

Test Your DER IQ

Think you're knowledgeable about Distributed Energy Resources (DER)? See if you can answer the questions below.



Question #1

Which of the following is a DER technology? Select all that apply.

1. Enhanced geothermal
2. Green hydrogen
3. Biomass gasification
4. Compressed air storage
5. All of the above
6. None of the above

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Question #1 Answer: #2. Hydrogen produced using excess wind or solar electricity for the hydrolysis of water is called “green hydrogen”. Equipment for the production and use of green hydrogen is available “modularized” for easy installation. Green hydrogen stores energy to generate electricity when renewables aren’t available, power cars, trucks and buses or use in various chemical processes.

Enhanced geothermal (not advanced geothermal), biomass gasification and compressed air storage systems usually require special geographic characteristics making them difficult to “distribute”.



Question #2

True or False? The supply of electricity from the local utility is more reliable than electricity from a Combined Heat & Power (CHP) system.

Question #2 Answer: False. The tens of thousands of miles of electric transmission and distribution lines utilities use to deliver electricity to consumers are vulnerable to storms, fires, equipment failure and human and animal-caused problems. Because CHP systems generate electricity at or near the point of usage, there are naturally far fewer opportunities for problems. Facilities with CHP systems typically remain connected to the electric utility for supplemental or backup electricity.



Question #3

Wind and solar are key elements of DER. More recently the concepts of wind “plus” and solar “plus” have emerged. What does the “plus” mean? Select all that apply.

1. Storing renewable energy in Li-ion flow batteries or other types of batteries
2. Selling excess renewable electricity
3. Making ice in a thermal storage system
4. Using renewable energy for thermal heating
5. All of the above
6. None of the above

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Question #3 Answer: #1 & #3. “Plus” refers to storing wind and solar energy for use at a more beneficial time. Batteries store renewable energy in an electrochemical process and produce electrical current. Alternatively, renewable energy can be stored in a thermal process by making and storing ice for later use to minimize the electricity needed to run chillers.



Question #4

What's the most important factor to consider when evaluating a potential CHP application? Select one.

1. The electrical load
2. The thermal load
3. The type of prime mover
4. The amount of floorspace
5. A and B should be considered equally
6. None of the above

Question #4 Answer: #2. Complete utilization of the waste heat is what gives CHP systems efficiencies in the 65-85% range. If the waste heat isn't utilized, CHP systems would have efficiencies in the 30-40% range. Therefore, CHP systems are typically sized to utilize the maximum amount of heat, even if the corresponding generation does not completely meet the maximum electrical demand of the facility.



Question #5

One of the major benefits of DER is resilience or the ability to withstand long-duration power outages. Which of the following terms are related to DER resilience? Select all that apply.

1. Blackstart
2. Microgrid or nanogrid
3. Islanding
4. Critical infrastructure protection
5. All of the above
6. None of the above

Question #5 Answer: #5. When natural disasters or major grid problems occur, facilities can be without electricity for days or weeks. Various DER can power facilities through long outages.

“Blackstart” refers to the ability to start up an electrical generator without power from the grid. Islanding is the operation of a facility or microgrid separate from the electrical grid. A microgrid is a group of interconnected generating sources and loads that can operate independently of the electrical grid, and a nanogrid is a portion of a microgrid. For example, a microgrid might be comprised of 480VAC, 120VAC and 12VDC nanogrids.



Question #6

True or False? CHP systems using natural gas are no more sustainable than large utility power plants using the same fuel.

Question #6 Answer: False. CHP systems are significantly more energy efficient than large central power plants and distribution systems. This increased efficiency results in reductions in greenhouse gas emissions of up to 40%.



Question #7

How can DER help lower electricity costs? Select all that apply.

1. Minimizing demand charges
2. Limiting electrical consumption at peak load times
3. Reducing the price of utility-supplied electricity
4. Supporting demand response
5. All of the above
6. None of the above

Question #7 Answer: #1, #2 & #4. DER enable control of the amount and timing of electricity purchases from the local utility in order to minimize electricity consumption costs and delivery-related charges. This control also offers the flexibility to minimize electricity costs when electricity rates or charges change. However, consumers can usually only reduce the price of electricity by changing suppliers or billing options.



Question #8

Utilities and state governments offer tax and financial incentives to promote the installation of DER in commercial, industrial and other facilities. Why? Select all that apply.

1. To help minimize the “stress” and capacity “bottlenecks” on the electric grid
2. For the substantial environmental benefits
3. To help meet state renewable portfolio objectives
4. To make critical infrastructure more resilient
5. All of the above
6. None of the above

Question #8 Answer: #4. Nearly two decades old, the DER concept is now recognized as a holistic solution to numerous challenges including:

- Integration of renewable energy sources into the grid
- Decentralization of generating resources
- Demand-side management (DSM), and
- Decarbonization of the electrical supply



Question #9

True or False? CHP systems provide premium quality electricity and very high reliability.

Question #9 Answer: True. Most power quality problems such as voltage sags, chronic low or high voltage, phase loss and blackouts originate on the transmission and distribution system. On-site generation eliminates those problems. Moreover, CHP systems with multiple, redundant generating units permit the loss of one or more units without impacting operations.



Question #10

Why is the natural gas supply system more reliable than the electric grid? Select all that apply.

1. The natural gas pipeline system is mostly located underground
2. The electrical grid is much more vulnerable to single point, cascading failures
3. The natural gas supply system doesn't need electricity from the grid to operate
4. The natural gas system doesn't require the constant balancing between production and demand that the electrical grid requires.
5. All of the above
6. None of the above

Question #10 Answer: #5. A quote from an MIT study of the natural gas and electrical supply systems summarizes the situation best:

The natural gas network has few single points of failure that can lead to a system-wide propagating failure. There are a large number of wells, storage is relatively widespread, the transmission system can continue to operate at high pressure even with the failure of half of the compressors, and the distribution network can run unattended and without power. This is in contrast to the electricity grid, which has, by comparison, few generating points, requires oversight to balance load and demand on a tight timescale, and has a transmission and distribution network that is vulnerable to single point, cascading failures.

BONUS

Bonus Question

We hear about an aging electrical system. So, what year did the first central power plant go into service in the U.S.? Select one.

1. 1876
2. 1882
3. 1887
4. 1891
5. 1892

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Bonus Question Answer: #2. Starting operation in 1882 with 82 customers using 400 Edison lamps, the Edison Illuminating Company's Pearl Street Station in Manhattan was the first commercial power plant. While the Pearl Street generating station is long gone, some parts of the electric grid are over a century old and 70 percent of the grid's transmission lines are more than 30 years old.

How did you do answering the questions?

If you're ready to start getting answers about DER for your facility, contact ENGIE MEP Services.