SAFETY REQUIREMENTS ADDRESSING INCREASING WILDFIRE RISK

Public Workshop

YouTube

Click the links to access the recording of this workshop:

Day 1 (July 13th)

Day 2 (July 14th)

CALIFORNIA OFFICE OF ENERGY INFRASTRUCTURE SAFETY

Green Grid inc

actionable sustainability intelligence©

SAFETY BRIEFING

Take care of your posture and sit in a comfortable position

Take regular breaks stretch, hydrate, and rest your eyes

Know the emergency exits and procedures in your physical location should the need arise

Keep emergency contact information readily available

Be prepared for **earthquakes**

HOW TO PARTICIPATE

If you wish to provide input to the discussion:

- Press the “raise hand” button on Zoom, participants will be unmuted in order of hands raised
- Dial-in participants need to press #2 to raise hand
- Use Zoom’s Q&A feature to provide input.

OPENING REMARKS

Caroline Thomas Jacobs, Director,

Office of Energy Infrastructure Safety

Darcie Houck, Commissioner,

California Public Utilities Commission

SAFETY REQUIREMENTS TO ADDRESS INCREASING WILDFIRE RISK FROM CLIMATE CHANGE AND AGING INFRASTRUCTURE

Lucy Morgans, Program Manager,
Electrical Safety Policy Division, Office of Energy Infrastructure Safety

AGENDA OVERVIEW
DAY 1 – JULY 13

9:30 a.m. – 9:45 a.m.	Welcome and Opening Remarks
9:45 a.m. – 10:00 a.m.	Project Overview
10:05 a.m. – 11:05 a.m.	Local Conditions
11:15 a.m. – 12:05 p.m.	Situational Awareness; Emergencies and Disasters
12:05 p.m. – 1:05 p.m.	Lunch
1:05 p.m. – 1:50 p.m.	Risk Assessment and Modeling
2:10 p.m. – 3:50 p.m.	Vegetation Management
4:00 p.m.	End of Day 1

OBJECTIVES

Facilitate Stakeholder Feedback

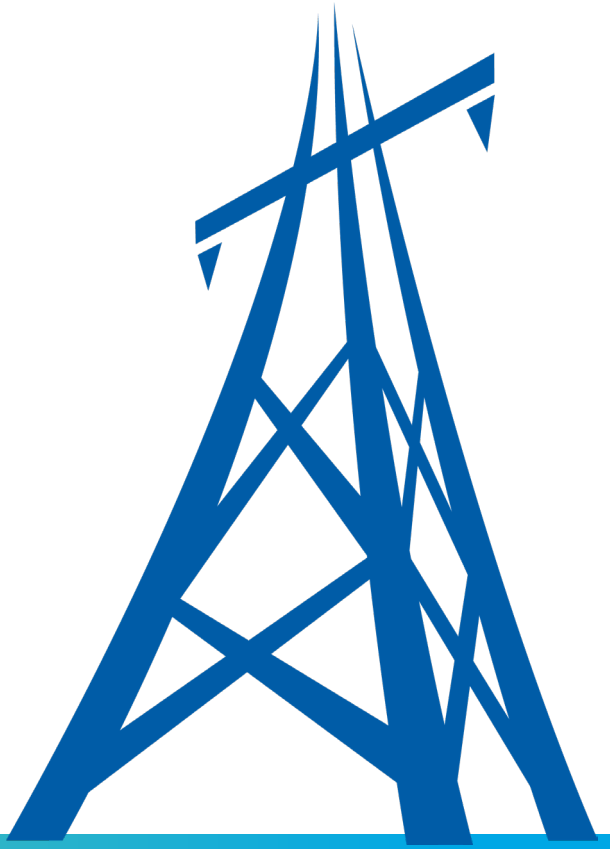
- Listen, understand, and consider the perspectives and insights of our stakeholders

Promote Public Engagement

- Have a collaborative discussion to explore recommendations for safety regulations to reduce utility wildfire ignitions and the effects of climate change and aging infrastructure

Enhance Communication and Transparency

- Provide clear feedback and participate in an open dialogue



INTRODUCTION TO WILDFIRE SAFETY REGULATORY REQUIREMENTS REVIEW

Chinmoy Saha, Green Grid Inc.

CAL FIRE INTRODUCTION

Jeff Fuentes
Division Chief – Utility Wildfire Mitigation
CAL FIRE

Utility Wildfire Mitigation

CAL FIRE

In State Responsibility Area

Investor-Owned Utilities

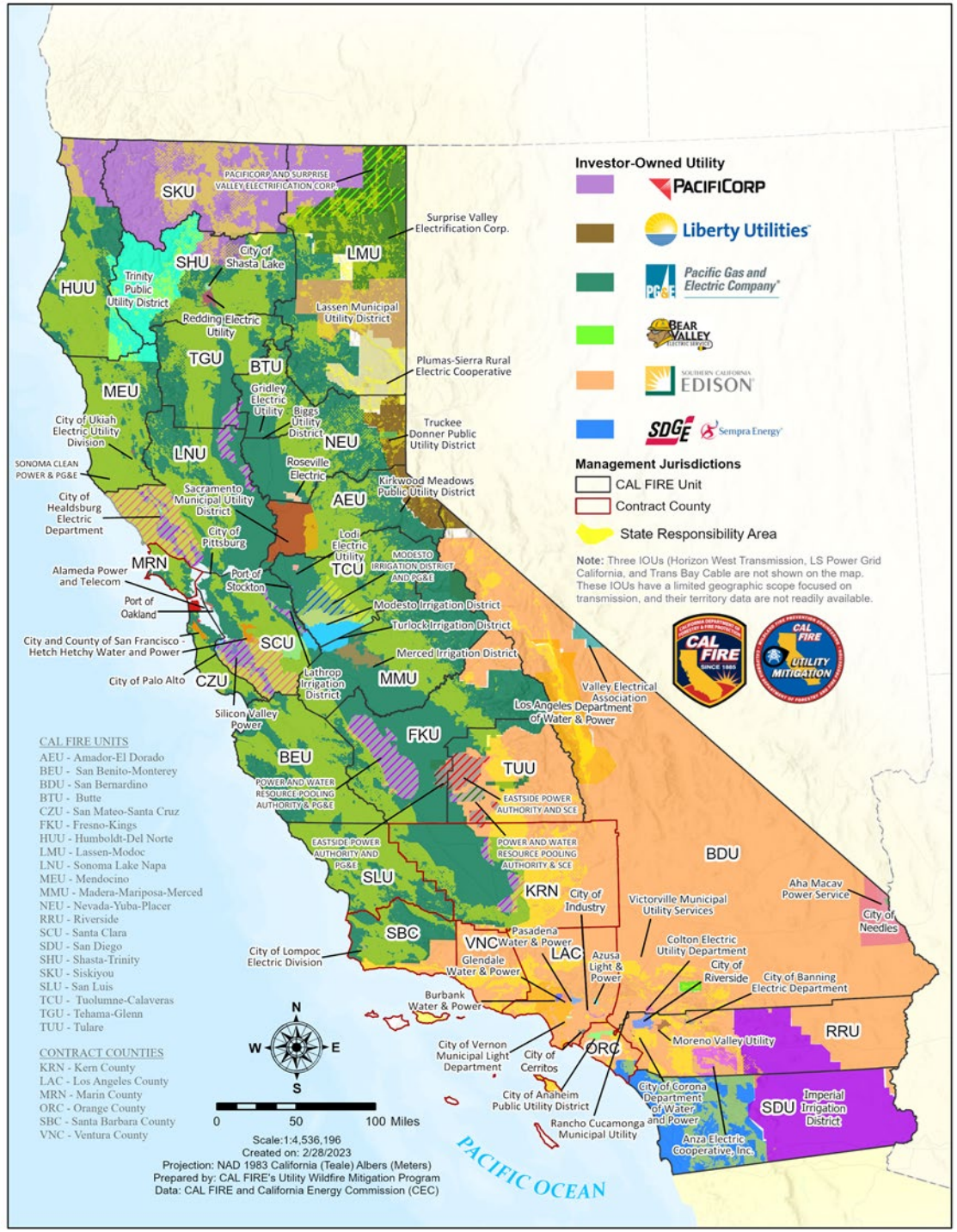
- PG&E
- SCE
- SDG&E

Small Multi-Jurisdictional Utilities

- PacifiCorp
- Bear Valley
- Liberty

Publicly Owned/Cooperative Utilities

- 30+ Utilities



Electrical Power Ignitions

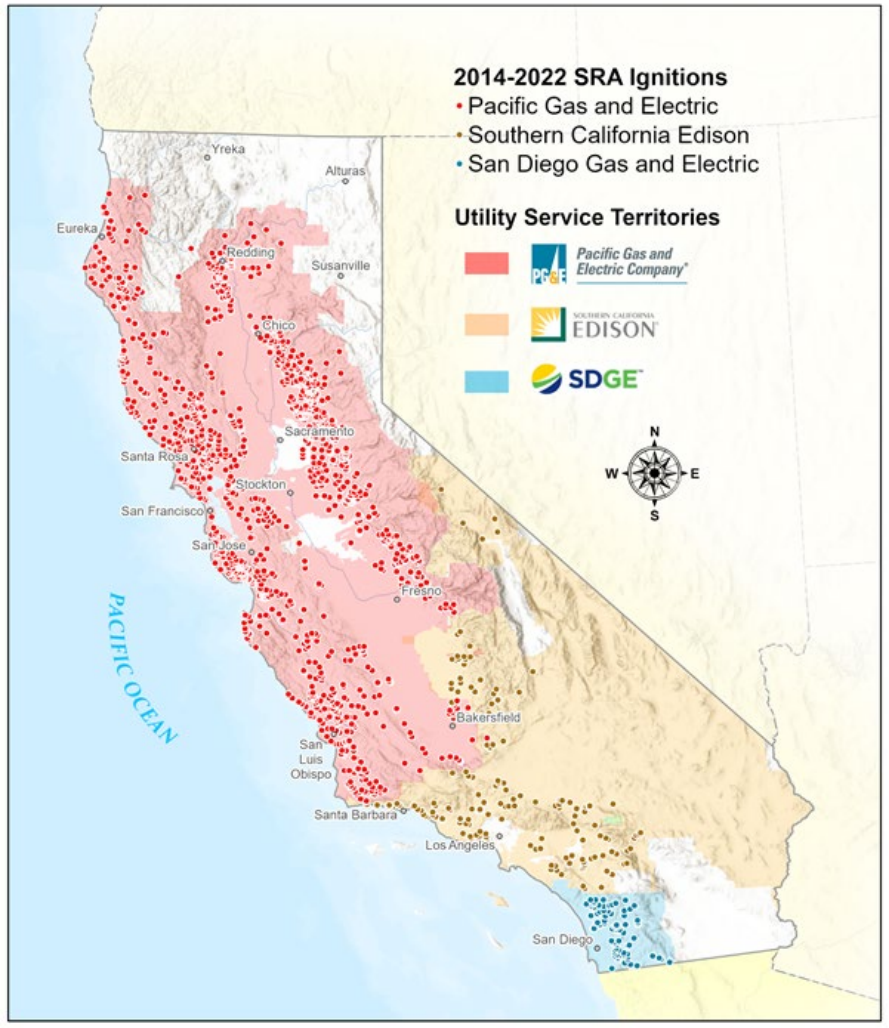
On average 10% of Wildland Fires in State Responsibility Area's are Electrical Power Caused*

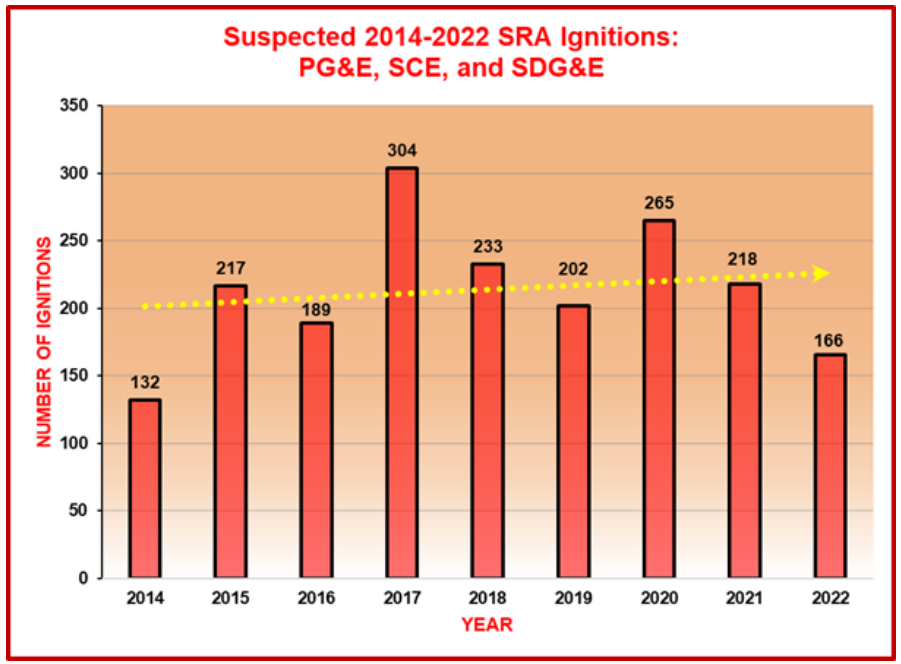
Account for:

- 6 of the Top 20 Destructive California Wildfires
- 3 of the Top 20 Largest California Wildfires
- 3 of the top 20 Deadliest California Wildfires

* Based on 9-year average from CAL FIRE Redbook 2014 - 2022

Investor-Owned Utility Ignitions 2014-2022



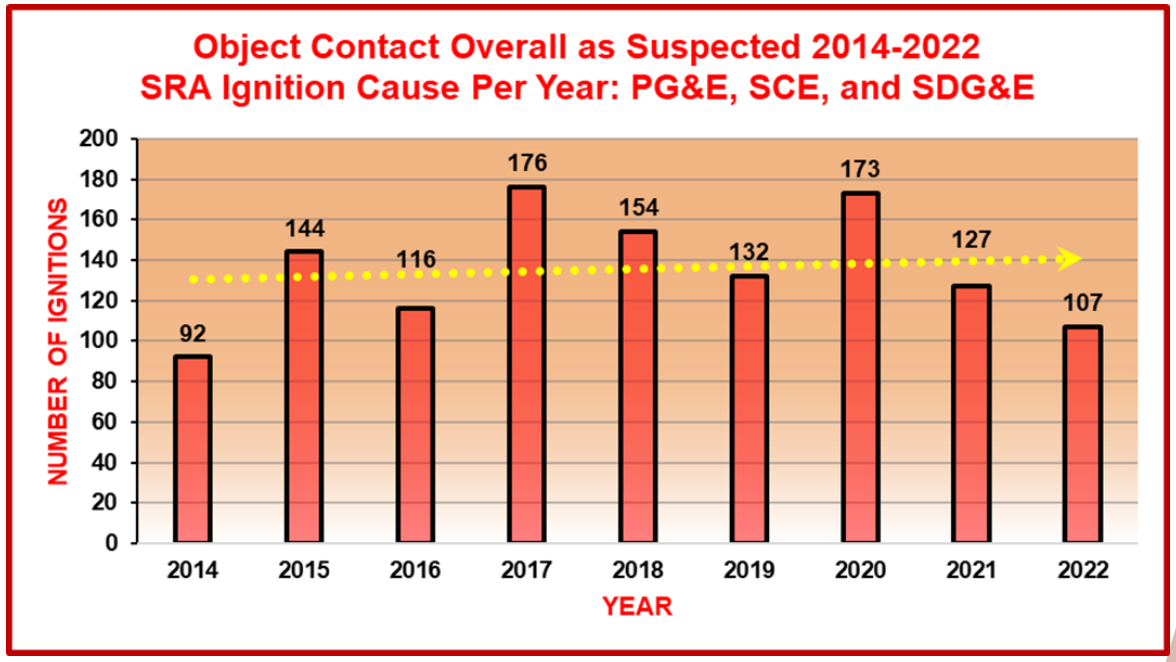


Ignition data based on annual CPUC Reportable Ignitions from 2014-2022 in the State responsibility Area (SRA)

Contact from Object

Over 60% of utility-related ignitions are attributed to Contact from Object:

- Vegetation: 36%
- Animal: 13%
- Vehicle: 9%
- Balloon: 3%



Based on annual CPUC Reportable Ignitions from 2014-2022 in the State responsibility Area (SRA)

Vegetation Contact

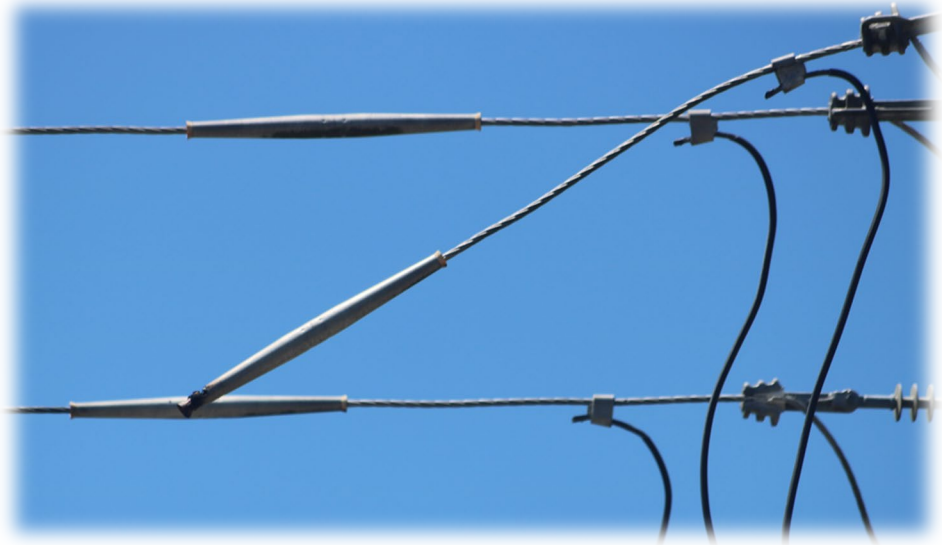
Tree hazards to powerlines or other electrical equipment

Animal Contact

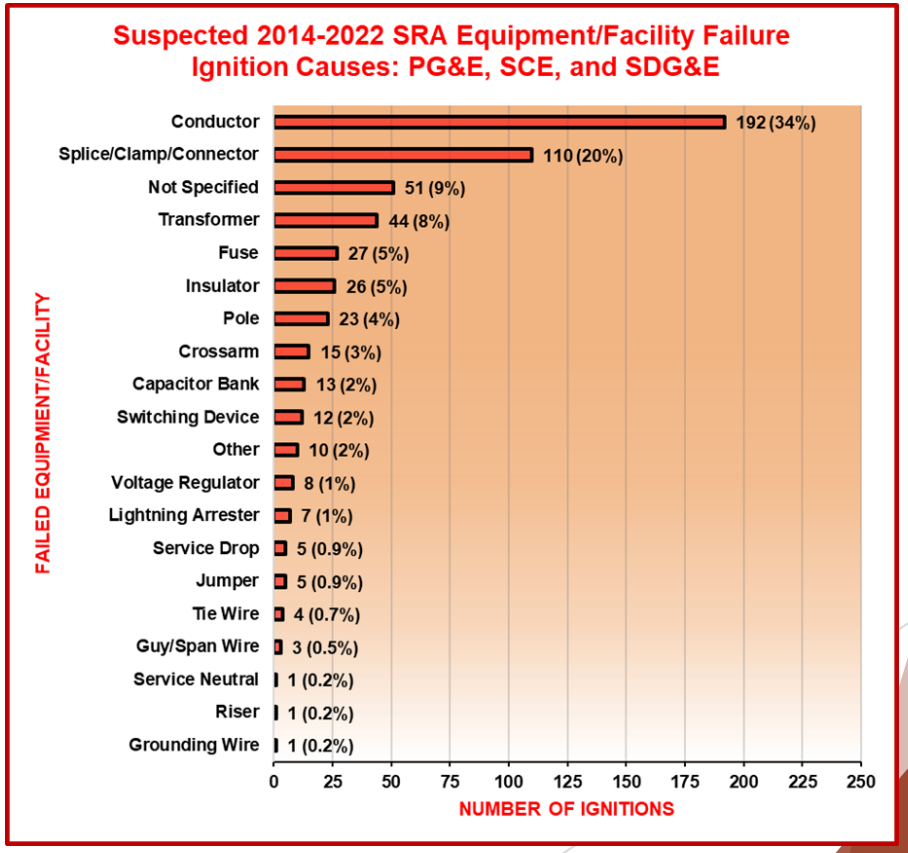
Vehicle Contact

Vehicles contacting Power poles cause ignitions

Powerline Equipment

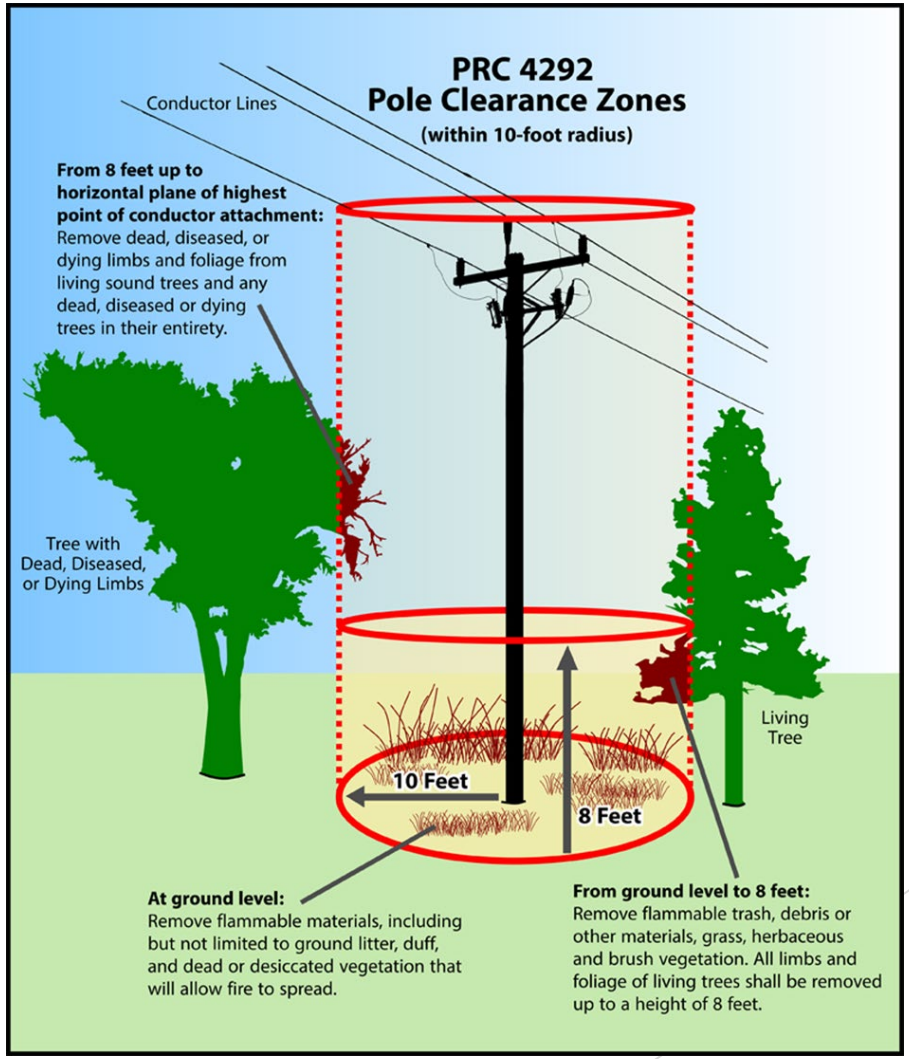


29% of the total utility-related ignitions in the SRA are powerline equipment related



