National Renewable Energy Laboratory
Innovation for Our Energy Future

Design-Build Support Services Pre-Proposal Conference

Energy Systems Integration Facility Overview

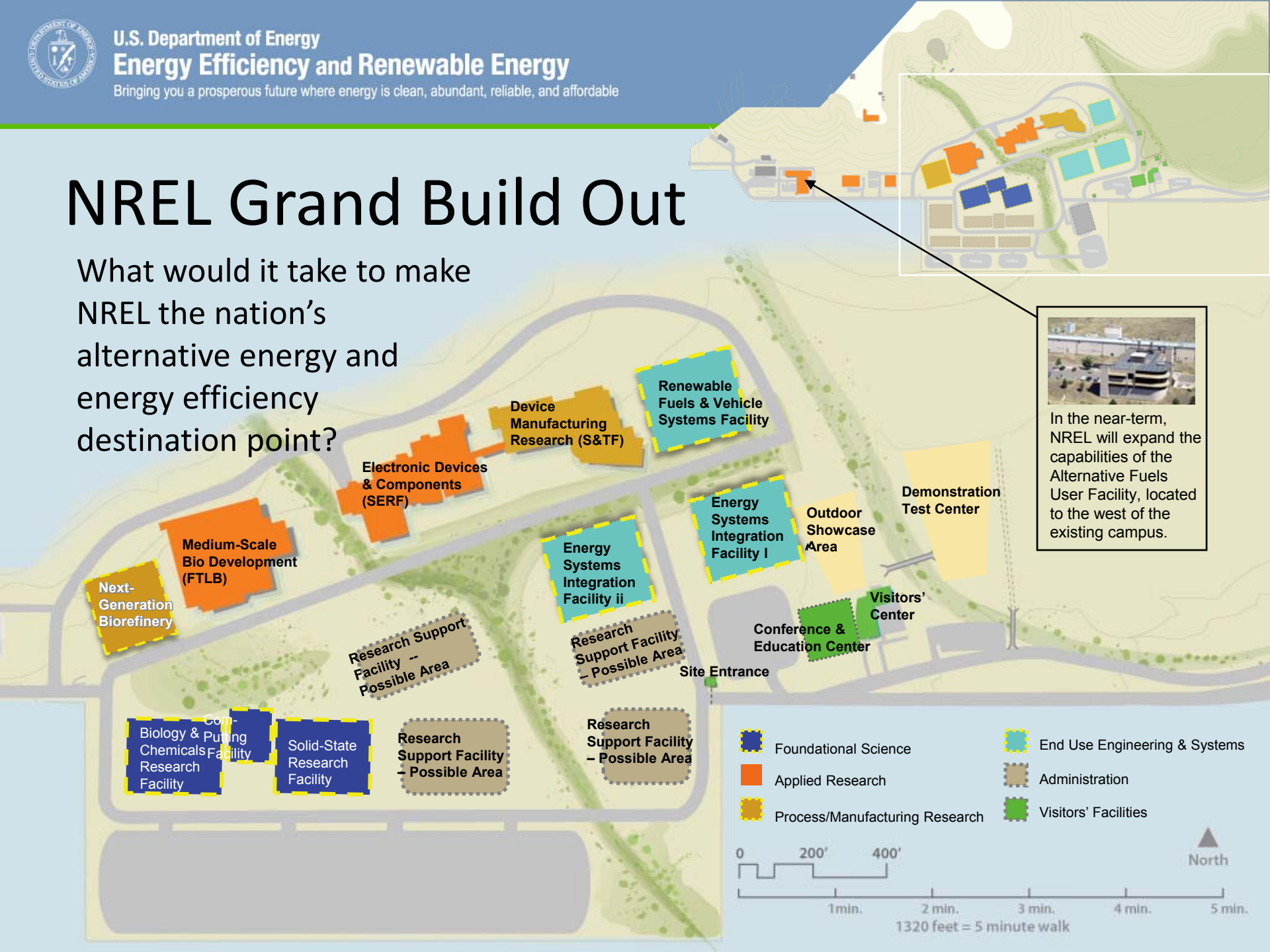
Dr. Drew Detamore
10/15/2008

Denver West (DW) and South Table Mountain (STM)

Site Aerial

NREL Grand Build Out

What would it take to make NREL the nation's alternative energy and energy efficiency destination point?



