



Better Plants

U.S. DEPARTMENT OF ENERGY

Welcome

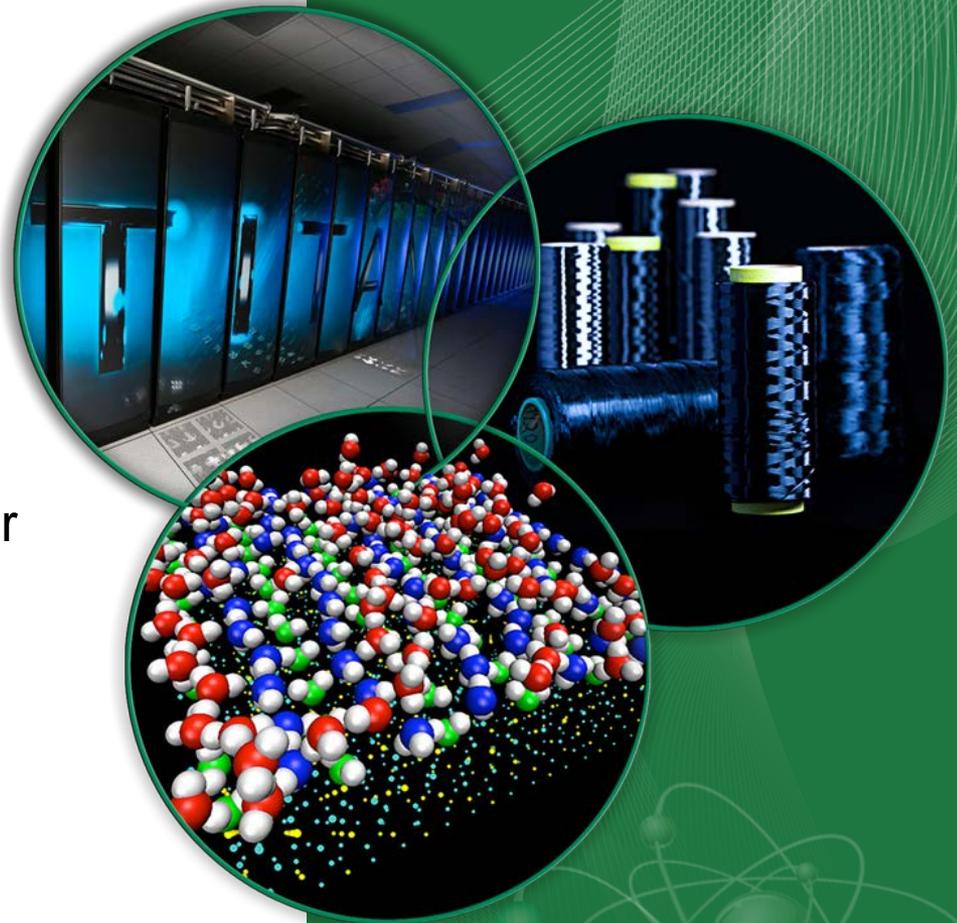
Partnering with the National Laboratories

