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Project Execution & Supply Chain Challenges

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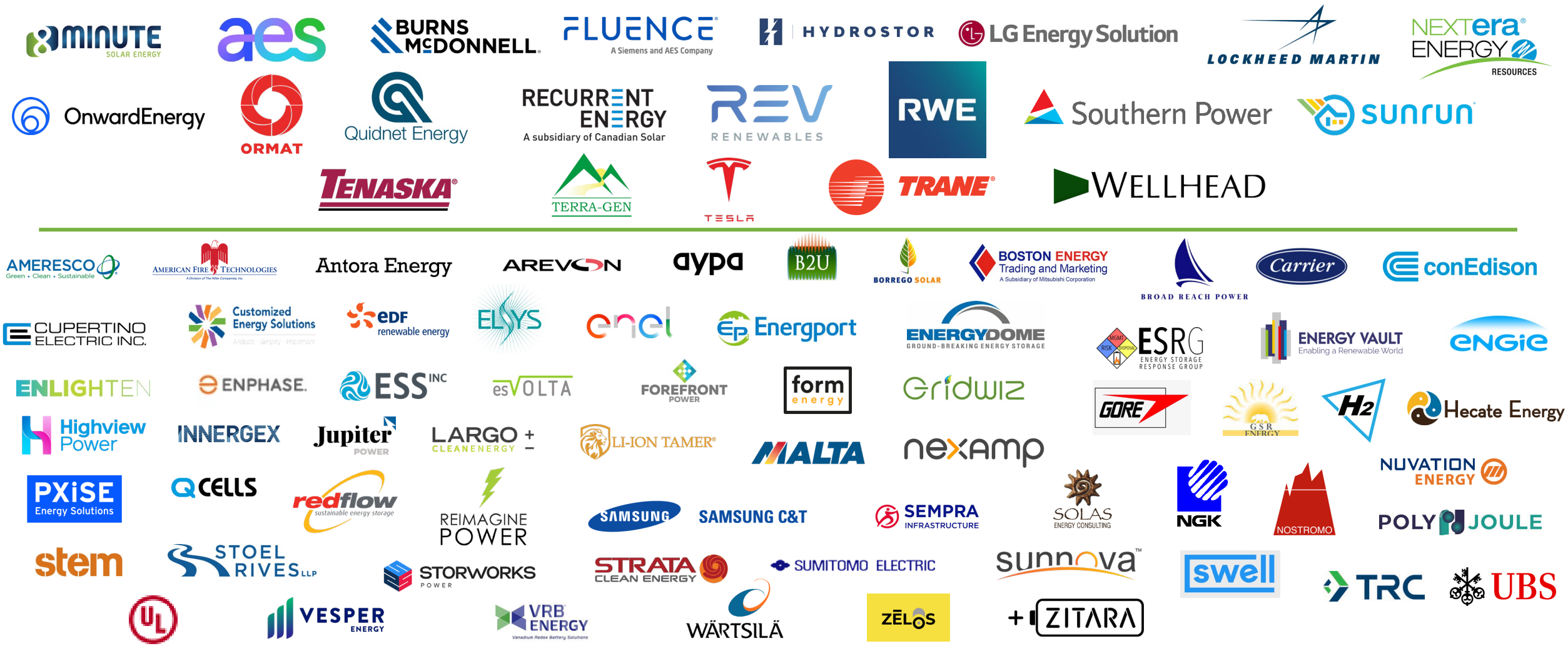
CALIFORNIA ENERGY STORAGE ALLIANCE

