

Critical Infrastructure Dependency: A View from the United States

*European Critical Infrastructure Protection Workshop
Frankfurt, Germany*

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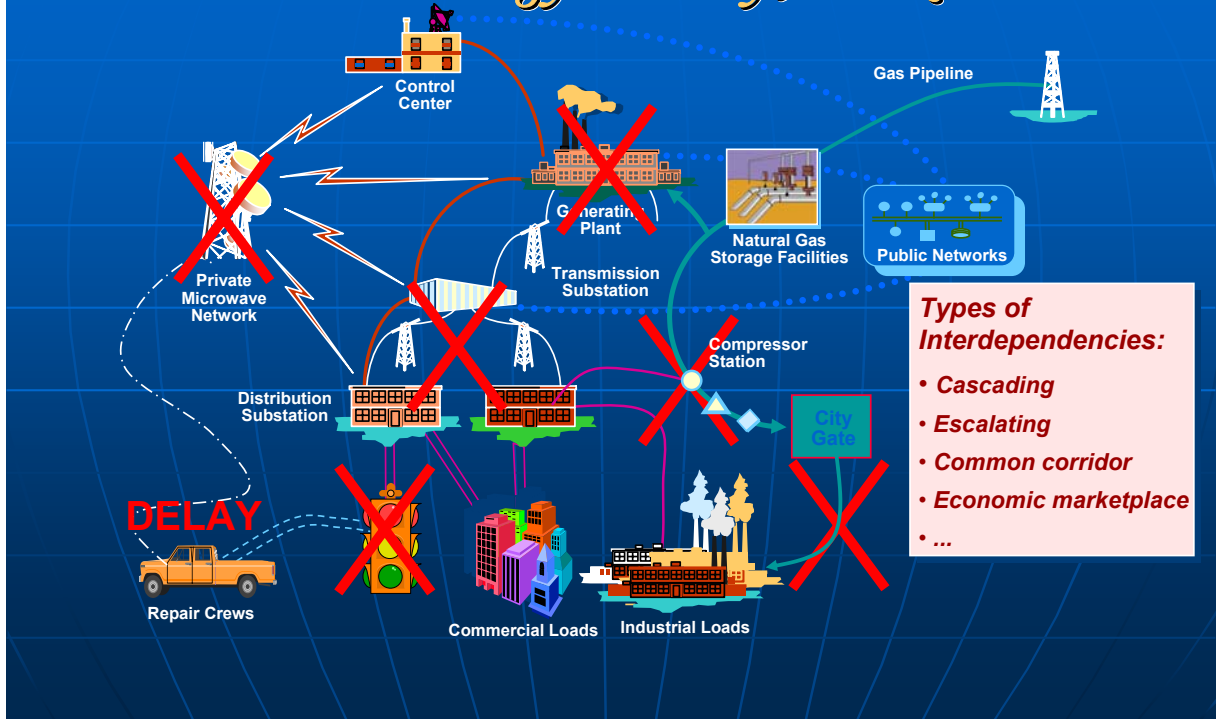
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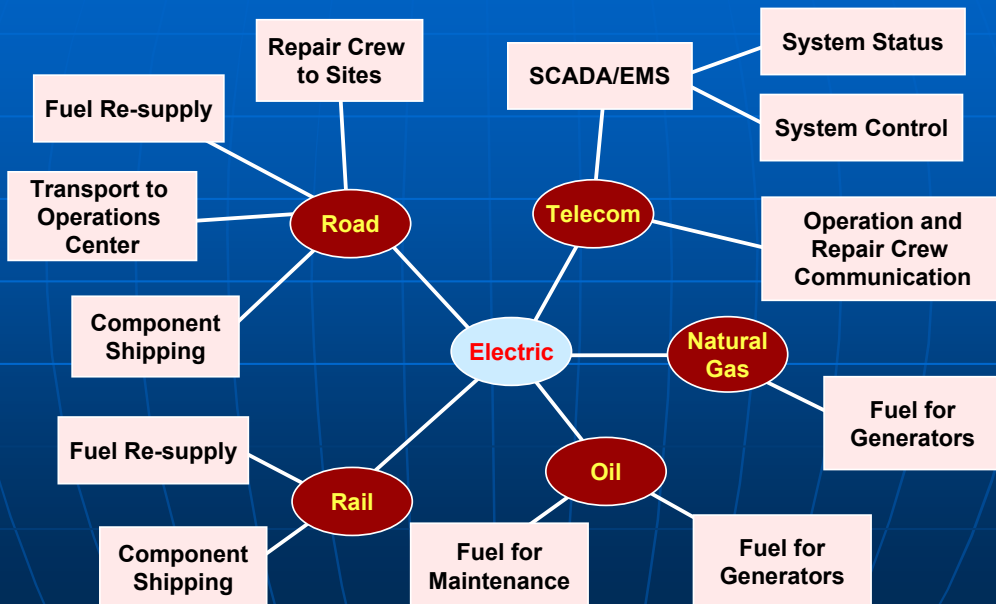
Complex Interactive Networks and Systems

