



Frequency Response Phase 2

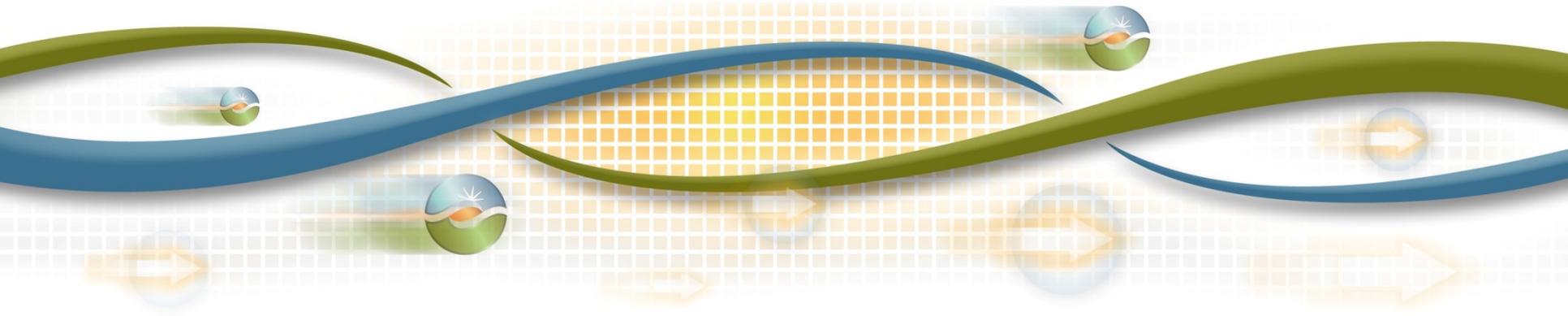
Cathleen Colbert

Senior Market Design and Policy Developer

Market and Infrastructure Policy

Issue Paper Stakeholder Call

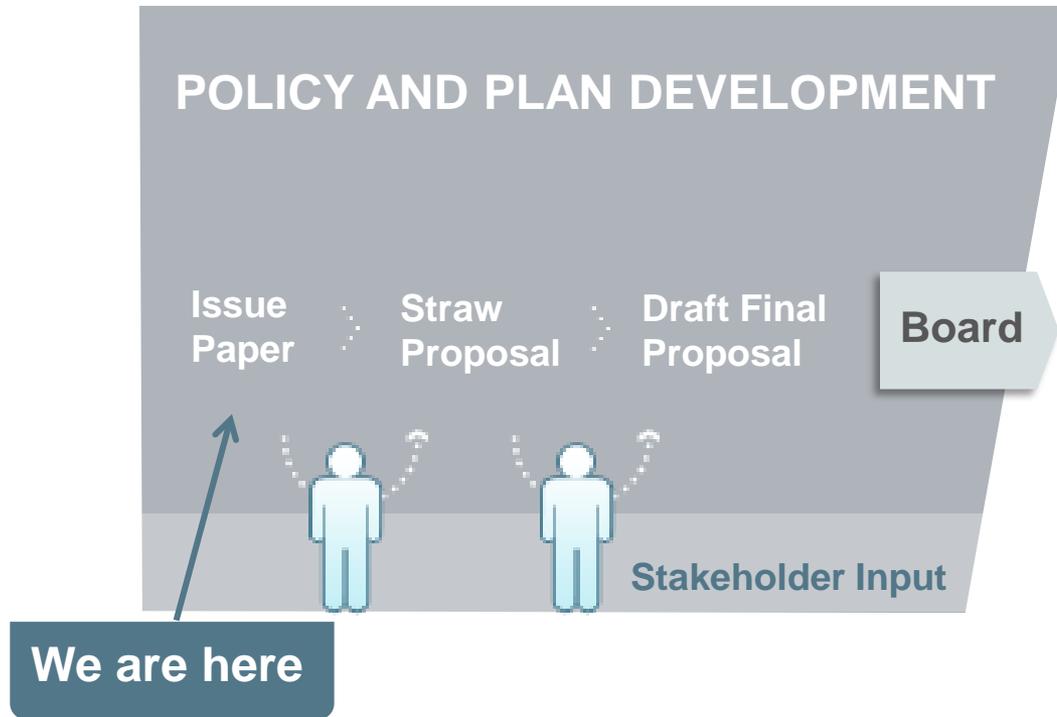
December 22, 2016



December 22, 2016 call agenda

Time	Topic	Presenter
1:00-1:05	Introduction	Kim Perez
1:05-1:10	Updated schedule	Kim Perez
1:10-1:30	Introduction	Cathleen Colbert
1:30-2:00	Background	Cathleen Colbert
2:00-2:30	Issues	Cathleen Colbert
2:30-2:55	Summary	Cathleen Colbert
2:55-3:00	Next Steps	Cathleen Colbert

ISO policy initiative stakeholder process



Phase 2 stakeholder schedule



Milestone	Date
Issue paper posted	December 15, 2016
Stakeholder call	December 22, 2016
Stakeholder written comments due	January 11, 2017
Straw Proposal Posted	April 6, 2017
Stakeholder call	April 13, 2017
Stakeholder written comments due	April 27, 2017
Draft final proposal posted	July 25, 2017
Stakeholder call	August 1, 2017
Stakeholder written comments due	August 15, 2017
Board of Governors meeting	September 2017

INTRODUCTION

Frequency Response Phased Approach

- Phase 1 – near term approaches
 - Enhancements to meet reliability criteria set by BAL-003-1
 - ISO committed to FERC to evaluate additional enhancements to encourage frequency response capabilities of all resources and enable diverse mix to provide services
- Phase 2 – long term approaches
 - Constitutes the ISO's commitment to FERC
 - Evaluate need for and merit of introducing long-term market design measures for automatic, autonomous frequency response up to 52 seconds after event.

Frequency Response Phase 2

Identified Need:

ISO expects frequency response will continue to worsen as non-conventional technologies increase since they:

- Have low to no inertial response
- Do not come standard with frequency response capability
- Deployment may require more than headroom & controls

Desired Benefit:

Produce market outcomes that:

- Position fleet to be able to sufficiently respond
- Send price signals to incentivize sufficient response

Frequency Response Phase 2

- ISO concerned with its ability to ensure the CAISO balancing authority area is in a position to respond consistent with the reliability requirement within a minute (i.e. reliable operation)
- ISO identified two potential limitations to its current market design, they are:
 - ISO fleet may not be positioned to provide sufficient primary frequency response
 - ISO may not be able to adequately incentivize resources for frequency response

