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PUBLIC NOTICE

PCD Division, Central Electricity Authority (CEA) proposes to publish guidelines namely "Manual of Communication Planning in Power System Operation". All the Stakeholders including the public are requested to send their comments on the draft Manual to Chief Engineer (PCD), Room No. 310, 3rd Floor, NRPC Building, 18A Shaheed Jeet Singh Marg, New Delhi-110016 by post or through e-mail [nbnareshbhandari@gmail.com] latest by 15th June, 2019.

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MANUAL OF COMMUNICATION PLANNING IN POWER SYSTEM OPERATION

Central Electricity Authority
Ministry of Power

PREAMBLE

Manual on transmission planning criteria was brought out by CEA in 1985 setting the planning philosophy of regional self-sufficiency and subsequently revised in January 2013 after enactment of Electricity Act – 2003. The communication network though was getting developed with the installation of OPGW, and a separate communication network could be established for the secure Power System Operation, but there was no consolidated planning being carried out in a coordinated manner which led to uncertainties and un-reliabilities of communication availability.

The Electricity Act, 2003 has brought profound changes in electricity supply industry of India leading to unbundling of vertically integrated State Electricity Boards, implementation of Open Access in power transmission and liberalization of generation sector. The phenomenal growth of private sector generation and the creation of open market for electricity have brought its own uncertainties. Large numbers of generation projects are coming up with no knowledge of firm beneficiaries. The situation is compounded by uncertainty in generation capacity addition, commissioning schedules and fuel availability. With the increasing complexities in the grid and with increasing integration of renewables and distributed generation, it is desired that the communication system should be planned in a coordinated manner to achieve the desired performance and should provide sufficient reliability.

Reliable communication planning is required to have a communication system which is future ready coping up with the advancement in the technology in communication and also with the requirement of robust communication system in power sector. Presently there is no widely adopted guidelines which determines the criteria for communication planning with acceptable reliability service as well as network security & safety. The communication planning criteria has considered the core theme of providing **“Reliability cum Performance”.**

CONTENTS

MANUAL OF COMMUNICATION PLANNING IN POWER SYSTEM OPERATIONS

1. SCOPE

1.1 Central Electricity Authority under section 73(a) of Electricity Act 2003 is responsible to formulate short term and perspective plans for development of electricity system and coordinate the activities of planning agencies for optimal utilisation of resources. Accordingly, CEA has been preparing transmission perspective plans. On the lines of transmission planning, the Central Transmission Utility (CTU) is responsible for development of an efficient and coordinated communication system on regional basis which are getting connected to provide a backbone communication system spread across India. Similarly, the State Transmission Utility (STU) is responsible for development of an efficient and coordinated communication system within the State. The Central and Intra-State communication systems are interconnected, and together constitute an integrated communication network for power system operation. It is, therefore, imperative that there should be a uniform approach to communication planning for developing a reliable communication system.

1.2 The planning criteria detailed herein are for planning of communication system required for power system operation at National / Regional / State / Distribution level.

2. APPLICABILITY

2.1 These planning criteria shall be applicable from the date it is issued by Central Electricity Authority i.e. _____.

2.2 These criteria shall be used for all new communication systems being planned after the above date.

2.3 The existing and already planned communication systems may be reviewed with respect to the provisions of these planning criteria. Wherever required and possible, additional system may be planned to strengthen the system. Till implementation of additional communication system, suitable backup communication system may be put in place.

3. PLANNING PHILLOSOPHY AND GENERAL GUIDELINES

3.1 The communication system is one of the main pillar for successful operation of a control centre and functioning of smart grid tools. Communication system provides “communication service” to all the generators, transmission licensees, distribution licensees and power exchanges in power system operation. In Indian Power System, the communication is broadly classified as Regional Communication system, Intra-State Communication system and Distribution communication system. While the regional and trans National communication system is operated and maintained by CTU, the State Communication system is maintained by STU and respective DISCOMs are maintaining their communication system. Users are responsible for maintaining their respective communication system upto the respective communication interface point to ensure communication required for exchange of information. However, these communication systems are not always connected or planned in a

coordinated manner with uniform approach. Therefore, the criteria prescribed here are intended to be followed for planning the Central, State and Distribution level communication.

