Appendix C 1

CPUC Energy Storage Use Case Analysis

Application Scenario: Bulk Generation

Use Case: Storage Peaker

Version 0.1

Contents

2. Overview Section

Add text

3. Use Case Description

This Use Case describes a hypothetical 100 MW energy storage system (ESS) functioning effectively as a "peaker" plant, referred to here as a "storage peaker," that connects to and charges off the transmission grid to deliver capacity, ancillary services, and energy to wholesale markets.

It is assumed that the resource has successfully connected to the transmission grid under California ISO interconnection rules and processes and includes CAISO-approved telemetry that allows for remote monitoring of the resource and related factors (i.e., generation output, availability, meteorological data, and circuit-breaker status).

3.1 Objectives

A "storage peaker" plant participates in wholesale markets and offers "emissions-free"[1] dispatchable capacity and energy in peak hours and ancillary services for balancing and reliability,

In comparison to conventional, gas-fired peaker plants, a storage peaker may offer several advantages, including: better operational flexibility, emissions reduction, renewable integration (including over generation), procurement flexibility, and risk mitigation,

Additionally, use of storage as a peaker, instead of a conventional combustion turbine (CT), may potentially avoid curtailment because of oversupply situations.

3.2 Actors

In this Use Case, the storage facility may be owned by 1) the utility, 2) a merchant supplier similar to an IPP, or 3) a third party that operates the facility under a under a long-term power purchase agreement with the utility (similar to a "tolling" agreement).

3.3 Proceedings and Rules that Govern Procurement and Markets for This Use

	Description	*Applies to*
CPUC	Long-term Procurement Proceeding	Utility
CPUC	Resource Adequacy	Utility
CAISO	GIP	Project developer/owner

Add more commentary here as needed.

[1] The "fuel" source for the charge cycle of the storage plant may not be emissions-free.

Location

The storage peaker plant is connected to the transmission grid and is an independent facility that is separate from other generators. It charges off the grid and discharges into the grid. The total capacity of the storage plant could be located at a single site or aggregated over multiple smaller sites.

3.4 Operational Requirements

The "capacity" of storage peaker plant typically ranges from 25 MW to 250 MW x 3-6 hours. The total capacity could be located at a single site or aggregated over multiple smaller sites.

A key feature of peaker plants is operational flexibility. A variety of requirements could be considered for operational flexibility that may need to be satisfied by a facility like the storage peaker. These include ramp rate, start/stop times, re-starts, minimum run times, dynamic range, emissions limits, hours of availability, etc.

The ISO may dispatch energy from its 5-minute market (aka, Balancing Energy Ex-Post Pricing, or BEEP-stack) which represents a real-time market for ancillary services.
Storage peakers can participate in this real-time market and supply incremental energy in the same manner as traditional generators.

3.5 Applicable Storage Technologies

The storage peaker is most likely to be based on some form of battery system of various chemistries, such as Sodium Sulfur (NAS) or Lithium Ion (Li-Ion). These could be a number of units stacked in a single location, or dispersed but aggregated to act as a single resource. Other technologies that may apply potentially include smaller scale compressed air storage (CAES) facility or pumped storage.

Storage Type	*Storage capacity*	*Discharge Characteristics*

3.6 Non-Storage Options for Addressing this Objective

Alternatives available to address functions associated with a peaker are:

- CT
- Hydroelectricity
- Combined Cycle Combustion Turbine (CCGT) coupled with TES

4. Cost-Effectiveness Analysis

4.1 End Uses / Benefits

End Use	*Primary/ Secondary*	*Benefits/Comments*
1. Frequency regulation	P	
2. Spin	P	
3. Ramp	P	
4. Black start		
5. Real-time energy balancing	P	
6. Energy arbitrage	P	
7. Resource Adequacy	P	
8. VER[2] / wind ramp/volt support,		
9. VER/ PV shifting, Voltage sag, rapid demand support		
10. Supply firming		
11. Peak shaving: load shift		
12. Transmission peak capacity support (deferral)		
13. Transmission operation (short duration performance, inertia, system reliability)		
14. Transmission congestion relief		
15. Distribution peak capacity support (deferral)		
16. Distribution operation (volt/VAR support)		
17. Outage mitigation: microgrid		
18. TOU energy mgt		
19. Power quality		
20. Back-up power		

[2] VER = Variable Energy Resource

4.2 Other Beneficial Attributes

Attribute	*Benefits/Comments*
Modularity/Incremental build	
Faster build time	
Locational flexibility / Mobility	
Multi-site aggregation	
Optionality	
Procurement flexibility	
Other?	

4.3 Costs

Cost Type	*Description*
Installation	
O&M	

4.4 Cost-effectiveness Considerations

Narrative

5. Barriers Analysis & Policy Options

5.1 Barrier Resolution

Barriers Identified	*Y/N*	Policy Options / Comments
System Need	Y	Incorporate flexibility requirements into need authorization
Cohesive Regulatory Framework		
Evolving Markets	Y	
Resource Adequacy Value	Y	Higher valuation for flexible resources
Cost Effectiveness Analysis	Y	
Cost Recovery Policies		
Cost Transparency & Price Signals		
Commercial Operating Experience	?	
Interconnection Processes		
Issues with RFO design and offer evaluation process	Y	Develop a more comprehensive design & evaluation to consider more attributes
Operational flexibility requirements unclear	Y	
Value of operational flexibility unclear	Y	
Value of portfolio/procurement flexibility undefined	Y	
		Consider designating storage-based generators as "preferred"
		Consider portfolio approach to procurement

5.2 Other Considerations

6. Real World Example

6.1 Project Description

Primus Power/Modesto Irrigation District.

- 25 MW/75 MWh.
- Projected to be online by Summer 2013.

6.2 Outstanding Issues

Description	*Source*

6.3 Contact/Reference Materials

7. Conclusion and Recommendations

Is ES commercially ready to meet this use?

Is ES operationally viable for this use?

What are the non-conventional benefits of storage in this use?
Can these benefits be monetized through existing mechanisms?
If not, how should they be valued?

Is ES cost-effective for this use?

What are the most important barriers preventing or slowing deployment of ES in this use?

What policy options should be pursued to address the identified barriers?

Should procurement target or other policies to encourage ES deployment be considered for this use?