



Stakeholder Comments Template

Submitted by	Company	Date Submitted
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CESA appreciates the opportunity to comment on the ISO's Draft Final Proposal in the Energy Storage Interconnection Initiative. CESA commends the ISO and its staff for a remarkably well thought through and timely initiative that has removed a significant amount of market uncertainty for the technology class and how it will interconnect to the grid and operate in the market.

CESA supports the ISO's methodology to apply the GIDAP to energy storage projects, and reiterates its previous comments: (i) support for the ISO's position the unbundling of flexible and standard RA , (ii) recommending that the CAISO add a "flexible deliverability" track to the GIDAP study process to study upgrades needed for resources to meet system flexibility requirements (flexible RA) , and (iii) agreement with the ISO that a "charging deliverability" assessment isn't currently appropriate as part of the study process. On this issue, CESA notes that the standard deliverability study process is designed to test a resource's ability to generate in order to meet system and local peak capacity needs for RA purposes, i.e., - to meet summer peak load. Whether a resource has enough "fuel" to generate is beyond the scope of the study. Failure to meet must offer obligations per system RA requirements are addressed through market penalties, not through network upgrades that only apply to one resource class without a similar requirement for other resources.)

CESA supports the ISO's commitment to provide information in the reliability studies about potential overloads due to charging under assumed study conditions; however, CESA requests that the ISO clarify in response comments that the study is designed to be information-only, and that no network upgrades will be required as part of this informational process.

During the ISO's stakeholder call on November 25, staff asked stakeholders to comment on a number of questions that, while possibly outside the scope of this specific initiative, would help inform future ISO

thinking on key barriers and market distortions that still exist for energy storage. CESA's feedback follows.

Wholesale LMP versus Retail Rate Applicability

While CESA supports the clarification the ISO provided in Section 8 of the Draft Final Proposal specific to standalone and generator-paired energy storage interconnected to the transmission system, much work still needs to be done to extend this paradigm to other energy storage configurations and use cases under the NGR model. Further, CESA views the issue of station power and charging round trip efficiency as having a significant amount of complexity and nuance that will require additional policy refinement in the near future. CESA recommends that the ISO evaluate the below issues either for clarification in the Market Operations BPM, or potentially for a future initiative clarifying provisions of the NGR (and/or PDR) model.

Round Trip Efficiency Losses versus Station Power

CESA believes that, while much progress has been made in extending wholesale market access to energy storage in both positive and negative generation mode, further policy refinement is still needed with respect to what is considered negative generation versus what is considered station load. Energy storage is a very broad technology class, and there is a significant amount of nuance around the issue of whether a device's load is directly related to the energy storage device throughput, versus what is more traditionally considered to be "station load". This nuance will have a major impact on the relative competitiveness of various energy storage technology subclasses, regardless of the *gross* efficiency of an energy storage device (all forms of load weighed against the amount the energy storage device generates).

CESA's view is that loads which are directly related to the throughput of the energy storage device should be considered to be part of RTE, and thus settled at wholesale LMPs. Those losses occur when the system is delivering power, storing power, or in idle mode ready to respond to system instructions. RTE includes inverter losses, thermal management of the energy storage device equipment, control system losses, wire losses within the system, and storing process losses. With pumped hydro energy storage, those losses include pipe friction and pumping losses; in electro-chemical storage, losses include exothermic reactions; in flow battery energy storage, losses include pump and friction losses, trickle flows, etc. required to stay synced and ready, and so forth.

RTE should include all energy flows needed for throughput to occur from the storage device, meaning that if those loads were turned off, the energy storage device could not operate. All RTE loads should be included in the efficiency calculation and included in the energy storage rate. These are the loads that are non-discretionary, and needed for resource operation when the energy storage device is being made available to the grid operator.

Systems that are not part of the energy storage device operation, HVAC and lighting for personnel, which do not affect the throughput of the device, which if turned off do not affect the operation physically, should be considered station power. These are unchanged whether the device is charging,

discharging, or off. These loads are discretionary, could be turned off during a rolling-black out, and could be increased or decreased without regard to the battery operation.

