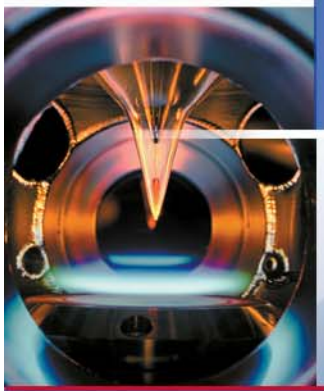
SAND2008-6050C

SANDIA NATIONAL LABORATORIES

LDRD Investments in Energy Security

2008 NNSA LDRD Symposium
September 18, 2008

Terry Michalske, Director
Energy Innovation Initiatives
Sandia National Laboratories
Email: tamicha@sandia.gov



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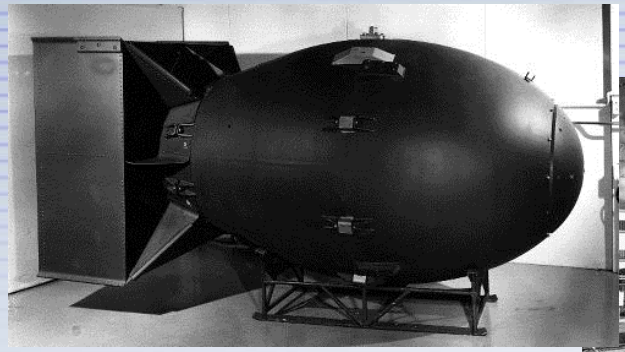
Sandia's Heritage



