

Exhibit No. _____
Filed: April 28, 2008
Witness: William A.
Pascoe

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

<p>IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF ITS 2007 COLORADO RESOURCE PLAN</p>	<p>Docket No. 07A-447E</p>
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**PRE-FILED ANSWER TESTIMONY OF
WILLIAM A. (BILL) PASCOE
ON BEHALF OF
TRANS-ELECT DEVELOPMENT COMPANY, LLC, AND
THE WYOMING INFRASTRUCTURE AUTHORITY**

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

* * * *

IN THE MATTER OF THE APPLICATION)
OF PUBLIC SERVICE COMPANY OF) **DOCKET NO. 07A-447E**
COLORADO FOR APPROVAL OF ITS 2007)
COLORADO RESOURCE PLAN)

ANSWER TESTIMONY OF WILLIAM A. PASCOE

1 **I. INTRODUCTION AND STATEMENT OF PURPOSE**

2 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

3 A. My name is William A. (Bill) Pascoe. My business address is 104 Country Club
4 Lane, Butte, Montana, 59701.

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

6 A. I am the principal in Pascoe Energy Consulting, LLC. My clients are primarily
7 entities in the electric power industry that are developing new generation and
8 transmission projects. Included among my clients are a number of companies
9 developing wind projects and other renewable energy resources.

10 **Q. PLEASE DESCRIBE YOUR EMPLOYMENT HISTORY AND INDUSTRY**
11 **EXPERIENCE PRIOR TO FORMING PASCOE ENERGY CONSULTING,**
12 **LLC.**

13 A. I formed Pascoe Energy Consulting in 2003. For twenty-five years prior, I was
14 employed by the Montana Power Company (MPC) and its successor
15 NorthWestern Energy (NWE). I served those companies in a variety of
16 progressively more responsible positions primarily in the power supply and

1 transmission areas. My last two positions at MPC/NWE were Vice President,
2 Energy Supply and Senior Vice President, Transmission Services.

3 As Vice President, Energy Supply I was responsible for procurement of a
4 portfolio of power supply resources from the competitive marketplace following
5 restructuring of the electric utility industry in Montana and the subsequent
6 divestiture of MPC's ratebased generating plants. I was also responsible for
7 acquiring natural gas supplies for the company's natural gas customers.

8 As Senior Vice President, Transmission Services I was responsible for all
9 aspects of the company's electric and natural gas transmission systems, including
10 system planning and administration of the company's Open Access Transmission
11 Tariff (OATT). During my tenure at MPC/NWE, I was privileged to serve as the
12 first Chair of the Western Electricity Coordinating Council (WECC) following its
13 formation through the consolidation of the Western Systems Coordinating
14 Council (WSCC), the Western Regional Transmission Association (WRTA) and
15 the Southwest Regional Transmission Association (SWRTA). I also served stints
16 as the Chair of IndeGO and RTO West, two efforts to form a regional
17 transmission organization for the Northwest states.

18 I hold degrees in Civil Engineering and Electrical Engineering from
19 Montana State University. I am a registered professional engineer.

20 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

21 A. I am testifying on behalf of Trans-Elect Development Company, LLC (Trans-
22 Elect), and the Wyoming Infrastructure Authority (WIA). Trans-Elect is a
23 privately-owned company focused on developing new transmission projects. WIA

1 is an instrumentality of the state of Wyoming focused on developing transmission
2 and other infrastructure to enable the development of Wyoming's vast energy
3 resources. Trans-Elect, WIA and the Western Area Power Administration
4 (WAPA) are partners in the development of a new transmission line across the
5 Wyoming-Colorado border that I will refer to as the Wyoming-Colorado Intertie,
6 or WCI.

7 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
8 **PROCEEDING?**

9 A. I will testify on three primary topics: 1) the development of WCI, 2) the benefits to
10 Colorado consumers of WCI, and 3) integration of WCI with the transmission
11 system of Public Service Company of Colorado (PSCo). I will also offer some
12 comments on PSCo's supplemental testimony in this docket regarding
13 transmission issues.

14 **Q. WHAT HAS BEEN YOUR ROLE IN THE DEVELOPMENT OF WCI?**

15 A. I was retained by the WCI developers in late 2005 to assist with the development
16 of WCI. I have been involved with many aspects of WCI, but my primary
17 responsibility has been managing the technical aspects of the project. WCI has
18 retained a number of expert consultants, and I have provided oversight and
19 direction for these consultants. I also have assisted in the evaluation of the wind
20 resource in southeastern Wyoming.

