# MARKET SURVEILLANCE COMMITTEE

# Operational Surprises, HASP Structure, Flexiramp and EIM Transfers

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#### Topics

- Operational Surprises
- HASP Structure
- EIM Transfers and Surprises
- Operational Surprises and Flexiramp
- Lessons and Questions

It is our understanding that CAISO/Western EIM operators were surprised by near real-time changes in the CAISO/Western EIM supply demand balance on July 20 and 25, 2023.

- Our understanding from the CAISO July summer report and various presentations is that these operational surprises contributed to very large infeasibilities in balancing net load in RTD during hour ending 20 on July 20, 2023, and may have contributed to small infeasibilities during hour ending 20 on July 25.
- There are also indications that CAISO systems and operator actions may have contributed to operational surprises for Western EIM balancing area operators n July 25,2023.
- It is important to understand the factors contributing to these surprises so they can be avoided going forward.
- CAISO operators had to make decisions based on their understanding of events at the time, but with time to sort out what happened, we may be able to develop a better understanding of core issues.

On July 20, 2023 prices rose from around \$100 in FMM and RTD to around \$1000 from 19:05 to 20:00, then fell back to around \$100. In addition, the CAISO July 2023 summer report indicates that the real-time supply demand balance deteriorated to infeasibility at 19:10. The infeasibility grew to reach 1524MW at 19:30 before declining to zero at 19:55.<sup>1</sup>

- EIM transfers were 500-700MW lower in RTD than in HASP during 4 RTD intervals during the middle of hour ending 20.
- All exports scheduled in the day-ahead market cleared in HASP, as did almost all real-time exports.<sup>2</sup>
- Thursday July 20,2023 Real-Time Daily Market Watch Report and CAISO July 2023 Summer Report Figure 101 p. 114.
- 2. CAISO July 2023 Summer Report Figure 118 p. 129.

Another consideration was that in the FMM interval 19:30 on July 20, 2023 the CAISO apparently only modeled around 750 MW of load conformance in HASP and FMM.<sup>1</sup>

- Figures in the July report indicate that procurement of FRU in the CAISO and EIM East for interval 19:30 was
  reduced by around 250MW by the operation of the demand curve, with perhaps 650MW procured in the CAISO
  and EIM East.<sup>2</sup>
- While almost all of the FRU procured in the Pacific Northwest appears to have been dispatched in RTD, there was
  congestion between PG&E and SCE and EIM East in the FMM, so none of this FRU may have been deliverable
  to SP-15 and EIM East in RTD.<sup>3</sup>
- In addition, about 75MW out of 225MW of CAISO Flexiramp was not dispatched, mostly batteries, probably either due to an insufficient state of charge or because they were located in NP-15. About 150 MW out of 425MW of Flexiramp procured in the Southwest was not dispatched in the middle of hour ending 20.<sup>4</sup>
- The bottom line is that there might have been very little capacity available in SP15 and EIM east to balance net load uncertainty during hour ending 20. Since the demand curve was reducing procurement of Flexiramp for FMM interval 19:30, very little additional unloaded capacity was likely available. There apparently was not even enough Flexiramp procured to cover realized VER forecast uncertainty in RTD.<sup>5</sup>
- 1. This is an eyeball estimate based on Figure100, CAISO July 2023 Summer Report p. 113.
- 2. Eyeball estimates, CAISO July 2023 Summer Report Figure 136 p. 147.
- 3. CAISO July 2023 Summer Report Figure 138 p. 148.
- 4. CAISO July 2023 Summer Report Figure 139 p. 149.
- 5. CAISO July 2023 Summer Report Figure 105 p. 118 The data in the Summer Report does not indicate where in the CAISO or DSW the VER uncertainty occurred so it might not all have occurred in the constrained region or perhaps more than all of the net uncertainty occurred lin the constrained region. The report also only reports changes in VER forecast over RTD intervals not between FMM and RTD, so the surprise relative to FMM might have been larger or smaller.

