

# Residential Buildings Integration

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# Residential Buildings Integration Team

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TELL US WHAT YOU  
THINK ABOUT...

WHERE WE ARE  
&  
WHERE WE'RE HEADING

# Guiding Principles for RBI's Work

Develop technologies, tools, and complementary resources that...



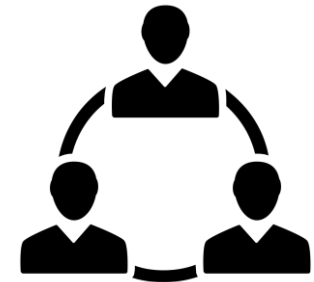
## Have impact

- ✓ Significant energy savings
- ✓ Scalable
- ✓ Inform better decisions



## Are smart investments

- ✓ Leverage DOE/labs' areas of expertise
- ✓ Complement other R&D



## Consider relevant actors

- ✓ Market viable
- ✓ Demand likely

# Key Criteria for Investments

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## Potential Impact

- Energy savings
- Consumer savings/affordability
- Grid reliability, resilience, and interoperability

## Demand

- If R&D is successful, will there likely be demand for this technology or tool?

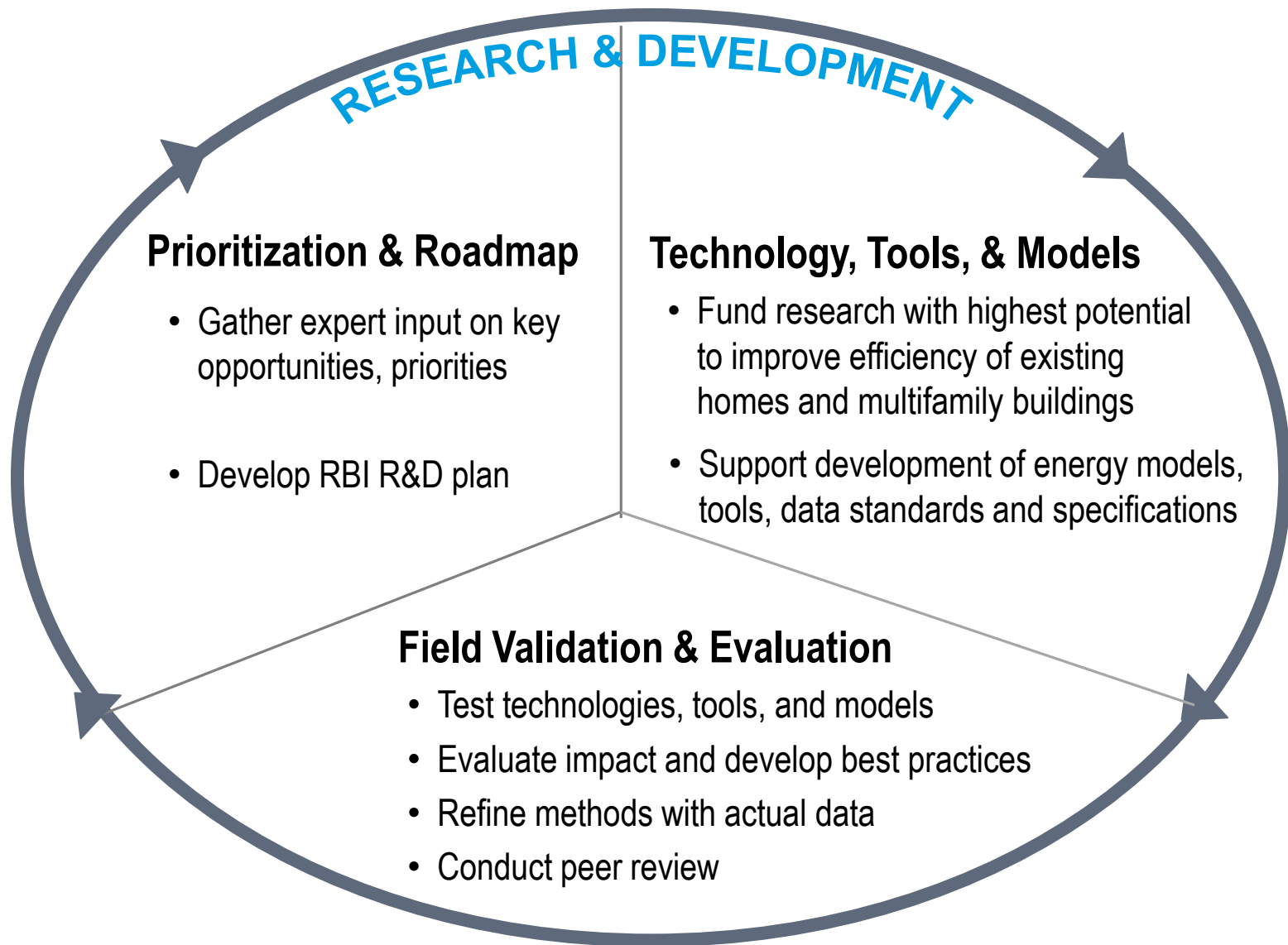
## Strategic Investment

- Unlikely to succeed without our support
- DOE adds significant technical expertise

## Relationship to other priorities

- STEM, workforce training

# Residential Energy Efficiency R&D Approach



# Leverage & Learn from Industry Partnerships

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- Home Performance with ENERGY STAR
- Home Energy Score
- Zero Energy Ready Homes
- STEM/Training
- Race to Zero
- Solar Decathlon
- Real Estate Integration & Financing

# Our Challenge: U.S. Residential Housing Stock

Characteristics	Estimate (millions)
Single Family	80
2 to 4	10
5 or more	20
