

Exhibit No.: _____

Commissioner: Loretta M. Lynch

Administrative Law Judge: Charlotte TerKeurst

Witness: Anjali Sheffrin, Ph.D.

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

Order Instituting Investigation into Implementation
of Assembly Bill 970 Regarding Identification of
Electric Transmission and Distribution Constraints,
Actions to Resolve those Constraints, and Related
Matters affecting the Reliability of Electric Supply

Investigation No. 00-11-001
(Phase 5)

**OPENING TESTIMONY ON BEHALF OF
THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR**

June 2, 2004

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11 **I. Supporting Witness**

12 My name is Anjali Sheffrin, Ph.D. I serve as Director of Market Analysis for the California
13 Independent System Operator Corporation (CAISO) and I am submitting this testimony on its behalf.
14 My job duties and qualifications are set forth as Attachment 6 to this testimony.

15 **II. Testimony Overview**

16 Phase 5 of this proceeding was established to evaluate the CAISO's methodology for assessing
17 the economic viability of proposed transmission projects. That methodology is set forth in the
18 "Transmission Economic Assessment Methodology Report on Path 26 Upgrade," ("Team Report")
19 and accompanying appendices. The Team Report constitutes a comprehensive, detailed, and fully
20 stand alone description of the economic methodology. The CAISO believes that submitting the
21 methodology as a technical report, rather than in the form of question and answer testimony, will be a
22 more useful format for future project proponents given the technical nature of the economic analysis
23 involved and its anticipated application in the CAISO grid planning process as well as potentially in
24 Commission proceedings. Accordingly, the purpose of my testimony is largely procedural, rather than
25 substantive, and will not attempt to duplicate the contents of the Team Report. Specifically, my
26 testimony will:

- a. Describe the structure of the Team Report and identify the sponsoring witnesses for particular chapters.
- b. Provide a brief procedural history leading up to this submission.
- c. Describe the stakeholder process used in developing and finalizing the Team methodology.
- d. Authenticate the Opinion of the CAISO Market Surveillance Committee on Team Methodology.

III. Description of Team Report

The Team Report is divided into nine primary chapters and includes an executive summary and appendices. A true and correct copy of the Team Report is identified as attachment 1 to this testimony, while true and correct copies of Appendices A through D to the Team Report are identified separately as attachments 2 through 5, respectively. In the chapters, we comprehensively present the methodology, including the evaluation principles, model requirements, and our recommended analytical approach. We also describe the application of our methodology by performing a transmission feasibility study on Path 26 consistent with the direction provided by Administrative Law Judge TerKeurst in her January 28, 2004 ruling. The following is a list of the chapters and appendices, the identity of the sponsoring witness, and the location of the sponsoring witnesses' qualifications in parentheses:

- i. Executive Summary
- ii. Introduction
- iii. Chapter 1 - Overview of Transmission Assessment Process – Anjali Sheffrin (Attachment 6) and Jeff Miller (Attachment 7)
- iv. Chapter 2 – Quantifying Benefits – Mingxia Zhang (Attachment 8)
- v. Chapter 3 – Network Model Requirements – Jeff Miller
- vi. Chapter 4 - Market Price Derivation – Jing Chen (Attachment 9)
- vii. Chapter 5 - Sensitivity Case Selection – Mingxia Zhang
- viii. Chapter 6 - Resource Substitution – Anjali Sheffrin
- ix. Chapter 7 - Overview of Analytical Process – Anna Geevarghese (Attachment

10)

- x. Chapter 8 - Base Case Assumptions – Steve Broad (Attachment 11), Mingxia Zhang, and Jing Chen
- xi. Chapter 9 - Results – Anna Geevarghese, Jing Chen, Steve Broad, Mohamed Awad (Attachment 12) and Mingxia Zhang