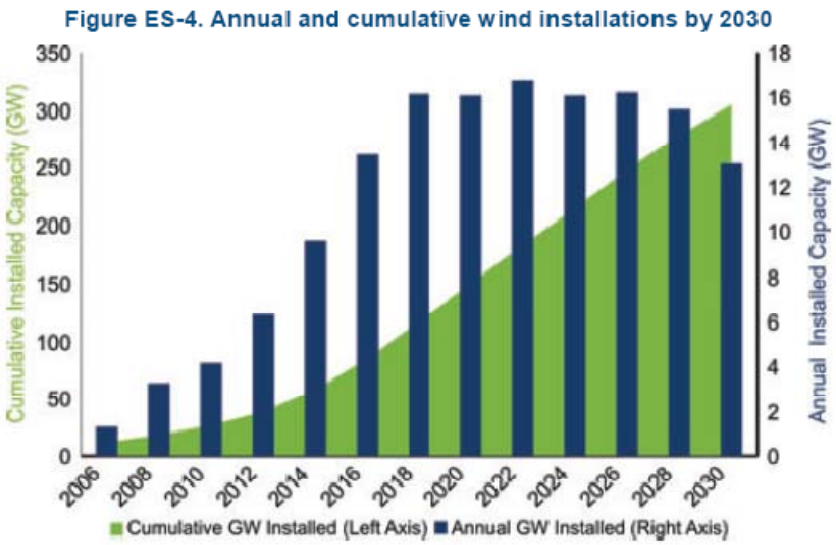
In the near-term, NREL will expand the capabilities of the Alternative Fuels User Facility, located to the west of the existing campus.

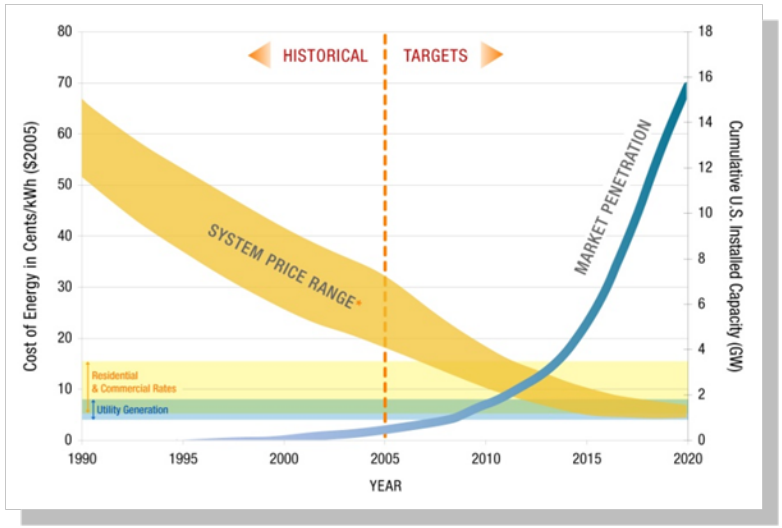
Challenge

Renewable and efficiency technologies are being deployed at rates and scales that will start to challenge the existing infrastructure's capacity and operability.

Unique issues related to large-scale deployment of renewable and efficiency technologies must be addressed:

- **Generation variability**
- **Dispatchability**
- **Distributed, sometimes remote**
- **New infrastructure requirements**
- **Intelligent grid technologies**





Fully assess the performance and reliability impacts **of large-scale RE and EE deployment on the nation's energy delivery infrastructure.**

Reduce uncertainties **for utilities by conducting analysis of RE and EE technologies under different operating and geographic conditions.**

