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




Building America Research: Part 2 What Makes a Successful Project?

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Building America Program Director
Building Technologies Office

Agenda

- Building America Research-to-Market Plan
- Current Building America Teams
- Building America Team Funding (FOA) Process
- What Creates Success?
- What Can Go Wrong?
- Q&A

Building America Research-to-Market Plan

- Published in late 2015
- Developed to guide Building America's Research, Development, and Deployment activities
- Fill critical research and information gaps
- Enable rapid market adoption of technologies and best practices for high performance homes
- Cost-effective solutions that are practical and profitable for builders and home improvement contractors
- Sets specific program objectives over the coming years

Integrated Roadmaps

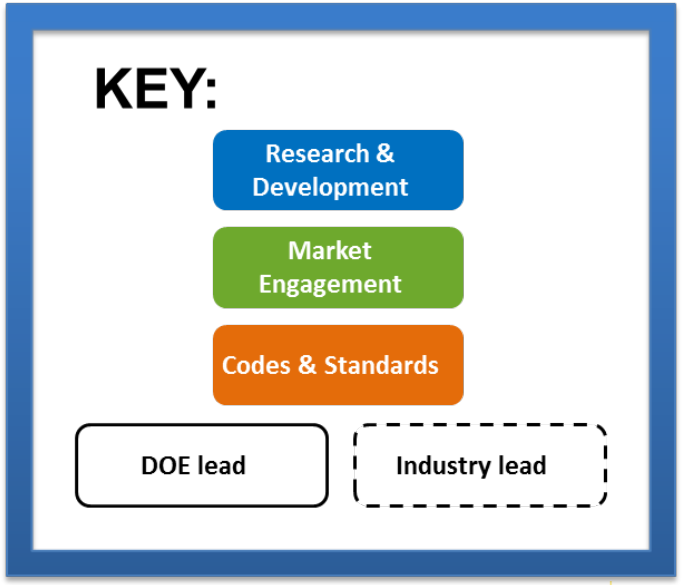
A. High Performance, Moisture Managed Envelope Systems

B. Optimal Comfort Systems for Low Load Homes

C. Optimal Ventilation Systems and IAQ Solutions for Low Load Homes

Overall Roadmap Objectives:

- Standard Practice as endpoints
- Manage risks to minimize problems of adoption
- Address optimal performance & cost-effectiveness
- Solutions must be practical & profitable for builders and home improvement contractors



Current Building America Teams

gti
GAS TECHNOLOGY INSTITUTE

IBACOS
innovation

cee
Center for Energy and Environment

Fraunhofer

Home Innovation RESEARCH LABS™

Steven Winter Associates, Inc.
Improving the Built Environment Since 1972

UNIVERSITY OF MINNESOTA

NP
Newport Partners L.L.C.

bsc Building Science Corporation

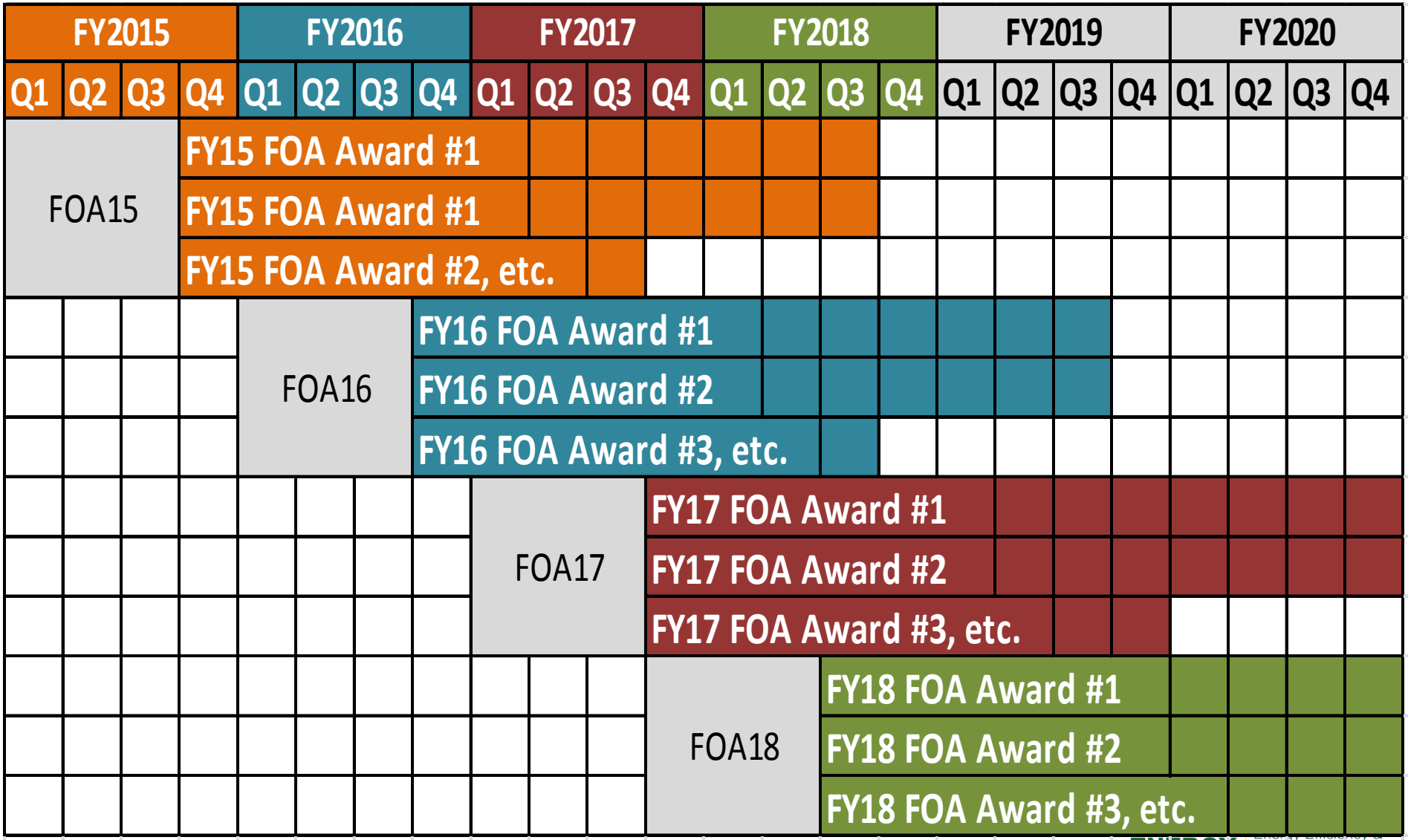
The Levy Partnership

FLORIDA SOLAR ENERGY CENTER®
A Research Institute of the University of Central Florida

