

# Tech Roundup

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**E Source**

2018 E Source Summit for the Tennessee Valley

# Presentation Outline

**Heat pump water heaters**

EVs

Batteries

Bitcoin mining

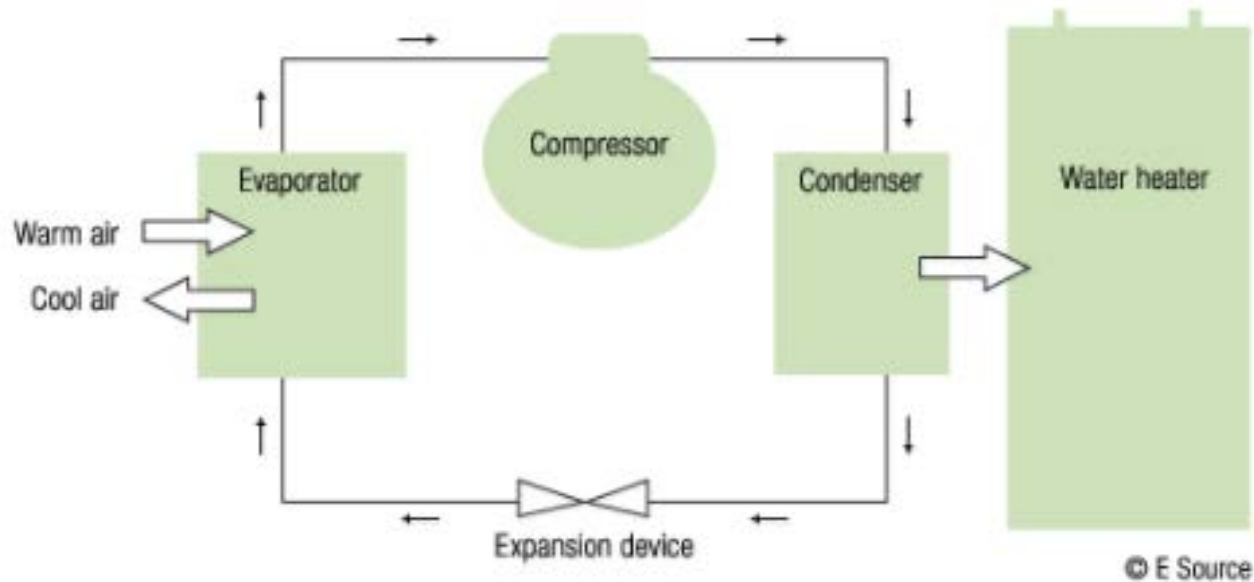
Smart home

Ultrasonic clothes dryers

A person is shown from the chest up, sitting at a desk and using a laptop. The laptop screen displays a social media profile page with a header 'People', a profile picture of a man, and a 'My Status' section. The background is a solid blue color. A white rectangular box is overlaid on the center of the image, containing the text 'Heat pump water heaters'.

# Heat pump water heaters

# Heat pump water heaters pull heat from surrounding air



# Great option for efficient water heating

- Best in hot, humid climates
- Additional HVAC benefits because they cool and dehumidify surrounding air

Courtesy: iStock

The background of the slide is a dark, grayscale image of several US dollar bills. The bills are crumpled and overlapping, with the number '10' and the word 'TEN' visible on one of the bills. The text 'But they're expensive' is centered over this background in a white, serif font.

