



POWERING POTENTIAL

Tutorials on Current Power & Energy Issue

John D. McDonald, P.E.
GM, T&D Marketing

IEEE PES Past President
IEEE Division VII Director
IEEE Fellow

Recent Trends in Substation Automation and
Enterprise Data Management to Support Smart Grid
Applications



imagination at work

Abu Dhabi – October 28, 2009



POWERINGPOTENTIAL

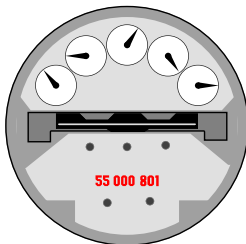
IED Integration, Substation Automation and Enterprise Data Management



imagination at work

Intelligent Electronic Device (IED)

- Any device incorporating one or more processors with the capability to receive or send data/control from or to an external source (e.g., electronic multifunction meters, digital relays, controllers)



Enterprise Level Data Management

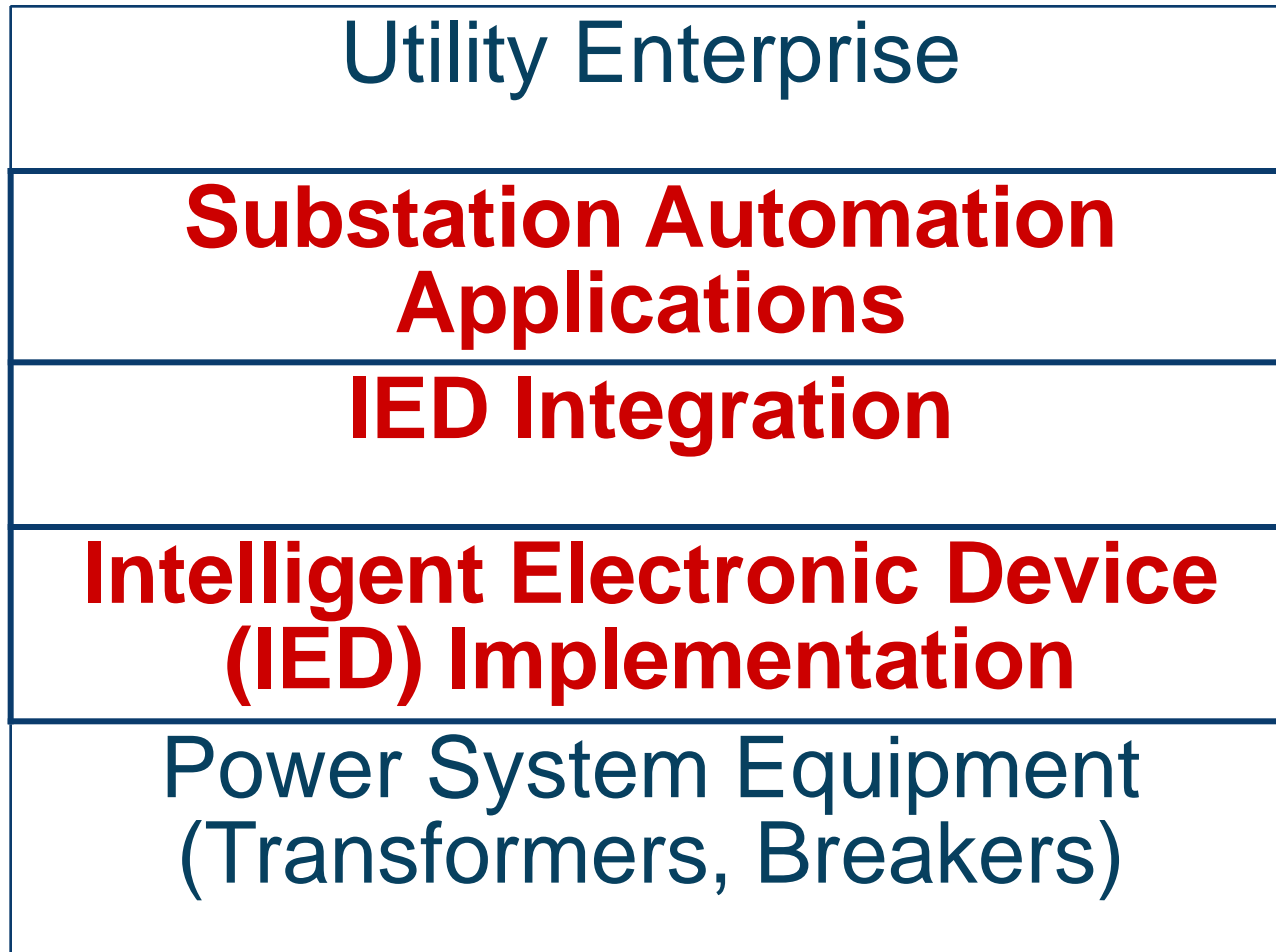
MISSION: “Integrate substation IEDs and Data Mart concepts so your company can leverage information to maximize the *business* value you get from equipment and its operation.

