enhance the efficiency of India's transmission network

Mr. Mayank Gupta, Sr. VP, Business Development and Strategy, IEX

Mr. Mayank Gupta's presentation on the functioning of power exchanges provided a comprehensive overview of India's major energy marketplace, the Indian Energy Exchange (IEX). Established in 2008 and regulated by CERC, IEX facilitated transparent and automated trading of electricity, renewables, and certificates. He explained about Power Exchange's Key Functions, Existing Products and Auction Mechanism, Price Calculation Algorithm, Risk Management in DAM (Day Ahead Market)/TAM (Term Ahead Market), Volumes and Price discovery, Cross Border Electricity Trade. He also mentioned about the Exchange supporting Emerging RE Market models, i.e. VPPA (Virtual Power Purchase Agreement) and Firm and Dispatchable RE (FDRE) tenders, future opportunities and their capacity building initiative in his presentation. It supported various market needs with innovations like the Day Ahead Market (DAM), Term Ahead Market (TAM), and Renewable Energy Certificates (REC). IEX operates under a robust regulatory framework ensuring transparency, reliability, and security in trading. It also introduced advanced trading options like round-the-clock TAM and cross-border trading, enhancing market liquidity and efficiency.

The presentation highlighted the exchanges' role in transforming India's power sector through continuous product innovation and regulatory compliance.

Ms. Rishika Sharan, Chief Electrical Inspector, Govt of India and Chief Engineer, CEA

The presentation by Ms. Rishika Sharan, addressed the alarming frequency of electrical accidents in India, which average between 12,000-14,000 annually, resulting in over 5,000 fatalities. The presentation emphasised the critical need for stringent safety practices across various sectors, including hospitals, malls, residential buildings, and industrial sites. It outlined the provisions of the Central Electricity Authority (CEA) Safety and Electric Supply Regulations, 2023, highlighting the roles and responsibilities of electrical safety officers and inspectors. Key aspects included mandatory training for engineers, periodic inspections, and adherence to updated safety standards. The presentation also highlighted new safety measures, such as requirements for earthing, fire retardant cables, and protective equipment, aimed at preventing accidents and fires. Additionally, it discussed the implementation of awareness programs, safety regulations for renewable energy installations, and the recognition of the efforts of linemen through initiatives like "Lineman Diwas". The overarching goal was to enhance electrical safety and minimise accidents through comprehensive regulations and proactive safety practices.

Ms. Priyam Shrivastav, Deputy Director**,** CEA

The presentation by Ms. Priyam Shrivastav focused on the Central Electricity Authority (CEA) regulations for technical standards in communication systems used in power system operations, published in 2020. These regulations aim to ensure reliable, secure, and efficient data exchange critical for the smooth functioning of the power grid. Key areas covered include requirements for design, planning, and cyber security, alongside the centralised monitoring and functional requirements of wideband communication networks, PLCC, cellular, VSAT, and RF communication. The presentation emphasised the need for interoperability, redundancy, and stringent performance metrics, such as low latency and quick switchover times, to maintain high reliability. Detailed technical specifications and standards for various communication interfaces, as well as the roles and responsibilities of system users, planners, and operators, were also discussed. The ultimate objective was to facilitate a stable, reliable, and secure operation, monitoring, and protection of the power grid, with a strong focus on maintaining high standards and adopting new technologies where necessary.

The Workshop ended with closing remarks and vote of thanks by **Mr. Pankaj Batra**, Senior Advisor, and a photograph of all the participants on Day 2.

