

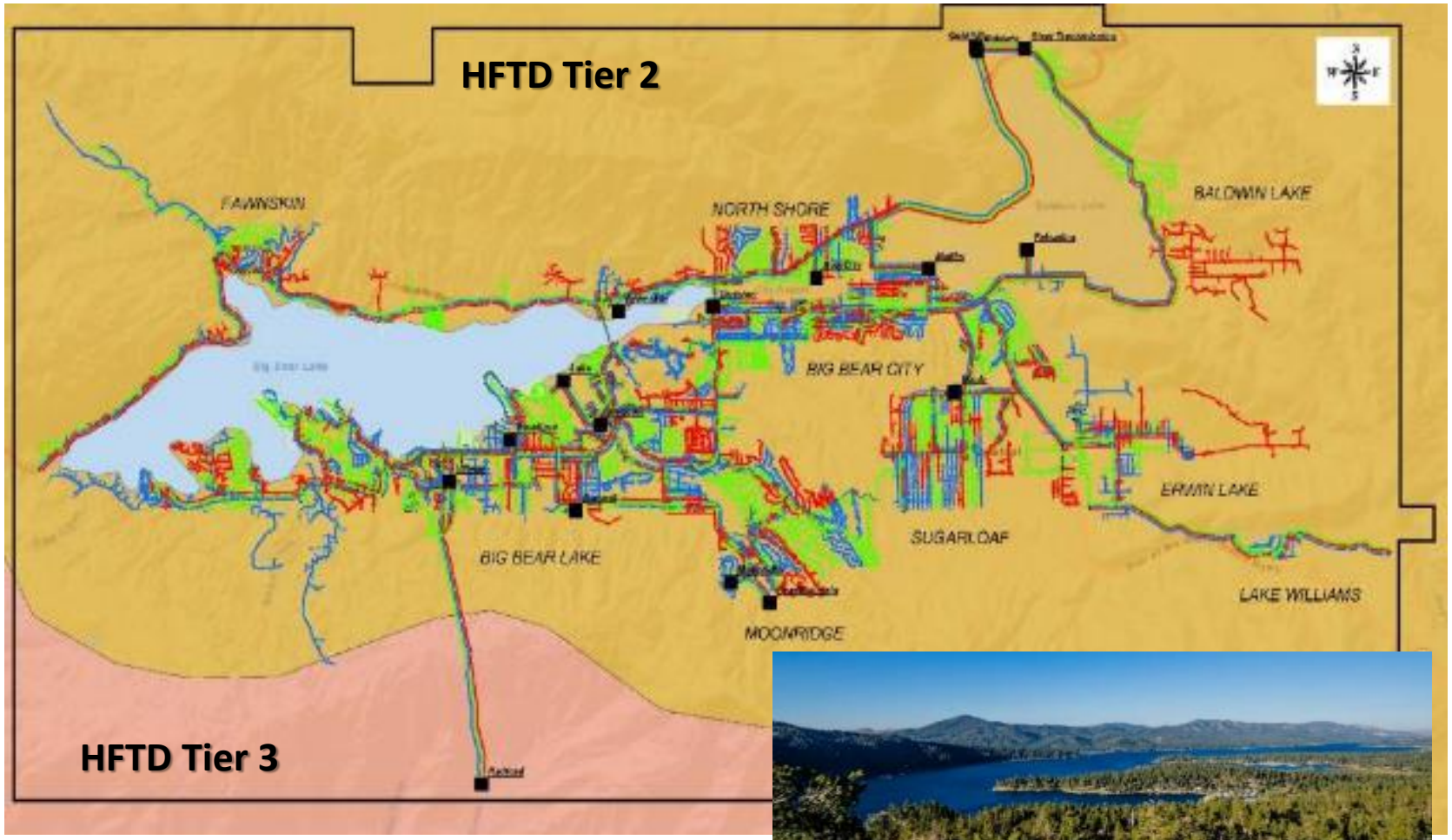
Bear Valley
Electric Service, Inc.
A Subsidiary of American States Water Company

Wildfire Risk Modeling Workshop

October 5, 2021

Paul Marconi, President, Treasurer, Secretary, & Safety Committee Chairman, BVES, Inc.

Service Territory Overview



Location: 32 square miles of rural and mountainous terrain at approximately 7,000 ft. in San Bernardino Mountains (80 miles East of Los Angeles).

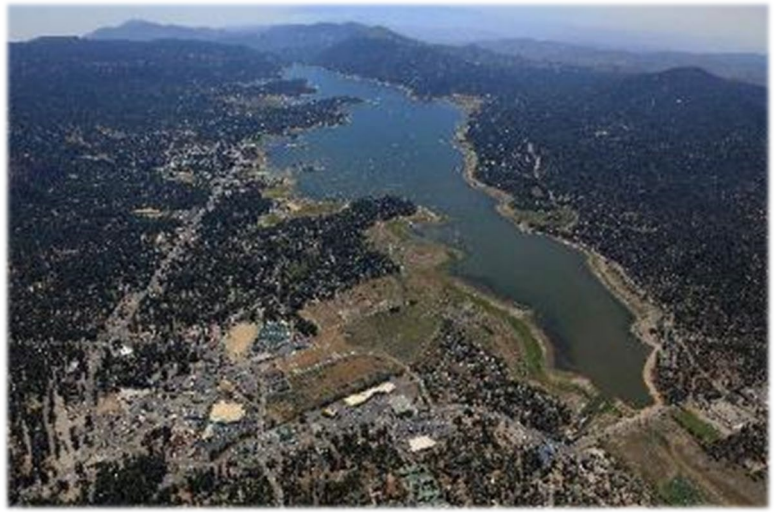
- Heavy tree and vegetation density and mostly dry environment (80.5%).
- Entire Service Territory in the High Fire Threat District (Tiers 2 & 3).
- Entire Service Territory in the Heavy Loading District (>3,000 ft.).

Key jurisdictions: County of San Bernardino, City of Big Bear Lake, US Forest Service.

Customers: 24,604 total [23,091 residential and 1,513 commercial].

