

Modernizing the Grid

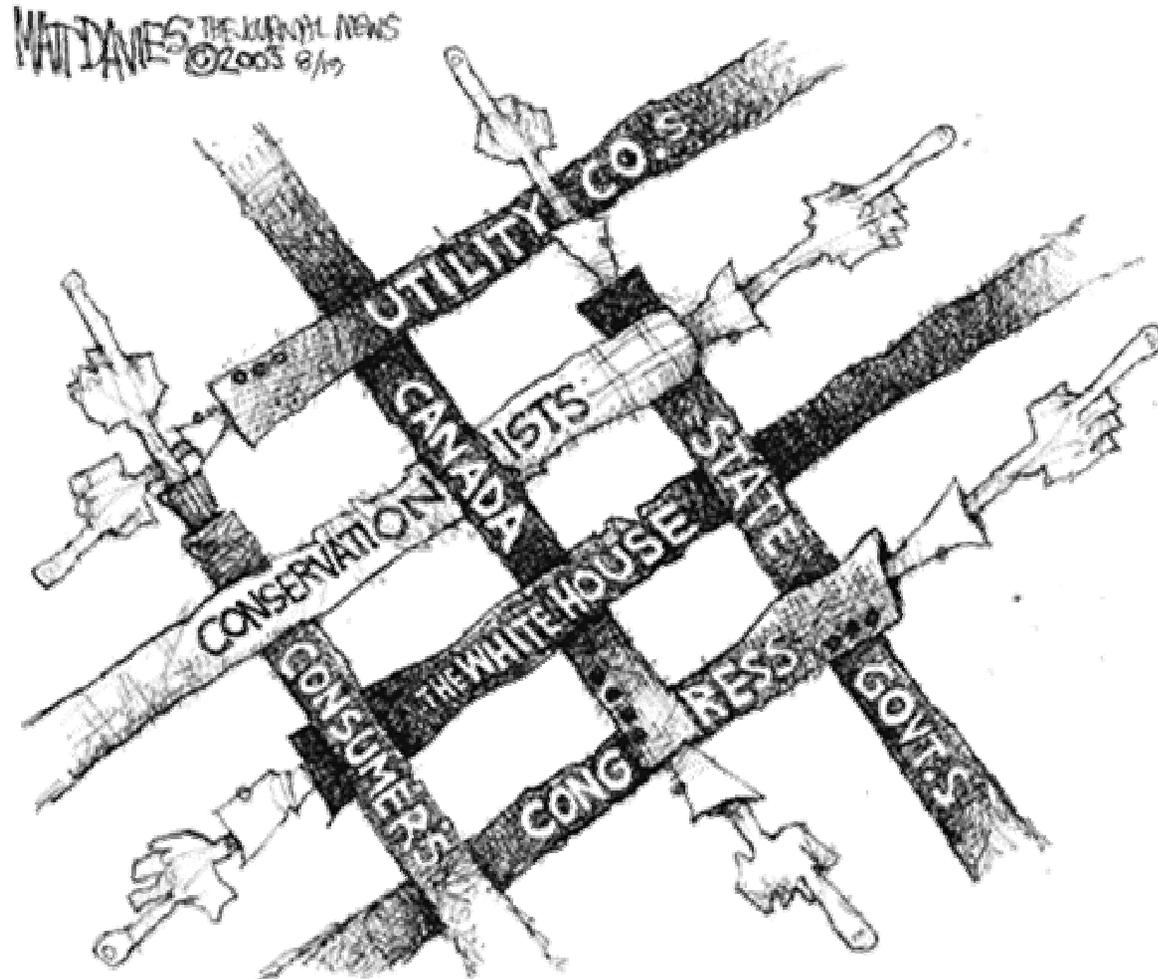


TVA

Presented to the Modern Grid Summit
by Terry Boston, EVP, Power System Operations
August 10, 2006



Our Modern Grid . . .



. . . After a Blackout



Would We Use These Tracks ...



