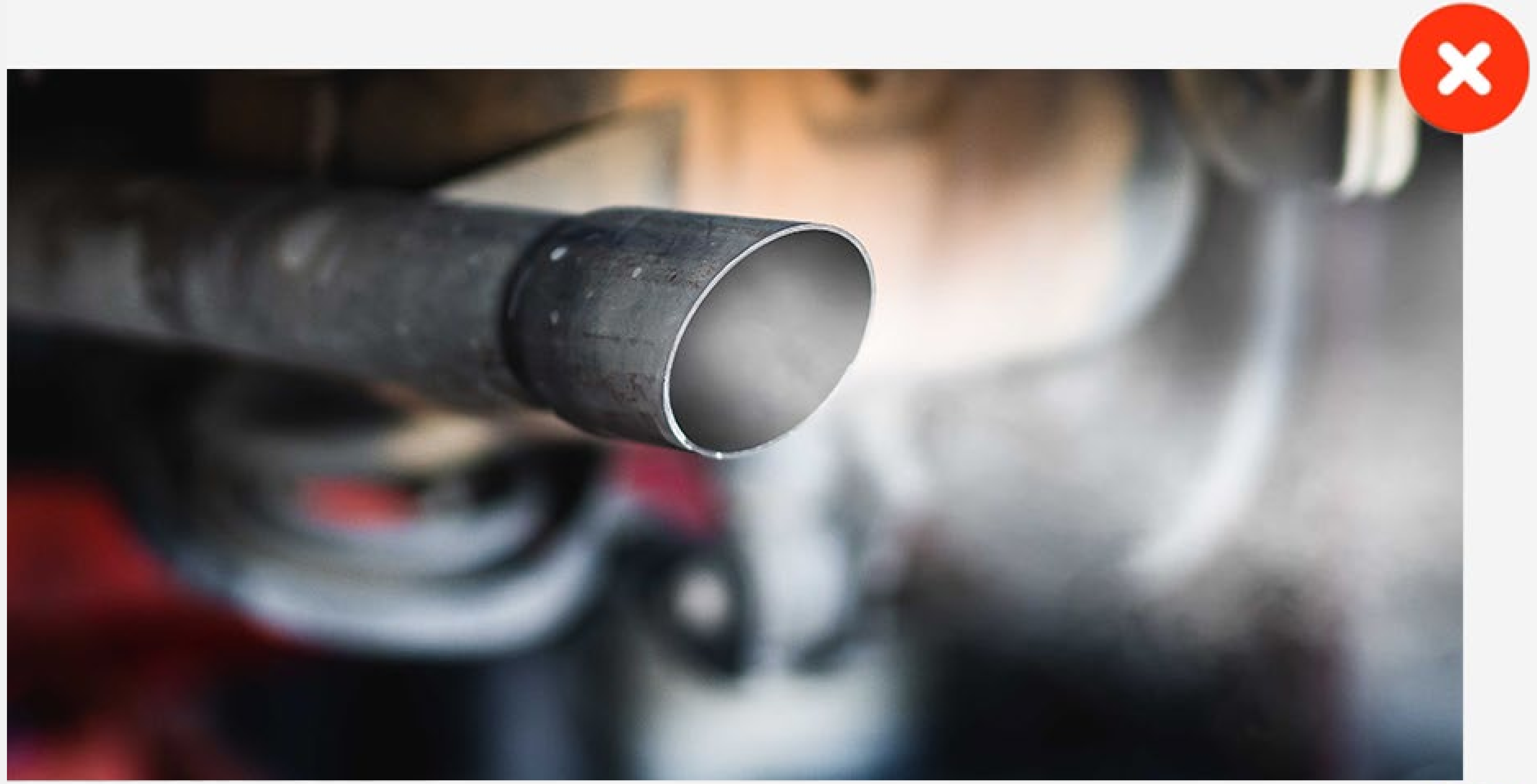
In 2021, the global fleet of Tesla vehicles, energy storage and solar panels enabled our customers to avoid emitting 8.4 million metric tons of CO_2e

The 6.8 million metric tons of vehicle CO_2e savings estimate is based on the net CO_2e savings during the use-phase of a Tesla vehicle compared to an ICE vehicle with a real-world fuel economy of ~24 mpg (of which 0.9 million metric tons was avoided through annual renewables matching for the global Supercharger network and home charging in California). The 1.6 million metric tons of solar + storage CO_2e savings estimate is based on CO_2e avoided through generation of zero-emission electricity from Tesla solar panels, including energy stored and later dispatched from our energy storage products. Geographic distribution of our deliveries (both vehicle and solar), grid mix at the country, state and province level and upstream emissions are reflected in these figures.

