BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF COLORADO

IN THE MATTER OF THE APPLICATION OF TRI-STATE GENERATIOIN AND TRANSMISSION ASSOCIATION, INC. (A) FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE SAN LUIS VALLEY-CALUMET-COMANCHE TRANSMISSION PROJECT, (B) FOR SPECIFIC FINDINGS WITH RESPECT TO EMF AND NOISE, AND (C) FOR APPROVAL OF OWNERSHIP INTEREST TRANSFER AS NEEDED WHEN PROJECT IS COMPLETED.	**DOCKET NO. 09A—324E**
IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO (A) FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE SAN LUIS VALLEY TO CALUMET TO COMANCHE TRANSMISSION PROJECT, (B) FOR SPECIFIC FINDINGS WITH RESPECT TO EMF AND NOISE, AND (C) FOR APPROVAL OF OWNERSHIP INTEREST TRANSFER AS NEEDED WHEN PROJECT IS COMPLETED.	**DOCKET NO. 09A—325E**

Answer Testimony and Exhibits of

James R. Dauphinais

On behalf of

Blanca Ranch Holdings, LLC and Trinchera Ranch Holdings, LLC

Project 9184
October 28, 2009

BRUBAKER & ASSOCIATES, INC.
CHESTERFIELD, MO 63017

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF COLORADO

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Table of Contents to the Answer Testimony of James R. Dauphinais (cont.)

Summary of Answer Testimony of James R. Dauphinais

- The Companies have not shown the need for the San Luis Valley-Calumet portion of their Proposed Project.

- The San Luis Valley voltage collapse-related reliability issue would be reasonably resolved with no transmission line additions in the San Luis Valley if at least 150 MW of thermal solar generation with storage, or other synchronous generation with a similar level of dispatchability and capacity factor, is added in the San Luis Valley area.

- Without any transmission line additions in the San Luis Valley area, up to 250 MW of generation can be accommodated in the San Luis Valley area. This amount can be expanded to 525 MW through the addition of a 230/115 kV transformer at Poncha and a San Luis Valley-Poncha 230 kV generation Remedial Action Scheme ("RAS"). This solution would cost less than one-sixth ($15 million) of the Companies' proposed $90 million San Luis Valley-Calumet transmission line.

- Alternatively, the San Luis Valley voltage collapse-related issue would be resolved with the addition of a new 230 kV transmission line from San Luis Valley to the north for a cost of approximately $40 to $50 million less than the cost of the Companies' proposed $90 million San Luis Valley-Calumet transmission line.

- If a new 230 kV transmission line addition from San Luis Valley to the north is pursued, between 525 and 575 MW of generation can be accommodated in the San Luis Valley area.[1]

- All of the Trinchera Ranch alternatives support up to 1,000 MW of generation additions at Calumet on a non-simultaneous basis and allow removal of the existing Comanche-Walsenburg 230 kV RAS.

- All of the Trinchera Ranch alternatives can accommodate at least 525 MW to 1,275 MW of generation on a combined basis in the San Luis Valley and Calumet/Walsenburg areas depending on how that generation is distributed between the two areas.

- The Companies have publicly identified proposed commitments to new generation of up to 310 MW for the San Luis Valley area and 250 MW for the Calumet/Walsenburg area. All of the Trinchera Ranch alternatives can readily accommodate this level of generation additions and have remaining capability left that could support other future generation additions in the San Luis Valley and Calumet/Walsenburg areas.

[1] If the current ratings of the Black Hills' West Canon to Portland 115 kV path cannot be raised at a relatively low cost, these 230 kV line alternatives would instead accommodate between 475 and 525 MW of new generation in the San Luis Valley area.

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Answer Testimony of James R. Dauphinais

I. Introduction

Q PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A James R. Dauphinais. My business address is 16690 Swingley Ridge Road, Suite 140, Chesterfield, MO 63017.

Q WHAT IS YOUR OCCUPATION?

A I am a consultant in the field of public utility regulation and a Principal of Brubaker & Associates, Inc. ("BAI"), energy, economic and regulatory consultants.

Q PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A I have earned a Bachelor of Science in Electrical Engineering from the University of Hartford and have completed a number of graduate level courses in electric power systems through the Engineering Outreach Program of the University of Idaho. In the twelve and one-half years prior to the beginning of my current employment with BAI, I was employed in the Transmission Resource Planning Department of the Northeast Utilities Service Company. While employed in that function, I conducted numerous dynamic and load flow analyses related to thermal, voltage and stability issues that I studied in support of Northeast Utilities' planning and operation of its electric transmission system. Since my employment with BAI, I have testified before the Federal Energy Regulatory Commission ("FERC") and many state commissions on a wide variety of issues including, but not limited to, avoided cost calculations, certification of public convenience and necessity, fuel adjustment clauses, interruptible rates, market power, market structure, prudency, resource planning, standby rates, transmission losses, and transmission planning. I have also assisted end-use customers with power procurement and assisted a variety of clients in regard to transmission access issues. My background is detailed further in Appendix A to my testimony.

Q ON WHOSE BEHALF ARE YOU APPEARING IN THIS PROCEEDING?

A My testimony is being presented on behalf of Blanca Ranch Holdings, LLC and Trinchera Ranch Holdings, LLC (collectively, "Trinchera Ranch").

Q WHAT IS THE SUBJECT OF YOUR TESTIMONY?

A My testimony addresses Public Service Company of Colorado's ("Public Service") and Tri-State Generation and Transmission Association, Inc.'s ("Tri-State"), collectively the "Companies", applications for a Certificate of Public Convenience and Necessity ("CPCN") for their proposed San Luis Valley – Calumet – Comanche Transmission Project ("Proposed Project" or "Alternative 1"). In particular, I address whether the Companies have demonstrated the need for the San Luis Valley to Calumet 230 kV double-circuit transmission line portion of the Proposed Project. I do not address the need for other portions of the Proposed Project, but I do address how the other portions of the Proposed Project would be affected by my alternatives to the San Luis Valley to Calumet portion of the Proposed Project.

My silence on any matter should not be taken as a tacit endorsement of any position taken by the Companies in this proceeding.

Q PLEASE OUTLINE WHAT YOU REVIEWED IN PREPARATION FOR YOUR ANSWER TESTIMONY IN THIS PROCEEDING?

A I reviewed the filings of the Companies, transcripts from the depositions of the Companies' witnesses, the responses of the Companies to data requests and interrogatories, industry technical articles regarding the state-of-the-art for solar generation technology, and Western Electric Coordinating Council ("WECC") and North American Electric Reliability Corporation ("NERC") transmission planning standards and criteria.

Q WHAT ELSE DID YOU DO TO PREPARE FOR YOUR ANSWER TESTIMONY?

A I applied my knowledge and experience to perform a study on behalf of Trinchera Ranch to evaluate alternatives to the San Luis Valley to Calumet portion of the

Proposed Project. I have attached my report on the study as Exhibit JRD-1. I will refer to my study as the "BAI Study".

Q PLEASE SUMMARIZE YOUR CONCLUSIONS IN REGARD TO THE COMPANIES' APPLICATION IN THIS PROCEEDING.

A The Companies have not shown there is a need for the San Luis Valley to Calumet 230 kV double-circuit transmission line portion of the Proposed Project. The need to address reliability in the San Luis Valley and accommodate proposed renewable resource commitments in the San Luis Valley and Calumet areas can be adequately met by substituting any one of a number of significantly lower cost alternatives for the San Luis Valley to Calumet transmission line portion of the Companies' Proposed Project. These lower cost alternatives to the San Luis Valley to Calumet transmission line portion of the Proposed Project (Alternative 1 from Public Service Exhibit No. TWG-1) include:

Alternative Trinchera Ranch 1 (TR1)

The addition of a second single-circuit 230 kV transmission line from San Luis Valley substation to Poncha substation.

Alternative Trinchera Ranch 2 (TR2)

The addition of:

- A new single-circuit 230 kV transmission line from San Luis Valley substation to Sargent substation and Poncha substation; and
- A new 230 kV/115 kV autotransformer at Sargent substation.

Alternative Trinchera Ranch 3 (TR3)

The addition of a new single-circuit 230 kV transmission line from San Luis Valley substation to West Canon substation.

Alternative Trinchera Ranch 4AR (TR4AR)

The addition of:

- A new Poncha 230/115 kV transformer; and
- A new San Luis Valley-Poncha 230 kV generation Remedial Action Scheme ("RAS")

As shown in Table 1 below, which is a reproduction of Table 1 from my Exhibit JRD-1, each of these four alternatives individually provides, at an estimated cost tens of millions of dollars less than the Companies' Alternative 1, adequate reliability for San Luis Valley and adequate support to accommodate new renewable resources in the San Luis Valley and Calumet areas that is well in excess of the publicly indicated proposed commitments by Public Service for such resources. Those publicly indicated proposed commitments only range from 280 to 310 MW for the San Luis Valley area and from 200 to 250 MW in the Calumet/Walsenburg area.

