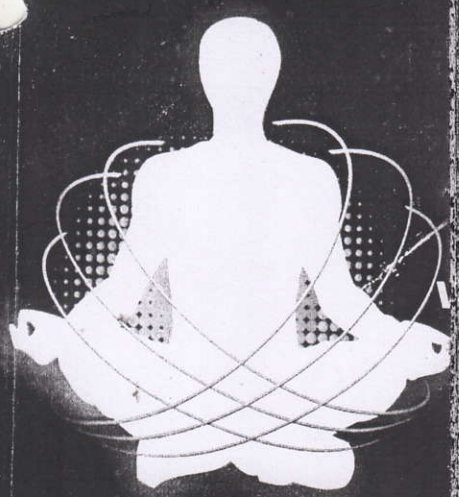
SOHAM

An International Multidisciplinary Peer Reviewed Research Journal

ISSN: 2350-0697

Impact Factor 5.005



Volume-29 Issue-1 July - Sept. - 2021

Editor – In – Chief
Dr. Dilkhush U. Patel

MEMBERS OF ADVISORY BOARD

Volume 29, Issue I, July. – Sep : 2021

ISSN: 2350-0697
Impact Factor (IIJIF):5.005

Content of the Table

Volume 29, Issue I, July. – Sep : 2021 ISSN: 2350-0697
Impact Factor (IIJIF):5.005

DIGITAL CATALYSTS FOR POWER SECTOR TRANSFORMATION

DIVYA NITINKUMAR SHAH
Research Scholar
DR. J.K. PATEL
Guide

ABSTRACT

As a result of that, power demand surged to an all-time high of 189.64 GW in January 20, 2021. While increment in power demand is a good sign for the Indian economy, it also means that the power sector continues to reel under deep stress. As the sector lags behind in the adoption of Digital, this stress continues to build up. Over the past two decades, the Ministry of Power has been introducing several measures with the aim of reviving the Indian power sector.

These measures have typically centered on customer satisfaction, operational efficiency, enterprise robustness and financial soundness. In 2020, significantly important policy measures were introduced, including amendments to Electricity Amendment Bill (2020) and Electricity (Rights of consumer rules (2020). Some noteworthy measures introduced in the bill and the rules include, direct benefit transfer, electricity contract enforcement authority, national renewable energy policy, standards of performance, reliability of supply, consumer as prosumer, operational efficiency, metering, billing and payment and disconnection and reconnection. While there is enough policy push for implementation of these measures, timely adoption of key digital initiatives discussed below, to catalyze the envisioned transformation, will be crucial for their success or failure.

Key words: Catalyze, Digital, Power

INTRODUCTION OF POWER SECTOR

Power is considered to be a pioneer of infrastructure; it is a part and parcel of human life. Power is heart of all kinds of economic activities. It is impossible to assume the world without electric power and it is inevitable for economic development. The economic development of a country is the result of aggregate work of all economic and non-economic variables. Since power is an important basic variable, it has unique and vital role in economic development. As a key infrastructure component, it increases the production and productivity of agriculture, industry and improves the quality of service sector. Power creates positive externalities acting as input, intermediate and final product in production, distribution and exchange. In this process power will creates and increases the employment, production, generates income and eventually leads to economic development of a country.

LITERATURE REVIEW

Smriti Jain, S.L. Surana, Akash Saxena (2014): Smart Grid Initiatives in India: The electricity requirements of India have grown tremendously and the demand has been running ahead of supply. The large disparity between electricity demand and availability continues to grow and so does the shortage with regard to peak demand. The country's plan to provide reliable and affordable power supply to all by rapid electrification while keeping carbon emission within control will put tremendous challenges before the Indian power industry. To meet these challenges with limited conventional energy resources, India needs to put forward efforts in research and development to find renewable substitutes particularly solar and wind. It is also necessary to modernize the existing grid and make it smarter. This will not only reduce the technical and commercial losses but will also reduce carbon footprint. There are many aspects of smartness and each aspect meets only a

particular objective. The cost involved in making the grid smarter is very high and hence priorities based on relative importance of various aspects of smart grid will have to be decided to achieve them. Installation of smart meters and by pushing demand side management will reduce peak demand & energy losses and hence should be given top priority.