The Future is Electric



Lifetime fuel consumption and use-phase GHG emissions

30,000 litres (~8,000 U.S. Gallons) of fuel burned per car

70 tons of CO_2e released into the atmosphere

Burned fossil fuel is extremely difficult to decarbonize as carbon capture is not economically viable today

70 MWh of electricity charged per car

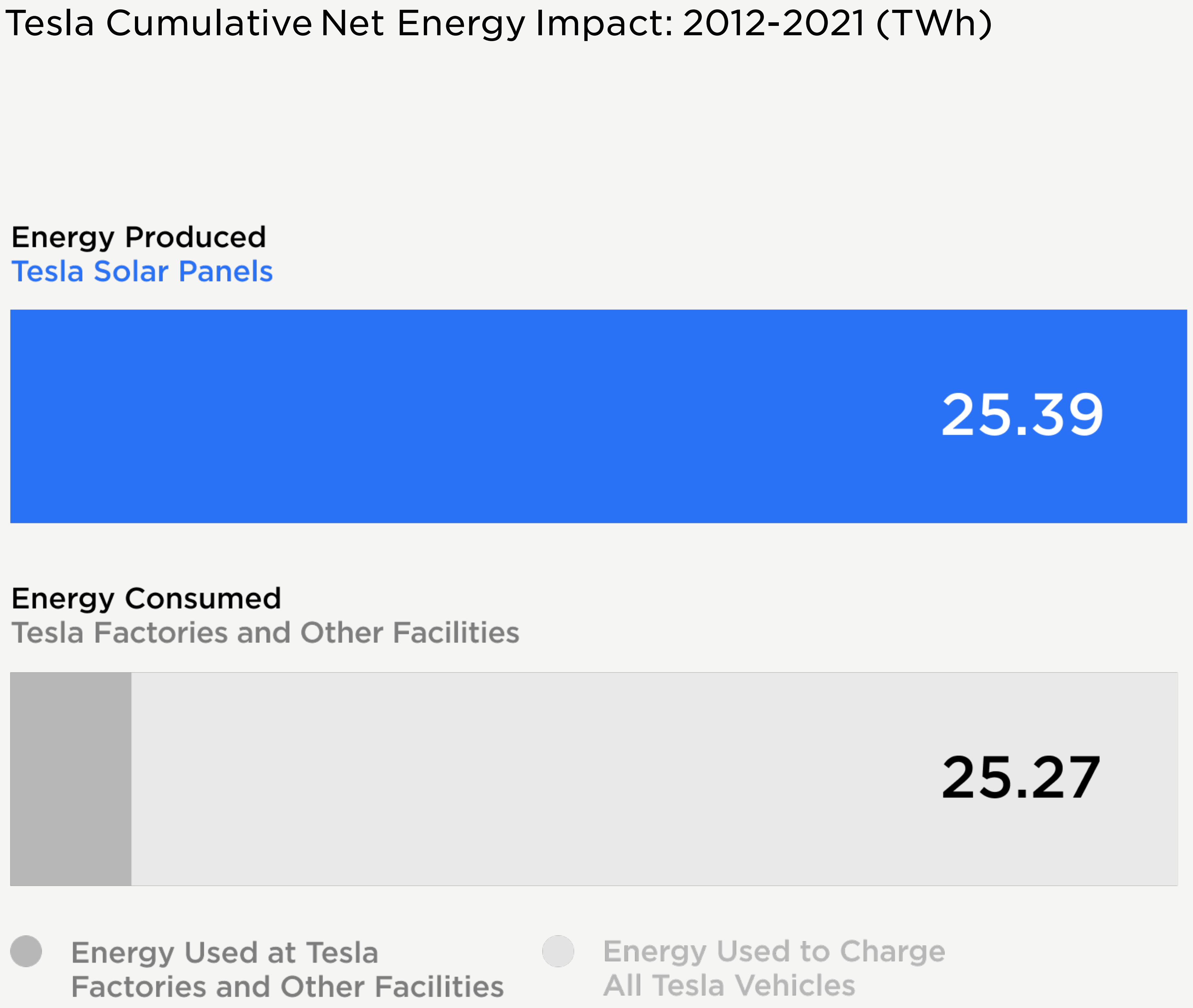
30 tons of CO_2 released, assuming current global grid mix

Production and lifetime use of EVs is possible to decarbonize using well-established technologies

Battery pack is recycled at the end-of-life and used to build a brand-new battery pack, over and over again.

More Energy Generation Than Consumption

Tesla solar panels have generated more electricity than has been consumed by our vehicles and factories between 2012 and 2021



Cover location: Arevon's Townsite Solar and Storage Facility

Our Goals

Tesla's purpose is to accelerate the world's transition to sustainable energy.

We strive to be the best on every metric relevant to our mission to accelerate the world's transition to sustainable energy. To maximize our impact, we plan to continue increasing our production volumes and the accessibility of our products. In more concrete terms, this means that by 2030 we are aiming to sell 20 million electric vehicles per year (compared to 0.94 million in 2021) and deploy 1,500 GWh of energy storage per year (compared to 4 GWh in 2021).

If we were to achieve such a vehicle delivery milestone through a consistent growth rate, the total Tesla vehicle fleet would surpass tens of millions of vehicles by 2030, and each of those vehicles could save tons of CO_2e emissions every year of usage.

Furthermore, each product we make must be continuously improved at each step of its lifecycle: from manufacturing to consumer use to recycling.

