The Energy Storage OIR: Best Practices

A Presentation to the CPUC and California Utilities

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

1:30 PM April 12, 2012,
San Francisco CPUC Headquarters
Room 4010
505 Van Ness Avenue
San Francisco, CA 94102

Agenda

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- » **Meeting Context (15 minutes)**
- » Defining Energy Storage Benefit Streams and Applications (45 minutes)
- » Prioritizing Energy Storage Applications (45 minutes)
- » First Cut at Application Priorities (From CESA's Perspective) (30 minutes)
- » Monetizing Benefits: Impact of Ownership/Business Model (15 minutes)
- » Discuss Next Steps – Getting to Consensus on Initial Set of Application Priorities (30 minutes)

Confidential

Meeting Goals

1. Agree on key definitions and terms.
2. Agree on a framework for evaluating and prioritizing energy storage applications (including the criteria for prioritization).
3. Achieve a ‘first cut’ of the application priorities.
4. Clarify next steps in the storage OIR process and timing.

Meeting Ground Rules

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1. Focus on common objectives
2. We're here to listen, learn and provide constructive feedback
3. Stay open to outcome – try to think outside the box
4. Proactively explore ways to collaborate and improve process efficiency

Fit with Storage OIR Process and Timing

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- The Energy Division Staff served an Energy Storage Framework Staff Proposal on the Energy Storage Rulemaking Service List, along with a cover letter, on April 3.
- The cover letter is an informal means to provide a point of view on party comments and to clarify how the comments were addressed in the Staff Proposal.
- The Staff Proposal does not address all comments received on the Staff Proposal, but attempts to cover the broad themes raised by the parties.
- The Staff recommends that the energy storage rulemaking proceeding move expeditiously into Phase 2 without an additional round of comments on the Staff Proposal.

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Background

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- Sandia National Laboratories’ Report: *Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide*
- Genesis: CEC Demonstration Evaluation Framework in 2004
- All the possible benefits
- +/- 30% Precision Assumed to be Good.
- Technology Neutral
- Initial Characterization as Point of Departure
    - For more detailed, precise evaluations

Defining Benefits and Value

- Benefit = Avoided cost and/or revenue
  - MONEY
- Value = Benefit *minus* Cost
- Value Proposition
  - A *combination* of benefit "building blocks"
- "Attractive" Value Proposition = **Benefit > Cost**
  - Including required ROI

Benefit Categories

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- » Electric Supply
- » Grid Operations (Ancillary Services)
- » Transmission and Distribution (T&D) Infrastructure
- » Renewables Integration
- » Energy End-user / Utility Customer
- » Other and Incidental

Benefits by Category

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Category	Benefits
Electric Supply	1. Electric Energy Time-Shift 2. Electric Supply Capacity
Grid Operations (Ancillary Services)	3. Load Following (hours) 4. Area Regulation (several or many seconds) 5. Fast Area Regulation (a few seconds) 6. Frequency Response (sub-second) 7. Ramping (a few seconds to a few minutes) 8. Electric Supply Reserve Capacity 9. Voltage Support 10. Black Start
Grid Infrastructure	11. Transmission Support 12. Transmission Congestion Relief 13. Transmission and Distribution Upgrade Deferral 14. Substation Onsite Power
End-User	15. Time-of-Use Energy Cost Management 16. Demand Charge Management 17. Electric Service Reliability 18. Electric Service Power Quality
Renewables Integration	19. Renewables Energy Time-Shift 20. Renewables Generation Capacity Firming 21. Variable Renewables Operational Integration

Incidental Benefits

1. Increased Asset Utilization (Generation, Transmission, & Distribution)

2. Dynamic Generation Operating Benefits (EPRI)
    a) Fewer startups
    b) Reduced part load operation
    c) Reduced ramping

3. Reduced Generation Air Emissions

4. Reduced Generation Fossil Fuel Use Means Less…
    a) Equipment wear
    b) Fuel use
    c) Air emissions

5. Reduced T&D "I^2R" Energy Losses (net)

Incidental Benefits

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6. Avoided Transmission Access Charges