Surendra Kumar Yadav (2013): GIS in Power Sector Management: GIS applications are many; power companies can collect and store a large amount of data that can be readily accessed and analyzed. Strength of GIS is integrating data and preparing it for analysis or modeling apart from tying together data from various sources makes it an important tool for the planning and decision making. User can display legend of all layers displayed on the map. This legend will be represented by the symbol of each layer with color and the name of the layers in a list. System will display coordinate of the current mouse position and the coordinate value will change with the movement of mouse pointer over the map area. User can see co-ordinate only when the mouse pointer is inside the map area. If the mouse pointer goes outside the map area then the system will not display the coordinate. User can query any layer of the GIS map to get the attribute data for a particular feature of that layer. User has to click on any feature of a particular layer to get the attribute of that feature. GIS provides a wide range of solutions encompassing the entire business value chain in the power distribution sector from setting up distribution network and load management to customer information, assets management, billing and customer services. Digital system provides timely, accurate and easier way of acquiring information, which is very vital in taking prompt and accurate decisions.

RESEARCH METHODOLOGY

Objective of the study:

- To know pain area of different digital initiative in power sector.
- To know impact of different digital initiative in power sector.

Research type: Descriptive research

Source: The information is obtained from different websites, magazines, journals, etc.

DIGITAL INITIATIVE

- AMI(Advanced Metering Infrastructure)
- Blockchain
- Power purchase optimization
- Internet of things
- Unified revenue management system
- Enterprise asset management
- Virtual augmented reality
- Unmanned aerial vehicles
- Virtual power plants
- Cyber security
- SCADA – EMS and ADMS

AMI (Advanced Metering Infrastructure)

Pain area

Indian DISCOMs have a 24.88 percent average technical and commercial loss, compared to an 8.3 percent global average. According to a Stanford research, reducing loss by 1% from this level would result in a 1.23 percent reduction in fossil fuel generating requirements.A Smart Meter, related communication devices, and software systems to acquire and handle meter data make up Advanced Metering Infrastructure (AMI). Lockdown DISCOMS with smart meters were able to bill around 95

percent of their customers remotely during COVID-19. It's also regarded as a critical component of a Smart Grid. In the next 3 years, India plans to install 300 million smart meters.

Impact

With rising financial pressures and decreasing operational efficiency.By implementing the AMI Solution, DISCOMs can enhance their billing efficiency, potentially lowering commercial losses.Consumer data is provided every 15 minutes by smart meters, which may aid DISCOMs in performing analytics on consumption patterns, asset performance, load profiling, and transformer loading,resulting in increased operational efficiency and consumer satisfaction.

Blockchain

Pain area

DISCOMs and energy generators can unlock the huge potential of blockchain by being an early adopter (improving the way of delivering services guaranteeing robustness, security and scalability), the facilitators (creating a regulatory framework; setting standards for security and privacy; building trust and interoperability), the collaborators (enable widespread adoption, transparent information sharing of capabilities and data, and evolution of new business models).

Impact

Block chain based solutions can assist businesses in swiftly, securely and accurately obtaining the appropriate information required to make quick and effective decisions. Blockchain based solutions can be leveraged to reduce cost, waiting periods and avoid conflicts that exists today in the execution of trade agreements by enforcing terms of the agreement through smart contracts deployed on blockchain, thus ensuring the creation of a single, consolidated and immutable record of transactions available to trading parties.

Power purchase optimization

Pain area

Power purchase cost for a DISCOM is in the range of 75% to 85% of its total expenditure. The DISCOMs are forced to purchase power at high costs due to inability to accurately forecast their demand.

Impact

Demand and supply side forecasting will be improved with the use of advanced analytics and sophisticated weather forecasting models, particularly for variable renewable energy sources. DISCOMs can reliably forecast short, medium, and long term power purchase trends using historical purchase data, allowing them to optimize their power buy portfolios.