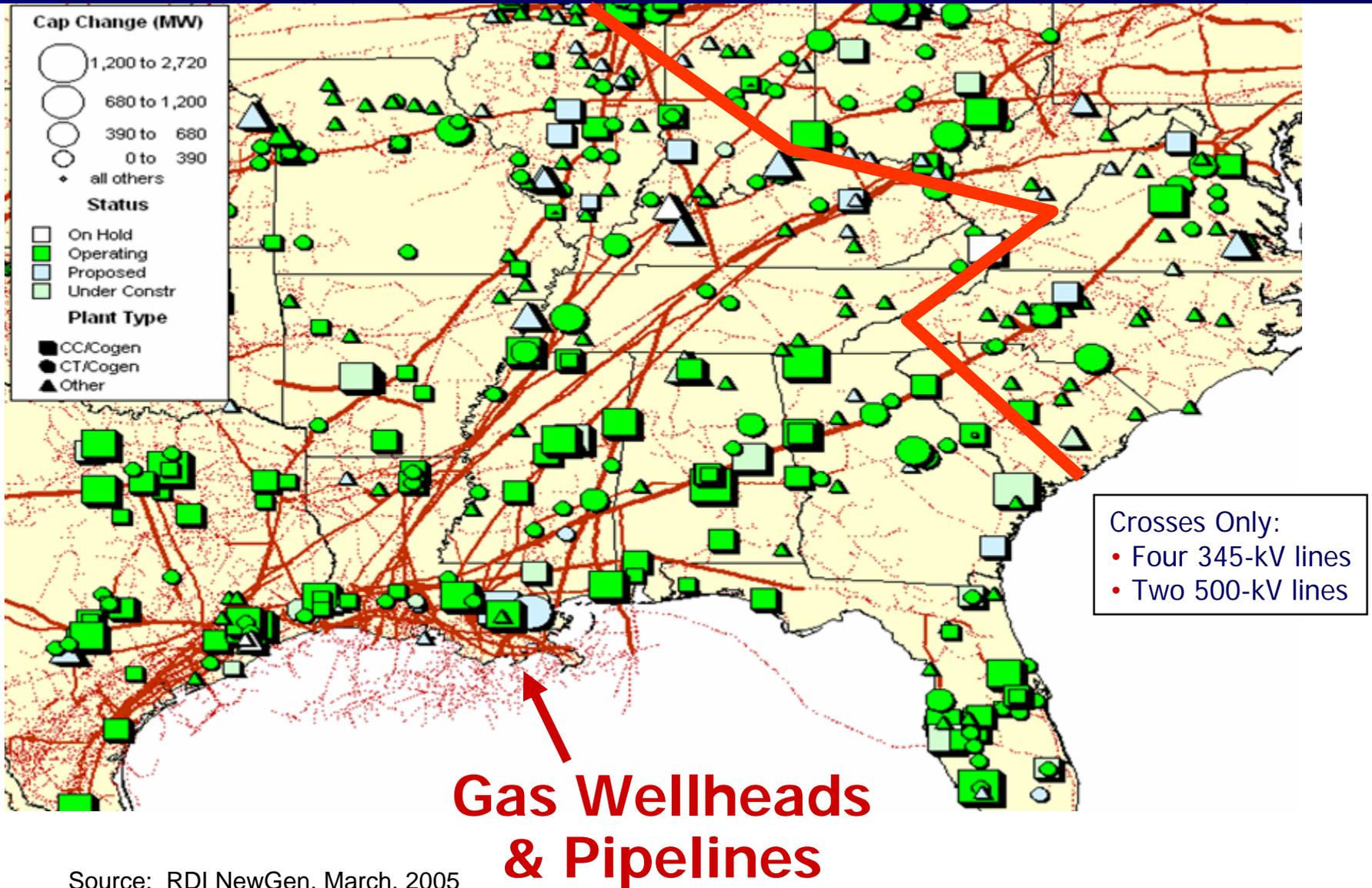


... to Run These Trains?





