

Energy in Great Britain

An introduction



What is in this slide deck?

This slide deck is an **introduction to energy system in Great Britain**. Although there are other types of energy, this deck will look specifically at **electricity** and **gas**. This deck breaks down the different parts of gas and electricity systems - how electricity and gas are used across sectors and also how our use is changing in order address climate change. We are witnessing a time of huge challenges but also opportunities for a cleaner, more sustainable energy system.

Part 1 (slides 3-16) is a summary of the energy system, specifically electricity and gas. They're very high level and list some of the key actors and issues.

Part 2 (slides 17-32) goes into more detail into each of these areas. Head to this section if there's something you're particularly interested in.

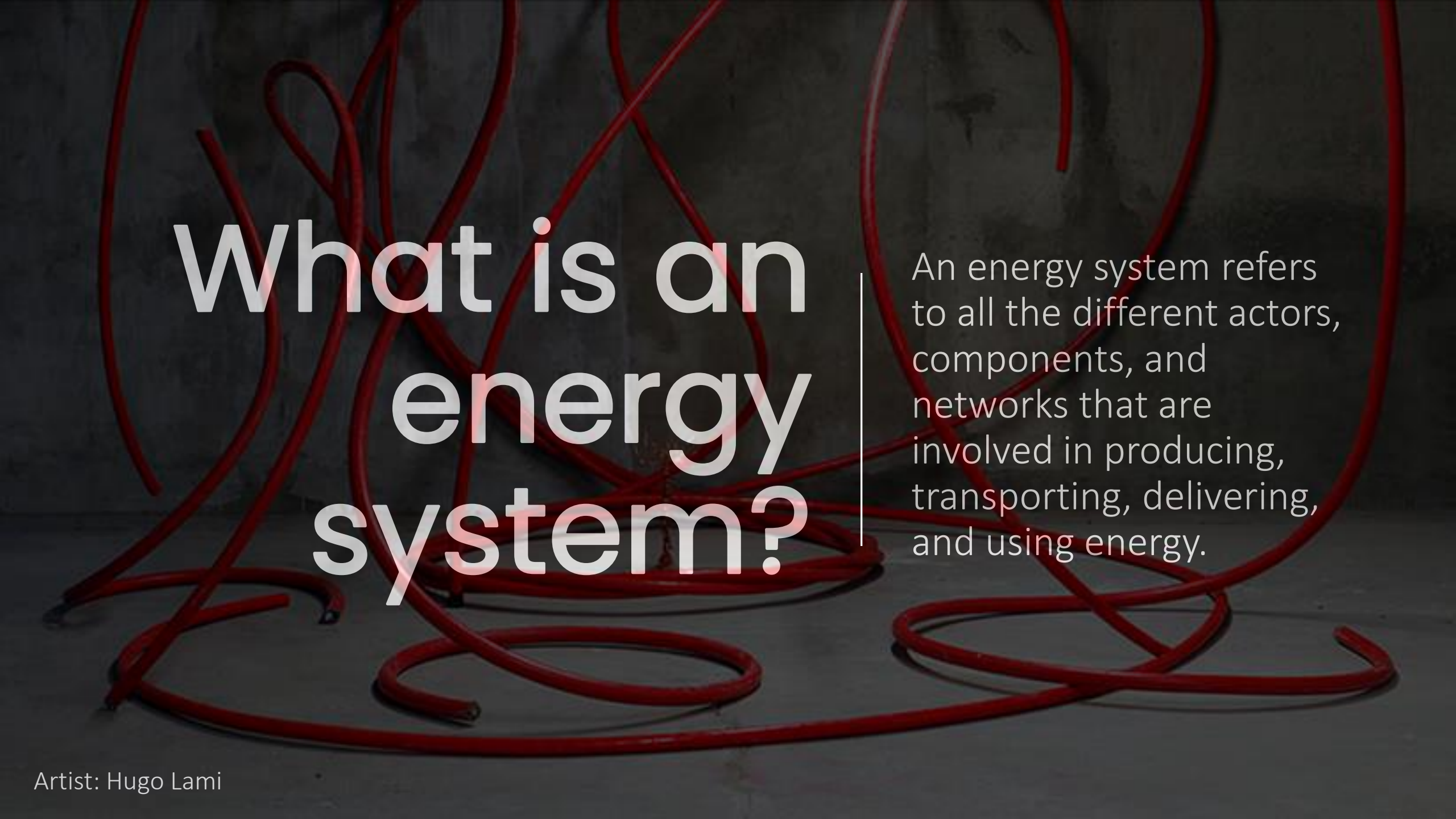
Part 1: Summary





Energy is an essential service

- Energy is essential for many aspects of our lives.
- We need energy to heat our homes and water, to connect to the internet, and to power our appliances, amongst others.
- It is needed by individuals, businesses, and other organisations to function as society, as well as for our health and wellbeing.



What is an energy system?