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,

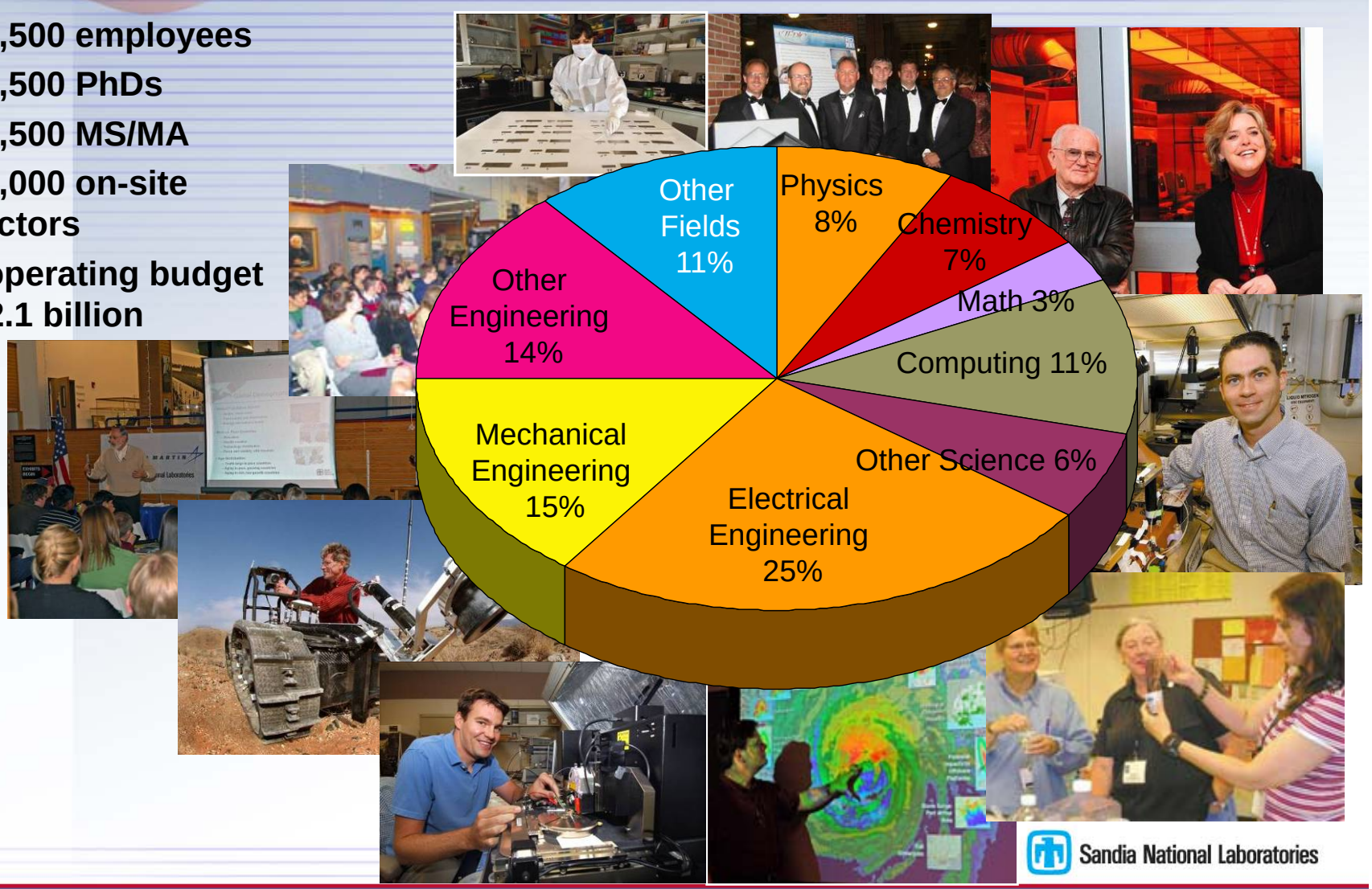
Harry Truman

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

Sandia National Laboratories

Sandia Employs More Than 8,500 Highly Skilled Workers

- Over 8,500 employees
- Over 1,500 PhDs
- Over 2,500 MS/MA
- Over 1,000 on-site contractors
- FY07 operating budget was $2.1 billion



Sandia National Laboratories

Sandia is Organized into Three Strategic Management Groups

Integrated Technologies and Systems
Three Management Units

- *Energy, Resources, and Nonproliferation*
- *Homeland Security & Defense*
- *Defense Systems & Assessments*

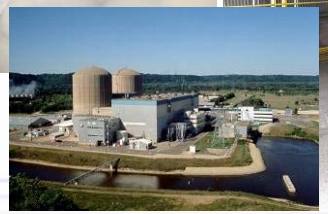
Nuclear Weapons
One Management Unit

- *Nuclear Weapons*

Laboratory Transformation
Two Management Units

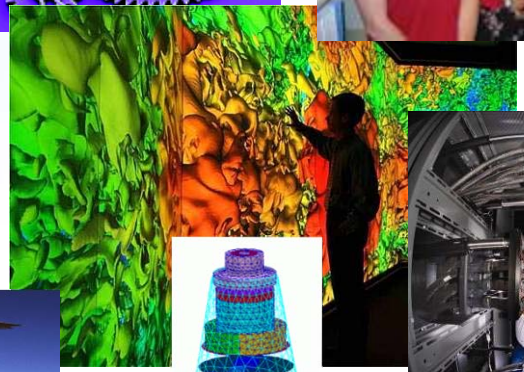
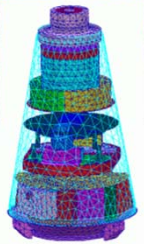
- *Integrated Enabling Services*
- *Science, Technology, and Engineering*







