Direct Testimony and Exhibits
Mark Lux

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

Record No._____

Docket No. 20002-___-GA-11

November 1, 2011

EXHIBIT
20

TABLE OF CONTENTS

I. Introduction And Qualifications 1

II. General Description Of Project (Section 204(b)) 2

III. Detailed Description Of Facility (Section 204(c)) 4

IV. Estimated Cost Of Proposed Construction And Ownership (Section 204(e)) 9

V. Start And Completion Date Of Proposed Construction. (Section 204(i)) 11

VI. Site Description (Section 205(a)) 12

VII. Surrounding Scenic, Historical, Archeological And Recreational Locations, (Section 205(b)) 14

VIII. Land, Mineral And Water Requirements (Section 205(c)) 15

IX. Requirements For Construction Or Operation Of The Facility (Subsection 205(g)) 16

X. General Description Of Devices (Section 206(a)) 17

XI. Source Of Water (Section 206(b)) 18

XII. Geological Description (Section 206(c)) 19

XIII. Effect Of Environmental Policy On BHP Generation Resources 21

XIV. Information Regarding IRPs. 22

Exhibits

Exhibit ML - 1	Estimated Cost of Facility and Ownership
Exhibit ML - 2	Construction Timeline
Exhibit ML - 3	Legal Description and Boundary Drawing
Exhibit ML - 4	Vicinity Map including topography
Exhibit ML - 5	Project Site Map
Exhibit ML - 6	Water Balance
Exhibit ML - 7	Terracon Report
Exhibit ML - 8	Soils Map
Exhibit ML - 9	Geology Map

1 **I. INTRODUCTION AND QUALIFICATIONS**

2 **Q. WHAT IS YOUR NAME AND BUSINESS ADDRESS?**

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

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

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).

13 **Q. ON WHOSE BEHALF ARE YOU APPEARING IN THIS APPLICATION?**

14 A. I am appearing on behalf of Black Hills Power and Cheyenne Light.

15 **Q. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE.**

16 A. I received a Bachelor of Science degree with honors in Mechanical Engineering
17 from the South Dakota School of Mines and Technology in 1987. I have more
18 than 25 years of experience working in the mining and electrical power industry,
19 in both nuclear and fossil fuel power generation, including operating experience
20 and power plant construction experience. I have been involved in the
21 development, engineering, construction and commissioning of Black Hills
22 Power's Wygen III plant and Neil Simpson II plant, Cheyenne Light's Wygen II
23 plant and Black Hills Wyoming's Wygen I plant. I have also been involved with

1 the development, engineering, construction and commissioning of several gas-
2 fired power plants owned or developed by subsidiaries of Black Hills Corporation,
3 including the recent construction of simple cycle and combined cycle natural gas
4 fired units.

5 **Q. HAVE YOU PREVIOUSLY TESTIFIED IN PROCEEDINGS BEFORE**
6 **THE WYOMING PUBLIC SERVICE COMMISSION ("COMMISSION")?**

7 A. Yes. I have filed testimony with the Commission and I have testified before the
8 Commission.

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

10 A. The purpose of my testimony is to describe the project that is proposed to be
11 constructed, to estimate the total cost of the proposed construction and the
12 estimated timeline to complete construction, to address land and water
13 requirements for the proposed project, to describe major federal and state permits
14 and approvals, to describe environmental technology, to describe the geological
15 report, to address the cost of retrofitting certain Black Hills Power generation
16 plants and to address other topics relevant to the request for a Certificate of Public
17 Convenience and Necessity.

