Consolidated EIM Initiatives
from 2017 Roadmap

Straw Proposal

July 31, 2017

Consolidated EIM Initiatives Straw Proposal

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1. Purpose

The purpose of this initiative is to consolidate energy imbalance market (EIM) related items from the 2016 roadmap into one effort. This will facilitate the stakeholder process and allow sufficient time for stakeholder feedback. The three items included in the Consolidated EIM Initiatives are:

- Third Party Transmission Contribution
- Management of Bilateral Schedule Changes
- Equitable Sharing of Wheeling Benefits

The Consolidated EIM Initiatives straw proposal is written with the assumption the reader has an understanding of the energy imbalance market. References and a brief description are in located in Section 2.3.

2. Plan for Stakeholder Engagement

Stakeholder input is essential for successful policy development. The Consolidated EIM Initiatives stakeholder process will shape the market design and policies through a series of proposals, meetings and written stakeholder comments. Stakeholders should submit comments to InitiativeComments@caiso.com. Table 1 lists the planned schedule for the Consolidated EIM Initiatives stakeholder process.

The ISO is committed to providing ample opportunity for stakeholder input into its market design, policy development, and implementation activities.

2.1. EIM Governing Body Role

This policy initiative involves market rules changes that fall entirely within the EIM governing body's primary authority. The EIM Governing Body will have primary authority in approving the policy resulting from this initiative.

2.2. Schedule

Item	Date
Post Straw Proposal	July 31, 2017
Stakeholder Meeting	August 7, 2017
Stakeholder Comments Due	August 17, 2017

Post Draft Final Proposal	September 5, 2017
Stakeholder Conference Call	September 12, 2017
Stakeholder Comments Due	September 19, 2017
EIM Governing Body Meeting	October 10, 2017
Board of Governors Meeting	November 1-2, 2017

Table 1: Schedule for Consolidated EIM Initiatives Stakeholder Process

2.3. Understanding the Energy Imbalance Market: Definition and Resources

The EIM is a real-time market used to economically dispatch participating resources to efficiently balance supply, transfers between balancing authority areas (BAA), and load across its footprint. The EIM extends the CAISO's real-time market and leverages the FERC Order No. 764 market design changes implemented in May 2014. As such, the EIM includes a fifteen-minute market and five-minute real-time dispatch across the combined network of the ISO and EIM entities.

This initiative assumes a basic understanding on the EIM design which went live on November 1, 2014. Review the EIM Draft Final Proposal and the EIM Year 1 Enhancements for additional information on the EIM design including: definitions, policy decisions, as well as descriptions of EIM design components such as the resource sufficiency evaluation and EIM settlements. The EIM Draft Final Proposal and EIM Year 1 Enhancements are posted at:

http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyImbalanceMarket.aspx

http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedStakeholderProcesses/EnergyImbalanceMarketYear1Enhancements.aspx

3. Changes from Issue Paper

3.1. Third Party Transmission Contribution – Removed from Scope

The intent of this initiative was to allow third party transmission owners[1] to contribute transmission capacity located between two EIM BAAs for use in the EIM. It was originally believed this would benefit EIM and non-EIM entities. EIM entities would benefit due to increased energy transfer throughout the EIM area, while non-EIM entities that contributed

[1] The term "transmission owner" is broadly defined as any entity holding firm transmission rights. This may be direct ownership or contract rights.

transmission capacity would be eligible to receive congestion revenues. This functionality would result in a financial benefit when the transmission capacity made available is used and valuable.

The Issue Paper proposed that third parties would receive congestion rents only for the transmission contribution and that any other type of payment is outside the scope of what the ISO is considering. However, stakeholder comments indicated congestion rents may not be adequate compensation. Specifically, a transmission contribution would increase the amount of capacity between EIM BAAs and therefore reduce the likelihood that congestion would occur. Without congestion, there would be no financial benefit for the transmission contribution.

Additionally, stakeholders did not believe this functionality would be widely used. Concerns were expressed that the implementation cost would outweigh the financial benefit. Therefore, stakeholders stated that pursuing this initiative would be an inefficient allocation of ISO resources.

Based on stakeholder feedback, the ISO will remove the Third Party Transmission Contribution from the scope of this initiative. Reference the Issue Paper for more details on the original problem statement, scope, and proposed solutions.[2]

3.2. Management of Bilateral Schedule Changes

Management of bilateral schedule changes was proposed to allow market participants better opportunity to hedge transactions after the EIM entities' base schedule submission deadline. The ISO proposed to leverage the current wheel through functionality to economically determine bilateral schedule changes that source in the EIM area or wheel across the EIM area. This would allow market participants with potential bilateral transactions to express a bid price at which the balanced source/sink pair would result in a schedule change.

Stakeholders commented that the ISO can address part of this issue by improving the ISO market timelines. This would enable EIM entities to move their base schedule deadline (currently T-57) closer to the NAESB e-Tagging timeline of T-20. However, the EIM will still initiate prior to the e-tagging deadline. As a result, any remaining imbalance settlement concerns will need to be managed by EIM entity business practices or changes to the OATT settlement of wheel schedule changes.

3.3. Equitable Sharing of Wheeling Benefits

Under the current EIM design each EIM entity is responsible for their own transmission cost recovery through their OATT. EIM entities benefit from the reciprocal benefits provided by the

[2] The Consolidated EIM Initiatives Issue Paper is located at: http://www.caiso.com/Documents/IssuePaper-ConsolidatedEnergyImbalanceMarketInitiatives_Updated.pdf

transmission made available to the EIM. The purpose of this initiative is to investigate equitable sharing of benefits when an EIM transfer wheels through an EIM BAA.

The ISO has identified a potential inequity resulting from the amount of wheeling transactions that occur throughout the EIM area. Said differently, some EIM entities experience more net wheeling than others relative to EIM transfers that sink or source within the EIM BAA.

The ISO is suggesting two solutions to allow benefits to be more evenly dispersed throughout the EIM. The first option (1) is an ex-post payment based on the amount of net wheeling that occurs. The second option (2) is a rate that can be incorporated into the market and therefore allow market competition while providing compensation for net wheeling.

Implementation of either of these options will allow entities that experience net wheeling to more equitably share benefits realized by facilitating transfers and providing an overall benefit to the EIM. The ISO requests feedback to determine if either option is favorable and will resolve concerns regarding equitable sharing of EIM benefits.

3.4. New EIM Functionality

The ISO is currently developing new EIM functionalities in preparation for entities joining the EIM. This straw proposal outlines those functionalities as they will be available for use by all current and future EIM BAAs.

4. Management of Bilateral Schedule Changes

4.1. Background

Several stakeholders believe there has been a decrease in bilateral scheduling since the implementation of EIM. Stakeholders commented this decrease may be influenced by the imbalance energy settlement which is applicable when schedule changes are made between T-57 and T-20. Several EIM entities have also argued that these bilateral schedules should be charged for imbalance energy because these "late" schedule changes can cause the EIM BAA to incur re-dispatch costs. Prior to the EIM, some market participants with bilateral transactions could make an hourly schedule change up to T-20; if re-dispatch costs were necessary to accommodate the schedule change, the cost was not charged to the market participant.

Market participants may consider the lack of exposure to imbalance energy settlement as a benefit when evaluating the type of transmission service they are considering. If schedule changes between T-57 and T-20 are now exposed to imbalance energy settlement the value proposition for procuring the transmission is reduced. The exposure to imbalance energy settlement exists only if there is a LMP difference between the point of entry/source and the point of exit/sink from/to affected EIM BAAs and the EIM entity's OATT authorizes the EIM entity to pass through the imbalance energy settlement to the market participant.

4.2. Market Resolving Congestion from Bilateral Schedule Changes

Prior to discussing how re-dispatch costs can occur and how they are settled in EIM, it is important to understand whether the 15-minute market (FMM) or real-time dispatch (RTD) will resolve congestion. If the schedule change is known prior to the start of the FMM market run, then it will result in an FMM schedule change. If the schedule change is not known prior to the start of the FMM market run, then it will be reflected in the corresponding RTD runs.

Bilateral schedule submitted before T-57

	Int 1	Int 2	Int 3	Int 4	Int 5	Int 6	Int 7	Int 8	Int 9	Int 10	Int 11	Int 12
Market	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Since the schedule is finalized prior to the EIM entity base schedule submission deadline there will be no imbalance settlement.

Bilateral schedule submitted between T-57 and T-40

	Int 1	Int 2	Int 3	Int 4	Int 5	Int 6	Int 7	Int 8	Int 9	Int 10	Int 11	Int 12
Market	FMM	FMM	FMM	FMM	FMM	FMM	FMM	FMM	FMM	FMM	FMM	FMM

The base schedule change is known prior to the ISO initializing the financially binding FMM run for the first 15-minute interval in T. Therefore the 15-minute schedule change is settled at the 15-minute price for the hour T.

Bilateral schedule submitted between T-40 and T-25

	Int 1	Int 2	Int 3	Int 4	Int 5	Int 6	Int 7	Int 8	Int 9	Int 10	Int 11	Int 12
Market	RTD	RTD	RTD	FMM	FMM	FMM	FMM	FMM	FMM	FMM	FMM	FMM

The schedule change is not known prior to initializing the financially binding run for the first 15-minute interval of the hour T and therefore results in 5-minute imbalances which are settled at the 5-minute price for Int 1, Int 2 and Int 3. However, since the change is communicated to the ISO before the initialization of the remaining financially binding FMM runs of the hour T and can be reflected in a 15-minute schedule change settled at the 15-minute price for Int 4 to Int 12.

Bilateral schedule submitted between T-25 and T-20

	Int 1	Int 2	Int 3	Int 4	Int 5	Int 6	Int 7	Int 8	Int 9	Int 10	Int 11	Int 12
Market	RTD	RTD	RTD	RTD	RTD	RTD	FMM	FMM	FMM	FMM	FMM	FMM

The schedule change is not known prior to initializing the financially binding run for the first and second 15-minute intervals of the hour T and therefore results in 5-minute imbalances which are settled at the 5-minute price for Int 1 to Int 6. However, the change is communicated to the ISO before the initialization of the remaining financially binding FMM runs of the hour T and can be reflected in a 15-minute schedule change settled at the 15-minute price for Int 7 to Int 12.

