

This report provides a fact-based overview of Minnesota's energy sector. It presents key metrics and highlights recent trends.

- Minnesota is increasing its energy independence; electricity imports fell to 10% in 2021, the lowest level in two decades.
- Renewables were the largest source of Minnesota's electricity generation in 2021, providing 28%.
- Zero-carbon sources, including renewables and nuclear, provided 52% of Minnesota's electricity.
- Renewables have been the majority of new electricity generation capacity over the last decade, at 81% of new build.
- Minnesota's power sector greenhouse gas emissions have fallen 40% in the last decade. Emissions increased in 2021 from 2020, due to rebounding economic activity, but remain below pre-pandemic levels.
- Minnesota's energy productivity, or how efficiently the state uses energy, has increased to 29% from 24% in 2020.

Table 1: Key power system metrics, Minnesota v. U.S. average, 2021

Metric	Units	MN	U.S. Average	Rank	Comment
Total electricity demand	TWh	66	74	23	Roughly average electricity demand
Total electricity generation	TWh	60	81	29	Roughly average electricity generation
Demand per capita	MWh	12	13	30	Below average electricity used per person
Retail electricity prices	¢/kWh	11	12	15	Roughly average retail prices
Generation from natural gas	%	21	36	36	Below average reliance on gas for power
Generation from renewables (incl. hydro)	%	28	26	23	Above average reliance on renewables
Energy efficiency score	ACEEE index	32	20	9	Well above average on efficiency efforts
CO2 emissions rate	tCO2/MWh	.36	.42	28	Below average power sector emissions rate

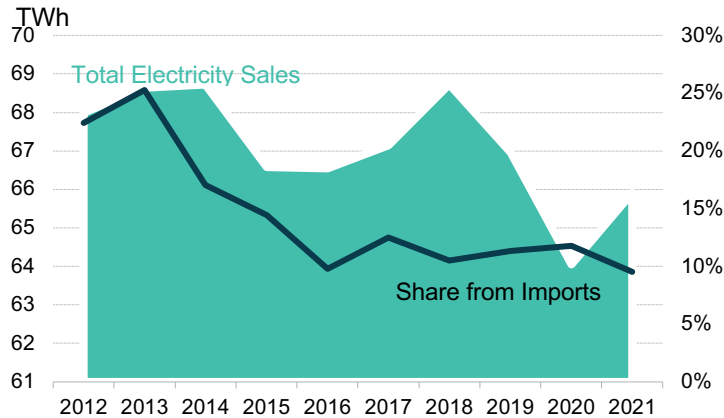
Source: BNEF, EIA, U.S. Census Bureau, ACEEE. Notes: U.S. ranks are in descending order (i.e., 1 = highest, 50 = lowest). For some metrics it is 'good' to have a high ranking, while for others it is 'good' to have a low ranking (e.g., retail electricity prices, CO2 emissions rate).

Overview of Minnesota's Electric Sector

Minnesota's electric sector continues to decarbonize and become less reliant on imports, due to substantial additions of renewable electric-generating capacity. Minnesota's clean energy industry employs more than 55,300 workers, and the industry rebounded twice as fast from pandemic economic declines as the state's overall workforce in 2020.

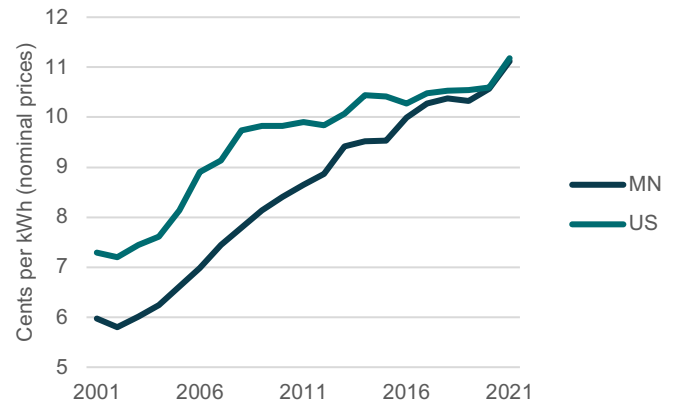
Minnesota consumed 66TWh of electricity in 2021 and imported 6.3TWh (Figure 1). That marks the lowest level of imports for two decades. Imported electricity accounted for 10% of consumption in 2021, down from 22% in 2012. Total electricity consumption in Minnesota grew 3% from 2020-2021, as the economy recovered from the Covid-19 impacts.