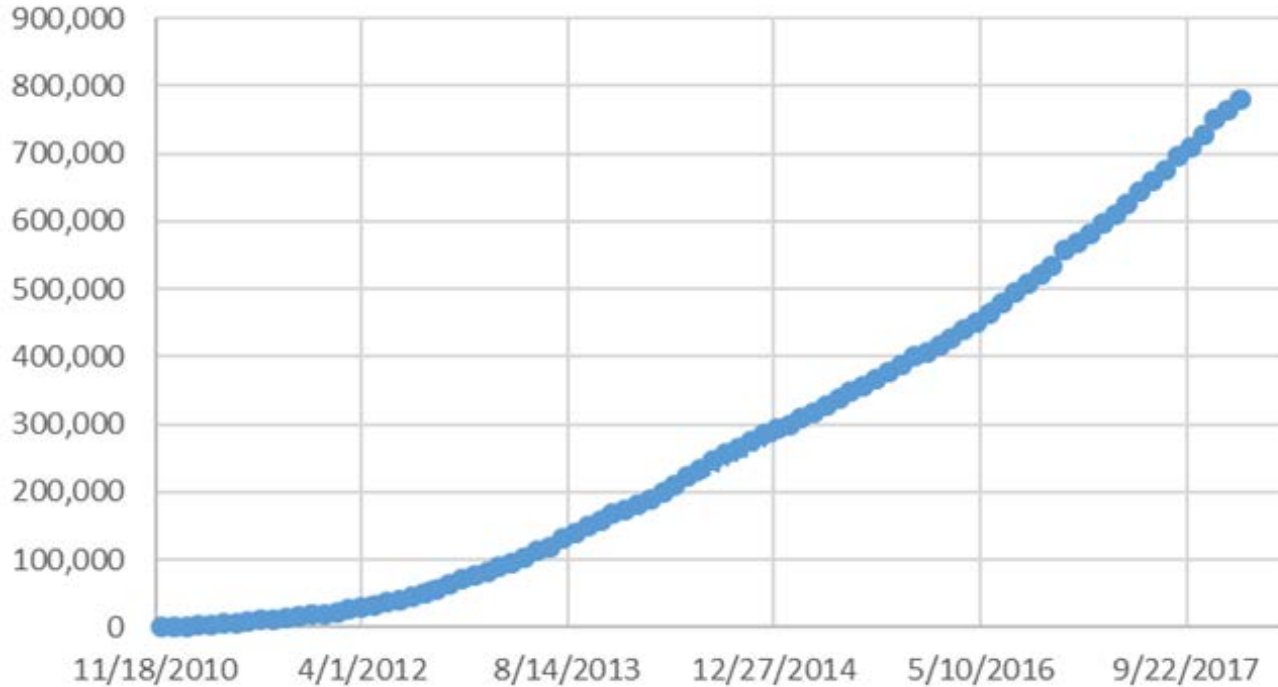
**But they're expensive**



# Electric vehicles

# EVs growing in popularity

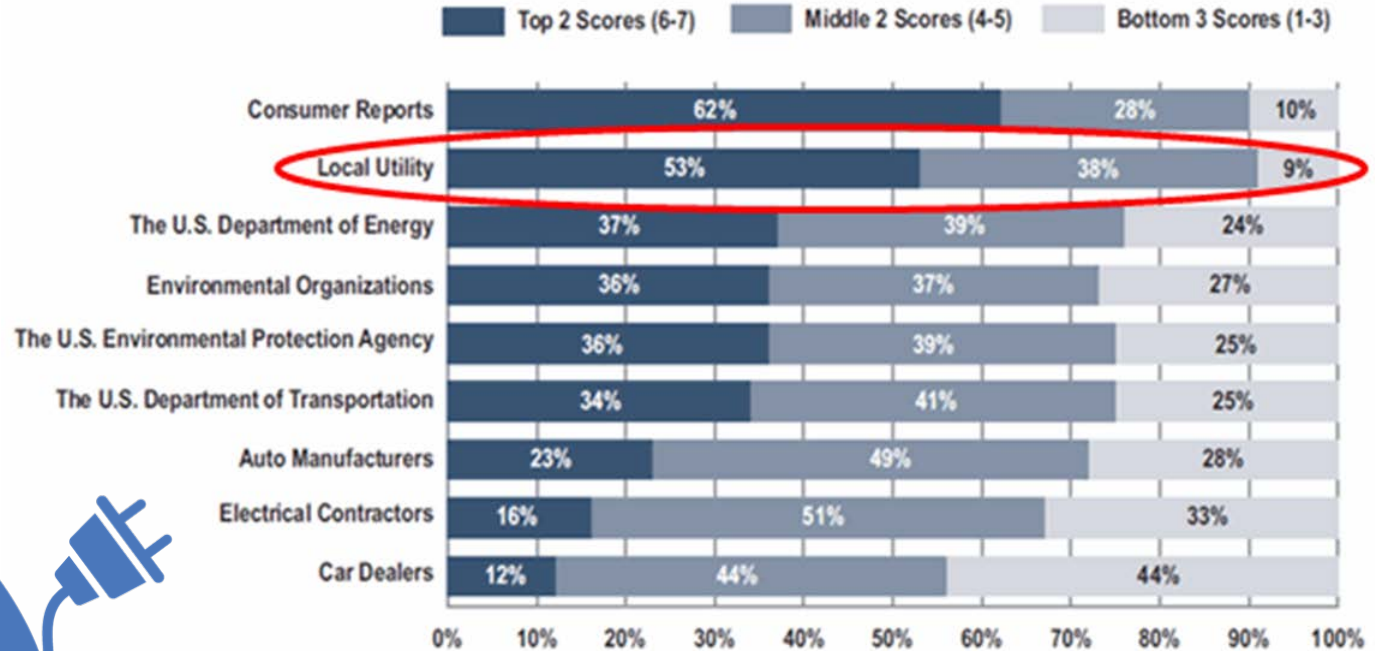
Historic EV sales in US



Source: EDTA



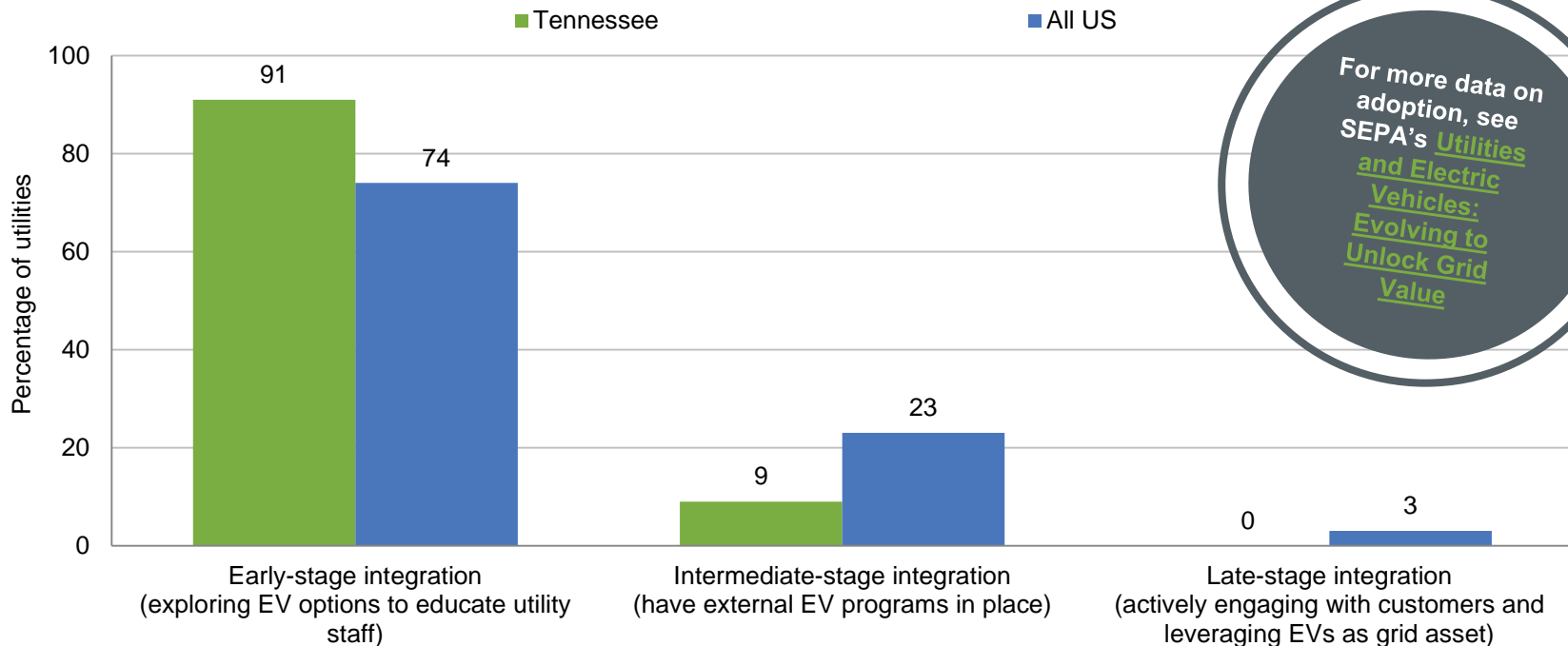
# Utilities are in privileged position



Courtesy: Edison Electric Institute member utility

# Lots of opportunity for growth

## Utility electric vehicle integration



For more data on adoption, see SEPA's [Utilities and Electric Vehicles: Evolving to Unlock Grid Value](#)

