

**Wildfire Risk Governance Forum
November 13, 2020**



Safety
Meeting Agenda

Earthquake
Duck, Cover & Hold

Emergency Plan & Exit Strategy
Have a plan for yourself and your household

24/7 Nurse Care Line
If you experience a work-related discomfort or injury, call [redacted] and notify your supervisor.

Wash your hands!

Wear a Mask

Practice social Distancing

Date:	11/13/2020		
Desire Outcomes:	• TBD		
Meeting Agenda			
	What - Content	Who - Facilitator(s)	Slide Number / Duration
1	TBD		
2			
3			

Action Item Review



Action Items					
Workstream	Action Item (Initial Date)	Description	Responsible Party	Resolution	Date
Enhanced Vegetation Management	EVM Risk Raydown Curve WGR - 11/9/2020	Plot and show the 1130 miles (80-90% Complete) Over Work that needs to be finished. EVM - 02: Strike Tree and Overhead (Weighted) Risk Raydown Curve			11/13/2020
Enhanced Vegetation Management	EVM programs timeframes WGR - 11/9/2020	Determine the overall program timeframes for the EVM program. Program time is a factor in the overall program time. Create a weighted risk			11/13/2020
Enhanced Vegetation Management	EVM programs and resources WGR - 11/9/2020			In Process - Review of other programs underway	TBD
Enhanced Vegetation Management	System hardware work WGR - 11/9/2020			In Process - Current scoping appears to not have operational efficiencies with hardening.	11/13/2020
Enhanced Vegetation Management	Tree density WGR - 11/9/2020	2019 and 2020 density number per mile. Future work 2021, 2022		Road Mapped - LIDAR tree density will be examined for inclusion in future risk modeling	TBD

To be discussed in working session

Action Items from 11/09/2020 (Federal Monitor Meeting)

Workstream	Action Item	Description	Responsible Party	Resolution	Date
Risk Models	Risk models comparison WGR – 10/09/2020	Identify any risk areas outside of NFDI Model in the next iteration of the DA Model		Road Mapped – This will be added as an enhancement to the model road map	XXX
Risk Models	Risk Model Enhancement	Incorporate 2018/19 DAH data and queries data in the next iteration of the DA model		Road Mapped – This will be added as an enhancement to the model road map	XXX
Risk Models	Risk Model Enhancement	Include Egress on the connectivity side for the next iteration of the DA Model		Road Mapped – This will be added as an enhancement to the model road map	XXX
Risk Models	Model Documentation	Area to be added to charts on slide 22 (ppt. 11/09/2020) and to Risk Model for new Phase 11		Completed	XXX



Risk Model Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Date
Risk Model	Risk Model Comparison W08 - 10/30/2020	Create risk comparison between the 2018 risk model and 2021 risk model to highlight movement of CPZs. The getting top 100 (circuits or CPZs)	[Redacted]	Complete - See the Risk Model Followup Section	11/3/2020



- Key Takeaways**
- No CPZs in the top 100 overlap
 - This will result in significant change to the prioritization and expected risk buydown of mitigations
 - The 2018 risk results were not distance weighted, where the 2021 prioritization included a distance factor.



Risk Model Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Date
Wild Model	Deep dive risk model session WDR-15/16/2020	Hold a Deep Dive session with (1) the Federal Monitor and (2) the Operational Observer	[REDACTED]	Complete - Meetings have been scheduled for 11/8 & 11/12	11/12/2020

Updates

- First Deep Dive session held on Monday 11/10/2020 at 1:00pm PST
- Second session will be held on Thursday 11/12/2020 at 12:30pm PST

Risk Model Action Items

Workstream	Action Item	Description	Responsible Party	Resolution	Date
risk models	risk model contributors	highlight contributors to the risk model	[REDACTED]	Complete - Targeted for inclusion in next time release	11/12/2020

