North East Ambition

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North East Energy Sector Toolkit Teacher Guide
Careers in Low Carbon Heat

Introduction

These resources have been designed to be used as starter/plenary sessions for subject lessons, connecting to relevant topics within the scheme of work or related subject specific skills. There are links to additional resources or optional extension activities which could support a full careers lesson if desired.

Learning Objectives

- Learn about the Energy sector and why it is important to the North East economy.
- Gain an awareness of the different job roles available in different industries within the North East Energy sector and how these may be appealing as a future career.
- Gain an understanding of the relevance of the curriculum to careers in the North East labour market and what skills and academic subjects are required for these roles.

North East Low Carbon Heat sector – Background Information

There are 3 current pathways being explored which include:

- Electrification – most homes to be heated by electricity which means the installation of a heat pump (replacing the traditional boiler)
- Hydrogen – most homes to be heated by hydrogen, which is a low carbon (so greener) form of gas. This would require a large increase in electricity generation (the North East has the first homes to be powered entirely by hydrogen)
- Hybrid – around half of home would run on electricity with others having hybrid heat pumps fitted which run on electricity, but have a gas back-up option

The North East is well positioned to make a huge contribution to the UK's net-zero target and is on its way to becoming the UK's first cluster for low carbon heat innovation, supply chain and delivery. The region:

- Has world class test and demonstration facilities to aid development of clean energy technologies
- Offers a geographically diverse landscape with a mixture of urban and rural sprawl to test and demonstrate low carbon energy technologies
- Has a deep heritage in energy production, generation, and supply
- The UK heat networks sector could create up to 35,000 direct additional jobs in the UK by 2050
- The current pipeline of heat network projects in the UK is worth over £1.2billion, the North East & Tees Valley pipeline could be over £500m

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Video activities

Students to answer questions using information provided in the videos, which provide context to the opportunities in the North East:

The path to zero carbon heat (3:10)
https://www.youtube.com/watch?app=desktop&v=BEc3GdtAjSM
Introductory video of the challenge faced by the UK to achieve net zero and offering 3 alternatives to fossil fuels – electrification, hydrogen and hybrid. Clear explanations of what each path involves.

How the North East is leading low carbon technology to tackle climate change (6:07
https://www.youtube.com/watch?v=9t-H9H_yErc Tees - YouTube
ITV local news report on how the North East is at the forefront of new technologies to help the UK achieve its Net-Zero ambitions, specifically looking at what is being done to address the challenge presented by half of the total energy used in the UK being used to heating our homes buildings and water supply, which is primarily done by gas

The following videos show people working in the sector and highlight some of the skills and qualifications which could help with a career. You do not need to show all the video clips but can select those which are most relevant to your students.

Northern Gas Network (2:48)
https://youtu.be/30Bl_L0cLEo
Two NGN staff involved in the Hydrogen homes project talk through their roles and career journeys. One progressed into their role through in-work training, while the other took an apprenticeship route.

North East LEP – Energy Accelerator heat programme (5:02)
https://youtu.be/GaDIg04-do4
Graduate civil engineer shares insight into her role as a programme manager, supporting low carbon heating projects. Highlights the different career routes an engineering qualification can lead to.

Gateshead Council (1:51)
https://youtu.be/_oy7f0wFJ9o
Apprenticeship qualified energy technician introduces his role managing utility contracts in the borough and projects to improve energy efficiency and work towards net zero. For example by developing solar farms and district heating networks.

Durham University
https://youtu.be/u8N8puzJFEQ
Durham University PhD student explains the applications of Geology in low carbon heat projects such as the use of mine water for geothermal district heating. Shares her route into a research-based career and outlines regional strengths.

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Curriculum links

These toolkit resources could be used to introduce a new topic, subject content or to make general links between your subject and how the skills and knowledge acquired can support a future career.

Select the links relevant to your subject from the table below and insert into slide 9 of the lesson PowerPoint template, to highlight the connections between the subject/topic taught and careers in the North East labour market.

