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# Behind-the-Meter Distributed Energy Resources: Best Practices for Integrating DERS into Commercial Buildings

July 8, 2020

1:00 – 2:00 pm EDT

# Rois Langner

National Renewable Energy Lab

U.S. DEPARTMENT OF ENERGY

# Better Buildings Alliance

## RENEWABLES INTEGRATION

https://betterbuildingsinitiative.energy.gov/alliance/technology-solution/renewables-integration

Strategic use of renewables can help businesses reduce energy costs and their environmental footprint. The Renewables Integration Technology Research Team is pleased to provide resources, information and guidance on integrating renewable energy into your building portfolio.

Have Questions on PV and Roofing?: View the PV Roofing Guide

# Distributed Energy Resources: Part 1

Better Buildings® U.S. DEPARTMENT OF ENERGY

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## THE VALUE OF DISTRIBUTED ENERGY RESOURCES TO OWNERS A CURRENT MARKET LANDSCAPE

DATE POSTED
Thursday, May 7, 2020

Building owners are becoming increasingly aware of opportunities to install distributed energy resources (DERs) on their properties to save utility costs, improve resiliency, and help meet their carbon reduction goals. Many technical options exist in the market, including battery storage, thermal storage, solar photovoltaics, on-site generation/combined heat and power, and flexing of building loads (such as shifting HVAC loads to off-peak). This webinar introduced the DER technology options, described multiple value streams from these DERs, and presented a landscape of customer-sited DER solution providers. The webinar was created based on a set of interviews with 15 DER Solutions Providers and five Better Buildings Alliance EMIS Team members.

https://betterbuildingssolutioncenter.energy.gov/videos/value-distributed-energy-resources-owners-a-current-market-landscape

# Agenda

1. Brief recap of LBNL's webinar on the current market landscape of DERs and the value to owners
2. Methods, best practices, and lessons learned from Kaiser Permanente on integrating DERs into their building portfolio
3. Q&A Session

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# Today's Presenters

**Hannah Kramer**
Lawrence Berkeley National Lab

**Gary Mullaney**
Kaiser Permanente

# Hannah Kramer

Lawrence Berkeley National Lab

Submit Questions
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U.S. DEPARTMENT OF ENERGY

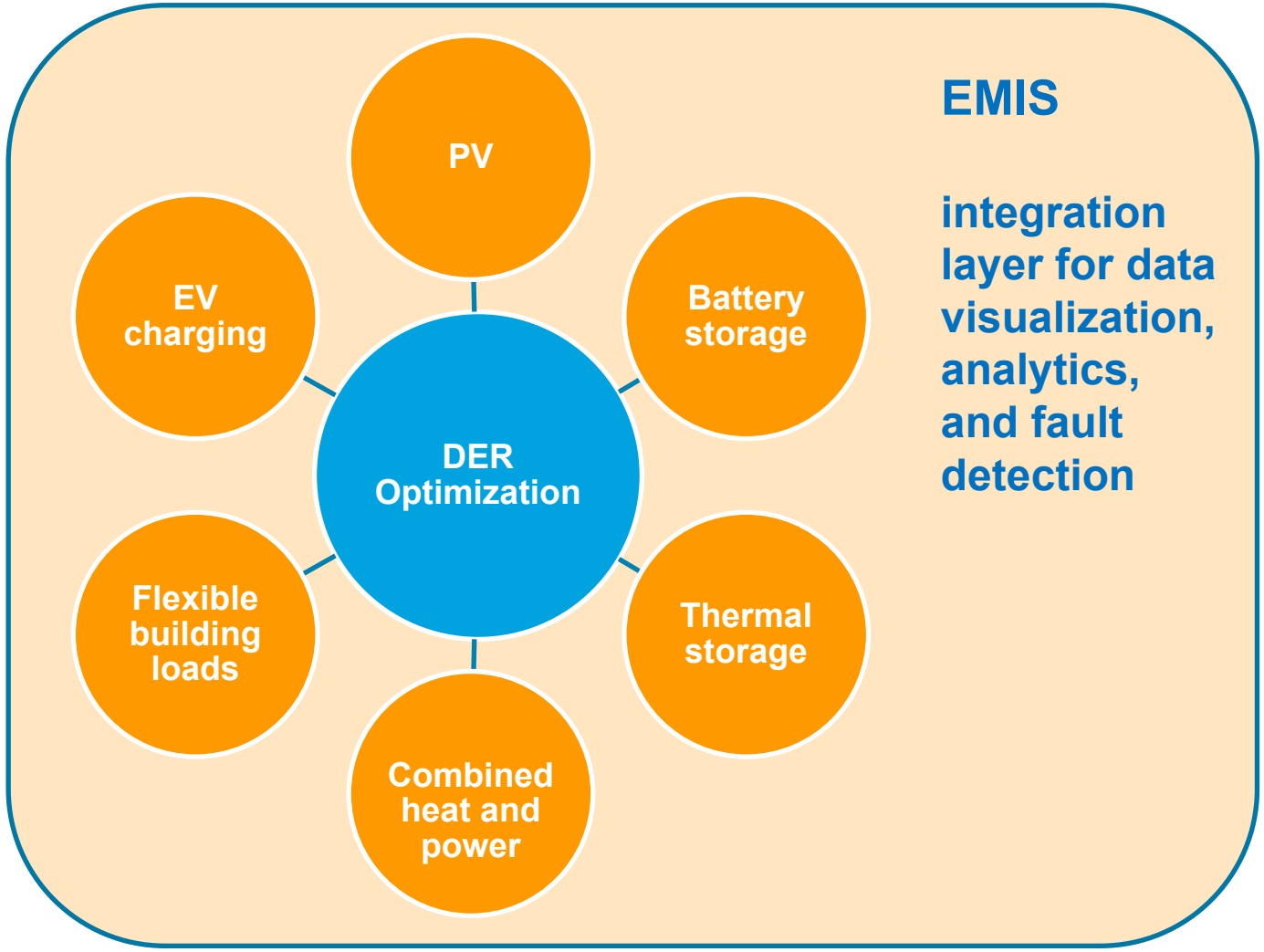
# The Value of Distributed Energy Resources to Owners: A Current Market Landscape

