
EnergyImbalanceMarket

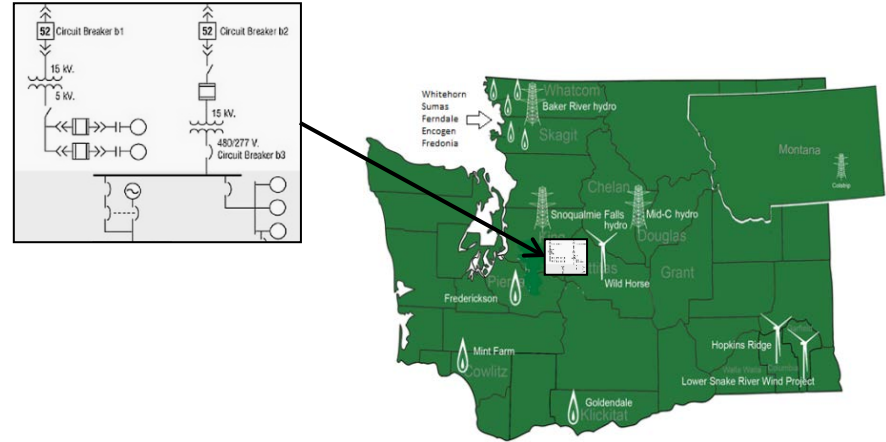


Puget Sound Energy
December 5, 2016

System Integration

Full Network Model

- PSE Inputs:
 - Real Time Load, Generation, Voltage, and Transmission Flow Values
- CAISO Outputs:
 - Pricing Nodes, CAISO State Estimator



Master File

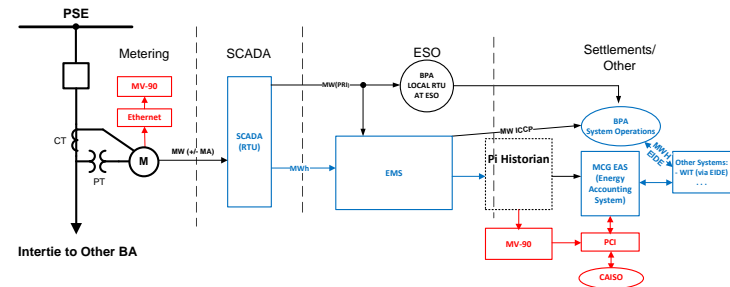
- Resource characteristics and costs (i.e., ramp time, start up, capacity)

