Volume III, Issue 3, May/June 2003

DG MONITOR℠

Education Sector Adopts Fuel Cells Early

Over the course of the fuel cell's research and development cycle, the education sector has played an important role in shaping and defining the fuel cell market. This sector has played a number of important roles, including early adopter of the technology, test marketer, and researcher.

There are a number of fuel cells installed in universities and colleges in the U.S. and abroad. Most recently, in May, DTE Energy Technologies announced it would be installing Plug Power fuel cell systems as at three campuses in Michigan. The month before, FuelCell Energy signed agreements with Yale University and with Grand Valley State University to install and service fuel cell power plants. As with the DTE Energy installations, these systems will provide both heat and power.

Other educational installations exist. FuelCell Energy has plans for installations at Ocean County College in Toms River, NJ, at a University of Connecticut campus, and at the New York College of Environmental Science and Forestry. A Plug Power fuel cell was placed at Hofstra University, and UTC Fuel Cells has installations operating or in the works at the University of Connecticut's School of Engineering, Alcorn State *(continued on page 5)*

Leading States Pre-Certify DG

A challenge for DG manufacturers, installers, and users is the relatively high per kW installation cost of DG equipment. Costs increase when an installation is uniquely sited, engineered, tested and licensed. Conversely, costs may be mitigated if standard equipment is pre-certified so that it requires little or no additional field testing prior to being licensed for operation.

The National Renewable Energy Laboratory continues to assist both development of the national interconnection standard (IEEE 1547) and the certification of test facilities that ensure interconnection devices meet the new standard. In addition, several states have proceeded with their own DG equipment pre-certification programs. This article summarizes the situation in leading states.

California established a certification program in September 2000 that exempts approved DG equipment from air pollution control and air quality management district permit requirements. Since January 2003 all electric generation equipment planning to be exempt from district permit requirements has to have been certified by the California Air Resources Board (CARB) before it can be sold or installed in California. Certification involves meeting defined emission levels (a large issue for DG in California) and other requirements. Currently four generation technologies have been approved. These are 1) United Technologies Corporation's 200 kW phosphoric acid fuel cell, 2) Capstone Turbine Corporation's 60 kW microturbine, 3) Fuel Cell Energy Inc's 250 kW fuel cell, and 4) Ingersoll-Rand Energy System's 70 kW PowerWorks microturbine. Ongoing efforts are considering certifying both other *(continued on page 8)*

IN THIS ISSUE

RESOURCE DYNAMICS CORPORATION

To view earlier editions of the DG Monitor or to begin receiving the publication via email please visit: www.distributed-generation.com.

About the DG Monitor. The DG Monitor is a bimonthly publication of the Resource Dynamics Corporation covering the many facets of the emerging Distributed Generation marketplace. Articles both report and interpret the most important items. In addition, the Monitor includes special series on DG technologies, applications, manufacturers, and other issues, providing the reader with a complete picture of these topics over several issues.

Comments or requests for additional information can be addressed to DGMonitor@rdcnet.com, through our website at www.distributed-generation.com, or by contacting Jean Connors at 703/356-1300 x 208.

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The **Resource Dynamics Corporation (RDC)** creates business solutions that empower clients to compete effectively in changing energy markets. Often, these involve evaluating the role of new technologies. All senior staff have both business and engineering backgrounds, with a distinct focus on strategy implementation. We combine these strengths to create innovative business solutions for energy technologies and markets. **RDC** utilizes an extensive set of tools including proprietary databases and models to develop these solutions.

We develop business solutions in four areas:

- **Distributed Generation**
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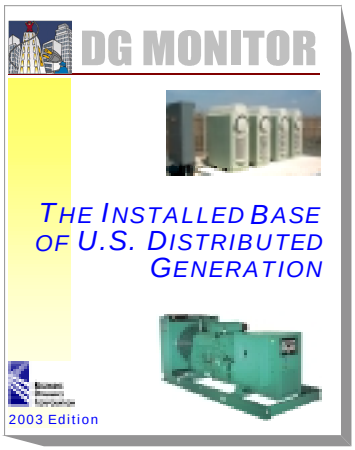


How much DG is there in my state or region?

What is their aggregate capacity?

Where are these units located?

