

HOME ENERGY STORAGE: NEXT GENERATION OPPORTUNITIES IN SMART HOMES

EFFICIENT INSIDE & OUT



Solar
Inverter



Battery Energy
Storage System



Home
EV Charger



Home
E-Mobility
Charger



Heat Pump
Water Heater



Heat Pump
Air-Sourced



Heat Pump
Clothing Dryer

Home Energy Storage

Next generation opportunities in Smart Homes








Investing in smart technologies for smart homes. This is an increasingly common theme as consumers around the world look to make their homes – from small apartments to large houses – equipped with smart home appliances, security systems, heating alternatives and even transportation solutions that address heightened convenience and the demand for energy efficiency.

As the focus on these smart home technologies takes root, there is a correlated interest in home energy storage. Driven by a series of global trends that are reshaping the macroenvironment and supported by various government policies and incentive programs for clean energy in different corners of the world, consumer interest in home energy usage and storage solutions is on the rise.

TE Connectivity (TE), a world leader in connectivity and sensor technology, has a dedicated focus on smart homes and in turn, home energy storage solutions. In the pages that follow, we will share a range of research-based insights to help developers – from general subcontractors and OEMs to product managers and procurement specialists – capitalize on these home energy storage trends. Designers and engineers should take particular note of the forces that are impacting home energy choices in order to take greater advantage of these market opportunities.

HOME ENERGY MANAGEMENT MARKET TRENDS

 <p>Population Change</p> <p>Social movements and issues are changing how people interact. As people become more mobile, the makeup of community's shift, creating new demands in new places.</p>	 <p>Changing Values</p> <p>Consumers are being influenced by new channels and sources of information regularly. This creates new behaviors, priorities, and lifestyle choices they engage in on a regular basis.</p>	 <p>Environmental Shifts</p> <p>As environmental issues worsen, from climate change, to deforestation and drought, communities are presented with new needs. As these threats grow, sustainability moves to the forefront of consumers' lives.</p>	 <p>Technology</p> <p>New developments continue to arise in order to solve problems globally. Technology allows consumers to adapt to the world around them more seamlessly and efficiently, allowing them to access more.</p>	 <p>Shifting Economic Power</p> <p>The power balance of the world continues to shift, as new populations have growing income and access to products and services they previously did not have.</p>
---	--	--	--	--

Global Trends Impacting Home Energy Storage

Extensive research conducted in conjunction with Euromonitor, a provider of strategic market research reporting, has identified five major global trends that are re-defining energy consumption and the related needs for energy management and storage. Below is a look at those trends and their underlying themes.

1. Population Change¹:

For centuries, people have migrated around the world and today is no exception. Facilitated by technology and changing views on how best to live, people are moving to new places and living in new ways, shifting the impact on energy choices, usage and storage. The result is that energy systems now need to become more specialized and efficient to more adequately address consumers' specific lifestyle needs. Key drivers and issues related to population change include:

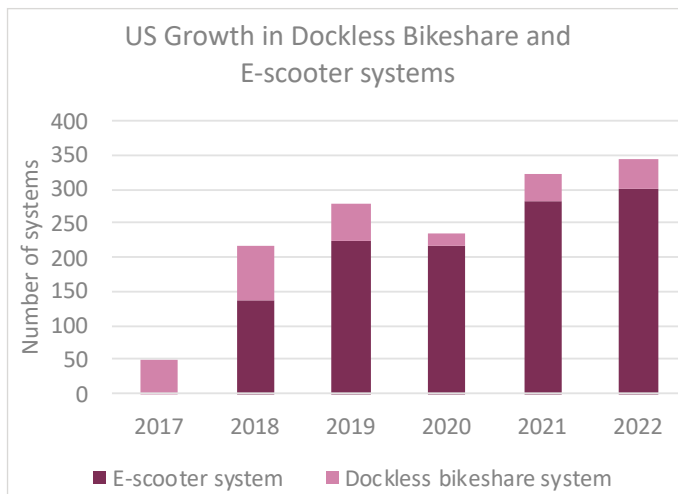
- **Moving from urban to rural areas²:** Consumers, especially in the US, UK, and Japan, are leaving urban centers to seek rural sanctuaries. Among the major reasons cited for this change are the desire to live in less stressful environments, the ability to take advantage of more flexible working schedules, and the availability of government incentives in select markets. In addition, consumers who choose non-urban living are typically looking to gain more living space and enjoy outdoor recreational activities. This migration away from cities to pursue new lifestyle choices also requires investments in more modernized energy infrastructures to support daily living.
- **Rise in e-bikes and e-scooters³:** Over the last few years, there has been a rise in the use of micro-mobility vehicles – a trend only exacerbated by the pandemic in deterring consumers from utilizing public transit. As consumers look for new forms of localized transportation, sustainable options in the form of e-bikes and e-scooters have become popular. Although primarily used in more urban areas, consumers are now buying these vehicles for use beyond city centers. This heightened demand is serving to drive the need for more diverse in-public and in-home energy supplies.

69% of global consumers indicated they wanted to simplify their lives in 2022

11% is the expected CAGR for the global electric bike market between 2022-2030

“Our Rural Future”

Ireland’s rural development policy encourages remote workers to establish communities in more rural areas, where the government intends to build internet access and remote work infrastructure.



Graphic source: Rise in e-bikes and e-scooters³



Home Energy Storage

Next generation opportunities in Smart Homes

- Growing prevalence of single-person households⁴:** One significant population shift around the world is the rise in the number of single-person households. As more people elect to “stay single,” have fewer children and live independently, these single-person households with typically smaller square footage homes, are looking for ways to cut energy usage and costs. The result has been an emphasis on heating systems and smaller appliances (including micro appliances) to better reflect space needs and usage habits.

Bob, the mini-dishwasher
 New companies have emerged selling compact, less energy-intensive appliances. Bob is one example, catering to consumers living independently or in smaller spaces.

