U.S. Department of Energy's
Office of Science

# Basic Research Integration with Applied Programs EPACT Section 994

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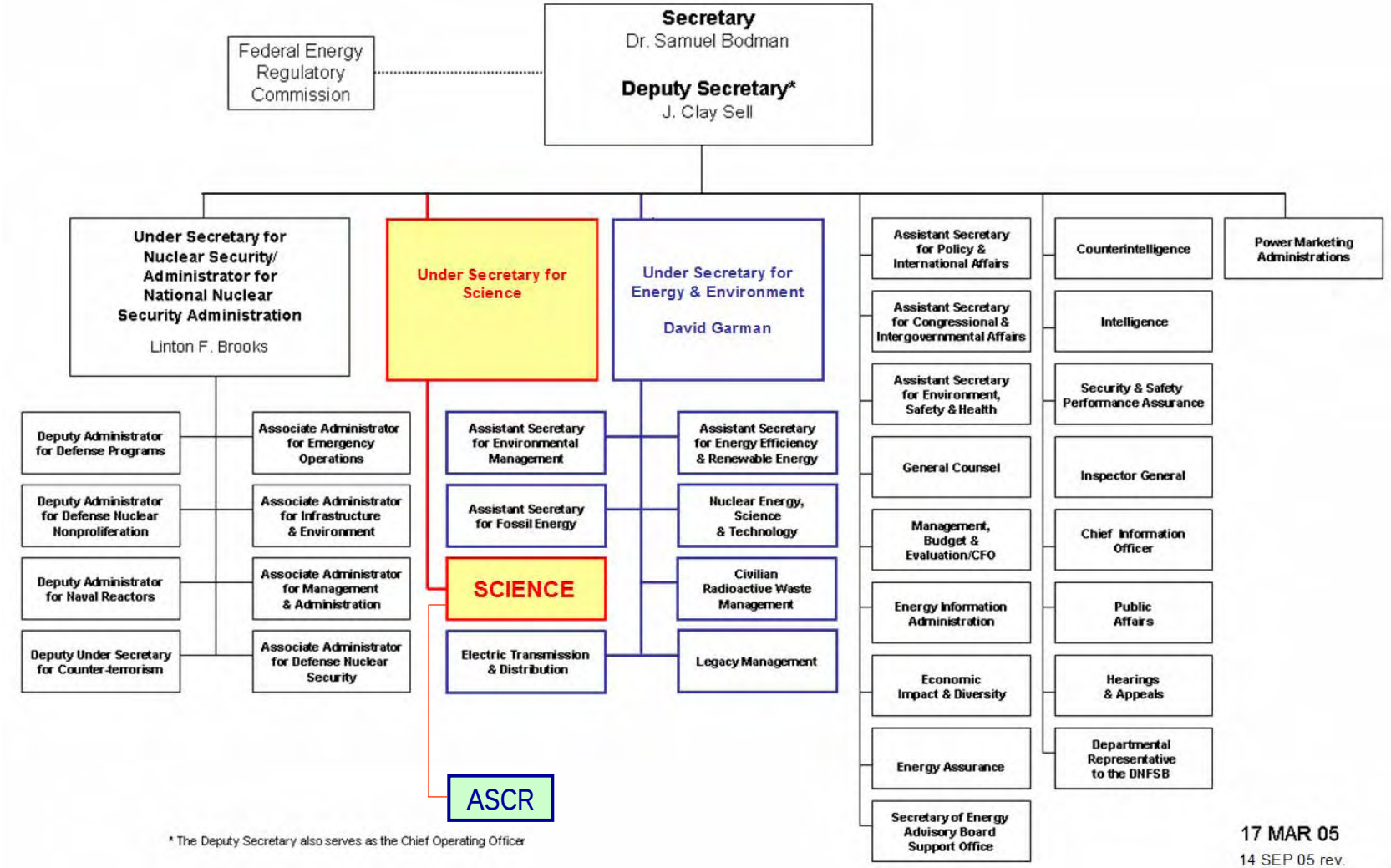
# Energy Policy Act Requirements (EPACT)

- **The Energy Policy Act of 2005 (EPACT), Section 994, requires the Department of Energy (DOE) to:**
  - **periodically review all of the science and technology activities of the Department in a strategic framework that takes into account both the frontiers of science to which the Department can contribute and the national needs relevant to the Department's statutory missions; and**
  - **develop a plan to improve coordination and collaboration in research, development, demonstration, and commercial application activities across Department organizational boundaries**
- **Plan is due to Congress August 8, 2006**

# Organization of DOE



# EPACT Report Sections

- **Integration Activities and Processes**
  - **identifies how the applied technology and science programs are currently coordinating activities**
- **Significant Crosscutting Scientific and Technical Issues**
  - **summarizes the scientific and technical issues and research questions that span more than one program or major office of the Department based on the results of the S&T Program Reviews**
- **Strategies for Implementation**

