Resource Sufficiency Evaluation
Phase 1B - Analysis Effort

Guillermo Bautista Alderete
Daniel Johnson

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Stakeholders requested additional analysis for the RSE initiative

and after some gained experience, that could be a potential solution. That being said, we ask that the CAISO provide analysis of the quantile regression approach and its estimated impact on the RSE tests

- Allow time and dedicate CAISO staff to assist EIM Entities with replicating the quantile regression uncertainty calculation in order to build confidence in its accuracy and identify any improvements that may be needed before it is implemented.

- A holistic examination of the uncertainty calculation that includes intertie and net load uncertainty
- Appropriate incorporation of significant and systemic adjustments made to a BAA's load forecast, including load conformance used by the real-time market, into the EIM RSE.

- *Systemic Load Conformance:* The CAISO has highlighted that the issue of its use of significant and systemic load conformance for the CAISO BAA is complex and multi-faceted and requires additional analysis and discussion to determine the best approach for its incorporation into the EIM RSE.

We urge the CAISO to perform additional analysis on the interaction between HASP and the RSE and take steps to address this RSE design flaw as soon as possible to ensure that CAISO does not continue to be unfairly disadvantaged.

PG&E also supports CAISO's plan to perform a holistic review in Phase 2 of the intertie deviation and net load uncertainty requirements and analyze the combined impact of using 95% confidence intervals for both adders.

, and PGP believes that this initiative will have a higher likelihood of success if the additional analysis on load conformance and uncertainty is shared as part of an open stakeholder process. As such, PGP suggests that CAISO commence Phase 2 immediately after the completion of Phase 1

- Further analysis of the impact of CAISO operator-induced load conformance
- Resolution of interactions between the Hour-Ahead Scheduling Process and EIM RSE resulting in the CAISO Balancing Authority Area becoming over-extended with exports it cannot support without relying on EIM import supply

In response to stakeholders feedback, CAISO is initiating RSE Phase 1B with an analysis effort to cover pending areas of assessment

The analysis phase will

- consist of different tracks to cover each of the areas identified in the previous RSE effort
- provide foundational information on actual performance of RSE and real-time markets
- guide the policy discussion with robust and factual analytics

Previous analysis covered multiple elements of RSE performance

- Capacity counted in RSE but not in actual market
- Preliminary analysis on the impact of load conformance on EIM transfers and HASP intertie
- Performance of intertie deviation adder
- Drivers for capacity counted in RSE not available in real time
- Impact of uncertainty added to the capacity test

