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Uptime on the Line?

Securing the construction pipeline with the insights of 700 European data centre consultants

2

Part Two Construction of Data Centres

CONTENTS

Data, Demand and Developments

Issues of supply and demand are rarely clearer than in today's data centre market. Since 2010, the number of internet users worldwide has more than doubled, while global internet traffic has increased 20-fold over the same period.[1]

Against these figures, it's not surprising to find construction in this sector now facing a period of accelerated growth. Construction News, for example, reports that total data centre capacity in Europe will rise exponentially over the coming years, with significant opportunities for contractors working on projects of this kind[2]. Other outlets, such as BisNow, have even labelled the rush to secure land and build new facilities the 'new digital space race'[3].

Yet, for all the speculation, there is still more that could be done. Research from Savills has found the data centre pipeline remains insufficient when compared with the latest industry forecasts. According to the company's report, power capacity will total 9,000MW by 2025, but the number of data centres will need to increase by almost 2.5 times in order to meet demand[4]. In other words, more than 3,000 new sites across Europe will be needed to satisfy the volume of traffic expected to route through edge, colocation and hyperscale facilities by the middle of the decade.

Getting to this number will be challenging, not least because construction firms have faced delays due to grid constraints and other on-site transmission issues slowing the sector's growth[5]. Scale and complexity also complicate matters. Some facilities can house more than 1,000 servers and require heating, cooling and humidity control equipment, as well as UPS, transformers, switchgears and utility service planning. All of these moving parts need to be managed carefully to avoid penalties for errors and delays.

Large-scale builds will always be challenging, but it's hard to escape the overriding need to build where possible. This highlights not only the importance of responsive suppliers that understand the data centre market, but also up-to-date market research based on the views of those currently working in the sector. Why? Because it can be used to identify opportunities for contractors to work more efficiently and ease some of the bottlenecks that stand in the way of targets like those set by Savills.

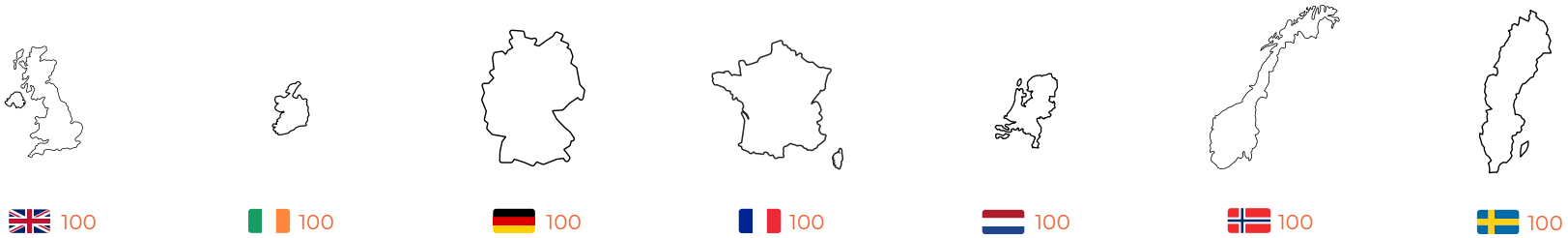
The findings in this report are based on pan-European research conducted by Aggreko from August to September 2022. Recommendations have been provided by the business's data centre experts.

1. https://www.iea.org/reports/data-centres-and-data-transmission-networks
2. https://www.constructionnews.co.uk/tech/the-data-space-race-27-04-2022/
3. https://www.bisnow.com/national/news/data-center/the-new-digital-space-race-edge-data-centers-in-orbit-and-internet-on-the-moon-113625
4. https://www.savills.co.uk/insight-and-opinion/savills-news/336014/savills--pipeline-of-data-centres-needs-to-more-than-double-by-2025-to-meet-demand-for-storage-in-europe
5. https://www.constructionenquirer.com/2021/03/05/construction-plant-shortages-start-to-bite/

This report is the second in a two-part series on European data centres. It looks at the challenges faced by businesses involved in the construction of new new facilities, whereas the first report examined the operational challenges faced by those working in existing data centres.

WHO DID AGGREKO INTERVIEW?

700 data centre professionals



100 | 100 | 100 | 100 | 100 | 100 | 100

Respondents included: engineers, design and energy consultants, facilities managers

All respondents were: consulting to large businesses (large/edge facilities with 250+ employees)

OUR DATA CENTRE EXPERTS

Billy Durie
GLOBAL SECTOR HEAD
Data Centres

Guido Neijmeijer
EUROPEAN SECTOR LEADER
Data Centres

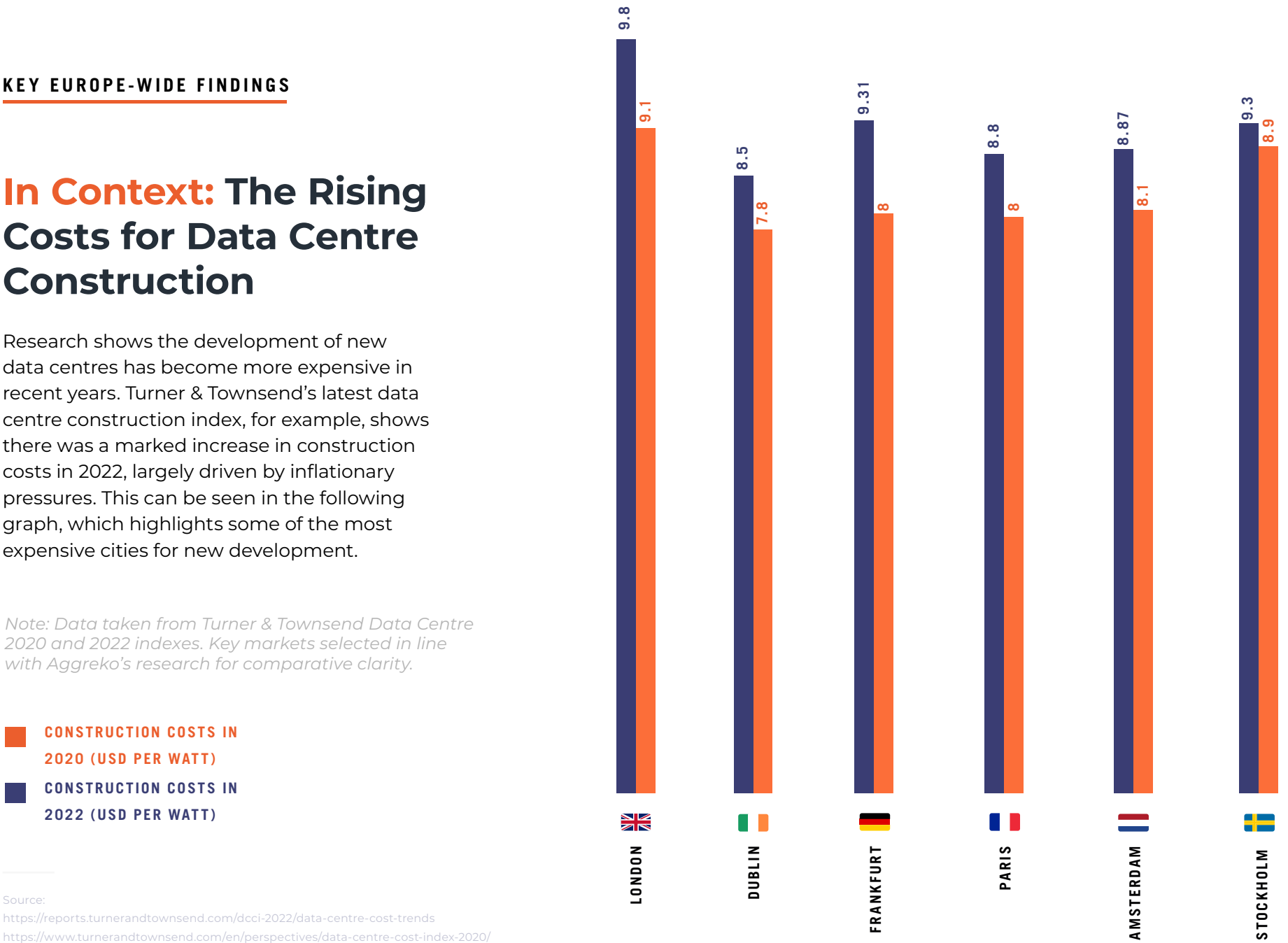
Greger Ruud
SECTOR DEVELOPMENT MANAGER
Nordic Data Centres

