Report of the Task Force on Communication System in Power Sector

February, 2016

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Neerja Mathur
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Draft Regulation on "Communication Systems in Power Sector"

12th February, 2016

Task Force for giving input for framing Draft Regulation on "Communication Systems in Power Sector" set up by CERC

Dear Shri Pradhan,

On behalf of the Task Force on framing draft Regulation on "Communication systems in Power Sector" I have great pleasure in forwarding a copy of the Report. We are thankful to CERC for entrusting this responsibility to this Task Force.

With regards

Neerja 12/2/16

(Neerja Mathur)
Member, JERC (for the State of Goa and Union Territories)

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Task Force on Communication Systems in Power sector

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CHAPTER-I

INTRODUCTION

1.1 Background

1.1.1 A healthy communication system is critical for safe and secure operation of electricity grid. In view of the integrated operation of Indian electricity grid, uninterrupted availability of the real-time data of various power system elements assumes utmost importance. At present the need for a robust communication system for the power sector is covered under IEGC which however does not touch upon a strategy for planning of communication system, roles and responsibilities of various organizationsand, standards / protocol to be followed, which are very vital in view of the criticality of communication system for the power sector. IEGC as well as tariff regulations also do not provide norms of availability of communication system in the country.It has, therefore, been proposed that a new regulation be framed covering planning, implementation, up-gradation, ofreliable communication system for power sector to facilitate transmission of data, voice, video and tele-protection signal for secure operation of the power system. Roles and responsibilities of various agencies also need to be clearly defined in the Regulations.

1.1.2 Accordingly a Task Force was constituted with the following Terms of Reference (ToR):

(i) Specifying the principles and procedures which shall be used for planning and development of communication systems in power sector.

(ii) Specifying necessary communication system required for transfer/exchange of data, voice and control signals between Generating Stations including Renewable energy sources,

Substations, control centres at national, regional, state, area, utility and discom level

(iii) Specify principles of up-gradation, operation & maintenance, resource and cost sharing of data, voice and video, dedicated and reliable communication system for the power sector

(iv) Specifying roles & responsibilities of various organizations (CEA, CTU, STUs, POSOCO, Users etc) & their linkages to facilitate development and smooth operation of communication systems in power sector

(v) Specifying Information and Communication requirements for smart-grid

(vi) Suggesting measures to address Security of communication systems

1.1.3 A copy of CERC Office Order dated 22.4.2015 constituting the Task Force and its Term of Reference is given as part of ***Annexure-I.***

1.2 Deliberation in the Task Force and Inputs

1.2.1 First meeting of the Task Force was held on 8th May, 2015. During the meeting, existing modes of communication in the power sector, Band-Width requirement for various applications, comparison of various modes, etc., were discussed. POWERGRID was of the view that considering the reliability of OPGW and reduced cost of optical fibre, which is about 0.5% to 1.5% of transmission line cost, all new transmission lines of 132 kV and above voltage level should be provided with OPGW. POWERGRID was requested to furnish comparison of cost of OPGW and earth wire. Members also discussed the need for standardization of communication systems and were of the view that CEA shall formulate and notify standards for Communications in the Indian Power Sector. Regarding specifying the procedure for planning and development of

communication system in the country, members were of the view that principles be decided considering long term as well as redundancy requirement for Communication of Power Sector.Requirements of Smart-Grid and cybersecurity may also be considered while deciding these principles. A Standing Committee on Communication, similar to Standing Committee on Power System Planning shallbe set up under the aegis of CEA, with representation from different stakeholders,for planning and development of the Communication System for Power Sector in the country.All the members were requested to provide inputs on the issue(s) for consideration of Task Force. A copy of minutes of the first meeting of Task Force is enclosed at ***Annexure-II.***

1.2.2 NTPC has, vide their communication dated 8th June, 2015, submitted the following:

(i) Data and Voice communication from generating plant switchyard to control centre involves number of transmission lines and substations, someof intermediate communication channels may be existing, whereas some may be upcoming. Availability of spare channels at existing intermediate sub stationsand readiness of upcoming Data collection point matching with start-up power drawl schedule is an area of concern for the generator. This results in requirement of a contingent point to point communication between generating plant and respective RLDC. Sometimes line charging for start-up power drawl also gets delayed due to non-availability of such links.

(ii) Establishing communication link involves many agencies namely CTU, Transmission licensee, RLDC and User. Cost of communication terminal equipment being very small as compared to cost of transmission lines and for ease of integration also, terminal equipment for both end may be retained in the scope of

transmission licensee in line with existing practice. The responsibility of making respective system available should lie with the owner of the equipment at intermediate substations/ RLDCs and responsibility of co-ordination should preferably be done by the planning agency who has complete information of the existing / upcoming communication network.

1.2.3 The Task Force is of the view that coordination while providing the communication is essential to ensure seamless integration. In the interest of the sector, the terminal equipment of both ends shall be procured from the same vendor. NLDC is the appropriate agency to issue guidelines in this regard. However the cost of above equipment needs to be recovered from user.

1.2.4 Second meeting of the Task Force was held on 6th July, 2015. POWERGRID informed that the cost of OPGW has come down drastically and is about Rs 1.5 lakh per km.; for short lines OPGW was a better solution than PLCC. However, members were of the view that the decision regarding a particular communication media for data, voice and protection systems may taken keeping in view data volume and response requirements.

1.2.5 The representative of IWPA was of the view that Communication systems be established by the Utility (STU/CTU) at the pooling stations at the cost of STU/CTU in respect of generation from Renewable Energy. The integration of the communication system with communication pooling point, terminal equipment of the load dispatch centrebe done only by the State utility for all substations at its cost and SLDC should ensure integration of data from plant to Control Centre. All charges for the use of communication system shall be borne by the utility.

1.2.6 Representative of Solar Energy Corporation India (SECI) was of the view that provision of redundancy should be there in the communication system. The communication system should be cost effective. Solar Power Developer may bear the cost of RTU and Communication channel till Area SLDC. However, equipment may be provided by the State utility.

1.2.7 Tata Power Delhi Distribution Limited(TPDDL) was requested to attend the second meeting of the Task Force as a special invitee. During the meeting the representative of TPDDL gave a detailed presentation in regard to the communication requirements for their Discom and their experience in regard to implementation of the communication system. Typical communication architecture for Distribution utilities as per TPDDL are annexed as ***Exhibit–I.*** The representative of TPDDL mentioned that during peak hour, band width requirement would be high and high capacity network for core ring would be needed for Discoms. The typical band width requirements indicated by TPDDL are also enclosed at ***Exhibit-I.*** The recommendations of TPDDL in regard to communication requirements for the Discoms are given at ***Annexure-III***.

1.2.8 In regard to cyber security aspects, it was decided that the CEA standards for communication system should cover this aspect as well. Members were also of the view that NLDC may frame guidelines in regard to interfacing requirements for the communication system which should be followed by all users, ISTS licensees, SLDCs and RLDCs for seamless integration. A copy of minutes of the second meeting of Task Force is enclosed at ***Annexure-IV.***

1.2.9 Third meeting of the Task Force was held on 22nd December, 2015. Members discussed in detail the comments received on the draft Regulations and modified the same. Taking note of the fact that the

jurisdiction of the Central Commission confines inter alia to Regulation forInter-State transmission of energy, the inputs for framing draft Regulationsfor communicationsystem in respect of inter-state transmission system have been firmed up and are enclosed at ***Annexure–V***. However, the Task Force also noted that the communication requirements presently specified in the Indian Electricity Grid Code specify that all users, STUs and CTU shall provide system to telemeter power system parameter. The IEGC also provides that the associated communication system to facilitate data flow upto appropriate data collection point on CTUs system shall also be established by the concerned user or STU as specified by CTU in the connection agreement. Further as per IEGC, user means a person such as a generating company including captive generating plant or transmission licensee (other than central transmission utility and state transmission utility) or distribution license or bulk consumer whose electrical plant is connected to the ISTS at a voltage level of 33 kV and above. Thus the Regulations in regard to communication for power sector can be framed as a separate chapter in IEGC. Alternatively,CERC may frame regulations relating to ISTS and the State regulators also frame similar regulations in respect of power system within the state.

1.2.10 In the above backdrop, the report of the Task Force has been structured covering (a) Communication needs of the Power Sector, (b) Planning for communication system of the power sector,(c) Smart Grid, (d)Cyber security of Communication Systems (e) Roles and responsibilities of various organizationsand (g) Conclusions and Recommendations.

CHAPTER-2

COMMUNICATION NEEDS OF POWER SECTOR

2.1 Evolution of Computer-based Operation and Control of Power System in the country

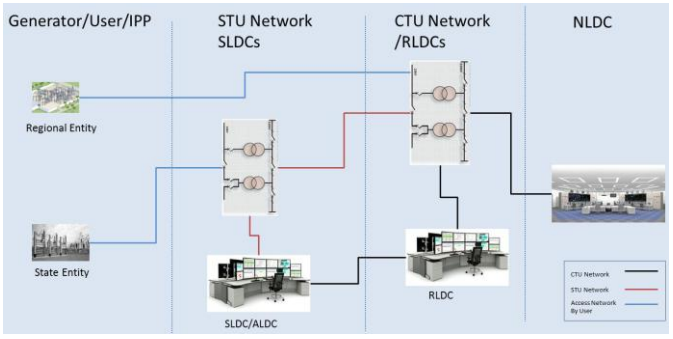
2.1.1 During the initial stages of evolution of power systems in the country, power systems were not only small in size but also not so complex in structure and their operation and control was fairly simple. Generating stations were, by and large, set up near demand centres for providing supply to electric loads. The grid parameters to be monitored and controlled were limited. The data, tele-metered or manually acquired, from the power system, was displayed on mimic panels, analog meters, etc. Monitoring and control was invariably done on the basis of judgment and intuition of human operators and operation and control instructions were passed on by the operators verbally.

2.1.2 In early Sixties, Indian Power System was demarcated in five regions for the purpose of planning, development and operation with a view to optimally utilize the unevenly distributed power resources in the country, as well as to achieve economy, reliability and security of supply. Five Regional Load Despatch Centres were set up to coordinate operations of the regional grids in real time. The exchange of data between load centers and generating stations was required to be faster to ensure secureand stable operation. This resulted in data exchange through analog and digital telemetry. At this stage also the number of stations and networks were still small and the amount of data handled was comparatively less.

2.1.3 Regional grids were strengthened with the establishment of large thermal, hydro and nuclear stations in the central sector in which the States of the concerned region had shares. Central sector

transmission was constructed for evacuation of power from the central generating stations to the beneficiary states. The contiguous regions were interconnected through HVDC back to back systems with the ultimate objective of achieving a national grid. However, with the increase in size and expanse of power systems and increasing interaction between power system elements distributed over a wider geographical area, a simplistic monitoring and control did not suffice. The strongly meshed and highly loaded power systems rendered monitoring and control more and more difficult. Large amount of data was required to be obtained from the field level on a near continuous basis and simultaneously processed and presented to the operators in a convenient and coherent manner for taking various operational decisions.Modern State-of-Art Regional Load Despatch Centres and State Load Despatch Centres with a mix of PLCC and microwave were set up in the Eighties.

