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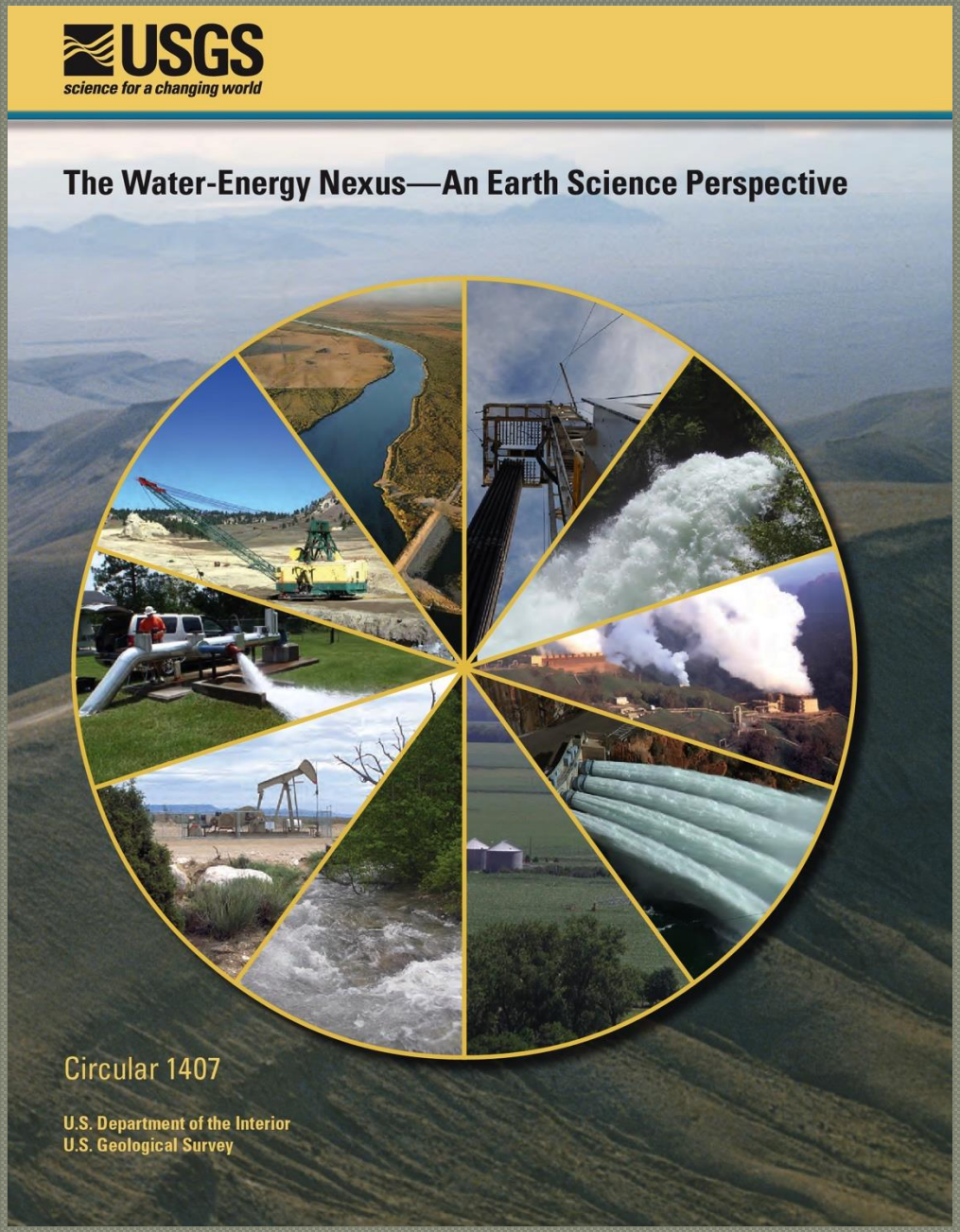
U.S. Geological Survey Capabilities for Characterizing Energy Materials and Byproducts in the Washington Metropolitan Area

TVA coal ash spill site
Kingston, TN 2009

Allan Kolker, Ph.D.
Research Geologist
U.S. Geological Survey
Eastern Energy Resources
Science Center
Reston, VA 20192

Lab-to-Market Technology Forum:
Energy & Water Infrastructures
Metropolitan Washington Council of Governments
June 2, 2016

U.S. Department of the Interior
U.S. Geological Survey



Water-Energy Nexus

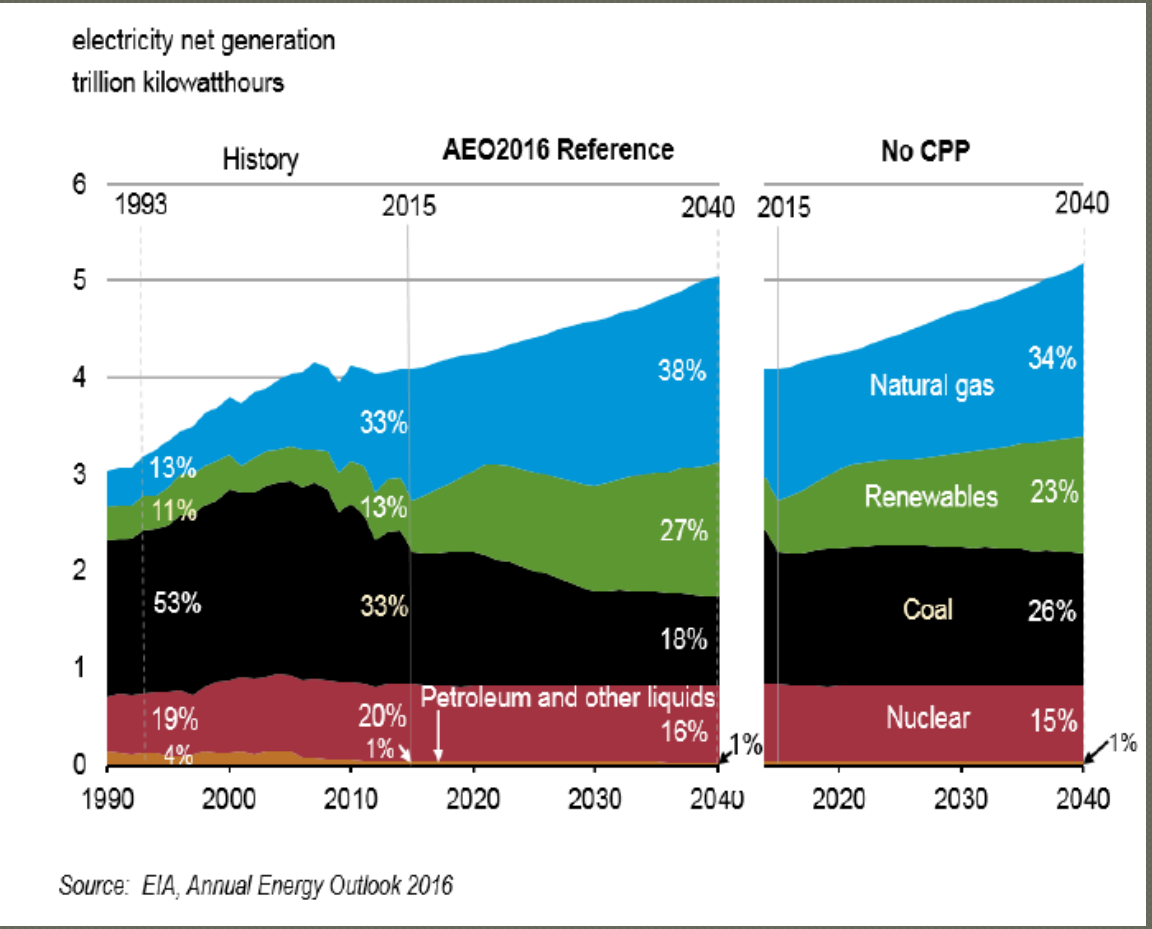
Identify the complex ways in which water and energy are interconnected and describe the earth science data collection and research that can help the Nation address water and energy needs.

Healy, R.W., Alley, W.M., Engle, M.A., McMahon, P.B., and Bales, J.D., 2015, The water-energy nexus—An earth science perspective: U.S. Geological Survey Circular 1407, 108 p.

Electric Power Generation
(From U.S. Energy Information Agency- EIA)

2015 U.S. Energy Mix

Coal – 33%
Nat. Gas – 33%
Nuclear – 20%
Hydro – 6%
Other Renewable – 7%
- Wind – 4.7%
- Biomass – 1.6%
- Solar – 0.6%



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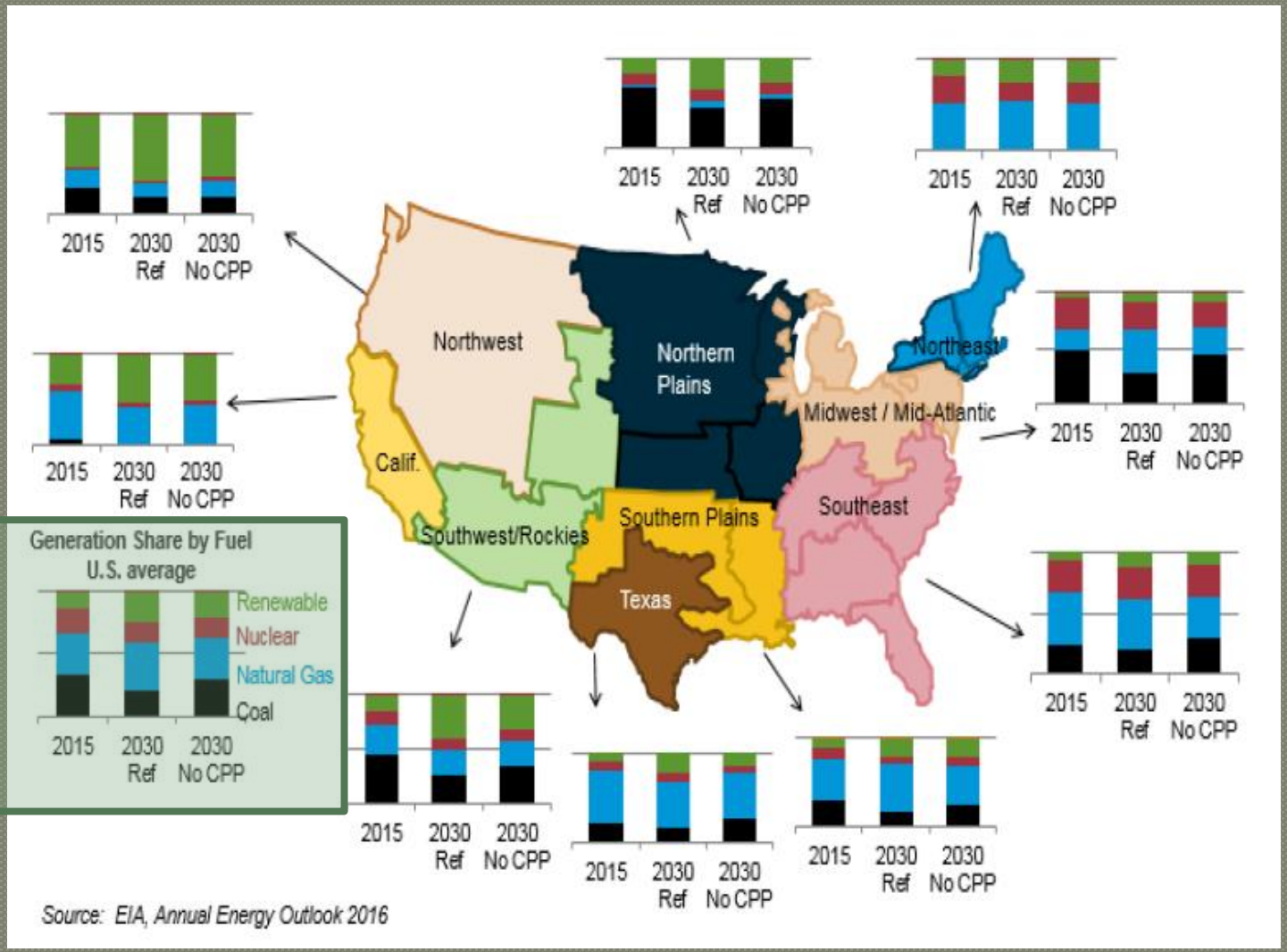
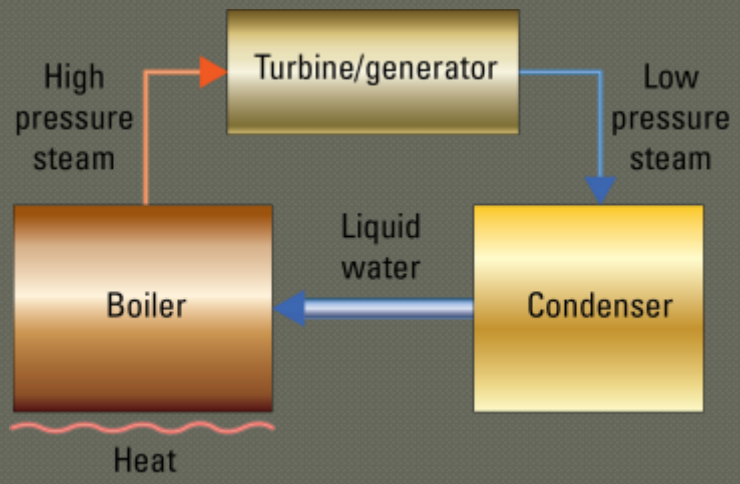
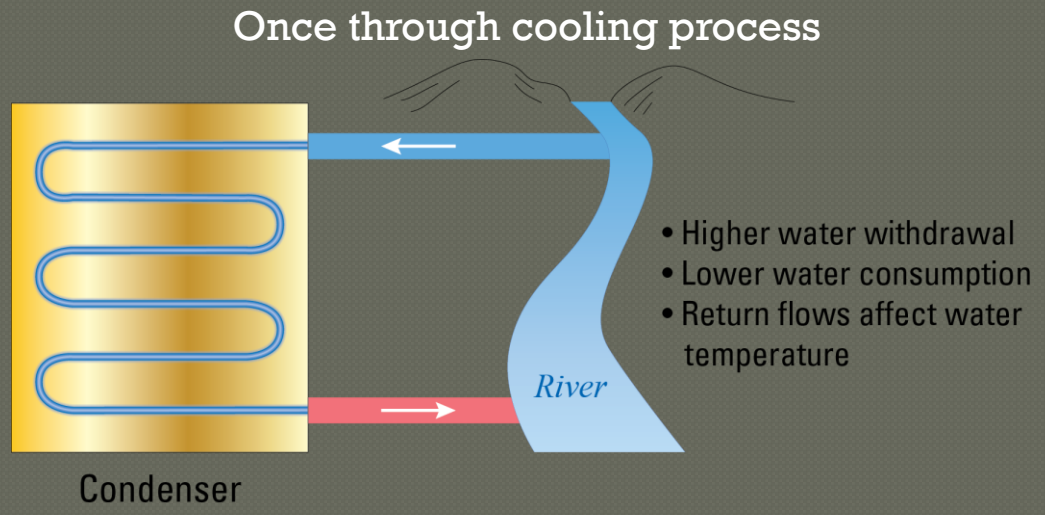
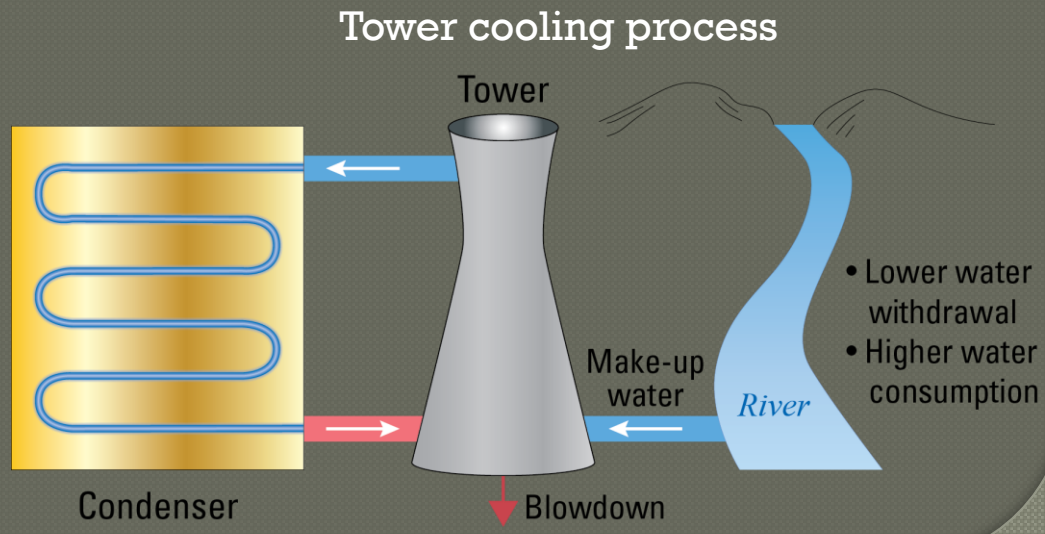
EIA Power Generation by Region



