UL 9540 Energy Storage Systems Certification Report

Report Number: UL-2026-NRL-001
Certification Date: April 2026
Valid Until: April 2029
Language: English (EN)
Issued By: UL (Underwriters Laboratories)

Executive Summary

NorseLink Global Energy Services AS has successfully obtained UL 9540 certification for its Energy Storage Systems (ESS). This certification confirms that the systems meet the stringent safety requirements for stationary battery energy storage systems.

Key Certifications Achieved:

- ✓ UL 9540:2020 - Energy Storage Systems and Equipment
- ✓ UL 1973:2013 - Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Power Applications
- ✓ IEC 62619 - Secondary batteries for the safe operation of portable electronic devices

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1. Product Description

System Overview

Product Name: NorseLink Modular Energy Storage System (MESS)

Capacity Range: 50 kWh to 5 MWh (modular design)

Chemistry: Lithium Iron Phosphate (LFP)

Voltage: 400V AC / 600V DC

Power Rating: 50 kW to 500 kW

Efficiency: > 98% (round-trip)

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2. Certification Scope

Systems Covered

This certification covers the following system configurations:

Component	Specification	Quantity
Battery Module	48V / 100Ah LFP	1-12 units
BMS (Battery Management System)	Multi-cell monitoring	1 per module
PCS (Power Conversion System)	50-500 kW	1-4 units
EMS (Energy Management System)	Cloud-based control	1 per system
Cooling System	Liquid or air-cooled	As required
Enclosure	IP54 rated steel	1 per system

Excluded Components

- Grid interconnection equipment (must comply with local grid codes)
- Backup power systems (separate certification required)
- Custom integration components

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3. Safety Requirements Compliance

3.1 Thermal Safety

Standard: UL 1973 Section 7.2.3

Requirements Met:

- ✓ Thermal runaway prevention
- ✓ Temperature monitoring (±2°C accuracy)
- ✓ Automatic shutdown at 65°C
- ✓ Thermal fuse protection

Test Results:

- External short circuit: No thermal runaway
- Overcharge test: Safe shutdown at 4.3V per cell
- Overdischarge test: No cell damage below 2.5V

3.2 Electrical Safety

Standard: UL 9540 Section 5.1

Requirements Met:

- ✓ Overvoltage protection (±10% tolerance)
- ✓ Overcurrent protection (< 200% rated current)
- ✓ Ground fault detection
- ✓ Insulation resistance ≥ 1 MΩ

Test Results:

- Insulation resistance: 1.2 MΩ @ 1000V DC
- Leakage current: < 3.5 mA
- Ground continuity: < 0.1 Ω

3.3 Mechanical Safety

Standard: UL 9540 Section 5.2

Requirements Met:

- ✓ Vibration resistance (5-500 Hz)
- ✓ Impact resistance (50 cm drop test)
- ✓ Structural integrity under load
- ✓ Corrosion resistance

Test Results:

- Vibration test: No component failure
- Drop test: No structural damage
- Salt spray test: No corrosion after 1000 hours

3.4 Fire Safety

Standard: UL 1973 Section 8.3

Requirements Met:

- ✓ Fire propagation prevention
- ✓ Flame retardant materials (UL 94 V-0)
- ✓ Smoke emission control
- ✓ Fire suppression system integration

Test Results:

- Flammability rating: UL 94 V-0
- Smoke density: < 200 (ASTM E662)
- Heat release rate: < 3 MW/m^2

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4. Performance Specifications

4.1 Energy Capacity

Metric	Value	Unit
Nominal Capacity	100-5000	kWh
Usable Capacity	95%	of nominal
Round-trip Efficiency	> 98%	%
Energy Density	150-200	Wh/kg

4.2 Power Output

Metric	Value	Unit
Rated Power	50-500	kW
Peak Power	110%	of rated
Response Time	< 100	ms
Ramp Rate	100%	per second

4.3 Operating Conditions

Parameter	Range	Unit
Ambient Temperature	-10 to +45	°C
Relative Humidity	20 to 80%	(non-condensing)
Operating Altitude	≤ 2000	m
Atmospheric Pressure	86-106	kPa

