



# TCIPG Overview

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on behalf of the TCIPG Team

2012 Industry Workshop  
October 30, 2012



**UCDAVIS**



# Welcome to the TCIPG 2012 Industry Workshop

- Who is here?
  - TCIPG researchers and students
  - representatives of industry: utilities, vendors, national labs, ...
  - our sponsors and external advisory board
- Why have an annual industry workshop?
  - For TCIPG and sponsors:
    - to have impact
    - to communicate our results
    - to help choose our research well
  - For industry:
    - to discover and explore TCIPG research
    - to influence future directions
    - to form productive collaborations that can profitably shape the evolving Smart Grid

# Welcome to the TCIPG 2012 Industry Workshop, cont.

- What happens during the Industry Workshop?
  - sharing TCIPG research results and directions
  - listening and learning about industry's perspective
- Purpose of this talk?
  - introduce TCIPG – provide context for navigating the next day and a half: who we are, what we do, and why we do it
  - invite your active participation in workshop and in the longer term as well

# The Challenge: Providing Trustworthy Smart Grid Operation in Possibly Hostile Environments

- **Trustworthy**
  - A system which does what is supposed to do, and nothing else
  - Availability, Security, Safety, ...
- **Hostile Environment**
  - Malicious Attacks
  - Accidental Failures
  - Design Flaws
- **Cyber Physical**
  - Must make the whole system trustworthy, including physical components, cyber components, and their interactions

# A Brief History ...

- SCADA systems were designed without specific attention to security
  - Security improvements were achieved by application of standard cyber security practices
- As cyber component of grid grew (and became “smart”) standard security practices were not sufficient
  - Security was “bolted-on” or “built-in” to many vendor products, but was largely limited to prevention
  - Cyber security solutions were specialized to the grid to deal with issues related to scale, embedded and exposed nature, cost, and importance of availability
  - But not all attacks can be prevented, so gaps still remained, and resilience approaches are needed ...

## and a Prediction ...

- In the grid of the future,
  - Generation, transmission, and distribution will become co-mingled
  - Islanding, reintegration, and microgrids will become the norm
  - Consumer end devices and ubiquitous sensors/actuators throughout the grid will produce/require an “avalanche” of data
  - Many of these devices/sensors will be outside the administrative and physical control of the utilities that rely on them
  - Energy markets could become as complex (and as risky) as derivative-based financial markets of today
  - Distributed stability maintenance will be the only option
  - Fundamentally new approaches to cyber security and resilience (both cyber and power system) will be required

# TCIPG Vision and Research Focus

**Vision:** Create technologies which improve the design of a resilient and trustworthy cyber infrastructure for today's and tomorrow's power grid, so that it operates through attacks

**Research focus:** Resilient and Secure Smart Grid Systems

- Protecting the cyber infrastructure
- Making use of cyber and physical state information to detect, respond, and recover from attacks
- Supporting greatly increased throughput and timeliness requirements for next generation energy applications and architectures
- Quantifying security and resilience