3.2 The communication system is generally augmented / expanded to cater to the requirement of the new users and additional requirement of the existing users due to requirement of multiple communication channels with higher bandwidth for implementation of new facilities for the power system operation requirement.

3.3 Users, who are getting connected to the existing communication system require to support communication service to make the real time data telemetry and voice communication available to the respective control centre; and to provide special power system protection, if envisage. There is also sometimes requirement of video communication for remote monitoring and conference purposes.

3.4 Users shall give their communication channel requirement along with the required interface at interconnecting points well in advance considering the expected implementation of their assets. However, the planning shall be done based on future requirement, considering CEA's perspective plans for transmission and distribution.

3.5 Planning of communication system shall be done to develop a backbone communication network on all India basis having sufficient redundancy with route diversity.

3.6 In case of highly constrained area, difficult terrain, congested and polluted urban area, the communication corridor shall be planned by taking long term perspective of optimising the right of way, taking care of environment from equipment safety point of view. This may be done by adopting cables with more no. of fibres, higher order terminal equipment and link with higher bandwidth.

3.7 When CTU or Power Utility lay fibre at transmission network of the state power utility or construct transmission line passing through substations of the state power utility, then provision shall be made to share the fibre (s) with the concerned state power utility. The number of fibres to be shared and other modalities would be based on mutual agreements.

3.8 CTU shall act as nodal agency for the communication planning on Regional and National basis whereas STU shall act as nodal agency for Intra-State Communication planning. CTU shall coordinate with STU for coordinated development of a communication network on all India basis to cater to the requirements of Power System Operation.

3.9 The interfacing between two communication networks i.e. DISCOM with STU and STU with CTU shall be done atleast at two points so as to establish a ring connectivity to ensure redundancy of communication between these two networks. However, efforts shall be made to have multiple connectivity, if feasible, to establish a robust communication system for reliability in case of multipoint failure.

3.10 Interfacing between two networks may be either at fibre level, if spare redundant fibres are available at the interface points or at 'service level' with sufficient bandwidth to cater to the future requirements of both the networks being connected at the interconnecting points.

3.11 Cyber security shall be ensured while establishing interfaces between two networks of two different entities like DISCOMs, STUs and CTU. The cyber security shall also be ensured while connecting a new user to the existing communication system.

3.12 Normally, the communication system thus setup shall be used by the Users getting connected to the communication system and in such case the concerned user shall approach concerned nodal agency, CTU/STU, for providing the connectivity to the existing communication network along with the details requirement related to bandwidth, nos. of communication channels between nodes and route diversity required by them at interconnecting points, considering atleast 10 years' development.

3.13 The availability of bandwidth required by the applicants shall be examined by the concerned nodal agency before allowing the connectivity to the existing communication network / system. Any up-gradation for the existing node and the existing network shall be implemented by the nodal agency to take care of the reliability (with route diversity and path protection) of the allocated communication. However, in case of radial connectivity to the existing node, the applicant shall develop their own redundant communication system up to the existing broadband node.

3.14 The system shall be planned to operate with acceptable response time. The reliability shall be provided with sufficient protection path and introducing route diversity while allocating the communication channel / bandwidth. The response time shall be as per the Technical Communication Standards approved by the Authority and updated time to time.

3.15 Following options may be considered for strengthening the communication network. The choice shall be based on cost, reliability, right of way requirement (for UG cable and other physical path), downtime, etc.

