

EMPOWERED

Education
Materials for
Professional
Organizations
Working on
Efficiency and
Renewable
Energy
Developments



IREC
INTERNATIONAL RENEWABLE ENERGY COUNCIL

UCF
UNIVERSITY OF CENTRAL FLORIDA

FSEC Energy
Research Center

Pacific Northwest
NATIONAL LABORATORY

ICC
INTERNATIONAL
CODE COUNCIL

SEEA
SOUTHEAST ENERGY ALLIANCE

IAEI

slipstream

nbi new buildings
institute

Southface

**SOLAR, ENERGY STORAGE,
AND ELECTRIC VEHICLES**

Educational materials, quick reference guides, inspection
and safety resources, and free CEU bearing training
courses for clean energy professionals.

CleanEnergyClearinghouse.org

Awardees: Interstate Renewable Energy Council, New Buildings Institute, Southface Energy Institute, National Fire Protection Association, International Association of Fire Fighters

PI: Kristen Hagerty, Senior Director of Workforce Development, IREC

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Project: DE-EE0009455

Project Summary

Objective and outcome

Reduce barriers to widespread deployment of distributed energy resources (DERs), including PV, energy storage systems (ESS), electric vehicles, and grid-interactive efficient building technologies (GEB), by providing research-supported, industry validated education and resources.

Team and Partners

International Association of Electrical Inspectors (IAEI)

International Code Council (ICC)

National Association of State Fire Marshals (NASFM)

Pacific Northwest National Laboratory (PNNL)

Slipstream, Inc.

Southeast Energy Efficiency Alliance (SEEA)

UCF: Florida Solar Energy Center (FSEC)

Stats

Performance Period: April 2021 - March 2024

DOE budget: \$2.1M Cost Share: \$126K

Milestone 1: 24 educational resources

Milestone 2: 4+ hours online training

Milestone 3: 30,000 users



Dynamic and Responsive Distributed Energy Resource Education Solutions

Problem

The nation's 118 million homes, 5.6 million commercial buildings, and 270 million vehicles represent a significant opportunity to **unlock energy savings or enhance energy resilience through efficiency improvements and new distributed energy resources (DERs)**—notably solar; energy storage; electric vehicles; and grid-interactive efficient building technologies.

Building, fire, and safety officials (code officials) play a critical role in enabling the safe, widespread, and rapid deployment of DERs. Yet these **emerging technologies have outpaced codes and existing educational resources**, creating an urgent need for up-to-date guidance for this audience.

Building owners and managers need to understand and manage the new technologies and practices.



IREC Project Goals

- **Increase knowledge** of emerging distributed energy resource (DER) technologies.
- **Provide job-specific skills** to code officials who inspect PV, energy storage, grid-interactive efficient building technologies, and electric vehicle supply equipment.
- **Provide resources** that respond to the changing audience needs and evolving technology over the 3-year period.
- Drive **diverse audiences** to a shared website.

Impact - Code Officials

When equipped with fact-based information about the safety and efficacy of GEB, ESS, EV, and PV technologies, **CODE OFFICIALS** can

- More efficiently inspect structures equipped with the technologies.
- Decrease permitting and inspection (P&I) time, therefore decrease P&I costs born by the consumer.
- Ensure the safe installation of emerging clean energy technologies.
- Improve working relationships with system integrators/installers.

Alignment with BTO Goals

- Increase building energy efficiency and resilience.
- Accelerate building electrification (reducing onsite fossil fuel based emissions).

Impact - Building Managers & Owners

When equipped with fact-based information about the safety and efficacy of GEB, EV, ESS, and PV technologies, **BUILDING MANAGERS** and **OWNERS** can

- Invest in cost-effective DER.
- Increase demand for emerging technologies.
- Decrease energy usage and operating costs.
- Help utilities manage grid operations and lower system costs.

Alignment with BTO Goals

- Increase building energy efficiency
- Accelerate building electrification
- Increase building demand flexibility and improve resilience

Where We've Been

Slow, expensive, inconsistent



Where We're Going

Accessible, educated, empowered



Educational Resources: CleanEnergyClearinghouse.org

V2H - Can I Really Power My House From My Car?

Chapter 1 of 1

Vehicle-to-Home

0% COMPLETE

Vehicle-to-Home

(Some, but not all) Benefits of Electric

“Electrification” is a buzzword these days. And electrifying our v... to helping states and the federal government achieve their energy targets.

