



IN THE MATTER OF THE
APPLICATION OF PUBLIC SERVICE
COMPANY OF COLORADO FOR A
CERTIFICATE OF PUBLIC
CONVENIENCE AND NECESSITY
FOR THE PAWNEE – SMOKY HILL
345KV TRANSMISSION PROJECT

DIRECT TESTIMONY
AND EXHIBITS
OF
GERRY M. STELLERN

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

**IN THE MATTER OF THE APPLICATION OF)
PUBLIC SERVICE COMPANY OF)
COLORADO FOR A CERTIFICATE OF)
PUBLIC CONVENIENCE AND NECESSITY) DOCKET NO.
FOR THE PAWNEE – SMOKY HILL 345KV)
TRANSMISSION PROJECT)**

DIRECT TESTIMONY AND EXHIBITS OF GERRY M. STELLERN

I. INTRODUCTION AND QUALIFICATIONS

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Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Gerry M. Stellern. My business address is 550 15th Street,
Denver, Colorado 80202.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Public Service Company of Colorado (“Public Service” or
“Company”). My title is Manager of Transmission Reliability & Assessment.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS DOCKET?

A. I am testifying on behalf of Public Service.

**Q. HAVE YOU PREPARED A STATEMENT OF YOUR EXPERIENCE AND
QUALIFICATIONS?**

A. Yes. That statement is included as Attachment A to my testimony.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to address why the Pawnee - Smoky Hill
345kV Transmission Project (“Pawnee – Smoky Hill Project”, or “Project”) is
recommended as a first step towards implementing transmission to

1 accommodate potential resources in Energy Zone 1 as required by Senate Bill 100
2 (“SB 07-100”) codified in relevant part at § 40-2-126 which encourages
3 utilities to invest in transmission facilities to serve expected electric generation
4 resources. I also explain the Project criteria and objectives, and the
5 evaluation of system alternatives concerning the Project.

6 **II. PURPOSE OF PROJECT**

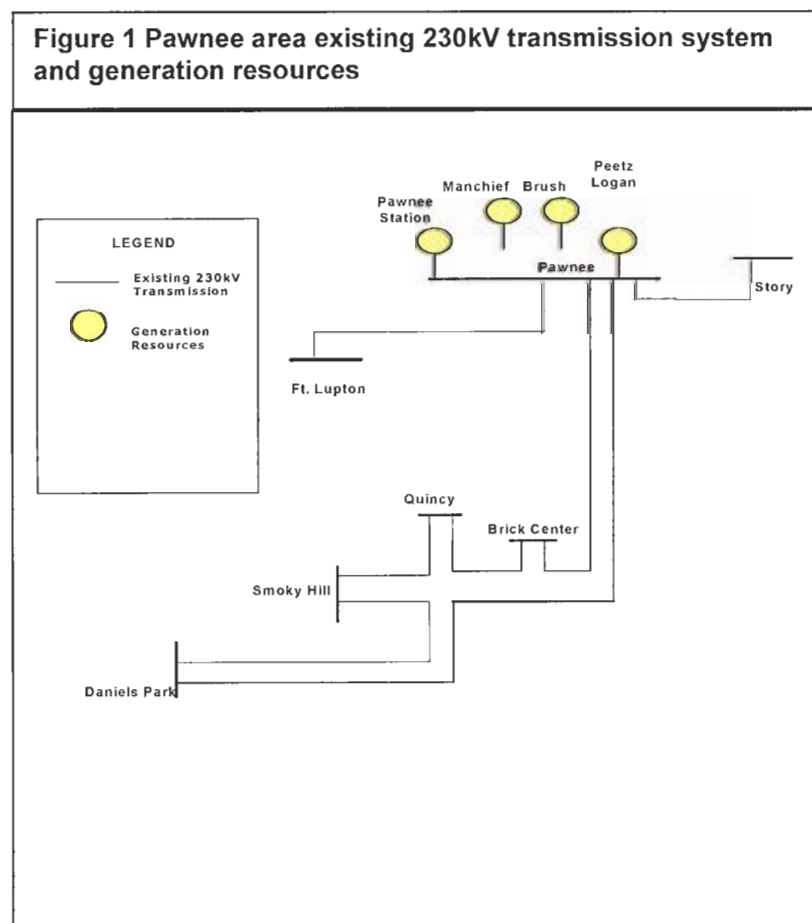
7 **Q. WHY ARE YOU PROPOSING THE PAWNEE - SMOKY HILL 345KV**
8 **TRANSMISSION PROJECT?**

