ENERGY SYSTEMS INTEGRATION FACILITY

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Stakeholder Workshop

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Administration Goals

Transport

- Reduce oil imports by 1/3 by 2025
- Put 1 million electric vehicles on the road by 2015

Stationary

- By 2035, generate 80% of electricity from a diverse set of clean energy sources
- Make non-residential buildings 20% more energy efficient by 2020

Environmental

- Cut GHG emissions in the range of 17% below 2005 levels by 2020, and 83% by 2050

Federal leadership

- Reduce Federal Greenhouse Gas emissions by 28% by 2020

Energy Security:

- Advance domestic energy resources.
- Diverse supplies.

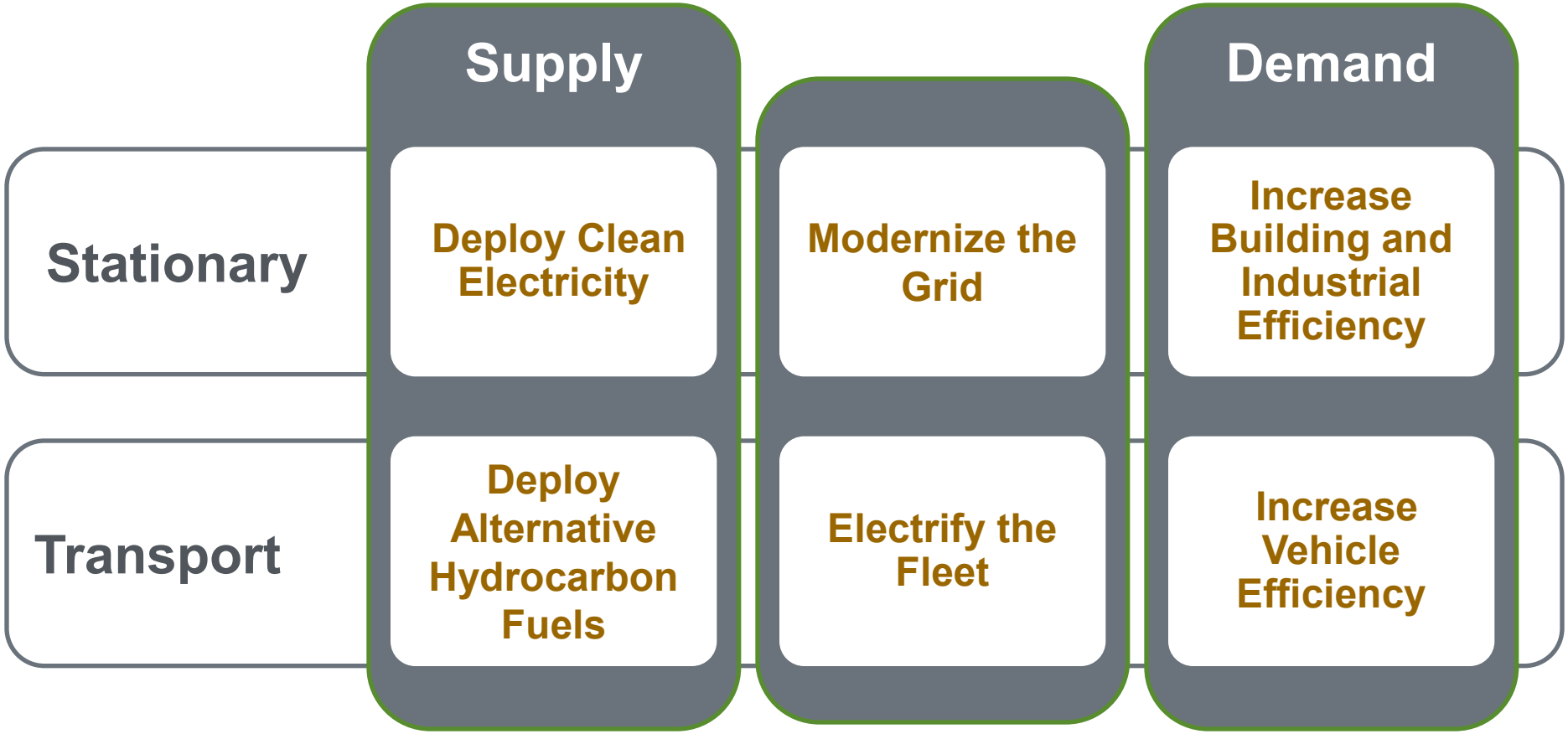
Environment:

- Achieve 80% reduction in Greenhouse Gas Emissions.
- Improve water and air quality (indoor and outdoor).

Economy:

- Low cost energy services.
- Clean energy business opportunities.
- Clean energy jobs.

DOE Six Strategies



ESIF can play a key role in addressing challenges in most of these strategies

From QTR

ESIF Enables Clean Energy Vision

- A clean, transformed energy system has the potential to include significant carbon-free variable generation, increased flexibility through integration of significant amounts of energy storage (fixed and PHEV), considerable distributed resources, two-way power flow, real-time customer/utility communications, high degrees of automation, and flexible/controllable loads that are part of high efficiency buildings (including load reduction and generation)

De-risking technologies/practices and Eliminating Uncertainties:
Testing, simulation, data analysis, engineering, and evaluation techniques in a risk-free environment to help transform the nation's energy infrastructure.

