



DOE Energy Storage Overview

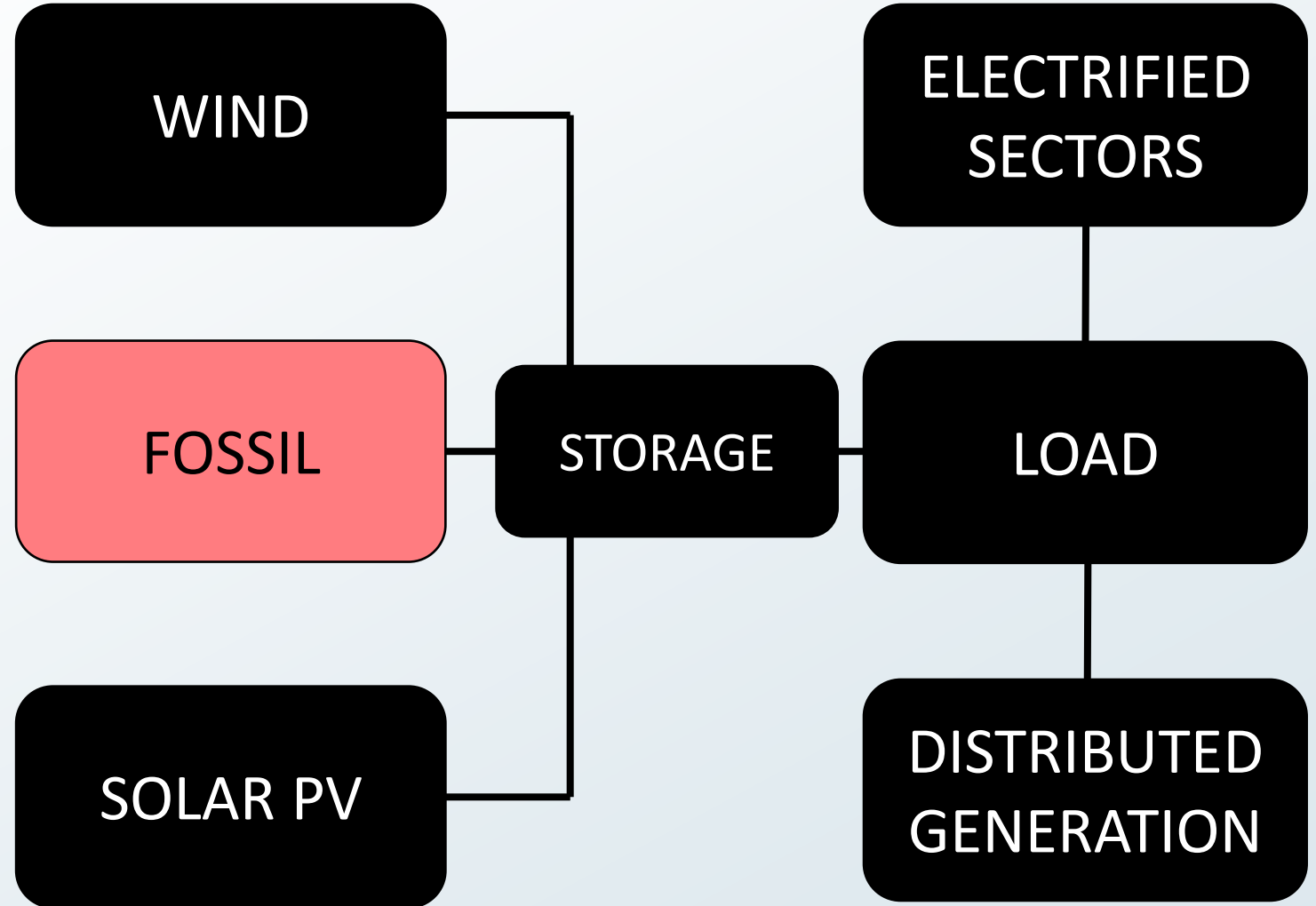
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U.S. Department of Energy

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Why storage?

Storage is
needed for
reliable
Resource
Adequacy



Storage of Various Durations will be Needed: Short, Medium, and Long

15 min – 4 hrs

Use: smoothing
renewables.

Example: Li-ion

4 – 12 hrs

Use: day/night PV storage.

Example: Flow Batteries

12h – 3 days:

Use: bad weather backup.

