

Direct Testimony
Mark Lux

Before the Public Utilities Commission
of the State of South Dakota

In the Matter of the Application of
Black Hills Power, Inc.

For the Phase In of Rates Regarding Construction Financing Costs

Docket No. EL12-____

December 17, 2012

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EXHIBITS

None

1 **I. INTRODUCTION AND BACKGROUND**

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

3 A. My name is Mark Lux. My business address is 1515 Wynkoop Street, Suite 500,
4 Denver, Colorado 80202.

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

6 A. I am currently employed by Black Hills Service Company, a wholly-owned
7 subsidiary of Black Hills Corporation (“Black Hills Corporation”), as Vice
8 President and General Manager, Regulated and Non-Regulated Generation. In
9 that role, I am responsible for the operation and construction of the electrical
10 power generation and coal mining assets owned by Black Hills Corporation
11 subsidiaries, including Cheyenne Light, Fuel and Power Company (“Cheyenne
12 Light”) and Black Hills Power, Inc. (“Black Hills Power” or the “Company”),
13 (Cheyenne Light and Black Hills Power collectively referred to as “Companies”).

14 **Q. FOR WHOM ARE YOU TESTIFYING ON BEHALF OF TODAY?**

15 A. I am testifying on behalf of Black Hills Power.

16 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND BUSINESS**
17 **BACKGROUND.**

18 A. I received a Bachelor of Science degree with honors in Mechanical Engineering
19 from the South Dakota School of Mines and Technology in 1987. I have more
20 than 25 years of experience working in the mining and electrical power industry,
21 in both nuclear and fossil fuel power generation, including operating experience
22 and power plant construction experience. I have been involved in the

1 development, engineering, construction and commissioning of several coal-fired
2 power plants, including Black Hills Power's Wygen III plant and Neil Simpson II
3 plant, Cheyenne Light's Wygen II plant and Black Hills Wyoming's Wygen I
4 plant. I have also been involved with the development, engineering, construction
5 and commissioning of several gas-fired power plants owned or developed by
6 subsidiaries of Black Hills Corporation, including the recent construction of
7 simple cycle and combined cycle natural gas-fired units in Colorado.

8 **II. PURPOSE OF TESTIMONY**

9 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

10 A. I address Black Hills Power's long-term plans for its generation assets including
11 plant closures scheduled for March 2014 and asset additions. I describe the
12 environmental regulations that are leading to the plant closures. I discuss the need
13 for new generation and the decision to build the Cheyenne Prairie Generating
14 Station ("CPGS"), a natural gas-fired power plant to be built in Cheyenne,
15 Wyoming that will be partially owned by Black Hills Power. I provide a detailed
16 description of CPGS and discuss the costs associated with the CPGS.

17 **III. GENERATION PLAN**

18 **Q. PLEASE DESCRIBE THE GENERATION ASSETS OF BLACK HILLS** 19 **POWER.**

20 A. Black Hills Power owns 471 MW of electric utility net generation capacity, as
21 follows:

Unit	Fuel Type	Location	Ownership Interest (%)	Gross Capacity (MW)	Year Installed
Osage	Coal	Osage, WY	100	34.5	1948-1952
Ben French	Coal	Rapid City, SD	100	25.0	1960
Neil Simpson I	Coal	Gillette, WY	100	21.8	1969
Neil Simpson II	Coal	Gillette, WY	100	90.0	1995
Wyodak	Coal	Gillette, WY	20	72.4	1978
Wygen III	Coal	Gillette, WY	52	57.2	2010
Ben French Diesel #1-5	Oil	Rapid City, SD	100	10.0	1965
Ben French CTs #1-4	Gas/Oil	Rapid City, SD	100	80.0	1977-1979
Neil Simpson CT	Gas	Gillette, WY	100	40.0	2000
Lange CT	Gas	Rapid City, SD	100	40.0	2002

1 In addition, Black Hills Power purchases 50 MW under a long-term agreement
2 expiring in 2023 and 14.7 MW and 20 MW under long-term agreements expiring
3 in 2028 and 2029, respectively.

