Energy Storage IOU Bid Evaluation Protocols

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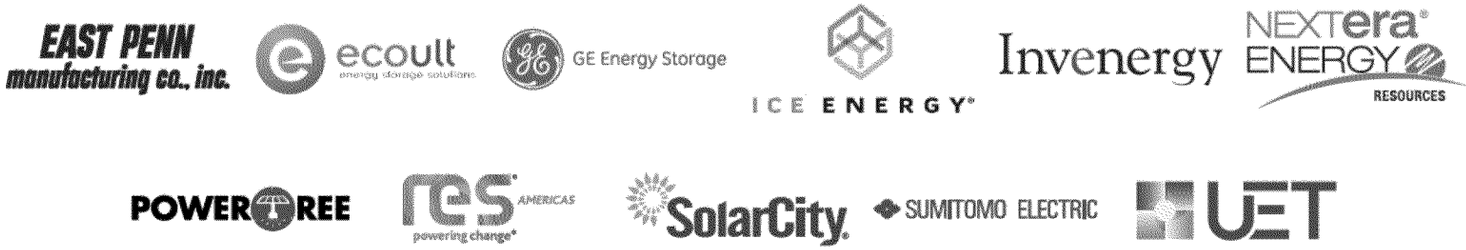
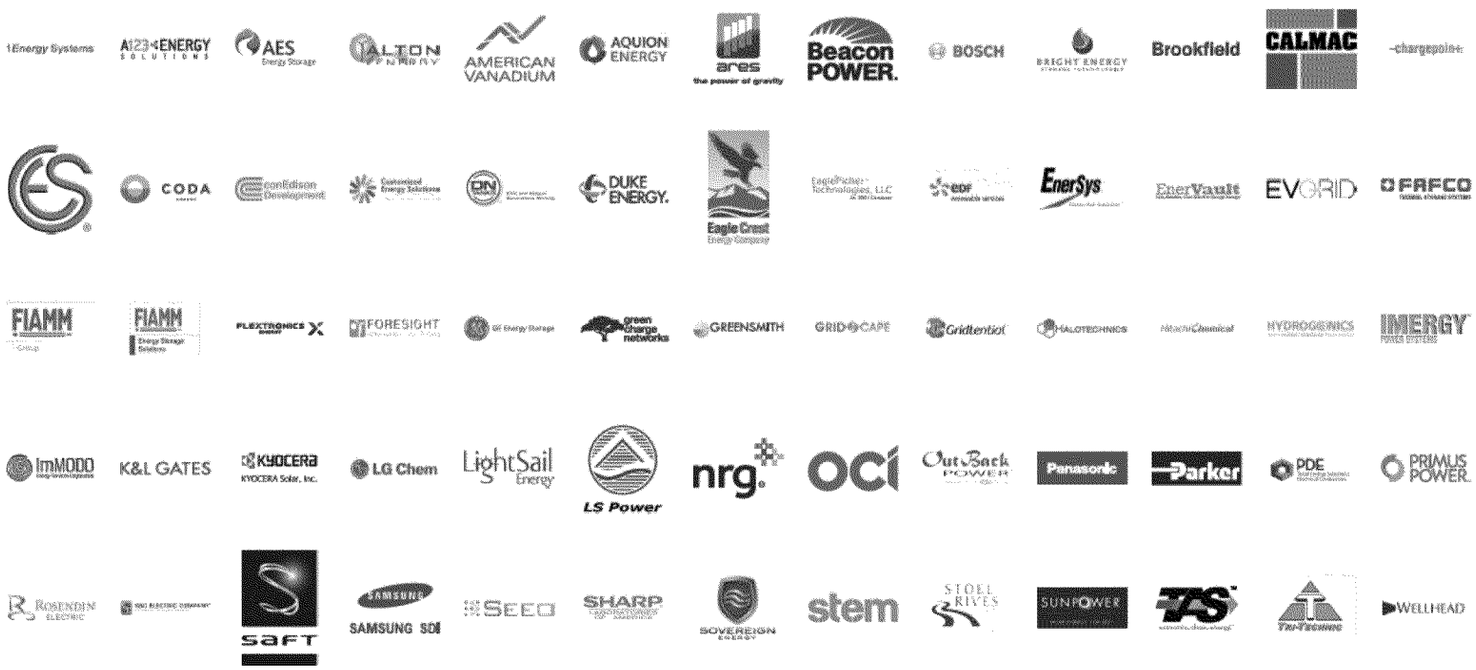
CESA Members