Southface

FOA Process - Timeline

Building America Multi-Year FOA Schedule (subject to appropriations)

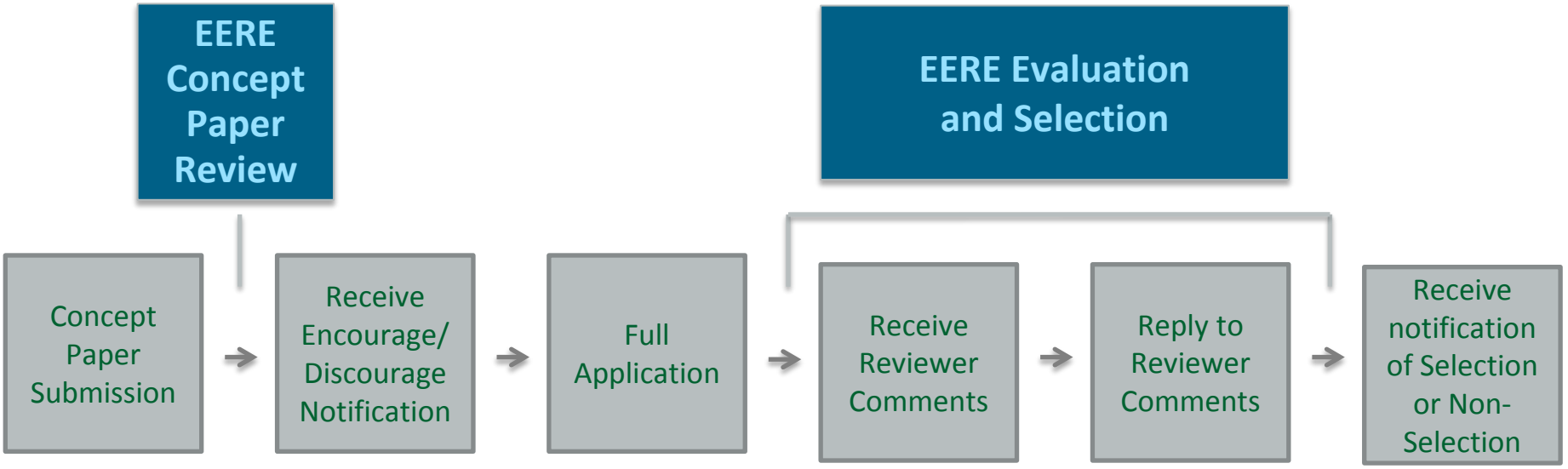


FOA Process – Award Structure

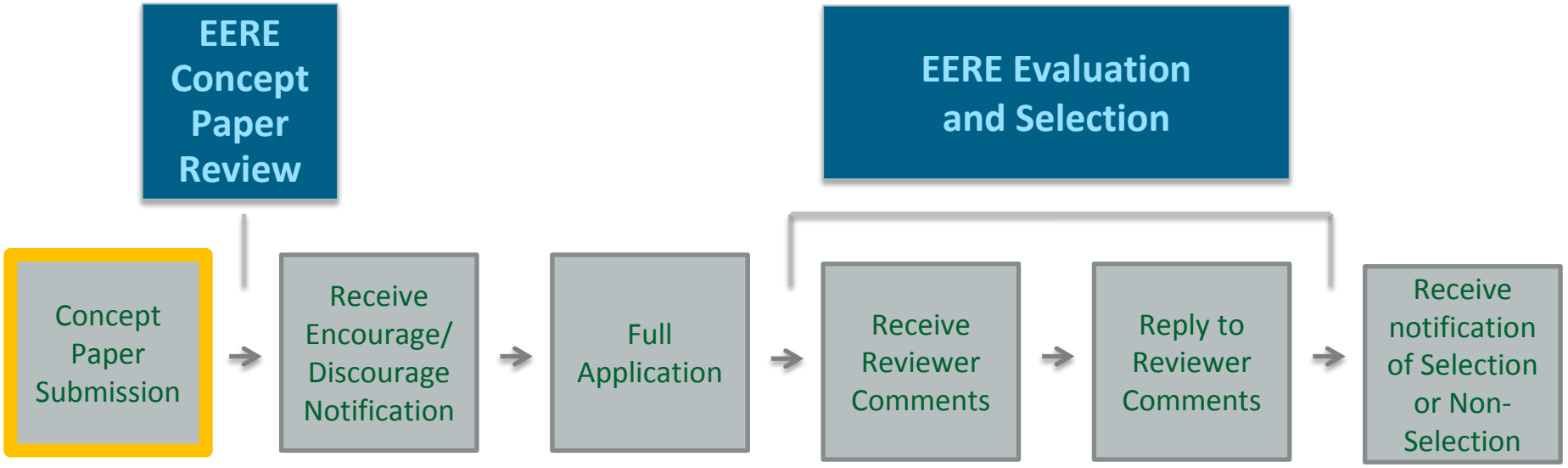
Cooperative Agreements

- Statement of Substantial Involvement
- Statement of Project Objectives (SOPO)
- Building America Program Support Activities
- Budget Periods
- Deliverables
- Cost Share (20%)

