

WSCC Path 26 Midway-Vincent Rating Increase Study Plan (Short - Term Plan)

Background

The WSCC Path 26 is defined as the path consisting of three Midway – Vincent 500 kV lines between Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE). At this time, the path rating is 3,000 MW in bi-directional direction. Critical disturbances of a double line outage between Midway and Vincent limit the transfer capability of the path. If the path flow is projected to exceed the path rating, congestion management is then applied to maintain flow within the path rating. The path congestion has been associated with the North to South flow for the last several years. In addition to the existing congestion concerns, there are a number of generation developments at Midway that potentially can cause higher congestion on the North to South direction on Path 26. Higher congestion in the future and the congestion costs on Path 26 over the last two to three years suggest that an increase in a path rating at this time may be justified.

Representatives from SCE, PG&E, and the California ISO (Cal-ISO) met on October 10, 2000 to initiate efforts to increase the rating on Path 26. The following are the major issues that were discussed at the meeting:

- Need for increasing the path rating;
- Expected future levels of congestion on Path 26.

The increase of generation levels in the Midway area would require the need to increase the existing path rating to accommodate the additional power transfer from north to south direction without the use of congestion management. Lastly, future up-rate of WSCC Path 15 (Los Banos-Gates-Midway path) could be impacted by limitations on Path 26.

Study Objectives

The primary objective is to achieve the WSCC approval on the Path 26 rating increase in the North-to-South direction in association with the short-term plan at this time. Since South-to-North rating on Path 26 is limited by Path 15 capability, a higher S-N rating will be investigated and pursued in the long-term plan studies. Studies for a long-term plan will commence immediately after completing the Comprehensive Progress Report for proposing the new path rating associated with the short-term plan.

Short – Term Plan

- Develop Remedial Action Scheme (RAS) or replacing components on the Midway – Vincent #3 500 kV line, as necessary, to achieve a higher path rating in 2002.
- Provide necessary studies to complete and submit a Comprehensive Progress Report to WSCC PCC and TSS Committees for review and approval. We will ask for an expedited process in reviewing and approval for a new Path 26 rating.

Long – Term Plan

Long-term plan will commence immediately after completing the Comprehensive Progress Report associated with the short-term plan. The long-term plan is needed evaluate the need for increasing the Path 26 rating due to the future up-rate of Path 15, and additional generation developments at Midway that will be on-line in 2003 and beyond.

- Develop long-term alternatives for increasing Path 26 rating (bi-directional rating). This is to factor in the future up-rate of Path 15 and projected future long-term congestion on Path 26.
- Analyze future congestion costs under various new generation and Path 26 rating scenarios.
- Perform economic analysis of alternatives.
- Recommend preferred long-term options for increasing Path 26's capability.

Alternatives for Increasing Path 26 Rating

The following alternatives were developed by the Study Group members to be evaluated. The Study Group also decided, as a starting point, consideration of various projects to accommodate a higher path rating. Due to an additional 1,400 MW of new generation developments that are planned to be on-line by 2002 from PG&E National Energy Group and Edison Mission Energy, a target higher rating of 4,000 MW was selected. However, the analysis will evaluate the maximum higher rating based on the implementation of the RAS.

Short-Term Plan

Option 1 – Install Remedial Action Schemes (RAS)

- Propose RAS for generation curtailment and load dropping will be investigated in the studies.
- Proposed generation curtailment *may* include 1,400 MW of new generation developments (or more as necessary).
- Proposed load curtailment *may* include 1,400 MW of load (or more as necessary) in SCE. The specific load under consideration may be obtained from the proposed load curtailment of the Initially-Out-Of-Service (IOOS) RAS that SCE is considering.

Option 2 – Increase Midway-Vincent #3 500 kV line rating

- Replace in-line components as necessary to increase the line rating. This option may be included as part of Option 1, as necessary, to increase the path rating to a higher value.

Study Assumptions

Short - Term Plan

- PTO's transmission reinforcements (as approved by the Cal-ISO and PTO's internal management) by Summer 2002 will be modeled in the Summer 2002 base case.
- New generation projects that have been approved by the CEC for operation by Summer 2002 will be modeled in the base case.

Study Scenarios and Base Cases

Three study scenarios will be developed and evaluated. The starting base cases will be the 2002 heavy summer south peak base case and the 2002 spring peak base case, which were developed for the 2000 ISO Control Area Transmission Expansion Plan study. Both cases will start out with 3000 MW of southbound flow on Path 26. The 2002 heavy summer peak case was developed from the 2003 HS 3 WSCC base case, and the 2002 spring peak base case was developed from the 2001 HSP 1 WSCC base case. All changes to the base cases were either provided or reviewed by the three PTO's and the municipal utilities through an open stakeholder process.

