# Workshop Slides and Recording

## Development of the 2023 Wildfire Mitigation Plan Guidelines

The Office of Energy Infrastructure Safety (Energy Safety) held a workshop on the development of the development of the 2023 Wildfire Mitigation Plan Guidelines on April 22, 2022. The recording of the workshop can be found on Energy Safety's YouTube channel at https://youtu.be/OFt0SpZRqto. The slides shown during the workshop presentation are attached to this document.

In accordance with the Public Meeting Announcement[1] for this workshop, written comments will be accepted through May 6, 2022. Written comments should focus on 2023 Wildfire Mitigation Plan Guidelines development and may include topics not directly covered during the workshop. Written comments must be submitted to the 2023 Wildfire Mitigation Plans docket (2023-WMP)[2] and no longer than 25 pages. Supporting documents may be included as appendices or attachments and are excluded from the 25-page limit.

[1] https://efiling.energysafety.ca.gov/eFiling/Getfile.aspx?fileid=52256&shareable=true
[2] https://efiling.energysafety.ca.gov/EFiling/DocketInformation.aspx?docketnumber=2023-WMPs

# 2023 WMP Guidelines Pre-Draft Workshop

By Energy Safety

April 22, 2022

# Safety Message

- Beware of your surroundings
- Know your evacuation route(s)
- Feel something, say something
- Stand up and move

# AGENDA

| Friday, April 22nd, 2022 \| 9:00 a.m. – 4:30 p.m. PDT | |
|---|---|
| 9:00 – 9:20 a.m. | **Introduction** |
| 9:20 – 11:30 a.m. | **Restructuring of the Guidelines**<br>Presentation by Jensen Hughes (9:20 a.m. – 10:20 a.m.)<br>Break (10:20 a.m. – 10:30 am)<br>Public comments & questions (10:30 a.m. – 11:30 a.m.) |
| 11:30 – 2:15 p.m. | **Risk Assessment**<br>Presentation by Jensen Hughes (11:30 a.m. – 12:30 p.m.)<br>Lunch (12:30 p.m. – 1:15 p.m.)<br>Public comments & questions (1:15 p.m. – 2:15 p.m.) |
| 2:15 – 4:25 p.m. | **Maturity Model**<br>Presentation by Jensen Hughes (2:15 p.m. – 3:15 p.m.)<br>Break (3:15 p.m. – 3:25 p.m.)<br>Public comments and questions (3:25 p.m. – 4:25 p.m.) |
| 4:25 – 4:30 pm | **Final Remarks and Next Steps** |

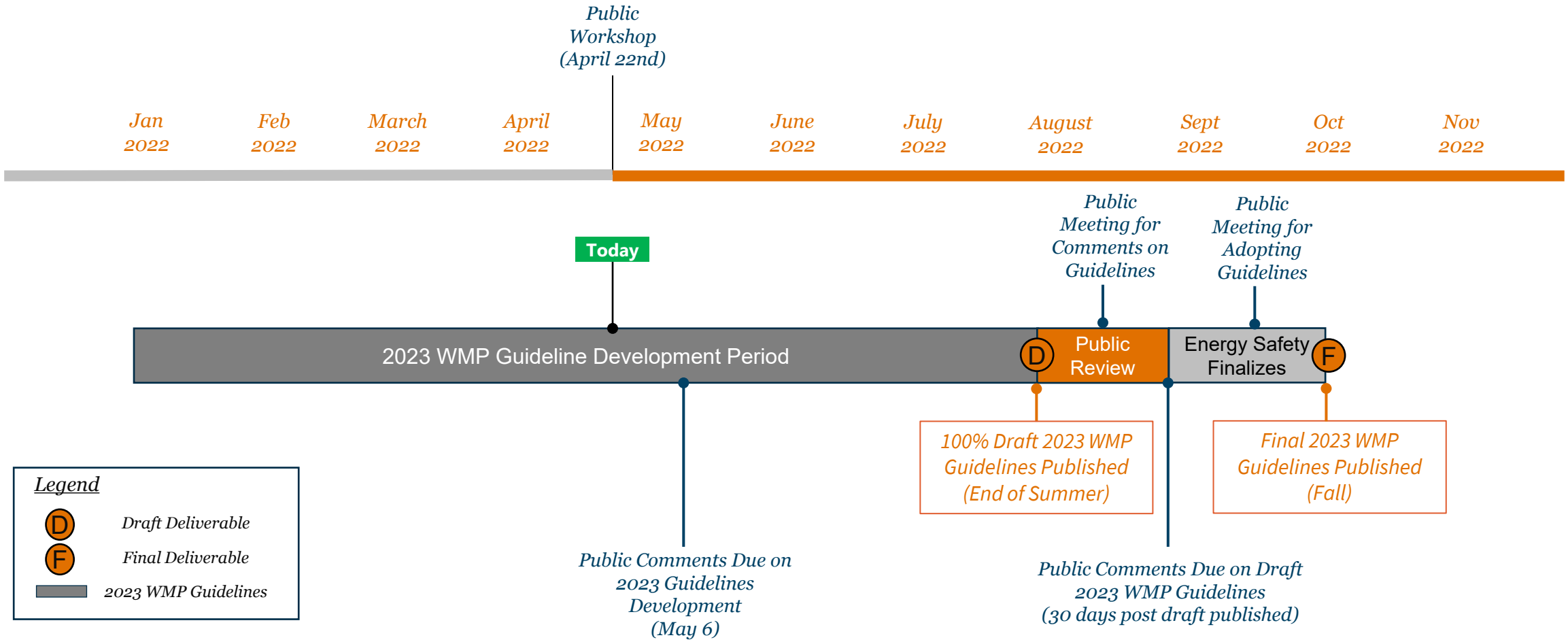
# WORKSHOP LOGISTICS

1. Please mute yourself during the session presentations.
2. Verbal comments and questions will be taken at the end of each session.
3. Please raise your hand on Zoom. We would love to hear feedback!
4. Written comments can be entered in the chat window at any time.
   - All comments will be recorded and evaluated for consideration.
   - Questions will be answered if time permits.
5. The workshop will be recorded and posted on Energy Safety's website.

# OBJECTIVES OF PUBLIC WORKSHOP

- Present key proposals for the upcoming 2023 – 2025 WMP Guidelines for discussion, including update years
- Proposals do not represent Energy Safety's final determination on 2023 WMP Guidelines
- Provide public with an early opportunity to ask questions and share feedback to help inform the Guidelines development process
  - Technical, administrative and process improvement suggestions
  - Lessons learned from 2020-2022 cycle

# 2023 WMP Guidelines Development – Est. Timeline



# Goals of 2023 – 2025 WMP Guidelines Development

**Primary Goal**

**Significantly Reduce Utility-Related Wildfire Risk**

**Secondary Goals**

- Optimize WMP Submissions
- Optimize Evaluations
- Optimize Compliance Division Assessments
- Increase Regulatory Maturity of WMP Program
- Increase Capacity for Comprehensive Risk Assessment

**Regulatory Maturity Categories**

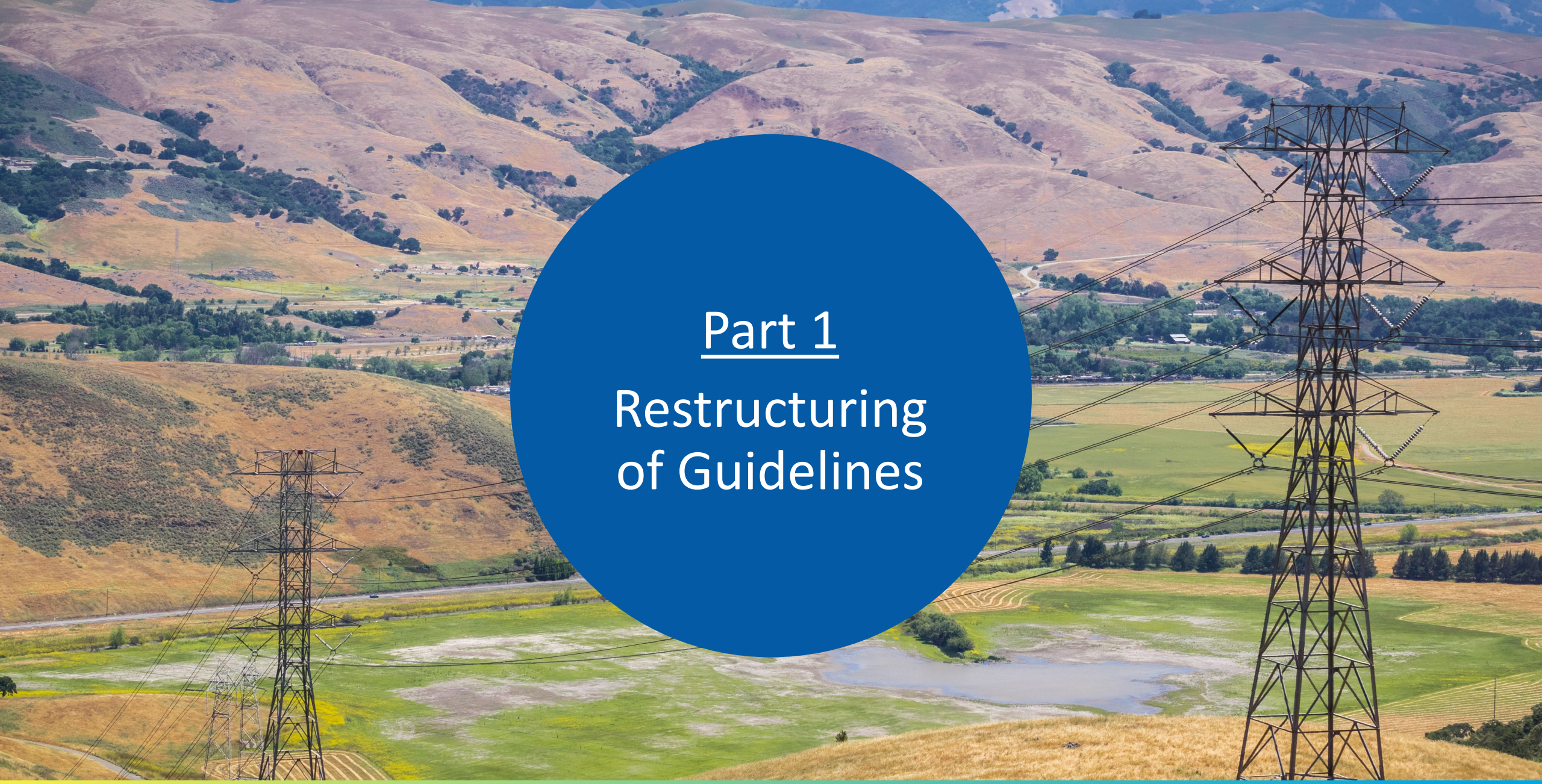
**9 Regulatory Maturity Categories**

- Legal Authority
- WMP Guidelines
- Consensus Standards
- Guidance Documents
- Evaluation Process
- Compliance
- Enforcement
- Stakeholder Participation
- Institutional Culture

# Session #1 Restructuring of the Guidelines

# SESSION OUTLINE

- Part 1: Restructuring the Guidelines
  - Overview of existing structure
  - Key proposals for consideration
- Part 2: Submission Timelines
  - Overview of current conditions
  - Key concepts that are currently under evaluation
- Part 3: WMP Update Guidelines
  - Overview of existing WMP Update Guidelines
  - Key proposals for consideration



# Part 1

# Restructuring of Guidelines

# 2020 – 2022 WMP GUIDELINES

- Consists of several attachments (e.g., 2022 Update Guidelines)
  - Attachment 1 = Summary of Changes
  - Attachment 2 = WMP Guidelines
  - Attachment 3 = WMP Quarterly Report
  - Attachment 4 = Maturity Model
  - Attachment 5 = Guidelines for Submission and Review
- Consists of supporting documents and external references
  - WSD Resolutions (e.g., WSD-001, WSD-002, WSD-011)
  - Statutes & Regs (e.g., 8386, 326, GOs, Decisions, Rulemakings)
  - Other standards, best practices and industry references

# Current WMP Guidelines – Scope & Structure

- Information **consolidated around theme(s)** and metric categories
- **Cross-reference multiple sections** of the WMPs
- Some **duplication of information**
- Emphasis on **reporting & gathering data**
- **Variability and volume of reporting**

***Outline for Existing WMP Guideline Instructions***

Introduction
Glossary of Terms
Section 1 – Persons responsible for executing the WMP
Section 2 – Adherence to statutory requirements
Section 3 – Actuals and Planned spending for mitigation plan
Section 4 – Lesson Learned and Risk Trends
Section 5 – Inputs to the plan and direction vision for WMP
Section 6 – Performance metrics and underlying data
Section 7 – Mitigation Initiatives
Section 8 – Public Safety Power Shutoffs (PSPS)
Section 9 – Appendix (Definitions of Initiative activities, and citations for relevant statues)

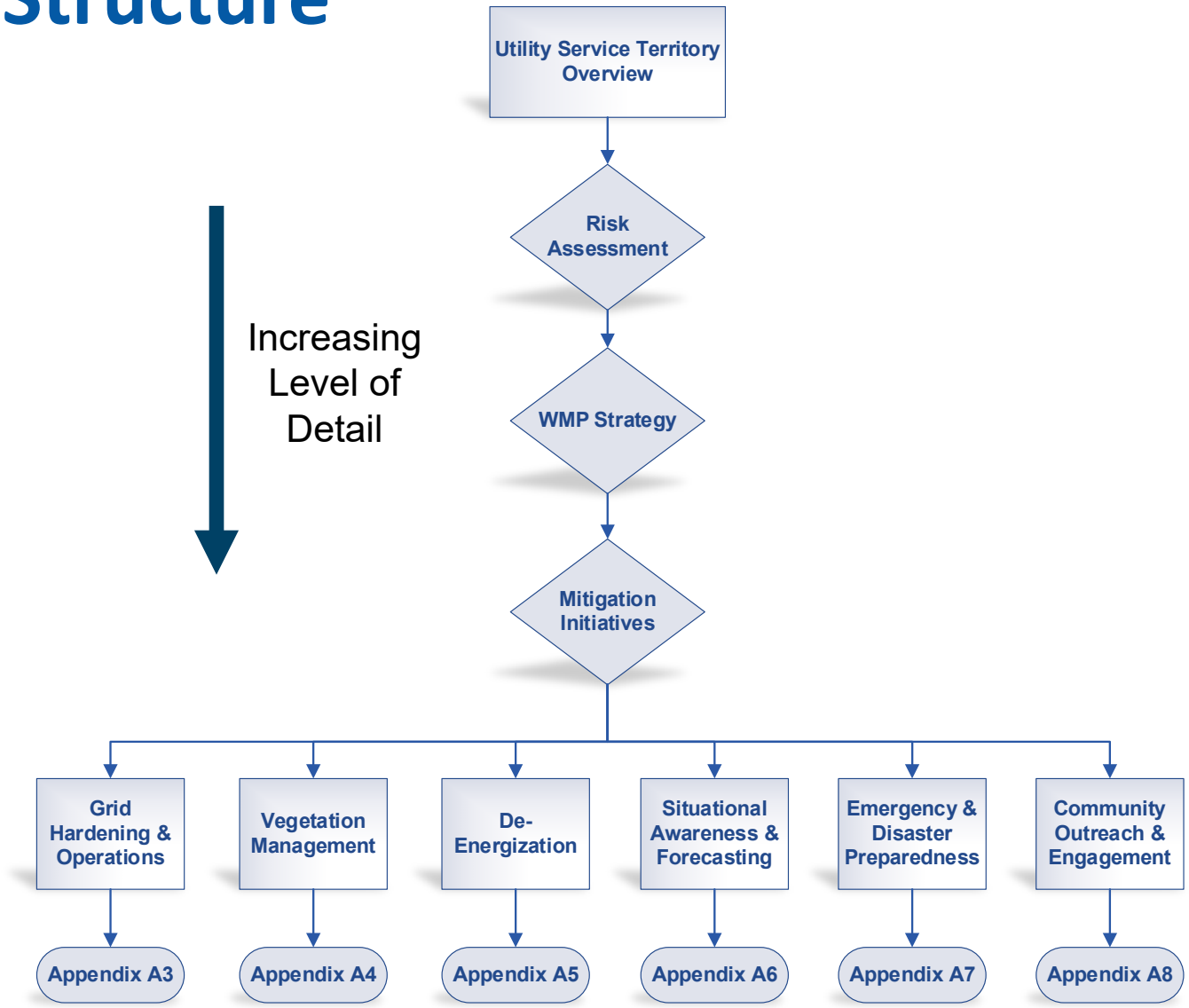
# Key Proposals – Scope & Structure

**Main Concept** = Streamline scope & structure of Guidelines to satisfy sub-goals (1) – (3)

- Provide top-down problem-solving format
- Provide dedicated sections for mitigation initiatives
- Streamline WMP main body to key narratives and metrics
- Consolidate administrative and technical requirements into one comprehensive document
- Standardize WMP submission with a .doc template

# Key Proposals – Scope & Structure

| |
|---|
| **Chapter C** – WMP Instructions |
| Section 1 – Persons responsible ***(No Major Changes)*** |
| Section 2 – PUC 8386 Compliance Matrix ***(No Major Changes)*** |
| Section 3 – Utility Service Territory Overview |
| Section 4 – Risk Assessment |
| Section 5 – Wildfire Mitigation Strategy |
| Section 6 – Mitigation Initiatives |
| Section 6.1 – Grid Hardening & Operations |
| Section 6.2 – Vegetation Management |
| Section 6.3 – De-energization |
| Section 6.4 – Situational Awareness and Forecasting |
| Section 6.5 – Emergency & Disaster Preparedness |
| Section 6.6 – Public Education and Community Engagement |
| Section 7 – Compliance Division Checklist |
| Appendix A – Supporting documentation<br>A.1 Risk Models & Assessment<br>A.2 Wildfire Mitigation Strategy<br>A.3 Grid Hardening & Operations<br>A.4 Vegetation Management Plans<br>A.5 De-Energization Plans<br>A.6 Situational Awareness Plans & Documents<br>A.7 Emergency & Disaster Preparedness Plan<br>A.8 Community Outreach and Engagement Plan |
| Appendix B – Quarterly Report Non-Spatial Data ***(Minor Changes)*** |
| Appendix C – Maturity Model |



# Key Proposals – Scope & Structure – Section 3

**Reference to 2022 WMP Guidelines**

- Section 5.1 and 5.2

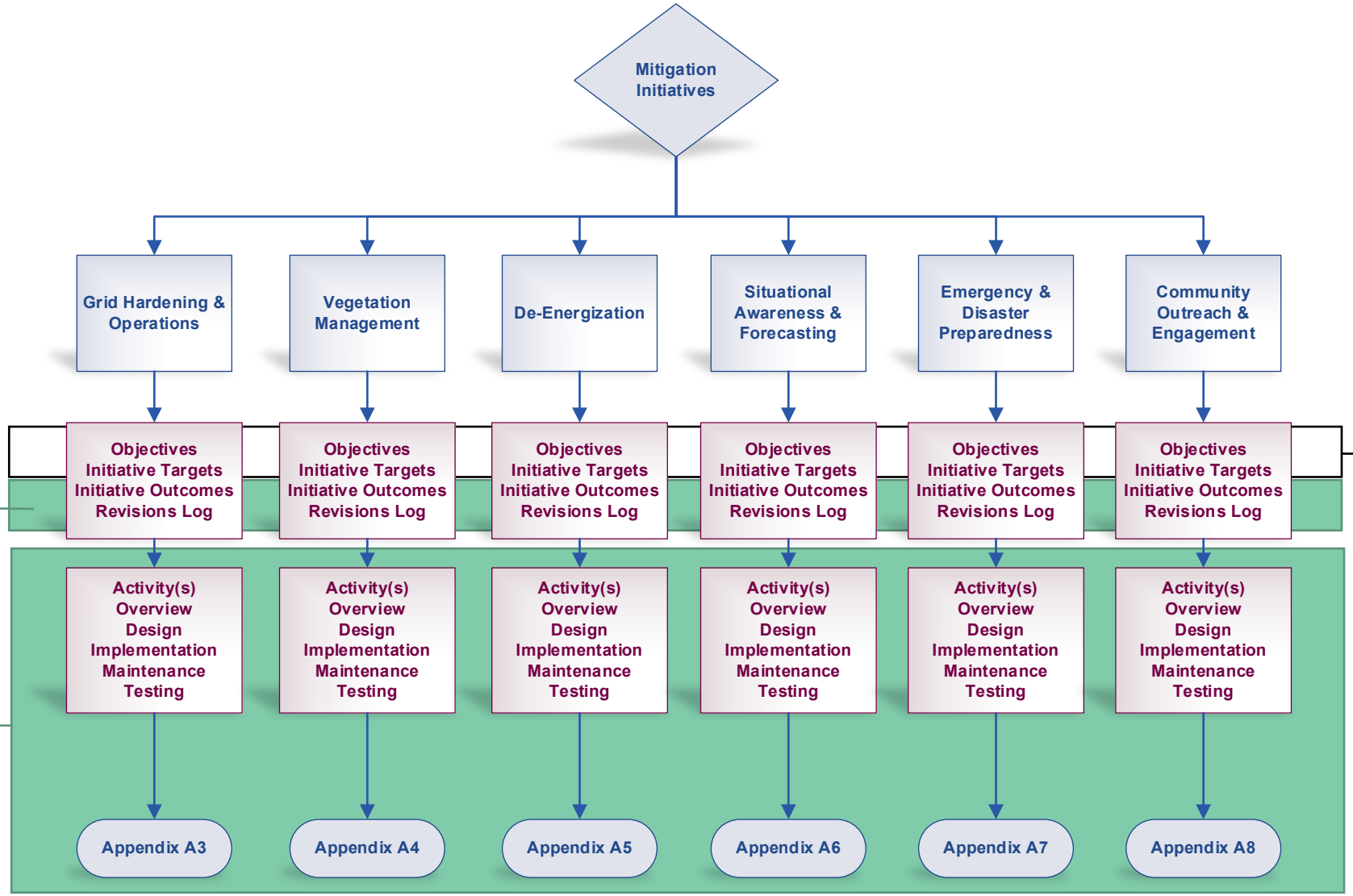
## *Section 3: Utility Service Territory Overview*

- Goal of WMP
- Objectives of WMP
- Overview of Utility Territory and System
  - Service Territory
  - Utility Electrical Infrastructure
  - Projected Growth Plans
- Overview of Wildfire Environmental Settings
  - Fire Ecology
  - Fire History
  - CPUC High Fire Threat Districts

New

- Vegetative Coverage
- Weather
- Climate and Climate Change
- Overview of Communities at Risk
  - Distribution of Urban, Rural and Highly Rural
  - Distribution of Communities-at-Risk
  - Distribution of Access & Functional Needs populations (AFN)
  - Single Access/Egress Capacities

# Key Proposals – Scope & Structure – Section 6




New
- Some QDR
- Modified 4.6

Modified Section 7.3
- New organization
- Maturity Model alignment
- Implementation details
- Standards and best practices
- Verifications

Modified, Sections
- 5.2 - 5.3

# Key Proposals – Dedicated Mitigation Initiative Sections

**Reference to 2022 WMP Guidelines**

- Section 4.1, 4.6
- Section 5.3, 5.4
- Section 6
- Section 7

Modified Section 7.3

- New organization
- Maturity Model alignment
- Implementation details
- Standards and best practices
- Verifications

## *(Exemplar) Section 10: Emergency & Disaster Preparedness*

**10.1 Introduction**
- 10.1.1 Overview of Initiative Program
- 10.1.2 Objectives for Initiative Program
- 10.1.3 Plan Program Targets
- 10.1.4 Plan Program Outcomes and Leading Indicators
- 10.1.5 Key Revisions

**10.2 Emergency and Disaster Preparedness & Planning**
- 10.2.1 Emergency and Disaster Planning
  - 10.2.1.1 Wildfire Emergency and Disaster Plan Integration
  - 10.2.1.2 PSPS Emergency and Disaster Plan Integration
- 10.2.2 State, County and Local Agency Coordination
  - 10.2.2.1 State, County and Local Agencies in Service Territory
  - 10.2.2.2 Memorandums of Understanding and Agreement
  - 10.2.2.3 Government Stakeholder Engagement and Feedback
- 10.2.3 Phasing and prioritization strategy
- 10.2.4 Staff and Vendor Training
  - 10.2.4.1 Personnel Staffing and Qualifications
  - 10.2.4.2 Personnel Training
  - 10.2.4.3 Vendor Training
- 10.2.5 Drills, Simulations and Tabletop Exercises
  - 10.2.5.1 Internal drills and exercises
  - 10.2.5.1 External drills and exercises
- 10.2.6 Schedule for Updating and Revising Plan

