



Utility Wildfire Resilience Bonds

2019 Kellogg-Morgan Stanley Sustainable Investing Challenge

Team



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Strategy and Communications



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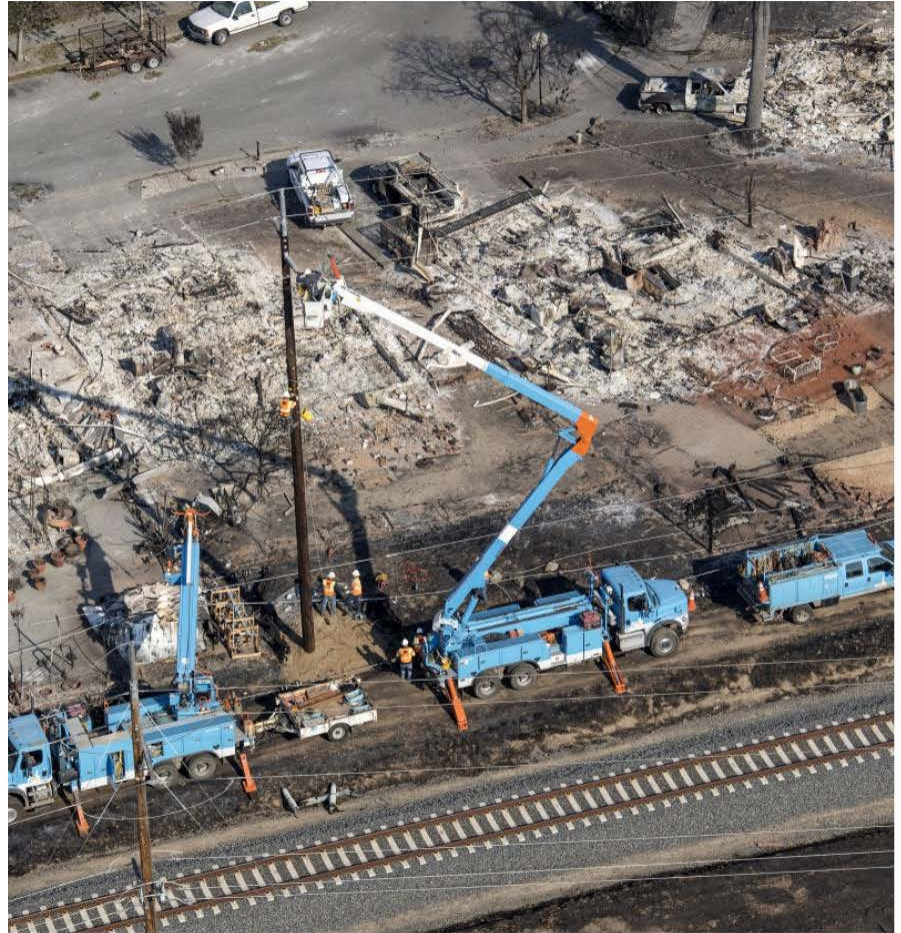
Mechanical Engineering

Power utilities will look to minimize community impacts of de-energization.





**2,000+
wildfires
caused by
utilities
since 2014**



PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

UTILITY AND ENFORCEMENT DIVISION
Electric Safety and Reliability Branch

Resolution ESRB
July 12, 20

R E S O L U T I O N

**RESOLUTION EXTENDING DE-ENERGIZATION REASONABLENESS
NOTIFICATION, MITIGATION AND REPORTING REQUIREMENTS
IN DECISION 12-04-024 TO ALL ELECTRIC INVESTOR OWNED
UTILITIES.**

