

**BEFORE THE
COLORADO PUBLIC UTILITIES COMMISSION**

IN THE MATTER OF THE APPLICATION
OF PUBLIC SERVICE COMPANY OF
COLORADO FOR APPROVAL OF ITS
2021 ELECTRIC RESOURCE PLAN AND
CLEAN ENERGY PLAN

Proceeding No. 21A-0141E

HEARING EXHIBIT 1411

TESTIMONY OF DR. MARIA ROUMPANI IN OPPOSITION TO THE PROPOSED NON-
UNANIMOUS, NON-COMPREHENSIVE SETTLEMENT

ON BEHALF OF CONSERVATION COALITION

DECEMBER 7, 2021

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Attachment MR-7

Securitization Calculations and Workpapers of David Posner

1 **I. INTRODUCTION**
2

3 **Q. Please state your name, position, and business address for the record.**

4 A. My name is Dr. Maria Roumpani and I am a Senior Manager at Strategen Consulting. My
5 business address is 2150 Allston Way, Suite 400, Berkeley, California 94704.
6

7 **Q. Are you the same Maria Roumpani who submitted answer and cross-answer**
8 **testimony in this case?**

9 A. Yes.
10

11 **Q. What is the purpose of your testimony?**

12 A. On November 24, 2021, Public Service of Colorado (“PSCo” or “Company”) and other
13 parties in this case filed a proposed, non-unanimous and non-comprehensive settlement
14 agreement including coal actions for the Comanche 3 and Pawnee units. In my testimony, I
15 address the settlement coal actions and compare them to the coal actions I recommended in my
16 answer and cross answer testimony.
17

18 **Q. How is your testimony organized?**

19 A. First, I present the results of additional EnCompass runs focusing on the settlement coal
20 actions and the actions previously recommended by Conservation Coalition. Second, I outline
21 some additional concerns regarding the settlement coal actions that are not sufficiently addressed
22 in a modeling exercise but still pose costs and risks to ratepayers.
23

24 **Q. Why did you need to perform additional EnCompass runs in response to the**

1 **proposed settlement?**

2 A. After the proposed settlement was filed on November 24, PSCo witness Jon Landrum
3 filed testimony on December 1 describing new EnCompass modeling he conducted of the
4 proposed settlement. Unfortunately, Mr. Landrum did not compare the proposed settlement's
5 coal actions to any coal actions modeled by intervenors. Instead, Mr. Landrum's modeling
6 compared the coal actions in the proposed settlement to only the Company's preferred portfolio
7 and the Company's ERP portfolio.¹

8

9 **Q. Are you surprised that the Company filed EnCompass modeling after it had already**
10 **selected coal actions in the settlement, and that the Company's new modeling did not**
11 **compare the settlement to any coal actions modeled by intervenors?**

12 A. Yes. Prior to the filing of the proposed settlement, the coal actions in the proposed
13 settlement had not been modeled and their PVRR and emissions impact had not been fully
14 evaluated, let alone compared to any of the other pairs of coal actions modeled by intervenors.
15 After almost a full year that the Company modeled different portfolios and several months of
16 intervenor modeling, settling on coal actions that were not fully evaluated against other possible
17 coal actions would be a huge omission, especially as the settlement coal actions mix and match
18 elements of different intervenor proposals making them difficult to compare to any portfolio that
19 was on the record up to that point. The modeling I present in this testimony attempts to provide
20 a basis for the parties and the Commission to compare the coal actions in the proposed settlement
21 to the coal actions proposed by the Conservation Coalition.

22

¹ Hearing Exhibit 135 at 16.

1 **Q. Please summarize your findings based on the analysis you conducted comparing the**
2 **settlement coal actions to the coal actions recommended by Conservation Coalition.**

3 A. Based on reviewing the Company's modeling, as well as conducting extensive modeling
4 myself presented in my answer, cross-answer, and settlement testimony, my findings are as
5 follows:

- 6 • From a simple PVRR standpoint (i.e., direct customer costs, exclusive of carbon costs),
7 the best option is to retire Comanche 3 prior to 2030. All portfolios I have modeled that
8 include a Comanche 3 retirement date prior to 2030 have shown PVRR utility costs very
9 similar, and in most cases, lower than that of portfolios with a later Comanche 3
10 retirement date. Portfolios with a Comanche 3 retirement date prior to 2030 always
11 achieve net PVRR savings when savings from earlier securitization are included.
- 12 • From a PVRR + CO2 standpoint (i.e., direct customer costs, inclusive of carbon costs)
13 earlier Comanche 3 retirement and Pawnee conversion dates significantly outperform all
14 portfolios with later retirement or conversion dates.
- 15 • Economic cycling of Comanche 3 and Pawnee can reduce both emissions and PVRR
16 costs (exclusive of the social cost of carbon). The same is true for the Craig 2 and Hayden
17 1 & 2 coal units. However, those savings are limited.
- 18 • Capacity factor targets that are below the level that would be achieved through economic
19 dispatch alone can reduce emissions but increase PVRR costs. Although the premise of
20 keeping coal units online for their capacity contribution might seem promising at first
21 sight, restricting their operations reduces their energy value and results in either
22 replacement energy from higher-cost resources or additional resource buildout while the
23 coal capacity keeps incurring costs.