CAISO proposes a multi-track analysis effort

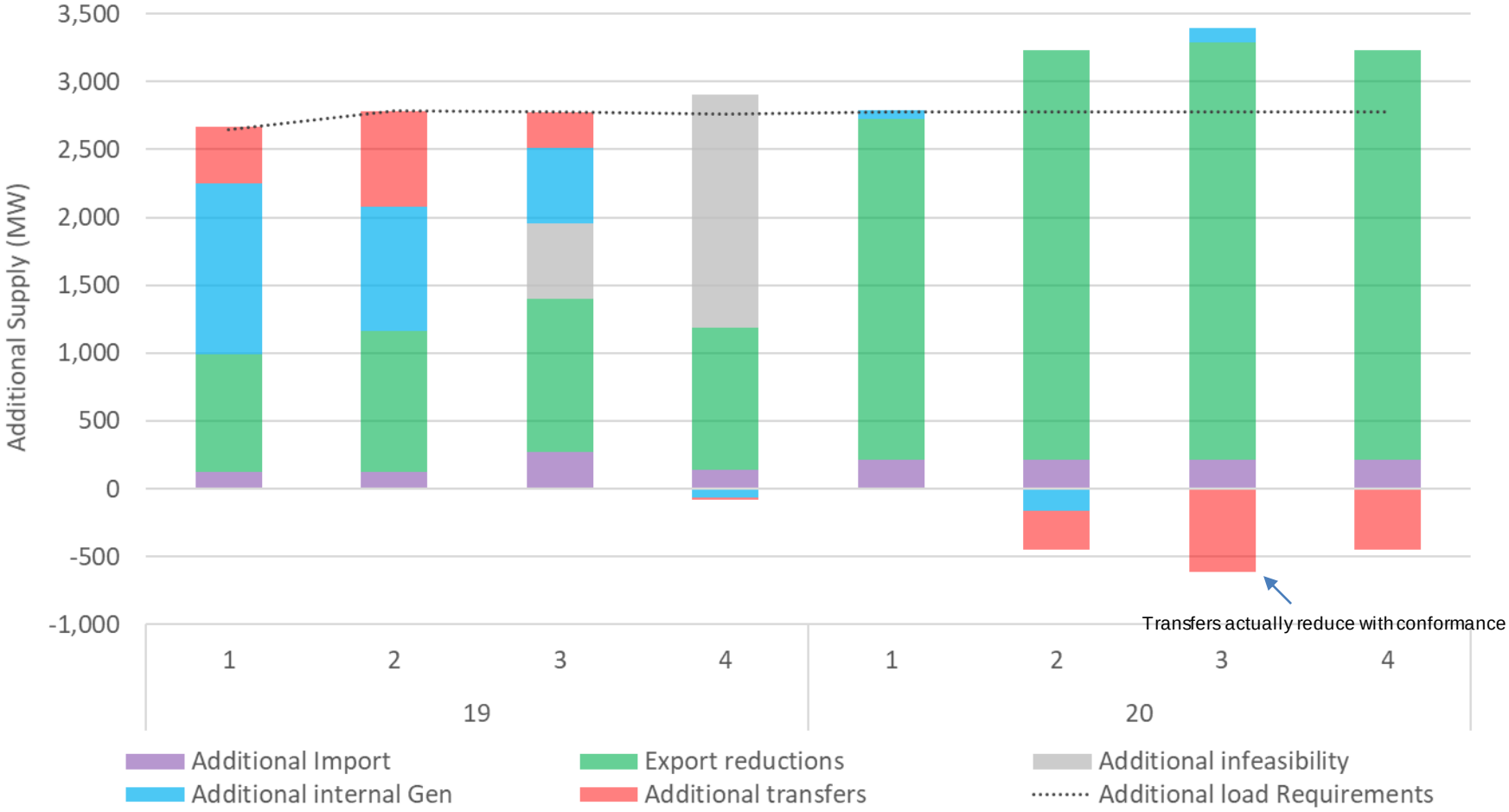
- Each track will proceed independently
- Four tracks to start:
  1. Load conformance impact
  2. Relationship between HASP intertie schedules and EIM transfers
  3. Uncertainty and intertie deviation adders performance
  4. Other suggested and agreed upon areas

- Analysis scope may expand on other aspects and implications of the RSE as we learn more through the analysis

1. Load Conformance - Background

- Including load conformance in the RSE was a topic widely discussed in the first phase of the initiative
- CAISO provided analysis of the impact of load conformance on the EIM transfers for two peak hours
- This limited analysis showed that there is not a 1:1 direct correlation between load conformance and an increase of EIM transfer imports to CAISO
- Only a fraction of the load conformance was found to drive additional EIM import transfer

2,600 MW of additional load bias in HASP resulted in 13% additional transfers in HE19, and in a reduction of transfers in HE20*