FOA Process – Proposal Selection



FOA Process – Proposal Selection

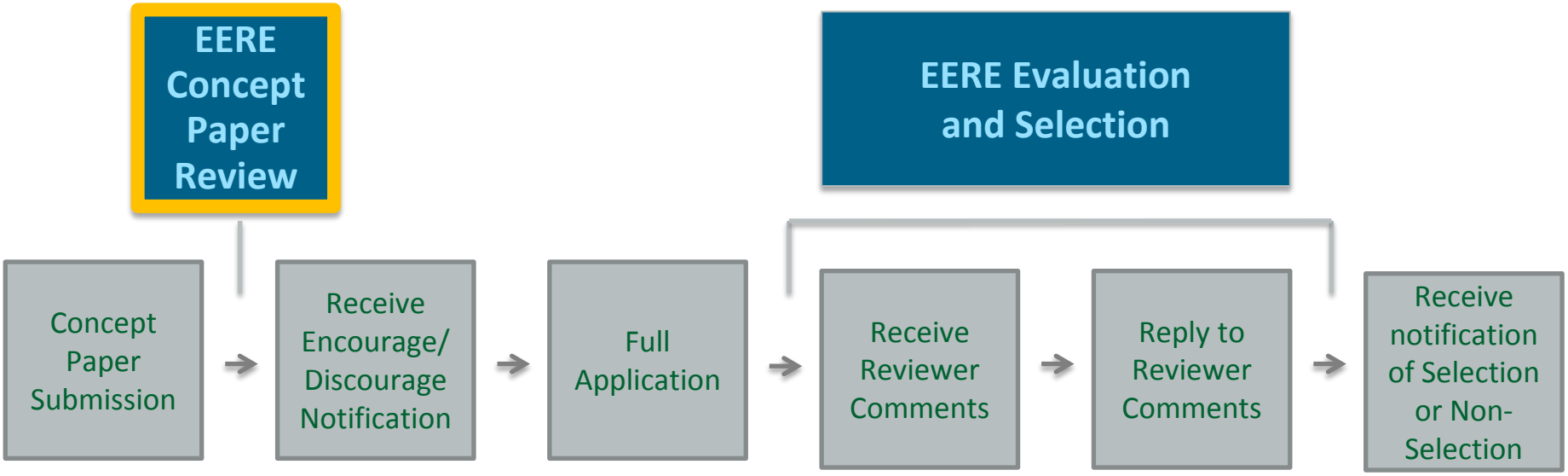


Concept Paper Submission

AKA your elevator pitch

- Brief and compelling description of proposed project
- Concisely explain technology, potential impact, and team qualifications
- Clearly address the Technical Review Criteria for Concept Papers
- Only a few pages, so make them count!

FOA Process – Proposal Selection

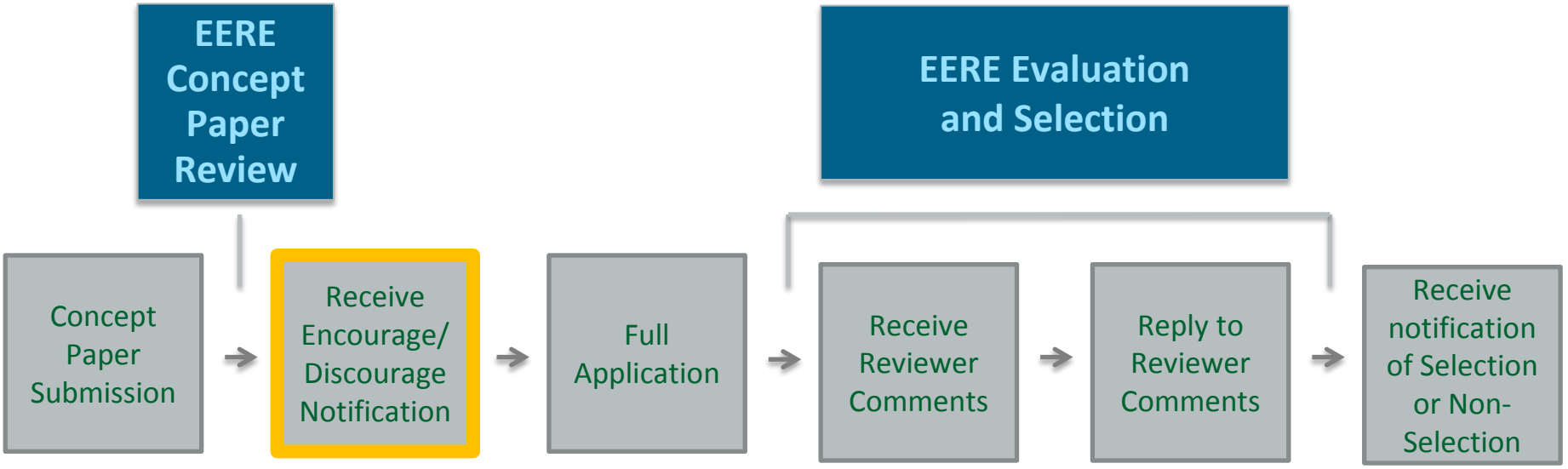


EERE Concept Paper Review

What happens between submission and response letter?

- 3 reviewers for each concept paper, from DOE and National Labs
- Reviews based on criteria stated in FOA
- FOA manager works to ensure fairness and consistency in reviews