Finally, all four of Trinchera Ranch's alternatives still allow for the removal of Tri-State's existing Comanche-Walsenburg 230 kV RAS by providing a second 230 kV source to Walsenburg from Comanche via Calumet. This second source is provided by the Calumet to Comanche and Calumet to Walsenburg portions of the Proposed Project.

TABLE 1

Comparison of Companies Proposed Project (Alternative 1) to Trinchera Ranch Alternatives

Alternative	Upgrades Included in Addition to Calumet-Comanche and Calumet-Walsenburg Portions of the Companies' Proposed Project[1]	Significantly Reduces Risk of Undervoltage Load Shedding in the San Luis Valley Area	Maximum Additional San Luis Valley Generation (MW)	Maximum Additional Calumet Generation (MW)	Maximum Additional Simultaneous Generation (MW)	Estimated Cost of San Luis Valley Upgrades
1	New Double-Circuit 230 kV San Luis Valley-Calumet Line (proposed by Companies)	Yes	750	1,400	750-1,400	$90 M
TR1	New Single-Circuit 230 kV San Luis Valley-Poncha Line	Yes	525[2]	1,000	525-1,300	$39 M
TR2	New Single-Circuit 230 kV San Luis Valley-Sargent-Poncha Line plus Sargent 230/115 kV Transformer	Yes	575[2]	1,000	800-1,300	$48 M
TR3	New Single-Circuit 230 kV San Luis Valley-West Canon Line	Yes	525[2]	1,000	900-1,275	$66 M
TR1A	TR1 with New Poncha 230/115 kV Transformer	Yes	575	1,000	1,125-1,325	$39 M[4]
TR2A	TR2 with New Poncha 230/115 kV Transformer	Yes	575	1,000	875-1,325	$48 M[4]
TR3A	TR3 with New Poncha 230/115 kV Transformer	Yes	550[2]	1,000	900-1,300	$66 M[4]
TR4	Only Minor San Luis Valley-Sargent-Poncha 115 kV Upgrades	Yes[3]	250	1,000	1,250	Not Applicable
TR4AR	TR4 with New Poncha 230/115 kV Transformer and Generation Remedial Action Scheme	Yes[3]	525	1,000	525-1,325	<$15 M

Note: All of these alternatives, including the Companies' Alternative 1, assume (i) a relatively low cost upgrade of the ratings of the existing San Luis Valley to Sargent and Sargent to Poncha 115 kV transmission lines, (ii) resolution of various 115 kV overloads on the Black Hills transmission system (in the Pueblo area) and (iii) 345/230 kV, 230/115 kV and 115/69 kV transformer overloads up to 115.9% of rating can be mitigated at relatively low cost. For the Black Hills' West Canon to Portland 115 kV transmission path, it was assumed overloads could be resolved at a relatively low cost up to 133 MVA of post-contingency loading. This is the minimum rating of the upstream Poncha to West Canon 115 kV transmission path.

[1]All of these alternatives assume the completion of the Calumet to Comanche and Calumet to Walsenburg portions of the Companies' Proposed Project which will allow removal of the existing Comanche-Walsenburg 230 kV Remedial Action Scheme reducing the likelihood of automatic load shedding of Tri-State load in northeastern New Mexico.

[2]This level of additional San Luis Valley generation is achievable to the extent a new 230/115 kV transformer is added at Black Hills' West Canon substation or the overload of the existing West Canon substation 230/115 kV transformer for the loss of the Midway BR – West Canon 230 kV transmission line is otherwise mitigated. The cost estimates for the affected alternatives conservatively include the estimated cost of adding a new 230/115 kV transformer to Black Hills' West Canon substation.

[3]Provided at least 150 MW of new thermal solar generation with storage, or other synchronous generation with a similar level of dispatchability and capacity factor, is added to the San Luis Valley area.

[4]The TR1A, TR2A and TR3A alternatives are alternatives presented to show how the capability of the TR1, TR2 and TR3 alternatives would change if Public Service goes ahead with its $8.4 million Poncha 230/115 kV transformer project. As such, the $8.4 million cost for that project is not included in the cost of San Luis Valley area upgrades for Alternatives TR1A, TR2A and TR3A.

II. Demonstration of Need for New Transmission Facilities in the San Luis Valley and Calumet Areas

Q CAN YOU PLEASE EXPLAIN THE ISSUES THE COMPANIES ARE PROPOSING TO ADDRESS WITH THE PROPOSED PROJECT?

A Yes. There are two main issues that the Companies are proposing to address with the Proposed Project. These are a voltage collapse-related reliability issue in the San Luis Valley, which is the primary concern of Tri-State,[2] and the accommodation of potential new renewable resource commitments in the San Luis Valley and Calumet areas, which is the primary concern of Public Service.

A. San Luis Valley Voltage Collapse-Related Reliability Issue

Q CAN YOU PLEASE PROVIDE A BRIEF DESCRIPTION OF THE SAN LUIS VALLEY VOLTAGE COLLAPSE ISSUE?

A Yes. But for an existing automatic undervoltage load shedding system currently utilized by Tri-State, the San Luis Valley would be in danger of voltage collapse for the single contingency loss of the existing San Luis Valley to Poncha single-circuit 230 kV transmission line when load in the San Luis Valley is in excess of approximately 65 MW (Direct Testimony of Tri-State witness Leoni at 5). Voltage collapse can be thought of as a sudden "cave in" (or collapse) of the electrical pressure on the transmission system due to operation at an unstable voltage level either just before or following a system disturbance such as a single contingency event. In alternating current electric power systems, voltage is primarily affected by reactive power flow. Reactive power flow is the flow of electric current over the transmission system caused by the constant exchange of energy between the power

[2] Tri-State is also seeking to remove its existing Comanche-Walsenburg 230 kV RAS in order to significantly reduce the likelihood of automatic load shedding of Tri-State load in northeastern New Mexico following the loss of the Comanche-Walsenburg 230 kV transmission line.

system's electric and magnetic fields. Reactive power flow performs no useful work, but the electric current associated with it lowers voltage, consumes the current carrying capacity of transmission lines and increases active (i.e., real) power losses. Transformers, non-synchronous generators, heavily loaded transmission lines and certain loads draw reactive power and this draw tends to depress voltage. Loads that fall into this category include, but are not limited to, non-synchronous motors, air conditioning, and discharge lighting. Synchronous generators, synchronous motors, lightly loaded transmission lines and devices such as capacitors, the latter two of which primarily involve electric rather than magnetic fields, provide reactive power support and tend to boost voltage.

Q CAN YOU PLEASE EXPLAIN HOW THE VOLTAGE COLLAPSE ISSUE IN THE SAN LUIS VALLEY IS CURRENTLY ADDRESSED WITH THE UNDERVOLTAGE LOAD SHEDDING SYSTEM YOU HAVE MENTIONED?

A Yes. The current undervoltage load shedding system automatically trips various amounts of the customer load of Tri-State's members in the San Luis Valley when voltage falls below 107 kV (93% of nominal voltage) for 10, 20 and 30 seconds (Tri-State's Responses to Data Requests Trinchera Ranch 4-7 and 7-1, attached as Exhibit JRD-2 and JRD-3, respectively.) By quickly tripping off customer load, both the reactive power load in the San Luis Valley area and the reactive power draw of the transmission lines feeding the San Luis Valley area are significantly reduced. This action generally prevents the collapse of voltage in the San Luis Valley area.

Q IS THE USE OF SUCH AN UNDERVOLTAGE LOAD SHEDDING SYSTEM ACCEPTABLE UNDER WECC AND NERC PLANNING CRITERIA AND STANDARDS?

A Yes. It is permissible under planning criteria to automatically shed a limited amount of load in order to meet that criteria.

Q HAS THE UNDERVOLTAGE LOAD SHEDDING SYSTEM BEEN EFFECTIVE?

A Yes. Since 2003, the undervoltage load shedding system has only activated once. During that one event, which took place on May 7, 2003, the system tripped 20.5 MW of load. 19 MW of this load was lost for only 15 minutes and the remaining 1.5 MW of this load was restored eight minutes later (Tri-State's Discovery Responses at TSGT 001206 attached as Exhibit JRD-4). Tri-State believes it is probable the removal of the load during this event mitigated further voltage decay and voltage collapse (Tri-State's Responses to Data Request Trinchera Ranch 7-1, attached as Exhibit JRD-3).

Q HOW OFTEN WILL THE SYSTEM CAUSE INTERRUPTIONS OF CUSTOMER LOAD?

A It will only cause interruptions when an event, such as the loss of the existing San Luis Valley-Poncha 230 kV transmission line when load in the San Luis Valley area is in excess of 65 MW, actually occurs and causes the 115 kV transmission voltage to fall below 107 kV for the required number of seconds for each of the three tripping intervals of the system. This has only occurred once in the past six years (Id.).