KEY EUROPE-WIDE FINDINGS

In Context: The Rising Costs for Data Centre Construction

Research shows the development of new data centres has become more expensive in recent years. Turner & Townsend's latest data centre construction index, for example, shows there was a marked increase in construction costs in 2022, largely driven by inflationary pressures. This can be seen in the following graph, which highlights some of the most expensive cities for new development.

Note: Data taken from Turner & Townsend Data Centre 2020 and 2022 indexes. Key markets selected in line with Aggreko's research for comparative clarity.



Source:
https://reports.turnerandtownsend.com/dcci-2022/data-centre-cost-trends
https://www.turnerandtownsend.com/en/perspectives/data-centre-cost-index-2020/

What Are the ‘Pinch Points’ During the Construction Phase?

Delays to data centre builds are costly but not uncommon. Managing different contractors, whose work relies on other parts of a build being completed, has often hampered major projects. It’s one of the main reasons why bodies Uptime Institute recommend owners and operators write penalty clauses into their contracts before any work begins.

However, the financial impact of delays is arguably less damaging when construction work in this sector is often awarded on the strength of a business’s reputation. Recognising potential ‘pinch points’ can help to keep projects to schedule but also offset escalating costs for each project, which research has shown increased by 15% on average across global markets in 2022.

WHAT ARE THE 'PINCH POINTS' DURING THE CONSTRUCTION PHASE?

ACCESS TO PLANT

Heavy equipment necessary to build large structures continues to be in short supply, with OEMs facing high levels of demand from competing industries.

SUSTAINABILITY

Decarbonisation is an important consideration within operational data centres. But now some of the industry's leading names are giving greater attention to the building's embodied carbon. Delays may result if suppliers are unable to provide credible evidence of their sustainability credentials.[12]

PRIME POWER

Grid connection can take some time to come online, leaving a project in the balance. This is especially challenging if electrical and mechanical infrastructure, such as switchgears, arrive on site ahead of full power availability. In this situation, parts need to be stored with environmental control to avoid static damage and water ingress.[10]

LOCAL CONDITIONS

Some popular data centre markets, such as the Nordics, often need to use on-site heating to thaw the ground in preparation for excavation. Unexpected frost and snowfall can set projects back by days or even weeks when equipment is not in reserve.[11]

SHORTAGE OF SKILLS AND RAW MATERIALS

Labour has been stretched in every major data centre market, increasing the cost for contractors. Price hikes are also being felt on important raw materials, such as steel, due to reduced output.

LOCAL IMPACT

As Data Centre Dynamics points out, opposition to data centre development often stems from a lack of understanding and engagement with local communities and stakeholders. Legal disputes can halt construction indefinitely.[13]

10. https://www.datacenterdynamics.com/en/opinions/minimize-risk-of-water-ingress-in-your-data-center/
11. https://datacentremagazine.com/critical-environments/cold-winter-could-compound-data-centre-construction-delays
12. https://www.datacenterdynamics.com/en/analysis/sustainable-data-centers-require-sustainable-construction/
13. https://www.datacenterdynamics.com/en/analysis/data-center-nimbyism-how-to-engage-with-local-communities-properly-during-data-center-projects/

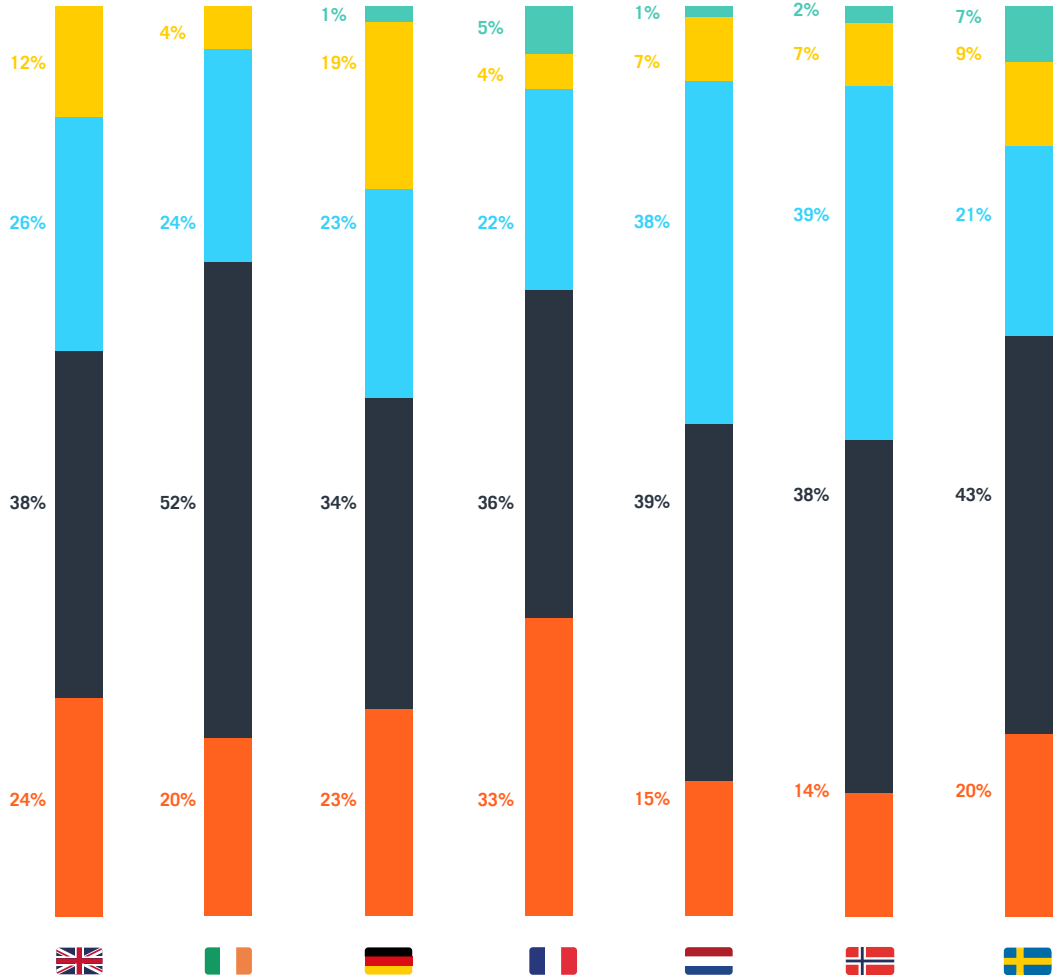
A Clearer Picture of European Data Centre Construction

Meeting high demand is one aspect of data centre construction. Location, sustainability and support from government also have a direct influence on the progress of a build, as do less-controllable factors such as the weather. Aggreko's research sought views on these issues from a Europe-wide perspective. These insights are examined by the company's sector experts.

