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INDUSTRY SEMINAR 2012

E M E A

The **Power** of **Data**

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PSE&G drives Operational Excellence
Technology enables results

Presented by **Richard Wernsing**
Manager Asset Strategy
Public Service Electric and Gas Company (PSE&G)
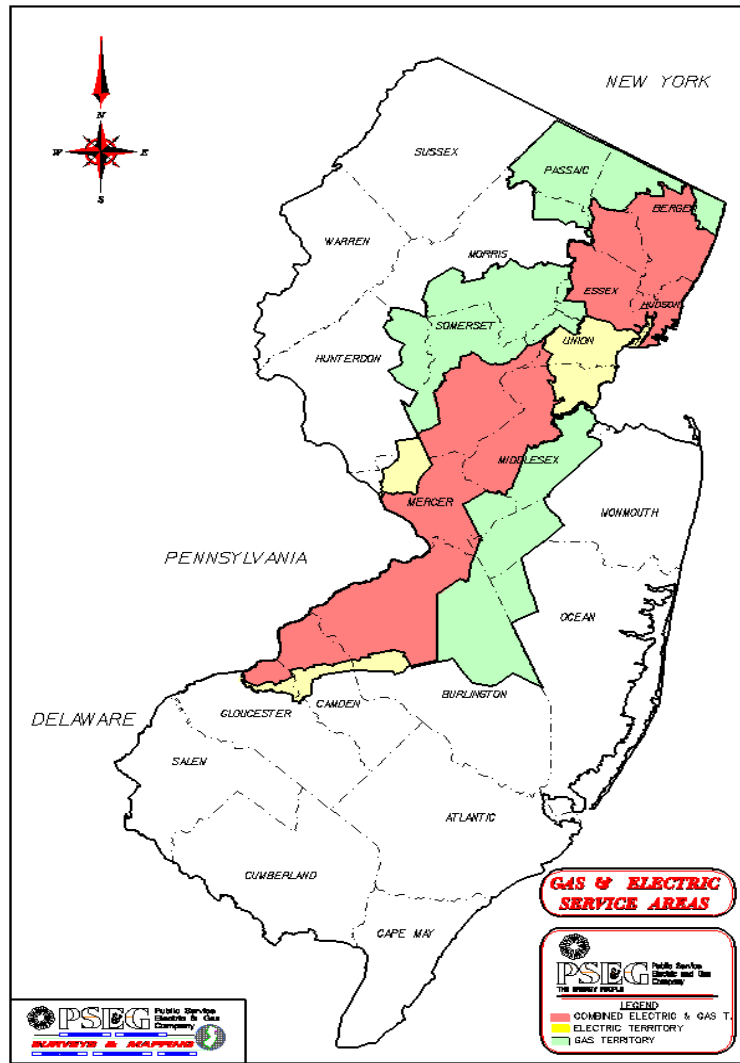
Agenda

- Introduction
- Asset Strategy Processes
- Accomplishments
- Future Direction

PSE&G Background

- **Utility Overview**
  - New Jersey Based
  - Total Assets ~ $14 Billion
  - Total Revenue ~ $7 Billion
- **Service Territory**
  - 323 Municipalities
  - 70% of New Jersey's population
  - 2.2 million Electric customers
  - 1.7 million Gas customers
  - 2,600 Square Miles

