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**DISTRIBUTION
UTILITY MEET
DUM 2023**

AI ML Blockchain in POWER SECTOR

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The current pace of change within the electric grid is challenging. At the same time, due to the continually evolving energy mix, Transmission & distribution operators are experiencing an ongoing increase in grid complexity. Successfully meeting these new demands requires digital transformation.

Challenges:

- Delivering more with less – network efficiencies and operational productivity
- Identifying and preventing issues — blending historical data and forecasting to drive predictability
- Providing the right amount of power at exactly the right time — balancing supply and demand

To protect business and improve results, utilities must:

- Protect and increase current reliability levels
- Decrease outage response times
- Improve power quality
- Integrate DG and DERs
- Provide resiliency to natural disasters and other threats

Digital transformation is the integration of digital technology into all areas of a business, fundamentally changing how you operate and deliver value to customers. It's also a cultural change that requires organizations to continually challenge the status quo, experiment, and get comfortable with failure.

Digital disruption is the change that occurs when new digital technologies and business models affect the value proposition of existing goods and services.

The transformation stage means that digital usages inherently enable new types of innovation and creativity in a particular domain, rather than simply enhance and support traditional methods.



- An integrated tech-enabled asset management system can help save at least ~3-5% of revenue loss. Technology-driven asset management practices will be instrumental in optimizing the performance and profitability of renewable energy assets, contributing to the overall success of the net-zero transition.
- Most critical is Transformer and DT is critical in Distribution
- Distribution transformers are one of the most important equipment in utility network. Because of, the large number of transformers distributed over a wide area in power electric system, the data acquisition and condition monitoring are Pivotal in Transformer Maintenance.
- one of the major failures of the transformer was related with the insulation breakdowns. The transformer condition is monitored using oil tests, temperature measurements and onsite inspections.
- Various tests are in place for testing power transformer while it is in operation –like Dissolved Gas Analysis (DGA), partial discharge detector, Furfuraldehyde Analysis (FFA), temperature measurements, thermal imaging etc.,
- But for DT we can restrict with few parameters like Oil level & temp, Winding temperature, Lug temperature and voltage and current and thermal picture if possible

Net Zero Technology innovations-

- New technologies will accelerate the transition to net zero
- New technologies are key to achieving arguably one of the greatest challenges for humankind, the transition to net zero –
 - Artificial Intelligence (AI) and Machine Learning (ML)
 - Internet of Things (IoT)
 - Virtual and augmented reality (VR/AR)
 - Blockchain.
- Digital transformation is the integration of digital technology into all areas of a business, fundamentally changing how you operate and deliver value to customers.
- For Net Zero operational efficiency is also key factor .
- For making Operational efficiency we must improve manpower skill by using Data analytics driven Software like FFA
- One of good example is FFA in ADMS/ Smartgrid solution .

- The Digital Twin concept provides a great choice for modelling complex systems such as a power transformer. A Digital Twin of transformer is a virtual image of the real-world transformer, which captures its historical, static and dynamic characteristics. Any changes in the actual transformer parameters get reflected in its digital counterpart.
1. **DT DATA ANALYTICS** – Detection of abnormalities in Physical parameters like Oil temperature Winding temperature or Surface lug temp and send alert
 2. **Phase imbalance**– Load in balance will also make DT unhealthy condition in long run so based on these data we have to do corrective action.
 3. **Health Index**– Based on above parameters System will calculate DT health index and this will give actual health of DT.

Internet of Things (IoT) uses real-time data to improve procedures and decision-making. As a result, the energy sector can move away from a dated centralized system to distributed, smart, and integrated networks.

Using IoT and AI/ ML-driven advanced algorithms, we can collect and analyze the energy usage trends of different assets over different time scales using. These insights generated can significantly help effectively optimize the energy consumption by different assets

Digital transformation is happening rapidly, right across the energy sector, with increased condition monitoring, sensors and analytics to enable smart grids and insight to grid assets to enable predictive maintenance and reduce outages and the use of grid edge technologies and smart meters to control domestic energy usage

By effectively tracking the condition and performance of assets through their life cycle, APM can help to “green the grid

The whole idea revolves around, “**Less Maintenance + Longer Asset Life = More Savings and Fewer Emissions**”.

