California Independent
System Operator Corporation

Competitive Path Assessment for spring 2010

Department of Market Monitoring

March 2010

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1 Executive Summary

The competitive path designations resulting from the competitive path assessment (CPA) will be used to establish the set of transmission paths applied in the two market passes of MRTU where local market power mitigation (LMPM) is applied. The initial competitive path designations were used for the first 12 months of the California Independent System Operator Corporation's (ISO) new nodal market design. 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 will be 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 2010 spring season (April, May, June).[2]

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production scenarios (high, medium, and low), and combinations of the nine largest suppliers' internal generation withdrawn from the model.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 125 candidate paths pass the test and will be deemed as competitive for market power mitigation purposes. It is important to note that by default, all paths are deemed uncompetitive except for "grandfathered" paths (existing branch groups).

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

- The Full Network Model is based on the 2010 release CRR model for DB43, while previous results are based on CRR model for DB32.
- Pivotal suppliers' capacities are adjusted based on the latest tolling agreement survey (December 2009) covering January 2010 to December 2010 from major generation companies and load serving entities.
- The candidate path list is updated based on 2009 operating data, with 2009 Q1 in pre-MRTU operation and 2009 Q2-Q4 in MRTU operation.
- Input data has been updated from historical data up to year 2009.

Additional details of the spring 2010 CPA were provided and discussed at the last two Market Surveillance committee meetings.[3]

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

[2] These designations will be updated for summer conditions by July 2010. However, we may apply summer designations in June if results of the summer CPA are completed and system conditions begin to more closely reflect summer conditions in June.

[3] http://www.caiso.com/271f/271f93564bde0.html
http://www.caiso.com/2757/275784e32baa0.html

2 Background

Local Market Power Mitigation and Reliability Requirement Determination (LMPM-RRD) under MRTU requires prior designation of network constraints (or paths)[4] into two classes, “competitive” and “non-competitive.” Under the MRTU 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.[5] In its MRTU Tariff Filing, the ISO proposed to designate all of today’s existing zonal transmission branch groups as “competitive” and undertake a study prior to MRTU implementation to determine whether additional transmission paths could be designated as “competitive” for day one of MRTU. Thereafter, the ISO proposed to reevaluate path designations on an annual basis or sooner if system or market conditions changed significantly.[6]

LMPM-RRD in MRTU will be applied in a two-step process that is used 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 FNM 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 (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 and 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 the same as the congestion revenue rights full network model (CRR FNM). The network model used in current CPA is the one released in late December, 2009 (named DB43). This CRR

[4] 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.

[5] A detailed description of the MRTU LMPM-RRD procedures can be found in the MRTU Tariff and MRTU Business Process Manuals on the CAISO web site at http://www.caiso.com/docs/2001/12/21/2001122108490719681.html.

[6] Specifically, the CAISO may perform additional competitive assessments during the first year if changes in transmission infrastructure, generation resources, or load in the CAISO Control Area and adjacent Control Areas suggest material changes in market conditions, or if market outcomes are observed that are inconsistent with competitive market outcomes.

FNM is a bus-branch oriented network model which is derived directly from MRTU FNM software using the CRR FNM exporting interface. This base PTI format bus-branch model was then imported into the PLEXOS simulation model for competitive path assessment effort.

2.1.1 Projected Transmission Upgrade

Since the competitive path assessment is a forward-looking study, potential major transmission upgrades and corresponding operating procedure changes are incorporated. Trans-Bay Cable project is a major transmission upgrade for 2010 operating year. The Trans Bay Cable (TBC) is a 53 mile, 400 megawatt, 200 kV, unidirectional (from Pittsburg to Potrero), direct current (DC) transmission line that runs under the San Francisco Bay that establishes a direct connection between Pacific Gas & Electric's (PG&E) Pittsburgh substation located adjacent to the City of Pittsburgh, California in Contra Costa County and the Potrero substation within the City of San Francisco. With Trans Bay Cable in service, Potrero unit 3 will be removed.

These changes due to the Trans-Bay Cable were incorporated in the CPA as follows:

1. An import schedule at Potrero substation and an export schedule at Pittsburg substation are put in the model. The import and export schedules are set to be equal.
2. Potrero unit 3 is removed from the model.
3. Potrero unit 4, 5, 6 are in the model.

