

The Future Direction of Smart Grid by 2050 in India

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ABSTRACT

The present power network utilizing the technology of 1970, however are associated with increment with the advancement in various idea of intensity age, issues with the power blackouts and robbery, and furthermore due to the interest, we require a modernized matrix to fit the requirements of the clients even in the to take the circumstance in case publicity, what can be called "Smart Grid". The Smart Grid performs different capacities, so it builds organize solidness, unwavering quality, proficiency and eventually decreases the conduction misfortunes. The Smart Grids are the two-way preparing intensity of the shoppers who may have disseminated age. Different advancements for example, sensors and estimation, utilization of propelled segments are utilized for the effective working of the system. Stood up to in this paper, Smart Grid, its highlights, advancements in keen framework utilized, usage and difficulties of Smart Grid in India are examined.

KEYWORDS: Smart Grids, URTDSM, CAGR, DSM, POPULACE, SYNCHROPHASORS

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INTRODUCTION

A keen framework conveys power from providers to shoppers utilizing two-way computerized innovation to control apparatuses at buyers homes to spare vitality, lessen cost and unwavering quality and straightforwardness. It is equipped for evaluating their well being progressively, the forecast of their conduct, prescient conduct, adjustment to new conditions, treatment of dispersed assets, stochastic interest and the ideal response to the keen gadget. It is an instrument, the power organization to you by concentrating on the changing genuine business drivers, cost control, end-to-end control conveyance control and a safe framework. The lattice is a discernible hub with information joining and examination have the advances in framework task and control bolster. These incorporate power conveyance and

the high combination of key arranging utility capacities. The current conveyance frameworks and use procedures and methodologies that are old and there is restricted utilization of computerized correspondence and control innovation. So as to accomplish moved forward, solid and sparing force conveyance stream of data and guarantee incorporated correspondence proposed. The shrewd lattice with shrewd capacities, it is required to process self-redress, reconfiguration and recuperation, and give capable burdens and irregularity of market members progressively while making complex intuitive conduct with keen gadgets, correspondence conventions, standard and savvy calculations to accomplish complex cooperation with Savvy correspondence and transport framework.

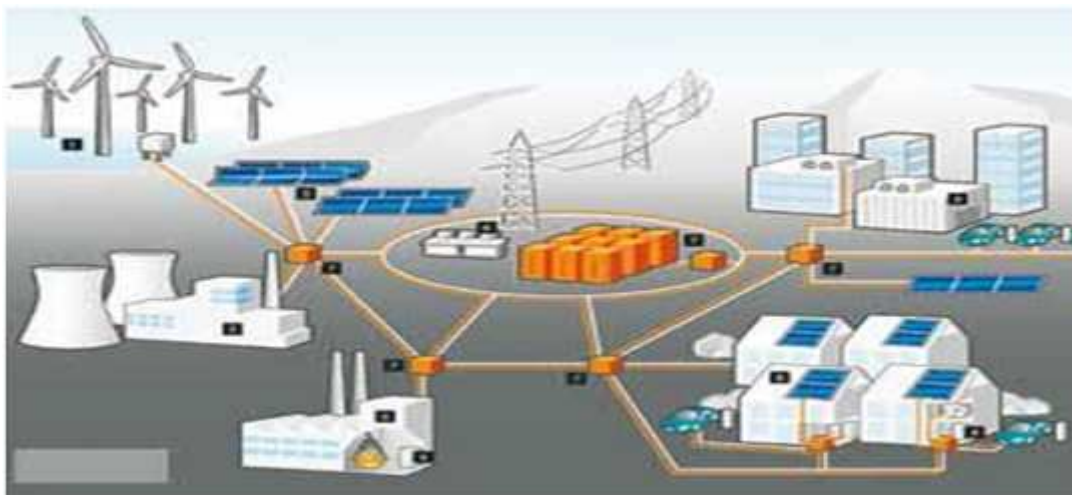


Fig-1 Micro Grid

Future power scenario by 2050:

18th Electric Power Survey Report (EPS) by Central Electricity Authority (CEA), ventures the power request development from twelfth arrangement to fifteenth arrangement (2031- 32). So as to assess long haul interest for year 2050, two situations have been examined. In hopeful situation, request development of 6% CAGR has been accepted which extends the interest to more than 1700 GW by 2050, right around multiple times of present interest. In moderate development situation, diminished versatility of interest development w.r.t. Gross domestic product development, due to progressing from creating to created country status, extensive scale execution of vitality proficiency and vitality protection programs combined with Smart Grid application, is imagined to result in moderate CAGR request development (sixteenth Plan [2032 onwards]- 3.5% and 0.5% decrease in ensuing arrangement because of expanded mindfulness, mechanical enhancement and so forth) up to 2050. Present investigation takes moderate development situation in record dependent on which projections of power request of the nation until 2050 are assessed as in the Table1