Water Withdrawal and Consumption in Power Plants







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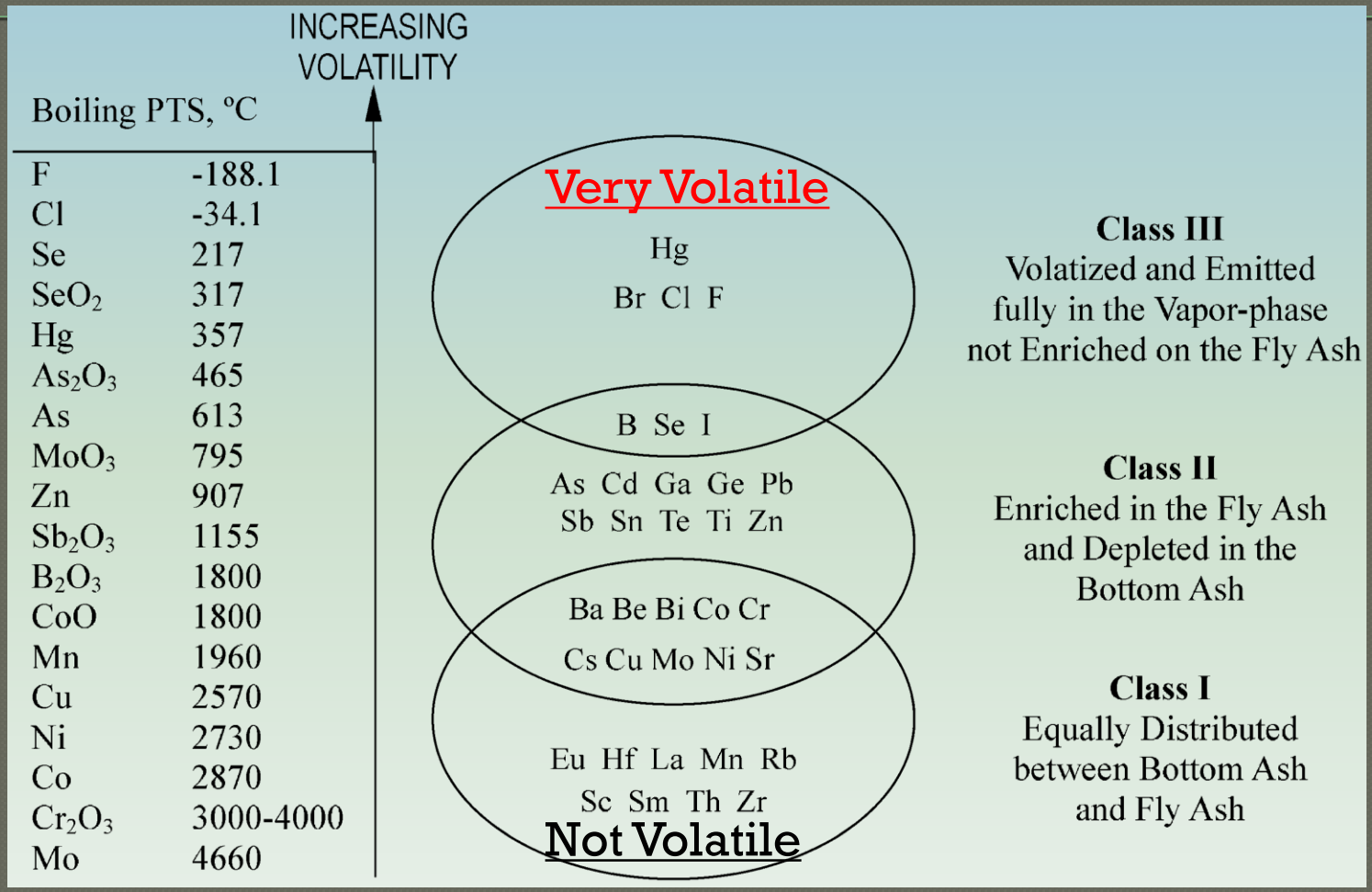
Coal Quality

- Differences in coal quality affect operation of coal-fired utility power stations and their emissions.
- Emission of mercury and other trace elements from coal to be regulated by EPA Mercury and Air Toxics Standards- MATS (currently on hold).
- USGS work on U.S. and international coal samples show how harmful constituents in coal occur.
- USGS studies can help predict reduction of harmful constituents during coal preparation prior to combustion in utility boilers.

USGS

Behavior of Elements During Coal Combustion



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Source: J.A. Ratafia-Brown, Fuel Process. Technol. 39 (2) (1994)

Coal Quality - Mercury

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Mercury and Halogens in Coal—Their Role in Determining Mercury Emissions From Coal Combustion

Introduction

Mercury (Hg) is a toxic pollutant. In its elemental form, gaseous mercury has a long residence time in the atmosphere, up to a year, allowing it to be transported long distances from emission sources. Mercury can be emitted from natural sources such as volcanoes, or from anthropogenic sources, such as coal-fired powerplants. In addition, all sources of Hg on the Earth's surface can re-emit it from land and sea back to the atmosphere, from which it is then redeposited.

Mercury in the atmosphere is present in such low concentrations that it is not considered harmful. Once Hg enters the aquatic environment, however, it can undergo a series of biochemical transformations that convert a portion of the Hg originally present to methylmercury, a highly toxic organic form of mercury that accumulates in fish and birds. Many factors contribute to creation of methylmercury in aquatic ecosystems, including Hg availability, sediment and nutrient load, bacterial influence, and chemical conditions. In the United States, consumption of fish with high levels of methylmercury is the most common pathway for human exposure to Hg, leading the U.S. Environmental Protection Agency (EPA) to issue fish consumption advisories in every State (fig. 1).

The EPA estimates that 50 percent of the Hg entering the atmosphere in the United States is emitted from coal-burning utility powerplants (U.S. Environmental Protection Agency, 2011a). An EPA rule, known as MATS (for Mercury and Air Toxics Standards), to reduce emissions of Hg and other toxic pollutants from powerplants, was signed in December 2011 (U.S. Environmental Protection Agency, 2012). The rule, which is currently under review, specifies limits for Hg and other toxic elements, such as arsenic (As), chromium (Cr), and nickel (Ni). MATS also places limits on emission of harmful acid gases, such as hydrochloric acid (HCl) and hydrofluoric acid (HF). These standards are the result of a 2010 detailed nationwide program by the EPA to sample stack emissions and thousands of shipments of coal to coal-burning powerplants (U.S. Environmental Protection Agency, 2011b,c). The United States is the only nation to have collected such detailed information for Hg in both its coal and its utility emissions.

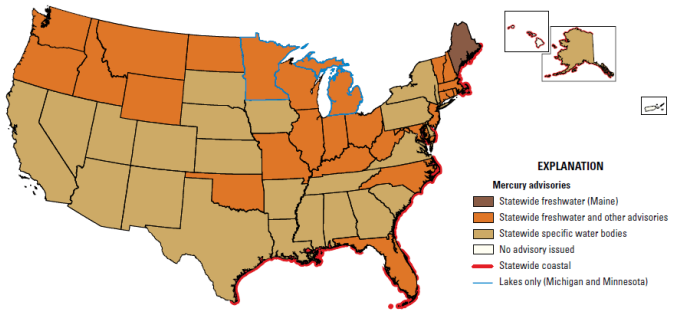


Figure 1. U.S. water bodies for which the Environmental Protection Agency issued fish consumption advisories in 2010. Advisories include statewide freshwater advisories (Maine), statewide freshwater advisories with additional advisories on specific water bodies, statewide advisories for specific water bodies, and statewide coastal advisories. In Michigan and Minnesota, statewide advisories are for lakes only. There are no fish consumption advisories for Hg in the District of Columbia and Puerto Rico; in Hawaii, there are only coastal advisories. Figure modified from U.S. Environmental Protection Agency. Alaska, Hawaii, and Puerto Rico not to common scale.

U.S. Department of the Interior
U.S. Geological Survey
Printed on recycled paper
Fact Sheet 2012–3122
October 2012

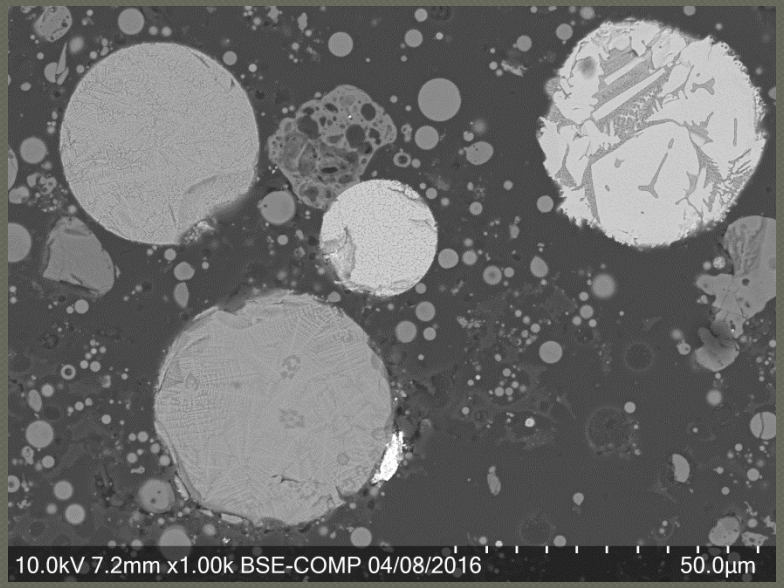
- U.S. fish consumption advisories have driven efforts by the EPA to limit emissions of mercury and other toxic substances from coal-fired utility power stations.
- USGS studies show the impact of coal quality on mercury emissions from coal combustion.
- Halogens in coal (e.g. Cl, Fl, Br) help reduce the fraction of Hg emitted by promoting its capture.
- But halogen emissions are also to be regulated as acid gasses under the EPA MATS.

USGS

A. Kolker et al., 2012, USGS Fact Sheet 2012-3122

Coal Combustion Byproducts (CCBs)

- Coal ash (primarily fly ash, bottom ash) is produced in large quantities during coal combustion for power generation.
- In 2013, 44% of U.S. coal fly ash was beneficially used, primarily in construction[1].
- USGS studies show the distribution of harmful constituents in CCBs, and their potential mobility in the environment.
- Potential for coal ash as a source of valuable elements such as the rare earths.



Fly ash backscattered electron image, 1000x, USGS Reston labs.

USGS

[1]Source: American Coal Ash Association

Potential for Mobility of Substances from CCBs into the Environment

- Potential mobility differs by element.
- Availability of oxygen effects degree of element leaching.
- Standardized leaching test protocols only consider case where oxygen is available.

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Trace Elements in Coal Ash

Overview

According to the U.S. Energy Information Association (EIA), approximately 37 percent of the electricity currently produced in the United States is generated using coal (U.S. Energy Information Administration, 2013). Coal ash (also known as coal combustion products) includes bottom ash, fly ash, and flue gas desulfurization products (fig. 1), which are generated in amounts averaging 130 million tons per year. In 2013, 14.5 million tons of bottom ash, 53.4 million tons of fly ash, and 35.1 million tons of flue gas desulfurization products were produced (American Coal Ash Association, 2013). The EIA predicts that coal use and coal ash generation in the United States will remain at current levels over the next few decades (U.S. Energy Information Administration, 2013).

Coal fly ash consists of fine particles, which contain a mixture of minerals such as clays, quartz, iron oxides, aluminosilicate glass formed by melting of mineral matter at the high temperatures of combustion, and unburned carbon remaining after the combustion process. Major chemical constituents of coal fly ash typically include silicon (Si), aluminum (Al), and iron (Fe), listed in order of decreasing abundance when expressed as oxides (elements in combination with oxygen), with lesser amounts of oxides of calcium (Ca), magnesium (Mg), potassium (K), sulfur (S), titanium (Ti), and phosphorus (P) whose proportions tend to be more variable. Coal ash also contains minor amounts of trace elements, including chromium (Cr), nickel (Ni), zinc (Zn), arsenic (As), selenium (Se), cadmium (Cd), antimony (Sb), mercury (Hg), and lead (Pb). In addition, uranium (U) is commonly present at concentrations ranging from 10 to 30 ppm, which is near the upper limit of concentrations found in naturally formed rocks such as granite and black shale (Zielinski and others, 2007).

In the United States, coal ash is currently disposed of in ash impoundments or landfills (fig. 2). Storage or disposal of large volumes of coal ash in suitably engineered and monitored impoundments or landfills is costly and may be limited by near-site storage capacities. Long-term storage of coal ash can be problematic because water infiltration (from rain or snow) combined

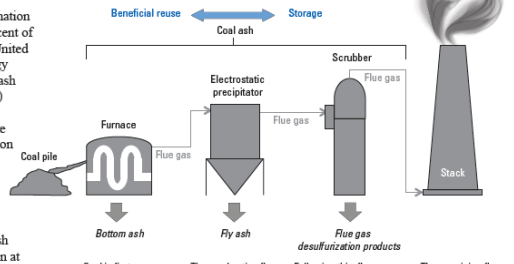


Figure 1. The main processes involved in coal combustion and generation of coal ash (bottom ash, fly ash, and flue gas desulfurization products) at a coal-fired powerplant. The coal ash generated as a result of coal combustion is collected and stored or reused for beneficial purposes.

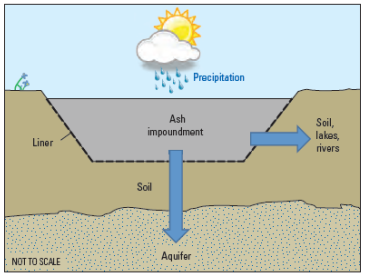


Figure 2. Potential pathways by which coal ash and its elemental constituents can escape from ash impoundments. Precipitation (rain and snow) can lead to water infiltration through the ash into groundwater aquifers, soil, lakes, and rivers. The liner helps prevent migration of constituents from the impoundment to its surroundings.