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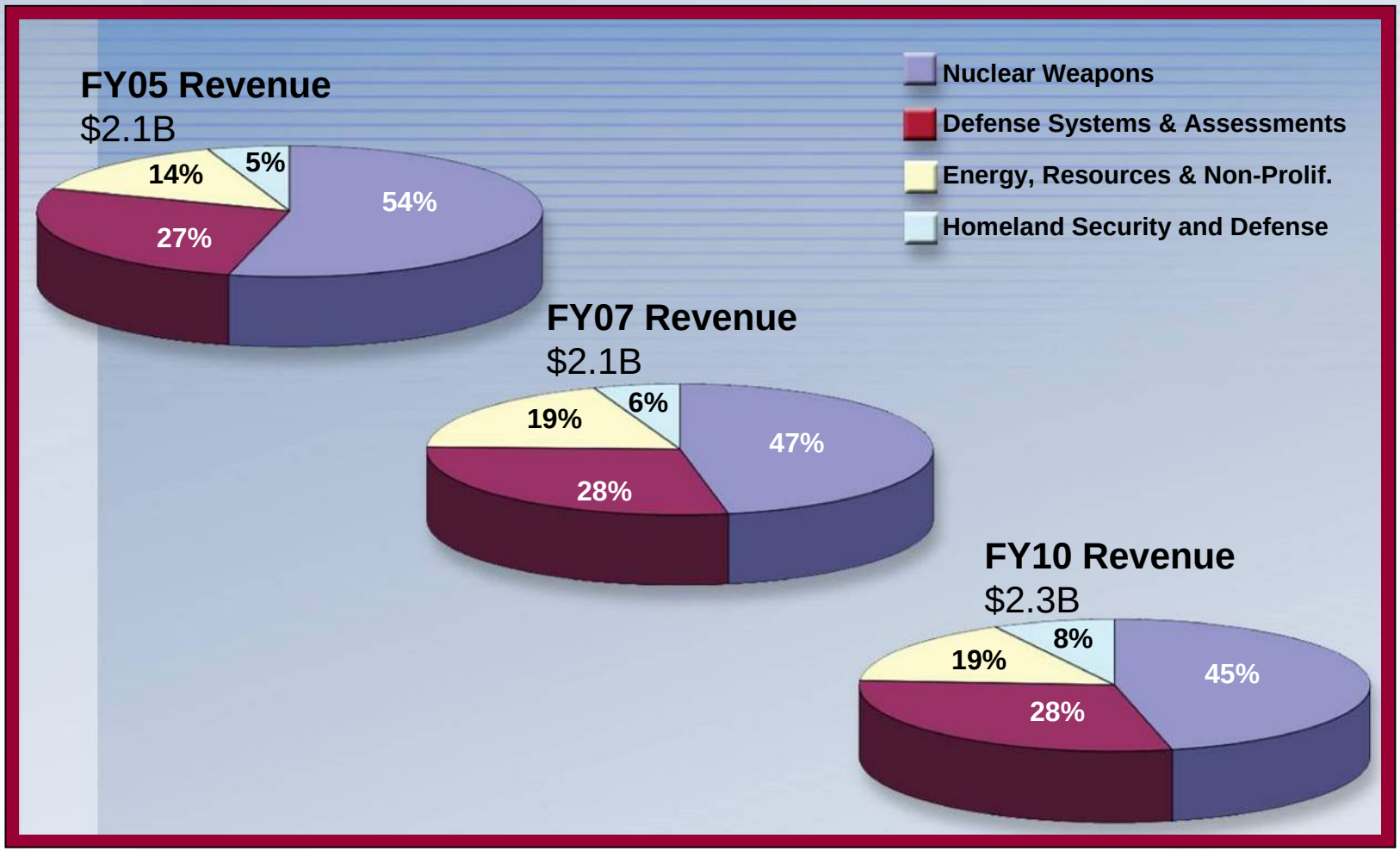
Sandia's Diversified National Security Mission



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U.S. Faces Significant Energy Security Challenges

- **Unprecedented international wealth transfer to satisfy U.S. oil dependence**
- **Antiquated and vulnerable electrical grid**
- **World-wide spread of nuclear materials**
- **Climate related changes affecting natural resources, weather, and public health**

World-wide Energy Demand Increasing

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Key Steps to Increase Energy Security

- **Eliminate Need to Import Oil**
- **Improve Flexibility and Security of Electrical Grid**
- **Increase Carbon Efficiency and U.S. Economic Competitiveness**