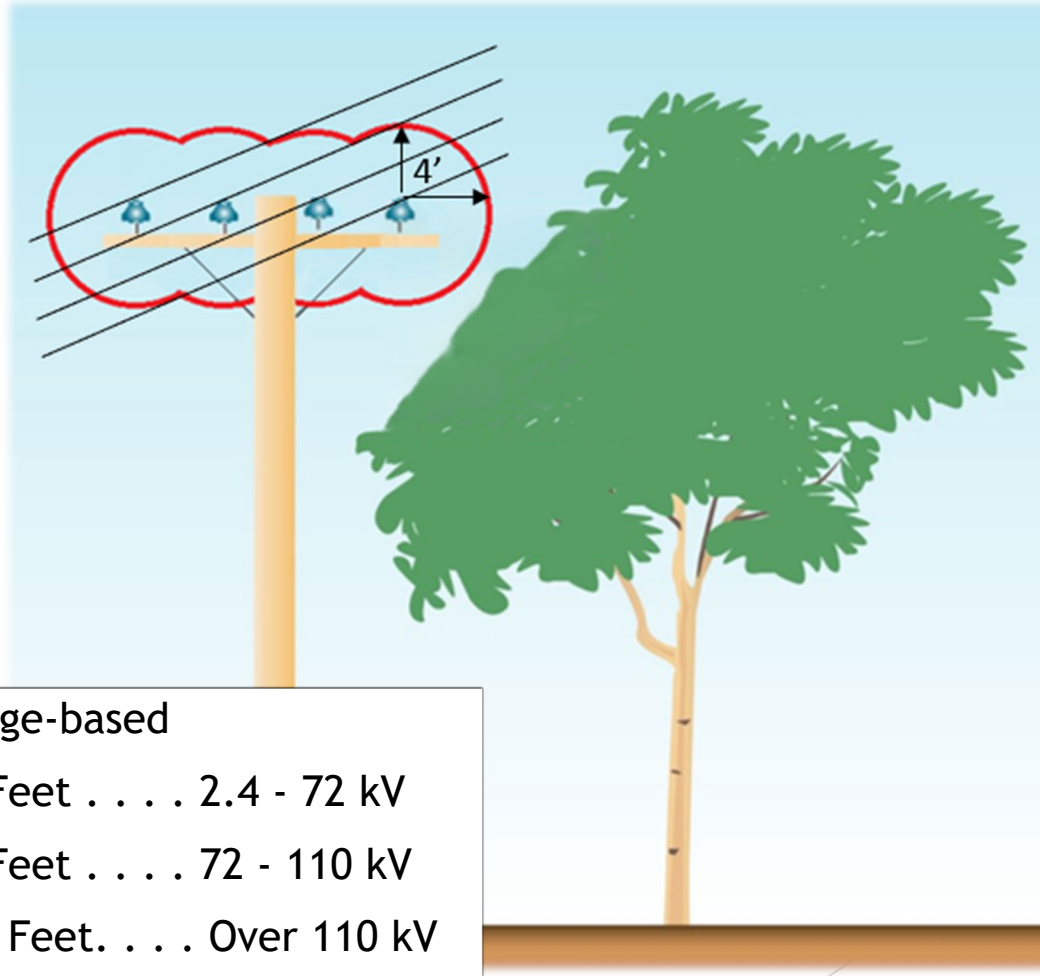
Vegetation Management

Public Resource Code (PRC) 4292 Pole Clearance



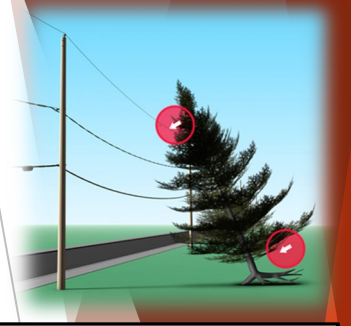
Vegetation Management

Public Resource Code (PRC) 4293
Minimum Conductor Clearances



Voltage-based

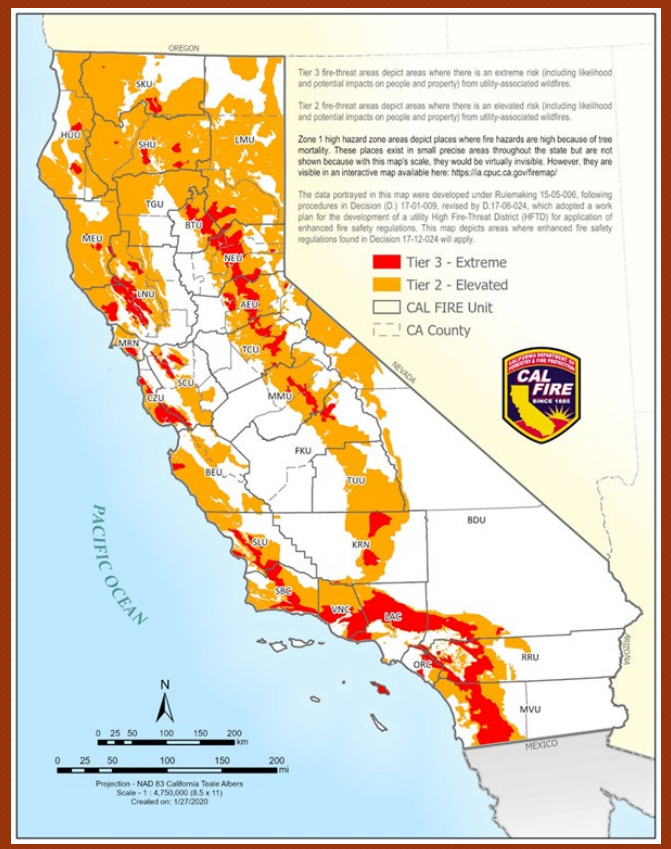
- 4 Feet . . . . 2.4 - 72 kV
- 6 Feet . . . . 72 - 110 kV
- 10 Feet. . . . Over 110 kV



Dead trees, old decadent or rotten trees, trees weakened by decay or disease and trees or portions thereof that are leaning toward the line which may contact the line from the side or may fall on the line shall be felled, cut, or trimmed so as to remove such hazard.

CA State Responsibility Area (SRA) vs. CPUC HFTD

High Fire Threat Districts (HFTD)

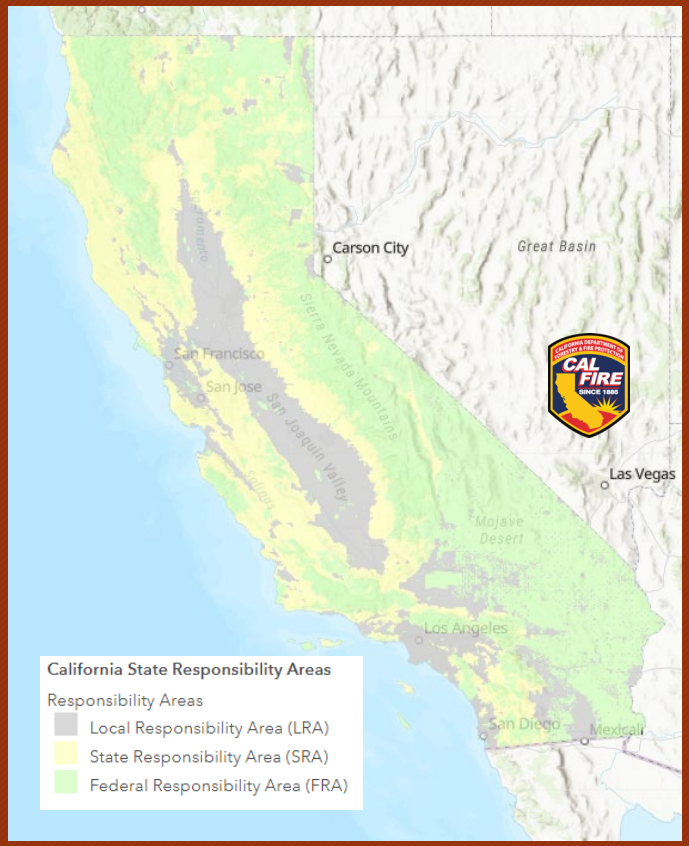


Total Acres of HFTD
45,000,000

48% of HFTD acres are within the SRA
21,575,440

52% of HFTD acres are outside of the SRA
23,437,572

CA State Responsibility Area



Jeff Fuentes

Assistant Chief
CAL FIRE – Utility Wildfire Mitigation
Jeff.Fuentes@fire.ca.gov

LOCAL CONDITIONS

Andre Lai
Spatial Data Analyst, B.S. (Geography-GIS)
Green Grid Inc.

LOCAL CONDITIONS
Background: Types

Geophysical

- Topography, soil type, and geology

Climatic

- Temperature, precipitation, humidity, wind, and extreme weather events

Environmental

- Local vegetation and wildlife

Demographic

- Population, land use patterns, and urban development trends

Image source: Loeffler, B. (2021, January 26). Micro-climates. https://blog.iceslicer.com/microclimates

LOCAL CONDITIONS

Background: Dynamics of Wildfire Spread

Climatic Factors

- High temperatures
- Low humidity
- Strong winds
- Red Flag Warning days

Geographical Factors

- Wind flow
- Slope
- Vegetation

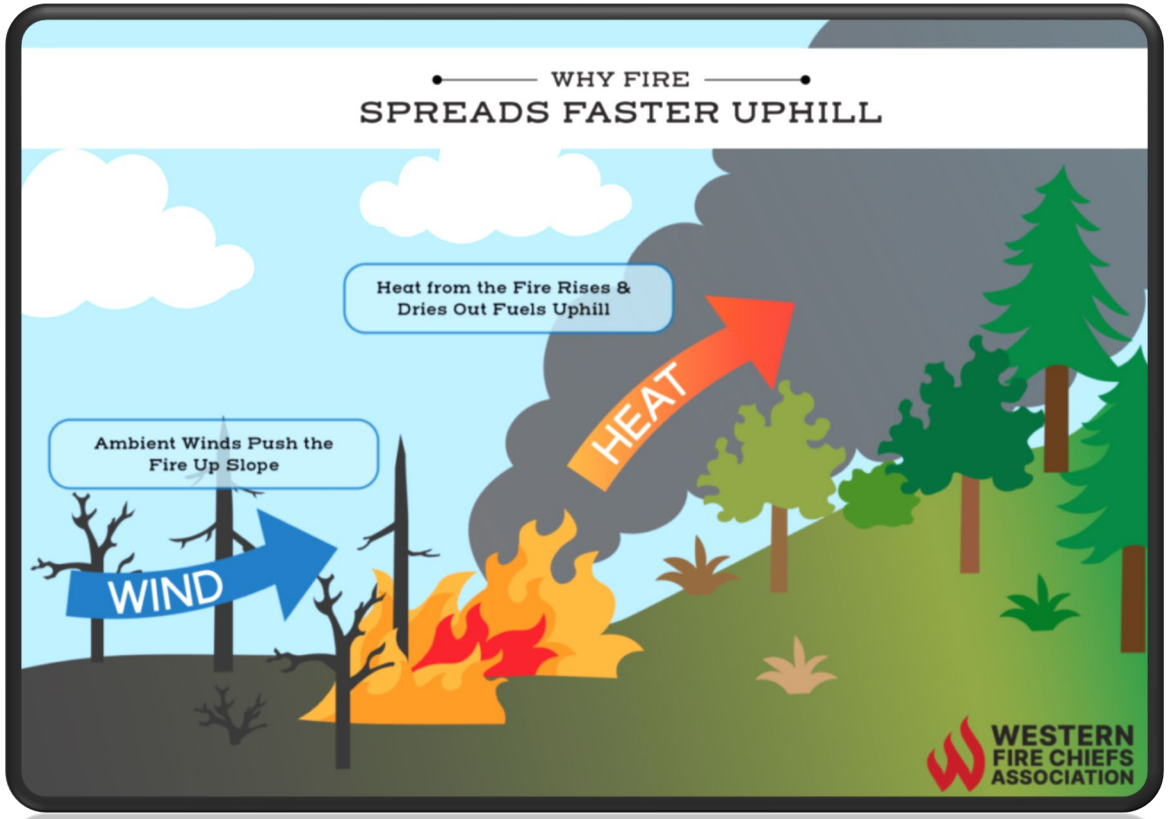


Image source: Western Fire Chiefs Association. (2022, November 2). How Fast do Wildfires Spread? WFCA. https://wfca.com/articles/how-fast-do-wildfires-spread/

LOCAL CONDITIONS

Background: Topographical Effects

Venturi Effect

- Air funneling
- Constricted areas
- Increased wind speed
- Compressed air

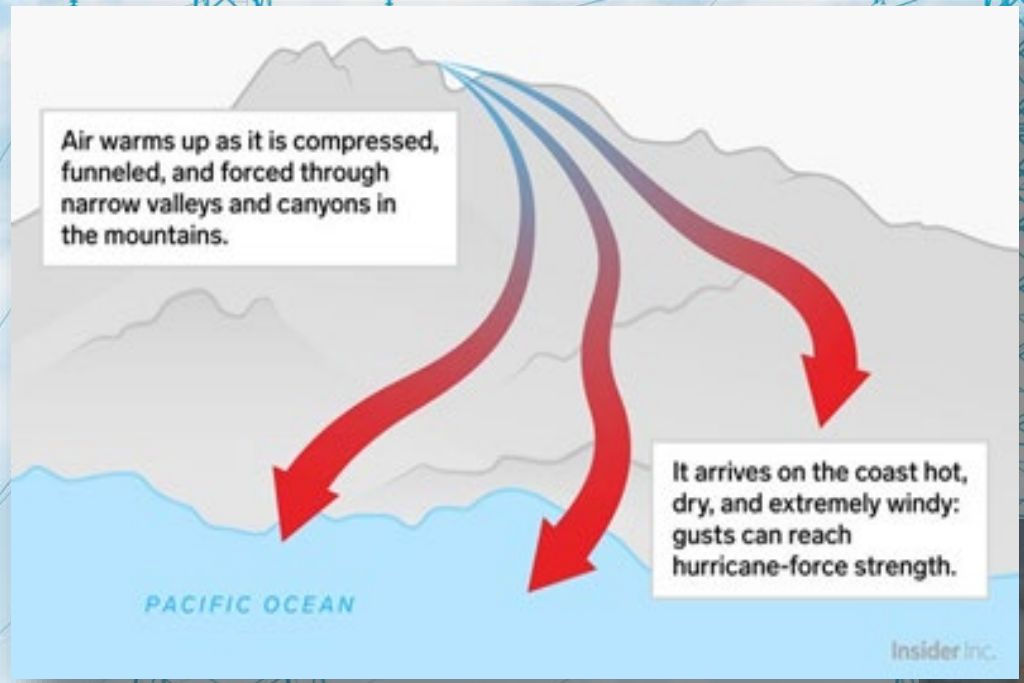
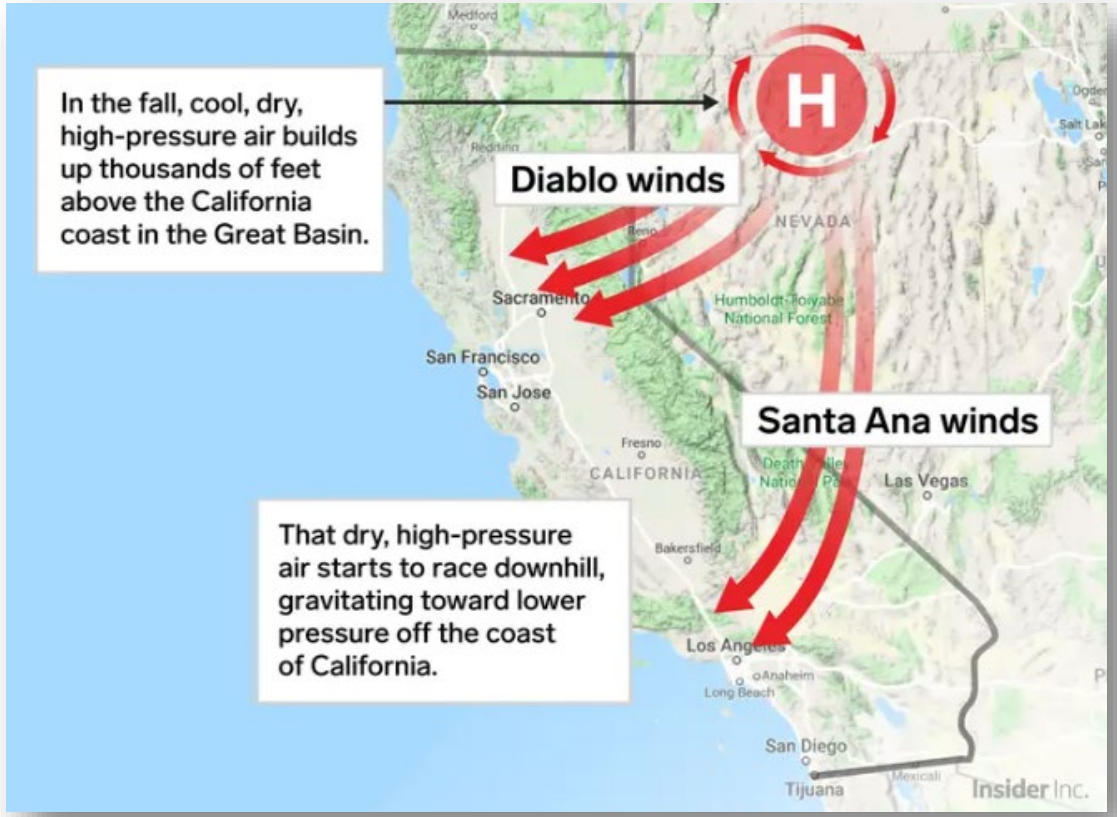


Image source: Brueck, H. (2019, October 28). Fires across California have been stoked by distinctly dangerous Santa Ana and Diablo winds. here's where they come from. Business Insider, from https://www.businessinsider.com/santa-ana-winds-why-they-spark-fires-2018-12

LOCAL CONDITIONS

Background: Diablo and Santa Ana Winds



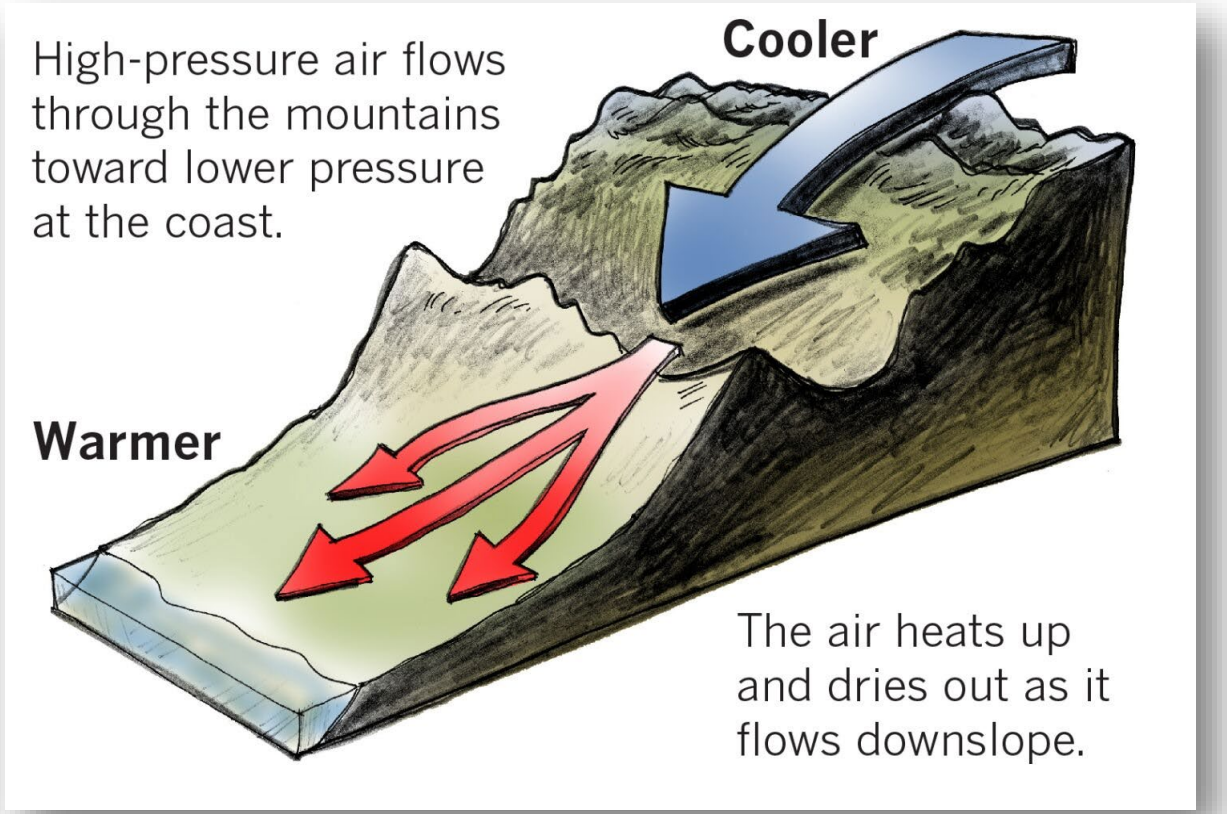


Image source: Brueck, H. (2019, October 28). Fires across California have been stoked by distinctly dangerous Santa Ana and Diablo winds. here's where they come from. Business Insider. Retrieved April 19, 2023, from https://www.businessinsider.com/santa-ana-winds-why-they-spark-fires-2018-12

LOCAL CONDITIONS

Observations

Opportunity for Specificity in Regulations[1]

- Compliance is currently achieved by following accepted good practice for the given local conditions known at the time
- Whether certain types of local conditions should be specified

Integrating the Impact of Climate Change

- Anticipating future extreme conditions
- Climate change projections, risk modeling, and situational awareness

Implementing New Technologies

- Advanced sensors, artificial intelligence, and remote sensing, etc.

