

Exhibit No.: _____
Commissioner: Geoffrey F. Brown
Administrative Law Judge: Carol A Brown
Witness: Irina Green

**BEFORE THE PUBLIC UTILITIES COMMISSION OF
THE STATE OF CALIFORNIA**

In the Matter of the of San Diego Gas
and Electric Company for a Certificate of
Public Convenience and Necessity
Authorizing the Construction of the for
the Otay Mesa Power Purchase
Agreement Transmission Project

Application 04-03-008

**TESTIMONY OF IRINA GREEN
ON BEHALF OF
THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR**

Submitted by the California Independent System Operator

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1 purchase agreement for the output of the Otay Mesa Power Plant (“Otay Mesa”) presently
2 under development by Calpine Corporation. However, the Commission correctly
3 recognized that “the output of Otay Mesa is not fully deliverable, and cannot fully satisfy
4 SDG&E’s local reliability needs, without some transmission system upgrade.” (D.04-06-
5 011 at p. 65.) The Commission expressly looked to the CAISO to provide information in
6 this proceeding as to “[w]hether that upgrade should be the two 230 kV lines proposed in
7 [this application], or some alternative.” (*Id.* at pp. 65-66.) Consistent with this directive, the
8 CAISO will attempt to assist the Commission by providing information regarding,

- 9 1. whether the Transmission Project renders Otay Mesa “deliverable,” and to what
10 extent, and whether the other identified benefits associated with the Transmission
11 Project will be realized;
- 12 2. whether the Transmission Project represents a reasonable means of achieving each of
13 its stated objectives; and
- 14 3. what factors the Commission should consider in making its decision.

15 Q. How is your testimony organized?

16 A. My testimony starts with this brief introduction and summary. In addition to setting forth
17 my conclusions, the introduction and summary explains some basic context surrounding my
18 testimony, including a general description of SDG&E’s electric power resources and the
19 Commission’s finding of need for Otay Mesa and the Transmission Project. In later sections
20 of my testimony, I describe,

- 21 1. the Transmission Project and evaluated scenarios;
- 22 2. the CAISO Grid Planning Standards and other criteria used to assess the
23 Transmission Project;
- 24 3. the need for and reliability benefits of the Transmission Project; and
25 how the Transmission Project fits into the long range transmission needs for the San
Diego Area.

1
2 **1. SAN DIEGO'S POWER RESOURCES AND THE NEED FOR**
3 **OTAY MESA AND THE TRANSMISSION PROJECT**
4

5 Q. Please provide your general overview of the relevant aspects of SDG&E's electric power
6 resources.

7 A. SDG&E's service area encompasses all of San Diego County and approximately one-third
8 of southern Orange County. The SDG&E area load is covered partly by local generation
9 and partly by the imported power. SDG&E's imported power is provided from the south via
10 the Miguel 230 kV bus and from the north by the five 230 kV lines from the San Onofre
11 Generation Plant. The maximum power delivered via these two paths is defined as the
12 SDG&E Simultaneous Import Limit ("SIL"). SDG&E Non-Simultaneous Import Limit
13 ("NSIL") is the maximum power that can be delivered by the transmission lines from San
14 Onofre if the 500 kV Southwest Power Link ("SWPL") by which power is transferred to the
15 Miguel Substation is out of service. Based on technical studies, the present SIL and NSIL
16 limits are 2850 MW and 2500 MW, respectively. SDG&E's peak customer load currently
17 exceeds these import limits. Accordingly, SDG&E's service area may be considered a "load
18 pocket" where local generation within its "local reliability area" must supply a portion of
19 SDG&E's load. SDG&E's local reliability requirement is a function of the demand forecast
20 for SDG&E's local reliability area. Current local generating resources are the Encina Power
21 Plant (connected into SDG&E's grid at 138 kV and 230 kV), the South Bay Power Plant
22 (connected at 69 kV and 138 kV), and a number of combustion turbine facilities located
23 around the service territory (connected at 69 kV).

24
25 Both the Encina and South Bay Plants are under Reliability Must Run ("RMR") contracts
with the CAISO. The CAISO, as part of its role to ensure grid reliability, enters into RMR

1 contracts with certain generating plants in order to give the CAISO the right to call on those
2 plants to deliver power when needed for grid reliability and to manage intra-zonal
3 congestion.

4
5 Q. Does the new Miguel-Mission #2 230 kV line approved by the Commission in Decision 04-
6 07-026 increase the import capability into the SDG&E's local reliability area so as to impact
7 the need for the Transmission Project?

8 A. No. As stated above, SDG&E's NSIL is the maximum power that can be delivered by the
9 transmission lines from San Onofre if SWPL is out of service. Power is transferred to the
10 Miguel Substation by SWPL, so increasing the transfer capability north of the Miguel
11 Substation by the addition of the Miguel-Mission #2 230 kV line does not effect the NSIL.

12
13 Q. Why is the fact that import capability into the San Diego area is limited important to this
14 proceeding?

15 A. The limitation on import capability itself is not the point. Rather, the important point is that
16 to satisfy the CAISO Grid Planning Standards, which I discuss later, without substantial
17 demand response programs, load growth must be addressed either through increasing the
18 transmission import capability or constructing additional generation internal to the local
19 reliability area. The CAISO Grid Planning Standards require that SDG&E have sufficient
20 on-system resources and import capability to serve the 1-in-10-year peak summer demand
21 forecast for the local reliability area during the worst G-1/N-1 event (outage of the largest
22 generation unit together with one transmission facility). SDG&E's relevant G-1/N-1 event
23 is currently defined as an outage of the Encina 5 unit and the loss of SWPL. After the
24 Palomar Energy Project comes into service, an outage of the whole Palomar plant will be
25 considered as G-1. In fact, it was precisely the need to acquire "additional capacity
conforming to the [CAISO] grid reliability criteria" that prompted SDG&E to issue a

1 Request for Proposals (“RFP”) on May 16, 2003, which ultimately led to the Commission’s
2 approval of the Otay Mesa Power Purchase Agreement in D.04-06-011. In addition to Otay
3 Mesa, D.04-06-011 also approved SDG&E’s procurement of other generation projects
4 totaling approximately 627 MW – Ramco combustion turbine (~45 MW), Envirepel
5 renewable (~40 MW), and Palomar combined cycle (~542 MW).

6
7 Q. Can you discuss how D.04-06-011 affects your testimony?

8 A. Yes. In evaluating the Transmission Project for purposes of this testimony, the CAISO
9 necessarily considers SDG&E’s application for a CPCN within the context the
10 Commission’s final opinion in D.04-06-011. That Decision “determined that SDG&E does
11 ... need Otay Mesa.” (D.04-06-011 at 54.) The finding of “need” rested on the reasoning
12 that approving Otay Mesa was “the provident and prudent thing” for the Commission to do
13 given the critical reliance on aging resources to meet SDG&E’s local reliability
14 requirements and the goal of the State’s Energy Action Plan to encourage “new, cleaner,
15 efficient power sources to meet anticipated demand growth, replace aging, less efficient and
16 dirty power plants both permanently and as part of RMR contract obligations so as to reduce
17 SDG&E’s RMR costs.” (*Id.* at 55.) The conclusion I draw from this outcome is that the
18 Commission has selected Otay Mesa to provide SDG&E with local capacity to meet
19 SDG&E’s anticipated grid reliability needs resulting from future load growth. Further, this
20 finding was made with the recognition that without some transmission upgrades, Otay Mesa
21 cannot be utilized to serve load in the San Diego local reliability area because of congestion
22 or, in other words, because the energy is not deliverable to load. Accordingly, the CAISO
23 does not view its role before the Commission in this proceeding as determining “need” or
24 “if” a transmission project associated with Otay Mesa should be constructed. Instead, based
25 on D.04-06-011, the CAISO assumes a prior Commission finding of “need” for both Otay
Mesa and transmission, and therefore addresses whether the proposed Transmission Project

1 constitutes the appropriate alternative to satisfy the stated objectives of SDG&E in
2 proposing Otay Mesa and the Commission in approving that resource.