18 **II. GENERAL DESCRIPTION OF PROJECT** (Section 204(b))

19 **Q. PLEASE GENERALLY DESCRIBE THE PROJECT THAT IS PROPOSED**
20 **TO BE CONSTRUCTED.**

21 A. The facility ("Facility") proposed to be constructed by Black Hills Power and
22 Cheyenne Light will be located in Laramie County, Wyoming, in the City of
23 Cheyenne, near the I-80 and Campstool Road interchange. The proposed project

site will include up to 250 acres. The Facility will include one (1) combustion turbine generator (CTG) wholly owned by Cheyenne Light, with a base load nominal net output of 37 MW and a jointly owned two CTG and one steam turbine combined cycle (CC) with a base load nominal net output of 95 MW, for a total of 132 MW at annual average ambient conditions. The CTG and the CC CTG's feature inlet air evaporative cooling to help maintain the generator output of the turbines during warm weather. The CTG and CC CTG's are designed to fire natural gas only and will be equipped with Low-NO_x combustors to control nitrogen oxide (NO_x) emissions.

Q. WHAT IS THE FUEL SUPPLY FOR THE FACILITY AND HOW WILL IT BE DELIVERED TO THE FACILITY?

A. The fuel for the Facility will be supplied by a pipeline owned by Cheyenne Light. The Cheyenne Light gas distribution system will require an additional pipeline interconnected to an interstate pipeline to support the natural gas supply for the Facility. The cost of a new connection with a natural gas interstate pipeline and constructing the natural gas pipeline to the Facility was used in estimating the cost of the proposed natural gas supply infrastructure that I will discuss later in my testimony. It is expected that any natural gas pipeline to the Facility will use a 12 inch diameter pipeline.

Q. PLEASE DESCRIBE THE WATER SUPPLY AND THE WASTEWATER DISPOSAL FOR THE FACILITY.

A. Several water and wastewater systems will be installed to meet the water and wastewater disposal needs of the Facility. The Facility will receive potable water

from the Cheyenne Board of Public Utilities (CBOPU) municipal water system, the treated water system will utilize wastewater effluent water from the CBOPU wastewater treatment plant and sanitary wastewater will be directed to the CBOPU treatment plant that is located adjacent to the Facility.

Q. WHO WILL MANAGE THE CONSTRUCTION OF THE FACILITY?

A. Black Hills Service Company, an affiliate of Cheyenne Light and Black Hills Power, will manage the construction of the Facility. Cheyenne Light and Black Hills Power affiliates have successfully constructed and operated other natural gas-fired generation facilities that are very similar to the Facility proposed for Cheyenne Light and Black Hills Power. Black Hills Service Company is currently constructing a combined cycle gas turbine facility in Pueblo, Colorado that includes LM6000 combustion turbines, which may be the combustion turbine models selected for the Facility and used as a basis for the construction plan.

III. DETAILED DESCRIPTION OF FACILITY (Section 204(c))

Q. PLEASE IDENTIFY THE MAJOR SYSTEMS THAT ARE REQUIRED FOR PLANT OPERATION.

A. The major systems for plant operation include:

1. Mechanical Systems;
2. Electrical Systems;
3. Instrumentation and Control Systems;
4. Civil Works; and
5. Structural Works.

1 **Q. WHAT MECHANICAL SYSTEMS ARE PART OF THE FACILITY?**

2 A. There are three primary categories of mechanical systems, systems unique to the
3 CTG, systems unique to the CC and systems common for both the CTG and CC.
4 Several mechanical systems are common to both the CTG and the CC including
5 the fuel gas supply system, ammonia storage system, fire protection and detection
6 system, compressed air system and water systems. The major mechanical systems
7 are as follows:

8 1. Combustion Turbine Generator (Simple Cycle) Systems
9 1.1 Combustion Turbine Generator (CTG)
10 1.2 Emissions Controls and exhaust stack
11 2. Combined Cycle Systems
12 2.1 Combined Cycle Combustion Turbine Generators (CC CTG)
13 2.2 Heat Recovery Steam Generator (HRSG)
14 2.3 Steam Turbine Generator (STG)
15 2.4 Steam Surface Condenser
16 2.5 Emissions Control Modules (ECM) and exhaust stack
17 2.6 Cooling Tower
18 3. Common Systems
19 3.1 Fuel Gas Supply System
20 3.2 Fire Protection and Detection System
21 3.3 Circulating Water System
22 3.4 Auxiliary Water System
23 3.5 Service Water System