The Installed Base of U. S. Distributed Generation 2003 Edition helps decision makers at all levels answer these questions and make informed DG policy, regulatory and market decisions by providing detailed estimates of the total number of DG units installed in the U.S. as of 2001, and their capacity by 19 size ranges from less than 15 kW to 60 MW. Breakouts are made by technology, application, primary fuel consumed and year of installation. Additional regional and industrial breakouts are provided for a subset of the larger generators.

Additional reports are also available:

With the new IEEE 1547 DG Interconnection Standard likely to be released this year, the ***DG Monitor's Directory of Interconnection Technologies and Equipment*** helps decision-makers quickly develop a short list of potential interconnection solutions. This publication lists the equipment and technologies necessary to interconnect all kinds of DG applications, and provides contact information for manufacturers and distributors.

Evaluating DG technologies or markets? Check out the ***DG Monitor's 2002 DG Sourcebook!*** A compendium of information on virtually every aspect of distributed generation technologies, applications, and markets - right at your fingertips!

These reports are part of the DG Monitor™ publication series produced by the Resource Dynamics Corporation (RDC).

To order this report or other DG publications, go to

www.distributed-generation.com.

APPLICATION SERIES: DG FOR LANDFILL GAS UTILIZATION

The Environmental Protection Agency (EPA) estimates that there are 6,000 landfills in the United States, 2,500 of which are active (still accepting waste). Landfill gas has about 50% the energy content of natural gas, and is composed of approximately half methane and half carbon dioxide. It is created from the decomposition of landfill waste. EPA's rules and regulations dictate that this landfill gas must be collected and either flared or put into use. Landfill gas can be used to fuel boilers and to generated power, often using DG.

Currently, only a small fraction of landfill gas is being productively utilized. According to the EPA's latest studies, 243 landfills currently utilize landfill gas to produce electricity. Rough RDC estimates, based on EPA data, show that if all of the landfills in the United States generated electricity, they would produce over 42 billion kWh of electricity each year[1], with an estimated capacity of between 7 and 14 GW.[2] Only a portion of this potential has been met - the EPA has identified approximately 122 additional landfills with immediate strong potential for electricity projects - and as such, this area remains a potential high growth niche for DG technologies.

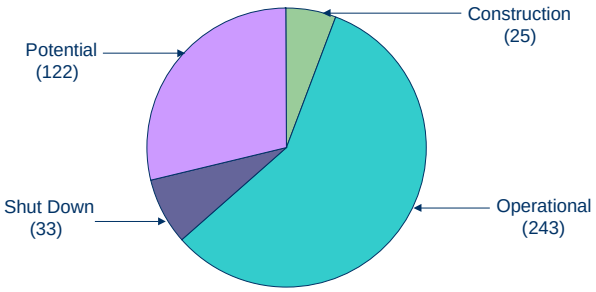


Figure 1. Landfills Gas Electricity Projects (423 Total)
Source: EPA Landfill Methane Outreach Program Data.

DG technologies that can use landfill and other waste gases (see *Waste Gas Utilization* in the Aug-Sept 2001 DG Monitor for a complete discussion of DG using waste gas) include reciprocating engines, microturbines, turbines, and fuel cells. In most cases, modifications need to be made to the DG prime-mover or fuel cell. Modifications can include special filters, desulphurisers, buffer tanks, gas analyzers, larger gas compressors, and changes to engine operating parameters. Currently, as shown in Figure 2 the majority of installations are of reciprocating engines, followed by gas turbines.

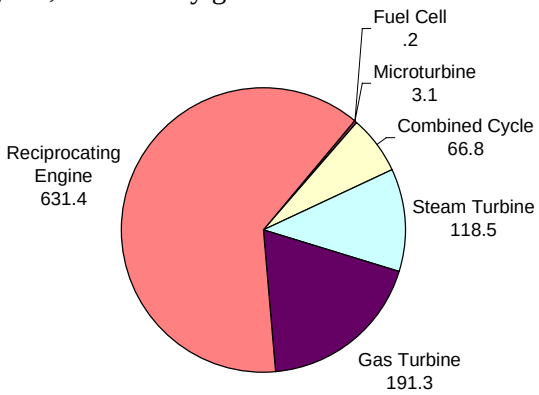


Figure 2. DG Landfill Capacity by Technology; Operational and Under Construction (1,011 MW Total)
Source: EPA Landfill Methane Outreach Program Data.