[1]GO 95 Rule 31.1

LOCAL CONDITIONS

Discussion Point 1: Adapting to Changing Local Conditions

Strategies currently in use to adapt existing infrastructure to local conditions

- Risk assessment and prioritization
- System hardening
- Undergrounding
- Microgrids
- Public Safety Power Shutoffs (PSPS)
- High Fire Threat District (HFTD) Map

Effectiveness and improvements for strategies

- Metrics
- Statistical analysis

Image source: Lowrey, Annie. "California Is Becoming Unlivable." The Atlantic, 30 Oct. 2019, www.theatlantic.com/ideas/archive/2019/10/can-california-save-itself/601135

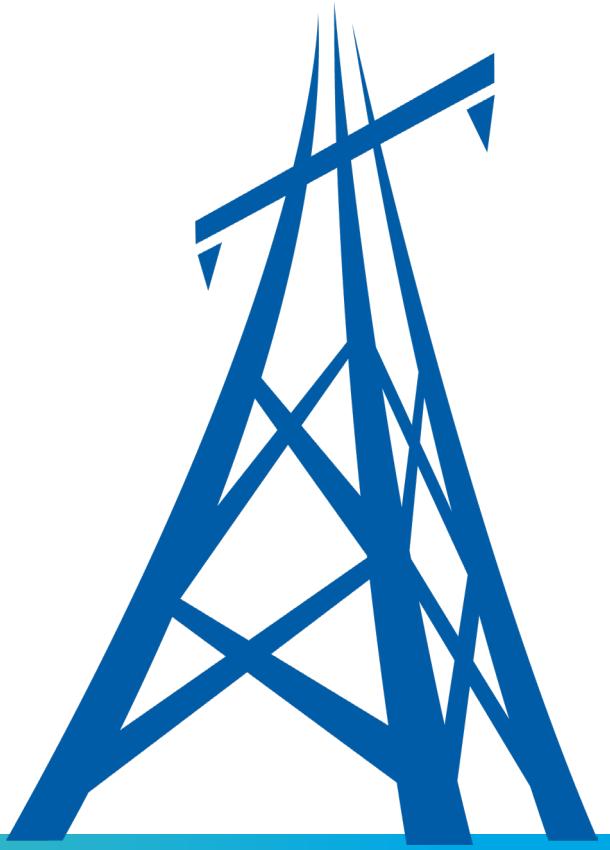
LOCAL CONDITIONS
Discussion Point 2: Embracing Technological Innovations

Leveraging new technology

- Advanced sensors
- Artificial intelligence
- Remote sensing

Potential benefits

- Better local awareness
- Efficient operations
- Effective resource allocation
- Increased safety and reliability



LOCAL CONDITIONS

Discussion Point 3: Compliance Assessment Depending on Local Conditions

Monitoring and Assessment of Compliance

- Current practices
- Opportunities for improvement
- Consistent adherence to standards

Image source: Miller, Ryan. ""Volatile," "Incredibly Dangerous": Images of Raging Flames as California Wildfires Burn." USA TODAY, 8 Nov. 2018, www.usatoday.com/story/news/nation-now/2018/11/08/camp-fire-hill-fire-images-destruction-california-wildfires/

LOCAL CONDITIONS

Panel Presentations &
Public Comment
Discussion

SITUATIONAL AWARENESS

John Alderson, Vegetation Management Expert, M.S. (Public Administration), B.S. (Forestry), B.S. (Biology), ISA Certified Arborist and TRAQ, Pest Control Adviser, Qualified Applicator, Green Grid Inc.

Jennifer Fuller, Utility Vegetation and Wildfire Analyst, B.S. (Environmental Science), ISA Certified Arborist and TRAQ, Green Grid Inc.

SITUATIONAL AWARENESS - BACKGROUND

Know what has happened in a similar situation in the past, what is happening now, and what is expected to happen next

Plan for all foreseeable threats

Expect the unexpected and proactively manage foreseeable situations

SITUATIONAL AWARENESS

Background

Personnel training, communication protocols and the use of equipment

Effective and efficient flow of situational information

Correlation of **analysis and predictive data** with ground truth data

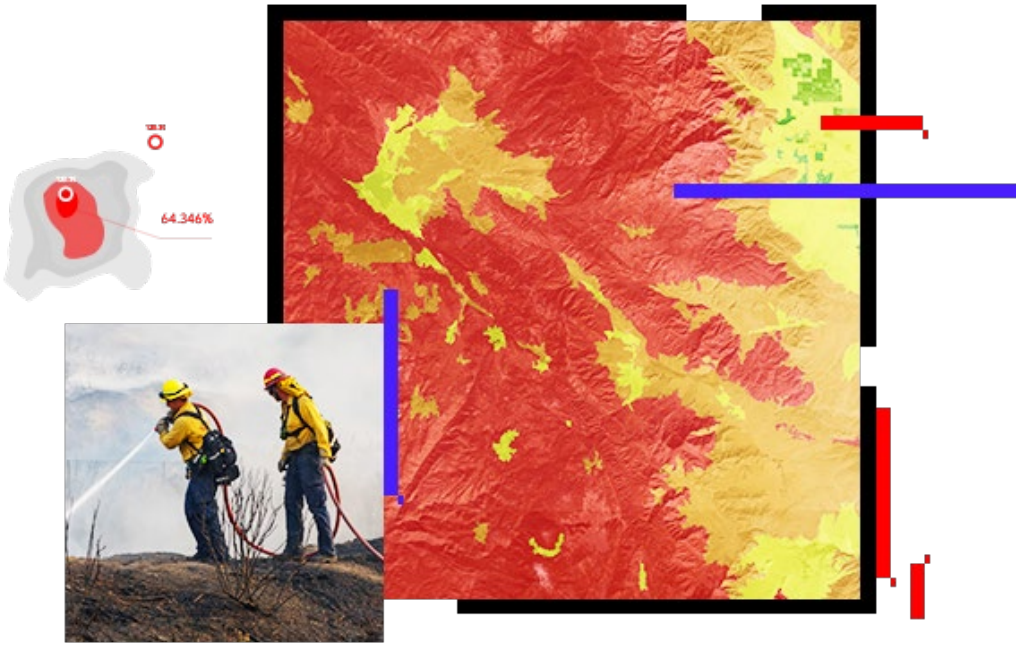


Image source: ESRI. "GIS for Wildfire Preparedness, Response & Recovery | Mapping for Situational Awareness." Www.sigsa.info, www.sigsa.info/es-mx/industries/fire-rescue-ems/solutions/wildland-fire-management.

SITUATIONAL AWARENESS

Observations

Industry Practices

- Advanced weather modeling
- Fire threat forecasting and monitoring
- Asset data
- Vegetation data

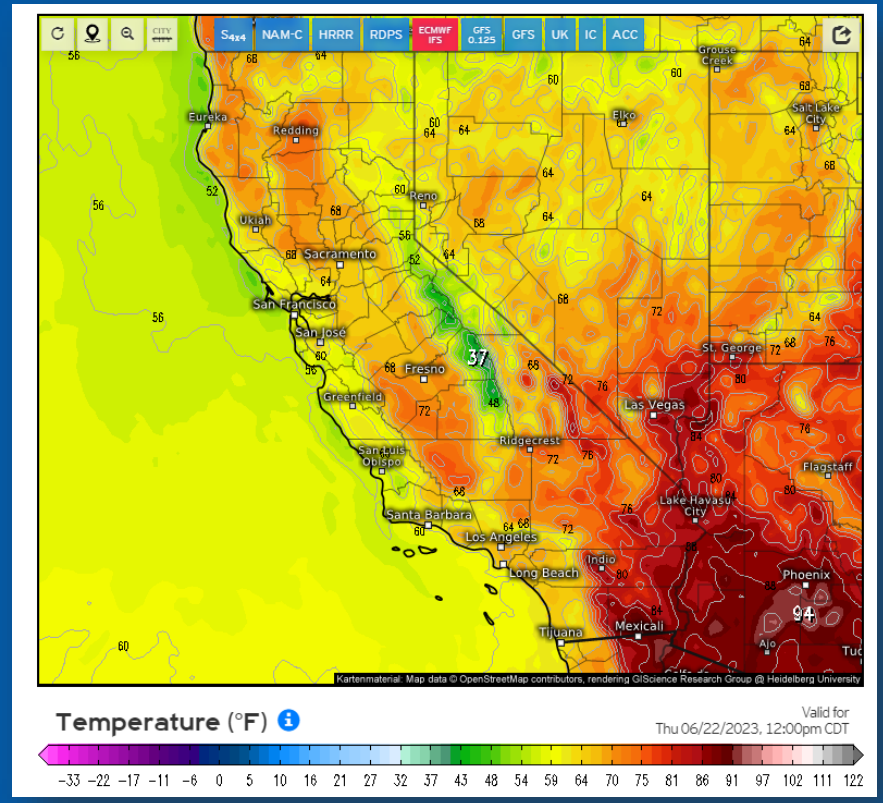


Image source: "Model Charts for California (Temperature) | ECMWF IFS HRES 0z/12z (10 Days)." Weather.us, weather.us/model-charts/euro/california.

SITUATIONAL AWARENESS

Discussion Point 1: Quantitative and Qualitative Information for Weather, Equipment, and Vegetation

Weather as a Dynamic Threat

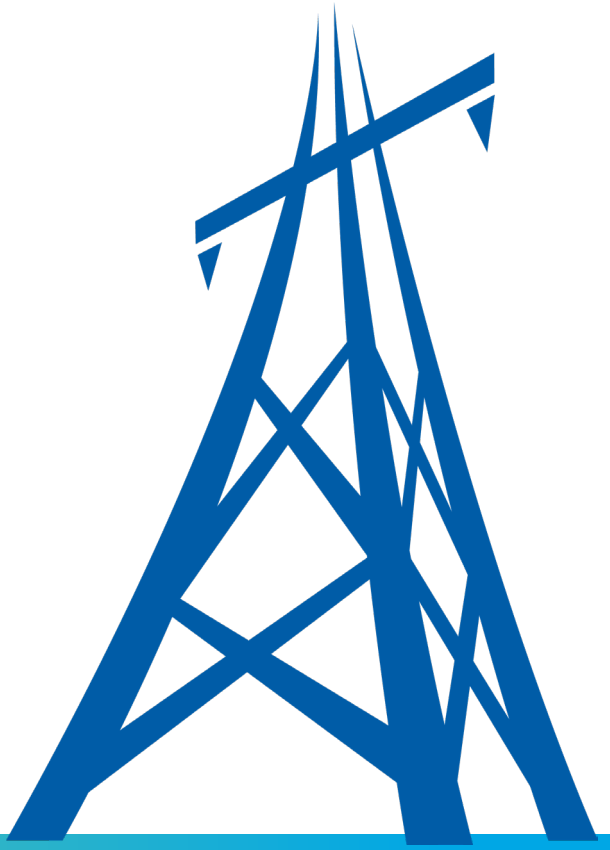
- Weather is a dynamic threat to utility services that can drive ignition
- Analyzing current weather-related threats and predicting future threats
- Respond to what is happening now, and anticipate what is happening next

Moisture Content in Vegetation

- Close link between weather conditions and moisture content in vegetation
- Level of threat in ignitions

Forecasting

- Better weather forecasting and real-world monitoring



SITUATIONAL AWARENESS

Discussion Point 2: Data Collection in Right of Ways

When, Where, and Why

- Analyzing past ignitions by examining the circumstances surrounding each event
- Comprehensive data collection for right of way situations

How

- Smart cameras
- Weather stations
- Continuous line sensors

Data Fidelity

- Need high confidence level in data

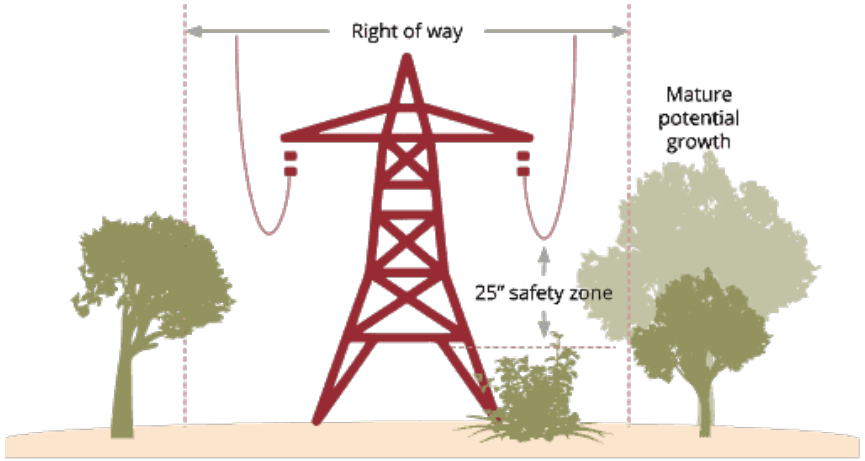


Image source: Lynn. "Advances in Utility Vegetation Management and Inspection - Mosaic51." Mosaic51.com, 31 Mar. 2021, www.mosaic51.com/technology/advances-utility-vegetation-management-and-inspection/

SITUATIONAL AWARENESS

Discussion Point 3: Remote Sensing Technologies

Types of Remote Sensing

- Airborne/Spaceborne
- Weather stations
- Remote monitoring systems

Potential Benefits

- Increased situational awareness
- Overcome geographical constraints
- Rapid response
- Increased safety and reliability

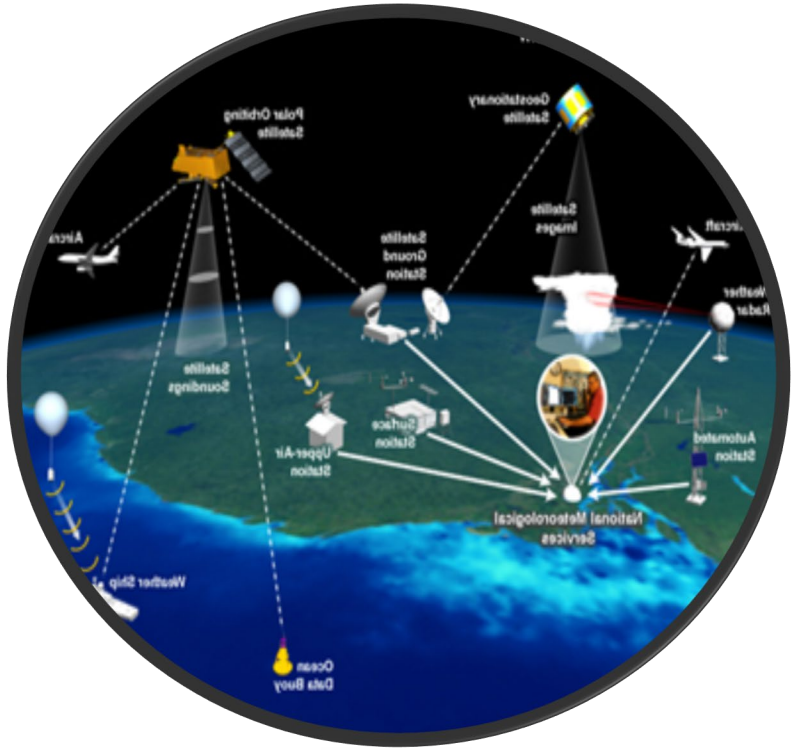


Image source: Singapore, M. S. (2023). Weather forecasting has evolved with huge advances in technology, yet limitations remain [Photograph]. http://www.weather.gov.sg/forecasting-2/

EMERGENCIES AND DISASTERS

Rebecca Tratter, Environmental Scientist, B.S. (Life Science)
Green Grid Inc.

EMERGENCIES AND DISASTERS
Background

- Crucial in saving lives, minimizing damages, enhancing community resilience, and promoting a safer and more secure environment

- Involves developing plans and implementing strategies to minimize natural and man-made disasters

Image source: Martinez, D. (2018). Tech companies offer donations and digital tools to aid California wildfire response [Photograph]. https://www.nbcnews.com/tech/tech-news/tech-companies-offer-donations-digital-tools-aid-california-wildfire-response-n935791

EMERGENCIES AND DISASTERS

Observations

Existing Regulations[1]

- Mutual assistance during a major outage
- Conducting annual emergency training and exercise

Opportunities for Specificity in Regulations

- Wildfire emergency management protocol
- Incorporating evacuation procedures in High Fire Threat and High Fire Risk Areas
- Monthly training on drills and techniques

Image source: Archibold, R. (2008). Wildfires Force Evacuations in L.A. [Photograph]. https://www.nytimes.com/2008/10/14/us/14fire.html

[1]GO 166

EMERGENCIES AND DISASTERS

Discussion point 1: Incorporating Wildfire Evacuation Guidelines in Regulations

Evacuation Zones and Routes

- Determined based on the fire's proximity and potential path
- Lifelines during a wildfire event
- Reduce the risk of stampedes and ensure a smooth flow of traffic
- Minimize accidents or further harm
- Allows access to Evacuation Centers and transportation assistance

Image source: Essex County, W. (2023). Are you Prepared? [Photograph]. Https://www.Wechu.org/Your-Environment/Emergency-Preparedness.

