

OE Visualization and Controls Peer Review

Reliability Compliance Monitoring

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October 2006
Washington, D.C.



Presentation Outline

Research for Reliability Visualization and Compliance Monitoring

- CERTS Approach, Solutions and Evolution
- NERC-CERTS Collaboration
- Dissemination at NERC and Stakeholders
- Accomplishments and Challenges

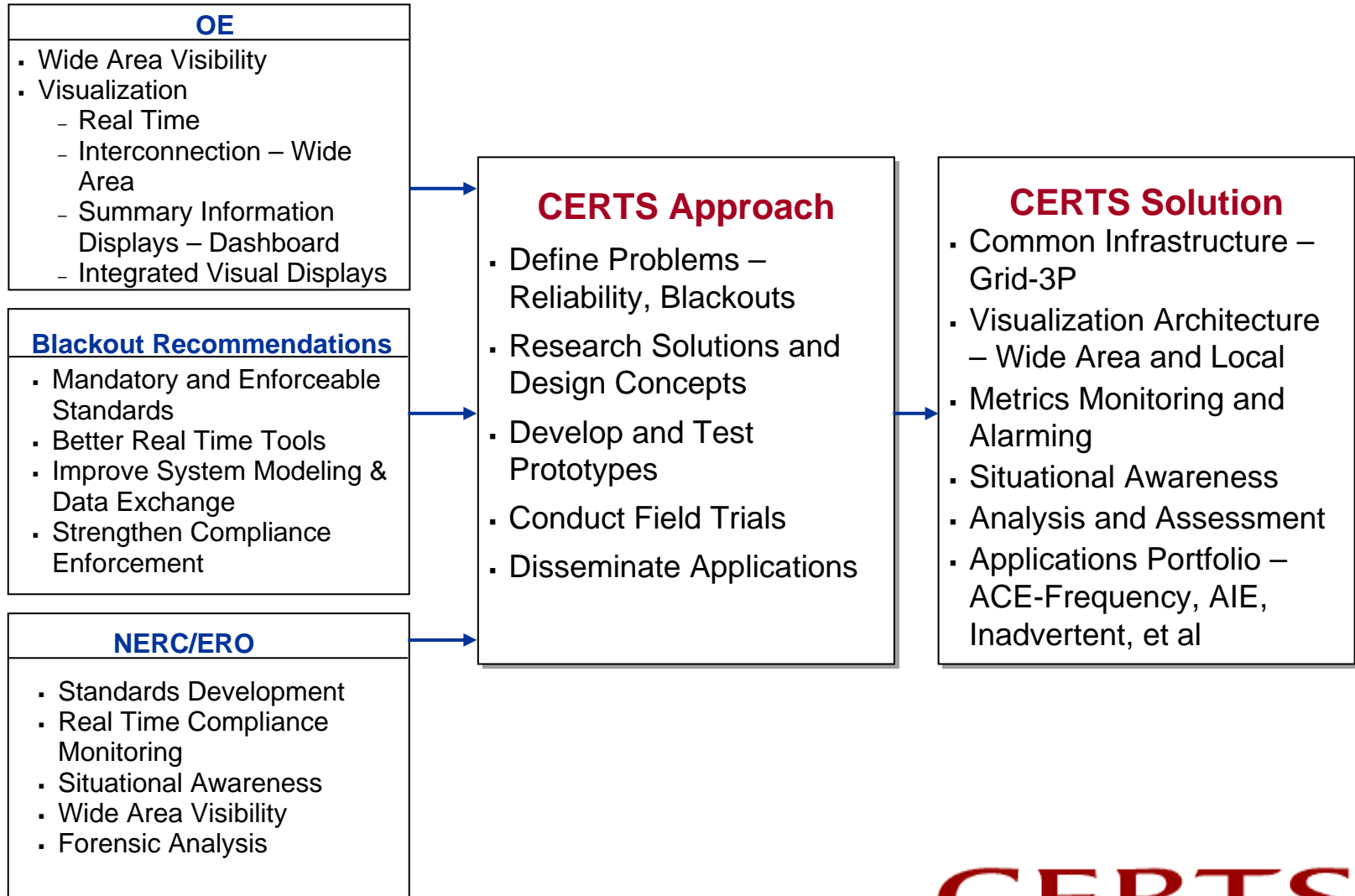


*Research for
Reliability Visualization and
Compliance Monitoring*

CERTS Approach and Evolution



Research Needs – CERTS Approach and Research Solutions



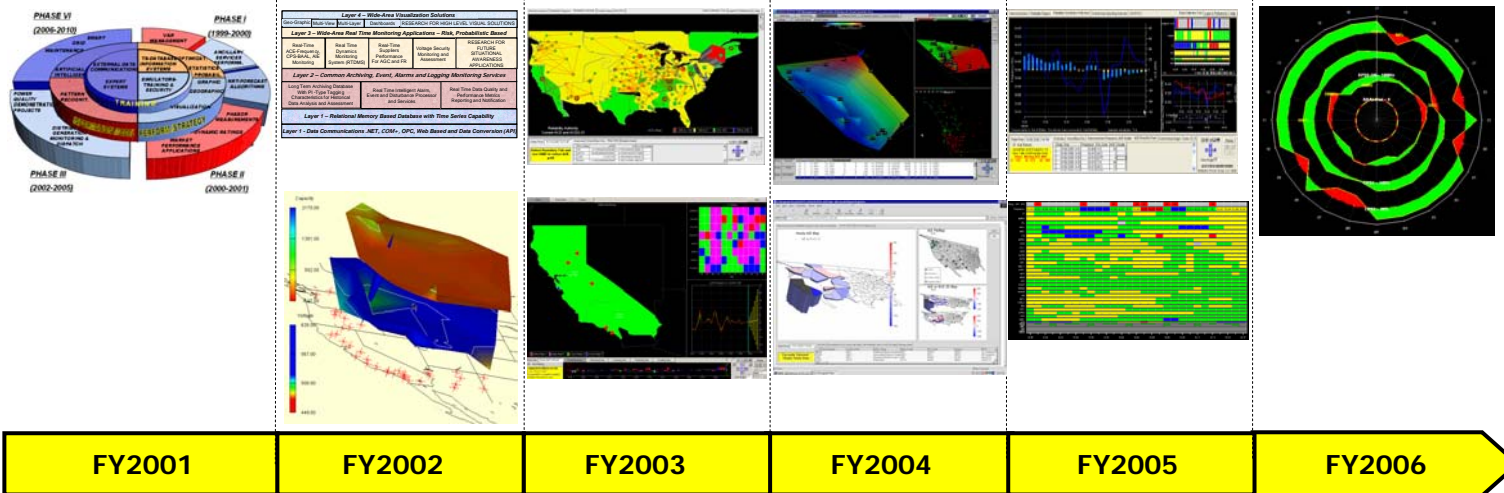
CERTS-NERC Research Evolution and Results

Visualization, Compliance, Monitoring, Infrastructure, Real Time Wide-Area Standards Compliance and Situational Awareness

GOAL

- Industry problems identification
- Brainstorm solutions, and research process
- Research portfolio definition
- Wide-area visualization infrastructure
- Relational time-series database
- Wide-area voltage, VAR visualization tool
- Wide-area real time ACE-Frequency monitoring tool
- Suppliers performance for AGC and frequency response
- VAR Management
- Area Interchange Error (ACE) Monitoring
- Wide-area Inadvertent Monitoring
- Performance standards research, validation, field trials
- Resources adequacy load-generation analysis and assessment
- CPS-BAAL monitoring and analysis
- Research for situational awareness for resource adequacy

Common Wide-Area, Real Time Compliance Monitoring, Reliability Management, Performance Analysis and Situation Awareness Visualization System for NERC, DOE, and FERC



