

# The U.S. Department of Energy's Field Validation Program for Commercial Buildings: A Guide for State and Local Governments

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy—Building Technologies Office, and Office of Weatherization and Intergovernmental Programs

January 2021



# Outline

These slides provide an overview of the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy's (EERE) Field Validation program for commercial buildings.

## Topics covered:

- About DOE's Commercial Building Integration program
- Key steps in the field validation process for commercial building technologies
- How energy-saving technologies are identified, grouped, screened and selected for field tests
- How state and local governments can participate in field validation and technology selection.

# DOE EERE—Commercial Buildings Integration (CBI)

**Mission:** Drive energy efficiency and greenhouse gas emissions reductions in commercial buildings through dynamic, beneficial, and accessible RD&D and through ongoing, equitable engagement with a diverse set of stakeholder groups.

## **Vision:**

1. Commercial buildings are constructed and operated so that they can consistently adapt and improve to provide optimal energy performance, minimize energy costs, reduce greenhouse gas emissions, and serve as a resource to the energy grid.
2. Commercial buildings supply comfortable conditions and services that enable occupant productivity and health.
3. Commercial buildings are a hub for integrated energy flexibility, generation, and storage to improve grid reliability, affordability and resilience.

# Field Validation

# What is Field Validation?

- **Technology:** Devices and platforms with efficiency benefits
- **Field:** “In the wild”; real world, dynamic conditions
- **Validation:** Research that answers pre-defined questions about the performance of a technology; are we testing the right product under the right operating scenarios.



# EERE's Field Validation Partnership

## Overview

The Weatherization and Intergovernmental Programs Office (WIP), Building Technologies Office (BTO), Federal Energy Management Program (FEMP), and the Advanced Manufacturing Office (AMO) are collaborating on near-term technology field validation efforts.

Our goal is to **partner with state and local governments** to identify host building sites in which to:

1. Install and validate high impact technologies, and
2. Provide technical assistance (e.g., modeling, data collection, installation) to energy staff and building managers to de-risk and inform broader adoption of successfully validated technologies.

# Benefits of State Energy Office Participation

- **Join DOE and other federal agencies, state and local governments to identify, evaluate, and de-risk high impact technologies that can help you and your constituents meet energy and climate goals**
- **Independent, 3rd party evaluation supported by DOE National Laboratories**
- **Deployment, outreach, dissemination with DOE and partners to address a lack of objective performance and cost data that inhibits some technologies from finding their customer base.**

# What Are the Objectives?

Validate the potential of selected technologies:

## Technical Examples

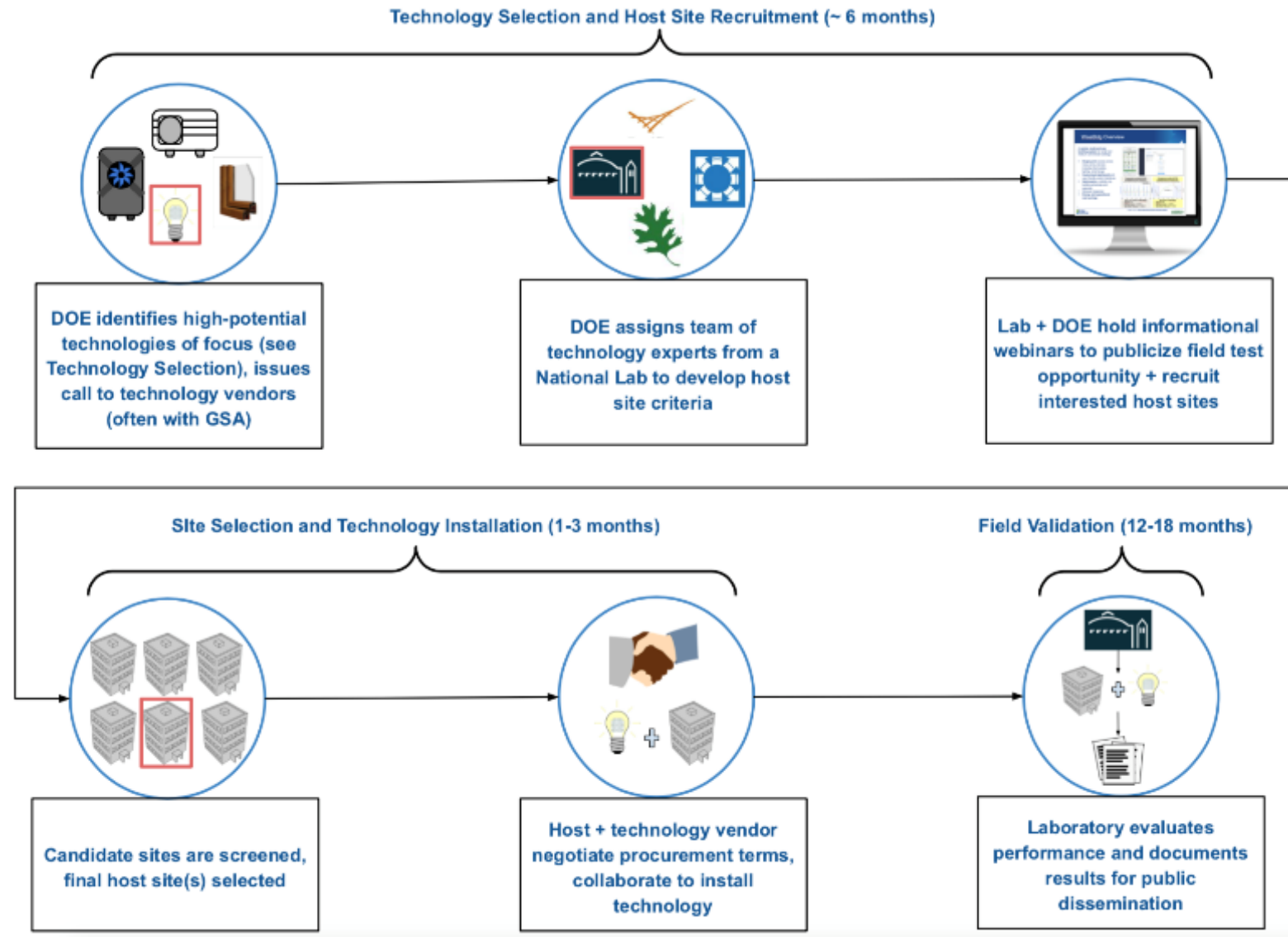
- Verify energy savings, associated utility cost savings, peak demand reductions
- Verify occupant satisfaction impacts.

## Market Adoption Examples

- Investigate applicability to different building types, sizes, and end use systems
- Evaluate maintenance and operability benefits to operations/management staff
- Verify the cost-effectiveness, (e.g., simple payback, ROI).