Q COULD TRI-STATE CONTINUE TO RELY ON THE UNDERVOLTAGE LOAD SHEDDING SYSTEM?

A Yes. Over time, the likelihood and frequency at which customer load is tripped in the San Luis Valley could increase to unacceptable levels as load grows in the San Luis Valley. However, it is also true that if new synchronous generation is added to the San Luis Valley (e.g., thermal solar generation with storage), the likelihood and frequency at which customer load is tripped would decrease because such synchronous generation would both back off active (i.e., real) power flows into the San Luis Valley (reducing the reactive power draw of the transmission lines feeding the area) and provide local reactive power support.

Q WHAT IS TRI-STATE'S JUSTIFICATION FOR REPLACING THE UNDERVOLTAGE LOAD SHEDDING SYSTEM WITH OTHER TRANSMISSION FACILITIES?

A It is not entirely clear from the testimony and exhibits of Tri-State why Tri-State believes it now needs to replace the existing San Luis Valley undervoltage load shedding system. However, it appears that Tri-State wants to significantly reduce the likelihood that customer load is automatically tripped to prevent voltage collapse (Direct Testimony of Tri-State witness Leoni at 5).

B. Delivery of Power from New Renewable Resources in the San Luis Valley and Calumet Areas

Q CAN YOU PLEASE DESCRIBE THE NEED TO ACCOMMODATE NEW RENEWABLE RESOURCES IN THE SAN LUIS VALLEY AND CALUMET AREAS?

A Public Service has identified a need to receive the delivery of electric power from new renewable resources that would be located in the San Luis Valley (Energy Resource

Zone (ERZ) 4) and Calumet/Walsenburg (ERZ 5) areas. Public Service notes that there are a large number of interconnection requests for new renewable resources in these areas within the Public Service generation interconnection queue (Public Service Docket No. 09A-325E Application at 14). However, very few of these renewable resource projects have made a firm commitment to move forward with construction. Furthermore, the preliminary preferred resource portfolio of Public Service's 2009 All-Source Solicitation only includes 280 to 310 MW of new resources in the San Luis Valley area and 200 to 250 MW of new resources in the Calumet area (Docket No. 07A-447E, Public Version of 120-Day Report at 14).

Q PUBLIC SERVICE WITNESS MR. TAYLOR DISCUSSES THE NEED TO BUILD TRANSMISSION BEFORE THERE ARE FIRM COMMITMENTS FOR NEW RENEWABLE RESOURCES OR THOSE RESOURCES MAY NOT BE PURSUED BY DEVELOPERS (DIRECT TESTIMONY OF TAYLOR AT 4). HOW DO YOU RESPOND?

A The concern Mr. Taylor raises could be addressed by using a horizon for new resources in Public Service's solicitations that is at least as long as the lead time for new transmission facilities. It is not necessarily inappropriate to size transmission capability slightly in excess of the need for the delivery power from committed resources, but Public Service has not shown the need for the addition of the large amounts of transmission capability in excess of its 2009 All-Source Solicitation preliminary preferred resource portfolio that would be provided by the Proposed Project especially at the significant additional cost of the San Luis Valley-Calumet portion of the Proposed Project over the Trinchera Ranch alternatives.

C. A Demonstration of the Need for New Facilities Does Not Demonstrate the Need for Specific New Facilities

Q IS A DEMONSTRATION BY THE COMPANIES OF THE NEED TO ADDRESS THE AFOREMENTIONED RELIABILITY AND RENEWABLE RESOURCE ADDITION ISSUES IN ITSELF A DEMONSTRATION OF THE NEED FOR THE PROPOSED PROJECT?

A No. There are a number of ways to adequately address the identified reliability and renewable resource issues. To demonstrate the need for a specific set of new facilities, the Companies must show the specific proposed facilities are the best choice for addressing the issues at hand. This generally requires a demonstration that the specific facilities being proposed are the least cost solution that adequately addresses the issues at hand within the bounds of any other constraints imposed by the Commission. It also requires a consideration of alternatives. My study (i.e., the BAI Study) shows there are other significantly lower cost alternatives that meet all of the identified needs and were not considered by the Companies.

III. Alternatives to the San Luis Valley to Calumet Portion of the Proposed Project that Adequately Address the San Luis Valley Voltage Collapse Issue

Q WHAT STUDIES HAVE THE COMPANIES RELIED UPON FOR THEIR SELECTION OF THE SAN LUIS VALLEY TO CALUMET DOUBLE-CIRCUIT 230 KV LINE AS THE BEST REMEDY TO THE SAN LUIS VALLEY VOLTAGE COLLAPSE ISSUE?

A They have relied upon Tri-State's June 2008 San Luis Valley Electric System Improvement Project Alternative Evaluation and Macro Corridor Study ("2008 AE/MCS"), which was filed with the Rural Utilities Service ("RUS") for Tri-State's previous plan for a single-circuit 230 kV transmission line from San Luis Valley

substation to Walsenburg substation. This was provided as Exhibit No. MJM-2 to the Direct Testimony of witness Mr. Murray. However, a review of the 2008 AE/MCS reveals that it heavily draws on Tri-State's 1997 San Luis Valley High Voltage System Study Report ("1997 Study") and 2004 San Luis Valley Substation Second 230-kilovolt Source PV Report ("2004 PV Study") (pages 1-2 of Exhibit MJM-2). Furthermore, Tri-State has confirmed that it did not perform any new voltage stability analysis for the 2008 AE/MCS. The 2008 AE/MCS relies upon the voltage stability analysis performed in the 2004 PV Study (Tri-State's Responses to Data Request Trinchera Ranch 4-8, attached as Exhibit JRD-5). I have attached the 1997 Study, less its bulky appendices, as my Exhibit JRD-6 and the 2004 PV Study in its entirety as my Exhibit JRD-7.

A. 1997 Study

Q CAN YOU PLEASE DESCRIBE THE 1997 STUDY AS IT RELATES TO THE VOLTAGE COLLAPSE ISSUE IN THE SAN LUIS VALLEY?

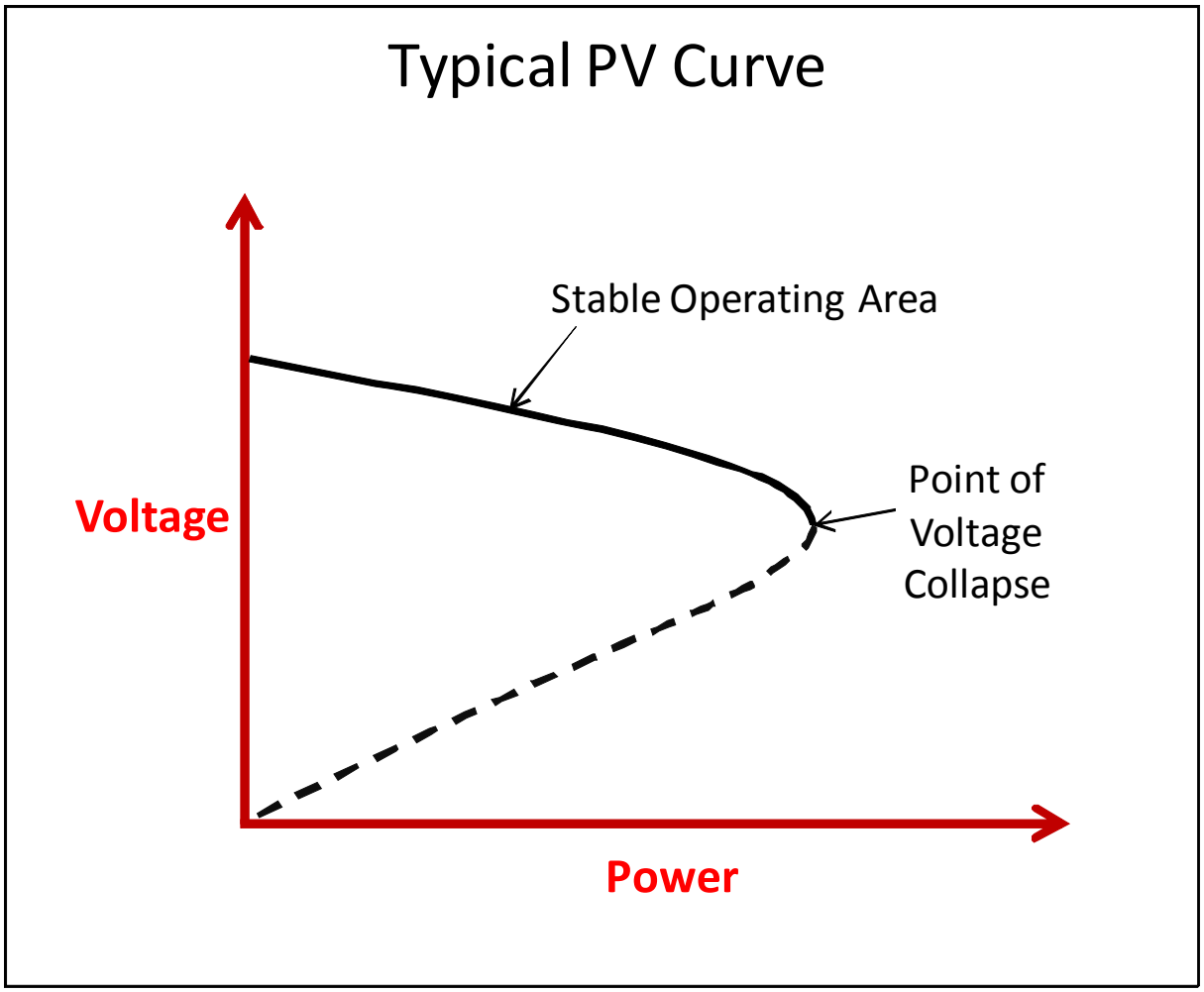
A Yes. The 1997 Study looked at a number of transmission issues associated with providing electric service to load in the San Luis Valley, but it identified the most serious concern to be the risk of voltage collapse in the San Luis Valley during an outage of the existing Poncha to San Luis Valley 230 kV transmission circuit when the total coincident load in the San Luis Valley exceeds 65 MW.[3] The study also indicated loads in the San Luis Valley exceeded 65 MW approximately 15% of the time in 1995 (Exhibit JRD-6 at 10).