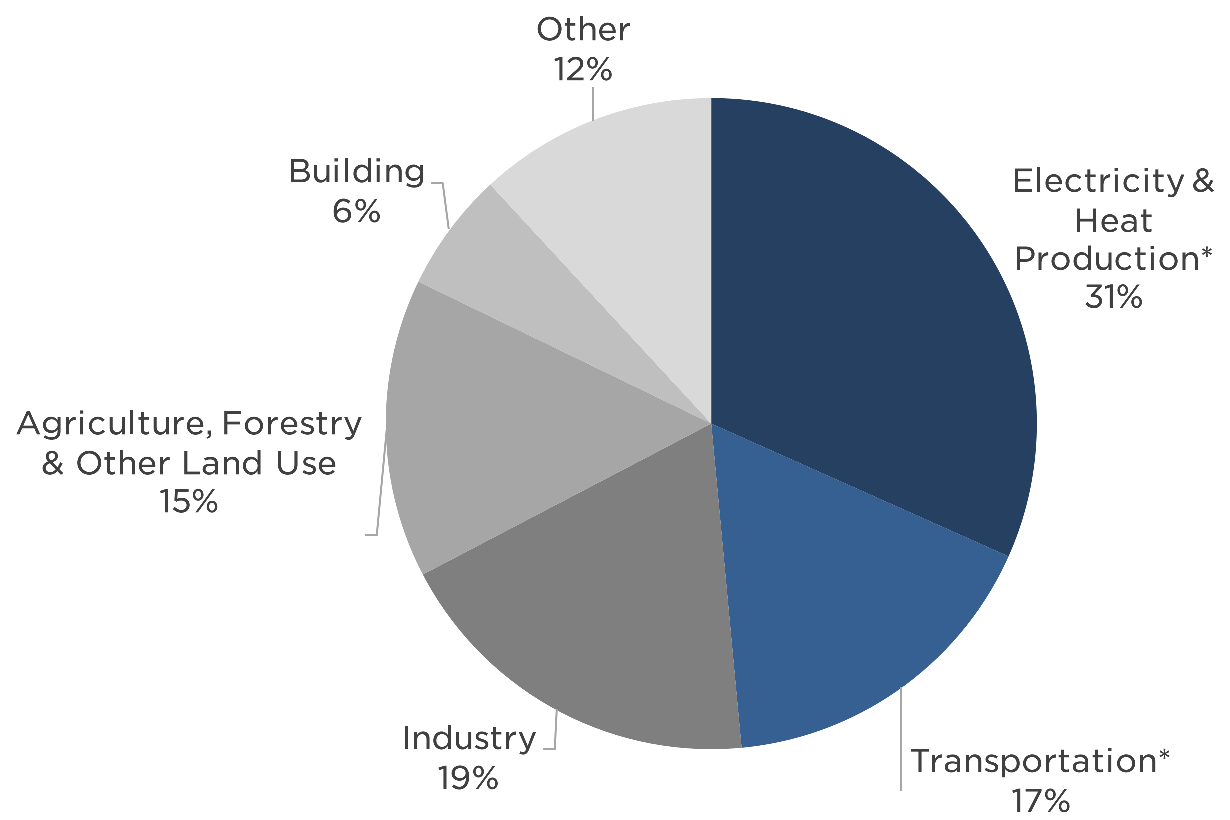
We must also improve every metric, including the energy and water used to make our products, how safe our customers and employees are and the affordability and accessibility of our products. Each of these themes will be covered in this year's Impact Report.

Making an Impact
Mission and the Tesla Ecosystem

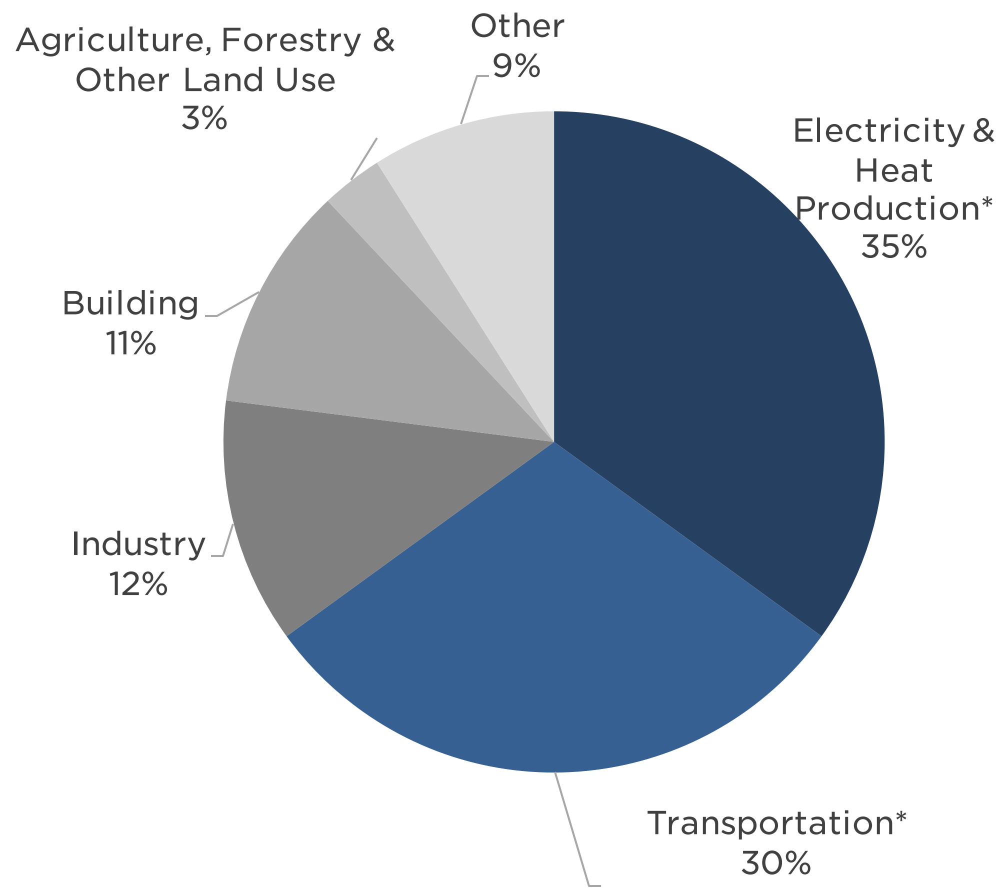
Sustainability drives us. And not just our products — it drives our values and mission as a company. It's at the core of everything we do and is what motivates us in our work. It also matters greatly to our customers, employees and shareholders. Our products and services are focused on transportation, energy production and storage — each of which have traditionally been some of the biggest polluters both in the U.S. and globally.

