

## Report Released!

CAE delivered the year-long study report into the Opportunities for DG in New Zealand to members of the Electricity Industry Group that sponsored it, at a presentation meeting on 20 March, in Wellington.

The 340 page report, which covers Fuel Supplies, Network and Regulatory issues, Case Studies, Social and Environmental externalities, Technologies, Drivers and Opportunities, and a prediction of penetration levels for each type of DG outward to 2015, remains confidential to the Group. Its release comes at a critical time for New Zealand as it faces electricity shortages again in 2003 due to the long dry summer. The report finds that DG can make a useful contribution

to bridging the energy supply gap under the right market conditions. These market conditions, and certain enabling technologies, must be embraced if DG is to have any significant impact.

The report contents are currently being used to produce a public version document, which CAE intends to launch with the help of the Industry partners at half-day seminars in the near future.

This will be followed-up with a one-day workshop at the EEA Annual Conference in Christchurch, on 19 June, with international keynote speaker Jerry Jackson. The theme of the workshop will be "Market Development and Investment Opportunities".

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### U.K. Company Reports Successful Tidal Energy Production

The Engineering Business Limited (EB), a company based in the United Kingdom, reported partially successful results from its tidal energy prototype in December. The prototype, called Stingray, was temporarily installed in Scotland's Yell Sound in mid-September 2002, and then retrieved at the end of that month.

According to the December report, the Stingray operators were able to generate a peak hydraulic power of 250 kilowatts and a time-averaged output of 90 kilowatts, with the tidal stream flowing at 1.5 meters per second. Automatic operation achieved a continuous output of 45 kilowatts, although an undersized oil reservoir prevented full-speed operation. However, the company reports hydraulic power rather than true generator power in its report, stating that "power data measured from the hydraulic system was more reliable than the data produced from within the generator/drive system and is the best output performance measure at the moment."

Even using the hydraulic power numbers, the machine fell below its goals, which were to achieve a 150-kilowatt average output in

a tidal stream of 2.0 meters per second. The company's subsequent cost estimate for a 5-megawatt demonstration plant yielded power costs between 8 and 30 U.S. cents per kilowatt-hour, which is a wider range and higher cost than predicted by other wave and tidal energy developers.

Still, the company is encouraged by its initial results, and is planning to modify the Stingray machine, redeploying it in Yell Sound this summer. The company will also continue preparations for the proposed 5-megawatt installation, which it hopes to begin installing in summer 2004.

See the EB report (in pdf format only) at: [www.engb.com/Downloads/M02-151-01.pdf](http://www.engb.com/Downloads/M02-151-01.pdf).

Meanwhile, a Norwegian company called Hammerfest Strom AS is working to install its own tidal energy prototype device in Kvalsundet, Norway. The device looks much like an underwater wind turbine. The company has installed the base, the connecting lines, and the shore terminal, and hopes to install the turbine nacelle early this year.

See the Hammerfest Strom Web site at: [www.e-tidevannsennergi.com/index.htm](http://www.e-tidevannsennergi.com/index.htm).

## DG News Highlights



### Wind Penetration in Ireland

Given the increasing importance of wind generation in both the Republic of Ireland (RoI) and Northern Ireland (NI), the Commission for Energy Regulation and the Office for the Regulation of Electricity and Gas in Northern Ireland commissioned a consortium led by Garrad Hassan and including ESBI and the Sustainable Energy Research Centre, UCC, to investigate the feasible level of wind penetration which can be safely and securely accommodated on the combined electricity systems of the RoI and NI, for three target years — 2005, 2007, 2010.

The report has now been completed, indicating that some 3,300 MW of wind power can be fed into the Irish electricity network by 2010 without significant system reinforcement or increase in reserve capacity. Saving in fossil fuel costs alone from this installed capacity would amount to approximately Eu.250M every year.

For more information, go to:  
[www.cer.ie/cerdocs/cer03024.pdf](http://www.cer.ie/cerdocs/cer03024.pdf)



### Fuel-cell Power Plant

The Siemens Power Generation Group (PG) is to build for the very first time a close-to-series fuel-cell power plant in Europe. Under contract to Stadtwerke Hannover AG and E.ON Energie AG a standardized SOFC (solid oxide fuel cell) plant with a maximum electrical capacity of 250 kilowatts is to be built in Hanover on the site of the Herrenhausen power plant by 2003. The high-temperature fuel-cell power plant valued at around EUR5 million, which PG will be supplying on a turnkey basis, will in normal operating mode feed 225 kilowatts of electrical energy into the grid operated by Stadtwerke Hanover. Simultaneously some 160 kilowatts of heat will be generated for Hanover's district heating network. The plant's overall efficiency will be more than 80 percent. "This plant will constitute a milestone for broad-based market introduction of our SOFC power plants", declared Klaus Voges, PG President, at the contract signing ceremony in Hanover today.