U.S. Department of the Interior
U.S. Geological Survey

Fact Sheet 2015–3037
May 2015

USGS

A. Deonarine et al., 2015, USGS Fact Sheet 2015-3037

CCBs and Resource Recovery

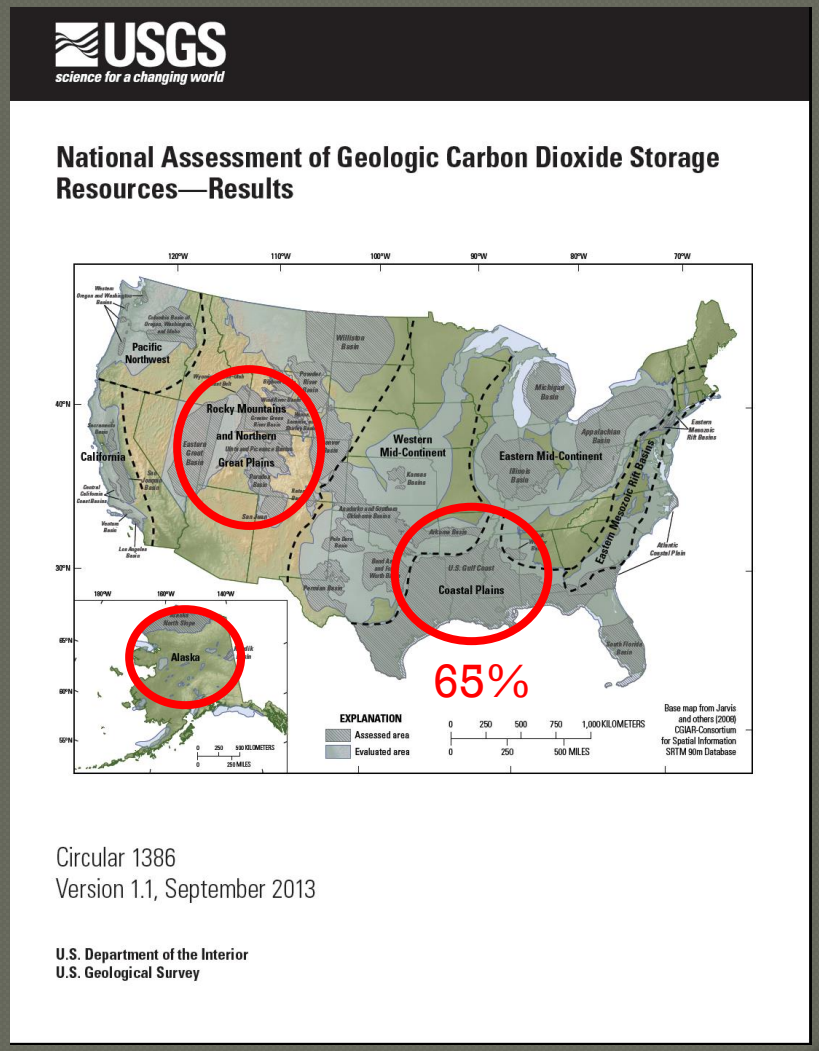
- Rare earth elements (REEs) are increasingly needed in commercial and military applications.
- Supply of REE is strongly controlled by a single international source.
- U.S. production (one mine - operations currently on hold) is not sufficient to keep up with demand.
- REEs from coal are strongly retained in CCBs during coal combustion for power generation.
- Alternative REE sources, including coal and coal ash, and methods of REE extraction from these sources, are sought.

USGS

Carbon Capture and Storage

- Geologic carbon storage addressed in USGS assessment of storage capacity in underground saline reservoirs.
- The regions with the largest technically accessible storage resources are the Coastal Plains (mostly in Gulf Coast); Rocky Mountains and N. Great Plains (9%); and Alaska (9%; mostly North Slope).
- Related questions-
  - Environmental risks of storing CO_2 in underground reservoirs?
  - Potential for CO_2 leakage, impacts to drinking water, and induced seismicity?
  - Injecting CO_2 into reservoirs for enhanced oil recovery?

USGS Circular 1386
http://pubs.usgs.gov/circ/1386



Shale Gas Studies

- EIA projects continued increase in U.S. shale gas production from 2020 to 2040.
- USGS fundamental studies of pore structure in gas shales to better understand gas occurrence and distribution.
- Sampling and analysis of waste water produced with oil and gas wells (produced water) and related environmental studies.
- Can we see chemicals from hydraulic fracturing in waste water produced from gas wells?

USGS

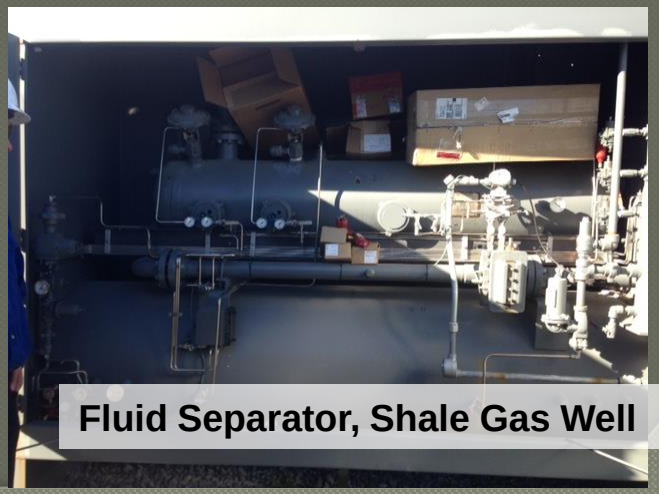
USGS Sampling Wastewater from Unconventional Oil and Gas (UOG) Production

Sampling from a tight oil well, Permian Basin, Texas

- Collect from UOG production at well heads and separators with time series
- Analyses
  - -Field measurements and Inorganics
  - -Dissolved Organic Carbon
  - -Extractable Hydrocarbons (GC/MS)
  - -Ethylene Glycol (LC/MS)
  - -LMW Fatty Acids (HPLC)

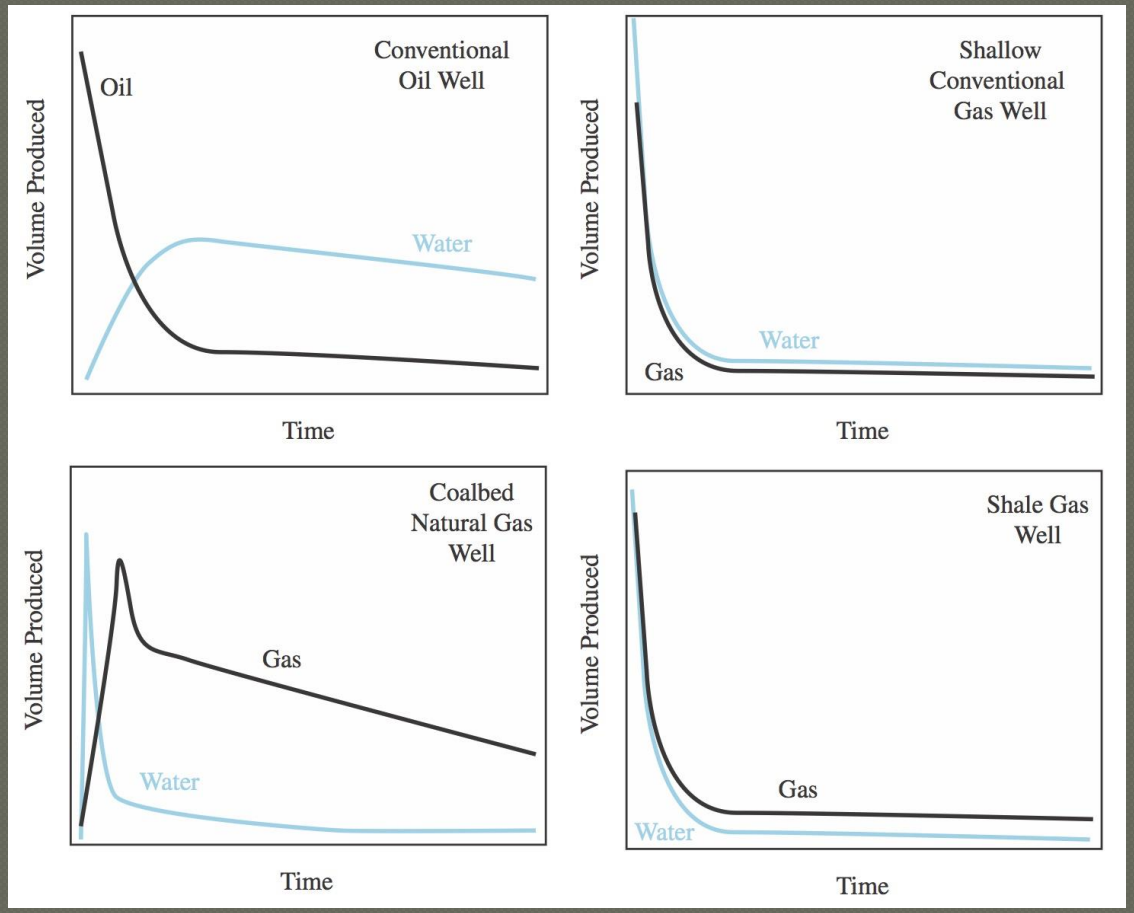
Organics Sampling

Field Measurements
Marcellus Shale Gas Well, WV



Fluid Separator, Shale Gas Well

Decline Curves – A source of complexity to water management



USGS

Source: Healy et al., 2015
U.S. Geological Survey Circular 1407

Conclusions

- The USGS recognizes the interrelation of water and energy and its societal importance.
- Ongoing USGS research investigates solids (shale, coal, CCBs) and fluids (oil and gas, produced water) from energy production and use and their potential impact on the environment.
- USGS studies provide a better understanding of the processes associated with energy production and use, which can help improve energy efficiency and reduce harmful impacts.

USGS

Thanks to

USGS Energy Resources Program, the primary sponsor of our research activities.

Mark Engle, Peter Warwick, Bill Orem, Philip Freeman, Emil Attanasi, and Matthew Merrill of the USGS Eastern Energy Resources Science Center, Reston VA, for contributing to this presentation.

USGS

Exceptional service in the national interest

Sandia National Laboratories

Energy & Water Infrastructures
Technical Support to Improve Security and Resiliency

Lab-to-Market Technology Forum
June 2, 2016

Mike Hightower
Distinguished Member of the Technical Staff
Sandia National Laboratories
mmhight@sandia.gov 505-844-5499

Emerging Global Security Issues

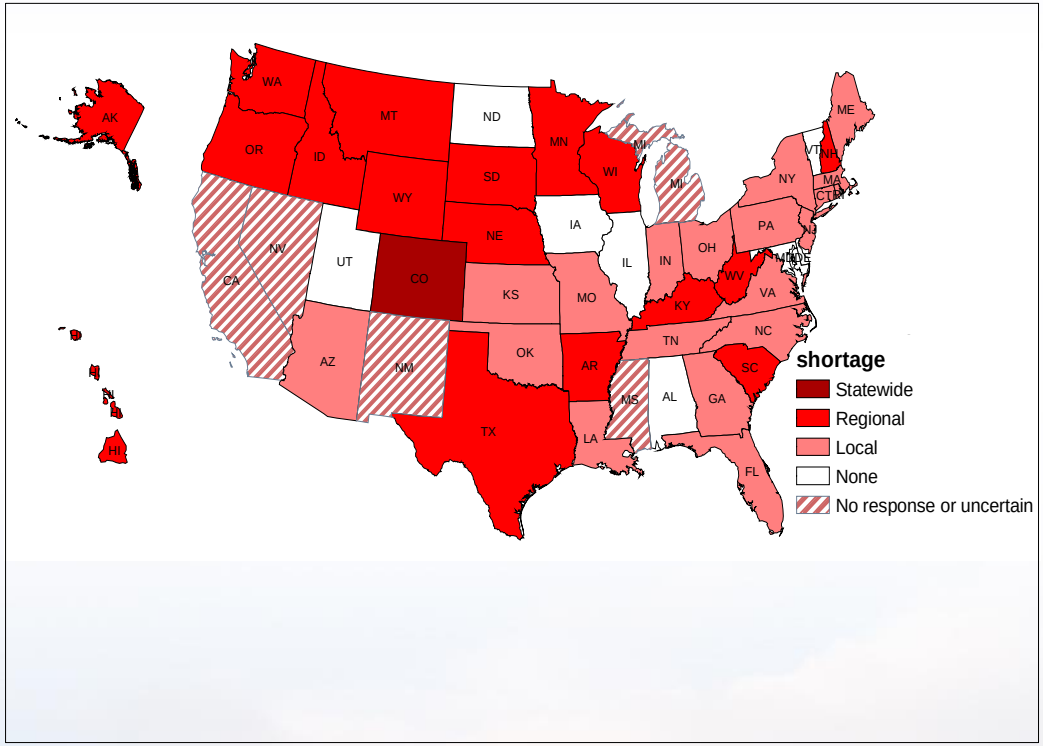
- **Asymmetric threats**
  - Changing , harder to define - requires flexible capabilities
- **Natural resources**
  - Climate, water, energy, food, and ecological induced social stress
- **Economic resources**
  - Need to transform government funding and spending paradigms
- **Infrastructure capacity and maintenance**
  - Maintain safe, secure, reliable, cost effective services - energy, water, transportation, waste, health, communications
  - Address significant interdependencies at a system level
- **Information technology mining and cyber security**

Sandia Vision 2050 – Role of the Labs in an Uncertain World

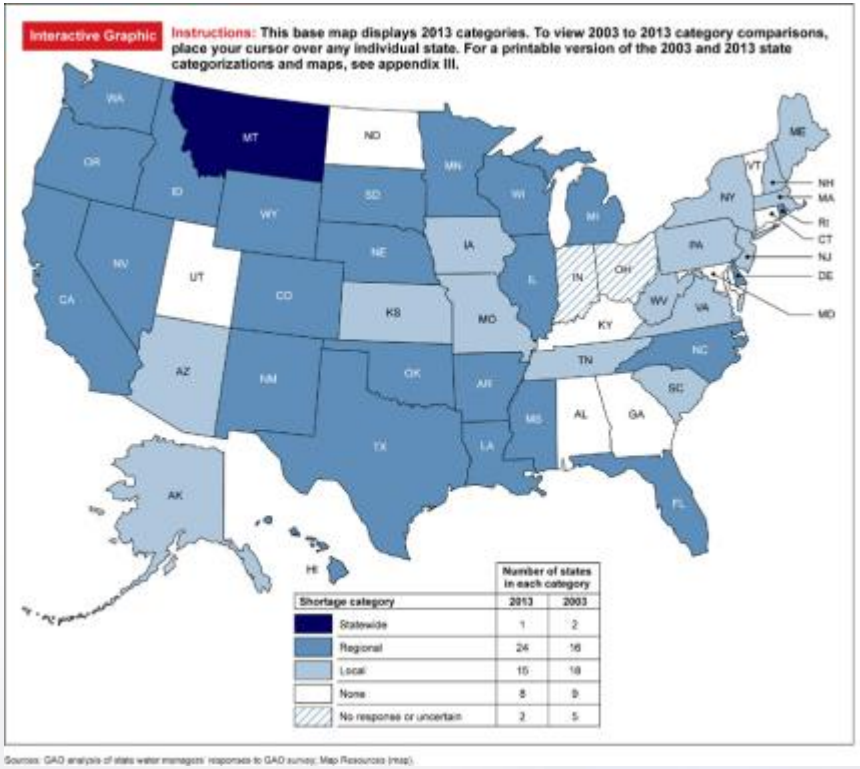
Mission Assurance – Will require approaches that are resilient and sustainable from an economic, natural resource, social, and infrastructure and technology viewpoint

Sandia National Laboratories

State Water Managers Expect Water Shortages to Increase Under Normal Conditions



GAO 2003



GAO 2013

Water stress is increasing and will impact water and energy infrastructure operations