**Note:** EV = electric vehicle.

© E Source; data from Smart Electric Power Alliance (SEPA)

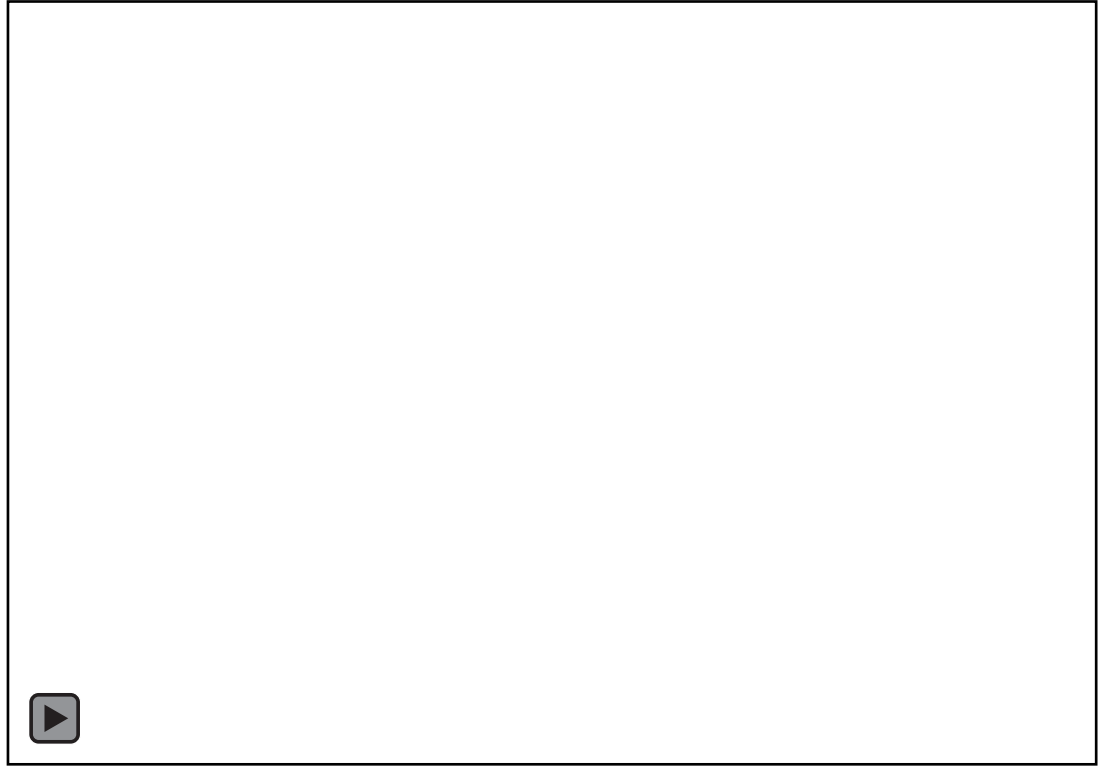
# Ethnographic research can guide EV strategy



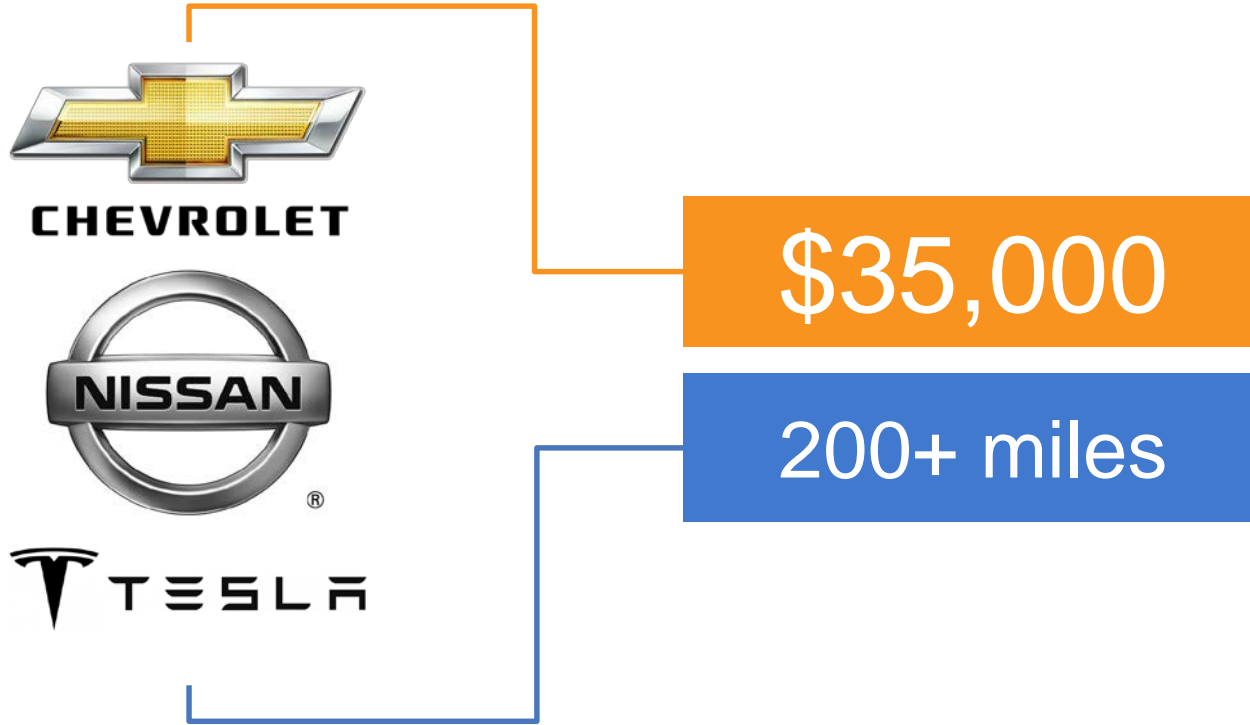
# Ethnographic research can guide EV strategy



