BPA - WISP Project

NASPI Work Group Meeting
October 12-13, 2011

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Lawrence Carter – Project Manager, PMU Installation
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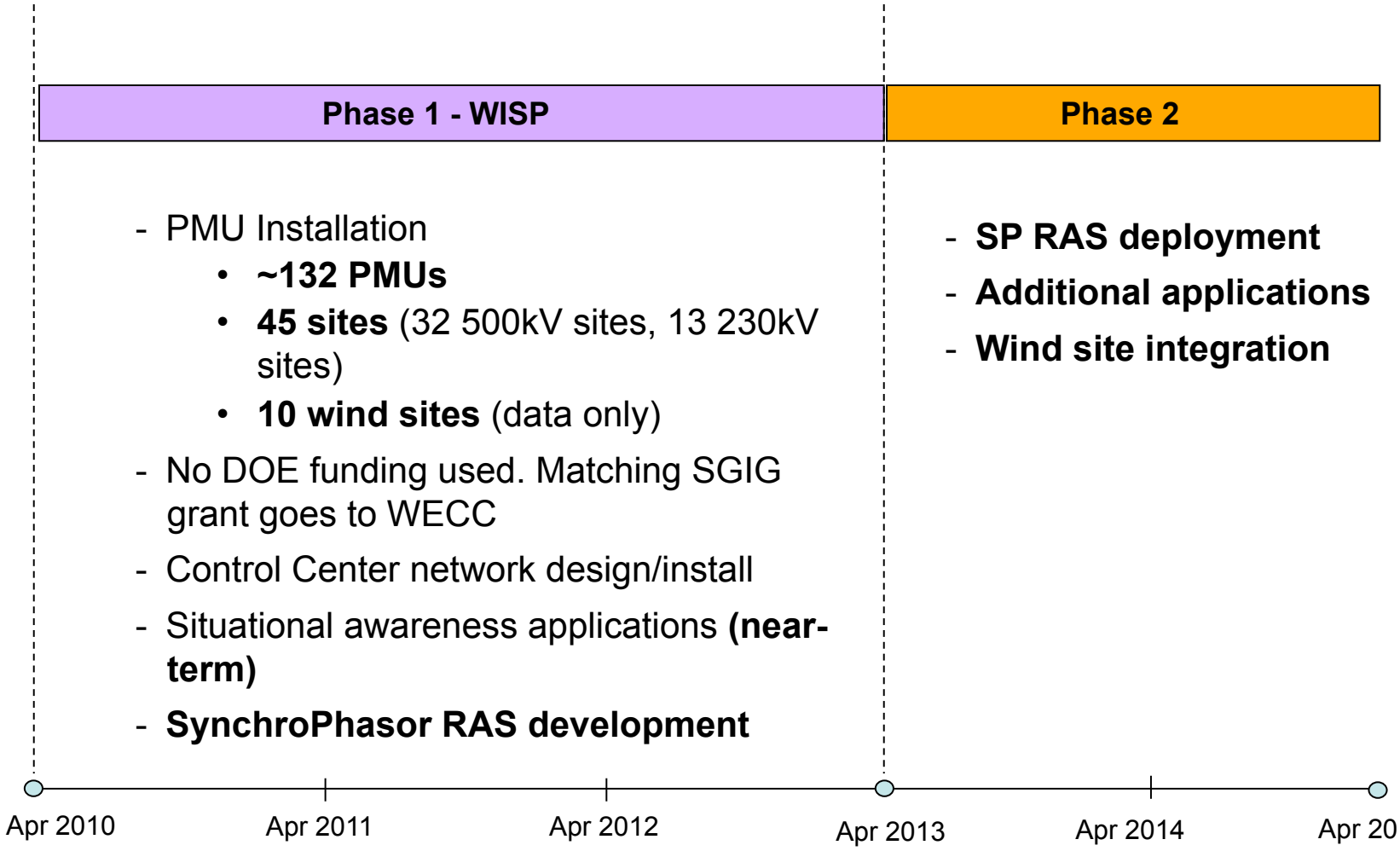
Project Overview



