

Direct Testimony and Exhibits  
Dr. Robert Pearson

Before the Public Service Commission  
of the State of Wyoming

Joint Application of  
Cheyenne Light, Fuel and Power Company and Black Hills Power, Inc.  
For a Certificate of Public Convenience  
and Necessity for a Gas-Fired  
Electric Generating Power Plant and  
Related Facilities

Docket No. 20003-\_\_\_\_-EA-11

Docket No. 20002-\_\_\_\_-EA-11

Record No. \_\_\_\_\_

November 1, 2011



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## Exhibits

RLP-1	Future Emissions Control Technology Cost Estimates for Neil Simpson 1, Osage 1-3 and Ben French 1
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**I. INTRODUCTION AND QUALIFICATIONS**

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

2 A. My name is Dr. Robert L. Pearson. My office address is 9193 South Jamaica St,  
3 Englewood, Colorado 80112.

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

5 A. I am Vice President of Environmental Services for CH2M Hill, an environmental and  
6 engineering firm based in Denver. My areas of responsibility include air quality  
7 permitting for utility power plants owned by electric utilities such as Black Hills  
8 Corporation. I am a senior member of the CH2M Hill team that performed the retrofit  
9 cost estimate to install additional environmental controls on the Neil Simpson 1, Osage  
10 and Ben French units for Black Hills.

11 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING?**

12 A. I am testifying on behalf of Cheyenne Light, Fuel and Power Company (“Cheyenne  
13 Light”) and Black Hills Power, Inc. (“Black Hills Power” or “BHP”).

14 **Q. BRIEFLY DESCRIBE YOUR EDUCATIONAL BACKGROUND AND  
15 EMPLOYMENT HISTORY.**

16 A. I hold three college level degrees. I graduated from the Colorado School of Mines in  
17 1964, with a degree of Professional Geophysical Engineer. I then graduated from  
18 Colorado State University in 1971, with a Master of Science Degree and again from  
19 Colorado State University in 1973, with a Doctor of Philosophy degree. I am a registered  
20 professional engineer in Colorado (license number 12582).

21 I am currently a Vice President in the CH2M HILL Denver office with emphasis in the  
22 Environmental Services Practice Area. I have 38 years of experience evaluating the air

1 quality impacts from the operation of utility power plants, including working for 19 years  
2 as a senior environmental engineer and then the Administrator of Environmental Affairs  
3 for the Public Service Company of Colorado (now Xcel Energy). In addition, I have been  
4 involved in two regional air quality studies in the Denver area and was appointed by the  
5 governor of Colorado to the Grand Canyon Visibility Transport Commission and am  
6 presently appointed by US Secretary of Energy Steven Chu to the National Coal Council.  
7 Finally, I have either managed or been a senior technical resource to the air quality  
8 permitting of five large coal fired power plants and five combustion turbine power plants,  
9 including four plants in Wyoming: the Basin Electric Dry Fork plant, Wygen Units 2 and  
10 3 for Black Hills and the Cheyenne Generating Station presently underway for Black  
11 Hills. Based on this experience, I am very familiar with the air quality issues involved in  
12 building and operating utility power plants—specifically the complexities involved with  
13 the future air quality rules that are being proposed or have been adopted by EPA and the  
14 Wyoming DEQ.

15 **II. PURPOSE OF TESTIMONY**

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

17 A. The purpose of my testimony in this proceeding is to provide a summary of the technical  
18 memorandum titled “Future Emissions Control Technology Cost Estimates for Neil  
19 Simpson 1, Osage 1-3 and Ben French 1”. The memorandum is attached to my testimony  
20 as Exhibit RLP-1.

21 **III. FUTURE EMISSIONS CONTROL TECHNOLOGIES**

1 **Q. PLEASE DESCRIBE THE ENVIRONMENTAL REGULATORY**  
2 **REQUIREMENTS THAT WERE CONSIDERED TO BE AFFECTING BLACK**  
3 **HILLS POWER'S GENERATION FLEET IN THE NEAR TERM.**

4 A. The EPA issued National Emission Standards for Hazardous Air Pollutants for Area  
5 Sources: Industrial, Commercial and Institutional Boilers (the "Area Source Rules"), on  
6 March 21, 2011 with an effective date of May 20, 2011. The deadline to comply with  
7 these rules is March 21, 2014. In addition, Section 169A of the federal Clean Air Act  
8 requires the continuous reduction to natural background levels of man caused visual  
9 impairment in National Parks by 2064 ("Regional Haze Rules"). The continuous  
10 reduction must be demonstrated by the states in filings with EPA every five years that  
11 show reasonable further progress in attaining this statutory requirement.

