Data center energy storage 370 kWh

Data centers can be thought of as the "brains" of the internet. Their role is to process, store, and communicate the data behind the myriad information services we rely upon every day, whether it be streaming video, email, social media, online collaboration, or scientific computing.

As the number of global internet users has grown, so too has demand for data center services, giving rise to concerns about growing data center energy use. Between 2010 and 2018, global IP traffic--the quantity of data traversing the internet--increased more than ten-fold, while global data center storage capacity increased by a factor of 25 in parallel (Masanet et al. 2020). Over the same time period, the number of compute instances running on the world"s servers--a measure of total applications hosted--increased more than six-fold (see Figure 3) (Masanet et al. 2020).

These strong growth trends are expected to continue as the world consumes more and more data. And new forms of information services such as artificial intelligence (AI), which are particularly computationally-intensive, may accelerate demand growth further. Therefore, the ability to quantify and project data center energy use is a key energy and climate policy priority.

These efficiency effects are not well captured in extrapolation-based approaches, given their lack of technological and structural detail. In other words, while extrapolation-based approaches generally capture the drivers of data center demand that would push energy use up (top half of Figure 3), they fail to adequately capture strong countervailing efficiency trends (bottom half of Figure 3) that keep energy use in check.

Another recent claim is that "the emissions generated by watching 30 minutes of Netflix (1.6 kg of CO2) is the same as driving almost four miles." This claim is backed up by assumptions that data centers providing Netflix streaming services would consume around 370 TWh per year (Kamiya 2020). Yet this value is 1.8 times larger than the 205 TWh estimated for all of the world"s data centers combined, which provide society with myriad other information services beyond just streaming Netflix videos. (For a more complete assessment, see Kamiya 2020.)

Therefore, the improved clarity that these recent bottom-up estimates have brought on global data center use can also enable "reality checks" that expose the implausibility of some attention-grabbing and widely-circulated claims about data centers" contribution to climate change.

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