Better Buildings
U.S. DEPARTMENT OF ENERGY

ENERGY EFFICIENCY DAY
Save energy. Save money.

Better Buildings Residential Network Peer Exchange Call Series:

Here Comes the Sun: New Advances in Solar and its Connection to Energy Efficiency

October 5, 2017

Call Slides and Discussion Summary

U.S. DEPARTMENT OF ENERGY

Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Polls
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers
  - **Steve Lefler**, Vice President, Modular Lifestyles
  - **Deborah Lewis**, Business Development Manager, SunTegra
  - **Mike Davis,** Senior Program Officer, Local Initiatives Support Corporation (LISC Boston) & **Seth Mullendore**, Project Director, Clean Energy Group
- Discussion
- Closing Poll and Announcements

Ground Rules:

1. **Sales of services and commercial messages are not appropriate** during Peer Exchange Calls.
2. Calls are a safe place for discussion; **please do not attribute information to individuals** on the call.

Better Buildings Residential Network

Join the Network

Member Benefits:

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Solution Center guided tours

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year

Upcoming calls:

- October 12: The Power of IR Diagnostics to Drive Home Upgrades without Incentives
- October 19: Powered Up: Batteries and the Future of Residential Energy Storage
- November 2: The Beatles, Radiohead, and Adele: Messaging for Different Generations
- November 9: Money Down the Drain: The Energy-Water Nexus
- November 16: Wicked Smart: Optimizing Diagnostics through Home Energy Monitoring
- November 30: **Solar Decathlon Peer Exchange Call**

Peer Exchange Call summaries are posted on the Better Buildings website a few weeks after the call

For more information or to join, for no cost, email bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn & click Join

U.S. Department of Energy Solar Decathlon

Oct 5-15, 2017 DENVER

- 13 Collegiate teams compete in 10 contests
  - New for 2017: Innovation and Water
- Winning team best blends technology, market potential, design excellence with smart energy solar production and maximum energy and water efficiency.
- Large free public event – showcases best of clean energy technology
- Denver location: new, mixed use smart community on transit line near Denver International Airport
- Sponsorship Opportunities
- Info: www.SolarDecathlon.Gov

Register for the Solar Decathlon Peer Exchange Call:

https://register.gotowebinar.com/register/8310877229536476 19?source=announce_email

Solar Decathlon 2015 Teams in Irvine, Calif.
Credit: Thomas Kelsey/U.S. Department of Energy Solar Decathlon

Best Practices: Modular Lifestyles

Steve Lefler, Vice President

U.S. DEPARTMENT OF ENERGY

Modular Lifestyles

Our Continual Quest For Energy Efficiency and Net Zero

Factory built Journey

www.modularlifestyles.com

Steven Lefler

VP

What is Factory Built Housing?
CA. Building Codes

- Tiny House (ANSI Code) under 400 square feet
- HUD code or Manufactured home (Federal >400 square feet) HCD code and Standards -Title 25
- Modular – Same as Site Built HCD Codes and Standards - Title 24 - CBSC/CRC

First Green Community

NEWS

A little bit of heaven

Each home, regardless of style or size, includes an attached "garagette," which offers ample space for one or two car parking as well as storage. The backside of the garagette is open and leads to a private patio area, providing privacy and space for outdoor living.

)0, 2013

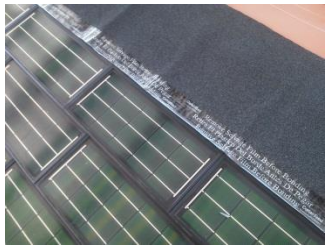
In Ojai, this senior community thrives in its eco-friendly and tranquil environment

By Margaret Aldrich

Oak Haven is a 22-unit, gated senior community at 1885 Maricopa Highway in the beautiful Ojai Valley. Any preconceived notions one might have about a senior

Green Home Awards

Better building practices



Example	Cities	Zone	Wall		Wall		Ceiling		Ceiling		Slab
Miami	Honolulu	1	19	-	27		44	-	60		2ft R-8 vertical perim
Jacksonville	Phoenix	2	19	-	27		30	-	70		Uninsulated
Charleston	Sacramento	3	15	-	31		30	-	60		Uninsulated, or 2-4ft R-8 vertical perim
San Francisco		Marine 3	19	-	23		30	-	38		4ft R8-20 vertical perim

Off-The-Grid Tiny House

Residential billing changes coming

SCE Notice to Residential accounts

- **2017 & Beyond without Solar**

The number or rate tiers reduces from three to two; however, a High Usage Charge will apply to customers who use more than twice the average amount of electricity **(more than 400% of the baseline allowance)**.

The residential rate pricing variance between tiers continues to be reduced.

In 2019, many residential customers will transition to a **Time-of-Use (TOU) rate plan**.