Figure 1: MN electricity sales and generation



Source: BloombergNEF, EIA.

Figure 2: MN average retail electricity prices relative to US average

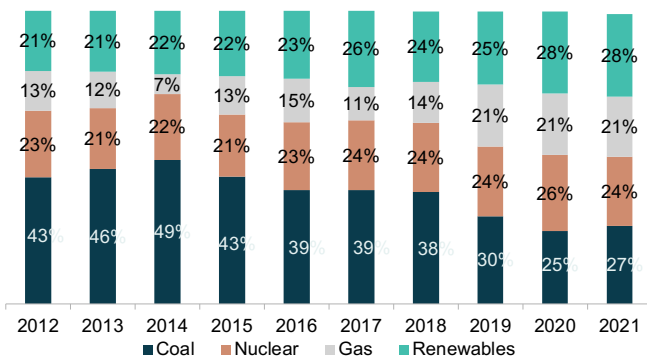


Source: Minnesota Department of Commerce, EIA.

Consumer electricity prices in Minnesota as measured on a cents-per-kilowatt-hour basis have been rising for residential, commercial and industrial clients over the last decade (Figure 2). These increases are due to a number of factors, including weather-related power supply challenges in 2021 and utility infrastructure investments. In 2021, Minnesota consumer electric rates averaged 11.12cts/kWh, up 5% from 10.57cts/kWh in 2020 and up 26% since 2012 (in nominal terms). Minnesota’s total average electricity prices today are in line with the U.S. total average of 11.18cts/kWh.

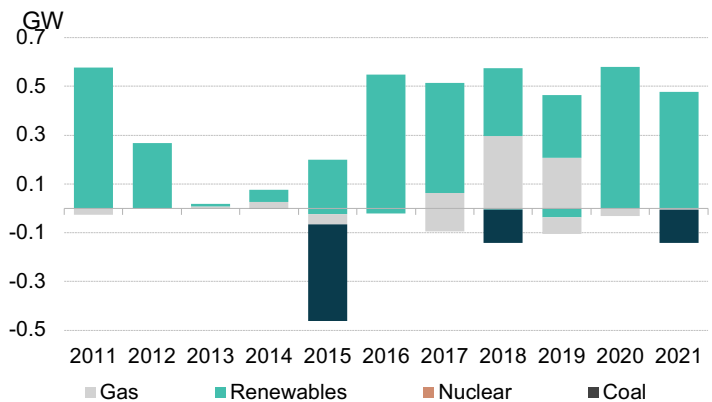
Minnesota’s electricity generation mix continues to trend away from coal-fired generation and toward renewables and natural gas (Figure 3). In the last ten years, no new coal-fired power plants were built in the state, and renewables accounted for 81% of all new capacity. All other additions were fossil fuel plants (natural gas and oil). In 2021, Minnesota built primarily renewable power plants, totaling 406MW of new wind and solar generation (Figure 4). Over the last decade, Minnesota retired 953MW of coal-fired power plants, and all coal plants located in Minnesota plan to retire by 2035.

Figure 3: MN electricity generation mix by technology



Source: BloombergNEF, EIA.

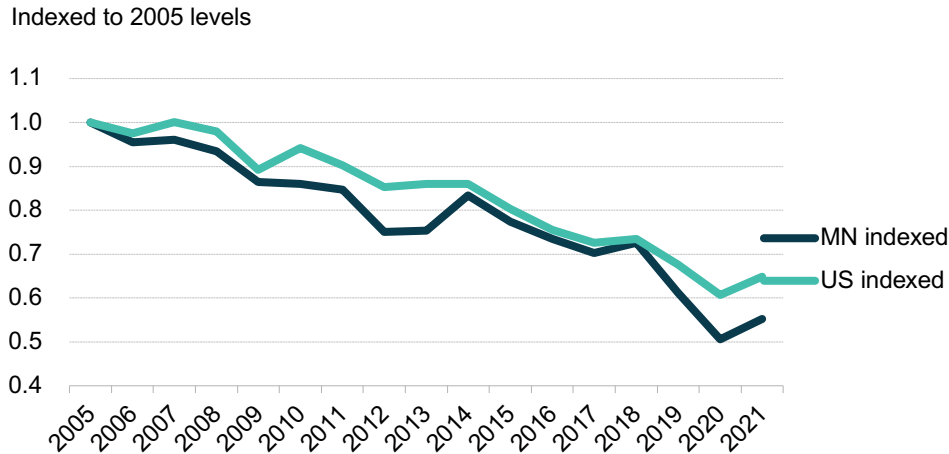
Figure 4: MN capacity build and retirements



Source: BloombergNEF, Minnesota Department of Commerce. Note: 2021 values include estimates for year-end build and retirements.