3
4 Q. Can you address whether construction of new transmission facilities to increase import
5 capability could replace the need for the Transmission Project in facilitating SDG&E's
6 compliance with CAISO Grid Planning Standards?

7 A. As I noted earlier, new import capability generally operates as a substitute for new local
8 generation in meeting SDG&E's local capacity requirements. However, relying on new
9 import capability in lieu of Otay Mesa and associated transmission would entail substantial
10 risk mainly because of the long-lead time necessary to build transmission facilities sufficient
11 to provide for necessary increase in the import capability. Numerous studies performed by
12 SDG&E and CAISO show that to provide for an increase in the SDG&E import capability
13 limit, construction of a new 500 kV transmission line in the San Diego area would be
14 required. Such construction and associated studies and permitting is a lengthy process with
15 4-5 years constituting a conservative estimate. Thus, even assuming SDG&E and the
16 CAISO are presently working on a 500 kV project, this new transmission line is unlikely to
17 be constructed in time to provide for the resource deficiency that would occur if the Otay
18 Mesa generation fails to materialize as an internal San Diego resource. For instance,
19 SDG&E has estimated in its application for CPCN that if Otay Mesa is not constructed, a
20 resource deficiency could occur as early as 2008. (See Table 2-1 to SDG&E Proponent's
21 Environmental Assessment.) Also, the cost of a new 500 kV transmission line will likely be
22 higher than the cost of the Transmission Project. In addition, to satisfy resource adequacy
23 requirements, external generation must be available to be transmitted over the additional
24 transmission facilities need to be associated with certain external generation. Due to all
25 these factors, construction of new transmission facilities to increase import capability does
not appear to be a satisfactory alternative to the Transmission Project. Finally, I should note

1 that the Commission has implicitly determined that SDG&E's anticipated near-term needs
2 should first be met through the addition of the internal generation resources approved in
3 D.04-06-011. Only after those resources are assumed in SDG&E's resource mix and a
4 resource adequacy deficiency again is anticipated does it appear that the Commission will
5 entertain an evaluation of whether transmission constitutes the optimal solution.

6
7 Q. Has the CAISO Board of Governors approved the Transmission Project?

8 A. Not at this time, but I do anticipate that it will be brought to the Board for their approval.

9 Generally, approval by the CAISO of a transmission project constitutes a preliminary step to
10 obtaining cost recovery through the CAISO's Federal Energy Regulatory Commission
11 ("FERC")-approved transmission Access Charge for new high-voltage (i.e., 200 kV or
12 higher) transmission investment placed under the CAISO's operational control. Projects,
13 such as the Transmission Project, which cost in excess of \$20 Million must be approved by
14 the Board of Governors. Since that has not yet happened, the views set forth in my
15 testimony represent the opinion of the CAISO staff and not the final position of the CAISO
16 Board of Governors. It should be noted that under the CAISO's transmission Access Charge
17 proposal currently pending before FERC in docket ER00-2019-006, the cost of approved
18 new high-voltage transmission lines becomes part of the grid-wide Access Charge recovered
19 from all load within the CAISO Control Area.

20 **CONCLUSIONS**

21
22 Q. Please summarize your conclusions.

23 A. As noted in SDG&E's application, "SDG&E proposes to construct the project as the primary
24 infrastructure needed to connect SDG&E's transmission system to the Otay Mesa Power
25 Plant and deliver its output to SDG&E's customers." (Application ES-1.) It involves, at its
most general level, construction of two new 230 kV electric transmission lines from the

1 SDG&E's Miguel Substation to its Sycamore Canyon Substation and Old Town Substation.
2 The CAISO concurs that the Transmission Project provides for the full output of the Otay
3 Mesa Generation Project under nearly all system conditions.
4

5 In addition, the connection of Otay Mesa through the Transmission Project will
6 provide for the firm transmission delivery of Otay Mesa generation to the SDG&E load
7 centers; prevent Otay Mesa generation from increasing transmission congestion north of
8 Miguel; reduce RMR costs by allowing displacement of a portion of the RMR generation in
9 SDG&E service area; provide higher operational flexibility during scheduled outages;
10 improve system voltages; and avoid the need to trip additional generation and load for the
11 Miguel corridor outage.
12

13 The studies of the Transmission Project and its alternative showed that the Transmission
14 Project was superior in meeting these objectives.
15

16 **OTAY MESA POWER PURCHASE AGREEMENT TRANSMISSION PROJECT**

17 **DESCRIPTION**

- 18
- 19 Q. Since the Transmission Project is related to generation from Otay Mesa, please first describe
20 Otay Mesa and its "Interconnection Facilities" or "Direct Assignment Facilities" that
21 interconnect the generation plant to the transmission grid.
- 22 A. Otay Mesa will consist of two combustion turbine generators (CTs) rated at 234 MVA each
23 and one steam turbine generator (ST) rated at 306 MVA. Maximum total net generation
24 output was specified in the SDG&E studies as 615 MW. Under the current CAISO Tariff,
25 Direct Assignment Facilities are "the transmission facilities necessary to physically and
electrically interconnect" a planned generating unit "to the CAISO Controlled Grid at the

1 point of interconnection.” (CAISO Tariff, Appendix A – Master Definitions Supplement at
2 311.) The CAISO intends to file with FERC new large generator interconnection procedures
3 in compliance with FERC Order 2003 and 2003a that replaces the term Direct Assignment
4 Facilities with the FERC preferred term “Interconnection Facilities.” For purposes of this
5 testimony, I will continue to refer to the term “Direct Assignment Facilities.” With respect
6 to Direct Assignment Facilities, Otay Mesa will have a 230 kV switchyard in a breaker-and-
7 a-half configuration with three transformers and three transmission lines. Each generator
8 will have a dedicated step-up transformer. The switchyard will have a reserved space for
9 future expansion for possible generation or transmission line additions. The original
10 interconnection plan was to connect Otay Mesa to SDG&E’s Miguel-Tijuana 230 kV
11 transmission line by looping this line into the Otay Mesa switchyard. The Miguel – Otay
12 Mesa transmission line section was to be converted to two bundled 900 kCMIL ACSS
13 circuits with separate circuit breakers and the Otay Mesa-Tijuana section of the Miguel-
14 Tijuana 230 kV line was planned to remain with the 1033 kCMIL ACSR conductor. As
15 discussed further below, this plan was considered as “Scenario 1” of three total scenarios in
16 SDG&E’s Facility Study (“FS”) completed in July 2004. Scenario 1 also comports with the
17 interconnection upgrades of \$16 million referred to by the Commission in D.04-06-011 as
18 “necessary and reasonable and solely attributable to the Otay Mesa generation facility.”

19
20 Q. Please describe “Scenario 2” of SDG&E’s FS.

21 A. Scenario 2 constitutes an intermediate interconnection plan, under which Otay Mesa could
22 operate until the Transmission Project can be fully constructed. Scenario 2 expands upon
23 Scenario 1 by adding the new Miguel-Sycamore Canyon 230 kV transmission line
24 connected to one of the Otay Mesa-Miguel circuits bypassing the Miguel Substation. There
25 is an option not to bypass the Miguel substation, if the breaker connecting the Otay Mesa-
Miguel line and the new Miguel-Sycamore Canyon line with the Miguel Substation is

1 closed. However, closing this breaker will cause overstress of the 230 kV circuit breakers
2 on the Tijuana Substation. The Otay Mesa 230 kV bus was assumed to be split with only one
3 of the Otay Mesa generators connected to the new circuit so that its output (190 MW) would
4 be directly delivered to the Sycamore Canyon 230 kV bus. This scenario considered the
5 Otay Mesa unit connected to the Sycamore Canyon Substation to be an internal SDG&E
6 resource. This scenario was considered as an interim transmission configuration during the
7 construction period required to complete Scenario 3.

8
9 Q. Please describe “Scenario 3” of SDG&E’s FS.

