Battery Energy Storage System

Economic Analysis Report

Report Date	February 12, 2026
Project	Unnamed Project
Assumption Library	SCE Utility-Owned Storage 2026

RECOMMENDATION: APPROVE - Strong economic case

The project demonstrates robust economics with benefits significantly exceeding costs. The BCR of 3.98 exceeds the 1.5 threshold typically required for regulatory approval. The project is expected to create substantial value for ratepayers.

Key Financial Metrics

Metric	Value	Interpretation
Benefit-Cost Ratio (BCR)	3.98	Pass (≥1.0)
Net Present Value (NPV)	$377.3M	Value created
Internal Rate of Return (IRR)	68.6%	Exceeds hurdle rate
Simple Payback	1.5 years	Within analysis period
LCOS ($/MWh)	$111.4	Competitive
Breakeven CapEx	$1,074/kWh	Above current cost

Project Summary

Parameter	Value
System Capacity	100.0 MW / 400.0 MWh
Duration	4.0 hours
Total Capital Investment	$52.2M
Analysis Period	25 years
Discount Rate (WACC)	7.0%
PV of Total Costs	$126.7M

PV of Total Benefits	$504.1M

Project Configuration

Technology Specifications

The proposed system utilizes **LFP** battery technology, which offers favorable cycle life characteristics for grid-scale applications. The system is designed for 4.0-hour duration with a nameplate capacity of 100 MW, providing 400 MWh of energy storage capacity.

Parameter	Value	Notes
Battery Chemistry	LFP	LFP preferred for long-duration, high-cycle applications
Round-Trip Efficiency	84.0%	AC-to-AC efficiency including inverter losses
Annual Degradation	2.5%	Capacity fade per year of operation
Cycle Life	5,999	Full depth-of-discharge cycles to 80% capacity
Augmentation Year	Year 12	Planned battery module replacement
Cycles per Day	1.0	Average daily discharge cycles assumed

Financing Structure

The project assumes a capital structure of 43.0% debt and 57.0% equity. Based on the financing assumptions, the weighted average cost of capital (WACC) is calculated at 7.3%.

Parameter	Value	Source/Basis
Debt Percentage	43.0%	Typical utility project financing
Interest Rate	4.7%	Current market rates
Loan Term	20 years	Standard project finance term
Cost of Equity	10.0%	Required return on equity
Tax Rate	21.0%	Federal corporate tax rate
Calculated WACC	7.3%	Used as discount rate

Cost Analysis

Capital Expenditures

Total capital expenditure is estimated at $76.7M, consisting of battery system costs ($61.2M) and infrastructure costs ($15.5M). After applying the Investment Tax Credit of $24.5M, the net Year 0 investment is $52.2M.

Cost Component	$/Unit	Quantity	Total
Battery System ($/kWh)	$153	400,000 kWh	$61.2M
Interconnection ($/kW)	$120	100,000 kW	$12.0M
Land Acquisition ($/kW)	$15	100,000 kW	$1.5M
Permitting ($/kW)	$20	100,000 kW	$2.0M
Gross Capital Cost			**$76.7M**
Less: ITC (40.0%)			**($24.5M)**
Net Capital Investment			**$52.2M**

Annual Operating Costs

Operating Cost	Annual Amount	Basis
Fixed O&M	$2.6M	$26/kW-year
Charging Costs	$3.1M	$25/MWh at 1.0 cycles/day
Insurance	$306.0K	0.5% of battery CapEx
Property Tax	$767.0K	1.0% of total CapEx (declining)
Total Annual OpEx	$6.7M	

Non-Recurring Costs

Cost Item	Year	Amount	Notes
Battery Augmentation	Year 12	$20.8M	Battery module replacement
Decommissioning	Year 25	$1.2M	End-of-life removal (net of residual value)

Benefit Analysis

The following benefit streams have been identified and quantified for this project. All values are shown as Year 1 amounts and escalated annually as indicated.