2. Changing Values⁵:

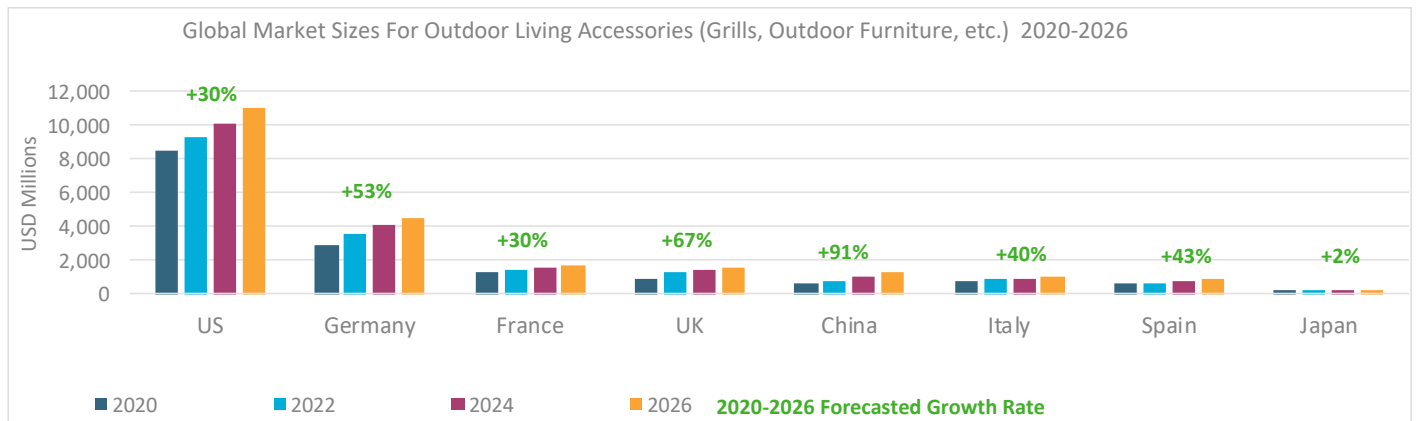
Today’s consumers are prioritizing flexibility and convenience in their daily lives. With the home continuing to be the center of a consumer’s existence, greater home-energy generation is being required to power a broader set of household needs. This includes ensuring adequate energy to support full-office technology, workout equipment, cooking appliances, and outdoor spaces for wellness and escape. Consumers are looking through a more specific lens at:

46% of global consumers reheat or prepare meals 1-2 times a week
33% of global consumers want outside space as a home feature

- Working from home⁶:** The increasing trend to work from home – initially enforced by COVID-19 mandates – has made consumers designate space for home offices. With a need to rely on strong and stable internet connections throughout the day, at-home workers will need to make sure their homes are equipped with more modern products and systems to support changing lifestyles and the heightened demand on energy usage.
- Upgraded appliances⁷:** Another by-product of COVID-19 has been the increased focus on home-cooking. Around the world, consumers are experimenting with new gadgets and mini-appliances (e.g., air fryers and pressure cookers) to facilitate both greater convenience and enhanced meal preparation. In addition, various governments are creating policies and providing incentives to shift away from gas-powered ovens and cooktops and move to more sustainable appliances. (See our trend paper [“Smart Homes: A look into Today’s Trends and Opportunities”](#) for an in-depth look at home appliance trends).
- Home design in health and wellbeing:** Following a difficult and challenging few years, consumers are taking stock of their lives in a post-pandemic world. One major area of focus is health and wellness, which is being prioritized in all aspects of life – from elevated home sanitary systems to investments in enhanced outdoor living. This emphasis on new systems and home space will also require new levels of energy usage throughout the home.

A US Treadmill Company created a treadmill desk
 This US treadmill company created a new product for at-home workers, incorporating a desk for consumers to walk while they work.

A US Multipurpose Cooker Company
 A suvie cooking tool is a new tabletop appliance that cooks frozen meals in around 20 minutes. It does everything from thawing the meal, to properly cooking each component at the right temperature and texture.



Graphic source: Euromonitor’s Passport Home & Garden Data 2020-2026

Home Energy Storage

Next generation opportunities in Smart Homes

- **Digital nomads require comfort everywhere⁹:** Young people around the world are reprioritizing their lives to try out new and unique places to live and visit. Taking advantage of today's flexible working arrangements, these young people have become known as "digital nomads." While predominantly in the US, digital nomads are spreading across Europe and APAC as well. This shift creates new opportunities and challenges as these Gen Z and Millennial consumers expect a level of amenities – full kitchens, wellness spaces, workstations and security – in their new dwellings. As the demand for these services grows, so will need the need for solutions that address energy usage, management and storage.

3.Environmental Shifts¹⁰:

Climate change and its negative impact on weather patterns, has stressed energy systems globally. This has made power outages more commonplace, motivating consumers to not only consider more stable energy connections in their homes but engage in more sustainable practices. With greater attention being paid to more energy-efficient systems, vehicles and appliances, an emphasis on power conversion systems to support these more modern technologies will also be necessary. Environmental shifts are being affected by:

- **Perils of climate change¹¹:** From earthquakes and floods in Europe and Asia Pacific (APAC) to freezing temperatures and blizzards across swaths of the US, energy systems and grids are being stressed to a breaking point. With infrastructures around the world unable to handle the intensity and frequency of these events, an increasing number of power outages and energy caps have occurred. For consumers, this has produced a more urgent need to invest in backup systems and consider more sustainable power sources.
- **Greater access to sustainable home products¹²:** At one time, clean-tech, green products were the domain of only select brands at premium costs. Today, consumers in developed markets can find energy saving appliances at a variety of major retailers offered at a range of price points. Heightened accessibility to sustainable options will only serve to encourage more mainstream adoption of these products, particularly if they are offered at costs that are affordable for the everyday consumer.

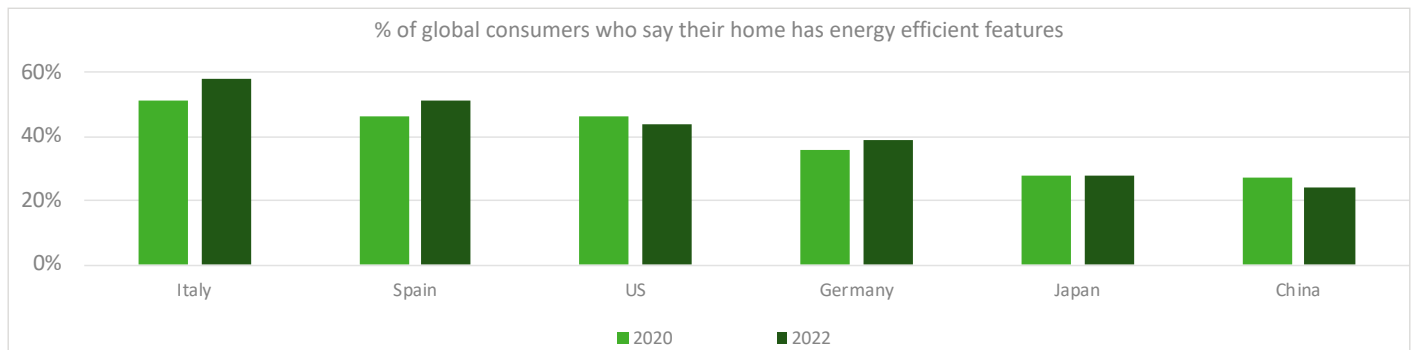
- **"Green features" add to home values¹³:** More consumers are equipping the outside of their homes with energy saving devices such as solar panels, charging stations, and generators. This presents not only an upgrade for the homeowner but also serves to enhance a home's value, as new home buyers are looking for modern, green features in their real estate search.