Internet of things

Pain area

According to IDC, there will be 55.7 billion linked devices on the planet by 2025, with 75% of them connected to an IOT platform. Utilities are also expected to have the biggest number of IOT endpoints. In the asset-intensive power sector, system dependability is still a problem.

Impact

IOT will be a game changer with the lowering cost of sensors that can be installed on assets and the growing need to increase resiliency through improved dependability and lower operational costs with the goal of improving customer happiness.

Unified revenue management system

Pain area

In the RAPDRP part A scheme launched in 2008, 1402 urban towns and cities with population of more than 30,000 (10,000 in case of special states) were selected for establishment of reliable and automated systems for sustained collection of accurate base line data, and the adoption of

Information Technology in the areas of energy accounting. In 2014, Integrated Power Development Scheme (IPDS) was launched which subsumed the RAPDRP Part A scheme and extended the IT enablement to balance 4041 urban towns and cities. IPDS, however, only covered urban areas and the rural areas were excluded either with no or decentralized billing systems. Creation of a consolidated demand, collection and balance report for both urban and rural consumers continues to be a challenge. Factors like limited capability of the then implemented urban revenue management systems to handle complex tariff structures is no longer an impediment.

Impact

DISCOMs can use a Unified Revenue Management System to have a bird's eye perspective of their whole customer base's revenue activities.Other key benefits include quicker account consolidation, seamless interaction with digital payment channels, and more information into consumer electricity consumption.

Enterprise asset management

Pain area

In India, asset-intensive electric utilities are under severe strain due to operational inefficiencies compounded by a failure to achieve the full potential of their assets. The International Organization for Standardization (ISO) published the ISO 55000 series of standards in January 2014, which describe an asset as a "thing, item, or entity with real or potential value."

Impact

When combined with SCADA, ERP, and GIS, EAM capabilities including Work Management, Asset Management, Planning and Scheduling, Supply Chain, and Health and Safety may help utilities maximize the value of their assets.Asset Performance Management, which makes use of advanced analytics to help with better predictive and prescriptive maintenance, is a must-have.

Virtual augmented reality

Pain area

We must first comprehend what virtual reality, augmented reality, and mixed reality are. Immersion is the key notion of virtual reality, which refers to the production of a three-dimensional virtual environment in which the user is entirely immersed. Employee and field staff training, as well as virtual site visits, are examples of VR applications in the power sector.AR (augmented reality) is a technique that uses technological equipment (such as a camera lens) to enhance the real world around us by adding digital content to it. Training of workforce and employees, as well as remote assistance to field workforce in inspection, maintenance, assembly, and other key activities using AR headsets and glasses, are some of the applications of AR in the power sector.

Impact

AR/VR in combination of edge devices can provide rich insights on assets, operations and maintenance management.

Unmanned aerial vehicles

Pain area

Drones, or unmanned aerial vehicles, are increasingly being used in the power sector. Drones help manage the geographic distribution of electricity assets by allowing for real-time monitoring and the establishment of "Golden records." While other industries such as oil and gas, mining, and agriculture have benefited from this technology, the trend in the electricity sector is picking rapidly. New use cases in the power sector, such as boiler inspection, vegetation monitoring, line, transformer, solar and wind assets, as well as other essential asset monitoring, are being identified often thanks to digital advances such as analytics, AI and ML, IOT, and high-end computer systems.

Impact

Power and utility businesses will benefit from an integrated solution that includes efficient drone operations, a comprehensive data management platform, and powerful analytics to get the most out of their dedicated drone programme. While drone technology has many advantages, the hazards of weaponization and personal security should not be overlooked.

Virtual power plants

Pain area

Access to important assets and plants proved to be particularly difficult during the COVID 19 peak, when stringent lockdowns were imposed. While utilities were under the category of essential services, it was impossible to maintain a full crew at important plants.A virtual power plant is a cloud-based duplicate of a physical power plant, with IOT devices put on the asset ecosystem and a virtual replica built to remotely monitor and control operations. It streamlines distant operations thanks to a strong connectivity backbone.