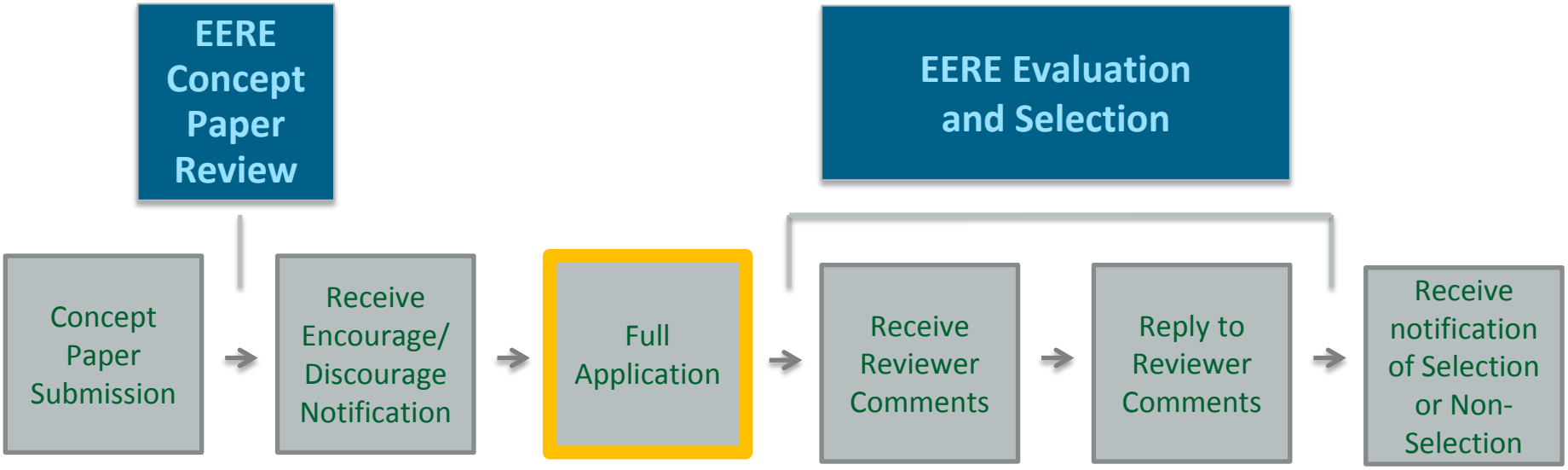
FOA Process – Proposal Selection



Encourage/Discourage Notification

- EERE provides applicants with: (1) an "encouraged" or "discouraged" notification, and (2) the reviewers' comments
- Allows applicant to make an informed decision about preparing a full application
- Gives applicant feedback on their proposed project through the reviewers' comments

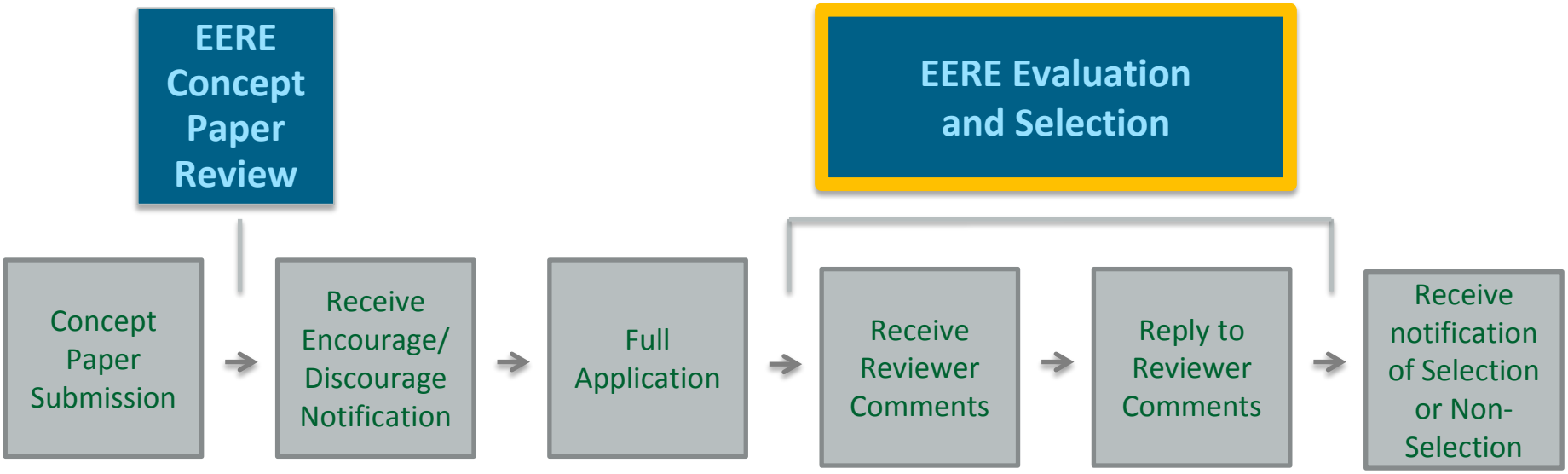
FOA Process – Proposal Selection



Full Application

- Technical Volume, Statement of Project Objectives, Budget, Commitment Letters, and other documents
- Clearly address Technical Review Criteria for Full Applications
- Must meet eligibility requirements in order to be reviewed

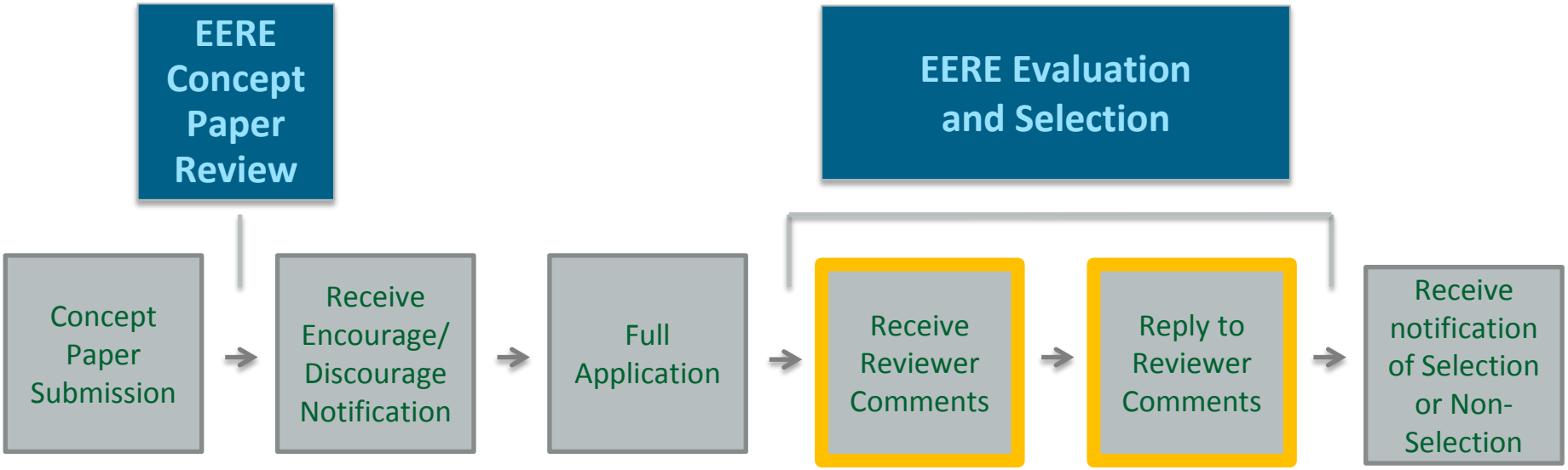
FOA Process – Proposal Selection



EERE Evaluation and Selection

- 3 reviewers for each application: DOE, National Labs, and industry experts
- Reviews based on criteria stated in FOA
- FOA manager works to ensure fairness and consistency in reviews
- Merit Review Committee meets in person to discuss all proposed projects.

