

SMARTER FIELD WORK MANAGEMENT SYSTEMS



Smart grid Software & Data Management

\$2.9 BILLION IN 2015

Source: SBI Energy

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Clearly, in the information economy, an organization is only as good as the innovative ideas it can nurture and execute at speed. Indeed, many good organizations are capable of harnessing innovation within their boundaries.

Recent innovation in smart grid technologies is set to transform the global electricity business by introducing transactional local markets, often referred to as “transactive energy”. Major elements of this transformation will be initiated by a wide scale deployment of net-zero residential generation, demand driven community micro-grids, and cost efficient commercial renewable energy. In addition, local markets will spawn a set of adjacent services in the areas of deployment, maintenance and management of local resources such as residential solar and community micro-grids. This work opens up a plethora of opportunities for local utilities to

extend services by exploiting existing customer base, vendor relationships, processes, systems and fieldwork technologies.

The service model in a local energy market will be competitive, driven by cost and service levels as opposed to the existing field work in a regulated utility. Every utility today focuses on many aspects of planned and unplanned fieldwork such as restoration, metering, maintenance, inspection, customer facing energy services and vegetation. The existing systems and processes are configured to timely schedule fieldwork, to comply with regulatory or other service level criteria. This model fits the current utility structure extremely well, but will not scale to meet the commercial needs of the emerging utility market.

In all market scenarios, planned work must take into account customer preferences such as time, day of the week, preferred touch points, schedule details and completion confirmation. On the other hand, all unplanned work must be proactively managed to minimize customer impact. Market studies indicate that first time successful completion and periodic customer communications are