# How Does the EERE Program Work?



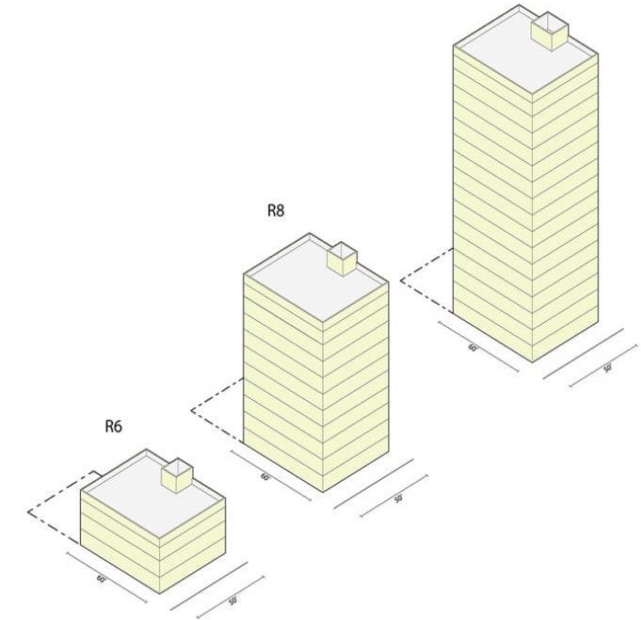
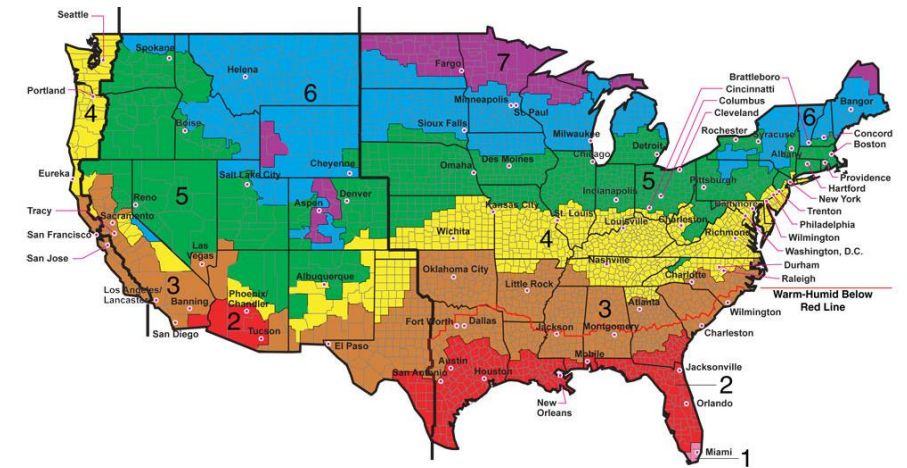
# Host Site Role vs. Lab Role

---

- **Site Role:** Work with National Lab team and technology provider to provide information needed to evaluate sites, install technology, conduct demonstrations, and provide information required for performance evaluation
- **National Lab Role:** Recruit host sites, evaluate candidate sites, select validation sites, conduct rigorous evaluations, and document findings

# Field Validation Site Selection

- Host site selected by National Labs and DOE technology managers based on compatibility with technology-specific target market and evaluation needs, such as:
  - Building type, size, existing equipment types, climates, geographies (target market), and
  - Resolution and type of metering, absence of other planned retrofits (evaluation needs).
- Selection criteria are split into required and preferred, and documented in ‘easy-fill’ spreadsheet forms provided by National Labs
- Prospective host site fills out form
- Host site determined using site selection survey, filled out by candidate building owner/operator



# Field Validation Host Site FAQs

- Does the state / local government have to pay for it? Is there funding available?
  - Technology purchase and installation costs are negotiated between host sites and technology vendors
  - Local utility incentives or rebates may be leveraged if/as available
    - Please reach out to DOE for a discussion on how to engage your utility.
- DOE may offer funding opportunities such as: **Building Technologies Proving Ground-Public Sector Field Validation FOA (now closed)**

[\(DE-FOA-0002324 Funding Opportunity Announcement \(FOA\)\)](#)

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

**Department of Energy (DOE)**  
**Office of Energy Efficiency and Renewable Energy (EERE)**

**Building Technologies Proving Ground –  
Public Sector Field Validation**

Funding Opportunity Announcement (FOA) Number: DE-FOA-0002324  
FOA Type: Initial  
CFDA Number: 81.086

FOA Issue Date:	June 26 <sup>th</sup> , 2020
Informational Webinar: <a href="https://doe.webex.com/doi/onstage/g.php?MTID=ea1fb7a04286dd99e8f1b3fe1fead184a">https://doe.webex.com/doi/onstage/g.php?MTID=ea1fb7a04286dd99e8f1b3fe1fead184a</a>	June 30 <sup>th</sup> , 2020, 12:00pm ET
Submission Deadline for Concept Papers:	July 27 <sup>th</sup> , 2020 5:00pm ET
Submission Deadline for Full Applications:	September 28 <sup>th</sup> , 2020 5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	November 2 <sup>nd</sup> , 2020 5:00pm ET
Expected Date for EERE Selection Notifications:	January 2021
Expected Timeframe for Award Negotiations:	Early 2021

- Applicants must submit a Concept Paper by 5:00pm ET the due date listed above to be eligible to submit a Full Application.
- To apply to this FOA, applicants must register with and submit application materials through EERE Exchange at <https://eere-Exchange.energy.gov>, EERE's online application portal.