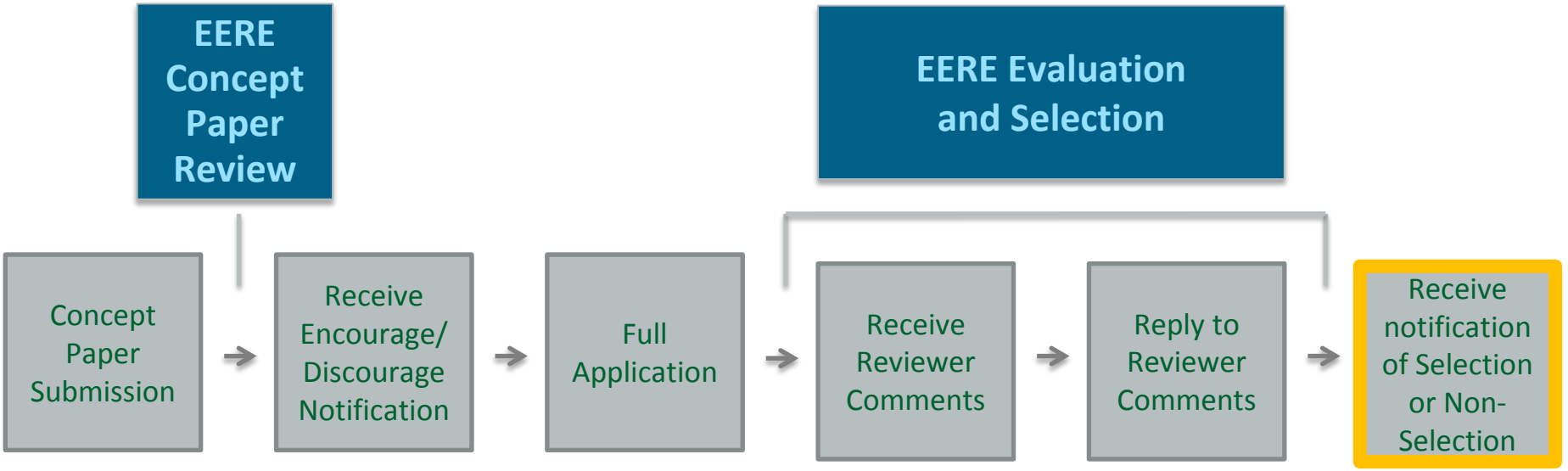
FOA Process – Proposal Selection



Reviewer Comments

- Reviewers' comments sent to applicant
- Gives applicants an opportunity to clarify or respond
- Applicants submit a short reply (optional)
- Reviewers may alter scores based on replies to comments

FOA Process – Proposal Selection



Receive notification of Selection or Non-Selection

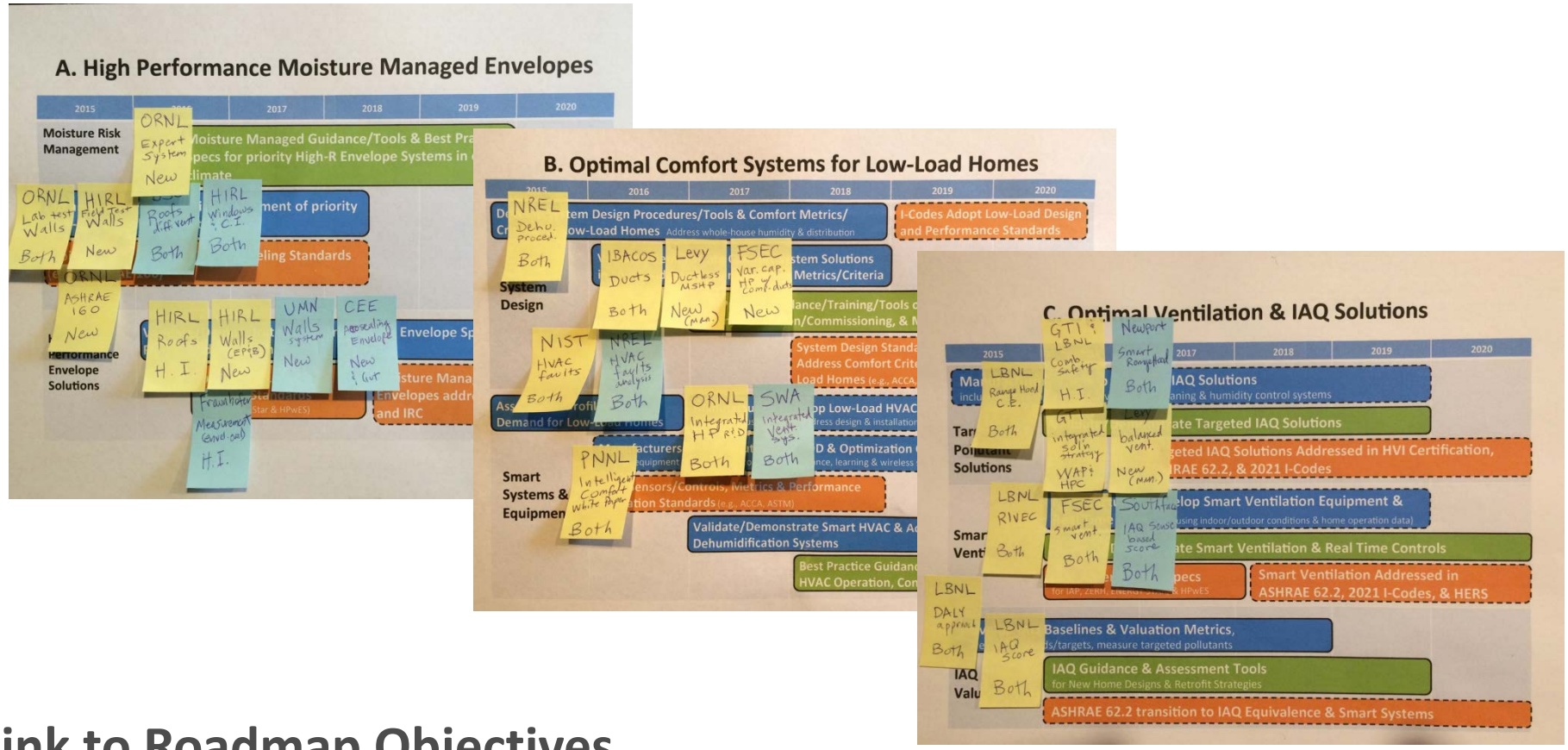
- Federal Consensus Board makes recommendation to Selection Official
- Selections consider reviewers' scores, program policy factors, and funds available
- Debrief available upon request

What Creates Success?