**10.3 External Notification and Communication Strategies**
- 10.3.1 Policies, protocols and procedures for Agency Notification
- 10.3.2 Roles and Responsibilities for Coordinating Public Communications

**10.4 Preparedness and Planning for Service Restoration**
- 10.4.1 Personnel Qualifications
- 10.4.2 Personnel Allocation and Schedule

**10.5 Policies, Practices and Procedures for Learning after Wildfires**
- 10.5.1 Overview
- 10.5.2 Monitoring, Data Collection and Evaluation
- 10.5.3 External Audits and Evaluations
- 10.5.4 Corrective action planning
- 10.5.5 Process for change

**10.6 Policies, Practices and Procedures for Learning after PSPS**
- 10.6.1 Overview
- 10.6.2 Monitoring, Data Collection and Evaluation
- 10.6.3 External Audits and Evaluations
- 10.6.4 Corrective action planning
- 10.6.5 Process for change

# Key Proposals – Dedicated Mitigation Initiative Sections

## *Exemplar Initiative Objectives Table*

New

*Table 10-1. Exemplar Emergency and Disaster Preparedness Initiative Objectives (3-year plan)*

| Objectives for Three Years (2023 – 2025) | Applicable Regulations, Codes, Standards and Best Practices[1] | Means of Verification (e.g., program plan, training records) | Target Completion Date | Reference[2] (Section # and Page #) |
|---|---|---|---|---|
| Modernization and enhancements of workforce training in the areas of storm response, process and documentation | e.g., Best Practices per Working group, IEEE …. | Training materials and training records | 05/01/2024 | Appendix A.1, pg. A15 |
| Collaborate with 211 in San Diego and Orange County to continue to support AFN customers | e.g., GO 95 | | | |
| Enhance community outreach by incorporating effectiveness outreach survey feedback, expanding Tribal and AFN campaigns, enhancing partnerships with Indian Councils, Community Based Organizations (CBOs) and local school districts | | | | |
| Continue maintenance of emergency response plans using an ICS structure and process | Incident Command System (ICS) | Revision log in Emergency & Disaster Preparedness Plan | Ongoing | Appendix A.1, pg. A20 |
| *Note 1: An asterisk is provided where the utility exceeds a particular code, regulation, standard or best practice.* *Note 2: Where the utility exceeds a particular code, regulation, standard or best practice, the utility must provide reference to the appropriate Appendix section and page where further documentation, justification and substantiation is provided.* | | | | |

# Key Proposals – Dedicated Mitigation Initiative Sections

## *Exemplar Initiative Outcome-Based Targets*

*Table 10-4. Exemplar Emergency and Disaster Preparedness Metrics for Measuring Outcome-Based Results (3-year plan)*

| Outcome-Based Metrics | Outcome-Based Targets by Year | | | | | | | | | | | | Units | Means of Verification (e.g., 3rd party evaluation, QDR) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2020 | | 2021 | | 2022 | | 2023 | | 2024 | | 2025 | | | |
| | Projected | Actual | Projected | Actual | Projected | Actual | Projected | Actual | Projected | Actual | Projected | Actual | | |
| • | | | | | | | | | | | | | | |
| • | | | | | | | | | | | | | | |
| • | | | | | | | | | | | | | | |
| • | | | | | | | | | | | | | | |
| • | | | | | | | | | | | | | | |
| • | | | | | | | | | | | | | | |
| • | | | | | | | | | | | | | | |

# Key Proposals – Administrative Chapters

| *Chapter or Section# and Title* |
|---|
| **Preface** |
| **Chapter A** – Scope and Administration |
| **Chapter B** – Definitions |
| **Chapter C** – WMP Instructions |
| Section 1 – Persons responsible |
| Section 2 – PUC 8386 compliance matrix |
| Section 3 – Utility WMP Overview |
| Section 4 – Risk assessment |
| Section 5 – Wildfire Mitigation Strategy |
| Section 6 – Mitigation Initiatives |
| Section 6.1 – Grid Hardening & Operations |
| Section 6.2 – Vegetation Management |
| Section 6.3 – De-energization |
| Section 6.4 – Situational Awareness and Forecasting |
| Section 6.5 – Emergency & Disaster Preparedness |
| Section 6.6 – Public Education and Community Engagement |
| Section 7 – Compliance Division Checklist |
| Appendix A – Supporting Documentation |
| Appendix B – Quarterly Report Non-Spatial Data |
| Appendix C – Maturity Model |
| **Chapter D** – WMP Submission Template (WMP Format) |
| **Chapter E** – Referenced Codes, Standards and Best Practices |
| **Chapter F** – WMP Update Guidelines (TBD) |

Admin (Preface, Chapters A & B)

WMP Instructions *(highlighted in yellow)*

Admin (Chapters D – F)

**Administrative Chapters**

- General WMP Guidelines Instruction
- (A) Powers & Duties
- (B) Definitions
- (D) Template
- (E) References
- (F) WMP Update Guidelines

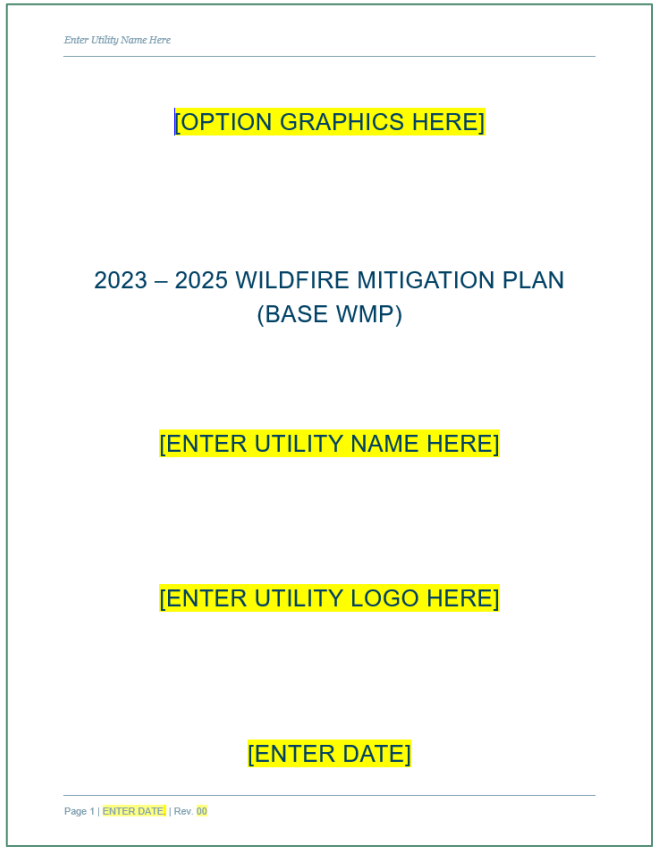
# Key Proposals – WMP Submission Template

**Reference to 2022 WMP Guidelines**

- n/a

## *Chapter D – WMP Submission Template*

- All WMP sections are standardized
- Standard narratives
- Standard tables
- Standards for data visualizations


Enter Utility Name Here

[OPTION GRAPHICS HERE]

2023 – 2025 WILDFIRE MITIGATION PLAN
(BASE WMP)

[ENTER UTILITY NAME HERE]

[ENTER UTILITY LOGO HERE]

[ENTER DATE]

Page 1 | ENTER DATE | Rev. 00

# Key Proposals – Administrative Chapters

**Reference to 2022 WMP Guidelines**

- Appendix 9.2

## *Chapter E – Codes, Standards & Best Practices*

- Table of referenced codes & standards by Section
- Best Practices provide additional clarification and guidance that can be used as a reference
- (Near and long-term goals) – Best practices for implementing an approach, calculation method, mitigation initiative etc. that is not an established standard.
  - ***Example = Outcome of Risk Modeling working group.***

# Part 2

# Submission Timelines

# Submission Timelines Discussion

**2022 Submissions**

- Large IOUs
  - February
  - 1 week stagger
- SMJUs/ITOs
  - May
  - No stagger

## *Current WMP Submission Timeline*

- **Pros**
  - Simultaneous cross-utility comparison
  - Equitable utility WMP preparation time
- **Cons**
  - All Large IOUs WMPs are evaluated (by Energy Safety) or reviewed (by public) simultaneously
  - Due to large volume of submissions and time constraints
    - Difficult to dive deeply into each WMP

# Submission Timelines Discussion

- What is the best timeline for WMP submissions to satisfy the following:
  - 3-month statutory evaluation period
  - Cross-utility comparisons
  - Public review and feedback

  Sample options: 1-,2-,3-weeks stagger; 1-year stagger
- What is the best approach to getting the WMP evaluation period, 1-year ahead of the period-of-application?

  Sample options: One-time 4year WMP

# Part 3
# WMP Updates

# 2021 and 2022 WMP Update Guidelines

- Current 2021 and 2022 WMP Update Guidelines
  - Did not restrict what utilities were permitted to add, modify, remove or replace in their 2020 – 2022 WMP, Base Plan

- 2021 WMP Update Submissions
  - Essentially **full WMPs**
  - Included **significant amount of new mitigation** strategies, implementations, operations, maintenance and inspection plans
  - **Limited summary, explanation or substantiation of changes** to strategy, mitigation initiatives, targets or other features.
  - **Challenging for utility to demonstrate progression** (with year-over-year changes)
  - **Challenging for utility to substantiate effectiveness of overall strategy and specific initiatives** in reducing wildfire and PSPS risk (with year-over-year changes)

# Key Proposals – WMP Updates

**Main Concept** = Limit WMP Update to (a) progress reporting and (b) permissible revisions to the base, 3-year WMP

1. Terminology
2. Progress Reporting
3. Permissible Revisions to Base WMP
4. Scope and Structure
5. Standard Template for WMP Update

# Key Proposals for WMP Updates – Terminology

**Existing Guideline Terminology**

- 2020 WMP Guidelines
- 2021 WMP Update Guidelines (“2021 Guidelines”)
- 2022 WMP Update Guidelines (“2022 Guidelines”)

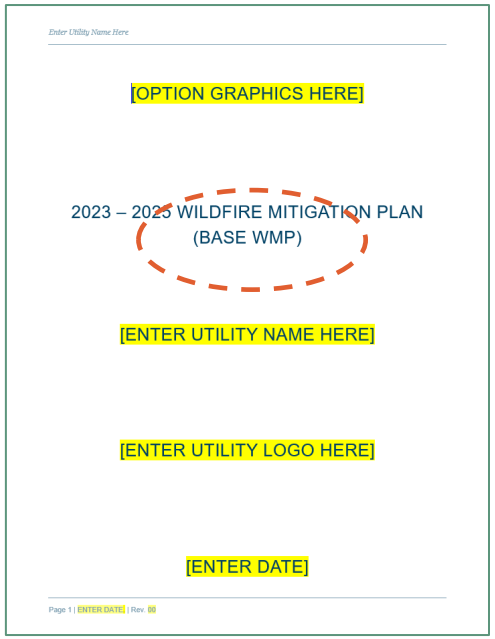
**Existing WMP Terminology**

- YYYY WMP
- YYYY+1 WMP Update

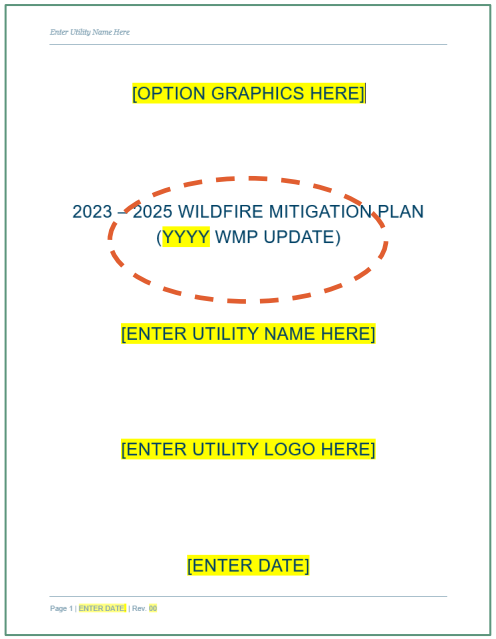
## *1. Proposed Terminology*

- Guidelines = “2023 – 2025 WMP Guidelines”
- WMP Update Guidelines = “2024 & 2025 WMP Update Guidelines“

Year 2023, “Base WMP”




Year 2024 or 2025, “YYYY WMP Update”



# Key Proposals for WMP Updates – Progress Reporting

## *2. Progress Reporting*

- Progress updates to risk maps (Session #2)
- Progress updates on tabulated data
  - Mitigation initiative objectives (previously Table 5.1)
  - Mitigation initiative targets (previously Table 5.2)
  - Mitigation initiative outcomes (new table)
  - QDR data (non-spatial data + GIS data)
- Discrepancies
  - Narratives to explain higher/lower performance
  - Proposed action plan to get back on track

| **Indicators for Three Years (2023 – 2025)** | **Means of Verification** | **Status** **(Completed, In-Progress, Not Started)** | **References for Substantiation and Verification in Appendix** (Appendix #, Page #) |
|---|---|---|---|
| (e.g., Modernization and enhancements of workforce training in the areas of storm response, process and documentation) | | | |
| (e.g., Collaborate with XXX Counties to continue to support AFN customers) | | | |
| (e.g., Enhance community outreach by incorporating effectiveness outreach survey feedback, expanding Tribal and AFN campaigns, enhancing partnerships with Indian Councils, Community Based Organizations (CBOs) and local school districts) | | | |
| (e.g., Continue maintenance of emergency response plans using an ICS structure and process) | | | |
| Participate and support Mutual Assistance Programs | | | |
| … | | | |

# Key Proposals for WMP Updates – "Permissible" Revisions

**Reference to 2022 WMP Guidelines**

- No restrictions on adding, modifying, removing or replacing features or components of Base WMP
- Utilities permitted to revise any aspect in the "off-years"

## *3. Proposed "Permissible" Revisions*

A. **Areas for Continued Improvement**

B. **Errata** from prior year

C. **Approved Change Orders** from prior year

D. **Addition, modification** or **elimination** of **operational policies, practices and procedures** for mitigation initiative(s) and activity(s)

E. **Approved Petitions** (new process)

# Key Proposals for WMP Updates – "Permissible" Revisions

**Reference to 2022 WMP Guidelines**

- n/a

## *Petition Process Concept ("New")*

- Provide Utilities with the opportunity to propose changes, that meet pre-defined criteria, not already permitted via Items A to D
- Utilities submit petition to Energy Safety the year prior to the next WMP Update (e.g., August – December)
- "Approval" of a petition does not imply acceptance of the proposed change, but permission for utilities to include it in their WMP Updates for evaluation

# Key Proposals for WMP Updates – Scope & Structure

## *4. Scope & Structure: Key components*

A. Revision log

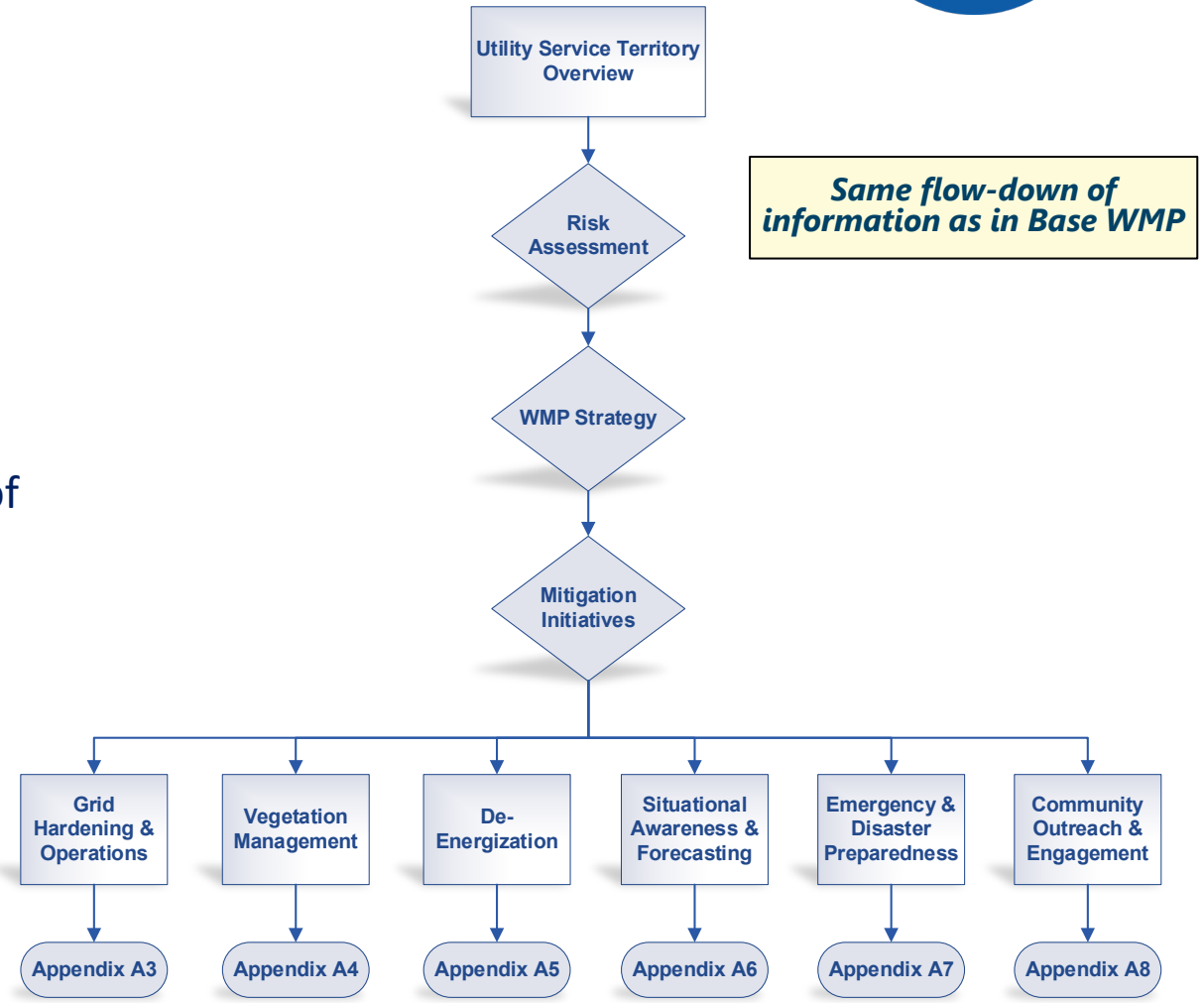
B. Re-run Risk Assessment

C. Mitigation Initiatives Update
   - Progress reporting
   - Additions, modifications and elimination of operational policies, processes and procedures

D. Maturity Model Updates

E. Compliance Division Corrective Action(s)

F. Appendices – Detailed Substantiation of Updates




***Same flow-down of information as in Base WMP***

# Key Proposals for WMP Updates – Scope & Structure

## *A. Revision log in "WMP Update" Report*

- Identify and summarize all "permissible" revisions to the utility Base WMP

**"Permissible" Revisions**

- Areas for Continued Improvement
- Errata from prior year
- Approved Change Orders from prior year
- Operational policies, practices and procedures
- "Approved" Petitions (new)

| ID # | Year of Revision | Type of Revision | Lesson-Learned in 2020-2022 | Revision Description | Reference |
|---|---|---|---|---|---|
| 1 | 2021 | Operational lesson-learned | Due to the increased weight introduced to distribution lines from the installation of covered conductors, [utility] observed significant harmonic frequencies that amplified line oscillations particularly during high-wind events. As the utility determined these oscillations to be a critical safety concern, a revision to the base design strategy was required. | Where covered conductors are installed on distribution lines in [utility's territory], dampers will also be installed to offset wind harmonics and other safety critical oscillations. | Title of Covered conductor analysis report, dated MM/DD/YYYY |
| 2 | 2022 | Errata | | | |
| 3 | 2022 | Area of Continued Improvement | | | |
| … | 2022 | Approved Petition | | | |

# Key Proposals for WMP Updates – Scope & Structure

## *B. Re-run Risk Assessment*

- Re-evaluation of risk models given new data from the prior year, including updating associated figures and maps
- Substantiate changes to **prioritization** of mitigation initiative or activity based on re-run of risk model or risk assessment.
- **New Concept** = “Freeze” several aspects of risk assessment (next slide)

# Key Proposals for WMP Updates – Scope & Structure

## *B. Re-run Risk Assessment (continued…)*

- Freeze fundamental risk models
  - How to integrate risk modelling working group outcomes?
- Freeze process for risk-informed decision-making
- Freeze high-level mitigation strategy
  - **Not acceptable** = Changes in mitigation initiatives, mitigation activities and geospatial allocation of those
  - **Acceptable** = Changes in operations (policies, practices and procedures) or prioritization of initiatives and activities (i.e., schedule)

Note: Significant changes are possible, but must be proposed via the Petition Process to allow Energy Safety time to assess justifications

# Key Proposals for WMP Updates – Scope & Structure

## *B. Re-run Risk Assessment (continued…)*

- Post-wildfire and Near-Miss Retrospective Analysis

1. ***Data***

   Provide all relevant geospatial risk data tied to the incident (i.e., environmental, forecasted, actual and inspection data).

2. ***Analysis/ Evaluation***

   Identify process and equipment failures that lead to the ignition/ near-miss event. Compare forecasted results to actual conditions.

3. ***Remedial action***

   Describe remedial action plan(s), if any, based on evaluation

Similar Proposal
PSPS Retrospective Analysis

# Key Proposals for WMP Updates – Scope & Structure

## C. *Mitigation Initiative(s) Updates*

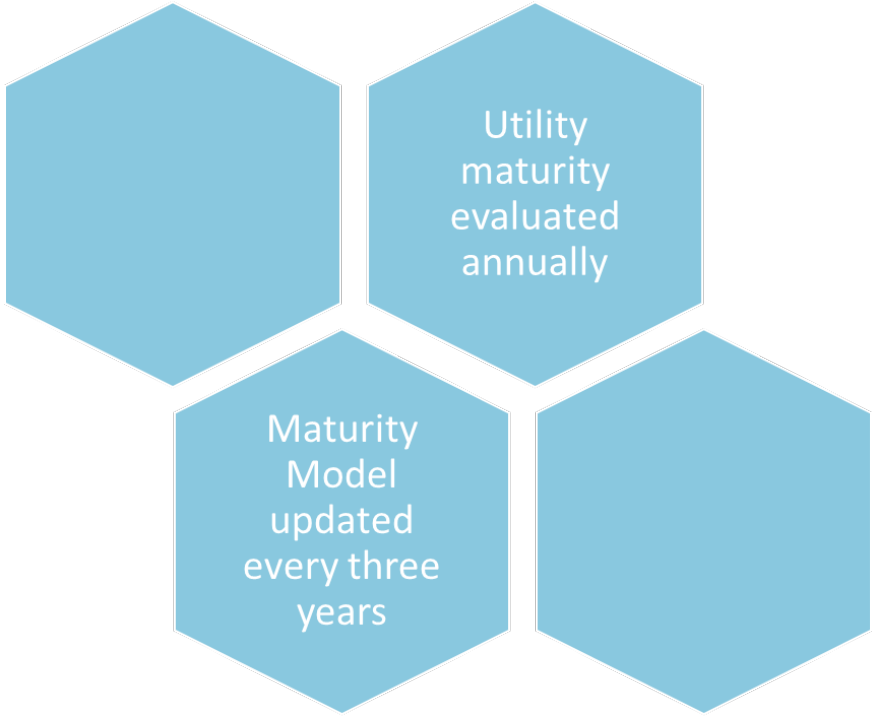
- Progress Reporting (covered in earlier slide)
- Update citation(s) for planning, design and implementation and maintenance documentation (e.g., O&M manuals, inspection plan reports), where modified since the Base WMP
  - Provide narrative on updates
  - Provide tracked changes, clouding, revision ID symbol, etc. for updated documents

| **Indicators for Three Years (2023 – 2025)** | **Means of Verification** | **Status** (Completed, In-Progress, Not Started) | **References for Substantiation and Verification in Appendix** (Appendix #, Page #) |
|---|---|---|---|
| (e.g., Modernization and enhancements of workforce training in the areas of storm response, process and documentation) | | | |
| (e.g., Collaborate with XXX Counties to continue to support AFN customers) | | | |
| (e.g., Enhance community outreach by incorporating effectiveness outreach survey feedback, expanding Tribal and AFN campaigns, enhancing partnerships with Indian Councils, Community Based Organizations (CBOs) and local school districts) | | | |
| (e.g., Continue maintenance of emergency response plans using an ICS structure and process) | | | |
| Participate and support Mutual Assistance Programs | | | |
| … | | | |

# Key Proposals for WMP Updates – Scope & Structure

## *D. Maturity Model Updates*

- Report on progress updates to capability maturity goals, objectives and targets
- Substantiate changes to planned maturity progression
- Provide narratives on any new mitigation activities or those that go above-and-beyond prescriptive standards for each maturity capability



# Key Proposals for WMP Updates – Scope & Structure

## *E. Compliance Division Violations and Defects*

- **Purpose:** To allow verification of feasibility of initiative objectives and targets
- **Main idea**: Provide summary table of key Compliance Division findings
  - Year of finding
  - Type of finding (violation or defect)
  - Narrative of corrective action
  - Status of corrective action

# Break

# Comments and Questions?

# Session #1 – Comments and Questions?

## *Guiding Questions*

- Restructuring of Guidelines
  - Do you think the proposed restructure is an improvement?
  - Any other suggestions that could better streamline the structure?
- Submission Timelines
  - Any initial thoughts on the best timeline for WMP submissions?
  - Any suggestions for getting 1-year ahead on evaluations?
- WMP Updates
  - Do you think Energy Safety should restrict changes in the WMP Update years?
  - What do you think of the petition process?
- What else would you like to see that we did not cover today?

