

Water Infrastructure Interdependencies

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February 12, 2006



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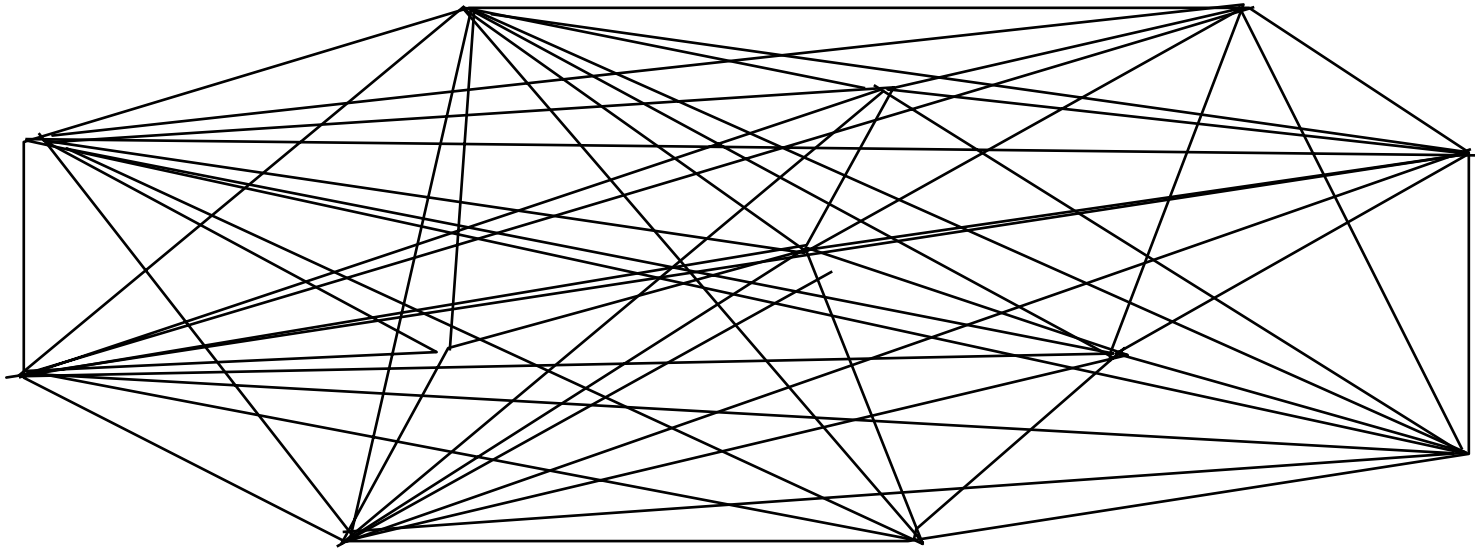
Overview

- Interdependent Events and Impacts
- Types of Interdependencies
- EPA Interdependency Efforts
 - Active and Effective Security Program Features
 - Water and Wastewater Interdependencies : The 2003 Blackout and Hurricanes of 2004
 - ANL RESTORE
 - Energy and Water Distribution workshop
 - Coordination with DHS efforts