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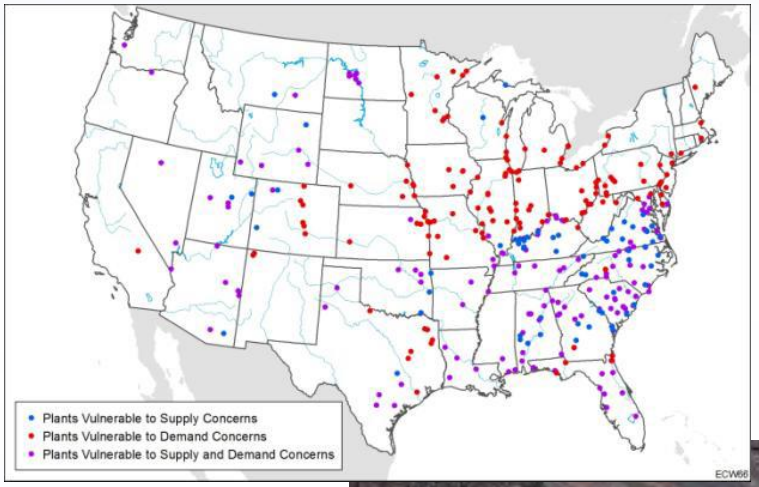
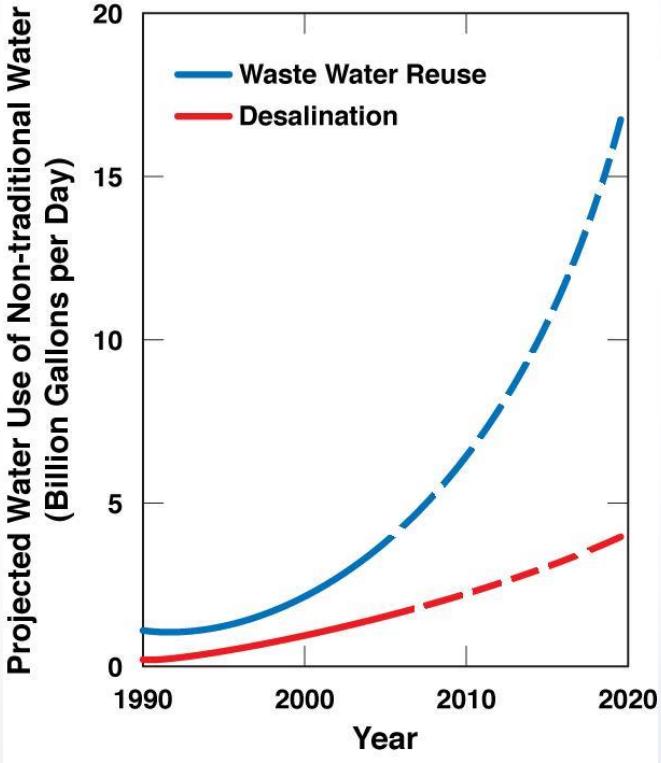
Climate is Impacting Water Runoff and Hydro and Thermoelectric Power Availability





Water stress is impacting water and energy infrastructure reliability, impacting future infrastructure needs and costs

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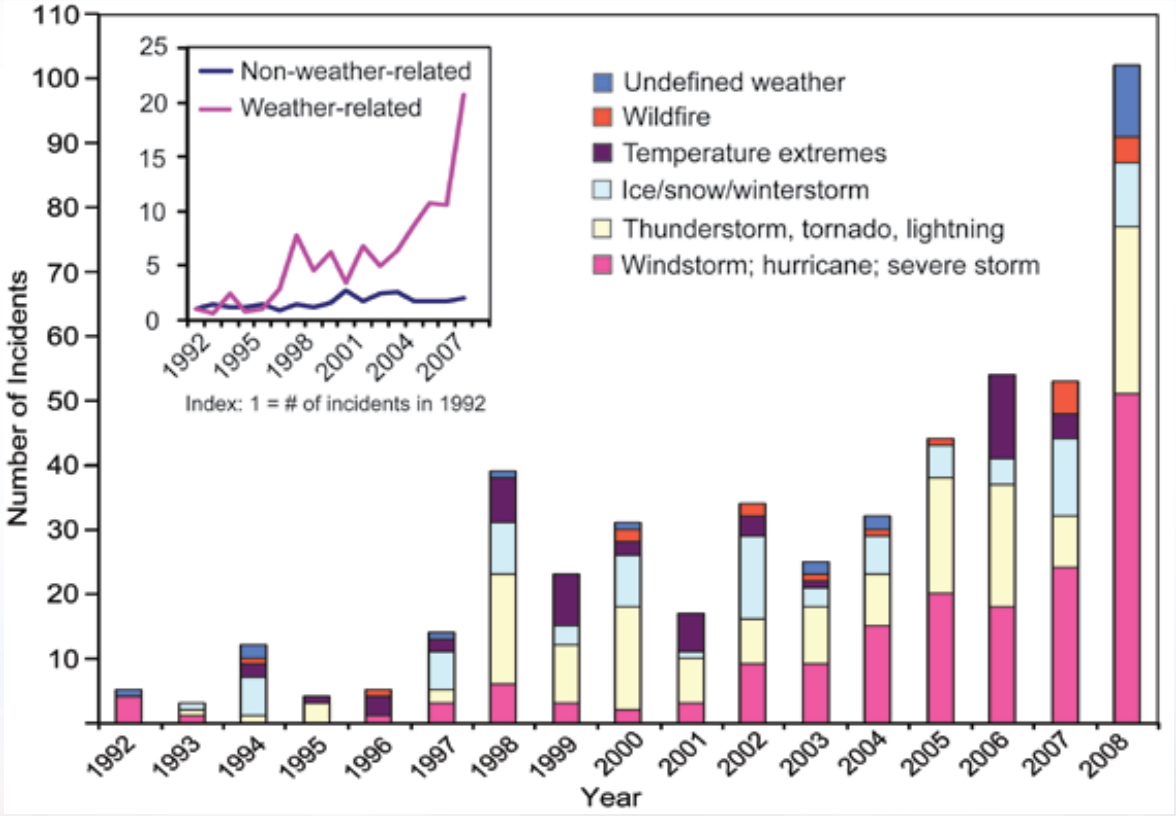
Climate is Impacting Electric Power Outage Causes, Frequency, Durations



Customers impacted per outage has tripled since 1990, also seeing regional outages significantly impacting community resiliency

Sandia National Laboratories

Example Community Infrastructure Resiliency Needs for an Extended Electric Power Outage

Asset	Building or Asset Name	Group A	Group B	Group C
1	Public Works Garage	■	■	■
2	Fire Department - HQ	■	■	■
3	Police Department - HQ	■	■	■
4	WTP + Low Lift Pump	■	■	■
5	WWTP	■	■	■
6	Radio Towers and System: Fire/Police	■	■	
7	High School (Emergency Shelter)	■	■	
8	WWTP Flood Control System	■		■
9	Flood Control - Remote Sewer Pump System			■
10	Municipal Building	■		
11	Food and Gas		■	
12	Fuel Company		■	
13	Cell Towers		■	

Common priorities to support community resilience are the electric power and water infrastructures

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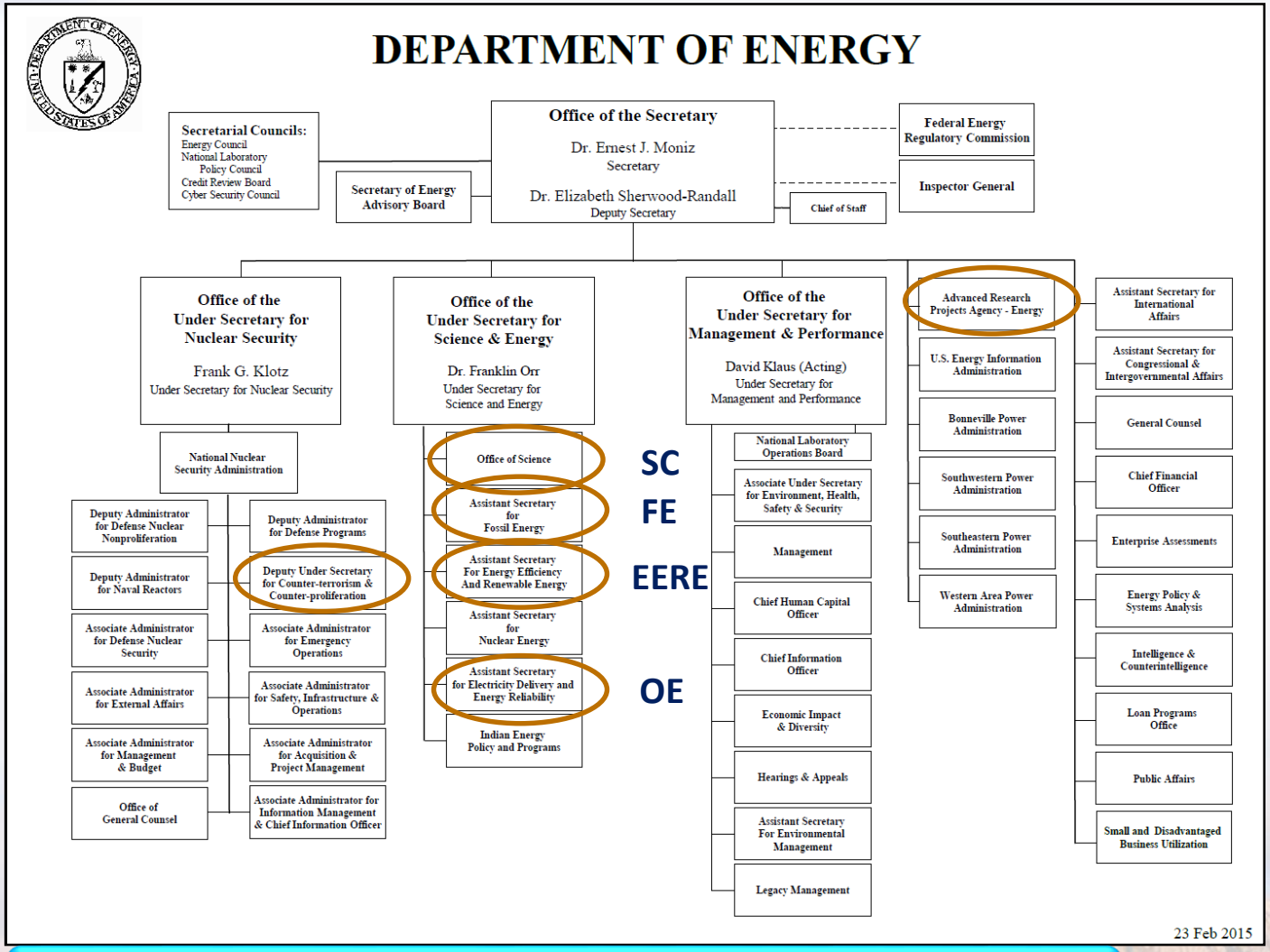
Department of Energy Management and Research and Development Structure



All of DOE's research and development efforts are coordinated through industry, academia, and the 17 DOE national laboratories

Sandia National Laboratories

Office of Electricity POC and Research and Development Focus Areas

MICHAEL PESIN, DEPUTY ASSISTANT SECRETARY, POWER SYSTEMS ENGINEERING RESEARCH AND DEVELOPMENT

Background: Mr. Pesin has 30 years of experience in the electric utility industry, much of it directing development and execution of advanced technology programs. His most recent assignment was with Seattle City Light (SCL) where he developed the technology strategy, managed research and development projects and directed strategic programs to management demonstration projects.

Research Management Portfolio:

- Substation automation, Distributed automation,
- Advanced metering infrastructure,
- Enterprise OT communication networks,
- Energy storage,
- Microgrids,
- Transactive energy management, and
- Distributed energy management systems.

Office of EERE POC's and Research and Development Focus Areas

ROLAND RISSER - DEPUTY ASSISTANT SECRETARY FOR RENEWABLE POWER

Background: Mr. Risser brings six years of experience directing EERE's Building Technologies Program and before joining EERE in 2010, he served on Pacific Gas and Electric's executive team overseeing Strategic Planning, Emerging Technologies, and Customer Energy Efficiency.
Research Management Portfolio:

- Geothermal, Solar, Wind,
- Water Power(hydropower, small head hydro, and kinetic hydropower), and
- Energy system integration

RUEBEN SARKAR - DEPUTY ASSISTANT SECRETARY FOR TRANSPORTATION
Research Management Portfolio:

- Vehicles, Fuel cells, Bioenergy

KATHLEEN HOGAN - DEPUTY ASSISTANT SECRETARY FOR ENERGY EFFICIENCY
Research Management Portfolio:

- Advanced manufacturing, buildings, federal energy management (FEMP), andintergovernmental partnerships

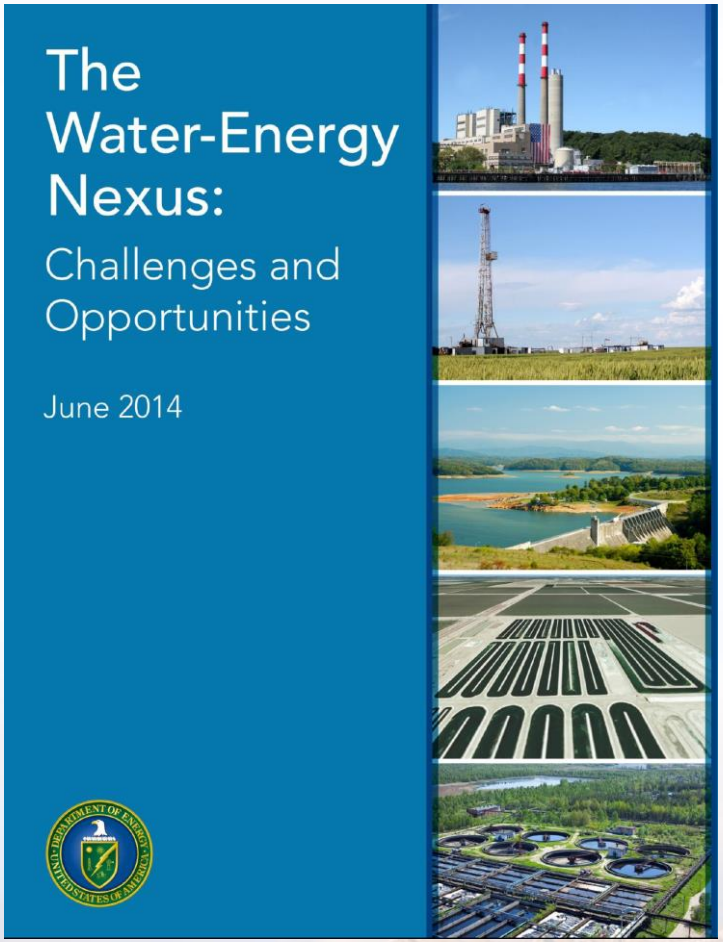
Sandia National Laboratories

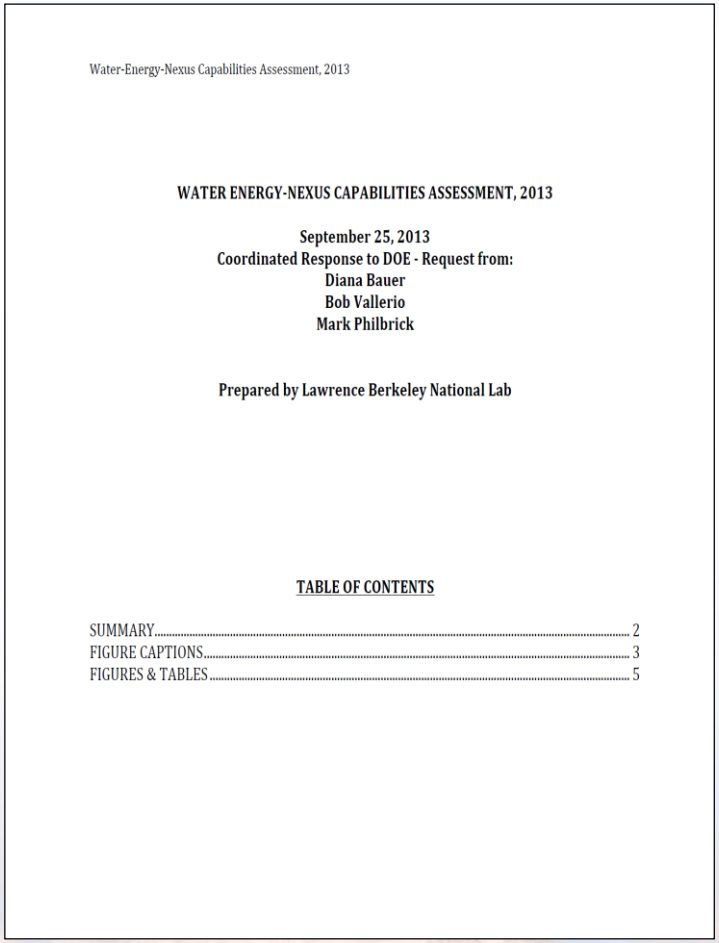
Department of Energy
Water Resources and Infrastructure Programs