		Installed Capacity requirement (GW)	Peak Demand (GW)
1	2012	200	130
2	2016-17	271	200
3	2021-22	372	283
4	2026-27	528	401
5	2031-32	712	542
6	2036-37**	882	644
7	2041-42**	1067	746
8	2046-47**	1258	844
9	2050**	1388	896

Source: Integrated Plan for Desert Power Development in INDIA by power grid corporation, page-3

Smart grid in India:

A "Smart Grid" is an idea for changing a control framework, with the advanced correspondence, computerized checks and different types of data innovation. It incorporates new, creative devices and innovations of age, transmission and appropriation to home apparatuses also, hardware. The earnestness for Smart Grids in India emerges from the difficulties that the business is presently in front. India works the third biggest transmission and appropriation arrange in the world, still faces various difficulties, such as: deficient access to power supply deficiencies (pinnacle and vitality), high system misfortunes, low quality and unwavering quality and widespread robbery. The improvement towards Smart Grid would deliver these issues and to change the existing system in a productive, dependable, safe what's more, less confined matrix that would push, access to power for all. Shrewd Grid incorporated vitality foundation, forms, gadgets, data and markets a composed and community oriented process that produces vitality, disseminated and can be utilized viably and proficiently. A keen lattice conveys power from providers to shoppers utilizing two-way computerized innovation to control apparatuses at shoppers homes to

spare vitality, lessen expenses and increment unwavering quality furthermore, straightforwardness. It overlays the power dissemination lattice with a data and net metering framework. Power goes from the power plant to your home through an astonishing framework called the power network. As a modernized power organize is being advanced by numerous governments, including the Government of India as a method for tending to vitality autonomy were, an unnatural weather change and crisis flexibility issues

Request Side Management (DSM) is fundamental for an improved and effective utilization of power. Given restricted assets, the primary issue DSM is in the Indian framework, where the interest is the recognizes of the accessible age, prompting decreases definitely welcome. DSM is the execution of measures that viably power to help the clients by utilizing their crest stack design. DSM can be accomplished by:

1. Development and advancement of vitality proficient advances.
2. Improving the proficiency of different end use through expanded vitality utility revision spills, framework transformation. Misfortunes, and so forth.
3. Demand administration through the presentation of delicate choices like more expensive rates amid pinnacle periods, at particular rates amid off-top season rates, interruptible taxes, and so on. Coming of shrewd framework are performed for Indian markets for future;

1. Data administration framework that incorporates information benchmarks and information the board.
2. Secure Communications and standard conventions.
3. Retail player rising needs and presentation to the administrations based on system quality.

There are a few organizations who take the activities for brilliant lattice in India:

- A. Crompton Greaves brilliant lattice activities.
- B. North Delhi Power Limited (NDPL) Smart Matrix activities.
- C. Bangalore Electricity Supply Company

Power grid and smart grid development in India:

POWERGRID has stepped up with regards to organization of savvy matrix innovation in all aspects of power supply esteem chain. In "Appropriation" area a pilot brilliant framework is being created at Puducherry through open coordinated effort with producer, academicians, arrangement suppliers and advisors. Essentially, Synchrophasor pilot ventures have been attempted in "Transmission" for continuous dynamic state estimation of framework in all the five districts over India. In light of the experience of synchrophasor pilot venture vast scale organizations of PMUs are being attempted in the type of "Brought together Real Time Dynamic State Estimation" (URTDSM) plot. For expansive scale incorporation of forthcoming inexhaustible limit in Indian lattice, a exhaustive report titled "Environmentally friendly power Energy Corridors" has been created by POWERGRID. It includes transmission framework reinforcing, Control Infrastructure, Energy Storage and REMC foundation. A contextual investigation of Smart Grid pilot Project executed at Puducherry.

Puducherry Smart Grid Pilot Project POWERGRID has taken a spearheading activity to create Smart Grid Pilot Project at

