Proposed Expansion of Spring Park Data Centre Campus on the Land South of Westwells Road, Corsham
Energy & Sustainability Statement

Ark Data Centres Limited

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Proposed Expansion of Spring Park Data Centre Campus
Energy & Sustainability Statement

Quality information

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P01	11/05/2023	Initial issue for comment
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Executive summary

Ark Data Centres is committed to environmental sustainability and energy efficiency in all aspects of its operations. As part of their ongoing efforts to minimise their environmental impact and promote sustainable practices, JCA have developed this Energy & Sustainability Statement Report on behalf of Ark for the Proposed Expansion of Spring Park Data Centre Campus on the Land south of Westwells Road, Corsham.

Energy usage:

Ark Data Centres recognise that data centres are energy-intensive facilities, and therefore strive to minimise their energy usage through various means. This new facility will be designed and operated with the following energy efficiency measures:

1. Free Cooling
2. Renewable Energy
3. Energy Monitoring and Management
4. High-efficiency Data Centre Equipment & Infrastructure
5. No fossil fuels used in running the facility.

Sustainability measures:

Apart from energy efficiency, Ark Data Centres also recognises the importance of sustainability in their operations. The new facility on the site for the proposed expansion of Spring Park will incorporate the following sustainability measures:

1. Rainwater Harvesting, Water Storage, Conservation & Recycling
2. Green Building Design – Aiming for BREEAM Very Good.
3. Air Source Heat Pumps used extensively to remove the requirements of fossil fuels for heating.
4. Waste Reduction and Recycling
5. Increased Biodiversity

In summary, Ark Data Centres is committed to being a leader in energy efficiency and sustainability in the data centre industry. This new data centre facility will be designed and operated with a strong focus on minimising energy usage, promoting renewable energy, implementing sustainability measures, and engaging with the local community. Ark is dedicated to continuously improving their environmental performance and driving positive change in the industry.

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1.0 Introduction

In today's world, where data centres play a crucial role in supporting our digital economy, addressing sustainability and environmental concerns has become a priority. As a responsible data centre provider, Ark Data Centres is committed to minimising the environmental impact of its operations and promote sustainability. This Energy & Sustainability Statement report outlines Ark Data Centres' approach to sustainability, with a focus on energy reduction, net zero carbon emissions, carbon offsetting, and implementing carbon reduction measures, and how the architectural, civil & structure and building services design of their new data centre facility in the Spring Park Campus expansion has looked at minimising the environmental impacts and promoting sustainability.

2.0 Ark Sustainability

Ark recognises the urgent need to address climate change and its profound impact on our planet. They take pride in being a market leader in implementation of sustainable, energy efficient solutions throughout its facilities and operating procedures. Ark strives to lead the way to achieve becoming carbon neutral by 2030 and are already working with some customers to exceed this target by becoming carbon negative by 2030 and then retrospectively removing all carbon dioxide emitted by 2050.

Sustainability is a key consideration in the design, construction, and operation of data centre facilities. Ark Data Centres is dedicated to implementing sustainable practices throughout the data centre life cycle, from inception to operation and beyond. This includes minimising energy consumption, reducing greenhouse gas (GHG) emissions, optimising resource usage, and promoting circular economy principles.

Ark will implement comprehensive waste reduction and recycling programs to minimise the environmental impact of their operations. This will include recycling of e-waste, paper, plastics, and other materials, as well as working with vendors and partners who share their commitment to sustainability. Ark work to develop their entire supply chain to align with these high standards and implement throughout the lifecycle of their facilities.

Ark Data Centres believes in actively engaging with the local community and stakeholders to promote sustainability. Throughout their occupation at Spring Park, Ark has actively collaborated with local organisations, educational institutions, and government agencies to raise awareness about energy efficiency, sustainability, and environmental conservation. Ark also actively participates in environmental restoration initiatives, including an on-site conservation zone to promote ecological welfare.

3.0 Defining Net Zero – Ark Definition

Ark Data Centres defines net zero for data centres as achieving a balance between the total amount of greenhouse gas emissions generated from the operation of a data centre and the total amount of GHG emissions removed or offset, resulting in no net increase in GHG emissions.