# Crosscutting Technical Issues

- **Highly Crosscutting**
  - **Radiation-Resistant Materials***
  - **Energy Storage**
  - **Advanced Mathematics for Optimization of Complex Systems, Control Theory, and Risk Assessment****
  - **Building Synergies With Work-for-Others, Laboratory Directed Research and Development (LDRD), and DOE University-Sponsored Research**

**Items with * have significant ASCR involvement, Items with ** are ASCR-Led**

# Crosscutting Technical Issues

- **Energy Related**
  - **Superconductivity**
  - **Power Electronics/Switching**
  - **Grid Control***
  - **Wind Power***
  - **Catalysis for Energy Efficiency and Renewable Energy**
  - **Nuclear Fuel Materials and Design**
  - **Catalysis for Hydrogen Production from Nuclear Energy**
  - **Risk Assessments for Geologic Carbon Sequestration***
  - **Gasification and Combustion Modeling and Computational System Dynamics***
  - **Advanced Sensors and Controls for Gasification and Combustion Systems***
  - **High Performance Materials for Advanced Fossil Energy Processes**

**Items with * have significant ASCR involvement, Items with ** are ASCR-Led**

# Crosscutting Technical Issues

- **National Nuclear Security**
  - **Innovative Materials for Safeguards and Security**
  - **Nuclear Test Detection***
  - **Remote Sensing and Analysis of Radioactive Materials and Nuclear Weapons**

Items with * have significant ASCR involvement, Items with ** are ASCR-Led

# Crosscutting Technical Issues

- **Environmental Management**
  - **Chemistry and Separations for Radioactive Waste**
  - **Modeling, Simulation, and Scaling Issues for Environmental Management***
  - **Predicting High Level Waste System Performance over Extreme Time Horizons***

**Items with * have significant ASCR involvement, Items with ** are ASCR-Led**

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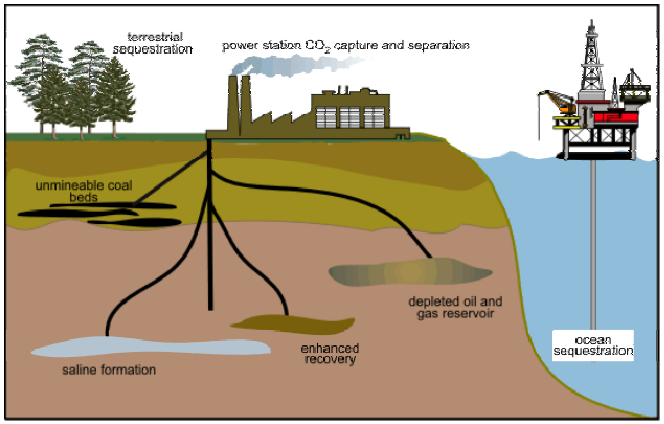
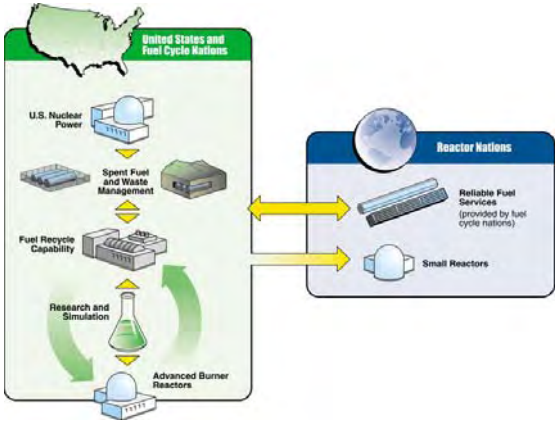
# Advanced Mathematics for Optimization of Complex Systems, Control Theory, and Risk Assessment

## Carbon Sequestration

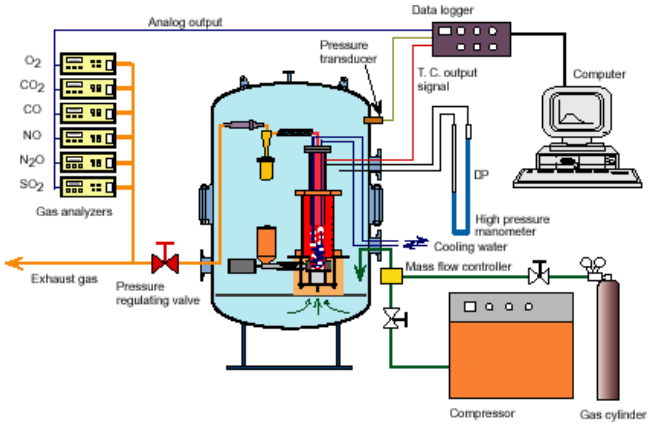



## Electric Power Grid

## Nuclear Power Systems (GNEP)




## Advanced Combustion Systems



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# Advanced Mathematics for Optimization of Complex Systems, Control Theory, and Risk Assessment

- **Characteristics**
  - Many control points or interacting subsystems
  - Stochastic loads or inputs
  - Complex interconnections
- **Example Questions**
  - How many sensors are needed? Where?
  - Is control system stable?
  - Can we evaluate risk systematically?
  - How do we optimize system?
- **Currently organizing workshop to further define opportunity and critical issues**