12 **Q. PLEASE GIVE A BRIEF DESCRIPTION OF THE AREA SOURCE RULES?**

13 A. The EPA hazardous emissions rules at 40 CFR 63 are designed to reduce emissions of  
14 hazardous air pollutants from various small boilers, to include coal-fired units of 25 MW  
15 or less. Compliance with these rules would require the addition of emission controls.

16 **Q. PLEASE GIVE A BRIEF DESCRIPTION OF THE REGIONAL HAZE RULES.**

17 A. The Clean Air Act (CAA) §169A contains the following goal: "Congress hereby declares  
18 as a national goal the prevention of any future, and the remedying of any existing,  
19 impairment of visibility in mandatory class I Federal areas which impairment results from  
20 man-made air pollution." The CAA also requires the states to demonstrate reasonable  
21 further progress toward meeting this goal by periodically amending their state  
22 implementation plans. EPA has adopted regulations at 40 CFR 51.300 to implement these  
23 requirements. The rules require certain existing sources to conduct best available retrofit

1 technology (BART) evaluations of new controls that could be added to reduce existing  
2 emissions. In addition the states are required to evaluate their implementation plans every  
3 five years and to amend them to further reduce emissions in their states to achieve this  
4 goal set by Congress by the year 2064.

5 **Q. SINCE THE REASONABLE FURTHER PROGRESS REQUIREMENTS FOR**  
6 **REDUCING MAN'S IMPACT ON REGIONAL HAZE WILL BE ADOPTED BY**  
7 **THE STATES AND EPA IN THE FUTURE BETWEEN NOW AND 2064, HOW**  
8 **CAN YOU BE SURE THAT THESE RULES WILL BE REQUIRED IN THE**  
9 **FUTURE?**

10 A. The reasonable further progress requirements are explicitly required by existing language  
11 in the Clean Air Act. The only way for this statutory language to change is for Congress  
12 to amend the Clean Air Act to either change or remove this language. I don't know of any  
13 initiative in Congress to amend the Clean Air Act in this way. Accordingly, CH2M Hill  
14 predicted the future regulatory impact of these rules and the compliance costs that would  
15 result for BHP.

16 **Q. WHICH GENERATING RESOURCES OWNED BY BHP AND CHEYENNE**  
17 **LIGHT ARE AFFECTED BY THE AREA SOURCE RULES AND REGIONAL**  
18 **HAZE?**

19 A. BHP owns three coal-fired power plants of 25 MW or less; Neil Simpson I, Osage and  
20 Ben French that are affected by the Area Source Rules and Regional Haze Rules. Black  
21 Hills Power also owns Neil Simpson 2 which is greater than 25 MW and therefore not  
22 affected by the Area Source Rule, but is likely to be impacted by the Regional Haze  
23 Rules. Cheyenne Light does not own any resources of 25 MW or less, therefore, it is not

1 affected by the Area Source Rules. Similarly, Cheyenne Light is not affected by the  
2 Regional Haze reasonable further progress rules.

3 **Q. HAS BHP COMMISSIONED A STUDY OF THE COST OF COMPLIANCE**  
4 **WITH THE AREA SOURCE RULES AND REGIONAL HAZE REQUIREMENTS**  
5 **WITH REGARD TO THESE PLANTS?**

6 A. Yes. BHP commissioned CH2M Hill to perform a study to evaluate the costs of  
7 compliance with these rules as well as future potential requirements at Neil Simpson I,  
8 Osage and Ben French. I was a senior member of the CH2M Hill team who performed  
9 this study and prepared the report that is attached as Exhibit RLP-1.