2.1.4 The hierarchy of operation and control of the Indian Power System is given below



2.1.5 Supervision and monitoring of grids called for transfer of real time operational data such as voltage, frequency, real and reactive power flow, energy, and status of circuit breaker & isolators positions, transformer taps and other parameters from their station to Data Collection Point(DCP) of CTU.

2.1.6 The data is required to be automatically updated cyclically (typically ever ten seconds) at the load dispatch centre for giving up to date information about the health of power systems on round the clock basis for enabling efficient and effective monitoring, supervision and control of the power system.

2.1.7 The integration of regional grids, which began with asynchronous HVDC back-to-back inter-regional links facilitating limited exchange of regulated power,subsequently graduated to high capacity synchronous links between the regions. The initial inter-regional links were planned for exchange of operational surpluses amongst the regions. However, later on when the planning philosophy had graduated from Regional self-sufficiency to National basis, the Inter-regional links were planned associated with the generation projects that had beneficiaries across the regional boundaries.In December, 2013, all the contiguous regions have been synchronously interconnected. Establishment of the national grid is expected to bring in considerable economic benefits and increase the reliability of power supply but at the same time the complexity of the power system poses a threat to the stability of the grid. Also, increasing grid penetration of renewable power, particularly solar and wind, and their inherent variability and unpredictability, has also posed a challenge for safe and secure operation of the grid.With the increase in the size and complexity of the grid, the communication needs of the power sector have increased drastically. To monitor and manage such a large integrated grid, it is essential to have reliable real time data, along with the voice communication. This necessitates the availability of a robust and extensive communication network.

2.2 Functions and Requirements of Communication System

2.2.1 Main functions of Communication systems for the power sector are as follows:

(i) **To facilitate safety, security, stability, and reliability of the grid:** One of the most important functions of communication system in power system is to facilitatesafe, secure and stable operation of the grid by continuously monitoring the power flow on the lines, voltage at the buses, maintaining the frequency close to nominal frequency and maintaining the tie-line power close to the scheduled values. Efficient communication technology makes it possible to implement real-time systems that are able to anticipate faults on the system and help the system to take corrective action to ensure reliability of the power system. Efficient communication systems also make real-time load/generation(including from renewable) balance possible. The grid no longer needs to be over-engineered to cater to increases in load, but can use real-time data to adjust production and delivery. Protection Schemes of various generating stations and other transmission elements also require reliable communication system for their operation

(ii) **Ensuring Economic operation and optimization of power system**: Reliable and economic operation of power systems through real time dispatch& control is only possible through a robust communication system. Further, real time economic dispatch through real power and reactive power control and optimal control of the power system by appropriately using both preventive and corrective control actions needs a reliable communication system.

(iii) **Optimal use of resources and Power Markets development** Operational planning, intended to minimize the energy cost by scheduling the cheaper generation available in the market, taking

into account forecasted loads, cost of generation of various generating units, technical constraints, load restriction, etc, can be achieved using reliable Information & Communication Technology.

2.2.2 While fulfilling the needs of the power system, essential features of the communication system are security, reliability and real-time operation.

(i) Security of communication system means fulfilling requirements of (a) confidentiality i.e. there should be no leakage /pilferage of data during data traversal and (b) integrity i.e. interception and alteration of data should not be possible during traversal.

(ii) Reliability of communication system requires that ffrequency of outage of communication system should be as low as possible so as to provide data and execute operational instructions with reliability at all points of time.

(iii) Real-time operation calls for low and predictable latency i.e. less travel time from source to sink and less variability in latency (minimum jitter) respectively.

2.3 Communication Media for Power System Operation and Control.

2.3.1 In the Power Sector, communication media commonly deployed are Power Line Carrier Communication (PLCC), wireless radio frequency, microwave, Optical fibre cable, cellular and satellite channels for various applications. Of late, in India, the microwave communication systems have been withdrawn for use of the power sector. The dedicated communication network of the power sector has been designed to be a combination of the various afore-mentioned modes of communication depending upon the speed of data required for each hop/ link. The speed of data in turn depends on the specific application and its communication

requirement. In wake of implementation of Schemes based on Phasor Measurement Units (PMUs), automatic generation control, ancillary services, demand side management, integration of renewable, smart cities, smart grid, advanced metering infrastructure etc., communication expressway needs to be created along with transmission system which can be utilized by all stakeholders of the Power sector in India.

2.3.2 Since the communication system of the power sector is by and large aligned with the transmission system, it is essential to plan for the communication system along with the respective transmission lines/ network. The communication system thus planned should firstly be adequate to cater to the entire communication needs along the hop and secondly should come up and be commissioned within the same time frame as the transmission system. While planning the communication links due consideration may be given to the fact that the future requirement of the data transmission which can be visualised may be considered upfront. Power Line Carrier Communication is a limited data media while optical fibre is a multichannel communication media. Therefore while planning a transmission system, if the future requirement for data is envisaged to be large, even though the immediate requirement may be limited, multichannel mode of communication may be planned outright.

2.3.3 It is therefore imperative to plan a reliable and a robust communication network at the Central as well as the State level to meet all the functional requirements of the grid efficiently while also considering the features of Wide Area Measurement System (WAMS), smart grid, Advanced Metering Infrastructure (AMI) and cyber security. This Report covers only the communication requirements of the ISTS network. However respective States may develop the State communication network on similar lines, which

is essential for effective monitoring and control of power system in the country.

CHAPTER-3

PLANNING FOR COMMUNICATION SYSTEM OF THE POWER SECTOR

3.1 Need for Planning

An adequate and robust communication system is an important pre-requisite for the efficient monitoring, operation and control of the integrated Power System. To manage such a large and complex grid, one requires firstly second to second information on the state of the grid and secondly a very reliable and speedy delivery of this information to the control centers. The requirement of Information capture is met by innovative sensors and devices provided by modern electronics and the Communications requirements are met by modern technologies/media like microwave, fiber optic, etc., as available for the use of power sector from time to time.

3.2 Planning of Communication System

3.2.1 Communication systems to meet the operational requirements of the Power Sector are generally Power Line Carrier Communication (PLCC) links or Optic Fiber links. Earlier, microwave radio links were also used for power sector communication, but the same were later withdrawnby the Government. PLCC, in view of its technology, is essentially required to be installed along the transmission line as it uses the line as its propagation media. In case of the Optical Fiber, it is possible not to align the underground cable or the overhead cable with the transmission line. However in view of the inherent technical advantage (availability of ROW of the transmission line) as well as the cost advantage of having a Composite Earth Wire cable (OPGW) or a separately strung fiber cable on transmission towers, communication is always aligned with the transmission lines. It is therefore necessary to plan as well as implement communication system along with the transmission network.

3.2.2 The planning of communication network involves the following

(i) To formulate technical standards and planning criteria/ guidelines of communication requirement for various categories of generating stations(including generation from renewable energy sources),Substations as well as other transmission elements.

(ii) To plan development of adequate and reliable communication network commensurate with the growth of the power system network and in accordance with the specified planning criteria/ guidelines. Redundancy, safety requirements and cyber security requirements may be considered while planning such a system.

(iii) In case of existing power system, to review the adequacy of the existing communication network in accordance with the standards/ norms and planning criteria and to plan for requisite strengthening of the communication system. Redundancy, safety requirements and cyber security requirements may be considered while planning such a system.

(iv) To formulate norms for operation and maintenance of communication network.

3.3 Methodology for Planning of Communication System

Considering the present challenges as described above and the emerging requirementssuch as the requirements for smart grid, planning and implementation of a robust, reliable and adequate communication network needs tobe done in the following manner:

(i) CEA shall formulate and notify technical standards/protocols for Communication System

(ii) CEA shall evolve the planning criteria/ philosophy for communication network of the power sector. In accordance with this, CEA shall formulate a perspective plan based on communications requirement of sector duly considering smart grid concept for inter-State transmission system as well as intra-State transmission system. These perspective Communication plans would be continuously updated to take care of future requirements of the power sector.

(iii) The CTU shall carry out communication planning from time to time as per the requirement of major inter-State transmission system including inter-regional schemes which shall fit in with the perspective plan developed by CEA. While planning schemes, the following shall be considered, in addition to authentic data by CTU:

(a) Communication Planning Criteria and guidelines issued by the CEA
(b) Perspective plan formulated by CEA.
(c) Operational feedback from NLDC/RLDCs/SLDCs
(d) Renewable capacity addition plan issued by Ministry of New and Renewable Energy Sources (MNRES), Govt. of India.

(iv) Planning is a continuous exercise considering the technological advancement and developments of power sector, Task Force are of the view that constitution of Standing Committee for communication system is essential. The communication requirement on inter-State transmission proposals including system strengthening scheme identified would be discussed, reviewed and finalized in the meetings of Standing Committees for Communication system to be set up by CEA. The Standing Committee shall be on the same lines as the existing Standing Committee for Power System Planning constituted by CEA. The Standing Committee on Communication System may function in close coordination with the Standing Committee on Power System

Planning since the communication links will come up along with the respective transmission lines.

(v) All STUs and users will supply to the CTU, the desired data from time to time to enable formulation of communication plan.

(vi) Based on Plans prepared by the CTU, State Transmission Utilities (STUs) shall have to plan their intra-state communication systems appropriately and adequately for further exchange of information to/ from the communication system for ISTS and to optimize the use of integrated communication network. STUs may also be advised to formulate a Planning Criteria/ Guidelines in line with the Criteria for the ISTS and a Committee in line with the Central Committee as above. The matter could be taken up in the Forum of Regulators for speedy and harmonious formulation of Planning Criteria / Guidelines in all the States.

(vii) The Inter-State communication System and associated intra-State communication system are complementary and inter-dependent and planning of one affects the other's planning and performance. Therefore, the associated intra-State communication system on the intra-State lines shall also be discussed and reviewed before implementation during the discussion for finalizing communication system for inter-State transmission of electricity as indicated above.

(viii) With a view to achieve uniformity and compatibility at all interfaces, technical standards of all communication subsystems including terminal equipment as well as communication media shall be formulated.

(ix) Guidelines and procedures for operation and maintenance of communication systems and cost sharing of communication

system may be formulated and respective organisations need to follow the same stringently.

(x) Safety of equipment as well as cyber security may be an inherent feature of the planning and implementation of communication systems.