Explore impacts on system interfaces **from large-scale EE and RE penetration.**

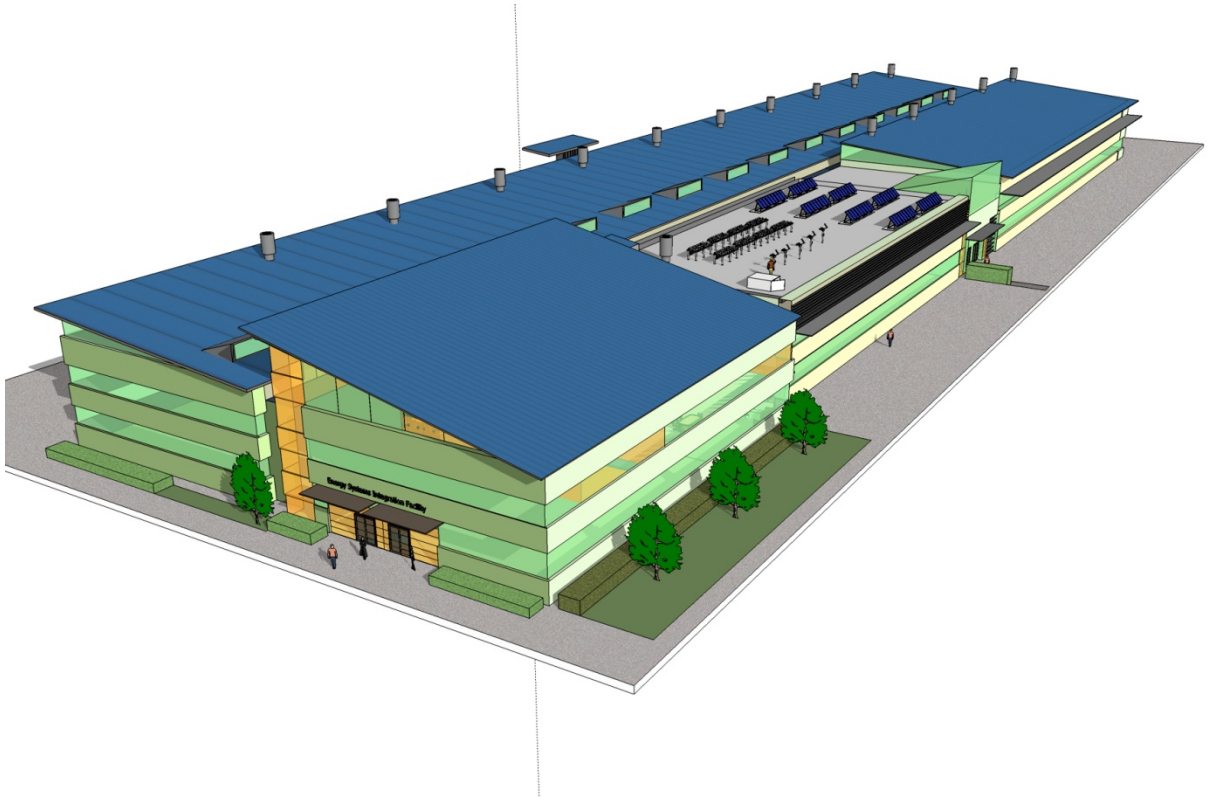
Develop performance models for integrated RE **generation systems for a combination of resources/geographies and demand control technologies.**

