

Application No.: A.06-04-_____
Exhibit No.: SDG&E-3
Witness: Richard A. Sheaffer

In the Matter of San Diego Gas & Electric Company's
Application for Authorization to (1) to Participate in
the Steam Generator Replacement Project As A Co-
Owner of San Onofre Nuclear Generating Station Unit
Nos. 2 & 3 (SONGS 2 & 3) ; (2) Establish Ratemaking
For Cost Recovery; and (3) Address Other Related
Steam Generator Replacement Issues

(U 902-E)

Application No. 06-04-____

PREPARED DIRECT TESTIMONY

OF

RICHARD A. SHEAFFER

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

April 14, 2006

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1 **PREPARED DIRECT TESTIMONY**

2 **OF**

3 **RICHARD A. SHEAFFER**

4 **I. PURPOSE OF TESTIMONY**

5 Mr. Schneider’s testimony describes the analyses of two potential sources of replacement
6 generating capacity that could be used by San Diego Gas & Electric Company (“SDG&E” or
7 “the Company”) to replace its ownership share in the San Onofre Nuclear Generating Station
8 (“SONGS”). I will refer to this SDG&E ownership share as “SONGS-Share.” The purpose of
9 my testimony is to describe the transmission system reinforcements (“reinforcements”) that
10 would need to be made if the Company were to exercise its election to opt out of SONGS and
11 replace its SONGS-Share with either of the two replacement generating sources analyzed.

12 It should be also understood that the most simplistic scenario, from a transmission
13 planning standpoint, is one in which SDG&E’s SONGS-Share, if lost, is replaced by a Power
14 Purchase Agreement (“PPA”) to supply SDG&E with that equivalent amount of power from
15 SONGS. For such a case, comparison of a Reference Case (a case with SDG&E remaining a
16 20% owner of SONGS Units 2 and 3) with a Replacement Case (a case where SDG&E has been
17 assumed to lose its entire 20% share of the output of SONGS Units 2 and 3, and replaced that
18 power with purchased power from SONGS), would have identical power flows, thus no
19 reinforcements would be required. This is true because:

- 20
- The output of SONGS would not change due to ownership change;
 - The generation within SDG&E’s system would not change due to replacing
21 SONGS ownership with an equivalent import;
 - The area interchange (power scheduled from one area to another) would not
22 change; and
23
24

- 1 • Load and other factors that may affect the various computer simulations of the
2 transmission model would not change.

3 Therefore, without study, I can state that replacing SDG&E's SONGS-Share with an
4 equivalent import into SDG&E's system would require no reinforcements to SDG&E's
5 transmission grid.

6 This testimony addresses the transmission reinforcements that would be required for
7 SONGS-Share replacement alternatives. To help in the determination of the system
8 reinforcements that would be required if new generation were added to replace SDG&E's
9 SONGS-Share, SDG&E engaged R.J. Rudden Associates, a unit of Black & Veatch Corporation
10 ("B&V"), to perform at my direction and under my supervision the transmission planning study
11 upon which my testimony relies. B&V, in turn, engaged Pterra Consulting to perform study
12 work. Working closely with SDG&E personnel and under my direction, B&V and Pterra
13 Consulting modeled the Company's transmission system based on SDG&E's present plans (*i.e.*,
14 its plans without any change in the status of the Company's SONGS-Share), as well as under Mr.
15 Schneider's two alternative replacement scenarios. Based on this transmission modeling effort,
16 the physical changes to the Company's transmission system that would be required to
17 accommodate each of the SONGS-Share replacement alternatives considered by Mr. Schneider
18 were determined. I then provided descriptions of these system reinforcements to Mr. Torre for
19 the purposes of his estimating the costs of the modifications. Mr. Torre, in turn, provided his
20 cost estimates to Mr. Schneider for inclusion in his comparative generation economics analysis.