Example: Thermal/Gravity

Long Duration Energy Storage is essential for the Development of a
Decarbonized, Reliable Grid

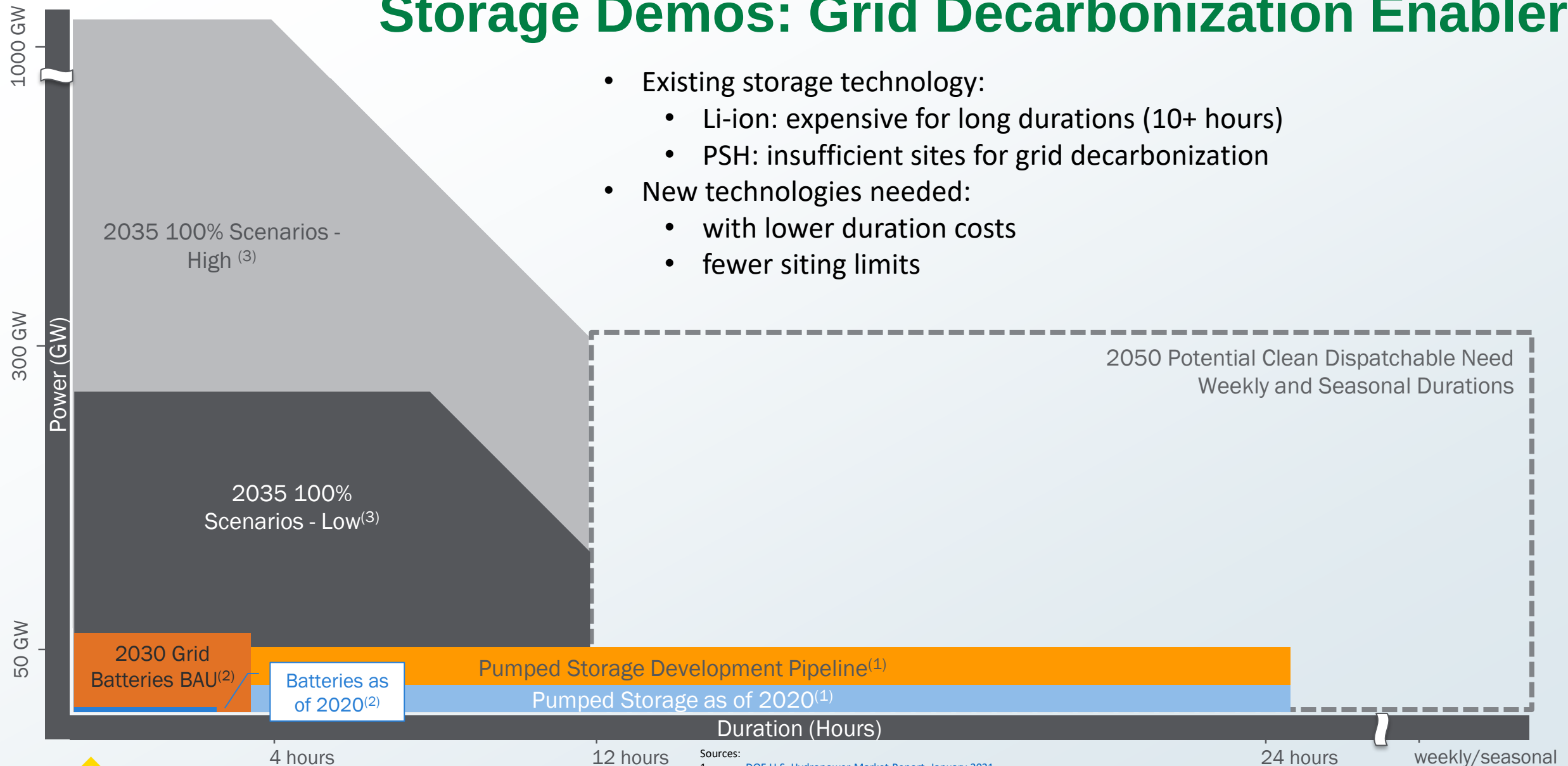
BUT it will require New Technology, New Business Cases and New
Regulatory Frameworks!