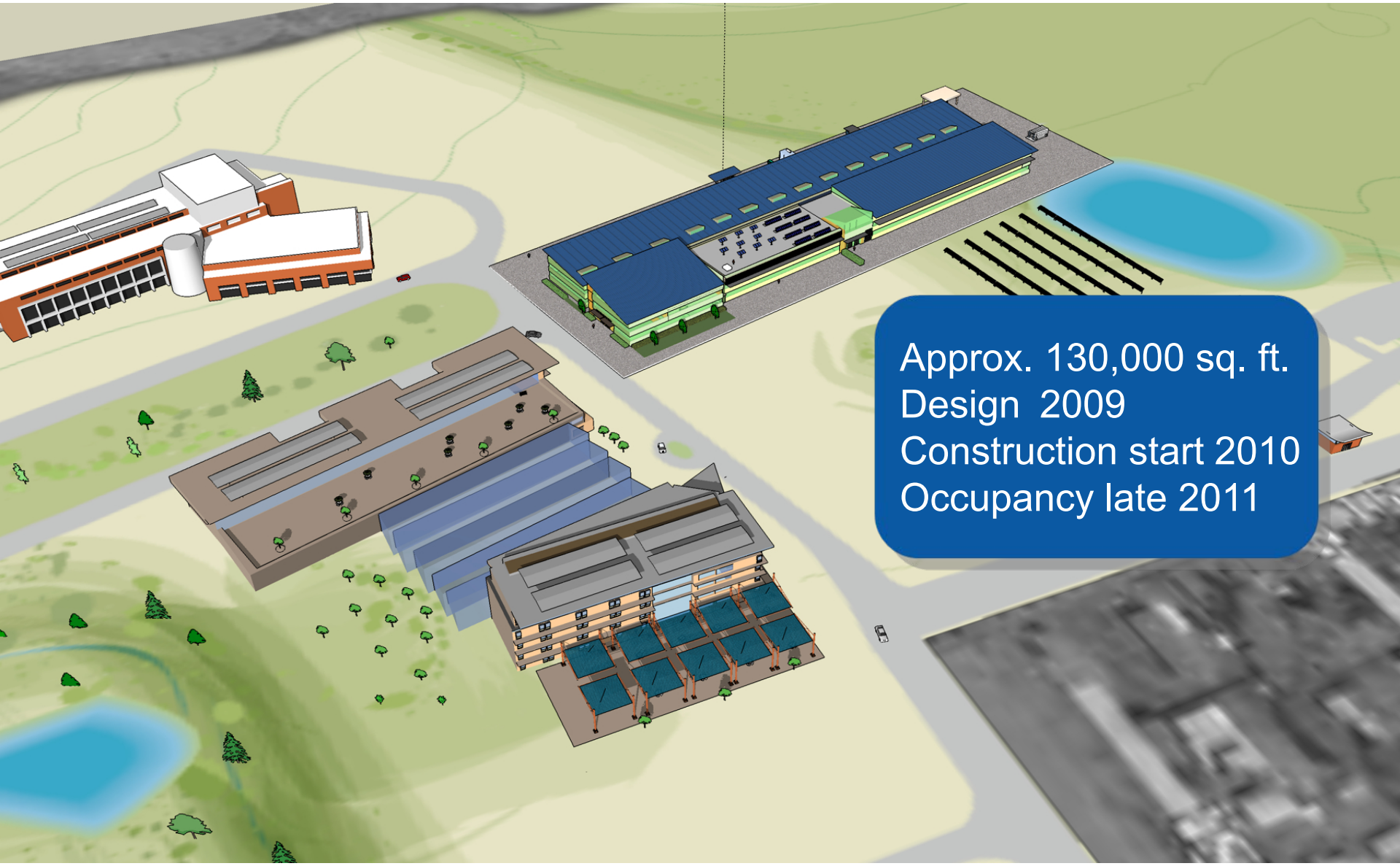
Optimize integrated RE and demand side systems configurations **under various load and storage configurations.**

