



SOUTHERN AFRICA REVENUE PROTECTION ASSOCIATION

19th ANNUAL CONVENTION 2015

Chasing your money – Simple strategies that work

6–7 August 2015

MBOMBELA



Technology Trends that are Transforming Smart Grid Strategy

“Eliminating Risks with New Technology”

Mbombela

7 August 2015

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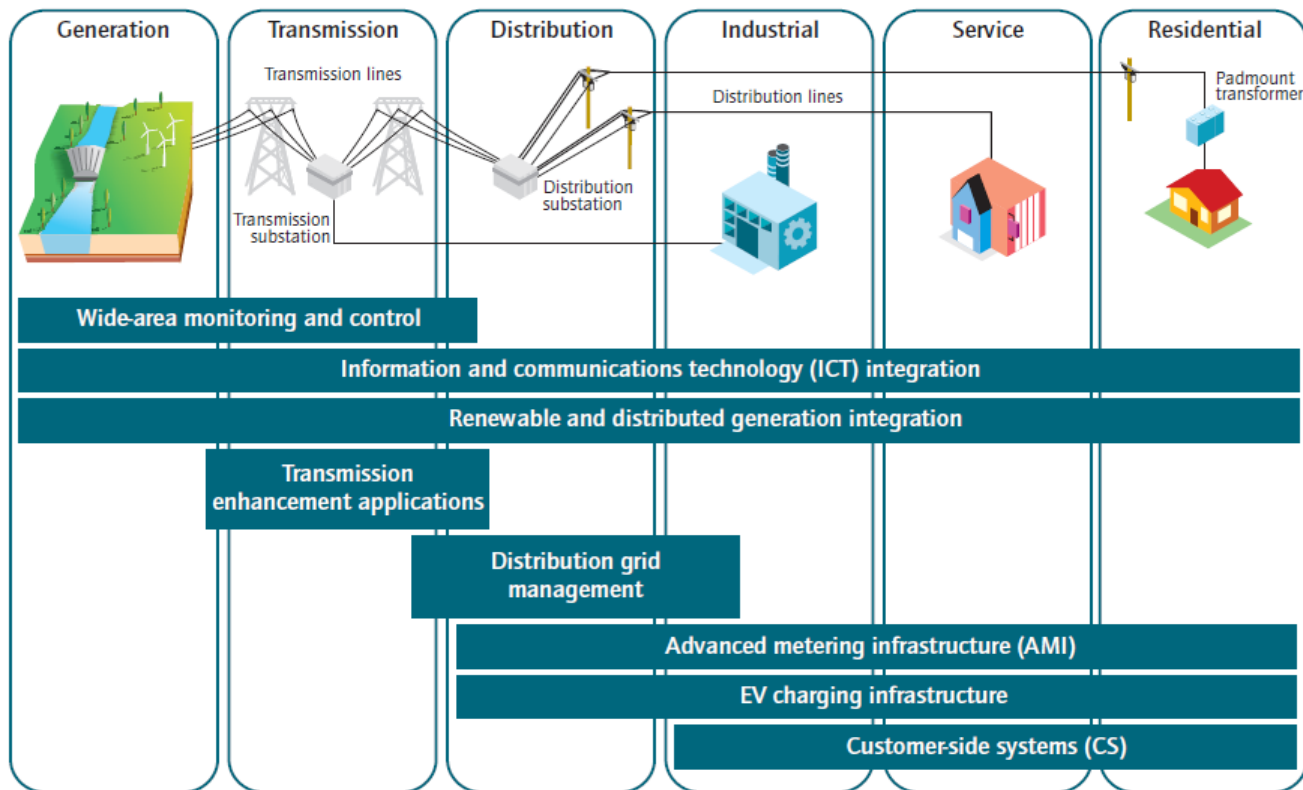
CONTENTS

- Smart Grid Technologies Categories
- Technology Development.
- Smart Grid Applications (from Utilities to end Consumers)
- Can we use new technology using Edge Computing & Distributed Analytics to detect Illegal Electricity Theft ?
- Key Takeaways & Conclusion

SMART GRID TECHNOLOGIES & APPLICATIONS

Overview

SMART GRID TECHNOLOGY CATEGORIES



Source: Technology categories and descriptions adapted from NETL, 2010 and NIST, 2010.

