Joint IOU
EPIC Benefits

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Working Benefits Framework

Benefit Area	Measurement
Reliability	• Equipment service life extension • Outage number, frequency and duration reductions • Reduction in system and equipment failures • Improved reliability to DAC customers
Safety	• Worker safety improvement and hazard exposure reduction • Public safety improvement and hazard exposure reduction • Safety improvements targeted towards DAC
Environmental	• Habitat area disturbance reductions • Reduce GHG emissions ($MMTCO_2e$) • DAC Residents impacted by reduced emissions
Economic/Financial	• Maintain/reduce O&M costs • Maintain/reduce capital costs • Peak load reduction • Reduced cost of DER adoption • Reduced cost of DER adoption for DAC. • Avoided customer energy use • Follow-on funding to projects • Customer bill or interconnection savings • CO_2 equivalent savings
Information Sharing	• Number of industry sharing events/papers presented • Number of times reports are cited in scientific journals and trade publications for selected projects • Number of information sharing forums held • Stakeholder attendance at workshops • Results provided to standard development organizations
Technology Adoption	• EPIC project results referenced in regulatory proceedings • Number of technologies/use cases demonstrated, in direct use post-EPIC • Number of technologies included for funding in the GRC, or for which post-EPIC funding has otherwise formally been committed
Technology Development Progress	• Technology Readiness Level (TRL) Scale Assignment
Support of CPUC Proceedings or State Policy	• Specific CPUC proceedings or state mandates
Informed Industry and/or Company Standards	• Specific standards which were created or updated

PG&E EPIC 3.20
Data Analytics for Predictive Maintenance

- The core objective of EPIC 3.20 was to determine if machine learning models can be developed using existing utility data sets (such as AMI i.e. smart meters, asset location, and or weather data) to predict electric distribution equipment failures and outages, so that corrective action can be taken before either occurs. The project aimed to improve system reliability and safety by reducing unplanned outages by proactively identifying and mitigating equipment failure.

Benefit Area	Measurement
Reliability	1.2 million CMI per year avoided
Economic Benefits	$3,200,000 per year

- Calculation:

$$100\frac{transformers\ flagged}{year} \times 90\% \frac{transformer\ outage}{transformers\ flagged} \times 13{,}275 \frac{customer-minutes}{transformer\ outage} \times 2.69 \frac{\$}{customer-minute} = \$3.2\ million/year$$

SME Estimate | SME Estimate | ILIS outage data | CMI for PG&E territory

SDG&E EPIC 3 – Project 7
Demonstration of Multi-Purpose Mobile Battery for Port of San Diego and Other Applications: San Diego Port Dist. and CRCs

The objective of this project was to examine the value proposition of using MBESS across multiple sites and use cases.

Benefit Area	Measurement
Economic Benefits	**$653,424**[1]/10 Year Lifecycle Net Benefit of 362kW MBESS vs. 285kW Diesel Generator Rental Local economic benefits for businesses and residential customers
Environmental Benefits	**3 metric tons** Carbon Dioxide Equivalent (CO_2e)/diesel generator/year
	Deployment in DAC territory impacts – improved air quality for DAC residents with reduced GHG emissions
Safety	Reduction of noise pollution of **24 decibels**

[1] SDGE Project 7 Module 1 Final Report p 56

- Basis for Calculations:

Fuel Used

Generator Size (KW)	Fuel Capacity Per Generator (Gal)	Fuel Consumption @ 50% Load Factor (Gal/Hr)	Hours of operation all gen (Hr)	Total Fuel used all gen (Gal)	Diesel Cost per gallon	Total Fuel Cost All Generators (10 months)	Total Fuel Cost All Generators (Per Month)	Total Fuel Cost All Generators (Per Year)	Total Annual Fuel Cost (Per Generator)	Yearly Generation Per Gen. (kWh)	Average Fuel Economy (kWh/Gal)	Fuel Consumption per Generator (Gal)
275	472	10	1162.5	11625	$ 5.95	$ 69,169	$ 6,917	**$ 83,003**	**$ 1,804**	**3,114**	**12**	**303**

GHG Emissions (Equivalence factor by EPA: 10.210 x 10^{-3} metric tons CO2/gallon of diesel) https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf

$23.30 Price per MTCO2e in CA Cap and Trade Market (Aug 2021)

Generator Size (KW)	Fuel Capacity Per Generator (Gal)	Fuel Consumption @ 50% Load Factor (Gal/Hr)	Hours of operation (Hr)	Total Fuel used (Gal)	GHG Emissions per Gallon of Diesel ($MTCO_2e$)	Total GHG Emissions ($MTCO_2e$)	Total GHG Emissions per Month ($MTCO_2e$)	Total GHG Emissions per Year ($MTCO_2e$)	Total GHG Emissions Value (Per Year)	Total GHG Emissions per Year per Generator ($MTCO_2e$)	Total GHG Emissions Value per Year per Generator $
275	472	10	1162.5	11625	0.01021	119	12	**142**	**$ 3,318.61**	**3**	**$ 72.14**