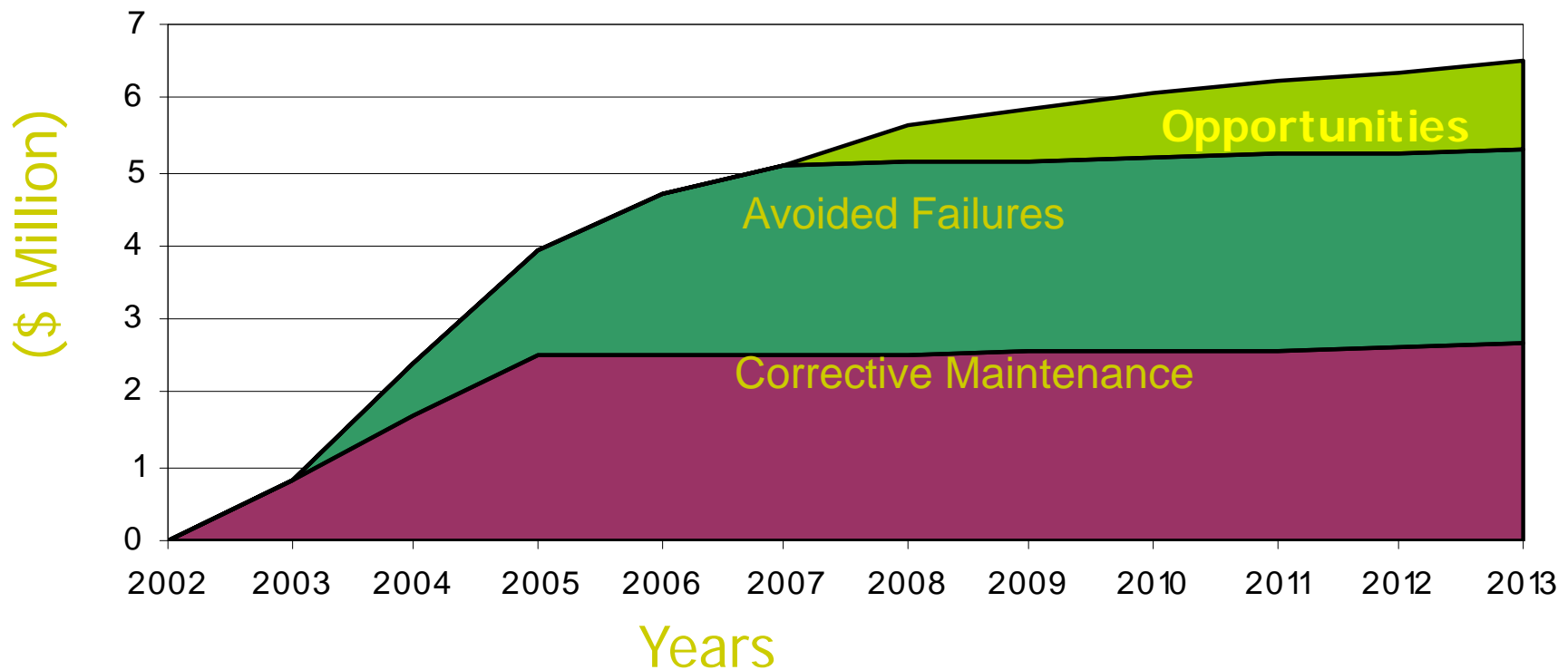# Asset Strategy Processes

Metric Driven Reliability

Focused _Investment to achieve_ **measurable** improvements in reliability
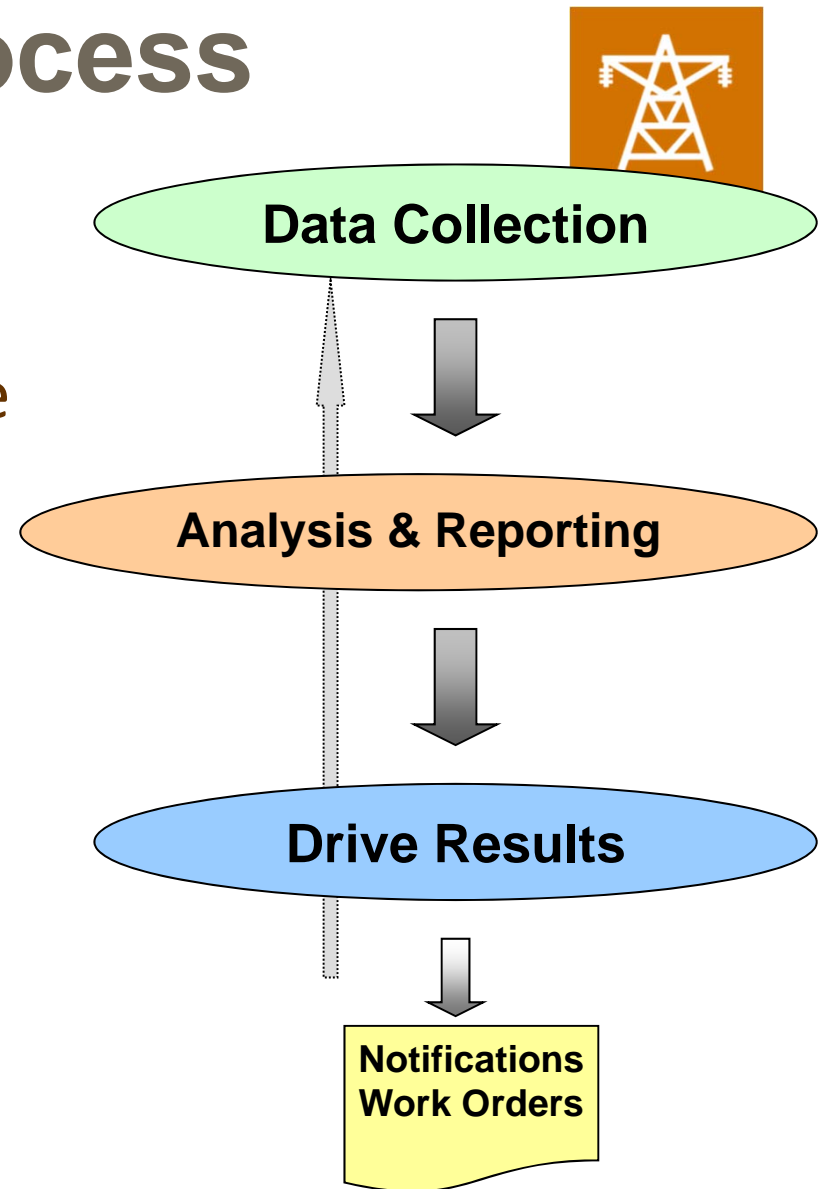
Why Asset Management?

Substation O&M Savings

Chart axes: Y-axis "($ Million)" from 0 to 7; X-axis "Years" from 2002 to 2013.

Areas labeled:
- Opportunities
- Avoided Failures
- Corrective Maintenance

Asset Strategy Process

- Collect and Centralize Data
  - Diagnostic/Inspection
- Transform data into Actionable Information
  - Condition Based Maintenance
  - SAIFI Optimization
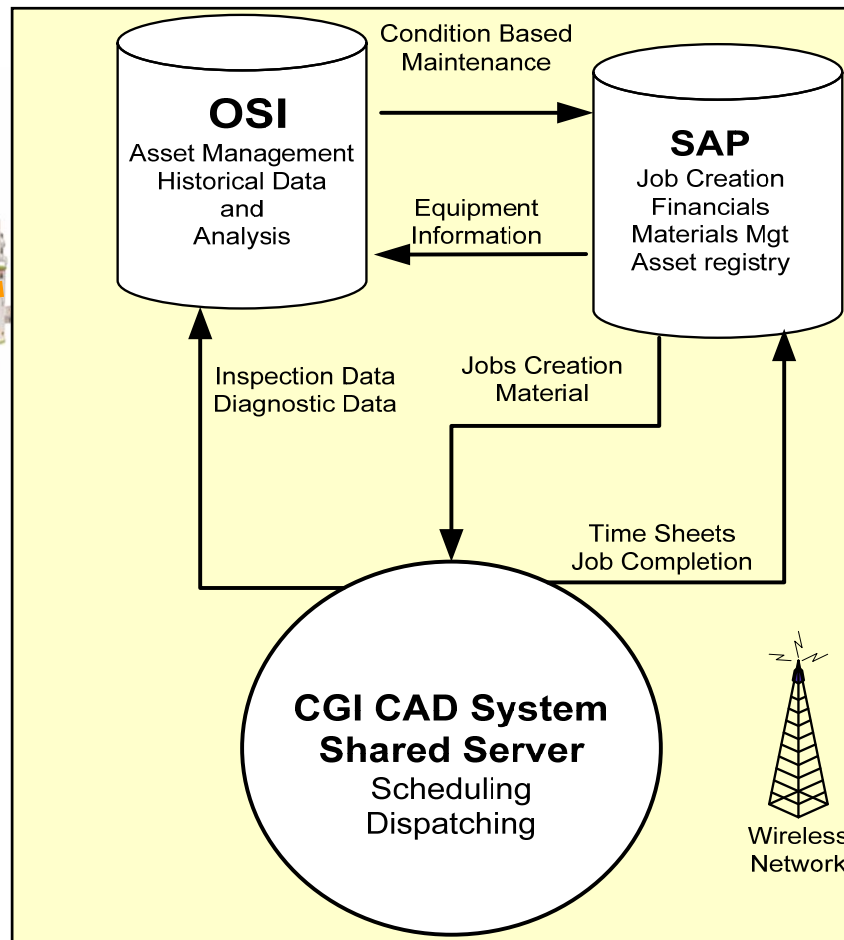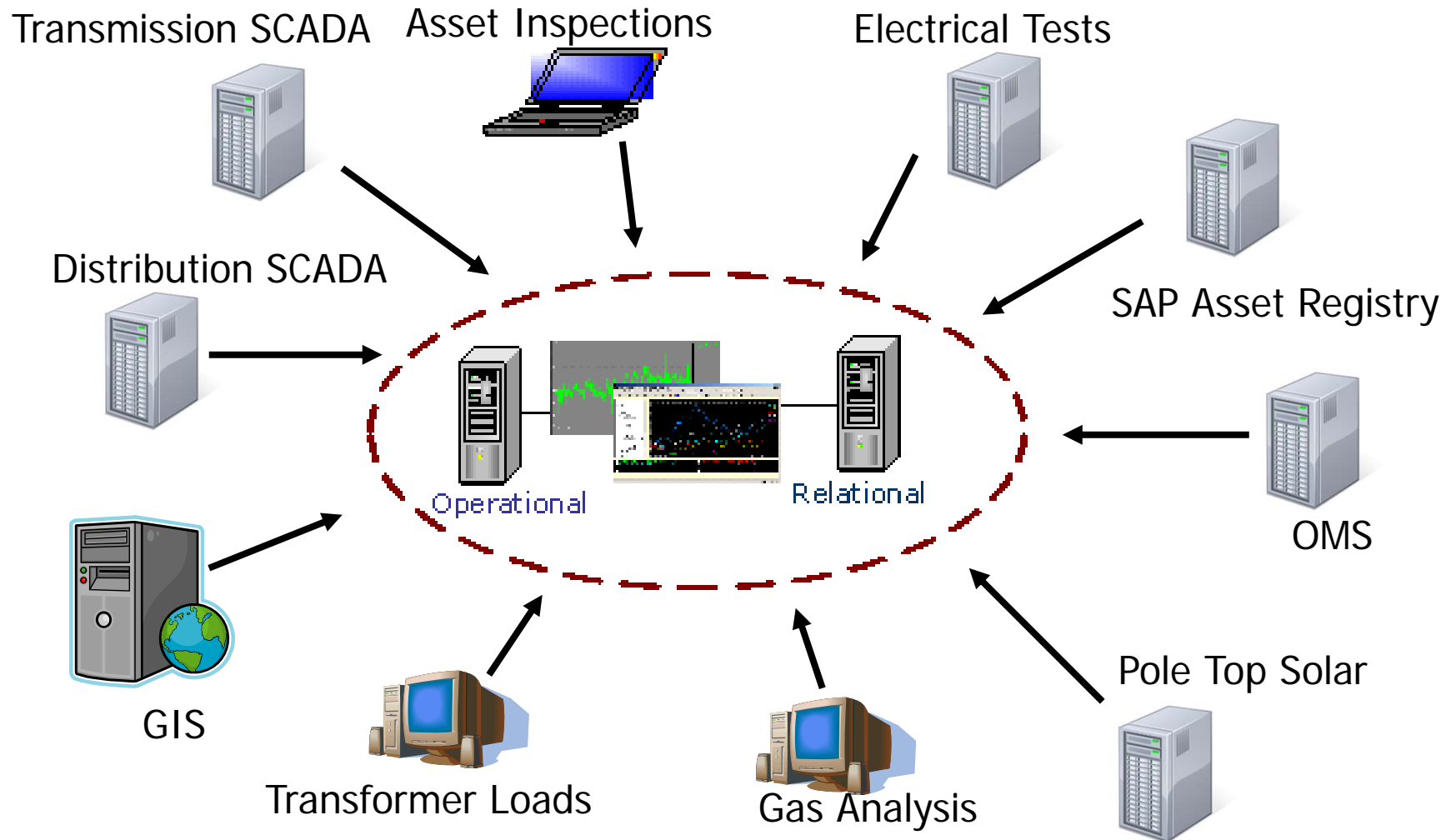 - Criticality
- Drive Results