Digital systems can enable the effective integration of renewable energy into the grid, leveraging advanced grid management and energy storage technologies to ensure efficient utilization and integration of intermittent renewable energy sources.

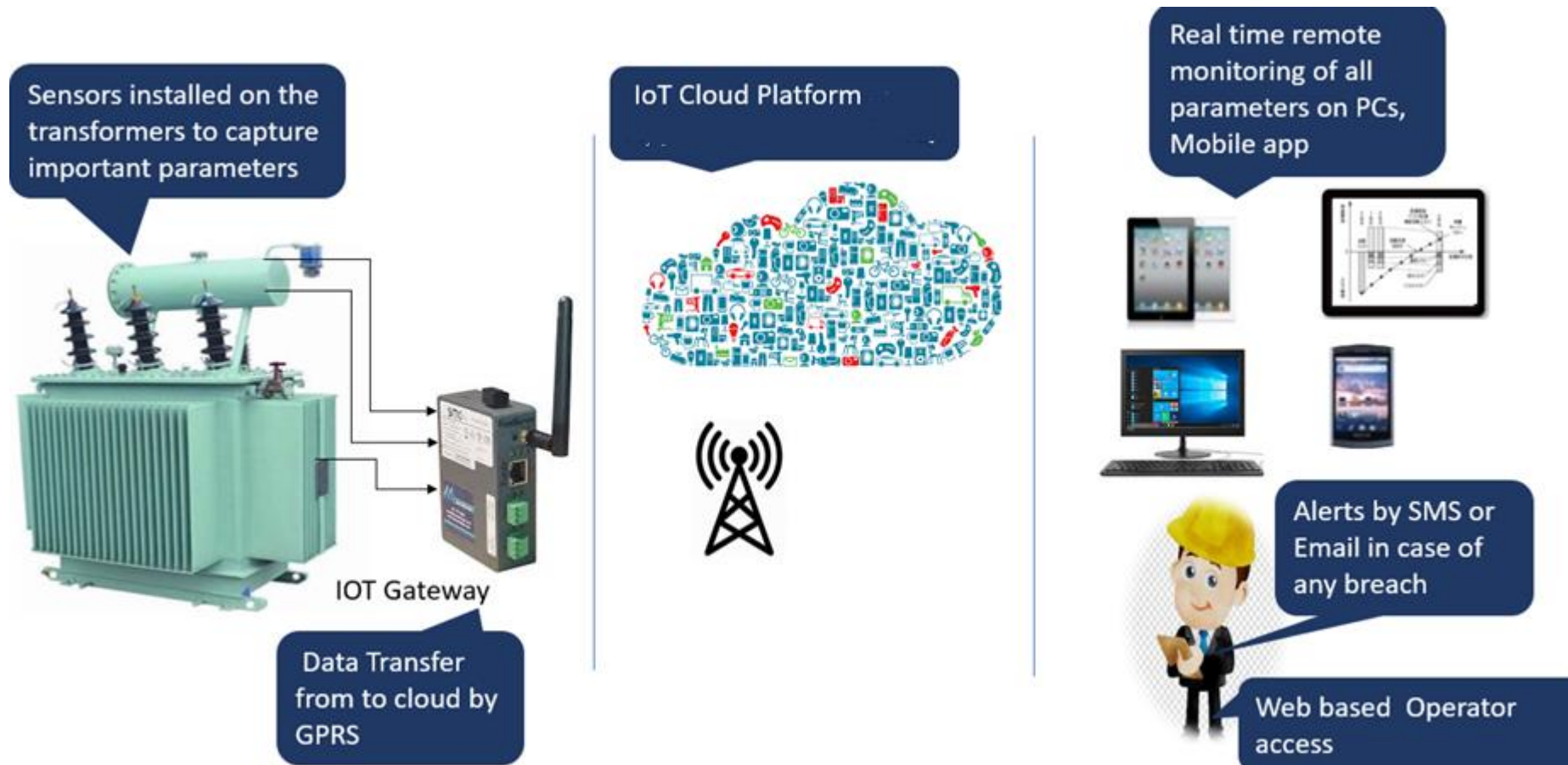
Additionally, digital systems can enable the optimization of energy systems through demand-side management, energy storage and smart grid technologies like Field Force Automation , leading to more efficient energy use and reduced emissions.