Q. What confidence do you have in local and national government to update old laws and regulations so that more renewable energy sources can be used in data centres?

Local Government

From a legislative point of view, the majority of respondents in each region were ‘at least somewhat confident’ that local government could support greater uptake of renewables in their facilities. However, it’s important to note that a much lower percentage were ‘very confident’, and in some markets, such as the Netherlands and Norway, a significant number said they were ‘not particularly confident’.



VERY CONFIDENT

NOT PARTICULARLY CONFIDENT

SOMEWHAT CONFIDENT

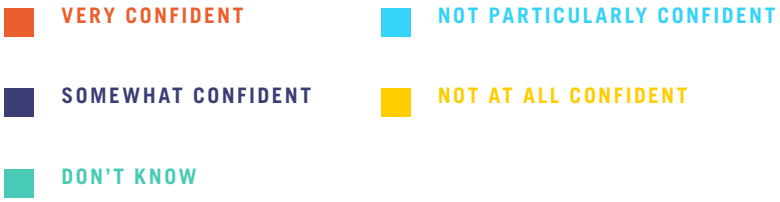
NOT AT ALL CONFIDENT

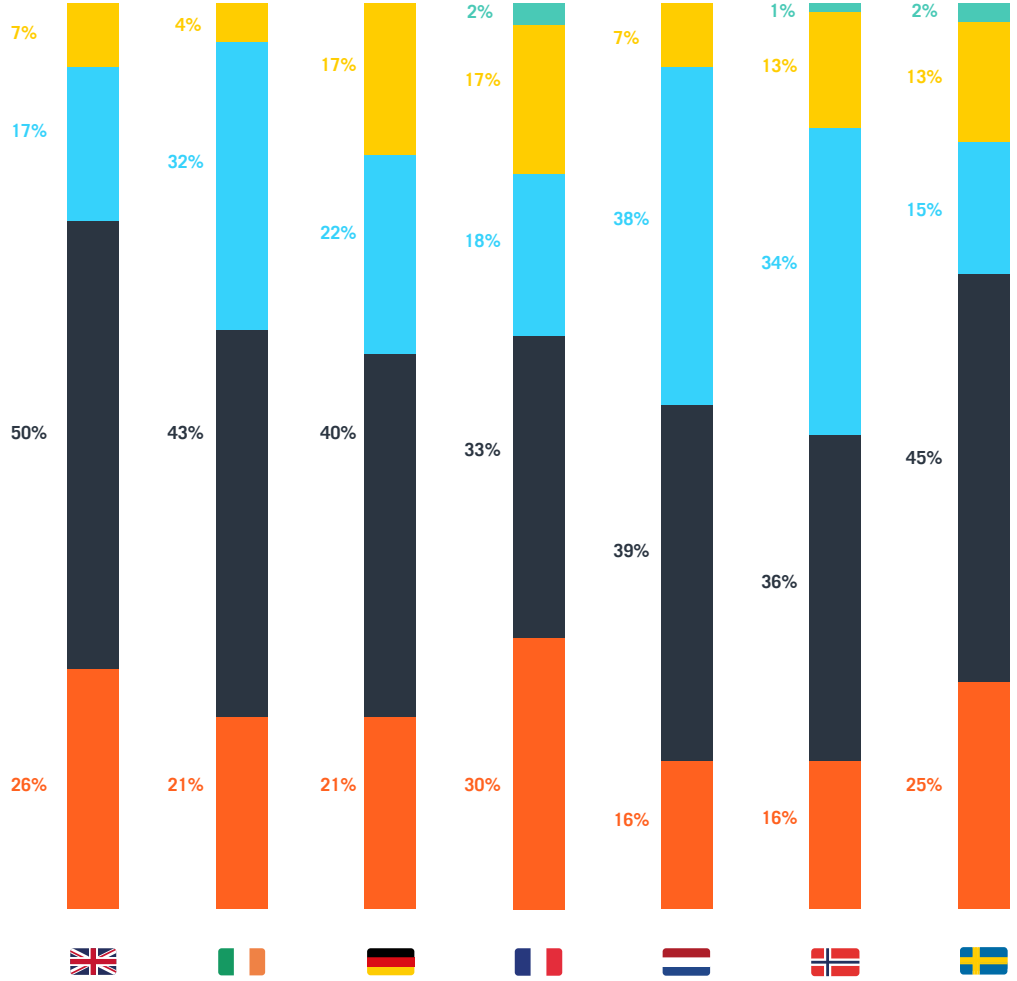
DON’T KNOW

Q. What confidence do you have in local and national government to update old laws and regulations so that more renewable energy sources can be used in data centres?

National Government

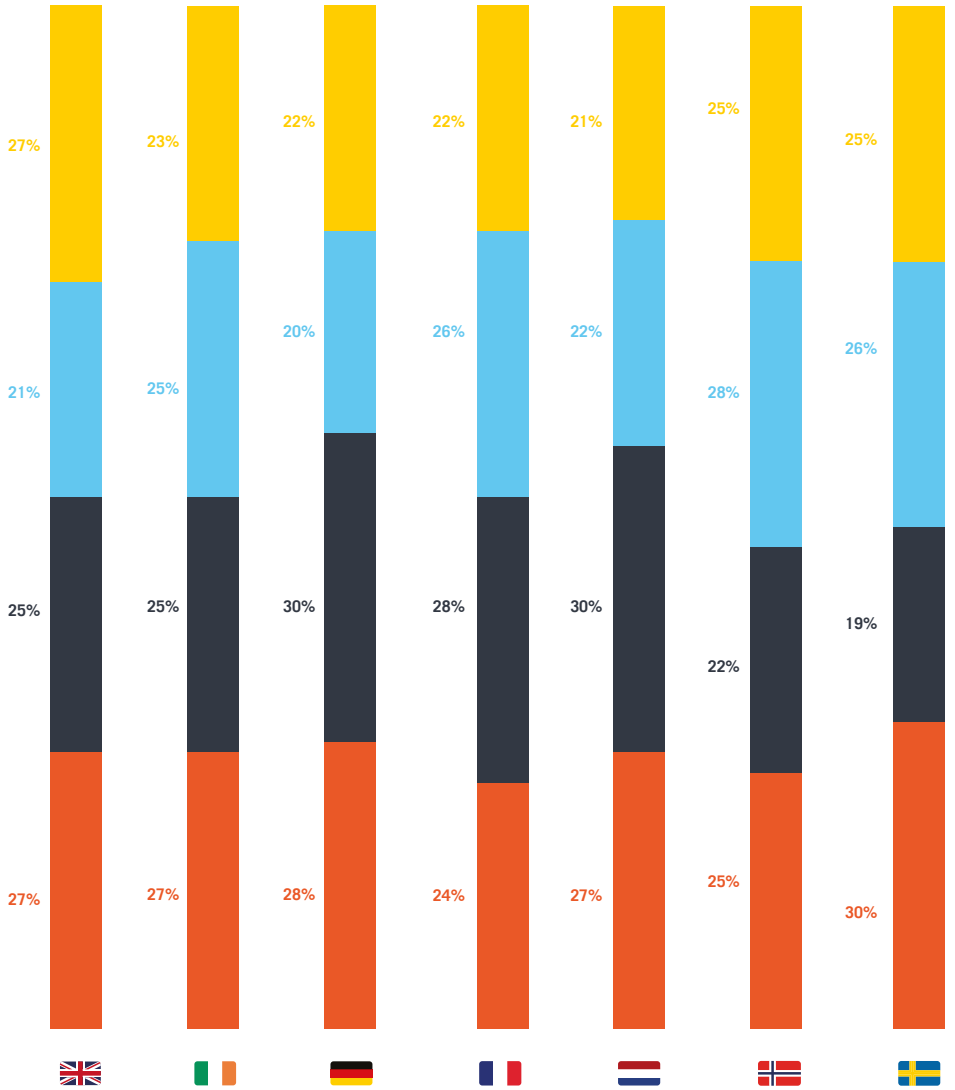
Similar splits were seen when respondents were asked about the capability of their national government. The UK was most confident, while the Netherlands and Norway were less confident.