Data Collection

Analysis & Reporting

Drive Results

Notifications Work Orders

Integrated for Success

OSI
Asset Management
Historical Data
and
Analysis

Condition Based Maintenance →

Equipment Information

SAP
Job Creation
Financials
Materials Mgt
Asset registry

Inspection Data
Diagnostic Data

Jobs Creation
Material

Time Sheets
Job Completion

**CGI CAD System
Shared Server**
Scheduling
Dispatching

Wireless Network

People

+ Process

+ Systems

- Service Assurance (Outage Management)
- Work Management (Crew Management)
- Wireless Communications
- Graphic Information (AM/FM)
- Decision Support (Data driven decisions)

Data Integration and Centralization

Transmission SCADA

Asset Inspections

Electrical Tests

Distribution SCADA

SAP Asset Registry

Operational

Relational

OMS

GIS

Transformer Loads

Gas Analysis

Pole Top Solar

Assessing Asset Condition

Assessing
Asset Condition

Substation
Reliability

Circuits
SAIFI

Underground
Network
Reliability

Dynamic Transformer
Monitoring
Transformers
Breakers/Relays

Poorest
Performing
Devices (PPD)

Advanced
Loop
Scheme (ALS)

Visibility
Monitoring

Asset Health Score

Asset Health Score – Drill down

CMMS System Benefits Breakdown

These annual expenditures protect $1.7 B of inside plant assets and full benefits after approximately five years.

Historical

- Capital Rep.
- Failures
- Corrective Maintenance
- Preventive Maintenance

Today

- Capital Rep
- Failures
- Corrective Maintenance
- Condition Based Preventive Maintenance
- Calendar Based Preventive Maintenance

10-20% Overall Reduction
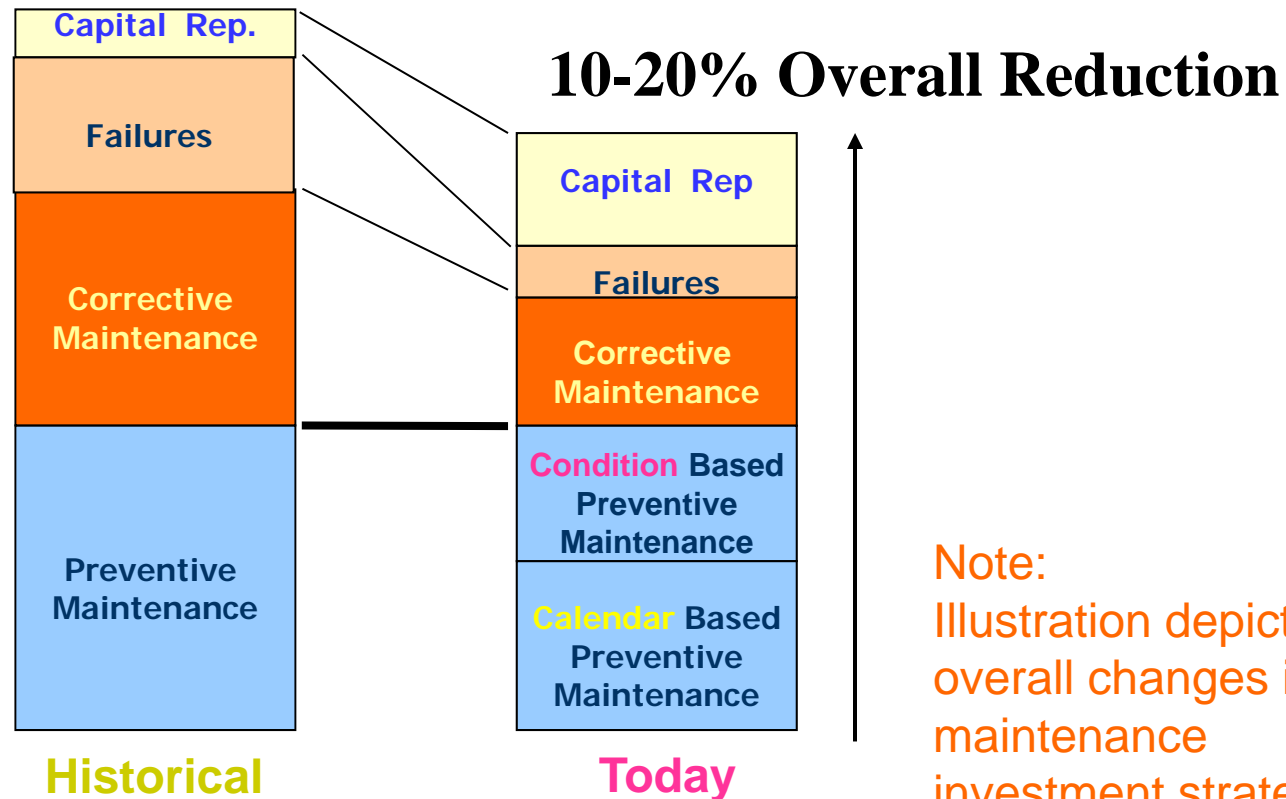
Note:
Illustration depicts overall changes in maintenance investment strategy.