9 A. The Project is recommended pursuant to SB 07-100, which is described in
10 the testimony of Mr. Jaeger. This project is the first step towards the
11 development of transmission to accommodate potential resources located in
12 Energy Resource Zone (“Zone”) 1, as described in Mr. Taylor’s testimony. As
13 I’ll explain later, Zone 1 does not have adequate transmission to deliver future
14 generation resources to Colorado customer loads. Transmission planning
15 studies have verified that Zone 1 is indeed constrained in terms of
16 transmission availability. This Project will alleviate the constraints and allow
17 additional resources to be injected at the Pawnee Substation for delivery to
18 loads in the Denver metro area. This Project is expected to be energized
19 beginning in 2013.

20 **Q. WHY IS THE TRANSMISSION FROM ZONE 1 CONSTRAINED?**

21 A. There are currently several generation resources that supply energy directly
22 or indirectly to Pawnee Substation. These include the coal powered Pawnee

1 Station, the Manchief gas-fired generation, gas facilities near Brush, and the
2 Peetz Logan wind farm. By the end of 2007, these combined facilities will
3 have a maximum output of approximately 1400 MW. The Laramie River
4 Power Station in Wyoming also delivers power to Pawnee Substation through
5 the Story Substation. However, there are only three existing 230kV lines that
6 can deliver generation resources from the Pawnee Substation to loads in and
7 around the Denver-metro area. Figure 1 shows the existing transmission
8 system and generation resources in the Pawnee area.



1 Planning studies and real-time operational experience have verified
2 that when the regional transmission system is heavily utilized, those three
3 230kV lines cannot reliably accommodate all the existing generation
4 resources simultaneously. The studies that document the transmission
5 constraints are included in a study report that is provided as Exhibit No. GMS-
6 1. The Benchmarking analyses show that loss of one of the 230kV lines
7 south of Pawnee has the potential to load one of the other 230kV lines to
8 unacceptable levels. When studies indicate that the loss of a single element
9 such as a transmission line causes unacceptable loading on another element,
10 we need to develop transmission system upgrades to ensure reliability.

11 **Q. PLEASE DESCRIBE THE COMPANY'S PLANS FOR TRANSMISSION**
12 **DEVELOPMENT IN ZONE 1 TO ALLEVIATE THE CONSTRAINTS OUT OF**
13 **THE PAWNEE SUBSTATION.**

14 A. Our transmission plan consists of a phased approach. The first phase
15 consists of transmission upgrades that can be implemented at low cost, in a
16 short (two-year) time frame, without the necessity of filing a CPCN
17 application. These "short-term" upgrades will increase the resource-carrying
18 capabilities of the existing Pawnee to Smoky Hill and Pawnee to Daniels Park
19 230kV lines. The lines will both be uprated to have a normal rated value of
20 approximately 735 MVA. These upgrades are accomplished by raising
21 structures and replacing terminal equipment and can be completed by the
22 end of 2008 at a cost of approximately \$3.5 million. These upgrades will
23 allow the existing Pawnee area generation to operate at its simultaneous

1 maximum output level of approximately 1400 MW. No additional generation
2 resources can be accommodated on a continuous basis without either re-
3 dispatching existing Pawnee area generation or pursuing the next phase of
4 the transmission plan, which is the subject of this CPCN.

5 **Q. WHAT IS THE NEXT PHASE OF DEVELOPMENT?**

6 A. The next phase of transmission development is the proposed Pawnee –
7 Smoky Hill 345kV Transmission Project, which is the subject of this CPCN.