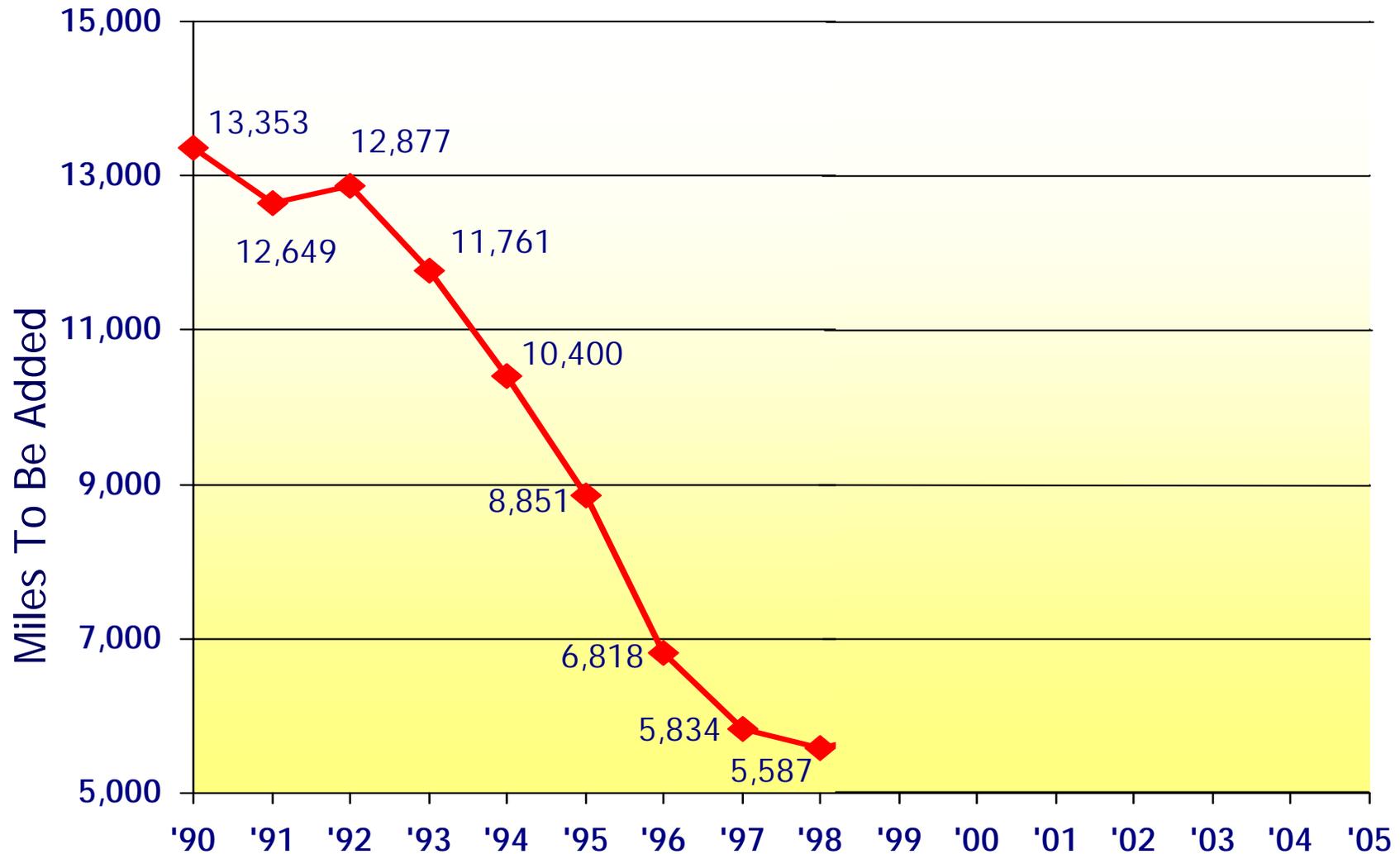
New Generation & Pipelines



Source: RDI NewGen, March, 2005



Transmission 10-Yr Plans*

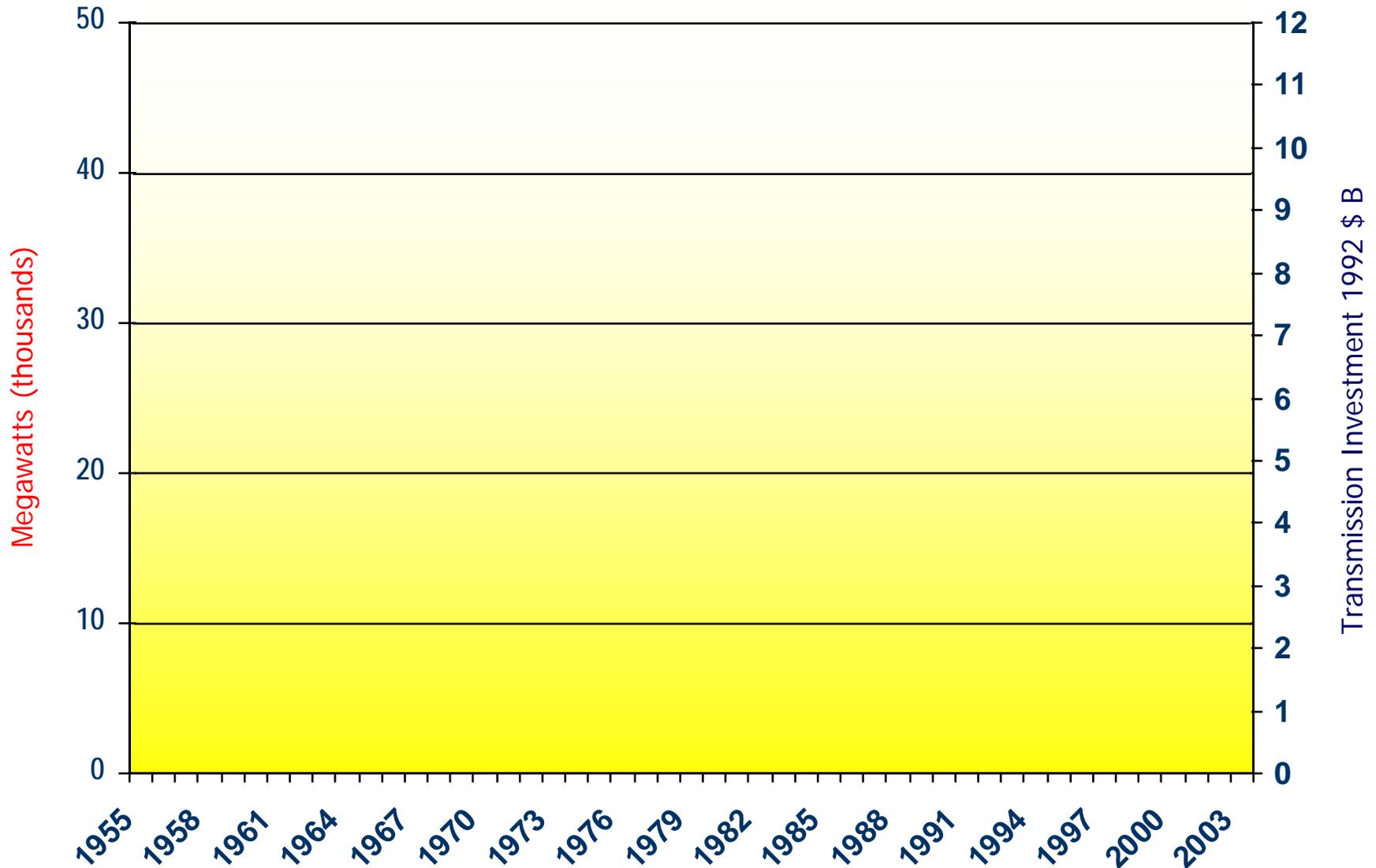