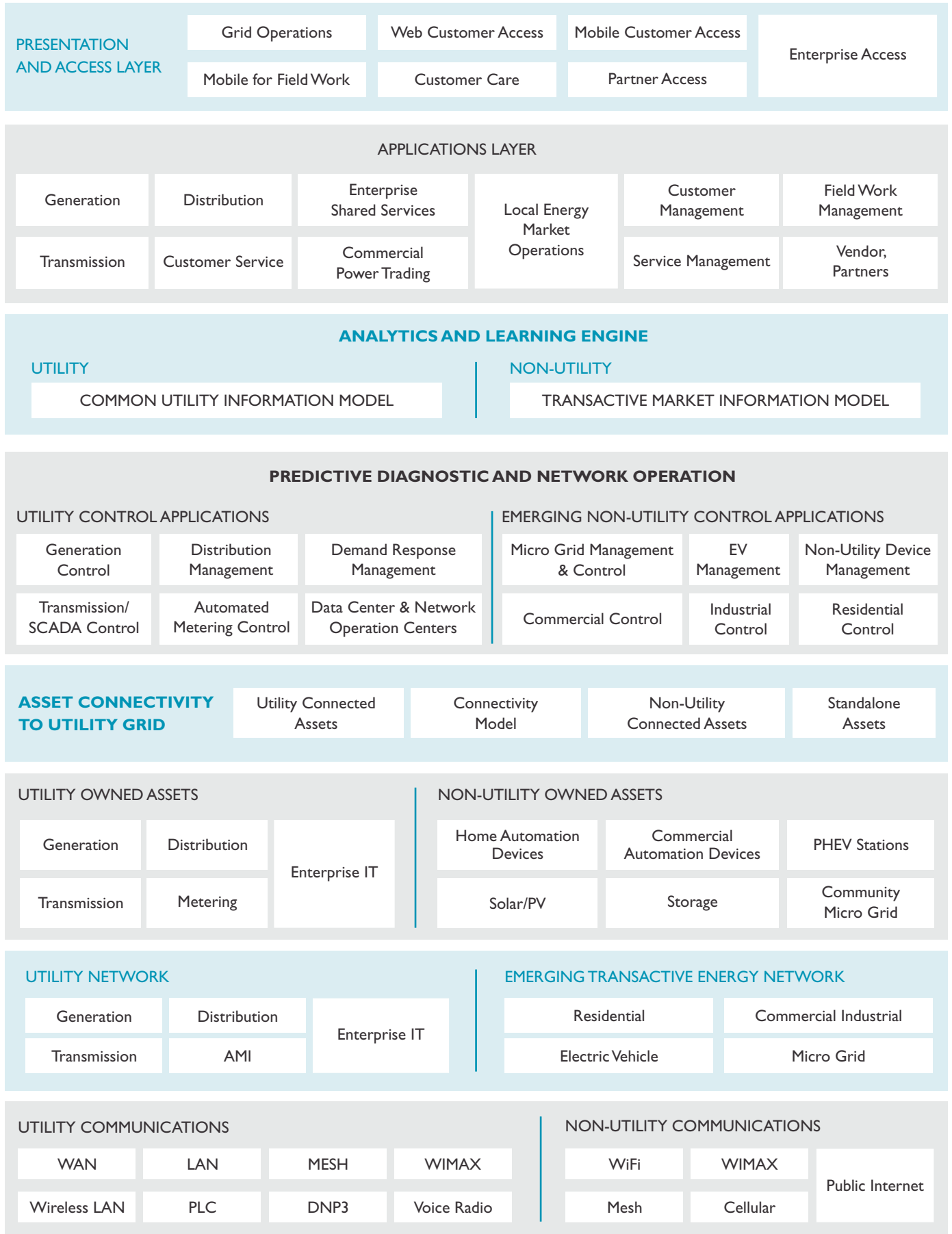


Fig 1: Emerging Utility Field Work Architecture

Smart Helmet

- Camera
- Motion Sensors
- Earphones
- Microphone
- Augmented Reality
- Induction Sensor
- Temperature Sensor
- Pressure Sensors
- Smoke Sensors

Field Truck Computing Platform

- Integrated NOC
- Field Applications
- Diagnostic Applications
- Safety Applications
- Manuals
- Construction Standards

Touch Enabled Dashboard

- GPS Applications

Connectivity

- Private/Public Cellular
- Public WiFi
- Cognitive Radio

In Vehicle Sensors & Devices

- Cameras
- Temperature Sensor
- Pressure Sensor
- Smoke Sensor
- Hitch Sensor
- Poisonous Gas Sensors
- Robotic Arm
- GPS
- Heat Sensors

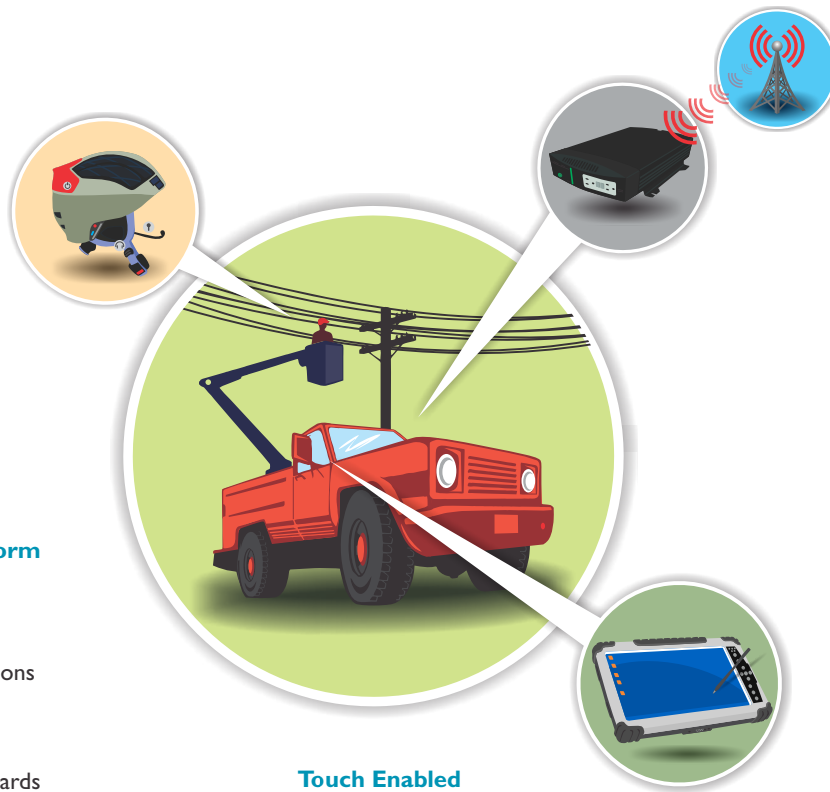


Fig 2:A Smart Utility Field Truck

the key factors in driving customer satisfaction and growth. A comprehensive systems architecture to meet such requirements is presented in Fig 1. This architecture holistically integrates emerging technologies (field and back office), componentizes app architecture and centralizes process management structures to effectively scale and exceed customer satisfaction.

