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Powering Possibilities: How Bidirectional Charging Benefits You and Your Community

What is bidirectional charging?

Bidirectional charging, also known as Vehicle-to-Everything (V2X), allows electric vehicles (EVs) to both draw power from the grid and send it back to homes, buildings or the grid itself. This two-way flow of energy can improve reliability and reduce emissions, contributing to cleaner air and more resilient communities. As Illinois works toward its **goal of registering 1 million EVs by 2030**, bidirectional charging offers an opportunity to use EVs as tools for strengthening the energy systems and supporting healthier, more sustainable communities.

Types of Bidirectional Charging Applications

Bidirectional charging is not a one-size-fits-all solution. There are several ways EVs can share stored energy to support homes, businesses and the grid. Each use case offers different benefits depending on how and where the energy is used, as shown in Figure 1.[1]

- **V2G (Vehicle-to-Grid):** EVs supply energy back to the grid.
- **V2H (Vehicle-to-Home):** EVs power homes during outages or high-cost periods.
- **V2B (Vehicle-to-Building):** EVs support commercial buildings with backup or supplemental power.[2]
- **V2L (Vehicle-to-Load):** EVs power tools, appliances or other equipment directly.

These technologies are being piloted across the country, including right here in the ComEd® service area, to explore how they can support customers, the grid and the environment.

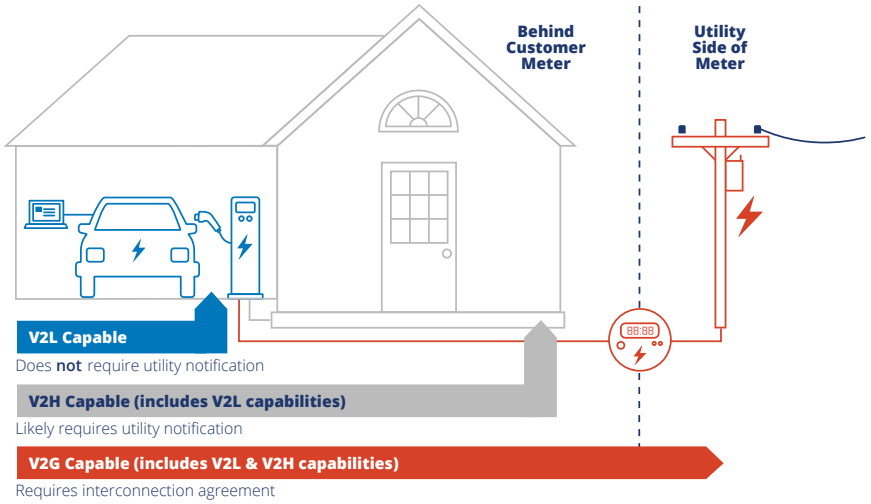

Figure 1. Overlay of Bidirectional Charging Application Configurations

Why It Matters: Environmental and Health Benefits

1. Reduced Fossil Fuel Usage

Reducing the use of fossil fuels is one of the key environmental benefits of bidirectional charging. By enabling EVs to send energy back to the grid during periods of high demand—a process known as peak shaving—these technologies can help reduce reliance on peaker plants.

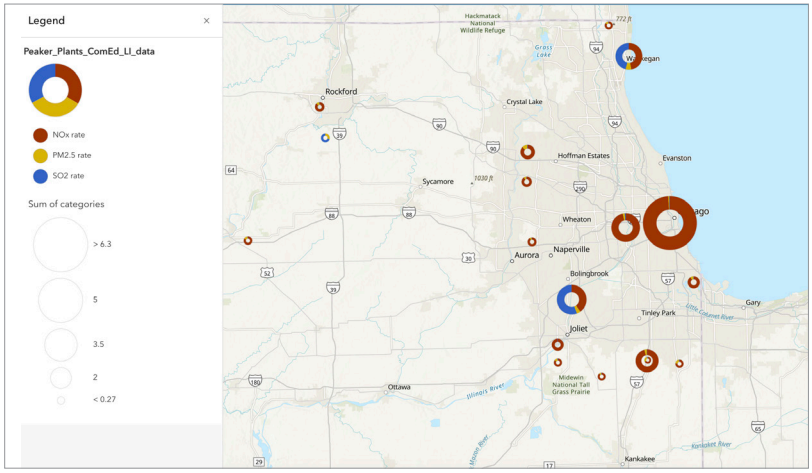

Figure 2. ComEd Peaker Plants

Peaker plants, which typically run on fossil fuels, operate during periods of peak electricity demand and often emit high levels of nitrogen oxides (NOx), a pollutant linked to respiratory and cardiovascular health issues. On average, these plants release between 15 and 24 pounds of NOx per megawatt-hour of electricity produced.[3]

Because many of these facilities are in or near disadvantaged communities, reducing their operation through bidirectional charging applications can lead to meaningful improvements in local air quality and support broader environmental justice (EJ) goals. Figure 2 shows the locations of peaker plants in Illinois.[4]

2. Lower Greenhouse Gas Emissions

Participating in bidirectional charging programs can help reduce greenhouse gas emissions by using stored energy from EVs during peak demand periods and reducing reliance on carbon-intensive fossil fuel sources like many peaker plants. Studies have shown that the environmental benefits of bidirectional charging can be significant—one EV can reduce up to 100 kilograms of carbon dioxide (CO_2) emissions each year, whereas a single electric school bus could cut as much as 1,000 metric tons of CO_2-equivalent emissions over its lifetime.[5]

3. Healthier Communities

In addition to environmental benefits, bidirectional charging technology can also support healthier communities. Many peaker plants—power plants that operate during periods of high electricity demand—emit pollutants such as NO_2, sulfur dioxide (SO_2) and fine particulate matter (PM2.5). These pollutants are known to contribute to respiratory and cardiovascular problems. For example, even short-term exposure to SO_2 can lead to reduced lung function, coughing, chest tightness and throat irritation. By reducing the need for peaker plants through bidirectional charging programs, EVs can help lower exposure to these harmful pollutants, especially in communities that are already overburdened by air pollution.[6]

Equity in Action

The Climate and Equitable Jobs Act amended the Electric Vehicle Act to include beneficial electrification (BE) provisions that will help leverage Illinois' clean electricity grid to unlock even greater climate and air pollution benefits equitably.

