

EPEI ELECTRIC POWER RESEARCH INSTITUTE

EPRI Roles in Support of NASPI Research and Training

NASPI, New Orleans
March 6, 2008
Stephen Lee
Senior Technical Executive
Kai Sun
Project Manager
Power Delivery and Utilization

Outline

- Education and Outreach
- Research Projects in Operation and Planning



Education and Outreach

- Support NASPI Webcasts and Training
 - Convert ERLphase TESLA
 DMEs to PMUs (11/1/07)
 - Tony Weekes, Manitoba Hydro
 - Krish Narendra, ERLPhase
 - 21 organizations, 25 attendees
 - Phasor Technology and RTDMS Training (1/22/08)
 - Terry Bilke, MISO
 - Manu Parashar, Vivek Bhaman, EPG
 - 33 organizations, 59 attendees (several are roomfuls)



Module 3 – Practical Exercises [Optional]

of Line Datasets Medicine Sectors (Pad user ORE-3P Patives U.S. Patert 7 233743, Partic Press Orea, 44 (other server



NASPI Training Resources Page & Industry Events Page

- <u>http://www.naspi.org/resources/training/training.stm</u>
- http://www.naspi.org/industry/industryevents.stm/

🖉 North American SynchroPhasor Initiative (NASPI) - Windows Internet Explorer			🖉 North American SynchroPhasor Initiative (NASPI) - Windows Internet Explorer				
🚱 🔍 🖉 http://www.naspi.org/resources/training/training.stm			Co Co 🖉 http://www.naspi.org/industry/industry/events.stm/				
Ele " Coogle 🖸 🗸 🐨 🐨 Google 🐨 🐨 🚱 🌑 🖉 🗧 + 😭 Bookmaris + 👰 761 blocked 🖤 Check + 🔨 AutoLink + " 🚇 Settings + 👰 +							🔘 Settings 🗸 🛛 📆 🔹
🔆 🏟 🖉 North American SynchroPhasor Initiative (NASPI)							i Tools • 🕢 • 🛈 📖 👋
NASPI North American SynchroPhasor Initiative							
		\rightarrow	NAS	PI Home About NASPI Vision (Organization ■		
NORTH AMERICAN SYNCHROPHASOR	Training Material		NORTH AMERICAN SYNCHROPHASOR INITIATIVE	Industry Events For more information about these events please contact <u>Stephen Lee</u> .			
INITIATIVE	Contact		Meetings	Month	Date	Conference	Location
Beagurean	Stephen Lee		News	February	February 12, 2008	NERC RCWG (Reliability Coordinator Working Group)	San Diego, CA
Resource Archivo	(650) 855-2486		Industry Events		February 13-14, 2008	NERC ORS (Operating Reliability Subcommittee)	San Diego, CA
Business			Related Sites		February 13-14, 2008	NERC RAS	Phoenix, AZ
Management	Date	Resource	Resources		February 18-22, 2008	EPRI Power Delivery & Markets Advisory Council Meetings	San Diego, CA
Task Team	January 22, 2008	NASPI Training Package Presentation (PDF 9,875KB)	Contacts		February 20-21, 2008	2008 National Electricity Delivery Forum	Washington, DC
Data & Network		Module 1 - Phasor Technology Overview (<u>Windows Media Video 8,944KB</u>)			February 26-28, 2008	NERC SPCTF	San Diego, CA
Task Team		Part A – Theory & Applications (45 min.)		March	March 6-7, 2008	NASPI Work Group Meeting	New Orleans, LA
Equipment		Part B – Infrastructure & Protocols (15 min.)			March 12-14, 2008	NERC OC/PC/CIPC	Dallas, TX
Placement Task		Module 2 – RTDMS Tutorial (<u>Windows Media Video 6,160KB</u>)		April	April 6-9, 2008	2008 International Conference on Electric Utility Deregulatio	n Nanjing, China
leam		Platform Overview & Navigation (60 min.)				and Restructuring and Power Technologies (DRPT)	
Uperations	Neurophan 1, 2007	NACOT Web December 20 Convert NutDecember Table DMC's to December 2			April 8-9, 2008	NERC TIS	Salt Lake City, UT
Task Team	November 1, 2007	NASP1 web Presentation: Convert NxtPhase Tesla DME's to Phasor Measurement			April 15-17, 2008	NERC SPCTF	Atlanta, GA
Performance and		unita (<u>minuowa medid Video 6,000Ko</u>)	A bttp://www.pacpi.org/				100%
Done							