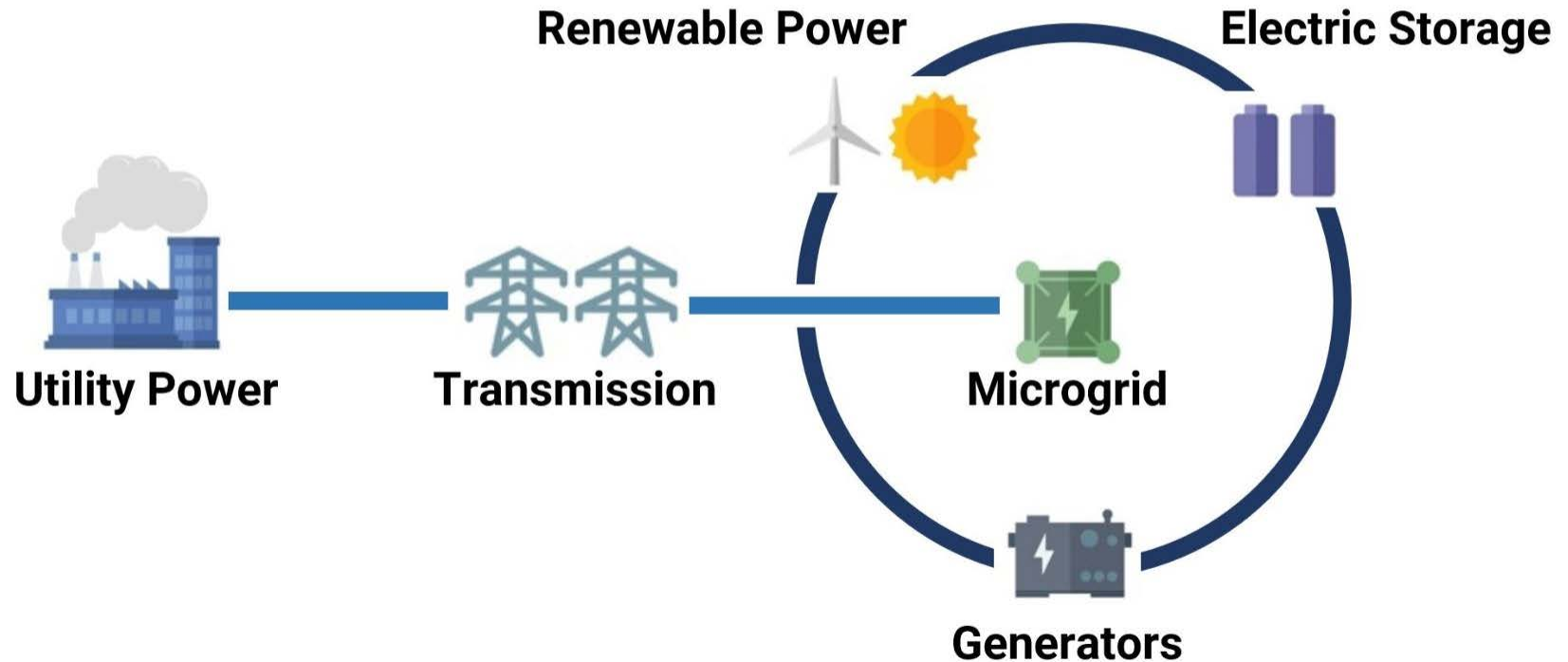
An aerial night photograph of a suburban neighborhood. The houses are mostly dark, but one large, two-story house in the middle-right is brightly lit from within, showing multiple windows and a glowing front entrance. The sky is dark and cloudy, and the overall scene is dimly lit, emphasizing the contrast between the dark houses and the illuminated one.

\$8B
in costs

The background of the image is a close-up, slightly angled view of several solar panels. The panels are dark blue or black with a visible grid of thin, light-colored lines. The perspective creates a sense of depth and repetition.