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NERC-CERTS Collaboration



Summary Research Results – Linked to Research Problems and NERC Priorities

✓ Standards Development

- Research Metrics
- Prototype Monitoring
- Field Trial and Validation

✓ Compliance Monitoring – NERC Standards

CPS-BRD

Alarms and Automatic Notification for Violation of Standards

✓ Situational Awareness Dashboard

Situational Awareness Dashboard

Display Key Metrics by Jurisdiction

✓ Lack of Wide-Area Visibility

Resource Adequacy (ACE-Frequency)

Color-coded status of Interconnections, Regions, Coordinators and BAs

✓ Forensic Analysis

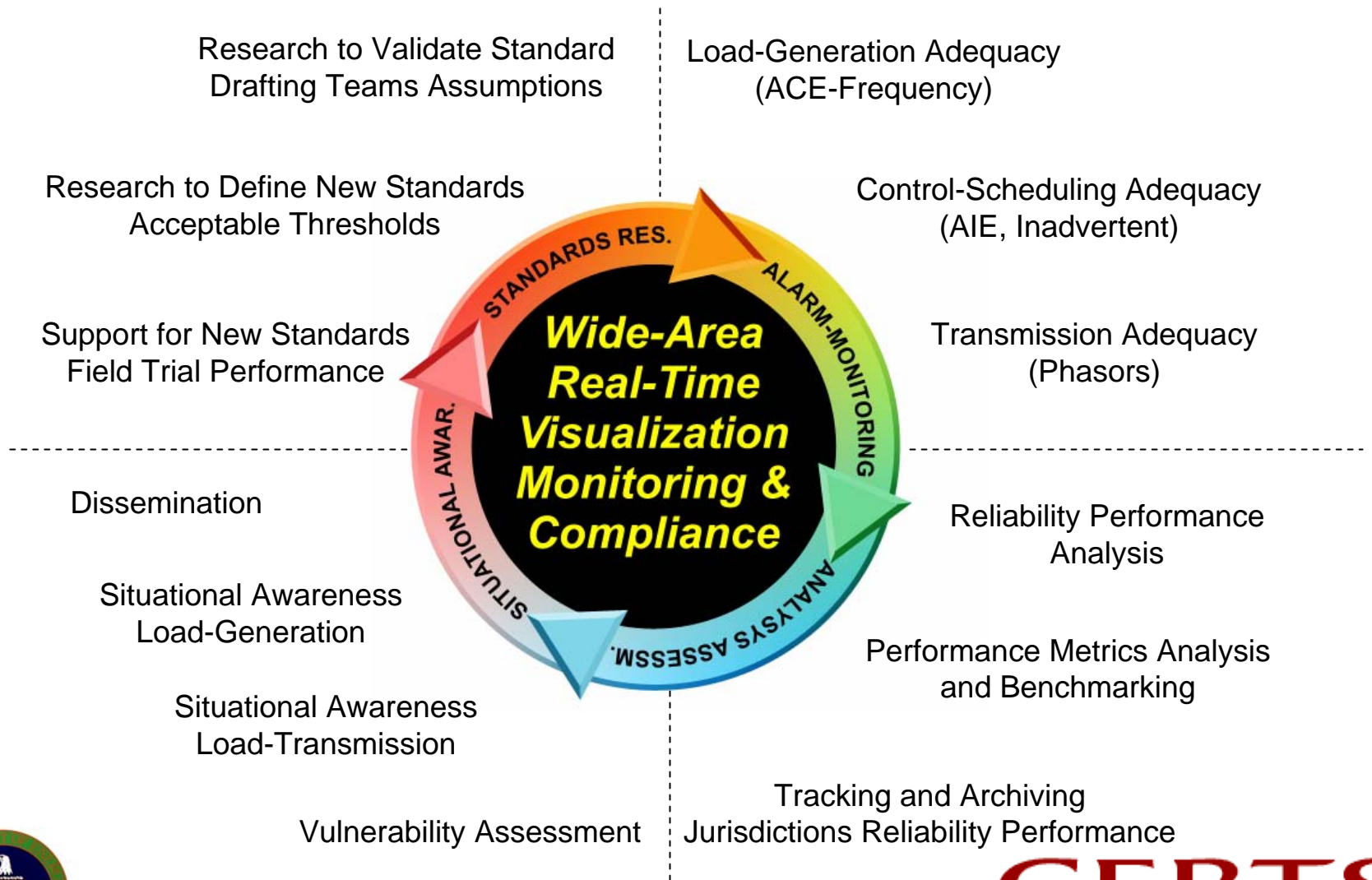
Performance Trends, Tracking and Reports, e.g., Blackout Investigation