Summary of Risk Models

- Risk Safety Model Approach for Small and Multi-jurisdictional Utilities (SMJUs).
- Fire Safety Matrix
- Advanced Ignition Probability and Risk Modeling

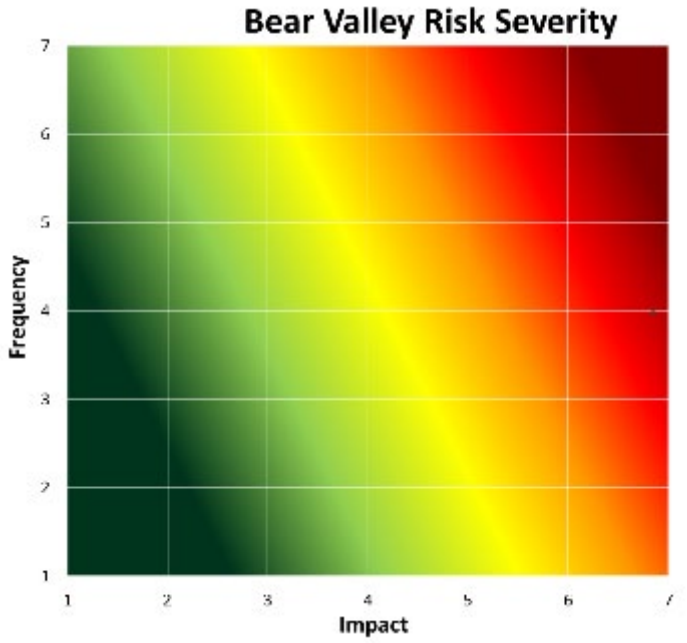




Risk Safety Model Approach for Small and Multi-jurisdictional Utilities (SMJUs)

Risk Model for SMJUs

- Decision 19-04-020 of April 25, 2019, Phase Two Decision Adopting Risk Spending Accountability Report Requirements and Safety Performance Metrics for Investor-owned Utilities and Adopting a Safety Model Approach for Small and Multi-jurisdictional Utilities provides requirements for SMJU risk modeling.
- 7x7 Logarithmic Risk Matrix
  - (Frequency vs. Impacts)
- Impact weights:
  - Public and Employee Safety
  - Reliability
  - Environmental
  - Quality of Service
  - Compliance
- Analyzed 54 mitigations
  - Cost of Project/Program
  - Period of Project/Program

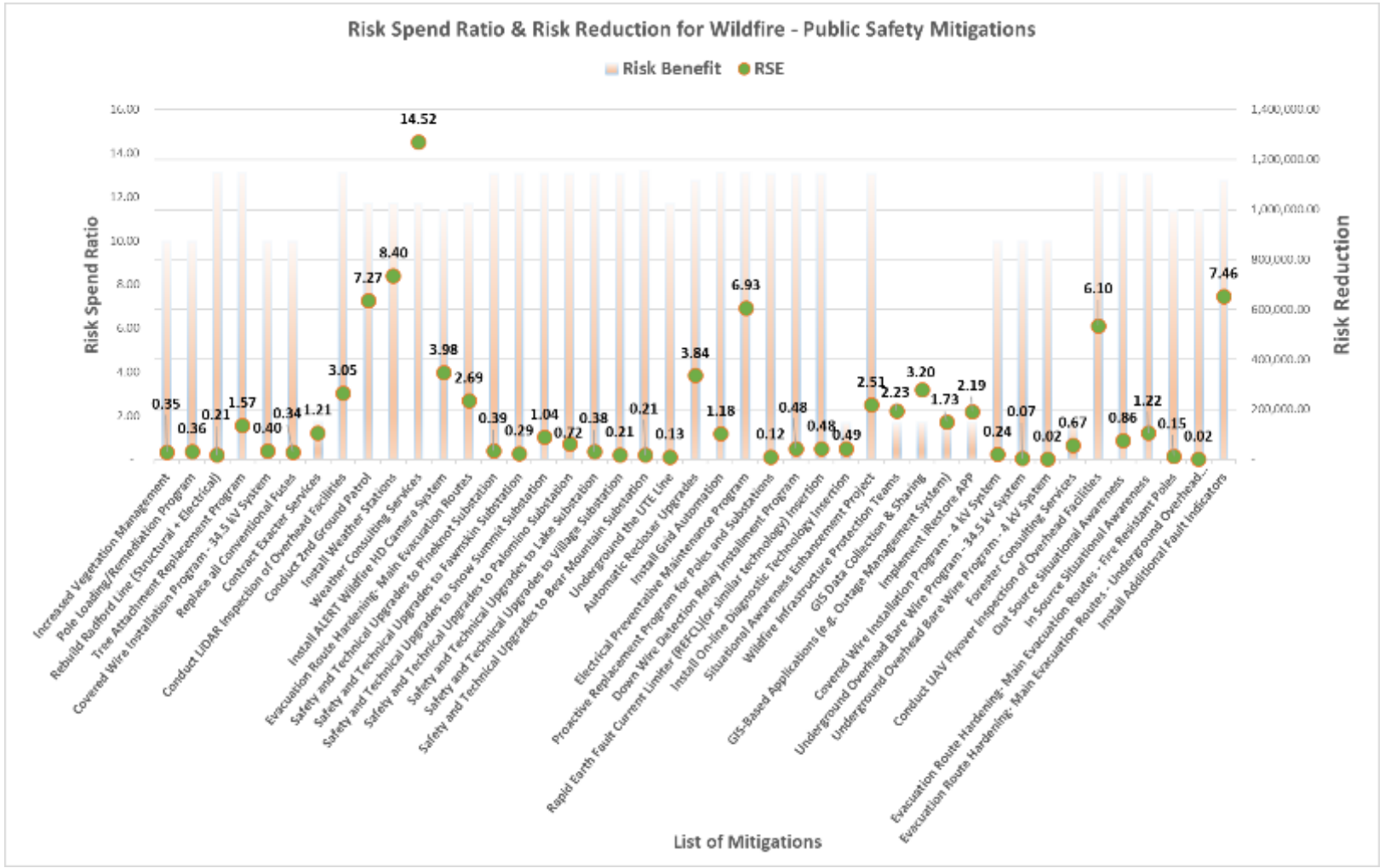


Risk Score = Frequency * SUM $_{i=1 \text{ to } 5}$ (CategoryWeight $_i$ x 10^Impact $_i$)

Frequency	Frequency Years (Events/Year) [Min rate]	Frequency Years (Events/Year) [Max rate]	Frequency Value			Negligible(1)	Minor(2)	Moderate(3)	Major(4)	Extensive(5)	Severe(6)	Catastrophic(7)	
						1	2	3	4	5	6	7	
> 10 times per year	10	100	31.6228	7	0	316.23	3,162.28	31,622.78	316,227.77	3,162,277.66	31,622,776.60	316,227,766.02	7
1 - 10 times per year	1	10	3.1623	6	0	31.62	316.23	3,162.28	31,622.78	316,227.77	3,162,277.66	31,622,776.60	6
Once every 1 - 3 years	0.3300	1.0000	0.5745	5	0	5.74	57.45	574.46	5,744.56	57,445.63	574,456.26	5,744,562.65	5
Once every 3 - 10 years	0.1000	0.3333	0.1826	4	0	1.83	18.26	182.57	1,825.74	18,257.42	182,574.19	1,825,741.86	4
Once every 10 - 30 years	0.0333	0.1000	0.0577	3	0	0.58	5.77	57.74	577.35	5,773.50	57,735.03	577,350.27	3
Once every 30 - 100 years	0.0100	0.0333	0.0183	2	0	0.18	1.83	18.26	182.57	1,825.74	18,257.42	182,574.19	2
Once every 100+ Years	0.0033	0.0100	0.0058	1	0	0.06	0.58	5.77	57.74	577.35	5,773.50	57,735.03	1
				0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
					0	1	2	3	4	5	6	7	

