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India SMART UTILITY Week 2024

Supporting Ministries



Session : EMERGING TECHNOLOGIES FOR UTILITIES BRPL EXPERIENCE

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- Now a days, Power Distribution system becoming increasingly interconnected, multi-directional and striving for more sustainable practices
- Risk for potential cyber threats in the network are on rise
- Peak demand in the network surging every year
- Demand for efficient and reliable utility networks will continue to grow & customer expectations are scaling up

- Emerging technologies, such as AI / ML, IoT, big data analytics, and digital twin technology, offer **immense potential for transforming the utility industry**.
- By adopting these technologies, utilities can overcome the limitations of traditional methods, enhance performance, reduce costs, and ultimately provide better services to meet the evolving needs of the modern world.
- Embracing the power of emerging technologies is key to unlocking the future of utility networks.

Benefits of technologies to the power distribution industry:

- **Enhanced Reliability:** enable quick identification and mitigation of grid faults, leading to improved reliability and minimized downtime.
- **Improved Efficiency:** by optimizing load balancing, power distribution, and maintenance schedules, utilities can maximize energy efficiency, grid planning, and lower greenhouse gas emissions.
- **Cost Reduction:** can reduce operational costs by optimizing resource allocation and energy generation.
- **Enhanced Customer Experience:** facilitate better services to meet the evolving customer needs of the modern world.

Top Trending Technologies	BRPL Utilization
<p>1. Artificial Intelligence (AI) - AI refers to computer systems built to mimic human intelligence and perform tasks such as recognition of images, speech or patterns, and decision making. AI can do these tasks faster and more accurately than humans.</p>	<p>AI has the potential to cut energy waste, lower energy costs for consumers. Remote asset monitoring for maintenance and predictive analysis. AI can also improve the planning, operation, and control of power systems.</p> <p>Use case: Chat Bot for Customer Care, Voice Bot, Cable fault analysis, Remote asset monitoring through Drone monitoring and decision.</p>
<p>2. Machine Learning (ML) - is a subset of AI. Computers are programmed to learn by discovering patterns and insights from data, neural networks, natural language processing (NLP), and deep learning. Self healing and smart decision are the capability of Machine Language .</p>	<p>Accurately Predict demand and supply. Fault analysis, Equipment performance and predictive analysis. Auto Government document verification.</p> <p>Usage: SCADA, Consumer / Equipment behavior & Performance optimization and Predictive analysis. DT and feeder monitoring. Meter reading through OCR reader. Document verifications.</p>

Top Trending Technologies

3. Cloud Computing – designed to host the application in third party hardware setup. Provide easy and faster availability of hardware setup. Edge computing can be used to process time-sensitive data in remote locations with limited or no connectivity to a centralized location. Accessibility and availability of system from any where.

4. Virtual Reality and Augmented Reality - Virtual Reality (VR) immerses the user in an realistic environment while Augment Reality (AR) enhances their environment. The 3D representation of real world and interactivity with it seems to be a more natural learning media than other traditional tools.

BRPL Utilization

Cloud technology to be used for POC.

Usage: Data Warehouse over Cloud / Data Lake Pilot POC which collect data from AMR , ISU , iOMS, net metering, SCADA, GIS. Provide the pictorial view of outage and number of consumer impacted.

The application of virtual reality technology used for safe training of operators , maintenance staff, in Distribution Power System

