ELECTRIC POWER RESEARCH INSTITUTE

7th Annual EPRI-IEA Challenges in Energy Decarbonisation Expert Workshop

Big or Small: Decentralised Resources in a Decarbonised World

October 27-29, 2020

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https://www.epri.com/pages/sa/washington-seminar
https://www.iea.org/past-events

www.epri.com

Meeting Logistics

Audio Options:

1. Connect via computer audio
2. Have Webex call your phone

You are Muted on Entry

RED button means muted in Webex
*6 to unmute/mute on phone

Chat window

Please introduce yourself, ask questions, and offer comments and advice. Choose “Everyone” at bottom or “Wil Smith” to remain anonymous

Participants/Attendees

View workshop attendees by clicking the participant icon in the bottom right

Polling will be offered throughout the event - watch right side panel for questions

We are Recording

Staying online is your consent to being recorded

The Brave(?) New(?) World of Energy Efficiency(!)

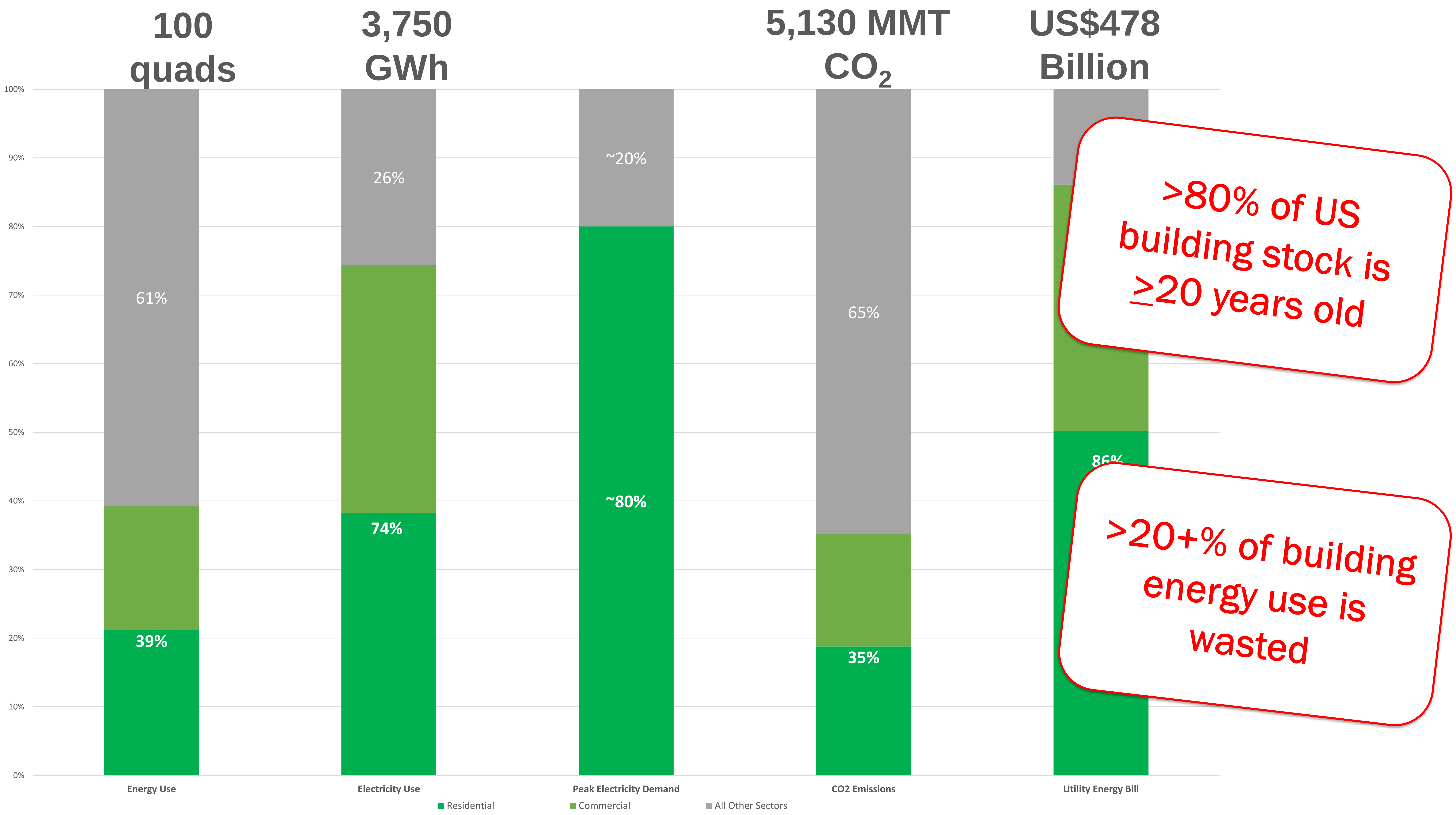
Buildings as a Distributed Energy Resource

EPRI-IEA Challenges in Energy Decarbonization Expert Workshop

DAVID NEMTZOW Director, U.S. Building Technologies Office *david.nemtzow@ee.doe.gov*

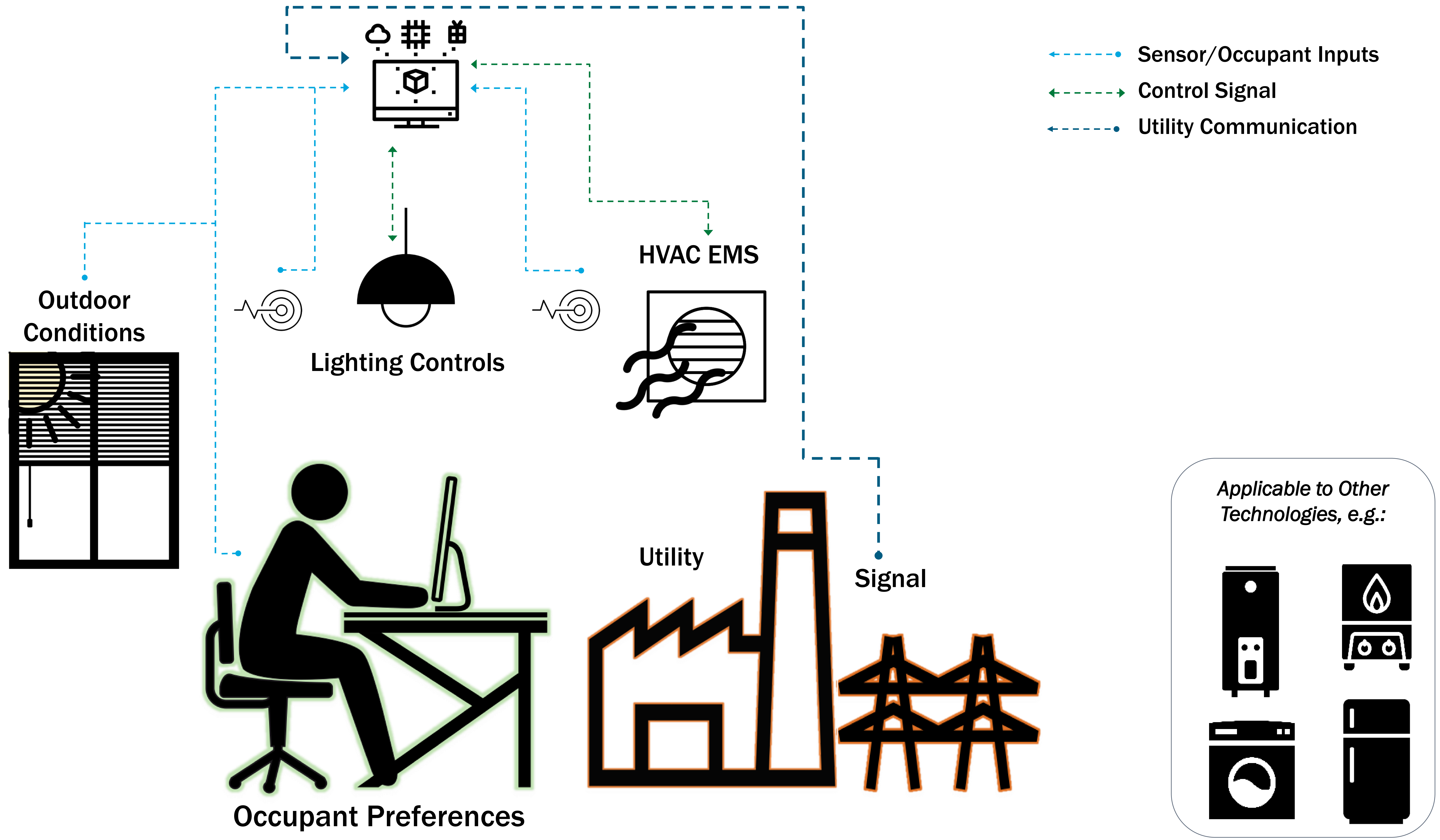
27 October 2020

Key Indicators – Buildings vs. Other Sectors (U.S.)