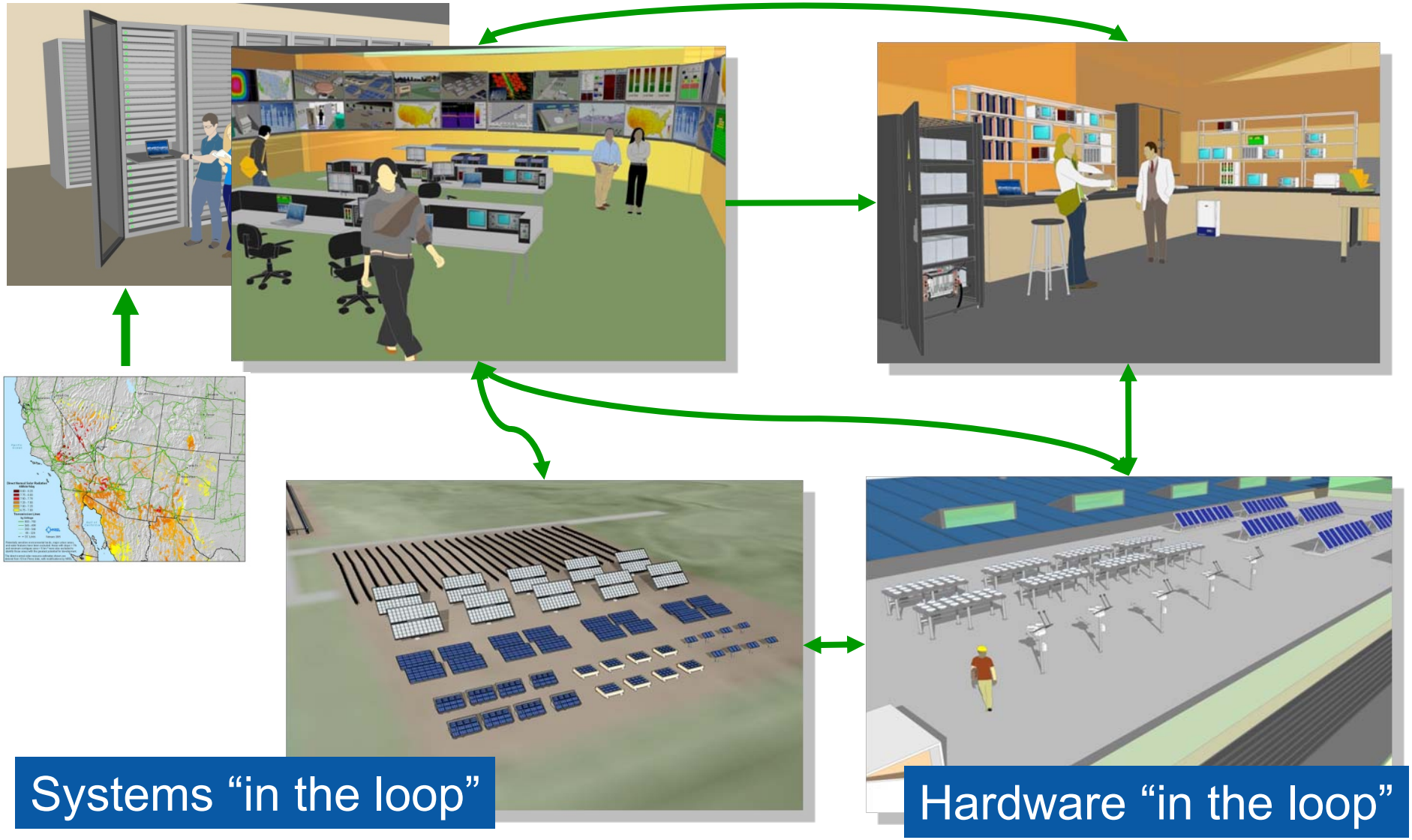
Validate benefits of storage solutions **for distributed and bulk RE and EE technologies.**

ESIF Vision

Enable complex systems research and development that fully integrates the most advanced simulation, data analysis, engineering, and evaluation techniques to transform the nation's energy infrastructure.