To achieve a zero-emissions future, we continue to implement programs and initiatives at our global manufacturing facilities and in our local communities.

Global
Greenhouse Gas (GHG) Emissions
by Economic Sector



U.S.
Greenhouse Gas (GHG) Emissions
by Economic Sector



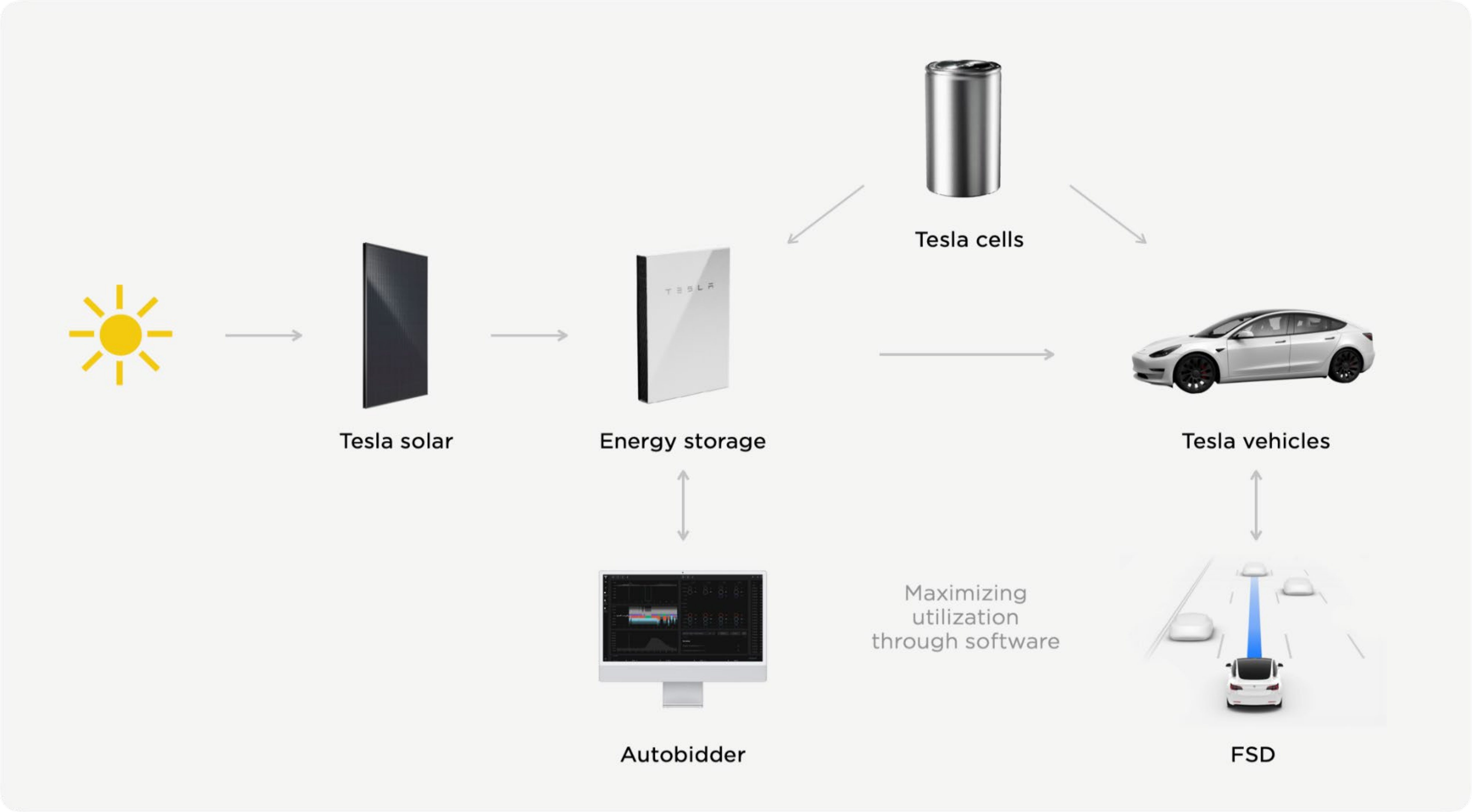
*Tesla-related sectors. Source: World Resources Institute

Making an Impact
Mission and the Tesla Ecosystem

Addressing climate change through an entire ecosystem

Climate change is reaching alarming levels globally due in large part to emissions from burning fossil fuels for transportation and electricity generation. The world cannot reduce GHG emissions without addressing both energy generation and consumption. And the world cannot address its energy habits without first directly reducing emissions in the transportation and energy sectors.

We are designing and manufacturing a complete energy and transportation ecosystem. We both develop the technology behind this ecosystem and focus on the affordability of the products that comprise it. We seek to achieve this through our R&D and software development efforts as well as through our continuous drive to develop advanced manufacturing capabilities.



