



PG&E Wildfire Risk Modeling Overview





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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

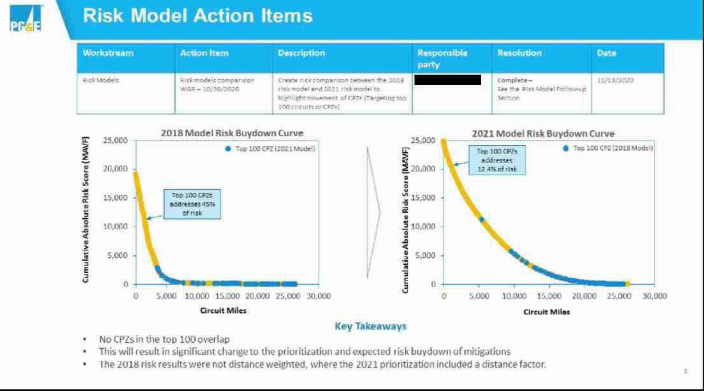



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Action Items				
Workstream	Action Item (Initial Date)	Description	Resolution	Date
Enhanced Vegetation Management	EVM Risk Baydown Curve WGR – 11/3/2020	Plot and show the 1130 miles (80,000 acres) of Over Work that needs to be finished by the EVM – 107 Strike Tree and the 1130 miles (80,000 acres) of risk Baydown Curve	Review of other programs underway	11/13/2020
Enhanced Vegetation Management	EVM programs timeframes WGR – 11/3/2020	Determine the timeframes for the EVM programs and the 1130 miles (80,000 acres) of risk Baydown Curve	In Progress – Review of other programs underway	11/13/2020
Enhanced Vegetation Management	EVM programs and resources WGR – 11/3/2020	Determine the resources for the EVM programs and the 1130 miles (80,000 acres) of risk Baydown Curve	In Progress – Review of other programs underway	TBD
Enhanced Vegetation Management	Systematic EVM WGR – 11/3/2020	Determine the systematic EVM for the 1130 miles (80,000 acres) of risk Baydown Curve	In Progress – Review of other programs underway	11/13/2020
Enhanced Vegetation Management	Tree density WGR – 11/3/2020	Determine the tree density for the 1130 miles (80,000 acres) of risk Baydown Curve	Road Mapped – Review of other programs underway	TBD

<div>  Action Items from 11/09/2020 (Federal Monitor Meeting) </div>					
Workstream	Action Item	Description	Responsible party	Resolution	Date
Risk Models	Risk models comparison WGR – 10/30/2020	Identify high risk areas outside of HFTD [REDACTED] in the next iteration of the Du Model	[REDACTED]	Road Mapped – This will be added as an enhancement to the model roadmap	XXX
Risk Models	Risk Model Enhancement	Incorporate 2019 LIDAR data, and species data in the next iteration of the Du model		Road Mapped – This will be added as an enhancement to the model roadmap	XXX
Risk Models	Risk Model Enhancement	Include Egress on the consequence side for the next iteration of the Du Model		Road Mapped – This will be added as an enhancement to the model roadmap	XXX
Risk Models	Model Documentation	Items to be added to charters slide 22 (ppt: 11.09.2020 Wildlife Risk Model Review Final.ppt)		Completed	XXX

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<div>  <div>Risk Model Action Items</div> </div>					
Workstream	Action Item	Description	Responsible party	Resolution	Date
4-03 Models	Deep dive risk model session WSE - 10/16/2020	Had a Deep Dive session with (1) the Palawan Monitor and (2) the Operational Character	[REDACTED] to [REDACTED] to be part of the meeting	Complete - Meetings have been scheduled for 11/9 & 11/12	11/12/2020
<div> <div>Updates</div> <ul style="list-style-type: none"> 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 </div>					



Risk Model Action Items

Workstream	Action Item	Description	Responsible party	Resolution	Date
Wild Models	Wild model contributors	Highlight contributors to the risk model		Complete - Targeted for inclusion in Deep Dive Assessment	11/12/2020


