



Plot Your Path
to Net Zero

A Focus on Sustainable On-Site Generation for the Public Sector

#RoadToNetZero



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Introduction

In 2020, we conducted a major survey of 100 organisations which asked them about the key measures and support they wanted to see from the UK government and other influential stakeholders to help support their decarbonisation plans.

The first report - 'Your Business Blueprint - The Road to Net Zero' - discovered that, while organisations widely supported the net zero ambition, they wanted greater clarity in terms of what their role would be in the low-carbon transition. They also wanted to know the policies that would be put in place to support them, and whether there would be additional incentives to help them make the necessary changes to their operations.

We are now several months on and, since that first report, the government has published its 'Ten Point Plan' and its long-awaited Energy White Paper. Alongside this, good news for the public sector came from the Industrial Decarbonisation Strategy published in March 2021, which confirmed a second round of funding for decarbonisation projects across England through the Public Sector Decarbonisation Fund (PSDS), to reduce carbon emissions from public buildings.

However, is this enough to give other public sector organisations the confidence to make the necessary investments to decarbonise their operations? And what additional considerations are there for public bodies and local authorities, which have been tasked with leading the way when it comes to developing more sustainable and specifically low carbon operations?

Now, in this second report, we take a closer look at **sustainable on-site generation** and the important role it can play in helping organisations plan their road to net zero, as well as how it can support the UK's wider 2050 ambition. We then dig a little deeper to explore how public sector organisations are approaching on-site generation.

We have conducted a further consultation with more than 50 organisations to find out whether they are investing, the types of on-site generation they would consider installing and any potential barriers to investment. The message is clear - organisations are already showing ambition in this area, but would welcome further support.

We also explore the benefits of on-site generation - not just in terms of access to 'green' energy, but also better energy security and increased flexibility - and the types of on-site generation that are available to organisations, from solar photovoltaic (PV) through to heat pumps.

For us, considering the installation of on-site generation technology is one of the key actions organisations can take to reduce their emissions and energy consumption. This guide is designed to help you make the most informed decision for your organisation, and our experts are on hand to help you turn that into a reality.

We hope you find it useful.

Sarah Middleton
Public Sector Manager,
E.ON UK and npower Business
Solutions (nBS)



Executive summary

We consulted with more than 50 organisations across areas including the public sector, manufacturing and transport to gauge whether they have invested, or are planning to invest in on-site generation, the potential barriers to investment and also the benefits of generating their own energy supply.

Organisations are investing, and solar PV is the most popular choice

The research showed that, despite a challenging economic environment, many organisations are pressing ahead with their on-site generation plans. Over 50% of our respondents said they had already invested - or were planning to invest - in their own supply.

For organisations in the public sector, the pressure to contribute towards our nation's green recovery after Covid-19 means that 'quick win' energy efficiency measures are no longer delivering enough cost or carbon savings. More and more organisations are now investing in on-site renewable generation to help them make faster progress towards net zero, often as part of a sustainable energy management programme.

Combined heat and power (CHP) provides a strong option for powering public buildings

For most organisations, solar PV is by far the most popular choice, with 77% of respondents saying they had already invested in solar PV.

The next most popular option was CHP, which was chosen by 38% of respondents.

For the public sector, CHP (sometimes also known as cogeneration) has provided a solution for reducing energy invoices in hospitals and public buildings for many years. With advancements in technology we have gained the ability to run CHP systems on carbon-neutral fuels, securing an important place in our future energy system.

The Association for Decentralised Energy (ADE) predicts that, **“flexible combined heat and power (CHP) located on-site at businesses and using the heat that is normally lost could triple from over 5GW today to over 15GW by 2050, the equivalent of 7 large power stations. All this CHP would use low-carbon fuels in line with the net zero goals.”**¹⁷

According to the government's Energy White Paper published in December, emissions from homes and from commercial and public sector buildings account for 19% of total UK greenhouse gas emissions, making buildings the second largest source of emissions after transport. Public sector buildings account for 9% of emissions from buildings.²

Demonstrating ROI is the key barrier to investment

The organisations we consulted also raised some of the issues they face when it comes to building a case for investment for on-site generation. The primary barrier is proving the return on investment (ROI) of an on-site asset, closely followed by access to funding. A quarter questioned whether it would be suitable for their premises.

That said, where on-site generation wasn't possible, a large number of respondents said they already had - or would consider - a Power Purchase Agreement (PPA) to buy renewable energy.

For public sector organisations, access to funding is an ongoing issue. The Public Sector Decarbonisation Scheme (PSDS) was created by the UK government to provide £1 billion of grants to public sector applicants, but industry experts believe that, considering the vast number of public sector buildings eligible for the grant and the tight deadlines involved, it might only 'scratch the surface' of the energy efficiency transformation required to meet net zero ambitions.