Assessing Asset Condition

Assessing Asset Condition

Substation
Reliability

Circuits
SAIFI

Underground Network
Reliability

Dynamic Transformer Monitoring Transformers Breakers/Relays

Poorest Performing Devices (PPD)

Advanced Loop Scheme (ALS)

Visibility Monitoring
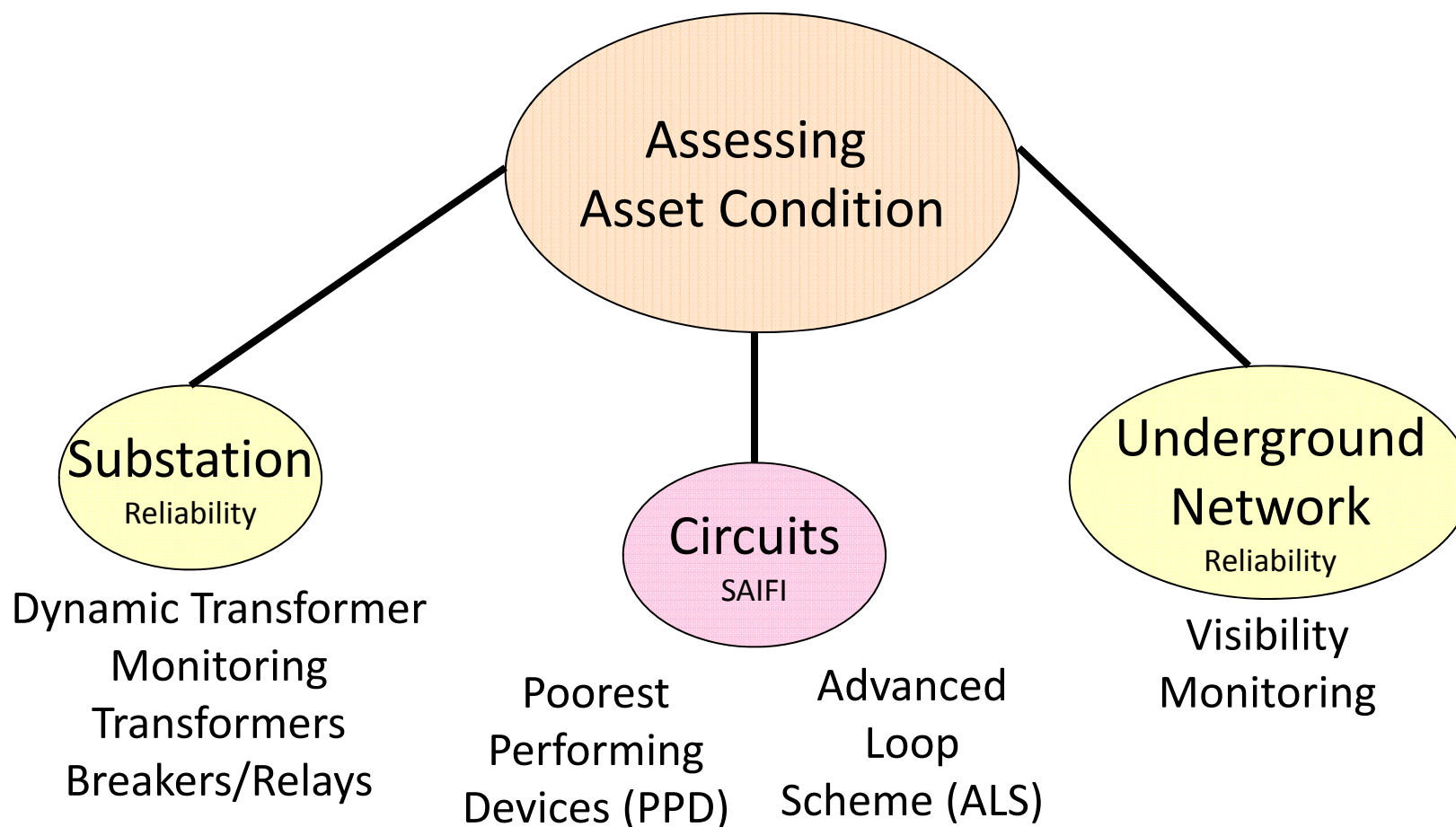
Traditional 13 kV Recloser Loop Scheme

Station #1   Station #2

    Fdr #1   Tie   Fdr #1
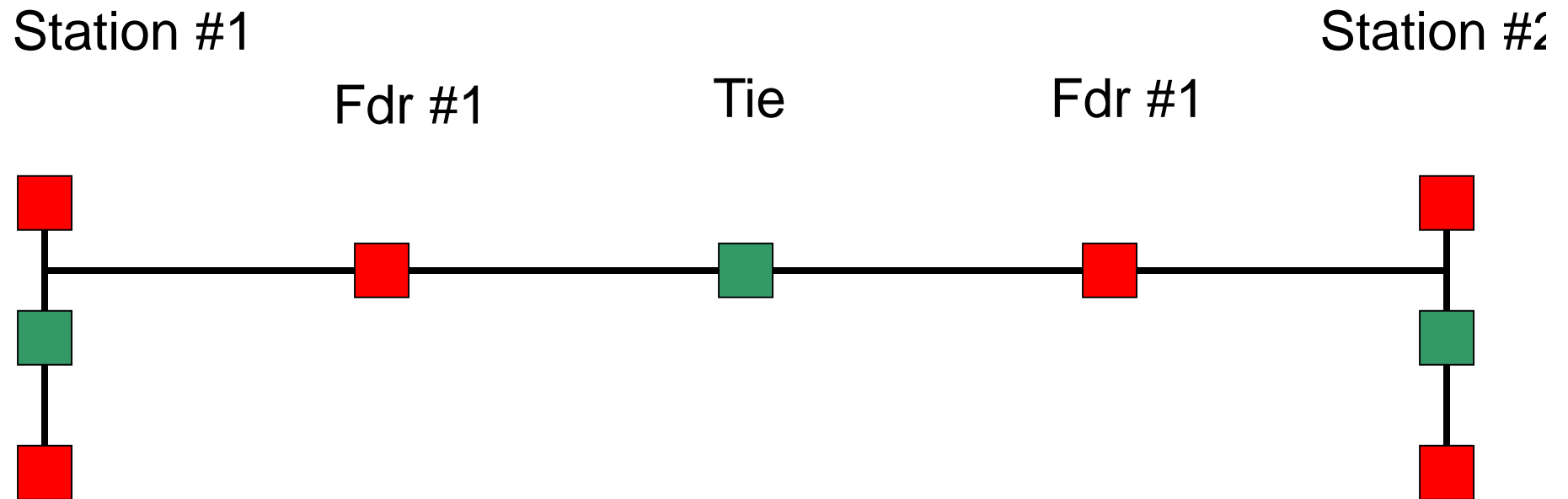
Existing Configuration

Advance Loop Scheme (ALS)

