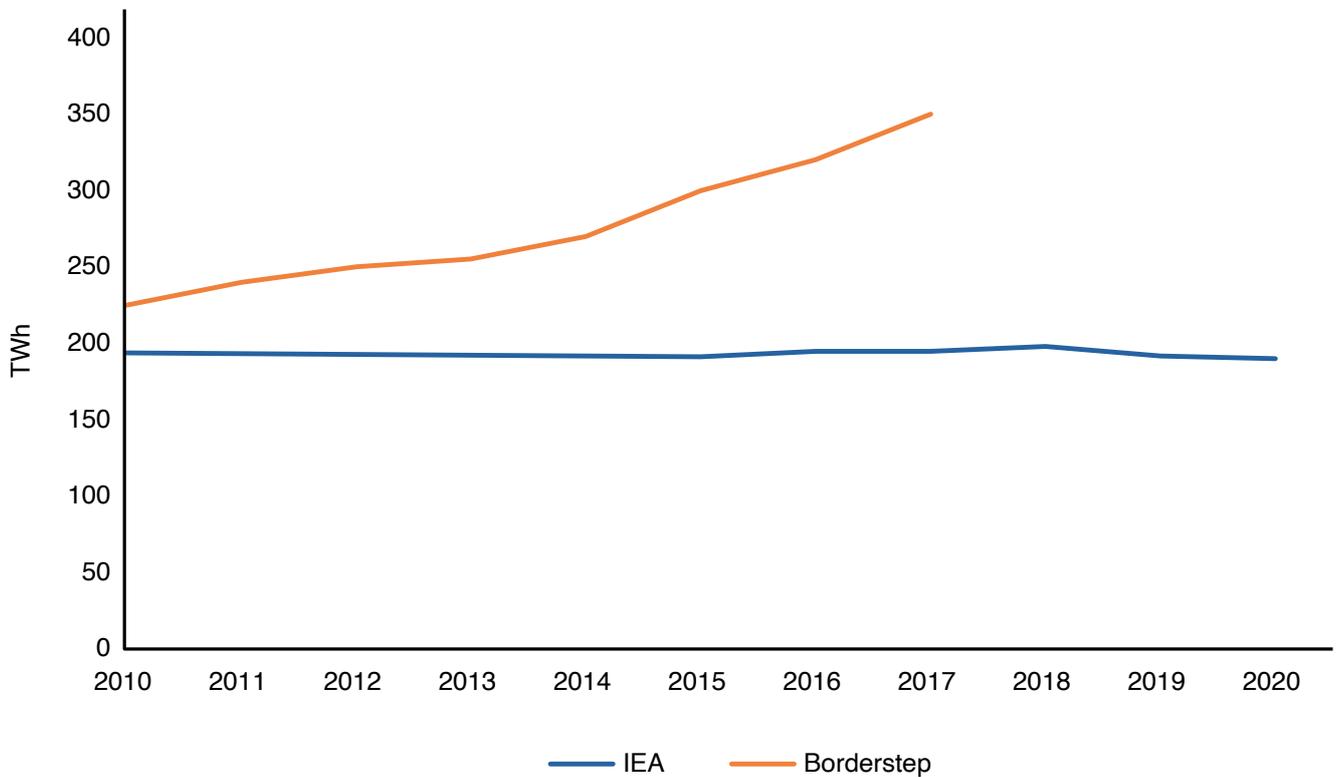


Data Insight

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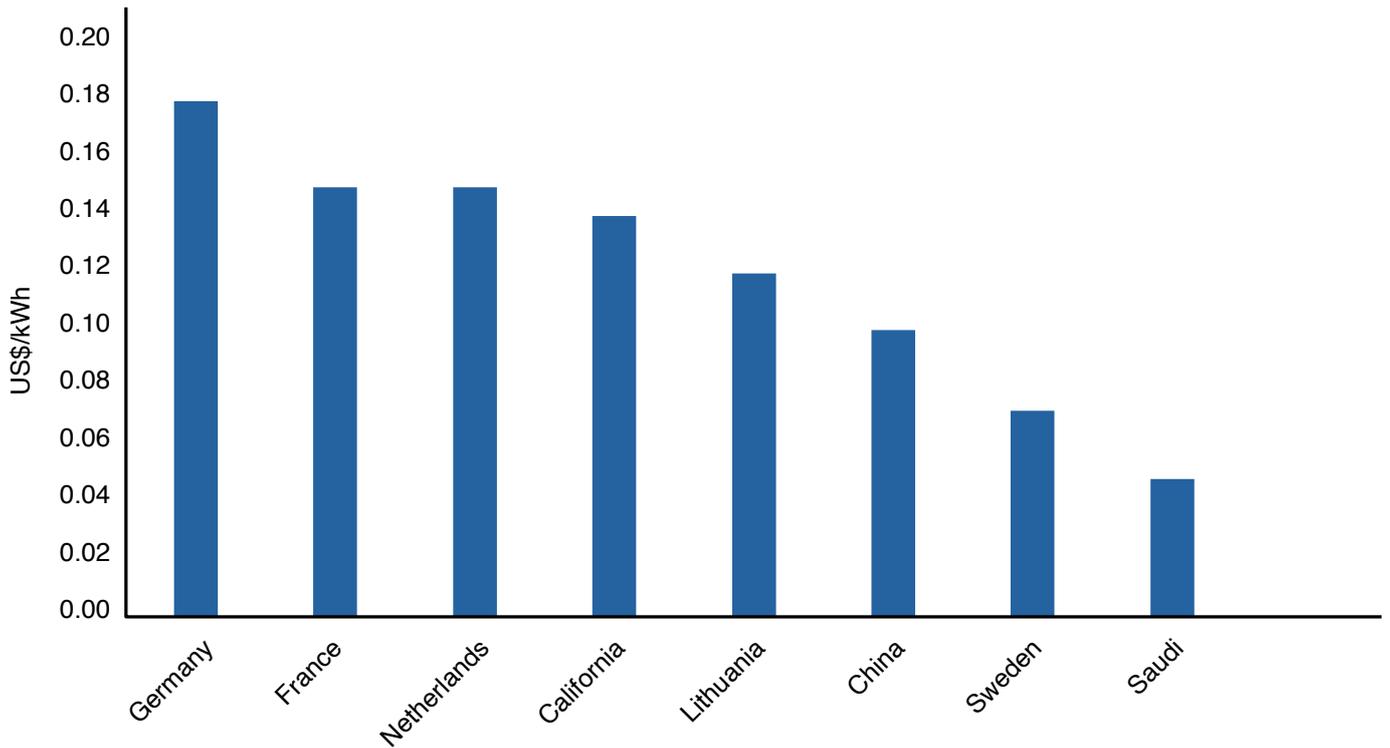
Global Trends in Cloud Computing and Saudi Arabia's Response

Figure 1. Global data center electricity consumption.



Sources: IEA (2020); Hintemann (2018).

Figure 2. Electricity tariffs for data centers.



Sources: GlobalPetrolPrices.com (2020); Site Selection Group (2017); Clesca (2016); Arab News (2021).

- According to the European Commission, digitalization will play a key role in addressing sustainability and energy transition challenges (European Commission 2014). Further, most economic sectors will be highly impacted by the digital revolution. This calls for a closer look at the current status of electricity demand and the potential future for data centers globally.
- Data centers are a large bundle of networked computer servers typically used to store, process, and distribute data. They consume large amounts of electricity. Currently, data centers are responsible for nearly 1% of the 22,315 terrawatt-hours (TWh) of global electricity consumption (IEA 2020).
- There is a discrepancy when accounting for data center electricity consumption globally, as indicated in Figure 1. The International Energy Agency (IEA) reports that data centers consumed approximately 200 TWh in 2017, and the Borderstep Institute estimates this consumption to have been 350 TWh (IEA 2020). To put this in perspective, the electricity consumption of data centers in China in 2018 was 161 TWh (Mikayilov et al. 2020b).

- The share of data centers in global electricity demand is projected to increase to 8% by 2030, or approximately 3,000 TWh (Anders and Edler 2015). Despite considerable energy efficiency gains, data centers' electricity consumption is expected to grow significantly due to increased technology adoption (which has been furthered by the effects of COVID-19) and additional requirements to serve new technologies and services (e.g., 5G, the internet of things, etc.). As a result, electricity demand from data centers will outstrip their efficiency improvements over the next few years (Rabih 2019).