# Ethnographic research can guide EV strategy



# Three EVs reach important thresholds





# Model 3 has highest sales in 2018, but Tesla halted production



Source: Tesla Press Information

# Batteries

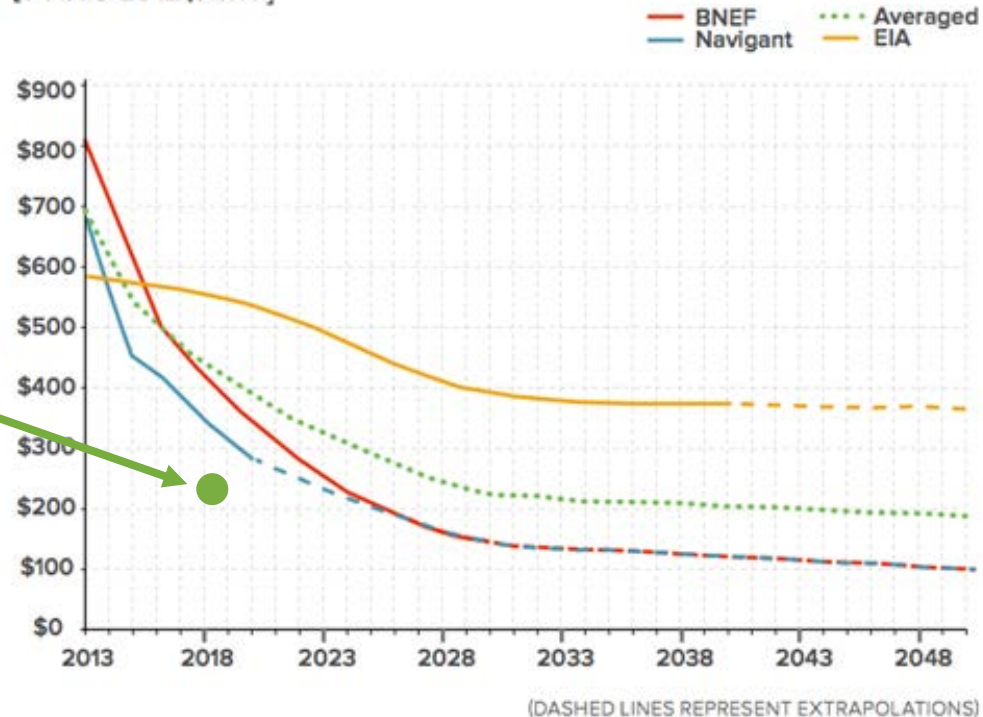


# Falling battery prices are a key driver

## BATTERY PRICE PROJECTIONS

[Y-AXIS 2012\$/kWh]

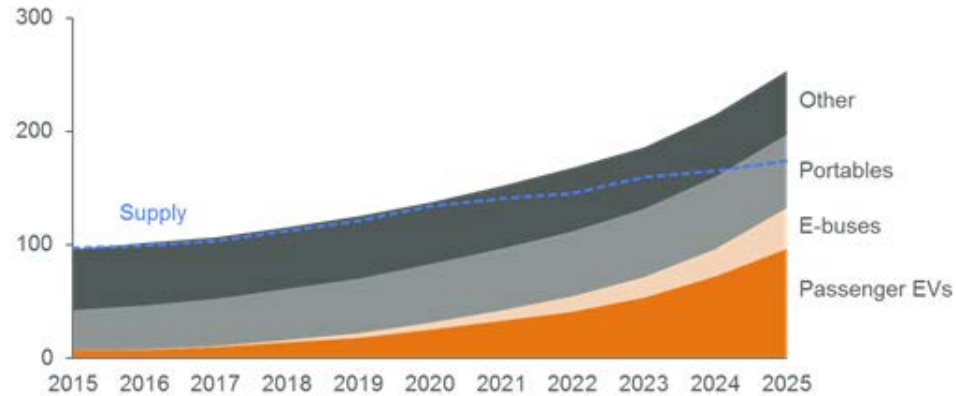
Actual Nissan Leaf  
battery pack retail  
price (\$5,500 + install)



Source: Clean Technica

# Alternative chemistries are important

Global cobalt demand and supply by sector, 2015–2025 [1,000 tonnes]