Reducing carbon and costs are the main benefits of on-site generation

When it comes to the key benefits of investing in on-site generation, reducing carbon emissions and energy invoices were at the top. Other benefits organisations cited were increased stability of supply and the ability to integrate it with other low-carbon technologies, such as energy storage or electric vehicles (EVs).

An increasing number of public sector organisations are combining on-site solar PV with battery storage as a cost effective way to power both buildings and vehicles. It provides three-fold benefits: the security of having an uninterrupted back-up power source, the option of avoiding peak-time energy costs by switching away from the grid and the opportunity to earn additional revenue by participating in Demand Side Response (DSR) schemes.



01

Section

What are organisations investing in?

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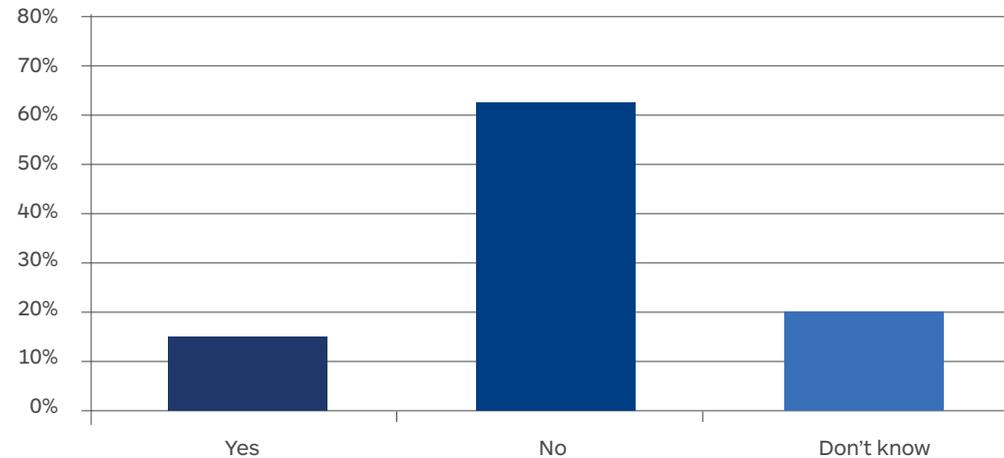
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What are organisations investing in?

When it comes to investing in on-site generation, our research shows that it is the top area where organisations would welcome additional government support or incentives to help them with the capital commitment.

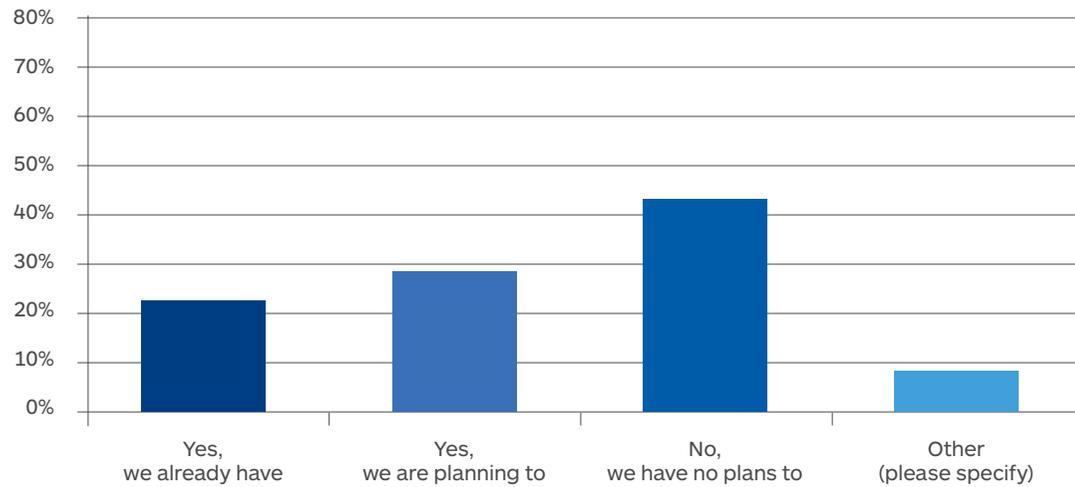
However, two thirds (63%) didn't feel that the latest government announcements and policies gave them the confidence to invest, indicating more needs to be done. (Figure 1.)

Figure 1: Do the latest government announcements and policies give you the confidence to invest in on-site generation?



That said, over 50% of our respondents said they had already invested - or were planning to invest - in an on-site asset. (Figure 2.)

Figure 2: Have you - or are you planning to - invest in some form of on-site generation?

