DG Integrated Solution Providers Overcome Siting Barriers

An important challenge in the DG market is understanding and navigating the DG siting process. An example DG siting process timeline is shown in Figure 1. Under the right circumstances, the siting process can be straightforward, and the customer can proceed through each step in a timely fashion. However, some customers have neither the time, skills, nor inclination to manage this process themselves. In this instance, the customer can hire an integrated solution provider (ISP). These companies, which provide full-service DG installations, were first profiled in the July-August 2002 issue of the DG Monitor. Since then, as the energy market has developed, so too have integrated solution providers. In this issue of the Monitor, we revisit this topic, and examine whether ISPs have met with success in this new market.

DG Makes Headway in Office Buildings

DG and CHP have long been underutilized in Commercial and Institutional Buildings. A recent study prepared by the Resource Dynamics Corporation for the U.S. Department of Energy and the Oak Ridge National Laboratory, entitled Integrated Energy Systems (IES) for Buildings: A Market Assessment, shows the potential building sector market for Integrated Energy Systems (IES). IES combine on-site power or DG technologies with thermally activated technologies, and this market is almost 17 GW in 2010, growing to over 35 GW by 2020. Though estimates vary, a rough calculation of IES capacity shows 3.5 GW currently installed, leaving a huge untapped market potential.

The study looked at the current building market for IES. Most of the approximately 3.5 GW of IES capacity currently installed is concentrated in education and health care buildings. These sectors have long used CHP as a means of controlling utility costs. For other building sectors, the economics of IES holds promise, but barriers prevent widespread adoption. As shown in Figure 3 on page 5, the potential for IES is highest in office buildings, with over 10 GW of total IES potential. Hospitals and colleges, while already established in CHP use, each offer over 7 GW of potential for IES respectively. Schools, retail, and hotels are smaller segments, but with their significant heating (continued on page 5)
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
• Marketing for Energy Businesses
• Strategies for Power Suppliers
• Strategies for Energy Purchasers

RDC has entered its 23rd year. Meeting our clients’ needs has always been our top priority and we have consistently delivered outstanding consulting services to enable our clients to reach their goals. Clients include energy companies, consumers, financial institutions, law firms, equipment vendors, trade associations, research organizations, government agencies and international institutions.

For more information, see www.rdcnet.com.

RDC DG NEWS

The Resource Dynamics Corporation was awarded two research contracts by the Oak Ridge National Laboratory. The projects are entitled “A Review of Distributed Generation Siting Procedures” and “Developing CHP Market Potential with Opportunity Fuels.”

CONFERENCES

IEEE P1547.1, P1547.2, P1547.3 Interconnection Work Groups (www.ieee.org) June 4-5, 2003, Denver, CO


DG Workshops. Cooper Power Systems offers a series of DG Workshops. For example, they offer a comprehensive three-day workshop that covers relevant aspects of DG technologies, technical and economic issues and reviews the major manufacturers and packagers of DG equipment. There are forthcoming workshops in Denver June 10-12 and in Portland Oct. 7-9. For more information contact Richard D. Marking-Camuto, rcamuto@cooperpower.com, or go to www.cooperpower.com.

DG Monitor Publications

Need to know how many DG units there are? Previously unavailable baseline information including the total number of units, capacities, generation and thermal output by 19 size ranges are available in the DG Monitor 2003 Installed Base of U.S. Distributed Generation. Breakouts by technology, by application, by primary fuel consumed and by year of installation will help decision-makers at all levels.

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! To order these report, go to http://www.distributed-generation.com/ and follow the links.
APPLICATION SERIES: DG FOR GRID SUPPORT

As the electric power market continues to evolve, and as a result of intense Wall Street scrutiny, utilities are paying more attention than ever to controlling costs in all phases of operations, maintenance and construction. One of the more significant elements of construction costs are upgrades to the transmission and distribution (T&D) system needed to increase capacity to meet customer load growth. Examples of T&D upgrades include replacing lines and transformers and installing additional feeders to serve high-growth geographic areas. However, T&D investments are costly, especially for typical projects involving tower replacement or underground construction.

Even for T&D projects for which asset or labor costs are not unusually high, the administrative resources committed to resolving community and regulatory questions can be significant. These non-asset related costs are often overlooked or underestimated in evaluating a project’s economic feasibility.

