

RESEARCH REPORT

Beyond zero carbon: the bigger picture for transformation and adaptation ahead of utilities

As utilities mobilise to fulfil an essential role in the UK's mission to decarbonise by 2050, this research report explores the scope for the net zero carbon experience to provide a model for urgent and ambitious transformation in other essential business areas

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Varun Kapur

Vice president and industry segment head, UK manufacturing and utilities, TCS

Foreword

Severe floods hitting the north of England and Scotland just as the UK hosted the UN's COP26 climate change talks in Glasgow, served as a stark reminder that climate change is here and now, and the UK faces significant impacts if it fails to act.

The UK government has set a target of net zero greenhouse gas emissions by 2050, and the utilities industry is key to achieving this. It will be no mean feat given the complexities of understanding and calculating carbon footprints monitoring, making changes and sustaining the same across the sector and its supply chains. Managing regulatory pressures, securing funding, and increasing influence over scope three emissions are just some of the factors that energy and water companies will have to handle to make meaningful strides towards the net zero vision.

At TCS, we empathise with the hard road ahead of utilities. We have committed to reduce our absolute greenhouse gas emissions across scope one and scope two by 70% by 2025, compared with 2016, and to achieve net zero emissions by 2030. We are doing this by improving energy efficiency in our buildings, reducing IT system power use and using TCS Clever Energy™ which leverages internet of things, machine learning and artificial intelligence to optimise energy consumption across our campuses.

But challenging as the net zero carbon mission is, we also know that achieving a more sustainable future for the environment, society and businesses will require more than cutting emissions. We all need to commit ourselves to a wider “zero” vision. A commitment to delivering zero outages, incidents and leakage would drive towards holistic infrastructure resilience while shooting for zero delays and zero boundaries for customers and information would

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force us to reinvent our industry ecosystem for greater customer inclusion and collaboration.

At TCS, we believe strongly in the pursuit of this wider “zero” vision and we are ready to partner with our customers to tackle every aspect of what it will entail. That is why we chose to collaborate with Utility Week to conduct this research, which explores the views of industry leaders on the significance of the zero carbon mission to their organisations and the scope they see to leverage lessons from this to increase the ambition and scope of transformation initiatives in other key business areas.

The following chapters review the findings of that research. What is clear is the resounding commitment of senior leaders to ensuring their organisations are trailblazers in both emissions reduction and broader adaptation for a very different future. However, as the results reflect, leaders do also have uncertainties and concerns about how they will live this commitment in an increasingly complex industry environment, especially with a perceived drag effect from outdated regulatory concepts.

Read on for more detail on these insights into the views, expectations and doubts of your peers and counterparts. I am confident that you will find the content a valuable aid to your own strategic thinking and decision making.



Key findings

Transforming for a zero

carbon future:

- 90% of utilities have committed to achieving net zero carbon emissions by 2050 or sooner
- 60% of utilities’ decarbonisation commitments include scope three emissions with energy retailers most likely to be tackling scope three and water companies least likely
- 79% of utilities are “somewhat” confident about successfully delivering their organisational decarbonisation commitments in a timely and cost effective way – 6% are not confident targets will be met
- Counteractive regulatory and policy regimes were the number one factor perceived to be putting decarbonisation ambitions at risk
- 48% are concerned that a lack of funds for investment in supporting technologies will hamper delivery of decarbonisation goals
- However, over 85% of respondents say budgets for investing in decarbonisation have remained steady throughout the trials of the pandemic. Just short of 80% say that non-financial resources to support decarbonisation have remained steady
- 65% of industry leaders recognise the scope for their organisation’s response to the net zero carbon emissions challenge to offer lessons which could help add pace and ambition to change programmes in other business areas

Introduction

The government’s commitment to achieving net zero greenhouse gas emissions across the UK economy by 2050 is forcing enormous change on all sectors as companies move to support the national mission through decarbonisation of their own assets, operations and services.

Utilities are of course no exception, indeed they have an especially pivotal role to play with energy networks and retailers shouldering responsibility for decarbonising the way we heat and power our homes and industries as well as the way we move ourselves from A to B. Meanwhile, water companies must reduce emissions from treating and distributing an ever-scarcer, life-dependent resource to a growing population.

But while huge focus has recently been placed on the aspirations and actions of large organisations and industries in supporting a net zero carbon transition, in truth, the business transformation agenda entailed in creating a more sustainable future goes far beyond the reduction of either direct or indirect emissions.

For future markets to function in a way which is zero carbon and resource efficient, but where high service levels are unimpeachable, accessible and affordable for all, utilities must dig deeper and push transformation across disciplines and into business model fundamentals.

To find out more about how utilities are responding to this broad ranging and complex

In association with



Sector-specific transformation imperatives

Energy retail

- 90% of energy retailers see the ability to engage consumers en masse in net zero-focussed products and services as fundamental to their future profitability
- 58% of suppliers are concerned that poorly executed or targeted marketing campaigns might undermine their own ability to engage consumers in the products and services they feel are essential to their future profitability
- 9 in 10 retailers are concerned that adaptation failures in UK infrastructure will have damaging knock-on impacts to their businesses

Water

- The top risk to the future reliability and resilience of water infrastructure is perceived to be an increasing incidence of extreme weather events (57% are extremely concerned about extreme weather impacts, 38% are quite concerned)
- Over 90% of respondents said advanced data analytics will be the most useful technology tool in combatting rising risks to resilience
- Confidence in meeting leakage reduction targets in AMP7 – a key factor in ensuring water resilience against the impacts of climate change and population growth – is widely varied. 41% are confident, a further 41% are unsure and 18% admit to a lack of confidence

challenge, Utility Week partnered with global technology consultancy and services firm TCS to conduct a unique piece of research with industry leaders. Our survey quizzed senior representatives of energy and water utilities about the magnitude and scope of their organisational commitments to net zero, but also the ways in which they feel decarbonisation provides a platform for wider business change. We also sought to uncover which rising challenges in their operating environments – mostly either direct or indirect consequences of climate change – are causing them most worry in terms of threats to future profitability or resilience.

Energy networks

- 85% of energy network respondents rated cyber security as a key risk to the future resilience of their infrastructure, outstripping the potential impact of slow moving regulation, rapid uptake of electric heating or uncoordinated development of energy flexibility services
- Almost 90% of energy network respondents say advanced data analytics is the technology area which will make the biggest difference to their ability to handle resilience risks
- 95% of energy network leaders support the principle of open data as a means to creating a smart and efficient net zero energy system – though 53% say their support comes with some reservations

Find out more about sector-specific research insights in the relevant chapters of this report.

Reassuringly, our survey confirmed that almost all organisations in the utilities sector have committed themselves to achieving net zero emissions by 2050 or sooner – though not all have bound themselves to decarbonisation goals for scope three emissions, that is emissions associated with supply chains and customers.

This reflects a certain lack of confidence among many organisations in their ability to support the added complexities involved in measuring and influencing scope three emissions while questions over how to deliver on scope one and two commitments remain live. It also reflects a perceived lack of availability in alternative materials, as commentary later in this report shows. In terms of those most and least likely to have written scope three emissions commitments into their net zero mission statements, energy retailers – whose net zero role hinges heavily on their ability to influence consumer behaviours – showed leadership while the water sector lagged behind with just 36% of respondents reporting commitments to tackle scope three emissions.

When it comes to the confidence of utilities in meeting their existing commitments, the vast majority say they are “somewhat” confident with around 6% admitting to a greater degree of pessimism.

Significant portions of this research report are dedicated to exploring some of the factors which caused so many leaders to qualify their confidence levels about meeting their own targets and, unsurprisingly, policy and regulatory factors stand out as the most common root cause for doubt. Energy retailers were especially vehement on this point with strong statements submitted to the survey about the ways in which current frameworks are preventing the kind of market innovation needed to unlock the potential of consumers to participate in decarbonisation.

Following close on these external factors however, there were a variety of internal organisational challenges which our respondents were worried could pose obstacles to the delivery of net zero carbon goals. Of these, the availability of funds to invest in relevant digital technologies, a lack of rigorous reporting and measurement frameworks for carbon in assets and operations and a lack of confidence that internal process change will happen in a timely way topped the list.

Interestingly though, while the availability of funds for technology investment was highlighted as a potential barrier to delivery of net zero goals, most respondents also said that their organisations have sustained budgets and allocation of resources for decarbonisation initiatives throughout the trials of the pandemic. This combination of results tends to suggest that while funding is available, it may not be relevant to the scale of the challenge.

With one of the key intentions behind this research being to uncover leadership views on the potential to leverage lessons from the net zero carbon response to accelerate other aspects of business transformation, it was encouraging to see that well over half of respondents recognised scope for this.

Unpacking this response in a little more detail, it was unsurprising to see that the most obvious area where the net zero carbon experience could help utilities up their game was seen in relation to wider environmental stewardship. However, many respondents also said they felt their organisational response to a clear decarbonisation imperative could



be used as a model for more concerted campaigns on issues such as leakage, supply interruptions, and time-to-fix asset or customer issues.

The key areas where respondents said they saw the scope for lessons learned were in the way decarbonisation has brought cross-functional focus around a common goal and the way it has inspired collaboration, both internally and with a multitude of external stakeholders.

Further insight into the survey results, including approaches to decarbonisation, the way this links to wider business change and sub-sector specific concerns about climate-related threats to resilience are covered in the later chapters of this report.

Methodology

This report is based on quantitative research carried out online by Utility Week in Autumn 2021 via an online survey. In total 55 individuals from across the energy and water sectors responded to the survey with around one third of these holding CEO or other C-suite positions in their organisations. Almost all other respondents were directors or heads of their functions or disciplines.

In terms of cross-sector representation, 22 responses came from individuals employed at energy networks, 21 from water and 12 from energy retail.

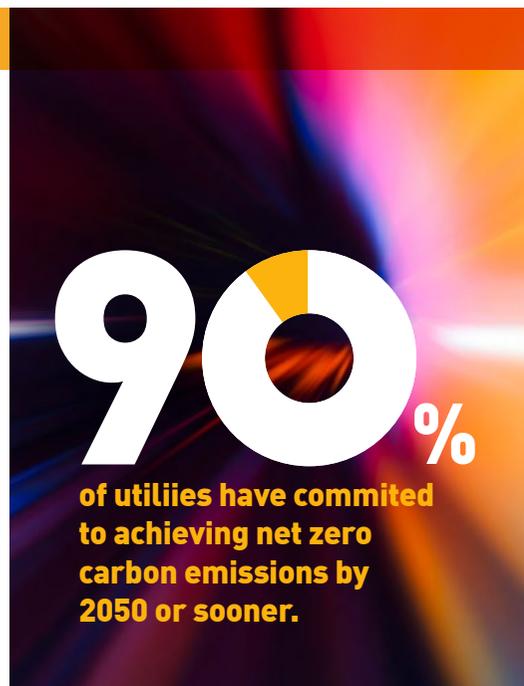
Utilities' carbon commitments

The good news is that nine in 10 organisations responding to the survey have made a corporate commitment to achieving net zero carbon emissions by 2050 or sooner, an achievement which was widely welcomed by commentators across the sector.