✓ Data Quality

- Research and Report on Infrastructure Requirements
- Reports and Alarms for Non-Reporting Jurisdictions



CERTS-NERC Research Collaboration for Visualization and Compliance Monitoring



NERC Compliance Monitoring and Visualization Components

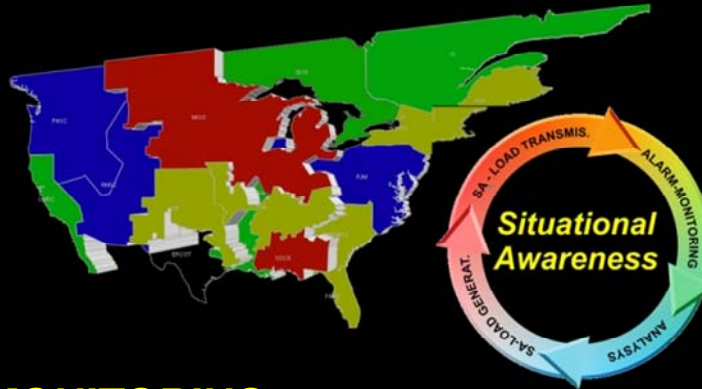
A STANDARD METRICS

- Balance Resource and Demand
- Frequency Response

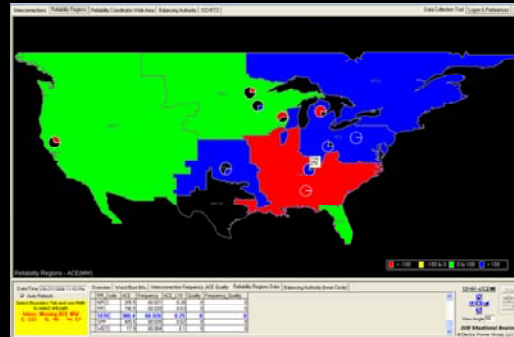
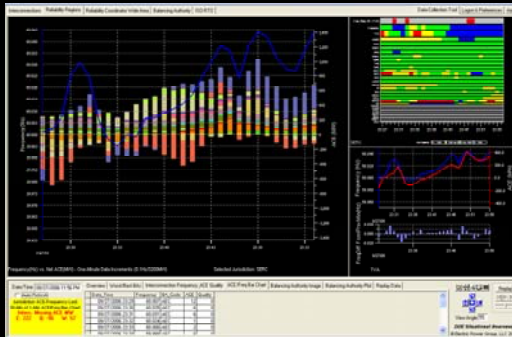
B REAL TIME ALARMING

SHORT-TERM: -EAST 9/28/2006 (EDT)
Frequency Absolute value of two most recent
1-Minutes: $ABS(59.979 - 60.027) = 0.048\text{Hz} > 0.034\text{Hz}$.

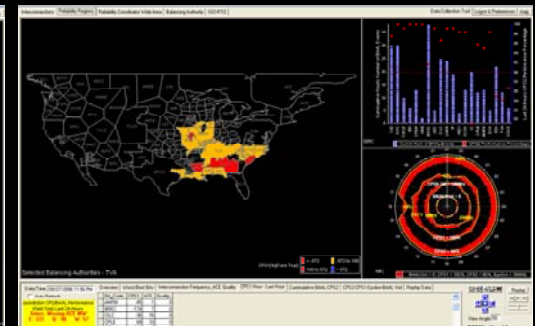
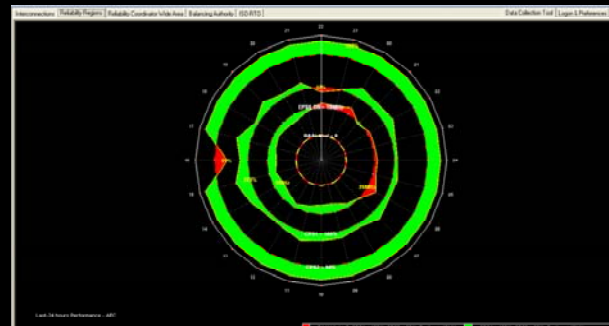
C WIDE-AREA SITUATIONAL AWARENESS