Wholesale vs Retail settlement in Load-Paired Configurations

CESA recognizes that many barriers may span multiple use cases for load-paired energy storage configurations, but the same barriers are highly sensitive to the energy storage device architecture. In addition, there can be confusion about what words like “dual use” and “hybrid” mean in the context of energy storage device configuration. CESA submitted the following table as part of the Energy Storage Roadmap Stakeholder Initiative, and believes this table should provide a framework to discuss how to extend wholesale market settlement to more complex configurations and use cases where wholesale market services are being provided.

Interconnection Type		Storage Input Energy Function	Wholesale vs. Retail	Comments
Transmission Connected	1	Storage charging during REM	Wholesale	Includes RTE Losses
	2	Storage charging for Non-REM wholesale market functions	Wholesale	Includes RTE Losses
	3	Storage charging for Transmission Support activities	Wholesale	Includes RTE Losses
	4	Pre-chilling of a thermal resource that directly offsets chilling at a later time	Wholesale	
Distribution Connected	1	Storage charging for REM	Wholesale	Includes RTE Losses
	2	Storage charging for Non-REM wholesale market functions	Wholesale	Includes RTE Losses
	3	Storage charging for Distribution Support activities	Wholesale	Includes RTE Losses
	4	Pre-chilling of a thermal resource that directly offsets chilling at a later time	Wholesale	
Behind the Meter - Non NEM Tariff	1	Storage charging during REM	Wholesale	
	2	Storage charging for Non-REM wholesale market functions	Wholesale	
	3	Storage charging to offset customer load	Retail	
	4	Storage charging to provide Demand Side DR	Retail	
	5	Storage charging to provide Supply Side DR	TBD	
	6	Ancillary battery heating/cooling	Retail	
	7	Pre-chilling of a thermal resource that directly offsets chilling at a later time	Retail	
Behind the Meter - NEM	1	Storage charging during REM	Wholesale	

Tariff	2	Storage charging for Non-REM wholesale market functions	Wholesale	
	3	Storage charging to offset customer load	Retail	
	4	Storage charging to provide Demand Side DR	Retail	
	5	Storage charging to provide Supply Side DR	TBD	
	6	Ancillary battery heating/cooling	Retail	
	7	Pre-chilling of a thermal resource that directly offsets chilling at a later time	Retail	

Role of System Architecture in Addressing Tariff Barriers in Load-Paired Configurations

CESA has been committed to supporting ISO's efforts in the Road Map Initiative by documenting the architecture of each of what we believe to be the energy storage industry's priority use cases. In some cases, the architecture itself has the potential to address certain barriers. For example: the location of metering equipment for behind the meter energy storage that provides peak shifting and wholesale market participation can help address potential interconnection and tariff barriers.

The following appendix, taken from CESA's comments on the Energy Storage Roadmap Initiative, shows single line descriptions of several industry high priority behind the meter use cases. CESA has committed to working with the Roadmap Team and other stakeholders to add to this list and build consensus around appropriate system architectures for different use cases.

Appendix

Behind the Meter Use Case Details

Provided by Stacey Reineccius, Powertree Services Inc.

