Draft Storage/Stationary Batteries Standards List
Courtesy of UL

Standards	Scope Summary	General Purpose			Comments
		Safety	Performance	Other	
UL 1973 Batteries for Use in Light Electric Rail (LER) and Stationary Applications	Safety standard for stationary batteries for energy storage applications, Non chemistry specific and includes electrochemical capacitor systems or hybrid electrochemical capacitor and battery systems. Includes requirements for unique technologies such as flow batteries and sodium beta (i.e. sodium sulfur and sodium nickel chloride)	X			Includes construction requirements, tests and production tests. Also includes requirements for cells used in these systems such as lithium ion, nickel, lead acid and includes sodium beta and flow battery requirements
UL Subject 9540, Safety for Energy Storage Systems and Equipment	Under Development These requirements cover energy storage systems that are intended to store energy from power or other sources and provide electrical or other types of energy to loads or power conversion equipment. The energy storage systems may include equipment for charging, discharging, control, protection, communication, controlling the system environment, fuel or other fluid movement and containment, etc. The system may contain other ancillary equipment related to the functioning of the energy storage system. These are intended for use in utility-interactive applications in compliance with IEEE 1547 and IEEE 1547.1 or other applications intended to provide grid support functionality.	X			Under Development These systems may be standalone to provide energy for local loads, or in parallel with an electric power system, electric utility grid or applications that perform multiple operational modes.
EN 50272-2 Safety Requirements for Secondary batteries and battery installations: Part 2 stationary	1500 Vdc limit, protection against electricity, gas emission and electrolyte Limited to lead acid and nickel technologies	X			Applications for telecom, PV, UPS, emergency lighting, power station, stationary engine starting

batteries					
EN5510-2-3	This standard gives guidance on writing the technical specification for the procurement of stationary batteries and chargers for use in electricity generating stations (power stations).			X	This Guide does not determine the type of specification (e.g. detailed, performance, functional) or the extent of supply for any given contract which is normally decided on the basis of the purchaser's project strategy.
IEC 62485-2 Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries	Appears identical to IEC 50272-2 This part of the IEC 62485 applies to stationary secondary batteries and battery installations with a maximum voltage of DC 1 500 V (nominal) and describes the principal measures for protections against hazards generated from: – electricity, – gas emission, – electrolyte. This International Standard provides requirements on safety aspects associated with the erection, use, inspection, maintenance and disposal.	X			Appears to be same as IEC 50272-2
IEC 60896-11 Stationary lead-acid batteries Part 11: Vented types - General requirements and methods of tests	This part of IEC 60896 is applicable to lead-acid cells and batteries which are designed for service in fixed locations and which are permanently connected to the load and to the dc power supply. This part 11 of the standard is applicable to vented types only. The object of this standard is to specify general requirements and the main characteristics, together with corresponding test methods associated with all types and construction modes of lead-acid stationary batteries, excluding valve-regulated types.	X	X		
IEC 60896-21 Stationary lead-acid batteries Part 21: Valve regulated types – Methods of test	Applies to all stationary lead-acid cells and mono-bloc batteries of the valve regulated type for float charge applications, (i.e. permanently connected to a load and to a dc power supply), in a static location and incorporated	X	X		This part of IEC 60896 does not apply to lead-acid cells and mono-bloc batteries used for vehicle engine starting applications (IEC 60095 series), solar

