BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the Matter of the Application of Southern California Edison Company (U 338-E) for a Certificate of Public Convenience and Necessity Concerning the Devers-Palo Verde No. 2 Transmission Line Project.	Application 05-04-015 (Filed April 11, 2005)
Order Instituting Investigation on the Commission's Own Motion into Methodology for Economic Assessment of Transmission Projects.	Investigation 05-06-041 (Filed June 30, 2005)

OPENING BRIEF ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR

March 10, 2006

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Pursuant to the California Public Utilities Commission's ("Commission") Rules of Practice and Procedure and instructions from the presiding Administrative Law Judge ("ALJ") issued on January 12, 2006, as subsequently modified by the ALJ's ruling granting extension of time, dated February 10, 2006, the California Independent System Operator Corporation ("CAISO") respectfully submits this opening brief to address (1) issues raised in the Commission's investigation to consider methodologies for assessing the economic benefits of proposed transmission upgrades and (2) the need for Southern California Edison's ("SCE") proposed 500 kV Devers-Palo Verde No. 2 ("DPV2") transmission line.

I. INTRODUCTION AND SUMMARY

A. DPV2 Application for a Certificate of Public Convenience and Necessity

The CAISO performed a comprehensive analysis of the anticipated economic benefits of DPV2 utilizing the CAISO's Transmission Economic Assessment

Methodology ("TEAM").[1] The analysis concluded that DPV2 will provide significant economic and reliability benefits to CAISO ratepayers. The CAISO estimated that the benefits from DPV2 will exceed its costs under a wide variety of future system conditions and that the expected benefit-cost ratio ("BCR") comfortably ranges from 1.2 to 3.2. In fact, Mr. Florio, witness for The Utility Reform Network ("TURN"), expressed greater confidence in the CAISO's analysis reflecting a BCR of 3.2, making the line "a pretty clear winner."[2]

The economic benefits largely result from an increased ability to import lower-cost energy from the southwest and displace higher-cost California resources. The important reliability benefits result from increasing voltage support to Southern California and enhancing system operational flexibility by providing the CAISO with more options to respond to transmission and generation outages.[3] Consequently, the CAISO urges the Commission to conclude that project "need" is established for purposes of SCE's CPCN application.

B. TEAM Investigation

The investigation properly addresses two areas of inquiry: (1) is the CAISO's Transmission Economic Assessment Methodology ("TEAM") reasonable and, if so, (2) how should TEAM be used, if at all, to improve the quality and efficiency of the regulatory process to evaluate applications for Certificates of Public Convenience and Necessity ("CPCN") for economically-driven transmission projects?

The answer to the first question is "yes," both generally and as applied by the CAISO. TEAM represents the culmination of several years of collaboration among

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1 Exhibit 11, Attachments 6 and 7.
2 Tr. at 369:2-371:6.
3 Exhibit 11, Attachment 6 at 1-3.

internal CAISO experts, Commission staff experts, external industry experts, including the CAISO's Market Surveillance Committee ("MSC"), and other stakeholders. Through this meticulous effort, TEAM reflects improvement on traditional transmission economic evaluations in five major areas:

1. Sets forth a framework to consistently measure the economic benefits of a transmission expansion project from the societal and CAISO Ratepayer and Participant perspectives.

2. Utilizes a network model that captures the physical constraints of the transmission grid as well as the impacts of a project in terms of locational marginal prices.

3. Incorporates a method to simulate the impact of strategic bidding and thereby provides a better representation of potential benefits from a transmission upgrade in a restructured market environment.

4. Addresses uncertainty utilizing a rigorous methodology for selecting scenarios and assigning relative probability to those scenarios to derive the expected benefit and range and distribution of benefits for a transmission upgrade.

5. Establishes a requirement to evaluate alternative resources in a systematic and comprehensive manner.[4]

These fundamental enhancements can be expressed in terms of general principles or minute details according to past application. The CAISO recognizes that how TEAM is defined may determine or influence its regulatory use. With this understanding, the CAISO characterizes TEAM in Section II.A of this brief as a set of principles, rather than a prescriptive study "recipe" that must be assiduously followed.

The CAISO has determined that an overly prescriptive application of TEAM is unlikely to be beneficial or practical. The five TEAM principles provide a framework and minimum requirements that allow for an evolutionary process that permits professional engineers and economists the ability to pursue creative refinements in

[4] See Section II.A below; see also Exhibit 11, Attachment 1 at ES-4.

various study areas. In contrast, adoption of TEAM at too great a level of detail threatens to stifle innovation and, ultimately, accuracy for the sake of regulatory certainty. Further, any economic assessment will need to be applied to a wide range of proposed transmission projects. A highly prescriptive and detailed definition of an acceptable economic evaluation methodology will impair the ability to adapt to the unique circumstances that inevitably surround each proposed transmission project.

The flexibility and freedom inherent in defining TEAM as a set of core principles and minimum requirements does not, however, diminish the value of TEAM in enhancing regulatory efficiency. By adopting TEAM principles, the Commission will:

- Expedite regulatory review by promoting consistency between the expected submissions at both the CAISO and the Commission. The CAISO intends to utilize TEAM. As such, standardization will eliminate the probability of multiple studies and the concomitant time associated with the CAISO either rejecting the proponent's study or performing an independent TEAM analysis.

- Enhance the quality of decision-making by establishing a transparent, standard framework that ensures that a transmission project approved on the basis of economic efficiency is reasonable and defensible given other resource options.

The investigation goes further by asking whether it is reasonable to "adopt the CAISO's economic determination" where the CAISO "has followed the guidance provided by the Commission in a reasonable manner."[5] The question, and level, of deference accorded to the CAISO is a combustible issue. Deference derailed Rulemaking 04-01-026. The current investigation proposes to "evaluate" the CAISO's implementation of adopted guidelines, rather than "validating" the CAISO's effort, as suggested in the prior rulemaking. The CAISO does not believe that this approach will

[5] *Administrative Law Judge's Ruling Addressing Phase I Testimony and Evidentiary Hearings,* A.05-04-015 and I.05-06-041 (Oct. 28, 2005) ("ALJ Ruling") at 2.

remove the alleged procedural and substantive obstacles identified by some vocal parties in the rulemaking. Moreover, it is unclear whether this proposed approach will expedite consideration of economic transmission projects. Instead, it may simply substitute a battle over whether the project is economically efficient with whether the CAISO followed the guidelines in a reasonable manner. The project proponent, not the CAISO, should be the primary protagonist in the CPCN proceeding.

The CAISO believes that a more sound approach would be to adopt the TEAM principles as a set of minimum requirements and find that where the CAISO has established that a transmission project will provide economic benefits to ratepayers, a jurisdictional project proponent may rely on the study underlying the CAISO's determination (whether performed by the proponent or the CAISO) to trigger a rebuttable presumption of economic efficiency. This rebuttable presumption would shift the burden of proof to an opposing party to demonstrate by some standard of evidence that the project is either not economic or other Public Utilities Code sections 1001 and 1002 factors compel denial. Parties would retain the right to challenge the presumption and the Commission would not be delegating its decision-making discretion because it would remain free to ultimately reject the CAISO's finding or override it based on other considerations. The Commission would merely be recognizing the CAISO's expertise and statutory responsibility in the area of transmission planning to give the study underlying its determination special weight. Moreover, since the Commission would be basing its regulatory treatment on attributes of the CAISO, rather than the particulars of the TEAM approach, adoption of, and compliance with, general principles would be sufficient.

II. TRANSMISSION INVESTIGATION ISSUES

A. TEAM Constitutes Reasonable Principles That Should Be Applied in Assessing the Economic Benefits of Transmission Projects

The ALJ Ruling asks "[w]hat general principles or methodologies should be implied in assessing the economic benefits of transmission projects" and whether TEAM is "consistent with such general principles or methodologies." The CAISO offers that TEAM encompasses the appropriate general principles.

The CAISO has consistently defined TEAM as consisting of five "key principles."

- Benefits Framework
- Network Representation
- Market Prices
- Uncertainty Analysis
- Resource Substitution

To assist the ALJ and the Commission in evaluating TEAM and demonstrating why the CAISO's approach is reasonable, the CAISO further defines "what is TEAM" by discussing each principle and the associated minimum requirements to be met under each principle in greater detail below. Each principle need not be applied to every proposed project and to the same degree. The principle's application and its rigor will depend on the size in capital costs and nature of the proposed project. There are three broad categories of potential transmission projects: (1) reliability projects, (2) intra-regional economic projects, and (3) inter-regional economic projects. As with many of the elements of a complex study, there is no clear delineation among the three categories – reliability projects may have economic impacts and economic projects frequently result in reliability benefits. Nevertheless, the CAISO believes it is helpful to consider application of TEAM within the context of these categories. Accordingly, after discussing the principles, the CAISO will describe there proposed application to each

project category.

