

A quarterly newsletter published by the U.S. Department of Energy for the U.S. fuel cell industry to foster development and adoption of codes and standards

Challenges in Siting Residential Fuel Cells Affecting Commercialization

While fuel cells are expected to be commercially available for residential use in a few years, several factors are inhibiting widespread acceptance of this new technology. Challenges in siting, operating, and maintaining residential fuel cell systems are beginning to emerge.

This project will not only increase our knowledge of fuel cells but will also provide valuable information regarding their installation into homes. We look forward to discussing this project with interested manufacturers of operational systems so we can begin the evaluation," said Bres.

The NAHB Research Center prepared a report for PATH, dated July 16, 2001, entitled, "Technical Factors Affecting Commercialization of Fuel Cells," that discusses the building codes and standards



NAHB/PATH Seek Builders and Fuel Cell Manufacturers to Install and Evaluate Residential Fuel Cells

The NAHB Research Center, the research and development leader in the home building industry, and PATH (Partnership for Advancing Technology in Housing), a new private/public effort to develop, demonstrate, and gain widespread market acceptance for the "Next Generation" of American housing, are working to resolve these challenges.

For market success, building codes need to address the interactions between the home indoor environment, gas and electricity use in the home, and the assumed utility responsibility for reliable, safe, maintenance-free electrical supply. According to Joe Wiehagen at NAHB, "To understand these interactions, the NAHB Research Center, through the national PATH program, is developing a project to work with interested builders and an as yet undetermined fuel cell manufacturer to detail building code, regulatory, and practical electrical consumption issues identified in the process of siting and using a fuel cell system in the home."

Dana Bres of PATH is also looking forward to working with a fuel cell manufacturer to contribute to the market success of residential fuel cells. "We are planning to install and evaluate a residential fuel cell.

primarily related to siting a fuel cell within a home, and the options for interconnecting a fuel cell with the home power system. According to this report, codes and standards must address several issues before residential fuel cells will experience full market acceptance, including:

- operating temperature of components
- location of stored combustible fuel
- use of ancillary energy sources such as batteries
- process air and/or ventilation
- removal of byproducts (water and heat)
- electrical connection with the home and the utility grid
- fuel gas supply piping and ventilation.

For additional information on siting fuel cells in residential buildings, contact Joe Wiehagen at jwiehagen@nahbrc.org or Dana Bres at dana_b._bres@hud.gov. To download the PATH/NAHB report, visit www.nahbrc.com.

For additional information, contact:

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State Incentives Promoting Fuel Cells

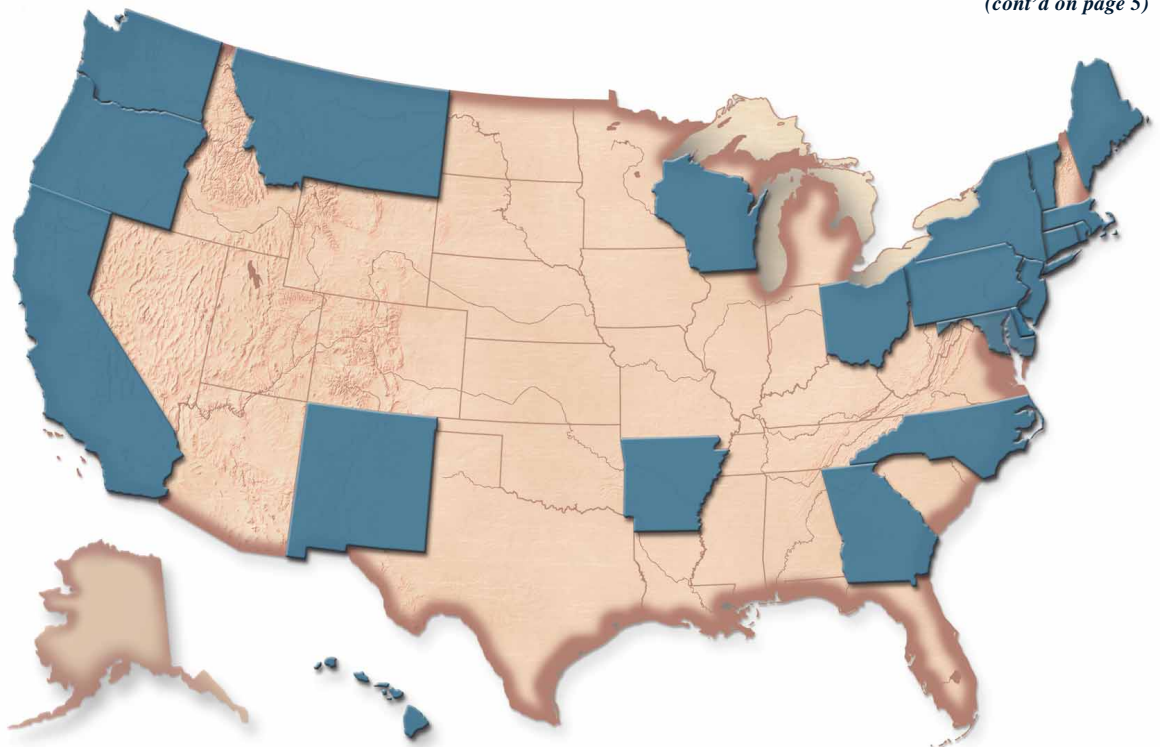
A multifaceted approach is needed to successfully move fuel cells into the marketplace. Manufacturers are working to produce efficient fuel cell products. Industry, code organizations, government agencies, and others are collaborating to develop codes and standards that facilitate the technology's movement into the marketplace. States, local jurisdictions, and utilities are providing incentives to promote the use of alternative energy systems, including fuel cells.

