

Qmerit

What is Electrification?

A GUIDE FOR ACCELERATING
THE ENERGY TRANSITION





Given the increasing importance of addressing climate change, electrification is becoming a pivotal alternative to reducing carbon dioxide (CO₂) emissions. Electrification is the process of using electricity to power end-use activities, often after the conversion of previous machinery to an electric-powered system. The goal is to increase the use of electricity and reduce the reliance on nonrenewable fuels such as coal, oil, and gas. Electrification offers a more efficient and environmentally friendly alternative to oil and gas, helping to mitigate climate change.

The transportation, building, and industrial sectors primarily make up these emissions. Currently, these sectors rely heavily on fossil fuels, accounting for **65%** of all CO₂ emissions in the United States. Statistically, these numbers

aren't surprising considering the vast amount of energy used across these sectors.

Consequently, technologies such as bidirectional charging, high-efficiency appliances, electric vehicles (EVs), and grid resiliency are being used for electrification purposes. With this in mind, electrification has the potential to dramatically reduce our reliance on fossil fuels by providing more efficient and clean energy for powering end-use activities.

This guide will explore electrification-based technologies and examine how they work together to create a more efficient and sustainable future. It will also outline the tax rebates available for electrification, explore what's needed to ensure grid resiliency, and give a picture of the future of electrification.



What Electrification Is

The Oxford Dictionary [defines electrification](#) as “the process of changing something so that it works by electricity.”

Today, electrification means a more significant share of electricity factoring into the final energy demand. It also means replacing fossil fuels in heating, transport, and industry with clean electricity.

Electrification in the Electric Vehicle Industry

Electrification can also mean the process of converting energy from one form to another, typically mechanical to electrical, as is being done by the EV industry. This form of electrification has revolutionized the automotive industry. Motor vehicle manufacturers sold [two million EVs globally](#) in the first quarter of 2022, an increase of 75% from the first quarter of 2021.

The future looks even brighter for the EV industry. Experts predict [1 out of 5](#) new vehicles sold worldwide by 2025 will be electric. That ratio is expected to increase to 2 out of 5 by 2030. By 2040, 100% of all new vehicles purchased could be EVs.

Bidirectional Charging Solutions and More Efficient Appliances

EVs present a unique opportunity to increase grid resiliency, which is the grid’s ability to handle stress. EVs can draw from and supply power back to the grid. This bidirectional charging solution allows EV owners to charge their cars during off-peak hours. Afterward, they can feed excess electricity back into the grid.

This practice is also known as Vehicle to Grid (V2G). The term applies not only to EVs in general but also to residential EVs. This along with other efficient appliances such as heat pumps can help reduce the residential carbon footprint.

In addition, the V2G process increases grid resiliency, allowing for more efficient energy distribution. As technology advances, we can increase the number of EV owners contributing to the grid.

More efficient appliances lead to significant energy savings. Upgrading to efficient appliances can result in energy savings of [10 to 50%](#). You can save even more if you replace an old appliance with an energy-efficient one. This is excellent news for those looking to reduce their environmental impact.

Electrification Creates Grid Resiliency

The Federal Energy Regulatory Commission [defines grid resiliency](#) as the ability to resist and reduce the magnitude and/or persistence of destructive events, which includes the ability to foresee, internalize, adjust, and/or quickly recuperate from such an incident. Grid resiliency is increased when electricity consumers can store and effectively manage their electrical usage. It is also one of the primary benefits of electrification.

By transitioning to electricity to meet more of their everyday needs, people can better understand and manage their electrical use, bidirectional charging technologies, and electric appliances. In effect, you can tailor your energy consumption to match available electricity from renewable resources such as solar and wind.

Grid resiliency also allows for more efficient management of energy resources. This solution reduces the need for costly infrastructure upgrades.



What Electrification **Is Not**

Electrification does not mean using electricity exclusively for all energy-related activities. Instead, it means that an ever-increasing share of electricity should be used when possible.

When we do this, we reduce the overall environmental impact. We also increase associated cost savings by using technologies such as certified [EnergyStar](#) products that are efficient and clean.

