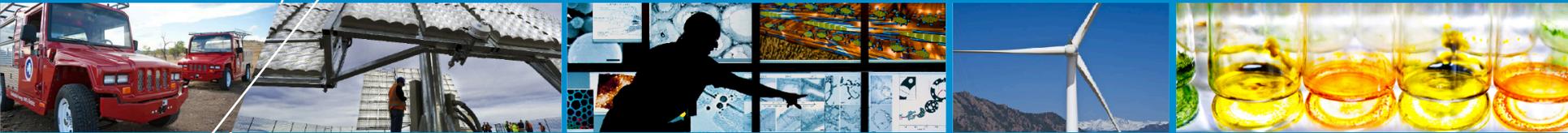


National Renewable Energy Laboratory



Overview for the Federal Utility Partnership Work Group (FUPWG)

Bobi Garrett

**Deputy Laboratory Director, Strategic Programs and
Partnerships**

January 14, 2014

DOE's National Lab Complex

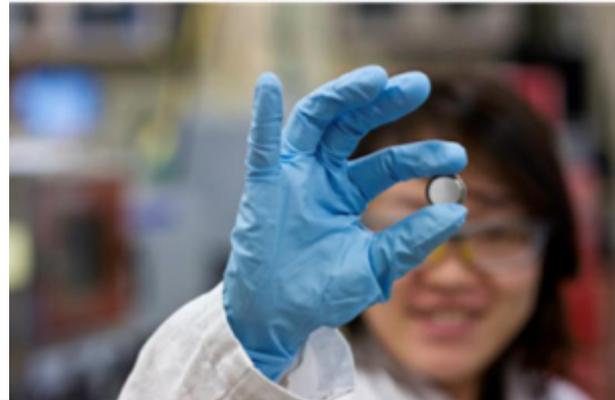


National Renewable Energy Laboratory is operated for the U.S. Department of Energy by the Alliance for Sustainable Energy, LLC

Laboratory Snapshot

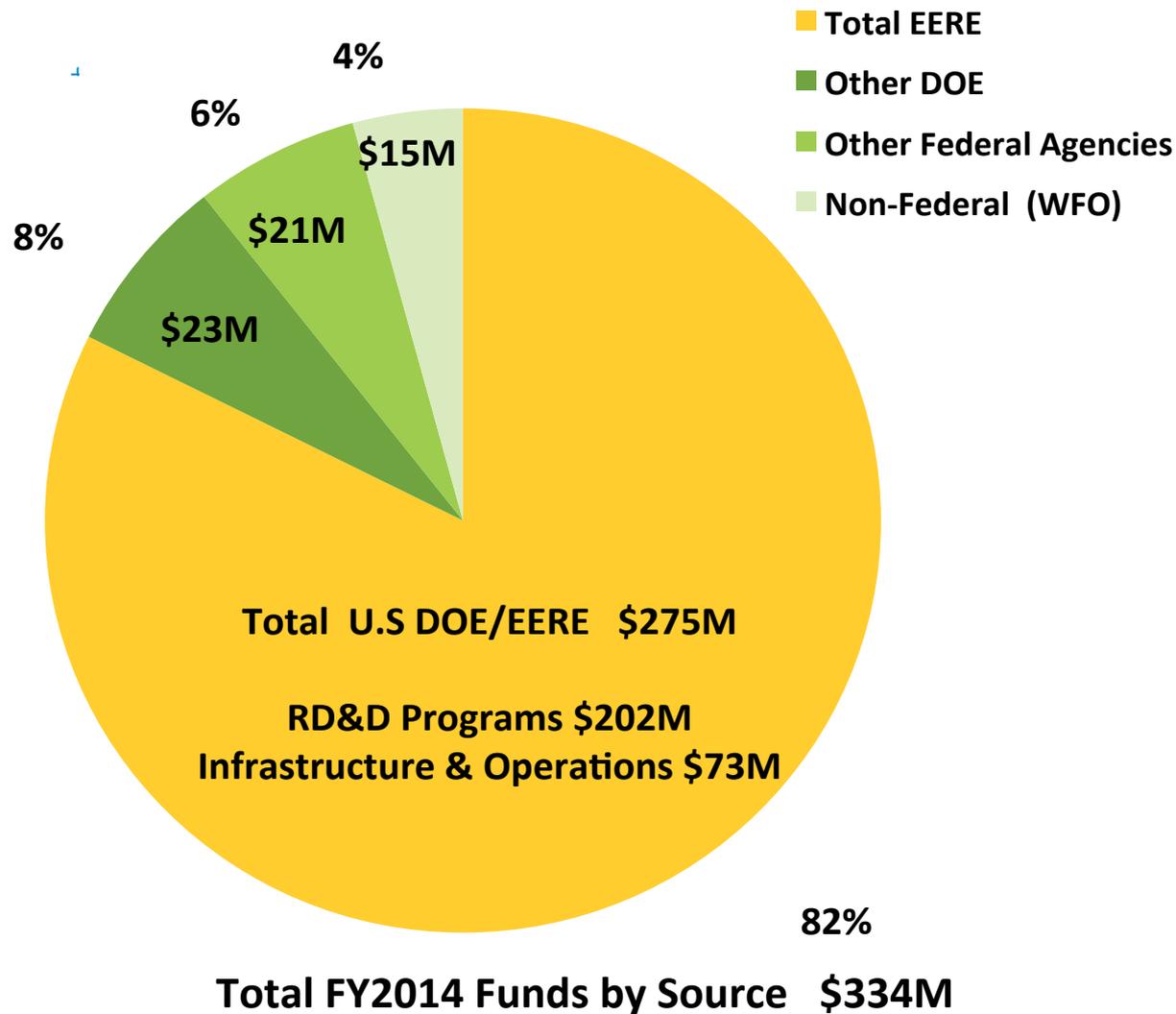
Mission to Advance Energy Efficiency and Renewable Energy