Risk Spend Ratio

- Model output:
  - Risk reduction
  - Risk spend ration





Fire Safety Matrix

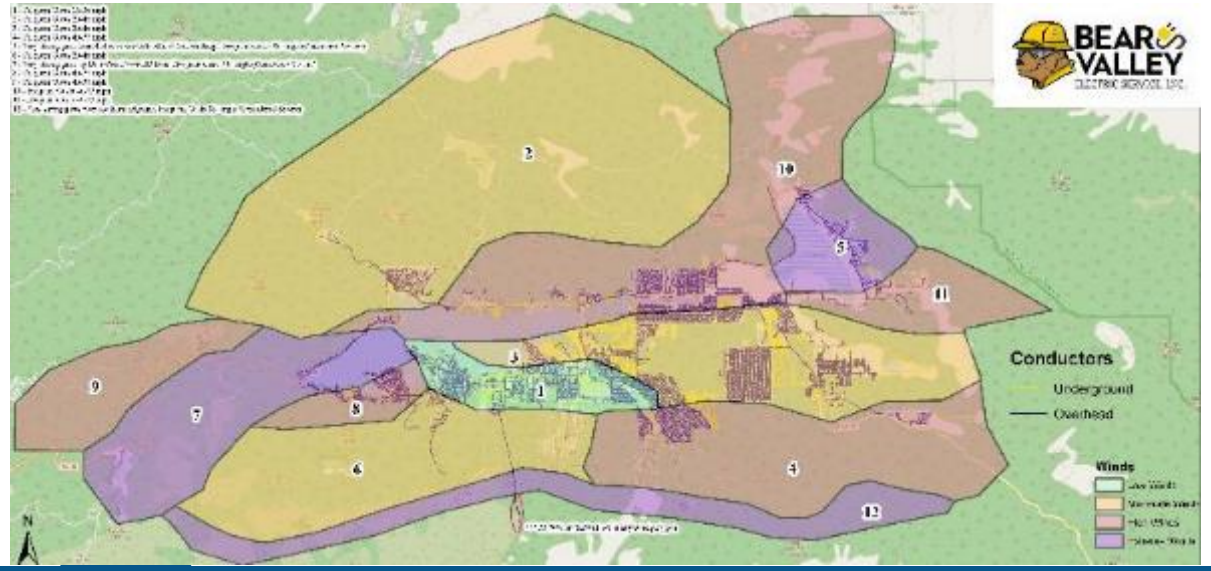
Fire Safety Matrix

Circuit Information																						Wildfire T&D Hardening												O&M Programs Implemented										
Algorithm Input = AI				AI		AI	AI	AI	AI	AI			AI				AI	AI	AI	AI	AI	AI						AI			AI													
Circuit	Substation	Wildfire Risk Group	Overall Risk Weighting	Risk Ranking	Voltage (kV)	High Fire Threat District Tier	Vegetation Density	Wind Intensity	# of Customers	# of Wood Poles	# of Fire Resistant Composite Poles	# of LWS Poles	# of Ductile Iron Poles	Bare Wire OH Circuit Miles	Covered Conductor OH Circuit Miles	UG Circuit Miles	# of Tree Attachments	# of Expulsion Fuses	# of Level 1 Deficiencies to be Corrected	# of Level 2 Deficiencies to be Corrected	Top Ten Worst Performing Circuit (1=Worst NR=Not Ranked)	Pole Loading Program (Percent Complete)	Tree Attachment Removal Program	Repalce OH Bare Wire with Covered Conductor	Replace Expulsion Fuses	Evacuation Route Hardening	Circuit Sectionalized to Reduce PSPS Impact	Fault Indicators	Replace AR with Pulse Conditioned Intellirupter	Circuit Meters Installed On All Phases Remotely Monitored	Install FLISR	Enhanced Vegetation Management	GO-165 Ground Patrol	GO-165 5-Year Inspections	GO-165 Intrussive Inspections	Bi-Annual LiDAR Survey	3rd Party Annual Ground Patrol	GO-174 Substation Inspections	Substation Electrical Equipment Preventative Maintenance	Exacter Survey	Fly-over Video Inspection Survey	Evaluate Protective Settings & Optimize for Fire Safety
Radford	SCE Feed	30521	0.2950	1	34.5	3	High	High	3403	89	0	0	0	2.82	0	0.02	0	0	0	0	NR	0%	None		NA			NA		X		X	X	X	X	X	X	NA		Next WMP	Next WMP
Shay	SCE Feed	11585	0.1120	2	34.5	2	High	High	9627	610	0	0	0	13.35	3.82	0.39	0	0	0	0	3	15%	None		NA			33.3%		X		X	X	X	X	X	X	NA		Next WMP	Next WMP
Baldwin	SCE Feed	8409	0.0813	3	34.5	2	High	High	11305	256	0	0	0	8.61	0.33	0.5	0	0	0	0	2	3%	None		NA			0.0%		X		X	X	X	X	X	X	NA		Next WMP	Next WMP
Boulder	Village	2951	0.0285	10	4.16	2	High	High	2046	1007	0	0	0	17.68	0	1.8	86	30	0	0	5	90%						100.0%		X		X	X	X	X	X	X	2021		Next WMP	Next WMP
North Shore (Fawnskin)	Fawnskin	6538	0.0632	4	4.16	2	High	High	1523	923	0	0	0	15.83	0	8.09	56	0	0	0	6	0%						33.3%		X		X	X	X	X	X	X			Next WMP	Next WMP
Erwin Lake	Maltby	5053	0.0488	6	4.16	2	High	High	2533	1058	0	0	0	21.83	0	7.41	7	0	0	0	NR	64%						82.9%		X		X	X	X	X	X	X			Next WMP	Next WMP
Pioneer (Palomino)	Palomino	2659	0.0257	13	4.16	2	Low	Medium	537	602	0	0	0	13.89	2.5	2.95	0	38	0	0	NR	20%	None					NA		X		X	X	X	X	X	X	2023		Next WMP	Next WMP
Clubview	Moonridge	3660	0.0354	8	4.16	2	High	Medium	1984	508	0	0	0	10.18	0	0.27	88	0	0	0	9	0%						60.0%				X	X	X	X	X	X	2023		Next WMP	Next WMP
Goldmine	Moonridge	5569	0.0538	5	4.16	2	High	Medium	1698	567	0	0	0	13.2	0	5.26	76	7	0	0	1	0%						40.0%				X	X	X	X	X	X	2023		Next WMP	Next WMP
Paradise	Maltby	2754	0.0266	12	4.16	2	Medium	Medium	1895	549	0	0	0	9.85	0	2	69	0	0	0	8	0%						33.3%		X		X	X	X	X	X	X			Next WMP	Next WMP
Sunset	Maple	3583	0.0346	9	4.16	2	High	Medium	1918	505	0	0	0	10.67	0	0.5	52	0	0	0	NR	0%						0.0%		X		X	X	X	X	X	X	2021		Next WMP	Next WMP
Sunrise (Maple)	Maple	2650	0.0256	14	4.16	2	High	Medium	1506	348	0	0	0	7.79	0	3.86	36	0	0	0	NR	0%						0.0%		X		X	X	X	X	X	X	2021		Next WMP	Next WMP
Holcomb (Bear City)	Bear City	4516	0.0436	7	4.16	2	High	Medium	1587	615	0	0	0	13.25	0	0.85	33	109	0	0	NR	0%						50.0%		X		X	X	X	X	X	X	2021		Next WMP	Next WMP
Georgia	Pineknot	1594	0.0154	18	4.16	2	Medium	Medium	1023	348	0	0	0	5.91	0	3.95	63	76	0	0	NR	0%						100.0%				X	X	X	X	X	X	2023		Next WMP	Next WMP
Eagle	Pineknot	2072	0.0200	15	4.16	2	Medium	Medium	959	323	0	0	0	7.38	0	1.53	16	104	0	0	NR	0%						33.3%				X	X	X	X	X	X	2023		Next WMP	Next WMP
Harnish (Village)	Village	385	0.0037	21	4.16	2	Low	Medium	254	83	0	0	0	1.34	0	1.21	13	38	0	0	NR	0%						NA		X		X	X	X	X	X	X	2021		Next WMP	Next WMP
Garstin	Meadow	1370	0.0132	19	4.16	2	Medium	Medium	1055	277	0	0	0	5.09	0.82	3	15	124	0	0	NR	5%						25.0%		X		X	X	X	X	X	X	2022		Next WMP	Next WMP
Lagonita	Village	2932	0.0283	11	4.16	2	Medium	High	1103	453	0	0	0	7.46	0	1.43	60	116	0	0	7	0%						100.0%		X		X	X	X	X	X	X	2021		Next WMP	Next WMP
Interlaken	Meadow	1891	0.0183	16	4.16	2	Medium	Medium	880	280	0	0	0	6.45	0	3.55	27	113	0	0	NR	0%						50.0%		X		X	X	X	X	X	X	2022		Next WMP	Next WMP
Castle Glen (Division)	Division	1733	0.0167	17	4.16	2	Medium	Medium	1188	343	9	0	0	6.74	0.19	3.68	45	80	0	0	NR	5%						100.0%		X		X	X	X	X	X	X	2022		Next WMP	Next WMP
Country Club	Division	845	0.0082	20	4.16	2	Medium	Medium	605	180	0	0	0	3.18	0	0.94	10	15	0	0	10	0%						33.3%		X		X	X	X	X	X	X	2022		Next WMP	Next WMP
Fox Farm	Meadow	-8	-0.0001	26	4.16	2	Low	Medium	35	4	0	0	0	0	0	0.84	0	0	0	0	NR	0%	None					NA		X		X	X	X	X	X	X	2022		Next WMP	Next WMP
Pump House (Lake)	Lake	178	0.0017	22	4.16	2	Low	Medium	4	22	0	0	0	0.64	0	0.02	0	10	0	0	NR	0%	None					NA		X		X	X	X	X	X	X			Next WMP	Next WMP
Lift (Summit TOU)	Summit	30	0.0003	23	4.16	2	Low	Medium	1	1	0	0	0	0.1	0	0	0	0	0	0	NR	0%	None	NA		NA	NA	NA		X		X	X	X	X	X	X	2023		Next WMP	Next WMP
Skyline (Summit Res)	Summit	0	0.0000	24	4.16	2	Low	Medium	0	0	0	0	0	0	0	0	0	0	0	0	NR	100%	None	NA	NA	NA	NA	NA		X		X	X	X	X	X	X	2023	NA	NA	Next WMP
Geronimo (Bear Mtn.)	Bear Mtn.	0	0.0000	24	4.16	2	Low	Medium	1	0	0	0	0	0	0	0.03	0	0	0	0	NR	100%	None	NA		NA	NA	NA		X		X	X	X	X	X	X	2022	NA	NA	Next WMP