Scenario 1 – 2002 Heavy Summer with High Midway Area Generation

New generation projects under development at Midway will be dispatched as necessary to increase the Path 26 flow to a higher value (sensitivity cases with 3,500 MW, 4,000 MW and 4,500 MW Path 26 flow will be developed to determine the proposed path rating). In addition to generation at Midway, other CEC-approved generation developments in the Bay Area will also be modeled, if they are planned to be on-line by Summer 2002. Path 15 flow is to be adjusted when developing the base case with higher Path 26 flow as a result of increased generation from the Midway area.

Scenario 2 – 2002 Heavy Summer with High Bay Area Generation

New generation projects under development in the Bay Area will be dispatched as necessary to increase the Path 26 flow to a higher value. This is to evaluate potential impact with high N-S Path 15 flow (~ 3,000 MW). New generation levels from Midway area would be adjusted under this scenario to accommodate high Path 15 flow.

Scenario 2 – 2002 Spring Peak

Generation in PG&E will be increased as necessary to increase the Path 26 flow to a higher value (same number of sensitivity cases as above).

Contingency Analysis

The following contingencies will be simulated.

- 500 kV N-1 and common corridor N-2 outages between Table Mt. and the East of River Path (including South of Lugo double line outage);
- Midway-Vincent 500 kV double line contingencies;
- PDCI and IPP bipolar outages;
- Palo Verde, SONGS, and Diablo G-2 outages;

- Selected 230 kV N-1 and common tower N-2 outages between Tesla and Midway and in SCE area.

Sensitivity Studies

The following sensitivity studies will be performed.

- Determine potential transmission impacts on the **existing** COI rating and SCIT OTC with PDCI at 3100 MW with a higher Path 26 flow.

Study Results

- ***Contingency Screening***

The worst contingencies in California including the following:

1. 2 PV unit outage
2. Bipolar outage of the PDCI
3. Table Mountain South double line outage (Table Mountain-Vaca Dixon 500 kV line and Table Mountain-Tesla 500 kV line)
4. 2 SONGS unit outage
5. SWPL line outage with RAS
6. 2 Diablo Canyon unit outage
7. 2 Moss Landing unit outage
8. 2 Pittsburg unit outage

- ***AC/DC/Northern California Hydro Nomogram***

For Northern California, the worst contingency is the loss of 2 PV units (G-2), the loss of PDCI Bipolar, the loss of 2 Moss Landing units, or the Table Mountain South double line outage (N-2). The limiting factor is the reactive margin at Round Mountain and various Northwest 500 kV buses (Grizzly 500 kV) for loss of 2 PV units.

- ***SCIT Nomogram***

For SCIT and Southern California, the worst contingencies are the loss of 2 SONGS units (G-2), loss of IV-Miguel (cross trip Miguel-Tijuana 230 kV), or the loss of the PV-N. Gila 500 kV line. The limiting factor is the reactive margin at the South Bay 69 kV bus in SDG&E.

Costs and Feasibility

The following cost estimates will be developed:

- Implementation for the proposed RAS to curtail generation and load.
- Replacing necessary components on the Midway-Vincent 500 kV line(s).
- Installation of other necessary transmission facilities to achieve a higher Path 26 rating associated with the short-term plan.

The following verification needs to be performed as part of the short-term plan:

- Higher rating on the Midway-Vincent #3 500 kV line (i.e., higher conductor rating, series capacitors, wave traps, circuit breakers, current transformers, and other in-line equipment).
- Thorough analysis of the Los Banos-Midway, Midway-Vincent and Vincent-Lugo 500 kV line ratings on a component level. This is to assist in determining if there are any constraints in achieving a higher Path 26 rating.

Congestion Cost Analysis

For the long-term plan, a parallel effort by the ISO Market Analysis/Operations Engineering is needed to complete the congestion cost analysis for Path 26. Part of this effort includes an analysis of congestion on Path 26 with various new generation and transmission projects assumed (i.e., Path 15 up-rate).