Several companies, seeing the potential of the market, are marketing projects focusing on landfills and other waste gas installations. STM Power is targeting these markets with its Sterling-cycle PowerUnits, currently in field testing. In December of 2002, Ingersoll-Rand Co.'s Energy Systems business unit introduced the PowerWorks microturbine line, which can use fuels from sources such as landfills, wastewater treatment plants, oil refineries, and oil and gas fields. Capstone has many microturbines installed at landfills, and is planning other installations.

In addition to serving on-site needs, landfill gas can be used in several ways. Excess power generated using the gas could be sold to nearby customers or back to the grid. Permitting issues, interconnection fees, and electricity buyback rates can hamper these applications. Also, the gas can be sold and used off site. While landfill gas has a lower BTU content than natural gas, it is essentially a "free" fuel, as landfills are already required to collect the gas. Distance can be a problem - landfills are usually built far from most commercial and residential areas - but this challenge is not always insurmountable. In May of this year, Northern Power Systems was selected to complete a cogeneration power system for SC Johnson that will burn methane gas from a nearby landfill. In Maryland, the NASA Goddard Space Flight Center is using landfill gas piped from a landfill five miles away to heat its buildings. BMW's Spartanburg, SC manufacturing plant is now using landfill methane from a *(continued on page 4)*

[1] 1 million tons of waste typically produces 300 ft^3/min of landfill gas, which generates about 7 million kWh per year.
[2] Assuming 3,000-6,000 hours of operation per year.

(Landfill, continued from page 3) landfill 9.5-miles away to provide 25% of its energy needs.

While the landfill gas market is an exciting one for DG, the market can be quickly saturated. There are a limited number of landfills, with few projected for construction in the near term. In addition, landfill installations must take into account the fact that the amount of gas emitted during a landfill's life varies over time. As shown in Figure 3, landfill gas production increases while the landfill is active, but once the landfill is closed, gas production decreases as the available organic material finishes the decay process. DG units, requiring a certain level of gas, can be used only within the time period where gas production is above that minimum. Figure 3 shows that, with finite gas production, an installation also has a finite life span. The amount of time covered by this curve differs depending on the specifics of each landfill, but can be 20 to 30 years.

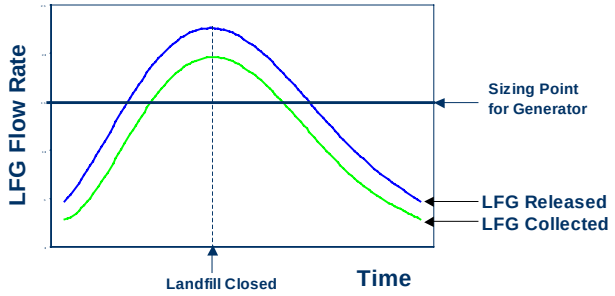


Figure 3. Landfill Gas (LFG) Released and Collected over the Landfill Lifecycle

There are programs in place like the EPA's Landfill Methane Outreach Program that support the use of landfill gas. Qualifying Facility Status and payments of 1.5 cents per kWh from DOE's Renewable Energy Production Incentive help make landfill gas utilization economic. Even with these incentives, it is not economically feasible for some landfills to bear the cost of capital expenditures, interconnection fees and permitting issues. About 700 landfills simply flare their landfill gas rather than using it.

Other market options for landfill gas use are emerging. Jenbacher Ltd. will construct and install more than 30 MW of power generation on six landfill sites in Houston for Reliant Energy. Jenbacher will operate and maintain the installations, with contractual guarantees for equipment availability reducing client risk. Reliant is following this path in part because the Texas Renewable Portfolio Standard requires electric providers to source a portion of their power portfolio from renewable energy. Renewable Portfolio Standards in other states can help bolster landfill gas utilization. Renewable energy credits also increase the economic feasibility of landfill gas utilization. Companies that use waste gas to produce power can sell renewable energy credits, or "green tags." Gas Recovery Systems, Inc. did this, selling a year-and-a-half of credits from two landfill gas systems to Massachusetts Electric for $1.8 million. Other projects, including a cogeneration system at the Essex Junction Wastewater Treatment facility in Vermont, have sold energy credits to help cover project costs. These and other methods can help make landfill gas utilization economic. ■

DG Interconnection Guide Updated

The newly published *Application Guide for Distributed Generation Interconnection: 2003 Update. The NRECA Guide to IEEE 1547* provides guidance for interconnecting DG with the grid. An update of the popular *Guide* published in 2001, this *Guide* helps readers comply with IEEE 1547, "Standard for Interconnecting Distributed Resources with Electric Power Systems." It covers the final version of the IEEE 1547 standard, with new and updated sections reflecting changes and additions made to the Standard since the first *Guide's* publication.