10 A. Scenario 3 is the Transmission Project in SDG&E’s application for a CPCN. The
11 Transmission Project in its final form further expands upon Scenario 2 by adding a Miguel-
12 Old Town 230 kV transmission line connected to the second Otay Mesa-Miguel circuit. The
13 new line would be constructed using a different route north of Miguel than the existing
14 Miguel-Mission line. The preferred scenario alternative bypasses the Miguel 230 kV bus by
15 operating the Miguel tap circuit breakers normally opened. These breakers may also operate
16 closed during some contingencies. Due to the bypassing of the Miguel bus, the Otay Mesa
17 generation output would be directly delivered to the Sycamore Canyon and Old Town 230
18 kV substations. In addition, SDG&E studied an option of Scenario 3 with termination of the
19 new 230 kV transmission line at the South Bay or Mission Substations. I will discuss the
20 advantages and disadvantages of these variations later in my testimony. In addition to
21 construction of the two new 230 kV transmission lines, the Transmission Plan includes
22 reconductoring of the Sycamore Canyon-Fanita Junction (Carlton Hills Tap) section of the
23 existing Chicarita-Carlton Hills- Los Coches 138 kV transmission line.

24
25 **OTHER TRANSMISSION ALTERNATIVES REVIEWED BY THE CAISO**

1 Q. What alternatives to the Transmission Project were studied?

2 A. There were alternatives for both Scenario 2 and Scenario 3 of the Transmission Project
3 studied. For Scenario 2, several alternatives with different injection of Otay Mesa
4 generation into the Sycamore Canyon Substation were studied. These alternatives included
5 598 MW (all three units), 375 MW or 300 MW of Otay Mesa generation connected to the
6 Sycamore Canyon 230 kV Substation. The option with the two units injecting 300 MW into
7 the Sycamore Canyon Substation assumed the third Otay Mesa unit as being off-line.
8 Different assumptions on Commission Federal Electricidad (“CFE” - the transmission
9 system in Mexico) import and East-of-River (“EOR”) flow were studied.

10
11 Q. What were the Transmission Project alternatives?

12 A. In addition to the proposed interconnection of the Otay Mesa Project to the Sycamore
13 Canyon and Old Town 230 kV Substations as set forth in the Transmission Project, several
14 other interconnection alternatives were studied. These alternatives are as follows:

- 15 • Build 230 kV Miguel-Sycamore No.2 and Miguel-Mission No.3 circuits in addition
16 to Scenario 1.
- 17 • Build 230 kV circuits Miguel-Sycamore No.2, Miguel-Mission No.3, and Otay Mesa
18 –Miguel No.3 (connected to Tijuana line) in addition to Scenario 1.
- 19 • Build 230 kV Miguel-Sycamore No.2 and Miguel-South Bay circuits along with a
20 new 230/138/69 kV substation at South Bay and various lower voltage upgrades in
21 addition to Scenario 1.
- 22 • Do not construct any transmission upgrades in addition to Scenario 2.

23
24 Q. How were these alternatives selected?

25 A. These are the alternatives that were analyzed in SDG&E’s FS.

1 Q. Did the CAISO have any role in determining which alternatives were included in SDG&E's
2 FS?

3 A. Yes. First, the CAISO reviewed the alternatives of transmission upgrades proposed by
4 SDG&E. Some alternatives we found reasonable and deserving of detailed studies. Some
5 alternatives after discussion with SDG&E were rejected, mainly because their performance
6 was obviously inferior. For example, an alternative of installing a second 230/138 kV
7 transformer at the Miguel Substation and looping the South Bay-Los Coches 138 kV
8 transmission line into Miguel Substation was rejected because of inferior performance in
9 case of a Miguel corridor transmission outage. CAISO also specifically requested SDG&E
10 to study additional alternatives to the Transmission Project, including termination of one of
11 the new 230 kV transmission lines at the South Bay Substation and upgrade of the South
12 Bay substation to 230 kV.

13
14 **STANDARDS AND CRITERIA USED TO ASSESS THE TRANSMISSION PROJECT**

15
16 Q. Please describe the CAISO standards utilized in evaluating the Transmission Project.

17 A. All transmission projects, whether developed through the CAISO Coordinated Grid Planning
18 Process or Generating Unit Interconnection Procedures, must satisfy the CAISO Grid
19 Planning Standards. In recognition of the need to closely coordinate the development of the
20 CAISO Grid with neighboring electric systems both inside and outside of California, the
21 CAISO Grid Planning Standards utilize national and regional planning standards, in
22 particular the North American Electric Reliability Council ("NERC") and Western
23 Electricity Coordination Council ("WECC") Planning Standards, to the maximum extent
24 possible. The CAISO Grid Planning Standards build from, rather than duplicate, standards
25 that were developed by WECC and NERC. This is accomplished by the CAISO Grid
Planning Standards because they,

- 1 • address specifics not covered in the NERC/WECC Planning Standards;
- 2 • provide interpretations of the NERC/WECC Planning Standards specific to the
- 3 CAISO Grid;and
- 4 • identify whether specific criteria should be adopted that are more stringent than the
- 5 NERC and/or WECC planning standards.

6 Electric power from new generation projects may cause violations of the CAISO Planning
7 Standards (for example, overloading of transmission facilities). To allow a new generation
8 project to operate at its full capability without violating the reliability criteria, additional
9 transmission system upgrades may be required. These upgrades are referred to as
10 Deliverability Upgrades because the generation on the system can be re-dispatched to
11 eliminate the limitation, compared with generation Reliability Upgrade, which are needed to
12 avoid customer outage or damage to the equipment caused by new generation project.

13
14 Q. How do the CAISO Grid Planning Standards interact with new generator interconnections?

15 A. Electric power from new generation projects may cause violations of the CAISO Grid
16 Planning Standards. To allow a new generation project to operate at its full capability
17 without violating the Reliability Criteria, additional transmission system upgrades may be
18 required. For example, when a new generating project operates at full output, the power
19 from this project may cause overload on a downstream transmission line, either under
20 normal (with all facilities in service) or single contingency (with one transmission facility
21 out of service) conditions. In this case, to allow the new generation project to deliver its
22 power, either the overloaded transmission line needs to be re-conducted or a new line
23 built. In the generation interconnection context, under the CAISO's currently effective
24 Amendment 39 procedures (CAISO Tariff §§ 5.7, et al.), there are two categories of what
25 are essentially network upgrades: reliability and deliverability. Reliability Upgrades are:

1 Transmission facilities, other than Direct Assignment Facilities, beyond the first
2 point of interconnection necessary to interconnect a New Facility safely and
3 reliably to the ISO Controlled Grid, which would not have been necessary but for
4 the interconnection of the New Facility, including network upgrades necessary to
5 remedy short circuit or stability problems resulting from the interconnection of
6 the New Facility to the ISO Controlled Grid. (see, CAISO Tariff, Appendix A:
7 Master Definitions Supplement.)

8 Deliverability Upgrades are defined as:

9 Transmission facilities, other than Direct Assignment Facilities and Reliability
10 Upgrades, necessary to relieve constraints on the ISO Controlled Grid caused by
11 New Generation Facility and to ensure the delivery of energy from the New
12 Facility to load. (*Id.*)

13 Both Reliability and Deliverability Upgrades can be necessitated by a need to remedy a
14 Reliability Criteria violation. One difference between the two is that the limitation requiring
15 Deliverability Upgrades can be eliminated by the redispatch of generation on the system,
16 while Reliability Upgrades are needed to avoid customer outage or damage to the equipment
17 caused by new generation project.

18
19 Another difference between the two is the assignment of costs. Under the CAISO Tariff and
20 FERC precedent, the New Facility Operator is responsible for paying the upfront costs of all
21 Direct Assignment Facilities and Reliability Upgrades, but will be reimbursed over time for
22 Reliability Upgrade costs by the Participating Transmission Owner (“PTO”). Direct
23 Assignment Facilities or “gen tie” costs are not reimbursed. The current CAISO Tariff
24 provides that “[e]ach New Facility Operator may, at its own discretion, sponsor, pursuant to
25 Section 3.2 of the ISO Tariff, any Delivery Upgrades.” (CAISO Tariff at §5.7.5(d).)
Section 3.2 of the CAISO Tariff allows for the cost of any transmission upgrade to be

1 reflected in the PTO's Transmission Revenue Requirement and recovered through the
2 Transmission Access Charge so long as the upgrade is deemed by the CAISO to be needed
3 to "promote economic efficiency or maintain system reliability." It is my understanding
4 that, although cost will be considered a factor in the CAISO's evaluation of the
5 Transmission Project, the Transmission Project will be evaluated as a project needed to
6 maintain system reliability, since Otay Mesa has been found to be needed to meet SDG&E's
7 resource adequacy requirements to provide for anticipated load growth.

