California ISO
Shaping a Renewed Future

California Independent
System Operator Corporation

Competitive Path Assessment for 2012 Release 4

Department of Market Monitoring

December 2012

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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 pre-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 the 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 effective for release 4 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production scenarios (high, medium, and low), and combinations of the eleven largest suppliers' internal generation withdrawn from the model.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 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 conditions relative to the prior study include:

- The full network model is based on the default full network model version DB59 as well as monthly release congestion revenue rights (CRR) model for December 2012.
- Pivotal suppliers' capacities are adjusted based on the latest tolling agreement information submitted to ISO by generation resource owners.
- The candidate path list is updated based on 12 months of operating data from November 2011 to October 2012.
- Generator outages for San Onofre Nuclear Generating Station (SONGS) units 2 and 3 remain in the model, and Huntington Beach units 3 and 4 are available in the model.

The ISO is implementing a new competitive path assessment methodology (dynamic competitive path assessment) which will be phased in in 2012 and will gradually replace the current competitive path assessment.[2] The first phase has already been implemented for the day-ahead market in April 2012, and the real-time market implementation is scheduled for the second phase. Once the dynamic competitive path assessment is fully implemented, there will be no need for the current seasonal release form of competitive path designations.

[1] Competitive Path Assessment for MRTU: Final Results for MRTU Go-Live, February 2009, http://www.caiso.com/Documents/WhitePaper-CompetitivePathAssessment.pdf

[2] Additional information on local market power mitigation enhancements is available at http://www.caiso.com/informed/Pages/StakeholderProcesses/LocalMarketPowerMitigationEnhancements.aspx

2 Background

Local Market Power Mitigation and Reliability Requirement Determination (LMPM-RRD) requires prior designation of network constraints (or paths)[3] 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.[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 DB59 as well as monthly release congestion revenue rights model for December 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 the 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.

[3] The term path is used synonymously with transmission constraint 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.

[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.

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 and 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

Year	Season	Daily peak load
2012	Winter	31,073
2003	Winter	31,151
2010	Winter	31,248
2011	Winter	31,378
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 2011. 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

