A Unified, Intelligent & Evolvable Solution to Enable NERC CIP Compliance and Substation Knowledge

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Modern Challenges, Modern Opportunities

- Existing Infrastructure
- Internal Changes
- External Forces
- Productivity & Effectiveness
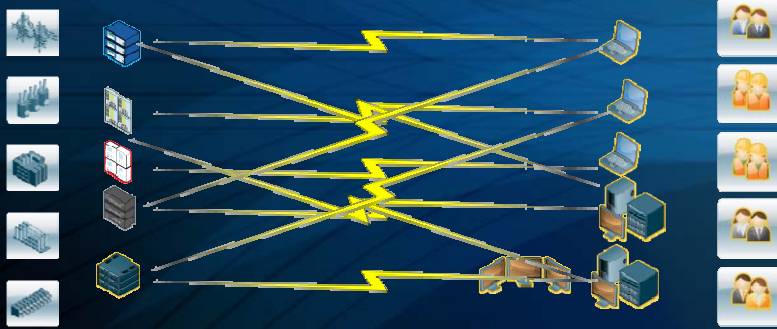- Future Flexibility
- Asset Maximization

The Challenge of Existing Infrastructure

IED + IED + IED + …
≠ Intelligent Substation

NETWORKS
= Security Concerns

BUSINESS SYTEMS
≠ Live Substation Information

The Challenge of Internal Changes

▸ People & policies

▸ Information access

▸ Cultural integration

▸ Systems integration

The Challenge of External Forces

▸ New legislation

▸ Deregulation

▸ Competition

▸ Lobbyists

▸ Unforeseen events

The Challenge of Productivity & Effectiveness

▸ Productivity, work satisfaction & organizational effectiveness.

▸ Focus on value-added tasks.

The Challenge of Future Flexibility

- Decisions regarding the unknown
- Fewer experts

The Challenge of Asset Maximization

- Islanded information
- Uninformed decisions

- Current asset investments
- Productivity

The Ideal Solution

- ‣ Maximizes the useful lifespan of existing assets.
- ‣ Unifies, simplifies, and speeds up the administration and management of data, infrastructure, and users.
- ‣ Retains the ability to exploit future opportunities without sacrificing current goals.
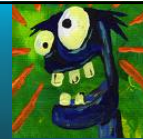- ‣ Improves the use of internal resources and streamlines decision-making processes.

Let's examine a utility that addressed its network asset management challenges with this ideal solution.

Network Asset Management
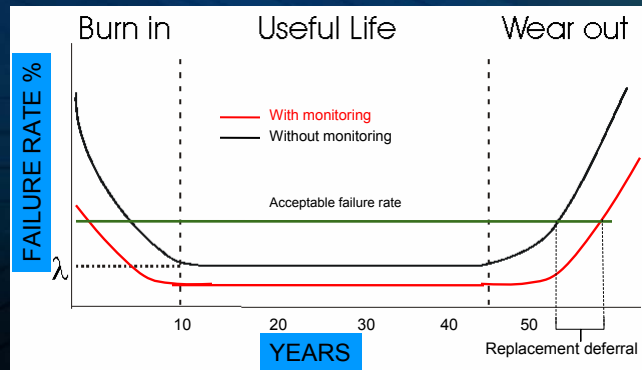

NAM…why bother?

You need to:	While:
• increase line loads	• equipment ages
• improve safety	• budgets are slashed
• enhance reliability	• experience is short
• reduce repair cost	• new legislation is introduced

It's enough to drive anyone mad.

First Base: On-line Monitoring & Diagnostics

Why On-line Monitoring & Diagnostics?

Objective of On-line Monitoring

What is monitored?