4.3. Managing Exposure to Re-Dispatch Costs within EIM Entity OATTs

Re-dispatch cost[3] in EIM occurs when a wheel schedule change causes congestion and forces the market to re-dispatch other resources to accommodate the schedule change. These re-dispatch costs are included in the real-time congestion offset of the EIM entity where the constraint is located. In addition, the real-time congestion offset includes congestion revenues that result from imbalance settlement of the wheel schedule change which can exceed the re-dispatch costs. The market optimization that resolves the congestion is dependent upon when the schedule change can be reflected in the market optimization as discussed above.

The following examples depict a simplified system with two generators, a wheel (import 1 and export 2), and a load with a single transmission line.

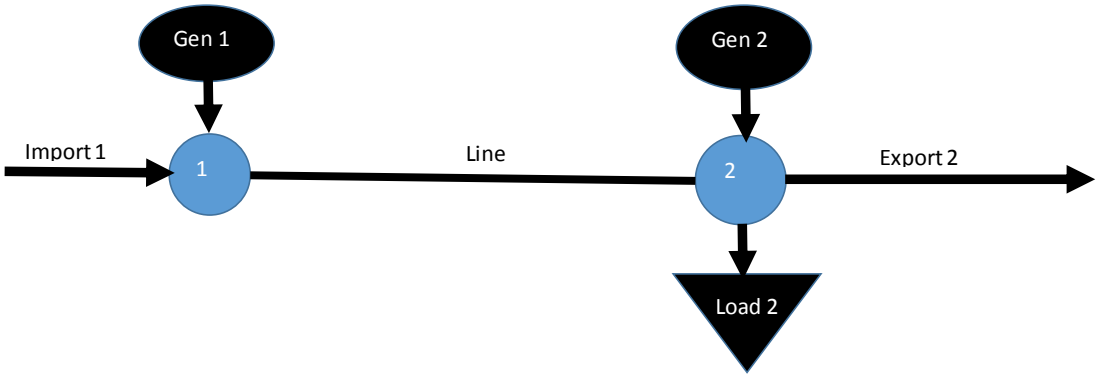

Figure 1: Wheeling transaction in a system with two generators, load & a single transmission line

Assumptions:

Generator 1 has a PMax = 900 MW, PMin = 0 MW and an energy bid = $20.00

Generator 2 has a PMax = 1000 MW, PMin = 0 MW and an energy bid = $30.00

[3] The price differential for wheels also includes losses between the import and the export.

Load 2 = 900 MW

Wheel = 200 MW

Transmission Limit = 1000 MW

Example 1 – Wheel known before T-57

Since the wheel schedule is communicated to the ISO prior to the EIM base schedule submission deadline, the EIM entity scheduling coordinator ensures that the base schedule on Generator 1 does not overload the transmission limit. The EIM entity scheduling coordinator is incentivized to resolve congestion prior to the operating hour because all re-dispatch costs will increase the real-time congestion offset for its BAA. In this example, there is no EIM re-dispatch required.

	Base (MW)	Dispatch (MW)	Imbalance (MW)	LMP	Settlement
Gen1	800	800	0	$ 20.00	$ -
Gen2	100	100	0	$ 30.00	$ -
Load2	900	900	0	$ 30.00	$ -
Import 1	200	200	0	$ 20.00	$ -
Export 2	200	200	0	$ 30.00	$ -
Real time congestion offset					$ -

Example 2a – Wheel known between T-57 and T-40 and EIM entity takes action to accommodate the wheel

In this example, the EIM entity was planning to serve the 900 MW of load completely from the lowest cost resource, Generator 1. However, the EIM entity has not yet submitted final base schedules to the ISO. Therefore, the EIM entity adjusts the base schedules of Generator 1 and Generator 2 so that there is no congestion in its base schedules when considering the wheel transaction. As a result of this action, there is no re-dispatch required.

	T-57 Base (MW)	T-40 Base (MW)	Dispatch (MW)	Imbalance (MW)	LMP	Settlement
Gen1	900	800	800	0	$ 20.00	$ -
Gen2	0	100	100	0	$ 30.00	$ -
Load2	900	900	900	0	$ 30.00	$ -
Import 1	0	200	200	0	$ 20.00	$ -
Export 2	0	200	200	0	$ 30.00	$ -
Real time congestion offset						$ -

Example 2b – Wheel known between T-57 and T-40 and EIM entity takes no action to accommodate the wheel

In this example, the EIM entity is planning to serve the 900 MW of load completely from the lowest cost resource, Generator 1. The EIM entity does not update final base schedules to reflect the bilateral schedule change which will result in FMM re-dispatch of Generator 1 and Generator 2 ($1000 cost). Since the EIM entity does not offer the perfect hedge[4] to wheel schedule changes up to the T-20 e-tagging deadline to the bilateral schedule, the EIM entity collects $2000 from the bilateral schedule change which exceeds the re-dispatch cost resulting in a surplus in the real-time congestion offset of the EIM entity's BAA. The ISO allocates the real-time congestion offset by EIM BAA to incentivize EIM entities to resolve congestion prior to submitting final base schedules. This example shows that the EIM entity receives a surplus if they do not communicate the schedule change to the ISO prior to the final base schedule submission deadline.

	T-57 Base (MW)	T-40 Base (MW)	Dispatch (MW)	Imbalance (MW)	LMP	Settlement
Gen1	900	900	800	-100	$ 20.00	$ 2,000
Gen2	0	0	100	100	$ 30.00	$ (3,000)
Load2	900	900	900	0	$ 30.00	$ -
Import 1	0	0	200	200	$ 20.00	$ (4,000)
Export 2	0	0	200	200	$ 30.00	$ 6,000
Real time congestion offset						$ 1,000

[4] The perfect hedge would be implemented by an EIM entity through its OATT settlement for not settling imbalance between the base schedule and the final e-tag schedule. The EIM entity would need to adjust its real-time congestion offset cost allocation amount to reflect that the collected congestion revenues from the wheel schedule change are used to exempt the wheel transaction from imbalance settlement.

Example 3a – Wheel known after T-40 and EIM entity takes action to accommodate the wheel

In this example, the EIM entity scheduling coordinator has recognized that it should not schedule Generator 1 into the transmission scheduling rights procured by the wheel until after the T-20 the scheduling deadline. The EIM entity scheduling coordinator restricts the base schedule of Generator 1 such that in the event the wheel schedule does materialize, there is still available transmission and supporting the wheel will not require re-dispatch by the market optimization. However, the wheel does result in congestion which results in a surplus of $2000 collected though the market which flows in to the real-time congestion offset. If the EIM entity chose to provide the perfect hedge, the $2000 would be provided to the market participant who scheduled the wheel.

	Base (MW)	Dispatch (MW)	Imbalance (MW)	LMP	Settlement
Gen1	800	800	0	$ 20.00	$ -
Gen2	100	100	0	$ 30.00	$ -
Load2	900	900	0	$ 30.00	$ -
Import 1	0	200	200	$ 20.00	$ (4,000)
Export 2	0	200	200	$ 30.00	$ 6,000
Real time congestion offset					$ 2,000

Example 3b – Wheel known after T-40 and EIM entity does not take action to accommodate wheel

In this example, the EIM entity scheduling coordinator submits base schedules equal to the least cost dispatch to serve Load 2. Since the transmission limit is 1000 MW, the base schedule of Generator 1 is set at its maximum 900 MW. When the wheel transaction is known by the market optimization, the transmission line becomes congested which causes re-dispatch of Generator 1 (down 100 MW) and Generator 2 (up 100 MW). The total imbalance settlement results in a congestion revenue surplus of $1000 which is paid to the EIM entity scheduling coordinator through the real-time congestion offset. The imbalance settlement for the wheel is charged $2000, but the re-dispatch cost for the EIM entity is only $1000 (difference between Generator 1 and Generator 2 settlement). Thus if the EIM entity was to offer the perfect hedge to the wheeling entity, *i.e.*, not pass through $2000 to the wheeling entity for imbalance energy, the EIM entity re-dispatch cost in this example would be $1000.

	Base (MW)	Dispatch (MW)	Imbalance (MW)	LMP	Settlement
Gen1	900	800	-100	$ 20.00	$ 2,000
Gen2	0	100	100	$ 30.00	$ (3,000)
Load2	900	900	0	$ 30.00	$ -
Import 1	0	200	200	$ 20.00	$ (4,000)
Export 2	0	200	200	$ 30.00	$ 6,000
Real time congestion offset					$ 1,000

As the examples illustrate above, the submission of a wheel transaction up to the T-20 scheduling deadline should not create re-dispatch costs for the EIM entity BAA if the base schedules of other resources are such that the transmission can accommodate the wheel. Re-dispatch costs will be incurred only if the base schedules of other resources are approved by the EIM entity that utilize the transmission reservation of the firm transmission holder.

The EIM entity can address the impact of bilateral scheduling after T-57 through its business practices by adjusting base schedules so that transmission sold to firm transmission holders is not used. However, to provide additional certainty to bilateral schedules, the EIM entity could chose to exempt certain wheel transactions from imbalance settlement (not pass through the imbalance energy charges or provide the perfect hedge through the EIM entity OATT) for schedule changes made after T-57 EIM entity base schedule submission deadline. That way, in the event that the business practices to accommodate wheel fail, the re-dispatch costs would accrue to the EIM entity's real-time congestion offset and not result in an over-collection of congestion revenue from the wheel transaction imbalance energy settlement.

5. Equitable Sharing of Wheeling Benefits

5.1. Background

Due to the geographical/topological boundaries, some EIM transfers will wheel through an EIM BAA. Specifically, energy will source in one EIM BAA, wheel through another[5], and sink in a third (see Figure 4). Should the source and sink EIM entities accrue the benefits of the transaction (current EIM structure) or should the wheel through EIM entity share the benefits in return for facilitating the transfer?

