Storage as a Transmission Asset:

Enabling storage assets providing regulated cost-of-service-based transmission service to access market revenues

Second Revised Straw Proposal

Karl Meeusen, Ph.D.

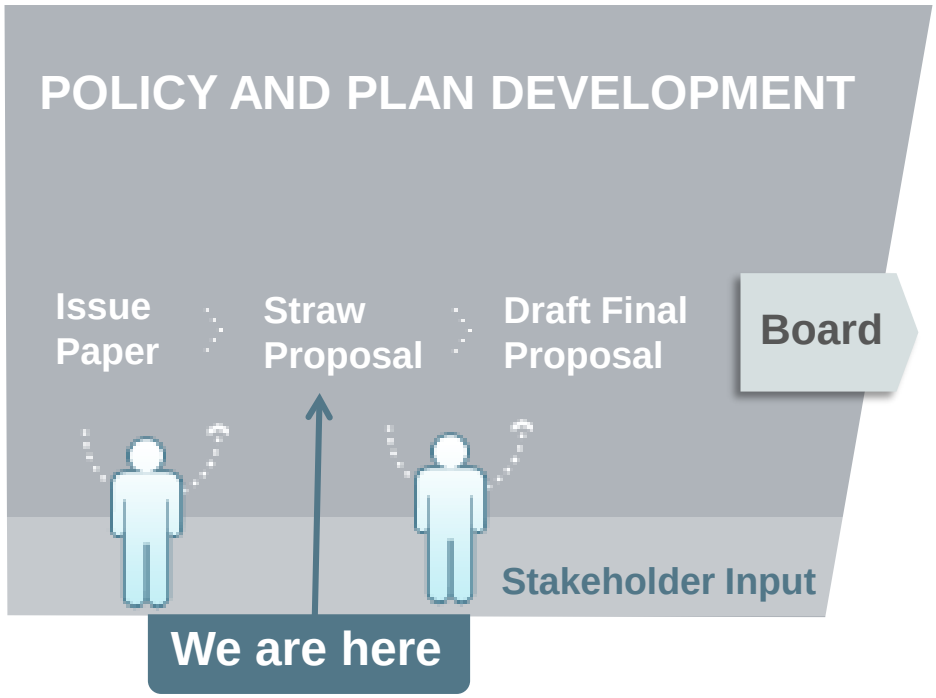
Stakeholder Meeting

October 23, 2018

Storage as a Transmission Asset
Second Revised Straw Proposal Meeting
Agenda – 10/23/2018

Time	Topic	Presenter
10:00 – 10:10	Introduction	James Bishara
10:10 – 10:30	Scope and Background	Karl Meeusen
10:30 – 12:00	Transmission Cost Recovery Options	Karl Meeusen
12:00 – 1:00	Lunch	
1:00 – 1:45	Contractual Arrangements between ISO and SATA Accessing Market Revenues	Debi Le Vine
1:45 – 2:30	Market Participation Notification	Chris Devon
2:30 – 2:45	Allocation to High or Low Voltage	Karl Meeusen
2:45 – 3:00	Next Steps	James Bishara

Stakeholder Process



Stakeholder Engagement Plan

Date	Milestone
Oct 16	**Second revised straw proposal**
Oct 23	Hold stakeholder meeting on second revised straw proposal
Nov 6	Stakeholder comments on second revised straw proposal due
Dec 10	Draft final proposal
Dec 17	Hold stakeholder meeting on draft final proposal
Jan 4	Stakeholder comments due
Feb 6-7	**Present proposal to ISO Board**

Scope and Background

Karl Meeusen, Ph.D.
Market and Infrastructure Policy

October 23, 2018

Scope: If storage is selected for cost-of-service based transmission service, how can that resource also provide market services to reduce costs to ratepayers?

