

Eastern Interconnect Phasor Project

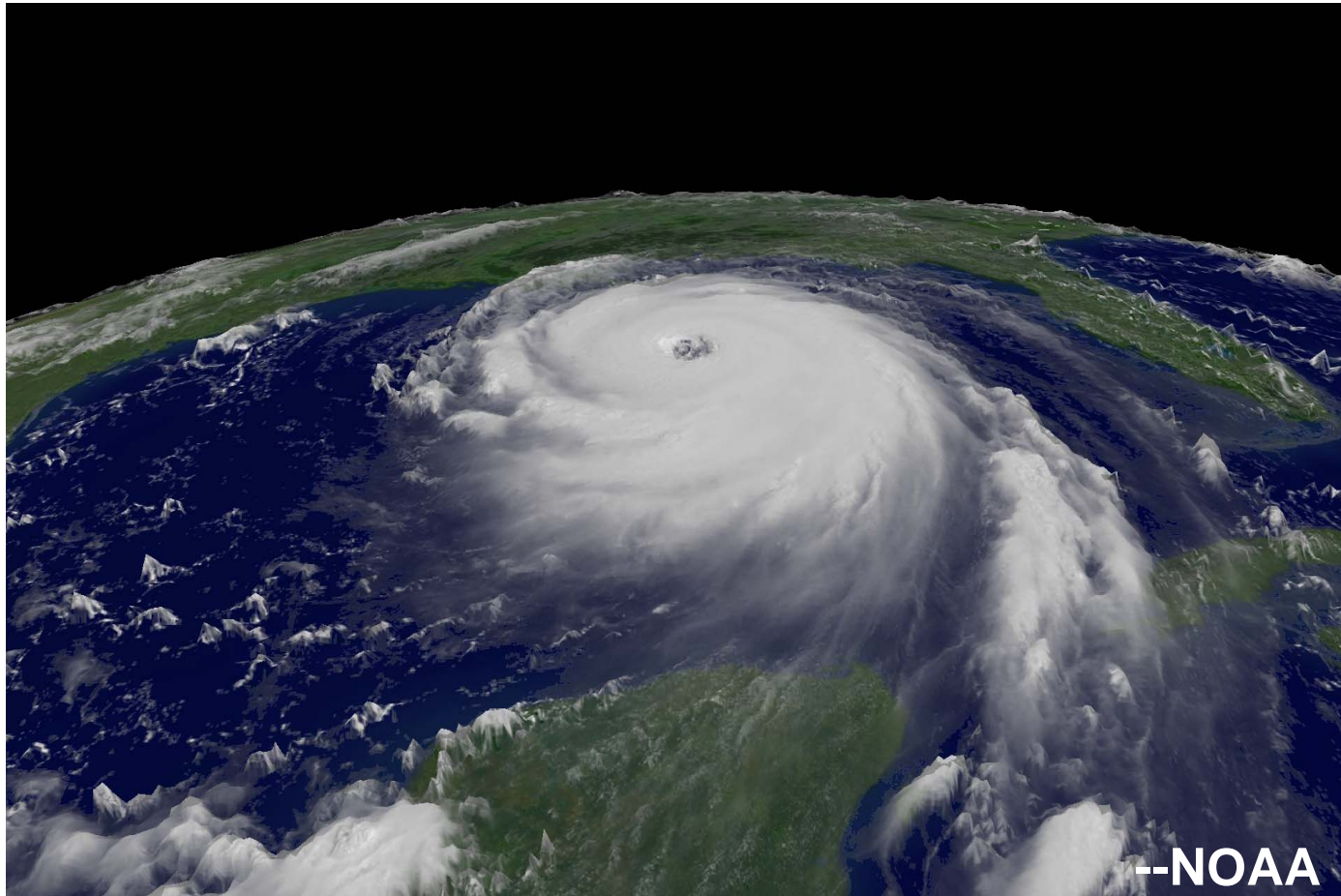


Briefing for
**Eastern Interconnection Phasor
Project Workshop**

Presented by
Terry Boston, Chair
EIPP Executive Steering Group
Chicago, IL, May 10, 2006

