U.S. DEPARTMENT OF ENERGY

Energy Storage Grand Challenge

Use Cases Workshop

MAY 13, 2020

U.S. DEPARTMENT OF ENERGY

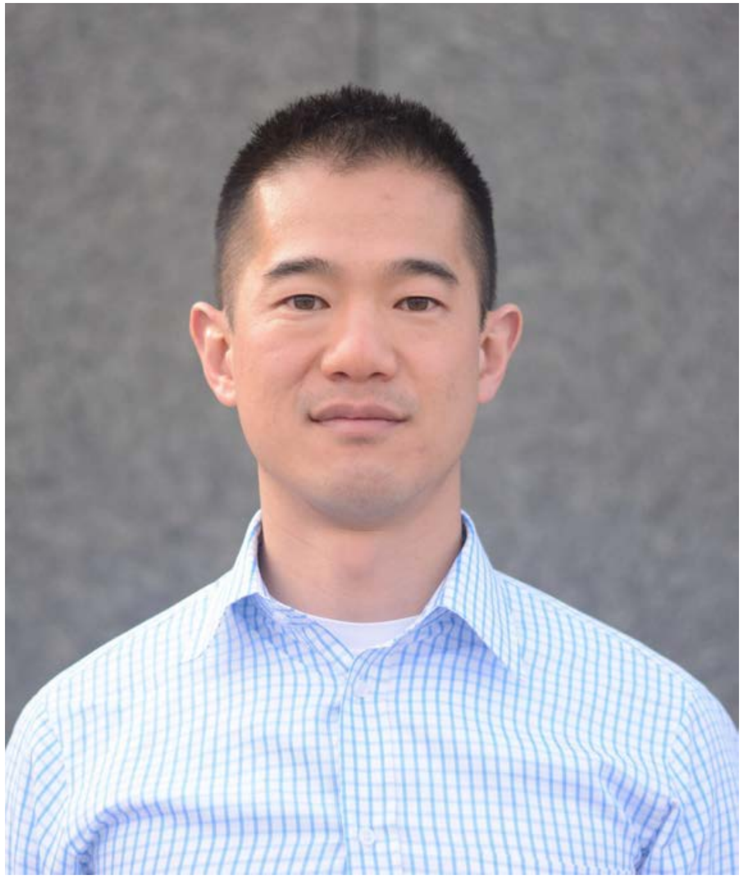
Questions

Please submit your questions
in the Chat box to the host. Reference the speaker or topic.

Welcome and Opening Remarks

Eric Hsieh

Office of Electricity
U.S. Department of Energy

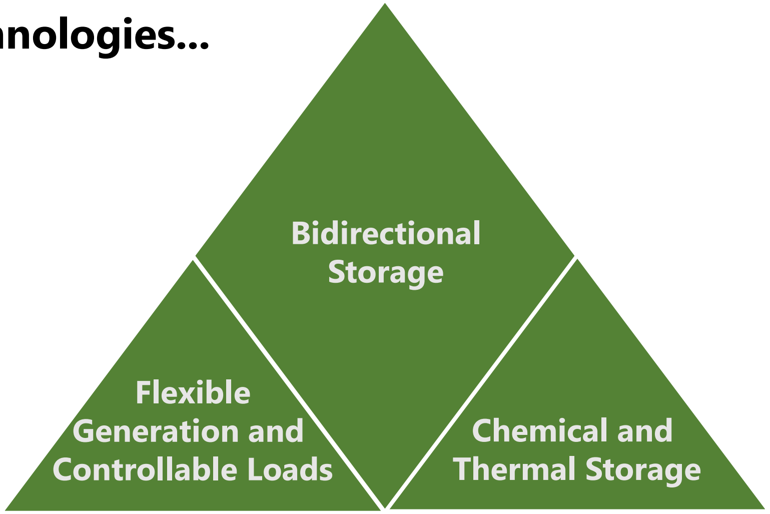


ESGC Vision, Mission, and Scope

DOE-wide strategy to accelerate US leadership in energy storage technologies

- Coordinated across DOE:

technologies...



...offices...

- Office of Electricity
- Energy Efficiency and Renewable Energy
- Office of Science
- Office of Technology Transitions
- Nuclear Energy
- Fossil Energy
- ARPA-E
- Loan Programs Office

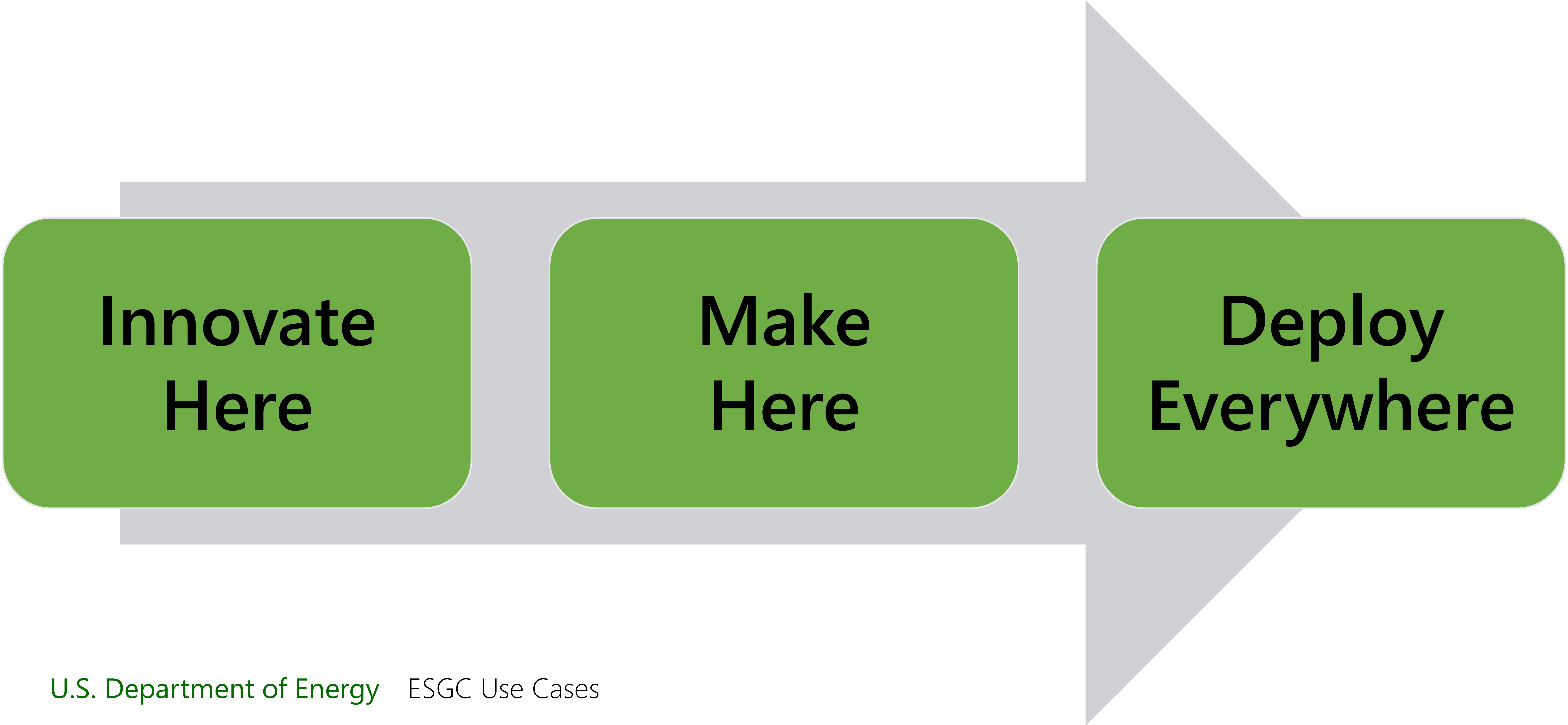
...and functions.

ESGC Focus Areas

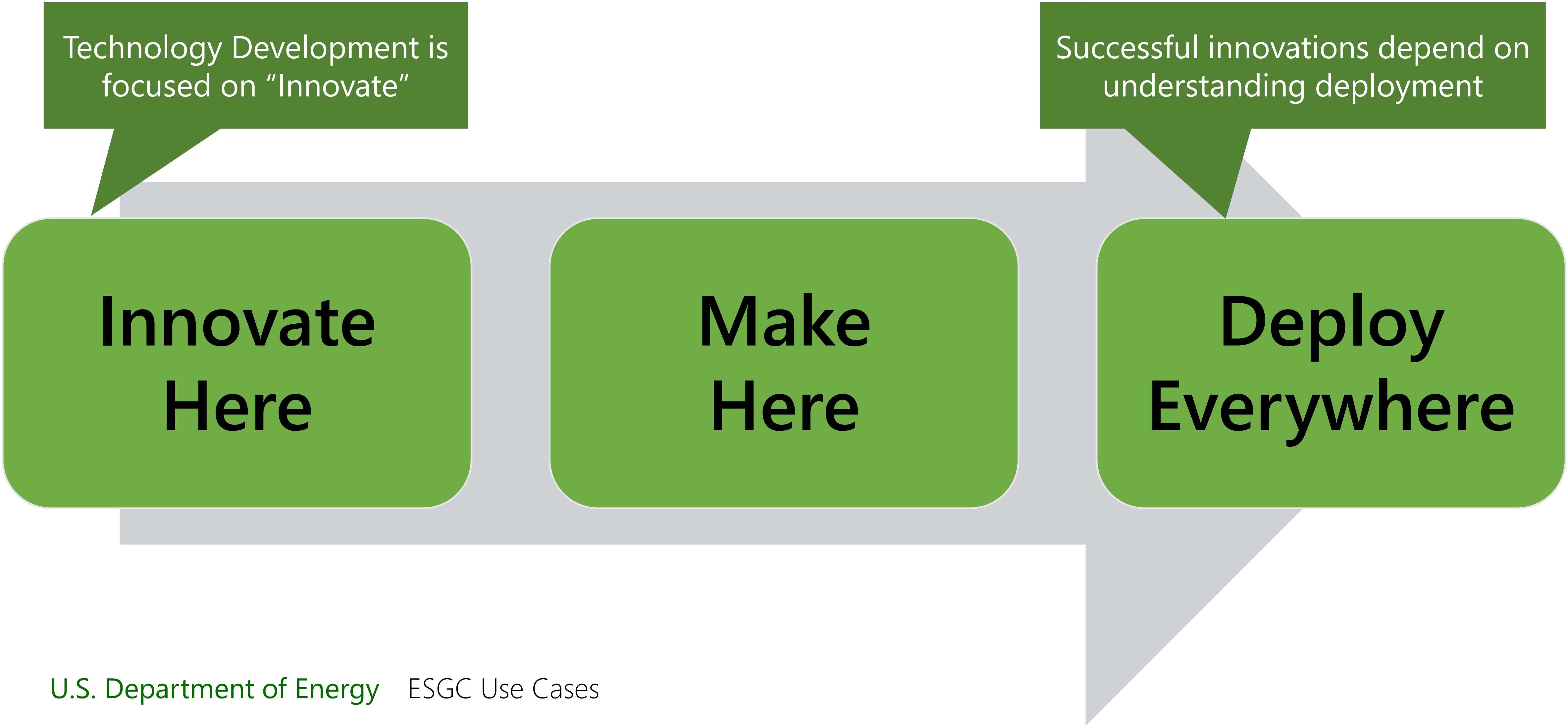
Five tracks to achieve US leadership in energy storage

Technology Development	Domestic Manufacturing and Supply Chain	Technology Transition	Policy and Valuation	Workforce Development
• Establish ambitious, achievable performance goals, and a comprehensive R&D portfolio to achieve them.	• Design new technologies to strengthen U.S. manufacturing, recyclability, and reduce dependence on foreign sources of critical minerals.	• Accelerate the technology pipeline from research to system design to private sector adoption through rigorous system evaluation, performance validation, siting tools, and targeted collaborations.	• Develop best-in-class models, data, and analysis to inform the most effective value proposition and use cases for storage technologies.	• Train the next generation of American workers to meet the needs of the 21st century grid and energy storage value chain.