KEY POINT: Smart grids encompass a variety of technologies that span the electrical system.

TECHNOLOGY DEVELOPEMENT

TECHNOLOGY CATEGORY

Wide Area Monitoring &
Control

ICT Technology

Renewable Energy Integration

Transmission Enhancements

Distribution Grid
Management

Advanced Metering
Infrastructure (AMI)

Customer Side Systems



DEVELOPEMENT

Phasor Measurement
Units (PMU), Sensors ,
WAMS.

PLC, RF Mesh, 3G/4G, LTE
IT and DATA innovations

PV, CSP, Large Scale
Storage

Superconductors, FACTS,
HVDC

Load Control , Automated
re-closers, Line sensors,
DMS,OMS

Smart Meters, MDM
systems, IHD

ENABLING SMART GRID APPLICATIONS

Moving beyond meter-to-cash

Smart Grid Network

Smart
Metering

Data Collection | Data Management | Customer Billing | Customer Service

Grid
Reliability

Outage Detection | Restoration Notification | Preventative Analysis | Outage Statistics | Power Quality

Grid
Efficiency

Transformer Load Management | Volt/VAR Optimization | Conservation Voltage Reduction

Consumer
Engagement

Smart Payment | Dynamic Pricing (Time of Use/Peak Time Rebate/DPP) | Demand Response | Home Energy Management | EV Smart Charging | Energy Efficiency

Peak Load
Management

Dynamic Pricing | Demand Response | Direct Load Control

Revenue
Cycle Services

Customer Billing | **Revenue Protection**

Embedded
Sensing

EV Smart Charging | Streetlight Monitoring

Distributed
Energy Resources

Solar Monitoring

EDGE COMPUTING: DISTRIBUTED ANALYTICS

Overview

DISTRIBUTED ANALYTICS

What is it?

- » Putting intelligence where it makes the most sense.



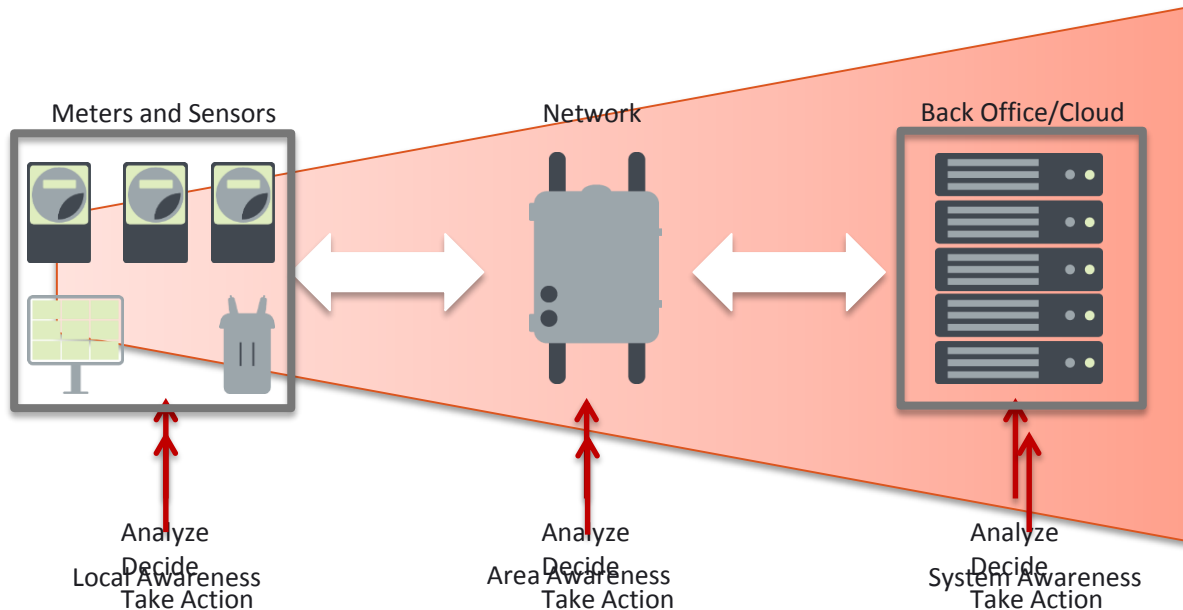
- » Deploy coordinated analysis, decision making, and action across the entire solution space.