KEY PRINCIPLE 1: BENEFIT FRAMEWORK

Decisions on economic-driven transmission investment have suffered from the absence of a standardized economic analysis framework. TEAM's benefit framework is intended to fill this gap by providing a structure to summarize the benefits, costs, and risks of a proposed transmission upgrade from the CAISO Ratepayer, Participant, and Societal perspective. The parties generally agreed that the benefit framework represented a significant advancement in understanding and explaining the economic impacts of transmission expansion.[6]

There are three general categories of benefits that should be considered: (1) change in total production costs ("Energy Benefits" in the DPV2 Report [Exhibit 11, Attachment 6]), (2) other quantifiable economic benefits (i.e., avoided capital and fixed costs resulting from resource substitution, and operational benefits, capacity benefits, system-loss reduction benefits, and emission reduction benefits to the extent these benefits are not adequately captured in the total production costs), and (3) non-quantifiable benefits (i.e., fuel diversity, reliability benefits, public policy goals). While decision-makers should consider each category, TEAM focuses on the first two categories. A determination of Energy Benefits calculated using a consistent method is required. A determination of other quantifiable economic benefits is recommended/preferred and project proponents should be provided the flexibility to offer credible methodologies.

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[6] Tr. at 48:6-12 [Hemphill: "So in terms of the benefit framework where they talk about the benefits, the revenues and participant benefits, we agree totally. And in fact, we agree totally with the notes that are on the right-hand side which shows the benefits being the change in producer surplus, consumer surplus, change in transmission congestion rates"]; Tr. 355 [Florio]; Tr. 237:4-11 [Woodruff]; Tr. 262:18-262:27 [Lauckhart].

1. Calculation of Energy Benefits

The benefit framework recognizes that there are several important economic equations that should hold true for any study in determining Energy Benefits/total production costs benefits. Further, the benefits framework permits measuring the benefits separately for consumers, producers, and transmission owners for different regions or participants. The primary equations for the benefit framework are listed below:

a) **Benefit Identity I (requirement)** - the following equation must always be valid when comparing two simulations (with and with project), for the societal perspective, for any hour (or larger time period):

$TB = \Delta PC = \Delta CS + \Delta GS + \Delta TS$	TB – Total Energy Benefits Δ PC = difference in total system Production Costs Δ CS = difference in total Consumer Surplus Δ GS = difference in total Generator Surplus Δ TS = difference in total Transmission Surplus

The total societal energy benefits are equal to the difference in production costs (plus capital and fixed costs if there is a different resource mix between the simulations). The total benefits are also equal to the change in consumer, generator, and transmission (owner or operator) surplus. The Consumer Surplus is defined as the difference between the value of power, and the cost of power for that consumer. Since the value of power is difficult to define, and this term cancels out if the load is considered inelastic, the Consumer Surplus can also be defined as the difference in Cost-To-Load ("CTL") for the two simulations. If the CTL is reduced as a result of the transmission addition, there is a Consumer Surplus. The Generator Surplus is defined as the generator net profit (energy revenue minus variable cost of production). And the Transmission Surplus is the

difference in Transmission Revenue between the two cases.

b) **Revenue identity (requirement)** – the following equation must always be valid for any simulation, for the societal perspective, for any hour (or larger time period):

CTL – GR = TR	CTL = Cost of Load GR = Generator Revenue TR = Transmission Revenue

The CTL is equal to the consumer energy requirement multiplied by the energy price (for each hour, and for each node). The Generator Revenue is equal to the generator production multiplied by the energy price (for each hour, and for each node). And the Transmission Revenue depends on the market scheme – it can either be equal to wheeling revenues in a contract-path market, or congestion revenue in a Locational Marginal Price (LMP) market. Accordingly, the difference between what the consumers pay for energy and what the generators receive for energy is equal to the transmission revenue.

The foregoing equations are written from the perspective of the "societal test," which takes all market participants in the whole WECC area into consideration. However, the CAISO, as noted above, believes it is also necessary to determine the relative benefits and costs to other subgroups. The following equations are derived from the societal test to reflect the different subgroups.

c) **Benefit Identity II (requirement)** - the following equation must always be valid for any hour (or larger time period). The sum of all participant benefits must equal to the total societal benefits:

TB = ΔPC = ∑all participant benefits	TB – Total Benefits Δ PC = difference in total system Production Costs Δ CS = difference in total Consumer Surplus Δ GS = difference in total Generator Surplus Δ TS = difference in total Transmission Surplus

The following tests are described as "modified" in that these tests exclude "monopoly profit" (i.e. generator profits from uncompetitive market conditions). The reason for excluding these profits is that one of the CAISO's primary goals is to ensure a healthy, competitive California energy market. According to this perspective, generator profits resulting from market power should not be included in a measurement of the benefits to the California market.[7] However, since calculation of the modified benefits perspective requires enhancements that are not currently implemented in most software packages, this attribute is not required at this time.

d) Modified Societal Test

MTS = ΔCS + ΔGRent + ΔTS	MTS – Modified Total Surplus Δ CS = difference in total Consumer Surplus Δ GRent = difference in total Generator Competitive Surplus Δ TS = difference in total Transmission Surplus

e) Modified CAISO Ratepayer Test

CAISO Ratepayer = ΔCS_{iso} + ΔURG_{iso} + ΔTS_{iso}	Δ CS = difference in CAISO Consumer Surplus Δ URG = difference in CAISO Utility-Retained Generator Competitive Surplus Δ TS = difference in CAISO Transmission Surplus

f) Modified CAISO Participant Test

CAISO Participant = ΔCSiso + ΔGSiso + ΔTSiso	Δ CS = difference in CAISO Consumer Surplus Δ GS = difference in CAISO Participant Generator Competitive Surplus Δ TS = difference in CAISO Transmission Surplus

[7] See Exhibit 11, Attachment 1 at 2-10 to 2-12, for additional information on "modified perspective."

2. Decision Making Criteria

The benefit framework provides decision-makers and regulators information necessary to render an informed decision whether to proceed with a particular project. Most parties agree that for proposed projects presented to this Commission through the CPCN application process, the appropriate perspective is the CAISO Ratepayer Test.[8] The CAISO Ratepayer Test most closely aligns with that group of consumers whose retail rates are established by the Commission. The CAISO similarly relied first on the CAISO Ratepayer Test in evaluating DPV2, but also considers the Societal Test and the CAISO Participant Test as well.

DRA proposed "the Commission should generally only approve transmission projects that have an expected Benefit-Cost-Ratio (BCR) of 1.25 and a Payback Period (Undiscounted) of 15 years or less."[9] The CAISO disagrees for two reasons. First, the CAISO cannot support a minimum BCR of 1.25 given that many potential economic benefits exists that are not currently quantified completely, but that may favor the economic value of the transmission upgrade. An example would be the insurance value for a transmission line, which is currently only partially quantified through modeling selected extreme cases. Further, the Commission should utilize decision criteria that focus on more than BCR. Risk reduction, environmental impacts, state policy considerations, local economic impact, deliverability of renewable resources, and other considerations should be given weight when making a final recommendation. Thus, the CAISO believes that any transmission project with a BCR greater than 1.0 could be

[8] Exhibit 11, Attachment 1 at ES16-17; Tr. at 185:23-27 [Toolson]; Tr. at 44:21-45:2 [Hemphill]; Tr. 355:5-12 [Florio]; Exhibit 18 at 2-5, lines 16-18 [DRA].

[9] Exhibit 18 at 2-6, lines 21-23.

considered when combined with other decision criteria.

Second, the CAISO does not believe that an undiscounted payback period should be used as a criterion. The payback period may be one of many interesting parameters that help to describe the cash flow of the project, but the CAISO believes that the only established payback requirement should be over the entire economic life of the project and involve discounted cash flows (i.e. the BCR).[10]

DRA also proposes that "inter-IOU" equity issues need to be considered by evaluating the IOU-specific BCRs and verifying "that ratepayers of each IOU are not expected to suffer a BCR of 0.75."[11] Again, the CAISO cannot agree with this recommendation for practical as well as legal reasons. On the practical side, the computation of BCRs for utilities can be challenging, time-consuming, and problematic. The smaller the entity, the more important it is to try to incorporate the impact of contracts. Contracts are difficult to project without biasing the results of the study. Also, the use of contracts requires considerable additional effort that may, or may not, be warranted. On the legal side, the proposal ignores the structure of the CAISO's federally-approved high-voltage transmission Access Charge ("TAC"). Through TAC, the costs of a new high-voltage network transmission facility, such as DPV2, will be collected from all users of the CAISO Controlled Grid. The CAISO's integrated transmission planning process, therefore, considers and approves projects based on whether the project is economically efficient for the users of the CAISO Control Grid as a whole. While each network project may not equally benefit all users, over time the aggregate projects to support the CAISO Controlled Grid as a whole should benefit all CAISO customers. As

[10] Exhibit 13 at 3:22-4:18.
[11] Exhibit 18 at 2-7, lines 14-22.

such, DRA concern is properly directed at the cost-allocation provisions of TAC – a matter within FERC's jurisdiction, not with this Commission's determination of project need under a CPCN application.

