



**2011 SENATE BILL 07-100 REPORT:**

**DESIGNATION OF ENERGY RESOURCE ZONES  
AND  
TRANSMISSION EXPANSION PLAN**

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TRANSMISSION PLANNING

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## 1. Introduction

### 1.1. Colorado Senate Bill 07-100

On March 27, 2007, Colorado Senate Bill 07-100 (“SB-100”), codified at Colo. Rev. Stat. § 40-2-126(2), became effective. The purpose of the bill is to ensure that Colorado utilities “continually evaluate the adequacy of electric transmission facilities throughout the state” and “promptly and efficiently improve such infrastructure as required to meet the state’s existing and future energy needs.”

The bill specifically requires each Colorado electric utility that is subject to rate regulation by the Colorado Public Utilities Commission (“Commission”) to perform the following on or before October 31 of each odd-numbered year:

- (a) Designate Energy Resource Zones;
- (b) Develop plans for the construction or expansion of transmission facilities necessary to deliver electric power consistent with the timing of the development of beneficial energy resources located in or near such zones.
- (c) Consider how transmission can be provided to encourage local ownership of renewable facilities, whether through renewable energy cooperatives as provided in Colo. Rev. Stat. § 7-56-210, or otherwise; and
- (d) Submit proposed plans, designations, and applications for Certificates of Public Convenience and Necessity to the Commission for simultaneous review.

The requirement for a Certificate of Public Convenience and Necessity (“CPCN”) for a particular transmission project is governed by Colo. Rev. Stat. §§ 40-2-126 and 40-5-101 and by the process in Commission Rule 3206, 4 *Code of Colorado Regulations* 723-3.

### 1.2. Stakeholder Participation

Black Hills/Colorado Electric Utility Company, L.P., d/b/a Black Hills Energy (“Black Hills”) encouraged all interested parties to participate in the 2011 SB-100 study process. An open stakeholder SB-100 Kick-off Meeting was held in conjunction with the Q1 Black Hills Colorado Transmission (“BHCT”) Transmission Coordination and Planning Committee (“TCPC”) on March 16, 2011 in Rapid City, South Dakota to inform stakeholders of the proposed study plan and to provide an opportunity for suggestions and feedback on the study process. The Kick-off Meeting was attended via web conference by neighboring utilities, resource developers and Commission Staff. A follow-up web conference was held on October 4, 2011 to provide the stakeholders with updates to the study progress and provide another opportunity for input to the process. Meeting notices and presentations were distributed via email and posted on the Black Hills OASIS page at <http://www.oatioasis.com/bhct/index.html>, as well as on a Colorado SB-100 webpage established on the Black Hills Corporation website at <http://www.blackhillscorp.com/transmission.htm>.

## **2. Designation of Energy Resource Zones**

### **2.1. Zone Identification Assumptions**

An Energy Resource Zone (“ERZ”), as defined in Colo. Rev. Stat. § 40-2-126(1), is “a geographic area in which transmission constraints hinder the delivery of electricity to Colorado consumers, the development of new electric generation facilities to serve Colorado consumers, or both.” SB-100 requires utilities to identify ERZs and to “develop plans for the construction and expansion of transmission facilities necessary to deliver electric power from resources in or near such zones.” Colo. Rev. Stat. § 40-2-126(2).

### **2.2. Colorado-wide ERZ Identification**

On November 24, 2008, Public Service Company of Colorado (“PSCo”) filed with the Commission an information report which identified its five ERZs within Colorado. Three of the ERZs identified by PSCo are located to the south of the Black Hills system. Specifically, the resources in PSCo’s defined Zones 3, 4 and 5 are geographically closest to the Black Hills system. In its informational report, PSCo further identified higher priority transmission projects which would facilitate the delivery of resources within Zones 3, 4 and 5 to PSCo’s customers. Two of these projects, San Luis Valley-Comanche and Lamar-Front Range, would terminate at a point of interconnection between the PSCo and Black Hills transmission systems, namely at Comanche substation.

Black Hills anticipates these facilities will be under the jurisdiction of PSCo’s FERC-approved Open Access Transmission Tariff (“OATT”). OATT provides transmission rights on a transparent, non-discriminatory, just and reasonable basis. As such, Black Hills believes it would be a least-cost, reasonable and prudent decision to procure firm transmission service utilizing PSCo transmission OATT facilities to deliver beneficial energy resources from PSCo ERZs to the PSCo points of interconnection with the Black Hills system as opposed to building redundant facilities to achieve a similar purpose.

### **2.3. Black Hills System Energy Resource Zone Identification**

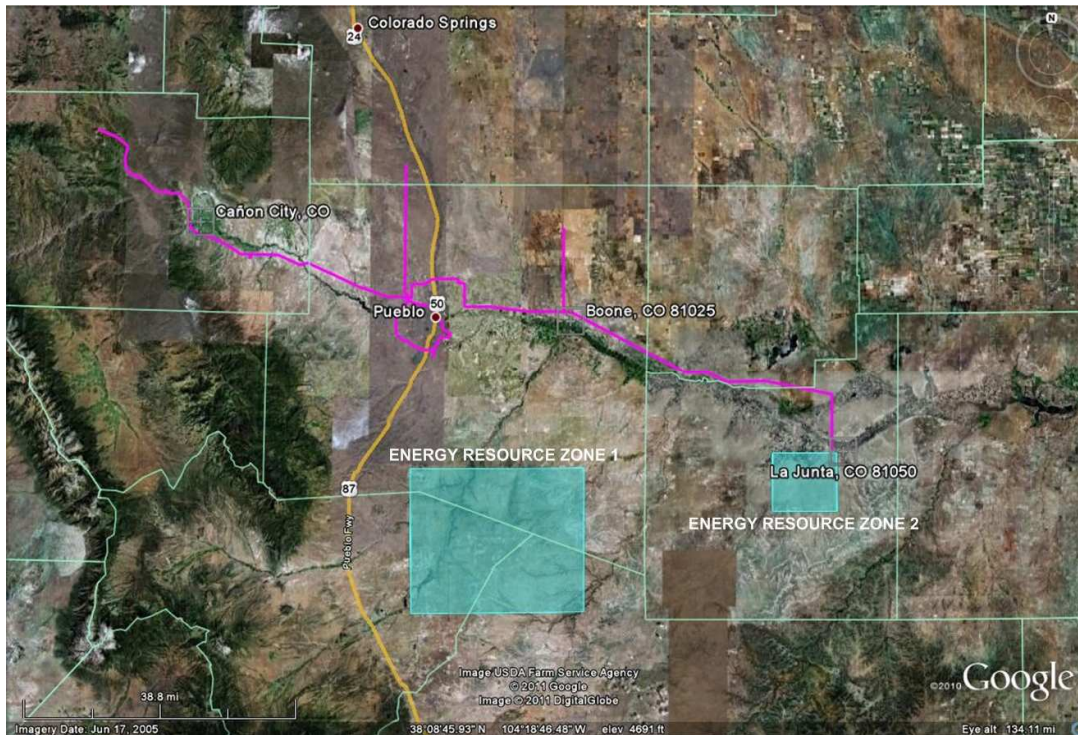
Black Hills identified two ERZs within its service territory.

#### **2.3.1. ERZ #1**

ERZ #1 was identified based on an active generator interconnection request (BHCT-G8) in the Black Hills generator interconnection queue. The Busch Ranch wind project (approved by Decision No. C11-0872 in Docket No. 10A-930E) consists of 29 MW of wind generation at a site located in Huerfano County approximately 30 miles south of Pueblo, CO. A single circuit 115 kV line is planned to connect the project site to the Black Hills transmission system at the Reader substation (*see* Paragraph 5.1). ERZ #1 is comprised of the local area surrounding the Busch Ranch wind project as shown in **Figure 1**.

#### **2.3.2. ERZ #2**

Similar to ERZ #1, ERZ #2 was identified for potential resource development based on an active generator interconnection request (BHCT-G9) in the BHCE generator interconnection queue. The request consists of 20 MW of solar PV generation planned to be connected to the Black Hills transmission system at the La Junta 69 kV substation. ERZ #2 is located to the west of the city of La Junta in Otero County, CO as shown in **Figure 1**.



**Figure 1: Black Hills Energy ERZ Designation**

### 3. Study Methodology

The SB-100 analysis was performed as a subset of the 2011 TCPC annual transmission assessment. The transmission system was evaluated under 2015 peak summer load levels to identify any significant adverse impact to the reliability and operating characteristics of the Western Electricity Coordinating Council (“WECC”) bulk transmission system and, more specifically, to the Black Hills and surrounding transmission systems. Steady state voltage and thermal analyses examined system performance without additional projects in order to establish a baseline for comparison. Performance was re-evaluated with resource injections modeled and compared to the baseline performance to determine the impact of the injections on area transmission reliability.

#### 3.1. Assumptions

The analysis was performed with the following assumptions:

- All existing and planned facilities and the effects of control devices and protection systems were accurately represented in the system model.

- Projected firm transfers were represented per load and resource updates.
- Existing and planned reactive power resources were modeled to ensure adequate system performance.
- There were no specific planned outages identified for the 2015 study period. A series of prior outages on facilities deemed to be most critical by the transmission planner was simulated to identify potential risks associated with such outages in the 2015 time frame. A list of the evaluated prior and forced outages is included in Appendix A. Extreme contingencies were not simulated.

The power flow analysis was performed with pre-contingency solution parameters that allowed adjustment of load tap-changing (LTC) transformers, static VAR devices including switched shunt capacitors and reactors, and DC taps. Post-contingency solution parameters allowed adjustment of DC taps and automatically switched shunt devices, as well as adjustment of manually switched shunt devices outside the study area. Area interchange control was disabled and generator VAR limits were applied automatically for all solutions. The solution method implemented was a fixed-slope decoupled Newton solution.

