Modeling and Pricing of Integrated Balancing Authority Areas (IBAA)

California ISO IBAA Team

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Presentation to
Market Surveillance Committee
April 11, 2008

Objectives of IBAA Proposal

- Ensure feasible forward-market schedules
- Effective Congestion Management
  - Align forward market *schedules* and *prices*
  - Increase market efficiency
- Eliminate: poor pricing incentives, inappropriate arbitrage; opportunities for gaming, etc.

Comparison of Alternative Approaches for Modeling IBAA

Option/Criterion	Modeling Accuracy	Effective Congestion Management	Reduces Gaming Opportunity
1) Full Physical Modeling and Pricing	High	High	Medium (relies on extensive data)
2) Radial Injections	Low	Low	Low
3) Multiple Proxy (CAISO Rec.)	High	Medium	Medium (with monitoring)
4) Single Proxy Bus	Medium	Low	Medium+/High (no monitoring/monitoring)

Modeling and Pricing of IBAA

Modeling

- Model sufficient portion of the IBAA transmission network to reflect parallel transmission paths
- Identify operationally relevant sub-region, if any, within IBAA that reflect groupings or resources/locations that would be a source for transactions between IBAA and CAISO.
- Identify proxy location(s) internal to the IBAA and identified sub-regions that will be used to model sources/sinks associated with transactions betweens IBAA and CAISO (CAISO shall determine Intertie Distribution Factors (IDF) for distributing transactions to multiple proxy nodes).

Pricing

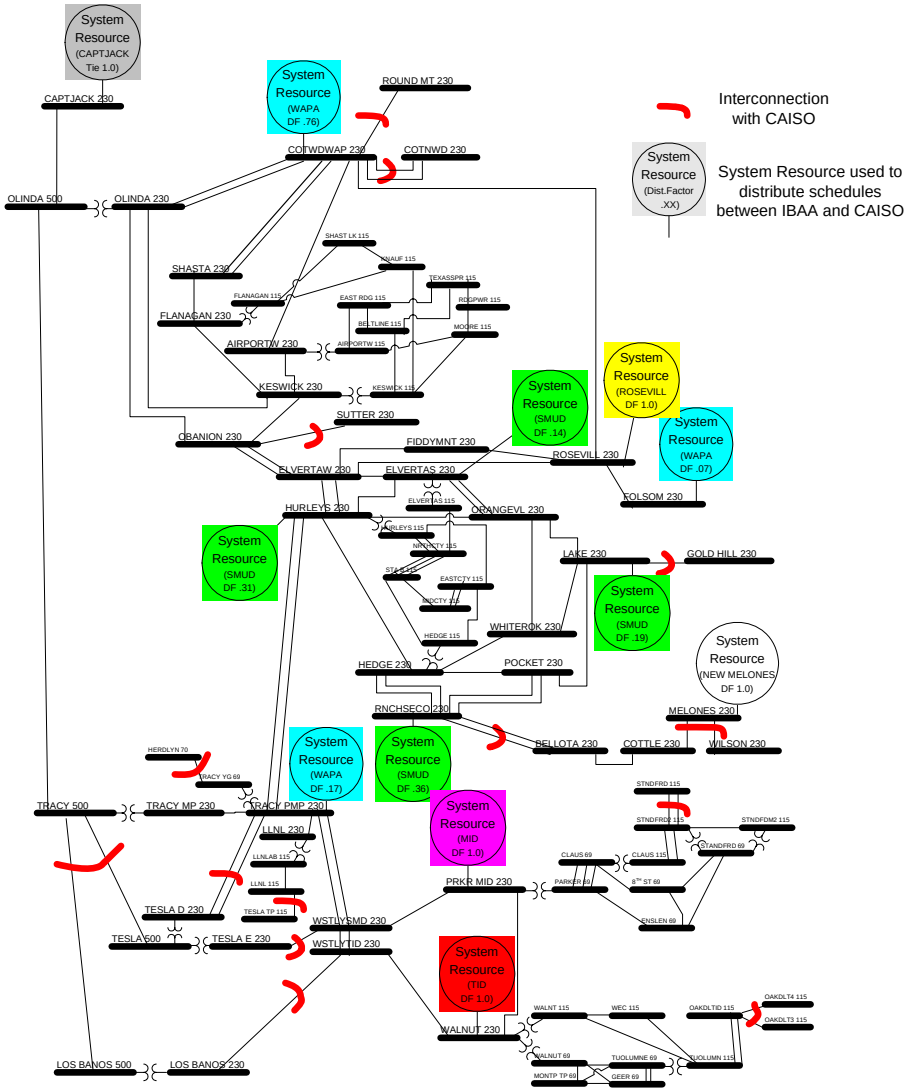
- Scheduling Coordinators submitting schedules will identify System Resource supporting CAISO-IBAA transaction
- Price for injection/withdrawal (supply/purchase) will be based on value of injection/withdrawal from identified resource for purposes of managing congestion on CAISO grid.