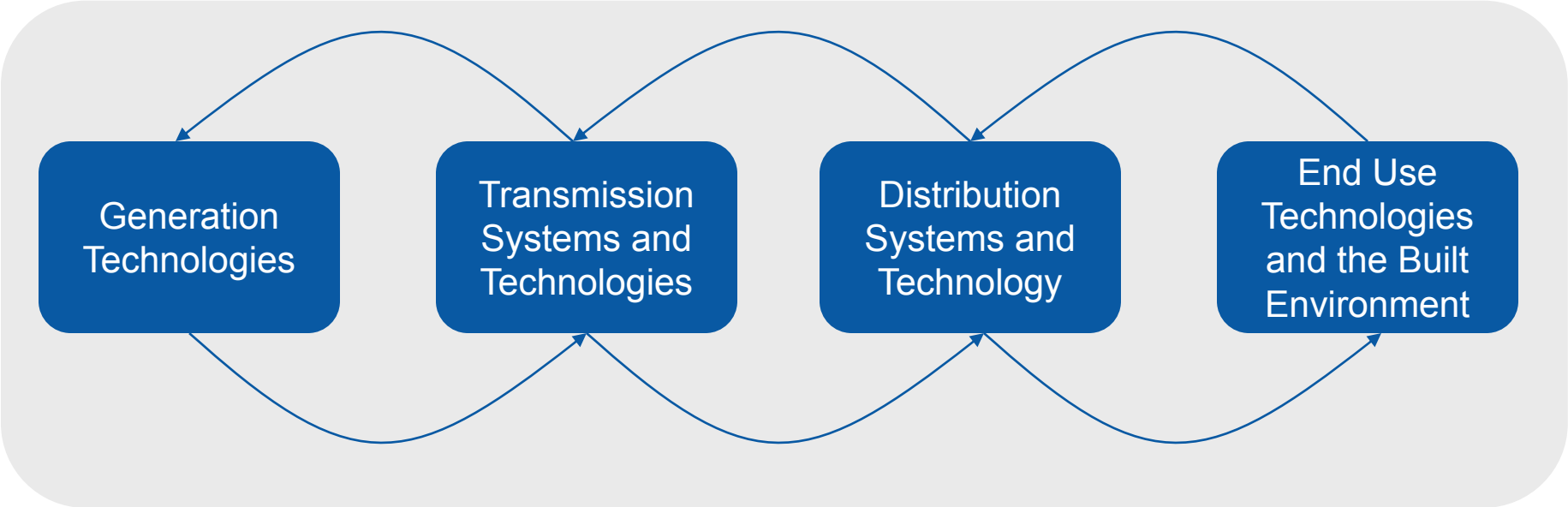



Approx. 130,000 sq. ft.
Design 2009
Construction start 2010
Occupancy late 2011


Systems “in the loop”
Hardware “in the loop”

A System of Systems

Technology R&D, Modeling, Simulations



Applied to Enhanced Integration Mission

ESIF System Integration Capabilities

System Testing, Data Analysis, Modeling, and Visualization Across Technologies

High-Performance Computing, Data Storage, and Networking

- Solar

- Interconnection
- Power electronics
- Building integration
- Thermal and PV system optimization

- Buildings

- Sensors and controls
- PV design and integration
- Modeling and simulation
- System integration

- Hydrogen

- H_2/electric interfaces
- RE electrolyzers
- Storage systems
- Standards
- Fuel cell integration
- Fueling systems