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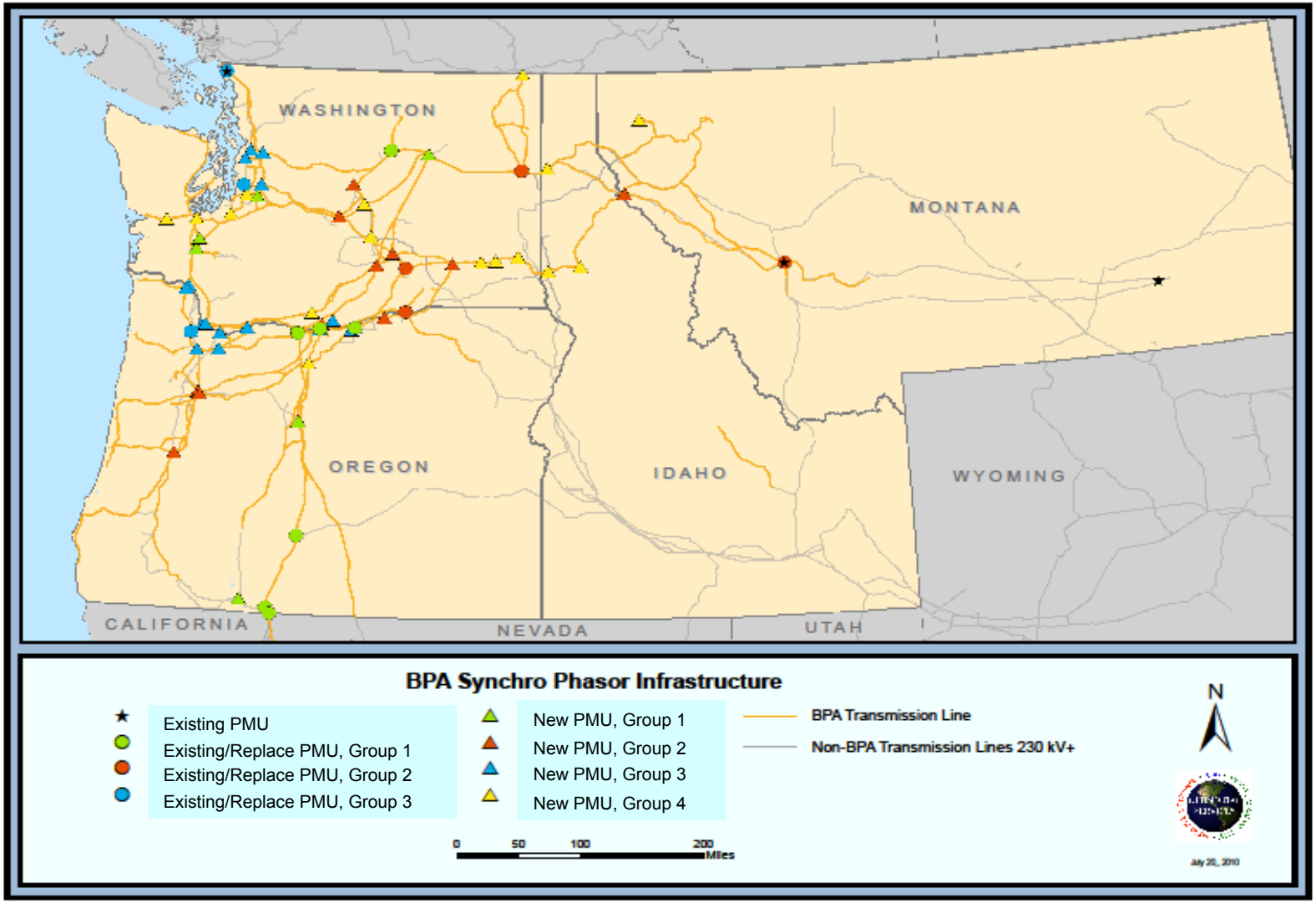
BPA PMU Deployment