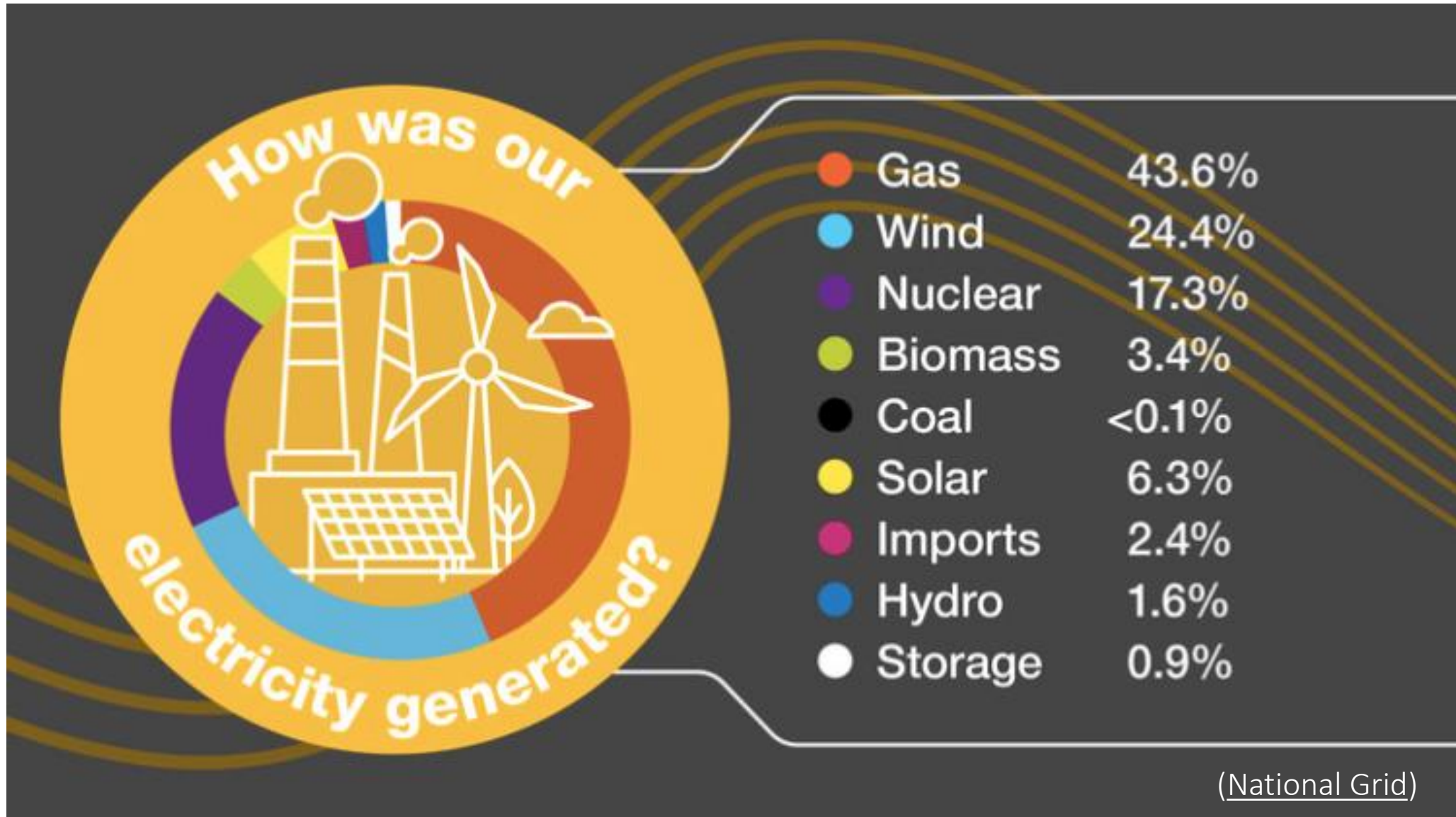
An energy system refers to all the different actors, components, and networks that are involved in producing, transporting, delivering, and using energy.

How is energy produced?

- Multiple fuels and technologies are used to produce the energy we use in Great Britain. These include fossil fuels - such as oil, gas, and coal; renewables - like wind, solar, and hydroelectric (which uses the flow of water to generate electricity); nuclear; and biomass – such as burning wood, plants, or waste.
- Great Britain is both an exporter and importer of energy, meaning we make our own energy which we transport and sell overseas and use energy produced elsewhere.
- Since the industrial revolution, the demand for energy has soared and the ways we source and use energy in Great Britain have changed significantly and will continue to change.
- Read more about fossil fuels and renewable energy in part two below.



Electricity Generation (May 2022)



How does energy get to our homes and other buildings?

In Great Britain, a network of powerlines and pipelines take electricity and gas along a journey to our homes and other buildings, and there are multiple actors operating along different points of this journey.

- **Energy producers**
- **Transmission companies** transport energy from large scale producers to the different places where it is used
- **Distribution networks** distribute energy at a regional level to where it's needed
- **Energy Suppliers** buy energy from producers and sell it to us (through our energy bills)
- The **System Operator** manages the electricity system – their control room makes sure there is always enough energy for everyone.



This video introduces our electricity network



[Click this link for the above video on our electricity network from National Grid](#)

What makes up the cost of your energy bill?

Our energy bills include the costs of wholesale costs of buying the energy from producer, costs of energy distribution, government schemes (e.g. social and environmental), operating different parts of this energy system, tax, and other direct costs. The image below is an example of an energy bill breakdown.