Presented to

Technology Deployment Day: Better
Plants Conference

Mike Paulus

March 15, 2017



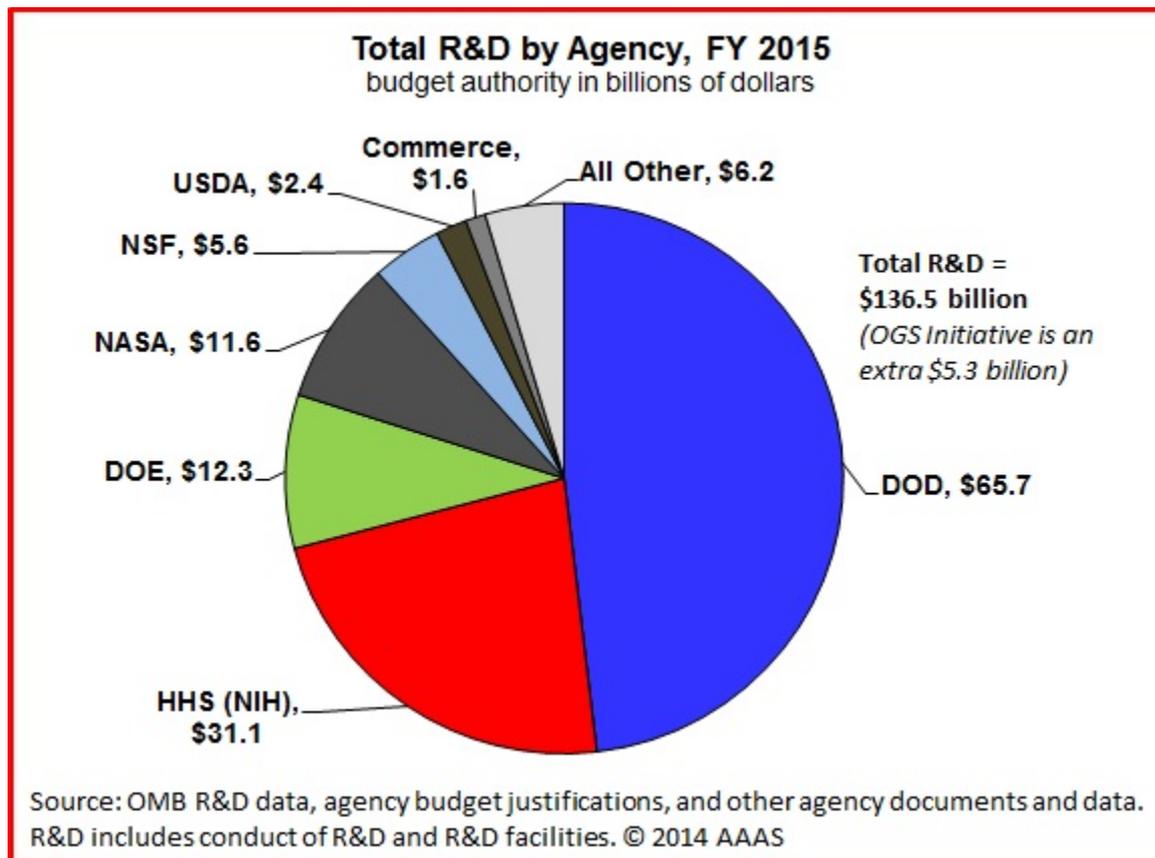
Why does the US government invest in research and development?



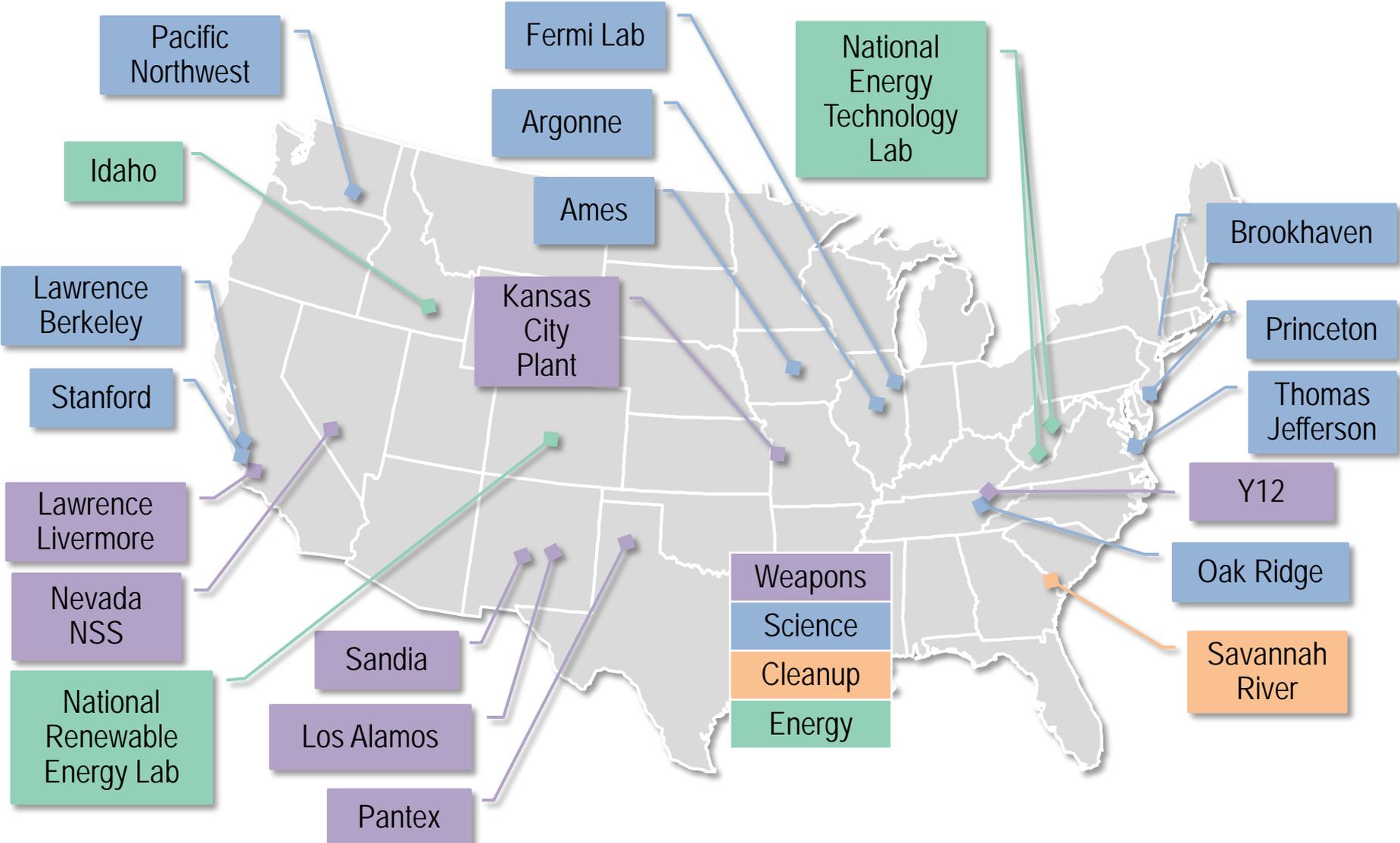
“Without scientific progress, no amount of achievement in other directions can insure our health, prosperity, and security as a nation in the modern world.”