21 **II. THE WCI PROJECT**

22 **Q. PLEASE PROVIDE SOME BACKGROUND ON TRANSMISSION**
23 **CONSTRAINTS BETWEEN WYOMING AND COLORADO.**

1 A. It is apparent that the transmission systems in and between Wyoming and
2 Colorado have been developed for traditional reasons – to deliver the output of
3 remote generating resources to loads and to provide limited opportunities for
4 economy energy transactions and emergency support between neighboring
5 utilities. The principal remote generating resources in Wyoming that serve
6 customers in Colorado are the Missouri Basin Power Project, generally referred to
7 as the Laramie River Station (LRS), which is a coal-fired plant; and WAPA’s
8 hydroelectric plants. The existing transmission system is adequate for the
9 purposes for which it was designed, but for some years it has lacked any excess
10 capacity that would allow for additional low-cost Wyoming resources to be
11 developed for delivery to Colorado consumers.

12 In 2003 and 2004, the states of Colorado, Idaho, Montana, Utah and
13 Wyoming collaborated to produce a transmission study known as the Rocky
14 Mountain Area Transmission Study (RMATS). RMATS looked at future
15 transmission needed to serve consumers in the five-state area and to allow for
16 exports from the resource-rich RMATS states to other areas of the Western
17 United States. The RMATS report, issued in September 2004, recommended,
18 among other things, the development of additional transmission capacity across
19 TOT3 between Wyoming and Colorado.

20 Following the completion of the RMATS process, Trans-Elect and WIA
21 joined together as development partners for an expansion of TOT3. Ultimately,
22 they also enlisted WAPA as an advisor in this effort.
23

1 **Q. PLEASE EXPLAIN THE PARTICULARS OF TOT3.**

2 A. TOT3 is the designation given to six electric transmission lines currently linking
3 southeastern Wyoming to northeastern Colorado as shown in Attachment WAP-1
4 to my testimony. The six lines making up TOT3 collectively have an accepted
5 WECC path rating of 1,605 MW for north to south (Wyoming to Colorado)
6 transfers.

7 Each of the six lines crossing TOT3 is owned by one or more utilities. The
8 owners have an operating agreement that allocates capacity across TOT3 as
9 follows: 70.5% to the Missouri Basin Power Project (LRS) owners, 24.93% to
10 WAPA, 3.74% to PSCo and 0.83% to Tri-Sate G&T. The TOT3 capacity
11 allocated to the LRS owners is further divided 61.7% to Basin Electric, 36.2% to
12 Tri-State G&T and 2.1% to the Wyoming Municipal Power Agency.

13 **Q. ARE THERE EFFORTS, OTHER THAN WCI, CURRENTLY**
14 **UNDERWAY TO ADD CAPACITY ACROSS TOT3?**

15 A. Yes, WAPA is moving forward with its Miracle Mile-Ault transmission project to
16 reinforce its transmission system in southern Wyoming and northern Colorado.
17 One element of this project is the construction of a new 230 kV line from
18 Cheyenne to Ault that will become the seventh transmission line crossing TOT3.
19 WAPA is seeking an increase in the TOT3 path rating from 1,605 MW to 1,680
20 MW when this project goes into service.

21 **Q. PLEASE DESCRIBE WCI.**

22 A. WCI is a project under development by Trans-Elect and WIA to make low-cost
23 Wyoming resources available to Colorado consumers. On the basis of RMATS,

1 WCI was initially planned in three segments, with the northernmost segment
2 configured to access coal resources in Wyoming's Powder River Basin coalfields.
3 However, interest in the project has been focused nearly exclusively on the wind
4 resources along the southern two segments, so the project is currently planned to
5 develop only these two segments as shown in Attachment WAP-2.

6 Of these two segments, the more southerly one is a 345 kV transmission
7 line between LRS and PSCo's Pawnee substation. This segment would cross
8 TOT3. The more northerly of the two segments is a 230 kV transmission line
9 between PacifiCorp's Dave Johnston (DJ) substation and LRS. There are a
10 number of wind projects under development or ready for development between
11 Cheyenne and the DJ substation that have expressed interest in connecting to WCI.

12 **Q. HOW WAS THE CURRENT CONFIGURATION OF WCI DETERMINED?**

13 A. WCI contracted with Siemens/PTI (PTI) to assess a number of different
14 configurations. This assessment included different voltages (230 kV and 345 kV),
15 different end points (Pawnee and Rocky Mountain Energy Center) and integrated
16 and radial options. The PTI report can be found at [www.wyia.org/wci/docs/R63-
17 07-TransElect.pdf](http://www.wyia.org/wci/docs/R63-07-TransElect.pdf). Based on the assessment prepared by PTI and knowledge
18 gained from discussions with generation developers and utilities, the current
19 configuration was selected.

20 **Q. PLEASE DESCRIBE THE WECC PATH RATING PROCESS AND**
21 **WHERE WCI STANDS IN THAT PROCESS.**

22 A. WECC requires a new project like WCI to engage in two related processes – the
23 Regional Planning Process and the Path Rating Process.

1 The Regional Planning Process provides neighboring transmission owners
2 and other stakeholders an opportunity to review and provide input into the plans
3 of the new project being developed. WCI formed a regional planning review
4 group and subsequently completed a regional planning report that was accepted
5 by WECC in August 2007. WCI has successfully completed the Regional
6 Planning Process.