Q. When working with clients, what main criteria, if any, is used for selecting a data centre location?

In most markets, access to the grid was more important than the cost of electricity when choosing a location for a new data centre. Germany, France and the Netherlands were outliers, citing cost of land as the determining factor. Norway was the only market where free cooling was most important. This finding is perhaps explained by the lower annual average temperature in the region, which allows Norwegian facilities to achieve a good power usage effectiveness score more easily than competing markets.



ACCESS TO GRID ELECTRICITY

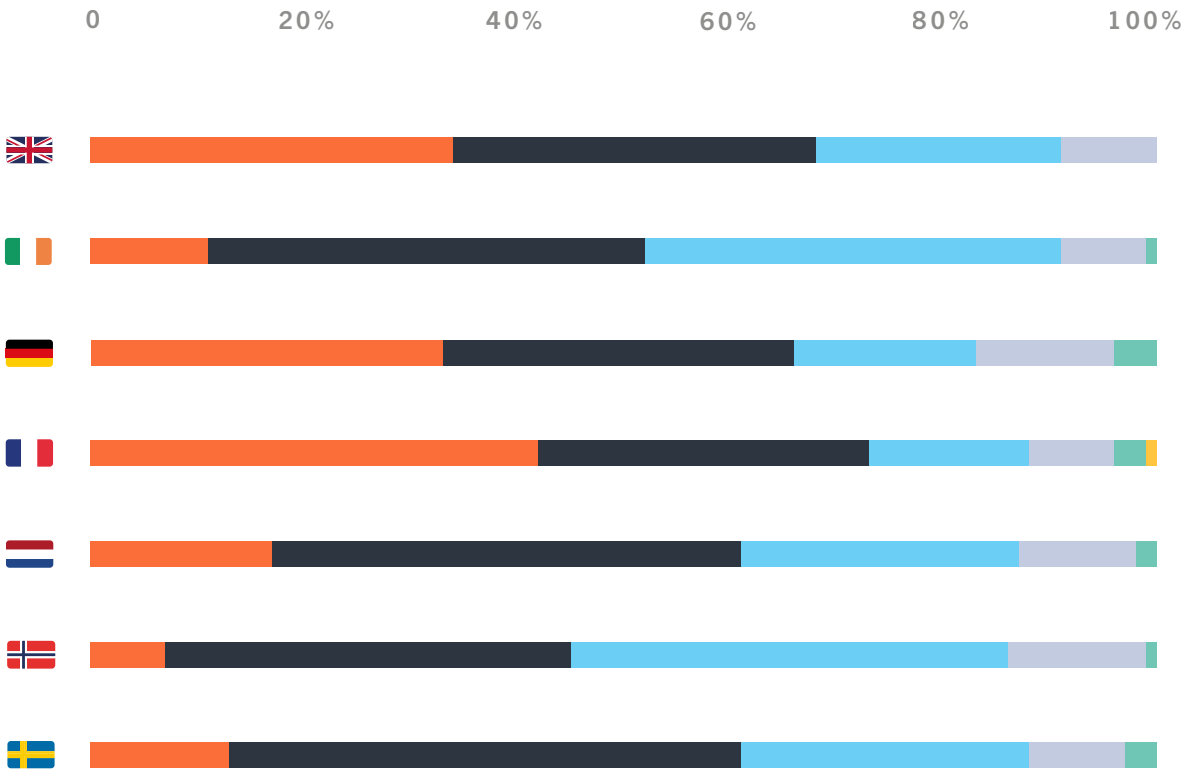
AMBIENT WEATHER CONDITIONS (I.E. FREE COOLING)

COST OF LAND

COST OF ELECTRICITY

Q. How important, if at all, is it for data centres to work with suppliers that have actively committed to an ESG strategy?

Most markets agreed that it was at least ‘somewhat important’ to work with suppliers that prioritised ESG. France, UK and Germany were the three regions where it was deemed most important, while Ireland and Norway had the highest percentage of those who said it was ‘neither important nor unimportant’.