- Designed to prioritize risk mitigations at the circuit level and account for changing conditions.
- Works in conjunction with Risk Safety Model Approach for Small and Multi-jurisdictional Utilities (SMJUs).

Fire Safety Matrix Inputs

- Utilizes an algorithm with over 20 data inputs to assess risk of circuits based on risk factors and status of mitigation measures.
  - Localized vegetation density along circuit quantified from LiDAR surveys.
  - Localized weather based on historical data used to develop wind intensity factors for each circuit.





Advanced Ignition Probability and Risk Modeling

Advanced Ignition Probability and Risk Modeling

- Expert consultant developing risk models tailored to BVES electrical system to provide the following:
  - Ignition probability mapping showing the probability of ignition along overhead electric lines and equipment.
  - Match drop simulations showing the potential wildfire consequence of ignitions that occur along electric lines and equipment under current (2021) conditions and under future (2050) conditions.
  - Summarized risk maps showing overall ignition probability and estimated wildfire consequence/risk under current and future conditions.
  - Initiative mapping and estimation of wildfire and PSPS risk-reduction impact.
  - GIS data and supporting documentation will be provided. Weather, fuels, and fire model output data are generated in raster (i.e., GeoTiff) format and will be provided to BVES.
- Project is expected to be completed by December 2021 (ahead of schedule).