—Source: NERC Reliability Assessment Reports

*230-kV & Above



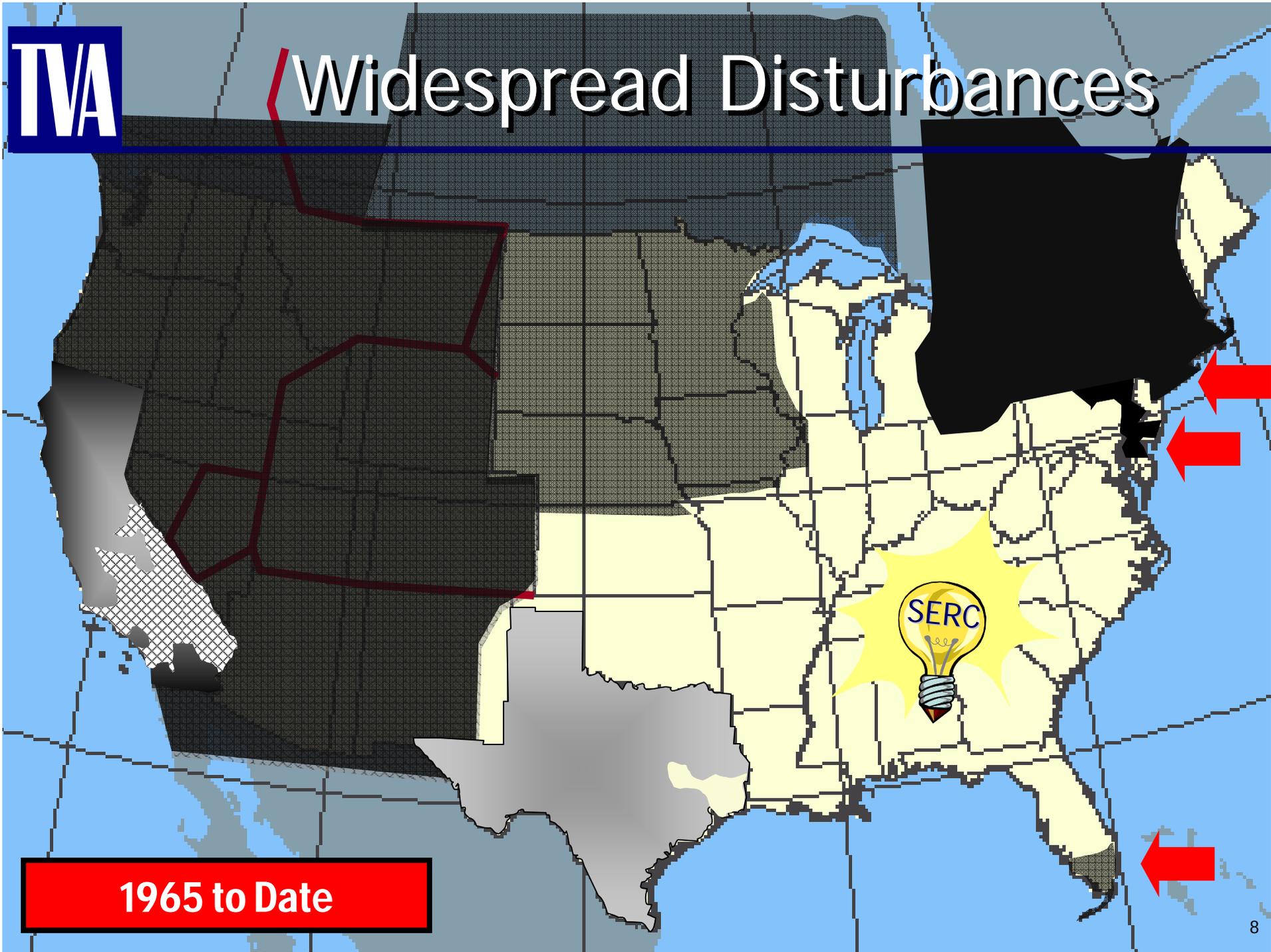
De-Coupling of Investment



—Sources: [EEl Statistical Yearbook & Energy Information Administration](#)