ESGC in Summary



Technology Development



Use Case-Informed R&D Framework

Stakeholder Vision

- What are your energy or infrastructure goals?
  - Home, business, community, regional
  - Potentially accelerated with next-generation storage

Use Case Framework

- Who are the beneficiaries?
- What are the performance requirements?
- What are other technical or deployment constraints?

Technology Portfolio

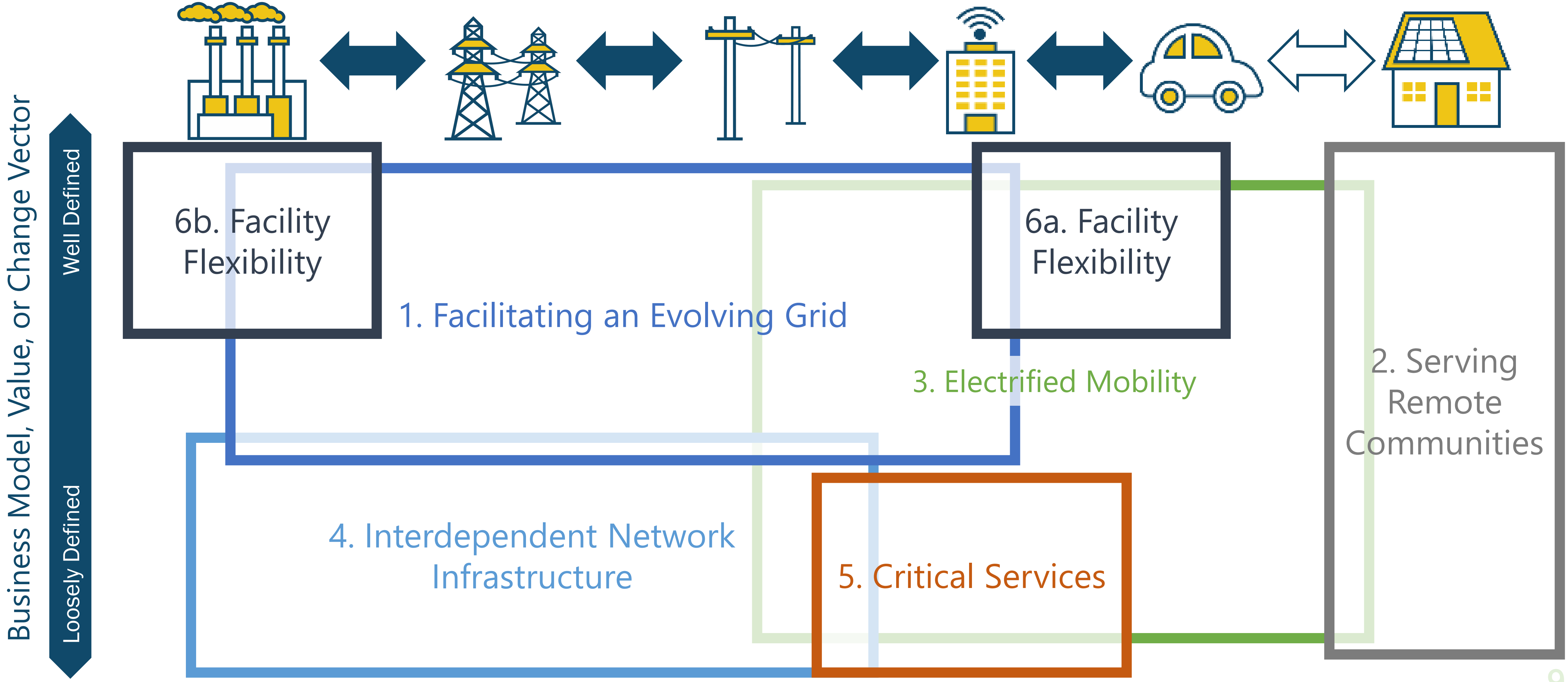
- What technologies could meet the use case need?
- Can substantial progress (cost, performance) be made by 2030?

Accelerate Pathways

- What is the R&D pathway to achieving commercial viability?
- What DOE resources (consortia, partnerships, test facilities, programs) would be utilized to accelerate each technology?

Updated Biannually

ESGC Use Cases



1. Facilitating an Evolving Grid

Scope	• The U.S. electric power system
Major Drivers	• Increasing adoption of variable renewable energy • Dynamic changes in customer demand • Weather, physical, and cyber threats
Success Statement	• Cost-effective storage, flexibility, and enabling technology solutions to maintain and enhance the provision of electricity services to end users as the grid increases in complexity and diversity.

Beneficiaries	• Utilities, balancing authorities
	• Localities, states, regions
	  • With high carbon-free electricity mandates
	  • Facing increasing external threats

Brattle estimated the benefit of distribution investment deferral at $14/kW-year [in Texas]; Edgette et al. estimated $104/kW-year [in Minnesota]; Maitra et al. estimated $9/kW-year [in the LADWP area]

Balducci, Patrick J., et al. "Assigning value to energy storage systems at multiple points in an electrical grid." Energy & Environmental Science 11.8 (2018): 1926-1944.

"…energy storage capacity costs below a roughly $20/kWh target would allow a wind-solar mix to provide cost-competitive baseload electricity in resource-abundant locations…"

Ziegler, Micah S., et al. "Storage requirements and costs of shaping renewable energy Toward grid decarbonization." Joule 3.9 (2019): 2134-2153.

2. Serving Remote Communities

Scope

- Island, coastal, and remote communities

Major Drivers

- Electricity premium due to fuel logistics and maintenance
- Fuel supply disruptions

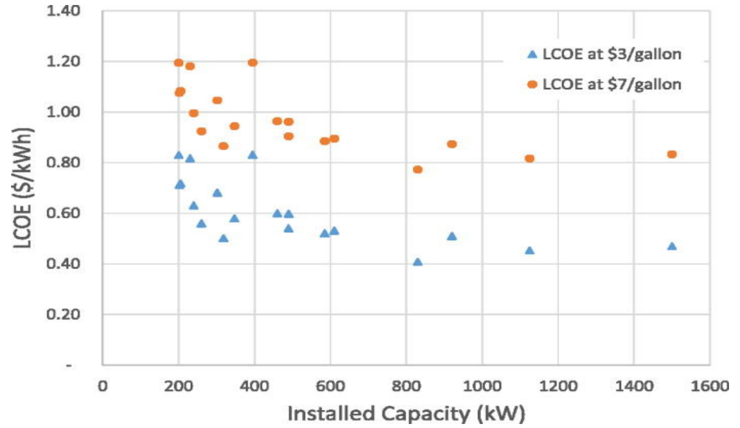
Success Statement

- Clean, resilient, and cost-effective storage and flexibility solutions to provide electricity for critical and beneficial public services.

Beneficiaries

- Communities
  - without current electrical infrastructure
  - power provided by delivered fuel
  - bulk power connections are not practical or economically unfeasible
- Remote Department of Defense locations
- Grid connected regions to improve local resiliency and flexibility

Levelized cost of electricity for Alaskan Communities under different fuel costs



Nathan Green; Marc Mueller-Stoffels; Erin Whitney; Journal of Renewable and Sustainable Energy 9, 061701 (2017) DOI: 10.1063/1.4986585

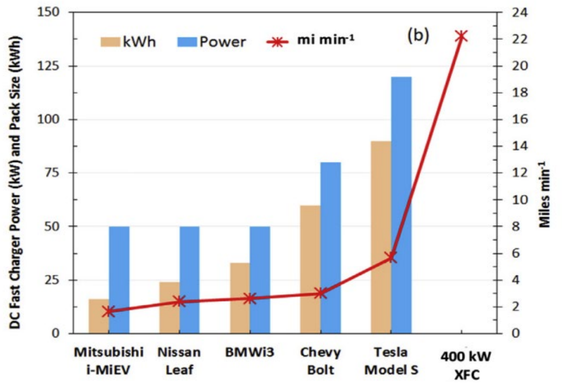
"Oregon's Office of Emergency Management encourages people to be prepared to be on their own for a minimum of two weeks."

https://www.oregon.gov/OEM/hazardsprep/Pages/2-Weeks-Ready.aspx

3. Electrified Mobility

Scope	• Charging infrastructure • Energy storage systems for electric vehicles
Major Drivers	• Fast charging can stress the delivery capacity of the local distribution grid • Opportunity for lower manufacturing costs and improved performance of electric vehicle batteries
Success Statement	• Clean and cost-effective storage solutions that facilitate a large-scale adoption of electric vehicles while maximizing beneficial coordination with the power grid.

Beneficiaries	• Fleet owners, including
	  • Department of Defense
	  • Delivery companies, logistics operators
	  • Emergency and first responders
	• Electric utilities
	• End consumers
	• New business models, such as charging station operators



"During high use times, multiple XFC events may occur either simultaneously at a single location or back-to-back at the same location. An effective energy storage solution would need to be able to buffer both the power and energy demands of such a station."

USDOE, "Enabling Fast Charging: A Technology Gap Assessment" October 2017

4. Interdependent Network Infrastructure

Scope	• Other infrastructure sectors critical to the electric grid, including • Natural gas and water • Communications, information technology, financial services
Major Drivers	• Interdependencies mean loss of function and service within these infrastructure can have far-reaching costs and impacts
Success Statement	• Cost-effective storage solutions that sustain and enhance normal operations amidst short term disruptions of energy inputs.
Beneficiaries	• Owner-operators of critical infrastructure equipment and systems

"Most telecommunications facilities have at least eight-hour backup— often required by regulation—but locations prone to lengthy power outages, such as hurricane-prone areas, require backup capability between 24 and 72 hours."

https://www.hydrogen.energy.gov/pdfs/44520.pdf

5. Critical Service Resilience

Scope	• Critical sectors, including:
	  • Defense
	  • Emergency Services
	  • Government Facilities
	  • Healthcare and Public Health
	• Companies, manufacturers, who need to maintain operations

Major Drivers	• Disaster-related and other power outages
Success Statement	• Cost-effective storage solutions that maintain critical services for a sufficient duration following extended power outages.
Beneficiaries	• Owners, operators, and users of critical sector facilities • Residents and businesses relying on critical services

Hospitals: <2% of commercial floorspace, 4.3% of commercial energy consumption.
https://www.eia.gov/consumption/commercial/reports/2007/large-hospital.php

"At a minimum MDLARA will require that sufficient on-site fuel storage be available to provide… demand for at least 24 hours."

Michigan Department of Licensing & Regulatory Affairs
Requirements For Emergency Fuel In Hospitals
https://www.michigan.gov/documents/mdch/Emergency_Fuel_and_Water_Supply_for_Hospitals_199271_7.pdf

Requirements regarding onsite fuel source during emergency [for FL Assisted Living Facilities]:
- 16 beds or less = 48 hours
- 17 or more beds = 72 hours

http://jchc.virginia.gov/5.%20Assisted%20Living%20Facilities%20-%20Generator%20Requirement%20FINAL.pdf

6. Facility Flexibility, Efficiency, and Value Enhancement

Scope	• Commercial and Residential Buildings
Major Drivers	• Enhance the overall facility value to the owner, operator and the end consumer
Success Statement	• Storage and flexibility solutions that deliver net benefits including energy expenditures, comfort, and functionality.
Beneficiaries	• Commercial and residential building owners, operators, and occupants

"In an effort to save taxpayers money…GSA has enrolled approximately 25 MW of load in demand response programs and receives about $1 million in annual benefits." [$40/kw-yr equiv.]

