# WILDFIRE MITIGATION PLAN

2024

Black Hills Energy Ready

# EXECUTIVE SUMMARY

Black Hills Energy has a long history of safely and reliably serving our customers dating back to 1883. During that time, our teams have managed wildfire risk associated with operating an electric utility business across our service territories. Our 2024 Wildfire Mitigation Plan (WMP) is our first plan. It provides a publicized overview of the programs that we employ as a Company and identifies many of the drivers for our efforts. We intend to share our forward-looking plans to continue to manage wildfire risks in future updates to this WMP.

To help address the risk of wildfire, electric utilities are assessing how the environment, human population growth and development, aging infrastructure and the impacts to human health and property contribute to their company specific wildfire risks.

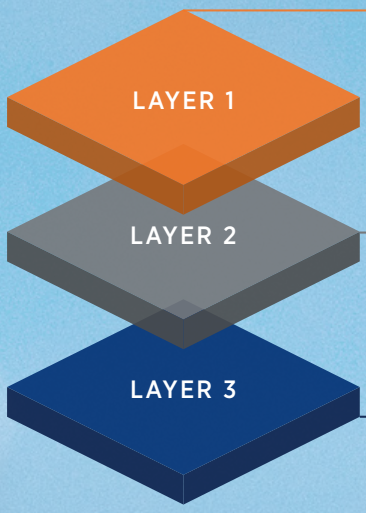
Based on wildfire activity across the United States, we reviewed our specific risks related to wildfire potential in our electric service territories. We conducted asset-based risk modeling to target mitigation activities that most significantly reduce the potential for ignition of wildfires and how best to respond to a wildfire near our facilities. These risk assessments use datasets developed by wildfirerisk.org (WRO), which were created by the United States Forest Service, in partnership with multiple federal agencies, at the direction of Congress to help community leaders such as elected officials, community planners and fire managers understand how risk varies across a state, region, or county and prioritize actions to mitigate risk.

The insights provided by the risk assessments enable our teams to identify and prioritize mitigation opportunities that most significantly reduce risk. The table below provides a summary of total circuit miles and circuit-miles in elevated fire risk based on the results of our internal risk assessments. Approximately 23% of total circuit-miles, 31% of which are underground distribution lines, across our three electric utilities are in elevated fire risk areas.

| Asset type | Total circuit-miles | Circut-miles in elevated fire risk | % of total miles |
|---|---|---|---|
| Transmission (all overhead) | 1,917 | 316 | 4% |
| Distribution | 7,189 | 1,762 | 19% |
| Distribution overhead | 4,928 | 1,110 | 63% |
| Distribution underground | 2,261 | 652 | 37% |
| | **9,106** | **2,078** | **23%** |

*Elevated fire risk refers to areas within our service territories classified as "High" or "Very High" as described in Section 3.1.1.*

Our wildfire risk mitigation strategies are supported by a three-layered approach, informed by asset-based risk assessments that include Asset Programs, Integrity Programs and Operational Response.




## ASSET PROGRAMS

We conduct proactive equipment inspections and repairs and utilize maintenance practices that include vegetation management within our rights of way, electric power line patrols (air and ground), in addition to power pole inspections and replacement.

## INTEGRITY PROGRAMS

We make system investments aimed at improving reliability and reducing risk, undergrounding electric distribution lines, and applying construction standards that reduce the likelihood of wildlife interactions with facilities.

## OPERATIONAL RESPONSE

We make risk-driven decisions including system reconfigurations and daily work activities and equipment operation (non-reclosing energized power lines) and use fire weather forecasting tools to enhance our team's situational awareness and better understand and appreciate potentially hazardous fire areas.

The primary objectives of our Wildfire Mitigation Plan (WMP) are to promote public safety by providing insight into wildfire risk specific to our service territories and to communicate actions we are taking to manage the risk of wildfire. The programs and initiatives described in this WMP are primarily designed to reduce ignition drivers and ignition event frequency associated with our electric facilities. Our wildfire mitigation strategies and programs are evolving as we continuously learn and improve. As such, we may implement programmatic changes or revise this plan as new practices and technologies develop or as environmental conditions, trends or risks warrant. Some of the wildfire risk mitigation advancements we have made over the last several years include:

- Developed operational procedures to disable automatic reclosing and restrict work based on wildfire risk conditions.
- Effectuated a contractor requirement to have a work-specific Wildfire Mitigation Plan.
- Implemented a 5-Day Fire Weather Forecast with contracted private weather stations and meteorological staff (DTN WeatherSentry).
- Updated policies and procedures formalizing asset program execution and metrics.

Our commitment to operating a safe and reliable system is evident through the work we perform daily. Our teams are connected to Black Hills Energy's wildfire risk mitigation strategies and recognize that what we do and how we do it truly matters.

Below are notable achievements from 2023 that reduce risk across our service territory:

- Inspected 60,406 assets associated with our transmission and distribution lines.
- Completed aerial inspections for 1,788 of our 1,917 miles of transmission line (69kV & above – Excluding Cheyenne, Wyoming, due to easily accessible structure locations).
- Mitigated 1,578 transmission and distribution hazards.
- Collected light detection and ranging (LiDAR) data for 149 miles of transmission line.
- Replaced or reinforced 644 wood poles due to reject categorization.
- Managed vegetation on approximately 1,400 of 9,106 miles of distribution and transmission line.
- Approximately 34,000 trees/vegetation were trimmed or removed.

Black Hills Energy is publishing this WMP as part of our ongoing commitment to communicate how we deliver safe, reliable, cost-effective electric service to our customers. We are actively involved in industry conversations relating to reducing impacts from wildfires and taking steps to reinforce a fire safe culture at Black Hills Energy. Our team's awareness of key drivers associated with wildfire risk and opportunities to mitigate risk continues to mature. We are committed to continuously learning and improving our approach to reduce the overall risk of wildfires to our customers, communities and the environment. We will continue to update our WMP and communicate our efforts to ensure coordination with customers, emergency responders, communities, regulators and other stakeholders.

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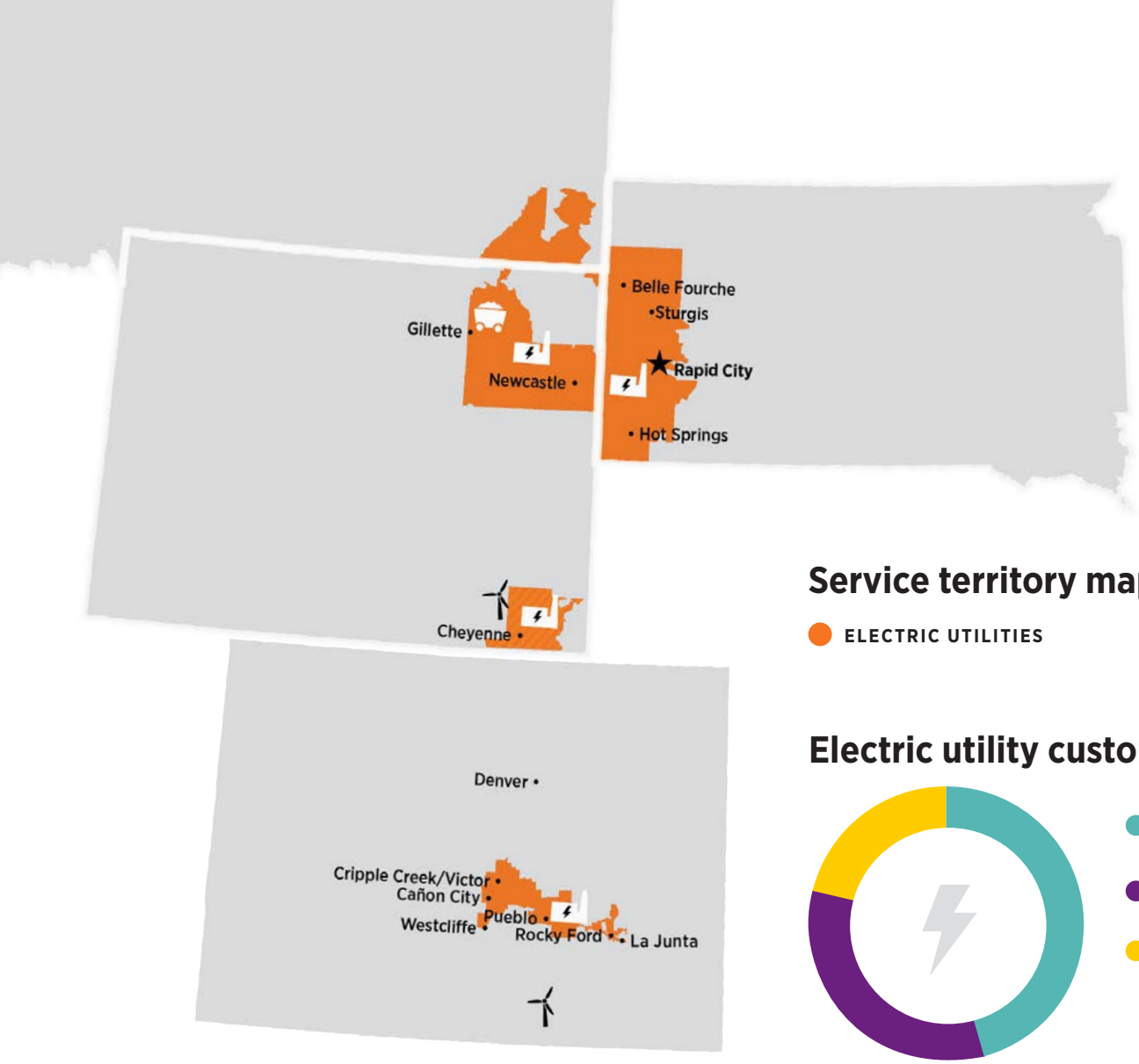
# 1.0 INTRODUCTION

Black Hills Energy is a customer-focused, growth-oriented utility company headquartered in Rapid City, South Dakota. Our three electric utilities subsidiaries operate under the Black Hills Energy name and generate, transmit and distribute electricity to approximately 222,000 electric utility customers in Colorado, Montana, South Dakota and Wyoming.




## Service territory map

**ELECTRIC UTILITIES**

## Electric utility customers




**South Dakota electric:**

- ~76,500 Customers
- Notable communities served:
  - o Rapid City
  - o Sturgis
  - o Hot Springs
  - o Belle Fourche
  - o Newcastle, WY
  - o Piedmont
  - o Belle Creek, MT

**Wyoming electric:**

- ~44,900 customers
- Notable communities served:
  - o Cheyenne

**Colorado electric:**

- ~100,900 customers
- Notable communities served:
  - o Pueblo
  - o Cañon City
  - o Rocky Ford
  - o La Junta

## 1.1 PLAN OBJECTIVES

The primary objectives of this Wildfire Mitigation Plan (WMP) are to promote public safety by providing further insight into wildfire risk across our service territories and to communicate our proactive efforts to reduce the risk of wildfire. Our wildfire mitigation strategies target ignition reduction opportunities associated with operating an electric utility.

To support the integrity of our energy delivery systems, we design, construct, maintain and operate our electric infrastructure in a manner that minimizes the risk of wildfire ignition. By incorporating industry consistent practices into our standards, operating procedures and education, we are committed to a fire safe culture across our company and in our communities.

## 1.2 GENERAL WILDFIRE RISKS

Threats resulting from a changing environment, declining forest health, aging infrastructure and increased human population development in wildland areas are primary drivers that make preventing wildfires a top priority for Black Hills Energy. The sections below describe industry-wide wildfire risk considerations.

### 1.2.1 ENVIRONMENT

For the past several decades, the effects of changing environmental conditions have intensified the numerous factors that contribute to fire conditions in the western United States (U.S.). In general, the American West has experienced a trend of increasing air temperatures, lower precipitation, and earlier snowmelt which has led to drier forests and fuels as well as a longer fire season (Shafer et al., 2014). These factors, coupled with forest management practices over the past several decades, contribute to increased fire potential.

Environmental impacts have also contributed to increased forest pest infestations; another major cause of tree death in forests and woodlands in the western U.S., including our service territories in Colorado, South Dakota, and Wyoming. Changing rain and snow patterns, shifts in plant communities and other environment-related changes combined with the impacts of decades of fire suppression policies and practices have increased the likelihood that fires may start more often and burn more intensely and widely than they have in the past.

