

BEFORE THE PUBLIC UTILITIES COMMISSION OF COLORADO

Docket No. 10M-245E

IN THE MATTER OF COMMISSION CONSIDERATION OF PUBLIC SERVICE
COMPANY OF COLORADO PLAN IN COMPLIANCE WITH HOUSE BILL 10-1365,
“CLEAN AIR –CLEAN JOBS ACT”

ANSWER TESTIMONY OF JOHN NIELSEN

September 17, 2010

(corrected September 21, 2010)

1 **I. PURPOSE AND SUMMARY**

2 **Q. Please state your name, occupation, and business address.**

3 A. My name is John Nielsen. My business address is 2260 Baseline Road, Suite 200,
4 Boulder, Colorado 80302.

5
6 **Q. By whom are you employed and in what capacity?**

7 A. I am the Energy Program Director for Western Resource Advocates (WRA), a non-profit
8 conservation organization working to protect and restore the natural environment of the
9 Interior American West. WRA’s Energy Program works to develop and implement
10 policies to reduce the environmental impacts of the electric power industry in the Interior
11 West by promoting the expanded use of renewable energy, energy efficiency, and other
12 clean energy resources in an economically sound manner. My qualifications are included
13 as Attachment A to this testimony.

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Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of Western Resource Advocates.

Q. Have you previously testified before this Commission?

A. Yes, I have testified before the Commission in proceedings concerning Public Service Company of Colorado’s (“Public Service” or “Company”) 1996 Integrated Resource Plan (IRP), Public Service’s 1999 IRP, Public Service’s 2003 Least Cost Plan and Public Service Company’s 2007 Electric Resource Plan as well as Public Service’s Windsource Program.

Q. What is the purpose of your testimony?

A. My testimony is provided to present WRA’s policy position in this case and to introduce other WRA witnesses and show how their testimonies helped shape our positions.

Q. Can you briefly summarize WRA’s overall position on Public Service’s Emissions Reduction Plan?

A. Overall, WRA is encouraged by the plan filed by Public Service. It is clear that Public Service is taking seriously the need to reduce emissions from its coal-fired power plants and begin a transition to cleaner sources of power. Given the short time the Company had in which to develop the plan, it is impressive for its thoroughness, the breadth and depth of the subjects it addresses as well as its overall quality. In particular, WRA is pleased that the plan includes the early retirement of Cherokee 1 in 2011, the retirement of Cherokee 2 at the end of 2011 or early 2012, the closure of Arapahoe 3 and the conversion of Arapahoe 4 from coal to a gas-fired peaking unit in 2013 and the

1 retirement of Valmont 5 and Cherokee 3 and 4. While we strongly support the overall
2 direction of Public Service's plan and many of its components, we believe that there are
3 opportunities to improve it.

4
5 **Q. In what ways does WRA believe the plan might be improved?**

6 A. We believe the retirement of Cherokee 4 should be advanced to the end of 2017 and the
7 retirement of Cherokee 3 advanced to the end of 2015. This can be done in a way that
8 maintains system reliability, results in a comparable or lower present value of revenue
9 requirements over the planning period, and yields significantly increased environmental
10 benefits. We believe these modifications would result in an appreciable improvement to
11 the Company's plan.

12
13 **Q. Please summarize WRA's recommendations to the Commission in this case.**

14 A. WRA recommends that the Commission:

- 15 • Approve the retirement of Valmont 5 and Cherokee 1-2 as proposed by the Company;
- 16 • Approve the Company's proposal to retire Arapahoe 3 in 2013 and to convert
17 Arapahoe 4 from coal to a gas-fired peaking unit in 2013;
- 18 • Approve the Company's proposal to construct a 569 MW combined-cycle unit at the
19 Cherokee site to be on-line by 2015;
- 20 • Approve the retirement of Cherokee 3 and Cherokee 4 but modify the Company's
21 plan to accelerate the retirement of Cherokee 4 to 2017 and Cherokee 3 to 2015;
- 22 • Approve the installation of 108 MVar of static var compensators in the 2011-2012
23 period at or near the Cherokee site to provide the additional reactive power that will
24 be needed with the earlier retirement of the Cherokee coal units;
- 25 • Postpone determination of replacement resources for the second combined-cycle
26 proposed by Public Service at the Cherokee site until the 2011 Electric Resource Plan
27 (ERP);
28

1 • Determine that the \$20/ton and \$40/ton CO₂ prices that PSCo has used in its
2 modeling analyses reasonably reflect the knowledge and uncertainties associated with
3 the timing and stringency associated with future limitations on greenhouse gas
4 emissions and determine that it is unreasonable to assume a \$0/ton CO₂ price for
5 resource planning analyses;

6 • Determine that any natural gas generation, energy efficiency or renewable resources
7 approved as part of Public Service’s 2011 ERP, and that are needed to supply
8 capacity and energy that would have otherwise been provided by the second
9 Cherokee combined-cycle plant proposed by Public Service in its preferred plan,
10 should receive at least as favorable treatment as that proposed by the Company for
11 that combined-cycle plant.