- 1 • The use of the social cost of carbon (“SCC”) in dispatch can significantly reduce
2 emissions but increases PVRR costs. My main concerns with the way in which the
3 settlement proposes to use the SCC in dispatch are:
- 4 • the length of time the SCC will be used is uncertain, and so are the emissions
5 savings; and
 - 6 • the SCC is assumed to be used in part of 2022 and 2023, when it will be difficult
7 to add new resources to the system, so coal generation will likely be replaced with
8 gas generation rather than clean energy.
- 9 • The settlement changes the metrics used to decide the coal actions. Prior to the
10 settlement, in all its testimony, the Company justified its preferred portfolio based on
11 direct customer costs (PVRR Utility Cost). But in its settlement testimony, the Company
12 downplays direct customer costs and abruptly pivots to emphasizing PVRR inclusive of
13 CO2 costs. Had the Company applied a consistent cost metric throughout this proceeding
14 and evaluated coal actions based on PVRR + CO2 costs, earlier gas conversion of
15 Pawnee and earlier retirement of Comanche 3 would have emerged as the unambiguously
16 better course of action. On a PVRR+CO2 basis, the Conservation Coalition’s preferred
17 portfolio is far superior to both the Company’s preferred portfolio and the settlement’s
18 coal actions.

19

20 **Q. Please summarize your recommendations.**

21 A. I recommend that the Commission modify the settlement in the following ways, or if it
22 rejects the settlement in its entirety, adopt the following:

- 23 • Direct PSCo to retire the Comanche 3 coal unit by December 31, 2027 (or,

- 1 alternatively, no later than December 31, 2029);
- 2 • Approve converting Pawnee to combust gas by December 31, 2024;
- 3 • Instruct the Company to remove the must-run designations and economically cycle
- 4 Comanche 3 and Pawnee starting in summer 2022.

5 If the Commission does not accept my primary recommendations and instead approves

6 the coal actions in the settlement, the Commission should instruct the Company to re-evaluate

7 the retirement date for Comanche 3 in its next ERP.

8

9 **II. MODELING OF THE SETTLEMENT’S COAL ACTIONS COMPARED TO THE**

10 **CONSERVATION COALITION’S COAL ACTIONS**

11

12 **Q. Please describe the modeling presented by Mr. Landrum in his December 1 filing.**

13 A. Mr. Landrum presents one modeled scenario that is consistent with the settlement coal

14 actions using the Company’s original modeling assumptions (i.e., *not* the modeling assumptions

15 that the settlement agrees to change in Phase II). This settlement scenario is compared to the

16 Company’s preferred portfolio as well as its ERP portfolio. The settlement scenario includes

17 assumptions – for example the period during which the Company will dispatch its units inclusive

18 of SCC – about how the settlement will be implemented that are not expressly required by the

19 settlement. Thus, actual implementation of the settlement could lead to different costs and

20 emissions than Mr. Landrum modeled.

21

22 **Q. In the testimony he filed on December 1, does Mr. Landrum present modeling of the**

23 **entire settlement agreement, or even all of its key provisions?**

24 A. No, he does not. Mr. Landrum expressly states that his modeling omits at least two major

25 categories of provisions in the proposed settlement. First, Mr. Landrum does not model the

1 provisions stating that replacement resources for Comanche 3 will be acquired through a
2 separate, stand-alone solicitation in which the Company will be guaranteed ownership of at least
3 \$626 million in replacement resources.² Second, Mr. Landrum acknowledges that he does not
4 conduct his new modeling using the changes to input assumptions that are in the settlement
5 agreement.³ Mr. Landrum's decision to model the settlement's coal actions based on
6 assumptions that need to be updated (as acknowledged in the settlement) significantly limits the
7 usefulness of Mr. Landrum's modeling of the settlement.

8

9 **Q. Please describe the model runs you are presenting in this testimony.**

10 A. I conducted the following model runs in response to the modeling that PSCo witness Jon
11 Landrum filed on December 1, 2021.

- 12 • Settlement: the settlement coal actions under my base case assumptions.
- 13 • CC6econ*: the Conservation Coalition's primary preferred portfolio, using the economic
14 dispatch date in the settlement;
- 15 • CC3econ*: the Conservation Coalition's secondary preferred portfolio, using the
16 economic dispatch date in the settlement;
- 17 • CC6sett: the settlement coal actions but the December 31, 2027 Comanche 3 retirement
18 date in the Conservation Coalition's primary recommended portfolio;
- 19 • CC3sett: the settlement coal actions but the December 31, 2029 Comanche 3 retirement
20 date in the Conservation Coalition's secondary preferred portfolio.

21

22 **Q. Please describe the model runs in greater detail.**

² Hearing Exhibit 135 at 17-18.

³ Hearing Exhibit 135 at 10-11.