- Addition of new nodes with higher multiplexing capability to support higher bandwidth
- Upgradation of existing node capability / terminal equipment.
- Replacement of existing terminal equipment with higher capacity
- Replacement of physical media (FO cables, etc.) to have more no. of fibre to remove the restrictions
- Establish a parallel route to relieve congestion
- Establish a separate path for provision of protection path
- Seamless integration with existing communication system/NMS

3.16 The communication system shall be planned for 100% redundancy with path diversity and implemented with required protection path for National LDC, Regional LDC, State LDC, Discom LDC, REMC and Power Exchange.

3.17 Critical generating plant connected to 66kV and above, and substations and pole mounted station at 11kV and above shall be planned for 100% redundancy, and as far as possible with path diversity, and implemented in coordination with CTU/STU.

3.18 Appropriate communication system shall be planned for the new substations and generating stations in advance by the respective nodal agency so that the implementation could be completed by CTU / STU / Users before first time charging / commissioning of their Power Stations / Substations.

3.19 Upgradation of the communication system shall be planned on continuous basis to cater to the requirement of the Power System Operation with the establishment of new elements / stations / control centre.

4. PLANNING CRITERIA

The communication system shall be planned considering the following general principles:

4.1 During normal operation, each communication channel configured for the Users shall be provided with alternate path in different route without having common section between the configured paths. Each path shall be protected suitably considering the fault prone zone to achieve the reliability and 99.9% availability of the communication channel.

4.2 The communication system may however be subjected to faults (outage of one connecting link between two consecutive nodes) and it is required that the channel shall be working through the provided protection path. There shall be no effect on the data/information communication channel and shall be available for 100% time.

4.3 However, after suffering one failure i.e. failure of the main communication channel under first failure of the equipment / path, the redundant communication channel shall be available for the required data/information communication. During second failure, the communication would sustain, however, in case the outage is of permanent nature, then manual intervention may have to be taken either to quickly restore the faulty equipment / physical media or to reroute the entire communication to the best available route.

4.4 Sufficient margin shall be kept to take care of the degradation of fibre / attenuation due to future fibre cut/joint during period of operation; and accordingly location of repeater station shall be decided in case of fibre network.

4.5 Dedicated auxiliary supply with dual redundancy shall be provided for the communication nodes / repeater stations with atleast 10 hrs backup system in the normal nodes. In case of remote nodes, additional backup shall be provided as deemed fit to ensure the reliability in case of power failure.

4.6 Redundancy shall also be provided at the card level for the configured redundant communication channels to ensure fail proof system.

5. ASSESSMENT REQUIREMENTS

Before starting to design the communication system, it is important to assess the Users requirement for which the communication network is being planned and developed. The following shall be taken into consideration while planning a communication network of Upgradation / Augmentation of the network.

<u>Service Oriented Needs</u>

- Assessment of type of Service
- Any new service to be provided in future
- Ways to optimize Capital expenditure
- Ways to minimise O&M expenditure

<u>Network Oriented Needs</u>

- Requirement of number of nodes to be installed
- Best location for nodes and related communication media

- Integration issues with existing system and mitigation
- Plan for capacity enhancement and solutions towards migration to new technology
- Requirement of creation of core communication layer
- Ensuring network Protection level
- Ensuring centralised network management system considering all heterogenic communication equipment (existing/future upcoming)

Operation Support Needs

- Manpower planning for the O&M period – Support service
- IT applications to support the operation & monitoring
- Operator's training
- Integration with OSS / Centralized NMS

6. DESIGN CRITERIA

6.1 Successful implementation of a data communications system depends to a great extent on the thoroughness of the data traffic analysis and the user requirement analysis. Gathering traffic information is difficult part of the planning. Traffic information should be collected from every user by means of existing measurements and future projections. Design of communication system for power system is comparatively easy as the present communication usage and requirements are known and also known. The information of future nodes available in the generation and transmission planning by CEA in the Standing Committee approvals, developments plans for establishment of RE generation through organisations like SECI (Solar Energy Generation Corporation Ltd. and MNRE (Ministry of New and Renewable Energy), etc.