Southern California Edison — An Edison International Company

SDGE — A Sempra Energy utility

Pacific Gas and Electric Company

House Appliance KW Design

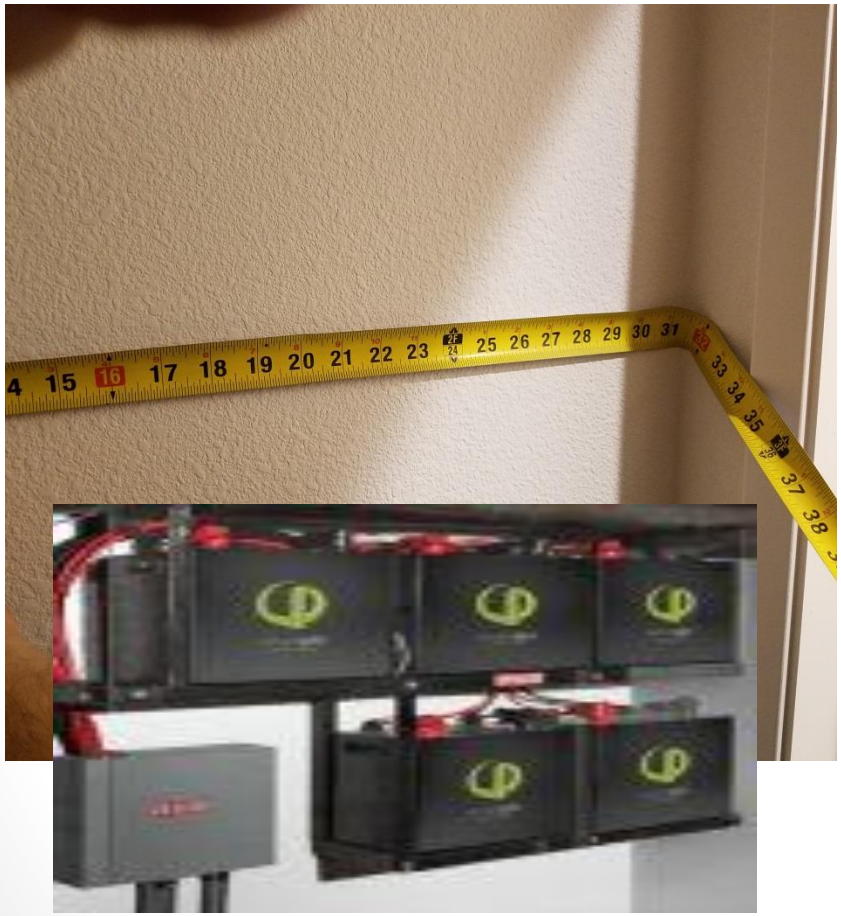
Appliances Daily WATT usage

Assumption: If all operated daily on their cycles

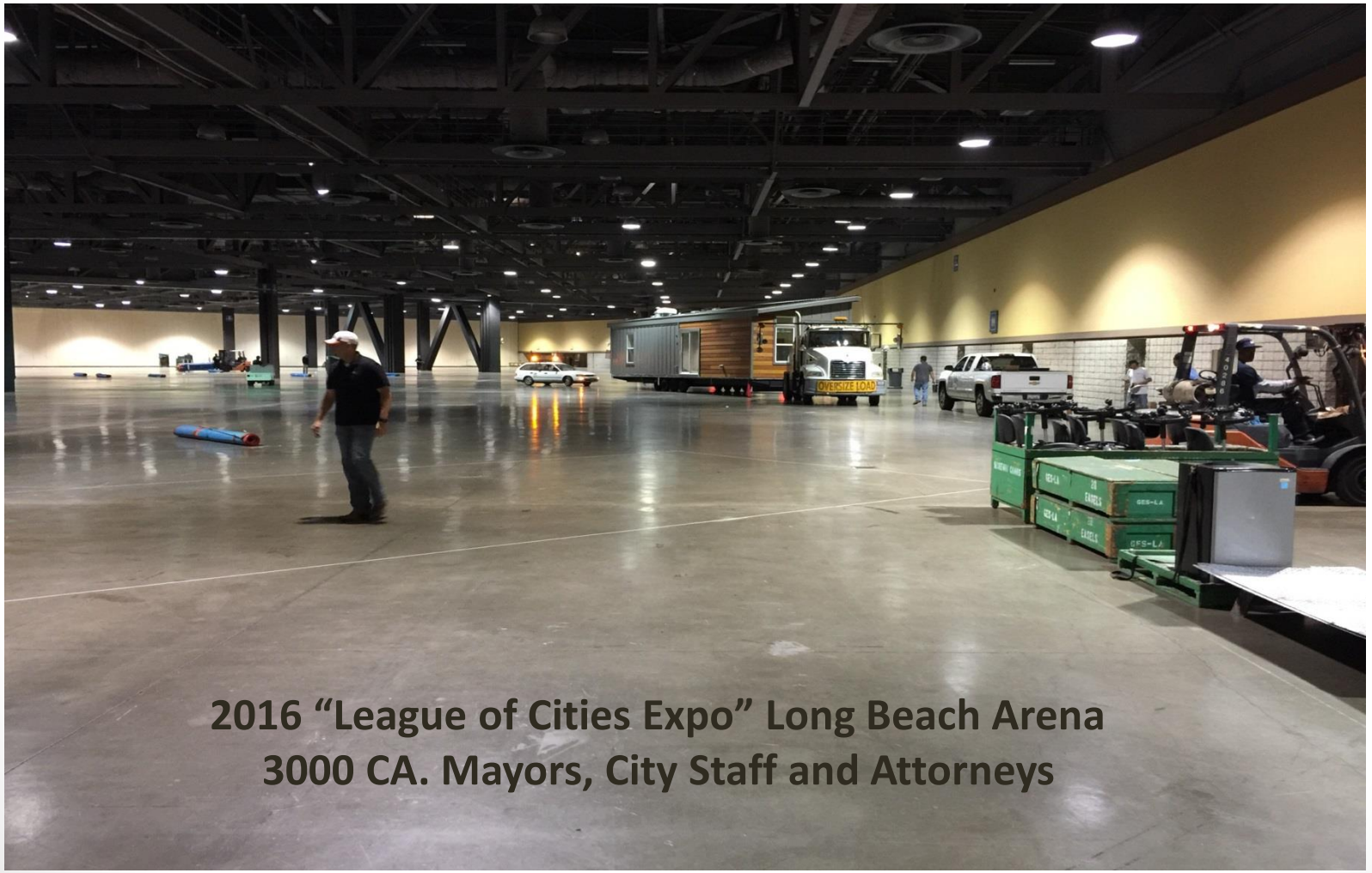
- **15 SEER Electric Heat Pump= 3.5 kw per hour**
- GE Frig 23 cu. in. = 1.56 kw per day
- GE Wine Frig 10 cu. In = 980 WATTS per Day
- Washer = 39 WATTS per cycle
- Dishwasher = 50 WATTS per cycle
- (4) LED Flat Screen TV's = 148 WATTS per day
- 57 Light bulbs (if all were ON) = 440 Watts per hour
- (4) ceiling fans = 100 Watts per hour

Suntegra Solar Roof Shingles

Solar to Battery Closet Setup



Transportable to showcase



2016 “League of Cities Expo” Long Beach Arena
3000 CA. Mayors, City Staff and Attorneys

Factory Installation

Does it work

Our Manufactured Houses = 1.5 kWh Solar

Case Study – DOW Chemical

(2) 50 AMP houses in our Sunnyvale, CA. community

Same House, Same Street - 1150 Sq. ft. Canadian Solar Panel versus DOW Solar Shingles
Family of 3 versus Family of 4




	kWh Purchased	kWh Generated	Nat Gas Purchased	Elec Annual cost to operate	Annual Water Usage	
◆	**1768 kWh**	**2088 kWh**	**415 Therms**	**$319.82**	**57 cu ft**	
▲	1235 Kwh	2159 kWh	242 Therms	231.80	28 cu ft	

My modular house

Summary of NEM Charges

Bill Period End Date	Net Peak Usage (kWh)	Net Part Peak Usage (kWh)	Net Off Peak Usage (kWh)	Net Usage (kWh)	Estimated NEM Charges Before Taxes	Estimated Taxes	Estimated Total NEM Charges
06/09/2016	-105	-36	171	30	-$18.51	$0.01	-$18.50
07/11/2016	-10	27	257	274	41.23	0.08	41.31
08/10/2016	69	76	281	426	91.47	0.12	91.59
09/11/2016	29	54	268	351	65.17	0.10	65.27
10/10/2016	27	49	304	379	72.08	0.11	72.19
11/08/2016	0	27	199	226	35.49	0.06	35.55
12/08/2016	0	74	439	513	81.58	0.15	81.73
01/09/2017	0	71	581	652	109.34	0.19	109.53
02/08/2017	0	70	514	584	96.35	0.17	96.52
03/12/2017	0	52	274	326	52.31	0.10	52.41
04/10/2017	0	34	50	84	14.99	0.02	15.01
05/10/2017	-12	15	32	35	3.81	0.01	3.82
TOTAL	-2	513	3370	3880	$645.31	$1.12	$646.43

Differences in net usage may occur due to rounding

Quote

- The fellow that can only see a week ahead is always the popular fellow, for he is looking with the crowd. But the one that can see years ahead, he has a telescope but he can't make anybody believe that he has it.
- Will Rogers

Presentation Highlights: Modular Lifestyles

- **Take them on a journey: Off-the-grid tiny houses are still a novelty and people have different levels of understanding.**
  - Modular Lifestyles took its Tiny House 395 square foot "Quest" Off-The-Grid concept home to the CA State Capitol and other tradeshows to showcase the solar factory built house.
- **Make it affordable: Highly energy-efficient homes bring great benefits for those living on moderate and low incomes.**
  - Modular Lifestyles' solar-powered housing for a senior community in Ojai resulted in limited energy use and lower utility bills.
- **Build a better cupcake and you don't need a lot of icing:** Modular Lifestyle's off-the-grid tiny houses use a highly efficient envelope to prevent any energy losses. The houses don't have indoor air quality issues and are equipped with carbon monoxide sensors.