Forest fire activity increased abruptly in the mid-1980s. Figure 2 illustrates that the annual total acres burned have increased over the period between 1983 to 2021 (NIFC, 2022).

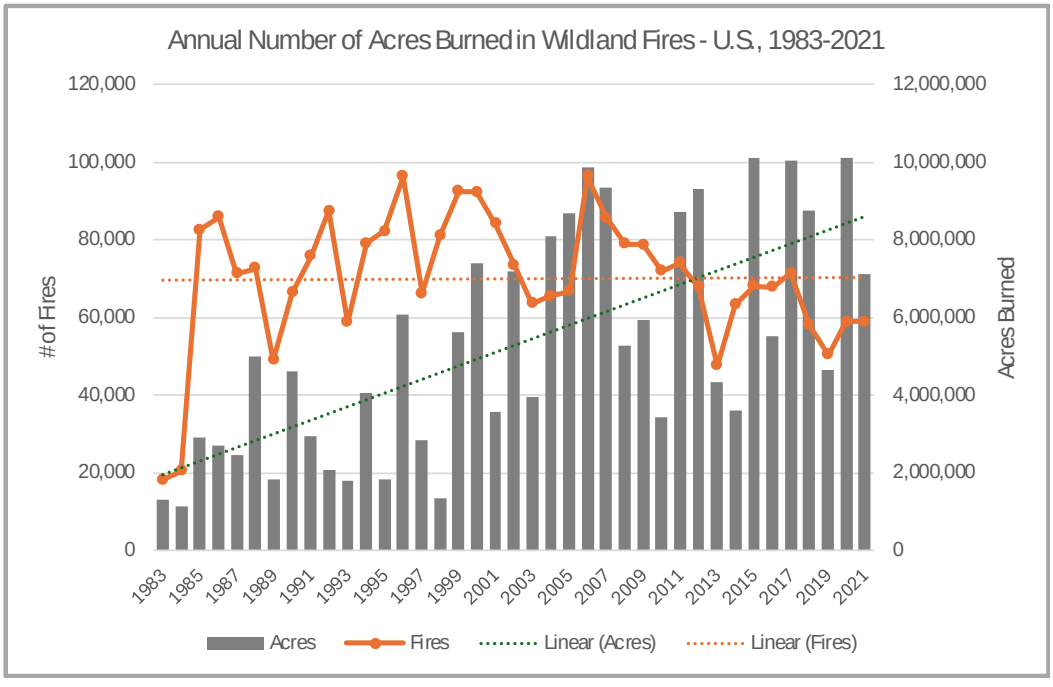



*Figure 2: Increased size of wildfires and total acres burned between 1983 – 2021 (Based on data provided by National Interagency Coordination Center at NIFC).*

*Note: 2004 fires and acres do not include state lands for North Carolina.*

### 1.2.2 HUMAN POPULATION GROWTH AND DEVELOPMENT

Wildland Urban Interface (WUI) is characterized by the intersection of the natural and the built environments and has been defined as the area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (Stewart et al., 2007). According to the U.S. Forest Service, WUI is the fastest-growing land use type in the U.S. In the western U.S., residential housing increased by 12 million homes, from 31 million to 43 million between 1990 to 2010 (Radeloff et al., 2018).

When humans build and develop close to forests or other types of natural vegetation, several wildfire related challenges may occur. With increased human presence and use of the land, there is increased likelihood of human caused ignitions. When wildfires occur within the WUI, they pose a greater risk to lives and homes and damages are expected to be higher. Wildfires will also be more difficult to fight and allowing a natural fire to safely burn its course may no longer be an option.

### 1.2.3 AGING INFRASTRUCTURE

In the 2020 “Black & Veatch Strategic Directions: Electric Report” (Black & Veatch) survey, respondents named aging infrastructure as the most challenging issue facing the electric industry today. In 2021-2022, it was ranked third. In the last 10 years of this survey the issue of aging infrastructure has been in the top five most critical issues facing the industry (Black & Veatch).

### 1.2.4 INTERSECTION OF ASSETS AND LANDSCAPE

Fire has played a significant role in ecosystem dynamics throughout the Rocky Mountains and tall grass prairies of the United States. It has the potential to change from a relatively benign facet of nature to a problematic force when it interacts with human values and infrastructure.

Fires in various locations have different effects and thus identifying where a fire would cause the greatest impact on human life and property is based upon understanding the probable consequences of the fire.

When population densities increase, the consequences of a wildfire can be significant. Our approach to risk assessment relies on predictions of how fires will respond to the combustible nature of the landscape coupled with information on human values and infrastructure to determine the areas of highest concern for fire prevention.

A variety of factors were utilized to qualify and quantify wildfire risk. The data, information, resources and process used as the basis for our approach are described in the next section.

## 1.3 ASSET SUMMARY

Black Hills Energy owns and operates generation, transmission, substation and distribution assets. Our electric utilities own 1,394 MW of generation and approximately 9,100 miles of electric transmission and distribution lines. Some of these assets are physically located in areas of elevated fire risk as illustrated in Table 1. However, approximately 31% (650 of the 2,078) of the line miles located in areas of elevated fire risk are underground facilities, significantly reducing risk.

| Asset type | Total circuit-miles | Circut-miles in elevated fire risk | % of total miles |
|---|---|---|---|
| **SOUTH DAKOTA ELECTRIC** | | | |
| Transmission | 1,232 | 266 | 22% |
| Distribution | 2,616 | 1,322 | 50% |
| - Overhead | 1,736 | 852 | 65% |
| - Underground | 880 | 470 | 35% |
| **WYOMING ELECTRIC** | | | |
| Transmission | 86 | 0.19 | 0.2% |
| Distribution | 1,360 | 18 | 1.3% |
| - Overhead | 840 | 16 | 89% |
| - Underground | 520 | 2 | 11% |
| **COLORADO ELECTRIC** | | | |
| Transmission | 599 | 50 | 8% |
| Distribution | 3,213 | 422 | 13% |
| - Overhead | 2,348 | 242 | 57% |
| - Underground | 865 | 180 | 43% |
| **Total** | **9,106** | **2,078** | **23%** |

*Table 1: Approximate line miles in areas of elevated fire risk (High & Very High HFA Categories) as of December 31, 2023. Elevated fire risk refers to areas within our service territories classified as "High" or "Very High" as described in Section 3.1.1.*

## 1.4 OUR APPROACH

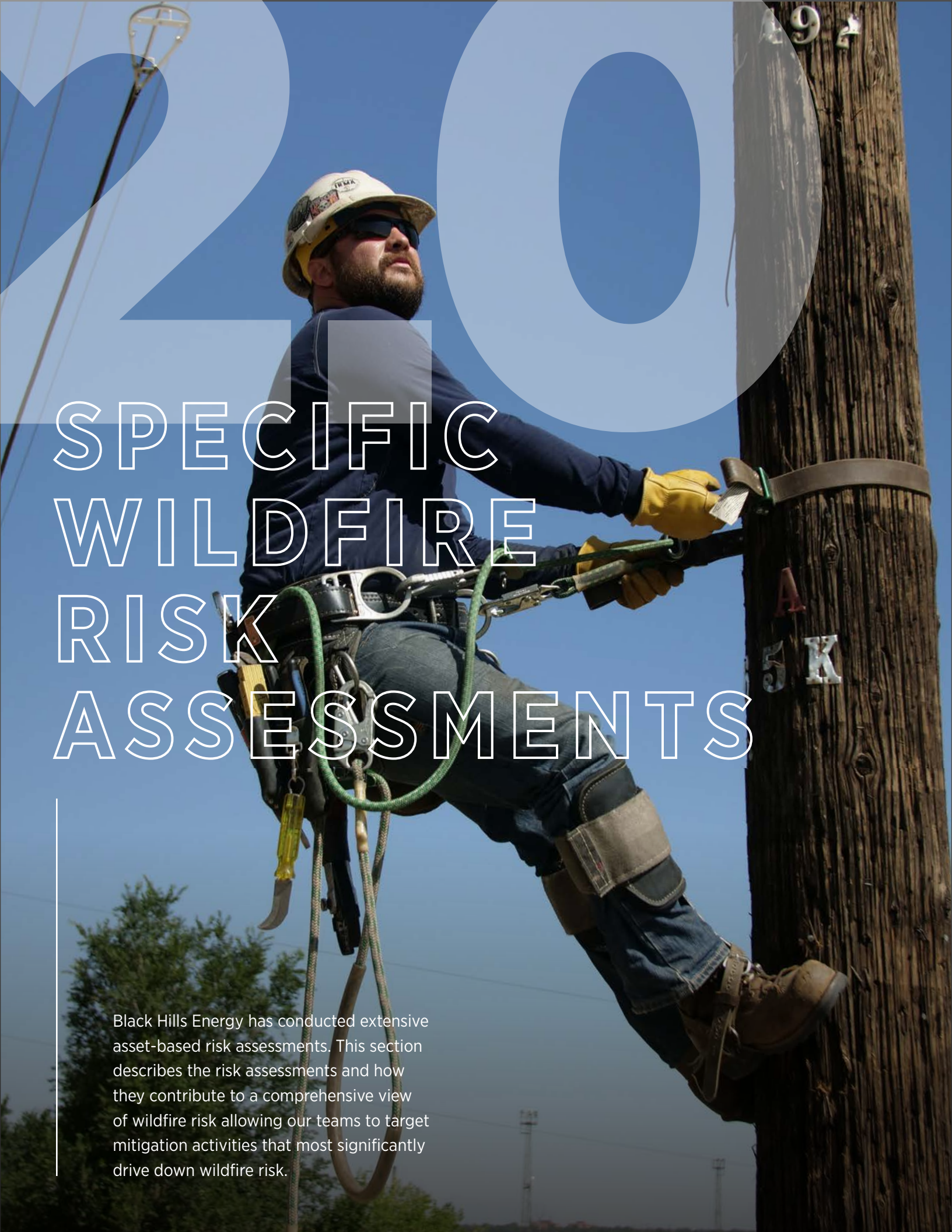
Our wildfire risk mitigation strategies are supported by a three-layered approach, driven by asset-based risk assessments (Section 3), that includes Asset Programs (Section 4), Integrity Programs (Section 5) and Operational Response (Section 6).


*Figure 4: Black Hills Energy's three-layered wildfire risk mitigation strategy.*

Asset Programs focus on preventative inspection, repair and maintenance practices including vegetation management, line patrol (air and ground), and pole inspections and replacement. Established policies and procedures tied to asset inspection and maintenance activities have allowed us to effectively achieve program objectives. Understanding the condition of our assets and timely remediation of identified hazards reduces wildfire risk. Asset Programs are covered in greater detail in Section 4.

Integrity programs focus on system investments aimed at improving reliability and reducing risk through undergrounding electric distribution lines, and applying construction standards that reduce the likelihood of wildlife interactions with facilities. Integrity Programs are covered in greater detail in Section 5.

Operational Response supports risk driven decisions including system reconfigurations, daily work activities, equipment operation (non-reclosing energized power lines) and fire forecasting tools to enhance our team's situational awareness and better understand and appreciate potentially hazardous fire areas. Operational Response is covered in greater detail in Section 6.



# 20 SPECIFIC WILDFIRE RISK ASSESSMENTS

Black Hills Energy has conducted extensive asset-based risk assessments. This section describes the risk assessments and how they contribute to a comprehensive view of wildfire risk allowing our teams to target mitigation activities that most significantly drive down wildfire risk.

- **Publicly available wildfire risk assessments:** Publicly available risk assessments can be helpful to identify wildfire risk beyond Black Hills Energy's service territory and throughout the continental United States. Black Hills Energy uses data from these publicly available sources to support our risk assessment process.

- **Service territory level:** Hazardous Fire Areas (HFAs), which are used to geospatially visualize wildfire risk and prioritize the various fire hardening projects and ignition reduction strategies contained in this WMP.

- **Circuit level:** Risk-based ranking of all distribution circuits throughout our service territories. The results are used to identify and prioritize circuit level risk reduction opportunities including non-reclosing activities and asset programs work execution priorities.

- **Pole level:** Per-pole risk assessment as part of our wildlife interaction reviews. The results allow for targeted risk reduction at an individual pole level.