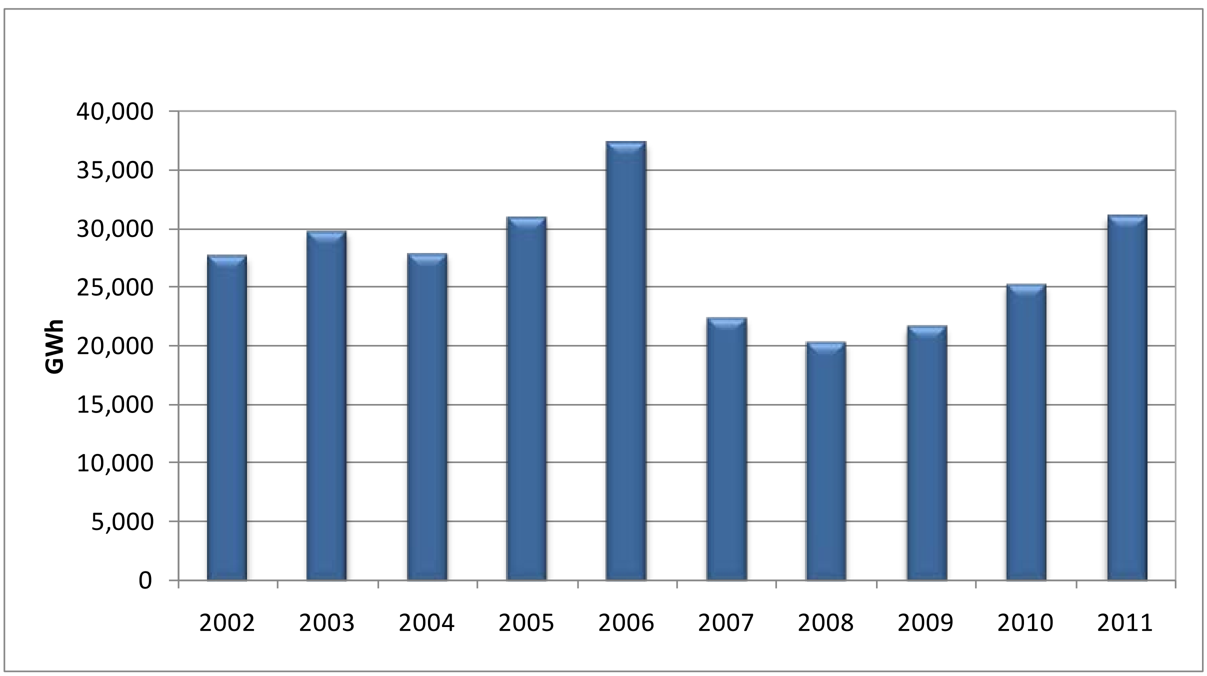

Table 4. Selection of typical day for seasonal hydro scenario

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. The generation resource owners are required to submit latest tolling contract information to the ISO, and the information for 2013 tolling contracts is used to identify generation ownership.

This study focuses specifically on the impact of generation capacity by the eleven 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	3,261
S3	3,094
S4	2,365
S5	2,084
S6	1,585
S7	1,187
S8	1,185
S9	743
S10	727
S11	590

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 November 2011 through October 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 procedure, 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
SCE_PCT_IMP_BG	1829
34101_CERTANJ2_115_34116_LEGRAND_115_BR_1_1	1399
T-133METCALF_NG	1334
34112_EXCHEQUR_115_34116_LEGRAND_115_BR_1_1	1287
30900_GATES_230_30970_MIDWAY_230_BR_1_1	1235
30875_MCCALL_230_30880_HENTAP2_230_BR_1_1	1096
SLIC1883001_SDGE_OC_NG	1064
30881_HENRIETA_230_34430_HENRETTA_115_XF_3	1021
30790_PANOCHE_230_30825_MCMULLN1_230_BR_1_1	1015
30825_MCMULLN1_230_30830_KEARNEY_230_BR_1_1	1015
30880_HENTAP2_230_30881_HENRIETA_230_BR_2_1	1015
34159_PANOCHEJ_115_34158_PANOCHE_115_BR_1_1	1015
34159_PANOCHEJ_115_34160_HAMMONDS_115_BR_1_1	1015
34160_HAMMONDS_115_34161_DFSTP_115_BR_1_1	1015
34161_DFSTP_115_34162_OROLOMA_115_BR_1_1	1015
34100_CHWCHLLA_115_34101_CERTANJ2_115_BR_1_1	1002
30790_PANOCHE_230_30873_HELM_230_BR_1_1	998
34157_PANOCHET_115_34156_MENDOTA_115_BR_1_1	985
34116_LEGRAND_115_34134_WILSONAB_115_BR_1_1	981
30515_WARNERVL_230_30800_WILSON_230_BR_1_1	978
30796_STOREY1_230_30800_WILSON_230_BR_1_1	978
30796_STOREY1_230_30810_GREGG_230_BR_1_1	978
30805_BORDEN_230_30810_GREGG_230_BR_1_1	978
30810_GREGG_230_30879_HENTAP1_230_BR_1_1	978
30830_KEARNEY_230_30835_HERNDON_230_BR_1_1	978
30835_HERNDON_230_34412_HERNDON_115_XF_1_P	978
30835_HERNDON_230_34412_HERNDON_115_XF_1_S	978
30835_HERNDON_230_34412_HERNDON_115_XF_1_T	978
30835_HERNDON_230_34412_HERNDON_115_XF_2_P	978
30835_HERNDON_230_34412_HERNDON_115_XF_2_S	978
30835_HERNDON_230_34412_HERNDON_115_XF_2_T	978
30873_HELM_230_30875_MCCALL_230_BR_1_1	978
30875_MCCALL_230_34370_MCCALL_115_XF_1_P	978
30875_MCCALL_230_34370_MCCALL_115_XF_1_S	978
30875_MCCALL_230_34370_MCCALL_115_XF_1_T	978
30875_MCCALL_230_34370_MCCALL_115_XF_2	978
30875_MCCALL_230_34370_MCCALL_115_XF_3_P	978
30875_MCCALL_230_34370_MCCALL_115_XF_3_S	978
30875_MCCALL_230_34370_MCCALL_115_XF_3_T	978
30879_HENTAP1_230_30881_HENRIETA_230_BR_1_1	978
34105_CERTANJ1_115_34100_CHWCHLLA_115_BR_1_1	978
34105_CERTANJ1_115_34121_SHARONT_115_BR_1_1	978
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1_1	978
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1A_1	978
34128_OAKH_JCT_115_34123_KERCH1TP_115_BR_2_1	978
34157_PANOCHET_115_34158_PANOCHE_115_BR_1_1	978
34158_PANOCHE_115_30790_PANOCHE_230_XF_1	978
34356_KERCKHF1_115_34123_KERCH1TP_115_BR_1_1	978
34358_KERCKHF2_115_34123_KERCH1TP_115_BR_2_1	978