	into stationary equipment or installed in battery rooms for use in telecom, uninterruptible power supply (UPS), utility switching, emergency power or similar Applications. The objective is to specify the methods of test for all types and construction of valve regulated stationary lead acid cells and mono-bloc batteries used in standby power applications.				photovoltaic energy systems (IEC 61427), or general purpose applications (IEC 61056 series).
IEC 60896-22 Stationary lead-acid batteries Part 22: Valve regulated types – Requirements	Applies to all stationary lead-acid cells and mono-bloc batteries of the valve regulated type for float charge applications, (i.e. permanently connected to a load and to a dc power supply), in a static location and incorporated into stationary equipment or installed in battery rooms for use in telecom, uninterruptible power supply (UPS), utility switching, emergency power or similar applications. The objective of this part of IEC 60896 is to assist the specifier in the understanding of the purpose of each test contained within IEC 60896-21 and provide guidance on a suitable requirement that will result in the battery meeting the needs of a particular industry application and operational condition.	X	X		This standard is used in conjunction with the common test methods described in IEC 60896-21 and is associated with all types and construction of valve regulated stationary lead-acid cells and mono-blocs used in standby power applications. This part of IEC 60896 does not apply to lead-acid cells and batteries used for vehicle engine starting applications (IEC 60095 series), solar photovoltaic applications (IEC 61427), or general purpose applications (IEC 61056 series).
IEC 61427-1 Secondary cells and batteries for photovoltaic energy systems (PVES) - General requirements and methods of test	This International Standard gives general information relating to the requirements of the secondary batteries used in photovoltaic energy systems (PVES) and to the typical methods of test used for the verification of battery performance. This International Standard does not include specific information relating to battery sizing, method of charge or PVES design. NOTE: This standard is applicable to lead-acid and nickel-cadmium cells and batteries. It is intended to amend this standard to include other electrochemical systems when		X		

	they become available.				
IEC 60622 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-cadmium prismatic rechargeable single cells	This International standard specifies marking, tests and requirements for sealed nickel cadmium prismatic secondary single cells.	X	X		
IEC 60623 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Vented nickel-cadmium prismatic rechargeable single cells	This International Standard specifies marking, designation, dimensions, tests and requirements for vented nickel-cadmium prismatic secondary single cells.	X	X		
IEC 62259 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Nickel-cadmium prismatic secondary single cells with partial gas recombination	This International Standard specifies marking, designation, dimensions, tests and requirements for vented nickel-cadmium prismatic secondary single cells where special provisions have been made in order to have partial or, under very specific conditions, full gas recombination.	X	X		
IEC CD 62619 Secondary cells and batteries containing alkaline or other non-acid electrolytes. - Safety requirements for secondary lithium cells and batteries, for use in industrial applications	Under Development Covers cells and batteries for stationary applications and motive (other than on-road vehicle)	X			Under Development moving toward CDV stage. Includes safety requirements for lithium ion cells for stationary and off road motive applications and some battery requirements (evaluation of battery and BMS combination) The standard is not a system standard as it

					only covers battery and BMS interaction.
IEC CDV 62620 Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for use in industrial applications	Under Development This International Standard specifies, marking, designation, dimensions, tests and requirements for large format lithium-ion secondary single cells and batteries used in Industrial Applications including Stationary applications."		X		Under Development Next stage is DIS stage. Generic performance requirements for lithium ion cells and batteries for stationary and off road motive applications. Tests based upon cell and battery specifications.
IEC 62896 Stationary Energy Storage Systems with Lithium Batteries – Safety Requirements	Under Development This part of the standard specifies general safety requirements for stationary energy storages with lithium batteries. The purpose of the requirements of this standard is to ensure that HAZARDS to the operator /user and the surrounding area are reduced to a tolerable level. Requirements for protection against particular types of HAZARDS: a) electric shock or burn b) mechanical hazards c) spread of fire from the equipment d) excessive temperature e) effects of fluids and fluid pressure f) liberated gases, explosion g) chemical hazard e.g. electrolyte	X			Under Development This is a new work proposal. It covers small battery systems for residential or similar use that can be connected to a mains source of supply
IEEE 1184 IEEE Guide for Batteries for Uninterruptible Power Supply Systems	This guide discusses various battery systems so that the user can make informed decisions on selection, installation design, installation, maintenance, and testing of stationary standby batteries used in uninterruptible power supply (UPS) systems.			X	This guide divides the available technologies into the following three main categories: - Vented lead-acid batteries (VLA) - Valve-regulated lead acid (VRLA) - Ni-Cd batteries