In alignment with the **ComEd BE Plan**, this bidirectional charging study will examine how the benefits of bidirectional charging can be delivered to all customers, especially **Low-Income** (LI) households;

Restore, Reinvest, and Renew (R3) communities; and **EJ** communities, jointly referred to as "Select Customers." ComEd Select Customers are consistent with **Illinois Equity Investment Eligible Communities**, as shown in Figure 3.[7,8]

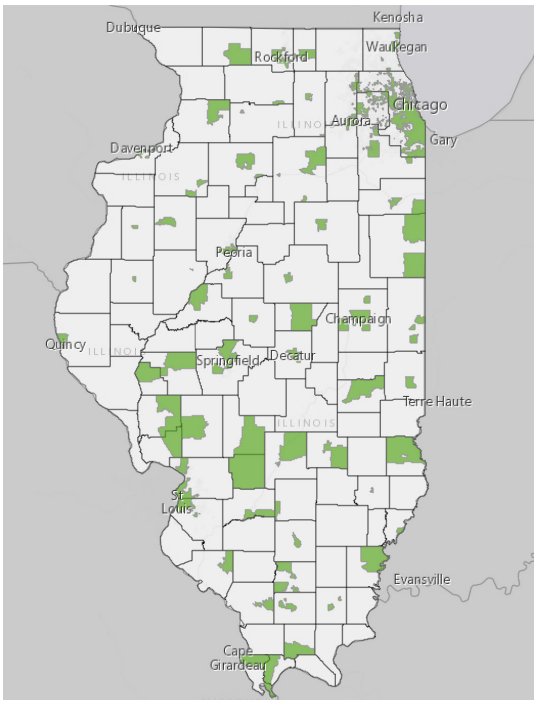

Figure 3. Illinois Equity Investment Eligible Community Map

What To Consider

As Illinois pursues its goal of registering 1 million EVs by 2030, the need for responsible sourcing and environmental safeguards grows alongside demand. Manufacturing EVs—especially their batteries—requires more energy up front than building traditional gas-powered vehicles. However, over their lifetime, EVs typically use fewer natural resources and produce fewer emissions. To reduce long-term environmental impacts, safe recycling and reuse of EV batteries will be essential. These practices help conserve valuable materials and minimize waste, supporting a more sustainable clean energy future.

What's next?

ComEd plans to conduct a study to explore the environmental and social impacts of bidirectional charging technology. Potential areas of focus may include:

- Assessing the environmental benefits of bidirectional charging technologies
- Researching strategies to ensure equitable access to bidirectional charging technologies for all communities
- Investigating policies, practices and strategic models encouraging resilient ownership models, and more

Insights from this study may help ComEd shape future programs and investments by examining how bidirectional charging technologies could best deliver benefits to all customers, whether through cleaner air, more reliable power, or support for LI, R3 and EJ communities. The findings may also guide how ComEd engages with communities and customers to expand access to these emerging solutions.

Want To Learn More?

Visit the ComEd **BE Plan Pilots** webpage and **V2G Pilot Program** webpage to learn how you can participate or benefit from upcoming initiatives. For additional information on ComEd available resources and programs, please visit **ComEd.com/EV**.

[1] Blair, Brittany, and Garrett Fitzgerald. *The State of Bidirectional Charging in 2023*. Smart Electric Power Alliance (SEPA), 2023. Available at: https://sepapower.org/resource/the-state-of-bidirectional-charging-in-2023/
[2] While the V2B use case is not explicitly illustrated in Figure 1, its application closely mirrors the V2H use case.
[3] Clean Energy Group. *Peaker Power Plant Data Show Persistent Economic and Racial Inequities*. September 7, 2023. Available at: https://www.cleanegroup.org/peaker-power-plant-data-show-persistent-economic-and-racial-inequities/
[4] Walker-Miller Energy Services. *ComEd Peaker Plant Emissions Map*. Based on data from Clean Energy Group and the U.S. Environmental Protection Agency. Available at: https://walker-miller.maps.arcgis.com/apps/mapviewer/index.html?webmap=64f8802236a0410187945a8c26757b04
[5] Horrox, James, and Sarah Nick. *Electric School Buses and the Grid: Unlocking the Power of School Transportation to Build Resilience and a Clean Energy Future*. PennPIRG Education Fund and PennEnvironment Research & Policy Center, Spring 2022. Available at: https://publicinterestnetwork.org/wp-content/uploads/2022/03/PA_V2G-2022-print.pdf
[6] U.S. Government Accountability Office. *Electricity: Information on Peak Demand Power Plants.* GAO-24-106145, May 2024. Available at: https://www.gao.gov/products/gao-24-106145
[7] Illinois Power Agency. *Equity Investment Eligible Community Map*. June 2024. Available at: https://energyequity.illinois.gov/resources/equity-investment-eligible-community-map.html
[8] Clean Energy Group. Peaker Power Plant Mapping Tool. Available at: https://www.cleanegroup.org/initiatives/phase-out-peakers/maps/