ASSESSING THE IMPACT OF WILDFIRES ON THE CALIFORNIA ELECTRICITY GRID

EPIC Policy + Innovation Coordination Group
Wildfire Mitigation Workstream Meeting #1
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- Energy Commission Study: CCCA4-CEC-2018-002

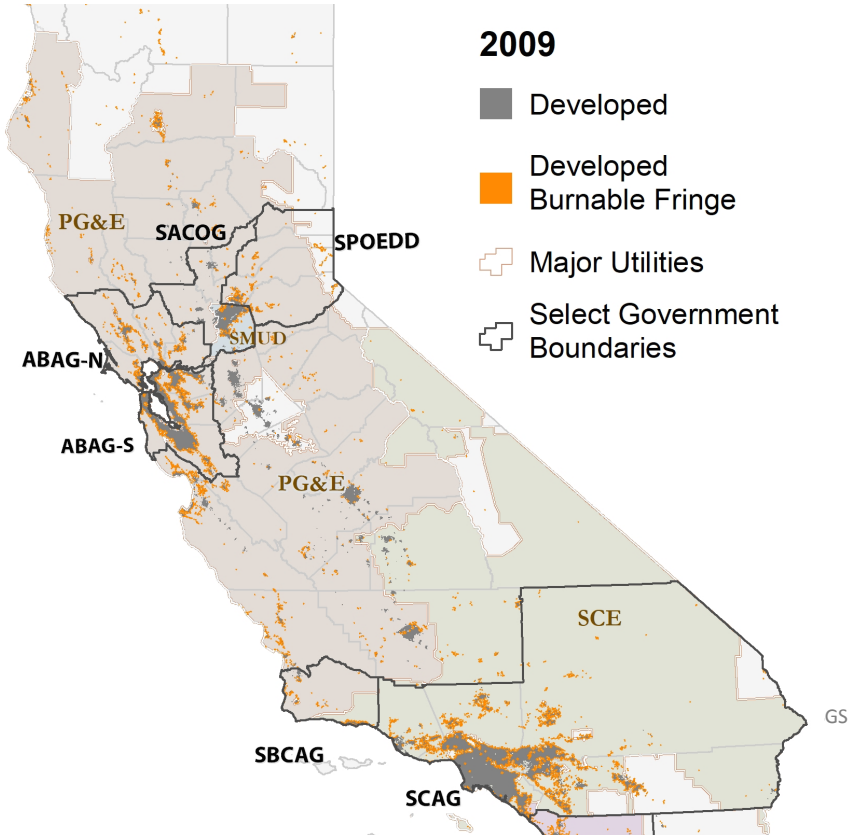
We focused on selected parts of the transmission and distribution grid

Transmission "Paths"

Credits: Dale et al. 2018.; CEC; WECC Envision Geo

Impact of 351 historical wildfires approaching these paths.

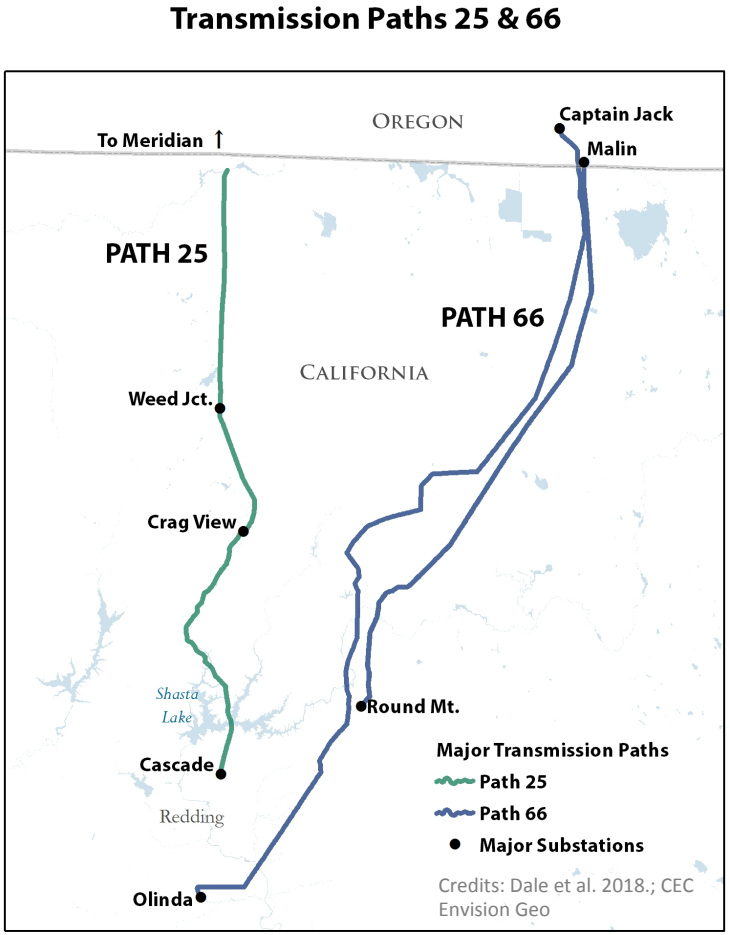
Distribution "Urban Fringe"