The Database of State Incentives for Renewable Energy (DSIRE) project tracks information on state, local, and utility incentives that promote the use of renewable energy technologies. The database includes financial incentives; investment and awareness programs; and rules, regulations, and policies related to the use of renewable energy technologies.

According to DSIRE, several states and utilities have recently implemented new incentives:

- The **California** Energy Commission (CEC) offers a rebate for the purchase of renewable energy generating systems, including fuel cells using renewable fuels, of \$4.50/watt or 50% off the purchase price to grid-connected utility customers within certain electric service areas. The CEC also provides grants to California residents to help offset the cost of purchasing and installing new distributed generation systems.
- The **Maryland** Clean Energy Incentives Act includes a sales tax exemption for fuel cells that generate electricity and heat using an electrochemical process, have an electricity-only generation efficiency greater than 35%, and have a generating capacity of at least 2 kW.
- The **Montana** Code allows a 35% tax credit for individuals, corporations, partnerships, or small business corporations that invest \$5,000 or more in a commercial system or a net metering system that generates energy through an alternative renewable energy source, such as fuel cells that do not require hydrocarbon fuel.
- In March 2001, the **New Jersey** Board of Public Utilities approved funding for renewable energy programs, including a customer-sited renewables rebate program administered by the state's utilities.
- **New York State** passed an innovative Green Building Tax Credit for business and personal income taxpayers. It offers fuel cell tax credits (distributed over a five-year period) to large commercial or multifamily residential "green" building owners and tenant spaces within green buildings for systems fueled by a "qualifying alternate energy source." The fuel cell credit is for 30% of the capitalized cost of each fuel cell (6% x 5 years) with a cap of \$1,000/kW x DC-rated capacity.
- In addition to the 35% corporate tax credit for renewable energy installations, **North Carolina**

(cont'd on page 5)



Highlighted States Offer Incentives for Fuel Cells

Standards Committee Activity Updates

▶ **ISO TC 197, Hydrogen Technologies.** TC 197 is holding a series of work group meetings in conjunction with its annual plenary to be held October 25-26 in Paris, France.

- WG 5 Gaseous hydrogen blends and hydrogen fuel - Service stations and filling connectors, Oct 22
- WG 1 Liquid hydrogen - Land vehicle fuel tanks, Oct 23
- WG 7 Basic considerations for the safety of hydrogen systems, Oct 23
- WG 6 Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks (Joint meeting of ISO/TC 58/SC 3 and ISO/TC 197 WG 6), Oct 24

The National Hydrogen Association held a Hydrogen Safety, Codes and Standards Workshop on September 27-28 in Washington, DC. Proceedings will be available in late November. A summary will be posted on the NHA website at www.HydrogenUS.com. Contact: Karen Miller (NHA), (202) 223-5547, email: kmiller@ttcorp.com.

▶ **ANSI Z21.83 - 1998/CSA, Fuel Cell Power Systems.** The first meeting of the new CSA Fuel Cell Technical Committee is scheduled for December 3-11 at Disney World in conjunction with some IEC TC 105 Working Group meetings. The two main priorities are agreement on proposals to CSA Fuel Cell Canvass Group to update and republish ANSI Z21.83 as ANSI/CSA FC1 and to establish a new working group to develop the draft on portable fuel cell power generators into ANSI/CSA FC3. Contact: Steve Kazubski (CSA America), (216) 524-4990 Ext. 8303, email: steve.kazubski@csa-america.org or steve.kazubski@csa-international.org.