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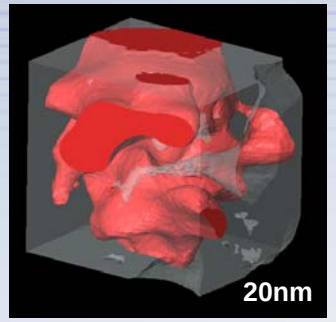
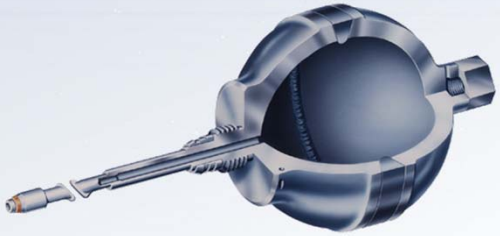
Eliminate Need to Import Oil: *Hydrogen Economy*

LDRD hydrogen science and engineering has enabled hydrogen fuels for advanced transportation and enhanced the tech base for NNSA GTS systems

LDRD: Electron Tomography of nano-porous Pd hydrogen storage materials





NNSA: DSW and Engineering Campaigns

GM: Hydrogen storage/fuel cell systems engineering

DOE EERE: Hydrogen Safety Codes and Standards

UCDAVIS INSTITUTE OF TRANSPORTATION STUDIES

NREL

Darmstadt University of Technology

NASA

GM

Ford

THE NATIONAL HYDROGEN ASSOCIATION

DOE EERE: Metal Hydride Center of Excellence and Global Partners

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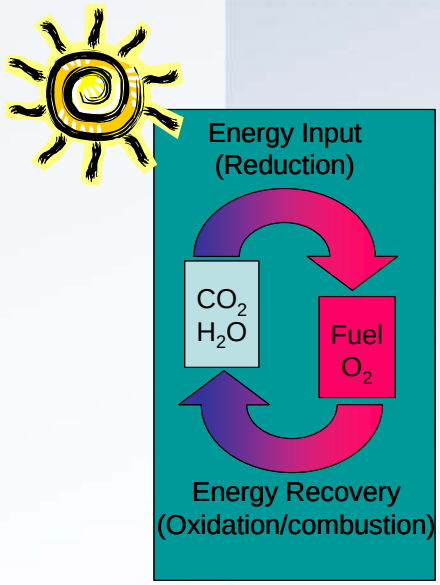
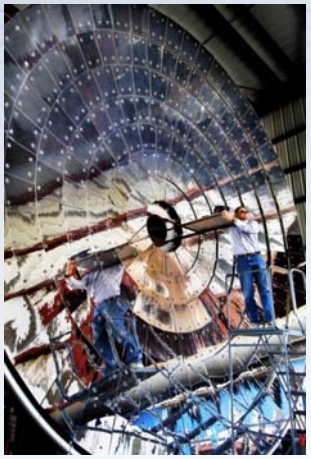
Eliminate Need to Import Oil: *Alternative Fuels*

Solar-to-Petrol

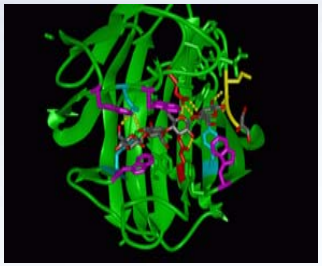
Reverse Combustion: Use solar energy to convert CO_2 and H_2O to liquid fuel with 10% efficiency





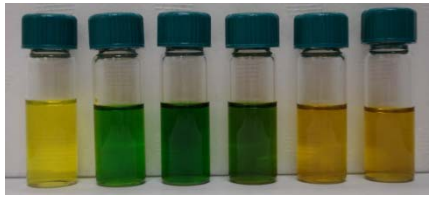
Bio-Fuels

Cellulosic Biorefineries: System modeling to optimize process and energy conversion



Biomass Conversion: Enzeme engineering using advanced computation and high-speed microfluidic platforms

Algal Biofuels: Molecular tools to reprogram TAG production and enhance growth rates



