

Station Power

Joint CPUC – CAISO Energy Storage Workshop – Day 1

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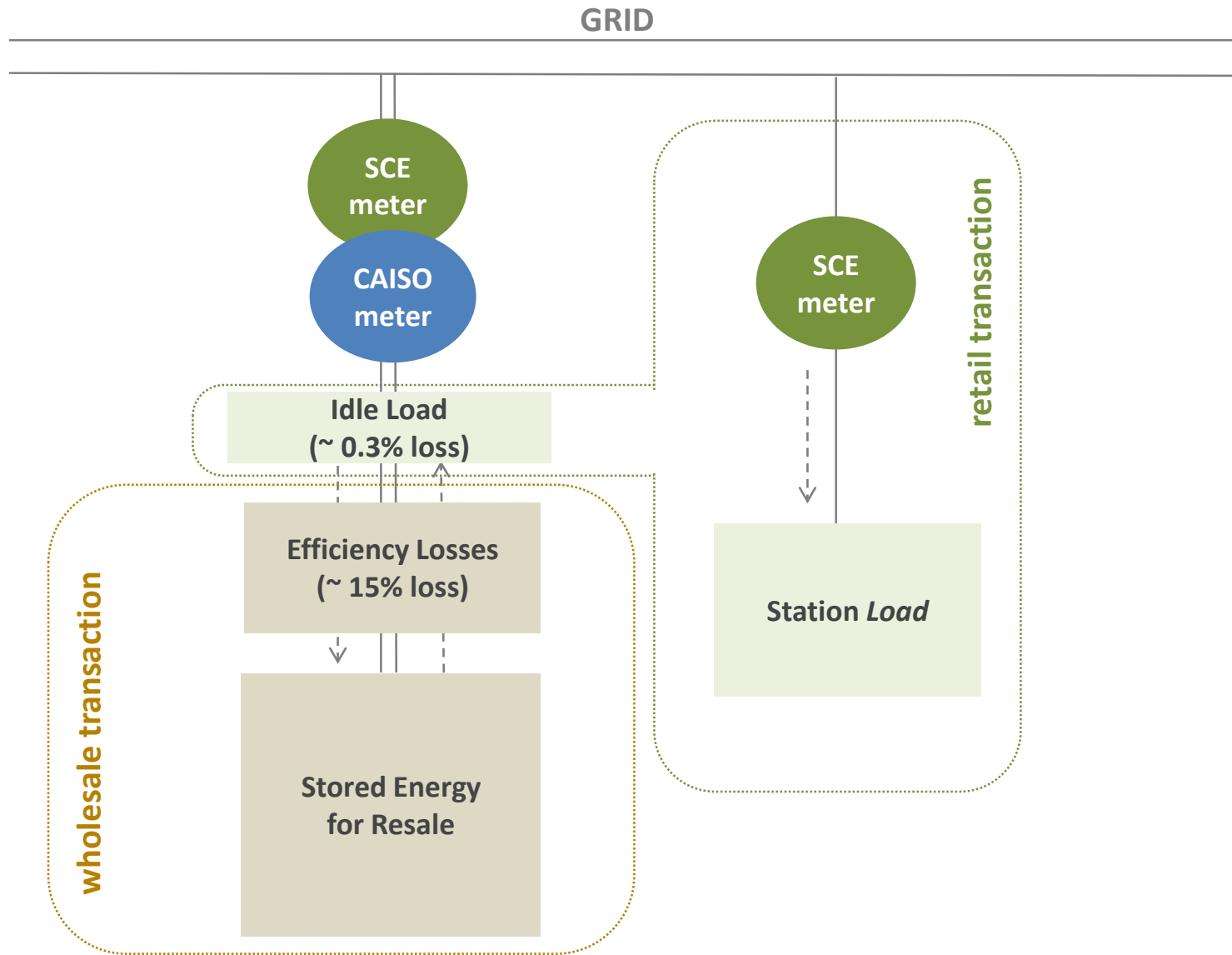
Overview

- Retail rates must be applied equally to all customers regardless of the makeup of the onsite load or technology
- Energy Storage (ES) represents a generation resource similar to existing natural gas and renewable resources
 - ES may provide various services to the grid such as voltage support, reg-up, reg-down, peaking capacity, etc.