Source: SunPower

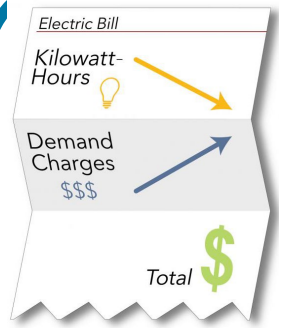
U.S. DEPARTMENT OF ENERGY

# Customer-sited DER investments

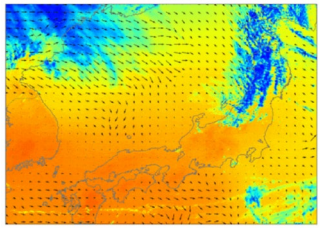
- DERs installed at a customer site are typically grid-tied and may also be able to island from the grid (microgrid)
- DERs allow owners to actively manage demand
- Customer-sited DERs have financial, environmental, and resiliency benefits to owners, and they can benefit the grid



# Customer-sited DER optimization controls



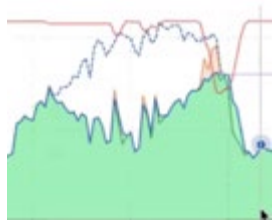

Utility rates



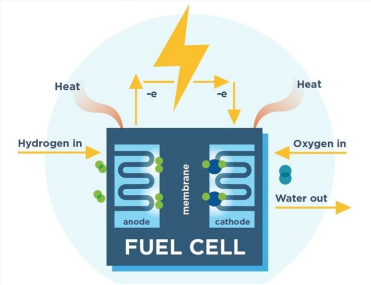
Solar power forecast

Financial value of back-up power

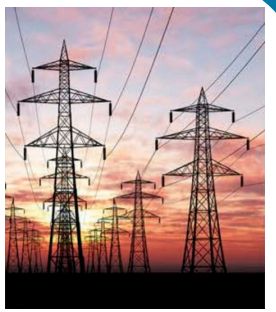
Battery/ thermal storage state of charge



Building load forecast




On-site generation forecast



Grid Signals and Market Rules

**INPUTS**

**DER Optimization**

**OUTPUT COMMANDS**

- Charge/discharge battery storage
- Charge/discharge thermal storage
- Enable/disable on-site generation
- Flex building loads
- Flex EV charging

# DER value streams for owners

| | | |
|---|---|---|
| 01 | **Energy Bill Savings** | • Reduce peak demand charges<br>• Energy cost savings: Use stored energy when energy rates are high, charge storage when rates are low (energy arbitrage) |
| 02 | **Resiliency** | • Microgrid serves building loads during grid momentary and sustained outages<br>• Protect critical loads |
| 03 | **Revenue Opportunities** | • Participate in demand response programs or wholesale capacity markets<br>• Provide other grid services |
| 04 | **Carbon Reduction** | • Integrate intermittent renewables<br>• Store renewable energy when there is excess production |