7. Reduced T&D Investment Risk

8. Power Factor Correction

9. Flexibility (especially modular & transportable)
    - Operational
    - Capacity management, expansion

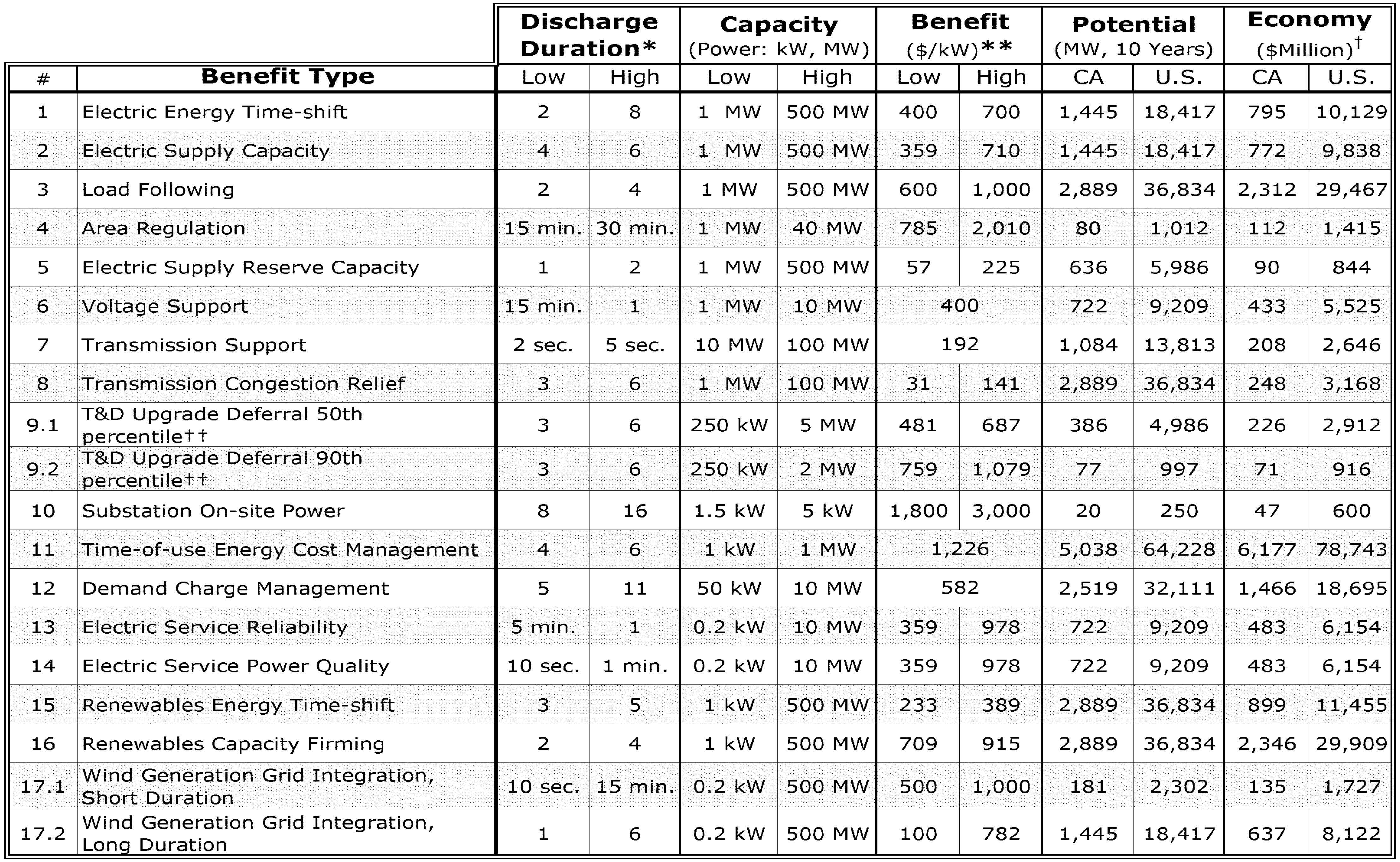
10. Option Value
    - "Real options"
        - *Business endeavors that are possible because an asset is owned*
    - Risk management, hedging
    - Take advantage of unexpected opportunities

Most Electricity Storage Benefits are Capacity-Related

- Reduce/avoid need for infrastructure, primarily:
  - Generation
  - Wires
  - Transformers
  - Capacitors
  - Land

- Energy-related benefits are important too
  - Reduced generation fuel use or cost
  - Profit from sales of electric energy
  - Reduced generation variable maintenance cost
  - Reduced generation air emissions ($ value?)