- Initiative will consider:
  - Storage resources providing reliability-based transmission services, economic, and policy projects
  - Indifferent to transmission or distribution connection

- Issues outside the scope of this initiative:
  - The TPP evaluation methodologies
  - The framework for competitive solicitation and the applicability of the ISO's current competitive solicitation framework
  - Cost allocation of the cost-based revenue requirements for rate-based assets
  - Resource adequacy value

FERC stated if a cost-of-service based resource providing transmission service is also accessing market revenues, the following need to be addressed:

1. The potential for cost recovery through cost-based rates to inappropriately suppress competitive prices in the wholesale electric markets to the detriment of other competitors who do not receive such cost-based recovery;
2. The level of ISO control over the operation of an electric storage resource could jeopardize its independence as the market operator; and
3. The potential for combined cost-based and market-based rate recovery to result in double recovery of costs by the electric storage resource owner or operator to the detriment of the ratepayer.

FERC provided additional direction in EL18-131-000

- [T]he *Storage Policy Statement* does not provide guidance for determining whether a particular electric storage resource is a transmission facility eligible for cost recovery through transmission rates. Rather, the *Storage Policy Statement* provides guidance only with respect to issues that must be addressed if an electric storage resource seeks to receive cost-based rate recovery for certain services, whether through transmission rates or any other cost-based rate, while also receiving market-based revenues for providing separate market-based services

The planning process and methodologies provide the context for the initiative

Background Topics Previously Reviewed in the Stakeholder Process

- Transmission Planning Process
- Scope of evaluation for storage assets
  - Types of projects considered
  - Interconnecting voltage
- FERC storage resource participation principles
- Assessments of need and technical requirements
- Economic evaluation of project alternatives
- Transmission Asset versus Market Local Resource considerations
- ISO Operational control of storage assets

Storage, to be a Transmission Asset as a subset of Advanced Transmission Technologies, must:

- Provide a transmission service (*e.g.*, voltage support, mitigate thermal overloads)
- Meet an ISO-determined need under the tariff (reliability, economic, public policy)
- Be the more efficient or cost-effective solution to meet the identified need
- “Increase the capacity, efficiency, or reliability of an existing or new transmission facility”
- Be subject to competitive solicitation if it is a regional transmission facility

The ISO has considered proposals where storage provides cost-of-service based transmission services

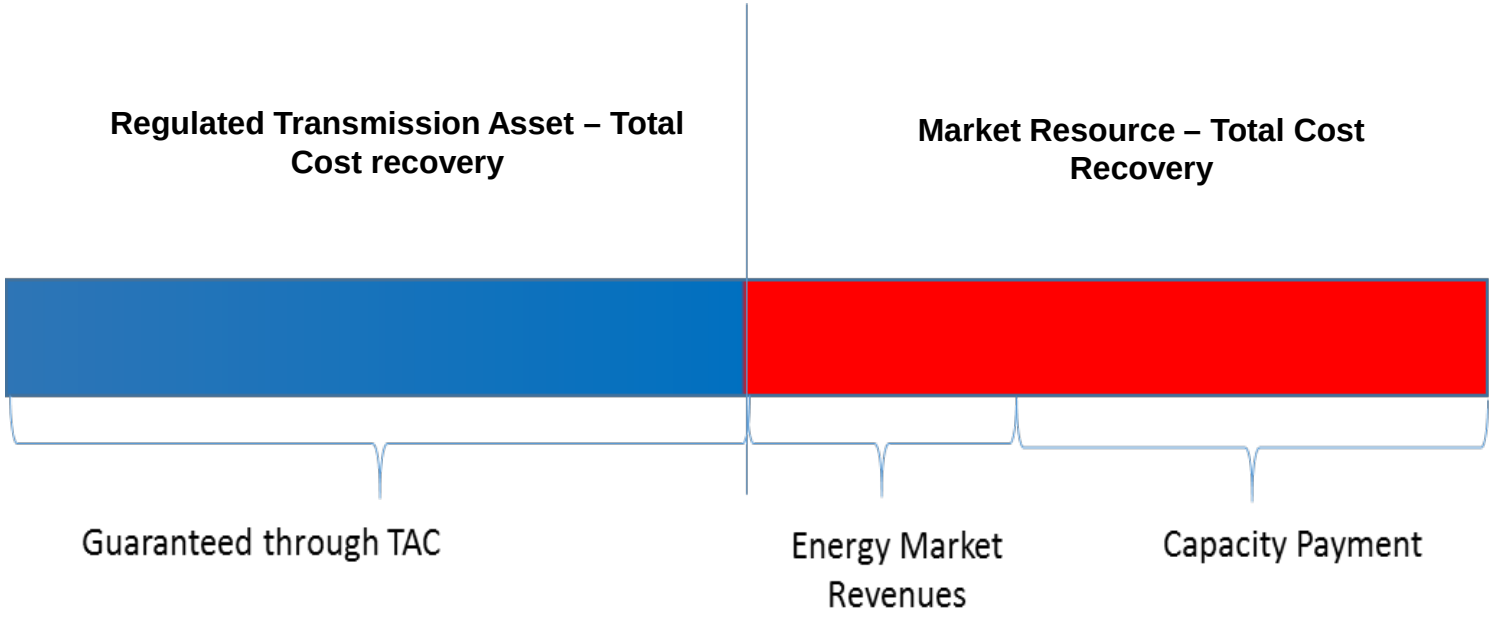
- Over the past several years, the ISO has studied
  - 27 battery storage proposals; and
  - one pumped hydro storage proposal as potential transmission assets.
- To date, only two proposals have resulted in storage projects moving forward
  - Both in the 2017-2018 Transmission Plan
- The ISO's experience to date is that electric storage has best fit as a market resource providing local capacity rather than as a transmission asset

