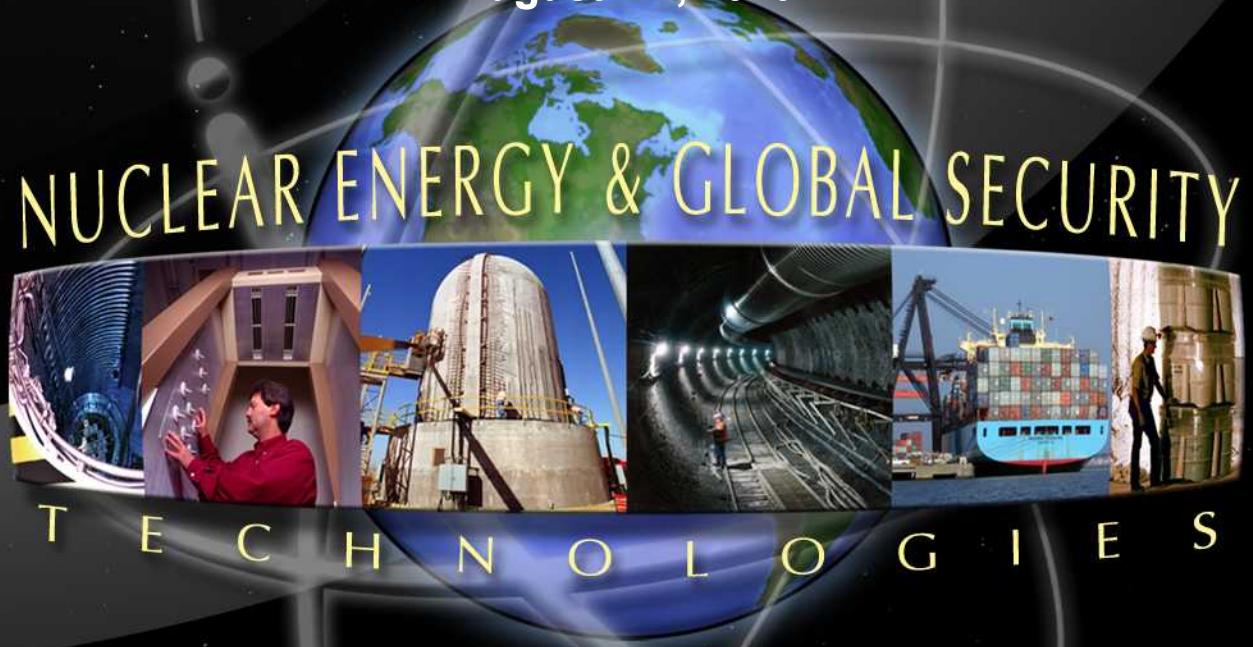
Overview of Capabilities and International Work

SAND2010-5499P

US Government's Steering Committee
Developing Countries Implementing Nuclear Power Programs

Washington DC
August 24, 2010



Susan Pickering, Senior Manager
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Sandia National Laboratories
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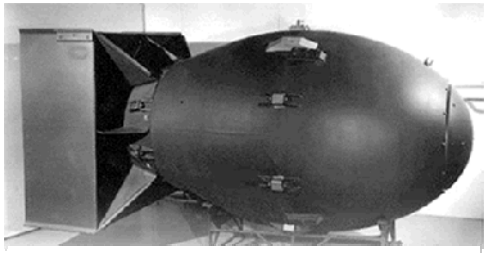
Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Today's talk

- General overview
- Capabilities
- International nuclear energy projects (selected)

Sandia's History

"Exceptional service in the national interest"



THE WHITE HOUSE
WASHINGTON

May 13, 1949

Dear Mr. Wilson:

I am informed that the Atomic Energy Commission intends to ask that the Bell Telephone Laboratories accept under contract the direction of the Sandia Laboratory at Albuquerque, New Mexico.