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The Tangled Web

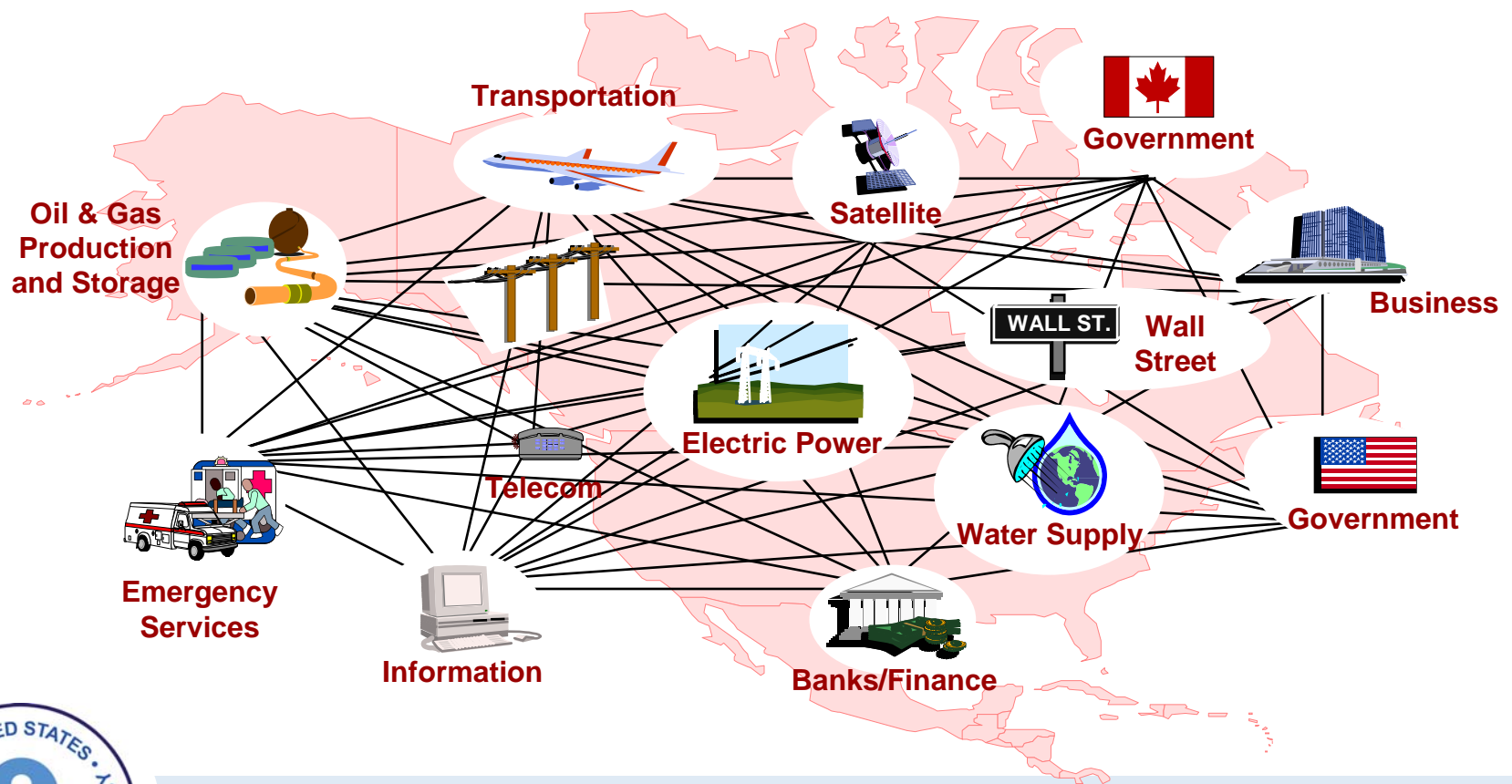


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November 2005

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Interdependencies are Intuitive, but Not Well Understood



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Examples of Events that Could Reveal Interdependency Issues

- **Natural Disasters**
 - Floods
 - Tornados
 - Hurricanes
 - Droughts
 - Thunderstorms
 - Wildfires
 - Winter Storms
 - Extreme Heat/Cold
 - Drought
- **Man-made Disasters**
 - Accidents
 - Deliberate Acts
 - Vandalism
 - Terrorism
 - System Failure
 - Mechanical
 - Human Error
 - Power Outages
 - Localized
 - Regional



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Types of Interdependencies

- **Physical** (e.g., material output of one infrastructure used by another: pressurized water used for fire fighting)
- **Cyber** (e.g., electronic, informational linkages: SCADA)
- **Geographic** (e.g., common corridor: fiber optic line, natural gas pipe and a water main “stacked” in a single trench)
- **Logical** (e.g., dependency through financial markets: bond market effects on a utility’s ability to finance improvements/major repairs)



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Several Infrastructures are Dependent on the Water Infrastructure