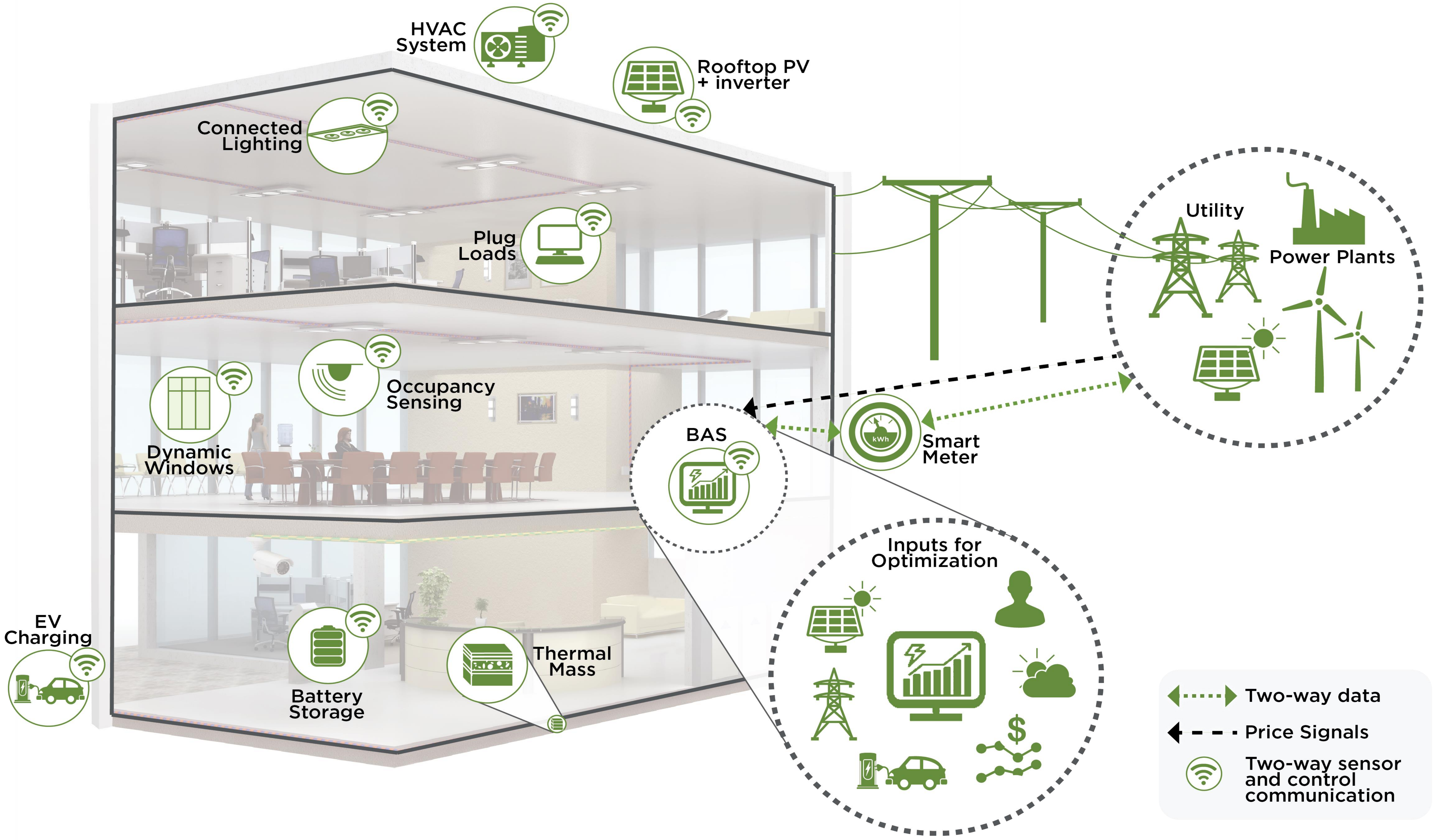
Note: All Other Sectors includes Industrial (all), Transportation (all), and Electric Power (utility energy bill only). Peak electricity demand data varies considerably by region. Estimates are for residential and commercial buildings combined. Data for utility energy bill includes electricity and natural gas consumption.

Interactions with Building Occupants



Grid-interactive Efficient Buildings (GEB)

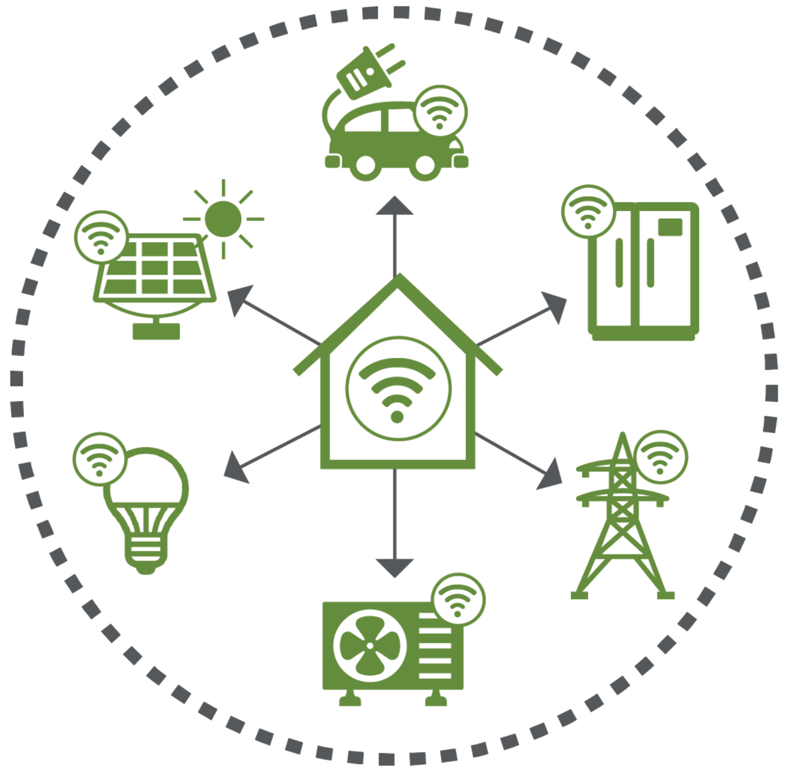
Grid-Interactive Efficient Commercial Buildings



Characteristics of grid-interactive efficient buildings

EFFICIENT

Persistent low energy use minimizes demand on grid resources and infrastructure

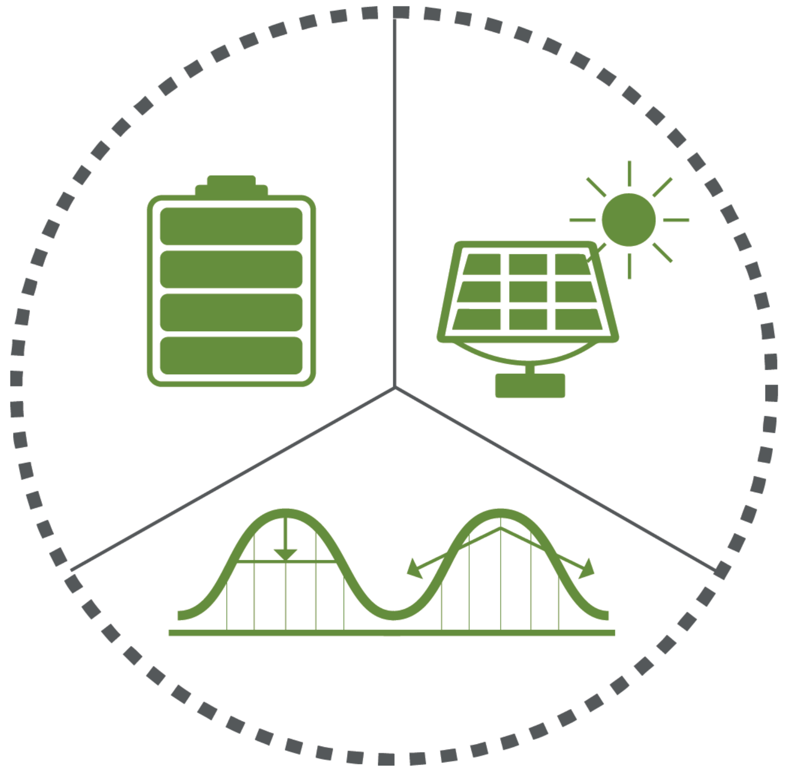


CONNECTED

Two-way communication with flexible technologies, the grid, and occupants

SMART

Analytics supported by sensors and controls co-optimize efficiency, flexibility, and occupant preferences

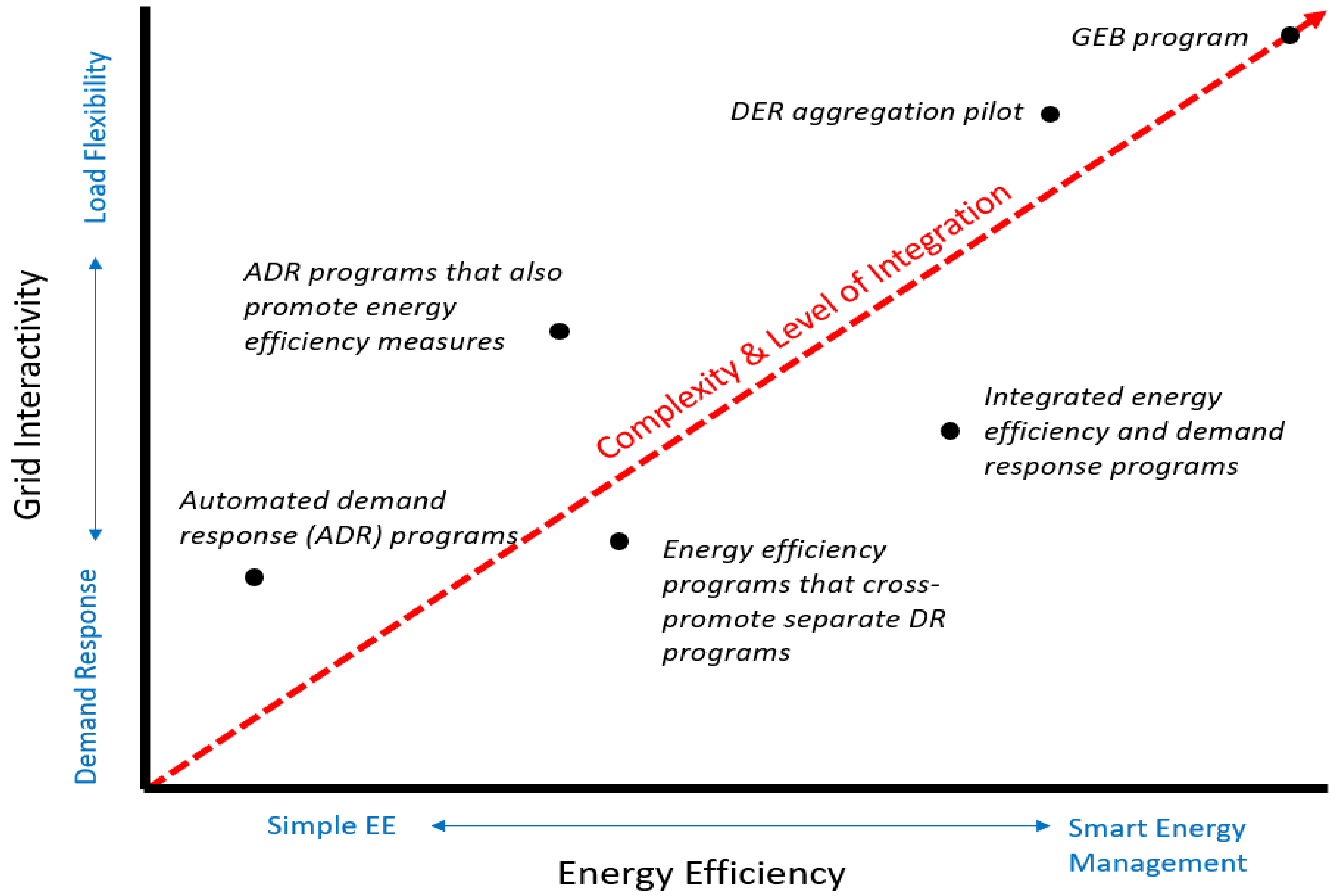


FLEXIBLE

Flexible loads and distributed generation/storage can be used to reduce, shift, or modulate energy use

Benefits of multi-building approach to DERs

Integrating EE, Demand Management/Flexibility…and more



Source: ACEEE GEB Utility Programs: State of the Market Report

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Electric Energy Storage

Current and Future Technologies

Haresh Kamath
Senior Program Manager, DER and Energy Storage

7th Annual EPRI-IEA Challenges in Energy Decarbonization Expert Workshop
27 October 2020

www.epri.com

What is driving energy storage adoption?

