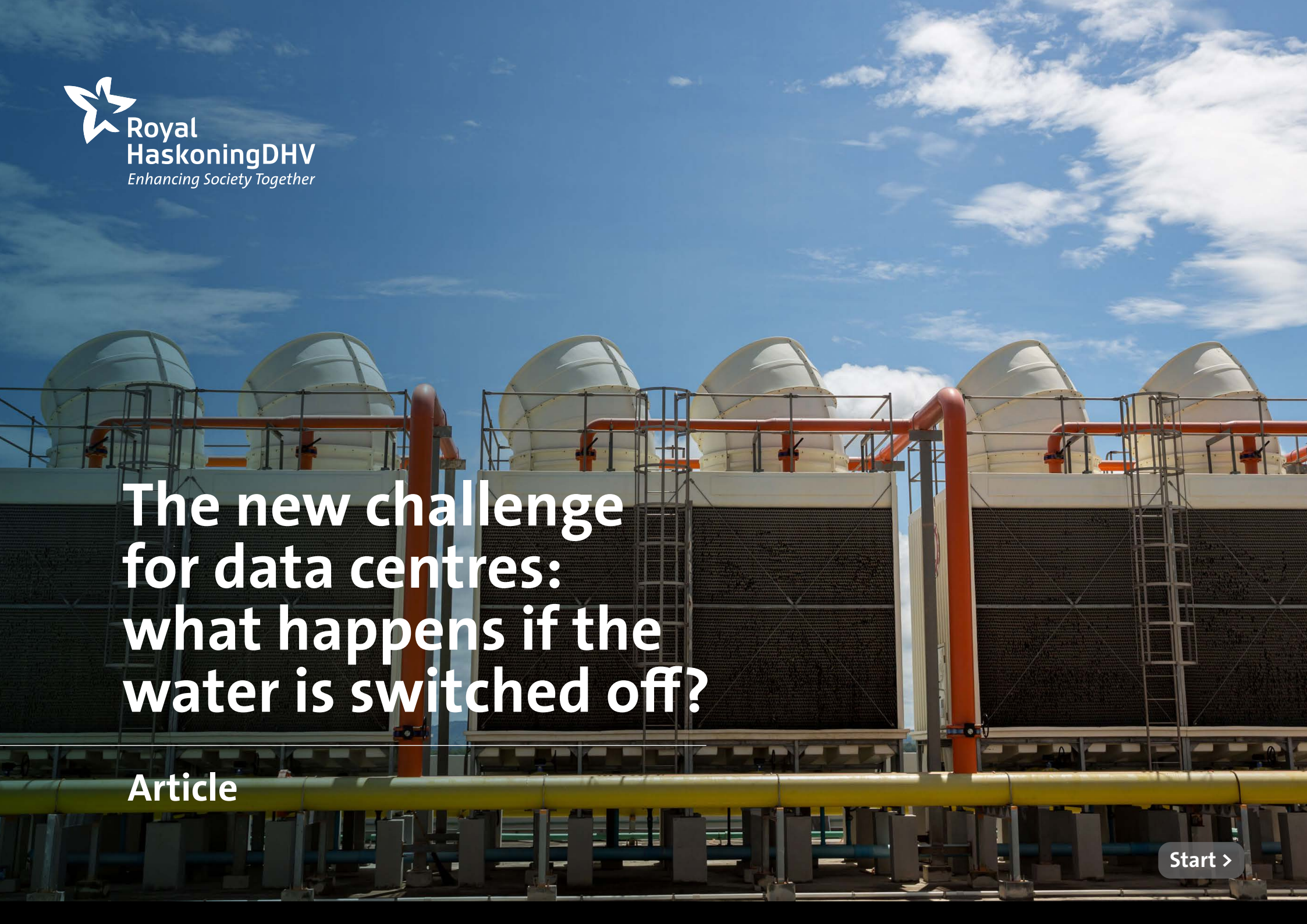


Royal HaskoningDHV
Enhancing Society Together

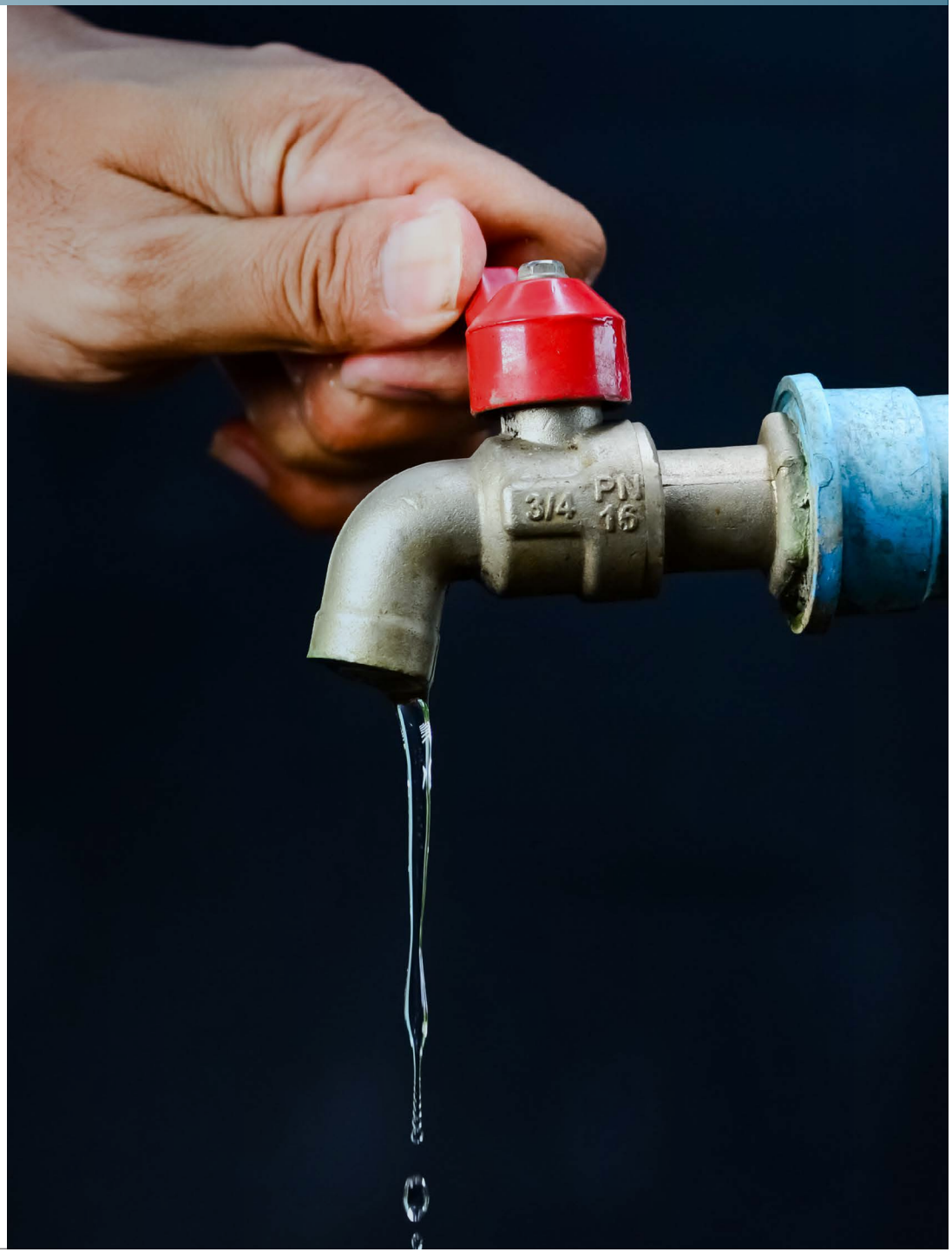
The new challenge for data centres: what happens if the water is switched off?

Article

Start >

The availability of water is likely to be a key challenge for data centres in the near future. Already some water companies in the Netherlands are refusing to supply water for cooling purposes. This article explores the issues and outlines a more sustainable approach to cooling.

As the digital revolution continues at pace, demands on the data centre industry are increasing. It's not just availability and reliability that are driving transformation, there's a need for operations to become more sustainable too. Even while communities become increasingly reliant on the connectivity and storage these facilities provide, people are less willing to accept the industry's demand for scarce resources such as drinking water and green energy sources.



How is water used by data centres?