- **Water Energy Tech Team (WETT) – Crosscutting Effort**
  - Water for Energy – Dianna Bauer (DOE/IA), Christopher Freitas (DOE/FE)
  - Energy for Water – Mark Johnson (DOE/EERE)
  - Climate impacts on ecosystems and water – Bob Vallario (DOE/SC)
- **Water Infrastructure Security**
  - National Infrastructure Simulation and Analysis Center (NISAC)
    - Joint with DHS – Sandia, Los Alamos, Argonne
  - DOE Deputy Secretary for Counter-terrorism
- **Water Resource and Infrastructure Resiliency**
  - Statewide water availability data base
    - National Energy Technology Laboratory and Sandia
  - Significant national laboratory research and regional support projects in the water resource and water infrastructure area
    - See 84 page list of specific national lab research and development projects, partners, and funding sources

Sandia National Laboratories

Recent DOE Water and Energy Infrastructure Related Needs and Capabilities Reports





Water-Energy-Nexus Capabilities Assessment, 2013

WATER ENERGY-NEXUS CAPABILITIES ASSESSMENT, 2013

September 25, 2013
Coordinated Response to DOE - Request from:
Diana Bauer
Bob Vallerio
Mark Philbrick

Prepared by Lawrence Berkeley National Lab

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Sandia National Laboratories

DHS Technology Transfer

LAB-TO-MARKET TECHNOLOGY FORUM

ENERGY & WATER INFRASTRUCTURES

THURSDAY, JUNE 2, 2016, 8:00 AM – 4:30PM

Homeland Security

Science and Technology

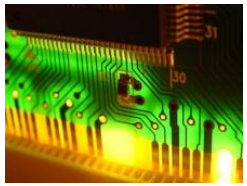
Homeland Security
Science and Technology

Homeland Security Missions

Preventing Terrorism

Border Security

Immigration Enforcement



Securing Cyberspace

Disaster Resilience

Counterterrorism + Cybersecurity + Resilience > Infrastructure Security

Operational and Support Components

A listing of all Operational and Support Components with websites or webpages on DHS.gov that currently make up the Department of Homeland Security.

United States Citizenship and Immigration Services (USCIS)
United States Citizenship and Immigration Services (USCIS) secures America's promise as a nation of immigrants by providing accurate and useful information to our customers, granting immigration and citizenship benefits, promoting an awareness and understanding of citizenship, and ensuring the integrity of our immigration system.

United States Customs and Border Protection (CBP)
United States Customs and Border Protection (CBP) is one of the Department of Homeland Security's largest and most complex components, with a priority mission of keeping terrorists and their weapons out of the U.S. It also has a responsibility for securing and facilitating trade and travel while enforcing hundreds of U.S. regulations, including immigration and drug laws.

United States Coast Guard (USCG)
The United States Coast Guard is one of the five armed forces of the United States and the only military organization within the Department of Homeland Security. The Coast Guard protects the maritime economy and the environment, defends our maritime borders, and saves those in peril.

Federal Emergency Management Agency (FEMA)
The Federal Emergency Management Agency (FEMA) supports our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

Federal Law Enforcement Training Center (FLETC)
The Federal Law Enforcement Training Center provides career-long training to law enforcement professionals to help them fulfill their responsibilities safely and proficiently.

United States Immigration and Customs Enforcement (ICE)
United States Immigration and Customs Enforcement (ICE) promotes homeland security and public safety through the criminal and civil enforcement of federal laws governing border control, customs, trade, and immigration.

Transportation Security Administration (TSA)
The Transportation Security Administration (TSA) protects the nation's transportation systems to ensure freedom of movement for people and commerce.

United States Secret Service (USSS)
The United States Secret Service (USSS) safeguards the nation's financial infrastructure and payment systems to preserve the integrity of the economy, and protects national leaders, visiting heads of state and government, designated sites, and National Special Security Events.

Homeland Security
Science and Technology

Homeland Security
Science and Technology

5 DHS Federal Laboratories

National Biodefense Analysis and Countermeasures Center (NBACC)

National Urban Security Technology Laboratory (NUSTL)

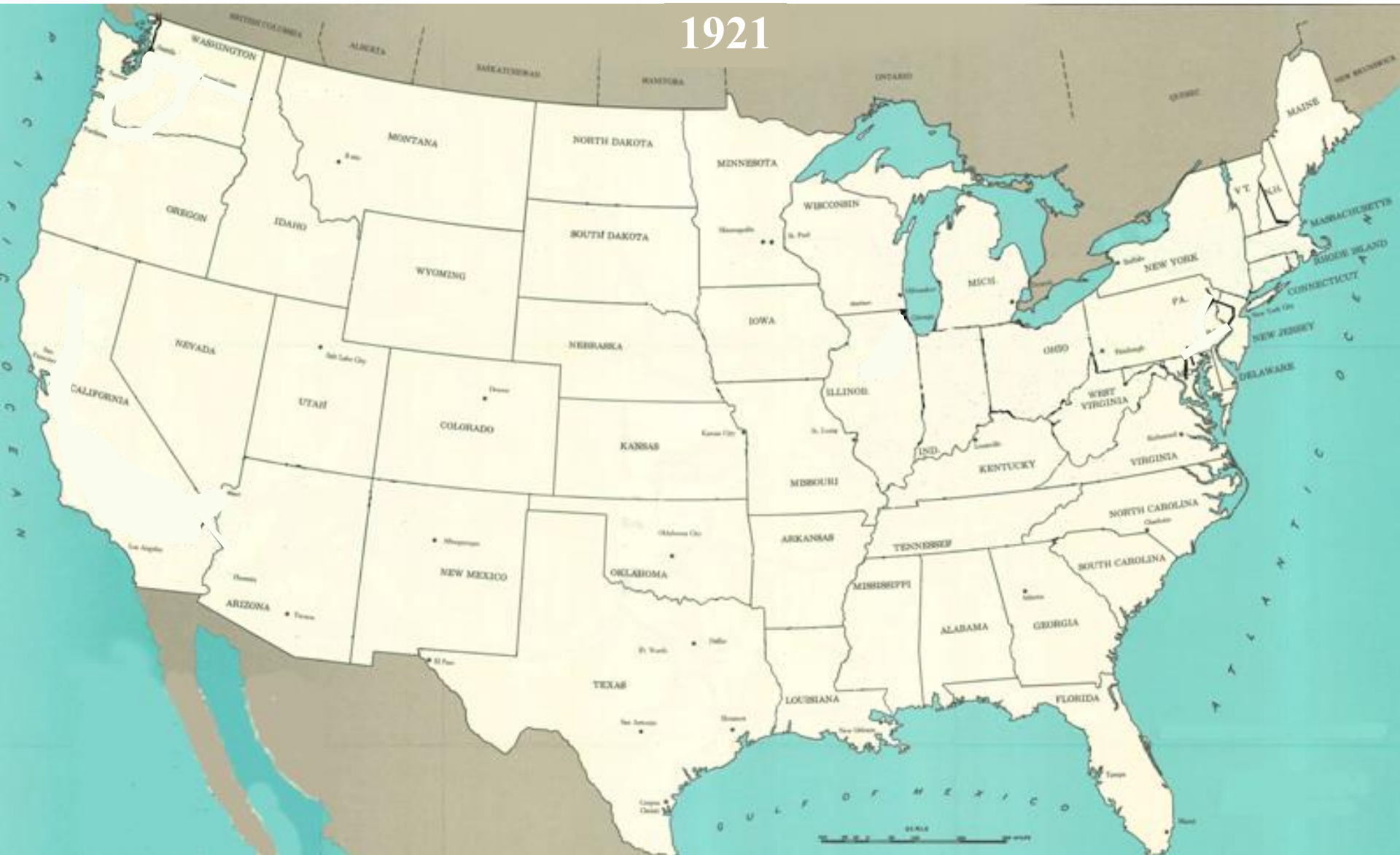
Chemical Security Analysis Center (CSAC)

Transportation Security Laboratory (TSL)

Plum Island Animal Disease Center (PIADC)

Homeland Security
Science and Technology

US Critical Infrastructure



Homeland Security
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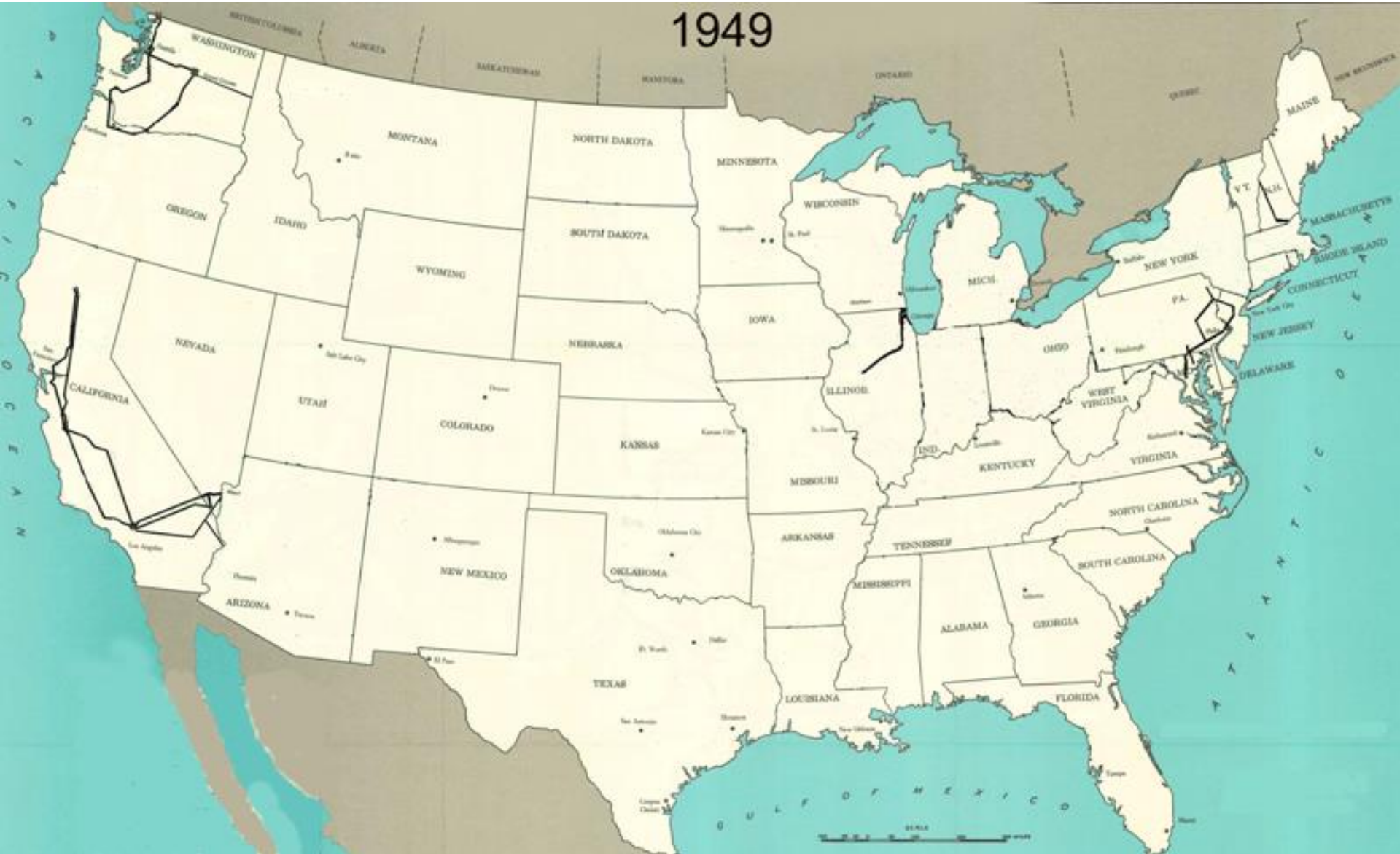
345KV+ Transmission Growth



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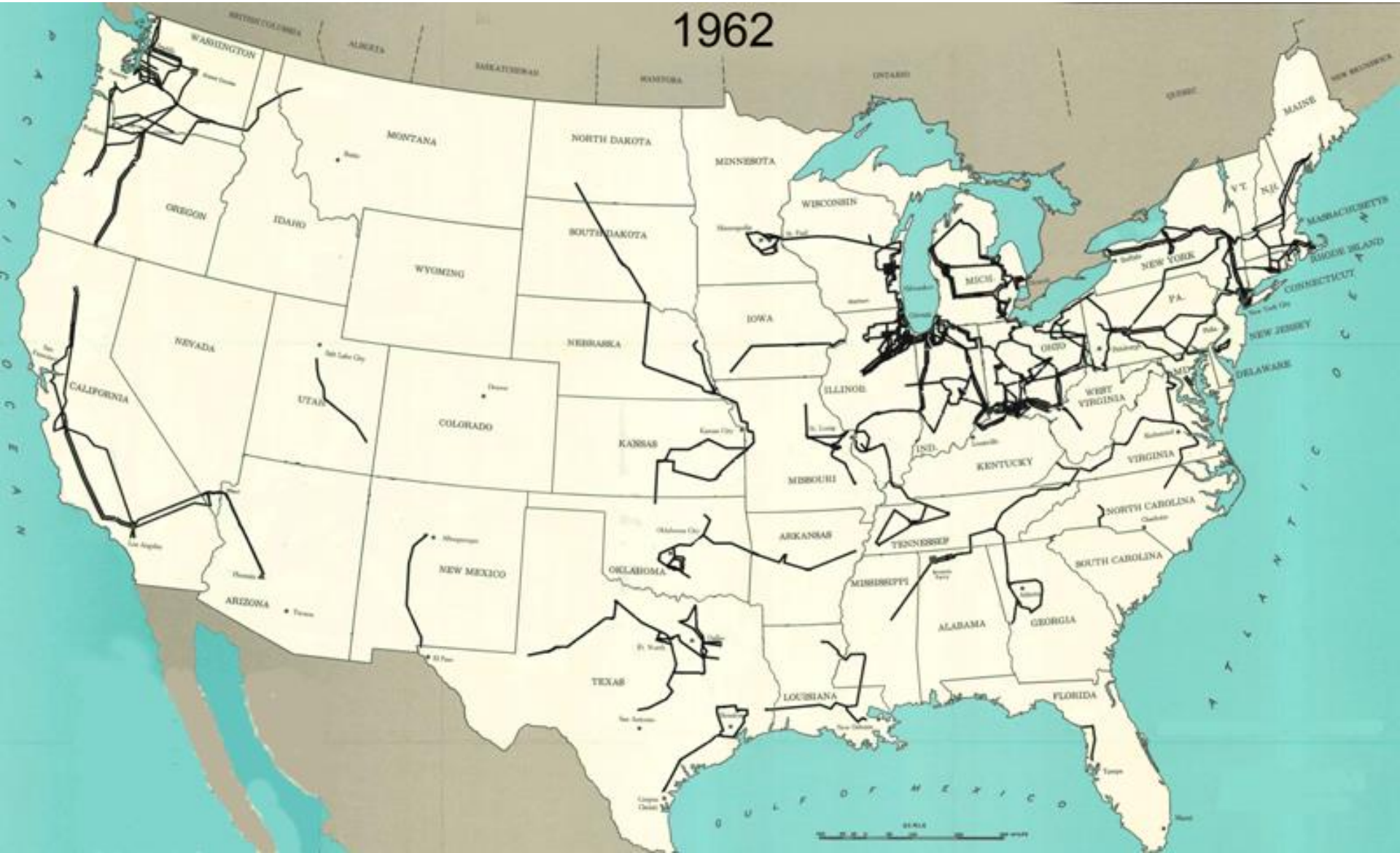
345KV+ Transmission Growth