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 PG&E, Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E) 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 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 four seasons 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 in spring 2008 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
2005	SP	38694
2009	SP	39370
2003	SP	40117
2004	SP	40476
2007	SP	40839
2002	SP	41023
2006	SP	43719
2008	**SP**	**46789**

Table 2. Selection of Typical Day for Seasonal Load Scenario

Load Scenario	Spring
High	5/15/2008
Medium	6/12/2008
Low	4/29/2008

Table 3. System Daily Peak Load for Three Load Scenarios (MW)

Load Scenario	Spring
High	41,545
Medium	36,069
Low	31,832

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 be simulated based on California's historical hydroelectric production data. Figure 1 shows the hydroelectric production level of hydroelectric resources within the ISO control area from 2002. As shown in Figure 1, 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 CAISO Hydroelectric Production

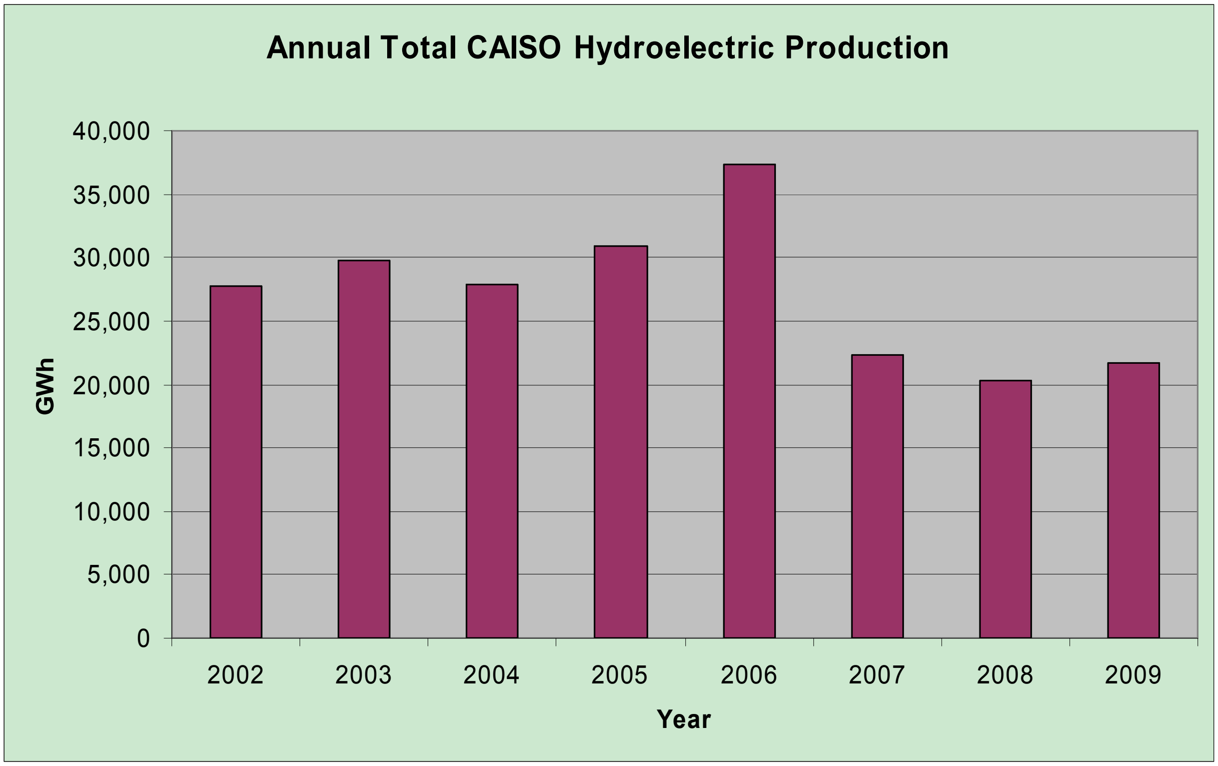

Table 4. Selection of Typical Day for Seasonal Hydro Scenario

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 2009 for large generation companies and load serving entities, for the survey period between January and December 2010.

