

anticipated load. The relevant personnel in the state distribution companies need to be specifically trained on these aspects so as to optimize power procurement portfolio.

9.2 Government is committed to introduce suitable market mechanisms and also to deepen the spot markets by enhancing its percentage share to about 25% during the year 2023-24. These mechanisms may include capacity markets/auction mechanisms that help do away with the rigidity of the present long term PPA driven arrangements while catering to the need for reliable capacity. The government is also working proactively to usher in the next level of reforms in the power markets by introduction of longer duration forward contracts and derivatives on power exchanges. CERC has already approved a term-ahead product for renewable energy in power exchanges. There is need to take measures for encouraging trade of renewable energy in day-ahead markets as well. Further, the emphasis has to be on broadening the scope of ancillary services and to move towards market based procurement of such services. One important measure to maintain fairness and to minimize possibility of collusion and gaming in power markets is to put in place a strong regulatory framework and infrastructure for market monitoring and surveillance.

9.3 DEEP portal has been created by Ministry of Power for e-bidding for procurement of short-term and medium term power. This has resulted in lower lead time for procurement as well as highly competitive prices. All states should use this portal for procuring power on competitive basis under various time horizons.

9.4 A new entity called aggregators may be created to aggregate demand, renewable power generation, demand response, micro-storage etc. to help small consumers, prosumers and producers reach the market. This would also help in promotion of open access which is presently allowed for consumers with a load of only 1 MW and above.

10.0 REGULATORY PROCESS

10.1 Regulatory Commissions should adopt regulatory process consistent with the policy of gradually moving towards light touch regulation. As more and more power is procured on competitive basis either through power exchange or through bidding, the burden of regulatory Commissions in tariff setting would come down. Even in cases where tariff is to be fixed by the regulatory Commission, they should follow performance based cost of service regulations with multi-year tariff (MYT) as laid down in the Tariff Policy. The Regulatory Commissions should focus more on emerging tasks such as market monitoring and surveillance, ensuring resource adequacy, balancing, demand response etc.

10.2 Forum of Regulators may evolve procedures for move towards light touch regulation. For example, certain pass-through costs may be get added to tariff after calculations are carried out based on pre-defined formula or algorithm and shared with stakeholders in a transparent manner.

10.3 Wherever power or transmission service is being procured based on guidelines issued by the Central Government under Section 63 of the Electricity Act, 2003, the role of Appropriate Commission is primarily to ensure compliance to the process. It needs to be ensured that regulations framed by Appropriate Commission are aligned to the aforesaid guidelines or Standard Bid Documents issued thereunder. In such cases, only those claims or disputes that do not get settled in accordance with the provisions of the contract, should be referred to the Appropriate Commission.

11.0 RESEARCH AND DEVELOPMENT (R&D) AND ADOPTION OF NEW TECHNOLOGIES

11.1 Effective utilization of all available resources for generation, transmission and distribution of electricity using efficient and cost effective technologies is of paramount importance. Effective control of power system at state, regional and national level can be achieved through use of Information Technology. Application of IT has great potential in reducing technical and commercial losses in distribution and providing consumer friendly services. Integrated resource planning and demand side management would also require adopting state of the art technologies.

11.2 Special efforts should be made for research, development, demonstration and commercialization of various types of renewable energy technologies, retrofitting of existing coal based power plants with new equipment to make them act as flexible generating plants and energy storage systems. Demonstration projects for new types of balancing technologies for intermittent generation including MW scale batteries, hydrogen storage etc. should also be encouraged.

11.3 There is a need to progressively introduce various components of Smart Grid technologies, particularly those which would contribute towards demand side management, reliability improvement, efficiency improvement and integration of renewable resources.

11.4 An efficient and reliable communication system is a pre-requisite for Smart Grid technologies. After implementation of extensive Information technology and communication infrastructure, there would be vast amounts of useful data available with the various players in the power sector. However, this data needs to be processed and analysed to obtain useful inferences, which requires faster adoption of data mining and data analytics techniques. The concerned stakeholders must have specialized personnel to examine this data and use it for the benefit of the utility.