D WIDE-AREA REAL TIME MONITORING



E ANALYSIS - ASSESSMENT



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Dissemination at NERC and Stakeholders



CERTS Research Dissemination

**CERTS Research
and Prototyping**



**Field Trials
NERC-ISOs-Utilities**



**NERC Acceptance –
Reliability Coordinators,
Resources Subcommittee**

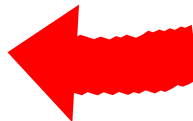
**NERC
ADOPTION AND
INTEGRATION OF
CERTS TOOLS AND
APPLICATIONS**

**NERC Strategy
and
Compliance Role**

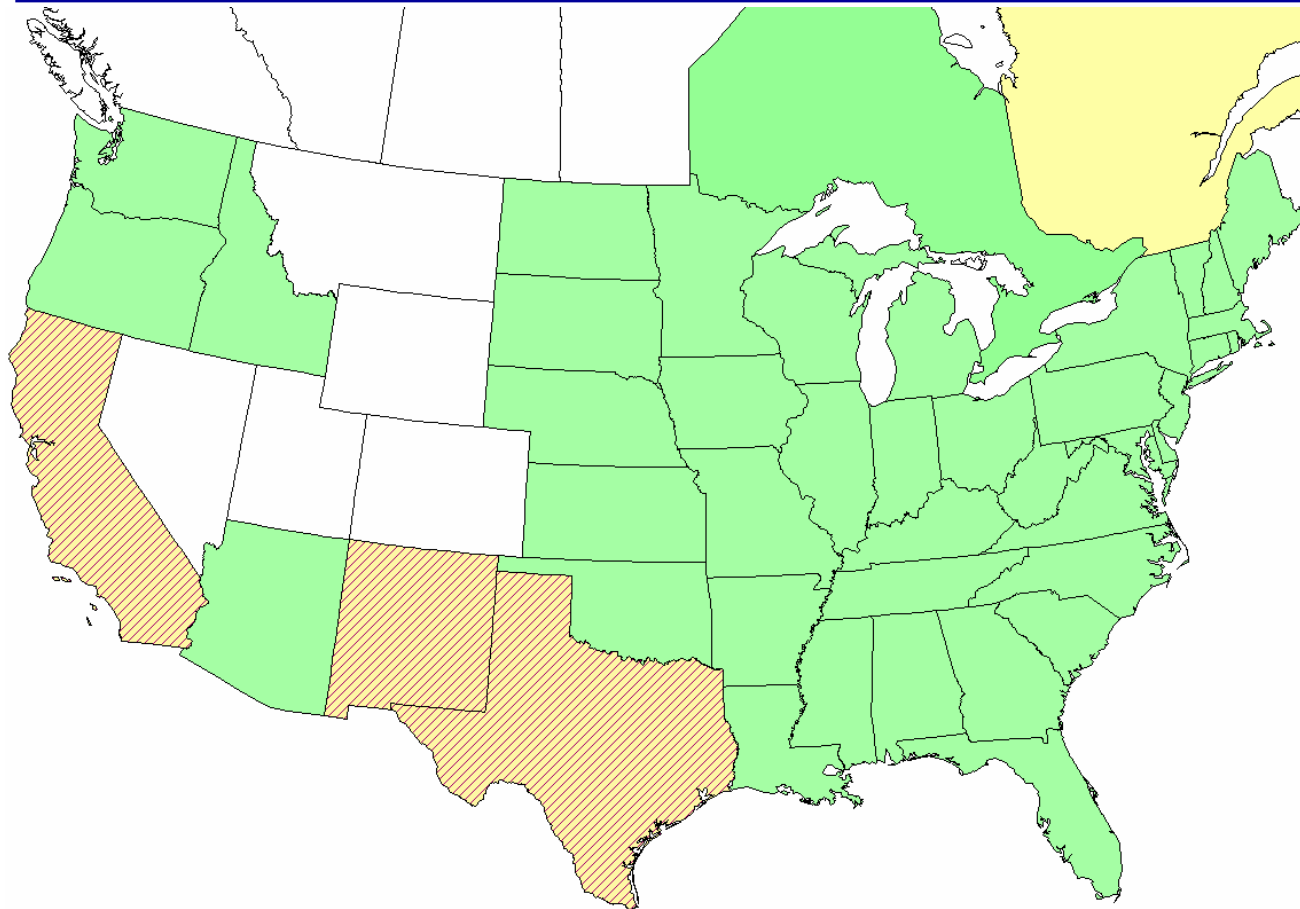


**NERC Infrastructure
Integration and
Operations**

**Application Users –
Feedback, Enhancements,
Priorities**



Dissemination to NERC Stakeholders



- 1 NERC Staff
- 2 FERC
- 3 DOE
- 4 Midwest ISO
- 5 PJM
- 6 Southwest Power Pool
- 7 New Brunswick Power Corporation
- 8 Electric Reliability Council of Texas
- 9 American Electric Power
- 10 Bonneville Power Association
- 11 California ISO
- 12 Duke Power Company
- 13 Entergy Services, Inc.
- 14 Florida Power & Light Company
- 15 Southern Company Services
- 16 Independent Electricity Market Operator
- 17 ISO New England
- 18 New York Independent System Operator
- 19 Northwest Power Pool
- 20 Pacific Northwest Security Coordinator
- 21 Western Area Power Admin.
- 22 Southern Company Services
- 23 Tennessee Valley Authority
- 24 We Energies
- 25 Ameren Services
- 26 South Mississippi Electric Power Association
- 27 Michigan Electric Power Coordination Ctr.
- 28 CERTS

About 5 Phone-Calls and 15-Emails
Per-Week For User Questions and Support.

52 Users in 27 Organizations Using Resource Adequacy

Currently Deploying

Future



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Accomplishments and Challenges



2006 Accomplishments

- ACE-Frequency Technology Transfer is Completed - NERC is directly supporting it, now is a production quality tool. Support is integrated with NERC budget
