# Maths

## Pylons and Cabling - Loci and Constructions

## Overview of Session

**Session Length** | 60 mins

**Age Group** | 11-14 Years

### Learning Outcomes

This lesson introduces students to pylons and cabling and how they are used by Northern Powergrid. It introduces students to planning regulations and shows contextual use of loci and constructions. Students will need prior knowledge of loci and constructions to complete the main task, alternatively this lesson could be used to identify these concepts.

### Learning Outcomes

- To identify how loci and constructions can be used in a real-life context.
- To work collaboratively to use loci and constructions to aid network planning.

## Lesson Overview

**This lesson demonstrates how students' mathematical skills can be applied to a real-life context. By applying learning to the context of Northern Powergrid's electricity distribution network, it also provides students with a greater understanding of how electricity is supplied to homes and businesses across its operating region.**

In addition to mathematical skills, students are also encouraged to use reasoning skills to help identify what needs to be taken into consideration when planning a network. Students are encouraged to develop their understanding of the topic. The extension task introduces students to technical language, such as 'creep'.

## Key Terms and Principles

Loci, constructions, pylons, scale, creep, cabling.

## Resources

- PowerPoint presentation
- Information sheet

**Teacher to provide:**

- A3 Print-out of a satellite map of the local area
- Compasses
- Rulers
- Protractors

# OK, Let's Go!

# Part 1: Introduction

Suggested length | 15 mins

**Provide an overview of Northern Powergrid.**

Students are shown selections of pictures of different pylons and asked to consider responses to the following questions:

- What are shown in these images?
- What are they used for?
- What shapes can you see?

## Resources

- PowerPoint slide

# Part 2: Body of Lesson

Suggested length | 30 mins

## Setting the Scene

- Class led discussion on loci and constructions, reminding the students of the key skills (angle bisectors, perpendicular bisectors, distance from a point, and distance from a line.)
- Students work in pairs to discuss how these mathematical skills could be used by Northern Powergrid.
- Students are then shown what pylons are used for and how they are connected to the network.

## Resources

- PowerPoint slide

## Task 1

- **Think, pair, share**
  Students should draw up a list of issues that Northern Powergrid needs to consider when placing pylons and cables. For example, safe distances from amenities such as roads, schools, railway tracks etc. disruptions to wildlife, concerns from locals about any possible health issues, disruption the look of the landscape.
- What other issues does Northern Powergrid need to take in to consideration to ensure safety? Can you provide examples?
- Introduce students to the planning regulations that Northern Powergrid faces.

# Task 2: Planning a Network

- Provide students with an A3 map of a section of the town, a list of building regulations and recommendations from local authorities (please see information sheet).
- In pairs, students will need to use loci and constructions to highlight areas on the map where the pylons and cabling could be placed and then choose where they should be placed. Groups should be encouraged to build a case for their decisions. Students will also be required to use scales correctly.

## Resources

- A map of the town
- Information sheet

## Extension Task

**There is an extension task where students will have to investigate what is meant by creep and then use the values associated with creep and identify any changes this causes to their network planning.**

### Creep

**For engineers working with equipment like pylons and turbines, "creep" refers to the way materials move and deform under mechanical stress. For example, if metals are exposed to heat for long periods of time, this will contribute to "creep".**

**The deformation caused by creep can lead to malfunction, failure and damage. The rate of change/ deformation (creep) is calculated by taking into account the properties of a material, exposure time, exposure temperature and the applied structural load.**

## Next Steps

**Students present their own scenario using loci and constructions**