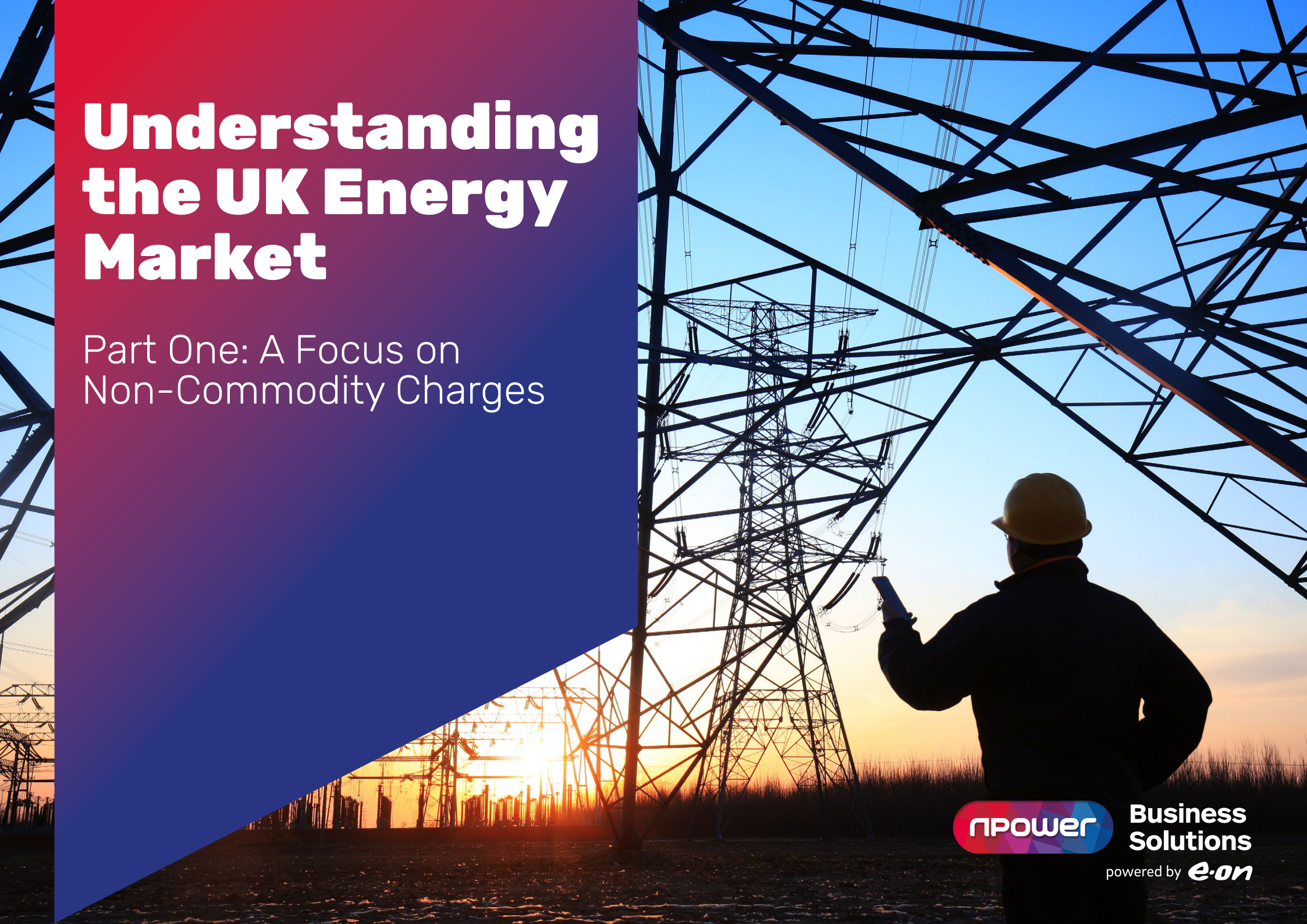
Understanding the UK Energy Market

Part One: A Focus on Non-Commodity Charges



npower Business Solutions
powered by E.ON

Introduction

In our previous 'Energy Made Simple' reports, we looked at where the UK gets our energy from, and the geopolitical and other factors that underpin volatility in the energy commodity markets. Now we turn our focus to the non-commodity elements that can make up as much as 60% of the total invoiced cost of electricity and 40% of gas.