Q. What greener alternatives, if any, are being adopted to power the construction of a new data centre in your region?

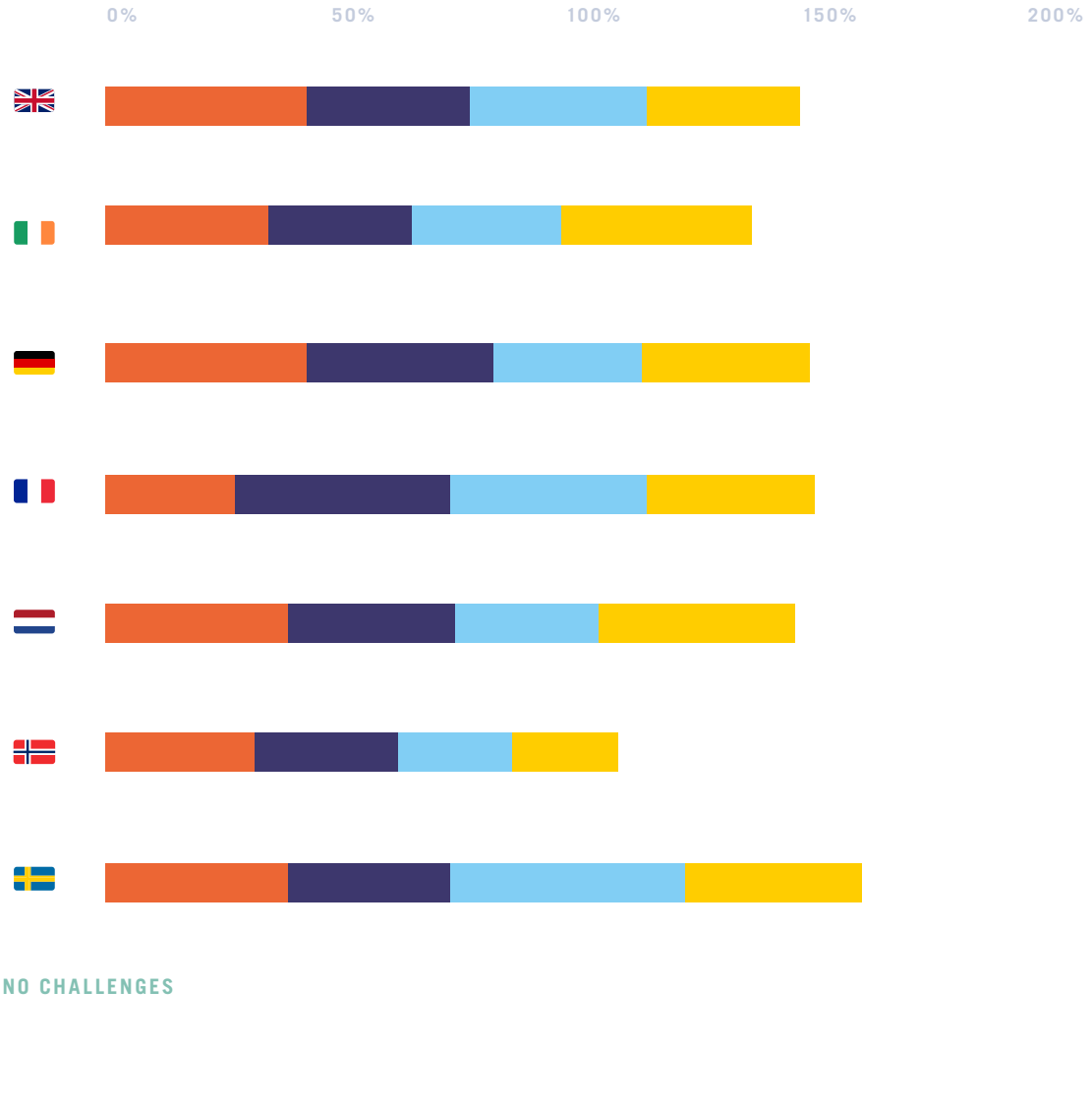
Respondents identified a mix of greener technologies being used to build today's data centres. In the UK, for example, wind and solar were most popular, perhaps owing to the earlier finding that showed the importance of suppliers with a clear ESG strategy in this market. Wind was also popular in the Netherlands and Sweden, both of which have a growing onshore installed base. Other markets such as Ireland, Germany and France were more invested in the use of HVO fuel and battery/hybrid technology. These findings demonstrate there are clear regional preferences when attempting to lower the impact of data centre construction.[14]

WIND POWER
SOLAR POWER
STAGE V GENERATORS
BATTERY / HYBRID TECHNOLOGY
ALTERNATIVE FUELS LIKE HVO
GREENER ALTERNATIVES ARE NOT BEING ADOPTED

14. https://windeurope.org/intelligence-platform/product/wind-energy-in-europe-2021-statistics-and-the-outlook-for-2022-2026/

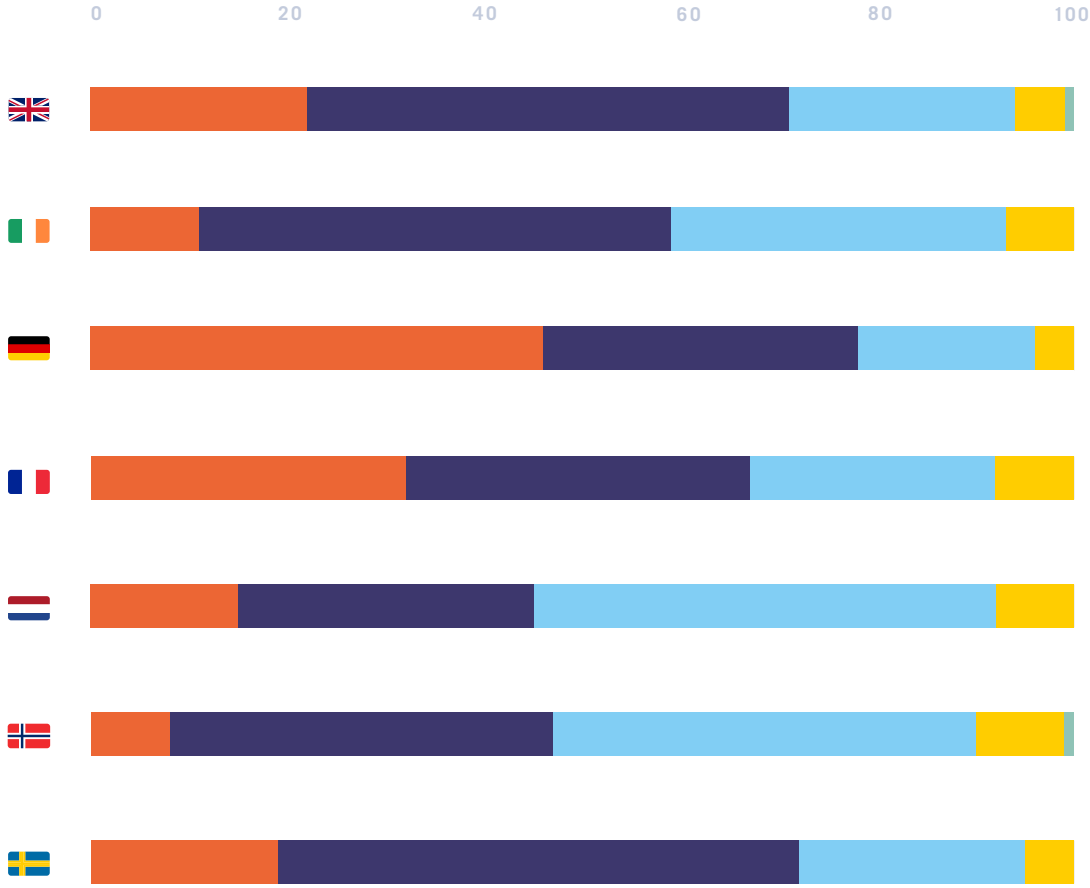
Q. What, if any, are the challenges you encounter when adopting renewable energy solutions in your region?

Besides France, lack of skills was among the top two challenges for adopting renewable energy during the construction phase of a new build in every region. The perceived risk when changing familiar plant with newer technologies was also high in Sweden, the UK and France. Ireland and the Netherlands were most concerned with the high upfront investment required. In some markets, like France and Germany, there were also worries about the level of power possible from renewable energy sources.[14]



Q. How has the demand for back-up diesel power changed as a result of greater use of greener on-site power solutions?

The introduction of greener on-site power has had no effect on the use of back-up diesel power in some markets, such as the UK, Ireland and Sweden. In the Netherlands and Norway, it has lowered demand. Germany and France said it had led to an increase in demand for the fuel, though the difference in France was not as noticeable. This is unsurprising given the previous finding that showed there were reservations about the ability for renewable power to cope with some applications during data centre construction.