Policy

Procurement targets for renewables and storage

New market designs and operational practice

Economic Transformation

Rapid cost reduction in lithium ion batteries

Markets to compensate energy storage services

Customer and Societal Change

Corporate and personal clean energy goals

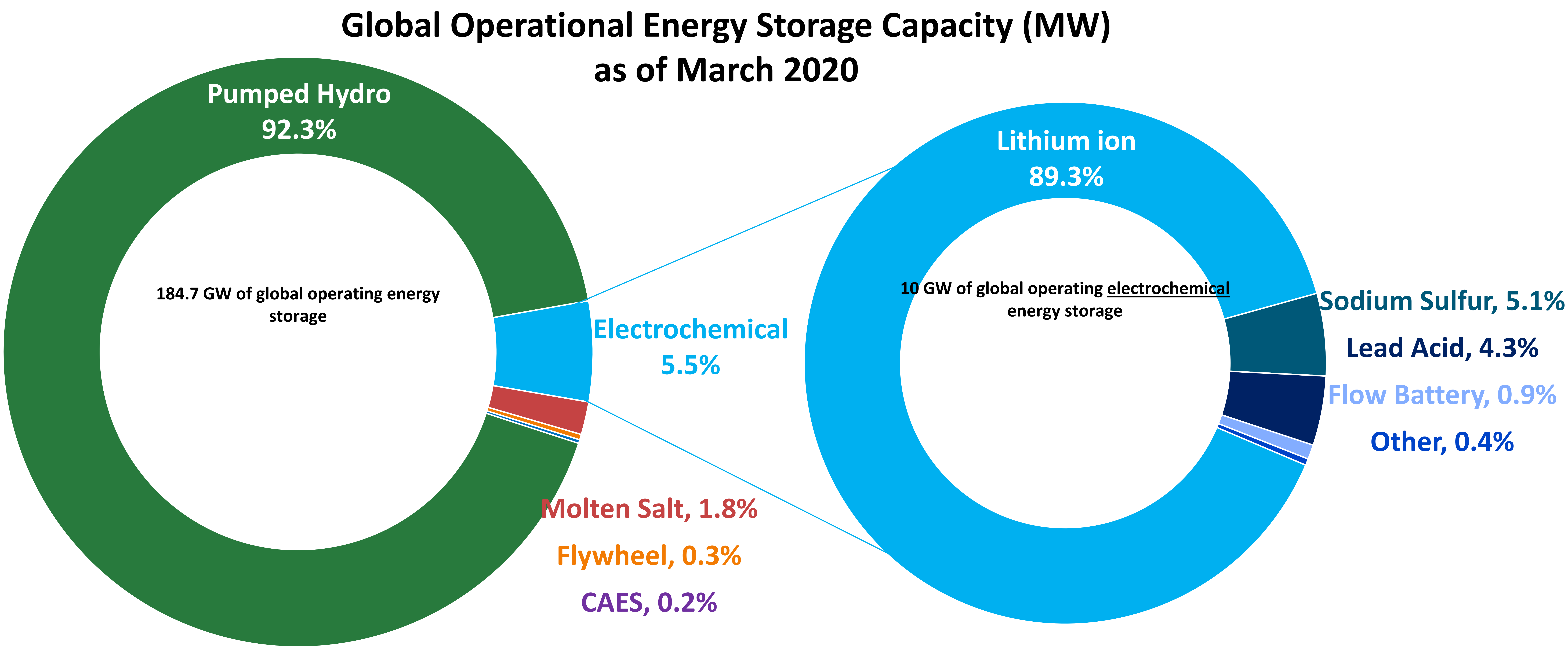
Disaster events are driving resilience solutions

Technological Advancements

Maturing products and integration practices

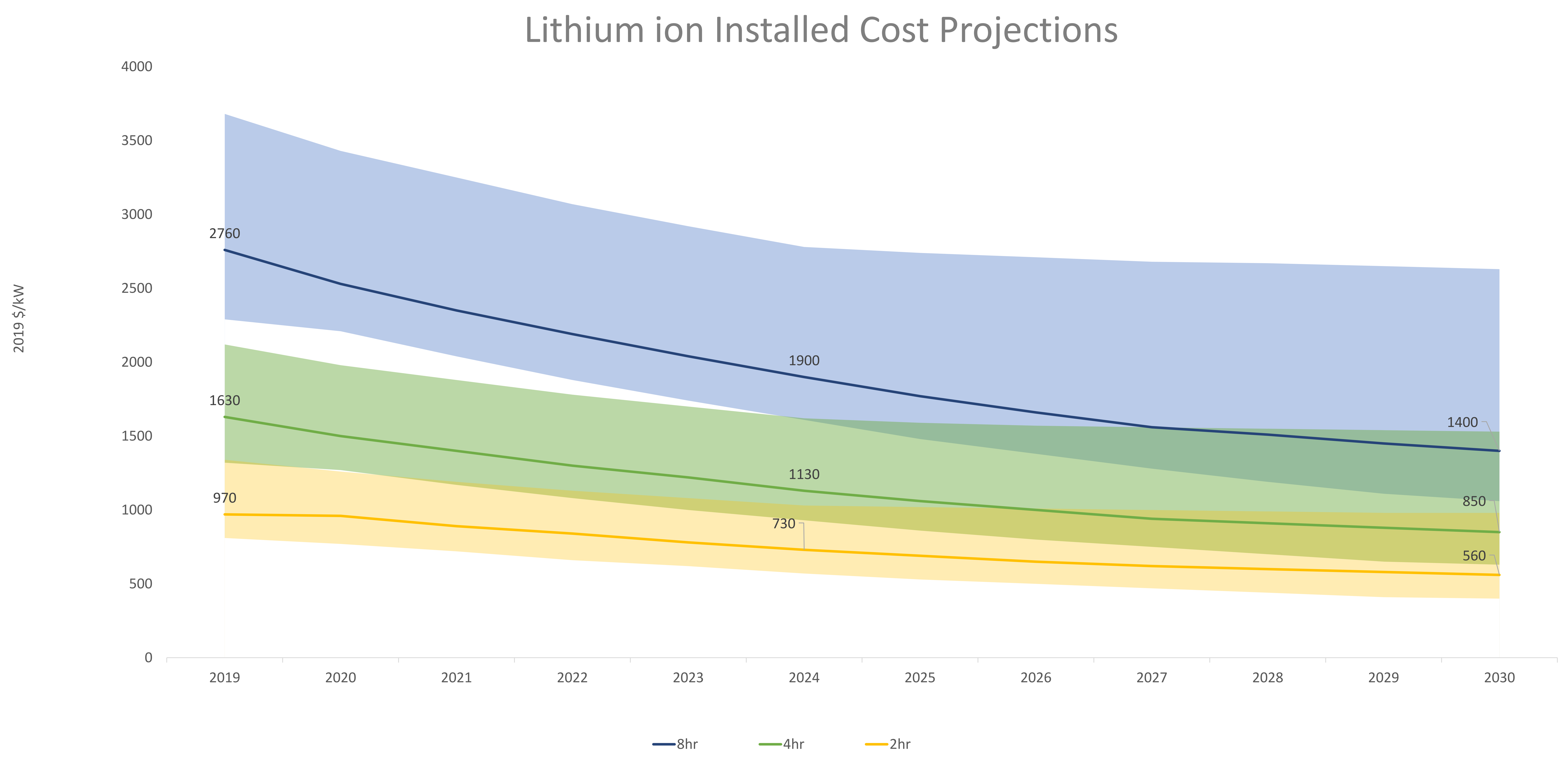
Massive R&D investments in technology

Technology Trends | Lithium ion dominates new battery energy storage deployments



Source: China Energy Storage Alliance Global Energy Storage Market Analysis 2020.2Q Summary