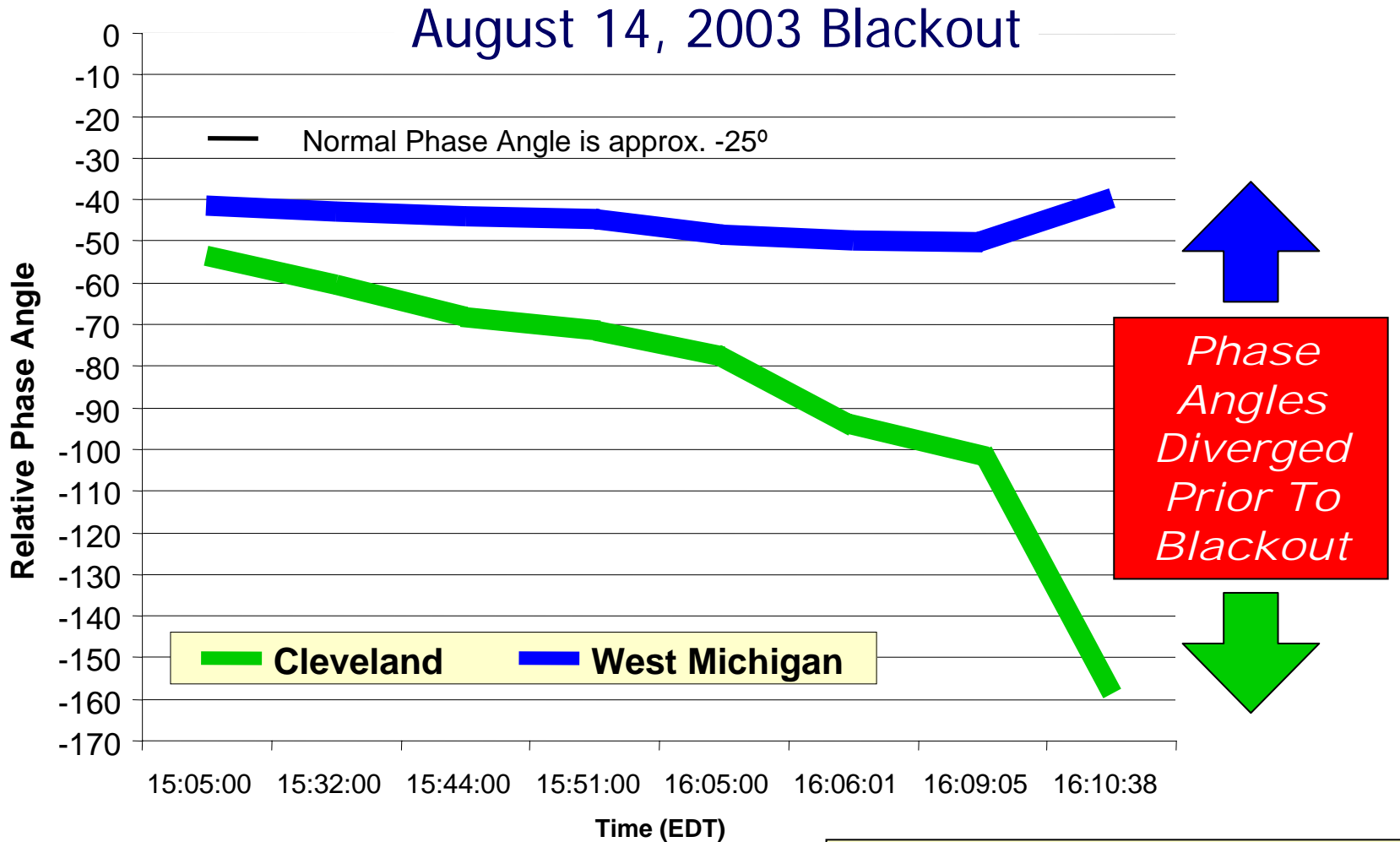
Wide Area View

What if no one could see it coming?