Environmental Impact

Introduction

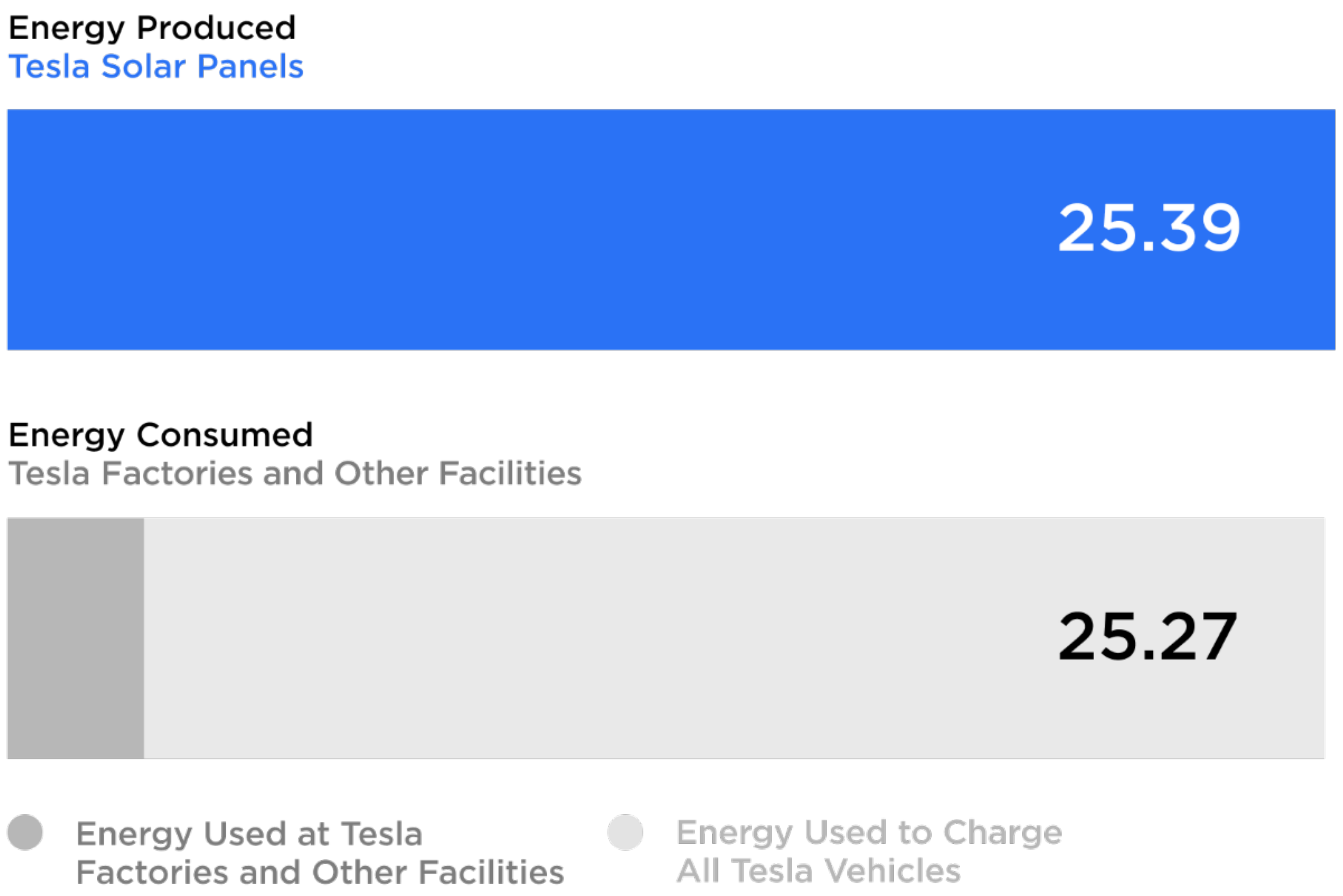
What Do We See As Impact?

The biggest environmental impact is achieved through early displacement of ICE vehicles and replacing them with EVs. Additionally, we want to displace fossil-based energy generation with renewable energy generation.