Best Practices: SunTegra

Deborah Lewis, Business Development Manager

U.S. DEPARTMENT OF ENERGY

SUNTEGRA®

Here Comes the Sun: New Advances in Solar and its Connection to Energy Efficiency

Thursday, October 5, 2017

Deborah Lewis
Business Development Manager | West Coast USA and Canada
www.suntegrasolar.com

What is SunTegra?

- **A 2-in-1 Solar Roof Solution**

  Functions both as a solar panel that generates electricity and a roofing material that protects your home or building.

- **Offers a Low-Profile Appearance**

  Unique roof-integrated design blends in seamlessly with the roofline, maintaining architectural integrity and preserving curb appeal.

- **A High Performance Solar Option**

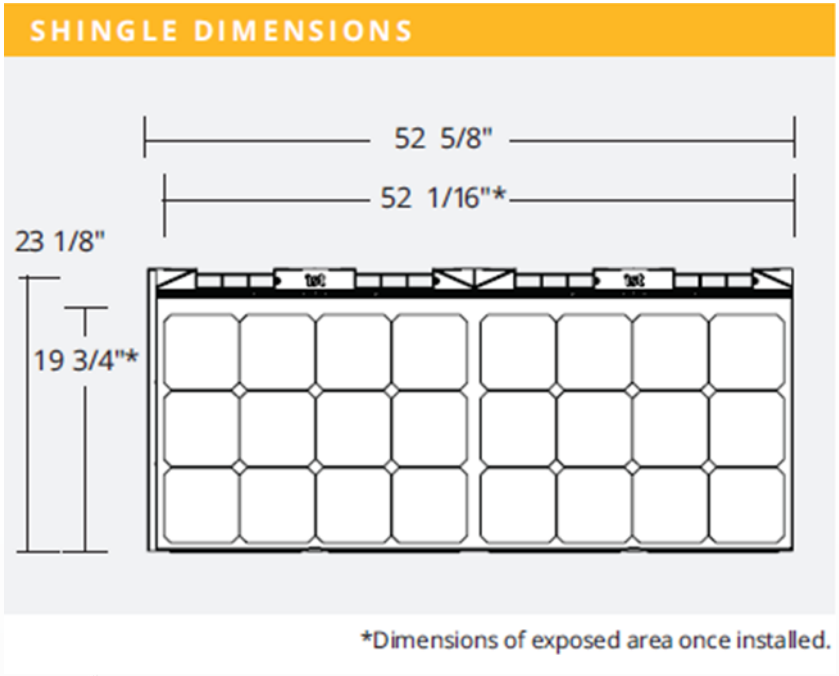
  Performance is comparable to standard high efficiency solar panels.

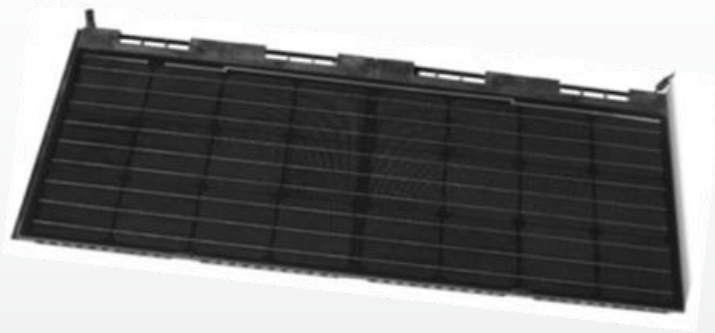
- **Easy to Install**

  Integrated design reduces complexity and speeds installation, requiring 50% fewer parts than conventional rack-mounted systems.

Shingle

Power Rating	105 W DC
Panel Efficiency	15.9%
Power Tolerance	+5/-3%
Solar Cell	24 x High Efficiency Monocrystalline Silicon
Exposed Length:	52 1/16"
Exposed Height	19 3/4"
Thickness	3/4"
Weight:	18 lbs., 2.5 lbs./ft2

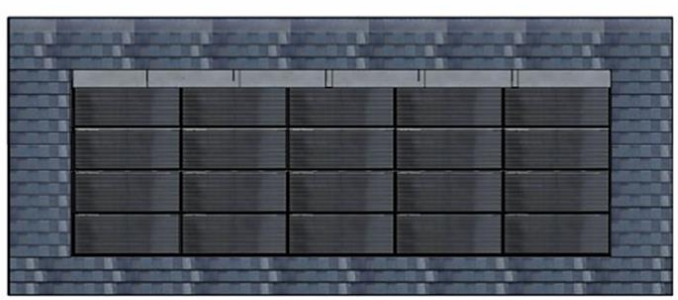


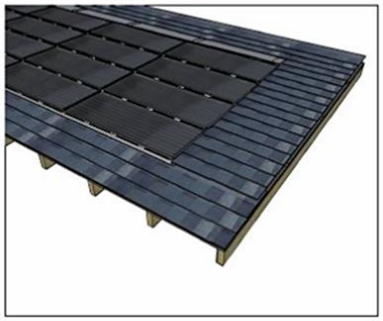


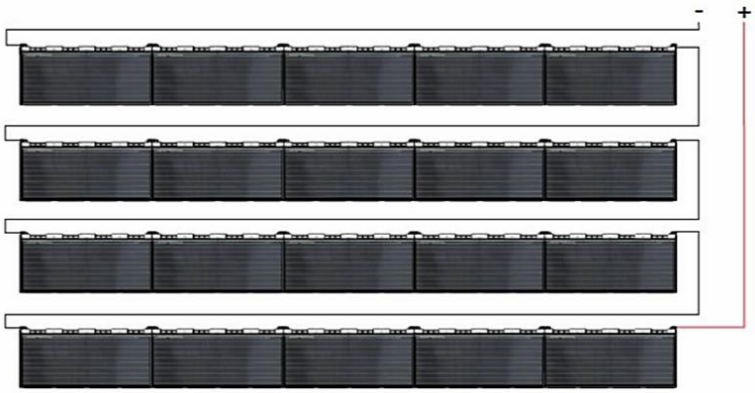
Installation Benefits

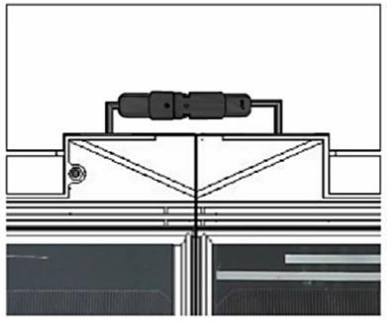
Designed for a simplified installation process and inclusion in the building/re-roof process.