UK's Homestays Platform: Plum Guide
Across the globe, platforms for homestays are forming. Plum Guide, a UK-based company is making luxurious homestays a reality for travelers looking for elevated experiences. The company recently raised an additional \$31 million to fuel growth of its properties.

47% of consumers in 2022 said climate change will impact their lives more than it does now
A **44%** increase in global production of solar, wind, and other energy was realized between 2018-2022

Panasonic and Omron Vehicle-To-Home Partnership¹¹
In Japan, Panasonic and Omron have developed a vehicle-to-home power system to provide back-up power during blackouts caused by extreme weather events.

IKEA's Partnership with SunPower UK
IKEA, the home furniture store, has partnered with SunPower, a residential solar technology company, to make solar energy more accessible to consumers, including equipment and installation services.



Graphic Source: Euromonitor's Voice of the Consumer Survey 2020-2022

Home Energy Storage

Next generation opportunities in Smart Homes

4. Shifting Economic Power¹⁴:

Consumers have faced a myriad of difficult financial situations over the past few years as COVID-19, geopolitical issues, and inflation have served to slow savings rates and increase spending. Energy costs have been a big part of this conundrum as both usage and prices have soared. As consumers look for ways to save, there is greater urgency in upgrading to cleaner energy systems, such as heat pumps and solar technology. Accessible pricing levels will also be an issue, with a clear need to cover installation costs. Factors that are shifting economic power include:

- **Greater demands for alternative energy¹⁵:** In Europe and parts of APAC, energy bills are higher than ever as a result of the reliance on Russian natural gas and inflationary costs. With consumers unable to afford this type of energy, there is a heightened focus on using less energy and finding alternative energy forms that cost less. This is one area where government policies are playing a key role by offering subsidies for short-term relief, as well as incentive programs for long-term home-related investments.
- **Inflation encourages downgrades and second-hand buying¹⁶:** With inflation high, price-sensitive consumers are looking for ways to save on their appliances. Purchasing or renting “used” equipment has emerged as one option. In Japan, Singapore and parts of Europe, appliance companies are also testing various business models to offer cost-effective and sustainable options. If price-sensitive consumers elect to downgrade to cheaper models, standby and usage power will likely be higher – an issue that will impact the requirements for home energy storage.

5. Technology¹⁷:

Significant investments are continuing to be made in clean energy technology, driving the advent of newer and more sustainable products. As consumers deal with inconsistencies in power sources, they will be seeking more efficient, seamless, and overall elevated experiences from these new technologies in their homes and vehicles. One anticipated development will be the focus on home energy independence, allowing consumers to look to their homes for full energy generation, usage, and storage. As this reliance builds, safety features and backup systems will also become crucial for long-term usage. Taking a deeper look at these technology opportunities:

- **Rise in luxury and premium status of electric vehicle (EV) ownership¹⁸:** Globally, the rising demand for EVs is not only being propelled by sustainability concerns, but also the “cool factor” these vehicles proffer. Vehicle manufacturers are answering this call by constantly advancing their EVs with sleeker, more premium designs and features. As a result, the market is expected to continue flourishing, with a range of hot new models.
- **Home devices require 24/7 connection and support¹⁹:** New technologies continue to make the lives of consumers easier and more secure. People now have access to automated package deliveries and even telehealth services that allow for minute-by-minute monitoring of health conditions. To suit these new conveniences, homes need to be equipped with round-the-clock connection and adjacent support systems to allow for these technologies to function fully and safely.

9% growth in the consumer price index between 2021-2022, up from 5% from 2020-2021

1.7% growth in consumer savings globally between 2020-2022

Octopus Energy Heat Pump Installation

This UK energy company is helping consumers transition their homes from gas-fueled central heating to renewable energy provided by heat pumps – an effort gaining traction in light of UK policies.

Electrolux's Appliance-as-a-service Model

Electrolux has introduced a new business model where consumers can rent appliances.

7% CAGR is expected for the global clean energy technologies market size between 2021-2026

36mn Smart home appliances shipped to consumers in 2022.

China's new luxury EVs in 2023

The Yangwang U8 off-road SUV and the U9 supercar are recent developments in luxury EVs. With prices above \$100,000, they offer extreme features including the ability to float in water.

Aloe Care Health Medical Alert System

This system, built on a smart hub, easily connects consumers to a 24/7 emergency response center through voice-activated calls for help. Other smart features include fall detection, and temperature and air quality reporting.