*Vannevar Bush
Science – The Endless Frontier (1945)*

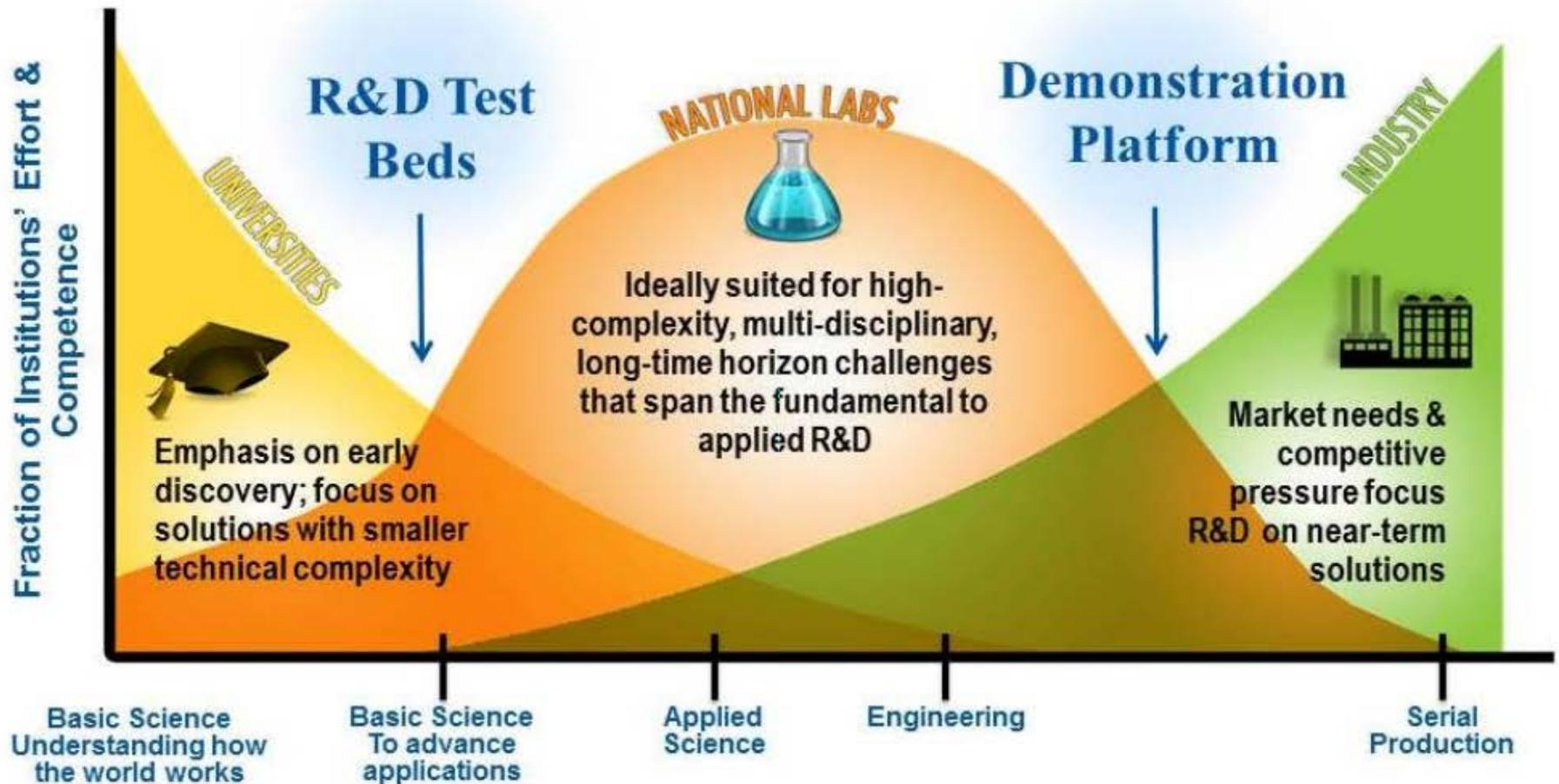
These priorities are reflected in today's R&D budgets



