



# Briefing on western energy imbalance market

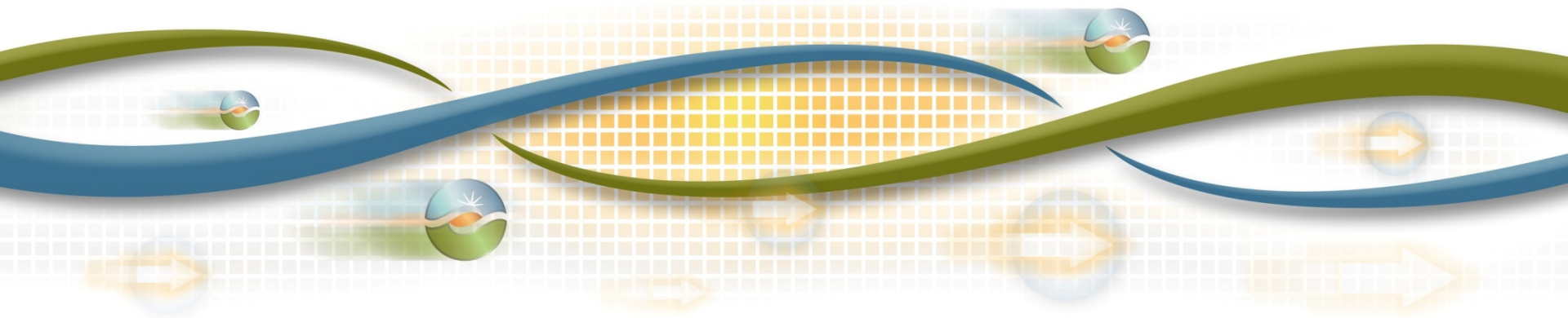
Mark Rothleder

Vice President, Market Quality and Renewable Integration

Board of Governors Meeting

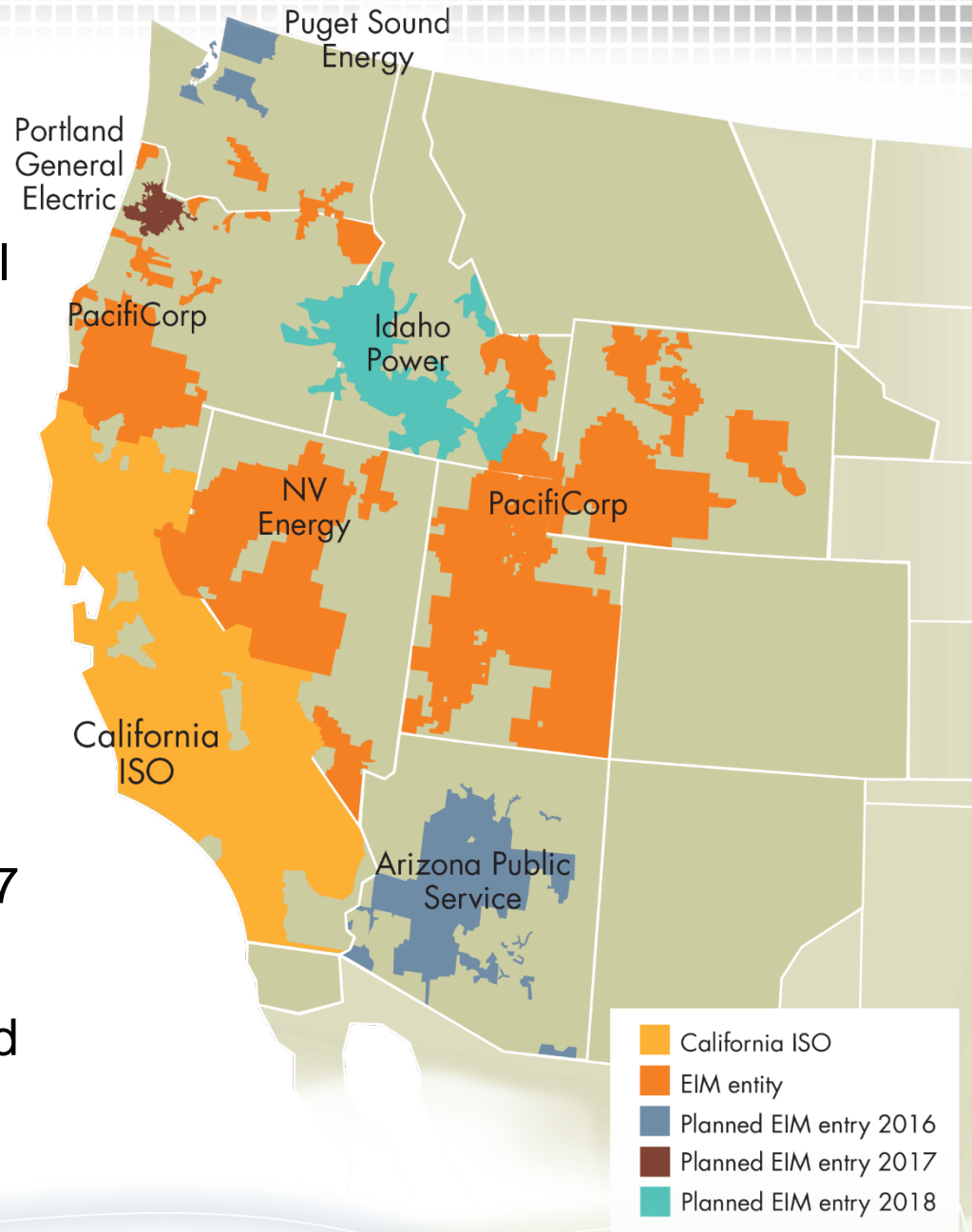
General Session

August 31, 2016 – September 1, 2016



# EIM update

- APS & PSE have completed integration and entered parallel operations.
