Feedback to CEA - **Draft National Electricity Plan (Volume II), Transmission (years 2022-27)**

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Preface:

As a part of its mandate under IE Act 2003, CEA has invited public comments on its draft National Electricity Plan Volume II Transmission (years 2022-27). The comments, as below, are provided with the hope that the letter and spirit of the same will be objectively taken into account in finalising the draft plan for this and the subsequent plan periods.

1.0 Introduction:

Like all other Acts of our Parliament, the IE Act 2003, and various plans under this Act should comply with the letter and spirit of the relevant sections of our Constitution. In this regard, to protect and improve the environment is a critical constitutional mandate. As per the sections 48 (a) and 51 (a) (g) of our Constitution it is the duty of the STATE and every citizen to make honest efforts to protect and improve our environment by protecting and improving rivers, lakes, forests and living beings. This critical mandate of our Constitution must not be ignored in our eagerness to enormously increase the electricity infrastructure facilities to meet the ever-escalating demand for electricity in the country.

1.1 The executive summary of the draft plan has said: "Electricity demand in the country has increased at a CAGR of about 5 % per annum during the period 2017-22. During the period 2022-27, electricity demand is projected to increase at a CAGR of about 6.4 % per annum. The development of an efficient, coordinated, economical and robust electricity system is essential for smooth flow of electricity from generating station to load centres and for optimum utilization of resources in the country in order to provide reliable, affordable, un-interruptible (24x7) and Quality Power for All. There has been more increase in the transmission system at higher voltage levels (400 kV and 765 kV level). This aspect of growth in transmission system highlights the requirement of transmission network to carry bulk power over longer distances and at the same time optimize right of way, minimize losses and improve grid reliability."

1.2 A common feature of the last few National Electricity Plans on Transmission, including the present one, has been the advocacy for a massive increase in the number and circuit length of EHV/ UHV, HVDC lines along with the associated increase in voltage transformation capacity, and other components such as voltage regulating devices. As compared to the transmission infrastructure in the country at the time of independence, the projection of 2032, as in this draft plan, as well for the future, say by 2050, is humongous by any standard. Our country has become one of the largest synchronous interconnected electricity grids in the world with 4,74,998 ckm of transmission line and 11,96,883 MVA of transformation capacity (as on Aug.'23) as per the website of CEA. In recent 8 years alone, between 2014 and 2022, the addition to transmission line was 1,73,459 ckm, and addition in transformation capacity was 6,21,176 MVA.

1.3 According to Central Electricity Authority (CEA), peak power demand in India will increase to 366 GW by 2032 and 693 GW by 2047. This draft itself has projected that the electricity demand is projected to increase at a CAGR of about 6.4 % per annum. At this CAGR the demand on the national grid can also become doubled in every 8-10 years. Such a massive increase in demand and the associated expansion of the transmission infrastructure should be viewed from the perspective of sustainability. CEA also says: "The expansion of the transmission system depends on the projected electricity demand and the generation capacity addition during a particular time frame. "

1.4 As a consequence of such a massive increase in peak power demand, the transmission infrastructure also will be expected to grow massively by 2047. A corollary of such a phenomenal increase in transmission infrastructure has been, and will be, the massive demand for land diversion; both forest lands as well as agricultural lands. Of course, the demand for various kinds of materials such as iron, steel, copper, aluminium and other metals; sand, cement and other construction materials; rare earth materials used in communication and protection related activities; and the demand for energy in manufacturing and installing these aspects of transmission infrastructure etc. will escalate with passage of each year, if such a BAU scenario continues. And the associated consequences for the true health of our natural resources cannot be anything but negative.

1.5 It should not be out of context to state the obvious here; that the overall objective of any national level policy/ plan should be to positively contribute to the overall welfare of the country, but not leading to the degeneration of our natural resources. The true objective of national electricity plan should be to further the overall welfare of the country by managing the demand/ supply scenario satisfactorily at the lowest overall cost to the country, and not just to increase the electricity infrastructure empire. If the experience all these years indicates that the continuation of BAU scenario of taking a unidirectional objective of expanding the electricity infrastructure will lead to the accelerated degradation of our natural resources, there must be a diligent review of such a BAU scenario. Such a due diligence in revisiting the overall objective of the plan is obviously not visible in this as well as previous draft/ plans.