DOE has 21 National Laboratories and Facilities with Broad Expertise



Where do the National Laboratories fit?



Bridging the Valley of Death – The Role of Test Beds for Advanced Nuclear Reactors. Source: Todd Allen, Idaho National Laboratory, & Jessica Lovering, Breakthrough Institute.

Some National Laboratory game changers



Nuclear power plants provided 10.9 percent of the world's electricity production in 2012. In 2014, 13 countries relied on nuclear energy to supply at least one-quarter of their total electricity.

Approximately 50 million nuclear medicine procedures are performed each year worldwide. BNL developed the Tc-99m generator and FDG.



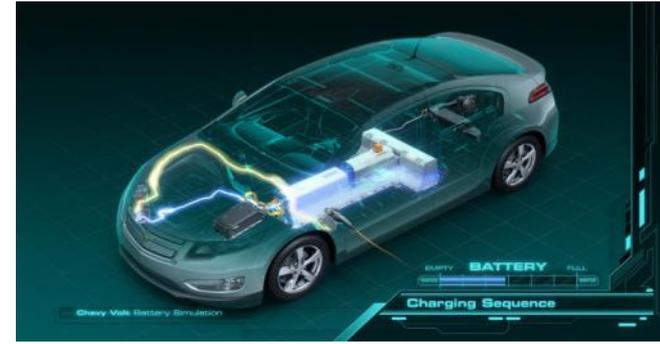
Since the end of World War II, nuclear deterrence has been a cornerstone of the United States defense strategy.

Some National Laboratory game changers

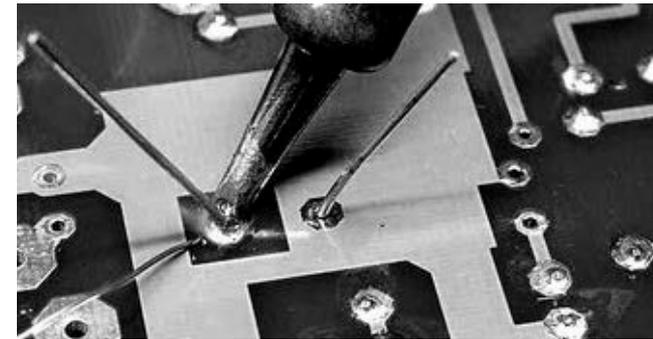


National laboratories (SNL, LANL, LLNL, NETL) contributed to shale gas technology that significantly improved US energy independence.

National laboratories are drivers of new wind energy technologies.