[5] Wheeling transfer can occur through EIM BAAs or non-EIM BAAs where ETSRs are enabled for EIM transfers.

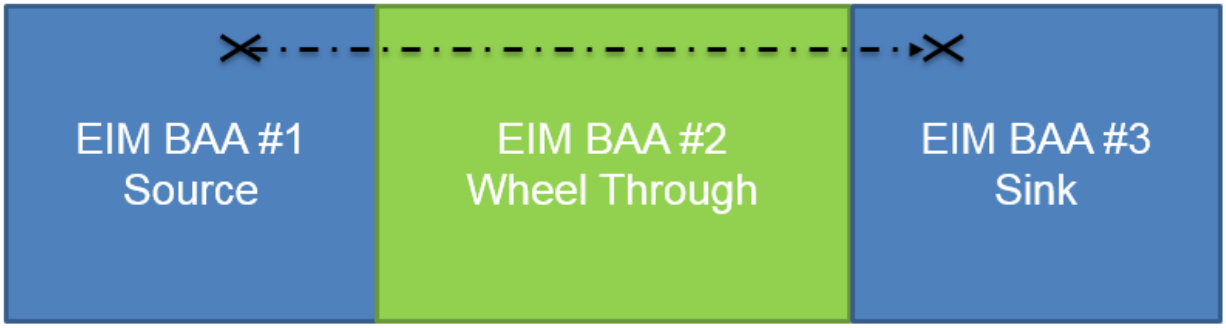

Figure 2: Wheel Through EIM BAA

This straw proposal suggests two options to equitably share benefits between the source, wheel-through, and sink EIM BAAs.

1. Ex-post payment based on the amount of net wheeling that occurs
2. Hurdle rate that can be incorporated into the market

5.2. Stakeholder Comments

The ISO appreciates stakeholder input and is committed to the stakeholder process. The ISO notes that stakeholder views[6] related to this initiative varied across entities.

Some stakeholders opposed this initiative stating it conflicts with the principle of transmission reciprocity and a hurdle rate would reduce the EIM's overall benefits. "The total EIM benefit is the cost saving of the EIM dispatch compared with a counterfactual (CF) without EIM dispatch."[7]

Other stakeholders supported the initiative but specifically requested the implementation of a transmission access charge (TAC) for compensation of wheeling transactions. Additionally, it was recognized that some EIM entities do facilitate more wheeling transactions than others and it would be prudent to complete data analysis and explore options to equitably share benefits with those entities.

In order to address and respond to stakeholder comments the ISO analyzed applicable EIM data and based on the analysis has outlined two potential solutions below.

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6 See stakeholder written comments from the Consolidated EIM Initiatives Issue Paper for more information: http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=D1F46FFD-209D-4398-896E-EB8B005AE2AB

7 For more information about EIM Benefits see the EIM Benefits Methodology document located at: https://www.westerneim.com/Documents/EIM_BenefitMethodology.pdf

5.3. Scope – Equitable Sharing of Benefits

Stakeholders did recognize a disparity in the amount of net wheeling that occurs across EIM BAAs. The amount of wheeling that occurs (or does not occur) is related to the geographical location of the BAA. When EIM was originally implemented between the CAISO and PacifiCorp in 2014 there was no wheeling that occurred. However, the footprint of the EIM has grown and will continue to change. It is prudent to investigate if benefits that result from a wheeling transaction should be more equally distributed to include the entity facilitating the transfer.

Currently, an EIM entity facilitating a wheel-through receives no direct financial benefit for facilitating the wheel; only the sink and source directly benefit. The scope of this initiative is limited to two potential solutions that would redistribute EIM benefits:

(1) Implement an ex-post payment based on the amount of net wheeling that occurs

(2) Implement a hurdle rate that can be incorporated into the market

5.4. Data Analysis

The ISO completed data analysis to quantify the disparity of net wheeling across the EIM footprint. 5-minute data for all EIM transfer scheduling resources (ETSRs) in the EIM footprint was used[8].

5.4.1. Methodology

This section describes the methodology, including definitions used in the data analysis. Figure 3 can be referenced in relation to the wheeling, import and export definitions.

- **Wheel through transaction** = minimum of the EIM transfers into or EIM transfer out of a BAA for a given interval
- **Net EIM transfers in** = sum of EIM transfers in minus wheels
- **Net EIM transfers out** = sum of EIM transfers out minus wheels

For the analysis below, the ISO using the term import as synonymous with EIM transfer in and the term export as synonymous with EIM transfer out.

[8] Data used in this analysis starts in November 2016 which is the date of the most recent EIM expansion.

In the example shown below: Sum of imports = 60 MW. Sum of exports = 35 MW + 65 MW = 100 MW. Therefore, the wheel through transfer is Minimum (60, 100) = 60 MW. The import and export quantity is then reduced by the wheel quantity since in a given 5-minute interval an EIM BAA can only be importing or exporting.

Sum of Imports = 60 MW

Sum of Exports = 100 MW

Wheeling = Min (∑Imports, ∑Exports) = 60 MW

Net Imports = Sum of Imports - Wheels = 60 – 60 = 0 MW

Net Exports = Sum of Exports - Wheels = 100 – 60 = 40 MW

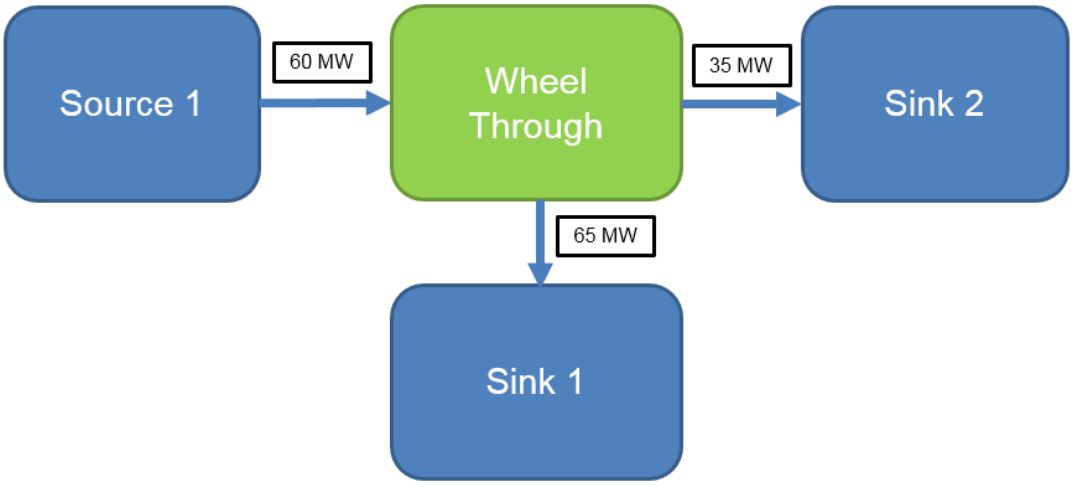


Figure 3: Wheeling transaction example

The Net Import and Net Export for each five minute interval were then summed and divided by 12 to determine the total MWh flow in each direction for a given period of time.

Total MWh Imports = ∑Net Imports for each 5-minute interval/12

Total MWh Exports = ∑Net Imports for each 5-minute interval/12

Additional notes:

- Base schedules have been excluded from this analysis as they are bilateral transactions that do not use EIM transfers.
- 5 Minute data was used because this is the final value used for tagging EIM transfers after the operating hour.

5.4.2. Data Summary

Data analysis shows the MWh of wheeling does vary across EIM BAAs. This was anticipated considering the geographical location of each BAA. For example, given Pugest Sound is currently on the border of the EIM footprint they are only able to import or export. Nevada on the otherhand is "in the middle" of the footprint and as a result facilitates wheeling transactions that source or sink in other EIM BAAs.

As EIM continues to grow and the footprint expands, the entities experienceing wheeling will shift. For example when Powerex joins EIM in 2018 energy will be able to wheel across Puget Sound's BAA.

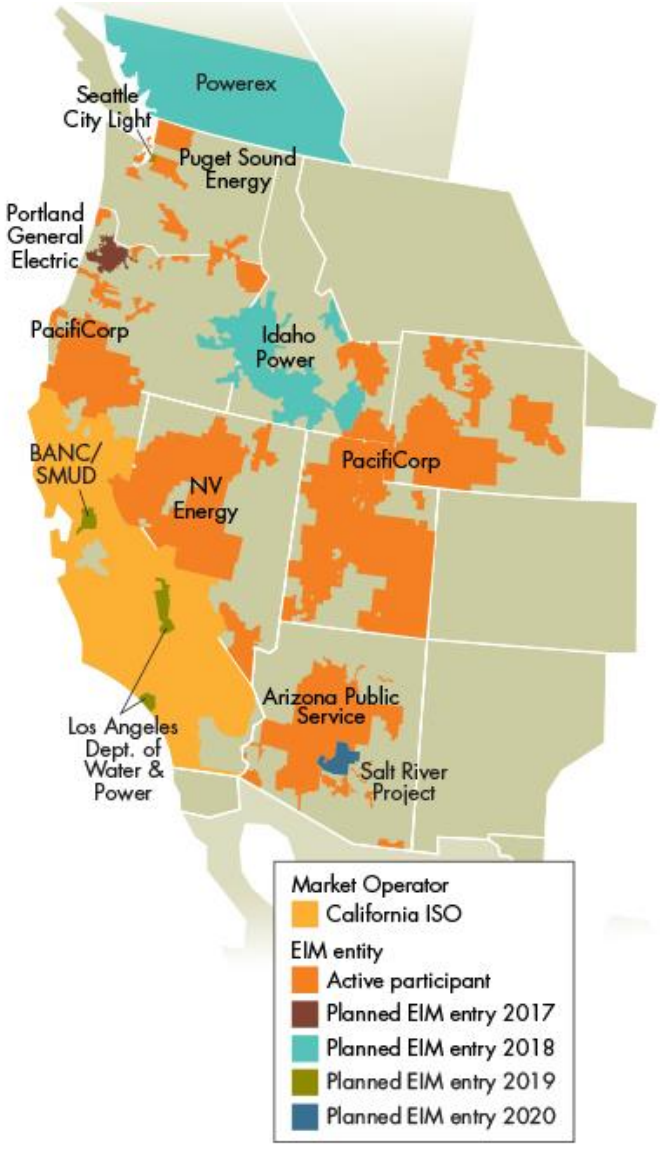


Figure 4: Current and planned EIM footprint

Data was complied as defined in Section 5.4.1: Methodology and a summary of the results are published below. As shown, Arizona Public Service currently experiences the highest amount of net wheeling (grey bar), relative to import and export amounts (blue and orange bars repsetivelly), across their system at 45.20% of total EIM transactions. With the expection of Puget Sound (who experiences no net wheeling), ISO experiences the smallest amount of net wheeling at 5.86% of its total EIM transactions.