▶ **IEC TC 105, Fuel Cell Technologies.** At the September IEC TC 105 meeting in London, UK, formal agreement between IEC TC 105 and ISO TC 197 was announced. The next meeting of IEC TC 105 will be in Montreal, Quebec, in June 2002. Working Groups 2 (FC Modules), 3 (Stationary FC-Safety), and 4 (FC Performance) will meet at Disney World on December 5-11 in conjunction with the CSA Fuel Cell Technical Committee. Contact: Steve Kazubski (CSA America), (216) 524-4990 Ext. 8303, email: steve.kazubski@csa-america.org or steve.kazubski@csa-international.org.

▶ **ASME PTC 50, Performance Test Code on Fuel Cell Power Systems.** A draft of the proposed ASME Performance Test Code 50 on Fuel Cell Power Systems Performance has been submitted for industry review. It is a consensus document developed over a 5-year period by a committee of industry experts representing manufacturers, users, and the general-interest community. The code will provide test procedures, methods, and definitions for the performance characterization of all fuel cell power systems regardless of output, type, or system application. The committee will address review comments (due by December 14, 2001) and will make changes accordingly. To obtain an electronic copy of the proposed test code, contact the Secretary of PTC 50, Jack Karian (ASME), (212) 591-8552, email: karianj@asme.org.

▶ **NFPA 853, Installing Fuel Cells.** NFPA 853 is complete. It does not address residential fuel cells, but they could be added to the next edition (Annual 2002) if proposals are submitted by December 28, 2001. The committee would meet in the spring of 2002 to take action on those proposals. The next revision of the Uniform Mechanical Code will reference NFPA 853. Contact: Don Drewry (Hartford Steam Boiler), email: Don_Drewry@hsb.com or Richard Bielen (NFPA), (617) 770-3000, email: rbielen@nfpa.org.

▶ **NFPA 70 - Article 692, Fuel Cell Plant.** The Standards Council issued the 2002 National Electrical Code (NEC), which is now available. Contact: Jean O'Connor, (617) 984-7421, fax (617) 984-7070, email: joconnor@nfpa.org.

▶ **National Evaluation Service (NES).** The Protocol for Evaluation of Stationary Fuel Cell Power Plants is available. NES has shared the protocol with other countries in hope of fostering some "global evaluation and acceptance of stationary fuel cell power plants." A copy of the protocol is available at www.nateval.org (copy and distribute as appropriate). Contact: Darren Myers (BOCA), (708) 799-2300, email: dmyers@bocai.org.

▶ **IEEE P1547, Distributed Resources and Electric Power Systems Interconnection.** The results of balloting on draft 8 of IEEE SCC21 P1547 should be known by the mid-October P1547 meeting in Las Vegas. Once published, UL plans to adopt the requirements in UL1741. Prospective new IEEE SCC21 projects include Standard for Interconnection System Testing for Distributed Resources with the Electric Power System, Guideline for Distributed Resources Applications with the Electric Power System, Guideline for Monitoring/Communication/Control of Distributed Resources, Guideline for Certification of Distributed Resources and Interconnection Equipment, Guideline for Network Specifications and Applications with Distributed Resources, and Recommended Practice for Distributed Generators and Equipment - Specifications and Performance. For further information, visit <http://grouper.ieee.org/grups/scc21/1547/archives/>. Contact: Richard DeBlasio (NREL), (303) 384-6452, email: delasid@tcplink.nrel.gov or Tom Basso (NREL), (303) 384-6765, email: thomas_basso@nrel.gov.

▶ **UL1741, Standard for Inverters, Converters and Controllers for Use in Independent Power Systems.** UL1741 is being harmonized with IEEE P1547. The UL1741 STP meeting is set for November 7-9. It was anticipated that P1547 would be published by the beginning of next year in accordance with the IEEE P1547 schedule. UL1741 is already published and UL plans to adopt the P1547 requirements in UL1741 once P1547 is published. The results of balloting on draft 8 of P1547 should be made known at the mid-October IEEE P1547 meeting in Las Vegas.

UL will soon have new product guide cards on their website that provide detailed information on QIKH inverters and converters covered under UL1741. These guide cards should address many AHJ, utility, and general-interest questions regarding the application and ratings of these products. Contact: Tim Zgonena, (847) 272-8800 Ext. 43051, fax (847) 509-6298, email: timothy.p.zgonena@us.ul.com.