"It would be a travesty if utilities felt that this wasn't a core business driver," says Rachel Fletcher, director of regulation and economics at Octopus Energy and former CEO of water regulator Ofwat.

In Fletcher's view, every part of the utilities sector has a pivotal role to fulfil in delivering the net zero carbon vision in a way which is fair and affordable. Retailers, she says, must enable consumers to reduce their consumption and gain access to cleaner power. Networks must innovate to ensure the energy system can support a dependence on distributed, clean and renewable energy sources and operate more efficiently by using demand side flexibility. And water companies have a duty to minimise the carbon content of water, she adds.

Focussing on the role of water, John Russell, senior director of strategy and planning at Ofwat adds: "Though the water sector is not the biggest emitter, it still uses a lot of energy, and there's a lot of process emissions. So it's great to see that the water sector is grasping the nettle here." He notes that the water sector's route map for achieving net zero emissions by 2030 represents a first-of-kind sectoral plan for decarbonisation.



Trying harder

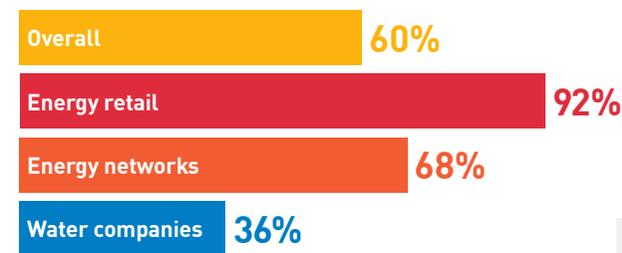
But while it is certainly welcome to see utilities embracing a leadership role in the drive for decarbonisation, other commentators warn that ambition must be backed with progress and that companies need to be ready to take on hard-to-tackle aspects of emissions reduction in order to make a meaningful difference.

Shuchi Nagar, head of architecture and analytics at gas network SGN for example, is positive about the way a common decarbonisation goal has galvanised commitments to change across the sector. But, he adds: "There's always some laggards, and that may still happen because committing to a target doesn't mean it will happen." Clear milestones and common methodologies for measuring progress are therefore very important to get in place, emphasises Nagar.

In water, where a common road map to net zero carbon does exist for certain aspects of decarbonisation, the areas which need special attention are process emissions and embodied carbon. Simon Parsons, director of strategic customer service planning at Scottish Water says these are hard-to-tackle issues because of a lack of widespread understanding about where baselines currently sit and a lack of access to appropriate technology solutions. He explains that this is why most water decarbonisation plans currently feature some significant recourse to carbon offsetting, usually via natural methods of sequestration like tree planting and peatland restoration.

Another key area many utilities will need to extend into as decarbonisation continues will be scope three emissions reduction – that is emissions resulting from supply chain activities or the consumption of products and services by customers – which are generally regarded as very hard to tackle since they sit beyond the direct control of companies.

Does your organisation's commitment to carbon neutrality include scope three emissions?



The data presented has been rounded to the nearest whole number.

At present, our research shows six in 10 utilities have included scope three emissions in their carbon neutrality plans though there is significant variation between subsectors. Energy retailers, for example – who generally own little by the way of physical assets and for whom influencing consumption lies at the core of their net zero carbon role – are most likely to have made scope three commitments. Water companies are least likely, with just 36% saying scope three emissions targets are currently included in their decarbonisation strategies.

Ofwat's Russell acknowledges it's an area the sector is just starting to grapple with, pointing to some early work with chemical supply chains where many embedded emissions lie. However, Russell echoes previous comments about the need for more robust and commonly observed measurement frameworks to be set up before scope three can be approached in a meaningful way. He adds that Ofwat is considering how to integrate a more comprehensive range of emissions into reporting and performance measurement mechanisms for the next regulatory period. This will include new measures for embodied emissions, he promises.

For energy networks, where 68% of companies have made scope three commitments, progress is being assisted by the rising role of energy flexibility in managing network capacity, according to Peter Emery, chief executive of power distribution network Electricity North West.

As networks use flexibility more to avoid and defer network reinforcements, Emery explains that scope three emissions will also be curtailed through a reduced need to use the carbon intensive materials needed in new infrastructure.

"The concept of being a DSO [Distribution System Operator] is to use embedded generation



from commercial investment in local supply such as solar, wind and batteries, and use the power generated by those assets to increase the capacity of your network. This is a smarter way to increase capacity without building more cables and transformers. Every cable I don't have to lay, and every transformer I don't have to install, is a big carbon saving," he says.

Inevitably though, as dependency on the power system grows through electrification of transport and heat, electricity infrastructure will need renewing and extending. As this happens, Emery is clear that markets and innovation need to come together to improve the availability of carbon neutral materials – including currently carbon intensive materials such as steel, copper and aluminium.

"For us to be net zero, we need net zero steel. That's an economic and technology hurdle, but until I can buy net zero steel, I'm not going to have net zero transformers," he says. On a more optimistic note, Emery observes that innovation is happening every day to reduce the emissions associated with

such core resources. He notes announcements from car makers, for instance, that they will source net zero steel. As these commitments come to fruition, he says demand will cause the price of such products to drop.

Speaking for the wider energy networks industry, Randolph Brazier, director of innovation and electricity systems at the Energy Networks Association (ENA) echoes Emery's optimism about the sustainability benefits that an increasingly flexible grid will bring. However, he also warns that this will bring scope three complexities as networks become more reliant on distribution-connected assets operated by third parties for the stability and reliability of their services.

More work and collaboration is needed, he emphasises, to ensure robust data is available, accessible and usable on the carbon footprint of connected assets. "We really need third-party owners and operators to provide that data and help us understand the carbon intensity of their plant and equipment," he comments.

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SSEN's Aillen McLeod, director of business planning and commercial, agrees that collaboration with supply chain and third parties is essential to delivery of ambitious and meaningful emissions reduction targets. SSEN is one of the few networks which has signed up to the Science Based Target Initiative, coordinated by the United Nations Global Compact alongside other partners. This system provides an independently verified framework for delivering stretching reductions to emissions, she explains, and for the scope three elements "working with our supply chain" is an absolute necessity for success.

Moving over to gas networks, David Watson, head of energy transition at distribution operator Cadent reflects that in his industry segment, the real battle for scope three emissions reduction is about end use of natural gas and the idea of transitioning to the use of a more environmentally friendly core product.

"We need to be clear that the fossil gas we put in the pipes now is part of the problem," he says. "I don't think consumers fully appreciate that – even if they support net zero and know that a power plant is part of the problem, they don't necessarily equate that with their boiler."

Energy suppliers however, are critically aware of the carbon content of gas and its impact on their scope three emissions profile. It's one of the core reasons, says Octopus's Fletcher, why some companies, like hers, expect to stop selling natural gas. She says this market change is "fundamental" to delivery of the national net zero carbon goal. "We've already made a commitment to supply only zero carbon products by 2040, which is one reason we're taking actions such as investing in heat pumps, as part of switching away from gas as a heat source," she says.

Making commitments happen

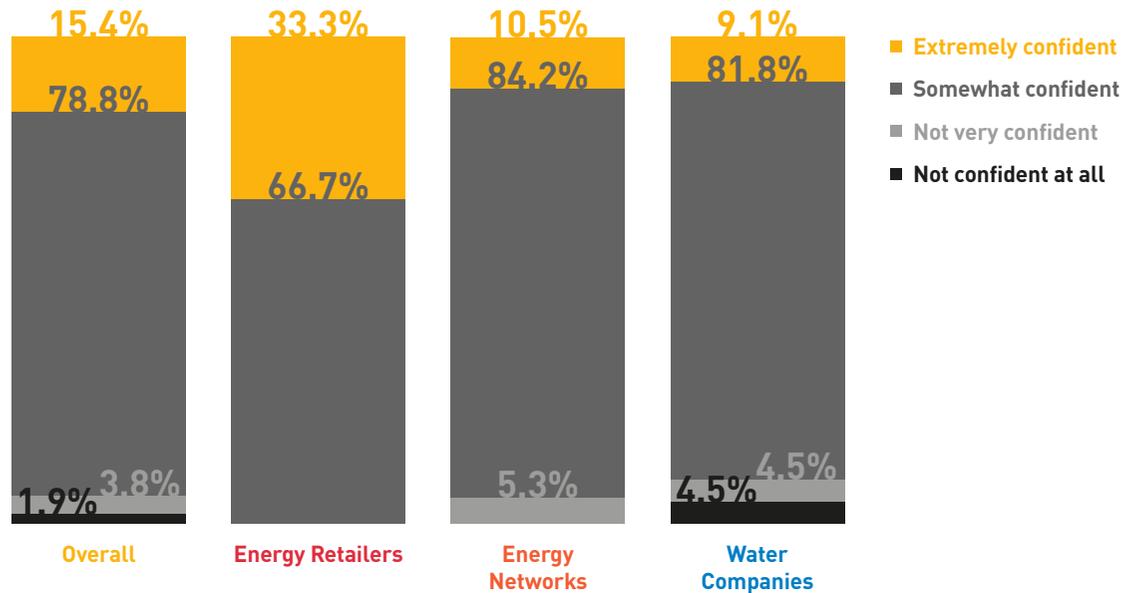
While utilities increasingly try to push the envelope with their commitment to emissions reduction – including via inclusion of scope three – a watchful eye also needs to be kept on delivery of existing goals.

As referenced above by SGN's Nagar, having commitments in place doesn't necessarily mean they will happen, and Utility Week's research certainly highlights some wavering confidence among leaders in the prospect of carbon neutrality aspirations becoming reality.

The overwhelming majority (79%) of respondents said they are "somewhat" confident that their organisation's net zero carbon goals will be delivered in a timely and affordable way. Meanwhile, around 6% said they are not confident this will happen. Again, energy retailers were the most bullish about their ability to make good on commitments, with 33% of respondents expressing very high levels of confidence, while water companies were again the most reserved with around 9% admitting to a lack of confidence – possibly a result of the sector's early deadline of 2030 for carbon neutrality.

How confident are utilities they can meet carbon reduction in a timely and affordable way?

– % confidence of achieving commitments



The data presented has been rounded to the nearest decimal number.

Asking what factors respondents feared are most likely to derail delivery of their net zero carbon goals, the effects of counteractive regulatory and policy regimes came out top, with energy suppliers in particular providing some forthright additional statements to outline why they felt policy and regulatory regimes could prevent timely delivery of net zero carbon. One retailer respondent observed: "Ofgem is the biggest blocker. How can we invest in a net zero future when we all operate under a price cap that means no supplier has turned a profit from its energy business since 2019? It is lamentable."