WHERE SHOULD ANALYTICS BE DEPLOYED?

Decision Criteria:

- What is the required breadth of knowledge?



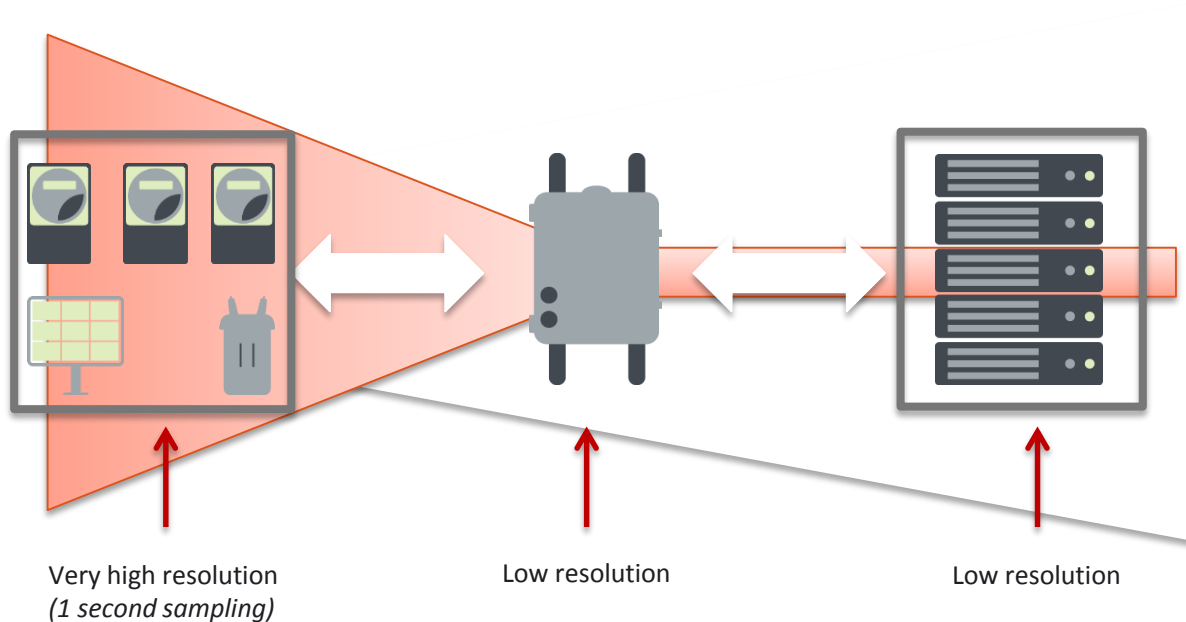
Example: Transformer Demand Management

Example: System Demand Management

WHERE SHOULD ANALYTICS BE DEPLOYED?

Decision Criteria:

- What is the required breadth of knowledge?
- What is the required data resolution?