EVs Reduce:

SEAC
Solar Energy Association

About SEAC | Our Work | Get Involved | Resources

How to Use SolarAPP+ For Rooftop Solar Projects

Articles/ blog posts - Design validation

GEB BUILDING SYSTEMS ARE:

- DYNAMIC
- SMART
- INTEGRATED

Interactive lessons - Vehicle-to-Home



IREC
INTERNATIONAL REFRIGERATION ENGINEERING COUNCIL

Building Automation and Controls Model Codes

<p>HVAC Fan Control</p> <p>Code: <u>IECC C403.8.6</u></p> <ul style="list-style-type: none"> • Fan airflow control • Space temperature fan control • Modulating fan control • Air-side economizer fan control <p>Code: <u>IECC C403.6.5</u></p>	<p>Lighting Control</p> <p>Code: <u>IECC C405.2.1</u></p> <ul style="list-style-type: none"> • Occupant sensors <p>Code: <u>IECC C405.2.2</u></p> <ul style="list-style-type: none"> • Time switching controls • Time switching controls requirements <p>Code: <u>IECC C405.2.3</u></p> <ul style="list-style-type: none"> • Light reduction controls 	<p>HVAC Mandatory Provisions</p> <p>Code: <u>ASHRAE 90.1_6.4.3</u></p> <ul style="list-style-type: none"> • Controls and diagnostics • Ventilation system controls • Heat pump control • Humidification and dehumidification control • Freeze protection and melting systems • Heated or cooled
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Infographics - Model codes

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Independent leadership. Trusted clean energy expertise.

A Checklist for Building Owners Considering Solar Energy

Today, many owners are choosing solar to provide clean, reliable power for their buildings. Learn more about how to maximize this important investment.

As you explore installing solar panels on your building, you will find you have many choices to make. Using this checklist puts important information in your hands that you need to know before entering into a contract to install a solar system.

It offers questions, considerations, and protective measures that can help you get the answers you need to make informed decisions that can affect your bottom line—the safe and effective installation of a system that meets your expectations.

Downloadable checklists - PV

Job-Focused Training: CleanEnergyTraining.org

IREC Empowered Resources Help

Evaluating for Compliance

Let's evaluate our plan for compliance.

Looking at this location of the array on the roof, are the access pathways compliant with the code?

Select the best answer.

Yes No

1 ARRAY LAYOUT
SCALE: 3/16" = 1'-0"

That's right!

To determine compliance of access pathways, you will typically view the location, including dimensions, of the array in a site plan.

Volume CC Pause Progress Rewind Play Forward



Challenges and Innovation

The project will tackle several unique challenges:

- The evolving needs of those on the front lines of DER adoption.
- The ability to cost-effectively reach a national audience.
- Establishing the relevance of efficient and renewable technologies.
- Reaching a wide enough audience.
- Creating accessible education.
- Avoiding duplication of effort and competing information.

Innovation. Deliver dynamic educational materials online and drive complementary stakeholders to a central clearinghouse website. Users can access resources on their own schedule and return frequently to deepen their understanding. In this way, IREC and our partners are poised to help code officials and building professionals contribute to the widespread adoption of distributed energy resources.

Accomplishments – 1st 2 years

- 2 active websites
 - 24+ resources (CleanEnergyClearinghouse.org)
 - 30 courses (CleanEnergyTraining.org)
- 75,000 unique visitors to the websites
 - Project Goal = 30,000
- 4,000 user accounts created (CleanEnergyTraining.org)
- 7,200 course registrations
- 1,000 webinar attendees (7 webinars, 2000 registrations)

EMPOWERED Awardees

Topic 1. Emergency Response & Resilience Planning



Topic 2. Safe DER Building Integration: Building, Fire, and Safety Department Officials