Transmission Cost Recovery Options

October 23, 2018

Transmission assets have traditionally been fully guaranteed and recovered through the ISO's TAC

- The lines between a transmission asset and market resource are clearly defined



Cost recovery for shared facilities will apply only to network upgrades

- Network and interconnection upgrades for the “right-sized” SATA resource will be covered under the TRR
- Some project sponsors may seek to include opportunities to add additional market based resources or capability
  - Any incremental cost for interconnection facilities and generation beyond the ISO’s preferred solution will not be covered by the TRR
- ISO will not require the project sponsor to enter to the interconnection queue for the approved SATA capacity
  - Any incremental capacity must complete the generation interconnection process (i.e. not permitted to jump the interconnection queue)

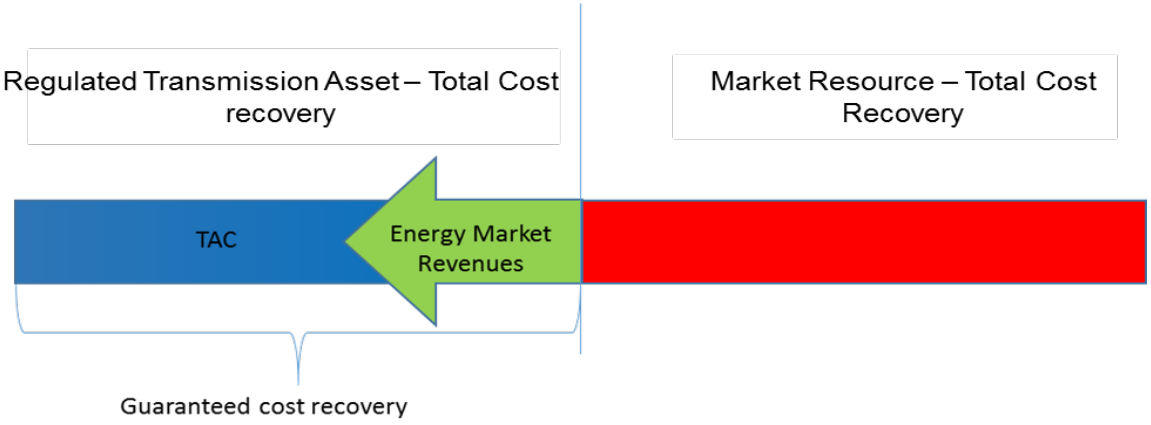
The ISO is proposing three cost recovery options for regional SATA projects

1. Full cost-of-service based cost recovery with complete energy market crediting to ratepayer
2. Partial cost-of-service based cost recovery and retain energy market revenues
3. Full cost-of-service recovery with partial market revenue sharing between owner and ratepayer

Market services must not conflict with the fundamental reliability purpose for which the resource was selected in the TPP