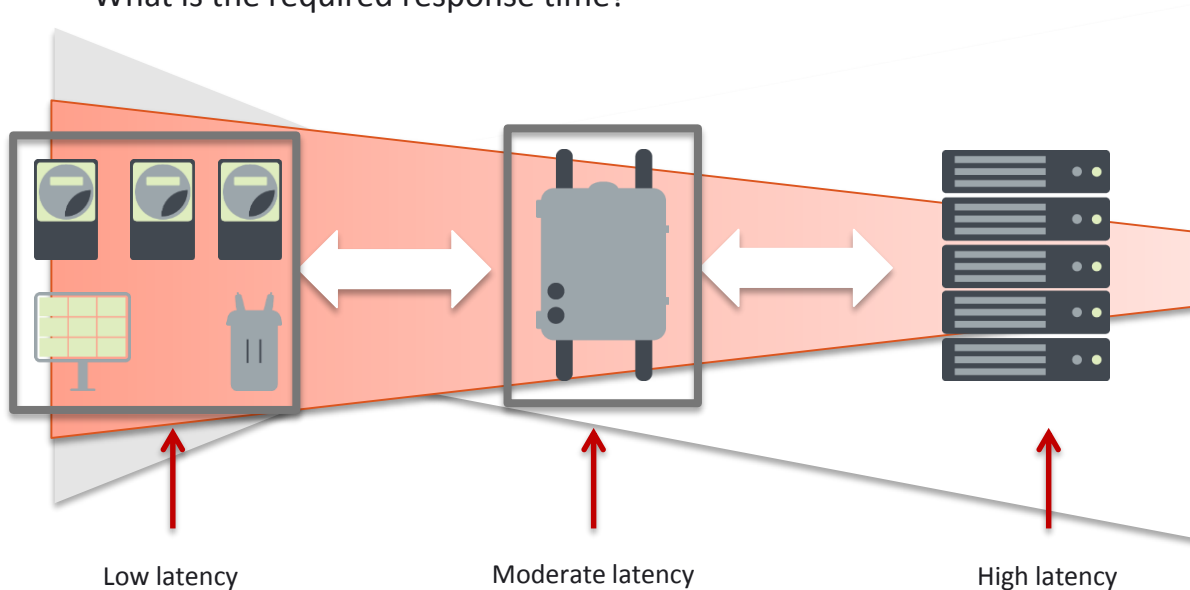


Example: High Precision Theft Detection, Investigation and Resolution

WHERE SHOULD ANALYTICS BE DEPLOYED?

Decision Criteria:

- What is the required breadth of knowledge?
- What is the required data resolution?
- What is the required response time?

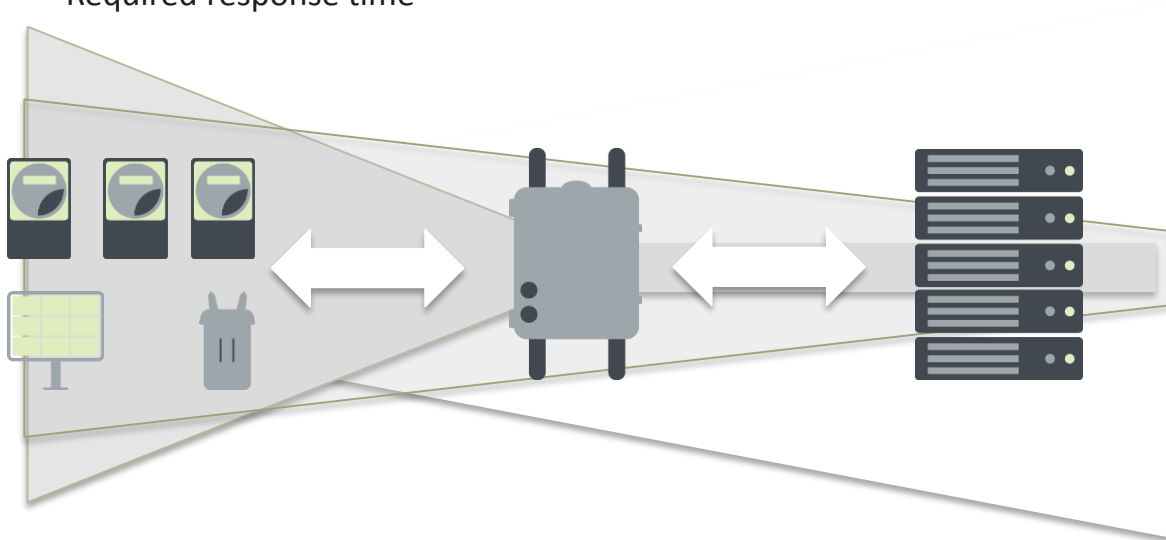


Example: Outage Detection
Large Data Center Load Shedding
Conductor Down

WHERE SHOULD ANALYTICS BE DEPLOYED?

Decision Criteria:

- Required breadth of knowledge
- Required data resolution
- Required response time



DISTRIBUTED ANALYTICS

Use Case: Theft Detection



Up To 1/3 Of Stolen
Electricity In Britain Used
To Grow Cannabis



USING TECHNOLOGY TO DETECT ILLEGAL CONNECTIONS

TECHNOLOGY AREA

Wide Area Monitoring & Control

ICT Technology

Renewable Energy Integration

Transmission Enhancements

Distribution Grid Management

Advanced Metering Infrastructure (AMI)

Customer Side Systems



Distributed Analytics

Good Peer to Peer Communication network in the field.