WHAT: A concept and framework, workshops, evaluation, design, planning, consultation, documentation and implementation assistance.

PRODUCTS:

- 1) Improved ability to leverage information.
- 2) Comprehensive plan for use in the future.
- 2) Business case maximized for VALUE: *Quick* start in the *right* direction toward *achievable business* goals.

Substation Integration and Automation Levels



Integration

- Integration of protection, control and data acquisition functions into a minimal number of platforms to reduce capital and operating costs, reduce panel and control room space, and eliminate redundant equipment and databases

Utility Enterprise

Substation Automation

IED Integration

Automation

- Deployment of substation and feeder operating functions and applications ranging from SCADA and alarm processing to integrated volt/Var control in order to optimize the management of capital assets and enhance operation and maintenance (O&M) efficiencies with minimal human intervention

Utility Enterprise

Substation Automation

IED Integration

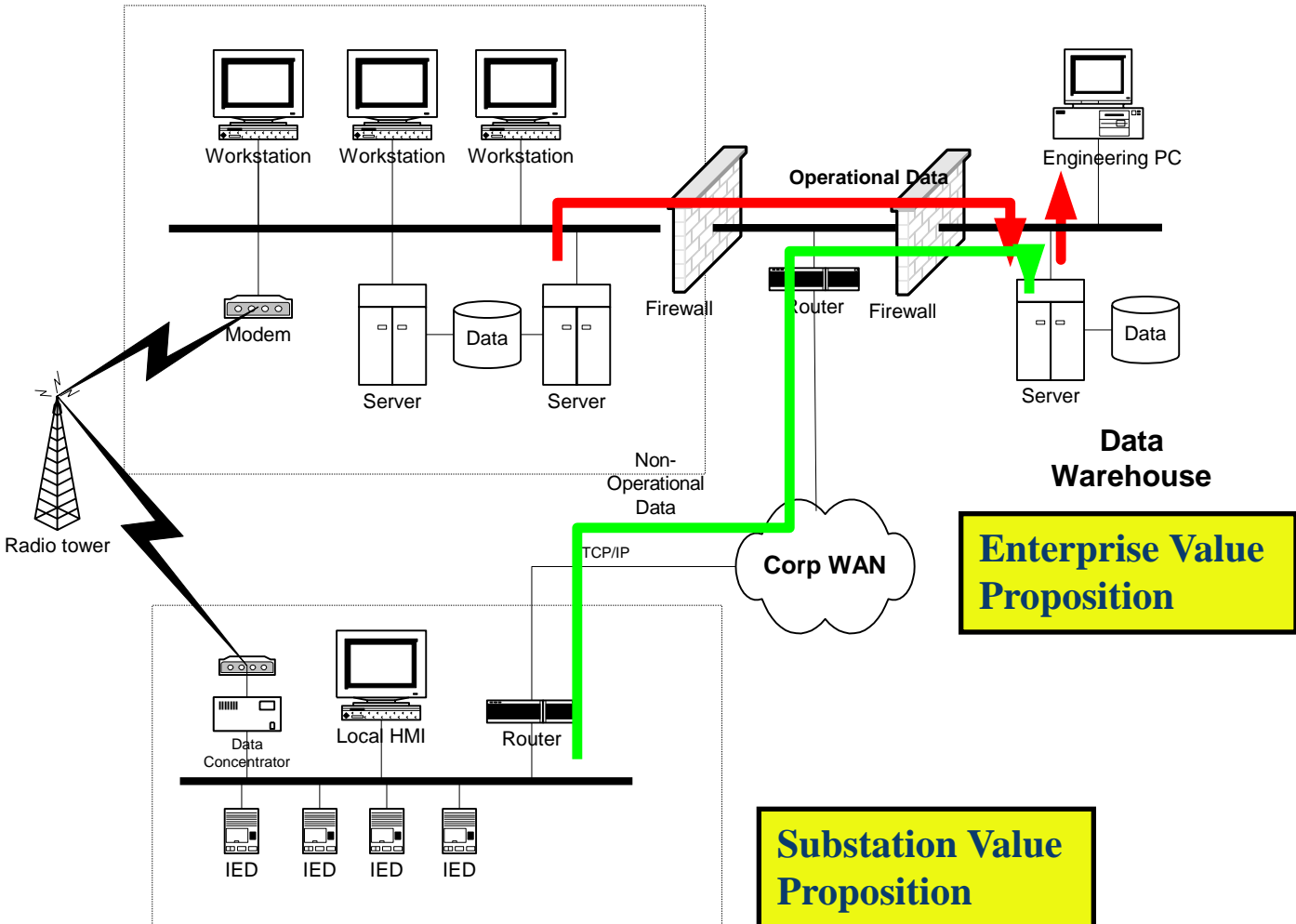
Communication Paths From Substation

- Two second data to SCADA system (**operational data** – extracted using industry standard protocol such as DNP3)
- On demand data to utility information server or data warehouse (**non-operational data** – extracted using IED vendor's proprietary ASCII commands)
- **Remote access** from remote site to isolate a particular IED (also called “pass through” or “loop through”)

Communication Paths From Substation (continued)

Utility Enterprise Connection		
SCADA Data to MCC	Historical Data to Data Warehouse	Remote Dial-In to IED
Substation Automation Applications		
IED Integration Via Data Concentrator/Substation Host Processor		
IED Implementation		
Power System Equipment (Transformers, Breakers)		

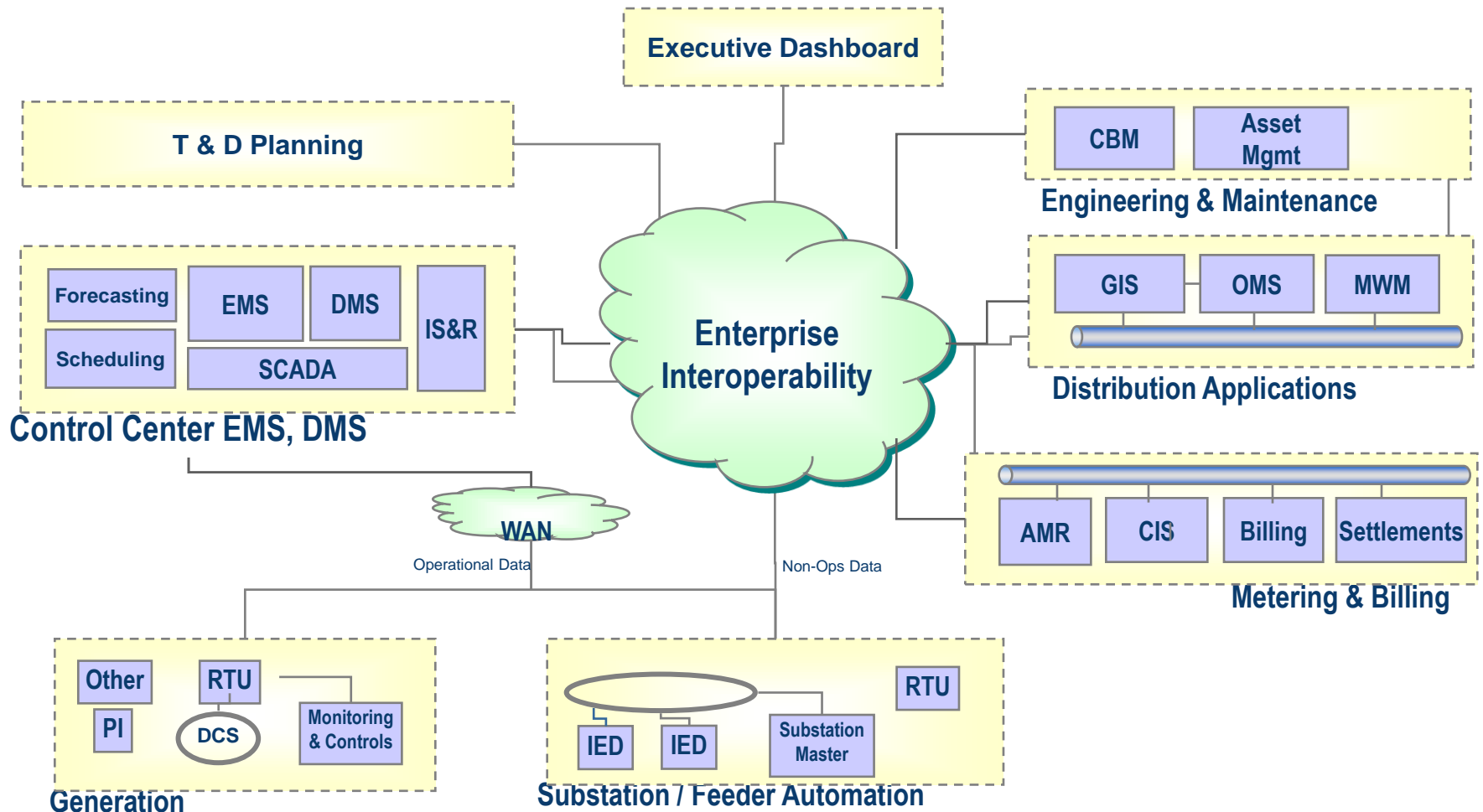
Operational and Non-Operational Data Paths