6 Appendices

- 7 1. Appendix A - List of Acronyms
- 8 2. Appendix B - Benefits Example for Three Node Model – Mingxia
- 9 Zhang
- 10 3. Appendix C - Base Case Assumptions – Steve Broad, Mingxia Zhang,
- 11 and Jing Chen
- 12 a. SSG-WI 2008 Thermal Plant by Technology
- 13 b. SSG-WI Resource Additions since 1/1/2000
- 14 c. WECC Major Path Listing
- 15 d. Inflation and Gas Price Forecasts
- 16 e. WECC 2008 and 2013 Expansion Plans
- 17 4. Appendix D - Public Process

18 **IV. Procedural History**

19 The CAISO is responsible for evaluating all potential transmission upgrades that CAISO
20 ratepayers may be asked to fund. As such, the CAISO recognized in the spring of 2001 that a new,
21 more robust, approach to assessing the economic benefits of transmission investment was needed to
22 adapt to changes created by California’s restructured wholesale electricity marketplace. The CAISO
23 set about to work cooperatively with those entities involved in the planning, financing, and siting of
24 transmission infrastructure to develop a common methodology. The objective was, and continues to
25 be, to reduce, to the extent possible, the potential for inconsistent assessments and results in the
26 various stages of project approval. To achieve this goal, the CAISO formed a steering committee to
27 oversee the effort. The steering committee was comprised of the CAISO, its Participating
28 Transmission Owners (“PTOs”), the Commission, the California Energy Commission (“CEC”), and

1 the Electricity Oversight Board. The CAISO issued a request for proposal for a consultant to develop
2 the methodology in conjunction with the CAISO and steering committee. London Economics was
3 selected in September 2001.

4 In Phase 2 of this proceeding, the Commission addressed long-term transmission planning
5 issues and, in particular, evaluated the need for a new Southern California link to Arizona, Nevada or
6 Mexico. The parties to Phase 2 did not address whether added transmission capability in the
7 southwest should be built on economic grounds. The decision noted instead “neither the CAISO nor
8 utility transmission planners have a clear basis for determining whether and when to construct
9 economic transmission additions.” (D.01-10-070 (Oct. 25, 2001).) Upon being advised that the
10 CAISO had recently initiated an RFP process to develop an economic methodology, the Commission
11 in D.01-10-070 directed the three-investor owned PTOs to file the CAISO’s economic methodology
12 with the Commission upon its completion.

13 From September 2001 to August 2002, the CAISO held five meetings/conference calls
14 between the steering committee and London Economics to facilitate the exchange of ideas and to
15 advance development of the methodology. During this period, the CAISO determined that testing the
16 methodology by applying it to a proposed upgrade would be more productive than simply engaging in
17 an extensive theoretical discussion of methodological concepts. Path 26 was selected and results
18 presented to the Commission in August 2002.

19 The CAISO had previously identified through the steering committee process a number of
20 concerns regarding the feasibility, economic soundness and other aspects of the methodology as
21 proposed by London Economics. The validity of these concerns was confirmed by the August 2002
22 results. Consequently, the CAISO acknowledged in the August 2002 submission to the Commission
23 that “it is likely that substantial additional work and further evolution of the methodology will be
24 required before the CAISO will accept a final methodology. While the CAISO is disappointed that
25 substantial work remains ahead, this should not be surprising. A rigorous methodology for the
26 evaluation of the economic value of proposed transmission upgrades is a substantial undertaking,
27 particularly in the context of a competitive wholesale electricity market where the impact of the
28 upgrades on the competitiveness of the market is an important aspect of the assessment.” (*Economic*

1 *Methodology Update of the California Independent System Operator*, I.00-11-001 (Aug. 16, 2002) at
2 p. 3.)

3 Subsequent to the August 2002 submission, the CAISO worked with London Economics to
4 revise the methodology to address the concerns identified by the CAISO. This effort involved revising
5 the methodology itself to enhance the analysis of market power and, concurrently, testing the revisions
6 and refinements using Path 26 as the test case example. However, in undertaking this effort, the
7 CAISO determined that the analytical tool used to implement the methodology, POOLMOD, was
8 insufficiently detailed in its representation of the network to permit an acceptably accurate economic
9 assessment. The CAISO informed the Commission of its expectation that, as a further step in the
10 development of an economic methodology, the development of a full network or nodal model of the
11 transmission system would be necessary.