Mobile/Trailer	7
<b>Total Occupied Units</b>	<b>118</b>
<b>Year Structure Built</b>	
2010 to 2015	4
2005 to 2009	8
2000 to 2004	9
1990s	15
1980s	16
1970s	18
1960s	13
1950s	13
1940s	6
1930s	4
1920s	5
pre-1920	8
<b>Median Year Built</b>	<b>1976</b>

✓ 118 million existing homes

✓ On average, only 1.3 million new units built per year since 1990

✓ Nearly one-third of U.S. households reported facing a challenge in paying energy bills or sustaining adequate heating and cooling in their home in 2015.

✓ About one in five households reported either reducing or forgoing basic necessities like food and medicine to pay an energy bill.

## Sources:

*U.S. Census Bureau, American Housing Survey (2015)*

*Residential Energy Consumption Survey (2015)*

# The residential energy efficiency market is ripe for game changing innovation



**millennials** will become America's largest generation by next year (2019)

Almost **three-quarters** of surveyed millennials said they're searching for greener products

They are **leading the way in using energy apps, with 34%** indicating that they use apps to be smarter about energy consumption

Sources: <http://www.pewresearch.org/fact-tank/2018/03/01/millennials-overtake-baby-boomers/>  
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# A Challenge... and An Opportunity



**How do we get....  
there?**

# Traditional Path

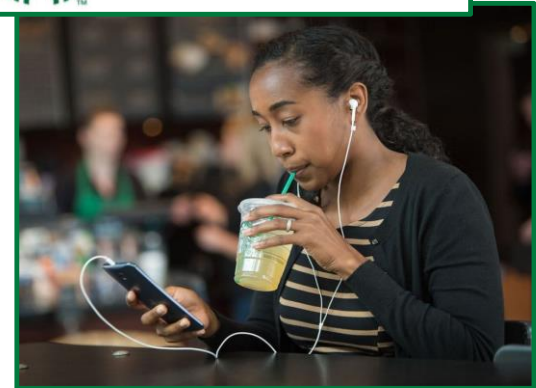
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# Types of Innovation

## Disruptive Innovation

*Breakthroughs* that change the game—new biz models, products, services (white space, blue oceans, etc.)