This operation, which is a vital segment of the atomic weapons program, is of extreme importance and urgency in the national defense, and should have the best possible technical direction.

I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

I am writing a similar note direct to Dr. O. E. Buckley.

Very sincerely yours,

Harry Truman

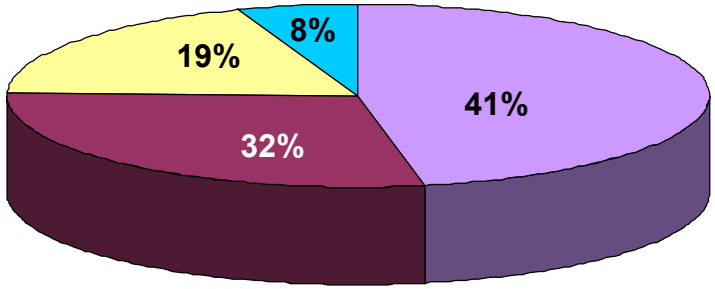
Mr. Leroy A. Wilson,
President,
American Telephone and Telegraph Company,
195 Broadway,
New York 7, N. Y.

Sandia National Laboratories

People and Budget

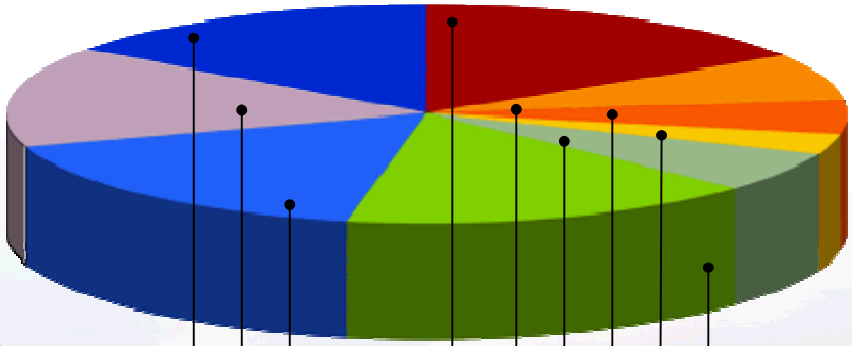
- On-site workforce: 11,415
- Regular employees: 8,225
- Gross payroll: ~$900 million

FY09 operating revenue
$2.2 billion

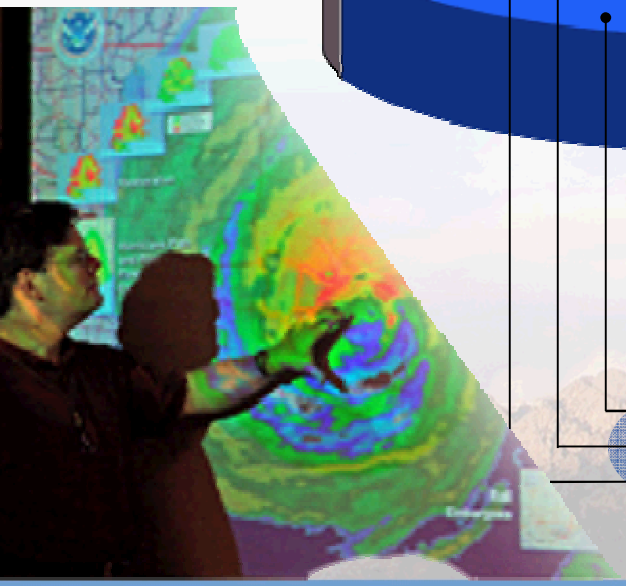


Nuclear Weapons
Defense Systems & Assessments
Energy, Resources, & Non-proliferation
Homeland Security & Defense

Technical staff (3,850) by discipline:

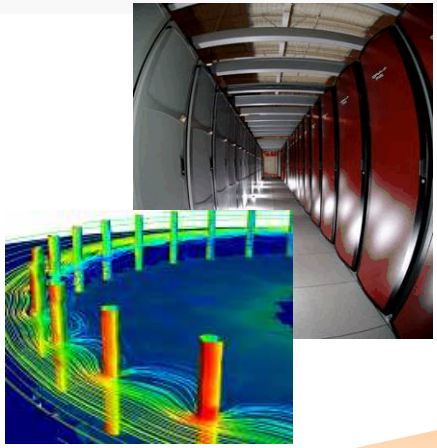


- Computing 16%
- Math 3%
- Chemistry 5%
- Physics 6%
- Other science 7%
- Other fields 16%
- Electrical engineering 17%
- Mechanical engineering 15%
- Other engineering 15%

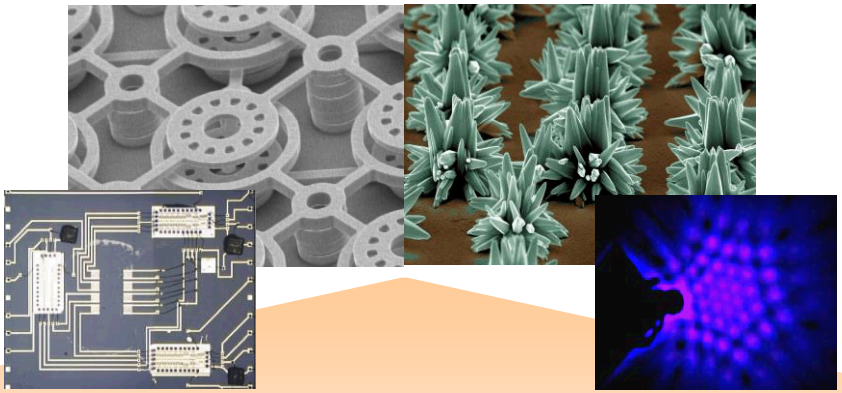


Sandia National Laboratories

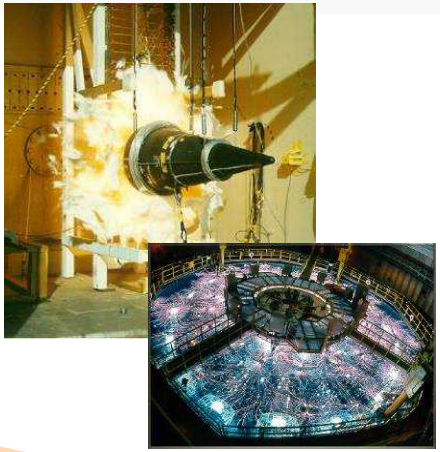
Research Disciplines Drive Capabilities



High Performance Computing

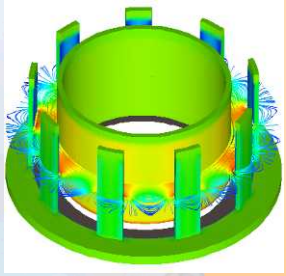


Nanotechnologies & Microsystems

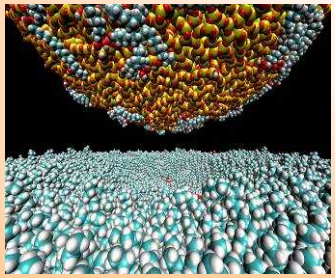