6.2 The communication network shall be designed so as to meet the stipulated performance criteria, and following considerations shall be made:

6.2.1 Message Response Time: This criterion is used to measure the promptness with which a system responds to terminals connected to the dedicated communication channels. Message response times have different definitions at different parts of a data communication system. So far as the users are concerned, "terminal response time" and "overall response time" are most meaningful. The terminal response time is defined to be the time required from the instant the "transmit" or equivalent key on a terminal keyboard is depressed to the moment the reply message begins to appear at the terminal. The overall response time is the time between the sending of a message from the source device to the receiving of the message at the destination device.

6.2.2 System capacity or throughput: The capacity is defined as the maximum traffic that a system can carry, while satisfying response time requirements.

6.2.3 Network reliability: While Planning the network, MTTF (Mean Time to Failure) & MTTR (Mean Time to Repair) of the network equipment and the stipulated performance criteria shall be met, considering the following %age time calculation and average numbers:

- % of time a terminal can communicate with the central computer

- % of time an office can communicate with the central computer (the office may have more than one terminal)
- % of time a terminal can communicate with any other terminal (this definition applies when there is direct inter-terminal communication)
- % of time an office can communicate with any other office
- Average number of terminals or offices that are connected to the network
- Average number of equipment failures, or the average man hours required for repair, in a day or other unit of time (this definition is usable for equipment maintenance crews)

However, the User shall provide the % availability for all the communication channels configured to provide the required services.

6.2.4 Sensitivity: A system may behave properly if the traffic volume is within the projected range, but break down entirely if traffic exceeds the volume for which the system was designed. Network planning shall consider the effects that the system would experience if the actual traffic is above the projection. It should make sure that a small variation in the projection does not create intolerable response times.

6.2.5 Transmission Error Rate or Bits Error Rate (BER) is the number of bit error per unit time. In digital transmission, the number of bits of data stream over a communication channel gets altered due to noise, interference or distortion, etc. BER is a function of message size, line conditioning, and hardware characteristics. It is more critical in a centralized data communications environment than in that of a distributed computer network. The error rate shall be less than 10^{-6}.

6.2.6 Traffic bottleneck: After a system has been designed to satisfy specified traffic requirements, the traffic bottleneck of the system may initially not be experienced. However, if in future the network has to be upgraded to handle more traffic under MTP (Medium Term Planning), the planner shall upgrade the network capacity and carrying out traffic engineering suitably to cater the additional traffic in the congested path. For example, if the bottle neck is the high speed line between a concentrator and the central computer, it is quite simple to upgrade the network capacity, either by adding an additional line or by using equipment with higher speed / bandwidth.

7. RELIABILITY CRITERIA

7.1 The system shall be designed for 100% communication channel availability to the required response time including peak traffic condition and all the equipment shall be under normal condition operating within their rated limit.

7.2 The system shall continue to provide 100% communication channel availability without any degradation of response time and bandwidth limitation after failure / loss of any one of the following elements (called single contingency or ‘N – 1’ condition)

- Outage of one node
- Outage of one link (fibre / MW link / radio)
- Outage of one battery bank & DCPS unit
- Outage of one cooling unit

- Outage of one interface card
- Outage of one CPU/controller card
- Outage of one Power Supply card

7.3 Under the scenario where a contingency as defined at paragraph 7.2 above has already happened, the system may be subjected to one of the following subsequent contingencies (called 'N – 1 – 1' condition):

- Outage of another node
- Outage of another link

The system shall provide 100% communication channel availability with required response time without any requirement of manual intervention. However, in case the outage is of permanent nature, re-routing needs to be done through manual intervention, to bring back the system in normal condition. The re-routing thus carried out needs to be returned to its original condition after restoration of the faulty part.