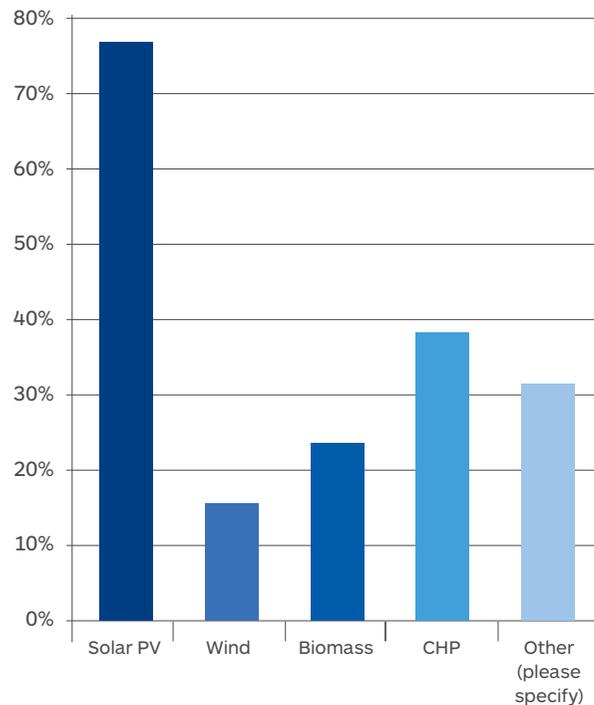


Over 50% of our respondents said they had already invested - or were planning to invest - in an on-site asset.



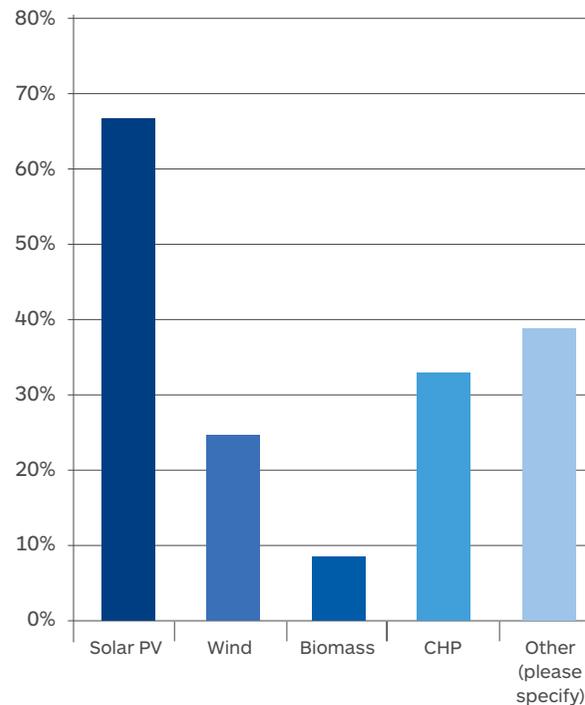
When it comes to the specific technologies organisations invested in, solar PV is proving to be the most popular, with 77% choosing to harness the power of the sun to generate renewable energy. (Figure 3.)

Figure 3: Which areas of on-site generation have you already invested in?



Solar PV is also the most popular choice for organisations that are planning to invest in on-site generation, again followed by CHP. Wind was also a choice for a quarter of respondents. (Figure 4.)

Figure 4: Which areas of on-site generation are you planning to invest in?



One of the main reasons for the growing popularity of solar PV could include the falling costs over recent years, even in a post-subsidy world. It is also widely regarded as one of the more straightforward technologies to install, yielding immediate results.

CHP is likely to see continued popularity in the public sector, where it has been used to help cut energy costs for many years. With systems now able to run on carbon-neutral fuels, CHP provides a safe, cost effective option for powering hospitals, schools and other public buildings.

‘Other’ answers included batteries and energy storage, as well as ground or air source heat pumps (ASHPs), with several organisations stating plans to combine a renewable energy source such as solar PV or wind, with storage to help protect against intermittency and ensure a more stable supply.

“The largest system benefit of cogeneration is that a CHP unit can run at any time. The flexibility cogeneration provides will be invaluable in an electrified system dominated by variable power generation from wind and sun. Alongside batteries, hydro storage and demand-side management, cogeneration will guarantee that electricity supply and demand are in balance.”