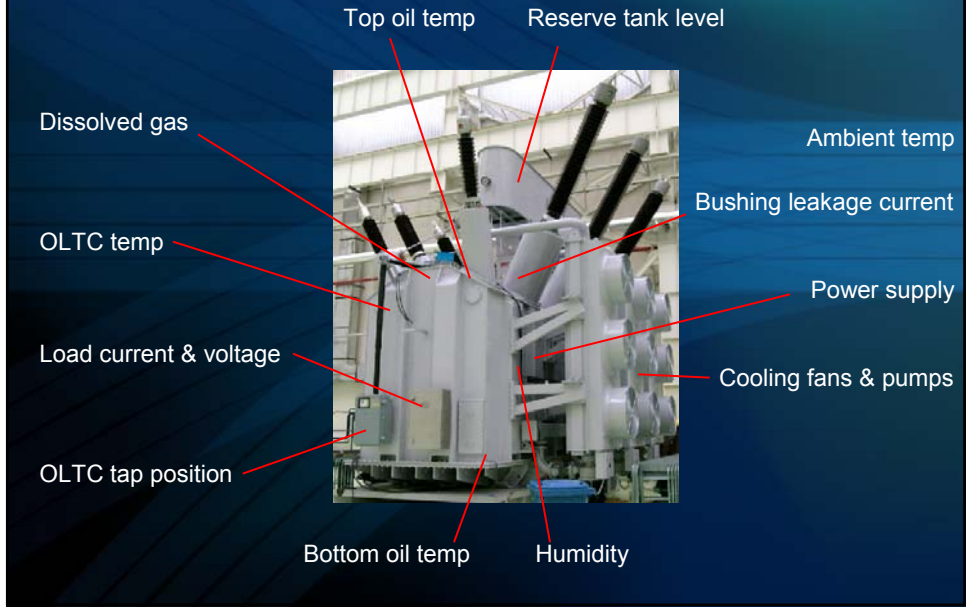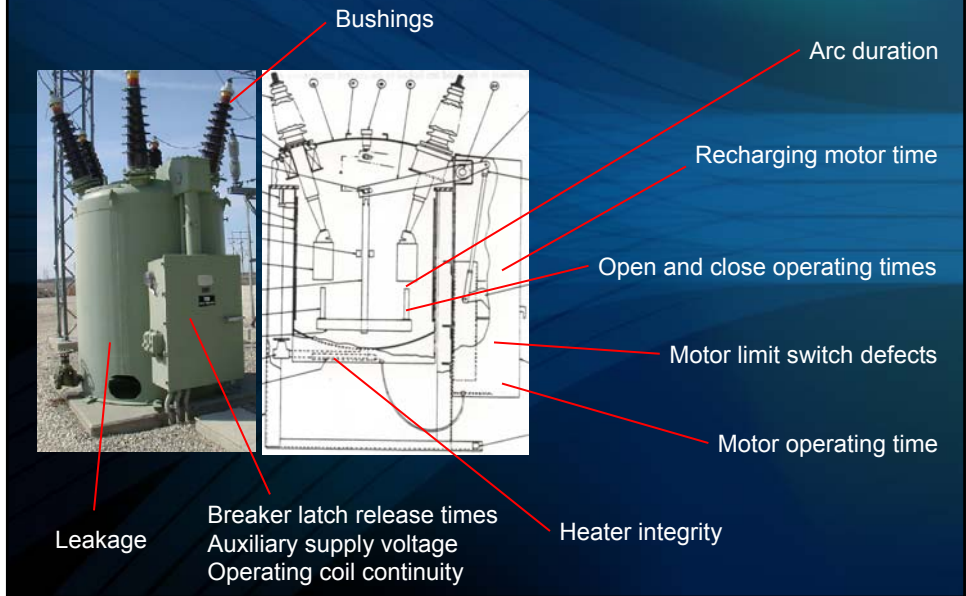Transformers

Battery banks

Breakers

Transcription Monitoring

Top oil temp   Reserve tank level

Dissolved gas

Ambient temp

Bushing leakage current

OLTC temp

Power supply

Load current & voltage

Cooling fans & pumps

OLTC tap position

Bottom oil temp   Humidity

Oil-filled Circuit Breaker Monitoring

Bushings

Arc duration

Recharging motor time

Open and close operating times

Motor limit switch defects

Motor operating time

Leakage

Breaker latch release times
Auxiliary supply voltage
Operating coil continuity

Heater integrity

Battery Monitoring

Interconnect resistance

Total bus current

Cell temperature

Float system voltage

Cell voltage

Charging system voltage

Cell impedance

Discharging system voltage

Ambient temperature

Average impedance per string

Floating string current

Charging string current

Discharging string current

Feature Project: Asset Management @ SWTC

Southwest Transmission
COOPERATIVE, INC

- Headquarters: Benson, Arizona
- Transmission Cooperative
- 613 miles of transmission line
- 30 plus substations and telecommunication facilities

www.southwesttransmission.coop

SWTC Goals

- Shift from time-based to condition-based maintenance for:
  - Transformers
  - Breakers
  - Relaying

- Transformers:
  - Add dissolved gas monitoring
  - Add electronic temperature monitoring
  - Integrate LTC and temperature functions

- Breakers:
  - Condition monitoring integrated into breaker control relay

- Planned network to all substations:
  - T1 to each location
  - Flow all maintenance data to a central server

SWTC Requirements

- Needed better database resolution and longer term storage:
  - 15 second snapshots instead of one minute
  - 30 year history instead of two weeks

- Fast database queries:
  - Ease of use
  - Multiple data requests
  - Make informed decisions quickly using accurate data

- System features desired:
  - Algorithms which would indicate maintenance issues
  - Feed SAP work order system
  - Email maintenance personnel
  - Trending of data