- APS & PSE have met all readiness criteria and certified ahead of schedule on Aug. 24 and Aug. 26 respectively.
- Portland General Electric's (PGE) Full Network Model ready for ISO integration.
  - Enters EIM October 1, 2017
- Idaho Power Company (IPC) implementation agreement filed and approved by FERC.
  - Enters EIM April 1, 2018



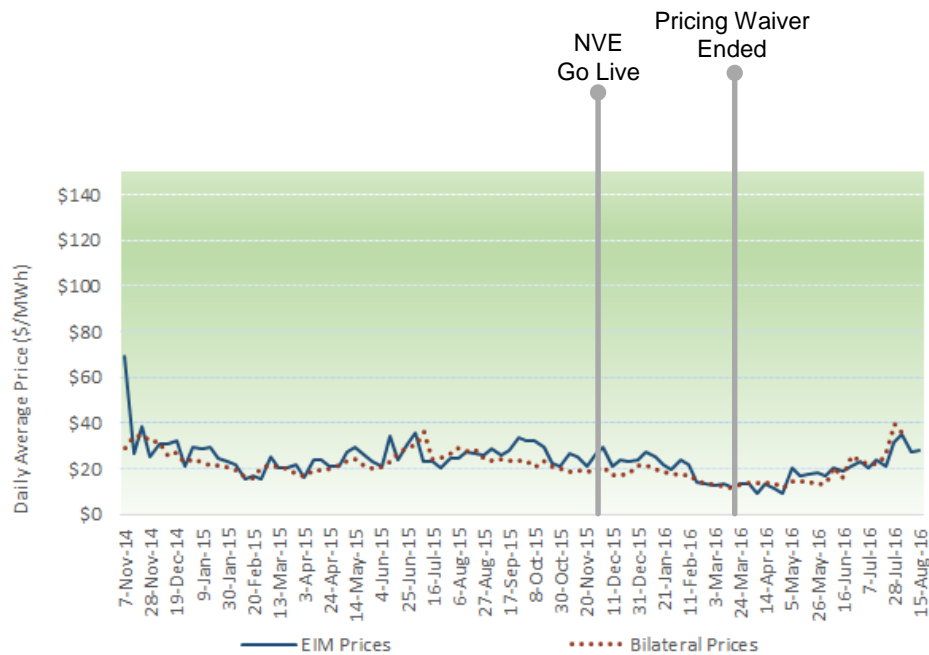
# Gross economic benefits since start of EIM = \$88.2M