Energy Storage Cost Trends | Lithium ion costs expected to decrease

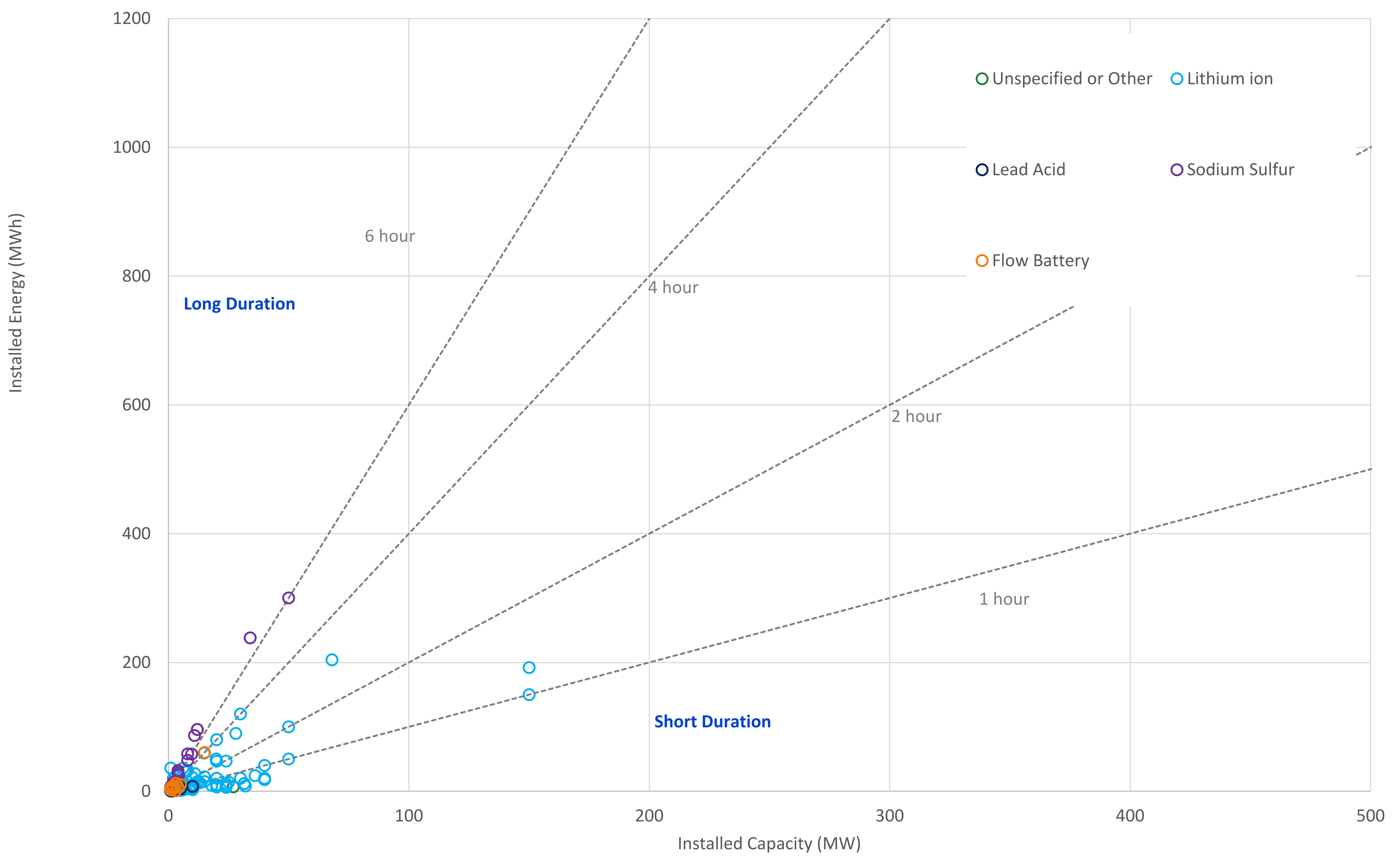


Source: EPRI, Solar Plus Storage Cost Assessment and Design Considerations

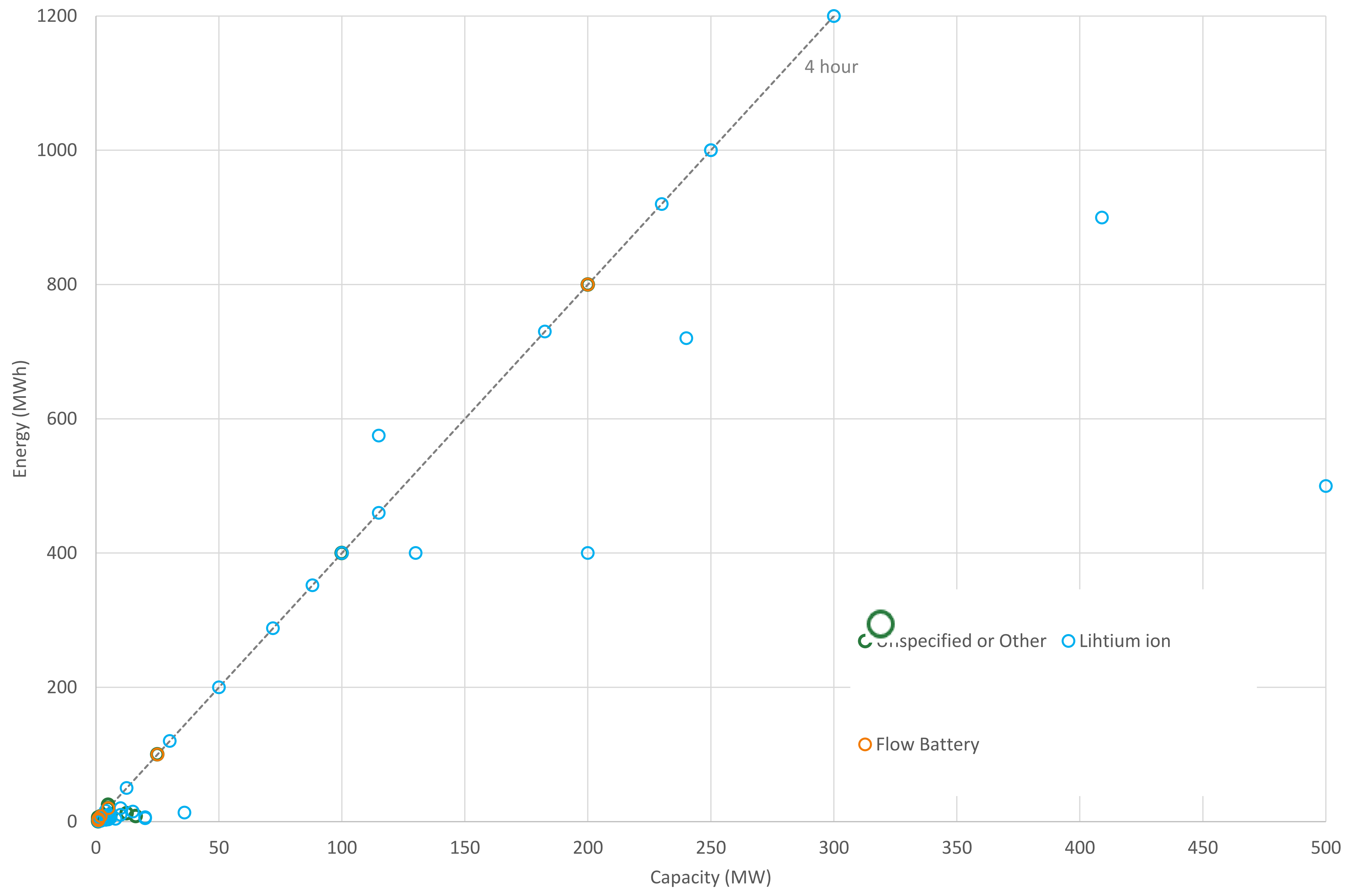
~50% cost reduction by 2030 for installed cost of lithium ion energy storage

Battery Sizing Trends | BESS system sizing is increasing

NOW: Installed Battery Energy Storage Systems by Technology



FUTURE: Announced and Under Construction Battery Energy Storage Systems

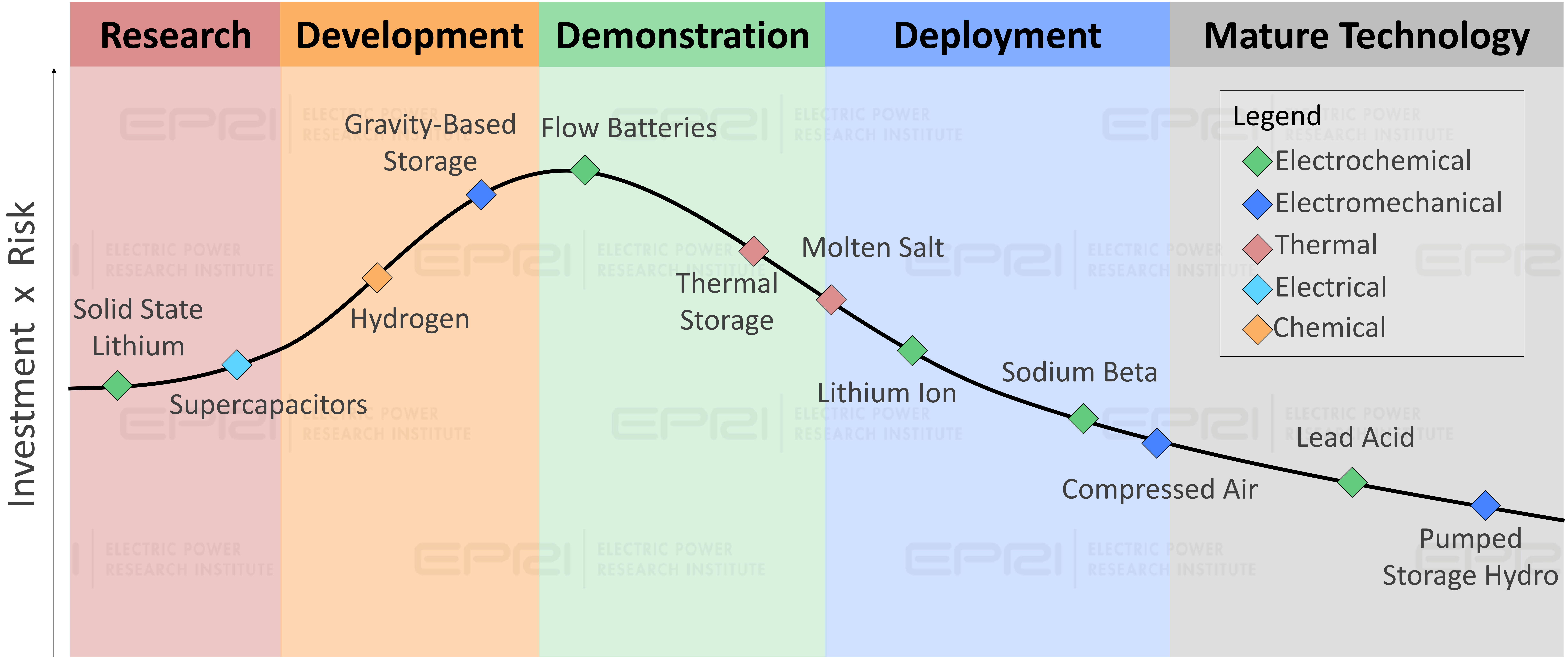


Source: EPRI and National Technology & Engineering Sciences of Sandia (NTESS), Accessed: September 2020

- Historically, shorter duration systems except sodium sulfur
- Lithium ion and sodium sulfur deployed at MWh scale

- Mostly 4-hour duration systems for resource adequacy
- Gigawatt-hour lithium ion systems being planned

Energy Storage Technology Maturity



Emerging technologies will likely need billions of dollars in investment to move to deployment and maturity. Lithium ion investment is being fueled by consumer electronics and electric vehicle R&D.

EPRI Energy Storage Vision: 2025

SAFETY	ELECTRICITY RELIABILITY	ECONOMICS	ENVIRONMENTAL RESPONSIBILITY	INNOVATION
Community resilience use cases viable	Energy storage asset reliability characterized and enhanced	Planning and operational modeling validated and applied	Reducing emissions with energy storage applications	Cross-industry disruption awareness and integration
Safety practices established	Energy storage controls integrated and inter-operable	Multi-use applications enabled	Sustainable life cycle implemented	Future workforce available and trained
Asset hazards characterized and minimized	Planning and maintenance practices established	Project capital and soft costs reduced	End-of-life impacts minimized	Technology advancements accelerated

Collaboration between EPRI and advisors to define desired future state of storage


Generation
Transmission & Distribution
Microgrids
Commercial & Industrial
Residential
Providing Flexibility, Reliability and Resilience Across the Electricity Supply Chain

Together…Shaping the Future of Electricity

UK Power Networks
Delivering your electricity

Innovations in Distributed Resources

7th Annual EPRI-IEA Challenges in Energy Decarbonisation Workshop

Sotiris Georgiopoulos
Head of Smart Grid Development
Tuesday 27 October 2020

Where we deliver, what we do

8.3M Customers

28% of UK Total

9.5GW Distributed Generation Connected

32% of UK Total

16GW Peak Demand

An Employer of Choice

A Respected and Trusted Corporate Citizen

Sustainably Cost Efficient

UK's leading Distribution Network Operator

Our **Flexibility Roadmap Principles**

Improve accessibility

- Co-design new arrangements
- Adoption of digital platforms
- Contribute to standardisation

Market testing

- Open all Load related capex at high voltage
- Trials for EV-driven constraints

Neutrality

- Publish info on size & location ahead of tenders
- Publish tender framework, assessment criteria, tender results