[3]The 1997 Study also identifies the loss of the San Luis Valley 230/115 kV autotransformer as an event that could also result in voltage collapse. However, since the addition of a second 230/115 kV autotransformer at San Luis Valley, this contingency is no longer a concern.

Q HOW WAS THE RISK OF VOLTAGE COLLAPSE EXAMINED IN THE 1997 STUDY?

A The risk was evaluated by performing what is referred to as a Power-Voltage Curve Study (PV Curve Study). A PV Curve Study is a common analytic technique used to analyze slow (tens to hundreds of seconds), rather than transient (less than 10 seconds), forms of voltage instability. It involves conducting a series of power flow (or load flow) computer simulations in order to plot snapshots of steady-state voltage behavior versus increasing levels of active (i.e., real) power load or, alternatively, import levels. Figure 1 below shows a typical PV Curve.

FIGURE 1



The voltage collapse phenomenon is evident from the rapid drop of voltage that is exhibited on the right side of the typical PV Curve shown in Figure 1. The right-most point on the curve is often referred to as the "point-of-collapse" or "critical voltage". However, in order to address the margin of error inherent in such analysis, it is not uncommon to limit operation to some percentage below the power level at the point-of-collapse such as 5%. In fact, the report for the 1997 Study proposes a 5% voltage stability margin criterion (Exhibit JRD-6 at 19) and Tri-State has indicated in its response to Data Request Trinchera Ranch 4-8 (Exhibit JRD-5) that this criterion remains in force.[4]

Q HOW COMPREHENSIVE WAS THE 1997 STUDY?

A It was very comprehensive from the perspective of analyzing the voltage collapse phenomenon in the San Luis Valley and the sensitivity of the analysis results to more detailed modeling of the characteristics of load and load-serving transformers within the San Luis Valley. However, it did not comprehensively examine the various alternatives available to reduce the risk of voltage collapse. It recommended the addition of a new single-circuit 230 kV transmission line between San Luis Valley and Walsenburg substations over the remainder of the limited number of alternatives that were evaluated.[5] However, the report also identified a long-term control strategy that would involve the installation of automatic undervoltage load shedding, which could be armed in intervals as regional load increases, to assure that the load does not

[4]However, Tri-State did not apply this margin in its 2004 PV Study (Exhibit JRD-7). This may have resulted in the 2004 PV Study overstating the voltage stability limit in the San Luis Valley for the alternatives that were evaluated in that Study.

[5]The principal alternatives the 1997 Study examined were a 230 kV line from San Luis Valley substation to Walsenburg, a 230 kV line from San Luis Valley to Burro Canyon supplemented by generation and the installation of Static Var Compensators (SVC) at a number of the 69 kV substations in the San Luis Valley area.

exceed 65 MW in the San Luis Valley area during a Poncha to San Luis Valley 230 kV line outage (Exhibit JRD-6 at 26).

Q BASED ON THE 1997 STUDY, DID TRI-STATE PURSUE CONSTRUCTION OF A NEW SINGLE-CIRCUIT 230 KV TRANSMISSION LINE BETWEEN SAN LUIS VALLEY AND WALSENBURG?

A No. It appears Tri-State instead chose to pursue the long-term control strategy outlined in its 1997 Study by installing the current undervoltage load shedding system in the San Luis Valley.

B. 2004 PV Study

Q CAN YOU PLEASE DESCRIBE THE 2004 PV STUDY?

A The 2004 PV Study was a PV Curve Study that examined adding a second 230 kV transmission source for San Luis Valley substation in order to address voltage collapse concerns that could occur during the outage of the existing Poncha to San Luis Valley 230 kV transmission line. As I have discussed, subsequent to the 1997 Study, Tri-State did not pursue construction of the new single-circuit transmission line between San Luis Valley and Walsenburg that was recommended by the study, but instead installed an undervoltage load shedding system.

It appears the 2004 PV Study was triggered for two reasons. First, apparently, system outages shortly before 2004 raised the level of concern over the voltage collapse issue in the San Luis Valley. Second, the 1997 Study did not provide an exhaustive analysis of the different alternatives available to provide a second 230 kV transmission source to San Luis Valley substation (Exhibit JRD-6 at 2).

In the 2004 PV Study, PV Curves were generated for 19 different alternative 230 kV transmission line sources (including a single-circuit 230 kV San Luis Valley to Walsenburg transmission line), the existing system and a Static Var Compensator (SVC) option at San Luis Valley substation (Exhibit JRD-7 at Appendix A). Table 2 of the 2004 PV Study (Exhibit JRD-7 at 7) ranked the alternatives on a lowest cost per MW basis and provided for each alternative the single contingency load limit for the San Luis Valley area, the incremental increase in that limit versus the existing system and the estimated cost per MW of incremental increase in the load limit. It should be noted that the load limits in that table correspond to the point-of-collapse of the PV Curves. The MW amounts were not reduced by the 5% called for by Tri-State's voltage stability margin criterion (Tri-State Response to Data Request Trinchera Ranch 4-8, attached as Exhibit JRD-5). Also, it appears that, in order to simplify the analysis, Tri-State assumed an aggregate 95% power factor for load in San Luis Valley, assumed a constant MVA load model and did not model load serving transformers with automatic load tap changers (Id.).

Q DO YOU AGREE WITH COMPANIES' RELIANCE ON THE 2004 PV STUDY FOR THE 2008 AE/MCS AND THIS PROCEEDING?

A No.

Q WHY DO YOU DISAGREE WITH THE COMPANIES' RELIANCE ON THE 2004 PV STUDY RESULTS FOR THE 2008 AE/MCS AND THIS PROCEEDING?

A The 2004 PV Study is flawed because it assumed the length of the transmission lines evaluated would be equal to the straight-line mileage between the substations the lines would connect. The actual general routing of a new transmission line between San Luis Valley substation and the Calumet/Walsenburg area would be very

circuitous, which significantly increases its length and cost versus alternative 230 kV sources that follow a route that is much closer to a straight-line route. Pages 3-9 and 3-10 of the 2008 AE/MCS (Exhibit MJM-2) indicate a straight-line mileage of 75 miles from San Luis Valley substation to Walsenburg substation and 70 miles from San Luis Valley substation to Monarch (just to the east of the existing Poncha 230 kV substation). The actual mileage for the general routing of the proposed transmission line from San Luis Valley substation to the Calumet/Walsenburg area is approximately 95 miles (27% greater than straight-line mileage) and the actual mileage of the existing 230 kV line from San Luis Valley substation to Poncha substation (a second such line would be a shorter functional equivalent to a San Luis Valley to Monarch line) is 62 miles (11% less than the straight-line mileage for San Luis Valley to Monarch) (Tri-State's Application in Docket No. 09A-324E at 4 and Companies' Response to Data Request Western Resource Advocates 2-3, attached as Exhibit JRD-8). Even accepting Tri-State's dollar per MW ranking approach, which I do not, the Monarch/Poncha connection becomes the lowest dollar per kWh alternative in the 2004 PV Study if actual mileages rather than straight-line mileages are used. Using the 2004 PV Study's assumption that the cost of these alternatives is proportional to length, the Walsenburg/Calumet connection would cost $264,000 per MW versus $213,000 per MW for the Monarch/Poncha connection. This is also true on a total dollar basis as the Walsenburg/Calumet connection would have a total cost of $38,016,000 versus $31,098,000 for Monarch/Poncha connection. Thus, the straight-line mileage assumption of the 2004 PV Study and 2008 AE/MCS is seriously flawed.