12 **Q. How is the remainder of your testimony organized?**

13 A. My testimony is organized as follows:

- 14 • First, I discuss my understanding of the legislative backdrop to this case;
- 15 • Second, I introduce WRA’s other witnesses in this case;
- 16 • Third, I discuss why WRA strongly supports the Company’s proposal to retire the
17 Cherokee and Valmont coal plants;
- 18 • Fourth, I discuss WRA’s recommendations to modify the Company’s preferred plan
19 to allow the Company to accelerate the retirement of Cherokee 4 from 2022 to 2017
20 and Cherokee 3 from 2017 to 2015, and summarize the cost savings and
21 environmental benefits this proposal yields.

22

23 **II. THE COLORADO CLEAN AIR – CLEAN JOBS ACT**

24

25 **Q. Please briefly describe the Colorado Clean Air-Clean Jobs Act (“Act”) as you**
26 **understand it.**

27 A. The Act provides a framework for Colorado’s investor-owned utilities to reduce air
28 pollution from coal-fired power plants to comply with regional haze requirements under

1 the Federal Clean Air Act and other reasonably foreseeable air quality regulations. Under
2 the Act Public Service is required to develop an emission reduction plan for approval by
3 the Colorado Public Utilities Commission and Air Quality Control Commission. The
4 Public Service plan must cover, at a minimum, 900 MW of the Company's coal-fired
5 generating capacity and must reduce emissions of oxides of nitrogen from the coal units
6 included in the plan by at least 70-80% from 2008 levels by the end of 2017. As part of
7 an emission reduction plan, the Act encourages utilities to retire aging coal-fired power
8 plants and replace them with natural gas generation or other low emitting resources.

9
10 **Q. Why did this legislative initiative arise?**

11 A. The driving force behind the legislation is the fact that, over the next several years, the
12 U.S. Environmental Protection Agency will require the state of Colorado and other states
13 to comply with a series of air quality requirements under the Clean Air Act. By 2018
14 coal-fired power plants and other sources of emissions will be required to reduce
15 emissions to comply with, among other things, regional haze, ozone non-attainment,
16 standards for fine particulates, SO₂ and NO_x, and requirements to address mercury and
17 other toxic air pollutants. Coal plants will also be subject to other requirements,
18 including regulations to manage fly ash and water discharges. Finally, the need to
19 address climate change means that coal plants will almost certainly be required to reduce
20 emissions of carbon dioxide either through regulation pursuant to the Clean Air Act or
21 pursuant to new legislation.

22 Seeing these requirements coming, policy makers in Colorado believed that a
23 coordinated, comprehensive approach to reducing emissions would likely result in

1 superior environmental performance at lower cost than a piecemeal approach. These
2 considerations drove the legislation.

3
4 **III. WESTERN RESOURCE ADVOCATES' WITNESSES**

5
6 **Q. Can you please identify WRA's other witnesses in this proceeding and summarize**
7 **the testimony they provide?**

8 A. WRA is sponsoring the testimony of eight other witnesses in this docket.

9 Mr. Jeff Palermo, an electrical engineer and Executive Consultant with KEMA
10 Incorporated, addresses system reliability and transmission issues related to the emission
11 reduction plan. Mr. Palermo's testimony shows that not all of the generating capacity
12 proposed at the Cherokee site under the Company's preferred plan is needed to maintain
13 system reliability. In particular, he testifies that the necessary reactive power will be
14 present, the "three-source principle" will be met, and the real power generation capacity
15 necessary to address thermal constraints on the transmission system will exist without the
16 need to construct a second combined-cycle natural gas plant at the Cherokee site. He
17 recommends the installation of 108 Mvar of static var compensators (4x27) at or near the
18 Cherokee site in lieu of converting Cherokee 2 to a synchronous condenser for purposes
19 of providing adequate reactive power. As a result, Mr. Palermo concludes that Cherokee
20 4 can be economically retired by the end of 2017 without jeopardizing system reliability.

21 Mr. David Schlissel, President of Schlissel-Technical Consulting, addresses
22 production cost modeling issues and how best to meet the energy and capacity needs on
23 Public Service's system resulting from the proposed retirement of the coal plants.