## Sustaining Innovation

*Major advances* in the core business for existing customers and markets (next generation)



## Incremental Innovation

*Small changes* in processes, products, services, strategies, etc. (continuous improvement)



Change in market appeal

Time

# More Disruptions...

FedEx. amazon

**minute clinic**  
the medical clinic in CVS/ph



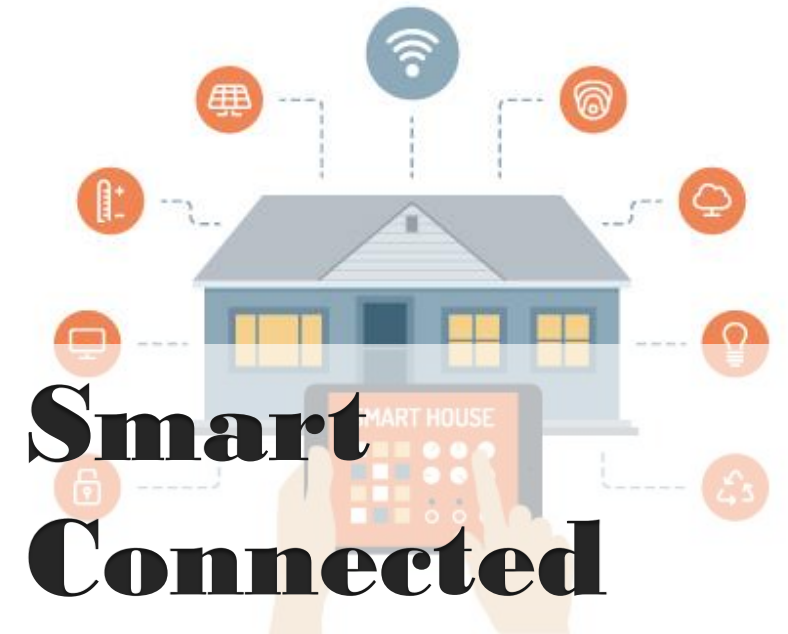
What do these examples have in common?

- ✓ Addressed a need that most consumers didn't know they had
- ✓ Created value...not just functional, but emotional and social in many cases

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**What new technologies or approaches can disrupt the residential housing market?**

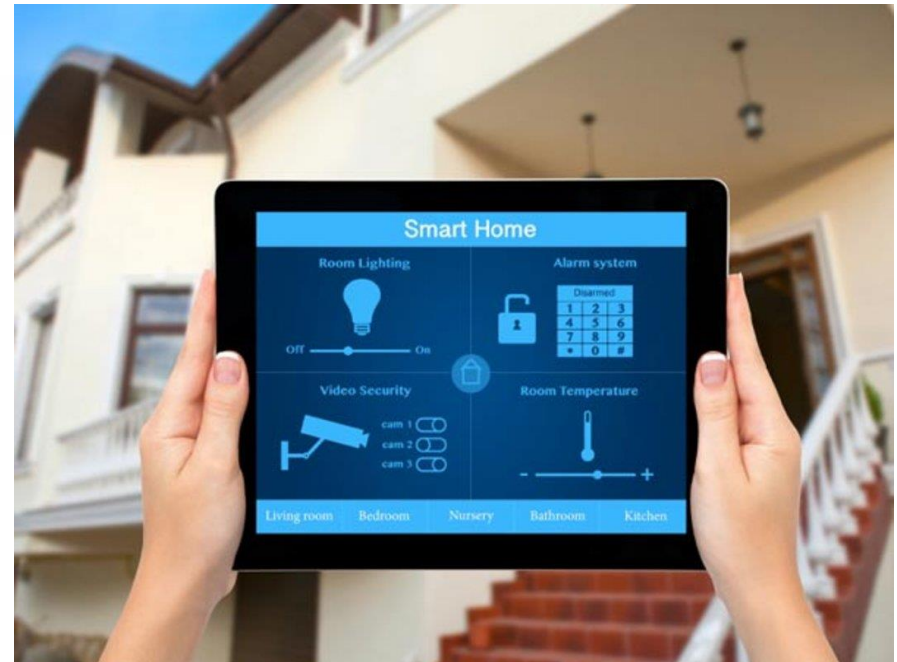
**What can get our existing U.S. housing stock to zero net energy or significantly closer?**