8 **Q. WHY IS THIS PROJECT BEING PROPOSED NOW?**

9 A. Transmission Reliability and Assessment has received numerous generator
10 interconnection requests in the area around Pawnee. Many of these requests
11 are for resources that can be built in a short period of time (within 2-3 years).
12 However, major transmission projects, such as the one being proposed, can
13 take up to 5-6 years to implement. Therefore, it is prudent to recommend
14 proceeding with the Pawnee – Smoky Hill 345kV Project now, to enable the
15 accommodation of future potential resources. The project aligns well with the
16 requirements set forth in SB 07-100, and would allow for the development of
17 approximately 500 MW of new generation resources, including renewable
18 resources, in Zone 1 on or after 2013 that will enable Public Service and
19 Colorado regional utilities to meet the Renewable Energy Standards set forth
20 in § 40-2-124, C.R.S.

21 Additionally, since the enactment SB 07-100 in March 2007, the
22 Company has conducted three general meetings and two transmission
23 workshops to solicit input from a variety of stakeholders interested in the

1 implementation of SB 07-100. During the workshop process, the Project
2 received support from stakeholders interested in the development of
3 generation resources including renewable resources in Zone 1.

4 **Q. DO YOU HAVE A PLAN FOR ADDITIONAL PHASES OF TRANSMISSION**
5 **FOR ZONE 1?**

6 A. Yes. The proposed Project is an essential component in the overall
7 development of transmission in Zone 1. By increasing transmission capacity
8 from Pawnee Substation to the metro Denver load center, the Project will
9 allow for future resource development of approximately 500 MW in Zone 1.
10 The Project also provides the potential for future development of transmission
11 into Pawnee Substation from other potential resources in Zone 1, but outside
12 the immediate vicinity of Pawnee. Once the transmission system from
13 Pawnee – Denver is improved, transmission could be built from generation
14 resources located throughout the broad geographic area that makes up Zone
15 1 into Pawnee. Public Service expects to develop a 345kV transmission
16 backbone system that would run from the Pawnee Substation to the
17 Comanche Substation, near Pueblo that would strengthen the reliability of the
18 entire Front Range transmission system. This Project would constitute a
19 critical portion of the Company’s overall 345kV transmission network. The
20 final link in this front range backbone would be to build a 345kV transmission
21 circuit between Smoky Hill and Daniels Park Substations. This Project would
22 also be a good fit with other regional projects that are currently being

1 considered, such as the Colorado – Wyoming Tie, and the High Plains
2 Express.