- Replaces roofing material.
- Integrated wiring within the module and a Row-to-Row jumper cable approach simplify the electrical connection on the roof.
- Direct-to-deck roof attachment speeds up installation.
- Tie-in with roofing material either during installation or at later time.









Warranty/Certifications

Warranty

- SunTegra — 25-Year Power Warranty
- SunTegra — 10-Year Product Warranty

Certifications

- UL 1703 — Flat-Plate Photovoltaic Modules and Panels
- UL 790 — Standard Test Methods for Fire Tests of Roof Coverings (Class A & C)
- UL 1897 — Uplift Tests for Roof Covering Systems (Tested to 45 PSF)
- TAS 100-95 — Wind and Wind Driven Rain Resistance

Patents

- US Patent — Advanced Frame Design for Roof-Integrated Solar Panels

Listings

- CEC — California Energy Commission List of Eligible PV Modules (STS-105M-B4U)

Authorized Dealers

We sell through a network of authorized dealers consisting of:

- Roofing/Home Improvement Contractors
- Builders (as a solar option) offered within a development
- Custom Builders (utilizing solar during the design process)
- Factories

Builders (As a Solar Option)

Builder (Custom Home Design)

Partner	Brookside Development
System Size	4.8 kW
Components	48 x SunTegra Shingles; 1 x SMA Sunny Boy 5.0-US Inverter

2016 Best Green Energy-Efficient Home
5 Singer Village Drive, Derby, CT

SunTegra Shingles Morristown, NJ

"We have been looking for solar for the last 10 years and we finally found the right product for our 215 year-old home. We are thrilled with the quality, the beauty, and the effect our SunTegra system is having on us and our community. Besides the obvious financial give back, it feels great to help protect the environment. We can now drive around in an electric car, powered by solar from our roof, not polluting both at home and on the road. You got to start somewhere!"

-Dave and Chris Sampson

Presentation Highlights: SunTegra

- **Make it an integrated system: Solar has generally been an after-thought for homeowners, and not considered at the outset in the home improvement process.**
  - Integrating solar capabilities in the energy upgrade process can provide greater energy efficiency benefits and require fewer structural changes, as opposed to adding solar later on.
  - By providing the possibility to combine roofing with solar without major structural interventions, Suntegra was able to install solar shingles on a home that is 200+ years old.
- **Work with contractors and help them integrate solar into their business model:**
  - **Contractors generally see solar as a "tough sell" due to the proposal preparations and financial calculations involved.** To address this, Suntegra provides contractors with the materials to promote solar in their transactions with homeowners.

Best Practices: Local Initiatives Support Corporation & Clean Energy Group

Mike Davis & Seth Mullendore

U.S. DEPARTMENT OF ENERGY

Here Comes the Sun: Better Buildings Residential Network Peer Exchange Call

LISC Boston's Green Retrofit Initiative

Mike Davis, AICP, LEED AP BD+C
Senior Program Officer, LISC Boston

Green Retrofit Initiative Over the Years

- Build owner demand (2010-2012)
  - New utility program created: LEAN Low-Income Multi Family
  - 11 Boston nonprofits enrolled in Green Retrofit Initiative
- Achieve deeper savings (2012-2015)
  - Awarded HUD Energy Innovation Fund
  - Expanded statewide engaging nonprofits, for-profits, and public housing authorities
  - Goal: Achieve 20+% savings; 29% electric, 23% gas actual
- Convening stakeholders and informing policy (2014-2016)
  - Green Asset Management Plans with 20 owners: proactive approach across portfolio
  - Policy work focused on connecting utilities and housing finance agencies

MassCEC Grant Goals (2016 – present)

- Audits – Getting all parties (owners, lenders, building science providers, state agencies, utilities) to communicate about deep energy efficiency and clean energy savings opportunities
  - How do we move from culture of free stuff to going deeper and get all EE and CE funded where applicable?
- Retrocommissioning – How do we make sure renewables, including solar + storage systems, are installed and maintained correctly to achieve projected savings?
- Inform program and policy design so there are more resources and technical assistance from state level

Driving Demand for Efficient, Clean Energy

- Collaborated with state housing finance agencies to provide comprehensive (ASHRAE Level II) energy audits for 24 projects approaching rehab
- Retrocommissioning feasibility analyses for 15 underperforming renewables (1 air source heat pump, 1 ground source heat pump, 6 co-gen, 4 solar PV, and 3 solar thermal)
- Worked with four building science providers
- Provided grants totaling $500K
- Received double the applications than available funding

Emerging Themes from Audits and RCx

- Additional guidance needed for investment-grade audits
- For measures LEAN cannot fund: Need to better understand what obstacles exist for permanent lenders to underwriting anticipated energy savings
- Owners need clean energy roadmap to make informed decisions
- What resources are needed to ensure solar and other clean energy technologies work long-term? E.g.
  - RFP for select vendors to serve sector
  - Performance-based contracts (not run time) on co-gen
  - Third-party monitoring
  - Continuous commissioning

Challenges LISC Plans on Addressing

- Clean energy for all or some? Low-income sector shortchanged in 2016 Omnibus Energy Bill. Unpredictable compensation causes paralysis (SMART Program). Continuing policy work to ensure solar and clean energy techs remain viable for multifamily affordable housing sector.
- Underwriting energy savings? Some permanent lenders have expressed willingness to underwrite EE and CE savings. How do we build demand among owners to ensure more of this happens?
- Affordable Passive House projects in MA? Partnership with RiseBoro Community Partners in NYC so MA owners can learn from their experience.
- Solar/Clean Energy Roadmap – What additional guidance and resources are needed from state? How do we make it easier for owners to make informed decisions? Statewide solar potential map?
- Connecting owners with technical assistance on solar + storage

Contact Us!