Noise Level https://www.engineeringtoolbox.com/adding-decibel-d_63.html

https://www.greenburghny.com/DocumentCenter/View/7255/PB-20-18-Eagle-Energy---Letter-to-PB-11-25-20

Equipment	Estimated Noise Single Unit (db)	Estimated Noise Two Units (db)	Estimated Noise Three Units (db)	Estimated Noise Four Units (db)	Estimated Noise Six Units (db)	Estimated Noise Eight Units (db)
275 KW Generator	85	88	89.8	91	92.8	94
MBESS	61	64	65.8	67	68.8	70
% Reduction	28%	27%	27%	26%	26%	26%
Difference	24	24	24	24	24	24

SCE Integrated Grid Project Benefits

SCE forecasts that GMS FLISR will help SCE customers avoid approximately 300 million customer minutes of interruption by 2030, with an estimated value to customers of $471 million

$ In Millions	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Circuits with Existing Automation																													
GMS: CMI due to 10 min switching time																													
CMI Reduction (minutes)		0.00	0.00	0.00	0.00	36,579,949	36,579,949	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209	38,505,209
CMI Reduction (minutes, in millions)		0.00	0.00	0.00	0.00	36.58	36.58	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51	38.51
CMI Value (PV)		0.00	0.00	0.00	0.00	$ 72.35	$ 67.28	$ 65.81	$ 61.15	$ 56.86	$ 52.89	$ 49.23	$ 45.80	$ 42.60	$ 39.61	$ 36.81	$ 34.20	$ 31.77	$ 29.50	$ 27.40	$ 25.45	$ 23.64	$ 21.95	$ 20.40	$ 18.95	$ 17.62	$ 16.37	$ 15.22	$ 14.15
GMS: Avoided CMI increase resulting from DER adoption																													
CMI Reduction (minutes)		0.00	0.00	0.00	-	-	-	10,914,021	13,071,796	14,895,896	17,407,484	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073	19,919,073
CMI Reduction (minutes, in millions)		0.00	0.00	0.00	0.00	0.00	0.00	10.91	13.07	14.90	17.41	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92	19.92
CMI Value (PV)		0.00	0.00	0.00	0.00	$ -	$ -	$ 18.65	$ 20.76	$ 21.99	$ 23.91	$ 25.47	$ 23.69	$ 22.04	$ 20.49	$ 19.04	$ 17.69	$ 16.43	$ 15.26	$ 14.17	$ 13.16	$ 12.23	$ 11.36	$ 10.55	$ 9.80	$ 9.11	$ 8.47	$ 7.87	$ 7.32

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Escalation Rates																														
WACC	10%																													
Discount Factor	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.42	0.39	0.35	0.32	0.29	0.26	0.24	0.22	0.20	0.18	0.16	0.15	0.14	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.06
Escalation Rates																														
Capital	1.00	1.04	1.07	1.09	1.11	1.14	1.16	1.18	1.21	1.23	1.25	1.28	1.30	1.33	1.36	1.38	1.41	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.65	1.68	1.72	1.75	1.79	1.82
O&M	1.00	1.01	1.03	1.04	1.06	1.08	1.10	1.12	1.14	1.17	1.19	1.21	1.24	1.26	1.28	1.31	1.34	1.36	1.39	1.42	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.65	1.68	1.72
JPGDP	1.00	1.02	1.05	1.08	1.10	1.13	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.54	1.57	1.60	1.64	1.68	1.71	1.75	1.79	1.83	1.87	1.92
CMI Value ($/CMI)	$ 2.63	$ 2.69	$ 2.76	$ 2.83	$ 2.90	$ 2.96	$ 3.03	$ 3.09	$ 3.17	$ 3.24	$ 3.32	$ 3.39	$ 3.47	$ 3.55	$ 3.63	$ 3.71	$ 3.79	$ 3.87	$ 3.96	$ 4.04	$ 4.13	$ 4.22	$ 4.31	$ 4.41	$ 4.51	$ 4.61	$ 4.71	$ 4.82	$ 4.93	$ 5.04

Overhead Rate

GMS 1%

Contingency Rate

GMS 20%

Franchise Fees & Uncollectables

FF&U Gross-up Factor 1.16051%

FF&U Factor 1.14720%

Other Assumptions

DER Impacts Occur with Gen >3MW.

Reliability improvements reflect Grid DA deployments through 2020.

Base DERMS completion 2024.

ADMS Assisted Switching Completion 2022.

Support for Foundational Principles

- Attribution to EPIC
  - IOU-run EPIC projects are the main early-stage technology development projects the IOUs use
  - If not for the project the utility would probably not undertake in the technology transfer process
  - Some projects have other partners, funding or support
- Market penetration assumptions
  - Maximum attributable market is generally size of each utility's system
  - Usually based on realistic adoption and rollout within respective service areas
- Methods
  - Using utility data
  - Value of Service studies
  - SME input
  - Emissions calculators
  - Commercial adoption
  - Presentations at industry events