Hurricane Katrina

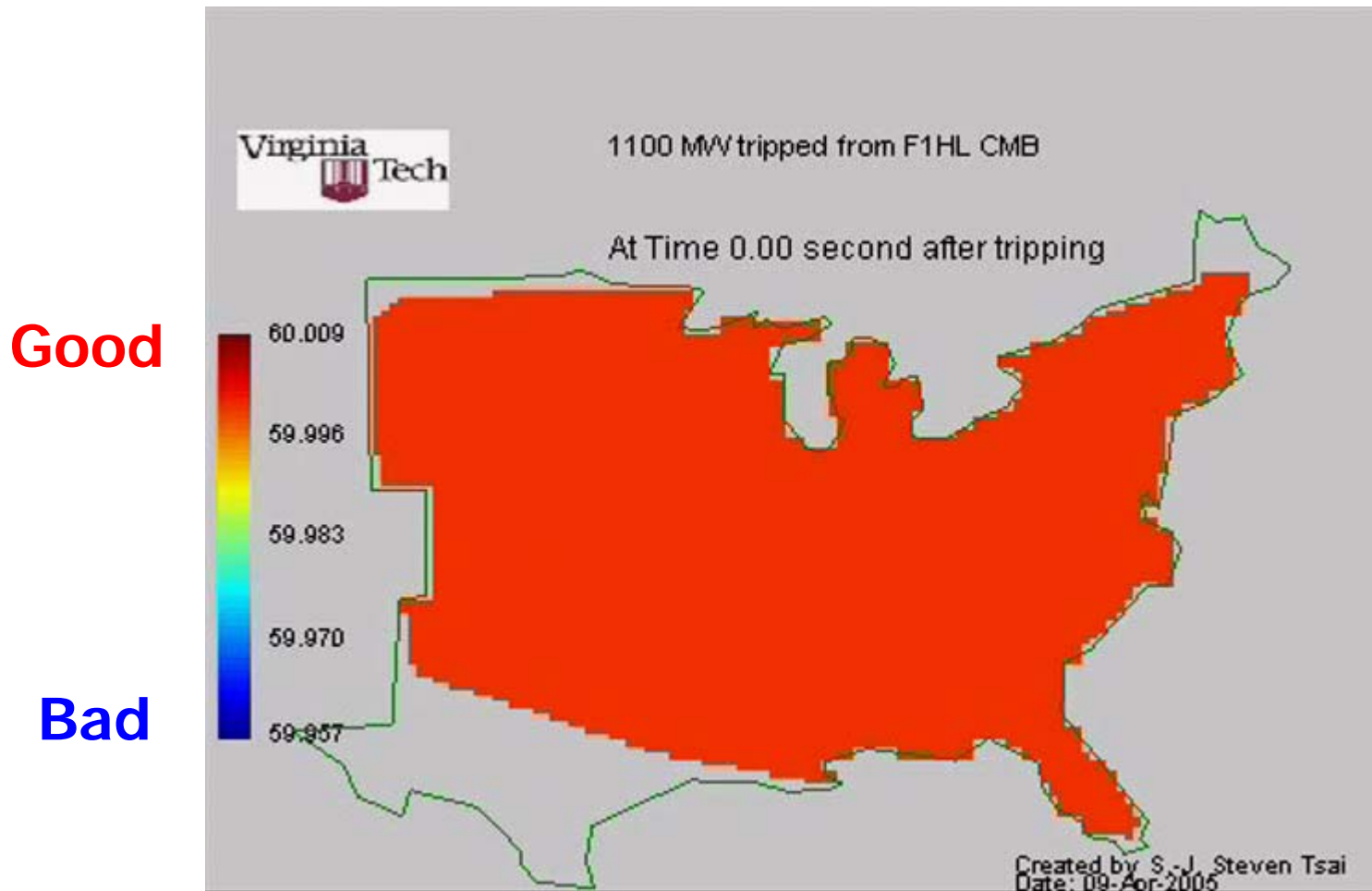
PMUs Detect System Stress



Notes:

Angles are based on data from blackout investigation.
Angles are calculated from a Powerflow Simulation.
Angle reference is Browns Ferry.

PMUs offer Wide-Area Visibility



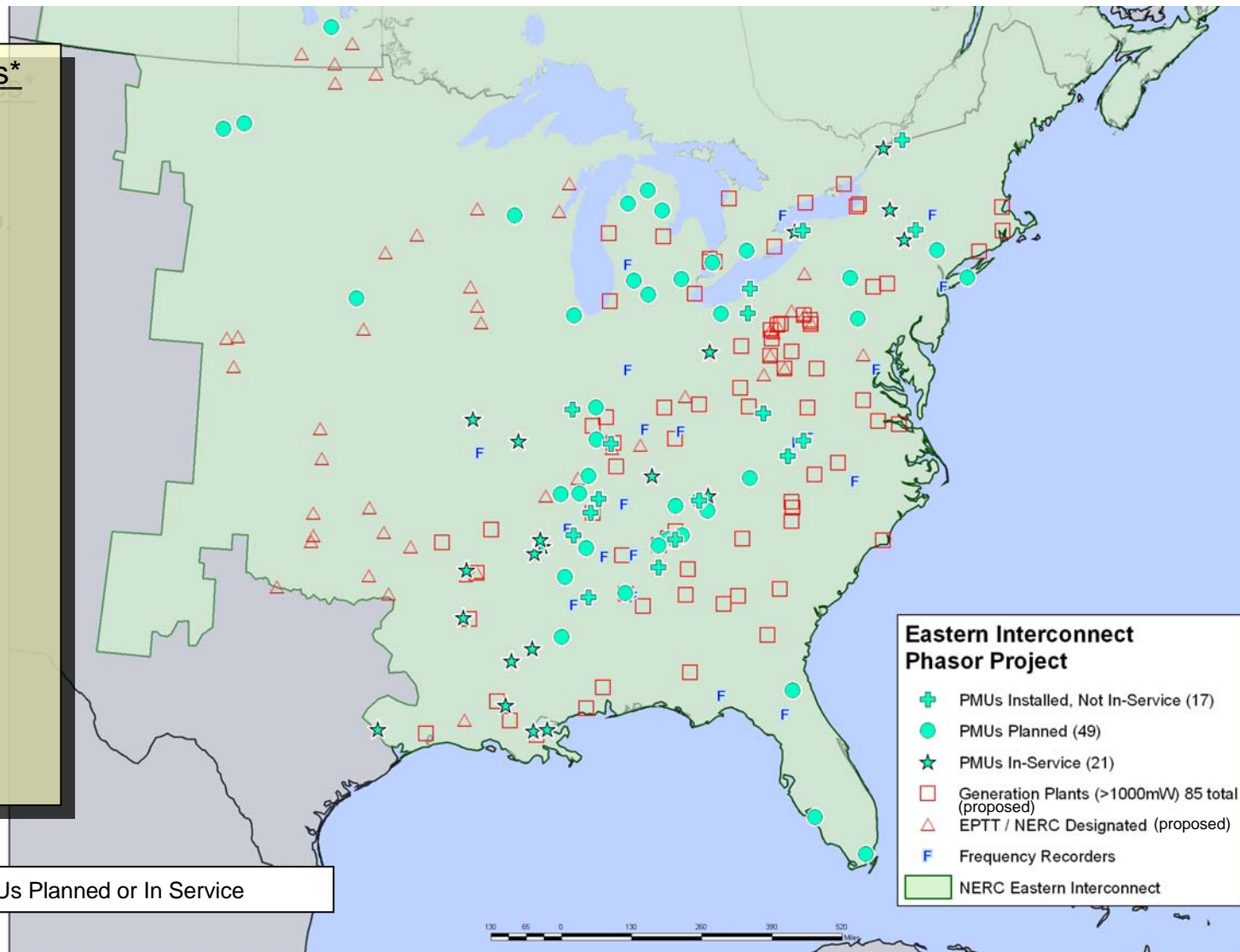
Ripple effect of an 1,100 MW generator tripping off line