Extreme Environments

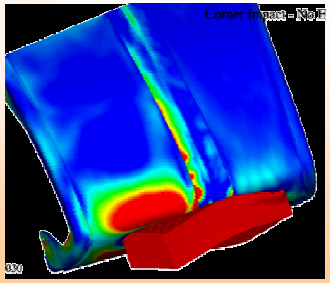
Computer Science



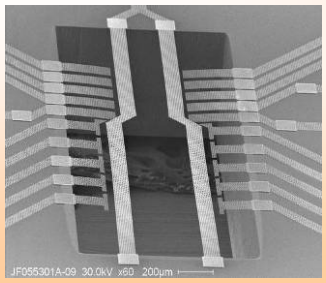
Materials



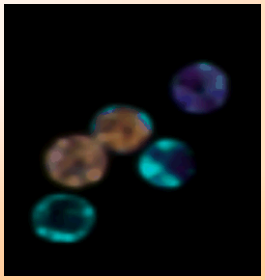
Engineering Sciences



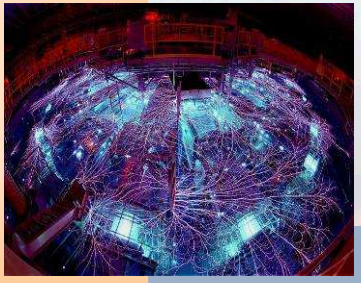
Micro Electronics



Bioscience



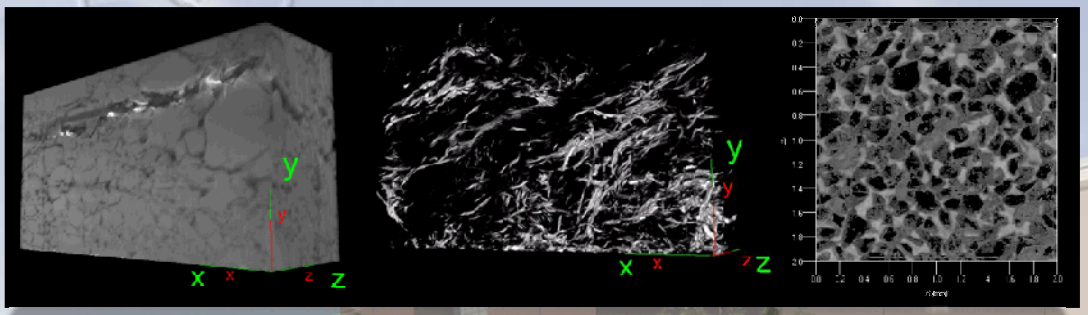
Pulsed Power



Research Disciplines

Sandia National Laboratories

Geoscience Research & Applications

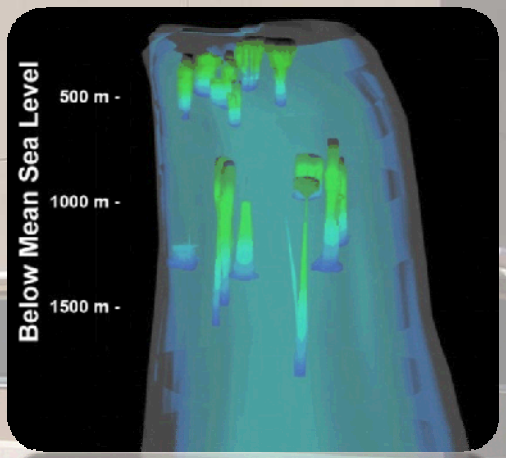


Selma Chalk, MS
(x dim=25 microns)

Kirtland Shale, NM
(x dim=25 microns)