Regulated utilities meanwhile, tended to be more positive about the direction of travel in their

regulatory and policy environment and contributions from commentators chimed in with this sentiment.

SSE's McLeod observes: "Government policy is crystal clear, the targets are clear, and the policy support is coming in behind. Ofgem's commitment to net zero is also welcome, it's something we've been saying is needed for quite some time. Now they just need to follow through in terms of big decisions. Its call for evidence on transmission charging is welcome, that's been a barrier for net zero for networks."

This said, McLeod also cautions that policy and regulatory leaders need to maintain focus on creating an environment that boosts confidence throughout energy value chains. While Scotland has

doubled the amount of renewable energy connected to its power system over the past eight years, net zero targets mean connection volumes will need to continue to rise through the 2020s, she points out. To support this, generators and their supply chains need confidence that necessary network investments will be made in good order.

For McLeod, the biggest policy and regulatory risks are associated with the scope for key influencers and decision makers to lose sight of the end destination as they become bogged down in important but complex questions of market reform. "There's a lot going on with policy reform and the potential to lose six to 12 months is very high. Maintaining focus is essential, and I mean that from the prime minister right down to the linesmen in our organisation," she says.

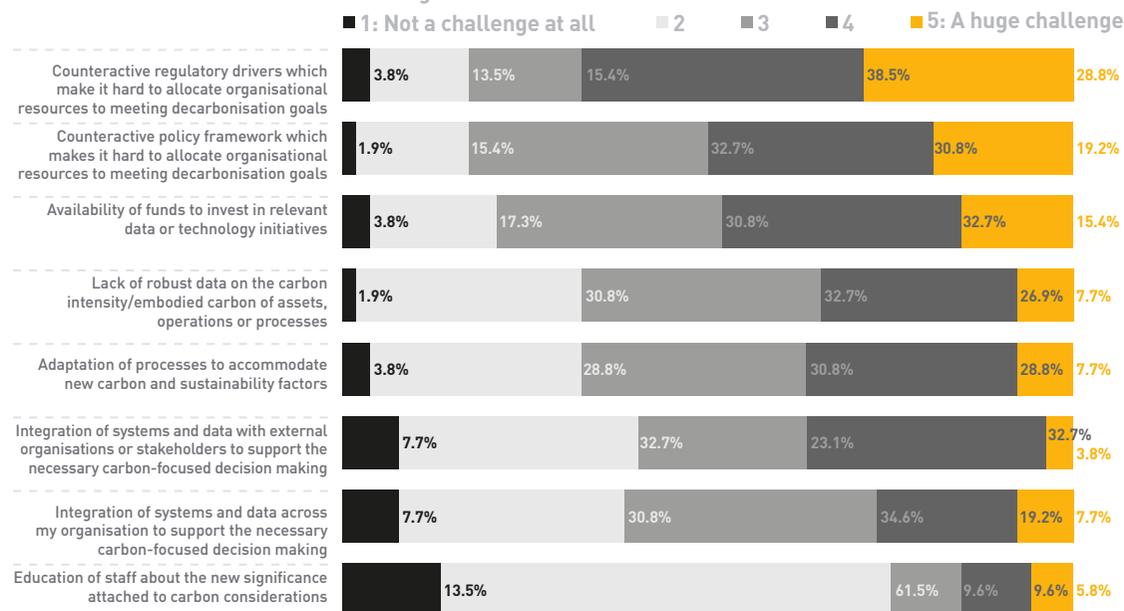
Beyond questions of policy and regulation however, survey respondents also identified a range of internal factors which have the potential to prevent decarbonisation targets being delivered.

Most prominently, these included a lack of sufficient funding for supporting data or technology investments. And alongside this funding issue, respondents identified a current paucity of robust data on the carbon intensity of different assets, operations and processes as a significant barrier.

Interestingly, while the availability of funding topped the list of internal barriers to delivery of net zero carbon commitments, respondents also said that budgets for investment in decarbonisation, as well as allocation to non-financial resources, had largely held steady through the pandemic. One commentator opined that this could suggest that while resources are being made available and ringfenced to support decarbonisation, the scale of this does not in fact reflect the scale of the challenge involved.

Factors which could derail delivery of net zero commitments

% extent of that factor could cause challenges to deliver commitments



The data presented has been rounded to the nearest decimal number.

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Other views on the apparent conflict between these two results speculated that it might reflect a differentiation between confidence in previously allocated or ringfenced funding, and the availability of funding in the future – especially for regulated utilities who rely on Ofgem and Ofwat to approve allowances for activities targeted at tackling decarbonisation and climate change.

SGN's Nagar reflected that the gas network's experience of securing funding for decarbonisation in its RII02 price control was a somewhat frustrating experience – notwithstanding Ofgem's public statements that it is dedicated to delivering a net zero carbon energy system.

Alongside other gas distribution and energy transmission networks, SGN appealed to the CMA against its proposed RII02 settlement which it felt did not provide sufficient scope for addressing the challenges of climate change, among other issues. The CMA's final decision on network appeals was published in October 2021, largely upholding Ofgem's settlements, but removing its controversial application of the so called "performance wedge".

Thinking about the appeal experience, Nagar says: "Some of the funding [we asked for] was related to net zero. We believe that the funding we obtained was restrictive, we even published numbers to say that much more carbon will be released in the environment as a result of the funding being not released. We will have to push our targets out because of [the level of funding we were eventually allocated]. For example, replacement of our gas mains will be slower, meaning we risk more gas leaks and so more carbon in the environment."

We believe that the funding we obtained was restrictive, we even published numbers to say that much more carbon will be released in the environment as a result of the funding being not released"

Shuchi Nagar, head of architecture, **SGN**

Over in the water sector, Laura Flowerdew, deputy chief executive of Bristol Water is also concerned that the regulator develops a clearer stance on how funding for decarbonisation and other measures to secure the long term resilience of water against the impacts of climate change will be handled in future price reviews. She says the regulator needs to have a methodology which makes it easier for companies to understand what projects have the potential to be funded and how net zero carbon considerations should be presented in bids.

"Otherwise, there will be a whole load of discussion and challenge, and investment cases will be rejected," Flowerdew predicts. "I'm not saying one size fits all, but having clear frameworks and expectations about how it will be addressed that are worked out with the companies themselves means that we can approach funding bids in a structured way."

Bristol Water was not granted any spending for net zero in its current spending allocation, she says. "For us, it's probably more of a challenge for Ofwat's 2024 price review than it was for the 2019 round."

Rhetoric from Ofwat on its PR24 approach suggests it is cognisant of the need to place a

stronger emphasis on decarbonisation and broader adaptation for climate change than has arguably been present in previous controls. Ofwat's Russell says this will include founding PR24 in a long term context, but also potentially introducing adaptive planning and funding mechanisms so that there is flexibility for water companies to respond to the latest scientific evidence about climate change and developments in available engineering or technology solutions.

He adds, "It's up to companies to come forward with plans and say how they're going to do that, but I think there's actually a lot that companies could do within their base allowances already." For example, when replacing mains pipes Russell suggests a spray lining technique exists which can be used to avoid the need to dig trenches along the route of the mains, reducing both carbon emissions and costs. Solutions like this show that, over time, investments in net zero should actually save water companies money, Russell argues.



Lessons for business transformation

The vigour and seriousness with which utilities have embraced the decarbonisation agenda reflect an appreciation that climate change will have wide ranging implications for the way in which energy and water companies function, and the kinds of risks to continuity of supply which need to be managed.

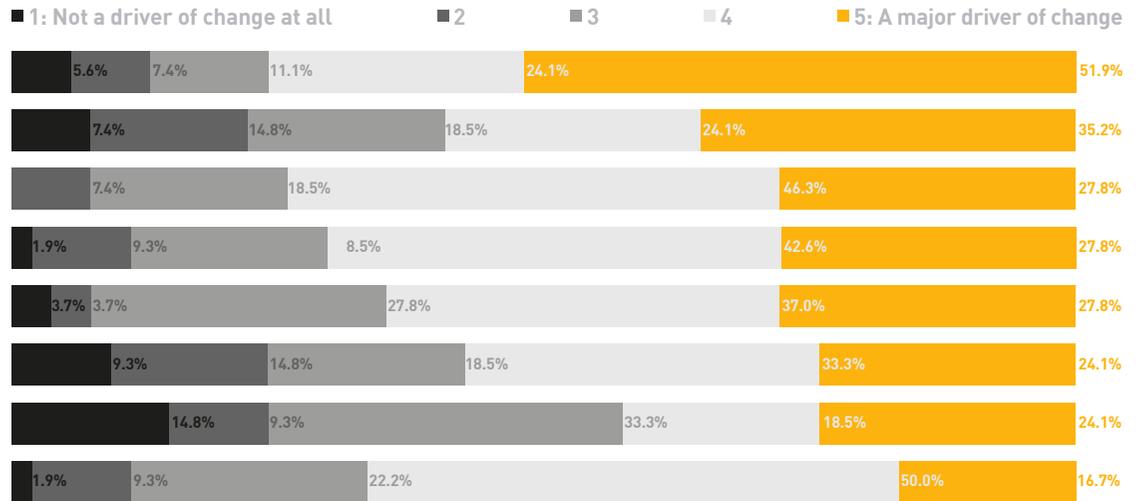
Responses to our research showed that companies are vividly aware of a gamut of climate-related factors which will drive change in their organisations. At the top of the pack, these include a need to make infrastructure resilient to rising climate threats, and there are deeper insights into the specific resilience risks different subsectors are most preoccupied with later in this report.

But alongside resilience, a range of other major drivers of change, mostly either directly or indirectly

tied to climate change and demands for resource efficiency, were also identified. For example, the need to protect against new vulnerabilities arising from convergence between previously distinct infrastructure systems was cited as a major motivator for transformation by over a quarter of respondents, with a further 46% citing it as a significant driver.

Another important prompt for transformation was identified in the need to engage more closely with demand side activities and to influence these more effectively. Clearly this has a direct relevance to decarbonisation, but it also links to thinking about more sustainable future business models and modes of affordable system operation.

To what extent do you recognise the following factors as drivers of change in your organisation?