CONSTRAINT_NAME	HOUR
34358_KERCKHF2_115_34360_WWARDJT_115_BR_1_1	978
34360_WWARDJT_115_34414_WOODWARD_115_BR_1_1	978
34362_CLOVIS_115_34363_CLOVISJ1_115_BR_1_1	978
34363_CLOVISJ1_115_34360_WWARDJT_115_BR_1_1	978
34363_CLOVISJ1_115_34366_SANGER_115_BR_1_1	978
34418_KINGSBRG_115_34420_CORCORAN_115_BR_1_1	978
34418_KINGSBRG_115_34420_CORCORAN_115_BR_2_1	978
34460_GUERNSEY_70.0_34462_GUR3TPT_70.0_BR_1_1	978
34462_GUR3TPT_70.0_34542_JCBSCRNR_70.0_BR_1_1	978
34462_GUR3TPT_70.0_34554_AMSTGSW_70.0_BR_1_1	978
34540_HENRITTA_70.0_34542_JCBSCRNR_70.0_BR_1_1	978
STHMAGUNDEN_BG	950
31000_HUMBOLDT_115_31452_TRINITY_115_BR_1_1	929
31461_JESSTAP_115_31464_COTWDPGE_115_BR_1_1	922
31452_TRINITY_115_31461_JESSTAP_115_BR_1_1	904
6110_TM_BNK_FLO_TMS_DLO_NG	787
31080_HUMBOLDT_60.0_31092_MPLECRK_60.0_BR_1_1	784
24087_MAGUNDEN_230_24401_ANTELOPE_230_BR_1_1	742
24087_MAGUNDEN_230_24401_ANTELOPE_230_BR_2_1	742
24401_ANTELOPE_230_24114_PARDEE_230_BR_1_1	742
HUMBOLDT_IMP_NG	698
31566_KESWICK_60.0_31582_STLLWATR_60.0_BR_1_1	693
31580_CASCADE_60.0_31582_STLLWATR_60.0_BR_1_1	693
SDGE_CFEIMP_BG	656
31080_HUMBOLDT_60.0_31088_HMBLTJT_60.0_BR_1_1	647
31010_LOWGAP1_115_31015_BRDGVLLE_115_BR_1_1	644
31011_FRSTGLEN_115_31010_LOWGAP1_115_BR_1_1	644
31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1_1	644
31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1_1	644
31092_MPLECRK_60.0_31093_HYMPOMJT_60.0_BR_1_1	623
31093_HYMPOMJT_60.0_31553_BIGBAR_60.0_BR_1_1	623
31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1_1	623
31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1_1	623
31555_MSSTAP2_60.0_31553_BIGBAR_60.0_BR_1_1	623
31555_MSSTAP2_60.0_31557_MILSTSTA_60.0_BR_1_1	623
31556_TRINITY_60.0_31555_MSSTAP2_60.0_BR_1_1	623
31080_HUMBOLDT_60.0_31000_HUMBOLDT_115_XF_2	602
31088_HMBLTJT_60.0_31084_HARRISST_60.0_BR_1_1	588
31088_HMBLTJT_60.0_31090_HMBLTBY_60.0_BR_1_1	588
25406_J.HINDS_230_24806_MIRAGE_230_BR_1_1	574
31000_HUMBOLDT_115_31015_BRDGVLLE_115_BR_1_1	574
7830_SXCYN_CHILLS_NG	571
IVALLYBANK_XFBG	556
32218_DRUM_115_32244_BRNSWKT2_115_BR_2_1	553
HUMBSB_BK_BG	540
32225_BRNSWKT1_115_32222_DTCH2TAP_115_BR_1_1	522
31482_PALERMO_115_31506_HONCJT1_115_BR_1_1	507
TRNTY-CTTWD_NG_SUM	506
BARRE-LEWIS_NG	502