The team at Ark are proud to be part of the Climate Neutral Data Centre Pact (CNDCP), which is a group of Data centre operators and trade associations committed to the European Green Deal, achieving the ambitious GHG reductions of the climate law, and leveraging technology and digitalisation to achieve the goal of making Europe climate neutral by 2050. To ensure data centres are an integral part of the sustainable future of Europe, data centre operators and trade associations agree to make data centres climate neutral by 2030.

4.0 Operational Net Zero Carbon

Ark Data Centres is committed to achieving operational net zero carbon emissions in its data centres. This involves implementing energy-efficient technologies, utilising renewable energy sources, and reducing the use of fossil fuels, such as diesel generators, in data centre operations. Through continuous monitoring and optimisation of energy usage, Ark Data Centres aims to minimise its carbon footprint and achieve operational net zero carbon emissions.

Ark will work with end clients to deploy the latest technologies in data centre infrastructure, including highly efficient servers, storage, and networking equipment. These technologies will be designed to operate at optimum efficiency levels, minimising energy waste and reducing overall energy consumption.

5.0 Whole Life Net Zero Carbon

In addition to operational net zero carbon, Ark Data Centres also considers the whole life carbon impact of its data centre facilities. This includes the embodied carbon emissions associated with the construction, maintenance, and decommissioning phases of the data centre life cycle. Ark Data Centres aims to minimise the whole life carbon impact by using sustainable building materials, implementing efficient construction practices, and considering the end-of-life treatment of data centre components.

With the construction of the new data centre facility prioritising steel over concrete, this makes a large portion of the facility recyclable at the end of its operational life – further reducing the whole life impact of the facility.

6.0 Carbon Offsetting

Ark Data Centres recognises that achieving absolute zero carbon emissions may not be feasible in the short term, and therefore, it may be necessary to offset some of the remaining emissions through carbon offsetting initiatives. Ark Data Centres will seek engagement with credible and verified carbon offset projects that align with recognised standards, such as the Verified Carbon Standard (VCS) or the Gold Standard, to offset any residual emissions that cannot be eliminated through other means.

7.0 Implementing Carbon Reduction Measures

Ark Data Centres is committed to implementing carbon reduction measures to minimise its environmental impact. For the last 6 years, all Ark facilities have been powered by 100% renewable energy, as well as the fact that each Ark facility has significant provisions to accommodate and encourage the use of electric vehicles including dedicated sections of their car parks equipped with Multiple EV Chargers with provision for up to 20% of car parking spaces in the future.

However, Ark has set its sights on implementing further carbon reduction measures which includes investing in energy-efficient technologies, optimising data centre design and layout, implementing advanced power and cooling systems, and utilising renewable energy sources, such as solar panels, air source heat pumps and free cooling, to reduce GHG emissions. Ark Data Centres also actively monitors and analyses energy consumption data to identify and implement further carbon reduction opportunities in operation.

8.0 Architecture

The new data centre facility being constructed on the proposed expansion of the Spring Park Campus intends to achieve BREEAM 'Very Good' rating by using high efficiency systems combined with thermally efficient building design to obtain energy reduction credits that are available for this development.

8.1 White Space Architecture

The proposed new facility prioritises a 'Fabric First' approach, and endeavours to maximise the thermal performance of the building envelope materials and components to reduce operational energy demand. The facilities carefully considered layout; with the integration of the cooling units within the data hall ensuring that the cooling system dovetails into the structure seamlessly. This is a unique design feature of the facility compared to more conventionally designed buildings. These integrated cooling units culminate in the data centre white spaces requiring only adiabatic evaporative cooling for most end user deployments, ensuring half of the data centre white space cooling will not require refrigerants and can operate at an annualised PUE of below 1.04. This Low PUE represents less than 4% of the total energy required to power the entire data centre and compared to the industry average, is over 10 times more efficient. The other half of the data centre facility will be designed with option for the addition of DX cooling should there be any specialist client requirements in the future where end users have stricter temperature tolerances than the adiabatic can provide alone.

