California Independent
System Operator Corporation

Competitive Path Assessment for Winter 2011

Department of Market Monitoring

January 2011

TABLE OF CONTENTS

1 Executive summary

The competitive path designations resulting from the competitive path assessment (CPA) are used to establish the set of transmission paths applied in the two market passes where local market power mitigation (LMPM) is applied. A description of the complete CPA procedure is provided in the previous white paper for initial competitive path designations.[1] Starting in April 2010, path designations are applied seasonally, at least four times per year. This white paper provides updated information on the CPA procedure, and the set of competitive path designations that will be in effect during the 2011 winter season (approximately January, February, and March).

This current release of CPA results evaluates path competitiveness across three load scenarios (high, medium, and low), three hydroelectric production scenarios (high, medium, and low), and combinations of the ten largest suppliers' internal generation withdrawn from the model. The general methodology remains the same, with updates on transmission network model, candidate path list, and input data.

Results show that all candidate paths pass the test and will be deemed as competitive for purposes of local market power mitigation procedures. Non-candidate paths are deemed uncompetitive except for "grandfathered" paths (existing branch groups).

Changes in the simulation condition relative to the prior study include:

- The full network model is based on the default full network model version DB50 as well as monthly release congestion revenue rights (CRR) model for January 2011, while previous results are based on the CRR model for DB45.
- Pivotal suppliers' capacities are adjusted based on the latest tolling agreement survey (October/November 2010) covering January to December 2011 from major generation companies and load serving entities.
- The candidate path list is updated based on 12 months of operating data from December 2009 to November 2010.

2 Background

Local Market Power Mitigation and Reliability Requirement Determination (LMPM-RRD) under the new market requires prior designation of network constraints (or paths)[2] into two classes, "competitive" and "non-competitive." Under the LMPM-RRD procedures, generation bids that are dispatched up to relieve congestion on transmission paths pre-designated as "non-competitive" are subject to bid mitigation.[3] LMPM-RRD is applied in a two-step process to identify specific circumstances where local market power exists. This process occurs just prior to running the market (day-ahead or real-time) and applies mitigation to resources that have been identified as having local market power. All transmission

[1] http://www.caiso.com/2365/23659ca314f0.pdf

[2] The term path is used synonymously with transmission constraints in this context, and includes all transmission constraints that are enforced in Pass 1 and Pass 2 of Pre-IFM. A path is by definition directional.

[3] A detailed description of the LMPM-RRD procedures can be found in the tariff and Business Practice Manuals on the ISO web site at http://www.caiso.com/docs/2001/12/21/2001122108490719681.html.

facilities that are modeled in the full network model have a designation of "competitive" or "non-competitive." The first step of this process clears supply against forecast demand, with thermal limits enforced only on the set of competitive constraints (the Competitive Constraint Run or CCR). This provides a benchmark dispatch that reflects competition among suppliers since only those transmission constraints deemed competitive are applied in the network model.

The second step applies all constraints, competitive and non-competitive, and re-dispatches all resources to meet forecast load. In this second step, the All Constraint Run (ACR), some resources will be dispatched further up (compared to the CCR) to relieve congestion on the non-competitive constraints now that they have been applied in the market solution. Those resources that have been dispatched up in the ACR, relative to the competitive benchmark dispatch from the CCR, are deemed to have local market power since they were needed to relieve congestion on a non-competitive constraint. These resources will have their bid curve mitigated to their Default Energy Bid from the CCR dispatch point to the full bid-in output for that resource.

2.1 Updated network model

The network model used for the competitive path assessment studies is based on the default full network model version DB50 as well as monthly release congestion revenue rights model for January 2011. The current study uses the default full network model for transmission topology and individual equipment (e.g., line and transformer) rating in PSS/E format, while using information from CRR model for aggregated constraints such as branch group rating.

The network model used in the current CPA is a bus-branch oriented network model which is derived directly from the full network model software using the exporting interface. This base PTI format bus-branch model was then imported into the simulation software for the competitive path assessment studies.