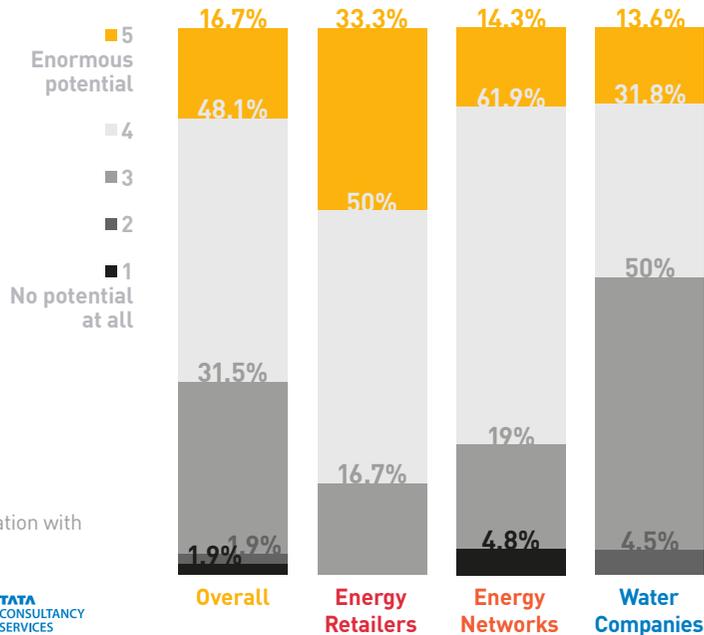
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The data presented has been rounded to the nearest decimal number.

To be as proactive as possible in responding to these drivers of change, our respondents recognised significant scope to take lessons from their organisational reactions to the sudden decarbonisation imperative introduced by the UK government’s legally binding 2050 net zero emissions target. Around 65% of respondents said they could see high potential for their organisation to leverage their net zero carbon experience in this way, with 17% saying they thought the potential was “enormous”.

Could your organisation derive lessons from its response to the net zero carbon agenda to improve its responses to other drivers of business change?
 – % potential to use learnings from its response to the net zero challenge



It comes as no surprise the most obvious way in which respondents thought their mobilisation on decarbonisation could provide an exemplar for change was in relation to broader environmental stewardship – including greater ambition on generating biodiversity net gain in line with investments and sustainable use of resources.

Scottish Water’s Parsons for example says that the commitment of governments to zero carbon emissions by, in the case of Scotland, 2045 has provided a fillip to nature-based solutions and other “soft” engineering options. These tend to have strong carbon benefits due to reduced use of carbon intensive construction materials and natural carbon sequestration in soil and trees. But they also have enormous biodiversity and local amenity benefits.

But beyond supporting better environmental and social responsibility in the round, there were other key industry challenges which respondents said could be dealt with better by replicating approaches and tactics used to tackle carbon. This included reduction of leakage and network losses, minimising supply interruptions and reducing the time it takes to fix both operational issues and customer problems.

One of the most prominent lessons respondents felt could be learned from the way in which utilities have responded to the instigation of carbon neutrality goals however, is how to quickly and effectively reduce barriers to collaboration.

Commentators on the research results agree that accelerating collaborative problem solving and innovation is a key benefit from net zero responses which utilities should look to leverage. They say lessons in how to quickly convene and efficiently manage multi-partner programmes and coordinate delivery of mutual benefits for multiple stakeholders should be proactively applied to solve other industry problems.

For example, Cadent’s Watson observes how decarbonisation has caused gas networks to coalesce around a common imperative to justify the case for a transition to hydrogen as a key heating and transport fuel in the UK. To do this, collaborative working has been kickstarted on economic and safety questions. The methodologies and approaches forged could now be taken forward to help iron out longstanding inefficiencies in sector processes, including asset planning and regulation.

“We need to plan from a whole systems point of view, because hydrogen can be used not just for heat and energy for industry, but also for balancing,” Watson comments. “So how can we come together to plan the most efficient way possible to net zero that would help both networks and retailers? It would require a complete different approach to regulation.”



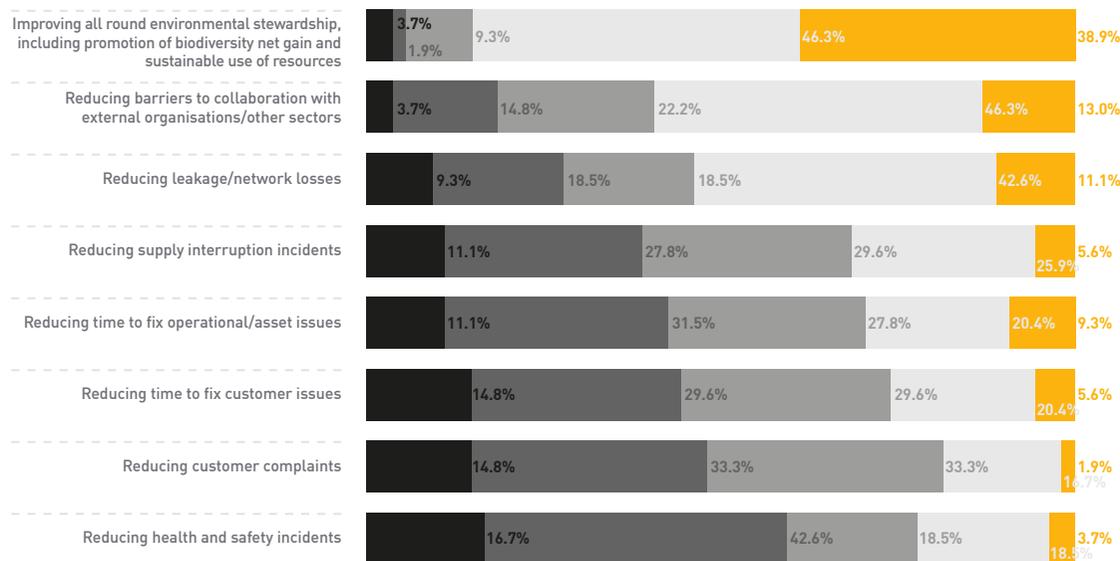
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The data presented has been rounded to the nearest decimal number.

Where do you see the strongest potential for lessons from your net zero carbon response to be applied?

■ 1: No potential at all / not relevant to my organisation ■ 2 ■ 3 ■ 4 ■ 5: Enormous potential



Another area where the gas industry needs to leverage best practice in collaborative action is in the way it tackles uncoordinated disconnections from the gas grid as a consequence of consumers installing heat pumps, Watson adds.

“There are parts of the country where it is likely that hydrogen will happen first, such as where there are clusters of heavy industry like the Thames Estuary, Humber and Merseyside. Making sure those parts of the network can transition to hydrogen, and if businesses and homes in that vicinity can also be some of the early adopters, requires a bit of thinking about future network planning,” he says.

Meanwhile, Scottish Water’s Parsons also sees a need to leverage collaborative best practice to ensure the development of a hydrogen economy is not stymied and does not cause adverse impacts on water. “Hydrogen is a fantastic opportunity, but also a risk from our point of view. Hydrogen generation

uses a lot of water – how do we use wastewater effluent rather than drinking water?”

“We’re working on the H100 project with Scottish Power, SGN and researchers at Cranfield to look at how we can treat wastewater effluent to hydrogen. That’s where we’d like to see the water coming from – a wholly circular economy way rather than using treated drinking water.”

Speaking for one of the partners in this collaboration, SGN’s Nagar expresses a hope that the enormous mobilisation of effort to tackle carbon emissions will now spur collective alignment and focus on digitalisation and data interoperability.

Improving the availability, quality and usability of energy system data is now acknowledged as a key enabler for decarbonisation, thanks to the work of initiatives like the Energy Data Taskforce which have helped shape government’s strategy and action plan *Digitalising our energy system for net zero*.



Nagar says this acknowledgement is welcome, also commending Ofgem for picking up a much stronger narrative on the efficiency and consumer benefits that energy system digitalisation could unlock, alongside environmental gains. “Collaboration now needs to be the mantra for success,” he comments. “As an industry we need to come together and come up with energy solutions which are fit for the future.”

Over in the power sector, ENW’s Emery also sees an opportunity to accelerate digitalisation initiatives on the back of momentum and insights created through the drive for net zero emissions. The power distribution network has been undertaking important data cleansing work, for example, which will feed in to a digital twin project involving multiple stakeholders and support more efficient network operation in the future. This will unlock carbon benefits, but also help reduce interruptions and disruption for customers and drive up the network’s service levels.

“This is a good example for how a data-cleanse activity driving a low carbon activity can have all sorts of benefits for customer services,” says Emery.

But better structures for supporting collaboration are not only needed between industry partners in order to ensure utilities are future fit. They also need to be able to effectively co-create with consumers and other demand-side stakeholders, and to influence the way they behave.

The need to interact more effectively with demand-side system users was identified as a major driver for business change by over a quarter of respondents, with a further 43% saying they felt it was a significant driver.

Later in this report, we explore in detail why energy retailers see a critical link between their

future profitability and their ability to effectively influence consumers and co-create new energy solutions with them. As we will identify, nine in 10 suppliers say the future sustainability of their businesses depends on this.

But it's not only energy retailers who stand to benefit from leveraging lessons in co-creation and collaboration which have been driven by the net zero carbon agenda. Ofwat's Russell says that the looming challenge of water scarcity means demand management is "a nettle the water sector really does need to grasp.

"Water resources are obviously going to be impacted by climate change. We're encouraging transfers of resources through programmes such as RAPID [Regulators' Alliance for Progressing Infrastructure Development] developed by Ofwat, the Environment Agency and the Drinking Water Inspectorate to accelerate the development of new water infrastructure and design future regulatory frameworks. But there is still a big need to reduce consumption. We do need to do that quite significantly because as a country, we still do consume a lot per head."

Russell continues: "Companies need to think more consistently about how they can make the most effective push on getting customers to reduce consumption. I would like to see something more robust and a national effort coming from the sector on that issue.

"There are some good efforts, such as the work of Water UK and some companies like Anglian Water, but it still feels to me that it lacks a really clear, energetic push. If you look at some of the analysis of

Companies need to think more consistently about how they can make the most effective push on getting customers to reduce consumption."

John Russell, senior director of strategy and planning, **Ofwat**

how much more infrastructure you need if you don't reduce consumption, it's quite a big figure. I don't think water companies are just going to be able to build their way out of this."

Speaking from within the sector itself, Flowerdew at Bristol Water agrees that the water resource outlook demands major action to influence demand reduction. But although she sees the scope for collaborative models inspired by the net zero carbon mission to help here, she warns that the messaging for consumers should be distinct and that water companies should not try too hard to conflate emissions reduction with the need to drive down water use.

"Though there's a role for reducing water use to cut emissions from energy, I think it's marginal gains – this is more about how we run and manage the network. Are we going to engage and make a significant difference through the conversation about net zero with consumers? I think they will find that quite hard to comprehend, because it's not that they're directly consuming energy, they're consuming water. I think the message around water efficiency is much more about the impact on water resources, rather than on net zero," she explains.

We believe in creating "zero boundaries" ecosystems where collaborative innovation and co-creation can thrive.

It's enormously encouraging to see leaders in the utilities sector identify with the scope to lift lessons from their organisational responses to a net zero carbon imperative. Well over half of respondents to this research said they see significant or enormous potential for learning to help accelerate and increase ambition in other important areas for business transformation.