An innovative approach that is gaining the attention of utilities, regulators, and stakeholders is the use of distributed generation (DG) to defer or replace T&D system upgrades. DG, by definition, generates electric power close to point of use, reducing the need to transport it from afar, which holds several problem-solving implications for T&D systems.

In many cases, DG can provide an economically attractive option to defer or replace a T&D investment. DG can defer the need to increase feeder capacity by providing supplemental power during periods of peak demand. Additionally, when capacity is added to a T&D system to relieve a constraint, much of it is usually unused—or stranded—for many years. DG capacity can be added in smaller increments, reducing the amount of stranded investment as shown in Figure 2. The economic benefit of reducing or eliminating this stranded investment can be measured by applying the cost of capital against the value of the project. This deferral value can be quite significant, especially for large T&D projects.

Another important benefit of DG is its ability to be quickly implemented. The lead-time for installing and connecting a DG unit is often shorter than the traditional T&D project, particularly when the T&D project is a new feeder installation.

DG can also defer the installation of a T&D project while additional data is gathered. In applications where there is uncertain load growth, the investment in a T&D upgrade can result in a longer stranded investment. DG can buy time to evaluate some project uncertainties more closely, which can promote a more accurate planning process.

![Figure 2. DG Can Reduce Stranded Investment When Used to Resolve T&D Constraints](image)

Options for using DG in these applications include the purchase and installation of DG units, the rental of temporary DG units to support seasonal or temporary peaks, and incentivizing the operation of existing DG units during peak hours. While the first two options require the purchase or leasing of a DG unit, the third option just requires incentivizing the operation of DG already in place. Each option has unique set of costs, benefits, and practical considerations that must be evaluated. For example, in some applications, DG can be leased and installed for a brief period, then moved to support another system need. Often, temporary power peaks on a feeder are caused by a maintenance, upgrade, or repair project on a neighboring feeder. DG has been used in support of such projects for many years. The same principles that make DG useful in these applications can make DG a reasonable component in the overall system planning process.

Although DG has several advantages, for many T&D upgrades, DG is not a feasible option. For example, high load growth rates and large system capacities make DG less favorable due to high capital costs associated with installing significant amounts of DG. Conversely, small system (continued on page 7)
(ISPs, continued from page 1) with the necessary interconnection engineering, and approval must be gained to go forward. Construction involves the installation of the unit, and operation and testing will be required in the post construction stage. ISPs help an end user obtain all necessary permits, locate financing, oversee construction, and work with the local distribution utility to meet interconnection requirement. Ideally, with multiple-site experience and established contacts, ISPs are able to expedite the siting process, making it both shorter in duration and less costly.

Most ISP work to date has been in states that have undergone deregulation. In California alone there are a number of companies that focus on ISP services or offer it as a key product. Examples include RealEnergy, AES NewEnergy, Coastintelligen, Solo Energy, Catalyst Power, L’communications, and Calpine. However ISPs are located and operate nationwide. For example, NextGen, which offers a full range of onsite power services, is base in Colorado. Vermont-based Northern Power Systems develops, designs, installs and maintains on-site power systems. In February, Northern Power Systems was selected to engineer, build and install an on-site power system for the Essex Junction Wastewater Treatment facility in Vermont. In November, Northern Power Systems was made responsible for the system design, engineering and commissioning of a 1.5 MW on-site power system for an office complex in San Francisco.

Several of these companies have taken things further by both installing and operating DG projects. They then manage the system and sell electricity and, sometimes, thermal energy, to the customer. This business plan allows customer to realize the benefits of DG without the initial capital outlay needed to install DG systems. While many of these firms are new companies, other are evolving from more traditional energy providers. For example, Peoples Energy Resources Corp., a subsidiary of Peoples Energy (PERC), announced it will provide onsite power to businesses in the Chicago region. PERC will use Hess Microgen DG and cogeneration systems.