"As a result of the separation of generation, transmission and distribution in the liberalized power markets, distributed power generation systems are gaining in importance", said the PG President. Because fuel cells are characterized by high electrical efficiency even at low cell ratings, the plants are assuming a special role, also for reasons of environmental protection.

In its efforts to push ahead with development in the field of fuel cell technology, Siemens had following the acquisition of Westinghouse's fossil power plant business in 1998 bundled the existing know-how within the two companies with the aim of having commercial products in the marketplace by 2003. For that purpose the Siemens Westinghouse research and development center located in Pittsburgh, Pennsylvania, was transformed into a Siemens Power Generation business sector with worldwide responsibility.

In September of last year, work commenced on construction of a fuel cell production facility in Pittsburgh, which is scheduled to start operations before the end of this year and to commence production in the fall of 2003. Capacity is to be expanded in three phases up to the production of more than 100 megawatts per year and manpower upsized from 150 to between 450 and 500 by 2006. The first standard product that Siemens PG intends to market will be the "CHP 250" system (combined heat and power, that is cogeneration, with a capacity of 250 kilowatts); at a later date the range of products will be extended to include fuel cell systems with downstream microturbine with an overall capacity of more than 500 kilowatts.

An SOFC operates similar to a battery: It generates electricity electrochemically using the chemical energy contained in the fuel — efficiently and with practically zero emissions. By contrast with other types of fuel cell, high-temperature SOFCs can use natural gas directly because at almost 1,000 degrees Celsius an internal conversion process enables use of the hydrogen contained in the natural gas. The waste products are primarily water and a small amount of carbon dioxide. There are no other emissions such as nitrogen oxides, sulfur dioxide or soot. To date, Siemens has nine demonstration plants worldwide in operation or ordered. North America and Europe are

# DG News Highlights

regarded as the most promising markets for SOFCs in stationary power plant applications.

The Power Generation Group (PG) of Siemens AG is one of the premier companies in the international power generation sector. In fiscal 2001 (which ended September 30), Siemens PG posted sales amounting to EUR8.6 billion and received new orders totaling EUR12.2 billion. Earnings before interest, taxes and amortization (EBITA) amounted to EUR634 million. On September 30, 2001, Siemens PG had a workforce of around 26,500 around the world.



## Hydrogen from Coal

The DOE and the U.S. State Department announced that it will lead a billion-dollar, 10-year, public-private partnership to build the world's first fossil-fuel plant that does not produce pollution. The 275MW power plant, known as FutureGen, will convert coal into a hydrogen-rich gas. Common air pollutants such as nitrogen and sulphur compounds, as well as mercury, will be removed from the coal gas, and carbon dioxide will be captured and sequestered in deep underground geologic formations. The hydrogen may be burned in a turbine or converted into electricity in a fuel cell, or it could be used in a refinery to upgrade petroleum products.



## Global Wind & Solar Generation

The global capacity to generate electricity from wind power grew by a record 6,868 MW in 2002, according to the American Wind Energy Association (AWEA). The 28 percent growth in capacity represents an investment of US\$7.3 billion, boosting world wind capacity to more than 31,000 MW. Global wind power capacity has quadrupled over the past five years, according to AWEA.

The global capacity for solar power production grew at nearly the same rate, increasing by 26 percent in 2002, according to Solarbuzz, Inc., an international solar energy consulting company. New solar power installations totaled a record 436 MW last year, fueled in part by

a 60 percent growth in the United States, despite a weak economy.

Manufacturers' worldwide shipments of solar cells grew by 36 percent in 2002, to 530 MW, suggesting that manufacturing capacity managed to keep ahead of demand during 2002.

Those high growth rates may be a continuing trend, according to a recent report from Clean Edge Inc. The report finds that the industries for wind power, solar photovoltaic technologies, and fuel cells will grow nearly tenfold over the next decade. A sustained growth of nearly 26 percent per year would be needed to accomplish that feat. See the Clean Edge report at: [www.cleannedge.com/reports-trends2003.php](http://www.cleannedge.com/reports-trends2003.php).