[Click this link for more information on Ofgem's website](#)

Consumer Protection & Regulation

- While much of the GB energy market was once publicly owned and run by government-owned firms, most of the sector was privatised from the 1990s onwards. When government privatised the sector, they set up regulators to make sure that private companies treated customers fairly and provided good service, where possible by promoting competition.
- Gas and electricity markets are regulated by **Ofgem**
- There are also several other bodies that work to protect customers and regulate the gas and electricity markets:
 - The statutory energy watchdog – advocates on behalf of energy consumers
 - The energy ombudsman – deals with complaints from consumers
 - Company self-regulation – companies set their own voluntary standards and codes

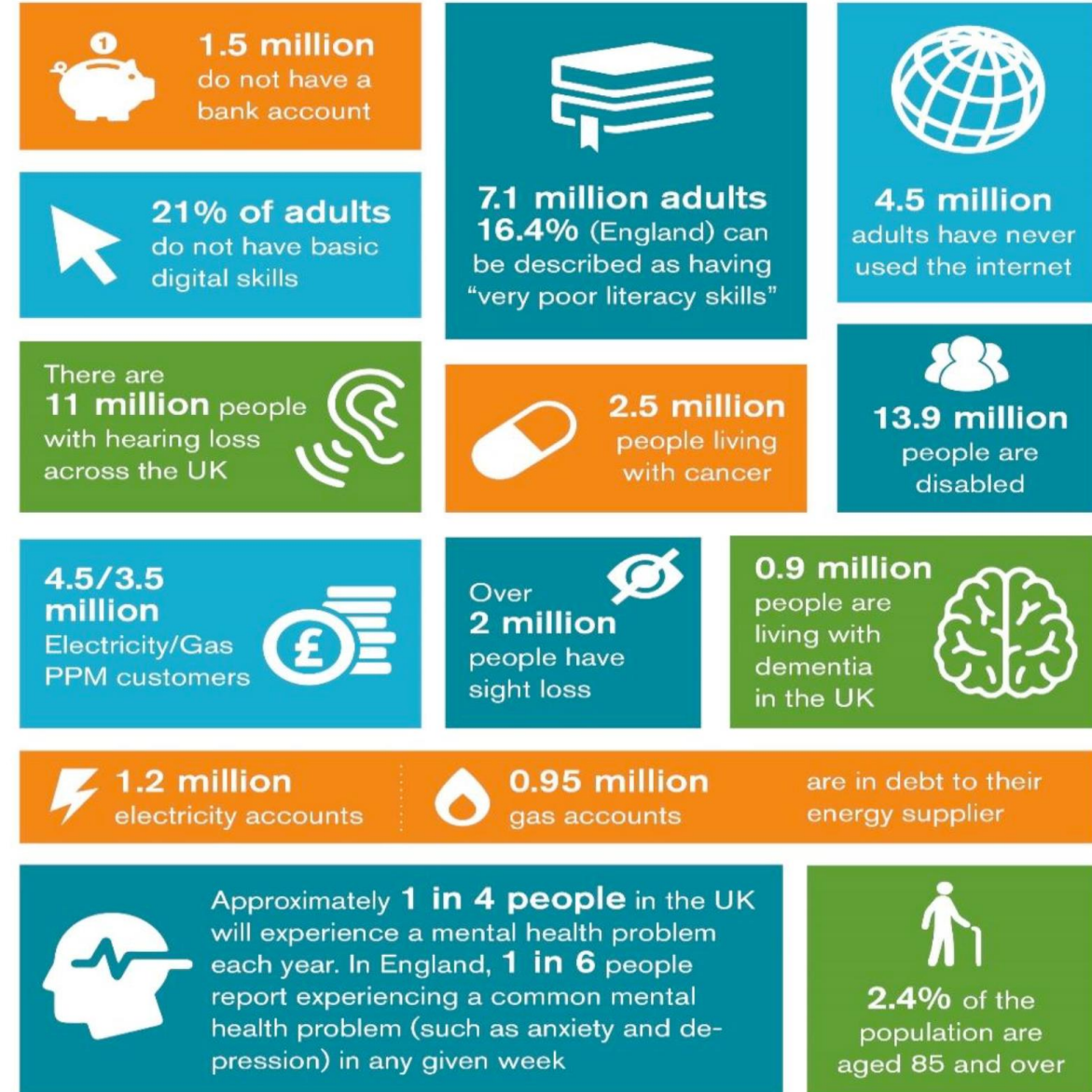
Who is Ofgem and what do they do?

- Ofgem's role is to protect consumers by working to deliver a greener, fairer energy system.
- Ofgem set and monitor rules that gas and electricity network companies and suppliers must meet. For example, Ofgem are responsible for setting the price cap – this limits the amount of energy suppliers can charge consumers in our bills, per unit of gas or electricity.
- Ofgem have enforcement powers and can issue fines.
- The core rules that companies must follow are set out in licence conditions and guidance by Ofgem.
- The regulator can also use 'soft power' by setting expectations of things they want companies to do.

Vulnerability

Socio-economic characteristics

GB adults unless stated



Looking to the future

- In the short and longer term there is expected to be a lot of social, economic and environmental change.
- There will also be increasing digitalisation, new smart technologies in our homes and changes in the way energy is produced and used.
- It is really important that everyone is protected, and we are all able to benefit from future changes to the energy market -no matter who you are or where you live. Nobody should be left behind!