RealEnergy, an on-site energy company based in California, owns and operates DG CHP systems. The company pays building owner rent for the space occupied by the project and sells electricity and waste heat to the building. In December, RealEnergy Inc. signed a contract to install an 1125 kW on-site generation system for Park 80 West building office complex in Saddlebrook, NJ. New to the market, AmericanDG obtained its first agreement in November. In partnership with AES-NJ Cogen Co., Inc., AmericanDG will install and operate a CHP system at the Resort Nursing Home in Arverne, NY. Several other contracts have followed in quick succession: In December, an agreement with East Orange General Hospital in East Orange, NJ, to supply energy for the hospital through a DG system; in January, an agreement with Greenpark Care Center in Brooklyn, NY, to supply electricity and hot water using an on-site, 150-kW cogeneration facility; in March, an agreement with Holliswood Care Center in Queens County, NY, to supply energy from an on-site, 150-kW cogeneration facility that will be installed and operated by AmericanDG. Another new entrant that has emerged is Office Power LLC. During the recent ASME conference “Gas Turbines for a National Energy Infrastructure,” Richard Slember, Executive Vice President, announced that this new venture will target DG in office buildings.

As the siting process remains a challenge for any DG project, tracking ISPs and other aspect of siting remain important for the DG market. As such, RDC, under the auspices of the Oak Ridge National Laboratory, is conducting a review of the DG Siting Process. This study will build upon earlier works, but delve even deeper into how people like you have successfully navigated the siting process.

In this phase of the project, we are looking for your stories, with the goal of learning from those of you in the trenches what it takes to make an installation happen, how long it really takes, and how much it really costs. We will look at the challenges DG installations have faced and what made it possible to overcome these challenges.

Your participation in this study can contribute greatly to an understanding of the current DG siting process and what we all might do in the future to help improve it. If you are interested in participating, please contact us at: DGMonitor@rdcnet.com. We will send you a brief questionnaire and set up a short interview at your convenience. Study participants will be kept apprised of study results and may have a chance to participate in later project impact studies.
(Office Buildings, continued from page 1) and cooling loads offer additional IES potential.

The large untapped IES market is starting to attract interest and making steady progress. The December issue of *Power Engineering* reported that the largest owner of office buildings in the U.S. is planning on incorporating DG into its commercial office properties nationwide. Other companies (see *DG Integrated Solution Providers* in this issue) are exploring the market.

This renewed interest is based in part on recent development including technological advances, electricity industry restructuring, and the emergence of companies who are making a business out of on-site installations. Of technological importance is the development of Thermally Activated Technologies (TAT). In buildings, heating and cooling loads are seasonal, reducing the need for thermal output during summer months. TAT can be integrated into a CHP system to utilize byproduct heat output to provide absorption cooling or desiccant humidity control during summer months when the need for heating is limited. TATs help make applications economic that would not have been so with CHP alone.

Some challenges for IES use in buildings center around research and development on a comprehensive integration approach: component integration, equipment integration, packaged and modular system development, system integration with the grid, and system integration with building and process loads. In addition, study sensitivity analyses showed that improvement in the installed cost and efficiency increases the market potential dramatically. Both future scenarios examined increase the potential market from 35 to almost 70 GW, nearly doubling the market size.

The Resource Dynamics Corporation study *Integrated Energy Systems (IES) for Buildings: A Market Assessment* study examines in greater details technologies and markets where IES is positioned for growth, identifies areas where technology needs improvement and where substantial barriers exist, and the potential market effects of overcoming these obstacles. It can be accessed at:

The **DG Monitor Index** lagged all three major U.S. stock indexes from January 2, 2002 through April 21, 2003. The Index pulled slightly ahead of the NASDAQ in the early part of this year, but lost its lead with the recent run-up of the NASDAQ.

Top-performers since January 2002 include Williams Energy, Caterpillar, and DTE Energy, although DTE Energy performance over the past four months has been mixed.

The poorest performers continue to be emerging technology manufacturers. Those weighing on the index in 2002 include Astropower, Capstone, Active Power and Ballard. The recently renewed interest in fuel cells, hydrogen, and the hydrogen economy has not, as yet, had a positive impact on Ballard’s stock price.

Companies in the DG Monitor Index 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 (WEG); Woodward Governor Company (WGOV).

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**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:** I saw a graph of current percentage levels of installed DG by type of technology in a recent presentation at the CADER symposium. Could you provide more details? Thanks, M.L.