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 4 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 Competitive path assessment results

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

Table 7. Model output for base case: 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	10,013	12,114	10,613	6,703	542	4,229	-1,117	803
2	9,688	11,715	9,947	6,709	616	3,959	-1,365	468
3	9,578	11,570	9,930	6,765	552	3,743	-1,376	487
4	9,649	11,635	10,107	6,830	558	3,734	-1,276	592
5	10,046	11,937	10,738	6,918	648	3,578	-1,000	928
6	10,974	12,855	12,199	7,136	817	3,578	-440	1,681
7	12,373	13,969	12,925	7,896	1,607	3,832	-638	1,600
8	12,820	14,847	13,022	8,332	2,247	4,204	-360	1,835
9	12,782	15,342	13,072	8,434	2,729	4,125	278	2,504
10	12,815	15,616	13,025	8,443	2,858	4,343	352	2,586
11	12,873	15,784	13,018	8,566	2,940	4,345	415	2,648
12	12,706	15,793	12,934	8,557	2,996	4,223	519	2,784
13	12,567	15,724	12,799	8,572	3,003	4,132	483	2,773
14	12,485	15,716	12,721	8,638	3,024	4,038	508	2,808
15	12,353	15,549	12,628	8,351	2,937	4,208	442	2,771
16	12,308	15,311	12,460	8,077	3,033	4,281	371	2,708
17	13,064	16,103	12,596	9,116	3,246	4,472	40	2,282
18	14,290	17,649	14,106	9,926	3,779	4,350	618	3,164
19	14,108	17,322	13,976	9,462	3,974	4,239	858	3,453
20	13,746	16,986	14,033	9,442	3,566	3,912	858	3,481
21	13,145	16,318	13,760	9,188	2,846	3,843	423	3,069
22	12,261	15,084	12,684	8,475	2,285	4,122	-5	2,293
23	11,159	13,794	11,762	7,475	1,657	4,002	-90	2,030
24	10,206	12,672	10,764	6,983	1,121	4,022	-497	1,422