On July 25, 2023 the day-ahead load forecast was 1400-1700MW lower than real-time load and VER output was 1000 MW lower than on July 20 at 18:00. Prices in the south rose to \$1000 during hour ending 19 and remained at that level into hour ending 21.

- The CAISO July 2023 summer report indicates that the real-time supply demand balance deteriorated to small infeasibility at 18:40. The infeasibility never exceeded 300MW over the period through 19:55 portrayed in Figure 102.<sup>1</sup>
- EIM transfers were very similar between HASP and RTD, but were far higher in FMM than in either HASP or RTD. EIM transfers were low in hour ending 20, and were mostly EIM transfer exports.
- Around 4000MW of day-ahead exports and wheels, along with another 1000 MW of real-time exports did not clear HASP for hour ending 20.<sup>2</sup>
- There were issues during hour ending 20 with late postings of HASP and FMM, hourly exports curtailed in HASP continuing to flow in RTD, and mid-hour cuts in hourly export transactions.<sup>3</sup>
- Some of the operational surprises and challenges on July 25 may have been due to HASP structure.
- 1. CAISO July 2023 Summer Report Figure 102 p. 115.
- 2. CAISO July 2023 Summer Report Figure 118 p. 129.
- 3. CAISO July 2023 Summer Report pp. 129-130.

In the FMM interval 19:30 on July 25, 2023 the CAISO apparently modeled around 4000 MW of load conformance in HASP and FMM.<sup>1</sup>

- Figures in the July report indicate that procurement of FRU in the CAISO and EIM East for interval 19:30 was not reduced by the operation of the demand curve, with the full amount procured.<sup>2</sup>
- It appears that a large proportion of the FRU procured in the Pacific Northwest was not dispatched because of congestion.<sup>3</sup>
- It appears that only about 150MW of FRU was procured in the CAISO and EIM East and less than 50 MW appears to have been dispatched.<sup>4</sup>
- The bottom line is that although very little FRU was available to meet net load uncertainty in the CAISO and EIM East, there should have been substantial capacity available in the form of HASP and FMM load conformance during hour ending 20.
- 1. This is an eyeball estimate based on Figure 100, CAISO July Summer Report p. 113.
- 2. CAISO July Summer Report Figure 141 p. 151.
- 3. CAISO July Summer Report Figures 143, 144 and 145 pp. 152-153.
- 4. CAISO July Summer Report Figure 143 p. 152.

The role of HASP has evolved dramatically since 2014, while HASP structure has not.

- The HASP originated as a tool to schedule interchange transactions between the CAISO and adjacent balancing areas in conjunction with scheduling of CAISO balancing area resources.
- While HASP still serves that role for the CAISO, with the development of the Western EIM Resource Sufficiency Evaluation, HASP has developed into an hourly spot market for the purchase of capacity to meet the Resource Sufficiency Evaluation, both for the CAISO and other Western EIM entities.
- HASP is also a reliability tool for the Western EIM that can commit generation not only in CAISO, but across the Western EIM, to balance Western EIM load.
- In 2014, almost all imports and exports scheduled in HASP were with balancing areas that did not belong to the Western EIM.
- In July 2023 essentially all imports and exports scheduled in HASP sourced or sank in balancing areas that belong to the Western EIM.

- Western EIM stakeholders have discussed the implications for the resource sufficiency evaluation of HASP transactions that are included in EIM base schedules but do not clear in HASP.
- The HASP structure also has implications for Western EIM short-term reliability. A core issue is that when the CAISO clears HASP to schedule hourly interchange between the CAISO and other Western EIM balancing areas, day-ahead market exports that do not clear in HASP improve the CAISO resource balance relative to the day-ahead market, appearing to increase supply in both the CAISO and the Western EIM in the HASP evaluation.
- However, market exports that do not clear in HASP may be included in the base schedules of EIM entities. This is particularly likely for price taking day-ahead market exports. If this is the case, an apparent improvement in CAISO supply is offset by a reduction in Western EIM supply.
- The current HASP structure models the improvement in CAISO supply when dayahead exports do not clear, but does not model the potential reduction in Western EIM supply. Hence, HASP can appear to show a supply demand balance in the Western EIM when there actually is a large supply gap.

