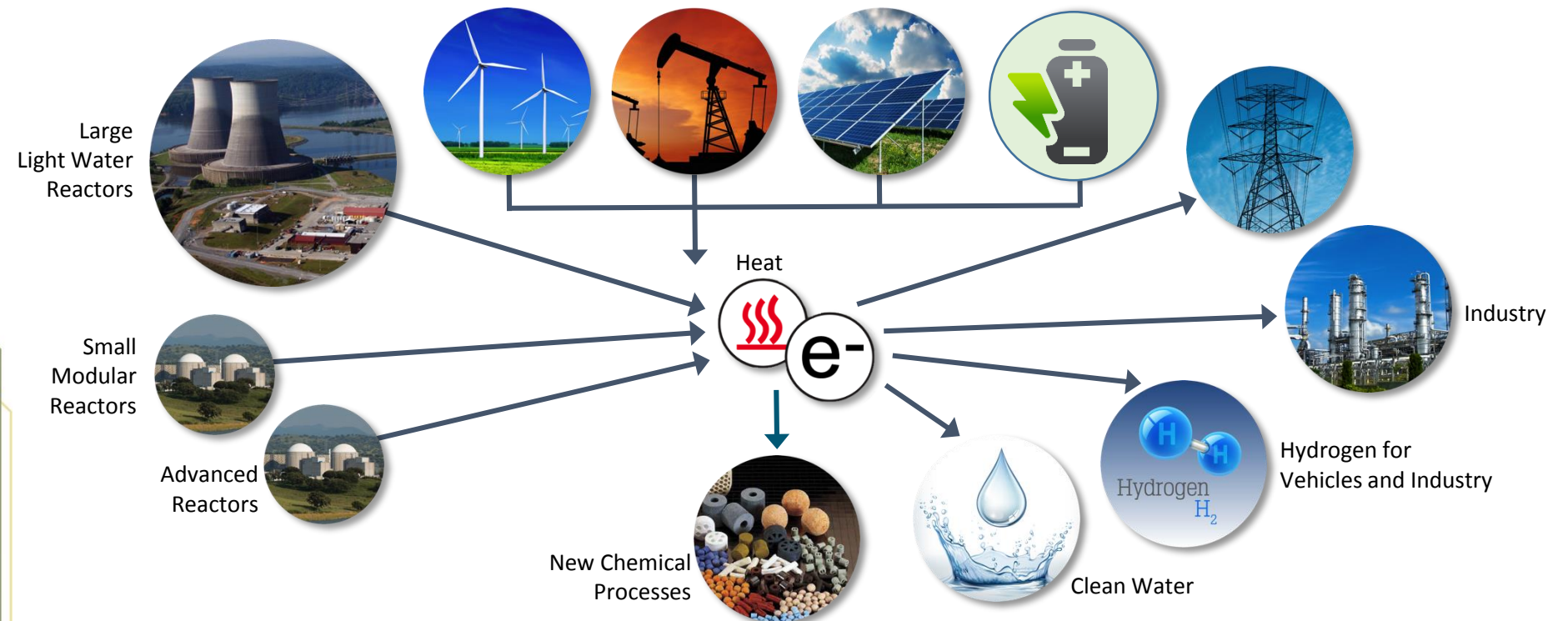


Revolutionizing Grid Security

FUTURE

Integrated, resilient, autonomous grid



www.inl.gov

**NOT TOO
DISTANT PAST**

Cyber-Physical Fundamentals

Past research has:

- **Demonstrated physical consequences of cyber attacks**
- **Improved security of digital equipment**
- **Developed methods for vulnerability detection, impact measurement, reporting, and mitigation**



National SCADA Test Bed



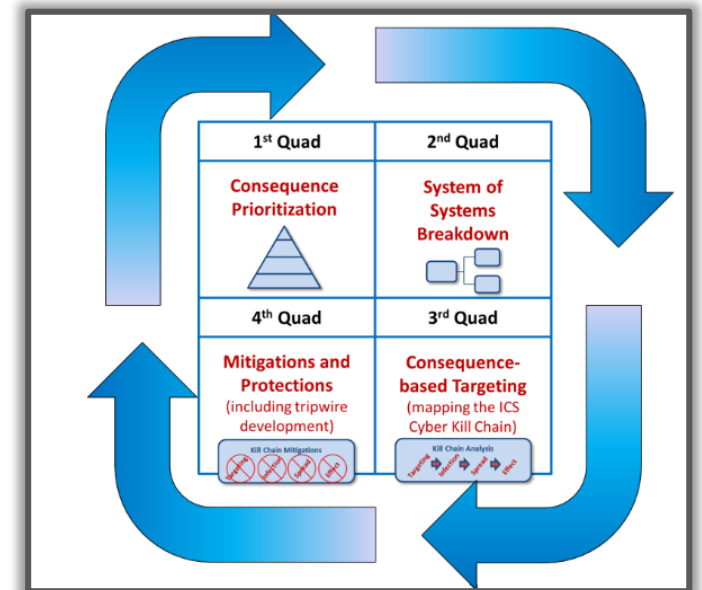
Aurora Experiment, March, 2007

CURRENT STATE

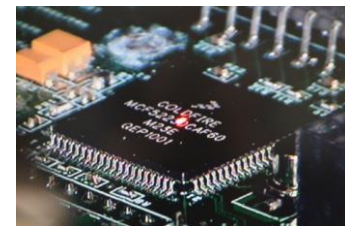
Engineering-Out Cyber-risk

Current research is:

- **Normalizing cyber hygiene**
 - Automated alerting
 - Automated remediation
- **High-consequence event analysis**
- **Cyber security deep into the architecture**
 - Subcomponent analysis (Supply chain)
 - Field and edge devices



Consequence-driven Engineering



Component Analysis

REVOLUTIONARY FUTURE

Cyber Security as a fundamental design principle

Research needed in:

- **Autonomous systems**
 - Dynamic configuration
 - Heterogeneous resilience
- **Sensing**
 - Distributed system awareness
- **Human factors**
 - Human above the loop
- **Cyber Informed Engineering**