Home Energy Storage

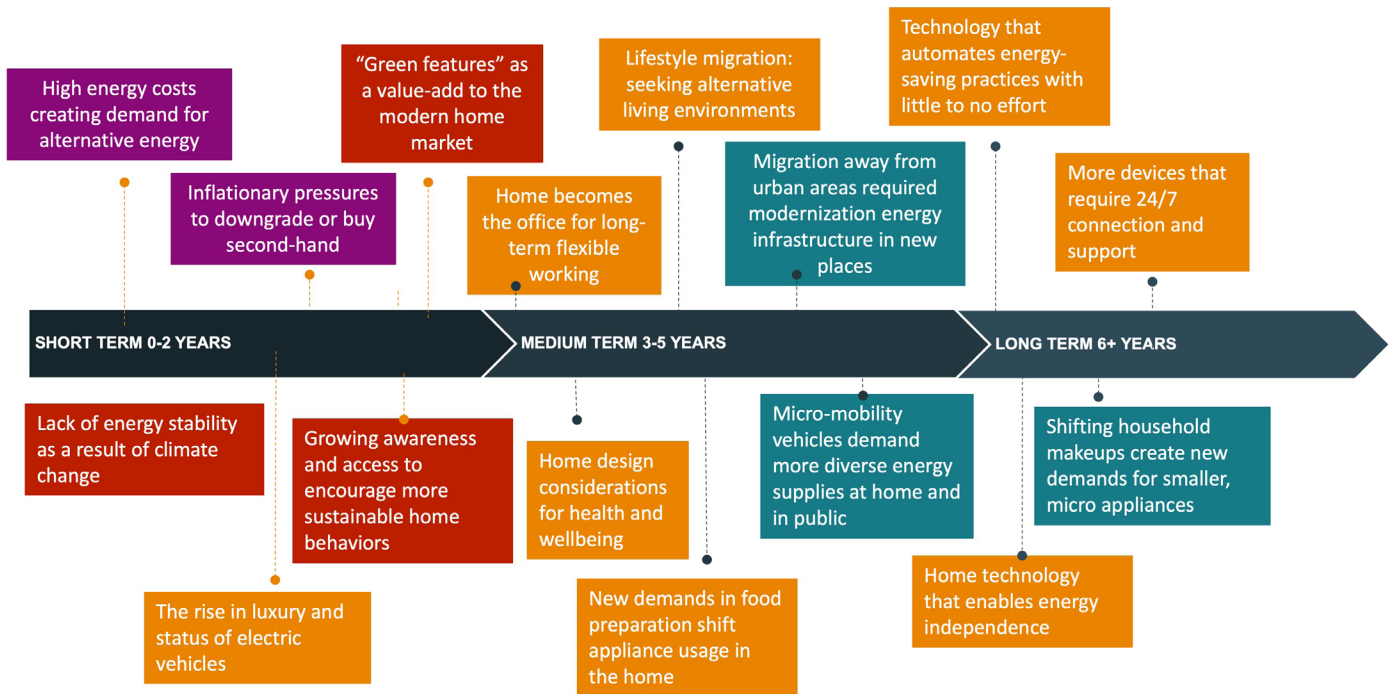
Next generation opportunities in Smart Homes

- Automated energy-saving practices with little to no effort²⁰:**
 Most consumers will not choose to adopt new energy saving behaviors if they don't realize a direct benefit or financial reward. This makes the advent of new technologies that automate more sustainable energy practices for consumers a winning solution. The ability to change consumer habits, without requiring them to learn new procedures and protocols, is expected to create long-term energy saving practices.
- Home technology enables energy independence²¹:**
 As buying solar panels, electric vehicles and e-bike charging stations for the home become more mainstream, so too will energy storage systems. Currently, many homes are not equipped with the technology that allows them to store excess energy. However, new battery technologies are making it possible for homes to become self-sufficient regardless of how far off the grid they may be located. This creation of a micro-grid ecosystem puts less stress on main energy grids and answers consumer needs for more reliable power supply.

Schneider Smart Home Hub
 This system will be dedicated to auto-switching between power sources at key times during the day. It will also notify consumers of blackouts, in order to turn off and save enough energy through power outages.

Home Energy Systems
 In an effort to provide total energy independence, Tesla is developing a home energy storage system to provide solar energy throughout the day and night, even during inclement weather. Toyota's recently developed O-Uchi Kyuden System offers similar solutions.

Economic and environmental factors are driving change in energy usage and storage in the immediate future while population change, and technology will have greater impact long term.



Graphic Source: Euromonitor International (EMI)

Home Energy Storage

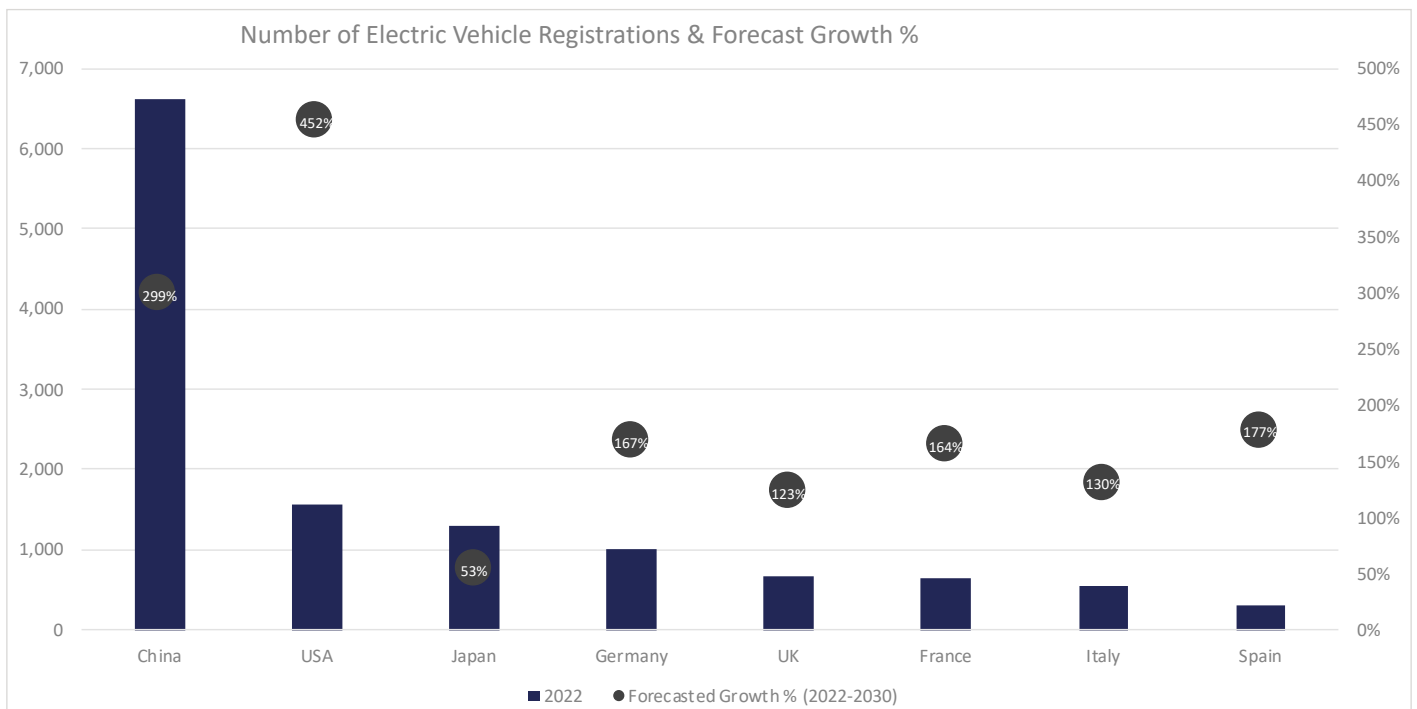
Next generation opportunities in Smart Homes

Government Policies and Incentives Around the World

Government incentives and policies around the world are aiming to change consumer behavior towards cleaner energy. In addition to the global trends, these efforts will ultimately affect home energy usage and storage.