10 **Q. DID CH2M HILL PROVIDE COST ESTIMATES FOR THE INSTALLATION OF**  
11 **NEW EMISSIONS CONTROLS ON NEIL SIMPSON 1, OSAGE AND BEN**  
12 **FRENCH THAT WOULD BRING THE BLACK HILLS POWER UNITS INTO**  
13 **COMPLIANCE?**

14 A. Yes.

15 **Q. WHAT PROCEDURE DID CH2M HILL FOLLOW TO PROVIDE THESE COST**  
16 **ESTIMATES FOR NEIL SIMPSON 1, OSAGE AND BEN FRENCH?**

17 A. CH2M Hill conducted a four step process to estimate these costs. Step 1 was to predict  
18 the applicable new rules and the allowed levels of emissions that would be compliant  
19 with these rules in the future. Step 2 was to assess the present condition of these  
20 generating units including the level of emissions that are presently being released from  
21 each unit. Step 3 was to perform a technology review to identify new emissions control  
22 technologies that may be available for retrofit installation on these units to reduce these  
23 present emissions levels to those required in the future and to select those technologies

1 that could be installed on each unit. Step 4 was to assess the cost of installing each  
2 technology on each unit.

3 **Q. HOW DID CH2M HILL DETERMINE THESE COST ESTIMATES FOR NEIL**  
4 **SIMPSON 1, OSAGE AND BEN FRENCH?**

5 A. The costs were estimated by scaling to each of the units other similar emissions control  
6 projects that CH2M Hill either conducted or is familiar with. The scaling was done by  
7 ratioing the size of the emission control projects to match the generation capacity of each  
8 of the units. In addition, a retrofit complexity factor was applied to account for extra costs  
9 of installing this new technology in difficult or space constrained locations.

10 No engineering studies were conducted to determine these costs. Also, no impacts to unit  
11 operation such as changes in heat rate or any cost efficiencies or increased costs resulting  
12 from the installation of more than one technology (e.g. the installation of a selective  
13 catalytic reduction and a baghouse) on a unit at the same time. The total costs for the  
14 retrofit of environmental controls ranged from \$1112 per kilowatt at Neil Simpson 1,  
15 \$1239 per kilowatt at Osage and \$1037 per kilowatt at Ben French.

16 **Q. DID CH2M HILL ALSO EVALUATE OTHER COSTS FOR THE**  
17 **INSTALLATION OF OTHER NEEDED EQUIPMENT ON NEIL SIMPSON 1,**  
18 **OSAGE AND BEN FRENCH?**

19 A. Yes. The installation cost of the environmental control equipment would need to be  
20 amortized over several years of future operation of each of these units. The operation of  
21 each unit into the future would necessitate the expenditure of even more funds for needed  
22 life extension projects to allow each of the units to operate for these future years. The



1 total of the environmental and life extension costs exceeded \$1300 per kilowatt capacity  
2 on each of these plants.

3 **Q. DOES BHP HAVE OTHER OPTIONS FOR THESE UNITS SUCH AS**  
4 **CONVERTING THEM TO NATURAL GAS FIRING?**

5 A. Yes, it does. BHP could convert these units to burn natural gas. However, there are a few  
6 drawbacks to this arrangement including gas pipeline capacity at the Ben French and  
7 Osage sites which is not sufficient to support burning natural gas in the units. Therefore  
8 additional gas supply would need to be brought to each site. Conversion to natural gas  
9 fuel would also require installation of new Low-NOx burners and potential modification  
10 to the boilers on all units. In addition, Black Hills would need to consider the same life  
11 extension projects for the units with conversion to gas which could result in triggering  
12 EPA permitting requirements and additional controls for the emissions of greenhouse  
13 gases.

14 **Q. WOULD CONVERTING THESE UNITS TO NATURAL GAS RESULT IN**  
15 **UNITS THAT WOULD BE AS EFFICIENT AS NEWER TECHNOLOGY?**

16 A. No. These units converted to natural gas will have close to the same efficiency that they  
17 were originally designed to have when they were originally built. The only way to make  
18 these units as efficient as new units would be to tear them down and replace them with  
19 new units. This would require not only the capital investment to tear down and replace  
20 these units but the necessary permitting to allow the new construction.

21 **Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

22 A. Yes, it does.