### **3.2. Reliability Criteria**

The criteria described in this section are consistent with the NERC TPL Reliability Standards, WECC TPL – (001 thru 004) – WECC – 1 – CR – System Performance Criteria and Colorado Coordinated Planning Group’s Voltage Coordination Guide.

#### **3.2.1. Steady State Voltage Criteria**

Under system intact conditions, steady state bus voltages must remain between 0.95 and 1.05 per unit. Following a Category B or C contingency, bus voltages must remain between 0.90 and 1.10 per unit. Pre-existing voltage violations outside the localized study area were ignored during the evaluation.

#### **3.2.2. Steady State Thermal Criteria**

All line and transformer loading must be less than 100% of their established continuous rating for system normal conditions (NERC/WECC Category A). All line and transformer loadings must be less than 100% of their established continuous or emergency rating under outage conditions (NERC/WECC Category B and C).

### **3.3. Study Area**

The Black Hills transmission system follows the Arkansas River Valley from the Royal Gorge west of Cañon City to La Junta. The major load centers on the system are at Cañon City to the west, Rocky Ford to the east, and Pueblo in the center. A one line diagram of the Black Hills transmission system is included in Appendix B. Points of interconnection to the neighboring utilities are shown in **Table 1**.

**Table 1: Black Hills Transmission System Interconnection Points**

<b>Interconnection Name</b>	<b>Interconnecting Utility<sup>1</sup></b>
Midway (PSCo)	PSCo
Midway (WAPA)	WAPA, CSU, Tri-State
Boone	PSCo, Tri-State
Reader	PSCo
Cañon West	WAPA, PSCo
West Station	Tri-State

### **3.4. Study Case Development**

#### **3.4.1. 2015 Study Cases**

The 2015 heavy summer time frame was chosen for the near-term analysis for several reasons. The summer demand levels have historically been the most critical of the seasonal load patterns in the study area. Additionally, Tri-State Generation & Transmission, Inc. (“Tri-State” or “TSG&T”) had recently compiled a 2015 heavy summer case as part of their Generator Interconnection Procedures. The case originated as a WECC-approved base case. The TSG&T case was used as the starting point for the 2015HS analysis. Updates to the case loads, resources, and topography were solicited from neighboring systems and applied to the model by TSG&T. Black Hills’ loads were served by planned or existing Black Hills’ generation.

Significant changes to the existing 2011 Black Hills transmission system to create the 2015 model included all projects listed the most recent Colorado Rule 3206 filing, as well as the addition of a third LMS-100 generator at Baculite Mesa to offset planned generation retirements under Colorado HB 10-1365 (the “Clean Air - Clean Jobs Act”). (See Decision No. C10-1330 in Docket No. 10M-254E) Terminal equipment that was the limiting element on several transmission lines was also assumed to be replaced.

TSG&T also compiled a 2015 light autumn load case for their generator interconnection studies. This case contained a similar transmission system topology and reduced area loads. The light autumn case was also evaluated as part of this 2011 SB-100 study.

It should be noted that the San Luis Valley-Calumet-Comanche transmission project and the Lamar Front Range transmission project were not included in the 2015 study cases, but were included in the 2021 case.

#### **3.4.2. 2021 Study Case**

The 2021 time frame was used to analyze resource injections from ERZ #1 and ERZ #2 along with any identified transmission upgrades and assess their impacts on system reliability into the future. The 2021 case was created by the Colorado Coordinated Planning Group (“CCPG”)

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<sup>1</sup> “CSU” means Colorado Springs Utilities; “WAPA” means Western Area Power Administration and “Tri-State” means Tri-State Generation and Transmission Association, Inc.

members for the Douglas, Elbert, El Paso, And Pueblo (“DEEP”) sub-committee study. As with the 2015 cases, current load and resource forecasts were modeled, as well as expected system topology for that time frame.

### **3.4.3. Resource Scenarios**

Resource injection alternatives to each benchmark case were evaluated to identify impacts to the existing transmission system. Incremental generation injections from each ERZ were dispatched against Black Hills generation. The evaluation of ERZ #1 included the 29 MW Busch Ranch wind project, which was modeled online to determine the total allowable injection from ERZ #1 into the Black Hills transmission system.

## **4. Results**

A number of voltage and thermal loading issues on the Black Hills transmission system existed in the benchmark case, prior to adding ERZ injections. These system issues and the associated solutions were outside the scope of the SB-100 analysis, and will be addressed through the current BHCT TCPC study process.

### **4.1. 2015HS ERZ #1 Results**

The 2015HS study results indicated the BHCE transmission system could accommodate a maximum of 140 MW of additional generation from ERZ #1 without significant impacts to the system. The Reader-Pueblo 115 kV line would reach or exceed its thermal limit for an injection of 140 MW following the N-1-1 loss of the Comanche-Daniels Park 345 kV #1 and #2 lines or the Baculite Mesa-West Station 115 kV #1 and #2 lines. The Reader-Pueblo line is current transformer (“CT”) limited to 159 MVA. Replacing the limiting equipment would increase the rating of the line to 194 MVA, mitigating the stated overloads.

The Reader-Blende 69 kV line segments reached their thermal limit for an injection of 140 MW following the N-1-1 loss of the Reader-Freemary 69 kV line and a West Station 115/69 kV transformer. This line is limited by relay equipment at Reader. This limitation will be removed during relay re-coordination as part of the Reader 115/69 kV transformer replacement project scheduled for completion in 2013.

By simulating only single contingencies without prior outages, the maximum allowable injection from ERZ #1 was 190 MW, due to a system intact thermal limit of 222 MVA on the Reader-Rattlesnake Butte 115 kV line.

### **4.2. 2015HS ERZ #2 Results**

The 2015HS study results indicated the Black Hills transmission system could accommodate a maximum of 50 MW of additional generation from ERZ #2 without significant impacts to the system. The continuous thermal limit of one of the parallel La JuntaW 115/69 kV transformers was reached following the N-1-1 loss of the La JuntaW-La JuntaT 115 kV line and one of the La JuntaW 115/69 kV transformers. The transformers were added to the system model as part of the planned addition of the La Junta Tie line between the Black Hills and TSG&T La Junta substations. The transformers were each assumed to have a 42 MVA continuous rating.

The 50 MW resource injection from ERZ #2 also caused the thermal limit of the Rocky Ford-La JuntaW 69 kV line to be reached following the N-1-1 loss of the Boone-La JuntaW and La JuntaT-La JuntaW 115 kV lines. The 24 MVA CT limitation was assumed to be removed for this analysis, and the 42 MVA conductor limit was observed.

By simulating only single contingencies without prior outages, the maximum allowable injection from ERZ #2 was 120 MW, due to a thermal overload on the La JuntaW-Rocky Ford 69 kV line following the loss of the La JuntaT-La JuntaW 115 kV line. The continuous thermal limit of the La JuntaW 115/69 kV transformer was also reached following the loss of the other La JuntaW 115/69 kV transformer.

#### **4.3. 2015LA ERZ #1 Results**

The 2015LA study results indicated the Black Hills transmission system could accommodate a maximum of 160 MW of additional generation from ERZ #1 without significant impacts to the system. Like the 2015HS results, the Reader-Pueblo 115 kV line was the limiting element, reaching its 159 MVA limit following the N-1-1 loss of the Comanche-Daniels Park 345 kV #1 and #2 lines. Replacing the limiting equipment would increase the rating of the line to 194 MVA, mitigating the stated overload.

By simulating only single contingencies without prior outages, the maximum allowable injection from ERZ #1 was 190 MW, due to a system intact thermal limit of 222 MVA on the Reader-Rattlesnake Butte 115 kV line.

#### **4.4. 2015LA ERZ #2 Results**

The 2015LA study results indicated the Black Hills transmission system could accommodate a maximum of 45 MW of additional generation from ERZ #2 without significant impacts to the system. The Rocky Ford-La JuntaW 69 kV line reached its 41 MVA limit, assuming the CT replacement, following the N-1-1 loss of the Boone-La JuntaW and La JuntaT-La JuntaW 115 kV lines. This outage also caused the Boone 115/69 kV transformer to reach 99% of its continuous thermal limit.

By simulating only single contingencies without prior outages, the maximum allowable injection from ERZ #2 was 145 MW, due to a thermal overload on the Boone-La JuntaW 115 kV line following the loss of the La JuntaT-La JuntaW 115 kV line. Increasing the injection to 160 MW caused the Rocky Ford-La JuntaW 69 kV line to reach its thermal limit as well.

#### **4.5. 2021HS ERZ #1 Results**

The 2021HS study results indicated the Black Hills transmission system could accommodate a maximum of 190 MW of additional generation from ERZ #1, due to a system intact thermal limit of 222 MVA on the Reader-Rattlesnake Butte 115 kV line. The 2021 scenario included the San Luis Valley-Calumet-Comanche transmission project as well as the Lamar-Front Range project. These projects reduced the loading on the Black Hills transmission system, allowing for larger resource injections from ERZ #1 than the 2015 scenarios allowed.

It should be noted that an injection of 160 MW caused one of the Reader 115/69 kV transformers to reach 109% of its continuous thermal rating following the N-1-1 loss of the West Station-Stonemoor 69 kV line and the other Reader transformer. This overload increased by 5% over the benchmark case without the ERZ #1 generation. The overload was mitigated by switching the 69 kV system into a different configuration.