Station #1

| | R | FR 1 | FR 2 | FR 3 | FR 4 | FR 5 |

| 451S | 651R | 651R | 651R | 651R | 651R |

Fiber Optic Cable

651R | tie

| 451S | 651R | 651R | 651R | 651R |

| R | FR 1 | FR 2 | FR 3 | FR 4 |
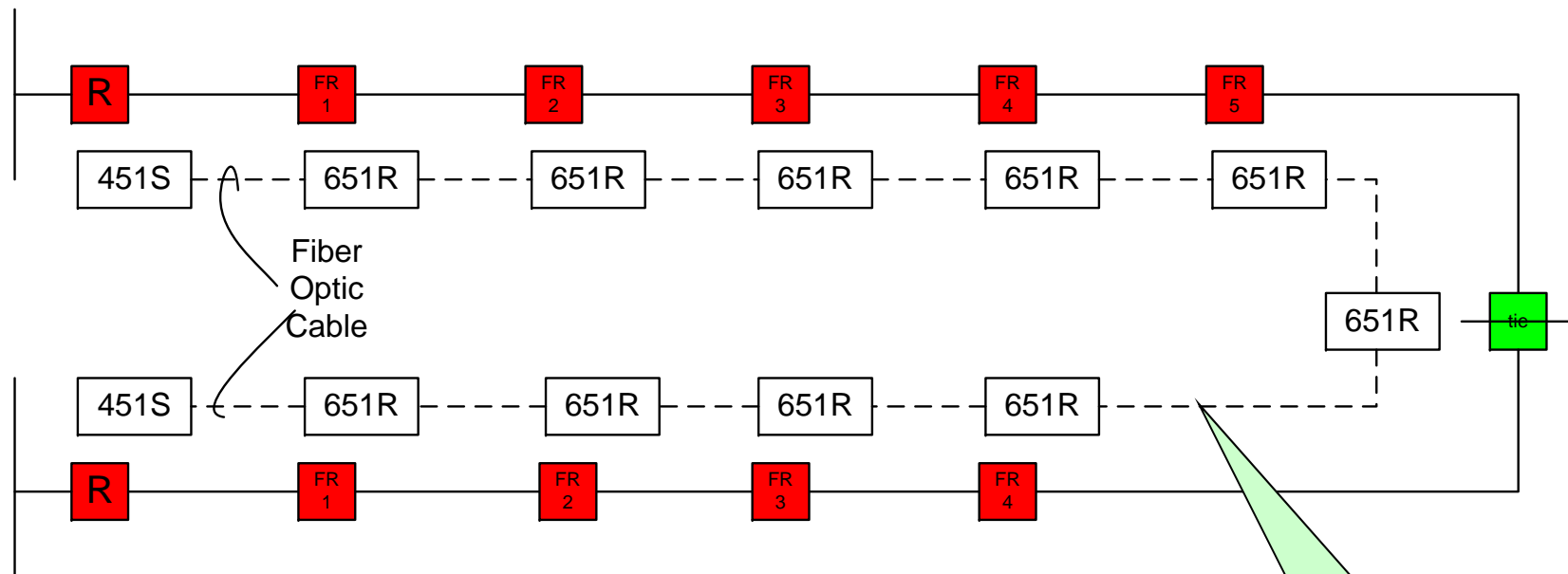
Station #2

High Speed Communications

Summary of Reliability Benefits

Innovations	Current System	Smart Grid
Customer Segmentation (SAIFI)	Average **1500** customers Impacted per outage	Average **500** Customers Impacted per outage
Single Phase Tripping (SAIFI)	Not Implemented Average **1500** customers Impacted per outage	Average **167** single phase customers impacted per outage
Make Before Break (MAIFI)	Momentary Interruption **30-60 seconds**	No Momentary Interruptions

Comparing – SAIFI Improvements

Options	Cost
Traditional Approach Trim tree's, replace equipment	$6 - 12 M per loop
Smart Grid Technology Limit risk, add communications (fiber), and leverage technology	$2 - 4 M per loop

Both options produce similar SAIFI results for the **first year**

Enhancements to SAIFI assessment and asset management programs…

Outcome
A device based program
that has optimized
SAIFI reduction and spend

Opportunity
Rising SAIFI Trends
are not adequately
being
addressed with
current
Asset Management
Programs

Solution
Leverage
opportunities
to improve tools
for investment
prioritization

Barriers
Culture Change
System upgrades
Dedicated personnel
Securing funding

…will mitigate rising electric distribution SAIFI trends.

Poorest Performing Device (PPD) Program

Targeting extended customers interrupted, a two part asset evaluation algorithm was developed, modeled after our current inside plant CMMS system structure.

I. Incident Evaluator Algorithm:

Device Health Score provides the basis for an initial prioritization of potential projects, subject to further field inspections and cost estimates as described below.

Customers Interrupted	Frequency	Remediation Complexity
60%	30%	10%
• Number of customer interruptions	• Number of occurrences	• Variance of cause codes

II. Field Inspection, SAIFI validation and Cost Estimates:

Scope of work assessment in field provides basis for cost estimate and validation of SAIFI benefit.

Benefits and costs form basis for ***SAIFI Investment Yield*** calculation and final prioritization of projects.

SAIFI Benefit Validation **Remediation Cost Estimate**

• Scope of work assessment by field engineering / asset management
  – SAIFI benefit validation
  – Remediation cost estimates

SAIFI Yield on Investment (Yield Score)

SAIFI Benefit

attained from Incremental Spend

Incremental SAIFI Benefit vs. Cumulative Cost

Reliability Base Spend plus Incremental Device Approach Spend ($M)
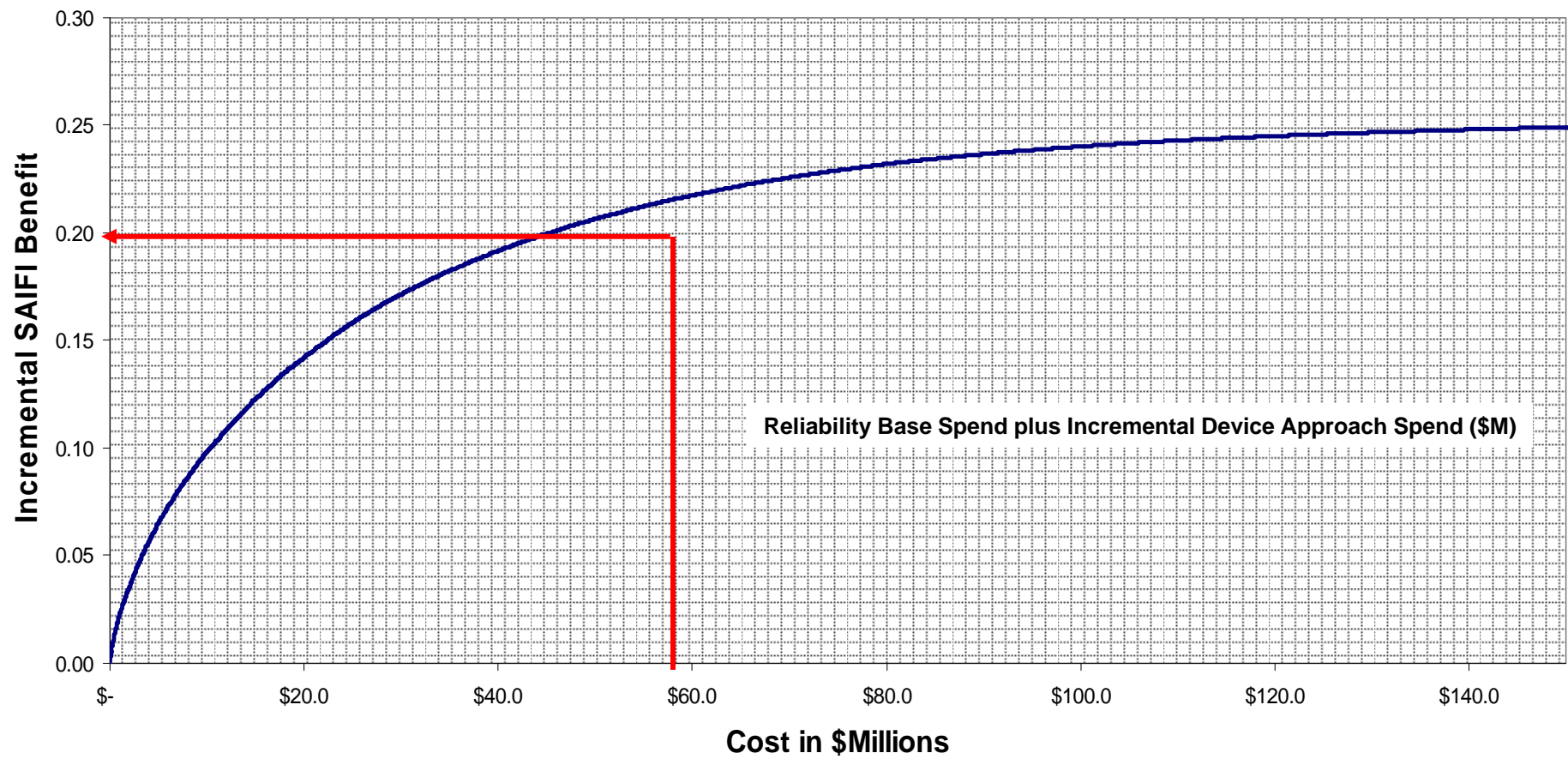
Remediation Options Prioritized by SAIFI Yield

