

The Changing Role of Buildings in the Energy Market



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The energy demand of buildings will be met to a significant extent by renewable energy sources. This will require substantial improvements in the ability of building energy systems to work with fluctuating energy production. In practice, this means that the building's energy use must be adapted to the requirements of energy production.

Renewable energy production is variable, especially for solar and wind power, which increases production instability and affects energy availability and costs. The volatility of the market price of electricity is expected to increase as the amount of weather-dependent renewable energy, such as wind and solar power, on the market increases. More dynamic pricing will also become more common in district heating, as production is based on the utilization of waste heat (e.g., data centers) using heat pumps.

In the future, improving energy efficiency alone will not be enough, but it will also be necessary to be able to manage the power demand of buildings. Instantaneous power and peak power demand are just as important as energy efficiency.

Improving the energy flexibility of buildings has been found to be an effective way to manage instantaneous power demand. This also enables a wider use of renewable energy sources in energy production. The energy flexibility of buildings can be considered an indicator of the ability of demand response to provide production with a method for managing power peaks. The change in energy systems is taking place both in a regulation-driven and market-driven manner.

In Art.15.1 of the EPBD 2024 it is stated that the European Commission shall take action to facilitate this approach: "The Commission shall adopt delegated acts in accordance with Article 32 to supplement this Directive concerning an optional common Union scheme for rating the smart readiness of buildings.

The rating shall be based on an assessment of the capabilities of a building or building unit to adapt its operation to the needs of the occupant, in particular concerning indoor environmental quality and the grid and to improve its energy efficiency and overall performance."

Guided by Commission directives, buildings must be at the zero-emission level in the future. In addition, the ratio of renewable energy in the total consumption must be increased. In market terms, the strong hourly fluctuation of energy prices is a clear motivation for property owners to utilize demand response.

For property owners, the transformation of energy systems offers a significant opportunity for savings. Savings can be achieved by examining power needs and analyzing how power needs can be reduced through demand response and energy storage.

In the future, buildings will not only consume energy, but also produce and store it and distribute surpluses. Energy communities offer the opportunity to manage larger loads that can be sold flexibly to the reserve market. Such operations require an aggregator that combines a number of loads into a larger entity and is responsible for their use towards the grid company.

Zero-emission buildings of the future will optimally utilize centralized production and energy production and storage at building and area levels. In addition to reducing energy consumption, it is important for buildings of the future to manage the momentary power demand according to production. These energy-flexible buildings will actively participate in the energy market by utilizing dynamically changing energy prices.

However, it should be noted that the change also means that the technical solutions will be more complex than the current technology. These complex technical systems require new expertise. In particular, ensuring the functionality of the systems throughout their entire life cycle is important, and the operation of control algorithms must be ensured in different operating situations. New solutions also require new service business models. Energy must be sold as a service, where an aggregator is responsible for the demand response, combining a number of loads into a larger entity and is responsible for their use towards the grid company. ■