A Solution: Microgrids

Microgrids





Resilience



Sustainability



**31 Potential
Utility Companies**

**272,000
Potential
Households**

Program Scale and Impact



\$100M

Capital investment



30.3MW

Electricity Generated



24,280

Households impacted

Sources and Uses of Funds

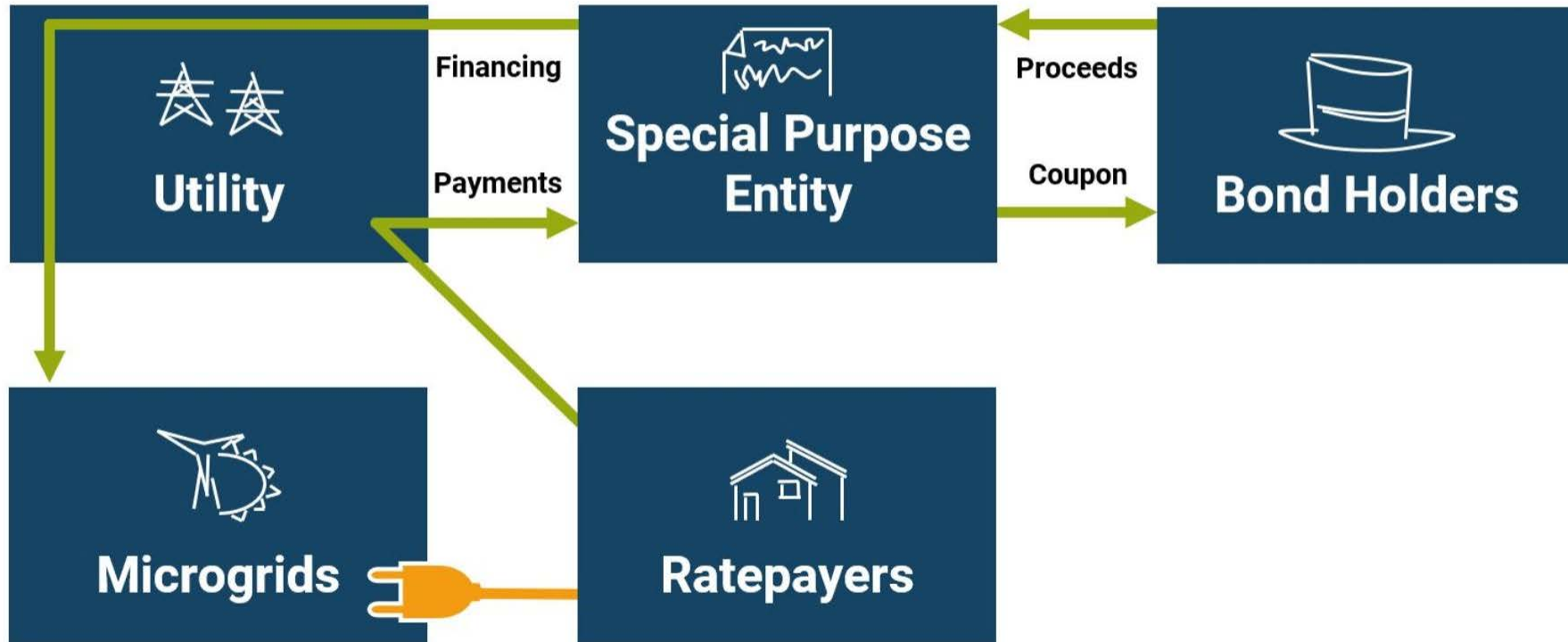
Sources of Funds	\$ (Millions)
Principal Amount	100.0
Fees & Underwriting Discount	-1.0
Total Sources	99.0
Uses of Funds	\$ (Millions)
Microgrid Development	92.0
Distributed Generation Subsidy (Household Solar)	7.0
Total Uses	99.0

Utility Wildfire Resilience Bond

Terms

Par Amount	\$100M
Bond Term	15 years
Note Coupon	3.50%
Rating (Moody's)	A1

Structure



Outcome



Returns

Maximum Potential Yield (Bonus)	4.00%
Minimum Potential Yield (Risk Share Payment)	2.96%
Maximum Federal Tax Equivalent Yield	6.30%
Maximum Double Tax Equivalent Yield	8.0%

Impacts

Utility

- Fewer Claims
- Customer Satisfaction
- Premium Reductions

Community

- Safety
- Power Availability
- Premium Reductions

Public

- Safety
- Carbon mitigation
- Habitat preservation

Risks



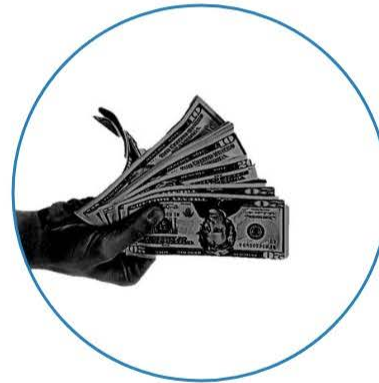
Regulatory

De-energization rulemaking



Political

Approval of rate increase



Financial

Utility bankruptcy



Thank you!

多謝!

Thank you to our advisors and mentors!

- **Paul Simon**

Paul Simon Advisory

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The Faro Group

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UCLA Anderson

- **Julien Gattaciecce**

Luskin Center for Innovation

Questions

Appendix



Resources

1. California utility equipment sparked more than 2,000 fires in over three years (LA Times, 28 January 2019)
2. Wildfire Liability Drives California Utility to Bankruptcy (PEW Trusts, 15 January 2019)
3. Utilities Cut Power To Prevent Wildfires. But Who Wins When The Lights Go Out? (New York Times, 15 October 2018)
4. Evaluating business models for microgrids: Interactions of technology and policy (Energy Policy, January 2017)
5. Making Solar Smarter - How microgrids deliver resilience, energy cost optimization, and sustainability (sustainablesolarstorage.com)
6. 2019 Press Release, California Department of Insurance, January 28, 2019
7. E. O. Lawrence, K. H. Lacommaré, J. H. Eto, K. H. Lacommaré, J. H. Eto, "Cost of power interruptions to electricity consumers in the United States (U.S.)", 2005.
8. 2017 Verisk wildfire risk analysis