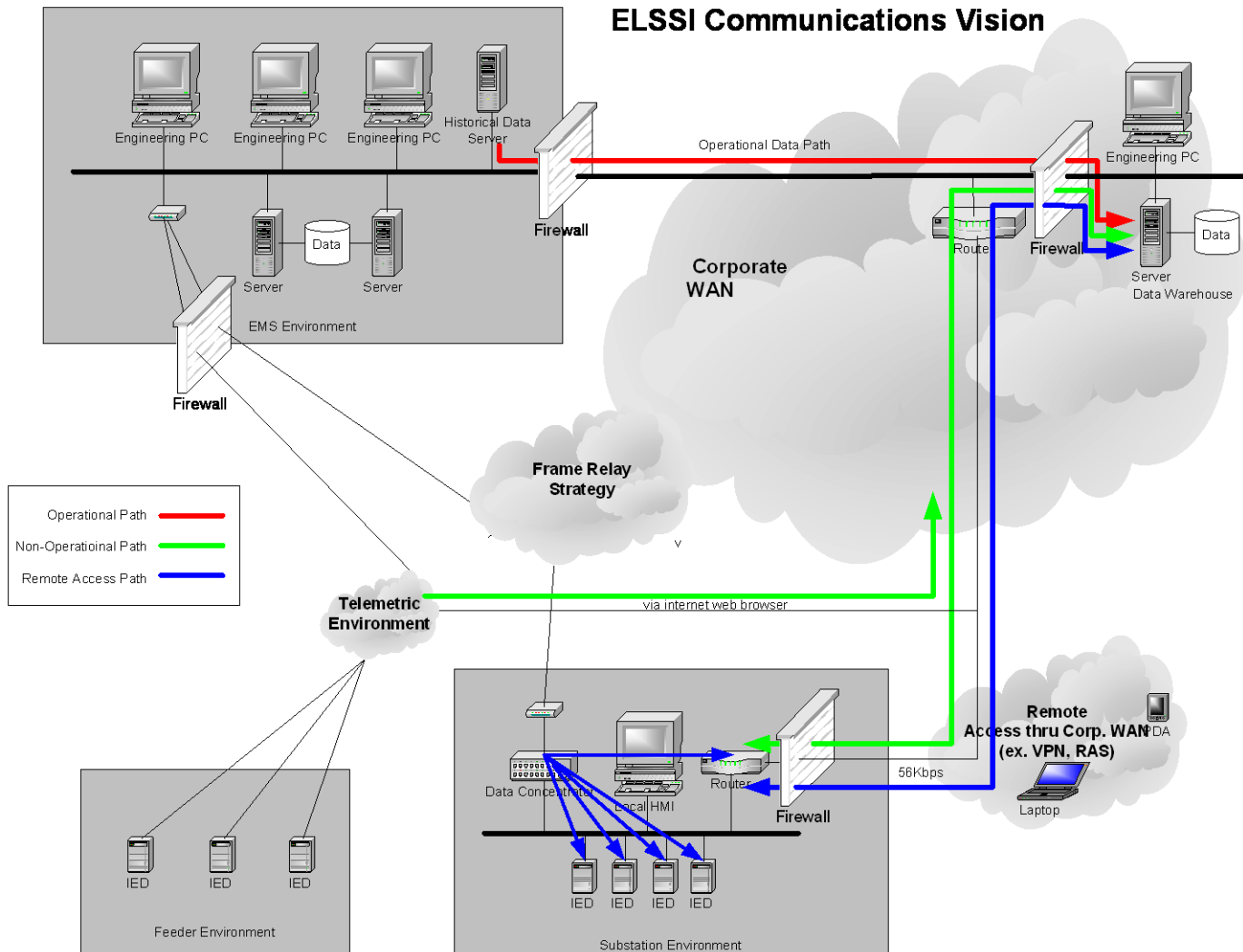
Local vs. Enterprise Data Marts

- Local historian at substation level is a component of the Substation Automation System (e.g., PC with local substation HMI and historical data archiving) and **is designed for** Data Mart integration
 - Ability to **push** data From substation to enterprise Data Mart based on time, demand or event triggered
 - Enterprise Data Mart can **pull** data from local Data Mart in substation

Enterprise Interoperability