1.6 Demand/ supply of electricity/ energy is intricately associated with the massive increase in the demand for various kinds of materials, including the diversion of land resources, which in tun is associated with the accelerated depletion of our natural resources, which in turn is intricately associated with existential threats due to climate change. The draft 'National Resource Efficiency Policy' (NREP), 2019 by MoEF&CC has said: "In the endeavor for economic growth, natural resources have been largely indiscriminately exploited, adversely impacting the environment and biodiversity. Further, cross linkages between resource use, climate change, land degradation and biodiversity loss has been scientifically well established. Meeting the demand for products and services, of rising population with increased aspirations has led to mostly indiscriminate exploitation of natural resources and would further lead to increased pressure on resources resulting in environmental degradation, thereby raising sustainability concerns."

1.7 The GHG contribution of electrical power sector in India alone is estimated to be about 40% of the total in the country. When we also take into account the fact that the environmental degradation is the root cause of climate change, the extreme care needed in minimizing such degradation through diligent planning in electrical power sector should become obvious.

1.8 In this larger context, it should become abundantly clear that the total demand for various kinds of materials from the power sector also should be brought down to the minimum feasible level in all the associated planning and implementation activities. It should also become obvious that the continued expansion of transmission infrastructure at the same rate of what has been happening in the recent years cannot be in the true interest of the country. There is a critical need to objectively review the entire power demand/ supply scenario in the country, keeping in view the national/ global scenario in the future; say by 2040/50. Since the role of conventional technology electricity generating sources, such as coal based, gas based, dam-based hydro, nuclear based will have to drastically reduce in the next few decades in our efforts to address the credible threats of climate change, the high growth rate of transmission infrastructure will not be needed, and may even come down drastically, if various enabling policy measures are also taken early. For example, if the humongous potential of the distributed renewable energy sources, such as roof top solar PV systems, is optimally utilized there will not be a need for so many additional transmission lines and

sub-stations, as being proposed in the present draft plan. It will not be an exaggeration to suggest that in such a scenario of optimal harnessing of distributed renewable energy sources, even many of the existing transmission lines may become redundant, and can be decommissioned.

1.9 It should become glaringly evident that the continued preference to build more of conventional technology power plants, and hence the associated transmission infrastructure will be diametrically opposite to the Union power minister's lofty statement on the humongous potential of RE sources, and the recent announcement by the honourable PM on a scheme to install roof top SPV systems on 1 crore houses.

1.10 Another common feature of the last few National Electricity Plans on Transmission, including the present one, has been that there is hardly any reference to the ecological impacts of the power sector; especially on the forest and agricultural lands of the ever-expanding transmission infrastructure.

1.11 Another recurring feature of such national plans has been the clear absence of discussion on the inevitable impact on the grid of the large number of distributed RE sources, such as rooftop SPVs solar, and on the imperative of micro/ mini/ smart grids for our country.

1.12 It is highly unfortunate if our planning authorities do not consider it necessary to always keep in focus the fast-changing scenario of the power sector, the escalating threats due to climate emergency, and the associated developments from around the world. There is a critical need to take the discussions on micro/ mini/ smart grids from the confines of academic focus only, to the national level debates for early consideration for implementation at various levels of our country.

2.0 The green energy transition needs a different scenario of transmission and distribution:

Since the large capacity RE sources in one location, such as solar and wind power parks, will also demand diversion of large chunks of lands for setting up power plants and the dedicated transmission lines of low utilisation factor (in usage for only 8-10 hours a day), the focus should obviously be on distributed RE sources, such as rooftop SPV systems. India’s residential rooftop solar potential alone is estimated at about 650 GW; and if the rooftop surface area of various kinds of buildings in the country is objectively considered for this purpose, the total potential of distributed kind of solar power can be thousands of GW at the national level, and may contribute more than 70-80 % of annual electrical energy for the country.

2.1 It is essential to take cognisance of the fact that unlike a power sector scenario which is based on conventional technology electricity sources, a mostly RE based power sector scenario will not need the massive number of additional transmission infrastructure as is being planned now, and may even lead to a scenario where many existing power lines may become redundant, and hence they can be decommissioned, thereby returning the associated land to its previous usage. In view of the unambiguous global target of moving away from the over reliance on conventional technology electricity sources, especially the fossil fuel-based ones, by 2040/50, our transmission plans should take such fast-developing changes into objective consideration, and plan to minimise the associated expenditure/ costs to the society.