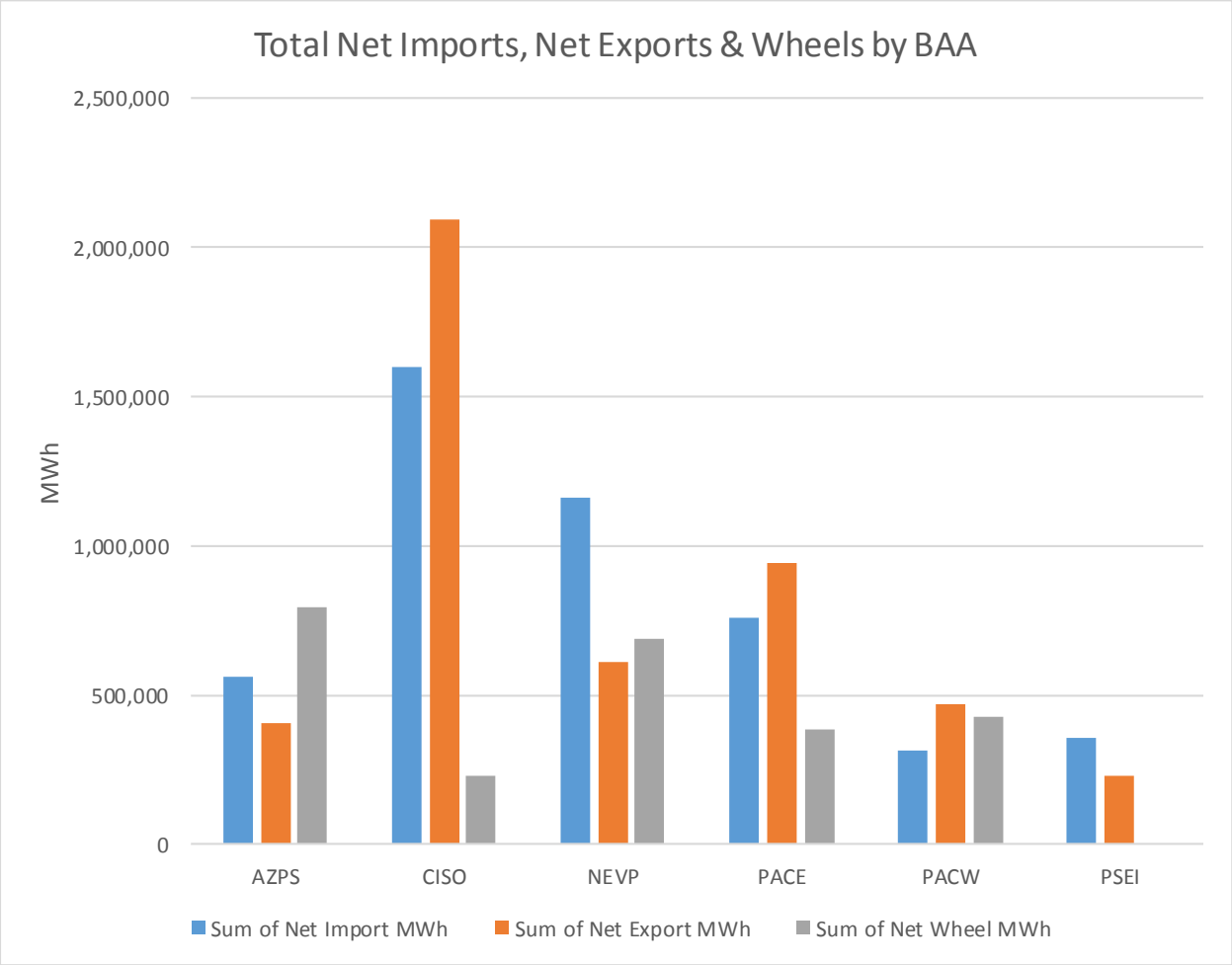


Figure 5: Total net imports, total net exports, and total wheels by BAA

See Section 8: Appendicies for a breakdown of each EIM BAA's net imports, net exports, and net wheels by month.

The figure above depicts the net imports and net exports of each EIM BAA in relation to wheeling. Since importing or exporting is considered a financial benefit it is more approripate to compare the sum of net imports and net exports in relation to wheeling. More specifically, when

a transaction sinks or sources in an EIM BAA the entity is benefiting by serving their load at a cheaper price or dispatching their generation economically. Therefore, it is necessary to view the summation of total net imports plust total net exports in comparison to net wheeling. This depicts when the EIM BAA was benefiting as opposed to facilitating a wheel.

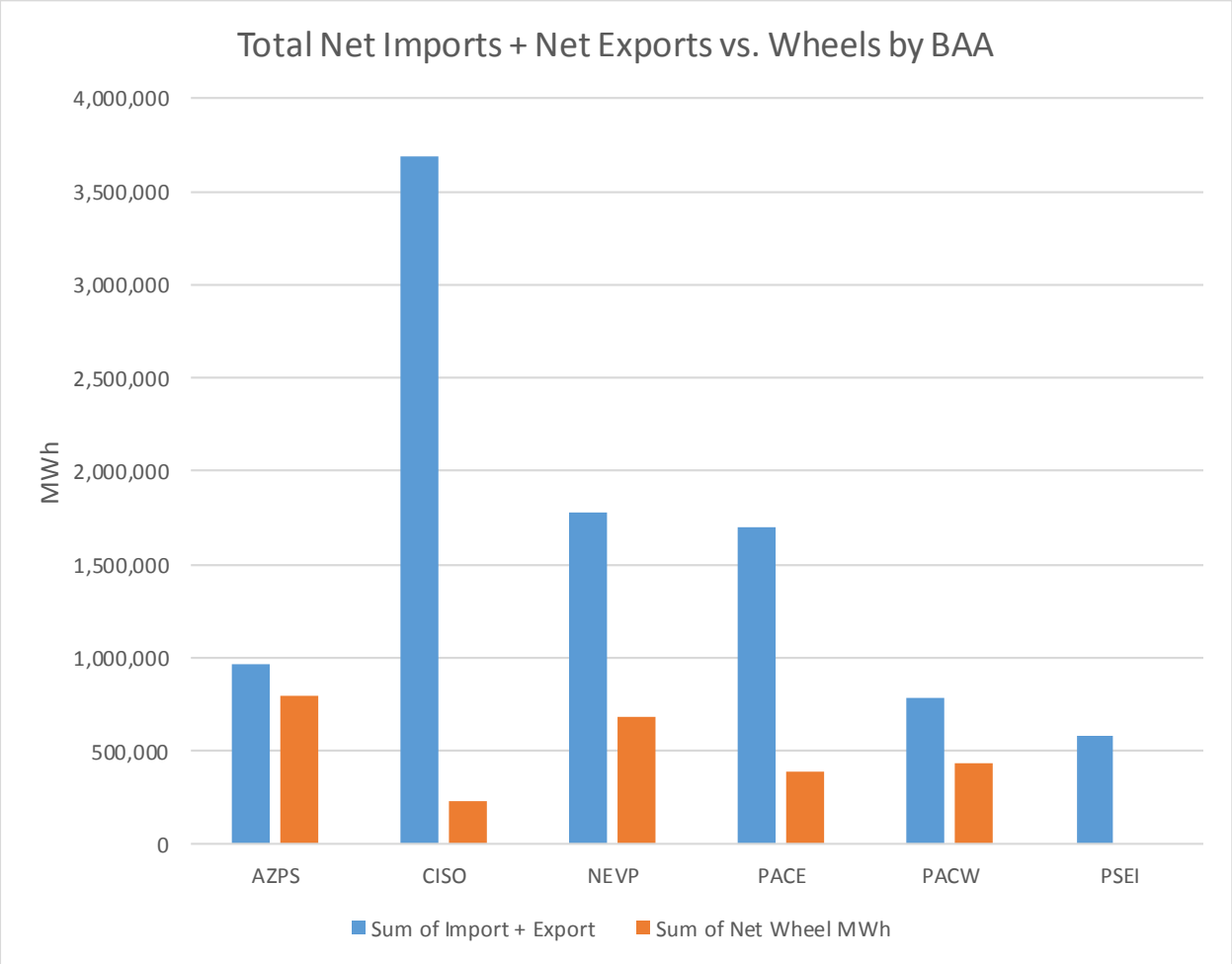


Figure 6: Summation of total net imports + total net exports in comparison to total wheels by BAA

This figure identifies if an entity is facilitating more transfers than its total amount of imports and exports when they are benefiting from participating in the EIM. It can be seen that all EIM BAAs are importing and exporting more than they are facilitating wheeling.

EIM Entity	Sum of Import + Export (MWh)	Net Wheel (MWh)	%Wheels/Total Transactions
AZPS	964,231	795,203	45.20%
CISO	3,686,118	229,658	5.86%
NEVP	1,774,096	685,275	27.86%
PACE	1,699,360	385,034	18.47%
PACW	785,986	427,925	35.25%
PSEI	581,972	0	0.00%

Table 2: Sum of Net Imports + Net Exports in comparison to Wheeling Transactions by EIM BAA

In summary, EIM BAAs may facilitate some amount of wheeling transactions and receive no direct financial benefit.