1 Building on Mr. Palermo's testimony, Mr. Schlissel testifies that, without the need for a
2 second combined-cycle plant at the Cherokee station to maintain system reliability,
3 neither the Company nor the Commission need to make a final commitment *in this case*
4 to resource replacements for Cherokee 4. Instead, the Company and the Commission
5 should wait until Public Service's 2011 Electric Resource Plan to determine how best to
6 replace the energy and capacity from Cherokee 4. To provide the Commission comfort
7 that Cherokee 3 and 4 retirements can be advanced in time without adverse economic or
8 electrical consequences, Mr. Schlissel describes a backstop plan that would convert Fort
9 St. Vrain combustion turbines 5 and 6 to combined-cycle operation. Given this backstop
10 plan, his testimony concludes that the Commission can be confident that an alternative
11 that is as cost effective and more environmentally sound than continuing to operate
12 Cherokee 4 until 2022 exists and can be relied on by the Company.

13 Mr. Schlissel's testimony goes on to discuss several issues concerning the
14 Company's Strategist modeling. These include: 1) why the \$20 per ton and \$40 per ton
15 CO₂ prices that Public Service has used in its modeling analyses reasonably reflect the
16 knowledge and uncertainties associated with the timing, stringency and design of federal
17 regulation of greenhouse gas emissions, and why it unreasonable to assume a \$0 per ton
18 CO₂ price in resource planning analyses; 2) why the Company's future coal cost
19 estimates appear to be too low; 3) why the Company's modeling treatment of
20 interruptible loads may inappropriately lead to excess required reserves; and 4)
21 opportunities for renewable energy and energy efficiency to replace the capacity and
22 energy of a retired Cherokee 4 as part of the 2011 resource plan.

1 Dr. Leland Deck, Managing Economist at Stratus Consulting, describes the
2 public health benefits from reduced fine particulate formation associated with reductions
3 of sulfur dioxide and nitrogen oxide emissions from the coal power plants included in the
4 Company's emission reduction plan. His testimony shows that emission reduction
5 strategies that rely more heavily on coal plant retirements yield greater benefits than the
6 retrofit strategy of the benchmark scenario. He also shows that there are significant
7 additional public health benefits of accelerating the retirements of Cherokee 3 and
8 Cherokee 4.

9 Dr. Paulette Middleton, President of Panorama Pathways, discusses other local
10 environmental benefits associated with reducing emissions from the coal power plants
11 included in the Company's Emissions Reduction Plan, including reductions in ground
12 level ozone, mercury pollution, regional haze and nitrogen deposition, and discusses how
13 these benefits would be increased by accelerating the retirement of Cherokee 3 and 4.

14 Mr. Michael Dirmeier, Principal at Georgetown Consulting, analyzes the revenue
15 requirements of Public Service's preferred plan relative to WRA's backstop. Mr.
16 Dirmeier's testimony shows that, on a net present value basis, the revenue requirements
17 over the planning period of WRA's backstop plan, that includes the earlier retirement of
18 Cherokee 3 and 4, are comparable to or slightly lower than the Company's preferred plan.
19 He shows that if public health benefits are considered, the costs of the WRA backstop are
20 even lower.

21 Dr. Nathaniel Keohane, Chief Economist at Environmental Defense Fund,
22 discusses the broad economic and societal benefits of reducing carbon dioxide emissions.
23 He also describes the significant economic and social consequences of failure to take

1 action on climate change. His testimony explains why it is prudent to consider CO₂ costs
2 in utility resource decisions.

3 Mr. Eric Schaeffer, Director of the Environmental Integrity Project, identifies
4 additional future regulations, beyond those considered by the Company in this case, that
5 increase the environmental risks associated with continuing to operate conventional coal
6 plants. These regulations include those governing coal ash and wastewater discharges
7 from coal plants. He testifies that retirement of coal plants as proposed by Public Service
8 will avoid the generation of large volumes of waste and wastewater discharges associated
9 with those plants, which provides additional environmental benefits from the retirements.

10 Ms. Stacy Tellinghuisen, Energy/Water Analyst at Western Resource Advocates,
11 explains the importance of the coal plant retirements for conserving Colorado's scarce
12 water resources. She explains that the South Platte River and its tributaries, the source for
13 the cooling water for the Cherokee and Valmont coal plants, support growing
14 municipalities, agriculture, and environmental needs, in addition to industrial uses like
15 electric power generation. She shows that retiring the coal plants as proposed by Public
16 Service would save large amounts of water which could be used for other purposes
17 including providing important environmental benefits on the South Platte River and its
18 tributaries where current uses greatly impact stream flows, and satisfying growing urban
19 demand. Finally, she explains that accelerating the retirement of Cherokee Units 3 and 4
20 would make water available at a critical point in time, when cities project a "gap"
21 between supplies and demands.