**DG Monitor Answer:** Dear M.L.: You (and others at CADER) recall seeing a chart similar to the one on the right. The information presented by the Resource Dynamics Corporation in November has now been revised and is summarized in the following table. A key point is that despite lots of discussion about new DG technologies, currently there is still only a tiny base of microturbines and fuel cells. This information should be kept in mind by those providing equipment, installation, fuel, or maintenance services, as well as by policy makers. These top-level results come from a recently completed comprehensive RDC study entitled *The Installed Base of U.S. Distributed Generation, 2003 Edition*. Copies may be purchased from RDC. See page 2 for more information or visit www.distributed-generation.com.

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<table>
<thead>
<tr>
<th>Technology</th>
<th>No. of Units</th>
<th>Capacity (MW)</th>
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<tr>
<td>Reciprocating Engines &gt; 100 kW</td>
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<td>75,000</td>
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<tr>
<td>Turbines &gt; 100 kW</td>
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<td>25,000</td>
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<tr>
<td>Microturbines &lt; 100 kW</td>
<td>1,200</td>
<td>40</td>
</tr>
<tr>
<td>Fuel Cells</td>
<td>200</td>
<td>40</td>
</tr>
</tbody>
</table>

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- The DG Monitor Staff
DG NOTES

Mar 31, 2003 - Connecticut Clean Energy Fund request for proposal to find projects that further promote the acceptance of fuel cells as an energy alternative netted 60 responses—doubling the number of applications from the prior year.

Mar 26, 2003 - Plug Power Inc. and H Power Corp. announced the consummation of their previously announced merger transaction. The transaction was completed shortly after the approval of the transaction by the respective stockholders of Plug Power and H Power. As a result of the transaction, H Power stockholders will receive 0.8305 shares of Plug Power common stock for each share of H Power common stock held immediately prior to the transaction.

Mar 19, 2003 - A vote by the Public Service Commission (PSC) of New York requires utilities to provide farmers a cash payment at the end of each year if they supply more electricity than they consume, making it easier for farmers to provide power generated by waste to local utilities. The PSC also eliminated individual utility requirements for connecting to their distribution systems when the requirements deviate from a commission-approved standard. In addition, the commission will direct power companies to increase the size of eligible waste-fueled generators to 400 kW.

Mar 10, 2003 - Salinas Valley Memorial Hospital has the largest solar installation at a hospital. Shell Solar manufactured the 1,000 solar panel, 140 kW power system at Salinas Valley Memorial Hospital, which is the largest solar installation at a hospital. The solar power system supplies about two-thirds of the daytime power needs of the building. Bizquests, Inc. of Aptos, Calif. and Princeton Energy Systems of Philadelphia developed the hospital’s system, while Solar Works, Inc. of Montpelier, VT installed the equipment for the project. SVMH qualified for PG&E’s Self-Generation Program and has received a $595,000 cash rebate from the utility.

Mar 5, 2003 - Stewart & Stevenson Distributed Energy Solutions Division introduced a new family of EnGen-Therm(TM) Power Modules, natural gas reciprocating engine generators deploying the Waukesha® VGF® industrial grade engine series and designed with Encorp APS® Genset Controls.

The engine generator is designed for easy integration of a heat recovery unit or absorption chiller system. The models deliver continuous power output ranges of 280, 375, 560 or 750 kW along with thermal output of 1700, 2277, 3352, or 4511 MBtu per hour. Water jacket and exhaust temperatures are approximately 210 and 1115 degrees Fahrenheit, respectively. Stewart & Stevenson’s team is currently building and installing a number of these units for hospitals, office buildings and small process industries in the U.S.

(T&D Support, continued from page 3) capacities and low load growth applications promote the feasibility of DG.

Several industry trends will significantly affect the role of DG as an alternative to a T&D investment, for example, improvements in the technologies that promote aggregated deployment of DG. Greater standardization of communication and control technologies will allow market participants to operate DG in response to price signals.

Although DG projects are not yet widely implemented to replace or defer T&D investments, as awareness regarding the advantages of DG projects increases, consideration of DG in utility planning processes should also increase. Identifying the applications in which DG can be economically competitive requires knowledge of the costs and requirements of both the T&D project and the potential DG options. As with many innovative problem solving approaches, the assistance of experienced professionals can be the key to ensuring implementation of the lowest-cost approach to meeting system requirements.