This study focuses specifically on the impact of withdrawn capacity by the 9 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. The 9 largest suppliers are the same as the largest suppliers in the previous CPA.

Table 5. Suppliers Considered and Their Generation Capacity Concentration, Adjusted for Tolling Agreements

Supplier	Capacity
S1	4388
S2	2582
S3	1898
S4	1892
S5	1119
S6	1036
S7	713
S8	625
S9	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 real-time operational mitigation that has occurred in the most recent 12 months of operation.

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

January – March 2009

For the first three months of this period (January through March 2009), hours of congestion management were based on the same methodology used for the initial designations made prior to implementation of the ISO's new market design. For this period, the frequency of real-time operational mitigation was based on real-time reliability must run (RMR) dispatches and real-time out-of-sequence (OOS) dispatches.

For real-time operational mitigation 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.

For out-of-sequence dispatches, operator log entries were used to identify the reason for each individual OOS dispatch. 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 dispatched out-of-sequence in real time was credited toward 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 OOS dispatch.

The mitigation information resulting from this mapping of resource-specific real-time RMR and OOS dispatch to transmission lines was combined to calculate the number of hours each identified transmission facility was mitigated during this three month period.

April – December 2009

For the period after implementation of the ISO's new market, hours of congestion management were based on RMR dispatches, exceptional dispatches, and market congestion.

Hours of potential congestion management via RMR dispatches were assessed using the same methodology used in prior CPA studies, and to account for RMR dispatches during the January – March 2009 period, as described above.

For exceptional dispatches, hours of potential congestion management via out-of-sequence dispatches were assessed using the same methodology used in prior CPA studies, and to account out-of-sequence dispatches during the January – March 2009 period, as described above.

For market congestion, Department of Market Monitoring (DMM) counted every hour where the constraint's market flow equaled or exceeded its limit 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.

Each hour that a constraint had congestion managed from RMR, exceptional dispatch, market congestion, or any combination of the three categories was counted as one hour of congestion for the constraint.

Finally, the total hours of managed congestion from Q1 were added to the total hours of managed congestion from Q2-Q4 for each constraint to determine the constraint's total number of hours of managed congestion for 2009.

Table 6 shows intra-zonal interfaces and individual transmission lines that are not part of any predefined interface/constraints that had greater than 500 hours of real-time mitigation and consequently have been identified as candidate paths.