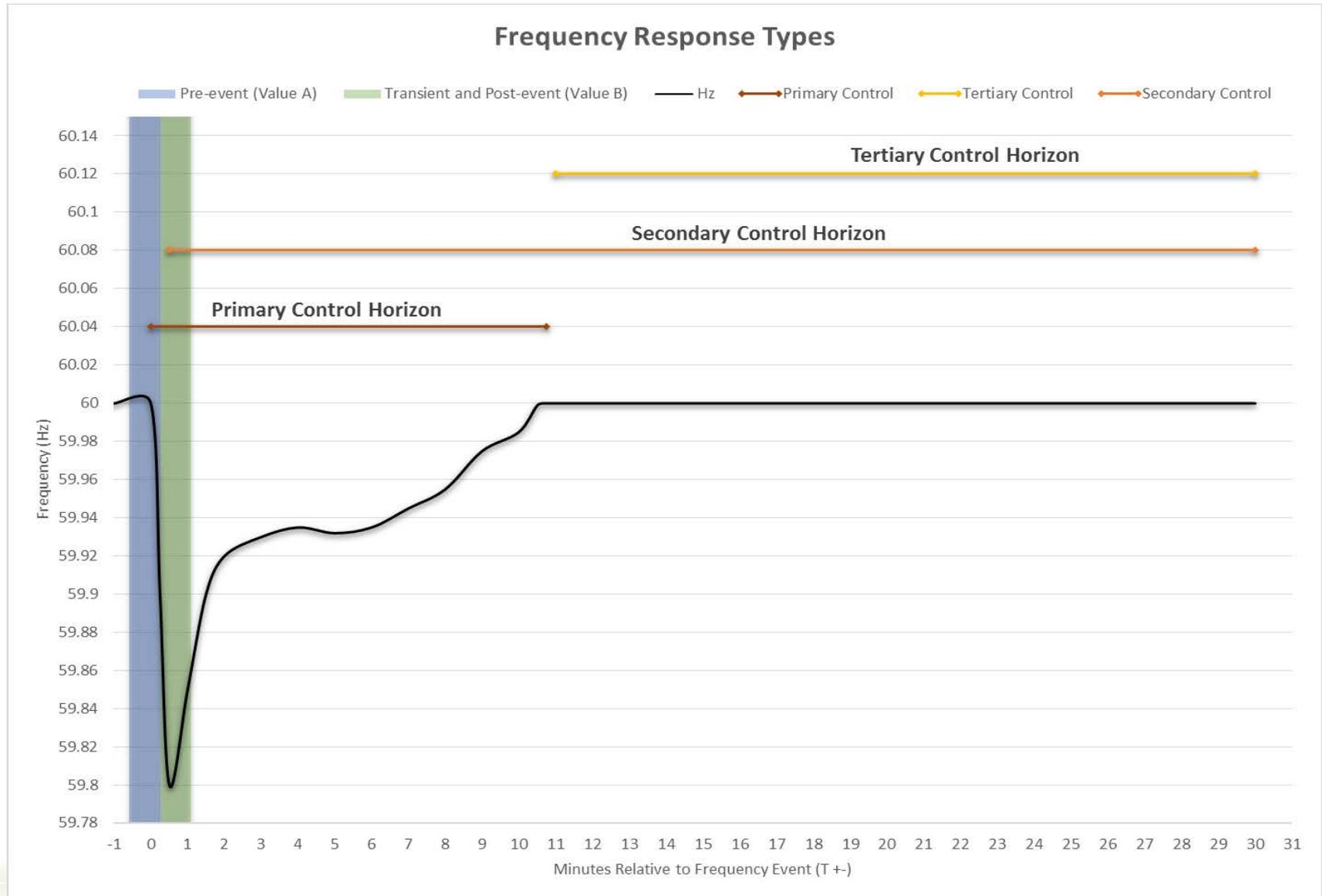
Frequency Response Phase 2

ISO proposes following market design principles to:

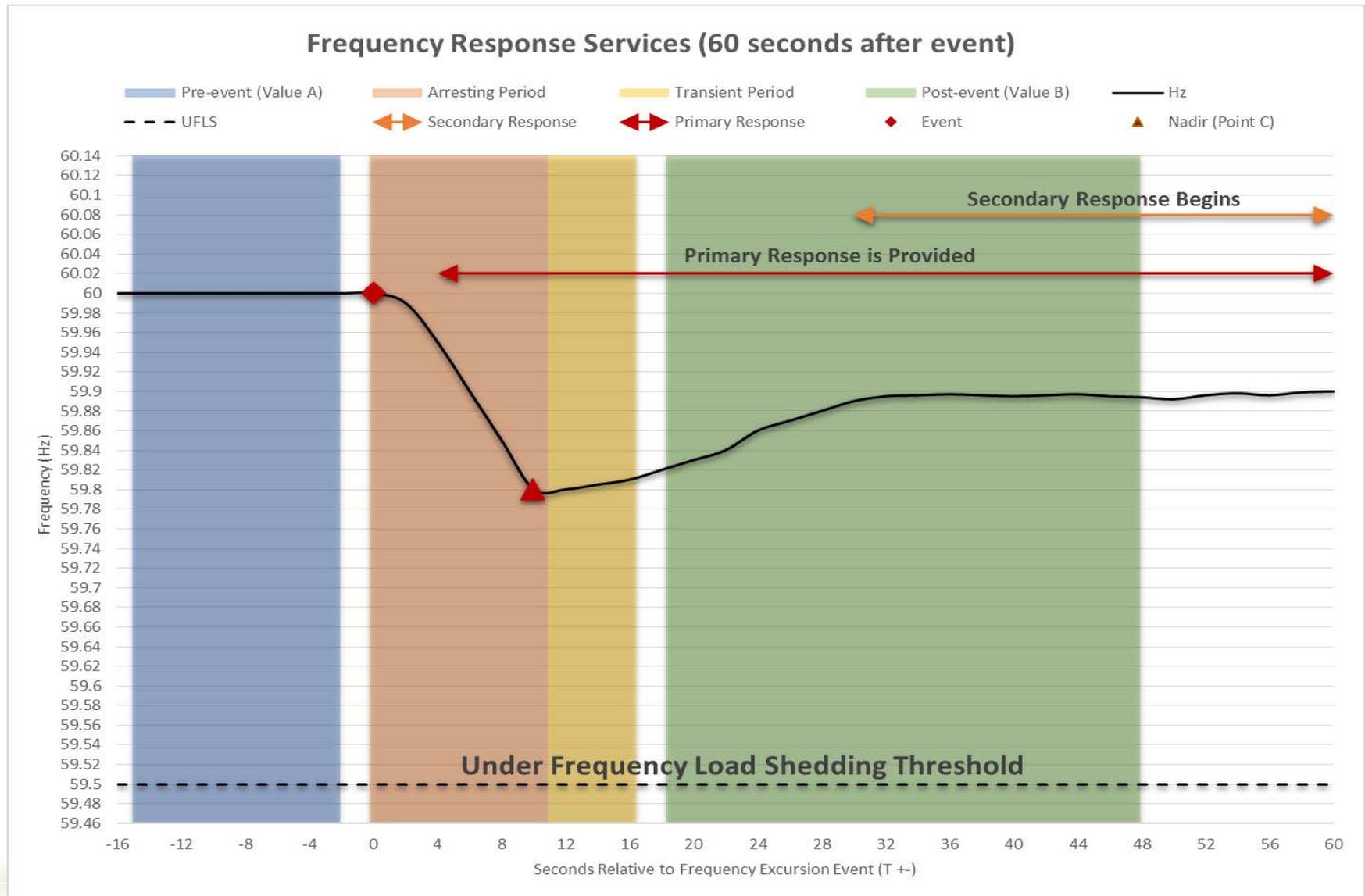
- Create a market environment so that ISO fleet is positioned to be able to provide sufficient primary frequency response
- Allow all technology types to participate through ensuring no barriers to entry
- Produce price signals that incentivize sufficient primary frequency response
- Ensure compensation of capital investments made to meet the required capability if frequency response capabilities become an interconnection requirement

BACKGROUND

Frequency Response Mechanisms



Frequency Response Mechanisms



Frequency Response Mechanisms

- Need to control frequency at stable levels – on average 60Hz
- Decreases well below scheduled levels can lead to grid instability which if persists could cause cascading outages
- NERC defines 3 frequency control mechanisms or services:
 - Primary – automatic & autonomous deployment at unit
 - Fast primary – automatic & autonomous deployment at unit within matter of cycles after event
 - Secondary – manual or automated dispatch from signal
 - Fast Secondary – dispatch from signal tuned to faster deployment than conventional secondary signals
 - Tertiary – reconfigure reserves and dispatch generation

BAL-003-1 Frequency Response Standard

- NERC Frequency Response Standard: creates obligation for ISO to demonstrate sufficient frequency response to disturbances between 20 – 52 seconds after an event