Risk Modeling Methodology

2021 Q3 Update

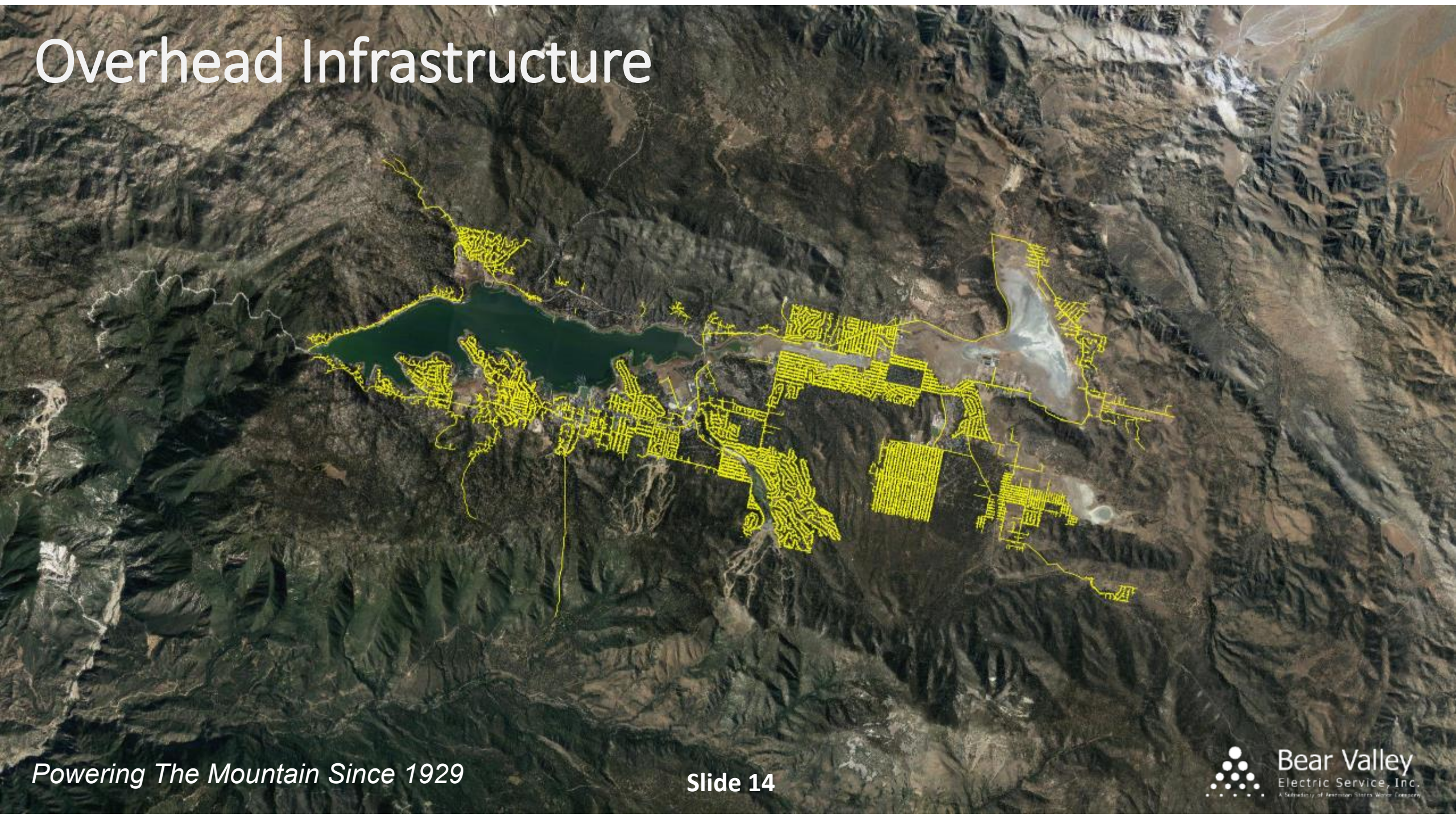
- Ignition rate (ignitions / line mi / hr..) quantified using publicly-available ignition and overhead facilities data on file with CPUC
  - Weather conditions at ignition location & time of ignition determined from RTMA and normalized by historical values that the entire overhead network “sees”
  - Ignition rate is an exponential function of wind gust speed, fine dead fuel moisture content, and fuel temperature
- 10-year climatologies (2021 and 2050) use to drive ignition & spread simulations
- 1,000,000 years of fires are simulated for current and climate-adjusted conditions. Simulation duration varied from 24 hours to 1 week.

Risk Modeling Inputs

2021 Q3 Update

- Fuel: 2021 CA fuel scape (Pyrologix / USFS R5) – 30 m resolution
- Structures: Microsoft US building footprints, 2021 refresh
- Weather / climate
  - Current (2021) conditions: Real Time Mesoscale Analysis (RTMA) ; hourly, 2.5 km resolution, years 2011 – current
  - Climate adjusted (mid-century) conditions: Dynamically downscaled WRF initialized with global climate models from 6th Coupled Model Intercomparison Project (CMIP6) ; hourly, 3.0 km resolution, years 2046 – 2055

Overhead Infrastructure



Powering The Mountain Since 1929

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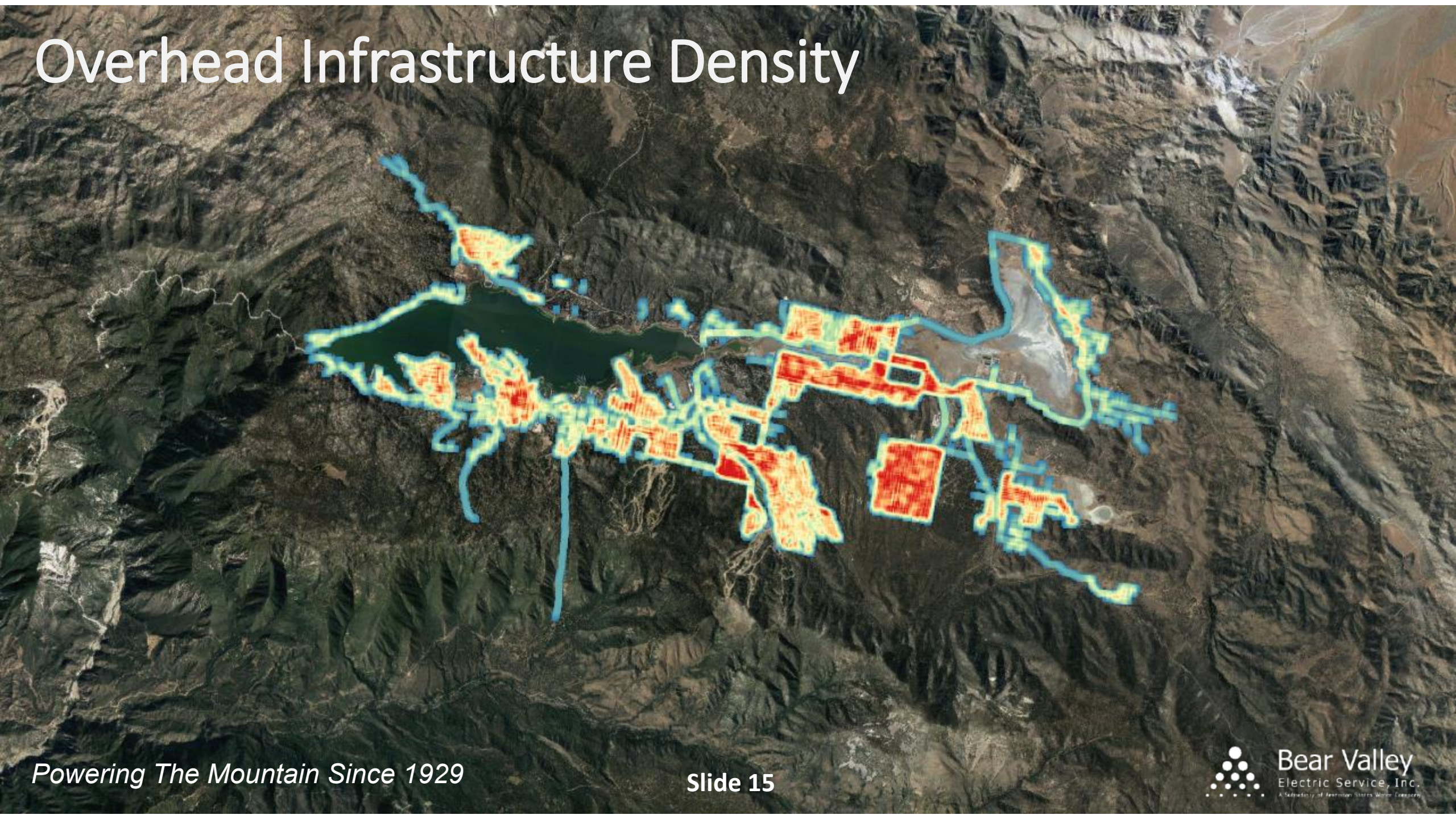
Electric Service, Inc.