What's also good to see is a recognition that one of the most important things that our collective response to decarbonisation has taught is how to quickly and effectively make collaboration happen and reduce barriers to knowledge transfer between key partners or parts of our industry ecosystem.

At TCS we believe strongly in a future of "zero boundaries" where there is frictionless integration of organisational systems and where different business functions as well as external stakeholders can work fluidly together on common goals.

Enabled by a sophisticated digital ecosystem, this idea of zero boundaries will help utilities push beyond the immediate challenge of zero emissions to pursue new "zeros" in interruptions, incidents and customer delays.



Varun Kapur **tcs** TATA CONSULTANCY SERVICES

Vice president and industry segment head, manufacturing and utilities industry segment



Key findings

- **Nine in 10** energy retailers believe the ability to engage consumers en masse in products and services designed to support the net zero transition is critical for future profitability
- **BUT 83%** are concerned that outdated regulation will prevent them bringing forward suitable mass market propositions for net zero in a timely way. 42% are extremely concerned about this
- **Other key risks which might prevent suppliers bringing forward suitable mass market propositions to support future profitability include:**
 - Rising use of third party intermediaries such as price comparison sites and auto switching services (a concern for 58%)
 - Ineffective marketing campaigns for new products and services (a concern for 33%)
 - An inability to convince customers to agree to sharing key data (a major concern for 25%)
- **73%** of suppliers are actively investing or have plans to invest in machine learning and advanced data analytics to help mitigate against the above risks
- **Other mission critical IT investments are being progressed by many in artificial intelligence, cloud computing and internet of things technologies.**
- **Nine in 10** retailers fear a failure to adapt UK infrastructure for a climate stressed future will negatively impact the reliability of energy supplies in the future, with knock-on effects for their businesses

Sector resilience threats and responses

In addition to a core research questions set focussed on organisational response to the net zero carbon agenda, and how this might precipitate more widespread transformation in the sector, Utility Week and TCS were keen to use this initiative to understand sector-specific concerns about the future resilience of utilities.

In the following chapters we highlight the top factors which energy retailers, energy networks and water companies respectively consider to pose threats to the future resilience and reliability of their services. We also highlight the perceived investment priorities for each subsector as they move to mitigate these threats.

Energy retail

Many energy retailers have recently launched new products and services for niche customer segments such as electric vehicle owners or consumers who have installed heat pumps. However, as decarbonisation gathers urgency and pace, our survey response made it absolutely clear that suppliers see a need to scale these kinds of services for a mass market. They need to do this to fulfil their role in enabling decarbonisation, but also to protect their own future competitiveness.

This was resoundingly demonstrated in the fact that 90% of energy retailers identified an ability to engage consumers en masse in new products and services designed to support the energy transition as critical to their future profitability.

Speaking for Octopus Energy, Fletcher agrees this ambition lies at the very core of the company's mission and vision. "Why have we invested in industry-leading customer relationship

In association with

management?” she asks. “It’s because we believe that if we’re going to help achieve net zero, it has to be a customer-focussed transition, so we need to be trusted by our customers, and have enduring relationships with them.”

This belief has driven the development of Octopus’s celebrated Kraken technology platform – which has now been adopted by three other UK retailers, Good Energy, Eon Next and EDF Energy. But it has also shaped Octopus’s operating model for service delivery which Fletcher explains is characterised by flat management and autonomy for a broad base of customer facing teams who own the experience of specific customer cohorts from end to end.

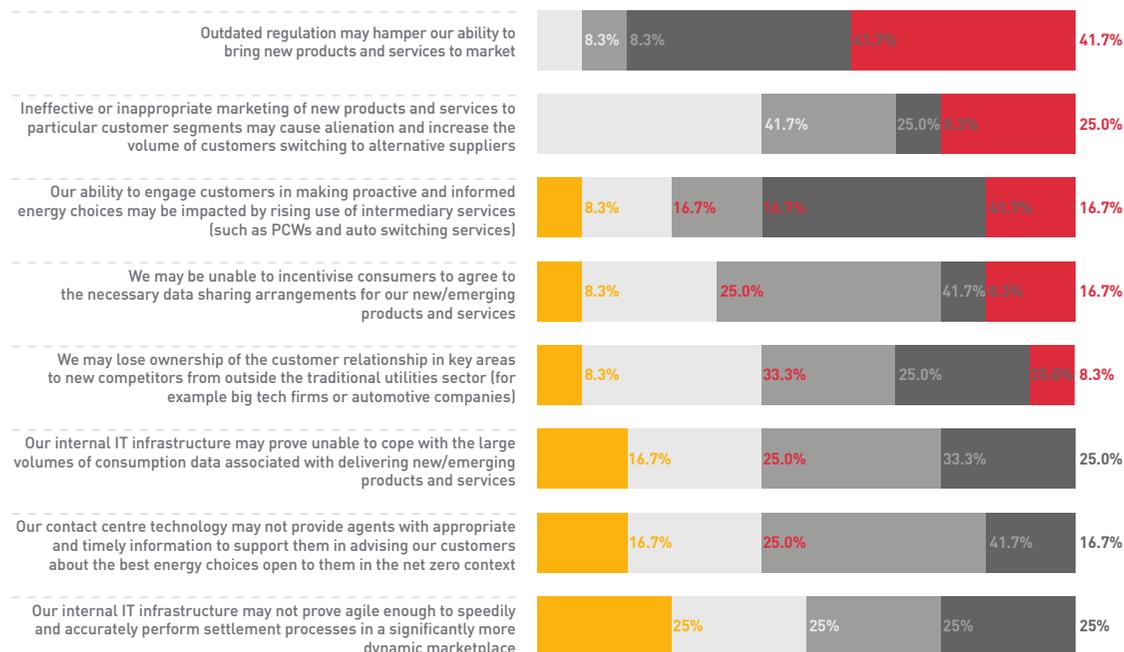
“Decarbonisation is not an add-on or separate part of what we’re about as a business, it’s a key driver of everything we do, and it affects decisions on technology, innovation and customer services,” Fletcher emphasises.

Like many others in the retail market however, Fletcher is unconvinced that this same focus on enabling decarbonisation is front of mind for policy makers and regulators. Over 80% of survey respondents said that they fear outdated regulation will hamper their ability to bring forward the products and services which they believe will be fundamentally important to the net zero carbon agenda, as well as the sustainability of their own businesses.

Energy UK’s deputy chief executive Audrey Gallagher recognises the trepidation and frustration which underlies the research result. Focussing on industry discontent with the government’s programme for retail market reform which was published in July, she says: “There’s a real worry from retailers on the strategy that is being pushed. I don’t think we’ll get a vision that’s ambitious enough, and in some cases it is absolutely

Supplier concerns about factors which may prevent them engaging customers with mission critical new products and services

■ 1: Not concerned at all ■ 2 ■ 3 ■ 4 ■ 5: Extremely concerned



backwards. For example, the consultation on opting in or out of switching. It is not clear on how this is linked to the transition.”

Gallagher also finds rhetoric from the government and regulator unhelpful. It’s not currently clear that government understands the important role retailers must play in the energy transition by enabling demand side engagement with energy flexibility through smart home services, or deploying energy efficiency and low carbon heating options at large scale, she says. Instead, government persists in using the retail industry “as a punchbag” and in tarring the whole industry with one brush when individual companies are found to have failed in delivering fair and competent services to their customers.

But it’s not just policy and regulation which are going to make it hard for retailers to deliver the mass market innovation in energy services which they imagine hanging their future businesses around. As our survey highlights, retailers are also nervous about the impact that rising use of third party intermediaries (TPIs), such as price comparison sites and auto switching services will have. In addition, they doubt their own abilities to deliver effective marketing campaigns for new products and services to make them broadly appealing and they are concerned about their ability to secure agreement from consumers to access important data – for example consumption or location data – which might be important to making smart energy services work well.

The issue of TPIs is one which industry sources regularly speak to Utility Week about. According to recent data from Citizens Advice and Ofgem, around 70% of consumer moves between energy suppliers currently take place via price comparison websites. Meanwhile, use of auto switching services is also on the rise, now accounting for around 5% of consumer switches.

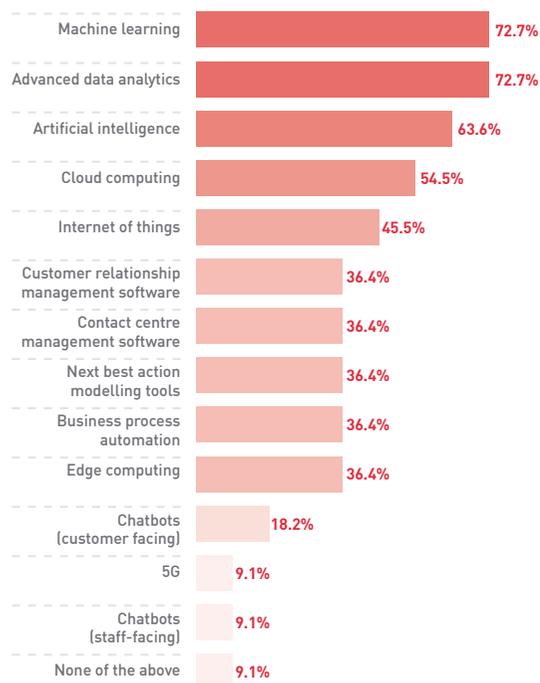
Most retailers recognise that services like these have a role to play in a competitive market and that they offer value to consumers who find it hard to make informed energy choices. But there is also a widespread belief that these services are perpetuating a focus on price above other value factors in suppliers' offerings and putting distance between suppliers' and their customers at just the moment when close engagement is needed in order to communicate the value of new, net zero focussed products.

As one industry leader recently commented: "The focus on price only in auto switching is damaging. If this takes off, will it cause customers to switch off just at the time that we really need them to engage in the decarbonisation agenda?"

The concern about becoming distanced from customers links to the doubts expressed in our survey about the ability of retailers to deliver effective marketing campaigns for products and services which could unlock decarbonisation value. This is because intelligent targeting of new products and services will depend heavily on a nuanced understanding of the different motivations and values of individuals – information which can only be gained and maintained through close and long term relationships, say customer strategy leaders in the sector.

Where are suppliers investing to mitigate risks to the sustainability of their businesses?

– % current investments / firm plans to invest



To help mitigate against the risks of disengagement and poorly executed marketing, as well as other barriers to market innovation identified in our survey, it is clear suppliers are proactively investing in a range of key technology fields. The top technology areas identified: machine learning, advanced data analytics and artificial intelligence are all angled towards improving capabilities to understand individual needs at large scale, and to respond to these flexibly but efficiently observe expert commentators.

We believe in empowering consumers through mass personalisation in the way customer experiences are tailored and delivered.

This research captures a clear message from energy retailers that improving their ability to engage with, understand and influence consumers at scale is absolutely essential to the future of their businesses.

