AN INTRODUCTION TO DEMAND CHARGES

National Renewable Energy Laboratory and Clean Energy Group have released a paper describing how millions of customers across the country may be subject to electric utility rate tariffs that include moderate to high demand charges. The paper, **"Potential Markets for Behind-the-Meter Battery Energy Storage: A Survey of U.S. Demand Charges,"** suggests where opportunities may exist to reduce those charges with battery storage. Read the paper at: www.cleanegroup.org/ceg-resources/resource/NREL-demand-charges-storage-market.

This fact sheet contains some additional background information on demand charges and the relationship and interaction between demand charge expenses and energy storage.

What are demand charges?

Along with fixed monthly fees, commercial electricity customers are typically billed for energy in two distinct ways: **consumption charges** and **demand charges** (see Table 1). Consumption charges (also known as energy charges), which are applicable to residential customers as well, are for the volume of electricity consumed and are measured in kilowatt-hours (kWh). Demand charges, which are not usually applied to residential bills, are for the highest level of electricity demand during a billing period ("peak demand") and are measured in kilowatts (kW). Figure 1 illustrates the difference between consumption and demand.

Table 1. Types of Charges	Consumption Charge	Demand Charge
What are you paying for?	Total amount of electricity used during a billing period	Highest level of electricity used during a billing period ("peak demand")
Customer Type	Residential and Commercial	Commercial
Unit of Measurement	Kilowatt-hours (kWh)	Kilowatts (kW)

Demand charges are designed as a way for utilities to recover some of the costs associated with providing sufficient electricity generation and distribution capacity to their customers. By basing a portion of a customer's electricity bill on their highest level of electricity demand, the utility is attempting to distribute more of the costs associated with building and maintaining the capacity of its power system to those who use it most.

Who pays demand charges?

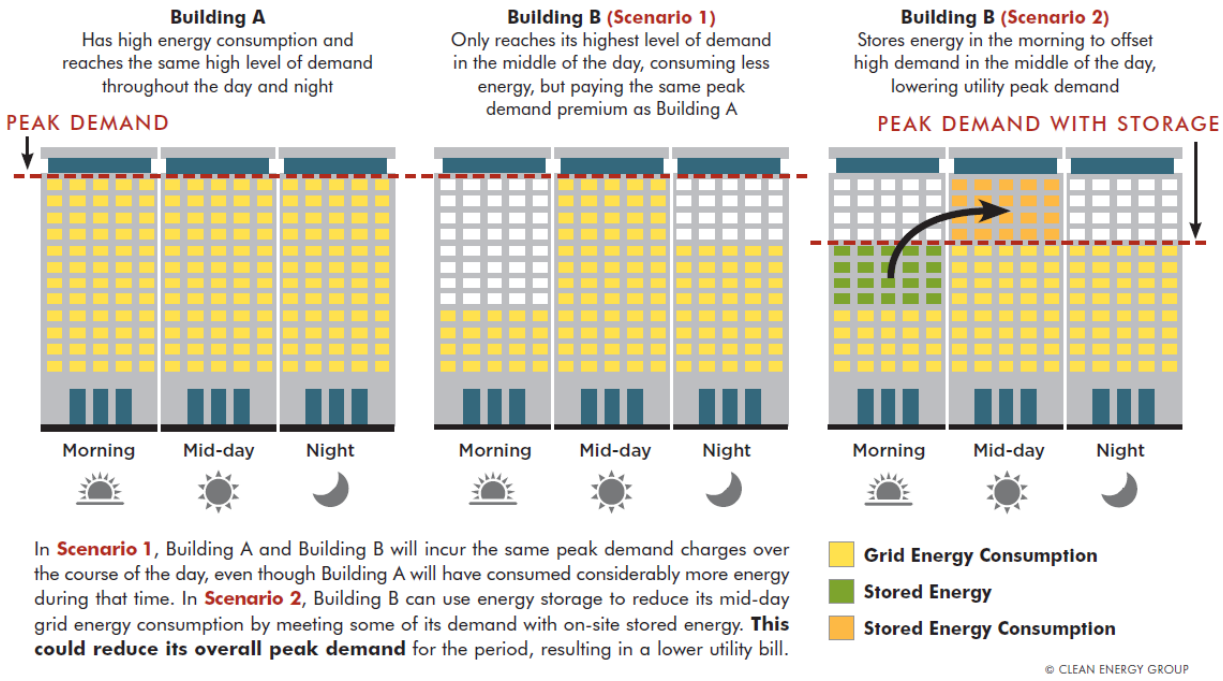
Nearly all medium and large commercial customers in every state are obligated to pay demand charges. This includes traditional commercial customers, like private and nonprofit businesses, as well as a wide array of additional customer types such as community facilities, public buildings, and multifamily housing properties.