Widespread Disturbances

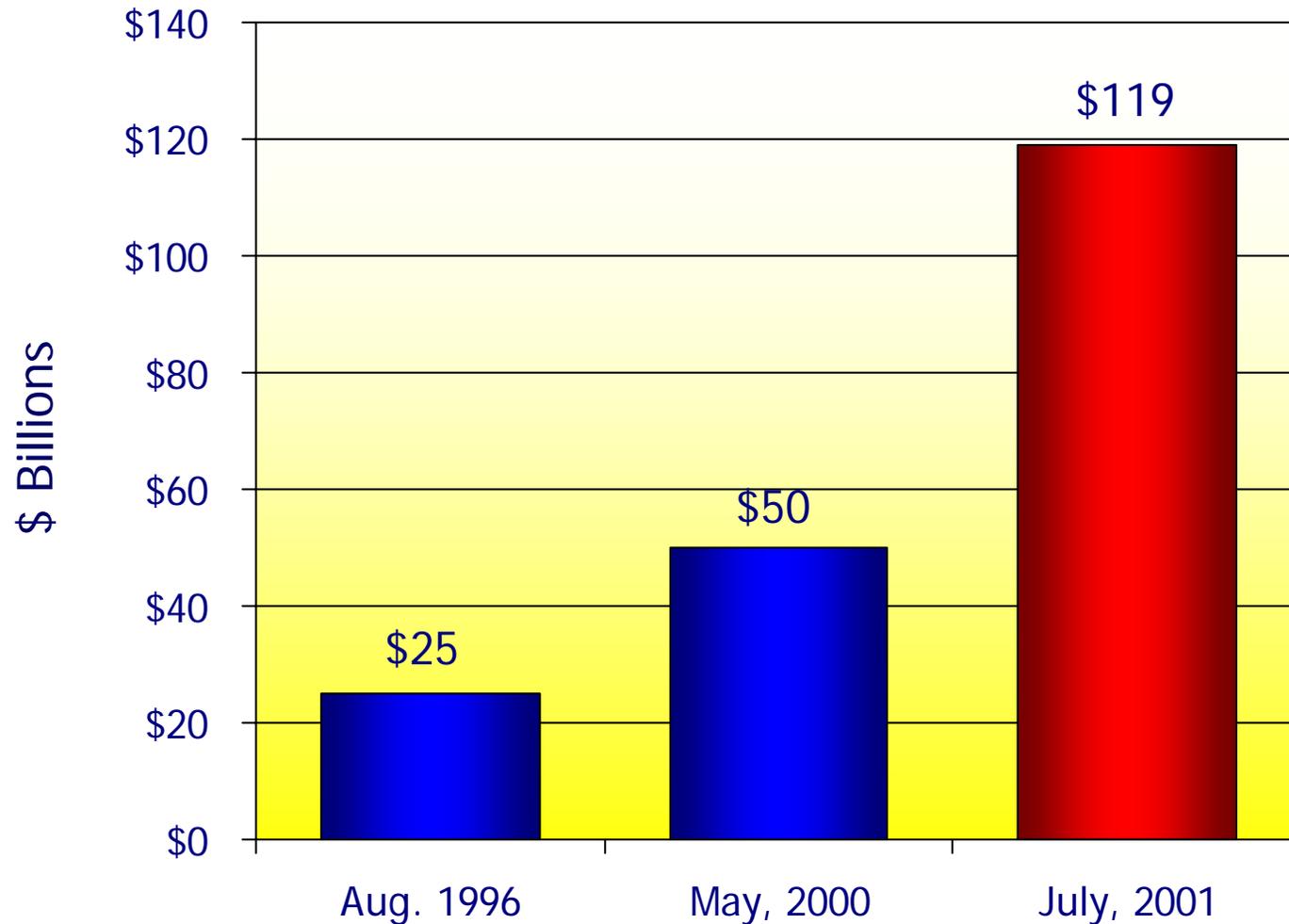


1965 to Date



Cost of U.S. Power Failures

(Blackouts & Voltage Sags)