4 **Q. PLEASE PROVIDE AN OVERVIEW OF BLACK HILLS POWER’S**
5 **PLANS FOR ITS EXISTING GENERATION ASSETS OVER THE NEXT**
6 **FEW YEARS.**

7 A. As a result of the National Emission Standards for Hazardous Air Pollutants for
8 Area Sources: Industrial, Commercial and Institutional Boilers (herein “Area
9 Source Rules”), issued by the Environmental Protection Agency (“EPA”), the

1 Company's Neil Simpson I, Osage and Ben French coal-fired generating plants
2 will be retired by March 21, 2014. This date is the deadline for compliance with
3 the Area Source Rules.

4 **Q. PLEASE GIVE A BRIEF DESCRIPTION OF THE AREA SOURCE**
5 **RULES.**

6 A. The Area Source Rules are designed to reduce emissions of hazardous air
7 pollutants from various small boilers, to include coal-fired units of 25 MW or less.
8 Specifically, the rules implement (1) new emission requirements for mercury and
9 carbon monoxide; (2) work practice standards addressing startup and shutdown
10 and energy assessments; (3) operating restrictions defining mercury sorbent
11 injection rates and coal quality; (4) continuous monitoring; and (5) compliance
12 testing. Compliance with these rules requires the addition of emission controls,
13 installation of monitoring equipment, restrictions on quality of the coal received
14 and adherence to new operating parameters established during the compliance test.

15 **Q. WHICH GENERATING RESOURCES OWNED BY BLACK HILLS**
16 **POWER ARE AFFECTED BY THESE RULES?**

17 A. Black Hills Power owns three coal-fired power plants equipped with boilers of 25
18 MW or less: Neil Simpson I, Osage and Ben French. All three of these plants are
19 subject to the Area Source Rules.

1 **Q. WHAT IS THE EFFECT OF THE AREA SOURCE RULES ON THE NEIL**
2 **SIMPSON I, OSAGE AND BEN FRENCH UNITS?**

3 A. These rules require either 1) the retrofit of expensive new environmental controls
4 on Neil Simpson I, Osage and Ben French or 2) retirement of the affected units.
5 Furthermore, if these older facilities are to continue to operate with new emission
6 controls to meet these regulations, life extension upgrades would be required. It is
7 highly likely that if this happens, the EPA will initiate New Source Review
8 (“NSR”) investigations, which historically have led to significant capital costs to
9 meet Best Available Control Technology emission limits similar to those of new
10 plants. Additionally, NSR now requires adherence to the Green House Gas New
11 Source Performance Standard (“GHGNSPS”) implemented in 2012 by EPA. The
12 GHGNSPS requires coal-fired plants that impact thresholds of greenhouse gas
13 emissions to install carbon capture and sequestration within 10 years and achieve
14 carbon emission limits equal to natural gas-fired emissions of 600 pounds per
15 megawatt hour on a 12-month annual average. As a result of these factors, as well
16 as the likelihood of additional future EPA regulations affecting the continued
17 operation of these facilities, Black Hills Power concluded that the most cost
18 effective plan for EPA compliance is to retire Neil Simpson I, Osage, and Ben
19 French by March 21, 2014.

20 **Q. WILL THE PLANT SHUTDOWNS BE STAGED?**

21 A. Black Hills Power has placed the three Osage units and the Ben French unit in an
22 economic shutdown mode. This means that the units are not staffed and are in a

1 standby mode such that if economic conditions warrant that they be started, they
2 can be run with at least 30 days of advance notice. They will stay in economic
3 shutdown (unless operated to meet customer demands) until their official
4 retirement date in 2014.

5 **Q. WHAT ARE THE DRIVERS FOR ECONOMIC SHUTDOWN AT BEN**
6 **FRENCH AND OSAGE?**

7 A. The primary driver is that other units on the Black Hills Power system as well as
8 power available in the market are more economic to serve the electricity
9 requirements of the customers of Black Hills Power than the Ben French and
10 Osage units.

11 **Q. WHAT WILL BE THE IMPACT OF THE ECONOMIC SHUTDOWN?**

12 A. The Black Hills Power system will continue to provide electricity to its customers
13 in the most cost effective means possible. If the Ben French and Osage units need
14 to be reactivated to provide power during peak periods or because of outages of
15 other units, they can be reactivated with thirty days advance notice.