This HASP structure can contribute to Western EIM reliability problems in at least two ways.

- First, because HASP sees a false supply demand balance, it could fail to commit capacity located in the Western EIM to replace curtailed CAISO exports.
  - The actual supply demand balance will eventually show up in RTPD and RTD, but time will have passed and some units may not be able to come on line in time to avoid adverse reliability impacts.
- Second, if EIM balancing areas only find out sometime after HASP posts that exports included in their base schedules will not flow in RTD, they will have less time to take remedial actions.

The implications of the current HASP structure can be illustrated with a simple example.

#### **Forward Schedules**

CAISO day-ahead market load	`	= -40,000MW

- RUC adjustments = -2,000MW
- CAISO day-ahead market exports to SW
- CAISO day-ahead market imports from NW
- CAISO day-ahead market supply

Supply Margin (RUC Adjustment)

EIM Southwest Base Schedule load EIM Base Schedule CAISO imports EIM Base Schedule supply including FRU Supply Margin (capacity for FRU)

- 2,000
- = -6,000MW
- = 6,000 MW
- = 42,000MW
- = 2,000MW
- = -20,000MW
- = 6,000MW
- = 15,000MW
- = 1,000MW

Suppose that in real-time, the CAISO load forecast in HASP is 3,000MW higher than day-ahead and imports from the NW are down 1000MW due to transmission derates. Further assume that 1000MW of that change is met with additional CAISO generation, and 3,000MW of the change is covered by reducing day-ahead market exports from 6,000MW to 3,000MW.

#### HASP

CAISO real-time market load= -43,000MWCAISO HASP exports (SW)= -3,000MWCAISO Load Conformance= -2,000MWCAISO HASP imports (NW)= 5,000MWCAISO day-ahead market supply= 42,000MWCAISO real-time supply= 1,000MW

CAISO supply margin (Load Conformance) = 2,000MW Combined apparent HASP supply margin = 3,000MW

The actual HASP supply balance in the southwest is a 2,000MW deficit, because the EIM base schedules assumed 6,000MW of imports from CAISO but only 3,000MW cleared in HASP.

Post HASP - Southwest

EIM Southwest Base Schedule load	= -20,000MW
EIM Base Schedule CAISO imports	= 3,000MW
EIM Base Schedule supply including FRU	= 15,000MW
Supply margin	= - 2,000MW

Combined HASP apparent supply margin = 3,000MW 2000 CAISO load conformance + 1000 capacity margin in base schedules Combined Post HASP actual supply margin = 0MW 2000 CAISO load conformance - 2000 capacity shortfall in base schedules

When HASP is cleared by cutting exports that are included in EIM entity base schedules, there appears to be 3,000MW of capacity available to meet real-time uncertainty across the Western EIM, including CAISO, but there actually is no margin to cover net load uncertainty.

- One element of the problem is that when HASP does not clear some dayahead export transactions, the software engine does not recognize that this creates a supply shortage in the region in which the curtailed exports were scheduled to sink.
- In the example, the HASP solution does not directly inform CAISO operators of the upcoming problem. The HASP solution indicates that there is a 3000MW capacity margin going into RTD.
- CAISO operators will therefore be surprised in the example when there is actually no capacity margin in RTD because the EIM outside the CAISO is 3000MW short relative to its HASP base schedules.

EIM balancing areas will apparently be surprised when the day-ahead exports included in utility base schedules that did not clear in HASP do not flow.

- The potential for surprises is increased if the curtailed exports are being used to cover WSPP contracts and the utility in the EIM balancing area may not even know that their supply is sourced from the CAISO spot market.
- Moreover, it is possible that supply to cover WSPP contracts might be sourced from the CAISO real-time spot market and have even lower priority in HASP, but the utility might not know this when submitting base schedules.
- Even if there is no marketer involved, the utility submitting a base schedule would apparently not know prior to HASP that its day-ahead market price taking exports would be curtailed.

