THE DEVELOPMENT AND APPLICATION OF UL STANDARD REQUIREMENTS FOR FUEL CELLS

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UL's Background

- With over 104 years of Product Safety Testing and over 80 years of Safety Standards writing experience, UL continues to develop new Standards with public safety and the environment foremost in mind.

UL's Unique Perspective in Standards Development

- Standards Writers - UL has over 100 Standard Staff Members Devoted to New Development and Maintenance of Existing Standards.
- Conformity Assessment - UL's Engineering Staff is Dedicated to Product Testing, requirement development, and formulation of hazard-based assessments.
- Follow-Up Services - UL provides inspection services of the manufacturer's products to verify that future production continues to meet established requirements.

Benefits of UL Standards

- In preparing their Standards, UL has developed a writing style and format that allows others to follow and understand the construction and testing requirements.
- Manufacturers can use established UL Standards to help design their products.
- Prior to their submittal to UL, Manufacturers can use UL Standards to perform their own construction review and tests in order to determine if their products may meet the requirements.
- UL Standards are closely maintained to reflect the latest technological and regulatory changes.

Applicable UL Standards for Fuel Cells

Applicable Gas-Fired Equipment Standards

Commercial-Industrial Gas Heating Equipment, UL 795

- These requirements apply to factory-built gas appliances having inputs of 400,000 to 12,500,000 Btu/hr that are intended primarily for commercial and industrial use.
- The typical appliances covered by UL795 are gas burners, furnaces, unit heaters and boiler assemblies.
- The gas-heating equipment covered by these requirements may be operated without a competent attendant being constantly on duty at the burners while the burners are in operation.

Applicable UL Standards for Fuel Cells (continued)

Applicable Electric Generator Equipment Standards

Stationary Engine Generator Assemblies, UL 2200

- These requirements cover stationary engine generator assemblies rated 600 volts or less that are intended for installation and use in ordinary locations in accordance with the National Electrical Code NFPA-70; the Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA-37, the Standard for Health Care Facilities, NFPA-99, and the Standard for Emergency and Standby Power Systems, NFPA-110.
- These requirements do not cover generators for use in hazardous (Classified) locations. That equipment is covered by the Standard for Electric Motors and Generators for Hazardous (Classified) Locations, UL 674.
- These requirements do not cover UPS equipment. That equipment is covered by the Standard for Uninterruptible Power Supply Equipment, UL 1778.
- These requirements do not cover generators for marine use. That equipment is covered by the Standard for Marine Electric Motors and Generators, UL 1112.

Applicable UL Standards for Fuel Cells (continued)

Applicable Electric Generator Equipment Standards

Engine-Generator Assemblies for Use in Recreational Vehicles, UL 1248

- These requirements cover engine driven generator assemblies intended for installation in recreational vehicles rated: 15 kilowatts or less, 115 volts, 2-wire single phase; 240 volts, 2-wire single phase; 115/230 volts, 3-wire single phase; 3 or 4 wire, any voltage, three phase. These generators may incorporate alternator or direct current generator sections for supplying energy to battery charging circuits.
- These requirements cover both open and totally-enclosed recreational vehicle generators. An open generator has ventilating openings that permit the passage of external cooling air over and around the windings. A totally-enclosed generator is enclosed to prevent the free exchange of air between the inside and the outside of the winding enclosure but not sufficiently enclosed as to be airtight.
- These requirements cover recreational vehicle generator parts and combinations of such parts.
- These requirements do not cover generators for use in hazardous (Classified) locations.

Applicable UL Standards for Fuel Cells (continued)

Applicable Electric Generator Equipment Standards

Marine Electric Motors and Generators (Cranking, Outdrive Tilt, Trim Tab, 1988 A Generators, Alternators), UL 1112

- These requirements cover Marine Duty engine-cranking motors, outdrive-tilt motors, power trim-tab motors, generators, and alternators rated less than 50 volts direct current.
- The products covered by these requirements are intended for installation and use in accordance with the applicable requirements of the Standard for Fire Protection of Pleasure and Commercial Motor Craft, NFPA 302, or the United States Coast Guard.
- These requirements also cover Marine Duty components for use with the end product, such as cranking motor solenoids, generator or alternator voltage regulators, and wiring harnesses.

