

Better Buildings Residential Network Peer Exchange Call Series: Solar Decathlon 2017: Winning Innovations in Efficiency, Health, and Water November 30, 2017 Call Slides and Discussion Summary



Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Polls
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers:
 - Linda Silverman, Director, Solar Decathlon, DOE
 - Mike Binder, Co-Principal Investigator & Project Manager, University of Maryland
 - Joan Gibbons, Head of Construction, UC Berkeley
 - Linda Silverman, Director, Solar Decathlon, DOE for University of Nevada - Las Vegas
- Discussion
- Closing Poll and Announcements

Ground Rules:

1. Sales of services and commercial messages are not appropriate during Peer Exchange Calls.









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:

- December 7: DOE Toolkit Launch: A New Approach to Evaluate as You Go
- December 14: <u>The Amazing Race: City Winners of the National Georgetown University</u> <u>Energy Prize (GUEP)</u>

Peer Exchange Call summaries are posted on the Better Buildings <u>website</u> 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





Linda Silverman Director, Solar Decathlon, U.S. Department of Energy



2017

U.S. DEPARTMENT OF ENERGY

JLAR DECATHLON

Bright Futures Built Here

Solar Decathlon

Linda Silverman Director, Solar Decathlon

Energy Efficiency & Renewable Energy U.S. Department of Energy SolarDecathlon.gov FB: @DOESolarDecathlon Twitter: @Solar_Decathlon Solar.Decathlon@ee.doe.gov









10 Contests in 2017 Solar Decathlon

- 1. Architecture*
- 2. Engineering* 7. Home Life
- 3. Market Potential* 8. Energy
- 4. Communications^{*} 9. Innovation^{*}

- 6. Appliances

- 5. Health & Comfort 10. Water*





Solar Decathlon 2017 Final Standings



A "T" in rank indicates a tie for that position.



Follow Solar Decathlon!

- Website<u>www.SolarDecathlon.gov</u>
- Facebook <u>https://www.facebook.com/DOESolarDecathlon/</u>
- Twitter https://twitter.com/Solar_Decathlon
- YouTube
 <u>https://www.youtube.com/user/DOESolarDecathlon</u>
- Flickr https://www.flickr.com/photos/solar_decathlon/
- Instagram https://www.instagram.com/doesolardecathlon/

Best Practices: University of Maryland

Mike Binder, Co-Principle Investigator & Project Manager





Solar Decathlon

University of Maryland College Park - November 2017





reACT: Resilient Adaptive Climate Technology University of Maryland College Park - November 2017



What Are the Aims and Benefits of Sustainable Building?



REGENERATIVE SYSTEMS



The reACT Home is a carefully balanced set of systems, which all work together to achieve a positive impact on the environment. The goal is to create a home that gives back more than it consumes.

- Architectural
- Thermal
- Water
- Power
- Living Systems

CONSTRUCTION SYSTEMS

reACT's modules were assembled individually, then transported to the home site. Final assembly of the modular home is completed with local labor - promoting local industry.













Presentation Highlights: University of Maryland

- Consider regenerative design as opposed to sustainable design.
 - The term sustainable design conveys an intention to use less water and energy. Houses are part of the ecosystem and can produce positive impacts. Maryland aimed to create a house that is good for people and environment.
- Optimize multiple energy efficiency features, not just one.
 - The solar panels on the Maryland house do not face south, but the orientation of the house maximizes multiple regenerative systems.
- Create a house that can easily be updated and evolve.
 - The Maryland house is made up of parts that can be reconfigured to meet the needs of different residents.
 - Wall panels are not just dry wall, but can be taken off to access electrical systems and the furniture is reconfigurable.





Best Practices: UC Berkeley

Joan Gibbons, Head of Construction





Solar Decathlon At UC Berkeley / U of

Denver

Team Contact: Joan Gibbons

OUR TEAM











Design Mission



RESIDENTIAL

Housing has developed over the past century with growing populations and limited space.

INVITING

Our units encourage a sense of community through multi-family collaborative spaces.



STACKABLE

Vertical and horizontal stackability allows communities to adapt to the transitioning Bay Area.



