Status of Smart Grids Resources in India

It has been noted as of late that the world's power frameworks are beginning to "decentralize, decarbonize, and democratize", much of the time from the base up [1]. These patterns, otherwise called the "three Ds", are driven by the need to get control over power costs, supplant maturing framework, improve versatility and dependability, lessen CO2 discharges to moderate environmental change, and give solid power to regions lacking electrical foundation [2]. While the equilibrium of driving components and the subtleties of the specific arrangement may vary from one spot to another, microgrids have arisen as an adaptable design for conveying distributed energy resources (DERs) that can meet the wide-going requirements of various networks. In industrialized nations, microgrids should be examined with regards to a developed "full-scale network" that highlights gigawatt-scale creating units, thousands or even countless miles of high voltage transmission lines, insignificant energy stockpiling, and carbon-based petroleum products as an essential fuel source. The present lattice is certainly not a static substance, however; we are voyaging a noteworthy curve that started with limited scope dispersed age (perceived as the first DC microgrids) spearheaded by Thomas Edison in the late nineteenth century, that went through union and centralization drove by developing interest, and that is currently encountering the beginnings of a re-visitation of decentralization. From the 1920s through the 1970s, the expanded dependability managed by associating numerous producing units to different burdens, diminished development costs per kilowatt (kW), and the capacity to draw power from far off huge creating assets like hydropower drove the improvement of the framework we see today [2,3]. Notwithstanding, those benefits appear to have arrived at their cutoff points and are progressively sabotaged by ecological and financial concerns. Driven by utility rebuilding, improved advancements, and the monetary dangers that go with the development of gigantic creating offices and transmission foundations, organizations that produce power have been progressively moving to more modest, decentralized units over time [3]. This change is driven by a scope of advantages that have been concentrated in detail; [4], like deferral of age,

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transmission, and distribution capacity ventures; voltage control or VAR (receptive force) supply, subordinate administrations, natural discharges benefits, reduction in system losses, energy production investment funds, upgraded dependability, power quality improvement, joined heat and power, demand reduction, and standby generation. These advantages gather not exclusively to little however dispatchable fossil-energized plants–numerous likewise go with the organization of discontinuous sustainable producing sources. The test of fundamentally diminishing ozone harming substance emanations to evade disastrous environment interruption has likewise prompted government approaches that boost the arrangement of sans carbon creating sources, a considerable lot of which loan themselves to disseminated applications.

Current Status of Various Renewable energy sources:

India has the capability of creating in excess of 2000 GW from onshore wind energy [5]. It intends to have an introduced wind energy limit of 70 gigawatts by March 2022 and 140 gigawatts by March 2030. Wind power age limit in India has essentially expanded as of late. Starting at 31 March 2019, the aggregate introduced wind power limit was 36.625 GW [5]. Around 5 GW of new limit is under development right now with a dispatching cut-off time in 2019. Wind power represents almost 10% of India's complete introduced power age limit also, produced 62.03 TWh in the monetary year 2018-19, which is almost 4% of the complete power age. The limit usage factor was about 19% in the year 2018-19. About 70% of yearly wind age is during the five months' length from May to September agreeing with the southwest storm. During these months' sun based force age is very low which makes the month to month energy age from sun powered and twist almost corresponding to each other.

India has set targets of 100 GW by 2022 and 350 GW by 2030 [8] for solar energy. The installed capacity has reached 28.18 GW as of 31 March 2019 [4]. The pace of capacity addition is picking up gradually. India added 3 GW of solar capacity in 2015-16, 5 GW in 2016-17, and over 10 GW in 2017-18.

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Unless the rate of capacity addition reaches 20 GW/year, India will fall short of its target of 100 GW by 2022. The government is providing incentives for the solar power sector by setting up solar parks, allowing accelerated depreciation of fixed assets, viability gap funding, and state guarantees for power purchase agreements. It is also encouraging companies to set up solar panel manufacturing units in India and has imposed a 25% solar module import duty for modules manufactured in China and Malaysia for a period of two years starting from August 2018. Rooftop solar has been the fastest growing renewable energy sub-sector in India, with a compound annual growth rate of 116% between 2012 and 2018. The share of rooftop solar to-date is just 14% of the cumulative solar installation in India, reaching 3,855 megawatts (MW) by December 2018 The target for rooftop solar is 40 GW by 2022. Growth in the rooftop solar sector is driven by the Renewable Energy Service Company (RESCO) model. Under the RESCO model, consumers can lease their rooftop to developers who finance, install, operate and maintain the solar power plant on the consumer’s roof. The rooftop owners consume the electricity generated from the solar plant for which they have to pay a pre-decided tariff. It is a low-cost intensive option as compared to the CAPEX model where the entire system is owned by the rooftop owners. Some 70% of the market growth has been driven by commercial and industrial (C&I) consumers who pay a very high power tariff.