# DER solution providers – technology integration

| Category | Vendor | Solar | Battery | Thermal storage | CHP | Flexible building loads | Microgrid |
|---|---|---|---|---|---|---|---|
| Solar + storage | Advanced Microgrid Solutions | ● | ● | | | | |
| | Enel X | ● | ● | | | | ● |
| | ENGIE Storage | ● | ● | | | | |
| | Forefront Power | ● | ● | | | | |
| | NantEnergy | ● | ● | | | | ● |
| | STEM | ● | ● | | | ● | ● |
| Multiple DERs | Go Electric | ● | ● | | ● | | ● |
| | Johnson Controls | ● | ● | ● | ● | ● | |
| | Schneider Electric | ● | ● | ● | ● | ● | ● |
| | Siemens | ● | ● | | ● | ● | ● |

# Poll #2

Please go to www.slido.com and enter code #DOE to respond

# Gary Mullaney

Kaiser Permanente

Submit Questions
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U.S. DEPARTMENT OF ENERGY

# Accomplishments and Lessons Learned in Integrating Distributed Energy Resource

Gary Mullaney, MBA, CEM

Senior Energy Consultant, Kaiser Permanente



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# Kaiser Permanente at a Glance

***Recognized as one of America's leading health care providers and not-for-profit health plans***

**Kaiser Foundation Health Plan**

**Permanente Medical Groups**

**Kaiser Foundation Hospitals**

| | | | | |
|---|---|---|---|---|
| 12.4+ million members | > $80 billion annual operating revenue | 23,271 physicians<br>63,306 nurses<br>219,149 employees | 80+ million square feet of occupied space<br>8 states and DC | 39 owned & 4 operated hospital<br>700+ medical offices and other facilities |



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# DER Drivers

Kaiser Permanente's 2025 Environmental Stewardship Goals:
Raising the Bar on Environmental Responsibility

At Kaiser Permanente, we recognize that healthy communities and a healthy environment are critical to the health and wellness of every person. Creating these has always been central to our mission.

CLIMATE ACTION
Become "carbon net positive" by buying enough clean energy and carbon offsets to remove more greenhouse gases from the atmosphere than we emit.

SUSTAINABLE FOOD
Buy all of our food locally or from farms and producers that use sustainable practices, including using

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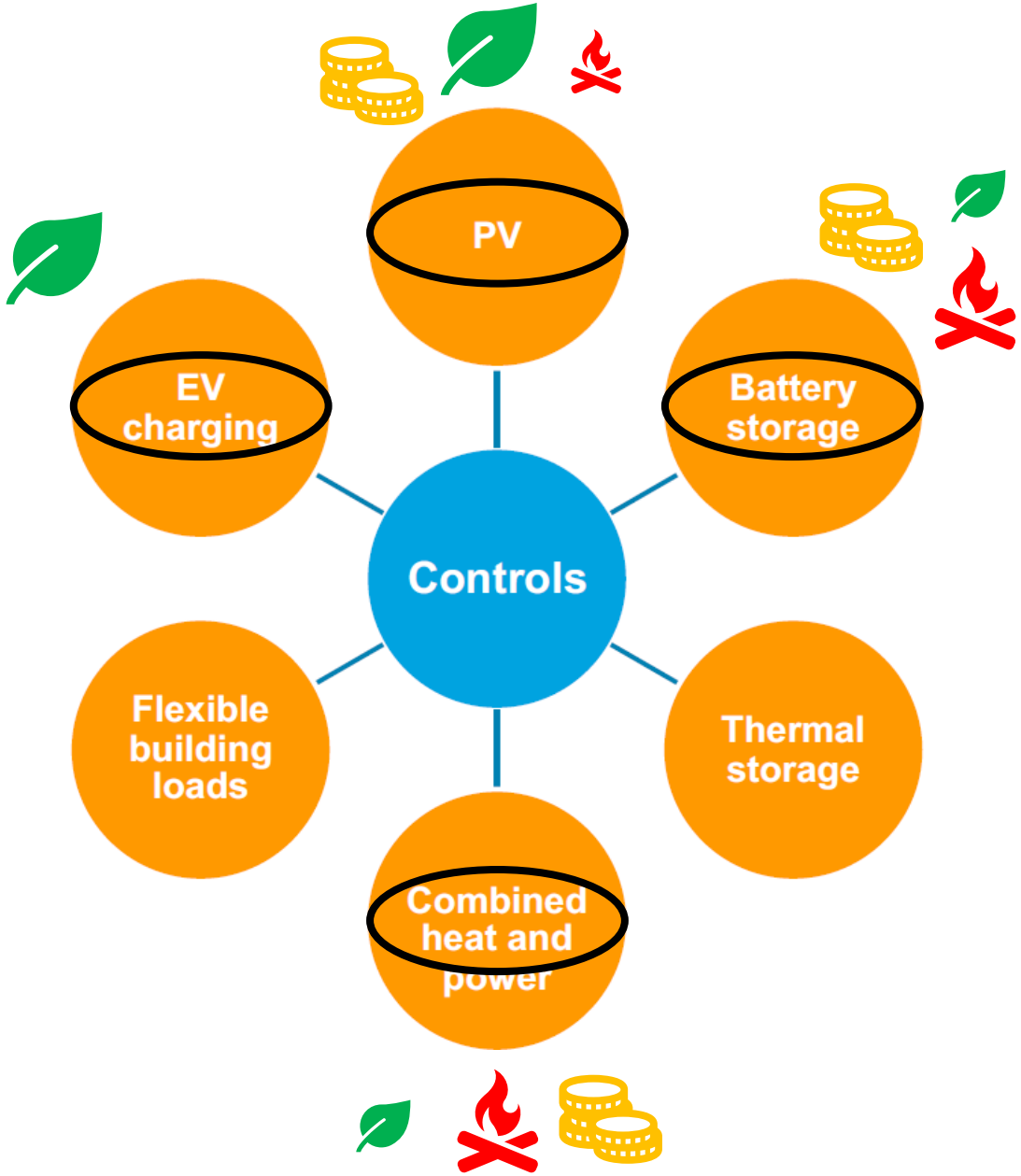
# General Approach

