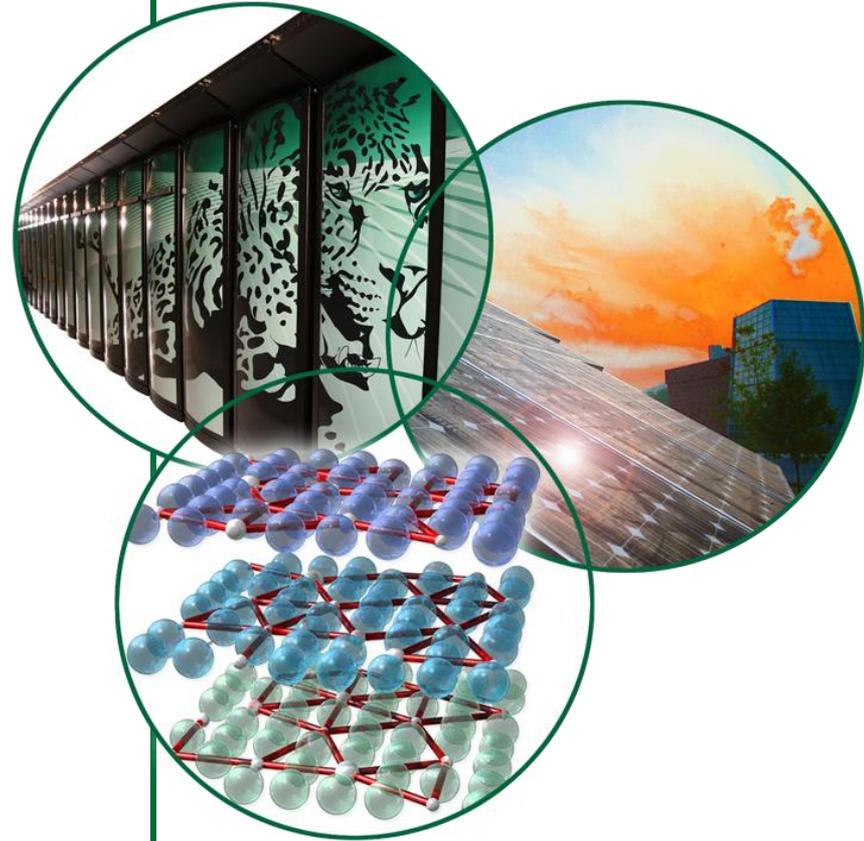


Introduction to Oak Ridge National Laboratory

Presented to
EPSCOR Program Review 2009

Gregory S. Smith
Neutron Scattering Science Division

Brookhaven National Laboratory
July 22, 2009



Oak Ridge National Laboratory evolved from the Manhattan Project



ORNL in 1943
The Clinton Pile was the world's first continuously operated nuclear reactor



Today, ORNL is DOE's largest science and energy laboratory



- \$1.4B budget
- 4,450 employees
- 3,900 research guests annually
- \$500M invested in modernization
- World's most powerful open scientific computer
- Operating the world's most intense pulsed neutron source and a world-class research reactor
- Nation's most diverse energy portfolio
- Nation's largest concentration of open source materials research
- Managing the billion-dollar U.S. ITER project

ORNL is uniquely positioned to deliver science and technology for energy

We have an extraordinary set of assets

- Outstanding tools for materials R&D including SNS and HFIR
- World-leading systems for open scientific computing
- Growing strength in climate change impact R&D
- BioEnergy Science Center
- The nation's broadest portfolio of energy programs
- Unique resources for nuclear technology
- Robust national security programs
- **ORNL is home to 12 user facilities**

**Our challenge:
Use these assets
to enable science
and technology
breakthroughs
that transform
our energy future**



Studying materials with the world's best resources for neutron scattering

Spallation Neutron Source:
World's most powerful accelerator-based neutron source

High Flux Isotope Reactor:
Complementary capabilities including a world class cold neutron source