THE
FUTURE

[Click this link for a video from Ofgem on the future of energy](#)

Some future trends

Technological change e.g.

- Growth in renewable energy
- Community energy
- Increasing digitalization
- Smart meters and smart grids
- Smart homes

Political change e.g.

- Net zero targets
- Geopolitical e.g. Ukraine War impacting energy security

Social change e.g.

- Population growth
- Increasingly aging and disabled population
- More homes, smaller households, and dispersed families
- More private renters
- Changing customer expectations and values e.g. in relation to speed of customer service, sustainability, net zero, fairness
- Changes in way we use energy e.g. increased home working, electric vehicles, more cooling equipment

Environmental Change e.g.

- Increasing flooding and storms
- Heat – growing need for cooling
- Biodiversity change

Economic change e.g.

- Affordability of energy bills
- Economic uncertainty
- Rising inequality

What are some of the key challenges in the energy sector?

- Tackling **climate change** and reaching '**net zero**' (*by net zero we mean cutting greenhouse gas emissions that cause climate change to as close to zero as possible, so that the amount of emissions being released and removed from the atmosphere are balanced*) e.g. What action should different organisations and customers take? Who pays?
- **Affordability** of energy e.g. how can we make sure everyone can afford energy and new products and services that can improve their lives?
- **Accessibility and inclusion** e.g. how do we make sure new smart and green products and services are easy to use for everyone regardless of your income, where you live, if you have good internet or additional needs?
- **Resilience and reliable supply** e.g. how do we keep the energy flowing even with increasing storms, flooding, increased and shifting energy use, more intermittent energy sources such as wind.
- **Protections** e.g. how do we ensure consumers are safe and treated fairly as the energy system and the energy market changes?

What are some of the opportunities in the energy sector?

- **Tackling Climate Change & improving air quality** - greener cleaner energy
- **Affordability** e.g. new more affordable energy options & greater control over how we manage and pay for energy
- **Accessibility and inclusion** e.g. new products and services could make it easier to use and access services.
- **Resilience** e.g. national and local generation could increase energy security. There will be new ways to protect customers i.e. timely support during power interruptions or fewer interruptions with smart grids.

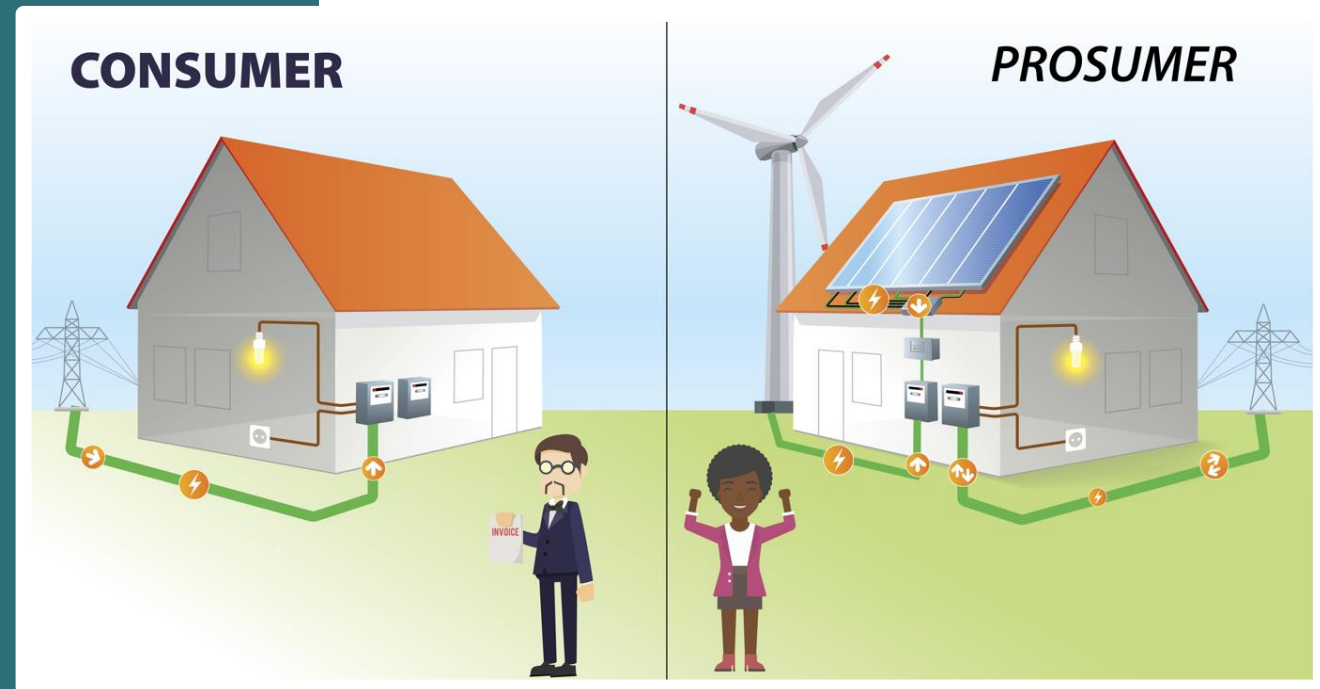
Part 2: Extra Details



Energy producers

Energy producers include oil and gas companies and renewable energy companies, such as those operating wind farms.