1 A. My first objective was to model the coal actions in the settlement using the base case
2 assumptions I used in my answer and cross-answer testimony, so that I could present an apples-
3 to-apples comparison between the coal actions in the settlement and the coal actions in my prior
4 modeling. To do this, I conducted a model run replicating the coal actions in the proposed
5 settlement, but using the assumptions that I used in my answer and cross-answer testimony.
6 These assumptions are described in detail in my answer testimony, and include: updated
7 renewable costs (based on the 2021 National Renewable Energy Laboratory's Advanced
8 Technology Baseline "NREL ATB"); SCC values starting at \$68/ton, to be consistent with 2021
9 Colorado legislation, SB 21-1238; updated Comanche 3 costs to reflect historical Comanche 3
10 costs; and increased energy storage effective load carrying capability ("ELCC"). Note that the
11 settlement proposes to use in Phase II many of the inputs that I have used in my base case
12 scenario, which validates my use of those inputs.⁴

13 I also include two model runs that update the Conservation Coalition's preferred
14 portfolios based on the Company's acknowledgement in the proposed settlement that it can
15 remove the must-run designation for Comanche 3 as early as June 1, 2022. The portfolios I
16 modeled in my cross-answer testimony removed the must-run designations for Comanche 3 and
17 Pawnee in 2024, based on information in the record at the time. Now that PSCo has
18 acknowledged in the settlement that it can remove the must-run designation for coal units as
19 early as June 1, 2022, I have updated the Conservation Coalition's preferred portfolios to be
20 consistent with the information in the proposed settlement as to the earliest date that PSCo can

⁴ There are two exceptions: while the settlement proposes to use a higher ELCC for standalone batteries than PSCo has used in Phase I, the proposed ELCC in the settlement is still lower than the ELCC I have used in my base case; and while the settlement proposes to use historical values for O&M costs for Comanche 3, the settlement does not address the forced outage rate that should be used for Comanche 3 (whereas my base case uses a forced outage rate for Comanche 3 that is higher than the Company's modeling assumption but lower than the historical forced outage rate).

1 remove must-run designations for its coal units. The only changes I made to these two portfolios
2 compared to the modeling in my cross-answer testimony was to move up the economic dispatch
3 date for Comanche 3 and Pawnee to June 1, 2022, consistent with information in the proposed
4 settlement (these two portfolios are labeled hereafter CCecon*).

5 Finally, I modeled the coal actions in the proposed settlement but changed the Comanche
6 3 retirement date to be consistent with the retirement dates recommended in my answer and
7 cross-answer testimony. In these runs, I included the settlement's proposed conversion of
8 Pawnee to burn gas by January 1, 2026, and closely follow the operational limits outlined in the
9 settlement for Comanche 3, but move the retirement date of Comanche 3 to 2027 and 2029 (as I
10 had recommended in my prior testimony). This allows me to study the PVRR and emissions
11 impact of the Comanche 3 retirement date independently of the operational limits. I find that
12 earlier retirement of Comanche 3 is a more cost-effective way of achieving the same emissions
13 reductions.

14

15 **Q. Your analysis is based on the input assumptions you used in your answer and cross-**
16 **answer testimony. Did you also compare the portfolios based on the assumptions used in**
17 **the Company's modeling?**

18 A. No. In the proposed settlement, the Company and other settling parties have agreed to
19 update several modeling inputs and assumptions for Phase II. Among others, these include:

20 1. Social Cost of Carbon ("SCC") Value. The SCC values will be based upon the February
21 2021 update to the Technical Support Document: Social Cost of Carbon, Methane, and
22 Nitrous Oxide Interim Estimates under Executive Order 13990, published by the federal
23 Interagency Working Group on Social Cost of Greenhouse Gases, and use the 2.5 percent

1 discount rate from that publication.

2 2. Phase II Generic Resource Cost Values. The Company will update the costs for generic
3 resources to the most recent vintage (2021) NREL ATB.

4 3. Phase II Comanche 3 Historic Operations and Maintenance (“O&M”) Costs. The
5 Company agrees that in this ERP Phase II modeling, the historical O&M costs for
6 Comanche 3 will be utilized, as proposed by Staff.

7 4. Phase II Standalone Storage Effective Load Carrying Capability Values & Hybrid
8 Resources ELCC Values. The Company will update its Effective Load Carrying
9 Capability for four-hour duration standalone energy storage projects and the storage
10 component of hybrid generation/storage projects.

11 Updates similar to those input changes in the settlement have been a part of all of the
12 modeling I conducted in my base case scenario in answer, cross-answer, and settlement
13 testimony. For the fourth input change in the settlement, my base case scenario uses an ELCC
14 for batteries that is higher than what the settlement proposes. In agreeing to update these
15 parameters, the settling parties will bring the Company’s Phase II modeling assumptions much
16 closer to what is reflected in my base case scenario throughout my testimony. Given that the
17 settlement agreement proposes to adopt similar input changes I have used in my base case
18 scenario, modeling the coal actions using the assumptions in the Company’s original and
19 settlement modeling would not be useful or informative as there is wide acknowledgement that
20 the inputs the Company has used in its modeling are inappropriate.

21

22 **Q. Does your modeling continue to use the same assumptions for replacement of lost**
23 **tax revenue that you used in your prior modeling, and that the Company used in its**

1 **modeling?**

2 A. Yes. The modeling I present in this testimony uses the same assumptions I used in my
3 prior testimony concerning the Company's payment of lost tax revenues associated with units'
4 accelerated retirement. In all of my testimony, I have used the same assumptions that the
5 Company used in its modeling concerning replacement of any lost tax revenues after a unit is
6 retired in the modeling.

7
8 **Q. How do the settlement coal actions compare against the CC recommended**
9 **portfolios?**

10 A. The results of my analysis are presented below. In summary, the CC recommended
11 portfolios are significantly lower in cost than the settlement portfolio while they also result in
12 lower emissions.