Summary

- The US is the global leader in residential incentives for upgrading to newer, more sustainable, clean energy systems for all consumer income levels.
- Across Europe, incentives exist for consumers to upgrade to cleaner energy technology, with hints towards larger, more comprehensive plans in the future.
- In the US, China and Japan, countries are prioritizing clean energy policies that mostly affect the commercial sector, with loose targets on EVs for consumers over the next decade.
- The UK and EU are more tactical in their approach to onboarding consumers to new clean energy technology, with stricter requirements in place relative to other markets.



Graph source: Euromonitor's Passport Data Mobility, Electric Car Registrations 2022-2030

Home Energy Storage

Next generation opportunities in Smart Homes

UNITED STATES ²²	CHINA ²³	JAPAN ²⁴
INCENTIVES		
<ul style="list-style-type: none"> The recent Inflation Reduction Act is the largest clean energy investment program in US history; it includes: <ul style="list-style-type: none"> Consumer tax credits, covering 30% of new clean energies for solar panels, heat pumps, batteries to store energy, energy efficient home systems (water heaters, central AC and boilers), and charging stations for cars or bikes in rural or low-income areas Adjacent costs for labor, permits, and inspections will be covered through 2032 	<ul style="list-style-type: none"> Subsidies and tax rebates are available for electric vehicle buyers Clean energy is focused on the commercial side of developing, producing, and implementing solutions Little traction exists with consumers and residential clean energy plans 	<ul style="list-style-type: none"> Funded by the Ministry of Environment, the focus is on bringing solar panels to more industrial buildings, and even farmland For consumers, rewards are available for daily practices, e.g., earning money back on more energy efficient appliance purchases through Rakuten Solar companies are starting to get involved, offering free installation and maintenance of solar panels
POLICIES		
<ul style="list-style-type: none"> US policy requires that at least 7.5% of the nation's total energy consumption come from renewable sources; that goal was surpassed in 2021, reaching 10% utilization Outside of a goal to make zero emissions vehicles account for 50% of new vehicles sold in 2030, there are few strict policies affecting consumers In California, there will be a ban on the sale of new gas-powered cars by 2035 	<ul style="list-style-type: none"> Lofty clean energy goals are aimed largely at industrial cases; the government released a plan in 2021 to have 25% of consumption met by non-fossil fuels by 2030 Clean energy goals focus on energy efficiency improvements in buildings as China works to expand production of renewable energy systems A consumer-centric goal is in place so that by 2030, 40% of vehicles sold will be electric 	<ul style="list-style-type: none"> Japan is transitioning towards cleaner energy solutions with net-zero goals by 2050 By 2030, roughly 40% of total electricity generated is aimed to come from renewable sources; Tokyo is already working towards this goal, requiring that by 2025 all new home builds have solar panels A target for all new cars sold to be "environmentally friendly" by 2035 is also in place

Home Energy Storage

Next generation opportunities in Smart Homes


UK ²⁵	EU: FRANCE, GERMANY, ITALY, SPAIN ²⁶
INCENTIVES	
<ul style="list-style-type: none"> The Green Deal and National Grid provide consumer incentives to make homes more energy efficient; this includes investments in renewable energy generation from solar panels or heat pumps Grants through the Eco Plus Scheme support these investments, covering 75% of total costs starting in April 2023 	<ul style="list-style-type: none"> Current efforts are underway to support clean energy investments; however, no major incentives or funding programs have yet to be solidified Smaller, local efforts to encourage sustainable practices exist, e.g., e-bike subsidies across France, Germany, and Italy where consumers can receive 500 EUR towards purchases
POLICIES	
<ul style="list-style-type: none"> Energy providers must ensure all energy comes from 100% zero-carbon generation by 2035; consumers, in turn, will need to equip their homes with technology fit for renewable energy Gas boilers will be banned in new homes by 2025, as part of a larger plan to achieve net zero carbon emissions by 2050 Sales of new gas-powered cars will also be phased out by 2030, with all zero-emission cars by 2035. 	<ul style="list-style-type: none"> Renewables needed to account for 20% of consumed energy by 2020; that goal was exceeded in 2021, reaching 22%; as a result, the 2030 target is being revised from 40% to 45% France, Germany, Italy and Spain are all banning gas-powered cars by 2035 Targets for installing heat pumps are in place to help achieve clean energy: 20 million heat pumps are to be installed by 2026 and 60 million by 2030 For solar panel technology, policies are currently being discussed for both industrial and residential usage, potentially requiring new and existing buildings to install solar panels between 2026 and 2029


TE Connectivity offers Quality Engineering Solutions

Complete energy independence will require strong and reliable energy generation and storage technology to keep homes functioning at all times. In turn, a singular platform is needed in order for energy to flow efficiently and automatically throughout the home – an issue that will affect new solar panel, water heater, and heat pump technologies as well.


TE Connectivity (TE) offers an extensive array of solutions to address the growing emergence of smart homes and related home-energy management and storage needs. TE Connectivity supports the design and engineering of safer, more sustainable products that deliver the type of strong performance and energy efficiencies home-energy storage products are meant to solve.

EFFICIENT INSIDE & OUT






Solar Inverter




Battery Energy Storage System




Home EV Charger



Home E-Mobility Charger



Heat Pump Water Heater



Heat Pump Air-Sourced



Heat Pump Clothing Dryer

Home Energy Storage

Next generation opportunities in Smart Homes

EV Charging

The growing purchasing trend for electric vehicles (EV) means there will be an increased need for in-home EV-charging stations. These home stations must be equipped to support multiple EV types and upgraded to match newly emerging EV technologies. There is another advantage to in-home charging stations: consumers value how they provide a source of backup energy when a power grid is down. TE's robust portfolio supports the development of EV (AC or DC) charging stations on a global basis regardless of the level of power or charging speed requirements.