Data centres use water for cooling, which occurs through the process of evaporation. Water evaporation offers a very efficient cooling mechanism, operating on the same principles as human sweating.

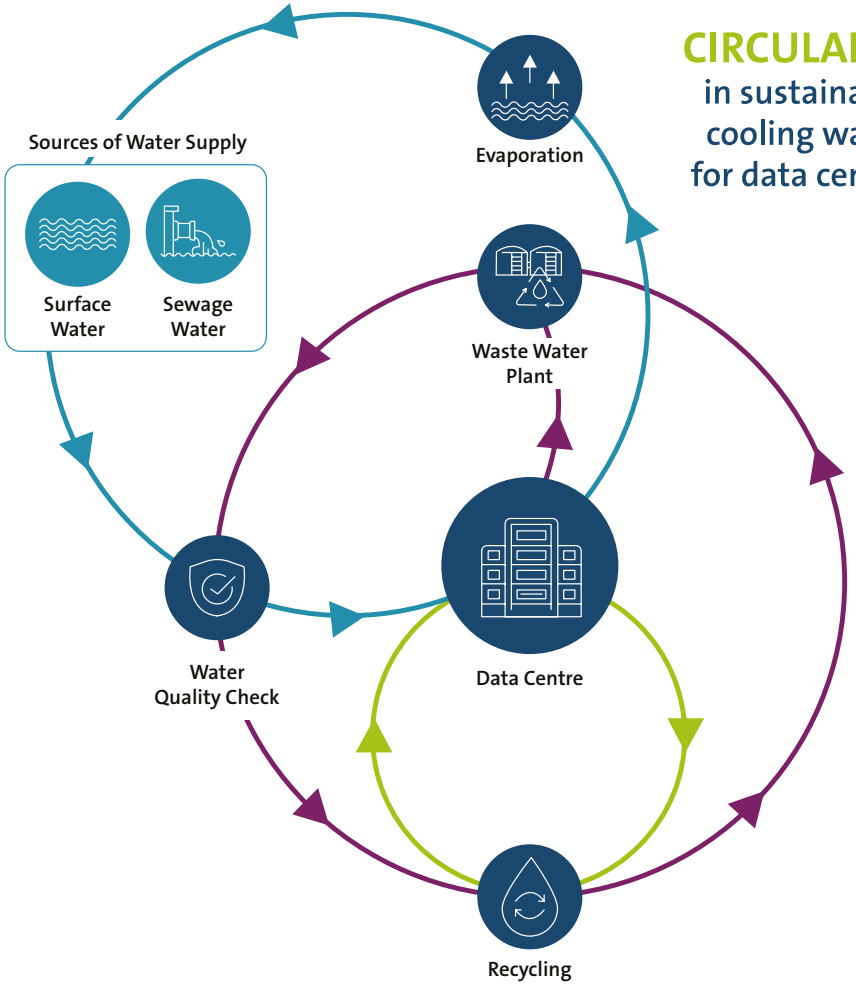
The efficiency of a data centre is measured by a ratio known as Power Usage Effectiveness (PUE). In the Netherlands, legislation requires a PUE of 1.2 which means that the operation uses no more than 20% more power than is required for IT. A decade ago, the average data centre PUE was over 2.0, which highlights how successful the industry has been in increasing efficiency. One way in which this has been achieved is through water evaporation for cooling. If water is removed from the system, the operation becomes less power efficient, so a balance needs to be struck between the most efficient use of green energy sources and the use of water. If an unlimited water source is readily available, it makes it an easy choice. However, if it is not available, what are the options?

Futureproofing against water restrictions

The issue of water is rising up the agenda. Availability of supply is likely to be a key challenge for our social economy and with this also for data centres.

The problem results from a combination of increased public demand for water - partly from the growing population - and reduced supplies. Climate change is creating longer dry periods during which groundwater and river levels fall. Water companies which rely on groundwater extraction have limited permits and are beginning to experience issues when water availability is depleted in the summer. Many of these water companies are at the point of maximum production based on available resources, while demand continues to grow. Seeking ways to continue to meet demand, some water companies are becoming less willing to provide water for 'low-quality' purposes. The water used for data centre cooling falls in this category. As water companies review their policies, there is a real prospect of new connections being denied or only provided under strict conditions. New data centres in Almere for example, can no longer count on access to a public water supply for evaporative cooling purpose.

