California Independent
System Operator Corporation

Competitive Path Assessment for 2012 Release 1

Department of Market Monitoring

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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 a 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 the release 1 for 2012. The effective date will be released in a market notice.

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production scenarios (high, medium, and low), and combinations of the ten largest suppliers' internal generation withdrawn from the model.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 but two candidate paths pass the test and will be deemed competitive for purposes of local market power mitigation procedures. Non-candidate paths are deemed non-competitive by default 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 DB56 as well as monthly release congestion revenue rights (CRR) model for March 2012.
- Pivotal suppliers' capacities are adjusted based on the latest tolling agreement survey (December 2011) covering January to December 2012 from major generation companies and load serving entities.
- The candidate path list is updated based on 12 months of operating data from February 2011 to January 2012.

The ISO is implementing a new competitive path assessment methodology (dynamic competitive path assessment) which will be phased in 2012 and gradually replace the current competitive path assessment[2]. Once the dynamic competitive path assessment is implemented completely, there will be no need for the current forms of competitive path release.

2 Background

Local Market Power Mitigation and Reliability Requirement Determination (LMPM-RRD) under the new market requires prior designation of network constraints (or paths)[3] into two classes, "competitive" and

[1] http://www.caiso.com/Documents/WhitePaper-CompetitivePathAssessment.pdf

[2] Local market power mitigation enhancements http://www.caiso.com/informed/Pages/StakeholderProcesses/LocalMarketPowerMitigationEnhancements.aspx

[3] 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.

"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.[4] 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 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 study is based on the default full network model version DB56 as well as monthly release congestion revenue rights model for March 2012. 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 study 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 corresponds

[4] 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/rules/Pages/default.aspx.

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

YEAR	SEASON	DAILY_PEAK_LOAD
2010	Spring	37,025
2005	Spring	38,694
2009	Spring	39,370
2011	Spring	39,387
2003	Spring	40,117
2004	Spring	40,476
2007	Spring	40,839
2002	Spring	41,023
2006	Spring	43,719
2008	**Spring**	**46,789**

Table 2. Selection of typical day for seasonal load scenario

Load Scenario	Spring
High	5/16/2008
Medium	6/12/2008
Low	4/29/2008

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

Load Scenario	Spring
High	41,540
Medium	36,069
Low	31,831

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 2010. 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

