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Understanding thermal and power-related operational challenges for North American data centers

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Foreword

Taking data center optimization to the next level

This EkkoSense CXO Priorities report clearly highlights the delicate balance that today's data center operations teams have to achieve if they are to support increased workloads while also delivering against their sustainability goals.

Fuelled by escalating demands for digital transformation, operations are busier than ever. At the same time, data centers are being pressured to cut energy and carbon consumption as part of corporate ESG initiatives. The good news – backed up this CXO Priorities report – is that it doesn't have to be a zero-sum game. It is possible to optimize thermal performance without increasing risk. It is possible to run your facilities more efficiently while also releasing stranded cooling capacity. And it is possible to remove thermal and power risk from your operations without resorting to increased cooling – translating directly into cooling energy savings and quantifiable carbon savings.

But it's not possible to do this if data center operations teams keep on running things in the same way. What this research confirms is that traditional, IT-led DCIM-based approaches simply aren't providing the levels of granularity and insight needed to run today's data center operations more efficiently. According to the results, just 11% of the companies responding said that they have had no major incidents over the last five years related to thermal and power causes. 38% reported that their facility had

failed to meet customer SLAs due to power and temperature breaches, while only 30% felt that their operations teams had access to the kind of live granular thermal performance data that would help to prevent these kind of incidents.

The CXO Priorities report focuses in on an alarming lack of confidence in monitoring and optimization tools, suggesting that it's perhaps one of the key reasons why operations teams don't have the visibility they need to run their facilities effectively. Over 40% felt their current rack and cooling unit thermal visibility was below standard or merely capable. And less than a third of respondents were highly confident that they would be alerted by their monitoring system should rack or cooling units approach their defined operating limits.

Part of the reason for this is that most data centers simply don't monitor and track their equipment temperatures on a rack-by-rack basis. Indeed, our own research at EkkoSense suggests that only 5% currently track performance in this way. Given the critical nature of today's data center workloads, this lack of true, real-time granular visibility at rack-level is a real concern and provides a very real barrier to effective data center thermal optimization.

That's why at EkkoSense we believe it's essential for operations teams to 'make the invisible, visible'. For us this means providing

the real-time operational visibility that teams need to thermally optimize their data center performance while simultaneously delivering quantifiable sustainability results.

AI and machine learning are at the heart of this approach, and are already changing the game for data center operators. New levels of IoT sensing bring an entirely new class of accuracy and granularity, and provide the core machine learning data that enables true real-time visibility of cooling, power and capacity performance. And, critically, the adoption of AI-powered optimization software not only shows what's happening – but also why – allowing teams to make informed decisions on how to resolve issues.

And, with the CXO Priorities report citing 'reducing energy costs' and 'reducing carbon footprint' as key priorities for investment, that's good news for operations teams who – for the first time – can secure key benefits including removing thermal and power risk, optimizing data center cooling capacity, minimizing energy waste, and supporting their corporate ESG programmes.

Dean Boyle
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Introduction

The rapid acceleration in the nation's demands from data centers has brought many new challenges. Numerous are unforeseen such as the cybersecurity obstacles born from the rising adoption of the cloud but there are more obvious complications that still strangle the data centers of today such as thermal and power-related incidents.

Addressing these challenges, we now face a overcrowded market of data center optimization software providers, all offering a myriad of services and claiming to possess the best functions and usability, but how successful are these current providers from the perspective of their users?

We asked North America's data center's C-levels, directors, vice presidents and engineers about their current Environmental Management Solutions and how effective their systems have been in tackling thermal and power-related incidents.

Through this survey, our purpose was to discover:

- Current challenges faced by North American data centers regarding thermal and power-related incidents
- The capabilities and shortcomings of respondent's current data center optimization software/ Environmental Management Solutions
- Priorities and plans for future investment in decreasing operational risks



Summary of findings:

- Almost half (41%) of respondents report their power and temperature-related incidents have corrupted their SLAs
- Eighty-five percent of respondents claim their rack and cooling systems visibility ranges from standard down to incapable
- Forty-one percent of respondents remain only slightly confident and a further 32% have no confidence at all that their current monitoring systems will provide alerts that their racks or cooling units are approaching their operating limits
- Eighty-six percent of participants are currently considering the venture into investing in the prevention of outages a medium-to-high priority



Chapter 1: Challenges



1

To your knowledge, in the past five years how many minor incidents have you had related to thermal and power causes?



Key takeaway

In the past five years, respondents have seen many minor incidents related to thermal and power causes, with 38% seeing 50 to 200+ incidents in the past half-decade alone. Since 2018, we have seen technology struggle to keep up with the world's demands and with the ever-growing responsibilities of data centers, leaders must consider how to prevent these avoidable incidents.



2 To your knowledge, in the past five years how many major incidents (outages) have you had related to thermal and power causes?