CESA Members



Breakdown of Battery Supply-Chain and Project Execution Challenges

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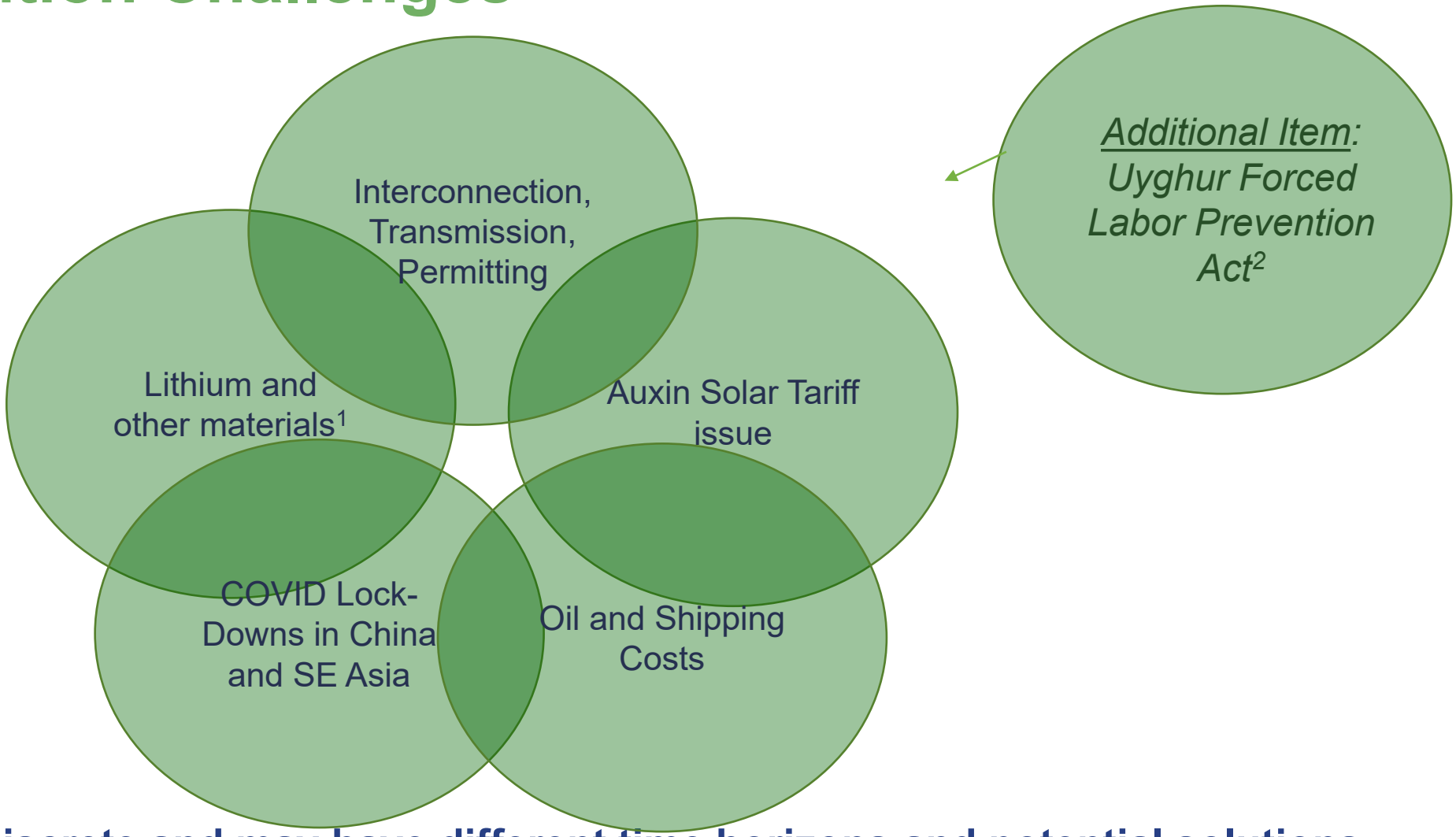

- **Each issue is discrete and may have different time horizons and potential solutions.**

1. Inflationary pressures on other items such as electrolyte, iron phosphate, PVDF, etc
2. https://www.cbp.gov/trade/forced-labor/UFLPA#:~:text=The%20Act%20requires%20CBP%20to,in%20part%20by%20forced%20labor.

Lithium Price Changes

- **Recent price changes in lithium affect project economics**
  - ≈300%+ increase in Lithium/kg since Fall[1]
  - Lithium-Carbonate generally '**unhedgeable**' to date w/ fixed prices in contracts
  - Solutions in contracts or with pass-throughs and re-pricing or re-negotiating should be explored
- **Rule of thumb, $1/kg increase in Lithium Carbonate ≈ $1/kWh increase in Li-Ion batteries[2]**
- **Example[2]: Project of 25 MW/100 MWh**
  - Fall '21 (Lithium at $14/kg) ≈ $16M (example only, batteries and racks only[3], not balance of plant)
  - Spring '22 (Lithium at $70/kg) ≈ $23M (example only, batteries and racks only[3], not balance of plant)
  - ***40%+ increase*** in costs, excluding balance of plant
- **Other commodity costs (steel, shipping, etc.) have also increased**

Impacts on contracts and project execution should be considered.

Material cost impacts may exceed contingencies, so negative margin

Mineral supply deals being affected, not just a storage issue.

1. Lithium-carbonate prices can vary. Some public indexes may show different information. Impact on battery prices may also depend on battery chemistry.
2. Many factors may vary, these are estimates intended to highlight the materiality of these issues. Battery chemistry, supply contracts, and other factors will affect ratios
3. Representative data only, not sourced

Near-Term Execution - Issues Assessment

Issue	Driving Cause (estimated)	Relevant for CA for ’22?	How it may affect CA storage market generally
Lithium Commodity Prices	Supply and Demand for lithium, and perhaps other factors	Unlikely but possible for later this year	Urgent need for storage diversity Affected contracts face risks, delays, or negative margins Contract innovation re commodity prices provisions or price re-negotiating Increasing liquidated damages hinders investment and development More investments in lithium supply
Oil and Shipping Costs	Part shipping back-logs, part oil costs, part COVID, etc.	Somewhat likely	Increased shipping costs over time, depending on oil prices
Auxin Solar Tariff	Federal Solar Tariff policy matters	Likely	May delay or hinder deployments of solar and storage projects
Q2 ‘22 Chinese Lock-Down	COVID-related	May cause delays but projects still online in ’22	COVID implications may wane
Interconnection and Transmission	Utility progress and equipment supplies	Yes and beyond	Delays to or extensive interconnection, deferred deliverability (RA capacity), transmission upgrade delays and ripple effects, threats to capacity plans

Recommendations

- **Commodity/Lithium/Shipping Prices**
  - Explore contract innovation re commodity price pass-through
  - Explore re-negotiations and re-pricing, a.ka. 're-openers'
  - Avoid extreme liquidated damages (investment deterrent)

- **Aggressive development of diversity for storage tool-kit**
  - Long-duration commercialization funding critical
  - 'Commercialization' requires larger projects, operational data, finance and insurance industry readiness, permitting familiarity, etc.

- **Auxin – continued strong outreach from CA to Federal authorities**

- **Support for transmission and interconnection and related improvement efforts**