Cogen Europe, for Energy Manager Magazine³

02

Section

Barriers to investment

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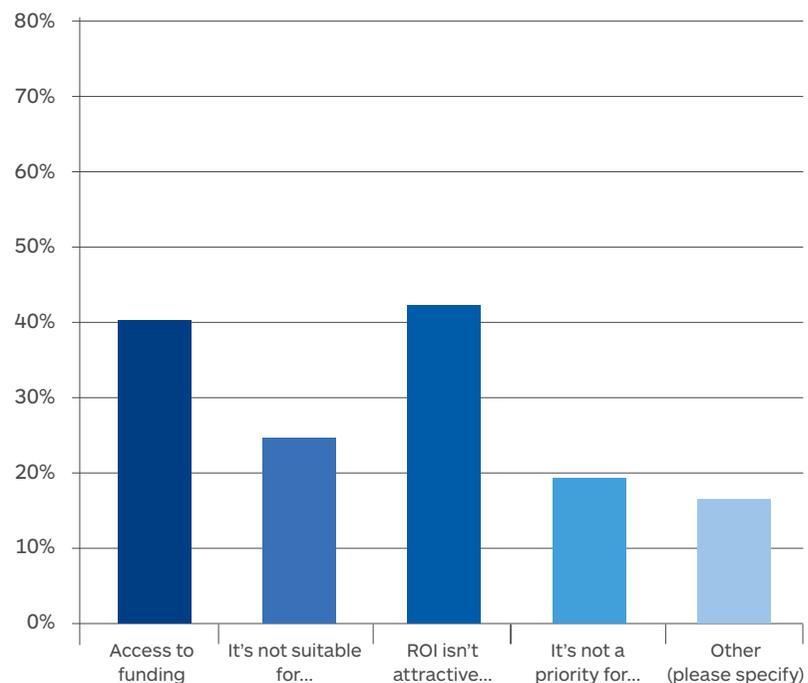
Barriers to investment

Despite the positivity around plans to invest in on-site generation, the organisations we consulted also raised some of the issues they face when it comes to building a case for the investment. With the majority (65%) saying that they use their own funds for any energy efficiency or sustainability initiatives, the fight for CAPEX can be tough - particularly during a challenging year.

As 'Figure 5' shows, the primary barrier is proving the ROI of an on-site asset (43%), closely followed by access to funding (40%). With some having payback of several years, it can be difficult to justify such a major capital investment at a time when finances are tight. And while the PSDS has helped more than 400 public sector organisations to invest in decarbonisation so far, this may only be 'scratching the surface' of the sector's net zero ambitions.

A quarter (24%) of organisations also questioned the suitability of on-site generation for their organisation. There is now a significant choice for commercial installations, so while conducting a thorough site feasibility assessment is important, installing your own asset doesn't necessarily need to be ruled out.

Figure 5: What are the barriers to you investing in on-site generation?



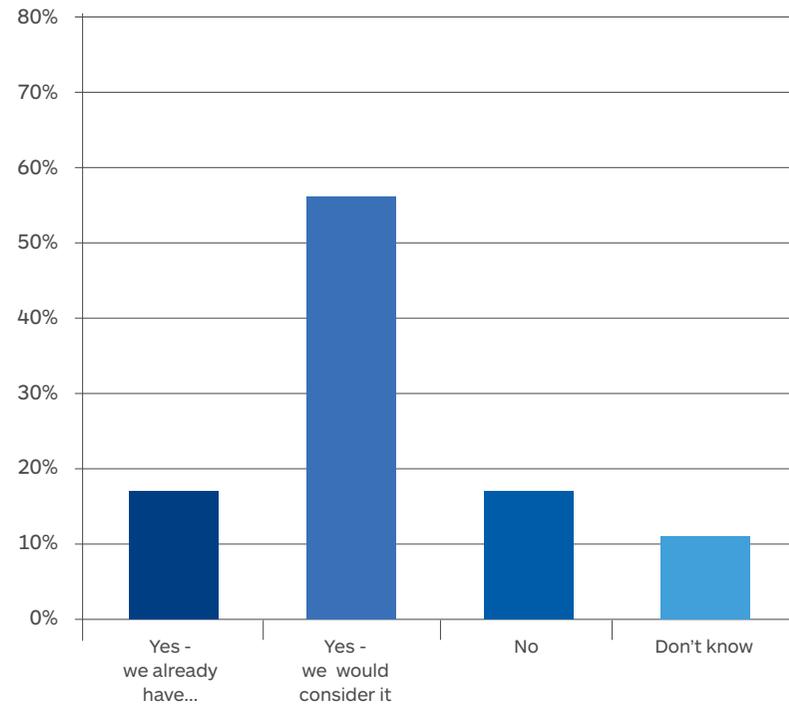


That said, where on-site generation is not an option due to cost barriers, one route to a renewable energy supply from an on-site source is via a PPA. These can be arranged via a third party funder, who can install and manage the on-site asset. The organisation then buys the energy from the funder over the course of a long-term PPA, negating the need for up-front investment.

If suitability for a particular site is also an issue, organisations can still benefit from a PPA to purchase energy from a local renewable energy source.

Encouragingly, this was a route that the majority of our respondents who could not install on-site generation (73%) were either already taking, or were considering (Figure 6.)

Figure 6: If you cannot install on-site generation, would you consider procuring renewable energy via a PPA?



If suitability for a particular site is also an issue, businesses can still benefit from a PPA to purchase energy from a local renewable energy source.