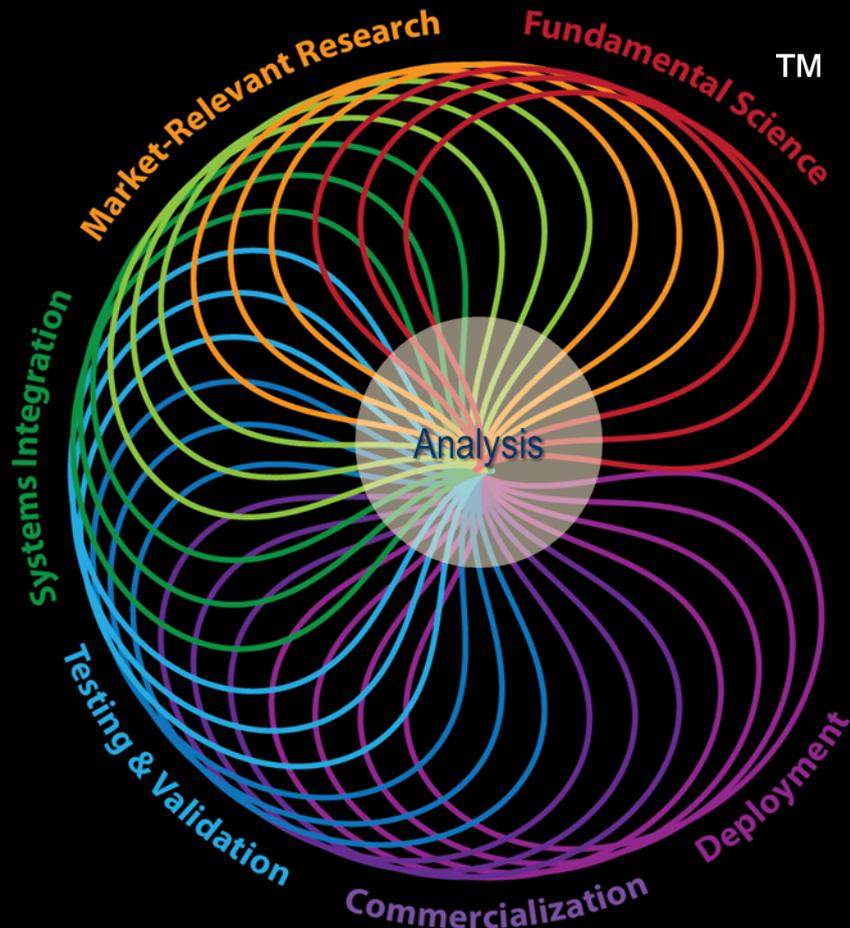
- Two Major Campuses in Colorado
- Physical Assets Owned by the U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy
- NREL operated by the Alliance for Sustainable Energy under a performance-based contract to DOE
- 2432* staff and world-class facilities
 - 1593 payroll staff
 - 839 contract staff
- More than 400 active partnerships
- Campus is a living model of sustainable energy