Electrification is also not a one-size-fits-all solution. Washington state, for example, relies on hydropower for most electricity generation and so benefits a great deal from electrification. Wyoming, on the other hand, uses an energy resource mix that leans heavily on coal while including only small amounts of natural gas and renewables. The clean hydropower that works for Washington state is an impossibility in water-resource-challenged states like Wyoming.

Such circumstances present environmental challenges to widespread “green” electrification.

In contrast, clean electricity is now prevalent across Europe and is projected to become its sole electricity source by 2050. The EU and the UK expect to be using [85%](#) clean power by 2030. These expected advances reflect the commitments of 26 countries and the EU to have carbon-neutral economies by 2050. To accomplish this, they plan to replace the fossil fuels used in heating and cooling, and transportation with clean electricity generated from solar, wind, hydro, and nuclear sources.





What are the Technologies Involved in Electrification?

To a great extent, the technologies we need to solve the fossil-fuel combustion problem are already available, technologies such as:

- Heat pumps
- Energy storage
- Solar integration
- Smart panels
- Nano grids
- EVs

Heat Pumps

Heat pumps, which use electricity to transfer heat from one place to another, are an excellent electrification technology and use only a fraction of the energy consumed by traditional heating systems. Modern heat pumps, for example, reduce electricity use by up to **50%** compared to electric resistance heating methods. Heat pumps can cool efficiently as well by pumping the heat out of a space into the atmosphere.

Heat pumps work best for heating in moderate climates where temperatures stay above 40 degrees Fahrenheit. At **lower temperatures**, they tend to lose their efficiency. On the cooling side, heat pumps **become less effective** when outdoor temperatures exceed 95 degrees. That said, technological advances are helping heat pumps function better in extremely hot and cold environments.

Energy Storage

The ability to store energy when it is not in demand, whether produced by traditional generation methods or more environmentally friendly ones, is an essential component of any electrification system. Having storage available helps reduce the need for expensive infrastructure upgrades and reduces electricity costs over time.

Energy storage can also play a crucial role for EV users by allowing them to access stored energy when the electric grid is offline. This gives EV owners more flexibility while promoting cleaner, more efficient transportation.

Solar Integration

Integrating solar systems, whether for supplementing the home's electrical requirements or providing power to the grid is a large part of transitioning to a more efficient, renewable energy system. This efficient, renewable energy production reduces costs and pollution when compared to conventional generation sources.

Smart Panels

Smart panels are also critical components of



electrification systems as they make real-time management and control of electricity use possible. Smart panels can be connected to individual appliances in the home as well as EV charging stations. These smart panels can allow the homeowner to turn circuits on and off via an app and can also be used to determine the most cost-effective time to charge an EV.

Nano Grids

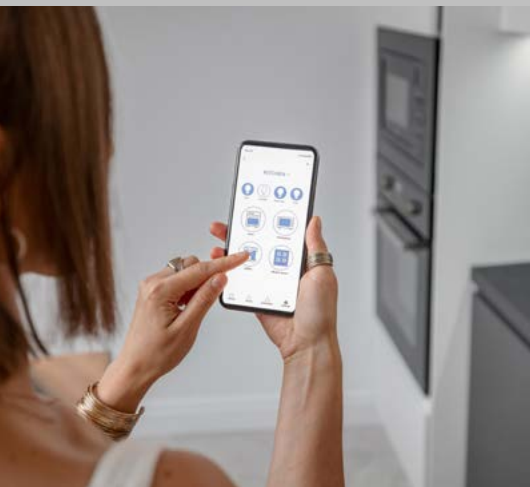
Nanogrids are small-scale electrical grids that also promote more efficient management of electricity use in households or businesses. They also can be used as a reliable, cost-effective, and sustainable way of electrifying rural or remote areas. As an added plus, nanogrids can incorporate energy from renewable sources such as solar, wind, and hydropower.

Microgrids are larger versions of nanogrids that are used to serve entire communities. They are becoming increasingly popular for providing reliable and cost-effective electricity access to parts of the world that are otherwise underserved by traditional, centralized grids.