Rate Schedule & Attribute Applicability Matrix

Service Attribute	Gas Fired Generators / Inverter Based Renewable Generation <i>(e.g., PV, wind)</i>	Energy Storage
Facilities - New Installation	WDAT / Interconnection Upgrade Cost (w/ on-going O&M Cost)	WDAT / Interconnection Upgrade Cost (w/ on-going O&M Cost)
Retail Rate Applies:		
- Station Load	Retail	Retail
- Idle Load <i>(when device is neither charging nor discharging)</i>	Retail	Retail
- Reactive Power (kVAR)	Retail	Retail
Wholesale Price Applies:		
- Generation to the Grid	Wholesale	Wholesale
- Charging Load (Fuel)	n/a	Wholesale
Applicable Billing Determinants	Metered Load & Reserve Capacity	Metered Load & Reserve Capacity
Applicable Tariff	Standby	Energy Storage Standby
Station Power Self Supply Rate	Retail <i>(exempt from transmission - when deemed self-supply)</i>	Retail <i>(exempt from transmission - when deemed self-supply)</i>
Meter Requirement for Retail Rate Billing	Dedicated SCE Meter	Dedicated SCE Meter

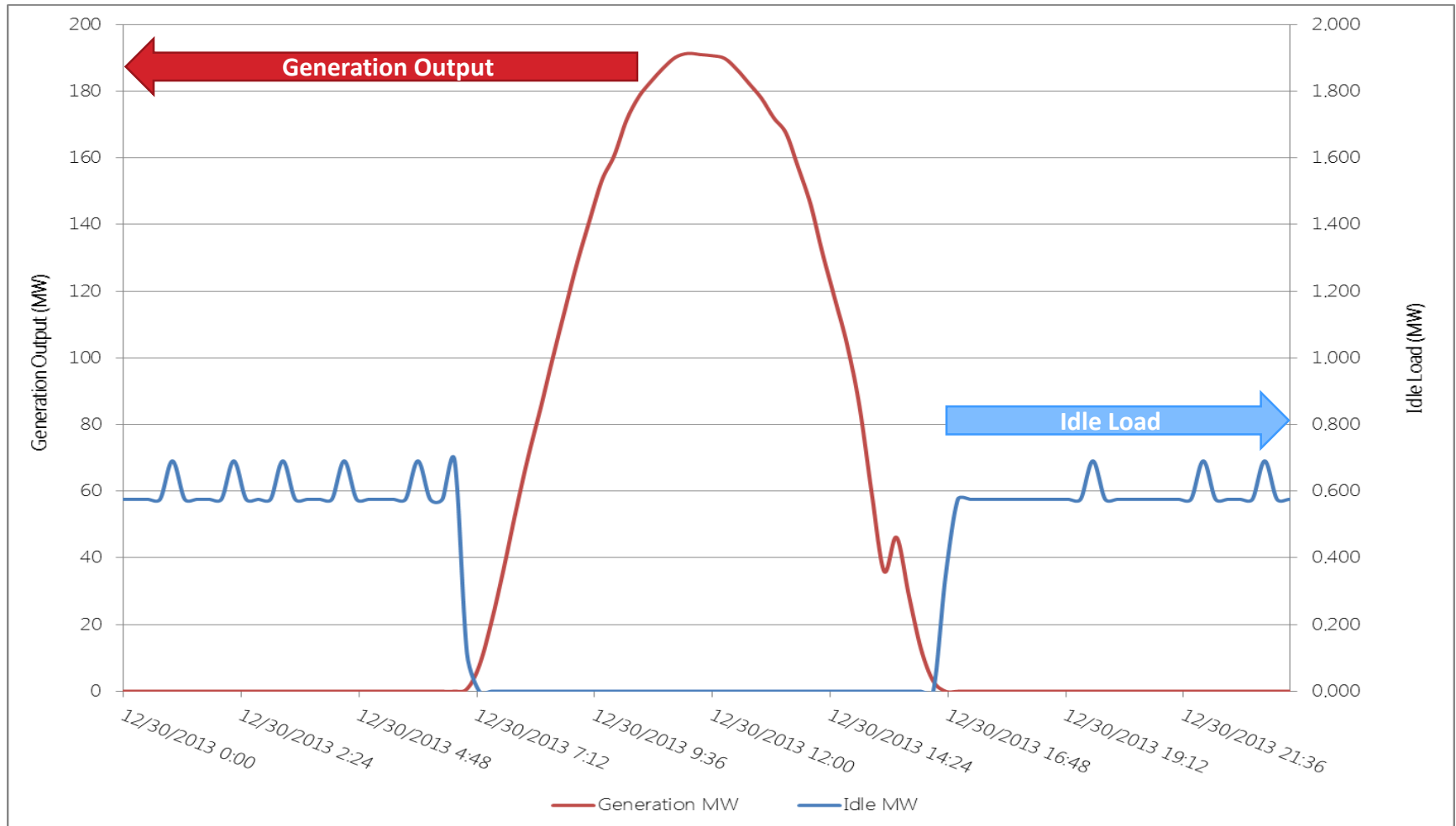
Storage Facility with Dual-Meter Arrangement