EMERGENCIES AND DISASTERS

Discussion Point 2: Enhancing Wildfire Training

Existing Practices

- Frequency and level of training
- Learning from past events

Training Enhancement

- Increased awareness
- Emergency response drills
- Collaborative tabletop exercises and simulations
- Learning opportunities
- Reduced wildfire impact

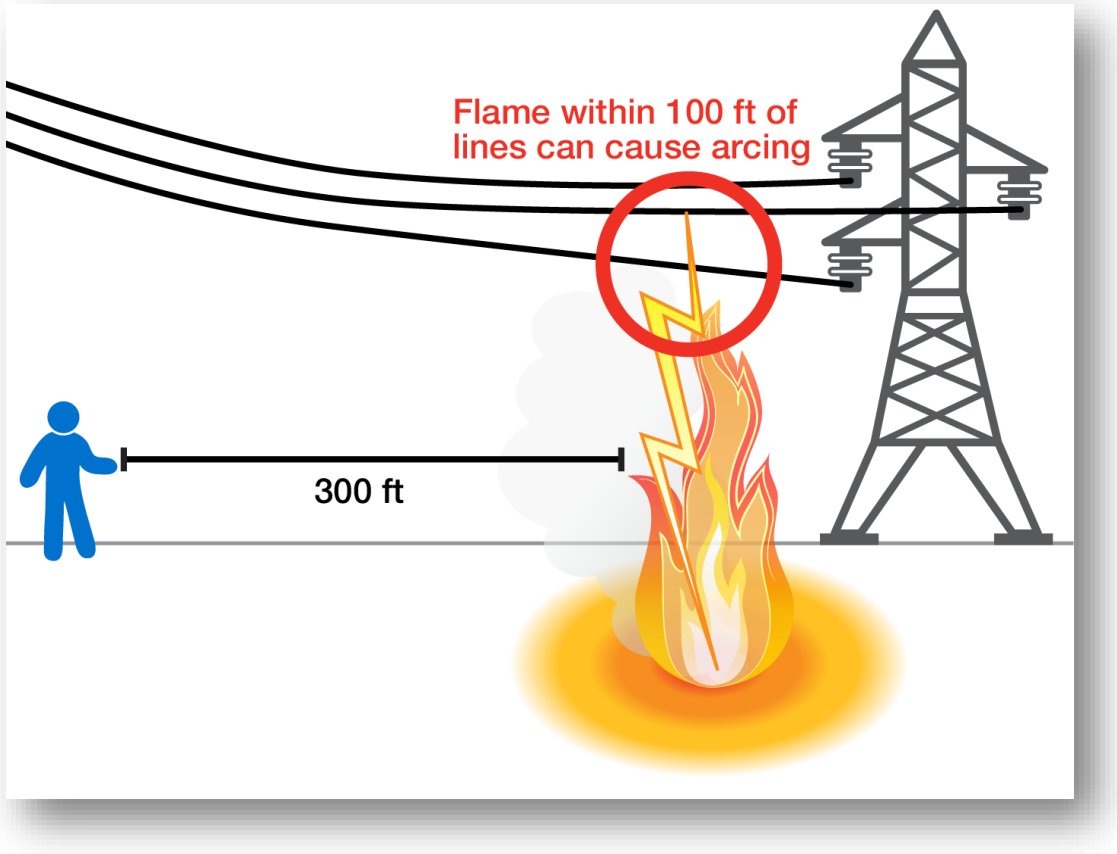
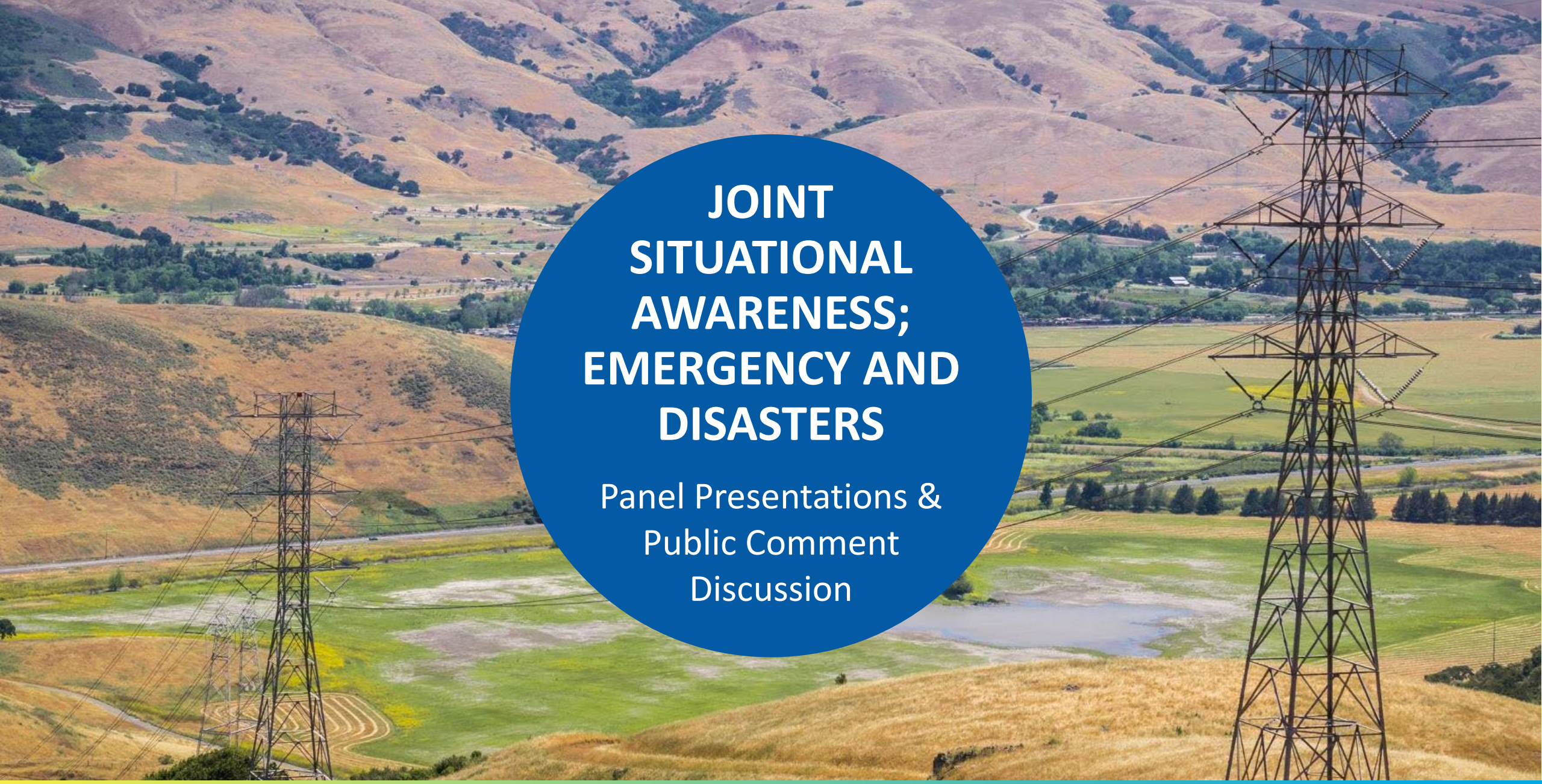


Image source: [PPL Electric Utilities]. (2023, June 17). Transmission line Fire [Video]. PPL Electric Utilities. https://ppl.e-smartresponders.com/topic/transmission-line-fires/



JOINT SITUATIONAL AWARENESS; EMERGENCY AND DISASTERS

Panel Presentations &
Public Comment
Discussion

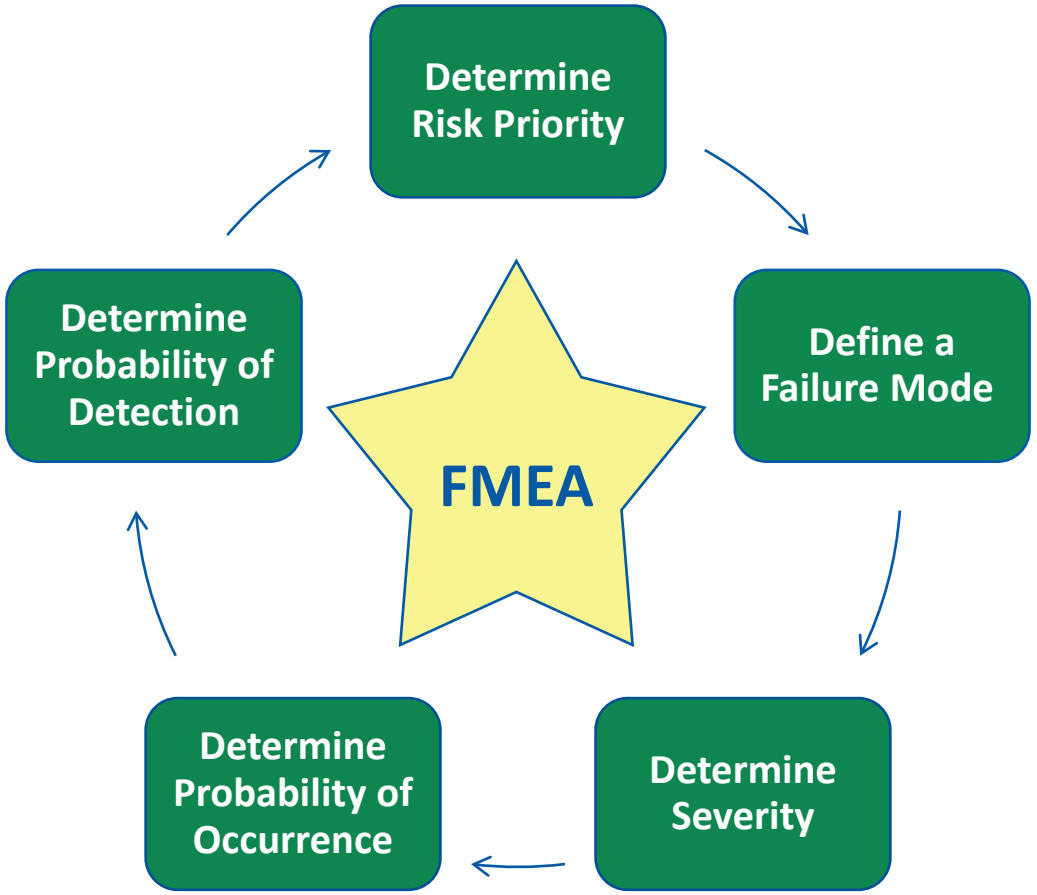
RISK ASSESSMENT AND MODELING

Marcela Jaramillo, Sr. Environmental Analyst, Ph.D. (Environmental Chemistry)
Green Grid Inc.

RISK ASSESSMENT AND MODELING
Background

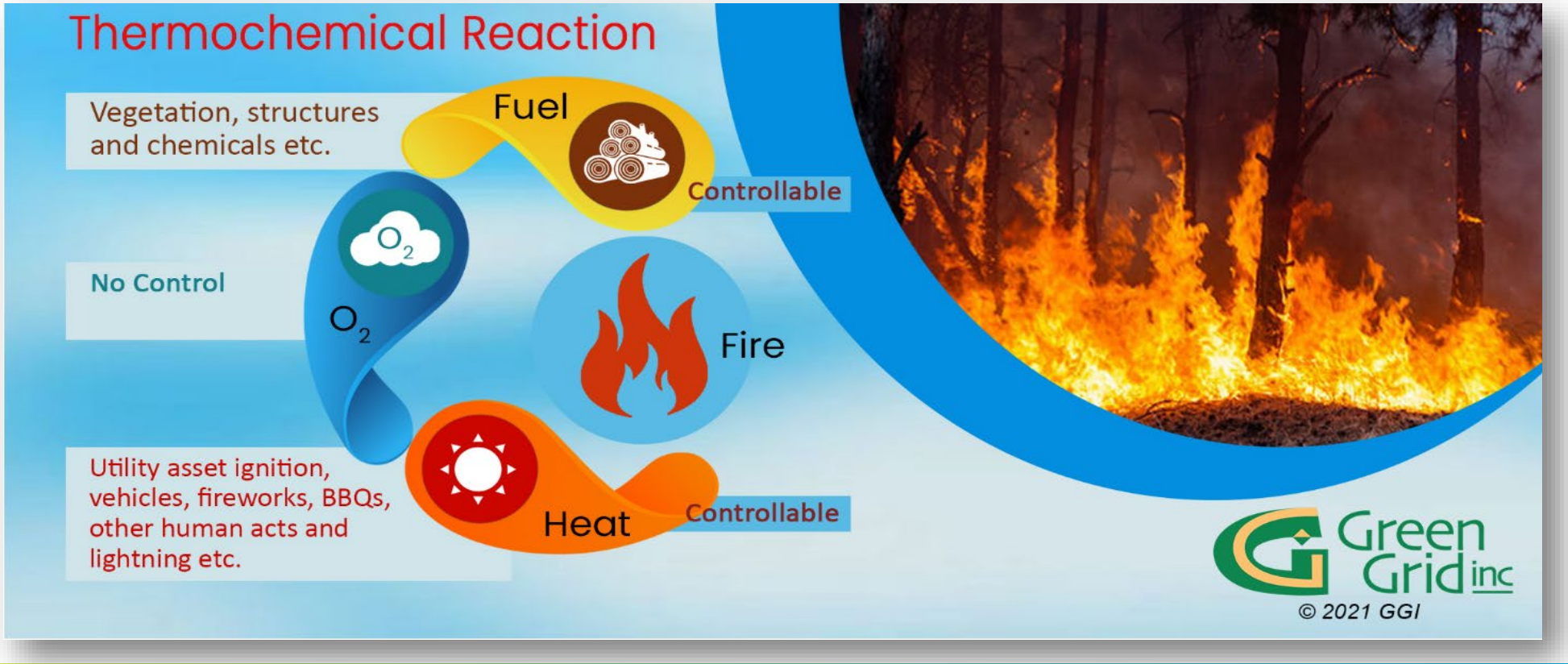
Risk-Based Prioritization and Operation

- Accurate input data
- Good quality reliable models
- Reliable output data/results
- Efficient and effective implementation of results
- Safer, reliable, and cost-effective operations



RISK ASSESSMENT AND MODELING
Background

Principles of Wildfires



RISK ASSESSMENT AND MODELING
Background

Inspection

Optimize schedule and priorities

System Hardening/Maintenance

Increased effective maintenance activities

Efficient and effective system hardening

Emergency Response

Streamline and prioritize response planning

Image source: Microsoft PowerPoint 365

RISK ASSESSMENT AND MODELING

Observations

Opportunity for Specificity in Regulatory Requirements

- Risk-Based Decision-Making Framework (RDF)
  - Risk Assessment and Mitigation Phase **(RAMP)**[1,3]
    - Annual Risk Mitigation and Spending Accountability Reports
  - Safety Modeling Assessment Proceeding **(S-MAP)**[2,4]
    - Examine, understand, and comment on the models
    - Establish guidelines and standards for these models
- Various statistical modeling approaches

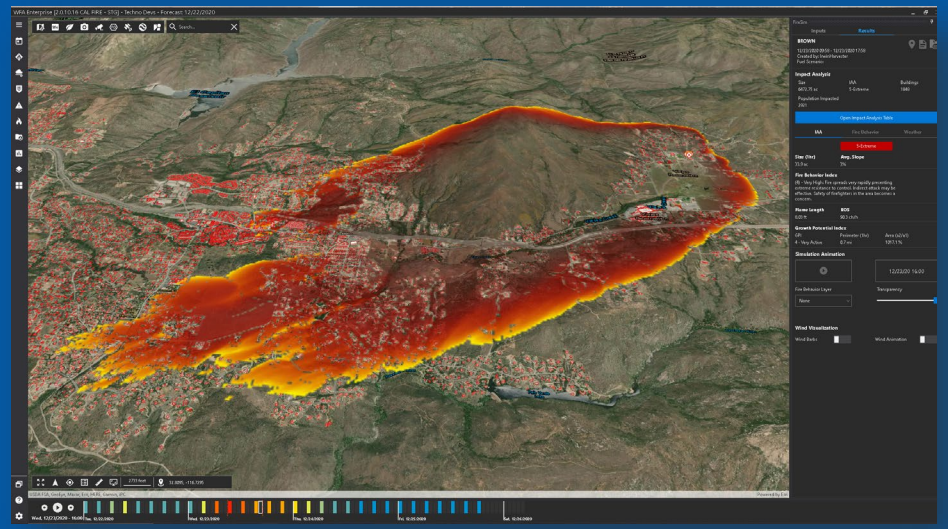


Image source: Elbein, Saul. "What the Complex Math of Fire Modeling Tells Us about the Future of California's Forests." MIT Technology Review, 18 Jan. 2021, www.technologyreview.com/2021/01/18/1016215/complex-math-fire-modeling-future-california-forests/.

[1]R.13-11-006 (2013-2020, Closed)
[2]D.16-08-018 (2016, 1st S-MAP)
[3]D.20-01-002 (2020)
[4]R.20-07-013 (2020-Inprogess, 2nd S-MAP)

RISK ASSESSMENT AND MODELING

Observations

Summary Map of Wildfire Risk

- Overall Ignition Probability
- Estimated Wildfire Consequences

Climate-Driven Risk Map and Modeling

- Using Relevant Weather Scenarios

Mapping and Estimation of PSPS

- Establishing Thresholds and Impacts

Modeling Resolution

- Temporal
- Spatial

Rott, Nathan. "Wildfire Risk Is Growing Everywhere, Even as More Americans Move into Harm's Way." LAist - NPR News for Southern California - 89.3 FM, 10 Aug. 2021, www.kpcc.org/npr-news/2021-08-10/wildfire-risk-is-growing-everywhere-even-as-more-americans-move-into-harms-way.

RISK ASSESSMENT AND MODELING

Discussion Point 1: Inclusion of Local Climate Factors

Risk Models

- Risk-based decision framework and climate change
- Climate-driven risk factors
- Extreme weather events and ignitions
- Seasonal vegetation growth rates
- Asset vulnerabilities

Standardizing Risk Models in Regulation

- Defining risk factors
- Accuracy and validation
- Regulatory compliance and enforcement

Image source: Green Grid Inc.

RISK ASSESSMENT AND MODELING

Discussion Point 2: Utilizing New Technologies to Enhance Risk Monitoring

Leveraging New Technology

- Potential of real-time surveillance
- Advanced sensors
- Artificial intelligence

Potential Benefits

- Enhanced risk measurement
- Real-time surveillance
- Improved decision making
- Resource optimization

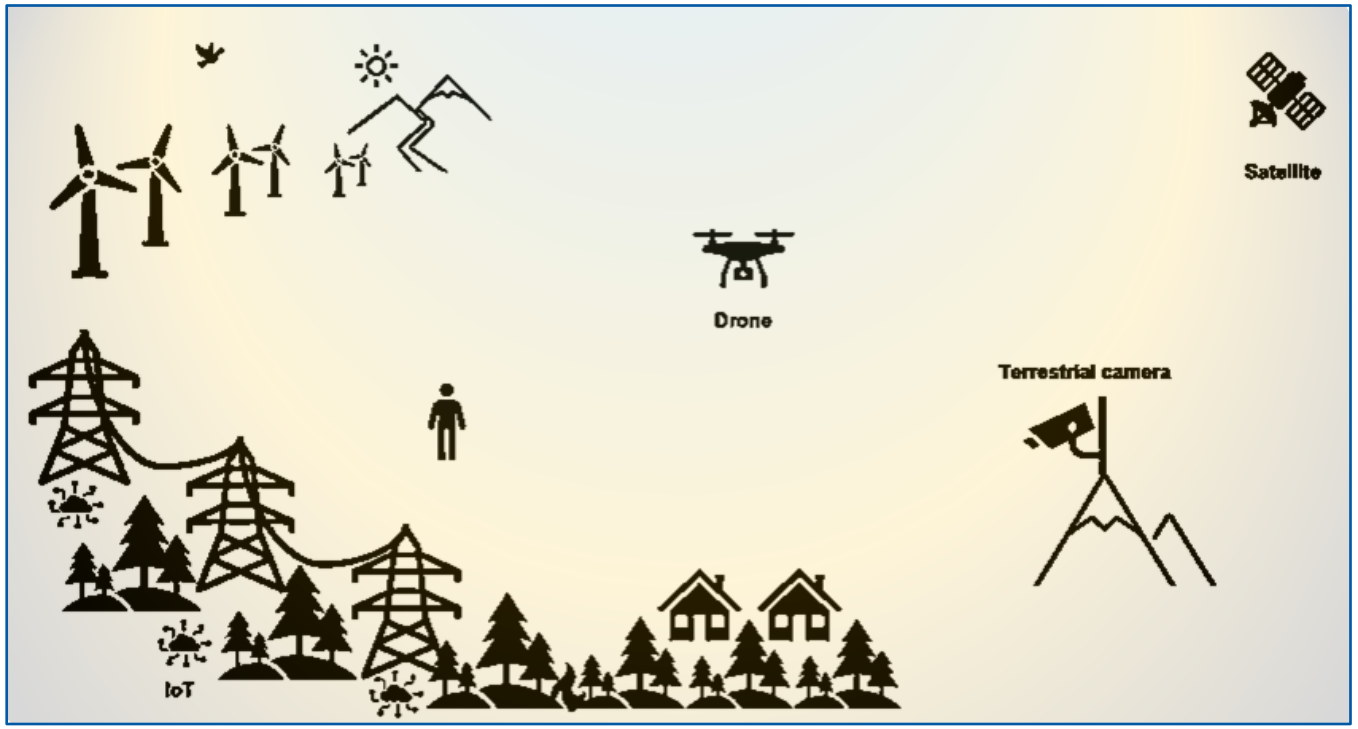


Image source: Green Grid Inc.

RISK ASSESSMENT AND MODELING

Panel Presentations &
Public Comment
Discussion

VEGETATION MANAGEMENT

John Alderson, Vegetation Management Expert, M.S. (Public Administration), B.S. (Forestry), B.S. (Biology), ISA Certified Arborist and TRAQ, Pest Control Adviser, Qualified Applicator, Green Grid Inc.

Jennifer Fuller, Utility Vegetation and Wildfire Analyst, B.S. (Environmental Science), ISA Certified Arborist and TRAQ, Green Grid Inc.

VEGETATION MANAGEMENT

Background: History of Wildfires in 11 Western States

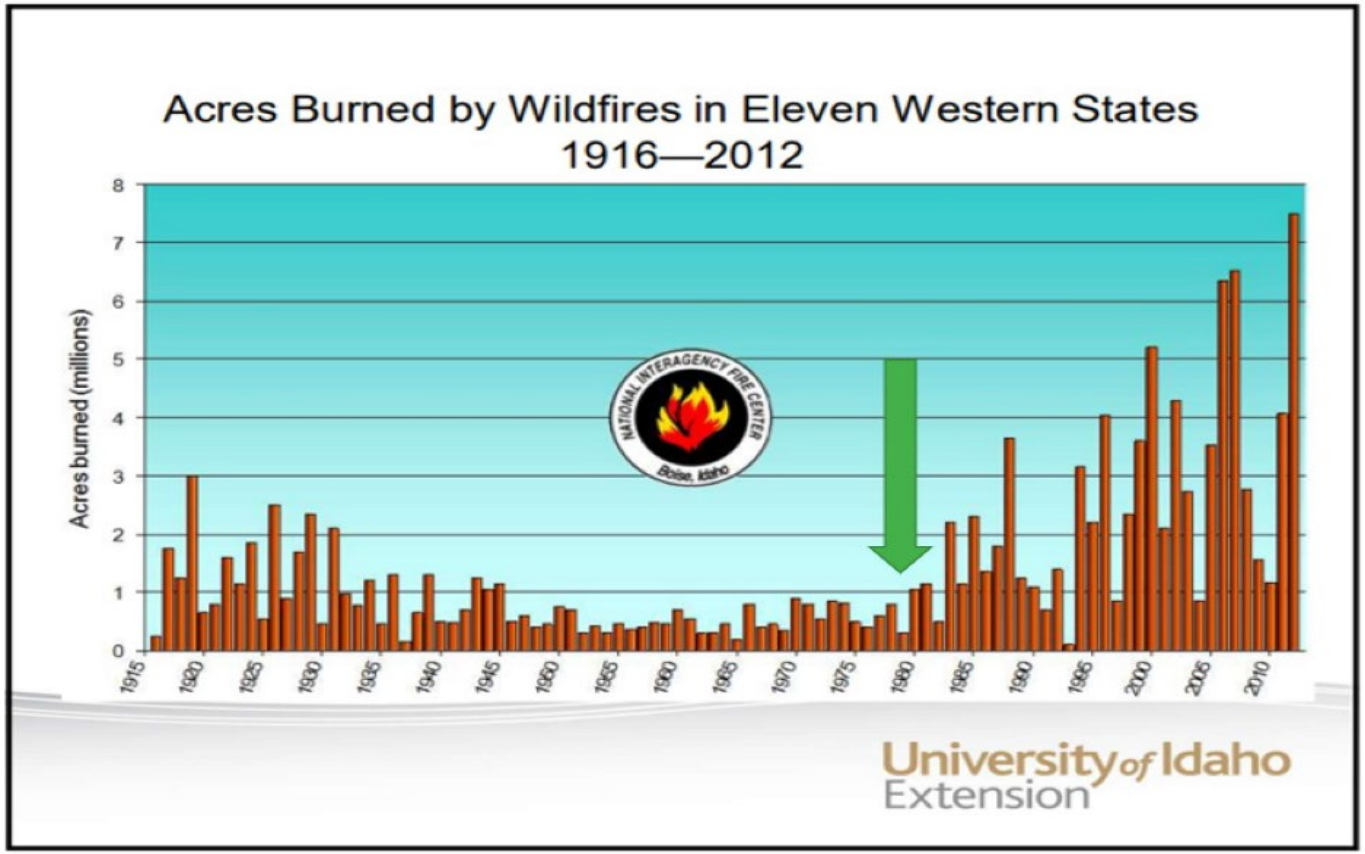


Image source: Miller, Beau. Territory Manager.Corteva Agroscience. (Received April 15th, 2023). Fire Frequency [Photograph]. University of Idaho Extension.

