



Guide for Fire Protection of Transmission Lines

Overview

Transmission lines represent a significant capital asset for electric utilities in terms of their physical value and as components of the bulk transmission system.

The performance of transmission lines exposed to wildfire events is poorly understood across the industry. This is due to the limited documentation of actual transmission line damage from wildfires, a small body of scientific work focused specifically on the transmission industry, and inherent uncertainties in fire behavior. Consequently, transmission line owners have been forced to address wildfire risk on an ad hoc basis without benefiting from industry guidelines.

This report provides a framework to allow owners to apply uniform rationale across highly variable fire environments, assess specific line assets in relation to the broader transmission system, and evaluate risk mitigation techniques in relation to one another.

**Overhead
Transmission Design
Interest Group**

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How to use this research

This document provides an overview of wildfire behavior, transmission line industry experience with wildfire, and damage inspection methodologies for common transmission line materials.

- Owners will assess the risk of wildfire based on vegetation conditions, line configuration, and line importance based on information offered in the report
- Personnel will be able to study risk analysis methods and increase funding for components of transmission lines that are more vulnerable to the effects of wildfires
- Industry professionals will be able to implement new, innovative risk mitigation techniques and forms of management

Key questions Addressed

- What factors affect the wildfire performance of transmission lines, including vegetation communities?
- What are industry-standard methods to identify risk and cost-effective mitigation?
- What are the factors affecting transmission line performance during fire incidents?
- What are the best utility practices regarding fire protection of transmission lines?
- What are the best techniques to minimize the impact of fires on transmission lines?
- How to use cost analysis techniques for risk mitigation?
- How to identify fire forecasting methods?

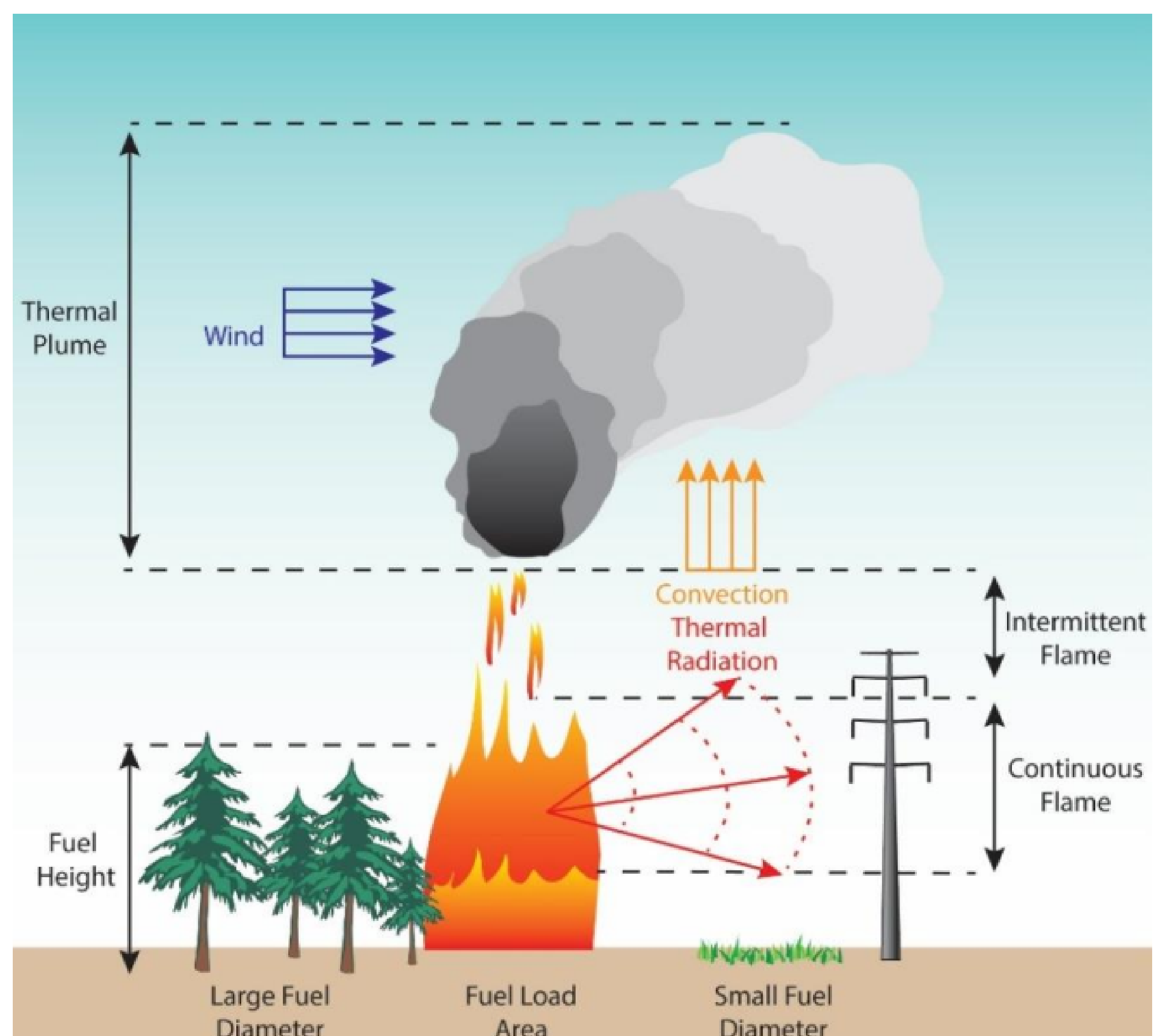
Research Summary

The report represents a synthesis of the best practices observed based on industry surveys, individual correspondence and alternate analysis methods observed in other industries affected by fire. It provides a comprehensive approach to wildfire risk management for transmission lines with considerations for asset importance and inherent fire risk as well as the cost and efficacy of potential risk mitigation measures. The following broad categories are covered:

1. Case histories and industry experience (details old methods used to mitigate the effects of wildfires and provides information on the vulnerability of different transmission components)
2. Wildfire behavior theory (overview of mechanisms that drive wildfire behavior)
3. Effects of wildfires on transmission lines (overview of critical temperatures of each transmission line)
4. Fire risk mitigation practices (divided into three categories; passive, active, and reactive)
5. Vegetation management strategies (considerations for probable fire severity based on existing fuel loads and vegetation type)
6. Risk analysis and cost evaluation strategies (allows industry professionals to study risk analysis methods and provide funding to assets with the highest risks)

The report provides a rational basis for selecting appropriate mitigation strategies, and the overall wildfire risk is evaluated against mitigation costs. Evaluation methods employ typical risk assessment techniques for compatibility with existing risk analysis protocols. Photo reference guides and example cost analyses guide document users through the field and desktop elements of the recommended fire risk assessment methods.

Wildfires are one of many risks which can affect the reliable operation of transmission lines. How they rank among other risks is a site-specific consideration. Owners' decisions should be correspondingly guided by rational analysis to determine the appropriate risk mitigation strategies based on assessed risk. Key ideas taken from this research which will guide owners toward a site-specific risk mitigation strategy.



Heat exposure of transmission line components during wildfire events

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