# Session #2
# Risk Assessment

# SESSION OUTLINE

## *Risk Assessment and Modeling*

- Chapter Outline
- Review existing requirements
- Define risk and related concepts
- Provide overview of key changes to risk assessment requirements
- Provide overview of key changes to model substantiation requirements

## *Wildfire Mitigation Strategy*

- Chapter Outline
- Define risk-informed decision-making process
- Provide overview of key changes to risk-informed prioritization requirements
- Demonstrate risk-informed concepts

# Part 1

# Risk Assessment and Modeling

# SECTION 4 – RISK MODELING AND ASSESSMENT

- Introduction
  - Definitions of Risk and Risk Components
- Risk Analysis
  - Risk Analysis Requirements
  - Modeling Requirements
- Calculation of Key Metrics (not discussed in this talk)
- Service Area Risk Maps
- Data Governance
- Retrospective Analysis from Fires, PSPS, and Near-Miss Events
- Maturity Assessment (discussed in session 3)

***Reference to 2022 Guidelines***

- Sections 4.2 to 4.3
- Section 4.5
- Sections 7.1 to 7.3

**New or Expanded Requirements for 2023 WMP Submissions**

# 2022 GUIDELINES – RISK ANALYSIS REQUIREMENTS

## *Subset from 2022 WMP Guidelines, Table 2-2 (Statutory Compliance Matrix)*

| Requirement | Description |
|---|---|
| 3 | A description of the preventive strategies and programs to be adopted by the electrical corporation to minimize the risk of its electrical lines and equipment causing catastrophic wildfires, including consideration of dynamic climate change risks |
| 8 | Identification of circuits that have frequently been de-energized pursuant to a de-energization event to mitigate the risk of wildfire and the measures taken, or planned to be taken, by the electrical corporation to reduce the need for, and impact of, future de-energization of those circuits, including, but not limited to, the estimated annual decline in circuit de-energization and de-energization impact on customers, and replacing, hardening, or undergrounding any portion of the circuit or of upstream transmission or distribution lines |
| 12 | A list that identifies, describes, and prioritizes all wildfire risks, and drivers for those risks, throughout the electrical corporation's service territory, including all relevant wildfire risk and risk mitigation information that is part of the Safety Model Assessment Proceeding and the Risk Assessment Mitigation Phase filings |
| 13 | A description of how the plan accounts for the wildfire risk identified in the electrical corporation's Risk Assessment Mitigation Phase filing |
| 15 | A description of where and how the electrical corporation considered undergrounding electrical distribution lines within those areas of its service territory identified to have the highest wildfire risk in a commission fire threat map |
| 17 | Identification of any geographic area in the electrical corporation's service territory that is a higher wildfire threat than is currently identified in a commission fire threat map, and where the commission must consider expanding the high fire threat district based on new information or changes in the environment |
| 18 | A methodology for identifying and presenting enterprise-wide safety risk and wildfire-related risk that is consistent with the methodology used by other electrical corporations unless the commission determines otherwise |

# 2022 GUIDELINES – RISK ANALYSIS REQUIREMENTS

***Key Themes from 2022 WMP Guidelines, Table 2-2 (Statutory Compliance Matrix)***

Describe strategies and programs to minimize risk from: (3, 8, 13, 15)

- Catastrophic wildfires
- De-energization

Evaluating risk and prioritization of risk mitigation including: (12, 18)

- Alignment with S-MAP and RAMP
- Consistent with other utilities

Describe areas within service area which are high risk but not captured in existing High Fire Threat Districts (HFTD) (17)

# WHAT IS RISK ANYWAY?

***Risk***

A measure of the annual expected adverse effects from hazards considering the consequences (adverse effects) and frequency of the hazard occurring.

***Frequency***

The expected number of occurrences of a hazard over time.

***Consequence***

The adverse effects from an event considering the hazard potential, community exposure, and local vulnerability.

$$\textit{Risk} = \textit{Frequency} \; X \; \textit{Consequence}$$

$$\frac{\text{Consequence Magnitude}}{\text{unit of time}} \qquad \frac{\text{Events}}{\text{unit of time}} \qquad \frac{\text{Magnitude}}{\text{event}}$$

"Every decision related to fire safety is a fire risk decision, whether it is treated as such or not…We have discovered that we cannot make our fire safety decision-making process more scientific and quantitative unless we first place our new engineering tools into an appropriate fire risk analysis context. To do otherwise is to make many implicit assumptions about patterns of danger and preferences for certainty and for safety versus other human wants and needs."

- *Society of Fire Protection Engineers*, 2016

# WHAT IS RISK ANYWAY?

***Consequence***

The adverse effects from an event considering the hazard potential, community exposure, and local vulnerability.

$$\textit{Risk} = \frac{\text{Consequence Magnitude}}{\text{unit of time}} = \textit{Frequency} \times \textit{Consequence}$$

$$\textit{Frequency} = \frac{\text{Events}}{\text{unit of time}}$$

$$\textit{Consequence} = \frac{\text{Magnitude}}{\text{event}}$$

***Exposure***

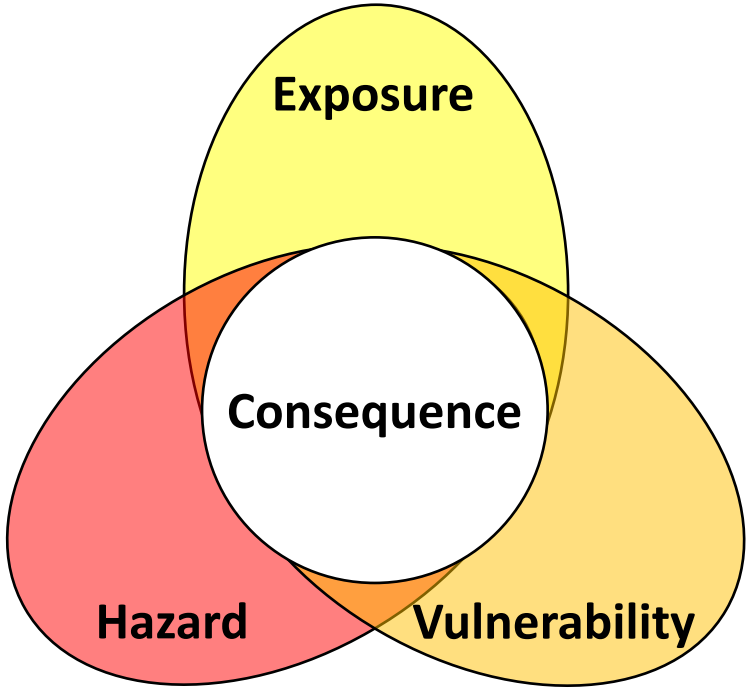
The presence of people, infrastructure, livelihoods, and environmental services and resources in places that could be adversely affected by a hazard

***Hazard***

A condition, situation, or behavior that presents the potential for harm or damage to people, property, or the environment.

***Vulnerability***

The predisposition of a community to be adversely affected by a hazard, including the characteristics of a person, group, or infrastructure that influences their capacity to anticipate, cope with, resist, and recover from the adverse effects of a hazard.



# RISK FRAMEWORK

***Overall Utility Risk***

Risk to the community from utility started wildfire and emergency de-energizations including the aggregate potential of adverse effects or damage to people, critical infrastructure, individual properties, or stakeholders in the community.

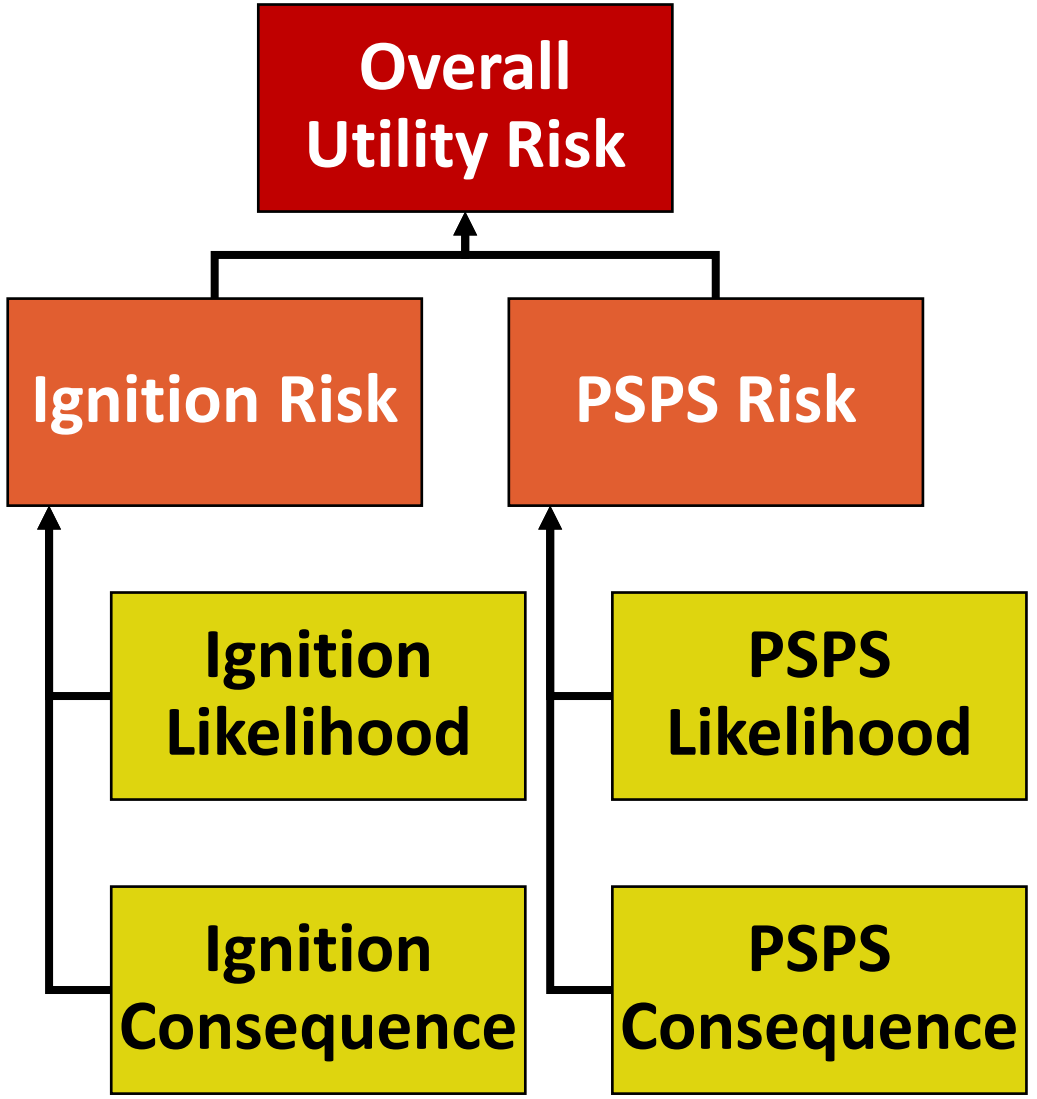
***Ignition Risk***

The total expected annualized adverse effects from utility ignitions at a specific location. This considers the likelihood that an ignition will occur, the likelihood that the ignition will transition into a wildfire, and the consequences that the fire will have for the community it reaches, including community-specific vulnerabilities.

***PSPS Risk***

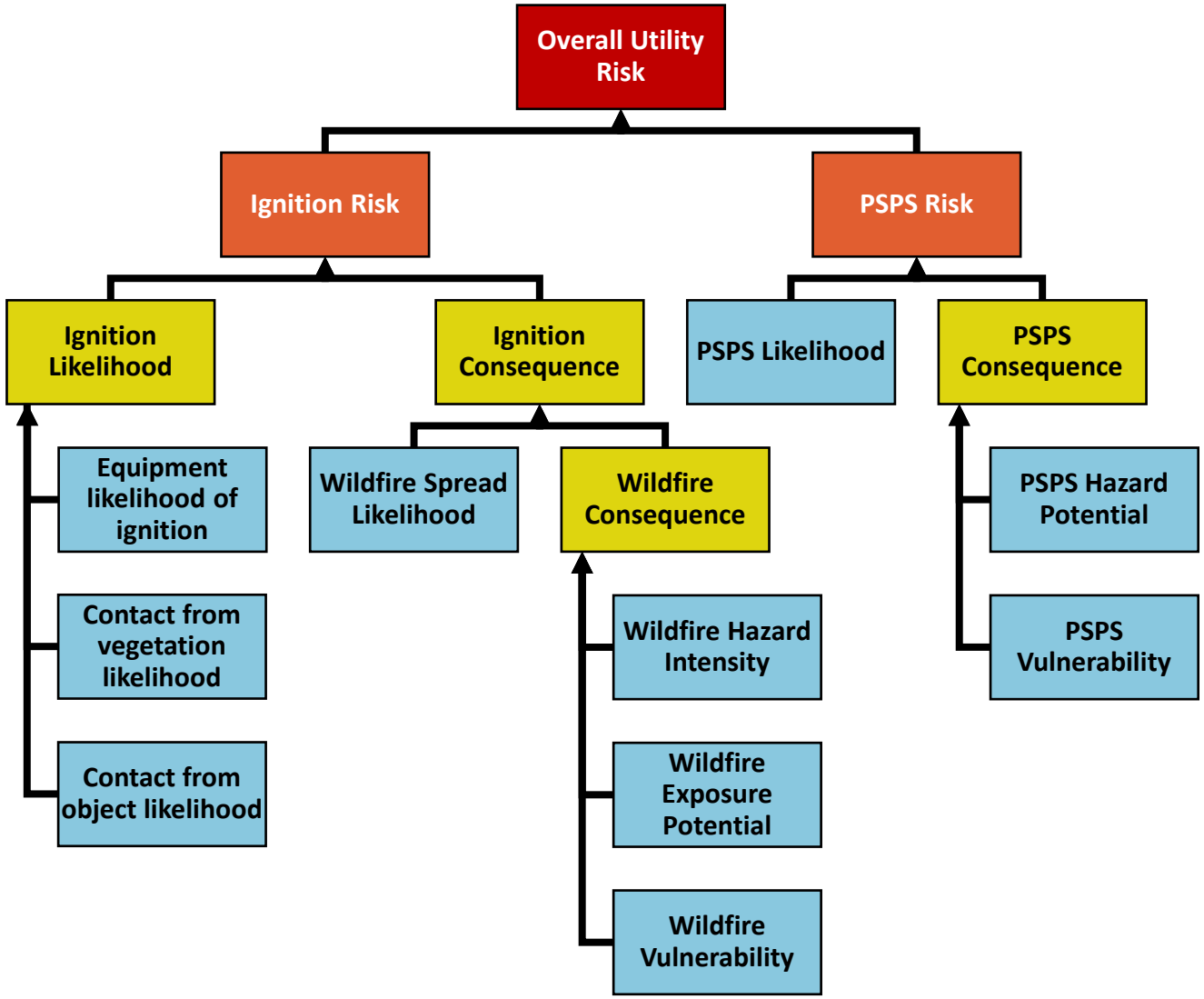
The total expected annualized adverse effects from a PSPS at a specific location. This considers the likelihood that a PSPS will occur due to environmental conditions exceeding design conditions and the consequences that the PSPS will have for the community in the service area, including community-specific vulnerabilities.

**Each hazard risk is composed of multiple risk components**



# RISKS AND RISK COMPONENTS

| Legend | Definition |
|---|---|
| **Overall Risk** | Annual adverse effects from utility started wildfires and wildfire prevention strategies. |
| **Ignition and PSPS Risks** | Annual adverse effects from a single hazard (either utility ignition or utility emergency de-energization). |
| **Intermediate Risk Components** | Intermediate combination of fundamental risk components which must be reported by the utility. |
| **Fundamental Risk Components** | Smallest component of risk which must be reported by the utility across their service area. |



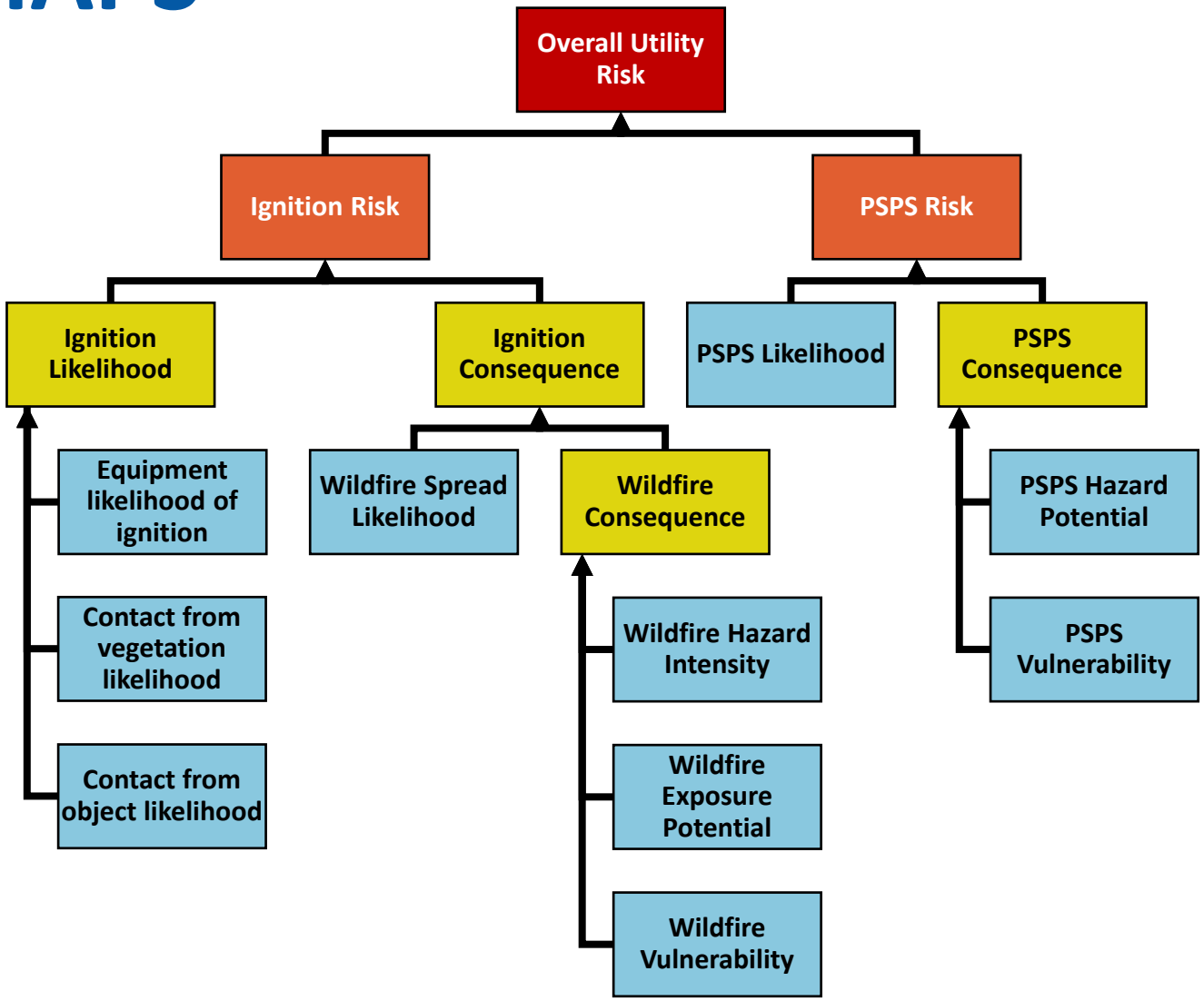
# RISKS AND RISK COMPONENTS

| Risk | Ignition and PSPS Risks | Intermediate Risk Components | | Fundamental Risk Components | Definitions |
|---|---|---|---|---|---|
| **Overall Utility Risk** | Ignition Risk | Ignition likelihood | | Equipment ignition likelihood | The likelihood that equipment will cause an ignition through normal operation or failure. |
| | | | | Vegetation ignition likelihood | The likelihood that vegetation will contact equipment and result in an ignition. |
| | | | | Object ignition likelihood | The likelihood that an object (such as balloons) will contact equipment and result in an ignition. |
| | | Ignition consequence | Wildfire spread likelihood | Wildfire spread likelihood | The likelihood that a fire with an unknown ignition point will spread to a given location based on a set of weather profiles, vegetation, and topography. |
| | | | Wildfire consequence | Wildfire hazard intensity | The potential hazard (intensity) that a wildfire poses when it reaches a specific location within the community. |
| | | | | Wildfire exposure potential | The presence of people, infrastructure, livelihoods, or economic, social, or cultural assets that are subject to potential future harm, loss, or damage (e.g., population, structures, acres burned, critical infrastructure). |
| | | | | Wildfire vulnerability | The predisposition of a community to be adversely affected by a wildfire, including all characteristics that influence their capacity to anticipate, cope with, resist, and recover from the adverse effects of wildfire. |
| | PSPS risk | PSPS likelihood | | PSPS likelihood | The likelihood of a PSPS occurring given a specific set of environmental conditions |
| | | PSPS consequence | | PSPS exposure potential | The potential hazard of a PSPS for a community including de-energization area and time delay for re-energization (e.g., population, critical infrastructure). |
| | | | | Vulnerability of community to PSPS | The predisposition of a community to be adversely affected by a PSPS, including all characteristics that influence their capacity to anticipate, cope with, resist, and recover from the adverse effects of PSPS. |