VEGETATION MANAGEMENT

Background: Frequency of Wildfires

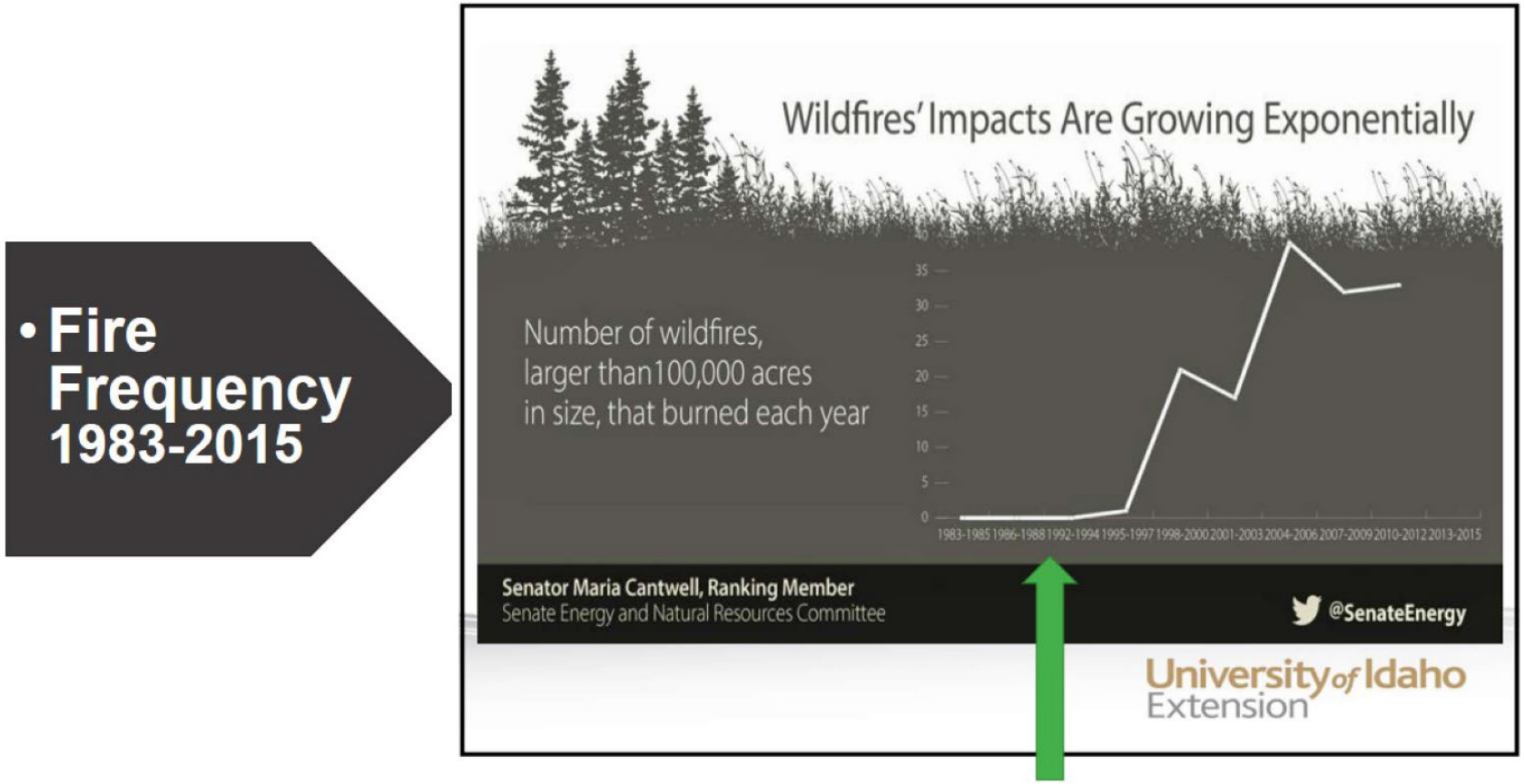


Image source: Miller, Beau. Territory Manager.Corteva Agroscience. (Received April 15th, 2023). Fire Frequency [Photograph]. University of Idaho Extension.

VEGETATION MANAGEMENT

Background: Temporal Forest Transition

Transition In Photos - 1909

Image source: Miller, Beau. Territory Manager.Corteva Agroscience. (Received April 15th, 2023). Fire Frequency [Photograph]. University of Idaho Extension.

VEGETATION MANAGEMENT

Background: Forest Succession

Same Location - 1948

Image source: Miller, Beau. Territory Manager.Corteva Agroscience. (Received April 15th, 2023). Fire Frequency [Photograph]. University of Idaho Extension.

VEGETATION MANAGEMENT

Background: Temporal Forest Transition

Same Location - 1989

Image source: Miller, Beau. Territory Manager.Corteva Agroscience. (Received April 15th, 2023). Fire Frequency [Photograph]. University of Idaho Extension.

VEGETATION MANAGEMENT

Background: Extremes of Climatic Conditions

- Drought, heat, wind, snow, rain, and fuels
- California has the highest variation in precipitation annually of any other state
- Increasingly heavy fuel load accumulations
- Rise in herbaceous plants and grass

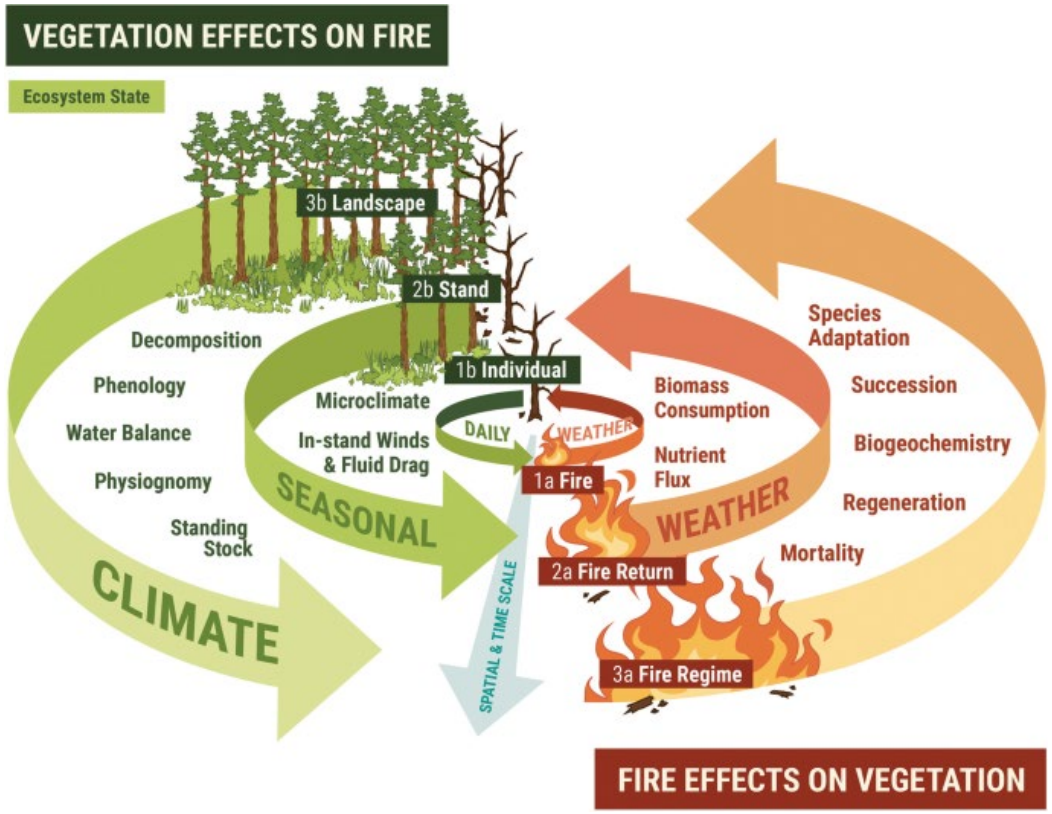
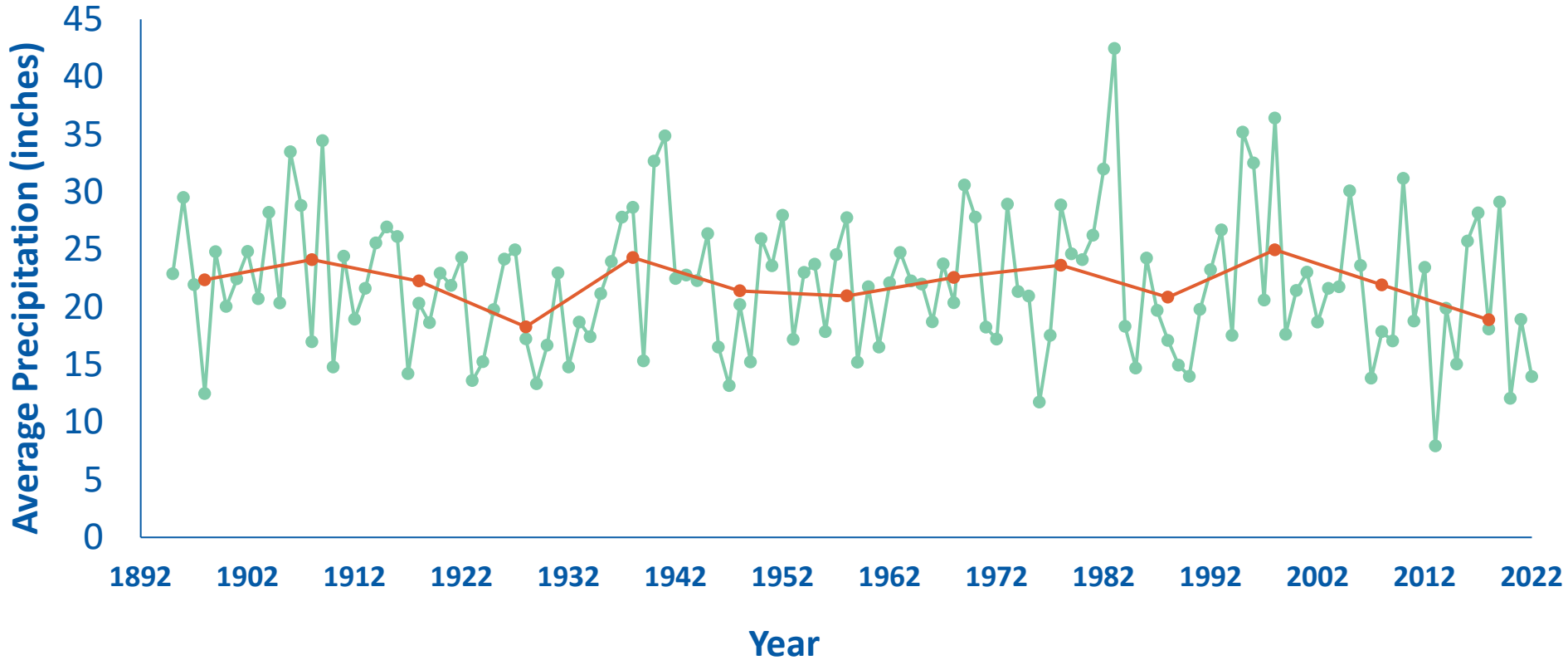


Image source: (2021). Vegetation's influence on fire behavior goes beyond just being fuel [Photograph]. Https://Fireecology.Springeropen.com/Articles/10.1186/S42408-022-00132-9#Fig1.

VEGETATION MANAGEMENT

Background: Average Precipitation in the State of California (1895 – 2022)



Date source: Average Annual Precipitation in inches in the State of California from 1895 to 2022 (Blue) and average precipitation per decade (Orange). The data is publicly available by NOAA and found at NOAA National Centers for Environmental Information, Climate-at-a-Glance: Statewide Time Series, published January 2023, retrieved on January 19, 2023

VEGETATION MANAGEMENT
Background: Fuel Loading

Higher Fuel Loading

- Frequent cooler low-intensity fires to high levels of fuel loading that burn with much higher intensity
- Increased number and frequency of catastrophic fires with greater consequences

Image source: (2021). Vegetation's influence on fire behavior goes beyond just being fuel [Photograph]. Https://Fireecology.Springeropen.com/Articles/10.1186/S42408-022-00132-9#Fig1.

VEGETATION MANAGEMENT

Observations

Existing Regulations[1]

- Vegetation clearance
- Defined radial clearances
- Defined pole clearances
- Major Woody Stem Exemption

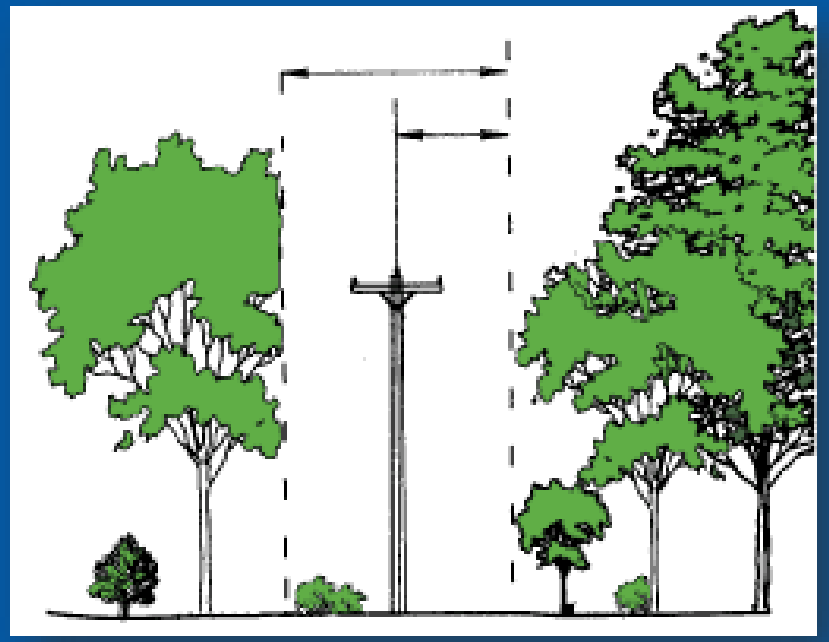


Image source: Cimarron Electric. Vegetation Management – Cimarron Electric Cooperative. cimarronelectric.com/home/resources/vegetation-management/.

[1]GO 95 Rule 35, PRC 4292, 4293

VEGETATION MANAGEMENT

Discussion Point 1: General Vegetation Management

Opportunities for Specificity in the Regulations[1]

- Vegetation Management
  - Vegetation inventory system
  - Integrated Vegetation Management (IVM)
- Vegetation clearance
  - Clearances between conductors and trees based on growth rates and species
  - Inspection intervals based on growth rates and tree conditions
  - Tree limbs over conductors
  - Risk-based clearance
  - Major Woody Stem (MWS) exemption

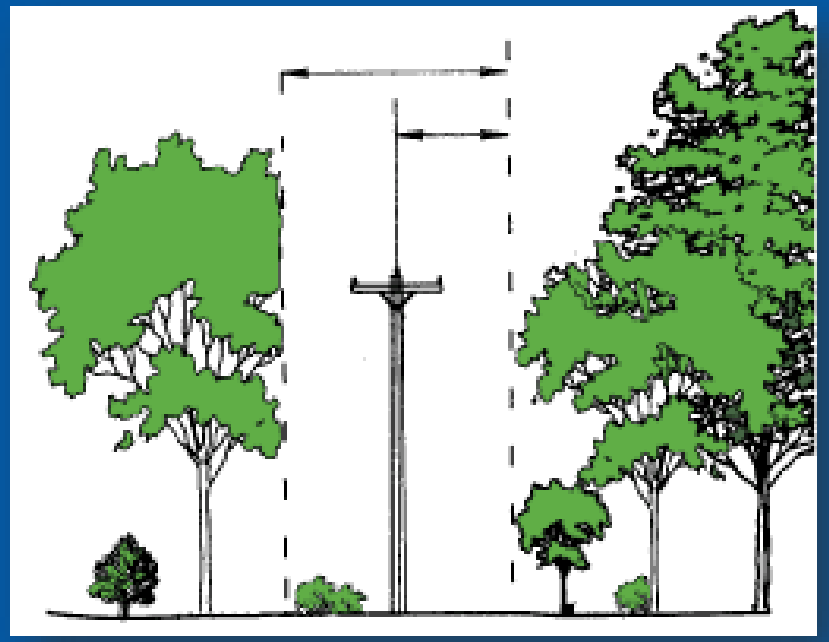


Image source: Cimarron Electric. Vegetation Management – Cimarron Electric Cooperative. cimarronelectric.com/home/resources/vegetation-management/.

[1]GO 95 Rule 35, PRC 4292, 4293

VEGETATION MANAGEMENT

Discussion Point 2: Identification of Hazard Trees

Danger tree:

"...any tree located on or adjacent to a utility right-of-way or facility that could damage utility facilities should it fall where (1) the tree leans toward the right-of-way, or (2) the tree is defective because of any cause, such as heart or root rot, shallow roots, excavation, bad crotch, dead or with dead top, deformity, cracks or splits, or any other reason that could result in the tree or main lateral of the tree falling." (California Code of Regulation Title 14 § 895.1)

Opportunities:

- Frequency of inspection for hazard trees
- Level of inspection (Level 1 vs. Level 2)
- Integrate tree mortality data set

Image source: W. B. (2023). A dead oak tree [Photograph]. https://www.picfair.com/pics/07640326-a-dead-oak-tree

VEGETATION MANAGEMENT

Discussion Point 3: Vegetation Inventory System

Existing Practices:

- Inventory systems
- Tree location
- Tree species and condition
- Tree history
- Data accessibility

Opportunities:

- Standardized electronic vegetation inventory systems
- Eradication of undesirable species
- Major Woody Stems (MWS)

Image source: Green Grid inc.

VEGETATION MANAGEMENT

Discussion Point 4: Risk-Based Prioritization of Work

Existing Practice:

- **Compliance-Based:** Policy dictates how often work and other tasks should occur

Potential Opportunity:

- **Risk-Based:** Inspection and work based on risk
- Arborist trained to make risk-based decisions on tree assessments

Image source: Green Grid Inc.

VEGETATION MANAGEMENT

Discussion Point 5: Vegetation Clearance – Tree Limbs Over Conductors

Branch Drop

- Tree branches growing over and falling on conductors
- Branches during high winds have the potential to be blown at an angle

Potential Remedies

- Proactive risk-based pruning strategy
- Risk assessment for tree removal
- Remove high risk trees within strike distance

Image source: Press, Associated. "Strong Gusts Fell Tree Limbs, Cutting Power to Thousands in New England." Concord Monitor, Concord Monitor, 29 Mar. 2021, www.concordmonitor.com/More-than-89K-without-power-because-of-high-winds-39703961

VEGETATION MANAGEMENT

Discussion Point 6: Integrated Vegetation Management

Fire Risk Scenarios

- Flammable vegetation on ROWs, substations, and utility poles
- Ignition risk from falling branches, trees, and grow-ins

Potential Opportunities

- Database for flammable ground vegetation locations
- Environmentally sensitive response dependent on site conditions
    - Biological, chemical, mechanical, manual, and cultural controls
    - Continuous remote monitoring of ROWs

Image source: Statnett. "Can Goats Be Used to Control the Vegetation under Power Lines?" Statnett, 12 June 2023, www.statnett.no/en/about-statnett/innovation-and-technology-development/.

VEGETATION MANAGEMENT

Panel Presentations &
Public Comment
Discussion

SURVEY

CLOSING REMARKS

Green Grid Inc.