PMUs offer Wide-Area Visibility

EIPP PMU Companies*

- Ameren
- AEP
- American Trans. Co.
- ConEdison
- Entergy
- Exelon/ComEd
- Exelon/PECO
- First Energy
- Hydro 1
- LIPA
- Manitoba Hydro
- METC
- Midwest ISO
- NY ISO / NYPA
- PPL Corp.
- Southern Company
- TVA

* Companies with PMUs Planned or In Service

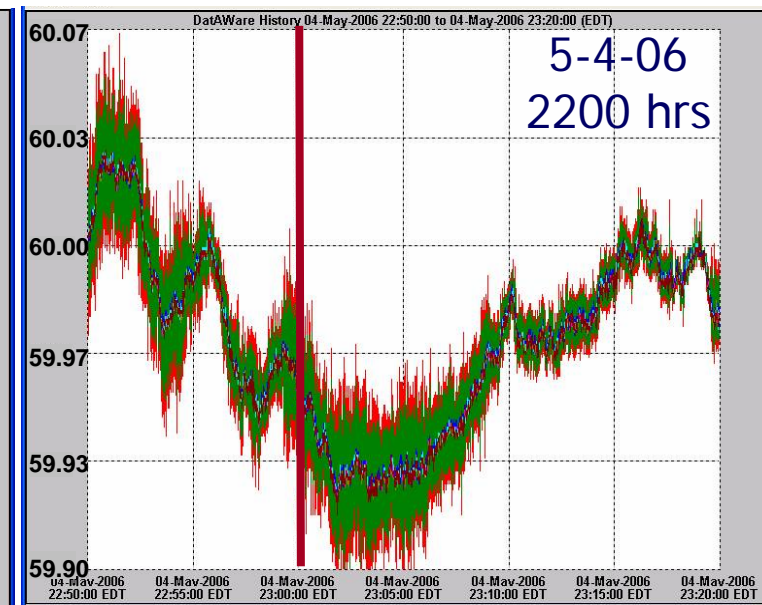
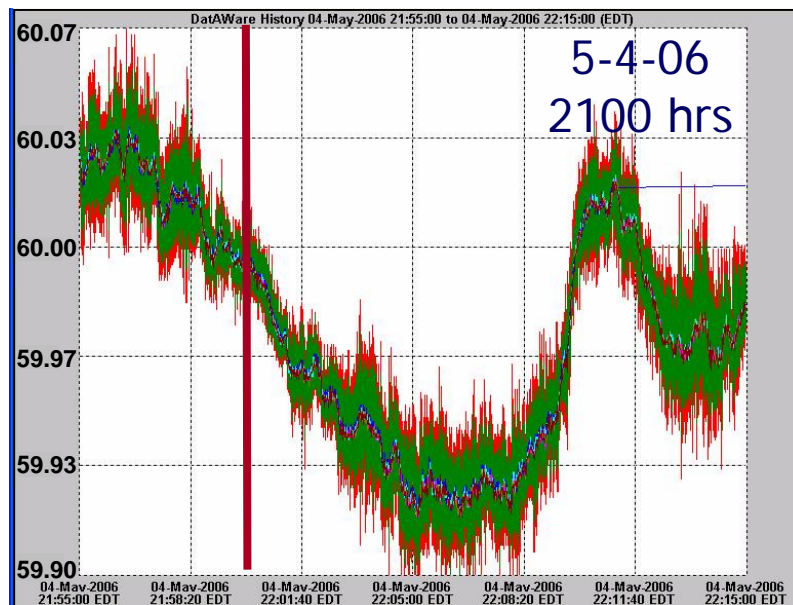
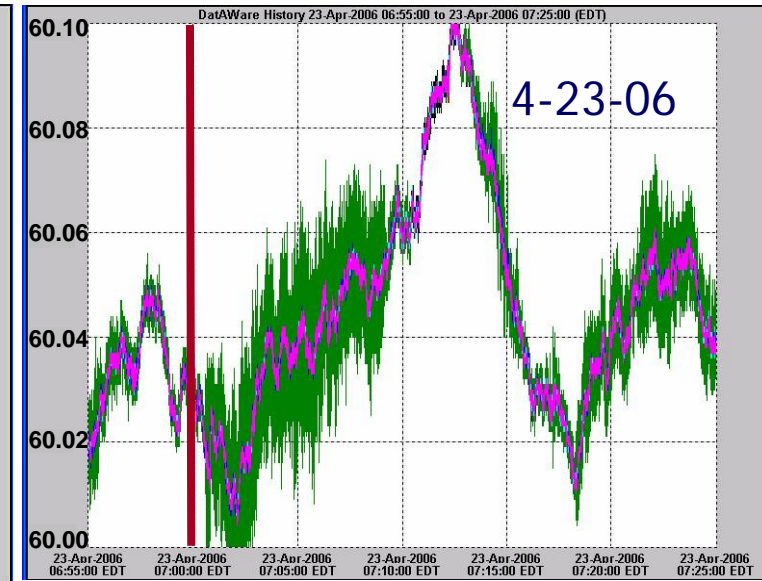
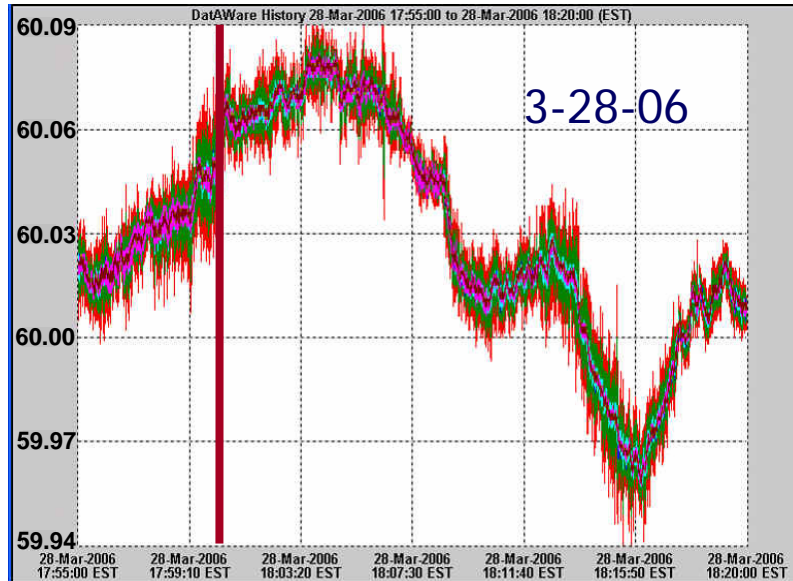