3. The Benefit Framework Does Not Overstate Consumer Benefits

DRA suggested that the CAISO's benefit framework overstates Consumer Benefits since these benefits are based on market and not contract prices.[12] The CAISO disagrees with DRA's criticism. From a societal perspective, the Consumer Benefits for a proposed new transmission line are defined as the reduction in Cost-To-Load for the society or WECC. This is the definition used to compute societal Consumer Benefits in the DPV2 evaluation, and by definition, those benefits are computed correctly.

It is true that the inclusion of contracts can impact participant benefits. The estimation of future contract prices is a legitimate approach to computing Consumer, Generator, and Transmission Surplus. The CAISO employed this approach when developing the original TEAM. However, subsequent review of this calculation in the DPV2 analysis caused the CAISO to be cautious about estimating forward contract prices. In the DPV2 study, the CAISO found that the participant results are very sensitive to the assumptions regarding contract prices. Since there were a wide range of valid assumptions for the forward contract prices, and since these legitimate assumptions directly impacted the participant results, the CAISO concluded it was prudent to eliminate these assumptions, and show the economics based on the market price projections. Furthermore, the CAISO believed that the most reasonable long-term contract assumption is that the contract prices would be expected to track expectations

[12] Exhibit 18 at 2-10; Tr. 226.

regarding the market price, subject to risk considerations.[13] Thus, the CAISO's method to calculate consumer benefits utilizes highly defendable assumptions and is reasonable.

In addition, if one assumes that CAISO Consumer Surplus is overstated due to the use of higher spot market prices (as compared to contract prices), these same assumptions may cause mitigating impacts for the CAISO Generator and Transmission Surplus and Transmission Revenue. The negative CAISO Generator Surplus would become less negative since an assumed reduction in power prices would mitigate the generator loss. A similar argument would also be valid with respect to the CAISO Transmission Surplus. If the market prices overstated the congestion revenue loss, then the switch to contract prices would reduce the negative impact of the Transmission Benefits. Accordingly, the purported overstatement may be eliminated or significantly mitigated.

KEY PRINCIPLE 2: NETWORK REPRESENTATION

1. The Use of a Network Model is a TEAM Requirement

The Market Surveillance Committee ("MSC") of the CAISO has stated:

> Because the major driver of the benefits of a proposed transmission upgrade is the difference in electricity prices across locations in the transmission network, the market simulation algorithm used to set the locational prices in the transmission benefits assessment methodology must represent as accurately as possible the actual market prices that would result from the assumed system conditions and bids submitted by market participants. This implies that a methodology for comprehensive transmission benefits assessment must have the capability to represent transmission constraints that limit flows and dispatch and, thus, affect production costs and locational prices.[14]

Consistent with the opinion of the MSC, TEAM requires a software tool that can accurately forecast physical flows and nodal prices on the WECC transmission network. To meet this requirement, the production cost program must, at a minimum, (1) use a

[13] Exhibit 13 at 4:25-6:25; Tr. at 145:15-151:1.
[14] Exhibit 13, Attachment 17 at p. 5.

network model derived from a WECC power flow case and (2) perform a DC optimal power flow ("OPF") or AC-OPF that models the physical power flows on transmission facilities for each hourly load and generation pattern.[15] The DC-OPF model can compute the Power Transmission Distribution Factors ("PTDF" or "shift factors") for every hour of the simulation (variable shift factors), or for the initial hour (fixed shift factors).[16] The CAISO considers both approaches an acceptable DC-OPF application.[17] The requirement to utilize a DC-OPF or AC-OPF production cost model does not constitute an endorsement of any particular vendor. Many vendors offer an acceptable production cost tool.[18] Moreover, TEAM is an evolutionary process such that the CAISO will, and the Commission should, remain receptive to innovations in modeling products that improve on the current state of the art.

The requirement to use a DC-OPF production cost program that models the actual electrical characteristics of the transmission grid generated the greatest controversy among the TEAM Key Principles. No party contested the reasonableness or appropriateness of using a DC-OPF.[19] Rather, the controversy surrounded the restriction on the use of a transportation or contract path model. This is understandable given the vested commercial and regulatory interests of other parties to this proceeding in that alternative modeling approach. The commercial interest is self-explanatory. The

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15 Exhibit 11, Attachment 1 at ES-7.

16 Tr. at 126:8-127-17; 135:12-16.

17 Since there is currently a significant execution time difference between the two approaches (perhaps on the order of 10 times as long for the variable shift factors), the CAISO views both approaches as meeting the minimum threshold for physical transmission modeling.

18 Tr. at 152:24-28.

19 See, Tr. at 194 [DRA witness Daniel Suurkask confirmed the CAISO's modeling was reasonable]; Tr. at 49 [SCE witness Stuart Hemphill, agreed "that you should be required to show that physical flow does take place"]; Tr. at 259:11-17 [Global Energy Decisions LLC ("GED") witness Richard Lauckhart, "So our view is that true DC-OPF can be done in scenario type basis. Has been done. This Commission should expect that level of analysis for purposes of its decisions"].

regulatory interest arises from the general risk-aversion of regulated entities. This Commission has previously endorsed the use of the transportation model to justify construction of a transmission project on economic grounds.[20] As such, until such time as the Commission explicitly requires an alternative approach, project proponents will promote the certainty of the *status quo* and not jeopardize a proposed project by acknowledging the superiority of the alternative modeling approach.[21]

In contrast, the CAISO has come to its recommendation after an independent evaluation of alternative approaches, stakeholder and expert input, and experience using the transportation model. As the ALJ is very aware, "the ISO engaged London Economics to assist in development of a generic economic methodology for evaluation of the economic need of transmission projects."[22] A workshop on the methodology was held on March 14, 2003. In response to that workshop, ALJ Gottstein stated: "The comments clearly indicate that the ISO needs additional time to more fully develop and apply the methodology described in the London Economics Report. In particular, the ISO states that it *requires a more detailed network model for such an effort,* and would need to

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[20] *Interim Opinion on Transmission Constraints: Mission-Miguel and Imperial Valley Upgrades,* Decision 03-02-069 (March 3, 2003).

[21] The CAISO recognizes that by advocating a requirement that the production cost model utilize a DC OPF or AC OPF to capture the actual characteristics of the electrical system it could be accused of simply substituting a new threshold target for regulated entities to meet. However, any such accusation would be disingenuous. The CAISO believes its requirement is sufficiently general to prevent stifling innovation. The use of a full network model involves representation of the physical reality of the electrical grid. There may be better or worse representations, but the characterization of the goal cannot be qualitatively improved. In addition, as the parties agreed, the current state of modeling does not permit the use of AC OPF technology to run a chronological study for multiple cases. As such, the allowance for the use of an AC OPF permits substantial flexibility and growth in modeling techniques.

[22] *Administrative Law Judge's Ruling Proposing Phase 5 Schedule and Setting Further Prehearing Conference,* I.00-11-001 (Dec. 15, 2003) at p. 2 [noting "the market power model contained in the ISO's economic methodology was still under development, *a more detailed network model was needed,* and the methodology had not yet been validated by application to a specific transmission project" (emphasis added)].

apply the methodology to additional cases."[23] Accordingly, it was these deficiencies identified by the CAISO, London Economics and the MSC after over a year of research and development of TEAM that triggered the decision by the CAISO to evaluate other production cost modeling alternatives. In doing so, the only CAISO interest furthered was that of developing the most effective methodology possible for capturing the economic value of proposed transmission projects.[24]

The reduced value of the transportation model for economic assessment of proposed transmission upgrades generally arises from its simplified representation of the transmission system.[25] Under the transmission model, nodes are grouped together in a "bubble" in those areas of the grid where fewer transmission limitations are expected. It is assumed that each bubble does not have significant internal transmission constraints. The transportation model then schedules transmission flows between bubbles based on economics, and then enforces transmission and interface limits *on the economic flows, instead of the physical flows*.[26] And although the transmission and interface limits may be set correctly, these limits are applied to the wrong set of flows and thus have limited or questionable value. In particular,

- **Transportation models cannot accurately model loop flow limitations** - Loop flow varies by season and time of day. The quantity of loop flow depends on the

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[23] *Administrative Law Judge's Ruling Modifying Phase 5 (Generic Methodology) and Phase 6 (Tehachapi Transmission Project) Schedules,* I.00-11-001 (April 4, 2003) at p. 2 [emphasis added].

[24] GED erroneously attempted to impugn the CAISO's neutrality in reaching the decision to reject the use of transportation models. However, the undisputed record shows that the CAISO independently evaluated models and without any economic bias whatsoever. (Tr. at 69:28-70:7.)