#### **4.6. 2021HS ERZ #2 Results**

The 2021HS study results indicated the Black Hills transmission system could accommodate a maximum of 40 MW of additional generation from ERZ #2 without significant impacts to the system. The continuous thermal limit of one of the parallel La JuntaW 115/69 kV transformers was reached following the N-1-1 loss of the La JuntaW-La JuntaT 115 kV line and one of the La JuntaW 115/69 kV transformers. The transformers were added to the system model as part of the planned addition of the La Junta Tie line between the Black Hills and TSG&T La Junta substations. The transformers were each assumed to have a 42 MVA continuous rating.

By increasing the resource injection from ERZ #2 to 50 MW, the thermal limit of the Rocky Ford-La JuntaW 69 kV line was reached following the N-1-1 loss of the Boone-La JuntaW and La JuntaT-La JuntaW 115 kV lines. The 24 MVA CT limitation was assumed to be removed for this analysis, and the 42 MVA conductor limit was observed.

By simulating only single contingencies without prior outages, the maximum allowable injection from ERZ #2 was 120 MW, due to a thermal overload on the La JuntaW-Rocky Ford 69 kV line following the loss of the La JuntaT-La JuntaW 115 kV line. The continuous thermal limit of the La JuntaW 115/69 kV transformer was nearly reached following the loss of the other La JuntaW 115/69 kV transformer.

#### **4.7. Results Summary**

The evaluated scenarios identified the maximum allowable resource injection from each ERZ, as well as the transmission system elements that limited such injections. Upgrades to the limiting transmission system elements often resulted in an increased injection capability. It is prudent to evaluate any identified upgrades in the context of resource needs and system capabilities.

The maximum allowable resource injection from ERZ #1 is 140 MW. Upgrading the Reader-Pueblo 115 kV line and performing the planned relay re-coordination at the Reader 69 kV substation would increase this limit to 170 MW. That limit is based on the Greenhorn-Reader 115 kV line reaching the thermal limit following various N-1-1 outages involving the loss of the Pueblo-Reader 115 kV line. Following the construction of the San Luis Valley-Calumet-Comanche transmission project and the Lamar-Front Range transmission project, the maximum allowable injection from ERZ #1 increased to 190 MW, reflecting the thermal limit of the Reader-Rattlesnake Butte 115 kV line connecting ERZ #1 to the Black Hills transmission system.

As detailed in Decision No. C11-0872 in Docket No. 10A-930E, Black Hills has been granted a Certificate of Public Convenience and Necessity by the Commission for the Busch Ranch Wind

generation resources located in ERZ #1. Black Hills considers this a “beneficial resource” and fully expects this resource to be constructed.

The maximum allowable resource injection from ERZ #2 was 40 MW. By increasing the size of the planned La JuntaW 115/69 kV transformers, this limit would increase to 45 MW. With a 45 MW injection, the Rocky Ford-La JuntaW 69 kV line thermal limit is reached, as well as the Boone 115/69 kV transformer. When the costs of the required upgrades to increase the injection from ERZ #2 were considered, it was determined that the best solution would limit the allowable resource injection to 40 MW or less.

Considering these facts, Black Hills has identified several new transmission projects, as well as previously identified projects which fulfill the objective of the reliable delivery of beneficial resources to customer loads. These projects are described in more detail in Section 5.

## **5. Transmission System Expansion**

The following transmission projects have been identified by Black Hills as fulfilling the objectives of the reliable delivery of beneficial resources to customer load.

### **5.1. Reader-Rattlesnake Butte 115 kV Project**

The Reader-Rattlesnake Butte project includes a new 36 mile 115 kV transmission line consisting of 795 ACSR conductor and terminating at the new 115 kV Rattlesnake Butte substation. The line will be rated for 222 MVA (summer). The Reader-Greenhorn 115 kV line will be rebuilt as part of this project. Terminal equipment additions at the Reader 115 kV substation are also required to accommodate the new line. This project has an estimated total cost of \$15.6 million which includes the transmission line cost and associated 115 kV substation construction/upgrades at Reader and Rattlesnake Butte. This project is planned to be in service by October 2012. Decision No. C11-0749 in Docket No. 11M-317E held that no CPCN would be required for this project.

### **5.2. La Junta-Tri-State Interconnection Project**

The La Junta-Tri-State Interconnection Project will add additional 115/69 kV transformation capacity at the Black Hills La Junta substation and add a new half-mile 115 kV line between the Black Hills La Junta substation and the Tri-State La Junta substation. A parallel 69 kV line will also be added between the two substations. This project has an estimated total cost of \$6.0 million. The project is currently scheduled for construction in 2013 with an in-service date of 2014. Decision No. C09-1240 in Docket No. 09M-392E held that no CPCN would be required for this project.

### **5.3. Pueblo-Hyde Park-West Station 115 kV line rebuild**

The Pueblo-Hyde Park-West Station 115 kV line rebuild will increase the line rating for improved reliability in the Pueblo area and was identified in Black Hills’ 2009 SB-100 report. This project has an estimated total cost of \$2.7 million. The project is currently scheduled for construction in 2013 with an in-service date of 2013. Decision No. C10-0644 in Docket No. 10M-206E held that no CPCN would be required for this project.

#### **5.4. Terminal Equipment Upgrades on Reader-Pueblo 115 kV line**

The Reader-Pueblo 115 kV line is currently rated for 159 MVA, which is based on an 800 amp wave trap limitation at the Reader and Pueblo substations. By removing the wave trap, the line rating would increase to the summer conductor limit of 194 MVA. The total estimated cost of this project is \$25,000.

#### **5.5. Terminal Equipment Upgrades on Boone-La Junta (BH) 115 kV line**

The Boone-La Junta (BH) 115 kV line is currently rated for 40 MVA, which is based on a CT limitation at La Junta (BH). Line relaying should be re-coordinated and differential relaying reset for 600:5 ratios. The next limiting element would be the CT's at Boone, which are set at 500:5. The ratios should be changed on the line relaying and watt/var transducer. The watt/var transducer owned by PSCo will also need to be reviewed and its replacement coordinated with them. The final line rating would be 120 MVA. The total estimated cost of this project is \$50,000.

#### **5.6. Terminal Equipment Upgrades on La Junta-Rocky Ford 69 kV line**

The La Junta (BH)-Rocky Ford 69 kV line is currently rated for 24 MVA, which is based on a CT limitation at both La Junta and Rocky Ford. The La Junta CT's should be re-tapped with all relaying and indicating instrumentation re-coordinated. Additionally, the replacement of the limiting bushing CT's at Rocky Ford would increase the line rating to the summer conductor limit of 41 MVA. The total estimated cost of this project is \$120,000.

#### **5.7. Terminal Equipment Upgrades on South Fowler Tap-Rocky Ford 69 kV line**

The South Fowler Tap-Rocky Ford 69 kV line is currently rated for 24 MVA, which is based on a CT limitation at Rocky Ford. By re-tapping the CT's and re-coordinating the relaying and metering, the line rating would increase to the summer conductor limit of 72 MVA. The total estimated cost of this project was \$50,000. The equipment upgrades are scheduled for construction and completion in 2012.

#### **5.8. Terminal Equipment Upgrades on Boone-Boone Tap 69 kV line**

The Boone-Boone Tap 69 kV line is currently rated for 24 MVA, which is based on a CT limitation at the Boone 69 kV substation. By replacing the limiting bushing CT's, the line rating would increase to 40 MVA based on the CT's at the Boone 115 kV breaker 8132. The emergency rating on the Boone 115/69 kV transformer is 41 MVA; therefore a transformer replacement would be required in addition to the replacement of metering and protection equipment associated with breaker 8132 to obtain a rating above 41 MVA. These additional upgrades were not necessary to mitigate the overload on the Boone-Boone Tap 69 kV line due to the additional injection from ERZ #2 and were not included in the cost estimate. The total estimated cost of the Boone CT replacement is \$25,000.

#### **5.9. Terminal Equipment Upgrades on Reader-Aspen Tap-Blende 69 kV line**

The Reader-Aspen Tap-Blende 69 kV line is currently rated for 57 MVA, which is based on a 51P relay limitation at Reader. By removing the relay equipment limitation, the line thermal rating would increase to the summer conductor limit of 68 MVA for the 0.4 mile stretch of

conductor between Reader and switch 5656. The relay re-coordination will be performed as part of the Reader 115/69 kV transformer replacement project scheduled for completion in 2013. No additional costs were assigned to this upgrade.

#### **5.10. Add Second Boone 230/115 kV Transformer**

This project consists of a new 150 MVA 230/115 kV transformer at the Boone substation. This project is needed to enhance the reliability of the Rocky Ford/La Junta portion of the Black Hills transmission system. The project is estimated to cost approximately \$5.3 million with an estimated construction start, end, and in-service date of 2013.

### **6. Ordinary Course of Business**

The projects in Sections 5.1-5.3 were previously found to be in the ordinary course of business by the Commission.

Black Hills believes that the projects detailed in Sections 5.4 through **Error! Reference source not found.** above are in the ordinary course of its business for several reasons. They are replacements for various components of Black Hills' existing transmission and/or distribution facilities. They will enhance the local load serving function and will improve reliability of service to our Colorado customers. These projects are similar in purpose to previous Black Hills' 115 and 69 kV projects the Commission has previously determined were in the "ordinary course of business." These transmission projects will provide increased reliability and long-term load serving capability for Black Hills customers. These projects will be part of the Black Hills base transmission infrastructure that is critical to the interconnection and delivery of capacity and energy from Black Hills' potential beneficial renewable resources.