Benefit Category	Year 1 Value	Escalation	PV Total	% of Total
Resource Adequacy	$8.9M	0.0%	$101.5M	20.1%
Distribution Capacity	$7.7M	2.0%	$104.8M	20.8%
Energy Arbitrage	$3.5M	2.5%	$49.7M	9.9%
Ancillary Services	$1.0M	1.0%	$12.4M	2.5%
Transmission Deferral	$2.5M	1.5%	$32.4M	6.4%
GHG Emissions Value	$1.8M	3.0%	$27.1M	5.4%
Renewable Integration	$3.0M	2.5%	$42.6M	8.5%
Total Benefits	**$28.5M**		**$504.1M**	**100.0%**

Benefit Stream Descriptions

Resource Adequacy: Capacity payments for providing reliable power during peak demand periods. Based on CPUC Resource Adequacy program requirements.

Distribution Capacity: No description available.

Energy Arbitrage: Revenue from buying electricity during low-price periods and selling during high-price periods. Based on historical CAISO price spreads.

Ancillary Services: Payments for providing frequency regulation, spinning reserves, and other grid services. Based on CAISO AS market prices.

Transmission Deferral: No description available.

GHG Emissions Value: Monetized value of avoided greenhouse gas emissions. Based on EPA Social Cost of Carbon.

Renewable Integration: Value of enabling increased renewable penetration by providing firming and shifting services.

Reliability (Avoided Outage): Avoided customer outage costs based on expected outage hours and value of lost load. Calculated as: outage_hours × customer_cost_per_kWh × capacity × backup_percentage.

Financial Metrics Analysis

Benefit-Cost Ratio (BCR)

The Benefit-Cost Ratio is calculated as the ratio of present value of benefits to present value of costs. A BCR greater than 1.0 indicates that benefits exceed costs.

Calculation:
BCR = PV(Benefits) / PV(Costs)
BCR = $504.1M / $126.7M
BCR = 3.98

Net Present Value (NPV)

Net Present Value represents the difference between the present value of benefits and present value of costs, discounted at the project's cost of capital (7.0%).

Calculation:
NPV = PV(Benefits) - PV(Costs)
NPV = $504.1M - $126.7M
NPV = $377.3M

A positive NPV indicates the project creates value above the required rate of return.

Internal Rate of Return (IRR)

The Internal Rate of Return is the discount rate at which NPV equals zero. It represents the project's expected return on investment.

Result: IRR = 68.6%

The IRR of 68.6% exceeds the required return of 7.0%, indicating the project meets the minimum return threshold.

Levelized Cost of Storage (LCOS)

LCOS represents the all-in cost per MWh of energy discharged over the project lifetime, following the Lazard methodology.