Internally, the integrated data centre design removes the need for the traditional raised floor air supplies or ductwork supplies seen in other data centre facilities, to provide the cooling to where it is required. This design innovation ensures that every inch of the facility and building fabric has been considered in line with day-to-day operation of the data centre facility.

8.2 Ancillary Block Architecture

The external envelope of the central ancillary block will combine to form a flexible and robust insulated system with defined tested and accredited performance. U-values shall meet the requirements within the amended Building Regulations Part L. The use of Low emissivity glazing further improves the thermal performance of the building structure. This shall combine to create a state-of-the-art new facility with low air permeability to further increase the operational efficiency of the building.

Low Zero Carbon (LZC) technologies shall be integrated into the facility, which shall include Electric Vehicle Charging Points (active & passive), roof mounted photovoltaics, LED lighting & PIR control. Low water consumption fittings such as dual flush WC and flow restricting basin mixer taps are to be specified in line with BREEAM WAT 01 credit requirements.

To ensure the general quality of products used in the construction, the provision of test certificates or certificates of compliance as necessary, for tests specified within listed British Standards, Codes of Practice, or other applicable documents, to confirm properties, composition or performance of materials and products proposed. Only certificates provided by independent and authoritative testing bodies will be accepted.

8.3 Landscaping

Alongside the current conservation area that is already well established on the Spring Park site, the proposed expansion on the land south of Westwells Road will incorporate further landscaping measures to support and encourage increased biodiversity on site. These measures will include the planting of native tree species to provide habitats for local wildlife, to attract pollinators and enhance local ecosystems. The expansion will also include water features to accommodate aquatic species and contribute to the overall ecological balance.

9.0 Civil & Structure

9.1 Favouring Steel over Concrete

Ark realises that the abundant use of concrete accounts for around 8% of all carbon emissions globally, that's more than 3 times that of the entire aviation industry. The new data centre facility favours steel over concrete which allows up to 90% of the building fabric to be recycled in the future; thereby lessening the overall environmental impact of the new facility, when compared to a traditionally constructed building.

At the core of the Bladeroom design is the use of engineered steel structures and composite floors. Not only does this make the overall weight of the building up to 30% less than that of concrete, but it also removes the need for a concrete deck to be used to achieve up to 15kn/m^2 loadings at each floor, further reducing weight and the use of concrete throughout.

The building's structure has been designed with an intended lifespan of 60 years and for repurpose and independent replacement of individual elements, based on their design life periods. The intention will be to prolong the useful life of the structure by refitting elements progressively over time. In addition, the data centre components will be designed and selected to facilitate disassembly and reuse at the end of their useful life. The key challenge to implementing design for disassembly and reuse relates to the data centre operator and customer's specific requirements for the fit out. This will be monitored and addressed as the project progresses.

9.2 Modular Building Design

The new facility utilises a factory focused modular building process that not only reduces the construction time on site (along with the health & safety and pollution risks of a construction site) with over 90% of the proposed data centre being built off site. This dramatically reduces the on-site carbon footprint for the scheme. The pre-engineered sections arrive on site complete with much of the equipment already installed and are bolted together to form the final facility.

The facility is modular in its construction, can be deconstructed and re-located to a new site at the end-of-life on site at Spring Park if this becomes necessary and appropriate. Equally most of the components making up the data hall structure and fit out could be recycled – such as the structural steelwork.

10.0 Building Services

10.1 Free Cooling

The new facility in the proposed expansion of the Spring Park Campus will utilise free cooling techniques, taking advantage of ambient outside air to cool IT equipment instead of relying solely on mechanical cooling systems. This will significantly reduce the buildings reliance on energy-intensive cooling methods, resulting in lower energy usage and reduced greenhouse gas emissions, leading to a smaller carbon footprint. This makes the new facility a more sustainable data centre that aligns with green initiatives and corporate social responsibility goals.