Maximise available opportunities using economic principles

Results from our April 2020 Flex Tender

UK Power Networks
Delivering your electricity

£14m
Total value awarded

123MW
Total capacity awarded

1,200
Stakeholders engaged with

Up to 7 year
Contracts awarded

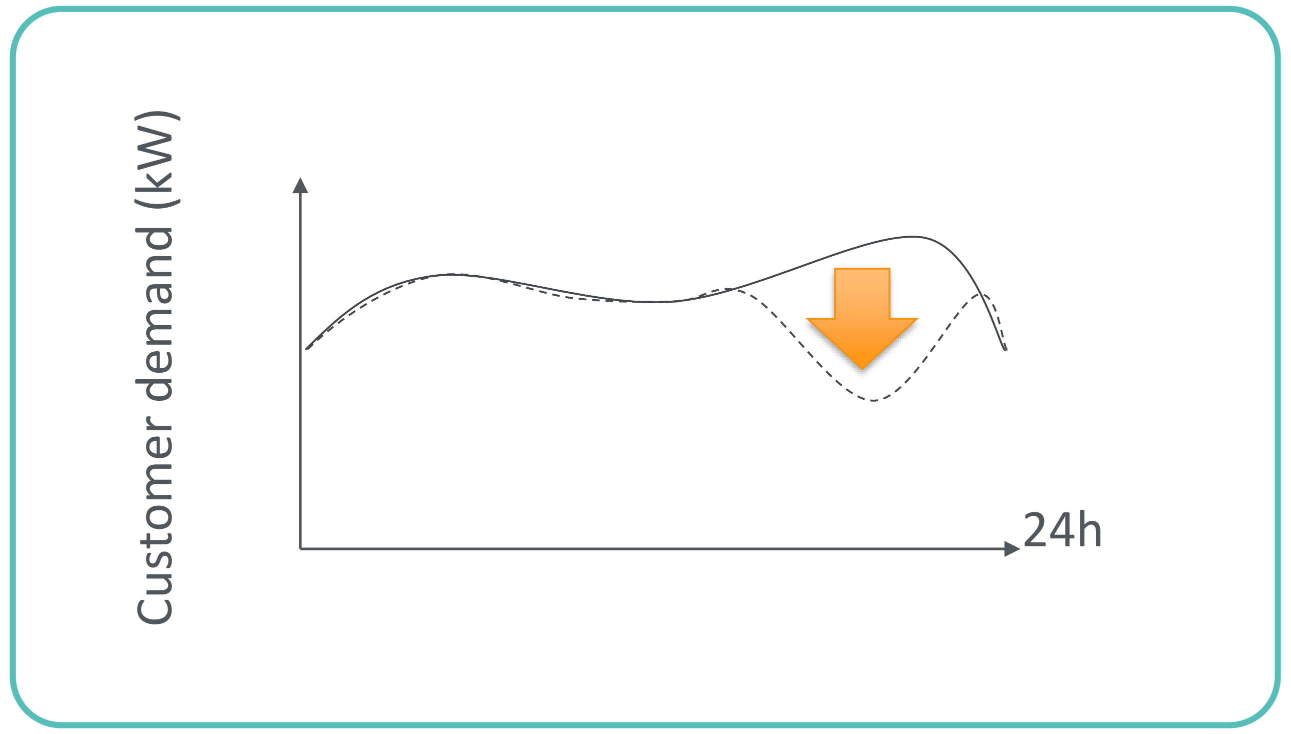
57 = **42 HV** **15 LV**
Number of zones awarded

(a world-wide first) **#1**

Shift – EV Smart Charging Market Trials

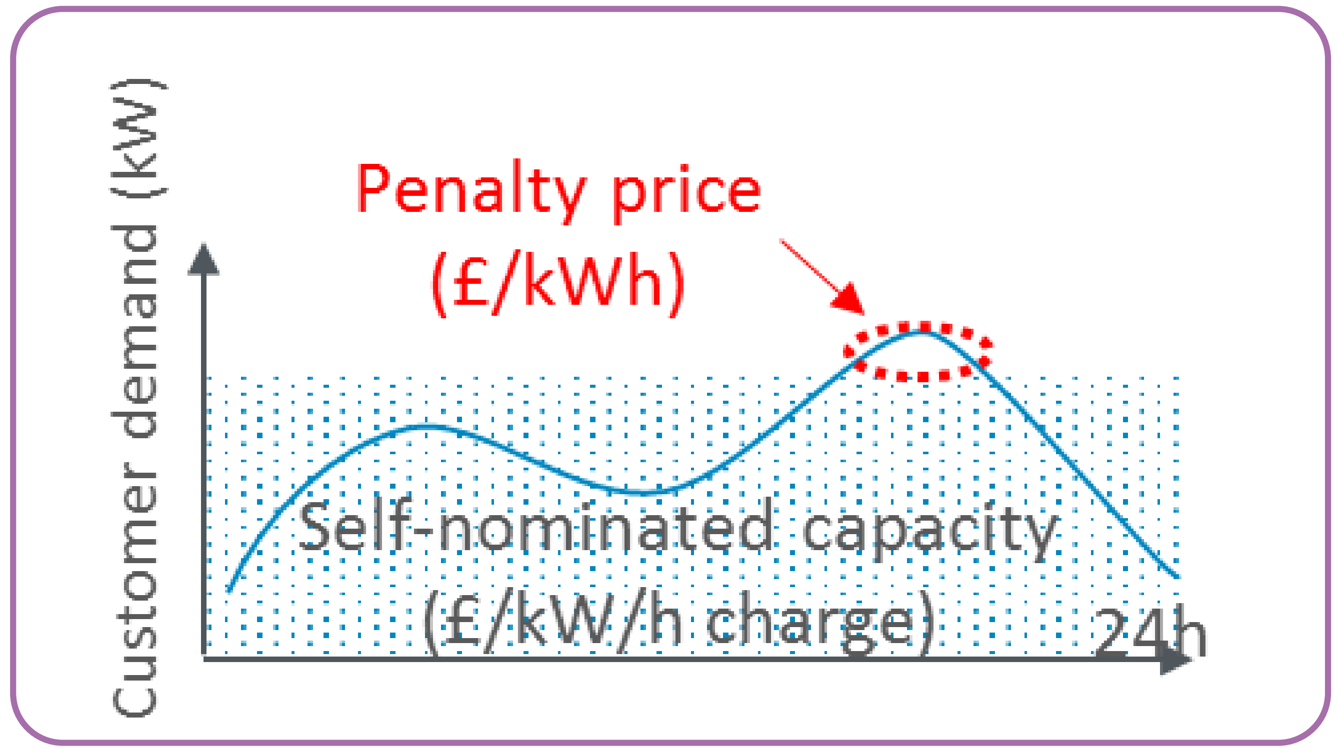
To investigate how DNO can support the **market** to manage smart charging

Flexibility Procurement



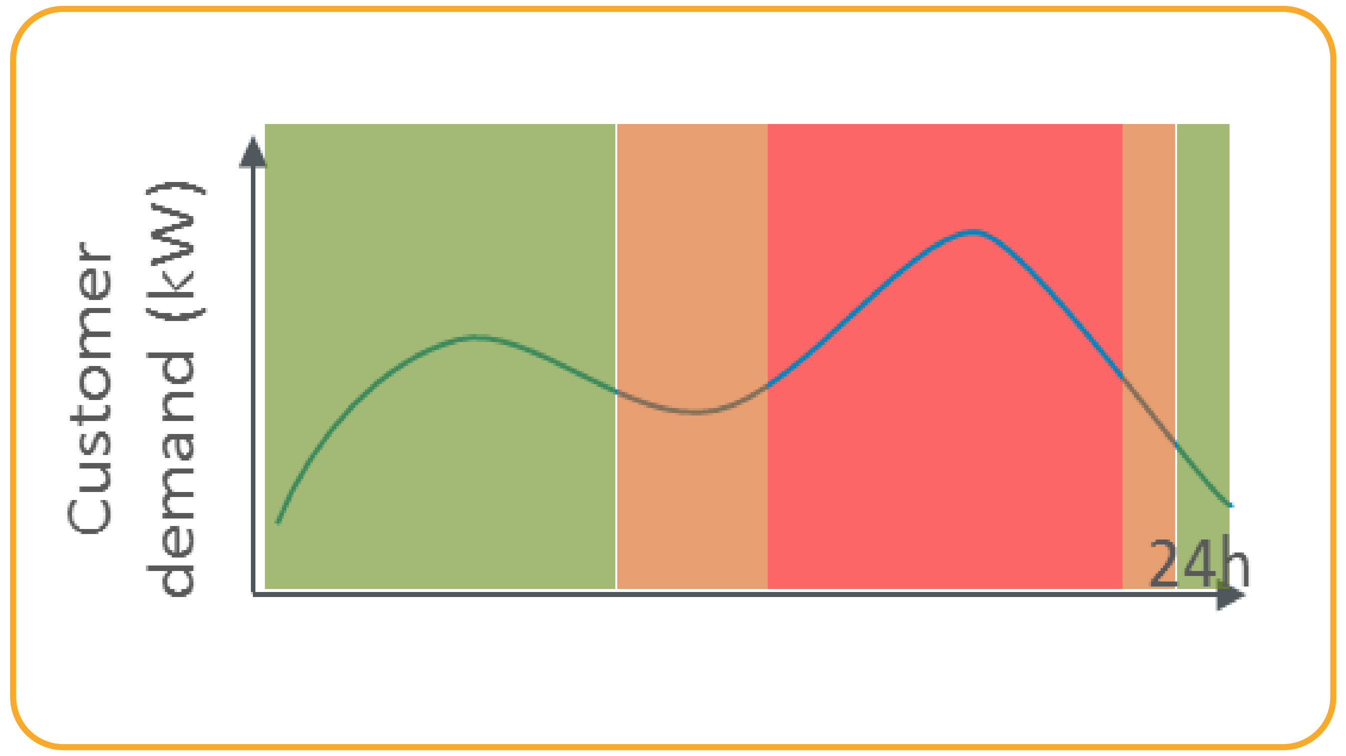
ev.energy

Capacity Based Pricing



octopus energy

DUoS Time of Use



KALUZA
AN OVO COMPANY

Market trials: **2019-20** > Interim solution: **2021-23** > Industry wide solutions: **2023+**

UK Power Networks
Delivering your electricity

UK Power Networks
Delivering your electricity

Flexibility delivers benefits for our customers and can re-define the future of energy.