Although most of the energy we use today is produced by large-scale producers, we are also seeing an increase in microgeneration – small-scale production of energy by households, communities, and small businesses, such as rooftop solar panels or community-owned renewable energy projects. The term ‘prosumer’ refers to someone who both produces and consumes energy – a shift made possible, in part, due to the rise of new connected technologies



How is energy produced – Fossil Fuels

- Before 2019, most of the energy we used in Great Britain came from fossil fuels, a non-renewable energy source.
- They are limited in amount and can take hundreds of thousands of years to form.
- Fossil fuels are made from decomposing plants and animals and are extracted from the earth and burned to create energy.
- When burned, fossil fuels emit greenhouse gases like carbon dioxide and can pollute the air.





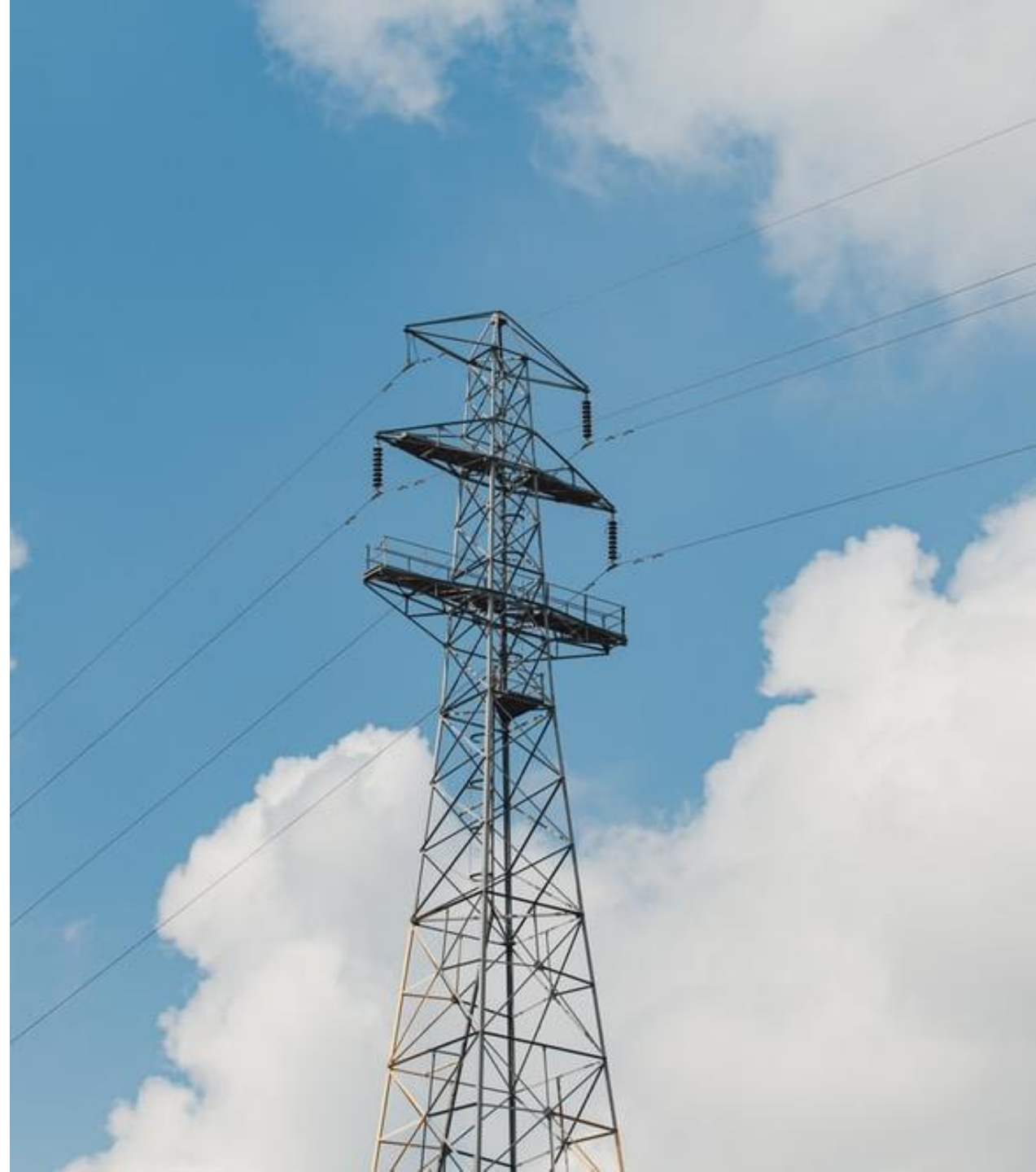
How is energy produced - Renewables

- Renewable energy is energy derived from natural resources that are replenished at a higher rate than they are consumed ([UN](#)) – such as the sun and wind.
- In 2020, 43% of UK power generation came from renewable resources and for the first time, more power was produced from renewables than fossil fuels ([Energy UK](#)).
- Of this renewable energy, the majority comes from wind power – produced mostly in offshore and onshore wind farms.
- Renewable energy creates far lower emissions than burning fossil fuels. It therefore plays a key role in helping us tackle climate change by reducing our greenhouse gas emissions, like carbon dioxide.