Vegetation Model - Contributors		Conductor Model - Contributors	
Variable	Permutation Importance	Variable	Permutation Importance
Tree height class	25.1	Non-burnable area	20.8
100 hour fuelst avg	24.1	Daily precipitation, mean	20.8
Vapor pressure deficit avg	21.6	Conductor material: ACSX	9.7
Quality summer day pct	6	Estimated conductor age	8.9
Wilt	4.3	Max tree height	4.5
Annual precipitation avg	3.1	Reliability program color	4.3
Humidity	2.8	Vapor pressure deficit, mean	4.0
Specific humidity avg	2.4	Conductor size: 2	3.4
Rainfall index avg	3.3	Conductor size: 4	1.6
Windiness	1.9	100 hour fuelst, mean	1.1
Temperature avg	1.6	Max temperature, mean	1.0
Windy summer day pct	1	Wind speed, mean	0.5
Local topography	0.8	Local topography	0.2
Tree height avg	0.8	Conductor size: 6	0.1
1000 hour fuelst avg	0.6	Conductor material: AL	-0
Emergence avg	0.4	Conductor material: CU	-0

Key Takeaways

- Tree height and "Non-burnable area" are the most important variables in the vegetation and conductor models, respectively.
- Vegetation density had low predictive utility in the vegetation model, and was not included in the final design



Risk Model Action Items


Workstream	Action Item	Description	Responsible Party	Resolution	Date
risk model	risk model contributors	provide a detailed description of the top model contributors	[Redacted]	Complete - Targeted for inclusion in next release	11/13/2020

Vegetation Model - Contributors Description

Variable	Description
Tree height_max	Maximum tree height, in meters, for each 100m x 100m pixel area using the distribution grid
100-hour-fuels_weg	The dead fuel moisture data from GRDMET
Vapor-pressure-deficit_weg	The average vapor pressure deficit from the GRDMET dataset
Windy-summer-day-act	Percentage of days that have high frequency of gusts
WU	High fuel/moisture district
Precipitation_weg	The average daily precipitation from the GRDMET dataset
Impervious	Impervious ground cover (i.e. non-flammable)
Specific-humidity_weg	The average specific humidity from the GRDMET dataset
Burn index_weg	An derived variable based off of the geographical and topographical aspects of a location
Wind_max	The maximum wind velocity at a height of 10 meters from the Real-Time Mesoscale Analysis (RTMA) dataset at a resolution of 2.5km
Temperature_weg	The average temperature from the GRDMET dataset
Windy-summer-day-act	Percentage of days that have a high percentage of days with high average wind speed
Local-topography	The topographic position index (TPI) was extracted from a USGS digital elevation model (DEM) at 100-meter resolution
1000-hour-fuels_weg	The dead fuel moisture data from GRDMET
Energy-release-weg	Heat insulation [Redacted]

Conductor Model - Contributors Description

Variable	Description
Nonflammable-area	Land cover description similar to imperviousness that includes surfaces that typically don't ignite when a spark occurs
Daily-precipitation_mean	The average daily precipitation from the GRDMET dataset
Conductor material_area	Aluminum conductor steel-reinforced
Estimated-conductor-age	Number of years since the installation year
Max tree height	Maximum tree height, in meters, for each 100m x 100m pixel area using the distribution grid
Reliability Program score	Spans with more than three sags per phase
Vapor pressure deficit_mean	The average vapor pressure deficit from the GRDMET dataset
Conductor size_2	Conductor size 2
Conductor size_4	Conductor size 4
100-hour-fuels_mean	The dead fuel moisture data from GRDMET
Max temperature_mean	The average maximum temperature from the GRDMET dataset
Wind speed_mean	The average wind velocity at a height of 10 meters from the Real-Time Mesoscale Analysis (RTMA) dataset at a resolution of 2.5km
Local topography	The topographic position index (TPI) was extracted from a USGS digital elevation model (DEM) at 100-meter resolution

 **Risk Model Action Items**

Workstream	Action Item	Description	Responsible party	Resolution	Date
Risk Models	Model process documentation	Bring the Model Process Level Documentation to this forum for an official approval	[REDACTED]	In Process Targeted for inclusion in deep dive sessions	11/20/2020

1 User Guide
Model procedure and details will be provided in the user guide to the forum for review at the 11/20 session

Risk Model Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Date
Risk Models	Protection zone selection criteria	Factor in Egress into process for selecting the protection zones to be worked	[REDACTED]	Need Mapped - Egress has been considered and future enhancement for the risk model	11/05/2020

Factors around Egress

Analysis of the difficulty to access or evacuate communities. Egress analysis was based on:

- 1) Population density of communities
- 2) The number of roads for each community
 - Highways / Interstates
 - Country roads
 - Residential roads

✓ Census data has been used as a proxy for calculation of population density of communities.