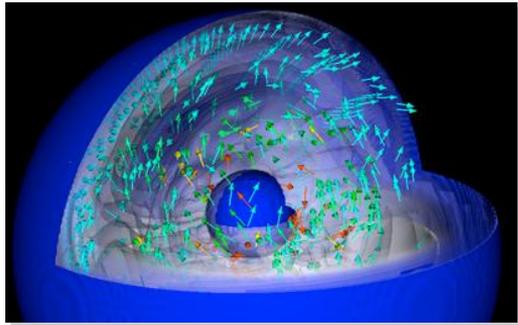
UT-ORNL Joint Institute for Neutron Sciences:
User gateway for SNS and HFIR

Ready to welcome thousands of researchers each year

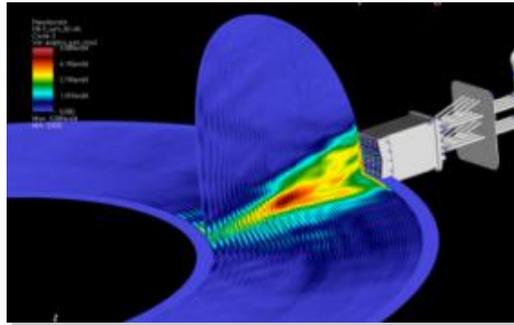


Leading the development of ultrascale scientific computing

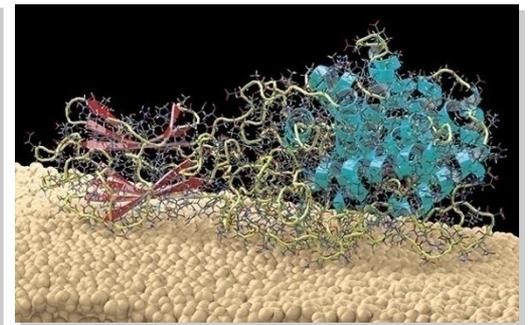
- World-leading open scientific computing facility: **National Center for Computational Sciences**
- Operating at 1.64 petaflops
- Focus on computationally intensive projects of large scale and high scientific impact
- Partnered with UT in an NSF petascale computing center through the UT/ORNL Joint Institute for Computational Sciences