RDT Processing Errors for file: BAD_Intertie_RDT_v2.xls

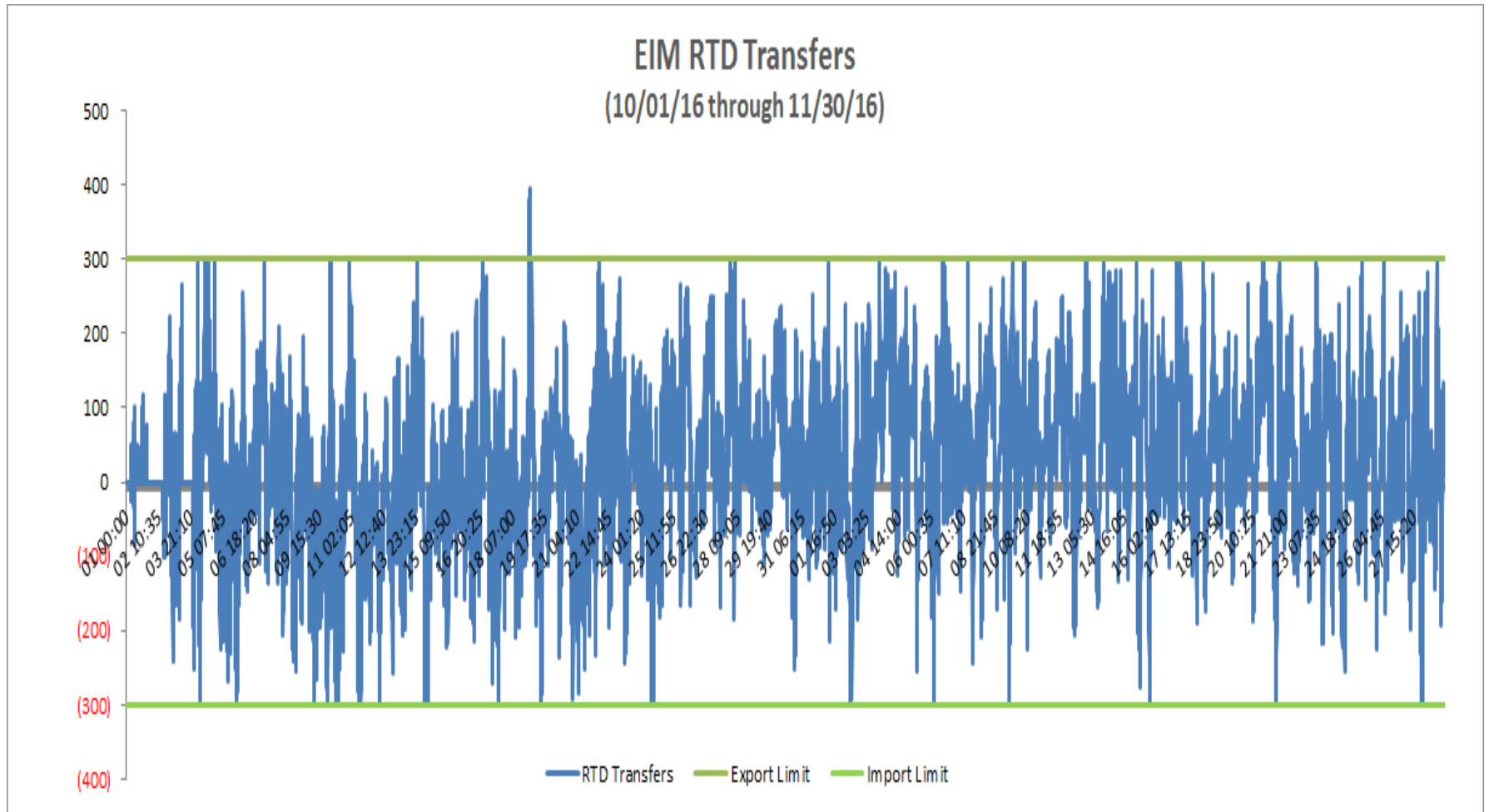
Sheet Name	Resource Id	Cell Location	Error Message
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	A3	Resource Id > 32 characters
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	B3	Energy Type needs to be 'FIRM', 'NFRM', 'WHL', or 'UCTG'
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	C3	Minimum Hourly Block Limit needs to be a valid number
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	F3	Certified for A/S Non Spin RTM needs to be 'Y' or 'N'
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	G3	Spinning Reserve Cap needs to be a valid number
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	I3	Certified for RUC needs to be 'Y' or 'N'
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	N3	Wheeling Reference Number > 32 characters
Intertie Resource	TEST_MARKET01_E_F_DAO_TEST_MARKET01_E_F_DAO	B4	Energy Type needs to be 'FIRM', 'NFRM', 'WHL', or 'UCTG'
Intertie Resource	TEST_MARKET01_E_F_DAO	C4	Minimum Hourly Block Limit needs to be a valid number
Intertie Resource	TEST_MARKET01_E_F_DAO	D4	Certified for A/S Spin needs to be 'Y' or 'N'
Intertie Resource	TEST_MARKET01_E_F_DAO	F4	Certified for A/S Non Spin RTM needs to be 'Y' or 'N'
Intertie Resource	TEST_MARKET01_E_F_DAO	G4	Spinning Reserve Cap needs to be a valid number
Intertie Resource	TEST_MARKET01_E_F_DAO	H4	Non-Spinning Reserve Cap needs to be a valid number
Intertie Resource	TEST_MARKET01_E_F_DAO	I4	Certified for RUC needs to be 'Y' or 'N'