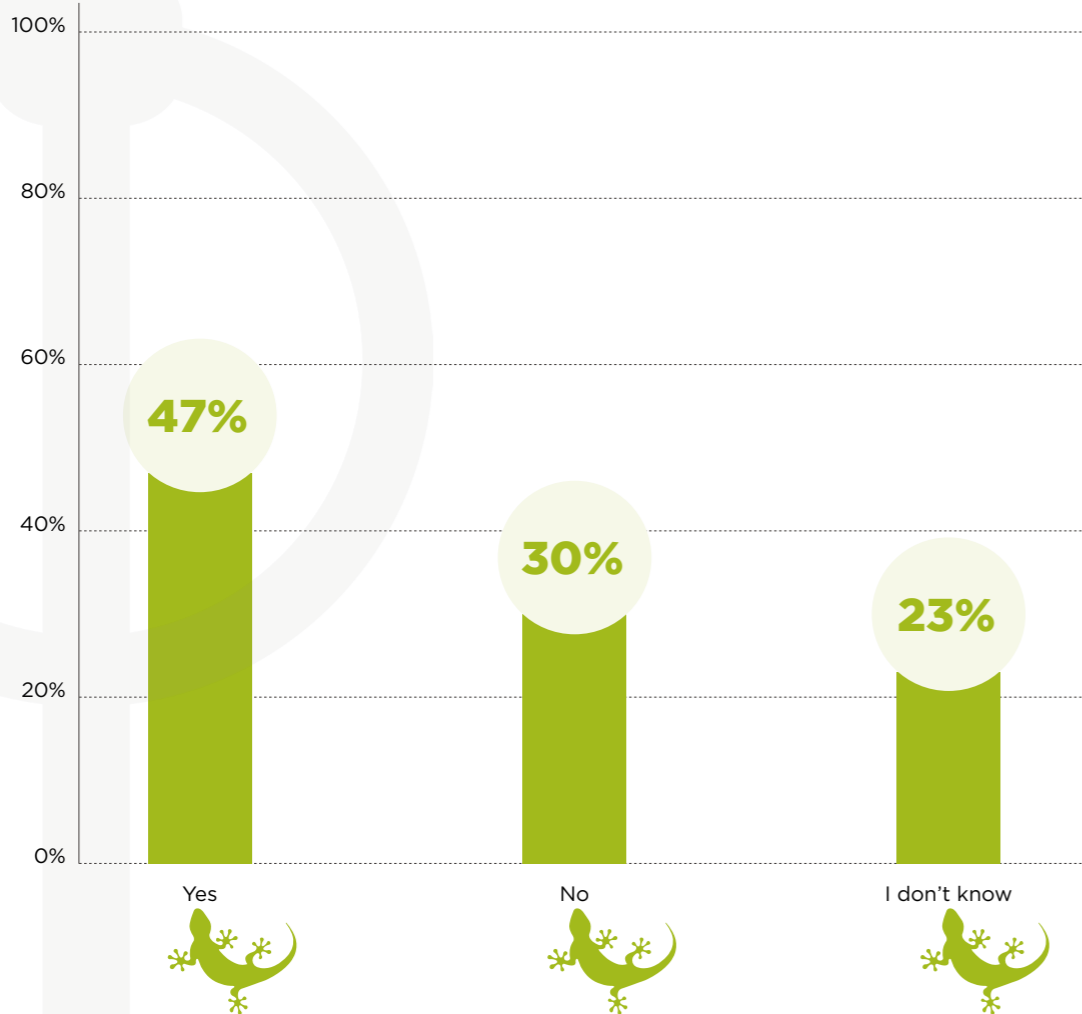
Key takeaway

Major outages have a detrimental effect on data centers, causing immediate complications but also further issues months or even years down the line. The effect of such an incident may lead to reputational damage, financial penalties, workplace stress, loss of customer base and more. With only 11% of respondents having no major incidents related to thermal and power causes, it is concerning that this preventable complication is causing North American data centers an abundance of challenges.



3

Do employees who require access to live granular thermal performance data struggle to maintain and/or operate the data center operations effectively?



Key takeaway

Live granular thermal performance data should be an accessible service with a smooth operation and a dependable and supportive tool for data center operations. However, almost half (47%) of respondents feel employees struggle to maintain and even operate this service effectively. With so many dependent on this software, it is disconcerting that there is a lack of enthusiasm across the board about a service created to make lives easier and operations more transparent.

Yes
47%

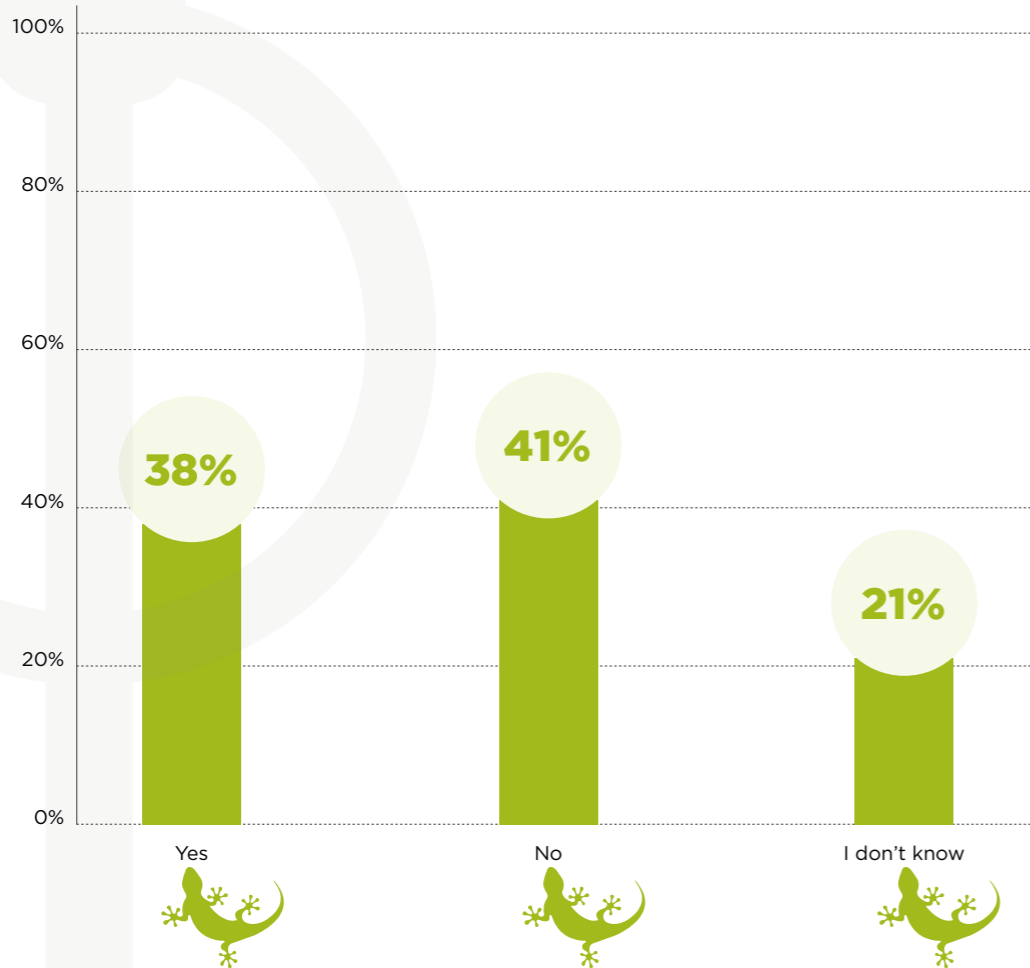
No
30%

I don't know
23%



4

Has your data center failed to meet its customer SLAs due to service metrics such as power and temperature breaches?



Key takeaway

Service Level Agreements (SLAs) allow trust and reliability to thrive between client and service provider. However, for almost half (41%) of respondents, their power and temperature-related incidents have corrupted their SLAs. We would expect to start to see these North American-based data centers begin to reconsider how they handle the prevention of these outages in the next year.