In this report, we focus on infrastructure costs – how electricity and gas are organised from generator or source, to the transmission and distribution networks that connect to your business premises – along with who manages what, and how these are charged.

These infrastructure costs impact all businesses, whether you pay non-commodity charges on a fixed or pass-through basis.

We also explore how things are changing as we move towards more low-carbon, decentralised generation and the challenges and opportunities this creates for major players. These include National Grid and the regional Distribution Network Operators (DNOs) – as well as business consumers.

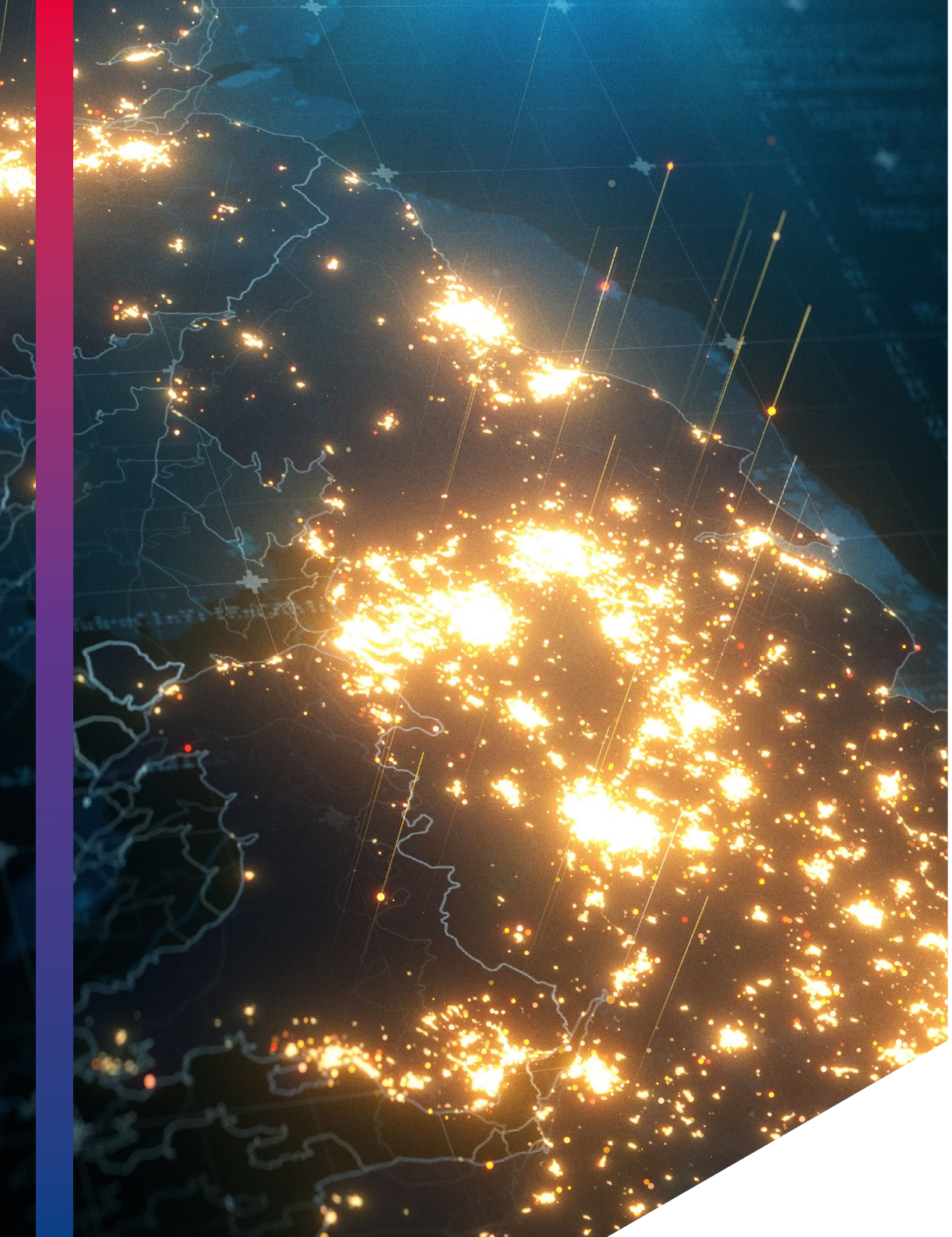
Plus, we look at:

- The transmission and distribution of electricity
- Why you are supplied by the Great Britain (GB), rather than UK, network
- The complex task of balancing supply and demand in each part of the electricity network
- How gas is delivered, and the role of gas shippers
- The shift to a decentralised, decarbonised and digitalised energy system

We also consider the role that energy regulator Ofgem plays on how network, transmission and distribution costs are calculated. And what forthcoming changes are likely to mean for the costs business consumers are being asked to meet.

We hope you find it useful.

Anthony Ainsworth
Chief Operating Officer,
npower Business Solutions (nBS)



The electricity superhighway

We've come a long way since the world's first public electricity supply went live in 1881, when hydroelectric power was used to illuminate street lighting in Godalming, Surrey. Today, more than 730 gigawatt hours (GWh) of high-voltage electricity is transported around the country – that's enough to power 146 billion streetlights.

Understanding how electricity gets from generator to your business premises is key to understanding what and who are involved in this process – and how you pay for these services.

At the start of the energy journey, power generated by the UK's power stations, windfarms and other generators is passed-through transformers to increase its voltage to enable it to travel more efficiently and with less power loss. It's then released onto the transmission network that forms the main nationwide motorways of our electricity system.

The county's transmission infrastructure – that is the transformers, pylons and cables that transport this high-voltage power – are owned and operated by National Grid Electricity Transmission in England and Wales, and Scottish Hydro Electric Transmission and SP Energy Networks (which is owned by Scottish Power) in Scotland. We pay for these services via Transmission Network Use of System (TNUoS) charges.

Why your network is GB – not UK

As an nBS customer, all the electricity and gas transmission and balancing charges you pay relate to the GB network, rather than the UK.

This is because Ireland has its own, completely independent gas and electricity transmission networks which align to its natural island geography.

What's more, the entire regulatory and energy supplier regime in Ireland is distinct from GB, which explains why GB suppliers such as nBS do not operate in Northern Ireland. So, while you might naturally expect to read about UK network costs, if you are based in England, Scotland or Wales, you are charged GB network costs.

Regional power distribution

The next stage in the journey is transferring the power from the main motorways onto the many smaller A and B roads that then deliver it to businesses and homes – the distribution network. But first it has to pass-through sub-stations to reduce the voltage so it can travel safely by smaller power lines.

This localised part of the delivery process is operated across 14 different regions by DNOs, of which there are seven. Their costs are covered by the Distribution Use of System (DUoS) charges we pay.

As the distribution network is so much more involved than the transmission network, both by area and infrastructure, distribution costs tend to be around ten times higher than transmission costs.

A second-by-second balancing act

In addition to being transported via transmission and distribution networks, our electricity supply also has to be carefully balanced. This is because it cannot be easily or economically stored (although the cost of technology to do this at scale is rapidly falling), so it has to be generated and consumed in almost real-time.