## 2.1 PUBLICLY AVAILABLE WILDFIRE RISK ASSESSMENTS

Publicly available wildfire risk assessments can serve as a useful tool to identify wildfire risk across the continental United States. This section describes two specific resources that we reference as part of our wildfire risk assessment, including the Federal Emergency Management Agency (FEMA) and a multi-agency effort led by the United States Forest Service (USFS) – Wildfirerisk.org (WRO).

### 2.1.1 FEDERAL EMERGENCY MANAGEMENT AGENCY MAPS

The Federal Emergency Management Agency wildfire map is commonly referenced. Figure 5 illustrates an example of FEMA risk categorization (county view) specific to Black Hills Energy service territories.

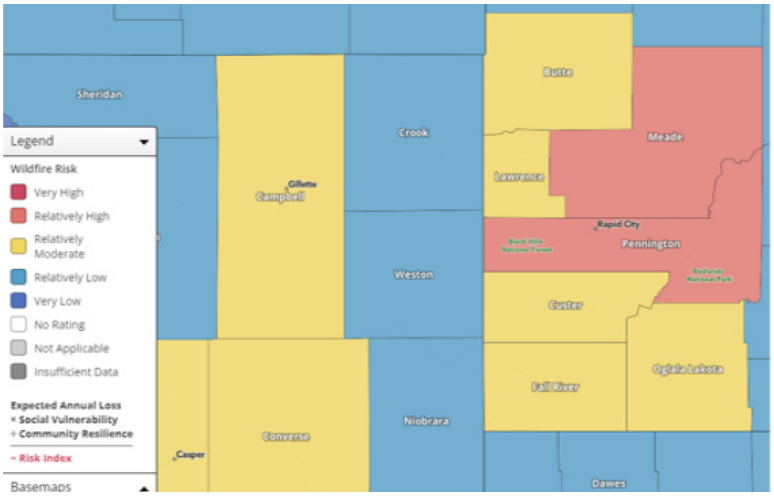



*Figure 5: Example - FEMA Wildfire Risk map of South Dakota electric as of December 2023.*

### 2.1.2 WILDFIRERISK.ORG (WRO) MAPS

Another publicly available resource is wildfirerisk.org. WRO's website includes an interactive mapping feature intended to help communities understand, explore and reduce wildfire risk. WRO breaks down wildfire risk into four categories: Risk to Homes, Wildfire Likelihood, Exposure and Vulnerable Populations. The wildfirerisk.org website provides detailed descriptions for each risk category.

WRO's risk categories provide users an opportunity to take a deeper dive into the different factors that impact wildfire risk at a level appropriate for community awareness. At Black Hills Energy, we require a more wholistic representation of risk to make operational and strategic decisions associated with operating an electric utility. Although we do not use the WRO resources and interactive maps directly, Black Hills Energy leverages the same datasets used by WRO to inform our own risk assessments as described below in Section 2.2.

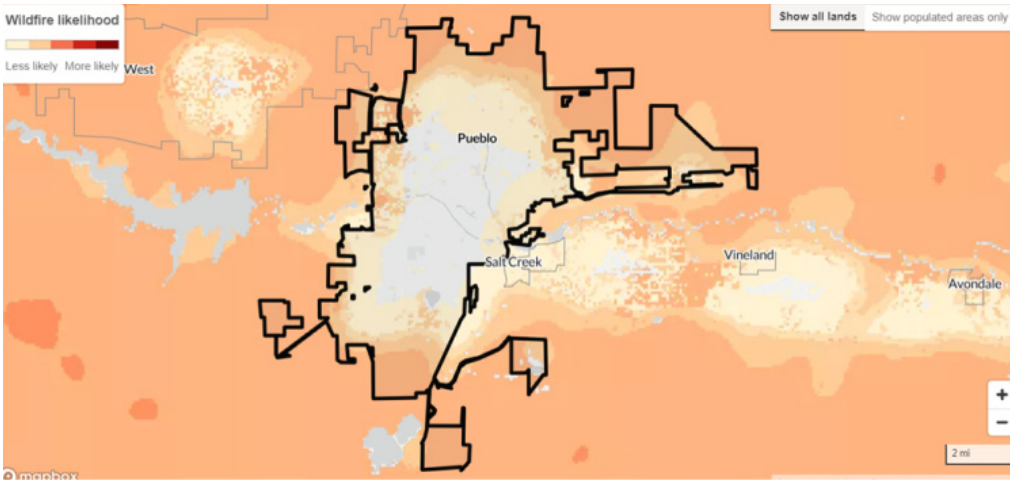



*Figure 6: Example - wildfirerisk.org "Wildfire Likelihood" risk assessment map for Pueblo, Colorado.*

## 2.2 SERVICE TERRITORY LEVEL (HAZARDOUS FIRE AREAS)

To efficiently assess wildfire risk across a complex electric network, Black Hills Energy has developed a geospatial representation of wildfire risk throughout our service territories allowing for data informed, risk-based decisions. The publicly available wildfire risk resources referenced in Section 2.1 are useful for general references but do not provide a wholistic representation of wildfire risk that would ultimately meet the needs of our business. Black Hills Energy conducted service territory specific risk assessments utilizing the same datasets as WRO. This effort produced the geospatial risk representation needed and Hazardous Fire Area (HFA) categorizations were developed.

The HFA categories are a primary driver for various engineering and operational decisions. Below are a few examples:

- Guiding the location and design of future transmission, distribution, substation, and communication facilities to avoid highly volatile wildfire areas or for undergrounding distribution lines when appropriate.
- Establishing construction standards and materials to reduce systemic ignition sources.
- Focusing our system integrity efforts to focus rebuilds, retrofits and relocation projects to reduce risk.

There are five HFA adjective classes (Very Low, Low, Moderate, High and Very High) used to categorize wildfire risk across our service territory. The development of adjective classes can be described in three steps:


*Figure 7: Three-step approach to HFA adjective classes.*

## 2.2.1 HFA DATA COLLECTION

Black Hills Energy utilized datasets that originate from wildfirerisk.org (WRO) for the development of our internal Hazardous Fire Area categorizations. These wildfire risk datasets were created by the U.S. Forest Service, in partnership with other federal agencies, at the discretion of U.S. Congress to provide guidance and mitigation prioritization to various organizations, including utilities. Additionally, the WRO dataset is built from nationally consistent data, including:

- Vegetation and fire-behavior fuel models from the interagency LANDFIRE program.
- Topographic data from the United States Geological Survey.
- Historical weather patterns from the National Weather Service.
- Long-term simulations of large wildfire behavior from the USDA Forest Service.
- Community data from U.S. Census Bureau and Department of Energy.

## 2.2.2 HFA CRITERIA ANALYSIS

Black Hills Energy partnered with a consultant to perform the data analysis to progress from the datasets referenced in Section 2.2.1, to a geospatial representation of risk. This team assessed five criteria as part of the data analytics including: Conditional Flame Length (CFL), Risk to Potential Structures (RPS), Burn Potential (BP), Wildfire Hazard Potential (WHP) and Housing Unit Risk (HU). A description of the risk criteria and data tables used as part of the analysis are included below.

**Conditional Flame Length (CFL):** Most likely flame length at a given location if a fire occurs, based on all simulated fires; an average measure of wildfire intensity.

**Conditional Flame Length (CFL):**

| Values | Legend Labels | | | |
|---|---|---|---|---|
| **Conditional Flame Length** | Flame Length (feet) | Color | Rank | Query |
| 0 | NA | | 0 | CFL_1 = 0 |
| ≤ 2 | 0 to 2 feet | | Low | CFL_1 <= 4 |
| ≤ 4 | 2 to 4 feet | | | |
| ≤ 6 | 4 to 6 feet | | Moderate | CFL_1 > 4 AND CFL_1 <= 8 |
| ≤ 8 | 6 to 8 feet | | | |
| ≤ 12 | 8 to 12 feet | | High | CFL_1 > 8 AND CFL_1 <= 20 |
| ≤ 20 | 12 to 20 feet | | | |
| > 20 | > 20 feet | | Very High | CFL_1 > 20 |

**Risk to Potential Structures (risk to homes) (RPS)**: A measure that integrates wildfire likelihood and intensity with generalized consequences to a home on every pixel. For every place on the landscape, it poses the hypothetical question, "What would be the relative risk to a house if one existed here?".

**Risk to Potential Structures (RPS):**

| Values | Legend Labels | | | |
|---|---|---|---|---|
| RPS Index | Percentiles (relative to US) | Color | Rank | Query |
| 0 | 0 | | NA | RPS_1 <= 0 |
| ≤ 0.011492 | 0 to 40th | | Very Low | RPS_1 > 0 AND RPS_1 <= .011492 |
| ≤ 0.098198 | 40th to 70th | | Low | RPS_1 > .011492 AND RPS_1 <= .098198 |
| ≤ 0.407671 | 70th to 90th | | Moderate | RPS_1 > .098198 AND RPS_1 <= .407671 |
| ≤ 0.700043 | 90th to 95th | | High | RPS_1 > .407671 AND RPS_1 <= .700043 |
| ≤ 11.967653 | 95th to 100th | | Very High | RPS_1 > .700043 |

**Burn Potential (BP):** The annual probability of wildfire burning in a specific location.

**Burn Potential (BP)*:**

| Values | Legend Labels | | | |
|---|---|---|---|---|
| **Annual Probability of Wildfire** | 1-in-X Chance of Fire in Any Year | Color | Rank | Query |
| 0 | 0 | | | |
| ≤ 0.0001000 | 0 to 1-in-10,000 | | Low | BP_C >= 0 AND BP_C <= 0.0010000 |
| ≤ 0.0002154 | 1-in-10,000 to 1-in-4,643 | | | |
| ≤ 0.0004642 | 1-in-4,643 to 1-in-2,154 | | | |
| ≤ 0.0010000 | 1-in-2,154 to 1-in-1,000 | | | |
| ≤ 0.0021544 | 1-in-1,000 to 1-in-464 | | Moderate | BP_C >= 0.0010000 AND BP_C <= 0.0100000 |
| ≤ 0.0046416 | 1-in-464 to 1-in-215 | | | |
| ≤ 0.0100000 | 1-in-215 to 1-in-100 | | | |
| ≤ 0.0215443 | 1-in-100 to 1-in-46 | | High | BP_C >= 0.010000 AND BP_C <= 0.0464159 |
| ≤ 0.0464159 | 1-in-46 to 1-in-22 | | | |
| ≤ 0.1300000 | 1-in-22 to 1-in-8 | | Very High | BP_C > 0.0464159 |

*BP: No very high found in CO, SD, WY, MT, NE

**Wildfire Hazard Potential (WHP):** An index that quantifies the relative potential for wildfire that may be difficult to control, used as a measurement to help prioritize where fuel treatments may be needed.

**Wildfire Hazard Potential (WHP)**

| Values | Legend Labels | | | |
|---|---|---|---|---|
| **WHP - 5-Class Percentile-Based Legend*** | | | | |
| **WHP Index** | Wildfire Hazard Potential Class | Color | Rank | Query |
| 0 | NA | | NA | WHP_2 <= 0 |
| ≤ 61 | Very Low | | Very Low | WHP_2 > 0 AND WHP_2 <= 61 |
| ≤ 178 | Low | | Low | WHP_2 > 61 AND WHP_2 <= 178 |
| ≤ 489 | Moderate | | Moderate | WHP_2 > 178 AND WHP_2 <= 489 |
| ≤ 1,985 | High | | High | WHP_2 > 489 AND WHP_2 <= 1985 |
| ≤ 100,000 | Very High | | Very High | WHP_2 > 1985 |

**Housing Unit Risk (HU):** An index that integrates all four primary elements of wildfire risk – likelihood, intensity, susceptibility and exposure – on pixels where housing unit density is greater than zero. It is conceptually similar to Risk to Potential Structures (i.e., risk to homes), but also incorporates housing unit count.