- SUBNET Solutions' EnterpriseSERVER.NET compatibility

- DNP 3.0 protocol (TCP/IP, Serial, Master/Slave) connectivity

- Automatic point creation to minimize duplication of work
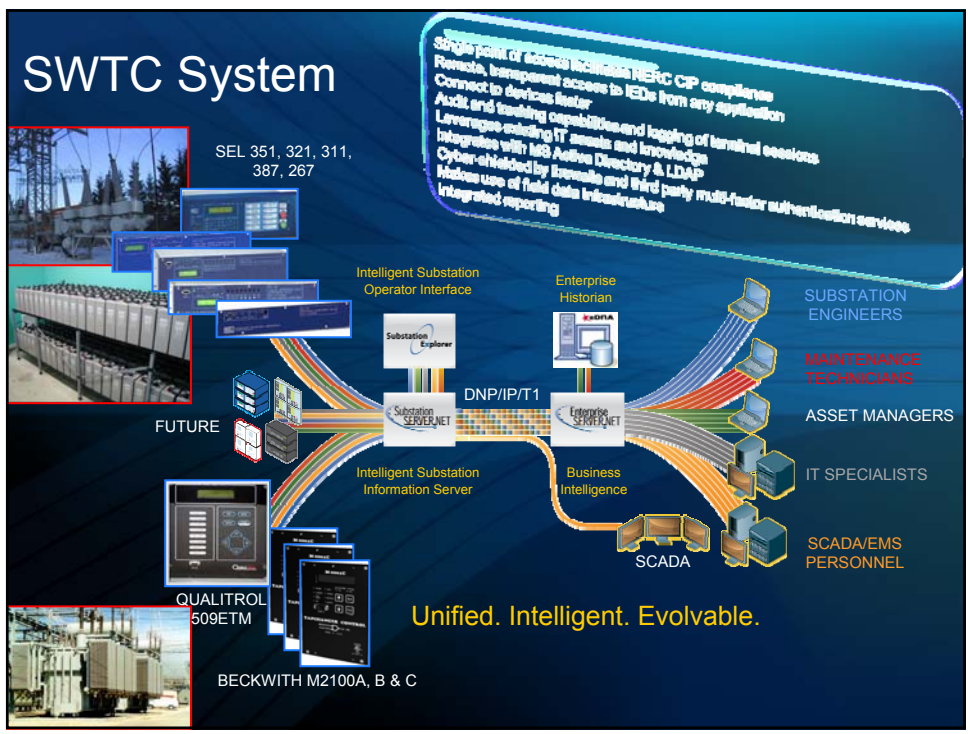
Successes to Date

- Issues resolved based on historian data
  - Kartchner Substation Tap Changer
  - Hackberry Substation Battery Charger
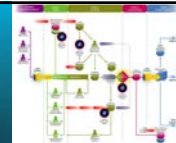
NERC CIP…this is only the start of the

- ▸ Change management
- ▸ Compliance management
- ▸ Compliance administration
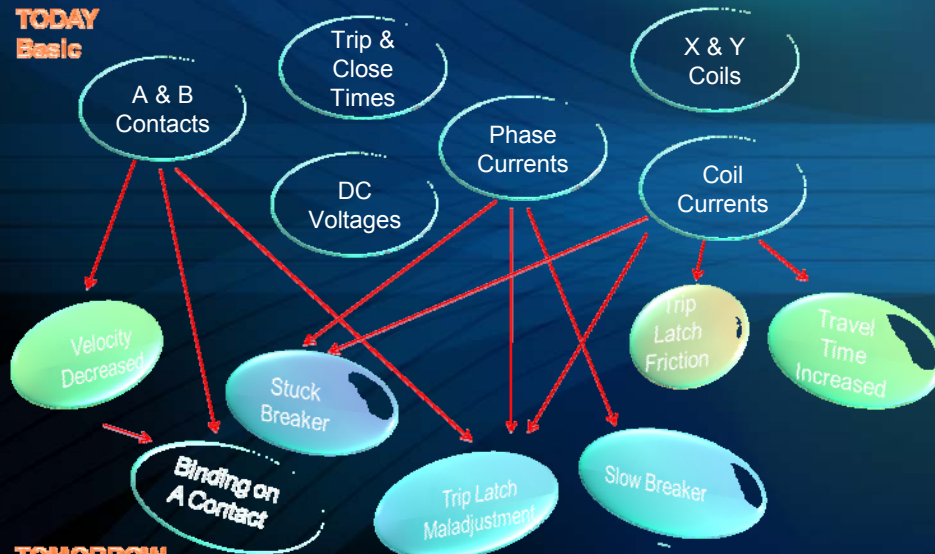

NERC CIP…a look ahead

Due to complexity, traceability will only be possible by standard templates, repositories, workflows and user interfaces.

SWTC's NERC CIP solution is already future-proof.

Summary Benefits

‣ Maximizes the useful lifespan of existing assets.

‣ Unifies, simplifies, and speeds up the administration and management of data, infrastructure, and users.

‣ Retains the ability to exploit future opportunities without sacrificing current goals.

‣ Improves the use of internal resources and streamlines decision-making processes.

Summary Benefits

- Facilitates NERC CIP compliance via the central management of connections between remote IEDs and authorized users.

- Hundreds of thousands of IEDs managed by this solution.

- Evolvable platform…not just best-in-class NERC CIP solution.

- No need to maintain clients and third party applications on user machines.

Summary Benefits

- Built-in report generator

- Provides access to authorized applications only.

- Access rights based n multiple, user-definable groups.

- Configurable logging of connection traffic.

- Accomplishes all of this without having to replace or duplicate, any existing SCADA or IT infrastructure.

Questions?