2001**OCT****Calendar of Events**

- 16-17 **CHP Roadmap Meeting**, Baltimore, MD. Contact: John Jimison at johnj@bcjlaw.com
- 16-18 **IEEE Distributed Resources and Electric Power Systems Interconnection Working Group (P1547) Meeting**, Las Vegas, NV. See <http://grouper.ieee.org/groups/scc21/1547/>
- 18-19 **2ND Annual Fuel Cell 2001: Research & Development**, Westin Innisbrook Hotel, Palm Harbor (Tampa), FL. Contact: Strategic Research Institute at (888) 666-8514 or (646) 336-7030, (646) 336-5891 (fax), info@srinstitute.com. See www.srinstitute.com
- 20-23 **National Association of Convenience Stores - Convention & Exposition**, Las Vegas Convention Center, Las Vegas, NV. Contact: (703) 684-3600
- 20-24 **18TH International Electric Vehicle Symposium**, Berlin, Germany. Contact: EVS 18 - Symposium Office at +49 30 314-24098 or -24087 (fax), evs18registration@wtb.tu-berlin.de
- 22-23 **Fuel Cells for Portable Devices: Latest Advancements in Research, Technology Development and Commercialization of Mobile Power Sources**, San Francisco, CA. Contact: International Quality and Productivity Center at (973) 256-0211, (973) 256-0205 (fax), info@iqpc.com. See www.iqpc.com or www.f-cellsnetwork.com/NA-1660-01
- 24-26 **World Energy Engineering Congress 2001**, Georgia World Congress Center, Atlanta, GA. Contact: The Association of Energy Engineers at (920) 338-0950, (770) 381-9865 (fax), debbie@aeecenter.org. See www.aeecenter.org
- 24-26 **Electric Power Generation Association 2nd Annual Conference**, Hershey Lodge and Convention Center, Hershey, PA. Contact: Ann Kulp at (717) 909-3742, ann@epga.org. See www.epga.org/confepga.html
- 29-30 **DOE Hydrogen Technical Advisory Panel, Fall Meeting of Department of Energy's HTAP**, Desert Research Institute, Reno, NV. Contact: Cathy Gregoire Padro at (303) 275-2919, (303) 275-2905 or (303) 275-3885 (fax), cathy_padro@nrel.gov
- 29-30 **ACEEE National Conference on Energy Efficiency and Reliability: Lessons Learned in 2001**, Radisson Hotel Berkeley Marina, Berkeley, CA. Contact: Rebecca Lunetta at (302) 292-3966, rlunetta@erols.com. See www.aceee.org
- 30-2 **F-Cells Week**, London, United Kingdom. Contact: IQPC Ltd at +44.20.7368.9350, +44.20.7368.9301 (fax), f-cellsweek@iqpc.co.uk. See www.iqpc.co.uk

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- 1-2 **The Cader Conference: Distributed Generation - Opportunities and Obstacles**, Catamaran Resort Hotel, San Diego, CA. Contact: Jairam Gopal at (916) 654-4880, jgopal@energy.state.ca.us. See www.cader.org
- 6-9 **Distributed Generation Conference (includes 8th Annual Conference)**, National Association of Energy Service Companies, Coral Gables, FL. Contact: Mary Lee Berger-Hughes at (202) 822-0954, (202) 822-0955 (fax), mlb@dwgp.com
- 7 **CES Fuel Cell Summit/Symposium**, Radisson Cleveland Southwest, Cleveland, OH. Contact: Cleveland Engineering Society at (216) 361-3100, (216) 361-1660 (fax), info@cesnet.org
- 11-14 **113th National Association of Regulatory Utility Commissioners Annual Convention**, Marriott Hotel, Philadelphia, PA. See www.naruc.org
- 12-14 **Distributed Energy Fall Outlook 2001**, Monterey Plaza Hotel, Monterey, CA. Contact: Primen at (877) 976-4681, (608) 829-2437 (fax), www.primen.com/deoutlook2001/
- 12-14 **Fuel Cells for Stationary, Automotive and Portable Applications**, Broward County Convention Center, Fort Lauderdale, FL. Contact: Florida Educational Seminars at (561) 367-0193, (561) 367-8429 (fax), Ansum@aol.com. See www.powersources.net
- 27-28 **EyeforFuelCells Europe 2001: The Business of Fuel Cells for Stationary Applications**, Le Plaza Hotel, Brussels, Belgium. Contact: +44 (0) 20 7375 7183, +44 (0) 20 7375 7576 (fax), helpdesk@eyeforfuelcells.com. See www.eyeforfuelcells.com
- 28-30 **First Distributed Energy Resources Conference and Peer Review - The Power to Choose: Creating an Expanded DER Industry**, Loews L'enfant Plaza Hotel, Washington, DC. Contact: Energetics Conference Services (410) 953-6277, cs@energetics.com