SMUD/WAPA/TID IBAA

Table 1: Preliminary Definition of System Resource Aggregations for SMUD/WAPA/MID and TID IBAAs

Aggregated System Resource	Imports to or Exports from CAISO	
	Bus	Inter-tie Distribution Factor
SMUD Hub	37005_ELVERTAS 230kV 37010_HURLEY S 230kV 37012_LAKE 230kV 37016_RNCHSECO 230kV	0.14 0.31 0.19 0.36
WAPA Hub	37545_COTWDWAP 230kV 37548_FOLSOM 230kV 37585_TRCY PMP 230kV	0.76 0.07 0.17
MID Hub	38204_PRKR MID 230kV	1.00
TID Hub	38400_WALNT 230kV	1.00
Roseville Hub	37567_ROSEVILL 230kV	1.00
Captain Jack Intertie	45035_CAPTJACK 500kV	1.00

SMUD / WAPA / TID IBAA



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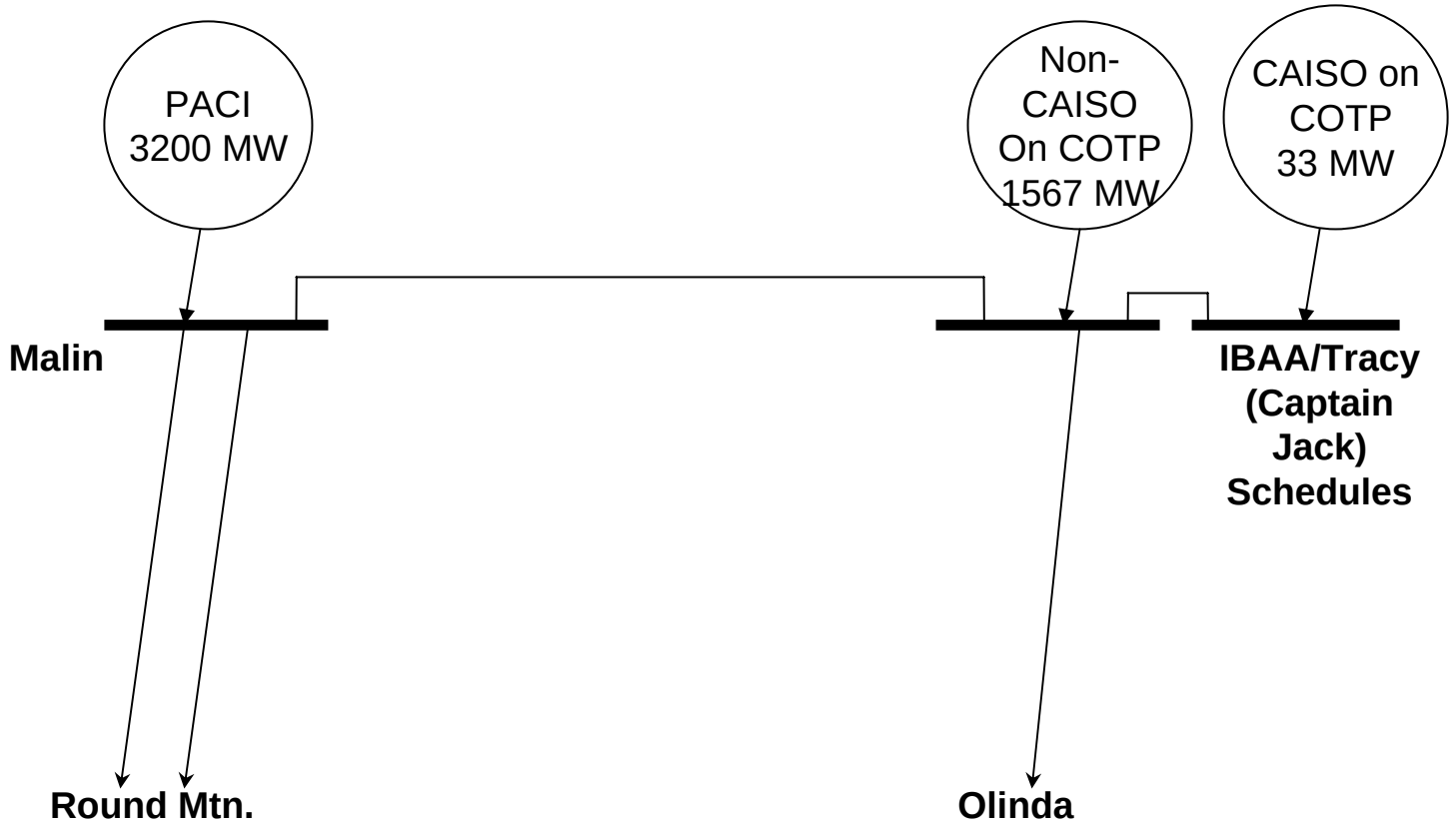
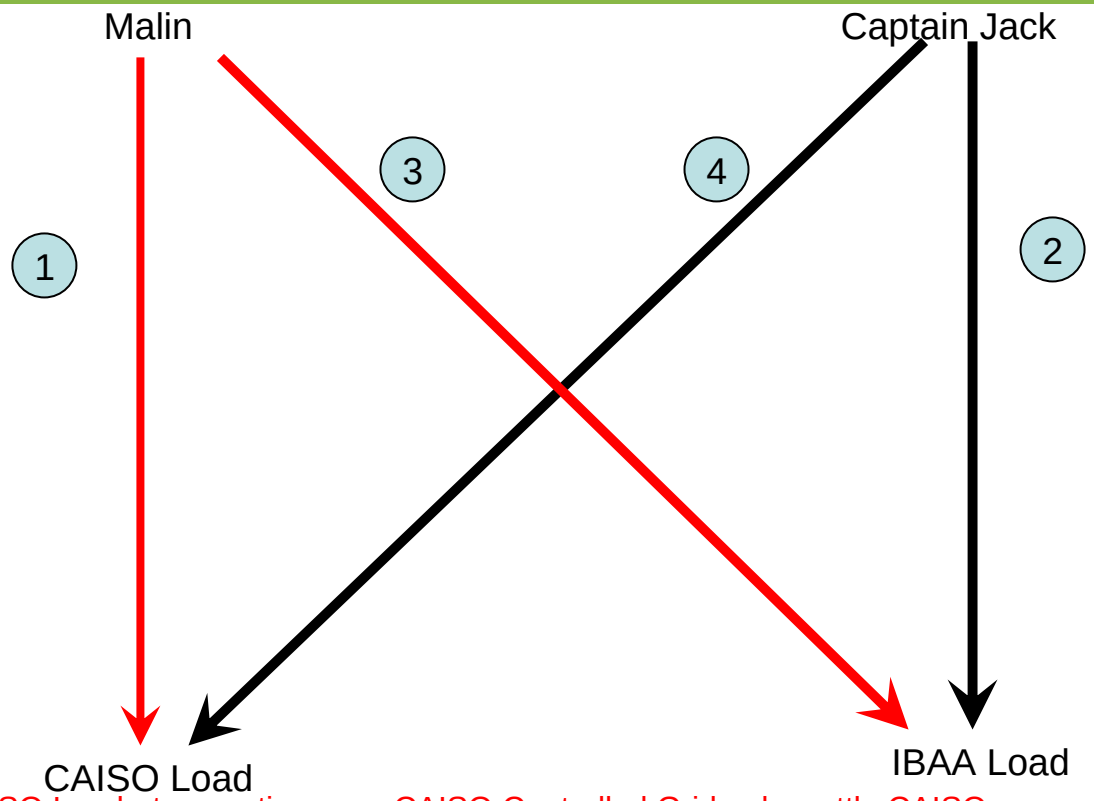
Modeling of CAISO Entitlements on PACI and COTP



- Note 1: CAISO entitlements on COTP may be binding while non-CAISO COTP scheduling limit is not binding. As a result Price on CAISO transactions and non-CAISO COTP transactions may be differ.