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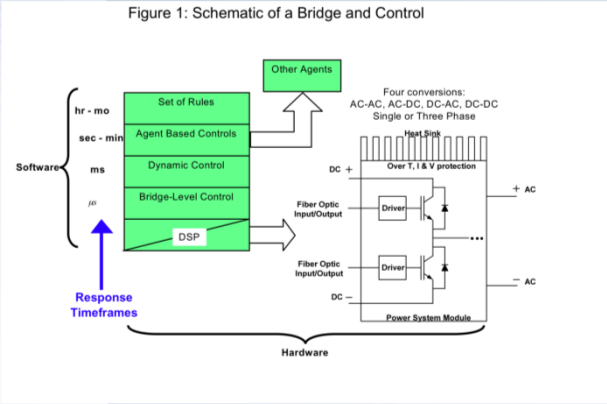
Improve Flexibility and Security of Electrical Grid

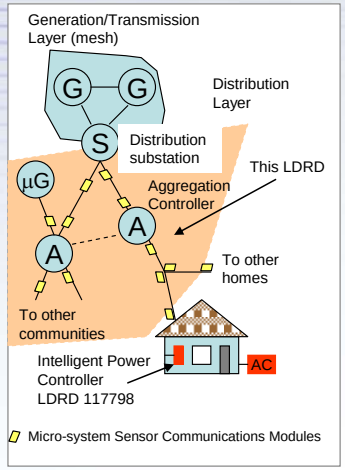
Power Electronics

Intelligent Controls: Silicon carbide power controllers-inverters and control algorithms



Adaptive Grid

Nonlinear Analysis: Simulate behavior of power grid critical infrastructure



Secure Control

Risk-informed decisions: Modeling tools to support design of power grid that is robust toward terrorist and natural threats

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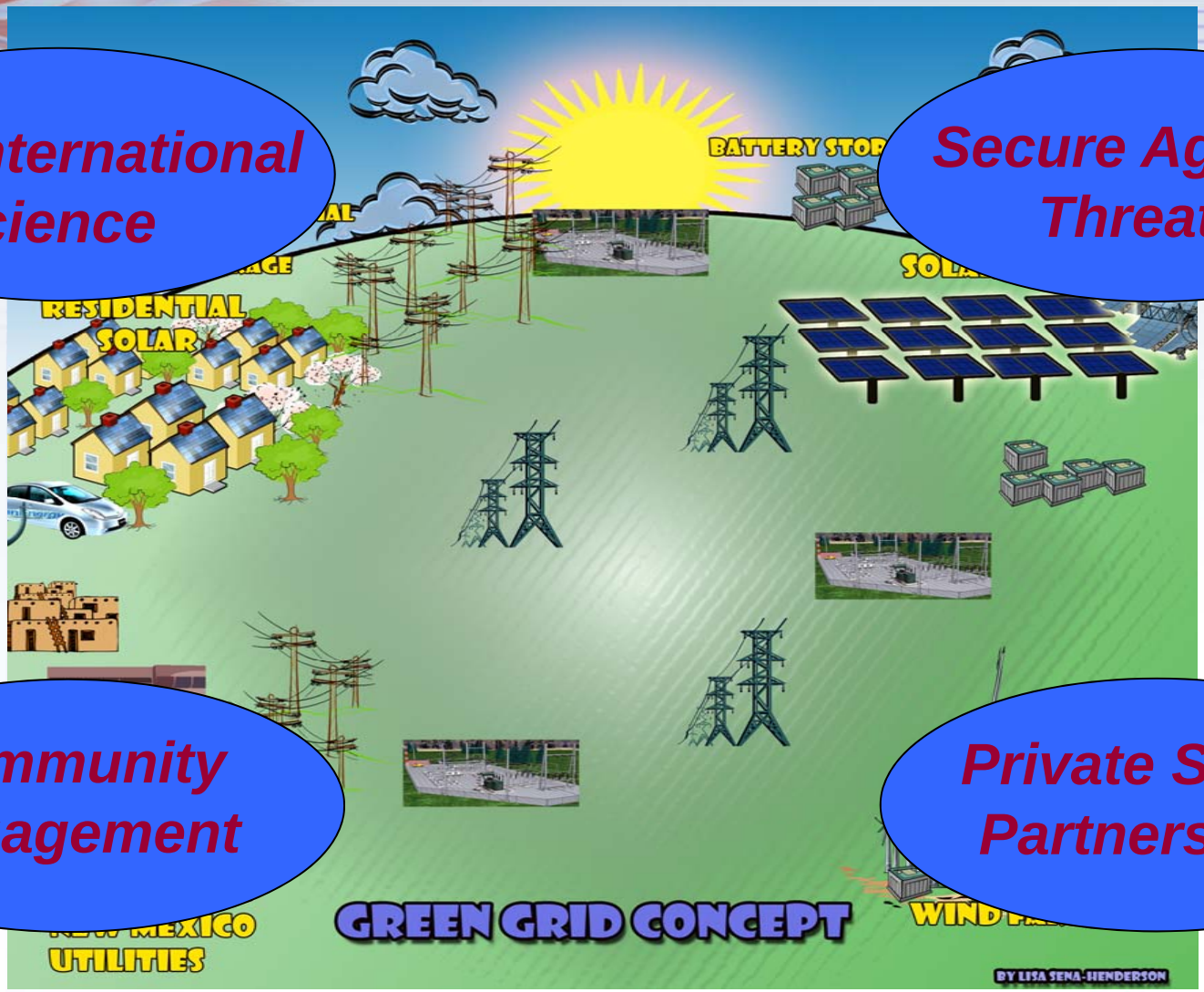
From Open Information to Secure Threat Management