Astrophysics



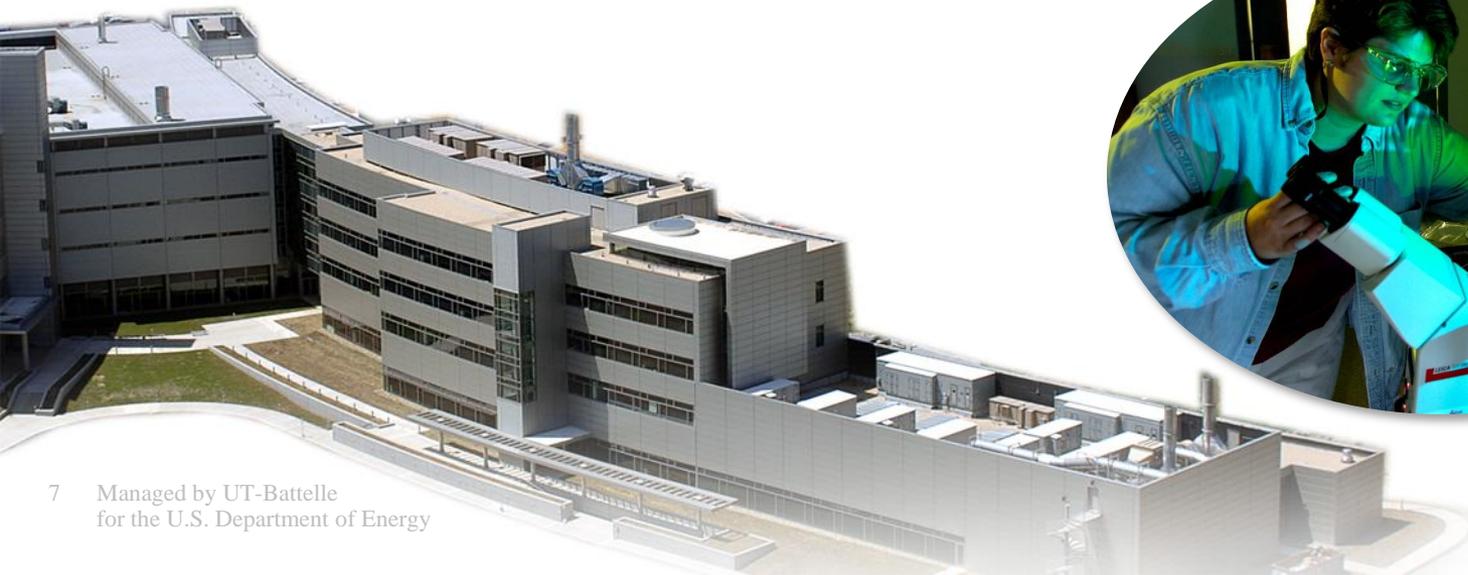
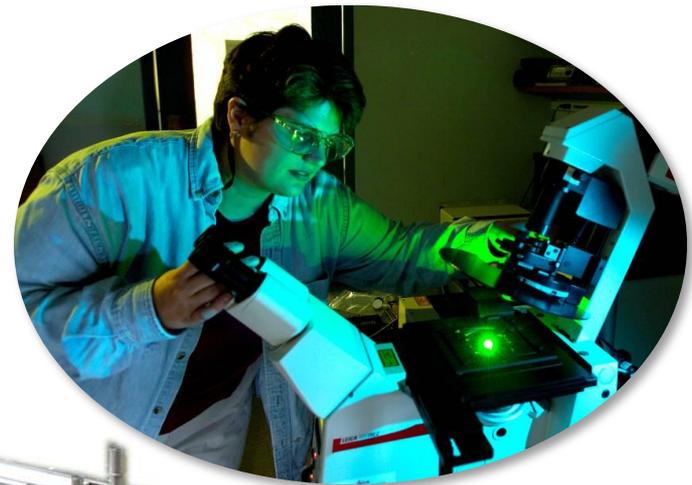
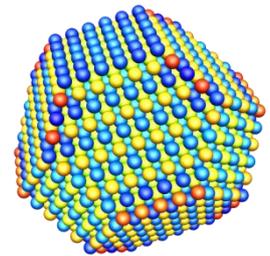
Fusion



Biology

World-class tools for nanoscale R&D

- DOE's first: **Center for Nanoscale Materials Science (CNMS)**
- Leverages neutron scattering and leadership computing capabilities at ORNL
- Unique facilities for:
 - Nanofabrication
 - Nanoscale characterization
 - Materials synthesis and chemistry at the nanoscale
- Understanding materials and chemistry at the length scale where properties are determined



Transforming the new biology into bioenergy

- Developing bio-based solutions for energy, the environment, and carbon sequestration
- Managing the \$135M DOE BioEnergy Science Center to advance cellulosic ethanol research
- Partnered with the \$73M Tennessee Biofuels Initiative
 - Brings UT, ORNL, and industry together
 - Includes bioenergy research, a 250,000 gal/year pilot plant, and agricultural incentives for switchgrass
- **Center for Structural Molecular Biology (Bio-SANS and Bio-Deuteration Lab)**



ORNL has a large and growing energy efficiency, renewable energy, and electricity delivery portfolio

- Over \$100M: Largest national lab effort in transportation and industrial technologies and in superconductivity
- Significant growth in solar energy, electrical energy storage, biomass, and grid visualization/modeling
- Major national facilities including **High Temperature Materials Laboratory, National Transportation Research Center, and Building Technologies Research and Integration Center**



