ÇAKMAK

Data Center Investments in Türkiye: Energy Supply to Data Centers

10 February 2026

Energy supply is one of the most critical aspects of data center operations. Meeting energy needs that increase in parallel with processing intensity, while ensuring the lowest cost and highest supply security, stands out as one of the most significant challenges that data center projects must address. In this article, we review global trends in meeting the energy needs of data centers and the methods that can be applied in Türkiye.

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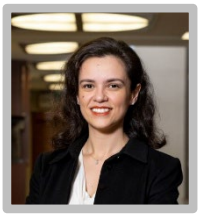

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Global Landscape

In the International Energy Agency's "Energy Supply for AI" report, the following points stand out regarding the global status of energy demand arising from artificial intelligence developments and data center projects, as well as future prospects:

- Data centers account for approximately 1.5% in global electricity consumption. With 45%, the United States ("US") holds the largest share, followed by China at 25%. The number of data centers, thus the energy needs of this sector, are expected to grow exponentially.
- Due to capacity constraints in power grids and delays in infrastructure development, 20% of the planned data center projects face the risk of postponement, making site selection, permit processes and grid connection agreements keystones of legal and commercial framework.
- Data centers based in the US and China consume most of the electricity from fossil fuels. With a share over 40%, natural gas is the greatest electricity source of data centers in the US, while coal dominates in China with a share of 70%.

- It is estimated that within the next five years, electricity generated from renewable energy resources will satisfy nearly half of data centers' energy demand, and that thermal and nuclear (including small modular reactors (SMRs)) power plants will assume a complementary role. This trend is expected to make long-term power purchase agreements ("PPAs"), hybrid supply structures, and on-site generation solutions more widespread [1].

Since the continuity of data center services relies heavily on uninterrupted electricity supply, meeting data centers' energy needs in the most secure and economical manner remains essential. Cooling systems, which are necessary for data centers to provide uninterrupted and efficient services, also stand out as a factor that significantly increases electricity consumption.

Energy Supply Methods for Data Centers in Türkiye

Ways of meeting data centers' energy needs appear as one of the most important issues to be addressed at the feasibility stage of such projects. With the Climate Law entering into force on 9 July 2025, the emissions trading system planned to be established for the purpose of reducing greenhouse gas emissions has been conceptually introduced into the legislation in Türkiye. [2] This system, the details of which are expected to be regulated through secondary legislation, will increase the importance of ensuring that the electricity used is generated from renewable sources.

In Türkiye, as in global examples, PPAs and on-site generation options prevail in meeting the needs of large electricity consumers.

Long-Term Power Purchase Agreements

PPAs are long-term agreements concerning the supply of electricity and generally have a term of 10 to 20 years. On one side of these agreements is a supply or electricity generation company as the seller, and on the other side is a consumer, generally operating in an industry where electricity is consumed on a large scale, as the purchaser. In this model, while the purchaser has the opportunity to purchase electricity at a more predictable price against market fluctuations, the seller secures its revenue through the long-term supply relationship.

In Türkiye, however, due to volatile market conditions, the risk that the electricity prices agreed by the parties in PPAs may remain significantly lower or higher than market prices over time leads to reservations regarding the implementation of this model, and the parties tend to make shorter-term agreements.

Even if not on similar terms and conditions to their global counterparts, PPAs stand out for their potential to be a quicker solution in meeting the energy needs of data center investments in Türkiye.

Self-Generation and Storage of Energy

The on-site generation model encountered in global examples is covered under the license-exempt electricity generation model in Türkiye. While the generation of electricity for commercial purposes in Türkiye is subject to licensing, in exceptional cases where generation is for self-consumption purposes, entities may engage in electricity generation activities without obtaining a license. Article 5 of the Regulation on License-Exempt Electricity Generation in the Electricity Market ("License-Exempt Regulation") lists such cases. The following summarizes those applicable to data centers:

- **The 5(1)[b] model**: This group includes generation facilities that operate without any connection to the transmission or distribution system. In this model, by establishing a direct connection between the consumption point and the generation point, the facility uses the electricity it generates directly at the relevant consumption site. Due to the physical proximity

required for this direct connection, operators carry out generation on-site. Considering the space required for on-site generation, this model has limited potential to meet the entire electricity demand of high-consumption projects such as data centers.

- **The 5(1)[c] model**: This model covers generation facilities based on renewable energy sources with an installed capacity of up to 5 MW. Due to the installed capacity limit, it has limited potential to meet the entire electricity need of high-consumption projects such as data centers. Any excess electricity is purchased by the authorized supply company at the active energy price for 10 years.
- **The 5(1)[ç] model**: This group includes generation facilities based on renewable energy sources that use all of the energy they produce without delivering it to the transmission or distribution system, and whose generation and consumption occur at the same measurement point.
- **The 5(1)[h] model**: This model covers generation facilities based on renewable energy resources established in the same or different measuring point as their consumption facilities, provided that their installed capacity is limited to the contractual power in the relevant connection agreement. This model, which makes it possible to meet the entire consumption by generating electricity from renewable energy sources, appears to be the most suitable model for data center projects. In addition, the authorized supply company purchases excess electricity delivered to the grid at the active energy price for 10 years.

Since the models mentioned above will include project development and construction costs, investors should evaluate at the feasibility stage whether they would be economically more advantageous compared to PPAs for the relevant data center project. Parties may also structure hybrid models that combine PPAs and license-exempt generation models, if needed.

Energy performance contracts (EPCs) and energy service companies (ESCOs), which are the key actors of such contracts, stand out in the implementation of investments aimed at self-generation of electricity. In the models applied in Türkiye, the financing of the investment is generally provided by the ESCO, while the project owner pays a monthly service fee to the ESCO based on the electricity generated during the operational period. In certain projects, the revenue obtained from the sale of surplus electricity generated to the authorized supply company belongs to the ESCO, whereas in other projects, such revenue is transferred to the project owner. [3]

Especially in electricity generations model based on renewable energy sources, the use of storage technologies is also important in order to ensure security of supply. Amendments to the Regulation on Storage Activities in the Electricity Market, effective as of 1 January 2026, permit license-exempt electricity generation facilities that are subject to set-off for excess energy under the License-Exempt Regulation to establish storage facilities. In this context, the materials used in the electricity generation facility and the connection equipment must be manufactured in accordance with the relevant legislation and standards, be covered by warranty, and have been produced within the last five years.

Conclusion

The increasing trend of digitalization in all sectors is also driving interest in data center investments in Türkiye. One of the most important issues to be considered when planning such investments is how the uninterrupted electricity needs of these structures will be met. The PPA, license-exempt generation, and storage models that can be implemented in Türkiye may, with proper structuring, be used to address this need.