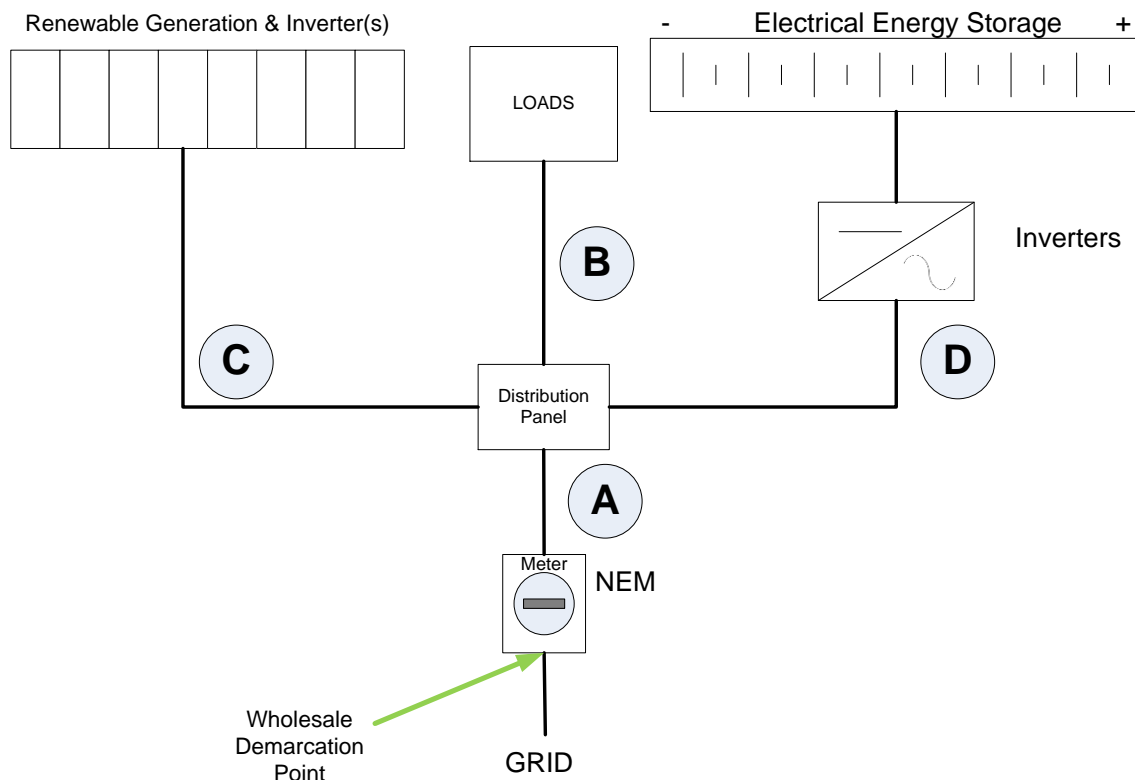
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Following are several feasible and useful installations for electrical energy storage with and without NEM.

The elements called out are:

- A – NEM meter
- B- End use loads
- C- CEC eligible renewable generator (Wind, Solar PV, etc.)
- D- Electrical energy storage system (AC in AC out) with grid interactive Inverters (typical of input and output sides of said inverter)
- E- Wholesale meter qualified for use with CAISO or Utility for wholesale operations.
- F- Retail bidirectional meter.

All illustrated scenarios assume a single customer facility.



**Behind the Meter renewable Generation plus Electrical Storage and NEM
Storage in parallel with Loads and Renewable Generation**

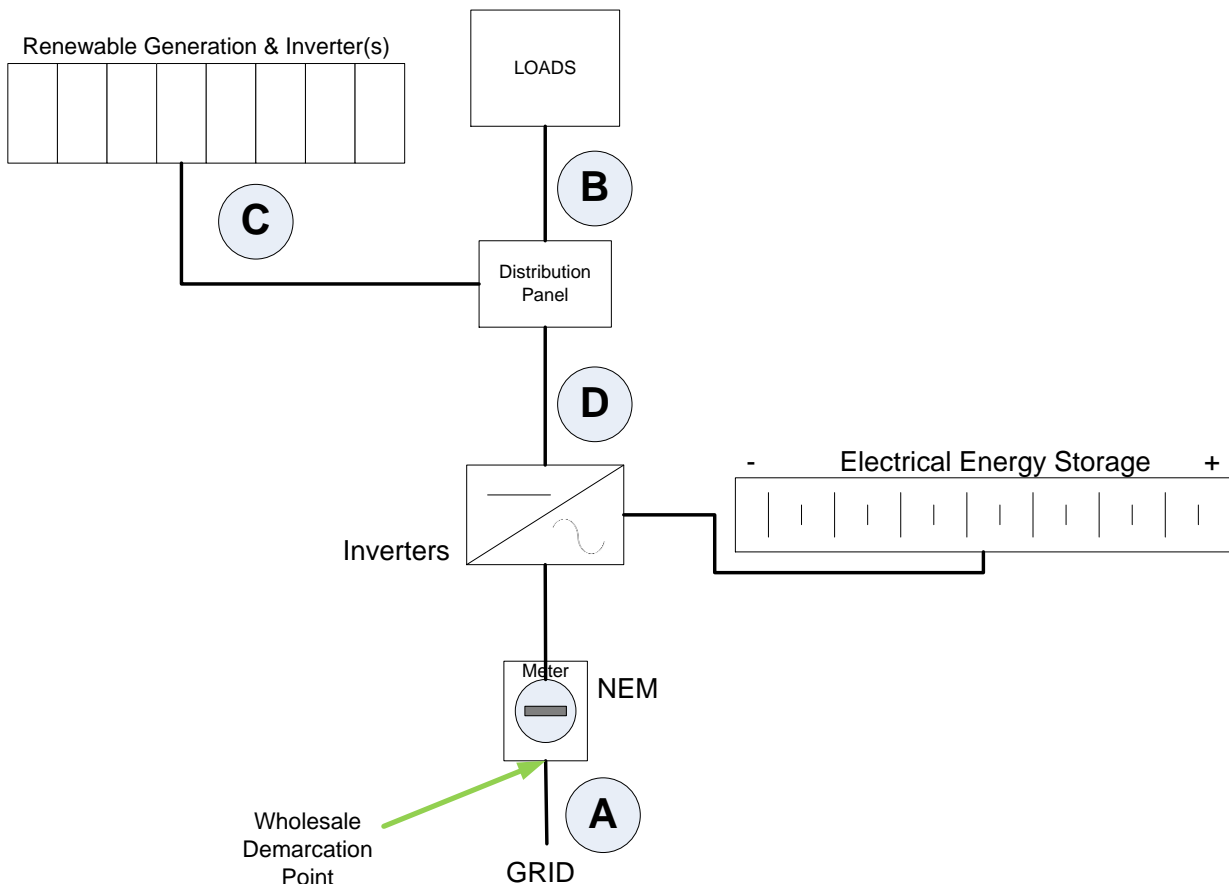
This scenario is a simple common installation and enables certain features and functions to be available. These include