3.4 POWERGRID has submitted that OPGW cost with respect to 400 kV line cost is around 0.5% (for D/C Quad Moose) to 1.36% (for S/C line). Similarly, OPGW cost with respect to 765 kV line cost is around 0.3% (for D/C line) to 0.7% (for S/C line). Further, OPGW cost with respect to HVDC line cost is around 0.34% to 0.8% (higher percentage is for 500 kV HVDC line and lower percentage is for 800 kV HVDC.). OPTCL has submitted that cost of GI wire on 132 kV line in their system is round Rs 51,500 per km against Rs 2,54,120 for OPGW. In this context it is noted that laying of OPGW on a transmission line at the construction stage is cheaper than the cost of OPGW involving re-engineering on the existing transmission lines. Considering the above as well as the downward trend of cost of Optical Fibre & marginal percentage cost difference of transmission line with and without OFC, the Task Force recommends that as a general guideline, all regional sub-stations at 132/110 kV or above and all new 132 kV and above transmission lines may have OPGW wherever needed for wide band communication.

3. 5 Implementation Strategy

Broad features of the process of planning and implementation of a reliable communication network have been given above. It is evident that this process would involve planning, execution as well as the operating agencies at the centre to plan, set up and utilize such a communication network for grid operation. Accordingly, different activities have been assigned to various organizations

keeping in view their respective roles and responsibilities. Details of the responsibilities of various organizations are covered in Chapter-5.

CHAPTER-4

SMART GRID AND CYBER SECURITY

4.1 Smart Grid

4.1.1 Smart Grid is a modernized electric power transmission and distribution network using robust two-way communications, advanced sensors, and distributed computing technologies to improve the efficiency, reliability and safety of power delivery and use. One of the major differences between the electrical grid as it is existing in the country today and the proposed Smart Grid will be addition of intelligence to the system. The Smart Grid will enhance and extend the features and functions of the current grid equipment with the implementation of Intelligent Electronic Devices (IEDs). These IEDs will not only provide more detailed information but also bi-directional communication to support remote control feature. The new multi-function electronic meters, intelligent relays and control units will then be able to exchange information with the provider of central control systems. This enhanced communication will help both grid operators and consumers to make more informed decisions and extend the functionality of the monitoring systems to not only collect information but to use it to help automated control of the grid and thus reduce the need for human intervention.

4.1.2 According to the United States Department of Energy, Modern Grid Initiative report, a modern smart grid must:

(i) Be able to heal itself

(ii) Motivate consumers to actively participate in operations of the grid

(iii) Resist attack

(iv) Provide higher quality power that will save money wasted from outages

(v) Accommodate all generation and storage options

(vi) Enable electricity markets to flourish

(vii) Run more efficiently

(viii) Enable higher penetration of intermittent power generation sources

4.2 Communications for Smart-Grid:

4.2.1 Integratedoperation, high performance, high reliability, scalablein nature, ubiquitous, and security-these are the characteristics describing the smart grid communication network. The communication network will be responsible for gathering and routing data, monitoring all nodes and acting upon the data received. The smart grid communication network will be like the internet in the sense of being a delay tolerant network, providing congestion control, and operating in distributed control manner.There will be three different layers in the communications network. They are

(i) **Core network** handling connectivity between substations and utilities' control centres.

(ii) **Distribution network-**handling broadband connectivity for transmitting data collected by the smart meters sensors and concentrators located on the grid to their related databases and analytics servers, which are located at headquarters.

(iii) **Access network** handling last-mile connectivity at homes, offices, and municipal facilities to the smart meters.

4.2.2 Millions of messages every second will be going back and forth in the network; different messages for different reasons can be put into three main categories.

(a) Real-Time operational communication requirements

(b) Administrative operational communication requirements

(c) Administrative communication requirements

4.2.3 With increasing demand on the power supply system, as well as the need for improved reliability, prevention of power supply disruption is one of the key goals of the Smart Grid. Because of the inherently interconnected and interdependent nature of the grid, improving wide area monitoring and situational awareness is necessary to achieve this objective. Further information about the power supply in neighbouring areas can help utilities optimize the economic operation of the grid. As Government of India is giving a thrust to solar generation (including Rooftop solar), their impact on operation the Grid can be monitored and handled when reliable communication is provided at the pooling station.The Task Forceis of the view that planning and development of the Communication system should be based in due consideration of smart grid requirements and technologies. Planners may consider broad band connectivity upto pooling stations. Also redundant paths and back up communication system during disaster should be in variablyconsidered during the planning process.

4.3 Cyber Security of Communication Systems:

4.3.1 With the large scale implementation of automation system, requirement of information flow from substations, generating stations, load dispatch centre and other control centres like National Transmission Asset Management Centre (NTAMC) etc have become critical for secure and reliable operation of power system. Further, remote access in the power system brings a whole new world of possibilities: supervision, asset management, troubleshooting, etc.With more and more dependence on Information & Communication Technology (ICT) in the power sector, the Power System is exposed to the vulnerabilities of cyber incidences. This assumes added importance in view of the proposed implementation ofsmart grid which makes considerable

use of IT system.With automated operation of grid elements, the cyber space in the Power Sector has increased and so have the Cyber Security vulnerabilities. Increased number of entry points and paths become available for potential adversaries with automation and an attack on Smart meters and Smart appliances may lead to commercial loss apart from breach of privacy to individual consumers at distribution level.

4.3.2 It is imperative that Cyber Security be planned and designed into systems from the very beginning. Security needs be addressed at all levels of the architecture. Various standards are being followed in different countries, mainlyIEC and IEEE standards. The Task Force is of the view that CEA is the appropriate authority to formulate standards including Cyber Security for communication system for Power Sector in the country and grid integration with the neighbouring countries. Accordingly, CEAmay formulate and notify the standards for cyber security for power system operation and control. Further the cyber incidences are to be closely monitored and discussed. The Task Force is of the view that a nodal agency, preferably NLDC, may monitor cases of cyber-attack and discuss at RPC forum for necessary preventive and remedial action.

CHAPTER-5

ROLES AND RESPONSIBLITIES OF VARIOUS ORGANIZATIONS

In accordance with the strategy outlined in Chapter-3, the roles and responsibilities of various organizations have been proposed in this chapter duly keeping in view the existing roles and responsibilities of various organizations.

5.1 Role of CEA

(i) CEA shall formulate communicationplanning criterion/ philosophy and guidelines for development of reliable Communication system for power system, duly considering requisite redundancy as well as requirements of smart grid and cyber security.

(ii) CEA shall notify a Standing Committee for Communication System in Power Sector which shall prepare a perspective communication plan duly considering optimal utilization of transmission assets for communication purposes. The Standing Committee shall also carry out periodic review of the perspective plan. The aforesaid Standing Committee shall prepare the perspective plan for communication system forpower sector in due consideration of the transmission planning carried out by CEA through Standing Committee on Power System Planning.

(iii) CEA shall formulate and notify technical standards, cyber security requirements, protocol for the communication system for Power Sector within the country including the grid integration with the neighbouring country's grid.

(iv) Standing Committee on communication system shall also monitor and facilitate timely completion of schemes and projects for improving and

augmenting the communication system along with transmission system in the power sector.

5.2 Role of CTU

(i) The CTU shall, in due consideration of the planning criteria/philosophy and guidelines formulated by CEA, be responsible for planning and coordination for development of reliable national backbone communication system among National Load DespatchCentre(s), Regional Load Despatch Centre(s) and State Load Despatch Centre(s) along with Central Generating Stations, ISTS Sub-Stations, UMPPs, Inter State Generating Stations, IPPs, renewable energy sources connected to the ISTS, Centralised Coordination/Control Centres for generation and transmission.

(ii) CTU shall also plan communication system up to the national boundary for integration with the communication system for cross border exchange of power.

(iii) CTU shall integrate communication planning with transmission and generation project planning in a comprehensive manner.

(iv) The CTU shall discharge the above functions in consultation with the CEA, State Transmission Utilities, ISGS, IPPs, Regional Power Committees, NLDC and RLDCs.

5.3 Role of RPC:

The RPC Secretariat shall monitor instances of non-compliance of CERC (Communication System for Inter-State Transmission of Electricity) Regulations, 2016 as amended from time to time and try to sort out issues in the respective region in such a manner that cases of non-compliance are prevented in future. Unresolved issues

and non-compliance of these Regulations shall be reported by the Member Secretary of RPC to the Commission.

5.4 Role of NLDC:

(i) The National Load Despatch Centre (NLDC) shall prepare and issue guidelines on the interfacing requirements in respect of terminal equipment, RTUs, SCADA, PMUs, Automatic Generation Control (AGC), AMI, etc, and for data communication from the User's point to the respective control centre(s) based on technical standards issued by CEA as mentioned in para 5.1 herein earlier. Till the time technical standards are framed by CEA, NLDC shall adopt necessary standards.

(ii) The National Load Despatch Centre shall be responsible for integration of the Communication system at NLDC end for monitoring, supervision & control of Power System and data adequacy in real-time.

5.5 Role of RLDC:

(i) The Regional Load Despatch Centre shall be nodal agency for integration of Communication System at RLDC end for monitoring, supervision & control of Power System and requisite data availability in real time.

(ii) RLDC shall be the Nodal Agency for supervision of integration of communication system in respect of ISTS and for requisite coordination to enable all the data to reach RLDC.

5.6 Role of SLDC:

(i) The State Load Despatch Centres shall be nodal agency for integration of Communication System in the STU network and shall be responsible for interfacing the telemetry system at SLDC end for

monitoring, supervision & control of Power System and data adequacy in real time.

(ii) SLDC shall be the Nodal Agency for supervision of integration of communication system in respect of intra-State transmission system and for requisite coordination to enable all the data to reach SLDC.

5.7 Role of STU

(i) The STU shall be responsible for planning and coordination for development of reliable backbone communication within a State for data communication among State Load Despatch Centres, DISCOM control centres along with Generating Stations in the state, Sub-Stations of STU and other transmission licensees, IPPs, and renewable energy generators within the State system.

(ii) The STU shall also plan redundant communication system up to the nearest Inter-State Transmission System wideband communication node for integration with the inter-State communication system at appropriate nodes.

(iii) The STU shall discharge all functions of planning related to the State backbone communication system in consultation with Central Transmission Utility, State Government and generating companies and distribution companies in the state.

(iv) STU shall also provide access to their wide band Network for grid management and Asset Management by all users.

5.8 Role of Users and Requesters:

(i) The Requesters and Users including renewable energy generators shall be responsible for provision of compatible equipment for un-interrupted communication with the concerned control centres and shall be responsible for successful integration with the

communication system provided by CTU/STU for data communication as per guidelines issued by NLDC.

(ii) Requesters and Users may utilize the available transmission infrastructure for establishing communication up to nearest wide band node for meeting communication requirements from their station to concerned control centres.

(iii) The Users shall also be responsible for expansion /up gradation as well as operation and maintenance of their terminal.

CHAPTER-6

CONCLUSIONS AND RECOMMENDATIONS

6.1 The Task Force discussed various aspects of communication requirement for the power sector in the country and it emerged that adequate communication for the power sector is extremely vital for safe and secure operation of the power system. There is a need for provision of robust, resilient and reliable communication system for the power sector. Judicial mix of communication media needs to be evolved considering the adequacy as well as the cost aspect. Formulation of a perspective plan for communication system for the power sector and its regular review and up gradation assumes critical importance in the context of continuous expansion of the grid, increasing commercial focus and optimal utilization of resources.