7.4 For radial path connectivity, the redundancy should be achieved for:

- Outage of one link fibre / MW link / radio
- Outage of one battery bank & DCPS unit
- Outage of one cooling unit
- Outage of one interface card
- Outage of one CPU/controller card
- Outage of one Power Supply card

8. STUDY TOOL AND RESULT

8.1 Normally, it is difficult to plan large communication network and proposing a system strengthening scheme of the existing communication network manually based on the assessment of the bandwidth requirement by the customers of different geographical locations. Optimization needs to be done while planning the networks and its future expansions which should also include forecasting of the future demands based on past and present growth of the demand. Hence suitable planning tool needs to be used for the planning purpose. The tool, while planning, shall consider the high complexities of the communication networks and imply the need to organise the analysis in many dimensions either by network type, segment, layer and time scale.

8.2 From the network type dimension, needs of networks are to be addressed apart from specific problems and requirements.

8.3 From the network segment, basic focussing may be given to the access to Intra State and Inter State Utilities, International access, IT networking and end-to-end segments like in protections / SPS / Voice & Video. Again, planning activities, solutions and required tools are dependent on type of the segment.

8.4 At the network layer side, most frequent splitting of the problems is done at physical, transmission, switching/routing, control-NM, IT-OSS-Applications. Network evolution may be performed at all layers or at a given subset, since the planning functionalities substantially differ from the low physical layer with long time standing heavy infrastructure to the upper layer with very flexible and dynamic evolution.

9. TIME HORIZON FOR PLANNING

9.1 Network planning addresses all the activities related to the development of the communication system in order to cater the User's bandwidth and communication channel requirement to support the Control Centre requirements, Telemetry, Voice & Video, System Protection Schemes, Power Exchange, IT needs and to support the Utilities plan for integration of customers metering interface for billing and accounting requirements, taking into account constraints of available type of communication system. Depending on the timescale of the communication system under study, three different planning activities shall be performed.

9.2 Long-term planning (LTP): The objectives are to define and dimension the network, considering the future nodes which are characterised by a long lifetime and deployment of new technologies; and additional footprint in the geographical area considering new / additional users. Therefore, mainly the topological and technological decisions and fibre cables capacity issues are addressed. LTP, then, elaborates a target network objective for the medium-term planning process. Two different phases / approaches in LTP are generally considered:

9.2.1 Strategic planning: It aims at defining the technology and architecture to be used in the network through the comparison of different options of development of new network layer. The mitigation of the integration problem with the existing network shall be the major activity under this domain.

9.2.2 Fundamental planning: It uses as input the technology and network architecture selected by the strategic planning, and defines the structure of the future network. The planning process includes the input from the assessment details considering the time domain as 10 years. The problems to be faced in the fundamental planning usually are the placement of network nodes, capacity of the nodes, the planning of topology & connectivity between the nodes, interfacing requirement with the adjacent networks (DISCOM / CTU / STU), and the definition of an optimal network structure.

9.2.3 LTP shall define the following aspects:

- Location and technological evolution of the network nodes.
- Partitioning into sub-networks (domain definition). In this aspect, the critical nodes for interconnecting the different sub-networks and neighbouring networks shall be identified. Additionally, the hierarchy between the different domains, if any, shall be established.
- Logical network structure for the considered network layer. The clear network plan with all network layer with available facilities and connectivities shall be prepared for implementation of the system.

9.2.4 The output of LTP is the dimensioned network structure. LTP uses as inputs the following data:

- Single-period long-term demand assessment
- Set of possible node locations
- Set of possible physical paths for the communications infrastructures

- Architecture to be used in each domain, ring or mesh. This aspect shall include the protection / restoration schemes / requirements and the general routing.
- Component and Communications infrastructure costs
- Technology options

9.2.4 The time scale of the LTP is normally few years (from 7 to 10). The LTP exercises shall be performed to plan future expansion. LTP may also be required especially when the assessment of bandwidth demand and forecasts have significantly changed or when totally new service requirements like SMART grid implementation, deployment of IT infrastructure, etc. are to be catered. LTP shall also be performed whenever a rupture / change in technology is foreseen.