Vegetation Model - Contributors		Conductor Model - Contributors	
Variable	Permutation Importance	Variable	Permutation Importance
Tree height class	29.5	Non-burnable area	20.8
100-hour fuel class	24.5	Daily precipitation, mean	22.8
Vapor pressure deficit, avg	21.6	Conductor material, ACS1	9.7
Global summer-day pct	6	Retreated conductor age	8.9
WBT	4.2	Max tree height	4.5
Interception, avg	3.3	Reliability Program score	4.1
Impervious	2.8	Vapor pressure deficit, mean	4.0
Specific humidity, avg	2.4	Conductor size, 2	3.4
Rainfall, avg	2.3	Conductor size, 4	2.6
Windiness	1.9	100-hour fuel, mean	2.1
Temperature, avg	1.4	Max temperature, mean	2.0
Windy summer-day pct	1	Wind speed, mean	0.9
Local topography	0.8	Local topography	0.2
Tree height, avg	0.8	Conductor size, 6	0.1
1000-hour fuel, avg	0.6	Conductor material, AL	-0
Evapotranspiration	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
4.0.0 Models	4.0.1 Model contributors	Provide a detailed description of the top model contributors		Complete - Targeted for inclusion in deep dive sessions	11/11/2020

Vegetation Model - Contributors Description		Conductor Model - Contributors Description	
Variable	Description	Variable	Description
Tree height, mean	Maximum tree height, in meters, for each 100m x 100m pixel area using the street/urban grid	Open/developed area	Land surface designations similar to imperviousness that includes surfaces that typically don't ignite when a spark occurs
100-hour fuel, avg	The 100-hour fuel moisture data from GROMET	Daily precipitation, mean	The average daily precipitation from the GROMET dataset
Vapor pressure deficit, avg	The average vapor pressure deficit from the GROMET dataset	Conductor material, acres	Assessments conductor (open/unroofed)
Days summer day, pct	Percentage of days that have high frequency of gusts	Estimated conductor age	Number of years since the installation year
WUJ	High fuel/wind district	Max tree height	Maximum tree height, in meters, for each 100m x 100m pixel area using the street/urban grid
Precipitation, avg	The average daily precipitation from the GROMET dataset	Reliable Prognosis pollen	Stems with more than three pollen per phase
Impervious	Impervious ground cover (i.e. non-flammable)	Vapor pressure deficit, mean	The average vapor pressure deficit from the GROMET dataset
Specific humidity, avg	The average specific humidity from the GROMET dataset	Conductor size, 2	Conductor size 2
Burn index, avg	An derived variable based off of the geographical and topographical aspects of a location	Conductor size, 4	Conductor size 4
Wind, max	The maximum wind velocity at a height of 10 meters from the RealTime Mesoscale Analysis (RTMA) dataset at a resolution of 2.5 km	100-hour fuel, mean	The 100-hour fuel moisture data from GROMET
Temperature, avg	The average temperature from the GROMET dataset	Max temperature, mean	The average maximum temperature from the GROMET dataset
Windy summer, days, pct	Percentage of days that have a high percentage of days with high average wind speed	Wind speed, mean	The average wind velocity at a height of 10 meters from the RealTime Mesoscale Analysis (RTMA) dataset at a resolution of 2.5 km
Local topography	The topographic position index (TPI) was extracted from a 30m digital elevation model (DEM) at 100-meter resolution	Local topography	The topographic position index (TPI) was extracted from a 30m digital elevation model (DEM) at 100-meter resolution
1000-hour fuel, avg	The 1000-hour fuel moisture data from GROMET		
Energy moisture, avg	Need input from [redacted]		



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 Progress. Targeted for inclusion in deep dive reports	11/20/2020

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User Guide

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

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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 enacted		Risk Mapped - Egress has been considered as a factor in the selection of 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