E-Mobility

Greater awareness of the negative impact of extreme climate issues has caused both eco-minded governments and consumers to focus greater attention on the need for green technologies. E-bikes and e-scooters, with their lower emissions, provide a viable transportation solution. TE offers a range of high-powered charging outlets to meet the demand for e-mobility vehicles across a variety of specifications.

Heat Pumps

As consumers look to upgrade to cleaner and more cost-friendly energy systems, heat pumps have become a popular solution. With their affordable costs, lower levels of maintenance and the availability of government incentives, they have become the most consumer-accessible option. Heat pumps are also a sufficient energy solution for homes that require a less-intensive energy system or are situated off the grid. TE's wide range of sensors are critical components in heat pump systems for monitoring the heating and cooling process, as well as indoor and outdoor environments.

Water Heaters

While not as energy efficient as heat pumps, water heaters present another option for consumers looking to control energy consumption, or who reside in rural areas where power grids are less modern. Designed to reflect changing household needs and parameters, water heaters fit a variety of sizes, shapes, utilities (tankless) and formats and do not need to generate or transfer as much power with more specialized, and less energy-intensive appliances. TE's portfolio of power and signal connectors, relays, terminal and splices supports the design of a variety of water heaters to meet contemporary needs and standards.

Solar Inverter

With consumers looking for ways to become more energy independent and take more control of their home energy costs, the use of solar panels will continue to expand as costs become more attainable. Government incentives for solar energy programs over the next 5-10 years will help to drive this consumer interest and make it more mainstream. In addition, consumer focus on solar energy may expand outside of powering homes to include outdoor spaces, driving the purchase of accessories such as solar lights. TE offers a range of connectors to be used in photovoltaic inverters, especially string inverters in residential areas and in energy utility plants. In solar power systems like solar inverters for the home, TE's connectors help to ensure flexibility, high efficiency and robust performance, even in the harshest environments or meteorological conditions.

Products:

- Power Connectors
- Relays
- Terminals
- Heat Shrink Tubing

Products:

- Power Connectors
- Relays
- Terminal Blocks
- Heat Shrink Tubing

Products:

- Sensors
- Power Connectors
- Signal Connectors
- Terminals
- Relays

Products:

- Terminal & Splices
- Power Connectors
- Signal Connectors
- Heat Shrink Tubing
- Relays

Products:

- Power Connectors
- Signal Connectors
- Relays
- Terminal Blocks
- Heat Shrink Tubing

Home Energy Storage

Next generation opportunities in Smart Homes

Power Conversion Inverter

With changing lifestyles and different levels of urgency for clean energy, consumers will adopt new tech as it becomes more accessible. This means a variety of appliances and energy system components will require conversion with one another, connectivity across a range of devices including high-tech smart equipment, and powering more outdoor space devices in tandem with indoor energy needs. Separately, older power systems, typically found in rural areas, will need updating to accommodate more energy efficient technology. TE's suite of products support the development of reliable power conversion systems that work efficiently and without interruption.

Products:

- Power Connectors
- Signal Connectors
- Relays
- Terminal Blocks

Battery Storage

Fundamental to generating renewable energy is the ability to ensure adequate battery storage. Building the next generation of energy-efficient infrastructures for battery energy storage systems (BESS) will require innovations that increase system voltage, improve power density and provide overall system efficiency. TE Connectivity's BESS solutions look to improve power allocation flexibility in power generation, transmission, and consumption to help meet the increased demand for alternative energy sources.

Products:

- Relays
- Connectors
- Passives
- Switches
- Electrical products

TE Connectivity supports your development needs

As a global industrial technology leader, TE is committed to listening to customer requirements and finding new and innovative ways to develop solutions that realize the most complex design challenges. With more than 7,000 engineers across 140 countries, we innovate alongside our customers and clients, sharing our expertise gained from extensive cross-industry, hands-on experience. As a result, we develop products and technology that address fast evolving consumer demands. Our size and scale also allow us to expedite product development timelines in bringing products quickly to market.

1 SEALING
Ingress protection (IP) rating for water, dust, and debris in harsh environments

2 RELIABILITY
High power and operating temperatures, locking mechanisms, and vibration resistance

3 MINIATURIZATION
Compact centerline and smaller construction size

4 SIMPLIFICATION
Insulation displacement (IDC) technology, ease of installation, and simplified assemble processes

5 SAFETY
Flame retardant material, ergonomic design, and insulation protection

More importantly, our approach is built on developing solutions to deliver reliable, steady optimized performance for smart home applications and home energy storage, including those that operate in the harshest environments. From the trends in miniaturization and simplification to continually testing the safety of products in our labs, we are committed to delivering value across the connectivity spectrum. Finding ways to solve customer design challenges while maintaining or increasing reliability and performance is just one of the ways TE lives up to its purpose of creating a safer, sustainable, productive, and connected future - the critical foundations to energy management and storage.