**Housing Unit Risk (HURisk):**

| ues | Legend Labels | | | | |
|---|---|---|---|---|---|
| **HURisk** | **Housing Unit Risk** | **Color** | **Rank** | **Values** | **Query** |
| ≤ 20,000,000 | > 100,000 | | Very High | > 100,000 | HURisk_CONUS > 100000 |
| ≤ 100,000 | 10,001 - 100,000 | | High | > 10,000 and ≤ 100,000 | |
| ≤ 10,000 | 1,001 - 10,000 | | | | HURisk_CONUS > 1000 AND HURisk_CONUS <= 100000 |
| ≤ 1,000 | 101 - 1,000 | | Moderate | >10 and ≤ 10,000 | |
| ≤ 100 | 11 - 100 | | | | HURisk_CONUS > 10 AND HURisk_CONUS <= 1000 |
| ≤ 10 | 2 - 10 | | Low | >2 and ≤ 10 | HURisk_CONUS >= 2 AND HURisk_CONUS <=10 |
| ≤ 1 | 1 | | Very Low | > 0 and ≤ 1 | HURisk_CONUS >= 1 AND HURisk_CONUS < 2 |
| 0 | 0 | | 0 | | HURisk_CONUS = 0 |

## 2.2.3 HFA WEIGHTED SCORING METHODOLOGY

As referenced previously, we require a wholistic assessment of wildfire. To achieve this, the criteria referenced in section 2.2.2, are aggregated through a weighted scoring methodology. This approach provides an analytical focus on strategic wildfire hazards and threats and allows our teams to categorize, at a granular level, wildfire risk across our service territory. Ultimately, wildfire risk is quantified by a single value as compared to a collection of values across a number of criteria. An example of the data used is included below along with the resulting adjective class thresholds.

| | Base Hazard Rating | | Uprate section to better value Utility wildfire hazards | | | | | | | | Landscape Wildfire Hazard Rating 2021 WRO | | Comparison Values | 2021 WRO Runs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WHP | | BP | | CFL | | RPS | | HU Risk | | | | 2019 HFA Rating | 2021 Avg Day | 2021 Bad Day |
| Values | 1 thru 5 | | 1 thru 10 | | Actual FL | | 1 thru 5 | | 1 thru 5 | | | | | | |
| Combing Process | + | | + | | + | | + | | + | | Final Weighted Value | Text Value | Text Value | Text Value | Text Value |
| Acres Value | | 20 | | 2 | | 3 | | 7 | | 3 | 35 | High | Very High | High | Very High |
| | Rank | Weight | Rank | Weight | Rank | Weight | Rank | Weight | Rank | Weight | | | | | |
| | NA | 0 | | | | | NA | 0 | NA | 0 | | | | | |
| | Very Low | 3 | | | CFL Bad Day (2) | | Very Low | 7 | Very Low | 3 | | | | | |
| | Low | 8 | Low | 0 | Low | 6 | Low | 12 | Low | 5 | | | | | |
| | Moderate | 15 | Moderate | 2 | Moderate | 8 | Moderate | 15 | Moderate | 8 | | | | | |
| | High | 20 | High | 4 | High | 10 | High | 20 | High | 10 | | | | | |
| | Very High | 25 | Very High | 5 | Very High | 12 | Very High | 25 | Very High | 12 | | | | | |
| | | | | | | | | | | | Total scoring | | | | |
| | | | | | CFL Average Day (1) | | | | | | 79 | | | | |
| | | | | | Low | 1 | | | | | | | | | |
| | | | | | Moderate | 3 | | | | | | | | | |
| | | | | | High | 7 | | | | | | | | | |
| | | | | | Very High | 10 | | | | | | | | | |
| | [WHP_Weight] + [BP_Weight] + [CFL_Weight1a] + [RPS_Weight] + [HU_Weight] | | | | | | | | FinalWeight1a = Average Day | | | | | | |
| | [WHP_Weight] + [BP_Weight] + [CFL_Weight2a] + [RPS_Weight] + [HU_Weight] | | | | | | | | FinalWeight2a = Bad Day | | | | | | |

0
1 - 22 - Very Low
23 - 30 - Low
31 - 37 - Moderate
38 - 47 - High
48 - 69 - Very High

Black Hills Energy used the results of this process and built out the necessary geographical representation of fire risk across our service territories. This risk assessment is specific to Black Hills Energy and our service territories and provides the appropriate level of awareness and insight to make data-informed, risk-driven decisions.

The following figures illustrate the HFA categorization resulting from the weighted scoring process:

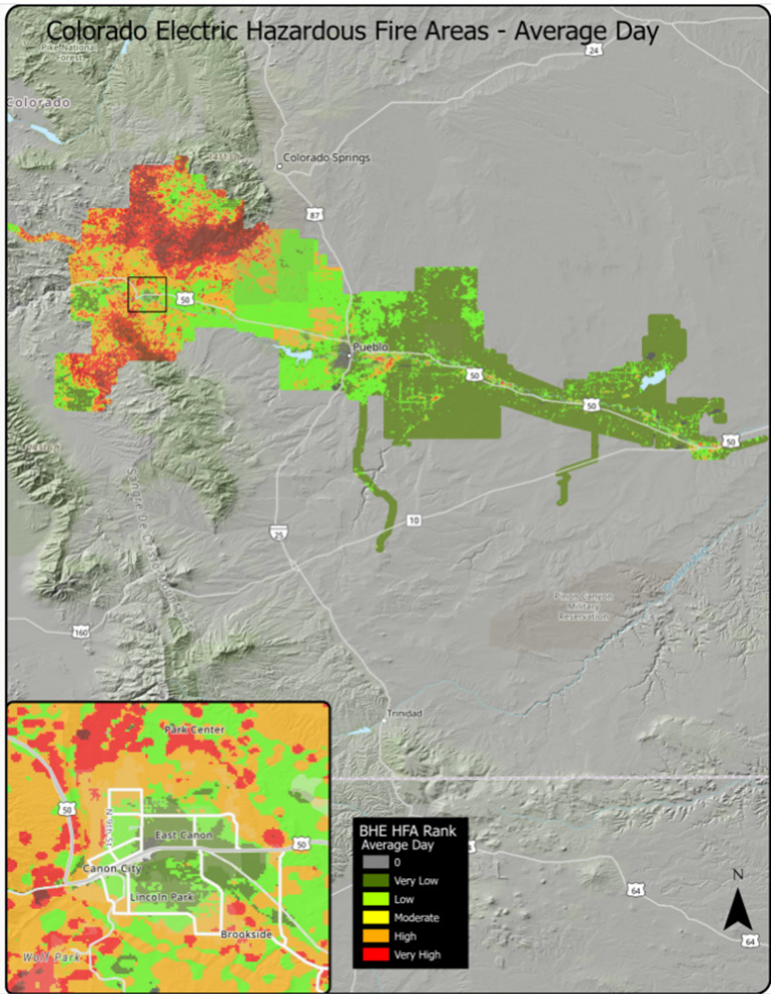



*Figure 8: Colorado electric hazardous fire areas.*

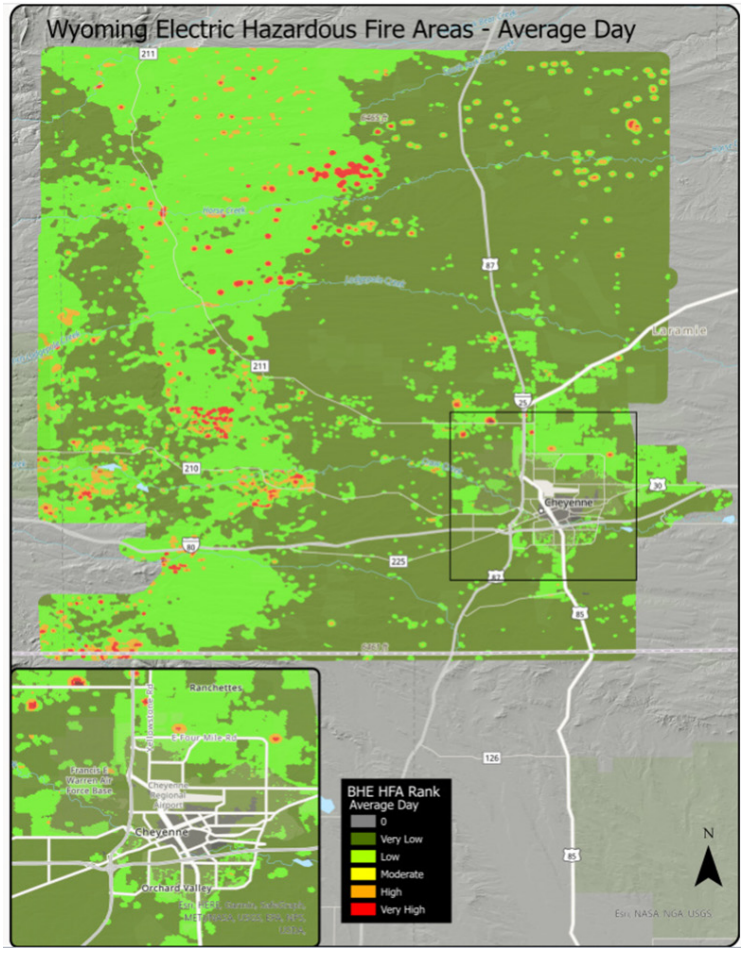



*Figure 9: Wyoming electric hazardous fire areas.*

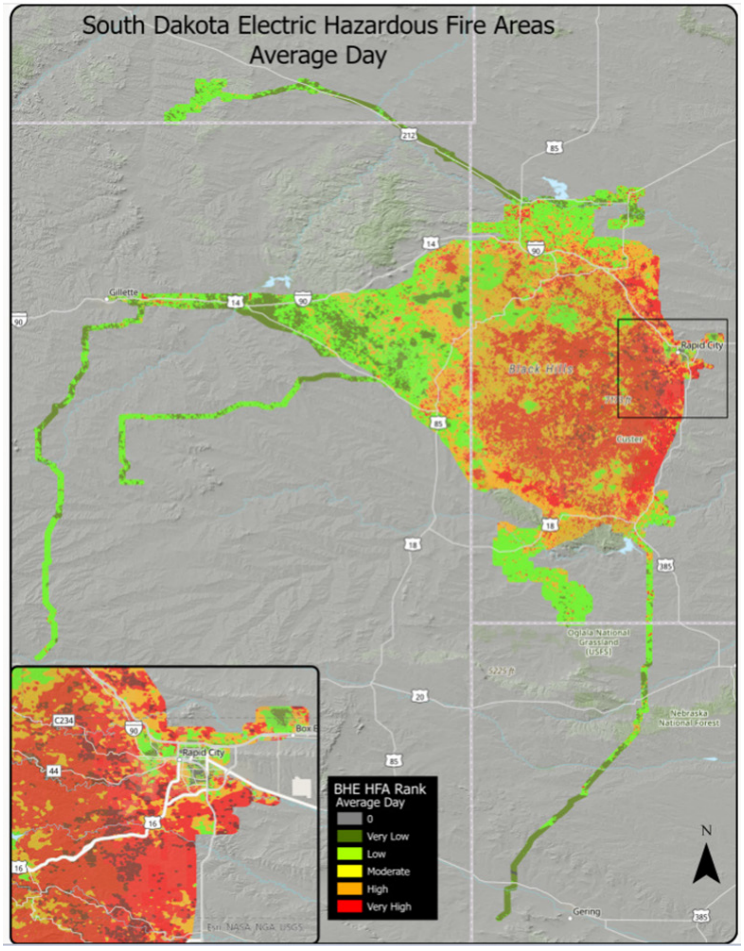



*Figure 10: South Dakota electric hazardous fire areas.*

## 2.3 CIRCUIT LEVEL

In addition to the risk assessments described in Sections 2.1 and 2.2, Black Hills Energy prioritizes wildfire mitigation activities at a circuit level. Unlike the previously described assessments, the circuit level assessment does not result in a geospatial representation of wildfire risk. Instead, the result is a stacked ranking of distribution circuits (25kV and below). Several factors are considered as part of the circuit level assessment, including:

- Line Miles in elevated fire risk areas (HFA categories of "High" and "Very High").
- Number of poles categorized as "High-Risk" (See Section 3.1.3).
- Line Miles of small copper conductor in HFA categories of "High" and "Very High".
- Number of expulsion fuses per line mile in HFA categories of "High" and "Very High".
- Number of outages (historical) per line mile.

The circuit level risk assessments are a primary consideration for facets of our electric operations, including:

- Identification and prioritization of capital projects.
- Selection of facility inspections to enhance wildfire prevention maintenance efforts prior to fire season.
- Determining reclosers to be set to one-shot (non-reclosing) during escalating wildfire weather.