Example Problems to Address

- Impacts on electric system stability and reliability under deployments of variable generation at scale
- Transmission system operations challenges under scenarios of variable generation deployed at scale
- Transition from passive to active operations of the distribution system under large-scale deployment of distributed (variable and conventional) generation technologies.
- Transmission and distribution strategies for accessing renewable resources and delivering them to load
- Lack of Smart Grid communications and interactivity of components across the grid from generation to storage to loads

Example Problems to Address

- Absence of significant, widely deployed storage in the system
- Limited, smart load control technologies and communications to reduce peak demands
- Distribution systems impacts caused by the interaction of the built environment with the electricity system
- Lack of control strategies for vehicle-to-grid and grid-to-vehicle required to enable the electrification of transportation
- Impacts on the physical infrastructure of transportation electrification and new infrastructure needs
- Addressing hydrogen production and storage interfaces with existing energy infrastructures

ESIF's Unique Capabilities

- Renewable and efficiency hardware-in-the-loop testing of new components in full scale simulations of the distribution and transmission systems, as well as the built environment
- Virtual utility operations and simulation dedicated to integration of RE and EE technologies at scale
- Visualization capabilities of real-time lab and field tests integrated with simulations
- High-power (MW scale at 480V and 13kV) capability to test prototype hardware
- Integrated electricity (AC and DC), fuels (e.g. hydrogen, natural gas), and thermal connections throughout multiple testing bays
- Integrated hardware testing, evaluation, and validation capabilities coupled with advanced computing and simulation capabilities.
- Smart Grid interoperability testing and validation

Summary Timeline (Calendar Year)
5 years since conception!

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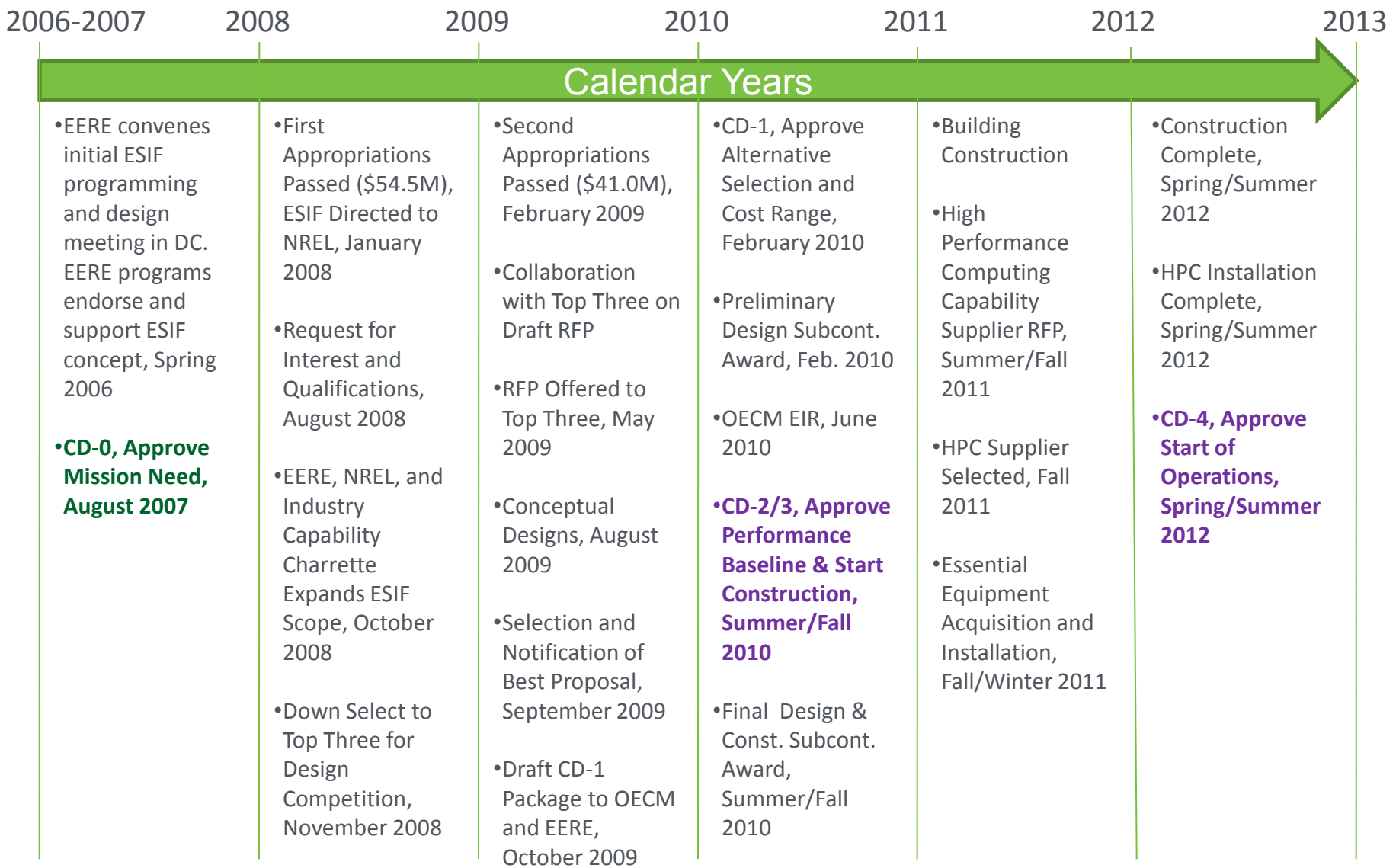

Architect's Images