					(Ni-Cd)
IEEE 450 IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications	This document provides recommended maintenance, test schedules, and testing procedures that can be used to optimize the life and performance of permanently-installed, vented lead-acid storage batteries used for standby power applications. It also provides guidance to determine when batteries should be replaced. This recommended practice is applicable to full-float stationary applications where a battery charger normally maintains the battery fully charged and provides the dc loads. However, specific applications, such as emergency lighting units and semi-portable equipment, may have other appropriate practices that are beyond the scope of this recommended practice.		X	X	
IEEE 484 Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications	Recommended practice provides recommended design practices and procedures for storage, location, mounting, ventilation, instrumentation, preassembly, assembly, and charging of vented lead-acid batteries. Required safety practices are also included. This recommended practice is applicable to full float stationary applications where a battery charger normally maintains the battery fully charged and provides the direct current (dc) loads	X	X	X	
IEEE 1106 IEEE Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications	This recommended practice provides recommendations for installation design and for installation, maintenance, and testing procedures that can be used to optimize the life and performance of vented nickel cadmium batteries used in stationary standby applications. This recommended practice also provides guidance for determining when these batteries should be replaced.		X	X	
IEEE 1188 IEEE Recommended	This recommended practice is limited to maintenance, test schedules, and testing procedures that can be used to		X		The maintenance and testing programs described in this recommended practice

Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead- Acid (VRLA) Batteries for Stationary Applications	optimize the life and performance of valve-regulated lead-acid (VRLA) batteries for stationary applications. It also provides guidance to determine when batteries should be replaced.				represent “the best program” based on the information reviewed at the time this document was developed. Stationary cycling applications, such as those found in alternative energy applications, are also beyond the scope of this recommended practice.
IEEE 1361 IEEE Guide for Selection, Charging, Test, and Evaluation of Lead-Acid Batteries Used in Stand-Alone Photovoltaic (PV) Systems	This guide was written to provide a relevant photovoltaic (PV) battery test procedure that can be used to evaluate battery performance and identify appropriate PV battery charging requirements.		X		This guide contains a tutorial on lead-acid battery technology, battery charging characteristics, and a laboratory test procedure to evaluate charge parameters and battery performance
IEEE 1375 IEEE Guide for the Protection of Stationary Battery System**s**	This document provides guidance in the protection of stationary battery systems. For the purposes of this guide, stationary battery systems include the battery and dc components to and including the first protective device downstream of the battery terminals. The recommendations provided are not intended to set requirements; rather, they present options to the designer of the battery system concerning the types of protection available.	X		X	Although not a test guide, has some useful information on battery protection for stationary applications
IEEE 1660 IEEE Guide for Application and Management of Stationary Batteries Used in Cycling Service	This guide is meant to provide assistance to users of stationary battery systems in determining appropriate battery management strategies that may be applied by addressing the primary similarities and differences in battery design and operation for standby versus cycling applications.		X	X	General information on batteries for stationary applications
IEEE 1661 IEEE Guide for Test and Evaluation of Lead-Acid Batteries Used in Photovoltaic (PV)	This guide was written to provide a photovoltaic (PV) hybrid power system battery test procedure that can be used to assist in evaluating battery capacity, and appropriate PV battery charging requirements.		X		