22

23

1 **IV. SUPPORT FOR COAL PLANT RETIREMENTS**

2

3 **Q. Do you support Public Service’s plans to retire the Valmont and Cherokee coal**
4 **plants, accelerate the retirement of Arapahoe 3 and convert Arapahoe 4 from coal**
5 **to a gas-fired peaking unit?**

6 A. Yes, with the exception that we believe the 2022 retirement date for Cherokee 4 should
7 be accelerated to 2017 and the retirement date for Cherokee 3 should be accelerated to
8 2015, WRA strongly supports the Company’s proposal to retire these coal plants.

9

10 **Q. Why?**

11 A. There are a number of reasons. First, there are important public health and environmental
12 benefits that will result from retiring these plants. These benefits are described in detail
13 in Dr. Deck’s and Dr. Middleton’s testimonies. Second, retiring these plants will reduce
14 CO₂ emissions and help Colorado contribute to combating climate change. Dr. Keohane
15 discusses these issues in detail in his testimony. Third, as described in Ms.
16 Tellinghuisen’s testimony, retiring the plants will conserve Colorado’s scarce water
17 resources. Fourth, retirement of the plants will eliminate the coal ash produced by these
18 plants and waste water discharges, which provides important environmental benefits.
19 Fifth, retirement of these plants and replacement of some portion of their capacity and
20 energy with modern natural gas units can facilitate the integration of larger amounts of
21 renewable energy on the Company’s system.

22

1 **Q. Please summarize the public health benefits of retiring these plants.**

2 A. Retiring these plants will result in reductions of harmful air pollutants, especially sulfur
3 dioxide, oxides of nitrogen and mercury. As described in Dr. Deck's testimony, SO₂ and
4 NO_x contribute to the formation of fine particulates with well-known adverse human
5 health impacts, including premature death, and increased emergency room visits, asthma
6 attacks and incidents of respiratory symptoms. Children, the elderly and individuals with
7 pre-existing cardiopulmonary diseases are most at risk. The adverse impacts of these
8 emissions are particularly significant for the Arapahoe, Cherokee and Valmont plants
9 because they are located in the heart of the highly-populated Denver metropolitan area.

10

11 **Q. Beyond the benefits of reduced fine particulates are there other public health and**
12 **local environmental benefits of reducing NO_x and SO₂ emissions?**

13 A. Yes. As described in Dr. Middleton's testimony, NO_x contributes to the formation of
14 ground-level ozone, a pollutant of concern for human health. NO_x also contributes to the
15 deposition of nitrogen in forests, soils and water bodies, which threatens Colorado's
16 ecosystems. This problem is particularly acute at Rocky Mountain National Park, where a
17 joint state and federal effort is underway to address the problem. Fine particulates formed by
18 SO₂ and NO_x emissions also cause haze that mars the grandeur of Colorado's spectacular
19 vistas.

20

21 **Q. Are there benefits associated with the lower mercury emissions and toxic air**
22 **pollutants that will result from the coal plant retirements?**

23 A. Yes. As Dr. Middleton describes in her testimony, mercury is a neurotoxin that, when
24 emitted into the atmosphere from coal-fired power plants, can end up in water bodies.

1 Once there it can be transformed into toxic methylmercury by bacteria in sediments. The
2 methylated mercury accumulates in the aquatic food chain and can be bio-accumulated to
3 toxic levels in fish. People consuming fish contaminated by mercury are then exposed to
4 unsafe levels of this neurotoxin, with fetuses and children especially at risk. As noted by
5 Dr. Middleton, mercury is already present in fish in water bodies throughout Colorado
6 above the mercury action level of 0.5 parts per million set by the state health department.
7 Dr. Middleton also explains that emissions from coal plants contain other hazardous air
8 pollutants and that those emissions will be eliminated when the plants are retired.

9
10 **Q. Why are the reductions in carbon dioxide emissions associated with the coal plant**
11 **retirements important?**

12 A. Carbon dioxide is the principal greenhouse gas associated with climate change. As
13 summarized in Dr. Keohane's testimony, a great body of scientific evidence shows that
14 climate change is real, that it is already occurring and that allowing CO₂ and other
15 greenhouse gas emissions to increase unchecked will likely have dramatic economic and
16 social consequences. Dr. Keohane describes the economic studies which have examined
17 the economic effect of taking action on climate change as against inaction and concludes
18 that taking action now to address climate change is economically rational.