Overhead Infrastructure Density



Powering The Mountain Since 1929

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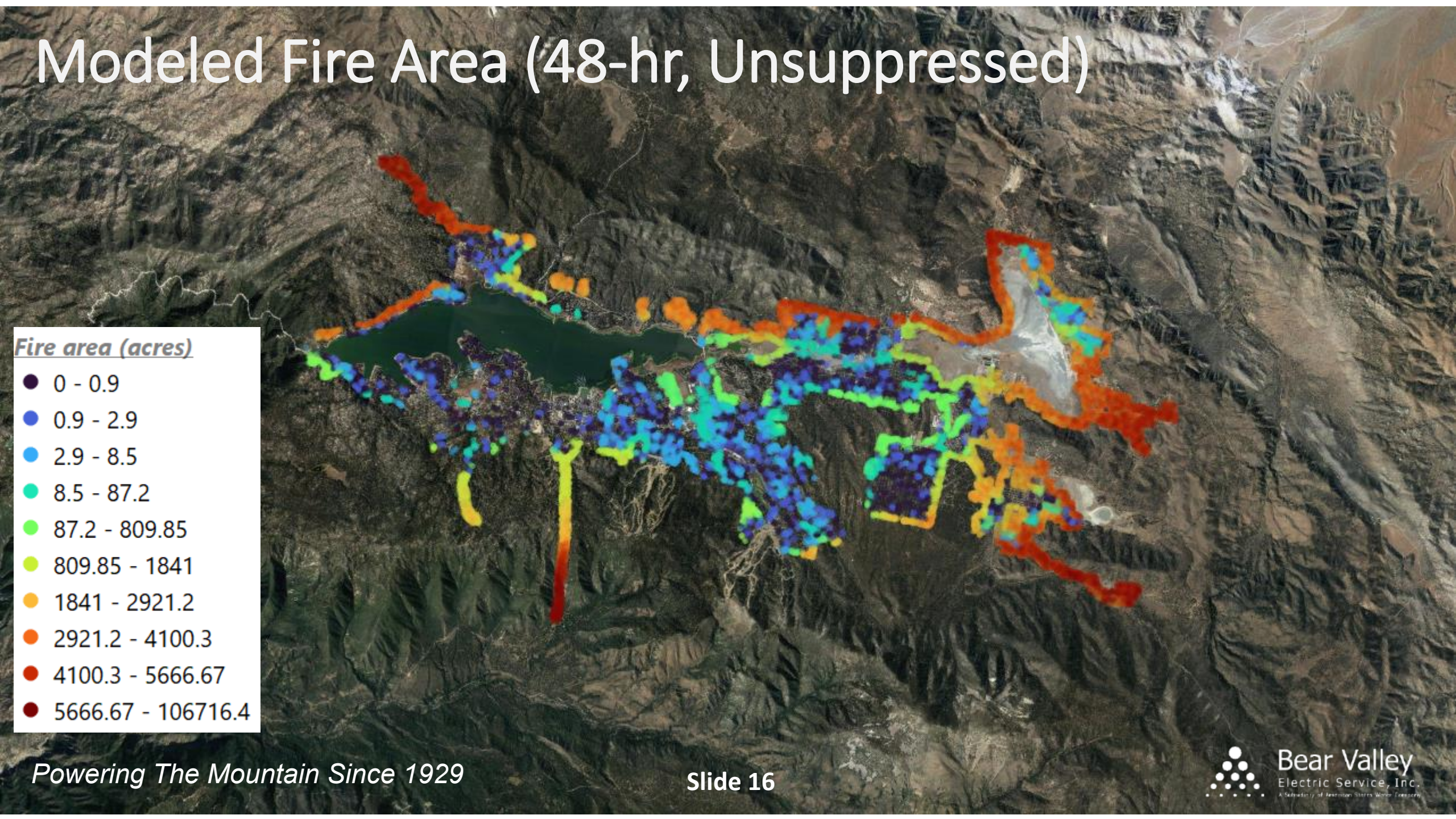
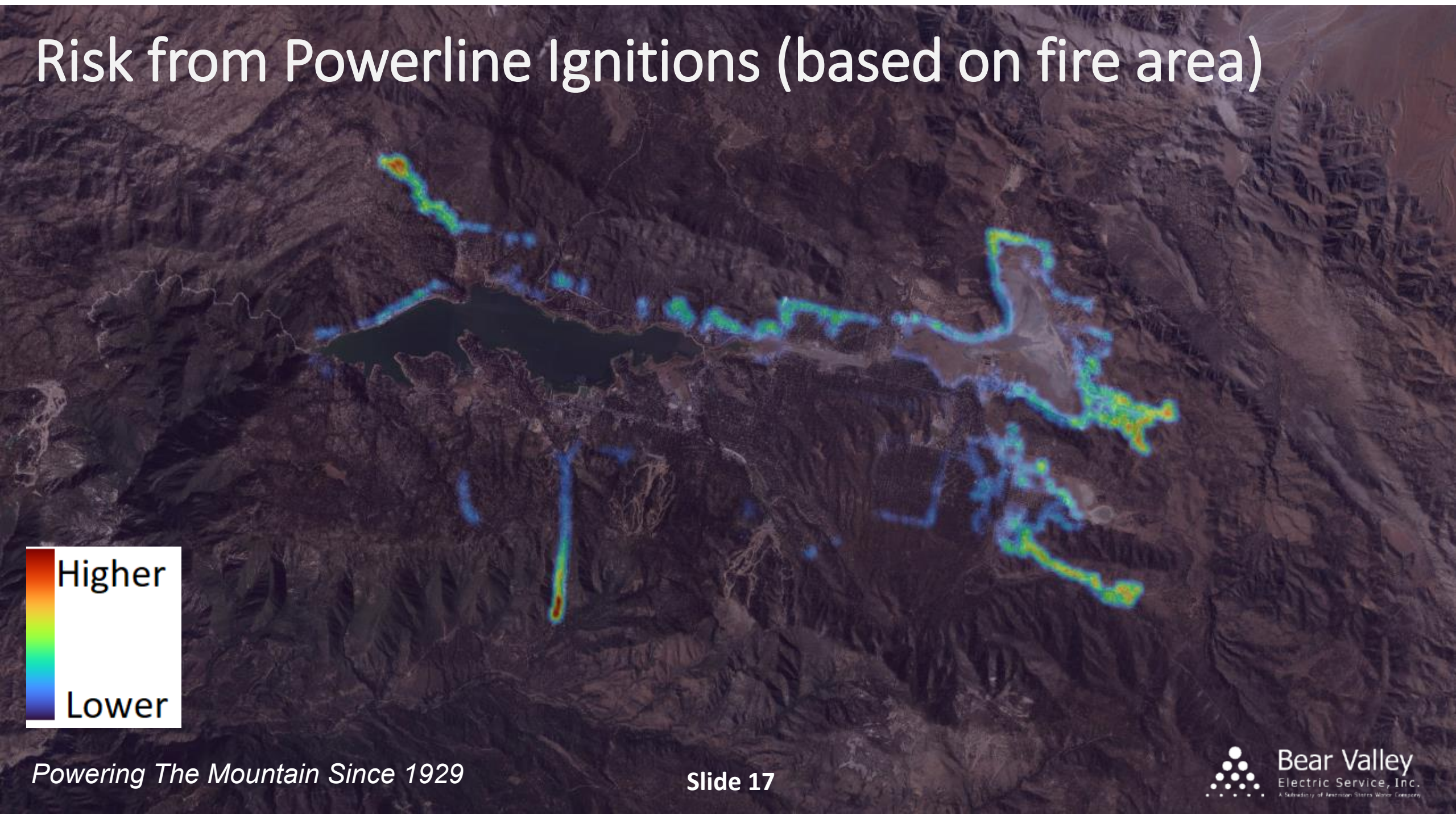
Electric Service, Inc.