8
9 Q. What other factors or criteria did you use to evaluate the Transmission Project and other
10 alternative scenarios?

11 A. For simplicity, I generally looked to the Transmission Project objectives articulated by
12 SDG&E in its application. These objectives basically include,

- 13 1. providing for firm deliverability of the output of Otay Mesa;
- 14 2. preventing further congestion north of the Miguel Substation;
- 15 3. providing for further transmission expansion and compatibility with the long-term
16 plan for the San Diego area; and
- 17 4. enhancing system performance.

18 It should be clarified that the CAISO Grid Planning Standards are not exclusive of these
19 factors and, in fact, are part of the underlying analysis in how to assess performance of these
20 factors. For example, according to the CAISO Planning Standards, a new generation project
21 should not cause overload on any transmission facility under normal conditions with all
22 facilities in service or with a single facility outage. If planning studies show that a new
23 generation project may cause overload on a transmission line or transformer, it means that
24 the power from this generation project is not deliverable, and to deliver full output of the
25 project, additional system upgrades need to be implemented. Other factors considered in
evaluation of a new generation project in addition to thermal loading on the transmission

1 system, include transient and voltage stability and short-circuit analysis. In addition, I also
2 looked at system losses associated with transmission alternatives and project costs.

3
4 Q. Can you please describe what the factors that you considered actually mean?

5 A. Deliverability, as used in this context means ability to deliver full output of Otay Mesa under
6 nearly all system conditions, including various contingencies as required by the applicable
7 CAISO Grid Planning Standards.

8
9 Preventing congestion north of Miguel Substation is an important factor. Congestion north
10 of the Miguel Substation has been a chronic and costly condition since the addition of
11 substantial new generating resources along the California/Mexico border and in Arizona.
12 Although SDG&E has taken steps to relieve this congestion through the addition of a new
13 230 kV circuit from the Miguel Substation to the Mission Substation and additional
14 transformer bank at the Miguel Substation, the existing constraint could be aggravated by
15 Otay Mesa since it is located south of the Miguel Substation. Accordingly, the plan of
16 service should be designed to prevent exacerbating congestion north of the Miguel
17 Substation.

18
19 By capability of further transmission expansion and compatibility with the long-term plan
20 for the San Diego area, I meant that the proposed transmission configuration should permit
21 the convenient expansion of the grid and the addition of new generation in SDG&E's service
22 territory.

23
24 System performance includes general system reliability, general impact on congestion and
25 RMR needs and costs, and performance during severe outages, such as an outage of all
transmission lines in the north of Miguel corridor.

1 Cost of the upgrades means total cost to construct the Transmission Project or its
2 alternatives.

3
4 System losses were estimated under peak load conditions when these losses are the highest.

5
6 Q. What was the process used to evaluate the Transmission Project?

7 A. As noted above, the Transmission Project was evaluated under the CAISO's current
8 Amendment 39 procedures for the interconnection of New Facilities. Although the original
9 request for interconnection of Otay Mesa preceded adoption by FERC of Amendment 39, in
10 January 2003, Calpine was required to submit a new application to the CAISO when it
11 decided to alter the design of the plant to increase output to 615 MW from the previously
12 proposed 558 MW. Under Amendment 39 procedures, the generation developer submits a
13 completed Interconnection Application to the CAISO with a copy to the PTO to whose
14 transmission system the generation is going to be connected – in this case SDG&E. The
15 data provided in the Interconnection Application forms the basis for analyzing the
16 interconnection of the New Facility. The CAISO and the PTO review the Application for
17 completeness and notify the New Facility developer if the Application is complete. After
18 the Application is complete, the CAISO establishes the position for the New Facility in the
19 CAISO Generation Interconnection queue.

20
21 Upon receipt of the New Facility Interconnection Application, the CAISO determines if a
22 System Impact Study ("SIS") for the interconnection is required and directs the
23 Interconnecting PTO to perform the necessary studies. If the SIS concludes that no Facility
24 upgrades or additions are required, the generation developer requests an Interconnection
25 Agreement from the Interconnecting PTO. If the SIS indicates that additions or upgrades to
the CAISO Controlled Grid are needed to satisfy the request for interconnection, then a

1 Facility Study (“FS”) is required. In this case, the generation developer either requests the
2 Expedited Interconnection Procedures or if it does not elect this option, the Interconnecting
3 PTO tenders a Facility Study Agreement (“FSA”). The generation developer may also
4 perform its own FS, or contract with a third party approved by the CAISO to perform the FS,
5 and notifies the CAISO and the Interconnecting PTO of this election at the time it submits
6 its Interconnection Application.

7
8 Here, as noted earlier, SDG&E performed a FS. My analysis is based on a review and
9 verification of that FS, as designed and implemented by SDG&E in coordination with the
10 CAISO. To verify the FS, I first reviewed the mathematical models used by SDG&E to
11 reach agreement on how to model the system and which conditions - in terms of load and
12 generation dispatch - to study. Then, I reviewed the alternatives of transmission upgrades
13 proposed by SDG&E and I also proposed additional alternatives, including terminating one
14 of the 230 kV lines at South Bay. When the FS was completed, I reviewed its results to
15 ensure that the studies were performed correctly and solutions were proposed for all
16 identified Reliability Criteria violations.

17
18 Q. So from what you said, it appears that you did not independently determine the cost
19 estimates for various alternatives.

20 A. That’s correct. I reviewed the cost information contained in the FS. This review was simply
21 to determine if the estimates appeared “reasonable” or “in the ballpark.” I found the cost
22 information acceptable in the FS and, therefore, did not seek additional cost information
23 from SDG&E in my review.

24
25 Q. Did you do any independent evaluation of SDG&E’s analysis of permitability and other land
use or environmental issues with regard to respective transmission alternatives?

1 A. No, I did not. I evaluated only issues relevant to reliability of the transmission system.

2
3 **RESULTS OF THE CAISO’S ANALYSES**
4

5 Q. What are the CAISO’s conclusions regarding Scenario 1?

6 A. The Commission was correct in D.04-06-011 that Scenario 1 fails to provide fully integrated
7 capacity from Otay Mesa. Otay Mesa cannot displace any RMR generation in this scenario
8 and does not contribute to SDG&E resource adequacy requirements. In other words, Otay
9 Mesa cannot be considered a resource “internal” to SDG&E’s local reliability area and
10 therefore cannot achieve the benefits of Otay Mesa generation as discussed by the
11 Commission in D.04-06-011. Also, the amount of required Special Protection Systems
12 (“SPS”) and the amount of required generation tripping exceeds the CAISO Planning
13 Guides, thus making operation of the system more complicated and less reliable.
14 Accordingly, Scenario 1 does not constitute a viable plan of service if the intent is to
15 achieve the benefits of Otay Mesa generation as discussed by the Commission in D.04-06-
16 011.

17
18 Q. What can you say regarding Scenario 2?

19 A. Scenario 2 includes construction of a new 230 kV line between the Miguel and Sycamore
20 Canyon Substations. Discussion of Scenario 2 is important because it was included as
21 “Alternative 4” in Chapter 3 of SDG&E’s Proponents Environmental Assessment and this
22 scenario reflects an “interim” operating condition for Otay Mesa until the second new 230
23 kV line (Miguel-Old Town), or an alternative, is constructed under Scenario 3.
24
25

1
2
3 Q. What are your conclusions regarding Scenario 2?