Q DO YOU HAVE ANY PROBLEMS WITH THE 2004 PV STUDY?

A The ranking approach used by Tri-State in the study ignores need. There is not a need to construct the Project with the lowest dollar per MW value. There is a need to construct the lowest cost project that adequately addresses the issue at hand within the bounds of any other constraints imposed by the Commission.

Q CAN YOU PLEASE ILLUSTRATE THIS WITH A HYPOTHETICAL EXAMPLE?

A Yes. Assume an area is forecasted to need 120 MW of new transmission capability by the in-service date of new transmission facilities. In addition, let us assume the following two alternatives were available:

- Alternative A – Adds 150 MW of transmission capability at a cost of $30 million.
- Alternative B – Adds 300 MW of transmission capability at a cost of $45 million.

In this example, while Alternative B has the lower cost per MW ($150,000 per MW versus $200,000 per MW), the extra capability provided by Alternative B cannot reasonably justify the $15 million higher total cost of Alternative B over A because there is no demonstrated need for the additional capability provided by Alternative B versus A.

C. Trinchera Ranch Alternatives for Addressing the San Luis Valley Voltage Collapse Issue

Q DO YOU HAVE ANY PROPOSED ALTERNATIVES TO THE COMPANIES' SAN LUIS VALLEY TO CALUMET PORTION OF THE PROPOSED PROJECT?

A Yes. I identified three transmission line alternatives to the San Luis Valley to Calumet portion of the Proposed Project that would adequately address the San Luis Valley voltage collapse issue. These alternatives, which would be used in conjunction with

the Calumet-Comanche and Calumet-Walsenburg portions of the Companies' Proposed Project are as follows:

Alternative Trinchera Ranch 1 (TR1)

Addition of a new second single-circuit 230 kV transmission line from San Luis Valley substation to Poncha substation.

Alternative Trinchera Ranch 2 (TR2)

Addition of a new single-circuit 230 kV transmission line from San Luis Valley substation to Sargent and Poncha substations plus a new 230/115 kV autotransformer at Sargent substation.

Alternative Trinchera Ranch 3 (TR3)

Addition of a new single-circuit 230 kV transmission line from San Luis Valley substation to West Canon substation.

Q DO YOU HAVE ESTIMATES OF MILEAGES AND COSTS FOR THE TRINCHERA RANCH TRANSMISSION LINE ALTERNATIVES?

A Yes. In Table 2 below these are presented in comparison to the San Luis Valley to Calumet portion of the Proposed Project (Alternative 1). The underlying calculations for these estimates are found in Appendix B of Exhibit JRD-1. Note that all three of the listed TR alternatives have a significantly lower estimated total cost than the San Luis Valley to Calumet portion of the Proposed Project. In fact, Alternative TR1 and TR2 are approximately $40 to $50 million less expensive than the estimated cost of Alternative 1. All of the cost estimate numbers below exclude Allowance for Funds Used During Construction ("AFUDC") just as the Companies' estimates did in their testimony.

TABLE 2

San Luis Valley Transmission Line Alternatives

San Luis Valley Alternative	Estimated Approximate San Luis Valley Line Mileage	Estimated San Luis Valley Cost
1	95	$90 M
TR1	62	$39 M
TR2	72	$48 M
TR3	108	$66 M

Q DOES EACH OF YOUR ALTERNATIVES PROVIDE A NEW SECOND INDEPENDENT 230 KV TRANSMISSION LINE SOURCE TO SAN LUIS VALLEY 230 KV SUBSTATION?

A Yes. Provided the proposed transmission lines are constructed on their own structures and are interconnected at the San Luis Valley, Poncha and West Canon 230 kV substations such that a single circuit breaker failure at one of these substations would not result in the simultaneous loss of the new transmission line and the existing San Luis Valley to Poncha 230 kV transmission line (or the simultaneous loss of the two 230 kV transmission lines that feed Poncha from the east and west).[6] There should be no reason why the proposed lines cannot be constructed and interconnected in this manner.

[6]Under the NERC standards, circuit breaker failure and loss of multiple transmission circuits sharing a common tower are classified as Category C contingencies. In general, the bulk power system must be designed to withstand these contingencies, which can lead to the loss of more than one transmission element (NERC Standard TPL-003-0 attached as Exhibit JRD-9). If the proposed lines are constructed in the manner described above, they would avoid these contingencies.

Q IF YOUR TRANSMISSION LINE ALTERNATIVES WERE PLACED IN A RIGHT-OF-WAY SHARED WITH THE EXISTING SAN LUIS VALLEY TO PONCHA 230 KV LINE, WOULD IT UNDERMINE THE INDEPENDENCE OF YOUR TRANSMISSION LINE ALTERNATIVES?

A No. The loss of all transmission circuits in a common right-of-way is considered to be a very low probability contingency. Neither WECC criteria, NERC criteria or the local planning criteria of the Companies require the transmission system to be designed to withstand such an extreme contingency. WECC and NERC criteria only require the testing of this extreme contingency as a stress test of the robustness of the bulk power system.[7] Generally, only when both the extreme contingency could potentially cause a widespread outage on the bulk power system[8] and the likelihood of the extreme contingency at the tested location is abnormally high, would mitigation of this extreme contingency be examined. This is not the case here. No evidence has been presented by the Companies that shows the likelihood of loss of the entire San Luis Valley-Poncha 230 kV right-of-way is abnormally high. Regardless, the loss of the right-of-way would separate the San Luis Valley area from the bulk power system and, thus, not lead to a widespread outage on the bulk power system.

The independence of my transmission line alternatives from the existing San Luis Valley to Poncha 230 kV line would not be unreasonably compromised by having them share the same right-of-way as the existing 230 kV line. My alternatives each

[7]Historically, the loss of all transmission circuits in a common right-of-way or all transmission circuits leaving the same substation have been classified as "Extreme Contingencies" or "Possible But Improbable Contingencies". Under the NERC standards, these contingencies are classified as Category D contingencies – extreme events that result in two or more transmission elements cascading out of service. The bulk power system is generally not designed to withstand these contingencies. The NERC standards only require that these contingencies be evaluated for risks and consequences (NERC Standard TPL-004-0 attached as Exhibit JRD-10).

[8]A widespread outage on the bulk power system would be an outage that covers a large geographical area and/or involves a very large amount of load.

provide a reasonably independent second 230 kV source to San Luis Valley substation.

Q DOES THE TERMINATION OF YOUR TR1 AND TR2 TRANSMISSION LINE ALTERNATIVES IN THE SAME SUBSTATION AS THE EXISTING SAN LUIS VALLEY TO PONCHA 230 KV TRANSMISSION LINE (i.e., PONCHA 230 KV SUBSTATION) UNDERMINE THE INDEPENDENCE OF THESE ALTERNATIVES FROM THE EXISTING LINE?

A No. Like the loss of all transmission circuits in a common right-of-way, the loss of an entire substation is a very low probability event. Neither WECC criteria, NERC criteria or the local planning criteria of the Companies require the transmission system to be designed to withstand such an extreme contingency. WECC and NERC criteria only require the testing of this extreme contingency to stress test the robustness of the bulk power system. Generally, only when both the extreme contingency could cause a widespread outage on the bulk power system and the likelihood of the extreme contingency at the location in question is abnormally high, would mitigation of this extreme contingency be examined. This is not the case here. No evidence has been presented by the Companies that shows an abnormally high likelihood that the aforementioned substations could be lost in their entirety. Regardless, the impact on the bulk power system of the loss of any of these substations will not be changed by the addition of a new 230 kV transmission line from San Luis Valley. The independence of my TR1 and TR2 alternatives are not unreasonably undermined by the fact they would terminate in the same substation as the existing San Luis Valley to Poncha 230 kV transmission line (i.e., Poncha 230 kV substation). As I have noted, my alternatives each provide a reasonably independent second 230 kV source to San Luis Valley substation.

Q HAVE YOU PERFORMED A PV CURVE ANALYSIS OF THESE ALTERNATIVES THAT SHOWS THAT THEY ARE ALL ADEQUATE TO ADDRESS THE SAN LUIS VALLEY VOLTAGE COLLAPSE ISSUE?

A Yes. I performed such an analysis in the BAI Study that shows this is the case. The results of that analysis are presented in Section VIII.A. of Exhibit JRD-1 and summarized below in Table 3. My analysis shows that all of the alternatives provide voltage stability for San Luis Valley area loads up to at least 180 MW following the loss of the existing San Luis Valley to Poncha 230 kV transmission line (the most severe voltage stability contingency of concern). This is well in excess of the 155 MW of load the Companies were previously forecasting for the San Luis Valley area for 2015. The Companies are currently not expecting San Luis Valley area loads of 155 MW until beyond the 2015 horizon (Exhibit TWG-1 at footnote 3 at page 7). Furthermore, rapid growth of the load in the San Luis Valley area appears very unlikely as page 3-1 of the 2008 AE/MCS indicates the energy needs in the area have remained steady since 1994 and the types of load and the relative energy needs by type are much the same today.