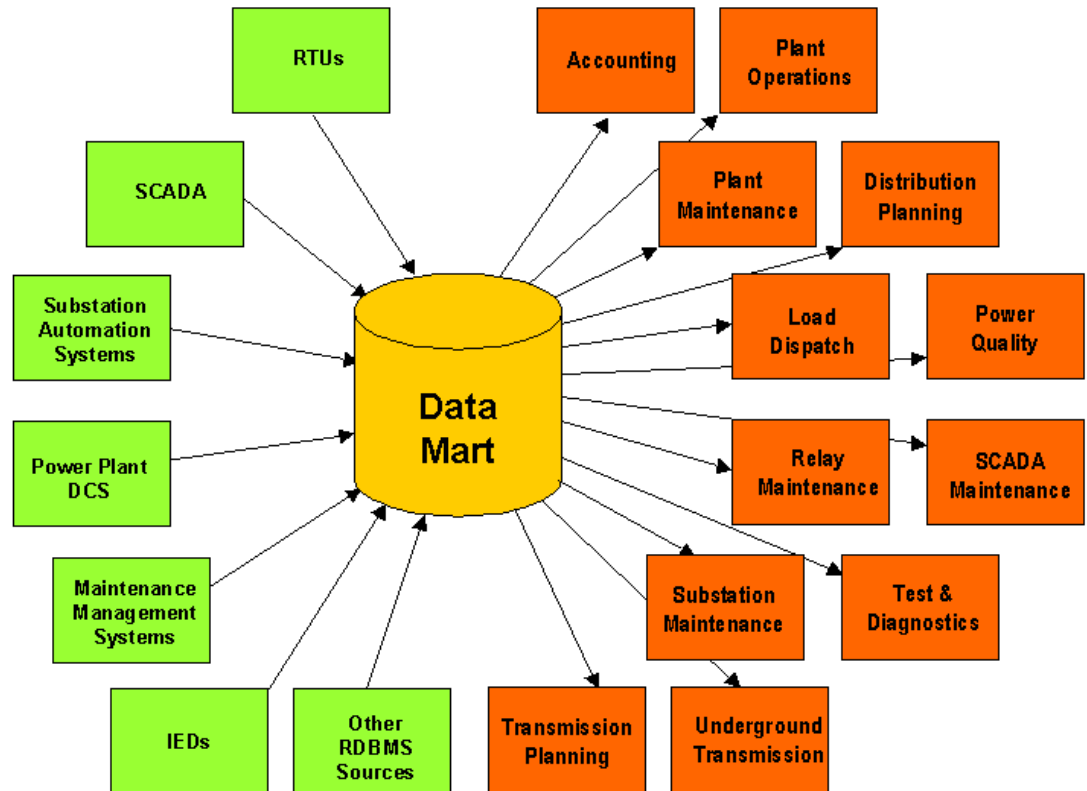


Enterprise Communications Vision



Data Mart Vision

The *Virtual* Data Mart Links Users and Applications to Data from Multiple Sources of Record



Smart Grid Applications



POWERINGPOTENTIAL



imagination at work

Smart Grid View

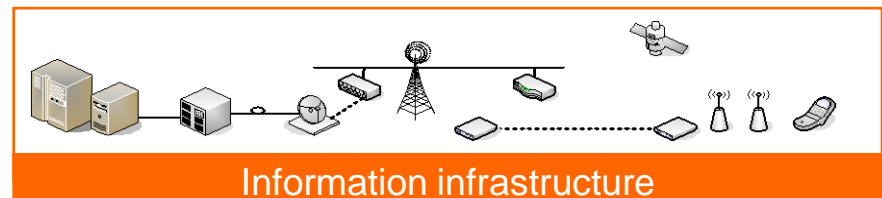
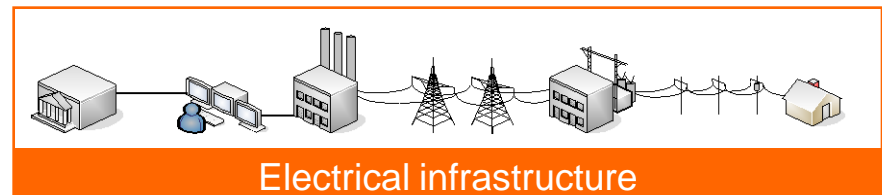
The integration of electrical and information infrastructures, and the incorporation of automation and information technologies with our existing electrical network.