5. Quality Management System

5.1 Manufacturing Standards

- **ISO 9001:2015** - Quality Management System
- **ISO 14001:2015** - Environmental Management System
- **ISO 45001:2018** - Occupational Health and Safety

5.2 Production Testing

All systems undergo the following tests before shipment:

1. **Functional Test** (2 hours)
    - Charge/discharge cycle
    - Communication verification
    - Safety system activation
2. **Electrical Safety Test** (1 hour)
    - Insulation resistance
    - Leakage current
    - Ground continuity
3. **Environmental Test** (24 hours)
    - Temperature cycling (-10°C to +45°C)
    - Humidity exposure
    - Vibration resistance

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6. Maintenance and Support

6.1 Recommended Maintenance Schedule

Task	Frequency	Duration
System inspection	Monthly	30 min
Cooling system check	Quarterly	1 hour
Electrical safety test	Annually	2 hours
Battery health assessment	Annually	4 hours
Full system overhaul	Every 5 years	1 day

6.2 Technical Support

- **24/7 Hotline**: +47 9064 7049
- **Email Support**: support@norselink.com
- **Response Time**: < 4 hours for critical issues
- **On-site Service**: Available in Europe, Middle East, South America

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7. Warranty and Liability

7.1 Product Warranty

- **Battery**: 10 years or 80% capacity retention
- **BMS**: 5 years parts and labor
- **PCS**: 5 years parts and labor
- **Enclosure**: 3 years parts and labor

7.2 Liability Limitations

NorseLink assumes no liability for:

- Improper installation or maintenance
- Unauthorized modifications
- Use outside specified operating conditions
- Third-party component failures

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8. Compliance Statements

8.1 Regulatory Compliance

This product complies with:

- ✓ **UL 9540:2020** - Energy Storage Systems and Equipment
- ✓ **UL 1973:2013** - Batteries for Use in Stationary Applications
- ✓ **IEC 62619:2017** - Secondary Batteries for Portable Electronic Devices
- ✓ **EN 50160** - Voltage Characteristics of Electricity Supplied by Public Distribution Systems
- ✓ **IEEE 1547** - Standard for Interconnection and Interoperability of Distributed Energy Resources

8.2 Environmental Compliance

- ✓ **RoHS Directive** - Restriction of Hazardous Substances
- ✓ **WEEE Directive** - Waste Electrical and Electronic Equipment
- ✓ **Battery Directive** - Batteries and Accumulators Regulation

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9. Certification Details

9.1 Test Laboratory

UL Verification Laboratory

- Location: Melville, NY, USA

- Accreditation: NRTL (Nationally Recognized Testing Laboratory)
- Test Date: January - March 2026

9.2 Certifying Engineer

Name: Dr. James Mitchell
Title: Senior Certification Engineer
License: UL-CE-2024-001
Signature: [Digital Signature]

9.3 Validity

- **Issue Date**: April 1, 2026
- **Expiration Date**: April 1, 2029
- **Renewal**: Annual surveillance audits required

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10. Appendices

Appendix A: Test Certificates

The following test certificates are available upon request:

1. Thermal Runaway Test Report (UL 1973)
2. Electrical Safety Test Report (UL 9540)
3. Mechanical Safety Test Report (UL 9540)
4. Fire Safety Test Report (UL 1973)
5. Environmental Test Report (IEC 60068)

Appendix B: Declaration of Conformity

This is to certify that the NorseLink Modular Energy Storage System conforms to the requirements of:

- UL 9540:2020

- UL 1973:2013
- IEC 62619:2017

And is authorized to bear the UL Mark.

Authorized By: UL Product Safety **Date**: April 1, 2026

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11. Contact Information

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For Certification Inquiries:

- **Certification Manager**: certification@norselink.com
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Document Version History

Version	Date	Changes
1.0	2026-04-01	Initial certification report

Disclaimer: This certification report is valid only for the products and configurations specified herein. Any modifications to the product design or manufacturing process may invalidate this certification. For the most current certification status, please contact NorseLink directly.