16 **Q. WHAT IS THE SCHEDULE FOR SHUTTING DOWN NEIL SIMPSON I?**

17 A. Neil Simpson I is expected to operate in a normal mode until its projected
18 retirement date in March 2014.

19 **Q. WHAT IS THE PLAN FOR DECOMMISSIONING PLANTS FOLLOWING**
20 **THE RETIREMENT OF THOSE PLANTS?**

21 A. Following the retirement of Neil Simpson I, Osage and Ben French no later than
22 March 21, 2014, those plants will need to be de-commissioned. The Company

1 needs more information before de-commissioning decisions may be made. The
2 timing and costs of de-commissioning will be analyzed and reviewed and better
3 information will be available prior to the Company's next rate case application.

4 **IV. NEED FOR CPGS**

5 **Q. WHAT ARE THE PLANS FOR NEW GENERATION ASSETS FOR**
6 **BLACK HILLS POWER?**

7 A. Black Hills Power and Cheyenne Light will construct in Cheyenne, Wyoming, a
8 natural gas-fired generating power station providing a total of 132 MW.

9 **Q. PLEASE GENERALLY DESCRIBE CPGS.**

10 A. CPGS will include a natural gas-fired combustion turbine generator and a
11 combined cycle unit. In addition, CPGS will include ancillary equipment,
12 electrical transmission and natural gas lines and related equipment, land and
13 buildings that are necessary to make the plant operational and compliant with
14 environmental requirements. Specifically, CPGS will include:

- 15 1. One natural gas-fired combustion turbine generator (CTG) to be wholly
16 owned by Cheyenne Light;
- 17 2. A Cheyenne Light and Black Hills Power jointly-owned combined cycle
18 (CC) that includes two combustion turbine generators, two heat recovery
19 steam generators and one steam turbine;
- 20 3. A wholly-owned Cheyenne Light fuel gas supply line;
- 21 4. A wholly-owned Cheyenne Light transmission line interconnecting the CC
22 and CTG to Cheyenne Light's existing 115 kV transmission system; and

1 5. Cheyenne Light and Black Hills Power jointly-owned ancillary equipment,
2 land and buildings, a substation, and other assets that do not fall within the
3 definition of the above four categories.

4 CPGS is designed to fire natural gas only and will be equipped with low-emission
5 systems.

6 The CTG will have a base load nominal net output of 37 MW. The CC will have a
7 base load nominal net output of 95 MW. Of the total base load nominal net output
8 of 132 MW, Black Hills Power will own 55 MW of generation and Cheyenne
9 Light will own the remaining 77 MW.

10 **Q. PLEASE DESCRIBE THE ANALYSIS THAT WAS CONDUCTED BY**
11 **BLACK HILLS POWER AND CHEYENNE LIGHT THAT LED TO THE**
12 **SELECTION OF CPGS AS THE RESOURCE OF CHOICE FOR NEW**
13 **GENERATION.**

14 A. As part of its planning process, Cheyenne Light recognized that it would need new
15 electric resources to offset load growth and the expiration of long-term power
16 purchase contracts occurring over the next several years. Accordingly, in June
17 2011, Cheyenne Light completed an integrated resource plan (IRP) in anticipation
18 of increased customer load and expiring PPAs.

19 The Cheyenne Light IRP identified a preferred plan that included the addition of
20 three combustion turbine generators for Cheyenne Light customers by 2014.

21 Shortly after Cheyenne Light completed its IRP, Black Hills Power was beginning
22 work on an IRP to identify the future resource needs of its customers. The future

1 resource needs of Black Hills Power were driven primarily by the impact of
2 environmental regulatory requirements on its existing generating facilities. Work
3 progressed on the IRP for Black Hills Power, and the preferred plan identified in
4 the IRP included the conversion of an existing combustion turbine generator to
5 combined cycle operation, in the 2014 time frame. As a result of the preferred
6 plan in Black Hills Power's IRP, consideration was given to whether siting a
7 combined cycle resource in Cheyenne would present an opportunity for both
8 Cheyenne Light and Black Hills Power.