Plan for utilizing Egress

Need input from [REDACTED]

Key Takeaways

- REAX model uses census data for calculation of community population density. Ichnosylva incorporates more granular data for population density calculation
- External validations on the 2018 egress model highlighted a lack of predictive performance.

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Risk Model Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Date
Wildfire Governance Charter	Charter update	Update charter to include review of broader set of WFP risk reduction activities and projects (see slide).	[REDACTED]	Completed. Risk Charter has been updated, included in attached materials.	11/05/2020

See updated slide for the updated wildfire governance Charter

Meeting Purpose:

- Drive decision making on:
 - Wildfire Governance Charter alignment on the top-level risk framework to guide the work, provide a focus to review key risk-based assumptions, and associated reports.
- Work:
 - Review completion of the highest priority risk mitigation work (associated with investments, asset, strategy and operational needs; guide charter is needed).
 - Discuss the approved work plans completed and the quality of the completed work is monitored.

Key Deliverables:

- Integrate individual wildfire mitigation workstream meetings into a single governance session.
- Attendees will focus on system leadership, operational expansion management, inspections and repairs and will expand into other areas of wildfire and PPS mitigation work. Meeting topics and supporting material will adjust based on discussion and request from Working Directors.

Attendees:


- Chair:** Chief Risk Officer
- Working Members:**
 - VP Asset, Risk Management & Community Wildfire Safety Program
 - VP Major Projects and Programs, Electric Operations
 - VP Wildfire Safety and Public Engagement
- VP Chief Audit Officer**
- Non-Voting Members:**
 - VP Director, Electric Asset Strategy
 - VP Director, Major Programs & Project Delivery
 - VP Director, Risk Management
 - Director, CIP & M&P
- Workstream Leads:**
 - System Handover Director, Distribution Strategy
 - Enhanced Inspection Management, Director, Regulatory Management
 - Inspections & Repairs Manager, Transmission Standards
- Facilitator:**
 - VP Director, Risk - Special Projects

How Decisions are Made:

- Initial meeting agenda will be an addendum for decisions to be made.
- A simple majority vote by attending committee members.
- For broader: Chair hold the tie-break vote.

Meeting Logistics:

- Frequency/Duration: Weekly (every Friday)
- Deliverable:
 - Pre-read materials sent 1 day before meeting.
 - Action items included in following meeting material.
- Agenda: VP Director, Risk - Special Projects to approve final agenda.

 Key Wildfire Risk Model Governance Forum Decision				
Workstream	Decision	Description	Approval Vote	Date
Risk Models	Adoption of the 2021 wildfire risk models for mitigation deployment	<ul style="list-style-type: none"> Adopt the approved ignition model for vegetation ignitions and Technology for 2021 PDM work Adopt the approved ignition model for equipment ignitions and Technology for 2021 System Rendering work 	Approved Approved Approved Not Present	10/20/2020

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Key Decision – Adoption of the 2021 Risk Model for Mitigation Deployment

Approval Status: **Approved**

Decision Detail

The approval is for moving from the 2018 wildfire risk model to the 2021 wildfire risk model to inform system hardening, enhance vegetation management and inspections. These changes included:

- Update to vegetation ignition model (LoRe)
- Update to conductor model (LoRe)
- Update to consequence (core)

Concerns and Mitigations

- Inclusion of non-447D areas requested in the next model iteration
- Inclusion of Egress model requested in the next model iteration
- Resource availability to complete "hot risk informed planned work" was challenged
- Detailed description of variables in particular "non-burnable areas" requested
- The ability to calculate tree density within pswh was challenged