PMUs Locate Disturbances

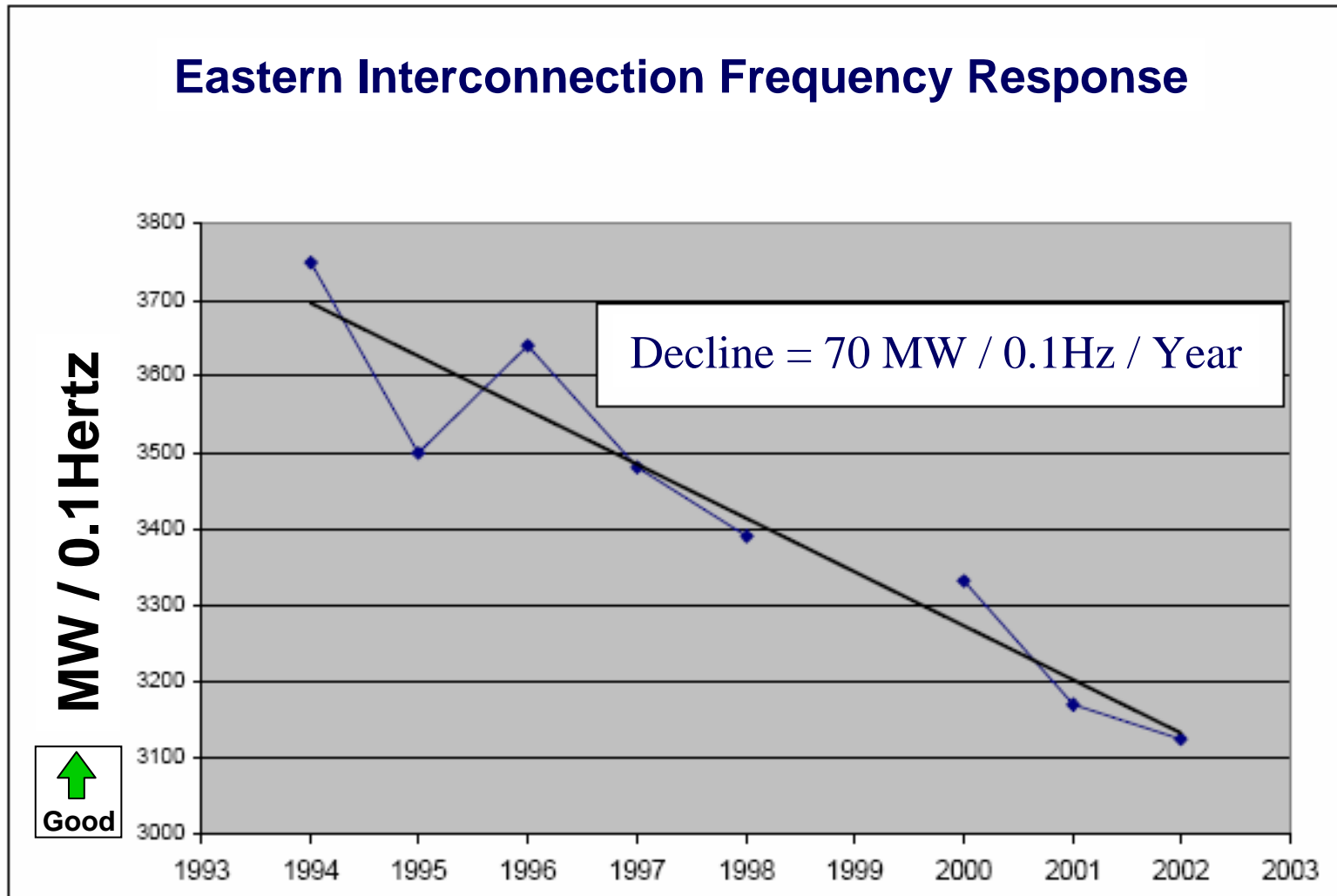


- Phasor Measurement Units will extend visibility across eastern grid
- Allows operators to triangulate the location of disturbances
- All are coordinated with reliability councils & ISOs
- Virginia Tech estimate was within 100 MW & 150 miles using 11 monitors