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PMUs

- **SEL 487e** chosen, with **customized features**:
  - Multicast capability
  - On-the-fly configuration for main/aux bus
  - Two fully-configurable data streams from a single PMU (PDCs and RAS)
- **Stand-alone units**, deployed in pairs or quads
- IEEE C37.118 standard, M-class
- **60 samples per second**
- Measurements:
  - Voltage and line current phasors in polar format, bus frequency, calculated line MW and MVAR, **PCB and MOD statuses**
- No PDCs in substations

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PMU Installation

- **Redundant PMUs** with redundant communication paths (to two control centers)
- Current Status:
  - ✓ "Standard" designs complete
  - ✓ **6 PMUs installed at 2 initial "Beta" sites**
  - ✓ "Beta" data being analyzed
- Contractor installation (Wilson/SAIC)
- Schedule
  - Group 1 (Sites 3 – 14): February, 2012
  - Group 2 (Sites 15 – 26): June, 2012
  - Group 3 (Sites 27 – 40): October, 2012
  - Group 4 (Sites 41 – 45): March, 2013
  - Wind sites 1-10: December 2012

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Communications Network

- **BPA-operated telecom network**
- SONET backbone
  - Digital microwave with legacy analog microwave
- PMU network is IP over TDM using fractional T1s. UDP protocol.
- **High-capacity routers** chosen to enable migration to future applications (Ethernet devices) and evolution of PMU requirements
- **RAS performance driving design** (latency requirements)
- **NERC CIP compliance** driving design, network monitoring
- Telecom backup battery and charger replacement required at most sites

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Control Centers

- **Redundant PDCs** in each control center
  - Currently in testing, final selection not yet made
- Control Center Architecture
  - Evaluating feasibility of in-house design based on **OSI PI architecture** and dedicated application server
- **Data archives** in each control center (short-term), and lab (long-term)
  - Currently in testing, final selection not yet made
- Responsible for **PMU network monitoring and NERC CIP compliance**
- WISP WAN gateway
- Communications link between control centers