* Based on counterfactual study without load conformance

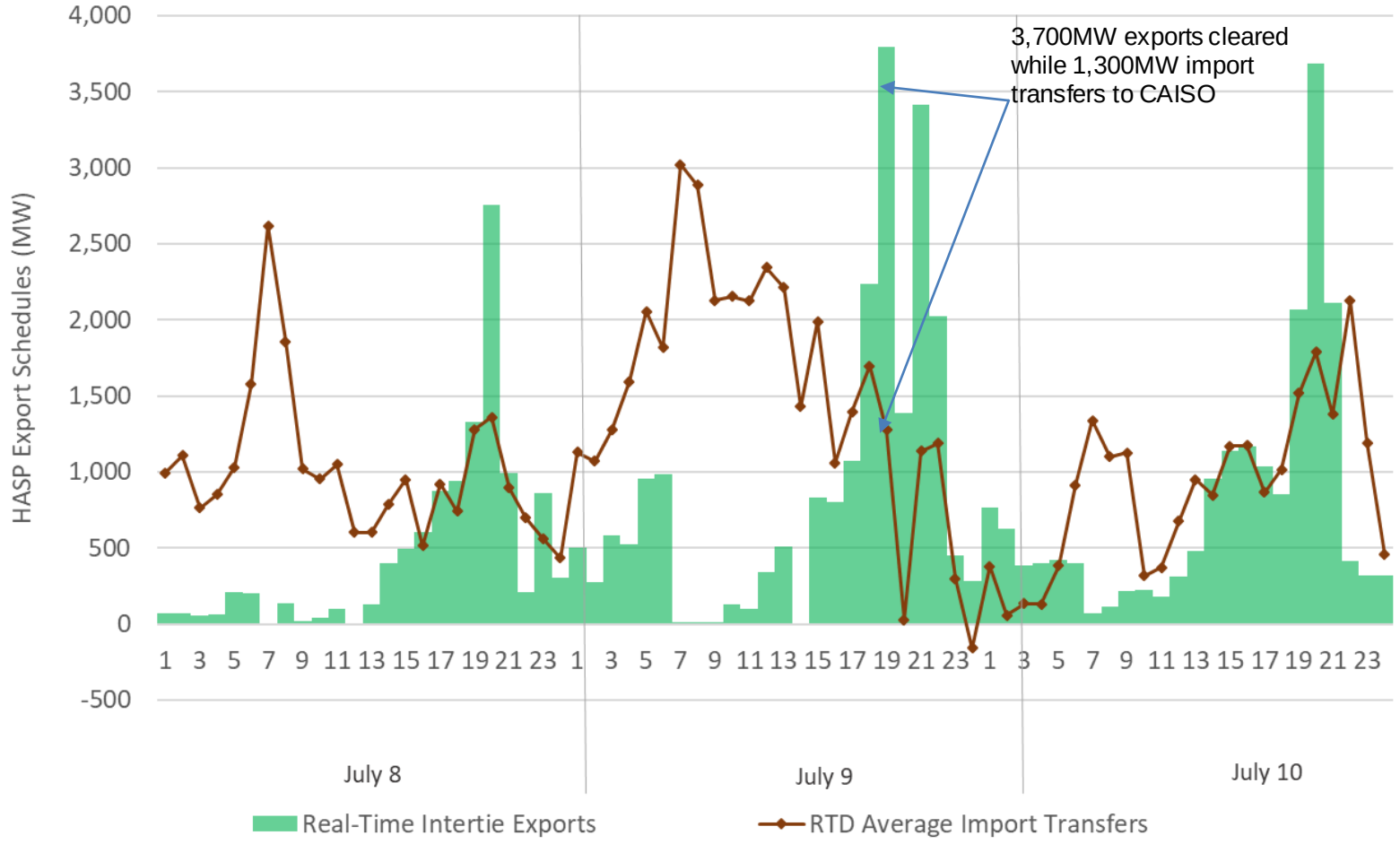
1. Load conformance - Scope

- CAISO plans to expand analysis of load conformance
- Cover a more comprehensive study period of at least top 5 days (based on peak load level) peak hours
- Cover FMM and HASP markets
- Study other market dynamics influenced by load conformance such as
  - Impacts on intertie schedules (HASP imports and exports)
  - Resulting reduced flex ramp in the RSE
  - Potential counterfactual impact on CAISO test failures