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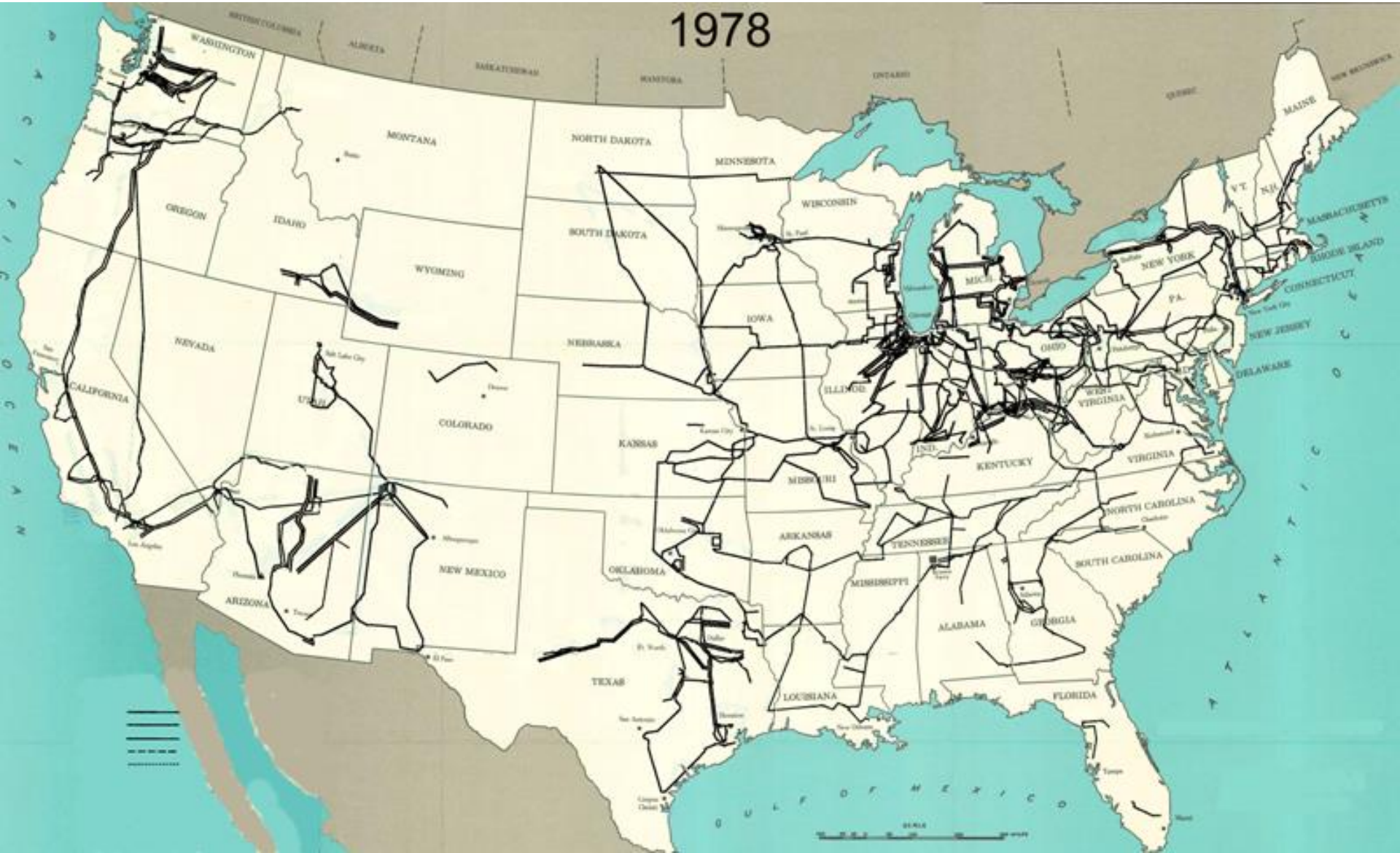
345KV+ Transmission Growth



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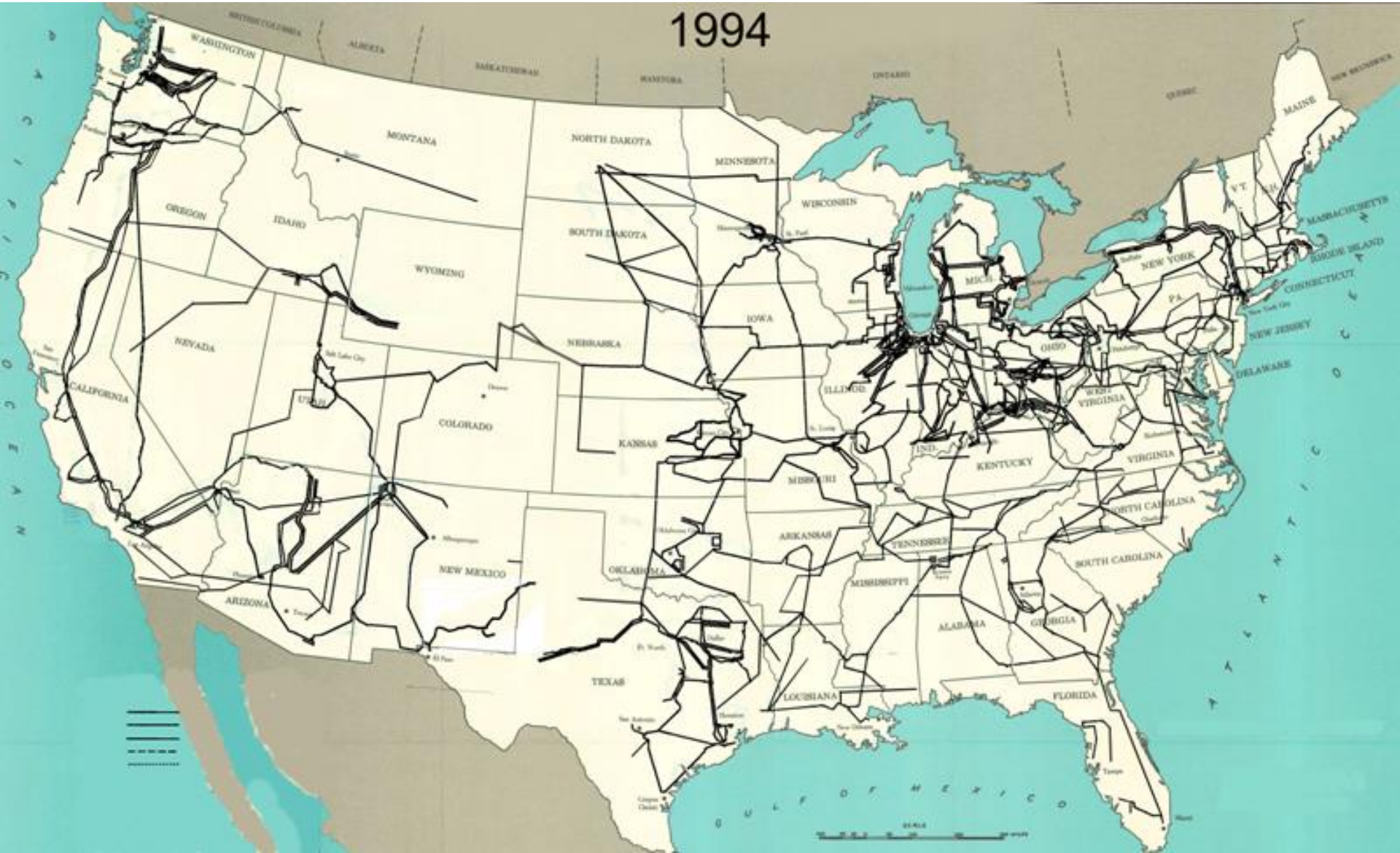
345KV+ Transmission Growth



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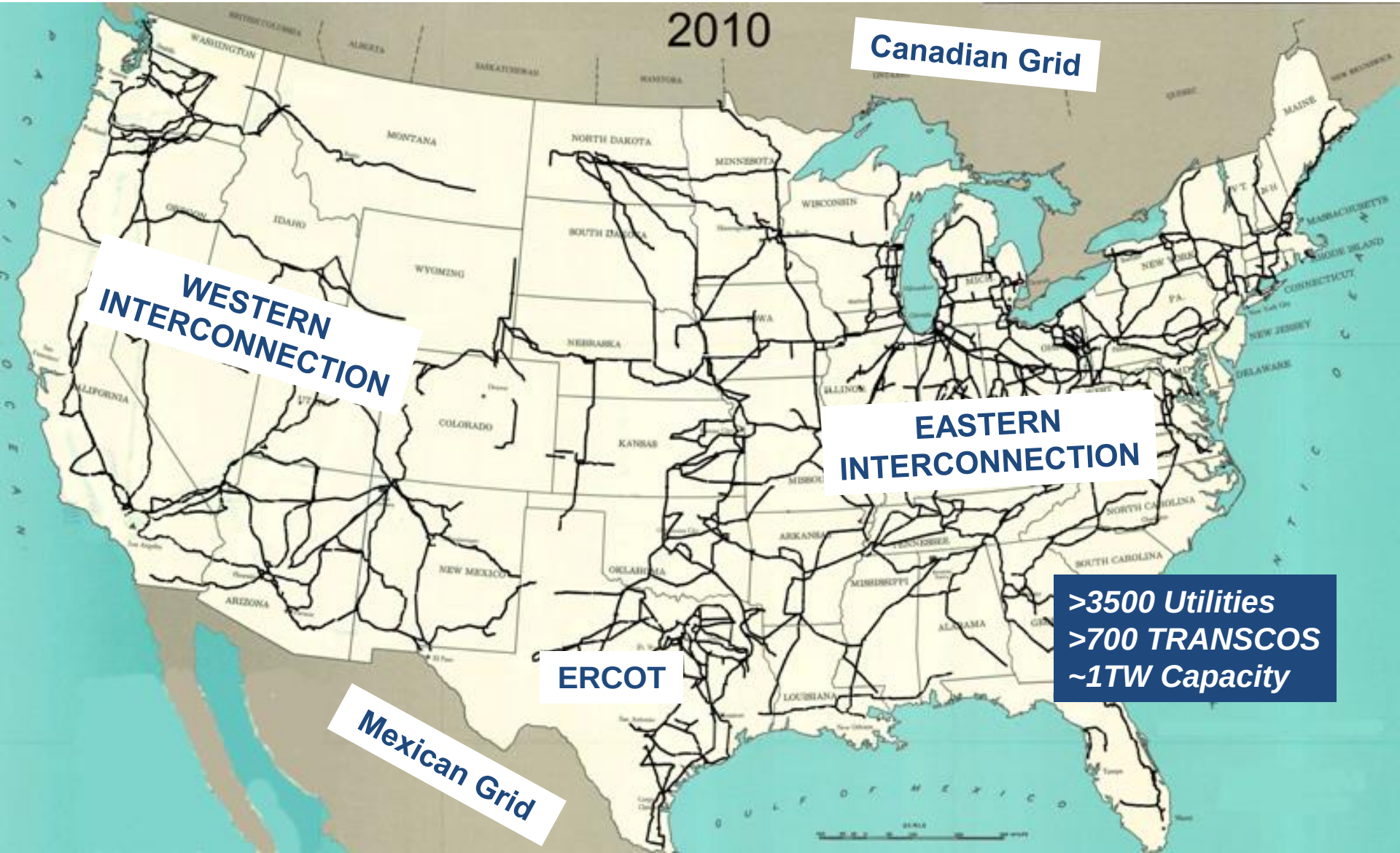
345KV+ North American Grid



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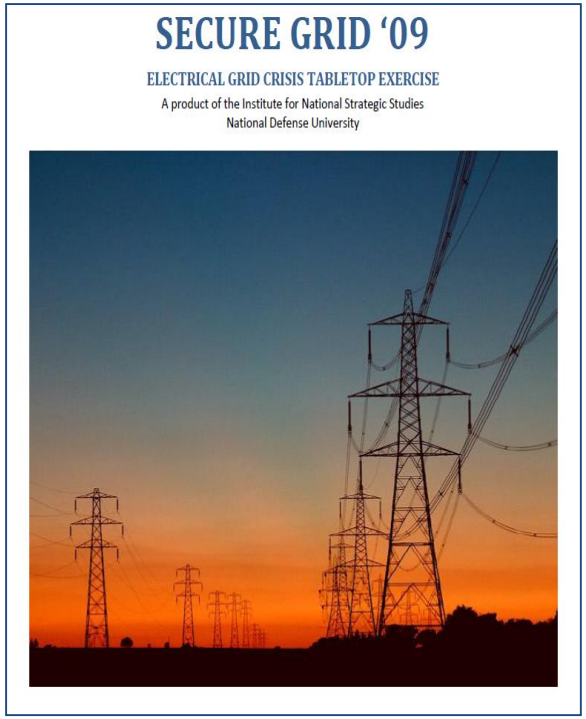
DHS-DOD-DOE Secure Grid Wargames

2009

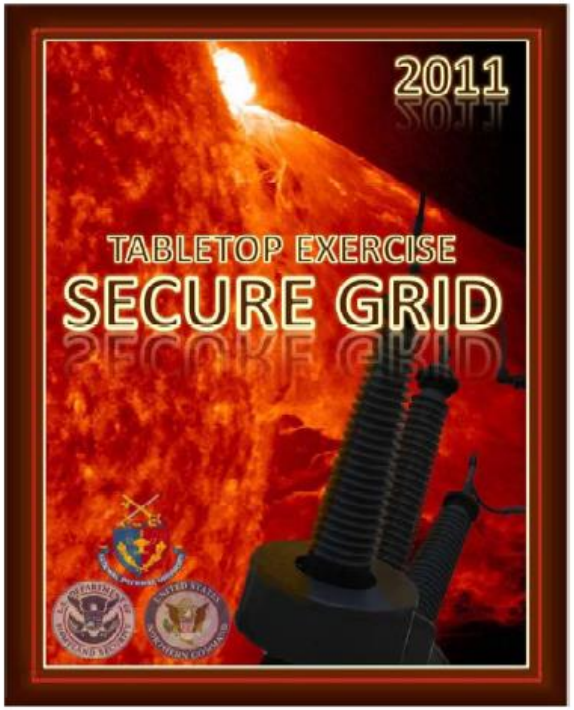


KINETIC ATTACK

2010

CYBER ATTACK

2011



SPACE WEATHER

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Extremely High Voltage Transformers

US grid has about 2000 EHV transformers

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Science and Technology

16 APRIL 2013

Shots in the Dark

A look at the April 16 attack on PG&E's Metcalf Transmission Substation

1	2	3	4	5	6	7
12:58 a.m., 1:07 a.m. Attackers cut telephone cables	**1:31 a.m.** Attackers open fire on substation	**1:41 a.m.** First 911 call from power plant operator	**1:45 a.m.** Transformers all over the substation start crashing	**1:50 a.m.** Attack ends and gunmen leave	**1:51 a.m.** Police arrive but can't enter the locked substation	**3:15 a.m.** Utility electrician arrives