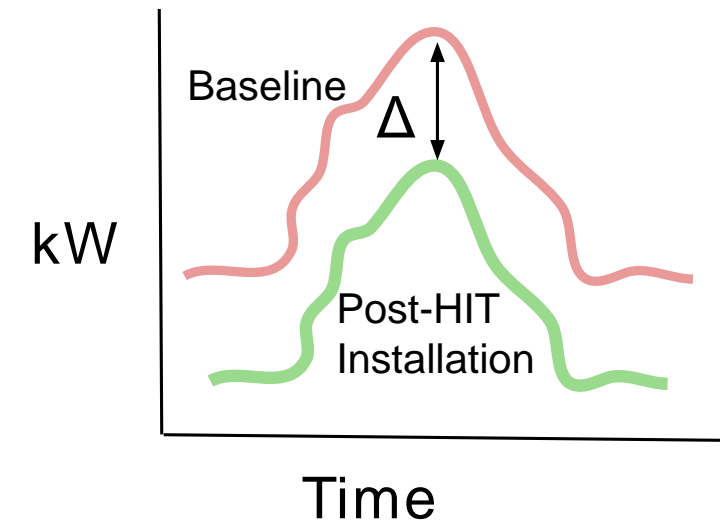
Applicants must designate primary and backup points-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. If an application is selected for award negotiations, it is not a commitment to issue an award. It is imperative that the applicant/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancellation of further award negotiations and rescission of the selection.

Questions about this FOA? Email [BTOProvingGroundFOA@ee.doe.gov](mailto:BTOProvingGroundFOA@ee.doe.gov).  
Problems with EERE Exchange? Email [EERE-ExchangeSupport@hq.doe.gov](mailto:EERE-ExchangeSupport@hq.doe.gov) Include FOA name and number in subject line.

# Field Validation Host Site FAQs

What value do DOE energy-saving technologies bring to my organization?

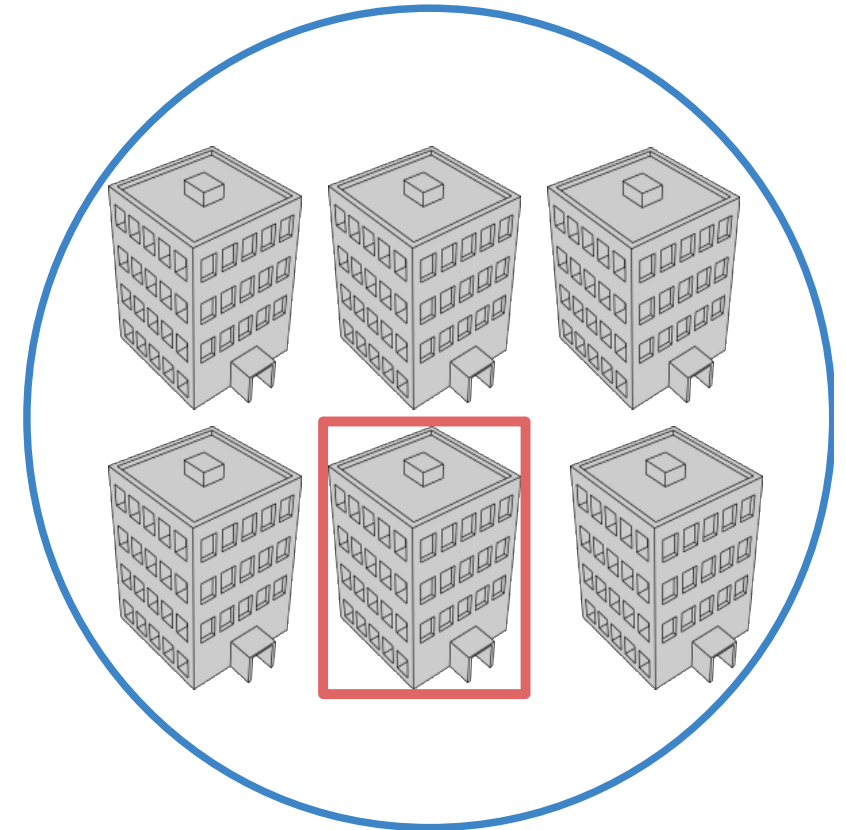
- Expected benefits are specific to each technology
- All technologies have been vetted for their energy and cost savings potential
- Some may reduce peak loads, adding additional cost savings
- Some may provide benefits to occupant comfort and O&M savings.



