

Comprehensive Open Source Development of Next Generation Wildfire Models for Grid Resiliency

The Issue

Many aspects of wildfires in California have changed in the past several decades, including climate patterns and the development of human infrastructure near wildlands. The resulting impacts of wildfire on the IOUs' electric grid have resulted in increased costs, reduced safety and weakened reliability. Wildfire science lacks the fundamental underpinnings to forecast risk in a changing climate. Operational wildfire behavior models are empirical and cannot be adapted to predict extreme fire behaviors. Therefore, IOUs, State agencies and stakeholders relying on the grid lack scientifically robust information to make effective near-term management and long-term planning decisions.

Project Innovation + Advantages

The proposed research will advance wildfire science by incorporating the interaction of tree mortality and extreme fire weather in next-generation fire models. The project will develop zero-to-seven-day risk forecasts for the grid with predictive capabilities, computational efficiency and scalability. To support planning, the team will develop long-term fire projections using a coupled fire-climate-vegetation statistical and dynamical model to integrate the latest climate projections, tree mortality, development in the wildland-urban interface, and adaptation strategies. At both time horizons, the team will compare different approaches to addressing the multiple technical dimensions and converge on the first best path to the next generation of wildfire models. To integrate the models into electric utility management and planning, the team will facilitate workshops with IOUs. To support the Fifth assessment, the team will develop a web-based scenario analysis tool to visualize and manipulate the impacts of climate change and landscape/urban adaptation strategies on the grid.

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The development of next-generation wildfire risk forecasting models to provide actionable insights to make effective near-term management and long-term planning decisions

BENEFITS

The project will aid regulators and stakeholders in meeting statutory goals by addressing critical fire science gaps and applying the science to provide advanced forecasting capability. Specifically the project will: 1) Provide breakthroughs in the science of measuring, modeling and analyzing extreme weather events, tree mortality and fire spread at scale; 2) advance risk-modeling frameworks to include, identifying where wind extrema can occur, statewide maps of fuel loads in areas of elevated tree mortality, parameterization of fire risk models to incorporate latest science, and signals or tip-offs where risk forecasting underestimates fire risk due to gaps in science; and 3) advance the integration of science and technology.

Lower Costs: The primary project benefit results from improved decision-making by IOUs to reduce the cost of wildfire impacts to the grid. The decision-support tools developed during the project will be integrated into IOU operating practices to deliver a more reliable, safe and cost-effective grid.

Greater Reliability: With the use of more granular, dynamic fire-spread models, mitigation activities can be more precisely configured, making them consequently less extensive in scope. Such improvement in management will reduce fire damage to grid infrastructure and outages that would result from such damage. Examples of fire-hardening efforts against major fire events include pole pretreatments, equipment replacements or upgrades. Examples of measures to minimize de-energization impacts include splitting the distribution network and distributed/off-grid resource investments.

Increase Safety: Safety will be improved as IOUs can better plan for maintenance cycles to avoid areas of elevated fire risk reducing the risk of injury and loss of life.