2.2 In this larger context, there is a critical need for our policy makers to diligently analyse how the mini/ micro/ smart grids have become highly relevant to our communities, in view of the irrefutable need to move towards a RE based electricity demand/ supply scenario for the country. We need to objectively address many associated questions such as:

(i) if distributed kinds of RE power sources were found to be uneconomical or inefficient to our people, why are more of them being considered across the length and breadth of our country, such as the recent development that UPNEDA has issued two O&M tenders for 2.9 MW of Mini-Grid, decentralised Solar projects?

(ii) if these are found to be techno-economically relevant to our communities, why are they not the most preferred technological options? Can we say that the recent decision by the PM to adopt a scheme to install solar rooftops on 1 crore houses is irrational?

(iii) can we say that the recent developments such as about 1,04,035 consumers joining the rooftop solar movement to generate 1,656 MW in Maharashtra has no true relevance to other communities/ areas/ states in the country?

(iv) can we say that the recent development that Indian Railways has signed a MoU with the US to achieve net zero carbon emissions by 2030, is not a wise move, and that the same has no relevance to other agencies/ sectors of our economy?

(v) Can we say that the large number of energy co-operatives in countries like Australia, Belgium, Canada, Germany, France, Netherlands, Spin, Switzerland (with the objectives of local energy generation, energy saving, strengthening the community, where the local members can be in charge of all parts of the energy process from production to consumption) are bad ideas; have we considered their true relevance to India?

(vi) can we say that the strategic goal by Indian Railways to optimise the utilisation of rooftop solar power potential of all kinds of its buildings is irrational?

(vii) are the plans by the states such as Tamil Nadu, Uttar Pradesh, J&K etc. to opt for massive rooftop SPV installations, as in news links below, techno-economically unviable?

(viii) if minimising the land diversion to install SPV systems, as discussed in another news item below, has become important for a large and resource rich country like the US, should it not be even more critical for a resource constrained country like India; especially in the context of multiple successful examples of distributed kind of REs from our own backyard?

(ix) there is a critical need to appreciate the overall objective of Union govt. in establishing India Smart Grid Forum (ISGF) as a Think-Tank of global repute on Energy Transition, Electric Mobility and Grid Modernization.

(x) in a BAU scenario of continuing to plan for more of EHV/UHV lines, what will be the upper limit for such lines and pumped storage plants in forests; and what happens when we exhaust all such sites; are such costs inevitable and should they be acceptable to us?

(xi) in view of the unacceptable costs to the society, and the very nature of PSPs, as net energy consumers, should we not consider optimizing the usage of BESS at all voltage levels instead of PSPs?

UPNEDA Issues O&M tender for 2.9 MW of Mini-Grid, decentralised Solar projects
https://mercomindia.com/upneda-tender-mini-grid-solar

UPNEDA Floats O&M tender for 2.89 MW of Mini-Grid, decentralised Solar projects
https://www.mercomindia.com/upneda-om-tender-mini-grid-projects

Game-changing solar power technology to get first US installation: 'Valuable land is almost completely preserved'
https://www.thecooldown.com/green-tech/vertical-agrivoltaics-vermont-solar-farm/

Indian Railways signs MoU with US to achieve net zero carbon emissions by 2030
https://www.newindianexpress.com/nation/2024/jan/06/indian-railways-signs-mou-with-us-to-achieve-net-zero-carbon-emissions-by-2030-2648508.html

Sunshine idea: Tamil Nadu targets 25 lakh solar-powered houses in a year
https://www.newindianexpress.com/states/tamil-nadu/2024/Feb/23/sunshine-idea-tamil-nadu-targets-25-lakh-solar-powered-houses-in-a-year

1,900 govt buildings solarised in J-K; 20,000 more to be covered by Dec'25

https://www.business-standard.com/india-news/1-900-govt-buildings-solarised-in-j-k-20-000-more-to-be-covered-by-dec-25-124010600800_1.html

U.P. govt to install solar rooftops on 25K Varanasi households in just two months
https://www.hindustantimes.com/cities/lucknow-news/up-govt-to-install-solar-rooftops-on-25k-varanasi-households-in-just-two-months-101704652796190.html

Agrivoltaics: India's next agriculture revolution can happen under solar panels
https://energy.economictimes.indiatimes.com/news/renewable/indias-next-agriculture-revolution-can-happen-under-solar-panels/105601323

3.0 Issues with the ever expanding the centralised grid network;

While considering suitable power supply technologies for the present scenario and for the near future, the vulnerability of large, integrated, and complex power networks due to climate change related risks such as heat waves, storms, floods, lightning strikes; and solar storms, terrorist activities etc. must not escape our attention. The latest report from Kalgoorlie in Western Australia, as in a news link below (which indicated that area faced a week without electricity amid heatwave due to WA power outages), should wake us up for credible solutions such as distributed power supply systems such as mini/ micro/ smart grids, which can restrict any planned or unplanned power loss to a tiny number of consumers.