BAA	2014 4 <sup>th</sup> Quarter	2015 1 <sup>st</sup> Quarter	2015 2nd Quarter	2015 3 <sup>rd</sup> Quarter	2015 4 <sup>th</sup> Quarter	2016 1 <sup>st</sup> Quarter	2016 2 <sup>nd</sup> Quarter	Total
<b>CAISO</b>	\$1.24	\$1.44	\$2.46	\$3.48	\$5.28	\$6.35	\$7.89	\$28.14
<b>NVE</b>	-	-	-	-	\$0.84	\$1.70	\$5.20	\$7.74
<b>PAC</b>	\$4.73	\$3.82	\$7.72	\$8.52	\$6.17	\$10.85	\$10.51	\$52.32
<b>Total</b>	<b>\$5.79</b>	<b>\$5.26</b>	<b>\$10.18</b>	<b>\$12</b>	<b>\$12.29</b>	<b>\$18.9</b>	<b>\$23.59</b>	<b>\$88.2</b>

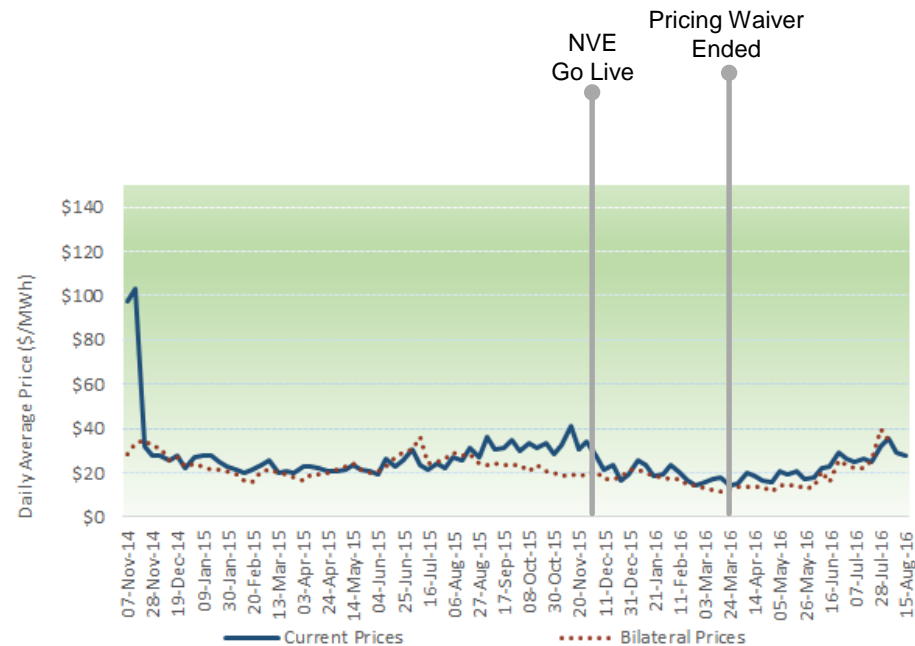
BAA	April	May	June	2016 – Q2 Total
<b>CAISO</b>	\$2.56	\$2.24	\$3.09	\$7.89
<b>NVE</b>	\$1.09	\$1.34	\$2.77	\$5.2
<b>PAC</b>	\$4.63	\$2.44	\$3.44	\$10.51
<b>Total</b>	<b>\$8.27</b>	<b>\$6.03</b>	<b>\$9.30</b>	<b>\$23.59</b>