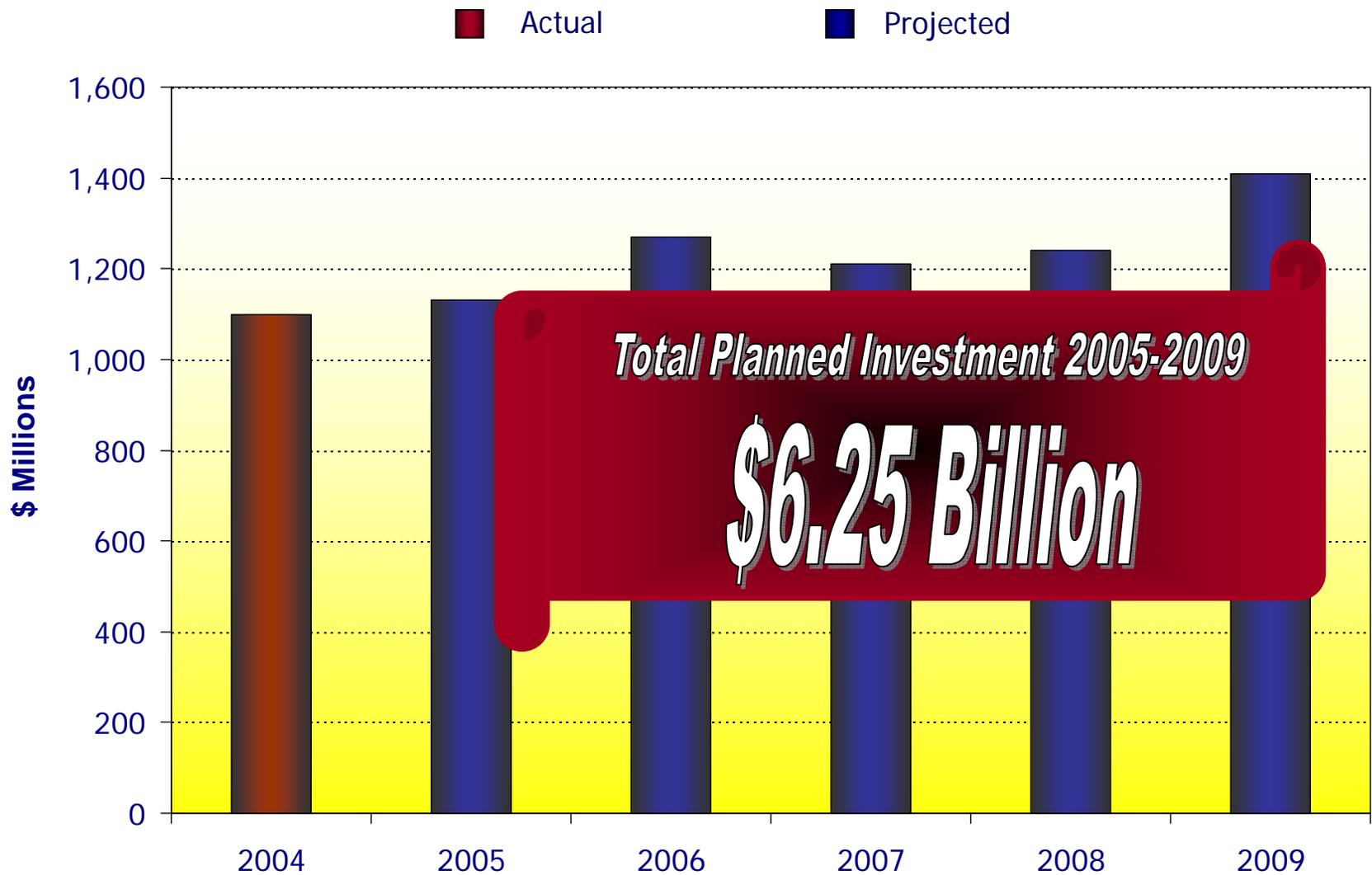
Long-Term Industry Needs

- Modernize the Grid to Meet Demands of the Marketplace – Inter-regional Transfers
 - Hint: It's not about incentives; it's about equitable cost allocation
- Mandatory Reliability Standards
- Take the Grid to the next level with new technologies