Symmetry of Treatment



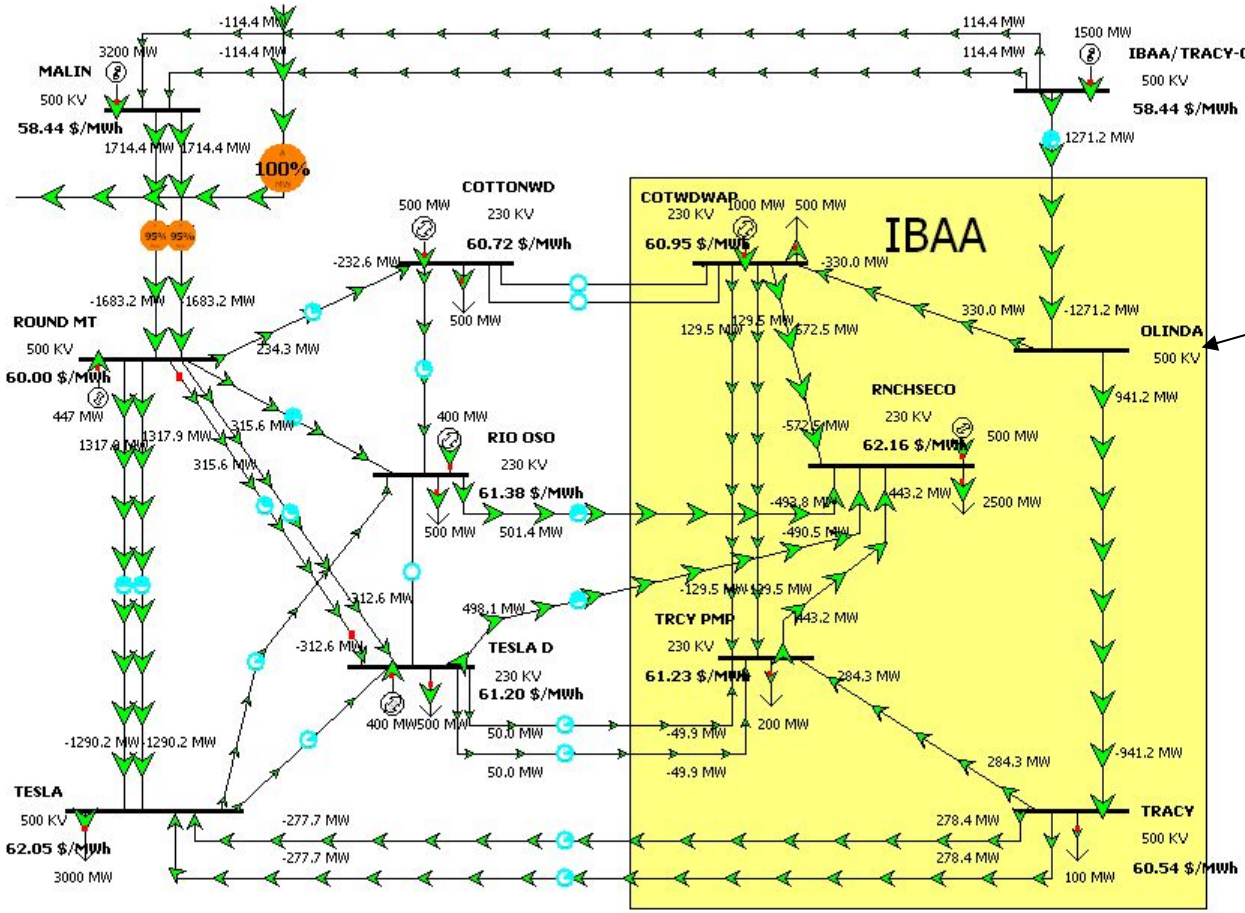
1. Malin to CAISO Load - transaction uses CAISO Controlled Grid only; settle CAISO congestion and losses only
2. Captain Jack to IBAA Load - transaction uses non-CAISO Grid; no settlement of losses or congestion by CAISO; all settlement of congestion and losses on external gird settled external to CAISO
3. Wheeling through CAISO Controlled Grid and deliver within IBAA Grid – CAISO settles for congestion and losses on CAISO grid; congestion and losses on the non-CAISO IBAA grid are settled external to CAISO
4. Schedules submitted at Tracy (Captain Jack) sinking to CAISO Load (using non-CAISO Grid to reach Tracy (Captain Jack) – using both CAISO grid and non-CAISO grid; congestion for losses on the CAISO grid are settled based on CAISO Tariff IBAA rules; and losses and congestion on non-CAISO grid are settled external to CAISO