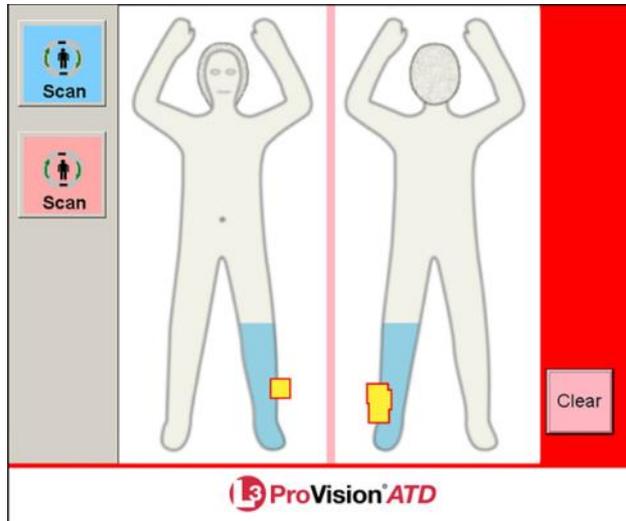


Argonne National Lab's battery cathode design powers the Chevy Volt.



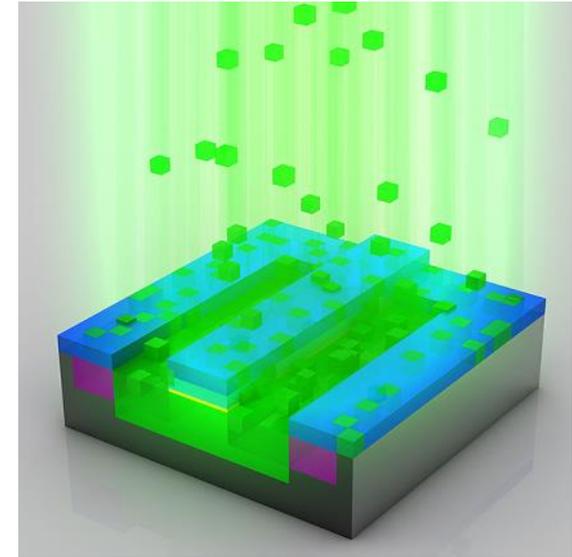
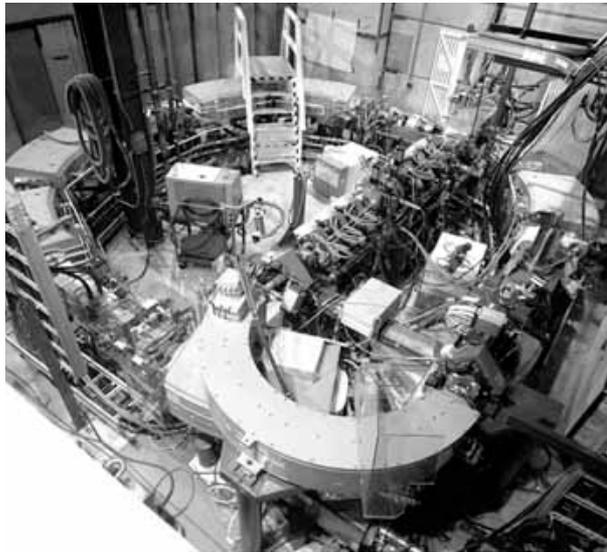
The Ames Lab lead-free solder alloy is the world wide market leader

