How should smart metering standards inform success for utilities?

Panel 3: Smart Metering in African Context – Standards of Installation and Operation

1/18/2022

FAST COMPANY

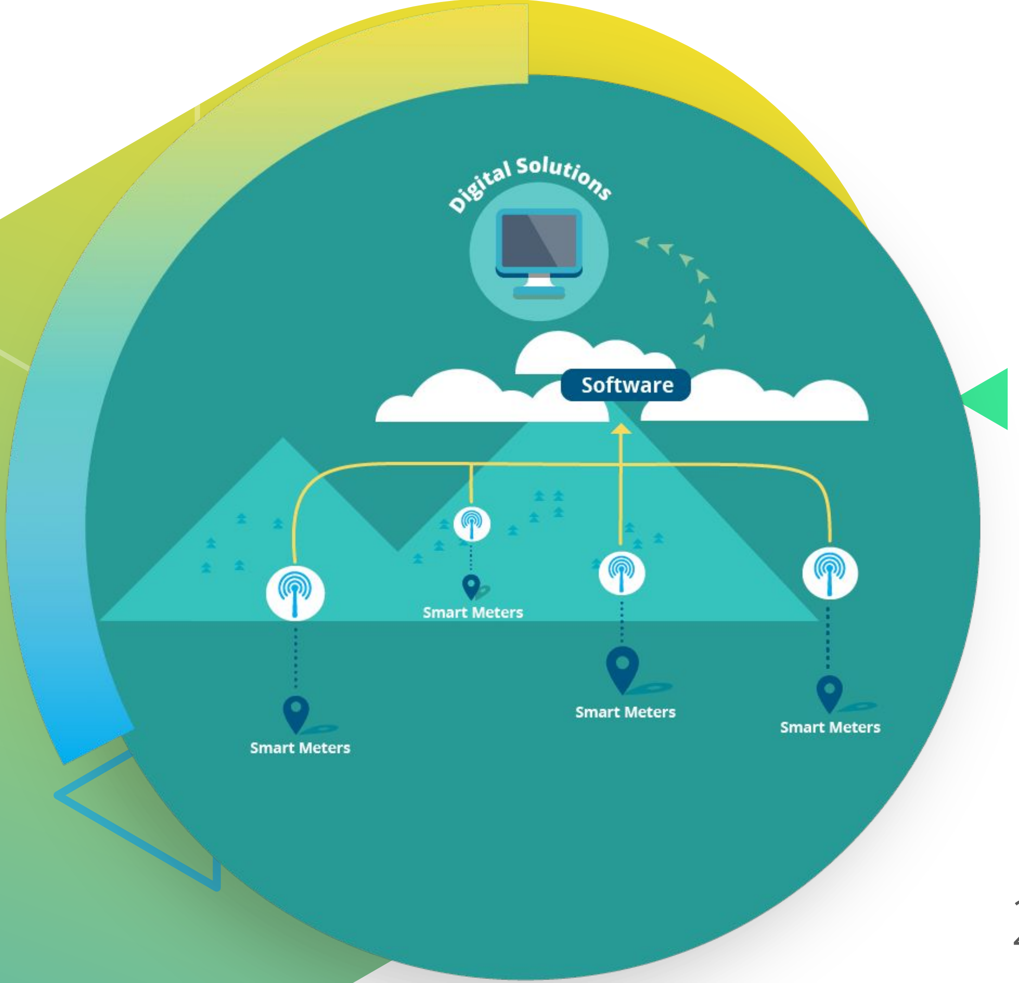
MOST INNOVATIVE COMPANIES 2021

▸ 2021 Honoree

SparkMeter is Fast Company's 2021 Most Innovative Company in Energy!

SPARKMETER

SparkMeter offers grid-management solutions that enable utilities in emerging markets to run financially-sustainable, efficient, and reliable systems.