5.5. Ex-Post Payment for Net Wheeling

The first potential solution to distribute EIM benefits to EIM entities facilitating net wheels would involve an ex-post settlement. This methodology would allow for funds to be collected and distributed based on the amount of wheeling that occurs. Implementation of an ex-post payment would ensure EIM BAAs that have facilitated wheeling transactions would be allocated a share of EIM benefits.

Under this approach, the ISO would determine the benefit provided by a wheel through that should be shared with the intermediary EIM BAA. This rate would then be paid to each wheeling MW resulting in a total wheel charge that must be allocated to EIM BAAs with imports/exports. As discussed above imports/exports are how EIM BAAs receive benefits though the EIM.

The net settlement per EIM BAA would be the compensation value minus the cost allocation value.

Total Wheel Charge = Total Wheeling Transactions * Defined Rate

Compensation = % of Wheeling Transactions * Total Wheel Charge

Cost Allocation = % (Imports + Exports) * Total Wheel Charge

For example, the table below shows the current EIM footprint using the data from Section 5.4: Data Analysis.

EIM Entity	Total Net Import/Export		Total Net Wheel	
	MWh	% of Total	MWh	% of Total
AZPS	964,231	10.16%	795,203	31.52%
CISO	3,686,118	38.83%	229,658	9.10%
NEVP	1,774,096	18.69%	685,275	27.16%
PACE	1,699,360	17.90%	385,034	15.26%
PACW	785,986	8.28%	427,925	16.96%
PSEI	581,972	6.13%	0	0.00%
Total:	**9,491,763**	**100.00%**	**2,523,095**	**100.00%**

Table 3: Net Imports + Net Exports and Wheels as a percentage of total transactions

If a defined rate of $1 is used, the Total Wheeling Charge is 2,523,059 MWh * $1 = $2,523,095. The Total Wheeling Charge is then multiplied by the percentage of Net Imports + Exports and Wheels respectively to determine the Compensation and Cost Allocation. A summation of the compensation and cost allocation determines the net ex-post settlement.

EIM Entity	Cost Allocation	Compensation	Net[9]
AZPS	$256,346	$795,203	**$538,857**
CISO	$979,970	$229,658	**-$750,312**
NEVP	$471,566	$685,275	**$213,709**
PACE	$451,634	$385,034	**-$66,600**
PACW	$208,912	$427,925	**$219,013**
PSEI	$154,666	$0	**-$154,666**
Total:	$2,523,095	$2,523,095	**$0**

Table 4: Example of compensation, cost allocation and net settlement for ex-post settlement to equitably share wheeling benefits

It is acknowledged that this methodology assumes all wheels are of equal value.

[9] Positive number is a net payment to the EIM BAA. Negative number is a net charge to the EIM BAA. As with other neutrality accounts, each BAA will need to determine how to distribute this account through it OATT. The ISO would be interested in stakeholders have other recommendation on how to distribute this revenue/cost.

Implementation of this methodology would equitably distribute wheeling benefits across the EIM footprint. Feedback is requested to determine the following:

- What defined rate would be used?
- Over what time period would the net settlement occur?
- Is this methodology favored by stakeholders?

5.6. Hurdle Rate Incorporated into Market

Another option to share wheeling benefits is to incorporate a hurdle rate into the market. This could be done using existing functionality by collecting through the EIM transfer cost and distributing benefits through the real-time congestion offset.

Currently, the EIM transfer cost is set at $0.01. This was put in place to minimize the number of tags needed between EIM BAAs to account for EIM transfers. However, it was contemplated during previous stakeholder initiatives that it could be used for other purposes as well, such as prioritizing which energy transfer system resources (ETSRs) should be used first. Since all ETSRs have the same transfer cost the market randomly selects which one to use (i.e. to wheel through Nevada or Arizona for the same source/sink pair).

The EIM transfer cost would be similar to a minimum congestion level and would be distributed to the real time congestion offset (RTCO) at a 50/50 split or 100/0 split in the same manner that congestion rents are currently split between EIM BAAs. Assuming a $1.00 transfer cost and a 50/50 congestion split, a wheel through transfer would be compensated as follows:

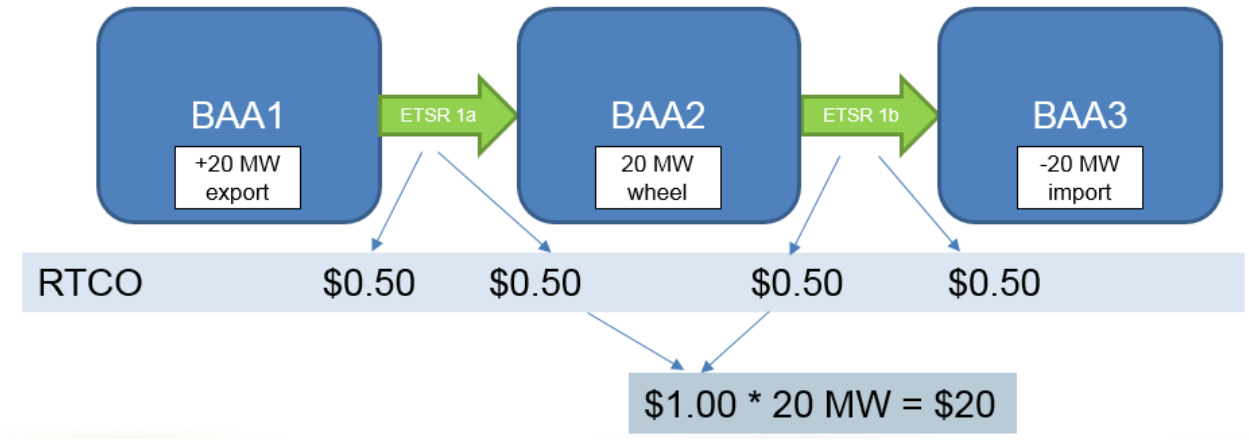


Figure 7: Wheeling compensation for a 20 MW transaction with a $1.00 cost and 50/50 congestion split.

A benefit to this methodology is that it can be incorporated directly in the market run. Additionally, it leverages existing EIM transfers for collection of wheeling charges and RTCO functionality for distribution of the collected wheeling charges. However, it does introduce a hurdle rate which was opposed in some stakeholder written comments after the publication of the Issue Paper.

Feedback is requested to determine the following:

- Value of the EIM transfer cost?
    - Who determines the value of the EIM transfer cost: ISO or individual EIM BAAs?
- Should the EIM transfer cost vary by EIM transfer location to encourage competition for wheels?
- Is this methodology favored by stakeholders?

6. New EIM Functionality

The ISO has identified several design enhancements that will be necessary to support the Powerex implementation. These design enhancements also provide general benefits to the EIM and are largely applicable to all EIM entities. Tariff revisions are required to support these enhancements for all EIM entities.[10]

6.1. Automated Matching of Import/Export Schedule Changes with a Single EIM Non-Participating Resource

This functionality allows an EIM entity to automatically adjust a single EIM non-participating resource schedule to match import or export schedule changes after T–40. For example, if imports to an EIM entity BAA increased after T–40 by 100 MW, the market software could decrease the schedule of an associated EIM non-participating resource by 100 MW automatically. This functionality eliminates the need for the EIM entity BAA Operator to issue a manual dispatch instruction to the EIM non-participating resource.

[10] Features that support Powerex's participation in the EIM will be included in the participation agreements to be filed with FERC for acceptance. For example, the Powerex implementation agreement included a principle that would exempt transactions wholly outside the US from the EIM administrative charge. This feature is not generally applicable to EIM entities so the ISO intends to support this functionality through FERC acceptance of a participation agreement. *See* CAISO Transmittal Letter and Answer in FERC Docket No. ER17-1796-000 (explaining that the ISO will separately submit for FERC acceptance participation agreements in support of the Powerex implementation).

This purpose of this enhancement is to facilitate the management of changes to base schedules that represent bilateral contracts outside the EIM. For this reason, it is limited to EIM non-participating resources such as system resources, including base energy transfer system resources (Base ETSRs).

6.2. Automated Mirror System Resources at ISO Intertie Scheduling Points

The EIM design uses mirror system resources to mirror import/export schedules with the ISO by an EIM entity at ISO intertie scheduling points. These schedules clear through the ISO's market processes such as the day ahead market as well as the fifteen minute market and the real-time dispatch. EIM entities are responsible for mirroring these schedules by submitting base schedules for their designated mirror system resources as well as adjusting these schedules to mirror changes made after T–40. This enhancement will automate the mirroring of ISO import/export schedule changes at ISO scheduling points after T–40. This functionality is limited to mirroring ISO import/export schedules from registered system resources; ISO intertie transactions must still be mirrored manually via different mirror system resources.

The auto-mirroring functionality can be combined with the auto-matching functionality described in the previous section by specifying an automated mirror system resource to be auto-matched by the single EIM non-participating resource used for that purpose. However, the automated mirror system resource must only be mirroring ISO import/export self-schedules in this case because bids must clear in the EIM and cannot be auto-matched.

6.3. Base EIM Transfer System Resource Imbalance Settlement

Currently, the ISO models bilateral transactions between EIM entities using base energy transfer system resources (Base ETSRs). The EIM entity registers a minimum of two base ETSRs (one in the import direction and one in the export direction) to model bilateral activity with each counterparty EIM entity. Currently, the ISO does not settle Base ETSR schedule changes. The enhancement will provide to EIM entities settlement information for Base ETSRs schedule changes. The data will allow EIM entities to determine the point of delivery of the Base ETSR and therefore the LMP used for settlement between the two EIM entities will be known. The ISO will not require EIM Entities to use this data but it may help facilitate settlement of bilateral transactions in the EIM area.

6.4. Leveraging New Non-Generator Resource (NGR) Modeling Functionality

Powerex will use aggregated resources to model EIM participating and EIM non-participating resources. These aggregated resources will utilize the ISO's NGR modeling functionality so that the resource can reduce output without having a forward energy schedule. This allows the aggregated resource to have base schedules equal to zero and still be able to receive a dispatch instruction to reduce output.