This is monitored in part by grid system frequency, which has to be maintained at 50 hertz* with very little tolerance either side. If there's more demand for electricity than supply, then frequency will fall. But if supply is higher than demand, frequency will rise. Either can lead to power outages unless properly managed.

In addition to frequency, balancing the grid involves carefully monitoring a range of other factors – such as voltage, generator output, interconnector supplies and weather changes – on a second-by-second basis. This job falls to a separate part of National Grid called the Electricity System Operator (ESO), which uses a number of initiatives to keep the transmission grid balanced.

These 'balancing actions' include asking generators to turn output up or down, or large consumers to reduce demand or switch to on-site generation, or even battery storage sites to rapidly discharge or consume power, often at a few seconds notice.

As we transition to more intermittent renewable supply, these mechanisms are set to increase to maintain balance when, for example, the wind stops blowing.

Additional challenges come when the wind is blowing strongly, as the transmission cables from the north of Scotland to large English population centres are too small to carry all the power generated. In these situations, windfarms are actually paid to turn off – while gas-fired power stations in England are paid to turn on.

Consumers fund the cost of all these activities – as well the operations of National Grid ESO – via Balancing Services Use of System (BSUoS) charges.

*Electrical appliances in the UK use alternating current (AC) at 50 hertz to power them. This means the electrical current 'alternates' between positive and negative voltage which 'oscillates' – or switches back and forth – 50 times per second.

From shore to door: delivering gas supplies

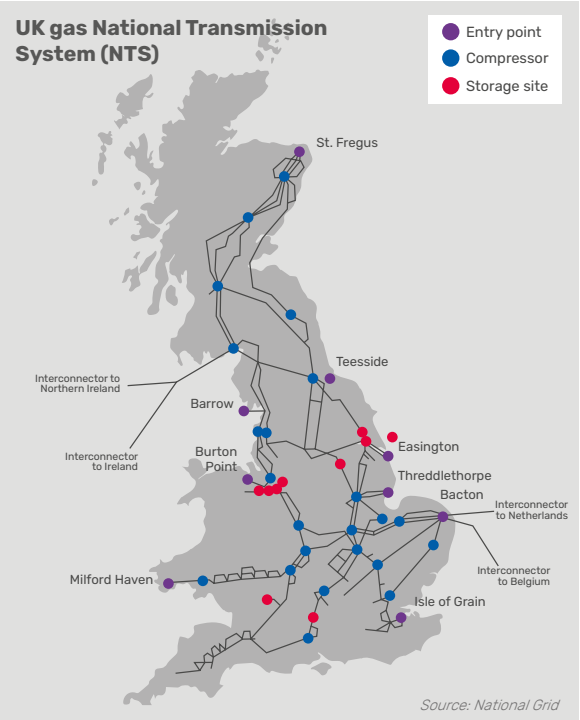
The first commercial use of gas is also purported to have occurred in England. But almost a century earlier than electricity, in the early 1790s, shortly after a Scottish engineer called William Murdoch developed a system of gas lighting, which he used initially to illuminate his own home in Redruth, Cornwall in 1782.

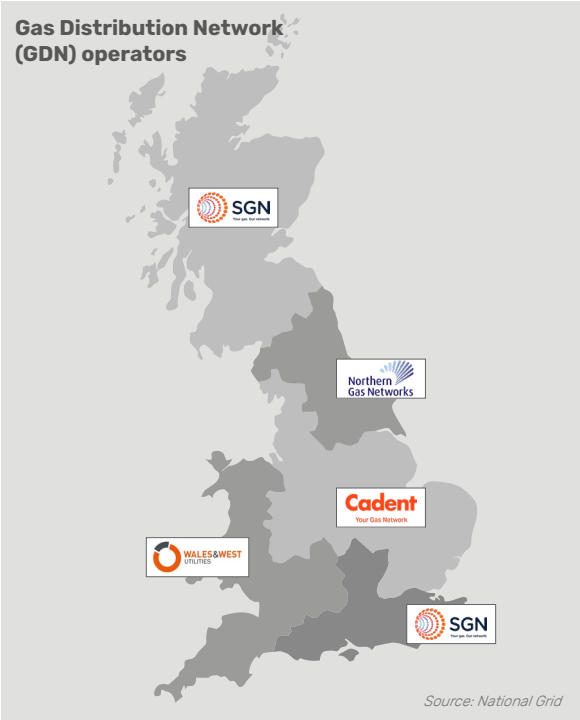
However, it wasn't until the late 1960s, when we discovered our own natural gas reserves in the North Sea, that gas started to be used more widely for electricity generation, industrial processes, heating and cooking. The National Transmission System (NTS) was then developed and built to pipe gas around the UK.