SERC Transmission Investment



—Source: SERC 2005 Information Summary

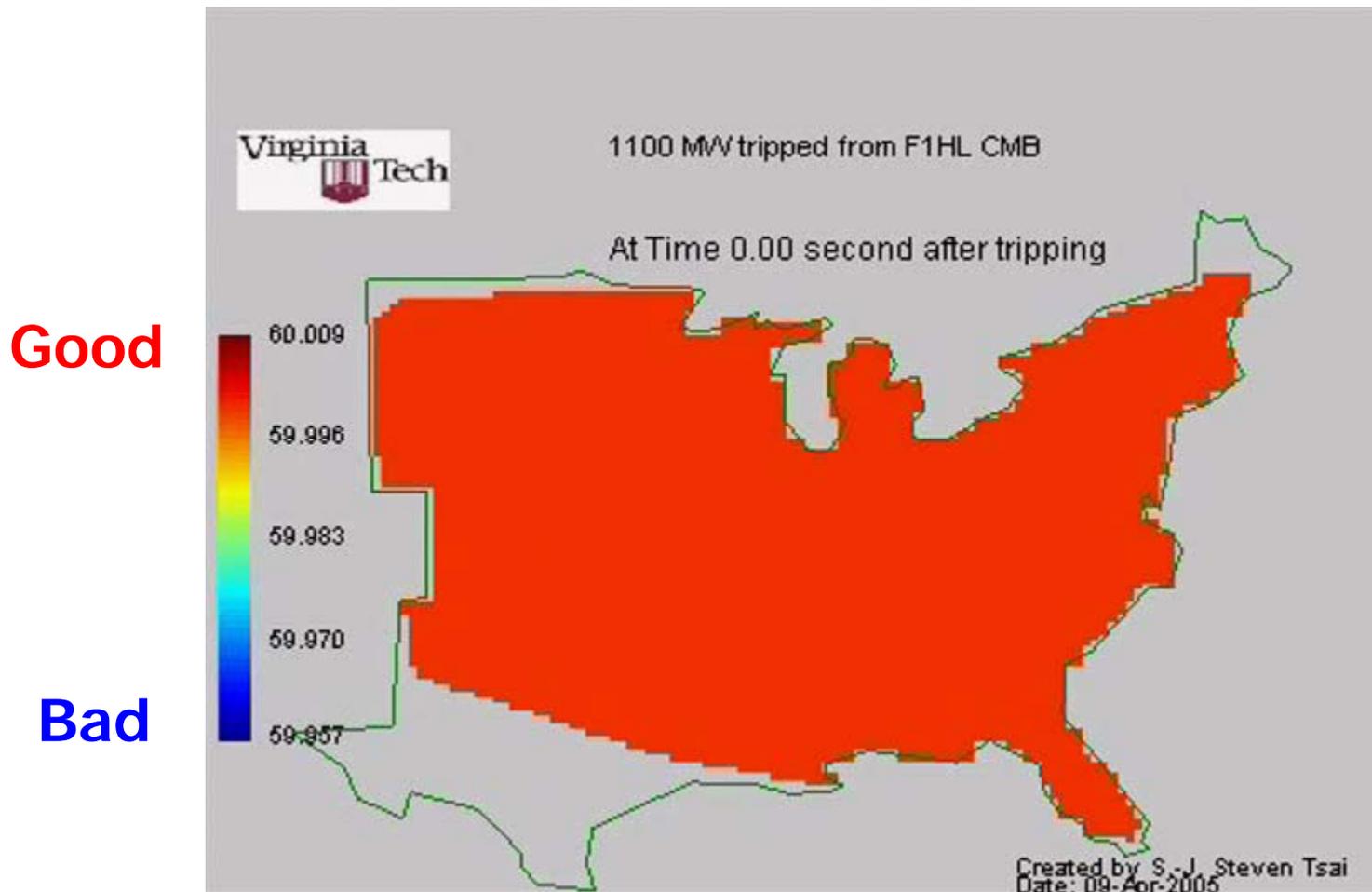
PMUs Offer Wide-Area Visibility



■ Estimated Location
● Actual Location

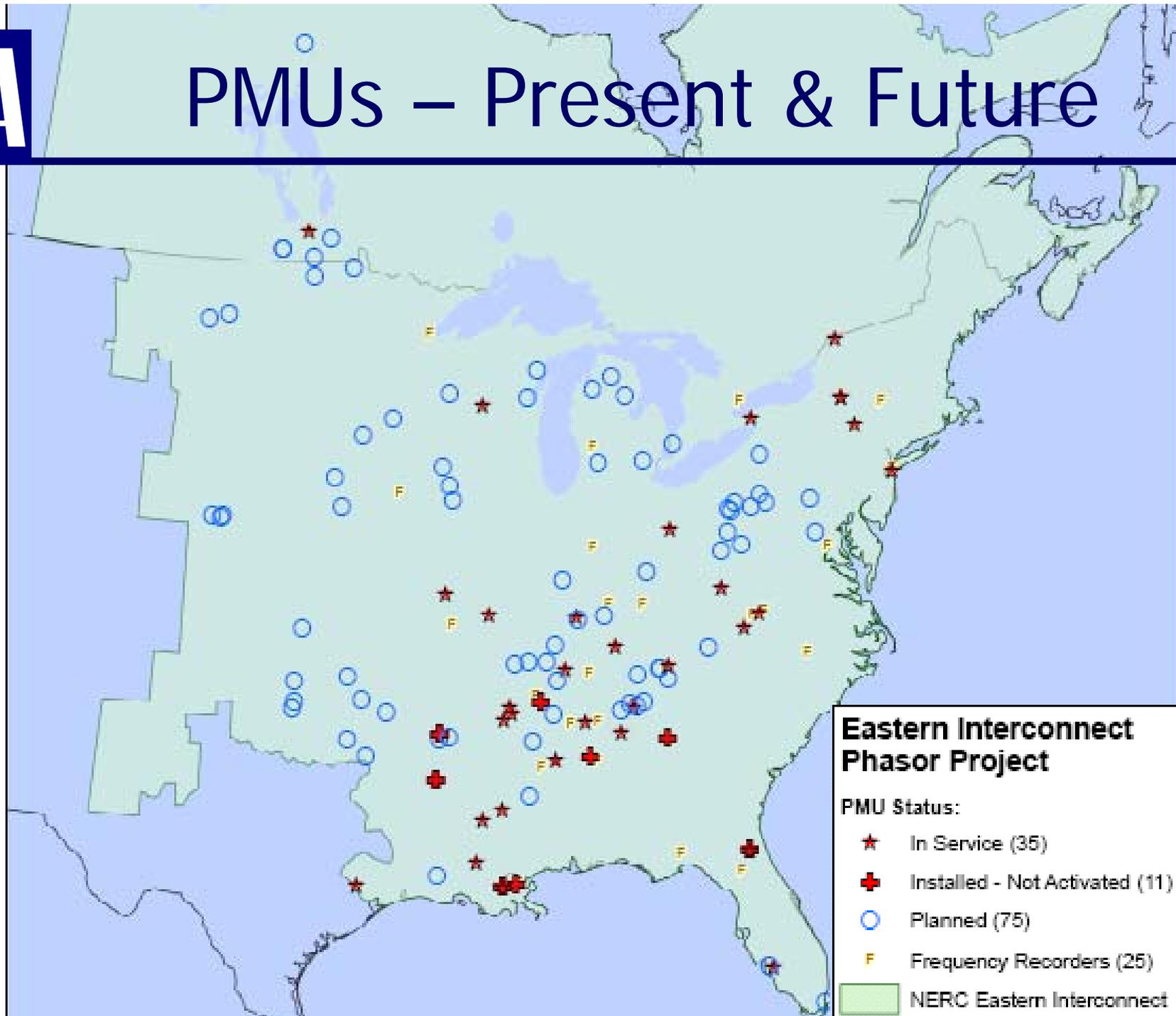
- Phasor Measurement Units will extend visibility across Eastern Interconnection
- Ability to triangulate the location of disturbances
- All were coordinated with reliability councils & ISOs