12 Nevertheless, pursuant to a ruling of the Administrative Law Judge on January 29, 2003, the
13 CAISO filed its then developed general blueprint for the economic methodology on February 28, 2003
14 and a workshop was held on March 14, 2003. At the workshop, the CAISO presented illustrative
15 cases regarding Path 26 to show how the methodology may be applied. Much of the conceptual and
16 theoretical underpinnings of the current Team methodology were presented at the March 2003
17 workshop. However, the CAISO reiterated that its presentation could not be considered a realistic
18 outcome of a representative Path 26 study because of the need to run additional sensitivity analyses
19 and to apply a more detailed network model. On April 10, 2003, the Administrative Law Judge issued
20 a ruling recognizing that additional time was necessary to fully develop and apply the methodology.
21 The procedural schedule for Phase 5 was, therefore, deferred “until the ISO has employed and
22 validated a network model, and the ISO and one or more respondents have completed a study using
23 the proposed methodology and network model for a specific, high priority transmission project.”¹ In so
24 doing, the ruling acknowledged that “[i]t may take up to a year for the ISO to employ and validate a
25 more detailed network model and finalize its proposed generic methodology, particularly with respect
26 to market power modeling issues.” The CAISO, as more fully described in Chapter 7 of the Team
27

28 ¹ *Administrative Law Judge’s Ruling Modifying Phase 5 (Generic Methodology) and Phase 6 (Tehachapi
Transmission Project) Schedules*, I.00-11-001 (April 10, 2003).

1 Report, subsequently moved forward with identifying, developing, and obtaining the model needed to
2 undertake the Path 26 assessments.

3 On December 15, 2003, the assigned Administrative Law Judge issued her ruling proposing a
4 Phase 5 schedule, setting a prehearing conference and seeking input on the identity of the transmission
5 project to be evaluated.² With respect to the latter issue, the ruling emphasized that “[i]n order to
6 allow this phase to focus on the economic methodology, the transmission project should be one that is
7 not planned to be brought to the Commission for a Certificate of Public Convenience and Necessity.”
8 Following the prehearing conference, the Administrative Law Judge confirmed that the methodology
9 should be applied to Path 26.³ In addition, the ruling agreed that the CAISO should conduct public
10 stakeholder workshops on roughly a monthly basis to facilitate preparation of the methodology for
11 filing. I discuss these workshops in the next section. Finally, the Administrative Law Judge ordered
12 that the methodology be filed on June 2, 2004.

13 **V. Description of the Stakeholder Process**

14 At the suggestion of the CAISO and pursuant to the ruling of the Administrative Law Judge,
15 the CAISO utilized a public stakeholder process to mold the Team methodology in preparation for
16 filing with the Commission. Three public workshops were held - February 3, 2004, March 16, 2004
17 and April 28, 2004. A list of the participating organizations and meeting agendas are part of Appendix
18 D to the Team Report, and is set forth in Attachment 5. During the workshops, we expressly provided
19 detailed descriptions of the methodology, the key components behind it, the modeling effort,
20 sensitivity case identification, and the preliminary results to date. The CAISO actively solicited
21 advice and stakeholder review during the workshops. In this regard, the stakeholder advice and review
22 received at the workshops was not part of a “formal” process where specific questions or issues were
23 formally raised and the CAISO responded through a set process. Instead, the CAISO formed three
24 technical subgroups to collaboratively assist in the detailed development of the methodology. The
25 three subgroups addressed based case assumptions, scenario selection, and market pricing. In all,
26 twelve conference calls were held by the subgroups and hundreds of e-mails exchanged.

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28 ² *Administrative Law Judge’s Ruling Proposing Phase 5 Schedule and Setting Further Prehearing Conference*,
I.00-11-001 (Dec. 15, 2003).

³ *Administrative Law Judge’s Ruling Regarding Scope and Schedule of Phase 5*, I.00-11-001 (Jan. 28, 2004).