wildfires approaching these urban fringe areas.

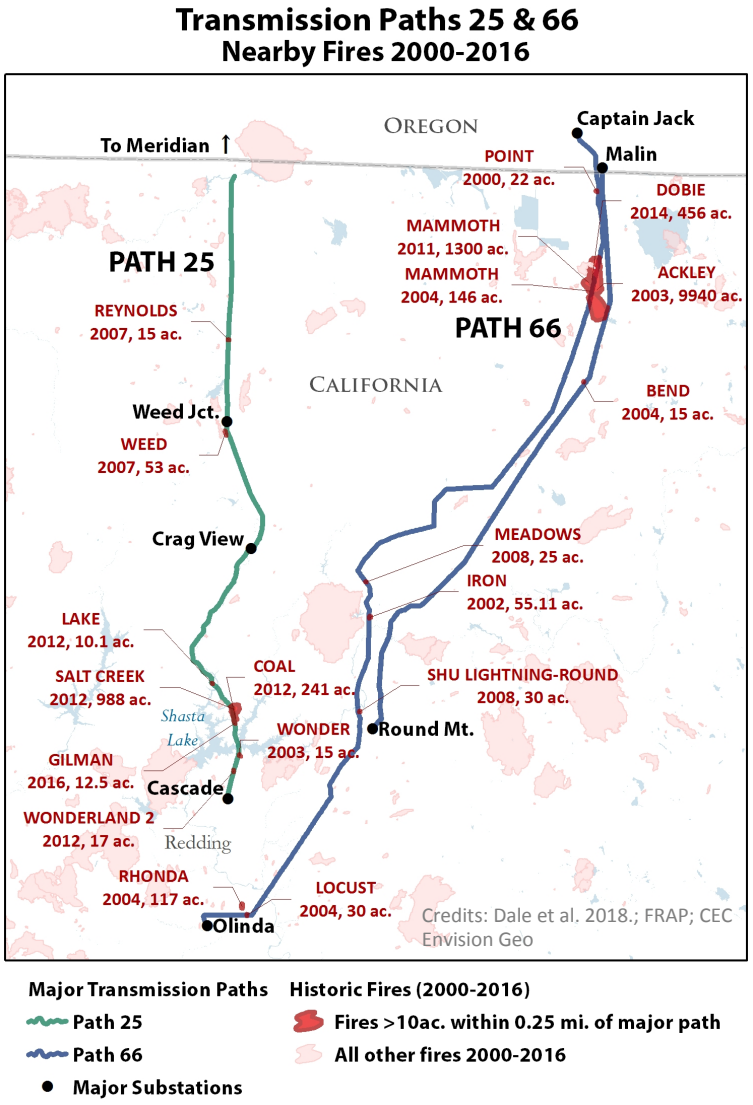
Transmission path identification (Path 25 and 66)

- 25 Meridian-Cascade
  - —Single 115kv line
- 66 Malin-Round Mountain
  - —3 500kv lines