Lightweight carbon fiber materials from lignin



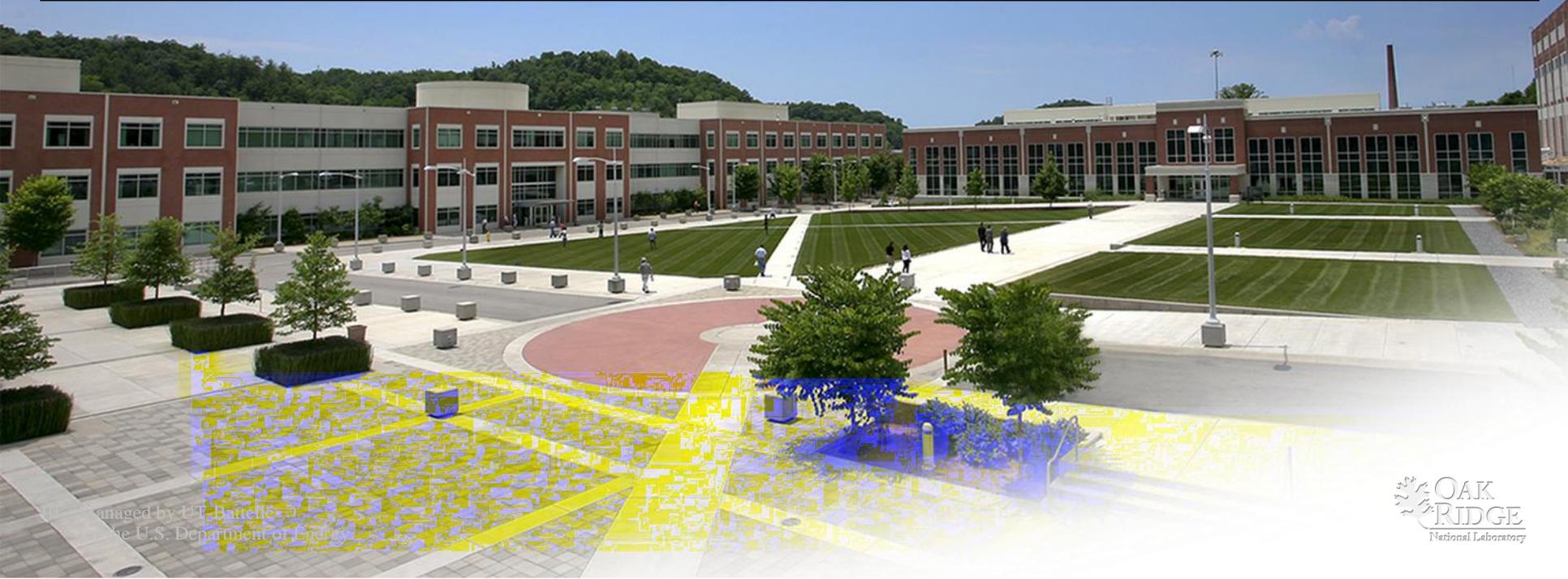
“Zero-energy” homes



Triaxial superconducting cable installed at AEP Bixby

Oak Ridge National Laboratory: Gateways to ORNL research

- For information on ORNL Research and ORNL User Facilities visit www.ornl.gov
- For neutron scattering see neutrons.ornl.gov
 - Join SNS/HFIR User Group (SHUG)
 - Apply to The National School on Neutron and X-ray Scattering
 - Attend workshops and conferences
- ORISE internships, fellowships, and research participation programs
<http://orise.ornl.gov/sep/index.htm>
- Bring student groups to ORNL
- Invite ORNL scientists to your campus
- Seek EPSCoR grants for travel and support <http://www.nsf.gov/div/index.jsp?org=EPSC> and <http://www.sc.doe.gov/BES/EPSCoR/about.html> (Travel support for users from UT-ORNL Joint Institute for Neutron Sciences (JINS). Contact Takeshi Egami at egami@utk.edu)