The CAISO Department of Market Monitoring has provided several analyses showing an apparent pattern of reductions in CAISO HASP hourly exports during the net load peak hours following the implementation of restrictions on EIM transfer imports in July 2023.<sup>1</sup>

- These data strongly suggest that EIM transfer imports were supporting HASP hourly exports.
- This would be perhaps be an appropriate outcome if these EIM transfer imports were supported by capacity in excess of that needed to meet EIM load and balance real-time net load uncertainty. This could be viewed as consistent with a HASP role of providing an hourly market for excess capacity to meet the resource sufficiency evaluation.
- On the other hand, if these EIM transfers are in fact supported by capacity that is needed to balance real-time net load uncertainty (Flexiramp), then these EIM transfer imports into CAISO in HASP will set up operational surprises in RTD when no capacity is available for balancing net load uncertainty.<sup>2</sup>
- California ISO, Department of Market Monitoring, Q3 2023 Report on Market Issues and Performance, April 24, 2024, Figures 2.4 and 2.5 pp. 66-67. There appears to have been little impact on hourly exports in November, which would be consistent with the looser capacity balance in November. California ISO, Department of Market Monitoring, Q4 2023 Report on Market Issues and Performance, April 24, 2024, Figures 2.3 and 2.4 pp. 77-79.
- 2. We recognize that there are also potential impacts on the RSE which have been discussed in other Western EIM stakeholder processes. We are focusing on the short-term reliability and market impacts in this discussion.

We have noted several times over the past years the potential, absent an effective deliverability test, for capacity needed to provide Flexiramp in a constrained area such as the CAISO and southwest, to be dispatched to meet load in HASP and FMM, and be replaced by unloaded capacity in the Pacific Northwest that cannot be dispatched to meet net load uncertainty in the CAISO or Southwest.

- This outcome is intended to be avoided by the nodal delivery test, but data in the July 2023 Summer Report suggests that the nodal delivery test was likely ineffective on July 20 and July 25 in ensuring that sufficient balancing capacity was available in SP 15 and the Southwest.
- The core short-term reliability problem is not the EIM transfer imports, but the dispatch of FRU capacity to meet load in FMM and HASP with little or no price signal of the need to commit additional capacity to provide flexiramp in the constrained region. If all capacity able to provide FRU was dispatched to meet load in the CAISO and Southwest in HASP with few or no EIM transfers, there would still be a surprise from the lack of FRU capacity to balance net load uncertainty in RTD.

There appear to have been two elements to Flexiramp delivery surprises on July 20 and 26, 2023.

- The first element was when the Flexiramp target for the SP15 and the Southwest was met in HASP and FMM with capacity in the Pacific Northwest that was not deliverable in real-time. We understand that the CAISO has made changes in the nodal delivery test since July 2023 to address this problem. We will need to evaluate how these changes perform over summer 2024.
- The second element was that the nodal delivery test by design does not test if the diversity benefit is deliverable. This is a fundamental element of the nodal delivery test design. Hence, even if the nodal delivery test performs as intended, it will make sense for CAISO operators to use load conformance in HASP and FMM to maintain additional balancing capacity in CAISO when they expect congestion between the CAISO and the Pacific Northwest.

Another source of operational surprises from Flexiramp on July 20, 2023 was the operation of the FRU demand curve.