Transmission path fire history

- Path 25
  - —6 Fires Within 0.25 mi
- Path 66
  - —11 Fires Within 0.25 mi



Transmission path fire impacts (351 fires)

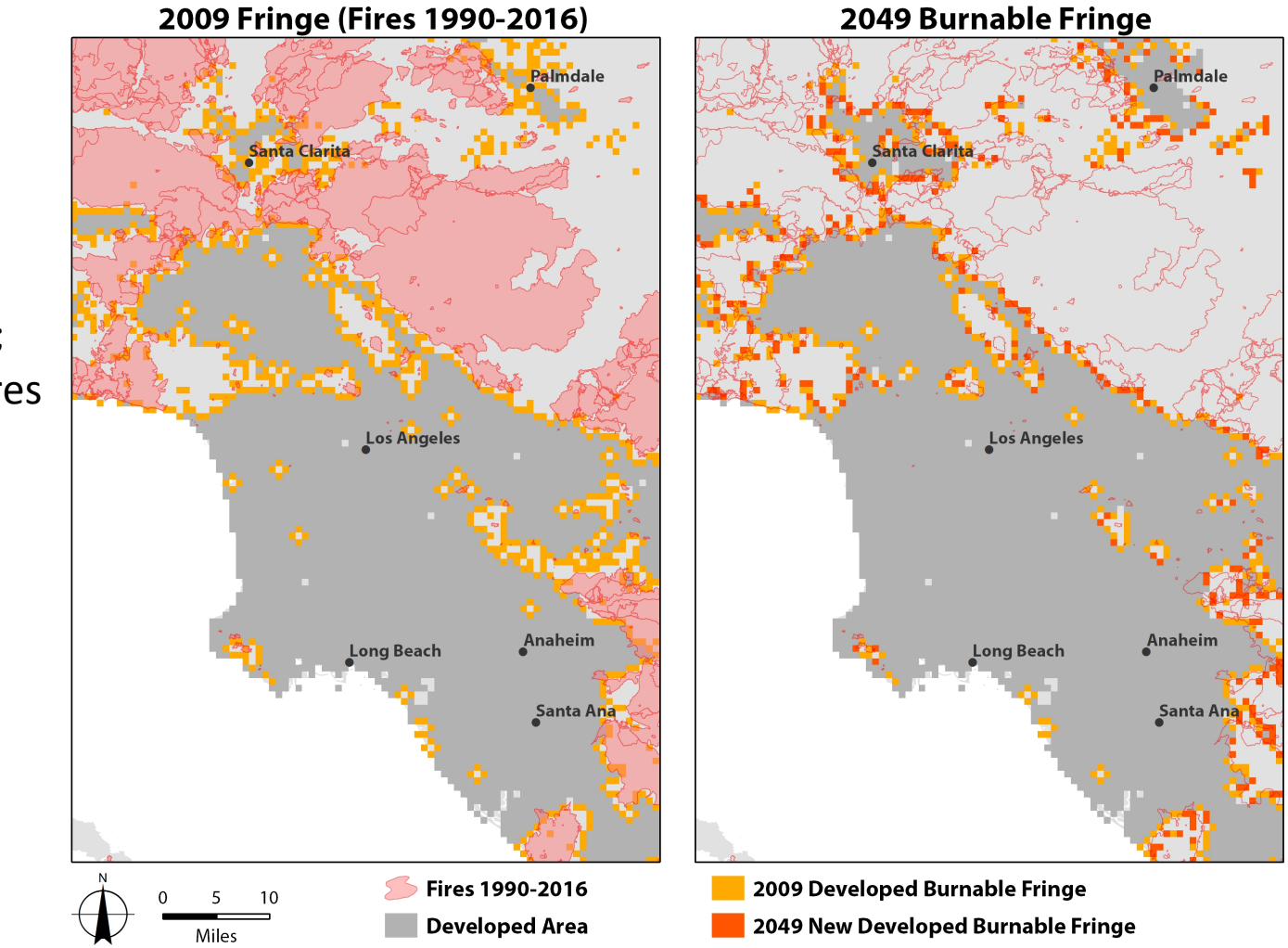
Impact Rating—Used by CAISO to "rate" impact severity.