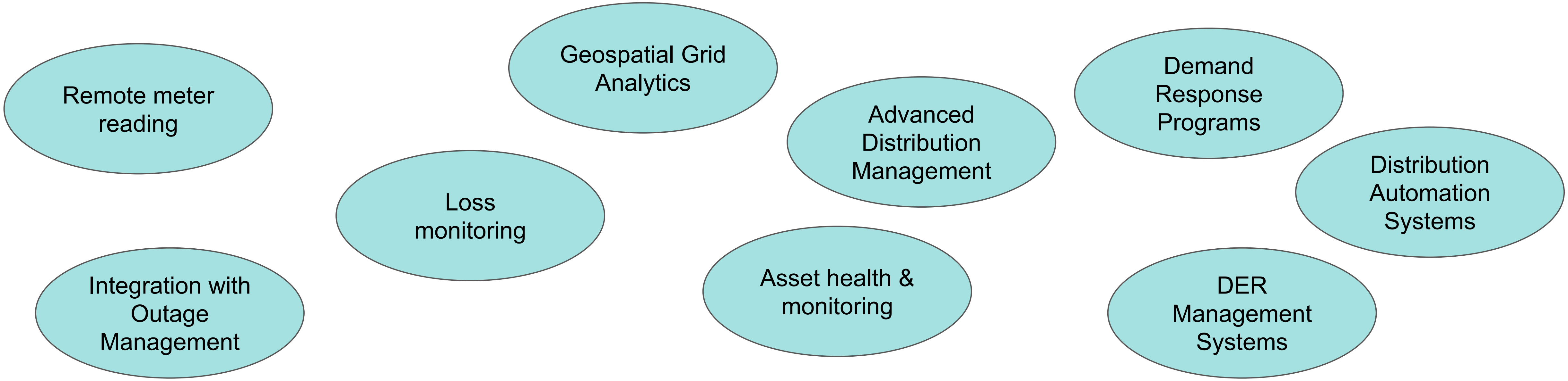
25+ Countries

400+ Systems installed

200k Meters sold

What do utilities want to achieve with smart metering?

This should be the driving question for us to approach smart metering standards.



I need _________ data from my smart metering system with ___% reliability and ___ minutes latency for my smart metering system to be used with ___________ system or for ___________ purpose.

Smart metering can help solve these problems… but it’s not guaranteed.

Revenue Loss

Substantial revenue is lost to energy theft, poor commercial practices, and technical leakages.

Grid Reliability and Resilience

Poor grid reliability due to unmanaged interruptions and outages.

The Aging Grid

Most utilities have neglected to invest in the distribution network over time due to financing constraints and under-recovery of cost

Coping with new grid dynamics

Utilities have to deal with new grid dynamics like EV integration

AMI standards emphasize component integration – not performance!

Typical AMI specifications emphasize how other components can interact with it or be integrated into it (emphasis on communication standards, exact meter registers, meter battery etc), instead of outcomes.

Here's what we believe smart metering standards and tenders should emphasize instead:

- What business outcomes need to be supported by the system?
- What key metrics are used to ensure that the outcomes are actually supported, and how the smart metering system supports the creation of those metrics?
- How will the smart metering system interoperate with other systems to support them?

SPARKMETER

Smart metering tenders are influenced by standards that don’t support utility outcomes

What we see in the marketplace.	What we recommend as an improvement.
Types of communication for the metering system to use (e.g., requirement for the meter to accommodate cellular/GPRS modules);	Specify the operating environment for the meters in detail so that the metering system provider can provide their best recommendation for what type of communication should be used.
Communication standards of the hardware itself (e.g., DLMS/COSEM);	Specify the data needed from the local metering system, the time resolution at which it’s needed, and maximum latency acceptable to bring it back to the utility, and require that the data be fully available through APIs;
Design/functional requirements of a meter LCD screen or CIU;	Specify what information should be made available for customers and for the utility to test the meters when necessary (an LCD is not the only way to display information); optionally specify the frequency at which it should be accessed and the conditions (e.g. require no need for specific device, no extra cost to the customer), so that the right solution can be proposed;
Battery specifications of an on-board battery;	Specify how the metering system should operate when power is not provided through the mains connection - a battery is not the only option;
STS prepaid token compatibility;	Specify a requirement for software-enabled prepaid tariffs, encryption, and secure payments;
Specific requirements for local memory on the meter itself;	Specify a requirement for what data - and how much - should be stored without relying on a connection to a cloud or remote server (not necessarily on the meter itself);
Very large (100A) capacity requirements for meters to be used for low-income residential customers;	Specify what load profiles need to be met;
Requirements for a limited number of tariffs to be stored on the meter itself;	Require that tariffs can be created, managed, and assigned from the metering system's software, essentially allowing for an unlimited number of tariffs that can be assigned to a given meter;

Result: The extent of digitalization today is insufficient

Utility visibility varies from none to some, but is typically limited to the Medium Voltage (MV) system -- not the Low Voltage (LV) system where customers are actually served. This poor visibility prevents utilities from developing DER programs and benefiting from VPP grid resources.