## 2.4 POLE LEVEL

Per pole risk assessments represent the most granular view of wildfire risk available at Black Hills Energy. The assessment focuses on wildlife caused outages and the potential for an associated ignition. Each wildlife-caused outage is a thermal event and represents a potential ignition source.

Our teams have found this risk assessment to be useful beyond wildlife interaction considerations, further allowing our teams to prioritize distribution integrity projects to most effectively target wildfire risk. Pole configurations that exhibit high wildlife outage risk and are physically located in areas categorized as "High" or "Very High" hazardous fire areas HFAs are prioritized for further field investigation and potential retrofitting and mitigation to reduce overall fire risk. After reviewing the historical wildlife-caused outage data, Black Hills Energy partnered with third-party consultants to create a geographic information system (GIS) based wildlife electrocution fire risk model.

The goal of the wildlife model is to apply the mathematical risk model published in Dwyer et al. 2013, in which avian electrocution risk for any given pole could be quantified based on the number of jumpers, number of conductors, presence of grounding and presence of good habitat, as shown in the two equations below:

**Equation 1:**

$$Y = -0.93167 + (0.09048 \times \text{number of jumpers}) + (0.14506 \times \text{number of primary conductors}) + (0.53203 \times \text{grounding present}) - (0.55151 \times \text{paved area dominant})$$

**Equation 2:**

$$P = 1/(1 + EXP(-Y))$$

The final output is a risk index between zero and one, where high values (closer to one) indicate a greater relative risk of avian electrocution than low values (closer to zero).

The model was originally developed to assign relative risk to birds using utility poles. The model predicts that risk increases as poles become more complicated (i.e., greater number of exposed jumpers, increasing number of phases and exposed ground contact points) and when located in favorable habitat.

Because the historical outage data showed many outages were associated with the more-complicated equipment poles, this model is considered suitable representation of ignition risk specific to poles and structures.

Table 2 summarizes the distribution of poles risk across our Hazardous Fire Area classes. This risk assessment allows our teams to target asset replacements, pole retrofits and/or line rebuild projects that most significantly drive down wildfire mitigation risks.

| **Structure risk** | **Hazardous Fire Area category** | | |
|---|---|---|---|
| | **Zero-Moderate** | **High** | **Very High** |
| Low Risk | 65,410 | 25,456 | 14,135 |
| High Risk | 14,404 | 5,526 | 3,334 |

*Table 2: Pole risk assessment with Hazardous Fire Areas for distribution poles with primary wire attachments (October 2022).*

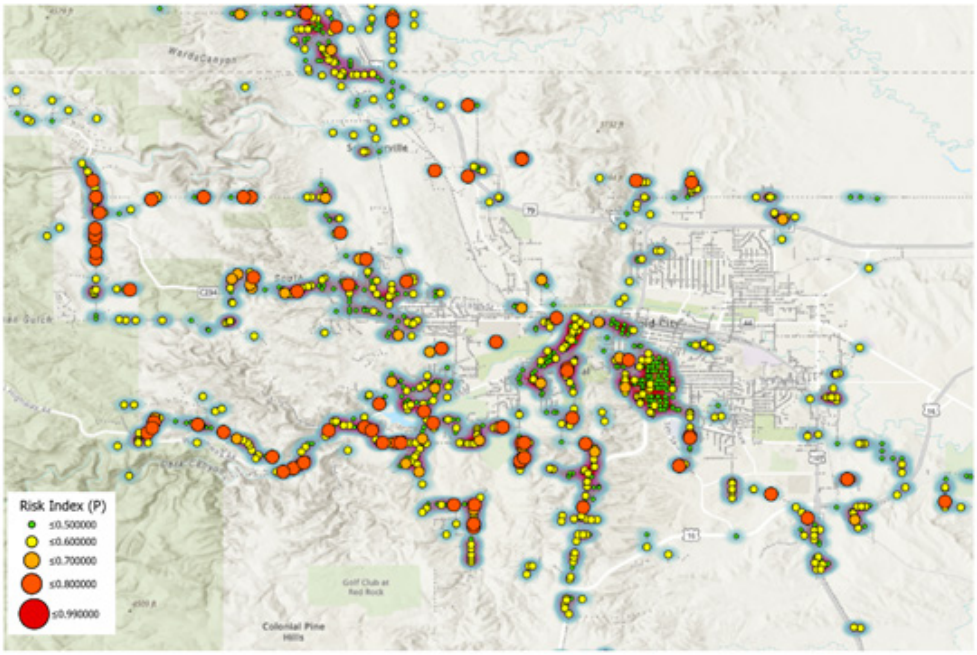



*Figure 11: Example GIS map showing Black Hills Energy pole risk assessment results in the vicinity of Rapid City, South Dakota.*

# 3.0 ASSET PROGRAMS

Asset Programs represent our first layer of our wildfire risk mitigation strategy. Our teams perform and/or oversee a wide variety of inspections and maintenance activities across our electric transmission and distribution system, including substations. These activities are focused on electric service reliability and compliance and are also key contributors to reducing wildfire ignition potential.

This section focuses on our three primary Asset Programs: Vegetation Management, Line Patrol and Pole Inspections. All three benefit from formalized procedures and periodic internal audit engagements. Lessons learned through work execution or internal audit engagements are evaluated and support the improvement of program objectives and work activities through procedure revisions. Technology systems position teams to efficiently and effectively capture asset inspection and maintenance records tied to program execution. Mobile devices, including laptops and iPads, are critical tools based on the need to capture this data real-time while working in the field.

## 3.1 VEGETATION MANAGEMENT

Our Integrated Vegetation Management (IVM) program supports our goal to deliver safe and reliable services to our customers while also reducing the risk of wildfire. To protect and enhance system reliability and reduce possible ignitions, we deploy vegetation activities such as tree trimming and the removal of hazard trees and unwanted vegetation in areas around company assets and power line corridors. We conduct this work in regular cycles across our geographically diverse service territory, based on environmental considerations as well as tree species found within our service territories.

### 3.1.1 PROGRAM OVERVIEW

Our IVM strategy combines a time and risk-based approach to work selection, including a focus on compliance, electric service reliability, public safety and wildfire prevention. The choice of control method or methods is based on considerations of their environmental impact and anticipated effectiveness.


*Figure 12: Black Hills Energy Integrated Vegetation Management process.*

### 3.1.2 APPLICABLE STANDARDS (INDUSTRY AND REGULATORY)

Black Hills Energy's vegetation management program processes align with various industry guidelines and regulatory requirements. The American National Standards Institute (ANSI), International Society of Arboriculture (ISA), National Electric Safety Code (NESC) and North American Electric Reliability Corporation (NERC) each direct or influence our program objectives and work execution practices.

**ANSI A-300, Part 1 and ISA's Best Management Practices for utility pruning of trees**

To the extent possible, Black Hills Energy's vegetation management activities align with guidelines and examples set forth by the ANSI A-300, Part 1, and the International Society of Arboriculture (ISA) Best Management Practices for utility pruning of trees. Both present performance guidelines for the care and maintenance of trees, brush and other woody plants. Internal and contracted teams strive to align work activities with these guidelines; however, field conditions including land usage, available ROW, etc. may limit the extent to which we can apply the guidelines.

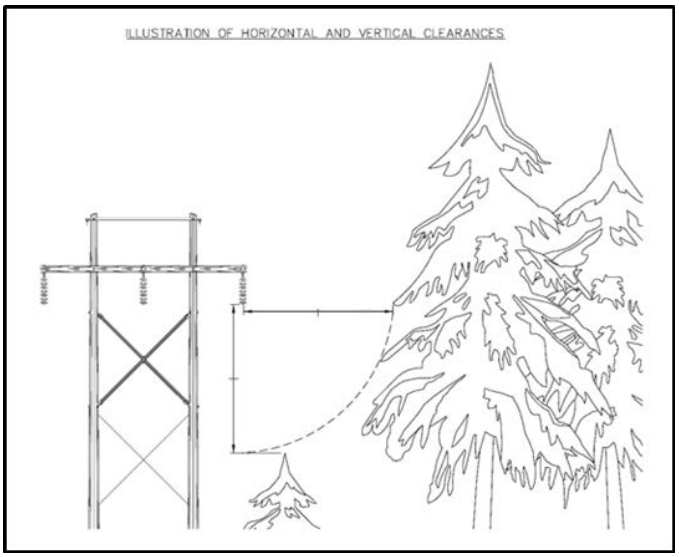



*Figure 12: Black Hills Energy Integrated Vegetation Management process.*

**National Electric Safety Code (NESC)**

State regulatory entities require electric utilities maintain their electrical systems in accordance with the National Electric Safety Code (NESC). The NESC generally requires the pruning or removal of interfering trees.

The 2017 National Electric Safety Code, Vegetation Management Section 218 states:

A. General

1. Vegetation Management should be performed around supply and communication lines as experience has shown to be necessary. Vegetation that may damage ungrounded supply conductors should be pruned or removed.

NOTE 1: Factors to consider in determining the extent of Vegetation Management required include, but are not limited to: line voltage class, species growth rates and failure characteristics, Right-of-Way limitations, the Vegetation's location in relation to the conductors, the potential combined movement of Vegetation and conductors during routine winds and sagging of conductors due to elevated temperatures or icing.

NOTE 2: It is not practical to prevent all tree-conductor contacts on overhead lines.

2. Where pruning or removal are not practical, the conductor should be separated from the tree with suitable materials or devices to avoid conductor damage by abrasion and grounding of the circuit through the tree.

B. At line crossings, railroad crossings and limited-access highway crossings, or navigable waterways requiring crossing permits. The crossing span and the adjoining span on each side of the crossing should be kept free from over-hanging or decayed trees or limbs that otherwise might fall into the line.

**North American Electric Reliability Corporation (NERC) Standards**

Black Hills Energy owns and operates electric facilities that are federally regulated by NERC. This includes reliability standard FAC-003 which establishes requirements specific to vegetation management activities for lines energized at greater than 200,000 volts (other applicability criteria may also apply).

According to NERC, the purpose of the FAC-003 Reliability Standard is to maintain a reliable electric transmission system by using a defensive in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation related outages that could lead to cascading.

At its highest level, FAC-003 requires applicable electric utilities to maintain Minimum Vegetation Clearance Distances (MVCD) based on Figure 14. Work practices that support the achievement of the MVCD can be unique to the electric utility and are not specified as part of the standard.

**FAC-003 — TABLE 2 — Minimum Vegetation Clearance Distances (MVCD)[17]**

For **Alternating Current** Voltages (feet)

