

Direct Testimony and Exhibit
Michael J. Fredrich

Before the South Dakota Public Utilities Commission
of the State of South Dakota

In the Matter of the Application of
Black Hills Power, Inc., a South Dakota Corporation

For Authority to Increase Rates
in South Dakota

Docket No. EL14-___

March 31, 2014

TABLE OF CONTENTS

I. INTRODUCTION AND QUALIFICATIONS 1

II. PURPOSE OF TESTIMONY 3

III. DISTRIBUTION GROWTH & RELIABILITY 3

IV. MAJOR CAPITAL DISTRIBUTION INVESTMENTS 6

V. LIDAR PROJECT 8

Exhibits

Exhibit MJF - 1 – Diagram of the BHP 230 & 69 kV transmission system

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I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Michael J. Fredrich. My business address is 409 Deadwood Avenue, P.O. Box 1400, Rapid City, South Dakota, 57701.

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

A. I am employed by Black Hills Utility Holdings Company ("BHUH") as Director, Engineering Services.

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

A. I am testifying on behalf of Black Hills Power, Inc. ("Black Hills Power" or the "Company").

Q. PLEASE DESCRIBE YOUR EDUCATION AND BUSINESS BACKGROUND.

A. I graduated from the South Dakota School of Mines and Technology with a Bachelor of Science Degree in Electrical Engineering in 1981. Following graduation, I accepted a position with Black Hills Corporation ("BHC"). Since that time, I have held a variety of engineering related roles.

From 1981 through 1986, I served as an electrical engineer in the Power Resources Department where I was responsible for the operation and maintenance of the generation and transmission protective relaying systems.

From 1987 to 1988, I served as the Substation Maintenance Supervisor for Black Hills Power's Electric Operations Department. From 1989 to 1991, I

1 served as the System Protection and Studies Engineer for the Black Hills
2 Power System Engineering Department, where I performed system study work
3 associated with the operational and planning requirements associated with the
4 Black Hills Power 230 kV and 69 kV transmission networks. From 1991 to
5 2000, I was the Manager for Planning and Coordination for Black Hills Power.
6 I was responsible for the development of operating and infrastructure plans
7 associated with maintaining the adequacy and reliability of all 230 kV and 69
8 kV transmission electrical facilities. From 2000 to 2005, I was the Director of
9 Transmission for Black Hills Power with responsibility for the entire
10 transmission network, including transmission planning, transmission contracts,
11 and Federal Energy Regulatory Commission ("FERC") tariff administration.
12 From 2005 to 2008, I was the Director of System Operations and Maintenance,
13 Engineering, and Transmission for Black Hills Power. I was responsible for
14 the operation and maintenance of the transmission network, including electrical
15 maintenance, the 24 hour System Control Dispatch Center, all transmission
16 planning activities, transmission contract administration, and FERC Open
17 Access Transmission Tariff administration. I also had management
18 responsibility over the Black Hills Power Engineering Department, which was
19 responsible for the design and construction of the transmission and distribution
20 networks of Black Hills Power. In 2008, I was named Director, Engineering
21 Services. I continue in this role today.

1 **Q. WHAT ARE YOUR PRIMARY RESPONSIBILITIES IN YOUR**
2 **CURRENT POSITION?**

3 A. As Director, Engineering Services, I currently manage and oversee the
4 engineering, design, construction, operation, and maintenance functions
5 associated with the major transmission and distribution networks of all three
6 electric utilities currently under BHC, those entities being Black Hills Power,
7 Cheyenne Light, Fuel & Power Company, and Black Hills/Colorado Electric
8 Utility Company. I also have responsibility for the metering services,
9 distribution planning, Geographic Information Systems electronic mapping,
10 and drafting support services for these organizations.

11 **II. PURPOSE OF TESTIMONY**

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

13 A. The purpose of my testimony is to provide the Commission with a brief
14 description of the Black Hills Power service territory and electrical network, a
15 summary of the major capital distribution investments that are included in this
16 rate case, and an overview of Black Hills Power's LIDAR project.

17 **III. DISTRIBUTION GROWTH & RELIABILITY**

18 **Q. PLEASE DESCRIBE THE GEOGRAPHIC AREA OF BLACK HILLS**
19 **POWER'S SERVICE TERRITORY.**

20 A. Black Hills Power's service territory is located in the northeastern part of
21 Wyoming, the western part of South Dakota (primarily the Black Hills of

1 South Dakota), and a portion of southeastern Montana. (See Exhibit MJF - 1 –
2 Diagram of the BHP 230 & 69 kV transmission system). Please refer to the
3 testimony of Vance Crocker for additional detail regarding Black Hills Power’s
4 service territory and business operations.