9 To assess the benefits and risks of a jointly-owned CC unit, the two companies
10 undertook additional analysis and modeling to determine the financial impact on
11 the completed resource plans of Cheyenne Light and Black Hills Power. The two
12 companies analyzed and considered whether the increased initial capital cost per
13 kW of a combined cycle, as compared to combustion turbine generators, would be
14 offset by the benefits associated with a more cost efficient combined cycle.

15 The result of the analysis indicated that a Black Hills Power/Cheyenne Light
16 jointly-owned CC unit, one CTG owned by Cheyenne Light, and additional firm
17 market purchases resulted in lower present value of revenue requirements than the
18 resource scenario of three CTGs identified in Cheyenne Light's original IRP.

19 **Q. PLEASE DESCRIBE THE BENEFITS OF CPGS.**

20 A. The CPGS – a jointly-owned CC unit, and one CTG owned by Cheyenne Light –
21 includes operational and environmental benefits, market risk benefits and the

1 benefit of resource diversity. A CC unit is an intermediate resource that provides
2 the following benefits to Black Hills Power and Cheyenne Light:

- 3 • Operates at a lower heat rate than a combustion turbine generator – thus
4 providing greater operational efficiency
- 5 • Lowers environmental emissions
- 6 • Reduces utility exposure to future environmental mandates or taxes
- 7 • Reduces reliance on the economy energy markets
- 8 • Provides a hedge against increases in future natural gas prices
- 9 • Diversifies the resource mix of both Black Hills Power and Cheyenne Light
10 through the addition of an intermediate resource
- 11 • Provides an economical system for wind regulation

12 Construction of a CC unit in Cheyenne in conjunction with the new construction
13 of a CTG is more efficient as compared to use of an existing CTG. In addition,
14 the availability of water and a gas fuel supply favored locating the jointly-owned
15 CC in Cheyenne. A dispatch agreement between Black Hills Power and Cheyenne
16 Light provides the ability to exchange energy between the two entities without a
17 resulting transmission cost between their respective service territories. In
18 summary, the proposed joint-ownership of a combined cycle resource by Black
19 Hills Power and Cheyenne Light represents a win-win opportunity for each utility.

1 **Q. PLEASE DESCRIBE HOW CPGS WILL OPERATE IN THE FUTURE AS**
2 **A BLACK HILLS POWER RESOURCE.**

3 A. CPGS is generally described as an “intermediate” unit. This means it performs
4 between the levels described as “baseload” and “peaking”. Baseload units are
5 expected to operate 24 hours per day, 7 days per week except when they are taken
6 out of service for scheduled maintenance or are forced offline when something
7 breaks and needs to be fixed. Peaking units operate for relatively few hours per
8 year – just during very high summer and very high winter loads, often less than
9 1,000 hours per year. Intermediate units operate in the middle. They provide
10 energy when load exceeds that fulfilled by the baseload units and would be
11 expected to operate every hour in which peaking units operate.

12 **Q. PLEASE DESCRIBE THE APPROVAL PROCESS IN WYOMING THAT**
13 **LED TO THE ISSUANCE OF A CERTIFICATE OF PUBLIC**
14 **CONVENIENCE AND NECESSITY.**

15 A. Cheyenne Light and Black Hills Power filed a joint application for a Certificate of
16 Public Convenience and Necessity (CPCN) for the CPGS in 2011. The
17 application contained information on all of the requirements for a CPCN
18 including: site description, facility description, facility estimated cost and
19 ownership, resource need and selection, financial condition of applicants,
20 financing, and other considerations. Black Hills Power and Cheyenne Light
21 settled with the Wyoming Office of Consumer Advocate, and at the hearing on the

1 joint application for a CPCN, the Wyoming Public Service Commission approved
2 that settlement and granted the CPCN in open meeting action on July 31, 2012.

3 **V. CHEYENNE PRAIRIE GENERATING STATION**

4 **Q. PLEASE PROVIDE ADDITIONAL INFORMATION ABOUT CPGS.**

5 A. CPGS will be located in Laramie County, Wyoming, in the City of Cheyenne, near
6 the I-80 and Campstool Road interchange. The site is approximately 250 acres. It
7 is located adjacent to the Cheyenne Board of Public Utilities (CBOPU) municipal
8 water system.