7 The Path Rating Process includes three phases. In Phase 1, WCI
8 conducted planning studies to arrive at a Planned Rating for the project. WCI filed
9 its Phase 1 Comprehensive Progress Report, which incorporates the PTI studies
10 described above, in June 2007. WECC found that WCI had met all of the Phase 1
11 requirements and accepted WCI into Phase 2 of the Path Rating Process in
12 October 2007 with a Planned Rating of 900 MW for the southern segment.

13 In Phase 2, WCI will form a project review group with interested
14 transmission owners and conduct more detailed planning studies to arrive at an
15 Accepted Rating. WCI plans to move forward with Phase 2 activities following
16 successful completion of the open season process described below. In Phase 3,
17 WCI will have to demonstrate that it is making satisfactory progress toward
18 completion of the project to maintain the Accepted Rating.

19 **Q. HOW WILL WCI CAPACITY BE SOLD?**

20 A. On March 31, 2008, WCI announced the commencement of a FERC-compliant
21 open season process to sell capacity on WCI. This announcement is Attachment
22 WAP-3. The open season will be administered by CRA International, Inc. (CRA)
23 and will include three phases. In Phase I, bidders will submit non-binding

1 indicative prices and contract terms. Phase II is an ascending clock auction with
2 standard products and contract terms. In this phase, CRA will gradually increase
3 the price through successive rounds until only enough bids are received to fully
4 subscribe the project. Phase III consists of final sealed bids submitted by parties
5 whose bids were accepted in the last two rounds of Phase II. A schedule of major
6 milestones in the open season process is provided in Attachment WAP-4. All of
7 the documents pertaining to the open season can be found at www.wcintertie.com.

8 **III. BENEFITS TO COLORADO CONSUMERS**

9 **Q. HOW WOULD SUCCESSFUL COMPLETION OF WCI BENEFIT** 10 **COLORADO CONSUMERS?**

11 A. Wyoming has tremendous potential for wind power development. Attachment
12 WAP-5 is a wind resource map for the area that WCI will serve based on
13 information provided by the National Renewable Energy Laboratory (NREL).
14 This map shows that the wind resource in southeastern Wyoming is especially
15 outstanding, particularly when compared against the northeastern Colorado wind
16 resource shown on the same map. In fact, given that it is relatively close to the
17 Denver metropolitan area, southeastern Wyoming may have the greatest
18 concentration of Class 5 (Excellent), Class 6 (Outstanding) and Class 7 (Superb)
19 wind speeds in close proximity to a major load center of any region in the United
20 States.

21 Because wind power costs are primarily driven by installed costs (the fuel
22 is free) and installed costs do not vary substantially among reasonably selected
23 sites, the primary difference in bus bar energy costs between wind sites is due to

1 the quality of the wind resource itself. A high-quality wind resource is
2 characterized by high wind speeds and high capacity factors, which lead to low
3 bus bar energy costs.

4 Of course, Colorado consumers are not interested solely in bus bar costs.
5 They care about delivered energy costs, including transmission costs. So, it is
6 important to determine if the bus bar costs of an outstanding wind site are low
7 enough to offset the transmission costs of delivering that power to customers.

8 **Q. HAVE YOU PREPARED SUCH AN ANALYSIS FOR WCI?**

9 A. Yes. Attachment WAP-6 is an illustrative set of calculations comparing the bus
10 bar and delivered energy costs for a hypothetical southeastern Wyoming wind
11 project delivering its output to the PSCo system over WCI and a hypothetical
12 northeastern Colorado wind project delivering its output to PSCo over a shorter
13 radial transmission line. The example in Attachment WAP-6 shows that the bus
14 bar costs for the Wyoming project are \$12/MWH lower and the delivered energy
15 costs are nearly \$5/MWH lower than for the Colorado project. Assuming 500
16 MW of new wind power development in southeastern Wyoming for Colorado
17 consumers, this difference in delivered energy costs amounts to about \$9 million
18 annually.

19 **Q. ARE YOU CONTENDING THAT BASED ON THE CALCULATIONS IN**
20 **THIS EXAMPLE PSCO SHOULD ACQUIRE WIND RESOURCES IN**
21 **WYOMING?**

22 A. I would urge the Commission to require PSCo to take steps that will enable it to
23 acquire southeast Wyoming wind power if southeast Wyoming wind power

1 proves to be as economical as this example suggests. Obviously, Attachment
2 WAP-6 contains a number of important assumptions. While I believe these
3 assumptions are reasonable, they ultimately need to be validated through a
4 competitive procurement process. The Commission should direct PSCo to design
5 its resource procurement process so that Wyoming resources have a fair
6 opportunity to compete and demonstrate their ability to deliver benefits to PSCo's
7 customers.

