



Smart electric grids are composed of

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An electrical grid is a network that delivers electrical power from the power plants where it is generated to customers. See Figure 1. An electrical grid includes wires, substations, transformers, and switches.

Definition: A smart grid is an electrical grid that uses computer-based remote control and automation to deliver electrical power from where it is generated to customers.

In order to improve the delivery of electrical power, the continual developments in smart grid technology can be used to make a power distribution system more intelligent, efficient, and secure.

A smart grid normally includes the following upgrades:

Upgrading the Electrical Grid

Upgrades to the electrical grid allow each critical component, such as substations and transformers, to have two-way communication. In this case, each device or location would be capable of calling for assistance if it were experiencing problems. It could also be called back to see the extent of the problem.

For example, if a critical component such as a transformer was overloaded or overheating, a message would go out to a monitoring station. When this information is received, the power could be rerouted until the transformer is inspected or replaced.

The monitoring station could also remotely call up the transformer and, with proper diagnostic software, determine its current condition and efficiency.

Two-way communication also allows one or more power sources on the generation side of the electrical grid to be accessed remotely and routed to a location needed by the customer, depending on the type and amount of power needed. The power may come from a centralized power plant, wind farm, or photovoltaic (PV) array.

Traditional centralized power distribution systems are aging and cannot keep up with the high demand being placed on the systems. Distributed power generation, interactive distributed generation, and microgrids are used to provide alternatives to aging centralized power distribution systems and relieve some of the stress of high demand.

Distributed Power Generation

Definition: Distributed power generation is the use of small-scale power generation technologies located close to the loads that are being served. Distributed power generation systems can include PV arrays, wind turbines,



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biodiesel generators, and other relatively small-scale power systems. See Figure 2.

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Web: <https://www.kary.com.pl/contact-us/>

Email: energystorage2000@gmail.com

WhatsApp: 8613816583346