19
20 **Q. Isn't climate change a phenomenon that ultimately will require action by countries**
21 **and emitters of greenhouse gases around the world?**

22 A. Yes, it is.
23

1 Q. **What is the benefit of the Company taking action to reduce its emissions of carbon**
2 **dioxide when there is no assurance that the rest of the world will follow?**

3 A. There are many benefits. Dr. Keohane's testimony elaborates on these benefits. I will
4 highlight three of them. First, taking such action will reduce exposure of the Company's
5 customers to the higher costs of burning coal to generate power when policy changes
6 attach an economic penalty to emissions of carbon dioxide. Dr. Keohane testifies that
7 these policy changes are highly likely in the not-too-distant future. Second, while
8 reduction of carbon dioxide emissions resulting from Public Service's Emissions
9 Reduction Plan cannot solve the global warming problem by themselves, they can
10 contribute to the solution. Even more importantly, Public Service's plan can serve as a
11 model for other utilities showing that meaningful reduction in greenhouse gas emissions
12 can be made cost-effectively and in a relatively quick time frame, while maintaining a
13 reliable electric system.

14
15 Q. **How will the coal plant retirements help conserve Colorado's scarce water**
16 **resources?**

17 A. As discussed in Ms. Tellinghuisen's testimony, retiring these coal plants would save at
18 least 5,240 acre-feet (1.7 billion gallons) of water annually, which could be used to meet
19 the needs of 52,000 local residents or provide important environmental benefits on the
20 South Platte River and its tributaries where current uses greatly impact stream flows. She
21 estimates that the value of the water rights for these plants could be \$86 million or higher.

22

1 **Q. What are the environmental benefits from reduced solid waste and water discharges**
2 **from retiring coal plants?**

3 **A.** As explained by Mr. Schaeffer, coal ash contains a number of toxic metals that can pose
4 risks to the environment and public health, and as a result, the regulation of ash is under
5 increased regulatory scrutiny. When a coal plant is retired, the retirement eliminates the
6 generation of coal combustion wastes at that plant. The plants that Xcel proposes to
7 retire in scenario 6.1E generated more than 340 tons per year, on average in 2008 and
8 2009. Retiring these units will eliminate the generation of this huge amount of waste,
9 which provides important benefits to the environment. The retirements would also
10 mitigate the discharge of water pollution from the plants, which is also under increased
11 regulatory scrutiny due to toxic constituents that are often associated with the discharge
12 of wastewater from coal plants.

13
14 **Q. How would replacing a portion of the Company's coal fleet with modern natural gas**
15 **generating capacity help integrate renewable resources into the Company's system?**

16 **A.** Renewable resources like wind and solar facilities produce electricity that can vary
17 widely over small time increments. For an electric system to integrate large amounts of
18 variable renewable energy, the system must be flexible, in other words capable of quickly
19 ramping up and down to accept large amounts of renewable energy or to replace such
20 energy when wind or solar power is unavailable. Natural gas units have much faster
21 ramp-up and ramp-down capabilities than coal units. As a result, the replacement of coal
22 fired generation capacity with natural gas capacity adds flexibility to the system, to the
23 benefit of the generation of renewable energy.

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V. THE VIABILITY AND BENEFITS OF ACCELERATING THE RETIREMENTS OF CHEROKEE UNITS 3 AND 4

Q. You have indicated that the Company’s preferred plan could be improved by accelerating the retirement of Cherokee 4 from 2022 to 2017 and the retirement of Cherokee 3 from 2017 to 2015 and that WRA is proposing that the Company modify its plan in this way. Please explain the basis of WRA’s proposal.

A. The core rationale behind WRA’s proposal is that, if the Company does not need to build a second combined-cycle unit at the Cherokee site, construction logistics problems, which are a basis of postponing retirement of Cherokee 4 until 2022, do not exist. In addition, so long as the first 569 MW combined-cycle unit is on-line at the site by the summer of 2015, the Company will have added enough new generating capacity to retire the Cherokee 3 unit by the end of 2015.

Q. Public Service has argued that a second combined-cycle unit at the Cherokee site is needed to maintain system reliability. Why does WRA believe that the second combined-cycle at the Cherokee site is not needed?

A. As Mr. Palermo shows, the Cherokee site needs only a minimum of 500 MW of real-power generation capacity to avoid significant thermal overload problems on the transmission system. The planned first 2X1 CC at Cherokee of 569 MW is sufficient for these purposes. He also shows that by adding 108 Mvar of static var compensators at or near the Cherokee site, the system’s need for reactive power can be met not only without

1 the second CC unit but also without converting Cherokee 2 to a synchronous condenser.