Yes
38%

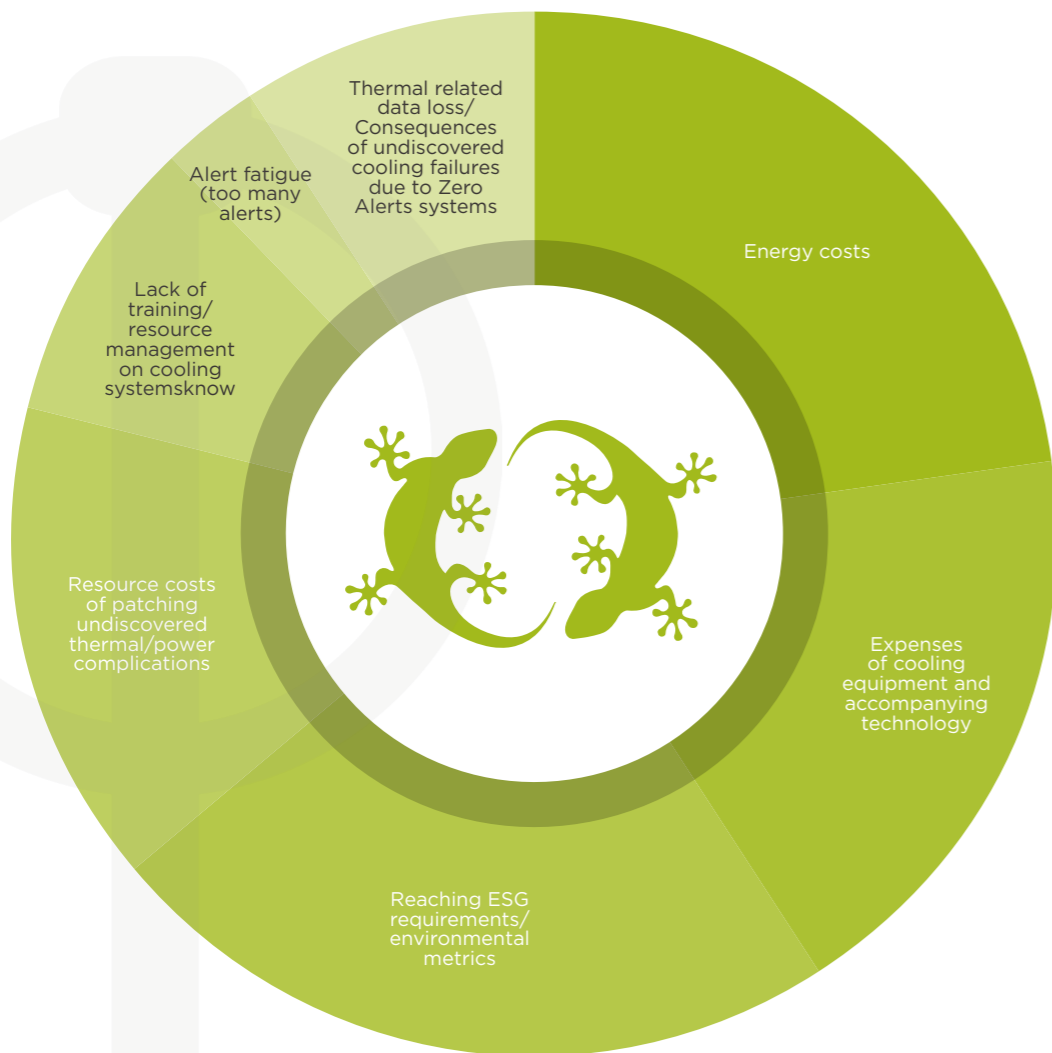
No
41%

I don't know
21%



5

What is the biggest challenge you face with cooling in your data center?



Key takeaway

The top two challenges faced by respondents when cooling their data centers are energy costs (23%) and reaching ESG requirements/environmental metrics (23%). It appears the majority of respondents are not reaping the benefits of high-quality data center optimization software and would do well to adopt a service that allows them to focus on these challenges. It would be strongly recommended they seek out a software that provides cooling performance recommendations and advisory actions. This would help to reduce energy costs and gives a systematic and synchronized application of cooling and optimization best practices built to reduce cooling power-related carbon emissions.

- Energy costs **23%**
- Expenses of cooling equipment and accompanying technology **18%**
- Reaching ESG requirements/environmental metrics **23%**
- Resource costs of patching undiscovered thermal/power complications **15%**
- Lack of training/resource management on cooling systems **9%**
- Alert fatigue (too many alerts) **3%**
- Thermal related data loss/Consequences of undiscovered cooling failures due to Zero Alerts systems **9%**

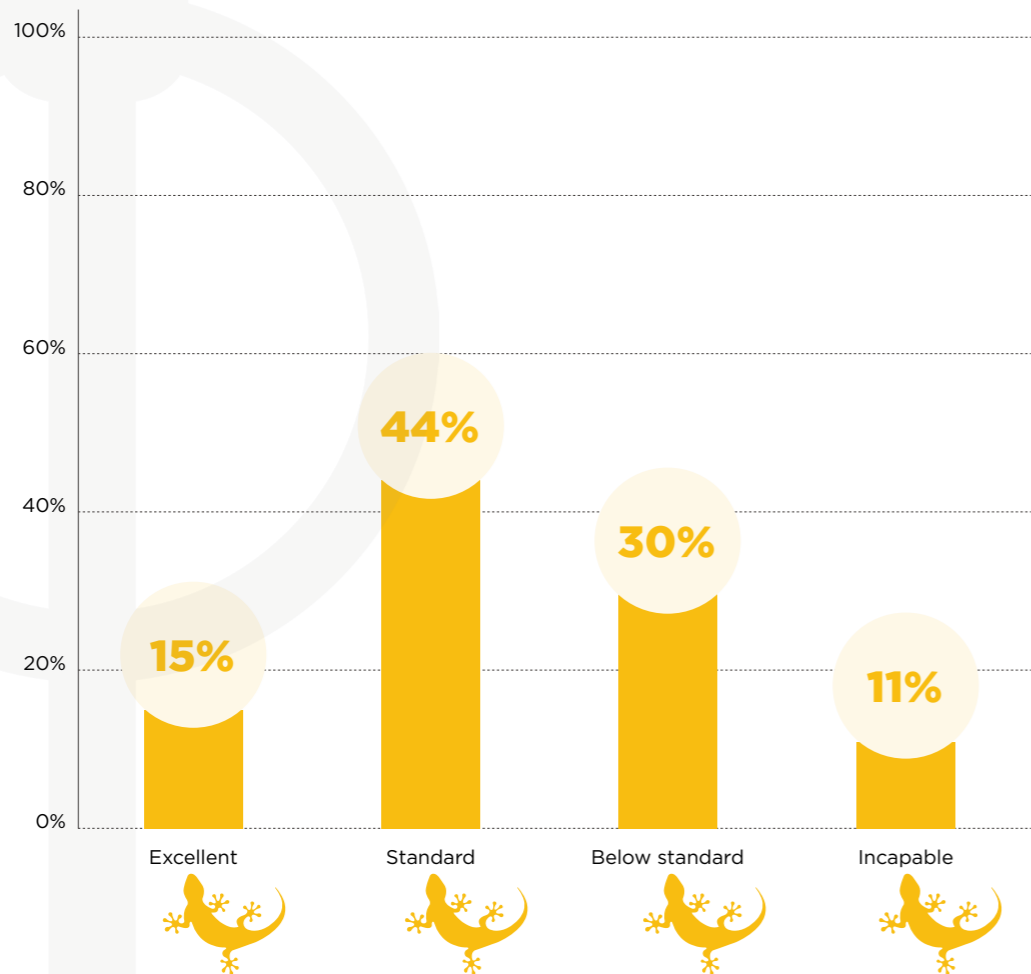


Chapter 2: Current attitudes and resources



1

How would you rate your current rack and cooling unit thermal visibility?