- Load Leveling
- NEM generation
- Peak Shaving
- Renewable Load Shaping
- Generation Output Shifting

This scenario does NOT enable

- Backup Power for loads
- Wholesale Operations or ISO market participation
- Renewable Generation and storage during grid outage (reliability/emergency)

This scenario is currently highly limited in effectiveness due to sizing constraints on storage imposed in latest NEM decision.



**Behind the Meter renewable Generation plus Electrical Storage and NEM
Storage in Series with Loads and Renewable Generation**

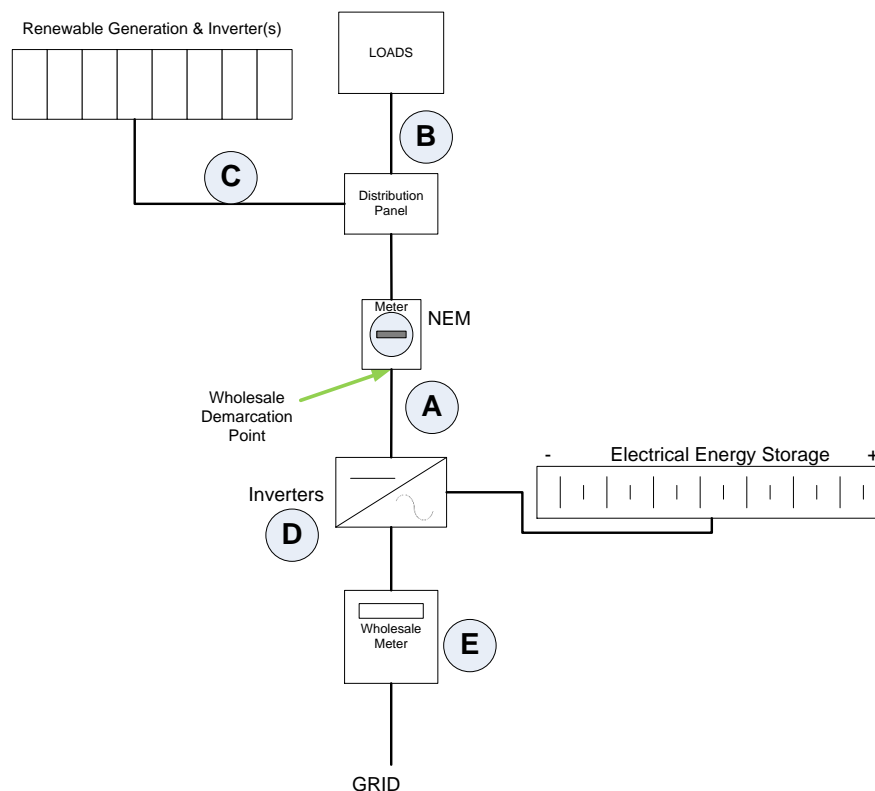
This scenario is a simple common installation and enables certain features and functions to be available. These include

- Load Leveling
- Peak Shaving
- Renewable Load Shaping
- Generation Output Shifting
- Backup Power for loads
- Accurate NEM credit for Renewable Generation
- Renewable Generation and storage during grid outage (reliability/emergency)

This scenario does NOT enable

- Wholesale Operations or ISO market participation

This scenario is currently highly limited in effectiveness due to sizing constraints on storage imposed in latest NEM decision.