# Smart Connected

## Homes:

Linking lighting, appliances, and equipment to electronic devices to provide real-time data that makes it easier to understand and lower energy use



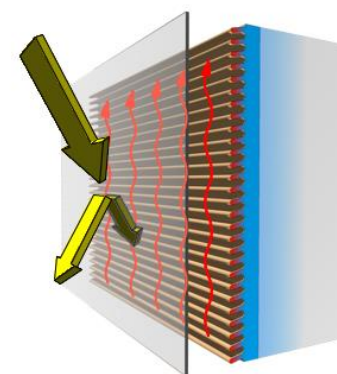
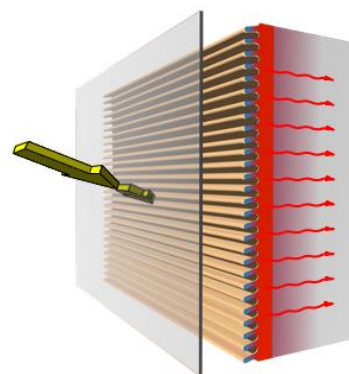
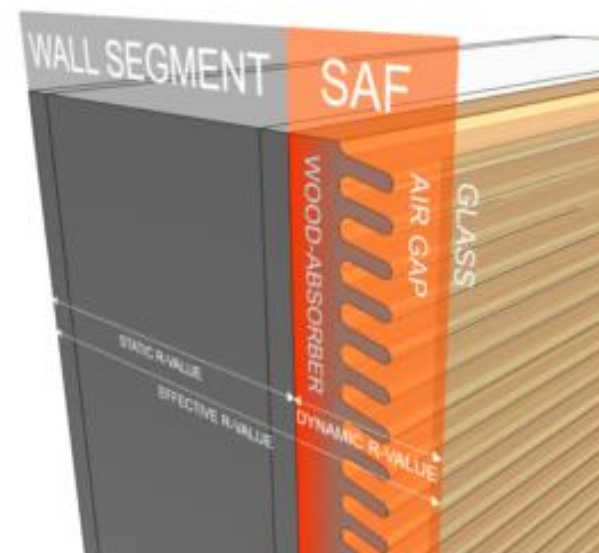
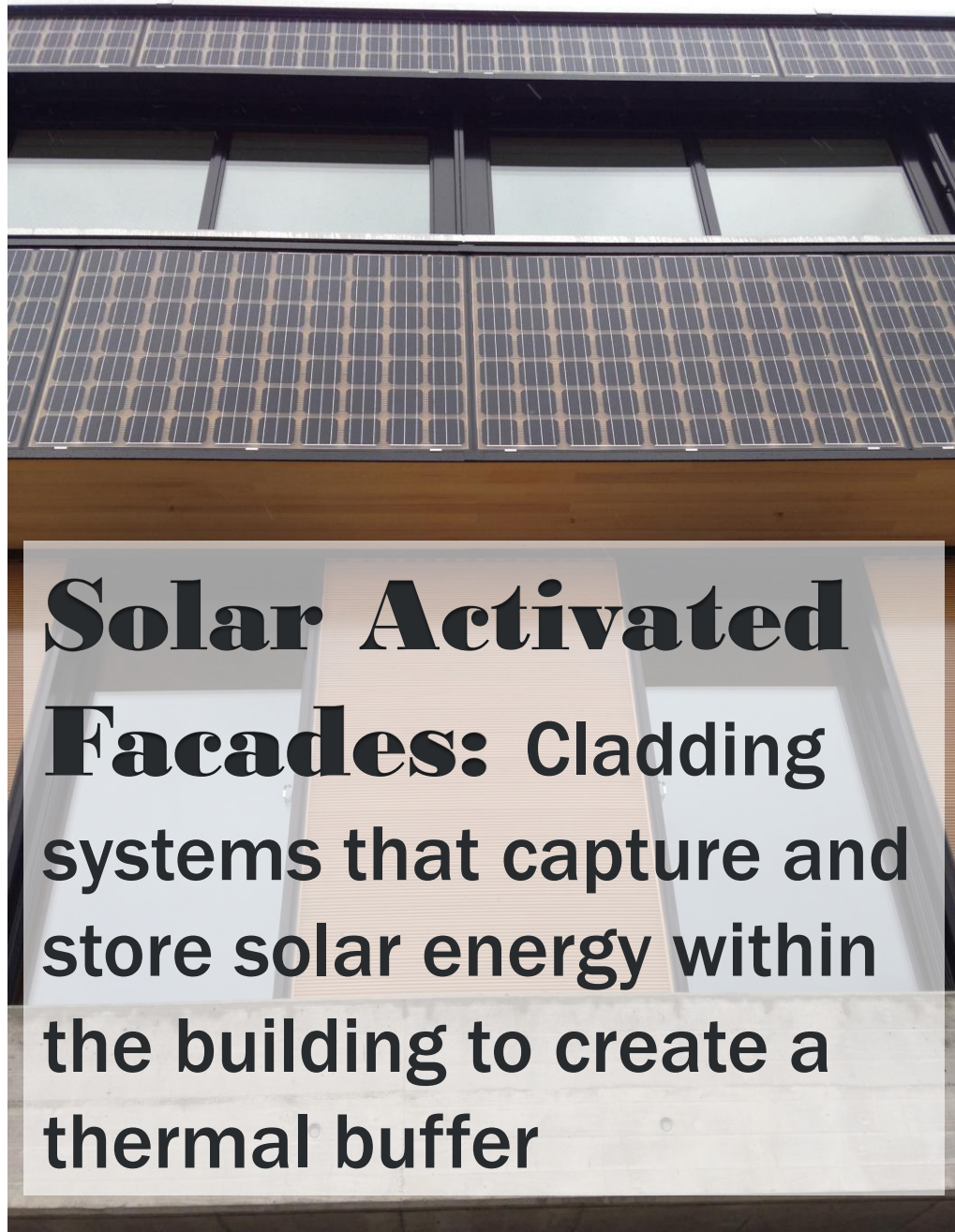