[25] The WECC has approximately 14,000 buses and 1,000 transmission lines to transformers. The network model represents all these physical assets. (Tr. at 130:8-16.)

[26] Mr. Toolson provided an example: "If we have a single generator that has a node, and that node had five, four lines leading out of it, in the DC-OPF each of those lines would carry some power because that is the physics of the electrical system. In a transportation model the power would go on the most economic path. It would go on a single path until that path was full and then it would go the next one. It doesn't reflect physics of the transmission system in that regard." (Tr. 133:26-134:6.)

specific generators being dispatched. Network models will correctly model loop flow as it varies with the load and generation patterns. Transportation models cannot accurately model loop flow. Instead, interfaces need to be artificially derated to account for loop flow impacts.[27]

- **Transportation models do not easily adapt to network changes** – Any change in the physical network, such as the addition or removal of a transmission line, will change the flows on the overall power grid and may change many normal and contingency transmission limits. As a result, many of the limits between the bubbles in a transportation model would need to be recalculated. If a network model is used, individual facility limits would not need to be recalculated. However, path limits and simultaneous limits may need to be recalculated.
- **Transportation models cannot model the detailed interaction between limits** – The MSC identified potential distortions resulting from the process of aggregating physical transmission elements in the transport model. First, by aggregating buses "distortions can occur even if there are no binding constraints within a zone, because different buses within a zone will have different swing factors relative to binding constraints outside the zone."[28] Second, over a transmission interface, individual transmission facilities (i.e., a transformer or a line) or a path (i.e., a group of transmission lines) may be the most limiting transmission constraint. There may also be simultaneous interaction between lines and/or paths that result in the most limiting transmission constraint. The specific limit may change with the time of day or season. Combining these limits

[27] Exhibit 11, Attachment 1 at 3-1; Exhibit 13, Attachment 17 at 6.
[28] Exhibit 13, Attachment 17 at 6.

together for modeling convenience into one limiting constraint is not likely to be accurate.[29] A network model can easily simulate these interactions.

- **Outputs from transportation model simulations are inadequate** – Transportation models can produce output showing the flows on the links between bubbles but they cannot plot individual line loadings. As a result, they cannot clearly identify the specific facilities causing the congestion. This makes analysis of the limitation difficult and may lead to incorrect conclusions. In addition, the flows shown on links between bubbles may not be closely related to the physical flows on a path. If a network model is used, the flows on individual facilities can be identified. This enables a much more detailed analysis of the problem.
- **Nodal prices are unavailable in a transportation model** – A transportation model groups individual nodes into a zone. A zone may include hundreds of nodes. With the CAISO transitioning to locational marginal pricing, the simulations should be able to produce nodal prices. As noted by the MSC, "there is no guarantee that a zonal price calculated by an aggregated model will closely approximate the load-weighted average locational price that would be derived by a full network model."[30]

In large part based on the foregoing potential distortions introduced by the use of a transport model, the MSC concluded that "[i]t has become abundantly clear that a radial representation of network constraints is inadequate, and that locational marginal pricing

[29] *Id.* at 7; Exhibit 11, Attachment 1 at 3-2.
[30] Exhibit 11, Attachment 1 at 3-2; Exhibit 13, Attachment 17 at 6-7.

based upon a full network model is required."[31] Nevertheless, the MSC recognized an exception to this requirement where "computational experiments under a representative range of cost and demand conditions show that little bias results from using a simpler [transport] model."[32]The CAISO has not fully adopted this position. The Path 26 Report acknowledge the value of a simplified model in screening a large number of cases to identify system conditions that may result in large benefits from transmission expansion. However, to the extent those results were critical to the economic support of the proposed project, "the results of this analysis should be confirmed using a network model."[33] This goes beyond merely verifying that power did not exceed applicable nomograms, which appropriately cap economic flows, but do little to verify the economic results themselves regarding congestion revenue or the magnitude of the benefits to various participants.[34]

A corollary to the foregoing is the argument that the CAISO's network representation requirement ignores the trade-offs between modeling options, with different advantages and disadvantages depending on the model utilized. The CAISO agrees that transport models offer the advantage of permitting stochastic analysis, which allows for consideration of a more complete range of fuel price, demand, hydrological and equipment outage scenarios.[35] However, there are qualifications to this advantage. First, Mr. Suurkask of DRA noted that "in order to get a good stochastic simulation to complete, there are other things that have to be given up."[36] Second, regardless of the greater robustness of stochastic over scenario analysis, the greater number of cases will

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31 Exhibit 13, Attachment 17 at 7.
32 *Id.*
33 Exhibit 11, Attachment 1 at ES-7.
34 Tr. 157:28-158-16.
35 Tr. at 157:4-10; 159:1-16.
36 Tr. at 20713-23.

not enhance the quality of the study if the underlying physical transmission system is not modeled accurately. That is the situation with transportation models. In that case, the proponent simply offers a myriad of cases with questionable results. The CAISO believes, therefore, that endorsing a network representation constitutes an appropriate choice between the modeling trade-offs.

2. The Use of the SSG-WI Database Is Not a TEAM Requirement

The CAISO has never, and does not now, advocate the exclusive or mandatory use of SSG-WI data to support a proposed project. Nor does the CAISO currently propose that the SSG-WI data be *required* for a cost-based reference case. The CAISO had *recommended* the use of the SSG-WI data for a cost-based reference case.[37] The purpose of the SSG-WI reference case was to assist in comparisons between alternative models and approaches. Having a single reference case using identical data will help illustrate the difference in software model algorithms as opposed to data differences.[38] Indeed, Mr. Florio, witness for TURN, recognized the "benefit in benchmarking models against each other using a common data set," and that "the basic principle that the ISO is articulating of having a common data set that can be run through all of the models that are used is a valid one."[39] However, while the CAISO intends on using the SSG-WI database and updating and supplementing it as appropriate as a cost-based reference case, the CAISO's recommendation rested, in part, on the anticipation that the SSG-WI database would be administered through the WECC. If so, the CAISO anticipated that

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[37] In this regard, there was some confusion whether the SSG-WI database was compatible with many production cost models. The SSG-WI data can be used either "as is" or modified and used, after data conversion, by many, if not most, DC-OPF production cost models. (Tr. 74:9-75:2.)

[38] Exhibit 13 at 10:7-19; Tr. 75:26-76:19.

[39] Tr. 356:24-26 and 357:5-8.

the SSG-WI database would become a well-vetted repository of data submitted by WECC members. The CAISO, therefore, recommends that if the Commission adopts the CAISO's requirement to use a DC-OPF, that the Commission revisit the issue of a common data set once, and if, the nature of the WECC's administration of the database becomes defined.

KEY PRINCIPLE 3: MARKET PRICES

TEAM focuses on the realities of a restructured electricity market. In a restructured electricity market, suppliers optimize their bidding strategies in response to changing system conditions or observed changes in the behavior of other market participants. Assuming marginal cost pricing in a restructured electrical market where suppliers must also recover fixed costs to remain commercially viable may result in depressed and inaccurate benefit estimates. "For this reason, a transmission benefits methodology that is to be applied in the context of a restructured wholesale market must try to account for the impacts of a transmission upgrade on market power and therefore market prices."[40] All parties to the proceeding agree.[41] As noted by DRA witness Woodruff, "I think the ISO's approach is correct, to try to include something to reflect market prices that are greater than the variable operating costs of the marginal units." Nevertheless, the CAISO has readily acknowledged, "forecasting market prices is a

[40] Exhibit 13, Attachment 17 at 7 [Comments of the CAISO's MSC].

[41] Tr. 227: 6-8 [DRA]; 357:9-15 [TURN]; 49:20-22 [SCE – Witness Hemphill stated, "I will put it in the non-quantifiable benefits category, but recognize things do have that impact. It is a positive value." However, Mr. Hemphill "didn't look at [the CAISO methodology] in any great detail. They may have done a fine job trying to get their arms around it." Tr. 52:17-20].

difficult task."[42] As such, two issues arise: (1) what method should be used and (2) do all evaluations need to include an assessment of strategic bidding.

1. Not All Studies Require Modeling Strategic Bidding

The CAISO has consistently stated that if a project is strongly economic under cost-based conditions, i.e., societal and CAISO Ratepayer BCR over 1.5, and it can be demonstrated that the inclusion of market prices would increase the BCR, then it is reasonable to allow the project proponent to decide whether or not to perform a strategic bidding analysis. This can be for both an inter-regional or intra-regional economic project as discussed below. [43]

2. TEAM Requires a Credible Bid Strategy – Game Theory/Empirical

There are generally two approaches to modeling strategic bidding behavior in market simulation studies. The first approach involves the use of a game-theoretic approach to simulate strategic bidding. A game-theoretic model typically consists of several strategic suppliers with each player seeking to maximize its expected profit by changing its bidding in response to the bidding strategies of all other players. The second approach is an empirical based method whereby the model uses estimated historical relationships between certain market variables and some measure of market power, i.e., the difference between estimated competitive prices and actual prices or estimated competitive bids and actual bids. Each approach has its advantages or disadvantages. Consequently, the CAISO's TEAM approach does not mandate one modeling approach over the other. Rather, TEAM requires that any proposed method be:

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42 Exhibit 11, Attachment 1 at ES-8.