6.2 The Task Force noted that its Terms of Reference (ToR) are very exhaustive requiring wide scale discussion with various stakeholders including manufactures, etc. Moreover, a one-time exercise by the Task Force would not suffice, as planning and execution of communication network is an on-going exercise considering the expansion of the grid in terms of new generation plants being connected and new transmission assets being added for evacuation of power. It was, therefore, considered appropriate to have in place a standing arrangement for streamlined planning and execution of communication system for the Power Sector. The views of the Committee in regard to Terms of Reference (ToR) of Task Force are as under:-

(i) **Specifying the principles and procedures which shall be used for planning and development of communication systems in power sector :** The Task Force is of the view that principles may be decided considering the long term as well as redundancy requirement in

respect of communication for the power sector. Task Force is of the view that CEA is the appropriate body for the following:

a) Evolving planning criteria/philosophy for communication system.

b) Framing of technical standards for communication system for power sector.

c) Formulating perspective plan for development of requisite communication system for the power sector. The planning for communication system for power sector needs to be coordinated with planning of transmission system done by CEA so as to achieve optimum utilization of resources. Accordingly, the Task Force has recommended that a Standing Committee for Communication System in Power Sector be constituted by CEA. Task Force is also of the view that CEA may notify technical standards, safety requirements, cyber security requirements, operation and maintenance requirements/protocol for the communication system for Power Sector within the country as well as for integration with the international Grid.

(ii) **Specifying necessary communication system required for transfer/exchange of data, voice and control signals between Generating Stations including Renewable energy sources, Substations, control centres at national, regional, state, area, utility and Discom level :** Task Force is of the view that the mode of communication between various nodes be decided by the Standing Committee on Communication System keeping in view the data volume and the response time requirement. As a General Guideline, it is suggested that all regional substations at or above 132 kV/110 kV level shall be on the fibre optic backbone. Also all new 132 kV and above inter -state lines shall have OPGW.

(iii) **Specify principles of up-gradation, operation & maintenance, resource and cost sharing of data, voice and video, dedicated and reliable communication system for the power sector :** The Task

Force took note of the fact that the principles for cost sharing of communication system for power sector and its operation and maintenance charges are notified by the Central Commission in the terms and conditions of Tariff framed by the Commission from time to time. In so far as the upgradation of communication facilities is concerned, the same may be addressed by the Standing Committee on Communication System duly keeping in view the technological advancements, requirements of power sector as well as the performance of existing communication facilities.

(iv) **Specifying roles & responsibilities of various organizations (CEA, CTU, STUs, POSOCO, and Users etc) & their linkages to facilitate development and smooth operation of Communication Systems in Power Sector :** The roles and responsibilities of various organizations have been specified Chapter-5 herein.

(v) **Specifying Information and Communication requirements for Smart Grid :** Task Force noted that the communication requirements for Smart Grid are extremely vital and they need to be duly considered while finalizing the planning principles.

(vi) **Suggesting measures to address Security of communication systems :** Task Force is of the view that CEA may notify cyber security requirements and protocol for the power sector. NLDC is the appropriate agency to monitor the cyber incidents which may be discussed at RPC level. Non-compliance of cyber security requirements be reported to the Commission by the Member Secretary of RPC.

6.3 Task Force is of the view that broadband ISTS Communication system shall cover the following nodes:

(i) NLDC

(ii) RLDCs

(iii) SLDCs

(iv) 132 kV/110 kV Substations and 132kV/110kV overhead transmission Lines connected to ISTS

(v) All ISGS and Generating Stations connected to ISTS as well as Solar generating plants/ solar parks and wind generation pooling stations connected to ISTS and HVDC stations as required

6.4 In addition to the above, the wideband communication systems may be planned prospectively considering the expected nodes to ensure comprehensive planning for the communication system by the respective agencies and all Grid station including polling stations may be considered for Broad Band Communication system in consultation with Standing Committee to be constituted by CEA.

6.5 The Task Force is of the view that the Solar/ Wind Power Developer needs to provide requisite communication equipments in its plant and ensure availability of data from its plant to the nearest control centre. Accordingly, it should bear the cost of terminal equipment at plant & other end, if required, and shall be responsible for integration of terminal equipment interfacing the communication system of transmission/distribution licensee. Transmission/distribution licensee should provide communication system between RLDC/SLDC/Distribution Control Centre and Solar/Wind pooling stations.

6.6 The Task Force noted that the CERC Office Order dated 22.04.2015 specifying its Terms of Reference proposes to frame a separate regulation on communication system in power sector covering inter alia types of communication system required for CTU, Central Generating Stations, STUs, role and responsibilities of various organizations, time lines, etc. The communication requirements presently specified in the Indian Electricity Grid Code specify that all users, STUs and CTU shall provide system to telemeter power system

parameter. The IEGC also provides that the associated communication system to facilitate data flow up to appropriate data collection point on CTU's system shall also be established by the concerned user or STU as specified by CTU in the connection agreement. Further as per IEGC, user means a person such as a generating company including captive generating plant or transmission licensee (other than central transmission utility and state transmission utility) or distribution license or bulk consumer whose electrical plant is connected to the ISTS at a voltage level of 33 kV and above. Thus the Regulations in regard to communication for power sector can be framed as a separate chapter in IEGC**.** Alternatively, CERC may frame regulations relating to communication system for inter-State transmission of electricity and the SERCs also frame similar regulations in respect of power system within the state. The secretariat of Forum of Regulators may take up the matter so that the SERCs also frame regulations pertaining to communication system for intra-state transmission of electricity.

Annexure-I

CENTRAL ELECTRICITY REGULATORY COMMISSION

3rd&4thFlor,Chanderlok Building,36,Janpath,New Delhi-110001
(Tele No.23353503/Fax.No. 23753923)

No.CERC/Engg./X/TF-CS/2014-15 Dated 22ndApril,2015
OFFICE ORDER

Subject:Task Force for giving input for forming of Draft Regulation on "Communication Systems in Power Sector".

The Central Electricity Regulatory Commission (CERC), in furtherance of the provisions contained in the Regulation No. 4.6.2 of the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010, proposes to frame a separate regulation on Communication System in Power Sector coveri8ng inter alia types of communication system required for CTU, Central Generating Stations, STUs, role and responsibilities of various organizations, time lines, etc.

2. Accordingly, it has been decided to constitute a "Task Force" with the following composition to examine various options, as per "Terms of Reference" in the context and give its recommendations to CERC for evolving draft Regulations on Communication Systems in Power Sector.

1. Smt. Neerja Mathur, former Chairperson, CEA -Chairperson
2. Shri. A. K Saxena, Chief (Engg.), CERC -Member
3. Shri. D. K Jain, Chief Engineer, CEA -Member
4. Representative of POSOCO -Member
5. Representative of CTU -Member
6. One Representative each from the TRANSCOs of -Member
   Gujarat, Assam, Karnataka and Odisha -Member
7. Representative of NTPC -Member
8. Representative of NHPC -Member
9. Representative of Indian Wind Power Association -Member
10. Shri. Vikram Singh, Deputy Chief (Engg.), CERC -Convenor

3. Engineering Division of CERC will provide assistance to the Task Force. Chairperson of the Task Force may co-opt any other expert as per requirement.

4. The Terms of Reference of Task Force inter alia include but not limited to:
   1. Specifying the principles and procedures which shall be used for planning and development of communication systems in power sector.
   2. Specifying necessary communication system required for transfer/exchange of data, voice and control signals between Generating

Stations including Renewable energy sources, Substation, control centres at National, regional, state, area, utility and discom level.

3. Specifying principles of up-gradation, operation & maintenance, resource and cost sharing of data, voice and video, dedicated and reliable communication system for the power sector.
4. Specifying roles & responsibility of various organizations (viz. CEA, CTU, STUs, POSOCO, Users etc) & their linkages to facilitate development and smooth operation of communication in power sector.
5. Specifying information and communication requirements for smart-grid.
6. Suggesting measures to address security of communication systems

5. Task force may complete the work and submit input/recommendations for framing proposed draft regulation within two months from the date of issue of this Order.

Sd/-
(Sushanta K. Chatterjee)
Joint Chief (Regulatory Affairs)

Copy to
Members of the Committee

C C to:

1. Chairperson,CEA- With a request to advise Shri D.K.Jain, Chief Engineer, CEA to participate in the work of Task Force

2. C.O.O, CTU
3. C.E.O, POSOCO
4. MD, GETCO, Gujarat
5. MD, AIGCL, Asam
6. MD, KPTCL, Karnataka
7. CMD, OPTCL, Orissa
8. CMD, NTPC
9. CMD, NHPC
10 Secretary General/Indian Wind Power Association

With a request to nominate a person and provide his contact details including e-mail address within one week from the date of issue of this order

Annexure-II

CENTRAL ELECTRICITY REGULATORY COMMISSION

3rd & 4thfloors,Chanderlok Building, 36,Janpath,New Delhi-11001
Telephone: 011-23753917

No:CERC/Engg./X/TF-CS/2014-15Dated: 18th May, 2015

To

The Members of the Task Force

(As per List Enclosed)

Subject: Minutes of the **First Meeting of Task Force for giving inputs forframing of Draft Regulation on "Communication Systems in Power Sector**

Madam/Sir,

Please find enclosed herewith minutes of the 1st Meeting of the TaskForce for giving inputs for framing of Draft Regulation on "Communication Systems in Power Sector" held in CERC on 08.05.2015.

Yours faithfully,

SD/-

Encl: As above

(Vikram Singh)

Dy.Chief (Engineering)

(Convenor of Task Force)

Members of the Task Force

Sl.No	Name of the Member	Name of the Organization	Designation
1.	Smt. Neerja Mathur	Member,JERC	Ex-Chairperson, CEA
2	Shri AK Saxena	CERC	Chief (Engg.)
3	Shri D.K.Jain	CEA	CE (EI)
4	Shri H.H.Sharan	POWERGRID	Addl. G.M.(LD&C)
5	Shri P.K.Agarwal	POSOCO	AGM
6	Shri Dinkar Devate	NTPC	GM
7	Shri Janardan Choudhary	NHPC	GM
8	Shri Chandrashekharaiah	KPTCL	Executive Engineer
9	Shri C.G.Thakkar,	GETCO	Dy.Engineer,
10	Shri H.K.Samantaray	OPTCL	Sr.G.M.Telecom
11	Shri Hitesh Kakati	AEGCL	AGM
12	Shri A.D.Thirumoorthy	IWPA	Chief Technical Advisor
13	Ms. J.Rexline Terese	TATTRANSCO	Chief Engineer
14	Sh.Atulya Kumar Naik	SECI	Additional GM
15	Shri Vikram Singh	CERC	DC (Engg.)