Data centres need to be actively exploring alternatives to futureproof their operations, preferably using sustainable and circular solutions.



CIRCULARITY
in sustainable cooling water for data centres

Options for sustainable water supply

We envisage a system where data centres no longer rely on public water for cooling but make use of alternative sources. The most sustainable alternative source is waste water from sewage treatment. Other options are industrial water and ground or open water sources. Ground and open water sources are the least favourable option and need to be assessed as to whether there is a possibility for conflict with other needs, such as agriculture, during periods of reduced availability.

While water from the sewage treatment system is of an acceptable quality to return to the water cycle, it would require treatment to remove minerals which can harm the cooling system. By avoiding the use of chemicals in the treatment process within the data centres, the water can safely be discharged into the environment. We consider there is a mutual benefit for water companies to secure water reuse opportunities. In locations of high demand, the business case could be viable, possibly through investment from municipality, water board and industry users in pursuit of a sustainable long-term solution which is beneficial to the environment.

State-of-the-art cooling for new data centres

A sustainable water supply is one element in next-generation cooling systems. The design for new state of the art data centres should also include flexibility in the use of evaporative water for cooling. During dry periods when water is scarce, the systems should incorporate options for saving water with a high ambient switchpoint, for example 30ºC dry bulb, for wet operations. It should still incorporate an annual PUE of maximum 1.2 and a design peak power consumption in high summer with PUE 1.35 or lower to limit the grid connection. This can be done by integrating highly efficient chillers and through aquifer thermal energy storage.

During winter and up to around 15ºC, the cooling system should be run dry. This avoids the plumes of water vapour discharged from the cooling tower which are mistakenly considered to be pollution by the public. During spring and autumn, sustainable water sources should be used - like sewage waste water described earlier. This maximises electrical energy efficiency, reducing green power consumption while plenty of water is available. Then, during summer droughts, the data centre should be able to switch to water saving mode to reduce consumption. Water is only used in summer conditions during the day and storage tanks filled in the evening and night when higher volumes of waste water is provided from showering and other activities in homes.

This provides a circular sustainable system. It combines the highest energy efficiency using sustainable water and power and limits the peak power consumption in high summer.

Steps towards more sustainable data centres

For existing and refurbished data centres

1. Look at your current consumption and ensure your data centre is operating in line with the design intent
2. Explore technical options to reduce both annual and peak water consumption
3. Investigate possibilities for using alternative water sources from sewage or industry supply lines
4. Investigate alternative sustainable water treatment options to avoid the use of chemicals etc
5. Investigate alternative discharge possibilities to avoid discharging water to sewer