3.1 The recent CEA projection that India needs a massive amount (Rs 4.75 tn) of investment in transmission infra to boost renewable energy integration by 2027, should be of great relevance in formulating the future demand/ supply of electricity scenario for the country. CEA's advocacy for EVs as energy storage in national grid support, if taken to its logical conclusion along with the optimal utilisation of distributed kinds of REs, should be able to put our electric power sector on a smooth energy transition pathway in a short span of time, while eliminating/ minimising the even the perceived need for more of power transmission lines. Unfortunately, even such technically sound advice is not being heeded to by our planners; obviously because of the irrational pursuit of conventional technology power plants and large size RE source plants.

3.2 Few of the recent developments around the world and in our own backyard, which indicate the multifarious issues of integrated power grids, should make it imperative for our planners to diligently consider the true need to continue with a BAU scenario of never ending grid expansion in India.

Kalgoorlie faces a week without electricity amid heatwave due to WA power outages
https://www.theguardian.com/australia-news/2024/jan/19/wa-power-outage-blackout-kalgoorlie-weather-temperatures-heatwave

Push to weatherproof Australia's electricity grid as 77,000 still without power in Victoria
https://www.theguardian.com/australia-news/2024/feb/15/victoria-power-outages-weatherproof-electricity-grid-australia-calls-lily-dambrosio

Grid infra can't cope with renewable energy boom
https://business.inquirer.net/446086/grid-infrastructure-cant-cope-with-re-boom-bmi-research

India needs Rs 4.75 tn investment in transmission infra to boost renewable energy integration by 2027
https://www.livemint.com/industry/energy/india-needs-rs-4-75-tn-investment-in-transmission-infra-to-boost-renewable-energy-integration-by-2027-11706255000935.html

CEA advocates for EVs as energy storage in national grid support
https://energy.economictimes.indiatimes.com/news/power/cea-advocates-for-evs-as-energy-storage-in-national-grid-support/105053731
https://m.economictimes.com/industry/renewables/indias-cec-wants-evs-to-be-used-for-energy-storage-to-support-national-grid/amp_articleshow/105069725.cms

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4.0 The ever-increasing complexity of modern power grids and the associated risks/ costs of blackouts:

A high-level understanding of the modern integrated power grid should indicate that because of the increased complexity, and the enormous power capacity being handled in such integrated networks, a fault in one part of the grid can spread out to other parts quickly, thereby affecting most parts, and leading to power outages for a number of hours, and even over few days as happened in the case of New Zealand in Feb. 1998 and in the US and Canada in Aug. 2003. In recent years even an advanced economy such as the US has seen an increasing number of annual outages, despite massive investments to strengthen and expand the integrated grids. It is reported that whereas between 1965 and 2000 there was on average one major blackout every two years, between 2001 and 2011 this figure was one major blackout every six months. There have been examples of blackouts in other countries also. Chronic deficit and/or poor management of the power demand/ supply situation, along with the annual heat wave conditions in India can only aggravate the associated problems. In the case of nuclear reactors, such prolonged outages can also lead to poisoning of reactors and/or catastrophic radiation leakages, as happened in Fukushima (2011).

4.1 Some of the major blackouts in recent history are: (i) New Zealand (20.2.1998) affecting 70,000 people for four weeks; (ii) Brazil (11.03.1999) affecting 70% of the territory; (iii) India (02.01.2001) affecting 220,000,000 people for 12 hours; (iv) US (north-east) + Canada (central) (14.08.2003) affecting 50,000,000 people for four days; (v) Italy (28.09.2003) affecting 56,000,000 people for 18 hours; (vi) Spain (29.11.2004); 5 blackouts within 10 days affecting 2,000,000; (vii) South West Europe (parts of Germany, France, Italy, Belgium, Spain and Portugal, (04.11.2006) affecting 15,000,000 people for 2 hours.
(Source: https://www.allianz.com/v_1339677769000/media/responsibility/documents/position_paper_power_blackout_risks.pdf)