Key takeaway

An overwhelming majority of respondents do not rate their current rack and cooling unit thermal visibility well. With 85% of respondents claiming their visibility ranges from standard down to incapable, we will see this majority face consequences as this lack of visibility will ultimately lead to complications that could be avoided with a respectable data center optimization software.

Excellent
15%

Standard
44%

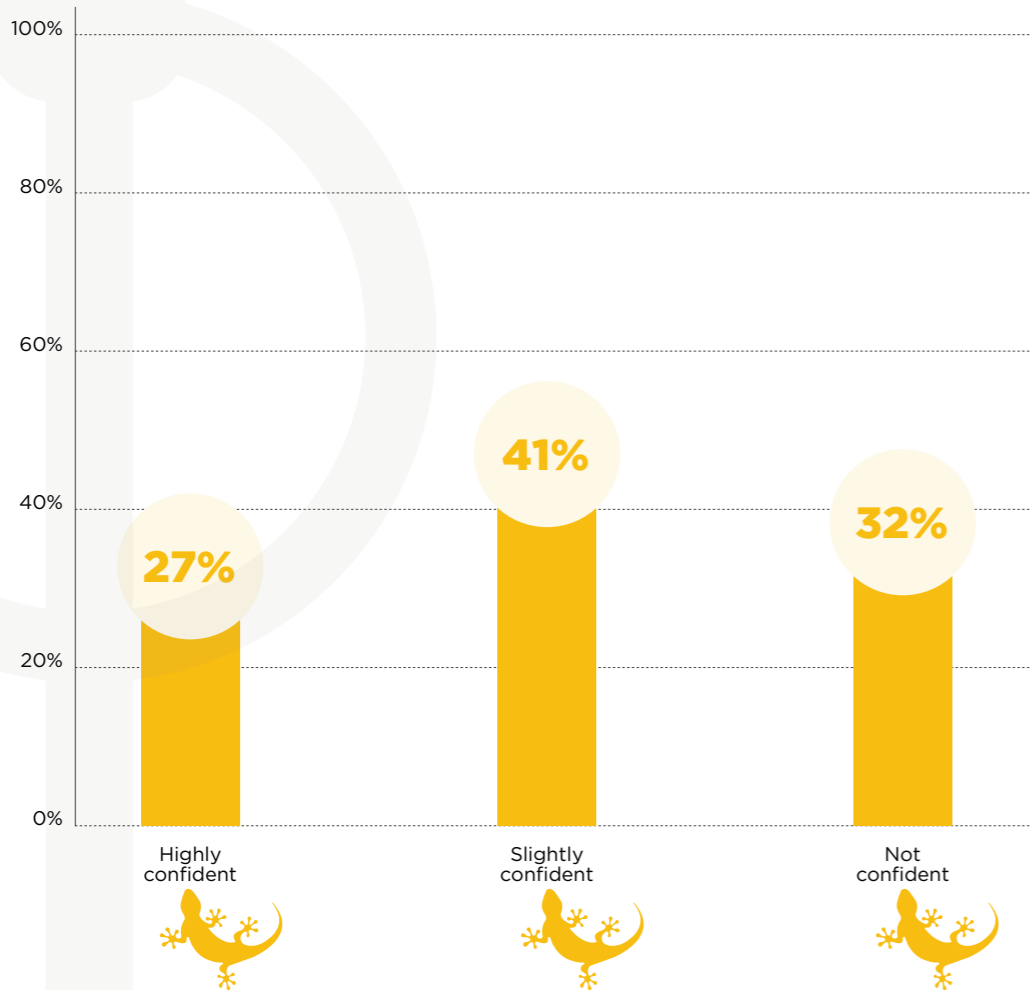
Below standard
30%

Incapable
11%



2

How confident are you that you will be alerted by your monitoring system if your rack or cooling units start approaching your defined operating limits?



Key takeaway

Again, we see the respondents' lack of faith and value in their current systems with 41% remaining only slightly confident and a further 32% having no confidence at all that their current monitoring systems will provide alerts that their racks or cooling units are approaching their operating limits. These concerning statistics highlight a stumbling block in the data center sector, and the North American market appears to be desperate for a trustworthy, supportive facilitator.