# **Grid Friendly Appliance™ Controller:**

Senses grid  
conditions by  
monitoring  
frequencies and  
responds to  
disturbances



**NextGen  
Insulation:**  
Innovative foam  
insulation and  
phase-change  
materials reduce  
home heating  
and cooling costs

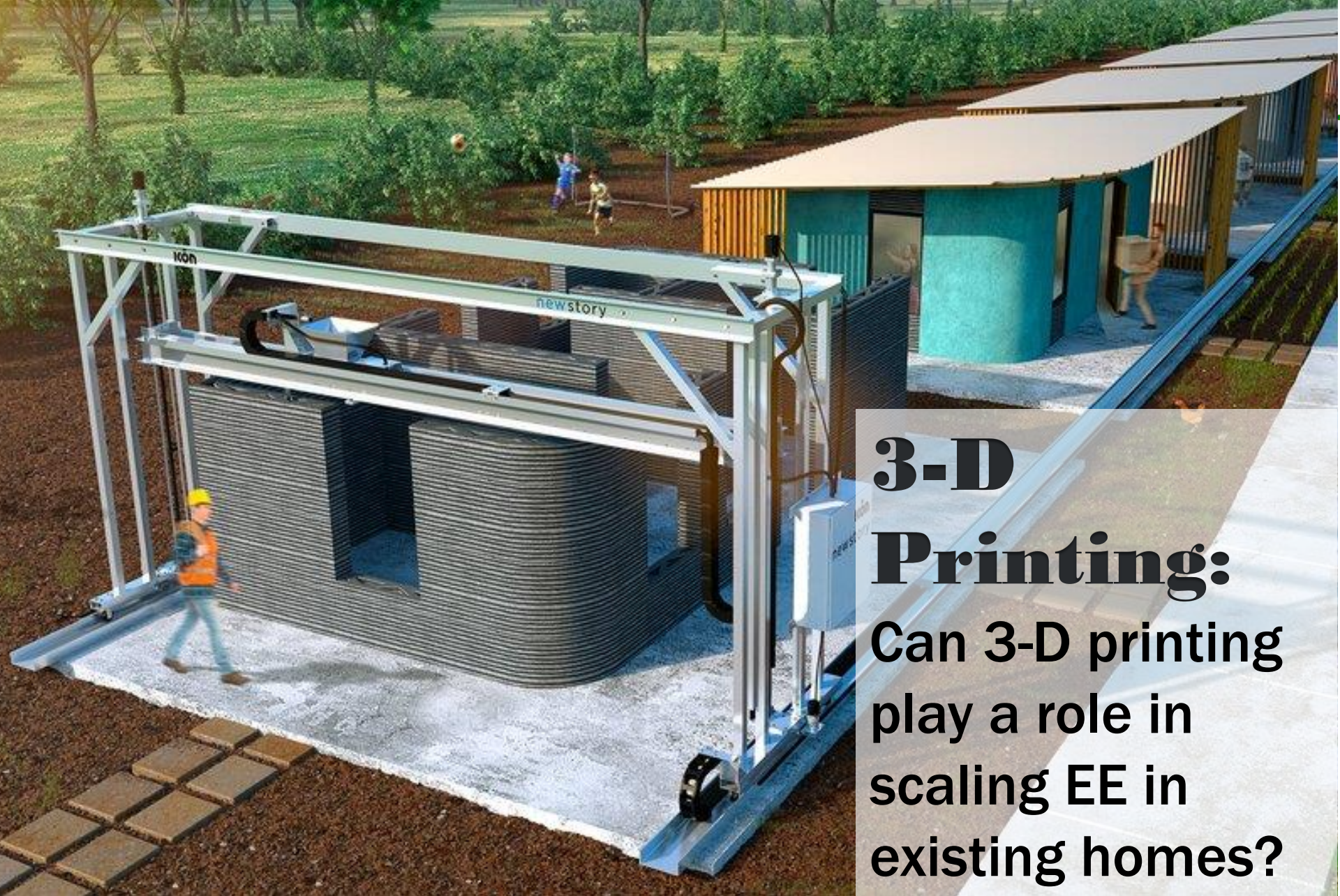




**Insulation**  
**Robots:** Remote controlled robot sprays insulation under the floorboards to reduce heat loss in an undistruptive way



# **Fujisawa Sustainable Smart Town: A sustainable and disaster-proof eco town development**



# **3-D Printing:** Can 3-D printing play a role in scaling EE in existing homes?

*Fortune Magazine*

# **Tiny Efficient Homes:** Cass Community Social Services is building homes to alleviate homelessness in Detroit.



# Race to Zero Grand Prize Winner – April 2018

## The Prairie View A&M “Mod Squad”



- **Interdisciplinary approach**
  - Architecture, mechanical engineering, construction, social services, economic development
- **Net zero energy, hurricane ready, affordable infill housing**
  - Addresses environmental, economic and social resilience
  - Modular system designed to be built by students in the University’s new Fabrication Laboratory
  - Community partners use of a land trust to ensure long-term affordability
  - Solar co-op
  - Independence Heights neighborhood in Houston, hit by Tropical Storm Harvey

# Where there's a will, there's a way...



C. Emma Giese

Wherever you are...you're never too far...for a pop-up bar

*Good design considers “the user, the experience, the social context and the impact of an object on the surrounding environment.”*



*“Good design balances substance with style”*

*Made by Canadian pre-fab home builder, Honomobo from recycled shipping container*

*“On the flip side, oftentimes real technological innovations – the ones which will eventually change the way we live our lives – are often not packaged into enough of a stylish aesthetic to move beyond niche circles and crossover into mainstream popular taste.”*

Antonio Gaudi, La Sagrada Familia

Source: Inhabitat.com

# Joan Glickman

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