4.2 In this larger context, the ever-escalating investment in the integrated grid cannot be seen as the most credible option of lowest overall societal level costs for our country to minimise the power blackout risks. In this crucial context of enormous societal costs/ risks associated with conventional technology based, vast and complex integrated grids, there is an imperative to diligently review the very need for such large size/ capacity integrated grid networks in a fast-emerging scenario, wherein there can be a very large number of small size renewable energy sources, such as rooftop SPV systems and small/ medium size wind turbines, bio-energy units etc. which all can be connected to distribution networks. In view of the fact that distributed kinds of renewable energy sources will become a major part of the power system in the near future, and that large size conventional technology power sources such as coal and nuclear power plants are likely to be completely eliminated in the next 3-4 decades, the very need for so many power transmission lines at 66, 110, 220, 400, 765 kV, and the HVDC lines should come under serious and rational review.

5.0 Lack of due diligence in proposing power lines through ecologically sensitive areas:
Whereas the large size conventional technology electricity sources in single location will invariably need high-capacity power lines, the ignorance/ indifference towards the societal level impacts of such power lines through ecologically sensitive areas has led to the planning of many such lines in recent years without due diligence. Two recent high-level examples, in Karnataka alone, can establish such a lack of care for and a sense of callousness towards the environment.

(i) Two corner states, Kerala and Goa, which are surrounded by the thick and high value forests of Western Ghats, did not seem to care for the destruction of these forests in seeking for 400 kV D/C lines through these forests in Karnataka in order to import power from the distant state of Chhattisgarh. A few years ago, one such line to Kerala (Mysore-Kozhikode 400 kV D/C line) through the Nagarahole Wildlife Sanctuary resulted in felling of more about 50,000 mature trees in Karnataka alone, in addition to similar environmental damage in Kerala forests. The concerned authorities refused to prevent such destruction despite fervent and credible representations by civil society groups which also provided credible alternatives. As a matter of fact, the authorities could not

provide any valid reasons as to why this line was essential, since there were already two other power lines between Karnataka and Kerala, and six of 400 kV lines between Tamil Nadu and Kerala were functioning.

One more proposal is being pursued by a CTU to build another 400 kV D/C line from Karnataka to Goa through the thick forests of Western Ghats, impacting the Anshi Tiger reserve and Mahaveer Wildlife sanctuary in Karnataka and Goa. At stake is about 174 hectares of thick natural forest of Karnataka of very high ecological value for the meagre benefits to Goa alone. What is even more worrisome in this proposal is the ludicrous claim by the project proponent that the costs of the project, including that of destroying 174 hectares of tropical forest, can give a total benefit equalling 715 times the cost. In their eagerness to build such un-substantiated power lines, the project authorities are taking the path of ridiculing the role/ value of our forests, even within the biodiversity hotspots, without bothering to discuss multiple alternatives available to our society.

(ii) Four other power transmission proposals through Wildlife Sanctuaries and ESA to evacuate power from four large size conventional technology power sources (two pumped storage projects, one hydel power project and one nuclear power project), are also threatening the remaining patches of natural forests within Western Ghats of Karnataka, which is also deemed as one of the most drought affected states in the Union.

(iii) There have also been cases where an LT single phase line or an 11 kV line were proposed (and implemented in many cases) to provide electricity to a few houses or a small hamlet deep within forested areas, and even within protected areas (PAs), at enormous damage to the forest ecology. A mini/ micro /smart grid with roof top SPV systems and suitably designed BESS, and without linkage to the external grids, should be able to meet the low electricity needs of such installations.

It is hard to notice any sensitivity/ accountability on part of the concerned authorities in all such cases in protecting the forest wealth of the country.

5.1 It is a highly deplorable scenario that the concerned authorities did not deem it necessary to ask the question why Goa and Kerala are desperate to import power through 400 kV systems through the forest of Western Ghats from a distant Chhattisgarh, at humongous costs to the environment and ecology of the country, as compared to much attractive option of harnessing REs within their own borders. It is also deplorable that numerous pumped storage plants in thick forests and eco-sensitive areas are being planned in the country, without diligently considering various other options to meet the peak loads of the grid, such as demand side management (DSM), and battery energy storage systems (BESS).