Highly confident
27%

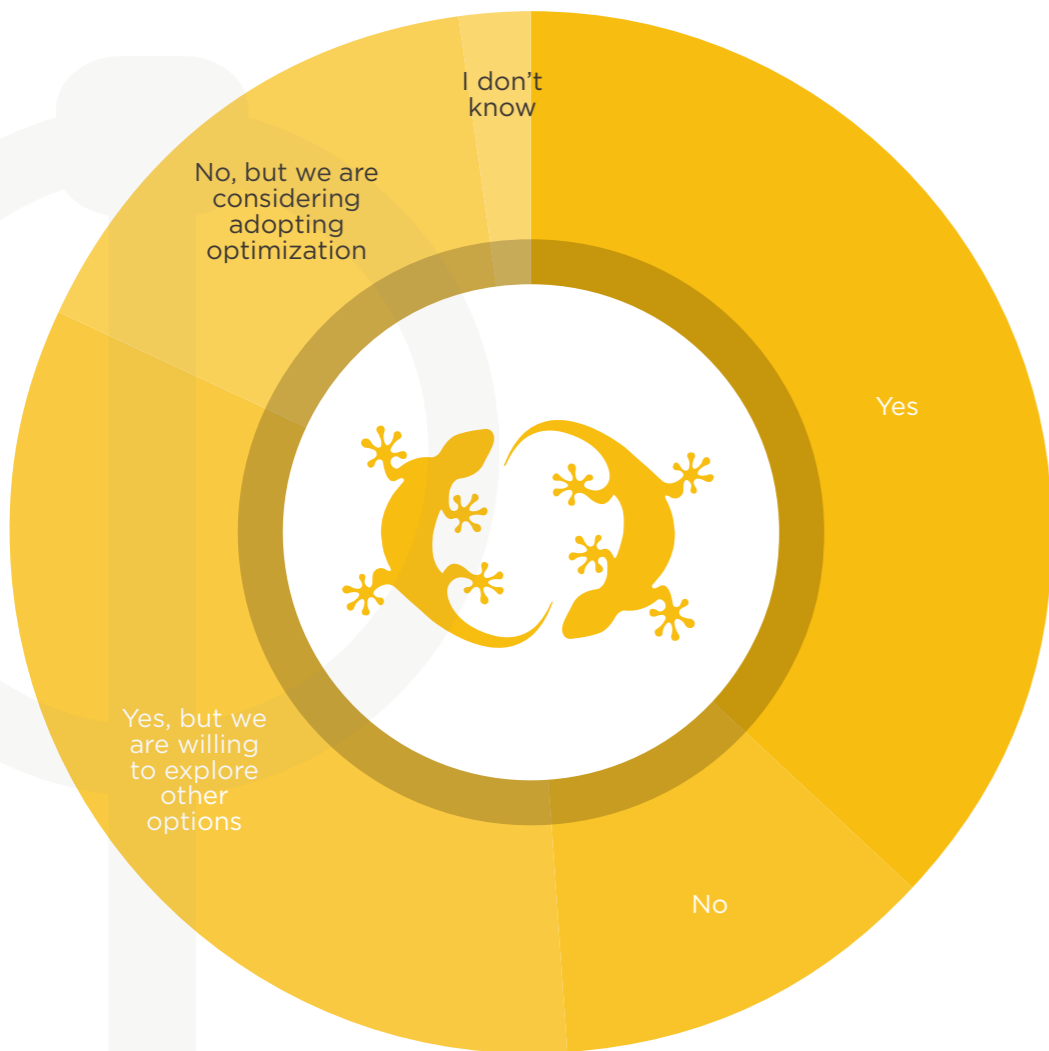
Slightly confident
41%

Not confident
32%



3

Do you currently invest in a software-driven cooling optimization solution



Yes
37%

No
12%

Yes, but we are willing to explore other options
33%

No, but we are considering adopting optimization
16%

I don't know
2%

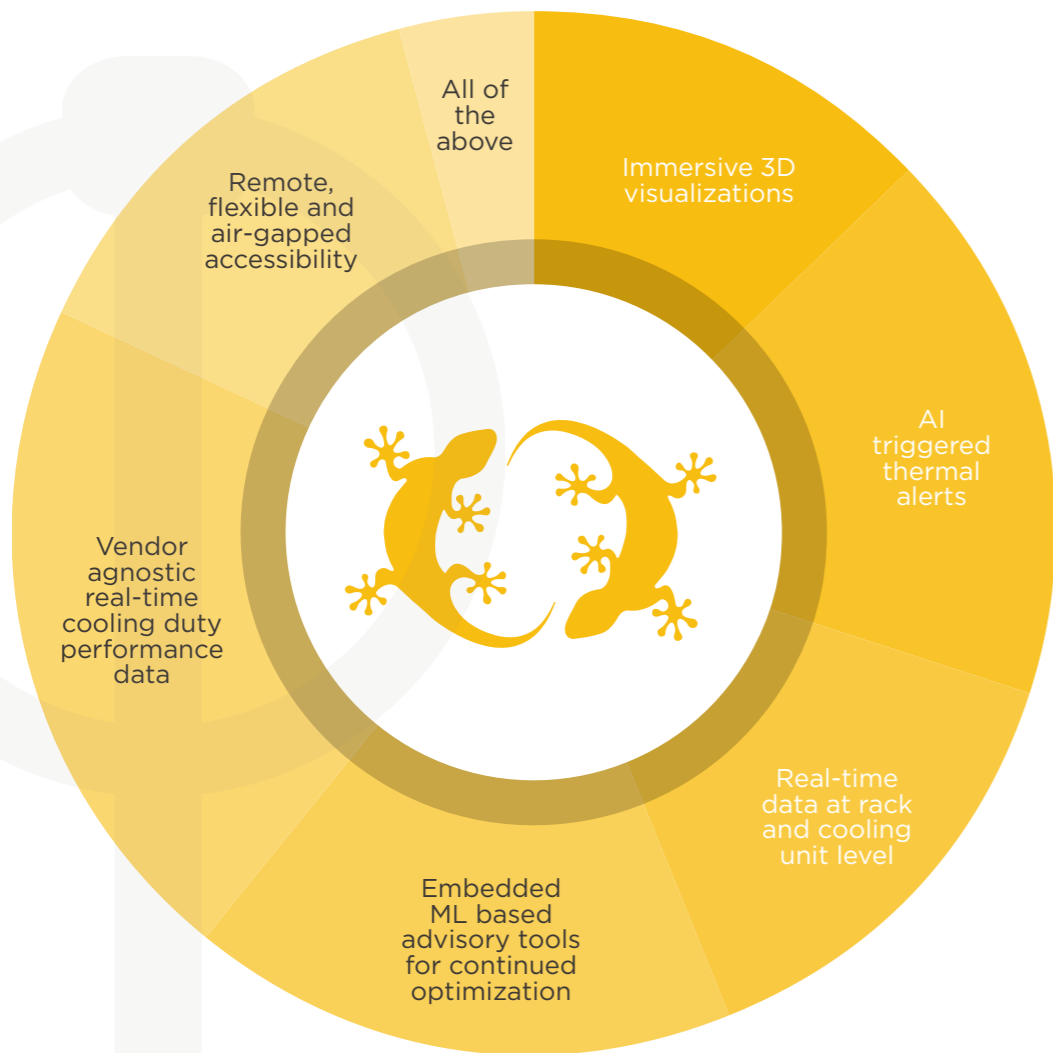


Key takeaway

One-third (33%) of respondents who currently attain a software-driven optimization solution are discontent and willing to explore other options. While 28% are currently operating without this solution in place, 16% are considering adoption. Although 37% of respondents' intentions appear to be to maintain their investments in current providers, many would benefit from an introduction to the best on the market.