THERE IS MORE DEMAND FOR BACK-UP POWER

IT HAS STAYED THE SAME

WE HAVE SEEN A REDUCTION IN BACK-UP POWER DEMAND

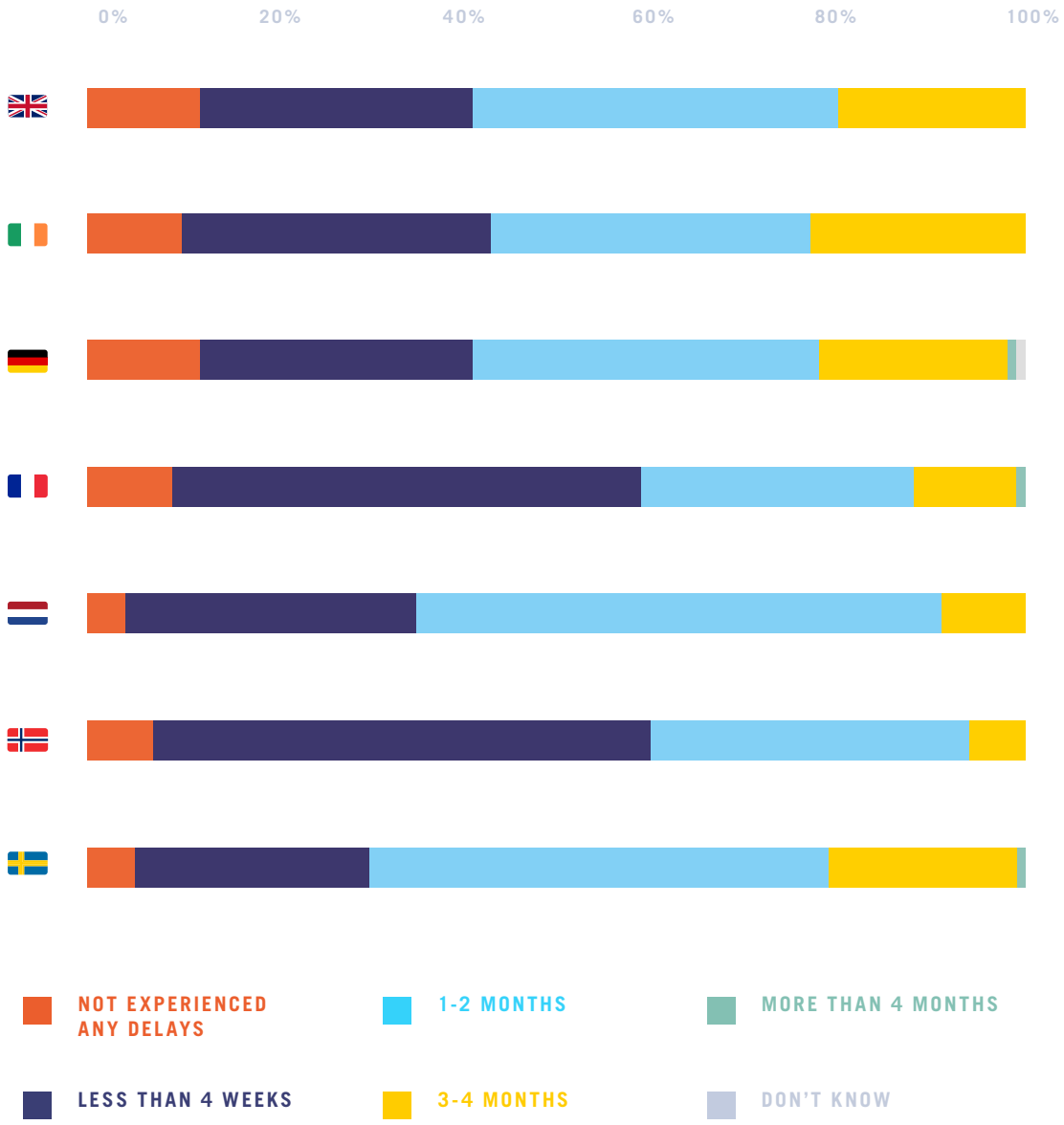
THERE HAS NOT BEEN A MOVE TO GREENER DECENTRALISED SOLUTIONS IN MY REGION

I DON'T KNOW

SUPPLY CHAIN DELAYS

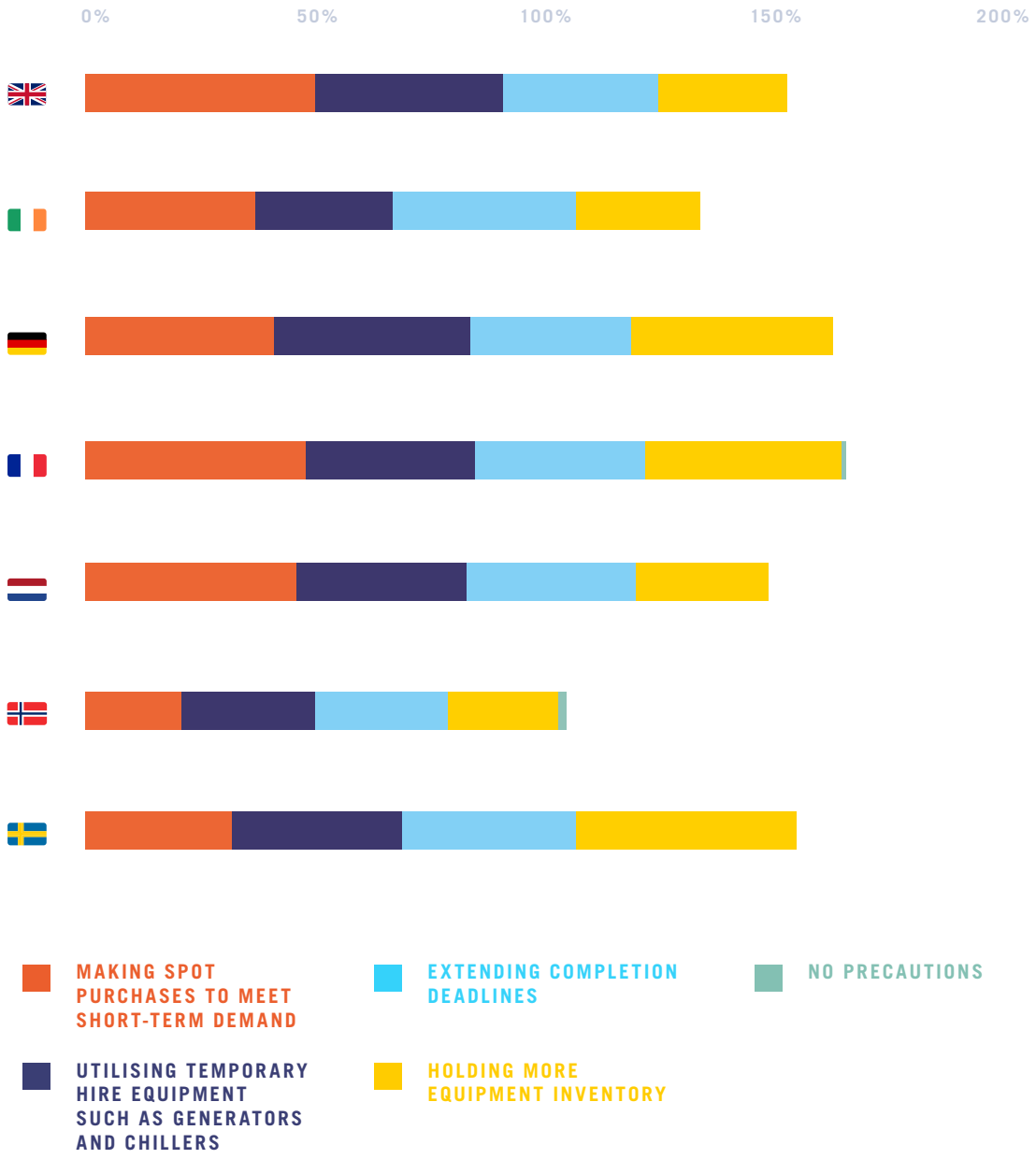
Q. On average, what delays are data centre projects experiencing as a result of critical infrastructure issues caused by supply chain disruption?