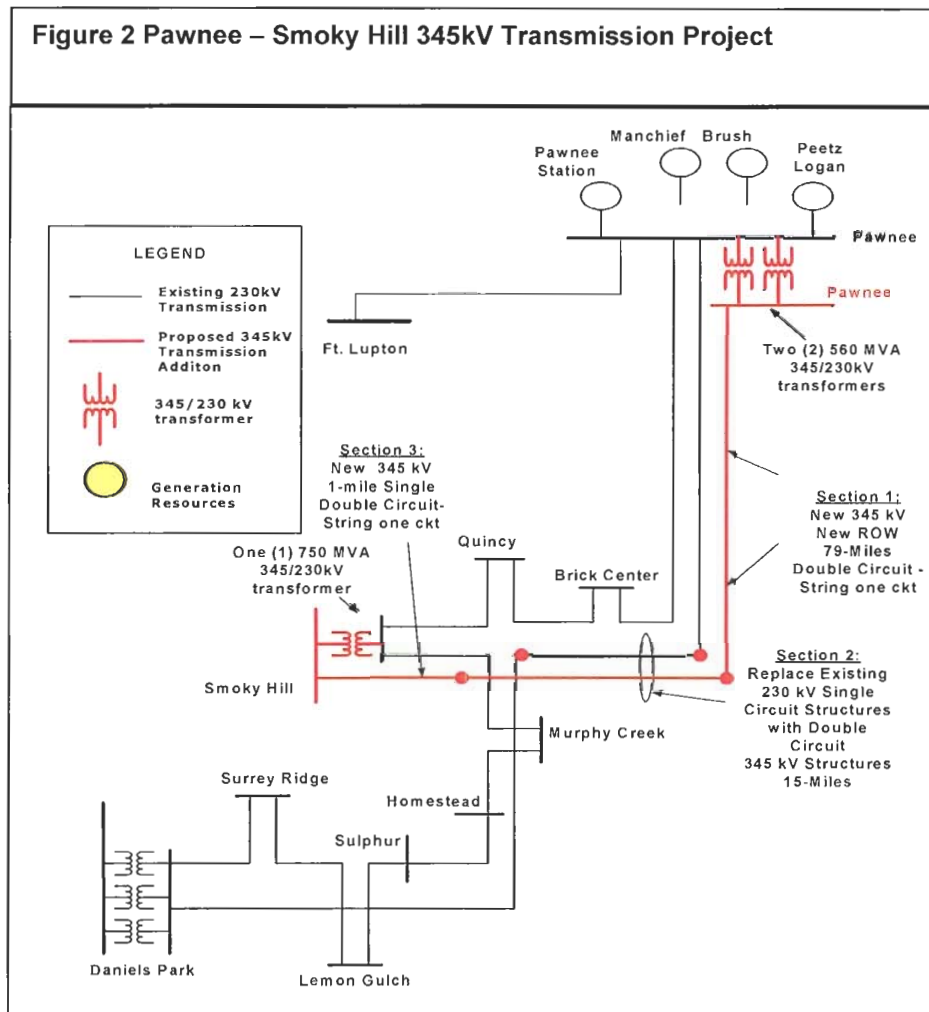
3 III. PROJECT DESCRIPTION

4 Q. HOW WILL THE PAWNEE – SMOKY HILL 345KV PROJECT BE 5 DEVELOPED?

6 A. The Project consists of three sections. Section 1 consists of approximately
7 79 miles of new transmission south from Pawnee Substation. This section
8 will require the acquisition of new right-of-way (“ROW”). Section 2 is
9 approximately 15 miles long and will utilize an existing Public Service
10 transmission corridor. For this section, an existing 15 miles of existing single
11 circuit H-frame construction 230kV line will be replaced with double-circuit
12 steel 345kV capable transmission. One circuit will be used to complete the
13 Pawnee – Smoky Hill 345 kV circuit. The other circuit will be used to maintain
14 the existing 230kV transmission circuit (that runs from Pawnee to Smoky Hill).
15 Section 3 consists of one-mile of 345kV new transmission that will be built for
16 the last mile into the Smoky Hill Substation. As with Section 1, the
17 transmission in Section 3 will be built 345kV double-circuit capable. Although
18 the third section requires new construction, Public Service has adequate
19 ROW adjacent to existing 230kV lines that will be used.

20 This project would also require new 345kV switchyards at Pawnee and
21 at Smoky Hill. Two 3-phase 560 MVA 345/230kV autotransformers are
22 recommended at Pawnee Substation. See Exhibit No. GMS-2. At Smoky Hill
23 we are recommending three, single-phase units to allow 750 MVA of

1 345/230kV autotransformation. See Exhibit No. GMS-3. Figure 2 shows the
2 proposed Project.