9.3 Medium-term planning (MTP): The objective is to plan a framework which should emphasise the behaviour and the relationships among the sets of entities (nodes, links, sub-networks). It involves list of planning actions and procedures, required for planning a network to establish long term plans. Therefore, MTP shall aim at the capacity upgrading of the network nodes and links while following the long-term (LT) deployment strategies.

9.3.1 MTP shall generate the following results for each planning period:

- Detailed routing and grooming for each demand (traffic relation). It shall not have conflicts with the defined LTP criteria.
- Communications systems infrastructure including equipment may be required to be installed, upgraded or uninstalled, however, it shall be done according to the MT assessment / forecasts, and within the set of nodes and communications infrastructure supplied by LTP.

9.3.2 For producing these results, MTP shall consider the following inputs:

- Network nodes (from LTP)
- Present and potential fibre routes (from LTP)
- Telecommunications systems in use
- Installed equipment in each node
- Assessed / Forecasted demands for each planning period

9.3.3 The MTP time scale shall be decided by subdividing LTP period in to several shorter periods (typically around one year each).

9.4 Short Term Planning (STP): The objective is to determine the routes and the telecommunications systems that support an immediate requirement. In this, the network has to satisfy the current telecommunications demands with the already installed capacities without additional capital investments.

10. SECURITY RISKS AND REQUIREMENTS

10.1 A variety of risks, some are given below, may appear in the network operation which needs to be considered while designing the network.

- Destruction of information or a network element
- Corruption of information content or modification of the stored Information
- Removal of information or critical data by theft / loss
- Disclosure or unauthorized access to an asset

- Interruption of a service or network subsystem

10.2 In order to protect the correct network operation and service delivery, a set of functional / security requirements or counter measures are to be ensured and are considered within the Service Provider's capabilities such as:

10.2.1 Establishment of trust relations to address the concerns to the content access to legal information and handling of Digital Rights Management.

10.2.2 For access control, ensure authenticity of the user by means of mechanisms like firewalls, digital certification, etc.

10.2.3 To maintain confidentiality, avoid access to unauthorised information by encryption on access interface of user communication and signalling by use of methods like encryption.

10.2.4 Ensure that the required information flows only between the intended origin and destination by use of specialized routing methods like MPLS, VPNs, etc. that will assign specific separated paths per traffic flow type.

10.2.5 Avoid unauthorised data modification and correct delivery on end to end bases by means of methods like digital signature, antivirus, etc.

10.2.6 Ensure no denial of service / accessibility of services or data under the agreed terms by means of correct forecasting, dimensioning, redundancy design, dynamic assignment, dynamic routing, etc.

10.2.7 The nodal utility shall ensure cyber security measures for the communication system under its supervision and carry out cyber security assessment through CERT-In certified agency. The compliance of the recommendation of VAPT (Vulnerability Assessment and Penetration Testing) test shall be done with priority.

11. OVERALL PLANS PER NETWORK LAYER AND TECHNOLOGY

11.1 The planning process starts with a first phase for the requirement of expansion of nodes, new connectivity requirements, new / additional users, assessment / forecasted metered customers both at user's interfaces and origin to destination. A second phase considers the design for the functional level for the involved functions and technologies like switching, routing, data, voice & video communication requirement, protection system requirement, IT requirements, etc. Intermediate results are given as inputs for Transmission and control layers. In a third phase, the transmission design and planning is performed and the results are provided as inputs to the Physical layer which may be OPGW, UG FO cable etc. Fourth phase contains the planning for the physical elements as ducts, buildings, cables, FO, etc. of the user's / customer premises.

11.2 The role of proper communication planning is to provide reliable communication, satisfying the network response requirements between origin to destination and also to ensure security both at the network resources as well as at information flows through the end to end communications.

11.3 Overall network planning and design has to take into account the new risks, requirements and solutions at the different network domains and layers. Those requirements apply not only for the end target network but also for the hybrid heterogeneous environments during the transition phases.