2.2 System conditions

2.2.1 Demand forecast

The purpose of the studies is to assess the competitiveness of the candidate paths using a wide range of system supply and demand conditions. To do this, we construct three demand forecast scenarios as follows. First, actual historical load for Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric transmission areas have been obtained from telemetry data. From this data, a seasonal ISO system-wide daily peak load duration curve is created to represent the peak load condition in that season. Four pairs of seasons/years are then selected based on seasonal peak load. Three load scenarios are then chosen for each season by selecting individual days within a season that correspond to specific points on the daily peak hour load duration curve for that season. Currently, the high, medium, and low load scenarios are chosen based on the 95th percentile, 80th percentile, and 65th percentile, respectively, for the daily peak hour load duration curve for each season.

Table 1 shows the historical peak load for the study season since 2002. Based on the daily peak load, the season/year is selected as the representing season in the studies. Table 2 shows the three specific days selected for the high load, medium load, and low load scenarios. Table 3 shows the assumed ISO system daily peak load for various load scenarios.

Table 1. Historical seasonal peak load

OPR_YR	SEASON	DAILY_PEAK_LOAD
2003	Winter	31,151
2010	Winter	31,248
2006	Winter	31,791
2009	Winter	31,904
2004	Winter	32,554
2005	Winter	32,611
2008	Winter	33,155
2002	Winter	33,182
2007	**Winter**	**34,008**

Table 2. Selection of typical day for seasonal load scenario

Load Scenario	Winter
High	1/11/2007
Medium	1/3/2007
Low	1/13/2007

Table 3. System daily peak load for three load scenarios (megawatts)

Load Scenario	Winter
High	32,831
Medium	31,939
Low	31,356

2.2.2 Hydroelectric generation

For purposes of determining bids for hydro units used in the analysis, three hydro scenarios (wet, medium, and dry) were simulated based on California's historical hydroelectric production data. Figure 1 shows the production level of hydroelectric resources within the ISO control area from 2002 through 2009. As shown, 2008 is a low hydroelectric production year, 2005 is a medium production year, and 2006 is a high production year.

After the low, medium and high hydro years are identified, a hydro daily production duration curve was constructed for each season and each year. The 95th percentile date was then determined in each season as the hydro scenario date for the actual 24-hour simulation. Table 4 summarizes the days identified for various load scenarios in each season.