8 **Q. DO WYOMING WIND PROJECTS POTENTIALLY OFFER OTHER**
9 **BENEFITS TO COLORADO CONSUMERS IN ADDITION TO LOWER**
10 **DELIVERED ENERGY COSTS?**

11 A. Yes. The electric power industry has devoted considerable attention in recent years
12 to dealing with the challenges posed by the variable output of wind power
13 projects. This variability causes concerns in two primary areas. One of those areas
14 of concern is system integration costs. These are costs imposed on a power system
15 to have fast-ramping generation available to respond to short-term fluctuations in
16 wind power output. The second area of concern is capacity value, or the amount
17 of wind power a utility can reasonably expect to have available at times of peak
18 demand.

19 Geographic diversity among wind projects is helpful in dealing with both
20 of these areas of concern. Currently, PSCo has contracted for more than 1,000
21 MW of wind power. Approximately 75% of this capacity is concentrated in Weld
22 and Logan Counties in northeastern Colorado. PSCo's initial response to the
23 requirements of SB 07-100 has been to further reinforce its system to allow for

1 more wind to be delivered at PSCo's Pawnee substation in this area. I am
2 referring to PSCo's pending application for authority to build the new Pawnee-
3 Smoky Hill 345 kV line. But even with the system reinforcement that the
4 Pawnee-Smoky Hill line will provide, unless some of the additional wind power
5 delivered to Pawnee comes from southeast Wyoming, there will be an even
6 greater concentration of PSCo's wind power coming from a relatively small
7 geographic area in northeastern Colorado.

8 Diversifying PSCo's existing wind resources by acquiring the output of
9 projects in Wyoming and areas of Colorado with wind patterns different from
10 those in northeastern Colorado has two benefits for Colorado consumers. First,
11 integration costs will be lower because geographic diversity will reduce the
12 frequency of large short-term changes in total wind farm output. Second, capacity
13 value will be enhanced because geographic diversity increases the probability that
14 some wind power generation will be available at times of peak demand.

15 **Q. ARE THERE ADDITIONAL DIVERSITY BENEFITS OF WYOMING**
16 **WIND?**

17 A. Yes. Wyoming wind has different seasonal and hourly generation patterns than
18 northeastern Colorado wind. Blending Wyoming wind with Colorado wind can
19 smooth seasonal and time-of-day variations in total wind power production and
20 result in more stable and predictable operation of PSCo's other resources.

21 **Q. DO YOU HAVE A RECOMMENDATION FOR THE COMMISSION**
22 **RELATING TO THE BENEFITS OF GEOGRAPHIC DIVERSITY IN**
23 **PSCO'S WIND POWER PORTFOLIO?**

1 A. Yes. The Commission should direct PSCo to explicitly consider the benefits of
2 geographic diversity when it evaluates bids that are submitted in whatever
3 competitive procurement process for wind is authorized as a result of this
4 proceeding. The value of these benefits are additive to the approximate \$5/MWh
5 savings in the cost of Wyoming wind delivered to PSCo’s system illustrated in
6 Attachment WAP-6.

7 **Q. THE COLORADO RENEWABLE ENERGY PORTFOLIO STANDARD**
8 **(RPS) GIVES AN ADDITIONAL 25% RENEWABLE ENERGY CREDIT**
9 **(REC) PREMIUM TO COLORADO WIND PROJECTS ACQUIRED BY A**
10 **UTILITY TO MEET THE RPS. DOES THAT IMPACT THE RELATIVE**
11 **ATTRACTIVENESS OF WYOMING WIND PROJECTS?**

12 A. PSCo has stated¹ that it has already acquired sufficient eligible energy resources to
13 meet its statutory non-solar RPS obligations through 2017 and beyond. Thus,
14 wind energy that PSCo may acquire (at least for on-line dates before 2017) as a
15 result of wind procurements authorized in this docket will be on top of what the
16 RPS requires. The 25% REC premium for Colorado wind applies only to
17 Colorado wind acquired to *comply* with the RPS requirement. It does not apply to
18 wind acquired on top of that requirement, as PSCo has acknowledged in the
19 discovery answer attached to my testimony as WAP-7.²

20 However, even if this weren’t the case, based on the figures presented in
21 Attachment WAP-6, it is reasonable to assume that a Wyoming wind project will

¹ For example, in the application it filed that commenced currently pending Docket No. 07A-462E.

² The response is to discovery from the Commission staff (CPUC2-2) in Docket No. 07A-462E. PSCo stated: “A REC is defined as 1 MWh of renewable energy generated. Public Service applies the in-state REC bonus only when submitting (and projecting) RECs for compliance.”

1 produce approximately 25% more energy than a Colorado wind project with the
2 same installed capacity. So, a Wyoming project would produce approximately the
3 same number of RECs for Colorado RPS compliance as would the same size
4 Colorado project that had the 25% in-state premium. The difference would be that
5 all of the Wyoming project RECs would be recognized and tradable in regional,
6 national and international markets, whereas 25% of the Colorado RECs w have no
7 value except for Colorado RPS compliance.