TABLE 3

Results of BAI PV Analysis with Existing San Luis Valley-Poncha 230 kV Transmission Line Out of Service and No Generation Added at San Luis Valley or Calumet

Alternative	Included San Luis Valley 230 kV Upgrades	San Luis Valley Load at Estimated Point of Voltage Collapse (MW)	Maximum Voltage Stable San Luis Valley Area Load[1] (MW)	Estimated Cost of San Luis Valley Upgrades
1	New Double-Circuit 230 kV San Luis Valley-Calumet Line (proposed by Companies)	240	225	$90 M
TR1	New Single-Circuit 230 kV San Luis Valley-Poncha Line	195	185	$39 M
TR2	New Single-Circuit 230 kV San Luis Valley-Sargent-Poncha Line plus Sargent 230/115 kV Transformer	210	195	$48 M
TR3	New Single-Circuit 230 kV San Luis Valley-West Canon Line	190	180	$66 M

[1]Applying Tri-State 5% voltage stability margin criteria and rounding down to the nearest 5 MW.

I have also performed a PV Curve analysis with no transmission line additions to the San Luis Valley area and found that if at least 150 MW of new thermal solar generation with storage, or other generation with a similar level of dispatchability and capacity factor, is added at San Luis Valley, the number of hours that the existing undervoltage load shedding system is relied upon would be dramatically reduced. Provided such generation is added, there would be no reliability need for new transmission line additions in the San Luis Valley area (Exhibit JRD-1 at VIII.A.).

Q CAN YOU PLEASE SUMMARIZE YOUR TESTIMONY ON THE ALTERNATIVES TO THE SAN LUIS VALLEY TO CALUMET PORTION OF THE PROPOSED PROJECT THAT ADEQUATELY ADDRESS THE SAN LUIS VALLEY VOLTAGE COLLAPSE ISSUE?

A Yes.

- My alternatives TR1, TR2 and TR3 all (i) have an estimated cost that is tens of millions of dollars less than the San Luis Valley to Calumet portion of the Proposed Project and (ii) adequately address the San Luis Valley voltage collapse issue for the foreseeable future.

- If at least 150 MW of new thermal solar generation, or other synchronous generation with a similar level of dispatchability and capacity factor, is added at San Luis Valley, it will dramatically reduce the exposure to undervoltage load shedding, which will eliminate a reliability need for new transmission facilities in the San Luis Valley area.

IV. Alternatives to the San Luis Valley to Calumet Portion of the Proposed Project that Adequately Support New Renewable Resources in the San Luis Valley and Calumet Areas

Q WHAT STUDIES HAVE THE COMPANIES RELIED UPON FOR THEIR SELECTION OF THE SAN LUIS VALLEY TO CALUMET DOUBLE-CIRCUIT 230 KV LINE AS THE BEST REMEDY TO MEET THE NEED TO SUPPORT NEW RENEWABLE RESOURCES IN THE SAN LUIS VALLEY AND CALUMET AREAS?

A They have relied upon the May 2009 San Luis Valley – Calumet – Comanche Transmission Project Transmission Study Report (Exhibit TWG-1). I will refer to this as the TWG-1 Study.

A. TWG-1 Study

Q CAN YOU PLEASE DESCRIBE THE TWG-1 STUDY?

A Yes. The TWG-1 Study examined accommodating up to 1,500 MW of additional generation resources in the San Luis Valley and Calumet areas on a combined basis.

This involved the Companies performing power flow analysis of various transmission alternatives that were built upon a default scenario that assumes certain planned, but not certified, transmission projects of Tri-State (such as a new single-circuit 230 kV transmission line between San Luis Valley and Walsenburg substations) would be built if none of the alternatives evaluated in the TWG-1 Study were pursued. This assumed default scenario was used by the Companies as the Benchmark case for the TWG-1 Study.

The TWG-1 Study recommends pursuit of its Alternative 1, which includes a double-circuit 230 kV transmission line from San Luis Valley substation to Calumet substation. The TWG-1 Study estimated that if loading 230/115 kV autotransformers at San Luis Valley and Walsenburg substations up to approximately 115% of rating is enforced as a limit, either up to 750 MW of new generation could be accommodated at San Luis Valley or up to 1,400 MW of new generation could be accommodated at Calumet. Alternatively, between 750 and 1,400 MW of additional generation could be accommodated on a combined basis between the two locations depending on how that generation is allocated between the two locations. The Companies estimate their Proposed Project would have a total cost of $180 million (excluding AFUDC) of which approximately $90 million is associated with the San Luis Valley to Calumet portion of Proposed Project (Exhibit TWG-1 at 1-2 and Tri-State Response to Trinchera Ranch Discovery at TSGT00977).

Q DO YOU AGREE WITH THE APPROACH AND CONCLUSION OF THE TWG-1 STUDY?

A No. I disagree with the default (or “benchmark”) scenario assumption that a new single-circuit 230 kV transmission line between San Luis Valley substation and Walsenburg substation will be constructed absent the Proposed Project, and the

failure of the Companies to consider alternatives that do not include a transmission line between San Luis Valley substation and the Calumet/Walsenburg area. Also, I do not believe there is a demonstrated need for transmission capability to support 1,500 MW of new generation on a combined basis in the San Luis Valley and Calumet areas. Other lower cost alternatives, not examined by the Companies, can still provide transmission capability to support new generation at more realistic levels.

Q CAN YOU PLEASE EXPLAIN WHY YOU DISAGREE WITH THE COMPANIES' DEFAULT SCENARIO ASSUMPTION THAT A NEW SINGLE-CIRCUIT 230 KV TRANSMISSION LINE WOULD BE BUILT BETWEEN SAN LUIS VALLEY AND WALSENBURG SUBSTATIONS IF NONE OF THEIR ALTERNATIVES WERE PURSUED?

A Yes. A key question in this proceeding is whether Tri-State has demonstrated a reliability need for a new 230 kV transmission line from San Luis Valley to the Calumet/Walsenburg area. While Tri-State had a plan to build such a transmission line and the 2008 AE/MCS had been submitted to the RUS for the line, Tri-State has not been granted a CPCN for such a line by the Commission. Furthermore, as I have discussed, the 2004 PV Study from which the 2008 AE/MCS was based is flawed due to its (i) reliance on a straight-line path assumption for the mileage of each alternative examined and (ii) focus on ranking projects on cost per MW basis rather than focusing on ranking adequate projects on a total cost basis.

If Tri-State, in its 2004 PV Study, had used more realistic mileage assumptions and ranked lines on a total cost basis, it would have ranked a new 230 kV line from San Luis Valley substation to either Poncha or Monarch over a new 230 kV line from San Luis Valley substation to Walsenburg. As a result, the starting point for the TWG-1 Study was the incorrect assumption and flawed conclusion that any

alternative examined by the Companies must include a new 230 kV transmission line from San Luis Valley to the Calumet/Walsenburg area to address voltage collapse in the San Luis Valley area. As I have discussed, there are other significantly less expensive alternatives that adequately address the voltage collapse issue. For example, sufficient support can be provided by a new transmission line run from San Luis Valley to a substation located on the existing west to east 230 kV transmission line that runs from Curecanti substation to Midway substation, such as at Poncha, Monarch or West Canon. Furthermore, no new transmission lines would be needed to address the voltage collapse issue if at least 150 MW of new thermal solar generation with storage, or other synchronous generation with a similar level of dispatchability and capacity factor, is added in the San Luis Valley area. The Companies did not adequately consider the ability of new solar generation to address the voltage collapse issue in the San Luis Valley area.

Q CAN YOU PLEASE EXPLAIN WHY THERE IS NOT A NEED FOR TRANSMISSION CAPABILITY TO SUPPORT 1,500 MW OF NEW GENERATION ON A COMBINED BASIS IN THE SAN VALLEY AND CALUMET AREAS?

A As I discussed earlier, while there are a large number of projects in the transmission interconnection study queue for Public Service, very few of these projects have firm commitments associated with them. Furthermore, Public Service's Preliminary Preferred Portfolio from its 2009 All-Source Solicitation process has only publicly identified a maximum of 560 MW (310 MW from San Luis Valley and 250 MW from Calumet) of new generation that Public Service may commit to from the study area. The Companies have not demonstrated the need for nearly three times as much transmission capability. Nor have the Companies shown that its Proposed Project, with the double-circuit 230 kV transmission line from San Luis Valley to Calumet, is

the least cost alternative of those alternatives that can provide adequate new transmission capability.