9 The fuel for CPGS will be supplied by a pipeline owned by Cheyenne Light. The
10 Cheyenne Light gas distribution system will require an additional pipeline
11 interconnected to an interstate pipeline to support the natural gas supply for CPGS.

12 **Q. PLEASE DESCRIBE THE WATER SUPPLY AND WASTEWATER
13 DISPOSAL FOR CPGS.**

14 A. Several water and wastewater systems will be installed to meet the water and
15 wastewater disposal needs of CPGS. It will receive potable water from the
16 CBOPU municipal water system, the treated water system will utilize wastewater
17 effluent water from the CBOPU wastewater treatment plant and sanitary
18 wastewater will be directed to the CBOPU treatment plant that is located adjacent
19 to the Facility.

20 **Q. PLEASE DESCRIBE HOW CPGS WILL BE CONSTRUCTED.**

21 A. Black Hills Service Company, an affiliate of Black Hills Power, will manage the
22 construction of the Facility. Black Hills Power affiliates have successfully

1 constructed and operated other natural gas-fired generation facilities that are very
2 similar to CPGS. Black Hills Service Company recently completed the
3 construction of a combined cycle gas turbine facility in Pueblo, Colorado that
4 includes LM6000 combustion turbines, which may be the combustion turbine
5 models selected for CPGS and used as a basis for the construction plan.

6 **Q. PLEASE DESCRIBE THE CONSTRUCTION SCHEDULE.**

7 A. Construction on CPGS is expected to commence during the first quarter 2013.
8 The expected commercial operation date of CPGS is October 1, 2014.

9 **VI. COSTS FOR CHEYENNE PRAIRIE GENERATING STATION**

10 **Q. PLEASE DESCRIBE THE GENERAL COMPONENTS OF CPGS AND**
11 **THE RESULTING DETERMINATION OF COSTS.**

12 A. CPGS consists of five general groups or components: 1) the Combustion Turbine
13 Generator (“CTG”); 2) the Combined Cycle Generation (“CC”); 3) the Gas
14 Pipeline; 4) the Transmission Interconnection; and 5) the Common Capital Assets.

15 **Q. PLEASE DESCRIBE THE CONSTRUCTION COSTS AND THE**
16 **OWNERSHIP ARRANGEMENT FOR CPGS.**

17 A. The current estimated cost of CPGS is \$222 million, excluding the Allowance for
18 For Funds Used During Construction. Black Hills Power’s total estimated portion
19 of the cost of CPGS is \$95 million. Based on my experience, the proposed capital
20 costs are reasonable. Cheyenne Light will own the simple cycle CTG. The CC
21 will be owned 42% by Cheyenne Light and 58% by Black Hills Power. The Gas
22 Pipeline and the Electrical Transmission Interconnection will be owned by

Cheyenne Light, and Cheyenne Light will recoup approximately 42% of its costs for these two items from Black Hills Power by contract through a revenue requirement cost recovery-type payment or payments. The Common Capital Assets will be owned by Cheyenne Light (58%) and Black Hills Power (42%). The percentage of Common Capital Assets cost allocation is based on net MW ownership compared to total net MW of the Facility.

Q. WHAT ARE THE ESTIMATED COSTS FOR EACH OF THE FIVE COMPONENTS OF CPGS?

A. The estimated cost of CPGS by component is set forth below. The final two columns of this table show the estimated cost to each entity after Cheyenne Light recoups from Black Hills Power a portion of the cost of the Gas Pipeline and the Electrical Transmission Interconnection:

<u>Component:</u>	<u>Estimated Cost</u>	<u>Cheyenne Light, Fuel & Power Company</u>	<u>Black Hills Power, Inc.</u>
CTG	\$ 45,457,000	\$45,457,000	\$0
CC	\$131,040,000	\$55,036,800	\$76,003,200
Gas Pipeline	\$15,390,000	\$8,926,200	\$6,463,800
Transmission Interconnection	\$6,755,000	\$3,917,900	\$2,837,100
Common Capital Assets	\$23,358,000	\$13,547,640	\$9,810,360
Total Estimated Facility Cost	\$222,000,000	\$126,885,540	\$95,114,460