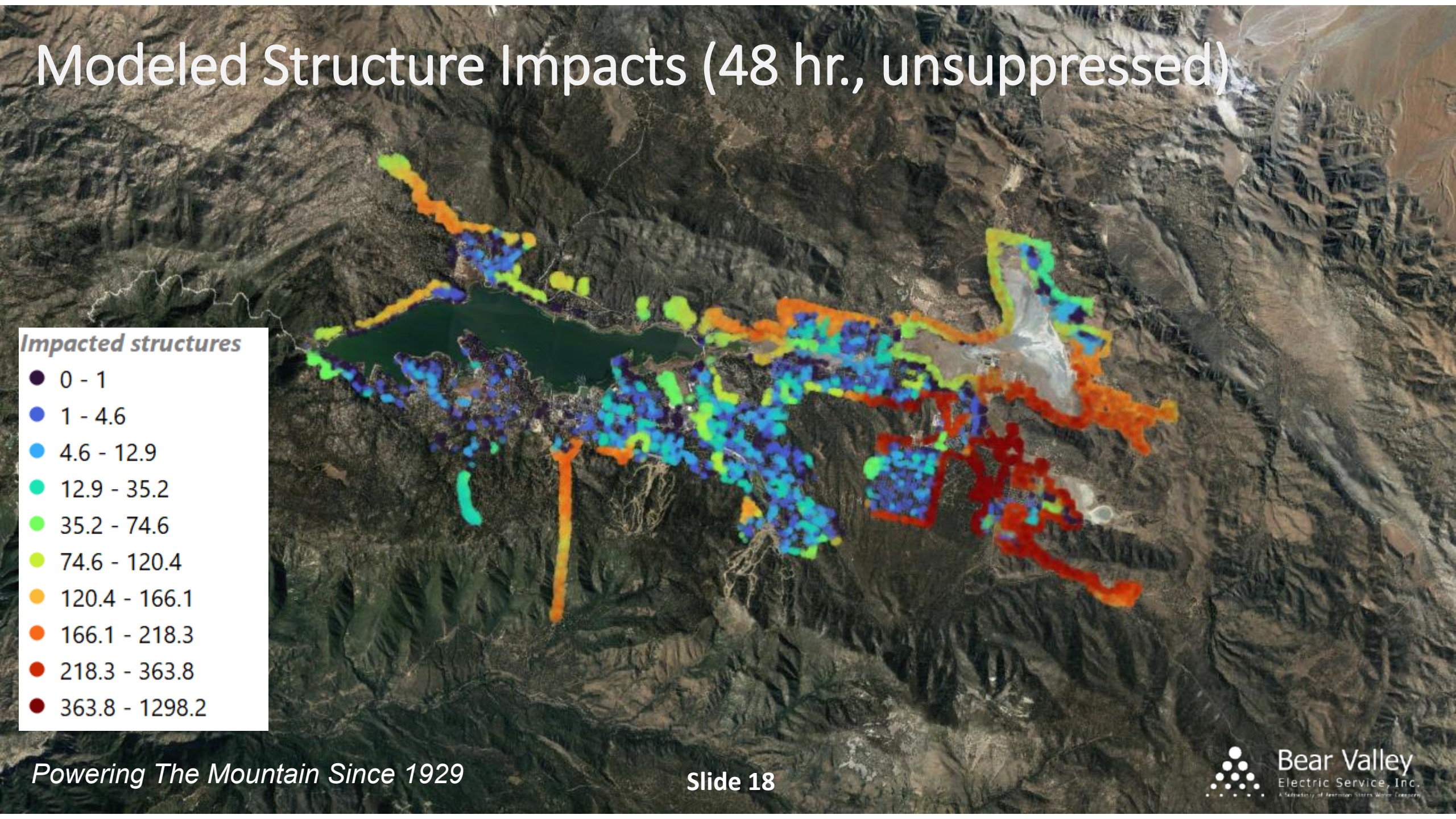
Modeled Fire Area (48-hr, Unsuppressed)