The additional modeling functionality will support individual resources and aggregation of resources in the broader EIM area. The modeling functionality will not enforce a state of charge constraint that is used by storage resources in the ISO's market today. Resources utilizing this function will have a continuous operating range from negative to positive injection, and no start-up cost, start up time, minimum up time, minimum down time, or forbidden operating regions. In addition, these resources will be subject to local market power mitigation (LMPM) and can use any of the methods under the ISO's tariff to establish a default energy bid. The existing dynamic competitive path assessment (DCPA) and LMPM methodologies will apply to the Generic NGR model considering it an algebraic injection. The energy bid of a resource modeled via the Generic NGR model will be subject to mitigation above the competitive LMP at its location.

6.5. Allow submission of Base Generation Distribution Factors (GDFs) for aggregated EIM Non-Participating Resources

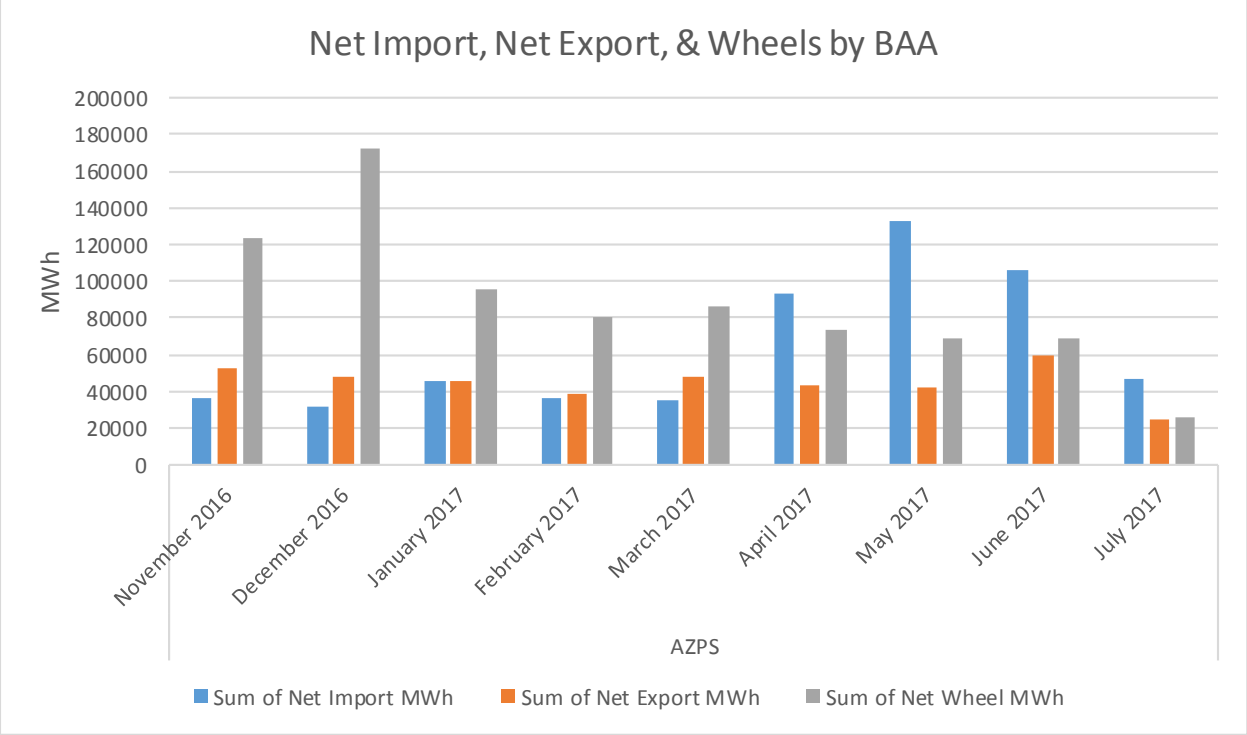
This enhancement will support base GDF submission for aggregate EIM non-participating resources through the submission of base schedules. The market will distribute the base schedule and any imbalances of aggregate EIM non-participating resources using the submitted base GDFs, if available, or otherwise the registered default base GDFs for the resource in the Master File, normalized for outages. The base GDFs will be used to calculate the aggregate LMP for the aggregate EIM non-participating resource, as usual.

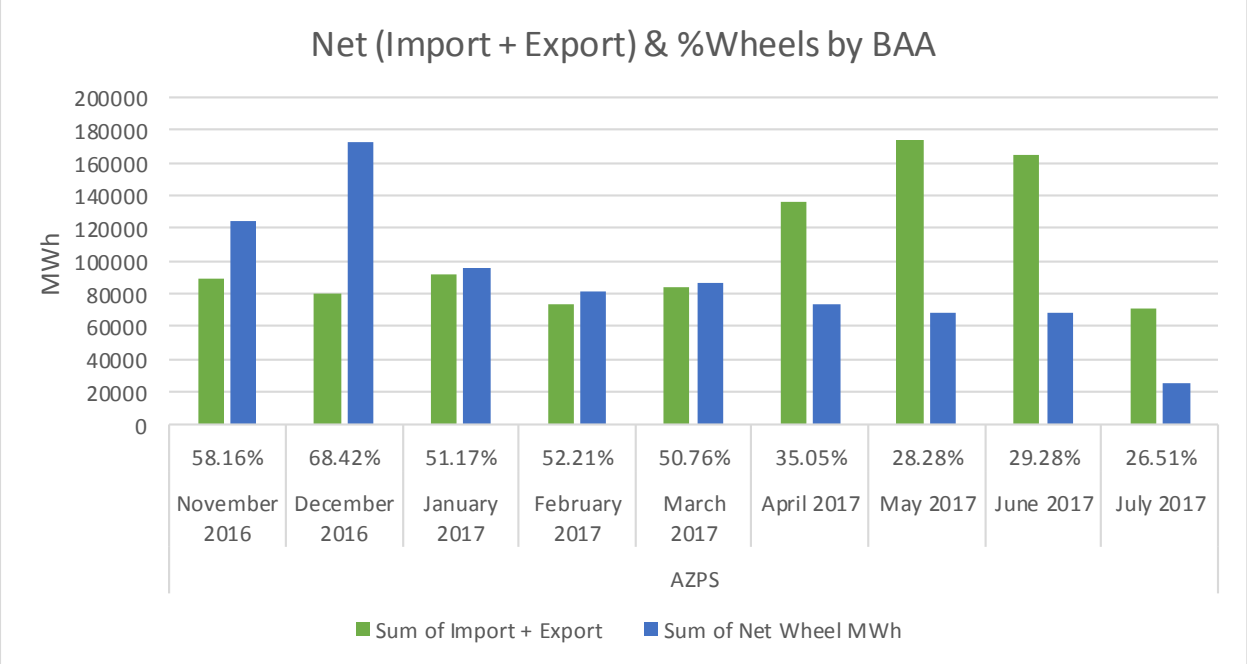
7. Next Steps

The ISO plans to discuss this Straw Proposal with stakeholders during a stakeholder meeting to on August 7th. The ISO requests comments from stakeholders on the proposed market design changes described in this straw proposal. Stakeholders should submit written comments by August 17th to InitiativeComments@caiso.com.