Recent Frequency Excursions

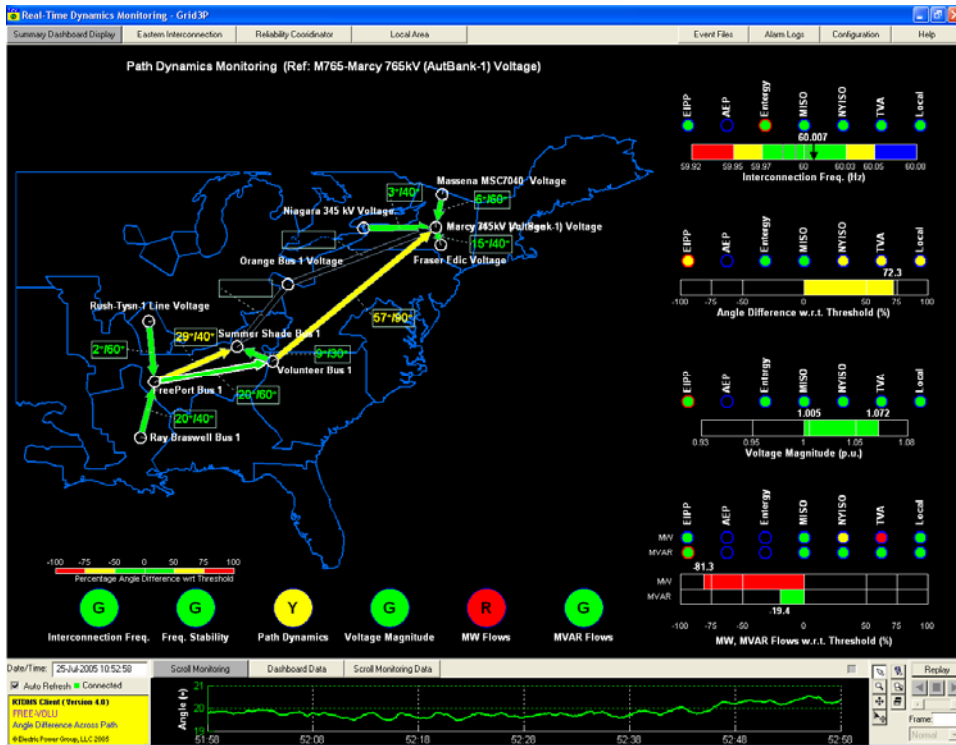


Declining Governor Response



DOE Is Leading The Charge

Under DOE leadership, coalitions of utilities, vendors & universities have made tremendous strides:



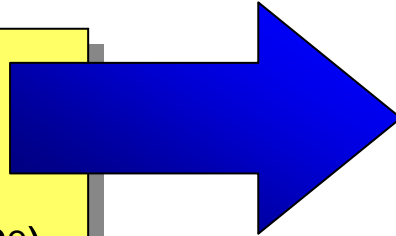
- 38 PMUs currently in service or about to be
- 49 more PMUs are planned
- Super Phasor Data Concentrator in service
- Southern Company, First Energy, Florida Power and Light, Manitoba Hydro, and MISO planning new PMU deployments
- 5:1 Ratio of Industry to DOE dollars

DOE Is Leading The Charge

Under DOE leadership, key long-range R&D activities are under way:

R&D Outcomes

- Baseline for normal (98.6°)
- Anomaly detection
- Anomaly characterization
- Extent of anomaly
- Speed of changes
- **Next actionable step**