* As of 11-30-13

FY14 Funding (Forecast)

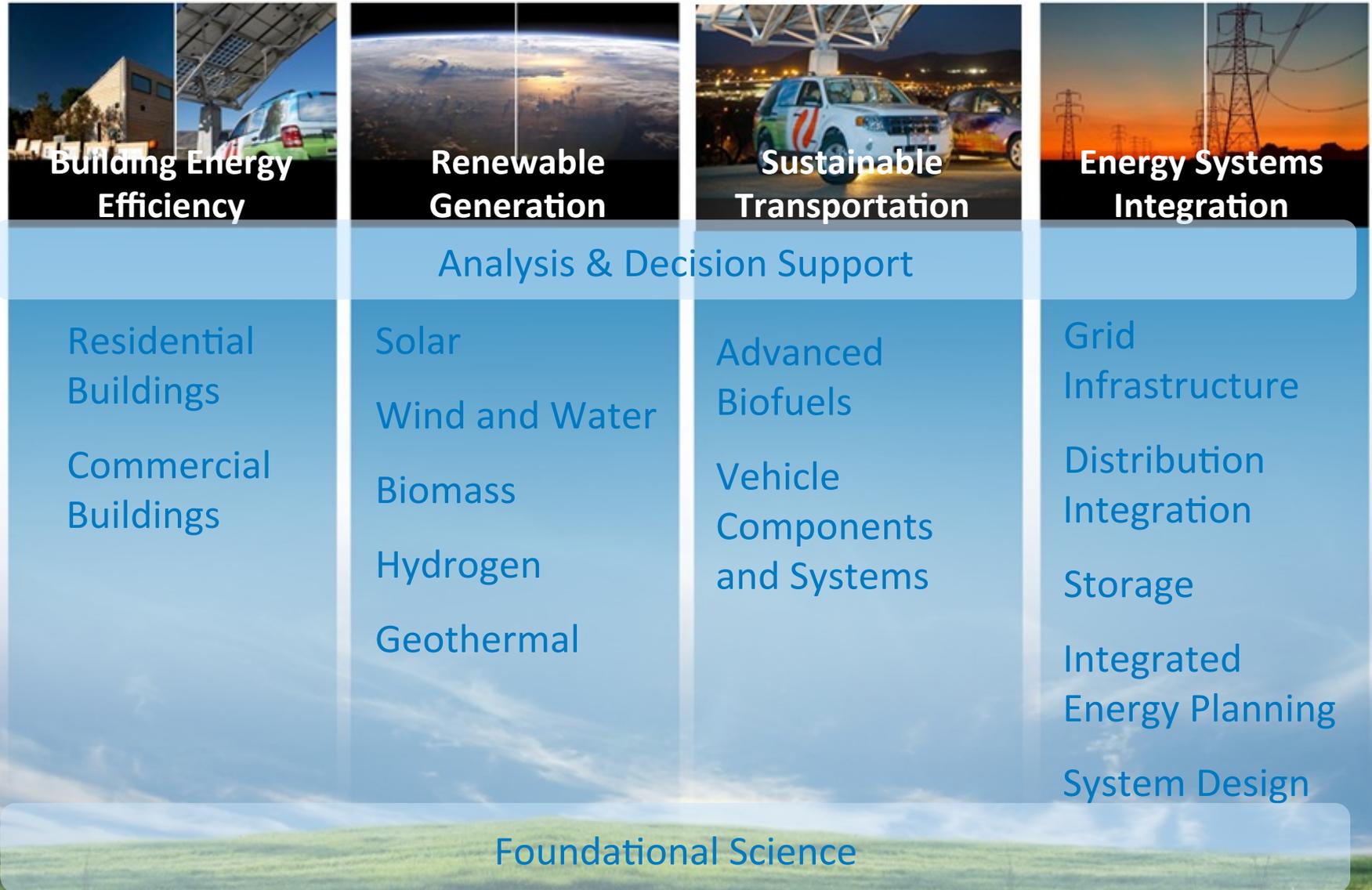




Creating Options and Reducing Risk from Science through Deployment

- Science:** Knowledge to Underpin Innovation
- Technology Research:** Focus on Cost and Risk Reduction
- Systems Research:** Integration and Interoperability
- Commercialization:** Move NREL Knowledge and Knowhow to Product Lines
- Deployment:** Reduce Barriers to Widespread Adoption
- Analysis:** Provide Insights to Guide Energy Related Decisions