3 **Q. WHAT IS THE ESTIMATED COST OF THE PAWNEE – SMOKY HILL**
4 **PROJECT?**

5 **A.** The Pawnee – Smoky Hill Project is estimated to cost \$120 million. This
6 estimate is in 2007 dollars and is based on cost per mile indicators of past
7 projects, average unit costs, and 2007 overhead and labor rates. At this
8 stage of the project, these are high level within a range of +/-30% of this

1 estimated cost. The following is a breakdown of the estimated Pawnee –
2 Smoky Hill Project costs: Pawnee – Smoky Hill Project costs (in millions):

3	Siting and Land Rights / Permitting:	\$8.7
4		
5	Substation Costs:	
6	Smoky Hill 345kV Substation	\$20.0
7	Pawnee 345kV Substation	\$15.7
8		
9	Transmission Costs:	
10	Smoky Hill-Pawnee 345kV Transmission	\$76.0
11		
12	PROJECT TOTAL	\$120.4

13 **Q. WHAT IS THE SCHEDULE FOR THE PAWNEE – SMOKY HILL**
14 **PROJECT?**

15 A. Our analysis indicates that the project can be in-service by May 2013. Public
16 Service anticipates the following:

- 17 • CPCN approval by May 2008, at which time the Company will begin local
18 permitting activities;
- 19 • Siting Studies, Easement Acquisition and Permitting for the Project will
20 be completed by December 2009;
- 21 • 345kV transmission line construction will be completed by April 2013;
- 22 • 345kV Substations at Pawnee and Smoky Hill will be completed by May
23 2013;
- 24 • Final 345kV transmission line connections and substation commissioning
25 and energization complete by May 31st 2013.

1 **Q. ARE THERE ANY OTHER UPGRADES REQUIRED TO THE PUBLIC**
2 **SERVICE SYSTEM AS PART OF THIS PROJECT?**

3 A. No. However, the following projects are in the process of being implemented
4 to strengthen the regional transmission system. The upgrades include:

5 • The Smoky Hill – Spruce 230 kV double circuit transmission line will be
6 updated from 478 MVA to 800 MVA, scheduled for 2008.

7 • The Smoky Hill – Jordan Rd 230 kV transmission line will be updated
8 from 326 MVA to 525 MVA, scheduled for 2008.

9 • Pawnee – Smoky Hill and Pawnee – Daniels Park will be updated from
10 478 MVA and 326 MVA respectively, to 735 MVA.

11 Exhibit No. GMS-1 describes these plans in more detail.

12 **Q. ARE THERE ANY UPGRADES REQUIRED TO THE FACILITIES OF**
13 **OTHER UTILITIES IN THE REGION TO ACCOMMODATE THIS**
14 **PROJECT?**

15 A. No. The Pawnee - Smoky Hill 345kV Transmission Project was designed to
16 minimize impacts to neighboring utilities, and does not require upgrades to be
17 made to other utilities' systems. However, Western Area Power
18 Administration and Intermountain Rural Electric Association have planned
19 projects in the region that increase the reliability of the proposed Project.
20 Public Service will continue to work with neighboring utilities to monitor and
21 evaluate our transmission plans to ensure that they have no adverse impacts
22 to those entities.

23 **Q. HOW WILL THE PAWNEE – SMOKY HILL PROJECT ENHANCE THE**
24 **RELIABILITY OF THE SYSTEM?**

1 A. As electrical loads continue to grow, and generation resources are added to
2 serve those loads, the capabilities of the existing 230kV and 115kV
3 transmission lines diminish. Adding higher-voltage transmission in parallel to
4 the existing facilities strengthens the overall power delivery system by taking
5 some of the burden off of the lower voltage lines. By increasing the ability to
6 transfer power out of Pawnee Substation, the Project also improves our ability
7 to reliably serve customers, for both normal maintenance and unexpected
8 outages. It also reduces electric system losses, which can result in economic
9 operational efficiencies.

10 **Q. WOULD THIS PROJECT BENEFIT THE TRANSMISSION SYSTEM IN**
11 **WAYS OTHER THAN ALLOWING NEW RESOURCE DEVELOPMENT?**

12 A. Yes. Even without new resource development in Zone 1, the Project provides
13 all the benefits I just mentioned. It will reduce the stresses on the existing
14 lower voltage transmission and will increase flexibility for system maintenance
15 of transmission lines as well as outages due to equipment failure and weather
16 related conditions.