Some National Laboratory game changers



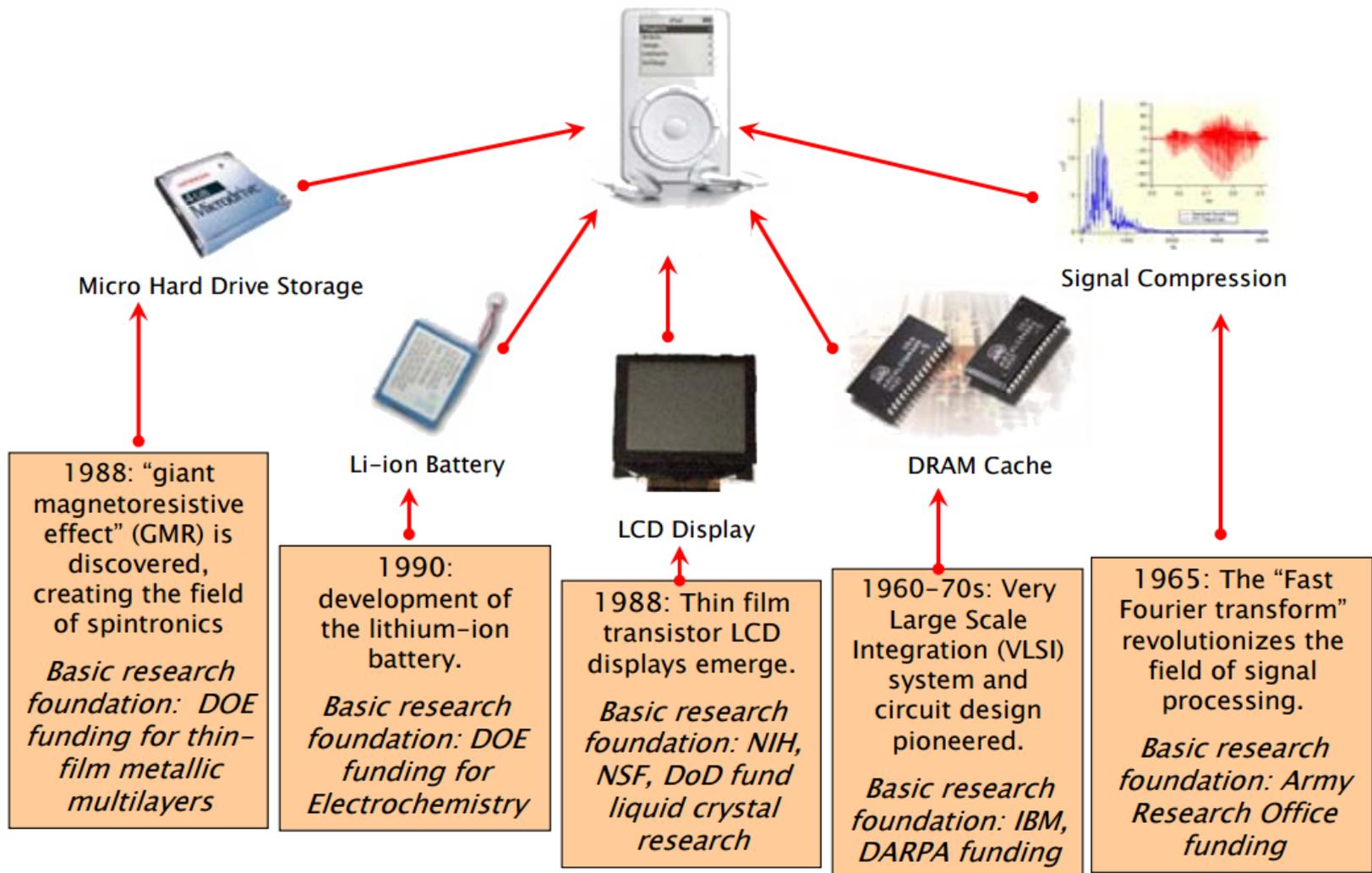
PNNL millimeter wave airport screening devices enhance airport security. More than 1300 systems have been deployed worldwide.

Fermilab designed the first proton accelerator for cancer treatment.



ORNL was an early leader in the use of ion implantation for semiconductor processing and artificial joint surface treatment.