Puducherry through open coordinated effort mutually with Electricity Department, Govt. of Puducherry for exhibition of innovation viability, give contribution to institutionalization and interoperability structure of different advancements, strategy promotion and administrative structure for levy plan and net metering, electric vehicle organization with charging through renewable[1] and so forth Under this undertaking different Smart Grid qualities have as of now been executed and are being scaled up in a dynamic way. Directly, in excess of 1600 brilliant meters at shopper premises alongside Data Concentrator Units (DCU) and Meter Data Management System (MDMS) have been incorporated at one normal stage at Smart Grid Control Center at Puducherry. Constant checking of vitality utilization design, different alerts related with it, and so forth have been made conceivable with AMI framework introduced at Puducherry. Meters with different correspondence advancements have been conveyed including slender band and expansive band PLC, RF- 2.4GHz, RF-865 MHz and GPRS. Keen Grid Control Focus at Puducherry is the first of its sort in the nation has been built up under this task. Continuous Distribution Transformer (DT) savvy vitality review is likewise conceivable, an case of month to month review of a given DT is appeared at To cut down blackout span and guarantee solid supply to customers, Outage Management System (OMS) having Conveyance Transformer Monitoring Unit (DTMU) and Blame Passage Indicators (FPI) have additionally been introduced incorporated with Smart Grid Control Center. DTMU screens different parameters of conveyance transformers (DT) like oil level, oil temperature, stack current, voltage, sounds, palm temperature and so on ongoing. Day by day normal Loading and temperature profile checked through a DTMU introduced at Puducherry is

appeared in Fig 4 and Fig 5. FPI encourages in fast recognition and recognizable proof of defective system. Blackout data is being sent to control focus through GPRS correspondence at standard interim. So as to guarantee quality supply to shoppers 140 kVAR Automatic Power Factor Corrector (APFC) in ventures of (50+50+20+10+10) as a component of Power Quality Management(PQM) has been coordinated. Execution of this APFC is appeared Moreover IGBT based 150 kVAR dynamic channels for symphonious concealment; responsive power remuneration and smooth voltage control have likewise been sent. A showing model of interest reaction has too been set up at Puducherry. It would encourage client to get utility signs and to react for interest the board. Likewise, proficient road light mechanization framework has been actualized for 126 nos. of road light which has come about into decrease of vitality utilizations for road lighting by about 57%. Inexhaustible reconciliation is one of the real pushed regions of Brilliant Grid execution. With housetop sun oriented age, each purchaser has turned into a "Prosumer" (a term ordinarily utilized for vitality maker and purchaser). For mix of circulated age as rooftop top sun powered and combination into matrix, net metering has been actualized in the premises of two distinct sorts of customers' i.e. private buyer and scholarly Institute in the Puducherry Project zone. Other than getting spotless and dependable supply of intensity, these buyers with housetop sunlight based are sparing fundamentally on month to month power bill. Ordinary month to month vitality utilization and Solar vitality age in the premises of these buyers with housetop sunlight based is appeared In and common day by day power request versus Sunlight based Age of a customer having housetop sun powered age.



Fig: Real Time DT wise Energy Audit



Fig: Daily Average Loading of a DT

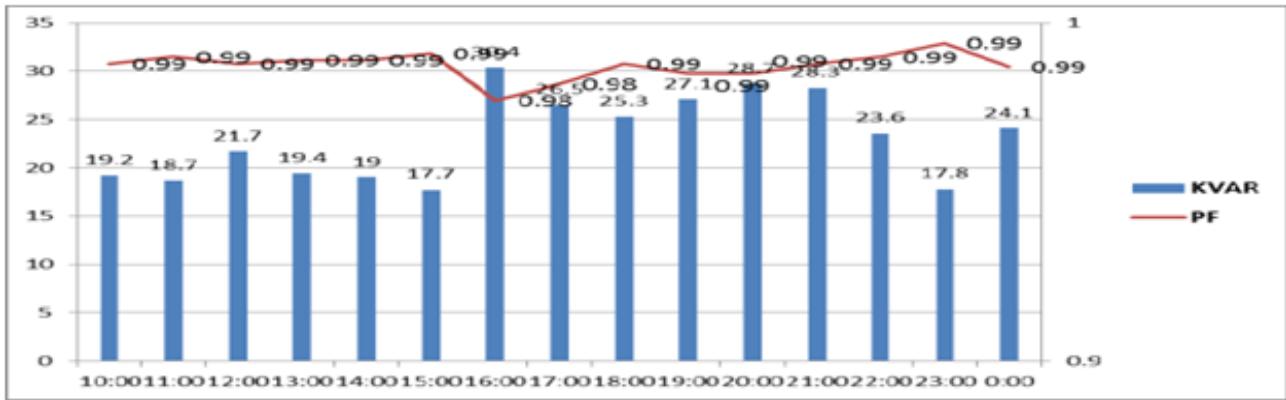


Fig:APFC Performance

Source: https://www.powergridindia.com/sites/default/files/footer/.../desert_power_india.pdf

Smart grids by Accenture in India:

Can India truly utilize shrewd networks to guarantee utilities not just supply better control at conservative rates, yet additionally draw in with customers to be of genuine administration to them, gain believability and manufacture trust? An Accenture inquire about has discovered that today, buyer trust in utilities is the most reduced in the recent years, with just 24 percent of buyers confiding in their vitality supplier to offer exhortation on vitality efficiency.