5 **Q. PLEASE DESCRIBE THE METHODS THE COMPANY USES TO**
6 **DETERMINE WHEN RELIABILITY AND GROWTH INVESTMENTS**
7 **ARE APPROPRIATE OR REQUIRED.**

8 A. Black Hills Power performs numerous power flow and voltage profile analyses
9 on the Company’s electrical transmission and distribution networks to
10 determine the overall capability of the existing electric facilities to serve the
11 projected customer peak loads during a typical near and long term planning
12 cycle. It is through these planning studies that Black Hills Power is able to
13 identify specific limitations associated with the existing transmission and
14 distribution facilities that may prevent the Company from providing safe and
15 reliable service to the Company’s existing customers. It is also through this
16 planning process that Black Hills Power will review, consider, and analyze
17 specific system additions and improvements required to meet existing
18 customer loads as well as the projected future customer loads. Black Hills
19 Power has developed a detailed set of distribution planning standards and
20 technical study criteria that it utilizes to evaluate and determine the best
21 solutions required to meet load serving requirements of customers.

1 **Q. PLEASE DESCRIBE THE TYPES OF INVESTMENTS NECESSARY**
2 **TO MAINTAIN RELIABILITY OF THE DISTRIBUTION SYSTEM.**

3 A. The types of investments associated with maintaining the reliability and
4 integrity of the distribution and 69kV sub-transmission networks that have
5 typically been considered in the Company's planning studies have been the
6 following:

- 7 * Rebuilding of existing 69kV lines
- 8 * Upgrading of substation equipment
- 9 * New substation additions
- 10 * Rebuilding of distribution feeders
- 11 * New 69kV sub-transmission lines
- 12 * New distribution feeder circuits
- 13 * Voltage conversions
- 14 * Replacement of aged or damaged infrastructure

15 As potential projects are evaluated to address specific integrity, reliability, and
16 growth requirements, Black Hills Power considers the cost benefit associated
17 with the alternatives that may have been identified as reasonable solutions to a
18 respective project. Black Hills Power takes into consideration a number of
19 planning and economic variables as it reviews and evaluates a given project to
20 consider reasonable cost alternatives for providing service to its customers.

1 **IV. MAJOR CAPITAL DISTRIBUTION INVESTMENTS**

2 **Q. PLEASE IDENTIFY THE COMPANY'S RECENT MAJOR CAPITAL**
3 **DISTRIBUTION INVESTMENTS.**

4 A. The following provides a brief description of some of the major distribution
5 capital investments that have been required to address various reliability and
6 long term growth issues and that are included as part of this rate case.

7 a. The East Meade Substation Project.

8 The East Meade Substation Project consists of the construction of a 10.5/12/14
9 MVA – 69/12.4 kV substation and associated switchgear located in the
10 southeastern part of Rapid City. This substation addition and associated
11 distribution tie lines are required to support the loads currently served from the
12 existing Robbinsdale Substation.

13 This project is necessary because the load service capability of the Robbinsdale
14 Substation has reached its maximum capacity. The Robbinsdale Substation
15 property site location is not conducive to physical expansion that would allow
16 a larger transformer. The existing Robbinsdale Substation property site is also
17 bordered by a drainage aqueduct on two sides of the property, which again
18 poses various limitations to our ability to expand this location. Also, the
19 ability to install additional distribution switchgear and associated distribution
20 feeder exits was prohibited due to the geographical location of this substation.

1 The East Meade Substation location is outside of this residential area and will
2 provide adequate access to the area distribution network. This new location
3 will allow critical distribution ties to be constructed that will support the loads
4 currently served from the Robbinsdale Substation. The additional transformer
5 capacity at the East Meade Substation will also allow additional load support
6 for loads served from adjacent substations during certain operating conditions
7 and when back up support is needed during outage events. The location and
8 capacity of the East Meade Substation will also provide additional system
9 capacity and operating options to serve potential load growth in the
10 southeastern portion of Black Hills Power's Rapid City service area.

11 The projected in service date for this project is September 30, 2014.

12 b. Neil Simpson Controls Project.