Mike Davis, AICP, LEED AP BD+C

Senior Program Officer, Local Initiatives Support Corporation

www.liscboston.org

LISC

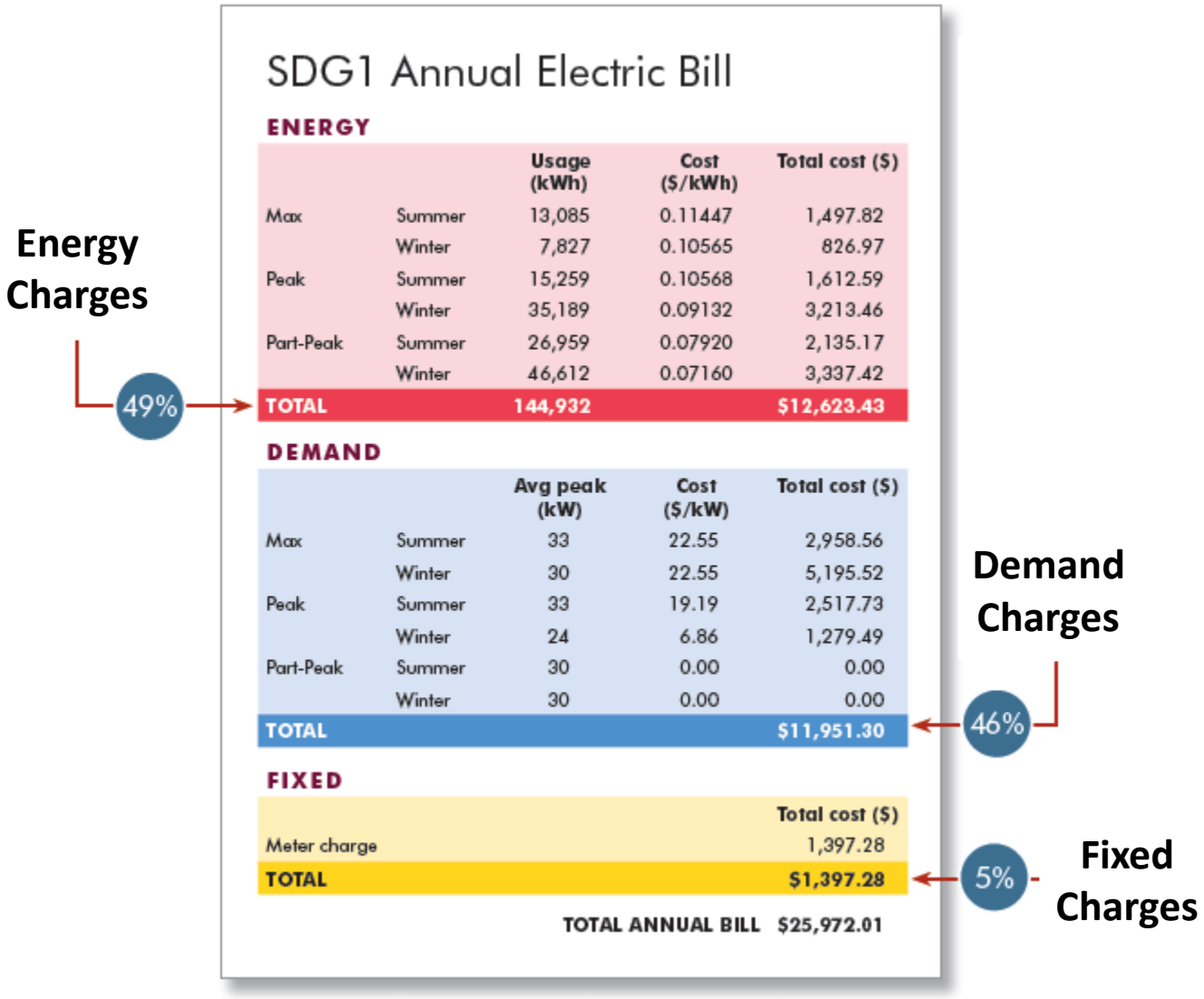
Helping neighbors build communities

RESILIENT POWER

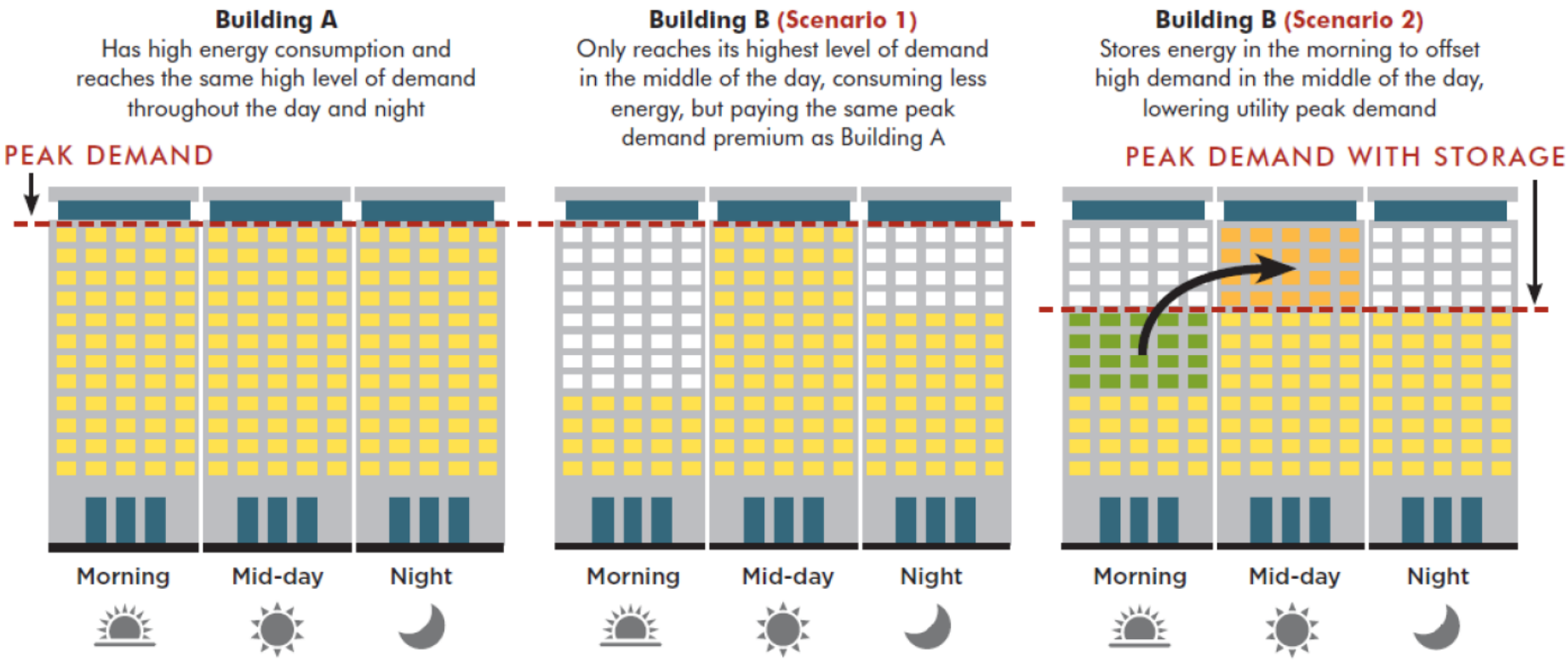
A project of CleanEnergyGroup

- Increase public/private investment in clean, resilient power systems
- Protect low-income and vulnerable communities: affordable housing and critical public facilities
- Advocate for state and federal supportive policies and programs
- Engage city officials to develop resilient power policies/programs
- Technical assistance for pre-development costs to help agencies/project developers get deals done
- See www.resilient-power.org for reports, newsletters, webinar recordings