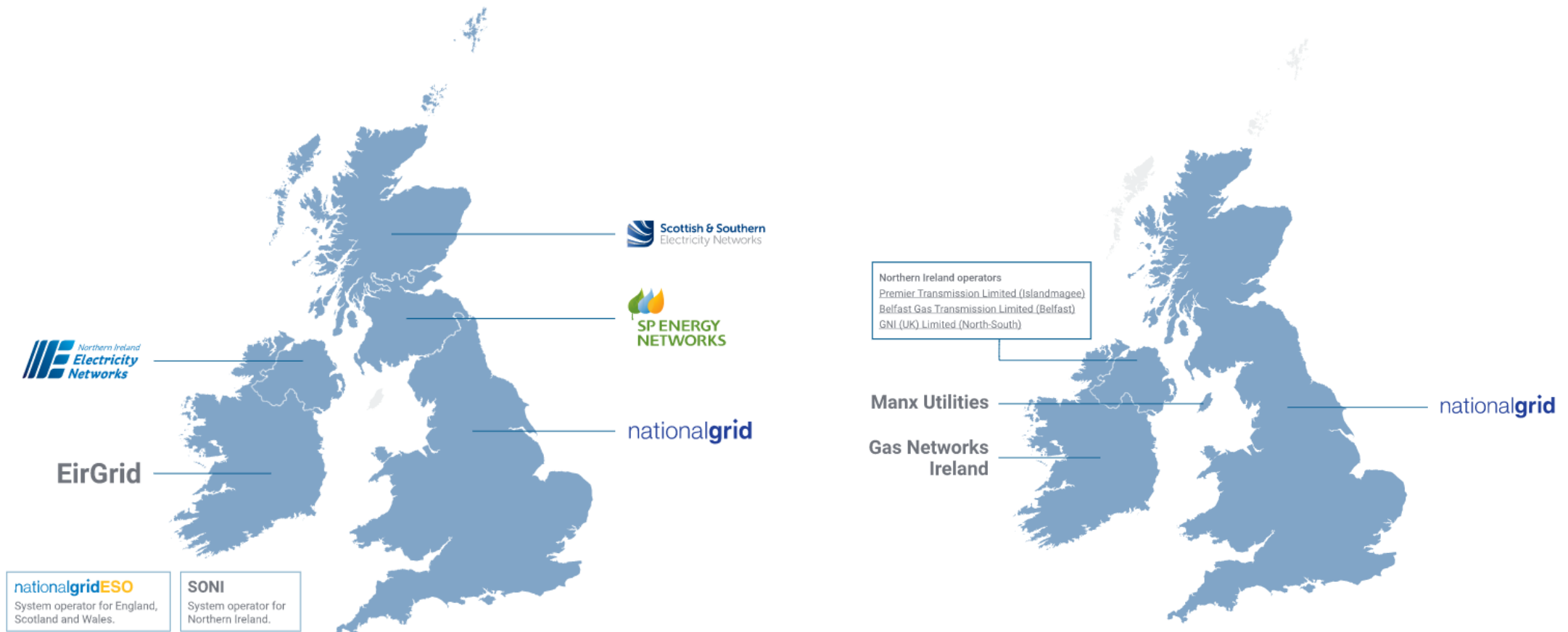
Transmission operators (1)

- Energy is then transported from large-scale producers to the different places where it is used.
- **Transmission operators** (TOs) transport energy, usually in the form of natural gas or electrical power, at a national or regional level. They take high-voltage electricity and high-pressure gas and carry it round the country on a network of cables, pipes, pylons, and wires. You can think of the transmission network as the ‘motorways’ of the energy system.

In England and Wales electricity transmission is run by National Grid. In Scotland, there are two electricity TOs: Scottish and Southern Electricity Networks and Scottish Power Energy Networks. National Grid is responsible for gas transmission for the whole of GB.