- Wind

- Models, methods for wind-grid integration
- Transmission
- Operations modeling

- Advanced Vehicles

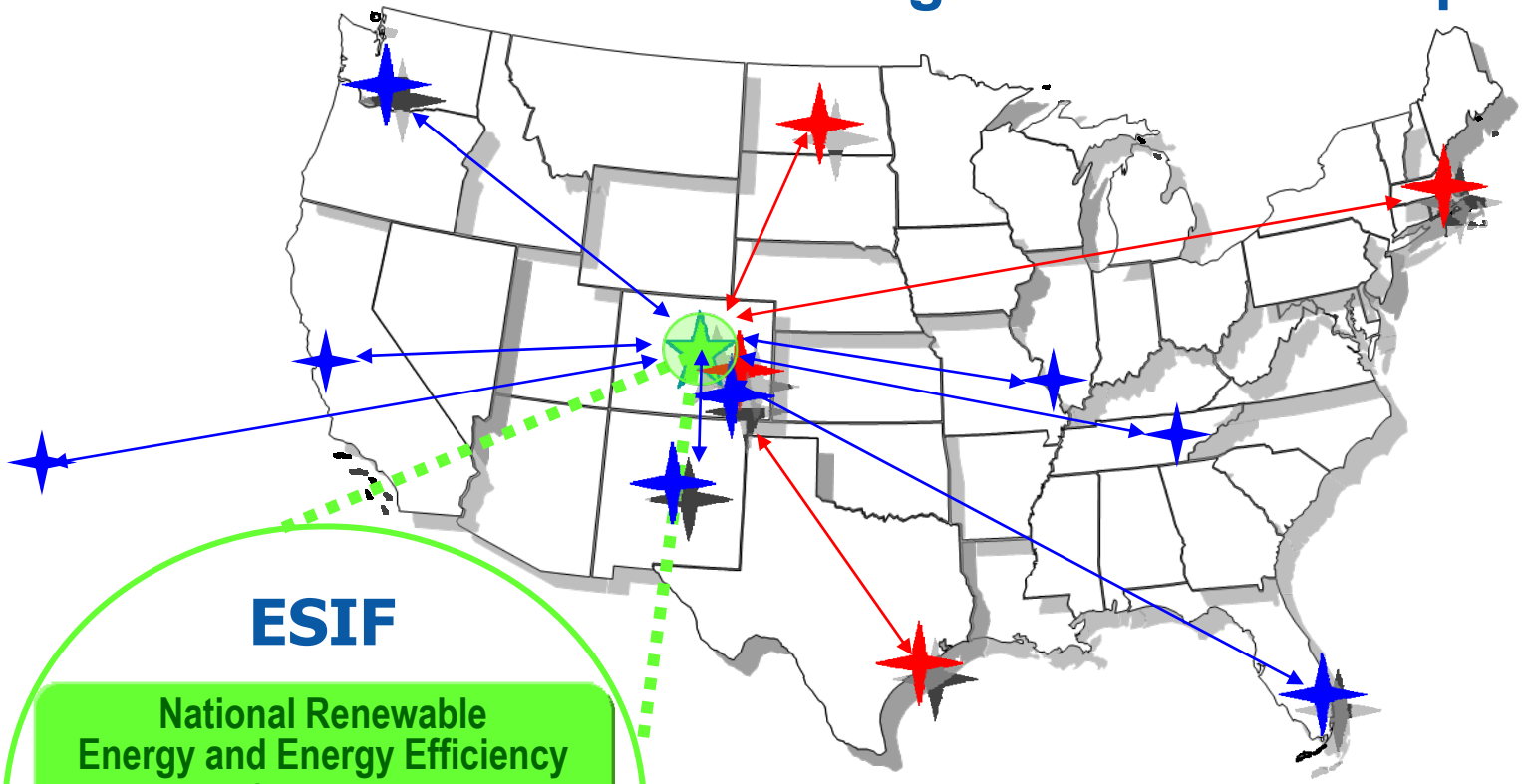
- Plug-in-hybrids and vehicle-to-grid
- Battery thermal management
- Power electronics

- Storage

- CSP Thermal Storage
- Utility scale batteries
- Distributed storage.

Full systems interface evaluation for integration of electricity, fuels, thermal, storage, and end-use technologies

EERE's Energy Systems Integration Facility at NREL as the 'Hub' of a Larger RDD&D Enterprise