Usage: VR based Training Module
ACB module RMU, etc



Top Trending Technologies	BRPL Utilization
<p>5. Robotic Process Automation (RPA) - is another technology that is automating jobs. RPA is the use of software to automate business processes such as interpreting applications, processing transactions, dealing with data, and even replying to emails. Used for repetitive task.</p>	<p>Robotic invoicing utilization - Robotic manual invoice data extraction and optical character recognition capabilities identify variable expenses to perform various regulatory disclosure requirements. Usage : Vendor invoice processing , Customer new connection verification. Meter reading validations.</p> <p>Trenchless Underground Cable laying technology.</p>
<p>6. Internet of Things (IoT) - Many “things” are now being built with WiFi connectivity, meaning they can be connected to the Internet—and to each other. Hence, the Internet of Things, or IoT. The Internet of Things is the future and has already enabled devices, home appliances, cars, and much more to be connected to and exchange data over the Internet.</p>	<p>Equipment failure identification using machine learning algorithms with the help of IoT device events recording. Control the equipment on remote location.</p> <p>Example - Smart Grid & Smart Meters , DT monitoring. Customer device monitoring.</p>

Top Trending Technologies

7. Big Data Analytics - **Big data analytics** is the use of advanced **analytic** techniques against very **large**, diverse **data** sets that include structured, semi-structured and unstructured **data**, from different sources, and in different sizes from terabytes to zettabytes.

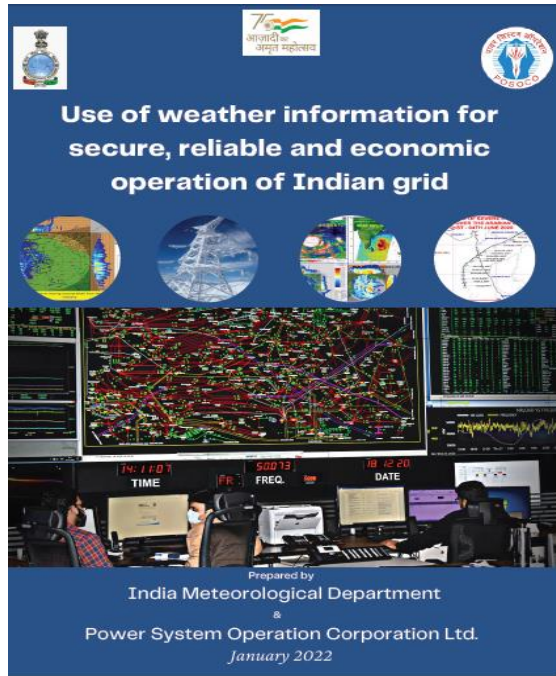
8. Mobility- Mobile based application for customers and Maintenance

BRPL Utilization

Large data storage for structured (table of database), semi-structured (Files, XML files text data) and unstructured (images, scanned, videos).

Usage: history data storage, easy and fast access and analysis.

Maintenance order processing through Mobile app.



5.2.9. Utilization of weather information by BRPL:

The Delhi's Discom BRPL was able to take proactive action to minimize its drawl from the grid and purchases from power exchange/bilateral contracts, based on the weather information obtained from IMD website. At BRPL, Day Ahead and Intraday demand forecast is done by AI and ML techniques (Artificial Intelligence and Machine Learning) which are data-driven techniques used to model complex relationships between inputs and outputs. The basis of machine learning is mostly statistical. Combinations of ensemble models are used for generating the best output. The input which goes into these forecasting tools are the historical data and historical and current weather parameters.

Meteograms published by IMD helps in Day Ahead demand forecasting which in turn leads to optimal use of available resources (generation) by way of practising Reserve Shut down options (RSD), balanced sale/purchase option in Day ahead Market (DAM)/ Real Time Market (RTM) etc. Further, the 3 hrs ahead weather advisory and live feeds of radar imagery finds its usefulness on volatile days in predicting changes in demand, based upon the intensity and approximate time of weather disturbances such as rainfall and thunderstorm as per radar imagery. The discom made significant savings by utilising weather portal. BRPL used meteogram to predict the increasing temperature and therefore anticipate the increase in demand, based on which requests were made to SLDC Delhi to bring additional generating units on bar. This also helped the Discom in following merit order despatch, by avoiding costly power purchase from power exchange during peak summer. During monsoon season, based upon prediction for thunderstorm/rainfall as per meteogram, decisions were made to reduce purchases from exchange/bilateral contracts while incorporating the above input in the Day Ahead demand forecasting. In addition to meteogram, live radar imagery helped BRPL in predicting reduction in intraday demand based on which timely revisions of its schedule were sent to SLDC for backing down of generating stations in anticipation of thunderstorms/ rain. By this action BRPL avoided under drawl of power, optimised distress sale on RTM and also ensured grid security. Further, it has helped System Operators in BRPL to minimize longer duration outages by way of putting off the feeders with less clearance, which are suspected to get damaged severely due to gusty winds and thunder storm. A few occasions where savings were made by the discom are as follows:

Use of Weather Information for secure, reliable and economic operation of Indian grid Page 58 of 98

- ❑ Both BRPL and BYPL are using AI/ML tools for Demand forecast and Schedule optimization
- ❑ POSOCO has highlighted the best practices adopted by us by the use of meteogram and radar imagery.
- ❑ This has resulted in limiting the under drawal quantum in case of sudden rainfall, putting plants in RSD to avoid loss on sale in case of day ahead prediction of rainfall
- ❑ Earlier also POSOCO has show cased same in 134th OCC of NRPC

USE CASE / CASE STUDY: VIRTUAL REALITY (2/3)



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Project Name: Virtual Reality Module for RMU & ACB Operation

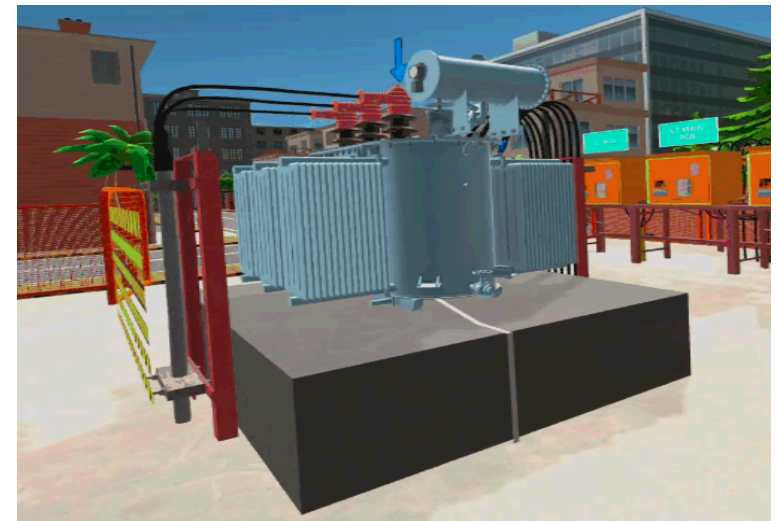
Project Brief:

- Based on 3D application & graphics module on Unity software platform
- Simulation in Operation of RMU/ACB through VR Concept
- Training through hand controllers and voice-over for safe operation of RMU and LTACB
- Saving accidents causing due to improper operation
- Multiple workforce can be trained in a limited period providing cost optimization

Purpose:

- Skilled manpower(Fitter/Lineman) will be trained through this module
- Skill test of workforce can be conducted through this module
- Enhance safety & uniform practice across BRPL

Till date 16 Nos of training programme completed with workforce of more than 4000 covering linemen.