4 A. This scenario was developed with the assumption that one new 230 kV transmission line is
5 constructed to relieve the congestion caused by a portion of the Otay Mesa generation.
6 Under this scenario, only one of the Otay Mesa units would be connected to this line so that
7 its output would be delivered to San Diego bypassing the Miguel Substation. The Miguel-
8 Sycamore Canyon transmission line is to be connected to one of the Miguel-Otay Mesa
9 circuits with an open circuit breaker at the Miguel 230 kV bus so that the Miguel Substation
10 would be bypassed. The studies assumed that the unit connected to the Sycamore Canyon
11 Substation would be one of the gas turbine units with a maximum output of 190 MW. In the
12 FS, SDG&E assumed that this Otay Mesa unit would replace some of the generation from
13 the Encina power plant.

14
15 The study results showed no overloads caused by the Otay Mesa generation under normal
16 condition when it operates under this scenario. However, with single contingencies, a 5%
17 overload was identified on the Sycamore Canyon-Carlton Hills Tap 138 kV transmission
18 line with an outage of the Palomar-Escondido 230 kV line and high Imperial Valley and
19 Palomar generation under heavy load conditions. The same overload, but at a lower level
20 (less than 1%), was identified under Scenario 1. If the Otay Mesa unit that is connected to
21 the Sycamore Canyon bus would replace South Bay rather than Encina generation as was
22 modeled in the SDG&E studies, the loading of the Sycamore-Carlton Hills tap section would
23 be higher. This line is planned to be recondored under Scenario 3, but its recondoring
24 may need to be advanced. Another single contingency overload under heavy load conditions
25 was observed on the Miguel-Otay Mesa 230 kV line with an outage of the Imperial Valley–
Miguel 500 kV line and high CFE exports.

1
2 Light winter cases identified the same overloads as in Scenario 1: Friars-Mission and
3 Doublet-Friars 138 kV lines with several single outages, and Imperial Valley 500/230 kV
4 transformer with an outage of the parallel larger transformer bank. The Friars-Mission and
5 Doublet-Friars 138 kV lines will be reconductored prior to summer 2007 as a part of the
6 SDG&E Transmission Expansion Plan. For the Imperial Valley transformer outage, an SPS
7 was proposed under Scenario 1.
8

9 For the Category C contingencies, which are outages of multiple transmission facilities with
10 an exception of one transmission line and one generator, which is Category B and extreme
11 contingencies, which are Category D, the impact of the Otay Mesa generation for Scenario 2
12 was the same as for Scenario 1. Multiple contingencies that resulted in overloads included
13 outages of the Palomar-Escondido and Escondido-Encina-San Luis Rey 230 kV lines,
14 double outage of the Miguel-Mission 230 kV lines or Miguel-Mission and Miguel-
15 Sycamore Canyon 230 kV lines, and Miguel 230 kV 4T stuck breaker. Other Category C
16 contingencies that may cause overloads impacted by the Otay Mesa generation are outages
17 of the Miguel 69 kV South bus or the Mission 69 kV North bus. SDG&E proposed several
18 SPS to trip generation to mitigate these overloads. According to the CAISO Planning
19 Standards, generation tripping is acceptable for multiple facility outages. The SPS for the
20 double line and bus section outages proposed for Scenario 1 will also mitigate the overloads
21 in Scenario 2. More severe contingencies such as the Miguel and South Bay-Main corridor
22 outages will require the same generation tripping as in Scenario 1.

23 In summary, it can be concluded that, although under Scenario 2 190 MW of Otay Mesa
24 generation can be integrated into the SDG&E resource adequacy plan and replace some of
25 the existing RMR generation, this scenario still does not provide for the full output of the

1 plant under all system conditions without additional upgrades. In addition, the amount of
2 generation that needs to be tripped under multiple contingencies exceeds 1400 MW
3 specified in the CAISO Planning Guides, and the amount of the required SPS is also higher
4 than the limit recommended by the CAISO Planning Guides. The upgrades in Scenario 2
5 reduce congestion caused by the Otay Mesa generation, but do not eliminate it. Under some
6 system conditions, the SDG&E transmission system may become overloaded if Scenario 2
7 is not expanded. Accordingly, while Scenario 2 can function as an interim step, stopping at
8 Scenario 2 is insufficient to meet the goals of the Commission in this proceeding and would
9 not be acceptable to the CAISO.

10
11 Q. You indicated that Scenario 2 could function as an interim step if deemed desirable by
12 SDG&E and the Commission. What would have to be done to accomplish this outcome?

13 A. Given that the completion of Scenario 3, however configured, will likely require a lengthy
14 permitting and construction process, the Otay Mesa plant may be connected to the grid
15 during this period under the plans described for Scenarios 1 and 2 if the following upgrades
16 are in place. Prior to the connection of the Otay Mesa Generation Project under Scenario 1,
17 the following upgrades are required,

- 18 1. the Miguel-Mission 230 kV #2 line;
- 19 2. reconductoring the Friars–Mission 138 kV line to a capability of at least 210 MVA;
20 and
- 21 3. reconductoring of the Doublet-Friars section of the Penasquitos-Friars 138 kV
22 transmission line to a capability of at least 180 MVA;
- 23 4. development of a solution to address overstress on thirteen 230 kV circuit breakers at
24 CFE’s Tijuana Substation;
- 25 5. development of a SPS to mitigate overloading on Imperial Valley 500/230 kV
transformer bank No.81 following the loss of the parallel larger bank; and

1 6. additional SPSs may need to be implemented.

2
3 Q. How many of these upgrades are already under construction or approved?

4 A. The Miguel-Mission 230 kV No. 2 transmission line is presently in construction and will be
5 completed prior to Otay Mesa. Reconductoring of the Friars–Mission and Doublet-Friars
6 138 kV lines was approved by the CAISO as a part of the 2003 SDG&E Transmission
7 Expansion Plan and according to this plan is expected to be completed in 2006 and 2007
8 respectively.

9
10 Q. What would need to be done prior to the connection of Otay Mesa under Scenario 2?

11 A. The following upgrades will need to be in place,

- 12 1. upgrades associated with the Palomar power plant including the installation of a
13 230/138 kV transformer at Sycamore Canyon Substation;
- 14 2. reconductoring the Sycamore Canyon-Carlton Hills tap section of the Sycamore-
15 Carlton Hills-Los Coches 138 kV transmission line to a capability of at least 280
16 MVA;
- 17 3. construction of the Sycamore Canyon-Miguel Tap section of the new Otay Mesa-
18 Sycamore Canyon 230 kV line with an emergency capability of at least 1090 MVA
19 to avoid the need to reduce Otay Mesa generation or constrain CFE exports; and
20 4. Additional SPSs may need to be implemented.

21
22
23 Q. How many of these upgrades are already under construction or approved?

24 A. Only upgrades associated with the Palomar power plant were approved by the CAISO. They
25 were a part of the Palomar power plant interconnection and are expected to be constructed in
April 2006.

1
2 Q. What are your conclusions regarding Scenario 3 (or SDG&E's Transmission Project)?

3 A. The CAISO concurs with SDG&E that the Transmission Project satisfies the objectives for
4 interconnecting Otay Mesa to the CAISO grid. The Transmission Project includes the
5 completion of an Otay Mesa-Sycamore Canyon 230 kV line and an Otay Mesa-Old Town
6 230 kV line. These lines will pass through Miguel Substation but the circuit breakers
7 connecting these lines to Miguel Substation will normally be kept open. This connection of
8 Otay Mesa will,

- 9 1. provide for the firm transmission delivery of Otay Mesa generation to SDG&E load
10 centers;
- 11 2. prevent Otay Mesa generation from increasing transmission congestion north of
12 Miguel;
- 13 3. reduce RMR costs by allowing the displacement of a portion of the RMR generation
14 in SDG&E;
- 15 4. provide higher operational flexibility during scheduled outages;
- 16 5. improve system voltages; and
- 17 6. avoid the need to trip additional generation or load for the north of Miguel corridor
18 outage.

19
20 Q. What demonstrates that the Transmission Project provides for full deliverability?

21 A. In studying the Transmission Project, it was assumed that all Otay Mesa generation output
22 was delivered to the internal SDG&E buses, and it replaced internal San Diego generation.
23 This way, Otay Mesa output could be tested whether it can be considered as a San Diego
24 reliability area internal resource. Several cases were studied including Heavy Summer and
25 Light Winter cases with different generation dispatch and different assumptions regarding
imports. Also several options of the generation interconnection were considered.