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- 3-4 **4TH Business Case for Fuel Cells: Latest Technologies, Applications, Markets, and Investment Opportunities**, Omni Colonnade, Miami, FL. Contact: The Center for Business Intelligence at (800) 817-8601. See www.cbnet.com
- 11-14 **The EVAA Electric Transportation Industry Conference 2001**, Sacramento, CA. Contact: Pam Turner at (408) 741-5870, (408) 741-5872 (fax), fristopt@aol.com. See www.evaa.org

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- 14-15 **Material Technologies for Fuel Cells and Power Electronics**, Hilton Hotel, Cocoa Beach, FL. See <http://www.ceramics.org/meetings/ECD2002/expo.asp>
- 28-1 **Distributed Power Program Annual Review Meeting**, Arlington, VA. Contact: Kimberly Taylor at kimberly_taylor@nrel.gov

State Incentives Promoting Fuel Cells (cont'd from page 2)

offers a corporate income tax credit to manufacturers of renewable energy products and equipment. The credit is equal to 25% of the installation and equipment cost of construction with no maximum limit to the credit except that it cannot exceed a taxpayer's tax liability in one year.

- **Oregon** offers a Residential Energy Tax Credit for fuel cells up to \$1,000.
- In **Vermont**, all equipment purchased to construct and install a net metered small-scale renewable energy system, including a fuel cell, is exempt from the state's 5% sales tax starting on July 1, 1999.
- Effective July 1, 2001, **Washington** legislation expands the sales and use tax exemption for solar, wind, and landfill gas electric facilities to include fuel cells.

Other states offering incentives to promote the use of residential fuel cells are

- Arkansas
- Massachusetts
- Wisconsin
- New Mexico
- Connecticut
- Georgia
- Ohio
- District of Columbia
- Maine
- Hawaii
- Pennsylvania
- Rhode Island

For more information on current renewable energy incentives, visit the DSIRE website at <http://www.ies.ncsu.edu/dsire/>.

Draft CSA Standard for Portable Fuel Cells Under Review

CSA, a leading provider of product testing and certification services, issued a preliminary draft of a new certification standard for portable fuel cells in late August 2001. The standard is designed to be inclusive rather than exclusive, and offers adaptability as new technologies emerge.

Specifically, the draft standard covers "nonhard-piped, nonhard-wired" units without limitation to size, input, fuel type, or output (ac or dc voltage). It is intended, however, to primarily cover power generation applications where output power is the function of the device, rather than the typically small units being designed expressly to power handheld and other devices (e.g., laptop computers, wrist-watches). The standard also covers only to the point of fuel hookup and does not extend to the fuel storage canister or tank (similar to the way gas barbecue grills are treated).

Because no other standard covers the scope of the draft standard, it will serve as 1) a U.S. requirement,

New Hydrogen Safety Training Now Available

The Center for Hydrogen Safety™ (CHS), launched last April by Diversified Commercial Hydrogen (DCH) Technology, Inc., has introduced a new modular hydrogen safety classroom curriculum based on the NASA Safety Standard for Hydrogen and Hydrogen Systems (NSS 1740.16) developed for the U.S. space program. The course targets those involved in the production and/or use of hydrogen as a process gas, as well as industry involved with the future use of hydrogen-producing electric energy through fuel cells.

The curriculum includes 17 training modules covering topics from hydrogen safety-related properties, including combustion hazards and control, to safe hydrogen systems design, hydrogen facility design and safety concerns, codes and standards, and risk management strategies. The CHS works with clients to select topics from the course syllabus pertinent to their needs and applications. The entire course runs two days.

For more information on the CHS hydrogen safety training curriculum, contact Douglas Rode at (860) 665-7534 or at rode@rode-llc.com. For a complete description of the curriculum, visit www.dcht.com.

The CHS is an engineering services firm that provides engineered risk management solutions, hydrogen safety training, reliability risk-based assessments, project risk assurance, emergency planning for business continuation, and operations and maintenance improvement services.