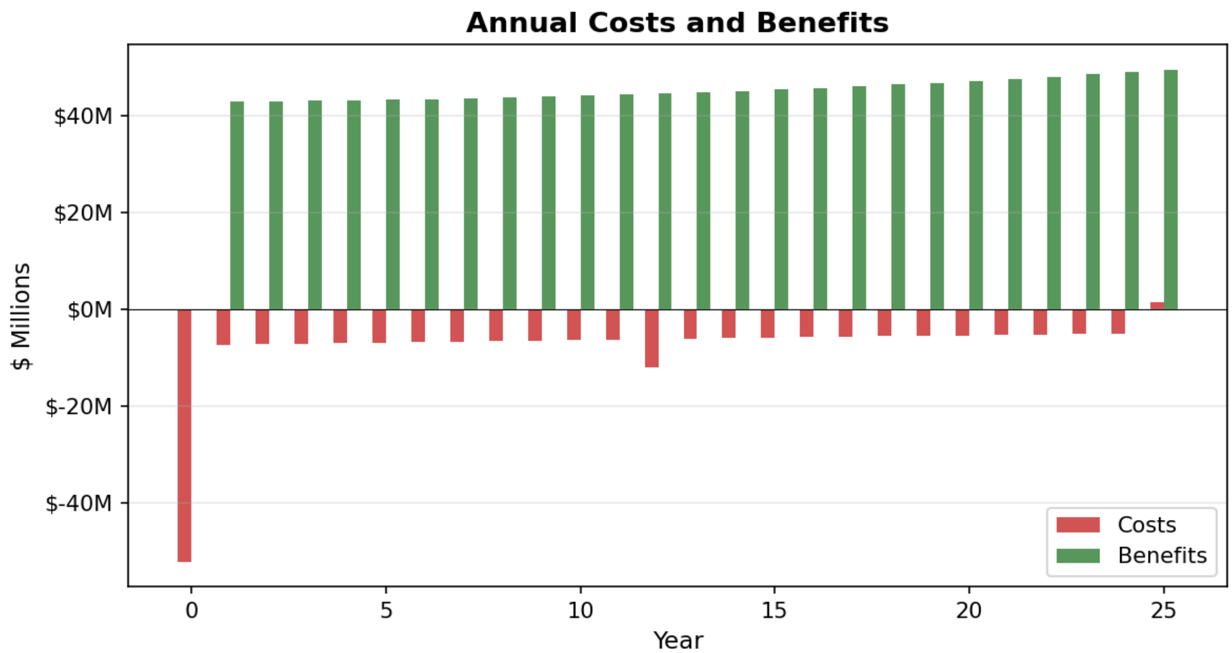
Result: LCOS = $111.4/MWh

This metric enables comparison across different storage technologies and project configurations. For context, current utility-scale battery LCOS typically ranges from $120-180/MWh.

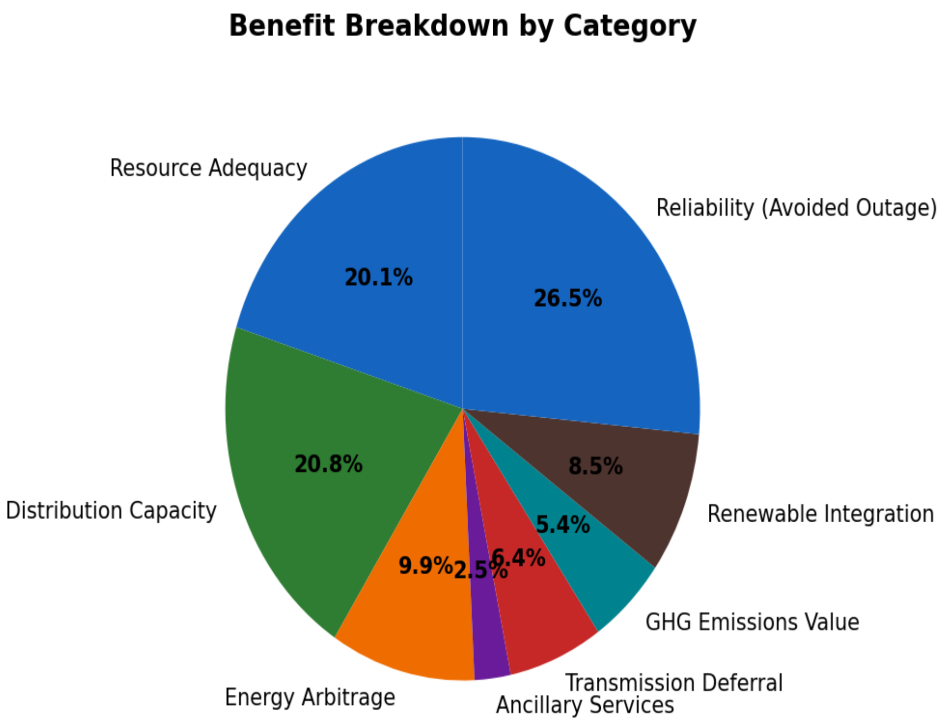
Cash Flow Analysis

Annual Cash Flows

Year	Year 0	Year 1	Year 5	Year 10	Year 15	Year 20
Costs	$52M	$7M	$7M	$6M	$6M	$5M
Benefits	$0	$43M	$43M	$44M	$45M	$47M
Net CF	$-52M	$36M	$36M	$38M	$40M	$42M