EFFICIENT Simplicity and user experience are at the forefront of our design.

Single Unit Floor Plan Overview



- 2 Bedrooms, 1 Bathroom
- Flexible, open floor plan
- Maximize energy, space and water efficiency
- Large deck doubles living space

Residential

- San Francisco is the 2nd most expensive city to live in next to NYC
- City of Richmond has been no exception to San Francisco's expansion to local Suburbs
- Currently 100,000+ Residents with 8.4% increase since 2000



Suraj Patel at a Community Education Event



U.S. Army Corps of Engineers Digital Visual Library

Our Approach:

- Working with Richmond City officials to understand how Building Code is evolving
- Interacting with community members to understand key concerns about current and future housing
- Creating a framework for future development in transitioning cities such as Richmond



Inviting

High School Students Descriptions of Current homes in Richmond:

"Secluded "Plain and Boring" "Dark" "Dilapidated"



http://richtheatres.blogspot.com/

- Our Design didn't focus on the aging city of Richmond, however, hopes to utilize strong community connections in Richmond to revitalize housing
 - Large Exterior Windows
 - Deck with Communal Gardening
 - Shared Communication
 - Open Floor Plan



A roof full of vegetables at the Cobb apartments on skid row



Image Courtesy of Dennis Schroeder/U.S. Department of Energy Solar Decathlon

Stackable

- The Single Family Home is an unsustainable concept for Bay Area Cities
- Density and Rent continue to increase throughout the area
- Our Single unit is part of a greater 5 unit vision for infill lots in transitioning suburbs
- A compromise between single family and high density housing





Efficient

- The Solar Decathlon Focuses on efficiency, but WHAT IS IT?
- To the competition, energy and water efficiency are main concerns
- We've gone beyond those and focused on spatial, construction, mechanical, and transportation efficiency
- A simple, easy user experience throughout the home's life cycle









Credit: Dennis Schroeder/U.S. Department of Energy Solar Decathlon)


Takeaways

Net-Zero Energy is easily attainable.

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Iteration is the key to working on unfamiliar tasks.



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Innovation is only innovative if it solves a problem.



Human attention can be smarter than "smart" technology

Presentation Highlights: UC Berkeley

Identify and respond to target population needs

- The Berkeley team created an affordable house that's stackable and can absorb density as people move out of big cities into communities like Richmond, CA.
- The house has no to few windows on the side so it can fit in a high density lot. Fiber optic light walls transmit light from outside without sacrificing privacy.
- The team did not include expensive tech solutions if the solutions did not solve problems for their target population.
- Pay attention to energy usage in the design phase to increase efficiency
 - The Berkeley team met energy efficiency goals in part through quality insulation and sealing.





Best Practices: University of Nevada - Las Vegas

Linda Silverman, Director, Solar Decathlon on behalf of Adam Betemedhin, Project Engineer







Problem Seeking

The number of people aged 65+ in Nevada is projected to rise 89% over the next 15 years. Nevada will have 1/3 of a million more people 65+ by 2030. US Census PopulationProjections

the error did.

the people

45%

of households will have someone 55 or older by 2020

life expectancy

is steadily rising as healthcare & technology improve over the decades.
 950
 68.9 years

 009
 79.2 years

 050
 82.9 years

 059
 84.0 years

Over **20%** of the US population will be over 65 by 2050.

Today's aging population is anything but senior.

Gensler Research Strategies for Active Aging

A New Market

These "actively aging" boomers are looking for housing options to support their lifestyles and allow them to live a long, purposeful life. And their lifestyles are anything but traditionally "senior" today's seniors are better educated than any of their predecessors, and as a population are well-connected and tech-enabled. As consumers, they are as savvy as these characteristics would suggest. As a result, we recognize the U.S. active aging population as a population with discerning tastes and a hunger for good design.





design concept



Adaptable Design

Provide an open, naturally illuminated interior design that adapts to the needs of persons who age in place, and may develop limited mobility and cognition.

2 Personal

Maximum Comfort

Attain an energy efficient performance that also maximizes occupant comfort, through radiant heating, energy recovery ventilation and ductless air conditioning.