- **Link to Roadmap Objectives**
- **Significant Impact**
- **Compelling Approach**
- **Address Risk**
- **Strong Team & Resources**

What Creates Success?

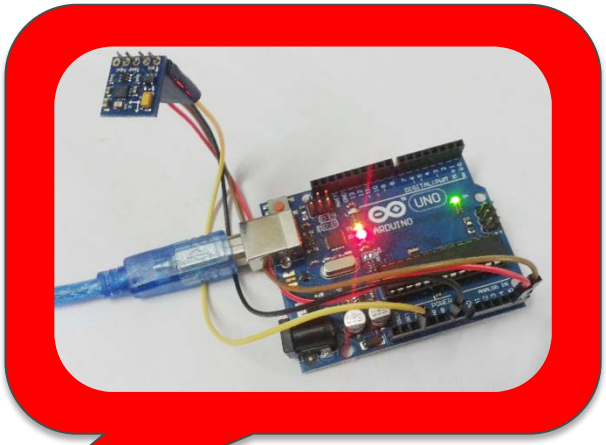
Link to Roadmap Objectives



Link to Roadmap Objectives

- Direct connection to specified program goals
- Projects that will push progress forward

What Creates Success?
Link to Roadmap Objectives



Develop IAQ Baselines & Valuation Metrics,
develop thresholds/targets, measure targeted pollutants

IAQ Valuation

IAQ Guidance & Assessment Tools
for New Home Designs & Retrofit Strategies

ASHRAE 62.2 transition to IAQ Equivalence & Smart Systems

Performance-Based IAQ and Optimized Ventilation, Southface Energy Institute

*Develop **low cost IAQ sensing capabilities for targeted pollutants**, conduct **IAQ benchmarking in real homes**, **validate prototype IAQ score** and inexpensive smart ERV solution. Project objectives are validation of improved IAQ metrics and ventilation solutions for humid climate that can achieve average annual HVAC energy cost savings of approximately $100 compared to CFIS systems, and ~50% reduction of ventilation related latent loads compared to supply or exhaust strategies. Goal is to overcome builder reluctance to air-tightness & ventilation strategies, to enable energy savings from tight construction in hot/humid climates, while reducing IAQ risks and improving comfort.*

Significant Impact

Significant Impact

- Magnitude of Impact
- Market Transformation

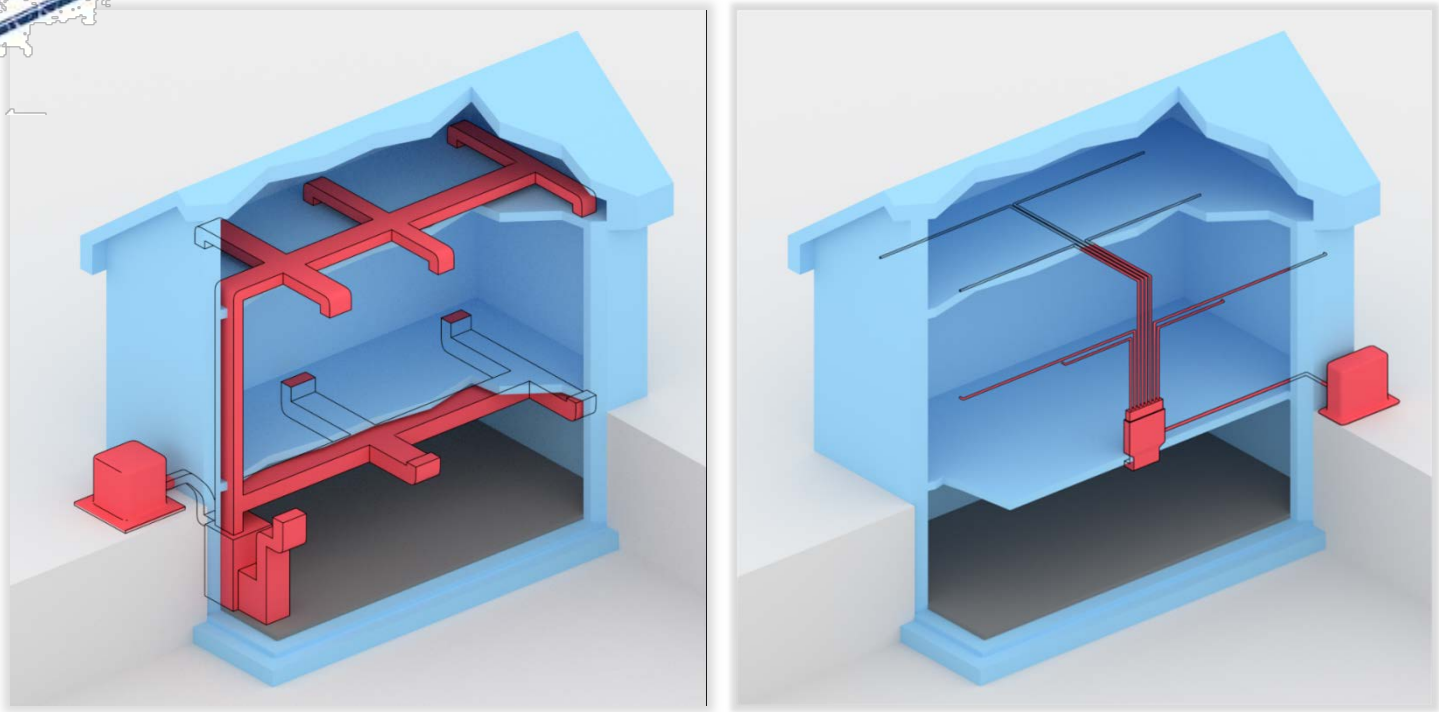
Significant Impact

Magnitude of Impact

Physics-based Interval Data Models to Automate and Scale Home Energy Performance Evaluations, Fraunhofer USA, Inc.