Overall, the use of Different technique to help to reduce energy consumption and carbon emissions, improve safety and efficiency, and optimize resource use, making them a key component in the path to net zero.

Does Field Force automation reduce carbon footprint?

Field Force Automation can reduce a firm's CO₂ emissions intensity by improving management efficiency and reduction of efforts,proper Resource utilization.

USE CASE / CASE STUDY- AI, ML and IoT



DT Loading Report

- Where DT and sum of Consumers load differences are high, we understand that at these DT some Issues.
- We can identify such DT and can take action.
- Proper rating of DT location of DT near to Consumer will also reduce loss.

Division Name	Total DT Studied	18-08-2021						
		0% to 20%	20% to 40%	40% to 60%	60% to 80%	80% to 100%	100% to 120%	Greater than 120%
2510 - ALAKNANDA	353	25	110	145	60	13	-	-
2511 - KHAN PUR	199	19	23	43	70	39	4	1
2520 - SAKET	31	1	10	14	4	2	-	-
2521 - VASANT KUNJ	32	2	5	12	8	5	-	-
2530 - NEHRU PLACE	342	39	155	123	24	1	-	-
2540 - NIZAMUDDIN	318	47	119	91	54	7	-	-
2541 - SARITA VIHAR	30	2	5	5	10	6	2	-
2542 - NEW FRIENDS C	3	2	1	-	-	-	-	-
2550 - R.K.PURAM	209	42	59	68	38	1	1	-
2551 - HAUZ KHAS	219	37	68	75	35	4	-	-
2610 - JANAK PURI	21	-	3	12	3	3	-	-
2620 - NAJAF GARH	15	-	2	5	7	1	-	-
2621 - JAFFAR PUR	9	-	1	2	3	2	-	1
2630 - NAGLOI	7	-	5	1	1	-	-	-
2631 - MUNDKA	10	1	2	1	4	1	1	-
2640 - PUNJABI BAGH	90	9	25	31	17	8	-	-
2641 - TAGORE GARDE	23	2	4	9	5	2	1	-
2650 - VIKAS PURI	5	-	1	-	1	2	1	-
2651 - UTTAM NAGAR	7	-	-	1	3	2	1	-
2652 - MOHAN GARDE	14	-	2	4	5	3	-	-
2660 - PALAM	43	6	4	8	16	6	2	1
2661 - DWARKA	4	-	1	3	-	-	-	-
Grand Total	1984	234	605	653	368	108	13	3

USE CASE / CASE STUDY- Field Force Automation

Field Force Automation(FFA) for Outage Management Systems (OMS) works with a utility's GIS system to handle different types of planned and unplanned field work.