Figure 1. Annual total ISO hydroelectric production

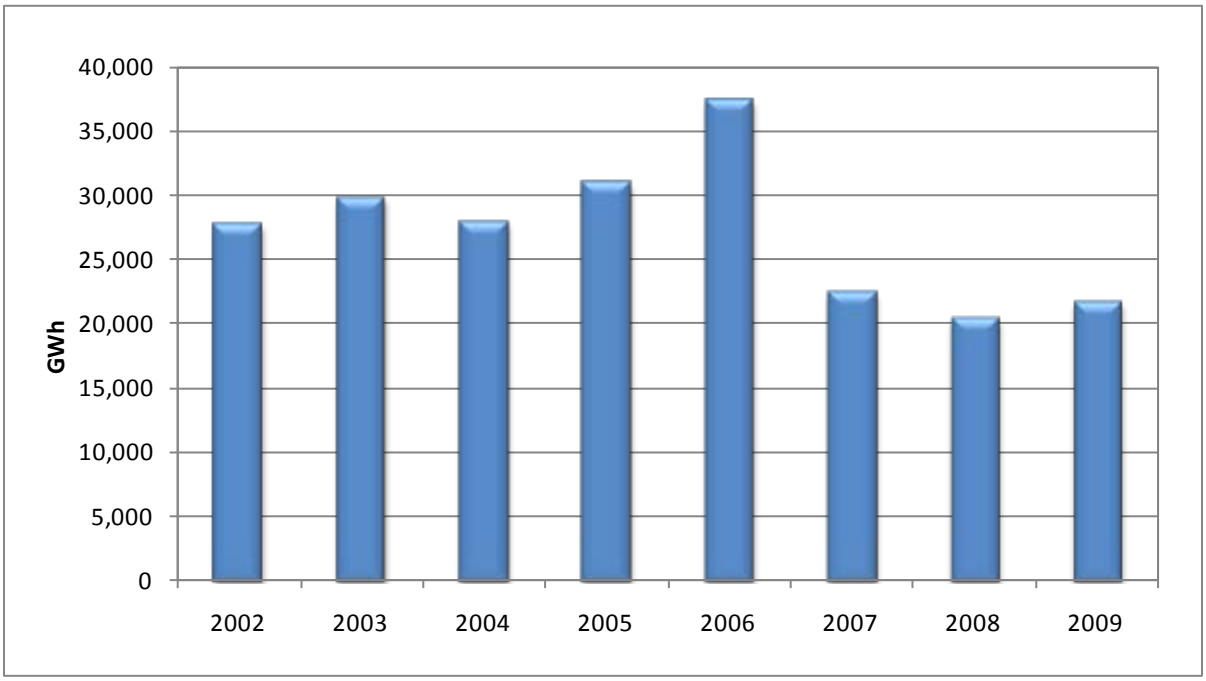

Table 4. Selection of typical day for seasonal hydro scenario

Hydro Scenario	Winter
High	3/23/2006
Medium	3/30/2005
Low	3/5/2008

2.3 Generation ownership and portfolios

Generation resources with a tolling agreement are excluded from the owners' portfolio. A new round of tolling agreement surveys has been done in October/November 2010 for large generation companies and load serving entities, for the survey period between January and December 2011.

This study focuses specifically on the impact of generation capacity by the ten largest owners in the ISO control area who are net sellers and have an installed generator capacity over 500 MW after consideration of tolling agreement adjustments. The CPA considers only net sellers in the selection of potentially pivotal suppliers since net buyers are less likely to benefit from increasing prices through withholding supply.

Table 5. Suppliers considered and their generation capacity concentration, adjusted for tolling agreements

Supplier	Capacity
S1	3,527
S2	2,582
S3	1,944
S4	1,691
S5	1,496
S6	1,036
S7	859
S8	743
S9	625
S10	552

2.4 Identification of candidate competitive paths

In evaluating whether or not paths are competitive, the CPA focuses on the subset of all transmission paths for which this designation is most likely to impact market outcomes. The criteria for identifying candidate competitive paths (those that will be tested in this assessment), is based on the frequency of operational mitigation that has occurred in the most recent 12 months of operation.

For the winter 2011 designations, candidate paths were identified based on data for the 12 month period from December 2009 through November 2010. This represents the most recent 12 month period for which data were available at the time this study needed to be initiated.

Hours of congestion management were based on hours when congestion occurred in the day-ahead or real-time market, as well as when congestion may have been managed in real time through reliability must-run (RMR) dispatches or exceptional dispatches.

- To identify hours when congestion occurred in the ISO's markets, every hour where a constraint's market flow equaled or exceeded its limit was counted as an hour of managed congestion for the constraint. A constraint was counted as being congested if it was binding during any part of an hour in the day-ahead LMPM run, day-ahead market run, real-time LMPM run, or the real-time market run.

- To identify hours when congestion on a constraint may have been managed in real-time using RMR resources, data were collected reflecting resources that received real-time RMR dispatch instructions. For any hour where an RMR dispatch was made to a specific resource, that hour was counted toward all lines that are mitigated using that RMR resource as identified in the ISO Operating Procedures. The line/resource relationships identified in the ISO Operating Procedures were used to create the specific mapping to count each hour of real-time RMR dispatch of a specific resource as an hour of operational mitigation for a specific line or path.

- To identify hours when congestion on a constraint may have been managed in real-time using exceptional dispatches, operator log entries were used to identify the reason for individual

exceptional dispatches for real-time energy. In cases where the reason did not include a specific line or lines, but cited a specific transmission operating procedures, these transmission operating procedures were used to map the resource to a specific set of transmission facilities. As with the real-time RMR dispatches, any hour where a resource was exceptionally dispatched for real-time energy was counted as an hour of operational mitigation for all lines for which that resource was identified as providing operational mitigation unless a specific subset of those lines was identified in the operator log for that particular exceptional dispatch.