Source: Bloomberg New Energy Finance

Cobalt use in batteries, % weight of total cell by battery type



Source: Bloomberg

# A few flow batteries we're tracking



Source: ViZn Energy Systems



Source: Eos Energy

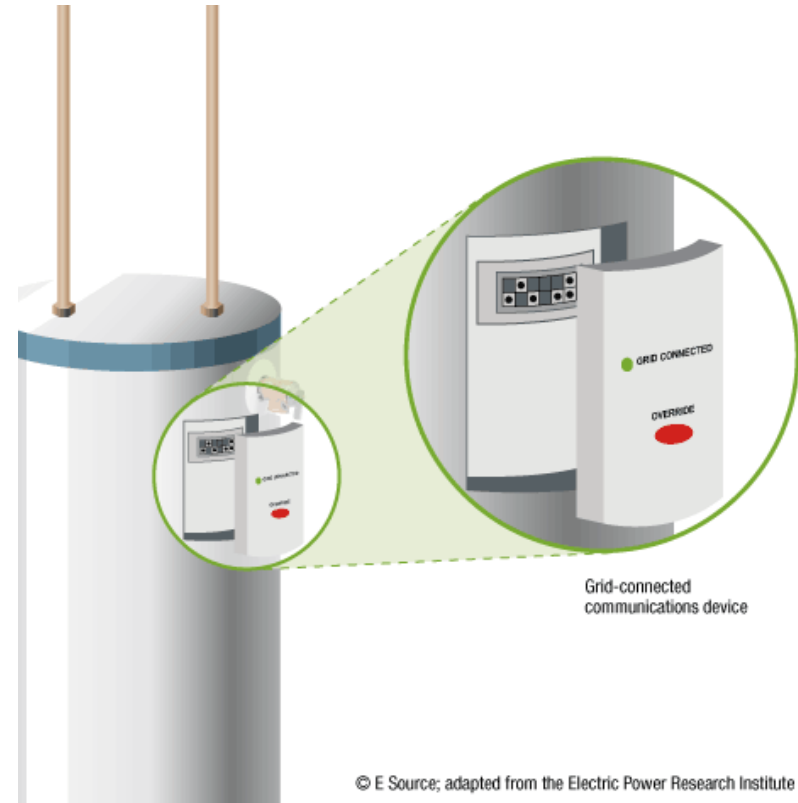


Source: Fluidic Energy

# And don't forget about alternatives ...



Source: Clean Energy Resource Teams



© E Source; adapted from the Electric Power Research Institute

# Lifetime cost-value accounting is key

- **Critical economic metric:**  
lifetime cost of energy (LCoE)
- Each installation will have unique characteristics that should be accounted for
- Model revenue streams, like generation assets



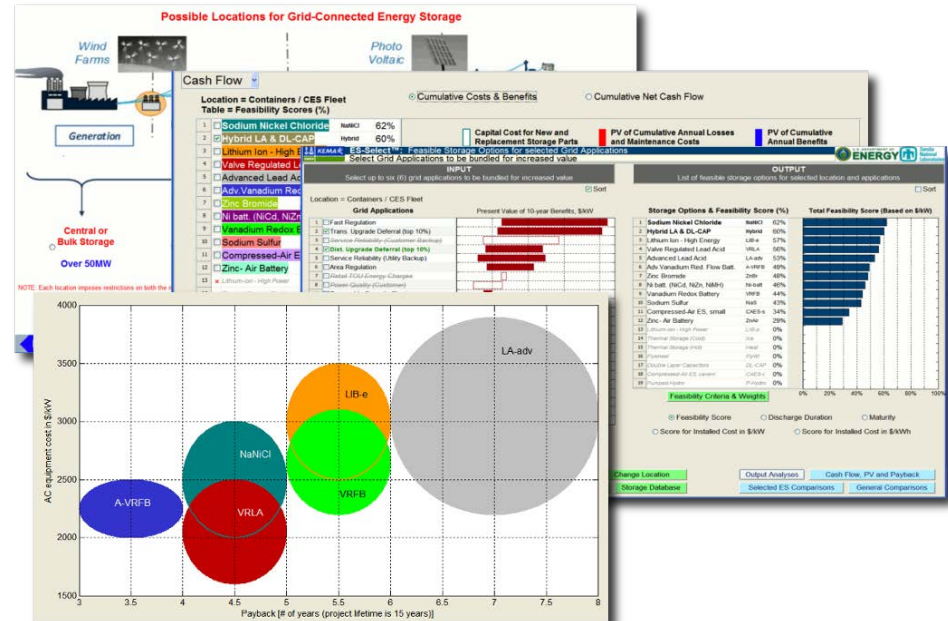
# The right storage for the right grid

Open Modeling Framework

ES-Select Tool



Source: [www.omf.coop](http://www.omf.coop)



Source: [www.sandia.gov/ess/tools/es-select-tool](http://www.sandia.gov/ess/tools/es-select-tool)



# Residential customers are confused



Source: iStock



# Bitcoin and blockchain



# Bitcoin mining uses more than a bit of energy



Courtesy: iStock



# Decentralized currency

Courtesy: iStock



**1**

A wants to send money to B

**2**

The transaction is represented online as a block

**3**

The block is broadcasted to every party in the network

**4**

The network approves the transaction

**5**

The block is added to the existing blockchain in a transparent and unalterable way

**6**

The transaction is complete



Courtesy: iStock

# Maintaining the blockchain

The background of the slide is a dark blue-grey color. It features several white line-art illustrations: four hands reaching upwards from the bottom, four gears of different sizes scattered around, and a central horizontal chain of four blocks. Each block contains a binary sequence: '0101001001', '010111', '1001011', and '010100'. Dashed lines with arrows connect the blocks in a sequence, and other dashed lines with arrows point towards the central chain from the top and bottom.

Courtesy: iStock



**Validation requires  
energy-intensive  
computation**

Courtesy: iStock

# Industry unclear on how energy-intensive the process is

- Difficult to measure energy consumption because of peer-to-peer network
- Estimates range from 1 to 32 terawatt-hours annually
  - 90,000 US homes
  - Denmark



# Revenue-generation potential exists, but be careful what you wish for

- Invited miners to its service territory to grow load
- Energy consumption exceeded expectations
- Reevaluating the invitation because of infrastructure limitations
- Defining new boundaries



# Energy-efficient validation alternatives

- Energy Web Foundation is creating and testing more-energy-efficient ways of maintaining the blockchain
  - Proof of authority
  - Proof of stake