EPRI Research Task Forces Relevant to NASPI

- Situational Awareness Task Force
- Online Stability and Control Task Force
- Controlled Separation and System Restoration Task Force
- Modeling and Standardization Task Force
- Reliability Assessment Task Force
- Engineering Study & Economic Assessment Task Force



2008 Portfolio – Situational Awareness

- Base Projects
 - P39.001 Alarm Management and Situational Awareness
 - P39.002 Next Generation State Estimation
 - P127.003 Visualization and Prediction of Cascading Outages with Human Factors
- Supplemental Projects
 - Online Risk Monitor for Cascading Outages Incorporating PMUs (Prediction of Cascading Outages)
 - ConEd, NYPA, Entergy, ISONE, Exelon, AEP, FirstEnergy, TriState
 - Wide Area Power System Visualization Using EMS Data
 - CenterPoint
 - Wide Area Power System Visualization and Location of Disturbance Using Real-Time PMU Data
 - ConEd

© 2008 Electric Power Research Institute, Inc. All rights reserved.

P39.001 Alarm Management & Situational Awareness

- Scope
 - Alarm root cause diagnosis with MFM (GoalArt)
 - Situation Awareness in Power Systems Operations (SA Technologies)
- Deliverables
 - Technical Updates
 - Workshop(s) on Situational Awareness



Situation Awareness in Power Systems Operations (SA Technologies)

- System Design Guidelines for Supporting Situation Awareness in Power T&D
 - A. Color Usage Guidelines for Power T&D
 - B. Guidelines for Enhancing Situation Awareness of Automated Systems
 - C. Guidelines for Supporting Predictive SA
- SA Technologies will work with 3-4 EPRI members
 - Interview, analyze and draft the initial guideline documents
- One or two EPRI workshops will present the findings, gather more input



Calendar

- May 27~29, PSAPO Technical Conference, Situational Awareness Task Force, Southern Co., Atlanta
- October 8th, Situational Awareness Task Force Conference, EPRI Charlotte, NC (followed by NASPI meeting, hosted by EPRI, Oct 9-10) – Guests are welcome



Full Situational Awareness

- Geographical awareness (within and outside own footprint)
- Facilities awareness (loading conditions, etc.)
- Controllability awareness (how much safety margin or elbow room for maneuvering?)
- Predictive awareness (when will problems arise?)
 - Look for CEC (PIER/TRP) report on Critical Operating Constraints Forecasting

Prototype Visualization of Frequency Location of Disturbance



Community Activity Room Visualizing Transmission Bottleneck



Critical Operating Constraint Forecast Predictive Situational Awareness



A comprehensive research framework addressing situational awareness to improve grid reliability



Online Reliability Monitor of Standard Contingencies & Potential Cascading Modes



Risk Exposure to One Cascading Mode With 1 Line on Maintenance Outage

Risk of Contingencies



Remaining Storage or Synchronizing Capacity (RSC) of an Interface Computed from PMU

$RSC = (P_{12} / \sin \theta_{12})(1 + \cos \theta_{12})$



Sequence of Faults with Line Outages





Remaining Storage Capacity



© 2008 Electric Power Research Institute, Inc. All rights reserved.

RSC in Phase Space





Combining Reactive Power Flows with RSC



Summary

- Continue to support NASPI training, education and outreach
- October 8th, Situational Awareness Task Force Conference, EPRI Charlotte, NC (the day before NASPI meeting, hosted by EPRI, Oct 9-10) – Guests are welcome
- System Design Guidelines for Supporting Situation Awareness – Workshops in Q4 2008
- Research in Cascading Outages