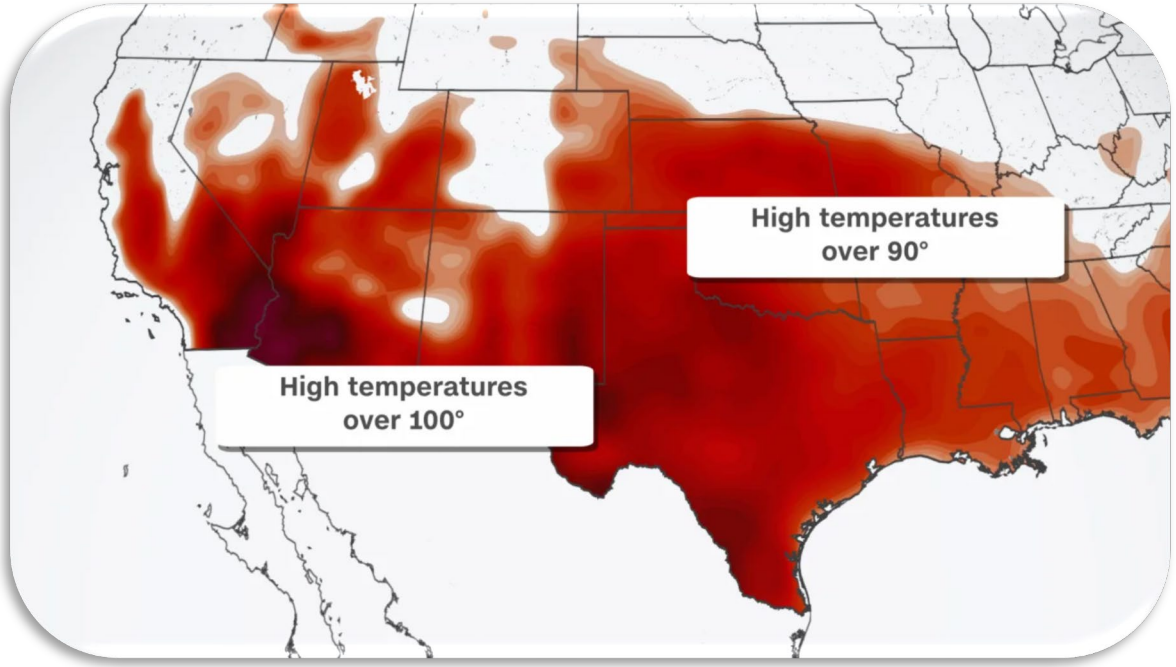


Image source: Gray, Jennifer. "A New Dangerous Long-Lasting Heat Wave Could Set Dozens of Heat Records, Even in Notoriously Hot Places." CNN, 10 July 2023, www.cnn.com/2023/07/10/weather/heat-wave-southwest-south-texas-florida/index.html

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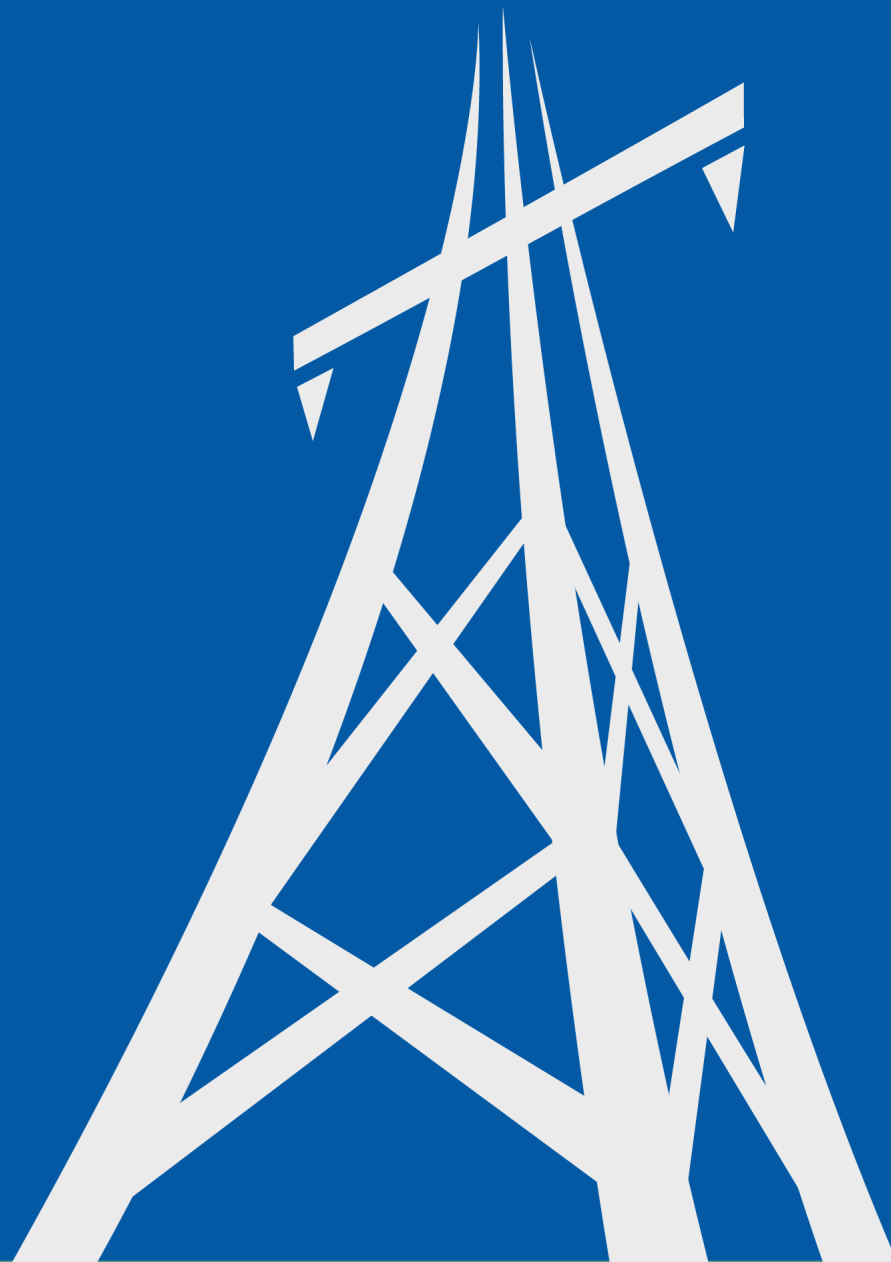
SAFETY REQUIREMENTS ADDRESSING INCREASING WILDFIRE RISK

Public Workshop

Green Grid inc

actionable sustainability intelligence©



WELCOME TO DAY 2

Lucy Morgans, Program Manager,
Office of Energy Infrastructure Safety

SAFETY BRIEFING

Take care of your posture and sit in a comfortable position

Take regular breaks stretch, hydrate, and rest your eyes

Know the emergency exits and procedures in your physical location should the need arise

Keep emergency contact information readily available

Be prepared for **earthquakes**

HOW TO PARTICIPATE

If you wish to provide input to the discussion:

- Press the “raise hand” button on Zoom, participants will be unmuted in order of hands raised
- Dial-in participants need to press #2 to raise hand
- Use Zoom’s Q&A feature to provide input.

OBJECTIVES

Facilitate Stakeholder Feedback

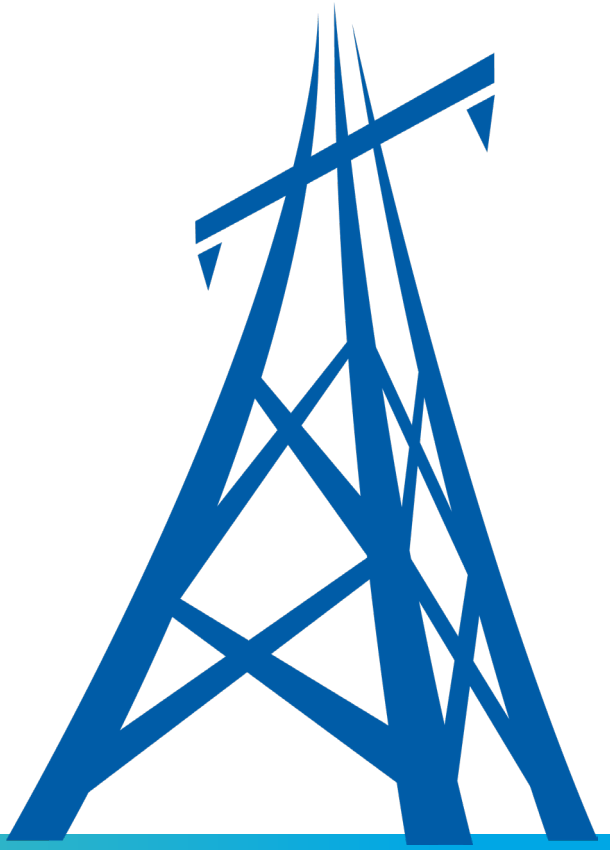
- Listen, understand, and consider the perspectives and insights of our stakeholders

Promote Public Engagement

- Have a collaborative discussion to explore recommendations for regulations to reduce utility wildfire ignitions and the effects of climate change and aging infrastructure

Enhance Communication and Transparency

- Provide clear feedback and participate in an open dialogue



AGENDA OVERVIEW
DAY 2 – JULY 14

9:30 a.m. – 9:40 a.m.	Welcome and Opening Remarks
9:40 a.m. – 10:40 a.m.	New Construction, System Hardening, and Grid Operations
10:50 a.m. – 11:40 a.m.	Undergrounding
11:40 a.m. – 12:40 p.m.	Lunch
12:40 p.m. – 1:40 p.m.	Asset Replacement and Repair Frequency; Inspection of Assets
1:50 p.m. – 2:50 p.m.	Additional Safety Considerations; Regulatory Change Impact Analysis
2:50 p.m. – 3:10 p.m.	Open Q&A – Any Topic
3:30 p.m.	Closing Remarks

NEW CONSTRUCTION

Negar Moharrami, Sr. Project Engineer, Ph.D., (Civil Engineering), PE (Civil)
Green Grid Inc.

NEW CONSTRUCTION
Background

"Building the Electricity Grid of the Future: California's Clean Energy Transition Plan" Governor Gavin Newsom[1]

- 100% clean energy by 2045 (SB 100)
- Clean energy progress and an implementation plan[1]
- $2 Billion Clean Energy Package[2]

New Electric Grid Construction Considering Local Conditions

- Heavy wind load
- Rising temperatures
- Access to water
- Soil conditions

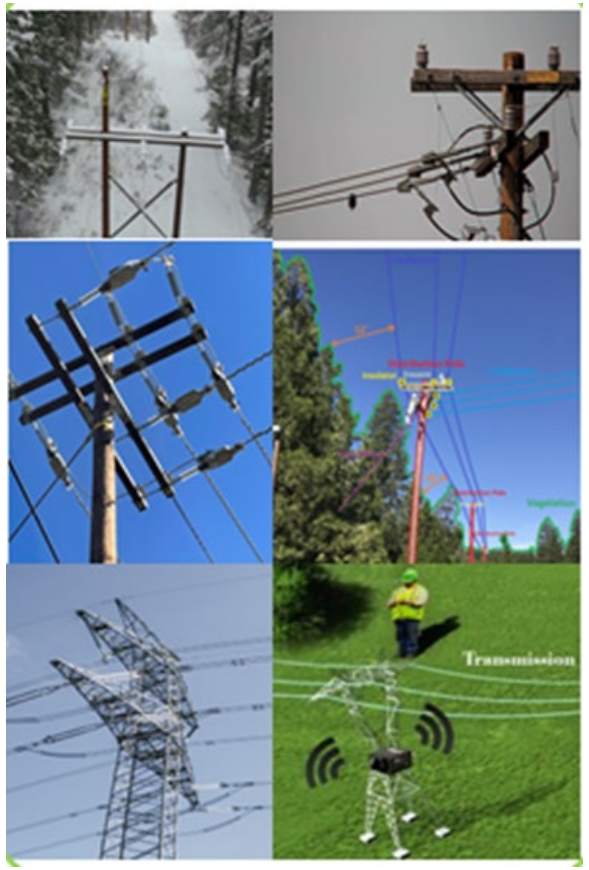


Image source: Green Grid Inc.

[1] California, State of. "Governor Newsom Updates the Roadmap to California's Clean Energy Future." *California Governor*, 25 May 2023, www.gov.ca.gov/2023/05/25/governor-newsom-updates-the-roadmap-to-californias-clean-energy-future/.
[2] "Clean Energy Package." *The 2022-23 Budget: Clean Energy Package*, 22 Feb. 2022, lao.ca.gov/Publications/Report/4554.

NEW CONSTRUCTION

Observations: Safety Factor

Opportunity for Specificity in Regulations[1]

- Strength requirements based on grades of construction
- Different safety factors for construction and in-place

Location

- High Fire Threat Districts and other potential high-risk areas

Local Conditions

- Local effects and climate change

Fail-Safe Design

Sustainable Construction

Image source: Green Grid Inc.

[1]GO 95 Rule 44

NEW CONSTRUCTION

Observations: Safety Factor (Cont.)

Safety Factor is the minimum allowable ratios of material and/or line element strengths to the effect of design loads[1]

- Extreme loads or stresses without failing due to climate change
- Use for designing, constructing, and hardening electric infrastructure
- Wind, ice, or other environmental factors

Image source: Grainger. "3 Most Common Causes of Electrical Accidents - Grainger KnowHow." Grainger.com, 27 Apr. 2017, www.grainger.com/know-how/safety/electrical-hazard-safety/advanced-electrical-maintenance/kh-3-most-common-causes-electrial-accidents.

[1]GO 95 Rule 44

NEW CONSTRUCTION

Discussion Point 1: Location-Driven Safety Factor

Locations

- High Fire Threat Districts (HFTDs)
- Specific safety factor requirements for Tier 2 and Tier 3
- Climate change impact/local conditions on the safety factor
- Others

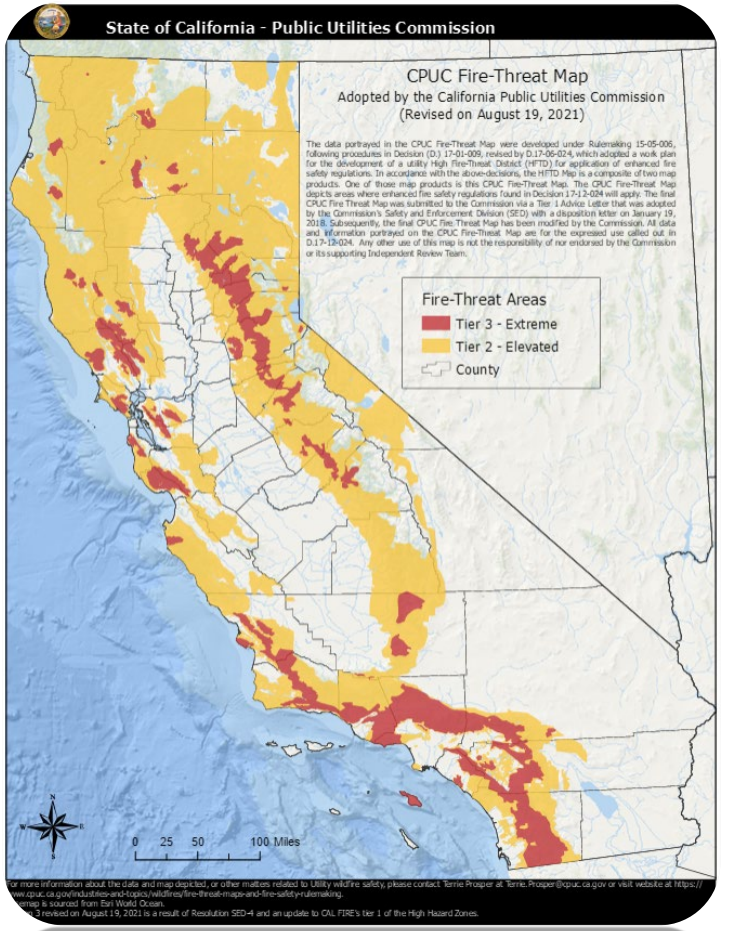


Image source: California Public Utilities Commission (CPUC)

NEW CONSTRUCTION

Discussion Point 2: Safety Factor Adjustment

Safety Factor

- Provide a safety margin that remains after all anticipated loads and stresses
- Reduce the risk of catastrophic failure
- Electrical infrastructure needs to withstand varied conditions and loads due to climate change
- Consider the overall integrity of the power line system

Image source: Hamzah, Nur & Usman, Fathoni & Omar, Rohayu. (2018). Geospatial study for wind analysis and design codes for wind loading: A review. International Journal of ADVANCED AND APPLIED SCIENCES.

SYSTEM HARDENING

Eric Pessima, Sr. Project Engineer, B.S., (Civil Engineering), PMP
Negar Moharrami, Sr. Project Engineer, Ph.D., (Civil Engineering), PE (Civil)
Kenneth Lam, Sr. Engineer, B.S., (Electrical Engineering), PE (Electrical)
Green Grid Inc.

SYSTEM HARDENING
Background

Strengthening and Fortifying Electrical Infrastructure to Enhance Resilience and Resistance to Reduce Wildfires Amid Climate Change

- Covered conductors
- Hardening overhead assets
- Modernizing equipment
- Locational safety factor
- Undergrounding

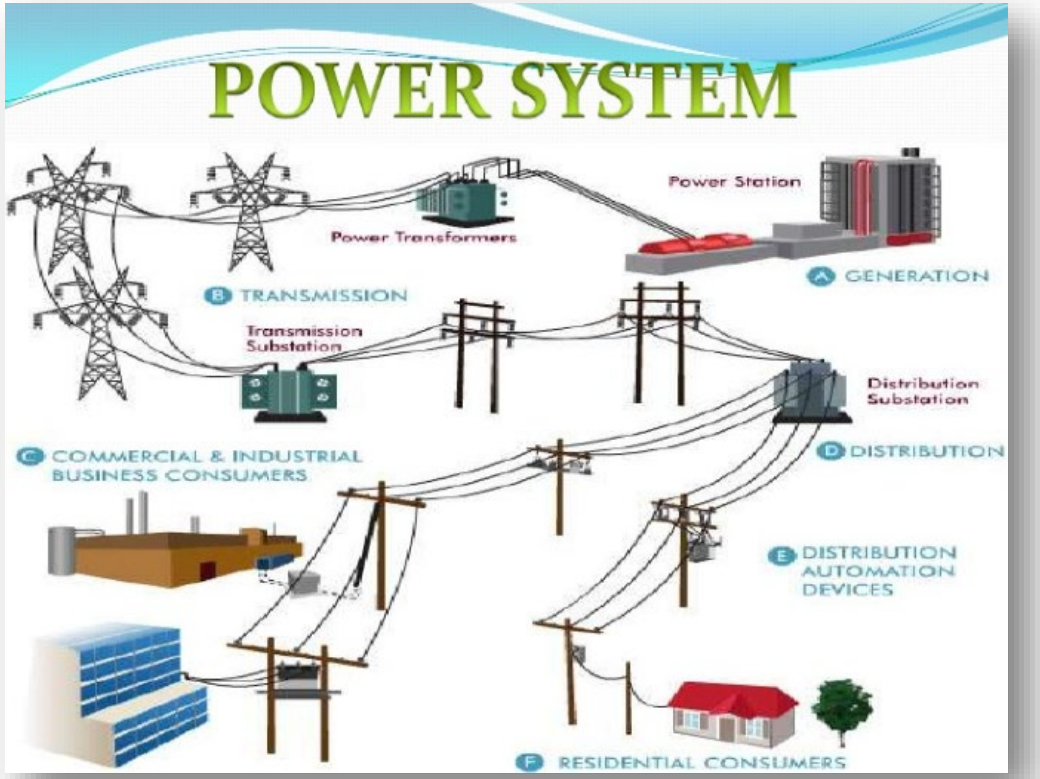


Image source: (2023). Global assembling of Academicians [Photograph]. Allied Academics Conferences. https://powerengineering.alliedacademies.com/events-list/power-systems

SYSTEM HARDENING

Background: Climate Change and Utility Assets

Extreme weather conditions

- High wind events: Wire, object, vegetation-to-wire contact
- Storms and Lightning: Equipment failure and Asset ignition
- High temperatures: Asset overheating
- Drought: Dehydrates surrounding vegetation (fuel)

Focus on High Fire Threat Districts (HFTDs)

Importance of System Hardening: Reduce the Risk of Wildfires

- Enhances resilience and safety of assets
- Improves reliability
- Improves operations and maintenance protocols

SYSTEM HARDENING

Observations

Opportunity for Specificity in Regulatory Requirements

Design, Construction, and Maintenance[1]

- Safe, proper, and adequate service based on known local conditions

Protective Covering Criteria[2]

- Electrical insulating efficiency, impact strength, material-specific criteria, thickness, sunlight resistance, etc.

Splices and Taps[3]

- Grade "A" construction requires consent from all parties who own or operate overhead assets
- Splices and taps in Grade "A" construction spans
- Number of splices per span

[1]GO 95 Rule 31.1
[2]GO 95 Rule 22.8
[3]GO 95 Rule 22.6-B, Rule 101.2, Rule 103.1, Rule 49.1, Rule 111.3

SYSTEM HARDENING

Observations (Cont.)

Opportunity for Specificity in Regulatory Requirements

Exempt and Non-Exempt Equipment

- Exempt Equipment Table[1]
- Exclusivity to State Responsibility Area (SRA)

Pole Replacement/Reinforcement

- Composite
- Steel
- Fire-resistant materials

Image source: Roberts, David. "California's Wildfire Blackouts Are a Mess. Here Are 3 Key Solutions." Vox, Vox, 22 Oct. 2019, www.vox.com/energy-and-environment/2019/10/22/20916820/california-wildfire-climate-change-blackout-insurance.

[1]CAL FIRE California Power Line Fire Prevention Field Guide

SYSTEM HARDENING

Discussion Point 1: Covered Conductors

Benefits

- Reduce risk of phase-to-phase contact
- Reduces wildfire risk
- Improves reliability

Areas of Ongoing Research

- Materials
- Inspection and Maintenance
- Replacement
- Long-term effectiveness
- Service life
- Potential failure modes

Image source: Green Grid Inc.