How are customers billed for demand?

Commercial customers typically face demand charges ($/kW) based on their **peak demand** during each billing period. This peak demand is usually defined as the highest average electricity usage occurring within a defined time interval (often 15 minutes) during the billing period. For many commercial customers, demand charges can account for 30 to 70 percent of the total charges on a monthly electric bill.

Demand charge rates vary considerably across utilities, locations, building sizes, and building types. Because peak demand is based on how and when a customer uses electricity, even two customers that consume similar amounts of electricity and are billed under the same utility rate may incur vastly different demand charge expenses, depending on their peak demand.

Figure 1 –The difference between electricity consumption and electricity demand, and how batteries can be used to reduce peak demand.

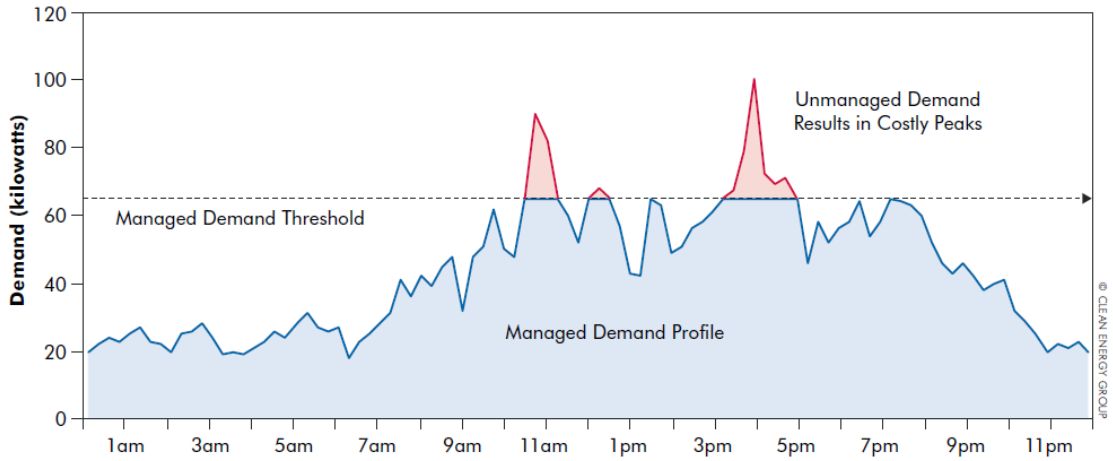


How can battery storage reduce demand charge expenses?

Both energy efficiency and stand-alone solar are well-suited to reducing electricity consumption; however, neither measure is typically very effective in reducing peak electricity demand. Battery storage, on the other hand, is a fully dispatchable and controllable resource, meaning that it can be strategically charged and discharged throughout a billing period to manage electricity demand.

Figure 2 shows how batteries can be discharged to hold demand for grid electricity below a certain threshold, effectively lowering peak demand and reducing demand charge expenses. This is often referred to as **peak shaving**. Battery management software solutions can use learning algorithms to anticipate when a facility is approaching peak demand, and deploy the batteries accordingly. Based on industry analysis and current battery system pricing, battery storage can begin to make economic sense for commercial customers facing demand charges of $15/kW or higher (see Greentech Media, "Commercial Energy Storage Economics Will Be Attractive in 19 US State Markets by 2021," 2016), which may represent millions of commercial customers in dozens of states across the country.

Figure 2 – How battery storage can help manage electricity demand over a 24-hour period



Through the deployment of an energy storage system, peak demand can be effectively capped at a specified level—significantly reducing utility demand charges. Assuming a demand charge of $10 per kilowatt and peak demand reduction from 100 kilowatts to 65 kilowatts each period (as shown here), energy storage could reduce the customer's demand charge by $350 per billing period, amounting to an annual savings of $4,200.