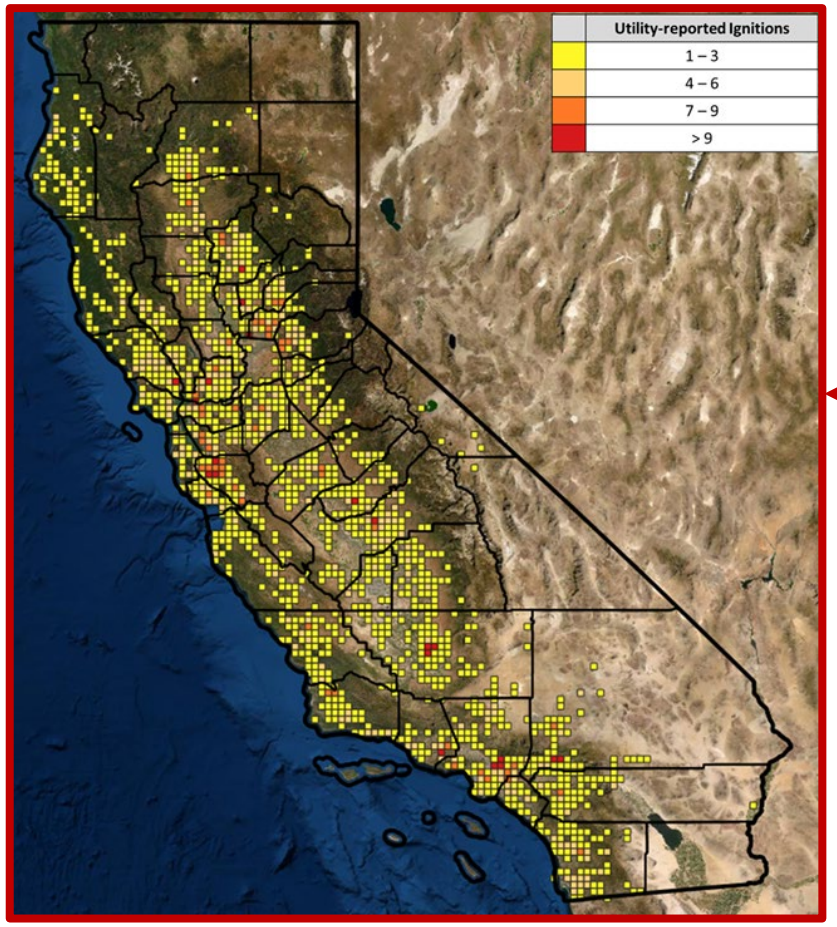
# SERVICE AREA RISK MAPS

***Requirements***

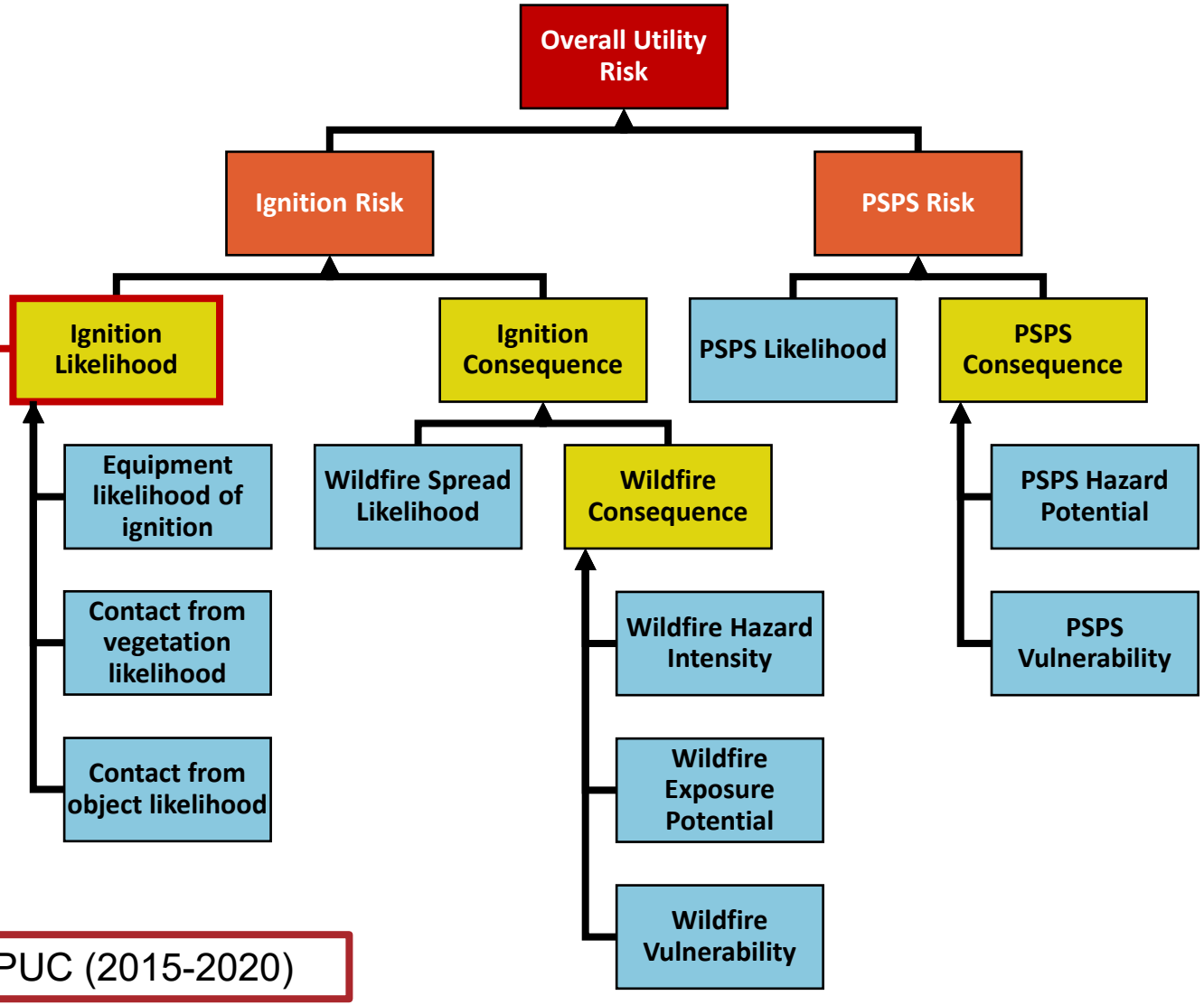
- Evaluate each risk and all risk components in service territory
- Maps of each risk and risk component in an appendix
- Map of high fire risk areas not included in HFTD
- Spatial data submission of risk, risk components, and HFRA



# DEVELOPMENT OF SERVICE AREA RISK MAPS (EXAMPLE)

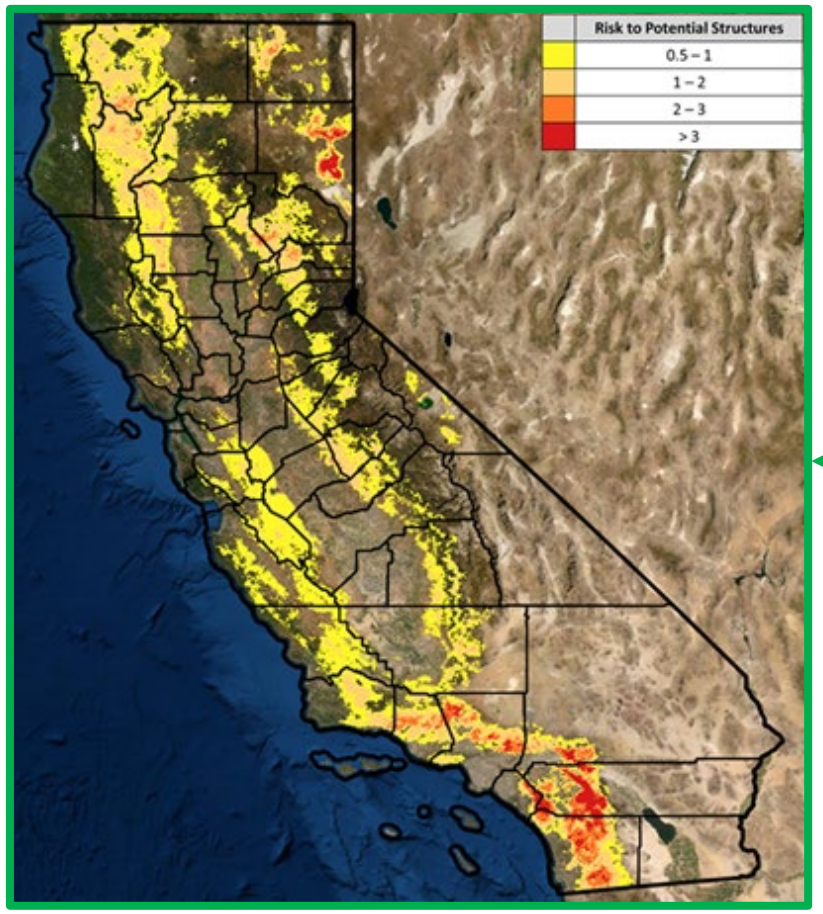



**Ignition Likelihood**
(i.e., how likely is a location to have an ignition from equipment or contact)

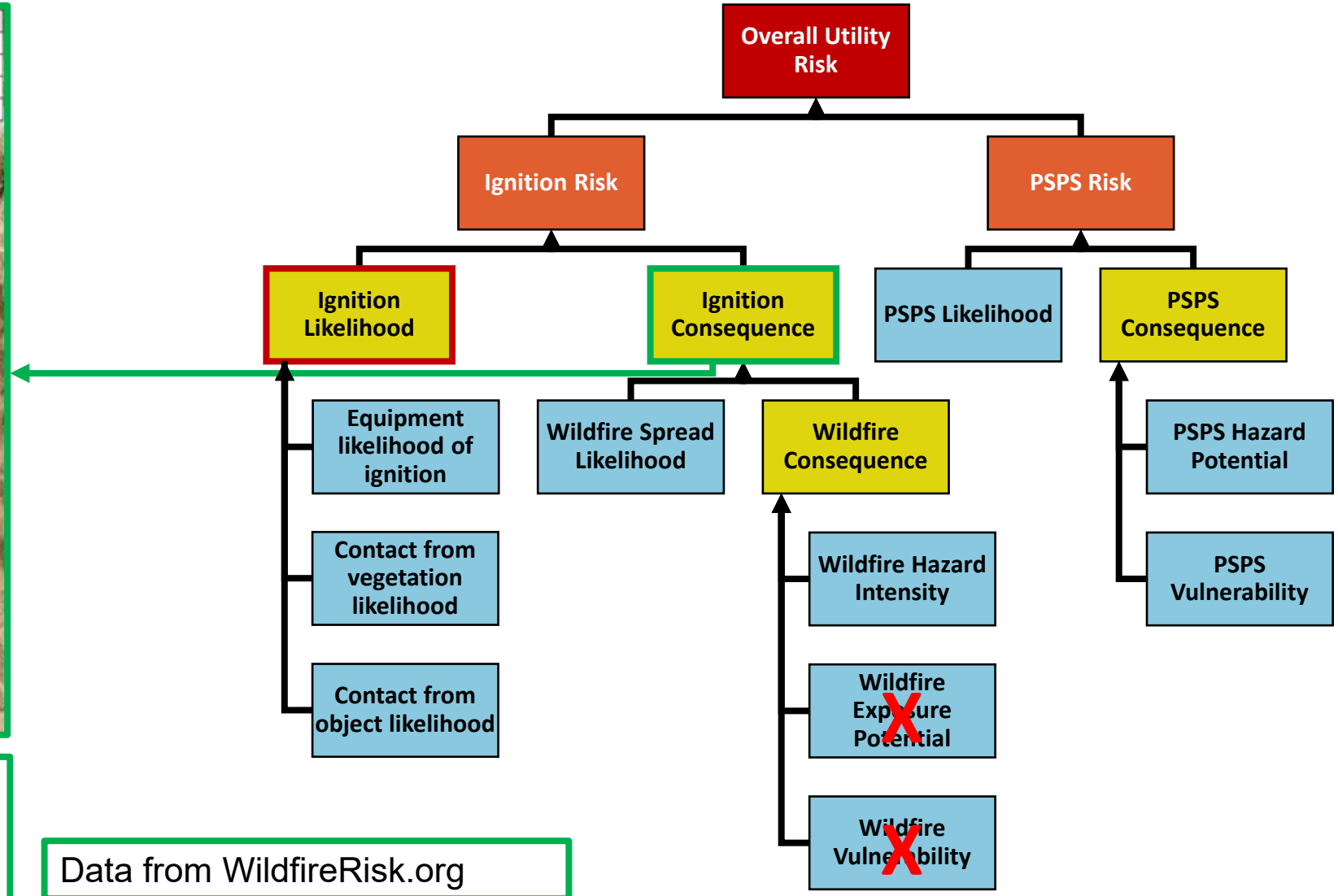



Data from CPUC (2015-2020)

# DEVELOPMENT OF SERVICE AREA RISK MAPS (EXAMPLE)

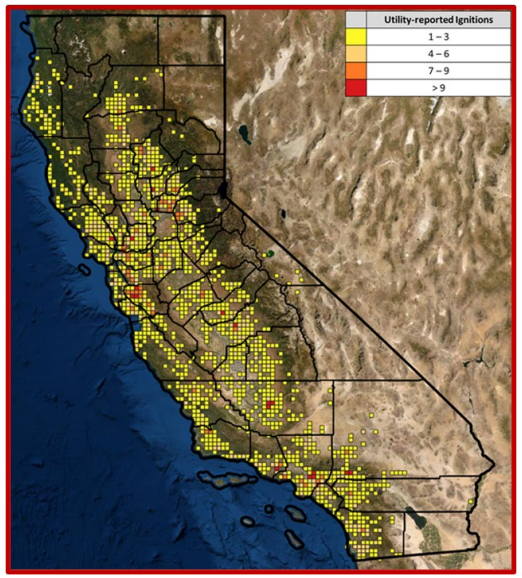



**Ignition Consequence**
Neglect exposure and vulnerability (how much damage would occur to a structure if it existed at the location)



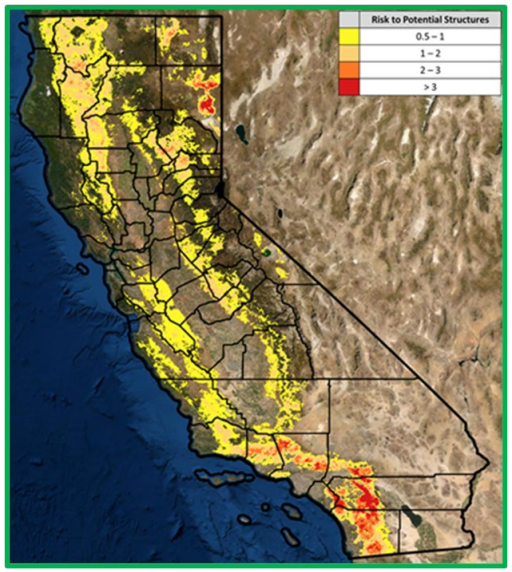

Data from WildfireRisk.org

# DEVELOPMENT OF SERVICE AREA RISK MAPS (EXAMPLE)




**Ignition Likelihood**
(i.e., how likely is a location to have an ignition from equipment or contact)

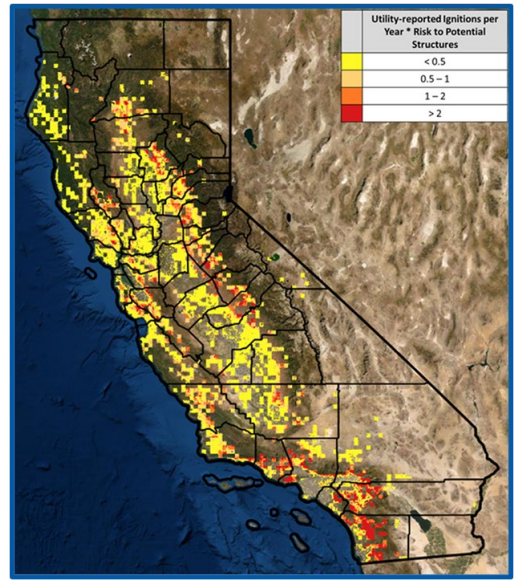
Data from CPUC (2015-2020)



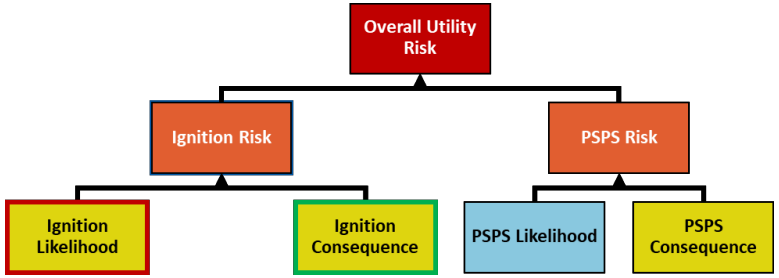

**Ignition Consequence**
Neglect exposure and vulnerability (how much damage would occur to a structure if it existed at the location)

Data from WildfireRisk.org

**Combination of Risk Components,**
such as through a Multi-Attribute Value Function (MAVF)




**Ignition Risk**
(i.e., how likely is a location to have a structure damaged from a utility started wildfire)




**Required to present service area maps of each risk and risk component.**

# 2023 RISK ANALYSIS SUMMARY

## *Key Changes and Alignment with Statutory Requirements*

| ID | Description | Statutory Reqs. |
|---|---|---|
| 1 | **Increased transparency in risk calculation methodology** | 3, 12, 17, 18 |
| 2 | **Additional requirements for model substantiation** | 12, 18 |
| 3 | **Additional requirements for model documentation** | 3, 12 |
| 4 | **Expanded requirements for data governance** | 8, 18 |

# INCREASED TRANSPARENCY IN RISK CALCULATION METHODOLOGY

- Evaluate each risk and all risk components in service territory
- For each risk and risk component, provide the following:
  - Bow tie schematic showing the inputs, outputs, and consequences
  - Schematic showing the high-level calculation procedure
  - Summary description for each model and sub-model
  - High-level description of the approach (such as MAVF) used to combine risk components
  - High-resolution geo-spatial maps for each risk and risk component in the appendix
  - Detailed model documentation for each model and sub-model

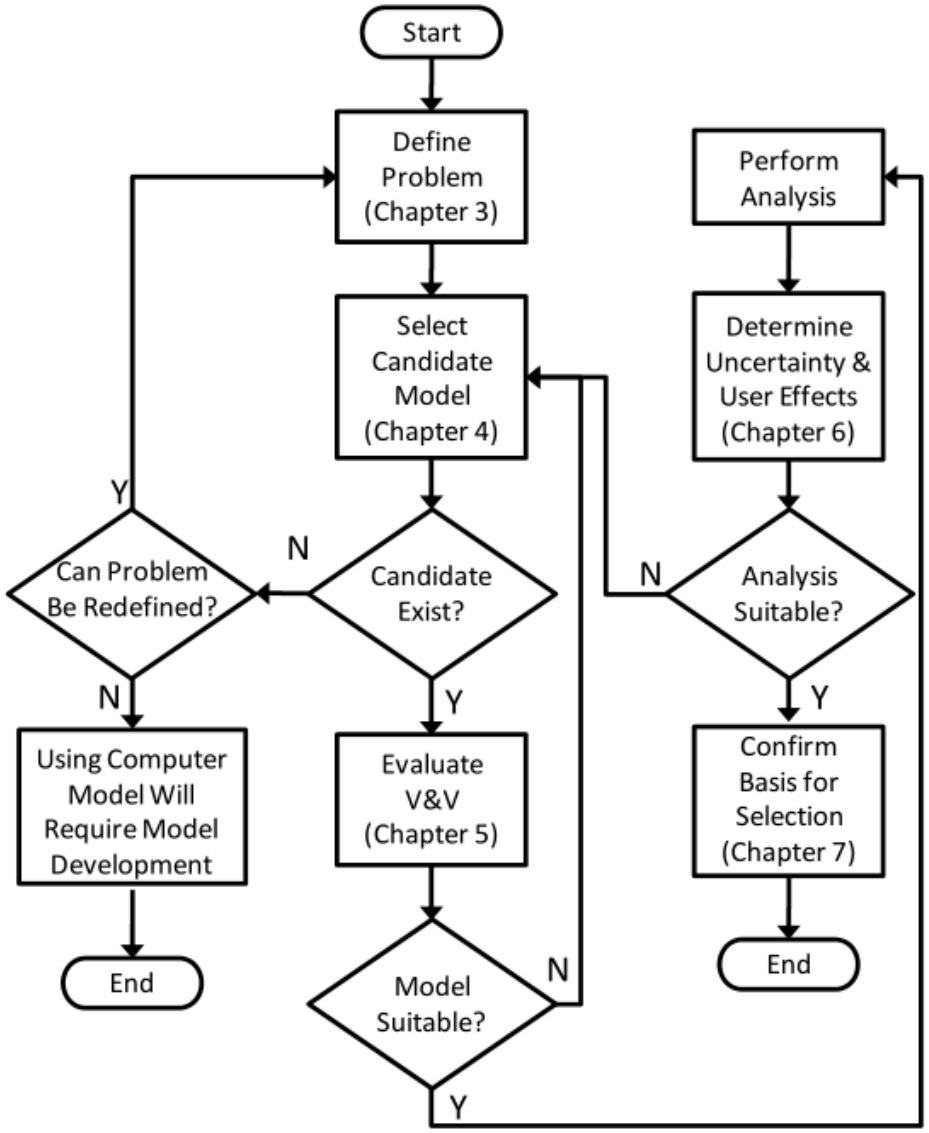
**New or Expanded Requirements for 2023 WMP Submissions**

# WHAT IS MODEL SUBSTANTIATION?

***Model Substantiation***

Process used to verify a model is correct and suitable to an application. Includes verification, validation, and uncertainty assessment.

**Model substantiation process from the Society of Fire Protection Engineers (SFPE)'s "Guidelines for Substantiating a Fire Model for a Given Application".**



# WHAT IS MODEL SUBSTANTIATION?

***Verification***

Process used to verify a model is working as designed; the equations are being properly solved. It is essentially a check of the mathematics.

***Verification test: 2 + 1 = x*** ***Successful verification: $x_M = 3$***

***Expected value: x = 3*** ***Failed verification: $x_M \neq 3$***

***Validation***

Process used to determine the degree to which a calculation method is an accurate representation of the real world. It is essentially a check of the capability of the model to predict new, unknown scenarios.

***Validation test: $|x - x_M| \leq 0.2$*** ***Successful validation: $x_M = 3.1$***

***Measured value: x = 3*** ***Failed validation: $x_M = 2.7$***

***Uncertainty***

The amount by which an observed (Experimental Uncertainty) or calculated (Model and Parameter Uncertainty) value might differ from the true value.

# MODEL VALIDATION AND UNCERTAINTY ASSESSMENT (EXAMPLE)

- Fire Dynamics Simulator – Wildfire Rate of Spread
  - Describes each experiment used in the validation
  - Describes specific notes for the modeling effort
  - Source code for the software and input files for validation publicly available
- Presents statistical analysis of model performance based on 353 fire rate of spread experiments
- Expresses model performance as a systematic bias and error standard deviation

### 3.12 CSIRO Grassland Fires

In July and August of 1986, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of Australia conducted controlled grassland fire experiments near Darwin, Northern Territory [152]. July and August are in the middle of the dry season when the grasses are fully cured (dried) and the weather is warm and dry. The experiments were conducted on flat plots measuring 100 m by 100 m, 200 m by 200 m, or 200 m by 300 m. Two cases have been simulated. Case C064 was conducted on a 100 m by 100 m plot of kerosene grass (*Eriachne burkittii*); Case F19 was conducted on a 200 m by 200 m plot of kangaroo grass (*Themeda australis*).

**Modeling Notes**

Two of these experiments were originally simulated with FDS by Mell et al. [153]. These simulations modeled the grass as a collection of cylindrical Lagrangian particles. The pyrolysis model assigned to the particles is described in the FDS User's Guide [1], chapter "Earth, Wind and Fire," Section 19.1, "Thermal Degradation Model for Vegetation."

Now these two experiments are also simulated using the Boundary Fuel Model (BFM) [154] and the Rothermel-Albini fire spread algorithm [155, 156]. For the experiment labelled Case C064, fuel index 1 (Short Grass) is used, with a modified moisture fraction of 0.063. For F19, fuel index 3 (Tall Grass) is used, with a modified moisture fraction of 0.058.

Measured properties for the specific types of grasses burned in the two experiments are listed in Table 3.4. Properties that were not measured are listed in Table 3.5. These assumed properties are typically for wood or cellulosic fuels. The moisture is modeled as water. The grass is assumed to be composed primarily of cellulose.

Snapshots of the Lagrangian particle simulation of Case F19 is shown in Fig. 3.7. The computational domain in this case is 240 m by 240 m by 20 m. The grid cells are 0.5 m cubes. The domain is subdivided into 36 individual meshes and run in parallel. The grass is represented 1 simulated blade per grid cell. The radius of the cylinder is derived from the measured surface area to volume ratio. Each simulated blade of grass represents many more actual blades of grass. The weighting factor is determined from the measured bulk mass per unit area. The fires in the experiments were ignited by two men carrying drip torches walking in opposite directions along the upwind boundary of the plot (the red strip in Fig. 3.7). In FDS, this action was modeled using a specified spread rate along the strip.