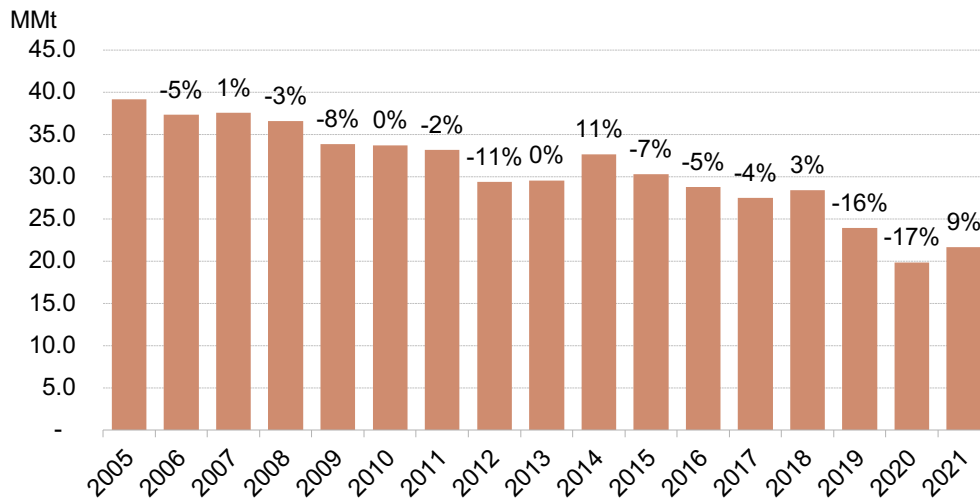
Due to these shifts, power sector CO2 emissions have fallen 45% in Minnesota since 2005 (Figure 5). Minnesota has reduced power sector CO2 emissions faster than the US average. In 2021, power sector CO2 emissions increased 9% over 2020 levels, due to increased economic activity, but emissions remain below pre-pandemic levels (Figure 6).

Figure 5: MN power sector carbon emissions vs US emissions



Source: BloombergNEF, EIA.

Figure 6: MN power sector carbon emissions, with year-over-year percent changes



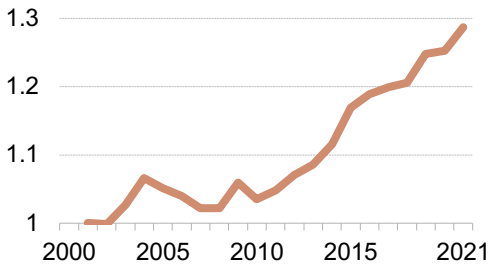
Source: BloombergNEF, EIA.

Sustainable Energy Deployment

Energy Efficiency

Minnesota continues to be a leader in pursuing energy efficiency measures, posting a 29% boost in energy productivity over the last decade and a 4% rise between 2020 and 2021 (Figure 7). The American Council for an Energy-Efficient Economy (ACEEE) ranked the state 9th nationwide in 2020 with a score of 32 out of 50 for its overall energy efficiency programs and policies.

Figure 7: MN energy productivity (GDP/retail sales)



Source: BloombergNEF. Notes: Values for 2021 are projected, accounting for seasonality, based on latest monthly values from EIA. 2021 GDP estimate is a projection from economists compiled at ECFC <GO> on the Bloomberg Terminal.