17 **III. PROJECT NEED**

18 **Q. WHY ARE YOU SEEKING APPROVAL FOR A PROJECT THAT ALLOWS**
19 **ONLY 500 MW OF ADDITIONAL RESOURCES TO BE ADDED IN THE**
20 **PAWNEE AREA?**

21 A. As mentioned previously, there are currently Transmission constraints
22 between the Pawnee generation area and the Denver load center. For
23 Transmission Reliability and Assessment, the proposed project is a prudent

1 project that will allow a reasonable increase in the ability to deliver new
2 resources from Pawnee to Denver-metro loads. The proposed Project will be
3 a building block for future phases of transmission upgrades that will enable
4 additional generation resources to be delivered to the Denver-metro area
5 loads when the need or resource development requires it. These future
6 phases of transmission upgrades are discussed in Exhibit No. GMS-1. The
7 500 MW increase in injection capability at Pawnee Substation is a minimum
8 level that was measured under high-transfer levels, with all existing regional
9 generation at maximum levels.

10 IV. SYSTEM ALTERNATIVES/STUDY REPORT

11 **Q. DID PUBLIC SERVICE PERFORM SYSTEM STUDIES TO DETERMINE**
12 **THE APPROPRIATE TRANSMISSION UPGRADES TO MITIGATE**
13 **CONSTRAINTS FROM ZONE 1?**

14 A. Yes. The studies evaluated several alternatives, and the results have been
15 summarized in a Study Report, filed with my testimony as Exhibit No. GMS-1.

16 **Q. WHAT OBJECTIVES WERE USED IN THE SYSTEM STUDIES?**

17 A. The objectives for the studies were similar to those used for other Company
18 studies, the basic objectives were to:

- 19 • reliably accommodate a reasonable level of new potential resources in
20 Zone 1;
- 21 • avoid adversely impacting the electrical systems of Public Service and
22 other utilities;

- 1 • implement higher-voltage (345kV and above) transmission where prudent;
- 2 • make practical use of existing transmission facilities and corridors;

3 In addition, Public Service adheres to Reliability Criteria published by the
4 Western Electricity Coordinating Council (WECC) and the North American
5 Electric Reliability Council (NERC) reliability Standards. The specifics of
6 those criteria are discussed in the Study Report.

7 **Q. DID YOU PERFORM A BENCHMARK ANALYSIS DURING YOUR STUDY**
8 **PROCESS?**

9 A. Yes. A normal practice in performing transmission planning studies is to
10 perform benchmark analysis. This is done to determine the loading
11 conditions of the existing system prior to including additional generation
12 resources in our powerflow models.

13 **Q. WHY IS THAT IMPORTANT?**

14 A. When additional generation is added to the system, there is the potential for
15 unacceptable loading conditions on neighboring transmission systems, and
16 on some of the Public Service transmission system. By performing
17 benchmark analysis, the impacts can be distinguished from the impacts due
18 to other regional loading conditions of the Public Service and neighboring
19 systems. Unless other agreements are made, the mitigation of unacceptable
20 transmission performance due to load growth is the responsibility of the utility
21 that serves that load. In other words, if benchmarking studies show that a
22 neighboring system needs to upgrade its transmission systems to serve its
23 load growth regardless of other system changes or generation additions, it is

1 not the responsibility of Public Service (or our customers) to improve other
2 transmission systems merely because we are adding new generation.

3 When the alternatives were evaluated, their system performance was
4 compared with the performance of the benchmark model without additional
5 generation resources flowing through the Pawnee Substation. I explain my
6 benchmarking analysis in Exhibit No. GMS-1.

7 **Q. WHAT DID THE BENCHMARK ANALYSIS CONCLUDE?**

8 A. The first step revealed the potential for some unacceptable transmission
9 loading conditions with the maximum Pawnee area generation and heavy
10 transfers through the region. Those conditions lead us to recommend the
11 short-term upgrades that I've mentioned previously. However, the studies
12 also showed that if all existing generation resources in Zone 1 were to be
13 dispatched simultaneously at full capacity, the transmission system could not
14 accommodate additional generation resources without making significant
15 transmission upgrades. Therefore, Public Service began evaluating
16 transmission alternatives that would implement new high-voltage transmission
17 from Pawnee to the Denver-metro area.