Charges on an Electric Bill



Consumption vs Demand



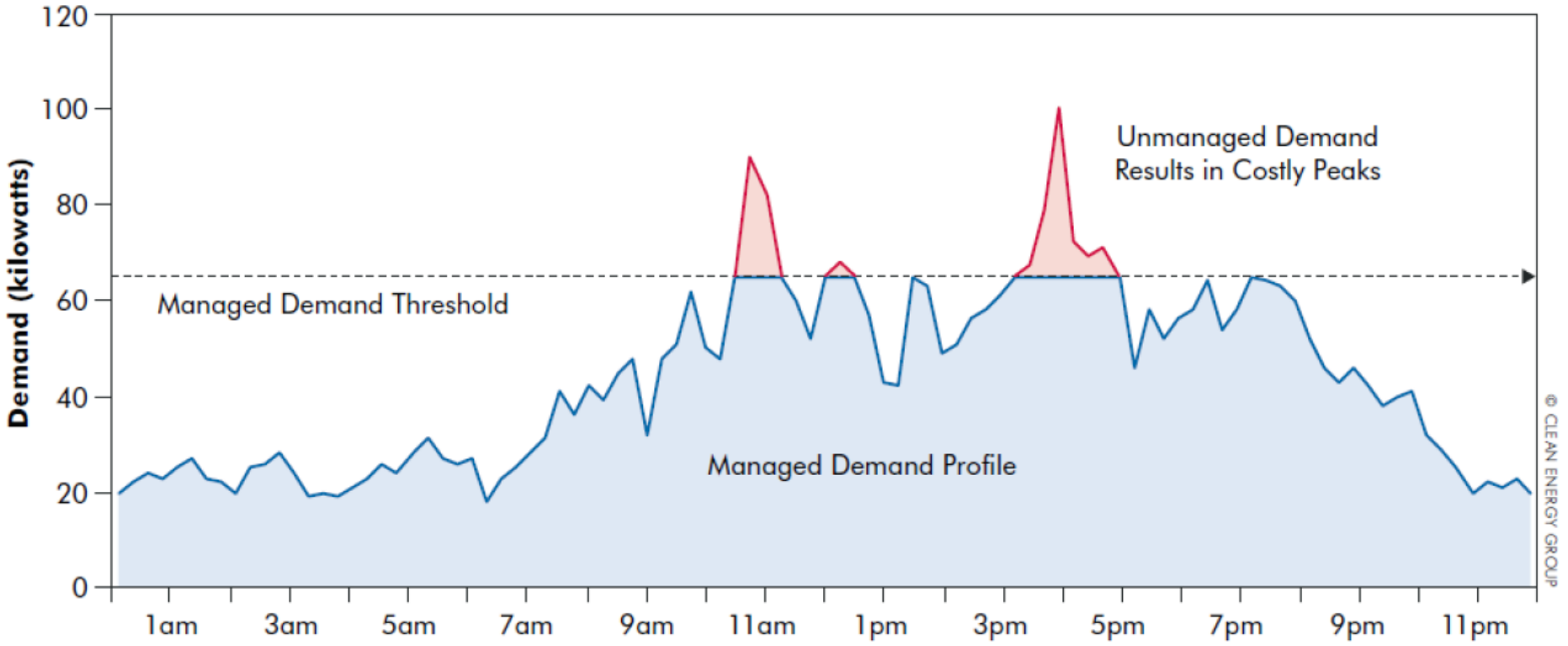
In **Scenario 1**, Building A and Building B will incur the same peak demand charges over the course of the day, even though Building A will have consumed considerably more energy during that time. In **Scenario 2**, Building B can use energy storage to reduce its mid-day grid energy consumption by meeting some of its demand with on-site stored energy. **This could reduce its overall peak demand** for the period, resulting in a lower utility bill.

Grid Energy Consumption

Stored Energy

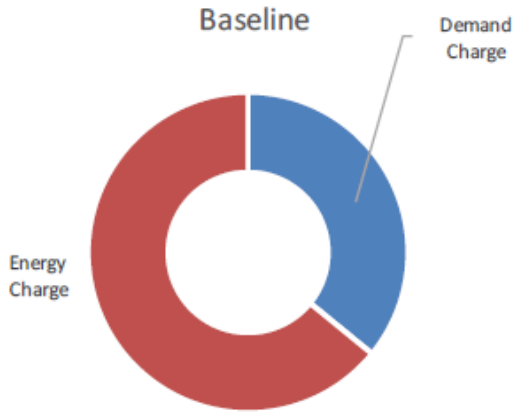
Stored Energy Consumption

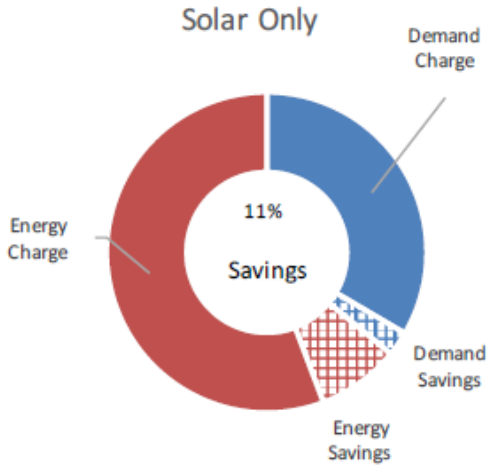
How can battery storage reduce demand charge expenses?

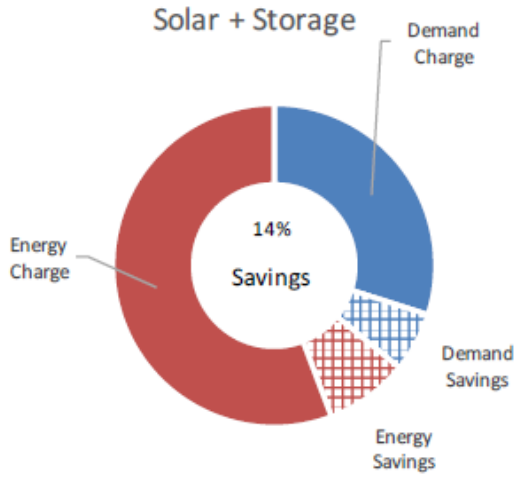


Through the deployment of an energy storage system, peak demand can be effectively capped at a specified level—significantly reducing utility demand charges. Assuming a demand charge of $15 per kilowatt and peak demand reduction from 100 kilowatts to 65 kilowatts each period (as shown here), energy storage could reduce the customer's demand charge by $525 per billing period, amounting to an annual savings of $6,300.