# 15-minute prices continue to be stable

## PAC West



## PAC East

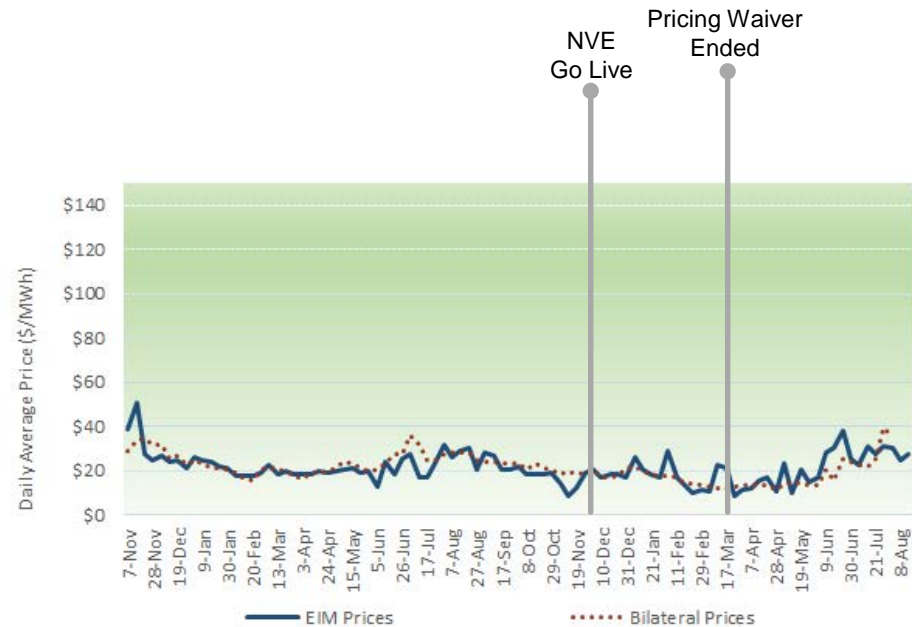


# Price discovery waiver ended March 23

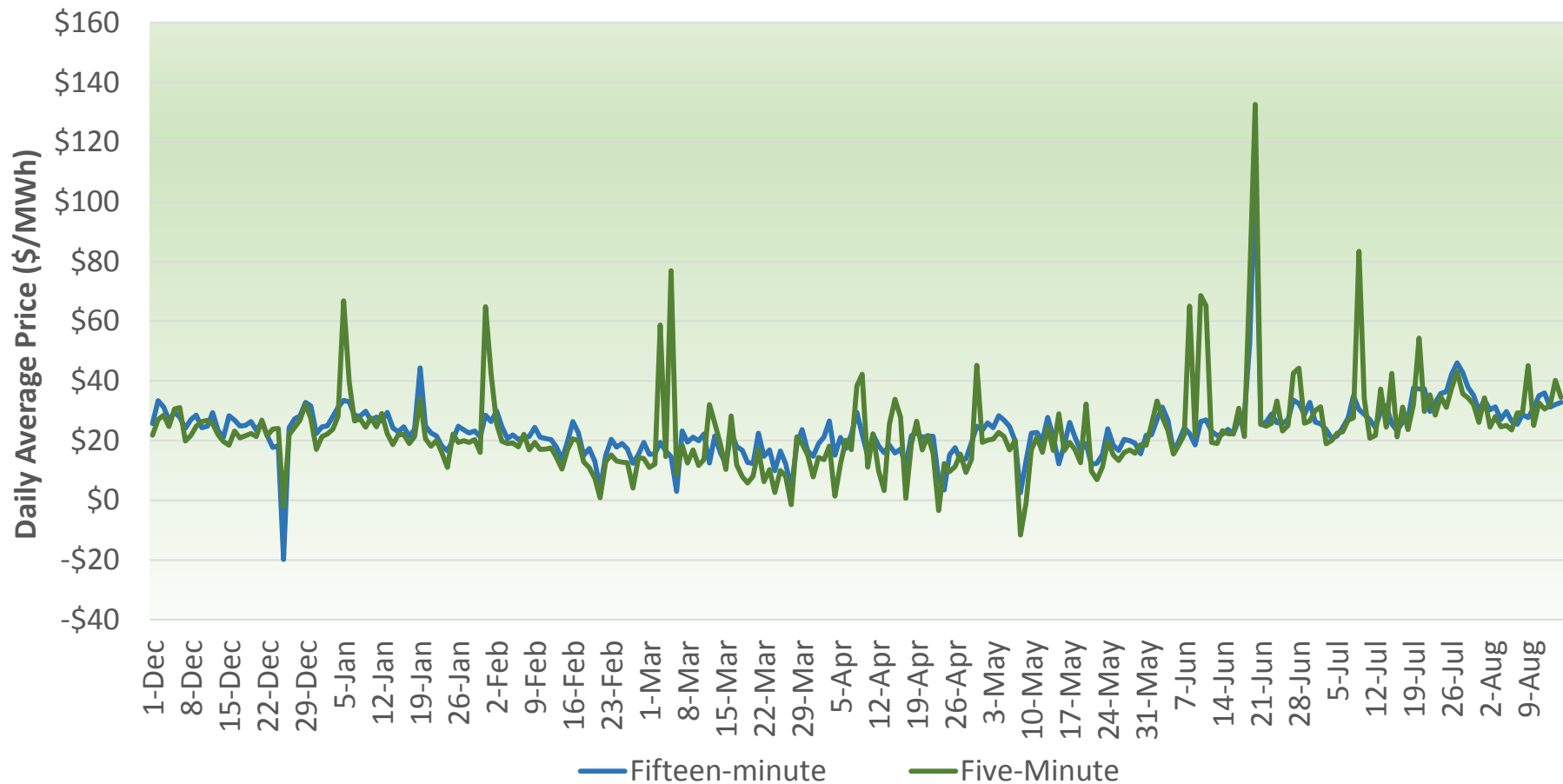
## Five-Minute Prices in PAC West



## Five-Minute Prices in