Key Takeaways

- REAX model uses census data for calculation of community population density. Technosylva 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 Executive set of WFR risk reduction activities and project oversight		Completed. Risk Charter has been updated, included in attached materials	11/05/2020
See updated slide for the updated wildfire governance Charter					
<div> <div>Meeting Purpose:</div> <ul style="list-style-type: none"> Drive decision making on: Wildfire Governance Charter: <ul style="list-style-type: none"> Review Charter: There is agreement on the approach to forward work to guide the work. Provide a focus to review key wildfire opportunities and associated impacts. Work: <ul style="list-style-type: none"> There is agreement on the highest priority risk mitigation work associated with development, asset strategy and operational needs, guide Charter as needed. Ensure the approved work plans completed and the quality of the completed work is monitored. Executive Summary: <ul style="list-style-type: none"> Integrate individual wildfire engagement stakeholder meeting into a single governance session. Integrate with focus on system functioning, enhanced vegetation management, inspections and reports and will require integration areas of wildfire and PSP mitigation work. Review topics and supporting material and support forward discussion and request from living documents. <div> <div>Attendees:</div> <ul style="list-style-type: none"> Chair: Chief Risk Officer Staffing Members: <ul style="list-style-type: none"> VP Asset, Risk Management & Community Resilience Safety Program VP Major Projects and Programs, Electric Reliability VP Wildfire Safety and Public Engagement VP Chief Audit Officer Non-Staffing Members: <ul style="list-style-type: none"> Dr. Director, Electric Asset Strategy Dr. Director, Major Projects & Program Delivery Dr. Director, Engineering Operations Director, O&P & R&M Supporting Execs: <ul style="list-style-type: none"> System Engineering Director, Distribution Strategy Enhanced Vegetation Management Director, Vegetation Management Inspection & Reports Manager, Transmission Standards Facilitator: <ul style="list-style-type: none"> Dr. Director, Risk - Special Projects <div> <div>How decisions are made:</div> <ul style="list-style-type: none"> Set of living documents that focus on collaboration for decision to be made. Small team to work by attending current other meetings. No longer: Chair hold the decision only for. <div> <div>Meeting Logistics:</div> <ul style="list-style-type: none"> Frequency/Duration: Weekly (30 min Friday) Structure: <ul style="list-style-type: none"> Pre-read materials sent 1 day before meeting. Action items included in following meeting material. Agenda: Dr. Director, Risk - Special Projects to approve final agenda. </div> </div> </div></div>					

<div>  Key Wildfire Risk Model Governance Forum Decision </div>					
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 proposed Ignition model for operations Ignitions and Technology for 2021 PDM work Adopt the proposed Ignition model for newsmets Ignitions and Technology for 2021 System Rendering work 	<div> <div></div> <div>Approved</div> <div>Approved</div> <div>Approved</div> <div>Not Present</div> </div>	10/06/2020	

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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 (Lulife)
- Update to conductor model (Lulife)
- Update to consequence (Core)

Concerns and Mitigations

- Inclusion of non-WETD 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 pixels 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 Technology for 2021. (VMS work)

Completed - Adopt the proposed ignition model for equipment ignitions and Technology for 2021. System hardening work

Risk models comparison

Completed - Dual risk comparison between the 2018 risk model and 2021 risk model to highlight movement of CPDs (Targeting top 100 circuits or CPDs)

Deep dive risk model session

In Process - Hold a Deep Dive Session with (1) the Federal Monitor and (2) the Operational Observer

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

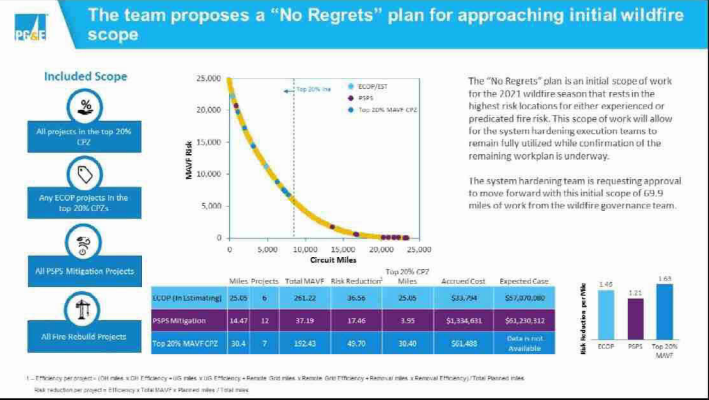
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System Hardening



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The scope for the 2020 Rebuild is focused in XXXX