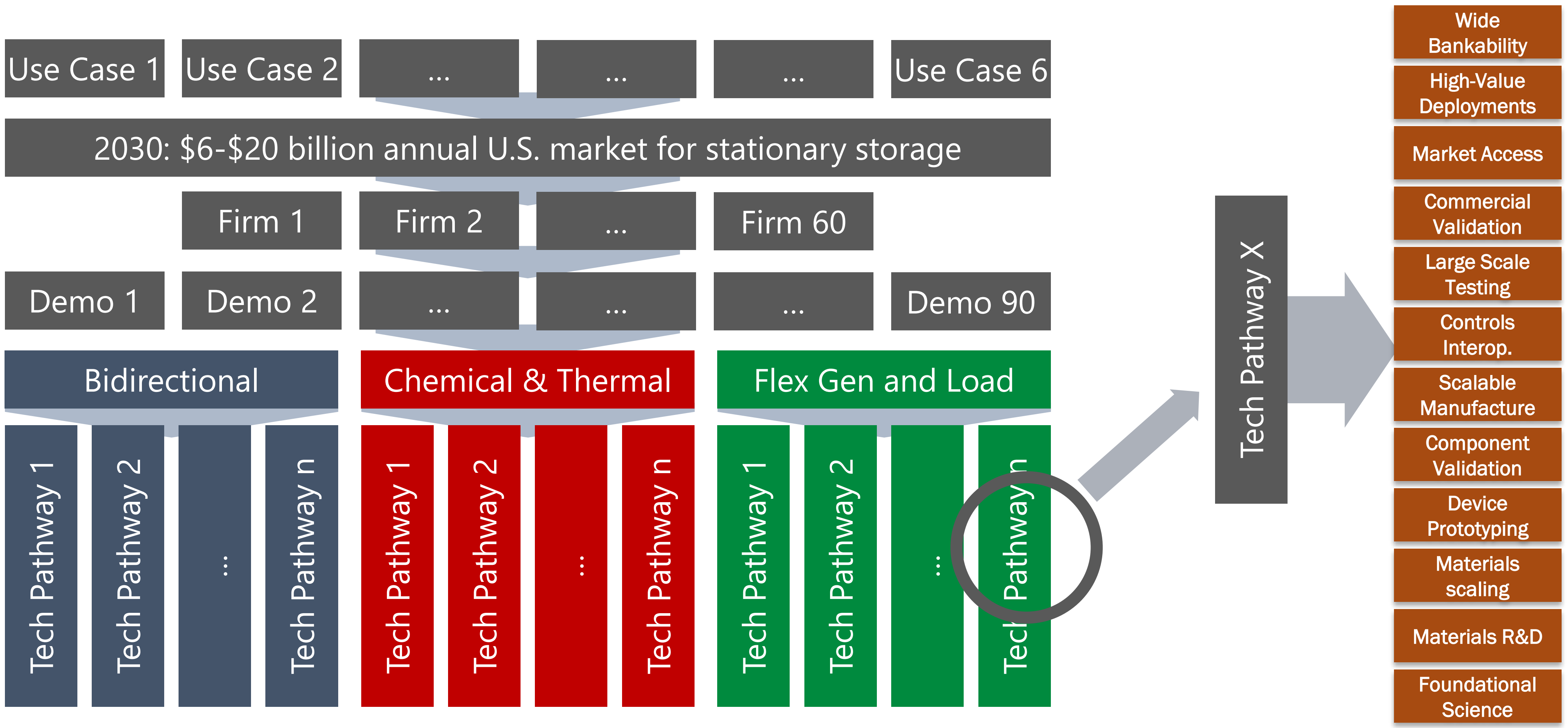
https://www.ferc.gov/legal/staff-reports/2019/DR-AM-Report2019.pdf

Scope	• Energy-Intensive Facilities, including • Electric Power Generation • Industrial Process Applications
Major Drivers	• Opportunities for improvement in economics, flexibility, and market diversity
Success Statement	• Storage and flexibility solutions that maximize the total value obtained from the process of interest.
Beneficiaries	• Utility plant owners, operators and shareholders • Industry plant owners, operators, and shareholders

"Upgrades to increase the maximum output, decrease the minimum output, increase the ramp limit, and combinations of all features would lead to a greater increase in net revenues under…a recent proposal by PJM to reform its reserve market."

https://www.eme.psu.edu/sites/www.eme.psu.edu/files/rewarding_flexibility_pjm_final_1.pdf

Technology Portfolios: 2030 U.S. Storage Industry Scenario



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Use Cases Panel

Moderator

Lola Infante

Member, DOE Electricity Advisory Committee; Edison Electric Institute

Panelists

- **Facilitating An Evolving Grid** – Sandip Sharma, Electric Reliability Council of Texas
- **Serving Remote Communities** – Larry Jorgensen, Homer Electric Association
- **Electrified Mobility** – Jordan Smith, Southern California Edison
- **Critical Service Resilience** – Steve Baxley, Southern Company
- **Interdependent Network Infrastructure** – Joshua Ruddick, Eugene Water and Electric Board
- **Facility Flexibility, Efficiency and Value Enhancement** – Andrew Maxson, Electric Power Research Institute

Facilitating An Evolving Grid

Sandip Sharma

Manager, Operations Planning

Electric Reliability Council of Texas (ERCOT)

ERCOT Grid- Brief Introduction

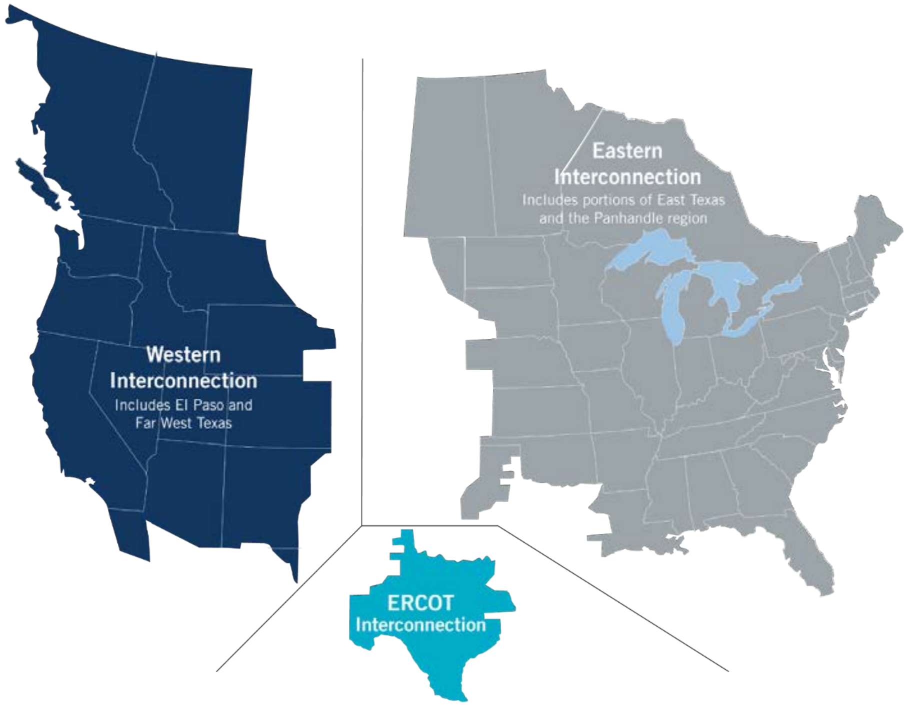
ERCOT ISO is a nonprofit organization and regulated by the Public Utility Commission of Texas, with oversight by the Texas Legislature

Peak Demand Record: 74,820 megawatts (MW)

- Aug. 12, 2019, 4-5 p.m.

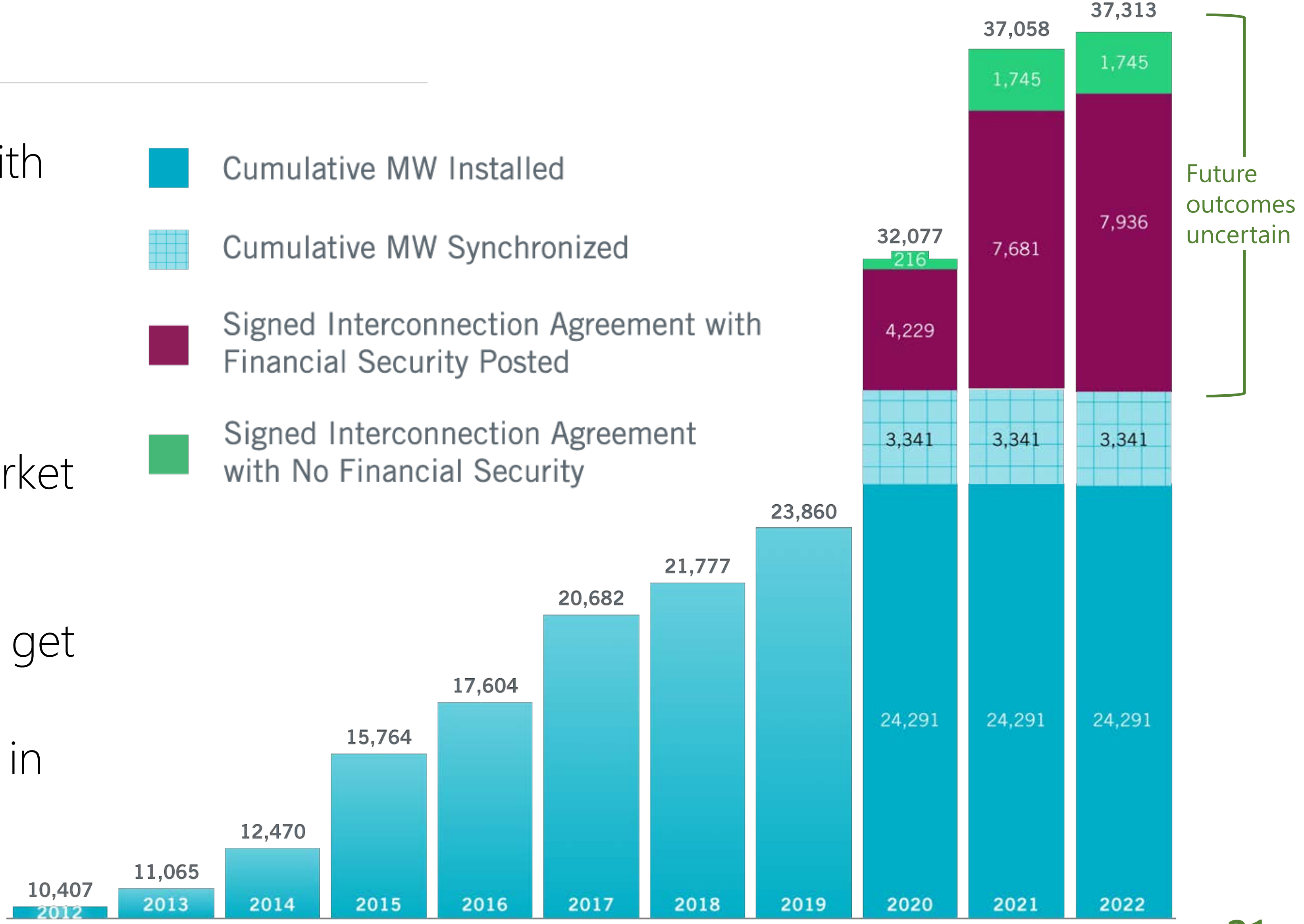
Wind Generation Records (instantaneous)

- Output: 21,144 MW on May 7, 2020, 20:43
- Penetration (load served): 59.30%
    - May 2nd, 2020, 2:10 a.m.
    - Total MW Served by Wind = 19,426 MW



Wind Generation Capacity – April 2020

- Steady growth continues, with some spikes.
- Largest annual increases:
  - 3,294 MW in 2015
  - 3,078 MW in 2017
- Tax incentives and other market drivers affect construction decisions and schedules.
- Not all planned projects will get built.
- Texas continues to lead U.S. in wind capacity.