PAC East

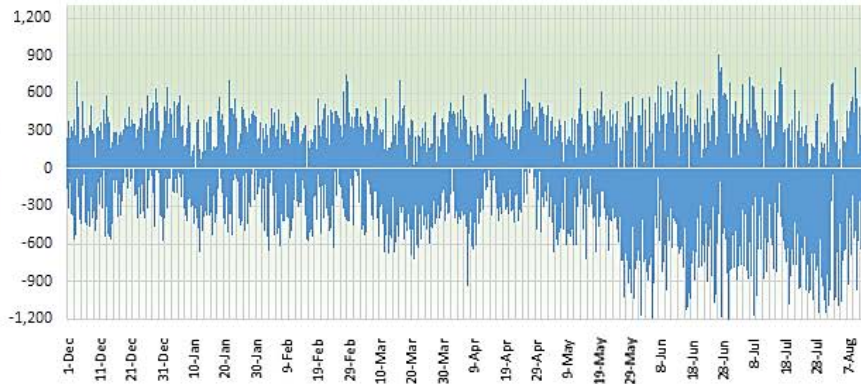


# Prices in NVE reflective of system conditions

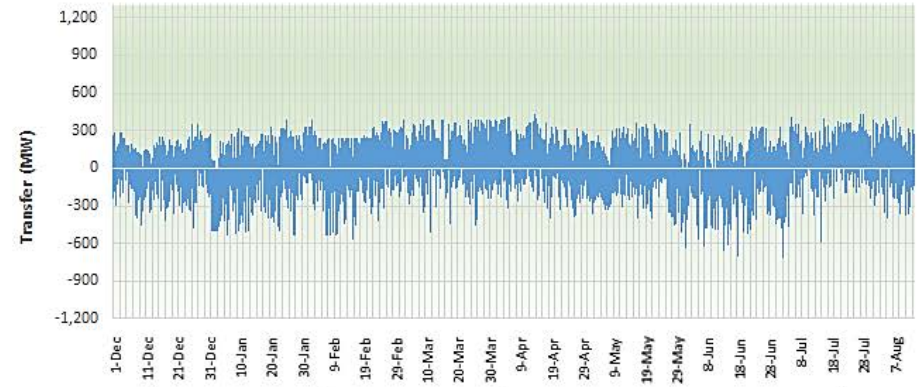


# Net transfers by area

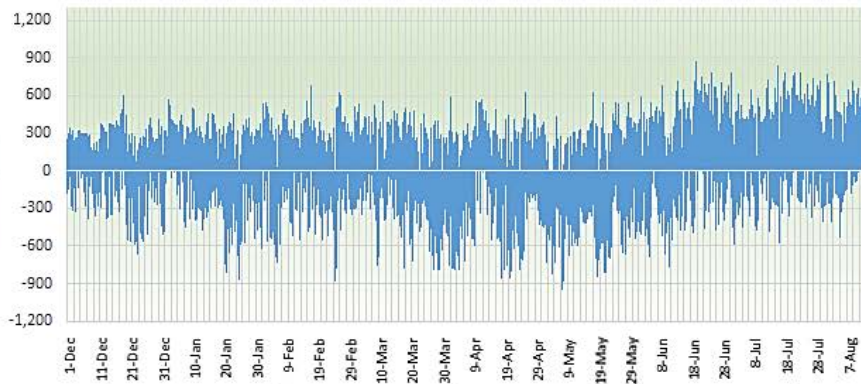
### Net Transfers from Nevada to other BAAs