Table 6. Candidate Competitive Paths that are Predefined Constraints

CONSTRAINT_NAME	Hour
31010_LOWGAP1_115_31015_BRDGVLLE_115_BR_1_1	3268
31011_FRSTGLEN_115_31010_LOWGAP1_115_BR_1_1	3268
31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1_1	3268
31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1_1	3268
31000_HUMBOLDT_115_31001_HMBLTTM_1.0_XF_1	3234
31000_HUMBOLDT_115_31452_TRINITY_115_BR_1_1	3230
31080_HUMBOLDT_60.0_31000_HUMBOLDT_115_XF_2	3230
31080_HUMBOLDT_60.0_31001_HMBLTTM_1.0_XF_1	3230
31080_HUMBOLDT_60.0_31092_MPLECRK_60.0_BR_1_1	3230
31110_BRDGVLLE_60.0_31112_FRUITLND_60.0_BR_1_1	3230
31112_FRUITLND_60.0_31114_FRTSWRD_60.0_BR_1_1	3230
31114_FRTSWRD_60.0_31116_GRBRVLLE_60.0_BR_1_1	3230
HUMBOLDT_BG	1425
31452_TRINITY_115_31461_JESSTAP_115_BR_1_1	1188
31461_JESSTAP_115_31464_COTWDPGE_115_BR_1_1	1188
31566_KESWICK_60.0_31582_STLLWATR_60.0_BR_1_1	1188
31580_CASCADE_60.0_31582_STLLWATR_60.0_BR_1_1	1188
31000_HUMBOLDT_115_31015_BRDGVLLE_115_BR_1_1	1074
31092_MPLECRK_60.0_31093_HYMPOMJT_60.0_BR_1_1	1074
31093_HYMPOMJT_60.0_31553_BIGBAR_60.0_BR_1_1	1074
31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1_1	1074
31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1_1	1074
31306_WILLITS_60.0_31308_LYTNVLLE_60.0_BR_1_1	1074
31555_MSSTAP2_60.0_31553_BIGBAR_60.0_BR_1_1	1074
31555_MSSTAP2_60.0_31557_MILSTSTA_60.0_BR_1_1	1074
31556_TRINITY_60.0_31555_MSSTAP2_60.0_BR_1_1	1074
HUMBOLDT_XFBG	1074
22652_PENSQTOS_230_22596_OLDTOWN_230_BR_1_1	967
15090_HASSYAMP_500_22536_N.GILA_500_BR_1_1	955
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_1_1	927
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_2_1	927
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_3_1	927
22844_TALEGA_230_24131_S.ONOFRE_230_BR_1_1	927
22844_TALEGA_230_24131_S.ONOFRE_230_BR_2_1	927
22536_N.GILA_500_22360_IMPRLVLY_500_BR_1_1	916
33912_SPRNGGJ_115_33914_MI-WUK_115_BR_1_1	915
22356_IMPRLVLY_230_22360_IMPRLVLY_500_XF_80	903
22652_PENSQTOS_230_22232_ENCINA_230_BR_1_1	899
20149_TJI-230_230_22464_MIGUEL_230_BR_1_1	894
22227_ENCINATP_230_22232_ENCINA_230_BR_1_1	894
22227_ENCINATP_230_22716_SANLUSRY_230_BR_2_1	894
22260_ESCNDIDO_230_22844_TALEGA_230_BR_1_1	894
22261_PALOMAR_230_22227_ENCINATP_230_BR_1_1	894
22261_PALOMAR_230_22260_ESCNDIDO_230_BR_1_1	894
22261_PALOMAR_230_22260_ESCNDIDO_230_BR_2_1	894
22356_IMPRLVLY_230_20118_ROA-230_230_BR_1_1	894
22356_IMPRLVLY_230_22360_IMPRLVLY_500_XF_81	894
22360_IMPRLVLY_500_22468_MIGUEL_500_BR_1_2	894
22464_MIGUEL_230_22504_MISSION_230_BR_1_1	894
22464_MIGUEL_230_22504_MISSION_230_BR_2_1	894
22464_MIGUEL_230_22832_SYCAMORE_230_BR_1_1	894
22464_MIGUEL_230_22832_SYCAMORE_230_BR_2_1	894
22596_OLDTOWN_230_22464_MIGUEL_230_BR_1_1	894
22596_OLDTOWN_230_22504_MISSION_230_BR_1_1	894
22596_OLDTOWN_230_22504_MISSION_230_BR_2_1	894
22648_PENSQTOS_138_22228_ENCINA_138_BR_1_1	894
22716_SANLUSRY_230_22232_ENCINA_230_BR_1_1	894
22716_SANLUSRY_230_22504_MISSION_230_BR_1_1	894
22716_SANLUSRY_230_22504_MISSION_230_BR_2_1	894
22832_SYCAMORE_230_22261_PALOMAR_230_BR_1_1	894