		Transmission Impact Severity Level				
		1	2	3	4	5
	Number of Fires	Low Impact	Small line impact	Medium Impact	Large Impact	Very Large Impact
		No CAISO action	Local Impact	Change Dispatch	Large Outage, Re-Dispacth	System Wide Threat
Numbered WECC Paths	125	69%	2%	15%	13%	2%
Other Transmission Paths	226	78%	3%	11%	2%	0%

- Most had low impacts
- A few had very large impacts

Urban area fire history (LA Basin)

Fringe area
Fire history;
Projected fires



Credits: Dale et al.; USGS; FRAP
Envision Geo

Urban area fire impacts (360 fires)

Impact a function of area burned

		Low	Medium	High	Severe	Catastrophic
	Number fires evaluated	No Fringe Burned	Partial Fringe Cell	Between 2-5 Fringe Cells	Between 6-10 Fringe Cells	Over 10 Fringe Cells
State	360	66%	10%	16%	4%	5%
Northern California	103	*84%*	*5%*	*9%*	*2%*	*0%*
Southern California	257	*58%*	*12%*	*18%*	*5%*	*7%*

Most fires had no impacts on basin fringe areas.
A few had major impacts.

Source: GIS analysis applied to wildfire fringe data set (Cal Fire 2001-2016)

Adaptation options

Transmission

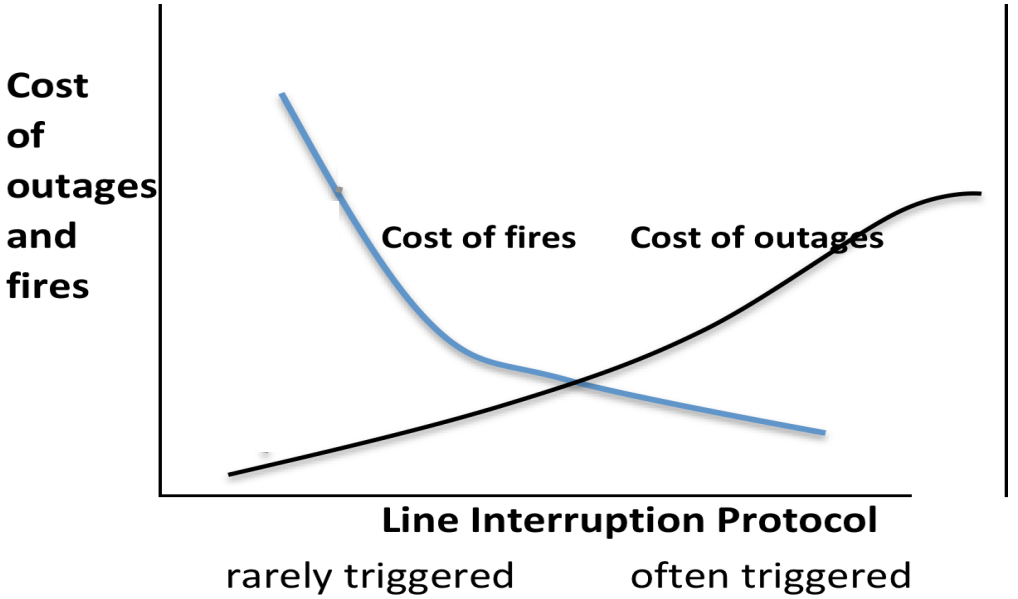
- Eliminate transmission
  - Micro grids
- Move transmission
  - Underground lines
  - Move lines
    - WECC transmission capacity is concentrated in some high fire risk areas.
- De-energize PSPS

Distribution

- Eliminate distribution exposure
  - Encourage urban infill, limit sprawl
- Move distribution
  - Underground lines
  - Move lines
- De-energize PSPS

De-energize lines

- Tradeoff between fires and power interruptions
  - — How costly are PSPS outages?
  - — How costly are fires?
  - — Cost to improve infrastructure
    - Decrease fire risk
    - increase grid reliability and decrease outages impacts.
  - — UC lab fees study.
    - Focus on methods to decrease cost of outages.