# TCIPG Statistics

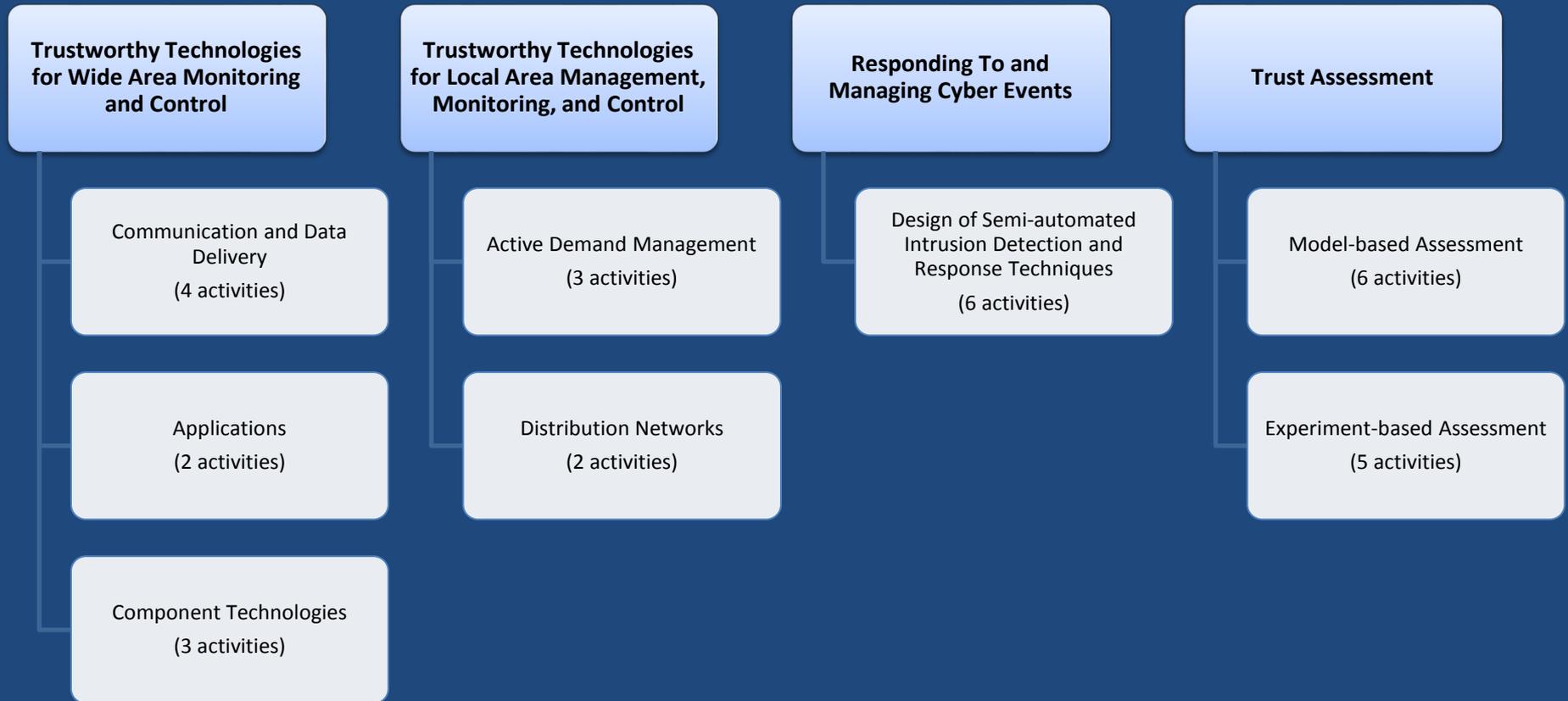
- Builds upon \$7.5M NSF TCIP CyberTrust Center 2005-2010
- \$18.8M over 5 years, starting Oct 1, 2009 (\$3.8M cost share)
- Funded by Department of Energy, Office of Electricity and Department of Homeland Security, Cybersecurity Division, Office of Science and Technology
- 5 Universities
  - University of Illinois at Urbana-Champaign
  - Washington State University
  - University of California at Davis
  - Dartmouth College
  - Cornell University
- 23 Faculty, 20 Technical Staff, 38 Graduate Students, 7 Undergraduate Students, 1 Admin Staff worked on the project in FY 2012

# TCIPG's Multifaceted Mission

- Identify and address critical security and resiliency needs at the cyber-physical junction in the evolving power grid
  - Meet the challenge of rapid evolution and mixed legacy environment
  - Address the proliferation of devices, demand response, DG integration, HAN...
  - Emphasis on trust and resiliency
- Engage Industry (utility, control system vendors, technology providers)
  - Ensure relevance of research
  - Foster technology transfer
- Research Excellence
  - Balance long-range basic research with the need to develop practical solutions in the near term
  - Publications and conference presentations
  - TCIPG is the “go to” academic center
- Education
  - Develop university students who will be experts in the field
  - Outreach to K-12 students, industry, and the public.



# TCIPG Technical Clusters and Threads



# Cross-Cutting Efforts

**Cross-Cutting Efforts** address issues that cross technical clusters:

- Education and workforce development
- Testbed Initiatives
- Industry interactions and technology transition

