

Energy Farm

Resources: Teacher Notes; PowerPoint slide; Activity Sheet

🔗 Siemens Energy Farm energyfarmgame.co.uk

Introduction

This simulation represents a farm with a budget to install energy generation equipment. Several different types of technology are offered, and users must decide what technologies to set up in order to keep the supply maintained, keep running costs down and avoid damage to the environment.

After trialling a set-up, feedback is provided and the opportunity to alter the chosen set-up is given, users can then see if improvements can be made against the three performance indicators.

Teaching materials can be used in a variety of ways, a suitable method is suggested below:

1. Use the PowerPoint slide to introduce the interactive resource and explain the context. Get students to understand that they need to make decisions about how to set up the system they will be trialling, using the information provided and ensure their understanding of the value of different options.
2. Get students to use the interactive resource, setting up a system and seeing how it works. Ideally, provide them with enough time to modify their design and see if they can address any shortcomings indicated in the simulation feedback.
3. Follow up with the activity sheet, this presents students with feedback from a hypothetical system and asks them to interpret the data.

Learning Objectives	Learning Outcomes
• To design a power generation system that will produce electricity cheaply, reliably and without damaging the environment.	• To justify decisions about aspects of a power generation system

Why this technology is important:

The traditional power grid provides reliable power – most of the time. But when natural disasters or security breaches threaten the grid, the ensuing blackouts can be catastrophic and costly. That's why companies and utilities are working together to build resilient, flexible power systems called microgrids.

Microgrids can generate, distribute, and control power in a campus setting, a small community, in critical infrastructures, military institutions, commercial and industrial areas, remote locations, and on islands.

Answers to support Pupil Activity Sheet

Activity sheet:

Q1:

Overall, they suffered a power cut but managed to keep the running costs low and minimise environmental damage.

Q2:

They didn't manage to maintain a constant supply of electricity as on Day 1 they ran out of power. It was cloudy so the solar cells would have been less effective and there was little wind to power the wind turbines.

Q3:

Their running costs were reasonably low as they were not having to buy fuel or pay for power from the National Grid.

Q4:

They managed to avoid damaging the environment by relying on wind, solar and biogas.

Q5:

There are several responses that could be made, the important observation is to have a back-up plan for a still and overcast day. One way is to install a petrol generator, which will avoid power cuts but which is expensive and polluting. Another is to buy a connection to the National Grid. This is more expensive to set up but a cheaper source of power and less polluting. The important thing is for students to try different solutions and settle on a trade-off of the different factors.

Answers to support Powerpoint Slides:

Powerpoint Slide Answers:

Q1:

Suggest what the graphics represent, selecting from:

- Photovoltaic cell
- Storage batteries
- Biogas generator
- Wind turbine
- Connection to the National Grid
- Petrol generator

This is the equipment purchasing screen on Energy Farm.

Q1. Suggest what the graphics represent, selecting from:

- photovoltaic cells
- storage batteries
- biogas generator
- wind turbine
- connection to the National Grid
- petrol generator

Q2. For each of these, suggest why they might be useful as part of the power generation set up on a farm

Q3. Suggest a potential disadvantage or limitation with each one

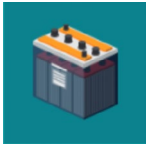
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Q2:

For each of these, suggest why they might be useful as part of the power generation set up on a farm

Q3:

Suggest a potential disadvantage or limitation with each one

Power source	1. Graphic	2. Use	3. Limitations
Photovoltaic cells		Produce electricity from sunlight.	Only function when light is falling on them.
Storage batteries		Store energy generated when this is in excess of demand for times when demand is greater.	Can only store what is generated and have a limit as to how much can be stored.
Biogas generator		Uses organic material to produce biogas which can be used as a fuel or used to produce electricity.	Depends on quality and quantity of organic material.
Wind turbine		Uses wind to turn blades and generate electricity.	Only works when the wind is blowing.
Connection to the National Grid		Enables electricity to be bought in if local supply is low. Also allows excess electricity generated on site to be sold to grid.	Electricity from the National Grid is generated using a range of technologies, some of which have a negative impact on the environment. It is more expensive than producing electricity from the wind or sun.
Petrol generator		It can be started up at any time to produce a supply of electricity.	It is expensive to run and polluting.

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Energy Island

Find the balance between cost, pollution and efficiency to keep Energy Island from grinding to a halt!

Infinity STARship

Virtual tour, discover quizzes, hear from Siemens apprentices and young graduates about the path they have followed to their career at the Wonder Wall and experience the SeeMe science and engineering show in the Auditorium.

Decarbonisation Game

Join the STARship crew on their first intergalactic mission to secure a sustainable future and protect Earth's resources.