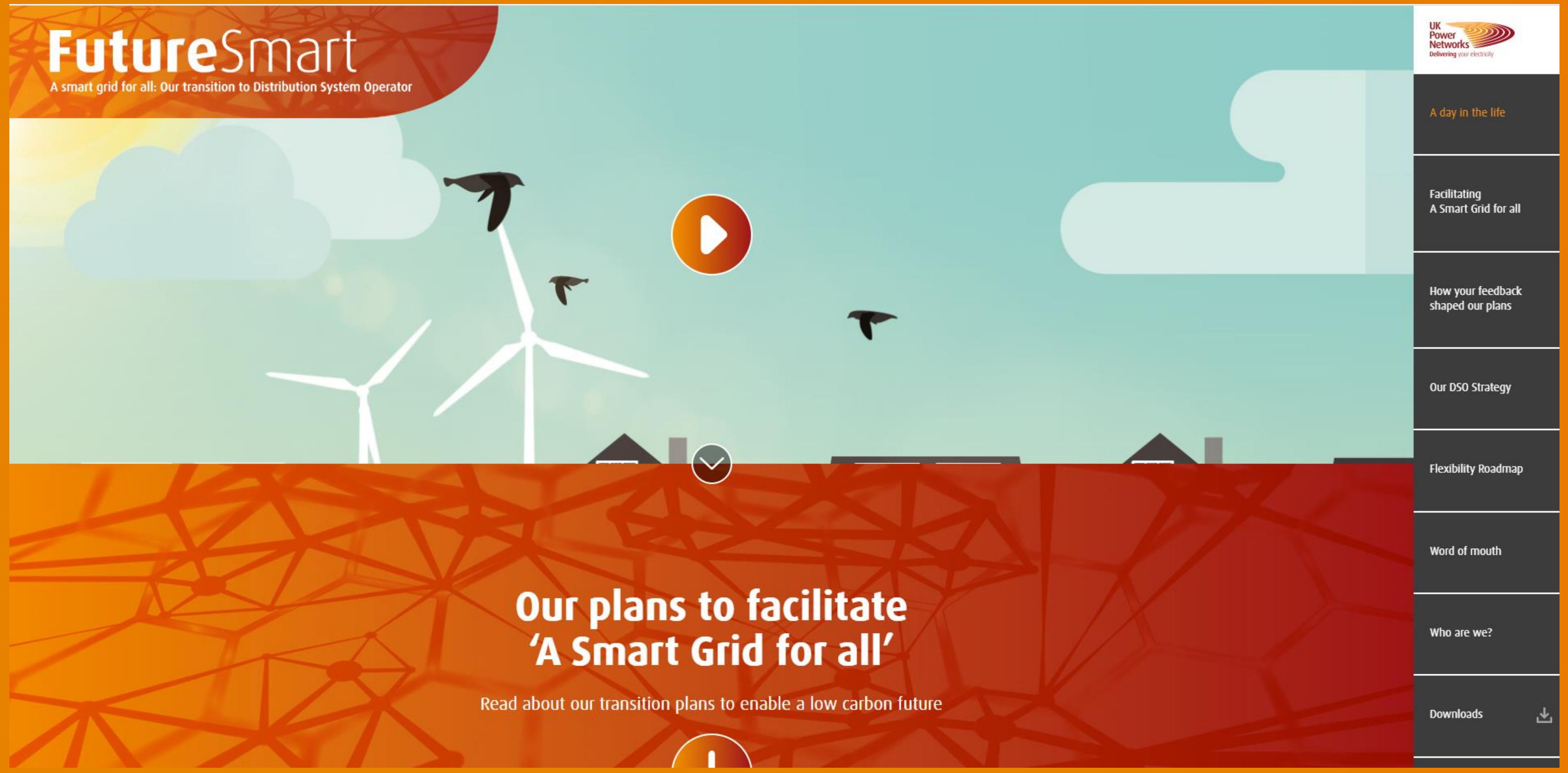
We’re facilitating the market for you, our stakeholders. Tell us how we can improve the market in future.

Our aims

- Defining the future of local flexibility together
- Engaging and understanding
- Collaborating
- Whole system benefits

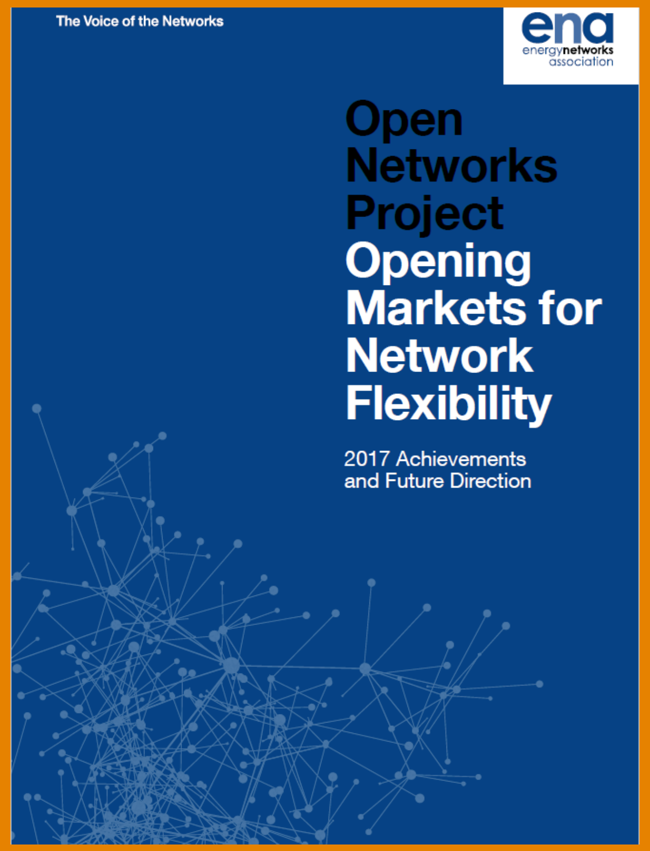
ADDITIONAL SLIDES

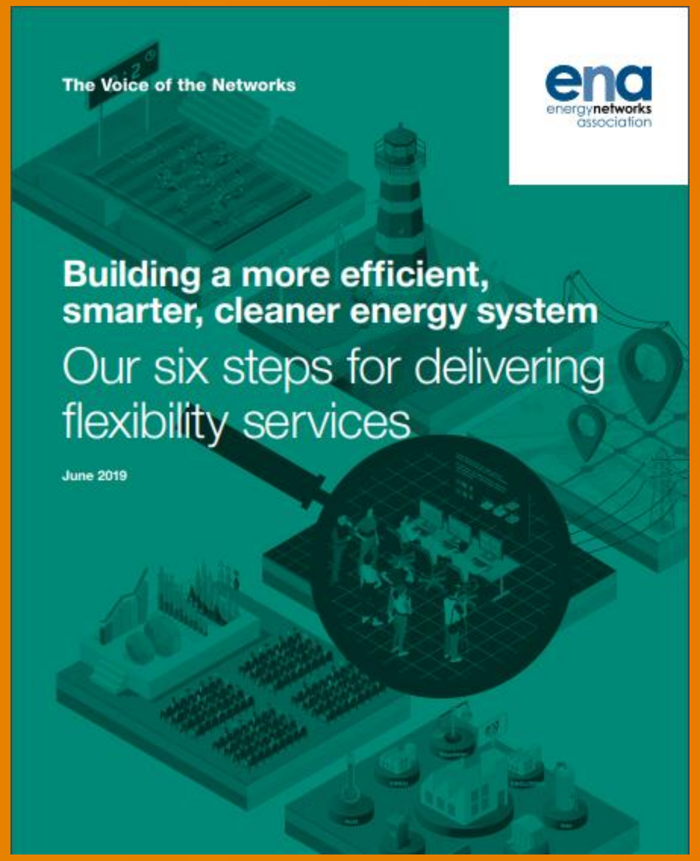
Our journey began by defining a DSO



2017

Jul-17 Future Smart consultation
Aug-18 Flexibility Roadmap consultation
Oct-18 stakeholder event





ENA

Open Networks Project
Flexibility Commitment

2018

Flexibility Roadmap published - Flexibility First approach
Consultation Report shared

April 2020 Flex Tender: contracts awarded

Flexitricity

Foresight
FOR A SMARTER FUTURE

EVC
EV CHARGERS

conrad
energy

ev. energy

centrica
Business Solutions

suez

KALUZA
AN OVO COMPANY

e·on

amp
CLEAN ENERGY

Electric Miles
Cheaper. Cleaner. Smarter.

kiwipower

city

BANKENERGI

moixa

GridBeyond®

MODERN
ENERGY

EPRI – EIA Innovations in DER Panel

October 27, 2020

Betty Watson
Sr. Director, Policy & Market Design

Certified B Corporation

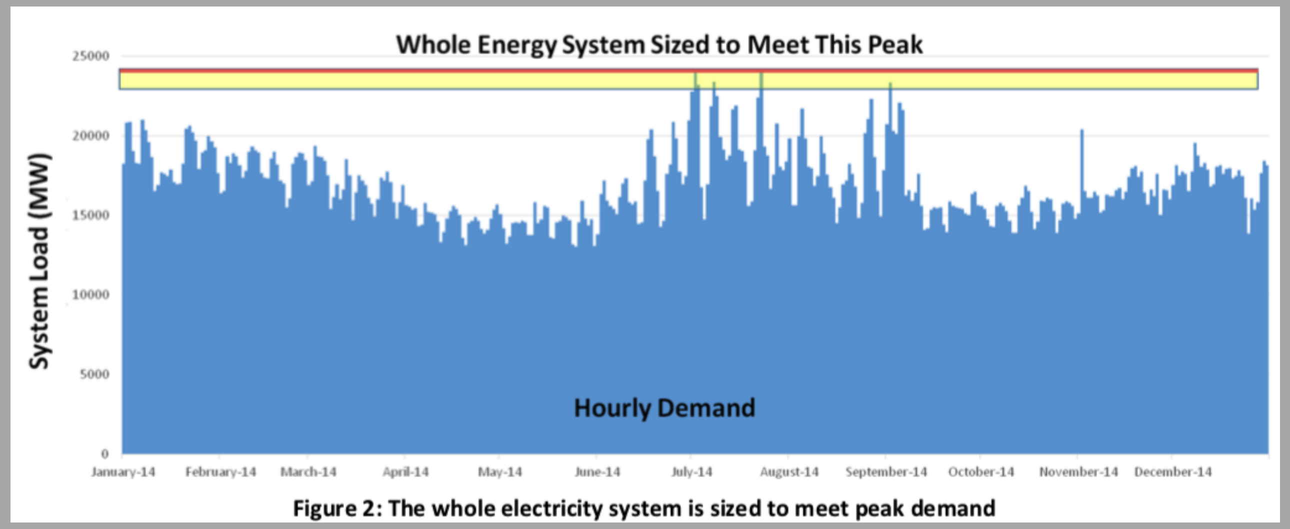
Modern Energy is dedicated to providing affordable, reliable, sustainable energy to everyone.