Science curriculum links		
Key stage and subject	**Curriculum link**	**These skills and knowledge are important to this industry because**
KS3 Science	**Energy**	The transition to low carbon heat provides an opportunity to discuss fuel use and costs in the domestic context, for example insulation to improve energy efficiency and reduce costs. Domestic heat pumps and district heating networks use the principles of heating and thermal equilibrium in their systems to heat up homes and buildings.
	Materials	Understanding properties of materials and how to develop new materials with certain properties is important to develop new technology and improve efficiency to support our low carbon heating future.
	Earth and atmosphere	Low carbon domestic heating is a key part of the government strategy to reduce carbon dioxide emissions and combat climate change.
KS4 Biology	**Ecology**	Increased carbon dioxide in the atmosphere through human activities is impacting ecosystems and biodiversity. Low carbon domestic heating is a key part of the government strategy to reduce carbon dioxide emissions and combat climate change.
KS4 Chemistry	**Bonding, structure, and properties of materials.**	Understanding properties of materials and how to develop new materials with certain properties, is important to develop new technology and improve efficiency to support our low carbon heating future.
	Chemistry of the atmosphere	Low carbon domestic heating is a key part of the government strategy to reduce carbon dioxide emissions and combat climate change.
KS4 Physics	**Energy**	Calculating energy changes and efficiency, understanding energy transfers and specific heat capacity are essential in the design of heating systems and networks.
	Electricity	Calculating current and resistance and designing electrical circuits is key in the design of heat pump systems and technology for homes. Domestic installers and technicians need to understand circuits and potential difference in home heating electrical systems. Demand for these skills will increase as more homes have heat pumps fitted.
Additional subject related skills	Development of skills such as scientific thinking, analysis and evaluation of data and risks, and an understanding scientific vocabulary, units and nomenclature is essential across all aspects of the low carbon heat industry. In order to design, manufacture and test new technologies and safely install and operate low carbon heat systems.	

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Maths Curriculum links

Key stage	Curriculum link	These skills and knowledge are important to this industry because
KS3	**Geometry and measures**	Geometry is used to develop and analyse scale drawings which are then used to manufacture equipment and install low carbon heat systems.
KS4	**Algebra**	Algebra is used to model situations to design home heating systems and new low carbon heat technology. The ability to interpret mathematical relationships both algebraically and graphically enables efficient and effective low carbon heating systems to be developed and evaluated.
	Geometry and measures	Geometry is used to develop and analyse scale drawings which are then used to manufacture equipment and install low carbon heat systems.
	Algebra	Algebra is used to model situations to design home heating systems and new low carbon heat technology. The ability to interpret mathematical relationships both algebraically and graphically enables efficient and effective low carbon heating systems to be developed and evaluated.
	Probability	Probability is important when evaluating the safety of equipment, manufacturing, and installation processes.
	Statistics	The ability to describe, interpret and compare data sets is used across the design, manufacture, and evaluation of low carbon heat technology and systems.
Additional subject related skills	Critical thinking, problem solving, analytical thinking and quantitative reasoning are skills used daily by those working in the design and manufacture of new domestic heating technology, and in the safe installation and operation of low carbon heat systems.	

English Curriculum links		
Key stage	**Curriculum link**	**These skills and knowledge are important to this industry because**
KS3 & KS4	**Spoken language**	The ability to hold discussion and debate as well as to work collaboratively is important to communicate effectively with colleagues. Being able to use technical language and adapt the language used depending on your audience is key when communicating with customers and other stakeholders.
KS3 & KS4	**Reading and Writing**	Reading for information, enhancing vocabulary through sector specific language and able to write for a variety of purposes and audiences e.g. through reading technical publications and instructions or to produce reports for a variety of audiences.
Additional information	Skills developed through English are important to the Low Carbon sector to ensure that employees are kept up to date with changing practices, able to clearly read and understand safety instructions and to work collaboratively. The information in the videos and presentation can be used as a research base to allow students to create their own piece of work e.g. a spoken or written piece around the importance of switching to Low Carbon energy.	

Additional activities and further information

There is an optional research task on slide 7 and 8 of the PowerPoint presentation if you would like to expand this activity into a full lesson. There is also an optional plenary on slide 10 which could be used as a reflection activity following a subject lesson. These could also be set as home learning tasks.

You can access more resources relating to careers in the curriculum on the North East Ambition website and on the Careers and Enterprise Company website.

If students are interested in finding out more about the industry in the and the varied career routes and opportunities available, there are some links on the plenary activity on the final slide which may be of interest.

Careers in the Curriculum CPD resources

Useful links for teachers to develop skills and knowledge to connect careers to the curriculum:

- Careers in the curriculum online CPD course delivered in partnership with NU:STEM
  - —Careers in initial teacher education 1 – Unconscious bias
    https://www.youtube.com/watch?v=DLSVltC8oNE
  - —Careers in initial teacher education 2 – Aspirations and gender
    https://www.youtube.com/watch?v=fucKEq4MvN8
  - —Careers in initial teacher education 3 – Employability characteristics and role models
    https://www.youtube.com/watch?v=l3jryc1s87M
- Teacher industry insights session – Construction – May 2022
  https://www.youtube.com/watch?v=wHOfuXYT7SA
- Online CPD course available from STEM learning
  https://www.stem.org.uk/cpd/ondemand/443955/linking-stem-curriculum-learning-careers