Agriculture	<i>Irrigation (p); Animal drinking (p); Facility cleaning (p)</i>
Food	<i>Food processing (p); Restaurant operation (p)</i>
Public Health	<i>Hospital/clinic operations (p); Nursing home operations (p)</i>
Emergency Services	<i>Fire fighting (p); Emergency water supplies (p); Equipment maintenance (p)</i>
Government Office operations	<i>(p)</i>
Def Industrial Base	<i>Office operations (p); Equipment cooling (p)</i>
Information & Telecommunications	<i>Equipment cooling (p); Common rights-of-way (g)</i>
Energy	<i>Steam generation (p); Mining operations (p); Ore processing (p); Refining (p); Pollution control (p); Raw material (e.g., H2 production) (p); Waste management (p); Common rights-of-way (g); Office operations (p)</i>
Transportation	<i>Office operations (p); Equipment maintenance (p); Common rights-of-way (g)</i>
Banking & Finance	<i>Office operations (p)</i>
Chem Ind. & Haz Mats	<i>Manufacturing operations (p); Office operations (p)</i>
Postal & Shipping	<i>Office operations (p)</i>
National Monuments	<i>Office operations (p); Facility maintenance (p)</i>



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What is EPA Doing?

- Identifying Features of an Active and Effective Security Program
- Water and Wastewater Interdependencies : The 2003 Blackout and Hurricanes of 2004
- RESTORE
- Tabletop Exercises with Interdependencies Scenarios
- Energy and Water Distribution Workshop



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Features of Active and Effective Security Programs

1. Explicit commitment to security
2. Security culture
3. VA up to date
4. Security resources and implementation priorities
5. Defined security roles and employee expectations
6. Intrusion detection & access control
7. Contamination detection
8. Information protection & continuity
9. Design and construction standards
10. Threat-level based protocols
11. ERP tested and up to date
12. Communications
13. Partnerships
14. Utility-specific measures and self assessment

Promote – Incentivize - Measure



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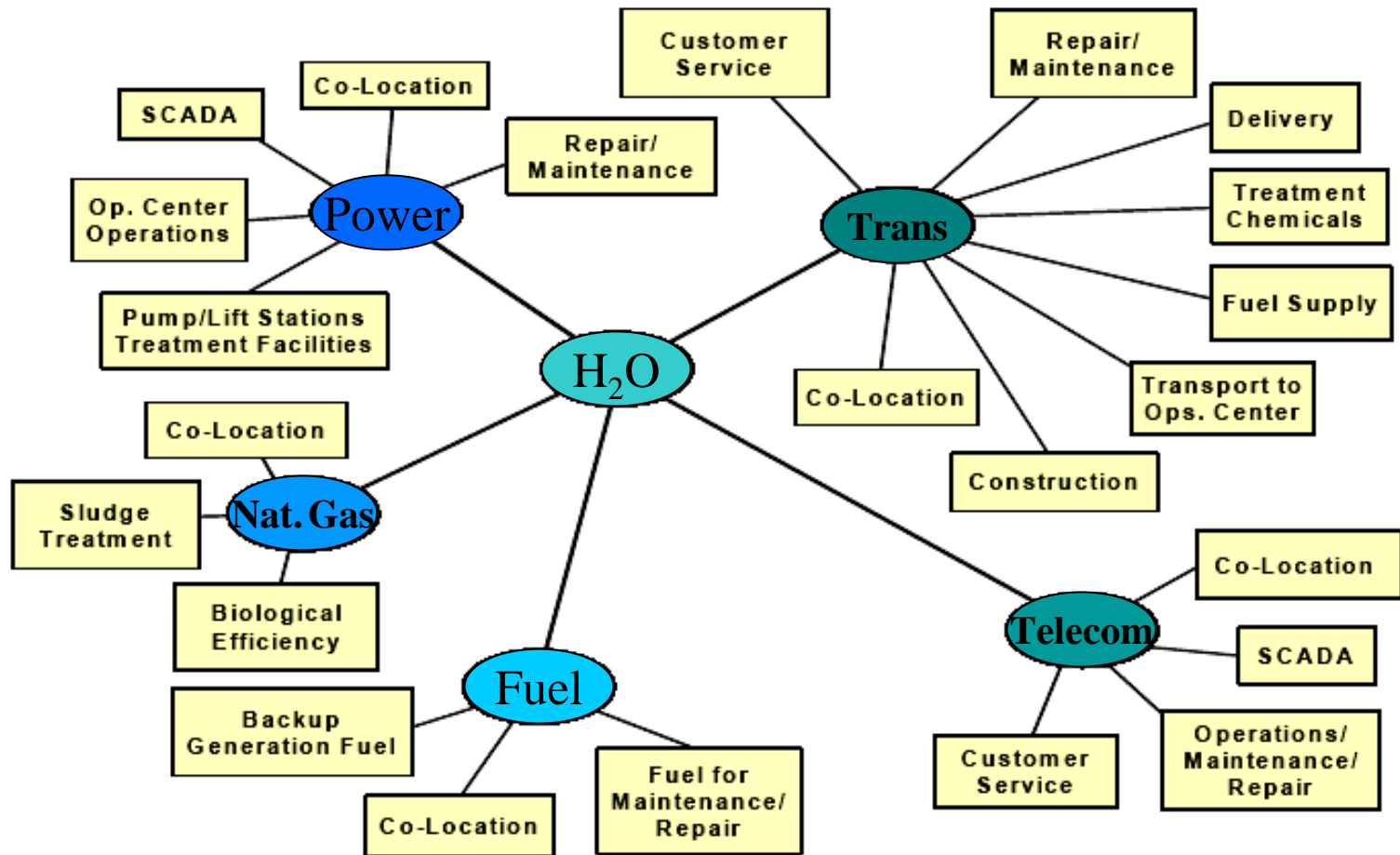
Water and Wastewater Interdependencies : The 2003 Blackout and Hurricanes of 2004