Steering Committee



General Members



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CESA supports most aspects of utility evaluation protocols

- The methodology for all utilities is built upon substantial utility experience with renewables procurement, which CESA supports.
- The protocols generally appear to be well aligned with the purposes of the storage procurement targets per AB2514:
  - Grid optimization,
  - Renewables integration
  - GHG reduction
- CESA particularly commends PG&E for including valuation of:
  - Increased efficiency of fossil generation
  - Renewable energy curtailment support
  - T&D investment deferral value
- CESA believes that valuation of those benefits should be included by all utilities
- CESA recommends the CPUC allow RPS-style cost recovery treatment for storage in order to enable PG&E to sign long term (>10 year) contracts (Appears to be less of an issue for SCE and SDG&E due to LCR cost recovery provisions)

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CESA requests transparency and alignment on assumptions

- Ancillary Services Price Projections
- Gas Price Projections, including GHG Projections
- Energy Price Projections
- Locational Adjustments Applied
- Capacity Value Calculations
  - System
  - Local
  - Flexible

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Fair comparison between transmission & distribution projects

- In the Least Cost Best Fit (LCBF) evaluation, care should be take to ensure that fair comparison exists between distribution-connected and transmission-connected projects

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Customer sited pilots should be addressed

- CESA appreciates that SCE is piloting customer sited energy storage
- CESA requests contracting mechanisms for all IOUs to procure services from customer sited energy storage resources, including:
  - Behind the meter 3rd party owned systems
  - Customer owned systems

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Accounting For GHGs

- CESA Agrees with SCE that GHGs can be partially accounted for using gas price adders
- However, it is important to account for the following:
  - Divergence of gas prices from LMPs with increasing renewable penetration
  - Charging of storage resources using otherwise-curtailed renewables
  - Increased efficiency of fossil generation
  - Systemwide GHG benefits due to energy storage
- Production simulations are needed to estimate overall GHG impacts

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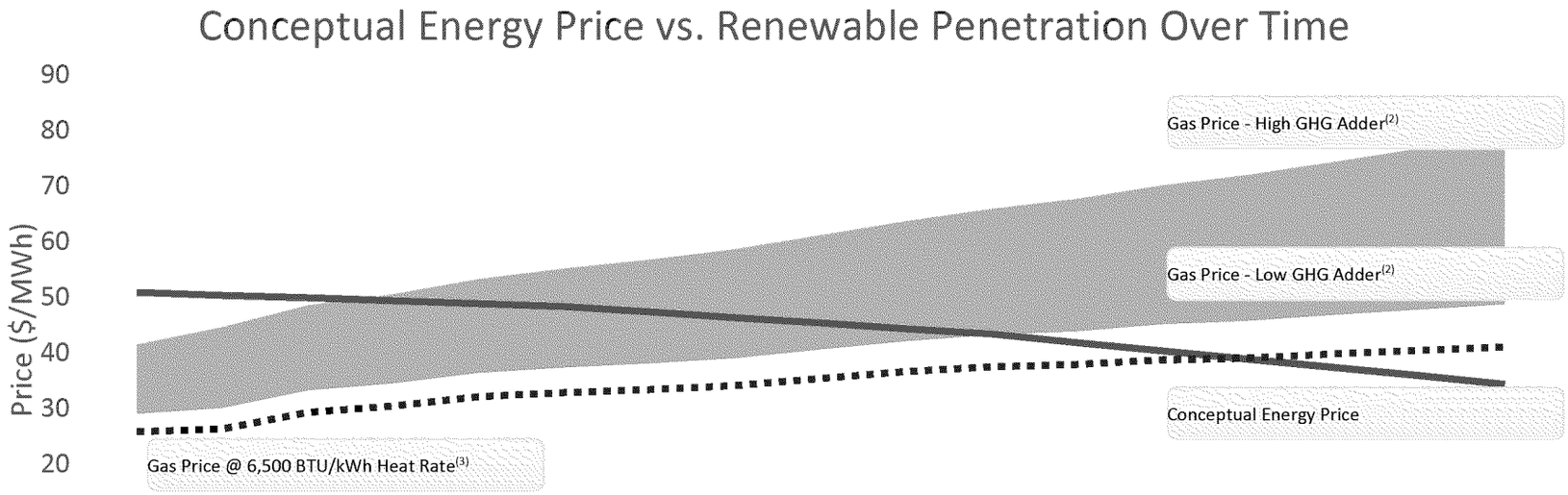
Gas and Energy Price Divergence, including GHGs