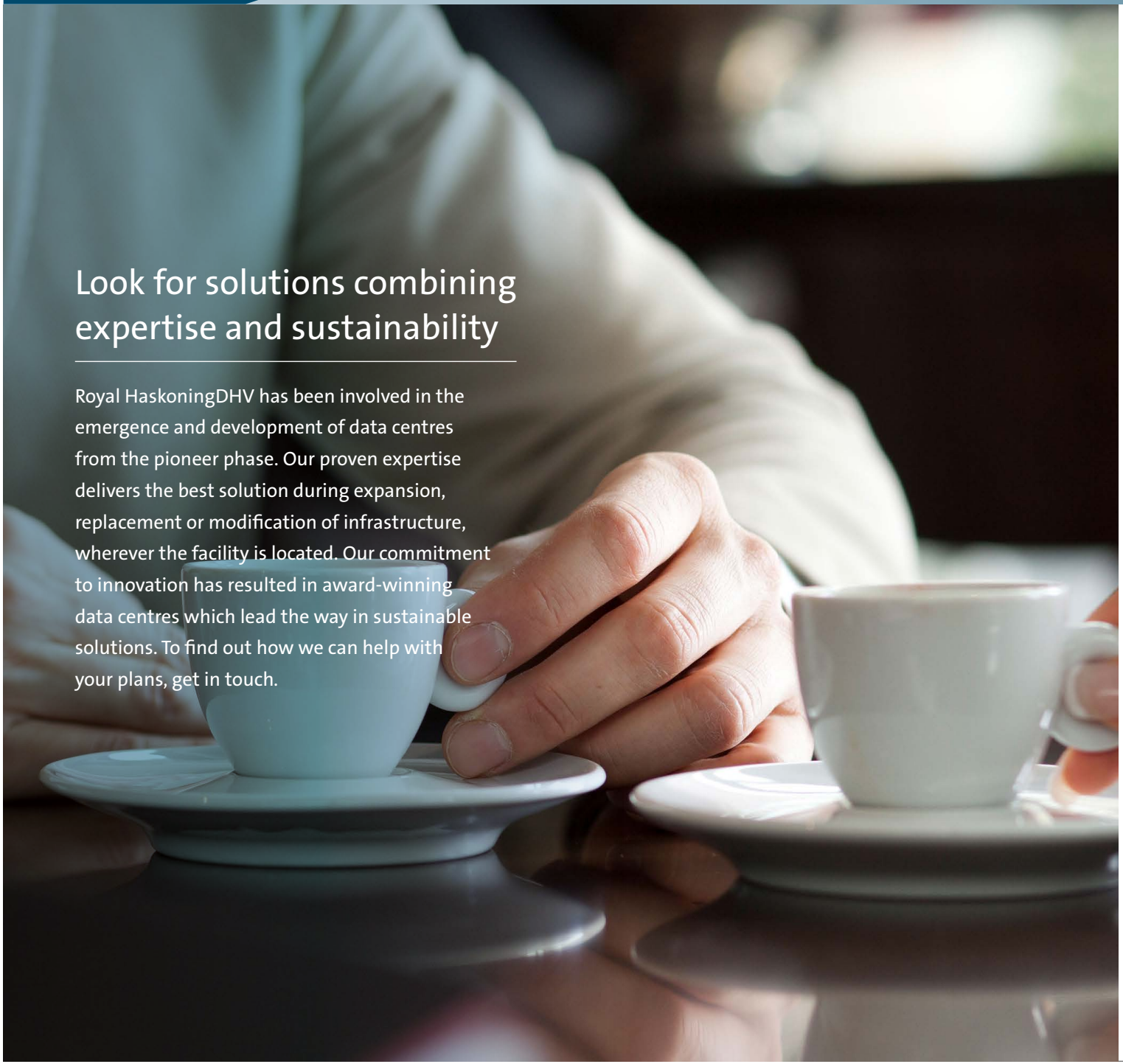
In planning new-build data centres

The due diligence for locations of new data centres should add focus on reuse of waste heat, alternative sources of water supply and discharge possibilities, as well as connectivity and power supply.

Heat harvesting: the next step in sustainable operations

When looking at circular systems, in an ideal world all the heat produced in the data centre would be used elsewhere, so the data centre cooling plant is only required as stand-by - like data centre power generators. Instead of destroying the heat through evaporation, the sustainable approach would be to harvest and reuse it. This is achieved through a closed heat transfer loop which takes the heat from the data centre to homes or businesses. Such a solution will require a harvesting system incorporated into the design. There will be periods when the heat cannot be reused, such as in high summer, so the harvesting will need to operate alongside methods to destroy the heat, such as those described above.

Currently data centres are being planned in isolated areas far from housing and use air-to-air cooling, draining green energy with no opportunity to harvest the heat. In the future, they would benefit from being in locations where they can implement a heat reuse solution and where there is good connectivity and power, such as hotel environments, science parks or residential areas. They could also potentially be used to heat greenhouses or swimming pools. This is a solution that is already implemented and operating, at the high-tech campus in Eindhoven and in Aalsmeer. Currently also heat reuse at scale is foreseen in the near future with the 100MW data centre in Westpoort Amsterdam where heating will be provided to the new residential areas of Amsterdam Haven-Stad.



Look for solutions combining expertise and sustainability

Royal HaskoningDHV has been involved in the emergence and development of data centres from the pioneer phase. Our proven expertise delivers the best solution during expansion, replacement or modification of infrastructure, wherever the facility is located. Our commitment to innovation has resulted in award-winning data centres which lead the way in sustainable solutions. To find out how we can help with your plans, get in touch.

Would you like to discuss your ideas? Please get in touch with:

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