Frequency Disturbances



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

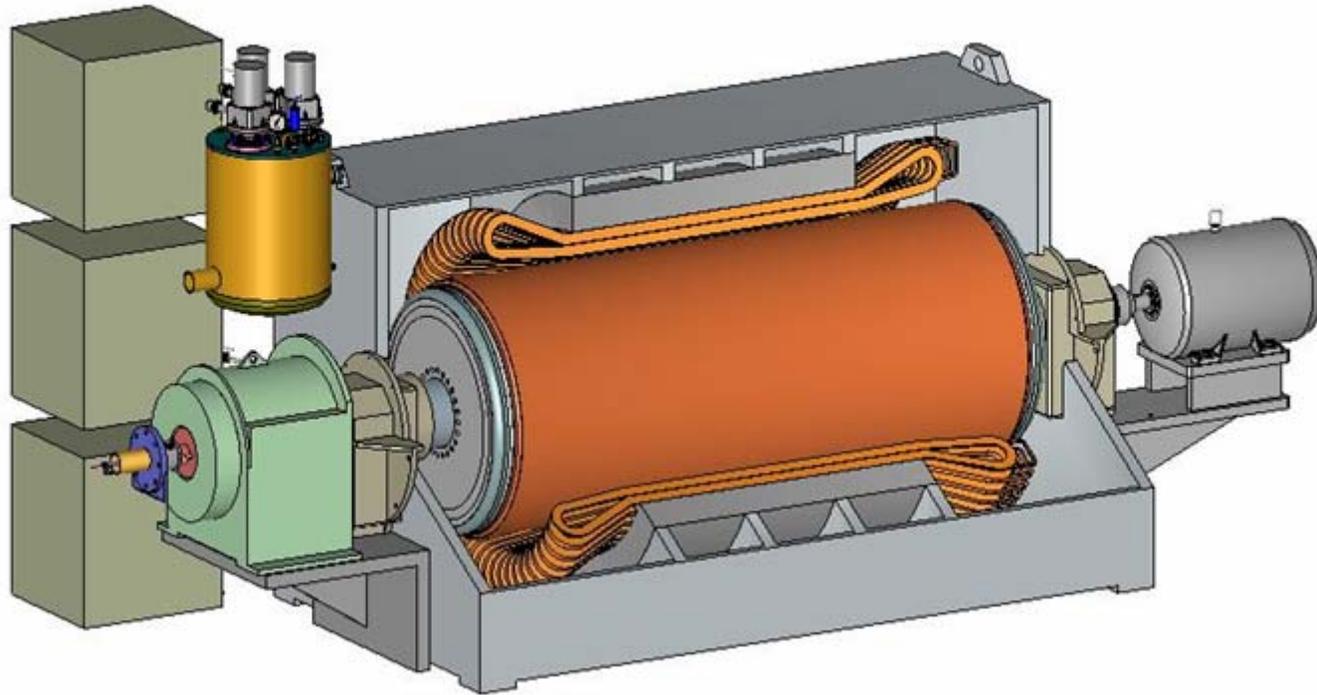
PMUs – Present & Future





R&D Top 100 in the World

10/20/05



SuperVAR



SuperVAR Technology . . .

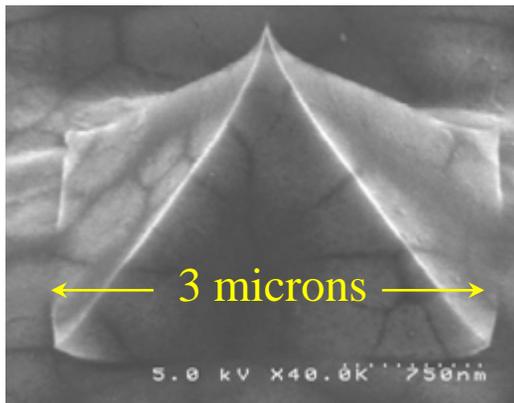
. . . Most Likely to “Benefit Humankind”



--IEEE Spectrum, April 4, 2006

Chemical Vapor Deposition of Diamond (CVD) devices can . . .

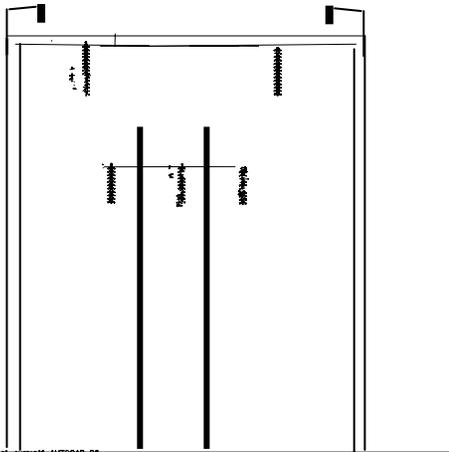
- ◆ Carry 10 times more current
- ◆ Conduct heat 4 times better than copper
- ◆ Carry 10 to 30 times the DC voltage
- ◆ Operate at much higher frequencies



. . . than conventional devices

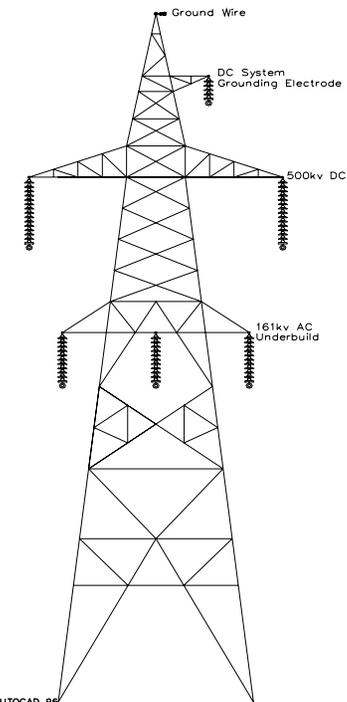


New Designs for Existing ROW



- Hybrid AC/DC solves many grid problems
- Built over existing AC lines --very little new right-of-way needed

- DC allows much higher power transfers over longer distances with fewer losses
- Hybrid designs have complex problems – studies are continuing



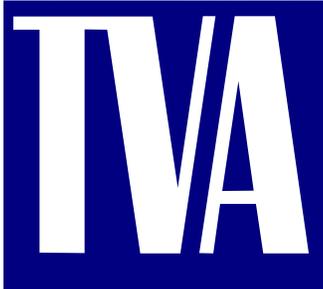
A Big Machine



Like a Rocket, the Grid Carries
Enough Energy . . .



. . . to Destroy Itself



Keeping the Lights On & Generating
Prosperity You Can See