5.2 As a national level planning document this transmission plan should honestly try to answer the question as to how much of such societal level costs, including the all-important ecological costs, are acceptable to a country which is already resource constrained and is already facing multiple ecological threats; and why other techno-economically viable alternative options to achieve the same objectives should not be considered.

5.3 It is in this larger context of national welfare that the critical need to consider adopting a holistic planning approach to the generation, transmission and distribution of electricity should be appreciated; as opposed to the ongoing practice of viewing generation and transmission as two distinct entities. Additionally, since the future scenario will have a large number of small size REs and PROSUMERS, there will be a need to focus more on distribution planning than the transmission planning, because of the need for distribution systems to handle most of the localised generation and loads.

6.0 Time to question the very need to connect all loads to integrated grid

Keeping in view the humongous costs/ risks to our society in building the ever growing and complex centralised transmission grid infrastructure, the time has come to diligently question as to the necessity of connecting even the small, non-essential and remote loads to the centralised grid. Such extension of centralised grid to all nooks and corners of a vast country like India (even through forests and protected areas) will further exacerbate the AT&C losses, while also complicating the voltage profile in the grid, in addition to complicating the grid operations. A large number of smaller loads such as streetlights, remote villages, agricultural pump sets, temples on hills, small hamlets in forests etc. can only pull down the voltage profile of the centralised grid, and hence should be diligently considered to be fed by localised RE sources. Such a rational approach to the credible need of every individual load must be diligently considered as a part of the overall power system planning, keeping in view the larger needs of the society.

7.0 Power sector scenario of the future

There are any number of reports/ articles from around the world on the subject of projecting a power sector scenario for the future, which all seem to agree on one common view; that all efforts must be made to minimise the total electricity demand to such a level where it can be managed on a sustainable basis, even with 100% RE sources, at lowest overall societal level costs. Hence, the first priority in planning any power sector scenario for the future should be to consider all the options available to minimise the grid electricity demand, while ensuring equitable and adequate electricity supply to all sections of the society.

7.1 It must be emphasised here that the time-tested measures such as efficiency improvement, DSM, energy conservation and effective usage of solar powered appliances (such as even in agricultural pump sets) have the potential to reduce the effective demand on the existing integrated power network by a huge margin; and hence on the very need to have massive additions to transmission infrastructure. One high level estimate indicates that an imaginative application of these measures can lead to an effective grid demand reduction by as much as 30-40 % at the national level. It is in this context that there is a critical need to consider the planning for generation, transmission and distribution in a holistic manner; instead of as separate planning processes.

7.2 A different paradigm for generation planning and/ or meeting the growing demand for electricity will be needed. In future, the electricity supply companies will be forced to adopt least cost planning process and integrated resource management process in an objective sense. While doing so the total cost (both the direct and indirect costs) to the society should be the primary criteria instead of only the financial cost to the company or project developer.

7.3 It is credible to suggest that instead of the need for more of EHV and UHV transmission corridors transferring large chunks of power over hundreds/ thousands of circuit kM, the electricity grid of the future will be required to be much stronger and more reliable at lower voltage levels in distribution level, and may be basically designed to connect a large number of mini/ micro/ smart grids; a scenario of a federation of mini/ smart grids. Since most of the power produced in the large number of small size roof top SPVs OR wind turbines OR community-based bio-energy/ CSP type solar power plants is expected to be consumed locally, only a small quantity of excess power may need to be transferred between such plants, OR between mini/ micro grids. Power distribution systems (say, at voltages below 33 KV) are likely to get maximum focus in the future as compared to the priority given to EHV/ UHV systems now. In view of large number of small size roof top SPVs OR wind turbines OR community-based bio-energy/ CSP type solar power plants, and mini/ micro/ smart grids, the distribution system will have to discharge a very critical role in maintaining the stability of the network in connecting power sources and consumers, and in ensuring reliable and quality supply in the most optimal way. In order to minimise the distribution losses, the distribution companies

may be expected to have much higher ratio of 11 kV to LT lines as compared to what it is at present. Each mini/ micro grid can be expected to become a Smart Grid and equipped with suitable Information and Communication Technologies (ICT) and protection systems to be able to be connected to the integrated grid. Much higher expectations from the public on the electricity companies managing electricity generation, transmission and distribution to deliver high quality service will be the norm, while suitable life style changes for the consumers of electricity to make demand and supply of electricity sustainable and of lowest cost to the society can also be expected.