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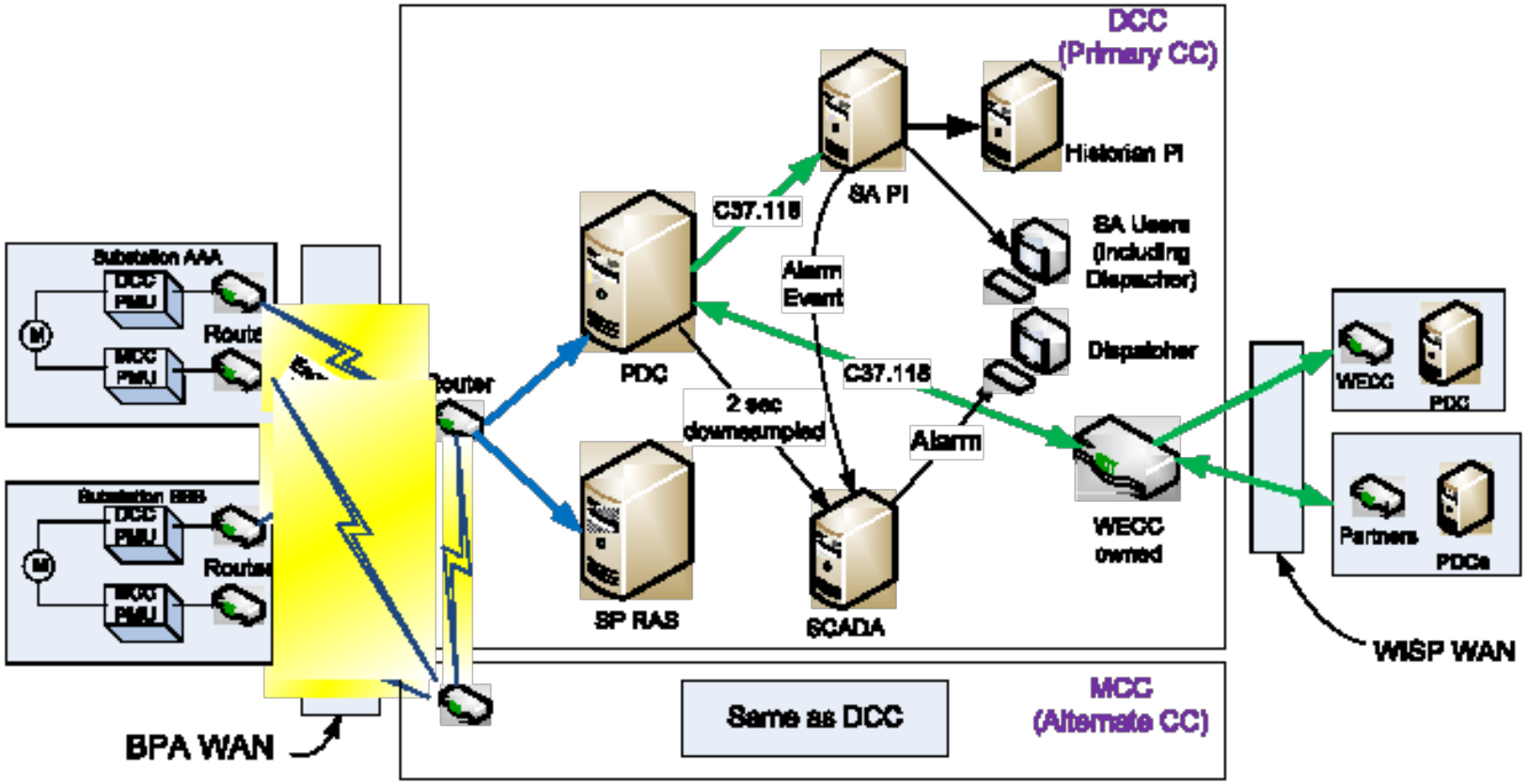
Network Architecture



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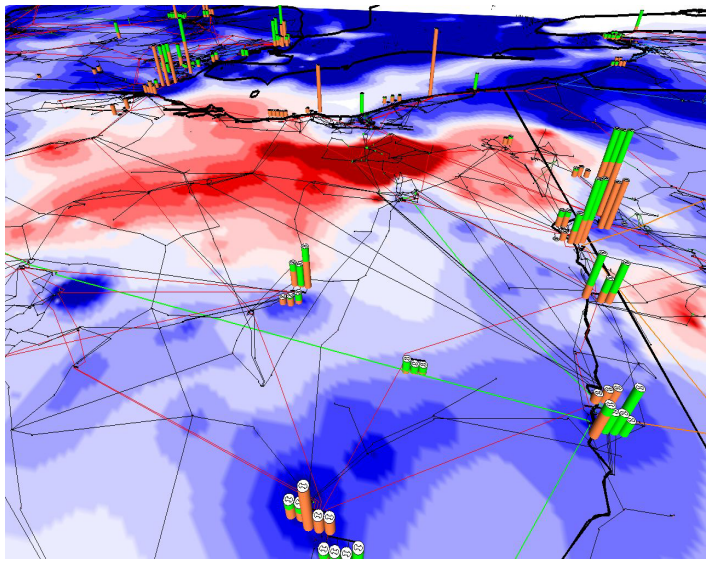
Applications

- **Strategy: Deploy "WASA light" and WECC shared view in Phase 1.**
- **Situational Awareness**
  - Phase angle alarm
  - Event detection
  - Oscillation Detection
  - Mode Meter (Montana Tech)
- **Engineering Applications**
  - Event analysis
  - Dynamic performance baselining
  - Model validation
- **Other applications** under development by BPA Technology Innovation:
  - Robust state estimation and contingency analysis
  - Wide area visualization