# Field Validation Host Site FAQs

What do I have to do to apply, and how do I know which of my buildings is a good candidate?

- Contact Greg Dierkers, [Gregory.Dierkers@ee.doe.gov](mailto:Gregory.Dierkers@ee.doe.gov), State Energy Program, WIP, for more information, eligible technologies, and for site screening surveys
- National Labs available to help identify the needed sites; technical assistance may be available.

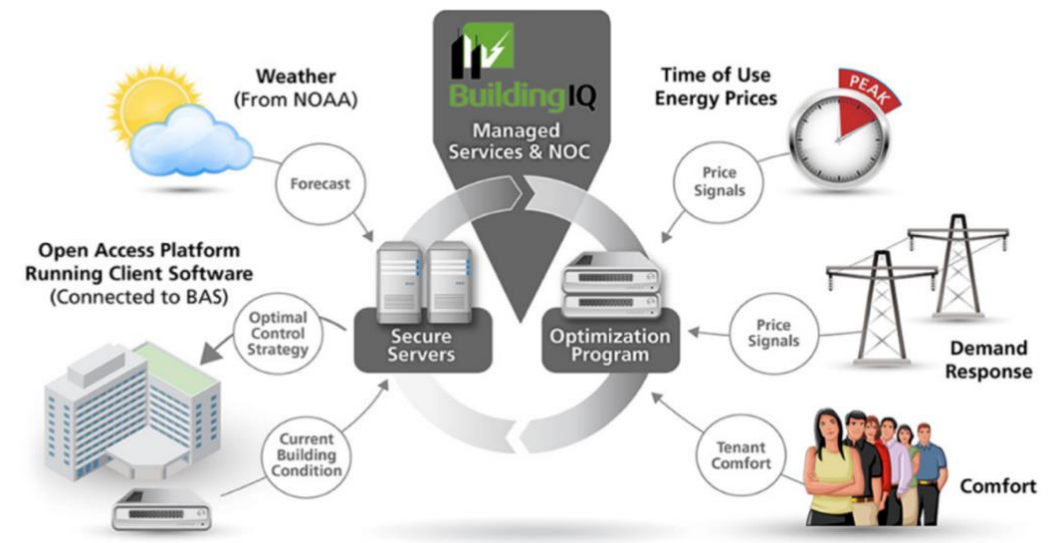


# Example of Completed Field Validation Project

# Validation Example: BuildingIQ Predictive Energy Optimization

## Building IQ:

- Predictive Energy Optimization (PEO), Software-as-a-service (SaaS) platform
- Optimizes commercial building HVAC control for system efficiency, occupant comfort, and cost
- Targeted for use in large, complex buildings
- Integrates with building automation system to conduct supervisory control
- Lawrence Berkeley National Lab tasked with evaluation and reporting findings.





# Building IQ Required Site Criteria

- Minimum floor area > 100,000 ft<sup>2</sup>
- Remotely accessible Building Automation System (BAS) with Building Automation and Control Networks (BACnet) or another protocol
- Central plant and air handling units (AHUs) or large packaged rooftop units (RTUs) with
  - Variable-frequency drives (VFDs) and
  - Modulating chilled water valves/multiple compressors
- Variable air volume (VAV) system (heating and ventilation)
- Direct digital control (DDC) for the AHUs
- Whole-building-level interval metering
- A building- or regional-level point of contact with the willingness and knowledge to provide evaluation information.