Illustrative Generation Output vs. Idle Load

- 15-minute Interval Data over 24-hours

- Idle load is approximately 0.7 MW of inverter load, ~ 0.4% of Gen capacity
 - Similarly sized traditional gen and general service customers are charged retail rates



Roundtrip Efficiency

- Roundtrip Efficiency (RTE) is used as a performance measure to determine at what level contracted payments should be made
 - Accounts for the amount of stored energy at the beginning and end of the period, and the amount of charge and discharge during the period
 - RTE is similar to heat rate for gas fired units (as a measure of an asset's performance capability)
 - RTE is stipulated in the contract
 - Traditional station loads are served on a dedicated meter
- Energy Storage agreements are structured in two ways:
 - Resource Adequacy (RA) – Capacity payment, RTE does not apply
 - Tolling – Primarily Capacity payment, RTE does apply
- For Tolling agreements where the storage device meets the RTE target, the customer will more likely receive a full monthly capacity payment
 - If the RTE target is missed, the capacity payment is reduced
- Roundtrip Efficiency function will need to account for Idle load

Retail Standby Rates

- Generation customers are required to take service on retail Standby rates for the various types of end-use load (i.e., Station Power)
 - Load used to drive onsite auxiliary equipment and other onsite loads used in the production of electricity
 - Load of electrical equipment used exclusively for the production of energy and any useful thermal energy by the generating unit
 - Incidental heating, lighting, air conditioning and office requirements
 - Reactive power – kVAR of reactive demand imposed on the grid
- Two types of standby load:
 - Supplemental – load regularly served by SCE
 - Backup (Standby) – load regularly served by the generator

Illustrative Standby Rates

Schedule TOU-8-Standby (Above 50 kV)	Trans	Dist	NBC	Total Delivery	Gen
SUPPLEMENTAL CHARGES					
Energy Charge - ¢/kWh					
<u>Summer Season</u>					
On-Peak	0.10	0.22	1.70	2.01	7.13
Mid-Peak	0.10	0.22	1.70	2.01	3.99
Off-Peak	0.10	0.22	1.70	2.01	2.50
<u>Winter Season</u>					
Mid-Peak	0.10	0.22	1.70	2.01	4.23
Off-Peak	0.10	0.22	1.70	2.01	2.93
Customer Charge - \$/month		2,352.53		2,352.53	
Facilities Related Demand Charge, excess of CRDC - \$/kW	4.33	2.43		6.76	
BACKUP/STANDBY CHARGES					
Capacity Reservation Demand Charge (CRDC) - \$/kW	0.59	0.94		1.53	
Time Related Demand Charge (Summer Season) - \$/kW					
<u>Backup demand</u>					
On-Peak					5.49
Mid-Peak					1.40
<u>Supplemental demand</u>					
On-Peak					15.36
Mid-Peak					4.02