California ISO's Estimated Requirement	2017 FRO	Units
Western IFRO	858	MW/0.1Hz
Estimated ISO FRO (30% share)	258	MW/0.1Hz
Actual ISO FRO (22.9% share)	196	MW/0.1Hz

- BA allocated share of Interconnection Frequency Response Obligation, which:
 - Protects against resource loss of 2 PV Units of 2,506 MW
 - Designed to limit excursion to a max drop of 0.292 Hz
 - Allocated based on share of generation and load

FERC NOPR – Primary Frequency Response

FERC proposes to require all resources submitting a new interconnection request that results in the filing of an executed or unexecuted interconnection agreement:

- Requires installation of frequency response capability
- Requires resources to have maximum droop settings of 5 percent and deadband of ± 0.036 Hz and provide sustained response until frequency returns to within deadband
- Prohibits any action that would inhibit provision of primary frequency response, except under certain conditions
- Requires droop settings to be based on nameplate capability with a linear operating range of 59 to 61 Hz

Phase 1 Strengthened Tariff Requirements

- ISO participating generator requirements in Section 4
- Participating generator requirements include:
 - Shall not inhibit governor response except to address physical constraints for ambient temperature limitations, equipment outages, or regulatory considerations
 - Shall coordinate all plant controls systems so that they include frequency bias to ensure resource can respond
 - Set governor droop settings to no more than 4% for combustion turbines and 5% for other technology types
 - Set control device deadbands to no more than ± 0.036 Hz

ISSUES

Issues – Overview

- Under Phase 1 the ISO committed to FERC to evaluate:
 - Encouraging frequency response capabilities of all resources
 - Enabling diverse mix to provide services
- To encourage frequency response capabilities of all resources → price signals and valuing the service are needed to encourage capabilities
- To enable diverse mix to provide services → Current economic barriers to entry would need to be removed through creating price signals and valuing the service

Issues – Overview

- ISO identified limitations with its current design relying on requirements to ensure it has positioned fleet to provide sufficient frequency response
 - ISO does not procure primary frequency response
 - ISO performance relies on deployment of unloaded frequency responsive capability
- ISO identified there may be little to no available frequency responsive capability due to factors including:
 - Frequency Responsive P_{max} may not equal P_{max}
 - Resource may be at or near fully loaded
 - Frequency responsive capability may be reserved on limited units where headroom far exceeds capability

Issues - Support for Need

- In the long term the ISO expects its own rate of performance will continue to deteriorate driving ongoing need for procurement of internal and/or transferred primary frequency response

Compliance Period	N	2017 Frequency Response Obligation	Frequency Response Obligation (FRO)	Frequency Response Measure (FRM)	Average Frequency Response Shortfall	Minimum Frequency Response Performance
2012	27	197	193	263	-71	56
2013	26	197	193	210	-35	95
2014	33	197	219	219	-6	60
2015	24	197	209	183	32	22
2016	36	197	198	168	17	-193

- ISO observed deteriorating trend in frequency response performance based on comparing median to obligation

SUMMARY

Summary

- Without explicit procurement of primary frequency response:
 - ISO cannot ensure it will position the fleet to provide sufficient frequency response
 - ISO needs to mitigate risk of non-compliance by procuring transferred frequency response
- ISO is concerned with relying on procuring compliance instrument to meet reliability requirement in the long term and believes it has received guidance to pursue other approaches

Summary

Competitive procurement mechanism will allow allocation of ISO frequency response obligation to internal or external market participants:

- Procured amounts would constitute performance requirement for the awardee
- Ensures ISO market outcomes will include frequency response awards to position fleet to sufficiently respond
- Compensate procured amounts of frequency response to fulfill principle to pay for services rendered
- Produce prices for frequency response so the grid service is appropriately valued

QUESTIONS & NEXT STEPS

Next Steps

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Stakeholders are asked to submit written comments by **January 11, 2017** to InitiativeComments@caiso.com.