

The Smart Grid

Objective:

Students will learn about the smart grid.

Materials and Curriculum
Correlations ▼

► Introduction

Smart grid technology allows multiple paths of communication between utilities, their customers and energy production sites. It uses computer based remote control and automation. These systems are made possible by two-way communication technology and computer processing that has been used for decades in other industries. They are now used on electricity networks, from the power plants and wind farms all the way to the consumers of electricity in homes and businesses. They offer many benefits to utilities and consumers, mostly improvements in energy efficiency on the electricity grid and in the energy users' homes and offices.

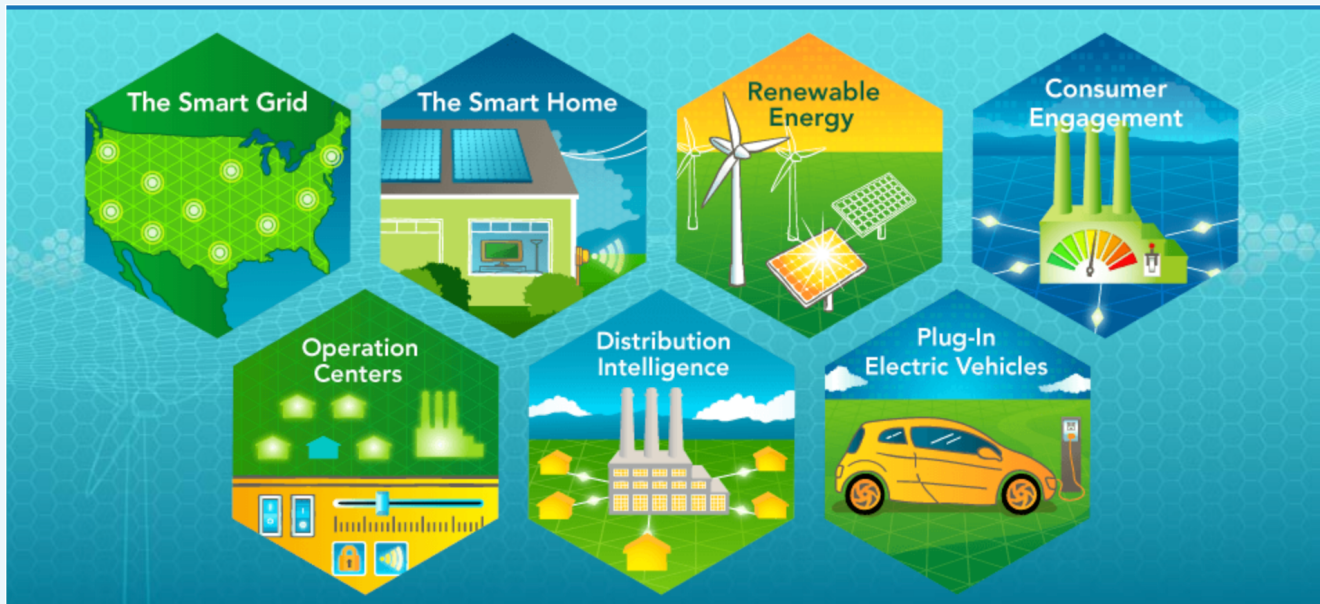
For a century, utility companies sent workers out to gather much of the data needed to provide information for electricity billing or damages. The workers read meters, looked for broken equipment and measured voltage. Today, most electric meter installations by utilities in the U.S. use smart metering infrastructure.

The grid amounts to the networks that carry electricity from the plants where it is generated to consumers. The grid includes wires, substations, transformers, switches and much more.

Procedure

1. Research the Federal Energy and Regulatory Commission (FERC).
2. Research the North American Electric Reliability Corporation (NERC).
3. What is the relationship between either of these organizations and the smart grid?
4. What are other emerging technologies in electric power transmission and distribution? Consider automation technologies such as Supervisory Control and Data Acquisition (SCADA), Advanced Metering Infrastructure (AMI), automated transfer system and fuel cells.
5. Individually or as a group, have students watch the U.S. Department of Energy video about the smart grid at [youtube.com/watch?v=JwRTpWZRejk](https://www.youtube.com/watch?v=JwRTpWZRejk). Then have students answer the following questions.

What is the smart grid?



(Source: energy.gov/smart-grid, accessed February 2025)

1. What makes a grid “smart?”
2. What does a smart grid do?
3. How does a smart grid give customers control?
4. What are the components of the smart grid?
5. What does the smart grid have to do with home energy management systems?
6. What are smart appliances?
7. How can home power generation systems use the smart grid?
8. How can renewable energy be connected to the smart grid?
9. What is consumer engagement?
10. What are time of use programs?
11. What is net metering?
12. Describe several financial incentives in connection with the smart grid.
13. What are grid operation centers?
14. How can the smart grid be self-healing?
15. How can the smart grid help prevent blackouts?
16. What is distribution intelligence?
17. How does the self-healing power distribution system respond to outages?
18. How will the smart grid help to fuel plug-in electric vehicles (PEVs) and promote the infrastructure to charge PEVs in the future?

To Know and Do More

1. Research your local utility and determine if they have installed smart meters in your area. If they don't, do they have plans to do so in the future?
2. List all possible careers that are needed to make the smart grid?

Materials Needed:

- Internet

Curriculum Correlations

K-ESS2 - 2

K-ESS3 - 3

4-PS3 - 2

4-PS3 - 4

4-ESS3 - 1

5-ESS3 - 1

MS-PS2 - 3

MS-ESS3 - 3

MS-ESS3.A

HS-PS3.B

HS-ESS3 - 1

HS-ESS3 - 4