13 This project is associated with the decommissioning of the Neil Simpson I
14 facility. This particular project will facilitate the relocation of all the control
15 and protective relaying equipment required for the Neil Simpson 69 kV
16 substation. This equipment is currently located within the physical confines of
17 the Neil Simpson I power plant. The new control house will be located outside
18 of the existing plant and be located near the 69 kV substation. The costs of this
19 project include the installation of a new substation control building and the
20 installation of new control and protective relaying equipment for the Neil
21 Simpson 69 kV substation. The initial relocation of the existing controls from

1 their power plant location into the new control building is anticipated to start in
2 April 2014 and is currently scheduled to be completed by the end of May 2014.

3 c. Jackson Boulevard 69 kV Relocation Project.

4 This project is associated with a major South Dakota Department of
5 Transportation road expansion/rebuild along Jackson Boulevard in Rapid City.

6 This project will require Black Hills Power to relocate and rebuild
7 approximately 3000 feet of existing single pole 69kV lines with 12.47 kV
8 underbuild. This project is expected to be completed in July 2014.

9 d. Rapid City Cemetery Transformer Replacement.

10 The Rapid City Cemetery Transformer Replacement project involves
11 replacement of the smaller of the two existing transformers (10.5 MVA) at this
12 location so that both transformers have the same 14 MVA rating. Replacement
13 is necessary because the smaller 10.5 MVA transformer can no longer support
14 the summer peak loads in this area. This upgrade is also required to address
15 system outages and reliability situations. The projected in service date for this
16 project is late April 2014.

17 **V. LIDAR PROJECT**

18 **Q. WHAT IS LIDAR?**

19 A. LIDAR (Light Detection and Ranging) is a remote sensing technology that
20 measures distance by illuminating a target with a laser and analyzing the
21 reflected light. LIDAR surveys are performed by attaching the LIDAR device

1 to an aircraft used to fly along the right-of-ways of the electric transmission
2 and distribution facilities. The LIDAR imaging, coupled with high-resolution
3 cameras, measures the distances between the particular facility, the ground,
4 vegetation and other objects or structures within the vicinity of the facility.

5 **Q. WHAT ARE THE BENEFITS OF LIDAR IMAGING?**

6 A. LIDAR provides an economically appropriate imaging tool for areas with
7 rough terrain and significant vegetation, such as the Black Hills. In particular,
8 LIDAR imaging will provide Black Hills Power another tool to more
9 accurately identify hazard trees and vegetation. LIDAR imaging will also
10 assist Black Hills Power in measuring the distance between its power lines and
11 the ground. As a consequence, Black Hills Power will be able to address
12 inadequate clearances in a timely manner and therefore minimize line de-
13 ratings caused by clearance issues.

14 **Q. DOES THE NORTH AMERICAN ELECTRIC RELIABILITY**
15 **CORPRATION ("NERC") RECOMMEND LIDAR IMAGING ON**
16 **BHP'S 230 kV TRANSMISSION LINES?**

17 A. Under NERC's facility rating reliability standard FAC-008, Black Hills Power
18 is required to ensure that the facility ratings used in the reliable planning and
19 operation of the Bulk Electric System are determined based on technically
20 sound principles. Black Hills Power's 230kV transmission facilities fall under
21 the definition of Bulk Electric System. As Black Hills Power continues to meet

1 these facility rating requirements, it will utilize LIDAR surveys of its 230kV
2 transmission facilities to validate and ensure it is maintaining the proper
3 clearances so that it does not have to derate the loading on any of its facilities.
4 In addition, Black Hills Power will also utilize these LIDAR surveys to better
5 ensure compliance with the clearance requirements associated with NERC's
6 Vegetation Management reliability standard FAC-003. The LIDAR technology
7 and survey results will provide Black Hills Power with the most economical
8 means of collecting electronic data on our facilities to perform these
9 assessments.

10 **Q. IS BLACK HILLS POWER PROPOSING TO PERFORM A LIDAR**
11 **ANALYSIS OF ITS ENTIRE TRANSMISSION SYSTEM?**

12 A. Yes. Black Hills Power plans to perform LIDAR imaging of all of its 230 kV
13 and 69 kV facilities. This project will be started in 2014 after all snow is gone
14 in the area and deciduous trees are fully leafed. Black Hills Power will hire an
15 independent contractor to perform the LIDAR imaging. Based upon past
16 experience of BHC, the cost estimate for this project is approximately
17 \$800,000 for the 69 kV system.

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

19 A. Yes, it does.