Open International Science

Secure Against Threats

Community Engagement

Private Sector Partnerships

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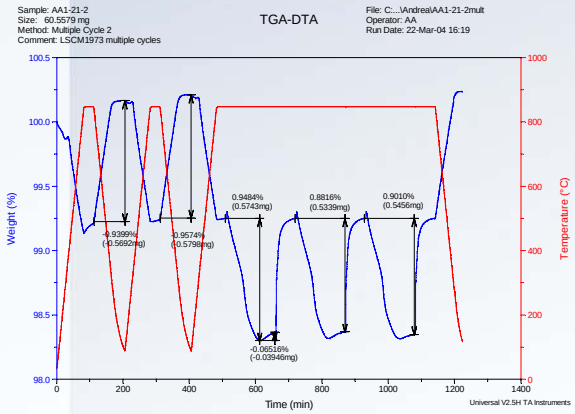
Low Carbon Competitiveness:
Nuclear Energy

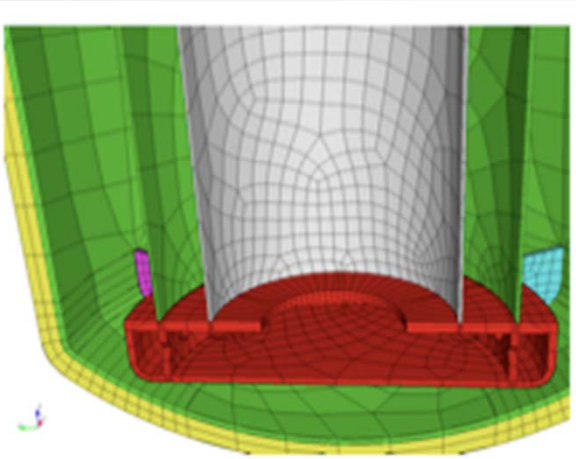
Nuclear H_2 Production

Metal-Oxide membranes: Thermally and chemically stable membranes are developed to support H_2 and O_2 separations in sulfur-iodide cycle



Reactor Safety

Safety code: Multi-scale modeling framework for Burner Reactor Integrated Safety Code.



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NNSA Laboratories Play Key Role

- **Energy and adverse climate change have emerged as the most significant threats to our nation's long-term security and prosperity.**

- **Energy mission engages across open science, industrial partnerships, and national security organizations.**

- **NNSA LDRD science and engineering supports core mission and leverages energy mission needs.**

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It's all About People…….

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