3 Reliable

Responsive Health

Provide networking capabilities to facilitate communications among occupants, family and professionals that improve healthcare outcomes. Our 990 square foot home has 3 goals.

001

theHome.

Way finding + Passive exercise The home provides simple circulation paths that encourage movement, improving the health of the resident by increasing their level of physical activity. The open floor plan allows for clear lines of sight and ease of orientation.

Project Program

Bed	194 SF
Bath	120 SF
Kitchen	276 SF
Living	139 SF
Flex	106 SF

Mechanical 55 SF



Passive design strategies Mechanical Electrical Water conservation Comfort Accessibility



2 Target Market 3. Energy Efficiency 4 Maximum 1000 SF

process

16⁄

`48′

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14'

Explore. Socialize. Live

process

1

хЗ

4.

Three separate functions and life necessities are joined with three modeles that maximize living space and ease of transport.









Wind Diagrams -Las Vegas

Wind Speed



process

MECHANICAL + ELECTRICAL

Integrated Mechanical Unit

A mechanical pod on the south deck houses the home's solar thermal units, water collector, and A/C condensers, while being integrated into the architectural form. This pod or module is unique and innovative in that it could be installed on any home that would like to add a solar thermal system but may not have the right orientation or roof slope. It contains all of the necessary system components and could easily be connected to any home.



Redundancy PV Systems +HVAC

A mechanical pod on the south deck houses the home's solar thermal units, water collector, and A/C condensers, while being integrated into the architectural form. This pod or module is unique and innovative in that it could be installe







The home will utilize a tight building envelope and high R-value insulation in the walls, ceiling and floors to reduce the amount of energy in the form of heat transferred between the inside and outside of the building.

Hydronic tubing warms the house during winter-time using two solar thermal units.



WATER CONSERVATION

process

Detailed Water Budget

Current Plans and Strategies for Water Conservation, Reuse, and Landscaping.

Conservation

To conserve water, the UNLV Solar Decathlon home will use low flow fixtures below the normal standards for US Homes. This will reduce the daily use of the home to 48 gallons per day from a normal 74 gallons per day. To further reduce the water needs of the home the landscaping irrigation will be done using grey water reuse from the shower fixture and washing machine, complimented by the collected condensate from the AC units. The goal is to completely remove the irrigation needs from the potable or municipal draws.

Reuse

Reusing water in the UNLV Solar Decathlon home will be done by dual purposing the radiant flooring to allow it to heat the home, reducing the load on the heater during colder weather and allowing water to constantly flow, in a closed loop system preventing stagnation. The grey water produced by the shower and washing machine will be filtered and reused in the landscape irrigation until fully utilized by the plants or evaporated. Rainwater collected will be placed into this grey water system and utilized for irrigation needs.

Landscaping

The landscaping of the UNLV Solar Decathlon Home will be done in a way that utilizes the least amount of water while maintaining the desired outside appearance of the home. These plants will be complemented small herbs or other plants in a water feature system that will filter out the rainwater and greywater from the home. An additional herb garden will be planted in a green wall system which will utilize the grey water generated to produce edible plants for use within the home. The current goal is to create a system of plants that could survive on 10 gallons per day feeds.

F	USAGE		ATIONS	NOTES
N C T				
P		GALLONS	EVENT	
Hot Water Draws	115.5	15	7	10% added toaccount for unexpected losses
Dishwasher	11.6	2.9	4	
Clothes Washer	65	13	5	
Fire Protection *	550	550	1	
Lavatory Faucet	72	1.2	60	10% added toaccount for unexpected losses
Kitchen Faucet	216	1.8	120	
Radiant Floor Heating 🍀	15			
Solar Thermal Loop	5			
Hat Water Storage Tank	120			
nor water storage tank	120	-		
Testing	50		-	
Evaporation	5		-	
Safety Factor	183.76			
SUB TOTAL 12	25.1 GALL	ONS		
TOTAL WATER 14	08.865 GA			

COMFORT + ACCESSIBILITY

process

Principles of aging in place design

The design of the interior environment and architecture consists of several principles in which evidence-based design research comes to fruition. Environments which integrate proper orientation for the user, operate autonomously in daily activities, provide intellectual and sensory stimulation, security, and balance private and social spaces are ideal for the aging individual. These principles create interior environments for true independent living and successful aging.