**Behind the Meter Renewable Generation, Load and NEM
Storage in Series on Wholesale Side**

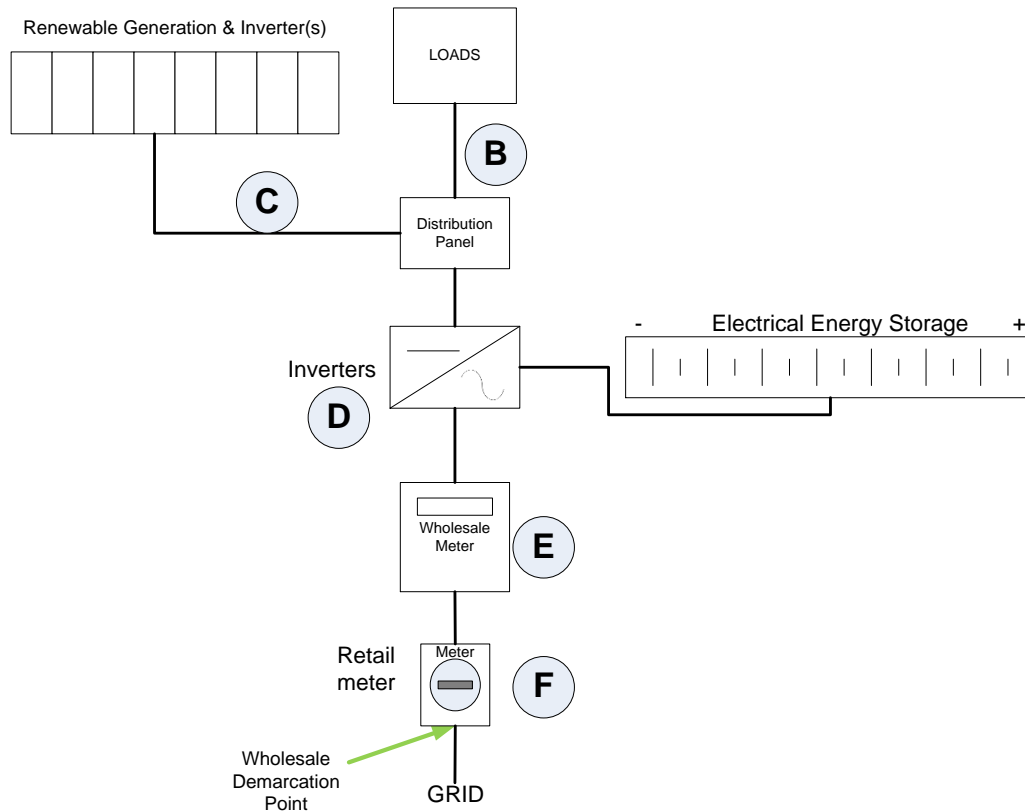
This scenario is a more sophisticated installation and enables certain features and functions to be available. These include

- Load Leveling at Grid Distribution level (not behind the meter)
- Peak Shaving at Grid Distribution level (not behind the meter)
- Renewable Load Shaping at Grid Distribution level (not behind the meter)
- Generation Output Shifting at Grid Distribution level (not behind the meter)
- Backup Power for loads without loss of retail revenue to utility
- Renewable Generation and storage during grid outage (reliability/emergency)
- Accurate NEM credit for Renewable Generation
- ISO market participation
- Avoids Double Billing of retail and Wholesale energy/power in wholesale operations

This scenario does NOT enable

- Consumer Load Shifting or Shaping
- Consumer Load leveling or Peak Shaving

This scenario is currently not available as utilities have insisted on charging retail for energy storage round trip efficiency losses at retail.