43 Tr. 144:13-27; Exhibit 12, Attachment 15.

- Credible and documented. To the extent the method builds upon the CAISO's analysis, it should describe the modifications and improvements;

- Reflect system conditions dynamically; and

- Expressly demonstrate and summarize the impact on market prices as compared to cost-based cases.

By "dynamic," the CAISO means that the hourly supply bids change as a function of system conditions. Most commercial models currently use a "static" bid strategy. In a static approach, the bid strategy is set for a period of time such as a month or year and does not change in response to dynamic system conditions such as hourly demand, supply, and import levels. A static bid strategy has difficulty capturing market power that may exist in times of supply inadequacy.[44]

While the CAISO does not compel a particular method to forecast market prices, it prefers an empirical approach to modeling strategic bidding behavior. The CAISO's empirical approach to market price forecasting is fully described in Chapter 4 of the TEAM Report. The CAISO believes that the primary advantages of modeling strategic bidding through an econometric or empirical approach lie in its strong historical basis and its ability to be applied to a detailed transmission network representation.[45] The MSC similarly observed:

> The advantage of econometric approaches is that, by definition they are benchmarked to actual relationships between these observable factors and market outcomes. The coefficients defining these relationships are based upon an econometric fit to historical data. This is a valuable aspect of this

[44] Exhibit 11, Attachment 1 at ES-8, fn. 9. The CAISO notes that it has not performed a detailed evaluation of the bidding strategy elements of GED modeling products. Accordingly, the CAISO is not in a position to conclusively determine the compatibility of GED's techniques and TEAM. However, the CAISO has some concern that GED employs a "fixed" bid adder that is not dynamic.

[45] Exhibit 11, Attachment 1 at 4-2.

> approach, and one can often take comfort in the fact that the estimated relationships make empirical sense.[46]

In fact, in reviewing the CAISO's DPV2 report, the MSC concluded that "basing mark-up projections on past behavior and allowing alternative scenarios as has been done in the TEAM methodology is an appropriate approach."[47] No party to this proceeding could, or did, dispute this conclusion. DRA witness Woodruff agreed that the CAISO's "market-power analysis reads credibly,"[48] while GED witness Lauckhart acknowledged that "its not an unreasonable approach."[49] Accordingly, there is no dispute that the development of bidding strategies for the economic evaluation of transmission is complex and necessarily evolutionary. This is equally no dispute that project proponents should attempt to capture the effect of strategic bidding, should not be restricted in attempting to advance modeling techniques through credible theoretic approaches, and that the CAISO's approach is reasonable.

KEY PRINCIPLE 4: UNCERTAINTY

1. Distribution of Benefits from Modeling Uncertainty

There are several fundamental reasons why considering risk and uncertainty is important when evaluating the economic viability of potential transmission expansion. These reasons are summarized and discussed below:

- Expected Value of Benefits
- Range of Benefits
- Distribution of Benefits.[50]

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46 Exhibit 13, Attachment 17 at 8. The MSC further noted, and the CAISO agrees, that the strength of the econometric approach will depend, in large part, on the quantity and quality of the data that are available to apply to the regression analysis. (*Id.*)

47 Exhibit 11, Attachment 10 at 3.

48 Tr. 222:6-7.

49 Tr. 278:5-6.

50 Exhibit 11, Attachment 1 at ES-10.

The expected value is equal to the benefits associated with a specific case, multiplied by the relative probability of that case, and summed for all cases. If the benefits for the reference case for a transmission upgrade are convincingly economic, then the expected value may not need to be calculated.[51] However, if the reference case benefits are not significantly positive, then the expected value may be essential to understand the true economic value of the proposed transmission expansion.

The relationship between future system conditions and the transmission benefit may be nonlinear.[52] As a result of this nonlinearity, the benefits for the reference case and the expected value may differ considerably. For example, assume that the energy benefit of a new transmission line is $100 million in a single year for the reference case. Further assume that in the low-load sensitivity case, the benefits drop to $80 million. If the results were linear, and if the high load case had the same probability as the low load case, the benefits would be expected to be approximately $120 million. But, experience has shown that the benefits may be something like $140 million or higher. Thus, the relationship between the underlying system variable load and the resulting benefits may not be linear.

This nonlinearity can occur due to the system characteristics. In the case of low load, the system can dispatch more efficient generation and reduce costs. In the case of high load, however, the system may not have sufficient resources during outages, and the relatively high cost of emergency power can result in nonlinear results.

The range of benefits can be better understood with numerous sensitivity cases. A "most likely range" can be computed statistically as is described in Chapter 5 of the

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51 Exhibit 12, Attachment 15 at 14.

52 *Id.* at ES-9 and 5-1.

original TEAM report. Or, an absolute range can be determined by comparing the highest and lowest benefits for the sensitivity cases developed. Either way, a range of benefits is important to understand the uncertainty associated with a transmission investment.[53]

The distribution of benefits is valuable with respect to understanding the probability of various outcomes. The distribution of benefits can be depicted in a histogram, which visually provides the decision maker with information regarding potential down-side risks as well as upside potential. To the extent that the project costs can be quantitatively described and overlaid on the histogram, the decision maker has a succinct summary of benefit and cost uncertainties.[54]

2. Acceptable Methodologies for Modeling Uncertainty

The CAISO has not proscribed a specific methodology for uncertainty other than to require that uncertainty be incorporated into the economic evaluation for high-voltage, inter-regional projects where the reference cases are not overwhelmingly economic.

From the CAISO perspective, the key principle is to continue to evolve the methodology of considering uncertainty in a statistically-defensible manner. At some point in the future, it may be possible to stochastically evaluate transmission investment with a DC or AC-OPF network model. That approach is not technically feasible today due to model execution times.[55] In the interim, the best approach is to develop as many sensitivity cases as possible that adequately reflect the physical transmission system and explore the associated impact of uncertainty on the potential investment through a histogram diagram as provided in the DPV2 recommendation provided in the CAISO's

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53 Exhibit 11, Attachment 1 at 5-1 to 5-13.
54 Exhibit 12, Attachment 15 at 11.
55 Tr. at 134:14-20.

report.[56]

The selection of these sensitivity cases is an important step. There are various "smart" Monte Carlo techniques that can be used to reduce the number of modeled cases. The CAISO employed a technique referred to as Importance Sampling to select the reference case, bookend or extreme-event cases, and those cases most useful for analytical comparisons (single- or multiple-variable sensitivity cases). Importance Sampling can be employed in a rigorous mathematical approach or in a more subjective manner. The CAISO used both techniques.

Once the reference and sensitivity cases have been selected, probabilities need to be assigned to the cases. The CAISO used mathematical techniques to determine these probabilities including Moment-Consistent[57], Maximum-Log Likelihood, and Minimum / Maximum linear programs.[58]

In summary, the CAISO is not proscribing a specific technique or methodology. The CAISO expects to see considerable advances made in the area of understanding uncertainty in the future and is optimistic that some of these advances can be incorporated into future transmission evaluations. In the interim, the CAISO requires a histogram of impacts using a stastistically-defensible uncertainty analysis for major transmission projects where the reference case benefit-cost-ratio is not substantially greater than one.

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[56] Exhibit 11, Attachment 6 at 20.

[57] The MSC noted: "Because different parties will have different expectations about the future distribution of important sources of uncertainties, it is important that a transmission benefits methodology be able to conveniently and quickly accommodate alternative probability distributions. For instance, if someone wishes to specify a mean and standard deviation for several variables (e.g., fuel prices and load growth), along with correlations among them, it would be possible to translate these assumption into a probability for a set of system condition scenarios. The TEAM methodology includes this approach in its 'moment consistent estimation' method." (Exhibit 13, Attachment 17 at 11.)

[58] Exhibit 11, Attachment 1 at 5-1 to 5-13; Attachment 6 at 7-9; and Attachment 7 at 6-7.