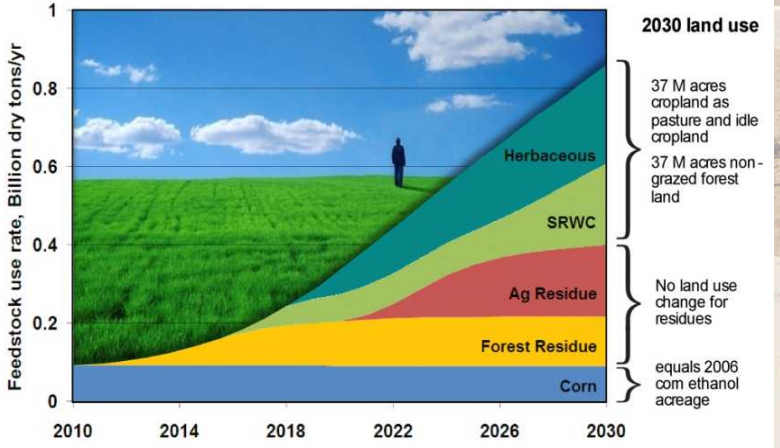
Castlegate Sandstone, CO
(x dim = 2mm

Caprock sealing analysis for CO_2 sequestration

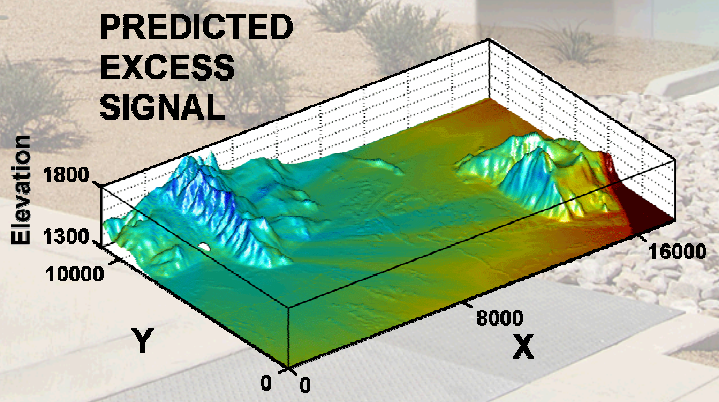


SPR 3D Representation of caverns in Bayou Choctaw Salt Dome

Biomass for 90 billion gallons of ethanol can be produced largely without reducing current active cropland



GM 90-Billion Gallon Biofuel Deployment Study, results of systems dynamics modeling of biofuel feedstocks.



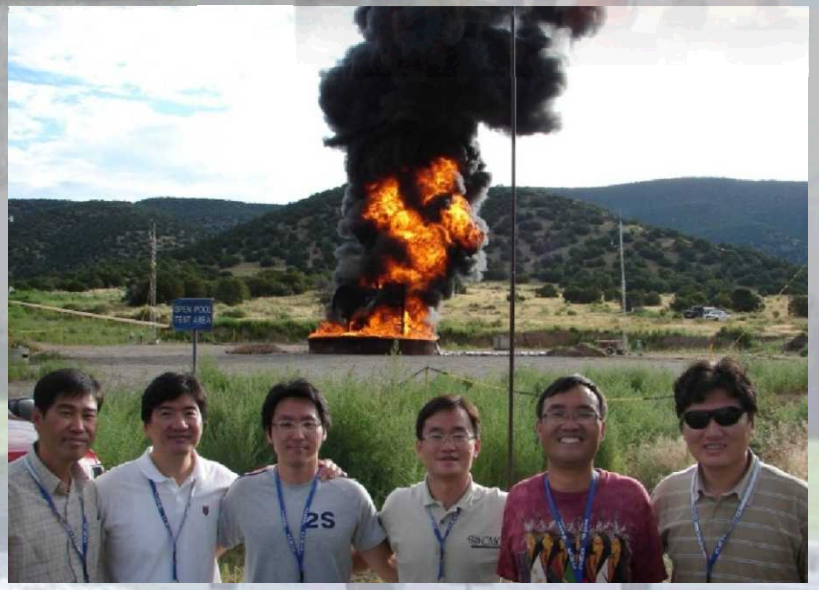
High-Fidelity Seismic and Acoustic Monitoring for Underground Facility Emissions.

Repository Programs: WIPP and YMP

Yucca Mountain Tunnel

North Portal of Yucca Mountain

Sandia mobile hydrologic well testing equipment



Training Korean engineers in repository science and operations.

Cooperative International Programs

IAEA Safeguards
Data Security

Warhead & Fissile Material Transparency Joint Exercise with the UK

Chemical industry security
in Asia

Risk assessment of the Al-Kindi Company for the Production of Veterinary Vaccines (Bagdad, Iraq).

