DOCKETED	
Docket Number:	23-OPT-01
Project Title:	Fountain Wind Project
TN #:	263370
Document Title:	County of Shasta's Comments in Response to PyroAnalysis Comments at Public Hearing
Description:	County of Shasta's Comments in Response to PyroAnalysis Comments at Public Hearing
Filer:	Kari Cameron
Organization:	County of Shasta
Submitter Role:	Public Agency
Submission Date:	5/27/2025 12:53:00 PM
Docketed Date:	5/27/2025

2342 Shattuck Ave., ▪ Berkeley, CA 94704 ▪ Phone 510-922-2669

David Rich, Ph.D.
rich@reaxengineering.com

Maria Theodori, P.E.
theodori@reaxengineering.com

Memorandum

To: Adam Fieseler, Assistant Director Shasta County Department of Resource Management

From: David Rich., Principal, Reax Engineering Inc.

Date: May 27th, 2025

Subject: Response to Hearing Comments Presented by PyroAnalysis - Fountain Wind Energy Project – Wildland Fire Impacts

Dear Mr. Fieseler,

We are disputing Mr. Lauderdale's arguments that Reax Engineering is unqualified to complete the work, have failed to adequately implement the model employed, and have knowingly attempted to mislead Staff who reviewed the work.

Mr. Lauderdale states in the CEC hosted meeting of the Staff Assessment for the Fountain Wind Project held May 20th, 2025, that Reax was *"not qualified to do the work that Shasta County had them do"* (611). This combined with Lauderdale's opinion that "*there was lack of experience with the evaluators*" and "*not credible evidence for Staff to evaluate*", "*resulted in an understanding that by staff assessment that the impacts would actually exacerbate fire from what it is presently*" (600-608) and that and that "*they* (Reax) *assume that the models are going to be read by people that do not understand how models are used which to me* (Mr. Lauderdale) *is mislea*ding". (655-657). (Emphasis added).

Reax Qualifications

Mr. Lauderdale states that

> *"Reax is an extremely respected fire protection engineering company. They design systems like the sprinkler system, alarm systems, smoke control systems, all kinds of systems for protection of buildings" and "are also experts in fire code, application and fire investigation" (613-614).*

While the staff at Reax Engineering are well respected experts in application of codes, best practices and standards to questions of fire life safety (including wildland fire safety), we are **not** fundamentally in the

business of designing fire alarm, smoke control, or fire sprinkler systems. We have been providing scientific support for 16 years to wildland fire investigations, building developments (especially in WUI areas), and research (including wildland fire research) through experiments, modeling, analysis, and code review.

Reax began work in 2010 supporting the California Communication Infrastructure Provider (CIP) Coalition developing a wildland fire risk model to identify areas of California at elevated risk of experiencing catastrophic wildland fires. This "CIP Fire Threat Map", sometimes called the "Reax Map", was presented to the California Public Utilities Commission (CPUC) and accepted on an interim basis for CIPs to identify high fire risk areas. Reax went on to work as co-lead with the CPUC (along with Pacific Gas & Electric and San Diego Gas & Electric) on High Fire Threat District Mapping that identify areas where overhead electrical utilities present elevated or extreme risks of igniting damaging wildland or wildland urban interface fires. This map was adopted by the CPUC for regulatory purposes in 2018 and is currently used to promulgate regulations related to electrical utility fire safety in California (Staff reviewed this map in their Fountain Wind assessments[1]).

We are currently retained as experts on numerous wildland fires including all three Los Angeles area fires. We have been retained and qualified in court as experts or hired as experts in WUI development questions on many dozens of projects over the past 16 years. Members of our staff, past and present, have researched, presented, and published in numerous peer reviewed journals on subjects of wildland fire behavior, and modeling.

The lead modeler on the Fountain Wind project defended her PhD thesis on modeling fire interactions with structures at the wildland urban interface and she is a co-author of a book chapter titled, “Modeling Wildland and WUI Fires[2]”. She is expert in the application of the typical models used by fire managers and custom models, including one developed at Reax for the purpose of modeling wildland fire spread. She is a California Licensed Fire Protection Engineer.

The Project Manager completed a PhD on experimental evaluation of fire spread and ignition topics. He regularly conducts experimental programs on fire including wildland topics, often supported by modeling. He has led and authored many projects evaluating wildland fire hazards for developments in the WUI and has been qualified as an expert at trial on issues related to wildland fire hazards, also supported by modeling.