1 3.6 Evaporative Cooling Water System

2 3.7 Demineralized Water System

3 3.8 Potable Water

4 3.9 Chemical Feed Systems

5 3.10 Wastewater System

6 3.11 Sanitary Waste System

7 3.12 Heating, Ventilation, and Air Conditioning

8 3.13 Compressed Air Systems

9 **Q. PLEASE DESCRIBE THE CTG.**

10 A. The CTG to be installed at the Facility will have a capacity of 37 MW net based
11 on annual average ambient conditions and is designed to provide peaking service.
12 The CTG combusts high pressure natural gas, which in turn drives the electrical
13 generator to produce electrical power.

14 **Q. WHAT ARE THE MAJOR COMPONENTS OF THE CTG?**

15 A. A list and general description of the major components of the combustion turbines
16 are as follows:

17 • Combustion turbine. The CTG consists of a multi-stage axial compressor,
18 a natural gas combustor and a multi-stage turbine.

19 • Generator. The generator is an air-cooled, two pole unit operating at 13.8
20 kv, 60 Hz with brushless excitation system with permanent magnet
21 generator. Neutral and line side cubicles are included.

22 • Inlet air cooling system. The combustion turbine inlet air cooling system
23 helps to maintain the output of the turbine during warm weather.

- Exhaust system. The combustion turbine exhaust systems include a catalyst for reducing NOx and CO emissions and the exhaust stack.
- Inlet Air Heating Unit. An inlet air heating unit will heat the inlet air during icing conditions.
- Enclosures and Freeze Protection Measures. There will be an enclosure for the auxiliary skid, heat tracing and insulation of piping, and heating of exposed instruments and equipment.
- CO_2 Fire Protection System. This system consists of high pressure bottle storage located beside each turbine enclosure on a separate skid.
- Turbine Control System. This system features an integrated turbine control system, vibration monitor, digital meter, digital generator protective relay module and an HMI (human machine interface) display of key discrete and analog data.

Q. PLEASE DESCRIBE THE COMBINED CYCLE UNIT.

A. The CC unit will include two (2) CTGs, an inlet air cooling system, two (2) heat recovery steam generators (HRSG), catalytic emission control systems, a steam turbine generator (STG), steam surface condenser and a cooling tower. The CC is designed to provide improved thermal efficiency compared to a simple cycle unit thus providing "intermediate service" and will have a net capacity of 95 MW based on annual average ambient conditions. The CC CTGs combust high pressure natural gas, which in turn drives the electrical generator to produce electrical power and exhaust flue gas heat which is utilized to produce steam in the

HRSG's and then converts this steam energy to additional electric power through the steam turbine-generator.

Q. PLEASE DESCRIBE THE MAJOR SYSTEMS OF THE CC UNIT.

A. A list and general description of the major components of the combined cycle unit:

- Combustion turbines. Each of two CTGs consists of a multi-stage axial compressor, a natural gas combustor and a multi-stage turbine. These units are duplicates of the simple cycle CT and also include a generator, inlet air evaporative cooling system, an inlet air heating unit, CO2 fire protection system, and a turbine control system.
- Heat Recovery Steam Generator (HRSG). Each HRSG will be designed as a two pressure steam generator without duct firing, and includes an emission control system with catalyst to control NOx and CO emissions.
- Steam Turbine Generator. The STG takes steam from the HRSG and expands that steam through rotating blades to produce rotational energy in the shaft. The shaft is connected to the generator, which converts the rotational energy into electric power.
- Steam Surface Condenser. The steam surface condenser receives exhaust steam from the steam turbine and condenses the steam using circulating water flowing from the cooling towers through tubes in a shell and tube heat exchanger. The condenser shell operates under a vacuum and contains the steam until it is condensed.
- Cooling Tower. The cooling tower receives heated water from the circulating water system and utilizes evaporative cooling as the water

cascades down the fill to reduce the water temperature to near that of the ambient wet bulb temperature.