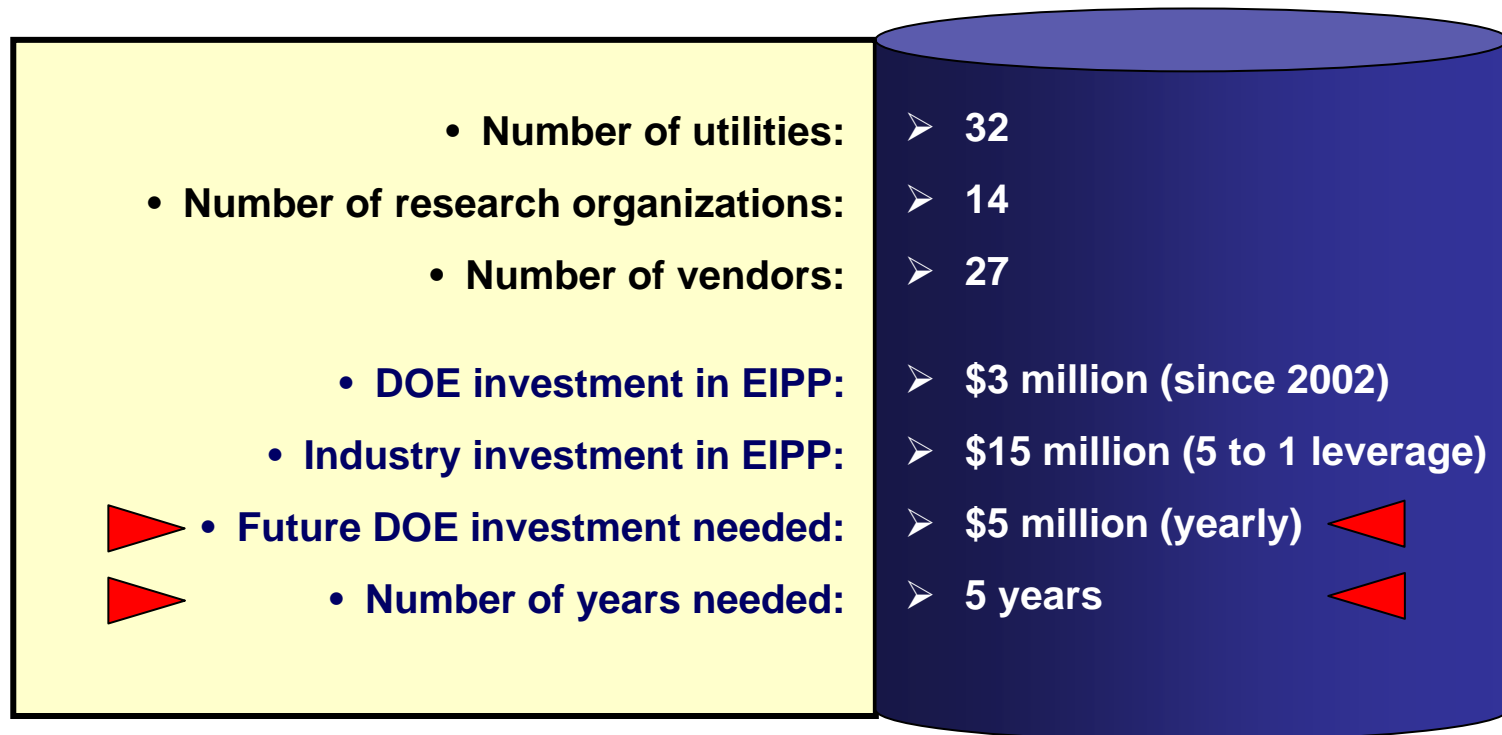
Standard
Operating
Procedure

RULES OF THE ROAD

**Blackout Prevention
Guide**

DOE Is Leading The Charge

Under DOE leadership, EIPP participation has been unprecedented:



EIPP Executive Steering Group

- Need for an EIPP Executive Steering Group (ESG) identified at last CERTS Board meeting
- ESG kicked off in San Diego on 7/31/05

WILLIAM (BILLY) O. BALL Southern Company	MICHEHL R. GENT NERC	MARTY MENNES Florida Power and Light
PAUL BARBER Barber Energy	DAVID GOULDING Independent Electricity Market Operator	WILLIAM C. PHILLIPS MISO
TERRY BOSTON - Chair Tennessee Valley Authority	HOLLY KOEPEL American Electric Power	ED TYMOFICHUK Manitoba Hydro
VIKRAM S. BUDHRAJA Electric Power Group	KEVIN KOLEVAR Department of Energy	STEVE WHITLEY ISO New England
JOSE DELGADO, P.E. American Transmission Company	MARK LYNCH NYISO	