Benefit Distribution



Benefit Breakdown by Category
Resource Adequacy
20.1%
Reliability (Avoided Outage)
26.5%
Distribution Capacity
20.8%
8.5%
Renewable Integration
5.4%
6.4%
9.9%
2.5%
GHG Emissions Value
Transmission Deferral
Energy Arbitrage
Ancillary Services

Sensitivity Analysis

The following tables show how key metrics change under different assumptions. This analysis helps identify the key value drivers and risk factors for the project.

BCR Sensitivity: CapEx vs. Benefit Levels

CapEx $/kWh	80% Benefits	90% Benefits	100% Benefits	110% Benefits	120% Benefits
$100	4.20	4.73	5.25	5.78	6.30
$120	3.75	4.22	4.68	5.15	5.62
$140	3.38	3.81	4.23	4.65	5.07
$160	3.08	3.47	3.85	4.24	4.62
$180	2.83	3.19	3.54	3.89	4.25
$200	2.62	2.95	3.27	3.60	3.93
$220	2.44	2.74	3.04	3.35	3.65

Green: BCR ≥ 1.5 (Strong) | Yellow: BCR 1.0-1.5 (Marginal) | Red: BCR < 1.0 (Fail)

Methodology & Formulas

Discounted Cash Flow Analysis

This analysis employs standard discounted cash flow (DCF) methodology as described in Brealey, Myers & Allen (2020) and consistent with CPUC Standard Practice Manual guidelines. All future costs and benefits are discounted to present value using the project's weighted average cost of capital (WACC).

Key Formulas

Present Value:

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PV = FV / (1 + r)^t
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where r = discount rate, t = time period

Net Present Value:

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NPV = Σ(CFt / (1 + r)^t) for t = 0 to N
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Sum of discounted cash flows

Benefit-Cost Ratio:

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BCR = PV(Benefits) / PV(Costs)
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Ratio of present values

Internal Rate of Return:

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Solve for r where: Σ(CFt / (1 + r)^t) = 0
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Discount rate at NPV = 0

LCOS:

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LCOS = PV(Costs) / PV(Energy)
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Levelized cost per MWh discharged

WACC:

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WACC = E/(D+E) × Re + D/(D+E) × Rd × (1-Tc)
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Weighted average cost of capital

Battery Degradation

Battery capacity is assumed to degrade at 2.5% per year. This affects both the energy output available for arbitrage and ancillary services, and the capacity available for resource adequacy. The analysis assumes battery augmentation (module replacement) in Year 12 to restore capacity.

Complete Assumption Set

Category	Parameter	Value	Source
Project	Capacity	100.0 MW / 400.0 MWh	Project specification
Project	Duration	4.0 hours	Project specification
Project	Analysis Period	25 years	Standard utility practice
Technology	Chemistry	LFP	SCE Utility-Owned Storage 2026
Technology	Round-Trip Efficiency	84.0%	Manufacturer specifications
Technology	Annual Degradation	2.5%	NREL ATB 2024
Technology	Cycle Life	5,999 cycles	Manufacturer warranty
Cost	CapEx	$153.0/kWh	SCE Utility-Owned Storage 2026
Cost	Fixed O&M	$26.0/kW-year	SCE Utility-Owned Storage 2026
Cost	Interconnection	$120.0/kW	Utility estimate
Tax Credit	ITC Rate	30.0%	IRA 2022 (26 USC §48)
Tax Credit	ITC Adders	10.0%	Energy Community/Domestic Content
Finance	Debt %	43.0%	Project financing structure
Finance	Interest Rate	4.7%	Current market rates
Finance	Cost of Equity	10.0%	CAPM estimate

References & Citations

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