The *Guide* was written by Dick Friedman, chairman of the Resource Dynamics Corporation, and commissioned by the National Rural Electric Cooperative Association's (NRECA) T&D Engineering System Planning Subcommittee. The *Guide* explains the technical requirements of IEEE 1547 by providing Standard language followed by application guidance divided into three sections: 1) Background, 2) Impact of DR, and 3) Tips, Techniques and Rules of Thumb.

This last section topic gives guidelines and thresholds where additional requirements above and beyond IEEE 1547 may apply. While the Standard was designed to cover the bulk of DG installations, in some circumstances additional technical specifications may be required. In addition, as most installations over 1 MW will require an engineering study to determine any additional requirements, the Guide addresses DG through 1 MWA rather than using the IEEE Standard's 10 MVA cutoff. The document can be accessed at:
www.nreca.org/nreca/leg_reg/DGToolKit/DGApplicationGuide-Final.pdf

(Education Sector, continued from page 1) University, Rochester Institute of Technology, and at South Windsor High School in South Windsor, CT.

While most of these mentioned installations are recent or planned, the educational sector has been a true early adopter of the fuel cell technology. UTC Fuel had a unit installed at the University of California, Santa Barbara in 1993. Although the unit eventually went offline, it provided important data for the development of today's fuel cell market. The educational sector is continuing its fuel cell technologies early adopter role, and expanding its activities into exploring new business plans. The recent FuelCell Energy installation agreements with Yale University and Grand Valley State University have been for installation and service, a market plan that is gaining supporters throughout the DG market (see *DG Integrated Solution Providers* in the March/April 2003 Issue).

In addition to its role as an early adopter, the educational sector has played an important role in the testing and demonstration aspects of fuel cell development. At present, Montana State University-Billings is testing and evaluating two fuel cell systems manufactured and provided by Global Thermoelectric Inc. The University of California at Irvine hosts the National Fuel Cell Research Center, and has tested units from Fuel Cell Technologies as well as one of the first fuel cell-gas turbine hybrid power plants, which combined a Siemens Westinghouse solid oxide fuel cell with an Ingersoll Rand microturbine. The sector's role is an international one; the University of Graz in Austria conducted early work on a direct methanol fuel cell based on Energy Visions Inc.'s technology, providing the basis for further testing by that company.

The educational sector has made vast contributions to fuel cell research and development. Fuel cell developers often work in conjunction with universities. In August of 2002, Pacific Fuel Cell Corp. (PFCE) signed an agreement with the University of California to research and build a fuel cell prototype based upon PFCE proprietary technology. Developers are also using intellectual property developed by university programs. In June of 2002, Acumentrics Corporation was awarded a U.S. patent for a micro-tubular solid oxide fuel cell stack based on intellectual property acquired by Acumentrics from Keele University.