| (AC) Nominal System Voltage (KV)* | (AC) Maximum System Voltage (kV)[18] | MVCD (feet) Over sea level up to 500 ft | MVCD feet Over 500 ft up to 1000 ft | MVCD feet Over 1000 ft up to 2000 ft | MVCD feet Over 2000 ft up to 3000 ft | MVCD feet Over 3000 ft up to 4000 ft | MVCD feet Over 4000 ft up to 5000 ft | MVCD feet Over 5000 ft up to 6000 ft | MVCD feet Over 6000 ft up to 7000 ft | MVCD feet Over 7000 ft up to 8000 ft | MVCD feet Over 8000 ft up to 9000 ft | MVCD feet Over 9000 ft up to 10000 ft | MVCD feet Over 10000 ft up to 11000 ft | MVCD feet Over 11000 ft up to 12000 ft | MVCD feet Over 12000 ft up to 13000 ft | MVCD feet Over 13000 ft up to 14000 ft | MVCD feet Over 14000 ft up to 15000 ft |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 765 | 800 | 11.6ft | 11.7ft | 11.9ft | 12.1ft | 12.2ft | 12.4ft | 12.6ft | 12.8ft | 13.0ft | 13.1ft | 13.3ft | 13.5ft | 13.7ft | 13.9ft | 14.1ft | 14.3ft |
| 500 | 550 | 7.0ft | 7.1ft | 7.2ft | 7.4ft | 7.5ft | 7.6ft | 7.8ft | 7.9ft | 8.1ft | 8.2ft | 8.3ft | 8.5ft | 8.6ft | 8.8ft | 8.9ft | 9.1ft |
| 345 | 362[19] | 4.3ft | 4.3ft | 4.4ft | 4.5ft | 4.6ft | 4.7ft | 4.8ft | 4.9ft | 5.0ft | 5.1ft | 5.2ft | 5.3ft | 5.4ft | 5.5ft | 5.6ft | 5.7ft |
| 287 | 302 | 5.2ft | 5.3ft | 5.4ft | 5.5ft | 5.6ft | 5.7ft | 5.8ft | 5.9ft | 6.1ft | 6.2ft | 6.3ft | 6.4ft | 6.5ft | 6.6ft | 6.8ft | 6.9ft |
| 230 | 242 | 4.0ft | 4.1ft | 4.2ft | 4.3ft | 4.3ft | 4.4ft | 4.5ft | 4.6ft | 4.7ft | 4.8ft | 4.9ft | 5.0ft | 5.1ft | 5.2ft | 5.3ft | 5.4ft |
| 161* | 169 | 2.7ft | 2.7ft | 2.8ft | 2.9ft | 2.9ft | 3.0ft | 3.0ft | 3.1ft | 3.2ft | 3.3ft | 3.3ft | 3.4ft | 3.5ft | 3.6ft | 3.7ft | 3.8ft |
| 138* | 145 | 2.3ft | 2.3ft | 2.4ft | 2.4ft | 2.5ft | 2.5ft | 2.6ft | 2.7ft | 2.7ft | 2.8ft | 2.8ft | 2.9ft | 3.0ft | 3.0ft | 3.1ft | 3.2ft |
| 115* | 121 | 1.9ft | 1.9ft | 1.9ft | 2.0ft | 2.0ft | 2.1ft | 2.1ft | 2.2ft | 2.2ft | 2.3ft | 2.3ft | 2.4ft | 2.5ft | 2.5ft | 2.6ft | 2.7ft |
| 88* | 100 | 1.5ft | 1.5ft | 1.6ft | 1.6ft | 1.7ft | 1.7ft | 1.8ft | 1.8ft | 1.8ft | 1.9ft | 1.9ft | 2.0ft | 2.0ft | 2.1ft | 2.2ft | 2.2ft |
| 69* | 72 | 1.1ft | 1.1ft | 1.1ft | 1.2ft | 1.2ft | 1.2ft | 1.2ft | 1.3ft | 1.3ft | 1.3ft | 1.4ft | 1.4ft | 1.4ft | 1.5ft | 1.6ft | 1.6ft |

* Such lines are applicable to this standard only if PC has determined such per FAC-014 (refer to the Applicability Section above)

** Table 2 – Table of MVCD values at a 1.0 gap factor (in U.S. customary units), which is located in the EPRI report filed with FERC on August 12, 2015. (The 14000-15000 foot values were subsequently provided by EPRI in an updated Table 2 on December 1, 2015, filed with the FAC-003-4 Petition at FERC)*

*Figure 14: NERC FAC-003 Minimum Vegetation Clearance Distances (MVCD).*

### 3.1.3 TIME-BASED CYCLE SELECTION

Cycle duration has been selected based on the unique vegetation characteristics within our service territories. There are two primary drivers that are considered when selecting the appropriate cycle durations:

1. Right-of-Way (ROW) width: Black Hills Energy has the right to perform maintenance activities on electric facilities within the ROW; this includes vegetation management. ROW widths may vary based on agreements with landowners but are generally consistent based on the energized voltage of the line. ROW widths and a utility's right to maintain facilities are limiting factors when considering cycle durations.

2. Anticipated Vegetation Growth Rates: Growth rates vary based on the species and location of the vegetation. This data is used, specific to service territory location, to determine the necessary clearance required at the time of the trimming activities.

These two datasets are used to determine the clearance needed to avoid unintended contact between vegetation and energized electric facilities. As a result of this analysis, we target the following time-based cycles:

- Distribution Facilities: 4-Year Cycle
- Transmission Facilities: 5-Year Cycle

There are extenuating circumstances, often the result of external factors, that may challenge our ability to remain on cycle. More specifically, contractor crew staffing levels and crew attrition, weather, greater than anticipated vegetation growth rates, etc. In these instances, we focus our program execution efforts to electric facilities based on the risk assessments included within this WMP. This typically involves referencing our circuit level prioritization rankings referenced in Section 2.3.

Our teams are positioned to direct contracted vegetation management crews to circuits that most significantly drive down risk as we evaluate opportunities to reestablish desired cycle lengths.

In 2023, Black Hills Energy experienced a total of 48 vegetation-caused outages. That represents an approximate 64% reduction when we compare 2023 results to 2017 results.

## 3.2 LINE PATROL

Our teams perform visual inspections on electric facilities as part of our reliability and risk reduction strategies. Teams inspect equipment for hazards that may result in an outage or an ignition and remediate those hazards per internal policies. The same employees that are trained to construct and perform maintenance also proactively identify electric facility conditions that could lead to an outage or an ignition.

Hazards identified during line patrol activities have steadily declined since 2020. The chart below illustrates annual hazard rates experienced across our electric service territories with an average hazard rate of 2.7% since 2019.

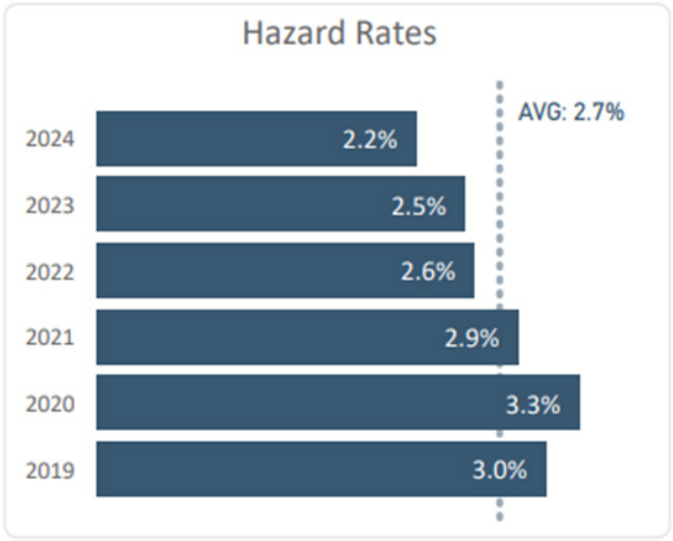



*Figure 15: Hazard Rates associated with line patrol from 2019 through May 2024.*

### 3.2.1 GROUND LINE PATROL

Black Hills Energy's electric operations teams target a ground level inspection for every line mile on our system every five years.

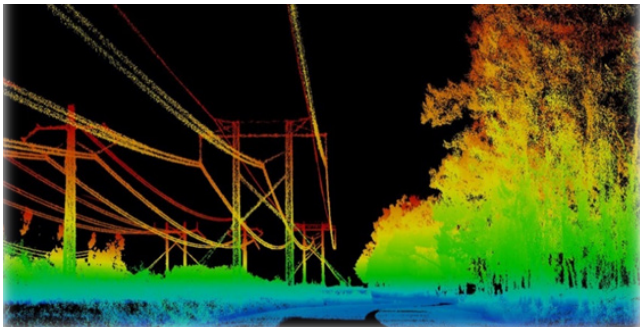
We are experienced in hazard identification and reporting requirements. This "boots on the ground" approach provides an opportunity for proactive mitigation of existing and potential hazards.

### 3.2.2 AERIAL PATROLS

Sub-transmission and transmission lines (69kV and higher) in our Colorado and South Dakota electric service territories are patrolled by helicopter providing a distinct perspective in support of hazard identification. These inspections are typically performed annually in the spring allowing for hazard identification prior to traditional fire seasons and peak outage months. A combination of engineering, electric operations and vegetation management resources support the aerial patrol activities providing a very technical and comprehensive perspective during aerial patrol activities.

### 3.2.3 LIGHT DETECTION AND RANGING (LiDAR)

Light Detection and Ranging (LiDAR) technology is leveraged to identify electric facility hazards, including vegetation, on our transmission system. This technology driven approach is complimentary to the ground line and aerial patrol activities performed on these assets. The lines are surveyed and the results are analyzed by our engineering and vegetation management resources.



## 3.3 POLE INSPECTIONS

Our pole inspection program is supported by third-party contractors trained in structural defect identification associated with utility poles. To the extent possible, we leverage a comprehensive inspection that includes sound and bore, full ground line excavation and pole treatment. This approach is widely recognized by the industry as a very accurate wood pole inspection and estimated to effectively identify 98% of rejected poles. In addition to reducing risk associated with pole failures, the process of pole treatment also extends the life of the asset.

**Visual inspection:** A visual inspection is the most basic of all inspection types and is used to assess the condition of the pole above ground, crossarms and hardware.

**Sound and bore:** This inspection involves striking the pole with a hammer from the groundline to detect voids. Inspectors are trained to assess potential decay by listening to the sounds and noticing the feel of the hammer. Poles with decay will result in a dull sound and less rebound experienced through the hammer strike. Boring involves drilling into a pole with a 3/8" bit. Trained inspectors will notice a change in the resistance against the drill if it contacts decayed wood. The pole shavings can also be examined to determine the condition of the wood.

**Excavation:** The accuracy and effectiveness of the inspection is improved when an excavation is added to the process. The soil excavation exposes sections of the pole that are most susceptible to decay. External decay pockets are removed with a specialized chipping tool and a pole circumference measurement is taken. The remaining circumference, or effective circumference, is compared to a standard pole of the same size and class to determine if the remaining pole strength is sufficient for its use.

**Treatment:** Treatments include chemicals applied to, or injected into, a wood pole with the objective of prolonging usability of the pole by preventing decay or resisting insects.

### 3.3.1 TIME-BASED CYCLE SELECTION

We referred to Rural Utility Service (RUS) Bulletin 1730B-121: Wood Pole Inspection and Maintenance, when we established our time-based cycle duration. The document was developed by the U.S. Department of Agriculture to furnish information and guidance for work practices associated with electric pole maintenance.

The bulletin establishes decay zones across the continental U.S. based on summer humidity, temperature information and a pole performance study performed by RUS.  Our service territories are located within Decay Zone 1 as illustrated below:


*Figure 16: Decay severity zones for wood utility poles (RUS Bulletin 1730B-121).*

Decay zone categorization is used to determine the appropriate cycle durations for a pole inspection program. Based on our service territories and the Decay Zone 1 categorization, we should perform an inspection every 12-15 years as referenced below.

| Decay Zone | Initial Inspection | Subsequent Re-inspection | Percent of Total Poles Inspected Each Year |
|---|---|---|---|
| 1 | 12 – 15 Years | 12 Years | 8.3 |
| 2 and 3 | 10 – 12 Years | 10 Years | 10 |
| 4 and 5 | 8 - 10 Years | 8 Years | 12.5 |

*Figure 17: RUS Inspection Cycles based on Decay Zones (RUS Bulletin 1730B-121).*

Based on this analysis, we perform an inspection every 10 years, not to exceed 12 years on all wood poles supporting distribution and transmission facilities. As of May 2024, all wood poles have been inspected per our internal procedures. Black Hills Energy has an average reject rate of approximately 3.3% going back to 2018 as referenced in the chart below.

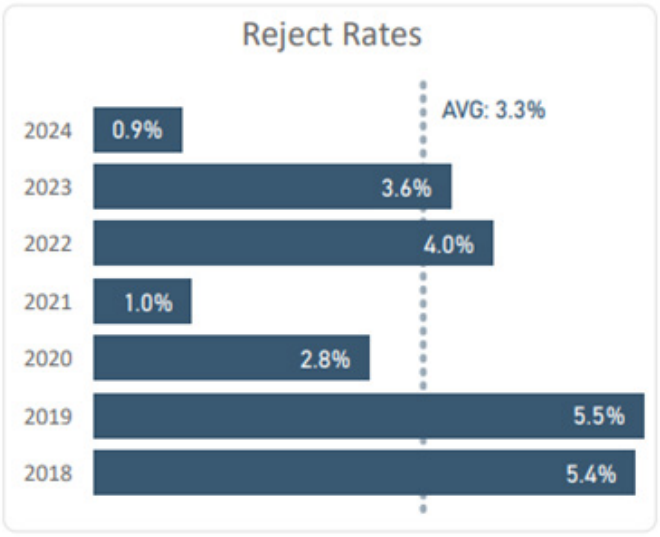



*Figure 18: Black Hills Energy Pole Inspection Program reject rates from 2018 through May of 2024.*

# 4.0 INTEGRITY PROGRAMS

We have established Integrity Programs focused on improving reliability and reducing risk through investment strategies and asset improvements. Our teams use the risk assessments referenced within this WMP to identify and prioritize integrity projects that most significantly drive down risk.