KEY PRINCIPLE 5: RESOURCE SUBSTITUTION – CONSIDERATION OF ALTERNATIVES TO TRANSMISSION EXPANSION

The economic value of a proposed transmission expansion directly depends on the cost of resources that could be added or implemented to achieve the objectives of the upgrade. In other words, a primary economic driver of a proposed transmission project is displacing the need for alternative resources or facilitating the achievement a different resource mix or portfolio. A key principle of TEAM, therefore, is to assess the interaction between the transmission investment and its objectives and a menu of other feasible alternative resources, including central station or distributed generation, renewable generation, demand-side management, transmission infrastructure, and/or operating procedures or additional remedial action schemes.[59]

The nature of the proposed transmission upgrade may eliminate certain resource alternatives from consideration. For instance, with a 500 kV inter-regional project such as DPV2, which substantially increases the import capacity into California, it may not be realistic to explicitly substitute distributed generation or demand-side management alternatives to realize the same effects on the electrical system.[60] Moreover, developing the resource mix of new market entry involves judgment in the construction of assumptions and scenario inputs. Accordingly, as with many of the TEAM Key Principles, it is unrealistic, impractical, and counterproductive to an effective and efficient transmission evaluation process to be overly prescriptive in defining the parameters for the resource substitution analysis. Nevertheless, additional "required"

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[59] Exhibit 11, Attachment 1 at ES-10.

[60] It should be noted, however, that the CAISO agrees with DRA witnesses that the uncertainty analysis should reasonably consider the impacts of potentially significant "paradigm" shifts in the electrical industry, such as technological advances that cause an increase in reliance on distributed generation rather than central station generation transported over bulk high-voltage lines.

elements of the Key Principle can be articulated.

- Evaluate alternative generation options for the importing area
- Evaluate alternative transmission configurations and projects

There are almost always some generation options for the importing area. These options may include new generation, refurbished generation, or expansion. These options may, or may not be, very attractive due to air emissions issues and public acceptance. But such options are generally legitimate and need to be considered in a comprehensive manner and compared to the transmission alternative.

In a similar manner, a number of alternative transmission projects need to be considered. In addition, alternative configurations of the proposed project should also be evaluated so that the final recommendation can be based on as much valid and comparative information as reasonable.

Additional "recommended" elements can also be articulated. Parties could utilize a "*what if*" analysis. TEAM accounts for private investment decisions by modeling the profitability of alternative resources within the transmission framework. This involves a "what if" analysis – how does the profitability alternative investment decisions change with and without the transmission upgrade. Generally, TEAM evaluates a mix of generic reliability-driven and economically-driven infrastructure that enters the market according to proponent-established parameters that should include, at a minimum, satisfaction of a planning reserve margin in each WECC region and earning sufficient revenues to cover capital costs under a range of market prices.[61] The resource additions or substitutions are then optimized for the "with" and "without" scenarios and the difference in costs between the two, including the fixed and variable costs of the new resources, reflects the value of

[61] Exhibit 11, Attachment 1 at 6-3 to 6-7; Exhibit 13, Attachment 17 at 9.

the upgrade.[62] An example of the specific steps TEAM used to derive the amount of new demand-side management/generation for the with and without transmission upgrade cases is set forth in the TEAM Report and can be used as a guide, and again NOT a requirement, for future compliance with the resource substitution element of TEAM.

- Run the market pricing function of the analytical tool without new generation/demand-side management for the study years using the baseline average fuel cost and demand scenarios and assumed hydro scenario.

- For the first year where the annual average market clearing price > revenue target price (established by proponent using generic resources), add a combination of resources in each zone such that the initial internal reserve margin of the CAISO control area is met.

- Rerun the market pricing function of the analytical tool for that year in which the new resources were added and beyond, seeking the all-in average resource revenues earned by each typical new entrant. Continuously recalculate the net revenues based on the implied load factor from the projections, not based on the typical static dispatch assumptions. This results in a load-factor appropriate target price, which can then be compared to new entrant's average unit revenues.

- If the amount of new generation added does not yield converging average unit revenues, refine the reserve margin (by adjusting MW amounts/or resource combinations) until such convergence is reached.

- Rerun market pricing function for the entire time period and repeat all steps for a new year.[63]

B. Other TEAM Study Attributes

There are several other TEAM study attributes that are important for transmission evaluations. These attributes are listed below as either requirements or recommendations:

- **Multiple years (requirement)** – Since the study is intended to represent the benefits for a 30 to 50-year economic life, at least two years must be

[62] Exhibit 11, Attachment 1 at ES-11.
[63] *Id.* at 6-7.

evaluated. These two years should be at least 5 years apart. Multiple interim years in succession are generally less valuable than isolated years or additional sensitivity cases.[64]

- **Chronology (requirement)** – For each year evaluated, at least 12 weeks per year, 168 hours per week, need to be simulated -- 8760 hours per year is recommended.

- **Unit Commitment (recommended)** – Software and associated data should be able to perform unit commitment and consider chronological parameters such as ramp rates, minimum up- and down-times. [65]

- **Hydro Optimization (recommendation)** – It is desirable that the software and associated data be able to provide some level of hydro optimization, so that static hourly hydro patterns are not used irrespective of changes in input parameters.[66]

C. Application of TEAM May Vary Depending on the Nature of the Proposed Project

1. Benefit-Cost-Ratios Significantly Greater than 1.0

In the case where the economic benefits may be a significant factor, and if it appears that the inclusion of market prices and uncertainty are not likely to substantially improve the economic differential estimate or conclusion, then these study requirements can be waived. However, a discussion regarding why these factors were excluded from the analysis is necessary. Resource alternatives are not required in the economic analysis since it is assumed that the resource alternatives have been identified from a reliability perspective and are being evaluated in the study.

2. Reliability Projects

Reliability projects should be evaluated on the basis of least-cost, net of any economic benefits that differ between alternatives. If the CAISO or other party evaluates a reliability project, the impact of the *difference* in potential economic benefits needs to

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64 Exhibit 12, Attachment 15 at 12; Tr. 151:17-152:2.

65 Exhibit 12, Attachment 15 at 12; Exhibit 11, Attachment 1 at 7-2; see also, Exhibit 22 at 6-7.

66 *Id.*

be considered. If this difference between alternatives is significant compared to the difference in capital costs, then the economic benefits should be computed. In other words, if the economic benefits may change the least-cost ranking of alternatives, these economic benefits should be included. Otherwise, the economic benefits can be ignored.

3. Intra-Regional Economic Projects

Intra-regional economic projects can be considerably less complex with respect to the economic analysis than the inter-regional proposals. In that vein, the study requirements are generally more relaxed. If the economic impact can be considered to be primarily limited to a single region, the region can be modeled with external markets from a societal basis to understand the benefits and compare these benefits to other alternatives. If there are clear economic differences at this level between alternatives, it may not be valuable to perform a more detailed study requiring market prices and sensitivity cases. In any case, the benefit framework needs to be utilized, a network model must be used, and resource alternatives to the proposed transmission line need to be identified and considered.

4. Inter-Regional Economic Projects

The level of analysis required for inter-regional economic projects is the most substantial. Each principle must be applied generally. As previously noted however, if the BCR for the proposed transmission upgrade is significantly positive, i.e., greater than 1.5 or in excess of any threshold established by the Commission, then it should not be necessary to derive market prices or uncertainty since the recommendation to proceed is unlikely to change with the additional information.

D. SCE and DRA Substantially Complied With TEAM

The ALJ requested that parties address whether "Edison's and ORA's analyses, are consistent with the general principles or methodologies that the parties recommend be employed in the future."[67] Since the CAISO recommends TEAM, it measures those analyses against the foregoing TEAM requirements.

SCE and DRA have both substantially met the requirements of TEAM. Both entities appear to have computed benefits in substantial accordance with the TEAM definitions for consumer, producer, and transmission owner surplus. In the future, parties should provide a demonstration that the sum of all parties' benefits equals societal benefits. The derivation of appropriate bid strategies and the computation of resulting market prices are not critical if the economic benefits (as summarized in the appropriate BCR) are substantially greater than one. The incorporation of bid strategies would be expected to increase the cost of power in California. Since the proposed DPV2 line is expected to displace higher cost power in California, it is a reasonable to assume that the inclusion of bid strategies would further increase DPV2 benefits.

SCE and DRA also developed numerous stochastic or sensitivity cases to explore the uncertainty associated with the forecast benefits. The CAISO views this approach as a reasonable way to address benefit uncertainty. SCE also provided significant discussion regarding potential resource substitution alternatives and its study adequately addressed this key principle.

SCE and ORA did not use a DC-OPF algorithm for their analysis. However, as the CAISO has stated previously, the CAISO views the TEAM requirements as a prospective requirement. Because the CAISO performed an independent study using the

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[67] Tr. 379:1-6.

DC-OPF, the CAISO is comfortable with SCE's results.[68] DRA did not have significant resources in terms of staff, time, or models to perform a DC-OPF study. Although the use of a transportation model is understandable under these circumstances, in the future, the CAISO would require a DC or AC-OPF modeling of the physical transmission network.