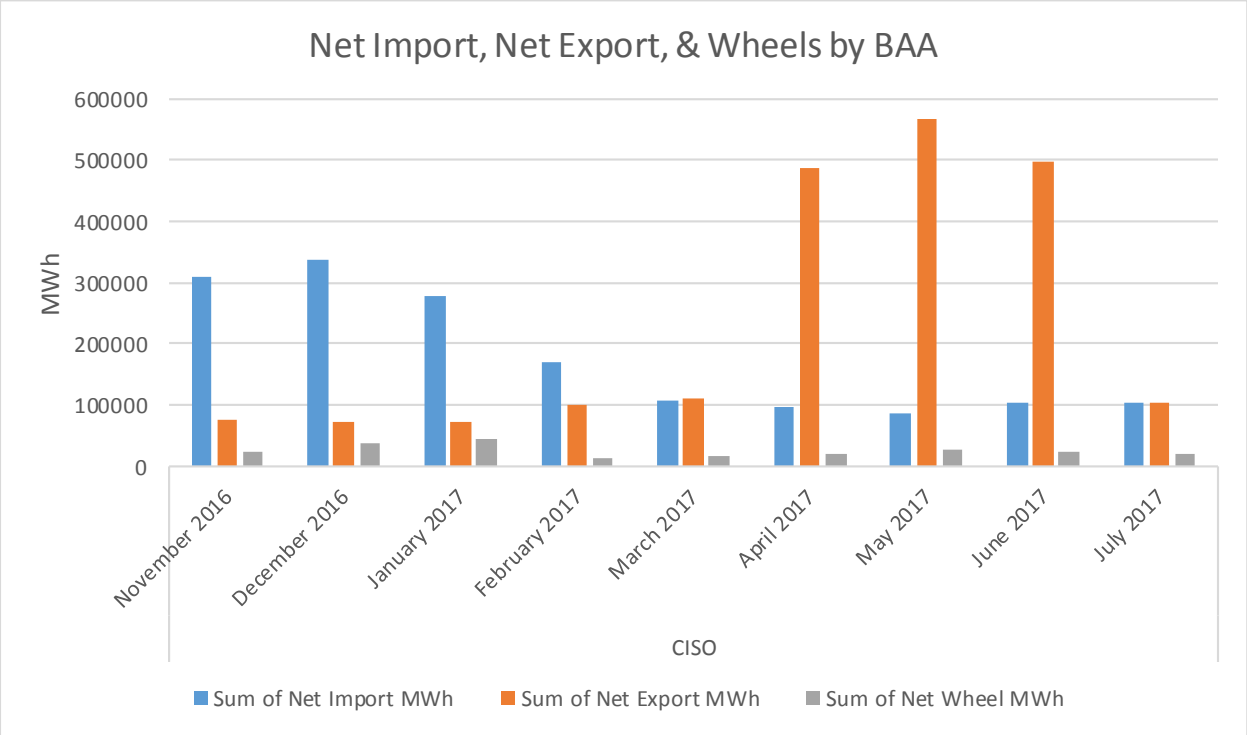
8. Appendices

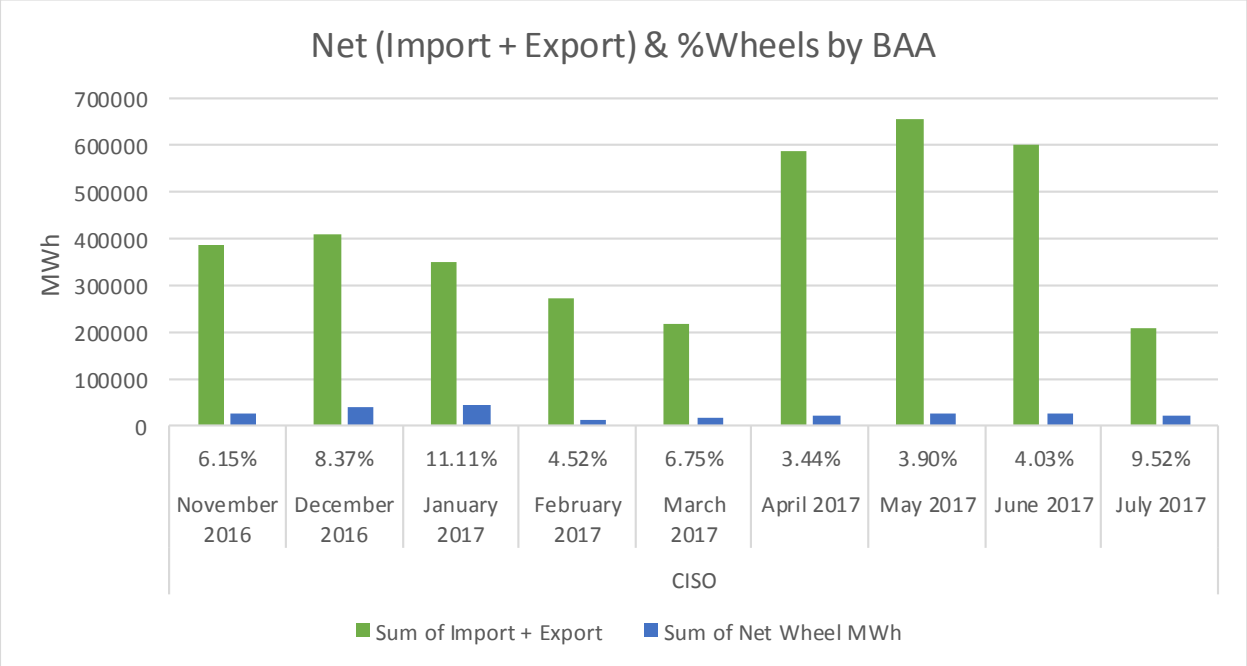
8.1. APZS 5-Minute ETSR Data



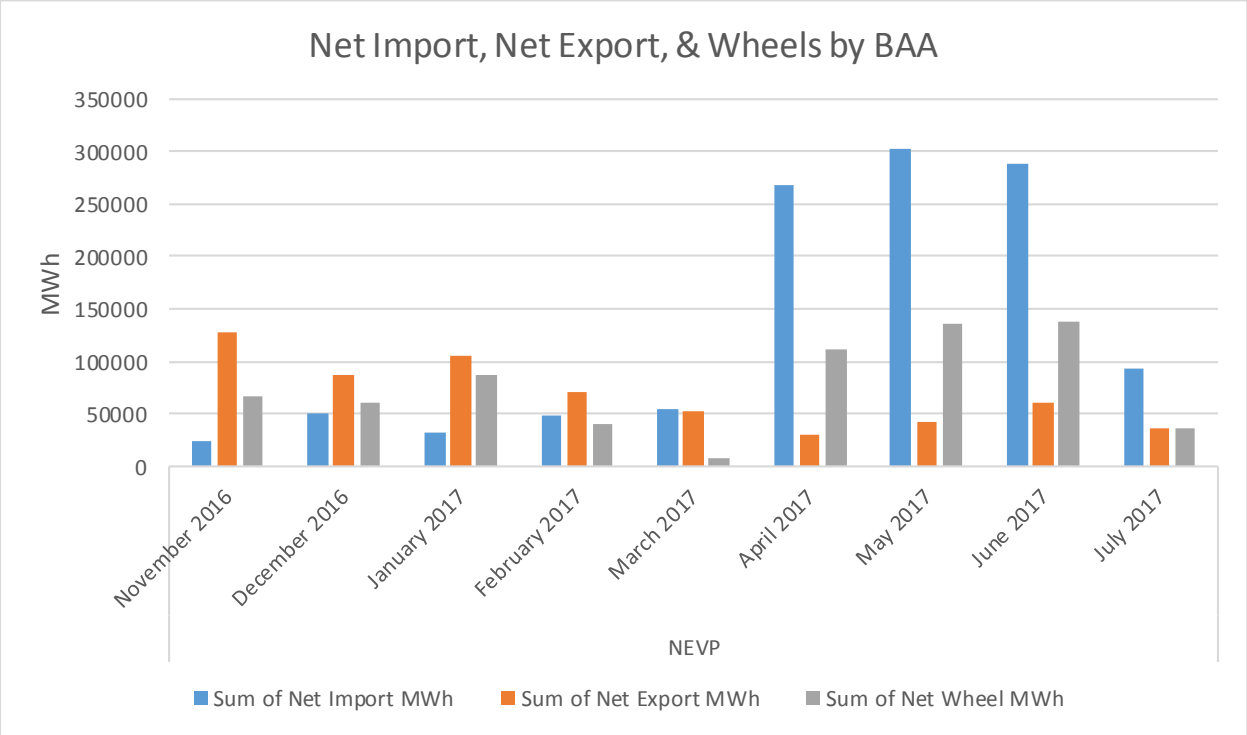


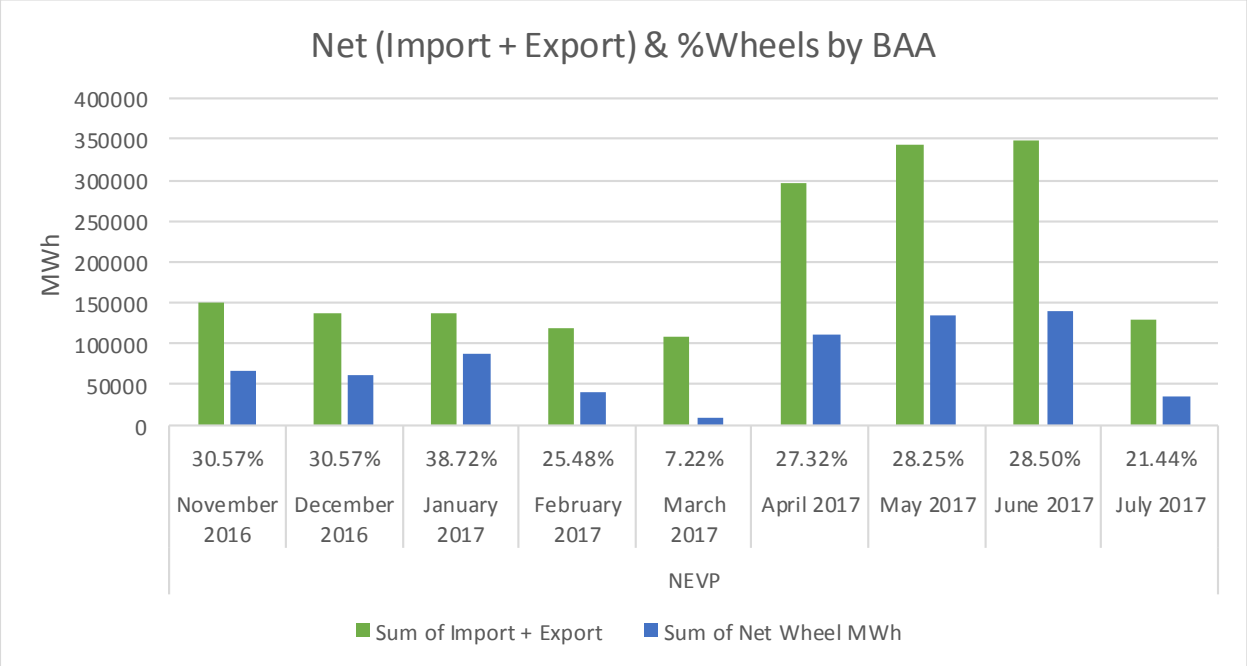
8.2. CISO 5-Minute ETSR Data



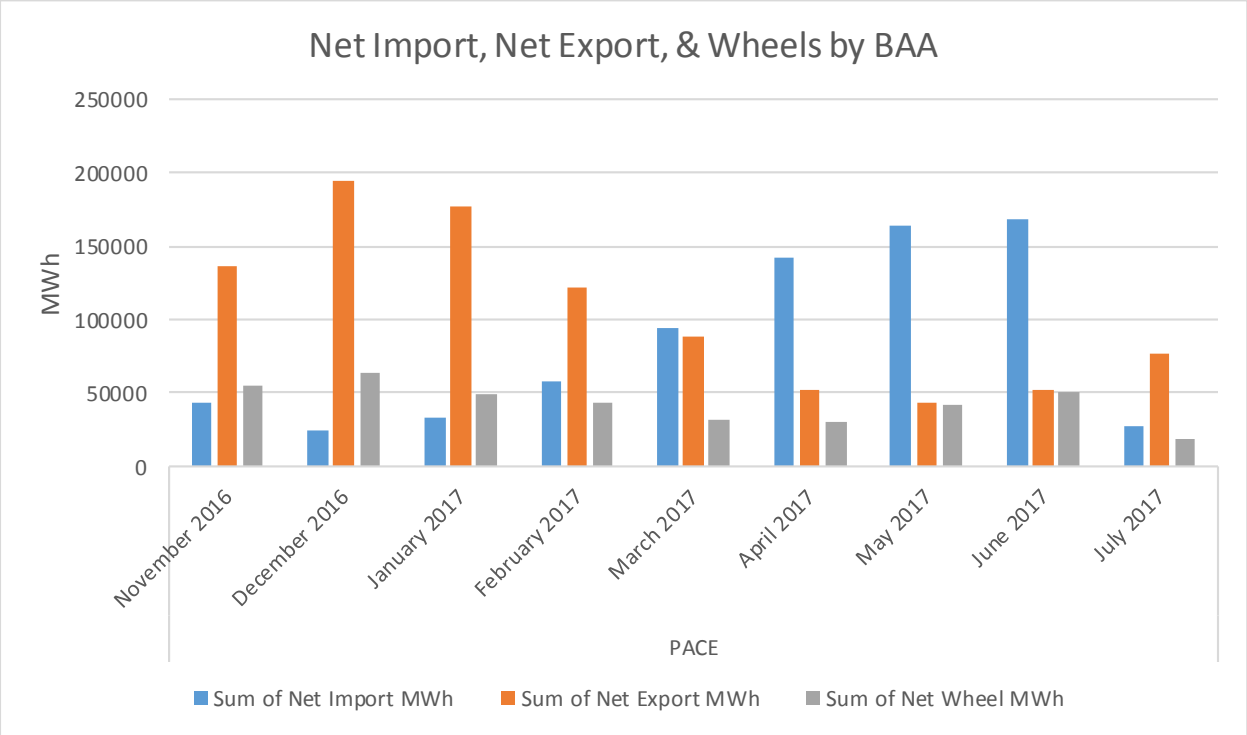