Example Load Flow

- The following example are intended to demonstrate:
  - The value COTP transmission provides owners when PACI is constrained
  - How the CAISO is valuing schedules based on Congestion and Losses only in the CAISO system and not the IBAA

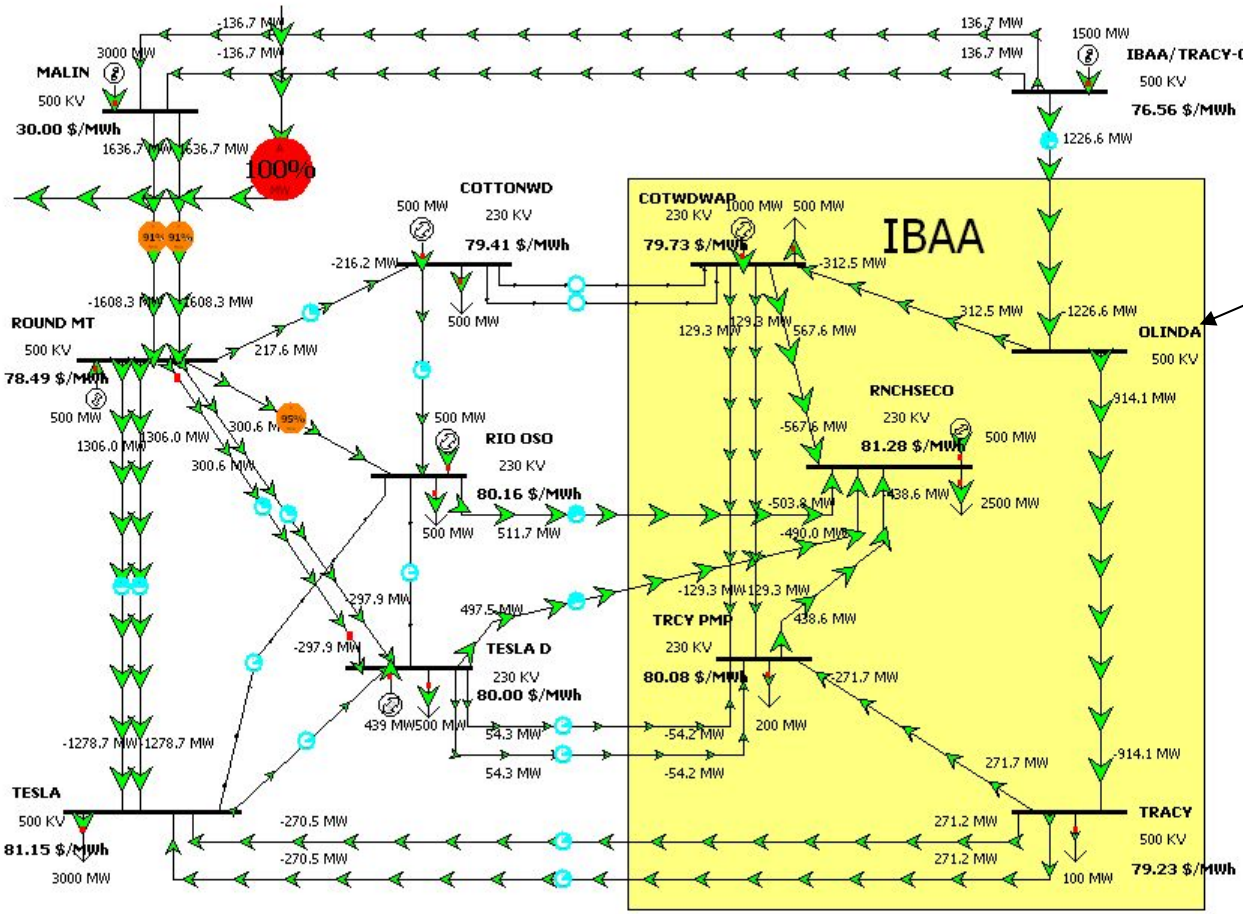
- The following load flow examples are illustrative and do not reflect the actual CAISO / IBAA transmission

Sample Load Flow
(CAISO No Congestion, CAISO Losses)