13 With respect to the Company's preferred portfolio, the settlement coal actions at least
14 reduce emissions, while compared to the CCEcon* portfolios they do not. Instead, CC6econ*, the
15 Conservation Coalition's preferred portfolio, reduces 2 million more tons of CO₂ before 2030
16 than the settlement, and the Conservation Coalition's preferred portfolio reduces 4 million more
17 tons of CO₂ before 2040 compared to the settlement—all at a lower customer cost than the
18 settlement.

19 The settlement coal actions include a combination of operational constraints that
20 significantly lower emissions, but come at an increased PVRR when compared to the Company's
21 preferred portfolio SCC 7. In my answer testimony, I had shown that the CC portfolios result in
22 dramatically lower emissions while having approximately the same cost with SCC7, while in my
23 cross-answer testimony, I showed that removing the must run designation of the two units could

1 result in additional savings; the CCEcon portfolios remain dramatically lower in emissions and
2 they outperform the SCC7 coal actions in PVRR. Thus, it is unsurprising that the settlement coal
3 actions are also much more expensive than the CCEcon* actions.

4 The settlement portfolio achieves incremental emissions reduction relative to the
5 Company's preferred portfolio by using costly operational restrictions instead of accelerating the
6 conversion date for Pawnee to 2024 and accelerating the retirement date of Comanche 3 before
7 2030. For example, the settlement's proposal to use the SCC in dispatch results in approximately
8 \$64M of increased costs (undiscounted) while in 2029 the capacity factor limit results in \$8M of
9 additional costs. And these costs are incurred while ratepayers will still pay for the high fixed
10 costs of Comanche 3, instead of paying for replacement resources.

11 When compared to the Conservation Coalition's preferred portfolio, CC6econ* , the
12 settlement portfolio emits more CO₂ both in the 2021-2030 period and the 2030-2040 period,
13 while it increases customer costs by more than \$206 million on a PVRR basis. Furthermore, the
14 PVRR estimate for the settlement portfolio seems to include securitization savings, and if the
15 savings from securitization were similarly included in the CC6econ* portfolio, the total cost
16 savings from CC6econ* relative to the settlement would be higher than \$300 million.⁵ Finally,
17 when CO₂ costs are included in the PVRR, the CC6econ* portfolio has PVRR + CO₂ cost
18 savings of over half a billion dollars compared to the settlement.

19

⁵ In Attachment MR-7, I present Conservation Coalition witness David Posner's updated calculations of securitization savings. Mr. Posner updated his calculations in response to the settlement's proposal to retire Comanche 3 by 2035.

1 *Table 1: Comparison of Coal Actions in the Settlement vs. Conservation Coalition Portfolios*

SCC Optimized Portfolios			
\$0/ton 8760-dispatch			
50% ownership			
Portfolio	Settlement	CC3econ*	CC6econ*
Pawnee Action:	Convert EOY 2025	Convert EOY 2024 Econ Ops	Convert EOY 2024 Econ Ops
Comanche 3 Action:	Retire EOY 2039 Settlement Operations	Retire EOY 2029, Econ Ops	Retire EOY 2027 Econ Ops
2030 CO2 % Reduction			
	-87%	-91%	-90%
Cumulative CO2 Emissions, Delta vs CC0 (million tons)			
2021-2030	\$ -	\$ 2	\$ (2)
2021-2040	\$ -	\$ (2)	\$ (4)
2021-2055	\$ -	\$ (2)	\$ (4)
PVRR Utility Cost 2021-2055 (\$M)			
	\$ 38,636	\$ 38,476	\$ 38,429
PVRR Utility Cost Delta vs. Settlement			
2021-2030 (\$M)	\$ -	\$ (73)	\$ (79)
2021-2040 (\$M)	\$ -	\$ (77)	\$ (261)
2021-2055 (\$M)	\$ -	\$ (160)	\$ (206)
NPV Comanche 3 Securitization (\$M)			
	included in PVRR	\$ (100)	\$ (122)
NPV CO2 2021-2055 (\$M)			
	\$ 7,930	\$ 7,852	\$ 7,737
NPV CO2 2021-2055 (\$M) Delta vs Settlement (\$M)			
	\$ -	\$ (78)	\$ (192)
PVRR Utility Cost + NPV CO2 + Securitization (\$M)			
	\$ 46,565	\$ 46,227	\$ 46,045
PVRR Utility Cost + NPV CO2 + Securitization Delta vs Settlement (\$M)			
2021-2055 (\$M)	\$ -	\$ (338)	\$ (521)
Resource Additions 2021-2030 (Nameplate MW)			
Wind	3,250	3,250	3,100
Utility-Scale Solar	1,150	1,100	1,050
Distributed Solar	1,158	1,158	1,158
Storage	1,000	1,150	1,000
Firm Dispatchable	588	1,176	884
Resource Additions 2021-2035 (Nameplate MW)			
Wind	4,450	4,400	4,200
Utility-Scale Solar	1,150	1,100	1,050
Distributed Solar	1,158	1,158	1,158
Storage	1,800	1,800	1,600
Firm Dispatchable	1,176	1,372	1,276

2
3

1 **Q. How do the settlement coal actions compare to the portfolios with a Comanche 3**
2 **retirement prior to 2030 (but with all other actions and operations in the settlement**
3 **remaining the same)?**