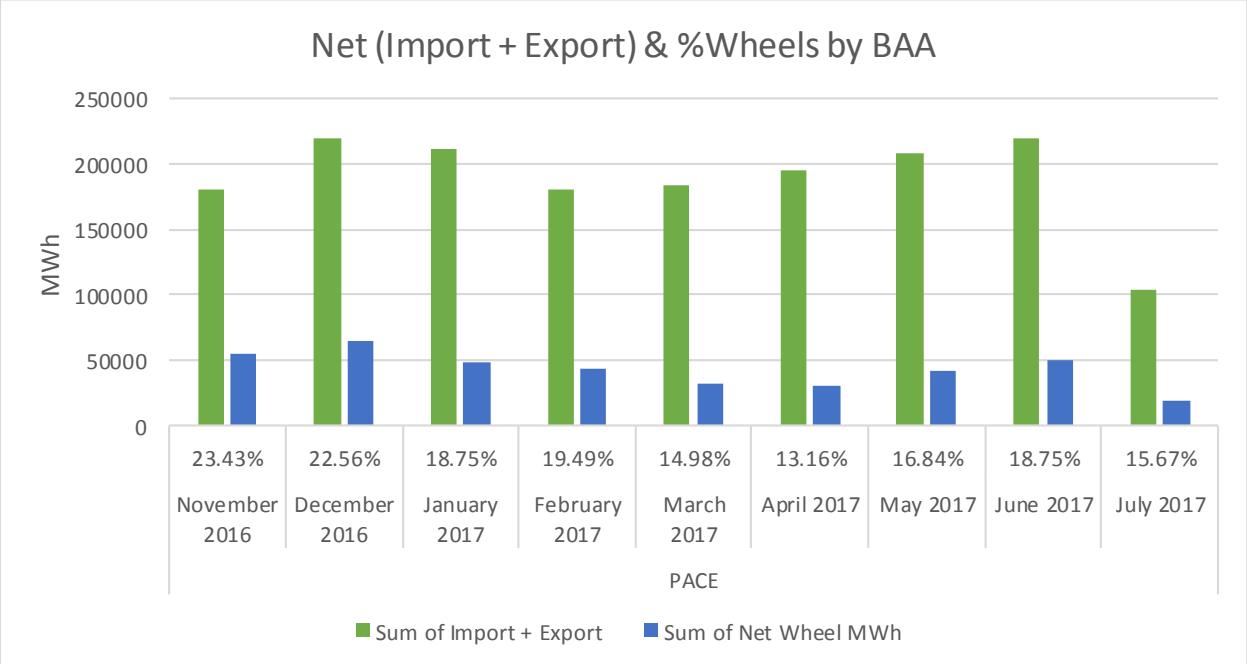
8.3. NEVP 5-Minute ETSR Data



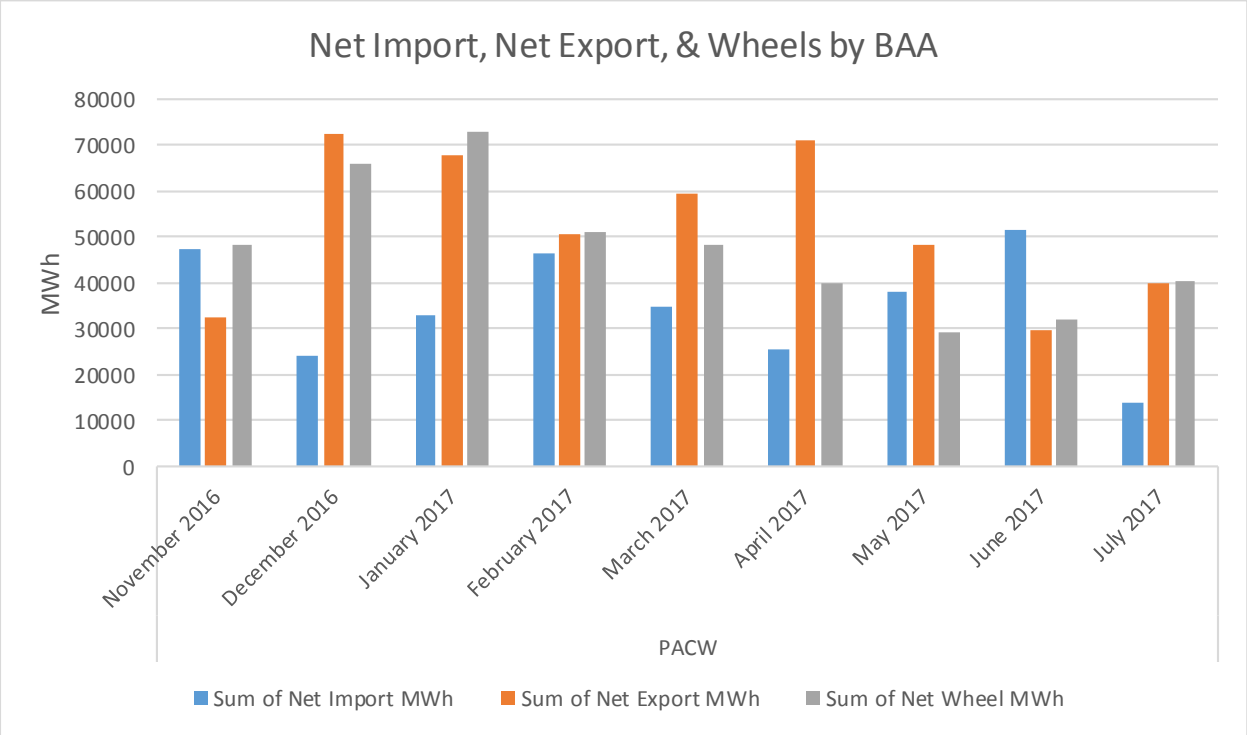


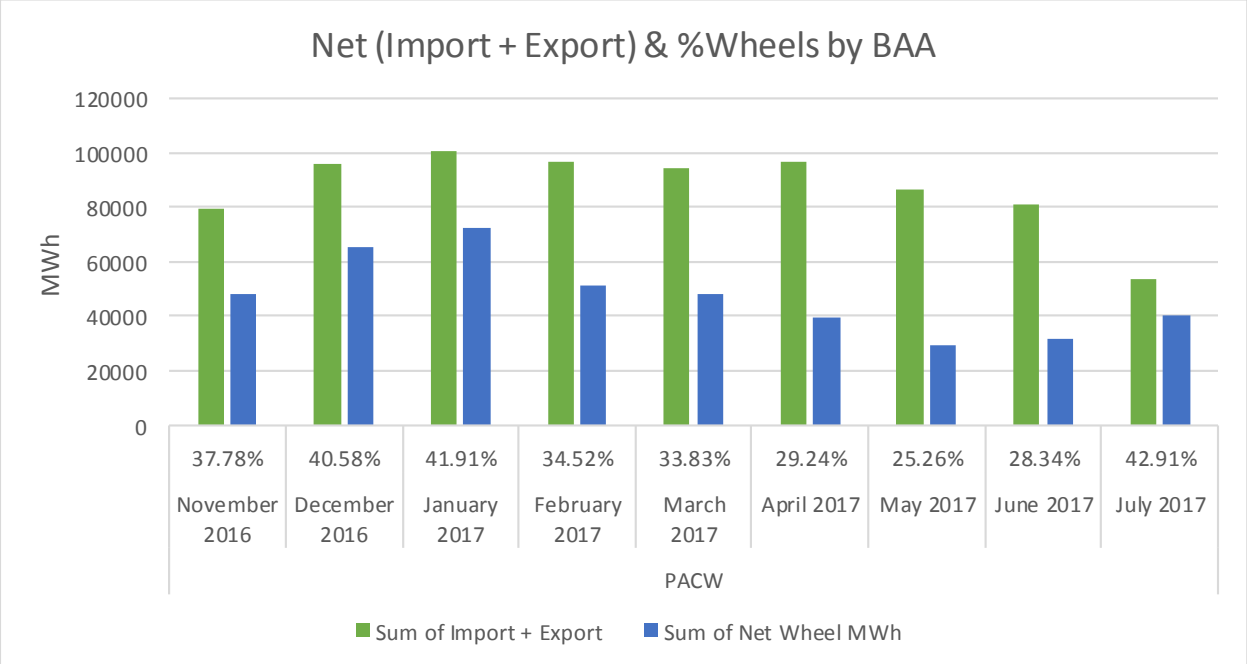
8.4. PACE 5-Minute ETSR Data





8.5. PACW 5-Minute ETSR Data





8.6. PSEI 5-Minute ETSR Data