B. Transmission Capability of Proposed Project Without Any Transmission Line Additions in the San Luis Valley Area

Q EARLIER, YOU INDICATED THAT IF AT LEAST 150 MW OF NEW SOLAR THERMAL GENERATION WITH STORAGE, OR OTHER SYNCHRONOUS GENERATION WITH A SIMILAR LEVEL OF DISPATCHABILITY AND CAPACITY FACTOR, WERE ADDED TO THE SAN LUIS VALLEY AREA, IT WOULD ELIMINATE THE RELIABILITY NEED FOR A NEW TRANSMISSION LINE IN THE SAN LUIS VALLEY AREA. HAVE YOU ANALYZED THE CAPABILITY OF THE EXISTING SAN LUIS VALLEY AREA TO SUPPORT GENERATION ADDITIONS?

A Yes. In the BAI Study, I found that up to 250 MW of generation additions can be supported in the San Luis Valley area by the existing San Luis Valley transmission system with only the minor 115 kV uprating of the San Luis Valley-Sargent-Poncha 115 kV transmission line, which is required by all of the alternatives studied by the Companies and BAI. This is discussed in further detail in Section VIII.B. of Exhibit JRD-1. I refer to this alternative as Alternative TR4.

Q PUBLIC SERVICE WITNESS TAYLOR INDICATES AT PAGES 5-6 OF HIS DIRECT TESTIMONY THAT THE EXISTING SAN LUIS VALLEY TRANSMISSION SYSTEM CAN ONLY ACCOMMODATE APPROXIMATELY 125 MW OF GENERATION ADDITIONS. HAVE YOU RECONCILED THIS CLAIM WITH YOUR 250 MW RESULT?

A Yes. As I detailed in Section VIII.D. of Exhibit JRD-1, Public Service's analysis that underlies Mr. Taylor's statement (the "130 MW Analysis") was not performed in a

manner consistent with the TWG-1 Study. Specifically, in the 130 MW Analysis, Public Service modeled the generation additions without any reactive power capability and set San Luis Valley area loads to 55% of the level they are at in the TWG-1 Study. I found that if the modeling of the generation additions was changed to make that modeling reasonable by allowing the generation additions to have a modest amount of real time power capability and the San Luis Valley area loads are raised to the same level as in the TWG-1 Study, 250 MW of generation can be accommodated by the existing San Luis Valley transmission system.

Q HAVE YOU ANALYZED WHETHER THE CAPABILITY OF THE EXISTING SAN LUIS VALLEY TRANSMISSION SYSTEM CAN BE EXPANDED BEYOND 250 MW WITHOUT THE COMPANIES' PROPOSED DOUBLE-CIRCUIT 230 KV SAN LUIS VALLEY-CALUMET LINE OR ANY OTHER SAN LUIS VALLEY TRANSMISSION LINE ADDITIONS?

A Yes. I found that if a new Poncha 230/115 kV transformer and a new generation RAS are added, up to 525 MW of generation could be accommodated in the San Luis Valley area at an estimated cost of less than $15 million -- less than one-sixth the cost of the Companies' $90 million proposed double-circuit 230 kV San Luis Valley-Calumet transmission line. The generation RAS would automatically trip, or runback, the output of the generation additions in the San Luis Valley area in the event of the loss of the existing San Luis Valley-Poncha 230 kV transmission line such that the Sargent-Poncha 115 kV transmission line is not overloaded. This is further detailed in Section VIII.C. of Exhibit JRD-1. In this testimony and Exhibit JRD-1, I refer to this alternative as Alternative TR4AR.

Q IS THE USE OF A GENERATION RAS PERMITTED UNDER WECC AND NERC PLANNING CRITERIA?

A Yes. There are WECC and NERC minimum requirements for RAS, but the use of an RAS is an acceptable approach for meeting planning criteria requirements.

Q WOULD THIS RAS INVOLVE THE INTERRUPTION OF ANY CUSTOMER LOAD?

A No, it would not. It would only trip, or run back, generation in the San Luis Valley in the event of the loss of the existing San Luis Valley-Poncha 230 kV transmission line. It would not trip any customer load.

Q HAVE YOU ANALYZED THE TRANSMISSION CAPABILITY PROVIDED AT CALUMET ON BOTH A NON-SIMULTANEOUS AND SIMULTANEOUS BASIS UNDER YOUR ALTERNATIVE TR4AR?

A Yes. Alternative TR4AR, as with all of the alternatives I have examined, includes the Calumet-Comanche and Calumet-Walsenburg portions of the Companies' Proposed Project. On a non-simultaneous basis, 1,000 MW of generation additions can be accommodated at Calumet. On a simultaneous basis, between 525 and 1,325 MW combined could be accommodated at San Luis Valley and Calumet depending on how the generation additions are distributed between those two locations. This is also further detailed in Section VIII.C. of Exhibit JRD-1.

C. Transmission Line Alternatives to the San Luis Valley to Calumet Portion of the Proposed Project that Provide Adequate Transmission Capability to Support New Generation in San Luis Valley and Calumet Areas

Q HAVE YOU ANALYZED THE TRANSMISSION CAPABILITY FOR GENERATION ADDITIONS AT SAN LUIS VALLEY AND CALUMET THAT WOULD BE PROVIDED BY THE THREE TRINCHERA RANCH TRANSMISSION LINE ALTERNATIVES?

A Yes. I analyzed each of the three alternatives as part of the BAI Study. Table 4 below shows that each of the three alternatives would be able to accommodate at least 525 MW of generation additions at San Luis Valley, 1,000 MW of generation additions at Calumet or at least between 525 MW and 1,275 MW of generation additions on a combined basis depending on how the generation additions are distributed between San Luis Valley and Calumet. Furthermore, all three of the alternatives have a significantly lower estimated cost than the Companies' proposed San Luis Valley-Calumet transmission line. Alternatives TR1 and TR2, in particular, have an estimated cost that is approximately $40 to $50 million less than the Companies' Alternative 1. More details on these results can be found in Section VI. of Exhibit JRD-1.

TABLE 4

Trinchera Ranch Transmission Line Alternatives versus
Companies' Proposed San Luis Valley-Calumet Transmission Line

Alternative	San Luis Valley Upgrades	Maximum San Luis Valley Generation[9] (MW)	Maximum Calumet Generation (MW)	Simultaneous Generation (MW)	Cost of San Luis Valley Upgrades
1	New Double-Circuit 230 kV San Luis Valley-Calumet Line (proposed by Companies)	750	1,400	750-1,400	$90 M
TR1	New Single-Circuit 230 kV San Luis Valley-Poncha Line	525	1,000	525-1,300	$39 M
TR2	New Single-Circuit 230 kV San Luis Valley-Sargent-Poncha Line plus Sargent 230/115 kV Transformer	575	1,000	800-1,300	$48 M
TR3	New Single-Circuit 230 kV San Luis Valley-West Canon Line	525	1,000	900-1,275	$66 M

Q PUBLIC SERVICE IN ITS APRIL 30, 2009 RULE 3206 REPORT TO THE COMMISSION INCLUDED A REFERENCE TO THE ADDITION OF A 280 MVA, 230/115 KV TRANSFORMER AT PONCHA WITH AN IN-SERVICE DATE OF MAY 31, 2013. CAN YOU PLEASE TELL US WHAT YOU KNOW ABOUT THIS PROJECT?

A Yes. This project involves adding a new 230/115 kV transformer at Poncha 115 kV substation and a one-mile length of single-circuit 230 kV transmission from the transformer to Poncha 230 kV substation. The project would establish a contract path between Public Service facilities at Poncha 115 kV substation and Public Service facilities at Poncha 230 kV substation. The project has a total estimated cost of $8.4 million (Public Service's Response to Data Request CPUC 5-1 attached at Exhibit JRD-11 and Attachment TR5-4.A3 of Public Service's Response to Data Request Trinchera Ranch 5-4 attached as Exhibit JRD-12.)

[9] If the current ratings of the Black Hills' West Canon to Portland 115 kV transmission path cannot be raised at a relatively low cost, the amount of San Luis Valley generation accommodated by Alternatives TR1, TR2 and TR3 would respectively change to 500 MW, 500 MW and 475 MW.

Q HAVE YOU ANALYZED WHAT IMPACT THE PROPOSED PONCHA 250/115 KV TRANSFORMER PROJECT WOULD HAVE ON THE TRANSMISSION CAPABILITY PROVIDED BY THE TRINCHERA RANCH TRANSMISSION LINE ALTERNATIVES?

A Yes. As part of the BAI Study, I examined Alternatives TR1, TR2 and TR3 with the Poncha 230/115 kV transformer project included as part of those alternatives. In this testimony and Exhibit JRD-1, I refer to these variants as Alternatives TR1A, TR2A and TR3A. The results of my analysis are summarized below in Table 5. I found that for Alternatives TR1A and TR3A, the addition of the Poncha 230/115 kV transformer project increased the San Luis Valley non-simultaneous limit by 25 to 50 MW and had no significant impact on the Calumet non-simultaneous limit. For Alternative TR2A, the Poncha 230/115 kV transformer addition had no significant impact on either San Luis Valley or Calumet non-simultaneous limits. Finally, for Alternative TR1A, the Poncha 230/115 kV transformer addition raised the lower end of the simultaneous limit by 600 MW. Further detail on this analysis is presented in Section VII. of Exhibit JRD-1.