The Second Boone Transformer project detailed in Section 5.11 has been reviewed by the Commission in Docket No. 11M-317E. In Decision No. C11-0749 (Ordering Paragraph No. 4, page 6), the Commission ordered Black Hills to: "file for a CPCN or for a formal determination that no CPCN is required" for the Second Boone 230/115 kV Transformer project. Black Hills plans to file an application for a formal determination that no CPCN is required for this project and will demonstrate in that filing that the Second Boone 230/115 kV Transformer project is in the ordinary course of its business and does not require a CPCN pursuant to Colo. Rev. Stat. § 40-5-101 and Rule 3206.

### **7. Conclusions**

Black Hills utilized an open and transparent process in conducting its 2011 Colorado Senate Bill 07-100 study. Stakeholders were provided several opportunities for involvement and input into the study process and scope. Through this process, Black Hills believes it has fulfilled the requirements of Colorado Senate Bill 07-100, codified at Colo. Rev. Stat. § 40-2-126.

*Designate Energy Resource Zones*

Two Energy Resource Zones, pursuant to the definition in Colo. Rev. Stat. § 40-2-126, were identified for inclusion in the 2011 SB-100 study. The first zone, ERZ #1, is composed of the local area surrounding the Busch Ranch wind project to the south of Pueblo, CO. The second zone, ERZ #2, is comprised of the area surrounding the proposed BHCT-G9 solar PV generation project to the west and south of La Junta, CO.

*Develop plans for the construction or expansion of transmission facilities necessary to deliver electric power consistent with the timing of the development of beneficial energy resources located in or near such zones.*

Black Hills identified the impacts of the various resource scenarios on the Black Hills transmission system and identified projects which ensure reliable delivery of beneficial resources from the designated ERZs to customer loads.

*Consider how transmission can be provided to encourage local ownership of renewable facilities, whether through renewable energy cooperatives as provided in Colo. Rev. Stat. § 7-56-210, or otherwise.*

Black Hills identified two ERZs as potential development sites for renewable resources within or near the Black Hills service territory. The proposed transmission projects will facilitate renewable resource development in these zones in excess of what can be accommodated by the existing Black Hills transmission system.

*Submit proposed plans, designations, and applications for Certificates of Public Convenience and Necessity to the Commission for simultaneous review.*

Black Hills believes that the transmission projects it has identified to facilitate the reliable delivery of beneficial resources to customer load are “in the ordinary course of its business” and do not require CPCNs, pursuant to Colo. Rev. Stat. §§ 40-2-126(3) and 40-5-101. The reasons as to why these projects are “in the ordinary course of its business” and should not require CPCNs are detailed in Section 5 of this Report.

# Appendix A

## Power Flow Analysis: Prior and Forced Outage Lists

## 2015 Reliability Analysis Prior Outages

PO 345 SERIES		PO 230 SERIES		PO 115 SERIES		PO 69 SERIES		PO X SERIES		PO GEN SERIES	
LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION
PO345-1	SYSTEM INTACT	PO230-1	BOONE-MIDWAYS	PO115-1	MIDWAYBR-RANCHO	PO69-1	ROCKY FORD-LAJUNTAW	POX-1	MIDWAYS 345:230	POGEN-1	COMANCHE 3
PO345-2	DAN PARK-COMANCHE-1	PO230-2	BOONE-COMANCHE	PO115-2	MIDWAYBR-NIXON	PO69-2	BLENDE-ST. CHARLES **	POX-2	COMANCHE 345:230-T3	POGEN-2	BAC MESA GEN 1
PO345-3		PO230-3	BOONE-LAMAR	PO115-3	FTN VALLEY-MIDWAYBR	PO69-3	WEST STATION-STONEMOOR	POX-3	LAMAR 230:115	POGEN-3	
PO345-4		PO230-4	COMANCHE-MIDWAYS-1	PO115-4	FTN VALLEY-DESERT COVE	PO69-4	READER-FREEMARY	POX-4	BOONE 230:115-1	POGEN-4	
PO345-5		PO230-5	MIDWAYS-FULLER	PO115-5	DESERT COVE-WEST STATION	PO69-5	PORTLAND-HIGHLAND	POX-5	WEST CANON 230:115-1	POGEN-5	
PO345-6		PO230-6	MIDWAYBR-NIXON	PO115-6	MIDWAYS-WEST STATION	PO69-6		POX-6	COMANCHE 230:115-T1	POGEN-6	
PO345-7		PO230-7	MIDWAYBR-LINCOLN	PO115-7	MIDWAYS-NORTHRIDGE	PO69-7		POX-7	WALSENBURG 230:115-1	POGEN-7	
PO345-8		PO230-8	MIDWAYBR-WEST CANON	PO115-8	OVERTON-NORTHRIDGE	PO69-8		POX-8	MIDWAYS 230:115	POGEN-8	
PO345-9		PO230-9	WEST CANON-PONCHA	PO115-9	OVERTON-BACULITE MESA	PO69-9		POX-9	MIDWAYBR 230:115	POGEN-9	
PO345-10		PO230-10	COMANCHE-WALSENBURG	PO115-10	BACULITE MESA-WEST STATION-1	PO69-10		POX-10	LAJUNTAW 115:69-1 ***	POGEN-10	
PO345-11		PO230-11		PO115-11	HYDE PARK-WEST STATION	PO69-11		POX-11	BOONE 115:69 ***	POGEN-11	
PO345-12		PO230-12		PO115-12	HYDE PARK-PUEBLO	PO69-12		POX-12	READER 115:69-T1	POGEN-12	
PO345-13		PO230-13		PO115-13	PUEBLO-READER	PO69-13		POX-13	WEST STATION 115:69-1	POGEN-13	
PO345-14		PO230-14		PO115-14	PORTLAND-WEST STATION	PO69-14		POX-14	PORTLAND 115:69-T1	POGEN-14	
PO345-15		PO230-15		PO115-15	PUEBLO TAP-STEM BEACH	PO69-15		POX-15	PORTLAND 115:69-T1 tied	POGEN-15	
PO345-16		PO230-16		PO115-16	PUEBLO TAP-WEST STATION	PO69-16		POX-16	CANON CITY 115:69	POGEN-16	
PO345-17		PO230-17		PO115-17	PUEBLO TAP-WEST STATION	PO69-17		POX-17	CANON CITY 115:69 tied	POGEN-17	
PO345-18		PO230-18		PO115-18	BURNT MILL-GREENHORN	PO69-18		POX-18	CANON CITY 115:69 tied	POGEN-18	
PO345-19		PO230-19		PO115-19	BURNT MILL-GREENHORN	PO69-19		POX-19	AREQUA GULCH 115:69	POGEN-19	
PO345-20		PO230-20		PO115-20	GREENHORN-READER	PO69-20		POX-20		POGEN-20	
PO345-21		PO230-21		PO115-21	READER-AIRPORT MEMORIAL	PO69-21		POX-21		POGEN-21	
PO345-22		PO230-22		PO115-22	ARPORT PARK-ARPORT MEMORIAL	PO69-22		POX-22		POGEN-22	
PO345-23		PO230-23		PO115-23	AIRPORT PARK-BACULITE MESA	PO69-23		POX-23		POGEN-23	
PO345-24		PO230-24		PO115-24	NYBERG-BACULITE MESA	PO69-24		POX-24		POGEN-24	
PO345-25		PO230-25		PO115-25	NYBERG-AIRPORT MEMORIAL	PO69-25		POX-25		POGEN-25	
PO345-26		PO230-26		PO115-26	NYBERG-DOT TAP	PO69-26		POX-26		POGEN-26	
PO345-27		PO230-27		PO115-27	NYBERG-DOT TAP	PO69-27		POX-27		POGEN-27	
PO345-28		PO230-28		PO115-28	BOONE-LAJUNTAW ***	PO69-28		POX-28		POGEN-28	
PO345-29		PO230-29		PO115-29	BOONE-LAJUNTAW	PO69-29		POX-29		POGEN-29	
PO345-30		PO230-30		PO115-30	LAJUNTAW-LAJUNTAW	PO69-30		POX-30		POGEN-30	
PO345-31		PO230-31		PO115-31	COMANCHE-READER-1	PO69-31		POX-31		POGEN-31	
PO345-32		PO230-32		PO115-32	PORTLAND-SKALA	PO69-32		POX-32		POGEN-32	
PO345-33		PO230-33		PO115-33	CANON CITY-SKALA	PO69-33		POX-33		POGEN-33	
PO345-34		PO230-34		PO115-34	CANON CITY-WEST CANON	PO69-34		POX-34		POGEN-34	
PO345-35		PO230-35		PO115-35	CANON CITY-WEST CANON	PO69-35		POX-35		POGEN-35	
PO345-36		PO230-36		PO115-36	AREQUA GULCH-WEST CANON	PO69-36		POX-36		POGEN-36	
PO345-37		PO230-37		PO115-37	SMELTER-WEST CANON	PO69-37		POX-37		POGEN-37	