Each hour during which this analysis indicated congestion occurred either (a) in the market or that may have been managed in real-time via (b) an RMR dispatch or (c) exceptional dispatch (or any combination of the three categories) was counted as one hour of congestion for the constraint.

Table 6 shows intra-zonal interfaces and individual transmission lines that had greater than 500 hours of congestion and consequently have been identified as candidate paths.

Table 6. Candidate path list

CONSTRAINT_NAME	HOUR
33912_SPRNGGJ_115_33914_MI-WUK_115_BR_1_1	1999
HUMBOLDT_BG	1011
30300_TABLMTN_230_30325_PALERMO_230_BR_1_1	979
31658_BANGOR_60.0_32308_COLGATE_60.0_BR_1_1	960
32308_COLGATE_60.0_30327_COLGATE_230_XF_3	960
31656_PALERMO_60.0_31658_BANGOR_60.0_BR_1_1	960
30325_PALERMO_230_30327_COLGATE_230_BR_1_1	821
31461_JESSTAP_115_31464_COTWDPGE_115_BR_1_1	782
31452_TRINITY_115_31461_JESSTAP_115_BR_1_1	782
31010_LOWGAP1_115_31015_BRDGVLLE_115_BR_1_1	778
31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1_1	777
31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1_1	777
31011_FRSTGLEN_115_31010_LOWGAP1_115_BR_1_1	777
33203_MISSON_115_33204_POTRERO_115_BR_1_1	741
31580_CASCADE_60.0_31582_STLLWATR_60.0_BR_1_1	740
31566_KESWICK_60.0_31582_STLLWATR_60.0_BR_1_1	740
31000_HUMBOLDT_115_31452_TRINITY_115_BR_1_1	721
31555_MSSTAP2_60.0_31553_BIGBAR_60.0_BR_1_1	718
31093_HYMPOMJT_60.0_31553_BIGBAR_60.0_BR_1_1	718
31092_MPLECRK_60.0_31093_HYMPOMJT_60.0_BR_1_1	718
31080_HUMBOLDT_60.0_31000_HUMBOLDT_115_XF_2	718
31555_MSSTAP2_60.0_31557_MILSTSTA_60.0_BR_1_1	718
31556_TRINITY_60.0_31555_MSSTAP2_60.0_BR_1_1	718
31000_HUMBOLDT_115_31001_HMBLTTM_1.0_XF_1	712
31080_HUMBOLDT_60.0_31092_MPLECRK_60.0_BR_1_1	707
31110_BRDGVLLE_60.0_31112_FRUITLND_60.0_BR_1_1	707
31114_FRTSWRD_60.0_31116_GRBRVLLE_60.0_BR_1_1	706
31306_WILLITS_60.0_31308_LYTNVLLE_60.0_BR_1_1	706
31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1_1	706
31080_HUMBOLDT_60.0_31001_HMBLTTM_1.0_XF_1	706