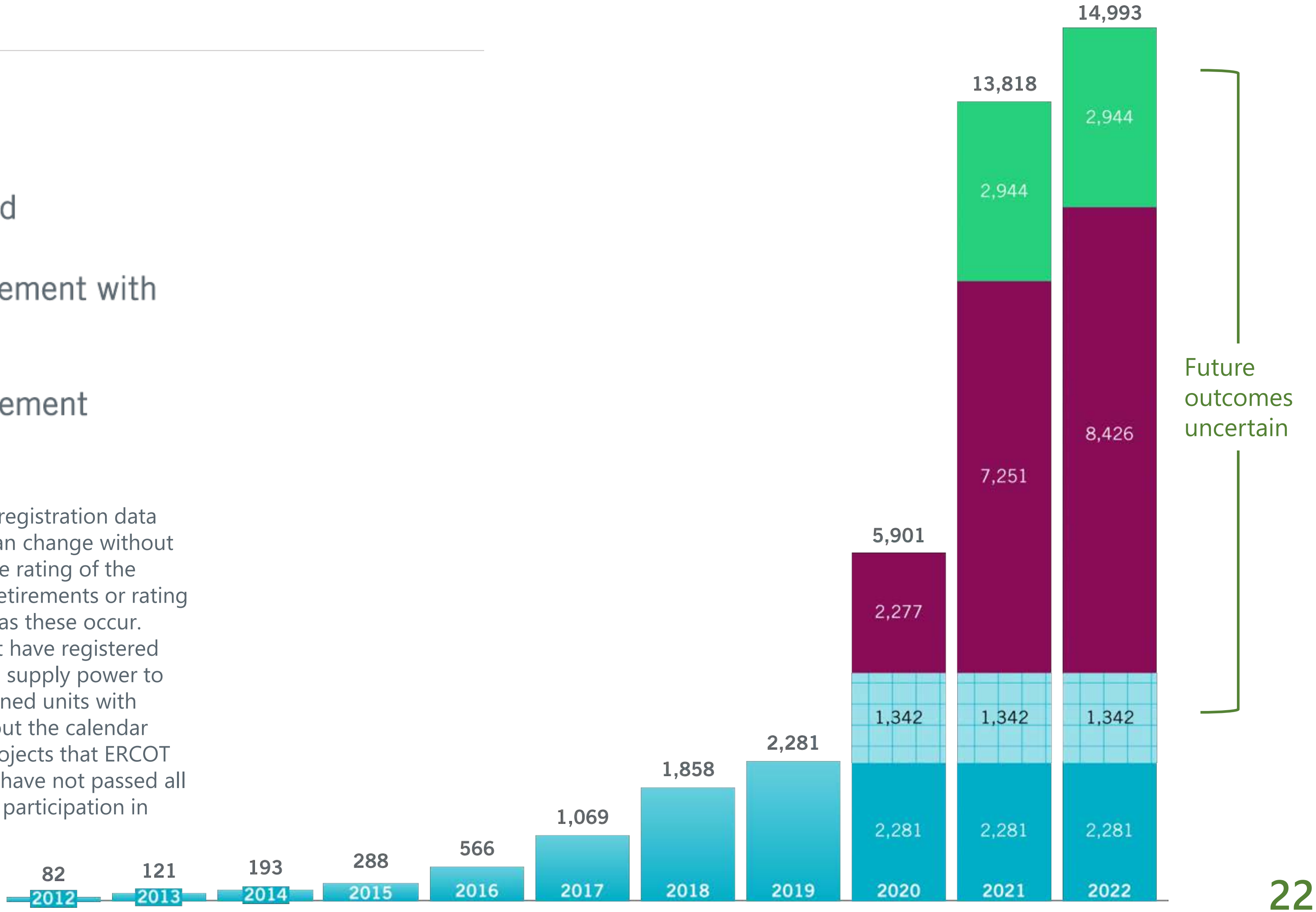


Cumulative MW Synchronized pertains to projects that ERCOT has approved to generate energy for the grid but have not passed all qualification testing necessary to be approved for participation in ERCOT market operations.

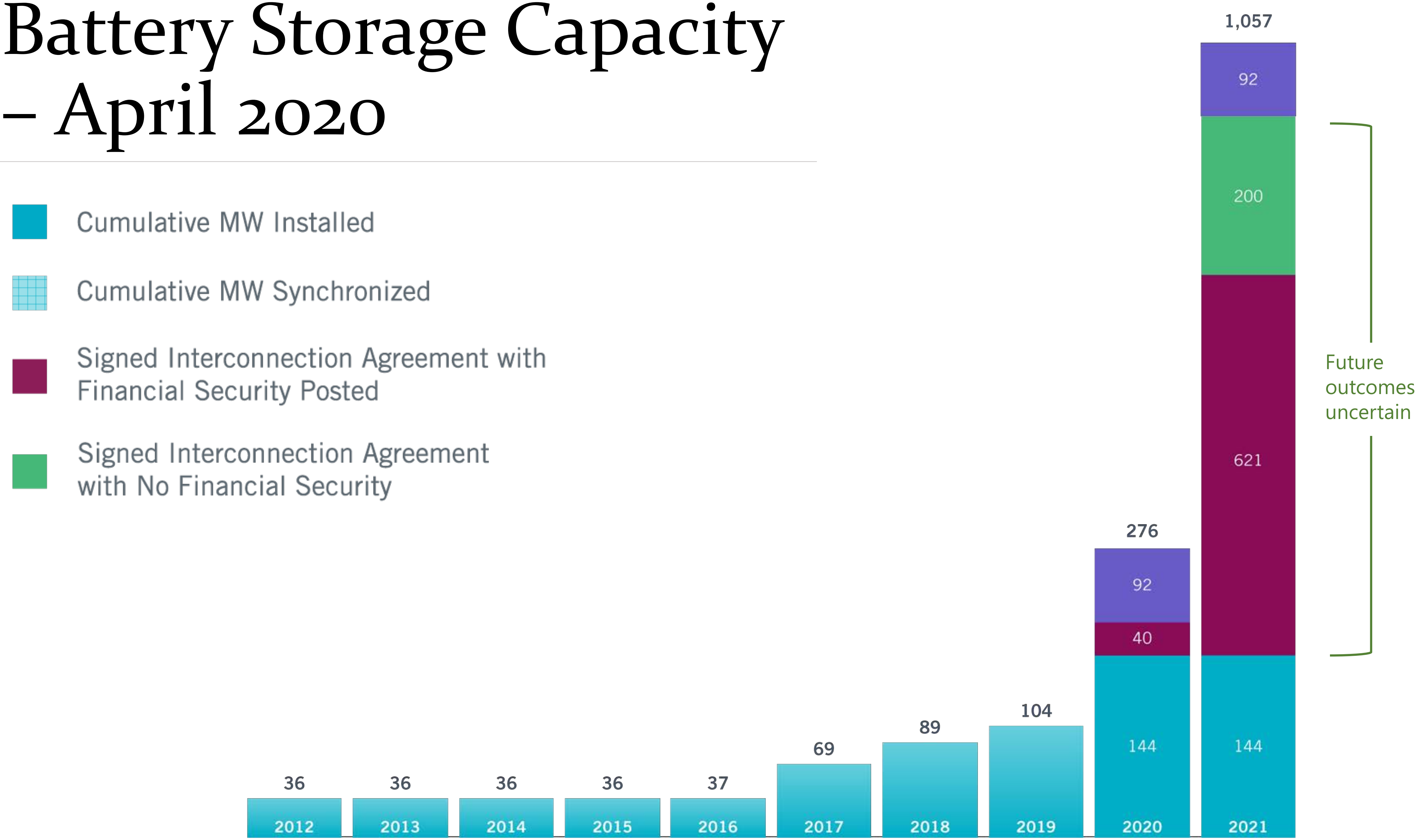
Utility Scale Solar Generation Capacity – April 2020

- Cumulative MW Installed
- Cumulative MW Synchronized
- Signed Interconnection Agreement with Financial Security Posted
- Signed Interconnection Agreement with No Financial Security

The data presented here is based upon the latest registration data provided to ERCOT by the resource owners and can change without notice. Installed capacities are based on nameplate rating of the commercially operational generation and reflect retirements or rating changes due to facility expansions or repowering as these occur. Installed capacities include only solar facilities that have registered with ERCOT (Those larger than one megawatt and supply power to the ERCOT system.) This chart reports annual planned units with projected Commercial Operations Dates throughout the calendar year. Cumulative MW Synchronized pertains to projects that ERCOT has approved to generate energy for the grid but have not passed all qualification testing necessary to be approved for participation in ERCOT market operations.



Battery Storage Capacity – April 2020



Cumulative MW Synchronized pertains to projects that ERCOT has approved to generate energy for the grid but have not passed all qualification testing necessary to be approved for participation in ERCOT market operations.

Long Term Vision and Goals

Time frame: 2030 and beyond

- Grid Inertia will continue to decline
- Weak grid issues will be more widespread
- Our dependency on faster ramping Resources will increase
- Intra-hour variability will continue to increase
- Risk of forecast uncertainty will continue to increase
- Ancillary Services will play important role in mitigating risks and maintaining system reliability.

Technology Needs/Opportunities

Where can R&D help?

1. Grid-Forming Inverters
2. Flexible Batteries that can provide continuous supply for energy for longer duration
3. Batteries that can mitigate system inertia issues
4. Firm-up Solar and Wind plants
5. Tools and applications that allow better modeling and allow more accurate study of battery capabilities

Serving Remote Communities

Larry Jorgensen

Director of Power, Fuels & Dispatch

Homer Electric Association

Project/Stakeholder Description

Homer Electric Association serves the Alaskan Kenai Peninsula. The Kenai Peninsula is known as “Alaska’s Playground”.

- ~35,000 meters in 3,166 sq. miles of service area.
- Connected to Alaskan “grid” via a single 115 kV tie line.
- Natural Gas price ~3.5 times higher than the lower 48.
- Current Electrical production is 90% from natural gas and 10% from hydro-electric.
- Installing a 93 MWh two hour Megapack battery from Tesla. (scheduled in service August 2021)

Long Term Vision and Goals

Time frame: 2030 and beyond

- Greater diversification of fuel/energy sources, thereby reducing exposure to high natural gas prices and market volatility.
- Overall reduction in GHG production with long-term sustainability.
- Increased penetration of renewables. On track to achieve 18% before 2030.
- Maintain system reliability especially during long, cold, and dark Alaskan winters.

Technology Needs/Opportunities

Where can R&D help?

- Development of the untapped Cook Inlet tidal resource with tides varying from 20 to 30 feet.
- Tidal machines that can operate in water with high amounts of glacial silt, critical habitat for endangered species (Beluga Whales), and as well as protected salmon habitat.
- Integration with energy storage to ensure beneficial use of tidal energy production without curtailment due to system constraints.

Electrified Mobility

Jordan Smith, P.E.