India's working nuclear energy has an introduced limit of 6.8 GW. A portion of these plants are likely to be resigned in the following not many years. Around 5 GW is under development and 9 GW in the pipeline. Subsequently by 2030, India is probably going to have an introduced nuclear power plant limit of around 20 GW. This would be a decent accomplishment at a time particularly during a period when nations like Germany and Japan is downsizing its atomic projects. In any case, it is well shy of its objective of 60 GW. This hole is basically in light of the fact that the imported LWR program has neglected to take off. The significant expense of French and American reactors is most likely the greatest gating factor. On the off chance that the EPR-1650 and AP-1000 reactors are implicit India at costs equivalent to the Flamanville (EUR 6,600/kW) and Vogtle power plants (US$9,000/kW), would not be financially suitable without sponsorships.

India has set eager focuses for adding clean and sustainable power supplies by 2030. New wind and sun oriented is presently 20% less expensive than existing coal-terminated age's normal discount power cost. The tipping point may have been 2016-2017 when sustainable power establishments outperformed coal interestingly. Both the sunpowered and wind areas are ready for quick development empowered by smoothed out government strategies, a developed industry, and grounded store network. Both these areas need to find some kind of harmony between decreasing expense and keeping up top-notch. Further reserve funds in solar-based power costs are conceivable if homegrown assembling of boards is set up. Offshore wind is a promising possibility however will require not many years to take off. Concentrating solar power innovation is as yet in the innovation showing the stage and can't be sent at scale. Nuclear power delivers just 3% of the nation's energy. By 2030, this may develop to 6%. This area needs to develop a lot quicker to cut down the reliance on coal plants. The old and exceptionally dirtying coal power plants are booked to be resigned by 2025 which is probably going to positively affect the country's fossil fuel byproduct. It is assessed that India needs to contribute more than US$ 50 billion to modernize its transmission grid to stay up with its becoming sustainable age limit. With supported interests in grid enhancements and inexhaustible sources, it is conceivable that India will meet its objective of creating 40% of its energy from clean sources by 2030.

Case study: 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 an exhibit of innovation adequacy, give a contribution to normalization and interoperability the system of different advances, strategy promotion and the administrative system for levy plan and net metering, electric vehicle organization with charging through renewables and so forth [8] Under this undertaking different Smart Grid ascribes have as of now been actualized and are being scaled up in a reformist way. As of now, in excess of 1600 smart meters at purchaser premises alongside Data Concentrator Units (DCU) and Meter Data Management System (MDMS) have been incorporated at one regular stage at Smart Grid Control Center at Puducherry. Constant checking of energy utilization design, different cautions related with it, and so forth have been made conceivable with an AMI framework introduced at Puducherry. Meters with different correspondence advancements have been conveyed including narrowband and broadband 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 set up under this venture. Constant Distribution Transformer (DT) insightful energy review is likewise conceivable, an An illustration of a month-to-month review of a given DT appears in Fig 3. [8] To cut down blackout term and guarantee a dependable stock to shoppers, Outage Management System (OMS) having Distribution Transformer Monitoring Unit (DTMU) and Fault Passage Indicators (FPI) have likewise been introduced coordinated with Smart Grid Control Center. DTMU screens different boundaries of dispersion transformers (DT) like oil level, oil temperature, load current, voltage, harmonics, palm temperature and so on progressively.

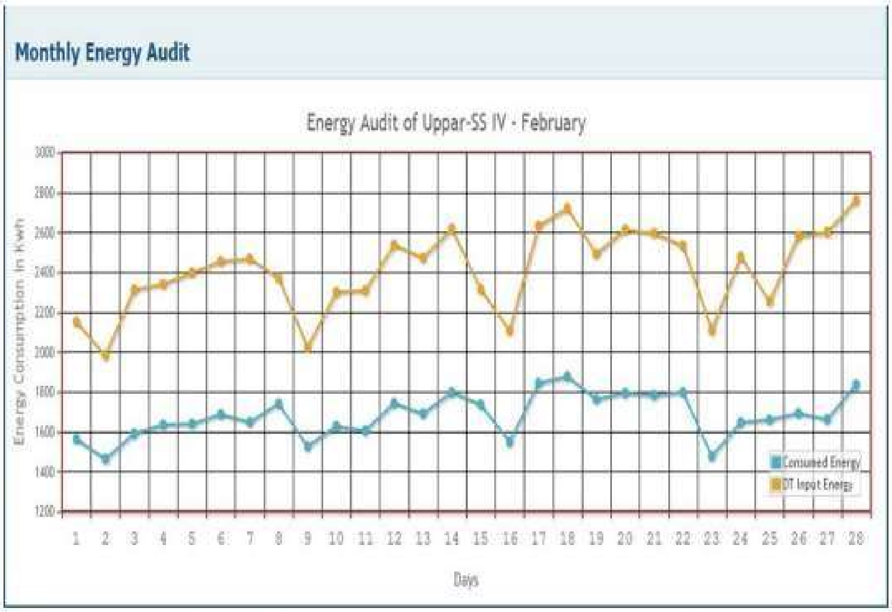

Fig 3: Real Time DT wise Energy Audit

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