- Pass Group Flexiramp Up FMM prices were only \$23.25 in FMM interval 19:30 on July 20 despite going short somewhere around 300MW on an around 900MW procurement target in CAISO and the Southwest, while the CAISO price was zero, as was the FRU price in Southwest BAs. <sup>1</sup> The Pass Group price of Flexiramp Up was \$0 in RTD from 19:15 through 20:00 on July 20, despite large infeasibilities in RTD. The CAISO price was also zero in RTD, as was the price in Southwest BAs. <sup>2</sup>
- If the CAISO FRU procurement that occurred was in NP-15, the proportional FRU procurement shortfall in SP-15 and the Southwest would have been even larger.
- FMM prices were around \$500 in the Southwest and SCE during this interval which would have incented commitment of additional capacity without regard to the FRU penalty price. We have not reviewed data on FRU and energy prices in HASP, nor do we know if there was an FRU shortfall in HASP.
- 1. Eyeball estimate from Figure 136 in the July 2023 Summer report p. 147 including AZPS, CAISO, EPE, LADWP, Nevada, PNM, SRP, Tucson and WAPA-LC, FRU prices from Real-Time Daily Market Watch. It is possible that FRU prices were actually higher in the CAISO and Southwest but are not show n because of the way FRU prices are reported.
- 2. FRU prices from Real-Time Daily Market Watch. It is possible that FRU prices were actually higher in the CAISO and Southwest but are not shown because of the way FRU prices are reported.

Flexiramp procurement and delivery appear to continue to be a potential source of operational surprises.

- As long as FRU delivery uncertainty and the locational operation of the FRU demand curve create material uncertainty for CAISO operators regarding the amount of balancing capacity that FRU will actually provide in RTD, we can foresee that CAISO operators will continue to rely at least in part on load conformance to meeting real-time balancing needs.
- Load conformance is deliverable to load to the extent it clears, and load conformance has a high penalty price.
- However, these advantages are also disadvantages.
  - Load conformance will commit capacity that is deliverable to load even if the net load uncertainty is not located at load, and lower cost capacity able to meet that uncertainty could be procured elsewhere.
  - Load conformance will commit capacity at a very high penalty price even if the incremental capacity is not very valuable.

EIM transfer imports in HASP might not be the cause of real-time surprises, instead drops in EIM transfer imports in RTD might be a result of real-time surprises. There were no EIM transfer imports in the HASP example above. The surprise in the example based on July 25, 2023 was that the EIM BAs were 3000MW short relative to their base schedules and would need transfer imports from the CAISO in RTD.

- If the HASP solution in the example met a part of the changes in CAISO load with EIM transfers rather than cutting day-ahead exports, the surprise would still come from double counting the supply supporting the curtailed exports, not from the EIM transfers.
- A ban on EIM transfers in HASP would not have reduced the reliability problem in the example, but could make it worse. This is because a ban on EIM transfer imports to the CAISO in HASP could result in more export curtailments in HASP, rather than commitment of additional capacity in the EIM BAs in HASP.
- In practice, EIM transfer imports were small during hour ending 20 on July 25, 2023 and mostly exports.

If the CAISO does not curtail price taking exports in HASP, then restricting EIM transfers in HASP can result in scheduling additional CAISO hourly imports or committing additional generation that would increase supply inside CAISO.

- Scheduling additional hourly imports in HASP from Western EIM BAs improves the CAISO's position in the Resource Sufficiency Evaluation but does not directly commit additional capacity in the Western EIM.
- Restricting EIM transfer imports in HASP and FMM can force commitment of capacity in CAISO rather than elsewhere in the EIM, but can also result in reduced capacity if the CAISO is short of capacity and there is capacity to commit elsewhere in the Western EIM. This appears to be what happened on July 26, 2023 when EIM transfer imports were restricted and there was a large infeasibility in FMM. <sup>1</sup> This did not matter on July 26, 2023 as the full load conformance was not needed in RTD.
- Restricting EIM transfer imports into CAISO in HASP will tend to shift Flexiramp procurement out of the CAISO and into adjacent balancing areas when the constraint is binding.

1. CAISO July 2023 Summer Report, Figure 99 p. 112.

Western EIM participants have previously discussed restricting EIM transfers in HASP in order to ensure that all CAISO exports are supported by EIM hourly imports supported by explicit import offer and capacity, or by CAISO capacity.