Consulting Engineer,
Grid Technology Innovation

Southern California Edison

Southern California Edison

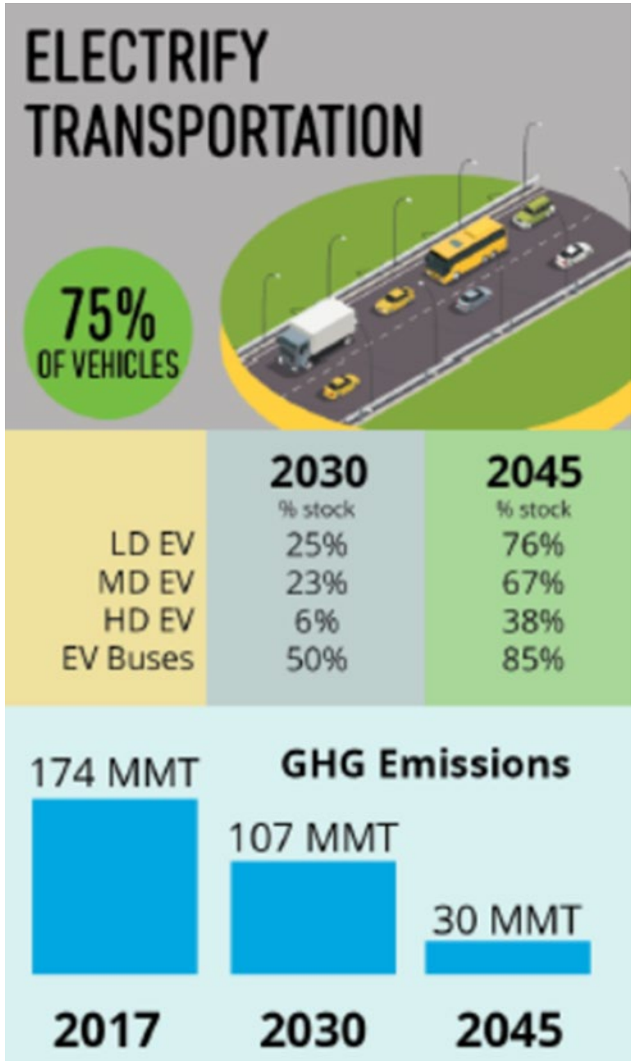
SCE System Characteristics

- 50,000 square-mile service area
- 5 million customer accounts
- 15 million residents
- Infrastructure
    - 1.4 million poles
    - 700,000 transformers
    - 103,000 miles of T&D lines
- Driven by:
    - Safety and reliability
    - Distribution Resources Plan
    - Renewables
- Electric Vehicle charging and energy storage
- Pathway 2045

Pathway 2045 to Clean the Electric Grid and Reach Carbon Neutrality

By 2045:

- 100% of retail sales carbon free
- 40% increase in peak load
- 80 GW of new generation3
- 30 GW of new energy storage needed
- 75% of vehicles electric
- 70% of buildings electric
- Two thirds of medium-duty trucks
- One-third of heavy-duty trucks



Technology Needs/Opportunities

Electric Program Investment Charge (EPIC)

Ratepayer funded program for electric system RD&D to meet states goals

- R&D portion managed by California Energy Commission
- Demonstration portion managed by state's IOUs, such as SCE

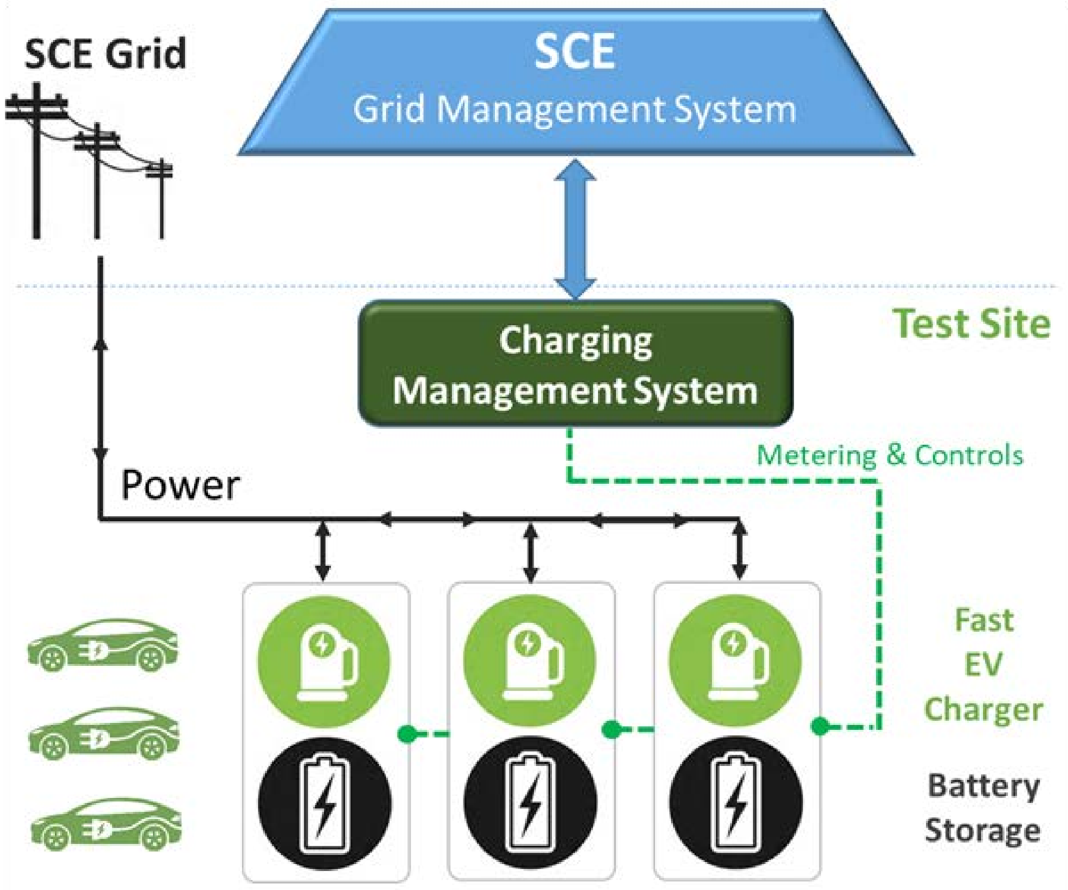
Now in IOU Demonstration Tranche 3 of 3

- 26 projects in various stages of forming and execution
- 3 Transportation Electrification projects

Distributed Charging Resources

Objectives

- Demonstrate function of high power EV charging integrated with utility operated batteries
- Reduce EV charger demand and energy costs from customer perspective
- Optimally charge EVs as quickly as possible and maintain high utilization
- Test use case for second life battery application
- Demonstrate functionality system to provide grid services

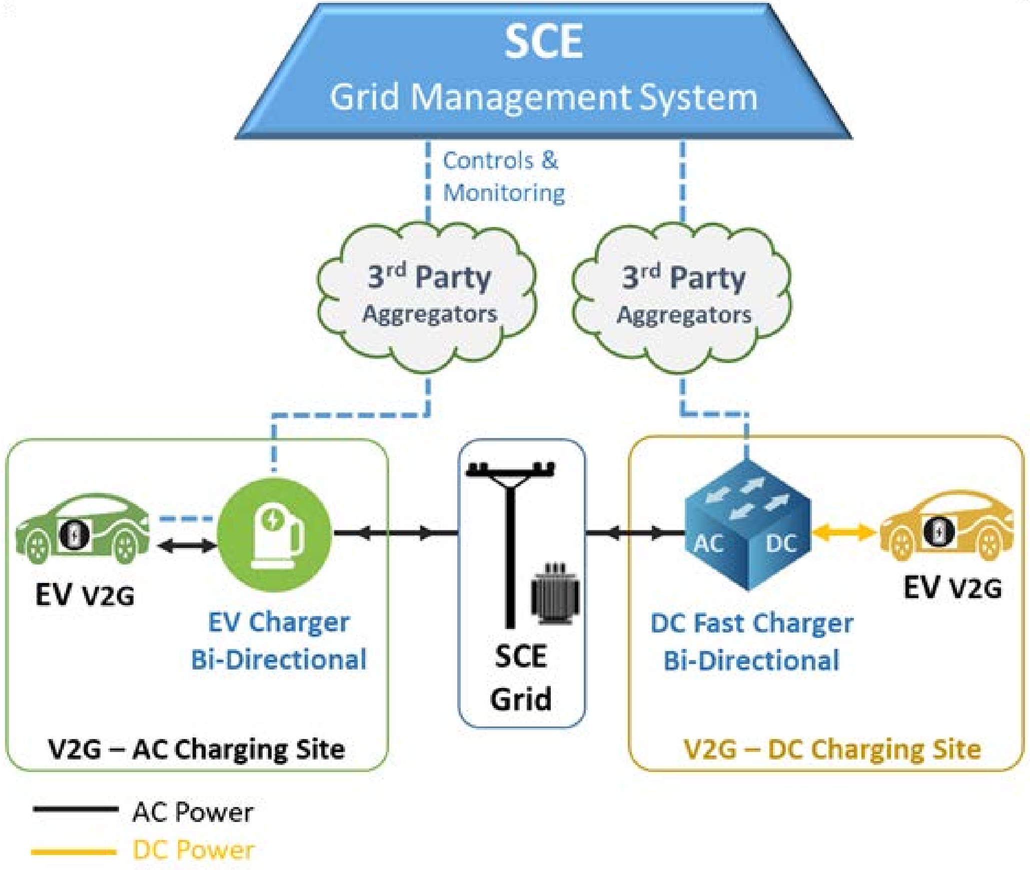


Context Diagram

Vehicle to Grid Integration

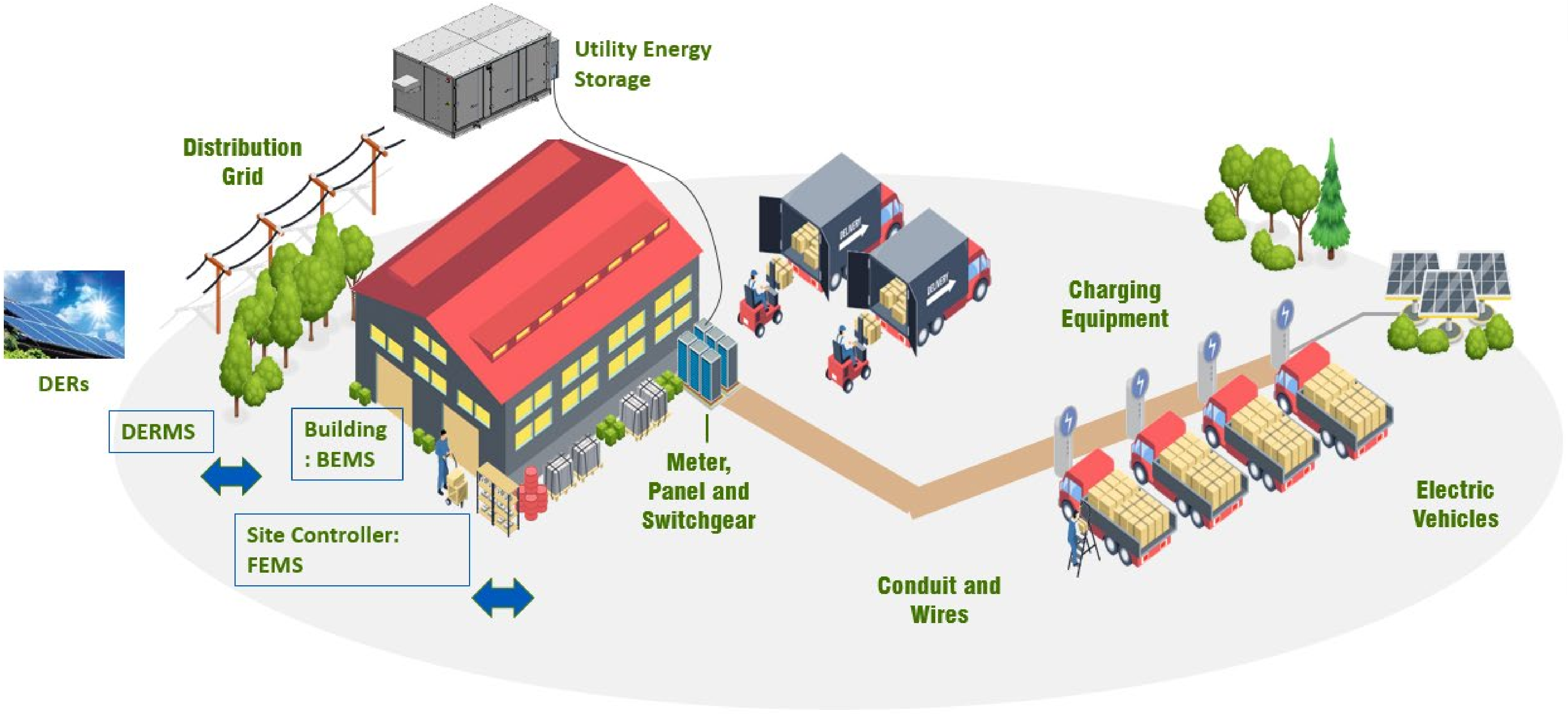
Objectives

- Validate controlled bidirectional EV charging (V2G) in lab and field demonstration
- Demonstrate interconnection requirements of customer-owned V2G systems
- Validate V2G use case to support customer bill reductions and distribution grid services
- Interconnect commercial V2G electric buses at customer site to demonstrate grid service



