A Techno-Economic Survey of Energy Storage Media for Long-Duration Energy Storage Applications

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Current U.S. Energy Storage Capacity

Cross-Referencing Sandia Global Energy Storage Database and EIA Data
Techno-Economic Analysis

Levelized Cost of Storage (LCOS) for Coupled and Decoupled Storage Media

Separation between

- Power Conversion System (PCS)
- Energy Storage Media (SM)

- Coupled or Decoupled energy capacity \( (Cap_E) \) and power capacity \( (Cap_P) \).
- Coupled SM have a limited nominal discharge duration

\[
DD_{nom} = \frac{\eta_d Cap_E}{Cap_P}
\]
Collected the Energy Capital Cost of the Storage Medium Materials, $C_{kWh,SM}$, of a Broad Range of SM

- Identified SM technologies and energy density ($\rho_E$) expressions from first-principles
- Developed a data collection framework to collect $\rho_E$ data and materials prices $C_{mat}$.
- Used data to calculate material cost floor of $C_{kWh}$,

$$C_{kWh,SM}[USD/kWh] = \frac{C_{mat}[USD/kg]}{\rho_E[kWh/kg]}$$
\( C_{kWh,SM} \) Data for all SM

Lines are rough guidelines for long-duration energy storage (LDES) applications identified from literature.
Individual Promising SM

Sensible Thermal, Latent Thermal, and Thermochemical

Coupled and Decoupled Chemical
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