- Customer and Standby charges are applicable every billing cycle, while Supplemental Energy and Delivery charges would apply only in months where the generator is not operating and SCE provides the auxiliary load requirements
- Standby charges are applied to the peak demand normally served by the generator (*i.e.*, standby demand)
 - Capacity Reservation Charge (CRC) is a reduced peak demand charge to reflect the fact that standby customer usage is less coincidental with the system peak demand
 - Backup Demand Charge is a summer time-differentiated demand charge for the portion of load regularly served by the generator

Sample Bill w/ One Week Generator Outage

Metered Consumption	Schedule TOU-8-Standby (Above 50 kV)	Trans	Dist	NBC	Total Delivery	Gen
SUPPLEMENTAL CHARGES						
	Energy Charge - ¢/kWh					
	<u>Summer Season</u>					
19,500	On-Peak	\$ 19	\$ 43	\$ 331	\$ 392	\$ 1,390
40,300	Mid-Peak	\$ 38	\$ 89	\$ 683	\$ 810	\$ 1,610
52,000	Off-Peak	\$ 49	\$ 114	\$ 882	\$ 1,046	\$ 1,299
	<u>Winter Season</u>					
	Mid-Peak	\$ -	\$ -	\$ -	\$ -	\$ -
	Off-Peak	\$ -	\$ -	\$ -	\$ -	\$ -
	Customer Charge - \$/month		\$ 2,353		\$ 2,353	
1,000	Facilities Related Demand Charge, excess of CRDC - \$/kW	\$ 4,330	\$ 2,430		\$ 6,760	
BACKUP/STANDBY CHARGES						
1,000	Capacity Reservation Demand Charge (CRDC) - \$/kW				\$ 1,530	
	Time Related Demand Charge (Summer Season) - \$/kW					
	<u>Backup demand</u>					
1,000	On-Peak					\$ 5,490
800	Mid-Peak					\$ 1,120
	<u>Supplemental demand</u>					
	On-Peak					\$ -
	Mid-Peak					\$ -
	TOTAL CHARGES	\$ 4,436	\$ 5,028	\$ 1,896	\$ 12,891	\$ 10,909

- In any billing month, if a generator outage occurs and SCE supplies auxiliary load for station power, the customer is billed a combination of Supplemental and Standby charges.
- For the period over which SCE serves the load, the customer is billed the Supplemental Customer and Energy charges. This includes all per-kWh Delivery charges and per-kWh Generation charges.
- Demand charges (FRD and TRD) on OAT are adjusted to ensure that the customer does not pay twice for T&D and generation capacity; the customer is only billed standby charges plus Back-up generation charges

Potential ES Rate Structure

- Establish a unique standby rate schedule for ES that specifies the following:
 - End-use load can be based on a measured level of load recorded in the testing and commissioning phase of the plant lifecycle, or through an engineering study of inverter design datasheet parameters
 - The recorded value can be reflected as Supplemental Contract Capacity load, representing the max amount of load that can be billed
 - A constant value can be stipulated on an agreement or form to be used for monthly billing
 - The monthly end-use load can be equal to or less than the Supplemental Capacity Contract load (but will always be greater than zero)
 - The resulting end-use load can be applied to an applicable retail rate schedule to determine monthly charges for retail service
 - Alternatively, the charge can be applied as a fixed monthly charge which would obviate the need for additional metering

Retail Rate Comprises 1.2% of Total Costs

- The retail rate is only applied to 0.3% of the nameplate rated capacity, which represents the end-use load during charging
 - Battery “roundtrip efficiency” is not considered end-use load
- A credit is applied to the retail rate accounting for the TAC and energy charges assessed by the CAISO, in the event double billing occurs