Original Sandia Report – Market Potential Results



#	Benefit Type	Discharge Duration*		Capacity (Power: kW, MW)		Benefit ($/kW)**		Potential (MW, 10 Years)		Economy ($Million)†	
		Low	High	Low	High	Low	High	CA	U.S.	CA	U.S.
1	Electric Energy Time-shift	2	8	1 MW	500 MW	400	700	1,445	18,417	795	10,129
2	Electric Supply Capacity	4	6	1 MW	500 MW	359	710	1,445	18,417	772	9,838
3	Load Following	2	4	1 MW	500 MW	600	1,000	2,889	36,834	2,312	29,467
4	Area Regulation	15 min.	30 min.	1 MW	40 MW	785	2,010	80	1,012	112	1,415
5	Electric Supply Reserve Capacity	1	2	1 MW	500 MW	57	225	636	5,986	90	844
6	Voltage Support	15 min.	1	1 MW	10 MW	400		722	9,209	433	5,525
7	Transmission Support	2 sec.	5 sec.	10 MW	100 MW	192		1,084	13,813	208	2,646
8	Transmission Congestion Relief	3	6	1 MW	100 MW	31	141	2,889	36,834	248	3,168
9.1	T&D Upgrade Deferral 50th percentile††	3	6	250 kW	5 MW	481	687	386	4,986	226	2,912
9.2	T&D Upgrade Deferral 90th percentile††	3	6	250 kW	2 MW	759	1,079	77	997	71	916
10	Substation On-site Power	8	16	1.5 kW	5 kW	1,800	3,000	20	250	47	600
11	Time-of-use Energy Cost Management	4	6	1 kW	1 MW	1,226		5,038	64,228	6,177	78,743
12	Demand Charge Management	5	11	50 kW	10 MW	582		2,519	32,111	1,466	18,695
13	Electric Service Reliability	5 min.	1	0.2 kW	10 MW	359	978	722	9,209	483	6,154
14	Electric Service Power Quality	10 sec.	1 min.	0.2 kW	10 MW	359	978	722	9,209	483	6,154
15	Renewables Energy Time-shift	3	5	1 kW	500 MW	233	389	2,889	36,834	899	11,455
16	Renewables Capacity Firming	2	4	1 kW	500 MW	709	915	2,889	36,834	2,346	29,909
17.1	Wind Generation Grid Integration, Short Duration	10 sec.	15 min.	0.2 kW	500 MW	500	1,000	181	2,302	135	1,727
17.2	Wind Generation Grid Integration, Long Duration	1	6	0.2 kW	500 MW	100	782	1,445	18,417	637	8,122

Source: Sandia National Laboratories' Report: *Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide*

Societal Value Proposition

- Economic activity and jobs
- Empowered electricity end-users (more alternatives)
- More robust, resilient and reliable grid
- Optimized generation fleet operation
  - **Dynamic operating benefits (per EPRI)**
  - Reduced wear and maintenance
  - Reduced fuel
  - Reduced air emissions
- Reduced GT&D infrastructure needs
- Lower electric energy & capacity price/cost
- Superior integration of more renewables

Storage Can Reduce Fuel Use and Air Emissions DRAFT

» Six possible ways:

- Reduce use of inefficient peaking generation
- Increase use of efficient, cleaner baseload generation
- Enable more renewables and demand response
- Optimizes electric generation fleet operation
  - Reduces generation startups, ramping, part load operation
- Reduce T&D I^2R losses (net)
- Enable more efficient energy end use (cold storage)

» Two key factors

- Generation prime movers and fuels, on and off peak
- Storage efficiency

Observations

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- Storage is multi-faceted

- Storage is unique
  - not a conventional asset
    - generation, wires, transformers, capacitors, “load”
  - rich spectrum of benefits
  - numerous variations of the technology
  - numerous stakeholders
  - requires unique evaluation: criteria, operation

- Probably need more than one Benefit and often need more than one Stakeholder
  - hence, it is helpful to think in terms of value propositions rather than “applications.”

Observations

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- Important synergies with the “grid of the future”
  - electric supply optimization
  - renewables integration
  - grid operations optimization
  - increased “asset utilization” (more kWhs per kW)
  - demand response
  - load aggregation
  - distributed generation
  - cooling efficiency
  - Smart Grid

- Need regulatory innovation to accommodate storage and to realize its potential

Establishing Consensus: Market Vocabulary

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A **Benefit (AKA Benefit Stream or Operational Use)** is Defined As:

- A single avoided cost and/or revenue which may be captured by an energy storage system in the context of the grid. Benefits may come from:
  - Reduced or deferred cost relative to the status quo
  - Direct market participation

An **Application (AKA Value Proposition)** is Defined As:

- A combination of benefit "building blocks" that an energy storage system may capture when sited at a specific place and managed in a particular way.

Establishing Consensus: Market Vocabulary

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An **Energy Storage System*** is defined as:

A commercially available technology that is capable of absorbing energy, storing it for a period of time, and thereafter dispatching the energy and which may have the following characteristics:

- Be either centralized or distributed.
- Be owned by either:
  - A load-serving entity or local publicly owned electric utility,
  - A customer of a load-serving entity or local publicly owned electric utility
  - A third party, or
  - Is jointly owned by two or more of the above.

*Definition from AB 2514 (Stats. 2010, ch. 469)

Establishing Consensus: Market Vocabulary

An **Energy Storage System*** must be cost effective and either…

- Reduce emissions of greenhouse gases,
- Reduce demand for peak electrical generation,
- Defer or substitute for an investment in generation, transmission, or distribution assets, or
- Improve the reliable operation of the **electrical generation (CESA proposed addition)**, transmission, or distribution grid.