Context Diagram

Service Center of the Future



SCOF Demonstration

Objectives

- Demonstrate an innovative approach to large heavy-duty fleet EV service using energy storage, integrated managed charging and DERs
- Implement a site energy controller, integrate EV chargers, add submetering, and electrify a building
- Optimize charging per fleet operations, tariffs, and DERs to ease site EV charging demand on grid while minimizing customer costs
- Aggregate facility DERs and connect with Grid Management System to provide local grid services

Use Case Examples

Some of the Use Cases to be demonstrated:

USE CASE 1: Demand Charge Mitigation, Demand Response

- Load-leveling strategy to reduce a customer's peak demand
- Fleet Management System (FEMS) reduces EV peak demand
- FEMS manages charging based on demand response (DR) event

USE CASE 2: Rate-based Charging Management

- FEMS manages battery to limit charging demand based on rates and facility tariffs
- FEMS limits power from grid by curtailing loads and PV, or leveraging ESS battery

USE CASE 4, 6: Voltage Support, Resiliency

- FEMS supports over/under voltage conditions using ESS
- FEMS monitors local voltage until voltage constraint condition is rectified
- In simulated outage the ESS will continue to support EV charging needs

Critical Service Resilience

Steve Baxley

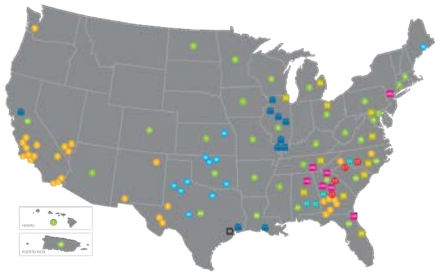
Manager - Renewables, Storage, and Distributed Generation

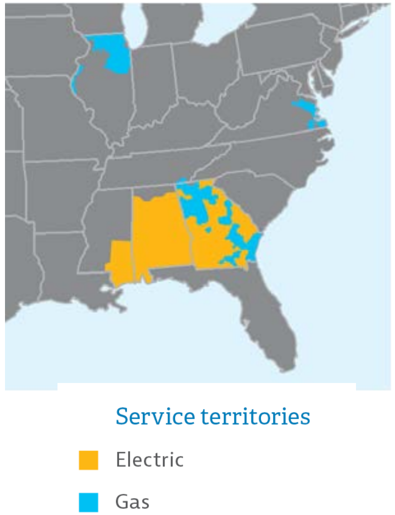
Southern Company

Project/Stakeholder Description

Southern Company provides clean, safe, reliable, and affordable energy

- Continue to provide **clean**, **safe**, **reliable/resilient**, and **affordable** energy
- Communities and customers that suffer from frequent environmental stresses or threats—*hurricanes and tornadoes*
- End users relying on life safety systems — *hospitals, emergency services, nursing homes*
- Military bases (require longer-duration storage than currently exists)





7
Electric & Natural Gas Utilities

9 Million
Customers

Approximately
29,000
Employees

Approximately
44,000 MW
of Generating Capacity

Project/Stakeholder Description

Two first-of-a-kind smart home communities at the intersection of energy efficiency, distributed energy resources & buildings-to-grid integration and the traditional utility model

Georgia Power — Smart Neighborhood™

Alabama Power — SMART NEIGHBORHOOD®

- **46 townhomes**
- Atlanta, Georgia
- Homeowner owned solar + storage
  - → 3.6 kW solar
  - → **20 kWh storage**
- Grid integration of solar, storage, HVAC, water heating & EV charging

- **62 single-family homes**
- Birmingham, Alabama
- Utility owned, grid-connected microgrid
  - → 330 kW solar
  - → **680 kWh storage**
  - → 400 kW NG generator
- Grid integration of microgrid, water heating & HVAC

Major Research Partners

Oak Ridge National Laboratory
Electric Power Research Institute
US Department of Energy

Key Vendor Partners

LG Chem, Delta, Carrier, ecobee, Rheem, SkyCentrics, Flair, Vivint, Pulte Homes, Signature Homes

Key Results

Homes are 30-40% more efficient
EV makes up 15-20% of total usage
Successful microgrid islanding
New business opportunities deployed

Long Term Vision and Goals

Time frame: 2030 and beyond

- Maintain critical services (military, communities, campuses, government, healthcare) during extended power outages
- Support grid recovery after disruptions from natural disasters or intentional threats (e.g. cold load pickup)
- Open, standardized interface to storage technologies for rapid control integration at all points of interconnection on the grid
- Co-optimize storage and DER with demand side flexibility and energy use for long duration outage events
- Intelligent dispatch of energy storage during disaster events coupled with distribution network topology

Technology Needs/Opportunities

Where can R&D help?

- Cost-effective technologies with sufficient storage duration and capacity
- Technologies and guidance supporting robust energy storage safety
- Technologies and guidance to support reliability of storage
- Power and storage-system electronics and controls; wider grid integration
- Tools for appropriate sizing of storage to support critical facilities/loads
- End-use optimization to accelerate the adoption of storage technologies
- Enabling emergency storage systems to provide grid services during normal times

Interdependent Network Infrastructure

Joshua Ruddick

Eugene Water and Electric Board

Interdependent Network Infrastructure

EWEB Grid Edge Demonstration Project: Howard Elementary

- EWEB
- Sandia National Laboratories
- Oregon DOE
- CESA
- Worley Parsons
- NEC
- Eugene School District 4J

Special Thanks

- Funding from US DOE, Dr. Imre Gyuk Energy Storage Program Manager

Grant Scope

- Install energy storage system equal or larger than 500kW
- Project must run connected to the distribution grid for at least one year
- Provide detailed plan to provide measurement and verification of promised services
- Services (Use Cases) Include:
  - Peak Demand Reduction / T&D Deferral
  - Energy Resiliency / Back-up Power
  - Voltage/VAR Support
  - Frequency Regulation
  - Renewable energy ramping, firming
  - Energy Arbitrage
  - Outage Mitigation
  - Reduction of Transmission Charges (reduction of utility co-incident peak)
  - Reduction of Transmission Charges (generation imbalance)
- Optimization Study

Long Term Vision and Goals

EWEB Resiliency

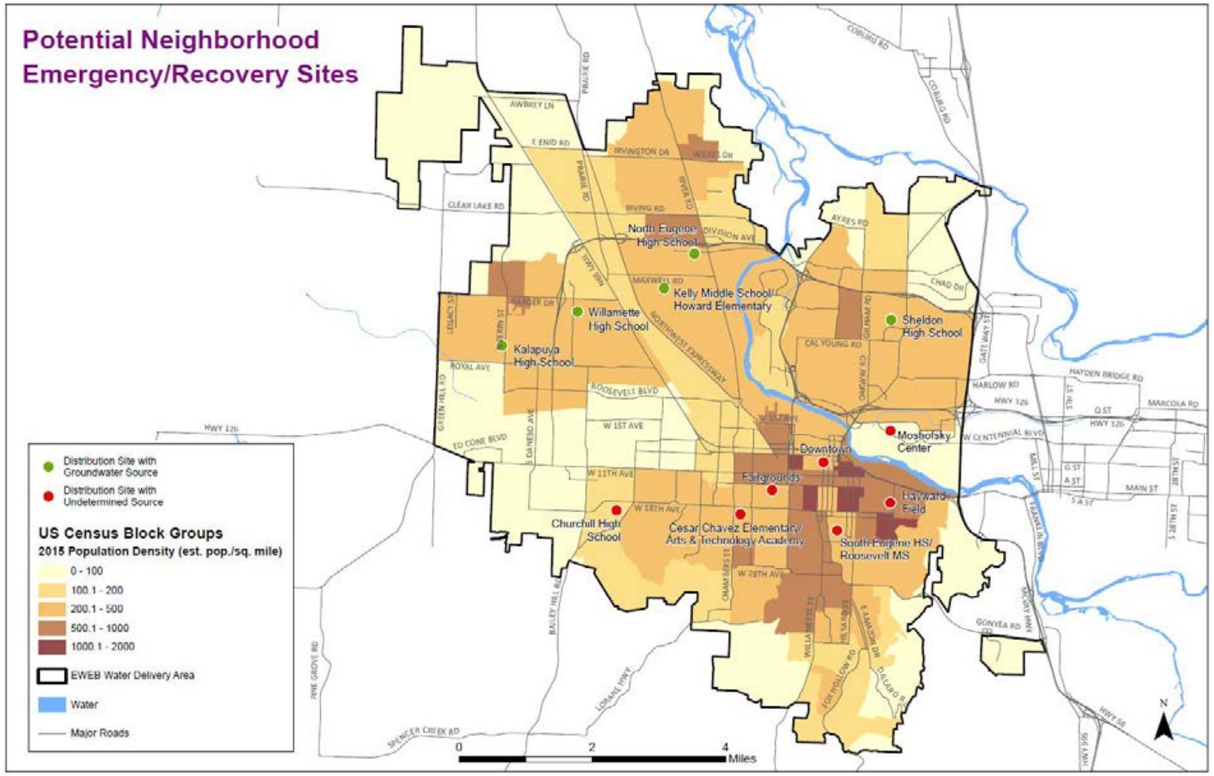
- Emergency Preparedness & Disaster Recovery
  - Rule of 3's (Restoration Order)
    - 3 days – Emergency Water Distribution Sites
    - 3 weeks – Power Critical Facilities
    - 3 months – System Repair and Restoration
- Electric Supply Resources

Long Term Vision and Goals

Goal: 5 Sites in 5 Years

Neighborhood Emergency Water Sites

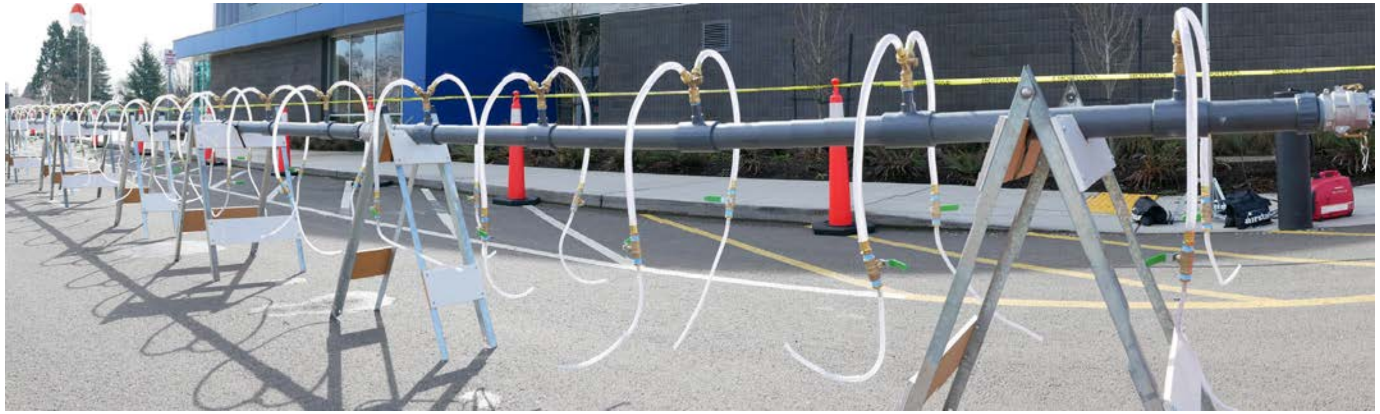
- Community
  - Focusing on Schools and sites already integrated
- Infrastructure
  - Working with local entities with common interest and facilities



BESS Usage

How Does EWEB Intend to Use the BESS?