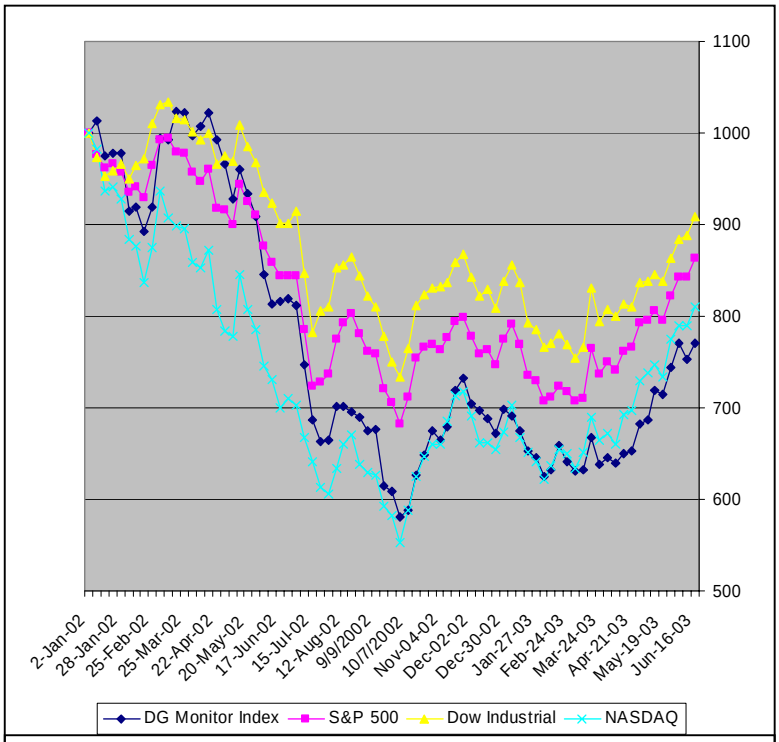
The educational sector has unique access to funding, a point which can help explain the sector's early adopter status. The Grand Valley State University installation is being funded by the Michigan Public Service Commission and bonding from the City of Muskegon, while the Wayne State University, Henry Ford Community College and the M-TEC facility installations will be funded through a grant program provided by the State of Michigan. The fuel cell-gas turbine hybrid power plant tested on the campus of the University of California-Irvine was funded by several partners including the U.S. Department of Energy, Edison International, the Electric Power Research Institute, the South Coast Air Quality Management District, and the California Energy Commission. Case Western Reserve University recently received an $18 million grant from the State of Ohio to support the research, development and commercialization of fuel cells. The Connecticut Clean Energy Fund has been investing in fuel cell installations, including a UTC fuel cell at South Windsor High School. These and other grants show how, with a wide range of funding sources to draw from, the education sector is in a unique position. They can explore the leading edge of the fuel cell market for research, educational and practical applications.

Beyond providing a service to the fuel cell industry, the education sector also has pragmatic reasons for adopting fuel cell technologies. The installations help meet power and heating needs, and, with much of the initial costs covered by grants, can also save money. Ocean County College projects that it will realize $60,000 in energy cost savings a year through the installation of the FuelCell Energy system. In addition, the education sector is able, through these installations, to perform its primary function, to educate. The knowledge and experience gained through these projects will help provide the engineers for tomorrow's fuel cell market, and help educate those already in the work force about fuel cell technologies. ■

CONFERENCES

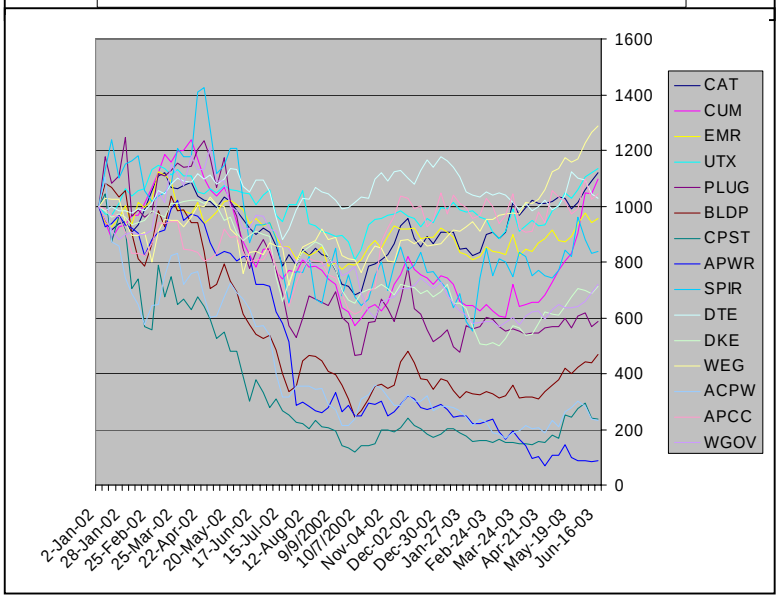
DG Monitor Internet Briefing Series, *Update on the Status and Progress of the IEEE 1547 Family of Standards*, Wednesday, June 25, 2003, at 1 pm EDT. To register please go to: www.webtrain.com click on "Browse Future Events", and navigate to the June 25 event titled "DG Monitor IEEE 1547 Update." You can enroll on that screen.

The DG Monitor Index[SM]



The DG Monitor Index[SM] continues to lag all three major U.S. stock indexes from January 2002 through June 16, 2003 although all four indexes have recovered considerably from their lows of October 2002.

Top-performers since January 2002 include Williams Energy Partners, United Technologies, Caterpillar, and Cummins. Williams Energy Partners is engaged in the storage, transportation and distribution of refined petroleum products and ammonia. The Company's portfolio consists of a 6,700-mile refined petroleum products pipeline system serving the central U.S. and numerous petroleum products terminal facilities. The recent run-up in petroleum prices has helped the company's stock.