Hybrid Power Systems					
IEEE 1679 Recommended Practice for the Characterization and Evaluation of Emerging Energy Storage Technologies in Stationary Applications	Covers recommended information for an objective evaluation of an emerging energy storage technology by a potential user for any stationary application. Energy storage technologies are those that provide a means for the reversible storage of electrical energy, i.e., the device receives electrical energy and is able to discharge electrical energy at a later time. The storage medium may be electrochemical (e.g., batteries), kinetic (e.g., flywheels), electrostatic (e.g., electric double-layer capacitors [EDLCs]), thermal, or some other medium. Devices recharged by non-electrical means, such as fuel cells, are beyond the scope of this document.	X	X		General guidance on performance and safety
IEEE P2030.2 Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure	Under Development Define technical characteristics of energy storage systems, and how discrete or hybrid systems may be compatible when integrated to the grid.	X	X	X	Under Development Provides guidance with regard to terminology, testing, operation and integration to the grid.
IEEE P2030.3 Standard for Test Procedures for Electric Energy Storage Equipment and Systems for Electric Power Systems Applications	Under Development This standard establishes test procedures for electric energy storage equipment and systems for electric power systems (EPS) applications.	X	X		Under Development
ATIS 06000330:2008 Valve Regulated Lead Acid Batteries Used in the Tele-communications Environment	Covers VRLA batteries, used as a reserve energy source that supports dc powered telecommunications load equipment. Defines the proper operational use, storage conditions and test criteria initial and lifetime for VRLA cells (modules). Intended to be used to establish initial physical and performance characteristics of	X	X		Addresses requirements for monobloc VRLA batteries (not system level requirements)

	VRLA cells or modules, performance expectations throughout their lifetime and operations conditions for appropriate use and guidance for designers of these cells or modules.				
Telcordia GR-3150-CORE Generic requirements for secondary non-aqueous lithium batteries	This Generic Requirements document (GR) presents the Telcordia and participating industry representatives view of proposed generic criteria for large format non-aqueous rechargeable lithium batteries (“batteries”) intended to • Replace or interoperate with conventional batteries (i.e., lead acid and nickel based) • Function seamlessly with DC power plants • Provide reliable backup power to load equipment located in a network environment of a typical telecommunications service provider. Lithium batteries compliant with the criteria in this document are recommended for deployment in the Outside Plant (OSP) at locations such as Controlled Environmental Vaults (CEVs), Electronic Equipment Enclosures (EEEs), huts, and in uncontrolled structures such as cabinets. This standard addresses lithium batteries comprised of non-aqueous liquid or polymerized electrolytes, which provide ionic conductivity between lithiated positive active material electrically separated from metallic lithium or lithiated negative active material. Furthermore, this document covers lithium batteries that are • Shipped disassembled. Full assembly requires the series or parallel connections of cells or modules and a connection to an external Battery Management System (BMS). • Shipped fully assembled	X	X		Requirements for telecom applications. Covers performance, safety and construction including formatting to serve as replacements for current lead acid technologies.

	as 48 V systems with an integrated electronic management system.				
Telcordia GR-4228-CORE VRLA battery string certification levels based on requirements for safety and performance	Provides a 3 -level system of VRLA String Safety and Performance Criteria based on Telcordia generic requirements documents. The VRLA string criteria levels are defined as follows: • Level 1 - Safety and Minimal Operability - the minimum acceptable level of compliance needed to preclude hazards and degradation of the network facility and hazards to personnel, and needed to ensure battery operability at the installation time in controlled environments. • Level 2 - Limited Operability - the minimum acceptable level of compliance needed to provide limited assurance of battery operability under controlled environment conditions. • Level 3 - Full Operability - the minimum acceptable level of compliance needed to ensure battery operability throughout its expected life under the range of acceptable environmental conditions.	X	X		Telecom battery requirements. Includes safety, performance, construction criteria and quality
Telcordia GR-3020-CORE Nickel cadmium batteries in the outside plant					
PNNL 22010 Protocol for Uniformly Measuring and Expressing the Performance of Energy Storage Systems	The protocol defines a set of test, measurement and evaluation criteria with which to express the performance of and applies to energy storage systems (ESS) that are intended for energy intensive stationary applications and/or power intensive stationary applications. The energy storage system includes the storage		X		This has been re-opened for further development and test methods are under study by the utility for further modification if necessary.

	device and any power conversion systems installed with the storage device and may include battery management systems. The protocol is agnostic with respect to the storage technology and the size and rating of the energy storage system. The protocol does not apply to single use storage devices and storage devices that are not coupled with power conversion systems, nor does it address safety, security or operations and maintenance of ESSs, nor does it provide any pass/fail criteria				