ESIF

National Renewable Energy and Energy Efficiency Data Clearinghouse

- **Performance benchmarks**
- **Public Data**
- **Analysis Toolkits**

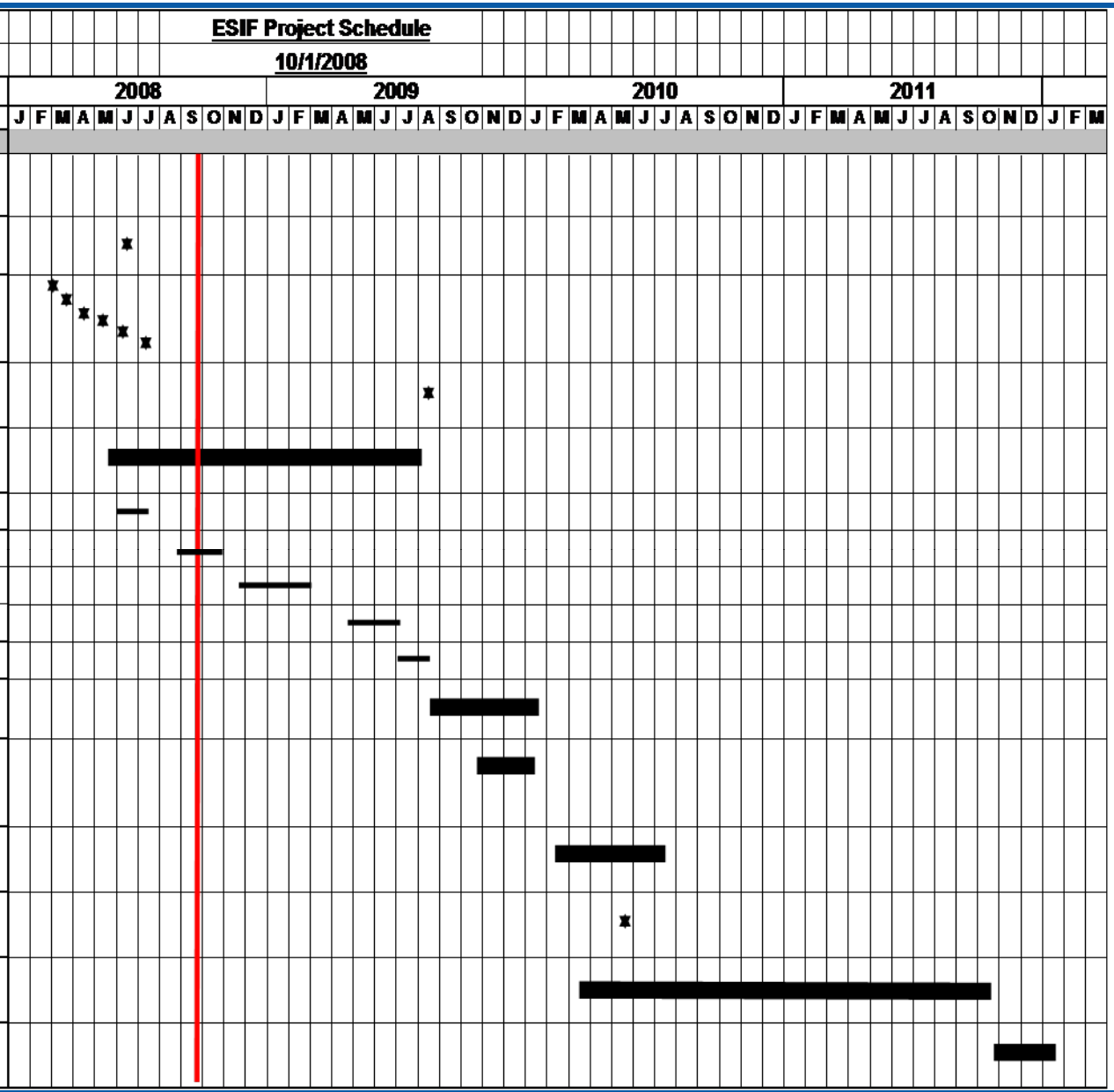
Firewall

Proprietary Data

Research and Testing Partners

ESIF Schedule

ESIF Project Schedule

10/1/2008

ID	Task Name	Start	Finish	Duration
	ESIF CD-0 (complete)		8/9/2007	Complete
	FY08 Funding Received	10/1/07	6/13/08	Complete
	USER Workshops (7 Total)	3/5/08 3/20/08 4/10/08	5/13/08 6/5/08 7/2/08	Complete
1	DOE approves concept CD-1	2/15/09	8/3/09	
2	ESIF Acquisition	5/27/08	8/13/09	
2a.	Issue RFQ	5/27/08	7/18/08	
2b.	Short List to 3	9/1/08	10/31/08	
2c.	Issue RFP	11/24/08	2/27/09	
2d.	Select Firm	4/28/09	7/9/09	
2e.	DOE/HQ App.	7/9/09	8/13/09	
3	Preliminary Design	8/14/09	1/12/10	
4	Prepare for DOE H/Q app. Design CD2/3	10/23/09	1/12/10	
5	Final Design	2/10/10	7/19/10	
	FY10 Funding Received	5/1/10	6/1/10	
6	Construction	3/23/10	10/24/11	
7	DOE App. Operation CD4	10/25/11	1/16/12