TABLE 5

Trinchera Ranch Transmission Line Alternatives
Poncha 230/115 kV Transformer Project

Alternative	Description	Maximum San Luis Valley Generation[10] (MW)	Maximum Calumet Generation (MW)	Simultaneous Generation (MW)
TR1A	TR1 with New Poncha 230/115 kV Transformer	575	1,000	1,125-1,325
TR2A	TR2 with New Poncha 230/115 kV Transformer	575	1,000	875-1,325
TR3A	TR3 with New Poncha 230/115 kV Transformer	550	1,000	900-1,300

IX. Conclusion

Q CAN YOU PLEASE SUMMARIZE YOUR TESTIMONY?

A Yes. In a nutshell:

- The Companies have not shown the need for the San Luis Valley-Calumet portion of their Proposed Project.

- The San Luis Valley voltage collapse-related reliability issue would be reasonably resolved with no transmission line additions in the San Luis Valley if at least 150 MW of thermal solar generation with storage, or other synchronous generation with a similar level of dispatchability and capacity factor, is added in the San Luis Valley area.

- Without any transmission line additions in the San Luis Valley, up to 250 MW of generation can be accommodated in the San Luis Valley area. This amount can be expanded to 525 MW through the addition of a 230/115 kV transformer at Poncha and a San Luis Valley-Poncha 230 kV generation Remedial Action Scheme ("RAS"). This solution would cost less than one-sixth ($15 million) of the Companies' proposed $90 million San Luis Valley-Calumet transmission line.

- Alternatively, the San Luis Valley voltage collapse-related issue would be resolved with the addition of a new 230 kV transmission line from San Luis Valley to the north for a cost of approximately $40 to $50 million less than the cost of the Companies' proposed $90 million San Luis Valley-Calumet transmission line.

[10] If the current ratings of the Black Hills' West Canon to Portland 115 kV transmission path cannot be raised at a relatively low cost, the amount of San Luis Valley generation accommodated by Alternatives TR1A, TR2A and TR3A would respectively change to 525 MW, 525 MW and 475 MW.

- If a new 230 kV transmission line addition from San Luis Valley to the north is pursued, between 525 and 575 MW of generation can be accommodated in the San Luis Valley area.[11]

- All of the Trinchera Ranch alternatives support up to 1,000 MW of generation additions at Calumet on a non-simultaneous basis and allow removal of the existing Comanche-Walsenburg 230 kV RAS.

- All of the Trinchera Ranch alternatives can accommodate at least 525 MW to 1,275 MW of generation on a combined basis in the San Luis Valley and Calumet/Walsenburg areas depending on how that generation is distributed between the two areas.

- The Companies have publicly identified proposed commitments to new generation of up to 310 MW for the San Luis Valley area and 250 MW for the Calumet/Walsenburg area. All of the Trinchera Ranch alternatives can readily accommodate this level of generation additions and have remaining capacity left that could support other future generation additions in the San Luis Valley and Calumet/Walsenburg areas.

Q DOES THIS CONCLUDE YOUR TESTIMONY?

A Yes, it does.

[11] If the current ratings of the Black Hills' West Canon to Portland 115 kV path cannot be raised at a relatively low cost, these 230 kV line alternatives would instead accommodate between 475 and 525 MW of new generation in the San Luis Valley area.

Qualifications of James R. Dauphinais

Q PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A James R. Dauphinais. My business address is 16690 Swingley Ridge Road, Suite 140, Chesterfield, MO 63017.

Q PLEASE STATE YOUR OCCUPATION.

A I am a consultant in the field of public utility regulation and a principal with the firm of Brubaker & Associates, Inc. ("BAI"), energy, economic and regulatory consultants.

Q PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A I graduated from Hartford State Technical College in 1983 with an Associate's Degree in Electrical Engineering Technology. Subsequent to graduation I was employed by the Transmission Planning Department of the Northeast Utilities Service Company as an Engineering Technician.

While employed as an Engineering Technician, I completed undergraduate studies at the University of Hartford. I graduated in 1990 with a Bachelor's Degree in Electrical Engineering. Subsequent to graduation, I was promoted to the position of Associate Engineer. Between 1993 and 1994, I completed graduate level courses in the study of power system transients and power system protection through the Engineering Outreach Program of the University of Idaho. By 1996 I had been promoted to the position of Senior Engineer.

In the employment of the Northeast Utilities Service Company, I was responsible for conducting thermal, voltage and stability analyses of the Northeast Utilities' transmission system to support planning and operating decisions. This

involved the use of load flow and power system stability computer simulations. Among the most notable achievements I had in this area include the solution of a transient stability problem near Millstone Nuclear Power Station, and the solution of a small signal (or dynamic) stability problem near Seabrook Nuclear Power Station. In 1993 I was awarded the Chairman's Award, Northeast Utilities' highest employee award, for my work involving stability analysis in the vicinity of Millstone Nuclear Power Station.

From 1990 to 1997 I represented Northeast Utilities on the New England Power Pool Stability Task Force. I also represented Northeast Utilities on several other technical working groups within the New England Power Pool ("NEPOOL") and the Northeast Power Coordinating Council ("NPCC"), including the 1992-1996 New York-New England Transmission Working Group, the Southeastern Massachusetts/Rhode Island Transmission Working Group, the NPCC CPSS-2 Working Group on Extreme Disturbances and the NPCC SS-38 Working Group on Interarea Dynamic Analysis. This latter working group also included participation from a number of ECAR, PJM and VACAR utilities.

In addition to my technical responsibilities, I was also responsible for oversight of the day-to-day administration of Northeast Utilities' Open Access Transmission Tariff. This included the creation of Northeast Utilities' pre-FERC Order No. 889 transmission electronic bulletin board and the coordination of Northeast Utilities' transmission tariff filings prior to and after the issuance of Federal Energy Regulatory Commission ("FERC" or "Commission") FERC Order No. 888. I was also responsible for spearheading the implementation of Northeast Utilities' Open Access Same-Time Information System and Northeast Utilities' Standard of Conduct under FERC Order No. 889. During this time I represented Northeast Utilities on the Federal Energy

Regulatory Commission's "What" Working Group on Real-Time Information Networks. Later I served as Vice Chairman of the NEPOOL OASIS Working Group and Co-Chair of the Joint Transmission Services Information Network Functional Process Committee. I also served for a brief time on the Electric Power Research Institute facilitated "How" Working Group on OASIS and the North American Electric Reliability Council facilitated Commercial Practices Working Group.

In 1997 I joined the firm of Brubaker & Associates, Inc. The firm includes consultants with backgrounds in accounting, engineering, economics, mathematics, computer science and business. Since my employment with the firm, I have presented testimony before the Federal Energy Regulatory Commission in Consumers Energy Company, Docket No. OA96-77-000, Midwest Independent Transmission System Operator, Inc., Docket No. ER98-1438-000, Montana Power Company, Docket No. ER98-2382-000, Inquiry Concerning the Commission's Policy on Independent System Operators, Docket No. PL98-5-003, SkyGen Energy LLC v. Southern Company Services, Inc., Docket No. EL00-77-000, Alliance Companies, et al., Docket No. EL02-65-000, et al., Entergy Services, Inc., Docket No. ER01-2201-000, and Remedying Undue Discrimination through Open Access Transmission Service and Standard Electricity Market Design, Docket No. RM01-12-000. I have also presented testimony before the Connecticut Department of Public Utility Control, Illinois Commerce Commission, the Indiana Utility Regulatory Commission, the Iowa Utilities Board, the Kentucky Public Service Commission, the Michigan Public Service Commission, the Missouri Public Service Commission, the Public Utility Commission of Texas, the Wisconsin Public Service Commission and various committees of the Missouri State Legislature. I have also participated on behalf of clients in the Southwest Power Pool Congestion Management System

Working Group, the Alliance Market Development Advisory Group and several working groups of the Midwest Independent Transmission System Operator, Inc. ("MISO"), including the Congestion Management Working Group. I am currently an alternate member of the MISO Advisory Committee in the end-use customer sector on behalf of a group of industrial end-use customers in Illinois. I am also the past Chairman of the Issues/Solutions Subgroup of the MISO Revenue Sufficiency Guarantee ("RSG") Task Force. In 2009, I completed the University of Wisconsin-Madison High Voltage Direct Current ("HVDC") Transmission course for Planners that was sponsored by MISO. I am a member of the Power Engineering Society of the Institute of Electrical and Electronics Engineers ("IEEE").

In addition to our main office in St. Louis, the firm also has branch offices in Phoenix, Arizona and Corpus Christi, Texas.

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