CONSTRAINT_NAME	HOUR
31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1_1	706
31000_HUMBOLDT_115_31015_BRDGVLLE_115_BR_1_1	706
31112_FRUITLND_60.0_31114_FRTSWRD_60.0_BR_1_1	706
33206_BAYSHOR1_115_33208_MARTINC_115_BR_1_1	665
32212_E.NICOLS_115_32214_RIOOSO_115_BR_1_1	653
32314_SMRTSVLE_60.0_32316_YUBAGOLD_60.0_BR_1_1	643
32318_BRWNSVY_60.0_32320_MRYSVLLE_60.0_BR_1_1	640
30015_TABLEMT_500_30040_TESLA_500_BR_1_3	640
30300_TABLMTN_230_30066_TBMT1M_1.0_XF_1	640
32316_YUBAGOLD_60.0_32318_BRWNSVY_60.0_BR_1_1	640
33200_LARKIN_115_33204_POTRERO_115_BR_2_1	629
99102_PIT-TES1_230_30567_TESJCT_230_BR_1_2	625
30567_TESJCT_230_30700_SANMATEO_230_BR_1_1	625
SCE_PCT_IMP_BG	618
33207_BAYSHOR2_115_33208_MARTINC_115_BR_2_1	616
33204_POTRERO_115_33207_BAYSHOR2_115_BR_2_1	614
33205_HNTRSPT_115_33208_MARTINC_115_BR_1_1	594
33204_POTRERO_115_33206_BAYSHOR1_115_BR_1_1	592
33205_HNTRSPT_115_33208_MARTINC_115_BR_3_1	587
33310_SANMATEO_115_33315_RAVENSWD_115_BR_1_1	575
33310_SANMATEO_115_30700_SANMATEO_230_XF_7_S	564
33208_MARTINC_115_30695_MARTINC_230_XF_7	564
33310_SANMATEO_115_30700_SANMATEO_230_XF_7_P	562
30712_SLACTAP2_230_30715_JEFFERSN_230_BR_2_1	560
30703_RAVENSWD_230_30700_SANMATEO_230_BR_2_1	560
30703_RAVENSWD_230_30700_SANMATEO_230_BR_1_1	560
30705_MONTAVIS_230_30712_SLACTAP2_230_BR_2_1	560
30710_SLACTAP1_230_30715_JEFFERSN_230_BR_1_1	560
33200_LARKIN_115_33203_MISSON_115_BR_1_1	560
30705_MONTAVIS_230_30710_SLACTAP1_230_BR_1_1	560
33200_LARKIN_115_33204_POTRERO_115_BR_1_1	557

CONSTRAINT_NAME	HOUR
33310_SANMATEO_115_30700_SANMATEO_230_XF_6_T	557
33310_SANMATEO_115_33312_BELMONT_115_BR_1_1	557
33208_MARTINC_115_33356_BURLNGME_115_BR_4_1	557
33200_LARKIN_115_33208_MARTINC_115_BR_1_1	557
33310_SANMATEO_115_30700_SANMATEO_230_XF_5_P	557
33306_SFIA_115_33310_SANMATEO_115_BR_5_1	557
33310_SANMATEO_115_33308_SFIA-MA_115_BR_2_1	557
33307_MILLBRAE_115_33310_SANMATEO_115_BR_1_1	557
33310_SANMATEO_115_30700_SANMATEO_230_XF_6_S	557
33310_SANMATEO_115_30700_SANMATEO_230_XF_7_T	557
33310_SANMATEO_115_30700_SANMATEO_230_XF_5_T	557
33208_MARTINC_115_33322_UALTAP_115_BR_5_1	557
33208_MARTINC_115_30695_MARTINC_230_XF_8	557
33308_SFIA-MA_115_33303_ESTGRND_115_BR_2_1	557
30685_EMBRCDR_230_99160_MAR-EMBE_230_BR_1_1	557
33310_SANMATEO_115_33305_SHAWROAD_115_BR_6_1	557
33203_MISSON_115_33205_HNTRSPT_115_BR_1_1	557
33310_SANMATEO_115_30700_SANMATEO_230_XF_6_P	557
33208_MARTINC_115_33307_MILLBRAE_115_BR_1_1	557
30717_TRAN230B_230_99170_MAR-JEF1_230_BR_1_1	557
33203_MISSON_115_33205_HNTRSPT_115_BR_2_1	557
33310_SANMATEO_115_30700_SANMATEO_230_XF_5_S	557
33305_SHAWROAD_115_33208_MARTINC_115_BR_6_1	557
33322_UALTAP_115_33306_SFIA_115_BR_5_1	557
33208_MARTINC_115_33303_ESTGRND_115_BR_2_1	557
99106_SAN-MAR1_230_99104_MAR-SAN1_230_BR_1_3	557
33204_POTRERO_115_33205_HNTRSPT_115_BR_1_1	557
33208_MARTINC_115_33310_SANMATEO_115_BR_3_1	557
30685_EMBRCDR_230_99158_MAR-EMBD_230_BR_2_1	557
30560_E.SHORE_230_30700_SANMATEO_230_BR_1_1	557
33356_BURLNGME_115_33310_SANMATEO_115_BR_4_1	557