THE ROLE OF ICT IN ENERGY EFFICIENCY MANAGEMENT
https://www.worldenergy.org/assets/downloads/20180420_TF_paper_final.pdf

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7.4 The perceived need for scores of additional power lines at 765/ 400 kV and/ or HVDC lines to transfer large chunks of power, such as the ones planned to bring hydro power from North-East to Agra; or taking power from Chhattisgarh to southern states will have to undergo multiple and diligent analysis w.r.t their criticality and w.r.t suitable alternatives. Even the true relevance of many more large size RE sources, such as solar and wind power parks, and the associated dedicated transmission lines must be subjected to diligent analysis. The recent example of such lines coming under the scrutiny of the SC of India in view of the existential threats to the species of Great Indian Bustards in Rajasthan and Gujarat must be taken into objective consideration.

7.5 Through effective Information and Communication Technologies (ICT) and protection systems, almost all consumers of electricity at all levels will be expected to actively participate in grid operations management, either as a PROSUMER, or in managing just the loads; may be through BESS/ or the parked EV at residences or in parking slots.

7.6 There is a critical need for our planners to be highly objective in deliberating as to why there are lot of efforts at the international level to move towards RE based energy transition. Our own CEA's advocacy on wider application of EVs as energy storage in national grid support, and highly relevant experiences in Australia, and elsewhere as in the news links below, should be objectively deliberated on as to why these countries are committed to such an early transition. When we diligently consider our country's overall welfare in the context of climate emergency, the vast potential of REs in the country, and the already constrained natural resources, it should become evident that we have no alternative but to move over to an energy transition based on REs at an early date.

CEC proposes $6,400 subsidy for home batteries to soak up rooftop solar
https://onestepoffthegrid.com.au/cec-proposes-6400-subsidy-for-home-batteries-to-soak-up-rooftop-solar/

South Australia fast-tracks 100 pct renewables target to 2027
https://reneweconomy.com.au/south-australia-fast-tracks-100-pct-renewables-target-to-2027/

11 COUNTRIES LEADING THE CHARGE ON RENEWABLE ENERGY
https://www.climatecouncil.org.au/11-countries-leading-the-charge-on-renewable-energy/

8.0 Critical need to move towards a sustainable and green power sector – the concept of a federation of micro/ smart grids

There is an ever increasing imperative to diligently consider a futuristic option, which may entail few or all of the following:

- Reduced focus on the grid quality power for all kinds of applications, or remote/ small/ non-essential applications; the need to strengthen the relevance of micro/ smart grids powered

by distributed renewable energy sources (REs), energy storage battery systems, and suitably designed protection and communication systems; and enabled by ICT.

- Increased reliance on distributed kinds of renewable energy sources (REs): solar, wind, bio-mass etc., and energy storage facilities such as BESS at all voltage levels; without an over-reliance on high/ extra high voltage lines, or complex integrated grids.
- Focus on the concept of a federation of micro/smart grids at the regional /national level connected to each other through distribution network, and/ or very few high voltage transmission lines.
- Shifting of all smaller and less important loads on to distributed REs, which are further supported through suitable energy storage facilities.
- Focus on strengthening the local distribution systems necessitating much higher efficiency, reliability & accountability through the creation of smart grids.
- Each of the mini/ smart grid should be designed to operate independently most of the time without importing electricity from the adjacent/ area/ regional grid.
- The exchange of power between mini/ smart grids, OR at different voltages, OR between state/ regional grids should happen only in cases of emergency, and suitably governed by appropriate operational discipline and tariff for such exchange of energy.
- Effective feed-in-tariff for distributed power sources such as roof top solar power or community-based bio-mass plants (PROSUMERS) etc. will lead to massively reduced investment by the STATE, at the same time minimizing the social and environmental impacts.

8.1 Such a scenario will assist in accelerated rural electrification & development. It will lead to vastly reduced pressure on the existing integrated grid, and to an increased reliability due to the resultant redundancy. It is evident that this option is sustainable & environmentally friendly leading to improved reliability of the existing grid. It also can be termed as a highly sensible option leading to overall welfare of the society in the larger context of sustainability and climate change.

8.2 This option will also minimize the impacts of widespread outages/ damages, which may also become more frequent due to Solar Storms or an act of terrorism on the integrated grid. Such reduced focus on an integrated nationwide grid, will restrict any power outage scenario to a small geographical area; and the power supply to such an area can be restored quickly.