SAIFI Yield (SAIFI Benefit/ $ Invested)

Assessing Asset Condition

Assessing
Asset Condition

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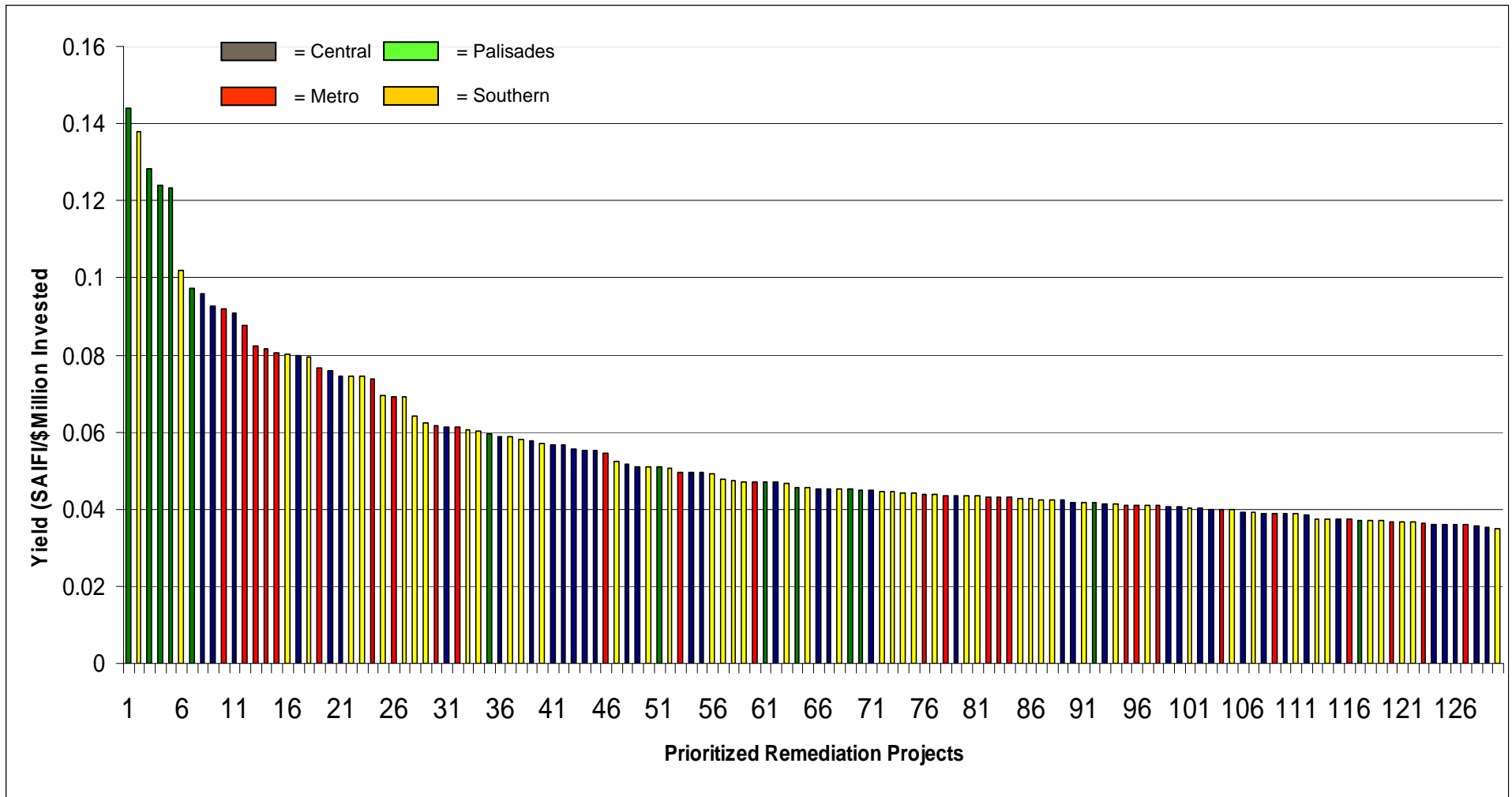
Visibility
Monitoring
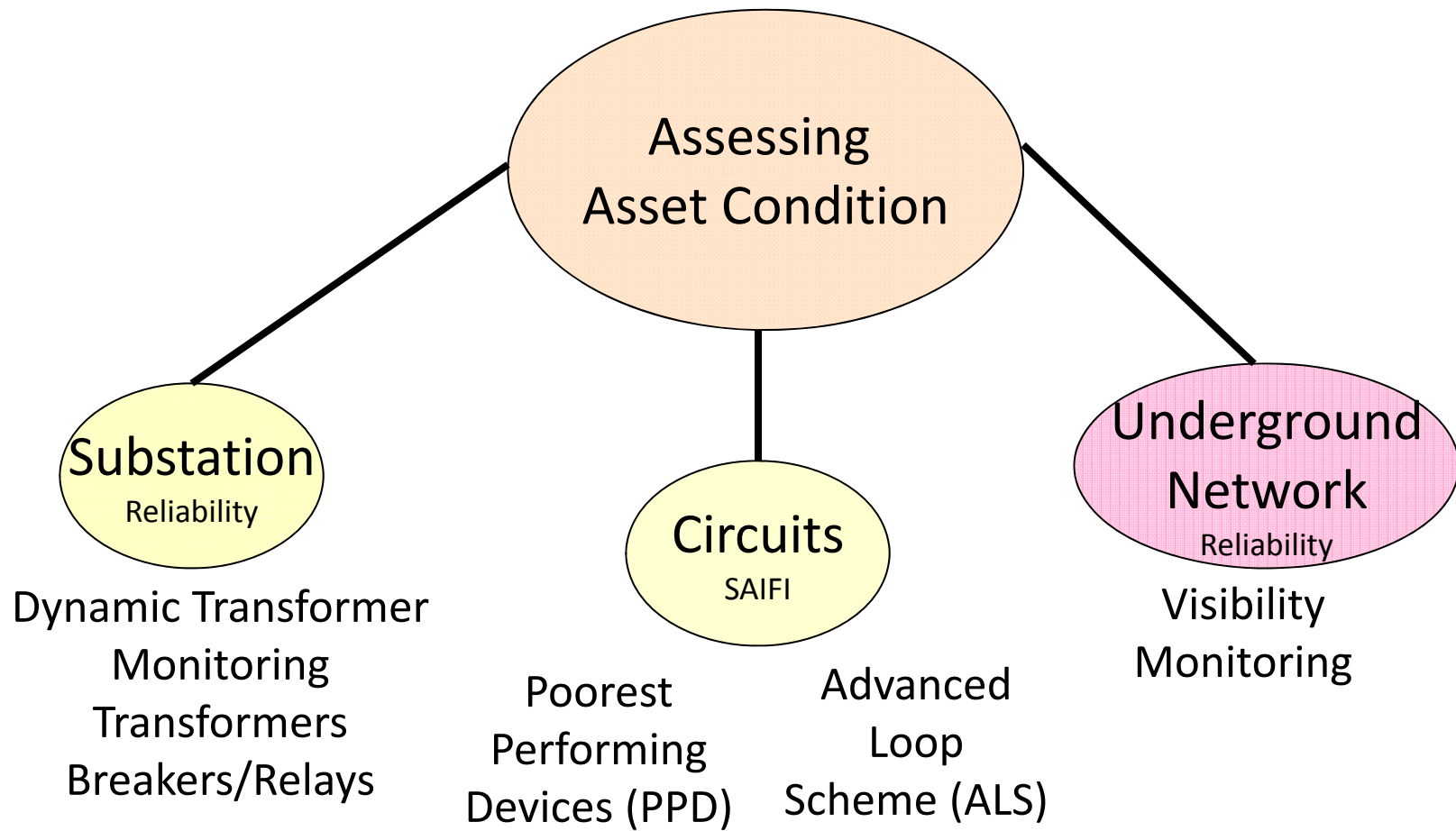
Networking Monitoring System (NMS)