SYSTEM HARDENING

Discussion Point 2: Reduce Splice-Caused Ignitions

Potential Causes of Asset Ignition

- Damage by environmental conditions
  - Corrosion
  - Moisture
  - Physical damage

Splices Protection Protocol

- Corrosion inhibitors
- Frequent maintenance/inspection
- Number of splices between spans

Image source: Murray, Meredith. "ButterflyMX Installation: How to Splice the Power Cable." Video Intercom System for Apartment Buildings | ButterflyMX, 20 Sept. 2020, butterflymx.com/blog/splice-power-cable/

SYSTEM HARDENING

Discussion Point 3: Hardening Aging Assets

Aging Assets

- Non-exempt equipment
- Potential to spark
- Tendency to overheat
- Higher likelihood of failure

Modernized and Exempt Equipment

- Single-phase reclosers
- Motorized switch operators
- Rapid Earth Fault Current Limiter (REFCL)
- Exempt surge arresters

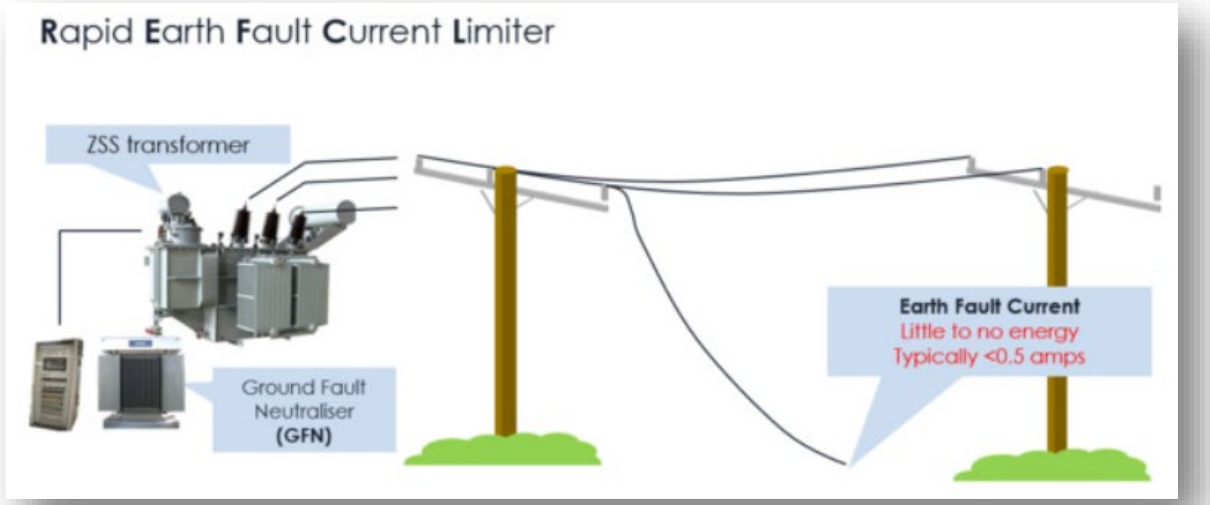


Image source: (2016). U.S. Utilities Apply Wildfire Technology Tested in Australia [Photograph]. Course Cloud. https://www.utilityproducts.com/line-construction-maintenance/article/14198802/us-utilities-apply-wildfire-technology-tested-in-australia

SYSTEM HARDENING

Discussion Point 4: Pole Replacement/Reinforcement

Pole Replacement

- Composite
- Steel

Pole Reinforcement

- Fire retardant

Image source: Green Grid Inc – Underbuild distribution pole

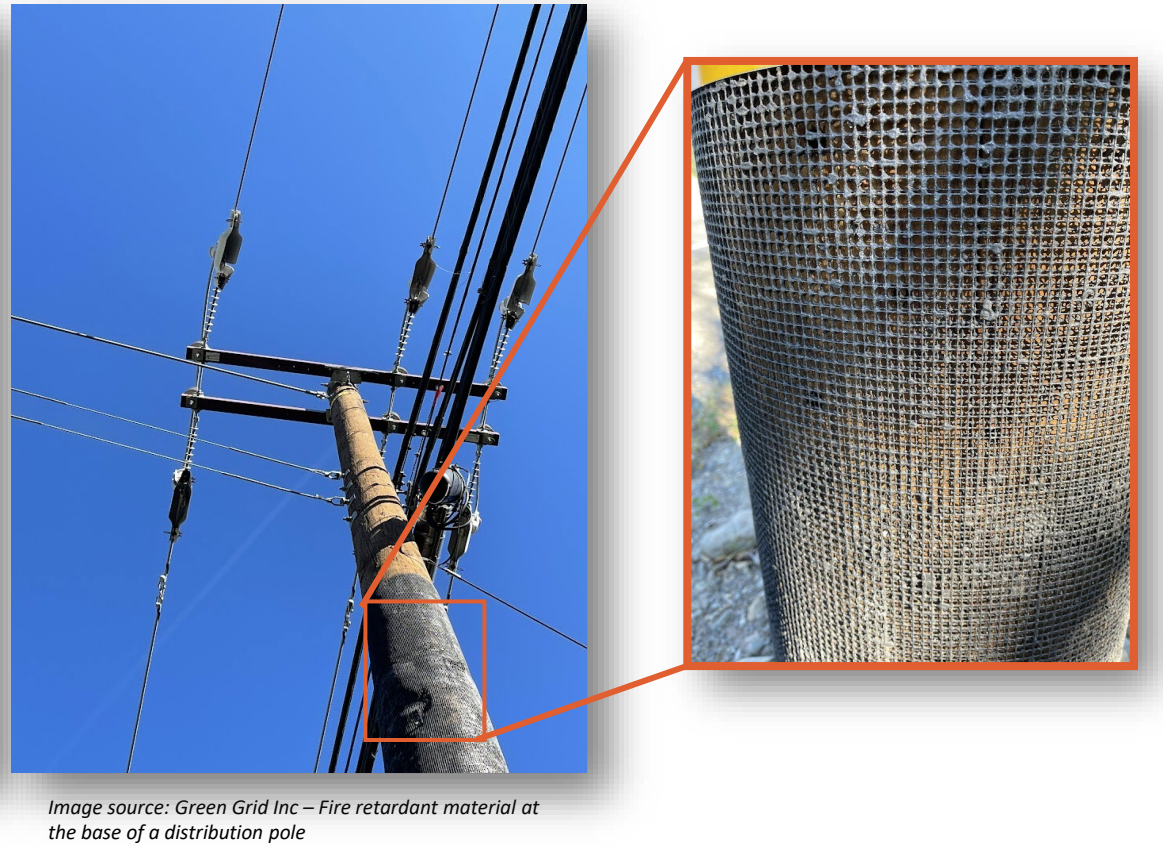


Image source: Green Grid Inc – Fire retardant material at the base of a distribution pole

SYSTEM HARDENING

Discussion Point 5: Residual Safety Factors vs. Safety Factor

Residual Safety Factor (RSF)

- Alternative definition for reducing Safety Factor
- Considering the impact of environmental loads in DCR (Demand / Capacity Ratio)
- The RSF account for residual stresses on the structural elements
- Applies to the existing constructions or new construction after installation

Image source: Robson Forensic. "Utility Pole Failures - Expert Witness Investigations." Www.robsonforensic.com, 18 Mar. 2022, www.robsonforensic.com/articles/utility-pole-failure-expert

GRID OPERATIONS AND PROTOCOLS

Kenneth Lam, Sr. Engineer, B.S., (Electrical Engineering), PE (Electrical)
Green Grid Inc.

GRID OPERATIONS AND PROTOCOLS
Background

Effective and Safe Operation of the Power Grid

- System automation and protocol
- Minimize the extent and duration of de-energization - Public Safety Power Shut-off (PSPS)
- Facilitate the flow of energy
- Reliable functioning of the power grid
- Reduces ignition and wildfire risk
- Achieve grid resilience

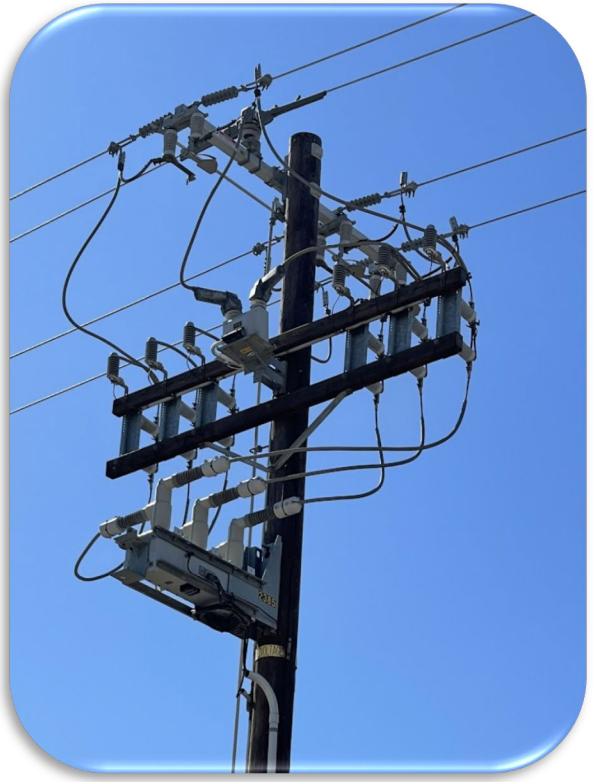


Image source: Green Grid Inc. - Remote activated recloser on composite pole

GRID OPERATIONS AND PROTOCOLS

Observations

Industry Practices

- Sectionalization
- Automation
- Changing sensitivity of protective device settings (including fast trip settings)
- Line loading and power flow optimization
- PSPS threshold

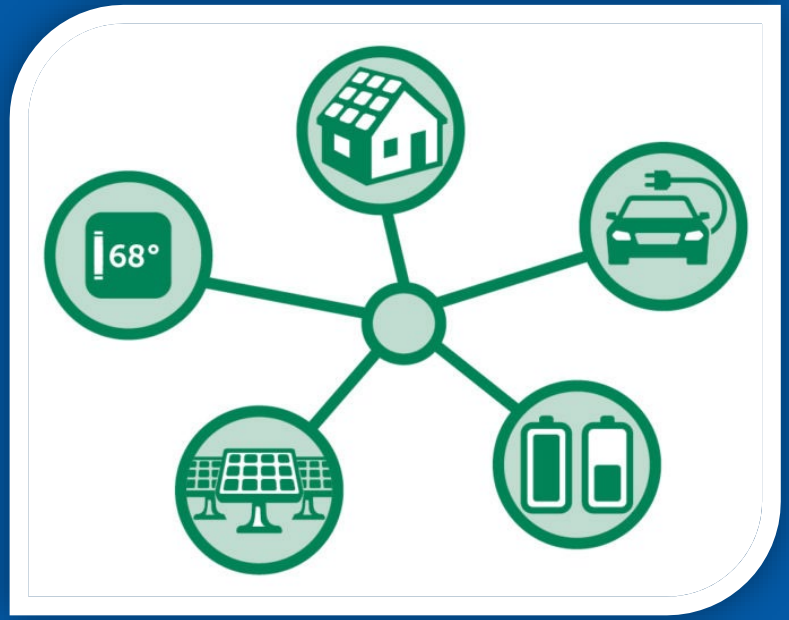


Image source: NC Electric Cooperatives. "Advanced Grid Operations." North Carolina's Electric Cooperatives, www.ncelectriccooperatives.com/energy-innovation/grid-operations

GRID OPERATIONS AND PROTOCOLS

Discussion Point 1: Mitigating the Impact of PSPS Events

PSPS Events

- Significant operation challenges
- Grid reliability
- Risk of public safety

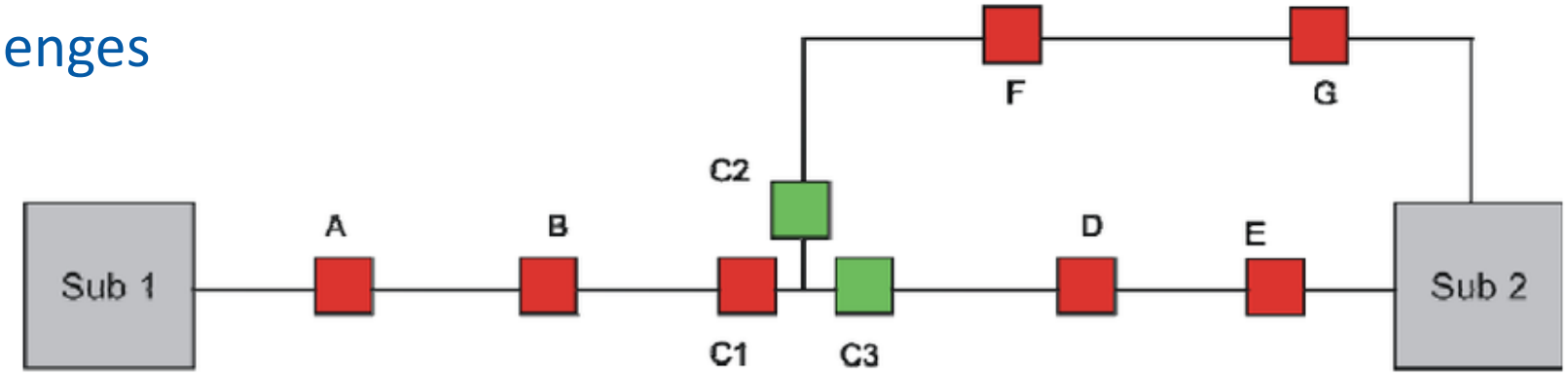


Image source: (2022). Sectionalizing Switches on a Distribution Feeder [Photograph]. ResearchGate. https://www.researchgate.net/figure/Sectionalizing-Switches-on-a-Distribution-Feeder_fig2_255217209

Impact Reduction

- Sectionalizing
- Advanced controls (e.g., SCADA)
- Backup power (battery storage, microgrids, local renewable generation)

GRID OPERATIONS AND PROTOCOLS

Discussion Point 2: Protective Equipment and Device Settings

Power Outages

- Object contact
- Vegetation
- Animal
- Balloons

Image source: (2022). Daily Mail Online. "Tree next to a Power Line Bursts into Flames." Mail Online, 28 June 2017, www.dailymail.co.uk/news/article-4646978/Tree-power-line-bursts-flames.html

Reducing Wildfire Risk Through Settings

- Reduces time to de-energize
- Rapid response for quicker power restoration
- Automatic power shut-off

NEW CONSTRUCTION, SYSTEM HARDENING, AND GRID OPERATIONS

Panel Presentations &
Public Comment
Discussion

UNDERGROUNDING

Eric Pessima, Sr. Project Engineer, B.S., (Civil Engineering), PMP
Green Grid Inc.

UNDERGROUNDING
Background

Physical Relocation of Electrical Lines and Associated Infrastructure Underground

- Reduces ignition drivers
    - Phase-to-Phase Contact
    - Equipment failures
    - Extreme weather (higher temperature, heavy snow, heavy wind)
- Potentially improves safety and reliability

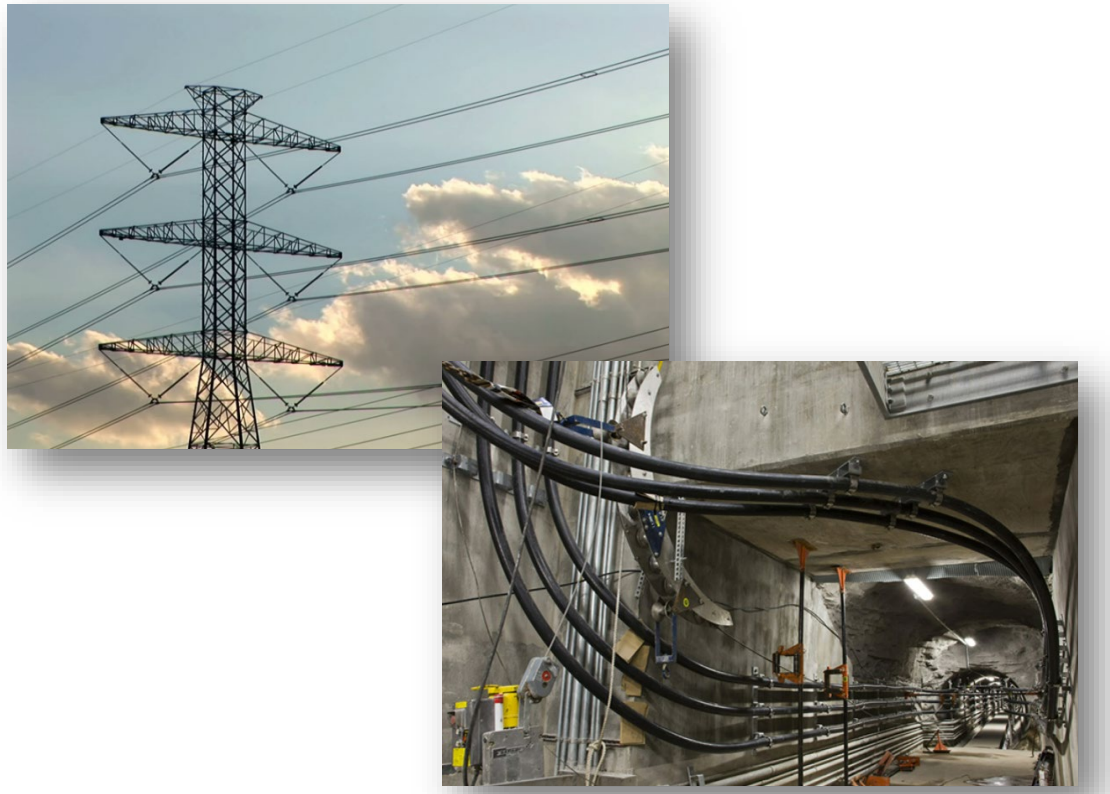


Image source: Upgraded (n.d.). Underground Electrical Service Cost. Electrical Engineer Portal. https://electrical-engineering-portal.com/download-center/books-and-guides/power-substations/underground-power-transmission-lines

UNDERGROUNDING

Observations

Opportunity for Specificity in Regulations

- **Construction[1]**
  - In accordance with accepted best practice
  - Provision for the safety of workers and the general public
  - Property preservation
- **Maintenance[2]**
  - Maintained to secure the safety of workers and the public in general
- **Environmental Conditions[3]**
  - Location-safe access
  - Maintenance interference with traffic

[1]GO 128 Rule 41.3, 17.1, 17.3
[2]GO 128 Rule 12.2, 22.3, 22.4A
[3]GO 128 Rule 32.8

UNDERGROUNDING

Discussion Point 1: Priorities for Wildfire Prevention

Environmental

- Climate, topology, geological landscape

Social

- Cultural sensitivities, critical facilities, public safety, emergency response access

Infrastructure

- Existing and future

Image source: (2022). Sectionalizing Switches on a Distribution Feeder [Photograph]. ResearchGate. https://www.researchgate.net/figure/Sectionalizing-Switches-on-a-Distribution-Feeder_fig2_255217209

UNDERGROUNDING

Discussion Point 2: Construction Technical Challenges and Factors to Consider

Post-construction Considerations

Asset corrosion

Soil erosion

Soil type variations (e.g., rock, wetland, hills)

Existing subsurface utilities

Possible Mitigation Efforts

Heat dissipation

Environmental assessment and geotechnical soil testing

Erosion and corrosion prevention

Tailored construction methods

UNDERGROUNDING

Discussion Point 3: Updated Construction Techniques for Modern Undergrounding

Updated Construction Techniques

- Horizontal directional drilling
- Mechanical excavation
- Vibratory plow (rural areas)

Materials and Equipment Innovations

- Cable-in-Conduit (CIC)
- High-Density Polyethylene (HDPE) Conduit
- Fault indicators

Image source: (2022). HORIZONTAL DIRECTIONAL DRILLING [Photograph]. SADB. https://www.sadb.com.au/what-we-do/horizontal-directional-drilling/

UNDERGROUNDING

Discussion Point 4: Revamping Maintenance Protocols for Underground Infrastructure

Maintenance Protocols

- Voltage tests on the cable sheath
- Tunnel inspection
- Transition stations inspection
- Utility hole/joint pit inspection
- Cable route and crossings inspection
- Securing pad-mounted equipment

Image source: UpGraded (n.d.). Underground Electrical Service Cost. Run Underground. https://upgradedhome.com/underground-electrical-service-cost/

UNDERGROUNDING

Discussion Point 5: Improving Underground Infrastructure Potential

Undergrounding Variables	Potential Opportunities
Cable deterioration	Cable quality improvement
Service disruptions	Minimize service disruption strategies
Cable failures	Efficient repair processes
Slow deployment	Improved deployment
High installation costs	Cost reduction strategies

UNDERGROUNDING

Panel Presentations &
Public Comment
Discussion

ASSET REPLACEMENT AND REPAIR FREQUENCY

Fred Kahl, Sr. Technical Program Manager, B.S., (Aerospace Eng.), MBA
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ASSET REPLACEMENT AND REPAIR FREQUENCY

Background: Replacement

Once a structure reaches a reduced safety factor, it needs to be replaced[1]

Grade "A" and “B” construction

- Safety factors should not fall below two-thirds of standards

Grade “C” construction

- Safety factors should remain above half of required standards

[1]GO 95 Rule 44.3

ASSET REPLACEMENT AND REPAIR FREQUENCY

Background: Inspection Requirements

Electric Distribution and Transmission Facilities Outside of a Substation[1]

- Ensure safe and high-quality electrical service
- Adequacy of inspection timeframes to minimize wildfire risk
- Differing inspection cycles for non-exempt equipment

Table 1
Distribution Inspection Cycles (Maximum Intervals in Years)

	Patrol		Detailed		Intrusive	
	Urban	Rural	Urban	Rural	Urban	Rural
Transformers						
Overhead	1	2[1]	5	5	---	---
Underground	1	2	3	3	---	---
Padmounted	1	2	5	5	---	---
Switching/Protective Devices						
Overhead	1	2[1]	5	5	---	---
Underground	1	2	3	3	---	---
Padmounted	1	2	5	5	---	---
Regulators/Capacitors						
Overhead	1	2[1]	5	5	---	---
Underground	1	2	3	3	---	---
Padmounted	1	2	5	5	---	---
Overhead Conductor and Cables	1	2[1]	5	5	---	---
Streetlighting	1	2	x	x	---	---
Wood Poles under 15 years	1	2	x	x	---	---
Wood Poles over 15 years which have not been subject to intrusive inspection	1	2	x	x	10	10
Wood poles which passed intrusive inspection	---	---	---	---	20	20

[1]GO 165

ASSET REPLACEMENT AND REPAIR FREQUENCY

Observations

Opportunity for Specificity in Regulations[1]

- Inspection cycle maximum set depending on asset and location
- Asset lifecycles are not always predictable and may not conform to an inspection/replacement cycle
- Determine optimal replacement timing
- Determine optimal inspection frequency

CPUC Reportable Number of Equipment Involved in Ignitions per Year (one IOU)

[1]GO 165

ASSET REPLACEMENT AND REPAIR FREQUENCY

Discussion Point 1: Hard-time vs Condition-based Maintenance

Hard time (set schedule) vs. condition-based maintenance balancing to reduce wildfire risk

Optimal inspection frequencies to reduce wildfire risk

- Reliability Centered Maintenance (RCM)
- Risk-based prioritization of inspections to reduce wildfire risk

INSPECTION OF ASSETS

Fred Kahl, Sr. Technical Program Manager, B.S., (Aerospace Eng.), MBA
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INSPECTION OF ASSETS
Background

- **Pivotal role in the safe and reliable operation and maintenance of electrical infrastructure**
  - Maintains safety standards
  - Ensures the safety of both personnel and public
  - Improved reliability
- **Inadequate inspections may carry unidentified risks in the powerline system**
- **Identified risks may be resolved in time to mitigate wildfire risk**

Image source: Green Grid Inc.