4 If yes to question 3, does your current software allow you to do the following:



Immersive 3D visualizations
13%

AI triggered thermal alerts
17%

Real-time data at rack and cooling unit level
14%

Embedded ML based advisory tools for continued optimization
17%

Vendor agnostic real-time cooling duty performance data
21%

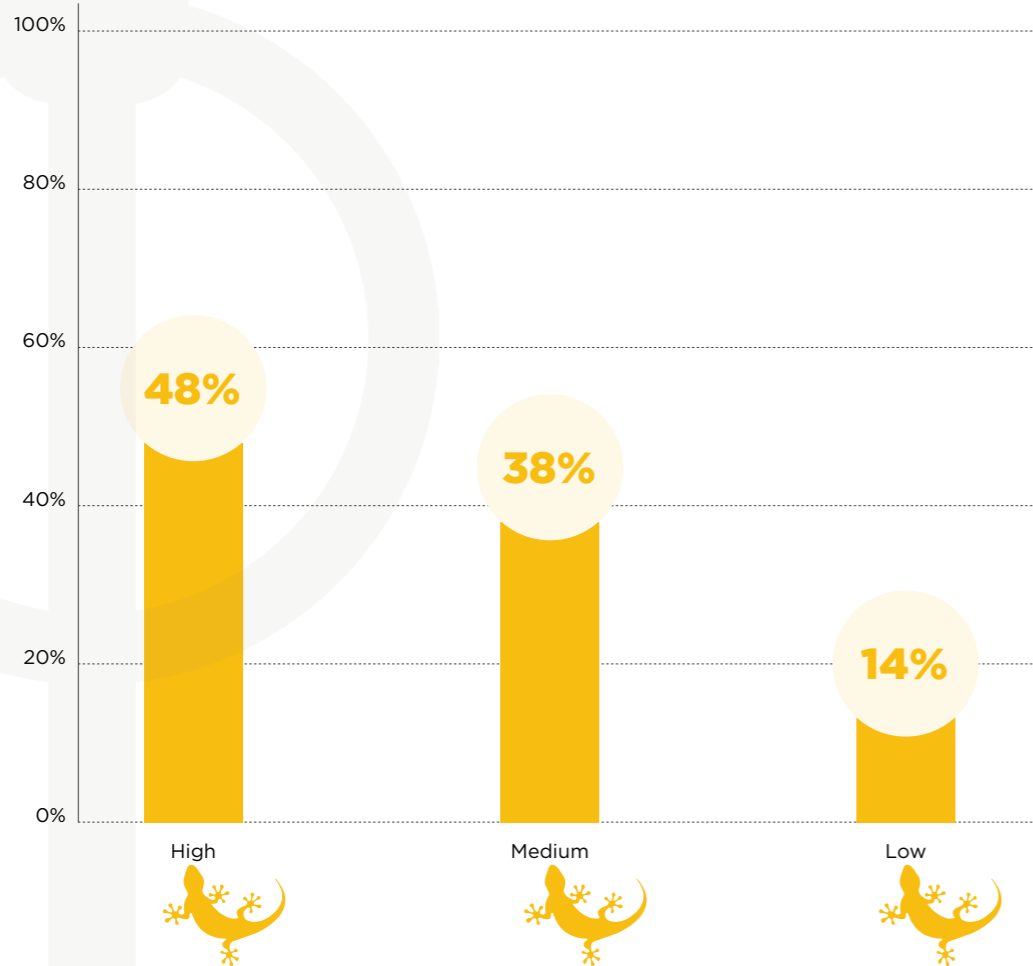
Remote, flexible and air-gapped accessibility
14%

All of the above
4%

Key takeaway

Four percent of respondents are investing in a solution that offers all the applications listed. All these functions will provide an easier and more dependable user experience which begs the question; why are so few of these data center leaders not investing in a software that provides all these applications?

5 How high of a priority is 'decreasing operational risks' on your investment list?



Key takeaway

Decreasing operational risks sits high on the respondents' investment priorities. With 86% considering the venture into investing in the prevention of outages a medium-to-high priority. This should align with Chapter 2, Question 3: 'Do you currently invest in a software-driven cooling optimization solution?' This suggests that many respondents have not yet comprehended the correlation between investing in a software-driven cooling optimization solution in reducing operational risks at this time.

High
48%

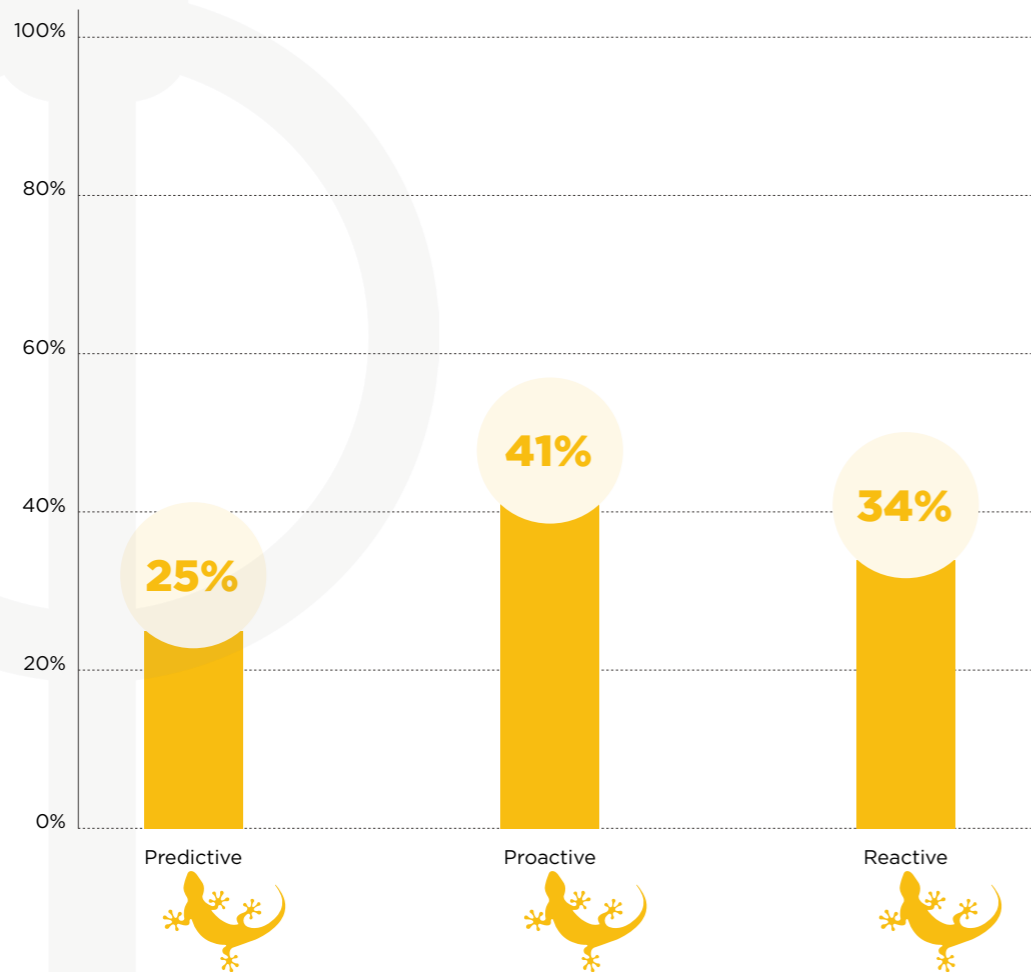
Medium
38%

Low
14%



6

Would you rate your approach to environmental management of your data center as Predictive, Proactive or Reactive?



Key takeaway

Over a third (34%) of respondents have adopted a reactive approach to the environmental management of their data center. While experts in the technology sector have implored enterprises to adopt a proactive and predictive approach to all areas of their system management, it appears many only consider the short-term effects (ie. financial) of taking precautionary measures.