*Develop & validate approach that correctly identifies households with highest energy saving potential, with **80% accuracy**, to significantly reduce # of unnecessary home energy audits and reduce program costs. Success metrics include **improving ECM implementation conversion rate by 50%**.*

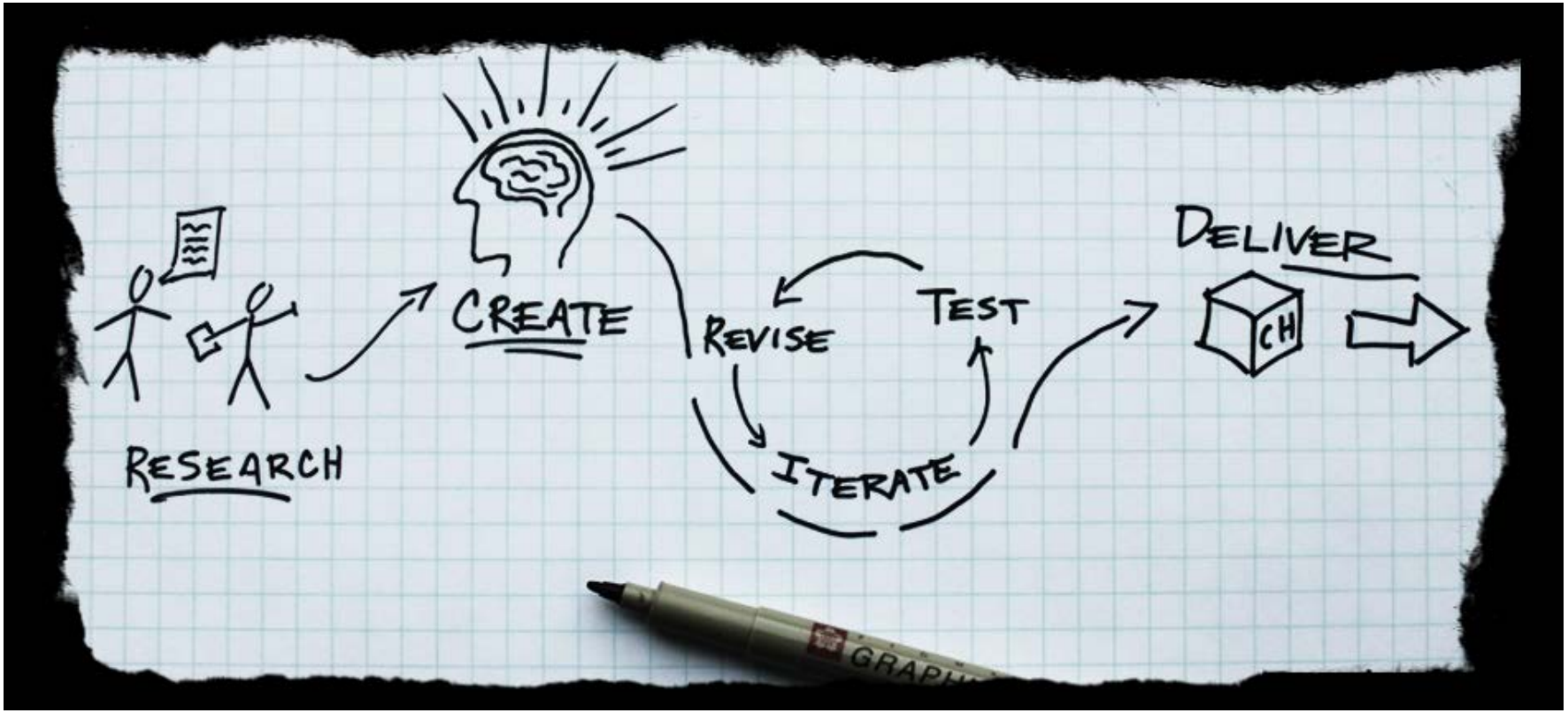
Market Transformation



Plug-n-Play Duct System, IBACOS

*Forced air distribution system easily integrated **within the home's conditioned space**, **installed with less error and waste**, and offers **predictable performance** to help provide comfort in low-load homes.*

Compelling Approach



Compelling Approach

- Effective Research Questions
- Clear Success Metrics
- Well Developed Plan

Effective Research Questions

BAD

Problem Statement: Industry needs market-ready exterior façade retrofit panels.

Hypothesis: *Missing* (or, Our proposed panels perform well.)

Research Question: What is the effective R-value of proposed exterior façade retrofit panels?

GOOD

Problem Statement: Wide scale adoption of envelope upgrades to existing houses is necessary to reduce EUI of existing homes, but current methods are too expensive, invasive, and labor intensive to have broad market appeal.

Hypothesis: Proposed innovative exterior façade retrofit panels meet or exceed moisture/thermal/air infiltration performance of conventional envelope upgrades, at a lower cost and higher quality installation.

Research Question: How does the cost, ease of installation, quality control, and moisture/thermal/air infiltration performance of proposed innovative exterior façade retrofit panels compare to a conventional envelope upgrade (i.e., drill & fill insulation and air sealing by hand)?

Compelling Approach

Clear Success Metrics

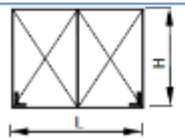
Assessment & validation of unvented roof construction detail to enable moisture managed fibrous insulation solutions in cold climates, achieving code & above code performance (R-49) with less expensive insulation materials, and saving >10% in HVAC energy use by locating ducts in conditioned space.
Monitoring of Unvented Roofs with Diffusion Vents and Interior Vapor Control in a Cold Climate, Building Science Corporation

Develop, validate, & demonstrate VICS, to reduce up-front cost $1,000-$2,000 compared to separately installed standard ducted ventilation & HAC systems. Enable large scale adoption of heat recovery ventilation, saving 400-800 kWh/year compared to exhaust-only ventilation. Enables balanced ventilation, better IAQ, & RH control in tight homes at lower cost.
Ventilation Integrated Comfort System (VICS), Steven Winter Associates