- Build a strong team
- Leverage 3rd Party financing
- Develop programs nationally and execute them regionally/locally
- Take a broader, longer term financial evaluation of programs

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# On-site Solar PV

Elk Grove Promenade Medical Office, California

- Deployed 44 MW at 65 sites with an additional ~26 MW at 32 sites in the pipeline
- First PPA portfolio started in 2010
- Leveraged Power Purchase Agreements (PPA) with buyout option for after ITC benefit exhausted
- Lessons Learned:
  - Capital project integration
  - Value of a good EPC/developer
  - Involvement in financing

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# Fuel Cell

- Deployed ~29 MW with an additional 11.5 MW in pipeline covering 40 sites
- Technology: Solid oxide fuel cell
- Leveraged PPA style financing
- 2012: 1st round included 4.3 MW at 7 sites
- 2016: 2nd round of projects
- Designing for resiliency
- Lessons Learned:
  - Sizing the system correctly
  - Gas volatility/exposure

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# Electric Vehicle Charging

- ~450 chargers at 45 sites
- 2014 Executed a RFP
- Level 2 chargers
- Master Service Agreement covers service, maintenance, driver billing and electric reimbursement
- Lessons Learned:
  - Installation options: Turn key or Kaiser led
  - Highly visible part of sustainability effort
  - Leveraging incentives
  - Integration with capital program

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# Battery Storage

- 5 projects: 4.86 MW/29.6MWh
  - 4 of 5 completed (last one Q4 2020)
  - SCE LCR program - Virtual Power Plant
- 2017 RFP aimed at CA SGIP funding
- Used for demand management

| Sites | Total Annual Expected Savings | Total Weighted Savings Expected to Date | Total Actual Savings to Date | Actual Performance to Date | Completed Billing Periods |
|---|---|---|---|---|---|
| Downey | $ 40,470.00 | $ 9,396.60 | $ 4,726.00 | 50.3% | 3 |
| Orchard | $ 71,209.00 | $ 26,451.31 | $ 16,042.00 | 60.6% | 5 |
| Baldwin Park | $ 84,078.00 | $ 46,622.48 | $ 44,299.00 | 95.0% | 8 |
| Bellflower | $ 32,658.00 | $ 32,658.00 | $ (12,892.00) | -39.5% | 12 |
| | $ 228,415.00 | $ 115,128.39 | $ 52,175.00 | 45.3% | 7 |

- Shared savings model with true up provision
- Lessons learned:
  - Lower lifecycle savings/margins made development more challenging
  - Achieving consistent savings more challenging than it looks
  - Load variability: sizing/development and performance
  - Solar/Forecasting
  - Charging restrictions/flexibility
  - Software/data science support team

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# Cogeneration

- Executed locally as part of original construction projects
- Cost savings was primary driver so they aren't configured to provide backup power
  - Evaluating cost-benefit of reconfiguring to add resilience
- Lesson Learned:  Performance/O&M have been common issues/concerns