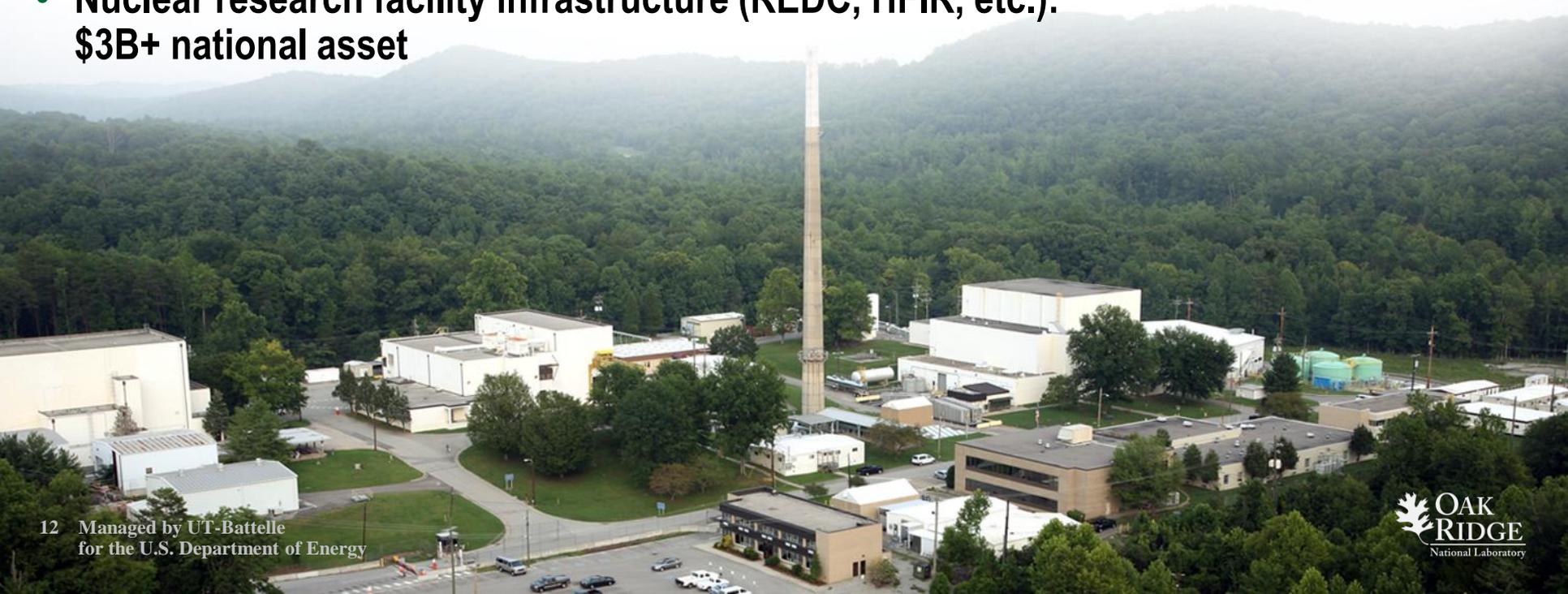


Other User Facilities

- **Holifield Radioactive Ion Beam User Facility (HRIBF)**
- **Oak Ridge Electron Linear Accelerator (ORELA)**
- **Safeguards Laboratory (SL)**
- **Shared Research Equipment (SHaRE) User Facility**

ORNL is uniquely positioned to support advanced nuclear fuel cycle research

- Coupled End-to-End (CETE) demonstration delivers advanced nuclear fuel cycle S&T
- Fuel examination and reprocessing
- Materials irradiation at HFIR
- Reactor design and engineering
- Nuclear research facility infrastructure (REDC, HFIR, etc.):
\$3B+ national asset



National security S&T has become a major activity at ORNL

- We are among DOE's leading labs for nuclear nonproliferation
- We have a growing role with the Department of Homeland Security
- We supply technology and expertise to the Department of Defense



National security S&T
builds upon and
complements
our DOE missions



UT-Battelle has managed ORNL since April 2000



**The University of Tennessee
Knoxville, Tennessee**



**Battelle
Columbus, Ohio**



Energy is the defining challenge of our time

- The major driver for
 - Climate change
 - National security
 - Economic competitiveness
 - Quality of life
- Incremental changes to existing technologies cannot meet this challenge
 - Transformational advances in energy technologies are needed
 - Critically dependent on the best science and technology

Global energy consumption will increase 50% by 2030

We are managing the U.S. ITER Project for DOE

- Joint international R&D project aimed at demonstrating the scientific and technical feasibility of fusion power.
- To be built in Cadarache, France with operation to begin at the end of the next decade.
- Partners include China, the European Union, India, Japan, Russia, South Korea, and the U.S.
- The U.S. is contributing more than \$1B in key components, R&D, and design.