The poorest performers continue to be emerging technology manufacturers. Laggards from January 2002 include Astropower, Active Power, Capstone, and Ballard. AstroPower develops and manufactures solar electric power generation products, including solar cells, modules, and panels. The Company also sells wholesale solar electricity under long-term agreements through a joint venture with First Energy Corp. AstroPower recently received a Nasdaq delisting notice for failing to file its Form 10-Q report with the SEC. The company said this delay in turn is pushing back the first quarter report because the two are dependent.

Companies in the DG Monitor Index[SM] include: Active Power (ACPW); American Power Conversion (APCC); AstroPower Incorporated (APWR); Ballard Power Systems (BLDP); Capstone Turbine (CPST); Caterpillar Incorporated (CAT); Cummins Incorporated (CUM); DTE Energy (DTE); Duke Energy Corp (DKE); Emerson Electric (EMR); PlugPower Incorporated (PLUG); Spire Corporation (SPIR); United Technologies (UTX); Williams Energy Partners (WEG); Woodward Governor Company (WGOV). ■

Advertising in the DG Monitor

Starting with the July/August 2003 issue, the DG Monitor will be accepting advertising. The cost will be $1,000 per page per issue. Advertisers will need to provide their copy in an Adobe Acrobat .pdf file. The current DG Monitor subscription base includes over 2,000 energy professionals. For more information, contact Elizabeth Kime at (703) 356-1300 ext. 214 or ekime@rdcnet.com.

Online DG Briefings

To better meet your needs, the *DG Monitor* will sponsor a series of live internet briefings on DG and CHP topics using the internet. To help plan briefings of high value, we conducted an online survey during recent weeks. Special thanks to those who offered their thoughts about this topic!

Briefing Topic	% Interested
Market potential for DG and implications for mid- to long-term business	75
Interconnection and what IEEE 1547 means in practice	70
The installed DG market and implications for current business	69
The effect of high gas prices on DG and CHP	54
Assessment of the financial health of the DG industry	48

In short, 85 percent of respondents prefer briefings 45-60 minutes long with the rest suggesting a 1-2 hour duration. There was very limited interest in receiving accreditation credit for these briefings. Of the surveyed topics, interest was focused as noted in the table above.

Reader-suggested topics that we will also evaluate include:

- Renewable DG applications and their economics;
- DG equipment choices at various capacity levels;
- Information technologies for DG aggregation;
- Regulatory and policy environment for DG;
- Distribution network control with DG; and
- Developing a hydrogen infrastructure.

While the formal survey has been completed, we would still appreciate comments. Please email us at DGMonitor@rdcnet.com.

Our first briefing is scheduled for Wednesday, June 25, 2003, at 1 pm EDT, providing an update on the status and progress of the IEEE 1547 family of standards. As you may be aware, promulgation of these standards promises to dramatically alter the DG grid-connection landscape. You can still participate in this briefing if interested. To register please go to www.webtrain.com, click on "Browse Future Events", and navigate to the June 25 event titled "DG Monitor IEEE 1547 Update." You can enroll on that screen. The *DG Monitor* will post the subsequent briefing schedule at a later date.

Ask the DG Monitor

The new column responds to reader's questions about the DG market and DG technologies. Have a question for the Monitor? Email: askthemonitor@rdcnet.com.

Reader Question: Is there a state that has exemplary state legislation with respect to lowering the barriers to DG? Is there a public service commission/state regulatory body that has developed exemplary rules for facilitating DG?

- D.H. at Harvard University

DG Monitor Answer: We hesitate to single out any particular state as being the best regarding lowering the barriers to DG, partly because the barriers differ by region of the country. For example, in California environmental issues dominate, along with exit fees, stranded costs and interconnection access, which have been the leading issues in the Midwest. Having said this, it is clear that California, Texas, New York, Massachusetts, Illinois, Arizona and Wisconsin have been leaders in considering DG barriers, policies, laws, and rules for implementing the laws. In particular, Texas, California, New York and Wisconsin have published guidelines for DG installers and those seeking to interconnect with the grid.