Applicable UL Standards for Fuel Cells (continued)

Applicable Electric Generator Equipment Standards

Proposed First Edition of the Standard for Static Inverters and Charge Controllers, UL Subject 1741

- These requirements cover inverters that convert dc power from photovoltaic systems to ac power; ac modules that supply ac power directly from photovoltaic arrays; and charge controllers that receive power from photovoltaic arrays and control the charging process of storage batteries. Also covered are inverters with charge controllers that convert ac power from a generator or an electric utility to dc power for charging batteries.
- These inverters, ac modules, and charge controllers are rated up to 600 volts and are intended to be installed in accordance with the National Electrical Code, NFPA 70.
- These inverters may include stand-alone units and utility interactive inverters for use in parallel with an electric utility to supply common loads. The ac modules are intended to be installed on a dedicated branch circuit in parallel for use with an electric utility to supply utility-interactive common loads. The charge controller may be incorporated with the inverter or provided as a separate unit.

Applicable UL Standards for Fuel Cells (continued)

Applicable Electric Generator Equipment Standards

Electric Motors and Generators for Use in Division 1 Hazardous 1994 A (Classified) Locations, UL 674

- These requirements cover electric motors and generators for installation and use in Class I - Division 1 - Groups C and D, and Class II - Division 1 - Groups E, F, and G hazardous (classified) locations. These requirements also cover explosion-proof electrical equipment for installation and use in Class I - Zone 1- Groups IIA and IIB hazardous (classified) locations. Installation is to be made in accordance with the National Electrical Code, NFPA 70.
- These hazardous (classified) location electric motors and generators have fractional or integral horsepower ratings and are for use on alternating current (ac) or direct current (dc).
- These hazardous (classified) location electric motors and generators are for use only under the following atmospheric conditions: a) A minimum ambient temperature of –70ºC (-94ºF), b) An oxygen concentration not greater than 21% by volume, and c) A nominal barometric pressure of one atmosphere.

Applicable Non-UL Standards for Fuel Cells

Applicable Gas-Fired Equipment Standards

Fuel Cell Power Plants, ANSI Z21.83-1998

- These requirements apply to packaged, self-contained or factory matched packages of integrated systems of fuel cell power plants, intended for operation on Natural or Propane gas.
- These requirements apply to fuel cell power plants for operation at an ambient temperature not less than -20ºF (-29ºC), with a nominal output voltage not exceeding 600 Vac, and with a power output not exceeding 1 MW (3,412,080 Btu/hr).

Gas-Fired Equipment Standards That Could Be Used As A Guide For Residential Gas-Fired Fuel Cells

Gas-Fired Low-Pressure Steam And Hot Water Boilers, ANSI Z21.13

- These requirements apply to gas-fired low-pressure steam and hot water boilers having input ratings up to 12,500,000 Btu/hr.

Domestic Gas Conversion Burners, ANSI Z21.17

- These requirements apply to domestic gas conversion burners having input ratings up to 400,000 Btu/hr.

UL Investigation Options for Fuel Cells

- As of this time, no published UL Standard presently exists specifically for Fuel Cells.
- However, UL can still investigate Fuel Cells for Listing Service, using the requirements of other applicable and related, currently published UL Standards.
- UL can also investigate Fuel Cells for Classification Service, using the requirements of other applicable, currently published non-UL Standards (i.e. ANSI, CGA, CSA, etc).
- UL can provide Preliminary Investigation service on products prior to full investigations for Listing or Classification.

UL's Standards Development Process for a Fuel Cell Standard

Review of existing and foreseen technology

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Requirements of other applicable and related, currently published UL Standards

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Requirements of other applicable and related, currently published non-UL Standards (i.e. ANSI, CGA, CSA, NFPA, ASME, etc.)

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Public Review and Comments

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UL Outline of Investigation for Fuel Cells

UL's Standards Development Process for a Fuel Cell Standard

UL Outline of Investigation for Fuel Cells

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Re-Review of existing and foreseen technology

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Requirements of other applicable and related, currently published UL Standards

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Requirements of other applicable and related, currently published non-UL Standards (i.e. ANSI, CGA, CSA, NFPA, ASME, etc.)

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Additional Public Review and Comments

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UL Standard of Investigation for Fuel Cells

Review and Public Comment Process in UL's Development of a Fuel Cell Standard

- Balance of Interests
- Users
- Manufacturers
- Government Agencies
- Other Interests
- ANSI Recognition
- Open Industry Meetings

Summary

- UL Standards are written to help manufacturers design and self-evaluate their products to the latest technological and regulatory requirements.
- While no UL Standard currently exists for Fuel Cells, other currently published Standards can be used together to evaluate a Fuel Cell for Listing Service.
- Before publishing a Standard, UL would prepare an Outline of Investigation for Fuel Cells. The Outline of Investigation would be based on existing and foreseen technology, currently published UL and non-UL requirements, and public review and commentary.
- UL's Outline of Investigation would serve as a foundation for the preparation and subsequent publication of a UL Standard for Fuel Cells.

Thank You !

For more information, contact:

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