**Behind the Meter Renewable Generation, Load
Storage in Series on Wholesale Side with Retail Meter (no NEM)**

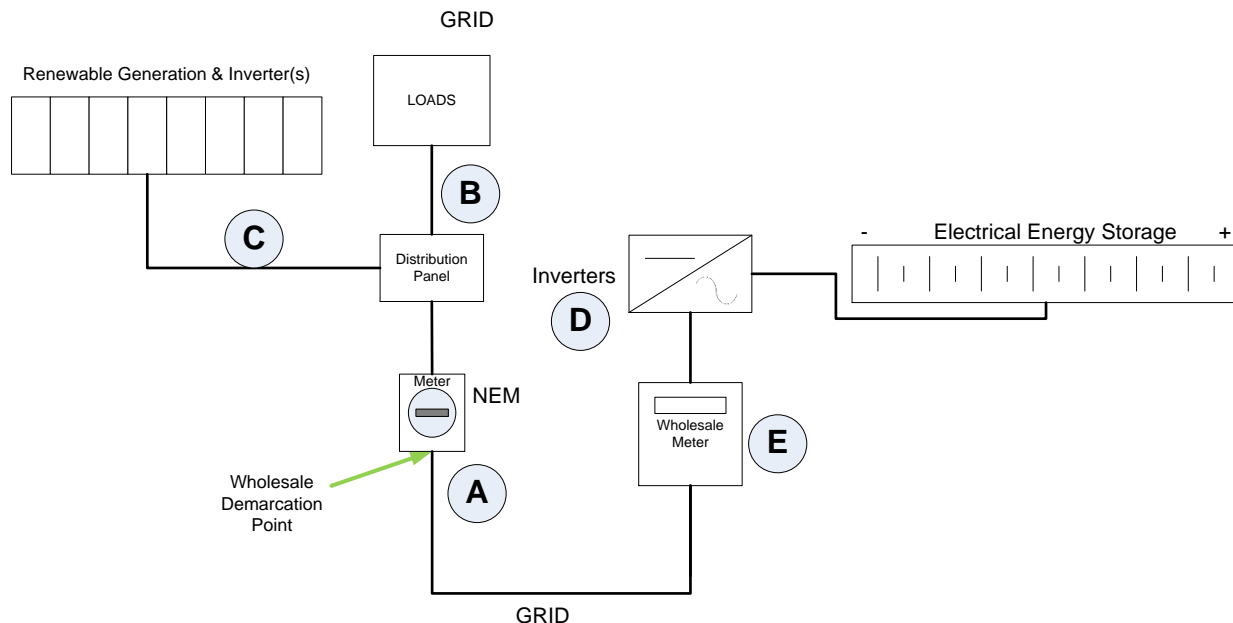
This scenario is a more sophisticated installation and enables certain features and functions to be available. These include

- Load Leveling
- Peak Shaving
- Renewable Load Shaping
- Generation Output Shifting
- Backup Power
- Renewable Generation and storage during grid outage (reliability/emergency)
- ISO market participation

This scenario does NOT enable

- Avoids Double Billing of retail and Wholesale energy/power in wholesale operations
- Accurate NEM credit for Renewable Generation
- Credit for Energy fed back to grid in excess of consumption

This scenario is limited due to sizing constraints of recent NEM decision. To be effective and allow market participation storage should be at larger power size (possibly much larger) than on site



**Behind the Meter Renewable Generation, Load and NEM
 “Standalone” Storage in Parallel to premise on Wholesale Side**

This scenario is a more sophisticated installation and enables certain features and functions to be available. These include

- Load Leveling at Grid Distribution level (not behind the meter)
- Peak Shaving at Grid Distribution level (not behind the meter)
- Renewable Load Shaping at Grid Distribution level (not behind the meter)
- Generation Output Shifting at Grid Distribution level (not behind the meter)
- Accurate NEM credit for Renewable Generation
- CAISO market participation
- Avoids Double Billing of retail and Wholesale energy/power in wholesale operations

This scenario does NOT enable

- Backup Power for loads without loss of retail revenue to utility
- Renewable Generation and storage during grid outage (reliability/emergency)
- Consumer Load Shifting or Shaping
- Consumer Load leveling or Peak Shaving

This scenario is currently not available, as utilities have insisted on charging retail for energy storage round trip efficiency losses at retail.