Home Energy Storage

Next generation opportunities in Smart Homes

Sources

- ¹Population
EMI's Voice of the Consumer Survey 2022
EMI's Passport Data, Households 202
[Electric Bike Market Size, Share, Analysis - E-Bike Trends Report \(alliedmarketresearch.com\)](#)
- ²Moving from urban to rural areas
[Micromobility is clean and quiet — how can it be widely used? | World Economic Forum \(weforum.org\)](#)
[Everything you ride is being electric, ready or not? - PingWest](#)
[Ebike sales outstrip Electric and Plug-in Hybrid cars in the USA/EU](#)
[Toyota tests waters with new electric bike, joining other car makers \(electrek.co\)](#)
[Rivian is working on an e-bike - The Verge](#)
[Do Tesla make electric bikes? Introducing the Model B - Electric Bike Sales blog](#)
[DYU globally launches four new e-bikes with a special promo - Gizchina.com](#)
[Ride Kola Melbourne | URBAN LIST MELBOURNE \(theurbanlist.com\)](#)
[Bikeshare and e-scooters in the U.S. \(bts.gov\)](#)
- ³Rise in e-bikes and e-scooters
[Ebike sales outstrip Electric and Plug-in Hybrid cars in the USA/EU](#)
[Toyota tests waters with new electric bike, joining other car makers \(electrek.co\)](#)
[Rivian is working on an e-bike - The Verge](#)
[Do Tesla make electric bikes? Introducing the Model B - Electric Bike Sales blog](#)
[Electric Bike Market Size, Share, Analysis - E-Bike Trends Report \(alliedmarketresearch.com\)](#)
[DYU globally launches four new e-bikes with a special promo - Gizchina.com](#)
[Ride Kola Melbourne | URBAN LIST MELBOURNE \(theurbanlist.com\)](#)
- ⁴Growing prevalence of single-person households:
Euromonitor's Passport Data Population, Single Person Households 2022-2030
[Discover Bob the mini dishwasher - Throw in the sponge, get Bob ! \(daan.tech\)](#)
[Living Alone Now More Common For US Adults | KFF Health News](#)
[The rise of Japan's 'super solo' culture - BBC Worklife](#)
[The Daily — Home alone: More persons living solo than ever before, but roomies the fastest growing household type \(statcan.gc.ca\)](#)
- ⁵Changing Values
EMI's Voice of the Consumer Survey 2022. n=39,832
- ⁶Working from home
[New IDC Report Reveals 56% of Asia/Pacific* Employees Want Flexible Work Even Beyond the Pandemic\](#)
[Discover Bob the mini dishwasher - Throw in the sponge, get Bob ! \(daan.tech\)](#)
[Is remote work here to stay in Asia-Pacific? \(linkedin.com\)](#)
[The hidden energy costs of working from home \(arcadia.com\)](#)
[Working from home can save energy and reduce emissions. But how much? - Analysis - IEA](#)
- ⁷Upgraded appliances
Euromonitor's Passport Data, Small Consumer Appliances (Air Fryer) 2022-2027
[Millennials drive growth of frozen foods category sparked by interest in premium, challenger brands \(foodnavigator-usa.com\)](#)
[Buying a Gas Stove or Dryer? Read This First. | Wirecutter \(nytimes.com\)](#)
[Suvie | Your Countertop Kitchen Robot - 100 Day Risk Free Trial](#)
- ⁸Fresh perspectives in a post-pandemic world
Euromonitor's Passport Home & Garden Data 2020-2026
[Global Outdoor Kitchen Appliances Market To Grow USD 10.12 Billion By 2030 | CAGR 8.3% \(yahoo.com\)](#)
[Market Research Company offers Syndicate & Custom Market Research Reports with Consulting Services - Allied Market Research](#)
[Real Estate Experts Share ROI Trends Of Wellness Design Home Features \(forbes.com\)](#)
[How Taylor Morrison Is Transforming Homebuilding From The Ground Up \(forbes.com\)](#)
[Taylor Morrison Partners with Broan-NuTone](#)

Sources

- ⁹Digital nomads require comfort everywhere
[Gen Z Habits Disrupting The Travel Industry \(forbes.com\)](#)
[2023 Travel Trends: Why Homestays Are Set to Make a Comeback \(timeout.com\)](#)
[Luxury Airbnb alternative Plum Guide raises USD\\$1 million and to disrupt homestay market \(traveldailymedia.com\)](#)
[What Is Plum Guide, the Flashy New Airbnb Competitor? \(vice.com\)](#)
[14 Vacation Rental Industry Statistics that You Won't Believe \(hoteltechreport.com\)](#)
[List of Countries With Digital Nomad Visas in 2023 \(businessinsider.com\)](#)
[Becoming a Digital Nomad \(Part 3 – What You Need\) - Nimbl \(nimblvehicles.com\)](#)
[Best Places to Live for Digital Nomads - The Complete Guide \(ivisa.com\)](#)
[Chinese workers ditch cramped cubicles for remote locales, freedom – and just look at that view | South China Morning Post \(scmp.com\)](#)
[The Omnichannel Future of 'Car as Wallet' | PYMNTS.com](#)
[Spain's digital nomad visa is finally available. Here's everything you need to know | Euronews](#)
[Spain Just Launched a Year-Long Digital Nomad Visa for Remote Workers | Inc.com](#)
[Digital Nomads Increased 131% From 2019. Will The Trend Prevail In A Tough Economy? \(forbes.com\)](#)
[Digital Nomad Visa For Aruba - Citizen Remote](#)
- ¹⁰Environmental
EMI's Passport Data, Commodities, Climatological Disasters 2022
EMI's Passport Data, Commodities, Production of Solar, Wind, and Other Energy 2018-2022
- ¹¹Perils of Climate change
[Powering homes with EVs: Panasonic, Omron set to enter Japan's V2H market - Nikkei Asia](#)
[US power outages jumped 73% in 2020 amid extreme weather events | S&P Global Market Intelligence \(spglobal.com\)](#)
[Norfolk families reveal how they have cut their energy bills | Eastern Daily Press \(edp24.co.uk\)](#)
- ¹²Greater access to sustainable home appliances
Euromonitor's Voice of the Consumer Survey 2020-2022
[Norfolk families reveal how they have cut their energy bills | Eastern Daily Press \(edp24.co.uk\)](#)
[Equitable Access to Solar Energy | Department of Energy](#)
[Clean Solar, Wind Power Still Isn't Accessible in Developing World \(bloomberg.com\)](#)
[New US Consumer Insights Reveal Overwhelming Support for Appliance Efficiency - CLASP](#)
- ¹³"Green features" add to home values
[Eco-Friendly Features Help Homes Sell Up To 10 Days Faster \(forbes.com\)](#)
[Realtors® See Sharp Increase in Homes with Green Features \(nar.realtor\)](#)
[Frontiers | Lessons Learnt From the Residential Zero Carbon District Demonstration Project, Governance Practice, Customer Response, and Zero-energy House Operation in Japan \(frontiersin.org\)](#)
[The Future of Sustainability in Japan: Paving the Way to Net Zero Energy Housing | ArchDaily](#)
[More Buyers Looking for the 'Green' – Real Estate In-Depth \(realestateindepth.com\)](#)
[Sustainable homes: Why eco-friendly homes are top of house buyers' lists - Industry Europe](#)
- ¹⁴Shifting Economic Power
EMI's Passport Data, Economies and Consumers Annual Data 2020-2026.
- ¹⁵Greater Demands for alternative energies
Euromonitor's Passport Data Consumer Expenditure, Electricity 2022-2025
[Renewable power's growth is being turbocharged as countries seek to strengthen energy security - News - IEA](#)
[Octopus Energy Is the Answer to a Broken, Inefficient Market | WIRED](#)
[Get A Heat Pump | Heat Pumps Explained | Octopus Energy | Octopus Energy](#)
- ¹⁶Inflation encourages downgrades and second-hand buying
Euromonitor's Voice of the Consumer Survey 2020-2022
[Electrolux launches Appliance-as-a-Service program to promote circular economy - Electrolux Group](#)
[Experts say buying used appliances could be better for environment and wallets | CTV News](#)
- ¹⁷Technology
EMI's Passport Data, Consumer Appliances 2022
[Record clean energy spending is set to help global energy investment grow by 8% in 2022 - News - IEA](#)
[Green Energy Investment Sets \\$1.1 Trillion Record in 2022 | Time](#)