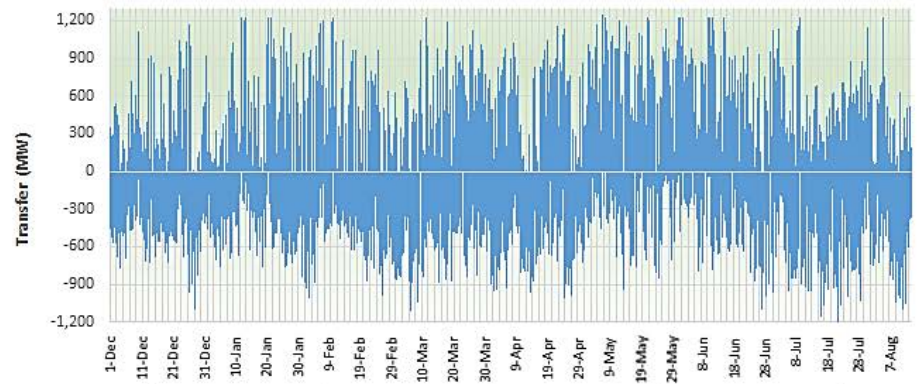
### Net Transfers from PAC West to other BAAs



### Net Transfers from PAC East to other BAAs



### Net Transfers from CAISO to other BAAs

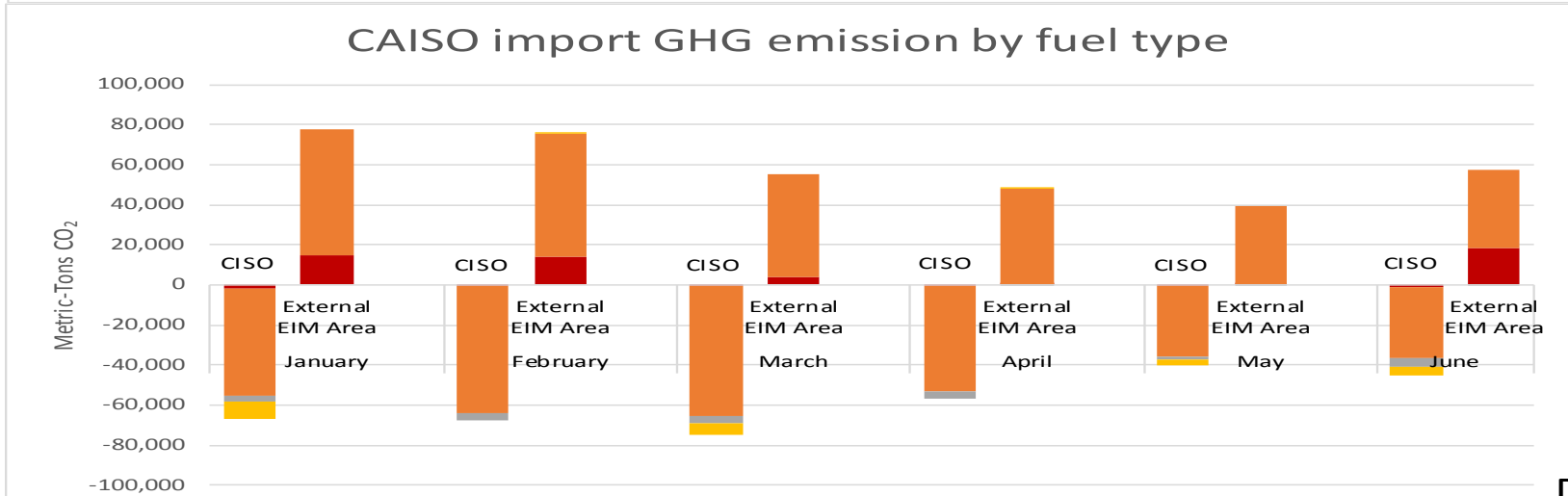
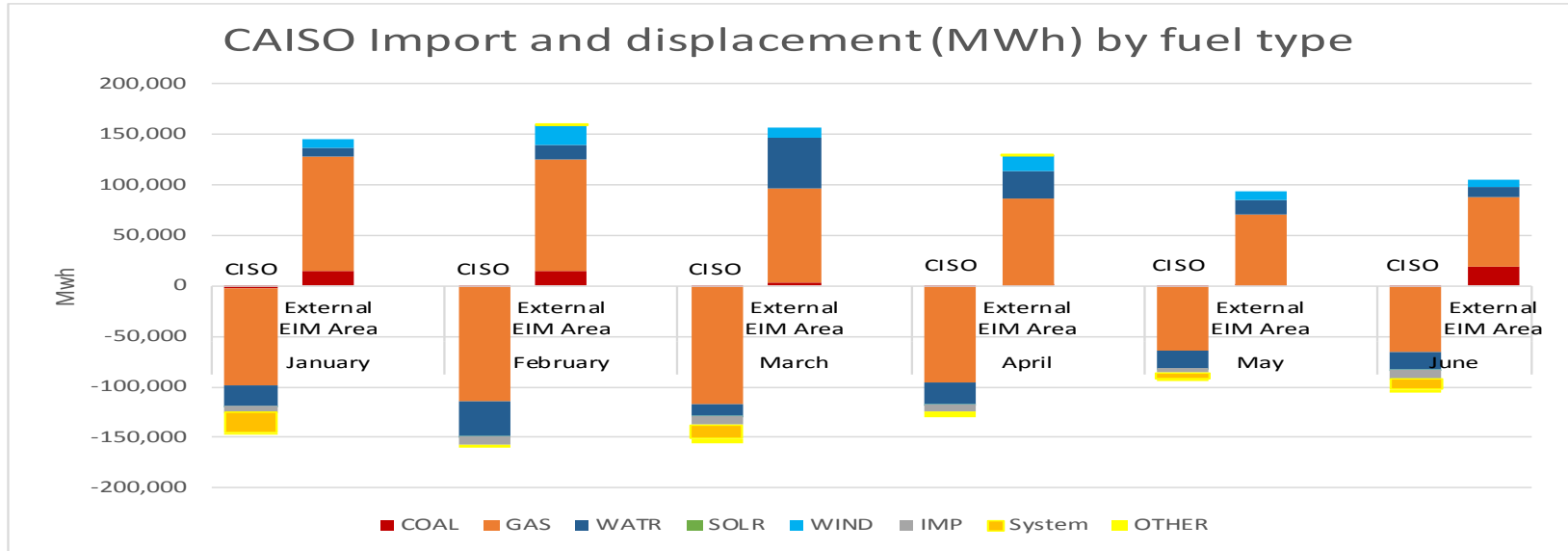