Annexure I: List of Participants

S.No	Name	Designation	Organisation
1	**Shri Ghanshyam Prasad**	Chairperson	CEA
2	**Shri Ashish Kumar Goel**	Chairman	UPPCL, UP
3	**Shri Arvind Kumar**	Chairperson	UPERC, UP
4	**Ms Ammi Topo**	Chief Engineer (IRP)	CEA
5	**Mr. Priyam Jain**	Chief Engineer	Grid Controller of India
6	**Mr. Shravan Kumar**	Chief Engineers	CEA
7	**Mr. B C Mullick**	Chief Engineers	CEA
8	**Mr. Awdhesh Yadav**	Chief (Engineering)	CERC
9	**Mr. Mayank Gupta**	Sr. VP, Business Development and Strategy	IEX
10	**Smt. Rishika Sharan**	Chief Engineer	CEA
11	**Ms. Priyam Srivastava**	Deputy Director	CEA
12	**Dr. Kirit Parikh**	Chairman	IRADe
13	**Dr. Jyoti Parikh**	Executive Director	IRADe
14	**Shri Pankaj Batra**	Senior Advisor	IRADe, and Ex Chairperson CEA
15	**Mr. Mohit Kumar Gupta**	Project Analyst	IRADe
16	**Dr. Navpreet Saini**	Sr. Research Analyst	IRADe
17	**Mr. Anil Jain**	Executive Director (Engg.)	DERC, Delhi
18	**Mr. Kushal Kumar Bhosikar**	Joint Director (PSandE),	DERC, Delhi
19	**Mr. M.P. Singh**	Director	Punjab Energy Development Agency (PEDA)
20	**Mr. Shivam Sharma**	Manager	PEDA
21	**Mr. Ravi Kant Verma**	Research Officer (Engg.)	Joint Electricity Regulatory Commission, Union Territories
22	**Er. Dipanjit Singh**	ASE/RPO	Punjab State Power Corporation Ltd. (PSPCL)
23	**Er. Ravi Kant Goel**	Sr.Xen/Market Op	(PSPCL)
24	**Mr. Arvind Pal**	JE	Electricity OP Division, U.T. Chandigarh
25	**Mr. Shusheel Anand**	JE	Electricity U.T. Chandigarh
26	**Mr. Paresh Gaur**	Assistant Director (Tech.)	Rajasthan Electricity Regulatory Commission
27	**Mr. Sumeet Kumar Agarwal**	Director (Distribution)	UP Electricity Regulatory Commission (UPERC)
28	**Mr. Sarabjeet Singh Dhingra**	Joint Director (Distribution)	UPERC
29	**Mr. Manvendra Singh,**	Joint Director (Generation, Planning and PPA)	UPERC
30	**Mr. Randhir Kumar Gupta,**	Deputy Director (Generation and PPA)	UPERC
31	**Mr. Harish Awasthi**	Deputy Director (Tariff Engineering)	UPERC

32	**Mr. Shailendra Gaur**	Director (Transmission and SLDC)	UPERC
33	**Mr. Abhishek Moza**	Joint Director (Transmission)	UPERC
34	**Mr. Manoj Rastogi**	Director (Generation)	UPERC
35	**Deepak Raizada**	C.E.	UPPCL
36	**Haroon Aslam**	C.E.	UPPCL
37	**Anurag Agarwal**	C.E.	UPPCL
38	**Sandeep Gupta**	S.E.	UPPCL
39	**S. C. Joshi**	E.E.	UPPCL
40	**S. K. Das**	Director(Pand E)	UPPTCL
41	**Amrendra Kumar**	S.E.	UPPTCL
42	**Satendra Kumar**	S.E. (TPand PSS)	UPPTCL
43	**Vikram Singh**	C.E.	UPPTCL
44	**Suraj Kumar Yadav**	Executive Engineer	UPPTCL
45	**Dipak Kumar Jaiswal**	Executive Engineer	UPPTCL
46	**Ashok Annad**	E.E.	UPPTCL
47	**A.N. Pal**	E.E.	UPPTCL
48	**Sushil KumarVerma**	E.E.	UPPTCL
49	**Mohd. Arif**	SDO	UPPTCL
50	**Alok Kumat**	SDO	UPPTCL
51	**Deepak Pandey**	SDO	UPPTCL
52	**Yash Pal Shukla**	SDO	UPPTCL
53	**Anuj Jaiswal**	SDO	UPPTCL
54	**Saurav Pandey**	SDO	UPPTCL
55	**Shrawan Kumar Verma**	SDO	UPPTCL
56	**Rajat Mishra**	A.E.	UPPTCL
57	**A.J. Siddiqui**	C.E.	UPSLDC
58	**Mayank Shukla**	Senior Engineer Consultant	UPNEDA
59	**Mr. Girish Kumar**	Sr Consultant Energy Efficiency	UPNEDA
60	**Sandeep Rastogi**	C.E.	UPRVUNL
61	**R. K. Tiwari**	C.E.	UPRVUNL
62	**Ratandeep Maurya**	E.E.	UPRVUNL
63	**Deepak Kumar**	E.E.	UPRVUNL
64	**Jaya Pandey**	E.E.	UPRVUNL
65	**Jaya Pandey**	E.E.	UPRVUNL
66	**S.K. Gupta**	E.E.	UPRVUNL
67	**Abhishek**	E.E.	UPRVUNL
68	**Kushagra Garg**	Senior Manager	IEX
69	**Vindyanchal Kumar**	Deputy Manager	IEX