Home Energy Storage

Next generation opportunities in Smart Homes

Sources

- ¹⁸Rise in luxury and premium status of electric vehicle (EV) ownership:
Euromonitor's Passport Data Mobility, Electric Car Registrations 2022-2030
[Green Energy Investment Sets \\$1.1 Trillion Record in 2022 | Time](#)
[The rise of luxury electric vehicles | Marsh Commercial](#)
[Luxury Car Market to Witness Significant Growth of USD 350.37 billion at a CAGR of 12.75% by 2029 With Leading Competitors Like General Motors, AUDI, Tesla, Daimler, BMW and others \(yahoo.com\)](#)
- ¹⁹Home devices require 24/7 connection and support
[Aging In Place: Smart Home Upgrades For Seniors - Forbes Health](#)
[Aging in place can be so much easier with smart home technology - The Washington Post](#)
[Technology, Gadgets For Seniors Aging In Place \(aarp.org\)](#)
[Aloe Care Health: Medical Alert for Seniors, Caregivers, Fall detection options.](#)
- ²⁰Automated energy-saving practices with little to no effort
[Smart Home Energy Management System | Bosch Global](#)
[5 ways Big Tech could have big impacts on clean energy transitions - Analysis - IEA](#)
[Ecojoko | 18% d'économie d'électricité](#)
[Schneider Home: a smart home where the electricity isn't so dumb - The Verge](#)
[Intelligent power consumption meter for the home - Springwise](#)
- ²¹Home technology enables energy independence
[Why You Need Home Batteries -- and It's Not All About Blackouts - CNET](#)
[All About Solar Batteries - Forbes Home](#)
[Toyota launches its home battery pack - like Tesla Powerwall \(electrek.co\)](#)
[The Worldwide Residential Energy Storage Industry is \(globenewswire.com\)](#)
[Why Powerwall | Tesla Support](#)
- ²²US
[How the Inflation Reduction Act Can Save You Money: A Consumer's Guide - The New York Times \(nytimes.com\)](#)
[Federal Agency Use of Renewable Electric Energy | Department of Energy](#)
[California plans to ban new gas cars by 2035. Will 17 states follow? \(usatoday.com\)](#)
[Electric Vehicles & Rural Transportation | US Department of Transportation](#)
- ²³China
[Guest post: Will China's new renewable energy plan lead to an early emissions peak? - Carbon Brief](#)
[China has a clear pathway to build a more sustainable, secure and inclusive energy future - News - IEA](#)
[China's solar, wind power projects need more policy support, says energy authority | Reuters](#)
[China's ambitious rooftop solar pilot helps drive 'blistering' capacity growth \(climatechangenews.com\)](#)
[China Is Racing to Electrify Its Future | WIRED](#)
- ²⁴Japan
[Japan's Transition Toward a Renewable Energy Future - The National Bureau of Asian Research \(NBR\)](#)
[Japanese capital will require new homes built from 2025 to have solar panels amid efforts to address climate change | CNN Business](#)
[Renewable Energy Laws and Regulations Report 2023 Japan \(iclg.com\)](#)
[Japan Transition to Electric Vehicles \(trade.gov\)](#)
[Japan in Rewarding Consumers for Climate Friendly Choices - Bloomberg](#)
[Japan launches rebate program for solar on farmland, water reservoirs, waste sites - pv magazine International \(pv-magazine.com\)](#)
- ²⁵UK
[Energy saving scheme: National Grid pays people to cut power again due to cold weather - BBC News](#)
[UK government to introduce grants to make homes more energy efficient | Energy industry | The Guardian](#)
[How much of the UK's energy is renewable? | National Grid Group](#)
[EU pledges wind, solar funding to narrow gap with U.S. | Reuters](#)
[CBP-7480.pdf \(parliament.uk\)](#)

Sources

²⁶EU

[Germany introduces tax breaks for rooftop PV - pv magazine International \(pv-magazine.com\)](#)

[Germany Grants Bonus Subsidy to Home Heat Pumps that Use Natural Refrigerants - Hydrocarbons21](#)

[France reduces electric vehicle subsidies - electrive.com](#)

[France is subsidizing EVs leases so you only pay 100 euros/month \(electrek.co\)](#)

[France offers citizens EUR 4,000 grants to switch from cars to bikes \(balkangreenenergynews.com\)](#)

[EU countries roll out incentives for E-Bike purchase · BEEQ Bicycles \(beeq-bicycles.com\)](#)

[Rooftop Solar Panels Are Taking Off in Spain - Bloomberg](#)

[Italy Energy Efficient Systems \(trade.gov\)](#)

[REPowerEU: heat pump strategy required to help sector deliver - European Heat Pump Association \(ehpa.org\)](#)

[Weekend read: Is EU doing enough? - pv magazine International \(pv-magazine.com\)](#)

te.com

TE Connectivity, TE Connectivity (logo) and Every Connection Counts are trademarks. All other logos, products and/or company names referred to herein might be trademarks of their respective owners.

The information given herein, including drawings, illustrations and schematics which are intended for illustration purposes only, is believed to be reliable. However, TE Connectivity makes no warranties as to its accuracy or completeness and disclaims any liability in connection with its use. TE Connectivity's obligations shall only be as set forth in TE Connectivity's Standard Terms and Conditions of Sale for this product and in no case will TE Connectivity be liable for any incidental, indirect or consequential damages arising out of the sale, resale, use or misuse of the product. Users of TE Connectivity products should make their own evaluation to determine the suitability of each such product for the specific application.

©2023 TE Connectivity. All Rights Reserved.

06/23 Original

TE TECHNICAL SUPPORT CENTER

USA:	+1 (800) 522-6752
Canada:	+1 (905) 475-6222
Mexico:	+52 (0) 55-1106-0800
Latin/S. America:	+54 (0) 11-4733-2200
Germany:	+49 (0) 6251-133-1999
UK:	+44 (0) 800-267666
France:	+33 (0) 1-3420-8686
Netherlands:	+31 (0) 73-6246-999
China:	+86 (0) 400-820-6015