Energy Storage at DOE

- U.S. has set a goal to reach **100% carbon pollution-free electricity** by 2035
 - Could require 40x – 110x more grid energy storage
- Storage includes a range of functions provided by many technologies
 - DOE storage work is found across the spectrum of offices and labs
- Successful storage deployment requires:
 - Full range of R&D, deployment, manufacturing, and institutional support
- New targets and opportunities:
 - Long Duration Storage Shot: tech targets for cost-effective decarbonization
 - Bipartisan Infrastructure Law: opportunity to validate at scale
 - Inflation Reduction Act: incentives for storage

Storage Demos: Grid Decarbonization Enabler

- Existing storage technology:
 - Li-ion: expensive for long durations (10+ hours)
 - PSH: insufficient sites for grid decarbonization
- New technologies needed:
 - with lower duration costs
 - fewer siting limits



Sources:

1. [DOE U.S. Hydropower Market Report, January 2021](#)
2. [IHS, Grid-Connected Energy Storage Market Tracker—First Half 2021, 25 August 2021](#)
3. McKinsey “Net-zero Power,” December 2021; Princeton, “Net Zero America,” October 2021; The Long-Term Strategy of The United States, November 2021; NREL, Solar Futures Study, 2021
4. [IHS, Battery Market Tracker: First Half 2021, 05 Oct 2021](#)
5. DOE, Supply Chain Review: Water Electrolyzers and Fuel Cells, Forthcoming

LONG DURATION STORAGE SHOT TARGET



Reduce storage costs by
90% from a 2020
Li-ion baseline...