Current Work: Mitigating and Managing Extreme Wildfire Risk
UC Lab Fees (2020-2023)

Climate change and extreme fire-weather

I. Understand the nature of recent changes in extreme fire-weather regimes in California

Wildfires and the electric power grid infrastructure

II. Determine wildfire-risks associated with the electric grid in California

Extreme fire-weather and de-energization policies

III. Develop an optimal coupled-fire-weather-grid model for de-energization operations

The economic costs of wildfires

IV. Economic Cost Assessment

Vegetation management and policies

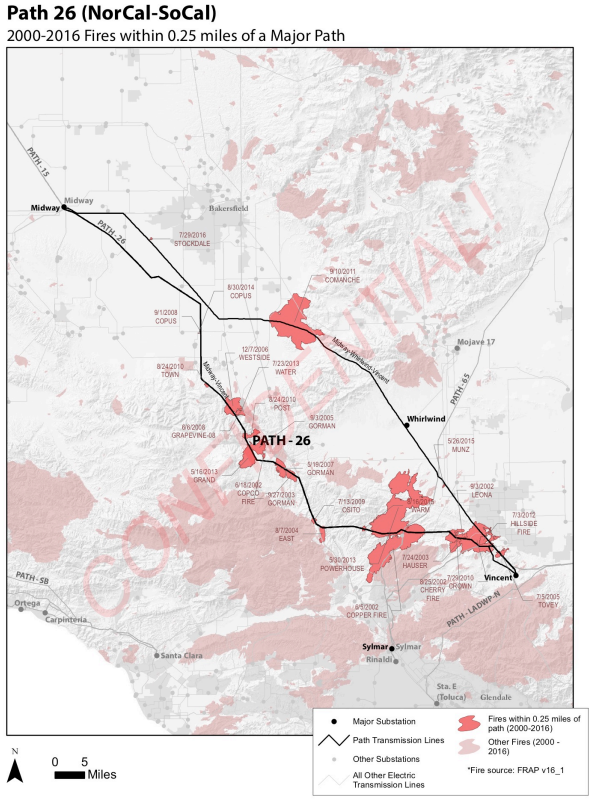
V. Study a cost-effective assessment to minimize fire-risks associated with vegetation management

Backup slides

Modeled costs of impacts

PLEXOS (TEPPC 2020 database)

Path 26 Example



Higher SCE generation costs during event

Credits: Dale et al. 2018.; FRAP; CEC
Envision Geo

Total estimate: $40-$100 million annual all utilities

PLEXOS Modeling

- **TEPPC 2020 database**
  - **Scenarios:**

Business As Usual	SC1	SC2B
No fire events, all selected lines are active	Selected line(s) are taken out during planned event	Selected line(s) are taken out in real time
Reference scenario	Wildfire forecast	No wildfire forecast

Wildfire Cost Assumptions

	Fire Severity					
	Low	**Medium**	**High**	**Severe**	**Catastrophic**	
Fire Cost Impacts						
Structures (# per fire)	2	55	79	293	379	
Distribution costs ('$000 per structure)	21	39	39	39	39	

Source: Redbook fires 2002-2016

Estimate $40,000 and $21,000 per structure for fringe and non-fringe fires, based on Utility CEMA data.

Transmission Generation Cost Assmptions

	Impact Severity Level					
	1	2	3	4	5	
	No Impact	**Small Line Impact**	**Medium Impact**	**Large Impact**	**Very Large Impact**	
Generation Costs Associated with these Impacts ($millions)						
High utilization						
WECC Path Cost	$-	$0.72	$26.60	$28.94	$9.72	
Non WECC Path Cost	$-	$0.58	$16.20	$5.30	$-	
Total Cost	$-	$1.30	$42.81	$34.24	$9.72	**$88.07**
Low utilization						
WECC Path Cost	$-	$0.36	$13.30	$14.47	$4.86	
Non WECC Path Cost	$-	$0.29	$8.10	$2.65	$-	
Total Cost	$-	$0.65	$21.40	$17.12	$4.86	**$44.03**