 - Data centers are low-risk investments, as they are long-term and secure streams of tax revenues for governments. Hence, many governments worldwide are devising several policies, including introducing tax cuts, lowering electricity tariffs, and applying other incentives to attract companies to domicile data centers in their countries. France cut its electricity tax for data centers from 22.5 euros per megawatt-hour (EUR/MWh) to 12 EUR/MWh, and recently the State of Kentucky in the United States gave US\$15 million tax breaks to attract companies to build data centers there (Dawn-Hiscox 2018; Cheves 2021).
 - Figure 2 summarizes the recent activities and data center electricity rates globally. Saudi Arabia recently announced that it would charge 0.18 Saudi Arabian riyals (SAR)/kWh (0.048 US\$/kWh) (Arab News 2021a). As shown in Figure 2, the country's data center electricity rate is among the most competitive globally.
 - Recently, Google and Alibaba decided to bring cloud services to the Kingdom through a combined investment of US\$1.5 billion, the most significant regional tech investment to date (Arab News 2021a). The Kingdom has been accelerating its efforts in adopting artificial intelligence solutions. In February, the Ministry of Energy announced the inauguration of the Artificial Intelligence Center for Energy to enable entrepreneurship and attract investment by supporting innovation (Arab News 2021b).
 - As data centers become operational in the Kingdom, they will be an additional driver of long-term electricity demand. KAPSARC is actively studying these challenges and their implications for the economy by modeling and forecasting electricity demand (Mikayilov et al. 2020a, 2020b).
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References