Often returns on R&D investment take time and can come in unexpected forms

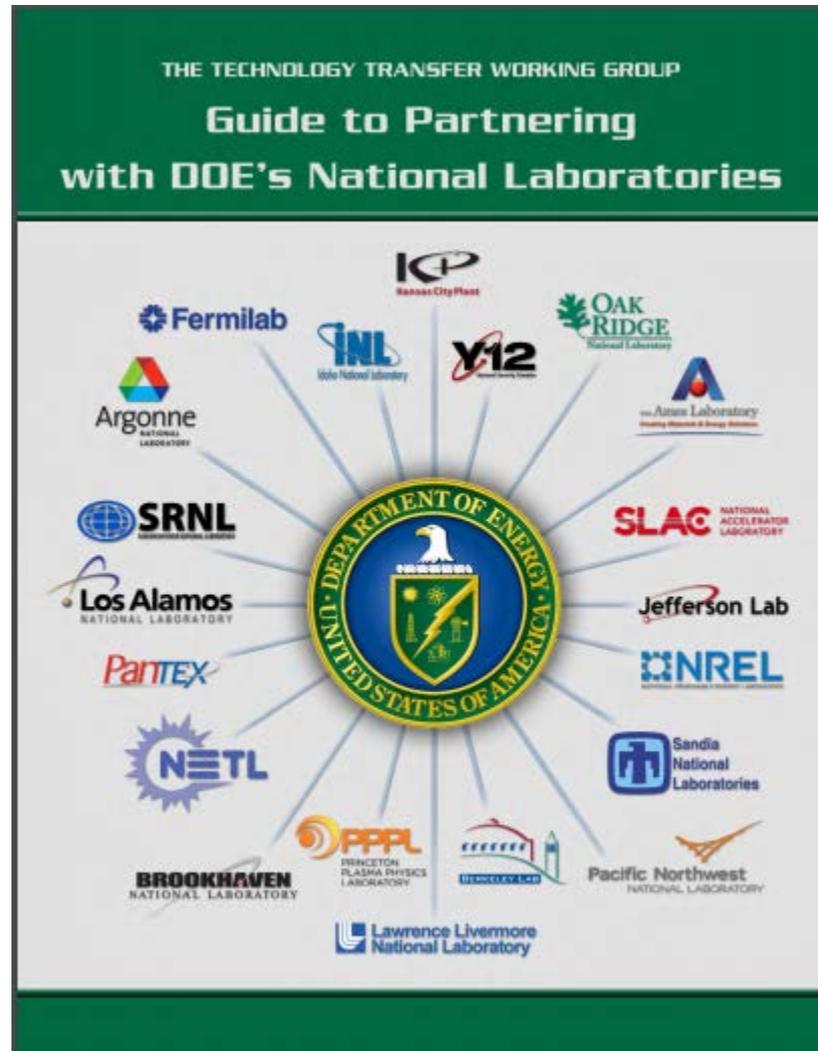


There are a variety of mechanisms for working with the National Laboratories

Cooperative
Research and
Development
Agreements

Strategic
Partnership
Projects

Agreements for
Commercializing
Technologies



Technology
Licenses

User
Agreements

Technology
Assistance
Programs

We have 4 mechanisms to collaborate with these assets



Department of Energy National Laboratory Statistics

Active CRADAs	Active NF-SPP agreements	Active patent licenses	Active copyright licenses	2014 inventions	2014 User Facility users
709	2,667	1,443	2,621	1,580	26,403

Cooperative Research & Development Agreement (CRADA)

A CRADA is...

- An agreement between ORNL and private sector partner(s) to conduct specified research or development activities consistent with the mission of the lab
- Each party provides personnel, services, facilities, equipment, intellectual property or other resources (intense collaboration)

Funding Mechanisms:

- 100% Funds-In by the Participant. Participant funds ORNL's portion of the project. No DOE funding involved.
- DOE funds ORNL's portion of the project.* Participant provides both funds-in and in-kind contributions.
- DOE funds ORNL's portion of the project.* Participant provides in-kind contribution.

**Subject to availability of funds. DOE funds ORNL through appropriation.*



Example CRADA: Local Motors

January 2014

CRADA on rapid automotive design and innovation using large-scale polymer additive manufacturing

- Demonstrate lightweighting of systems and subsystems
- Develop tools for additive and subtractive manufacturing
- Explore innovative assembly approaches

September 2014

Demonstration:
3D printing of an entire vehicle
at International Manufacturing
Technology Show in Chicago



IMTS
2014

3D PRINTED CAR
DESIGN CHALLENGE

GINGINNATI
CORPORATE TECHNOLOGIES

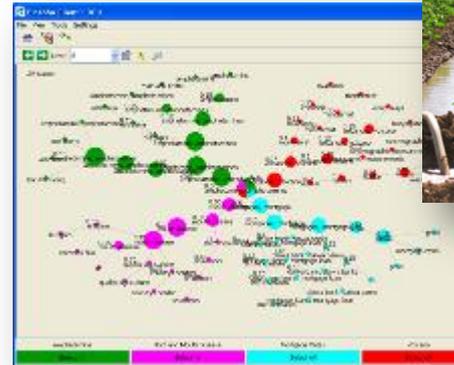
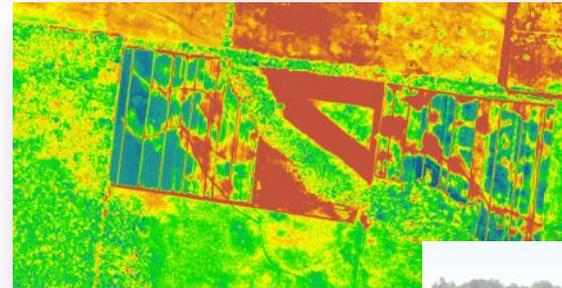
OAK RIDGE
National Laboratory