As well as do one of the following

- Use mechanical, chemical, or thermal processes to store energy that was generated at one time for use at a later time.
- Store thermal energy for direct use for heating or cooling at a later time in a manner that avoids the need to use electricity at that later time.
- Use mechanical, chemical, or thermal processes to store energy generated from renewable resources for use at a later time.
- Use mechanical, chemical, or thermal processes to store energy generated from mechanical processes that would otherwise be wasted for delivery at a later time.

*Definition from AB 2514 (Stats. 2010, ch. 469)

Benefit Streams

Duration	Benefit Stream	Description
Short	**Frequency Regulation**	Frequency Regulation
Short	**Ramping**	Smoothing the rapidly varying output changes due to renewables
Short	**Transmission Support**	Improves transmission system performance by compensating for electrical anomalies and disturbances such as unstable voltage, over-voltage and under-voltage conditions, and sub-synchronous resonance.
Long	**Electric Energy Time Shift**	Shifting peak supply to off peak periods
Long	**Electric Supply Capacity** (potential future benefit)	Resource Adequacy
Long	**Transmission Congestion Relief**	Reducing load to extend equipment life
Long	**T&D Asset Deferral and Life Extension** (potential benefit)	Delaying, and in some cases avoiding entirely, utility investments in distribution system upgrades.
Long	**Time of Use Energy Cost Management**	Commercial bill savings from better energy management
Long	**Demand Charge Management**	Use of storage to mitigate demand charge penalties
Intermittent	**Electric Supply Reserve Capacity- Spinning**	Online generation capacity that is called upon as needed
Intermittent	**Electric Supply Reserve Capacity – Non-Spinning**	Offline generation capacity that is called upon as needed
Intermittent	**Voltage Support** (potential future benefit)	Offset reactive effects and maintain grid system voltage.
Intermittent	**Black Start**	Energy used to start up a generator
Intermittent	**Local Electric Service Reliability and Quality**	On-site backup power used for residential or commercial applications
N/A	**Reduced T&D Energy Losses**	Energy reductions from shorter transmission distances
N/A	**Increased T and/or D Asset Utilization**	Increased efficiency gained from more efficient use of existing T and D assets
N/A	**Reduced Air Emissions and/or Fuel Use**	Environmental benefits from reductions in greenhouse gas emissions.

*Based on current annual grid spending

**Calculated from GlobalData October 2011 UPS report

Energy Storage Scenarios

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Two scenarios appear to be missing from the Staff report…

Staff-proposed scenarios

- A. Renewables Support/Dispatchability
- B. Distributed Storage
- C. Demand-Side Management
- D. Ancillary Services