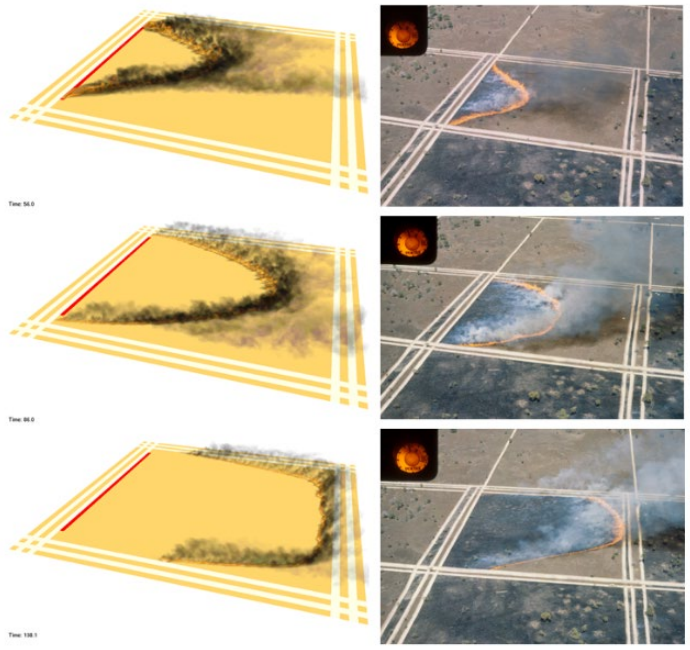
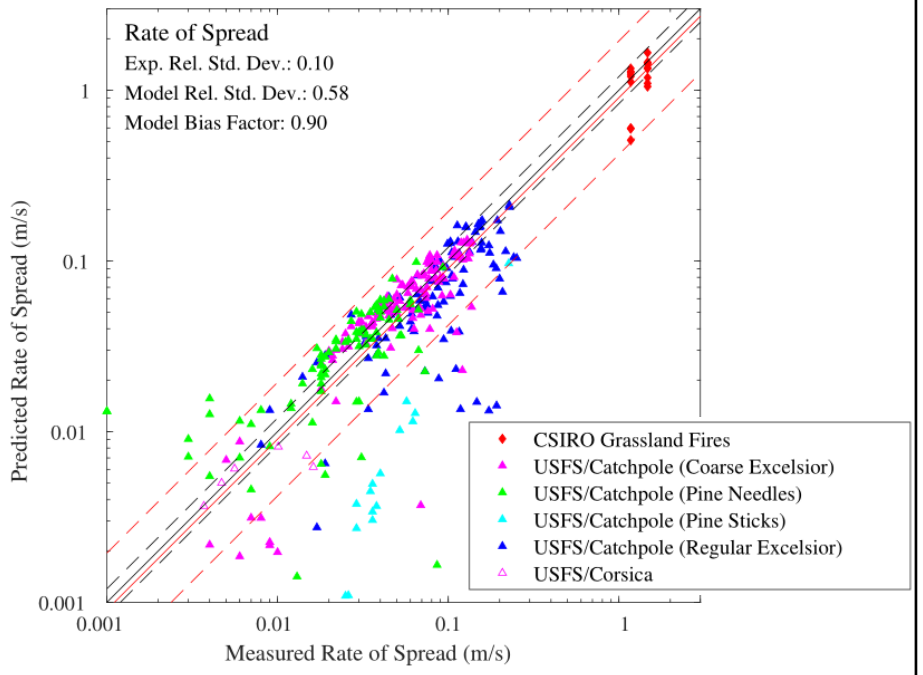


Figure 3.7: Snapshots of the simulation of CSIRO Grassland Fire F19 compared to photographs of the fire.




**Snapshot from Fire Dynamics Simulator (FDS) Validation Manual**

# INCREASED SUBMISSION OF DETAILED MODEL DOCUMENTATION

- Detailed technical documentation for each model

**7. Contents of the Technical Document**

7.1 *Problem or Function:*

7.1.1 Define the fire problem modeled or function performed by the program, for example, calculation of fire growth, smoke spread, people movement, etc.

7.1.2 Describe the total fire problem environment. General block or flow diagrams may be included here.

7.1.3 Include any desirable background information, such as feasibility studies or justification statements.

7.2 *Technical Description:*

7.2.1 Convey a thorough understanding of the theoretical and mathematical foundations, referencing the open literature where appropriate.

7.2.2 *Theoretical Foundation:*

7.2.2.1 Describe the theoretical basis of the phenomenon and the physical laws on which the model is based.

7.2.2.2 Present the governing equations and the mathematical model employed.

7.2.2.3 Identify the major assumptions on which the fire model is based and any simplifying assumptions.

7.2.2.4 Provide results of any independent review of the theoretical basis of the model. Guide E 1355 recommends a review by one or more recognized experts fully conversant with the chemistry and physics of fire phenomena but not involved with the production of the model.

7.2.3 *Mathematical Foundation:*

7.2.3.1 Describe the mathematical techniques, procedures, and computational algorithms employed to obtain numerical solutions.

7.2.3.2 Provide references to the algorithms and numerical techniques.

7.2.3.3 Present the mathematical equations in conventional terminology and show how they are implemented in the code.

7.2.3.6 Identify the limitations of the model based on the algorithms and numerical techniques.

7.4 *Data Libraries*—Provide background information on the source, contents, and use of data libraries.

7.5 *Evaluation of Predictive Capability*—Provide the results of efforts to evaluate the predictive capabilities of the model for a specific use, employing the methodologies outlines in the Guide E 1355. Include the scenarios used in the evaluation and any known limitations for the use of the evaluation for other fire scenarios.

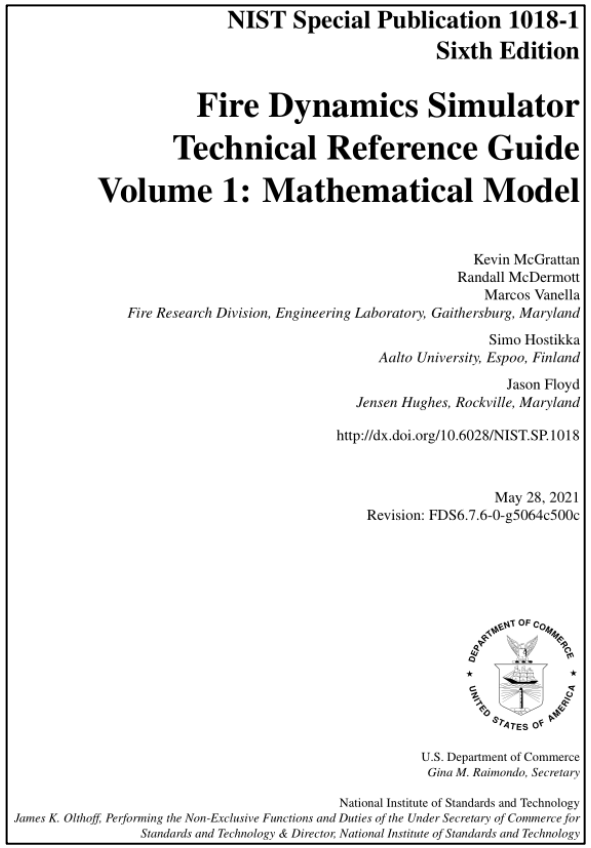
7.6 *Sensitivity*—Provide the results of any sensitivity analysis of the model (see Guide E 1355).

**Snapshot from ASTM E 1472**

| Document ID | Document Name |
|---|---|
| ASTM E 1472 | Standard Guide for Documenting Computer Software for Fire Models |
| ASTM E 1355 | Standard Guide for Evaluating the Predictive Capability of Deterministic Fire Models |
| ASTM E 1895 | Standard Guide for Determining Uses and Limitations of Deterministic Fire Models |
| SFPE Guide 2010 | Guidelines for Substantiating a Fire Model for a Given Application |
| SFPE Guide 2022 | SFPE Guide to Fire Risk Assessment |

# INCREASED SUBMISSION OF DETAILED MODEL DOCUMENTATION

- Detailed technical documentation for each model (Example)



NIST Special Publication 1018-1
Sixth Edition

**Fire Dynamics Simulator**
**Technical Reference Guide**
**Volume 1: Mathematical Model**


Kevin McGrattan
Randall McDermott
Marcos Vanella
*Fire Research Division, Engineering Laboratory, Gaithersburg, Maryland*

Simo Hostikka
*Aalto University, Espoo, Finland*

Jason Floyd
*Jensen Hughes, Rockville, Maryland*

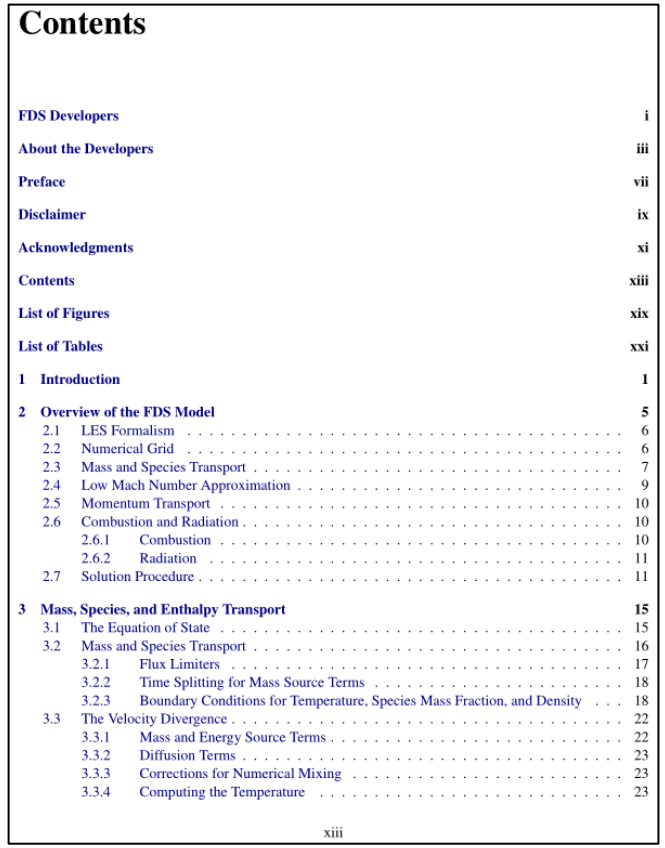


http://dx.doi.org/10.6028/NIST.SP.1018

May 28, 2021
Revision: FDS6.7.6-0-g5064c500c

U.S. Department of Commerce
*Gina M. Raimondo, Secretary*

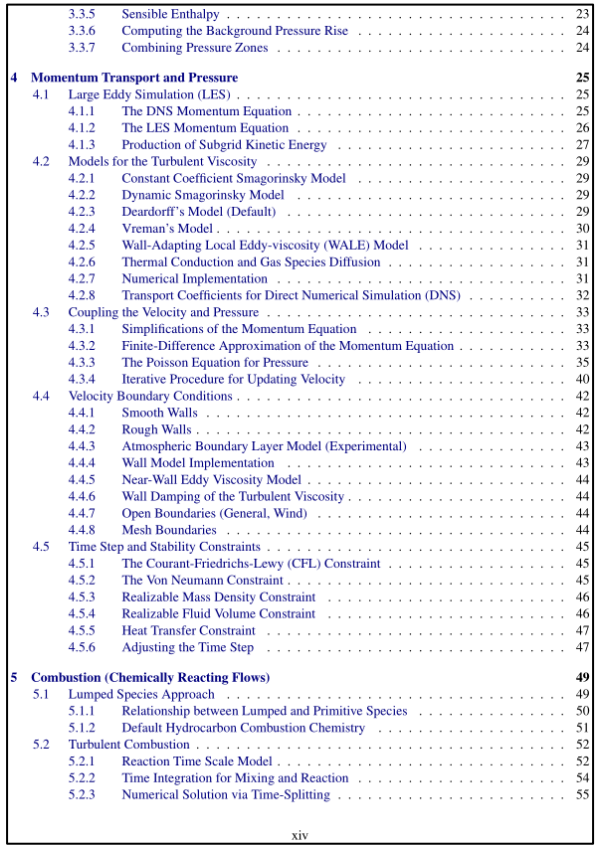
National Institute of Standards and Technology
*James K. Olthoff, Performing the Non-Exclusive Functions and Duties of the Under Secretary of Commerce for Standards and Technology & Director, National Institute of Standards and Technology*

## Contents

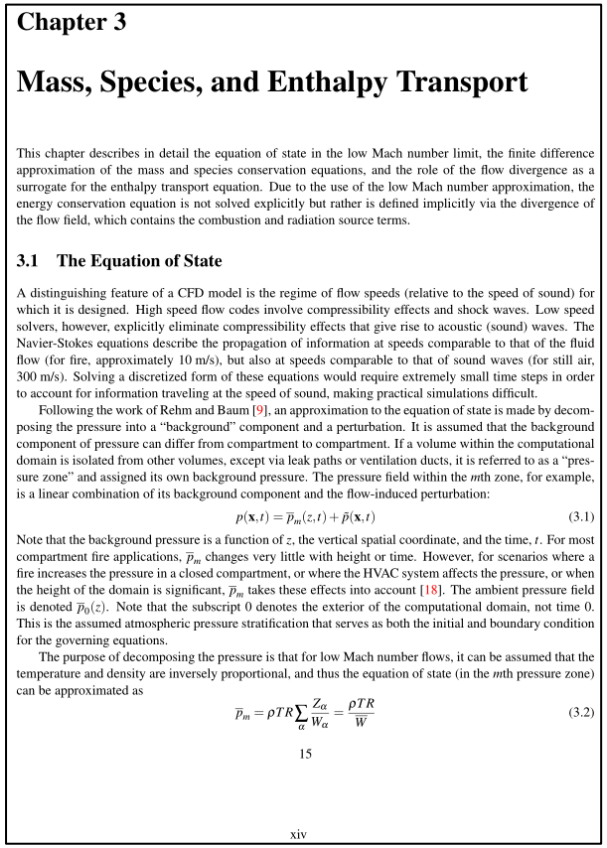












## Chapter 3

## Mass, Species, and Enthalpy Transport

This chapter describes in detail the equation of state in the low Mach number limit, the finite difference approximation of the mass and species conservation equations, and the role of the flow divergence as a surrogate for the enthalpy transport equation. Due to the use of the low Mach number approximation, the energy conservation equation is not solved explicitly but rather is defined implicitly via the divergence of the flow field, which contains the combustion and radiation source terms.

### 3.1 The Equation of State

A distinguishing feature of a CFD model is the regime of flow speeds (relative to the speed of sound) for which it is designed. High speed flow codes involve compressibility effects and shock waves. Low speed solvers, however, explicitly eliminate compressibility effects that give rise to acoustic (sound) waves. The Navier-Stokes equations describe the propagation of information at speeds comparable to that of the fluid flow (for fire, approximately 10 m/s), but also at speeds comparable to that of sound waves (for still air, 300 m/s). Solving a discretized form of these equations would require extremely small time steps in order to account for information traveling at the speed of sound, making practical simulations difficult.

Following the work of Rehm and Baum [9], an approximation to the equation of state is made by decomposing the pressure into a "background" component and a perturbation. It is assumed that the background component of pressure can differ from compartment to compartment. If a volume within the computational domain is isolated from other volumes, except via leak paths or ventilation ducts, it is referred to as a "pressure zone" and assigned its own background pressure. The pressure field within the $m$th zone, for example, is a linear combination of its background component and the flow-induced perturbation:

$$p(\mathbf{x},t) = \overline{p}_m(z,t) + \tilde{p}(\mathbf{x},t) \tag{3.1}$$

Note that the background pressure is a function of $z$, the vertical spatial coordinate, and the time, $t$. For most compartment fire applications, $\overline{p}_m$ changes very little with height or time. However, for scenarios where a fire increases the pressure in a closed compartment, or where the HVAC system affects the pressure, or when the height of the domain is significant, $\overline{p}_m$ takes these effects into account [18]. The ambient pressure field is denoted $\overline{p}_0(z)$. Note that the subscript 0 denotes the exterior of the computational domain, not time 0. This is the assumed atmospheric pressure stratification that serves as both the initial and boundary condition for the governing equations.

The purpose of decomposing the pressure is that for low Mach number flows, it can be assumed that the temperature and density are inversely proportional, and thus the equation of state (in the $m$th pressure zone) can be approximated as

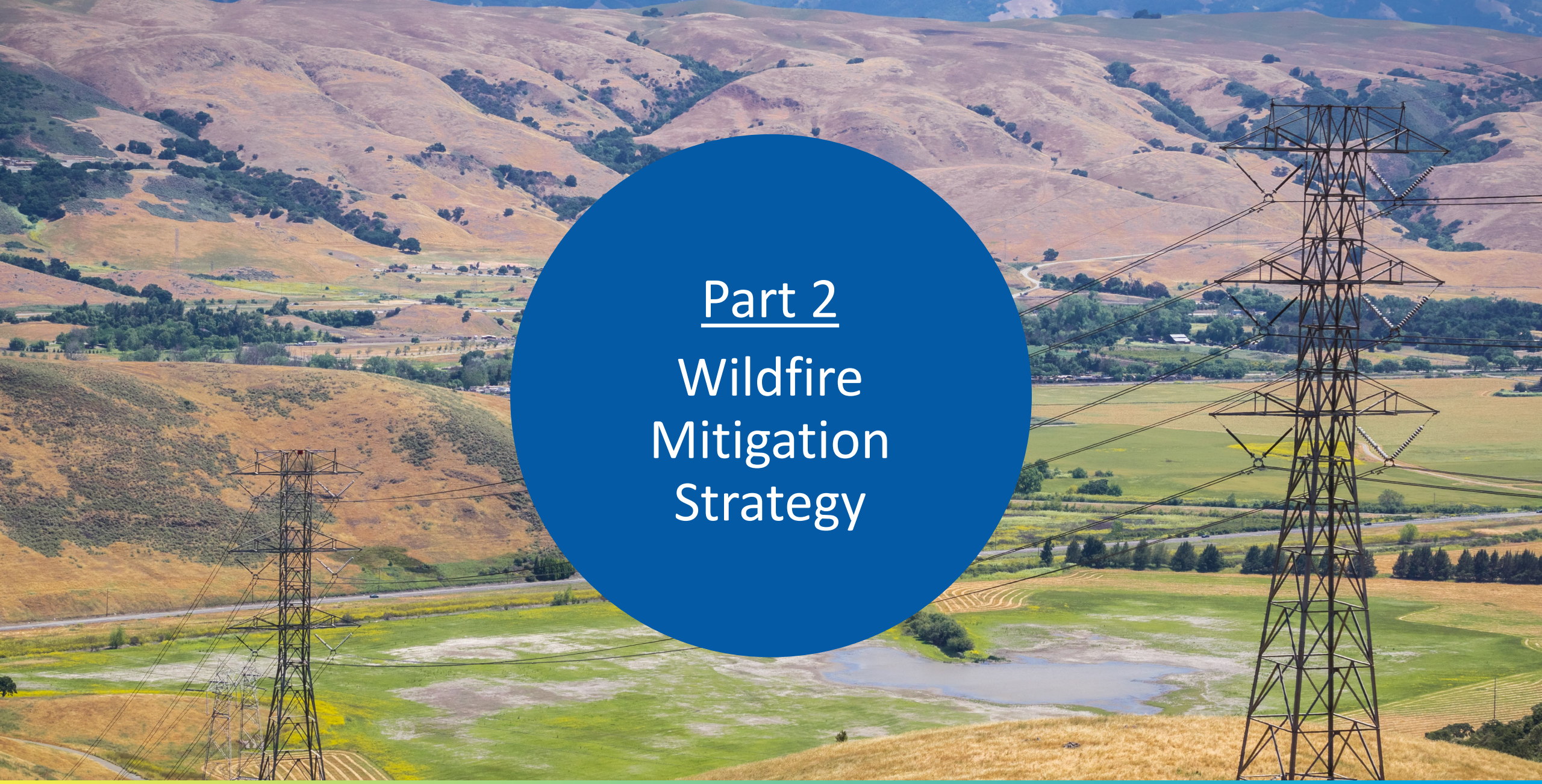
$$\overline{p}_m = \rho T R \sum_\alpha \frac{Z_\alpha}{W_\alpha} = \frac{\rho T R}{\overline{W}} \tag{3.2}$$



**Snapshot from Fire Dynamics Simulator (FDS) Technical Manual**

# EXPANSION OF DATA GOVERNANCE REQUIREMENTS

- Submit risk, risk component, and model output layers to submitted geospatial data
- Additional data collection from each ignition / retrospective analysis
  - Risk and risk component scores at the time ignition occurred
  - Risk and risk component scores at the time WMP was submitted
  - Local conditions at the time ignition occurred
  - Local conditions (forecasts) at the time ignition occurred
- Updating definitions in WMP, non-spatial data, and GIS schema to be aligned. Similar data in non-spatial and geo-spatial data must be consistent.
- Emphasis on modular design of models
  - Simplify sensitivity assessment of different assumptions
  - Ease of version control and independent review
- Alignment of sub-models



# Part 2

# Wildfire Mitigation Strategy

# SECTION 5 – WILDFIRE MITIGATION STRATEGY

- Introduction
- Overview of risk-informed approach
- Risk-informed decision making and mitigation prioritization
  - Methodology for identifying areas prioritized for mitigation
  - Methodology for selecting mitigation type
  - Methodology for resource allocation
- Proposed schedule of mitigations
- Implementation
  - Implementation (internal staff, contractors, public, etc.)
  - Monitoring progress
  - Interim strategies (i.e., strategies to mitigate risk before plan can be completed)
- Annual Service Area Prioritization Maps
  - Geo-spatial timeline for implementation throughout service area
  - Projected risk maps after mitigation for annual updates
- Maturity Assessment

**New or Expanded Requirements for 2023 WMP Submissions**

***Reference to 2022 Guidelines***

- Sections 7.1 to 7.3
- Sections 8.1 to 8.2

# 2023 RISK-INFORMED PRIORITIZATION SUMMARY

## *Key Changes and Alignment with Statutory Requirements*

| ID | Description | Statutory Reqs. |
|---|---|---|
| 1 | **Increased transparency in risk-informed prioritization process** | 3, 8, 12, 13, 15, 17, 18 |
| 2 | **Additional reporting of schedule and implementation** | 3, 12, 13 |
| 3 | **Additional requirements for mapping forecasted risk reduction** | 12, 13, 15 |

# RISK-BASED VS RISK-INFORMED PRIORITIZATION

***Risk-Based Prioritization***

Risk reduction areas based on quantitative risk assessment. Highest risk regions are prioritized without consideration for other factors.

- This sounds equitable in theory; however, what if the equation is wrong?

"Risk assessment is a set of tools, not an end in itself. The limited resources available should be spent to generate information that helps risk managers choose the best possible course of action among the available options."

- *National Research Council*, 1994

***Risk-Informed Prioritization***

The process in which quantitative risk analysis, engineering analysis and judgement, and performance history are used to:

1. Focus attention on the most important areas for mitigation activities,
2. Establish objective criteria for evaluating performance,
3. Develop measurable or calculable parameters for monitoring risk reduction based on local specific risk drivers,
4. Encourage improved outcomes, and
5. Focus on results as the primary basis for regulatory decision-making.