Global supply chain disruption is affecting the European market in different ways. The UK, Ireland, the Netherlands and Sweden are mainly experiencing delays of up to two months, though in other markets, such as France and Norway, the majority are 'only' dealing with disruption lasting a few weeks. However, in some cases, builds are being pushed back by several months or more. Regardless, these hold-ups are impeding access to critical infrastructure necessary to bring a facility online. Missed deadlines can carry significant penalties when owners and operators are unable to take ownership of the building on the agreed date, so bridging solutions are now critical for keeping projects to schedule and maintaining the new-build pipeline.



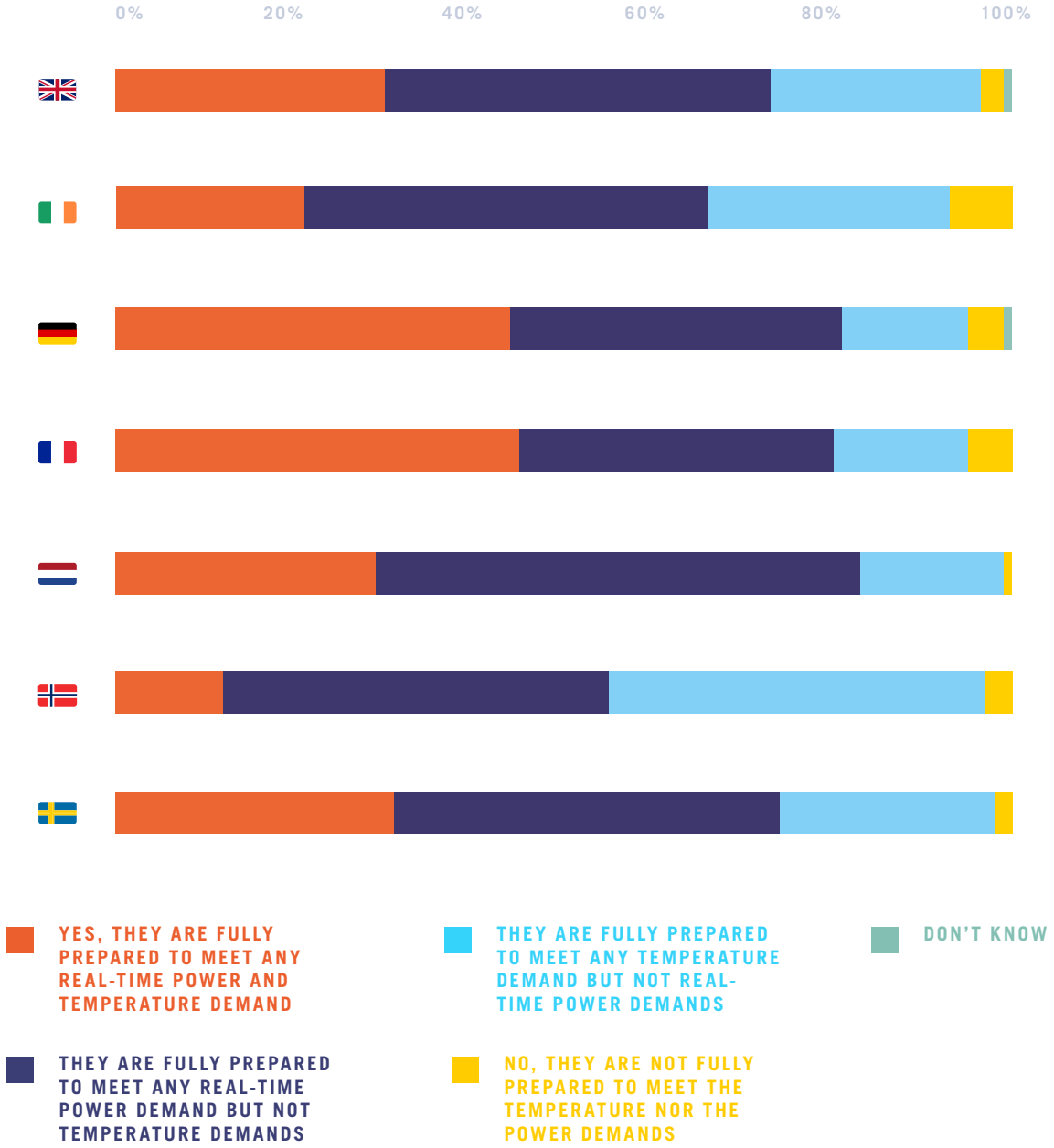
Q. What precautions, if any, are data centres taking to avoid delays caused by supply chain disruption?

Spot purchases were a popular way to avoid supply chain disruption in the UK, France and the Netherlands. The latter market is notable given earlier results that showed some reservations about upfront investment for newer, more efficient equipment. Hired power as a solution scored highly in most markets. Though also scored high in other markets. However, arguably the most important finding is the high numbers of those across every market choosing to extend completion deadlines. Given current demand, this will soon become unsustainable, creating further problems at a later stage.



Q. Do you believe that first-generation infrastructure designs can completely fulfil changing power and temperature control demands in your region?

Besides Germany and France, every market expressed concern about the capability of existing facilities to meet changing temperature demands. This not only highlights the need to build more data centres, but it also shows that extreme weather is beginning to have a more profound impact on the industry. This extends to the design and construction of new facilities – be it in colder climates throughout winter or longer heatwaves during the European summer.[15]



15. https://www.bloomberg.com/news/features/2022-04-22/climate-change-hits-europe-with-new-weather-extremes

Keeping Builds on Track

Responsive Power and Temperature Control

End users expect to move in on the agreed date listed when a data centre is first commissioned. This is challenging because the lead contractor will often be working to a design provided by the owner or operator, which will usually have been created by the principal mechanical or electrical consultant. This unfamiliarity adds extra pressure on what is already a tight deadline, so oversights need to be anticipated before they affect the completion date.

Aggreko's research has shown many businesses are now having to extend deadlines due to market disruption, making contingency planning as important as ever. Many of the issues affecting today's data centre projects are difficult to control, but there are opportunities to offset their effects with the use of bridging solutions. This section examines some of the key challenges that emerged from the research and offers recommendations from Aggreko's team of data centre sector experts.