- Reduce restoration time for underground cables.
- Pattern recognition to determine type of fault.
- Visibility to all key underground network assets
- Consolidated asset inspection, test and maintenance data
- Consistent information base for comparative analysis

System Visualization

Networking Monitoring System (NMS) Benefits
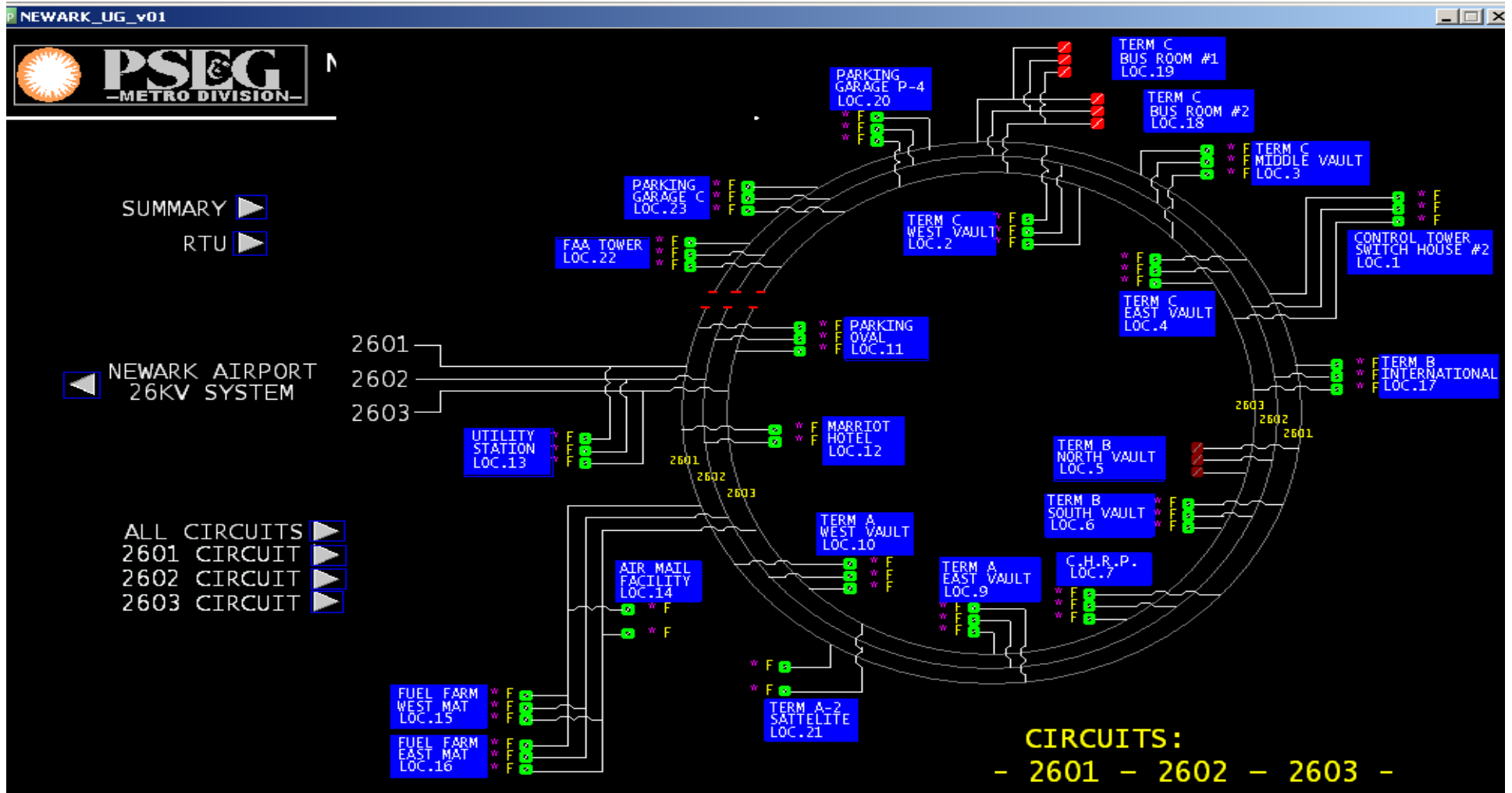
- Provides control and indication
- Provides Condition Assessment for transformers and network protector
- Remote access to network relays for settings and validation.
- O&M savings
  - OT savings (5% reduction in CM)
  - "Day priors" can be done via system rather than by field crew
  - Improved response & turnaround during faults