\*\*\* INDICATES MUST RUN GENERATION WAS UTILIZED FOR THIS PRIOR OUTAGE

**2015 STEADY STATE FORCED OUTAGES (SYSTEM INTACT ONLY)**

1	BACULITE MESA GEN #1	35	LAJUNTAT-LAJUNTAW 115	69	WSTATN-PORTLAND115+WSTATN115 XFMR-2,7CAP	103	WEST STATION-MIDWAYBR 115	137	DANIELPK-COMANCHE 345 #2
2	BACULITE MESA GEN #2	36	AREQUA GULCH-NORTH CANONW 69	70	WSTATN-STEMBECH115+WSTATN115 XFMR-2,7CAP	104	SKALA 115 SUB	138	MIDWAYBR-RANCHO 115
3	ROCKY FORD DE SELS	37	CANON CITY-EAST CANON 69	71	WSTATN-HYDE115+WSTATN115 XFMR-3,6CAP	105	WEST CANON-PONCHA+WCANON 115 CAP	139	MIDWAYBR-RD_NIKON 115
4	BOONE-DOT TAP-NYBERG 115	38	PORTLAND-EAST CANON 69	72	WSTATN-MWPS115+WSTATN115 XFMR-3,6CAP	106	WSTATN-MWPS 115 + OVERTON-MWPS 115	140	MIDWAYBR-RD_NIKON 230
5	BOONE-LAJUNTAW 115	39	CANON CITY-HIGHLAND 69	73	WSTATN-DCOVE115+WSTATN115 XFMR-3,6CAP	107	MWPS-OVERTON 115 + WSTATN-BELMONT 69	141	MIDWAYBR-MIDWAYS 230
6	NYBERG-BACULITE MESA 115	40	WEST STATION-SUNSET 69	74	WSTATN-BACULITEMESA115 #2+WSTATN115 XFMR-3,6CAP	108	BACULITE MESA-WSTATN 115 #1 & #2	142	MIDWAYBR-LINGOLN 230
7	NYBERG-APT-MEMORIAL 115	41	PUEBLO-WEST STATION 69	75	WSTATN-BACULITEMESA115 #2+WSTATN115 XFMR-2,7CAP	109	EX PUERBLO 115 SUB	143	MIDWAYBR-WEST CANON 230
8	APT INDUSTRIAL PARK-APT-MEMORIAL 115	42	WEST STATION-BELMONT 69	76	READER-APT-MEMORIAL 115+READER 115 XFMR #1	110	EX BOONE 115 SUB	144	WEST CANON-PONCHA 230
9	READER-APT-MEMORIAL 115	43	READER-BELMONT 69	77	READER-COMANCHE 115 #1 + READER 115 XFMR #2	111	EX BAKMISA-WSTATN115 #2 + MWPS-OVTT115 + WSTATN-BMT69	145	COMANCHE 230:115 XFMR #2
10	PUEBLO-READER 115	44	BOONE-ROCKY FORD 69	78	READER-COMANCHE 115 #2 + READER 115 XFMR #1	112	EX PORTLAND-WSTATN 115 #1 & #2	146	COMANCHE 345:230 XFMR #4
11	ROCKY FORD-FOWLER 69	45	ROCKY FORD-FOWLER 69	79	READER-GREENHORN 115 + READER 115 XFMR #1	113	EX PORTLAND 115 SUB	147	LAJUNTAT 115:69 XFMR #2
12	HYDE PARK-PUEBLO 115	46	LAJUNTAW-ROCKY FORD 69	80	READER-PUEBLO 115 + READER 115 XFMR #2	114	EX BACULITE MESA 115 SUB	148	LAMAR 230:115 XFMR #1
13	HYDE PARK-WEST STATION 115	47	LAJUNTAT-LAJUNTAW 69	81	READER-RATTLESNAKE 115 + READER 115 XFMR #1	115	EX NYBERG 115 SUB	149	MIDWAYS 230:115 XFMR
14	BACULITE MESA-WEST STATION 115 #1	48	LAJUNTAW-LAMAR 69	82	COY 115 XFMR-COY-E CANON89+CCY-SCANON69	116	EX READER 115 SUB	150	MIDWAYS 345:230 XFMR
15	BACULITE MESA-WEST STATION 115 #2	49	BOONE 230 XFMR #1	83	NYBERG-BACULITE MESA 115+ NYBERG-APT-MEMORIAL 115	117	EX CANON CITY 115 SUB	151	MIDWAYS-FTNVLV GSU XFMR + FTNVLV GEN #3&4
16	BACULITE MESA-OVERTON 115	50	BOONE 230 XFMR #2	84	READER-APT-MEMORIAL 115+READER-GREENHORN 115	118	EX WEST CANON 115 SUB	152	WALSENBURG 230:115 XFMR #3
17	MIDWAYS-NORTRIDGE-OVERTON 115	51	WEST CANON 230 XFMR	85	READER-COMANCHE 115 #1 & #2	119	EX WEST STATION 115 SUB	153	MIDWAYBR 230:115 XFMR
18	MIDWAYS-WEST STATION 115	52	CANON CITY 115 XFMR	86	READER-RATTLESNAKE 115+READER-PUEBLO 115	120	READER-WEST STATION 69	154	RD_NIKON 230:115 XFMR
19	DESERT COVE-WEST STATION 115	53	PORTLAND 115 XFMR #1	87	BURNT MILL 115 SUB	121	WALSENBURG-GLADSTONE 230	155	FULLER 230:115 XFMR
20	MIDWAYBR-FTNVLV-DESERT COVE 115	54	PORTLAND 115 XFMR #2	88	GREENHORN 115 SUB	122	BOONE-LAJUNTAT 115	156	COMANCHE #1 GEN
21	PORTLAND-WEST STATION 115 #1	55	AREQUA GULCH 115 XFMR #1	89	APT INDUSTRIAL PARK 115 SUB	123	BOONE-COMANCHE 230 #1	157	COMANCHE #2 GEN
22	WEST STATION-STEM BEACH 115	56	AREQUA GULCH 115 XFMR #2	90	APT-MEMORIAL 115 SUB	124	BOONE-LAMAR 230 + RAS	158	COMANCHE #3 GEN
23	BURNT MILL-WEST STATION 115	57	WEST STATION 115 XFMR #2	91	HYDE PARK 115 SUB	125	BOONE-MIDWAYS 230	159	RD_NIKON #1 GEN
24	BURNT MILL-READER 115	58	READER 115 XFMR #1	92	OVERTON 115 SUB	126	CF&FLUR-COMANCHE 230	160	
25	GREENHORN-READER 115	59	READER 115 XFMR #2	93	BACULITE MESA-NYBERG 115+BACULITE MESA GEN #1	127	COMANCHE-MIDWAYS 230 #2	161	
26	COMANCHE-READER 115 #1	60	BOONE 115 XFMR	94	BACULITE MESA-APT INDUSTRIAL 115+BACULITE MESA GEN #2	128	COMANCHE-WALSENBURG+WALS-GLADSTONE 230 RAS	162	
27	COMANCHE-READER 115 #2	61	LAJUNTAW 115 XFMR #1	95	BACULITE MESA-W STATION 115 #2 + BACULITE MESA GEN #3	129	LAJUNTAT-WILLOWCREEK 115	163	
28	READER-RATTLESNAKE 115	62	LAJUNTAW 115 XFMR #2	96	BACULITE MESA-W STATION 115 #1 + BACULITE MESA GEN #4	130	LAMAR-VILAS 115	164	
29	PORTLAND-SKALA 115	63	LAJUNTAW 115 XFMR #2	97	WSTATN-BURNT MILL 115+WSTATN-HYDE PARK 115	131	LAMAR-WILLOWCREEK 115	165	
30	CANON CITY-SKALA 115	64	WEST CANON 115 CAPACITOR	98	WSTATN-PORTLAND 115 #1 + WSTATN-MIDWAYS 115	132	MIDWAYS-FULLER 230	166	
31	CANON CITY-WEST SCANON 115	65	PORTLAND 115 REACTOR	99	WSTATN-STEMBEACH 115 + WSTATN-DESERT COVE 115	133	PONCHA-SARGENT 115	167	
32	WEST CANON-PONCHA 115	66	BOONE 115 REACTOR	100	PORTLAND-WSTATN 115 #1 + PORTLAND-SKALA 115	134	PONCHA-COURREGANT 230	168	
33	AREQUA GULCH-WEST CANON 115	67	BOONE-LAJUNTAW 115 + LAJUNTAW 115 XFMR #2	101	PORTLAND 115 XFMR #1 & #2	135	STEMBEACH-WALSENBURG 115	169	
34		68	WSTATN-BURNTMILL115+WSTATN115 XFMR #1+2,7CAP	102	BACULITE MESA-MIDWAYS 115 + BACULITE MESA GEN #5	136	MIDWAYS-WATERION 345	170	