CHALLENGE

Securing Prime Power

“Data centre construction is faced with two connected challenges. First, digitalisation is increasing, which adds pressure on grid infrastructure that’s already struggling to cope with demand. Second, utilities are decarbonising at pace, introducing a higher degree of intermittency. This situation makes it difficult to secure prime power – especially when many major renewable projects in Europe are still waiting for a connection, adding to the shortfall. There are also a variety of components involved when transmitting power from a utility substation to the data centre, some of which have been impacted by ongoing supply chain disruption. Here, bridging power can offer an immediate fix. Aggreko’s fleet of generators and battery energy storage systems offer easily scalable power, ranging from 30 kVA to multi-MW solutions. This modular set up provides flexible power, even when there are load ramp requirements, and can run on alternative fuels such as HVO to lower emissions by up to 90%.”

Billy Durie

GLOBAL SECTOR HEAD

Data Centres

SOLUTION

Stage V Generators, Gas Generation, Battery Storage and MW Transformers

CHALLENGE

Mitigating the Impact of Construction Delays

“Sometimes delays will be unavoidable, especially in the current market. This will have a knock-on effect – construction delays will impact when commissioning takes place, and delays to the commissioning phase will affect the date when a data centre is brought online and handed over to the owner or operator. But Aggreko has proven there are ways around this problem. We have installed UPS and chillers, and built temporary data halls inside construction sites. Working this way means you can commission equipment and continue a build simultaneously, minimising the time it takes to get servers online and the final structure completed. Aggreko can also deliver a set of load banks on site to ensure a facility’s electrical power supplies are prepared for the unique demands of a fully operational data centre. This includes back-up generators, turbines, UPS, electrical distribution and the site’s prime power connection, as well as water-cooled load banks to test liquid cooling technologies. Our engineers can plan, test and program the load banks to match – providing a seamless process when it’s needed most. We can also provide full testing documentation if the owner or operator requires it.”

Guido Neijmeijer

EUROPEAN SECTOR LEADER

Data Centres

SOLUTION

UPS, Chillers, Load Banks

CHALLENGE

Integrating Greener Power During Construction

“Aggreko’s research showed some businesses are concerned about the high upfront investment necessary to incorporate more renewable energy sources during construction. Others said these technologies might not be able to provide enough power on site. These are reasonable concerns given the thinner margins many contractors have faced in recent months. In this situation, it makes sense to minimise any risk and rely on familiar equipment. However, Aggreko’s Greener Upgrades can work around both these problems, with a low-risk route to more sustainable construction. For example, tower cranes using 320 kVA generators can run more effecively when swapped out with a 200 kVA model running on HVO coupled with a battery energy storage system. This cuts emissions and delivers a significant fuel saving. When powering temporary office cabins during build phase, a hybrid solution comprising 3 x 320 kVA generators and a 300 kW battery, can provide significant reductions in fuel usage, costs and emissions. In this scenario over a 2 month period, an estimated 20,000 litres of fuel and 53,000 kg of CO2 emissions can be saved. Sustainability is as much about efficiency and this is a key part of the thinking behind Greener Upgrades.”

Billy Durie

GLOBAL SECTOR HEAD

Data Centres

SOLUTION

Greener Upgrades

GREENER UPGRADES™

For more information about Greener Upgrades in data centre construction:

CLICK HERE

CHALLENGE

Changing Weather Conditions

“When installing and storing equipment before the building is energised, fluctuating temperatures and humidity can put electrical equipment at risk which can void warranty and lead to spiralling costs for the project lead. Electric heaters are ideal for smaller areas, such as switchgear and UPS rooms, and can also be used to cure concrete, while IDF heaters can be used for larger jobs. IDF heaters can run on HVO fuel to lower the carbon penalty – an important advantage given what respondents said about working with suppliers that have an active ESG strategy. Steam and electric boilers are also available for heating and hot water. For worker welfare during hotter weather, there are several options for contractors to consider, including air conditioning, industrial chillers and cooling towers. Greener Upgrades can also be applied in this scenario. For example, the impact of an 800kVA chiller and 500kVa generator temporary cooling package can be reduced by switching to a right-sized hybrid solution.”

Greger Ruud

SECTOR DEVELOPMENT MANAGER

Data Centres

SOLUTION

Electric/Indirect Fired Heaters and Boilers for Cold Weather; Chillers and Cooling Towers for Hot Weather

CHALLENGE

Maximising Efficiency to Tackle Emissions

“Equipment that is oversized or poorly matched for its chosen application leads to inefficiencies. Right sizing equipment or adopting a load on demand setup – which replaces one large generator with a set of smaller ones that switch on when needed – can improve efficiency while also minimising costs and emissions. Making a switch to alternative fuels, such as HVO, can also reduce the amount of diesel burned each day. Construction will always require a certain level of expertise to get the most out of plant being used on site, but that doesn’t mean the project lead has to employ extra staff or specialists. Across all its projects, Aggreko offers third-party expertise, helping customers to use their equipment most effectively. Our remote monitoring service provides data centre construction with the insights needed to maximise plant performance while lowering fuel consumption, emissions and costs. Over the duration of a typical build, these recommendations can deliver significant savings.”

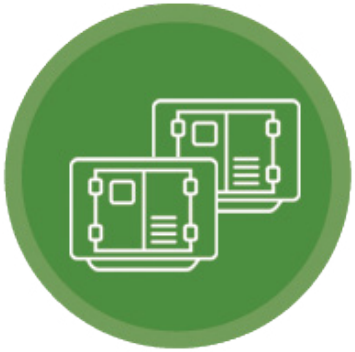
Guido Neijmeijer

EUROPEAN SECTOR LEADER

Data Centres

SOLUTION

Right Sizing, Load on Demand, Remote Monitoring and Alternative Fuels



Securing the Construction Pipeline

Competing issues and uncertain trading conditions are never good for business, less still for large-scale construction that depends on stability to deliver.

Demand is still outstripping supply in the data centre market, and the expectation for contractors to build more sites on time and to specification will only become more intense as the industry heads further into the decade.

Yet it's difficult to avoid the basic financial pressures many companies are currently under, with materials and plant difficult to secure, and skilled labour in short supply. In fact, forecasts suggest construction cost increases on yield for developers will be among the biggest risks for new activity in the sector – all at a time when new facilities are needed most. Sustainability is also a major component in any new data centre project, forcing developers to compete for greener plant that can cut emissions throughout the course of a build. [17]

It's clear that responsive suppliers will be key to meeting demand without further hitting the bottom line. It's not necessarily about alternative procurement models, but rather working with businesses that understand the data centre market and what's needed to bring its new buildings to life. Aggreko's sector experts have shown there is equipment available that addresses many of today's key challenges, both in terms of power and temperature control, as well as more practical issues of getting the right solution delivered on time.

Aggreko's approach is ultimately driven by three key principles:

- **Innovation** – Challenging conventional ideas and improving the performance of today's hired power and energy solutions
- **Environment** – Using existing and emerging technologies to develop low-carbon industry
- **Simplicity** – Clearly presenting the options for different applications and operating scenarios

With over 35 locations across Europe, we are here to support your build through uncertain times.

For more information, visit: **Aggreko.com**

17. https://www.turnerandtownsend.com/en/perspectives/data-centre-cost-index-2022/

aggreko

For more information

03458 247 365

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