12. PLANNING OF INTEROPERABILITY / INTERWORKING

12.1 Multiple networks shall be planned by respective DISCOMs, STUs, CTU to cater the specific communication service requirements. A number of interworking principles have to be planned and designed to ensure the correct end to end operation. The interfacing between two networks shall be planned according the interfacing requirements as decided by the two nodal agencies. The operation of different networks either belonging to the same nodal agency or different nodal agencies shall be organized either in service domains or at physical domain.

12.2 Interworking and interoperability apply to a given country, a region, a local communication provider / nodal agency with a given technological solution and shall be ensured atleast at the planning level. Mitigation plans shall be developed in case of constraints in interoperability to ensure optimised use of the existing network along with the future network with new infrastructure.

12.3 In order to ensure interoperability between areas and administrative domains, a set of network capabilities have to be planned. Such network capabilities include:

- Converting and transcoding the media traffic
- Static and dynamic routing configuration, policies and algorithms
- Conversion of name, number or address
- Signalling interworking
- Exchanging user and terminal profiles
- Security policy and authentication

12.4 The central planner shall have a new set of tasks to specify, locate, design, dimension and optimize the following network interfaces, points and functionalities:

- Network interworking points, points of presence, peering points, user edges that have to be deployed at the networks edges with the corresponding functionality, location and dimensioning.
- Admission control procedures for the traffic flow acceptance on the base of flow priority, demanded sustained bit rate, Quality of Service, available capacities, network routing algorithms and coordination between the origin based and destination based acceptance criteria.
- Management and filtering functionality across networks for the sensitive control and management information like security level, authentication, authorization, user profiling, nonrepudiation, data confidentiality, communication security, data Integrity, availability, privacy, etc.
- Protocol interworking or adaptation for the different types of traffic flows and the information required to be interchanged for services across domains. Support multiple transport stratum address interworking scenarios i.e. interworking scenarios among different address domains such as IPv4 and IPv6 address domains, public and private address domains.
- SLA and e2e (exchange of information) QoS management functionality with all procedures to measure and control parameters defined at the SLA such as

performance ratios, throughput, delays, packet loss probability, path availability, etc. that have to be coordinated among multiple domains.

13. PLANNING MARGIN

13.1 While planning large communication network, the assessment of critical nodes and high traffic nodes is necessary. However, the actual bandwidth requirement may be in variance with the planning scenario as it sometimes difficult to assess the requirement, which may lead to congestion / non-availability in some part of the network. Such uncertainties are un-avoidable and hence some margins at the planning stage may help in reducing the impact of such uncertainties. Therefore, at the planning stage, following planning margins may be provided:

13.1.1 Against the requirement of Connectivity sought, the new links emanating from the Utility to the nearest grid node may be planned considering future expansion. Further, in case while providing the connectivity, if it is felt that the new links may be a part of providing the additional ring formation to aid the redundancy, the terminal equipment capacity should be planned accordingly.

13.1.2 Network strengthening may be planned keeping a margin of 200% growth in requirement along with necessary margin for provision of redundancy for the existing network.

13.1.3 Additional planning margin shall be provided for new communication service requirement.

14. PLANNING PROCESS

14.1 A coordinated planning process needs to be followed to have continuous development of the communication system to cater the need to various users of power system.

14.2 A standing committee may be formed who shall coordinate among Central, State and Discom level nodal agencies who are responsible for development of communication system at the Central, State and Discom level respectively for the implementation of the communication system as per the National Transmission plan prepared by CEA. Central Transmission Utility, State Transmission Utility and the respective Discom shall be the nodal agencies for implementation of communication network at the Central level, State Level and Discom level respectively. The committee thus formed shall also discuss and approve the details of interfacing of two neighbouring networks (DISCOM / STU / CTU) at different points of interconnections. The two respective nodal agencies then shall have service agreements for operationalization of the interconnection as approved by the Standing Committee.