3 Competitive path assessment

As described above, the CPA is based on typical days in the season being examined. For each typical day, various potentially pivotal supplier combinations are evaluated for each of the nine load and hydro scenarios. The following section presents the hourly system conditions for the base case, medium load, and medium hydro scenario in the study season without any suppliers' capacity removed.

3.1 2011 winter season results

3.1.1 Base case results

The base case results are presented in Table 7 below for medium load, medium hydro, and no supplier capacity withdrawn. General simulation characteristics are presented, including load, total generation internal to the ISO, net import values, and internal path flows (Path 15 and Path 26) for each of the 24 hours of the medium load medium hydro base case.

3.1.2 CPA results

All candidate paths pass under the study conditions, and are therefore deemed competitive for the 2011 winter season.

Table 7. Base case: Model output, medium hydro, medium load, and no supply withdrawn

Hour	Load (MWh)		Generation (MWh)		Net Import (MWh)		Internal Path Flow (N->S)	
	NP26	SP26	NP26	SP26	NP26	SP26	Path 15	Path 26
1	10,013	12,114	10,659	6,632	542	4,254	-1,513	814
2	9,688	11,715	9,434	7,147	616	4,035	-2,382	-45
3	9,578	11,570	9,229	7,440	552	3,770	-2,547	-214
4	9,649	11,635	9,534	7,378	558	3,759	-2,294	19
5	10,046	11,937	10,223	7,529	435	3,695	-2,072	200
6	10,974	12,855	11,282	7,986	817	3,645	-1,486	714
7	12,373	13,969	12,295	8,432	1,618	3,914	-1,185	946
8	12,820	14,847	12,861	8,417	2,247	4,280	-475	1,674
9	12,782	15,342	12,630	8,928	2,694	4,108	-172	1,985
10	12,815	15,616	12,686	9,099	2,691	4,192	-146	2,039
11	12,873	15,784	12,670	9,244	2,716	4,239	-129	2,035
12	12,706	15,793	12,487	9,142	2,771	4,311	-111	2,084
13	12,567	15,724	12,638	8,995	2,703	4,172	89	2,292
14	12,485	15,716	12,276	8,984	2,953	4,209	68	2,263
15	12,353	15,549	11,910	8,961	2,937	4,316	-206	2,011
16	12,308	15,311	11,577	8,891	2,973	4,410	-462	1,744
17	13,064	16,103	12,656	9,303	2,946	4,524	-609	2,006
18	14,290	17,649	14,782	9,587	2,997	4,795	218	3,084
19	14,108	17,322	14,560	9,881	2,910	4,299	19	2,931
20	13,746	16,986	14,116	9,918	2,872	4,048	125	2,830
21	13,145	16,318	13,110	9,629	2,830	4,067	-369	2,381
22	12,261	15,084	12,320	9,039	2,035	4,172	-1,197	1,638
23	11,159	13,794	10,875	8,545	1,563	3,913	-1,851	1,010
24	10,206	12,672	10,003	7,732	1,121	4,034	-2,301	627