Explosive Portal, King Hussien Border between Isreal and Jordan

International Security Systems

Training and Workshops

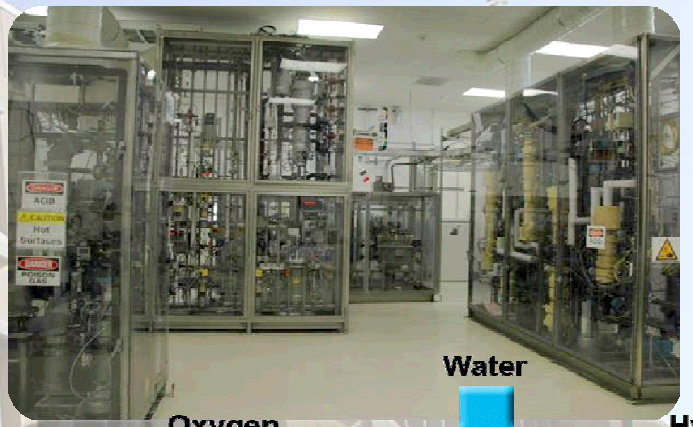
Physical Security Solutions for High Value Assets

Second Line of Defense Rail Monitoring for Radiation

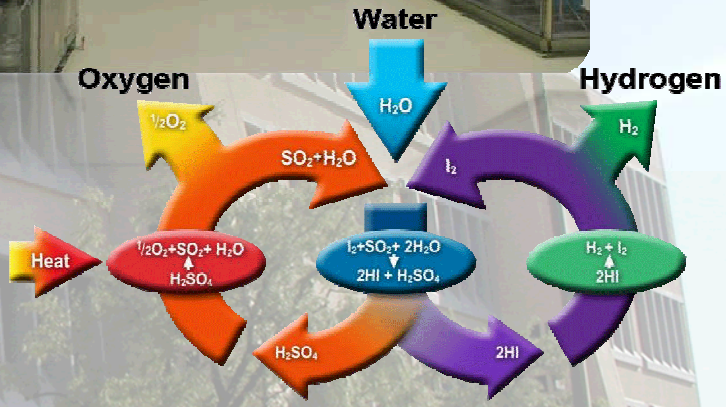
Technology Integration and Development

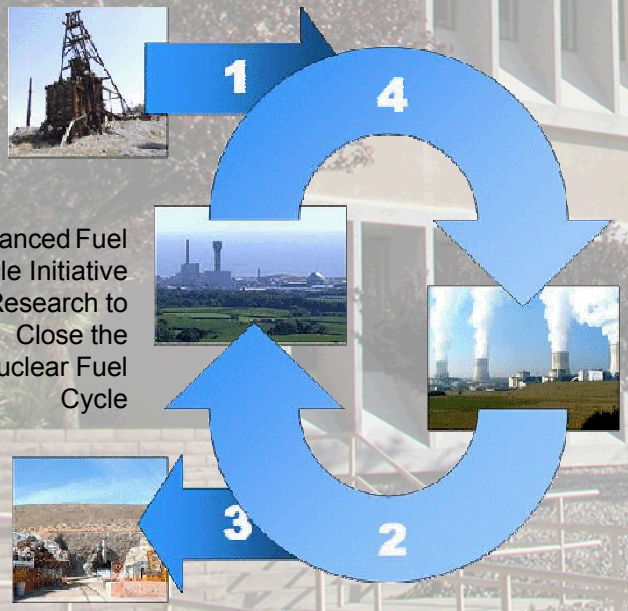
Advanced Nuclear Energy Program

GEN IV Advanced Energy Conversion Supercritical CO2 Brayton Cycle Technology for Advanced Reactors

