Comprehending Science: Black Start

The Comprehending Science series of resources uses extracts from Drax website articles that are relevant to the national curriculum, alongside comprehension questions. We've also made available a longer version of this resource, providing additional short answer questions and challenges.

Teacher notes

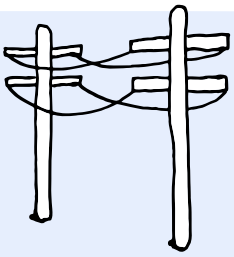
Most suited to	KS3, KS4
May be suitable for	KS2
Skills	Comprehension, scientific literacy
Subject	Science, English language
Topic	Electricity generation, sources of energy, electricity
Suggested use	Lesson activity, homework, remote provision, home learning
Resources needed	Optional internet access, paper or electronic copies of worksheet and questions
Mark schemes guidance	Suggested or model answers are provided

Feedback: https://forms.office.com/r/VkQ6FF4xxJ

Contact us: educational.resources@drax.com

Comprehending Science: Black Start

- Read the text below about a backup plan for the UK's national grid, which brings electricity to individuals and organisations across the country. We've based the text on this Drax web article: www.drax.com/power-generation/black-start-important-back-plan-youve-never-heard
- Use full sentences to answer the questions, either in your book or on the sheet. The numbers in brackets after each question help you find the line number(s) you need in the text.



Black Start: the most important back up plan you've never heard of

Although a nationwide grid blackout may be unlikely, it is something that's prepared for. The challenge is that, normally, all power stations need an electrical supply to start up – and with a total blackout, there's no electricity to restart the system. That's why the reboot procedure is called 'Black Start'.

Tests happen regularly to assess how long it would take to restart an individual generation unit at a major power station and bring it up to capacity. These tests help to make sure that any Black Start would run smoothly. However, not all power stations can do a Black Start – some simply don't have the ability to be the starting point of a system reboot. In contrast, modern gas and biomass power plants can restart rapidly on demand; Drax Power Station uses biomass and is a key part of today's Black Start planning.

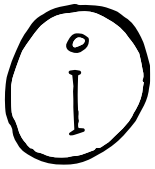
The way it works is relatively simple: using smaller power sources to start ever bigger ones, scaling up and up until the entire country has power. The auxiliary generating units at Drax Power Station consist of three gas turbines that staff can get started by accessing the power stored in batteries nearby. These would generate enough power to restart one or two of the plant's main generating units, which would then be used as the backbone of an 'island network'. Operating independently of the national grid, this network would grow by adding pockets of supply. The generating units would match the speed and frequency of the national grid to create normal grid conditions – and to quickly restore supplies locally. Finally, the affected area's 'island networks' would be hooked up to each other to distribute electricity around the country with the reliability and stability we're accustomed to.

Comprehending Science: Black Start Questions

1. What's the name of the emergency reboot procedure used in the event of a complete power cut? (4)
2. What type of stored electricity is used to begin the restart process? (14)
3. Which fuel is used in the auxiliary generating units? (14)
4. What is the next step after starting the auxiliary units? (16-17)
5. Is power returned to the grid for the whole country at the same time? (18-22)
6. Is electricity usually available when we need it? (22-23)

Feedback:

Comprehending Science: Black Start Answers



1. The emergency procedure used in the event of a complete power cut is called a Black Start.
2. Batteries are used to begin the restart process.
3. Gas is used in the auxiliary generating units.
4. After starting the auxiliary units, the next step is to use the electricity to restart one or two of the generating units within the main power station.
5. No, power isn't returned to the whole country at the same time. Restarted units restore a local supply, in a series of 'island networks'. These smaller, local networks are then joined together when they're stable.
6. Yes, the national grid is generally very reliable so there's electricity available when we need it.