TCS appreciates this imperative and has developed a concept we call "the power of one" to express the way we see mass personalisation of service design and delivery happening. Our approach is powered by machine learning and artificial intelligence as well as big data analytics (all called out as key technology priorities by survey respondents). Using these tools we are helping our customers transform the way they engage with their customers today and supporting their ability to offer smarter energy products to the right people, at the right moment.



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Strategic advisor and consulting partner, utilities industry segment, UK&I, TCS



Energy networks

As energy networks become smarter, with more remote monitoring and embedded intelligence as well as an increasing volume of connected third party devices, it has long been acknowledged that cyber security risks will also rise.

Our survey results reflect that concern about how to contain this risk is reaching a peak with 85% of respondents saying cyber threats are a significant or extreme cause for worry about network resilience and reliability. ENW's Emery sums up the sentiment from industry leaders saying: "The cyber threat keeps me awake at night - if anyone running a sizeable business with a sizeable customer base is not worried about cyber then they don't know enough about it."

Similarly, SGN's Nagar comments: "If anyone working for a critical network thinks they're sitting safe right now they're fooling themselves." He adds that cyber risk currently tops SGN's corporate risk register and that, despite receiving close to £40m from Ofgem to manage and mitigate vulnerability to cyber threats, "nothing is fool proof".

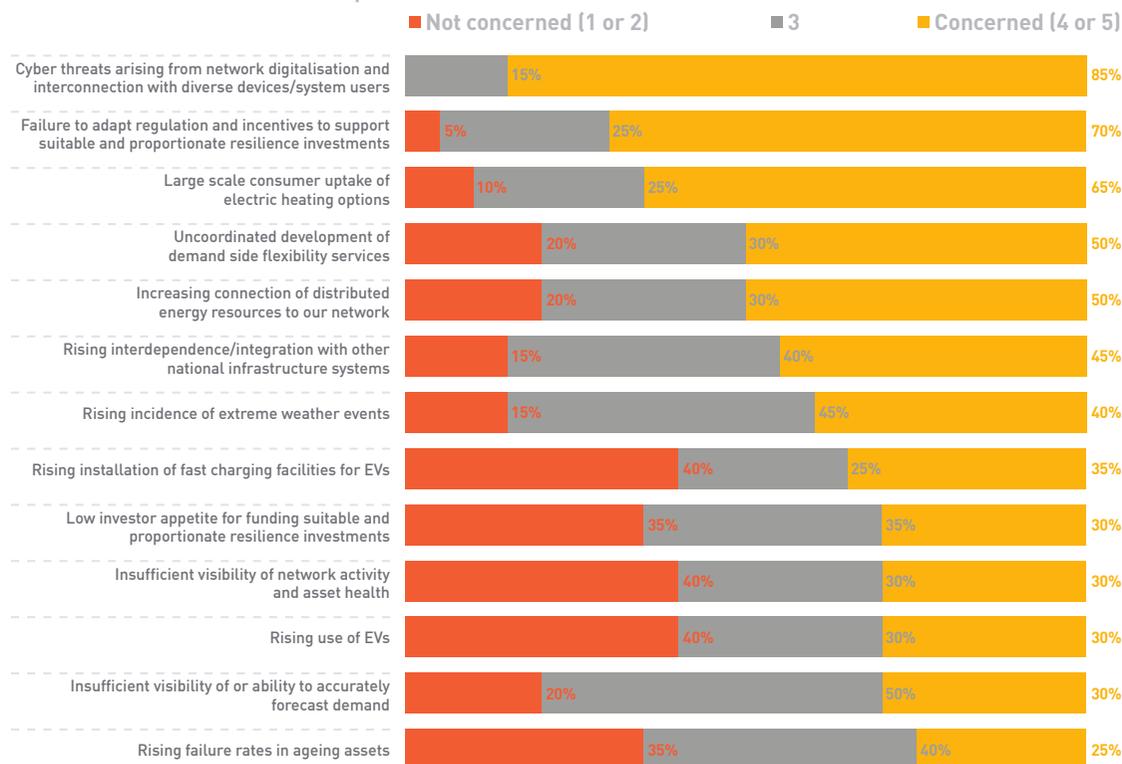
Expanding on the scenarios most likely to cause network issues, Nagar says the biggest cyber risks stem from the potential that an employee unintentionally clicks on a link that allows a hacker access to core systems, or that a ransomware attack gains control over the same. "We lose sleep over this," he says.

Key findings

- 85% of respondents from this subsector identified cyber threats as a major worry when it came to the future resilience and reliability of their networks
- Other big risks to future resilience were identified as:
 - A failure to adapt regulatory incentives to support proportionate infrastructure investment (a worry for 70%)
 - Large scale uptake of electric heating options (a worry for 65%)
 - Uncoordinated development of demand side flexibility (50%)
- Around 90% are investing in, or have plans to invest in, advanced data analytics to help mitigate the risks posed by the above factors and others
- Other technology investment priorities to help manage resilience threats were identified as:
 - New network management systems (79% are investing)
 - Fault monitoring technologies (74% are investing)
 - Field force management software (68% are investing)
- Adopting open data principles to support the creation of a smart and efficient net zero energy system is supported unreservedly by four in 10 network leaders. A further 53% support the idea but with some reservations
- In light of climate change and efficiency pressures, 84% believe regulatory incentives for the reduction of leakage or losses are no longer fit for purpose

Factors network leaders fear as threats to infrastructure resilience and reliability

– % extent of concern that factors pose threats to the network



The exact steps networks are taking to stave off serious cyber breaches are closely guarded, but training staff and promoting cultures of cyber security are the first lines of defence. Investment in advanced diagnostic tools for identifying anomalies in the way certain assets or data sets are behaving is also important, say commentators.

Other key causes of concern for resilience identified by respondents included a failure of adaptation in regulation so that proportionate resilience investment is not incentivised, followed by mass uptake of electric heating and uncoordinated development of demand side flexibility services.

However, for commentators, it was adaptation for extreme weather and the increasingly obvious impacts of climate change which was front of mind – a factor which was rated as a key cause for concern by 40% of research respondents.

ENW’s Emery is among those to rate these as a prominent and concerning risk factor for resilience.

ENW is especially sensitive to the rising challenge of high winds, heavy rainfall and flooding in its region, says Emery - especially given vivid memories for the organisation of Storm Desmond in 2015 when the combined effects of power outages and flooding led to a total breakdown of

“The cyber threat keeps me awake at night - if anyone running a sizeable business with a sizeable customer base is not worried about cyber then they don’t know enough about it.”

Peter Emery, CEO, Electricity North West

essential service supplies and communications for the city of Lancaster.

Spurred on by this experience, and by wider evidence of increasing incidences of extreme weather, Emery says ENW is collaborating with the Environment Agency and other utilities to create “whole systems” solutions to flooding, including tree planting to slow water flow in to urban areas.

Cadent’s Watson is also on high alert for weather related challenges to network resilience. Flooding is a particular concern due to the risk it poses to gas pipes and the potential for public safety hazards in the event of gas leaks. Particularly critical points of the network are where distribution systems meet with transmission. At these points, “there are huge bits of kit and if they were flooded there would be a big issue.”

At SGN, Nagar agrees weather related risks need to be taken very seriously, and he puts his faith in technology to help. For example, he says SGN is investing in artificial intelligence to help predict asset vulnerabilities, including their susceptibility to extreme weather events. Already, SGN has a model which takes in feeds from over 30 data sources which bring insight into weather, peak demand trends, gas prices and public sentiment about the cost of energy. It uses these to inform asset interventions and operations and maintenance regimes.

A next step will be to develop this model into a digital system twin which, by integrating third party data, can also suggest when pipe damage may be more likely to occur due to the activities of other organisations – for example other utilities conducting street works. As technology advances, Nagar looks forward to this model returning ever higher degrees of accuracy and nuance to support decision making. And he adds that the digital twin will prove its worth in the transition of the gas grid to carry hydrogen.

“Scenario planning becomes a very easy thing once you have the digital twin of your entire company on a cloud,” he explains. “I think that will be a game changer for net zero planning, because we will do scenario planning on computers in minutes, rather than days in a lab.”

SSEN’s McLeod agrees that investing in the creation of this kind of modelling is absolutely essential to resilience and the wider vision for

Scenario planning becomes a very easy thing once you have the digital twin of your entire company on a cloud.”

Shuchi Nagar, head of architecture, **SGN**

a smarter, more efficient energy system in the future. She adds that it will become imperative for visualising and managing interdependencies and vulnerability between infrastructure systems, especially as transport and heat become more dependent on the power system.

The significance placed by leaders like Nagar and McLeod on sophisticated modelling and decision making tools to safeguard resilience is reflected in responses to the research questions on active investment areas for risk mitigation.

At the top of the pack, almost 90% said their organisation is actively investing or plans to invest in advanced data analytics to help stave off threats to resilience. Other important technology areas include network management systems – which power distribution networks have particularly strong drivers to revamp thanks to growing responsibility for dynamic local system balancing. Meanwhile fault monitoring, field force management, artificial intelligence, drones, machine learning, internet of things and cloud computing were all active investment areas for over half of respondents.

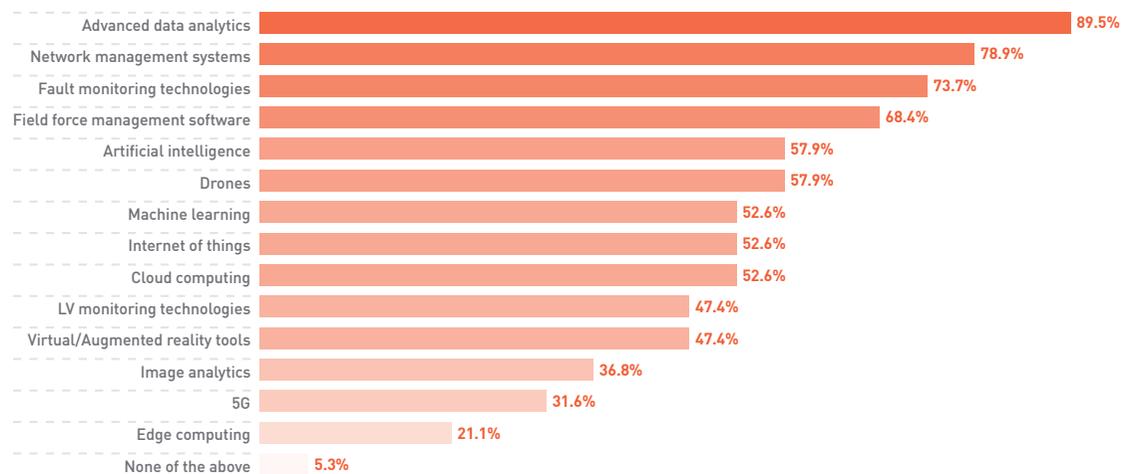
The gamut of technology types in play reflects the scale and pace of change in the way the energy system functions and the amount of pressure on networks not to be seen to be stalling the energy transition through a lack of preparedness, observed one commentator.