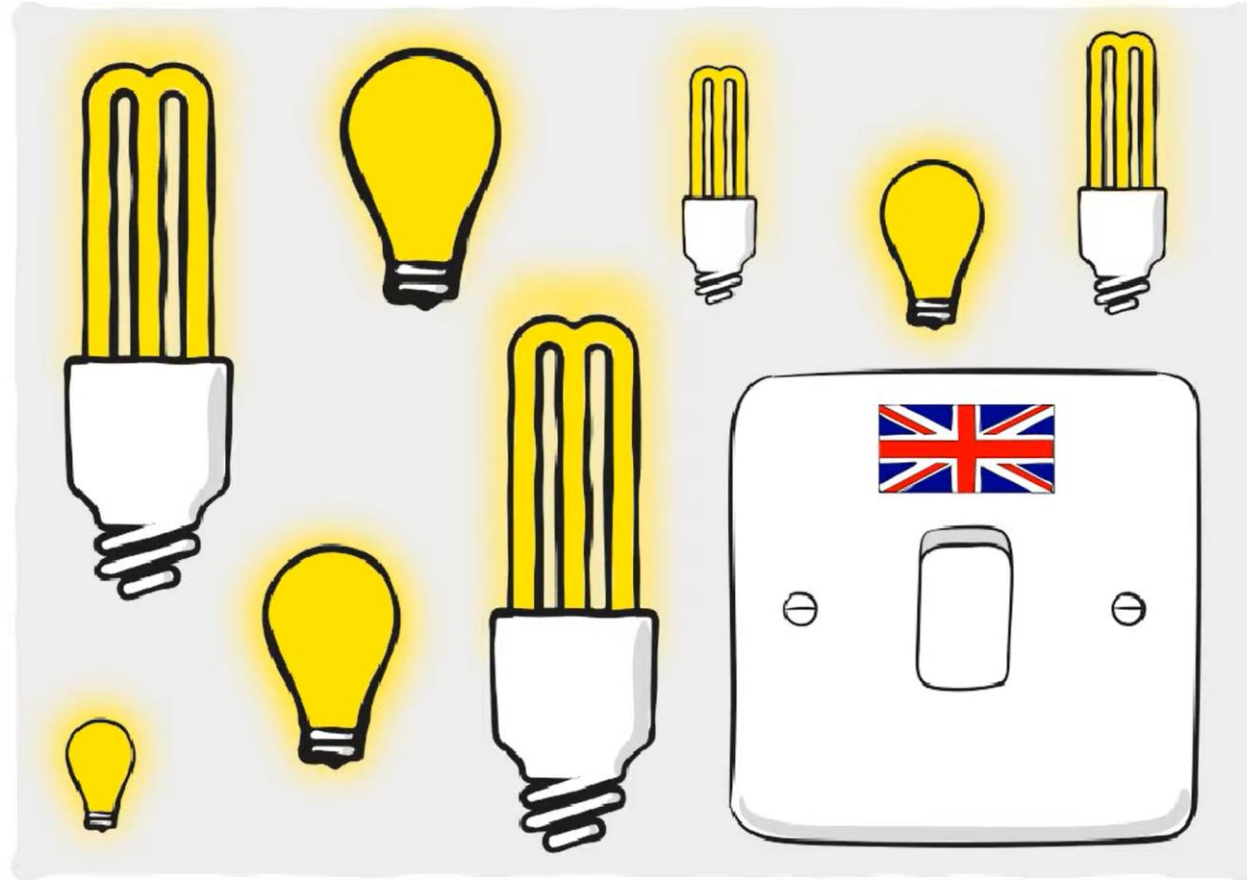
Transmission Operators (2)



Electricity transmission operators ([ENA](#))

Gas transmission operators ([ENA](#))

Watch this video for an illustrated guide to our electricity network



[Click this link to watch the video – an illustrated guide to the electricity network](#)



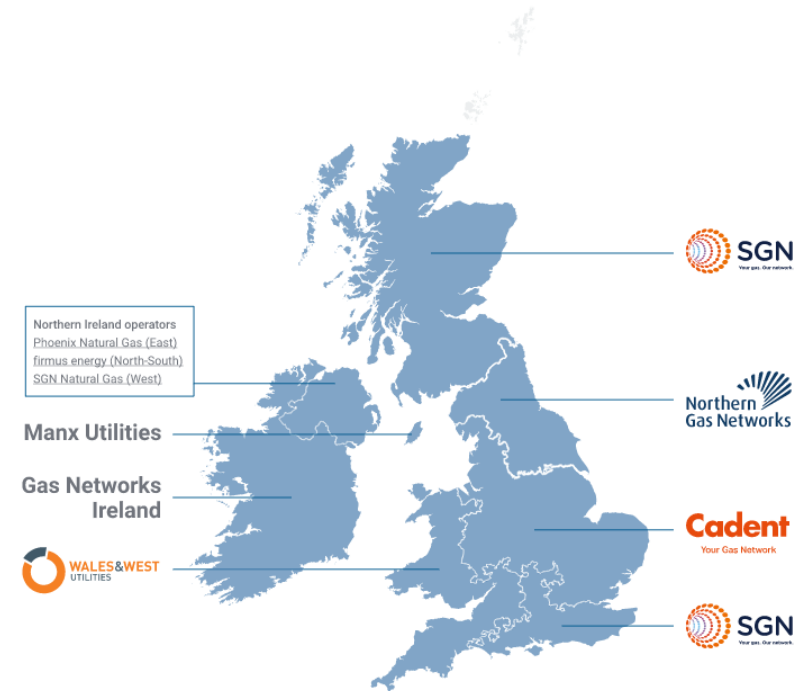
Distribution Networks (1)

- Energy is then passed onto another set of actors at a regional level. These are called the **distribution networks** – because they distribute the energy to where it's needed.
- The distribution networks might be thought of as the 'B-roads' of the energy system - linking 'motorways' to houses and businesses within regions.
- To make it safe to use, organisations called **Distribution Network Operators (DNOs)** or **Gas Distribution Networks (GDNs)** lower the voltage of electricity and pressure of gas, before feeding it down their pipes and cables to our front doors.
- If you're interested in finding out who the DNO or GDN operating where you live is, you can [enter your postcode here](#).

Distribution Networks (2)



Distribution Networks Operators ([ENA](#))



Gas Distribution Networks ([ENA](#))



Energy Network Companies

- Transmission operators, DNOs, and GDNs are collectively referred to as **energy network companies**.
- Energy network companies are privately-owned **monopolies** in their specific regions. This means that they operate in that region without competition from other companies and you can't choose who your network or transmission company is for electricity or gas.