Metering

- 5 minute (Generation Meters)
- Settlement Quality Meter Data
- ISOME or SCME



RTD Transfers

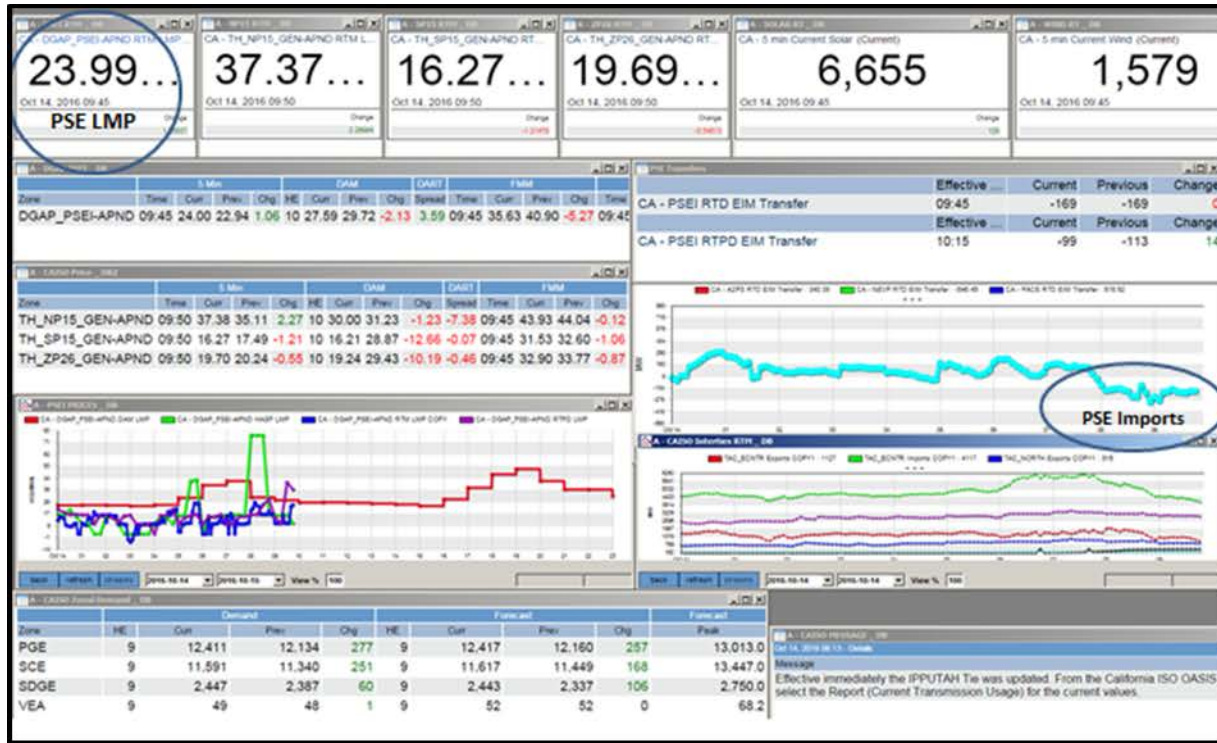


EIM Prices vs Bilateral

Table 1: Load Settlement Price versus MidC Indices	October	
	Average Price	
EIM Load Settlement Price	\$	21.92
ICE MidC Day Ahead	\$	21.25

Table 2: Load Price Spikes	October	
	FMM	RTD
% Intervals Load Price above \$50	3.86%	0.99%
% Intervals Load Price above \$50 coincident with SMEC above \$50	2.00%	0.69%

Example Scenario - October 14th



WIND GENERATOR	X UNIT	MW's
Hopkins Ridge	11	-3.4
	12	-13.8
	13	-13.8
	21	-19.9
	22	-25.2
Wild Horse	23	-20.1
	11	-23.1
	12	-22.9
	13	-19.5
	14	-17.5
Lower Snake River:	15	-17.6
	21	-22.4
	22	-19.1
	23	-21.2
	24	-21.2
	25	-23.1
	31	-16.8
	32	-21.6
PHG:		-84.1
DJN:		-27.2
Total Wind		-415.1 (circled in red)

- Wind dropped off from ~ 600 MW to 400 MW
- EIM transfers (imports) increased at cost lower than PSE thermals

Merchant Business Process Changes

- **PSE still actively trading in short term bilateral markets**
 - Day-Ahead
 - Economically dispatching resources to meet forecasted demand
 - Buy/sell energy to meet demand & optimize resources
 - Real-Time
 - Monitoring changes to demand and resource stack based upon day of conditions
 - Buy/sell energy to meet demand & optimize resources
- **CAISO EIM adds new requirements for Participating Resources**
 - Day-Ahead
 - 7 day forecasts provided
 - Real-Time
 - Balanced base schedule
 - Hourly bids for each generation resource participating in the market
 - EIM scheduling timelines pushing back time to execute real-time trades

Current EIM Activity

- Portland General joins EIM October 2017 and Idaho Power follows in April 2018
- SCL and SMUD are exploring joining EIM
- (ARB) currently has a rulemaking process to amend its greenhouse gas regulations for emissions associated with EIM transfers
- Intertie bidding workshop occurred at end of October. Public discussions continue