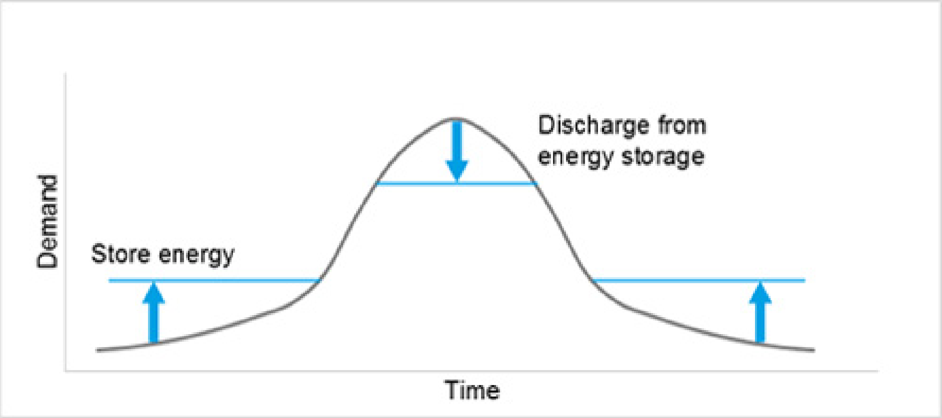
1. Resiliency
   - Customer outage resiliency (short outages)
   - Disaster resiliency
     - Community gathering site
     - Water distribution site
     - Staging area
   - Aggregated generation (future)



BESS Usage

How Does EWEB Intend to Use the BESS?

2. Research
   - Help National Labs with PNW economic analysis (use cases)
   - Develop EWEB interconnection standards for energy storage
3. Economics
   - Customer demand bill reduction
   - Utility BPA bill reduction



Technology Needs/Opportunities

Where can R&D help?

Project challenges to learn from:

1. Metering if behind the meter
2. Additional metering requirements (e.g. BPA)
3. Not self-starting (requires UPS to power controller and Inverter)
4. Unable to charge with solar while islanding
5. Better defined commissioning plan
6. Consolidate battery and inverter
7. Controllers are expensive

BESS and Water Distribution Conex

Facility Flexibility, Efficiency and Value Enhancement

Dr. Andrew Maxson

Electric Power Research Institute, Inc. (EPRI)

EPRI

Research leader in energy storage

- Research, development, and demonstration consortium for the electricity sector
- Founded in 1972
- Independent, non-profit
- ~500 participants from over 40 countries and six continents

- Full spectrum of programs touching all aspects of electricity
- Research on energy storage for over a decade including all types
- Larger-scale, “bulk” energy storage with longer durations is growing in interest for industry

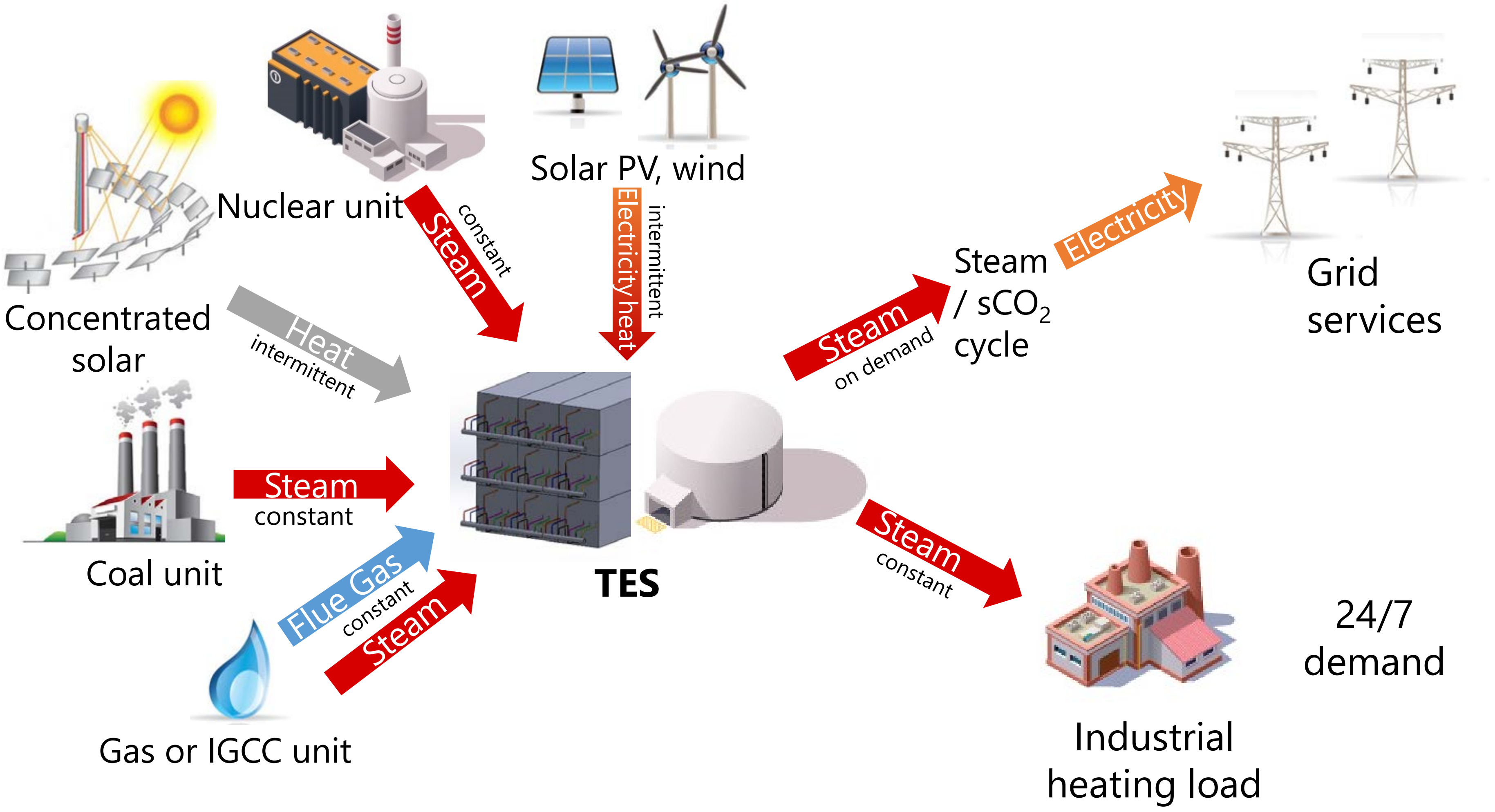
Project/Stakeholder Description

Penetration of renewables has caused thermal facilities to operate in inefficient and non-economic modes

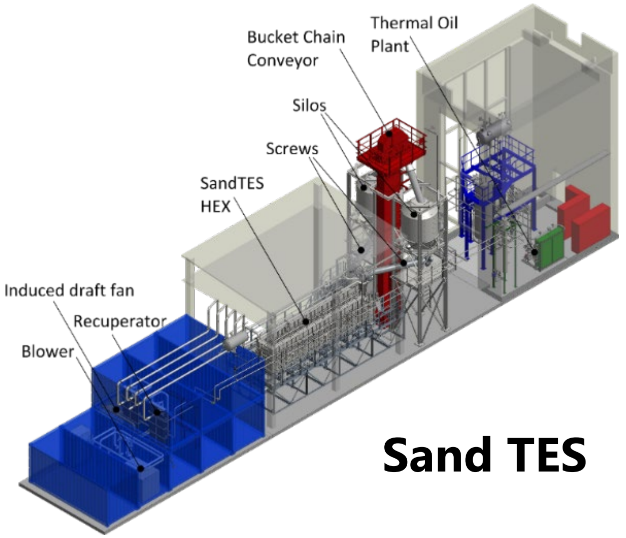
- Capacity factors have decreased while cyclic operation has increased
- Ramping and start-stops increase maintenance and environmental impacts, and reduce efficiency and life
- Overall economics of the facility deteriorates
- Grid instability increases

- Integrate thermal energy storage (TES) so that when power is not needed, energy can be stored, and then used when needed. Facility operates at design capacity factor, improving performance and value.
- Rotating assets are maintained providing "real" system inertia and synchronous power