E. CAISO Response to Questions Posed in the ALJ Ruling

The ALJ Ruling asks several interrelated questions:

3. Are the following procedures a reasonable approach at this time for the Commission's assessment of the economic benefits of transmission projects?

    a. In I.05-06-041, the Commission would adopt principles, a framework for decision-making, and criteria for the economic analysis of transmission lines.

    b. In subsequent certificate proceedings, the Commission would evaluate whether the CAISO, in evaluating economic need for the proposed project, has followed the guidance provided by the Commission in a reasonable manner.

    c. If so, the Commission would adopt the CAISO's economic determination, so that the outcomes at the CAISO and the Commission would be consistent.

4. After the Commission adopts general principles or methodologies for assessing the economic benefits of transmission projects, how should the Commission evaluate in a certification proceeding whether the CAISO in evaluating economic need for the proposed project, has followed the guidance provided by the Commission in a reasonable manner?

5. If the Commission determines in a certification proceeding for a transmission project proposed for its economic benefits that a CAISO

[68] Tr. at 158:17-26.

assessment of need has followed the guidance provided by the Commission in a reasonable manner, are there additional requirements that must be met in the Commission's determination of economic benefits and need for the project?[69]

1. The CAISO Reiterates Its Position That a Rebuttable Presumption of Economic Efficiency Based on an CAISO Finding Is the Most Practical and Effective Mechanism to Improve the Efficiency of the Review Process for Economically-Driven Transmission Projects

As noted in the introduction, the CAISO is skeptical that the procedure outlined above will withstand public scrutiny given the hostility engendered by R.04-01-026. It is apparent from the CAISO description of the TEAM principles that any adopted general guidelines will, by design, grant modelers substantial latitude in performing the economic assessment. Indeed, Mr. Toolson admitted that two competent modelers could have different opinions on assumptions, model settlings, probabilities, and market prices and, as a result, would reach two different answers for "marginal" cases.[70] Accordingly, an evaluation whether the CAISO reasonably followed the Commission's "guidance" is unlikely to satisfy those parties who contended that the "validation" proposal of R.04-01-026 constituted an unlawful delegation of Commission authority. The CAISO agrees with President Peevey that pursuing such a strategy "raise[s] the specter of time-consuming and costly litigation, rather than timely, thoughtful reform."[71]

Further, it is unclear whether such a proposal would increase the efficiency of the CPCN process. Parties opposing the project would litigate whether the CAISO followed the guidance and whether its interpretation of the guidance was reasonable. The

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69 ALJ Ruling at 2.

70 Tr. 184:10-19.

71 *Assigned Commission's Ruling on Next Steps*, R.04-01-026 (Oct. 15, 2004).

variability of study conditions and the necessary judgment exercised by the modelers renders this outcome a very real possibility. In doing so, the proceeding may be partially distracted from its proper focus, whether the upgrade is economically efficient, to other tangential issues related to CAISO process.

The CAISO proposes to increase the likelihood of consistency between the CAISO and Commission, while fully preserving parties' ability to contest the quality and reasonableness of CAISO determinations by recommending that a jurisdictional project proponent may rely on the study underlying the CAISO's determination (whether performed by the proponent or the CAISO) to trigger a rebuttable presumption of economic efficiency. That rebuttable presumption would shift the burden of proof to an opposing party to demonstrate by some standard of evidence that the project is not economic. It is the study underlying the determination, not solely the determination, that forms the basis of the CPCN proceeding. Parties therefore retain the right to challenge the details supporting the presumption and the Commission does not delegate its decision-making discretion. Rather, the Commission would be recognizing the CAISO's expertise and statutory responsibility in the area of transmission planning to give its determination special weight.

In addition, the finding of economic efficiency need not be equated with a finding of "need" under Public Utilities Code section 1001. The Commission should remain empowered to reject the proposed projects, notwithstanding its economic value, based on any other factors, including those listed in Public Utilities Code section 1002, it is legally permitted to consider.

2. Commission's Authority to Implement Recommendation

Adopting a rebuttable presumption standard and procedure is well within the Commission's authority and overcomes many of the challenges raised during R.04-01-026. California courts have recognized that the Commission "is not an ordinary administrative agency, but a constitutional body with far-reaching powers, duties and functions." (*Utility Consumers' Action Network v. Public Utilities Commission* (2004) 120 Cal.App.4th 644, 654; *Consumers Lobby Against Monopolies v. Public Utilities Commission* (1979) 25 Cal.3d 891, 905; Cal. Const., art. XII, §§ 1-6.) The constitution confers broad authority on the Commission, including, most importantly, the power to hold various types of proceedings and establish its own procedures. (Cal. Const., art. XII, §§ 2, 4, 6.). That the Commission possesses judicial and legislative powers is well established. (*People v. Western Air Lines, Inc.* (1954) 42 C.2d 621, 630.) Moreover, neither the technical rules of evidence nor the prescriptions of the Administrative Procedures Act apply to Commission adjudicatory proceedings. (Pub. Utilities Code § 1701.)

A presumption is not evidence. Rather, it is "an assumption of fact that the law requires to be made from another fact or group of facts found or otherwise established in the action." (Evid. Code § 600.) Here, the assumed fact is that the proposed project is economic based on the established fact that the CAISO previously found that *a study performed by itself or the proponent* demonstrated such a conclusion. Presumptions can be either conclusive or rebuttable.[72] (Evid. Code § 601.) The CAISO advocates a

[72] A conclusive presumption is likely legally permissible notwithstanding the opposition raised during R.04-01-026. Nevertheless, it is not absolutely necessary to gain the efficiencies sought by this investigation. If other more comprehensive changes are made to California's resource planning process

rebuttable presumption.

A rebuttable presumption may affect either the burden of producing evidence or the burden of proof. (Evid. Code § 601.) The CAISO suggests the latter is appropriate. A presumption affecting the burden of proof is intended to "establish or implement some public policy other than facilitation of the particular action in which it applies." (Evid. Code § 605; *State Compensation Ins. Fund v. Workers' Comp. Appeals Bd.* (1995) 37 Cal.App.4th 675, 682.) The public policy underpinning the proposed presumption rests on streamlining infrastructure development and creating greater coordination between the Commission role and the CAISO's statutory responsibility to ensure the "efficient use and reliable operation of the transmission grid." (Pub. Utilities Code § 345.) Further, Public Utilities Code § 334 provides explicitly that "[t]he proposed restructuring of the electric industry would *transfer* responsibility for ensuring short- and long- term reliability away from electric utilities and regulatory bodies to the Independent System Operator . . ." The ability to identify economic transmission projects is tantamount to ensuring the efficient use of the transmission grid and the CAISO has gathered the expertise to perform such function. Therefore, the present context conforms to the historic use of rebuttable presumptions that shift the burden of proof to fulfill a public policy.

Next is what proof is required to overcome the burden. The CAISO previously advanced the notion of the "clear and convincing" standard. The clear and convincing standard requires that the evidence be so clear as to leave no substantial doubt in the mind of the trier of fact. It must be sufficient strong to commend the unhesitating assent of

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where, for example, the CAISO's transmission plan forms a component of an integrated resource plan adopted by the California Energy Commission or the Commission, it may be appropriate to revisit the type of presumption applied.

every reasonable mind. (See, e.g., *Tannehill v. Finch* (1986) 188 Cal.App.3d 224.) This standard is more stringent than the typical "preponderance" standard, which only calls for probability, while "clear and convincing" demands a high probability. (*In re Angelia P.* (1981) 28 Cal.3d 908.). The CAISO now believes either standard would serve the purpose of improving the review process.

Again, as the CAISO has noted previously, this solution does not implicate due process or delegation concerns. Due process of Commission action is provided by the requirement of adequate notice to an affected party and an opportunity to be heard. (*People v. Western Air Lines, Inc., supra,* 42 C.2d at 632.) Nothing in the CAISO's proposal alters the procedures afforded during a CPCN process. The project opponent continues to have the opportunity to marshal whatever evidence available to disprove that the project is, in fact, not economic to construct. This challenge rests, as it does today, on an assessment of the analysis underlying the CAISO's determination of economic efficiency, e.g., the study performed by the CAISO or project proponent. Thus, the CAISO's determination must be defensible and is testable. A party can also challenge the project on a myriad of other grounds. Thus, all the process constitutionally due individuals potentially affected by the CPCN application has been, or will be, satisfied.[73] Several parties in R.04-01-026 cited *Cal. Sch. Employee's Ass'n v. Pers. Comm'n of the Pajaro Valley Unified School Dist.* (1970) 3 Cal.3d 139, 144, for the proposition that

[73] "[Due] process is flexible and calls for such procedural protections as the particular situation demands." (*Morrissey v. Brewer* (1972) 408 U.S. 471, 481.) Since the types of property protected the due process clause vary widely, what may be required by that clause in dealing with one set of interests may not be required in dealing with another set of interests. (*Arnett v. Kennedy* (1974) 416 U.S. 134.) The deprivation of liberty interests or those benefits constituting "means for daily subsistence" are accorded greater procedural protection than mere economic interests. Even assuming that a property interest existed in a determination of economic or reliability need, that interest would be tangential, at best, and largely affecting an economic interest. Consequently, the process contemplated by the CAISO satisfies the flexible requirements of due process.

powers conferred upon public agencies that involve the exercise of judgment or discretion cannot be surrendered or delegated to subordinates. The CAISO proposal involves no delegation whatsoever. The Commission remains the ultimate finder-of-fact regarding whether, after weighing submitted evidence, the presumption has or has not been overcome. Simply put, the presumption changes the Commission's internal procedures, not its functions or ultimate authority to determine the outcome of the CPCN proceeding.[74]

III. THE CPCN APPLICATION FOR DVP2 SHOULD BE GRANTED

The CAISO fully applied all five principles of the TEAM approach to evaluate DPV2. The CAISO concluded that DPV2 will provide significant economic and reliability benefits to CAISO ratepayers. SCE and DRA independently reached similar conclusions.