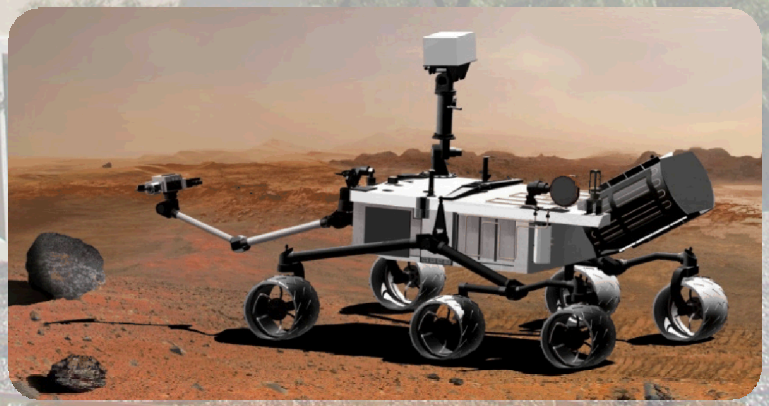


Nuclear Hydrogen Initiative Sulfur Iodine Thermo-chemical Water-Splitting Cycle



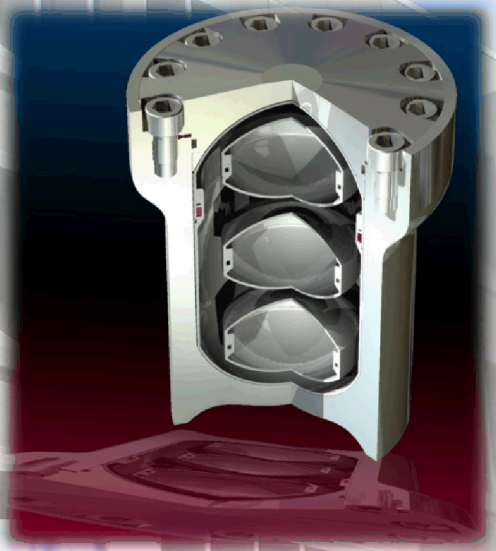


Advanced Fuel Cycle Initiative Research to Close the Nuclear Fuel Cycle



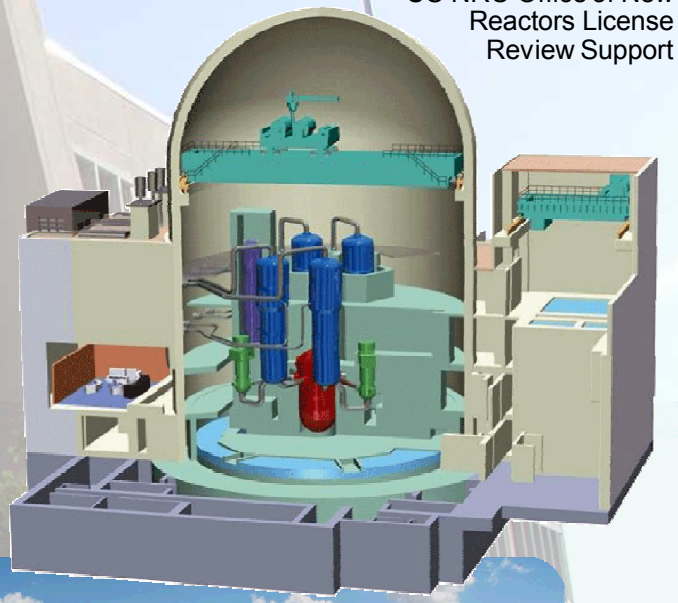
Space Nuclear Power RTG Launch Safety Mars Science Lab Rover