11.5 In addition, cyber security would need to be ensured to (a) thwart an undesirable action to control or manipulate one or more elements of power system and (b) to deny access to a confidential data to outside parties. The confidential data should be defined by the regulatory commissions in consultation with CEA. To minimize the possibility of cyber attacks, cyber security standards should be made specifically for the power system.

11.6 The country has specialized institutions engaged in research and development in the electricity sector which should be further augmented. Large power companies should set aside a portion of their profits for support to R&D.

12.0 POWER QUALITY

12.1 Frequency excursions, supply interruptions, voltage variations and harmonics injection are the critical power quality issues that result in problems for the grid and for consumers like unnecessary losses, false readings of electronic meters, burning of equipment and appliances etc. With the introduction of Deviation Settlement Mechanism and progressive tightening of the provisions thereof, there has been considerable improvement in operating frequency of the grid. There is need to give due attention to the other aspects of power quality such as interruptions, voltage variation, harmonics, flicker etc. Although there are technical standards by CEA and regulations by CERC and SERCs on these issues, there is need for proper monitoring and enforcement of penalties for violations. Regulatory Commissions should take up this issue on priority basis.

13.0 ENERGY CONSERVATION AND ENERGY EFFICIENCY

13.1 The SERCs must mandate utility-driven DSM programme and customer engagement as a means of peak load management, energy conservation and saving in cost of power.

13.2 The Standards and Labelling programme is to provide consumers an informed choice about the energy and cost saving potential of the labelled appliances/equipment being sold commercially. This scheme entails laying down minimum energy performance norms for appliances / equipment, rating the energy performance on a scale of 1 to 5, 5 star being the most energy efficient one. Energy labelling is one of the most cost-effective policy tools for improving energy efficiency and lowering associated energy cost of appliances or equipment. As on 2020, the programme covers 26 appliances out of which 10 appliances are under the mandatory regime and the remaining 16 appliances are under the voluntary regime. The labelling programme is being extended to more equipment and appliances. State Governments and distribution companies specially in urban areas need to encourage energy efficient lighting and appliances. Further, installation of energy-efficient pumps conforming to standard specifications needs to be encouraged for use in agricultural sector and incentivized by innovative financing schemes.

13.3 Energy efficiency in buildings is being achieved through adoption of the “Energy Conservation Building Code (ECBC)” which sets minimum energy standards for new commercial buildings. The updated version of ECBC code was launched in 2017 which provides current as well as futuristic advancements in building technology to reduce building energy consumption and promote low-carbon growth. The residential building energy conservation code and labeling program for residential building has been launched. In order to promote energy efficiency in residential building sector, “ECO-NIWAS” Portal has been developed.

13.4 Government of India has launched the National UJALA programme, which aims to provide LED bulbs to domestic consumers and the Street Light National Programme (SLNP) programme to replace conventional street lights with smart and energy

efficient LED street lights. These schemes have led to significant savings and reduction in CO₂ emission.

13.5 National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight national missions under the National Action Plan on Climate Change (NAPCC). One of the flagship schemes under NMEEE, the Perform, Achieve and Trade (PAT) scheme is a mechanism designed to achieve emissions reduction in energy intensive industries and it is designed on the concept of reduction in Specific Energy Consumption (SEC). The PAT scheme is in its sixth cycle now and covers 1073 energy intensive industries / establishments from 13 sectors. The recently concluded second cycle of the PAT scheme has resulted in energy savings of 13.28 Million Tonne of Oil Equivalent (MTOE). This saving is worth INR 31,445 crores and contributed in reduction of 61.34 Million Tonne of carbon dioxide.

13.6 MSMEs in India have started to shift from a traditional strictly cost and quality approach to energy efficiency, zero waste and reduced carbon emissions. Further, for bringing more competitiveness and making this sector more energy efficient, it is quintessential to understand the consumption of energy and its flow within the facility along with the classification of energy usage and its relationship to processes and production outputs in present scenario. Bureau has also developed more than fifty (50) multimedia tutorials on energy efficient technologies for more than twenty (20) sectors for knowledge transfer and thereby easy adoption of these technologies. Bureau of Energy Efficiency is also implementing energy efficient technologies in many energy intensive clusters of India with the support from Global Environment Facility through UNIDO and World Bank towards the common goal of facilitating development of the SME sector in India through promotion and adoption of clean, energy efficient technologies and practices. A knowledge portal namely Simplified Digital Hands-on Information on Energy Efficiency in MSMEs (SIDHIEE) was developed. The portal hosts variety of knowledge resources like case studies, best operating practices, details of latest energy efficient technologies etc.

