<table>
<thead>
<tr>
<th><strong>Docket Number:</strong></th>
<th>22-BUSMTG-01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Title:</strong></td>
<td>Business Meeting Agendas, Transcripts, Minutes, and Public Comments</td>
</tr>
<tr>
<td><strong>TN #:</strong></td>
<td>241282</td>
</tr>
<tr>
<td><strong>Document Title:</strong></td>
<td>Agenda Item 5 - Pecho Technology Overview_Hydrostor_ACAES_Pecho_CEC Business Meeting 1_26_2022 FINAL_ADA</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Filer:</strong></td>
<td>Chester Hong</td>
</tr>
<tr>
<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
</tr>
<tr>
<td><strong>Submitter Role:</strong></td>
<td>Commission Staff</td>
</tr>
<tr>
<td><strong>Submission Date:</strong></td>
<td>1/26/2022 9:08:41 AM</td>
</tr>
<tr>
<td><strong>Docketed Date:</strong></td>
<td>1/26/2022</td>
</tr>
</tbody>
</table>
➢ Hydrostor & Advanced Compressed Air Energy Storage Overviews
➢ Pecho Energy Storage Center – Project Overview
About Hydrostor

*Hydrostor is the global leader in Advanced Compressed Air Energy Storage (A-CAES)*

**Founded:** 2010

**Offices:** Toronto, Canada (HQ), SF Bay Area, Adelaide, Australia (satellite)

**Operating Facilities:**
2 (Canada – Toronto Hydro; Canada – IESO)

**Company Financing:**
$250 M investment by Goldman Sachs – Jan. 2022

**Project Pipeline:**
900+ MW commercially bid in CA in 2020-21, 4 GW project pipeline (focused on U.S., Canada, Australia)

A-CAES is a breakthrough for long-duration energy storage:

- Uses only water, pressurized air and commercially proven equipment to provide long-duration, *emissions-free* storage.
- Provides similar characteristics to pumped hydro storage, but with the key advantage of being able to *flexibly site* where the grid needs it.
How Advanced-CAES Works (A-CAES)

A-CAES integrates proven technologies and construction approaches in innovative ways to produce a superior long-duration grid-scale energy storage solution.

**STEP 1**
Compress air using electricity

*Electricity runs a compressor to produce heated compressed air*

**STEP 2**
Capture heat in thermal Store

*Heat is extracted from the air stream and stored in a proprietary thermal store*

**STEP 3**
Store compressed air in purpose-built cavern

*Air is stored in a purpose built cavern using water to maintain constant pressure*

**STEP 4**
Convert the air to Electricity

*Water forces air to the surface where recombined with heat and expanded through a turbine*

---

- **Major Equipment**: Utilize off-the-shelf, commercially proven power generating equipment, including air compressors, turbo-expanders, generators and heat exchangers

- **Underground Storage Caverns**: Purpose-built underground cavern construction using industry standard and well-proven mining techniques

- **Efficiency**: Round Trip Efficiencies (RTE) of the A-CAES process are approximately **60%**
## Long Duration Energy Storage Attributes

<table>
<thead>
<tr>
<th><strong>Fossil Plant Replacement</strong></th>
<th><strong>Transmission Deferral</strong></th>
<th><strong>Renewable Integration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provides synchronous dispatchable generation with fast ramp rates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Projects can be flexibly sited in areas of highest benefit to the grid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Commercially attractive alternative to new and existing natural gas plants (no emissions and lower permitting hurdles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Can leverage existing transmission infrastructure while minimizing land use and related environmental impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-wires alternative to defer transmission system &amp; network investments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Long-duration alleviates grid congestion during peak periods, and enables transmission alternatives requiring longer-term outage management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Projects can be flexibly and strategically sited near critical load pockets and infrastructure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Provide dispatchable or baseload renewables at rates ~$60-120/MWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Optimize large solar/wind project utilization and economics through time-shifting of generation to reduce curtailments</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pecho:** 400 Megawatts (MW) for 8 hours = 3,200 MWh

**Gem:** 500 Megawatts (MW) for 8 hours = 4,000 MWh
Statewide Benefits of A-CAES LD Energy Storage

- Provides 500 MW (Gem) and 400 MW (Pecho) of new quick-starting synchronous generation with fast ramp up/down capabilities
- Projects support California Climate Policies and Renewable Portfolio Standards (RPS) by maximizing renewable generation and integration
- No fossil fuel use during operations – no combustion emissions
- A-CAES Technology produces fresh water from ambient air during operation
- Displaces older and less efficient generation with carbon-free generation
- Flexible capacity with minimal response time: local and regional voltage support and primary frequency response
  - Fossil fuel-free and emissions-free spinning reserve
  - Flexible capacity with minimal start time
  - Peaking energy for local contingencies
  - Voltage support & primary frequency response
  - Long duration generation capacity to assist with prolonged system contingencies
Pecho Energy Storage Center - SLO County, CA

Project Capacity: 400 MW
Storage Duration: 8 Hours (3,200 MWh)
POI: PG&E Morro Bay Switchyard (230 kV)
Target Commercial Operation Date: Q1 2027
Pecho Energy Storage Center - Vicinity Map

Transmission Line Route Alternatives
(All follow existing T-line Rights-of-Way)

Pecho Project Site
Local Benefits of Pecho Energy Storage Center

➢ Repurposes existing San Luis Obispo County electrical infrastructure including the CAISO-controlled Morro Bay Switching Station
➢ Helps replace the loss of generation from Diablo Canyon Nuclear Power Plant decommissioning
➢ Facilitates the efficient integration of onshore and offshore renewable energy development
➢ Total Installed Cost: $750 million to $900 million
➢ Construction Jobs:
  • Average Construction Workforce: ~200 over 4+ years
  • Peak Construction Workforce: ~450
  • Total Construction Labor: ~1.6 million man-hours
➢ Operations & Maintenance Jobs: 25-40 Full-time equivalent positions
➢ Fiscal Benefits: Over $500 million in Regional Direct & Indirect Economic impacts
➢ Hydrostor will work closely with San Luis Obispo County to establish a Community Benefits Program in connection with the project
Contact Information

Curt Hildebrand
Senior Vice President, Commercial Affairs
curt.hildebrand@hydrostor.ca
925-872-3791