2) a seed document for a possible national (United States and perhaps Canadian) standard, and 3) an International Electrotechnical Commission document.

CSA distributed copies of the draft to manufacturers, code officials, code bodies, and testing laboratories, and requested public comment through September 24, 2001. It received around 30 comments that included several favorable comments and no major issues. If successful in resolving comments, CSA hopes to publish a desktop standard before the end of December that may be used to evaluate manufacturers' designs for certification.

In 1997, the former Canadian Standards Association (CSA) and the American Gas Association Laboratories merged to form CSA International. CSA International certifies most gas utilizing equipment and is the second largest certifier of electrical equipment in North America.

For more information, contact Todd Strothers, CSA International, at (704) 552-5125 or todd.strothers@csa-international.org.



Manufacturers Can Expedite Product Safety Certifications

Courtesy of Tim Zgonena, Underwriters' Laboratories

Obtaining certification that a distributed generation (DG) product meets public safety requirements can be a protracted endeavor. Manufacturers can speed up the certification process by providing the precise information and components required by the product safety and certification organization during the evaluation process.

Before the Authority Having Jurisdiction can approve the installation of DG equipment, assurances that public safety is protected must exist. In the United States, many municipalities have laws, codes, or regulations that require products be evaluated and tested by a third party. Equipment, devices, and materials must have been evaluated, listed, and labeled by a Nationally Recognized Testing Laboratory such as Underwriters' Laboratories (UL), Canadian Standards Association, Intertek Testing Services, and the National Electrical Manufacturers Association. The third-party label, specifically the UL Mark, on a product is the manufacturer's representation that UL has tested samples of the complete product to nationally recognized Safety Standards and found it to be free from reasonably foreseeable risk of fire, electrical shock, and related hazards, and that the product was manufactured under UL's Follow-Up Services program.



Manufacturers can minimize the time and simplify the certification process by dividing it into two parts: 1) the preliminary investigation and 2) the evaluation and testing sequence.

Preliminary Investigation - During the preliminary investigation, representatives from UL examine a product sample at the manufacturer's facility to determine if its construction complies with current requirements. UL then provides a written report indicating any portions of the product construction that may not comply and any requests for additional information.

Construction Evaluation and Testing - After making necessary changes to the product and assembling additional information, the manufacturer submits the product to UL for construction evaluation and testing. UL examines and tests the product to confirm it has met construction requirements. If it complies, the manufacturer is authorized to apply the UL Mark to the product.

Supplying UL with certain product information and components at the beginning of the evaluation will expedite the certification process:

- **Product Ratings and Markings** - a complete set of product ratings, markings, and special features with a detailed function description and theory of

operation, as well as environmental ratings and mounting means.

- **Product Information** - a copy of any advertising literature; a complete set of product installation, operating, and maintenance instructions that will be provided with the product; and a copy of all drawings of product markings.
- **Product Samples** - adequate product samples to complete all testing, and preferably enough samples to run multiple tests concurrently. The actual required number of samples depends on test sequence; ratings; and product robustness, features, and design.
- **Peripherals** - special product communication cables, devices, controllers, monitors, and software necessary to communicate or control the unit, as well as any special external components, isolation transformers or external surge protection devices, and special or proprietary wiring system components required to properly connect and operate the unit.
- **Description of Insulation Systems** - a complete description of the insulation, windings, and materials for each transformer, coil, and motor, including the insulation class or system used in the component.
- **Component Description** - a complete description of all product components in list or tabulation format (NOT engineering drawings) that includes all enclosure materials and their thickness and physical dimensions.
- **Plastics** - a list of any thermoplastic or thermosetting materials used in the product by the material manufacturer's name and generic name of the material and compound design.
- **Wiring Schematic** - a copy of the wiring schematic with AWG sizes, insulation thickness, and temperature rating of wires; a printed wiring board foil drawing that identifies the conductors located on one side of the primary circuit, the other side of the primary circuit, frame ground, low-voltage secondary circuits, and high-voltage secondary circuits.
- **Fault Analysis** - a fault analysis of input/output circuits and the main product circuits that indicates what happens in the primary and secondary circuits when the primary circuit components are individually shorted or opened under either maximum or minimum load during or after start up.
- **Manufacturer Test Data** - any product test data, accompanied by schematic diagrams of the test circuits and a description of the instruments used.

For specific information on submitting your DG product for approval, call Tim Zgonena at (847) 272-8800 Ext. 43051. For additional information, visit the UL website at www.ul.com.