UPLIFTING FLEET VEHICLES AS TECHNOLOGY PLATFORMS

Emerging technologies are poised to revolutionize fieldwork solutions, specifically in the areas of fieldwork gear and vehicles. Integrated technologies provide a unique opportunity to enable a fleet of work

vehicles to act as a self-sufficient hot spot, to enable both guided and independent work completion. A fleet vehicle, such as an outage management truck used in day to day restoration, should be equipped with a low cost computing platform, housing field applications that can run in connected and disconnected modes. This vehicle, will also implement a communication platform architected with advanced radios, which can seamlessly manage a wide spectrum of available networks, ensuring high availability and low operating costs.

In addition, these mechanisms will provide digital mobility for several feet around the vehicle delivering a Vehicle Area Network (VAN) and ensuring untethered access to key diagnostic and other work management applications. The communication layer can also implement reliable mechanisms for the computing platform to connect and sync

with the back office. The vehicle should integrate advanced telematics that can measure, monitor and report a variety of useful measurements such as location, speed, vehicle condition, fuel status, boom angle, etc. The live feed cameras in the vehicle can provide a 360 degree view and when integrated with telematics data, can deliver a new range of safety applications. In connected communication scenarios, the VAN can

deliver reliable voice at a competitive cost. In emergency scenarios, the VAN can switch to a pre-allocated and negotiated communication band, increasing availability and reliability under all environmental conditions. In short, every fleet vehicle can be turned into a cost effective technology platform to address essential fieldwork computing requirements.