- Since all exports to Western EIM BAs in HASP are sourced from the CAISO. CAISO operators effectively imposed this policy on July 26, 2023 by restricting EIM transfer imports.
- This restriction eliminated the potential for flaws in the Flexiramp design and implementation to result in EIM transfers supported by capacity needed to provide real-time balancing being turned into HASP exports to meet the Resource Sufficiency Evaluation during the net load peak hours.
- This restriction does not eliminate the potential for capacity needed to provide FRU being dispatched in HASP, creating a false picture of the real-time supply demand balance.

Whether or not restrictions on EIM transfers in HASP are viewed as a good thing because of their impact on the Resource Sufficiency Evaluation, we need to separately consider the impact of imposing such a restriction in other RTPD intervals, particularly the binding FMM interval.

- Western EIM load serving entities and system operators are intended to offer sufficient capacity in their base schedules to meet their load and provide real-time balancing. This capacity is effectively available to meet balancing between the HASP forecast and FMM and well as in RTD.
- The commitment of capacity in HASP to meet Western EIM flexiramp requirements is 1) premised on the diversity benefit, 2) scheduled at least cost across the western EIM (with the intent that it be deliverable although that is not always the case).

If EIM transfer imports into the CAISO, or any other balancing area, are restricted in FMM as well as in HASP:

- the BA cannot access the diversity benefit from flexinamp located in other balancing areas in FMM, although it would be available in RTD
- If HASP did not commit capacity in the BA to provide flexiramp because it was cheaper elsewhere, the BA cannot access this flexiramp capacity in FMM, although it would be available in RTD.
- A cap on EIM transfer imports in HASP will tend to shift the scheduling of Flexiramp out of the BA in HASP and RTPD to locations where it is not available to be converted into EIM transfer imports in FMM.

# **EIM Transfers - Conclusions**

Restrictions on EIM transfer imports in HASP can prevent capacity needed to provide flexiramp from being converted in HASP exports to meet the Resource Sufficiency Evaluation as a result of weaknesses in the flexiramp design or implementation.

Restrictions on EIM transfer imports in HASP cannot prevent weaknesses in the flexiramp design or implementation from causing HASP to provide a false image of the supply demand balance.

Restrictions on EIM transfer imports in HASP will tend to shift flexiramp scheduling out of the CAISO in HASP, making more supply available in the CAISO, but FMM will prevent the balancing area from accessing flexiramp scheduled in other balancing areas, turning the flexiramp demand curve into a \$1000 penalty price.

# **EIM Transfers - Conclusions**

Restrictions on EIM transfer imports in HASP will not eliminate operational surprises resulting from CAISO export curtailments in HASP and might at times make them worse.

Restrictions on EIM transfer imports can shift some scheduling of HASP supply into the CAISO, but that does not ensure that the CAISO supply will be available in RTD. The restriction could fail to procure capacity if CAISO supply is limited or shift HASP energy schedules onto CAISO resources such as batteries that have high offer prices in order to manage their state of charge instead of committing generation in the Western EIM.

With the expansion of the Western EIM:

- There is no need for the CAISO or other Western EIM entities to use HASP to schedule economy energy imports or exports. Economy interchange can be scheduled in FMM and RTD and is priced the same way, unless bid price guarantees are triggered.
- The HASP structure needs to be consistent with its defacto role as the software tool for evaluating overall Western EIM resource needs and making real-time unit commitment decisions, not just evaluating CAISO reliability.
- HASP also serves a role at present in scheduling interchange transactions that the CAISO and other Western EIM balancing areas count to meet the Resource Sufficiency Evaluation.
- EIM transfers in HASP can be recycled into exports that meet the Resource Sufficiency Evaluation.

The current HASP structure appears to inherently have the potential for double counting supply when CAISO hourly exports included in EIM base schedules do not clear in HASP or CAISO hourly imports are not included in EIM base schedules that clear in HASP. This problem is not resolved by restrictions on EIM transfer imports.

Without restrictions on EIM transfer imports in HASP, the HASP inherently has the potential to turn capacity needed to meet net load uncertainty into HASP exports to meet the Resource Sufficiency Evaluation. This potential is exacerbated by Flexiramp design choices and implementation issues.

