Greening the grid: data centres address their footprint

The world's surging adoption of Artificial Intelligence in our daily lives is accelerating the demand for data centres. It is also drawing attention on the sector's growing demand for energy resources and the impact of greenhouse gas emissions on the wider economy.

Currently supplied via a mix of legacy fossil fuel and renewable sources, the 'round-the-clock' energy demand is set to grow dramatically. The International Energy Agency estimates that data centres' total electricity consumption could double from 2022 levels to 1,000TWh (terawatt hours) in 2026, approximately Japan's current total level of electricity demand.

This demand for energy resources comes at a pivotal time as the sector's widening carbon footprint raises questions on whether "Big Tech's" plans to invest heavily in artificial intelligence products undermines their goals to reduce carbon emissions.

Demand for digital services from hyperscale clients – the world's biggest technology companies – is growing at double digit annual growth rates, prompting them to build data centres near power transmission grids.

However, some governments have felt compelled to slow down expansion. In Ireland, the local planning authority was forced to halt new construction in the greater Dublin area in 2021 while Netherlands also temporarily halted the construction of new data centres in 2019.

Water consumption is another sticky issue with some cooling solutions requiring large volumes of water to support cooling of server racks. Some data centres are located in populous areas and water stress is leading to disquiet from some communities with Google recently asked to revisit a planned $200m project in Santiago over concerns for the local aquifer.

Where sustainability and technology collide

With the growing scrutiny on the sector's sustainability credentials, investors are mindful of the extent to which underperformance on key metrics could impact liquidity and refinancing needs.

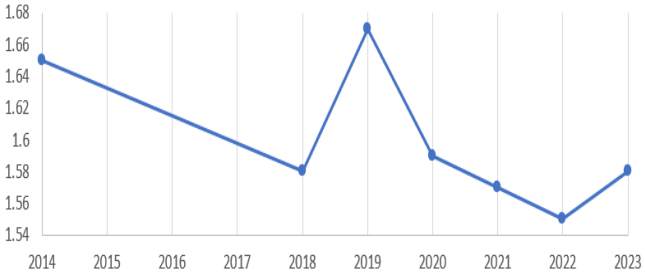
They are scrutinising the sources of renewable energy procured by data centres, focusing on the widespread use of often low-quality renewable energy certificates (RECs). New rules are under discussion on their use in carbon reporting which seek to offer a more accurate picture on real-world emissions.

Developers are focusing on efficient designs to reduce power wastage and minimise reliance on energy-intensive cooling solutions to help reduce the sector's 'power usage effectiveness (PUE) ' factor. Therefore, investments in closed-loop water consumption and recycling systems are growing as the sector navigates licence-to-operate issues.

Companies are focussing on data centre infrastructure management by leveraging data analytics to reduce energy consumption footprints. Power supply companies are providing the latest generation of superconducting transmission cables which aim to cut as much as a tenth of the energy output.

Regulators are also taking a greater interest in the sector's environmental footprint by shining a spotlight on data centre sustainability credentials. The European Union recently revised its Energy Efficiency Directive to create a rating system for the sustainability of data centres.

Power Usage Effectiveness (PUE) Trends by Year



New Energy Sources

The need for baseload electricity, especially during periods when renewable energy sources are not generating sufficient power, underscores the potential role of natural gas and nuclear energy in complementing and 'firming' renewable energy sources. Energy providers are looking at natural gas to meet additional power demand as it can be quickly deployed at relatively lower costs. Therefore, midstream energy suppliers are becoming an attractive opportunity set, though scientists warn the climate impact of natural gas can be detrimental.

Nuclear technologies could produce stable, limitless low-carbon energy. Google became the first tech company to commission new nuclear power plants for its data centres. The prices technology companies are willing to pay for stable secure energy sources could flatten the cost curves for emerging technologies such as large-scale battery storage over time, as buyers prioritise reliability of supply over unit costs.

However, the long lead times for new nuclear capacity in developed markets means the role of nuclear energy in addressing total demand may be limited in the short term. Nevertheless, we expect to see significant investments in 'microgrids' and renewables increasingly complemented with backup generation sources.

Conclusion

Improving resource efficiencies will be helpful, but still amount to steps on a long road when factoring in the future energy needs created by digitalization. For data centres to become completely carbon-free, the grids that power them will have to become carbon-free. As a result, all stakeholders will have to work together towards reducing emissions.

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