Solar+Storage Economic Analysis





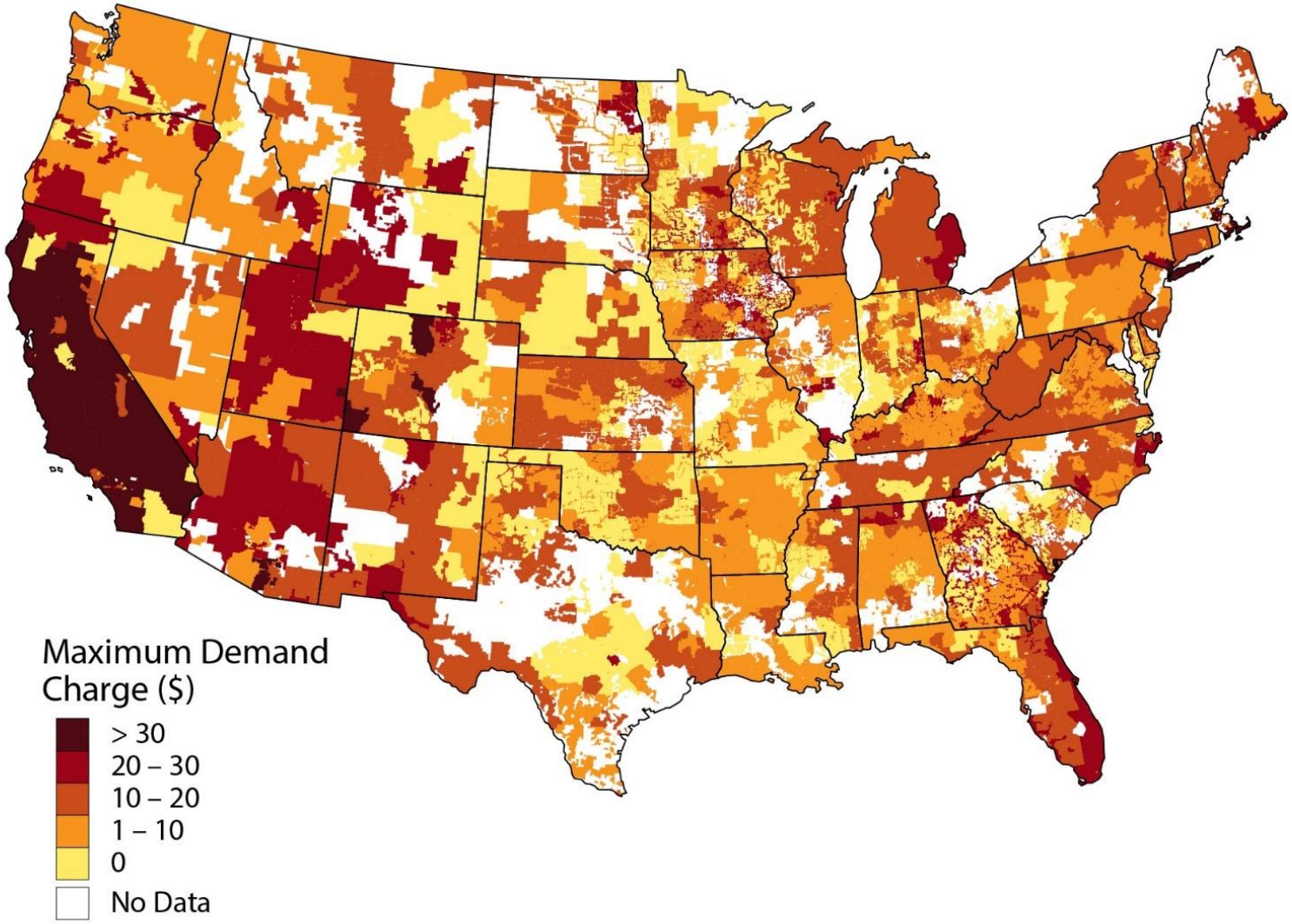


Baseline	
Total Charge	$ 220,188
Energy Charge	$ 139,871
Demand Charge	$ 78,317
Fixed Charge	$ 2,000

Solar Only	
Total Charge	$ 196,610
Energy Charge	$ 121,667
Demand Charge	$ 72,943
Fixed Charge	$ 2,000
Total Savings	$ 23,578
Solar Payback ($2.5/W), yr	5.7
NPV (20 yr, @ 6%)	$ 177,183
IRR (20 yr)	14.48%

Solar + Storage	
Total Charge	$ 188,965
Energy Charge	$ 121,667
Demand Charge	$ 65,298
Fixed Charge	$ 2,000
Total Savings	$ 31,223
Project Payback, yr	5.3
NPV (15 yr, @ 6%)	$ 169,977
IRR (15 yr)	14.28%
NPV (20 yr, @ 6%)	$ 235,807
IRR (20 yr)	15.33%

A Survey of U.S. Demand Charges



Contact Information

Seth Mullendore
Project Director
Clean Energy Group

Find us online:
www.resilient-power.org
www.cleanegroup.org
www.facebook.com/clean.energy.group
@cleanenergygrp on Twitter
@Resilient_Power on Twitter

CleanEnergyGroup
Innovation in Finance, Technology & Policy

RESILIENT POWER
A Project of Clean Energy Group

Presentation Highlights: Local Initiatives Support Corporation (LISC) & Clean Energy Group

- **Focus on the point of rehab**: Leveraging planned home improvements is a great way to promote deeper upgrades and clean energy savings opportunities.
  - Massachusetts Green Retrofit Initiative helped 129 multifamily buildings reduce their yearly energy use by 29% on average, primarily through lighting upgrades.
- **Communicate, Communicate, Communicate:**
  - LISC's advocacy is two-fold: Towards the State housing policymakers on the need to align resources at the time of rehab, and towards homeowners on their energy efficiency upgrade options.
- **Solar can increase energy resiliency for communities:** The Resilient Power Project aims to deploy solar PV combined with storage in low-income communities to reduce energy use and maintain energy even in times of extended power outages.
  - Energy storage can offset high energy demand during peak times and Clean Energy Group found that solar storage could result in $6,300 dollars over a year for homeowners, with a payback of 5.3 years.

Upcoming webinar: Assessing Costs for Home Upgrade Program Results: Follow the Money!

Across states and utility service areas, home energy upgrade programs vary in design, implementation, and performance, and can sometimes be more costly options for acquiring energy savings in the residential sector.

When administrators identify where to focus investments to get the most savings, however, these programs can contribute significantly to meeting energy policy objectives.

In this webinar, learn from an industry veteran about how to assess your programs cost and identify where to focus investments to get more for your money.

- **Date & Time**: Wednesday, October 25 from 3-4:30pm ET
- **Registration Link**: https://srameeting.webex.com/srameeting/onstage/g.php?MTID=ed5c39b3a83541a18da3fd3c5f347665b
- **Presenters: Dale Hoffmeyer** (U.S. Department of Energy), **Mark Dyen** (Mark Dyen Consulting)

Upcoming Seasonal Messaging Opportunities

Now is the time to start planning energy efficiency messaging!