# Selected Public Sector Site

**Woodson High School (235,000 ft<sup>2</sup>)**  
Washington D.C., Department of General Services

## Evaluation Objectives:

- Energy savings
- Utility cost savings and payback period
- Occupant comfort impacts
- Scale-up considerations
  - Implementation lead time
  - Staff engagement
  - Impact on Building Energy Management activities
  - Information technology, security, continuity of connectivity.

## Estimated Annual Energy and Cost Savings:

- Electric: 22,080 kWh
- Gas: 711 Therms
- Cost savings: \$3,640.

## Results:

<https://eta.lbl.gov/publications/buildingiq-technology-field>

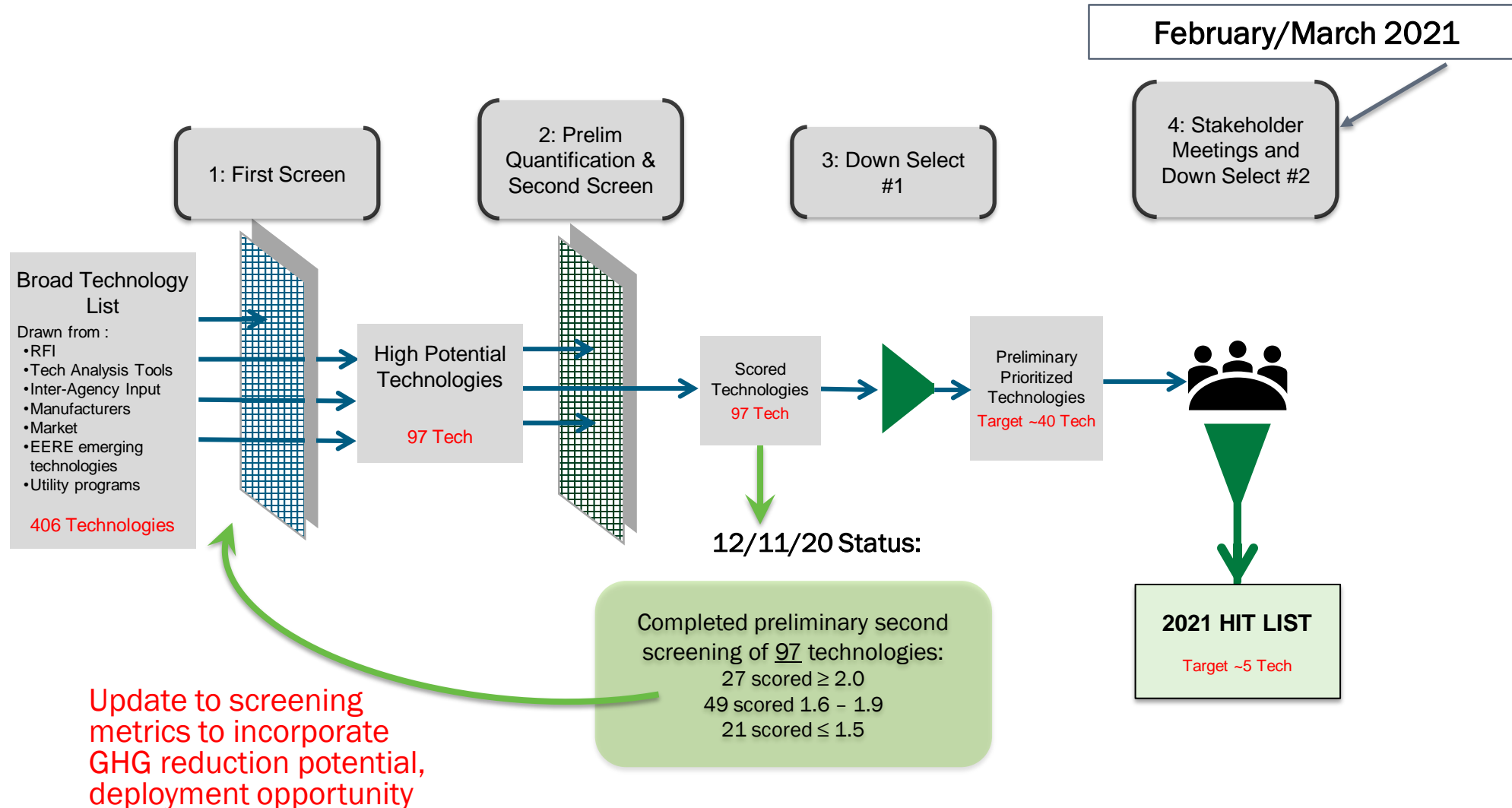


# **Technology Selection: How State Energy Offices (SEOs) Can Participate**

# Technology Selection Overview

- **The DOE EERE Commercial Buildings Integration (CBI) selection approach**
  - Identifies cost-effective, innovative building technologies with high energy and GHG emissions reduction potential
  - Focuses programmatic activities on the integration of these technologies into new and existing buildings
  - Ensures input from a variety of national labs, industries, utilities, and other stakeholders.
- **Building Technologies Office (BTO) identifies, compiles and analyzes technologies with the most impact in achieving energy savings goals**
  - Prioritization is based on key quantitative and qualitative criteria.
- **Program is cyclical; new technologies are regularly considered and added**

# Technology Selection: Identification



# Stakeholder Workshop Process

- BTO collects comprehensive input and feedback on technology through existing stakeholder networks
- Key component of the prioritization process is discussions with stakeholders
  - Helps solicit specific feedback on the methodology, candidate technologies, etc.
  - Examples of stakeholders include:
    - Better Buildings Partners
    - US General Services Administration and DoD
    - ARPA-E
    - Rocky Mountain Institute
    - Con-Edison, and
    - NYSERDA.
  - Currently seeking more participation from state, local, and tribal governments!