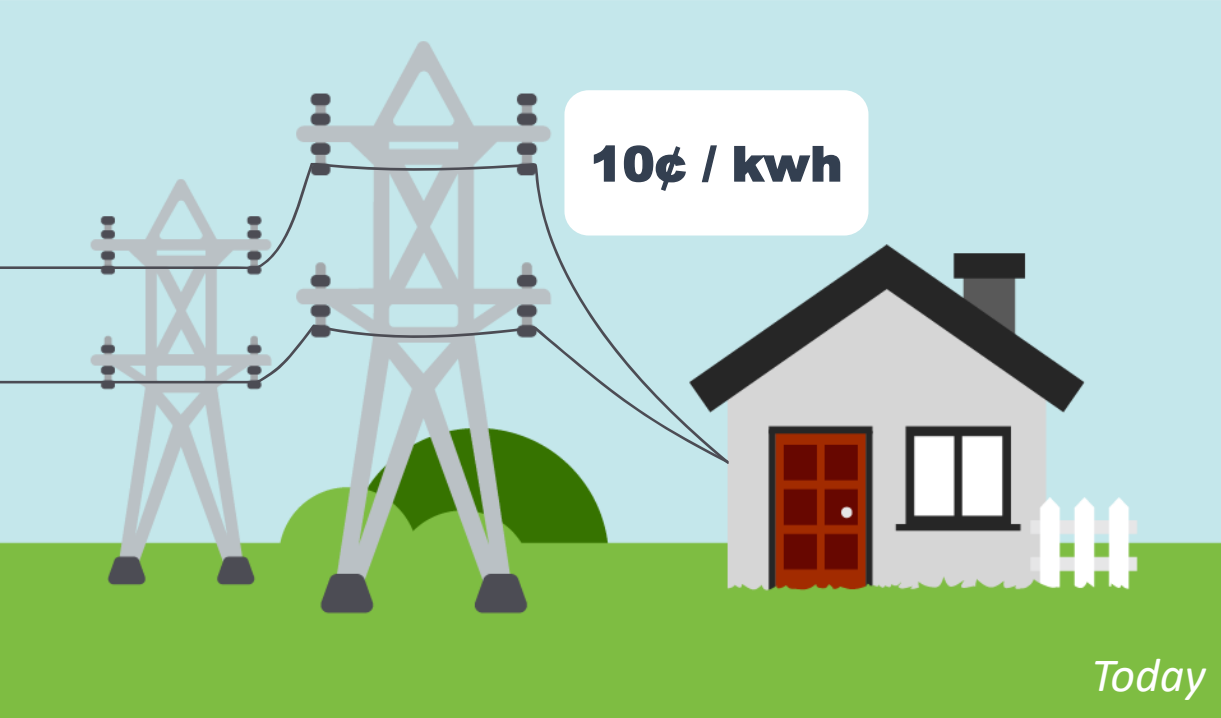


...in storage systems that
deliver **10+**
hours of duration



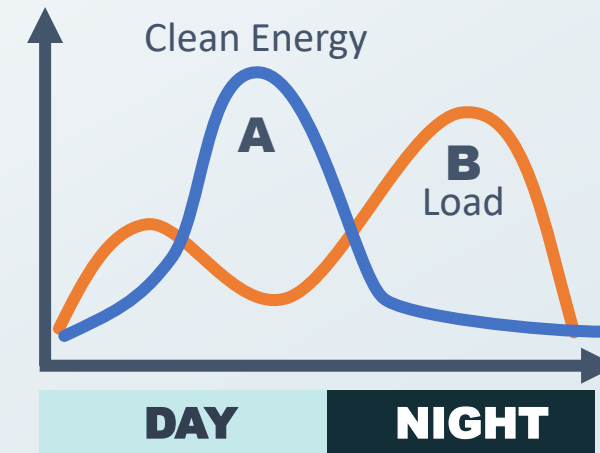
...in **1** decade

Affordable grid storage for clean power – any time, anywhere



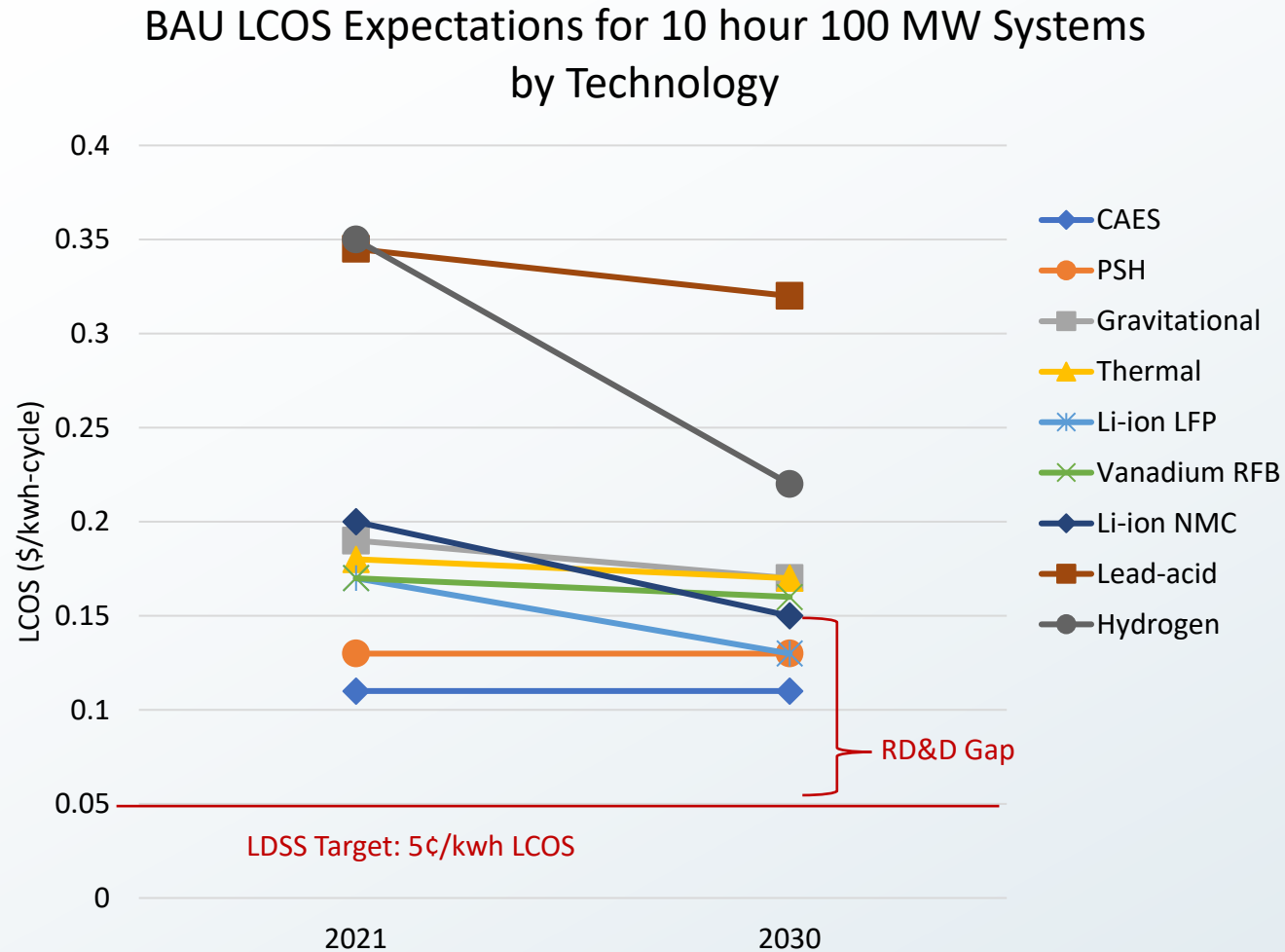
THE LONG DURATION STORAGE SHOT TARGET

With 5¢ / kwh storage, dependable clean energy is competitive with existing electricity sources



