Apia data center energy storage

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Average data centres are quite small in power terms, with demand in the order of 5-10 megawatts (MW). But large hyperscale data centres, which are increasingly common, have power demands of 100 MW or more, with an annual electricity consumption equivalent to the electricity demand from around 350000 to 400000 electric cars.

Additionally, data centres will be a key focus of the IEA"s forthcoming Global Conference on Energy & AI. The event, which will take place at our headquarters in Paris on 4-5 December, will bring together high-level decision makers from governments, the tech sector, the energy industry and civil society to discuss the ways in which AI could transform energy systems in the future.

In part because of expectations for AI, the next few years will see a substantial rise in the number and size of data centres. This growth will be partially mitigated by continued efficiency improvements at both the hardware and software level. Nonetheless, electricity demand from data centres is set to grow strongly to 2030 under today"s policies settings and trends.

However, when considered in a broader context of total electricity consumption growth globally, the contribution of data centres is modest. Global aggregate electricity demand grows by 6 750 terawatt-hours (TWh) by 2030 in our Stated Policies Scenario, equivalent to more than the combined demand from the United States and European Union today. While growing digitalisation, including the rise of AI, is one factor, continued economic growth, electric vehicles, air conditioners and the rising importance of electricity-intensive manufacturing are all bigger drivers.

In large economies like the United States, China and the European Union, data centres account for around 2-4% of total electricity consumption today. But because they tend to be spatially concentrated, their local impact can be pronounced. The sector has already surpassed 10% of electricity consumption in at least five US states. In Ireland, it now accounts for over 20% of all electricity consumption.

For comparison, large data centres can have a power demand equivalent to that of an electric arc furnace steel mill. However, steel plants are less likely to be clustered in the same geographic area.

The growth of data centres could therefore lead to considerable strain on local power networks, exacerbated by the huge mismatch between rapid data centre construction times and the often sluggish pace of expanding and strengthening grids and generation capacity. There have already been instances of jurisdictions pausing new contracts for data centres due to a surge of requests. For regions or countries that are particularly affected, rising electricity consumption from data centres could make meeting their climate targets more difficult.

With the role of data centres in the electricity system set to increase, it is important that policymakers and

regulators have the tools to understand this new driver of demand growth. A number of key variables merit further discussion and analysis.

Thirdly, more effort is needed to understand the physical constraints on demand growth. Understanding of the data centre project pipeline is limited, and data is not readily available. Meanwhile, chip production may present a near-term bottleneck. The energy sector itself may slow down the growth of AI, if generation and grid capacity is not available in the places it is most needed.

Finally, the impact of AI applications in the energy sector more broadly needs to be fully assessed. Promising examples include accelerating breakthroughs in clean energy innovation, managing the electricity system to facilitate more renewables, and deploying AI to enhance the profitability and speed of electrification programmes in developing economies. These applications could potentially transform energy systems, but today, their impacts, enabling conditions and scalability are not well known.

Overall, there is an urgent need for public-private dialogue, with policymakers, the tech sector and the energy industry coming together for discussions. The promises of AI are real - not least for clean energy innovation. But delivering responsible AI will require new partnerships to quickly emerge. The upcoming Global Conference on Energy & AI aims to provide a space to kickstart and advance these conversations.