8 **Q. DOES THE ADDITIONAL ENERGY RPRODUCED BY WYOMING WIND**
9 **PROJECTS HAVE ANY IMPACT ON GREENHOSUE GAS**
10 **EMMISSIONS?**

11 A. Yes. The additional energy produced by Wyoming wind projects relative to
12 Colorado projects with the same nameplate capacity will decrease the amount of
13 fossil generation that would otherwise be necessary to meet PSCo's load
14 requirements. Acquiring Wyoming wind power would thus be consistent with
15 PSCo's stated objective of lowering its greenhouse gas emissions and with
16 Governor Ritter's initiatives to address climate change.

17 **Q. DO YOU HAVE A RECOMMENDATION FOR THE COMMISSION**
18 **RELATING TO RECS AND GREENHOUSE GAS EMISSIONS?**

19 A. Yes. The Commission should direct PSCo to explicitly consider the
20 value of incremental RECs and incremental reductions in greenhouse gas
21 emissions associated with Wyoming wind as compared to non-Wyoming wind
22 when it evaluates proposals in its competitive procurement process. This value
23 would be in addition to the approximate \$5/MWh savings for Wyoming wind

1 delivered to PSCo's system illustrated in Attachment WAP-6, as well as the value
2 resulting from geographic diversity.

3 **Q. DOES AN INTEGRATED TRANSMISSION LINE SUCH AS WCI HAVE**
4 **ANY BENEFITS FOR PSCO COMPARED TO A RADIAL**
5 **TRANSMISSION LINE?**

6 A. As discussed above, PTI's initial assessment considered integrated and radial
7 configurations for WCI. An integrated configuration was selected based primarily
8 on reliability considerations. In simple terms, if a radial transmission line suffers
9 an outage, any generation connected to that line becomes unavailable and would
10 have to be shut down. On the other hand, an integrated line such as WCI is
11 designed and rated such that the transmission system can withstand any single-
12 contingency outage without reducing power transfers.

13 An integrated configuration can also provide economic benefits. Since
14 capacity on WCI is expected to be purchased primarily to deliver Wyoming wind
15 power to Colorado consumers, there will be unused capacity at times when the
16 wind projects are not at full output. This unused capacity can be used for
17 economy energy imports to Colorado. In addition, northbound capacity on WCI
18 could be used for economy energy sales to benefit Colorado consumers. These
19 economy energy opportunities could be increased in the future if east-west
20 transmission expansions planned by PacifiCorp in Wyoming are completed.
21 These economy energy opportunities are not available with a radial transmission
22 line.

1 **Q. WHAT OTHER BENEFITS COULD RESULT FROM AN INTEGRATED**
2 **LINE?**

3 A. An integrated line also provides opportunities for wind developers to consider the
4 potential economic benefits of “overbuilding.” For example, a wind developer
5 holding 100 MW of capacity on WCI could construct a wind farm with 110 MW
6 of installed capacity—a scenario that would improve the utilization of the 100
7 MW of transmission capacity, thereby reducing effective transmission rates. The
8 first 100 MW of output could flow on firm WCI capacity and the remaining 10
9 MW, when available, could flow on nonfirm capacity available on other
10 transmission systems. With a radial transmission line this overbuild scenario
11 would not be considered.

12 Developers of wind projects in Wyoming have encouraged WCI to install
13 an integrated line because it provides them with benefits that are not available on
14 a radial line. These include the overbuilding scenario noted above as well as
15 providing an alternate path to customers in the event of an outage on WCI.

16 In recent years, some new wind projects have used radial lines, sometimes
17 of significant length, to connect to the transmission system. This is
18 understandable since these lines can generally be constructed more quickly than
19 integrated lines that require greater coordination with other transmission owners,
20 and may require completion of the WECC path rating process. However, this
21 tendency is ultimately short-sighted since the reliability and economic benefits of
22 integrated lines are foregone.

23

1 **IV. COORDINATION OF WCI WITH PSCO WIND RESOURCE**
2 **ACQUISITION**

3
4 **Q. HOW DOES THE SCHEDULE FOR WCI FIT WITH PSCO'S WIND**
5 **RESOURCE ACQUISITION PLANS?**

6 A. WCI is scheduled to be operational prior to the 2013 summer peak season. This
7 date has been selected to coincide with the expected completion date of PSCO's
8 new Pawnee-Smoky Hill 345 kV line. As further explained below, the Pawnee-
9 Smoky Hill upgrade is needed to integrate WCI with PSCO's transmission system.
10 The fact that both WCI and Pawnee-Smoky Hill will come on line in 2013 will
11 enable Wyoming wind developers to participate in PSCO's post-2012 wind
12 resource solicitation which is expected to occur in late 2008.