- Wide-Area NERC ACE-Frequency Application with the new CPS-BAAL performance metric released to Reliability Coordinators
- Wide-Area Inadvertent Monitoring Application Field Trial by WECC – currently underway
- Wide-Area Interchange Error Monitoring Application – targeted for release in 4Q06
- Research and specification for frequency response using phasors, including archiving for performance assessments and forensic analysis
- Research started for Wide-Area Situational Awareness for Resources Adequacy
- Data Quality Project – Technology Transfer Completed – Roadmap on infrastructure requirements and performance metrics reporting – Hardware implementation and support is integrated in NERC budget



Ongoing Research Challenges

- **Evolving Industry Reorganization and ERO Role**
 - Stakeholders levels of responsibility and ownership continue being defined
 - Expansion of ERO responsibilities and staff will be challenging for research and prototype definition and joint coordination
 - Uncertain sources of research funding and resources
- **Evolving Levels of Operations and Monitoring**
 - Appropriate performance metrics visuals for high levels of situational awareness
 - Extending platform from monitoring to analysis, post-assessment and situational awareness
 - Appropriate visualization solutions to address multi-variable data images needs
- **Data Quality Issues**
 - Real time data availability and quality because of data confidentiality and priority concerns (ERCOT, WECC)
 - Expansion from SCADA to Phasor Data. Data quality issues for production tools
- **Evolving Reliability Standards and Requirements**
 - Transition from deterministic to risk-probabilistic approaches for monitoring and analysis, and its impact on operations and tools
 - Lack of required coordination between standard drafting teams defining new or replacement performance metrics