Annexure II: Agenda

Day 1 – Tuesday, 2nd July 2024	
09.30 -10.00 Hrs.	**Registration**
10.00 -11.00 Hrs.	**Inaugural Session**
10.00 -10.05 Hrs.	Welcome Address by **Dr. Jyoti Parikh**, Executive Director, IRADe
10.05 – 10.10 Hrs.	Context Setting by **Shri Pankaj Batra**, Senior Advisor, IRADe and Ex Chairperson, CEA
10.10 – 10.15 Hrs.	Introductory Remarks by **Dr. Kirit Parikh**, Chairman, IRADe and Former member, Planning Commission
10.15 - 10.25 Hrs	Special Remarks by Guest of Honour, **Shri Ashish Goel** (IAS), Chairman, UPPCL Govt. of U.P.
10.25 - 10.35 Hrs.	Special Remarks by Guest of Honour, **Shri Arvind Kumar**, Chairperson, UPERC, Govt. of UP
10.35 – 10.45 Hrs.	Special Remarks by Guest of Honour, **Shri Narendra Bhooshan,** Principal Secretary, Department of Additional Sources of Energy, Govt. of U.P.
10.45 - 10.55 Hrs.	Inaugural Address by Chief Guest, **Shri. Ghanshyam Prasad**, Chairperson, CEA/Member CEA,
10.55 -11.00 Hrs.	Vote of thanks by **Dr. Navpreet Saini**, Senior Research Analyst, IRADe
11.00-11.20 Hrs	**Group Photograph and Tea**
11.20-12.00 Hrs.	**Presentation on Outline of Laws, Rules, Guidelines, Regulations of the Government of India/CERC – Shri Pankaj Batra,** Senior Advisor, IRADe and Ex-Chairperson, CEA
12.00-12.30 Hrs.	**Roundtable of Secretaries on Capacity Building Requirements for Northern Region's State**
12.30 -13.00 Hrs.	**Roundtable of Regulators on Capacity Building Requirements for Northern Region's State**
13.00 -13.30 Hrs.	**Roundtable of Renewable Energy Development Agencies on Capacity Building Requirements for Northern Region's State**
13.30 -14.30 Hrs.	**Lunch Break and Networking**
14.30 -15.30 Hrs.	**Resource Adequacy and laws/Guidelines /Regulations related thereto – Ms Ammi Topo,** Chief Engineer (IRP), CEA ➢ Demand Forecasting ➢ Power Generation Resource Planning ➢ Renewable Generation/Energy Storage Planning ➢ Power Trading/Power Exchange in India ➢ QandA
15.30 -16.30 Hrs.	**Grid balancing, Grid stability due to intermittent generation. Ancillary Services Regulations – Mr. Priyam Jain,** Chief Engineer, Grid Controller of India ➢ Issues relating to tackling intermittency of variable renewable generation ➢ Grid stability, frequency control, voltage control ➢ Demand Response ➢ Ancillary Services Regulations ➢ QandA
16.30-17.00 Hrs.	**Tea**
17.00-18.00 Hrs.	**Tackling intermittency, Long duration storage, Flexibilizing thermal power plants –** ➢ Closed Loop Pumped Hydro Storage - **Mr. Shravan Kumar**, Chief Engineers, CEA ➢ Flexibilizing thermal power plants – **Mr. B C Mullick**, Chief Engineer, CEA ➢ QandA
Day 2 - Wednesday, 3rd July 2024	
10.00 -10.15 Hrs.	**Recapitulation and introduction to the forthcoming Sessions – Shri Pankaj Batra,** Senior Advisor, IRADe and Ex-Chairperson, CEA
10.15-11.15 Hrs.	**New Grid Code 2023 – Mr. Awdhesh Yadav,** Chief (Engineering, CERC) ➢ Objective and Scope ➢ Resource Planning Code ➢ Connection Code ➢ Protection Code ➢ Commissioning and Commercial Operation Code ➢ Operating Code ➢ Scheduling and Dispatch Code ➢ Cyber Security ➢ Monitoring and Compliance Code ➢ Miscellaneous ➢ QandA
11.15-11.30 Hrs.	**Tea**