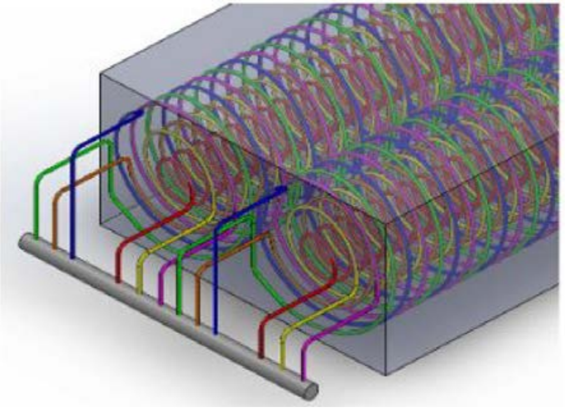
TES Applications



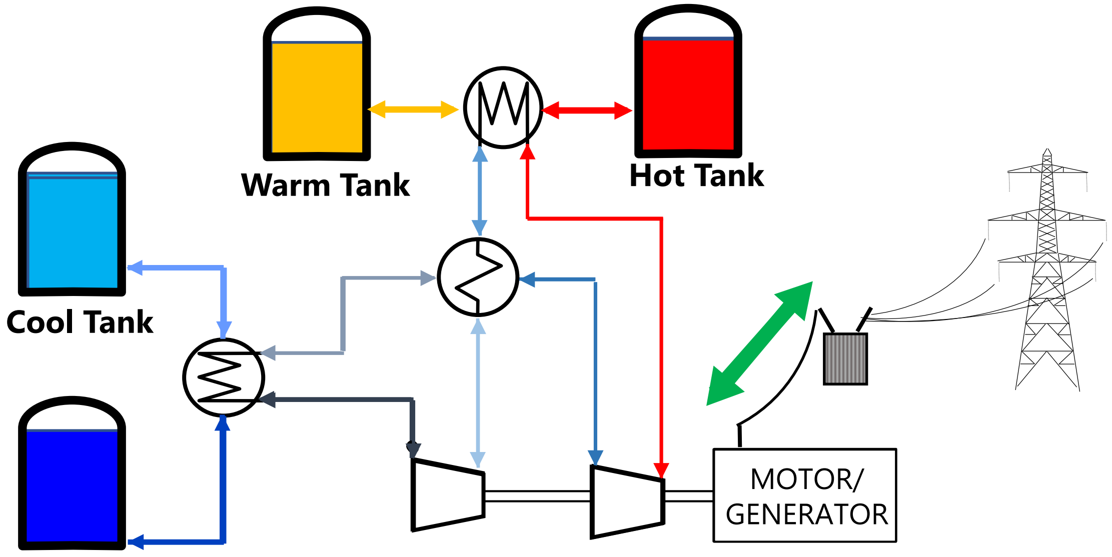
TES Examples



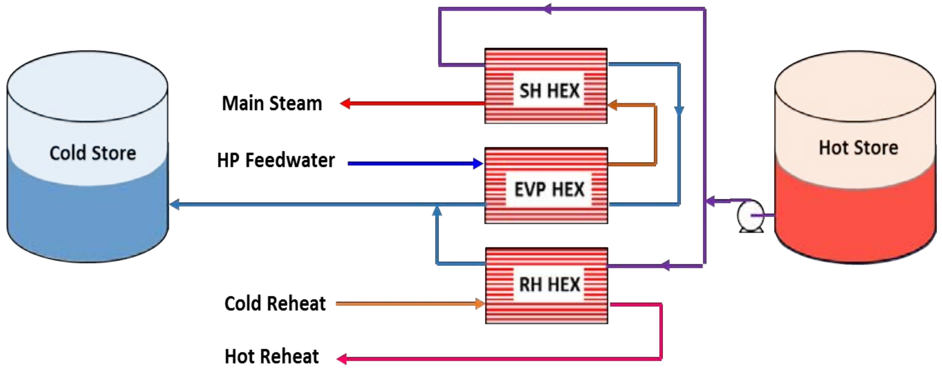
Sand TES



Concrete TES



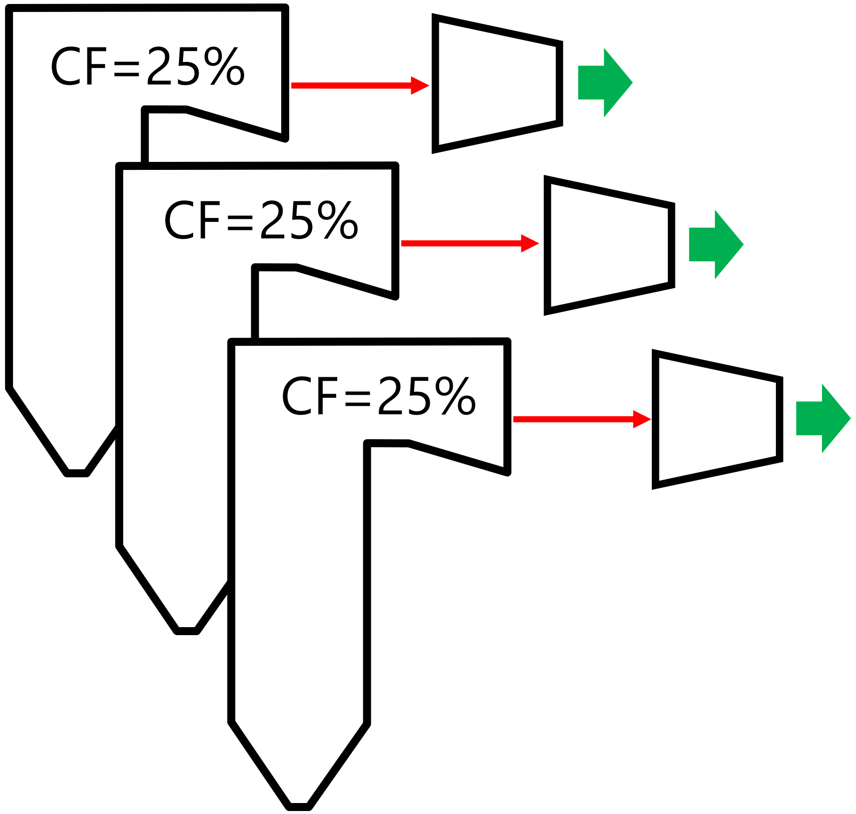
Pumped Heat Energy Storage



Molten Salt TES

Use Case Example

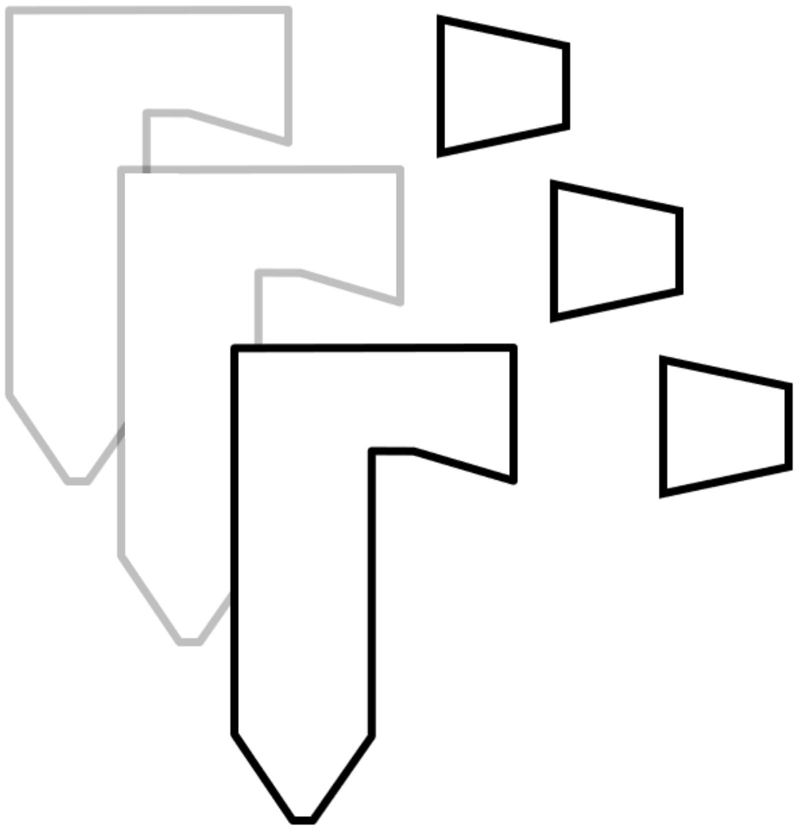
Existing plants start/stop frequently



Use Case Example (cont.)

Existing plants start/stop frequently

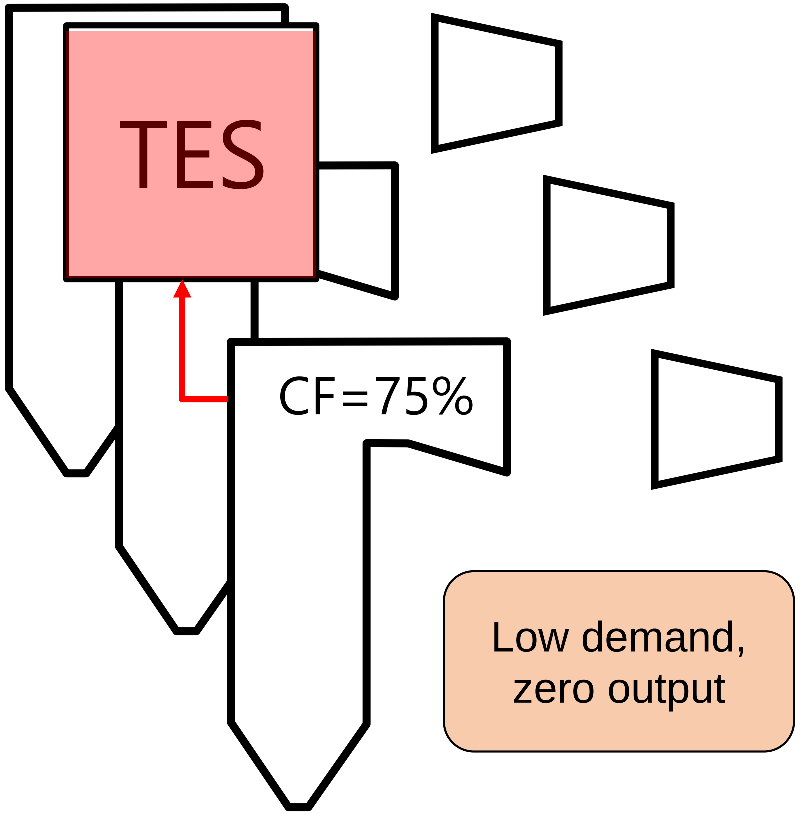
Single plant becomes primary energy source



Use Case Example (cont.)

Existing plants start/stop frequently

Single plant becomes primary energy source

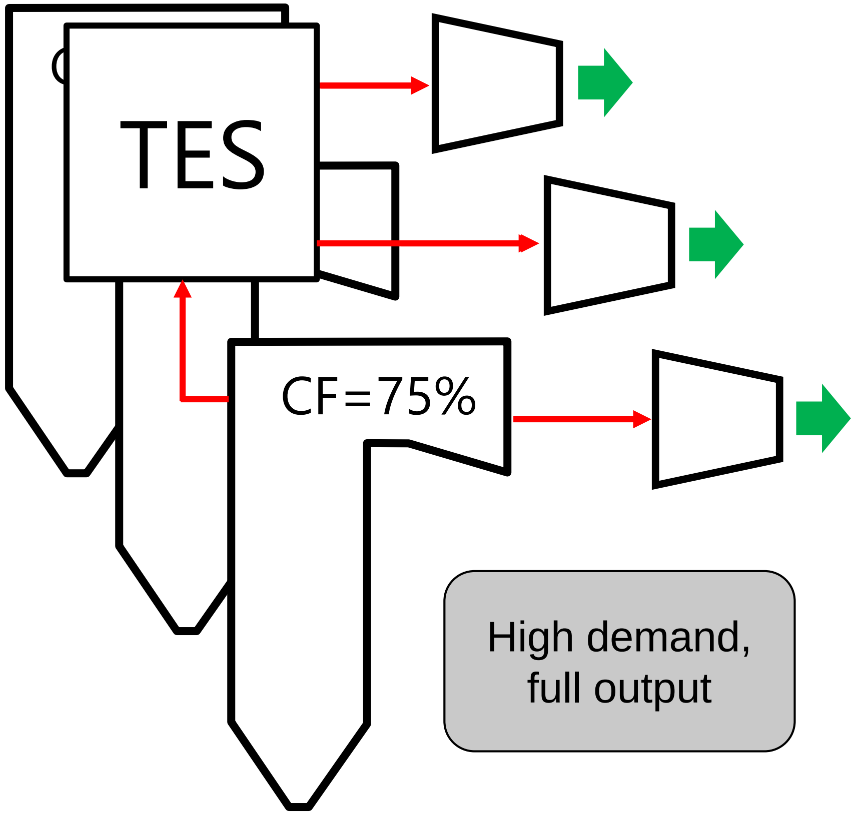


nstall TES to enable zero output during high renewable resource periods

Use Case Example (cont.)

Existing plants start/stop frequently

Single plant becomes primary energy source



Install TES to enable zero output during high renewable resource periods

Assured output when needed that exceeds source plant capacity

Long-Term Vision and Goals

Timeframe: 2030 and beyond

- By 2025, longer-duration, cost-effective TES systems that are optimally integrated to operating thermal facilities (fossil, industrial, nuclear, solar thermal)
- After 2030+, facilities should be able to convert to using electricity for heating, if needed
- Thermal facilities operate as designed and are more efficient, cleaner, last longer, and make more money by time-shifting output
- Dispatchable power and “real” system inertia are maintained

Technology Needs/Opportunities

Where can R&D help?

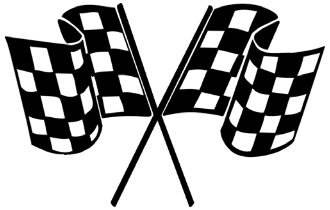
Technology Advancement → Component Testing, Design Reviews, Integration

Technology Assessment → Costs, Performance, Identifying Gaps

Technology Demonstration → Relevant Scale and Environments

→ Value of Long-Duration Storage

→ Supply-Chain Development



→ Goal: Commercially Guaranteed Long-Duration Energy Storage (>8 hours) Available by 2025

Enabling a stable future electricity supply with higher renewable generation levels

Questions

Please submit your questions
in the Chat box to the host. Reference the speaker or topic.

Thank you.

Our next workshops:

- West/Southwest Regional Workshop, May 19
- Pacific/Northwest Regional Workshop, May 20
- Midwest/Northeast Regional Workshop, May 27

For more information, visit:
https://www.energy.gov/energy-storage-grand-challenge

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