The following generation dispatch cases were studied since it was judged to represent all the variety of possible options.

- Case 1 No South Bay generation, except for units 1 and 2 operating as synchronous condensers, high Encina generation
- Case 2 High South Bay, low Encina generation
- Case 3 South Bay and Encina generation balanced to mitigate overloads
- Case 4 2007-2008 Light Winter

The Otay Mesa generation was modeled at full output in all the cases. The new Palomar, Ramco, and Envirepel generation plants, approved in D.04-06-011, were also modeled.

No thermal overloads were identified under normal system conditions with all facilities in service for all the cases studied. This demonstrates that under normal conditions, the Transmission Project achieves the objective of providing full deliverability of the Otay Mesa generation output and does not aggravate congestion at the Miguel Substation.

Q. What are the results under single contingencies?

A. The following table summarizes the results for the single contingencies for the Heavy Summer cases. The facility loading is provided for the import conditions when the loading was the highest. The import conditions studied included different exports from CFE, different East-of-River flows and different modeling of the Imperial Valley generation.

Single Contingencies with the Transmission Project. Heavy Summer.					
Overloaded Facility	Outage	% Loading			Proposed Mitigation, comments
		No S. Bay, high Encina	High S. Bay, low Encina	Min RMR at S. Bay & Encina	

Single Contingencies with the Transmission Project. Heavy Summer.

Overloaded Facility	Outage	% Loading			Proposed Mitigation, comments
		No S. Bay, high Encina	High S. Bay, low Encina	Min RMR at S. Bay & Encina	
Otay Mesa-TJI 230	Imp Vly-Miguel w/RAS	102	101	102	Modify SPS to cross-trip I.Vly-La Rosita230
Sycamore-Miguel Syc tap 230	Otay Mesa-Old Town 230	111	111	112	Higher emerg. rating or constraint CFE export
Miguel500/230 #1or2	Miguel 500/230 #2 or 1	108	104	106	SPS to trip Imp Vly gen
Imp Vly 500/230 #80	Imp Vly 500/230 # 81	107	107	107	SPS to trip Imp. Vly gen in Scenario 1
Old town 230/69 #1or2	Old town 230/69 # 2or1	105			Dispatch S. Bay gen
Friars-Mission 138	Encina 4 Penasqt-Old town 230 8 more outages		136 120	126 114	Reconductor. in 2006, SDG&E project, larger conductor may be required
Doublet-Friars 138	Encina 4 Penasqt-Old town 230 1 more contingency		118 103	108 104	Reconductor in 2007, SDG&E project
Sycamore-Carl'n Hls tap 138	Palomar-Escondido230 Miguel 230/138 Ot Mesa- Old Town 230 outages between Miguel& S.Bay	131 111 136	105 <100 105 <100	111 115	Reconductor in 2007, may be advanced for Scenarios 1 and 2
Old Town-Kettner 69	Miguel 230/138 Imperial Vly-Miguel 500 3 more outages	113 121			Dispatch S. Bay gen
Kettner-B 69	Proctor Vly-Miguel 138 or Miguel 230/138 Imperial Vly-Miguel 500 6 more outages	120 120 130			Dispatch S. Bay gen
Division-Navl Statn 69	South Bay 138/69 Imperial Vly-Miguel 500 2 more outages	120 106			Dispatch S. Bay gen
Poway-Pomerado 69	Palomar-Escondido230		106		Dispatch Encina gen
Est gate-Ros Cyn 69	Rose cyn-Pensqts 69	103			Dispatch S. Bay gen
Ave 58-Banister 161 (IID)	Palo Verde-Devers 500	103	105	104	IID is investigating

Single Contingencies with the Transmission Project. Heavy Summer.

Overloaded Facility	Outage	% Loading			Proposed Mitigation, comments
		No S. Bay, high Encina	High S. Bay, low Encina	Min RMR at S. Bay & Encina	
El Centro 161/92 (IID)	Palo Verde-Devers 500 Niland 161/92 Pilotknob 161/92	102 127 103	102 127 103	102 127 103	Existing SPS, overload w/out Otay Mesa
Knob-Pilotknob 161 (IID)	N.Gila-Imp. Vly 500	101			Depends on Blythe gen, overload w/out Otay Mesa
Midway 230/92 # 1 or 2 (IID)	Midway 230/92 # 2 or 1	136	136	136	Same w/out Otay Mesa, IID is investigating
PAP 230/69 kV #1 or 2 (CFE)	PAP 230/69 # 2 or 1 ERB 230/69 (CFE)	123 122	123 122	123 122	Proposed CFE project, overload w/out Otay Mesa
LOM 115/69 (CFE)	FLO –HRD 69 (CFE)	122	122	122	Proposed CFE project, same w/out Otay Mesa

Under low load conditions, the Friars-Mission-Doublet 138 kV line may overload with single outages, or the Imperial Valley 600 MVA transformer may overload with an outage of the larger parallel bank. However, there is an SDG&E project to reconductor the Friars-Mission line. The conductor size can be selected such that the overload is eliminated. The SPS proposed for Scenario 1 will mitigate overloading on the Imperial Valley transformer.

Studies of double and multiple outages for Scenario 3 did not identify the need for any new SPS compared to Scenarios 1 and 2. On the contrary, two new 230 kV transmission lines decrease the need for generation tripping during double and multiple contingencies.

It can be concluded that the objective of deliverability of the Otay Mesa generation can be achieved under the final plan of Scenario 3 (Transmission Project) if some additional system upgrades and Special Protection Systems are implemented.

1 Q. What do these results mean with respect to compliance with the CAISO's Grid Planning
2 Standards? How does the Transmission Project impact the system performance?

3 A. The study results showed that if the transmission system upgrades proposed for the final
4 interconnection plan (two new 230 kV transmission lines from Miguel Substation to the
5 Sycamore Canyon and Old Town Substations) and the additional upgrades including the
6 ones listed herein for Scenarios 1, 2 and 3 are implemented, the Otay Mesa generation
7 would be delivered to the customers without any violations of the CAISO Planning
8 Standards under meaningful system conditions. In this case, the Otay Mesa Generation
9 Project will serve as a SDG&E power resource without any negative impact on the
10 transmission system performance.

11
12 Q. You indicate in your table that certain of the facility overload situations during single
13 contingencies can be mitigated by dispatching either Encina or South Bay units. Does this
14 mean that the Transmission Project does not satisfy the objective of displacing RMR
15 generation?

16 A. No. It is true that overloading of the Old Town 230/69 kV transformers, the Old Town-
17 Kettner, Kettner-B, Division-Naval Station Meter, and East Gate-Rose Canyon 69 kV
18 transmission lines, which may occur in the absence of or with low South Bay generation,
19 may be mitigated by dispatching South Bay units. The overloading of the Poway-Pomerado
20 69 kV line may be mitigated by dispatching power from Encina. However the CAISO
21 recommended SDG&E to reconnector this line since the line is short and its reconnectoring
22 would be an inexpensive and efficient solution. Accordingly, the Transmission Project is
23 fully dispatchable, and can therefore displace RMR needs, subject to minimum RMR
24 requirements to mitigate the identified constraints. Moreover, the fact that a certain portion
25 of South Bay generation will remain under RMR contract does not suggest the presence of
Otay Mesa will fail to result in substantial RMR cost savings. The cost savings will come in

1 the form of lower variable RMR costs because the older, less efficient units will be
2 dispatched less frequently. For example, in 2003, variable costs payments associated with
3 South Bay totaled approximately \$75 million.
4 (See <http://www.caiso.com/docs/2004/02/23/2004022310231623931.xls>.) Furthermore,
5 since the lease of the property where the South Bay plant is located will expire in 2009, a
6 possibility exists that the plant may retire at that time. There is a plan to re-build the South
7 Bay power plant on an adjacent site, but at the present time this plan is not certain.
8 Therefore, dispatching South Bay generation may not be feasible after 2009. In addition,
9 due to the large amount of outages that may cause overloading and the large amount of
10 overloaded facilities, relying only on the generation re-dispatch to mitigate the overload did
11 not seem to the CAISO to be a reliable permanent option. Therefore, the CAISO
12 recommended that additional system upgrades be investigated to eliminate the overloads
13 with low or absent South Bay generation.