Sources: PG&E; Santa Clara County Sheriff's Dept.; California Independent System Operator; California Public Utilities Commission; Google (image)
The Wall Street Journal

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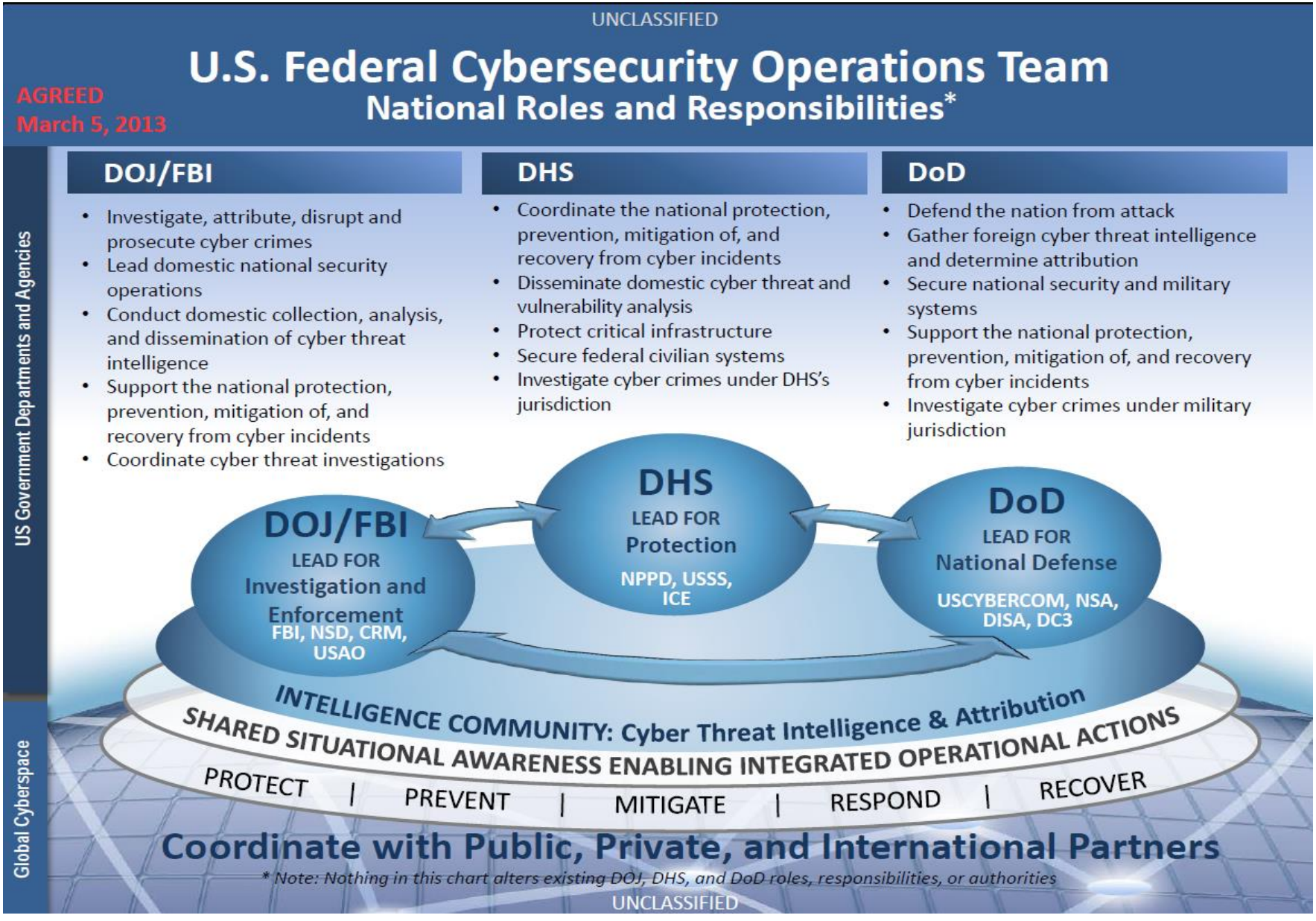
Federal Cyber Roles



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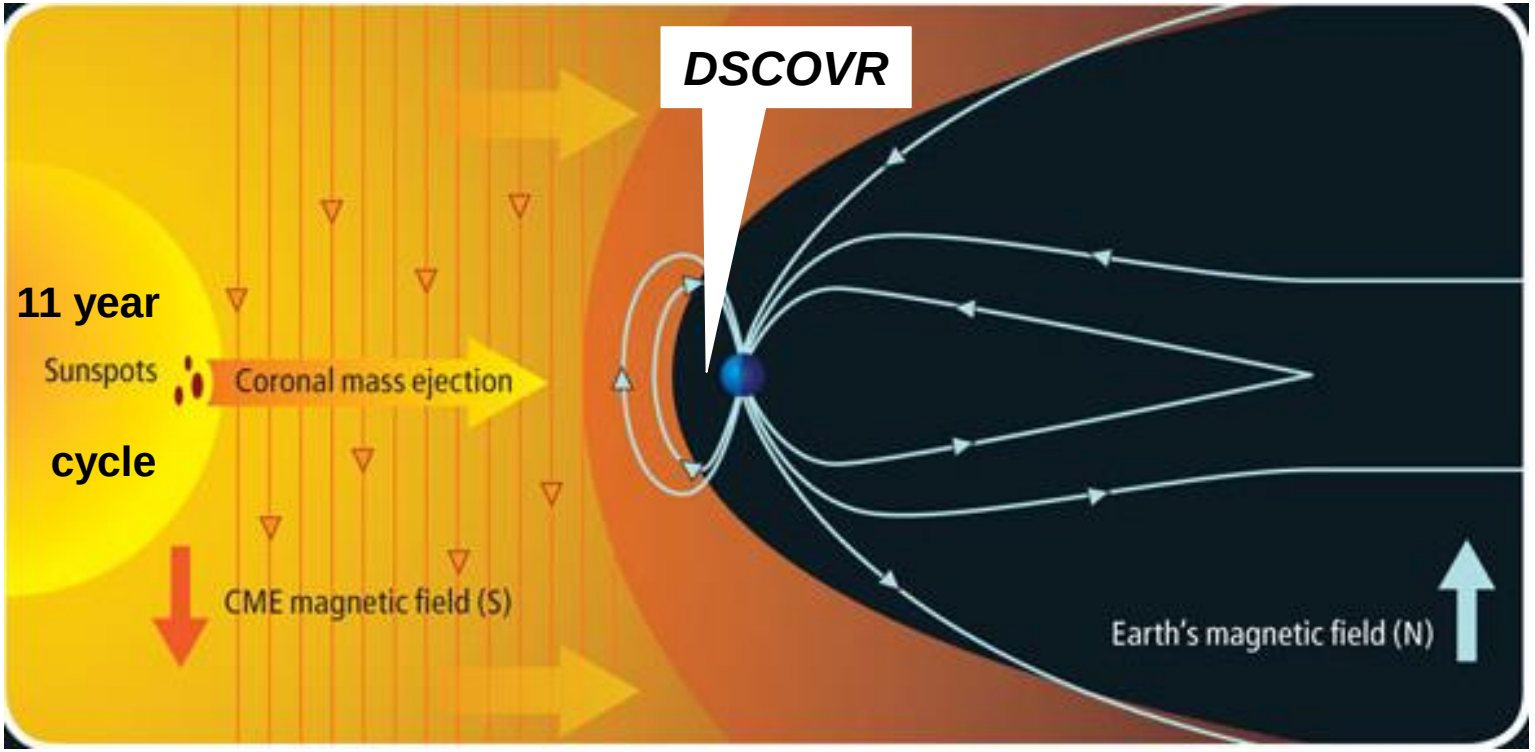
Severe Space Weather



Space Weather Superstorms
1859 & 1921
Can Reach Earth in 18 Hours

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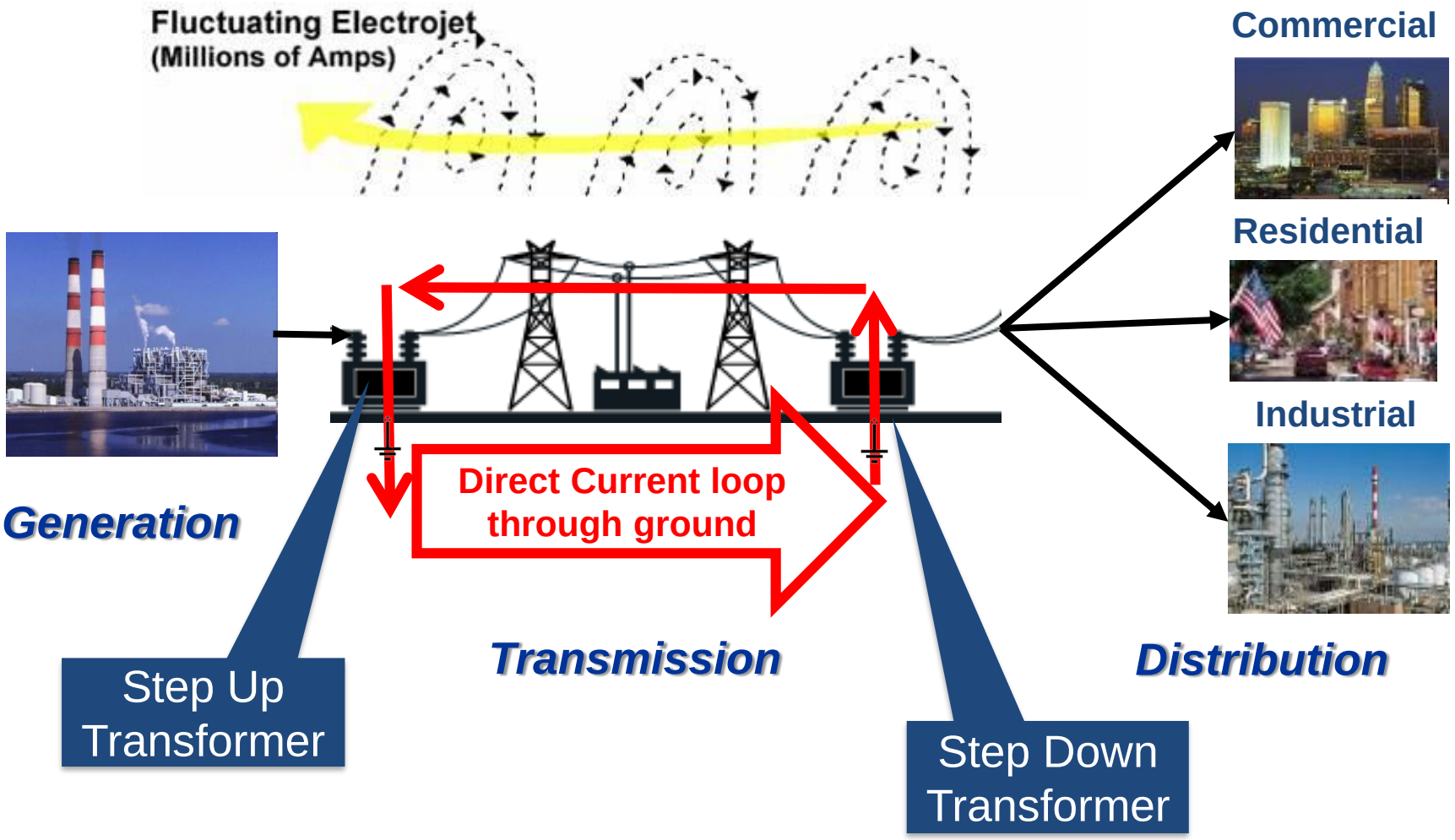
Geomagnetic Induced Current (GIC)



AC transformers can be damaged by DC

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A Recent EHV Transformer Example

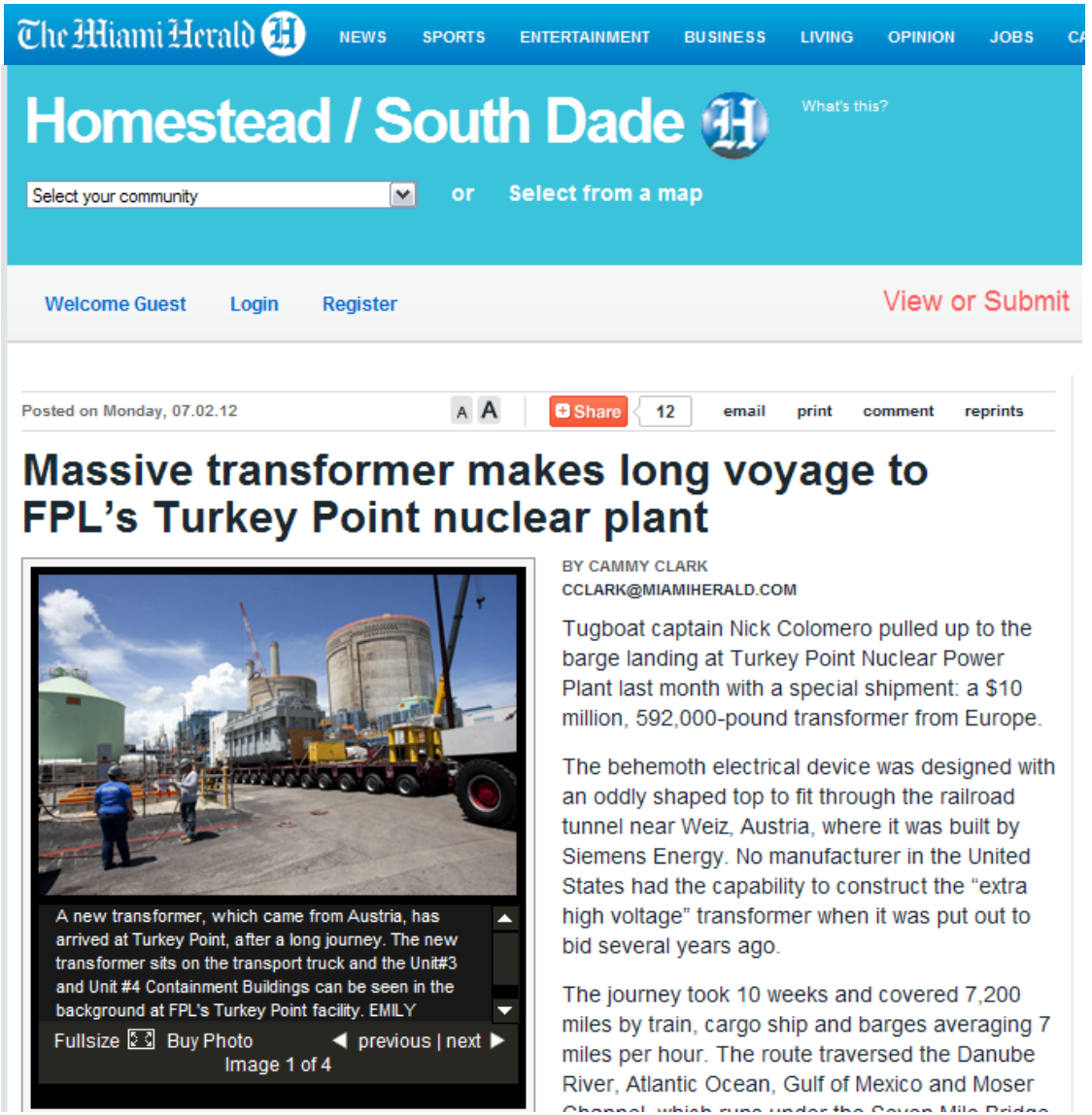
1000 MW

$10M

600,000 pounds

2 ½ months

Built by Siemens in Austria



The Miami Herald

NEWS SPORTS ENTERTAINMENT BUSINESS LIVING OPINION JOBS CA

Homestead / South Dade

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Posted on Monday, 07.02.12 A A Share 12 email print comment reprints

Massive transformer makes long voyage to FPL's Turkey Point nuclear plant

A new transformer, which came from Austria, has arrived at Turkey Point, after a long journey. The new transformer sits on the transport truck and the Unit#3 and Unit #4 Containment Buildings can be seen in the background at FPL's Turkey Point facility. EMILY

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Image 1 of 4

BY CAMMY CLARK
CCLARK@MIAMIHERALD.COM

Tugboat captain Nick Colomero pulled up to the barge landing at Turkey Point Nuclear Power Plant last month with a special shipment: a $10 million, 592,000-pound transformer from Europe.