Artist: Hugo Lami

Energy Suppliers / Retailers

- The companies that bill customers, and that most people will have contact with, are **energy suppliers** - they don't make the energy, but they buy it from the energy producers, and then sell it to us.
- These are companies such as British Gas, EDF, E.ON, Npower, Scottish Power, SSE, Octopus, and others which you may have heard of.
- Energy suppliers are competitive companies. This means multiple energy suppliers will operate in your area, and you can choose who you buy your energy from.



System Operators

The **Electricity System Operator (ESO)** manages the electricity system in Great Britain. Their control room their control room makes sure there is always enough energy for everyone - they work to make sure that the amount of electricity going into (supply) and out of (demand) the grid is balanced at all times.

There are also plans to set up a **Future System Operator (FSO)**.

- This will be an expert, impartial body with an important duty to facilitate net zero whilst also maintaining a resilient, and affordable energy system.
- The FSO will play an important role in coordinating and ensuring strategic planning across the sector.
- It will coordinate the flow of electricity and gas systems, both onshore and offshore, the flow of new fuels such as hydrogen and Carbon Capture and Storage.

About Ofgem

- Ofgem is **Great Britain's independent energy regulator** for gas, electricity, and heat networks.
- Ofgem work to **protect current and future energy consumers** - including people who may need extra help i.e. those with disabilities, elderly people, those living in rural areas and digitally excluded - by ensuring they are treated fairly and benefit from a cleaner, greener environment.
- They are responsible for: working with government, industry and consumer groups to ensure energy is reliable including in the future in the face of climate change and more extreme weather; to deliver a net-zero economy at the lowest cost to consumers.
- They focus on enabling competition and innovation, as a way to drive down prices and deliver new products and services for consumers.
- They operate in a legal framework set by Parliament. This sets up their duties (legal responsibilities) and gives them powers to achieve their objectives – see next slide.



[Click this link for a video introducing Ofgem](#)

Ofgem's Powers & Duties

- To protect the interests of existing and future consumers
 - These includes their interests in the reduction of greenhouse gases and in the security of supply
- Ofgem must protect the interests of customers in vulnerable situations, including those who are disabled or chronically sick, of pensionable age, with low incomes, or living in rural areas
- Ofgem's duties include:
 - Meeting reasonable demands for gas and electricity
 - Ensuring licence holders are able to finance their activities
 - Contributing to the achievement of sustainable development
- Ofgem is required to:
 - Promote efficiency and economy, and the efficient use of gas/electricity by energy systems
 - Protect the public from dangers (that arise across the energy system)
 - Secure a diverse and long-term energy supply and have regard to the effect on the environment



Ofgem's Priorities

- **Greener and cleaner technologies** e.g. to support the increase in electric vehicles, renewable energy and micro-generation such as heat pumps.
- Ensuring that the **market in which we buy our energy works for all consumers** and the planet e.g. domestic and business customers regardless of who they are, where they live are able to access energy and products and services that will benefit them.
- **Fair prices for consumers.** For Ofgem fair prices doesn't necessarily mean affordable prices. By fair we normally mean consumers aren't overcharged for the products and services they receive relative to how much it costs companies to produce them.
- **Protection for consumers in vulnerable situations** e.g. millions of customers may face barriers to accessing the benefits of new smart energy markets e.g. due to where they live, their skills, knowledge, confidence, lack of internet access or disabilities or because they can't afford new products and services. Those on low incomes may struggle to afford to heat and cool their homes to a level that is healthy.
- **Ensuring energy company business models are financially sustainable** e.g. July 2021 and May 2022, 29 energy suppliers failed, affecting nearly four million households in the UK. This is estimated to have cost energy bill payers and customers more than £2.7bn.
- **Great customer service**
- **Reliable energy - A 'smart' energy system** i.e. using digital technology to monitor what energy the country needs and when it needs it. **A 'flexible' energy system** – that can adapt to changes in how energy is generated and used in different circumstances and still keep the lights, heat, and power on.
- **Maximising the role of data and digitalisation** – such as more access to data sharing and digital tools. Sharing data can improve customer service, efficiency, and reduce the costs of energy.
- **Governance of the energy sector**
- **Safety** for energy employees, communities and customers

Consumer Protection & Regulation – More Information

- **The statutory energy watchdog:** Following privatisation government also set up a statutory watchdog to advocate on behalf of all current and future energy consumers, in particular those who may be in vulnerable situations. This watchdog function now sits within [Citizens Advice](#).
- **The Energy Ombudsman:** If you have a complaint about an energy company and you are not happy with how they handle it, you can also contact the [energy ombudsman](#). The energy ombudsman is independent and can get the supplier to look at your complaint again, decide if the supplier has made the right, and force the supplier to give you a response to your complaint. [Here are the top complaints reported](#).
- **Company self-regulation:** The energy suppliers have an industry association called [Energy UK](#) and energy networks an association [Energy Networks Association \(ENA\)](#) to represent their interests. Sometimes companies self-regulate – setting their own, voluntary standards and codes that they will meet to improve service and company behaviour.