4 A. When isolating the impact of the retirement date of Comanche 3, the results have been
5 consistent across my three rounds of testimony: earlier retirement of Comanche 3 does not
6 increase PVRR materially while it significantly reduces emissions. In this comparison, the
7 settlement's operational restrictions that reduce emissions and drive PVRR up are applied to all
8 portfolios and thus any differences between portfolios can be attributed only to the retirement
9 date of Comanche 3. At first sight the CCsett portfolios result in similar PVRR as the settlement
10 portfolio. However, it is worth noting that the settlement portfolio appears to include
11 securitization benefits, whereas my calculation of the PVRR for the Conservation Coalition
12 portfolios does not include securitization savings. Thus, an apples-to-apples comparison would
13 require either removing the securitization savings from the settlement proposal (and increasing
14 its PVRR) or including securitization savings in the CC portfolios (thus decreasing their PVRR).
15 Either way, an apples-to-apples comparison would show net savings for the CC portfolios in
16 PVRR alone, when compared to the settlement. When comparing the actions based on PVRR +
17 CO2, retiring Comanche 3 before 2035 can save hundreds of millions of dollars. This is shown
18 in Table 2 below.

19
20
21
22
23

1 *Table 2: Comparison of Settlement and Conservation Coalition Portfolios with Comanche 3*
 2 *retirement prior to 2030*

SCC Optimized Portfolios			
\$0/ton 8760-dispatch			
50% ownership			
Portfolio	Settlement	CC3sett	CC6sett
Pawnee Action:	Convert EOY 2025	Convert EOY 2025	Convert EOY 2025
Comanche 3 Action:	Retire EOY 2039 Settlement Operations	Retire EOY 2029, Settlement Operations	Retire EOY 2027 Settlement Operations
2030 CO2 % Reduction			
	-87%	-90%	-90%
Cumulative CO2 Emissions, Delta vs CC0 (million tons)			
2021-2030	\$ -	\$ (1)	\$ (4)
2021-2040	\$ -	\$ (5)	\$ (7)
2021-2055	\$ -	\$ (5)	\$ (7)
PVRR Utility Cost 2021-2055 (\$M)			
	\$ 38,636	\$ 38,661	\$ 38,598
PVRR Utility Cost Delta vs. Settlement			
2021-2030 (\$M)	\$ -	\$ 41	\$ 28
2021-2040 (\$M)	\$ -	\$ 97	\$ (88)
2021-2055 (\$M)	\$ -	\$ 26	\$ (38)
NPV Comanche 3 Securitization (\$M)			
	included in PVRR	\$ (100)	\$ (122)
NPV CO2 2021-2055 (\$M)			
	\$ 7,930	\$ 7,682	\$ 7,540
NPV CO2 2021-2055 (\$M) Delta vs Settlement (\$M)			
	\$ -	\$ (247)	\$ (390)
PVRR Utility Cost + NPV CO2 + Securitization (\$M)			
	\$ 46,565	\$ 46,244	\$ 46,016
PVRR Utility Cost + NPV CO2 + Securitization Delta vs Settlement (\$M)			
2021-2055 (\$M)	\$ -	\$ (322)	\$ (550)
Resource Additions 2021-2030 (Nameplate MW)			
Wind	3,250	3,250	3,150
Utility-Scale Solar	1,150	1,100	1,100
Distributed Solar	1,158	1,158	1,158
Storage	1,000	1,150	1,150
Firm Dispatchable	588	1,176	980
Resource Additions 2021-2035 (Nameplate MW)			
Wind	4,450	4,400	4,250
Utility-Scale Solar	1,150	1,100	1,100
Distributed Solar	1,158	1,158	1,158
Storage	1,800	1,800	1,800
Firm Dispatchable	1,176	1,372	1,372

1 **Q. Did you conduct any modeling for this settlement testimony using the sensitivity**
2 **assumptions you used in your answer and cross-answer testimony?**

3 A. No. In my answer and cross answer testimony, the modeling results indicated that the
4 Conservation Coalition's preferred portfolios had direct customer costs (i.e., PVRR Utility Cost
5 values) approximately equal to, or slightly lower than, the Company's preferred portfolio under
6 different storage ELCC assumptions. Given the short amount of time between the filing of Mr.
7 Landrum's new modeling results on December 1 and the deadline for this testimony, I did not
8 have the time to model the sensitivity case with the lower energy storage ELCC assumption that
9 I presented in my answer and cross-answer testimony.

10 Had I modeled the sensitivity case, however, I am confident that the relative cost
11 differences between the settlement portfolio and the other portfolios I modeled would be similar
12 to the results presented here. The higher storage ELCC results in more storage procurement
13 versus natural gas in the model, but does not change the economics of coal retirement. This is
14 because procuring capacity from storage becomes more economic when the firm capacity of
15 storage is higher, as with the same money the model perceives a higher capacity contribution
16 towards the planning reserve margin. This dynamic between capacity resources (storage and
17 other firm dispatchable) will be important in Phase II and Conservation Coalition maintains its
18 position on the issue as stated in the answer testimony of Derek Stenclik. However, in Phase I, I
19 have shown that under both ELCC assumptions outlined, it remains more economic both in
20 terms of PVRR and PVRR + CO2 Costs to retire Comanche 3 prior to 2030. Whether by
21 replacing it with more storage and less gas, or more gas and less storage, the best and most
22 economic course of action is to retire Comanche 3 prior to 2030. The energy storage ELCC
23 assumption is relevant for the economics of coal retirement, but it is not driving the conclusions.