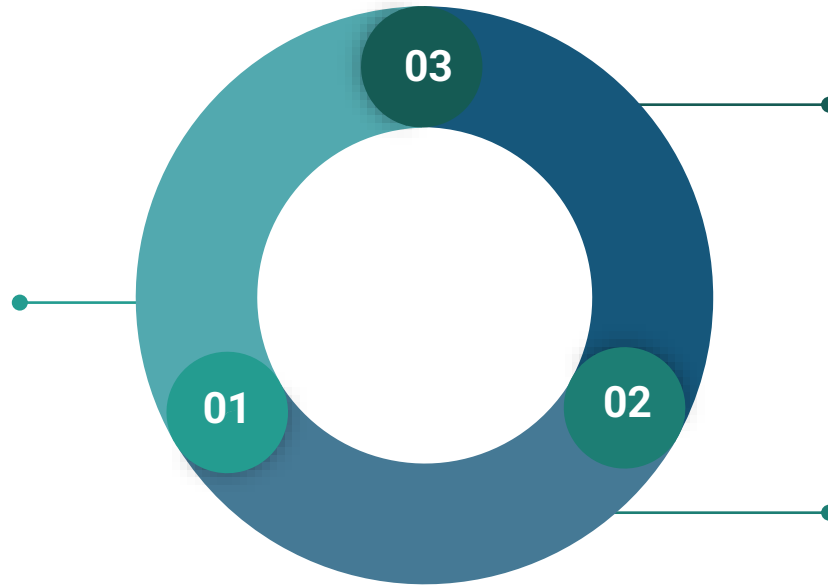
Collaboration: Examples

- Webinars that feature other awardees.
- Resources that direct users to awardees' work.
- Complementary, not duplicative products.
- Extended outreach: Promotion of each awardee's material.
- Educational products that build on other awardees' work.
- Monthly meetings with same-topic awardees.

Collaboration: Safe DER Integration – Example

New Buildings Institute

Produce Permitting & Inspection Guidelines for residential energy storage systems based on SolSmart's document.



Southface Energy Institute

Develop interactive diagrams to illustrate concepts in the guides.

IREC

Develop training to encourage adoption, customization, and use of guidelines.

Collaboration: Awardees Topics 1 & 2

Plans for a future webinar featuring all of the EMPOWERED awardees to showcase training developed during the project.

EMPOWERED WEBINAR SERIES
SOLUTIONS



High Performance Homes and
Material Safety

JANUARY 17 | 2-3:30 PM ET | 11 AM-12:30 PM PT

Featuring Sean DeCrane, IAFF

EMPOWERED WEBINAR SERIES
SOLUTIONS



Commercial Building Electrification
Pathways

MARCH 21 | 2-3:30 PM ET | 11 AM-12:30 PM PT

Featuring Alexi Miller, New Buildings Institute

Residential ESS Project Introduction

Large-scale burn experiments involving renewable energy components:

- Part 1: Full-scale vertical flame spread of new residential cladding materials
- Part 2: Potential impact of li-ion residential ESS on incident response

Objectives:

1. Determine whether li-ion battery gas impacts compartment fire dynamics.
2. Develop size -up and tactical considerations for first responders to li-ion residential energy storage system fire incidents



U.S. DEPARTMENT OF
ENERGY



Metrics & Data Collection

- End of course evaluations for CEU-bearing courses
- Mid-webinar polls to gauge usefulness
- Partner-issued questionnaires

Rank your preferred formats for learning.

- #1
- #2
- #3
- #4
- #5
- #6

Course Evaluation: Electrical Elements of Solar PV Plan Review

* Indicates required question

* 1. For each question, please describe your agreement.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I found this course useful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My knowledge of the topic increased.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The course was engaging.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would recommend this course to a colleague.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Lessons Learned – Educational Delivery

- Online education is scalable and responsive.
- Basic education is still in demand.
- A variety of formats is attractive.
- Live webinars are popular.
- Shorter, less technical information captures attention.
- Real-world examples and “hands-on” learning can be supported in online formats.
- Learners learn best when you build on what they know.
- An essential part of successful training and education is identifying the learner’s motivation.

Lessons Learned – Outreach

- Reaching a high volume of potential learners is critical.
- Just-in-time learning is great, as long as people can find it when they need it.
- Cultivate the desire to learn about new technology and what is in it for the learner.
- Relate the available resources to what the learner needs.

Lessons Learned – Collaboration

 **The Interstate Renewable Energy Council (IREC) @IRECUSA · 11m** ...

A key element will be collaboration: we need diverse stakeholders from employers & training providers to community-based organizations to align on needs and solutions to prepare the [#CleanEnergy](#) workforce that is needed now. irecusa.org/programs/the-n... [#NetZeroNow](#)

nbi New Buildings Institute @NewBldgsInst · 12m


Q8: How can we prioritize workforce development to reach a [#CleanEnergyFuture](#) within the built environment? [#NetZeroNow](#)



June 13, 2022

Net Zero Buildings: 18 Industry Recommended Ways to Start Learning

Fact-based, industry-vetted, educational resources supporting a clean energy future.




The Interstate Renewable Energy Council (IREC), New Buildings Institute (NBI), and Southface Institute are working in concert under the U.S. Department of Energy (DOE)'s EMPOWERED program and unite almost 20 clean energy organizations as additional collaborators. The following list of resources were curated by project partners as part of our joint participation in Net Zero Buildings Week.

Check out the links below to access fact-based, industry-vetted educational resources on a variety of topics related to clean energy, energy efficiency, building technologies and more!