This section describes three of those Integrity Programs in greater detail including our Distribution System Integrity Program (DSIP), Wildlife Retrofits, and Undergrounding Projects.

## 4.1 DISTRIBUTION SYSTEM INTEGRITY PROGRAM (DSIP)

Our Distribution System Integrity Program is a proactive approach to distribution improvements and modernization through capital investments. It provides a programmatic approach that supports project identification and prioritization activities. Key program objectives include reducing wildfire risk while improving the safety and reliability of the electric system.

Primary drivers of DSIP projects:

- Wildfire risk.
- Age of assets and expected useful life.
- Reliability metrics.
- Number of customers served.
- Lines utilizing small copper conductor.

The team assesses each of these drivers and applies a weighted criteria approach that results in a prioritization ranking. The heaviest weighted factor is wildfire risk. Projects typically resulting from the DSIP program include line rebuilds in elevated fire risk areas. In some cases, these projects also involve rerouting facilities to reduce the risk of wildfire or to move the facilities underground altogether.

## 4.2 WILDLIFE RETROFITS

Wildlife interactions and the potential for wildlife caused ignitions represent a challenge for electric utilities from both a reliability and wildfire risk perspective. Black Hills Energy has completed asset-based risk assessments (Section 3.4) to further our understanding of the specific risks our electric facilities face with wildlife. The additional insight produced through those assessments allow our teams to most effectively target mitigation options that drive down risk.

Based on our wildlife risk assessments, the European starlings and squirrels are the most common wildlife interaction we experience with respect to our electric facilities.

Wildlife interactions with overhead electric distribution equipment are sometimes unavoidable and inherent to operating an electric utility. We have found there is a strong case for proactively making appropriate infrastructure investments, especially when those investments can demonstrate risk reduction.

Black Hills Energy has construction standards that are engineered to reduce the likelihood of wildlife interactions with our facilities. Examples include using wildlife guards on overhead equipment as shown in Figure 20, design overhead facilities with increased spacing between energized components, and the utilization of covered jumpers for complex structure construction. New electric facilities are built to these standards and pole retrofit projects are targeted based on the risk assessments described within this WMP.

*Figure 19: Examples of common wildlife interactions on Black Hills Energy facilities.*

### 4.2.1 AVIAN POWER LINE INTERACTION COMMITTEE

Black Hills Energy is a member of the Avian Power Line Interaction Committee (APLIC). In 2011, we adopted an Avian Protection Plan (APP) which provides structure and procedures to facilitate its compliance with applicable avian and wildlife laws, regulations and permits. The APP is aligned with industry best management practices and APLIC and U.S. Fish and Wildlife Service (USFWS) recommendations (APLIC and USFWS 2005). The plan states that we will document bird mortalities and injuries; poles and lines with elevated risk of wildlife interaction; and high-risk nests as well as provide information, resources and training to improve employees' knowledge and awareness of APP requirements. We have also certified that all new facilities will provide avian-friendly clearances and that the company will retrofit or modify infrastructure (APLIC 2006) where a protected bird has died or been injured to prevent future incidents.

*Figure 20: Example - Wildlife guards on overhead equipment*

## 4.3 UNDERGROUND PROJECTS

Black Hills Energy recognizes that underground facilities have a reduced wildfire risk profile as compared to overhead facilities. We also recognize that undergrounding is not always feasible or cost effective. As such, our teams evaluate opportunities to construct new facilities underground or to replace existing overhead facilities with underground cable.

Of our 9,106 total line miles, 2,261 (approximately 25%) are underground and that number will continue to grow as undergrounding is a primary consideration for growth and integrity projects. Additionally, 37% of our distribution miles in elevated fire risk areas are underground.

| Asset type | Total circuit-miles | Circut-miles in elevated fire risk | % of total miles |
|---|---|---|---|
| Transmission (all overhead) | 1,917 | 316 | 4% |
| Distribution | 7,189 | 1,762 | 19% |
| Distribution overhead | 4,928 | 1,110 | 63% |
| Distribution underground | 2,261 | 652 | 37% |
| | **9,106** | **2,078** | **23%** |

*Table 3: Black Hills Energy line miles summary.*

# 5.0 OPERATIONAL RESPONSE

Black Hills Energy rounds off its three-layered approach with Operational Response. Our understanding of wildfire risk across our service territories enables our teams to adjust various operating practices and work activities to mitigate potential wildfire ignitions.

## 5.1 IMPROVED SITUATIONAL AWARENESS

Our field operation teams start every morning with a five-day fire weather forecast allowing for improved insights related to environmental factors that drive wildfire risk across our service territories. This service is provided by DTN and the WeatherSentry tool produces an Energy Event Index (EEI) risk ranking (Section 5.2) based on localized weather conditions across our service territories (three states, six regions). The improved situational awareness positions our teams to make informed, data-driven decisions, including disabling automatic reclosing of devices (Section 5.3.2) and adjusting work activities for the day (Section 5.5), based on wildfire risk.

As of May 2024, DTN had over 180 meteorologists on staff and leverages information provided by over 20,000 weather stations worldwide to accurately produce localized forecasts. A subset of these weather stations is specific to our service territory allowing for a tailored view of localized weather conditions that drive wildfire risk.

WeatherSentry
powered by DTN

**Energy Event Index for BLACK HILLS SERVICE COMPANY,LLC**
Valid Time: September 25, 2023 6:00 AM MDT

| Parameter | Region | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|---|
| Wind Speed | Co Mtn | 1 | 1 | 1 | 1 | 1 |
| | Pueblo | 1 | 1 | 1 | 1 | 1 |
| | Black Hills | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands North | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands South | 1 | 1 | 1 | 1 | 1 |
| | Wyoming | 1 | 1 | 1 | 1 | 1 |
| Wind/Gust | Co Mtn | 1 | 1 | 1 | 1 | 1 |
| | Pueblo | 1 | 1 | 1 | 1 | 1 |
| | Black Hills | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands North | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands South | 1 | 1 | 1 | 1 | 1 |
| | Wyoming | 1 | 1 | 1 | 1 | 1 |
| Wildfire | Co Mtn | 1 | 1 | 1 | 1 | 1 |
| | Pueblo | 2 | 2 | 2 | 3 | 3 |
| | Black Hills | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands North | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands South | 1 | 1 | 1 | 1 | 1 |
| | Wyoming | 2 | 2 | 2 | 3 | 2 |
| Snow | Co Mtn | 1 | 1 | 1 | 1 | 1 |
| | Pueblo | 1 | 1 | 1 | 1 | 1 |
| | Black Hills | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands North | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands South | 1 | 1 | 1 | 1 | 1 |
| | Wyoming | 1 | 1 | 1 | 1 | 1 |
| Ice | Co Mtn | 1 | 1 | 1 | 1 | 1 |
| | Pueblo | 1 | 1 | 1 | 1 | 1 |
| | Black Hills | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands North | 1 | 1 | 1 | 1 | 1 |
| | SD Grasslands South | 1 | 1 | 1 | 1 | 1 |
| | Wyoming | 1 | 1 | 1 | 1 | 1 |
| Confidence Level | Co Mtn | High | High | High | High | High |
| | Pueblo | High | High | High | Medium | Medium |

## 5.2 ENERGY EVENT INDEX (EEI)

The Energy Event Index (EEI) is the risk ranking produced (1-4 scale) by DTN meteorological services and is primarily influenced by localized relative humidity and wind conditions experienced within our service territories. Other key drivers include Fire Weather Watches and Red Flag Days as issued by the National Weather Service.

The EEI risk ranking is referenced on a 1-4 scale as described below:

- **Level 1** – Low: All factors, especially burning index are low compared to the risk of wildfire
- **Level 2** – Moderate: Moderate winds are present and relative humidity is lower, stay aware
- **Level 3** – High: Higher winds are present and relative humidity is lower; monitor closely
- **Level 4** – Severe: All factors indicate extreme wildfire risk

The EEI risk ranking drives operational decisions including System Configuration and Equipment Operations (Section 5.3), Outage Response practices (Section 5.4) and Fire Weather Operating Procedures (Section 5.6) as described in subsequent sections.

## 5.3 EQUIPMENT OPERATIONS, OUTAGE RESPONSE AND OPERATING PROCEDURES

We leverage wildfire risk situational awareness to drive decisions relating to system configuration and equipment operations. This section will cover these considerations based on EEI risk rankings under otherwise normal operating conditions. Operational decisions during active fires or other emergency conditions will be covered in Section 5.6.

### 5.3.1 EQUIPMENT OPERATIONS

Isolation devices (ex. fuses, breakers, reclosers) are used throughout our electric system. They are designed to identify system abnormalities and to isolate (de-energize) the problem areas while reducing the overall impact to customers. An isolation device, commonly referred to as a recloser, is used to re-energize electric facilities after a predetermined amount of time to prevent longer duration outages that result from a temporary system abnormality. Under normal conditions, these devices provide significant value to electric service reliability and often prevent field crew truck rolls.

*Figure 21: Example – Distribution line recloser.*

This automatic reclosing functionality can negatively contribute to wildfire risk by automatically re-energizing facilities when the problem, or electric fault, persists; potentially causing an ignition. The potential for an ignition increases during high fire risk days as represented by the EEI risk ranking. Black Hills Energy has formalized processes that disable automatic reclosing on a subset of these field devices that feed elevated fire risk areas that support auto-reclosing functionality.

## 5.4 OUTAGE RESPONSE

Outages that occur during times of elevated fire risk require careful consideration and assessment prior to re-energization of facilities. While under EEI Level 4 conditions, Black Hills Energy field crews perform a patrol of impacted electric facilities prior to re-energization. Localized weather conditions are considered (i.e. recent moisture) and may influence the need or the extent of the patrols. This cautionary measure reduces the likelihood that teams start an ignition as part of our electric service restoration efforts. This generally results in additional time needed to restore electric service to our customers and represents a tradeoff between reliability and risk that all electric utilities must consider.

## 5.5 FIRE WEATHER OPERATING PROCEDURES

Aligning employees and daily work activities to our wildfire risk mitigation strategies ultimately drives the effectiveness of our program. We have formalized a *Work Mitigations and Restrictions for Escalating Fire Weather* procedure that guides field and seasonal operations during escalating fire weather conditions. This operational procedure is applied across all our electric service territories.

### 5.5.1 WORK MITIGATIONS AND RESTRICTIONS FOR ESCALATING FIRE WEATHER

Certain field work activities have the potential to cause wildfire ignitions if not managed appropriately. The company procedure assigns mitigation measures to common field tasks and associates them with operating conditions. This may include postponing or delaying the work until wildfire conditions improve. The table below groups potential mitigation activities and categorizes them as A, B, C, SC or R. Pre-job briefings (tailboards) and having fire tools available at the jobsite are always required.

| Mandatory | Mitigation Options Group A | Mitigation Options Group B | Mitigation Options Group C | Special Circumstances (SC) | Restricted Work (R) |
|---|---|---|---|---|---|
| • Tailboard<br>• Fire tools on truck<br>• Fire tools at job site (within 50') | • Designated Fire Sweep | • Fresh tailboard<br>• Welding blanket(s)<br>• Fire retardant<br>• Dedicated Fire Sweep | • Fire retardant<br>• Special Mitigation / Equipment | • Essential Work that is done only with Management approval and mitigation determination by Management | • Restricted. Work may not be done during these conditions |

*Table 4: Work mitigations and restrictions for escalating fire weather.*

Table 5 specifies work activities and EEI level conditions that require certain mitigation measures as identified in Table 4. These conditions, along with the selected mitigation measures are captured as part of our pre-job safety briefings that occur prior to the start of work activities.

| | | Energy Event Index (EEI) Level | | | |
|---|---|---|---|---|---|
| | | Level 1 - Low | Level 2 - Moderate | Level 3 - High | Level 4 - Severe |
| **Work Activity** | | **EEI 1** | **EEI 2** | **EEI 3** | **EEI 4** |
| Vehicle Use with Potential Vegetation Contact | | **A** | **A** | **B** | **SC** |
| Access Road Maintenance | | **A** | **B** | **B** | **SC** |
| Cutting, Grinding, Welding | **Substation** | **A** | **A** | **B** | **SC** |
| | **ROW** | **A** | **SC** | **SC** | **R** |
| Vegetation Management Work | | **A** | **B** | **B** | **SC** |
| Other At-Risk Maintenance or Construction Activities | | **A** | **B** | **C** | **SC** |

*Table 5: Work mitigation groups based on work activity & EEI level.*

Most field work activities can be performed safely when wildfire ignition risk is appropriately mitigated. Work activities and EEI level combinations that result in "SC" 'and "R" mitigation groups are considered the exception. Combinations resulting in a "SC" mitigation group require review and approval from management (typically electric operations managers and general managers). This optionality is necessary as there may be occasions when essential work (work that is deemed necessary based on public and/or employee safety) needs to be completed under adverse wildfire conditions (EEI Level 4) to preserve public health.