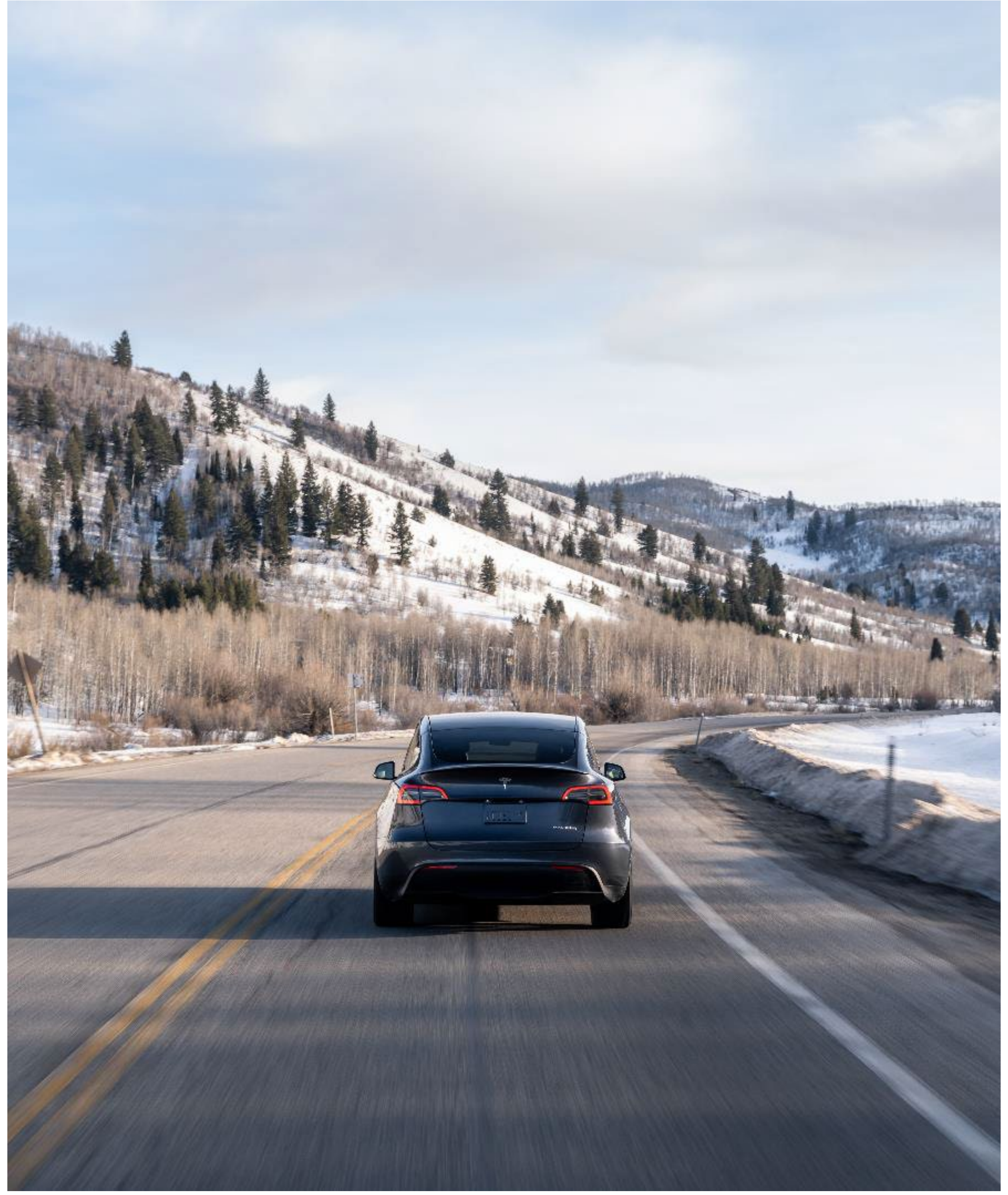
As of the end of 2021, Tesla (including SolarCity prior to its 2016 acquisition by Tesla) has installed almost 4.0 Gigawatts of solar systems and cumulatively generated over 25.0 Terawatt-hours (TWhs) of emissions-free electricity. For reference, that is more energy generated by our installations than the total energy Tesla has used to run all our factories since we began producing Model S in 2012 and electricity used to power all of our vehicles in that same period combined.

We are striving to always remain a net contributor to renewable energy generation. It is our goal to eventually have all our manufacturing energy needs satisfied through renewable sources where possible. Additionally, we are hoping to see more Tesla vehicle customers installing solar panels or Solar Roof along with a Powerwall to meet their own energy needs in a sustainable way.

Energy Generation vs. Energy Consumption (in TWh)



Introduction



6,500 miles

The manufacturing process of Model 3 and Model Y currently results in slightly higher GHG emissions than an equivalent combustion engine vehicle. However, based on the global weighted average grid mix, Model 3 and Model Y have lower lifetime emissions than an equivalent ICE after driving 6,500 miles.

In addition to an updated Lifecycle Analysis (LCA) for Model 3 and Model Y, we are reporting total Scope 1 and Scope 2 emissions and use-phase emissions of our vehicles

In this year's report we are reporting our Scope 1 (direct emissions from our facilities) and Scope 2 (purchased electricity, heat, etc. for our facilities) emissions resulting from global operations. This information is not only important to benchmark our performance against other manufacturers but is also the first step to track progress as we continue to work to decarbonize our own operations. While the most important work we can do to reduce GHG emissions is through selling as many of our products as possible, we are also committed to reducing carbon emitted from our own operations longer term. This is not only the right thing to do, but it also makes business sense as we reduce the resource intensity of our processes.

It is possible to fully decarbonize the manufacturing and use of EVs – this is economically unfeasible for ICE vehicles

We are often asked if electric vehicles (EVs) are more sustainable than internal combustion engine (ICE) vehicles. The environmental impact of zero-emission transport and energy products, like the products that Tesla produces and sells, is undeniably more positive than the GHG-emitting alternatives. This becomes more pronounced when determining the lifetime impact of EVs versus ICE vehicles, which requires looking at the entire lifecycle — from raw materials to use-phase emissions to disposal — and not just at vehicle usage emissions.

Variables often overlooked by other lifecycle studies:

- Using Worldwide Harmonized Light Vehicle Test Procedure (WLTP) or Environmental Protection Agency (EPA) fuel/energy consumption data (both of which overestimate fuel-economy and underestimate emissions) rather than real-world data
- Not considering the higher energy efficiency of Tesla's powertrains
- Assuming the average EV needs a battery replacement at some point in its life (it doesn't)
- Not considering emissions generated through the oil refining and the transportation process
- Using outdated data for the carbon impact of cell manufacturing

*For a definition of Scope 1, 2 and 3 emissions see page 135 of this report.