Study Schedule for Path 26 Rating Increase Study (Short - Term Plan)

Item	Target Completion Date
Power System Studies	
Receive comments from Study Group members	March 16, 01
Finalize Study Plan	March 26, 01
Send out draft base cases for comments	April 6, 01
First Study Group Meeting	April 2 – 6?, 01
Receive comments on study base cases	April 20, 01
Issue final base cases for studies	April 30, 01
Perform power flow/post-transient/transient studies	May 1 – June 8, 01
Second Study Group Meeting	June 11 – 15, 01?
Costs and Feasibility	June 11 – June 22, 01
Issue the congestion cost analysis (To be done by ISO Market Analysis/Operations Engineering) – This is needed for the long-term plan study.	TBD
Draft the Comprehensive Progress Report	June 25 – July 6, 01
Send the draft Comprehensive Progress Report with recommendation to the Study Group members for comments	July 9 – July 13, 01
Third Study Group Meeting	July 9-13, 01?
Finalize Comprehensive Progress Report	July 16 - 20, 01
Send Comprehensive Progress Report to WSCC PCC and TSS Committees	July 23 – 27, 01
Present to the Cal-ISO Board for approval (TBD) *	TBD

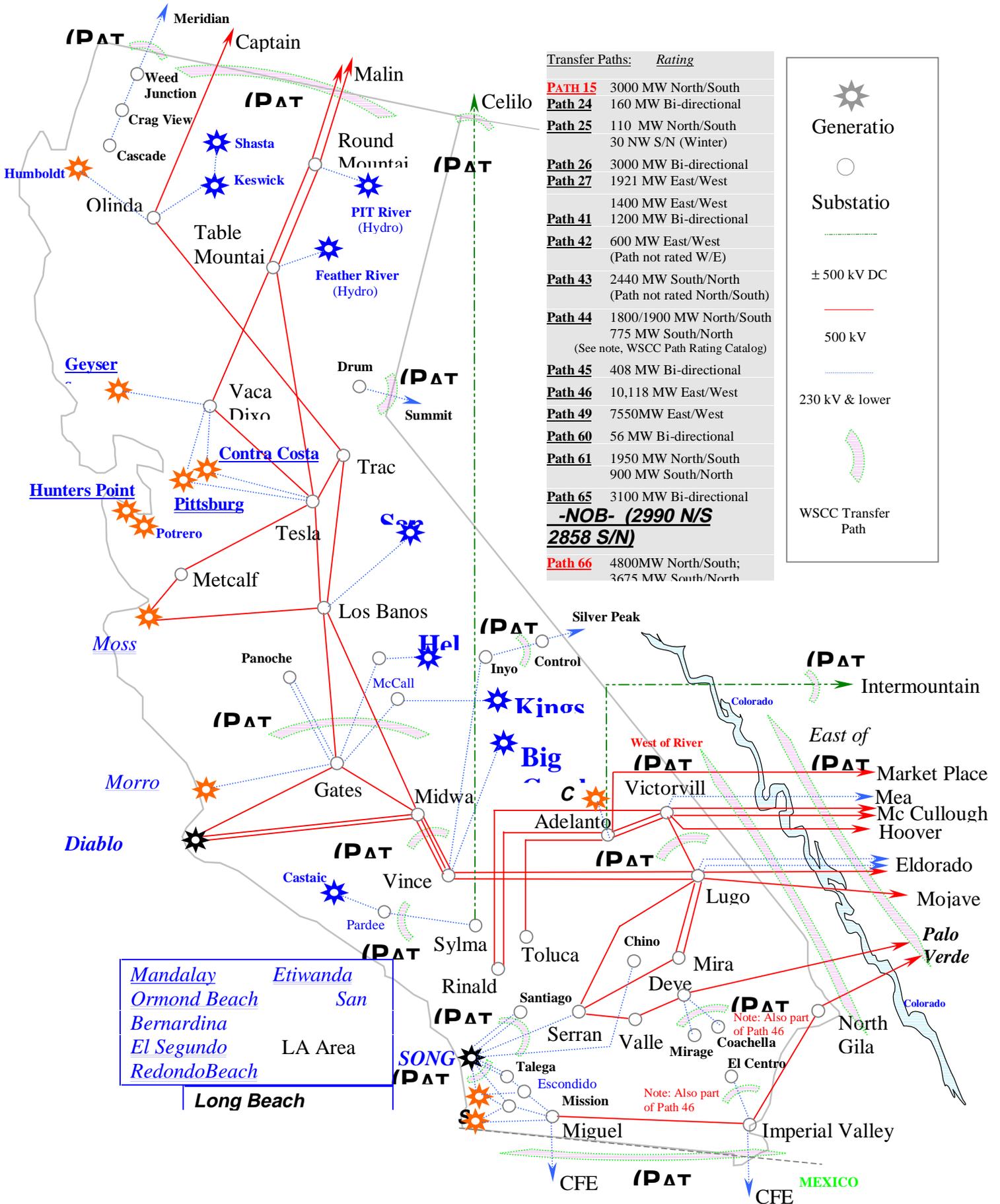
Note: * If the cost exceeds \$20 million, the project will be presented to the Cal-ISO Board for approval.