13 **Q. ARE THERE SPECIAL CHALLENGES ARISING FROM THE LONG**
14 **LEAD TIMES ASSOCIATED WITH MAJOR TRANSMISSION**
15 **PROJECTS SUCH AS WCI?**

16 A. Significant new transmission projects have long lead times due to requirements for
17 planning studies, permitting, right of way acquisition, design and construction. As
18 examples, both WCI and PSCO's Pawnee-Smoky Hill project will take about five
19 years to bring on line. Thus, they will not be available until the summer of 2013
20 despite the diligent efforts of the developers of both projects.

21 In contrast, renewable resources, especially wind and solar, can sometimes
22 be developed with lead times approaching two years. These short lead times have
23 allowed utilities to defer their procurement decisions until just a few years before
24 these short lead-time resources are needed. However, this approach limits utilities
25 to considering only those resources located in close proximity to existing

1 transmission lines with unused capacity or causes wind developers to install long
2 radial lines. This may not provide the best value for consumers.

3 Many states, including Colorado, have identified the need to be more
4 proactive about extending new transmission lines to areas with significant
5 renewable resource potential. This is the underlying philosophy of SB 07-100 that
6 led directly to PSCo's decision to file for approval of a Certificate of Public
7 Convenience and Necessity (CPCN) to construct the Pawnee-Smoky Hill project.
8 The same philosophy, hopefully, will lead to more CPCN filings in 2009.

9 **Q. ARE THERE DIFFERENCES BETWEEN THE WAY IN WHICH PSCO**
10 **AND THE WCI DEVELOPERS GO ABOUT THE DEVELOPMENT OF**
11 **MAJOR NEW TRANSMISSION ADDITIONS?**

12 A. The expansion of PSCo's transmission system to integrate more renewable energy
13 projects is based on a regulated utility model under which the issuance of a CPCN
14 gives PSCo sufficient assurance of cost recovery to proceed with a major new
15 transmission project. However, development of a merchant transmission line like
16 WCI is fundamentally different. Instead of relying on a CPCN, or some similar
17 process, for cost recovery, WCI must secure sufficient commitments from
18 customers to proceed. Because most of the WCI capacity is expected to be
19 contracted to deliver low-cost Wyoming wind resources to Colorado consumers,
20 and because PSCo represents a large market opportunity for Wyoming wind
21 developers, it is imperative that the timing of the WCI capacity subscription
22 process and PSCo's resource procurement process be properly aligned. In order
23 for this to occur, some adjustments may be required to PSCo's bid documents and

1 typical resource acquisition procedures, as will be explained by WCI witness
2 Eugene T. Meehan. I believe these adjustments are warranted by the potential
3 benefits to Colorado consumers that will result from gaining access to Wyoming's
4 superior wind resources.

5 **V. INTEGRATION OF WCI INTO PSCO'S TRANSMISSION SYSTEM**

6

7

7 **Q. HAS WCI MADE APPLICATIONS TO PSCO FOR INTERCONNECTION**
8 **OR TRANSMISSION SERVICE?**

9

A. Yes. WCI has made a request to interconnect to the PSCo transmission system at
10 Pawnee. PSCo has designated this request as T-2006-4. Also, PSCo's merchant
11 function has made a request on behalf of WCI for network transmission service to
12 deliver power from WCI to network loads on the PSCo transmission system.
13 PSCo has designated this request as T-2007-3. PSCo has completed System
14 Impact Studies for both of these requests which are posted on PSCo's Open
15 Access Same-time Information System website.

16

16 **Q. WHAT ARE THE RESULTS OF THESE SYSTEM IMPACTS STUDIES?**

17

A. These studies conclude that upgrades are needed to the PSCo transmission system
18 to reliably integrate the additional 900 MW of power that can flow across TOT3
19 with the addition of WCI. Three upgrades were identified:

20

A new 345 kV transmission line from Pawnee to Smoky Hill,

21

A new 345 kV transmission Line from Smoky Hill to Daniels Park,

22

A new 230 kV transmission line from Ault to Cherokee.

23

23 **Q. PLEASE COMMENT ON THE NEED AND COST FOR EACH OF THESE**
24 **UPGRADES.**

1 A. These projects are discussed in PSCo's October 31, 2007 SB 07-100 filing with
2 the Commission and in the Pawnee-Smoky Hill CPCN application.

3 The 2007 SB 07-100 filing identified the Pawnee-Smoky Hill 345 kV line
4 as the highest priority project for integrating additional renewable energy into
5 PSCo's system. As noted, PSCo has applied for a CPCN for this project and that
6 filing is currently before the Commission. WCI supports the granting of this
7 CPCN. The 2007 SB 07-100 filing indicates that this project will allow for the
8 injection of an additional 500 MW at Pawnee and has an estimated cost of \$120
9 million. This computes to a cost of \$240 per kw of new transmission capacity.