Full cost-of-service based cost recovery with energy market crediting ensures that a resource's TRR is covered through TAC

- Any revenue received from market services would be treated as a revenue offset
  - Reduces the revenues otherwise required through TAC



- Two scenarios under this cost recovery option.
  - Projects directly assigned to the incumbent PTO
  - Project sponsor selects option in TPP phase 3

All transmission projects connected at 200 kV or lower are directly assigned to the incumbent PTO

- The same assignment process will hold for SATA projects
  - i.e. SATA projects not subject to the TPP phase 3 competitive solicitation process
- Only option available to direct assigned SATA projects
  - Net market revenues limited to positive net market revenues on a monthly basis
  - Ensure the resource is not operating inefficiently in the market at the expense of captive ratepayers
- **Example**
  - Total cost of service = Annual TAC = Annual Revenue Requirement – Annual Revenue Credits
  - Annual Revenue Credit to rate payers from net market revenues = 100% Net market revenues
  - Rate of Return/Equity – Based on existing Rate of Return/Equity
  - Bidding – Required, as permitted by CAISO

This model provides little incentive for the resource to participate in the market for direct assigned projects

- ISO is exploring establishing a must offer obligation
  - Ensures ratepayers are able to benefit from market participation
- ISO is considering MOO that sets the discharge price at
  - Energy price cap; or
  - 95 percent level at a given location
    - Ensures the resource is not suppressing market prices and ensures the ISO remains independent
- All maintenance costs, including those incurred due to market participation will be eligible for recovery under the TRR
- Is a MOO for charging is needed
- The ISO is seeking stakeholder feedback regarding what a MOO should look like for direct assigned SATA resources

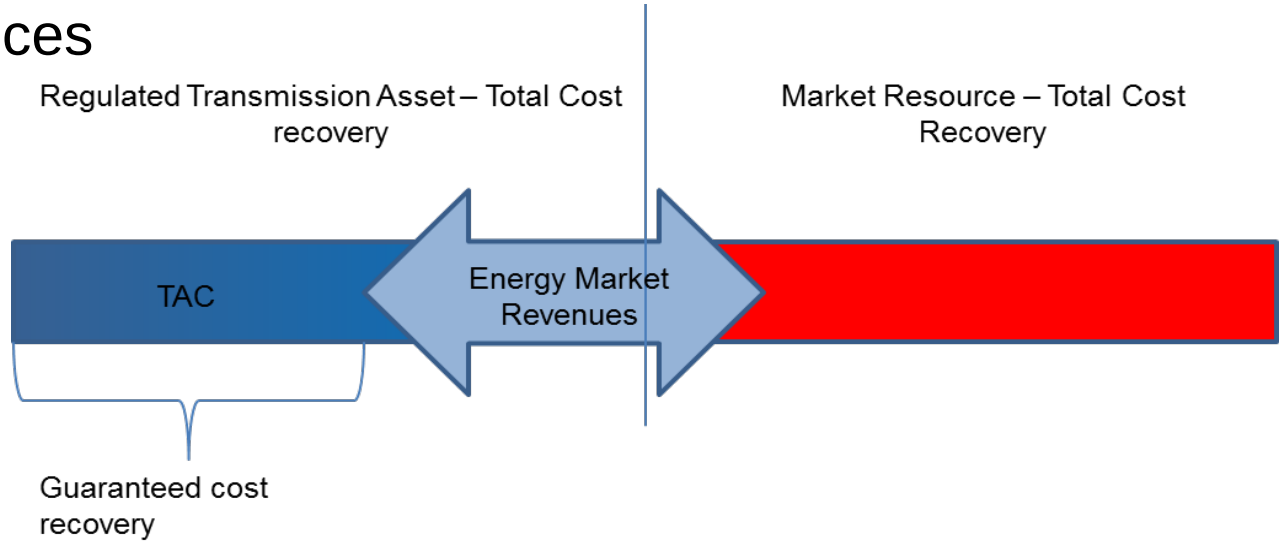
Competitively procured resources may not pursue phase 3 projected market revenues