Approvals

Approved
Approved
Approved
Approved
Abstain – Not Present

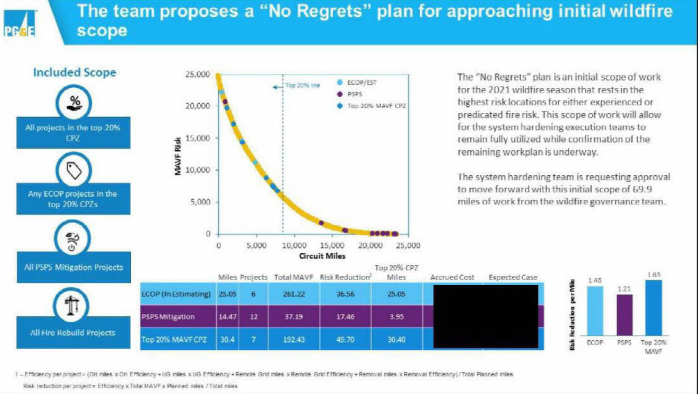
Action Items and Validations

Adoption of the 2021 wildfire risk model for mitigation deployment Deep dive risk model session	Completed - Adopt the proposed ignition model for vegetation ignitions and Technosylva for 2021. OVM work Completed - Adopt the proposed ignition model for equipment ignitions and Technosylva for 2021. System hardening work
Risk models comparison	Completed - Detailed risk comparison between the 2018 risk model and 2021 risk model to highlight improvement of CP2s (Targeting top 100 circuits or CP2s)
Deep dive risk model session	In Process - Hold a Deep Dive Session with (1) the Federal Monitor and (2) the Operational Closure
Model process documentation	In Process - Bring the Model Process Level Documentation to this forum for an official approval
Egress Consideration	In Process - Factor in Egress into process for selecting the protection zones to be worked

System Hardening



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*Need to show data on Top CPZ that got hit
In 2019 and 2020 PSPS Events on the Risk Curve
As well as a table of those CPZ, similar to the
Top 50 miles, may not have it for this week
But we need to mention it*



The scope for the 2020 Rebuild is focused in XXXX

On a GIS Map and on a Tableau Dashboard – I can get [REDACTED]
[REDACTED] started on both once I have the order numbers.

*Yes of course. I can have [REDACTED] Work with you
Tableau has GIS Views.*

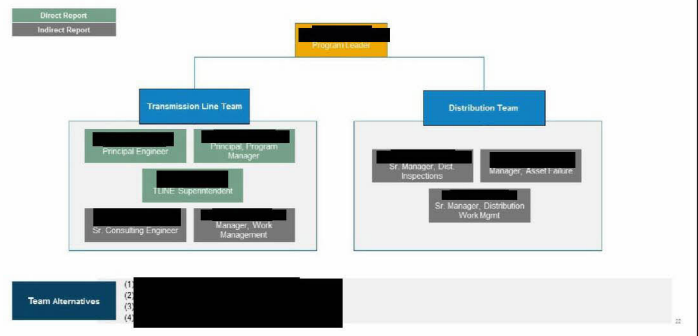
Overhead Inspections



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The inspections team is requesting the following structure to support the execution of the defined scope



Enhanced Vegetation Management



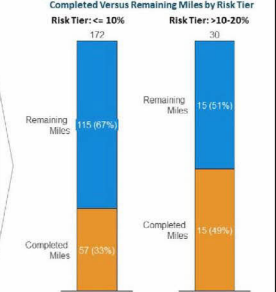
EVM is requesting approval to commence work on ~130 'no regret' miles involving a total of seven Circuit Protection Zones (CPZs)