Lifecycle Analysis of Tesla EVs vs. Equivalent ICE Vehicles

70 tons

Lifetime CO_2e emitted by an average internal combustion engine vehicle (model year 2021) sold in the U.S. through its use-phase, excluding CO_2e emitted during the oil refining phase.

Using only real-world data, not official NEDC, WLPT or EPA[1] consumption data

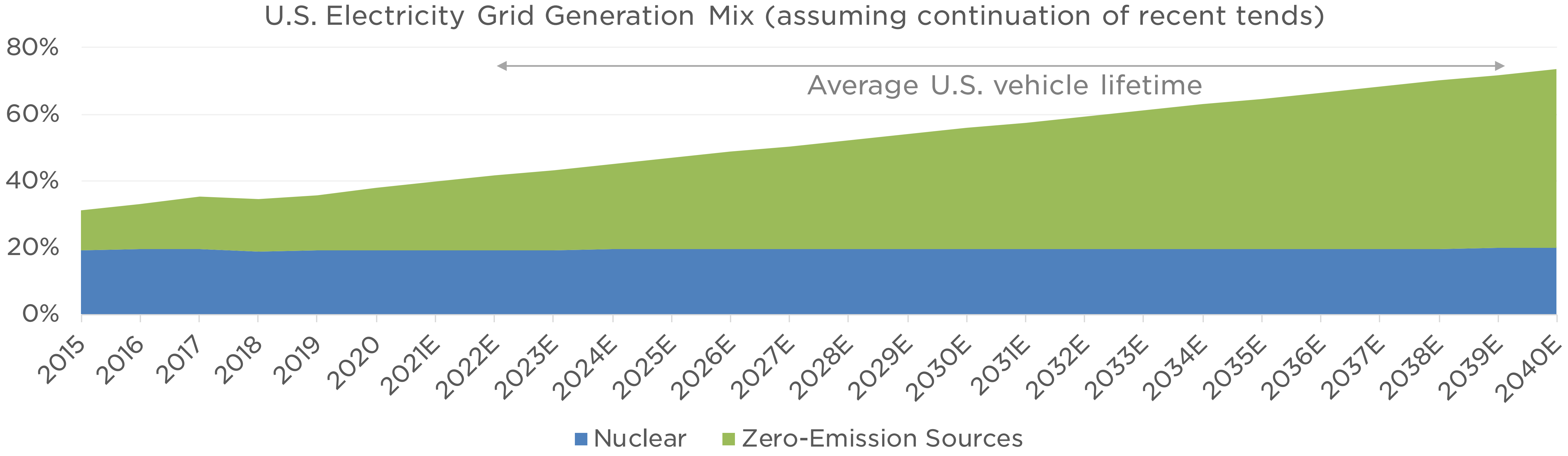
The most important variable in a lifecycle analysis of an automobile is real-world fuel consumption or electricity consumption, as applicable, which impacts the use-phase of the lifecycle. Various efficiency testing cycles such as NEDC, WLTP or EPA do not truly represent real-world fuel or energy consumption. Therefore, we used:

EV energy consumption: Real world energy consumption based on 25 billion miles traveled Tesla Model 3 and Model Y vehicles, including energy losses during the charging process.

ICE fuel consumption: Data provided by Consumer Reports, which reports model year 2020 mid-size premium sedans achieve 24.3 MPG on average. This translates to over 400 grams of CO_2e per mile once we account for emissions generated through the extraction, refining and shipment of oil.