- This differs from the direct assigned projects
  - Incumbent PTO has no option about what cost recovery option
  - For competitive procurement, the project sponsor has other options available to it
- ISO explored various options to provide additional incentives
  - Concluded that no additional incentive is required
- Resources selecting this option will be assessed at overall cost-of-service and will not assume any market revenues

The ISO seeks stakeholder input regarding whether it should make the same provisions available to both direct assigned projects and to the projects subject to competitive solicitation process

Partial cost-of-service with no energy market crediting ensures that a portion resource's total costs are covered, the remainder is recovered through market

- Guarantees less of the TRR through TAC
  - ISO market revenues would not be credited against the TAC recovery
- Resource owner accepts both upside and downside risk of recovering a portion of its costs (and return) from market services



Unpredictable changes in market participation opportunities can impact a resource's ability to cover costs

- In Phase 3 competitive solicitations, the ISO will evaluate each bid to determine
  - If it assumes reasonable levels of expected market revenues and/or
  - If the project sponsor is able to accept the risks that all costs may not be recovered
- Not clear if proposed notification processes provide sufficient information to facilitate financing

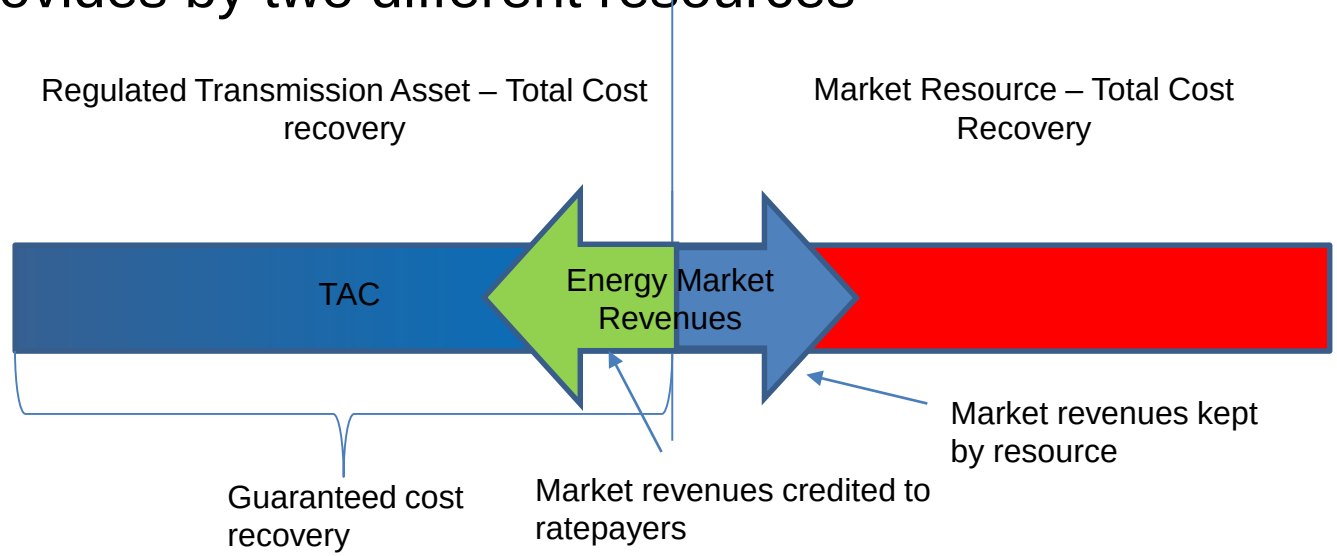
The ISO considered eliminating this option, but there seems to be sufficient support to maintain it

- The ISO has determined that is not feasible to provide a firm schedule that identifies market opportunities
- Numerous stakeholders supported the ISO maintaining this option.
- Opposition focused option never being selected or not financeable
  - Did not demonstrate harm from maintaining option

- **Example**
  - Total cost of service > Annual TAC = Annual Revenue Requirement – Annual Revenue Credits
  - Annual Revenue Credit to rate payers from net market revenues=0
  - Rate of Return/Equity – Based on competitive solicitation
  - Bidding – As permitted by CAISO, but not required

Full cost recovery with revenue sharing provides an incentive to bid into the market and can reduce overall cost to ratepayer