## High-capacity Transmission Systems

The electric power industry expects to eventually use superconducting cables to build to a more energy-efficient, high-capacity transmission system. But currently American Superconductor Corporation (AMSC) is helping solve transmission woes using a spin-off from its superconducting business instead. A voltage regulating system originally developed for the company's superconducting magnetic energy storage devices is now being used as a stand-alone device to help transmission systems respond to voltage fluctuations caused by heavy industrial machinery.

Launched in May of last year, the system, called D-VAR, has been sold to number of U.S. and international utilities. In Connecticut, a new D-VAR system will allow an additional 100 megawatts of power to flow through congested transmission lines serving the southwestern part of the state.

PacifiCorp also installed a D-VAR system at the Wyoming Wind Energy Project, and Nordex USA Inc. is planning to install one at a 2.6 MW wind facility in Minot, North Dakota. According to AMSC, wind facilities are often located in weak parts of transmission grids and can sometimes cause transmission lines to experience voltage irregularities, which the D-VAR system can correct. See the AMSC Web site at: [www.amsuper.com/html/index.html](http://www.amsuper.com/html/index.html)

# Releasing the Potential of DG



A recent North American survey by Primen completed 600 interviews with businesses ranging in size from 300 kW to 10 MW, including 78 Canadian establishments. Selected highlights from this major research study are listed below; the complete report provides a detailed analysis on today's market for distributed energy in the States.

The key findings were 13% of large business customers in the United States and Canada are receptive to baseload DE applications, with 2% deemed strong prospects.

- Strong prospects state that they are likely to purchase/lease DE in the next two years and are currently evaluating their DE options.
- Soft prospects say they are likely to acquire DE in the next two years but have not begun to actively investigate their options.

The profile of strong prospects quantifies some of the conventional wisdom about DE markets while challenging other assumptions.

- The strongest prospects are found among the largest customers (700 kW+).
- Energy cost savings and cogeneration potential are stronger drivers of acquisition than the prospect of enhanced reliability.
- Strong prospects do not necessarily consist of companies with 24x7 operations for whom energy represents a significant portion of operating costs.
- Strong prospects show a slight preference for buying rather than leasing distributed energy solutions.
- Strong prospects differ from soft prospects in many other ways, including their end-use sector, their geographical regions, and their vendor and technology preferences.

Follow-up interviews with businesses that were evaluating DE last year underscore the length of the sales cycle.

- Customers report that identifying options

and securing budget is a multiyear process.

Fuel cells, despite their novelty, are more familiar to energy users than gas turbines, though few companies expect to use fuel cells in the near term.

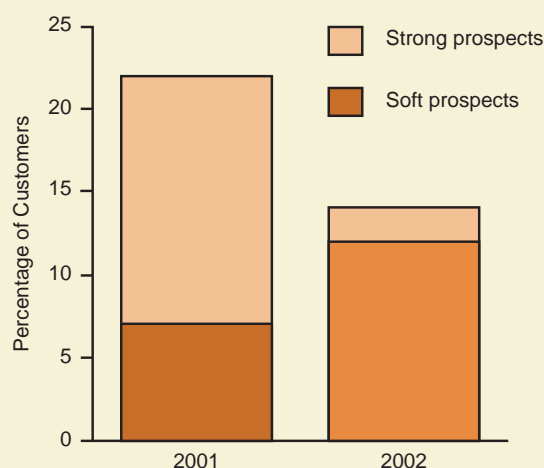
- 78% of the commercial and industrial customers surveyed were aware of fuel cells, but only 74% were aware of gas turbines.
- Prospects who are actively evaluating DE options cite gas engines (29%), gas turbines (29%), and microturbines (21%) as the technologies they are most likely to acquire. Not a single strong prospect surveyed said they were likely to purchase a fuel cell.

Most of those likely to adopt grid-alternative DE have standby generators and are excellent targets for load dispatch programs.

- 75% of all prospects and 90% of strong prospects would be willing to dispatch their generators during peak demand if given the proper incentives.

Although we found some strong prospects for DE, the overall DE market in North America has clearly softened.

- The main reasons for this seem to be stabilizing electricity prices, continued volatility in natural gas prices, and the economic slowdown.



Engineering is the science of economy, of conserving the energy, kinetic and potential, provided and stored up by nature for the use of man. It is the business of engineering to utilize this energy to the best advantage, so that there may be the least possible waste.

William A. Smith, 1908