21 **II. ANALYSIS METHODOLOGY**

22 The transmission study was consistent with applicable reliability criteria and planning
23 standards of NERC, WECC, the California ISO and SDG&E (collectively, the "Reliability
24 Criteria"). The methodology used for this study is a standard, industry-accepted approach used

1 for analyses of this type. It consists of a comparison of the transmission system between a
2 “Reference Case” and two “Replacement Scenarios” (Replacement Scenario 1 and Replacement
3 Scenario 2). The Reference Case and two Replacement Scenarios we modeled are described
4 below:

- 5 • *The Reference Case* reflects SDG&E’s transmission plans under the
6 assumption that it continues to own its existing SONGS-Share. The
7 transmission system modeled in this case reflects reinforcements and other
8 planned system modifications that would be required under the Reliability
9 Criteria to meet expected load growth.
- 10 • *Replacement Scenario 1* models SDG&E’s transmission plans under the
11 assumption that its SONGS-Share is replaced by a 541 MW Combined
12 Cycle Combustion Turbine (“CCCT”) power plant located at the present
13 Encina site.
- 14 • *Replacement Scenario 2* models SDG&E’s transmission plans under the
15 assumption that the Company substitutes capacity from a geothermal
16 power plant that is interconnected to SDG&E’s transmission system at the
17 Imperial Valley Substation. That plant was modeled as four 111 MW
18 units, for a total of 444 MW.

19 In both of the two Replacement Scenarios, Mr. Schneider specified in general the
20 location of the replacement generation. I was then responsible for the determination of the
21 transmission reinforcements required to reliably support the replacement generation on the
22 transmission system.

23 For the Reference Case and both Replacement Scenarios, we modeled the Company’s
24 transmission system for each of the following years: 2010, 2015 and 2022. The first year

1 analyzed, 2010, was selected to approximately align with the planned completion of the SONGS
2 Steam Generator Replacement Project (“SGRP”). The last year, 2022, was selected to align with
3 the last year of the SONGS Nuclear Regulatory Commission (“NRC”) operating license. The
4 year 2015 was chosen since it was near the middle of the analysis period to provide an
5 approximate mid-point between the end points of the analysis.

6 **III. RESULTS OF ANALYSIS**

7 The results of the studied Reference Case and the two Replacement Scenarios for the
8 three years of study are as follows:

9 Reference Case:

10 The Reference Case analysis included the generation additions and transmission
11 system reinforcements which are assumed to be in service by the relevant year
12 studied.

13 Replacement Scenario 1:

14 As previously stated, Replacement Scenario 1 modeled the SDG&E transmission
15 system assuming that the SONGS-Share is replaced by a CCCT located at Encina.

16 By comparing Replacement Scenario 1 with the Reference Case for each
17 respective year studied (2010, 2015, and 2022), the changes that would be needed
18 to the system should SDG&E replace its SONGS-Share with capacity from a
19 CCCT at the Encina location were identified. The reinforcements indicated by
20 the Replacement Scenario 1 analysis include the following:

- 21 1. Acceleration of the reconductoring of the Escondido to Felicita 69 kV line
22 to 2015 (identified in the Reference Case as being otherwise needed by
23 2022), an advancement of approximately seven years. The project would

1 increase the rating of the 69 kV line from 97.5 MVA to 137 MVA using a
2 single 1033 kCMIL aluminum conductor steel reinforced (“ACSR”)
3 conductor or equivalent.

- 4 2. Acceleration of the reconductoring of the Felicita to Ash Tap 69 kV line to
5 2015 (identified in the Reference Case as being otherwise needed by
6 2022), an advancement of approximately seven years. The project would
7 increase the rating of the 69 kV line from 97.5 MVA to 137 MVA using a
8 single 1033 kCMIL ACSR conductor or equivalent.

9 Replacement Scenario 2:

10 Replacement Scenario 2 modeled the SDG&E transmission system assuming that its
11 SONGS Share is replaced by a Power Purchase Agreement (“PPA”), for a total of 444 MW of
12 geothermal capacity, comprised of four 111 MW units, interconnected at Imperial Valley
13 Substation. By comparing Replacement Scenario 2 with the Reference Case for each respective
14 year studied (2010, 2015, and 2022), the changes that would be needed should SDG&E replace
15 its SONGS-Share by a geothermal source interconnected at Imperial Valley were identified. The
16 reinforcements indicated by the Replacement Scenario 2 analysis include the following:

- 17 1. Addition of a third 500 kV to 230 kV transformer at the Imperial Valley
18 Substation in 2010.
- 19 2. Addition of a third 230 kV to 69 kV transformer at the Sycamore Canyon
20 Substation in 2015.
- 21 3. Acceleration of the reconductoring of the Felicita to Ash Tap 69 kV line to
22 2015 (identified in the Reference Case as being otherwise needed by
23 2022), an advancement of approximately seven years. The project would

1 increase the rating of the 69 kV line from 97.5 MVA to 137 MVA using a
2 single 1033 kCMIL ACSR conductor or equivalent.

3 4. Reconductor the Pomerado – Sycamore Canyon 69 kV Double-Circuit
4 Line to 204 MVA (per circuit) in 2015 using bundled 636 kCMIL ACSR
5 conductors or equivalent.

6 5. Reconductor the Melrose Tap – San Luis Rey 69 kV Line to 204 MVA in
7 2022 using bundled 636 kCMIL ACSR conductors or equivalent.

8 **IV. APPLICATION OF RESULTS AND CONCLUSIONS**

9 Once I completed the comparisons of the two Replacement Scenarios against the
10 Reference Case, I provided the Replacement Scenario transmission reinforcement descriptions to
11 Mr. Torre, who then estimated their costs as input to Mr. Schneider’s economic analysis.

12 Mr. Schneider’s testimony addresses the effects that the transmission reinforcements
13 have on the comparative economics of generation sources that might replace the Company’s
14 SONGS-Share. The transmission system impacts of the alternative generating resources
15 modeled could, in practice, be readily addressed with typical system reinforcements. The few
16 potential incremental reinforcements indicated as a result of replacing SDG&E’s SONGS-Share
17 all involve relatively minor physical changes to the transmission system, and would utilize
18 existing technology and proven procedures to implement. The studies indicate that their
19 implementation would not involve any changes to established power system operating
20 procedures.

21 **V. QUALIFICATIONS OF WITNESS**

22 My name is Richard A. Sheaffer. My business address is San Diego Gas & Electric
23 Company, 8316 Century Park Court, CP52A, San Diego, CA 92123. I am presently employed

1 by San Diego Gas & Electric Company (“SDG&E”) as Principal Engineer in the Electric
2 Transmission Planning Section.

3 I graduated with a Bachelor of Science degree in Electrical Engineering (“BSEE”) from
4 The Pennsylvania State University (“Penn State”) in 1972. I later received a Master of Science
5 degree in Electrical Engineering (“MSEE”) from the University of Southern California (“USC”)
6 in 1975. I further received a Master of Business Administration (“MBA”) degree, with a
7 management focus, from Pepperdine University in 1996. I am also a registered Professional
8 Engineer (in the Electrical Branch) in the State of California (No. E8877) and in the State of
9 Florida (No. PE-0030014).

10 With respect to my professional experience, I worked for Southern California Edison
11 Company (“SCE”) during the period from 1973 to 1979, and again from 1980 to 1990. For
12 approximately one year, between 1979 and 1980, I was employed by Harris Corporation
13 (Controls Division), located in Melbourne, Florida. I began working for SDG&E in 1990, and
14 continue to do so.

15 I have held a number of positions throughout my career involving electric utilities, the
16 majority of which have involved electric transmission planning and grid operations. Such
17 positions have involved modeling of the transmission grid for both California and the
18 interconnected system of the Western Systems Coordinating Council (“WSCC”). I have also
19 served as a representative on the WSCC Technical Studies Subcommittee, Pacific and Southwest
20 Transfer Subcommittee, and Rating Methods Task Force. WSCC is now known as the Western
21 Electricity Coordinating Council (“WECC”). In addition, I have also served as SDG&E’s
22 representative to the San Onofre Nuclear Generating Station (“SONGS”) in regard to
23 decommissioning Unit 1, and continue those responsibilities.

1 Having worked for both SDG&E and SCE, I am familiar with their transmission systems
2 and the systems to which they interconnect.

3 I have previously testified before this Commission.

4 This concludes my prepared direct testimony.