The white spaces are served by the air optimiser adiabatic cooling units that will prioritise the use of full fresh air free cooling over the adiabatic cooling process. The technical room cooling systems have external dry air coolers and use free cooling by running fans only when possible before initiating refrigerant compressors. The Variable Refrigerant Volume (VRV) condensing units serving the ancillary building are selected with integral controls that allow the use of free cooling and run condenser fans only where possible.

All supply and extract AHU's will have mixing sections to recirculate conditioned air back into the space and will have controls strategies to allow their prioritising of free cooling over mechanical air conditioning plant to condition the occupied spaces. In addition to this energy recovery from exhausted conditioned air shall also be prioritised over the use of heating or cooling coils.

10.2 Renewable Energy Systems

The new facility in the proposed expansion of the Spring Park Campus prioritises the use of renewable energy technologies throughout its design and has strived to incorporate as many green technologies as possible. The data centre is being designed around innovative technology that is proven to dramatically reduce energy consumption and carbon emissions.

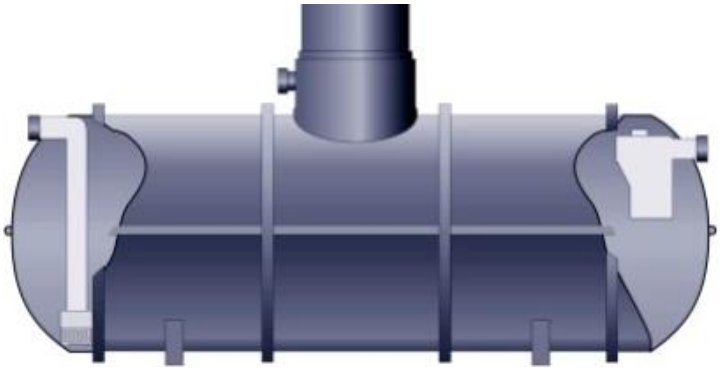
The facility does not use any fossil fuel for its energy use on site. All air handling units and air conditioning equipment uses air source heat pumps for both heating and cooling. This not only enables the use of renewable energy, but also removes the requirements of combusting fossil fuels for heating and hot water generation.

The new data centre facility will be designed to meet or exceed industry-leading green building standards. This will include energy-efficient lighting, insulation, and other green building design features to minimise the environmental impact and promote sustainability.

10.3 Water Consumption & Storage

Water is a precious resource, and Ark will implement measures to minimise water usage of the proposed facility. This will include using water-efficient cooling systems, utilising a vast rainwater harvesting system, implementing water recycling and reusing measures, and educating their staff on water conservation practices.

Water Consumption is a great example where a data centre which uses evaporative cooling could have a significant adverse impact on the local water supply. However, by employing innovative thinking the team at Ark has developed a 'Water Buffering and Saving Mode' for their cooling equipment which reduces the sites original peak water usage by a staggering 85%.



A 650m^3 dedicated rainwater harvesting storage tank shall be installed to directly capture run off from all significant roof areas – totalling roughly 7,100 m^2. This tank has been sized to exceed the expected water volume from a design storm event. This water is used as a priority for the adiabatic cooling process water use.

In addition, another equally sized 650m^3 attenuation tank will capture any additional rainwater which is then linked to two surface water attenuation ponds which combined will provide a regulated SUDS outflow from the site. The larger of these ponds shall be connected to the rainwater harvesting tanks via a pump and filter system to supplement the rainwater harvesting volume. It is intended that the stored rainwater would be significantly drawn down before the next design storm event.

By capturing water from the roof and from the 'run-off' of the car parks it is possible for the new data centre evaporative cooling systems to operate almost entirely on harvested rainwater and recycled water from the water plant. In addition to capturing rainwater, where water systems on site generate wastewater, this is captured and recycled via the drainage system for reuse within the rainwater harvesting system. As far as is practicable, the combined rainwater harvesting system will ensure that all rainwater runoff is re-used as a resource, rather than discharged off site.