# Transfer into ISO by supporting resource type

Month	Coal (%)	Gas (%)	Non-Emitting (%)	Total
15-Aug	0.02%	86.48%	13.50%	100%
15-Sep	0.00%	92.27%	7.73%	100%
15-Oct	0.10%	99.90%	0.00%	100%
15-Nov	0.00%	25.25%	74.75%	100%
15-Dec	0.00%	15.79%	84.21%	100%
16-Jan	0.00%	28.97%	71.03%	100%
16-Feb	0.00%	22.21%	77.79%	100%
16-Mar	0.00%	12.72%	87.28%	100%
16-Apr	0.00%	46.26%	53.74%	100%
16-May	0.00%	51.63%	48.37%	100%
16-Jun	0.00%	67.89%	32.11%	100%
16-Jul	0.00%	82.42%	17.58%	100%

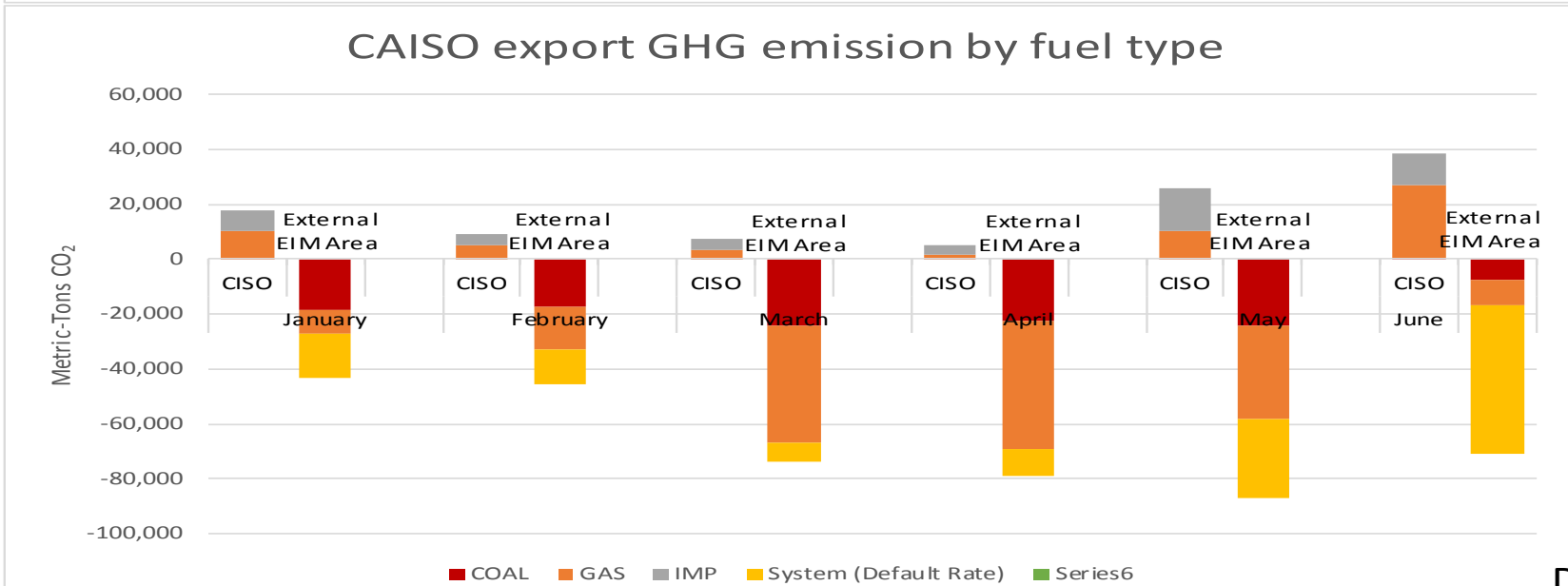
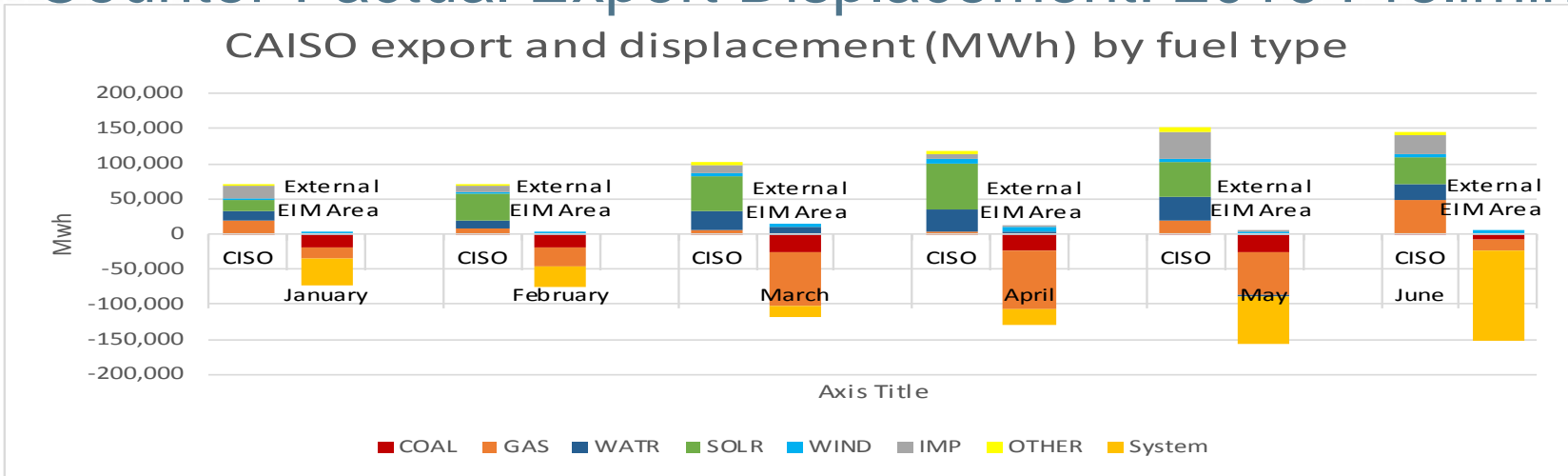


# Counter Factual Import Displacement: 2016 Preliminary



GHG Difference	January	February	March	April	May	June	Total Difference
	10,471	7,529	-19,571	-8,073	-314	12,065	2,106

# Counter-Factual Export Displacement: 2016 Preliminary



**GHG Difference**

January	February	March	April	May	June	<b>Total Difference</b>
-25,293	-36,289	-66,411	-73,260	-60,564	-32,287	-294,105

**EIM reduces GHG by total of 291,998 Mtons**

# Conclusions

- EIM dispatch reduces GHG emission by 291,998 MTons for the period January-June 2016.
- The secondary dispatch GHG effects associated with EIM transfers to into the ISO to serve load are offset by the GHG reduction effects associated with transfer out of renewables resources displacing external emitting resources.