Minutes of the First Meeting of Task Force for giving input for framing of Draft Regulations on "Communication Systems in Power Sector"

1. First Meeting of Task Force for giving input for framing of Draft Regulations on "Communication Systems in Power Sector" was held at CERC, New Delhi on 8th May, 2015. List of participants is enclosed as ***Annexure-I***.

   Chairperson of the Task Force, Smt. Neerja Mathur, Ex Chairperson, CEA, welcomed the participants. She briefly mentioned the Terms of Reference of Task Force as given below and requested members to give their views:

(i) Specifying the principles and procedures which shall be used for planning and development of communication systems in power sector.

(ii) Specifying necessary communication system required for transfer/exchange of data, voice and control signals between

(iii) Generating Stations including Renewable energy sources, Substations, control centres at national, regional, state, area, utility and discom level

(iv) Specify principles of up-gradation, operation & maintenance, resource and cost sharing of data, voice and video, dedicated and reliable communication system for the power sector

(v) Specifying roles & responsibilities of various organizations (CEA, CTU, STUs, POSOCO, Users etc) & their linkages to facilitate development and smooth operation of communication in power sector

(vi) Specifying Information and Communication requirements for smart-grid

(vii) Suggesting measures to address Security of communication systems.

2. Shri P.K.Aggarwal, AGM, POSOCO was requested to give an overview of telecommunication requirements of power sector. Relying on one of his presentations, he mentioned that communication system is required to control, monitor, protection, data acquisition, metering, maintenance, research and customer interface. The evolution of communication needs for power sector, provision in IEGC regarding requirement of communication system and communication need for major upcoming projects like Unified Real Time Dynamic State Measurement System (URTDSM), National Transmission Asset Monitoring Centres (NTAMC), and Smart Grid were covered in the presentation. Need for reliable communication for various schemes like Special Protection Systems (SPS), System Integrity Protection Schemes (SIPS) and integration of renewable energy into the grid were discussed. Requirement for high speed data transmission network for URTDSM was also underlined.

3. Representative of GETCO of the view that PLCC is most reliable mode of communication for protection system, but it is not so reliable for voice and data communication. Further, as Microwave channels have already been vacated under the directions of Department of Telecommunications, Government of India, more emphasis is now on optical fibre. Representative of POWERGRID informed that it has approximately 30,000 km of optical fiber network and around 4000 km. of OPGW is under implementation. Representative of POWERGRID was of the view that considering the reliability of OPGW and reduced cost of optical fibre, which is about 0.5% to 1.5% of transmission line cost, all new transmission lines of 132 kV and above voltage level should be provided with OPGW. Representative of GETCO mentioned that optical fibre is also required on existing lines so as to get a ring system. It was mentioned that it is possible to do so „on-line" with the help of skilled manpower. Representative of KPTCL mentioned that data requirement below 132 kV voltage level is very low.. NTPC representative wanted the data requirement below 132 kV level to be clarified. CEA representative was of the view that below 132 kV level GPRS or VSAT or ADSS could be used. It was informed that NDPL (Tata Power Delhi Distribution Limited) has also provided OPGW on its 33 kV lines. It was suggested that while laying a new 33 kV line, optical-fiber may be laid along with right of way (ROW). It was also suggested to use All Dielectric Self Supporting (ADSS) Fiber Optic cable for 33 kV lines. POWERGRID was requested to submit the cost data of Transmission lines with and without Fibre Optic Cables. Further the cost data for other modes of communication at different voltage levels of transmission lines may also be provided.

4. While discussing the Bandwidth requirement for various applications, AGM (LD&C), POWERGRID informed that minimum Bandwidth required for RTU would be 64 kbps and for sub-station Automation it would be around 2 Mbps. Chief Engineer(EI), CEA stated that the bandwidth required would depend on application and the type of online terminal equipments used. Representative of KPTCL said that they have a bandwidth of 19.5 MHz in VSAT at a cost of about Rs. 2.5 crore per annum. Representative of GETCO suggested that tele-protection may also be included. He was of the view that in PLCC limited frequency band (45 KHz to 500 KHz) is the main constraint. He added that a good mix of PLCC, Optical Fibre& Satellite Communication on selective basis may be required. He further mentioned that communication standards may specify minimum bandwidth required for different applications. Chief Engineer (EI), CEA was also of the view that standards need to be specified for communication systems for power sector. It was decided that standards shall be framed considering bandwidth requirement as well as all other aspects of communication keeping in view of the future needs of the power sector in the country. It was decided that CEA may be requested to formulate standards in regard to Communication System for power sector. In view of the above, it was proposed that a representative from Load Dispatch & Telecommunication Division (LD&T) of CEA be co-opted as a member of the Task Force. The same was agreed by the Task Force.

5. Representative of AEGCL stated that data and speech communication should have an alternate route to control centres in order to avoid contingency situation. He was of the view that the up -gradation of the communication system should not disturb the existing system. He added that they were using GPRS services, which was giving good performance. He mentioned that performance of any system depends on the type of protocol it uses.

6. Representative of KPTCL stated that Satellite Communication is also useful for rural connectivity. He was of the view that Satellite Communication would also be useful in disaster management, when other communication system fails. He added that Satellite Communication may be provided as back up communication at certain strategic locations. CEA may also consider this aspect for providing back up Communication for disaster / natural calamity while forming the standards.

7. Members also discussed about the need for communication for Smart Grid and integration of renewable energy sources into the grid. IWPA intimated that Suzlon Energy is using optical-fiber communication for wind generators within a wind farm and the same can be integrated into the grid. Representative of IWPA further stated that wind generators in Tamil Nadu were facing a lot of problem and at present they were not having any type of communication system which was leading to problems in their scheduling. Members felt that for integration of renewable energy sources, proper communication facility is required and Tamil Nadu being a State with large amount of wind generation, representative of Tamil Nadu on the Task Force will be helpful in this exercise. It was, therefore decided to co-opt an officer from SLDC of Tamil Nadu as a member of the Task Force. Further, to understand the needs and challenges of communication required for Solar Generation, it was decided to co-opt an officer from Solar Energy Corporation of India (SECI).

8. Regarding specifying the procedure for planning and development of communication system in the country, members were of the view that principles be decided considering long term as well as redundancy requirement for Communication of Power Sector. Representative of OPTCL stated that they have notified the procedure for communication and data transmission. A copy was submitted during the meeting and is same enclosed at ***Annexure-II***. After discussion members were of the view that a Standing Committee on communication, similar to Standing Committee on transmission planning system be set up under the aegis of CEA, with representation from different stakeholders to plan development of the communication system for Power Sector in the country.

9. Representative of OPTCL was of the view that STU/CTU has to incur extra expenses for expansion of data channel in the communication system including Plesiochronous Digital Hierarchy (PDH)/Synchronous Digital Hierarchy (SDH) equipment to take care of new

users/applications increasing data volume and these expenses should be shared. Members were of the view that agency who installs the Communication System also be responsible for integration with the existing system. Members also felt that need for proper maintenance of the Communication System.

10. Representative of GETCO was of the view that if planning is to be done for the next 5 years, life of the communication system should be more than 7 years. Some members were of the view that OFC might have life of 15 years and the life of terminal equipment is shorter period Chairperson requested all the members to communicate their views on the life of communication equipment to Secretariat of the Task Force.

11. After discussion, the following points were concluded:

(i) Representatives from Load Dispatch & Telecommunication Division of CEA, SLDC of Tamil Nadu and Solar Energy Corporation of India were co-opted as members.

(ii) A Standing Committee on Communication System for Power Sector may be formed, under the aegis of CEA to plan development of Communication System for Power Sector.

(iii) CEA may formulate and notify standards for Communication System for Power Sector

(iv) All the members will provide input on Role and Responsibilities of various Organizations as provided in the circulated note.

(v) Representative from GETCO and IPWA will provide a brief write up in regard to data requirements and collection of data from wind farms as well as communication needs for the wind generators.

(vi) Representative of POWERGRID and POSOCO will provide write-up on Communication requirements for Smart Grid

(vii) Representative of NTPC and POWER GRID will provide write-up on Cyber Security

12. All members were requested to provide inputs on any of the issue(s) for consideration of the Task Force by e-mail to Shri Vikram Singh, Deputy Chief (Engg.), CERC at vikramsingh@cercind.gov.in and Shri Ramanjaneyulu, Asst. Chief (Engg.), CERC at ramcerc@gmail.com.

The Odisha Gazette

EXTRAORDINARY

PUBLISHED BY AUTHORITY

No. 485 CUTTACK, THURSDAY, MARCH 29, 2012/CHAITRA 9, 1934

ODISHA POWER TRANSMISSION CORPORATION LIMITED

(A Government of Odisha Undertaking)

Regd. Office: Janpath, Bhubaneswar-751022, Odisha

Procedure on Communication and Data Transmission

(Approved by Hon'ble Odisha Electricity Regulatory Commission vide order, dated 23-09-2011 passed in Case Nos. 41, 42 and 51/2011 followed by corrigendum order issued in letter No. 2243, dated 01-12-2011)

Statement of Object and Reasons:

As per the provisions under Sections 32, 33, 39 & 40 of the Electricity Act, 2003, the SLDC & STU respectively have been assigned many statutory functions and duties. The SLDC being the apex body shall ensure integrated operation of Power System in the State for achieving the maximum economy and efficiency in operation. Similarly, the State Transmission Utility (STU) is required to ensure development of an efficient, co-ordinated and economical system of Intra-State Transmission Lines for smooth flow of electricity from a generating station to the load centers.

In order to achieve the above objectives and to implement the Odisha Grid Code Regulation, 2006 as amended from time to time in an equitable and non-discriminatory manner, the State Transmission Utility (STU) hereby make the following procedure for regulating technical standards for connectivity to the grid and establishment of voice and data communication to SLDC, Bhubaneswar in line with the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and Odisha Grid Code Regulations, 2006.

This is in supersession to the procedure published in the Odisha Gazette No.2162, Dt. 24-12-2010 approved vide theCommission's order, Dt. 20-09-2010 in Case No. 2/2009 and 106/2010.

1. Short title & commencement:

(i) These procedures may be called **"Procedure for Provision of Voice & DataCommunication facilities".**

(ii) These procedures shall come into force on the date of their publication in the Official Gazette.

Definitions:

All the words, phrases, abbreviations etc. shall have the same meaning as provided in the Electricity Act, 2003, Odisha Grid Code Regulations, 2006 and Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007.

2. Responsibility of STU:

The STU shall provide all necessary infrastructures up to all 220kV/132kV grid substations for providing voice and data communication interface points (SCADA interface points).

3. Data Requirement:

The Users/Requesters/Generators including CGPs as provided in OGC who are planning to connect to STS or connected to STS shall have to provide the data relating to voltage, frequency, line flows, status of breaker, isolator position and other parameters as prescribed by the SLDC for effective control of the transmission system and operation of Power System by SLDC.