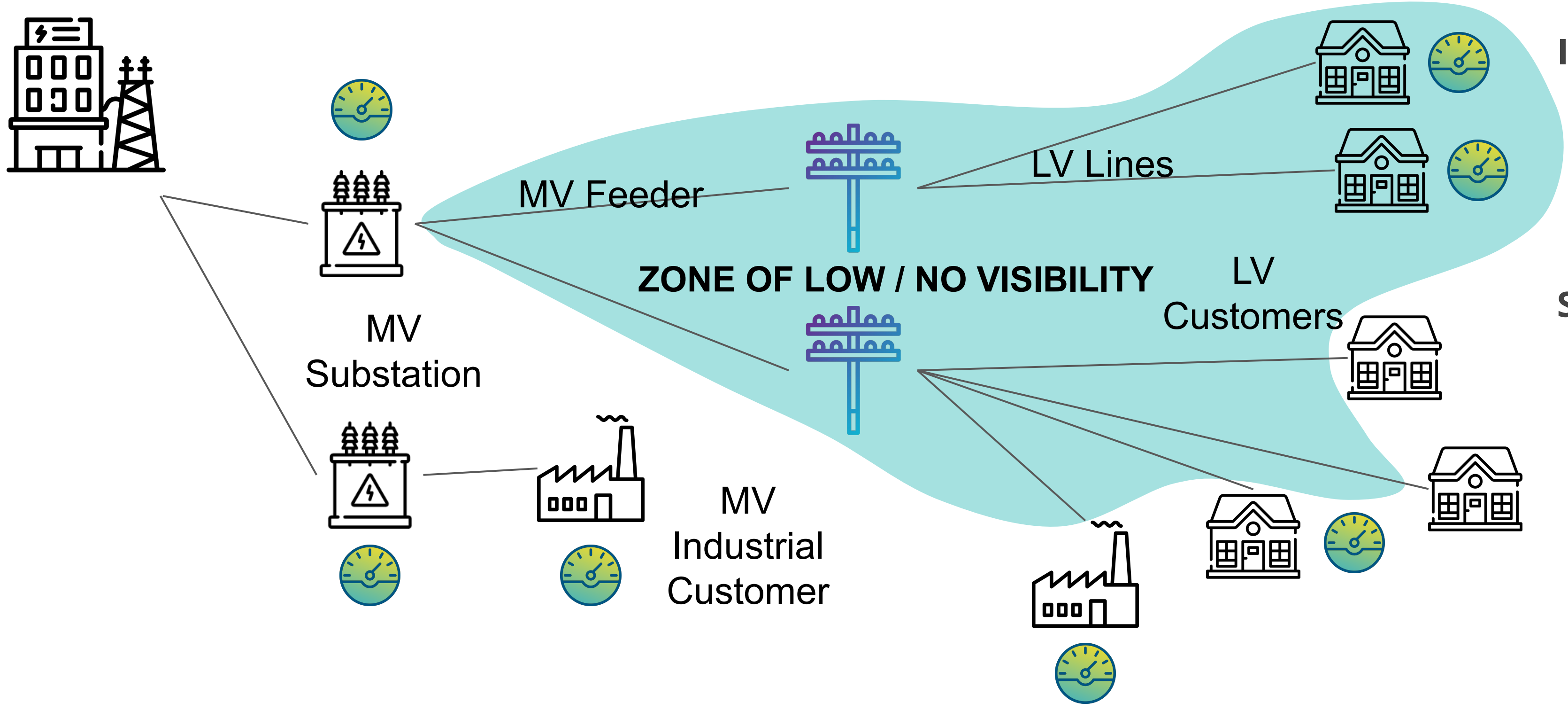
Impact

Medium visibility from SCADA on HV/MV system and substations.
This provides insight into:

- MV system reliability
- Large-scale technical losses

Low to no visibility on MV/LV lines and customers.
No insight into:

- Technical and non-technical losses
- Customer consumption
- Outages
- Load / demand
- Asset performance and health
- Distribution phase balancing and power quality



International Utilities:

- Billing and consumption data read once a month for some customers;
- Many customers are unmetered or meters are not being read at all.

Small US Utilities:

- Even with AMI smart metering, only receiving billing (kWh) information;
- Most not integrating AMI data into digital outage management, asset management, or distribution network management because many vendors will not work with utilities serving <250,000 customers.