Cost Goal: Move energy from A to B for less than 5¢ / kwh

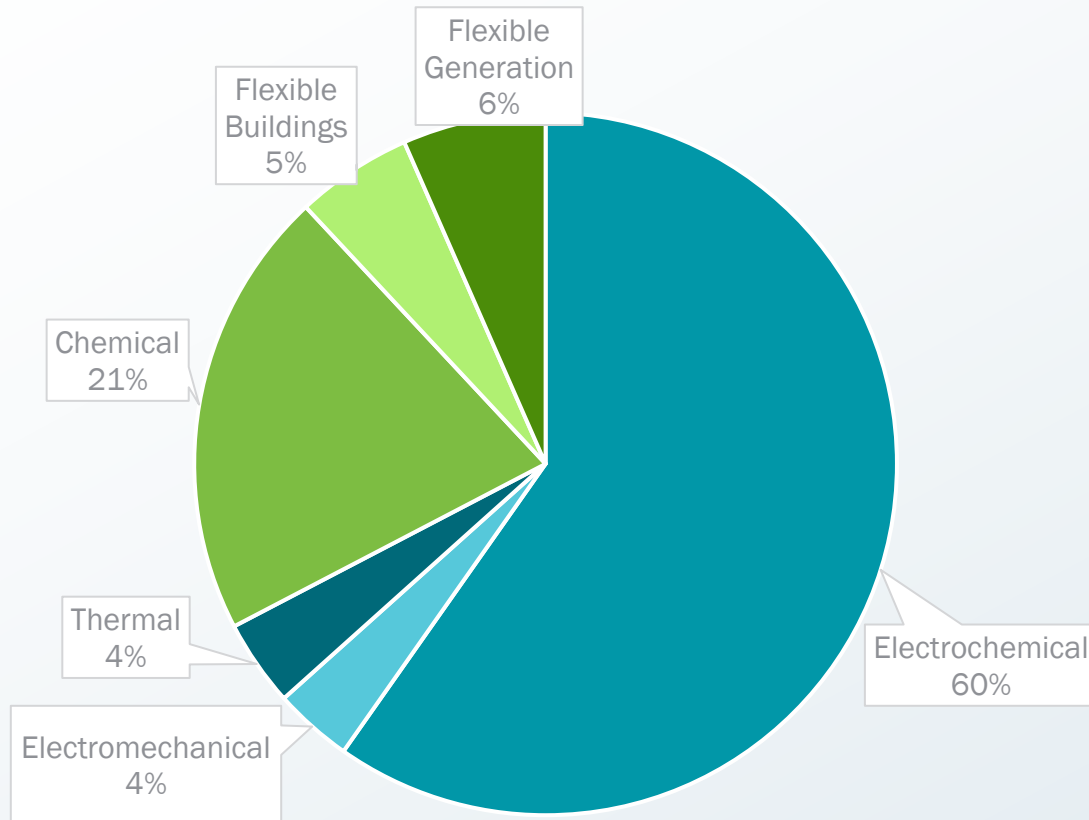
RD&D Required for Cost-Effective Decarbonization



- 5¢/kwh LCOS enables dispatchable clean energy while minimizing rate increases
- Business as Usual LCOS Expectations will not achieve this goal