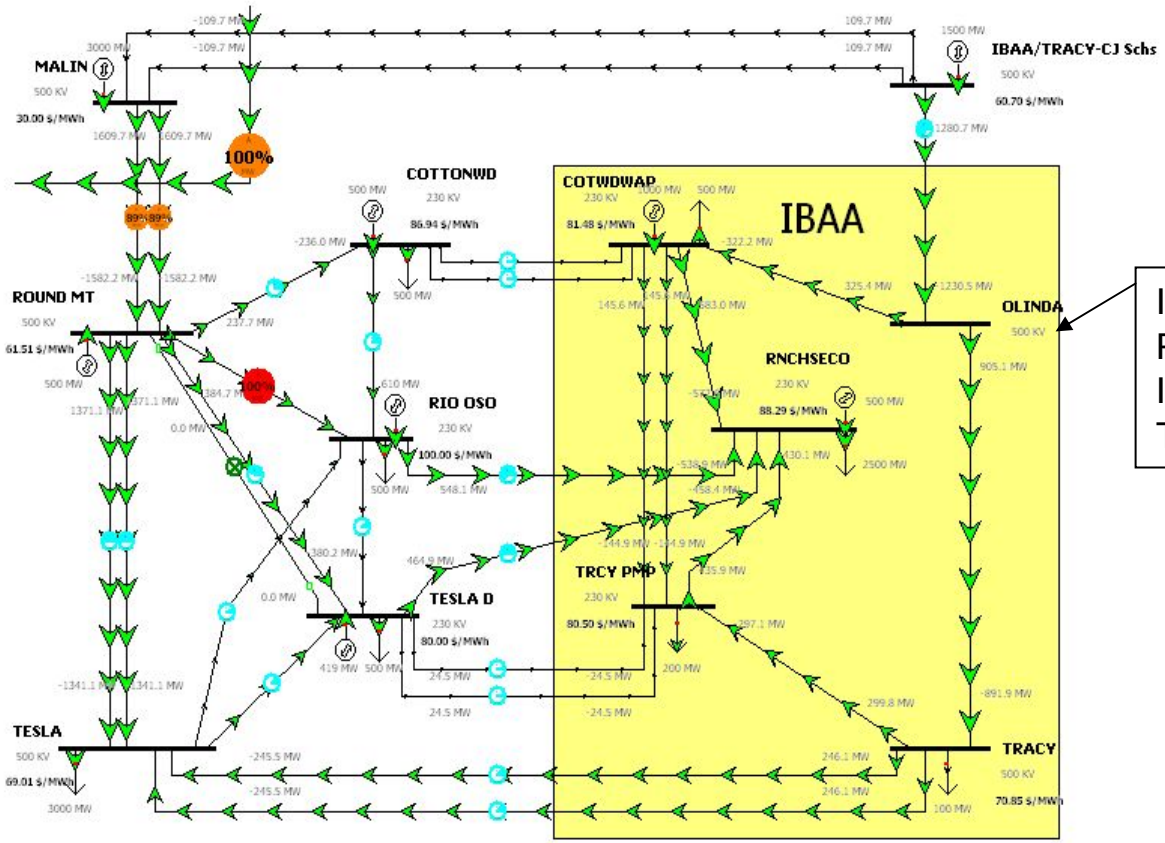
No Congestion or Losses enforced in IBAA

Sample Load Flow
(CAISO Scheduling Congestion, CAISO Losses)