1 Input from the stakeholders tangibly impacted the filed Team methodology. Stakeholder input
2 was critical in the development of the base case assumptions, which are fully described in Chapter 8 of
3 the Team Report. Through the base case assumptions subgroup several important modifications were
4 made to the Seams Steering Group – Western Interconnection (“SSG-WI”) dataset, which generally
5 formed the starting point for development of the 2008 and 2013 base cases. First, the addition of
6 renewable and other resources to the Western Electric Coordinating Council between 2008 and 2013
7 will likely require an expansion in transmission infrastructure. Subgroup input augmented the SSG-
8 WI dataset to produce the likely transmission expansion plan applied to the study years. (See, Table
9 8.3 of the Team Report.) Second, new hourly load forecast data was developed for each of the 21
10 regions modeled in the Team methodology through input from the CEC and the stakeholder subgroup
11 and, again, in collaboration with the CEC, synthetic load shapes were utilized to provide the most
12 reasonable base profile. These topics are discussed in section 8.3.1 of the Team Report. Third,
13 through subgroup input, our treatment of natural gas prices deviated from that employed in the SSG-
14 WI dataset. Unlike the SSG-WI dataset, the Team Report uses monthly, not annual, gas prices and
15 relies on the CEC’s 2003 Electricity and Natural Gas Assessment Report. Fourth, through subgroup
16 participation, the Team methodology incorporated the more aggressive implementation timeframe for
17 California’s renewables portfolio standard pursuant to Energy Action Plan adopted by the
18 Commission, CEC and the California Power Authority. Under the Energy Action Plan,
19 implementation of the 20 percent renewables target established by Public Utilities Code § 399.11 et
20 seq., has been accelerated such that the goal will be reach by 2010, rather than 2017. Renewable
21 energy targets are listed in Table 8.9 of the Team Report.

22 With respect to market price derivation, the subgroup identified a concern regarding the
23 potential non-linear relationship between the Lerner Index and variables describing system conditions.
24 With the assistance of stakeholders and the CAISO’s Market Surveillance Committee (“MSC”), we
25 modified the methodology to include two non-linear specifications in the regression analysis in an
26 effort to enhance our confidence in the results.

27 The CAISO also utilized the stakeholder process to provide interested parties with exposure to
28 PLEXOS, the analytical tool selected by the CAISO to perform the Team methodology. At the April

1 28, 2004, stakeholder meeting, the CAISO brought in the developer of PLEXOS to demonstrate the
2 tools capabilities and answer questions. Although the Team methodology does not stipulate which
3 software tool must be used, we recognized that some familiarity with PLEXOS will facilitate and
4 increase the value of stakeholder input in this proceeding. It was, in large part, to encourage
5 participation in this proceeding that the CAISO made the PLEXOS developer available.

6 **VI. Market Surveillance Committee Opinion**

7 The MSC or Market Surveillance Committee of the CAISO is an independent advisory group
8 to the ISO Governing Board. The MSC consists of four industry experts with Prof. Frank Wolak of
9 the Department of Economics at Stanford University as Chairman, and Prof. Brad Barber of the
10 Graduate School of Management at UC Davis, Prof. James Bushnell, Research Director of the
11 University of California Energy Institute, and Prof. Benjamin Hobbs of the Department of Geography
12 and Environmental Engineering at The Johns Hopkins University as members. To ensure
13 independence, none of the MSC members are affiliated with or have any financial interest in any
14 market participant. Their charter allows them to suggest changes in rules and protocols or recommend
15 rules, protocols, sanctions or penalties directly to the CAISO Governing Board. In this regard, the
16 MSC may produce independent reports containing its recommendations.

17 The MSC has been aware of the ISO effort since the inception and has provided an assessment
18 of the original London Economics work. On April 5, 2004, at a regularly scheduled MSC meeting, we
19 asked the MSC to provide a formal opinion evaluating the Team methodology. On May 17, 2004, the
20 MSC held a public meeting seeking public comment of the Team methodology. The MSC's opinion
21 was adopted and published on June 1, 2004, a true and correct copy of which is attached as
22 Attachment 13. The MSC "strongly supports the adoption of a comprehensive transmission benefits
23 assessment methodology for the California market" and that "[t]his methodology should provide a
24 robust framework for conducting a net present value analysis of proposed transmission upgrades."