As noted above, TEAM focuses on identifying the economic benefits that can be quantified and attributed to the proposed transmission upgrade. For purposes of evaluating DPV2, the CAISO quantified the following economic benefits attributable to the proposed upgrade: (1) energy cost savings, (2) operational benefits, (3) capacity benefits, (4) system-loss reduction benefits, and (5) emission reduction benefits. A summary of the lifecycle benefits, costs and BCR for TEAM's societal, modified societal and CAISO ratepayer perspective (LMP only and LMP and contract path) yield BCRs ranging from 1.2 to 3.2 in 2008 dollars.[75]

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[74] Some may argue that the acceptance of a rebuttable presumption obviates the need to adopt general principles. While potentially true if the presumption rested solely on the CAISO's status, the CAISO suggests that the presumption could be conditioned on a memorandum of understanding between the CAISO and Commission that the CAISO will comply with the guidelines. If , at some point in time, the CAISO felt it was imprudent to follow the guidelines, the MOU would terminate along with the presumption.

[75] Exhibit 11, Attachment 6 at 1-2.

	WECC or Societal	Enhanced WECC Competition or Modified Societal	CAISO Ratepayer (LMP Only)	CAISO Ratepayer (LMP+ Contract Path)
Levelized Benefits				
- Energy	$56	$84	$57	$198
- Operational	$20	$20	$20	$20
- Capacity	$12	$12	$6	$6
- System Loss	$2	$2	$1	$1
- Emissions	$1	$1	$1	$1
- Total	$91	$119	$84	$225
Levelized Costs	$71	$71	$71	$71
Benefit-Cost Ratio	**1.3**	**1.7**	**1.2**	**3.2**

As explained above, energy savings is the difference between production costs to serve the load without the proposed DPV2 upgrade and the lower production costs with the upgrade in service. In this case, the project's primary economic benefit results from an increased ability to import lower-cost energy from the southwest and displace higher-cost energy in California.[76]

The CAISO Ratepayer (LMP Only) analysis was performed assuming congestion revenue based on physical-flows throughout the WECC. An important assumption is that LMP will be uniformly implemented by all the entities in the Western Interconnection. However, this pricing mechanism may not be implemented in the immediate or even near future. At present, most of the WECC operates based on contract path (rather than physical-flow network model) scheduling. The CAISO Ratepayer (LMP Only) computes transmission congestion revenue for each line in the WECC. In some cases, this congestion revenue can be very high. However, today some congestion is managed in

[76] *Id.*

real-time resulting in uplift charges rather than congestion revenue. The net result is that the LMP methodology, as applied to the CAISO Ratepayer perspective, likely exaggerates the loss of congestion revenue in today's environment due to the upgrade.[77] Given that this over-estimation is a reduction in the revenues earned by utility-owned transmission assets, which revenue is applied as a credit to reduce transmission revenue requirements, the effect will be to lower the benefits received by consumers as a result of the upgrade.

To address this issue, the CAISO also performed an CAISO Ratepayer (LMP + Contract Path) analysis. For the CAISO Ratepayer (LMP + Contract Path) perspective, the CAISO made adjustments to the transmission congestion revenue both before and after the upgrade. The net impact was usually an increase in transmission upgrade benefits for the CAISO ratepayers, more closely reflecting the upgrade benefits to the ratepayers under the current WECC scheduling rules.[78] As explained by TURN witness, Mr. Florio, a former member of the CAISO Board of Governors, the CAISO Ratepayer (LMP + Contract Path) perspective "was actually a better representation of what would really happen than the LMP Only column" and "if you consider the contract path and the absence of LMP pricing on other lines, it goes up to 3.2, which makes it, you know, a pretty clear winner." [79]

In addition to energy savings, DPV2 will also provide access to additional efficient generating capacity that can serve to meet the State's resource adequacy

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77 *Id.* at 18-19.
78 *Id.*
79 Tr. 370:19-27.

requirements.[80] This will also lower total operating costs by reducing the amount of uneconomic generation dispatched for operational reliability purposes.[81] The CAISO further concludes that DPV2 will improve reliability by increasing voltage support in southern California, and enhance system operational flexibility by providing CAISO operators with more options in responding to transmission and generation outages.[82] Finally, but significantly, under extreme conditions, such as high load growth and fuel prices, dry hydro, and uncompetitive markets, the benefits of DPV2 can be very high with an annual benefit-to-cost ratio that can range from 2 to 10. Given these large savings or, alternatively, the large cost exposure under adverse conditions, the CAISO believes this line can provide a significant insurance value that will help to mitigate the impact of adverse conditions on CAISO ratepayers.[83] This insurance value is summarized in a histogram below. It shows that there is a 70% probability that the annual energy benefits in 2013 exceeds $50 million. There is a 5 % probability that the project would provide an annual ratepayer benefit between $150 million and $350 million, thus providing a significant insurance value from the impact of a range of uncertain conditions to ratepayers.

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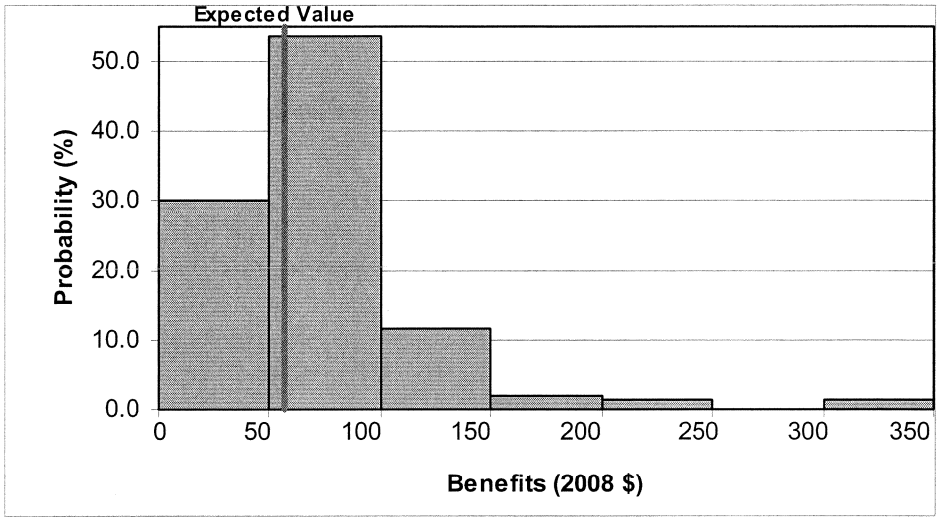
80 A discussion of the method for calculating capacity benefits is set forth at Exhibit 11, Attachment 6, pages 25-26, and Attachment 7, pages 63-65.

81 A discussion of the method for calculating operational benefits is set forth at Exhibit 11, Attachment 6, pages 22-25, and Attachment 7, pages 42-44.

82 Exhibit 11, Attachment 6 at 10.

83 *Id.* at 31.

Historgram of Energy Benefits (2013, CAISO Ratepayer – LMP Only Case)



Accordingly, based on the foregoing benefits, the CAISO concludes that the DPV2 proposed transmission upgrade is cost-effective and supports the granting of a CPCN.

IV. CONCLUSION

Based on the foregoing, the CAISO urges the ALJ to prepare a proposed decision that (1) finds the DPV2 transmission project economically efficient and (2) adopts or endorses as minimum requirements for future economic assessments, the TEAM principles outlined herein.

March 10, 2006

Respectfully Submitted:

By: _____
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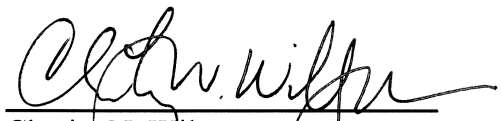
CERTIFICATE OF SERVICE

I hereby certify that I have served, by electronic and United States mail, a copy of the foregoing Opening Brief on Behalf of The California Independent System Operator to each party in Docket Nos. A.05-04-015 and I.05-06-041.

Executed on March 10, 2006 at Folsom, California.



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