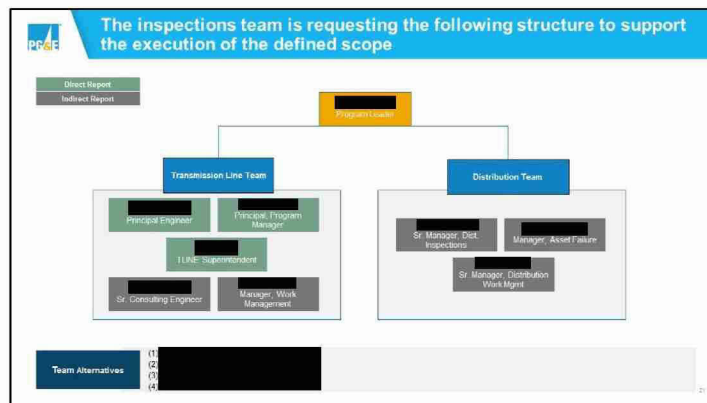
On a GIS Map and on a Tableau Dashboard – I can get [REDACTED]
[REDACTED] started on both once I have the order numbers.

Overhead Inspections



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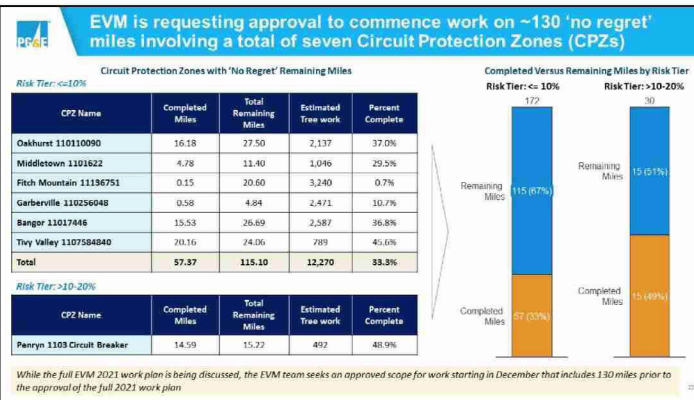