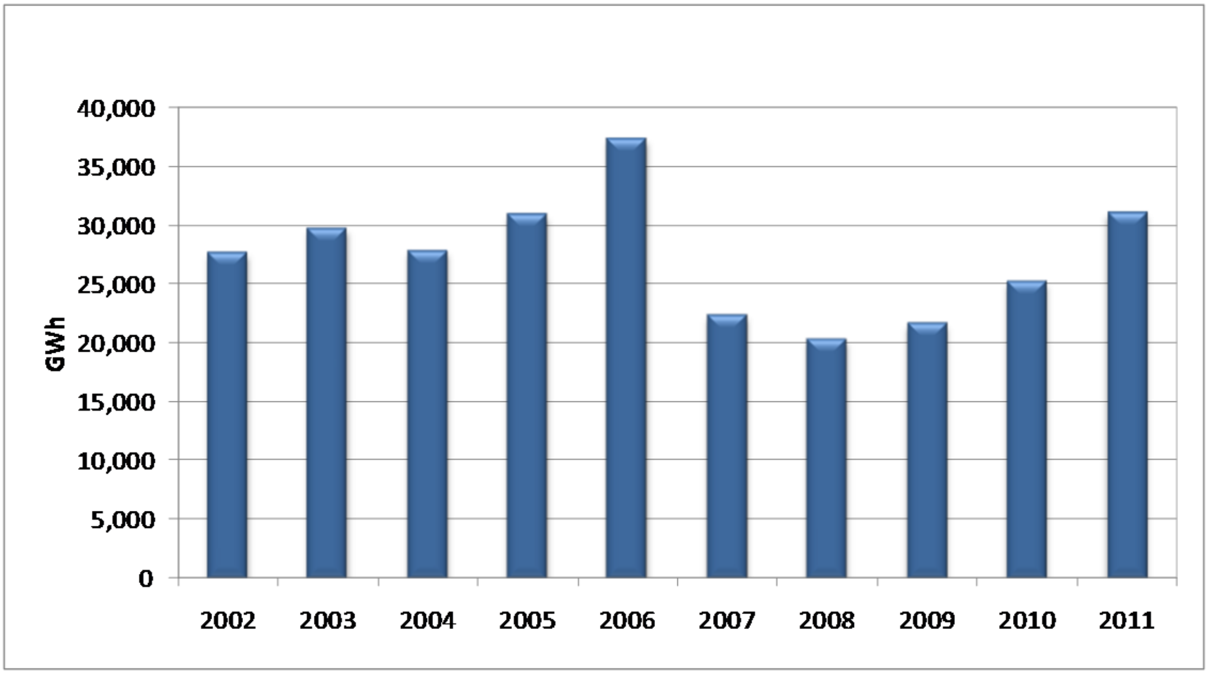

Table 4. Selection of typical day for seasonal hydro scenario

Hydro Scenario	Spring
High	5/19/2006
Medium	5/25/2005
Low	6/20/2008

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 December 2011 for large generation companies and load serving entities, for the survey period between January and December 2012.

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	3,582
S2	3,186
S3	2,587
S4	2,246
S5	1,187
S6	1,185
S7	1,145
S8	1,119
S9	743
S10	635

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 coming designations, candidate paths were identified based on data for the 12 month period from February 2011 through January 2012. 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	4093
34112_EXCHEQUR_115_34116_LEGRAND_115_BR_1_1	2629
31000_HUMBOLDT_115_31452_TRINITY_115_BR_1_1	2002
31566_KESWICK_60.0_31582_STLLWATR_60.0_BR_1_1	1421
31580_CASCADE_60.0_31582_STLLWATR_60.0_BR_1_1	1393
31461_JESSTAP_115_31464_COTWDPGE_115_BR_1_1	1386
31452_TRINITY_115_31461_JESSTAP_115_BR_1_1	1367
30900_GATES_230_30970_MIDWAY_230_BR_1_1	1246
31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1_1	1195
31011_FRSTGLEN_115_31010_LOWGAP1_115_BR_1_1	1191
31010_LOWGAP1_115_31015_BRDGVLLE_115_BR_1_1	1191
31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1_1	1191
34101_CERTANJ2_115_34116_LEGRAND_115_BR_1_1	1131
POTRERO_MSL	1091
31080_HUMBOLDT_60.0_31092_MPLECRK_60.0_BR_1_1	1088
30515_WARNERVL_230_30800_WILSON_230_BR_1_1	1037
30790_PANOCHE_230_30873_HELM_230_BR_1_1	1027
31555_MSSTAP2_60.0_31553_BIGBAR_60.0_BR_1_1	1026
31556_TRINITY_60.0_31555_MSSTAP2_60.0_BR_1_1	1025
31093_HYMPOMJT_60.0_31553_BIGBAR_60.0_BR_1_1	1023
31092_MPLECRK_60.0_31093_HYMPOMJT_60.0_BR_1_1	1023
31555_MSSTAP2_60.0_31557_MILSTSTA_60.0_BR_1_1	1017
31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1_1	1017
31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1_1	1017
30875_MCCALL_230_30880_HENTAP2_230_BR_1_1	1017
34105_CERTANJ1_115_34121_SHARONT_115_BR_1_1	1011
30881_HENRIETA_230_34430_HENRETTA_115_XF_3	1008
30835_HERNDON_230_34412_HERNDON_115_XF_1_P	1007
30810_GREGG_230_30879_HENTAP1_230_BR_1_1	1007
34159_PANOCHEJ_115_34160_HAMMONDS_115_BR_1_1	1007
30805_BORDEN_230_30810_GREGG_230_BR_1_1	1007
30835_HERNDON_230_34412_HERNDON_115_XF_2_P	1007
30875_MCCALL_230_34370_MCCALL_115_XF_3_P	1007
34161_DFSTP_115_34162_OROLOMA_115_BR_1_1	1007
34160_HAMMONDS_115_34161_DFSTP_115_BR_1_1	1007
30875_MCCALL_230_34370_MCCALL_115_XF_1_P	1007
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1_1	1007
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1A_1	1007
34157_PANOCHET_115_34156_MENDOTA_115_BR_1_1	1007
34100_CHWCHLLA_115_34101_CERTANJ2_115_BR_1_1	1007
34158_PANOCHE_115_30790_PANOCHE_230_XF_1	1007
30873_HELM_230_30875_MCCALL_230_BR_1_1	1007
30835_HERNDON_230_34412_HERNDON_115_XF_2_T	1006
30875_MCCALL_230_34370_MCCALL_115_XF_2	1006
30835_HERNDON_230_34412_HERNDON_115_XF_2_S	1006
30835_HERNDON_230_34412_HERNDON_115_XF_1_S	1006
34460_GUERNSEY_70.0_34462_GUR3TPT_70.0_BR_1_1	1006
30880_HENTAP2_230_30881_HENRIETA_230_BR_2_1	1006
30879_HENTAP1_230_30881_HENRIETA_230_BR_1_1	1006
30875_MCCALL_230_34370_MCCALL_115_XF_3_T	1006