Q. DOES THE APPLICATION INCLUDE A DETAILED DESCRIPTION OF THE FACILITY?

A. Yes, it does.

IV. ESTIMATED COST OF PROPOSED CONSTRUCTION AND OWNERSHIP (Section 204(e))

Q. WHAT IS THE ESTIMATED COST OF THE PROPOSED FACILITY?

A. The current estimated cost of the Facility is $237 million. See Exhibit ML–1. This cost estimate is based on the design basis document that was developed to identify all the required systems and major equipment of the facility as listed in Subsection 204(c) of the Application. In addition, vendor proposals, current equivalent project costs and known site development cost impacts were all taken into consideration in developing this cost estimate.

Cheyenne Light's total estimated portion of the cost of the Facility is $145.3 million, but Cheyenne Light will recoup a portion of that amount from Black Hills Power on a revenue requirement cost recovery-type basis as more fully described below. See Exhibit ML–1. Black Hills Power's total estimated portion of the cost of the Facility is $91.7 million. See Exhibit ML–1.

Q. WHAT PORTION OF THE $145.3 MILLION IS CHEYENNE LIGHT INVESTING THAT WILL BE PAID BY BLACK HILLS POWER?

A. Black Hills Power is paying, in the form of a contract payment(s) to Cheyenne Light, approximately 42% of Cheyenne Light's capital costs in the Gas Pipeline

1 and the Transmission Interconnection. Therefore, excluding the revenue credit
2 that Cheyenne Light receives from Black Hills Power, the effective capital cost
3 ("Effective Capital Cost") to Cheyenne Light is $135.7 million.

4 **Q. PLEASE DESCRIBE THE FACILITY ASSET GROUP AND THE**
5 **RESULTING DETERMINATION OF COSTS.**

6 A. As noted in the Application, the Facility consists of five general groups or
7 components: 1) the CTG; 2) the CC; 3) the Gas Pipeline; 4) the Transmission
8 Interconnection; and 5) the Common Capital Assets.

9 The allocation of the estimated cost of the Facility by entity and by asset group is
10 set forth in Exhibit ML-1 and is for purposes of illustration only and was prepared
11 in order to provide an estimated cost of construction. The final proposed
12 methodology for allocation of construction costs by entity and asset group will be
13 set forth in the rate cases that will be filed by Cheyenne Light and Black Hills
14 Power.

15 **Q. WHO WILL OWN THE FACILITY?**

16 A. Cheyenne Light will own the simple cycle CTG. The CC will be owned 42% by
17 Cheyenne Light and 58% by Black Hills Power. The Gas Pipeline and the
18 Electrical Transmission Interconnection will be owned by Cheyenne Light, and
19 Cheyenne Light will recoup approximately 42% of its costs for these two items
20 from Black Hills Power by contract through a revenue requirement cost recovery-
21 type payment or payments. The Common Capital Assets will be owned by
22 Cheyenne Light (58%) and Black Hills Power (42%).

1 **Q. HOW WAS OWNERSHIP DETERMINED?**

2 A. The ownership percentage of the CC was based on the integrated resource
3 planning process and additional analysis performed for Cheyenne Light and Black
4 Hills Power as described in Eric Scherr's testimony. The percentage of Common
5 Capital Assets cost allocation is based on net MW ownership compared to total
6 net MWs of the Facility.

7 **Q. HOW WILL FUTURE OPERATING AND MAINTENANCE COSTS BE**
8 **ALLOCATED?**

9 A. The full time operation and maintenance employees of the Facility will be
10 employed by Black Hills Service Company (BHSC). BHSC employees are
11 required to direct charge work hours to the units and systems for which work
12 activities are performed. For common assets there will be a shared facilities
13 agreement that will determine the allocation of costs consistent with FERC 707
14 requirements.