We are a holding company for outstanding clean energy businesses, driving various elements of the clean energy transition – from energy efficiency and distributed generation to demand response.

AmericanEfficient FARO ENERGY tether

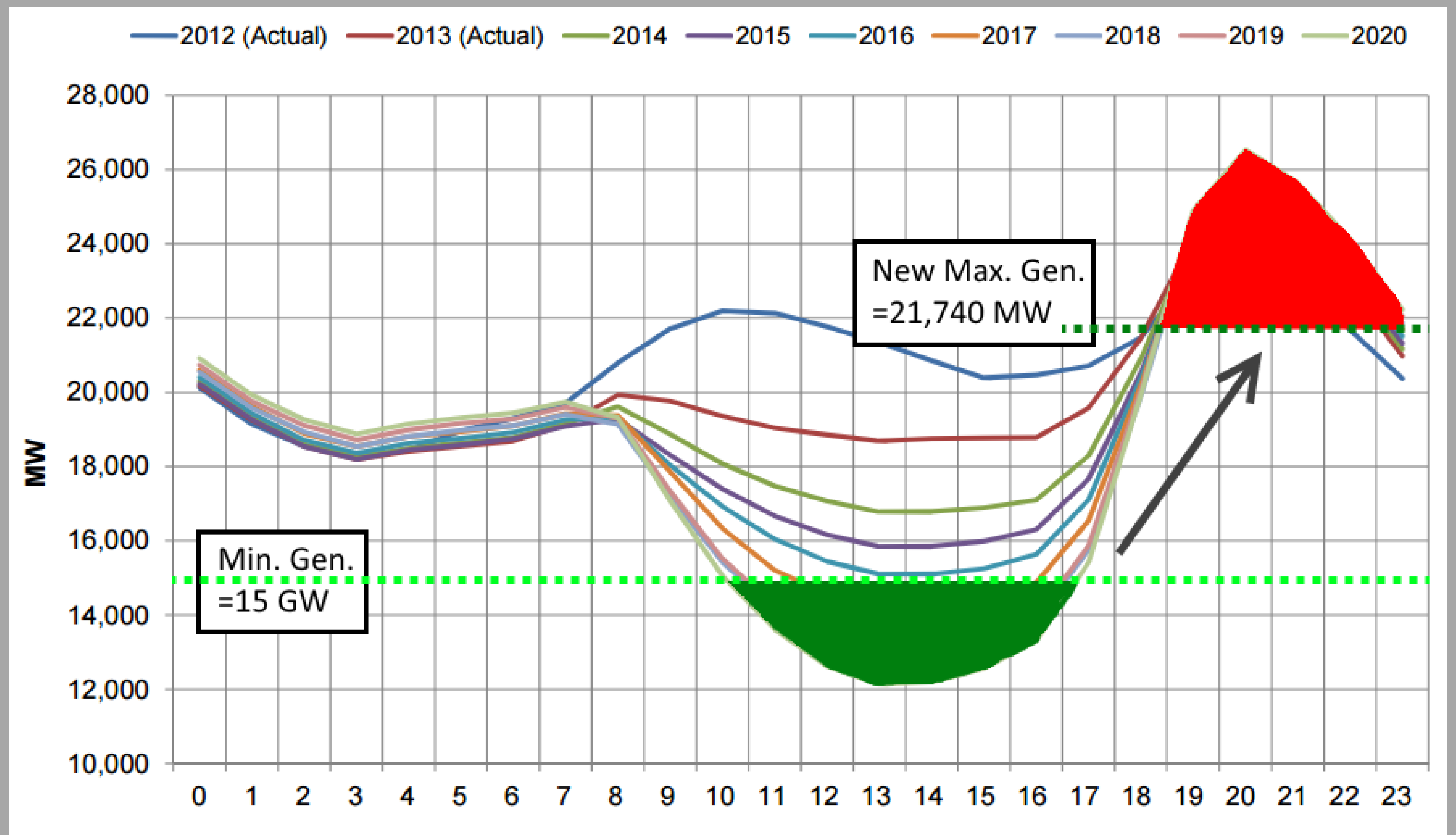
How Can We Use Distributed Energy Resources?

Build a more affordable and efficient grid



"The top 10% of hours… accounted for 40% of annual spend."[1]

Provide grid services and balance intermittent renewables



Provide service when the grid is not available

MODERN ENERGY

See : (1) State of Massachusetts, "State of Charge," https://www.mass.gov/doc/state-of-charge-report/download; (2) Burnett, M. (2016), "Energy Storage and the California Duck Curve," http://large.stanford.edu/courses/2015/ph240/burnett2/

How to Enable Distributed Energy Resources?

Allow DER to fully access all value streams
- Transmission, distribution, capacity, energy, ancillary services, resilience
- Make peak pricing / time differentiated pricing available
- Allow DER to participate on Supply and Demand sides

Open all planning and markets to DER
- Evaluate DER compared with other resources
- Allow DER to participate directly or respond to prices
- Compensate all resources comparably

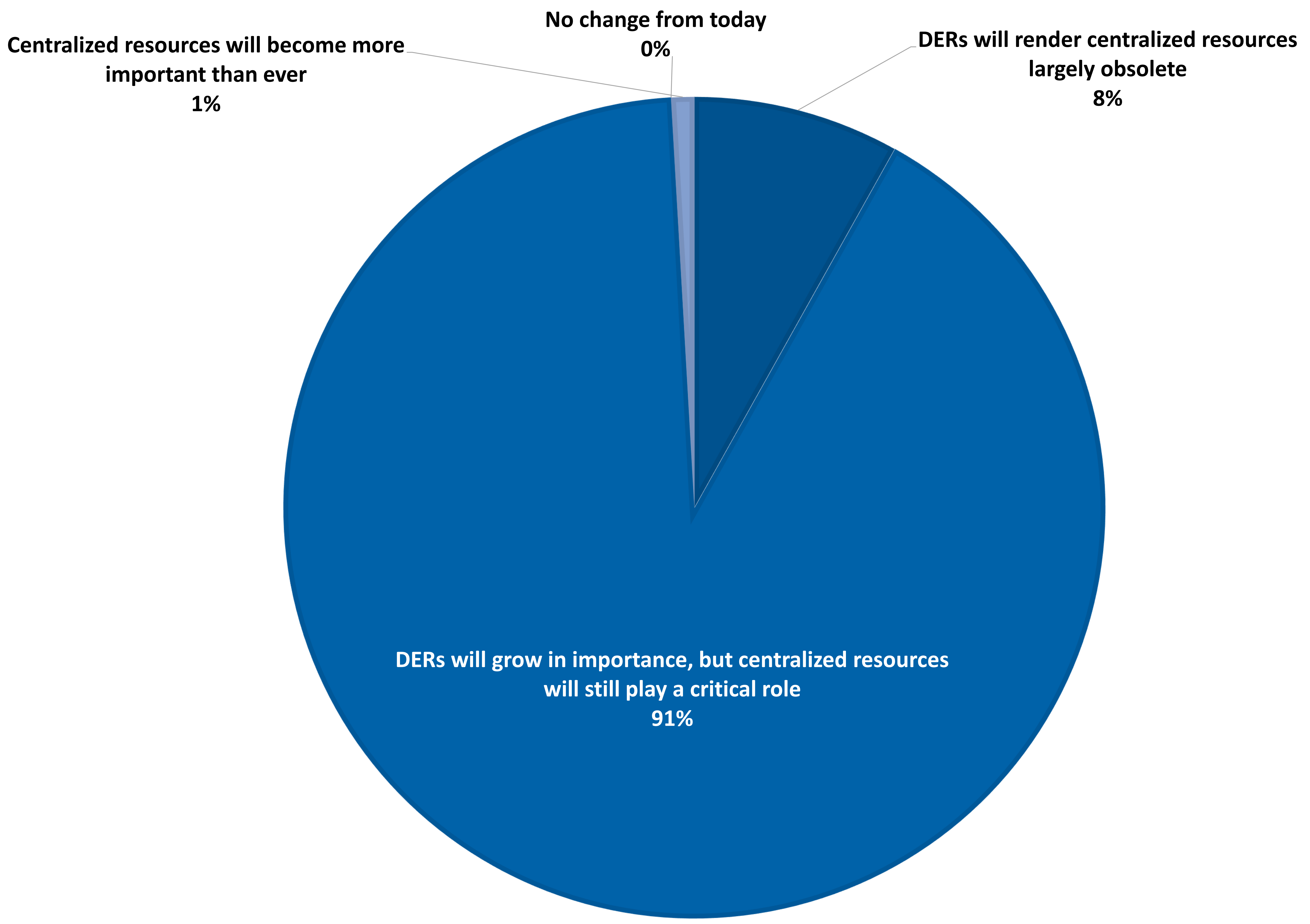
Make system operators and markets technology-neutral
- Remove financial biases
- Remove technology biases

Thank you.