3 intellectual +sensory stimulation

The design provides spaces for multipurpose activities and consequently a sense of novelty and variety throughout the day. It is a high priority to create variety in multipurpose spaces, as it is a form of intellectual and sensory stimulation.



facilitating orientation

Priming the user with appropriate visibility through fenestrations of the building is a primary component to facilitate orientation.



4 providing a safe and secure environment

The interior environment is nestled within a sequence of transparent and opaque partitions to create a comfortable enclosure for privacy and security. The sequence of partitions allow for transparency and privacy in appropriate spaces.



2 autonomy



The home is divided into social and private modules. Both modules allow for generous outdoor exposure and semi-visibility to the adjacent spaces to retain way-finding abilities.













Presentation Highlights: University of Nevada - Las Vegas

- Conduct market research using community partners with access to your target population
 - The Las Vegas team built their house to appeal to aging empty nesters who retire to Las Vegas. The team held focus groups through AARP to understand this population's needs.
- Use technology to get feedback on design elements
 - The team used virtual reality to walk focus group participants through the home.
 - Market research helped identify important house features to include such as slip resistant flooring, fall detection sensors, and adjustable height counters.





Additional resources

- Competition houses have a life beyond the Solar Decathlon, including being purchased by the host city for Habitat for Humanity, sold to private parties, and serving as sustainability centers or living labs at universities. See <u>Where Are the Solar Decathlon Houses Now?</u>
- Insights on Technology Innovation A Review of the U.S. Department of Energy Solar Decathlon Competition Entries 2002 –2015
- Since the first competition in 2002, the Solar Decathlon has expanded internationally to <u>include five additional</u> <u>worldwide competitions</u>.





Upcoming Seasonal Messaging Opportunities

Now is the time to start planning energy efficiency messaging!



Mass Save <u>Article</u>: Avoid the Shadow this Groundhog Day

American Home Shield Article & Card: Valentine's Cards for our Appliances

Energize Delaware Facebook Post: Don't let energy leaks sack your next game day. A <u>#HPwES</u> home energy audit is the winning play.




Addenda: Attendee Information and Poll Results



Call Attendee Locations







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Network members

- American Council for an Energy-Efficient Economy (ACEEE)
- Boulder County (CO)
- City of Cambridge
- CLEAResult
- Cold Climate Housing Research Center
- Efficiency Nova Scotia
- Focus on Energy
- Fort Collins Utilities





Non-members (1 of 2)

- Arconic
- Brendle Group
- Colorado Code Consulting
- California Public Utilities Commission
- Decent Energy Inc.
- Eden Housing Inc.
- US Energy Information Administration
- Enbridge Gas Distribution
- House is a System (Environmental Design/Build)
- Ford Land
- Go Sustainable Energy

- Green Compass Sustainability
- ICF
- Lantern Energy
- Mitsubishi Electric
- Navitas Partners, Inc.
- Nextant
- Oregon Department of Energy
- Park City Municipal
- Proctor Engineering
- Questline
- Rebuilder Group
- RTI International



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Non-members (2 of 2)

- Snohomish County (WA)
- Snohomish County Public Utility District
- Soulardarity
- Southwest Energy Efficiency Project
- Hawaii State Energy Office
- Texas A&M University
- United States Gypsum Corporation
- University of Maryland
- University of California Berkeley





Opening Poll #1

- Which best describes your organization's experience with the Solar Decathlon?
 - Very experienced/familiar 22.6%
 - Some experience/familiarity 22.6%
 - Limited experience/familiarity 22.6%
 - No experience/familiarity 22.6%
 - Not applicable 9.7%



Closing Poll

- After today's call, what will you do?
 - Seek out additional information on one or more of the ideas - 50%
 - Consider implementing one or more of the ideas discussed
 28%
 - Other (please explain) 17%
 - Make no changes to your current approach 6%