Table 8. Competitive path list

CONSTRAINT_NAME	CONSTRAINT_NAME
30015_TABLE MT_500_30040_TESLA _500_BR_1 _3	32318_BRWNS VY_60.0_32320_MRYSVLLE_60.0_BR_1 _1
30300_TABLMTN _230_30066_TB MT 1M_ 1.0_XF_1	33200_LARKIN _115_33203_MISSON _115_BR_1 _1
30300_TABLMTN _230_30325_PALERMO _230_BR_1 _1	33200_LARKIN _115_33204_POTRERO _115_BR_1 _1
30325_PALERMO _230_30327_COLGATE _230_BR_1 _1	33200_LARKIN _115_33204_POTRERO _115_BR_2 _1
30560_E. SHORE_230_30700_SANMATEO_230_BR_1 _1	33200_LARKIN _115_33208_MARTIN C_115_BR_1 _1
30567_TES JCT _230_30700_SANMATEO_230_BR_1 _1	33203_MISSON _115_33204_POTRERO _115_BR_1 _1
30685_EMBRCDR _230_99158_MAR-EMBD_230_BR_2 _1	33203_MISSON _115_33205_HNTRS PT_115_BR_1 _1
30685_EMBRCDR _230_99160_MAR-EMBE_230_BR_1 _1	33203_MISSON _115_33205_HNTRS PT_115_BR_2 _1
30703_RAVENSWD_230_30700_SANMATEO_230_BR_1 _1	33204_POTRERO _115_33205_HNTRS PT_115_BR_1 _1
30703_RAVENSWD_230_30700_SANMATEO_230_BR_2 _1	33204_POTRERO _115_33206_BAYSHOR1_115_BR_1 _1
30705_MONTAVIS_230_30710_SLACTAP1_230_BR_1 _1	33204_POTRERO _115_33207_BAYSHOR2_115_BR_2 _1
30705_MONTAVIS_230_30712_SLACTAP2_230_BR_2 _1	33205_HNTRS PT_115_33208_MARTIN C_115_BR_1 _1
30710_SLACTAP1_230_30715_JEFFERSN_230_BR_1 _1	33205_HNTRS PT_115_33208_MARTIN C_115_BR_3 _1
30712_SLACTAP2_230_30715_JEFFERSN_230_BR_2 _1	33206_BAYSHOR1_115_33208_MARTIN C_115_BR_1 _1
30717_TRAN230B_230_99170_MAR-JEF1_230_BR_1 _1	33207_BAYSHOR2_115_33208_MARTIN C_115_BR_2 _1
31000_HUMBOLDT_115_31001_HMBLT TM_ 1.0_XF_1	33208_MARTIN C_115_30695_MARTIN C_230_XF_7
31000_HUMBOLDT_115_31015_BRDGVLLE_115_BR_1 _1	33208_MARTIN C_115_30695_MARTIN C_230_XF_8
31000_HUMBOLDT_115_31452_TRINITY _115_BR_1 _1	33208_MARTIN C_115_33303_EST GRND_115_BR_2 _1
31010_LOW GAP1_115_31015_BRDGVLLE_115_BR_1 _1	33208_MARTIN C_115_33307_MILLBRAE_115_BR_1 _1
31011_FRSTGLEN_115_31010_LOW GAP1_115_BR_1 _1	33208_MARTIN C_115_33310_SANMATEO_115_BR_3 _1
31080_HUMBOLDT_60.0_31000_HUMBOLDT_115_XF_2	33208_MARTIN C_115_33322_UAL TAP _115_BR_5 _1
31080_HUMBOLDT_60.0_31001_HMBLT TM_ 1.0_XF_1	33208_MARTIN C_115_33356_BURLNGME_115_BR_4 _1
31080_HUMBOLDT_60.0_31092_MPLE CRK_60.0_BR_1 _1	33305_SHAWROAD_115_33208_MARTIN C_115_BR_6 _1
31092_MPLE CRK_60.0_31093_HYMPOMJT_60.0_BR_1 _1	33306_SFIA _115_33310_SANMATEO_115_BR_5 _1
31093_HYMPOMJT_60.0_31553_BIG BAR _60.0_BR_1 _1	33307_MILLBRAE_115_33310_SANMATEO_115_BR_1 _1
31110_BRDGVLLE_60.0_31112_FRUITLND_60.0_BR_1 _1	33308_SFIA-MA _115_33303_EST GRND_115_BR_2 _1
31112_FRUITLND_60.0_31114_FRT SWRD_60.0_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_5 _P
31114_FRT SWRD_60.0_31116_GRBRVLLE_60.0_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_5 _S
31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_5 _T
31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_6 _P
31306_WILLITS _60.0_31308_LYTNVLLE_60.0_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_6 _S
31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_6 _T
31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_7 _P
31452_TRINITY _115_31461_JESSTAP _115_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_7 _S
31461_JESSTAP _115_31464_COTWDPGE_115_BR_1 _1	33310_SANMATEO_115_30700_SANMATEO_230_XF_7 _T
31555_MSS TAP2_60.0_31553_BIG BAR _60.0_BR_1 _1	33310_SANMATEO_115_33305_SHAWROAD_115_BR_6 _1
31555_MSS TAP2_60.0_31557_MILSTSTA_60.0_BR_1 _1	33310_SANMATEO_115_33308_SFIA-MA _115_BR_2 _1
31556_TRINITY _60.0_31555_MSS TAP2_60.0_BR_1 _1	33310_SANMATEO_115_33312_BELMONT _115_BR_1 _1
31566_KESWICK _60.0_31582_STLLWATR_60.0_BR_1 _1	33310_SANMATEO_115_33315_RAVENSWD_115_BR_1 _1
31580_CASCADE _60.0_31582_STLLWATR_60.0_BR_1 _1	33322_UAL TAP _115_33306_SFIA _115_BR_5 _1
31656_PALERMO _60.0_31658_BANGOR _60.0_BR_1 _1	33356_BURLNGME_115_33310_SANMATEO_115_BR_4 _1
31658_BANGOR _60.0_32308_COLGATE _60.0_BR_1 _1	33912_SPRNG GJ_115_33914_MI-WUK _115_BR_1 _1
32212_E.NICOLS_115_32214_RIO OSO _115_BR_1 _1	99102_PIT-TES1_230_30567_TES JCT _230_BR_1 _2
32308_COLGATE _60.0_30327_COLGATE _230_XF_3	99106_SAN-MAR1_230_99104_MAR-SAN1_230_BR_1 _3
32314_SMRTSVLE_60.0_32316_YUBAGOLD_60.0_BR_1 _1	HUMBOLDT_BG
32316_YUBAGOLD_60.0_32318_BRWNS VY_60.0_BR_1 _1	SCE_PCT_IMP_BG