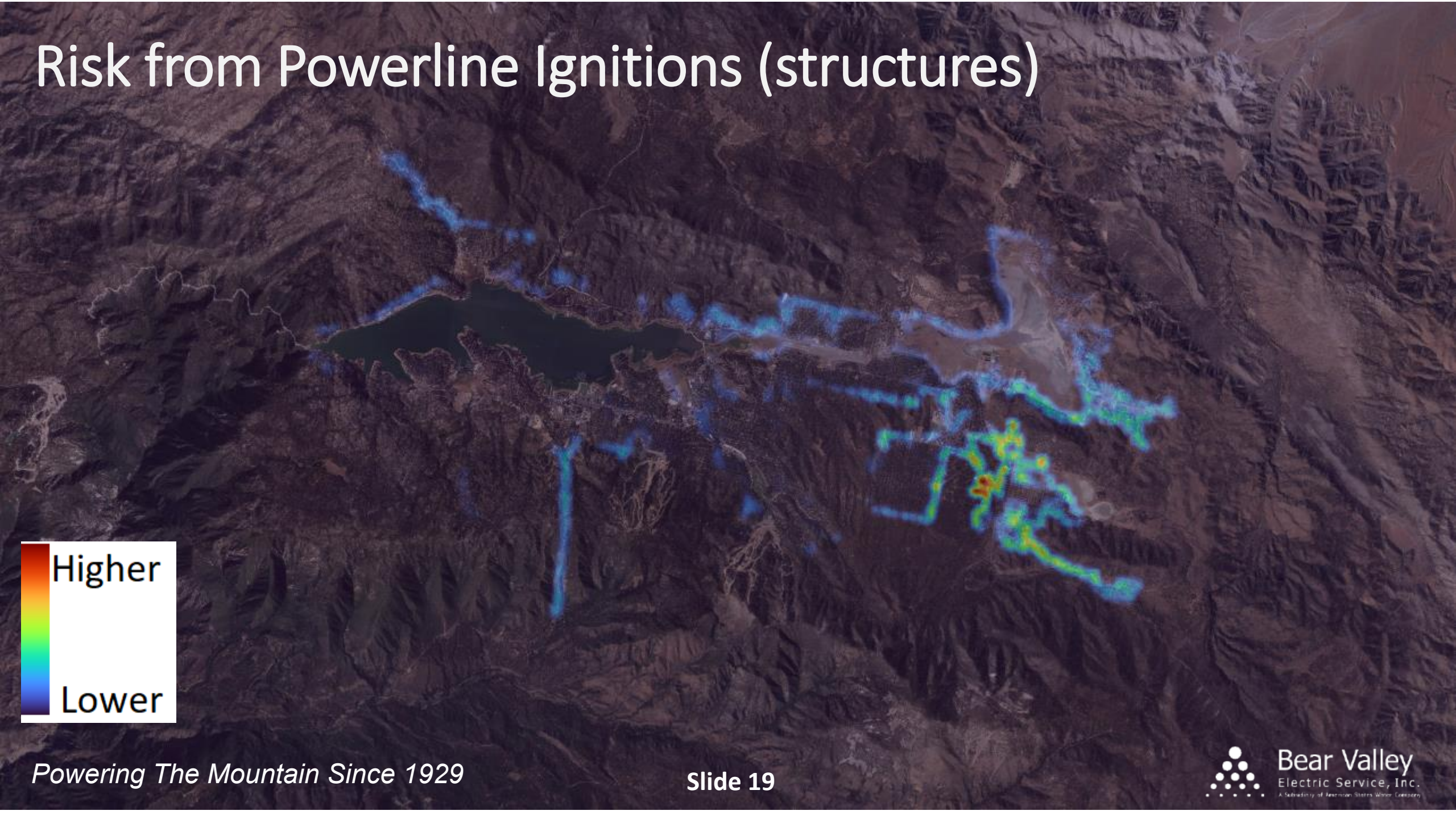
Risk from Powerline Ignitions (based on fire area)



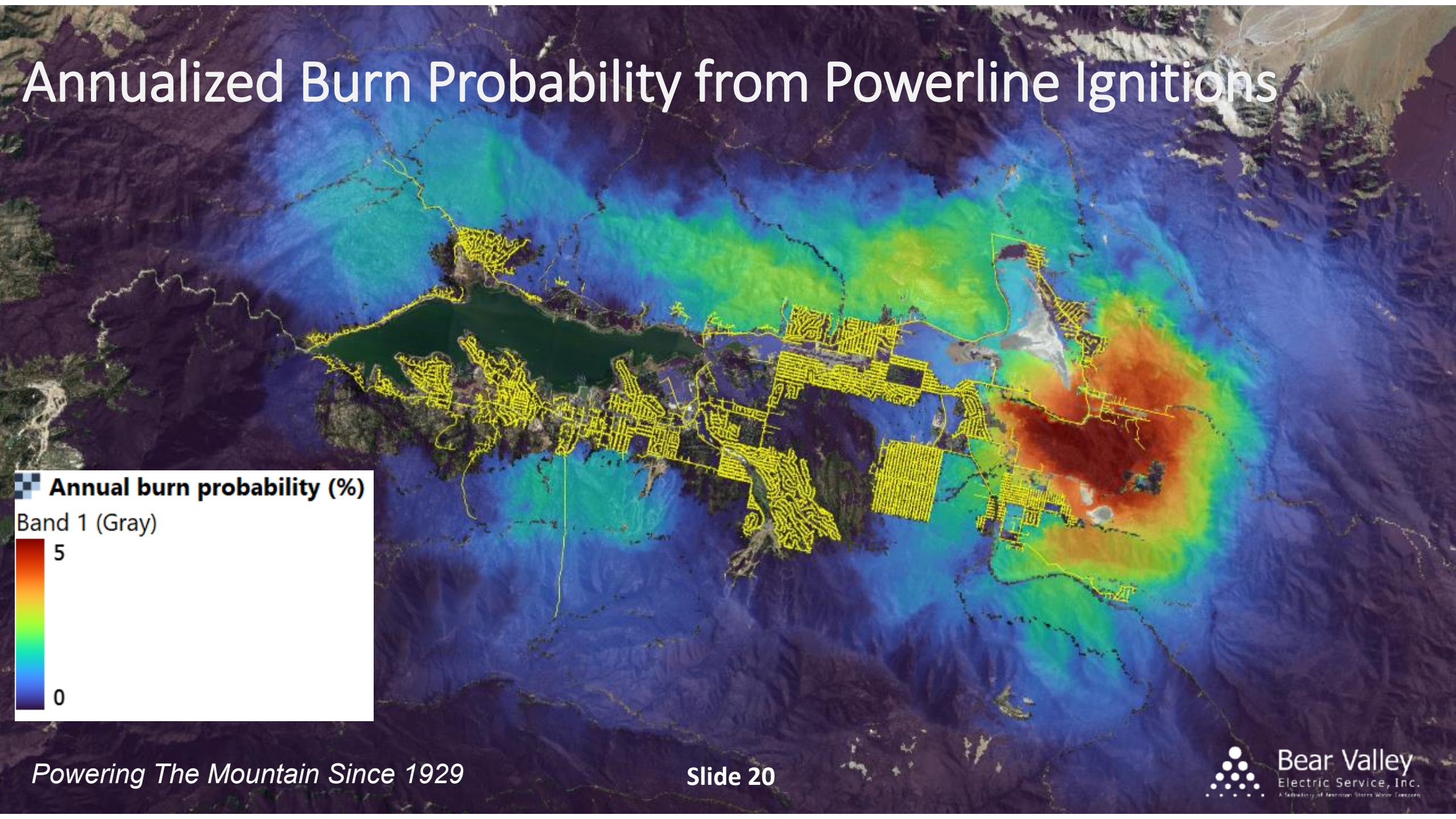
Modeled Structure Impacts (48 hr., unsuppressed)



Risk from Powerline Ignitions (structures)



Annualized Burn Probability from Powerline Ignitions





Questions?

Our Values

In pursuing our mission, the board of directors, management and the company´s employees are guided by the shared Values presented below:

Integrity - Building trust through honest communications and doing what is right
Teamwork - Maximizing efficiency through collaboration and individual strengths
Respect - Valuing diversity and treating all stakeholders with fairness
Excellence in Service - Striving for excellence and quality in everything we do
Accountability - Taking ownership of one´s actions