Additional suggested scenarios

- E. Flexible Generation/Peaker
- F. Transmission

These two scenarios are equally as important for ongoing grid stability

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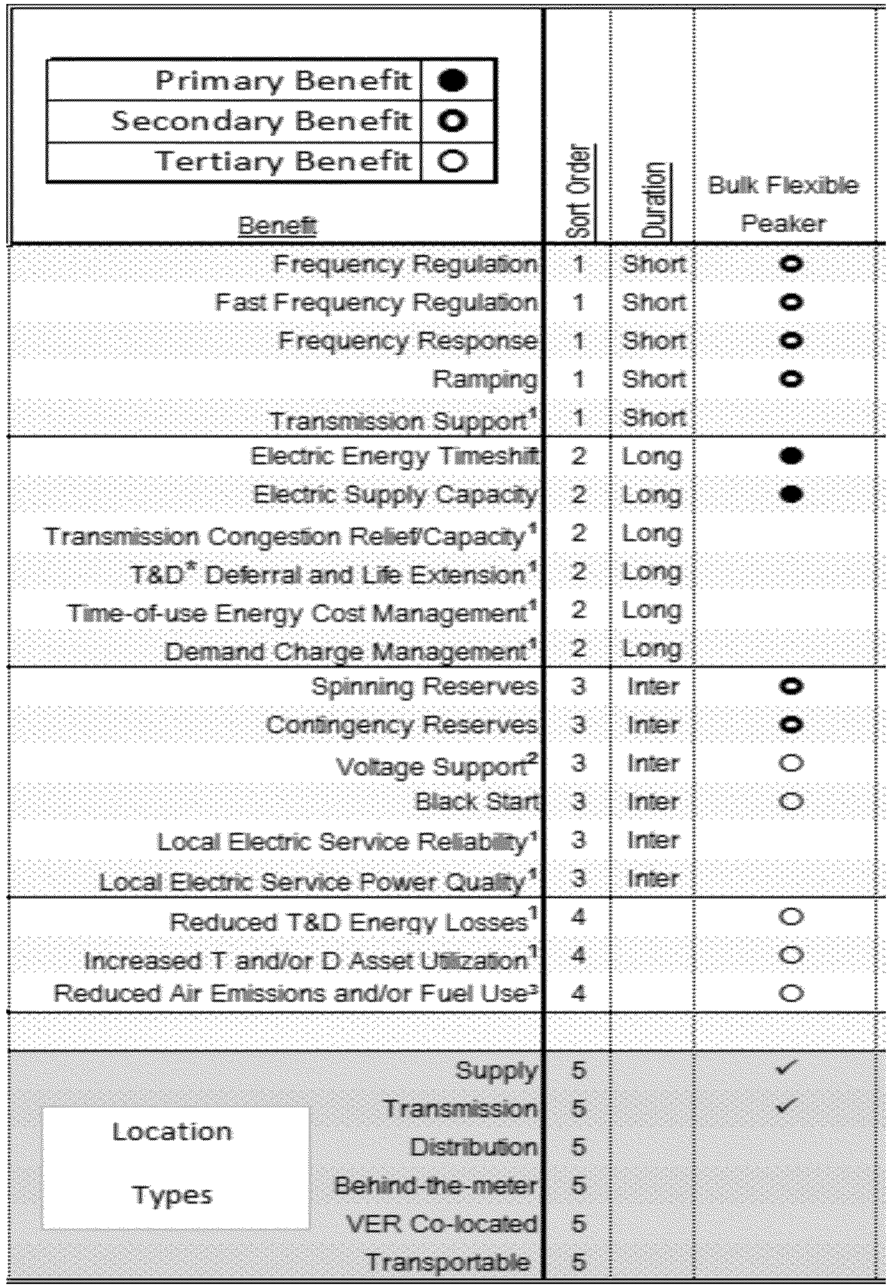
The Application Matrix – A Logical Analytical Framework

Here is an example of how a single application is analyzed



Primary Benefit	●
Secondary Benefit	**○**
Tertiary Benefit	○

Benefit	Sort Order	Duration	Bulk Flexible Peaker
Frequency Regulation	1	Short	**○**
Fast Frequency Regulation	1	Short	**○**
Frequency Response	1	Short	**○**
Ramping	1	Short	**○**
Transmission Support[1]	1	Short	
Electric Energy Timeshift	2	Long	●
Electric Supply Capacity	2	Long	●
Transmission Congestion Relief/Capacity[1]	2	Long	
T&D* Deferral and Life Extension[1]	2	Long	
Time-of-use Energy Cost Management[1]	2	Long	
Demand Charge Management[1]	2	Long	
Spinning Reserves	3	Inter	**○**
Contingency Reserves	3	Inter	**○**
Voltage Support[2]	3	Inter	○
Black Start	3	Inter	○
Local Electric Service Reliability[1]	3	Inter	
Local Electric Service Power Quality[1]	3	Inter	
Reduced T&D Energy Losses[1]	4		○
Increased T and/or D Asset Utilization[1]	4		○
Reduced Air Emissions and/or Fuel Use[3]	4		○
Location Types: Supply	5		✓
Transmission	5		✓
Distribution	5		
Behind-the-meter	5		
VER Co-located	5		
Transportable	5		

The Application Matrix – A Logical Analytical Framework

The framework appears complicated, but is actually a very straightforward way of analyzing the possibilities for Grid Energy Storage