CONSTRAINT_NAME	Hour
IVALLYBANK_XFBG	851
30569_KELSO_230_30570_USWP-RLF_230_BR_1_1	796
30570_USWP-RLF_230_30625_TESLAD_230_BR_1_1	796
30580_ALTMMDW_230_30625_TESLAD_230_BR_1_1	796
38610_DELTAPMP_230_30580_ALTMMDW_230_BR_1_1	796
30460_VACA-DIX_230_30478_LAMBIE_230_BR_1_1	791
30460_VACA-DIX_230_30478_LAMBIE_230_BR_1A_1	789
30472_PEABODY_230_30529_BRDSLDNG_230_BR_1A_1	740
30472_PEABODY_230_30529_BRDSLDNG_230_BR_1_1	740
33206_BAYSHOR1_115_33208_MARTINC_115_BR_1_1	727
SDGEIMP_BG	720
SDGE_CFEIMP_BG	688
30567_TESJCT_230_30700_SANMATEO_230_BR_1_1	653
99102_PIT-TES1_230_30567_TESJCT_230_BR_1_2	653
33205_HNTRSPT_115_33208_MARTINC_115_BR_3_1	638
33204_POTRERO_115_33206_BAYSHOR1_115_BR_1_1	613
33310_SANMATEO_115_33315_RAVENSWD_115_BR_1_1	613
33203_MISSON_115_33204_POTRERO_115_BR_1_1	611
33204_POTRERO_115_33207_BAYSHOR2_115_BR_2_1	606
33207_BAYSHOR2_115_33208_MARTINC_115_BR_2_1	606
30703_RAVENSWD_230_30700_SANMATEO_230_BR_1_1	605
30703_RAVENSWD_230_30700_SANMATEO_230_BR_2_1	605
30705_MONTAVIS_230_30710_SLACTAP1_230_BR_1_1	605
30705_MONTAVIS_230_30712_SLACTAP2_230_BR_2_1	605
30710_SLACTAP1_230_30715_JEFFERSN_230_BR_1_1	605
30712_SLACTAP2_230_30715_JEFFERSN_230_BR_2_1	605
33205_HNTRSPT_115_33208_MARTINC_115_BR_1_1	579
33208_MARTINC_115_33310_SANMATEO_115_BR_3_1	578
99106_SAN-MAR1_230_99104_MAR-SAN1_230_BR_1_3	578
30560_E.SHORE_230_30700_SANMATEO_230_BR_1_1	577
30685_EMBRCDR_230_99158_MAR-EMBD_230_BR_2_1	577
30685_EMBRCDR_230_99160_MAR-EMBE_230_BR_1_1	577
30717_TRAN230B_230_99170_MAR-JEF1_230_BR_1_1	577
33200_LARKIN_115_33203_MISSON_115_BR_1_1	577
33200_LARKIN_115_33204_POTRERO_115_BR_1_1	577
33200_LARKIN_115_33204_POTRERO_115_BR_2_1	577
33200_LARKIN_115_33208_MARTINC_115_BR_1_1	577
33203_MISSON_115_33205_HNTRSPT_115_BR_1_1	577
33203_MISSON_115_33205_HNTRSPT_115_BR_2_1	577
33204_POTRERO_115_33205_HNTRSPT_115_BR_1_1	577
33208_MARTINC_115_30695_MARTINC_230_XF_7	577
33208_MARTINC_115_30695_MARTINC_230_XF_8	577
33208_MARTINC_115_33303_ESTGRND_115_BR_2_1	577
33208_MARTINC_115_33307_MILLBRAE_115_BR_1_1	577
33208_MARTINC_115_33322_UALTAP_115_BR_5_1	577
33208_MARTINC_115_33356_BURLNGME_115_BR_4_1	577
33305_SHAWROAD_115_33208_MARTINC_115_BR_6_1	577
33306_SFIA_115_33310_SANMATEO_115_BR_5_1	577
33307_MILLBRAE_115_33310_SANMATEO_115_BR_1_1	577
33308_SFIA-MA_115_33303_ESTGRND_115_BR_2_1	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_5_P	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_5_S	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_5_T	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_6_P	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_6_S	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_6_T	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_7_P	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_7_S	577
33310_SANMATEO_115_30700_SANMATEO_230_XF_7_T	577
33310_SANMATEO_115_33305_SHAWROAD_115_BR_6_1	577
33310_SANMATEO_115_33308_SFIA-MA_115_BR_2_1	577
33310_SANMATEO_115_33312_BELMONT_115_BR_1_1	577
33322_UALTAP_115_33306_SFIA_115_BR_5_1	577
33356_BURLNGME_115_33310_SANMATEO_115_BR_4_1	577
24156_VINCENT_500_24155_VINCENT_230_XF_1_P	506

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 present the hourly system conditions for the base case, medium load and medium hydro scenario in the spring without any suppliers' capacity removed.

3.1 2010 Spring Season Results

3.1.1 Base Case Results

The base case results for spring 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,[7] and internal path flows (Path 15 and Path 26) for each of the 24 hours of the spring medium load medium hydro base case.