Scope of NREL Research Portfolio

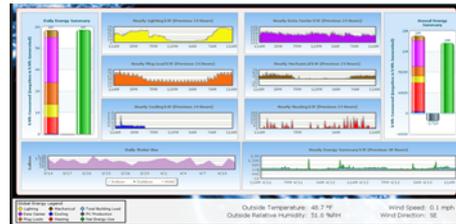




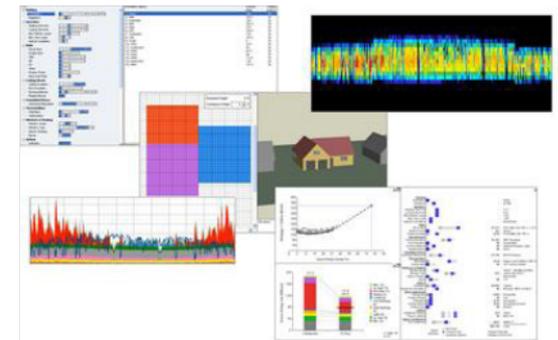
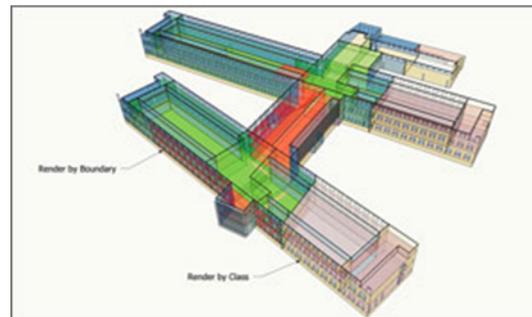
Advanced Components



Performance Monitoring/Verification

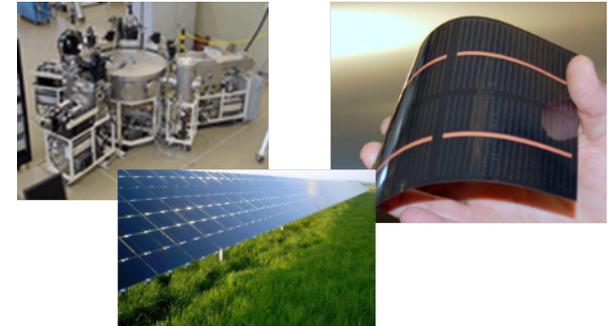


Whole Building Energy Modeling



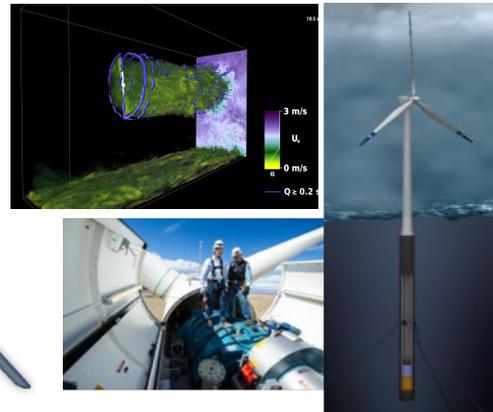
SOLAR

- Materials and Devices
- Manufacturing processes
- Power electronics
- Grid integration & Storage
- “Soft costs”
- Modeling and analysis