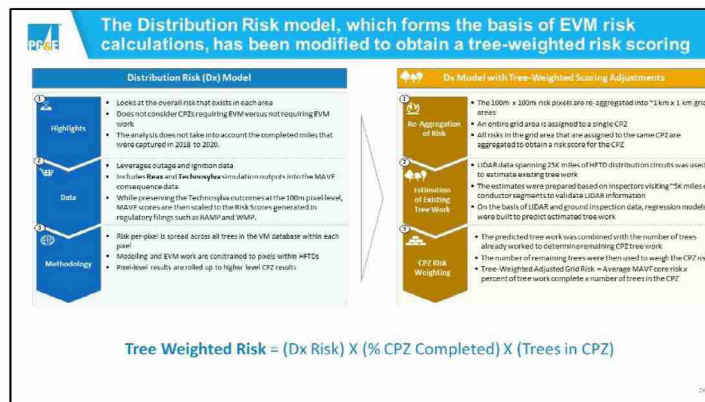


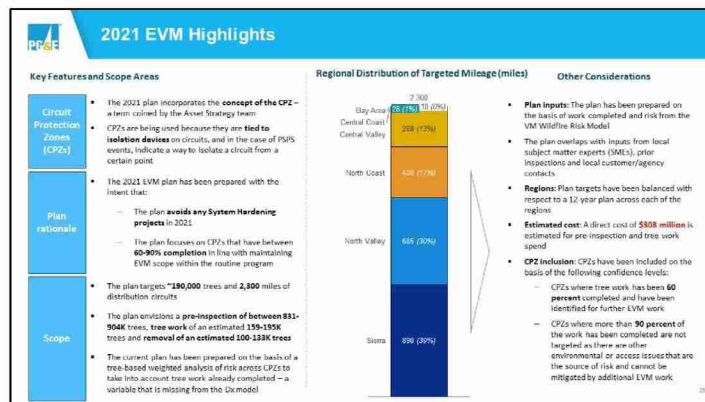
Enhanced Vegetation Management

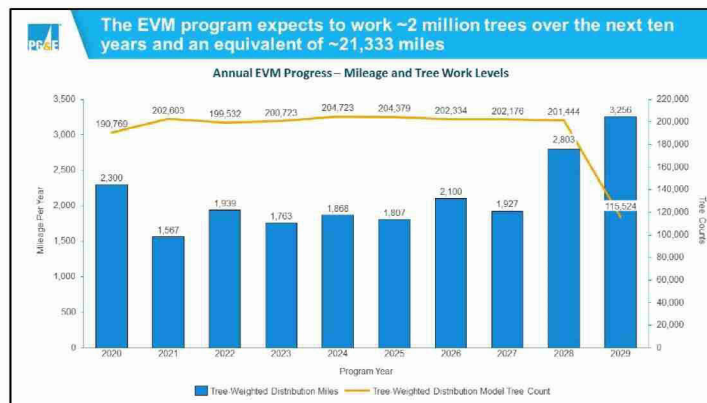


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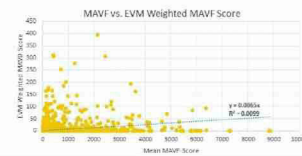
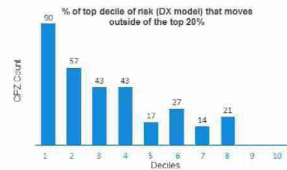








Comparison of the Tree Weighted model to the Dx Model



Key Take-aways

- The correlation between the EVM weighted prioritization scores and the MAVF score is low at 0.0099
- Of the top 20% of circuits that were identified in the Dx model, only 147 remained in the top two deciles of the Tree Weighted model.
- Of the top 100 CPZs, only 14 were common across both prioritization lists
- Over 10% of the CPZs identified to have risk in the Dx model were zero risk locations in the tree weighted model.


First 100
common CPZs

VACA DIXON 110540092	AUBERRY 110542578
AUBERRY 110209000	DISCHUTES 11041270
TINY VALLEY 1107869546	COARSEGOLD 210110620
OREGON TRAIL 11041634	TINY VALLEY 1107584840
MARIPOSA 210210880	DAKUHUNT 110114990
SAND CREEK 110345190	RED BLUFF 11011334
TINY VALLEY 110781817	ZACA 1102154

Action Items and Next Steps




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<div>  <div>Action Items</div> </div>					
Workstream	Action Item (Initial Date)	Description	Responsible Party	Resolution	Date
Enhanced Vegetation Management	FVM Risk Buydown Curve Work – 11/1/2020	Print and show the 1:25 miles (52,900) Carry Over Work that needs to be printed on the EVM – Q2, EVM Tree and Overhang Worksheet Risk Buydown Curve		In Process – Current scope is being plotted against the current risk buydown curve	11/14/2020
Enhanced Vegetation Management	FVM programs (initiatives) Work – 11/1/2020	Determine the overall tree trunks and gaps for the EVM programs when 2016 Potential Trees are factored into the 2020 miles of FVM programs. Understand which of the 29,000 miles need EVM work.		In Process – Dependent on prioritization decision	11/26/2020
Enhanced Vegetation Management	FVM programs and resources Work – 11/1/2020	Provide a full picture of all vegetation management work, include all of the enhanced vegetation management.		In Process – Review of other programs and density.	11/26/2020
Enhanced Vegetation Management	System hardening and EVM work overlay Work – 11/1/2020	Evaluate the areas that are being targeted by action hardening to align for operational efficiencies between the two programs. Dependent on 2021 O&M Work Plan		In Process – Current mapping approaches not have operational efficiencies with hardening	Dependent on SH plan
Enhanced Vegetation Management	Tree density baseline Work – 11/1/2020	2016 Tree Density from the 2019 and 2020 Work. Provide tree density number per mile as needed as we show future work 2021, 2022.		Ready Mapped – 2016 tree density will be examined for inclusion in future risk modeling.	TBD

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Action Items (Cont'd)					
Workstream	Action Item	Description	Responsible Party	Resolution	Date
Risk Models	Risk models comparison WGR - 10/30/2020	Compare risk comparison between the 2018 risk model and 2021 risk model to highlight movement of CRAs (Targeting top 100 in units w/ CRAs)		Completed	11/14/2020
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		Completed	11/11/2020
Risk Models	Risk model contributors	Highlight contributors to the risk model		Completed	11/11/2020
Risk Models	Model process documentation	Bring the Model Process sheet documented on for this forum for an official approval		In Process - Targeted for end of month deep dive sessions	11/20/2020
Risk Models	Express Consideration	Factor in Express into process for selecting the protection cases to be worked		Road Mapped - Express has been considered as a future enhancement for the risk model	11/03/2020
Workforce Governance Charter	Charter update	Update charter to include review of broader set of WFT non-reduction activities and project oversight		Complete - Risk charter has been updated, included in attached materials	11/09/2020