In both the hearing and a comment letter from the applicant (PyroAnalysis) regarding the REAX (Shasta County) fire spread modeling, Mr. Lauderdale broadly questions our ability to present these models based on our not being certified fire behavior analysists or fire control experts (615-617). On these subjects, we defer to Staff comments that,

> *“many fire behavior experts, including professors at universities, such as those that performed the modeling analysis for Shasta County perform sophisticated fire behavior modeling and analysis for the state of California, and publish their work in the peer-reviewed literature, without the specific qualifications listed in the applicant’s response letter to the County. Many are also not wildland firefighters; yet, they have a deep understanding of fire behavior patterns under diverse conditions, and like the County did, are able to incorporate the effect of fire suppression without simulating the actual suppression activities.”.*

Respectfully, considering these facts, we show that Mr. Lauderdale has mischaracterized our experience which strongly supports our qualifications to develop fire models informing Staff’s evaluation.

---

[1] California Energy Commission’s (CEC) Staff Assessment and environmental impact review for the Fountain Wind Energy Project, dated March 25, 2025 (TN# 262350).
[2] See SFPE Handbook 6th Edition (in press).

Adequacy of the Model

Mr. Lauderdale questions some of the approaches taken in our modeling. In particular, the specification of DC10 air tankers. We provide here, greater exposition of the assumptions supporting this approach.

One important starting point for the model is the premise that wind turbines will delay and/or reduce effectiveness of aerial firefighting. This subject is given thorough coverage in the Staff report with a review of interviews and letters which quote authoritative sources on the subject (bold emphasis added), e.g.,

> *Staff reviewed a detailed letter submitted by the Associated Aerial Firefighters and former Deputy Chief of CAL FIRE air operations that noted concerns that the project would pose* ***"serious impediments to aerial firefighting in Eastern Shasta County"*** *(Public 2023a TN249668). Staff reports that "the authors of the letter have significant experience with aerial firefighting including a retired CAL FIRE Deputy Chief of air tanker operations with 34 years of experience and a Current DC-10 retardant dropping pilot (Public 2023a TN249668)". Staff goes on to report that the letter states that the project* ***would "effectively create a no fly"*** *zone Fountain Wind Project that would greatly increase the risk that any wildfire that either began in the project site or spread into the project site from any surrounding area, could not be quickly contained, and would likely grow beyond the project area to out-of-control proportions. (Emphasis added.)*

Staff also reference interviews with Chief Sean O'Hara (CAL FIRE Unit and Shasta County Fire Department Chief Sean O'Hara) summarizing in their report,

> *In the event of a large wildfire within the project site, Chief Sean O'Hara has indicated that the* ***turbines would impair aerial firefighting at the site*** *(CEC 2024i TN 254899, CEC 2024h TN 254875)" and that that the project's turbine layout and smoke conditions from the wildfire would be a large impediment to using aerial assets near wind turbines. (Emphasis added.)*

However, staff comments on other letters, some submitted by PyroAnalysis, suggest the impediments of wind turbines to aerial firefighting are nuanced, i.e.,

> *Chief Bret Gouvea authoritatively addressed this concern, stating: "Aerial hazards do pose a safety concern for aerial firefighters; however, they are something we must work around on a daily basis" (Gouvea, 2021).*

Again, referring to the Staff report,

> *Chief O'Hara noted that several factors such as turbine spacing, fire conditions, and smoke would determine to what extent aerial assets could be used to help fight a wildfire onsite. Additionally, Chief O'Hara pointed out that the project's turbine layout and smoke conditions from the wildfire would be a large impediment to using aerial assets near wind turbines. Chief O'Hara indicated that based on the project layout there are only a few areas within the project's boundary that fixed wing aerial resources could be used, primarily in the northern part of the project site and along the project perimeter (CEC 2024i TN 254899).*

And as Mr. Brett Fooks from the Safety and Reliability Branch noted in his comments at the hearing,

> *"Several factors, such as turbine spacing. fire conditions and smoke, would determine to what extent aerial assets could be used to help to fight a wildfire on site" and that "before any aerial assets could be used, terrain, fire and weather conditions involved would have to be analyzed to determine if the aerial assets could be deployed safely". He also notes that "The project's layout would only allow for a few locations for fixed wing aerial resources to be used, though helicopters*

could potentially be used to fight a wildfire on the project, they would be subject to the same hazardous air conditions from a wildfire that would only be able to drop smaller loads of fire retardant" and that "local firefighting agencies could not provide the full suite of firefighting assets in the event of a wildfire at the project site".

The point from a modeling perspective is that the range of possible scenarios in a wildland fire and the approach to fighting it are numerous and complex. Trying to input these variables when addressing fire dynamics, variable terrain, available assets, response times, decision making processes, smoke obscuration and weather are complex and for the most part, not available to fire models. Reax sought a way to simplify these variables into an accurate but digestible reference for experts to assess the role that wind turbines might play in delaying delivery of the most effective aerial resources.

One approach was to take the arrival of large air tankers as a threshold for likely suppression of the fire.

Again, quoting from the Associated Aerial Firefighters and former Deputy Chief of CAL FIRE air operations letter,)

The most effective way to quickly contain wildfires in California is with the use of fixed wing aircraft that drop fire retardant (TN249668).