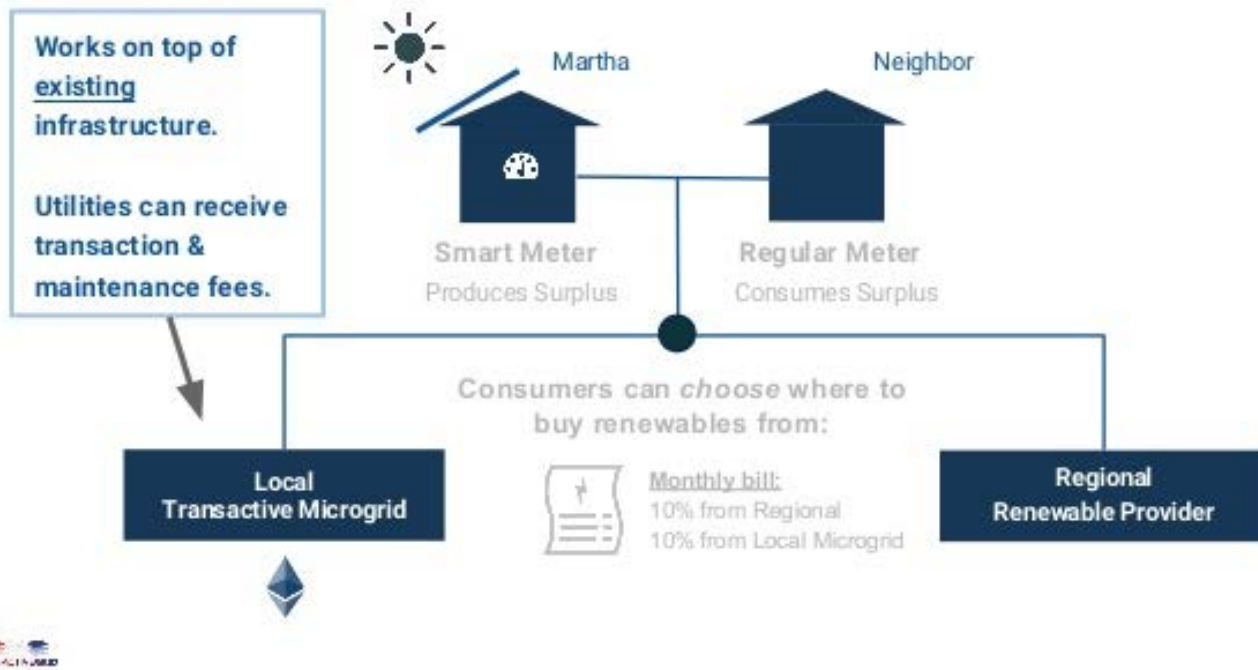


**The future is  
unclear**

Courtesy: iStock

# Applying blockchain to power grids

## Transacting Local Energy with Neighbors



Source: LO3 Energy



# Smart home

# Utilities and the smart home



Courtesy: iStock

**61% of people in the US and  
Canada think smart homes are  
a good investment.**

”

*—E Source*

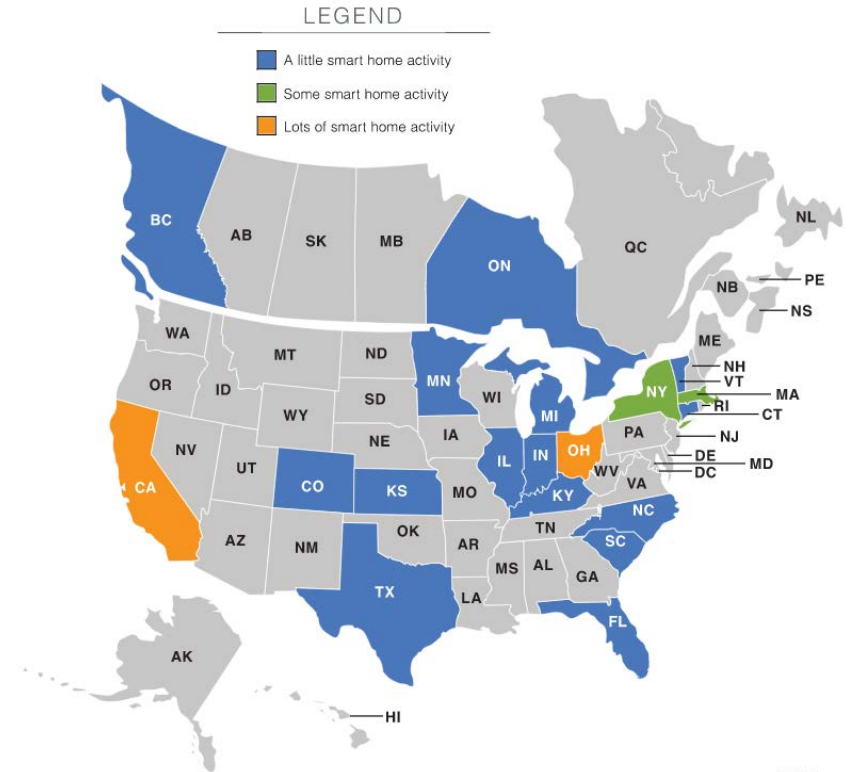
A large, stylized white quotation mark icon on a blue background.

**Nearly half of surveyed utility executives believe the smart home will revolutionize the utility industry.**






*—Antenna*

# Utilities are becoming more engaged with smart homes

- More than 20 utilities have already created offerings
  - Efficiency
  - Load management
  - Marketing
  - Customer education
  - Revenue generation

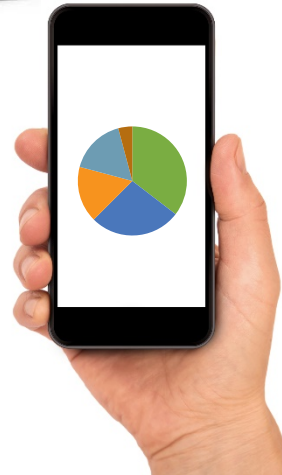
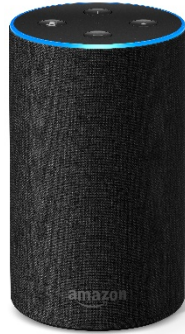


# 5 common approaches to utility smart home initiatives

-  Focus only on specific individual smart home technologies
-  Install and study smart home technologies in new-construction projects
-  Create a custom smart home system from the ground up
-  Partner with third-party smart home vendors for programs
-  Leverage existing third-party platforms




# What kinds of devices are we talking about?



Sources: iStock, Amazon, ecobee, ThinkEco

# The smart home can also open up new business models

**FirstEnergy**  
FirstEnergy Home  
Products and Services  
**Connected Home Plan**  
Plumbing Repair Plan  
Electric Vehicle  
Charger Lease



ecobee

**ACT NOW!**  
**MORE COMFORT.**  
**More control.**  
**RIGHT FROM YOUR SMARTPHONE**

**Connected Home Plan**  
Today's smart thermostat technology gives you total control over your home's heating and cooling system – anytime, from anywhere – using your smartphone. Not only do smart thermostats make your life easier, they also result in greater energy efficiency and enhance the comfort of your home. And with our Connected Home Plan, turning your home into a smart home is now more affordable than ever – with more information than ever.  
**Enroll now** in our Connected Home Plan and get the comfort and convenience you need from a smart thermostat. Plus, our unique energy efficiency diagnostic reports – using FirstEnergy's HVAC Monitoring Service – provide the data and tools you need to save energy and improve the performance of your systems.