15 **V. START AND COMPLETION DATE OF**
16 **PROPOSED CONSTRUCTION.** (Section 204(i))

17 **Q. WHAT ARE THE ESTIMATED START AND COMPLETION DATES OF**
18 **THE PROPOSED CONSTRUCTION?**

19 A. Based on a summer of 2014 commercial operation date, construction activities are
20 anticipated to commence during the fourth quarter 2012 when the air permit and
21 CPCN have been received and will begin with the purchase of major equipment.
22 The construction phase is scheduled to last approximately 18 months and the
23 expected commercial operation date is June 2, 2014. During the spring of 2013, it

is anticipated that construction activities will consist of equipment mobilization; preliminary site work including clearing, leveling, and grading work; excavation; substructures and piping; and civil foundation work including erection of foundations and steel structures. Major construction activities will commence in the third quarter 2013, including final civil construction, mechanical and electrical work supporting the installation and construction of the combustion turbine generators, steam turbine generator, heat recovery steam generators, air quality control exhaust systems and major auxiliary equipment. This estimated schedule is based on recent past experience associated with construction of similar facilities. Attached hereto as Exhibit ML-2 is a timeline schedule showing construction milestones for the Facility.

VI. SITE DESCRIPTION (Section 205(a))

Q. PLEASE DESCRIBE THE PROPOSED SITE FOR THE FACILITY.

A. The proposed site for the Facility is located in the City of Cheyenne, Laramie County, Wyoming, near the I-80 and Campstool Road interchange. The Facility is located within the zoning boundaries of the City of Cheyenne. The proposed site consists of up to 250 acres. The legal description and boundary map of the proposed project site, including a metes and bounds description, is set forth in Exhibit ML-3. Also attached as Exhibit ML-4 is a Vicinity Map showing the topography of the project site. The proposed site for the Facility is bordered to the east by the Dry Creek Water Treatment Facility, to the north by a transmission line, to the south by the Burlington Northern railroad, and to the west by

1 undeveloped property. Attached as Exhibit ML-5 is a Project Map showing the
2 location of the CTG, CC and the buildings on the project site.

3 **Q. WHAT FACTORS WERE CONSIDERED WHEN DECIDING WHERE TO**
4 **BUILD THE FACILITY?**

5 A. The main factors that were considered by Cheyenne Light were the availability of
6 reliable cost effective sources of natural gas and water, the availability
7 of electrical transmission from the generation site to Cheyenne Light's
8 distribution system, the location of the generation site relative to load, the ability
9 to obtain an air permit and the availability of land for the generation site.
10 For Black Hills Power, the ability to participate in a jointly-owned CC at the
11 Cheyenne Light location was a significant factor. Other factors considered by
12 Black Hills Power included diversification of resource location, availability of
13 water, natural gas pipeline capacity and site constructability.

14 **Q. PLEASE DESCRIBE THE VARIOUS TYPES OF COUNTRY ON WHICH**
15 **THE FACILITY WILL BE CONSTRUCTED.**

16 A. The proposed site of the Facility is presently grassland, and the current land use is
17 grazing. The parcel is characterized by gently rolling hills ranging from 5,900 to
18 6,000 feet above sea level.

VII. SURROUNDING SCENIC, HISTORICAL, ARCHEOLOGICAL AND RECREATIONAL LOCATIONS. (Section 205(b))

Q. PLEASE DESCRIBE THE CULTURAL RESOURCES REGARDING THE SITE.

A. Based on a consultant's review of the available literature, 1) the proposed site has not been previously surveyed for cultural resources; and 2) there are no known cultural resources within the project area.