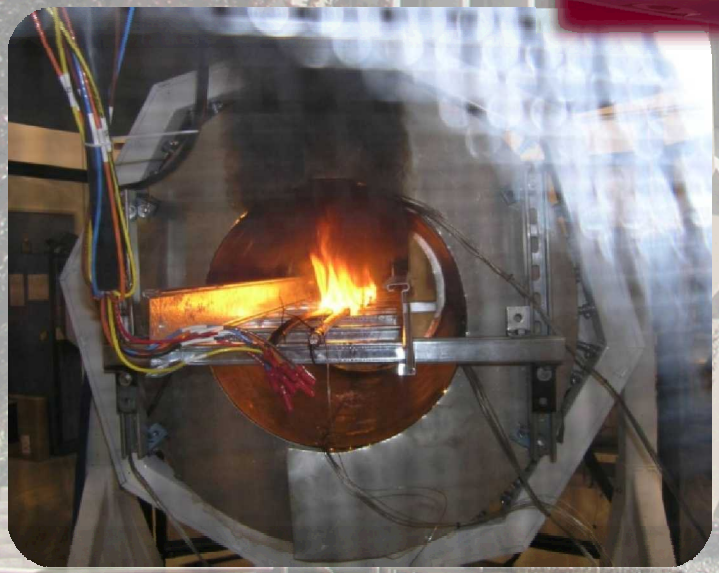
Nuclear Energy Safety Technologies



Plutonium Air Transport package

US NRC Office of New Reactors License Review Support





Fire Program, experiment on direct current (DC) control circuits respond to fire-induced cable failure

Environmental Restoration, Mixed Landfill Cover

Nuclear Energy Safety Technologies

- **Computational simulation and technical analyses**
  - Nuclear reactor accident progression
  - Public health consequences
  - Containment performance
  - Reactor fuel pin modeling
  - Sodium combustion
  - Airplane crash into nuclear power plant
  - Emergency preparedness and response
  - WIPP Performance Assessment
  - YMP Total System Performance Assessment
  - Physical Security
  - Cyber Security

Nuclear Energy Safety Technologies

- **Experiments, data, and code validation**
  - Equipment qualification
  - Spent fuel pool testing
  - Sever transportation environments
  - Reactor containment
  - In-situ fuel pin clad strain
  - Cable fire tests
  - WIPP
  - Yucca Mountain Project
  - Physical Security
  - Cyber Security

Nuclear Energy Safety Technologies

- **Methodology and technology development**
  - Dynamic PRA
  - HRA
  - Reactor consequence modeling/SOARCA
  - Uncertainty quantification and risk margins
  - Sodium combustion models
  - Fast reactor models
  - Energy conversion
  - Nuclear hydrogen
  - Waste form research
  - Physical security
  - Cyber security

Nuclear Energy Safety Technologies

- **Regulatory infrastructure**
  - License reviews for new nuclear power plants
  - Regulatory gap analyses
  - Standards & regulations development
  - Environmental management
  - Training
  - Quality assurance

Nuclear Safety Projects
Funded by foreign entities

- **Korea Power Engineering Co**
  - Nuclear waste training
- **Korean Atomic Energy Research Institute**
  - Hydrology training
- **Atomic Weapons Establishment, UK**
  - Spent fuel air transport package
- **Equipos Nucleares SA (ENSA), Spain**
  - Dual purpose spent fuel metal cask
- **Health & Safety Executive, UK**
  - Generic design assessment
- **Autoridad Regulatoria Nuclear, Argentina**
  - Review of probabilistic safety assessment for Atucha II

Proposed Nuclear Safety Project - UAE

- **Federal Authority for Nuclear Regulation**
  - Formed to regulate nuclear technologies in the Emirates
    - Emirates Nuclear Energy Corp. will be the licensee
    - 4 plants, first one scheduled to go on line in 2017, all by 2020
  - Issued RFQ for technical support related to upcoming licensing effort for new Korean reactors, APR-1400
  - Licensee Safety Analysis Report will be patterned after the NRC Standard Review Plan
  - Technical support Organizations (bidders) will prepare portion(s) of the Safety Evaluation Report – evaluate application, request additional information
  - Work packages based on the 19 SRP chapters, e.g., design of structures, reactor, instrument & controls, PRA, severe accidents
    - Current call does not include chapters on security, safeguards, site characteristics, waste management, rad protection , or emergency management.