The SP26 area is a net importer from Path 26 and interties, and NP26 has relatively balanced generation and load. Flows on Path 15 are from south-to-north (ZP26 to NP15) and Path 26 is from north-to-south. The peak Northwest import from Malin and Cascade are over 3,000 MW, and peak import to SP26 is over 6,000MW from interties such as NOB, Mead, Palo Verde, etc.

3.1.2 CPA Results

All of the candidate path 125 paths examined in the CPA passed under spring conditions, and are therefore deemed competitive for the 2010 spring season.

[7] The net imports into NP26 are calculated as the net intertie from Cascade and Malin. The net imports in the SP26 are calculated as the sum of NOB, BLYTHE, ELDORADO, Four Corner, .MCCLUG, MEAD, Palo Verde, Merchant, Parker, and TJUANA.

Table 7. Base Case: Model Output for Spring, 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	12,554	12,630	11,301	6,499	2,682	3,817	-359	2,009
2	12,126	12,074	11,438	5,263	1,725	3,538	-961	1,663
3	11,800	11,776	11,416	5,007	1,435	3,572	-960	1,725
4	11,749	11,722	11,461	4,931	1,355	3,576	-953	1,740
5	12,093	12,239	11,740	5,551	1,944	3,607	-360	2,295
6	12,415	12,768	11,805	6,025	1,961	4,064	-489	2,047
7	13,500	13,960	12,614	6,550	1,780	4,770	-1,337	1,298
8	13,721	14,969	13,178	6,939	1,819	5,120	-1,044	1,510
9	13,883	15,891	14,121	7,348	1,884	5,464	-286	2,294
10	14,521	16,808	14,950	7,726	1,875	5,851	-122	2,469
11	15,125	17,548	15,321	7,963	2,184	5,779	-30	2,719
12	15,524	17,977	15,731	7,820	2,223	5,597	-239	2,598
13	15,865	18,394	17,112	7,416	1,951	5,465	-117	3,112
14	16,418	18,854	17,676	7,550	1,953	5,597	-139	3,061
15	16,917	19,109	18,157	7,791	2,179	5,612	-9	3,202
16	17,169	18,900	18,361	7,447	2,010	5,437	-184	3,035
17	17,309	18,694	18,205	7,352	1,751	5,601	-801	2,444
18	17,174	18,006	17,948	7,671	2,008	5,663	-918	2,334
19	16,786	17,365	17,099	8,032	2,398	5,634	-669	2,318
20	16,070	17,207	16,353	8,646	2,835	5,811	147	2,857
21	15,929	17,620	16,104	8,204	2,613	5,591	-20	2,714
22	15,067	16,401	15,243	8,048	2,270	5,778	-195	2,374
23	13,576	15,020	12,749	8,183	2,921	5,262	128	2,286
24	12,570	13,736	11,990	7,746	3,186	4,560	826	2,915