13.7 To promote energy efficiency in the transport sector, average fuel consumption standards for passenger cars were issued. The fuel consumption standards are under implementation from April 2017 onwards, and a second set of standards would come into force from 2022-23. The fuel efficiency norms for Heavy Duty Vehicles and Light Commercial Vehicles have also been issued.

14.0 ENVIRONMENTAL ISSUES

14.1 India's Nationally Determined Contributions (NDC) builds on its goal to reduce its emissions intensity per unit GDP by 33 to 35 percent below 2005 level by 2030. In accordance with the global concerns, carbon emissions need to be minimized. This is being done through the National Mission on Energy Efficiency through the PAT and other Schemes of the Government of India and the clean energy thrust given by the Government of India.

14.2 Power sector projects involve substantial land usage. In view of increasing difficulty in getting land, land usage should be minimized. All new plants must reduce land usage for the same quantum of power generated. Land banks may be identified by the State Governments for setting up power plants. Right-of-way for transmission lines is also becoming increasingly difficult to obtain. In order to economize use of land for sub-stations, Gas Insulated Sub-stations (GIS) should be adopted, particularly in urban areas, which require about 30% less land as compared to conventional sub-stations. Wherever required, MW scale batteries should be installed at the sub-stations to mitigate the requirement of additional land.

14.3 There is also substantial usage of water for coal based stations. There is a need to conserve water, keeping in view the demand for water in the future years. The thermal power plant(s) including the existing plants located within 50 km radius of sewage treatment plant of Municipality/local bodies/similar organizations shall in the order of their closeness to the sewage treatment plant, mandatorily use treated sewage water produced by these bodies and the associated cost on this account is to be allowed as a pass through in the tariff as provided in the revised Tariff Policy dated 28.1.2016. Air cooled condensers may be considered for future coal based plants instead of water cooled condensers provided a techno-economic analysis supports the same. Solar PV plants should consider use of robotic dry cleaning instead of water cleaning based on cost-benefit analysis.

14.4 Indian coal is of low grade having high ash content of the order of 30-45% which produces large quantity of fly ash. The disposal of fly ash requires large area of land and causes pollution of air and water. It is, therefore, necessary to enhance the gainful utilization of fly ash in various modes e.g. manufacturing of cement, preparation of concrete, in making bricks, blocks and tiles, in raising of ash dykes, in reclamation of low lying areas, in mine filling, in agriculture and waste land development and in other modes as per MOEF&CC norms.

14.5 Stringent emission norms have been notified by MoEF&CC for SO₂, NO_x, mercury and water which are required to be achieved in accordance with a notified time schedule and have cost implications on the operation/design of coal based plants. In addition to the equipment cost to be incurred to meet the revised norms, there will be auxiliary power consumption. Efforts must be made to meet the compliance norms in the most cost effective way in order to minimize cost to consumers. These impacts should be captured by Regulators in the tariff determined under Section 62 of the Electricity Act. In case of tariff determined through tariff based competitive bidding under Section 63 of the Electricity Act 2003, these impacts should be allowed under "Change of Law" provision. Additionally, the use of biomass pellets (agro residue based) in co-firing with coal for power generation should be encouraged in order to curtail environmental pollution due to burning of crop residues.

14.6 Disposal of electronic waste is one of the major concerns for solar photovoltaic power projects. The State Governments (Central Government) should formulate a disposal policy so that the developer can easily dispose of the waste materials in line with the policy. With reduction in prices of batteries, usage of batteries is likely to

increase in future. Recycling/disposal policy for the batteries also need to be formulated.