The NTS is today owned and operated by National Grid and transports gas through its high-pressure nationwide network from GB's various gas sources (see map opposite). National Grid acts as both Transmission Owner (TO) and System Operator (SO) for the gas network, and gas consumers pay for these services via a NTS charge.

As with electricity, gas is then transferred from the main transmission motorways onto smaller distribution networks – the equivalent of A and B roads that transport it to businesses and homes. These networks are run by Gas Distribution Network (GDN) operators, of which there are four in GB, Cadent being the largest. Consumers pay for these distribution services via a Local Distribution Zone (LDZ) charge.

Like electricity, gas distribution still costs about ten times more than transmission, due to the extra mileage and complexity of transporting gas from the main transmission motorway along all the A and B distribution roads to businesses and homes.





Balancing the gas system and the role of gas shippers

Balancing the gas networks is far more straightforward than electricity because it can be stored, and GB has a range of short-term gas storage sites. In addition, even just increasing the pressure in gas transmission pipelines (otherwise known as 'linepack') can compress its volume to enable up to a day's gas to be stored within the network. The job of balancing the system primarily falls to National Grid, who manages system linepack.

The gas itself is put into the transmission networks by a collection of companies authorised to operate as gas shippers.

Shippers purchase gas from various sources – offshore gas fields in the North Sea, direct pipelines from countries such as Norway, Belgium and the Netherlands, and large tankers delivering Liquefied Natural Gas (LNG). They then contract with suppliers, who in turn sell gas on to businesses and domestic consumers. Shippers also sell directly to large consumers such as power stations.

Gas shippers, who are expected to ensure the volume of gas supplied via the transmission and distribution networks meets daily demand, are charged for any system imbalance, along with any other gas balancing costs as part of the gas imbalance charge. This means there is no corresponding balancing charge for gas consumers, although gas distribution charges still make up more than a quarter of the gas invoice.

A new decentralised, decarbonised and digitalised energy system

As we transition towards a net zero emissions future, the way in which we make, transport and use energy is changing. In our first report, we looked at how we're already moving away from the most-polluting fossil fuels and embracing more renewable sources.

This means that rather than connecting to a smaller number of large centralised, synchronous and dependable generation sources, we now need to accommodate higher numbers of diversified, smaller and potentially intermittent sources.

We are also seeing an increase in demand for electricity, as we start to shift away from gas and petrol as fuel-sources and see more electrification of heating and transport.

As a result, the electricity transmission and distribution network operators are having to upgrade and expand their networks to support an energy system that's decentralised, decarbonised and digitalised.

Incorporating greater flexibility will become key, with the need to incorporate far more smart, responsive technologies to help better match energy supply and network capacity to consumer demand.

"These changes mean consumers will be paying higher transmission and distribution and balancing charges in years to come", says Stephen Evans, Head of Industry Charging at nBS and E.ON. "We estimate this could double costs over the next 20 years, although the size of the change will be set by successive governments and the choices they make around how best to regulate and finance these network changes".

For all consumers – and especially businesses – this also creates more opportunities to participate in flexibility services, either by being adaptable around consumption at certain times or by incorporating more on-site generation assets or energy storage to reduce grid demand.