Table 8. Competitive Path List

CONSTRAINT_NAME	CONSTRAINT_NAME
31010_LOWGAP1_115_31015_BRDGVLLE_115_BR_1_1	30580_ALTMMDW_230_30625_TESLAD_230_BR_1_1
31011_FRSTGLEN_115_31010_LOWGAP1_115_BR_1_1	38610_DELTAPMP_230_30580_ALTMMDW_230_BR_1_1
31450_WILDWOOD_115_31011_FRSTGLEN_115_BR_1_1	30460_VACA-DIX_230_30478_LAMBIE_230_BR_1_1
31450_WILDWOOD_115_31464_COTWDPGE_115_BR_1_1	30460_VACA-DIX_230_30478_LAMBIE_230_BR_1A_1
31000_HUMBOLDT_115_31001_HMBLTTM_1.0_XF_1	30472_PEABODY_230_30529_BRDSLDNG_230_BR_1A_1
31000_HUMBOLDT_115_31452_TRINITY_115_BR_1_1	30472_PEABODY_230_30529_BRDSLDNG_230_BR_1_1
31080_HUMBOLDT_60.0_31000_HUMBOLDT_115_XF_2	33206_BAYSHOR1_115_33208_MARTINC_115_BR_1_1
31080_HUMBOLDT_60.0_31001_HMBLTTM_1.0_XF_1	SDGEIMP_BG
31080_HUMBOLDT_60.0_31092_MPLECRK_60.0_BR_1_1	SDGE_CFEIMP_BG
31110_BRDGVLLE_60.0_31112_FRUITLND_60.0_BR_1_1	30567_TESJCT_230_30700_SANMATEO_230_BR_1_1
31112_FRUITLND_60.0_31114_FRTSWRD_60.0_BR_1_1	99102_PIT-TES1_230_30567_TESJCT_230_BR_1_2
31114_FRTSWRD_60.0_31116_GRBRVLLE_60.0_BR_1_1	33205_HNTRSPT_115_33208_MARTINC_115_BR_3_1
HUMBOLDT_BG	33204_POTRERO_115_33206_BAYSHOR1_115_BR_1_1
31452_TRINITY_115_31461_JESSTAP_115_BR_1_1	33310_SANMATEO_115_33315_RAVENSWD_115_BR_1_1
31461_JESSTAP_115_31464_COTWDPGE_115_BR_1_1	33203_MISSON_115_33204_POTRERO_115_BR_1_1
31566_KESWICK_60.0_31582_STLLWATR_60.0_BR_1_1	33204_POTRERO_115_33207_BAYSHOR2_115_BR_2_1
31580_CASCADE_60.0_31582_STLLWATR_60.0_BR_1_1	33207_BAYSHOR2_115_33208_MARTINC_115_BR_2_1
31000_HUMBOLDT_115_31015_BRDGVLLE_115_BR_1_1	30703_RAVENSWD_230_30700_SANMATEO_230_BR_1_1
31092_MPLECRK_60.0_31093_HYMPOMJT_60.0_BR_1_1	30703_RAVENSWD_230_30700_SANMATEO_230_BR_2_1
31093_HYMPOMJT_60.0_31553_BIGBAR_60.0_BR_1_1	30705_MONTAVIS_230_30710_SLACTAP1_230_BR_1_1
31116_GRBRVLLE_60.0_31118_KEKAWAKA_60.0_BR_1_1	30705_MONTAVIS_230_30712_SLACTAP2_230_BR_2_1
31118_KEKAWAKA_60.0_31308_LYTNVLLE_60.0_BR_1_1	30710_SLACTAP1_230_30715_JEFFERSN_230_BR_1_1
31306_WILLITS_60.0_31308_LYTNVLLE_60.0_BR_1_1	30712_SLACTAP2_230_30715_JEFFERSN_230_BR_2_1
31555_MSSTAP2_60.0_31553_BIGBAR_60.0_BR_1_1	33205_HNTRSPT_115_33208_MARTINC_115_BR_1_1
31555_MSSTAP2_60.0_31557_MILSTSTA_60.0_BR_1_1	33208_MARTINC_115_33310_SANMATEO_115_BR_3_1
31556_TRINITY_60.0_31555_MSSTAP2_60.0_BR_1_1	99106_SAN-MAR1_230_99104_MAR-SAN1_230_BR_1_3
HUMBOLDT_XFBG	30560_E.SHORE_230_30700_SANMATEO_230_BR_1_1
22652_PENSQTOS_230_22596_OLDTOWN_230_BR_1_1	30685_EMBRCDR_230_99158_MAR-EMBD_230_BR_2_1
15090_HASSYAMP_500_22536_N.GILA_500_BR_1_1	30685_EMBRCDR_230_99160_MAR-EMBE_230_BR_1_1
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_1_1	30717_TRAN230B_230_99170_MAR-JEF1_230_BR_1_1
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_2_1	33200_LARKIN_115_33203_MISSON_115_BR_1_1
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_3_1	33200_LARKIN_115_33204_POTRERO_115_BR_1_1
22844_TALEGA_230_24131_S.ONOFRE_230_BR_1_1	33200_LARKIN_115_33204_POTRERO_115_BR_2_1
22844_TALEGA_230_24131_S.ONOFRE_230_BR_2_1	33200_LARKIN_115_33208_MARTINC_115_BR_1_1
22536_N.GILA_500_22360_IMPRLVLY_500_BR_1_1	33203_MISSON_115_33205_HNTRSPT_115_BR_1_1
33912_SPRNGGJ_115_33914_MI-WUK_115_BR_1_1	33203_MISSON_115_33205_HNTRSPT_115_BR_2_1