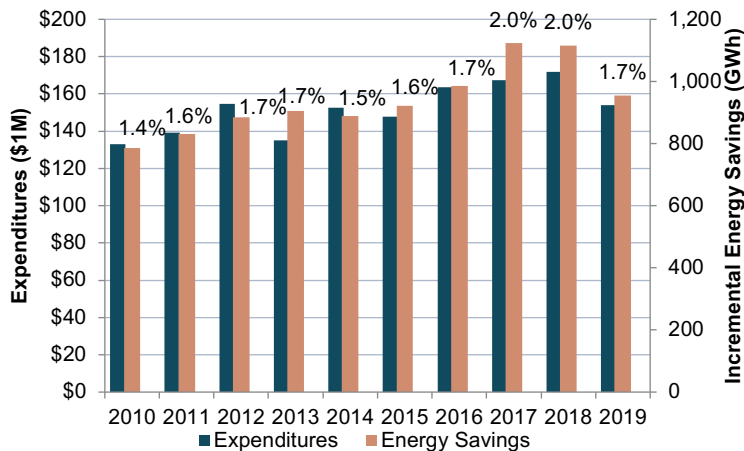
Utility energy efficiency programs, overseen by the Minnesota Department of Commerce through the Conservation Improvement Program (CIP), have paved the way for Minnesota to cost-effectively achieve the savings required by its annual Energy Efficiency Resource Standard (EERS). In fact, CIP is Minnesota’s oldest and most successful energy efficiency policy. It began in Minnesota in the 1980s with the goal of motivating utility spending on energy efficiency. The passage of the 2007 Next Generation Energy Act established Minnesota’s EERS, which required utilities, beginning in 2010, to develop CIP plans to achieve energy savings equal to 1.5% of average annual retail sales each year, unless adjusted by the Commissioner to no less than 1.0%. The Minnesota Energy Efficiency Potential Study 2020-2029, led by Center for Energy and Environment, found that meeting or exceeding on average the current CIP energy savings goal of 1.5% for electric utilities and the statutory minimum of 1.0% for gas

utilities is achievable over the next decade.

In 2021, Governor Tim Walz signed the Energy Conservation and Optimization Act (ECO Act) into law. The ECO Act primarily serves to modernize CIP with a more holistic approach to energy efficiency programming. The ECO Act increased the state’s overall economy-wide energy savings goal from 1.5% to 2.5%, which includes savings from utility energy efficiency programs and also savings from rate design, efficient improvements to utility infrastructure, advancements in the state’s energy codes and more. The ECO Act also increased the minimum spending requirements for electric and gas utilities for energy efficiency programs that serve low-income customers. Technical guidelines for investor-owned and consumer-owned utilities to determine whether an efficient fuel switching program meets the criteria and to calculate the amount of energy saved by a fuel switching improvement were released earlier this year.

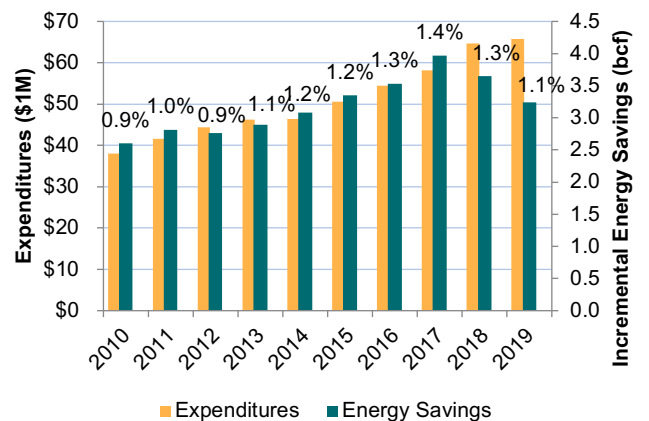
According to the Minnesota Department of Commerce, through 2019, Minnesota’s electric utilities have met or exceeded 1.5% annual energy savings each year since 2011 (Figure 8). Additionally, the state’s natural gas utilities have generally met or exceeded 1% energy savings each year (Figure 9).

Figure 8: Conservation Improvement Program Electric Results 2010-2019



Source: Minnesota Department of Commerce.

Figure 9: Conservation Improvement Program Natural Gas Results 2010-2019



Source: Minnesota Department of Commerce.