Circuit Protection Zones with 'No Regret' Remaining Miles

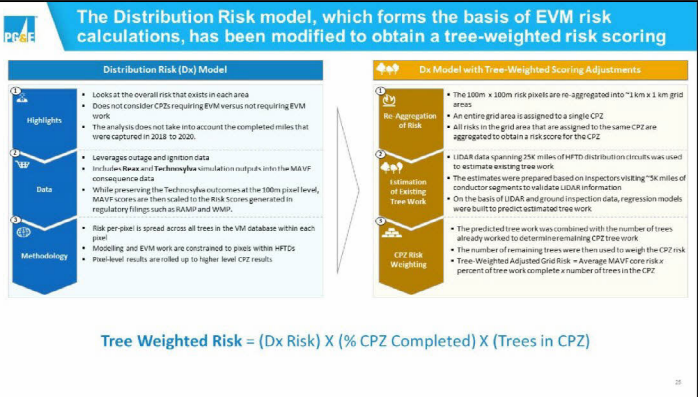
CPZ Name	Completed Miles	Total Remaining Miles	Estimated Tree work	Percent Complete
Oakhurst	16.18	27.50	2,137	37.0%
Middletown	4.78	11.40	1,046	29.5%
Fitch Mountain	0.15	20.60	3,240	0.7%
Garberville	0.58	4.84	2,471	10.7%
Bangor	15.53	26.69	2,587	36.8%
Tivy Valley	20.16	24.06	789	45.6%
Total	57.37	115.10	12,270	38.8%

Risk Tier: >10-20%

CPZ Name	Completed Miles	Total Remaining Miles	Estimated Tree work	Percent Complete
Penryn 1103 Circuit Breaker	14.59	15.22	492	48.9%



While the full EVM 2021 work plan is being discussed, the EVM team seeks an approved scope for work starting in December that includes 130 miles prior to the approval of the full 2021 work plan



PG&E 2021 EVM Highlights

Key Features and Scope Areas

Circuit Protection Zones (CPZs)

- The 2021 plan incorporates the **concept of the CPZ** – a term coined by the Asset Strategy team
- CPZs are being used because they are **tied to isolation devices** on circuits, and in the case of PSPS events, indicate a way to isolate a circuit from a certain point

Plan rationale

- The 2021 LVM plan has been prepared with the intent that:
 - The plan **avoids any System Hardening projects** in 2021
 - The plan focuses on CPZs that have between **60-90% completion** in line with maintaining EVM scope within the routine program

Scope

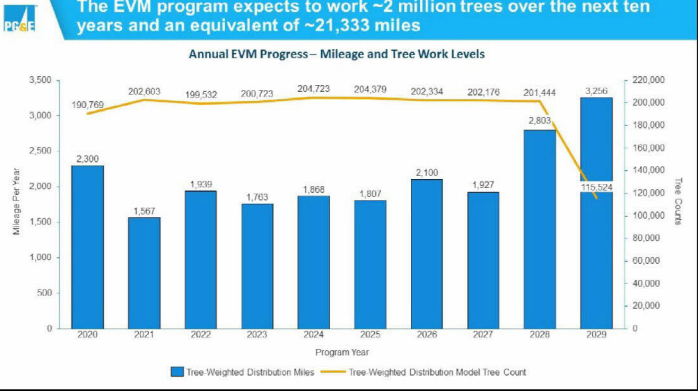
- The plan targets **190,000 trees** and **2,300 miles** of distribution circuits
- The plan envisions a **pre-inspection of between 831-904K trees**, **tree work of an estimated 159-195K trees** and **removal of an estimated 100-133K trees**
- The current plan has been prepared on the basis of a tree-based weighted analysis of risk across CPZs to take into account tree work already completed – a variable that is missing from the Dix model

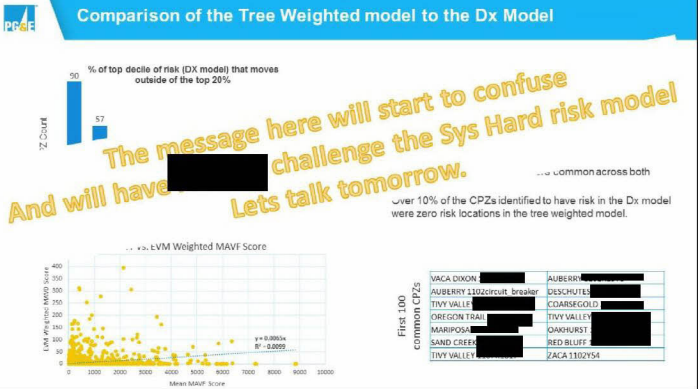
Regional Distribution of Targeted Mileage (miles)

Region	Miles	Percentage
Bay Area	1,606	22%
Central Coast	949	13%
Central Valley	1,241	17%
North Coast	1,061	17%
North Valley	2,190	30%
Sierra	1,854	26%
Total	7,300	100%