Q. PLEASE DESCRIBE ANY EFFECT THE FACILITY MAY HAVE ON NATURAL RESOURCES, AND PLANTS AND ANIMALS.

A. The project site presents a uniform upland grassland habitat for wildlife. No special or unique habitats are present. There are no wetlands within the project site. There are no national parks or state parks within twenty miles of the project site. A query of the Wyoming Department of Environmental Quality, Land Quality Division, shows that as of March 31, 2011 in the Cheyenne area, 33 sites are identified as having unresolved contaminated issues (Wyoming DEQ, 2011). None of the sites identified are located within one mile of the project boundaries.

Q. PLEASE DESCRIBE ANY POSSIBLE SAFETY HAZARDS AND ANY PLANS FOR RECLAMATION AND TO PROTECT THE ENVIRONMENT.

A. Since the proposed site is undeveloped, the safety hazards associated with demolition of structures, such as asbestos or lead-based paints, will not be an issue. During operations, solid waste will be hauled to an off-site landfill by a private contractor. During construction, the contractor will locate all underground

and overhead utilities to prevent interference with utilities. To ensure public health and safety, Cheyenne Light and Black Hills Power will obtain a National Pollutant Discharge Elimination System ("NPDES") permit and will adhere to all requirements of this permit to ensure wastewater discharges are properly treated prior to entering a receiving water body. Air quality will be protected through the Best Available Control Technology as required by the Wyoming Department of Environmental Quality. Cheyenne Light and Black Hills Power will assume responsibility for reclaiming areas adjacent to the site that are disturbed during construction. The Facility will be decommissioned at the end of its useful life and the land reclaimed if appropriate.

VIII. LAND, MINERAL AND WATER REQUIREMENTS (Section 205(c))

Q. WHAT ARE THE LAND REQUIREMENTS OF THE FACILITY?

A. The land on which the Facility will be located will consist of up to 250 acres within the following described tracts:

Section 1, T13N R66W 6th PM, Laramie County, Wyoming.

The land for the proposed site is presently owned by B and L Land Company, and an affiliate of Cheyenne Light and Black Hills Power has entered into an option to purchase between 200 and 250 acres of said land. The exact number of acres that will be purchased for the project site will be determined once additional engineering and permitting work has been completed. For purposes of this Application and the estimated cost of the Facility, Cheyenne Light and Black Hills Power have assumed that the project site will be 250 acres. Additional

easements for gas transmission and electric transmission lines will be procured as necessary. The site has been re-zoned heavy industrial as approved by the City of Cheyenne.

Q. WHAT ARE THE WATER REQUIREMENTS OF THE FACILITY?

A. The water balance figure attached hereto as Exhibit ML-6 shows the flow rates of water that will normally be consumptively used by the proposed Facility.

The water requirements for the Facility will be met through purchase of municipal and treated water from the Cheyenne Board of Public Utilities, which has the ability to provide more than adequate water supply to the Facility.

Q. WHAT IS THE FUEL SUPPLY REQUIRED OF THE FACILITY?

A. As I previously testified, the proposed Facility will require a high pressure natural gas fuel supply with a minimum of 700 psig of gas pressure.

IX. REQUIREMENTS FOR CONSTRUCTION OR OPERATION OF THE FACILITY (Subsection 205(g))

Q. PLEASE LIST ALL LOCAL, STATE, INDIAN, OR FEDERAL GOVERNMENTAL AGENCIES HAVING REQUIREMENTS WHICH MUST BE MET IN CONNECTION WITH THE CONSTRUCTION OR OPERATION OF THE PROPOSED FACILITY.

A. Cheyenne Light and Black Hills Power recognize that the proposed Facility must comply with all local, state, and federal regulations and permit requirements, and understands that certain permits are required prior to commencing construction and/or operation. A list of permits and approvals that must be obtained in addition to the Certificate of Public Convenience and Necessity from the

Commission is included in the Application. The Company will update the Commission on the status of those permits and approvals including any final orders regarding such permits and approvals.