For additional information, we suggest that you peruse a number of websites that monitor DG regulatory actions, including:

- *State Electricity Regulatory Policy and Distributed Resources* (www.nrel.gov/docs/fy03osti/32497.pdf)
- National Association of Regulatory Utility Commissioners (www.naruc.org)
- National Regulatory Research Institute (www.nrri.ohio-state.edu)
- DOE Distributed Power Program (www.eere.energy.gov/der/reg_policy.html)
- Database of State Incentives for Renewable Energy (www.dsireusa.org)
- Western Interstate Energy Board (www.westgov.org/wieb/electric/distgen).

- The DG Monitor Staff

(Pre-certification, continued from page 1) generation technologies and interconnection devices. For further information see www.arb.ca.gov/energy/dg/dg.htm.

California also allows for pre-certification of equipment meeting the Type Testing and Production Testing requirements of California Rule 21. Rule 21 specifies standard interconnection, operating, and metering requirements for DG. DG equipment currently Rule 21 certified includes Capstone Turbine's 30 and 60 kW Microturbine Generators, Fuel Cell Energy Model DFC300A-S, Plug Power's 5 kW Fuel Cell, and two 60 kW and two 75 kW Tecogen generators. For an overview, go to: www.energy.ca.gov/distgen/interconnection/california_requirements.html

New York established standardized interconnection requirements in 1999 for DG units 300 kW and smaller. The emphasis in New York has been on interconnection equipment standards rather than air emission standards. To assist manufacturers seeking pre-certification, New York has established and published a type testing certification checklist. Currently, approved type tested equipment includes Capstone's 30 kW and 60 kW microturbines, Plug Power's fuel cell inverter, Tecogen's 60 kW and 75 kW cogeneration systems, plus inverters manufactured by Ascension Technology, Trace Engineering, Xantrex Technology, Advanced Energy, SMA America, interactive relays by Schweitzer Engineering, and intertie protection relays by Beckwith Electric. For more information see www.dps.state.ny.us/distgen.htm.

Texas established rules for the pre-certification of DG units and the approval of testing laboratories in February 2001. Currently two laboratories are authorized to perform this testing: Underwriters Laboratory Inc. and Wyle Laboratories Inc. However, no particular DG equipment has yet been certified by these labs under these rules. This is consistent with the time lag experienced in California and New York between the adoption of rules and creation of a pre-certified equipment list. For more information see www.puc.state.tx.us/electric/projects/22318/22318.cfm.

Other states are working in this arena. For example, in February 2003 Wisconsin published draft interconnection guidelines that are likely to be finalized later this year. Rules vary for units less than 20 kW, 20 to 200 kW, 200 kW to 1 MW, and 1 to 15 MW. Smaller scale DG applications have a more streamlined application procedure, as in other states. Wisconsin may develop pre-certification standards as their work matures. But as happened in other states, it may take a couple of years to go from initial work to creation of a list of pre-certified DG equipment. See www.renewwisconsin.org/dg/dg1/html for more information. Also of note is Kansas, which plans to complete state interconnection guidelines by September and Massachusetts, which is nearing completion of state interconnection guidelines.

To realize the many benefits of DG, regulations continue to evolve that streamline the installation of DG. Pre-certification lowers costs and thereby increases adoption. We anticipate that these efforts by California, New York, Texas and others may become prototypes for further regulatory work. Meanwhile, in order to gain a competitive edge, manufacturers are expected to continue to seek pre-certification of their equipment in states that have established guidelines for approval. ■

DG Recognized As A Protective Measure for Secure Infrastructure

During a recent conference in Washington DC, Jim McDonnell, Director of Vulnerability Reduction Division within the newly-formed Department of Homeland Security, emphasized that DG could play a critical role in the protection of the nation's grid. McDonnell cited the importance of the U.S. electric power system, stating "[n]othing happens without electric power," and included cyber space and telecom as services which were dependent on the country's electric power infrastructure. He added, "DG is a good example of making things [the grid] less critical."

Other topics discussed at the conference co-sponsored by the U.S. Dept. of Energy and the ASME International Gas Turbine Institute were the nation's future energy demands and the role of gas turbines. Recognizing the significant role of legislative policies in applications and growth, executives from the gas turbine and power industries and top governmental policymakers gathered to discuss legislative and policy issues in the context of current energy concerns and emerging technologies. The conference, *Gas Turbines for a National Energy Infrastructure*, was held February 26- 27, 2003, at the DoubleTree Hotel in Arlington, Virginia. ■

DG NOTES

June 17, 2003 - **Spire Corporation** and **Marubeni Corporation** renewed their technology licensing agreement under which Marubeni has rights to manufacture and distribute Spire's PV manufacturing equipment in Japan and to Japanese companies worldwide.