14
15 Q. Are you saying that the Transmission Project is insufficient to serve its purpose and that
16 more upgrades beyond those proposed are necessary to achieve the objectives of the
17 Commission in D.04-06-011?

18 A. No. Presently, SDG&E plans to remove two 138 kV transmission lines between the South
19 Bay and Main Street Substations due to its aged infrastructure and negative environmental
20 impact. As a result of the removal of these lines, additional transmission upgrades may be
21 needed regardless of the Transmission Project, and the Transmission Project may become a
22 part of an overall plan for the South Bay area. SDG&E is working on the Long-term
23 Transmission Plan for the South Bay area, which will mitigate the overloads and also
24 replace the aging infrastructure in the South Bay-Main Street corridor. One of the solutions
25 may be the construction of a South Bay 230 kV substation and looping the new Miguel-Old
Town 230 kV transmission line into this substation. Expanding the existing South Bay

1 Substation to 230 kV may be also needed due to the removal of the South Bay-Main Street
2 138 kV lines, and having the 230 kV transmission line to Old Town will facilitate the
3 overall plan. Until the upgrades are implemented, South Bay generation, whether existing
4 or re-powered will need to continue to operate as RMR.

5
6 Q. Can you explain why the Transmission Project will not aggravate congestion north of the
7 Miguel Substation?

8 A. The new 230 kV transmission lines to the Sycamore Canyon and the Old Town Substations
9 will bypass the Miguel Substation by operating the circuit breakers at the Miguel Substation
10 normally open. This way, the power from Otay Mesa will be delivered directly to San
11 Diego load and not impact the north of Miguel path. Therefore, the Otay Mesa generation
12 will not contribute to the congestion north of Miguel.

13
14 Q. Please describe what your conclusions were with respect to whether the Transmission
15 Project provides any value in avoiding the need to trip additional generation or load for the
16 north of Miguel corridor outage as well as additional operational flexibility.

17 A. The north of Miguel corridor outage is a rare, but very severe contingency, which may take
18 out four 230 kV transmission lines in this corridor (Miguel-Mission Nos. 1 and 2 and the
19 existing and new Miguel-Sycamore Canyon lines). An outage that severe may require
20 tripping of some generation and even interrupting some customers' load. However, because
21 the Transmission Project will include the new Otay Mesa-Old Town 230 kV transmission
22 line that will be constructed with a different route, west of this corridor, some power still
23 will be transmitted on this line even if the other 230 kV transmission lines north of Miguel
24 will be disconnected with this contingency.

1 The Transmission Project provides additional operational flexibility due to the new
2 transmission lines, which will allow taking the existing transmission lines out for
3 maintenance when needed, without causing additional problems. This way, it will facilitate
4 the system operation.

5
6 Q. What other studies were performed for the Otay Mesa Project and relied on by the CAISO?

7 A. Other studies performed by SDG&E and reviewed by the CAISO for the Transmission
8 Project included Voltage and Dynamic Stability Studies and Short Circuit studies.

9 Voltage stability studies were performed for Scenario 3 with various CFE exports and EOR
10 flow assumptions. In the studies, SDG&E used the criteria of a 150/75 MVAR reactive
11 margin on the SDG&E buses, a 30/15 MVAR margins for CFE buses, and a 50/25 MVAR
12 margins for IID buses for the single and double contingencies respectively. These criteria
13 are equivalent to the WECC Voltage Support and Reactive Power Standards, which require
14 positive reactive margin with a 5% increase in the power transfer or area load for single
15 contingencies and positive reactive margin with a 2.5% increase in transfer or load for
16 double contingencies.

17
18 The studies identified the need for additional reactive support with high EOR flow.
19 However, the need for reactive support is not associated with the addition of Otay Mesa, but
20 rather with high power transfers from Arizona. This is a known problem and the installation
21 of dynamic and static reactive support devices is planned regardless of Otay Mesa.

22
23 The dynamic stability studies did not identify any criteria violations caused by the Otay
24 Mesa generation. These studies examined 500 kV and 230 kV single and double
25 contingencies in the vicinity of the Otay Mesa Project and on the SWPL.

1 Short circuit studies identified overstressed 69 kV circuit breakers on several SDG&E
2 substations. These breakers will need to be replaced, however, their replacement is a part of
3 the SDG&E Transmission Expansion Plan and not related to the Otay Mesa Project.
4

5 In Scenario 3, when Otay Mesa is connected to the San Diego substations bypassing Miguel,
6 no circuit breakers are expected to be overstressed. However, if the Miguel 230 kV
7 breakers in Scenario 3 are normally closed, the Miguel 230 kV breakers may be overstressed
8 by 5%. No overstress was identified with the closed breakers and the Miguel-Old Town 230
9 kV line out of service. The preferred Scenario 3 is to operate the Miguel breakers normally
10 open.
11

12 Q. Similar to Scenarios 1 and 2, are there any other upgrades that the CAISO suggests should
13 be constructed prior to connection of Otay Mesa under the Transmission Project?

14 A. Yes. Prior to the connection of Otay Mesa under the Transmission Project, the following
15 upgrades will need to be in place;

- 16 1. construction of the Old Town-Miguel Tap section of the new Otay Mesa-Old Town
17 230 kV line with an emergency capability of at least 1176 MVA;
- 18 2. Reconductoring of the Poway-Pomerado 69 kV transmission line to a capability of at
19 least 175 MVA; and
- 20 3. Additional SPSs may need to be implemented.

21 These upgrades are not a part of SDG&E's current Transmission Expansion Plan. However,
22 SDG&E indicated that overload on the Poway-Pomerado 69 kV transmission line will be
23 addressed in the future, 2005 SDG&E Transmission Expansion Plan. Reconductoring of the
24 Poway-Pomerado 69 kV transmission line was recommended by the CAISO after the FS
25 review and therefore its cost has not been estimated.

OTHER POTENTIAL TRANSMISSION UPGRADE SCENARIOS

Q. What other alternatives of the Transmission Project were studied?

A. In addition to the proposed interconnection of the Otay Mesa Project to the Sycamore Canyon and Old Town 230 kV Substations, several other interconnection alternatives were studied. These alternatives are summarized and compared with the preferred alternative in the following table.

Transmission Alternatives for Scenario 3		
Alternative	Advantages	Disadvantages
1. Miguel-Mission #3 230 kV line instead of Miguel-Old Town	Provides full deliverability. Does not contribute to north of Miguel congestion. Strong 230 kV power source. Reduces RMR cost by displacing RMR generation. Provides for future load growth. No generation tripping and minimal load tripping for Miguel corridor outage. These advantages are the same as for the preferred alternative.	Likely higher costs due to longer underground section. Higher losses. Several disadvantages are the same as the Transmission Project: requires full dispatch of South Bay generation, Path 45 (CFE export) constraints may be required, and closing of the Miguel 230 kV tap breakers not possible due to high short circuit duty at Miguel and Tijuana.
2. Miguel-Mission #3 230 kV line instead of the Miguel-Old Town, a new line to connect Tijuana to Miguel instead of to Otay Mesa	Less congestion north of Otay Mesa due to Tijuana-Miguel line. Other advantages same as in Alternative 1 and preferred alternative.	Potentially significantly higher cost due to the new Otay Mesa-Miguel line section. Congestion north of Miguel with high CFE export. Higher load tripping for Miguel corridor outage.
3. Miguel-South Bay 230 kV line instead of the Miguel-Old Town, upgrade South Bay to 230 kV, additional lower voltage upgrades	Same as preferred alternative in the absence of South Bay generation if no additional upgrades are implemented	Likely higher cost due to 69 and 138 kV upgrades to eliminate overload with high South Bay generation. Requires new 230 kV switchyard and 230/138 kV banks at South Bay, which may become not needed with the Long-term Plan for South Bay. Not efficient long-term solution, 230 kV loop not completed. Prohibits simultaneous dispatch of Otay Mesa and South Bay without upgrades. Path 45 (CFE export) constraints may be required, same as in the preferred alternative. Possible need to sectionalize the 69 kV system. Excessive generation trip with Miguel corridor outage. Higher losses. Additional overstressed breakers if South Bay does not retire.
4. Build only Miguel – Sycamore 230 kV line,	Lower cost	Does not provide full deliverability. No 230 kV source in downtown. Provides congestion

1 **Transmission Alternatives for Scenario 3**

2

Alternative	Advantages	Disadvantages
3 no second line		4 at South Bay and Miguel. Excessive generation trip with Miguel corridor outage. Higher losses.