X. GENERAL DESCRIPTION OF DEVICES (Section 206(a))

Q. PLEASE GIVE A GENERAL DESCRIPTION OF THE DEVICES TO BE INSTALLED AT THE MAJOR UTILITY FACILITY TO PROTECT AIR, WATER, CHEMICAL, BIOLOGICAL AND THERMAL QUALITIES; THE DESIGNED AND TESTED EFFECTIVENESS OF SUCH DEVICE; AND THE OPERATIONAL CONDITIONS FOR WHICH THE DEVICES WERE DESIGNED AND TESTED.

A. The continuous emissions monitoring system (CEMS) measures and records the emissions from each of the exhaust stacks as required by the U.S. Environmental Protection Agency (EPA) Code of Federal Regulations and the Wyoming Department of Environmental Quality (WDEQ). Each CEMS will consist of one set of continuous emissions monitors that will monitor flue gas constituents including nitrogen oxides (NOx), oxygen (O_2), carbon monoxide (CO) and carbon dioxide (CO_2).

Each CTG will be equipped with Low-NOx combustors. Each HRSG has Selective Catalytic Reduction (SCR) to control NOx and CO. The catalyst in presence of a reducing agent chemically reacts and converts NOx contained in the flue gas into nitrogen (N_2) and water vapor (H_2O). The CO catalyst will convert CO to CO_2 in the presence of a metal oxidation catalyst. The CTG units are provided with weatherproof, acoustic enclosures. All chemical containing

equipment will be surrounded by a curbed area or other containment method in order to contain spillage and prevent exposure to storm water runoff. Drains from the chemical feed areas will be contained locally, and pumped to a waste truck if required. Spent CTG wash water will be collected in the CTG wash drain tanks. The spent CTG wash water contains detergent and could contain some oily residue from turbine washes. The water is pumped into a chemical waste removal truck for disposal as needed. Spent cooling tower blowdown and sanitary wastewater will also be discharged to the adjacent CBOPU water treatment facility or a permitted discharge. During construction, drainage and storm water will be managed using a clean storm drain sewer and ditch system and oil-contaminated runoff sewer system. All of these devices are industry-standard, and have been shown to protect environmental qualities as designed. Environmental control devices were designed to function under normal operational conditions. Cheyenne Light and Black Hills Power have constructed and operated facilities with these devices, and have successfully remained in compliance with environmental permits and regulations.

XI. SOURCE OF WATER (Section 206(b))

Q. WHAT IS THE NAME OF ANY BODY OR SOURCE OF WATER OR RIVER ALONG WHICH THE MAJOR UTILITY FACILITY WILL BE CONSTRUCTED OR FROM WHICH IT WILL OBTAIN WATER?

A. The Facility will be constructed near Crow Creek and Dry Creek. Water sources for the Facility will not come from either of these sources. Water will be obtained from a combination of city supply and effluent from the adjacent CBOPU water

1 treatment facility. Water will not be discharged to either creek without a NPDES
2 discharge permit. All sanitary wastewater is currently planned to be directed to
3 the CBOPU treatment plant that is located adjacent to the Facility. CBOPU
4 discharges its excess wastewater into Crow Creek under its NPDES permit.

5 **XII. GEOLOGICAL DESCRIPTION** (Section 206(c))

6 **Q. PLEASE PROVIDE A GENERAL GEOLOGICAL REPORT OF THE**
7 **STATION SITE.**

8 A. The area surrounding the Facility location can be described as undulating and
9 rolling and is typical of the high plains and grasslands located in southeastern
10 Wyoming. A topographical map showing the area within a five mile radius is set
11 forth in Exhibit ML-4. Soil conditions have been evaluated in an October 2005
12 report by Terracon which is attached as Exhibit ML-7.