**New or Expanded Requirements for 2023 WMP Submissions**

# RISK-INFORMED PRIORITIZATION

**Describe the method used to identify areas for mitigation prioritization**

- Schematics and decision trees showing the risk-informed prioritization process
- MAVFs to weigh safety, reliability, and financial interests (SMAP-1A)
- Processes to identify candidate areas for mitigation prioritization (SMAP-2A)
- Processes for engaging with the public in risk-informed decision making (SMAP-2B)

**Describe the method used to select mitigation type for a prioritized area**

- Process to identify which type of mitigation (e.g., increased vegetation management, capital improvements, operations changes)
- Discuss effectiveness calculations of mitigation efforts

**Include the following for each region identified for mitigation**

- Zoomed-in maps of target area showing risk component(s) driving the high risk of the region
- Quantitative analysis and narrative justifying mitigation type

**New or Expanded Requirements for 2023 WMP Submissions**

# SCHEDULE AND IMPLEMENTATION

- Provide a schedule of planned mitigation activities
  - What granularity of time to provide?
  - How far into the future?
- Provide interim strategies for long-term mitigation activities
  - What are long-term mitigation activities?
  - What are acceptable interim strategies?
- Provide a table listing each circuit identified for mitigation and summarize key parameters (see example subset below)

**Example Interim Strategies**

**PSPS usage and criteria**

**More frequent inspections**

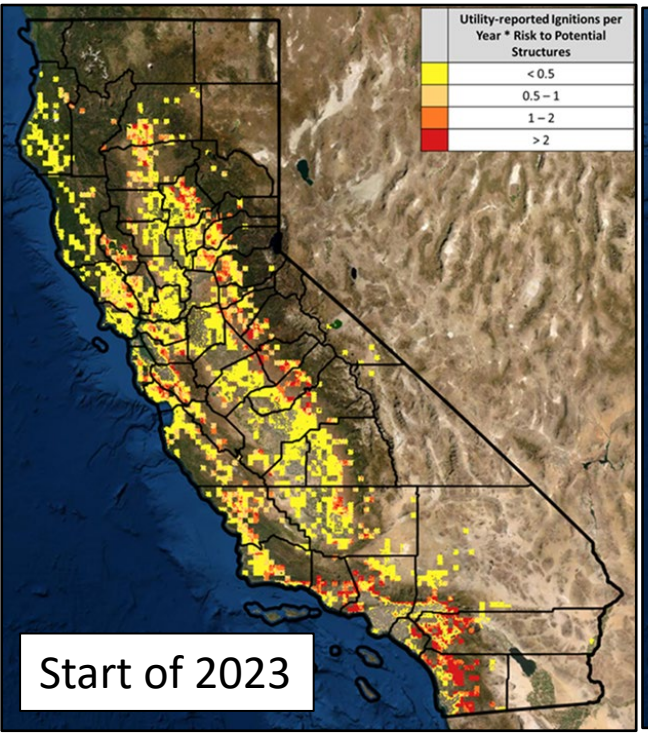
**Enhanced fire detection & monitoring activities**

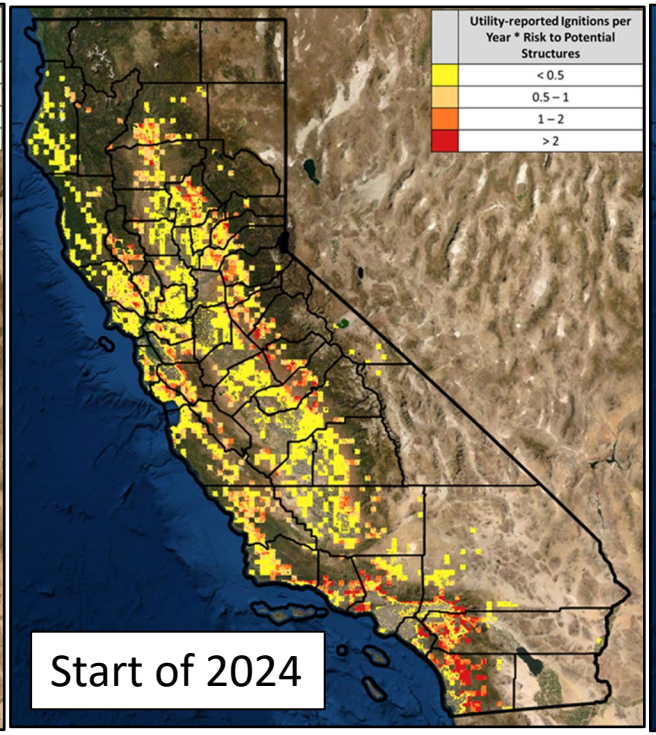
| Circuit # / ID | Current State | Planned Mitigation Initiatives | Risk Score / MAVF Before Implementation | Risk Score / MAVF After Implementation | Implementation Timeline | Interim Strategy |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

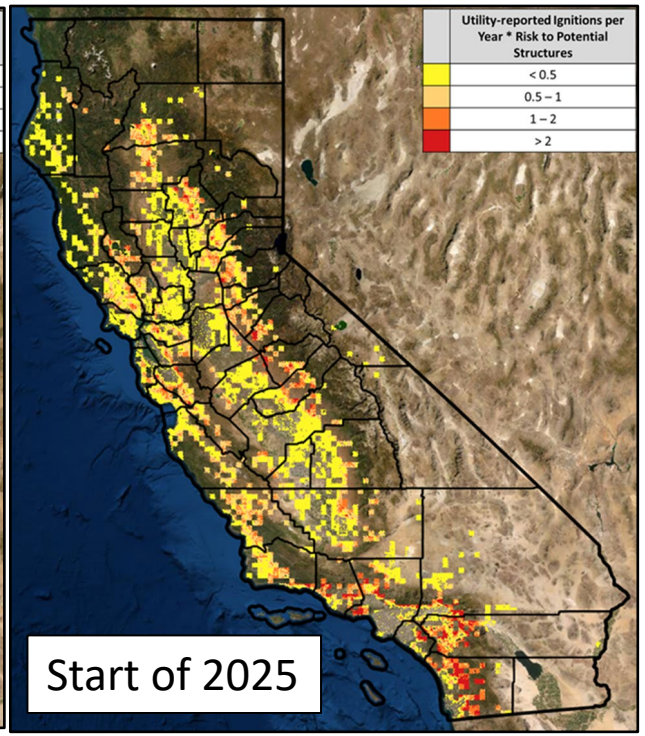
**New or Expanded Requirements for 2023 WMP Submissions**

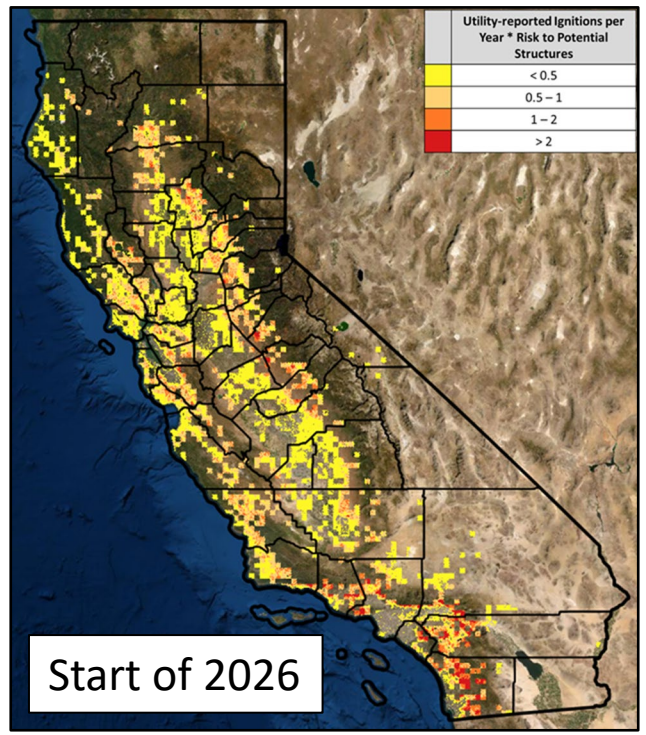
# ANNUAL SERVICE AREA RISK MAPS (EXAMPLE)

- Provide a geo-spatial timeline for mitigation strategy implementation throughout service area
- Projected risk maps after mitigation for each annual update
- Longer term risk maps should consider climate change, human development, vegetation types, etc.




Mitigation strategy reduces top 20% of risk areas reduced 30% per year.

# SUMMARY OF BIG PICTURE CHANGES

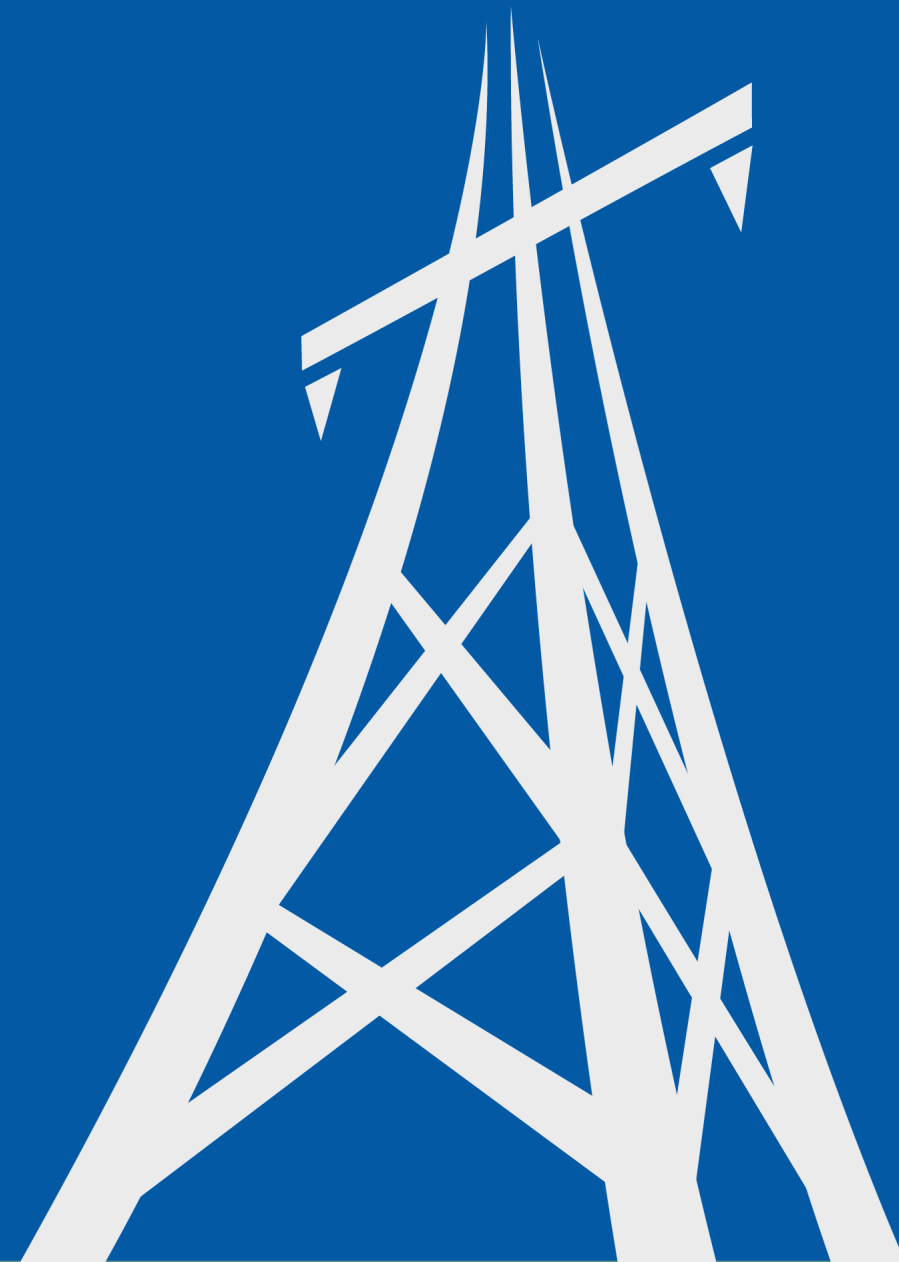
## *Risk Assessment and Modeling*

| ID | Description |
|---|---|
| 1 | **Increased transparency in risk calculation methodology**<br>• Required reporting of individual risk components and outputs<br>• Required reporting of approach to combine risk components<br>• Increased model documentation requirements |
| 2 | **Additional requirements for model substantiation**<br>• Established standards on model substantiation<br>• Required reporting of each aspect of model substantiation |
| 3 | **Additional requirements for model documentation**<br>• Technical documentation describing the model<br>• Verification and Validation documentation |
| 4 | **Expanded requirements for data governance**<br>• Required reporting of local conditions and model forecasts of risk events and outcomes<br>• Required version control for models<br>• Emphasis on modular approach to models<br>• Alignment of models |

## *Wildfire Mitigation Strategy*

| ID | Description |
|---|---|
| 1 | **Increased transparency in risk-informed prioritization process**<br>• Required reporting of method used to identify areas for mitigation prioritization<br>• Required reporting of method used to select type of mitigation in a prioritized area<br>• Required mapping and narrative justifying mitigation selection |
| 2 | **Additional reporting of schedule and implementation**<br>• Required to provide a schedule of planned mitigation activities<br>• Required to document interim strategies for long-term mitigation activities |
| 3 | **Additional requirements for mapping forecasted risk reduction**<br>• Required to provide geo-spatial maps of the implementation plan<br>• Required to provide forecasted annual risk maps based on successful implementation of the plan |

# Lunch Break



# Comments and Questions?

# Session #2 – Comments and Questions?

## *Guiding Questions*

- Risk Assessment and Modeling
  - Thoughts on the risk and risk component framework? Risk reporting requirements?
  - Thoughts on model documentation requirements (Technical and V&V)? Any additional needs?
  - What risk / risk component maps should be required in the WMP? At what interval (annual, 3-year, 5-year, 10-year, etc.)?
  - Thoughts on additional data recording of ignitions (local environmental conditions + forecasts)?
  - Thoughts on model stability, version control, and modularization?
- Wildfire Mitigation Strategy
  - What information should be collected about prioritization strategy?
  - What granularity of implementation timeline should be provided? How far into the future?
  - What are acceptable interim strategies? What are long-term mitigation activities?

# Session #3 Maturity Model

# SESSION OUTLINE

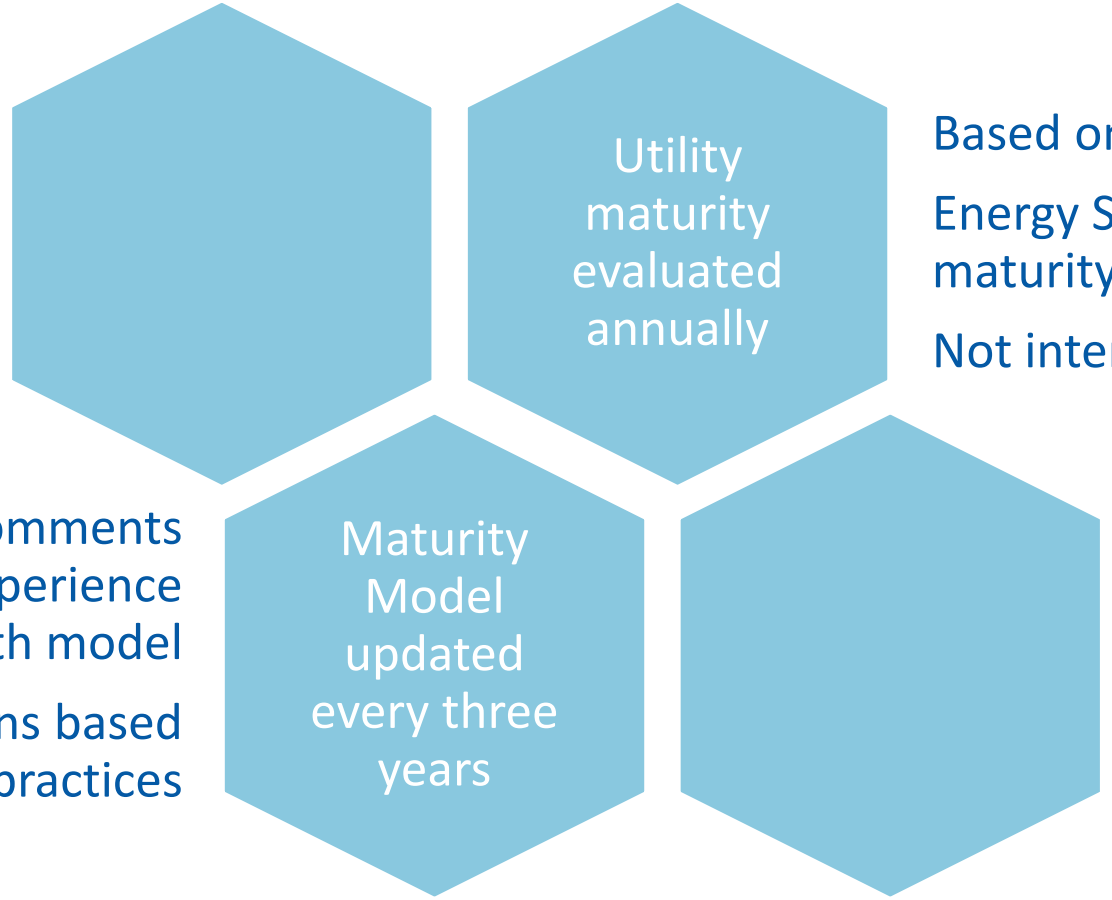
***Maturity Model***

- Objectives of the Maturity Model
- Review existing design and requirements
- Overview of key changes to Maturity Model
  - 2023 Maturity Model matrix
  - Example capability
  - Maturity level determination
  - Maturity assessment and the WMP

# MATURITY MODEL OBJECTIVES

***Reference to 2022 Guidelines***
- Attachment 4

# MATURITY EVALUATION AND UPDATING MODEL




Based on utility self-reported survey

Energy Safety determines utility maturity levels

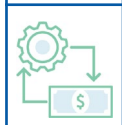
Not intended to evaluate compliance

Improve design based on comments from stakeholders and experience working with model

Update maturity level definitions based on best practices

# Review of 2020-2022 Maturity Model

# EXISTING MATURITY MODEL

| | Category | I. Capability | II. Capability | III. Capability | IV. Capability | V. Capability | VI. Capability |
|---|---|---|---|---|---|---|---|
|  | **A. Risk assessment and mapping** | 1. Climate scenario modeling | 2. Ignition risk estimation | 3. Estimation of wildfire consequence for communities | 4. Estimation of wildfire and PSPS risk-reduction impact | 5. Risk maps and simulation algorithms | |
|  | **B. Situational awareness and forecasting** | 6. Weather variables collected | 7. Weather data resolution | 8. Weather forecasting ability | 9. External sources used in weather forecasting | 10. Wildfire detection processes and capabilities | |
|  | **C. Grid design and system hardening** | 11. Approach to prioritizing initiatives across territory | 12. Grid design for minimizing ignition risk | 13. Grid design for resiliency and minimizing PSPS | 14, Risk-based grid hardening and cost efficiency | 15. Grid design and asset innovation | |
|  | **D. Asset management and inspections** | 16. Asset inventory and condition assessments | 17. Asset inspection cycle | 18. Asset inspection effectiveness | 19. Asset maintenance and repair | 20. QA/QC for asset management | |
|  | **E. Vegetation management and inspections** | 21. Vegetation inventory and condition assessments | 22. Vegetation inspection cycle | 23. Vegetation inspection effectiveness | 24. Vegetation grow-in mitigation | 25. Vegetation fall-in mitigation | 26. QA/QC for vegetation management |
|  | **F. Grid operations and protocols** | 27. Protective equipment and device settings | 28. Incorporating ignition risk factors in grid control | 29. PSPS op. model and consequence mitigation | 30. Protocols for PSPS initiation | 31. Protocols for PSPS re-energization | 32. Ignition prevention and suppression |
|  | **G. Data governance** | 33. Data collection and curation | 34. Data transparency and analytics | 35. Risk event tracking | 36. Data sharing with research community | | |
|  | **H. Resource allocation methodology** | 37. Scenario analysis across different risk levels | 38. Presentation of relative risk spend efficiency for portfolio of initiatives | 39. Process for determining risk spend efficiency of vegetation management initiatives | 40. Process for determining risk spend efficiency of system hardening initiatives | 41. Portfolio-wide initiative allocation methodology | 42. Portfolio-wide innovation in new wildfire initiatives |
|  | **I. Emergency planning and preparedness** | 43. Wildfire plan integrated with overall disaster / emergency plan | 44. Plan to restore service after wildfire related outage | 45. Emergency community engagement during and after wildfire | 46. Protocols in place to learn from wildfire events | 47. Processes for continuous improvement after wildfire and PSPS | |
|  | **J. Stakeholder cooperation and community engagement** | 48. Cooperation and best practice sharing with other utilities | 49. Engagement with communities on utility wildfire mitigation initiatives | 50. Engagement with AFN populations | 51. Collaboration with emergency response agencies | 52. Collaboration on wildfire mitigation planning with stakeholders | |

# EXISTING SCORING PHILOSOPHY

Maturity

| | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| **Scoring philosophy** | **Below minimum expectations** or expected standards (e.g., GO-95, FERC) | **Meets minimum expectations** or expected standards (e.g., GO-95, FERC) | **Beyond minimum expectations** but not consistent with best practices | **Consistent with best practice** | **Improvement over best practice** |
| **Typical characteristics** | • Fails to establish consistent procedures or policies that meet minimum expectations | • Basic collaboration with other agencies | • Utility coordinates closely with other agencies | • Utility leads efforts with other agencies in all areas where appropriate | • Utility leads efforts with other agencies and develops new protocols to reduce wildfire and PSPS risk |
| **Typical data validation and granularity** | • Sporadic or inconsistent data validation<br>• Generally, little granularity across grid | • Ad-hoc data validation by experts<br>• Regional granularity across grid | • Systematic data validation using historical measurements and expert input<br>• Circuit-level granularity | • Systematic validation using historical measurements and expert input<br>• Span-level granularity | • Systematic validation using historical measurements and expert input<br>• Real-time machine learning<br>• Asset-level granularity |
| **Level of systemization and automation** | • Little systemization<br>• No automation | • Basic systems in place for workflow management<br>• Some automated processes to support decision makers | • Detailed and tested workflow systems<br>• Semi-automated processes exist to support decision makers in key decisions | • Detailed and tested workflow systems<br>• Automated and vetted processes exist to support decision makers in nearly all circumstances | • Detailed and tested workflow systems<br>• Automated processes competently handle most decisions and actions without manual intervention |
| **Typical approach to learning and updates** | • Insufficient structures to incorporate learnings in updated processes | • Basic systems and methods in place to manually incorporate learnings into new processes<br>• Subject matter experts review decision-making and manually incorporate learnings into new decision-making | • Detailed systems and methods in place to manually incorporate learnings into processes<br>• Subject matter experts review decision-making and incorporate learnings into future decisions using defined processes | • Well-defined systems and methods in place to frequently incorporate most learnings into processes<br>• Subject matter experts review decision-making and incorporate learnings into automated processes to support decision makers | • Tested systems and methods to automatically and continuously update processes and tools in real time<br>• Subject matter experts review decision-making and incorporate learnings into fully automated decision-making processes and algorithms |

# EXISTING CAPABILITY DEFINITION (EXAMPLE)

| Capability | Summary | Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|---|---|
| **Climate Scenario Modeling** | For planning purposes, the ability of the utility to reliably model various climate scenarios. The ability to understand how changing weather patterns impact wildfire and PSPS risk across their grid. Higher scores are achieved for incorporating a wider range of inputs and having more granularity. | No clear ability to understand incremental risk under various weather scenarios | Ability to reliably determine wildfire risk i) across each region of the grid ii) based on weather and estimates of how the weather affects failure modes and fire propagation | i) Partially automated tools and process to reliably categorize weather scenarios by level of risk ii) across each circuit of the grid, iii) based on existing hardware, and weather and estimates of how the weather affects failure modes and fire propagation, and iv) independently assessed by experts | i) Mostly automated tools and process to reliably estimate risk of various weather scenarios ii) for each span of the grid, iii) based on level of vegetation, weather as measured at circuit level, existing hardware, and estimates of how the weather affects failure modes and fire propagation, and iv) independently assessed by experts and supported by historical data of incidents and risk events | i) Fully automated tools and processes to accurately and quantitatively estimate incremental risk of foreseeable weather scenarios ii) for each asset of the grid, iii) based on level of vegetation, weather measured at the circuit level, and existing hardware, and estimates of how the weather affects failure modes and fire propagation, iv) independently assessed by experts and verified by historical evidence of risk events and incidents, and v) updated based on real-time learning during weather event |

**Related to spatial granularity of modeling.**

**Related to SME verification and validation.**

# EXISTING CAPABILITY DEFINITION (EXAMPLE)

| Capability | Scoring Philosophy | Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|---|---|
| **Climate Scenario Modeling** | Level of Automation | No clear ability to understand incremental risk under various weather scenarios | Ability to reliably determine wildfire risk (manually) | Partially automated tools and process to reliably categorize weather scenarios by level of risk | Mostly automated tools and process to reliably estimate risk of various weather scenarios | Fully automated tools and processes to accurately and quantitatively estimate incremental risk of foreseeable weather scenarios |
| | Typical data granularity | No requirement | across each region of the grid | across each circuit of the grid | for each span of the grid | for each asset of the grid |
| | Typical Characteristics | No requirement | based on weather and estimates of how the weather affects failure modes and fire propagation | based on existing hardware, and weather and estimates of how the weather affects failure modes and fire propagation | based on level of vegetation, weather as measured at circuit level, existing hardware, and estimates of how the weather affects failure modes and fire propagation | based on level of vegetation, weather measured at the circuit level, and existing hardware, and estimates of how the weather affects failure modes and fire propagation |
| | SME Verification and Validation | No requirement | No requirement | independently assessed by experts | independently assessed by experts and supported by historical data of incidents and risk events | independently assessed by experts and verified by historical evidence of risk events and incidents |
| | Typical approach to learning and updates | No requirement | No requirement | No requirement | No requirement | updated based on real-time learning during weather event |

# LESSONS LEARNED FROM 2020-2022

***Transparency***

- Technical basis of capabilities and how they relate to risk reduction could be more clear
- Transparency in maturity level determination could help utilities focus their improvements to reduce wildfire and PSPS risk

***Comprehensiveness***

- Addressing gaps in capability design is important to credit the activities where the utilities are doing well
- Maturity determination approach highlights lacking subject areas, but could provide more specific guidance on improvement

***Standardization***

- Improving clarity in survey questions could improve consistency in question interpretation and responses across industry
- Establishing guidance on the usage of the Maturity Model in the WMP could improve consistency in utility submissions