2. Relationship between HASP intertie schedules and EIM transfers -Background

- HASP process clears simultaneously imports and exports, and estimates EIM schedules (reflected as EIM transfers)
- HASP market will drive an optimal solution by co-optimizing estimated EIM transfers with intertie schedules
- CAISO showed as part of the RSE analysis the interplay between EIM imports and imports/exports
- Hourly imports and exports can be cleared based on transfers that may not realize
- This concern was raised during the RSE initiative

Exports cleared in real time were generally higher than EIM Import transfers coming into CAISO during critical peak hours



2. Relationship between HASP interties and EIM transfers - Scope

- Assess the impact of EIM transfers into the clearing of Imports and Exports in real-time
- For tight supply conditions analyze the extend of exports being supported by advisory EIM transfers
- Assess the impact of unrealized EIM transfers into the real-time market
- Assess interplay of HASP imports and exports with the RSE
- Consider at least the top 5 days (based on peak conditions) for assessment

3. Uncertainty adders performance - Background

- CAISO has provided analysis on the uncertainty and intertie adders through its normal course of assessment and during the RSE initiative
- As part of the Flexible Ramping Product enhancements, CAISO is scheduled to implement a quantile regression-based methodology for uncertainty requirements in Fall 2022
- As part of the FRP initiative CAISO provided a performance assessment of the proposed methodology (appendix C)
- As part of the RSE initiative, CAISO provided analysis on the intertie deviation adder

Quantile regression assessment includes a comparison with current histogram approach*

Table 2: Comparing Performances of Histogram (H) and Quantile Regression (Q) approaches

	Coverage		Requirement		Closeness		Exceeding	
BAA	H	Q	H	Q	H	Q	H	Q
AZPS	96.87%	96.17%	122.72	117.17	144.24	139.08	49.56	45.65
CISO	96.71%	96.10%	602.85	547.13	595.46	540.99	175.07	163.74
IPCO	97.16%	96.80%	66.02	61.58	67.61	63.08	24.84	20.75
NEVP	97.00%	96.08%	70.63	62.02	78.05	69.79	29.10	26.77
PACE	96.99%	96.57%	108.79	107.11	110.65	109.08	36.86	33.97
PACW	97.19%	96.86%	59.33	53.81	58.40	52.70	23.51	18.35

1. Coverage: The percentage of the observed imbalance exceeding the requirement. This measurement is used to see how much deviation there is from the nominal level, say, 97.5.
2. Requirement: The average amount of the calculated requirement.
3. Closeness: The average of the distance between the observed and the requirement.
4. Exceeding: The average of the amount when the observed imbalance is exceeding the requirement.

* Appendix C is available at http://www.caiso.com/InitiativeDocuments/AppendixC-QuantileRegressionApproach-FlexibleRampingProductRequirements.pdf

