# Metering for Distributed Generation

The U.S. energy.gov website defines distributed generation (DG) as "the term used when electricity is generated from sources, often renewable energy sources, near the point of use instead of centralized generation sources from power plants."[1] Instead of relying on remote power plants to transmit energy over what may be long distances, DG allows energy to be consumed near where it is generated. According to bcc Research "The global market for distributed energy generation is estimated to increase from $141.3 billion in 2023 to reach $241.6 billion by 2028 with a compound annual growth rate (CAGR) of 11.3% during the forecast period of 2023-2028."[2]

DG can be used in a variety of applications and in large and small systems. For example, a homeowner may use solar panels to power an individual home's electrical needs; while a large college campus may use a small solar farm to power all the buildings on campus. The DG system may stand on its own, without being connected to the electrical grid, or it may be integrated into the grid. DG sites that are connected to the grid are sometimes referred to as microgrids. For microgrids, the grid's energy can be used to supplement the DG energy when necessary, during times of high demand or when renewable sources are not available, e.g., during cloudy days. And excess DG energy can be sold back to the grid to be used for other customers. Many large industries, universities, and municipalities also rely on DG sites to supply energy when there are power outages in the electrical grid, due to weather-related events or other causes.

There are several distinct advantages to DG systems:

- The traditional electrical grid is made up of large generation plants, high voltage transmission lines, substations, and distribution lines that move the generated electricity to the end user. There are always some electrical losses during the transmission and distribution. DG lowers these losses since the energy doesn't need to be transmitted long distances, resulting in greater energy efficiency.

- The U.S. Energy Information Administration (EIA) projects that the global demand for electricity will increase by at least one third, and up to three quarters, by 2050. They attribute the increase to growth in population, increase of income, and increased industrial productivity. They also anticipate a significant increase in electric vehicle sales, globally.[3] As electricity demand increases, utilities must be able to meet that demand. This can be a very expensive proposition. The costs of building new generation plants and transmission lines are much greater than the

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[1] "Renewable Energy: Distributed Generation Policies and Programs," accessed 5/15/2024 from https://www.energy.gov/scep/slsc/renewable-energy-distributed-generation-policies-and-programs#:~:text=Distributed%20generation%20is%20the%20term,generation%20sources%20from%20power%20plants.

[2] "Distributed Energy Dynamics: Illuminating the Future of Global Power Generation," bcc Research, accessed 5/17/2024 from https://blog.bccresearch.com/the-future-of-global-power-generation-industry#:~:text=The%20global%20market%20for%20distributed%20energy%20generation%20is%20estimated%20to,forecast%20period%20of%202023%2D2028.

[3] Press Release from October 11, 2023, U.S. Energy Information Administration, accessed 5/17/2024 from https://www.eia.gov/pressroom/releases/press542.php#:~:text=EIA%20projects%20global%20electricity%20demand,come%20from%20renewables%20and%20nuclear.

costs associated with the smaller DG systems. And the necessary costs for modernizing and repairing the aging grid architecture to meet growing demand are also much greater than installing new DG systems.

- Another benefit is the easy integration of renewable energy sources (RES) into DG systems. Since renewables such as solar, wind, and hydropower are generated in specific locations, e.g., windy areas or places with a lot of sunlight, integrating RES energy into a local DG is both efficient and economical. With the move toward zero-emission targets around the world, DG has increased in importance, since DG power is generally cleaner than fossil fuel generated power. The EIA report on projected growth by 2050 states that "Renewables, nuclear, and battery storage account for most of the growth in both global capacity and generation."[4] DG is in the best position to support the growth of RES and related battery storage.

- DG that is connected to the electrical grid "has benefits for the electric grid's resilience, as it provides a more diversified portfolio of energy sources than schemes that rely exclusively on centralized power plants."[5] A more resilient grid is able to handle increased demand and respond better to challenges.

DG needs the same kind of accurate metering and power quality analysis as the traditional electrical grid. To be reimbursed correctly by business units or college departments, a DG system needs revenue accurate submetering to determine actual energy usage. This has the added advantage of allocating energy costs fairly. It also encourages energy conservation, by making energy consumers aware of their usage and directly responsible for it. An associated billing application can use metering data to automatically generate bills to individual departments, tenants, or business units.

Accurate power quality and energy meters also provide real time readings of energy, power, demand, frequency, etc. This lets the DG operator ensure that the power is being distributed correctly to consumers. Real time readings also let DG operators determine if they need to access energy from the grid to prevent a loss of power. A meter's power quality features give the operator extensive information to ensure that the energy generated is reliable and of good quality. Limit alarms on voltage, current, harmonics, excess demand, etc., enable DG operators to respond proactively to keep the power on.

A grid-connected DG also needs to monitor the main connection to the grid, measuring the energy they are receiving from the grid as well as keeping track of how much energy they are selling back to the grid. Reports generated by energy monitoring software can give system operators and managers the ability to verify the utilities' bills. Real time readings let DG operators see if they need to access energy from the grid to prevent a loss of power. Power quality analysis of the energy being delivered to the grid ensures that it has the correct frequency and power factor for grid integration.

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[4] *Ibid*.

[5] "The Future of Distributed Generation: Moving Past Net Metering," Richard L. Revesz and Burcin Unel, Environmental Law Institute, accessed 5/17/2024 from chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://policyintegrity.org/files/publications/Moving_Past_Net_Metering.pdf.

In conclusion, the growth of DG in response to changes in the energy sector presents advantages for utilities and consumers alike. An important aspect of DG reliability and effectiveness is the information provided by revenue accurate power quality and energy meters and energy monitoring and billing software. For information on Electro Industries' range of meters and energy management software, visit https://www.electroind.com/.