Weaknesses in Flexiramp design and implementation inherently create the potential for HASP and RTPD to provide a false picture of the real-time supply demand balance. This potential is only slightly mitigated by restrictions on EIM transfer imports.

With the current Flexiramp design which procures Flexiramp on a regional basis with requirements taking account of a diversity benefit, restrictions on EIM transfer imports into a BA in HASP will shift Flexiramp procurement out of the BA, producing an illusion of greater internal supply.

If restrictions are also imposed on EIM transfer imports in FMM, this will have an inherent potential to result in artificially high or low prices in FMM relative to RTD.

There do not appear to be easy solutions to the HASP structure issues relating to export curtailments. There are things we might be able to do better without major changes.

- Does the CAISO inform WECC balancing areas when day-ahead market exports to those balancing areas do not clear in forward STUC evaluations?
- Does the CAISO inform WECC balancing areas when CAISO operators foresee a potential for day-ahead market exports to those balancing areas to not clear in HASP?

#### Appendix: EIM Transfer Import Example

The implications of the EIM transfers can be illustrated by continuing the simple example, the forward schedules are the same as in the HASP example above.

#### **Forward Schedules**

CAISO day-ahead market load	= -40,000MW
RUC adjustments	= -2,000MW
CAISO day-ahead market exports to SW	= -6,000MW
CAISO day-ahead market imports from NW	= 6,000 MW
CAISO day-ahead market supply	= 42,000MW
Supply Margin (RUC adjustments)	= 2,000MW

EIM Southwest Base Schedule load EIM Base Schedule CAISO imports EIM Base Schedule supply including FRU Supply Margin (capacity for FRU)

- = -20,000MW
- = 6,000MW
- = 15,000MW
- = 1,000MW

As in the HASP example, suppose that in real-time, the CAISO load forecast in HASP is 3,000MW higher than day-ahead and imports from the NW are down 1000MW. In the EIM transfer example we assume that 1000MW of change is met with additional CAISO generation, 1000MW with EIM transfer imports and 2,000MW of the change is covered by reducing day-ahead market exports. The EIM transfer imports reduce export curtailments.

HASP

- CAISO real-time market load
- CAISO HASP exports (SW)
- CAISO Load Conformance
- CAISO HASP imports (NW)
- CAISO EIM Transfer imports (SW)
- CAISO day-ahead market supply
- CAISO real-time supply
- CAISO supply margin (Load Conformance)
- Combined apparent HASP supply margin

- = -43,000MW
- = -4,000MW
- = -2,000MW
- = 5,000MW
- = 1000MW
- = 42,000MW
- = 1,000MW
- = 2,000MW
- = 3,000MW

The actual HASP supply balance in the southwest is a 1,000MW deficit, because the EIM base schedules assumed 6,000MW of imports from CAISO but only 4,000MW cleared in HASP. The EIM transfers are assumed to be offset by the commitment of additional generation in HASP.

Post HASP - Southwest

EIM Southwest Base S	Schedule load	= -20,000MW

EIM Transfers = -1,000MW

EIM Base Schedule CAISO imports = 4,000MW

EIM Base Schedule supply including FRU

EIM generation committed in HASP = 1,000MW

Supply margin

Combined HASP apparent supply margin= 3,000MWCombined Post HASP actual supply margin= 1,000MW

CAISO Load Conformance =2000 EIM supply margin = -1000

= 15,000 MW

= - 1.000MW

The post HASP supply margin is higher in the example in which EIM transfers are used to meet CAISO load than in the HASP example with no EIM transfers.

- This is because in the EIM transfer example above, HASP commits 1000 MW of capacity in the EIM to meet CAISO load rather than cutting an additional 1000MW of CAISO exports.
- Cutting CAISO exports that are included in base schedules does not actually improve the supply balance for the Western EIM, while committing additional capacity does.
- If there were no additional capacity in the Western EIM to support EIM transfers, or if FRU capacity were used to support the EIM transfers, the outcome would be the same as in the HASP example, a 2000MW capacity shortfall in the Western EIM.