In relation to this, one area where there is growing expectation for networks to show themselves as progressive is in the adoption of so called “open data” principles. The idea that open data (making information visible, accessible and usable to any interested party) is desirable for a smart and affordable transition to net zero carbon was argued strongly by the government commissioned Energy Data Taskforce in 2019.

In an influential report, the taskforce described how opening up data on energy system assets would allow for smarter network management, more fluid knowledge transfer and development of best practice between networks and a proliferation of innovative solutions from entrepreneurs and big technology players alike, to big energy transition questions.

Since the publication of the taskforce’s report, the networks industry has been working hard behind the scenes to adopt its recommendations, including establishing common information models which can

Technology investment priorities for managing and mitigating resilience risks



The data presented has been rounded to the nearest decimal number.

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support open data and undertaking massive data cleansing and governance initiatives.

Responses to our survey suggest this work is not begrudged, with respondents expressing widespread support for open data as a foundation for the smart, efficient, net zero carbon energy system of the future.

However, 52% of respondents did also say that their support for open data comes with some reservations. The presence of niggling doubt was certainly recognised by commentators, with the ENA's Brazier saying he is aware of a range of concerns, including uncertainty about what acceptable commercial gains should be allowed from use of open network data and implications for network security.

Given the clearly expressed fear among leaders about cyber vulnerabilities, it is no surprise that security considerations seemed the foremost issue among network commentators.

"The big issue for some in the industry is the security and terrorist threat," explains Emery. "If the data is completely open, then every man and his dog can find out the information they need to plant a bomb."

But even with this profound threat in play, Emery adds that there's "no doubt" that making data open and transparent will "allow markets to flourish". Networks must be supportive of this in all possible cases, and only put up barriers to data transparency where there is a genuine case to protect national infrastructure, he argues.

SGN's Nagar agrees, but adds that making his ideal a reality will require a big culture change in the networks industry. "For 30 years we've been

told to secure data, now we're told to open it up. It's not going to be an easy change," he says.

The right checks and balances need to be assured to enable networks to get behind the idea of open data with confidence, Nagar adds. These mechanisms need to satisfactorily answer questions like how to ensure only the right people can access data. "For example, if I publish my data with all the projections and everything in it, and if that gets used by a hacker community, we are in deep trouble, because we are suddenly exposed," he says. "We need to be very careful - it is the security aspect of open data that everybody gets a bit nervous with," he says.

And notwithstanding these big security questions, Nagar adds that progressing an open data idea across the energy system is major administrative and logistical undertaking. While industry is working hard in groups convened by the ENA to establish common standards and frameworks for open data, Nagar believes regulatory bodies need to get more involved to ensure neutrally designed standards for open data can be established as fast as demand is growing for access to information.

We believe in resilience and adaptability by design.

Network monitoring and management has been identified by more than 80% of network companies as key to mitigate the vulnerability to their networks posed by cyber threats, faults and climate-induced emergencies.

TCS believes in "resilience by design" through the adoption of exactly these kinds of technologies, as well as digital twins and the use of automated, intelligent asset inspection tools such as drones and satellite applications, backed with image analytics.

Armed with these technologies – and the skills and capabilities to leverage them, both in house and via strategic alliances – networks can square up to the undoubted pressures the energy transition entails for them with confidence.

One of the many examples of the ways in which TCS is helping its network customers leverage technology like this, can be seen in its work with one of the world's largest electric utilities to cement a sustainable transition away from compliance-focussed inspection approaches to a more risk-informed strategy. This focuses on finding ways to both increase data collection from sources such as images, videos, and satellite data and to combine this with data analytics to inform and improve inspection programmes.

We also note the strong statement of concern from industry leaders responding to this survey about cyber threats to resilience. TCS recognises the seriousness and complexity of this challenge and is proactively helping its customers to automate and implement intelligent management of security. This is manifest in the capabilities of our managed security services platform, IdentiFence.



Krishna Kanth Papparaju  TATA CONSULTANCY SERVICES

Head of utilities Industries unit,
utilities industry segment, UK&I, TCS



Key findings

- 95% of water company representatives say they are concerned or extremely concerned about the impacts of increasing extreme weather events on resilience
- Other big causes of worry about resilience are:
 - Rising failure rates in ageing assets (a concern for 81%)
 - Low consumer engagement with demand reduction (a concern for 67%)
 - Water scarcity (a concern for 62%)
- 59% are unsure or not confident that they will meet their leakage reduction targets for AMP7
- 57% are unsure or not confident that they will meet their pollution reduction targets for AMP7
- Advanced data analytics was identified as a key technology for overcoming resilience risks, with over 90% of respondents saying they are actively investing here, or have firm plans to
- Other technology investment priorities to safeguard resilience include:
 - New network management systems (86% are investing)
 - Machine learning (81% are investing)
 - Field force management software (71% are investing)

Water companies

While energy networks are consumed with concern about the potential for complexity and digitalisation to expose their infrastructure to serious cyber breaches, water leaders see their most pressing resilience threat in increasing extreme weather events as a consequence of climate change.

95% of water sector respondents say they are concerned or extremely concerned about the implications of extreme weather for the resilience and reliability of supplies, and none say they are unconcerned.

Ofwat’s Russell appreciates why sector leaders are so worried. Climate science suggests we will see more intense rainfall in the future, which as witnessed

in Europe this year can lead to catastrophic and sudden flooding. But it also tells us that big spikes and dips in temperature will become more common.

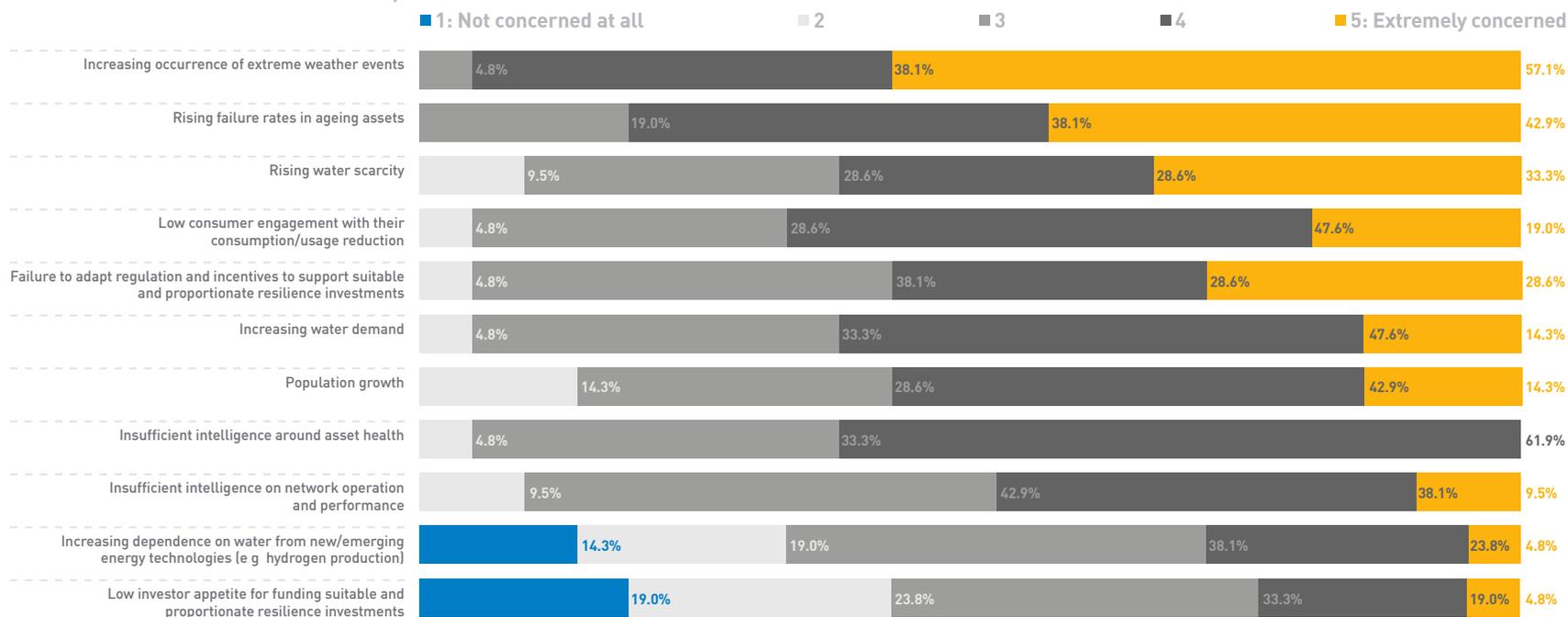
“Pipes don’t deal well with temperature fluctuations, or soil movements,” Russell observes. So, to maintain resilience in the future, water companies need to be able to get ahead of asset failures and get better at preventing weather-related interruptions to supply. “We have to make sure that the way assets are monitored is evolving all the time to be able to cope with what might be greater extremes in temperature – and greater pressures on networks – that either mean that you get asset failures through pipes breaking or you get sewer flooding,” he says.

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The factors leaders fear will jeopardise the resilience and reliability of water networks

– % extent of concern that factors will be potential threat to the network



At Bristol Water, Flowerdew agrees that increasingly extreme and unpredictable weather is a big challenge for resilience, especially for water infrastructure which incorporates many ageing assets. “We’ve got an ageing network which never stands still...It only takes a particularly cold snap, and suddenly you find that there’s been a huge amount of pressure on the network causing a resurgence in leakage, so you’re constantly battling to keep it down, and reduce it further.”

Flowerdew’s words go a long way to explaining why increasing asset failure rates from ageing assets were also identified as a big cause for concern by water sector leaders (81%) and why many are also uncertain about their ability to meet challenging leakage reduction targets in coming years – a critical

factor in tackling water scarcity challenges as well as running more efficient networks. 59% are unsure or unconfident about how their AMP7 leakage targets will be met.

Flowerdew expresses cautious optimism that Bristol will in fact meet Ofwat’s stretching expectation for a 15% reduction in leakage during the current regulatory period, but admits it will be “incredibly challenging”. “There are lots of ideas and innovation happening to try and improve performance on leakage,” she adds. “But still, fundamentally it’s a lot of hard work.”

Flowerdew puts her faith in a range of technologies targeted at improving leakage prevention, detection and repair to get ahead of Ofwat’s demands and implications of diminishing

water resources (a key resilience concern for 62% of survey participants). For her, the stand out solutions will be built on artificial intelligence, machine learning and sensors such as pressure loggers which will support more intelligent network management approaches.

Similarly our research respondents said they are actively on the lookout for solutions which will help with identifying leaks and fixing them, as well as solutions which will generally improve the sophistication of network monitoring. Metering solutions to add visibility into consumption volumes and patterns were also seen to be useful, with fewer respondents saying better metering would be “extremely useful” for tackling leakage more assertively.