10 The Pawnee-Smoky Hill CPCN filing indicates that construction of the
11 Smoky Hill-Daniels Park 345 kV line would allow for the injection of an
12 additional 300 MW at Pawnee. According to System Impact Studies performed by
13 PSCo for WCI, the Smoky Hill-Daniels Park project has an estimated cost of \$35
14 million. This computes to a cost of \$117 per kw of new transmission capacity.
15 This project has additional significance because it would complete a 345 kV
16 backbone for the PSCo transmission system extending from Pawnee in the north
17 to Comanche in the south. Given the relative cost effectiveness of this project
18 (about one-half of the cost per kw of Pawnee-Smoky Hills) and the likelihood that
19 this project would be included in any reasonable long range plan for expanding
20 PSCo's transmission system, I believe it would be appropriate for PSCo to make a
21 CPCN filing for this project in March of 2009. This is what appears to be
22 contemplated by the Transmission Process Planning Agreement that Ms.

1 Mogensen of PSCo has provided with her supplemental testimony in this docket
2 as Exhibit TMM-2.

3 The 2007 SB 07-100 filing indicates that the Ault-Cherokee 230 kV line
4 will allow for the injection of an additional 600 MW at Ault at an estimated cost
5 of \$69 million. This computes to a cost of \$115 per kw of new transmission
6 capacity. This project would eliminate a significant bottleneck in the transmission
7 system across TOT7.

8 **Q. PLEASE EXPLAIN THE PARTICULARS OF TOT7.**

9 A. As shown in Attachment WAP-7, TOT7 is the designation given to three 230
10 kV transmission lines extending south from Ault between Fort Collins and North
11 Denver. TOT7 has an accepted WECC path rating of 890 MW for north to south.
12 Each of the lines crossing TOT7 is owned by one or more utilities. The owners
13 have an operating agreement that allocates capacity across TOT7 as follows: 58%
14 to PSCo and 42% to Platter River Power Authority.

15 TOT7 is located electrically just downstream from TOT3 and as a result
16 can limit transfers across TOT3. For example, the additional 75 MW of TOT3
17 capacity that will result from WAPA's Miracle Mile-Ault project cannot be
18 effectively utilized due to a lack of matching capacity across TOT7.

19 **Q. WHAT BENEFITS COULD BE REALIZED BY REINFORCING TOT7?**

20 A. Area utilities have long understood that TOT7 is operating close to its reliable
21 limits. Reinforcement of TOT7 by construction of the Ault-Cherokee 230 kV line
22 would enhance the load serving capability of the transmission network in the Fort
23 Collins area, accommodate additional transfers across TOT3 and allow for

1 integration of additional renewable energy projects in the area. In my opinion,
2 PSCo should pursue this project in conjunction with other utilities with interests
3 in this area.

4 **Q. WCI WOULD INTERCONNECT WITH PSCO AT PAWNEE. WHY**
5 **THEN ARE UPGRADES TO TOT7 RELEVANT TO WCI?**

6 A. WCI would be the eighth transmission line across TOT3. All of these lines work
7 as a group to allow for reliable power transfers across TOT3 under various
8 system-normal and single-contingency outage conditions. The addition of WCI
9 will allow for an additional 900 MW of power to be reliably transferred across
10 TOT3. However, because of the laws of physics and the physical characteristics
11 of the lines crossing TOT3, less than 900 MW may actually flow on WCI. For
12 example, under the summer peak conditions studied by PTI only about 90% of the
13 900 MW of additional transfers across TOT3 flows on WCI. The remaining 10%
14 flows on other TOT3 lines, with about 6% to 7% of the incremental power flows
15 going to Ault and then across TOT7.

16 **Q. IF TOT7 IS NOT REINFORCED IS WCI STILL A VIABLE PROJECT?**

17 A. As discussed above, there are a number of good reasons to reinforce TOT7 and I
18 believe it would be in the interest of PSCo and other area utilities to accomplish
19 this task.

20 However, if TOT7 is not reinforced, various techniques can be employed
21 to reduce or eliminate any WCI impacts on TOT7. For example, WCI's current
22 design includes 50% series compensation to lower the project's impedance and
23 reduce the amount of flow on other TOT3 elements. Studies by PTI show that

1 increasing WCI series compensation to 70% combined with the installation of
2 series reactors in the Ault area would eliminate any TOT7 impacts. This is not
3 WCI's preferred approach, but if TOT7 is not reinforced this solution could be
4 implemented.