WIND

- Wind Plant Performance
- Offshore Wind
- Power electronics
- Grid integration
- Modeling and analysis



Marine Hydrokinetics

- Computer-aided engineering
- Resource characterization
- Testing, evaluation and standards
- Modeling and analysis



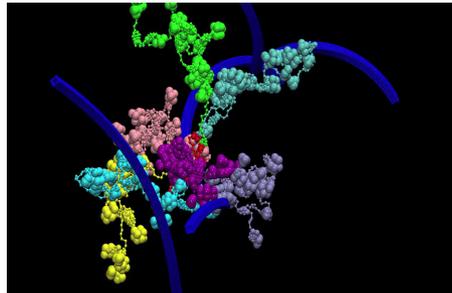
Geothermal

- Thermal energy conversion systems
- Modeling and analysis
- Energy project assessment





Advanced Fuels –
Biofuels and Hydrogen



Advanced Biofuels

- Chemical and catalysis science
- Biomass characterization
- Biochemical & thermochemical conversion
- Process modeling and analysis
- Sustainability analysis

Hydrogen and Fuel Cells

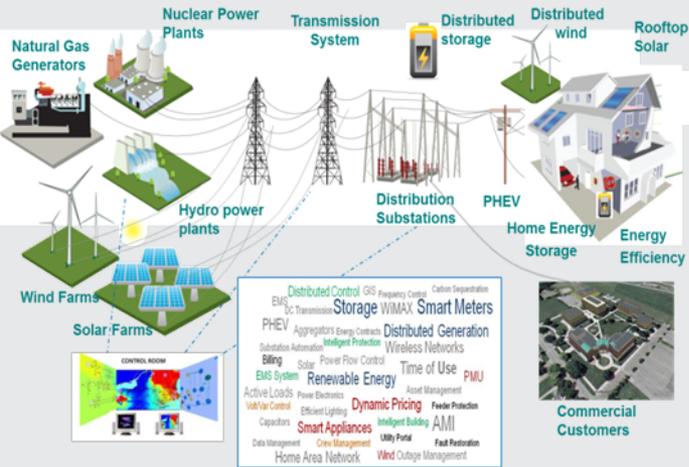
- Renewable hydrogen production
- Advanced materials
- Manufacturing processes
- Safety, codes and standards
- Thermal and water management
- Systems analysis



Advanced Vehicles

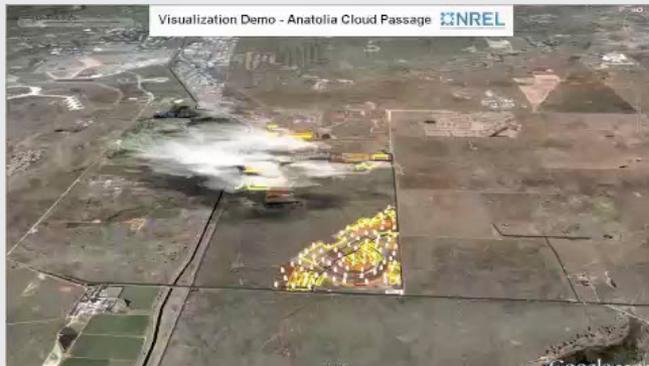
- Computer-aided design tools
- Thermal management
- Fuels compatibility
- Vehicle-to-grid integration

Future Energy Systems



Energy Systems Integration

- Physics-based systems modeling and simulation
- Integrated system experimentation
- Communication and control architectures
- Hybrid systems
- Scenario and impact analysis