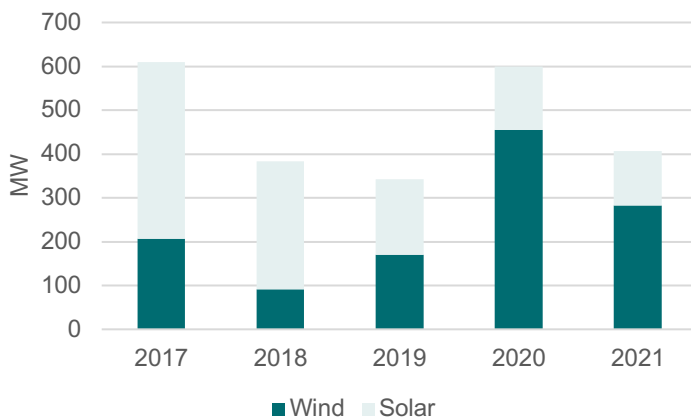
Renewables

Minnesota’s Renewable Energy Standard (RES) requires most of the state’s investor-owned utilities to obtain 25% of their retail electricity sales from renewable sources by 2025, plus an additional 1.5% from solar alone starting 2020. Xcel Energy, the largest utility in the state, is required to meet a target of 30% by 2020, plus a 1.5% solar carve-out.

In 2021, wind was the largest source of renewable energy at 22% of all power generated. Solar technologies provided another 3.2%, hydro 1.5%, and biomass/waste-to-energy 2.2%.¹ Over the last decade, Minnesota invested primarily in renewable electricity generation sources, adding 3.4GW. This included 1.3GW of solar and 2.0GW of wind, plus 51MW of biomass and small hydro. Activity has been particularly strong in the past five years with 2.3GW of new renewables added, including 1.1GW of solar and 1.2GW of wind (Figure 10).

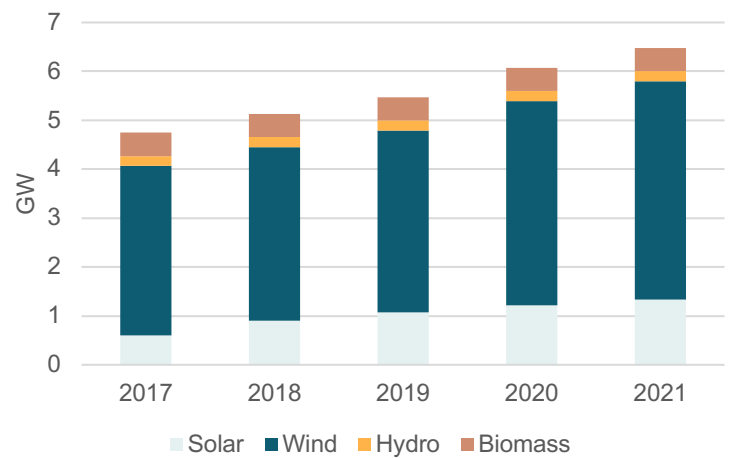
In 2017 and 2018, total new solar capacity added outpaced wind by a considerable margin. In 2019, wind and solar capacity additions were split roughly evenly, and in 2020 and 2021, wind pulled far ahead. As a result, total installed renewable capacity in Minnesota rose to 6.5GW in 2021 (Figure 11). Wind accounts for more than two-thirds of total capacity, while solar is responsible for just over one-fifth.

Figure 10: MN renewable capacity additions



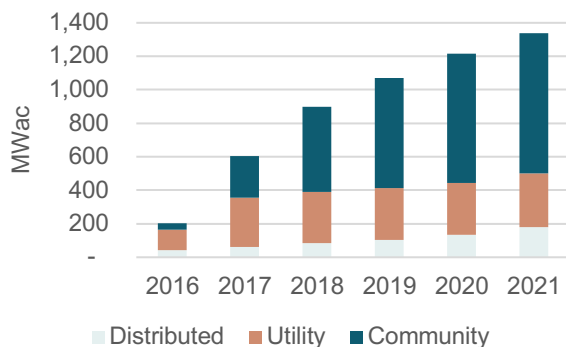
Source: Minnesota Department of Commerce.

Figure 11: MN cumulative renewable capacity



Source: Minnesota Department of Commerce.

Figure 12: MN cumulative installed solar capacity



Source: Minnesota Department of Commerce.

Distributed solar’s contributions are growing in Minnesota. In 2021, installed residential, commercial and industrial PV systems rose from 135MW to 181MW. A 2013 law that created the solar carve-out under the state’s RES also established a framework to promote community solar. This led to a boom in community solar activity, leading to the 2021 program size of 839MW (Figure 12).