CONSTRAINT_NAME	HOUR
30835_HERNDON_230_34412_HERNDON_115_XF_1_T	1006
34540_HENRITTA_70.0_34542_JCBSCRNR_70.0_BR_1_1	1006
34462_GUR3TPT_70.0_34554_AMSTGSW_70.0_BR_1_1	1006
34462_GUR3TPT_70.0_34542_JCBSCRNR_70.0_BR_1_1	1006
34418_KINGSBRG_115_34420_CORCORAN_115_BR_2_1	1006
30796_STOREY1_230_30810_GREGG_230_BR_1_1	1006
34418_KINGSBRG_115_34420_CORCORAN_115_BR_1_1	1006
34363_CLOVISJ1_115_34366_SANGER_115_BR_1_1	1006
34362_CLOVIS_115_34363_CLOVISJ1_115_BR_1_1	1006
34360_WWARDJT_115_34414_WOODWARD_115_BR_1_1	1006
34358_KERCKHF2_115_34360_WWARDJT_115_BR_1_1	1006
34358_KERCKHF2_115_34123_KERCH1TP_115_BR_2_1	1006
34356_KERCKHF1_115_34123_KERCH1TP_115_BR_1_1	1006
30875_MCCALL_230_34370_MCCALL_115_XF_1_T	1006
34159_PANOCHEJ_115_34158_PANOCHE_115_BR_1_1	1006
30875_MCCALL_230_34370_MCCALL_115_XF_1_S	1006
34157_PANOCHET_115_34158_PANOCHE_115_BR_1_1	1006
34128_OAKH_JCT_115_34123_KERCH1TP_115_BR_2_1	1006
34116_LEGRAND_115_34134_WILSONAB_115_BR_1_1	1006
30796_STOREY1_230_30800_WILSON_230_BR_1_1	1006
34105_CERTANJ1_115_34100_CHWCHLLA_115_BR_1_1	1006
30830_KEARNEY_230_30835_HERNDON_230_BR_1_1	1006
34363_CLOVISJ1_115_34360_WWARDJT_115_BR_1_1	1006
30875_MCCALL_230_34370_MCCALL_115_XF_3_S	1006
30790_PANOCHE_230_30825_MCMULLN1_230_BR_1_1	1006
30825_MCMULLN1_230_30830_KEARNEY_230_BR_1_1	1006
33950_RVRBKTP_115_33934_TULLOCH_115_BR_1_1	961
33950_RVRBKTP_115_33944_RVRBANK_115_BR_1_1	960
33932_MELONES_115_33934_TULLOCH_115_BR_1_1	958
33562_BELLOTA_115_33950_RVRBKTP_115_BR_1_1	958
33948_RVRBKJ2_115_33953_VLYHMTP2_115_BR_1_1	952
33511_AVENATP2_115_33514_MANTECA_115_BR_1_1	951
33511_AVENATP2_115_33510_AVENA_115_BR_1_1	950
33506_STANISLS_115_33948_RVRBKJ2_115_BR_1_1	950
33953_VLYHMTP2_115_33952_VALLYHM_115_BR_1_1	950
33953_VLYHMTP2_115_33511_AVENATP2_115_BR_1_1	950
HUMBOLDT_BG	920
31110_BRDGVLLE_60.0_31015_BRDGVLLE_115_XF_1	841
33200_LARKIN_115_33204_POTRERO_115_BR_2_1	743
SDGE_PCT_UF_IMP_BG	739
32218_DRUM_115_32244_BRNSWKT2_115_BR_2_1	618
31112_FRUITLND_60.0_31114_FRTSWRD_60.0_BR_1_1	606
31110_BRDGVLLE_60.0_31112_FRUITLND_60.0_BR_1_1	606
31114_FRTSWRD_60.0_31116_GRBRVLLE_60.0_BR_1_1	604
31306_WILLITS_60.0_31308_LYTNVLLE_60.0_BR_1_1	580
TMS_DLO_NG	575
31086_EUREKA_60.0_31090_HMBLTBY_60.0_BR_1_1	519
SCE_PCT_IMP_BG	513
31080_HUMBOLDT_60.0_31090_HMBLTBY_60.0_BR_2_1	501

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 2012 release 1 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 but two candidate paths pass under the study conditions, and are therefore deemed competitive for the study season.