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The data presented has been rounded to the nearest decimal number.

What would be most useful to help tackle water leakage better?

% usefulness to help achieve leakage reduction targets

■ 1: Not at all useful ■ 2 ■ 3 ■ 4 ■ 5: Extremely useful



Looking more broadly at the technologies which water companies are investing in to mitigate resilience threats, the pattern falls out similarly to energy networks with advanced data analytics and network management systems at the top of the ranking – over 90% of water sector leaders report current or imminent investments in data analytics and 86% in network management software. Like their energy network counterparts, water sector leaders also place high importance on smarter field force management solutions – with 71% saying they are actively investing here.

Reflecting on this line-up of technology priorities, commentators agree it suggests a strong awareness on the part of water companies that they need to inject greater intelligence into the way assets

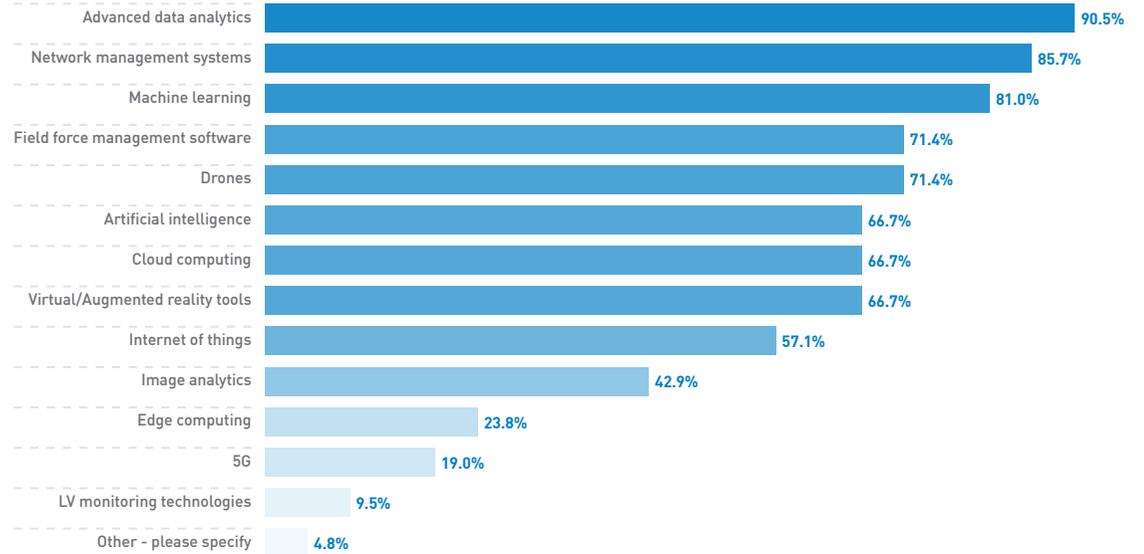
are managed and operated if they are to manage the resilience threats that have also been identified.

Scottish Water’s Parsons says the results reflect the solutions his company is employing to enable more sustainable, long term solutions to improve climate resilience in the round. For example, he talks about a “smart canal” being conducted in collaboration with Glasgow City Council and Scottish Canals. This is providing an alternative to conventional expansions of sewer capacity to cope with flooding risks from increased rainfall. The canal will use clever sensors and predictive weather data to provide early warning of wet weather. In turn this will trigger automated processes to lower canal water levels to allow for surface run off to be absorbed safely.

Such projects are far from a one off, according to another observer. “There’s loads of work going on around machine learning and AI to better understand how we manage and optimise the network,” says a senior water company executive, adding that improved field force management will also be a key component in their company’s journey towards optimised and safe system operation.

Ofwat’s Russell welcomes the impression given by our research that water companies are embracing a broad base of technologies to help them meet their acknowledge resilience challenges. He feels there is already notably more innovation happening across the sector in AMP7 than was evident during the previous price control, especially on high profile issues like leakage.

Technology investment priorities to combat water resilience threats



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The data presented has been rounded to the nearest decimal number.

This uptick is sorely needed, he emphasises, to help water companies form a better understanding of the “underlying resilience” of their assets, including the materials used in construction and the way investments are planned, as well as the way assets behave under different stresses. Investment areas like advanced analytics, artificial intelligence and machine learning should also enable companies to drive more aggressively for “real time dynamic management of networks,” which Russell insists will be fundamental to forming a confident response to extreme weather threats while minimising pollution incidents and customer interruptions.

However, Russell adds that he’d still like to see more collaborative working between companies to ensure that innovation activities and resources are being optimised and points of double working minimised. The launch of the new centre for excellence – enabled via Ofwat’s new innovation fund – should really help here, he hopes.



Due to open its virtual doors in December, the centre of excellence, to be called “Spring” has been coordinated by UK Water Industry Research and will have a remit to coordinate and map innovation endeavours across the sectors, facilitating knowledge exchange and disseminating lessons learned.

Beyond the ways in which Spring can help water companies align and maximise value from innovation efforts though, Russell also says he’s keen to see water companies working together on big, imaginative infrastructure projects to address very pressing water scarcity challenges in certain parts of the country by transferring resources from more water rich regions. He points to the Havant Thicket reservoir project between Portsmouth and Southern Water as an exemplar of this kind of working and expresses confidence that the RAPID programme will accelerate similar long-term resilience schemes into being.

“The sector is starting to come together on these things, it just needs to move a bit faster,” Russell sums up.

“There are lots of ideas and innovation happening to try and improve performance on leakage. But still, fundamentally it’s a lot of hard work.”

Laura Flowerdew, deputy CEO, Bristol Water

We believe in responding to physical context with digital intelligence to unlock exponential value.

More than 55% of water sector leaders are concerned about the combined implication of ageing infrastructure and increasing incidences of extreme weather for asset failures. Quite rightly, they are looking at ways to monitor, assess and identify asset failure scenarios in advance so they can be armed to take proactive steps in mitigating these risks.

TCS believes technologies that help with asset condition monitoring such as internet of things, use of advanced analytics and network modelling will be key to the ability of water companies to sustain resilient and reliable supplier in the future. Increasingly, we should also look for these tools to be fed with more varied data sets, including weather data and customer demographic information as well as detailed, up to date records on the environment in which assets sit, to form a truly rounded picture of the context within which assets are operating.



TCS is actively working with multiple companies in the UK water sector – and around the globe – to make this ideal of technology-enabled resilience management a reality.

Anandh Rajappa  TATA CONSULTANCY SERVICES

Director, growth and digital transformation, manufacturing and utilities industry segment, TCS

In association with





Key takeaways

65%

see significant or enormous potential to leverage lessons from their net zero carbon response to drive faster and more ambitious change in other business areas

59%

say the biggest area of potential for lessons to be learned from the net zero response is in reducing barriers to collaboration – both internal and with third parties

Conclusions

Responses to this research show a critical awareness across the utilities sector that adaptation for the future is going to require vigorous action on decarbonisation and environmental stewardship. But also that it will demand other significant changes to the way companies operate and the services they offer to customers.

To adapt successfully, it is reassuring to see companies in all subsectors proactively investing in key technology fields, especially advanced data analytics which can help them make sense of their increasingly complex surroundings and make informed business decisions.

What is even more encouraging however, is the appetite expressed in this survey by 60% of leaders, to draw lessons from the way their organisation has mobilised behind a net zero carbon imperative. Given the scale of change ahead of the sector, this readiness to see the net zero carbon experience as an

opportunity to improve the pace and ambition of wider transformation initiatives is extremely important.

Furthermore, a recognition that one of the most important lessons to be learned from responses to decarbonisation is how to activate effective collaboration between varied stakeholders, will stand the sector in good stead. This is made especially clear by the survey response which showed a need to manage new and emerging vulnerabilities due to rising complexity and interdependencies between infrastructure systems as the third biggest driver for business change across all sector segments.

There are some strong examples of multi-party collaboration to draw down these lessons from. For example, ENW's work with other utilities, communications providers and local authorities is beginning to show the value that can be created by coordinating vested interests in the resilience and prosperity of a region.

We believe in ecosystems that empower sustainable choices

More than 60% of respondents agreed that reducing barriers to collaboration with external organisations and other sectors is key to achieving performance improvements. We believe that no single organisation can create a sustainable future. An ecosystem approach is needed.

TCS is actively engaged with projects to trial and demonstrate the value of this ecosystem philosophy at localised scale. This includes our involvement in a “Bring your own battery” project being conducted in partnership with a power utility. In this scenario we are enabling many different solar connected batteries – including domestic scale assets – to come together as a virtual power plant which can be leveraged by the network to improve local reliability. The mutual benefits for the company and consumers are being proved as significant. Consumers taking part in the initiative receive direct rewards for making their assets available via financial credits to their electricity bills. But all consumers also benefit in the round through more effective network operation and sustained reliability of services.

This is just a small example of the way in which we all need to think about how technology, organisations and people need to work together to achieve a more sustainable future in the broadest sense.

“We all face the same threat in the same areas, so it makes sense to work together,” says Emery. “We pool resources and work together to reduce threats to assets. Some of it is investment in infrastructure, but we treat that as a last resort - using natural methods to slow down the pace of water from rivers and canals is a good long-term solution.” He adds that as collaborative working on resilience increases, so the viability and value of natural capital solutions – which have lower carbon implications and can create biodiversity benefits – will become easier to see.

Emery also agrees that the benefits being generated through diverse collaborative programmes like this, may never have been incentivised without the burning platform of climate change. “If everyone is signed up to net zero, it makes collaboration a lot more effective, and easier for all of us,” he observes.

As wider business drivers for transformation create more common interest areas to incentivise innovation, we can also expect to see a growing need for the adoption of open data principles and other methods of facilitating zero friction between a set of organisations with high dependencies on one another.

As evidence from our energy network contributors highlights, removing barriers to the visibility, usability and movement of data between systems, organisations and sectors is not without its challenges or risks. However, as customer inclusion in the operation of systems becomes more prevalent and smart assets and devices – both within the control of utilities and owned by third parties – proliferate, fluid use of diverse data will define the success or failure of utilities in adapting for the future.

New and emerging vulnerabilities as a result of increasingly complex and interdependent operating environments was the biggest driver of business change after the need for climate resilience and resource security – a significant or major change driver for...

74%



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A part of the Tata group, India's largest multinational business group, TCS has over 500,000 of the world's best-trained consultants in 46 countries. The company generated consolidated revenues of US \$22.2 billion in the fiscal year ended March 31, 2021, and is listed on the BSE (formerly Bombay Stock Exchange) and the NSE (National Stock Exchange) in India. TCS' proactive stance on climate change and award-winning work with communities across the world have earned it a place in leading sustainability indices such as the MSCI Global Sustainability Index and the FTSE4Good Emerging Index.

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