INSPECTION OF ASSETS

Observations

Opportunity for Specificity in Regulations[1]

- Frequency and rigor of inspections for in-service and out-of-service lines
- Corrective finding resolution/corrective action timeline

Compliance/Time-Based Inspection vs Risk-Based Inspection

- Inspection could be targeted based on risk

Type of inspection methodology

- Patrol
- Detailed
- Other (technology-enhanced, aerial and terrestrial sensors)

Image source: Green Grid Inc.

[1]GO 165

INSPECTION OF ASSETS

Discussion Point 1: Inspection Frequency and Corrective Action Timelines

Compliance-Based and Risk-Based Frequency

- Risk-focused, resource-efficient, effective results
- Target risk mitigation, resource optimization, enhanced safety
- Removes complexity, subjectivity, and regulatory compliance challenges

Image source: Helicopters inspecting local power lines using infrared, ultraviolet technology | Chronicle Telegram

INSPECTION OF ASSETS

Discussion Point 2: Technology-Enhanced Inspections

Existing Inspection Types for Equipment:

- Patrol inspection, detail inspection, and intrusive inspection

Technology-Enhanced Inspection Techniques:

- Infrared
- Non-destructive testing
- AI-enabled smart sensor
- GIS
- Data-driven

Image source: Drone Power Solutions. "Drone Inspections Are Improving Efficiency in the Utilities Industry." Leading Drone Company | Drone Service Provider, 23 Sept. 2020, feds.ae/drone-inspections-in-utilities-industry/

JOINT ASSET REPLACEMENT AND REPAIR FREQUENCY; INSPECTION OF ASSETS

Panel Presentations &
Public Comment
Discussion

ADDITIONAL SAFETY CONSIDERATIONS

Fred Kahl, Sr. Technical Program Manager, B.S., (Aerospace Eng.), MBA
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ADDITIONAL SAFETY CONSIDERATIONS

Background: Continuing Analysis and Surveillance System (CASS)

- **Practiced in the aviation industry since 1964**
- **Follows Federal Aviation Administration (FAA) safety framework**
- **CASS to prevent wildfires**
    - Identifying potential hazards
    - Environmental monitoring
    - Early warning system
    - Measurement vs Modeling
    - Proactive maintenance
    - Continuous improvement

Image source: https://www.faa.gov/about/plans_reports/media/fy20_avs_wfp

ADDITIONAL SAFETY CONSIDERATIONS

Background: Statistical Analysis for Scheduled Maintenance Optimization (SASMO)

SASMO to prevent wildfires

- Data collection
- Failure rate modeling
- Maintenance program optimization
- Proactive measures

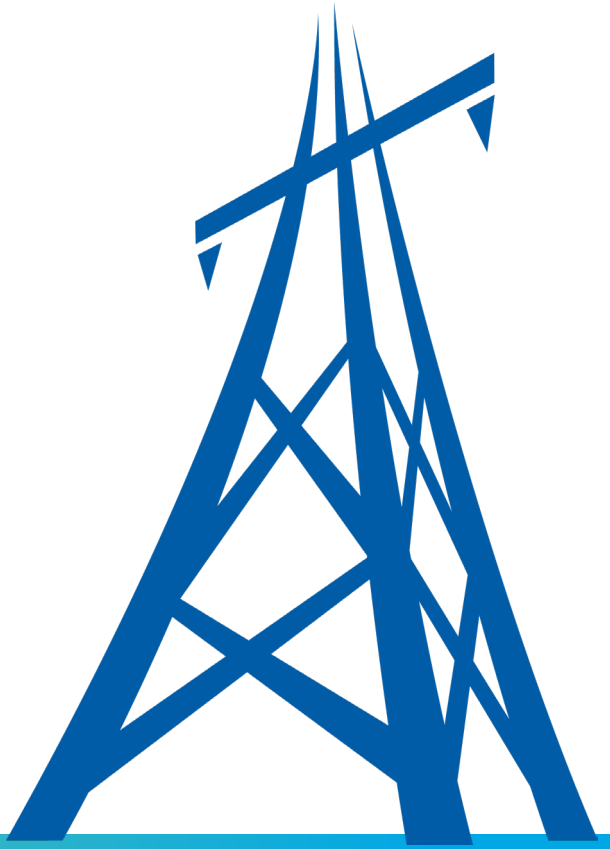
Image source: https://www.istockphoto.com/photos/electric-lineman

ADDITIONAL SAFETY CONSIDERATIONS

Observations

Opportunity for Specificity in Regulatory Requirements[1]

- Transitioning maintenance program from time/compliance based to risk-prioritized/condition-based program
- Adopting aviation industry inspired practices

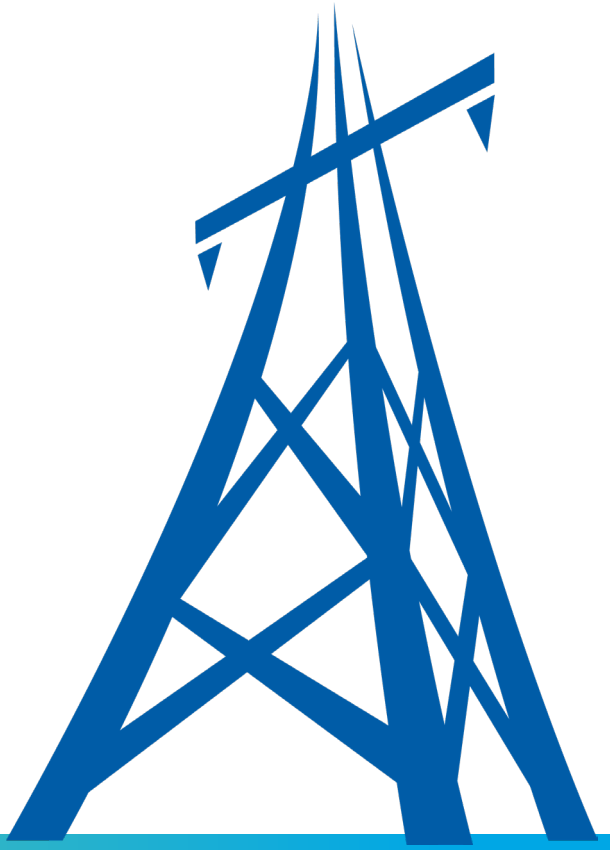


[1]GO 165

ADDITIONAL SAFETY CONSIDERATIONS

Discussion Point 1: Electronworthiness

- Framework designed to maximize safety and minimize wildfire risk for electric utilities
- Replicated from FAA airworthiness
- Proven for safety-critical practices in operations and maintenance
- Adopting to design, construction, maintenance, and operations of electric utility equipment and support structures
- Resulting significant reduction in wildfire risk



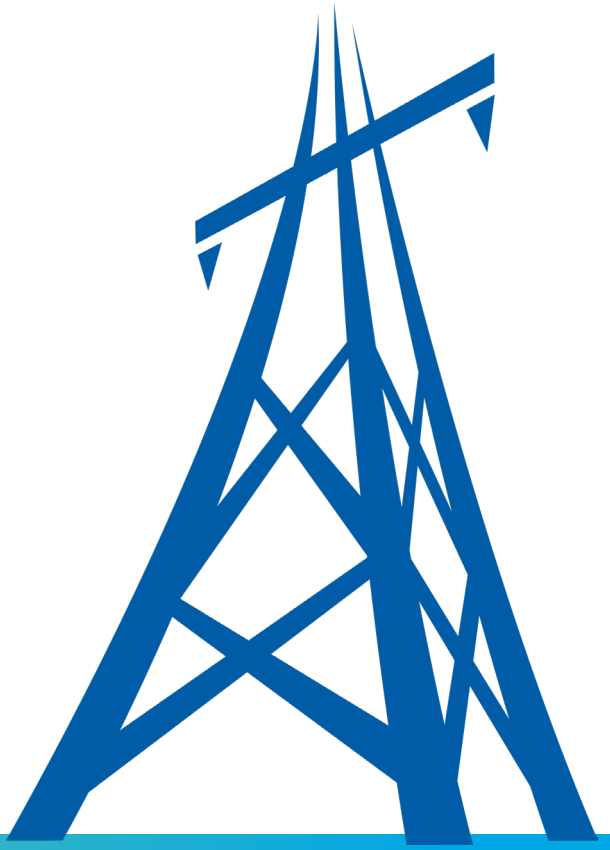
POTENTIAL REGULATORY CHANGE IMPACTS

Amy Chiang, Organizational Change Consultant, Ph.D. (Human and Organizational Systems), M.A. (Human Development), M.S. (Organizational Change Management)
Green Grid Inc.

POTENTIAL REGULATORY IMPACTS

Background: Metrics to Consider

- Burned Area (Acres) – the size of the affected ecosystem, the scale of habitat loss, etc.)
- Carbon Emissions (Metric Tons of CO2) - carbon emissions from wildfires and their contribution to greenhouse gas concentrations
- Air Quality Index (AQI) - human health and ecosystem vitality
- Economic Losses – impact on individuals, communities, and the state as-a-whole (e.g., cost of firefighting, property damage)



POTENTIAL REGULATORY IMPACTS

Background: Social Impacts

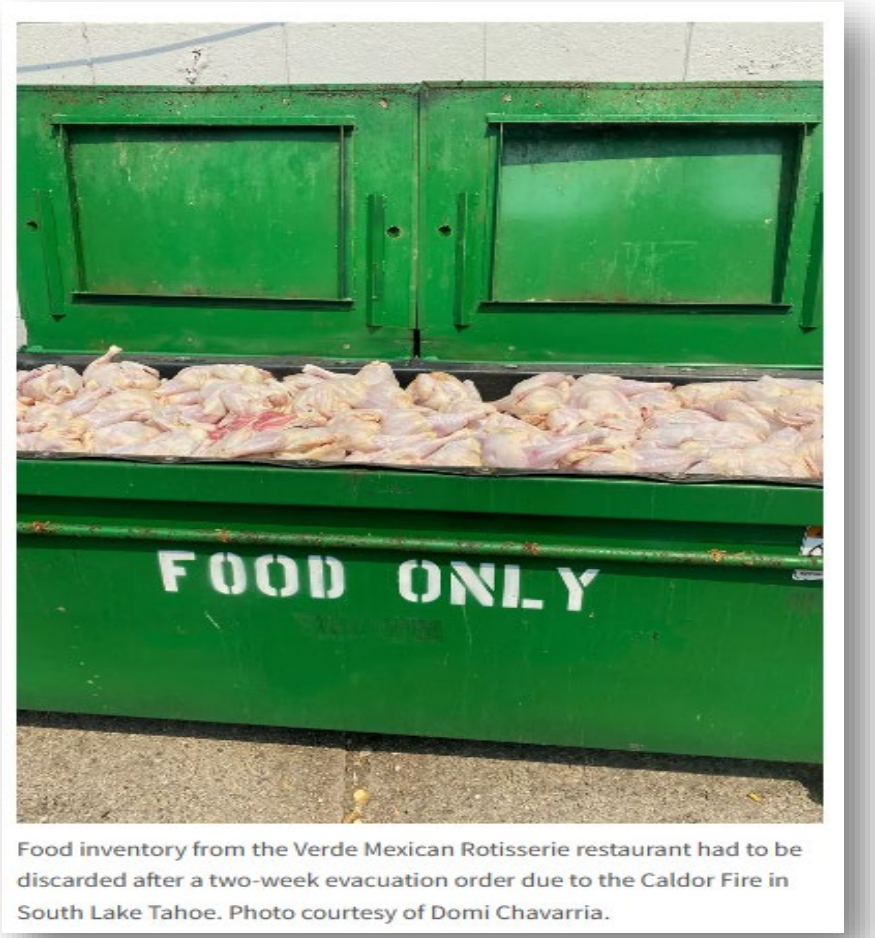
- **Displacement and Evacuation**
- **Loss of Life and Injury**
- **Health Effects (including mental health)**
- **Community Disruption**
- **Equity and Social Vulnerability**
- **Emergency Response and Resources**

Image source: Reuters. (2018, November 9). Northern California wildfire leaves town in ruins, thousands flee. The Indian Express. https://indianexpress.com/article/world/northern-california-wildfire-chico-city-5439626/

POTENTIAL REGULATORY IMPACTS

Background: Economic Impacts

- **Property damage and loss**
- **Disruption to businesses**
- **Agricultural losses**
- **Insurance losses**
- **Emergency response and resources**



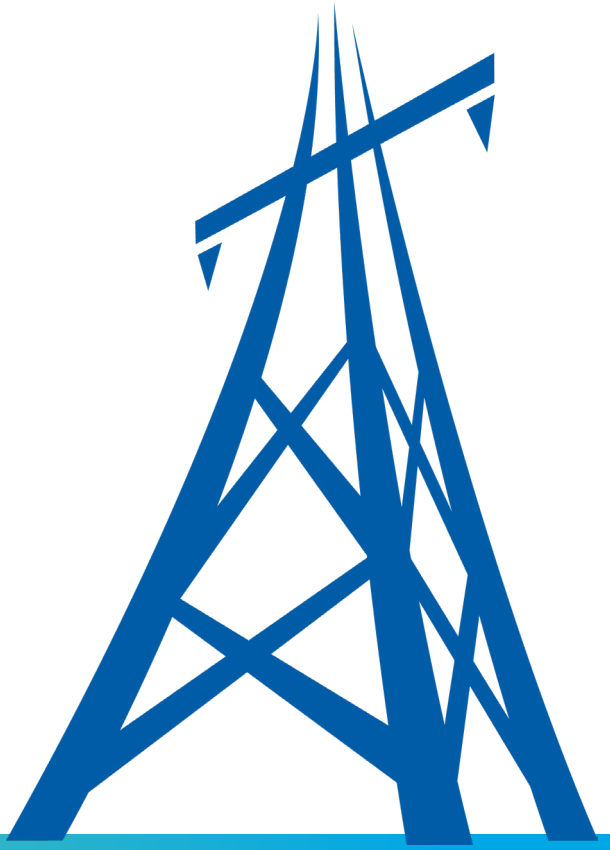
Food inventory from the Verde Mexican Rotisserie restaurant had to be discarded after a two-week evacuation order due to the Caldor Fire in South Lake Tahoe. Photo courtesy of Domi Chavarria.

Image source: Gedye, G. (2021, October 11). How much do wildfires really cost California's economy? CalMatters. https://calmatters.org/economy/2021/10/california-wildfires-economic-impact/

POTENTIAL REGULATORY IMPACTS

Discussion Point 1: Vegetation Management

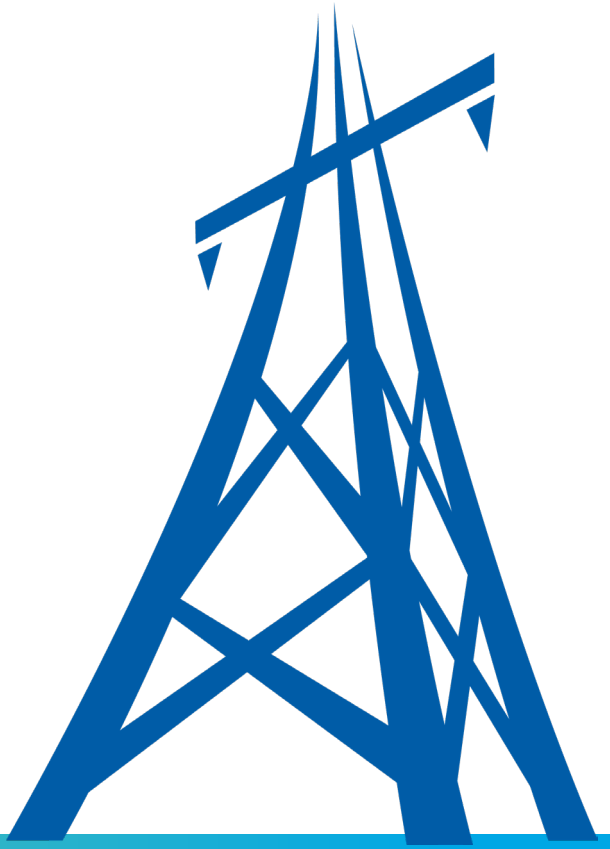
- **Cost and Resources:** requires funding, skilled personnel, and equipment – can be more demanding for smaller budgets
- **Stakeholder Opposition:** residents, private landowners, and timber companies may challenge the feasibility
- **Scheduling and Timing:** weather, seasonal restrictions, and wildlife nesting periods may add complexity and reduce flexibility
- **Regulatory/Legal Considerations:** environmental law, and securing permits play a role



POTENTIAL REGULATORY IMPACTS

Discussion Point 2: Undergrounding

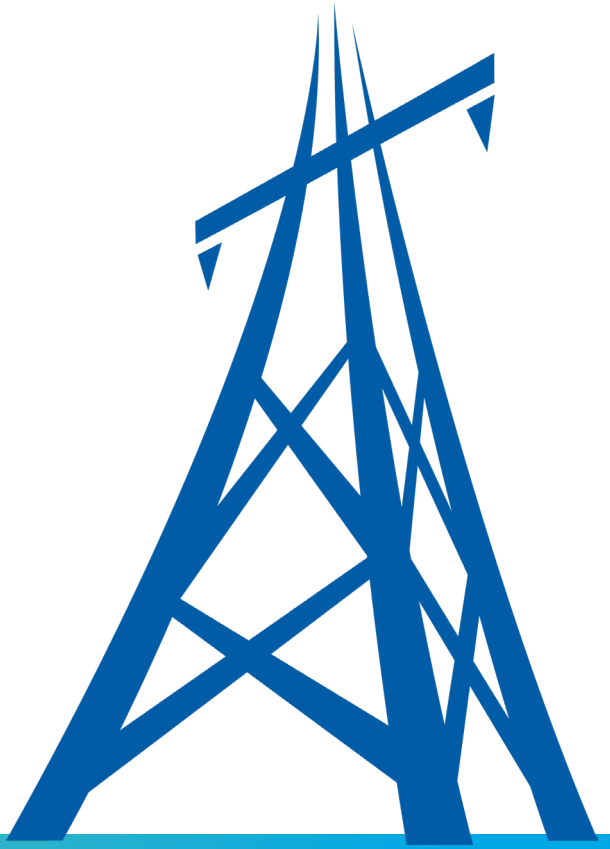
- **High Cost:** The cost of trenching, and cable installation, can be substantial – disproportionately affects communities/regions with limited resources
- **Maintenance and Repair:** More costly to maintain
- **Long Project Timelines:** Causes inconvenience to communities during the construction phase
- **Environmental Impact:** Excavation and trenching can disrupt natural habitats, impact soil quality, and require the removal of trees and vegetation



POTENTIAL REGULATORY IMPACTS

Discussion Point 3: Power Line Inspections

- **Frequency and Timing:** Finding the appropriate balance between inspection frequency and resource utilization is crucial
- **Weather Dependency:** High winds, heavy rainfall, or extreme temperatures can impact the safety and feasibility of inspections
- **Cost and Resources:** Requires financial resources, skilled personnel, and appropriate equipment, this may be challenging for smaller budgets



JOINT ADDITIONAL SAFETY CONSIDERATIONS; POTENTIAL REGULATORY IMPACTS

Panel Presentations &
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SURVEY

NEXT STEPS AND CLOSE OUT

- Energy Safety is accepting written comments until July 28. These should be filed in the Energy Safety E-Filing system to the Wildfire Safety Requirements Recommendations docket (#2023-WSRR).
- Public input will be considered by Energy Safety when developing recommendations for safety requirements to address the increasing risk from climate change and aging infrastructure.
- Energy Safety anticipates providing the CPUC with these recommendations in the fall of 2023.
- These recommendations will feed into the formal CPUC proceeding, the climate change adaptation proceeding, which will be exploring changes to the existing safety requirements starting in the second half of 2023.

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SAFETY REQUIREMENTS ADDRESSING INCREASING WILDFIRE RISK

Public Workshop

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