Electric Vehicles

EVs are a critical component of electrifying and decarbonizing the transportation sector, which now accounts for **16%** of the planet's CO₂ emissions. EVs charged with electricity from renewable sources have no carbon footprint, and EVs, in general, are becoming more efficient and cost-effective than conventional gas-powered vehicles, and they are getting more affordable every day. They also eliminate traditional fuel and maintenance charges and qualify in many states and some federal programs for cost-saving rebates or purchase incentives.

HOW DO ELECTRIFICATION TECHNOLOGIES WORK TOGETHER?



The critical piece of widespread electrification is integration. When all these technologies work together, they can provide a comprehensive solution for efficient and renewable energy production and consumption.

Building electrification means moving away from using fossil fuels for heating and cooking. When homes “go electric,” they deliver climate, economic, and health benefits. Most importantly, they are an essential component of a clean energy future.

By integrating these technologies into a single system, we can create an electrification solution that is efficient and renewable. For example, coupling energy storage with solar and wind energy production will reduce reliance on the grid, and using smart panels to monitor and manage electricity use adds efficiency and lowers consumption.

Lastly, 70 million homes and businesses in the U.S. burn gas, propane, and oil to cook food and heat spaces. The process creates **600 million tons** of CO₂ emissions annually. Instead, we can use incentives and rebates to help fund projects that swap out these dirty energy sources for cleaner, more efficient integrated electric appliances and equipment.



Will Future Electrification Strain the Grid

The electrical grid is the backbone of our energy system. Considering that, we should consider its capacity when planning for electrification.

As more people switch to EV electrification and other electrification forms, an increased demand will be put on the grid. If not appropriately managed, this could lead to outages or brownouts during peak hours.

Utilities are investing in new technologies to ensure the grid can handle this increased demand. Technologies such as energy storage and smart grids

will optimize electricity use. These innovations allow electricity to be used more efficiently and reduce the strain on the grid during peak usage times.

Some people remain concerned that the country's grids can't handle the increased demand for EV electrification. This is especially true in California. Critics jumped on this aspect when authorities asked consumers not to charge their EVs during the Sunshine State's heat wave in 2022, but experts agree that electrification will work to strengthen the grid.



STATE OF CHARGE INTERVIEW

with Tom Moloughney ft. John Markowitz and Eric Cahill

In an engaging State of Charge interview, "[Will Electric Vehicles Crash the Grid?](#)", Tom Moloughney speaks with two industry experts in California and New York to explore the implications of transitioning to an electric vehicle future. California and New York are significant to electrification in part due to their high population density which in turn translates into the sheer number of EVs that will be on the road as EV adoption continues to gain traction.

With legislation in place to ban the sale of gas-powered cars as soon as 2035 in these electrification-leading states, Eric Cahill, the Senior Strategic Business Planner of the Sacramento Municipal Utility District, and John Markowitz, the Senior Director and Head of eMobility for the New York Power Authority, discuss how utilities must invest in the necessary infrastructure now to ensure the grid is prepared for the increase in demand.

While infrastructure upgrades present some of the biggest challenges that utilities will face, Markowitz believes investing in smart grids, energy storage solutions, and EV charging

infrastructure will ease the energy transition. Cahill, however, maintains that the focus should be on incentivizing consumers to switch to EVs, which will in turn help keep the grid stable.

Both Cahill and Markowitz agree that the grid can handle this increased demand as long as the proper infrastructure is implemented. However, utilities must invest in the necessary infrastructure now to ensure that when future electrification demand does come, utilities and their respective communities will be prepared.

While the infrastructure needs to be improved in some areas, there is less upgrading to the grid than one might expect, and energy storage and EVs will play an important role in grid resilience as electrification continues to expand.

Overall, it's clear that the grid is well on its way to making the transition and both experts agree that governments should provide tax credits to encourage customers to make the switch. Ultimately, they conclude that utilities must work together with consumers to ensure the infrastructure is up to par and ready for the energy transition.



What Rebates are Available?

Incentives and rebates are available for those interested in transitioning to an electrification system.