June 10, 2003 - A natural gas-powered 28 kW **Capstone** microturbine was installed on the Hilton of Santa Fe's rooftop. The unit is the second of two installed in Santa Fe as part of a PNM demonstration project designed to document and study the performance of the microturbines. The first 60 kW unit has been producing electricity at St. Vincent Hospital for more than a year. Sandia National Laboratories and New Mexico State University also are participants in the project.

June 5, 2003 - **Avista Labs** installed a 3 kW fuel cell system, composed of six Avista Labs Independence 500(tm) fuel cells, to provide backup power for a Federal Aviation Administration (FAA) site for a one-year, intensive field test of the fuel cell's capabilities. The project is funded by the Department of Defense Fuel Cell Demonstration Program lead by the Army Corp of Engineers Construction Engineering Research Laboratory.

May 29, 2003 - **Ballard Power Systems** is discontinuing the development, sale and marketing of its internal combustion engine generator sets. This decision will not impact development of its fuel cell product lines or commercialization plans.

May 28, 2003 - **BP Solar** completed the installation of a 1 MW solar project on the Del Mar Fairgrounds. Over 9,000 of BP's solar panels were installed and will reduce the Fairground's electrical consumption by 22% and decrease the monthly electrical bill by about one-third. This is the largest utility-tied installation in San Diego County.

May 9, 2003 - **FuelCell Energy's** sub-megawatt Direct FuelCell® power plant is now state-certified to meet the California Air Resources Board's new distributed generation emissions standards for 2007, and is thus categorized as an 'ultra-clean' technology, exempted it from air pollution control or air quality district permitting requirements by CARB (www.arb.ca.gov). Earlier, FuelCell Energy was certified for grid interconnection with the investor owned electric utilities under California's "Rule 21" and was certified to meet the American National Standards Institute (ANSI) products safety standard for stationary fuel cell systems, ANSIZ21.83.

May 7, 2003 - **General Motors Corp** will commercialize its hydrogen fuel cell technology to generate electricity from hydrogen created as a co-product at **The Dow Chemical Company** 's operations in Freeport, Texas. If tests proceed according to plan, Dow could eventually use up to 35 MW of power generated by 500 GM fuel cell units on an ongoing basis. The test is expected to begin during the fourth quarter of 2003 and to run through 2005, with plans to commercialize starting in 2006.

May 7, 2003 - **Siemens Building Technologies, Inc**., will build and operate two natural gas-fired CHP plants for Monroe New Power, Inc. in Monroe County, NY. The first of the two CHP plants, at the Iola heath facility campus, will generate approximately 2,700 kW of electricity and up to 65,000 pounds of steam per hour. The second CHP plant will be built at Monroe County Community College and will supply approximately 4,000 kW of power and up to 20,000 gallons of hot water per hour. In addition to providing heat, the hot water will be used seasonally to produce cooling through a 400-ton chiller.

May 2003 - **Siemens Westinghouse Power Corporation** developed a new tube design for their 5-kW units that uses flat, high power density tubes, allowing for a shorter tube length and twice the power output compared to their current cylindrical tube. SWPC, with partner **Fuel Cell Technologies**, learned that a stack with shorter cells performs differently from a larger cell stack. This has necessitated several design changes within the stack and the control system. Within the next year, these insights will be applied to the high-power density cells being developed under the SECA program.

May 2003 - **The California Power Authority** has announced the availability of its Industrial Development Bond Program for 2003, which is authorized to issue up to $30 million of tax-exempt IDB loans. Eligible technologies & equipment listed under this program include fuel cells using a renewable or non-renewable source. Manufacturers of components of the clean distributed technologies listed may qualify for loans for new and/or expanded eligible manufacturing facilities in California. Loan applications are due no later than August 1, 2003. www.capowerauthority.ca.gov/News/IDB.htm

May 2003 - **Hess Microgen** announced a successful CHP pilot project at a Raley's supermarket in Fairfield, California. The Hess system contains two 200-kW synchronous reciprocating engines and a 110-ton absorption chiller. The system is expected to provide 85% of the facility's electrical requirements, offset existing refrigeration equipment load, and provide domestic hot water and space heating. The design uses hot water from the system to drive an absorption chiller, which produces chilled water for the condensing line.