Future Vision

- Cyber Security
- Asset Reliability Management System
- Outage Management
- Graphic Information System
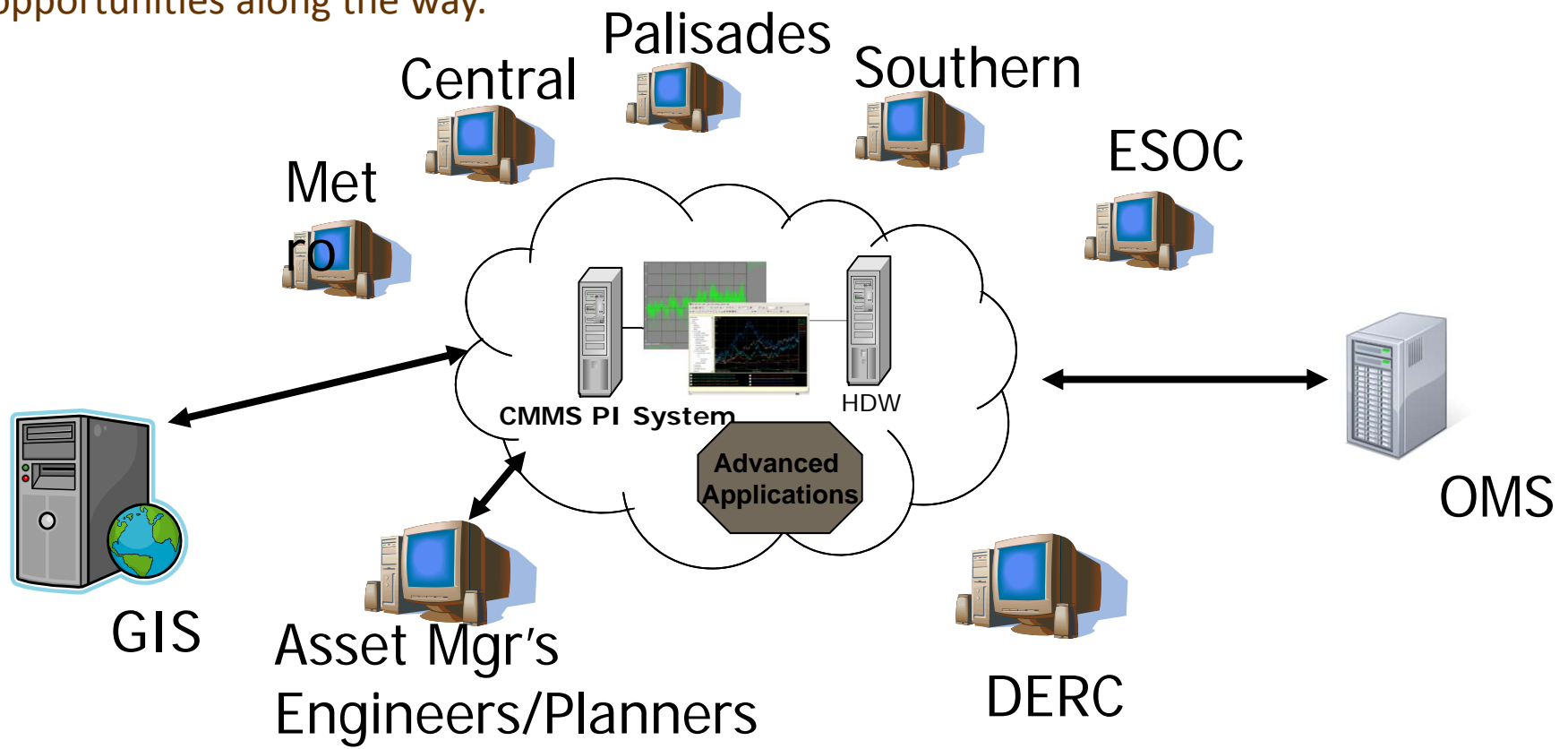- Mobile Data
- Risk Management

Asset Reliability Management System
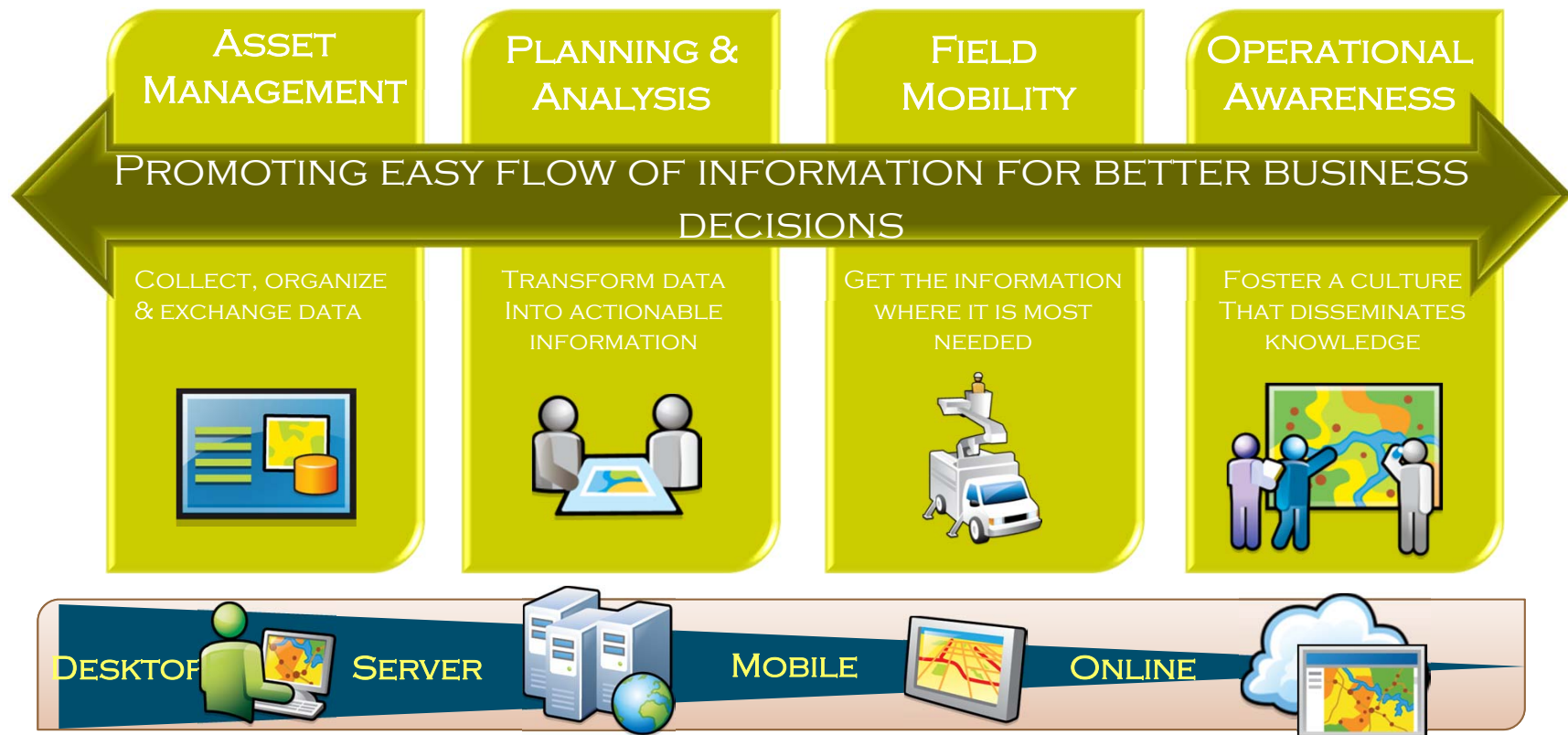
To Be Virtual Dispatch Center

The overall initiative focuses on utilizing, improving and augmenting the overall capabilities of the Transmission Operation System while incorporating new technology, methodology, recognizing and capitalizing on business drivers and opportunities along the way.

The Future of GIS and OMS

A Fully Integrated, Reliable and Robust GIS and OMS Enterprise Systems!

Asset Management	Planning & Analysis	Field Mobility	Operational Awareness
Promoting easy flow of information for better business decisions			
Collect, organize & exchange data	Transform data Into actionable information	Get the information where it is most needed	Foster a culture That disseminates knowledge

Desktop — **Server** — **Mobile** — **Online**

Questions?

THANK YOU

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