1 **Q. Given ambiguity in the settlement about which coal units will have the must-run**
2 **designations removed, did you model the impact of removing the must-run designations for**
3 **all the Company’s coal units at issue in this case?**

4 A. Yes. The settlement states expressly that the Company would commit to remove the
5 must-run designation for Comanche 3.⁶ But it is unclear whether the settlement is proposing to
6 remove the must-run designation for the Company’s other coal units, or only for Comanche 3. In
7 cross-answer testimony, the Conservation Coalition had recommended that the must-run
8 designations be removed for all the Company’s coal units at issue in this case (i.e., Comanche 3,
9 Pawnee, Craig 2, and Hayden 1 & 2).⁷ Given the ambiguity in the settlement about whether the
10 must-run designation would be removed for only Comanche 3, or all the Company’s coal units, I
11 modeled removal of the must-run designations for Comanche 3, Pawnee, Craig 2, and Hayden 1
12 & 2.

13 Removal of the must-run designations for the Craig and Hayden units prior to their
14 retirement (i.e., from 2022-2028) could result in additional cost and emission savings.
15 Specifically, when removing the must run designation of those coal units in CCEcon*, I project
16 additional savings of approximately \$7 million in PVRR alone and a reduction of 0.5 million
17 tons of CO₂ emissions. For all the coal units, removing the must run designation results in small
18 savings for the first years when no new resources are allowed, but cost and emissions savings
19 keep growing in later years when clean and less expensive energy comes online.

20
21

⁶ Settlement at 17(¶ 35(i)).
⁷ Hearing Exhibit 1407 at 41-42.

1 **III. ADDITIONAL CONCERNS WITH THE SETTLEMENT'S COAL ACTIONS**
2

3 **Q. Do you have any additional concerns with the settlement's coal actions?**

4 A. Yes. I am concerned that the ownership provision allowing the Company to own at least
5 \$626 million of replacement resources will increase costs and that Mr. Landrum's and my
6 modeling do not reflect this. Furthermore, I am concerned that the emissions and costs as
7 projected in the settlement modeling are highly uncertain. Finally, I am especially concerned
8 with the possibility of the approval of the Comanche 3 retirement by 2035 if the Commission
9 does not reevaluate the Comanche 3 retirement date in the next ERP.
10

11 **Q. Do your results likely underestimate how much more expensive the settlement will**
12 **be compared to the Conservation Coalition's preferred portfolio, because Mr. Landrum**
13 **did not model the impacts of the guarantee that the Company own \$626 million in**
14 **Comanche 3 replacement resources?**

15 A. Yes. As I noted above, Mr. Landrum acknowledges that his EnCompass modeling does
16 not account for the provisions in the settlement stating that a separate, standalone solicitation will
17 be used to replace Comanche 3 and that the Company will be guaranteed to own a minimum of
18 \$626 million of those replacement resources (provided there is a capacity need). This provision
19 will likely increase customer costs, but the precise amount of the cost increase is unknown,
20 because the Company did not model these provisions of the settlement.
21

22 **Q. Does the Company's modeling allow parties to make a rough estimate of the utility**
23 **ownership percentage that would result from the provision guaranteeing the Company**
24 **ownership of at least \$626 million in resources to replace Comanche 3?**

1 A. In his settlement testimony, Mr. Landrum did not attempt to calculate the dollar value of
2 the resources that replace Comanche 3 in his modeling of the settlement. However, in its direct
3 case, the Company presented the infrastructure investment from 2021-2030 for each portfolio it
4 modeled. Portfolios 5 and 6 differ only in the Comanche 3 retirement date, with portfolio 5
5 retiring Comanche 3 in 2029 and portfolio 6 retiring it in 2030. Thus, the difference in
6 investment should be attributable primarily, if not exclusively, to the resources that replace
7 Comanche 3 after it retires. Note that the Company provided the investment figures only
8 through 2030, and thus these figures may not fully capture the dollar value of all the resources
9 that replace Comanche 3.⁸

10 The Company's direct case shows that when the SCC is used in capacity expansion, there
11 is an additional \$823 million in capital investment through 2030 when Comanche 3 retires in
12 2029 compared to 2030.⁹ When the SCC is not used in capacity expansion, there is an additional
13 \$646 million in capital investment through 2030 when Comanche 3 retires in 2029 compared to
14 2030.¹⁰

15 Using these investment figures from the Company's direct case, the settlement provision
16 guaranteeing \$626 million in Company ownership of resources that replace Comanche 3 would
17 amount to the following percentage of utility ownership of Comanche 3 replacement resources:

- 18
- 97% utility ownership using the \$0/ton modeling results; or

⁸ When Comanche 3 retires in 2029 in SCC5, the Company has projected the need to invest in a 392 MW Combustion Turbine, and a dditional solar, wind, and storage (compared to SCC6). The settlement specifies that, at a minimum, the Company will own \$626 million in capital investment for resources necessary to replace the accredited capacity of Comanche 3. Based on this, I assume that under the settlement, among other resources, the Company would own the combustion turbine, resulting in additional costs of more than \$20 million for ratepayers from this asset alone compared to a no ownership requirement.

⁹ Hearing Exhibit 101, Attachment AKJ-1_Plan Overview, Rev. 2 at 45 (Comparing portfolio SCC 6 to portfolio SCC 5 in Table 1.5-3).

¹⁰ Hearing Exhibit 101, Attachment AKJ-1_Plan Overview, Rev. 2 at 53 (Comparing portfolio \$0/ton 6 to portfolio \$0/ton 5 in Table 1.5-8).