4. Communication System Requirement:

All the Users/Requesters and Generators including CGPs who are connected to or planning to connect to STS shall provide necessary RTU at their premises and communication channels/facilities up to the nearest 220/132kV S/S of STU (SCADA interface point) as per the recommendation of the STU. However, the Users/Requesters/Generators including CGPs may use the equipments/ communication channels other than those stipulated by the STU provided that they (Users/Requesters/ Generators including CGPs) furnish an undertaking to the effect that they (Users/Requesters/ Generators including CGPs) shall be wholly responsible for fast and reliable voice/data communication to SLDC in the format annexed in the **Schedule-I** to this procedure, soon after getting permission from OPTCL for construction of line/substation to connect with OPTCL network. The undertaking shall be furnished to SLDC.

However, in case the User/Requester elects not to provide the aforesaid communication channels/facility himself in order to avoid the difficulty of provision of communication facility in the requisite mode, the STU may

provide the same at the cost of the Requester/User by getting reimbursed at the beginning of the initial installation and running O&M cost of such communication facility from the User/Requester. In that case the undertaking under ***Schedule-I*** *shall not be required. However, such Users/Requesters shall be responsiblesolely for the availability of required voice/data output at their RTU.*

5. Applicability of the procedure:

This procedure for voice/data communication shall be applicable to all Users/Requesters/ Generators including CGPs intending to connect/already connected with the State Transmission System with contract demand of 5 MVA or more/injection of 5 MW or more. It is further clarified as below:

(1) For 132 connectivity, loads and generators shall be monitored irrespective of capacity.

(2) In order to provide a win-win situation to both SLDC/OPTCL and small generators including CGP (up to 25 MW) connected to STS at 33 kV can be monitored by SLDC through their metering data till establishment of ALDCs. Thereafter ALDC shall monitor them through the available metering data.

(3) The generators (including CGP) and the consumers embedded inside the Distribution System (33 kV) can be monitored through DSOCC. The above two case Nos. (2) and (3) need not be required to communicate their data directly to the nearest SCADA interface point of OPTCL.

6. Authorized person for all official correspondence:

The General Manager, Telecommunication Circle of the STU, Bhubaneswar or any authorized officer of the STU shall act as the Nodal Officer for execution and implementation of this procedure.

7. Submission of application for Voice & Data Communication:

The User upon availing permission of its connectivity to the STS of the STU shall write to the G.M., Telecommunication Circle of the STU, Bhubaneswar for preparation of communication system diagram as well as bill of quantities for provision of voice & data communication to the SLDC. The User is also required to send single line diagram of its substation and generating station well in advance to the G.M., Telecom Circle of STU.

8. Approval of the Communication System:

All the Users and Generators including CGPs who have elected to provide the communication channels/facility themselves, shall adhere to the communication scheme as approved by the G.M., Telecom Circle

of the STU or any authorized officer of STU on its behalf. If any deviation is noticed, the Users have to execute an undertaking as per the provision of the clause-5 above in the format available in the **Schedule-I** of this procedure.

9. Availability of Spares & Test instruments:

It shall be the responsibility of the Users and Generators including CGPs who have elected to provide the communication channels/facilities themselves and are connected to STS to procure & keep sufficient stock of spares as per the recommendation of the STU in consultation with the manufacturers for smooth and uninterrupted operation of voice and data communication system.

10. Periodic Testing of the SCADA system:

All Users and Generators including CGPs who have elected to provide the communication channels/facility themselves shall co-operate with STU for periodic testing of the voice & data communication system as per the recommendation of STU.

11. Direction of STU to the Users:

Notwithstanding anything in this procedure, the direction of STU/SLDC as regard to operation of the voice & data communication system shall be adhered to by the respective Users or Generators including CGPs in the interest of reliable and fast voice and data communication necessary for power system operation.

12. Power to remove difficulties:

Member-Secretary, GCC shall remove operational difficulties arising out of implementation of this procedure.

13. Nodal Officer for adjudicating the dispute:

Member-Secretary, GCC shall be adjudicating authority for any dispute arising in the implementation of this procedure.

14. Penalty for non-compliance of directions:

Each User/Generator including CGPs/Requesters who are connected to STS shall have to pay penalty as per the decision of OERC for non-compliance of directions.

15. Appeal & Limitation:

Any User/Generator including CGPs who are connected to STS may appeal before the Odisha Electricity Regulatory Commission (OERC) against any decision of Member-Secretary, GCC and/or STU/SLDC in

the matter of voice and data communication within three months time from the date of communication of such decision.

HEMANT SHARMA
Chairman-*cum*-Managing Director

Recommendations of representative of TPDDL in regard to communication system for Discoms:

a) Fiber network (OPGW &underground OFC) for core and a combination of RF mesh, PLC and VAST/Cellular technologies, depending on consumer density and geo-graphical conditions.

b) Use of Packet Technology Network for Core for handing huge amount of data being generated by Smart Grid applications like AMI ensuring deterministic prioritization of mission critical services.

c) Interoperable and standard based RF-mesh network for last mile connectivity.

d) Interoperable and standard based PLC network for remote and slum areas.

e) Use of P2P RF links or VSAT as a feedback arrangement for mission critical services.

Annexure-IV

CENTRAL ELECTRICITY REGULATORY COMMISSION

3rd & 4thfloors, Chanderlok Building, 36,Janpath,New Delhi-11001

Telephone: 011-23753917

No:CERC/Engg./X/TF-CS/2014-15 Dated: 22nd July, 2015

To

The Members of the Task
Force (As per List Enclosed)

Subject: Minutes of the **2ndMeeting of Task Force for giving inputs for framingof Draft Regulation on "Communication Systems in Power Sector**

Madam/Sir,

Please find enclosed herewith minutes of the 2nd Meeting of the Task Force for giving inputs for framing of Draft Regulation on "Communication Systems in Power Sector" held in CERC on 06.7. 2015.

Yours faithfully,

SD/-
(Vikram Singh)
Dy.Chief (Engineering)
(Convenor of Task Force)

Encl: As above

Members of the Task Force

Sl.No	Name of the Member	Name of the Organization	Designation
1.	Smt. Neerja Mathur	Member,JERC	Ex-Chairperson,CEA
2	Shri AK Saxena	CERC	Chief (Engg.)
3	Shri D.K.Jain	CEA	CE (EI)
4	Shri H.H.Sharan	POWERGRID	Addl. G.M.(LD&C)
5	Shri P.K.Agarwal	POSOCO	AGM
6	Shri Dinkar Devate	NTPC	GM
7	Shri Janardan Choudhary	NHPC	GM
8	Shri Chandrashekharaiah	KPTCL	Executive Engineer
9	Shri C.G.Thakkar,	GETCO	Dy.Engineer,
10	Shri H.K.Samantaray	OPTCL	Sr.G.M.Telecom
11	Shri Hitesh Kakati	AEGCL	AGM
12	Shri A.D.Thirumoorthy	IWPA	Chief Technical Advisor
13	Ms. J.Rexline Terese	TATTRANSCO	Chief Engineer
14	Sh.Atulya Kumar Naik	SECI	Additional GM
15	Shri Vikram Singh	CERC	DC (Engg.)

CENTRAL ELECTRICITY REGULATORY COMMISSION, NEW DELHI

Minutes of the 2nd Meeting of Task Force for giving input for framing of Draft Regulations on "Communication Systems in Power Sector"

Second meeting of Task Force for giving input for framing Draft Regulation on "Communication System in Power Sector" was held at CERC, New Delhi on 6th July,2015. List of participants enclosed as **Annexure-1.**

1. Chairperson of the task force Ms. Neerja Mathur, welcomed the participants. It was mentioned that co-opted members from TANTRANSCO and SECI were also present. Chief (Engg.) CERC expressed pleasure in finding that representative from Tata Power Delhi Distribution limited (TPDDL), who on its own purused the minutes of the first meeting of the Task Force available on the CERC Website and desired to share their experience with the group. He welcomed representative from TPDDL as a special invitee.

2. Chairperson elucidated the highlights of last meetings and requested members to furnish their views on the requirement of communication systems for various applications and draft Regulations circulated. She recapitulated the terms of reference and discussion held during the last meeting. She recalled that during the last meeting POWERGRID was requested to submit the cost data of transmission lines with and without fiber optic cables.

3. Representative of POWERGRID stated that the cost of OFC has come down drastically and at present it is around Rs.1.5 Lakh per km. In respect of PLCC, the cost involved is towards outdoor equipment and irrespective of length of the line cost remains same. He was of the opinion that for lines shorter than 25 km, optical fiber option is economical than PLCC.

4. KPTCL was of the view that PLCC should be kept for protection purposes. Chief Engineer (EI), CEA was of the view that it may be left to the utility to choose a particular system for data, voice and protection.

5. Representative of TANTRANSCO stated that they are only using Optical Fiber and are providing OPGW on all lines and have dispensed with use of PLCC.

6. Representative of TPDDL was of the view that present communication system provided for Delhi Discoms has become obsolete. SDH equipment was provided in 2007 and with technological obsolescence OEM support did not exist. They, therefore, took-up-up gradation with DERC without any regulation or standards on communication system, it was very hard for a utility to convince Appropriate Commission for up-gradation/ replacement of old

communication system.

7. The representative of Indian Wind Power Association (IWPA) was of the view that cost for providing communication system from plant to control center should be borne by the utility. Further SLDC should ensure the integration of data from plant to Control Center. Giving the rough estimate of the cost involved , the representative of IWPA stated that the one time cost would be around Rs. 2 lakhs for less than 10 MW Wind Turbine and Rs. 3 lakhs for more than 10 MW Wind Turbine. He was also of the view that cyber security is important and there is need for standards for cyber security and its compliance.

8. Representative of Solar Energy Corporation India (SECI) was of the view that provision of redundancy should be there in the communication system. The communication system should be cost effective. Solar Power Developer may bear the cost of RTU and communication channel till Area SLDC, however equipment may have to be provided by the State utility. The cost should not be loaded on to a trader. Chief (Engg.) CERC was of the view that it is the responsibility of the Solar Power Developer (SPD) to ensure availability of data from plant to the nearest control center and the SPD should also bear its cost.

9. Representative of Karnataka Power Transmission Corporation Ltd. (KPTCL) was of the view that in broader aspect, an STU needs to develop communication infrastructure for the State. In so far as wind generator is concerned, STU may provide SCADA upto the pooling point, which is also the billing point. The generator needs to bear the cost incurred by STU for providing the communication infrastructure.

10. Chief Engineer, CEA pointed out that since Karnataka has developed SCADA up to 11 kV; it is easier for Karnataka to integrate RE generators up to 11kV. However, other States have not developed the infrastructure hence it will be difficult for them.

11. Representative of TPDDL gave a presentation on the communication system in TPDDL. He explained TPDDL network architecture and various technological options for network up-gradation and the challenges faced during the up-gradation. He opined that fiber network for WAN network is the best solution. For last mile connectivity combination of RF mash, PLC and VSAT/Cellular Technology, may be adopted depending on consumer density and geographical condition.

