BESS Sizing Calculator Report

1. Input Parameters

Customer Load:	2.5 MW
Discharge Duration:	4.0 hours
C-Rate:	0.5C
Grid Power Available:	2.0 MW
Solar Power Available:	1.0 MW
Other Power Available:	0.0 MW
Project Application:	Peak Shaving
Ambient Environment:	Inland
Voltage Standard:	11.0 kV
Grid Stability:	Stable
Cooling System:	Liquid Cooling System
Cycles per Day:	1
Black Start Required:	No
Depth of Discharge:	90.0%
Static Efficiency:	90.0%
Cycle Efficiency:	95.0%
Power Factor:	0.95
Aging Derate:	5.0%
Temperature Derate:	3.0%
Auxiliary Load:	2.0%
Charging C-Rate:	0.5C
Cable Length:	50.0 m
Site Preparation Cost:	$50,000.00

2. Calculation Results

Battery Sizing Calculations:

Initial Battery Capacity	10.0 MWh	Customer Load × Discharge Duration
After DoD Adjustment	11.11 MWh	Initial Capacity ÷ (DoD %)
After Static Efficiency	12.35 MWh	After DoD ÷ Static Efficiency

After Cycle Efficiency	13.0 MWh	After Static Eff ÷ Cycle Efficiency
After Derating Factors	14.39 MWh	After Cycle Eff ÷ Derating Factors
Required Discharging Power	2.5 MW	Customer Load
Battery Size Based on C-Rate	5.0 MW	Required Power ÷ C-Rate
Battery Size Sufficient	Yes	
Required Battery Capacity	14.39 MWh	Final calculated capacity

Charging Calculations:

Power Available for Charging	3.0 MW	Grid + Solar + Other Power
Time to Fully Charge	5.7 hours	Battery Capacity ÷ Charging Power ÷ Efficiency

3. Bill of Quantity (BOQ)

Component	Model	Quantity
Battery System	BESS-3727	4
Power Conversion System	PCS-10MW	1
Transformer	TX-8MVA	1
Switchgear/RMU	SG-11kV-RMU	1
AC System Cabinet	AC-CAB-S	1
EMS & SCADA System	EMS-ADV	1
Containerization	CONT-20FT	4
Cabling	CAB-MV	50.0m
Fire Protection	FIRE-FM200	1

Battery System Details:

Model:	BESS-3727
Quantity:	4
Capacity per Unit:	3727.36 kWh
Total Capacity:	14.91 MWh
Chemistry:	NMC
Cycle Life:	5000 cycles
Warranty:	10 years

PCS Details:

Model:	PCS-10MW
Quantity:	1
Power per Unit:	10.0 MW
Efficiency:	98.0%
Cooling Type:	Liquid

Transformer Details:

Model:	TX-8MVA
Quantity:	1
Power per Unit:	8.0 MVA
Type:	Oil-Filled
Primary Voltage:	0.69 kV
Secondary Voltage:	11.0 kV
Configuration:	Step-Up Transformer
Losses:	2.3%
Impedance:	6.5%
Mounting:	Pad Mounted

Switchgear Details:

Model:	SG-11kV-RMU
Quantity:	1
Voltage Rating:	11 kV
Type:	RMU
Current Rating:	630 A
Breaking Capacity:	25 kA

EMS/SCADA Details:

Model:	EMS-ADV
Features:	Monitoring, Control, Forecasting
Hardware:	Redundant Servers
Software:	Advanced Analytics

Container Details:

Model:	CONT-20FT

Quantity:	4
Dimensions:	6.1x2.4x2.6m

4. Cost Breakdown

Equipment Cost:	$7,242,870.40
Site Preparation:	$50,000.00
Engineering & Design:	$724,287.04
Contingency:	$1,202,573.62
Total Project Cost:	$9,219,731.06

5. Financial Analysis

Total Project Cost:	$9,219,731.06
Daily Energy:	10,000.00 kWh
Daily Energy Revenue:	$1,500.00
Annual Energy Revenue:	$450,000.00
Capacity Revenue:	$250,000.00
Annual Revenue:	$700,000.00
Payback Period:	13.2 years
Levelized Cost of Storage:	$0.1998/kWh
Net Present Value (NPV):	$-2,347,027.87
Approximate IRR:	7.59%
System Lifecycle:	16.7 years
Annual Degradation:	2.5%

Maintenance Costs:

Annual Maintenance:	$138,295.97
Battery Replacement (Year):	Year 10.0
Battery Replacement Cost:	$2,765,919.32
Major Maintenance (Year):	Year 8.3
Major Maintenance Cost:	$921,973.11

Transportation Logistics:

Battery Weight:	108,000.00 kg
Container Weight:	12,000.00 kg
Transformer Weight:	6,000.00 kg
PCS Weight:	4,800.00 kg
Total Weight:	130,800.00 kg (130.80 tons)
Trucks Required:	7

6. Design Recommendations

Design Option	Battery Qty	PCS Qty	Total Cost	Payback (Years)
Cost-Optimized Design	1	1	$7,103,550.00	10.1
Base Design	4	1	$9,219,731.06	13.2
High-Efficiency Design	4	1	$9,346,231.06	13.4
LFP Long-Life Design	5	1	$9,456,450.00	13.5
Extended Autonomy Design	2	1	$10,139,550.00	14.5
Modular Scalable Design	15	4	$12,492,450.00	17.8

Option 1: Cost-Optimized Design

20% reduced battery capacity for lower initial investment, suitable for applications with shorter backup requirements.

Option 2: Base Design

Optimized design based on your requirements with best balance of cost and performance.

Option 3: High-Efficiency Design

Premium components with higher efficiency and advanced EMS for optimal performance and monitoring.

Option 4: LFP Long-Life Design

LFP battery chemistry for enhanced safety and longer cycle life (6000+ cycles), ideal for daily cycling applications.

Option 5: Extended Autonomy Design

20% additional battery capacity for extended backup time and improved cycle life.

Option 6: Modular Scalable Design

Modular design with smaller units for easier expansion and redundancy, suitable for phased implementation.

Recommended Design:

For the best return on investment, we recommend the Cost-Optimized Design with a payback period of 10.1 years. This option provides the optimal balance between initial investment and long-term financial returns.

7. Additional Considerations

1. Site preparation may require additional civil works depending on soil conditions and local regulations.
2. Grid connection approval from the local utility may be required and could involve additional costs.
3. Environmental permits may be necessary, especially for larger installations.
4. Regular maintenance is essential for optimal system performance and longevity.
5. Consider future expansion possibilities when designing the layout and electrical infrastructure.
6. Training for operations and maintenance staff should be included in the project planning.

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