Compelling Approach

Well Developed Plan

Table 3. Test Matrix

Config #	Description	# Tests	Sheathing Fastener	Expected Peak Load, lb	Purpose and Notes
Phase I – Engineered design values and IRC intermittent bracing method: E72 – 8'x8' specimen					
1	Standard 2x6 IRC WSP Wall	2	6d common at 6/12 oc	515	Establish a baseline – standard construction
2	EP&B–Nailing1	2	6d common at 2 oc at plates; 0.131x4.0 at 12 oc at studs	600	Using standard IRC nails at plates (large field nails)
3	EP&B–Nailing2	2	6d common at 2.5 oc at plates; 0.131x4.0 at 12 oc at studs	515	Same as two, except increased spacing for constructability
4	EP&B–Nailing3	2	0.131x4.0 at 3/12 oc	600	8d nails diameter
5	EP&B–Nailing4	2	0.148x4.0 at 4/12 oc	540	Larger nails (12d)
6	EP&B–Nailing5	2	0.131x4.0 at 2/12 oc	725	8d nails for max capacity
7	EP&B–Nailing6	2	0.148x4.0 at 3/12 oc	720	Placeholder only, wish list
Phase II – IRC continuous bracing method E564 – varying specimens 0.131@3/12 (nailing will be finalized based on results of Phase I)					
1					Results adopted from Phase I unless the results require testing Douglas Fir-Larch lumber, sample size – (2)
					This test is unnecessary because it evaluates the performance of nails along the bottom edge of the 2-foot corner panel. OSB has been previously evaluated in this configuration

Extended Plate and Beam Wall System, Home Innovation Research Labs

Address Risk

Address Risk

- Demonstrate Understanding
- Capacity to Correct

Demonstrate Understanding

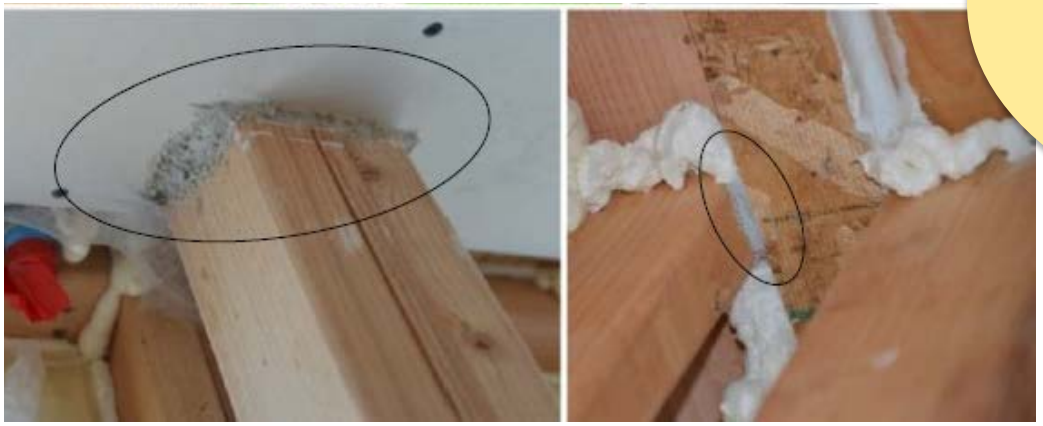
Team's long standing involvement in the industry. History of successful research with low income housing.

Integrated Design: A High Performance Solution for Affordable Housing, The Levy Partnership, Inc.

Reduce space conditioning energy use by 50% relative to IECC 2009 in Habitat and factory built homes in mixed-humid and cold climates

Capacity to Correct

Project staged to allow lessons learned from first phase of field test to information improvements to second round of field tests.



Aerosol Sealing in New Construction, Center for Energy and Environment.

20-home study optimizes integration of aerosol envelope sealing in production building process to radically improve QC and significantly reduce labor cost compared to traditional air sealing.

What Creates Success?
Strong Team and Resources

Team and Resources

- Technical Qualifications
- Representation of Key Stakeholders
- Strength of Commitments (cost share)

EXAMPLE

Technical Qualifications

Variable Capacity Comfort Systems for Low Load Homes,
Florida Solar Energy Center

EXAMPLE

Representation of Key Stakeholders

Team and Partners

University of Minnesota

w/ MonoPath, Urban Homeworks, Twin Cities Habitat for Humanity, Thrive, Building Knowledge, Simply Green, Huber, Unico

Managed

isture (2016)

building enclosure system that

- energy savings (compared to typical 2015 new home).
- Building system delivered by a single enclosure contractor ensuring better QA/QC and faster dry-in.
- Test and compare this solid panel wall system with high performance wood-frame wall system for performance, constructability, and cost.
- Current target market is affordable housing.

Success Metrics: Design, build, and monitor 20+ affordable homes to demonstrate and verify >25% enclosure energy savings (above IECC 2009) with performance targets of <1 ACH @50 Pa, improved moisture durability, and lower cost than wood-frame walls with comparable thermal performance.

Innovative, Affordable, High-Performance, Moisture-Managed Building Enclosure System, University of Minnesota: Twin Cities

Strength of Commitments (Cost Share)

Newport Partners L.L.C.

BROAN

NuTone

Newport Partners and Broan-NuTone partner to develop first Smart Range Hood

"Smart" range hood developed & validated that is very quiet (≤ 1 sone), 5 times more efficient than ENERGY STAR, and near 100% capture efficiency, at a target price point competitive with the intermediate market. ***Commercialization goal is 100,000 units within one year of project completion****. Enables tighter homes, ZERH specs, & better IAQ by addressing major indoor pollutant source.*

What Can Go Wrong?

Technical Merit, Innovation, and Impact

- "Look and See" projects without clear research questions
- "If this is the solution, what is the problem?"
  - Unconvincing problem statement
  - Proposal is not a compelling solution

Project Research and Market Transformation Plan

- Lacking market engagement strategy
- Demonstration project without wide scale applicability
- Fail to identify key risks and/or insufficient risk mitigation plan

Team and Resources

- Demonstrate little connection to stakeholders/industry
- Emerging technology without manufacturing partner
- Construction costs as cost share

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Questions & Answer Session

www.buildingamerica.gov

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- Top Innovations
- Climate-specific case studies
- *Building America Update* newsletter
- Building America Solution Center
- Publications Library

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