A non-peer reviewed industry study[3] reports that shorter initial time lapses between a fire being initially reported and the first air tanker assignment being filled are correlated with shorter fires and that fires with rapid initial air tanker response are less likely to "get out of control," as indicated by longer duration times. The research findings presented here suggest that the duration of forest fires could be reduced by the early deployment of air tankers but cautions that this research focuses on the correlations between air tanker use and the duration of fires with a recommendation for future analysis focusing on a causal relationship.

A 2005 study concludes that firefighting effectiveness directly influences fire growth potential, e.g., more than 97% of US wildland fires between 1995–2005 were extinguished during initial attack while they were very small (Stephens and Ruth 2005)[4]

Considering the complexities and differing opinions around use and effectiveness of smaller aerial assets, the difficulty with directly incorporating their suppression effects, the possibility raised by some experts that serious losses in effectiveness or setting of a no-fly zone could occur, and the effectiveness of large and very large air tankers, our model set forth a simple premise as follows:

We assume that without wind turbines, very large air tankers could reach the site within 6 hours based on their location in New Mexico, air speed, and fueling and retardant filling times. We also assume that they would have a reasonably high probability of contributing to extinguishing the fire quickly after their arrival. This scenario does not explicitly model suppression or tanker activity. It does not model other suppression activities before or after tanker arrival. It simply identifies the fire perimeters at 6 hours.

In a second scenario, the fire is assumed to burn through the wind farm (about 24 hours or longer) before very large air tankers can apply retardant. This added time increases the size of the fire when retardant is applied. The 24-hour results assume no suppression at all by ground crews or smaller aircraft or the synergy between fire breaks and application of retardant which, as discussed in detail in our report, would not be true in reality. Yet the purpose of the study is to visualize the potential impact of reduced air tanker access.

[3] The Impact of Utilizing Aerial Tankers in Fighting Forest Fires By Keith L. Waters, Ph.D. and Stephen S. Fuller, Ph.D. February 2020

[4] Stephens, Scott L., and Lawrence W. Ruth. 2005. Federal forest-fire policy in the United States. Ecological Applications 15 (2): 532–42

No assessment is made regarding whether the air tanker contributions result in extinguishing the fire at this stage, only the size of the fire is reported. This scenario is conservative (not apocalyptic[5]) and would likely (based in part on references above) represent a larger and more challenging fire to control due to the absence of early large tanker suppression following ignition.

For the reasons stated above, we respectfully disagree with the criticisms that Mr. Lauderdale has proffered and stand behind this model. The construction of a simple premise provides an easily digestible, conservative, but realistic sense of the role air tankers could play in combating a fire starting near the project site and subject to a no fly or reduced effectiveness of their capabilities. It is not intended to be a perfect representation of all fires or all outcomes. Models are used as tools for representation of phenomena, prediction, and experimentation in conjunction with other experts.

Accusations of Knowingly Misleading Staff

Mr. Lauderdale states in the Fountain Wind Hearings that **"**there was lack of experience with the evaluators" (609) and that "they (**Reax**) assume that the models are going to be read by people that do not understand how models are used which to me (**Mr. Lauderdale**) is misleading". (655-657). (Emphasis added).

Section 12-1 of the Fountain Wind Staff Assessment lists authors and reviewers. While we don't know what contributions were made, several individuals are listed with review designations of "Fire Protection" or "Hazards/Hazardous Materials/Wildfire". None are known to us but one of the resumes we reviewed describes an individual with over 100 peer reviewed publications in subjects related to wildland fire, with additional references to "modeling", "climate change", and "fuel breaks". She has PhD in a related field and has authored 10 book chapters in related subjects. She is/was on the Science Advisory Panel for the California Wildfire Safety Task Force, an Associate Editor with the International Journal of Wildland Fire and a Board Member with the California Wildfire Safety Advisory Board.

Noting that we don't know who made contributions, Staff review of wildland fire topics and modeling read as though highly qualified individuals in these areas were the authors. Characterizing them as lacking experience and people that do not understand how models are used seems premature.

Regarding the integrity of Reax Engineering and our employees. In the hearing, Mr. Lauderdale described Reax as "highly respected." Our lead modeler on this project is a Licensed California Fire Protection Engineer. A provision of the California Code of Regulations, Title 16, Division 5 § 400-476, Board Rules and Regulations Relating to the Practices of Professional Engineering requires that Professional Engineers are bound by a Code of Professional Conduct which includes, "§475 (7) "A licensee shall only express professional opinions that have a basis in fact or experience or accepted engineering principles."

Stating that Reax is assuming that our models won't be understood as a strategy for misdirection, seems unfounded on fact and cynical.

Maria Theodori, M.S., PE

Fire Protection Engineer
Reax Engineering

David Rich, PhD

Principal
Reax Engineering Inc.

[5] Annie Mudge. Cox Castle and Nicholson – Fountain Wind Hearing (568)