Dec 31 – Jan 1	January 6	January 10
New Year	National Technology Day	National Cut Your Energy Costs Day

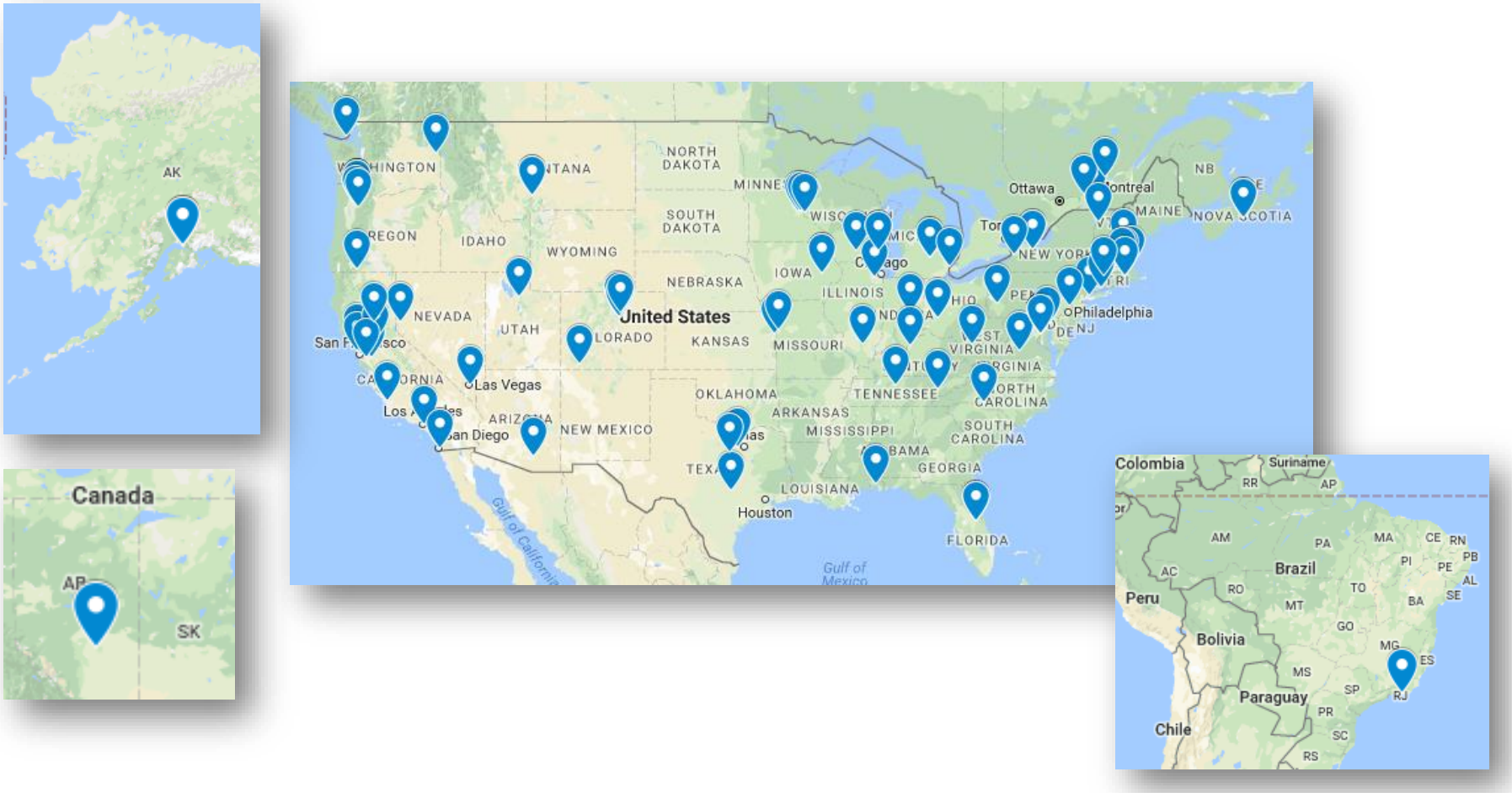
U.S. Department of Energy
[Article: Home Energy Audits Can Help You Keep That New Year's Resolution]

City of Columbia, Missouri
[Facebook Post]

Addenda: Attendee Information and Poll Results

U.S. DEPARTMENT OF ENERGY

Call Attendee Locations



Call Attendees: Network Members

- Alaska Housing Finance Corporation
- American Council for an Energy-Efficient Economy (ACEEE)
- Arlington County Government
- Center for Energy and Environment
- Center for Sustainable Energy
- City of Charlottesville
- City of Providence
- CLEAResult
- Connecticut Green Bank
- Earth Advantage Institute
- Eden Housing
- Efficiency Nova Scotia
- Efficiency Vermont
- Elevate Energy
- Energy Efficiency Specialists
- EnergyWize
- Horizon Residential Energy Services NH, LLC
- La Plata Electric Association
- Modular Lifestyles
- International Center for Appropriate and Sustainable Technology (ICAST)

Call Attendees: Non-Members (1 of 3)

- Acadia Center
- Alliant Energy
- American River College
- Association for Energy Affordability
- Boston Housing Authority
- Build Coach
- California Public Utilities Commission
- Carolina Smart Homes
- City of Milwaukee
- City of Mount Vernon
- City of Orlando
- Clark County
- Community Action Agency of South Alabama
- Craft3
- Dimensions-Energétiques
- E4TheFuture, Inc.
- Focus on Energy (Madison WI USA)
- Ford Motor Land Development Corporation
- Fox Energy Specialists
- Franklin Energy Group
- Green Compass Sustainability
- Greenbanc
- Home Office Training & Technology

Call Attendees: Non-Members (2 of 3)

- Hydro-Québec
- Hydro-Québec's Research Institute (IREQ)
- ICF
- Insight Property Services, Inc.
- Integrative Design & Architecture
- Lantern Energy
- Local Government Commission
- Local Initiatives Support Corporation (LISC Boston)
- Metro Nashville Government
- National Association of Home Builders
- National Association of Realtors
- National Fuel Gas Company
- National Renewable Energy Laboratory
- New Ecology, Inc.
- Nexant
- Office of the People's Counsel
- Oregon Institute of Technology
- People's Self Help Housing
- Philip Neumann Energy Design
- Rebuilder Group, Inc.
- Rhode Island Housing
- Smith & Boucher Engineers
- Sonoma County Energy Independence Program

Call Attendees: Non-Members (3 of 3)

- South-central Partnership for Energy Efficiency as a Resource (SPEER)
- Southwest Environmental Finance Center (SWEFC)
- Studio Jack Rees
- SunTegra
- TRC Solutions
- TRJ Construction Inc
- Utah Governor's Office of Energy Development
- Waiye & Associates
- West Virginia Office of Energy
- Woods Bagot
- XLR8SUN Electric Car

Opening Poll #1

- Which best describes your organization's experience with solar advances?
  - Some experience/familiarity – ***49%***
  - Limited experience/familiarity – ***28%***
  - Very experienced/familiar – ***21%***
  - No experience/familiarity – ***2%***
  - Not applicable – ***0%***

Closing Poll

- After today's call, what will you do?
  - Seek out additional information on one or more of the ideas – ***72%***
  - Consider implementing one or more of the ideas discussed – ***25%***
  - Make no changes to your current approach – ***3%***
  - Other (please explain) – ***0%***