- Guarantees full submitted cost-of-service recovery through TAC
- Revenue split provides incentive to bid into market, but total transmission and energy costs for rate payers are less than if provides by two different resources



Full cost of service with revenue sharing can help project sponsors balance risks while still providing benefits to ratepayers

- All *net* market revenues would be split
- ISO will not propose a fixed split for market revenue sharing.
  - Each proposed split will be assessed within the TPP phase 3 process for the preferred solution

- **Example**
  - Total cost of service = Annual TAC = Annual Revenue Requirement – Annual Revenue Credits
  - Annual Revenue Credit to rate payers from net market revenues = net market revenues * X%
    - X% = Percent to credited back to ratepayers
  - Rate of Return/Equity – Based on competitive solicitation
  - Bidding – As permitted by CAISO, but not required

The ISO is considering options in the event of insufficient qualified project sponsors

- Require at least three qualifies project sponsors for the partial cost-of-service or full cost of service with revenue sharing to be options for consideration
  - All project sponsors would be required to also submit a full cost-of-service bid as a contingency option
  - Only consider this option if there is an insufficient number of qualified project sponsors

SATA agreement provisions

Debi Le Vine
Infrastructure Contracts and Management

October 23, 2018

Summary

- Structure of SATA agreement
- New terms and conditions proposed
  - Contractual alternative to TRR credit mechanism
  - Multiple variants of contract terms for SATA resources

Structure of SATA agreement- broad terms and conditions

- Performance, including obligation to perform
- Operations and maintenance
- Lifecycle replacement/capital additions
- Dispatch and scheduling of resource
- CAISO operational control vs market participation
- Accounting of market and cost of service revenues
- Implementation schedule
- Resource characteristics
- Interconnection requirements

New terms and conditions proposed

Following significant stakeholder input, the CAISO is proposing the following updates to the terms and conditions of the proposed *pro forma* SATA agreement:

- Contractual alternative to TRR credit mechanism
- Three variants of contract terms for SATA resources

As discussed in the second revised straw proposal, the CAISO is also considering other terms and conditions proposed by stakeholders, but is not raising them as significant discussion points in this presentation

Contractual alternative to TRR credit mechanism

- The SATA agreement will detail the maintenance and replacement obligations, consistent with the Option 1, 2 or 3, selected by the SATA owner:
- SATA owner will be responsible for maintaining the resource at a certain pre-defined performance level consistent with meeting the transmission solution requirements, as identified in the agreement
- CAISO to test the resource periodically to ensure transmission requirements are being met, and results may dictate implementation of maintenance or replacement plan

Contractual alternative to TRR credit mechanism-cont'd

- Cost sharing of maintenance and replacement costs to be negotiated between SATA owner and CAISO and will depend upon term of agreement
- Cost sharing between CAISO and SATA owner may be calculated based on historical performance, e.g. no of cycles due to transmission dispatch vs market dispatch
- Degradation due to market driven use of resource to be paid for by SATA owner without CAISO cost recovery
- The CAISO invites stakeholders to provide comments on developing cost sharing mechanism, and performance and maintenance obligations

Multiple variants of contract terms for SATA resources

- The ISO proposes to develop three variants of SATA agreement to cover 10 year, 20 year and 40 year terms
- Appropriate term and contract variant to be picked based on resource technology characteristics and transmission requirements
- Bulk of the *pro forma* would be common, but differences in terms and conditions around escalation factors, market participation conditions, maintenance obligations, capital additions and repairs, testing and monitoring, among others

Multiple variants of contract terms for SATA resources-cont'd

- The CAISO invites stakeholders to provide comments on this issue to better develop this concept into the various pro forma agreements

SATA market participation notification process

Chris Devon
Market and Infrastructure Policy

October 23, 2018

The ISO continues to explore options for SATA resource notification

- ISO previously attempted to identify specific time (hours, months, or seasons) when a resource would be permitted to provide market services
  - Based on additional analysis and sensitivity studies, the ISO determined it is not possible to provide resources such information with certainty during TPP phase 2
- ISO also previously explored two potential notification timeframe options of either 1) Day-Ahead market option or 2) prior to Day-Ahead market option timeframes
  - After further review, ISO believes prior to day-ahead market timeframe is not a viable option due operational concerns over the limitation of available forecast and resource bid availability in that timeframe