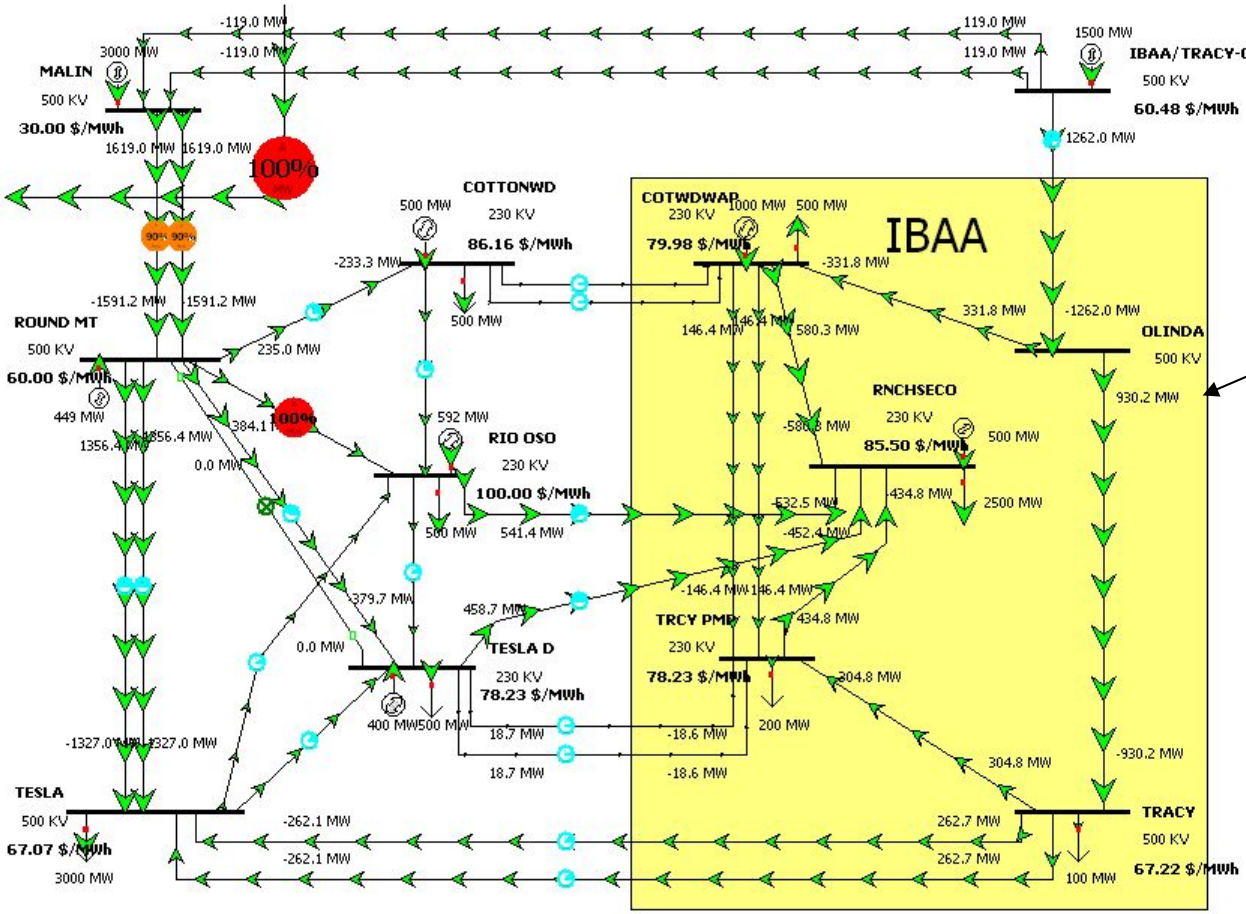
No Congestion or Losses enforced in IBAA

Sample Load Flow (CAISO Scheduling and Flow Congestion, CAISO and IBAA Losses)



Included Resistances in IBAA Transmission

Sample Load Flow
(CAISO Scheduling and Flow Congestion, CAISO Losses)



No Congestion or Losses enforced in IBAA

SMUD / WAPA / IBAA LMP

Total LMP	Jan 05	Feb 05	Mar 05	Apr 05	Jan-Apr 05
SMUD Hub	48.04	50.58	50.28	53.07	50.47
WAPA Hub	45.84	48.28	48.81	51.61	48.62
MID Hub	47.01	49.38	49.55	52.40	49.56
TID Hub	47.04	49.42	49.61	52.47	49.62
Roseville Hub	48.00	50.59	50.35	53.15	50.50
CAISO's NP15 EZGen Hub	46.17	48.49	48.81	51.22	48.66
37012 LAKE 230 kV	48.14	50.67	50.39	53.17	50.57
37016 RNCHSECO 230 kV	47.92	50.41	50.04	52.85	50.28
37545 COTWDWAP 230 kV	45.53	47.91	48.56	51.37	48.33
30035 TRACY 500 kV	46.40	48.97	49.25	52.00	49.13
37585 TRCY PMP 230 kV	46.33	49.05	49.32	52.09	49.18
30670 WESTLEY 230 kV	46.79	49.22	49.45	52.26	49.41
38230 STANDFRD 115 kV	47.54	49.92	49.90	52.85	50.03
38432 OAKDLTID 115 kV	47.03	49.40	49.59	52.49	49.61
45035 CAPTJACK 500 kV	45.61	48.14	47.99	50.51	48.04