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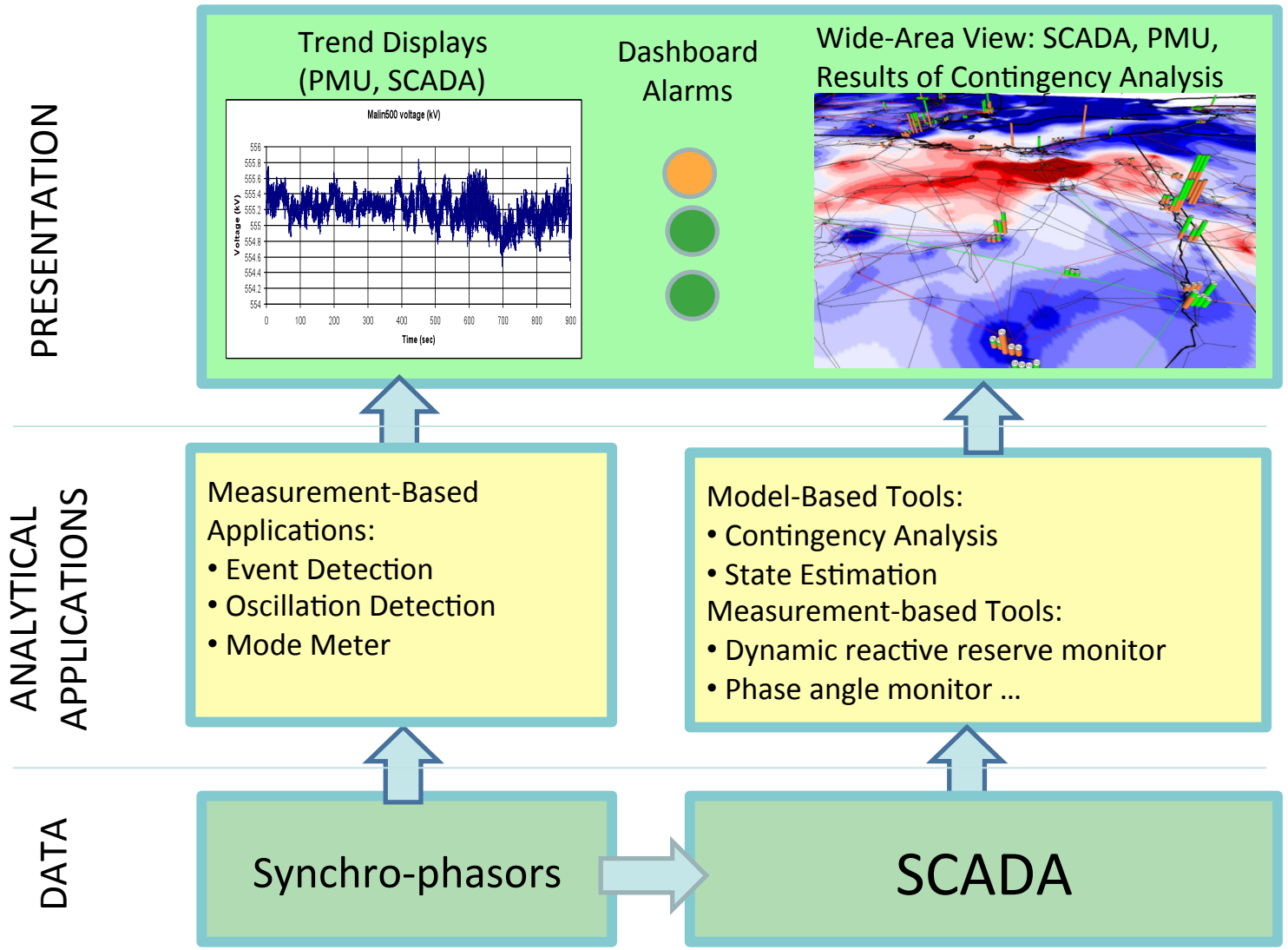
BPA WASA Strategy