# CBI HIT Evaluation Example

## Energy Management and Information Systems / Whole Building Diagnostics

<b>Description</b>	Validate the performance and functionality of EMIS and whole building diagnostic or automation tools. Continue research into opportunities that ease connection and automation of additional components and systems. These systems encompass a broad family of tools and services to manage commercial building energy use including energy information systems (EIS), equipment-specific fault detection and diagnostic (FDD) systems, benchmarking and utility tracking tools, automated system optimization (ASO), and building automation systems (BAS).		
<b>National Primary Energy Savings Potential</b>	<b>Stakeholder Interest</b>	<b>Criticality of DOE Involvement</b>	<b>Cost-Effectiveness and Reduction Potential</b>
1,000+ TBtu  Estimated annual energy savings if all commercial buildings adopted advanced EMSs/EMISs.	2.0  CBI efforts focusing on EMISs to date have drawn significant interest from building owners.	3.0  Most offerings are focused on HVAC systems but there is a strong opportunity for DOE to support current R&D through validation and identify gaps in functionality.	2.5  Systems can currently achieve desirable paybacks; however significant energy savings is available with sophisticated autonomous, learning, or adaptive whole building applications.
Peak demand impact potential: Significant benefit			

Numeric rankings for each factor on a scale of 1-3 with 3 indicating highest need/opportunity

# How Can Your SEO Get More Involved?

## Participate

- Join BTO stakeholder discussions and workshop and technology selection process (see slides 21 and 22) coming up in Feb/March 21, contact Greg Dierkers, [Gregory.Dierkers@ee.doe.gov](mailto:Gregory.Dierkers@ee.doe.gov)
- Understand your role and time commitment via discussions with DOE and National Labs.

## Discuss

- Share DOE validation-ready technologies with Building Managers in your state and seek to understand their interest and needs (see slides 12-15 for details on site selection)
- Engage with other state and local agencies to promote adoption of energy-saving technologies.

## Share

- Provide wider pool of host building sites for technology validation field tests.



# Thank You!

For questions/comments contact:

Greg Dierkers, State Energy Program, WIP, [Gregory.Dierkers@ee.doe.gov](mailto:Gregory.Dierkers@ee.doe.gov)