The use of low water use sanitary fittings is specified throughout to comply with the BREEAM credit WAT 01. Mixer taps are also specified throughout. In addition to this, water leak detection systems are to be installed in each area of significant domestic water use and these are linked to automatic shut off valves to reduce wastewater from leakage. Pulsed output water meters are also specified to meet BREEAM and SBEM credits.

Within each ancillary building, domestic cold-water storage is provided. This will be sufficient to allow at least 24-hour storage capacity. Within the process water plantroom water storage tanks are provided sufficient to allow for 48 hours of continuous operation during peak weather conditions.

The water storage systems have been designed to allow the local water provider to modulate the water flow into the site to suit their available distribution system capacity and avoid the need for network reinforcement to support the site.

10.4 Waste heat re-use

Green technologies have been integrated throughout the design of the new Data centre and associated ancillary building. A hydrobox water heater that utilises waste heat energy from the VRV system has been included which is an energy-efficient solution that helps reduce overall energy consumption. The VRV system, which is used for heating or cooling spaces, generates waste heat during cooling mode operation. This heat is captured and used to generate domestic hot water, maximising the use of available energy, and reducing the need for additional energy sources. This results in lower energy costs and reduced greenhouse gas emissions, making it an environmentally friendly option.

The VRV system also uses branch selector boxes which allows local zonal capture and reuse of rejected heat energy in the other FCUs on that zone. This allows the refrigerant compressors to be held off.

Each main supply and extract Air Handling Unit (AHU) have heat recovery sections. Main AHUs use thermal wheels and CO_2 sensor with controlled fresh air mixing sections to allow re-use of conditioned exhaust air whenever possible. Within the white spaces, the air optimiser units have mixing sections that allow re-use of conditioned air whenever possible.

10.5 BMS/EMS Controls

The facility will implement advanced energy monitoring and management systems to track and optimise energy consumption in real-time. This will allow the operations team to identify and rectify energy inefficiencies promptly, ensuring that the data centre facility operates at peak energy efficiency levels, targeting industry leading low Power Usage Effectiveness (PUE) values.

A Building Management System (BMS) controls system shall be designed that prioritises energy re-use and free cooling over the use of heating and cooling plant. This shall provide out of condition alarms to alert maintenance staff of excess energy use as well as system faults.

An Energy management system (EMS) shall be installed and connected to the BMS. This system will provide trend data logging that will allow monitoring of the energy use of most systems on the site. This will allow improved efficiency in systems operation and maintain low energy use during the continuing operation of the site.

10.6 Eliminating Diesel Fuel

The necessity for an uninterrupted and secure electrical power supply for any critical data centre unfortunately involves the requirement for standby generation. This requirement for generators is always a source of greenhouse gas emission that cannot be removed from the scheme. Therefore, the priority must be on reducing the impact of the generation of electricity. The new generators shall run on Hydrotreated Vegetable Oil (HVO) fuel rather than Diesel or Natural gas.

The use of HVO fuel over diesel offers several advantages, including lower greenhouse gas emissions, improved air quality, and enhanced sustainability. HVO fuel presents a renewable and sustainable alternative to diesel that can contribute to reducing the environmental impact of standby generation, supporting efforts to mitigate climate change and promote a more sustainable future.

10.7 Solar Panels

The new facility will have solar panels installed along much of its empty roof area, turning a redundant roof space into a clean energy source, with all the generated electricity being used directly on site.

The ancillary block of the proposed facility alone will have more than 700m^2 of available roof space to utilise for PV arrays. This should equate to an array which would deliver a peak of over 100kW, all of which shall be utilised by the facility. In total this could provide over 75,000kWh of electricity per year, offsetting over 20,000kg of CO_2 p.a. There may be further opportunity to expand the solar array onto the roof of the data centre facility which shall be explored further as the design progresses.

Solar panels produce clean and renewable energy by harnessing sunlight, which is a renewable and abundant energy source. Installing solar panels offers several environmental benefits, including reducing greenhouse gas emissions, promoting renewable energy, reducing dependence on fossil fuels, and promoting sustainable energy consumption. Solar panels can contribute to mitigating climate change, protecting the environment, and fostering a more sustainable energy future.

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