Study Group Members

- California ISO – Jeffrey Miller, David Le, Chuck-Yan Wu, Mark Willis, Nam Nguyen, Ashish Bhaumik
- Pacific Gas & Electric Company – Ben Morris, Ron Markham, Karen Shea
- Southern California Edison – Dana Cabbell, Ying He, David Szumlas, Michael Lopez
- PG&E National Energy Group – James Filippi
- Midway Sunset Cogeneration Company – Greg Jans, Ed Western, Ray Smith
- NCPA – Les Pereira
- Williams Energy – Samuel Kwong, Manuel Canalita
- FPL Energy – Mark J. Smith
- Calpine – Steven Schleimer
- CDWR – Tony Lam
- CPUC – Xuguang Leng
- Consultants – Barbara Barkovich



California EHV Transmission System



Transfer Paths:	Rating
Path 15	3000 MW North/South
Path 24	160 MW Bi-directional
Path 25	110 MW North/South 30 NW S/N (Winter)
Path 26	3000 MW Bi-directional
Path 27	1921 MW East/West
	1400 MW East/West
Path 41	1200 MW Bi-directional
Path 42	600 MW East/West (Path not rated W/E)
Path 43	2440 MW South/North (Path not rated North/South)
Path 44	1800/1900 MW North/South 775 MW South/North (See note, WSCC Path Rating Catalog)
Path 45	408 MW Bi-directional
Path 46	10,118 MW East/West
Path 49	7550MW East/West
Path 60	56 MW Bi-directional
Path 61	1950 MW North/South 900 MW South/North
Path 65	3100 MW Bi-directional
-NOB- (2990 N/S 2858 S/N)	
Path 66	4800MW North/South; 3675 MW South/North

Legend:

- Generation (Star symbol)
- Substation (Circle symbol)
- ± 500 kV DC (Dashed green line)
- 500 kV (Red line)
- 230 kV & lower (Blue line)
- WSCC Transfer Path (Dashed green line with arrow)

Mandalay Etiwanda
Ormond Beach San
Bernardina
El Segundo LA Area
Redondo Beach
Long Beach

Study Methodology

The WSCC reliability criteria, the WSCC voltage stability criteria, and member reliability criteria as appropriate were used to evaluate the adequacy of study results.

Steady-state Analysis

- No system element is loaded more than 100% of its continuous thermal rating under pre-contingency conditions.
- No system element is loaded more than 100% of the emergency thermal rating after a contingency.

Transient Stability

- Transient stability runs will be run out to 20 seconds to ensure the system is stable and positively damped.
- Additional RAS used in transient stability analysis:
- Insert 21 ohms Fort Rock series capacitors (fast insertion) between Grizzly and Captain Jack, Grizzly and Malin, Buckley and Summer Lake.
- Refer to an updated table Northwest Generator Drop for Bipolar PDCI Outage (N-S) for amount and timing of generator dropping in Northwest.
- Drop filter banks at Celilo and Sylmar (the MVAR levels dropped will depend upon the DC schedule).
 - *Insert 400 MVAR of MSC @ Malin, 200 MVAR shunt capacitor @ Olinda, 600 MVAR shunt capacitor @ Tracy, 454 MVAR shunt capacitor @ Table Mt.*
- The WSCC Reliability Criteria for Transmission System Planning will be observed for the transient stability results.

Post transient

- Power margin test will be performed on all paths being studied. This would include stressing the path 5% for N-1 and 2.5% for N-2. The system needs to have positive reactive margin.
- Additional RAS used in post-transient:
 - (a) remove all Sylmar filter banks.
 - (b) insert 175 MVAR shunt capacitor @ Kinport if the voltage drops to 0.96 p.u. and sustains for 3 seconds.
 - (c) Insert 126 MVAR shut capacitors @ Vaca-Dixon 230, 252 MVAR @ Tesla 230, and 375 MVAR @ Metcalf 230 based on local voltage control
 - (d) Insert 132 MVAR SVC at Adelanto if Adelanto voltage dip beyond 5%.
 - (e) IV-Miguel line outage RAS updated to cross trip Miguel-Tijuana 230 kV Line.

Other

- For PDCI outage, the maximum permissible 2700 MW generator drop in the Northwest is an integral part of the RAS, which mitigates the impact of a PDCI bipolar outage.
- Refer to California Operating Studies Subcommittee (OSS) Handbook for switching sequence for transient and post-transient analyses of 500 kV line contingencies.