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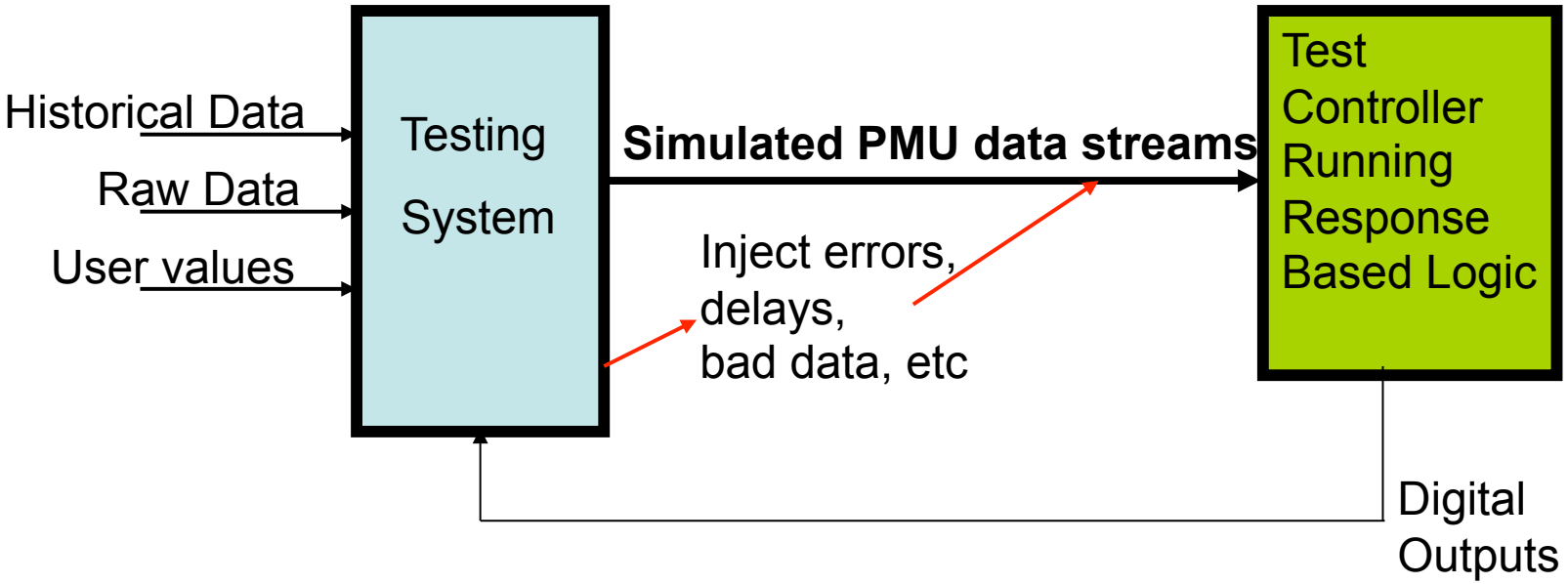
Wide Area Controls