Benefit streams on the Y axis

Applications along the top select the possible benefits

Primary Benefit ●
Secondary Benefit ◎
Tertiary Benefit ○

	Benefit	Sort Order	Duration	Bulk Flexible Peaker	Flexible Peaker (Bulk) plus Transmission Congestion Relief	Bulk Renewables Integration	Fast Frequency Regulation	Flexible Ramping	Enhanced Reserves Management	Merchant Supply Only	Merchant Supply Plus Transmission¹	Transmission (Electrical) Support¹	In Lieu of Transmission Capacity¹	Stationary T&D* Deferral and/or Life Extension¹	Transportable T&D* Deferral and/or Life Extension¹	Distributed Modular Flexible Peaker	Community Energy Storage (CES)²	Electric Service Bill Management¹	Distributed PV Integration	Bulk Wind Generation to Distributed Storage	Air Conditioning Load Management	Fast EV Charging
1	Frequency Regulation	1	Short	◎	◎			◎	◎	◎	◎		◎	◎	◎	◎	◎		◎	◎	◎	
2	Fast Frequency Regulation	1	Short	◎	◎	◎	●	◎	◎	◎	◎		◎	◎	◎	◎	◎		◎	◎	◎	
3	Frequency Response	1	Short	◎	◎			◎	◎	◎	◎		◎	◎	◎	◎	◎	○	◎	◎	◎	◎
4	Ramping	1	Short	◎	◎	◎		●	◎	◎	◎		◎	◎	◎	◎	◎		◎	◎	◎	
5	Transmission Support¹	1	Short									●										
6	Electric Energy Timeshift	2	Long	●	●	●				●	●		◎	◎	◎	●	●		●	●	●	●
7	Electric Supply Capacity	2	Long	●	●	●				●	●		◎	◎	◎	●	●		●	●	●	●
8	Transmission Congestion Relief/Capacity¹	2	Long		●						●			◎	◎	◎	◎		◎	◎	◎	◎
9	T&D* Deferral and Life Extension¹	2	Long										●	●	●	◎	◎		◎	◎	◎	◎
10	Time-of-use Energy Cost Management¹	2	Long															●				
11	Demand Charge Management¹	2	Long															●				
12	Spinning Reserves	3	Inter	◎	◎			○	●	◎	◎		◎	◎	◎	◎	◎	○	◎	◎	◎	◎
13	Contingency Reserves	3	Inter	◎	◎			○	●	◎	◎		◎	◎	◎	◎	◎	○	◎	◎	◎	◎
14	Voltage Support²	3	Inter	○	○					○	○		○	◎	◎	◎	◎	○	◎	◎	●	○
15	Black Start	3	Inter	○	○						◎			○	○		○					
16	Local Electric Service Reliability¹	3	Inter											◎	◎	◎	●	◎	◎	◎	◎	
17	Local Electric Service Power Quality¹	3	Inter											◎	◎	◎	●	◎	◎	◎	◎	
18	Reduced T&D Energy Losses¹	4		○	○					○	○		○	○	○	○	○	○	○	○	○	○
19	Increased T and/or D Asset Utilization¹	4		○	○					○	○		○	○	○	○	○	○	○	○	●	●
20	Reduced Air Emissions and/or Fuel Use³	4		○	○					○	○		○	○	○	○	○	○	○	○	○	◎
21	Supply	5		✓	✓	✓	✓	✓	✓	✓												
22	Transmission	5		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓							
23	Location Types Distribution	5						✓	✓					✓	✓	✓	✓		✓	✓	✓	
24	Behind-the-meter	5							✓	✓	✓					✓		✓	✓		✓	✓
25	VER Co-located	5				✓		✓											✓			
26	Transportable	5			✓			✓							✓	✓						

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[1] Location is critical.

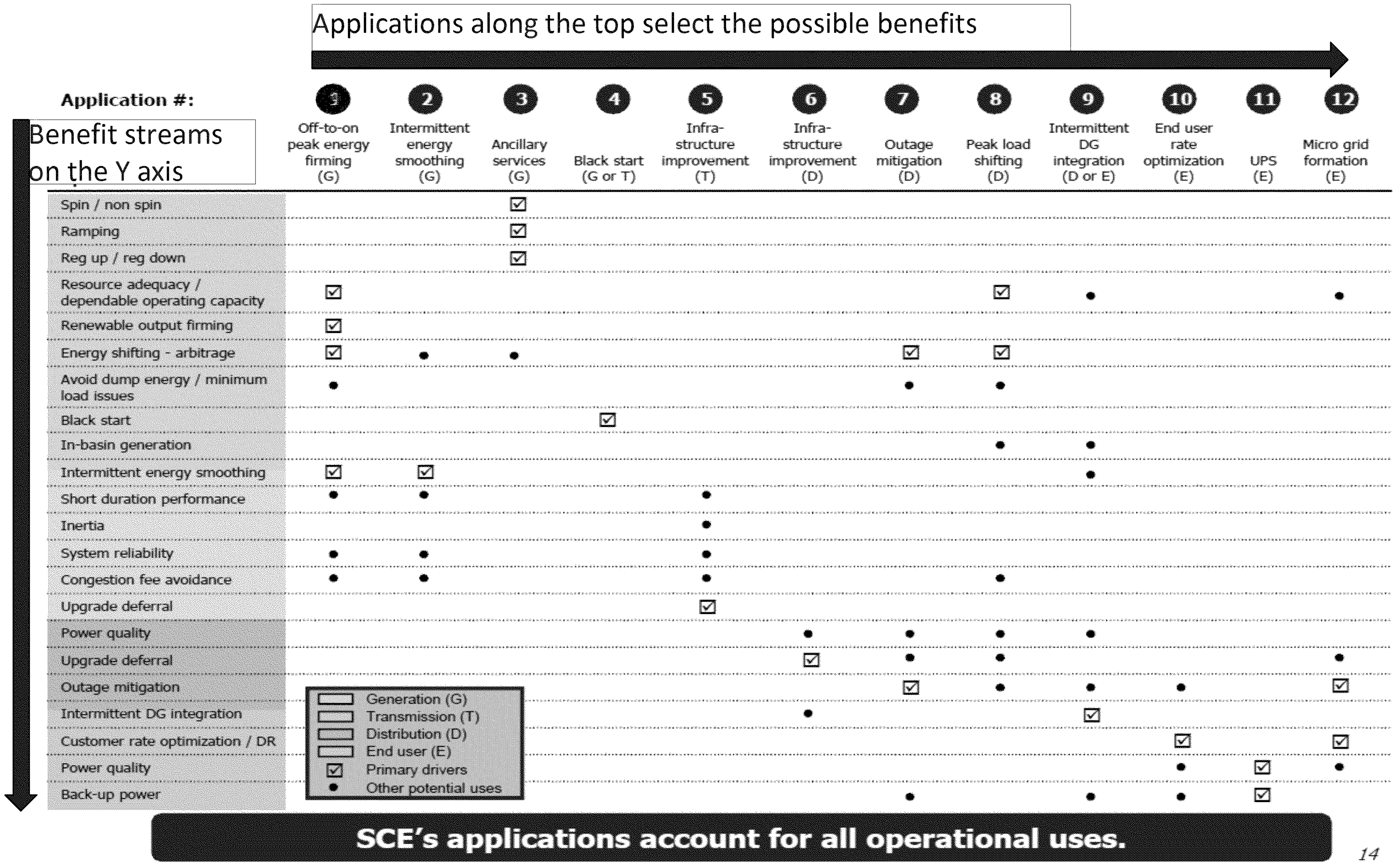
[2] Location matters.