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

	Load (MWh)		Generation (MWh)		Net Import (MWh)		Internal Path Flow (N->S)	
Hour	NP26	SP26	NP26	SP26	NP26	SP26	Path 15	Path 26
1	11,630	12,630	9,728	6,799	3,644	3,785	-700	1,421
2	11,202	12,074	8,886	7,588	3,242	3,257	-1,339	604
3	10,876	11,776	8,608	7,916	2,952	2,872	-1,627	362
4	10,825	11,722	8,617	7,802	2,997	2,830	-1,431	465
5	11,169	12,239	9,379	7,799	3,092	2,836	-1,156	978
6	11,491	12,768	9,493	7,945	3,050	3,472	-1,348	726
7	12,576	13,960	10,921	8,125	3,228	4,087	-1,440	1,113
8	13,413	14,969	12,487	8,828	2,977	4,082	-1,010	1,624
9	13,883	15,891	13,355	8,857	2,911	4,642	-644	1,952
10	14,521	16,808	14,215	9,677	2,950	4,645	-328	2,235
11	15,125	17,548	14,609	10,537	3,155	4,575	-643	2,242
12	15,524	17,977	15,206	11,040	3,019	4,587	-994	2,200
13	15,865	18,394	15,748	11,292	2,978	4,694	-1,049	2,133
14	16,418	18,854	16,317	11,715	2,703	4,990	-1,421	1,919
15	16,917	19,109	16,563	11,825	3,126	5,050	-1,190	2,095
16	17,169	18,900	16,647	11,678	3,218	5,189	-1,412	1,833
17	17,309	18,694	16,618	11,579	2,986	5,519	-1,834	1,396
18	17,174	18,006	16,375	11,160	2,938	5,549	-2,006	1,248
19	16,786	17,365	15,551	10,841	3,359	5,199	-1,704	1,231
20	16,070	17,207	14,768	10,381	3,580	5,301	-1,187	1,431
21	15,929	17,620	14,678	10,621	3,465	5,225	-959	1,630
22	15,067	16,401	14,186	9,542	2,822	5,233	-1,052	1,397
23	13,576	15,020	12,069	8,801	3,588	4,414	-1,043	1,536
24	12,262	13,736	10,831	7,920	3,591	3,965	-918	1,625