22356_IMPRLVLY_230_22360_IMPRLVLY_500_XF_80	33204_POTRERO_115_33205_HNTRSPT_115_BR_1_1
22652_PENSQTOS_230_22232_ENCINA_230_BR_1_1	33208_MARTINC_115_30695_MARTINC_230_XF_7
20149_TJI-230_230_22464_MIGUEL_230_BR_1_1	33208_MARTINC_115_30695_MARTINC_230_XF_8
22227_ENCINATP_230_22232_ENCINA_230_BR_1_1	33208_MARTINC_115_33303_ESTGRND_115_BR_2_1
22227_ENCINATP_230_22716_SANLUSRY_230_BR_2_1	33208_MARTINC_115_33307_MILLBRAE_115_BR_1_1
22260_ESCNDIDO_230_22844_TALEGA_230_BR_1_1	33208_MARTINC_115_33322_UALTAP_115_BR_5_1
22261_PALOMAR_230_22227_ENCINATP_230_BR_1_1	33208_MARTINC_115_33356_BURLNGME_115_BR_4_1
22261_PALOMAR_230_22260_ESCNDIDO_230_BR_1_1	33305_SHAWROAD_115_33208_MARTINC_115_BR_6_1
22261_PALOMAR_230_22260_ESCNDIDO_230_BR_2_1	33306_SFIA_115_33310_SANMATEO_115_BR_5_1
22356_IMPRLVLY_230_20118_ROA-230_230_BR_1_1	33307_MILLBRAE_115_33310_SANMATEO_115_BR_1_1
22356_IMPRLVLY_230_22360_IMPRLVLY_500_XF_81	33308_SFIA-MA_115_33303_ESTGRND_115_BR_2_1
22360_IMPRLVLY_500_22468_MIGUEL_500_BR_1_2	33310_SANMATEO_115_30700_SANMATEO_230_XF_5_P
22464_MIGUEL_230_22504_MISSION_230_BR_1_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_5_S
22464_MIGUEL_230_22504_MISSION_230_BR_2_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_5_T
22464_MIGUEL_230_22832_SYCAMORE_230_BR_1_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_6_P
22464_MIGUEL_230_22832_SYCAMORE_230_BR_2_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_6_S
22596_OLDTOWN_230_22464_MIGUEL_230_BR_1_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_6_T
22596_OLDTOWN_230_22504_MISSION_230_BR_1_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_7_P
22596_OLDTOWN_230_22504_MISSION_230_BR_2_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_7_S
22648_PENSQTOS_138_22228_ENCINA_138_BR_1_1	33310_SANMATEO_115_30700_SANMATEO_230_XF_7_T
22716_SANLUSRY_230_22232_ENCINA_230_BR_1_1	33310_SANMATEO_115_33305_SHAWROAD_115_BR_6_1
22716_SANLUSRY_230_22504_MISSION_230_BR_1_1	33310_SANMATEO_115_33308_SFIA-MA_115_BR_2_1
22716_SANLUSRY_230_22504_MISSION_230_BR_2_1	33310_SANMATEO_115_33312_BELMONT_115_BR_1_1
22832_SYCAMORE_230_22261_PALOMAR_230_BR_1_1	33322_UALTAP_115_33306_SFIA_115_BR_5_1
IVALLYBANK_XFBG	33356_BURLNGME_115_33310_SANMATEO_115_BR_4_1
30569_KELSO_230_30570_USWP-RLF_230_BR_1_1	24156_VINCENT_500_24155_VINCENT_230_XF_1_P
30570_USWP-RLF_230_30625_TESLAD_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 Spring 2010. 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, 125 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 125 of these 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 MRTU 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 outage may have a significant impact on market congestion.
- **Market Clearing Model and Optimization**. Currently the CPA is done by the simulation tool different from MRTU 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-pivitol supplier tests are computationally intensive, and there are an extremely large number of potential combinations of suppliers that could withdrawal. It 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, DMM 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.