Theft Detection Analytics

Smart Meters,

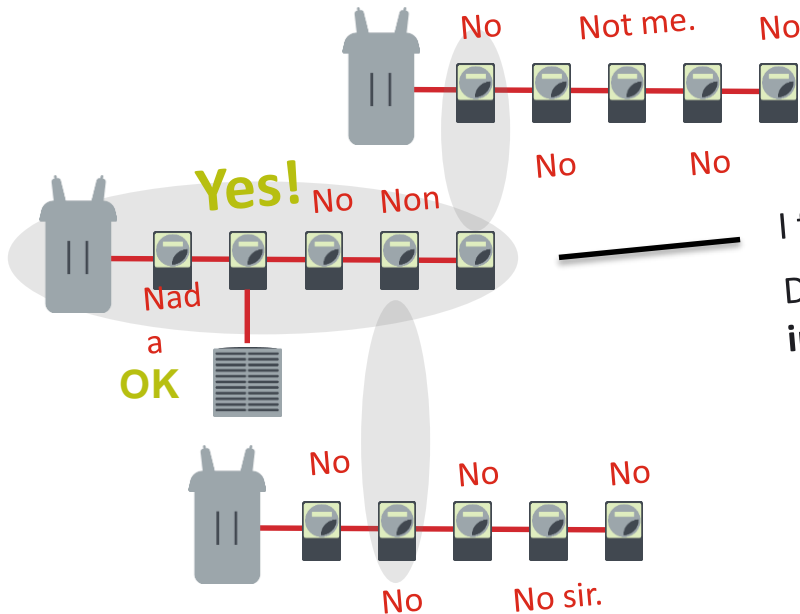
DISTRIBUTED ANALYTICS

Use Case: Theft Detection

Theory:

New Load = Slight drop in measured voltage

New *Metered* Load = Measured current change



I felt a **drop in voltage** of X.
Did anyone notice an
increase in current of Y?

DISTRIBUTED ANALYTICS

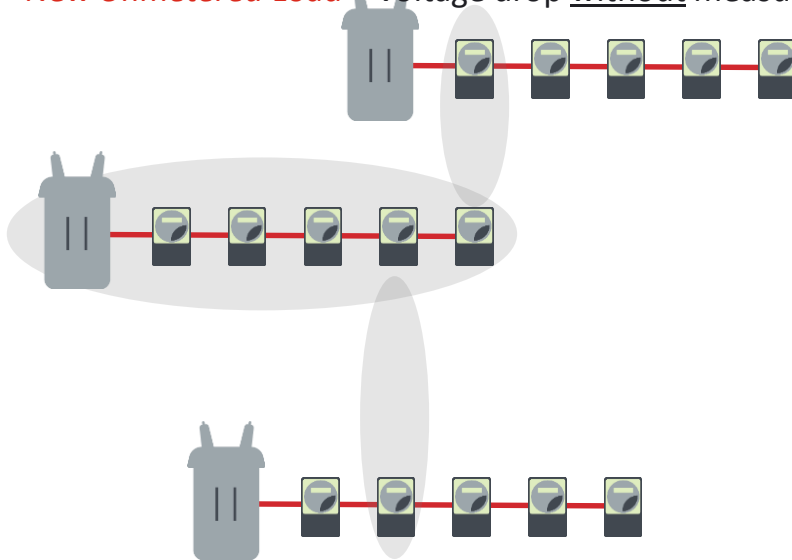
Use Case: Theft Detection

Theory:

New Load = Slight drop in measured voltage

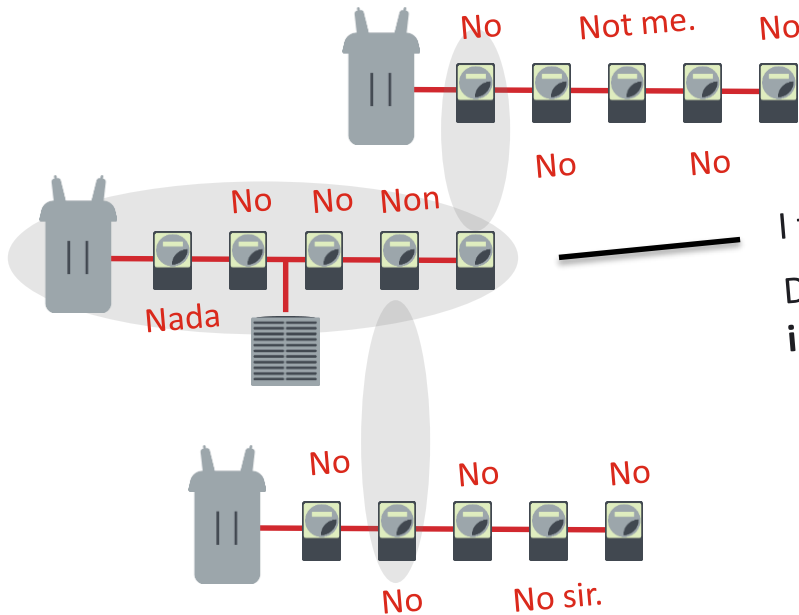
New *Metered* Load = Measured current change

New Unmetered Load = Voltage drop without measured current change



DISTRIBUTED ANALYTICS

Use Case: Theft Detection



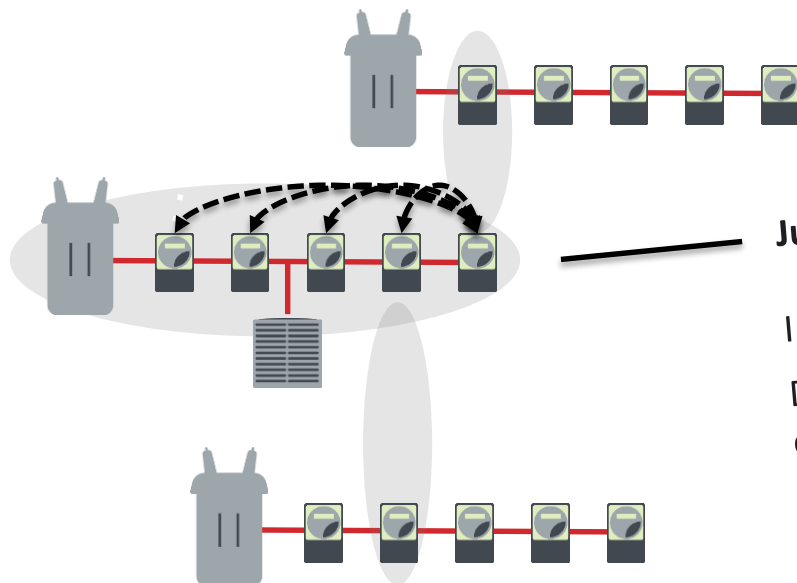
I felt a **drop in voltage** of X.
Did anyone notice an
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DISTRIBUTED ANALYTICS

Use Case: Theft Detection



THEFT



Just making certain . . .

I felt a drop in voltage of X.
Did **you** notice an increase in current of Y?

SUMMARY OF KEY TAKE-AWAYS

- Smart Grid is not a single event, project or technology but it is a journey
- Smart Grid Technologies span the entire electrical ecosystem and are at different levels of maturity and deployment.
- Note the importance of the communication infrastructure for the bigger vision (Smart Metering, Distribution Automation, Smart Cities, IoT and Societal Impact)
- Think about how easy “Banking Activities” have become where you can remotely access money, or adjust your “limits”, create new beneficiaries, transfer money etc. (“Edge intelligence”) While the Bank is ensuring they not breaking rules/regulation and maintain control and. (“Distributed Analytics”) -> Now imagine a Utility to be able to do this and run its business & operations similar to this.



ITRON OPENWAY RIVA SOLUTION

New capabilities, new value from the Itrons revolutionary OpenWay Riva solution stack



Locational Awareness

Grid devices and meters are aware of their location in relation to other grid assets.



“Multi-lingual”

Multiple communication and application protocols on same device; e.g. meters can speak “Distribution Automation” and vice versa.



Distributed Computing

Real-time data processing and analytic capabilities in edge devices.

THANK YOU



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