Issues with prior proposal for use of Day Ahead RUC market process for need identification

- Previous proposal for the proposed Day-Ahead market approach to utilize the DAM RUC process
  - ISO received stakeholder feedback indicating concern over the proposed approach to use the DAM RUC market run to determine if SATA resources would be needed for transmission service
  - Some feedback indicated a belief that the ISO's DAM process model does not capture the level of detailed constraints that are utilized in the ISO TPP studies
- ISO has reviewed this feedback and adjusted the proposal for notification

SATA notification need assessments will be made for an entire calendar day (24 hour period)

- Determinations are proposed for a daily granularity due to potential for forecast errors that may result in transmission needs at times that differ from the initial projection when the resource may not be fully charged

ISO proposes a SATA notification process to inform resource owners and market participants of the identified need

- ISO will provide notification to indicate to resource owners when SATA resources will be permitted to participate in ISO markets
  - Once notified the resource will be allowed market participation, the owner will be responsible for bidding and market participation of resource, not the ISO
- ISO will also notify all market participants of designation of SATA resources as transmission assets through CAISO Market Results Interface (CMRI)
  - Similar to how transmission constraint activations are currently noticed through CMRI
  - ISO may consider other options given stakeholder feedback

ISO proposes a load based notification test process to determine if SATA resources will be needed

- Proposed notification process studied in Day-Ahead timeframe will determine if forecasted load levels for following day indicate a need for a SATA resource as a transmission asset

- ISO believes a load based test would be an accurate approach to determine if needs in a local area will require SATA resource be dedicated to providing transmission services the following day

Proposed load based notification process

- In the Day-Ahead time frame, the ISO will perform the following load based notification test

- Will identify when SATA resources are needed based upon:
  1. Load forecast for the local load pocket area,
  2. Available capacity from other local area resources, and
  3. Import capability into the load pocket

Proposed load based notification process (continued)

- If load forecast for local area exceeds the level identified as a reliability concern, considering the import capability and capacity resource availability in the local load pocket areas, the SATA resource(s) in the local area will be designated as a transmission asset the following day.
  - Load studies will including an additional 10% operational reliability margin
  - SATA resources need to be fully charged starting at 12AM of delivery day and are not be allowed to participate in Real-Time market for following calendar day (24 hour period)

Proposed load based notification process (continued)

- If load based notification test did not indicate following day's load forecast (including additional 10% operational reliability margin) would be needed then SATA resource(s) would be allowed to participate in Real-Time market for the following day

- The ISO has also included the 10% operational reliability margin adder to this proposed local load based notification test to protect against potential load forecast errors, uncertainty, and resource availability

Market Participation Rules Allocation to High or Low Voltage

Karl Meeusen, Ph.D.
Market and Infrastructure Policy

August 21, 2018

SATA resources may bid like any other non-RA resource when participating as a market resource

- SATA resources would be able to bid similarly to other storage resources when participating in the ISO markets

- Treats SATA resources in a fair and equitable manner compared to other market resources by maintaining similar bidding requirements and parameters

The ISO plans to maintain the current practice of allocating costs to high or low voltage TAC based on the point of interconnection

- Transmission connected resources are resources that are connected to the ISO controlled grid
  - Regional resources – greater than 200 kV and
  - Local resources – lower than 200 kV

The ISO plans to maintain the current practice of allocating costs to high or low voltage TAC based on the point of interconnection

- SATA resource may be connected to the transmission system at a level that differs from the transmission issue it has been identified to resolve
  - For example, the ISO may identify a Regional need, but identify a SATA resource connecting at a Local level as the best solution
- The ISO plans to allocate to high or low voltage TAC based on point of interconnection to the CAISO controlled grid

Next steps

- Stakeholders are asked to submit written comments by November 6, 2018 to: initiativecomments@caiso.com
- The initiative page is available at the following link: http://www.caiso.com/informed/Pages/StakeholderProcesses/StorageAsATransmissionAsset.aspx
- Draft final proposal December 10, 2018