2 In addition, as Mr. Schlissel testifies, the capacity and energy needs that would be met by
3 the second combined-cycle at the Cherokee site could be provided by other resources in
4 other locations.

5

6 **Q. What are these alternative resources?**

7 A. There are a variety of available alternatives, including energy efficiency, renewable
8 energy, relying on existing independent power producer-owned units, converting existing
9 combustion turbines to combined-cycle operation, or building new natural gas combined-
10 cycle plants or combustion turbines.

11

12 **Q. How should the proper alternative to the second combined-cycle plant at Cherokee
13 be determined?**

14 A. While an alternative could be selected in this case with reference to the information the
15 Company has submitted, WRA believes it is best to await Public Service's filing in the
16 2011 Electric Resource Plan case.

17

18 **Q. Why is that?**

19 A. Public Service's system requirements do not require an immediate determination of an
20 alternative. In the 2011 Electric Resource Plan the whole range of resource alternatives
21 will be before the Company and the Commission, and the relative costs and benefits of
22 these resources can be assessed in a more comprehensive manner than is permitted under
23 the time constraints in this proceeding. In addition, by that time new information

1 concerning renewable resources and energy efficiency should be available that can used
2 in the development of the next resource plan. For example, as discussed in Mr.
3 Schlissel's testimony, the Commission's resolution of the issues currently being
4 addressed in the DSM strategic issues docket can inform the decision on the timing and
5 size of any new generating capacity that would be needed if the second combined-cycle
6 unit is not to be built. Similarly, the Company's ongoing renewable energy integration
7 study as well as information on the level of retail distributed generation from the
8 Renewable Energy Compliance Plan scheduled to be filed in May 2011 will also provide
9 information that bears on alternatives to a second combined-cycle plant at the Cherokee
10 site.

11
12 **Q. What happens if the 2011 Resource Plan does not identify sufficient new energy**
13 **efficiency, renewable energy or other resources to replace the second combined-**
14 **cycle which the Company wants to build at Cherokee?**

15 A. While I think this is unlikely, especially given the history of successful resource
16 acquisitions in previous resource planning proceedings and that this replacement capacity
17 does not have to be in place until the end of 2017, if that were the case our
18 recommendation is that the Company convert the Fort St. Vrain 5 and 6 combustion
19 turbines to combined cycle capacity. In essence the Fort St. Vrain combustion turbine
20 conversion would serve as a "backstop" to the resource planning process.

21
22 **Q. Would WRA's backstop plan provide adequate capacity by 2017 to replace all of the**
23 **retired coal plants?**

1 A. Yes. As discussed in Mr. Schlissel's testimony, by the end of 2015 the backstop plan
2 includes 680 MW of replacement capacity (the 569 MW 2X1 combined-cycle unit at
3 Cherokee and the 111 MW Arapahoe 4 gas-peaker). This is more than enough capacity
4 to replace the 365 MW from Cherokee units 1-3 that would be retired by that time. By
5 the end of 2017 an additional 538 MW of coal will be retired (the 352 MW Cherokee 4
6 unit and the 186 MW unit at Valmont). However, by that time at least an additional 245
7 MW of replacement capacity will be available due to the conversion of the Fort St. Vrain
8 combustion turbines to combined-cycle operation. Thus, by the end of 2017 at least 925
9 MW of capacity will be available to replace the 903 MW of capacity that the Company
10 would be retiring at Cherokee 1-4 and Valmont 5.

11

12 **Q. Were you able to compare the costs of the WRA proposal to the Company's**
13 **preferred plan?**

14 A. Because our proposal calls for determining the resources that would be acquired to
15 replace the Cherokee 4 coal plant as part of the 2011 resource plan we are unable to say
16 at this point what exactly those resources would be or what exactly they would cost.
17 Using the Company's Strategist modeling performed in this case as a starting point,
18 however, we were able to estimate the costs of the backstop plan that relies on the Fort
19 St. Vrain combustion turbine conversion as a replacement resource for Cherokee 4
20 instead of resources chosen in the 2011 resource plan. The costs of relying on the Fort St.
21 Vrain conversion can be thought of as an upper bound on the costs of the WRA proposal,
22 since, if more cost-effective resources are identified in the 2011 Electric Resource Plan
23 docket, they could be acquired instead.