Strategic Projects Program (SPP)

- A Strategic Projects Program is:
 - Performance of work for non-federal entities by contractor personnel
 - Utilization of DOE resources that is not directly funded by appropriations
- SPP is appropriate when:
 - ORNL is performing the research with minimal collaboration with sponsor
- A Materials & Services Order Form is:
 - A simplified SPP agreement
 - An agreement supporting non-R&D projects
 - An agreement with minimum terms and conditions
 - A one-page agreement (front & back)
 - Quick and easy to use



Example SPP Agreement: CIMMYT



Five-year project deploys a broad array of sensor technologies and data analytics to enhance worldwide agricultural sustainability

Intellectual Property License

- A License is:
 - A contract enabling a partner to make, use or sell ORNL intellectual property
 - Associated with patent(s) (granted or pending) or other ORNL IP
 - Associated with defined field(s) of use
 - Exclusive or Non-Exclusive
- Payment typically includes
 - Patent cost reimbursement
 - Execution fee (in some cases equity in lieu of cash may be negotiated)
 - Royalty fees
- Options may also be executed, which provide partners with an exclusive right to negotiate a license for a defined period of time

Example License: Vertimass LLC

2014 License

Vertimass, LLC

2015 – DOE Awards
Vertimass a grant to develop the technology



ORNL has developed a process to upgrade ethanol to gasoline, jet fuel and other high value products



2016 – ORNL and Vertimass are negotiating a CRADA

User Agreement

A User Agreement is

- A mechanism for private industry or academia to conduct research at the contractor's DOE-designated user facilities
- An agreement (proprietary or non-proprietary) stipulating terms and conditions, including disposition of intellectual property
- An agreement under which the partner directs the activity, within framework of agreement

Types of User Agreements:

- Nonproprietary: funded by DOE program and/or cost-recovery from User
- Proprietary: cost-recovery required for all users
- Pre-competitive: allows collaboration; currently available for only a few facilities

Example User Agreement: BMI Aerodynamic Truck Design



- High performance computing reduced simulation times from days to hours
- New design could save \$5B in fuel costs per year
- BMI awarded Heavy Duty Trucking Magazine top 20 design award



Recent Initiatives

DOE Small Business Vouchers (SBV) Overview

The mission of the SBV Pilot is to significantly increase the industrial impact of DOE national labs on the U.S. clean energy sector.



Goals

- Increase small business accessibility to lab capabilities and lab awareness of needs
- Accelerate commercialization timelines for EERE technologies
- Align lab practices with private sector business cycle timelines

Award Size: \$50,000-\$300,000

Period of Performance: 12 months

Cost Share Requirement: 20%

Details available at www.SBV.org

ORNL REVV! and Technology Assistance



- Funded by a grant from the State of Tennessee
- Provides Tennessee Manufacturing Companies with access to ORNL and The University of Tennessee
- 5-page Proposals are competitively selected by a ORNL/UT committee
- Companies must currently manufacture a product
- Companies must employ a minimum of 10 employees in Tennessee or have made a firm commitment to do so

Jeff Cornett 865-241-3807



Technology Assistance Program

- Available to any US Small Business that has licensed an ORNL technology
- Intended to assist in the transfer of technology from ORNL to the small business
- Maximum of 120 hours of effort; typically completed in 3 months
- Funded by royalty receipts
- Available on a first-come first-serve basis
- Requires a simple contract with statement of work and budget

Mike Paulus 865-574-1051

Technical Collaborations Program

The MDF Model

Explore

- Opportunity for industry to discover and apply new manufacturing technologies

Engage

- Work with MDF staff to develop scope of work

Execute

- Simplified on-line application
- Phase 1 \$40K, Phase 2 \$200K
- 1:1 Cost Match
- Non-Negotiable CRADA
- ~90-day cycle time from review to a signed agreement

Additive Manufacturing

Drawing on its close ties with industry and world-leading capabilities in materials development, characterization, and processing, ORNL is creating an unmatched environment for breakthroughs in both metal and polymer additive manufacturing, or 3D printing.

Carbon Fiber and Composites

New manufacturing processes for low-cost precursor development technologies hold the key to reducing carbon fiber cost for energy applications. Similarly, innovative performance-focused materials and processes can potentially drive significant performance improvements for national security applications.

www.ornl.gov/manufacturing

Oak Ridge National Laboratory: Science and technology for innovation