# TCIPG Impacts All Aspects of the Roadmap Framework

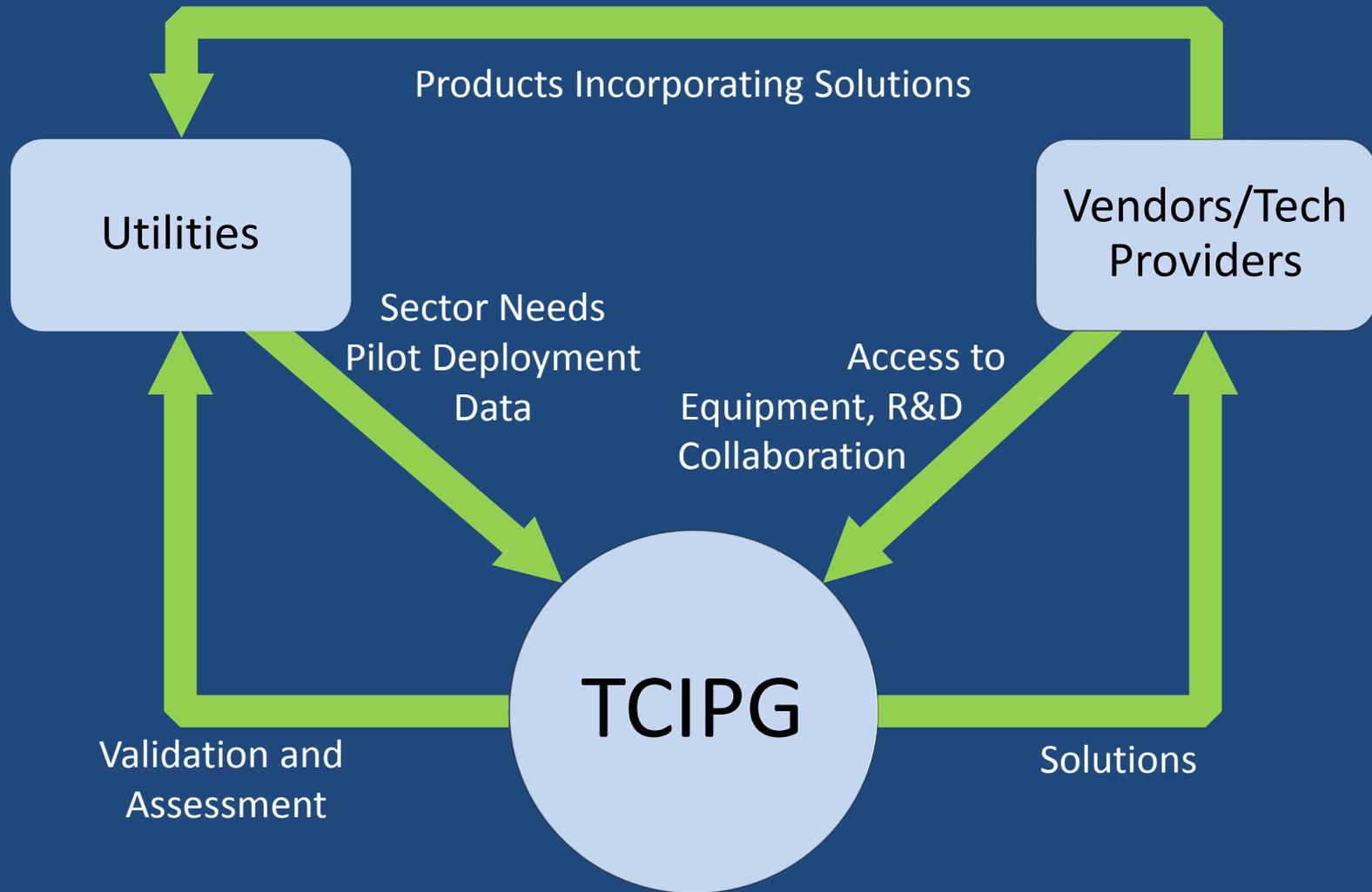
TCIPG Efforts



# TCIPG Industry Interaction and Collaboration

- TCIPG emphasizes industry validation of research
- TCIPG is actively working with utilities and technology providers to anticipate and define sector's critical needs
- TCIPG is the “go to” center for academic/industry collaboration on smart grid security, and now benefits from *industry-initiated* outreach
- In addition to industry, TCIPG collaborates with the National Laboratories, NIST, NASPI, EPRI, and others

# TCIPG as Catalyst for Accelerating Industry Innovation



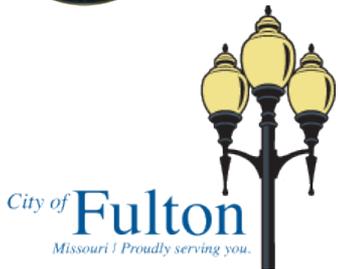
# Industry Interaction: Vendors and Utilities that have participated in TCIPG Events (2010-2011)



# Industry Interaction: Other organizations that have participated in TCIPG Events (2010-2011)



# New Participants for 2012 (1)



# New Participants for 2012 (2)



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# FY12 TCIPG Focused Industry Interaction Examples

- NetAPT used in growing number of reviews and audits
- Interaction with investor-owned utilities
  - FirstEnergy AMI IDS collaboration
- Rural Electric Cooperatives
  - Continued Vulnerability assessment for members of the Association of Illinois Electric Cooperatives
- NERC RCs
  - Ongoing evaluation of NetAPT as CIPS pre-audit tool
- Vendors/Technology providers
  - Dartmouth Autoscapy Jr (SEL), WSU GridStat (SEL), Illinois AMI IDS (Itron)

# TCIPG Commercialization, Transition, and Industry Interaction

- **TCIPG capabilities and technologies in commercial transition**
  - NetAPT commercialization under DHS grant
  - River Loop security startup based on Api-Do/ZigBee
  - Autoscopy Jr. adoption by SEL
- **TCIPG develops expertise that enables deeper engagement with the sector under DOE Industry-led projects**
  - Secure Information Exchange Gateway (SIEGate) with GPA, in part builds on TCIPG CONES
  - Telcordia
  - Honeywell collaboration on access control
- **Synergistic Industry funding on related projects**
  - EPRI
  - Fujitsu
  - GE
  - Lockheed Martin
  - Northrup Grumman
  - SEL

# How can you get involved?

- Provide feedback on the research activities and directions that you will hear in the cluster and cross-cutting area talks
- Actively participate in the panel sessions, providing (together with the panelists) answers to the questions the panel's pose
- Engage deeply with TCIPG researchers in the poster session, indicating (with the stickers provided) which activities that you would like to engage with after the workshop
- Alert us to any gaps you see in our research program and suggest new activities that we should start

# Summary

- TCIPG is addressing a complex, multifaceted mission
- TCIPG is a world-leading research center, but uniquely positioned with relationships to industry
  - Identifying and taking on important hard problems
  - Uniquely balancing a long view of grid cyber security, with emphasis on practical solutions
  - Working to get solutions adopted
- TCIPG is an important research nucleus, enabling additional valuable industry/academic collaboration