**2015 STEADY STATE FORCED OUTAGES (WITH PRIOR OUTAGES ONLY)**

1	BACULITE MESA GEN #1	35	LAJUNTAT-LAJUNTAW 115	69	BOONE-COMANCHE 230 #1	103	COMANCHE #1 GEN
2	BACULITE MESA GEN #2	36	AREQUA GULCH-NORTH CANONW 69	70	BOONE-LAMAR 230 + RAS	104	COMANCHE #3 GEN
3	ROCKY FORD DIESELS	37	CANON CITY-EAST CANON 69	71	BOONE-MIDWAYPS 230	105	RD_NIXON #1 GEN
4	BOONE-DOT TAP-NYBERG 115	38	PORTLAND-EAST CANON 69	72	GF&FURN-COMANCHE 230	106	
5	BOONE-LAJUNTAW 115	39	CANON CITY-HIGHLAND 69	73	COMANCHE-MIDWAYPS 230 #2	107	
6	NYBERG-BACULITE MESA 115	40	WEST STATION-SUNSET 69	74	COMANCHE-WALSENBERG+WALS-GLADSTONE 230 PAS	108	
7	NYBERG-APT MEMORIAL 115	41	PUEBLO-WEST STATION 69	75	LAJUNTAT-WILLOWCREEK 115	109	
8	APT INDUSTRIAL PARK-BACULITE MESA 115	42	WEST STATION-BELMONT 69	76	LAMAR-VILAS 115	110	
9	APT INDUSTRIAL PARK-APT MEMORIAL 115	43	READER-BELMONT 69	77	LAMAR-WILLOWCREEK 115	111	
10	READER-APT MEMORIAL 115	44	BOONE-ROCKY FORD 69	78	MIDWAYPS-FULLER 230	112	
11	PUEBLO-READER 115	45	ROCKY FORD-FOWLER 69	79	PONCHA-SARGENT 115	113	
12	HYDE PARK-PUEBLO 115	46	LAJUNTAW-ROCKY FORD 69	80	PONCHA-CURRECANTI 230	114	
13	HYDE PARK-WEST STATION 115	47	LAJUNTAT-LAJUNTAW 69	81	STEMBEACH-WALSENBERG 115	115	
14	BACULITE MESA-WEST STATION 115 #1	48	LAJUNTAW-LAMAR 69	82	MIDWAYPS-WATERTON 345	116	
15	BACULITE MESA-WEST STATION 115 #2	49	BOONE 230 XFMR #1	83	DANIELPK-COMANCHE 345 #2	117	
16	BACULITE MESA-OVERTON 115	50	BOONE 230 XFMR #2	84	MIDWAYBR-RANCHO 115	118	
17	MIDWAYPS-NORTHBRIDGE-OVERTON 115	51	WEST CANON 230 XFMR	85	MIDWAYBR-RD_NIXON 115	119	
18	MIDWAYPS-WEST STATION 115	52	CANON CITY 115 XFMR	86	MIDWAYBR-RD_NIXON 230	120	
19	DESERT COVE-WEST STATION 115	53	PORTLAND 115 XFMR #1	87	MIDWAYBR-MIDWAYPS 230	121	
20	MIDWAYBR-FITNLY-DESERT COVE 115	54	PORTLAND 115 XFMR #2	88	MIDWAYBR-LINCOLN 230	122	
21	PORTLAND-WEST STATION 115 #1	55	AREQUA GULCH 115 XFMR #1	89	MIDWAYBR-WEST CANON 230	123	
22	PORTLAND-WEST STATION 115 #2	56	AREQUA GULCH 115 XFMR #2	90	WEST CANON-PONCHA 230	124	
23	WEST STATION-STEM BEACH 115	57	WEST STATION 115 XFMR #1	91	COMANCHE 230:115 XFMR #2	125	
24	BURNT MILL-WEST STATION 115	58	WEST STATION 115 XFMR #2	92	COMANCHE 345:230 XFMR #4	126	
25	BURNT MILL-GREENHORN 115	59	READER 115 XFMR #1	93	LAJUNTAT 115:69 XFMR #2	127	
26	GREENHORN-READER 115	60	READER 115 XFMR #2	94	LAMAR 230:115 XFMR #1	128	
27	COMANCHE-READER 115 #1	61	BOONE 115 XFMR	95	MIDWAYPS 230:115 XFMR	129	
28	COMANCHE-READER 115 #2	62	LAJUNTAW 115 XFMR #1	96	MIDWAYPS 345:230 XFMR	130	
29	READER-RATTLESNAKE 115	63	LAJUNTAW 115 XFMR #2	97	MIDWAYPS-FITNLY GSU XFMR + FITNLY GEN #3&4	131	
30	PORTLAND-SKALA 115	64	WEST CANON 115 CAPACITOR	98	WALSENBERG 230:115 XFMR #3	132	
31	CANON CITY-SKALA 115	65	PORTLAND 115 CAPACITOR	99	MIDWAYBR 230:115 XFMR	133	
32	CANON CITY-WEST SCANON 115	66	BOONE 115 REACTOR	100	RD_NIXON 230:115 XFMR	134	
33	WEST CANON-PONCHA 115	67	WALSENBERG-GLADSTONE 230	101	FULLER 230:115 XFMR	135	
34	AREQUA GULCH-WEST CANON 115	68	BOONE-LAJUNTAT 115	102	COMANCHE #2 GEN	136	

## 2021 Reliability Analysis Prior Outages

PO 345 SERIES		PO 230 SERIES		PO 115 SERIES		PO 69 SERIES		PO X SERIES		PO GEN SERIES	
LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION	LABEL	DESCRIPTION
PO345-1	SYSTEM INTACT	PO230-1	BOONE-MIDWAYPS	PO115-1	MIDWAYBR-RANCHO	PO69-1	ROCKY FORD-LAJUNTAW	POX-1	MIDWAYPS 345:230	POGEN-1	COMANCHE 3
PO345-2	DAN PARK-COMANCHE-1	PO230-2	BOONE-COMANCHE	PO115-2	MIDWAYBR-NIXON	PO69-2	BLLENDE-ST. CHARLES***	POX-2	COMANCHE 345:230-T3	POGEN-2	BAC MESA GEN 1
PO345-3	COMANCHE-CALUMET-1	PO230-3	BOONE-LAMAR	PO115-3	FTN VALLEY-MIDWAYBR	PO69-3	WEST STATION-STONEMOOR	POX-3	LAMAR 230:115	POGEN-3	
PO345-4	COMANCHE-LAMAR-1	PO230-4	COMANCHE-MIDWAYPS-1	PO115-4	FTN VALLEY-DESERT COVE	PO69-4	READER-FREEMARY	POX-4	BOONE 230:115-1	POGEN-4	
PO345-5	LAMAR-ENGYCNTR-1	PO230-5	MIDWAYPS-FULLER	PO115-5	DESERT COVE-WEST STATION	PO69-5	PORTLAND-HIGHLAND	POX-5	WEST CANON 230:115	POGEN-5	
PO345-6		PO230-6	MIDWAYBR-NIXON	PO115-6	MIDWAYPS-WEST STATION	PO69-6		POX-6	COMANCHE 230:115-T1	POGEN-6	
PO345-7		PO230-7	MIDWAYBR-LINCOLN	PO115-7	MIDWAYPS-NORTHRIDGE	PO69-7		POX-7	WALSENBURG 230:115-1	POGEN-7	
PO345-8		PO230-8	MIDWAYBR-WEST CANON	PO115-8	OVERTON-NORTHRIDGE	PO69-8		POX-8	WALSENBURG 230:115	POGEN-8	
PO345-9		PO230-9	WEST CANON-PONCHA	PO115-9	OVERTON-BAGULITE MESA	PO69-9		POX-9	MIDWAYBR 230:115	POGEN-9	
PO345-10		PO230-10	COMANCHE-CALUMET	PO115-10	BACULITE MESA-WEST STATION-1	PO69-10		POX-10	LAJUNTAW 115:69-1***	POGEN-10	
PO345-11		PO230-11		PO115-11	HYDE PARK-WEST STATION	PO69-11		POX-11	BOONE 115:69***	POGEN-11	
PO345-12		PO230-12		PO115-12	HYDE PARK-PUEBLO	PO69-12		POX-12	READER 115:69-T1	POGEN-12	
PO345-13		PO230-13		PO115-13	PUEBLO-READER	PO69-13		POX-13	WEST STATION 115:69-1	POGEN-13	
PO345-14		PO230-14		PO115-14	PORTLAND-WEST STATION	PO69-14		POX-14	PORTLAND 115:69-T1	POGEN-14	
PO345-15		PO230-15		PO115-15	PUEBLO TAP-STEM BEACH	PO69-15		POX-15	PORTLAND 115:69-Tilted	POGEN-15	
PO345-16		PO230-16		PO115-16	PUEBLO TAP-WEST STATION	PO69-16		POX-16	CANON CITY 115:69	POGEN-16	
PO345-17		PO230-17		PO115-17	PUEBLO TAP-WEST STATION	PO69-17		POX-17	CANON CITY 115:69	POGEN-17	
PO345-18		PO230-18		PO115-18	BURNT MILL-WEST STATION	PO69-18		POX-18	CANON CITY 115:69	POGEN-18	
PO345-19		PO230-19		PO115-19	BURNT MILL-GREENHORN	PO69-19		POX-19	AREQUA GULCH 115:69	POGEN-19	
PO345-20		PO230-20		PO115-20	GREENHORN-READER	PO69-20		POX-20	CALUMET 345:230 T2	POGEN-20	
PO345-21		PO230-21		PO115-21	READER-AIRPORT MEMORIAL	PO69-21		POX-21	LAMAR 345:230 T2	POGEN-21	
PO345-22		PO230-22		PO115-22	AIRPORT PARK-AIRPORT MEMORIAL	PO69-22		POX-22		POGEN-22	
PO345-23		PO230-23		PO115-23	AIRPORT PARK-BACULITE MESA	PO69-23		POX-23		POGEN-23	
PO345-24		PO230-24		PO115-24	NYBERG-BAGULITE MESA	PO69-24		POX-24		POGEN-24	
PO345-25		PO230-25		PO115-25	NYBERG-AIRPORT MEMORIAL	PO69-25		POX-25		POGEN-25	
PO345-26		PO230-26		PO115-26	NYBERG-DOT TAP	PO69-26		POX-26		POGEN-26	
PO345-27		PO230-27		PO115-27	BOONE-DOT TAP	PO69-27		POX-27		POGEN-27	
PO345-28		PO230-28		PO115-28	BOONE-LAJUNTAW***	PO69-28		POX-28		POGEN-28	
PO345-29		PO230-29		PO115-29	BOONE-LAJUNTAT	PO69-29		POX-29		POGEN-29	
PO345-30		PO230-30		PO115-30	LAJUNTAT-LAJUNTAW	PO69-30		POX-30		POGEN-30	
PO345-31		PO230-31		PO115-31	COMANCHE-READER-1	PO69-31		POX-31		POGEN-31	
PO345-32		PO230-32		PO115-32	PORTLAND-SKALA	PO69-32		POX-32		POGEN-32	
PO345-33		PO230-33		PO115-33	CANON CITY-SKALA	PO69-33		POX-33		POGEN-33	
PO345-34		PO230-34		PO115-34	CANON CITY-WEST CANON	PO69-34		POX-34		POGEN-34	
PO345-35		PO230-35		PO115-35	CANON CITY-GULCH-WEST CANON	PO69-35		POX-35		POGEN-35	
PO345-36		PO230-36		PO115-36	AREQUA GULCH-WEST CANON	PO69-36		POX-36		POGEN-36	
PO345-37		PO230-37		PO115-37	SMEALTER-WEST CANON	PO69-37		POX-37		POGEN-37	