[3] Per kWh. Depends on generation used to produce charging energy, avoided generation on-peak, storage round-trip efficiency.

* Subtransmission and Distribution.

The Southern California Edison Storage Analysis

SCE's approach is practically identical to CESA's



Applications along the top select the possible benefits

Benefit streams on the Y axis

Application #:	1 Off-to-on peak energy firming (G)	2 Intermittent energy smoothing (G)	3 Ancillary services (G)	4 Black start (G or T)	5 Infra-structure improvement (T)	6 Infra-structure improvement (D)	7 Outage mitigation (D)	8 Peak load shifting (D)	9 Intermittent DG integration (D or E)	10 End user rate optimization (E)	11 UPS (E)	12 Micro grid formation (E)
Spin / non spin			☑									
Ramping			☑									
Reg up / reg down			☑									
Resource adequacy / dependable operating capacity	☑							☑	●			●
Renewable output firming	☑											
Energy shifting - arbitrage	☑	●	●				☑	☑				
Avoid dump energy / minimum load issues	●						●	●				
Black start				☑								
In-basin generation								●	●			
Intermittent energy smoothing	☑	☑							●			
Short duration performance	●	●			●							
Inertia					●							
System reliability	●	●			●							
Congestion fee avoidance	●	●			●			●				
Upgrade deferral					☑							
Power quality						●	●	●	●			
Upgrade deferral						☑	●	●				●
Outage mitigation							☑	●	●	●		☑
Intermittent DG integration						●			☑			
Customer rate optimization / DR										☑		☑
Power quality										●	☑	●
Back-up power							●		●	●	☑	

▭ Generation (G)
▭ Transmission (T)
▭ Distribution (D)
▭ End user (E)
☑ Primary drivers
● Other potential uses

SCE's applications account for all operational uses.

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*Source: *SCE's Approach to Evaluating Energy Storage* presentation to the ESA Economics and Policy Panel, June 2011

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Proposed Criteria and Prioritization Schema

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The approach to grid energy storage should take into account…

- The costs and benefits of ES as part of existing methodologies, and if different methodologies should be developed for different applications.
- The many benefits of storage, especially those that bridge procedural and jurisdictional lines.
- All system and environmental benefits associated with ES, especially the reduction in emissions from cycling thermal units to "fill in around renewable generation and provide marginal peak generation"
- The establishment of measurement and metering standards as necessary to track benefits from energy storage.
- A methodology to determine the resource adequacy values and procurement targets for storage.

Source: CESA Storage OIR Comments from 1/21/2011; Page 8-9

Proposed Criteria and Prioritization Schema

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Specifically, we suggest prioritizing applications by…

- » Magnitude of societal benefits
- » Magnitude of direct benefits
- » Renewables enablement
- » Fit with CPUC jurisdictional control
- » Availability of commercially ready technologies
- » Ability to be deployed quickly – “quick win” potential

Results of analytical application prioritization

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Based on our filtering criteria, these are the top applications to focus on.