- Lessons Learned:
- Especially with Power, Transportation, and Communications sectors
- Geographic or Common Corridors effects
- Affect Response, Repair, Recovery and Duration



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Water and Wastewater Interdependencies



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Lessons Learned: *Power*

- **Understanding of electrical grid incomplete**
- **Incorrectly assumed sufficient redundancy – geographic issues**
- **Backup power was unavailable or unreliable**
- **Water utilities not identified as priority customers by power companies**
- **Loss of power severely hampered communication**



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Recommendations: *Power*

- **Geographic diversity**
- **Quantify emergency generator requirements**
- **Maintain emergency generators**
- **On-site fuel storage**
- **Confirm generators meet appropriate air quality and noise limits**



RESTORE -- Critical Infrastructures Interdependencies Integrator

- Purpose
 - Estimate service restoration time (i.e., the amount of time required to restore a system to an operational state)
- Objective:
 - Create a model to help identify restoration times for repairing a water system
 - Identify measures to minimize outages to own systems and interdependent infrastructures when disruptive events occur



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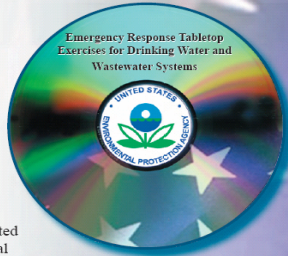
Emergency Response Tabletop Exercises for Drinking Water and Wastewater Systems

Emergency Response Tabletop Exercises for Drinking Water and Wastewater Systems

EPA is making available a new CD product entitled Emergency Response Tabletop Exercises for Drinking Water and Wastewater Systems. The tabletop exercises on this CD were developed to help train water and wastewater utility workers in the application of their emergency response plans. In total, twelve unique exercises can be created from the CD from five basic event types: intentional contamination, security breach, cyber security, physical attack, and interdependency. Users are also encouraged to adapt the materials on the CD to meet their own needs and objectives.

The exercises also contain secondary roles for health officials, laboratories, fire, police, emergency medical services, and local, state, and federal officials. The training goal of the CD is to strengthen the relationships between a water supplier and their emergency response team members and to enable water suppliers to "test" their emergency response plans before an actual incident occurs.

Information about the Emergency Response Tabletop Exercises for Drinking Water and Wastewater Systems CD (EPA 817-C-05-001) is available on EPA's website at <http://www.epa.gov/watersecurity> under "Tools and Technical Assistance." Copies can also be obtained by calling 1-800-490-9198, sending an email to ncepimail@one.net, or visiting <http://www.epa.gov/ncepihom/ordering.htm>.



EPA 817-F-05-004

- Help systems in the application of their Emergency Response Plans
- Identify and bring partnerships together
- Increase Preparedness
- Improve Response



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Energy and Water Distribution Workshop

- Half-day tabletop exercise and lessons learned seminar: A case study of a major energy system disruption in the Washington D.C. Metropolitan Area and the resulting effects on the water distribution and supply infrastructure in the area.
- Presentations and discussion focused on pre-emergency planning, emergency operation plan implementation, alternative water supply options, and energy and water-related best practices and policy options.



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Water Infrastructure is Also Interdependent with the Ecosystem



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