CREDC in a nutshell

• identify and perform cutting edge research and development whose results are actually used to increase cyber-resiliency of energy delivery systems
Supporting objectives

• Understand EDS cyber-resiliency investment from C-suite perspective
• Identify impediments and find highest impact adoptable solutions
• Develop, validate, verify high impact solutions, with industry
• Make solutions available
• Develop model of operation that is ultimately self-supporting
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Educational Goals

- Develop cyber/energy aware graduates for industry and academia
- Create workforce development curriculum
- Create and deliver workshops to industry (e.g. at industry oriented forums)
- Create and deliver summer school
- Create K-12 hands-on and interactive educational materials
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Approach

INDUSTRY
needs prioritize participate

Long-term Research
Mid-term R&D
Verification & Validation

1. Establish theoretical feasibility
2. Gap analysis
3. Influence standards
4. Inform policy

Impacts

1. Demonstrate feasibility
2. Change industrial practice
3. Achieve roadmap goals
4. Transition to practice

Impacts
Trends shaping CREDC research and DOE Roadmap goals

- Technology that creates new attack surfaces,
  - IoT, cloud, distributed generation, electric vehicle infrastructure
- Evolving adversary
- Push towards standardization and compliance
- Increased integration of renewable energy
- Increased monitoring and control
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Industrial Advisory Board

- **Mark Browning**, Exelon Utilities
- **Dennis Gammel**, Schweitzer Engineering Laboratories
- **Richard Jackson**, formerly with Chevron Corporation
- **Himanshu Khurana**, Honeywell Building Solutions
- **Blake Larsen**, Western Refining
- **Scott Mix**, North American Electric Reliability Corporation (NERC)
- **Paul Myrda**, Electric Power Research Institute (EPRI)
- **David Norton**, Federal Energy Regulatory Commission (FERC)
- **Kymie Tan**, Jet Propulsion Laboratory, Cyber Defense Engineering and Science Directorate
- **Zach Tudor**, SRI International, Computer Science Laboratory
CREDC Research Areas
Cyber-protection Technologies

• Develop new technologies and enhance existing technologies to protect EDS from cyber-attack, emphasis on using physical models for validation / spoof detection

Cyber Monitoring, Metrics, and Evaluation

• Identify metrics that correlate with cyber events
• Monitor w/o disturbing EDS
• Leverage physical state for validity checks
• Account for uncertainties and unknowns in data, metrics correlation with cyber-events, risk of non-response, costs of dynamic response, effectiveness of solution
Risk Assessment of EDS Technology and Systems

- Forecasting cyber security events in EDS
- Cyber-physical modeling and analysis, quantification of risk
- Security risks in dynamic EDS

Data Analytics for Cyber Event Detection, Management, Recovery

- Analyze volumes of EDS data to identify evidence of events that threaten resiliency, such as the presence of malicious actors or tampered data
- Privacy issues related to data sharing
Human and Organizational Decisions

• Understand how the perception of humans and organizations w.r.t. security and resiliency impacts decision-making. Develop communication-to-C-Suite strategies

Resilient EDS Architectures and Networks

• Explore how emerging networking technologies (e.g. software-defined networking) can be used in EDS to increase robustness, security, and resiliency

Impact of Disruptive EDS Technologies on EDS

• Identify technology gaps impacting EDS resiliency in anticipation of coming impacts on how EDS systems are organized, cyber-technologies used on them, and on new threats to resiliency that will be exposed.
Verification and Validation

Ensure that CREDC technologies is designed to meet customer needs, is implemented correctly, and meets technical specifications

Remote Management
- Design, execute, analyze experiments without physical access

Test-bed Federation
- Develop technology for combining assets of distributed test-beds, and an understanding of the contexts where this is technically and scientifically feasible

Design and Execute V&V Evaluations
Mid-term Research and Development

Projects with promise for prototype testing and adoption
  • Opportunity for industrial partners to ‘advocate’, contribute to requirements and testing/evaluation

Research directions informed by input from industry and sponsor

Activities need up to one year research, up to one year development
CREDC Outreach
Stakeholder Engagement and Sustainability

Sharing of information and facilitation of outreach activities with industry stakeholders

• Annual Project Review (Industry Day)
• Presentations / Workshops at Industry Forums
• Education Program (summer school)
K-12 and Public Outreach

• Engage and inform students, educators, families on working and importance of cyber-secure and resilient EDS

• Outreach through
  • Interactive learning materials
  • Public presentations

• Partner with other national curriculum activities
CYBER RESILIENT ENERGY DELIVERY CONSORTIUM

http://cred-c.org
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