The behemoth electrical device was designed with an oddly shaped top to fit through the railroad tunnel near Weiz, Austria, where it was built by Siemens Energy. No manufacturer in the United States had the capability to construct the "extra high voltage" transformer when it was put out to bid several years ago.

The journey took 10 weeks and covered 7,200 miles by train, cargo ship and barges averaging 7 miles per hour. The route traversed the Danube River, Atlantic Ocean, Gulf of Mexico and Moser

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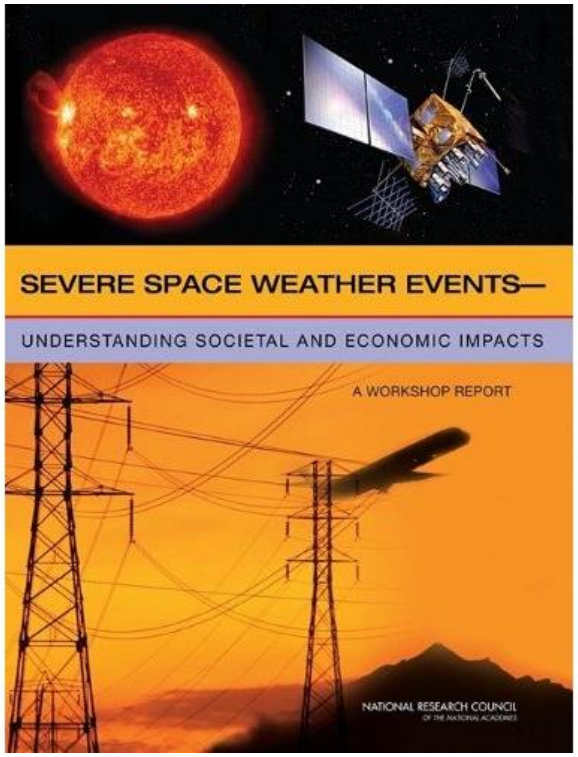
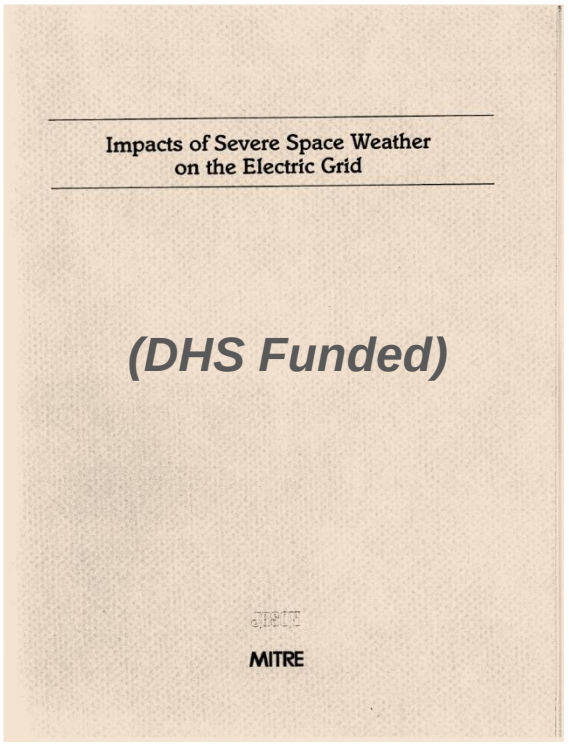
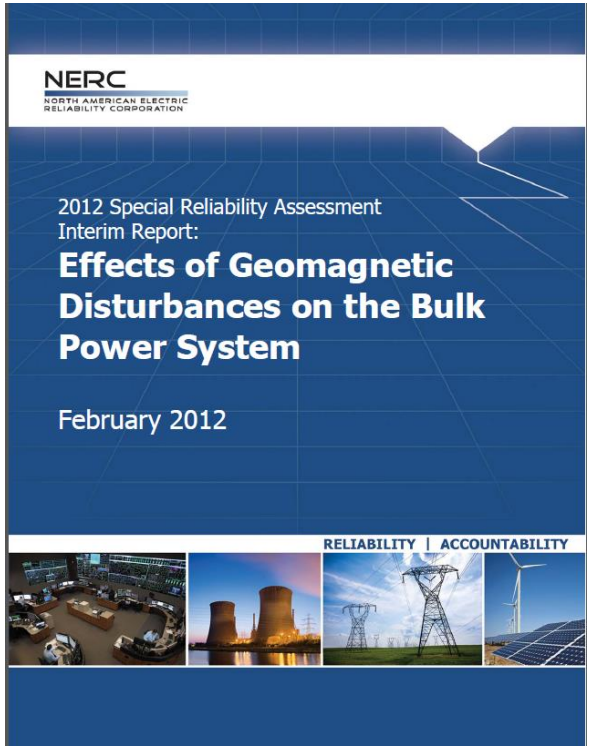
Space Weather Impact Studies



NAS 2008



JASONS 2011



NERC 2012

HIGH IMPACT LOW

Homeland Security
Science and Technology

DHS Recovery Transformer Program

1 Large Heavy 3φ 345KV XFMR

3 Smaller Lighter 1φ 345KV XFMRs

Rapid Crisis Response

Recovery Transformer (RecX) In-Grid Demonstration March 2012

Homeland Security
Science and Technology

RecX Deployment Overview

In Partnership with:

EPRI ELECTRIC POWER RESEARCH INSTITUTE
CenterPoint Energy
ABB
INL Idaho National Laboratory

The New York Times
Business Day
Energy & Environment

14 MARCH 2012

A Drill to Replace Crucial Transformers (Not the Hollywood Kind)

Scott Dalton for The New York Times

CenterPoint Energy workers installed emergency replacement transformers on Wednesday in Texas City, Tex., near Houston.

By MATTHEW L. WALD
Published: March 14, 2012

The electric grid, which keeps beer cold, houses warm, and city traffic from turning to chaos, depends on about 2,100 high-voltage transformers spread throughout the country.

Green
A blog about energy and the environment.
Go to Blog »

But engineers in the electric business and officials with the Department of Homeland Security have long been concerned that transformers are vulnerable to disruptions from extreme weather like hurricanes, as

Homeland Security
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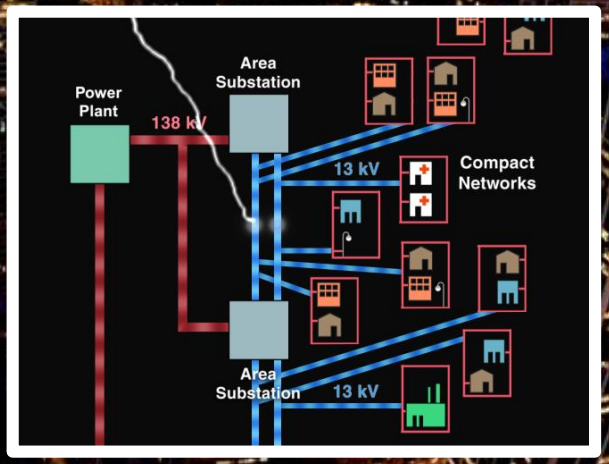
Resilient Electric Grid (REG)



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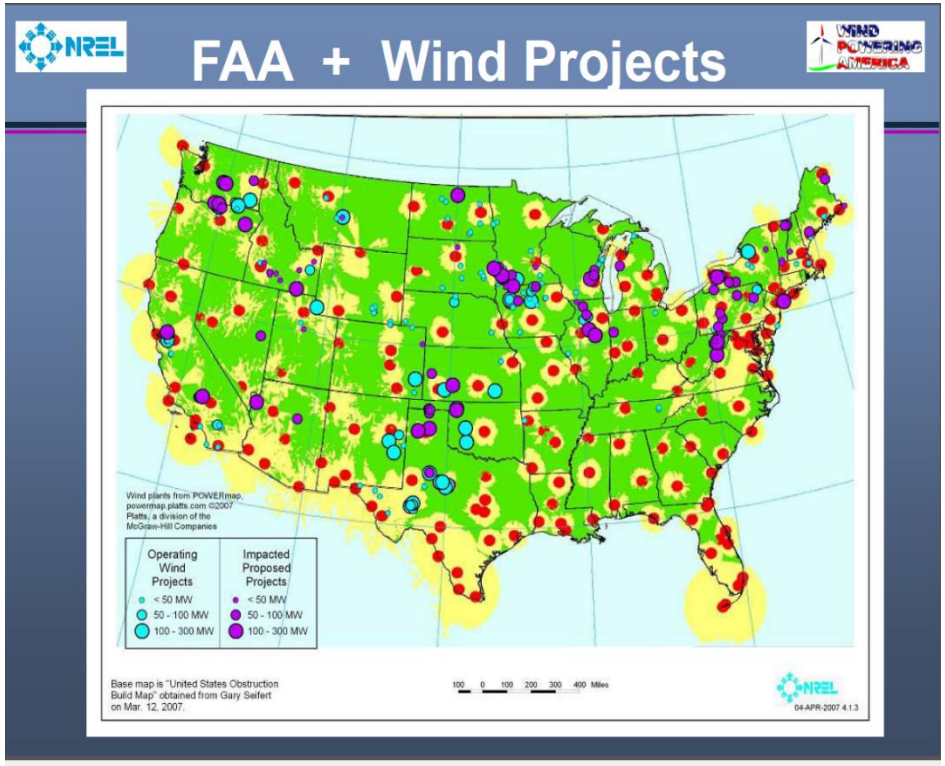
Wind Farm Siting

Radar Interference Mitigation



washingtonpost.com > Nation > Green

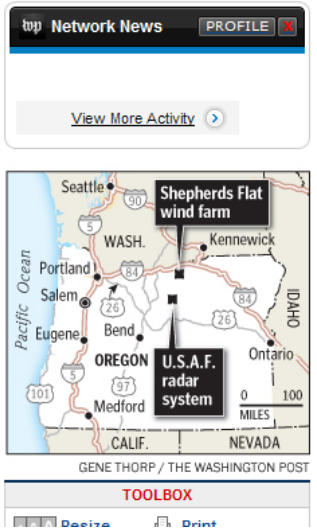
Pentagon objections hold up Oregon wind farm

By Juliet Eilperin
Washington Post Staff Writer
Thursday, April 15, 2010; 9:09 PM

One of the Obama administration's prime initiatives -- the development of sources of alternative energy to reduce U.S. reliance on foreign oil, create American jobs and combat climate change -- is being jeopardized by competing concerns of the Defense Department.

The Pentagon is threatening to scuttle what promises to be the world's largest wind farm, in eastern Oregon, arguing that the giant turbines could interfere with an Air Force radar system.

Caithness Energy had planned to break ground two weeks from now on the 845-megawatt, $2 billion Shepherds Flat wind farm near Arlington, Ore., an economically depressed rural community. But last month, Pentagon officials moved to deny the developer its final Federal Aviation Administration permit.



350 mph wind turbine blade tips look like aircraft on FAA long range Doppler radars (now funded by DoD and DHS for long term national airspace surveillance)

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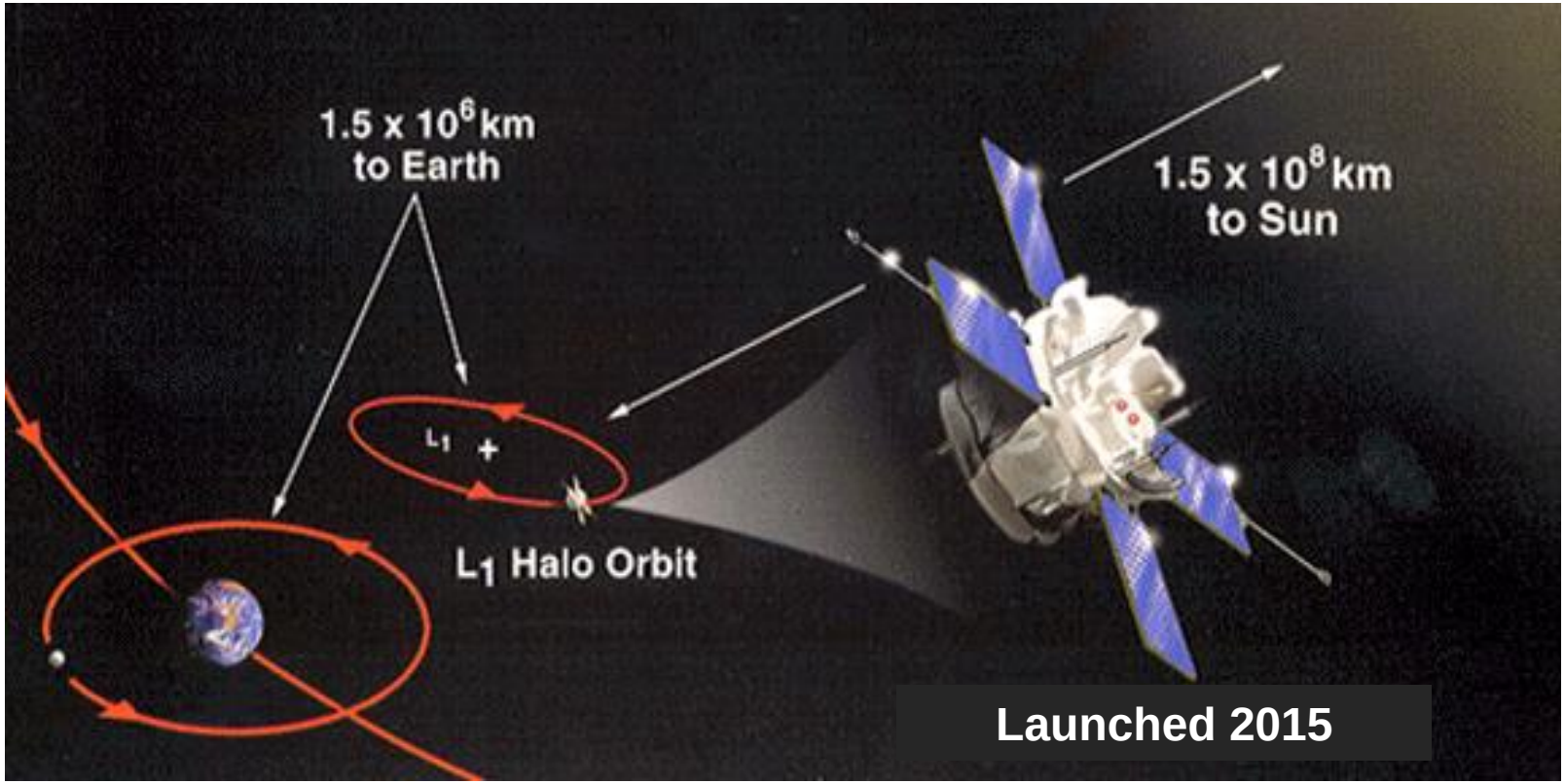
Science and Technology

BACKUP

Homeland Security
Science and Technology

DSCOVR - *Provides about 20 to 45 minutes warning*



Tells NOAA if CME Impacts Will Be Strong or Weak