    TPDDL was of the view that packet technology network for Core for handling huge amount of data should be provided. Interoperable and standard based PLC network may be used for remote and slum areas and P2P RF link or VSAT as a fall back arrangement for mission critical services may be provided. A

copy of the presentation is placed at Annexure-2.

12. Members also discussed draft Regulations. It was noted that POWERGRID, GETCO, KPTCL, OPTCL and NTPC have submitted comments on the draft Regulations after the first meeting.

13. Members of the view that life of optical fiber may be kept 15-20 years however the life for terminal equipment should not be more than 7 years.

14. POWERGRID stated that 'user' needs to be defined in the draft Regulations. It was pointed out that definition is already given at 2(bb). Chief (Engg.) CERC stated that the draft Regulations are for ISTS, 'Voltage level 33 kV and above' given in the definition may be deleted. KPTCL and GETCO were of the view that state network should also be covered by the Regulations. It was clarified that the report of the Task Force may bring out such communication requirement including smart grid requirement. The State Electricity Regulatory Commissions may eventually frame communication Regulation for the respective State.

15. It was decided that definitions given under Section-2 may be checked/verified with respect to Act 2003, and CERC Regulations and the same, if provided therein, shall be used in these Regulations also. More related definitions may also be included.

16. In the objectives under Section-3, tele protection, audio-visual/video conferencing may be added. In the scope under Section-4, applicability shall be added.

17. Under Section-5, members discussed roles and responsibilities of various agencies. It was decided that sequencing of the agencies given the draft may be changed in a hierarchal manner, starting from CEA followed by CTU, RLDC, and so. Members were of the view that CTU at the Center and STU at the State level is only responsible for planning and coordination, whereas an ISTS licensee owning the transmission system shall establish the communication system. Further, members were of the view that one agency may be made responsible for ensuring cyber security. It was also decided that the CEA standards for communication system need to cover the cyber security aspect as well.

18. In the role of user under Section-6.4, NHPC representative was of the view that it would be difficult for the user to integrate its communication system with the communication pooling point, terminal equipment of load dispatch center and NHPC is facing problem particularly when CTU system comes in series with STU system. NHPC representative was of the view that CTU or RLDC should be responsible for such integration. Chief Engineer, CEA clarified that the user should integrate its system at interconnection point

and thereafter the communication system provider (transmission licensee) should take care. NLDC may frame guidelines on interfacing requirements for the communication system which should be followed by all users, ISTS licensee, SLDCs and RLDCs for seamless integration.

19. GETCO was of the view that there should be a communication model which can be applied to any STU network. It was agreed that the specific choice of the mode of communication may not be specified in the regulation but the availability of adequate communication is mandatory.

20. At the end of the discussion while emphasizing the cyber security requirement, perceived threats and protection in the Power transmission and Communication sector, Chairperson urged all the participants to give their suggestion with reference to terms of references of the Task Force so that draft regulations could be finalized with clear perceptions of the present and upcoming trends in the Communication system in Power sector. Presently draft regulation is prepared with the CERC purview. Chairperson decided that the draft Regulations needs to be modified based on the discussion and requested Sh. C.G. Thakkar, GETCO, Sh. H.H. Sharan, POWERGRID and Sh. P.K. Agarwal, POSOCO to assist Sh. Vikram Singh, the member convener, in modifying the draft Regulations and preparation of report of the Task Force. She also requested Sh. Sanjay Banga, TPDDL to provide input on the topic of cyber security and smart grid.

21. She also requested other members to give their inputs on draft Regulations as well as Terms of Reference of the Task Force to the member convener for preparation of the report.

Meeting ended with Vote of thanks to the Chair.

Annexure-V

Inputs for framing draft Regulations

CENTRAL ELECTRICITY REGULATORY COMMISSION

NEW DELHI

The CERC (Communications System for inter-State transmission of electricity) Regulations, 2015" is made by the Central Commission in exercise of powers under Section 178 of the Electricity Act, 2003. The regulation lays down the rules, guidelines and standards to be followed by various persons and participants in the system for continuous availability of data for system operation and control including market operations. These Regulations deal with the planning, implementation, operation & maintenance and up gradation of reliable communication system for all communication requirements including exchange of data forinter-State transmission of electricity.

NOTIFICATION (DRAFT) No._____.-In exercise of the powers conferred under Section 178 of the Electricity Act, 2003 (36 of 2003), and all other powers enabling it in this behalf the Central Electricity Regulatory Commission hereby makes the following regulations, namely:

1. SHORT TITLE AND COMMENCEMENT:

(i) These regulations may be called the Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2015.

(ii) These regulations shall come into force on the date of their publication in the official Gazette **(date to be inserted at the time of final regulations).**

2. DEFINITIONS AND INTERPRETATIONS:

(i) In these regulations, unless the context otherwise requires,-

a) "Act" means the Electricity Act, 2003 (36 of 2003) as amended from time to time;

b) "Ancillary Services" means in relation to power system (or grid) operation, the services necessary to support the power system (or grid) operation in maintaining power quality, reliability and security of the grid e.g. active power support for load following, reactive power support, black start, etc.;

c) "Associated communication system" means a communication system associated with a project set up for exchange of voice/video data with load despatch centre as per IEGC.

d) "Commission" means the Central Electricity Regulatory Commission referred to in sub-section (1) of section 76 of the Act;

e) "Central Transmission Utility" means any Government company which the Central Government may notify under sub-section (1) of section 38;

f) "Communication System" is a collection of individual communication networks*, , relaying stations, tributary stations, terminal equipment usually capable of interconnection and interoperation to form an integrated whole. It also includes existing communication system of Inter State Transmission System, Satelliteand Radio Communication System and their auxiliary power supply system etc. used for regulation of inter*-state transmission of electricity;

g) "Communication network" means a combination of media from one node to another node, either directly or through intermediary node(s);

h) "Data" means is a set of values of analogue and digital signal including a text, voice, video, tele-protection, alarm, and weather, parameter of a machine or the power system.

i) "Date of Commercial Operation" or COD means the date declared by the communication system provider from 0000 hour of which the

Communication system or element thereof is put into regular service after completion of site acceptance test including transfer of voice, video and data to respective control centre as certified by the respective Regional Load Despatch Centre.

Provided that in case an element of communication system is ready for use for regular service but is prevented from providing such service for reasons not attributable to the communication system provider, its supplier or contractor, the Commission may approve the date of commercial operation prior to the communication system coming into regular service.

j) Forecasting Service Provider (FSP) means a service provider who provides forecast related to weather/Renewable Energy Resources and Demand for use of Users.

k) “Generating station” means a generating station as defined in Clause 2 (30) of the Act.

l) “Grid Code” means the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 as amended from time to time or subsequent re-enactment thereof.

m) "Inter-State transmission system" means the ISTS as defined in clause 2 (36) of the Act.

n) “Meter” means a device suitable for measuring, indicating and recording consumption of electricity or any other quantity related with electrical system and shall include, wherever applicable, other equipment such as Current Transformers (CT), Voltage Transformer (VT) or Capacitor Voltage Transformer (CVT) with necessary wiring and accessories.

o) "National Load Despatch Centre" means the Centre established under sub- section (1) of section 26 of the act;.

p) “Operation and maintenance expenses” or “O & M expenses” means the expenditure incurred on operation and maintenance of the

communication system, or part thereof, and includes the expenditure on manpower, repairs, spares, consumables, insurance and overheads;

q) “PMU” (phasor measurement Unit): means a device which provides phasor information (both magnitude and phase angle) for one or more three phase AC voltage or current waveforms in real time.

r) "Real time operation" means action to be taken at a given time at which information about the electricity system is made available to the concerned Load Despatch Centre;

s) “Real time data” denotes information relating to current operating state of power system in accordance with system operation and control requirements.

t) “Regional Load Despatch Centre" means the Centre established under sub- section (1) of section 27 of the act;

u) “Remote Terminal Units” (RTU) means a device suitable for measuring, recording storing the consumption of electricity or any other quantity related with electrical system and status of the equipment in real time basis and exchanging such information with the data acquisition system for display and control and shall include, wherever applicable, other equipment such as Transducers, relays with necessary wiring and accessories.

v) “Requester” means a person such as a Generating Company including Captive Generating Plant, RE Generator or Transmission Licensee (other than the Central Transmission Utility and State Transmission utility) or Distribution Licensee or Bulk Consumer, whose electrical system is proposed to be connected to the ISTS :

w) “State load despatch centre(SLDC)” means the centre established under subsection (1) of section 31 of the Act;

x) “State Transmission Utility” means the board or the government company specified as such by the state government under sub-section (1) of section 39 of the Act;

y) "Supervisory/system control and data acquisition (SCADA)" means a system of remote control and telemetry used to monitor and control the transmission system. (source:- Glossary of Terms Used in NERC Reliability Standards Updated May 19, 2015)

z) "System operation function" includes monitoring of grid operations, supervision and control over the Inter-State Transmission System, real-time operations for grid control and dispatch, system restoration following grid disturbances, compiling and furnishing data pertaining to system operation, congestion management, black start coordination and any other function(s) assigned to the RLDC by the Electricity Act 2003 or by CERC regulations and orders; (as defined in RLD fee and charges Regulations)

aa) "Users" means a person such as a Generating Company including Captive Generating Plant, RE Generator or Transmission Licensee (other than the Central Transmission Utility and State Transmission utility) or Distribution Licensee or Bulk Consumer, whose electrical system is connected to the ISTS.

3. Save as aforesaid and unless repugnant to the context or the subject-matter otherwise requires, words and expressions used in these regulations and not defined, but defined in the Act, or the Grid Code or any other regulations of this Commission shall have the meanings assigned to them respectively in the Act or the Grid Code or any other regulations.

GENERAL

INTRODUCTION:

4. OBJECTIVE:

The CERC (Communications System for inter-State transmission of electricity) Regulations, 2015" provide for planning, implementation, operation & maintenance and up-gradation of reliable communication system for all communication requirements including exchange of voice, video, data and tele-protection for inter-State transmission of electricity.

5. SCOPE & APPLICABILITY:

These regulations, after they come into force, shall apply to the communication infrastructure to be used for voice, video and data communication and tele-protection for the power system.

All Users, SLDCs, RLDCs, NLDC, CEA, CTU, STUs, RPCs, Renewable Energy Management Centre (REMC), FSP and Power Exchanges shall abide by the principles and procedure defined in the Communications Regulations in so far as they apply to that party.

6. NODAL AGENCY:

(i) The nodal agency for planning, and coordination for development of communication system for ISTS shall be the Central Transmission Utility (CTU).

(ii) The nodal agency for planning, and coordination for development of communication system for intra state transmission system shall be the State Transmission Utility (STU).

(iii) Nodal agency for integration of communication system with SCADA, WAMS, VCS, AMR, EPABX, Tele-protection system shall be respective RLDC for ISTS and SLDCs for intra-state system.