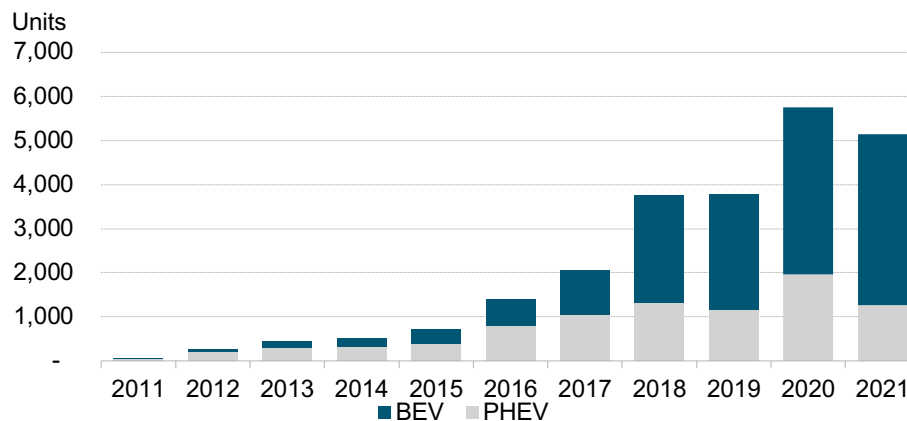
¹ Minnesota Department of Commerce data includes more sources of renewable electricity than BloombergNEF, for a total of 29% of Minnesota’s electricity.

Electric Vehicles

The sales of electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) have ramped up in recent years thanks to a combination of lower prices, federal subsidies, and greater consumer choice. In 2021, U.S. consumers purchased or leased a total of 642,000 EVs and PHEVs. By the end of 2021, an estimated 2.4 million of these vehicles were on U.S. roads.

Transportation is the sector that contributes most to Minnesota CO₂ emissions. To meet the state's aggressive goal to cut economy-wide emissions, EV adoption must therefore accelerate dramatically. While Minnesota is not among the very top states for EV/PHEV adoption, new electric vehicle registrations have risen in recent years. According to the Minnesota Department of Public Safety, as of December 2021, the state had approximately 24,000 EVs/PHEVs on the road. From 2017 through 2021, annual battery electric vehicle registrations increased 300% to 3,900 units. Annual plug-in hybrid electric vehicle registrations rose 20% to 1,300 units. Combined annual registrations totaled around 5,200 in 2021 (Figure 13). This was slightly lower than in 2020, due to supply chain challenges from the Covid-19 pandemic.

Figure 13: MN annual electric vehicle registrations



Source: Minnesota Pollution Control Agency. Note: PHEV is plug-in hybrid electric vehicles, BEV is battery electric vehicles.

In July 2021, Governor Walz signed Clean Cars Minnesota into law, making Minnesota the first Clean Cars state in the Midwest. The Minnesota Pollution Control Agency (MPCA) adopted rules that require vehicle manufacturers to deliver vehicles to the Minnesota market that produce lower emissions of GHGs and other air pollutants. The Clean Cars Minnesota rulemaking includes standards for low-emission vehicles (LEV) and zero-emission vehicles (ZEV) that were formally adopted by 14 other states and the District of Columbia. The effective date for the standards was December 31, 2021, and enforcement will begin with vehicle model year 2025.

The state has also taken steps to improve consumer education about EVs, established charging corridors along state and interstate highways and enabled EV adoption in state and local government fleets. Minnesota utilities have sought to make it easier for customers to use EVs by establishing flexible electricity rates to provide power to charge EVs among other programs. In 2020, Xcel Energy announced its goal to power 1.5 million EVs in its service areas by 2030. This would push EVs to 20% market share in those territories, more than 30 times their absolute number today.

The bipartisan Federal Infrastructure Investment and Jobs Act (IIJA) was signed into law by President Biden in November 2021. IIJA offers a once-in-a-generation opportunity to enhance and decarbonize Minnesota's transportation sector. Minnesota is eligible to receive a total of \$5 billion in transportation funding to modernize and improve its transportation infrastructure, including \$68 million for EV charging infrastructure. The IIJA provides a further \$200 billion in competitive grant funding. By taking advantage of these resources, Minnesota has a chance to take a giant step forward in assisting and incentivizing EV adoption.