Other Considerations

- Plan Inputs:** The plan has been prepared on the basis of work completed and risk from the VM Wildfire Risk Model
- The plan overlaps with inputs from local subject matter experts (SMEs), prior inspections and local customer/agency contacts
- Regions:** Plan targets have been balanced with respect to a 12 year plan across each of the regions
- Estimated cost:** A direct cost of [redacted] is estimated for pre-inspection and tree work spend
- CPZ Inclusion:** CPZs have been included on the basis of the following confidence levels:
 - CPZs where tree work has been **60 percent** completed and have been identified for further LVM work
 - CPZs where more than **90 percent** of the work has been completed are not targeted as there are other environmental or access issues that are the source of risk and cannot be mitigated by additional EVM work






Action Items and Next Steps



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 Action Items					
Workstream	Action Item (Initial Date)	Description	Responsible party	Resolution	Date
Enhanced Vegetation Management	FVM Risk Reduction Curve WGR - 11/1/2020	Plot and show the 120 miles (90-90% Carry Over Work that needs to be included) on the DM - Q2 (Dens Tree and Overhang Weighted) Risk Reduction Curve		In Process - Current scope is being plotted against the current risk laydown curve	11/19/2020
Enhanced Vegetation Management	FVM programs timeframes WGR - 11/1/2020	Determine the overall time frame and pace for the FVM programs when Stock Potential Trees are factored into the 23000 miles of W12 Groups Underplant which of the 29500 miles need FVM work		In Process - Dependent on prioritization decision	11/26/2020
Enhanced Vegetation Management	FVM programs and roadwork WGR - 11/1/2020	Provide a full picture of all vegetation management work, outside of just the enhanced vegetation management.		In Process - Review of other programs underway	11/26/2020
Enhanced Vegetation Management	System hardening and FVM work overlay WGR - 11/2/2020	Evaluate the areas that are being targeted by system hardening to align for operational efficiencies between the two programs. Dependency on 2021 SR Work Plan		In Process - Current scoping apparatus not have operational efficiencies with hardening	Dependent on SR plan
Enhanced Vegetation Management	Tree density statistic WGR - 11/1/2020	Show Tree Density from the 2018 and 2020 Work. Provide tree density number per mile processed as we show future work 2021, 2022		Road Mapped - Update tree density will be examined for inclusion in future risk modeling	TBD



Action Items (Cont'd)

Workstream	Action Item	Description	Responsible Party	Resolution	Date
Risk Models	Risk models comparison WGR - 10/30/2020	Create risk comparison between the 2018 risk model and 2023 risk model to highlight movement of CRs (Targeting top 100 in both WGRs).	[REDACTED]	Completed	11/11/2020
Risk Models	Deep dive risk model session WGR - 10/30/2020	Hold a Deep Dive Session with (1) the Federal Monitor and (2) the Operational Observer.	[REDACTED]	Completed	11/11/2020
Risk Models	Risk model contributors	Highlight contributors to the risk model.	[REDACTED]	Completed	11/13/2020
Risk Models	Model process documentation	Bring the Model Process documentation to the fore for an official approval.	[REDACTED]	In Process - Targeted for inclusion in deep dive sessions.	11/20/2020
Risk Models	Egress Consideration	Factor in Egress into process for selecting the protection zone to be worked.	[REDACTED]	Road Mapped - Egress has been considered as a future enhancement for the risk model.	11/09/2020
Offshore governance Charter	Charter update	Update charter to include review of broader set of WP risk reduction activities and project oversight.	[REDACTED]	Complete - Risk charter has been updated. Included in attached materials.	11/09/2020



Action Items from 11/09/2020 (Federal Monitor Meeting)