**Only \$14.99 A Month:**  
**Enroll Now**  
Or call 1-866-747-7893

Comfort, control and peace of mind with:

- A state-of-the-art ecobee thermostat that can save 23% on your energy costs.\*
- A low monthly amount conveniently added to your electric bill – just \$14.99 a month.
- Professional installation at no additional cost – we take care of it all.
- FirstEnergy's HVAC Monitoring Service provides custom monthly reports and alerts via text or email that notify you of potential performance issues with your heating and cooling system – allowing you to fix issues to improve energy efficiency and avoid serious breakdowns.


Source: FirstEnergy

”

**16% of Americans over age 18  
now own a smart speaker**


—*NPR*

# Smart speakers are creating new opportunities for utilities



43% of smart speaker owners would be interested in using Skills from companies or brands they follow on social media

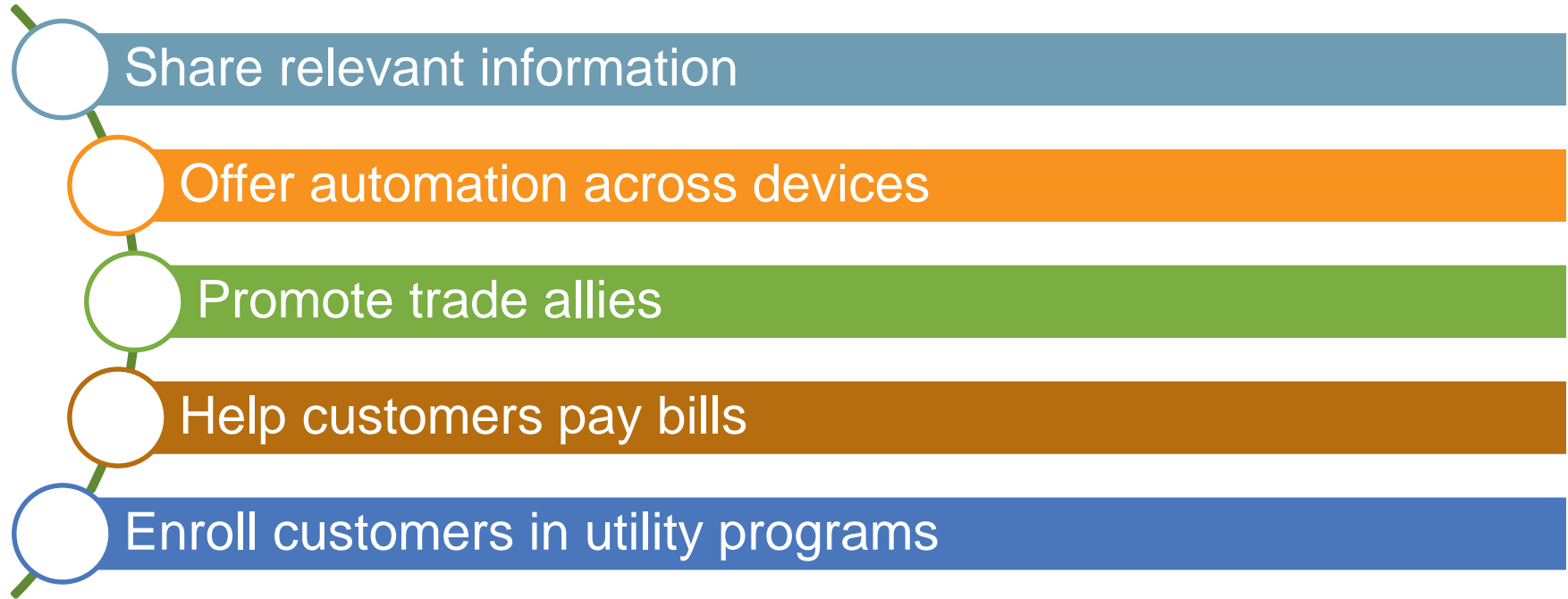
Data from NPR's [Smart Audio Report, Fall/Winter 2017](#)



31% of smart speaker owners have controlled household devices with a smart speaker in the last week

Image sources: Google, Amazon

# What can utilities do with Skills and Actions?

- 
- Share relevant information
  - Offer automation across devices
  - Promote trade allies
  - Help customers pay bills
  - Enroll customers in utility programs

# Several utilities are already starting to engage with this channel





# What do customers think?

We surveyed 1,029 residential utility customers in the US and Canada on a number of topics, including:

- Smart homes
  - General thoughts and preferences
  - Device-specific feedback
- Lighting
- Home battery storage



© E Source

# Customers see value in smart homes

People agree that smart homes:

- Increase efficiency
- Provide convenience
- Add security
- Save money
- Increase comfort



High level of familiarity with a variety of smart devices

# Utility data can provide value

Customers would value getting notifications when they're close to exceeding their average monthly consumption



Some of the most valued attributes of the smart home include:

- Being alerted to malfunctioning devices
- Setting up devices to automatically save energy
- Monitoring energy use

# Opportunities for utilities

More than 20% of customers would prefer to buy a smart home system from their energy utility

Utilities can help with some of the major barriers:

- Expense
- Lack of knowledge



# Want more?

Check out our  
Smart Home Resource Center!