18 **Q. WHAT SYSTEM ALTERNATIVES DID THE STUDIES FOR THE**
19 **NORTHEASTERN COLORADO INTERCONNECTION EVALUATE?**

20 A. The alternatives all looked at high-voltage transmission from Pawnee to the
21 Denver-metro load center. Through recent Generator Interconnection
22 studies, Public Service has looked at a variety of alternatives in this regard.
23 Some preliminary studies looked at building from Pawnee to the Ft. Lupton or

1 Green Valley Substations. The results of those studies indicated that
2 terminating at either of those locations would result in the potential for
3 significant transmission overloads in the north Denver transmission system.
4 Therefore, subsequent studies focused on terminating at more amenable
5 locations, such as Smoky Hill and Daniels Park. The Study Report, Exhibit
6 No. GMS-1, discusses the study process and why other alternatives were not
7 considered feasible.

8 **Q. DID YOU CONSIDER ALTERNATIVES AT OTHER VOLTAGES THAN**
9 **345KV?**

10 A. Yes. We did some preliminary studies of 230kV alternatives. However, the
11 230kV alternatives did not provide sufficient means to deliver significant
12 generation resources from Pawnee to Public Service loads. The 230kV
13 alternatives we studied would also require significant upgrades to the regional
14 transmission system.

15 **Q. HOW WAS RELIABILITY MEASURED?**

16 A. Reliability can be measured on how well an alternative meets study criteria.
17 The WECC/NERC criteria state that following a disturbance and/or outage on
18 the system, the power loading on transmission elements must remain within
19 acceptable limits. In performing its analysis the Company first benchmarked
20 system performance without additional generation resources. Then, with the
21 new generation added to the study models, transmission alternatives were
22 evaluated based on their ability to achieve at least the same level of
23 performance as was observed with the benchmark case.

1 **Q. WHAT DID THE STUDY REPORT CONCLUDE?**

2 A. Building the Pawnee - Smoky Hill 345kV Transmission Project is the
3 recommended project. The Project:

4 • Fully accommodates a reasonable (500 MW) of additional potential
5 generation resources through Pawnee Substation.

6 • Does not interfere with existing electric systems.

7 • Implements higher-voltage transmission. The proposed Project will
8 operate at 345kV, and help to establish a high-voltage backbone
9 transmission system in the Public Service electrical network.

10 • Makes practical use of existing transmission facilities and corridors.

11 • Allows for additional upgrades in Zone 1

12 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

13 A. Yes.

Attachment A

Statement of Qualifications

Gerry M. Stellern

I graduated from the University of Missouri-Rolla in December of 1973. I started my career at Public Service Company of Colorado in 1974. My career started in the Electric Planning and Analysis group where I worked for approximately 15 years working as a Transmission Planning Engineer, and later as the Supervisor of Loads and Resources Planning. My job function was primarily to produce a customer demand load forecast and to acquire adequate resources to meet that customer demand. I received my Professional Engineer's license from the State of Colorado in 1978.

In 1990 my career directed me to Operations and the Operations Control Center. I worked as Senior Operations Engineer, Manager of the Transmission and Substation desk, Operations Manager, and Manager of the Real Time Engineering group. In this capacity, I performed all functions related to managing and operating the Transmission assets of Public Service and the interconnected Transmission system.

In 2005, I became the Manager of Transmission Reliability Assessment for Public Service, in which I have responsibility for the capital transmission budget as well as planning the Transmission system of Public Service to meet the growing needs of our customers to ensure reliability for the customers. I am also responsible for responding to customer requests for generation, transmission and load interconnections by performing technical studies and to determine any Network

upgrades required to accommodate the request. In 2006 and 2007 the Planning function has completed approximately 30 generation interconnection study reports, several transmission study reports and a multitude of load interconnection reports.