Energy Analysis and Decision Support

Energy Analysis

Integrated Assessments

Markets and Finance

Energy Systems

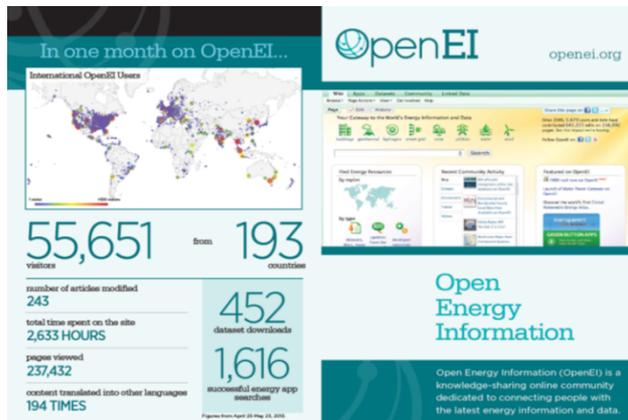
Technology/Components

Resources

Generation Systems/Grid
Vehicles/Fuels Systems
Cross Sectors

Industrial Systems
Buildings

Information Access



Specific Analysis Competencies

- Techno-Economics
- Finance/Economics
- Environmental Impact/Sustainability
- Modeling/Simulation
- Risk & Decision analysis
- Data Mining & Analysis
- Synthesis/Stakeholder Engagement

Technical Assistance

- Energy planning
- Design and specification
- Project development
- Market barrier mitigation

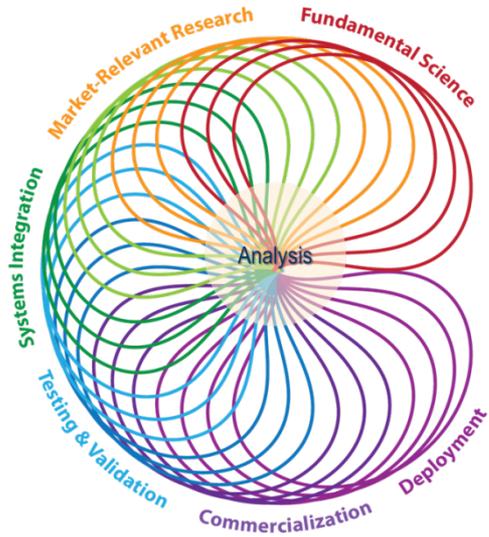


Model Sustainable Campus

- **Very high efficiency buildings**
 - Three LEED platinum certifications
 - Research Support Facility - Net zero energy
- **On site renewable power**
 - 4.36 MW installed PV capacity
 - 9.68 MW installed wind capacity
 - ~34% of total power use
- **Alternative Fuel Use**
 - 59% of total consumption
 - Operations fleet includes 24 E85 vehicles and 5 hybrid-gas vehicles
 - Research fleet of advance vehicles – hybrids, plug-on hybrids, fuel cell vehicles
- **Campus Used As a Research Test Bed**



Importance of Partnerships



Leveraging Knowledge and Knowhow to Address Energy Challenges



Major Partnering Mechanisms

Work for Others Agreements

A fee-for-service contract that enables the partner to access the laboratory to perform a defined scope of work that draws upon unique laboratory capabilities (facilities, equipment, expertise). Rights to intellectual property developed under the agreement are typically vested in the sponsor if they are a U.S. entity and in the laboratory if they are a non-U.S. entity.

Agreements for Commercializing Technology

Enables a flexible agreement framework for conducting privately-funded research under terms that are negotiated between the laboratory contractor and the partner.

Cooperative Research & Development Agreement

Provides a mechanism for implementing a shared research agenda while providing access to resulting intellectual property. Partners provide research funds and/or in-kind contributions. The lab may provide personnel, services, facilities, equipment, intellectual property or other resources if the work aligns with Department of Energy interests.

User Agreements*

Specialized standard agreements to enable user access to unique DOE capabilities designated as user facilities. Users doing non-proprietary work and agree to publish results bear no facility operating costs. Those conducting proprietary work pay full cost.

**Relevant to work in the ESIF*



www.NREL.gov