Workstream	Action Item	Description	Responsible Party	Resolution	Date
Risk Models	Risk Model Comparison WGR: 10/30/2020	Include high risk areas outside of MFD basins in the next iteration of the Du Model	[REDACTED]	Risk Mapped - This will be added as an enhancement to the model roadmap	11/23/20
Risk Models	Risk Model Enhancement	Incorporate 2019 LIDAR data and species data in the next iteration of the Du Model	[REDACTED]	Risk Mapped - This will be added as an enhancement to the model roadmap	11/23/20
Risk Models	Risk Model Enhancements	Include signs on the consequence side for the next iteration of the Du Model	[REDACTED]	Risk Mapped - This will be added as an enhancement to the model roadmap	11/23/20
Risk Models	Model Documentation	Asa to be added to charters slide 22 (see 11.09.2020 Wildfire Risk Model Review Presentation)	[REDACTED]	Completed	11/23/20



Past Action items

Workstream	Action Item	Description	Responsible party	Resolution	Date
Inspection	Inspection Workstream Owner	Schedule meeting to identify the owner of the inspection and/or workstream		Completed – inspection lead identified	10/21/2020
Risk model	Risk Model Deep Dive	The risk model needed further detailed discussion before voting and approval could take place		Completed – Follow up session held 10/27. Detail on the risk model was provided in advance of 10/30 approval meeting.	10/23/2020
RIM	RIM review meeting	Schedule additional meeting for RIM review		Completed – Follow up meeting was held on 11/05	11/05/2020
Governance meetings	Meeting updates	Update meeting to be 90 minutes		Completed – future meetings updated – effective 11/13	11/01/2020
Governance meetings	All future meetings	[REDACTED] to be added to future meetings to provide additional direction from audit		Completed – [REDACTED] has been added to all future governance meetings	10/23/2020



Upcoming Review Agenda Items

11/20/2020

- Final Decision on System Hardening Plan (If feasible)
- Initial Review into Inspections 2021 Plan
- Initial Review into Repairs 2021 Plan
- Close out Completed Action Items

12/01/2020

- Final Decision on EVM 2021 Plan (If feasible)
- Decision Items needed for Inspections 2021 Work Plan
- Close out Completed Action Items

12/08/2020

- Decision needed on Inspection. Initial views of 2021 Work Plan
- Decisions needed on Repairs 2021 Work Plan
- Tier 1 – Overhead Conductor Replacement Discussion

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Appendix



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Key Wildfire Risk Model Governance Forum Decision

Workstream	Decision	Description	Approval State	Date
Risk Models	Adoption of the 2021 wildfire risk models for mitigation deployment	<ul style="list-style-type: none"> Adopt the approved ignition model for equipment ignitions and Technology for 2021 PDM work Adopt the approved ignition model for equipment ignitions and Technology for 2022 System Rendering work 	<ul style="list-style-type: none"> Approved Approved Approved Not Present 	10/20/2020



Key Decision – Adoption of the 2021 Risk Model for Mitigation Deployment

Approval Status Approved

Decision Detail

The approval is for moving from the 2018 wildfire risk model to the 2021 wildfire risk model to inform system hardening, enhance vegetation management and inspections. These changes included:

- Update to vegetation ignition model (LoRe)
- Update to conductor model (LoRe)
- Update to consequence (core)

Concerns and Mitigations

- Inclusion of non-447D areas requested in the next model iteration
- Inclusion of Egress model requested in the next model iteration
- Resource availability to complete "hot risk informed planned work" was challenged
- Detailed description of variables in particular "non-burnable areas" requested
- The ability to calculate tree density within pswh was challenged

Approvals

Approved
Approved
Approved
Approved
Abstain – Not Present

Action Items and Validations

Adoption of the 2021 wildfire risk model for mitigation deployment Deep dive risk model session	Completed - Adopt the proposed ignition model for vegetation ignitions and Technosylva for 2021 DVM work Completed - Adopt the proposed ignition model for equipment ignitions and Technosylva for 2021 System Hardening work
Risk models comparison	Completed - Detailed risk comparison between the 2018 risk model and 2021 risk model to highlight improvement of CP2s (Targeting top 100 circuits or CP2s)
Deep dive risk model session	In Process - Hold a Deep Dive Session with (1) the Federal Monitor and (2) the Operational Closure
Model process documentation	In Process - Bring the Model Process Level Documentation to this forum for an official approval
Egress Consideration	In Process - Factor in Egress into process for selecting the protection zones to be worked