Energy	Jan 05	Feb 05	Mar 05	Apr 05	Jan-Apr 05
SMUD Hub	49.12	51.32	51.15	53.81	51.33
WAPA Hub	49.12	51.32	51.15	53.81	51.33
MID Hub	49.12	51.32	51.15	53.81	51.33
TID Hub	49.12	51.32	51.15	53.81	51.33
Roseville Hub	49.12	51.32	51.15	53.81	51.33
CAISO's NP15 EZGen Hub	49.12	51.32	51.15	53.81	51.33
37012 LAKE 230 kV	49.12	51.32	51.15	53.81	51.33
37016 RNCHSECO 230 kV	49.12	51.32	51.15	53.81	51.33
37545 COTWDWAP 230 kV	49.12	51.32	51.15	53.81	51.33
30035 TRACY 500 kV	49.12	51.32	51.15	53.81	51.33
37585 TRCY PMP 230 kV	49.12	51.32	51.15	53.81	51.33
30670 WESTLEY 230 kV	49.12	51.32	51.15	53.81	51.33
38230 STANDFRD 115 kV	49.12	51.32	51.15	53.81	51.33
38432 OAKDLTID 115 kV	49.12	51.32	51.15	53.81	51.33
45035 CAPTJACK 500 kV	49.12	51.32	51.15	53.81	51.33

Loss	Jan 05	Feb 05	Mar 05	Apr 05	Jan-Apr 05
SMUD Hub	1.59	1.50	0.72	0.59	1.09
WAPA Hub	-0.71	-0.90	-0.85	-1.01	-0.87
MID Hub	0.51	0.25	-0.04	-0.02	0.18
TID Hub	0.53	0.30	0.03	0.07	0.23
Roseville Hub	1.55	1.51	0.79	0.66	1.12
CAISO's NP15 EZGen Hub	-0.41	-0.72	-0.85	-1.12	-0.77
37012 LAKE 230 kV	1.70	1.59	0.84	0.69	1.20
37016 RNCHSECO 230 kV	1.45	1.32	0.47	0.34	0.89
37545 COTWDWAP 230 kV	-1.07	-1.30	-1.11	-1.32	-1.20
30035 TRACY 500 kV	-0.06	-0.17	-0.35	-0.35	-0.23
37585 TRCY PMP 230 kV	0.02	-0.09	-0.28	-0.28	-0.16
30670 WESTLEY 230 kV	0.26	0.09	-0.14	-0.13	0.02
38230 STANDFRD 115 kV	1.09	0.82	0.33	0.29	0.63
38432 OAKDLTID 115 kV	0.53	0.28	0.01	0.10	0.23
45035 CAPTJACK 500 kV	-0.91	-1.04	-1.26	-1.50	-1.18

Congestion	Jan 05	Feb 05	Mar 05	Apr 05	Jan-Apr 05
SMUD Hub	-2.67	-2.24	-1.60	-1.32	-1.96
WAPA Hub	-2.58	-2.13	-1.50	-1.19	-1.85
MID Hub	-2.62	-2.19	-1.57	-1.40	-1.94
TID Hub	-2.62	-2.20	-1.57	-1.41	-1.95
Roseville Hub	-2.68	-2.24	-1.60	-1.32	-1.96
CAISO's NP15 EZGen Hub	-2.54	-2.10	-1.50	-1.47	-1.90
37012 LAKE 230 kV	-2.68	-2.24	-1.60	-1.33	-1.96
37016 RNCHSECO 230 kV	-2.66	-2.23	-1.59	-1.30	-1.94
37545 COTWDWAP 230 kV	-2.52	-2.11	-1.48	-1.12	-1.80
30035 TRACY 500 kV	-2.66	-2.17	-1.55	-1.46	-1.96
37585 TRCY PMP 230 kV	-2.81	-2.18	-1.56	-1.44	-2.00
30670 WESTLEY 230 kV	-2.60	-2.19	-1.56	-1.42	-1.94
38230 STANDFRD 115 kV	-2.67	-2.22	-1.58	-1.25	-1.93
38432 OAKDLTID 115 kV	-2.62	-2.20	-1.57	-1.42	-1.95
45035 CAPTJACK 500 kV	-2.61	-2.13	-1.90	-1.80	-2.11