PHASE 1

- **Developmental version of PMU-based Remedial Action Scheme (RAS)**



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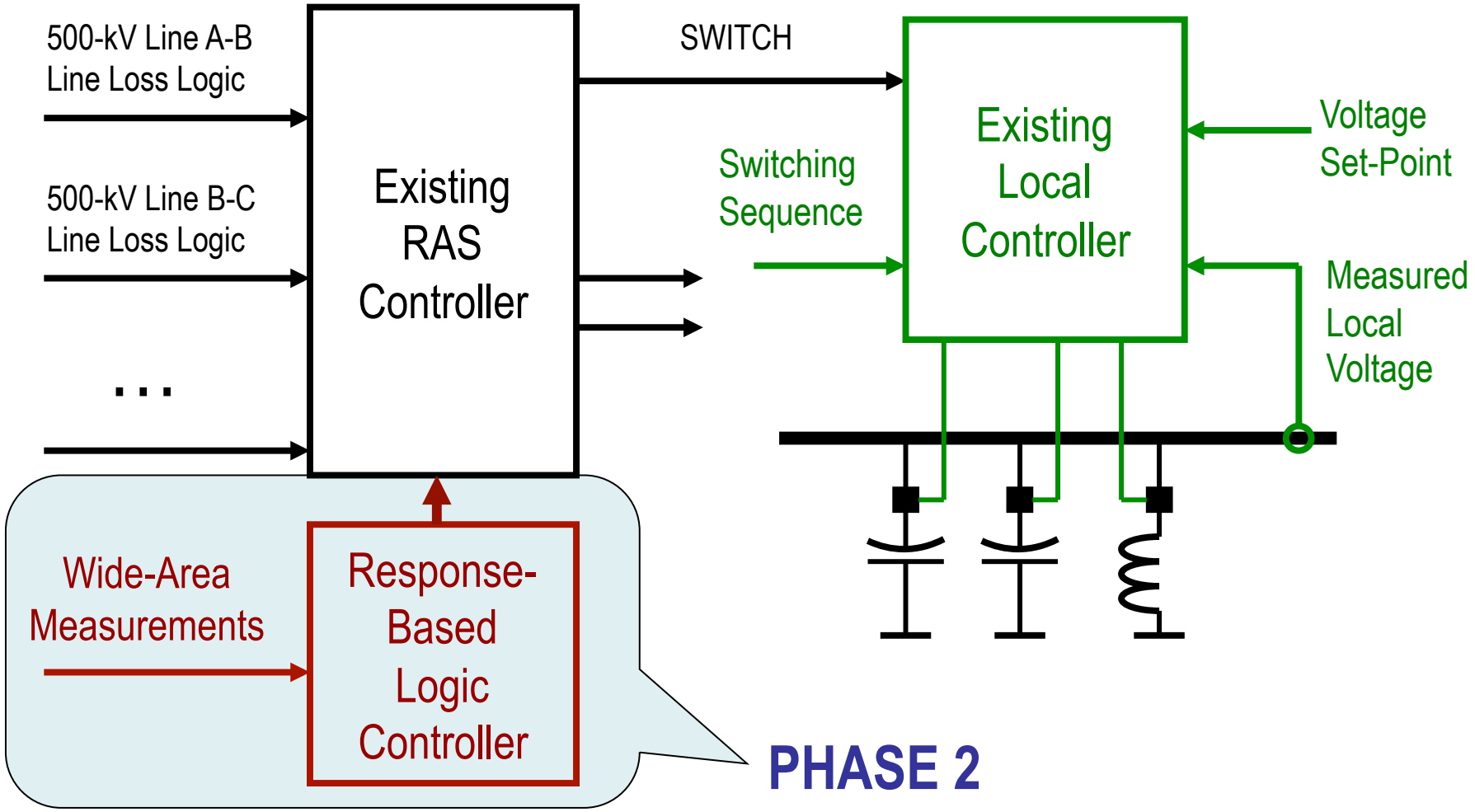
Build on Existing Control Architecture



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Challenges

- PMU Installation
  - Short timeline
  - Scheduling equipment outages
- Telecom
  - **Equipment selection impacted by RAS latency requirements, and bandwidth for future traffic**
  - Necessity for upgrades of back-up batteries and chargers at substations
- **Cyber security**
  - PMUs will be CCAs, with associated PSP, ESP and operational requirements
- Selection/development of near-term situational awareness applications and environment (compatibility with legacy systems)
- Training for operations and maintenance of new equipment and network

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