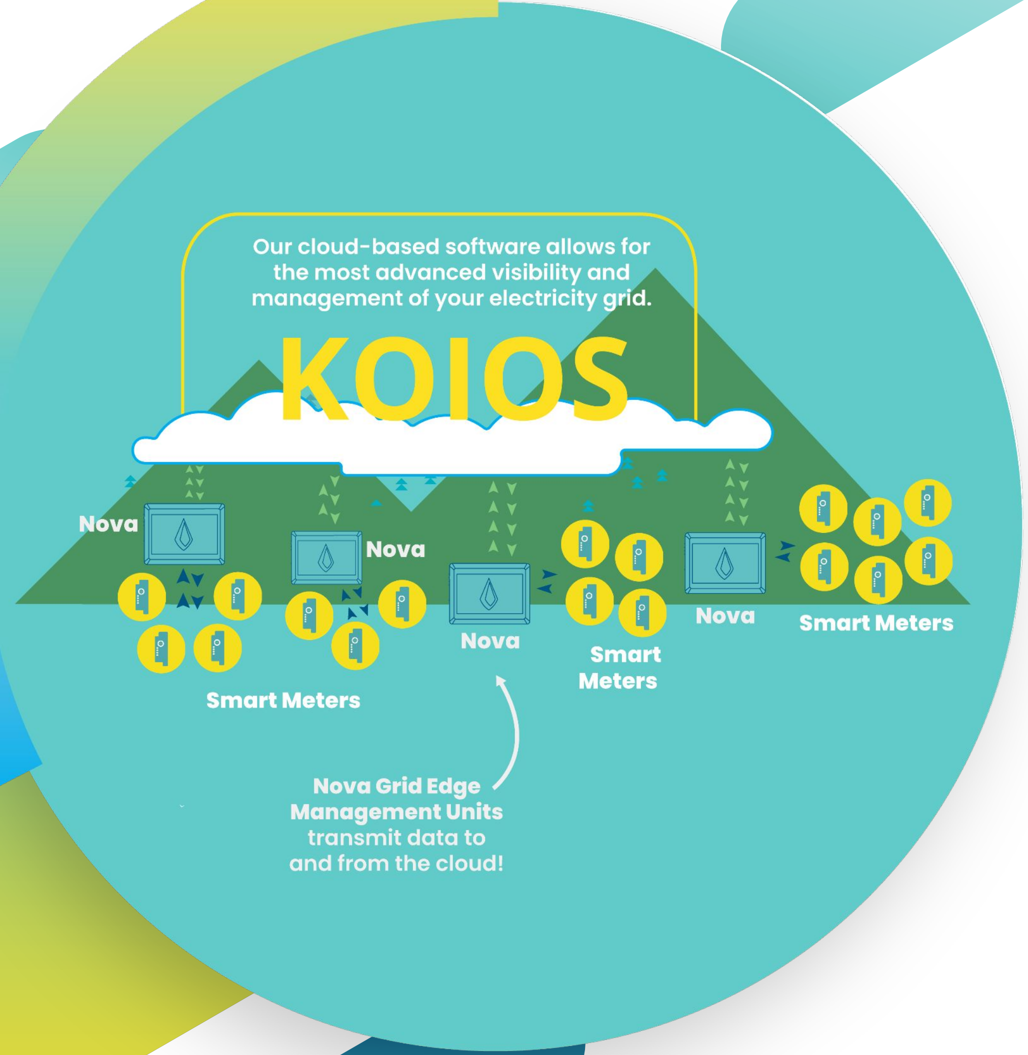
Implications - An example from experience

- A utility AMI system complies with all the standards. It only provides a time series of hourly energy data once a day.
- Any other data (V, I, p.f., events, etc) sits on the meters themselves in local memory, being regularly overwritten.
- Unless the meters are polled by the user from the Meter Data Management System (MDMS), the utility will not receive that data, which is crucial to enable other systems or report on utility performance metrics like losses, outages, SAIDI and SAIFI.
- There is no guarantee that the system would have the necessary bandwidth to provide that data at the right time resolution and with a targeted maximal latency to be useful. There's no specification that the MDMS database should store data in time-series format for large datasets.
- Potential limitations:
    - polling takes 4 seconds/meter to retrieve data.
    - waiting for hours or days just to get the most recent voltage reading.
    - MDMS isn't storing the data with timestamps and might only be capable of storing and querying a fraction of the amount of data required for applications outside of capturing energy readings.

Recommendations

At a high level, AMI procurements should be less concerned with meter design requirements like those mentioned above, and more concerned with the data and interoperability specification for the system as a whole. This would include attributes like:

- System latency requirements (how long the system should take to populate the remote server with data);
- Data synchronization (within what accuracy should data be timestamped across meters)
- Data caching (how robust the system should be to gaps in communication between the local system and the remote server);
- Data reliability (how much data the system should populate to the remote server as a percentage of the data generated by the local system);
- Data requirements for billing, including time resolution and target latency;
- Data requirements for digital outage management systems or analytics, including time resolution and target latency;
- Data requirements for digital distribution management systems or analytics, including time resolution and target latency;
- Data requirements for distribution automation, including time resolution and target latency;
- Data requirements for energy accounting, including time resolution and target latency;
- Timestamped data registers;
- Openness to "Energy IoT" approaches to smart metering that diverge from traditional AMI systems;
- Openness to cloud-based software as a service approaches to smart metering databases and software that diverge from traditional AMI MDMSs;
- Complete API access to all meter data in the remote database at specified latency and reliability;


Our cloud-based software allows for the most advanced visibility and management of your electricity grid.
KOIOS
Nova
Nova
Nova
Nova
Smart Meters
Smart Meters
Smart Meters
Nova Grid Edge Management Units transmit data to and from the cloud!

Thank You.