7. ROLE & RESPONSIBILITIES OF VARIOUS ORGANIZATIONS AND THEIR LINKAGES:

7.1 Role of CEA

(i) CEA shall formulate communication planning criterion/ philosophy and guidelines for development of reliable Communication system for power system, duly considering requisite redundancy as well as requirements of smart grid and cyber security.

(ii) CEA shall notify a Standing Committee for Communication System in Power Sector which shall prepare a perspective communication plan duly considering optimal utilization of transmission assets for communication purposes. The Standing committee shall also carry out periodic review of the perspective plan. The aforesaid Standing Committee shall prepare the perspective plan for communication system for power sector in due consideration of the transmission planning carried out by CEA through Standing Committee on Power System Planning.

(iii) CEA shall formulate and notify technical standards, cyber security requirements, protocol for the communication system for Power Sector within the country including the grid integration with the neighbouring country's grid.

(iv) Standing Committee on communication system shall also monitor and facilitate timely completion of schemes and projects for improving and augmenting the communication system along with transmission system in the power sector.

7.2 Role of CTU

(i) The CTU shall/ in due consideration of the planning criteria/philosophy and guidelines formulated by CEA, be responsible for planning and coordination for development of reliable national backbone

communication system among National Load Ddespatch Centre(s), Regional Load Despatch Centre(s) and State Load Despatch Centre(s) along with Central Generating Stations, ISTS Sub-Stations, UMPPs, Inter-state generating stations, IPPs, renewable energy sources connected to the ISTS, Centralised Coordination/Control Centres for generation and transmission.

(ii) CTU shall also plan communication up to the national boundary for integration with the communication system forcross borderexchange of power.

(iii) CTU shall integrate communication planning with transmission and generation project planning in a comprehensive manner.

(iv) The CTU shall discharge the above function in consultation with the CEA, State Transmission Utilities, ISGS, IPPs, Regional Power Committees,NLDC and RLDCs.

7.3 Role of RPC:

The RPC Secretariat shall monitor instances of non-compliance of CERC (Communication System for Inter-State Transmission of Electricity) Regulation, 2016 as amended from time to time and try to sort out issues in the respective region in such a way that cases of non compliance are prevented in future. Unresolved issues and non-compliance of these Regulations shall be reported by the Member Secretary of RPC to the Commission.

7.4 Role of NLDC:

(i) The National Load Despatch Centre (NLDC) shall prepare and issue guidelines on the interfacing requirements in respect of terminal

equipment, RTUs, SCADA, PMUs, Automatic Generation Control (AGC), AMI, etc, and for data communication from the User's point to the respective control centre(s) based on technical standards issued by CEA as mentioned in para 5.1 herein earlier. Till the time technical standards are framed by CEA, NLDC shall adopt necessary standards.

(ii) The National Load Despatch Centre shall be responsible for integration of the Communication system at NLDC end for monitoring, supervision & control of Power System and data adequacy in real-time.

7.5 Role of RLDC:

(i) The Regional Load Despatch Centre shall be nodal agency for integration of Communication System at RLDC end for monitoring, supervision & control of Power System and adequate data availability in real time.

(ii) RLDC shall be the Nodal Agency for supervision of integration of communication system in respect of ISTS and for requisite coordination to enable all the data to reach RLDC.

7.6 Role of SLDC:

(i) The State Load Despatch Centres shall be nodal agency for integration of Communication System in the STU network and shall be responsible for interfacing the telemetry system at SLDC end for monitoring, supervision & control of Power System and data adequacy in real time.

(ii) SLDC shall be the Nodal Agency for supervision of integration of communication system in respect of intra-State transmission system and for requisite coordination to enable all the data to reach SLDC

7.7 Role of STU

(i) The STU shall be responsible for planning and coordination for development of reliable backbone communication within a State for dat

communication among State Load Despatch Centres, DISCOM control centres along with Generating Stations in the state, Sub-Stations of STU and other transmission licensees, IPPs, and renewable energy generators within the Statesystem.

(ii) The STU shall also plan redundant communication system up to the nearest Inter-State Transmission System wideband communication node for integration with the inter-State communication system at appropriate nodes

(iii) The STU shall discharge all functions of planning related to the State backbone communication system in consultation with Central Transmission Utility, State Government and generating companies and distribution companies in the state.

(iv) STU shall also provide access to their wide band Network for grid management and Asset Management by all users.

7.8 Role of Users and Requesters:

(i) The Requesters and Users including renewable energy generators shall be responsible for provision of compatible equipment for un-interrupted communication with the concerned control centres and shall be responsible for successful integration with the communication system provided by CTU/STU for data communication as per guidelines issued by NLDC.

(ii) Requesters and Users may utilize the available transmission infrastructure for establishing communication up to nearest wide band node for meeting communication requirements from their station to concerned control centres.

(iii) The Users shall also be responsible for expansion /up gradation as well as operation and maintenance of their terminal.

8. BOUNDARY OF THE ISTS COMMUNICATION SYSTEM

8.1 ISTS Communication system shall cover the following nodes:

(i) NLDC

(ii) RLDCs

(iii) SLDCs

(iv) 132 kV/110 kV Substations and 132kV/110kV overhead transmission Lines connected to ISTS

(v) All ISGS and Generating Stations connected to ISTS as well as Solar generating plants/ solar parks and wind generation pooling stations connected to ISTS and HVDC stations as required

8.2 In addition to the above, the wideband communication systems shall be planned prospectively considering the expected nodes to ensure comprehensive planning for the communication system by the respective agencies and all Grid station including polling stations may be considered for Broad Band Communication system in consultation with Standing Committee to be constituted by CEA.

9. ACCESS TO COMMUNICATION SYSTEM:

Access to the communication system shall be allowed to the requester in line with the standards and guidelines issued under the Regulations

10. PERIODIC TESTING OF THE COMMUNICATION SYSTEM:

(i) All users that have provided the communication systems shall facilitate by for periodic testing of the communication system as per the standards and guidelines issued under these regulations.

(ii) Testing process for communication network security should also be included even for third party system if exists.

11. FAULT REPORTING:

(i) RLDC and SLDC in case of outage of telemetered data, or communication failure shall inform the respective user so that the user can lodge complaints for failure of the communication to the communication system owner for quick restoration.

(ii) The communication provider shall explore the possibility for route diversion on the existing facility in case the fault restoration is prolonged. No separate charges shall be paid for such route diversion or channel re-allocation. However such rerouting shall be discontinued once the original channel restored.

12. COMMUNICATION SYSTEM AVAILABILITY:

The owner of communication system shall maintain the channel availability up to 99.9%.

13. CYBER SECURITY:

(i) Communication infrastructure shall be planned, designed and executed to address the network security needs as per standard specified by CEA.

(ii) NLDC, shall monitor case of cyber security-incidences and discuss them at RPC level and take necessary action as deemed fit.

14. GUIDELINES TO BE ISSUED BY NLDC

(i) Subject to the provisions of these regulations, NLDC shall submit the Guidelines for Interfacing Requirement, calculation of availability of the Communications systems etc to the Commission for approval within 60 days of notification of these regulations in the Official Gazette:

Provided that prior to submitting the guidelines to the Commission for approval, NLDC shall make the same available to the public and invite

comments by putting the draft on its website and giving a period of one month to submit comments;

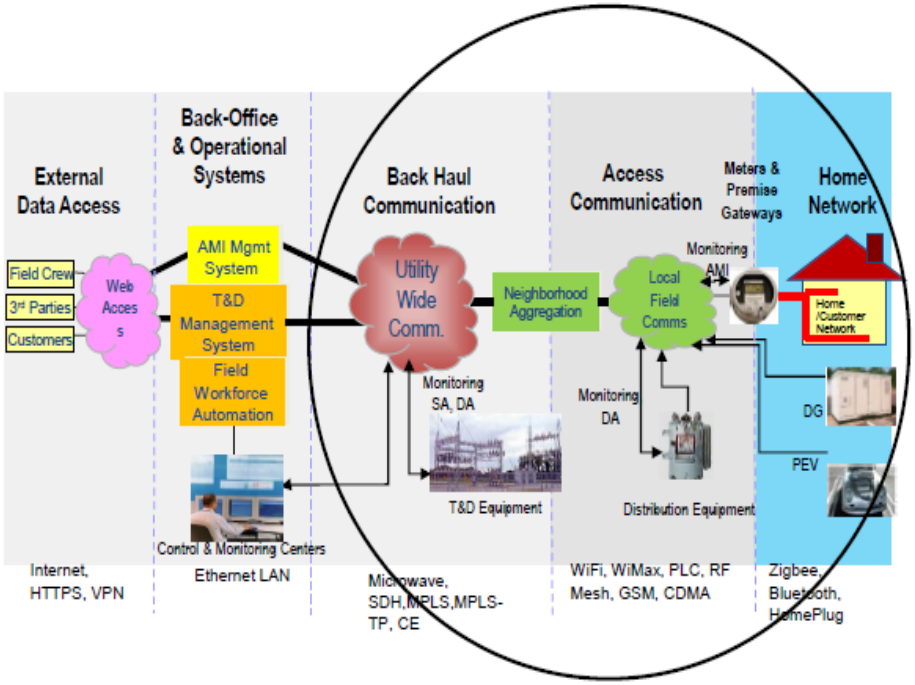
Provided further that while submitting the detailed procedure to the Commission, NLDC shall submit a statement indicating as to which of the comments of stakeholders have not been accepted by it along with reasons thereof.

15. POWER TO RELAX

The Commission may by general or special order, for reasons to be recorded in writing, and after giving an opportunity of hearing to the parties likely to be affected by grant of relaxation, may relax any of the provisions of these regulations on its own motion or on an application made before it by an interested person.

Exhibit – I

Integrated Communications architecture for Utilities



Traffic and Capacity Requirements

Considering 100% substation participation with fully loaded DA, AMI/HAN and IT Data Centers; the aggregate traffic during peak hours approaches 10 Gbps in Core ring – existing bandwidth capacity is inadequate. Summarization of different traffic

Applications	Bandwidth per Grid Substation (Mbps)*	Bandwidth per Data Center (Mbps)
IT - Enterprise	100	
Security Solution	87.4	
Grid OT	2.0	
Distribution Automation (DA)	0.60	
Automated Metering Infrastructure (AMI)	0.233	
Home Area Network (HAN)	1.25	
Data Center	-	1000
Total	191.5	1000

Total bandwidth requirement = (Number of Grids × Bandwidth required per Grid) + (Number of Data Centers × Bandwidth required per DC) = (100 × 191.5 Mbps) + (2 × 1,000 Mbps) = (19,150 + 2,000) Mbps = 21,150 Mbps.

As per best practice (HUB & SPOKE practices) only 40 to 50% of total HUB bandwidth (i.e. around 10 Gbps) will be used.

TATA POWER-DDL

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power to the people