Table 8. Failed candidate path list

CONSTRAINT NAME
SDGE_PCT_UF_IMP_BG
SCE_PCT_IMP_BG

Table 9. Competitive path list

CONSTRAINT_NAME	CONSTRAINT_NAME
33912_SPRNGGJ_115_33914_MI-WUK_115_BR_1_1	30875_MCCALL_230_34370_MCCALL_115_XF_3_T
34112_EXCHEQUR_115_34116_LEGRAND_115_BR_1_1	30835_HERNDON_230_34412_HERNDON_115_XF_1_T
31000_HUMBOLDT_115_31452_TRINITY_115_BR_1_1	34540_HENRITTA_70.0_34542_JCBSCRNR_70.0_BR_1_1
31566_KESWICK_60.0_31582_STLLWATR_60.0_BR_1_1	34462_GUR3TPT_70.0_34554_AMSTGSW_70.0_BR_1_1
31580_CASCADE_60.0_31582_STLLWATR_60.0_BR_1_1	34462_GUR3TPT_70.0_34542_JCBSCRNR_70.0_BR_1_1
31461_JESSTAP_115_31464_COTWDPGE_115_BR_1_1	34418_KINGSBRG_115_34420_CORCORAN_115_BR_2_1
31452_TRINITY_115_31461_JESSTAP_115_BR_1_1	30796_STOREY1_230_30810_GREGG_230_BR_1_1
30900_GATES_230_30970_MIDWAY_230_BR_1_1	34418_KINGSBRG_115_34420_CORCORAN_115_BR_1_1
31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1_1	34363_CLOVISJ1_115_34366_SANGER_115_BR_1_1
31011_FRSTGLEN_115_31010_LOWGAP1_115_BR_1_1	34362_CLOVIS_115_34363_CLOVISJ1_115_BR_1_1
31010_LOWGAP1_115_31015_BRDGVLLE_115_BR_1_1	34360_WWARDJT_115_34414_WOODWARD_115_BR_1_1
31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1_1	34358_KERCKHF2_115_34360_WWARDJT_115_BR_1_1
34101_CERTANJ2_115_34116_LEGRAND_115_BR_1_1	34358_KERCKHF2_115_34123_KERCH1TP_115_BR_2_1
POTRERO_MSL	34356_KERCKHF1_115_34123_KERCH1TP_115_BR_1_1
31080_HUMBOLDT_60.0_31092_MPLECRK_60.0_BR_1_1	30875_MCCALL_230_34370_MCCALL_115_XF_1_T
30515_WARNERVL_230_30800_WILSON_230_BR_1_1	34159_PANOCHEJ_115_34158_PANOCHE_115_BR_1_1
30790_PANOCHE_230_30873_HELM_230_BR_1_1	30875_MCCALL_230_34370_MCCALL_115_XF_1_S
31555_MSSTAP2_60.0_31553_BIGBAR_60.0_BR_1_1	34157_PANOCHET_115_34158_PANOCHE_115_BR_1_1
31556_TRINITY_60.0_31555_MSSTAP2_60.0_BR_1_1	34128_OAKH_JCT_115_34123_KERCH1TP_115_BR_2_1
31093_HYMPOMJT_60.0_31553_BIGBAR_60.0_BR_1_1	34116_LEGRAND_115_34134_WILSONAB_115_BR_1_1
31092_MPLECRK_60.0_31093_HYMPOMJT_60.0_BR_1_1	30796_STOREY1_230_30800_WILSON_230_BR_1_1
31555_MSSTAP2_60.0_31557_MILSTSTA_60.0_BR_1_1	34105_CERTANJ1_115_34100_CHWCHLLA_115_BR_1_1
31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1_1	30830_KEARNEY_230_30835_HERNDON_230_BR_1_1
31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1_1	34363_CLOVISJ1_115_34360_WWARDJT_115_BR_1_1
30875_MCCALL_230_30880_HENTAP2_230_BR_1_1	30875_MCCALL_230_34370_MCCALL_115_XF_3_S
34105_CERTANJ1_115_34121_SHARONT_115_BR_1_1	30790_PANOCHE_230_30825_MCMULLN1_230_BR_1_1
30881_HENRIETA_230_34430_HENRETTA_115_XF_3	30825_MCMULLN1_230_30830_KEARNEY_230_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_1_P	33950_RVRBKTP_115_33934_TULLOCH_115_BR_1_1
30810_GREGG_230_30879_HENTAP1_230_BR_1_1	33950_RVRBKTP_115_33944_RVRBANK_115_BR_1_1
34159_PANOCHEJ_115_34160_HAMMONDS_115_BR_1_1	33932_MELONES_115_33934_TULLOCH_115_BR_1_1
30805_BORDEN_230_30810_GREGG_230_BR_1_1	33562_BELLOTA_115_33950_RVRBKTP_115_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_2_P	33948_RVRBKJ2_115_33953_VLYHMTP2_115_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_3_P	33511_AVENATP2_115_33514_MANTECA_115_BR_1_1
34161_DFSTP_115_34162_OROLOMA_115_BR_1_1	33511_AVENATP2_115_33510_AVENA_115_BR_1_1
34160_HAMMONDS_115_34161_DFSTP_115_BR_1_1	33506_STANISLS_115_33948_RVRBKJ2_115_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_1_P	33953_VLYHMTP2_115_33952_VALLYHM_115_BR_1_1
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1_1	33953_VLYHMTP2_115_33511_AVENATP2_115_BR_1_1
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1A_1	HUMBOLDT_BG
34157_PANOCHET_115_34156_MENDOTA_115_BR_1_1	31110_BRDGVLLE_60.0_31015_BRDGVLLE_115_XF_1
34100_CHWCHLLA_115_34101_CERTANJ2_115_BR_1_1	33200_LARKIN_115_33204_POTRERO_115_BR_2_1
34158_PANOCHE_115_30790_PANOCHE_230_XF_1	32218_DRUM_115_32244_BRNSWKT2_115_BR_2_1
30873_HELM_230_30875_MCCALL_230_BR_1_1	31112_FRUITLND_60.0_31114_FRTSWRD_60.0_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_2_T	31110_BRDGVLLE_60.0_31112_FRUITLND_60.0_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_2	31114_FRTSWRD_60.0_31116_GRBRVLLE_60.0_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_2_S	31306_WILLITS_60.0_31308_LYTNVLLE_60.0_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_1_S	TMS_DLO_NG
34460_GUERNSEY_70.0_34462_GUR3TPT_70.0_BR_1_1	31086_EUREKA_60.0_31090_HMBLTBY_60.0_BR_1_1
30880_HENTAP2_230_30881_HENRIETA_230_BR_2_1	31080_HUMBOLDT_60.0_31090_HMBLTBY_60.0_BR_2_1
30879_HENTAP1_230_30881_HENRIETA_230_BR_1_1	

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 but two candidate paths passed the competitiveness test. Note that there are a total of roughly 4,800 individual line segments in the Full Network Model 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.