Rating Comparison

LA Department of Water and Power System Revenue Series A	Moody's: AA2
	US \$345 million
	January 2019
Burbank Water and Power Revenue Bonds	Moody's: Aa3
	US \$82 million
	August 2017

ROI (Total Yearly Revenue / Total Cost * 100) vs % solar and storage			
% solar and storage	ROI		
	Best	Worst	Nominal
0	12.284	8.570	10.235
10	13.205	6.105	9.695
20	13.971	5.059	9.337
30	14.616	4.481	9.083
40	15.169	4.115	8.893
50	15.646	3.861	8.746
60	16.063	3.676	8.628
70	16.431	3.534	8.532
80	16.757	3.422	8.452
90	17.048	3.332	8.385
100	17.310	3.257	8.327
Investment Required (\$)			
% solar and storage	Investment Required		
	Best	Worst	Nominal
0	25,476,563	32,460,938	28,968,750
10	28,077,344	54,503,906	36,368,750
20	30,678,125	76,546,875	43,768,750
30	33,278,906	98,589,844	51,168,750
40	35,879,688	120,632,813	58,568,750
50	38,480,469	142,675,781	65,968,750
60	41,081,250	164,718,750	73,368,750
70	43,682,031	186,761,719	80,768,750
80	46,282,813	208,804,688	88,168,750
90	48,883,594	230,847,656	95,568,750
100	51,484,375	252,890,625	102,968,750

Cost and Revenue Analyses

Electric Storage (\$/kWh)	175.00	1,050.00	350.00
Thermal Storage (\$/kWh)	40.00	60.00	50.00
Solar PV (\$/kW)	1,195.00	3,585.00	2,390.00
Microturbines (\$/kW)	2,056.00	2,228.00	2,142.00
Internal Combustion Engine (\$/kW)	1,205.00	1,927.00	1,566.00
Fuel Costs			
	Min	Max	Nominal
Fuel for Microturbine (\$/kWh)	0.095	0.1	0.098
Fuel for ICE (\$/kWh)	0.058	0.075	0.067
Solar + Storage Costs (Nominal solar output, 12 hour storage. Unlimited storage)			
	Min	Max	Nominal
Solar total cost (\$)	18,671,875.00	56,015,625.00	37,343,750.00
Storage total cost (\$)	32,812,500.00	196,875,000.00	65,625,000.00
Total (\$)	51,484,375.00	252,890,625.00	102,968,750.00
Emergency ICE Generator Costs (fuel only for shutoffs)			
	Min	Max	Nominal
ICE Cost (\$)	18,828,125	30,109,375	24,468,750
Yearly Fuel Cost (\$)	0	281,250	125,625
Emergency Microturbine Generator Costs (fuel only for shutoffs)			
	Min	Max	Nominal
Microturbine Cost (\$)	32,125,000	34,812,500	33,468,750
Yearly Fuel Cost (\$)	0	375,000	183,750
Total Project Cost vs % solar and storage			
% solar and storage	Total Project Cost		
	Min	Max	Nominal
0	25,476,563	32,460,938	28,968,750
10	28,077,344	54,503,906	36,368,750
20	30,678,125	76,546,875	43,768,750
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40	35,879,688	120,632,813	58,568,750
50	38,480,469	142,675,781	65,968,750
60	41,081,250	164,718,750	73,368,750
70	43,682,031	186,761,719	80,768,750
80	46,282,813	208,804,688	88,168,750

Cost and Revenue Analyses

# of residents served	74,000
# of MW microgrid installed	31.25

	Tariff	Percentage	Notes
Normal Electricity Tariff (\$/kWh)	0.170	N/A	
Additional Electricity Tariff (\$/kWh)	0.010	6.000	Average Additional Monthly payment per household (\$): 9.27265
Total Electricity Tariff (\$/kWh)	0.180	N/A	
Premium during Shutoff (\$/kWh)	0.000	0.000	

	Microturbine based	Solar + Storage based
Cost to install microgrid (\$)	28,968,750	102,968,750
ROI (%)	10.2351068	8.326963278
Construction period # of years	Between 8 and 18 months	

Results Summary