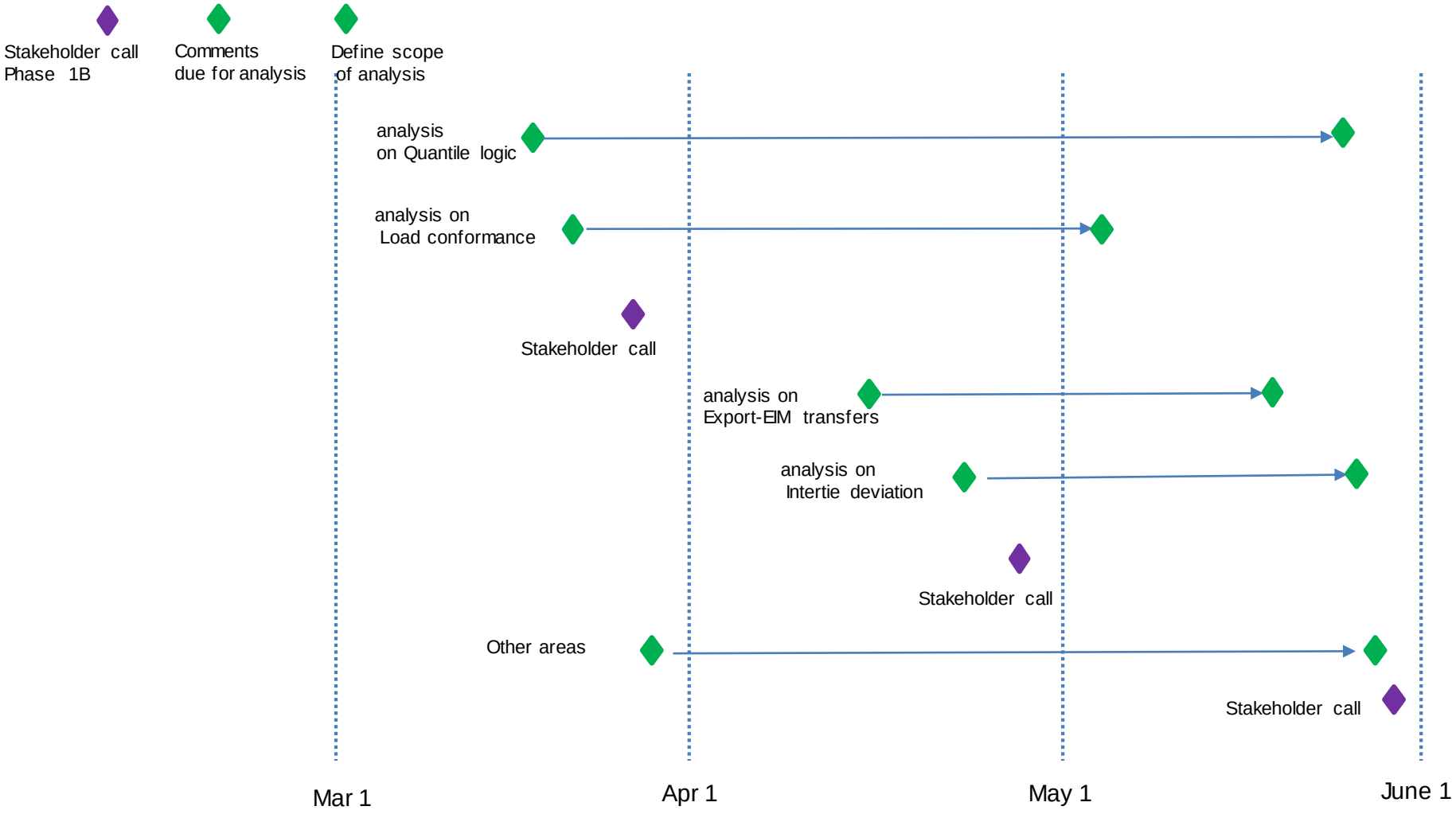
3. Uncertainty adders performance -Scope

- Performance assessment of proposed approach for uncertainty in EIM and CAISO areas
  - Robustness of proposed approach (coverage, closeness, exceedance)
  - Comparison to current approach (histogram)
  - Sensitivity analysis of using different historical data samples
- Counterfactually assess test failures with uncertainty adders estimated with quantile approach
- Further assess existing logic of intertie deviation adders
- Assess the relationship between uncertainty and intertie deviation
- Provide detailed description of methodology for EIM entities to replicate calculation

4. Any other identified areas for analysis

- Based on further feedback and assessment of this effort, other related areas may be analyzed
- Depending on the topic, it may be tracked separately or as part of any of the proposed three tracks

Estimated timeline to complete analysis effort



Proposed Schedule for Phase 1B

Date	Milestone
March 2, 2022	Comments due on Feb 16 stakeholder call presentation and discussion
June 28, 2022	Straw proposal posted
July 7, 2022	Straw proposal stakeholder call
July 21, 2022	Straw proposal comments due
Aug 16, 2022	Revised straw proposal posted
Aug 24, 2022	Revised straw proposal stakeholder call
September 8, 2022	Revised straw proposal comments due
October 4, 2022	Draft final proposal posted
October 11, 2022	Draft final proposal posted stakeholder call
October 21, 2022	Draft final proposal stakeholder comments due
December 2022	Joint Governance Meeting

Note: These dates may be subject to change.