## 5.6 ACTIVE FIRE RESPONSE AND EMERGENCY PREPAREDNESS

Strong partnerships with emergency responders and fire suppression crews are essential during "active fires". The overall goal, for all parties involved, is to provide for firefighter safety, public safety and to minimize impacts on company assets, customers and electric service reliability. Formalized processes and periodic tabletop exercises are used to prepare our teams for these events.

### 5.6.1 EMERGENCY PREPAREDNESS

Black Hills Energy is committed to strong relationships with our fire agency partners given the collaborative nature of wildfire emergency response. Our team provides electrical safety training to first responders using a high voltage trailer training prop and routinely responds to residential and commercial fires. Interactions like this provide opportunities for both parties to educate each other on key considerations that pertain to their operational and emergency response practices.

We have also adopted the use of the Incident Command System (ICS). This level of formalization is critical during low frequency, high impact events to ensure key contributors are efficient and effective. An established Major Event Playbook (MEP) enables Black Hills Energy to pull together the appropriate resources quickly, communicate event details to key stakeholders and company representatives, and coordinate work activities. Tabletop drills are used to simulate potential events and strengthen ICS skills. During complex wildland fires, a company liaison officer serves as the single point of contact with the Incident Management team.

To enhance emergency communications, we provide phone numbers and "whom to call" information to all first responders in our service areas. For emergency/critical communications, a single, rolling phone number per functional area is used.

## 5.7 CUSTOMER, PUBLIC AND AGENCY COMMUNICATIONS

Black Hills Energy recognizes the value of having a public awareness campaign relating to wildfire mitigation. It leverages relationships among key stakeholders such as local governments, emergency management centers, business associations and chambers of commerce to activate a comprehensive community outreach strategy. Critical messaging and mitigation efforts are disseminated across multiple channels including traditional media relations efforts, social media, community meetings and direct customer communications to support its public awareness campaigns which focus on communicating outage and restoration information. In addition, we participate in annual meetings with first responders, emergency personnel and local government officials to collaborate on emergency response and provide a single point of contact to represent Black Hills Energy.

## 5.8 RECOVERY, RESTORATION AND REMEDIATION OF SERVICE

Our post-fire recovery efforts begin as soon as the scene is safe and the controlling fire agency agrees to allow utility access. A restoration plan including timeline, activities and a prioritized list of desired work areas is communicated to the fire's Incident Command Structure (ICS) as soon as practical.

Different types of work such as demolition, aerial operations and rebuilding can take place concurrently with agency approval. Communication is key to expeditious restoration. The Black Hills Energy company representative on scene is responsible for laying the groundwork for each of these activities as soon as possible. Coordination with key fire personnel such as air operations is to occur before any restoration activities begin.

Our approach includes a mechanism for personnel accountability so that all personnel assigned to work in the fire area can be accounted for. Safety of electric crews, firefighters and the public is of of the highest importance. All overhead facilities within a fire perimeter are to be patrolled and repairs (temporary or permanent) made prior to re-energization. Along with line construction personnel, vegetation management crews may be engaged to patrol and inspect certain areas and fuel types if there are concerns related to vegetation.

We collect tools, supplies, equipment, contractors and internal personnel in anticipation of a fire area being declared safe for utility company restoration operations. If the magnitude of the wildfire damage is considered significant, mutual assistance will be considered.

# 6.0 CONCLUSION

Black Hills Energy has developed a WMP as part of its commitment to deliver safe, reliable, cost-effective electric services to our customers. The WMP demonstrates our continued focus on taking proactive measures to reduce the risk of our equipment causing ignitions and minimize the potential impact for wildfires in our service territories.

Our organization is actively involved in industry conversations relating to wildfire and takes steps to reinforce a fire safe culture. Our team's awareness of key drivers associated with wildfire risk and opportunities to mitigate risk continues to grow. We are committed to continuous learning and improving our approach to reduce the overall risk of wildfires to our coworkers, customers, communities and the environment.

The three-layered approach referenced throughout this document sets the foundation for our wildfire risk mitigation strategies. Remaining intentional about our Asset Programs helps ensure that our electric facilities will function as intended. Thoughtful consideration of our Integrity Programs, including capital investment strategies and construction standards, will provide opportunities for our teams to target projects and asset investments that most significantly contribute to wildfire risk reduction. Connecting our teams and daily work activities as part of our Operational Response efforts will continue to promote a fire safe culture at Black Hills Energy while also driving down risk.

We will continue to update our WMP and communication efforts to ensure coordination with customers, emergency responders, communities, regulators and other stakeholders.

# APPENDIX A: DEFINITIONS

**Avian Protection Plan (APP):** A utility-specific document that delineates a program designed to reduce the operational and avian risks that result from avian interactions with electric utility facilities.

**Conductor:** An object or type of material, usually a metal, that allows the free flow of electric current in one or more directions.

**De-Energized:** A term used to describe an electrical conductor that does not have power flowing through it.

**Distribution:** The portion of the electrical system that delivers power to an end user.

**Electric power distribution:** The final stage in the delivery of electric power; it carries electricity from the transmission system to individual consumers.

**Energy Event Index (EEI):** An index published by DTN (Weather Sentry) daily that tracks weather and wildfire condition. DTN's meteorologists watch wildfire conditions for each region or zone based on the current conditions and forecast to issue an EEI score using the following scale:

- Level 1 - Low: All parameters, especially burning index are far better than risk thresholds.
- Level 2 - Moderate: Moderate winds are present and relative humidity is lower, stay aware.
- Level 3 – High: Higher winds are present and relative humidity is lower; monitor closely.
- Level 4 – Severe: All parameters show extreme wildfire risk; follow all mitigation protocols.

**Energized:** A term used to describe the status of an electrical conductor as having power flowing through it.

**Fault:** Fault in electrical equipment or apparatus is defined as an imperfection in the electrical circuit due to which current is deflected from the intended path. In other words, the fault is an abnormal condition of the electrical system which can damage electrical equipment and disturbs the normal flow of the electric current.

**Fire sweep:** A crewmember tasked to perform periodic sweeps or walk-throughs of the work area looking for smoking or smoldering materials.

**Fire Weather Watch (FWW):** Issued when the combination of dry fuels and weather conditions support extreme fire danger, and a National Weather Service forecast confidence is high that Red Flag Warning criteria will be met within 72 hours. Often will be issued before a Red Flag Warning.

**Flammable vegetation:** Native or decorative plants (grass, bushes, trees) that can readily burn and cause fire to spread structures or other vegetation.

**Fresh tailboard:** "Tailboards" may be known as Job Safety Analysis, Job Walk, Job Safety Analysis, or other similar names. The intent of a Tailboard is to discuss and document hazards that might be encountered during the day's work and mitigations appropriate for them. A "Fresh Tailboard" might be necessary when working conditions or activities change to the extent that review of the hazards and mitigations is necessary.

**Hazard:** Any real or potential condition that can cause injury, illness or death of personnel, or damage to, or loss of equipment or property.

**Hazard assessment:** Assess hazards to determine risks in terms of potential loss, cost, or strategy and goals based on probability and severity.

**Hazardous Fire Area (HFA):** Geospatial polygon areas referencing wildfire risk categories that are set by analyzing and processing data from the Wildfire Risk to Communities (WRO) datasets focusing on utility-specific risk.

**Ignition Management Plan (IMP):** A structured process designed to harvest useful data from service calls and outages to help inform future risk reduction efforts.

**Incident Command System (ICS):** A standardized on-scene emergency management concept designed to allow its user(s) to adopt an integrated organizational structure without being limited by jurisdictional boundaries.

**Integrated Vegetation Management Plan (IVM):** The American National Standard Institute's (ANSI) A300 Part 7 defines Integrated Vegetation Management (IVM) as a system of managing plant communities in which managers set objectives, identify compatible and incompatible vegetation, consider action thresholds, and evaluate, select, and implement the most appropriate control method or methods to achieve their established objectives.

**Learning organization:** An organization which proactively makes efforts both in the form of investment and encouragement to educate their employees so that the company can adapt with the rapidly changing technology and business environment.

**Non-Expulsion:** A term used to describe an electrical fuse that will not emit sparks out of its cartridge during a short circuit.

**Phase-to-Ground:** Voltage which exists between a single phase of a power system and ground.

**Phase-to-Phase:** The electrical potential (voltage) between two conductors, each having its own electric potential relative to ground.

**Public Safety Power Shutoff (PSPS):** A last resort method to reduce the chances of a Black Hills Energy facility causing a wildfire. It entails selectively and intentionally turning off power to a small portion of a service area when high risk fire weather and fuel conditions occur.

**Rate of Spread (ROS):** The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually, it is expressed in chains or acres per hour for a specific period in the fire's history.

**Recloser:** An automatic, high-voltage electric switch. Like a circuit breaker on household electric lines, it shuts off electric power when trouble occurs, such as a short circuit.

**Red Flag Warning (RFW):** A weather condition issued by the National Weather Service (NWS) when weather and fuel conditions combine to produce critical burning conditions where fires can grow rapidly and may be difficult or impossible to control.

**Risk:** The chance of fire starting as determined by the presence and activity of causative agents and/or the chance of suffering harm or loss.

**Situational Awareness (SA):** Awareness of current conditions and the anticipated future events that could happen given the elements in the environment. For example, the heat, fuel, and oxygen sources in an area viewed at a particular time can lead to the conclusion that a fire is likely to happen.

**Substation:** A substation is a part of an electrical generation, transmission, and distribution system. Substations transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels.

**Supervisory Control and Data Acquisition (SCADA):** A system of software and hardware elements that allows industrial organizations to 1. Control industrial processes locally or at remote locations 2. Monitor, gather, and process real-time data 3. Directly interact with devices such as sensors, valves, pumps, motors, and more through human-machine interface (HMI) software and 4. Record events into a log file.

**Transmission:** A system of structures, wires, insulators, and associated hardware that carry electric energy from one point to another in an electric power system. Lines are operated at relatively high voltages varying from 69 kV up to 765 kV and can transmit large quantities of electricity over long distances.

**Wildfire:** A destructive fire that spreads quickly over woodland or brush where the goal is to put the fire out.

**Wildland Urban Interface (WUI):** The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

B

# APPENDIX B: ACRONYMS GLOSSARY

**APLIC**
Avian Powerline Interaction Committee

**APP**
Avian Protection Plan

**CI**
Continual Improvement

**DSTAR**
Distribution Systems Testing, Application and Research

**EEI**
Energy Event Index

**EPRI**
Electrical Power Research Institute

**FWW**
Fire Weather Watch

**HFA**
Hazardous Fire Area

**IEEE**
Institute of Electrical and Electronics Engineers

**IMP**
Ignition Management Plan

**ICS**
Incident Command System

**LiDAR**
Laser Imaging, Detection and Ranging

**MW**
Mega Watt

**NRECA**
National Rural Electric Cooperative Association

**PSPS**
Public Safety Power Shutoff

**QC**
Quality Control

**RFW**
Red Flag Warning

**ROI**
Return on Investment

**ROS**
Rate of Spread

**ROW**
Right(s)-of-Way

**SA**
Situational Awareness

**SCADA**
Supervisory Control and Data Acquisition

**SME**
Subject Matter Expert

**WUI**
Wildland Urban Interface

**WMP**
Wildfire Mitigation Plan

**WRO**
wildfirerisk.org

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