1

2 **Q. Can you describe how the Company's Strategist modeling was used as a starting**
3 **point to assess the cost of the WRA's backstop proposal?**

4 A. Yes. Public Service examined numerous scenarios as part of the development of its
5 Emissions Reduction Plan. The scenario that is closest to the WRA Fort St. Vrain
6 backstop proposal is Scenario 6H. Like the WRA proposal, Scenario 6H retires
7 Cherokee 3 in 2015, includes both the 2X1 Cherokee combined-cycle unit and the Fort
8 St. Vrain combustion turbine conversion as replacement resources for the retired coal
9 capacity, and does not include a second combined-cycle unit at the Cherokee site.
10 Scenario 6H also accelerates the retirement of Cherokee 4 from 2022, but only to the end
11 of 2018.

12 Using scenario 6H as a starting point, WRA made the following revisions to
13 develop its proposal. First, we advanced the retirement of Cherokee 4 from 2018 to
14 2017. Second, we removed the Cherokee peaking unit because, as shown in Mr.
15 Schlissel's testimony, it is not required as part of the replacement capacity for the coal
16 plants. Finally, to provide the necessary reactive power needed to maintain system
17 reliability (due to having fewer generators at the Cherokee site), we replaced the
18 Cherokee 2 synchronous condenser with four 27 Mvar static var compensators, as
19 described in Mr. Palermo's testimony. We then adjusted the costs of scenario 6H to
20 reflect these revisions. We refer to this backstop plan as WRA Scenario 6H-Revised.

21

22 **Q. How do the costs of WRA's 6H-Revised scenario compare to Public Service's**
23 **preferred plan?**

1 A. As described in Mr. Dirmeier's testimony, the present value of revenue requirements over
2 the 2010-2046 planning period of WRA's Scenario 6H-Revised are \$68 million lower
3 than the Company's preferred scenario.
4

5 **Q. Can you put this figure in perspective?**

6 A. Yes. While the costs of Scenario 6H-Revised are \$68 million lower than the costs of the
7 Company's preferred plan, on a percentage basis the difference is only -0.1%. Thus, in
8 terms of costs as measured by the present value of revenue requirements, the two plans
9 are virtually equivalent.

10
11 **Q. Are there additional public health, and environmental benefits associated with**
12 **WRA's 6H-Revised scenario?**

13 A. Yes. Because Scenario 6H-Revised involves the earlier retirement of Cherokee 4 in
14 2017 and Cherokee 3 in 2015, when compared to Company Scenario 6.1E, it has
15 substantially lower NOX and SO2 emissions by 2018 and until 2022. Starting in 2023
16 the annual emissions from the two plans become similar due to the retirement of
17 Cherokee 4 under Scenario 6.1E. For example, compared to 2010 levels, by 2018, WRA
18 6H-Revised reduces NOX emissions by 90% compared to the 79% reductions in NOX
19 with Scenario 6.1E. In 2018, WRA 6H-Revised reduces SO2 emissions by 86%, while
20 such emissions are reduced by 78% under Scenario 6.1E. In addition, WRA Scenario
21 6H-Revised results in approximately 50 pounds of additional mercury reductions over the
22 2010-2046 planning period, almost all of which occurs prior to 2023.

23 Moreover, as discussed in Dr. Middleton's testimony, these additional emission
24 reductions associated with the earlier retirements of Cherokee 3 and 4 under WRA

1 Scenario 6H-Revised lead to greater reductions in ozone, haze, nitrogen deposition, and
2 mercury deposition and, as a result, increased human health and environmental benefits
3 for the state of Colorado. For these reasons, the WRA alternative is superior to Public
4 Service's preferred alternative from a human health and environmental standpoint.

5
6 **Q. Has WRA quantified any of the increased public health benefits of its proposal?**

7 A. Yes. The analysis presented in Dr. Deck's testimony quantifies the increased public
8 health benefits associated with changes in ambient fine particulate matter that results
9 from reducing SO₂ and NO_x under various scenarios. His analysis shows that,
10 compared to Company Scenario 6.1E, the lower cumulative NO_x and SO₂ emissions
11 under Scenario 6H-Revised are worth an additional \$74 million, when measured on a net
12 present value basis over the planning period.