Predictive
25%

Proactive
41%

Reactive
34%



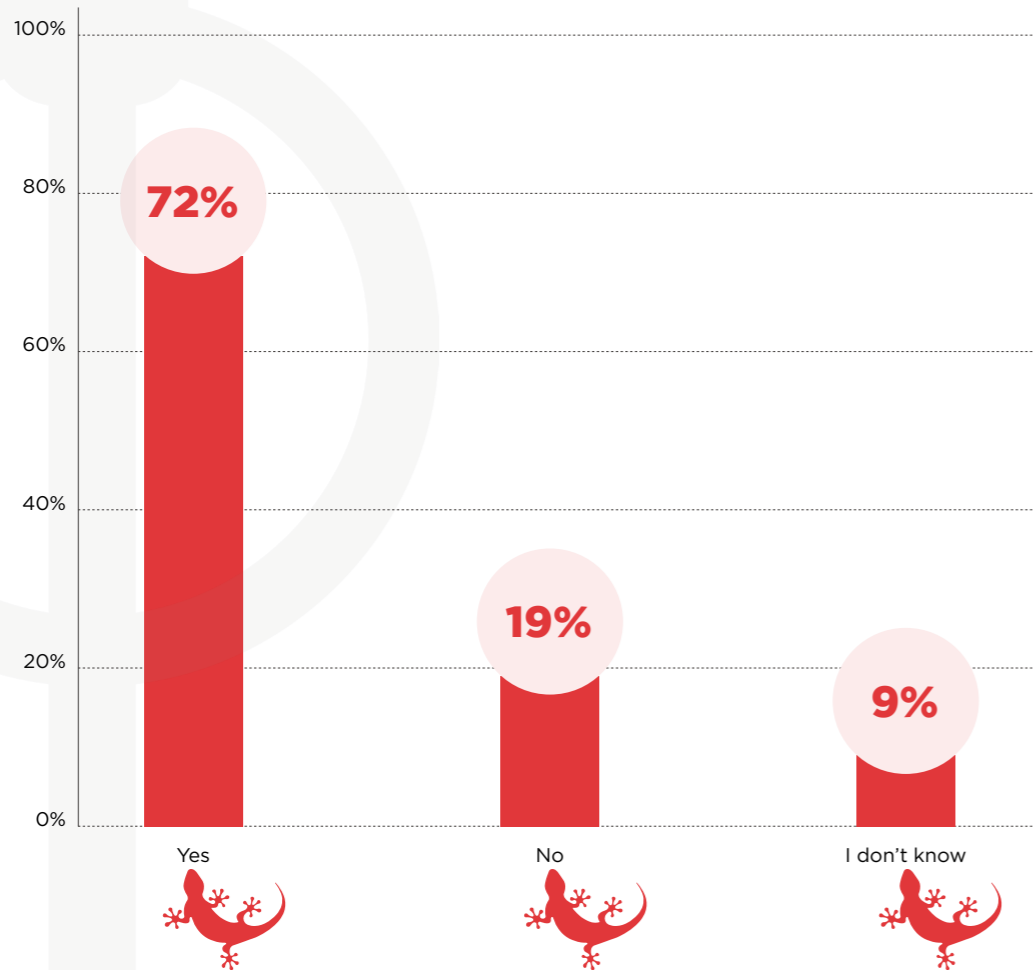


Chapter 3: Priorities and planning ahead



1

Do you have plans to invest in your environmental management software within the next 24 months?



Key takeaway

Participants feel the importance of improving or adopting Environmental Management Software, with a predominant amount of these North American data centers (72%) planning to invest in the next 24 months. This will be a great step forward for these data centers if it can be trusted they invest wisely in respectable software providers.

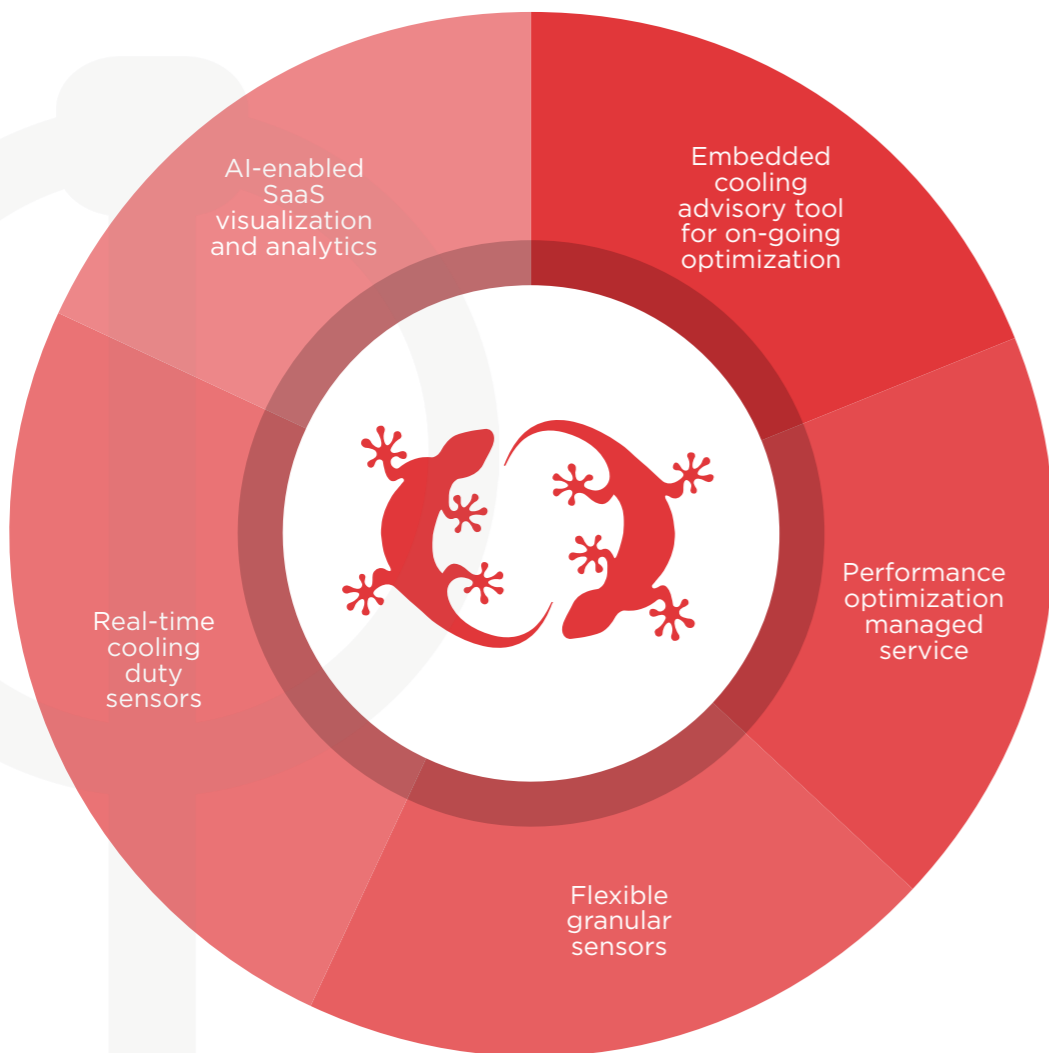
Yes
72%

No
19%

I don't know
9%



2 Which two of the following would you consider priorities when evaluating an Environmental Management Solution:



Key takeaway

Real-time cooling duty sensors are considered a top priority when evaluating an Environmental Management Solution, with a quarter of respondents (25%) claiming it as one of their most important considerations. This is closely followed by flexible granular sensors (20%) and embedded cooling advisory tools for on-going optimization (19%). All these functions appear to be valued when considering next investments, even the lowest selected have been priorities for no less than 18% of participants.