The top credits to take advantage of for 2023 include:

- The Clean Vehicle Credit
- The Home Electrification Rebate
- The Home Rebate Program
- The Energy Efficient Home Improvement Credit



The Clean Vehicle Credit

This credit offers up to a \$7,500 tax credit for people buying or leasing an EV within [specific criteria](#). This tax credit can go a long way toward budgeting for purchasing an EV or related equipment.



The Home Electrification Rebate

This program helps people reduce their energy bills and emissions. In addition, it provides financial incentives for residents that change their appliances and installations to run on electricity. Participants can receive [rebates up to \\$14,000](#).

The program features the following measure caps:

- \$840 for electric ranges and ovens
- \$840 for an electric heat pump dryer
- \$1,750 to install a heat pump water heater
- \$2,500 for wiring
- \$4,000 to upgrade an electric panel
- \$1,600 for air sealing, insulation, and ventilation
- \$8,000 for heat pumps utilized for HVAC systems



The Home Rebate Program

The Home Rebate Program is available to those planning home retrofits. Rebates for this program are determined by total measured or projected energy savings for the home.

For instance, single-family homes with modeled energy systems can receive 20-35% savings. The rebate goes toward half the project cost or \$2,000, whichever is less.



Energy Efficient Home Improvement Credit

[The Home Efficient Home Improvement Credit \(EHIC\)](#) is part of the Inflation Reduction act. Starting in 2023, the EHIC equals 30% of the costs for homeowners making qualifying energy-efficient improvements or equipment upgrades during the year.

Eligible appliances to get the EHIC includes EVs and chargers, electric thermal storage technologies, and related equipment.

Many different types of rebates and incentives are out there. It's a good idea to research what's available and ensure you are taking advantage of them.

Acting on them now can help to reduce the overall cost of transitioning to an electrification system. It will also make it a more accessible option for everyone.



What is the **Future of Electrification?**

Some states, such as California and New York, already have legislation in place to ban gas-powered cars as soon as 2035, while many other states such as Washington and Oregon [are making plans to implement similar legislation](#).

Utilities are already investing in the infrastructure to make sure that they can handle increased EV charging. Homeowners and businesses also need to invest in the necessary upgrades.

Industries will have to work together to shift from fossil fuels to electricity. The drive for decarbonization will also require further engineering changes to the energy system.

In addition, the shift to electrification will require massive cooperation between industries and the government. That way, we can successfully wean the world from its dependence on fossil fuels.

These movements will help reduce emissions while improving the reliability of electricity grids globally.

What is the Battery Belt?

One significant development for future electrification is the “battery belt.” This label represents manufacturing regions in countries where companies will build EVs and their batteries. Last year, the U.S. garnered more than a dozen investments in new or expanding lithium-ion battery manufacturing facilities. Most are clustered in the South and throughout the Northeast and Midwest.

Other green developments include:

- Reducing waste
- Biodegradable products
- Locally-sourced materials
- Eco-friendly delivery methods

Another green initiative includes carbon capture technology, however, with the overarching goal being complete decarbonization, we must eventually phase out carbon capture technology entirely.

THE TAKEAWAYS



Ultimately, electrification will bring with it many benefits. It's safe to say that the future of electrification will be unpredictable but no doubt ambitious. The future of electrification will depend heavily on governments, industries, and consumers working together to make this shift a reality.

Making the switch to electrification is a big step, but some incentives and rebates can help make this transition more affordable for everyone. Researching available rebates and utilizing digital portals such as Qmerit's is essential in ensuring you get the most out of your investment in an electrification system.




Qmerit Is Helping to Ensure a Greener Tomorrow

Qmerit's digital portal is a valuable resource for those looking to switch to electrification. It can provide a valuable resource in this transition by helping to identify these opportunities.

The future of electrification will be brighter than ever, with increasing incentives and new technological advancements. By transitioning today, you can help ensure a greener tomorrow.

Getting the help you need while making your energy transition seamless is possible with Qmerit.

With the installation of over 269,000 EV Charging Stations, 18,500 battery storage energy systems, 53,000 solar panel system integrations, and 86,700 electric panel upgrades, we have the experience and expertise to help make the transition to electrification easier.

 How do you find qualified, experienced contractors your can rely on for your home or business electrification? [Contact Qmerit!](#)