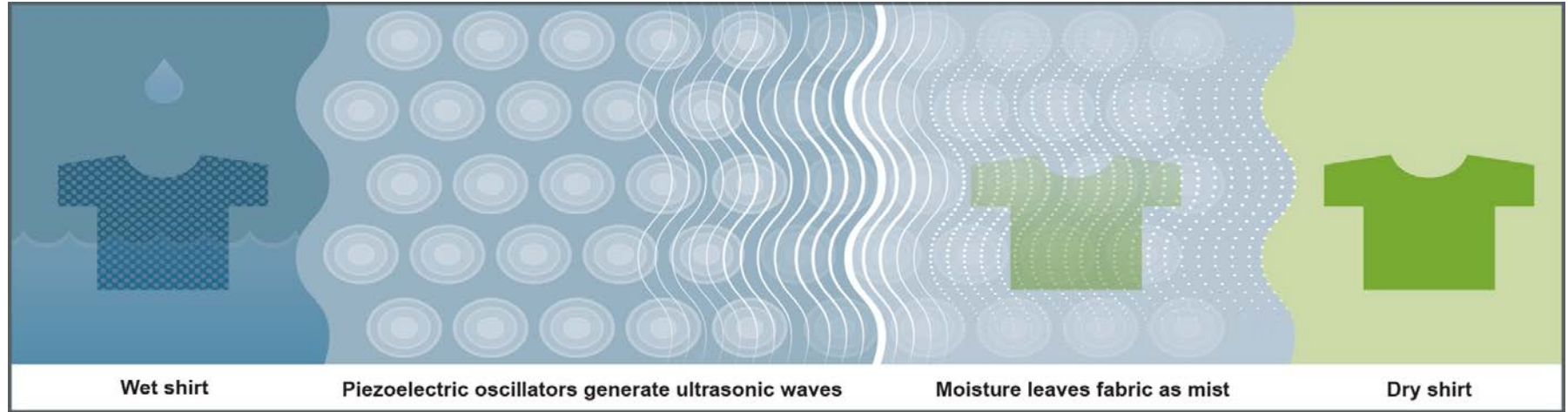




# Ultrasonic clothes dryers

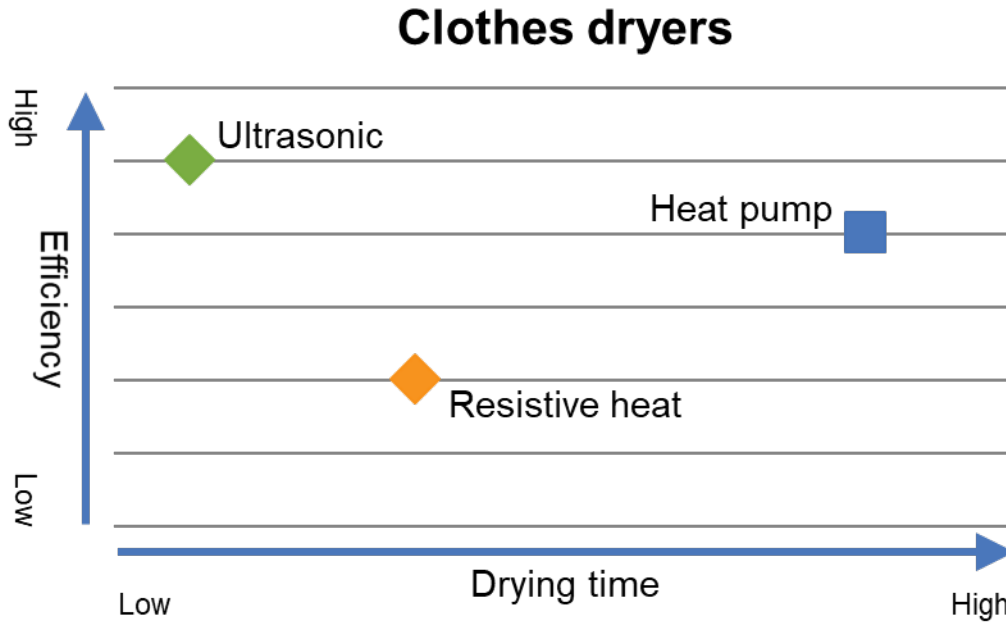


# Ultrasonic clothes dryers vibrate fabrics until dry



© E Source

# Ultrasonic consumes less energy

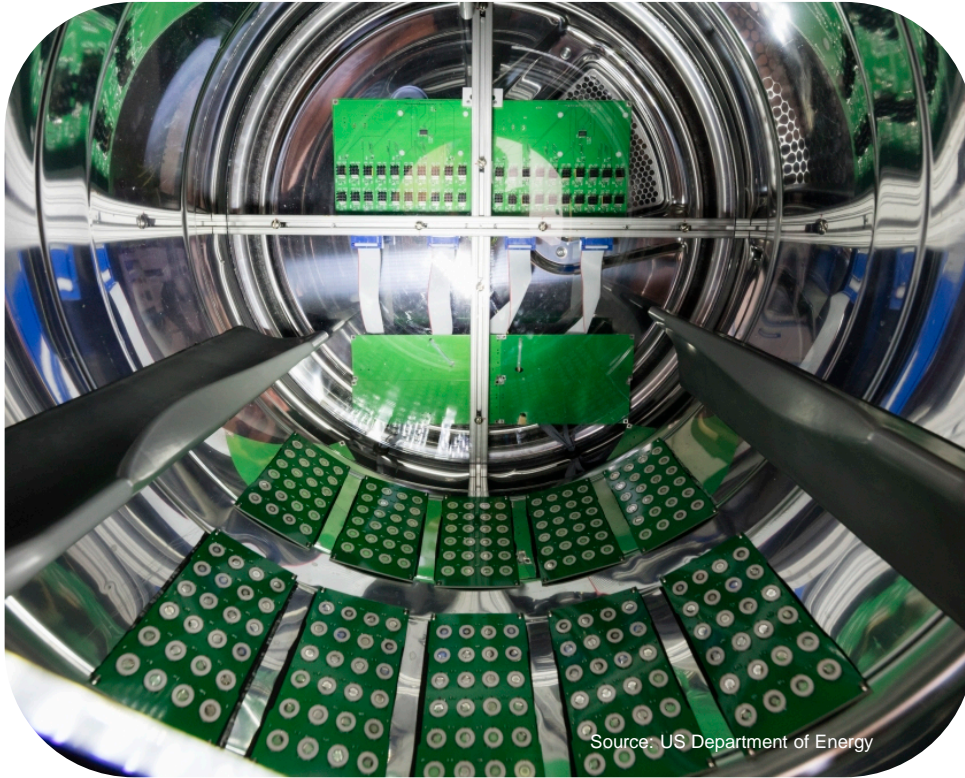


© E Source



Source: Oak Ridge National Laboratory

# The initial prototype is here!



Source: US Department of Energy



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# Won't hurt animals' ears

Audible frequencies compared to ultrasonic waves (hertz [Hz])



Note: Graphic for illustration purposes only; data not to scale.

Courtesy: iStock

# Thank you! Questions?



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