- **Clean Energy Training and Workforce Development**
Interstate Renewable Energy Council
CEU bearing training courses and educational resources for clean energy and allied professionals, including code officials, AHJs, building safety officials, facility managers, installers and others.
- **Net Zero Energy and Decarbonization Toolkit**
International Code Council
Comprehensive resource for states, tribes, local jurisdictions, and other organizations interested in developing and implementing advanced energy efficiency and carbon reduction goals for a net zero future.
- **Understanding How Building Controls Can Save Energy**
Slipstream
This guide demonstrates how smarter use of building controls could improve energy savings by up to 30 percent. Implementing energy efficiency measures in buildings is a key step in meeting clean energy goals.
- **Evolving Technologies**
International Association of Electrical Inspectors
IAEI Magazine articles that include technical details of evolving technologies such as renewable energy systems including PV, Wind, fuel cells, and energy storage devices.
- **Affordable Housing and Existing Home Retrofits**
FSEC Energy Research Center
Energy efficiency and building science measures for safety, durability, and indoor



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Cross-Office Collaboration is Valuable



Secretary Jennifer Granholm 
@SecGranholm



DOE is working in partnership to train the workforce for our clean energy buildings future—building operators, managers, safety officials. Thank you [@IRECUSA](#) [@SouthfaceInst](#) [@NewBldgsInst](#) :



ngtnews.com

DOE, IREC, NBI, Southface Offer Resources to Advance Cl...
Three clean energy organizations have formed a partnership to provide educational resources and training on clean ...

7:01 AM · Jun 4, 2022 · Twitter for iPad



A Holistic Approach to Education Advances Goals

Increase Consumer Demand

Accessible, fact-based education about efficient heating & cooling and DERs.

Improve Planning & Zoning

Technical assistance and resources about getting buildings ready for solar, energy storage, and EVs.

+

Decrease Permitting & Inspection Time

Permitting & inspection guidelines and practice using them.

Get Buy-In from First Responders

Accurately-informed first responders pose fewer barriers to DER.

Improved Building Efficiency & Reduced GHG Emissions

Consumer demand for efficient and renewable technology met with DER-friendly zoning policies supported by efficient and cost-effective permitting practices and educated inspectors and first responders.

Future Work – Year 3

- Increase cross-award collaboration.
- Permitting & Inspection Guides pilot in AZ and MA (NBI).
- Training on P&I Guides (IREC and Southface).
- IAFF and NFPA will develop training based on research.
- EMPOWERED Awardee webinar showcasing available training for all of the audiences.
- Experiment with different outreach methods.



EMPOWERED SOLUTIONS

WEBINAR SERIES

On CleanEnergyClearinghouse.org



Scalability, Replicability, Impact

- Well-maintained and frequently added to website encourages repeat visitors.
- Users from multiple facets of the industry can view the same information to align view points.
- Engaging online training can cost-effectively reach a nationwide audience, while still allowing for regional customization.
- **Active collaboration** among resource creators results in more complementary resources that reinforce a consistent message.

IREC builds the foundation for rapid adoption of clean energy and energy efficiency to benefit people, the economy, and our planet.



Suggestions welcome

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EMPOWERED DE-EE0009455



EERE/BTO goals

The nation's ambitious climate mitigation goals



Greenhouse gas emissions reductions

50-52% reduction by 2030 vs. 2005 levels

Net-zero emissions economy by 2050



Power system decarbonization

100% carbon pollution-free electricity by 2035



Energy justice

40% of benefits from federal climate and clean energy investments flow to disadvantaged communities

EERE/BTO's vision for a net-zero U.S. building sector by 2050



Support rapid decarbonization of the U.S. building stock in line with economywide net-zero emissions by 2050 while centering equity and benefits to communities

Increase building energy efficiency

Reduce onsite energy use intensity in buildings 30% by 2035 and 45% by 2050, compared to 2005

Accelerate building electrification

Reduce onsite fossil-based CO₂ emissions in buildings 25% by 2035 and 75% by 2050, compared to 2005

Transform the grid edge at buildings

Increase building demand flexibility potential 3X by 2050, compared to 2020, to enable a net-zero grid, reduce grid edge infrastructure costs, and improve resilience.

Prioritize equity, affordability, and resilience

Ensure that 40% of the benefits of federal building decarbonization investments flow to disadvantaged communities

Reduce the cost of decarbonizing key building segments 50% by 2035 while also reducing consumer energy burdens

Increase the ability of communities to withstand stress from climate change, extreme weather, and grid disruptions