Comprehensive solutions that:

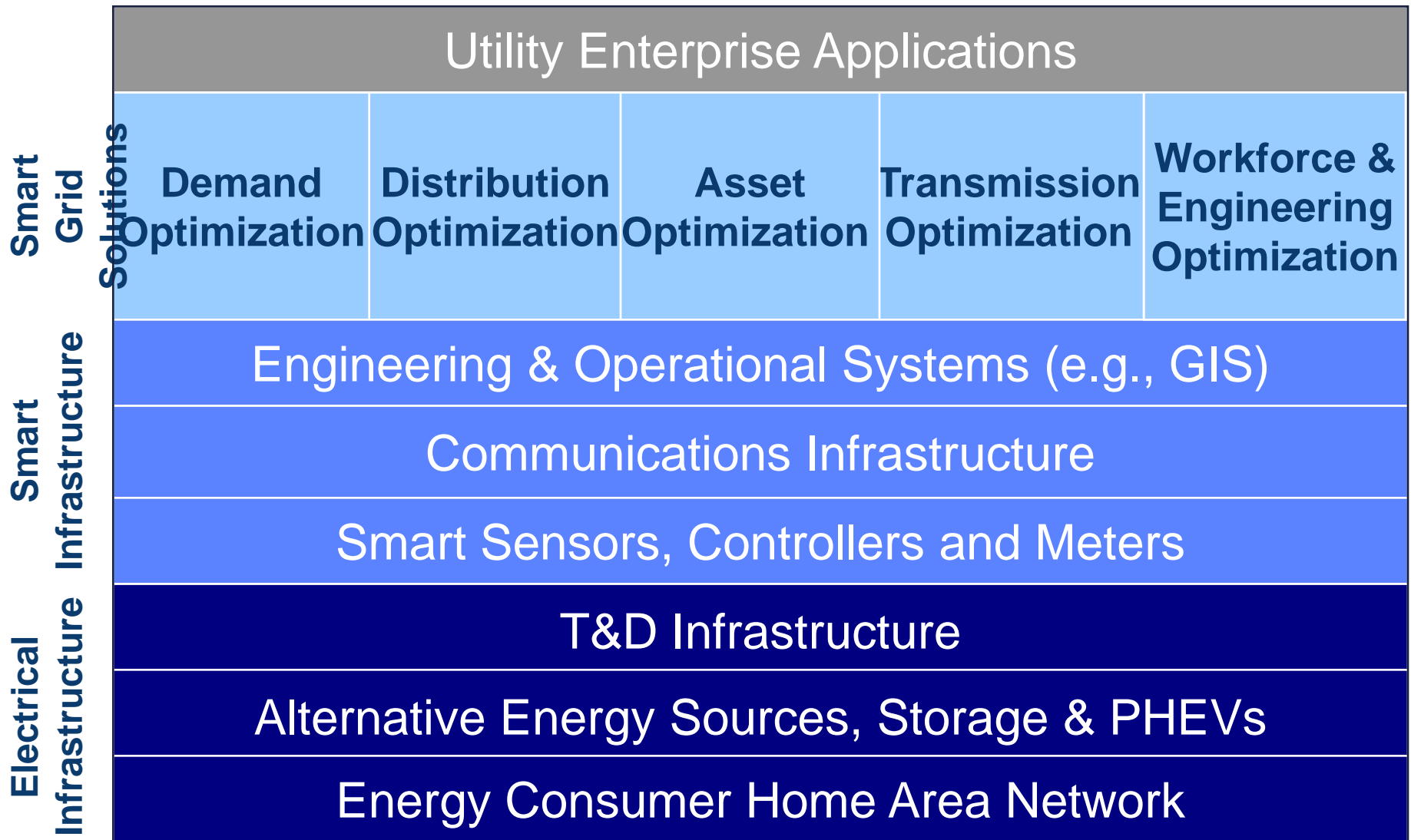
- ✓ Improve the utility's power reliability, operational performance and overall productivity
- ✓ Deliver increases in energy efficiencies and decreases in carbon emissions
- ✓ Empower consumers to manage their energy usage and save money without compromising their lifestyle
- ✓ Optimize renewable energy integration and enabling broader penetration

That deliver meaningful, measurable and sustainable benefits to the utility, the consumer, the economy and the Environment.