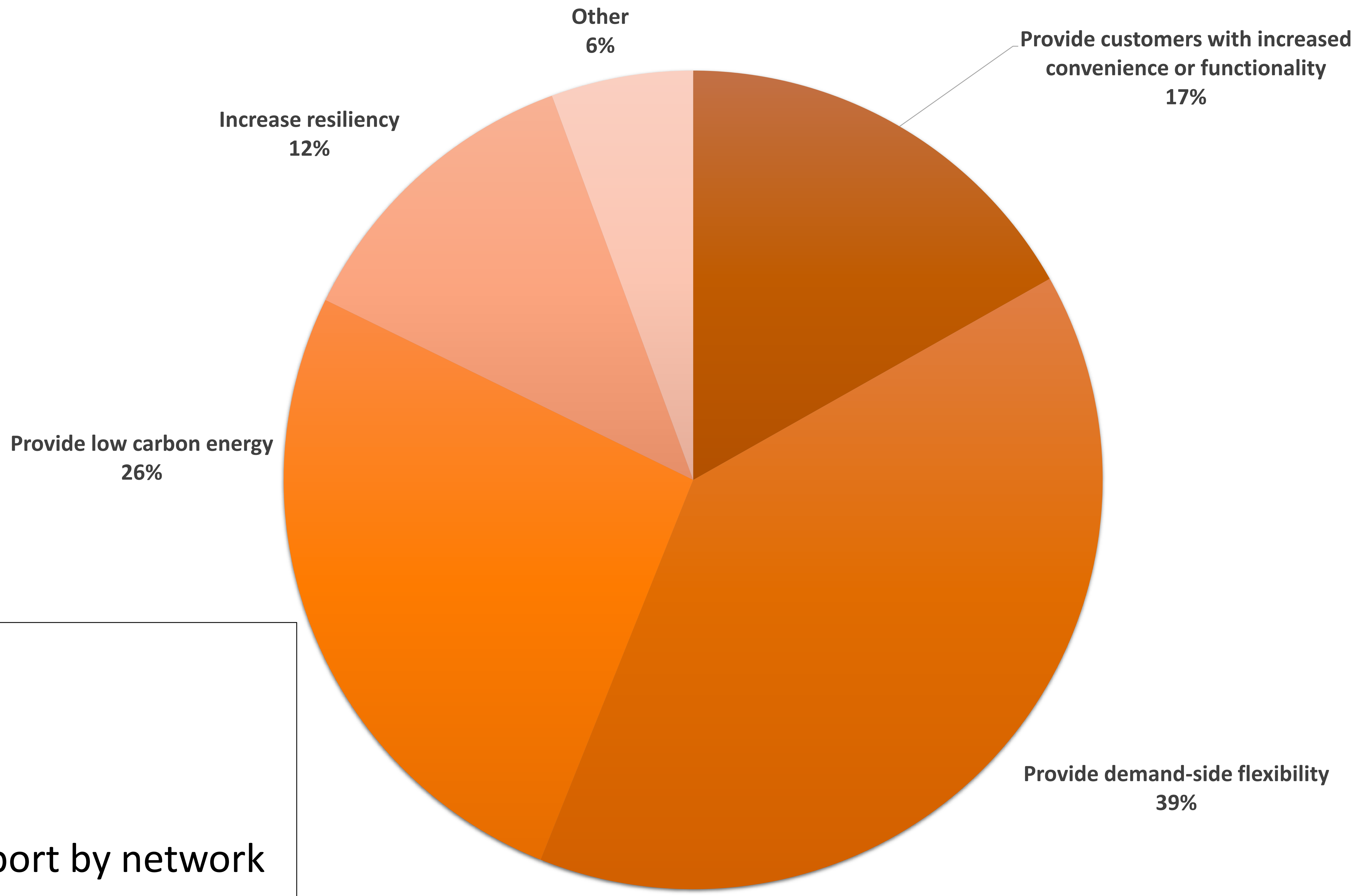
betty@modern.energy

Polling Questions

Q1: In the future, how will the role of centralized resources change relative to Distributed Energy Resources (DERs)?

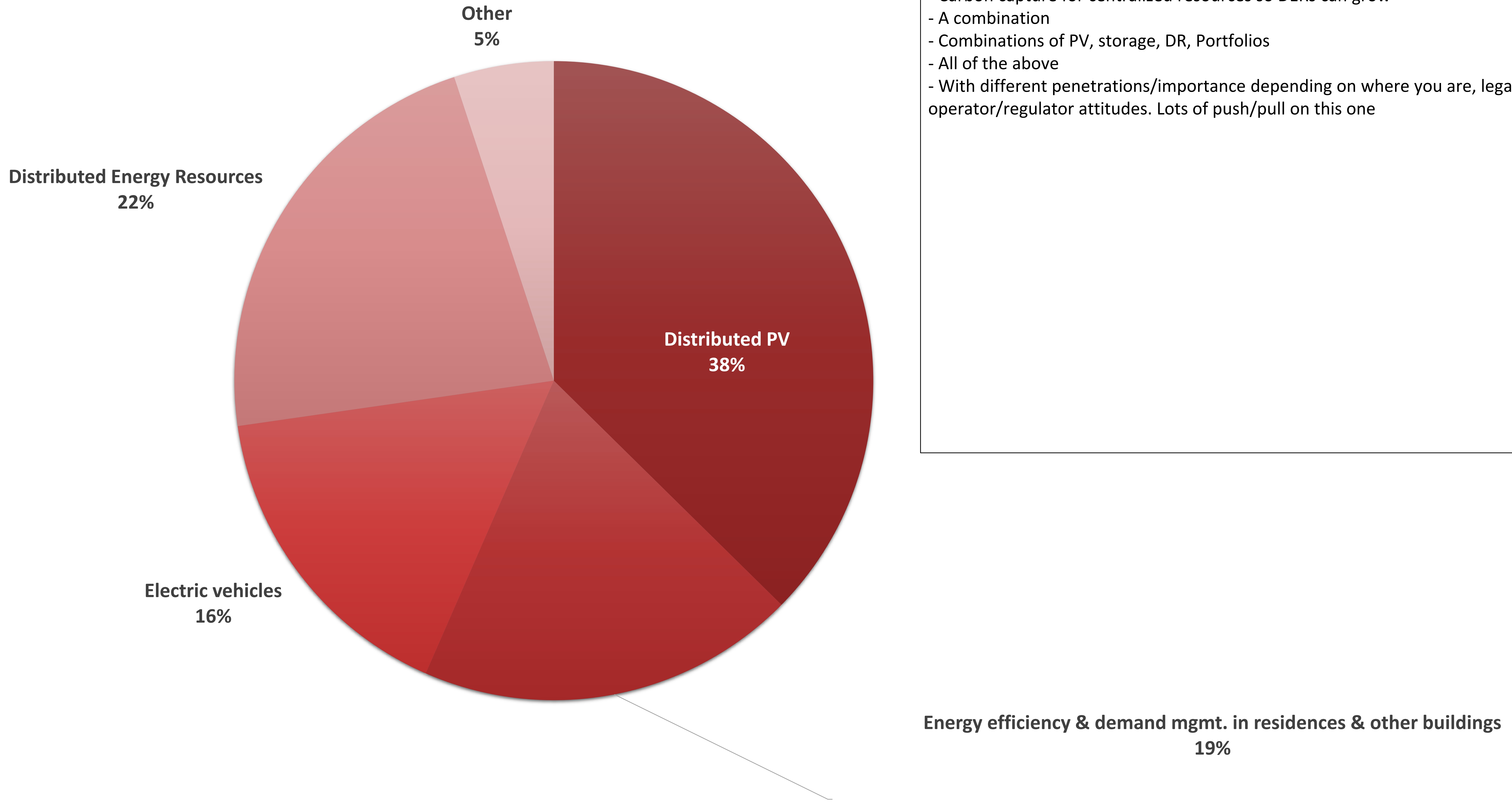


Q2: What will be the main contribution of DERs in a decarbonized world?



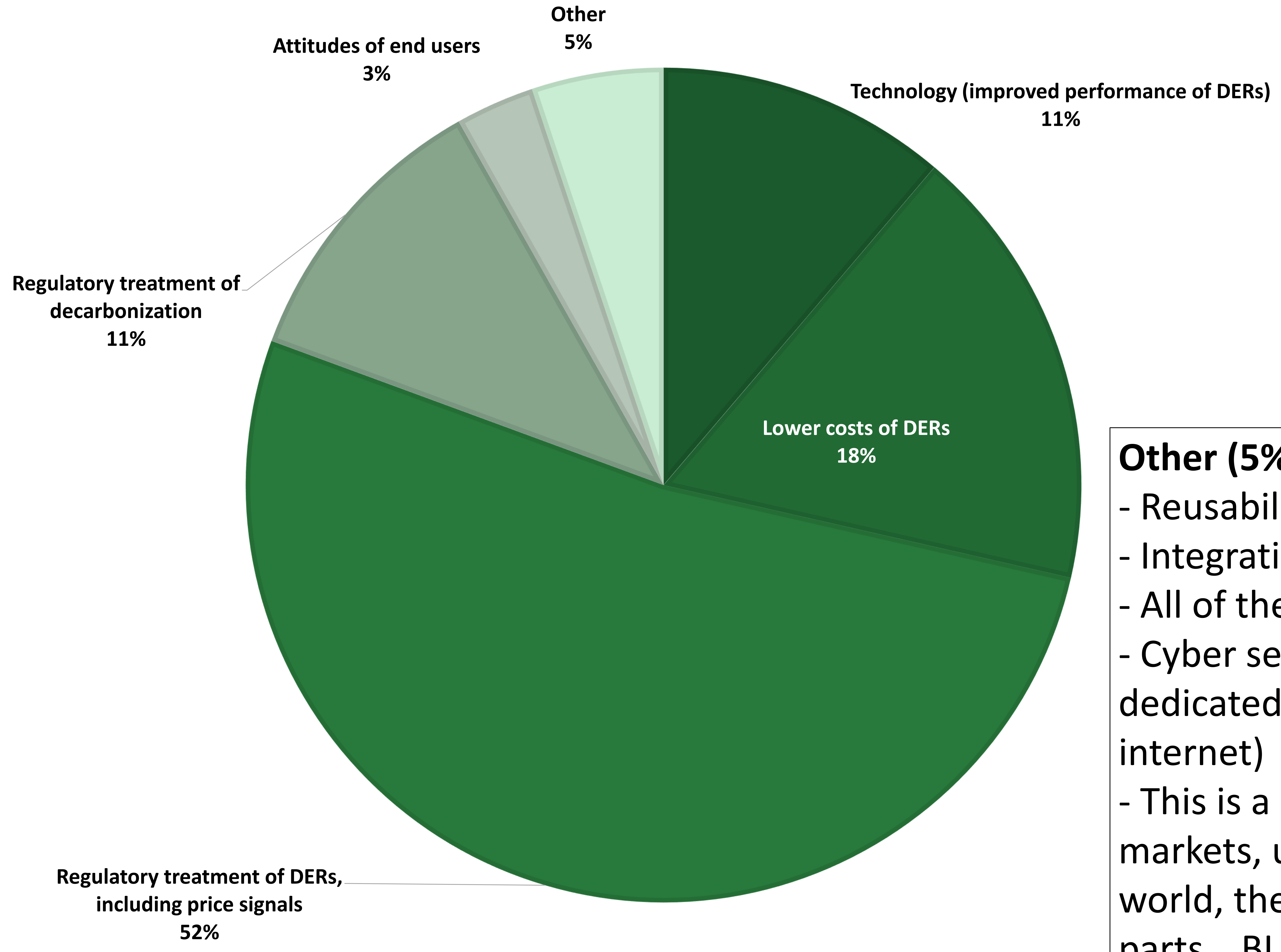
Other (6%):
- All of the above x5
- Community based energy
- Personal interest of consumers
- More self-sufficiency if good support by network
- Multiple contributions
- Will vary with grid needs- stacked

Q3: Which of the following DERs will make the greatest impact toward decarbonization over the next 5 years?



Other (5%):
- Microgrids at different scales
- Carbon capture for centralized resources so DERs can grow
- A combination
- Combinations of PV, storage, DR, Portfolios
- All of the above
- With different penetrations/importance depending on where you are, legacy systems and other resources…and grid operator/regulator attitudes. Lots of push/pull on this one

Q4: Which is the most important to advance so that DERs as a whole can have the greatest impact toward decarbonization over the next 5 years?



Other (5%):
- Reusability/recycling
- Integration of DERs and the grid
- All of the above x2
- Cyber security & functionality demand reliable dedicated communications networks (not the internet)
- This is a co-evolution of the technologies, markets, users, and system objectives. In the ideal world, the sum is greater than the individual parts… BUT … that integration story is critical too