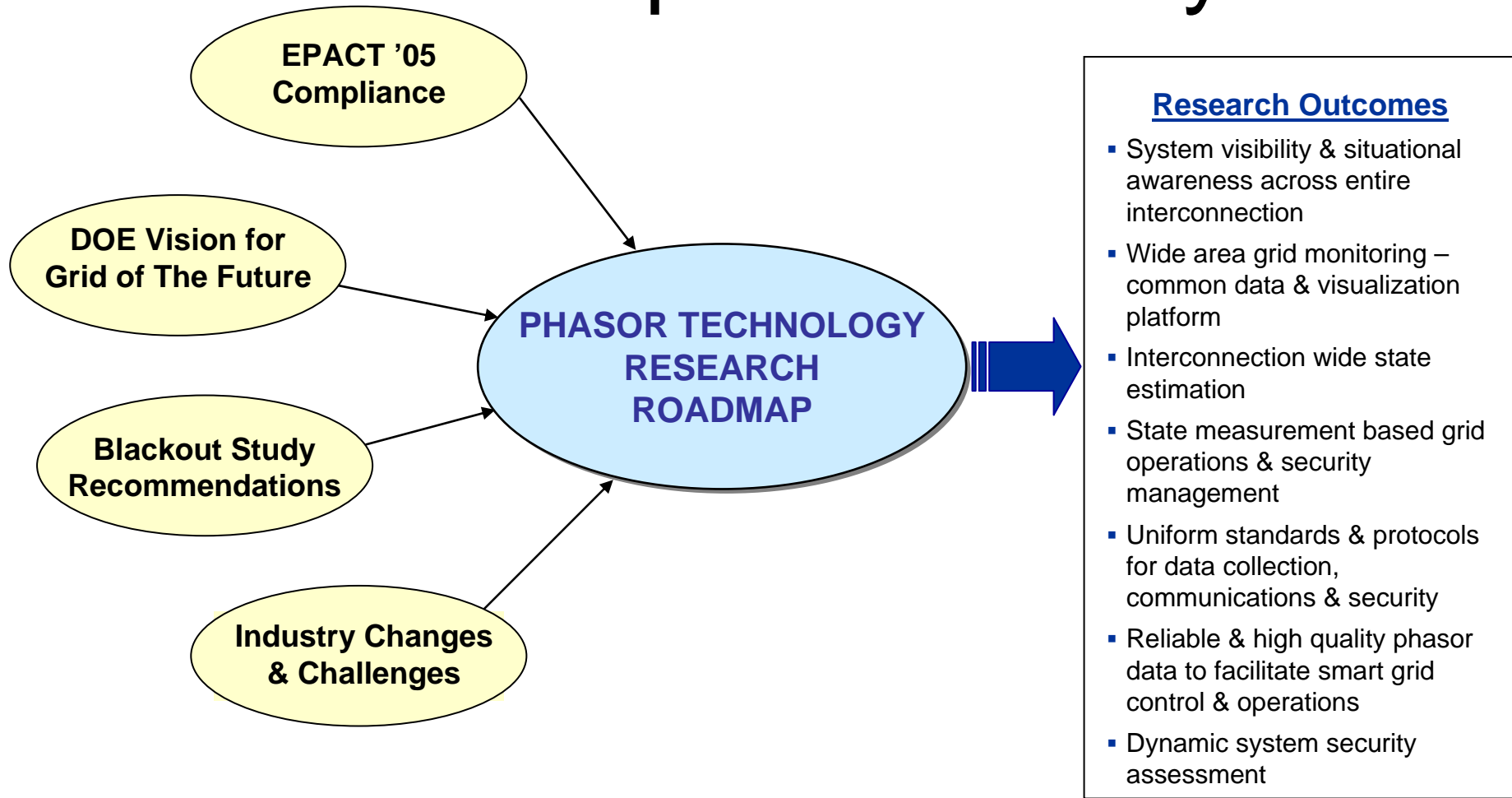
EIPP ESG Topics

- Use of Frequency Propagation visuals
- NERC-Relay Committee
- EIPP Research Roadmap
- Expanding PMU Installations

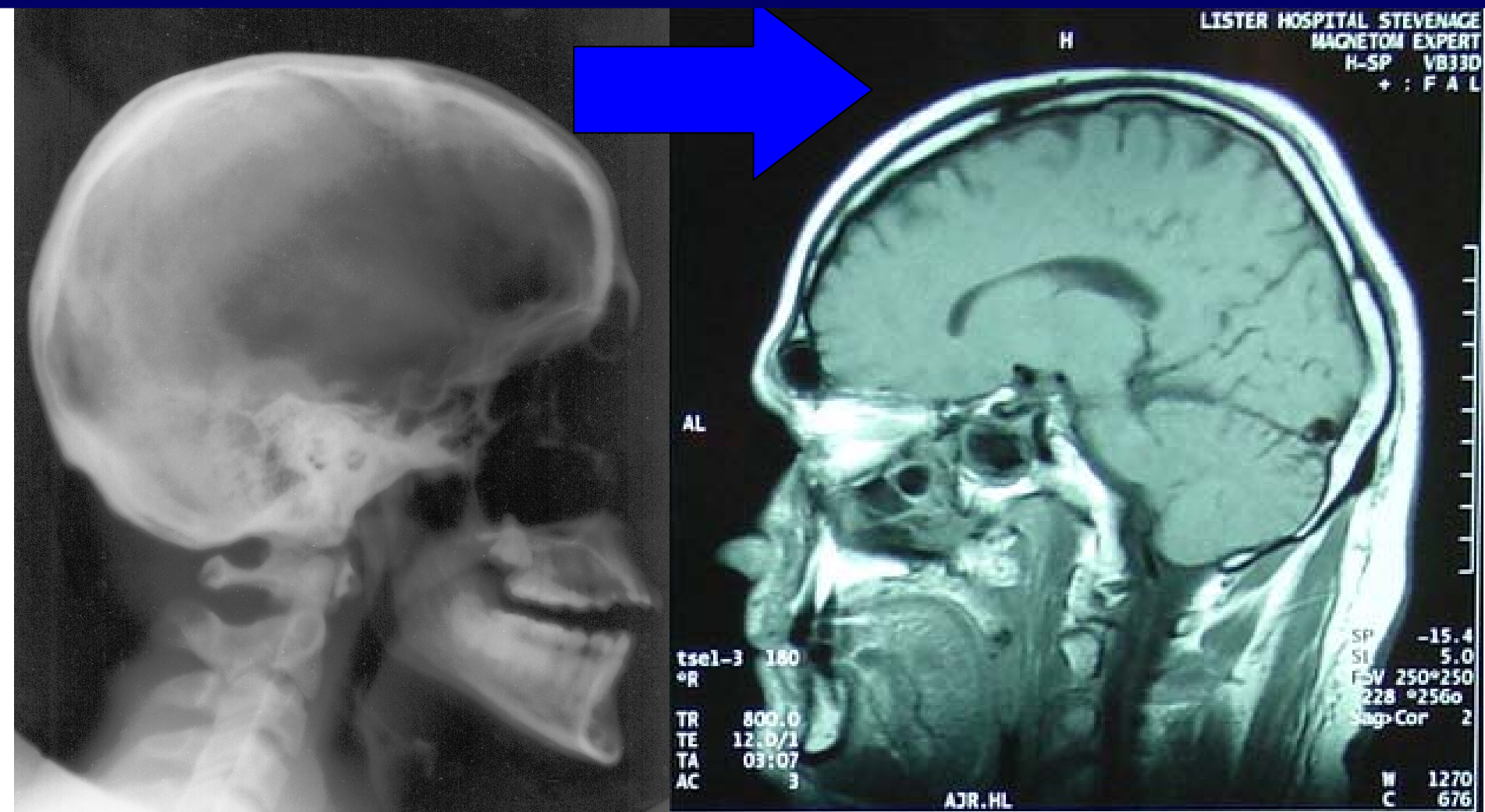
EIPP ESG Topics

- Use of PMUs to measure generator response
- Technical requirements for sharing state estimator outputs
- Next meeting 8/2/2006 in Toronto

Phasor Technology Vision & Roadmap -- Summary



Why R&D--From X-Rays to MRIs



1952

Nobel Prize

1972

1ST Patent

1977

1ST Human Scan



Continued DOE leadership and funding are needed to convert phasor data into meaningful insights.