- Complex interactive networks are omnipresent
 - Energy infrastructure
 - Telecommunication
 - Transportation and distribution
 - Banking and finance

Interdependencies Among Physical and Cyber Assets Within the Energy Industry Are Extensive



Electric Power Infrastructure Dependencies



Cascading, Dependent, Interactive and Large-scale

Many nodes +

Very many links +

Vulnerability to cascading failures

(owners, operators, sellers, buyers, customers)

- Multi-layered, multi-resolutional and intertwined grids.
- Too complex for single central entity to evaluate, monitor, and manage in real time.
- Too complex for conventional mathematical methodologies.

Infrastructure Sectors

Dept of Defense Perspective

Financial Services;

Transportation;

Public Works;

Global Information Grid/Command and Control;

Health Affairs;

Personnel;

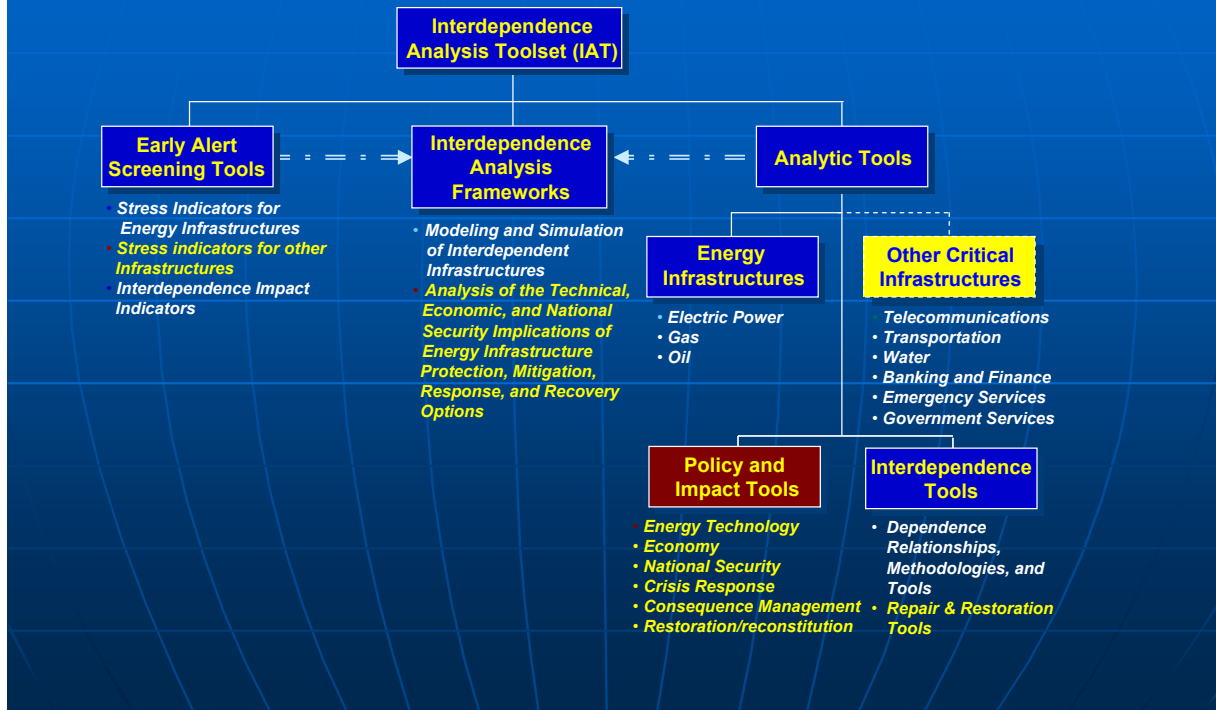
Intelligence, Surveillance, and Reconnaissance;

Logistics;

Space;

Defense Industrial Base (added as a sector at the beginning of FY 2003).