13 **Q. WHAT ARE THE GROUNDWATER CONDITIONS OF THE PROPOSED**
14 **SITE?**

15 A. The hydrologic properties of these soils are considered Group B as defined by the
16 U.S. Department of Agriculture soil classification system, consisting of moderate
17 infiltration rates and are well drained with moderately fine and coarse textures
18 (USDA, 2011 and USDA, 2007). Surface water transmission is moderate and
19 indicates a low capillary capacity or ability to hold water within the soil horizon.
20 Excavation activities within the near surface to approximately 5 ft. below ground
21 surface (bgs) will require careful attention to slope stability due to the
22 unconsolidated sandy soils. Beyond 10 to 15 ft. bgs, heavy excavation equipment
23 will be required due to the higher percentage of cohesive silty sands and clayey

sands. With the presence of Group B soils, recharge of the shallow aquifer will be predictable and at a higher rate in some areas with more sandy conditions then those with silty or clayey soils present. Although the groundwater gradient and average flow direction has not been formally calculated, it is expected to follow the drainage topography of the site towards Stewart Ditch and Crow Creek to the south. A soils map of the project site and surrounding area is attached as Exhibit ML-8. Based on the suspected flow of groundwater towards Crow Creek to the south, it is expected that groundwater may be encountered at depths less than 20 ft. bgs within the southern half of the site. The presence of shallow groundwater less than 20 ft. bgs within the higher elevations located in the northern half of the site is less likely, but still possible due to aquitards or other features where more consolidated fine soils within the vadose zone demonstrate higher water holding capacity. During excavation, monitoring for groundwater intrusion will be necessary. A geology map is attached as Exhibit ML-9. The cost estimate for the CTGs and balance of plant foundations is based on installation of steel piles.

Q. ARE THERE OPERATING MINERAL DEPOSITS ON OR WITHIN A ONE MILE RADIUS OF THE PROPOSED SITE?

A. Cheyenne Light and Black Hills Power are not aware of the presence of operating mineral deposits within the project site or within a one mile radius. In any event, it is not expected that mining of mineral deposits on or under the project site will adversely affect the operation of the Facility.

XIII. EFFECT OF ENVIRONMENTAL POLICY ON BHP GENERATION RESOURCES

Q. HOW DID BLACK HILLS POWER EVALUATE THE COST OF RETROFITTING THE POWER PLANTS THAT DO NOT COMPLY WITH THE NEW EPA NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR AREA SOURCES: INDUSTRIAL, COMMERCIAL AND INSTITUTIONAL BOILERS?

A. As a result of the recently adopted and proposed Environmental Protection Agency (EPA) Maximum Achievable Control Technology (MACT) rules and future requirements for achieving reasonable further progress for regional haze, Black Hills Power contracted with an engineering firm, CH2M HILL, to perform an analysis on several of its generating units. The analysis provided an estimate of the capital cost to add emission controls to these units to meet the existing and future air pollution control requirements. The units evaluated were Neil Simpson Units 1, Osage Units 1, 2, & 3, and Ben French Unit 1. The study titled Future Emissions Control Technology Cost Estimate is discussed in the testimony of Dr. Robert L Pearson, an employee of CH2M HILL, and the study is set forth as Exhibit RLP-1. After reviewing this information, the senior management of Black Hills Corporation made the decision not to retrofit, but rather to replace the Neil Simpson 1, Osage and Ben French 1 units, and the Board of Directors approved this decision.

XIV. INFORMATION REGARDING IRPs.

Q. WHAT INFORMATION DID YOU PROVIDE FOR PREPARATION OF THE CHEYENNE LIGHT IRP AND THE BLACK HILLS POWER IRP?

A. On behalf of Cheyenne Light and Black Hills Power, I provided capital cost assumptions for small pulverized coal generating units, and small combined cycle (CC) and simple cycle (SC) gas-fired configurations because the Ventyx 2010 Fall Power Reference Case does not include assumptions for smaller generation configurations. All of the assumptions included direct capital costs for an ideal site. Also on behalf of Black Hills Power, I provided retrofit costs from the CH2MHILL study because the Ventyx 2010 Fall Power Reference Case does not include assumptions for retrofit capacity expansion options.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.