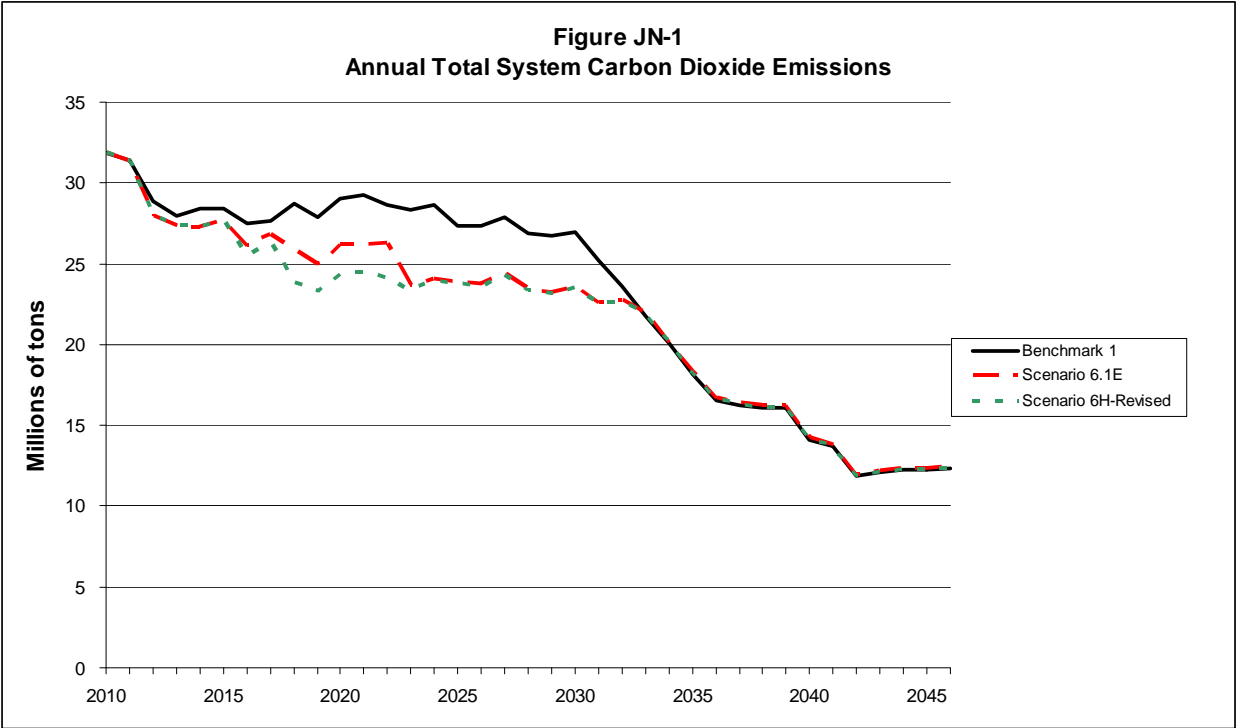
13
14 **Q. When these public health benefits are included in the cost analysis how does WRA's
15 Scenario 6H-Revised compare to Public Service's preferred plan?**

16 A. As shown in Mr. Dirmeier's testimony, when the value of these health benefits is
17 included, the cost savings of WRA's 6H-Revised over the Company's 6.1E increase from
18 \$68 million over the planning period to \$142 million.

19
20 **Q. Are there additional carbon emission reduction benefits associated with the WRA
21 Scenario 6H-Revised?**

22 A. Yes. As shown in Figure JN-1, the earlier retirements of Cherokee 3 and 4 in Scenario
23 6H-Revised result in considerably fewer CO₂ emissions than the Benchmark 1 scenario

1 and the Company’s preferred 6.1E scenario. Over the 2010-2046 planning period, CO₂
2 emissions under WRA Scenario 6H-Revised are 64.7 million tons lower than under the
3 Benchmark 1 scenario and 13.2 million tons lower than under Scenario 6.1E.



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6 **Q. Does WRA’s 6H-Revised scenario also provide additional water savings benefits?**
7 **A.** Yes. As described in Ms. Tellinghuisen’s testimony, accelerating the retirement of
8 Cherokee Units 3 and 4 would make additional water available at a critical point in time,
9 when cities project a “gap” between supplies and demands.

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VI. CONCLUSIONS

Q. In Section I you presented WRA’s recommendation to the Commission in this case. Do you have any concluding thoughts that you wish the Commission to consider?

A. Yes I do. I think that the Company is to be commended for the effort it made in making its filing in this case. The Company has put forth a thoughtful plan with many benefits. However, we believe that the plan can be modified in ways that provide significantly greater public health and environmental benefits and a more robust approach to hedging the risk of climate change regulation. Moreover, these benefits can be achieved at comparable or lower cost than the Company’s plan.

Under the terms of the Clean Air-Clean Jobs Act the Commission can modify the Company’s Plan to implement WRA’s recommendations. However, modifications to the Company’s Plan also permit the Company to withdraw its Application, an outcome that would be very discouraging. For that reason, WRA also asks that, in addition to modifying the Company’s Plan pursuant to WRA’s recommendation, the Commission authorize reasonable ratemaking or other mechanisms to ensure that the Company is not harmed financially, relative to its preferred plan, by the adoption of our recommendations.

Q. Does this conclude your testimony?

A. Yes.