Priority Applications

Primary Benefit	●
Secondary Benefit	⭘
Tertiary Benefit	○

	Benefit	Sort Order	Duration	Bulk Flexible Peaker	In Lieu of Transmission Capacity[1]	Distributed Modular Flexible Peaker	Community Energy Storage (CES)[2]	Electric Service Bill Management[1]
1	Frequency Regulation	1	Short	⭘	⭘	⭘	⭘	
2	Fast Frequency Regulation	1	Short	⭘	⭘	⭘	⭘	
3	Frequency Response	1	Short	⭘	⭘	⭘	⭘	○
4	Ramping	1	Short	⭘	⭘	⭘	⭘	
5	Transmission Support[1]	1	Short					
6	Electric Energy Timeshift	2	Long	●	⭘	●	●	
7	Electric Supply Capacity	2	Long	●	⭘	●	●	
8	Transmission Congestion Relief/Capacity[1]	2	Long			⭘	⭘	
9	T&D* Deferral and Life Extension[1]	2	Long		●	⭘	⭘	
10	Time-of-use Energy Cost Management[1]	2	Long					●
11	Demand Charge Management[1]	2	Long					●
12	Spinning Reserves	3	Inter	⭘	⭘	⭘	⭘	○
13	Contingency Reserves	3	Inter	⭘	⭘	⭘	⭘	○
14	Voltage Support[2]	3	Inter	○	○	⭘	⭘	○
15	Black Start	3	Inter	○			○	
16	Local Electric Service Reliability[1]	3	Inter			⭘	●	⭘
17	Local Electric Service Power Quality[1]	3	Inter			⭘	●	⭘
18	Reduced T&D Energy Losses[1]	4		○	○	○	○	○
19	Increased T and/or D Asset Utilization[1]	4		○	○	○	○	○
20	Reduced Air Emissions and/or Fuel Use[3]	4		○	○	○	○	○
21	Supply	5		✓				
22	Transmission	5		✓	✓			
23	Distribution	5				✓	✓	
24	Behind-the-meter	5				✓		✓
25	VER Co-located	5						
26	Transportable	5				✓		

Location Types

[1] Location is critical.

[2] Location matters.

Alignment with CPUC Staff Proposed Scenarios:

Scenario	Corresponding Priority Application(s)
Scenario A: Renewables Support/Dispatchability	Bulk Flexible Peaker – Can perform the same role as a renewables-cited system
Scenario B: Distributed Storage	Distributed Modular Flexible Peaker
Scenario C: Demand-Side Management	Electric Service Bill Management; Community Energy Storage
Scenario D: Ancillary Services	Bulk Flexible Peaker; Distributed Modular Flexible Peaker;
***Scenario E: Flexible Supply/Peaker**	Bulk Flexible Peaker; Distributed Modular Flexible Peaker
***Scenario F: Transmission**	In Lieu of Transmission Capacity

*Proposed additional scenario

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- **Monetizing Benefits: Impact of Ownership/Business Model (15 minutes)**
- Discuss Next Steps – Getting to Consensus on Initial Set of Application Priorities (30 minutes)

Important Considerations for Key Ownership Types

Each ownership model has certain regulatory and technical considerations

Owner	Regulatory Considerations	Technical Considerations
Investor-owned Utility	» "Permission" and rationale for rate basing » Guaranteed cost recovery	» Established performance track record of storage systems » Reliable control and dispatch software » Assessment and design standard practices (e.g. Rule 21)
Electricity End-user	» Consistent electric service pricing "Rules" for aggregation » Ability to participate in A/S markets » Standard interconnection rules	» Reliable control and dispatch software » Reasonable interconnection and protection requirements.
Third Party	» Long term financeable cash flows » Pay-for-performance and/or "efficient" pricing » Resource-type-neutral PPA terms.	» Financeable performance track record » Reliable control and dispatch software » Reasonable interconnection and protection requirements.

Agenda

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- Meeting Context (15 minutes)
- Defining Energy Storage Benefit Streams and Applications (45 minutes)
- Prioritizing Energy Storage Applications (45 minutes)
- First Cut at Application Priorities (From CESA's Perspective) (30 minutes)
- Monetizing Benefits: Impact of Ownership/Business Model (15 minutes)
- **Discuss Next Steps – Getting to Consensus on Initial Set of Application Priorities (30 minutes)**

Proposed Road Map

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CESA recommends that the Roadmap include firm milestones, which should include the following…

1. Determine priority applications (end uses) to focus on by June 2012.
2. Develop cost-effectiveness methodology for selected applications by December 2012.
3. Identify long term procurement mechanism for energy storage by December 2012.
4. Determine RA value for energy storage by June 2013.
5. Authorize additional utility pilots to test priority applications, ownership models, and procurement mechanisms by January 2014.

Source: CESA Reply Comments, January 31, 2012, page 12

Next Steps

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- Who?
- What?
- Where?
- When?
- How do these conclusions fit with the existing Storage OIR timeline?