Embedded cooling advisory tool for on-going optimization
19%

Performance optimization managed service
18%

Flexible granular sensors
20%

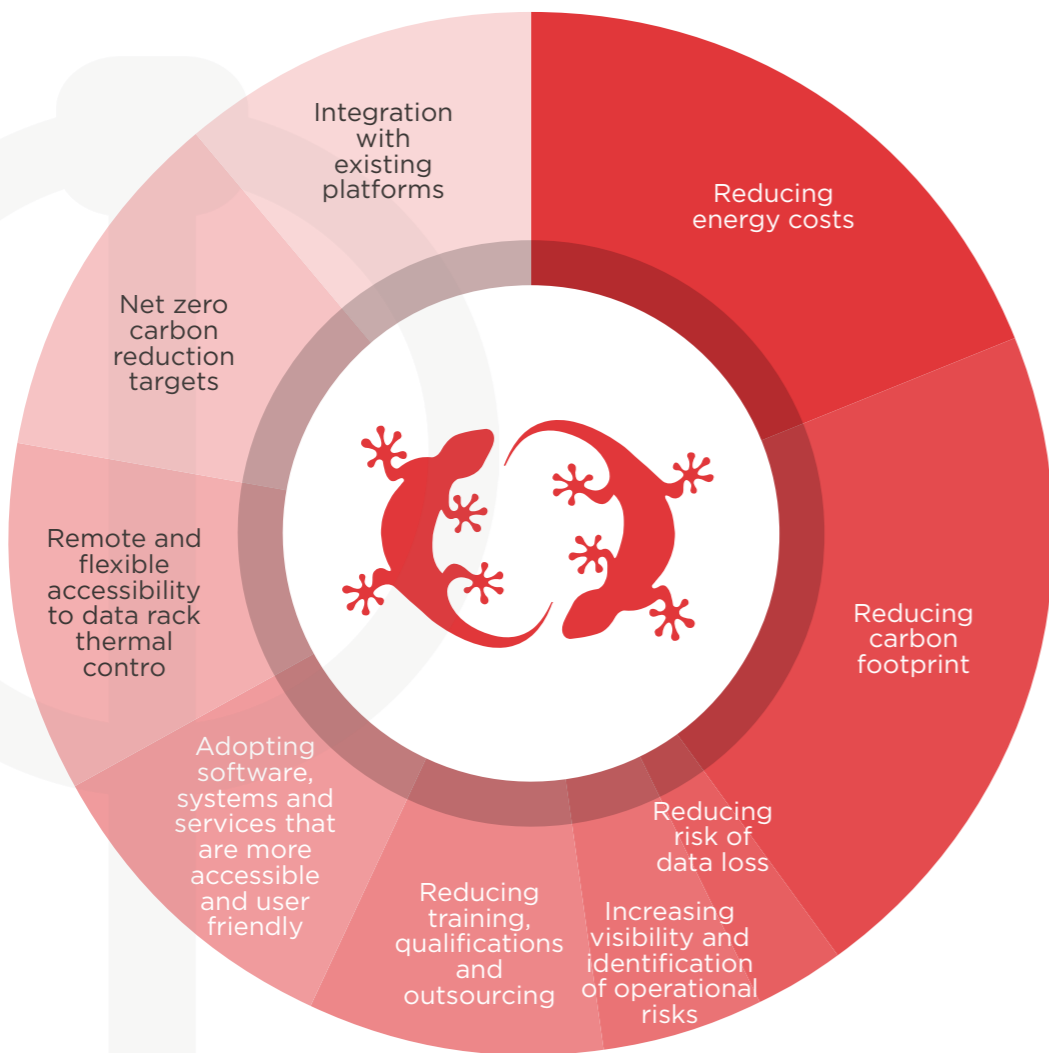
Real-time cooling duty sensors
25%

AI-enabled SaaS visualization and analytics
18%



3

What are your key priorities for investment and planning looking ahead?



Key takeaway

The top priorities for future investment are reducing energy costs (19%) and reducing carbon footprint (21%), reflecting on earlier findings (see Chapter 1, Question 5) where respondents listed their biggest challenges as reaching ESG requirements/ environmental metrics and tackling energy costs. As previously stated, it appears most respondents are not reaping the benefits of a high-quality data center optimization software and would do well to adopt a service that allows them to focus on these challenges. These statistics show that respondents are willing to take steps in the form of the investment of time and resources to tackle these issues and should be guided to the best options on the market.



- Reducing energy costs
19%
- Reducing carbon footprint
21%
- Reducing risk of data loss
3%
- Increasing visibility and identification of operational risks
5%
- Reducing training, qualifications and outsourcing
9%
- Adopting software, systems and services that are more accessible and user friendly
10%
- Remote and flexible accessibility to data rack thermal control
11%
- Net zero carbon reduction targets
11%
- Integration with existing platforms
11%



Conclusion

When tackling thermal and power risks and optimizing cooling systems to improve critical M&E infrastructures, North America's data centers want to be spending less whilst doing more. However, this report concludes that the average Environmental Management Solutions utilized across the nation's data centers are greatly underachieving.

With these systems' failures, we have seen power and temperature-related incidents corrupting nearly half of the respondents' SLAs, only a tenth of the respondents' report having no major incidents related to thermal and power causes and almost half of the respondents feel employees struggle to maintain and even operate their service effectively.

These abundance of challenges can be whittled down to overlooking the preventative and more effective solutions available on the market that value visibility and usability. Visibility is a superpower within environmental management and this survey highlights that the trust in visibility, effectiveness and alerts in current software systems is poor, with the majority of respondents claiming their visibility ranges from standard down to incapable, leading these enterprises to an abundance of complications.

Tackling these complications by decreasing operational risks sits high on the respondents' investment priorities, as does the improvement or adoption of their Environmental Management Software within the next 24 months. The top considerations for these investment plans are finding a solution that; provides real-time cooling duty sensors, flexible granular sensors and embedded cooling advisory tools for on-going optimization, with the main goals of reducing energy costs and reducing carbon footprint.

To conclude, the North American data center landscape is desperate for a service that optimizes cooling capacity, provides the real-time operational visibility needed to remove thermal and power risk and minimizes energy waste to lead the way in achieving net zero. The majority of this survey's respondents have recognised their Environmental Management Solution's shortcomings and are taking action in the form of investment and exploring other providers and should be considering a tried and-tested successful solution that can help them reach their long-term goals.





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