Table 8. Failed candidate path list

CONSTRAINT NAME
-None -

Table 9. Competitive path list

CONSTRAINT_NAME	CONSTRAINT_NAME
SCE_PCT_IMP_BG	34358_KERCKHF2_115_34360_WWARDJT_115_BR_1_1
34101_CERTANJ2_115_34116_LEGRAND_115_BR_1_1	34360_WWARDJT_115_34414_WOODWARD_115_BR_1_1
T-133METCALF_NG	34362_CLOVIS_115_34363_CLOVISJ1_115_BR_1_1
34112_EXCHEQUR_115_34116_LEGRAND_115_BR_1_1	34363_CLOVISJ1_115_34360_WWARDJT_115_BR_1_1
30900_GATES_230_30970_MIDWAY_230_BR_1_1	34363_CLOVISJ1_115_34366_SANGER_115_BR_1_1
30875_MCCALL_230_30880_HENTAP2_230_BR_1_1	34418_KINGSBRG_115_34420_CORCORAN_115_BR_1_1
SLIC1883001_SDGE_OC_NG	34418_KINGSBRG_115_34420_CORCORAN_115_BR_2_1
30881_HENRIETA_230_34430_HENRETTA_115_XF_3	34460_GUERNSEY_70.0_34462_GUR3TPT_70.0_BR_1_1
30790_PANOCHE_230_30825_MCMULLN1_230_BR_1_1	34462_GUR3TPT_70.0_34542_JCBSCRNR_70.0_BR_1_1
30825_MCMULLN1_230_30830_KEARNEY_230_BR_1_1	34462_GUR3TPT_70.0_34554_AMSTGSW_70.0_BR_1_1
30880_HENTAP2_230_30881_HENRIETA_230_BR_2_1	34540_HENRITTA_70.0_34542_JCBSCRNR_70.0_BR_1_1
34159_PANOCHEJ_115_34158_PANOCHE_115_BR_1_1	STHMAGUNDEN_BG
34159_PANOCHEJ_115_34160_HAMMONDS_115_BR_1_1	31000_HUMBOLDT_115_31452_TRINITY_115_BR_1_1
34160_HAMMONDS_115_34161_DFSTP_115_BR_1_1	31461_JESSTAP_115_31464_COTWDPGE_115_BR_1_1
34161_DFSTP_115_34162_OROLOMA_115_BR_1_1	31452_TRINITY_115_31461_JESSTAP_115_BR_1_1
34100_CHWCHLLA_115_34101_CERTANJ2_115_BR_1_1	6110_TM_BNK_FLO_TMS_DLO_NG
30790_PANOCHE_230_30873_HELM_230_BR_1_1	31080_HUMBOLDT_60.0_31092_MPLECRK_60.0_BR_1_1
34157_PANOCHET_115_34156_MENDOTA_115_BR_1_1	24087_MAGUNDEN_230_24401_ANTELOPE_230_BR_1_1
34116_LEGRAND_115_34134_WILSONAB_115_BR_1_1	24087_MAGUNDEN_230_24401_ANTELOPE_230_BR_2_1
30515_WARNERVL_230_30800_WILSON_230_BR_1_1	24401_ANTELOPE_230_24114_PARDEE_230_BR_1_1
30796_STOREY1_230_30800_WILSON_230_BR_1_1	HUMBOLDT_IMP_NG
30796_STOREY1_230_30810_GREGG_230_BR_1_1	31566_KESWICK_60.0_31582_STLLWATR_60.0_BR_1_1
30805_BORDEN_230_30810_GREGG_230_BR_1_1	31580_CASCADE_60.0_31582_STLLWATR_60.0_BR_1_1
30810_GREGG_230_30879_HENTAP1_230_BR_1_1	SDGE_CFEIMP_BG
30830_KEARNEY_230_30835_HERNDON_230_BR_1_1	31080_HUMBOLDT_60.0_31088_HMBLTJT_60.0_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_1_P	31010_LOWGAP1_115_31015_BRDGVLLE_115_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_1_S	31011_FRSTGLEN_115_31010_LOWGAP1_115_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_1_T	31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_2_P	31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_2_S	31092_MPLECRK_60.0_31093_HYMPOMJT_60.0_BR_1_1
30835_HERNDON_230_34412_HERNDON_115_XF_2_T	31093_HYMPOMJT_60.0_31553_BIGBAR_60.0_BR_1_1
30873_HELM_230_30875_MCCALL_230_BR_1_1	31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_1_P	31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_1_S	31555_MSSTAP2_60.0_31553_BIGBAR_60.0_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_1_T	31555_MSSTAP2_60.0_31557_MILSTSTA_60.0_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_2	31556_TRINITY_60.0_31555_MSSTAP2_60.0_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_3_P	31080_HUMBOLDT_60.0_31000_HUMBOLDT_115_XF_2
30875_MCCALL_230_34370_MCCALL_115_XF_3_S	31088_HMBLTJT_60.0_31084_HARRISST_60.0_BR_1_1
30875_MCCALL_230_34370_MCCALL_115_XF_3_T	31088_HMBLTJT_60.0_31090_HMBLTBY_60.0_BR_1_1
30879_HENTAP1_230_30881_HENRIETA_230_BR_1_1	25406_J.HINDS_230_24806_MIRAGE_230_BR_1_1
34105_CERTANJ1_115_34100_CHWCHLLA_115_BR_1_1	31000_HUMBOLDT_115_31015_BRDGVLLE_115_BR_1_1
34105_CERTANJ1_115_34121_SHARONT_115_BR_1_1	7830_SXCYN_CHILLS_NG
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1_1	IVALLYBANK_XFBG
34116_LEGRAND_115_34154_DAIRYLND_115_BR_1A_1	32218_DRUM_115_32244_BRNSWKT2_115_BR_2_1
34128_OAKH_JCT_115_34123_KERCH1TP_115_BR_2_1	HUMBSB_BK_BG
34157_PANOCHET_115_34158_PANOCHE_115_BR_1_1	32225_BRNSWKT1_115_32222_DTCH2TAP_115_BR_1_1
34158_PANOCHE_115_30790_PANOCHE_230_XF_1	31482_PALERMO_115_31506_HONCJT1_115_BR_1_1
34356_KERCKHF1_115_34123_KERCH1TP_115_BR_1_1	TRNTY-CTTWD_NG_SUM
34358_KERCKHF2_115_34123_KERCH1TP_115_BR_2_1	BARRE-LEWIS_NG

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 5,000 transmission facilities 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 full network model 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.