9.0 True relevance of India Smart Grid Forum (ISGF)

There is also a need to appreciate as to why the Union govt. has established India Smart Grid Forum (ISGF) as a Think-Tank of global repute on Energy Transition, Electric Mobility and Grid Modernization. ISGF, established as a Public Private Partnership initiative of Government of India in 2011, is expected to spearhead the mission to accelerate electric grid modernization and energy transition in India.

9.1 In the transmission planning process, it is highly relevant to take into objective account what "India Smart Grid Forum" had stated as multiple milestones for the smart grid sector in the country. A few highlights of these milestones are:

- Appropriate policies and programs to provide access for electricity for all:
    - o Uninterrupted life line supply (8 hours/day minimum) by 2015
    - o Electrification of 100% households by 2017
    - o 24×7 quality supply on demand to all citizens by 2027
- Policies supporting improved load control through dynamic tariffs and mandatory demand response programs;
- Policies created for: implementing energy efficiency in public infrastructure by 2014, Electric Vehicle (EV) charging facilities by 2015, and Demand Response ready appliances by 2017.

• Mandated roof top solar for large establishments with connected load >20kW and where space is available.
• Microgrids at 1,000 sites including villages, industrial parks and commercial hubs by 2017 and 10,000 sites by 2022 – microgrids should be able to island from the main grid during peak hours or emergencies as and when needed.
• Tariff mechanisms, new energy products, energy options and programs to encourage participation of customers in energy markets and the evolution of "prosumers" (consumers who also produce) by 2017. Critical features for the success of a micro grid/ smart grid are the highest possible efficiencies, high reliability of operational services and accurate measurement, communication and control of various parameters of the grid on real time basis.

9.2 It should become obvious that the transmission planning will be significantly influenced by the objective implementation of these milestones "India Smart Grid Forum".

9.3 It will not be an exaggeration to state that the early and true realisation of the overall objective of ISGF to have a large number of smart grids in the country to meet the electricity needs of all categories of consumers will be imperative if we are to achieve smooth energy transition and sustainability.

10. Summary:

- Like all other Acts of our Parliament, the IE Act 2003, and various plans under this Act should comply with the letter and spirit of the relevant sections of our Constitution. In this regard, to protect and improve the environment is a critical constitutional mandate. This plan as well as the relevant plan on electricity generation should have environment at their focal point; but there is hardly any reference to environment in this plan.
- Keeping in view the global focus on the sort of climate emergency that is being experienced all over the planet, and the inextricable linkage of the power sector to the global warming, there should have been unambiguous efforts in this plan to minimize the associated impacts.
- But sadly, the focus of the plan seems to be on massive expansion of the transmission infrastructure at enormous cost to the society; but various credible alternatives available to minimize such impacts seem to be completely absent in the plan document of the CEA.
- The long-term needs of the power sector, constraints of our natural resource base, and global efforts to minimize the impacts of climate change seem to have been ignored in the pursuit of BAU scenario of ever-expanding transmission infrastructure.
- There seems no obvious effort in the plan to prepare the country for the inevitable energy transition based on REs. By not deliberating on the inevitable impacts of the widespread usage of distributed kinds of REs, such as rooftop solar PVs, BESS, and EVs on the generation, transmission and distribution of electricity in the country, the plan has given an impression that the energy transition is a far-away concept.
- The costs and risks associated with the modern integrated power grid, because of the increased complexity, and the enormous power capacity being handled in such integrated networks, in the form of blackouts, have not been deliberated on.
- There is a critical need to diligently consider how widespread usage of rooftop solar PVs, BESS, and EVs can effectively reduce the perceived need for massive expansion of the transmission infrastructure as has been projected in the plan.
- A different paradigm needed to take a holistic view of planning for generation, transmission and distribution as a single document; instead of viewing them separately.
- There is a need for a reduced focus on the grid quality power for all kinds of applications, or remote/ small/ non-essential applications; the need to strengthen the relevance of micro/ smart grids powered by distributed renewable energy sources (REs), energy storage battery systems, and suitably designed protection and communication systems; and enabled by ICT.

- Increased reliance on distributed kinds of renewable energy sources (REs): solar, wind, bio-mass etc., and energy storage facilities such as BESS at all voltage levels; without an over-reliance on high/ extra high voltage lines, or complex integrated grids.
- Focus on the concept of a federation of micro/smart grids at the regional /national level connected to each other through distribution network, and/ or very few high voltage transmission lines.