European Commission. 2014. "Advancing Manufacturing - Advancing Europe." Force on Advanced Manufacturing for Clean Production.

International Energy Agency (IEA). 2020. "Data centres and data transmission Networks – ANALYSIS." June 01 Retrieved March 21, 2021. <https://www.iea.org/reports/data-centres-and-data-transmission-networks>

Andrae, Anders S.G., and Tomas Edler. 2015. "On Global Electricity Usage of Communication Technology: Trends to 2030" *Challenges* 6, no. 1: 117-157. <https://doi.org/10.3390/challe6010117>

Bashroush, Rabih. 2019. "Data center energy use goes up and up and up." December 19. Retrieved March 21, 2021. <https://journal.uptimeinstitute.com/data-center-energy-use-goes-up-and-up/>

Dawn-Hiscox, Tanwen. 2018. "France to cut electricity tax for data centers." September 21. Retrieved March 21, 2021. <https://www.datacenterdynamics.com/en/news/france-cut-electricity-tax-data-centers>

Cheves, John. 2021. "Tax breaks for Amazon and Facebook? KY lawmakers advance data center incentives bill." March 2. <https://www.kentucky.com/news/politics-government/article249629218.html>

GlobalPetrolPrices.com. 2020. "China electricity prices." June. Retrieved March 21, 2021. https://www.globalpetrolprices.com/China/electricity_prices

Site Selection Group. 2017. "Power in the Data Center and its Cost Across the U.S." Retrieved March 21, 2021. <https://info.siteselectiongroup.com/blog/power-in-the-data-center-and-its-costs-across-the-united-states>

Clesca, Bertrand. 2016. "Electricity Price and Data Center Location in Europe." Retrieved March 21, 2021. <http://opticalcloudinfra.com/index.php/2016/10/25/electricity-price-and-data-center-location-in-europe/>

Hintemann, R. 2018. "Boom führt zu deutlich steigendem Energiebedarf der Rechenzentren in Deutschland im Jahr 2017." Borderstep Institut für Innovation und Nachhaltigkeit, Berlin.

International Energy Agency (IEA). 2020. "Electricity information: Overview: Statistics report – July 2020." Retrieved March 21, 2021. <https://www.iea.org/reports/electricity-information-overview>

Arab News. 2021a. "Saudi Arabia reduces power tariff to boost cloud computing." March 15. Retrieved March 21, 2021. <https://www.arabnews.com/node/1825521/saudi-arabia>

Arab News 2021b. "MoU signed to launch AI center for energy in Saudi Arabia." Retrieved March 28, 2021. <https://www.arabnews.com/node/1801571/saudi-arabia>

Mikayilov, Jeyhun, Abdulelah Darandary, Ryan Alyamani, Fakhri Hasanov, and Hatem Alatawi. 2020a. "Regional heterogeneous drivers of electricity demand in Saudi Arabia: Modeling regional residential electricity demand." *Energy Policy*, 146, 111796. doi: 10.1016/j.enpol.2020.111796

Mikayilov, Jehun, Fakhri Hasanov, Wahid Olagunju, and Mohammed Al-Shehri. 2020b. "Electricity demand modeling in Saudi Arabia: Do regional differences matter?" *Electricity Journal*, 33(6), 106772. doi: 10.1016/j.tej.2020.106772

Smart Energy International. 2019. "China's data centres emit as much carbon as 21 million cars - report." September 12. <https://www.smart-energy.com/industry-sectors/energy-grid-management/chinas-data-centres-emit-as-much-carbon-as-21-million-cars-report>

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