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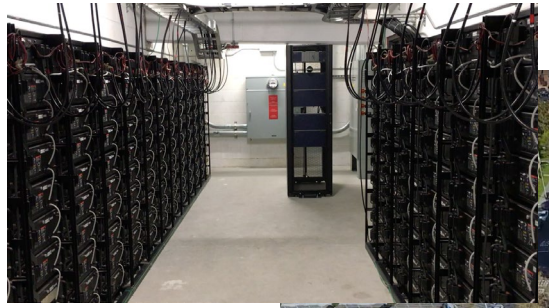
# Microgrids

- Richmond Hospital (250kW PV/1MW BESS)
  - $4.7M California Energy Commission (CEC) grant funding
  - 1st Renewable integrated microgrid tied into a CA hospital
  - Backs up generators for life safety branch on manual transfer switch
- Focused now on most vulnerable areas and where opportunities present themselves
  - Areas impacted by PSPS
  - Generator replacement projects
  - New construction – microgrid ready
  - Existing solar and fuel cell projects



Battery Room

Solar PV array on Parking Deck

- Lessons Learned/Challenges
  - Valuing resiliency as an HMO
  - Cost of isolating critical loads
  - Getting alignment on resiliency goals

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# Overall Lessons Learned

- Coordination/integration: coordinating multiple programs/vendors that intersect is challenging with a small team
- Construction coordination under PPA contract was challenging initially
- Education: value proposition and what technology does/doesn't do
- Sizing: properly sizing DER is critical
  - Do energy efficiency first!
- Performance/Bill Monitoring:
  - Have a good plan to monitor system and financial performance
  - Have a good plan to audit bills to ensure PPA/contract compliance
    - Standard utility bill monitoring/payment systems don't handle these well….still

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# Q & A

Submit Questions
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# Additional Resources

Better Buildings Alliance Renewables Integration Team website

Better Buildings Alliance EMIS Team Website

Part 1: The Value of Distributed Energy Resources to Owners: A Current Market Landscape

DOE Grid-Interactive Efficient Buildings website

On-Demand Better Buildings Webinar Series

Market Brief: Customer-sited Distributed Energy Resources (LBNL, March 2020)

# Better Buildings: Summer Webinar Series

**BEHIND THE METER DISTRIBUTED ENERGY RESOURCES:**
BEST PRACTICES FOR INTEGRATING DERS INTO COMMERCIAL BUILDINGS

July 8

**NEXT-GENERATION BUILDING PERFORMANCE POLICIES:**
MAXIMIZING ENERGY SAVINGS AND ENVIRONMENTAL IMPACTS

July 16 REGISTER TODAY

**EVERYONE HAS A DATA CENTER:**
HOW TO BE AN ENERGY CHAMPION FOR YOURS

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LOW-INCOME SOLAR PROGRAM STRATEGIES

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**STRATEGIES TO COMBINE ENERGY + HEALTH UPGRADES IN MULTIFAMILY HOUSING**

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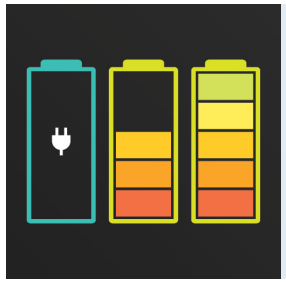
**SUCCEED WITH SUBMETERING:**
HOW TO MAKE THE BUSINESS CASE

August 4 REGISTER TODAY

**THE DYNAMIC DUO:**
UNLEASH PUBLIC SECTOR ENERGY SAVINGS WITH FINANCING AND TECHNICAL ASSISTANCE

July 14 REGISTER TODAY



**CASE IN POINT:**
OREGON'S RECENT EFFORTS TO REDUCE PLUG LOAD ENERGY CONSUMPTION

July 22 REGISTER TODAY

On-Demand Webinars

# Better Buildings: Summer Webinar Series

## PROGRAM DESIGN WITH EVERYONE IN MIND:

### LOW-INCOME SOLAR PROGRAM STRATEGIES

Thursday, July 9, 2020 | 1:00 - 2:00 PM ET

REGISTER TODAY

This webinar will showcase successes from DOE programs: Solar in Your Community Challenge and Clean Energy for Low-income Community Accelerator. DOE and stakeholders (Philadelphia Energy Authority, Denver Housing Authority, and Clean Energy States Alliance) will highlight several examples of low-income renewable energy programs, share best practices, and discuss DOE's newest program, the National Community Solar Partnership.

Discover online training and education opportunities from the U.S. Department of Energy (DOE) and Better Buildings Affiliates who are working with DOE to promote energy efficiency in U.S. buildings and manufacturing plants.

**Learn more at:** https://betterbuildingssolutioncenter.energy.gov/e-learning-center

# Additional Questions?

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