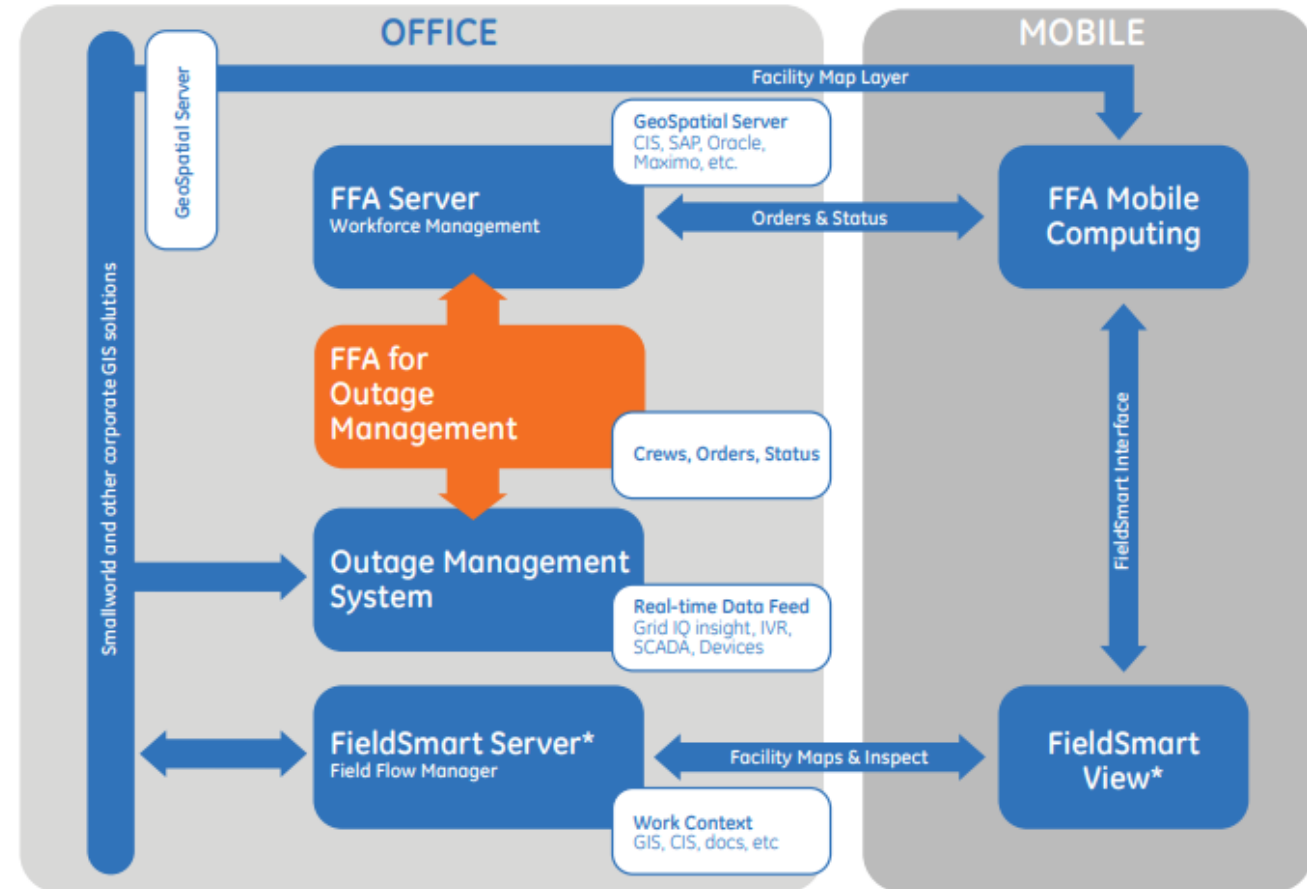
The full solution comprises of the following key elements:

Outage Management System: Ensures impacts of planned and unplanned outages and incidents are minimized, based on a common network model for engineering.

FFA Workforce Management: Unified resource, inventory and work management, with dynamic schedule optimization.

FFA Mobile Application: Single platform for all different mobile business processes.

Information Flow within FFA for Outage Management



By using this we can predict and calculate Health index of asset. Based on this Asset performance Management will work and give lot of benefits like

- Improve reliability —analytics that predict potential equipment failures with enough lead time to effectively plan maintenance
- Improve availability — Accurate diagnosis of equipment issues that enables faster repairs and shortens outage duration
- Maintain technical expertise — A unified and accurate view of assets that provides clear guidance
- Reduce maintenance costs — Customized maintenance strategy that increases plant reliability while reducing the amount of maintenance activity performed overall

The Smart grid solution like FFA will improve operational efficiency

- Reduction in downtime— Build ecosystem that speeds the process by which new analytics are created, enabling operators to draw insights more quickly and drive action
- Improvement in Operational efficiency- As we reduce Downtime and maintenance cost that itself improve Operational efficiency

THANK YOU

For discussions/suggestions/queries email: dum@indiasmartgrid.org

www.isuw.in

Links/References (If any)

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