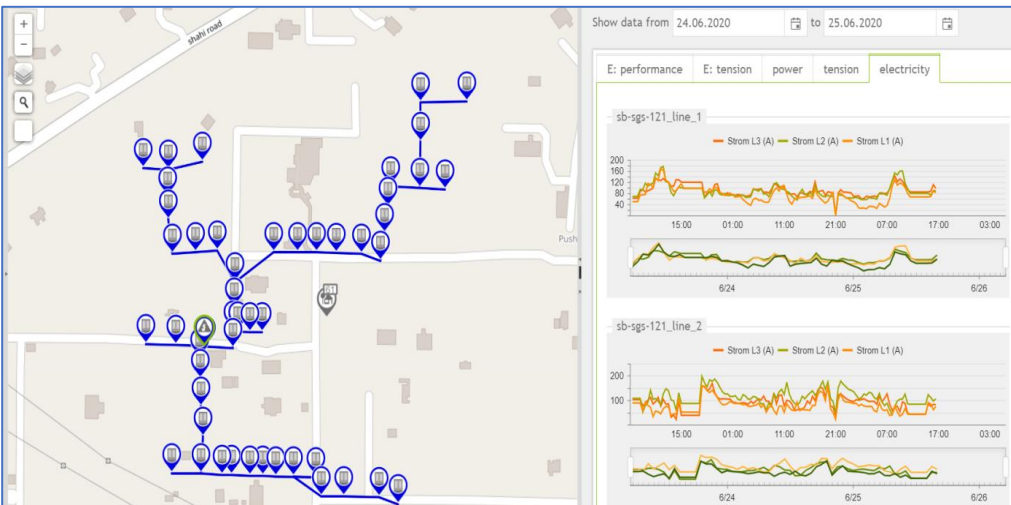
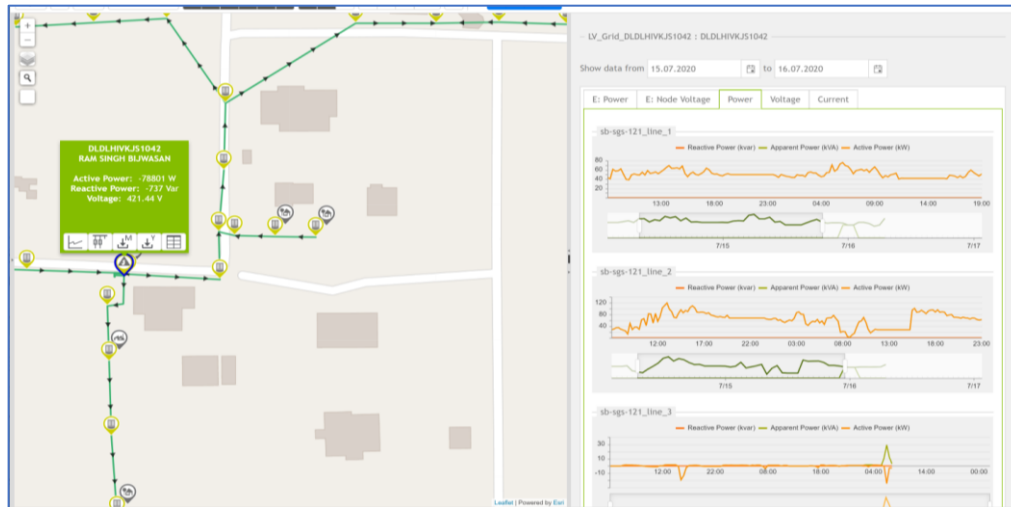


USE CASE / CASE STUDY: DIGITAL TWIN (3/3)



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- Creating a **digital twin** of the LT network based on various data sources
- Enables to easily **monitor, analyse and control** their electricity grids in real time
- Provides **transparency** into grid domains via **real-time calculation** and depiction of the distribution grid below classic SCADA systems
- The platform provides information and intelligence by combining data from **GIS**, asset management and other systems and integrates **smart meter data** and high-resolution power analysers
- The right measure to integrate **renewable energy sources, electric vehicle charging** and **flexibility management**
- **Cloud based** massive parallel **processing** of various data sources and models



- Utilities should encourage innovation to enhance process automation
- Prioritize the actions which can yield operational flexibility
- Big data yield value to all stakeholders with predictive analytics
- Smart devices will enhance the network visibility
- Managing peak demand is a crucial factor

THANK YOU

*For discussions/suggestions/queries email: **isuw@isuw.in***

visit: www.isuw.in

Links/References (If any)