Higher renewable penetration tends to decrease the wholesale price of energy[1], while GHG adders increase effective gas prices.
This increases the relative cost effectiveness of storage charging over time.



Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Renewable Penetration	22%	24%	26%	28%	30%	32%	33%	35%	37%	39%	41%	43%	45%	47%	48%	49%	50%

1) *Policy Challenges Associated with Renewable Energy Integration*, The Brattle Group, April 2011 (p. 9)
2) GHG Adder from CPUC 2011 MPR Model; high/low ranges from E3's *Investigating a Higher Renewables Portfolio Standard in California* (January 2014)
3) EIA 2013 Annual Energy Outlook

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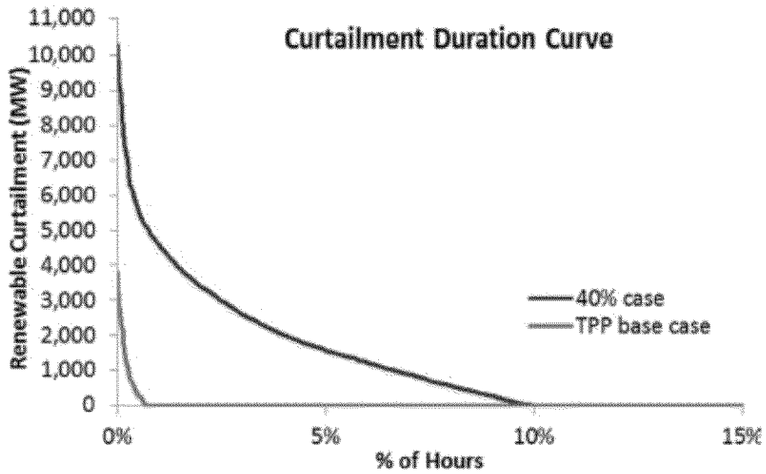
Charging via Curtailed Renewables

» The CAISO, with E3 and its preliminary REFLEX modeling efforts[1], has predicted significant renewable curtailment under potential future portfolio mixes:



» When storage is charged by renewables which would otherwise be curtailed, it increases the GHG benefits.

1) Source: E3 Renewable Energy Flexibility (REFLEX) Results Presentation at the CASIO Webinar on December 9, 2013

System Benefits

» Storage can reduce the reliability costs associated with renewable integration

Violation Type	40% Reduced Flexibility Case	40% No Curtailment Case
Downward violation costs ($MM)	**468**	**365**
Regulation down	0	0
Sub-hourly overgen	14	1
Hourly overgen (curtailment)	454	165
Dump energy	0	198
Upward violation costs ($MM)	**48**	**9,092**
Regulation up	6	467
Sub-hourly unserved energy	27	3,347
Hourly unserved energy	15	5,279
Total ($MM)	**516**	**9,457**

» Storage can also reduce the overall system heat rate by reducing starts and minimum operation of existing generators.