03
Section

Benefits of on-site generation

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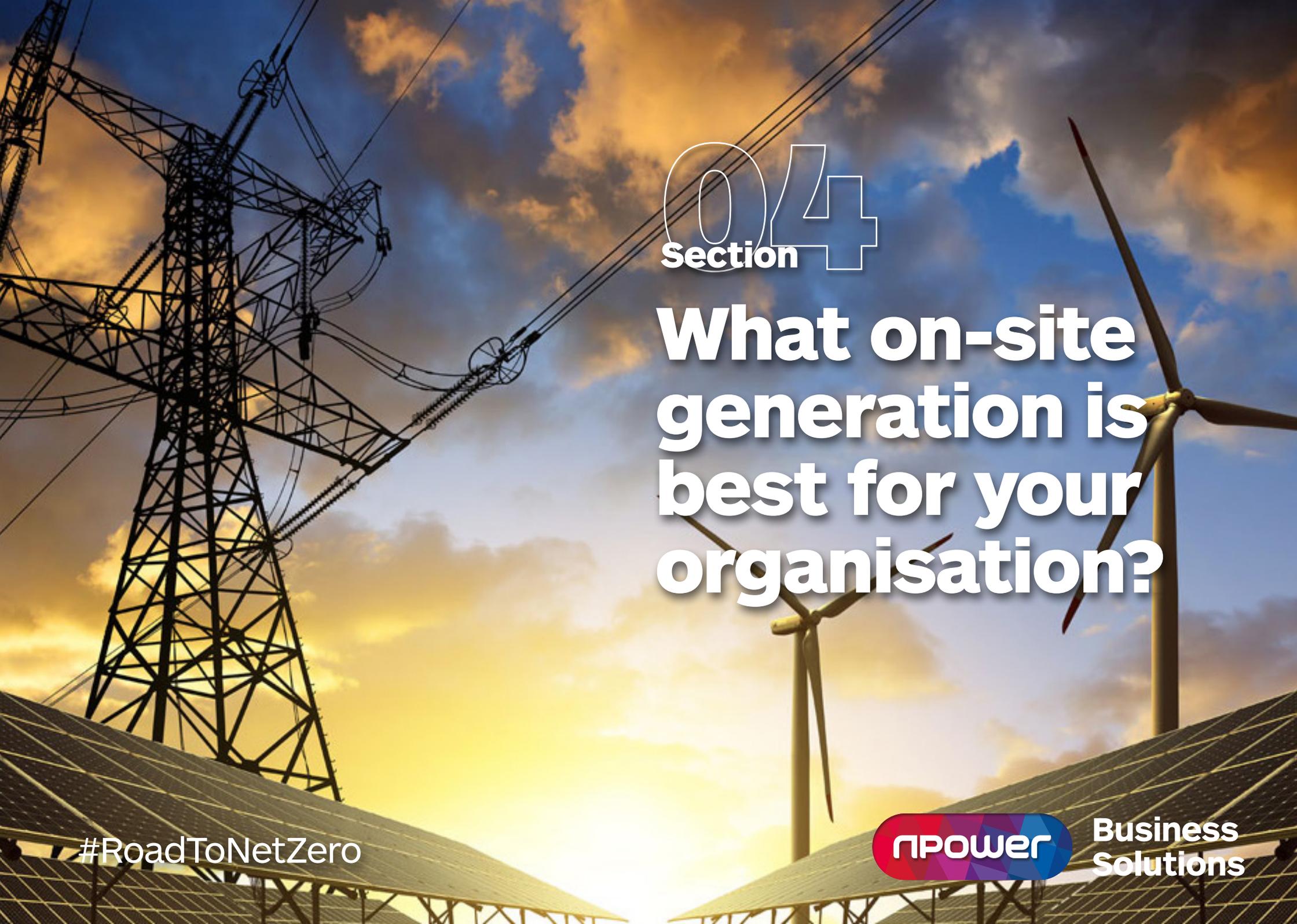


Although organisations highlighted some of the barriers to on-site generation, when it comes to overall decarbonisation targets, the majority (73%) were in agreement that the climate benefits to achieving net zero outweighed the potential cost implications.

This is reflected in what organisations believe are the main benefits of investing in on-site generation. When asked to rank the positive impact of having an on-site source of electricity - with 1 being the most important - the results were as follows:

- 1 Reduction of carbon emissions**
- 2 Reduction in energy invoices**
- 3 Stability in terms of security of supply**
- 4 It is future-proof as it has the potential to integrate with other low-carbon technologies, such as EVs**
- 5 Potential revenue opportunities i.e. selling surplus energy back to the grid**
- 6 Reputational benefits**

You can read more about the benefits of on-site generation in our 'The expert view' section later in this report.