15.0 SKILL BUILDING AND HUMAN RESOURCE DEVELOPMENT

15.1 It is very important that the persons employed in the power sector have the required skills to enable them to adopt good operating practices so as to improve the efficiency of operation of power plants, transmission and distribution system, power procurement etc. Skill building in the sector, especially at the State level, has so far been neglected. The National Training Policy of 2012 had recommended that each Ministry/Department/Organization should set aside at least 2.5 percent of its salary budget for training. The Electricity Act 2003 also emphasizes about the importance of trained human resources for the electricity industry. Training infrastructure especially in the field of electricity distribution, regulation, trading and power markets needs to be strengthened. Availability of adequate man power needs to be ensured by the power utilities as per the requirement of the job.

15.2 Skill building of institutions in the power sector should be done at regular intervals. This would promote institutional capacity building and provide the technical institutions, policy makers and regulators with the necessary skill sets. The respective State Governments should also initiate steps to provide skill building to the staff of their institutions and regulatory commissions since it has been observed that the in-house capacity of most of the SERCs is inadequate. Specialized training programme should be organized covering all facets of power sector including that of the distribution sector in the form of On-the-Job Training (OJT), refresher courses, etc.

15.3 With increase in size and complexity of our power sector, there should also be a review of roles/functional skill set of personnel in the statutory bodies like CEA, CERC, SERC and other organizations like CTU, STUs, NLDC, RLDCs and SLDCs, to align with new requirements.

16.0 COORDINATED DEVELOPMENT

16.1 Power being a concurrent subject, it is imperative that there is uniformity in the policies which are being promoted by the Centre and the States. The Electricity Act 2003 provides for a mechanism like the Coordination Forum and the Advisory Committee to facilitate this consultative process. While these mechanisms are in place, an important role has to be played by the Forum of Regulators which provides for a common platform for all regulators to deliberate on the policies and regulations which can be uniformly applied to the whole country.

17.0 CREATION OF ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

17.1 The shift to electric mobility has become necessary on account of fast depletion of fossil fuels, rapid increase in energy costs, impact of transportation on the environment and concerns over climate change. The Government of India has given a thrust to electric vehicles (EVs) and launched the National Electric Mobility Mission Plan (NEMMP) 2020. Further, it has launched the FAME – India (Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India) Scheme as a part of the National Mission for Electric Mobility (NMEM) from 1st April 2015. With support of the government, electric vehicles have started penetrating in the Indian market. One of the challenges in faster adoption of electric mobility is lack of charging infrastructure. Ministry of Power has issued “Charging Infrastructure for Electric Vehicles – Guidelines and Standards” mentioning the roles and responsibilities of various stakeholders at Central & State level for expediting the development of public EV charging infrastructure across the country. Ministry of Power has designated Bureau of Energy Efficiency (BEE) as the Central Nodal Agency (CNA) for the National-level rollout of charging infrastructure in the country. CEA has also amended their technical standards to ensure safety aspects and to minimize impact of EV charging on the supply system.

17.2 Certain tariff related measures may be required to be undertaken for Public Charging Stations (PCS). For example, there may be a need to create a separate consumer category due to specific nature of load. Time of the Day tariff may also be desirable to avoid charging load during peak demand hours. This in turn should be reflected in the rates for charging levied by the PCS on EV owners to discourage them from approaching PCS during peak demand hours.

17.3 Quick charging stations are likely to come up in malls, metro stations, office complexes etc. There could also be a provision of injecting power back to the grid from the electric vehicle batteries when the grid needs the same, when these vehicles are parked and are connected to charging points. Thus, there is a need to fix the tariff and rules of EV charging by the concerned SERC, including that for injection of power back to the grid.

17.4 Distribution Licensee should be proactive in identifying part of distribution network that needs strengthening due to EV charging. SERCs may need to come out with special provision for early approval of the augmentation proposed by Distribution Licensee to facilitate EV Charging.

17.5 Full potential of environmental benefits of electric mobility will be realized when use of renewable energy for charging is maximized. To facilitate this, aggregators may be allowed to aggregate demand of several PCS to purchase renewable energy using open access.

18.0 MAKE IN INDIA INITIATIVE AND AATMANIRBHAR BHARAT ABHIYAN