Impact

According to an article published by powered-India, the virtual power plant market is expected to be worth $4.5 billion by 2024, which means that it will benefit enabling stakeholders such as cloud service providers, analytics vendors, communication service providers, and utility personnel, in addition to IOT devices.

Cyber security

Pain area

Since 2016, 529 federal and state government websites have been hacked, according to statistics supplied by Information and Technology Minister Ravi Shankar Prasad. Utilities are expected to have the biggest number of IOT endpoints, implying a significant number of possible entry points for vulnerabilities.The Central Energy Regulatory Commission has been emphasizing to grid operators and regulatory agencies the importance of having a cyber-attack continuity strategy and upgrading their security infrastructure. The information technology act of (2000), as well as the 2011 rules, define 'reasonable security methods and processes, as well as sensitive personal data or information.'However, DISCOMs that are adopting various consumer-centric initiatives still have a lot of work to do in this area. Furthermore, the future personal data protection regulation is likely to drastically alter the DISCOMs' data privacy and related security policies in order to protect consumer data.According to the draught bill, a Data Protection Authority (DPA) would be created as the data regulator, which will guarantee that the data protection act is enforced and that a mechanism for imposing fines in the case of lapses by organizations is in place.

Impact

It is evident that cyber security governance and technical safeguards deployed for infrastructure and operations would be key elements of a resilient power sector and mitigating the risk of cyber attacks.

SCADA – EMS and ADMS

Pain area

SCADA and Energy Management System (EMS) has been implemented in all state transmission and regional grids while SCADA and Distribution Management System in distribution is still underway. National Electricity Plan (Volume II) on Transmission i.e. NEP-Trans, the review of development of transmission system during 12th plan period and planning for the ongoing plan period 2017-22 and perspective plan for 2022-27 discusses the importance of use of emerging technologies to move from steady state SCADA EMS systems to dynamic monitoring of grid using Phasor Management Unit(PMU) and Wide Area Measurement(WAM) which can enable features such as Remedial Action Services(RAS), System integrated protection scheme(SIPS), adaptive

islanding, self-healing grid. On the distribution front, the RADPRP scheme launched in 2008 was the biggest driver of SCADA implementation. However only cities with population of 0.4 Mn and annual energy input of more than 350 MUs.

Impact

With increased impetus on smart grids, ADMS (unification of SCADA, DMS and OMS) installation is picking tremendous speed.Adopting emerging technologies will assist in the transition from steady-state SCADA EMS systems to dynamic grid monitoring using Phasor Management Units (PMU) and Wide Area Measurement (WAM), which can enable features like Remedial Action Services (RAS), System integrated protection scheme, and others (SIPS)

CONCLUSION

The digital initiatives shared above, will enable a fast-paced digital transformation and can future proof the utility to face more changes and challenges. Driven by the need to lower losses, improve efficiency, enable data-driven decision-making and deliver better services to end consumers, utilities can benefit significantly through digitalization. The COVID-19 pandemic has further compelled utilities to accelerate this shift.

REFERENCES

Smriti Jain, S. S. (2014). Smart Grid Initiatives in India. Skit Research Journal.

Yadav, S. K. (2013). GIS in Power Sector Management. International Journal of Engineering Research and Technology.

WEBSITES

https://twitter.com/Sanjiv_Sahai/status/1355512337042558984 2
https://pib.gov.in/PressReleasePage.aspx?PRID=16342533
https://pib.gov.in/PressReleasePage.aspx?PRID=16823844
https://www.uday.gov.in/atc_india.php
https://web.stanford.edu/group/efmh/jacobson/Articles/I/TransmisDistrib.pdf6
https://economictimes.indiatimes.com/industry/energy/power/discoms-generate-95pc-billing-efficiency-due-to-smart-meters/articleshow/75694995.cms
https://www.business-standard.com/article/economy-policy/govt-s-new-move-to-revive-discoms-install-300-mn-smart-meters-in-3-years-119062800168_1.html
https://www.idc.com/getdoc.jsp?containerId=prAP46737220#:~:text=IDC%20predicts%20that%