11.30-12.30 Hrs.	**Grid operation – Mr. Priyam Jain,** Chief Engineer, Grid Controller of India ➢ Frequency and voltage control ➢ Transmission Capacity and Transfer Capability, TTC. ATC and RM ➢ Transmission Congestion ➢ Angular Stability ➢ QandA
12.30-13:30 Hrs.	**Connectivity Regulations and General Network Access –** **Mr. Awdhesh Kumar Yadav,** Chief (Engineering), CERC ➢ Connectivity ➢ Long Term Access, Medium Term Access, Short Term Open Access ➢ Provision of General Network Access ➢ QandA
13.30-14:30 Hrs.	**Lunch Break and Networking**
14:30-15.30 Hrs.	**Functioning of Power Exchange:** **Mr. Mayank Gupta,** Sr. VP, Business Development and Strategy, IEX ➢ Types of markets in the Power Exchange, and their features ➢ Bid Matching mechanism ➢ Prudential Norms for establishment of Power Exchange ➢ Settlement Guarantee Fund (SGF) ➢ Management of Power Exchange ➢ Risk Management by Power Exchange ➢ POC mechanism of sharing of transmission charges and losses ➢ Open Access charges ➢ Deviation Settlement Mechanism ➢ QandA
15.30-16.30 Hrs.	➢ **CEA Measures Relating to Safety and Electric Supply Regulations – Smt. Rishika Sharan,** Chief Engineer, CEA ➢ **CEA Communication Regulations – Ms. Priyam Srivastava,** Deputy Director, CEA
16.30-17.00 Hrs.	**Closing remarks and Vote of thanks Shri Pankaj Batra,** Senior Advisor, IRADe and Ex-Chairperson, CEA
17.00 Hrs.	**Tea**

About Central Electricity Authority of India (CEA)

The Central Electricity Authority of India advises the government on policy matters and formulates plans for the development of electricity systems. It is a statutory organization constituted under section 3 of Electricity Supply Act 1948, which has been superseded by section 70 of the Electricity Act 2003.

CEA vision to ensure reliable 24×7 power supply of adequate quality to all consumers in the country.

Central Electricity Authority seeks to achieve the vision by performing its statutory function by providing technical support base to all stakeholders in the power sector, to support Ministry of Power for forming policies in the power sector, to make technical standards and regulations, to carry out project monitoring, to disseminate power sector information, to upgrade skills of human resources in the power sector of the country.

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About Integrated Research and Action for Development (IRADe)

Integrated Research and Action for Development (IRADe) is an independent advanced research institute which aims to conduct research and policy analysis to engage stakeholders such as government, non-governmental organisations, corporations, academic and financial institutions. Energy, climate change, urban development, poverty, gender equity, agriculture and food security are some of the challenges faced in the 21st century. Therefore, IRADe research covers these, as well as policies that affect them.

IRADe's focus is effective action through multi-disciplinary and multi-stakeholder research to arrive at implementable solutions for sustainable development and policy research that accounts for the effective governance of techno-economic and socio-cultural issues. Being Asia Center for Sustainable Development, we have been carrying out policy research and its implementation for enabling socio-economic growth and charting pathways for sustainable development in South-Asia.

IRADe was established under the Society's Act, in 2002 at New Delhi. It is certified as a Research and Development Organization by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (MoST). It has also been selected as a Center of Excellence by the Ministry of Urban Development (MoUD) for urban development and climate change. In addition, it provides expertise to other ministries, national and international institutions and partners with other reputed organisations.

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