



Grid Modernization



I. Issue and Definitions

(what we are facing)

II. Common State

(current operational capability....situational awareness)

III. Common Direction

(A changing world - Internal and External Pressures)

IV. An Operational Technology Vision

(Where we need to be...Technology Capable Vision)

V. A Roadmap

(How we're going to achieve the Operational Technology Vision)

VI. Summary & Discussion



I. Issues: Storage and DG bring a new set of tools

How to prepare for a different set of tools?

How to determine the value streams?

- **The Past: Control and limited Monitoring at the BES level.**
 - Distribution and DG present a shift
- **Need better system view to drive to the value streams**
- **System Operations – changing the way of thinking?**
- **Shifting of technology, operations, planning, workforce (SILOs)**
- **Re-engineering the electric utility**



I. Definitions:

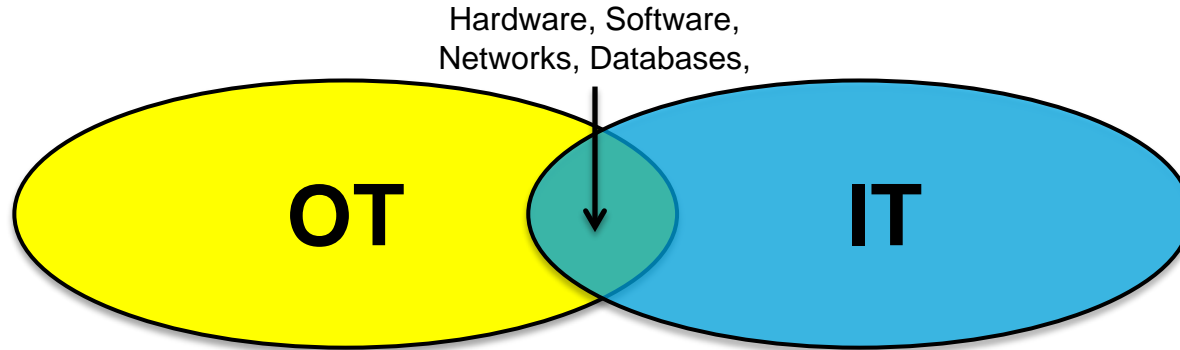
Situational Awareness

Situational Awareness - the access to, and use of, state data, control, and understanding of the operating parameters that define the physical state of the electric systems (transmission, substations, distribution, and customers) and the state resource availability.



I. Definitions:

Operation Technology and Information Technology



OT - hardware, operating systems, embedded systems, communication network(s), and applications in support of monitoring, control, and operation of the electrical network.

IT - hardware, operating systems, communication network and business software support including email, document management, workflow development, and back office system support of electric utility business needs such as accounting, billing, data storage, and web services.



II. Common State

System Operations - Visibility & Control

- Basic monitoring and limited control to 90% of Substations at Transmission level
- EMS to Generation coordination efforts
- Metering: non uniform metering applications and lack of synchronized timing
- High percentage of “Manual” operation of systems
- Distribution visibility and control limited to feeder breakers

Distribution Operations - Visibility & Control

- Very limited visibility and control beyond the feeder breakers
- 99% manual switching
- Customer driven outage notification
- No visibility of DG systems



II. Common State

Metering- Visibility & Control

- Metering technology
 - Residential: limited to energy usage since last read
 - Commercial: single maximum demand and energy usage since last read
 - Special applications to 5% of meters (expensive)
 - No granular load profile data

Generation- Visibility & Control

- Individual and localized monitoring and control
- Limited and challenged EMS and generation coordination
- Generation fleet tending towards lower inertia
- Increased DG penetration with zero inertia and dispatchability



II. Common State

Communications

- Evolved upon Serial communications, analog signals, dry contacts
- Time division multiplexing architectures
- Limited reach within system
- Dial up to a hand full of substations for limited data

Resulting in:

- Limited information of the system and shift in technology is primary driver for a reactive engineering and planning approach



II. Common Direction

(A changing world - Internal and External Pressures)

- Rate of Change in technology
- Legislative and commission efforts
- Regulatory focus: BAL, PR, NERC, MOD, ...
- Distributed Generation – integration to legacy systems



III. An Operational Technology Vision

(Where we need to be...A Technology “capable” Vision)

The qualities of the vision include:

- Foundational Cyber Security Posture
- Robust, resilient, high capacity communication network
- Ability to deploy embedded systems to the edge
- Ability to gather and aggregate information
- Ability to effectively make decision and control the system real-time
- Workforce technology capable



III. An Operational Technology Vision

(Where we need to be...A Technology “capable” Vision)

The four pillars of the Operational Technology vision include:

- **Situational Awareness**
- **Adaptability**
- **Flexibility**
- **Education**



IV. An Operational Technology Vision

Data – Operational / At Rest

4. Deploy Embedded System Technology Solutions

3. Validation & Integration: Cyber Security, Embedded system

2. Architect and Deploy Flexible High Speed Networks

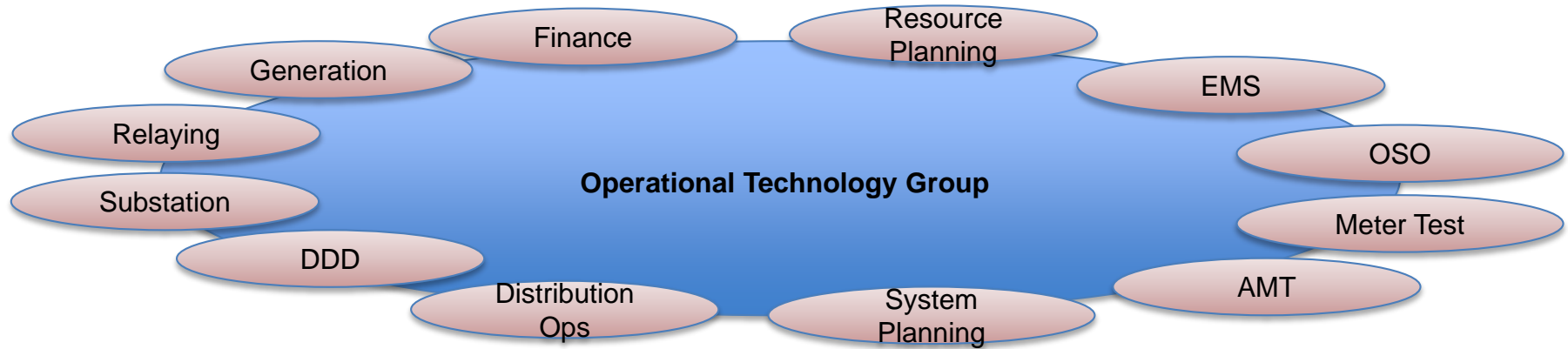
1. Defined Cyber Security Posture across all Operational Depts.

Achieve Expanding Situational Awareness!



IV. An Operational Technology Vision -

Formation of the Operational Technology Group (OTG)



Removing the silo's and shifting the way we have done things



Discussions