04
Section

**What on-site
generation is
best for your
organisation?**

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On-site generation is defined as the 'production of energy at the point of use', i.e. where the energy generated will be primarily utilised. It can also be referred to as 'decentralised energy', as it means an organisation can generate its own electricity at its own site, without relying on buying that energy through the grid.

There are now several different options for organisations, and which is most suitable will depend on the size of your premises, its location and the feasibility of installation.

For organisations in the public sector, cost-effectiveness will always be a primary concern, and this must be balanced against increased policy pressure to lead the way on decarbonisation.

Here, we look at some of the ways you can generate your own energy from low or zero-carbon sources.

Solar PV

According to Solar Energy UK, solar technologies can be found on one in every 25 buildings in the UK, from 'garden sheds to commercial estates'. It works by capturing the sun with thermal or PV panels to create heat or electricity.

Solar PV systems are experiencing a significant growth in popularity, as it is often seen as one of the simplest and most cost effective ways to generate renewable electricity. It enables organisations to unlock value from existing assets like their roof, parking areas, or ground space and generate their own efficient energy supply.

What makes solar PV an attractive option?

- Even in a post-subsidy world, the falling cost of components has made it affordable
- Technology has evolved which means it can produce effective yields even on a cloudy day
- It can be easily integrated with storage technologies to provide 24/7 electricity, as well as other low-carbon technologies such as EVs

What sites are solar PV suitable for?

- Those with a good amount of south-facing roof space are ideal e.g. distribution centres, manufacturing plants, large retail properties, or large hospital buildings. However, smaller spaces can also be effectively used

What is the ROI?

- This depends on the size of the system and how it is funded. For example, a self-funded project could pay back in 10 years, whereas a third-party funded project where a developer owns the asset and the organisation purchases the power via a long-term PPA can be over a 10-20 year period





Wind

Wind is one of our most powerful natural resources and can be a highly efficient generator of renewable energy. This was demonstrated by it accounting for nearly 50% of the generation mix during a particularly blustery May bank holiday in 2021.

It has also been highlighted by the government as one of the key ways for the UK to hit net zero by 2050, with the Prime Minister saying that he wanted offshore wind farms to power every home in the UK by 2050.

For organisations, installing an onshore wind turbine can be a really effective way of generating its own zero-carbon energy.

What makes wind power an attractive option?

- Falling costs have made it more cost effective to install
- Wind can be a more reliable source of renewable generation in the UK
- It can be easily integrated with other low-carbon technologies such as EVs

What sort of sites is wind power suitable for?

- Exposed areas, with a high average wind speed and good site access are ideal. Installing a wind turbine does require careful planning, and consent will be required to ensure there is sufficient distance between the turbine and any noise-sensitive neighbours, and whether the area has any special environmental or landscape designations

What is the ROI?

- This depends on the size of the system and how it is funded. For example, a self-funded project of a small turbine could pay back in under 10 years. If it is funded through a 10-20 year PPA, then savings on energy invoices could be around 10%

Combined heat and power (CHP)

A CHP unit provides on-site electricity generation, while the heat produced from the process is captured and used elsewhere in your building. It works by converting fuel into electricity through a generator to power on-site operations.

The heat generated during this process is then captured and can be used for heating, hot water or air conditioning.

What makes CHP an attractive option?

- On-site generation with a CHP unit can reduce energy costs by up to 20%, with the potential to sell excess electricity back to the grid
- The excess heat generated can be used to warm your building, or it can be converted and used for air conditioning
- Reducing your dependency on the electricity grid with a CHP unit will stabilise your energy supply and lower your risk of disruption

What sites are CHP suitable for?

- CHP can be used across a variety of sites, but it is particularly suited to industrial and commercial sites that use large quantities of heat and power. It is important to analyse the energy demand profile of your site to assess whether CHP is the best option

What is the ROI?

- If self-funded, CHP can achieve around 20% saving on energy costs and an average payback of around 2-5 years



Heat pumps

Heat pumps work by extracting heat from natural sources like the ground, air or water, or as a by-product of cooling equipment. The pumps then store the heat or distribute it as central heating or hot water - commonly in heating, ventilation and air conditioning (HVAC) systems.

What makes ground, water or air source heat pumps an attractive option?

- They can be combined with additional renewable sources such as solar PV or wind
- They can be used as a replacement for natural gas, helping to reduce emissions
- Reductions in your heating and cooling costs will help your business generate savings

What sort of sites are heat pumps suitable for?

- Most organisations can install a heat pump. There are different types of heat pump - air, ground and water - and suitability can be assessed on a site-by-site basis. Ground source heat pumps (GSHPs) are more expensive than air source heat pumps (ASHPs), but arguably provide a more reliable energy supply

What is the ROI?

- The larger the pump, the lower the cost per kWh. If self-funding, payback can be between 5-8 years

Additional technologies

One other area to consider is ancillary technologies i.e. those solutions that can be integrated with a new or existing on-site generation solution.