\*\*\* INDICATES MUST RUN GENERATION WAS UTILIZED FOR THIS PRIOR OUTAGE

**2021 STEADY STATE FORCED OUTAGES (SYSTEM INTACT ONLY)**

1	BACULITE MESA GEN #1	35	LAJUNTA-LAJUNTAW 115	69	WSTATN-PORTLAND115+WSTATN115 XFMR+2,7CAP	103	WEST STATION-MIDWAYBR 115	137	LAMAR-ENGVNTR 345-2
2	BACULITE MESA GEN #2	36	AREQUIA GULCH-NORTH CANONW 69	70	WSTATN-STEMBCH115+WSTATN115 XFMR+2,7CAP	104	SKALA 115 SUB	138	COMANCHE 230,115 XFMR #2
3	ROCKY FORD DIESELS	37	CANON CITY-EAST CANON 69	71	WSTATN-HYDE115+WSTATN115 XFMR+3,6CAP	105	WEST CANON-PONCHA-W/CANON 115 CAP	139	COMANCHE 345,230 XFMR #4
4	BOONE-DOOT TAP-NYBERG 115	38	PORTLAND-EAST CANON 69	72	WSTATN-MWPS115+WSTATN115 XFMR+3,6CAP	106	WSTATN-MWPS 115 + OVERTON-MWPS 115	140	LAJUNTA 115,69 XFMR #2
5	BOONE-LAJUNTAW 115	39	CANON CITY-HIGHLAND 69	73	WSTATN-DCOVE115+WSTATN115 XFMR+3,6CAP	107	MWPS-OVERTON 115 + WSTATN-BELMONT 69	141	LAMAR 230,115 XFMR #1
6	NYBERG-BACULITE MESA 115	40	WEST STATION-SUNSET 69	74	WSTATN-BACULITE MESA 115 #2+WSTATN115 XFMR+3,6CAP	108	BACULITE MESA-WSTATN 115 #1 & #2	142	MDWAYPS 230,115 XFMR
7	NYBERG-APT MEMORIAL 115	41	PUEBLO-WEST STATION 69	75	WSTATN-BACULITE MESA 115 #2+WSTATN115 XFMR+2,7CAP	109	READER-WEST STATION 69	143	MDWAYPS 345,230 XFMR
8	APT INDUSTRIAL PARK-BACULITE MESA 115	42	WEST STATION-BELMONT 69	76	READER-APT MEMORIAL 115+READER 115 XFMR #1	110	WALSENBURG-GLADSTONE 230	144	MDWAYPS-FTNVLV GSU XFMR + FTNVLV GEN #3&4
9	APT INDUSTRIAL PARK-APT MEMORIAL 115	43	READER-BELMONT 69	77	READER-COMANCHE 115 #1 + READER 115 XFMR #2	111	BOONE-LAJUNTA 115	145	WALSENBURG 230,115 XFMR #3
10	READER-APT MEMORIAL 115	44	BOONE-ROCKY FORD 69	78	READER-COMANCHE 115 #2 + READER 115 XFMR #1	112	BOONE-COMANCHE 230 #1	146	MDWAYBR 230,115 XFMR
11	PUEBLO-READER 115	45	ROCKY FORD-FOWLER 69	79	READER-GREENHORN 115 + READER 115 XFMR #1	113	BOONE-LAMAR 230 + RAS	147	RD_NIXON 230,115 XFMR
12	HYDE PARK-PUEBLO 115	46	LAJUNTA-W/ROCKY FORD 69	80	READER-PUEBLO 115 + READER 115 XFMR #2	114	BOONE-MIDWAYPS 230	148	FULLER 230,115 XFMR
13	HYDE PARK-WEST STATION 115	47	LAJUNTA-LAJUNTAW 69	81	READER-RATTLESNAKE 115 + READER 115 XFMR #1	115	CF&FURN-COMANCHE 230	149	CALUMET 345,230 T2 XFMR
14	BACULITE MESA-WEST STATION 115 #1	48	LAJUNTA-W/LAMAR 69	82	CCY 115 XFMR+CCY-E CANON69+CCY-SCANON69	116	COMANCHE-MIDWAYPS 230 #2	150	LAMAR 345,230 T2 XFMR
15	BACULITE MESA-WEST STATION 115 #2	49	BOONE 230 XFMR #1	83	NYBERG-BACULITE MESA 115+ NYBERG-APT MEMORIAL 115	117	COMANCHE-CALUMET 230 #1	151	COMANCHE #1 GEN
16	BACULITE MESA-OVERTON 115	50	BOONE 230 XFMR #2	84	READER-APT MEMORIAL 115+READER-GREENHORN 115	118	LAJUNTA-WILLOWCREEK 115	152	COMANCHE #2 GEN
17	MIDWAYPS-NORTHBRIDGE-OVERTON 115	51	WEST CANON 230 XFMR	85	READER-COMANCHE 115 #1 & #2	119	LAMAR-VILAS 115	153	COMANCHE #3 GEN
18	MIDWAYPS-WEST STATION 115	52	CANON CITY 115 XFMR	86	READER-RATTLESNAKE 115+READER-PUEBLO 115	120	LAMAR-WILLOWCREEK 115	154	RD_NIXON #1 GEN
19	DESERT COVE-WEST STATION 115	53	PORTLAND 115 XFMR #1	87	BURNIT MILL 115 SUB	121	MIDWAYPS-FULLER 230	155	
20	MIDWAYBR-FTNVLV-DESERT COVE 115	54	PORTLAND 115 XFMR #2	88	GREENHORN 115 SUB	122	PONCHA-SARGENT 115	156	
21	PORTLAND-WEST STATION 115 #1	55	AREQUIA GULCH 115 XFMR #1	89	APT INDUSTRIAL PARK 115 SUB	123	SANLUISVALLEY-PONCHA 230	157	
22	PORTLAND-WEST STATION 115 #2	56	AREQUIA GULCH 115 XFMR #2	90	APT MEMORIAL 115 SUB	124	PONCHA-CURREGANTI 230	158	
23	WEST STATION-STEM BEACH 115	57	WEST STATION 115 XFMR #1	91	HYDE PARK 115 SUB	125	STEMBEACH-WALSENBURG 115	159	
24	BURNIT MILL-WEST STATION 115	58	WEST STATION 115 XFMR #2	92	OVERTON 115 SUB	126	MIDWAYPS-WA TERTON 345	160	
25	BURNIT MILL-GREENHORN 115	59	READER 115 XFMR #1	93	BACULITE MESA-NYBERG 115+BAULITE MESA GEN #1	127	DANIELPK-COMANCHE 345 #2	161	
26	GREENHORN-READER 115	60	READER 115 XFMR #2	94	BACULITE MESA-APT INDUSTRIAL 115+BACULITE MESA GEN #2	128	MIDWAYBR-RANCHO 115	162	
27	COMANCHE-READER 115 #1	61	BOONE 115 XFMR	95	BACULITE MESA-W/STATION 115 #2 + BACULITE MESA GEN #3	129	MIDWAYBR-RD_NIXON 115	163	
28	COMANCHE-READER 115 #2	62	LAJUNTAW 115 XFMR #1	96	BACULITE MESA-W/STATION 115 #1 + BACULITE MESA GEN #4	130	MIDWAYBR-RD_NIXON 230	164	
29	READER-RATTLESNAKE 115	63	LAJUNTAW 115 XFMR #2	97	WSTATN-BURNIT MILL 115+WSTATN-HYDEPARK 115	131	MIDWAYBR-MIDWAYPS 230	165	
30	PORTLAND-SKALA 115	64	WEST CANON 115 CAPACTOR	98	WSTATN-PORTLAND 115 #1 + WSTATN-MIDWAYPS 115	132	MIDWAYBR-LINCOLN 230	166	
31	CANON CITY-SKALA 115	65	PORTLAND 115 CAPACTOR	99	WSTATN-STEMBEACH 115 + WSTATN-DESERT COVE 115	133	MIDWAYBR-WEST CANON 230	167	
32	CANON CITY-WEST SCANON 115	66	BOONE 115 REACTOR	100	PORTLAND-WSTATN 115 #1 + PORTLAND-SKALA 115	134	WEST CANON-PONCHA 230	168	
33	WEST CANON-PONCHA 115	67	BOONE-LAJUNTAW 115 + LAJUNTAW 115 XFMR #2	101	PORTLAND 115 XFMR #1 & #2	135	COMANCHE-CALUMET 345-2	169	
34	AREQUIA GULCH-WEST CANON 115	68	WSTATN-BURNITMILL115+WSTATN115 XFMR #1+2,7CAP	102	BACULITE MESA-MIDWAYPS 115 + BACULITE MESA GEN #5	136	COMANCHE-LAMAR 345-2	170	