# Overview of Maturity Model for 2023-2025

# OBJECTIVES OF REDESIGN

| Objective | Description |
|---|---|
| **1. Establish link between increased maturity and reduced risk** | • Integrate maturity capabilities with updated risk assessment framework<br>• Identify technical basis for each capability and how it links to overall utility risk<br>• Evaluate existing capabilities in each subject matter area and identify any gaps which need to be addressed with additional capabilities |
| **2. Improve standardization in reporting among utilities** | • Standardize metrics of models used in assessment and reporting of outcomes and maturity<br>• Integrate maturity self-assessment more fully with the broader utility WMP program<br>• Enhance mechanisms to inform ongoing learning and improvement of WMP/Maturity Model program |
| **3. Improve quantitative assessment of maturity** | • Identify links between reported data and maturity capabilities, including identification of additional data / metrics which would enhance evaluation of utility maturity<br>• Identify comprehensive metrics to support evaluation of utility maturity<br>• Improve capability of data provided in quarterly reports to track improvement in maturity |
| **4. Increase transparency in maturity assessment** | • Establish transparent criteria used to determine maturity levels<br>• Develop strategy to fuse capability maturity levels to provide additional insights in utility progress beyond existing capability and category maturity levels<br>• Redesign maturity levels and survey questions to facilitate third party and compliance review |

# 2023 MATURITY MODEL

## *Key Changes*

| ID | Description | Related Objective(s) |
|---|---|---|
| 1 | Reorganize the Maturity Model into nine (9) categories covering forty-five (45) capabilities | 1, 3 |
| 2 | Expand maturity capability definition | 1, 2, 3 |
| 3 | Develop cross-category theme metrics which evaluate key scoring philosophies across all categories | 3, 4 |
| 4 | Increased transparency in maturity level determination | 4 |
| 5 | Link maturity assessment to utility WMP discussion and on-going initiatives | 1, 2 |

# 2023 MATURITY MODEL REORGANIZATION

### *2020-2022 Capabilities*

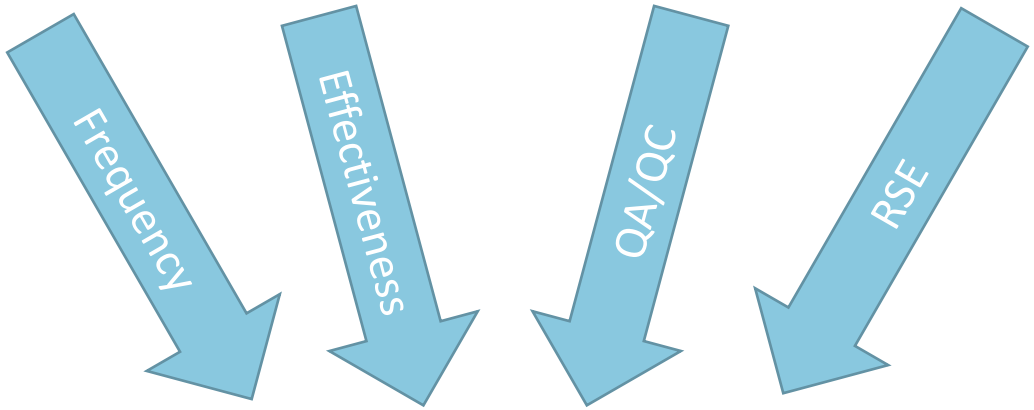
- Multiple capabilities covering the same concept
- Consider different scoring philosophies

### *2023-2026 Capabilities*

- Each capability designed around a single concept
- Different scoring philosophies considered in each capability
- Resulted in the merging of capabilities
- Cross-cutting scoring philosophies (such as QA/QC)
  - Not their own capability
  - Included as scoring philosophy in related capability

### *Merging Capabilities*

| Capability 17 | Capability 18 | Capability 20 | Capability 40 |
|---|---|---|---|
| Asset inspection cycle | Asset inspection effectiveness | QA/QC for asset management | Process for determining risk spend efficiency of system hardening initiatives |




| Asset Inspections | |
|---|---|
| Scoring Philosophies | • Frequency<br>• Effectiveness<br>• QA/QC<br>• RSE |

# 2023 MATURITY MODEL REORGANIZATION

| | Category | I. Capability | II. Capability | III. Capability | IV. Capability | V. Capability | VI. Capability |
|---|---|---|---|---|---|---|---|
|  | A. Risk assessment and mitigation strategy | 1. Statistical weather, climate, and wildfire modeling | 2. Estimation of wildfire and PSPS hazard and exposure | 3. Estimation of community vulnerability to wildfire and PSPS | 4. Estimation of risk and combination of risk components | 5. Wildfire mitigation strategy and estimation of risk reduction impact | 6. Risk event tracking and integrating lessons learned |
|  | B. Situational awareness and forecasting | 7. Ignition likelihood estimation | 8. Weather forecasting ability | 9. Wildfire spread forecasting | 10. Data collection for near-real-time conditions | 11. Wildfire detection and alarm systems | 12. Centralized monitoring of real-time conditions |
|  | C. Grid design, inspections, and maintenance | 13. Asset inventory and condition database | 14. Asset inspections | 15. Asset maintenance and repair | 16. Grid design and resiliency | 17. Asset and grid personnel training and quality assurance | |
|  | D. Vegetation management and inspections | 18. Vegetation inventory and condition database | 19. Vegetation inspections | 20. Vegetation treatment and removal | 21. Vegetation personnel training and quality assurance | | |
|  | E. Grid operations and protocols | 22. Protective equipment and device settings | 23. Incorporating ignition risk factors in grid control | 24. PSPS operating model | 25. Protocols for PSPS re-energization | 26. Ignition prevention and suppression | |
|  | F. Emergency planning and preparedness | 27. Wildfire emergency & disaster preparedness plan & coordination | 28. Plan to restore service after wildfire related outage | 29. External notification and communication systems & strategies | 30. Process and protocols for learning after wildfire events | 31. Process and protocols for learning after PSPS events | |
|  | G. Inter-utility cooperation and community engagement | 32. Cooperation and best practice sharing with other utilities | 33. Public outreach program for wildfires and PSPS | 34. Emergency communication during and after a wildfire and PSPS | 35. Communication and engagement with vulnerable populations | 36. Collaboration with communities on local wildfire mitigation and planning | |
|  | H. Safety culture | 37. Organizational systems | 38. Safety governance | 39. Enabling systems | | | |
|  | I. Data governance | 40. Continuous improvement and stability of WMP program | 41. Transparency and analytics | 42. IT infrastructure, database management, and documentation | 43. Data granularity | 44. Data relevance and visualization | 45. Data quality assessment and QA/QC |

# EXPAND MATURITY CAPABILITY DEFINITION

| Component | Description |
|---|---|
| 1. Name | Short identifier of the capability |
| 2. Primary category | Primary grouping of the capability |
| 3. Description | A detailed overview of the scope of the capability, including minimum expectations and an overview of how higher maturities are achieved |
| 4. Maturity levels | A list documenting the requirements to achieve each maturity level for each scoring philosophy relevant to a capability |
| 5. Scoring philosophies | A list documenting the scoring philosophies which are relevant to the capability and a description of how increased maturity is achieved |
| 6. Risk components | A list documenting the link between improving maturity and a reduction in wildfire risk for each capability |
| 7. Outcome metrics | A list documenting the outcomes which are expected to be impacted by improved maturity in each capability |
| 8. Maturity survey | A list of questions used to assess the maturity level for each capability in each scoring philosophy |

**New or Expanded Content for 2023 WMP Submissions**

# SCORING PHILOSOPHIES

### *Anticipating*

The utility's ability to identify the potential for issues that could result in a hazardous event before they occur.

### *Automation*

The utility's ability to receive, process, and act on information in a prescribed, consistent, and timely fashion that reduces wildfire and PSPS risk.

### *Collaboration*

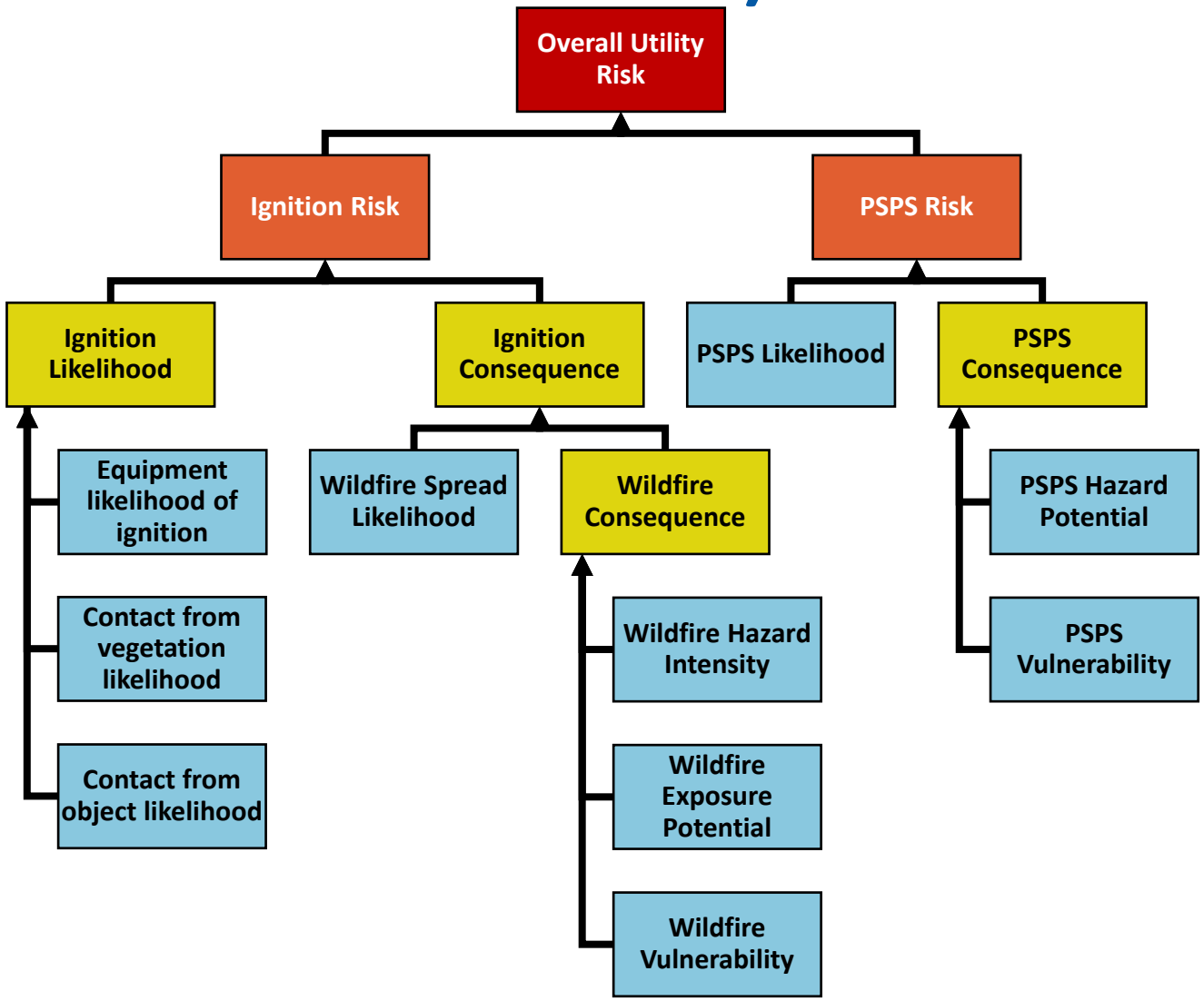
The utility's level of cooperation with Energy Safety, emergency responders, other utilities, government agencies, and other stakeholders in wildfire risk mitigation

| Scoring Philosophies |
|---|
| Anticipating |
| Automation |
| Climate change |
| Collaboration |
| Data visualization |
| Documentation & disclosures |
| Engagement |
| Frequency |
| IT infrastructure & database management |
| Learning and continuous improvement |
| Measurable indicators |
| Model inputs |
| Modularization |
| Quality assurance and quality control (QA/QC) |
| Risk spend efficiency |
| Sharing with research community |
| Spatial granularity |
| Stability of assumptions |
| Subject matter expert (SME) Verification |
| Systemization, policies, and procedures |
| Transparency |
| Validation |

**New or Expanded Content for 2023 WMP Submissions**

# RISK COMPONENTS (REVIEW FROM SESSION 2)

| Legend | Definition |
|---|---|
| **Overall Risk** | Annual adverse effects from utility started wildfires and wildfire prevention strategies. |
| **Ignition and PSPS Risks** | Annual adverse effects from a single hazard (either utility ignition or utility emergency de-energization). |
| **Intermediate Risk Components** | Intermediate combination of fundamental risk components which must be reported by the utility. |
| **Fundamental Risk Components** | Smallest component of risk which must be reported by the utility across their service area. |



# RELATIONSHIP TO OUTCOMES

### *One Key Objective of Maturity Model*

Objective quantification of capabilities which enable utilities to reduce utility-started wildfire and PSPS risk

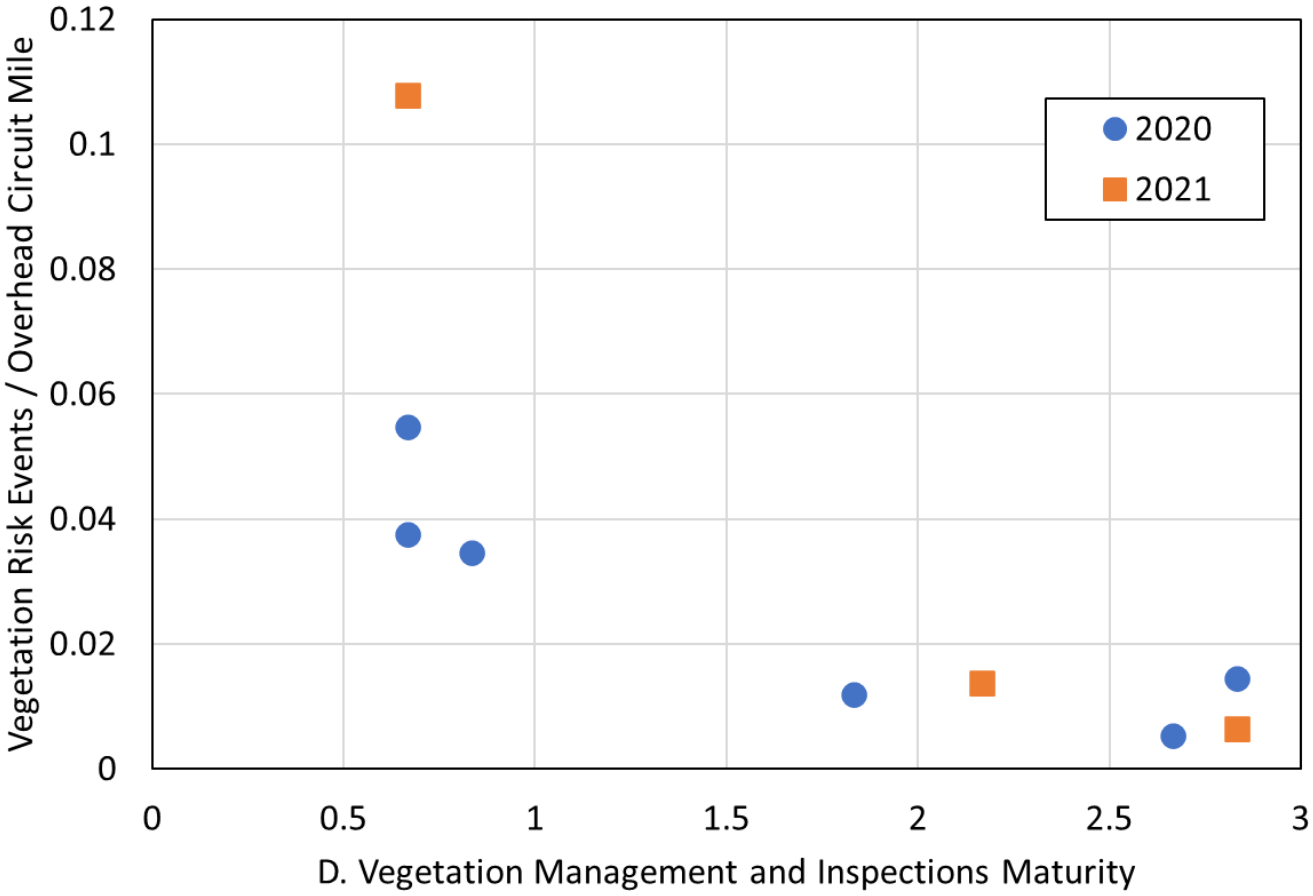
### *Expected Relationship Between Related Outcomes and Maturity*

- Increased maturity should lead to reduced risk
- Reduction in risk should lead to reduction in negative outcomes over time

### *Maturity Capability Definition*

- Establish outcomes which are expected to be affected by increased maturity
- Increase data collection to include broader range of outcomes

### *Correlation Between Related Outcomes and Maturity (Risk events should decrease with increased maturity)*



# EXPANDED CAPABILITY DEFINITION (EXAMPLE)

| Capability Name | Capability Description | Risk Components | Outcome Metrics | Scoring Philosophy | Scoring Description |
|---|---|---|---|---|---|
| Statistical Weather, Climate, and Wildfire Modeling | Technical description of the capability and relevant scope.<br><br>Description of minimum expectations aligned with WMP guidelines (i.e., level 1 requirements).<br><br>Description of indicators of mature systems for this capability. | List of each risk and risk component which is affected by the capability | List of each outcome metric which is affected by the capability | List of each scoring philosophy related to this capability, including a description of minimum expectations and indications of higher maturity related to that specific scoring philosophy. | |

# EXPANDED CAPABILITY DEFINITION (EXAMPLE)

| Capability Name | Capability Description | Risk Components | Outcome Metrics | Scoring Philosophy | Scoring Description |
|---|---|---|---|---|---|
| Statistical Weather, Climate, and Wildfire Modeling | For planning purposes, the ability of the utility to model various weather, climate, and wildfire scenarios.<br><br>For weather and climate scenarios, this includes characterizing the statistical distribution of various weather and climate conditions and quantifying the likelihood of extreme weather conditions on a seasonal, annual, and decadal basis. For wildfire scenarios this includes calculating the fire spread probability map considering numerous ignition locations, weather conditions, and vegetation coverage conditions. For each possible ignition location, the utility must incorporate the probability of ignition (by incorporating capability 7) as well as the probability of spread which is based on a statistical ensemble of weather and vegetation inputs.<br><br>At a minimum, the utilities must calculate weather parameters (e.g., wind speed, relative humidity, temperature, and fuel moisture content) required to estimate the likelihood of ignition, wildfire spread probability, and wildfire hazard intensity. Weather conditions must be calculated on a 50 th (mean), 84 th , and 98 th percentile basis. The utility must clearly explain the inputs, algorithms and assumptions behind the implemented models in accordance with the model substantiation requirements of the WMP Guidelines.<br><br>Higher maturity is achieved by conducting and documenting additional model substantiation efforts, increasing spatial granularity, incorporating key physics into model algorithms, accounting for long-term changes in condition likelihoods due to climate change, evaluating the impact of uncertainty in inputs and outputs on the overall risk assessment, and stability of the modeling approach. In addition, mature systems have higher quality predictions which is demonstrated by lower systematic bias and standard deviation of error between predictions and experiments in the validation basis documentation. | Equipment likelihood of ignition<br><br>Vegetation contact likelihood<br><br>Contact by object likelihood<br><br>Wildfire spread likelihood<br><br>PSPS likelihood | Number of experiments in validation<br><br>Validation error (systematic bias and standard deviation)<br><br>Observed wind percentiles compared with calculated statistical percentiles<br><br>Observed input percentiles compared with calculated statistical percentiles (e.g., fuel aridity)<br><br>Risk events normalized by observed weather percentile | Climate Change | Impact of long-term climate change on the statistical weather and fire behavior modeling. More mature systems evaluate the impact of climate change on the length of the fire season, statistical weather conditions, statistical vegetation growth and moisture, vegetative species / invasive species, and extension of the WUI. |
| | | | | IT Infrastructure & Database Management | Clarity and completeness of documentation of database schema and definitions. The model inputs and outputs at the time used to prioritize mitigation efforts should be maintained in the database along with the calculation methodology (i.e. model version #). More mature systems appropriately link databases (assets, weather, vegetation, model results, etc.) to support on-going evaluation. |
| | | | | Learning and Continuous Improvement | Historic model performance is consistently compared to observed conditions to determine discrepancies and biases in the model not covered by the validation basis. Processes are in place to document these findings and improve the models over time. |
| | | | | Model Inputs and Outputs | Inputs to estimate statistical weather, climate, and wildfire behavior are comprehensive including all key physics in weather, fire, and vegetation. Statistical conditions are evaluated at required percentiles. |
| | | | | Modularization | Modularization of the software models. Higher maturity includes more modular code which can be used to evaluate the impact of different assumptions on the statistical results. |
| | | | | Spatial Granularity | Vertical and horizontal / geo-coordinate resolution of the weather, climate, and wildfire predictions. Higher maturity is achieved by using a sufficiently fine resolution to resolve the local effects of fire and weather. |
| | | | | Stability of Assumptions | Assumptions and limitations of the model are known, and the model does not need significant changes in future updates to the WMP. |
| | | | | Transparency | Sharing of data and methods with the public and research community. More mature systems provide access to input data, source code, and an automated verification and validation suite to the public. |
| | | | | Uncertainty Propagation | Documentation of the sensitivity of the overall risk model predictions to 1) inputs to these models and 2) down-stream impacts of uncertainty in these model predictions. |
| | | | | Validation & Documentation & Disclosures | Documentation of model substantiation efforts. Higher maturity includes automated verification and validation suites which are provided to the regulator for third-party review. In addition, more mature systems demonstrate a lower systematic bias and standard deviation in error in the Validation Documentation. |

# MATURITY LEVEL DEFINITIONS

Maturity

| Maturity Level Definitions | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| | **Below minimum expectations** or expected standards (e.g., GO-95, FERC) | **Meets minimum expectations** or expected standards (e.g., GO-95, FERC) | **Beyond minimum expectations** but not consistent with best practices | **Consistent with best practice** | **Improvement over best practice** |

# EXPANDED CAPABILITY DEFINITION (EXAMPLE)

Maturity

| Capability Name | Scoring Philosophy | Scoring Description | Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|---|---|---|
| | | | **Below minimum expectations** or expected standards | **Meets minimum expectations** or expected standards | **Beyond minimum expectations** but not consistent with best practices | **Consistent with best practice** | **Improvement over best practice** |
| Statistical Weather, Climate, and Wildfire Modeling | Validation & Documentation and Disclosures | Documentation of model substantiation efforts. Higher maturity includes automated verification and validation suites which are provided to the regulator for third-party review. In addition, more mature systems demonstrate a lower systematic bias and standard deviation in error in the Validation Documentation. | No model substantiation is provided in accordance with WMP Guidelines | Model substantiation is provided in accordance with WMP Guidelines | Model substantiation is provided in accordance with WMP Guidelines<br><br>Model verification and validation suites are version controlled and re-evaluated every time underlying data or models are updated.<br><br>Discrepancies between production model and observed reality are quantified and statistically evaluated to performance.<br><br>Model performance on each key metric demonstrates a systematic bias < 20%.<br><br>Model performance on each key metric demonstrates a standard deviation in error < 40%. | Model substantiation is provided in accordance with WMP Guidelines<br><br>Model verification and validation suites are automated, version controlled, and re-evaluated every time underlying data or models are updated.<br><br>Discrepancies between production model and observed reality are quantified and statistically evaluated to performance.<br><br>Model verification and validation suite (data + code) is provided to the regulator for third-party review.<br><br>Model performance on each key metric demonstrates a systematic bias < 10%.<br><br>Model performance on each key metric demonstrates a standard deviation in error < 20%. | Model substantiation is provided in accordance with WMP Guidelines<br><br>Model verification and validation suites are automated, version controlled, and re-evaluated every time underlying data or models are updated.<br><br>Discrepancies between production model and observed reality are quantified and statistically evaluated to performance.<br><br>Model verification and validation suite (data + code) is provided to the regulator for third-party review.<br><br>Model performance on each key metric demonstrates a systematic bias < 5%.<br><br>Model performance on each key metric demonstrates a standard deviation in error < 15%.<br><br>Annual blind model validation is accomplished by analyzing model performance for the previous year based on the data available at the time of WMP submission and on the assumptions presented in the WMP accepted prior to the fire season. |