These could include:

Batteries - these are particularly good to combine with 'intermittent' renewable technologies such as solar PV or wind, where excess power can be stored to be used at a later stage e.g. when the sun isn't shining or the wind isn't blowing

Orcan - a waste heat recovery system, ORC (Organic Rankine Cycle) is a closed cycle process similar to a conventional steam cycle process. Waste heat is used to generate a vapour, which through an expander drives a generator to produce electricity. The working fluid is often based on organic components, to be able to use medium to low temperature waste heat sources. It can result in significant carbon and cost savings

Demand Side Response (DSR) - you can maximise the value of your on-site asset by connecting it to our virtual power plant, and participating in DSR to identify sources of flexibility in your existing energy assets. Reducing your on-site demand during peak periods can help your organisation sell excess energy back to the grid

Energy management and monitoring software and services - these are vital to track the effectiveness of the on-site technology, and to help organisations make any adjustments based on real-time data

“An empowered public sector can do more than just cut emissions from its own estate, which makes up around 2% of the national total, it can catalyse action across society. With greater vision and an increasingly sophisticated approach, organisations will be able to make better use of their powers in areas like procurement, planning, housing, education and transport to help drive reductions elsewhere in society. Getting it right could be the key to unlocking a low carbon future for Britain.”

Richard Rugg,
Managing Director, The Carbon Trust⁴

⁴ carbontrust.com/news-and-events/insights/how-can-the-uks-public-sector-show-international-leadership-on-climate

05

Section

On-site generation in action

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On-site generation in action

Installing your own generation asset can yield impressive results, as the following case study demonstrates:

West Sussex County Council - solar PV and battery storage and participation in DSR

Local authorities are required to meet substantial environmental targets to reduce carbon emissions. West Sussex County Council (WSCC) wanted to develop one of its disused landfill sites into an energy park to maximise return on its real estate while reducing its carbon footprint.

The solution:

In partnership with LASER, a public sector buying group, nBS worked closely with WSCC to co-locate a large-scale Lithium-ion battery with a 7.4MW solar PV array. The overall strategy included the sale of power and embedded benefits via a PPA, access to DSR including Triad export benefit, Firm Frequency Response (FFR), both Static and Dynamic, and Capacity Market (CM), as well as price arbitrage and targeted activity in wholesale markets.

The results:

- The asset was one of the first batteries to commence participation in National Grid's new weekly FFR auction trial, at the beginning of 2020
- The asset achieved the highest accepted tendered price in 2019 of £60.42/MW/hour in the Dynamic FFR market
- During the large national power outage in August 2019, the asset responded within two seconds to help reduce the sudden shortfall in supply



06

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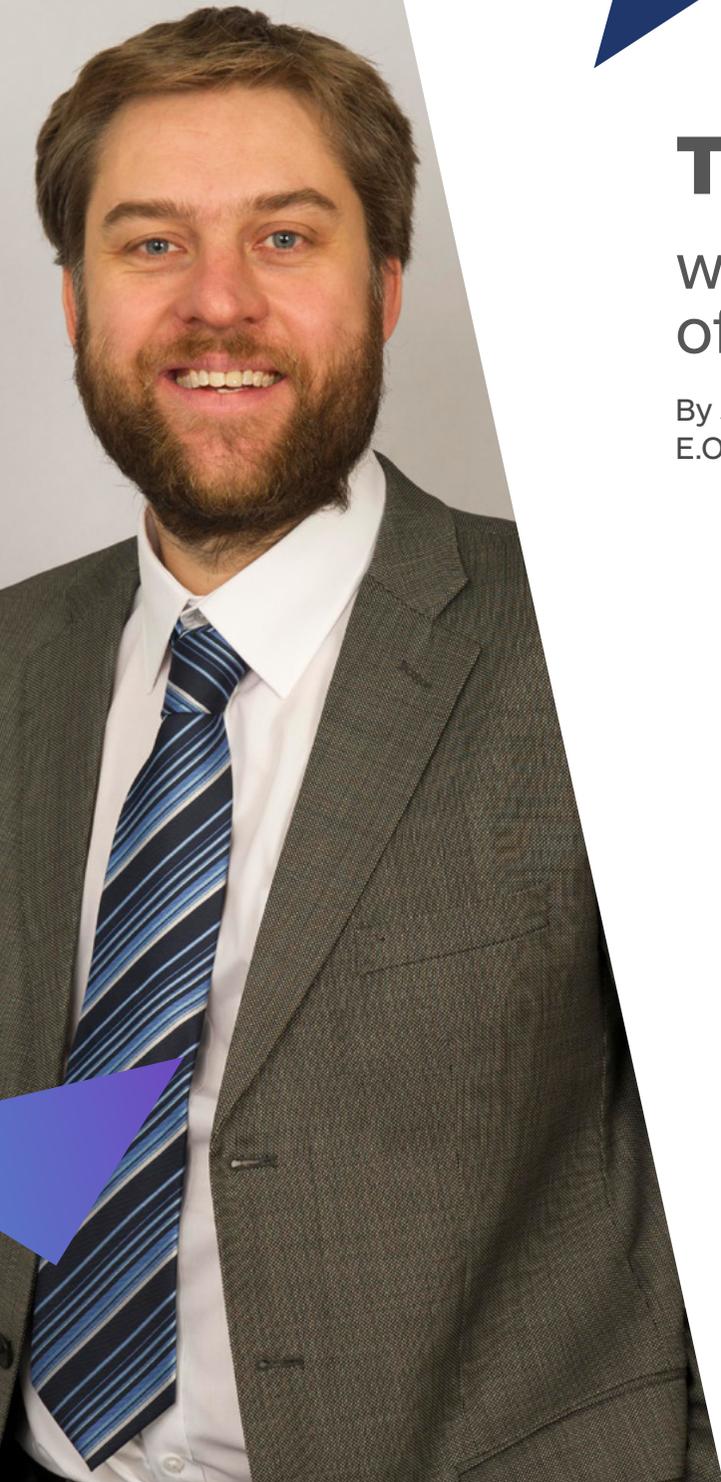
The expert view:

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The expert view:

why on-site generation should be a key part of an organisation's net zero strategy

By John Martin, Product Development Manager,
E.ON UK and npower Business Solutions (nBS)

This report shows that organisations are not only considering investing in on-site generation, but that they are actively investing, and across various different technologies. This is great news and demonstrates the commitment towards achieving a net zero future.

For those that still need convincing, there are clearly hurdles to overcome, particularly when it comes to financing.

However, for us, there are five clear reasons why on-site generation should be a key part of an organisation's net zero strategy.

1. Reduction in carbon emissions

The UK government has set some very ambitious targets for the reduction of carbon emissions. As well as committing to net zero emissions by 2050, it recently announced a mid-point commitment of a Greenhouse Gas (GHG) emissions reduction of 78% by 2035 compared to 1990 levels.

The most effective way to reduce emissions is by switching to a zero-carbon supply. On-site generation options that use 100% renewable sources - such as solar PV or wind - will help your organisation significantly reduce its carbon footprint.

2. Reduction in energy invoices

Installing on-site generation technology can make a real impact on your bottom line through a reduction in energy invoices through increased efficiency, as your site will only generate the energy your organisation needs to use.

There is also the opportunity to avoid non-commodity costs, such as the third-party costs required to maintain and balance the grid, if you are generating your own electricity.

3. Protection against price fluctuations

Linked to a reduction in energy invoices, on-site generation helps to mitigate against price fluctuations in the market. As well as avoiding non-commodity costs, having your own on-site supply helps to protect against wholesale price volatility, meaning you can plan ahead with greater certainty.

In short, it puts you in control of your energy usage, and allows you to unlock flexibility in terms of demand.

4. Increased stability of supply

Hitting net zero emissions by 2050 relies heavily on mass-electrification, putting increased pressure on the central grid. The major power outage of August 2019 also served as a timely reminder of what can happen when there is too much demand on the grid. Any loss of energy - no matter how brief - can be costly, particularly to those mission-critical organisations, for example hospitals that rely on 24/7 supply.

Installing on-site generation - especially if combined with battery storage - helps to protect organisations from any downtime by increasing self-sufficiency and minimising the reliance on the grid.

5. Improved reputation and sustainability credibility

As more and more organisations announce their sustainability plans, there has been a greater focus on so-called 'greenwashing', particularly as the public become more climate aware.

A recent report from the Energy and Climate Intelligence Unit and Oxford Net Zero showed that one fifth of the world's largest companies have net zero targets. However, it came with a warning against 'greenwashing' as only a little over a quarter of those met the report's 'robustness' criteria.

Installing on-site generation is a clear signal that your organisation is serious about sustainability, mainly in the eyes of customers and throughout your supply chain.

Future-proofing your organisation

When it comes to on-site generation, there is now a great deal of choice for organisations, with more innovative technologies on the horizon. That said, organisations need to make sure that any plans for on-site generation are scoped appropriately, so they strike the right balance between economic and environmental benefits.

In summary, investing in on-site generation makes business and reputational sense. As well as reducing emissions, it also makes organisations less reliant on the grid, mitigates against price changes, enables greater control of energy consumption, and provides future revenue opportunities by becoming a flexible asset.

How we can help

However ambitious your net zero goals, speak with our business experts to see how we can help you find the best on-site generation option for your organisation.

Get in touch with our experts now and start your on-site generation journey.

Contact us

 0800 622 6966

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