5 **Q. EARLIER YOU STATED THAT WCI IS EXPECTED TO BE IN SERVICE**
6 **BY THE SUMMER OF 2013. THE PAWNEE-SMOKY HILL PROJECT IS**
7 **PLANNED TO BE IN SERVICE BY THEN, BUT THE OTHER**
8 **UPGRADES YOU'VE DISCUSSED MAY NOT MEET THAT SCHEDULE.**
9 **HOW WILL WCI BE IMPACTED?**

10 A. For the reasons stated above, I believe that the Smoky Hill-Daniels Park and Ault-
11 Cherokee projects would be good additions to the PSCo transmission network and
12 I hope PSCo will pursue these projects aggressively, including making CPCN
13 filings in March 2009. However, even with diligent efforts, these projects may not
14 be in service when WCI and Pawnee-Smoky Hill are complete. In that case, there
15 may be an interim period during which PSCo would have to re-dispatch gas-fired
16 resources in the Pawnee area to accommodate full flows on WCI. This approach
17 has been implemented by PSCo to accept the full output of the recently completed
18 northeastern Colorado wind projects until reinforcements to the PSCo 230 kV
19 system around Pawnee can be completed.

20 **VI. PSCO SUPPLEMENTAL TESTIMONY**

21 **Q. DO YOU HAVE COMMENTS ON MR. BONAVIA'S ADDITIONAL**
22 **SUPPLEMENTAL TESTIMONY?**

1 A. Yes. I certainly concur with Mr. Bonavia's views that a more proactive approach
2 to transmission development is needed to facilitate development and integration
3 of more renewable energy resources in Colorado. I am especially encouraged by
4 Mr. Bonavia's reference to PSCo's efforts to facilitate a solution to the historic
5 TOT3 bottleneck. As discussed elsewhere in this testimony, modifying PSCo's
6 resource procurement process to allow serious bids from Wyoming wind
7 developers in 2008 for wind projects with post-2012 on-line dates would certainly
8 help to accomplish this objective.

9 **Q. DO YOU HAVE ANY COMMENTS ON MS. MOGENSEN'S AND MR.**
10 **STELLERN'S SUPPLEMENTAL TESTIMONY?**

11 A. Yes. I am encouraged by Ms. Mogensen's and Mr. Stellern's statements that PSCo
12 is committed to working cooperatively with other area transmission owners. It is
13 this type of collaborative approach that will be needed to reinforce TOT7.

14 I do note, however, that in describing PSCo's approach to the next SB 07-
15 100 filing, Ms. Mogensen talks about possible transmission projects in Zones 2, 3
16 and 4, but does not explicitly mention the additional new projects for Zone 1 that I
17 have discussed earlier in this testimony. I assume this is merely an oversight in
18 the testimony and that PSCo will aggressively pursue the Smoky Hill-Daniels
19 Park and Ault-Cherokee projects including CPCN filings in March 2009.

20 **Q. DO YOU HAVE ANY COMMENTS ON MS. HYDE'S SUPPLEMENTAL**
21 **TESTIMONY REGARDING HOW TRANSMISSION COSTS WILL BE**
22 **CONSIDERED IN EVALUATING NEW RESOURCES?**

1 A. Yes. My understanding is that Ms. Hyde proposes to treat the costs associated with
2 the Pawnee-Smoky Hill project as essentially sunk costs, since that project is well
3 along in the CPCN process, but that the costs of other transmission
4 reinforcements will be added to resource bid prices. While I can appreciate Ms.
5 Hyde's desire to get some clarity on this subject, I think the proposed approach
6 may be too simplistic and may lead to inappropriate decisions.

7 As an example, under the proposed approach, the first 500 MW injected at
8 Pawnee would be assigned no transmission costs since these injections could be
9 accommodated by the already-sunk Pawnee-Smoky Hill project. However, as I
10 understand it, a portfolio of resources that contained the next injections at Pawnee,
11 up to an additional 300 MW, would be assigned the full costs of the Smoky Hill-
12 Daniels Park project. This approach would seem to ignore the system benefits that
13 Smoky Hill-Daniels Park would contribute above and beyond facilitating further
14 wind injections at Pawnee. As Mr. Stellern testified in the Pawnee-Smoky Hill
15 CPCN docket, the Smoky Hill-Daniels Park project would strengthen the
16 reliability of PSCo's entire Front Range transmission system.

17 As another example, under the proposed approach, a portfolio of resources
18 containing Wyoming wind bids dependent on WCI might be assigned the entire
19 cost of the Ault-Cherokee project, even though WCI has only a minor impact on
20 TOT7, and the Ault- Cherokee project would add substantial capacity that could
21 be used for purposes unrelated to WCI, as discussed earlier in my testimony. In
22 addition, this approach to cost-assignment might fail to recognize that the WCI

1 design could be modified, as discussed earlier in my testimony, to avoid the need
2 for the Ault-Cherokee project.

3 In light of these potential ramifications, I recommend that the Commission
4 direct PSCo to thoughtfully consider transmission cost assignment in its bid
5 evaluation process and to fully support and explain how these costs are treated
6 when the results of the bid evaluations are presented to the Commission. This will
7 result in better decisions than adopting a perhaps over-simplistic approach at the
8 beginning of the process.

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

10 A. Yes