DOE's Energy Storage Portfolio

DOE Storage Spending FY2020-FY2021

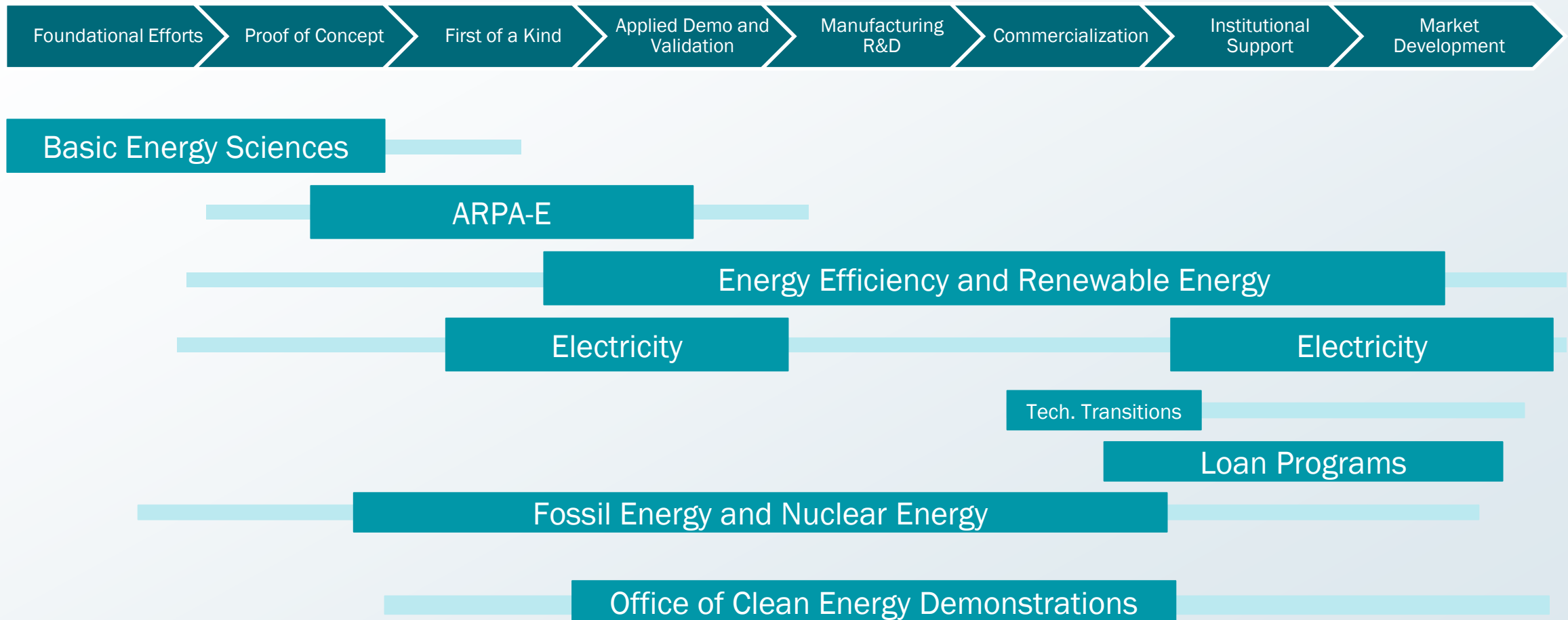


Many Technology Offices:

- Basic Energy Sciences
- ARPA-E
- Energy Efficiency and Renewable Energy (Water Power, Solar, Vehicles, Advanced Manufacturing)
- Office of Electricity
- Office of Technology Transitions
- Loan Programs Office
- Nuclear Energy
- Fossil Energy and Carbon Management

+ Crosscutting Technical Assistance

Energy Storage Advancement Throughout DOE



Energy Storage Grand Challenge (ESGC) Use Case Framework



Facilitating Grid Decarbonization

- Ensure reliability, resilience, and security in a decarbonized grid



Serving Remote Communities

- Support communities not connected to the bulk power system



Electrified Mobility

- Support electrification of the transportation sector



Interdependent Network Infrastructure

- Services that use and serve the electric grid



Critical Services

- Maintain operations in facilities critical to public health/safety



Facility Flexibility, Efficiency, and Value Enhancement

- Optimize energy production/usage

Long Duration Energy Storage

- Bipartisan Infrastructure Law (BIL)-funded \$505 million program
- Key Initiative goals:
 - **Demonstrate** new, innovative storage technologies that may address future long duration needs.
 - **Validate** first-of-a-kind long duration systems at utility scale and validate pathways to Storage Shot 90% cost reduction targets.
 - **Pilot** storage to help new storage end users overcome institutional and informational barriers.
 - Increase **resilience** of critical government facilities.
- Future activities beyond:
 - Scaling up domestic manufacturing
 - Incentives to accelerate deployment

Four Long Duration Energy Storage Demonstration Programs

\$355 million

- **Validation:** “Demo Projects” for first-of-a-kind LDES utility scale demonstrations.
- **Piloting:** “Pilot Grants” to lower the barriers to storage deployments.

\$150 million

- **Demonstration:** “Demo Initiative” for innovative early-stage long duration technologies.
- **Resilience:** “Joint Program” for storage demonstrations on DOE/ DOD facilities.