1. Increasingly, shoppers expect dependable supply, clean vitality, responsive administration, new offices and cost proficiency from their utilities. Keen matrices can empower all that and then some. An insightful power supply framework is not actually advanced science. Accenture's Carefully Enabled Grid research of 2013, a study of C-level administrators in the utilities business over the world, discovered that 98 percent of them consider the keen framework a characteristic expansion of the progressing overhauls of the power network.
2. Smart lattice isn't simply savvy metering, or an interest the executives or then again gauging framework, or system the executives. In all actuality, a keen lattice is a blend of inventive, computerized innovation driven arrangements that assistance modernize the utility foundation in totality—from creation and conveyance to end client utilization. They work over the utility esteem chain and, above all, have the ability to on a very basic level change the way individuals interface with their power supplier.

Balancing/Flexible Capacity Requirement For 2050:

Examination has been done for different interest situations (top/off pinnacle/other than crest) in three seasons viz. Summer, Winter and Monsoon. Request situation has been isolated into other than pinnacle and off pinnacle hours due to changeability of interest design at various time in seasons e.g. off pinnacle (least interest) and in addition other than pinnacle situation.

Goal of the investigation is to recognize testing working situations where impediments can emerge out of variety in regular/every day request designs. For this, local and all India stack bends have been contemplated for all the three seasons for a common day. Investigation uncovers that occasional off pinnacle and other than pinnacle request situations are for the most part surplus while crest request situations are turning shortfall. This circumstance is normal

due to high accessibility of inexhaustible viz. Sunlight based and Wind amid other than pinnacle hours and low interest amid off pinnacle hours. Be that as it may, this offers a chance to convey huge scale network stockpiling arrangements like Pumped Storage Hydro, Battery advancements and Concentrated Solar Power (CSP) with Storage office which can store vitality amid surplus situations to be utilized later in taking care of demand in pinnacle hours.

Transmission System Requirement by 2050:

Transmission is the focal connection in the whole power conveyance bind interconnecting sources to the indirectly found load focuses. A strong and dependable transmission organize is expected to guarantee supply with safe and anchored way at sensible expense. In the high inexhaustible infiltration situation, fortifying/extension of network interconnection extending power adjusting territory is a fundamental necessity for managing the difficulties of sustainable matrix reconciliation and accomplish ideal usage/sharing of topographically scattered adaptable assets. Wide shapes of transmission plan have been set up with above methodology:

1. Development of Hybrid EHV AC/HVDC (VSC) Transmission framework for adaptability of controls and Power stream directions
2. Interconnection of Desert Transmission Corridors with significant load focuses in the States as contact focuses incorporating with Green Energy Corridors
3. Desert Transmission Corridors incorporated with other high limit transmission passages related with regular age buildings particularly gas/warm and new hydro rich edifices to accomplish supply adjusting Innovation Alternatives

From the innovation point of view, most recent transmission innovation choices are to be chosen in perspective of the developing Right- of-Way concerns, foundation of GW scale age buildings like deserts at concentrated areas, feeble short out qualities at Renewable edifices and so on. In AC innovation choices, there is further need of expanding power force (MW/km) of transmission passageway, which can be tended to through Ultra High Voltage AC innovation (1200 kV). Line Commutated Converter (LCC) or regular HVDC experiences specialized confinement that substitution inside the converter is driven by AC voltage of interconnected AC framework requiring least short out dimension of encompassing AC framework. Inexhaustible age pockets do have feeble short out qualities presenting confinement on the

utilization of traditional HVDC frameworks. Appearance of Voltage Source Converter (VSC)- HVDC transmission innovation dependent on protected door bipolar transistors (IGBT) addresses above restriction of Conventional HVDC innovation.

Conclusion:

With the developing total populace and hence expanding request and the requirement for resource depleting clever and productive in our vitality utilization must have turned into a goal. Usage of the savvy matrix idea would go far in illuminating a large number of the present vitality issues and issues. The whole system needs to be enhanced to meet the necessities, ie transmission and appropriation level prerequisites. Research keep on finding to make all the ideal properties conceivable the ideal arrangement and new advances. Using shrewd lattice innovation, vitality can be utilized something like and would not be squandered. This innovation additionally serves to spare the earth from a dangerous atmospheric deviation. It alludes to the modernized adaptation of the before conventional strategies for vitality supply. Shrewd meters, Smart Homes, Smart City thus would make the Keen Grid. As the new innovations

would be created and reinforced existing ones to the wanted determinations meet the Smart Grid would be reality and change the entire example of vitality on the planet.

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