# EXPANDED CAPABILITY DEFINITION (EXAMPLE)

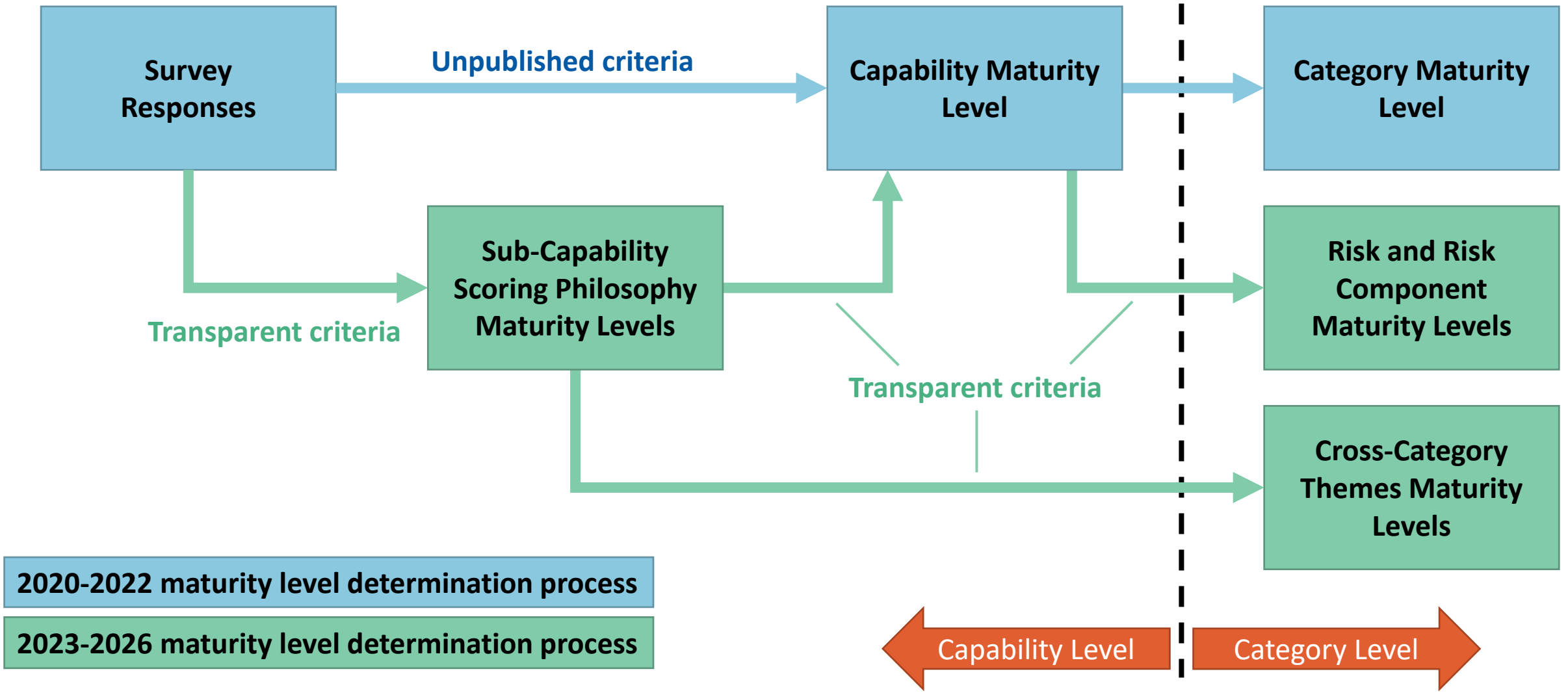
Maturity

| Capability Name | Scoring Philosophy | Scoring Description | Level 0<br>**Below minimum expectations** or expected standards | Level 1<br>**Meets minimum expectations** or expected standards | Level 2<br>**Beyond minimum expectations** but not consistent with best practices | Level 3<br>**Consistent with best practice** | Level 4<br>**Improvement over best practice** |
|---|---|---|---|---|---|---|---|
| Statistical Weather, Climate, and Wildfire Modeling | Transparency | Sharing of data and methods with the public and research community. More mature systems provide access to input data, source code, and an automated verification and validation suite to the public. | Utility does not share data and methods. | Data and methods meet the minimum reporting requirements of the WMP Guidelines. | Data and methods meet the minimum reporting requirements of the WMP Guidelines.<br>Statistical summary of data and model performance is provided to the public.<br>Model technical documentation is available to the public. | Data and methods meet the minimum reporting requirements of the WMP Guidelines.<br>Geo-spatial model input data is provided to the public.<br>Model verification and validation documentation is available to the public. | Data and methods meet the minimum reporting requirements of the WMP Guidelines.<br>Model software source code and automated verification and validation code provided by the utility to the public.<br>Model verification and validation documentation is available to the public. |
| | Spatial Granularity | Vertical and horizontal / geo-coordinate resolution of the weather, climate, and wildfire predictions. Higher maturity is achieved by using a sufficiently fine resolution to resolve the local effects of fire and weather. | Utility does not meet the minimum resolution reporting requirements of the WMP Guidelines. | Data and methods meet the minimum requirements of the WMP Guidelines.<br>Horizontal resolution of the statistical weather and climate modeling is evaluated at a resolution <= 4 km.<br>Horizontal resolution of the statistical fire modeling is evaluated at a resolution <= 1 km. | Data and methods meet the minimum requirements of the WMP Guidelines.<br>Horizontal resolution of the statistical weather and climate modeling is evaluated at a resolution <= 2 km.<br>Horizontal resolution of the statistical fire modeling is evaluated at a resolution <= 100 m.<br>Vertical resolution of the statistical weather and climate modeling is sufficiently resolved to evaluate the local conditions at the average height of lines on a circuit. | Data and methods meet the minimum requirements of the WMP Guidelines.<br>Horizontal resolution of the statistical weather and climate modeling is evaluated at a resolution <= 1 km.<br>Horizontal resolution of the statistical fire modeling is evaluated at a resolution <= 30 m.<br>Vertical resolution of the statistical weather and climate modeling is sufficiently resolved to evaluate the local conditions at the average height of lines on a span. | Data and methods meet the minimum requirements of the WMP Guidelines.<br>Horizontal resolution of the statistical weather and climate modeling is evaluated at a resolution <= 100 m.<br>Horizontal resolution of the statistical fire modeling is evaluated at a resolution <= 10 m.<br>Vertical resolution of the statistical weather and climate modeling is sufficiently resolved to evaluate the local conditions at the average height of individual lines. |

**Total of ten (10) scoring philosophies for this capability**

# Maturity Level Determination and Transparency

# MATURITY LEVEL DETERMINATION SUMMARY



# CAPABILITY MATURITY LEVEL DETERMINATION

***Sub-Capability Scoring Philosophy Maturity Level***

- Based on level of achievement for one scoring philosophy
- Survey used to assess which level is reached for each scoring philosophy
- All criteria must be achieved to reach the next level

Since there is no requirement at level 0, a utility cannot achieve a lower level than 1 for this scoring philosophy in this capability.

| Capability Name | Scoring Philosophy | Scoring Description | Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|---|---|---|
| | | | **Below minimum expectations** or expected standards | **Meets minimum expectations** or expected standards | **Beyond minimum expectations** but not consistent with best practices | **Consistent with best practice** | **Improvement over best practice** |
| Statistical Weather, Climate, and Wildfire Modeling | Modularization | Models should be designed in a modular manner so that different sub-models (e.g., climate change) can be exchanged and different assumptions tested. | No requirement | Software code is not modular. | Software design is modular with sub-modules which can be replaced to evaluate the impact of different assumptions on the results. Sub-modules include at least the following:<br><br>1. Long-term statistical weather calculation<br>2. Long-term statistical fire behavior calculation<br>3. Impact of climate change on extreme fire weather | Software design is modular with sub-modules which can be replaced to evaluate the impact of different assumptions on the results. Sub-modules include at least the following:<br><br>1. Impact of climate change on long-term statistical weather calculation<br>2. Impact of climate change on long-term statistical fire behavior calculation<br>3. Impact of climate change on extreme fire weather | Software design is modular with sub-modules which can be replaced to evaluate the impact of different assumptions on the results. Sub-modules include at least the following:<br><br>1. Impact of climate change on long-term statistical weather calculation<br>2. Impact of climate change on long-term statistical fire behavior calculation<br>3. Impact of climate change on extreme fire weather<br>4. Weather submodules for key physics parameterizations (micro physics, PBL physics, shallow convection, etc.)<br>5. Long-term changes in vegetation growth includes submodules considering the impact of climate change |

# CAPABILITY MATURITY LEVEL DETERMINATION

***Capability Maturity Level***

- All criteria must be achieved to reach the next level
- Not all criteria have requirements for each level
- Capability maturity is the minimum of the sub-capability scoring philosophy maturity levels

***Sub-Capability Scoring Philosophy Maturity Levels (Example)***

| Scoring Philosophy | Climate Change | Learning and Continuous Improvement | IT Infrastructure & Database Management | Model Inputs and Outputs | Modularization | Spatial Granularity | Stability of Assumptions | Transparency |
|---|---|---|---|---|---|---|---|---|
| Achieved Level | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 4 |

Minimum Level = 1

Capability Maturity Level of 1

# CATEGORY MATURITY LEVELS

***Category Maturity Level***

- Capability maturity is the minimum of the sub-capability scoring philosophy maturity levels
- Category maturity is the average of each capability maturity level within the category

***Category Maturity Level Determination (Example)***

| A. Risk Assessment and Mitigation Strategy | | | | | | |
|---|---|---|---|---|---|---|
| Capability | 1. Statistical weather, climate, and wildfire modeling | 2. Estimation of wildfire and PSPS hazard and exposure to life-safety and human-environment system | 3. Estimation of community vulnerability to wildfire and PSPS | 4. Estimation of risk and combination of risk components | 5. Risk-informed wildfire mitigation strategy and estimation of risk reduction impact of mitigation activities | 6. Risk Event Tracking and Integrating Lessons Learned |
| Achieved Level | 1 | 3 | 2 | 2 | 3 | 4 |

Sum of Capability Maturity Levels (15)
Number of Capabilities (6)

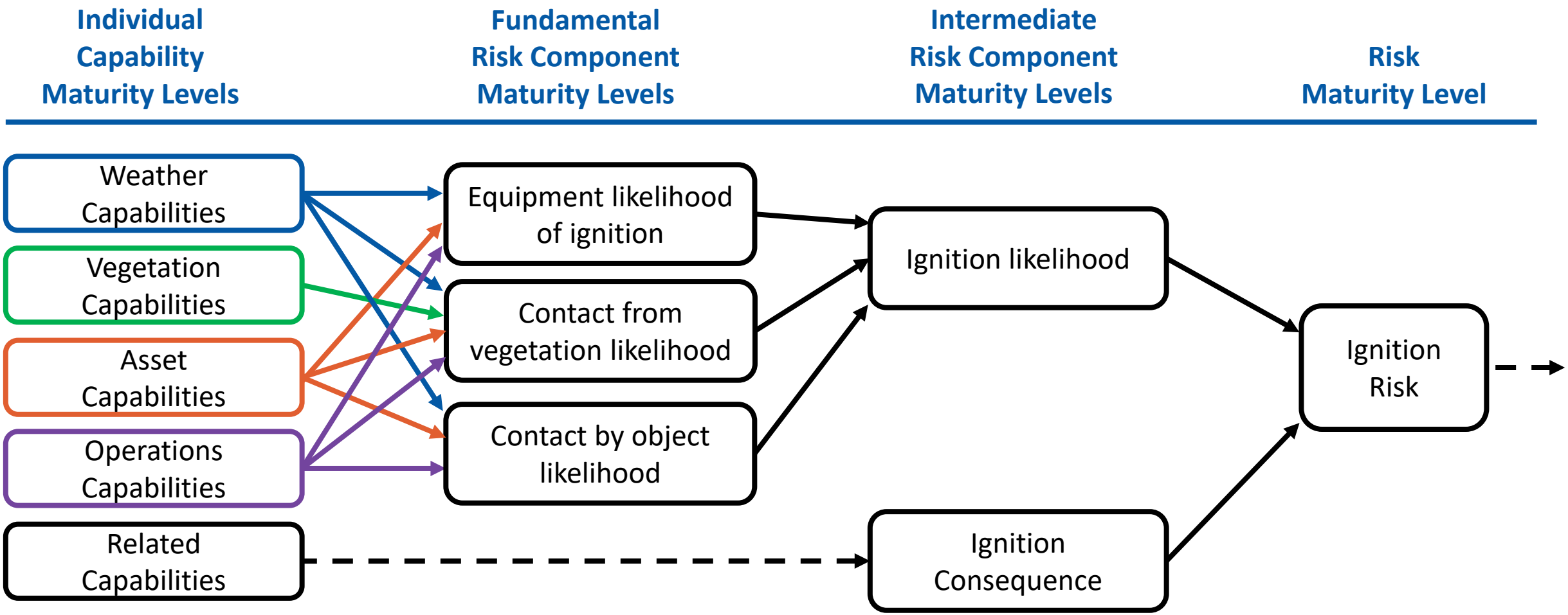
Category Maturity Level of 2.5

# RISK COMPONENT MATURITY LEVELS

| Category | | Capability | Risk Component Maturity Components | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Equipment Likelihood of Ignition | Contact by Vegetation Likelihood of Ignition | Contact by Object Likelihood of Ignition | Wildfire Spread Likelihood | Wildfire Hazard Intensity | Wildfire Exposure Potential | Wildfire Vulnerability | PSPS Likelihood | PSPS Hazard Potential | PSPS Vulnerability |
| **A. Risk assessment and mitigation prioritization** | 1 | Statistical weather, climate, and wildfire modeling | | | | | | | | | | |
| | 2 | Est. of wildfire and PSPS hazard and exposure… | | | | | | | | | | |
| | 3 | Est. of community vulnerability to wildfire and PSPS… | | | | | | | | | | |
| | 4 | Estimation of risk and combination of risk components | | | | | | | | | | |
| | 5 | Risk-informed wildfire mitigation strategy and estimation… | | | | | | | | | | |
| | 6 | Risk event tracking and integrating lessons learned | | | | | | | | | | |
| **B. Situational awareness and forecasting** | 7 | Ignition Likelihood Estimation | | | | | | | | | | |
| | 8 | Weather forecasting ability | | | | | | | | | | |
| | 9 | Wildfire spread forecasting | | | | | | | | | | |
| | 10 | Data collection for near-real-time conditions | | | | | | | | | | |
| | 11 | Wildfire detection and alarm systems | | | | | | | | | | |
| | 12 | Centralized monitoring of real-time conditions | | | | | | | | | | |

**Risk component maturity levels are the combination of the levels from each capability related to that risk component.**

# RISK AND RISK COMPONENT MATURITY LEVELS




**Maturity at each level represented by an arrow. Maturity at the next level is the average of each arrow entering the section.**

# CROSS-CATEGORY THEME MATURITY LEVELS

- Maturity levels of critical areas that are common to most capabilities and categories
- Each cross-category theme related to specific scoring philosophies
- Determine maturity level by calculating the average of sub-capability scoring philosophies
- Cross-category theme maturity level is the average of the scoring philosophy maturity levels

| Example Cross-Category Metrics | Scoring Philosophies | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
|  **Automation and Systemization** | Anticipating | Automation | IT Infrastructure & Database Management | Learning and Continuous Improvement | Systemization, Policies, and Procedures | | | | |
|  **Continuous Improvement** | Collaboration | Engagement | Learning and Continuous Improvement | Risk Spend Efficiency | Stability of Assumptions | Stability of Assumptions | Systemization, Policies, and Procedures | Transparency | |
|  **Data Governance** | Data Relevance and Visualization | Documentation and Disclosures | Frequency | IT Infrastructure & Database Management | Learning and Continuous Improvement | QA/QC | Spatial Granularity | Stability of Assumptions | Transparency |
|  **QA/QC** | Quality Assurance | Quality Control | SME Verification | Validation | | | | | |
|  **Risk Prioritization** | Data Relevance and Visualization | Learning and Continuous Improvement | Risk Spend Efficiency | | | | | | |

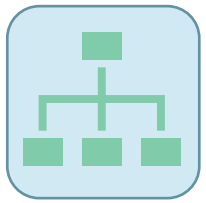
# CROSS-CATEGORY THEME MATURITY LEVELS (EXAMPLE)

| Cross-Category Theme Metrics | Scoring Philosophies | Scoring Philosophy Maturity Level | 1. Statistical weather, climate, and wildfire modeling | 2. Est. of wildfire and PSPS hazard and exposure… | 3. Est. of community vulnerability to wildfire and PSPS | 4. Estimation of risk and combination of risk components | 5. Risk-informed wildfire mitigation strategy… | 6. Risk Event Tracking and Integrating Lessons Learned |
|---|---|---|---|---|---|---|---|---|
| **Data Governance**  | Data Relevance and Visualization | **2.0** | **2** | **2** | **2** | **2** | **2** | **2** |
| | Documentation and Disclosures | **1.7** | **1** | **1** | **1** | **2** | **2** | **3** |
| | Frequency | **2.5** | **-** | **-** | **-** | **-** | **2** | **3** |
| | IT Infrastructure & Database Manag. | **3.0** | **3** | **3** | **3** | **3** | **3** | **3** |
| | Learning and Cont. Improvement | **2.0** | **2** | **2** | **2** | **2** | **2** | **2** |
| | QA/QC | **2.0** | **-** | **-** | **-** | **2** | **2** | **2** |
| | Spatial Granularity | **2.0** | **2** | **2** | **2** | **2** | **2** | **2** |
| | Stability of Assumptions | **1.8** | **3** | **2** | **1** | **1** | **2** | **-** |
| | Transparency | **3.0** | **4** | **2** | **2** | **4** | **4** | **2** |

Average yields Data Governance maturity level of 2.2

# Maturity Assessment and the Utility WMP

# MATURITY ASSESSMENT AND THE UTILITY WMP



***WMP Section Organization***

- Mitigation initiative sections align with categories in Maturity Model
- Cross-category theme maturity levels discussed in Sections (e.g., Data Governance sub-section in Vegetation Management)

***Transparency in Maturity Level Determination***

- Utilities will know maturity levels prior to submitting the WMP
- Discussion of mitigation initiatives in each area should identify how the plan will result in improved maturity

***Maturity Survey***

- Survey questions will be updated to align with changes to Maturity Model and WMP sections
- Additional context will be provided for survey questions to improve consistent interpretation
- Space for a word-limited narrative in the Maturity Survey for each capability
  - Activities undertaken related to the capability but not covered by the 2023-2026 model
  - Comments on capability design (i.e., description, scoring philosophies, and maturity levels) for consideration in 2026 update

# 2023 MATURITY MODEL

## *Key Changes*

| ID | Description |
|---|---|
| 1 | **Reorganize the Maturity Model into nine (9) categories covering forty-five (45) capabilities**<br>• Merged existing "Grid Design and System Hardening" and "Asset Management and Inspections" category<br>• Addition of a new "Safety Culture" category<br>• Merging/splitting of existing capabilities to better align with updated scoring approach (see number 3)<br>• Replaced "Resource Allocation Methodology" categories with comprehensive maturity levels (see number 3) |
| 2 | **Expand maturity capability definitions**<br>• Expand list of scoring philosophies to include other key maturity themes<br>• Link each maturity capability to related risk and risk components<br>• Link each maturity capability to related outcomes |
| 3 | **Develop cross-category theme metrics which evaluate key scoring philosophies across all categories**<br>• Risk and risk component maturity levels<br>• Critical cross-cutting theme maturity levels such as automation and systemization, continuous improvement, data governance, QA/QC, and risk prioritization |
| 4 | **Increased transparency in maturity level determination**<br>• Document the approach used to determine utility maturity levels in the WMP Guidelines attachment<br>• Provide additional granularity on the maturity of each capability based on the different scoring philosophies |
| 5 | **Link maturity assessment to utility WMP discussion and improving best practices**<br>• Add a section within each subject matter chapter on maturity assessment for the utility to describe how the initiatives are expected to advance their maturity and reach the levels projected for future years<br>• Provide space for utilities to describe efforts undertaken in each capability which are expanding the state-of-the-art that are not captured in the existing maturity level definitions for potential inclusion in the 2026 update |

# Break

# Comments and Questions?

# Session #3 – Comments and Questions?

## *Guiding Questions*

- Maturity model reorganization and integration with WMP guidelines
  - Thoughts on reorganization of capabilities? New capabilities? Gaps in updated model?
  - Thoughts on expanded capability definition (link to outcomes, risk components, scoring philosophies)?
  - Thoughts on integration in WMP guidelines?
- Expanded maturity levels
  - Thoughts on new maturity levels (risk and risk components, cross-category themes)?
  - Are there other cross-category theme scores which would be valuable?
- Maturity level determination
  - Clarification needed on the proposed determination approach?
  - Are there other areas to consider in determining maturity level?

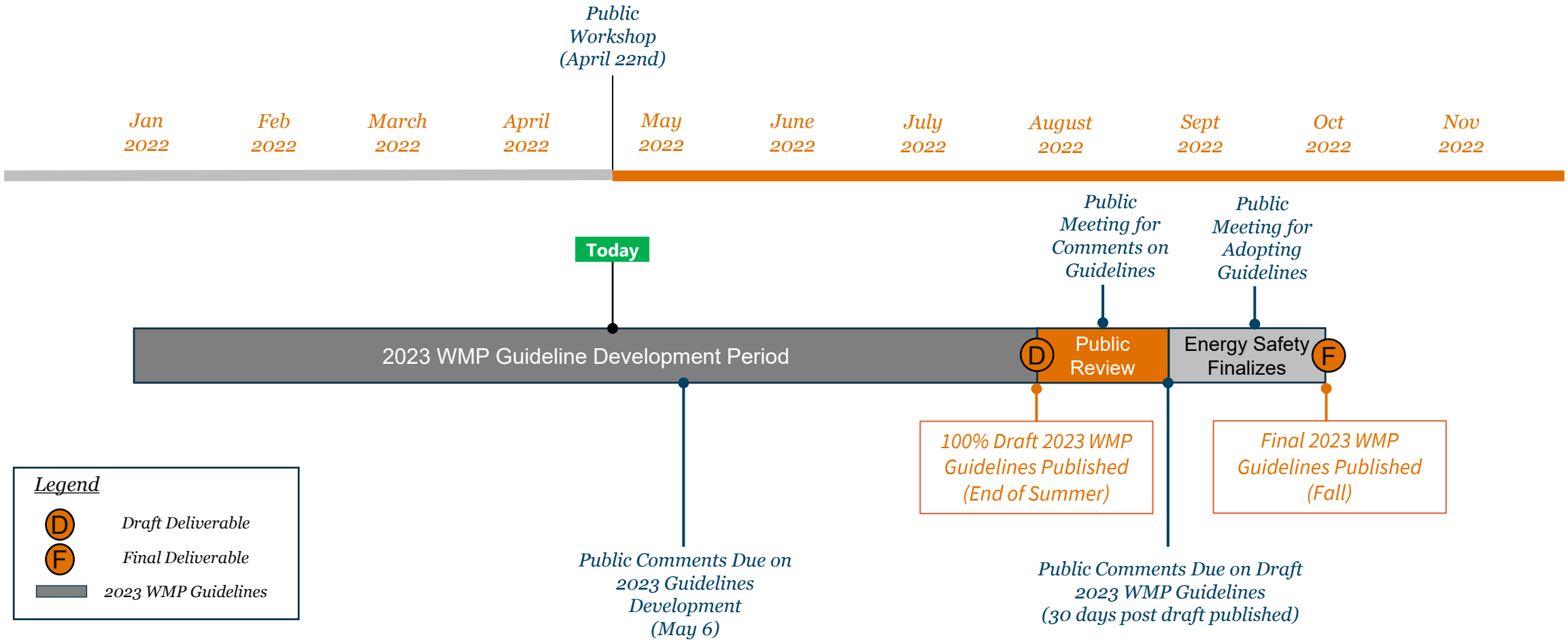
# Session #1 Restructuring of the Guidelines

# SESSION OUTLINE

- Part 1: Restructuring the Guidelines
  - Overview of existing structure
  - Key proposals for consideration
- Part 2: Submission Timelines
  - Overview of current conditions
  - Key proposals for consideration
- Part 3: WMP Update Guidelines
  - Overview of existing WMP Update Guidelines
  - Key proposals for consideration

# Final Remarks

# 2023 WMP Guidelines Development Timeline



# Final Remarks & Next Steps

- Recording and slide show will be available after the conclusion of this workshop
- Workshop comments are due May 6, 2022. Comments may cover items not specifically discussed today
- More opportunities for engagement in 2023 WMP Guidelines development