Balancing and flexibility services have historically been managed across GB by National Grid ESO, involving only the largest consumers. But as our energy supply diversifies, there are increasing requirements to balance supply and demand at a local level too. So many of the DNOs are looking to transition to Distribution System Operators (DSOs), which means they wish to provide broader balancing and dispatch services, procuring flexibility direct from local businesses and consumers.

For a useful summary of transmission and distribution charges, along with typical costs and what's set to change in the future, see our Understanding Energy Network Charges factsheet here.

The role of Ofgem

The UK's electricity and gas transmission and distribution networks are private companies operating monopoly businesses. As a result, they are tightly regulated by industry regulator, the Office of Gas and Electricity Markets (Ofgem).

In turn, Ofgem is directed by the government's Department for Business, Energy and Industrial Strategy (BEIS), which appoints and removes members to the Gas and Electricity Markets Authority (GEMA) Board that directly steers Ofgem.

Ofgem oversees a regulatory framework under which network operators must abide – for example, meeting expected standards of service. It also agrees price controls regarding how much network operators can charge for their services.

These price controls follow what's called an RIIO model, which stands for Revenue = Incentives + Innovation + Outputs. This was introduced by Ofgem in 2010 and came into force from 2013 to provide a framework for the £40 billion investment needed to transform the UK energy system at that time.

Net zero targets are now factored into these price controls, and the next period (RIIO-2) is set against statutory climate change targets that require a 100% reduction to net Greenhouse Gas (GHG) emissions in the UK by 2050 (and 2045 in Scotland).

RIIO-2 starts at different times for different network functions. For example, for gas distribution network charges, RIIO-2 runs from 2021-26, but won't start until 2023-28 for electricity distribution network charges. You'll likely see these RIIO periods referred to when you receive news of network charge price rises ahead of each new charging timescale.

A long-standing key focus for Ofgem is ensuring charges are fair to all consumers, especially the most vulnerable. To support this aim, Ofgem recently instigated the biggest-ever shake-up of transmission and distribution charging methodology, via its Targeted Charging Review (TCR) and Access and Forward-Looking Charges (AFLC) Significant Code Review (SCR).

These reviews focussed on the way in which TNUoS, DUoS and BSUoS charges are calculated, and instigated major changes that will take effect from April 2022 and April 2023. For business consumers, this is likely to result in higher charges for many – but some may also see lower charges.

Mitigating rising costs

Because network costs form such a large part of your energy invoices – around £50/MWh on electricity and £11/MWh on gas – it's important to understand not only the costs themselves and future developments, but also how these might enable your business to reduce your total energy invoice.

At present, this is largely limited to ensuring you have the optimal physical gas and electricity connections to your properties, considering network costs when making decisions on where to locate future sites, considering on-site generation and consuming minimal amounts over Triad (i.e. peak demand) periods.

However, as the demand for balancing services increases, this will create opportunities for businesses to monetise their operating flexibility, particularly with DSOs, through investments in solutions such as battery storage.

> ***"Communication and insight from multiple sources are vital as we progress through the energy transition, for business consumers to make informed decisions. It is therefore great to see in addition to MEUC's own guidance demystifying non-commodity charges, this report by nBS further raises awareness of this important subject and the roles energy sector stakeholders play."***
>
> Robin Hale, Chief Executive, MEUC

How we can help

Our next report will explore the raft of policy-related non-commodity charges that also appear on your energy invoices, and how these green subsidies are set to rise dramatically over the coming years. We'll also explore how gas is likely to cost even more, as plans to lessen the burden on electricity invoices and level up subsidies on gas take shape.

If you have any questions in the meantime, please get in touch.

Contact us:

info@npowerbusinesssolutions.com

npowerbusinesssolutions.com/focus-on-non-commodity

Follow us:

@npower_nbs

npower Business Solutions

npower Business Solutions

nPower Business Solutions
powered by E.ON