- 1 • 76% utility ownership using the SCC modeling results.¹¹

2 Please note that these should be treated as very rough approximations, given that the
3 actual dollar amount of resources needed to replace Comanche 3 is dependent on a number of
4 assumptions, including the date it is retired and replaced, the input assumptions used in the
5 modeling, and the exact portfolio of resources that replaces Comanche 3 and the settlement
6 proposal includes very limited information. I would welcome the Company providing more
7 precise information on this topic, but unfortunately, the Company's settlement testimony did not
8 address this issue.

9
10 **Q. Please elaborate on your concern about the uncertainty of costs and emissions as**
11 **modeled for the settlement coal actions.**

12 A. EnCompass modeling does not properly account for uncertainty both in terms of costs as
13 well as emissions. In terms of emissions, both Mr. Landrum's and my EnCompass modeling of
14 the settlement reflect Mr. Landrum's assumptions concerning how the settlement would be
15 implemented, which is one possible future, and does not account for other possibilities that
16 would still be consistent with the settlement as written but would result in very different
17 emissions and costs for ratepayers. I further explain my concern later in this section. In terms of
18 costs, there is still the probability that Comanche 3 will continue to experience operational
19 problems that result in additional costs, an uncertainty that is not fully captured within the model.
20 As long as Comanche 3 remains online, ratepayers are exposed to the risk of additional costs and
21 emissions.

22

¹¹ The 97% utility ownership value is calculated as: \$626 million/\$646 million. The 78% utility ownership value is calculated as: \$626 million/\$823 million.

1 **Q. Why are you concerned about the discrepancy between what the settlement actually**
2 **says and what Mr. Landrum assumes in his modeling?**

3 A. A large fraction of the incremental CO₂ emission reductions from the proposed
4 settlement come from the use of the SCC in dispatch and capacity factor limits. However, the
5 actual emission reductions are highly dependent on whether and how these operational practices
6 are implemented. And what Mr. Landrum assumes in his modeling is not what is actually
7 required by the proposed settlement.

8 Mr. Landrum assumes that the Company will use the SCC in dispatch from June 1, 2022
9 until December 31, 2023. But the proposed settlement does not require the Company to use the
10 SCC in dispatch for this period of time. Instead, the settlement states that the Company would
11 use the SCC in dispatch until it joins any kind of organized market. Thus, if the Company joins
12 an energy imbalance market prior to December 31, 2023, the use of the SCC in dispatch would
13 end—and the accompanying emission reductions would end as well, resulting in higher
14 emissions than Mr. Landrum modeled.

15 Mr. Landrum also assumes that the Company operates Comanche 3 below the capacity
16 factor targets in the settlement. But the settlement does not establish these capacity factor targets
17 as limits that can never be exceeded. Instead, they are targets, and the Company is allowed to
18 exceed the targets under certain circumstances. Thus, the actual emissions from Comanche 3
19 could exceed the emission level projected in Mr. Landrum's EnCompass modeling.

20

21 **Q. What are your other concerns with how the settlement proposes to use the SCC in**
22 **dispatch?**

23 A. One of my concerns is that the settlement proposes to use the SCC in the dispatch of a

1 system that was not built and optimized with the social cost of carbon in mind, and that the SCC
2 will be used before the Company can acquire new resources optimized based on the use of the
3 social cost of carbon.

4 The settlement proposes to use the SCC in dispatch starting in 2022 and through 2023.
5 The problem is that this is before most new resources can be acquired and brought online
6 through this ERP. That means that the current system will be dispatched by making carbon
7 emissions more expensive—but before large amounts of new, non-emitting resources can be
8 brought online to replace the carbon-emitting resources.

9

10 **Q. Is there also a problem with using the social cost of carbon in dispatch, but not using**
11 **the social cost of carbon to influence the retirement date for Comanche 3?**

12 A. Yes. As I noted in my prior testimony, in all of the Company's modeling, the Company
13 hard-wired the retirement date for Comanche 3, rather than allowing the model to select the
14 least-cost retirement date for Comanche 3. When I allowed EnCompass to select the retirement
15 date for Comanche 3, the model selected the earliest retirement date I allowed—which was 2025.
16 If the Company had conducted any modeling in which the model were able to select the
17 retirement date for Comanche 3, and had included the social cost of carbon in dispatch, the
18 model would have selected a retirement date prior to the 2035 retirement date in the settlement.

19 As I explained in my cross-answer testimony, the Company applied the SCC in the
20 selection of new resources but not in the retirement decision of the coal units (as these were
21 hard-wired in the SCC capacity expansion step). Thus, the Company's modeling in this case has
22 consistently made decisions about coal unit retirement dates using a different method than it has
23 used for decisions about which new generic resources to acquire. Instead of retiring the coal units

1 earlier, the Company is pursuing much more expensive ways of reducing emissions either by
2 having a cleaner replacement resource portfolio or by including costly operational restrictions
3 only to keep the unit longer.

4 This highlights the fundamental problem with the proposed settlement: the components
5 of the coal actions seem to have been selected independently of each other, rather than being
6 selected after the entire combination of actions had been modeled and compared to other
7 combinations of actions.