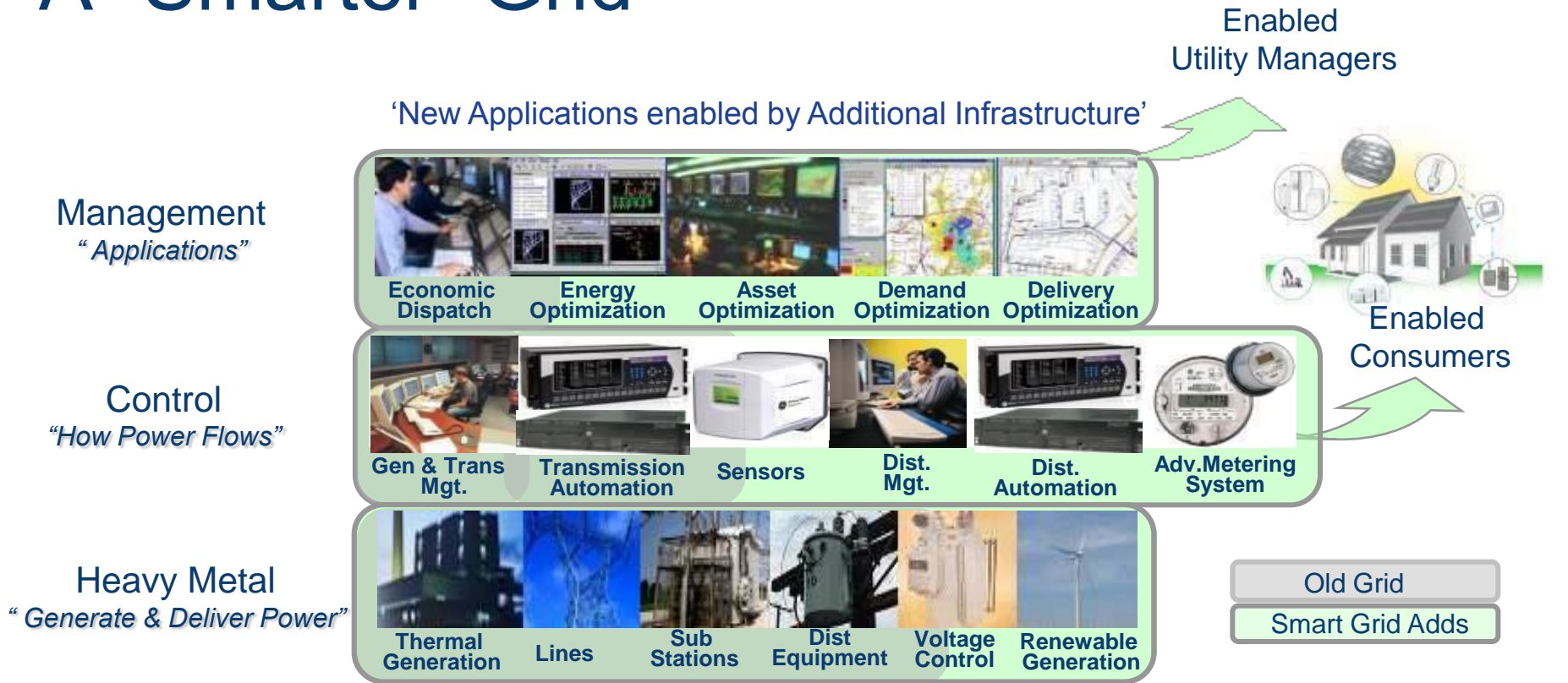
More Focus on the Distribution System



Smart Grid Framework



A "Smarter" Grid



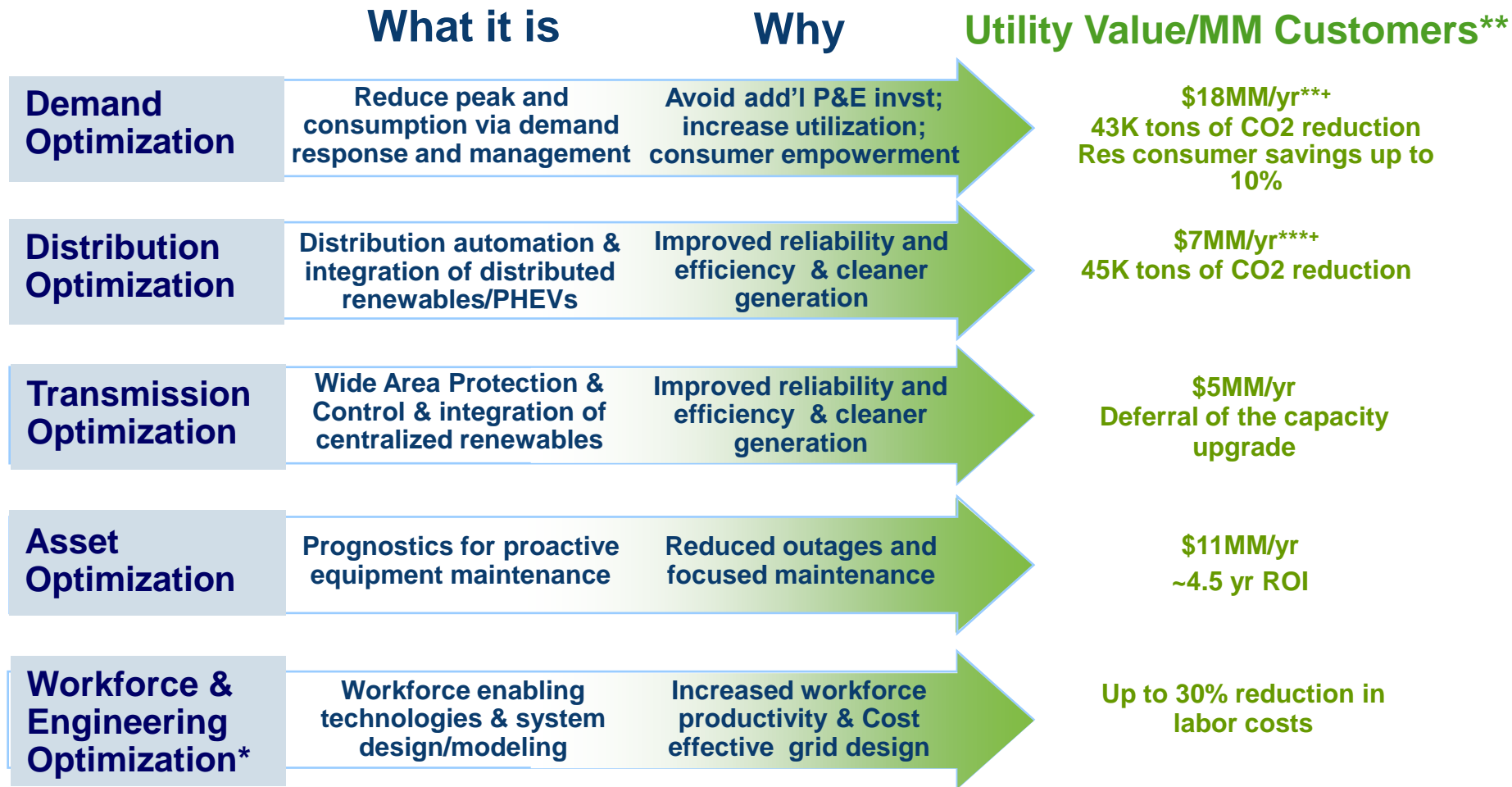
Old Grid

- You call when the power goes out.
- Utility pays whatever it takes to meet peak demand
- Difficult to manage high Wind and Solar penetration
- Cannot manage distributed generation safely.
- ~10% power loss in T&D

Smart Grid

- Utility knows power is out and usually restores it automatically.
- Utility suppresses demand at peak. Lowers cost. Reduces CAPEX
- No problem with higher wind and solar penetration.
- Can manage distributed generation safely.
- Power Loss reduced by 2+%... lowers emissions & customer bills.

Smart Grid Pillars



*Some regions will use the term "Operations Optimization" as an alternative

**Utility savings are approximate annual savings per one million customers

**1.5% peak load reduction using CPP

***1.5% peak load reduction using CPP

****1.5% peak load reduction using CPP

+ \$85/kW-yr peak generation capacity value

RPS: Renewable Portfolio Standard



Thank you!