Overview of DOE Interdependence Analysis "Toolset" Concept



National Institute of Standards and Technology

Cybersecurity of Industrial Control Systems - GOAL

By 2007, **increase the security** of computer systems that control production and distribution in critical infrastructure industries, including electric power, oil and gas, water, chemicals, pharmaceuticals, metals and mining, pulp and paper, and durable goods manufacturing by:

- (1) defining and applying standard information security requirements,
- (2) developing information security best practice guidelines and conducting outreach activities, and
- (3) developing laboratory and field test methods for information security products and approaches applied to the process control sector.

DoD Analysis and Assessment

Mission analysis and infrastructure assessment is key to the DoD CIP Program. The purpose of Analysis and Assessment is to:

- Determine what assets are truly critical mission independent and those tied to specific missions, including identification of support infrastructure assets, their **dependency** on other assets,
- Identify vulnerabilities that could result in **degradation or disruption** of missions, regardless of the cause,
- Determine the **consequences** of cascading failures on operations, and identify possible corrective actions.

International and Private Sector Partnerships

In the US over 90 percent of the infrastructures are privately owned and operated. This creates a challenge regarding standards, levels of detail, cost and accountability. This is further complicated by the need for international coordination, especially in the financial sector.

US National Science Foundation Typical IT Research Topics

- Software
- IT Education and Workforce
- Human-Computer Interface
- Information Management
- Advanced Computational Science
- Scalable Information Infrastructure
- Social and Economic Implications of IT
- Revolutionary computing



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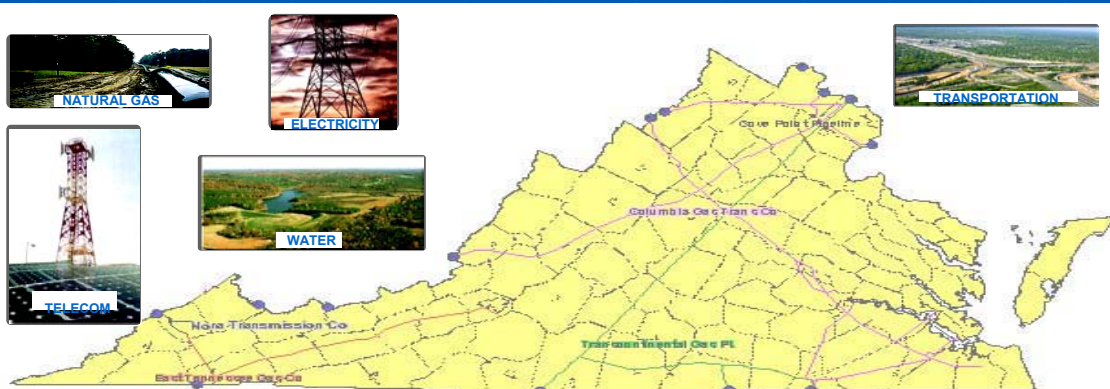
Project Title: Critical Infrastructure Modeling and Assessment Program (CIMAP)
 Principal Investigators: Dr. Saifur Rahman and Dr. Michael Willingham
 Student Researchers: Manisa Pipattanasomporn and Monica Mallini-Rourke
 Project URL: www.cimap.vt.edu

VIRGINIA'S DEVELOPMENT: AT THE CROSSROADS

VIRGINIA'S HIGH TECH INDUSTRY:
BUILT ON COMPLEX INFRASTRUCTURES

VIRGINIA'S IMPRESSIVE GROWTH

- The 12th-most populous state in the U.S. (2000 Census)
- \$750 million of venture capital for high-tech investment (1999)
- 675,000 miles of fiber optic cable in place (1999)



FUTURE DEVELOPMENT MUST ADDRESS

- Impacts of electricity and natural gas deregulation
- Shortage of primary energy resources for Virginia use
- Proliferation of wholesale electricity merchant power plants
- Increasingly stringent air quality regulations
- Overburdened demands on water resources
- Potential for linked catastrophic infrastructure failures