4 Concluding comments

The simulation results and competitive test outcomes presented in this paper represent the competitive path designations that will be incorporated in the market software for the upcoming season. These designations reflect updates introduced in the last version of the CPA, updated input data and network model, as well as adjustments to supplier portfolios to account for transfer of operational and bidding control of generation resources within the ISO control area.

Incorporating results from the season studied, all candidate paths passed the competitiveness test. Note that there are a total of roughly 4,800 individual line segments in the FNM and several aggregated constraints, and a subset of these constraints were included in the testing as candidate paths.

There are still factors that may require periodic review and update of the CPA. Such factors include:

- **Update of full network model.** The FNM is updated periodically to reflect new transmission facilities, adjustments of major transmission limits, seasonal switching, and other factors. Temporary network changes such as outages may have a significant impact on market congestion.
- **Market clearing model and optimization**. Currently the CPA is done by a simulation tool different from the market software. To further align the simulations used for path designations with the actual market model and software, developing the CPA within a simulation tool that more closely reflects the market software will be reviewed.
- **Impact of relatively small generation owners.** The 3-pivotal supplier tests are computationally intensive, and there are an extremely large number of potential combinations of suppliers that could withdraw. It is impractical to simulate all potential combinations for all suppliers. The reason for the threshold of 500 MW is to identify larger suppliers that can more easily influence market prices. However, there may be cases where, in a relatively small congested area, a small generation owner whose generation capacity is less than the selection threshold may be pivotal to relieve the constraint. While this analysis does not consider such cases, the Department of Market Monitoring has developed tools to analyze the effectiveness of LMPM in local areas and will monitor market outcomes for the purpose of detecting potentially uncompetitive circumstances in local areas. In cases where uncompetitive outcomes are observed and the competitive path designations for that area do not appear to be consistent with the market outcomes, DMM will evaluate both the path designations as well as the application of LMPM in that area.