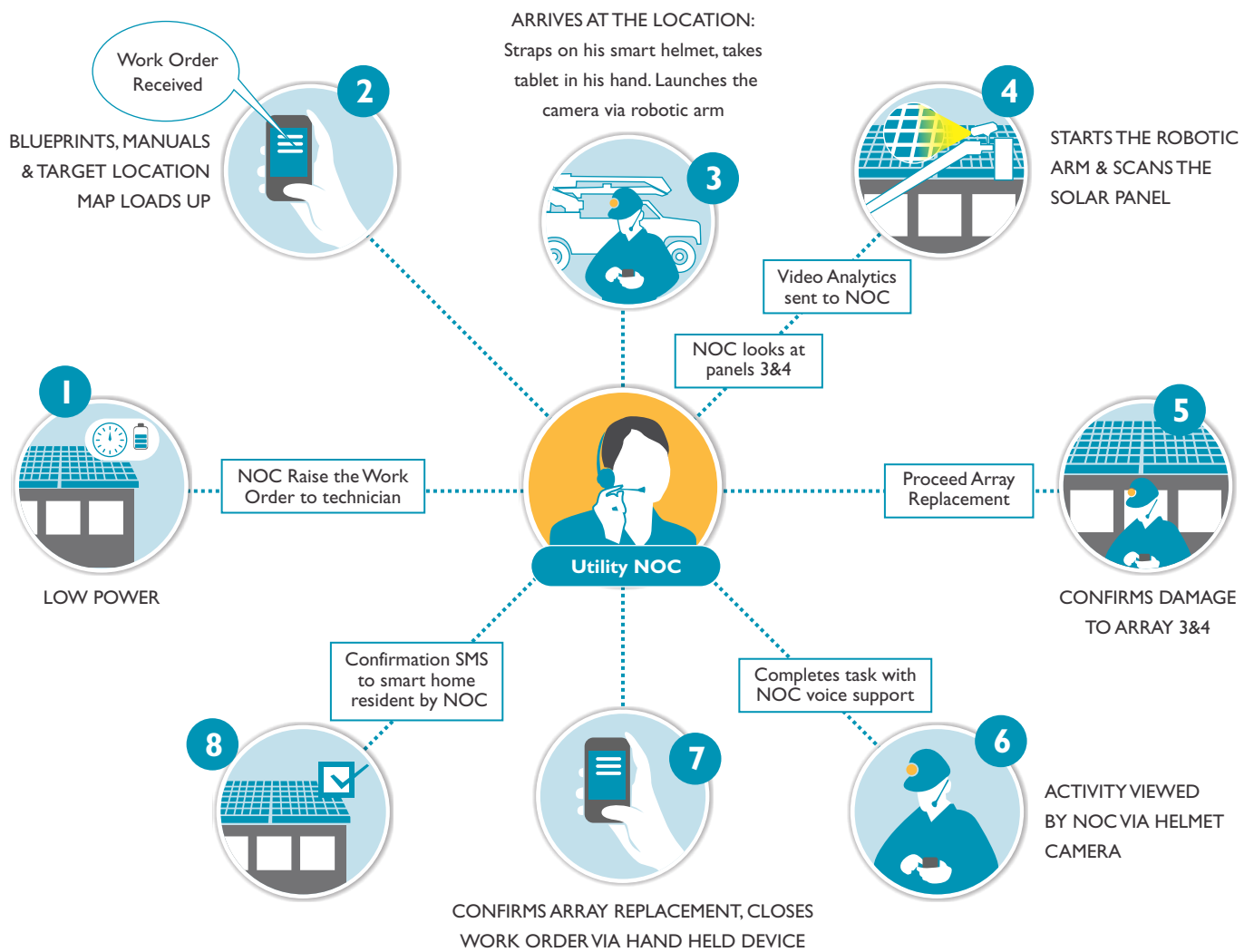


Fig 3:A Smart Residential Solar Field Work Process

WEARABLE TECHNOLOGY FOR ENHANCED PRODUCTIVITY

The crew productivity can be tremendously improved by strategically employing wearable technologies, to expedite work completion. The next generation work helmet will include a camera, GPS, poisonous gas sensor, accelerometer, temperature sensor and induction sensor. Most engineering design diagrams and safety manuals can be housed in the vehicle-computing platform and streamed directly to the technician's wearable or projection surfaces as appropriate. The integrated wearable can stream real-time video from the work site to a remote diagnostic center, where an expert can help aid problem resolution. Additionally, the vehicle can be fitted with a guided robotic arm and other special devices that can help resolve technical issues such as attending to rooftop solar panels.

NEW AGE APPS TO IMPROVE CSAT

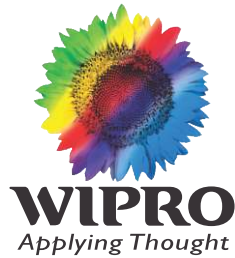
Most digital grid devices incorporate powerful processors and several components like data validations etc., of an end-to-end business process can be executed right within the device. Many such business processes can be functionally de-componetized and distributed across grid devices, the vehicle computing platform and back office. Essentially, this leads to a component architecture that is functionally distributed as opposed to stove-piped service architectures. A primary feature of this app architecture is its ability to dynamically reconfigure devices in the field to restore partial or full function capabilities. Utilities must extend the existing application portfolio to include both field and back office components so that they seamlessly align and deliver fieldwork capabilities. Back office components must include scheduling and dispatch apps. The former should prioritize work based on customer preferences, historical work crew performance and contractual obligations. The latter should initiate work based on real-time crew availability, environmental and service level agreements.

All app components will embed several adaptive learning and predictive algorithms and evolve to optimize work dispatch given customer expectations and resource availability. These new age apps will work with advanced asset management and operational systems to deliver optimal work schedules. Crews will be empowered with specialized apps that can provide individualized customer experience in order to effectively improve customer satisfaction. These apps will work in tandem with communication systems that can deliver real-time work status anywhere, anytime to customers. A practical realization of a residential solar panel outage/restoration process is depicted in Figure 3.

NEXT STEPS FOR PROCESS EXCELLENCE

The digital integration of field devices and vehicles using a robust communication layer, enables a unique opportunity to centrally manage, and optimize fieldwork processes. Utilities can set up a network operations center that can help schedule, dispatch and manage all fieldwork including existing lines of business regulated work. In addition, these centers can also prioritize, sequence, dispatch and manage work across the entire service area. They can effectively coordinate a wide variety of tasks and respond quickly to an emergency scenario like a tornado disaster. Customer preferences and compliance criteria can be implemented using standardized processes, established and directed by these operations centers. These centers can also implement predictive process models that can help optimize operational costs to the productivity and effectiveness metrics for various processes can be centrally captured and analyzed for specific improvement objectives.

As smart grid and other digital evolutions mature in the electric industry, accelerating local market structures, utilities can expand their service resulting in higher customer satisfaction and retention rates. Smart utilities can leverage their existing customer base and advance the growth agenda by employing emerging field technologies.



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