5

6 Q. Previously you indicated that the CAISO suggested studying the alternative to terminate one

7 of the 230 kV lines at South Bay instead of at Old Town. Why specifically do you now

8 conclude that the South Bay alternative is not an attractive alternative?

9 A. Sensitivity studies performed by SDG&E showed that if the South Bay power plant retires

10 and is not re-built, the upgrade of the South Bay 138/69 kV Substation to 230 kV and the

11 interconnection of the Otay Mesa Project to this substation instead of the Old Town

12 Substation would be a viable alternative. Without South Bay generation, and with the South

13 Bay termination, overloading on the downtown 69 kV system and the Old Town 230/69 kV

14 transformers would be avoided. The only emergency overload with a single facility outage

15 may occur on the Poway-Pomerado 69 kV line with high Palomar generation and it is not

16 related to the South Bay generation or the line termination point. The Poway-Pomerado line

17 may also overload with the termination of the new line at Old Town if the South Bay power

18 plant remains in operation. However, even if the South Bay termination option works

19 without the South Bay generation, it will not work if the South Bay plant does not retire or

20 is re-powered. With high generation from the South Bay Power plant and Otay Mesa,

21 numerous overloads may occur on the South Bay 69 kV transmission system under various

22 single contingency conditions. To mitigate these overloads, additional upgrades will be

23 required. Upgrading only the 69 kV system is not an efficient long-term solution. Also, to

24 avoid some overloads, the 69 kV system may need to be sectionalized, which will reduce

25 reliability. Implementation of all the upgrades required to mitigate overload in this

alternative may make the South Bay termination alternative more expensive than the

1 Transmission Project. The CAISO proposed that SDG&E study this alternative because, at
2 that time, future South Bay generation retirement was considered and there were no plans
3 for repowering the facility.

4 Q. Is the South Bay termination alternative inferior from a system expansion perspective?

5 A. Table 2.1 of SDG&E's Proponent's Environmental Assessment suggests that if South Bay
6 retires, SDG&E may have a capacity deficiency as early as 2010 in an estimated quantity of
7 329 MW. Even assuming this need is met by the construction of a new 500 kV line, Table
8 2.1 suggests that additional local generation or import capability will again be necessary by
9 2012. The Transmission Project maintains the option of utilizing the existing transmission
10 at South Bay to locate a resource in the area of the current South Bay plant. Having the
11 Transmission Project in place will facilitate the re-powering of South Bay or interconnection
12 of a new generation project in this location. In addition, the Transmission Project will
13 facilitate the system expansion at the Main Street location; if the Main Street Substation is
14 upgraded to 230 kV, it can be connected to the 230 kV transmission line to Old Town, which
15 cannot be done with the South Bay termination alternative.

16
17 Q. The alternative with the termination of the second 230 kV transmission line at the Mission
18 Substation, instead of the Old Town Substation, also has performance similar to the
19 Transmission Project. Why was this alternative not selected?

20 A. According to the SDG&E evaluation, this alternative had higher impact on the land use and
21 was visually inferior. The route of the new line would be through residential areas, which
22 might cause opposition from the elective officials and the public. This alternative is also
23 likely to be more expensive because it may require complete undergrounding of the section
24 between Main Street and Mission Substations.

1
2 Q. What was the difference in losses between the alternatives?

3 A. Under peak load conditions, the losses in the SDG&E transmission system were estimated
4 from 113 MW in alternative 2 to 120 MW in alternative 4 above. Losses for the
5 Transmission Project were estimated s 114 MW.
6

7 **LONG-TERM TRANSMISSION PLAN FOR THE SAN DIEGO AREA**
8

9 Q. How does the Otay Mesa Transmission Project integrate in the long-term plan for the San
10 Diego area?

11 A. SDG&E is presently working on the South Bay Area Long-Term Study. This study
12 addresses such aspects as expiring rights-of-way for transmission lines between Sweetwater
13 River and Main Street, aging transmission system infrastructure in the Main Street – South
14 Bay corridor, possibility the retiring of the South Bay Power Plant either with or without
15 being re-built, and maximizing power carrying capability of the existing transmission rights-
16 of-way. The Otay Mesa Transmission Project is a part of this long-term plan. The final
17 transmission plan for the Downtown and the South Bay areas of San Diego depends on
18 where and how the Otay Mesa generation is delivered. The South Bay Area Long-Term
19 Study is based on the selected alternative of the Otay Mesa Transmission Plan upgrades.
20

21 Q. What is the Long-term Transmission Plan for the South Bay Area?

22 A. The final alternative for the plan is not yet selected. Most likely, the 138 kV transmission
23 circuits from the South Bay to Main Street Substation will be removed together with the
24 Main Street 138/69 kV transformers. The Main Street Substation will be rebuilt to 230 kV,
25 and the Otay Mesa-Old Town 230 kV line will be looped into this substation. The system
arrangement will have flexibility for future looping of the transmission line from Otay Mesa

1 to Old Town also to the South Bay Substation if this substation is upgraded from 138/69 kV
2 to 230 kV or to the Main Street Substation if this substation is upgraded. The final plan will
3 have transmission system performance within the CAISO Grid Planning Standards
4 regardless of the South Bay generation retirement or re-built. SDG&E is also studying other
5 alternatives of the long-term plan.

6
7 However, if the Otay Mesa Power Purchase Agreement Transmission Project is not
8 constructed, the proposed Long-term Transmission Plan for the South Bay Area may appear
9 not to be achievable.

10
11 Q. Does that conclude your testimony?

12 A. Yes

ATTACHMENT

Qualifications of Irina Green

1 **QUALIFICATIONS OF IRINA GREEN**

2

3 Q. Please state your name and business address.

4 A. My name is Irina Green. My business address is California Independent System Operator, 151
5 Blue Ravine Road, Folsom, CA 95630

6 Q. Briefly describe your responsibilities at the California Independent System Operator.

7 A. I am a Senior Grid Planning Engineer in the Grid Planning Department. One of my primary job
8 responsibilities is to review technical analysis and proposals prepared by Transmission Owners to ensure
9 that facilities are in place as needed to meet applicable reliability criteria, to review generation
10 interconnections, including system upgrades needed to relieve congestion, and to coordinate and review
11 annual transmission expansion plans of the Transmission Owners.

12 Q. Please summarize your educational and professional background.

13 A. I received a Master of Science degree in Electrical Engineering from Leningrad Polytechnic
14 Institute in Russia in 1976. After graduation I worked for a National Research and Design Institute of
15 Electric Power Systems in Leningrad, Russia in various electrical engineering positions until 1991.
16 From 1991 to 1997 I worked for a Sacramento Municipal Utility District first as Associate and then as
17 Senior Transmission Planning Engineer. In 1997 I joined PG&E as a Senior Transmission Planning
18 Engineer where I worked until October 1999, when I joined the California ISO as a Grid Planning
19 Engineer and then was promoted to a Senior Grid Planning Engineer. I have over 20 years experience in
20 electric transmission system planning.

21 Q. Does this conclude your statement of qualifications?

22 A. Yes.

23 ///

24 ///

25

26

27

28

PROOF OF SERVICE

I hereby certify that on November 17, 2004 I served, by electronic mail, Testimony of Irina Green on behalf of the California Independent System Operator Corporation in Docket #A.04-03-008.

DATED at Folsom, California on November 17, 2004.


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