» These impacts should be considered in the 2014 procurement valuations

1) Source: E3 Renewable Energy Flexibility (REFLEX) Results Presentation at the CASIO Webinar on December 9, 2013

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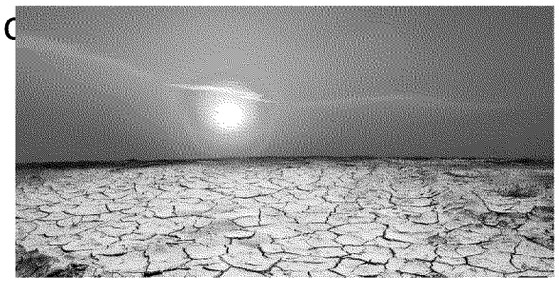
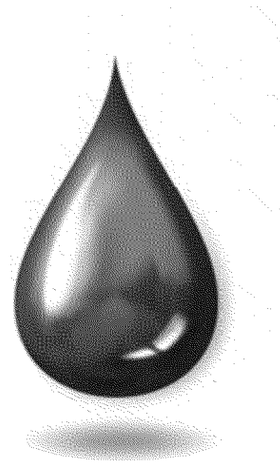
Accounting for Water Consumption



» One LMS 100 consumes approximately 64 million gallons o water per year.[1]

» Cooling for power plants represents:
- Approximately **40%** of freshwater withdrawals
- Approximately **3%** of domestic water consumption (portion of water that is not returned to source).[2]



» Given California's drought conditions and increased variability of seasonal weather patterns going forward, energy storage has the ability to:
- Reduce thermoelectric power plant water usage
- Reduce associated energy costs of water delivery

» In the least-lost, best-fit analysis proposed by IOUs, storage resources should be evaluated for water consumption reduction versus status quo generation resources.

[1] *Source: Bullard Energy Center Facility Description - http://www.energy.ca.gov/sitingcases/bullard/documents/applicant/afc/E_Section_3.0.pdf*

[2] *Changing the Spatial Location of Electricity Generation to Increase Water Availability in areas with drought: a feasibility study and quantification of air quality impacts in Texas,* Environmental Research Letters, Volume 8, Number 3, February 5, 2013

Other Critical Issues

Utility Scale Interconnection Tariff Misalignment

- T & D storage charging / discharging currently interpreted by CAISO and utilities as subject to both generator and load interconnection tariffs
- This creates significant problems:
  - Load is studied serially, while most generation is studied in a cluster process; base case assumptions therefore likely quite different
  - Same asset may therefore generate different network upgrades for load vs generation because of study assumptions
  - Even if upgrades from load vs generation were the same, load and generator interconnection tariffs have conflicting provisions for assigning cost responsibility
- Questionable whether storage charging is legitimate "load" because it is not an end use (i.e. power is resold when discharging)
- CESA recommends CPUC more clearly define which storage project activities meet the definition of "load" versus which should be excluded from the definition.
  - Charging should be excluded from the definition of "load," which would allow CAISO and utilities to develop method to study impacts of charging subject to a streamlined process governed by a single tariff (CAISO GIDAP or IOU wholesale distribution tariffs)

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Other Critical Issues

Rate Treatment for Wholesale (Non-Load Paired) Storage Assets

- It is currently unclear whether charging of wholesale T/D connected storage asset would be subject to retail rate treatment
- Subjecting charging to retail rate treatment creates numerous negative consequences:
  - Distorts utility procurement (could disincent utility procurement of standalone grid connected storage in favor of renewable-paired storage that never charges from grid)
  - Unfairly favors utility ownership of storage (utilities not subject to retail rate treatment for charging)
  - Removes realtime market signals to align charging with grid conditions
  - Decimates value proposition of 3rd party owned grid connected wholesale storage
- Excluding charging from definition of "load" would remove roadblock for CAISO to extend wholesale pricing model to charging of transmission connected resources
- CPUC, IOUs and the industry should work together to evaluate best approach for wholesale rate alignment at the distribution level (may need a new retail rate structure mirroring wholesale pricing)

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