1 **Q. WHAT PORTION OF THE TOTAL ESTIMATED COST WILL BE PAID**
2 **BY CHEYENNE LIGHT AND BLACK HILLS POWER?**

3 A. After its recoupment from Black Hills Power of a portion of the cost of the Gas
4 Pipeline and the Electrical Transmission Interconnection, Cheyenne Light's total
5 estimated portion of the cost of the Facility is \$126,885,540, and Black Hills
6 Power's total estimated portion of the cost of the Facility is \$95,114,460.

7 **Q. PLEASE DESCRIBE THE CAPITAL INVESTMENTS MADE BY BLACK**
8 **HILLS CORPORATION OVER THE PAST THREE YEARS IN ORDER TO**
9 **ENABLE THE CONSTRUCTION OF CPGS.**

10 A. As of November 30, 2012, Black Hills Corporation has spent a total of \$12.7
11 million to enable the construction of CPGS. These costs include engineering,
12 project management, permitting, and the option to purchase of property.

13 **Q. PLEASE DESCRIBE HOW THE COMPANY INTENDS TO ESTIMATE**
14 **THE FORECASTED MONTHLY CONSTRUCTION COSTS AS**
15 **PROVIDED IN THE PROPOSED PHASE IN PLAN.**

16 A. The proposed phase in plan tariff requires the Company to estimate the forecasted
17 monthly construction costs of CPGS. The forecasted monthly construction costs
18 of CPGS for Black Hills Power are set forth in Exhibit CJK-104 –Schedule D.
19 Black Hills Corporation or its subsidiaries have experience building natural gas-
20 fired generation facilities (including the recently built natural gas-fired generation
21 facility in Colorado), and using that experience were able to estimate on a monthly
22 basis the forecasted monthly construction costs of CPGS.

1 **Q. PLEASE PROVIDE FURTHER EXAMPLES OR INFORMATION ON**
2 **HOW THE MONTHLY CONSTRUCTION COSTS ARE FORECASTED.**

3 A. Each of the five components described above include major cost areas for each
4 component. For example, the cost of the Combined Cycle Generation component
5 includes five categories of major cost as follows: 1) Engineering, 2) Project
6 Management, 3) Equipment Procurement, 4) Construction Contracts, and 5)
7 Indirect Costs. The costs of each of these five categories were then forecasted on
8 a monthly basis in greater detail such as by contract or equipment purchase.
9 Generally speaking, negotiations will take place with vendors, including such
10 things as delivery dates and payment terms, for each contract or service to be
11 performed. Some negotiations are presently taking place while other negotiations
12 will take place at a later time because certain items are not needed until later in the
13 construction timeline. For example, the on-site electrical work will likely not be
14 negotiated until later in the process because there is significant construction that
15 needs to take place before the electrical work becomes necessary. An example of
16 an immediate negotiation is the combustion turbine. From experience, because of
17 the extended period of time required to manufacture the combustion turbine
18 (described as the LM 6000), the order for the two combustion turbines must be
19 placed in the first month, and payment terms for those combustion turbines are
20 required to commence in the first month. By analyzing the expected cost and the
21 timing of each expected cost of the five general components of CPGS, forecasted
22 construction costs were estimated for all of CPGS on a monthly basis. There are

1 complete detailed work papers that support the monthly forecast by contract
2 and/or equipment purchase that support the total monthly forecast for CPGS.
3 However, since we are still in negotiations with vendors and do not want this
4 information public as to hinder our ability to receive the lowest cost for our
5 customers, we have only provided a summary of the work papers.

6 **Q. WILL THE FORECASTS BE UPDATED DURING THE CONSTRUCTION**
7 **PROCESS?**

8 A. Yes. As construction costs are incurred, Cheyenne Light and Black Hills Power
9 will have better information on future estimated costs and will be able to update
10 their monthly forecasted construction costs.

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

12 A. Yes, it does.