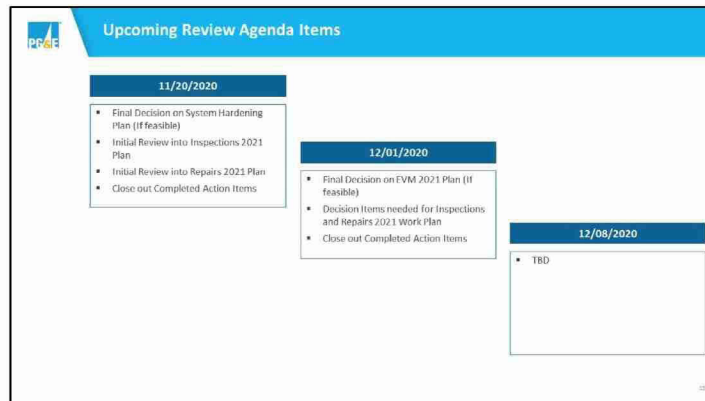
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<div>  Action Items from 11/09/2020 (Federal Monitor Meeting) </div>					
Workstream	Action Item	Description	Responsible party	Resolution	Date
Risk Models	Risk models comparison WQ1- 10/30/2020	Incorporate high risk areas outside of NPDES in the next iteration of the Dr. Model		Road Mapped - This will be added as an enhancement to the model roadmap	11/13/20
Risk Models	Risk Model Enhancement	Incorporate 2019 LCRA data, and species data in the next iteration of the Dr. Model		Road Mapped - This will be added as an enhancement to the model roadmap	11/13/20
Risk Models	Risk Model Enhancement	Incorporate the consequence side for the next iteration of the Dr. Model		Road Mapped - This will be added as an enhancement to the model roadmap	11/13/20
Risk Models	Model Documentation	Assets list added to Chapter 4 slide 22 (ppt 11.09.2020 Wildlife Risk Model Review meeting)		Completed	11/13/20

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Past Action items					
Workstream	Action Item	Description	Responsible party	Resolution	Date
Inspection	Inspection Workstream Owner	Schedule meeting to identify the owner of the important audit risk in workstream		Completed – inspection lead identified	10/25/2020
Risk Model	Risk Model Deep Dive	The risk model needed further detailed discussion before voting and approval can take place		Completed – Follow up session held 10/27. Detail on the risk model was provided in advance of 10/29 approval meeting.	10/23/2020
RMA	RMA review meeting	Schedule additional meeting for RMA review		Completed – Follow up meeting was held on 11/09	11/09/2020
Governance meetings	Meeting updates	Update meeting to be 90 minutes		Completed – Future meetings updated – effective 11/12	11/09/2020
Governance meetings	And [REDACTED] to 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

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Appendix



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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 proposed Ignition model for operations Ignitions and Technology for 2021 PDM work Adopt the proposed Ignition model for assessment Ignitions and Technology for 2021 System Rendering work 	<div> <div>Approved</div> <div>Approved</div> <div>Approved</div> <div>Not Present</div> </div>	10/05/2020

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

Approval Status

Approved

Decision Detail

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- Update to consequence (Core)

Concerns and Mitigations

- Inclusion of non-WETD 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 pixels 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	<p>Completed - Adopt the proposed ignition model for vegetation ignitions and Technology for 2021. (1500 work)</p> <p>Completed - Adopt the proposed ignition model for equipment ignitions and Technology for 2021. System hardening work</p> <p>Completed - Dual risk comparison between the 2018 risk model and 2021 risk model to highlight movement of CPDs (Targeting trip 100 circuits or CPDs)</p> <p>In Process - Hold a Deep Dive Session with (1) the Federal Monitor and (2) the Operational Observer</p> <p>In Process - Bring the Model Process Level documentation to this forum for an official approval</p> <p>In Process - Factor in Egress into process for selecting the protection zones to be worked</p>
Risk models comparison	
Deep dive risk model session	
Model process documentation	
Egress Consideration	