## 2021 STEADY STATE FORCED OUTAGES (WITH PRIOR OUTAGES ONLY)

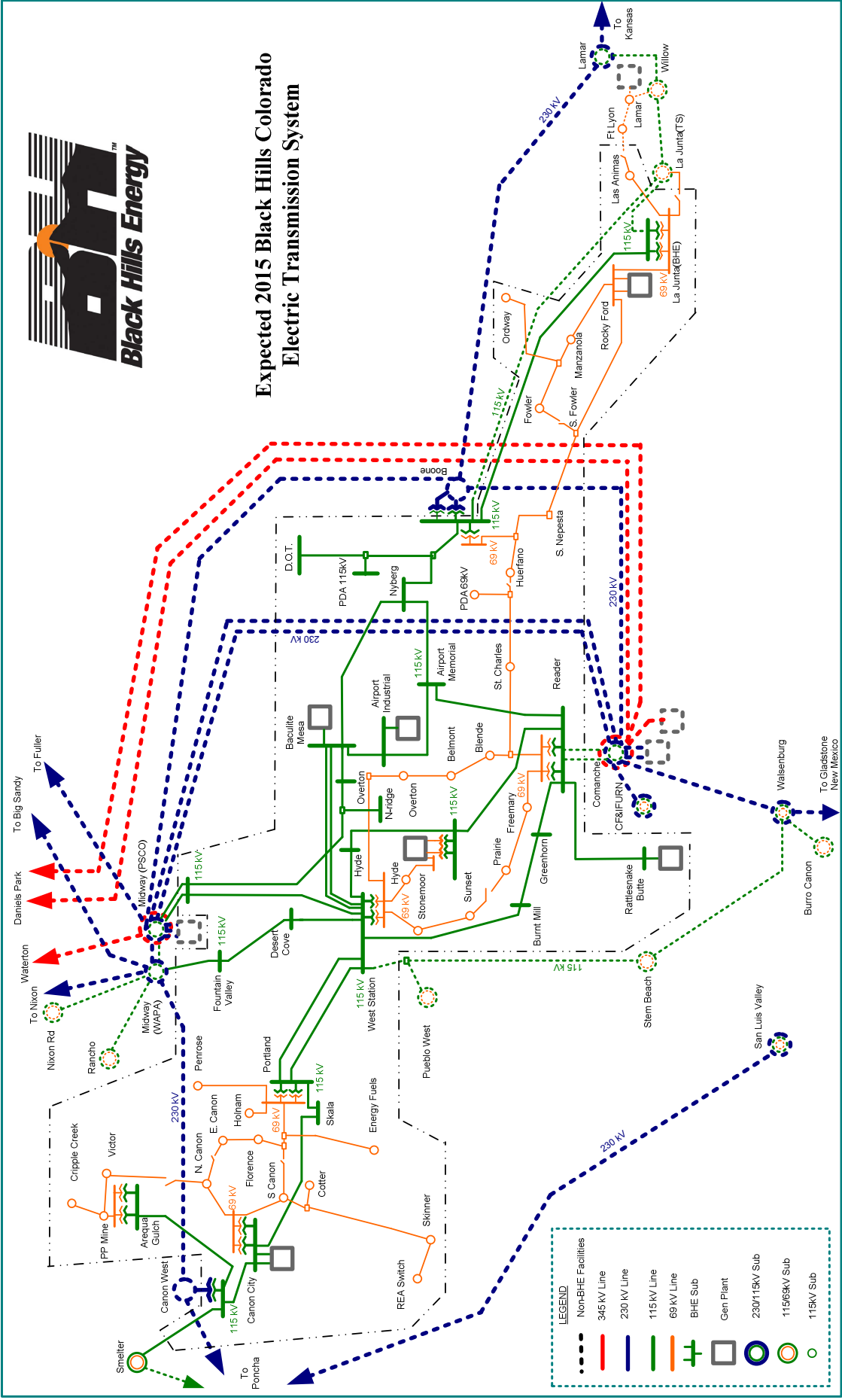
1	BACULITE MESA GEN #1	35	LAJUNTAT-LAJUNTAW 115	69	BOONE-COMANCHE 230 #1	103	MIDWAYBR 230:115 XFMR
2	BACULITE MESA GEN #2	36	AREQUA GULCH-NORTH CANONW 69	70	BOONE-LAMAR 230 + RAS	104	RD_NIXON 230:115 XFMR
3	ROCKY FORD DIESELS	37	CANON CITY-EAST CANON 69	71	BOONE-MIDWAYPS 230	105	FULLER 230:115 XFMR
4	BOONE-DOT TAP-NYBERG 115	38	PORTLAND-EAST CANON 69	72	CF&FURN-COMANCHE 230	106	CALUMET 345:230 T2 XFMR
5	BOONE-LAJUNTAW 115	39	CANON CITY-HIGHLAND 69	73	COMANCHE-MIDWAYPS 230 #2	107	LAMAR 345:230 T2 XFMR
6	NYBERG-BACULITE MESA 115	40	WEST STATION-SUNSET 69	74	COMANCHE-CALUMET 230 #1	108	COMANCHE #1 GEN
7	NYBERG-APT MEMORIAL 115	41	PUEBLO-WEST STATION 69	75	LAJUNTAT-WILLOWCREEK 115	109	COMANCHE #2 GEN
8	APT INDUSTRIAL PARK-BACULITE MESA 115	42	WEST STATION-BELMONT 69	76	LAMAR-VILAS 115	110	COMANCHE #3 GEN
9	APT INDUSTRIAL PARK-APT MEMORIAL 115	43	READER-BELMONT 69	77	LAMAR-WILLOWCREEK 115	111	RD_NIXON #1 GEN
10	READER-APT MEMORIAL 115	44	BOONE-ROCKY FORD 69	78	MIDWAYPS-FULLER 230	112	
11	PUEBLO-READER 115	45	ROCKY FORD-FOWLER 69	79	PONCHA-SARGENT 115	113	
12	HYDE PARK-PUEBLO 115	46	LAJUNTAW-ROCKY FORD 69	80	SANLUISVALLEY-PONCHA 230	114	
13	HYDE PARK-WEST STATION 115	47	LAJUNTAT-LAJUNTAW 69	81	PONCHA-CURRECANTI 230	115	
14	BACULITE MESA-WEST STATION 115 #1	48	LAJUNTAW-LAMAR 69	82	STEMBEACH-WALSENBURG 115	116	
15	BACULITE MESA-WEST STATION 115 #2	49	BOONE 230 XFMR #1	83	MIDWAYPS-WATERTON 345	117	
16	BACULITE MESA-OVERTON 115	50	BOONE 230 XFMR #2	84	DANIELPK-COMANCHE 345 #2	118	
17	MIDWAYPS-NORTHRIDGE-OVERTON 115	51	WEST CANON 230 XFMR	85	MIDWAYBR-RANCHO 115	119	
18	MIDWAYPS-WEST STATION 115	52	CANON CITY 115 XFMR	86	MIDWAYBR-RD_NIXON 115	120	
19	DESERT COVE-WEST STATION 115	53	PORTLAND 115 XFMR #1	87	MIDWAYBR-RD_NIXON 230	121	
20	MIDWAYBR-FTNVLV-DESERT COVE 115	54	PORTLAND 115 XFMR #2	88	MIDWAYBR-MIDWAYPS 230	122	
21	PORTLAND-WEST STATION 115 #1	55	AREQUA GULCH 115 XFMR #1	89	MIDWAYBR-LINCOLN 230	123	
22	PORTLAND-WEST STATION 115 #2	56	AREQUA GULCH 115 XFMR #2	90	MIDWAYBR-WEST CANON 230	124	
23	WEST STATION-STEM BEACH 115	57	WEST STATION 115 XFMR #1	91	WEST CANON-PONCHA 230	125	
24	BURNT MILL-WEST STATION 115	58	WEST STATION 115 XFMR #2	92	COMANCHE-CALUMET 345-2	126	
25	BURNT MILL-GREENHORN 115	59	READER 115 XFMR #1	93	COMANCHE-LAMAR 345-2	127	
26	GREENHORN-READER 115	60	READER 115 XFMR #2	94	LAMAR-ENGYCNTR 345-2	128	
27	COMANCHE-READER 115 #1	61	BOONE 115 XFMR	95	COMANCHE 230:115 XFMR #2	129	
28	COMANCHE-READER 115 #2	62	LAJUNTAW 115 XFMR #1	96	COMANCHE 345:230 XFMR #4	130	
29	READER-RATTLESNAKE 115	63	LAJUNTAW 115 XFMR #2	97	LAJUNTAT 115:69 XFMR #2	131	
30	PORTLAND-SKALA 115	64	WEST CANON 115 CAPACITOR	98	LAMAR 230:115 XFMR #1	132	
31	CANON CITY-SKALA 115	65	PORTLAND 115 CAPACITOR	99	MIDWAYPS 230:115 XFMR	133	
32	CANON CITY-WEST SCANON 115	66	BOONE 115 REACTOR	100	MIDWAYPS 345:230 XFMR	134	
33	WEST CANON-PONCHA 115	67	WALSENBURG-GLADSTONE 230	101	MIDWAYPS-FTNVLV GSU XFMR + FTNVLV GEN #3&4	135	
34	AREQUA GULCH-WEST CANON 115	68	BOONE-LAJUNTAT 115	102	WALSENBURG 230:115 XFMR #3	136	

# Appendix B

## Black Hills Transmission System One Line Diagram



## Expected 2015 Black Hills Colorado Electric Transmission System



**LEGEND**

- Non-BHE Facilities
- 345 kV Line
- 230 kV Line
- 115 kV Line
- 69 kV Line
- BHE Sub
- Gen Plant
- 230/115kV Sub
- 115/69kV Sub
- 115kV Sub