8

9 **Q. Are you saying that capacity factor targets and using the SCC in dispatch can never**
10 **be appropriate?**

11 A. No. My settlement testimony is limited to assessing the particular capacity factor targets
12 and SCC in dispatch proposed for Comanche 3 in this particular settlement, and comparing these
13 proposals in the settlement to the coal actions I recommended in my prior testimony. I am not
14 analyzing the pros and cons of capacity factor targets and use of the SCC in dispatch in general,
15 but instead am focused on the details of the particular proposal in this settlement.

16 I want to be clear that the emissions savings from the settlement's use of capacity factor
17 targets and SCC in dispatch come with a higher PVRR cost. The cost is lower than the societal
18 cost avoided, so their implementation could be justified from a societal perspective.

19 However, my modeling indicates that these operational restrictions are not the most cost-
20 effective option for reducing emissions. I have shown that portfolio CC6econ*, with accelerated
21 retirement of Comanche 3 and conversion of Pawnee, combined with economic cycling, can
22 deliver greater emissions reductions at significantly lower cost than the settlement. Moreover, the
23 emissions reductions from CC6econ* are more certain and less complex to implement and track

1 than the uncertain and complex operational restrictions in the settlement coal plan. In my
2 opinion, there is no doubt that the first course of action should be to retire Comanche 3 prior to
3 2030, convert Pawnee to gas by 2024, and remove those units' must-run designations.

4

5 **Q. If the Commission were to reject your recommendations and approve the settlement**
6 **provision retiring Comanche 3 by 2035, should the Commission instruct PSCo to**
7 **reevaluate the Comanche 3 retirement date in the next ERP?**

8 A. Yes. Comanche 3 came online barely more than ten years ago, in 2010. When it was
9 built, the Company projected that Comanche 3 would be online until at least 2070. But as the
10 Commission Staff's March 2021 Report concluded, Comanche 3 has cost more and run less than
11 expected, and suffered from a series of a forced outages that have made it the most unreliable
12 thermal unit in the Company's fleet. At the same time, renewable and storage prices have
13 plummeted, and regulatory pressures to reduce the emissions that contribute to climate change
14 have intensified.

15 The settlement proposes to set a retirement date for Comanche 3 that is 13 years out in
16 the future—this is longer than Comanche 3 has been in service. Given the dramatic changes
17 over the last decade that have upended the expectations for Comanche, it would be a mistake for
18 the Commission to set a retirement date for Comanche 3 that is 13 years in the future, without
19 revisiting that decision in the next ERP. Thus, if the Commission were to approve the
20 Comanche 3 retirement date in the settlement—which it should not do, for the reasons explained
21 above—the Commission should direct the Company to model retirement of Comanche 3 before
22 2030 in its next ERP, and to file its next ERP in time to preserve the ability to retire and replace
23 Comanche 3 before 2030.

1 **IV. CONCLUSION**

2
3 **Q. Please summarize your conclusions.**

4 A. In my answer and cross answer testimony I found that the Conservation Coalition
5 portfolios were achieving significantly higher emissions reductions than the Company's
6 preferred portfolio for the same cost. The settlement coal actions attempt to close the emissions
7 gap while still keeping the coal units online results in significantly higher costs. The EnCompass
8 modeling indicates that the Conservation Coalition's preferred portfolio, CC6econ*, has lower
9 CO₂ emissions and lower costs than the settlement coal actions.

10 Specifically, adopting portfolio CC6econ* would lead to:

- 11 • 4 million tons of additional CO₂ reductions compared to the settlement;
- 12 • \$206 million in direct customer savings compared to the settlement, when
13 securitization savings are excluded;
- 14 • \$328 million in direct customer savings compared to the settlement, when
15 securitization savings are included; and
- 16 • \$521 million in savings when CO₂ costs and securitization savings are included in
17 the PVRR.

18
19 **Q. Please summarize your recommendations.**

20 A. I recommend the Commission adopt the coal actions in portfolio CC6econ*: conversion
21 of Pawnee to burn gas by December 31, 2024; retirement of Comanche 3 by December 31, 2027;
22 and removal of the must-run designations for both Pawnee and Comanche 3 so that both units
23 can be dispatched economically.¹² If the Commission does not follow my recommendation and

¹² To the extent the settlement does not remove the must-run designations for Craig and Hayden, I recommend

1 instead chooses to approve the coal actions in the settlement, I strongly recommend that the
2 Comanche 3 retirement date be revisited in the next ERP with updated information about
3 technology costs, Comanche performance, modified operations, climate damage costs and
4 transmission availability.

5

6 **Q. Does this conclude your testimony?**

7 A. Yes.

removal of the must-run designations for those coal units as well, given that the modeling shows that doing so would reduce emissions and the PVRR.

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

**IN THE MATTER OF THE
APPLICATION OF PUBLIC SERVICE
COMPANY OF COLORADO FOR
APPROVAL OF ITS 2021 ELECTRIC
RESOURCE PLAN AND CLEAN
ENERGY PLAN**

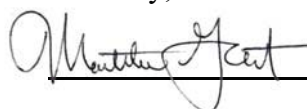
PROCEEDING NO. 21A-0141E

AFFIDAVIT OF DR. MARIA ROUMPANI

I, Dr. Maria Roumpani, state that the above Settlement Testimony in Proceeding No. 21A-0141E was prepared by me or under my supervision and control. The testimony is true and correct to the best of my knowledge and belief. I would give the same testimony orally and would present the same attachments if asked under oath before the Commission.



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Signature of Counsel