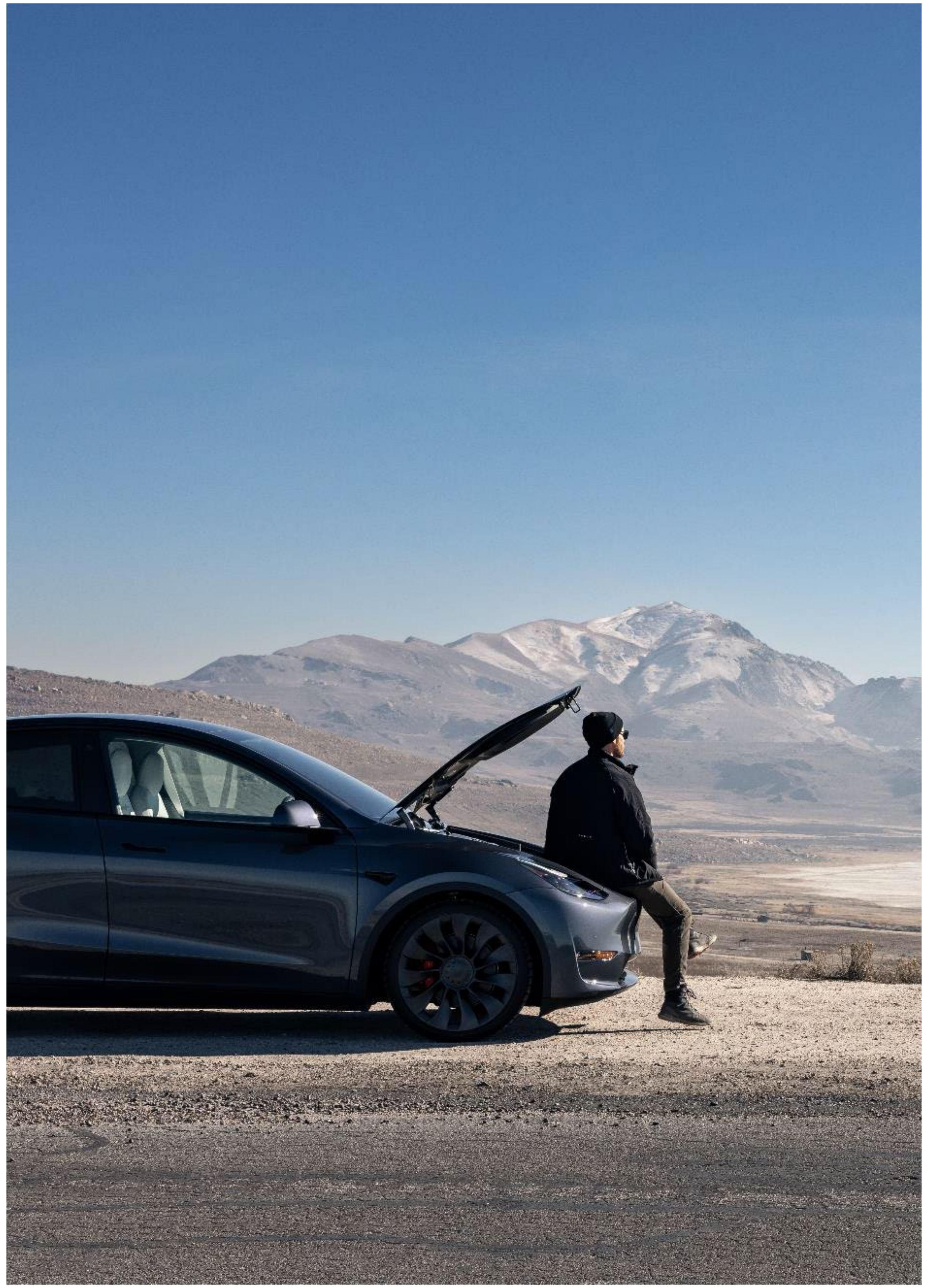
The carbon impact of ICE vehicles remains the same every year of use, but for EVs, it should improve every year

Based on publicly available sales and fleet data, we estimate that an average vehicle in the U.S. is driven slightly less than 12,000 miles per year for about 17 years before it is scrapped. Furthermore, as an ICE vehicle ages, its fuel efficiency only remains stable if serviced properly. On the other hand, electricity generation to charge EVs has become "greener" over time with the addition of cleaner energy sources to the grid. Below, we show zero-emission electricity generation capacity (including nuclear) in the U.S. since 2015. Even without factoring in any changes to federal policy or an acceleration of the adoption of renewables in the U.S. (which is likely), if current trends remain stable, emissions generated through EV charging should continue to decline over time.



[1]NEDC = New European Driving Cycle; WLPT = Worldwide Harmonized Light Vehicles Test Procedure; EPA = U.S. Environmental Protection Agency
[2]2021-2040 Tesla estimate based on recent grid mix shifts. Conservatively assumes no change in federal policy or acceleration of move to renewables in the U.S. for electricity generation.

Lifecycle Analysis of Tesla EVs vs. Equivalent ICE Vehicles



On the following pages, we will show the per mile lifecycle emissions of our vehicles

This includes emissions from upstream supply chain, direct emissions from manufacturing and electricity consumption and use-phase emissions when charged from a grid with a generation mix that reflects the geographic distribution of Model 3 and Model Y deliveries in the U.S., Europe and China. Below are the lifecycle emissions scenarios we show, and the assumptions used in each of the charts on the following pages:

Average Premium ICE: The reference ICE vehicle is based on an average of mid-size premium sedans and mid-size premium crossover SUVs, with a real-world fuel economy of 24.3 MPG.

Model 3/Y* Personal Use (Grid Charged): What emissions per mile could be if a Model 3/Y were principally charged at home from the grid.

Model 3/Y Ridesharing Use (Grid Charged): What emissions per mile could be if a Model 3/Y were used for ridesharing over one million miles using cell chemistry from Tesla energy products, charged from the grid.

Model 3/Y Personal Use (Solar Charged): What emissions per mile could be if a Model 3/Y were principally charged at home using a solar system and energy storage.

Model 3/Y Ridesharing Use (Solar Charged): What emissions per mile could be if a Model 3/Y were used for ridesharing over one million miles using cell chemistry from our energy products and if it were only charged using a solar system and energy storage.

Other assumptions:

- Charging a Model 3/Y using solar panels and a Powerwall adds emissions to the manufacturing phase while reducing use-phase emissions to as low as zero when 100% of charging is done using that system.
- We conservatively assume no additional renewable energy capacity on the grid during the life of the vehicle given the shape of the renewable energy adoption curve is still very much up for debate.
- Manufacturing phase emissions for Model 3/Y in the U.S. represent a Fremont-made vehicle, while manufacturing phase emissions in Europe and China represent a China-made vehicle.

* This year we have added the impact of Model Y to the emissions per mile calculation in our LCA. Given that Model 3 and Model Y have 70%+ parts commonality and share many manufacturing processes their GHG footprints are very similar. We have decided to present the LCA as a weighted average of Model 3 and Model Y based on production share for each vehicle (for manufacturing phase emissions) and delivery volumes in each region (for use-phase emissions).

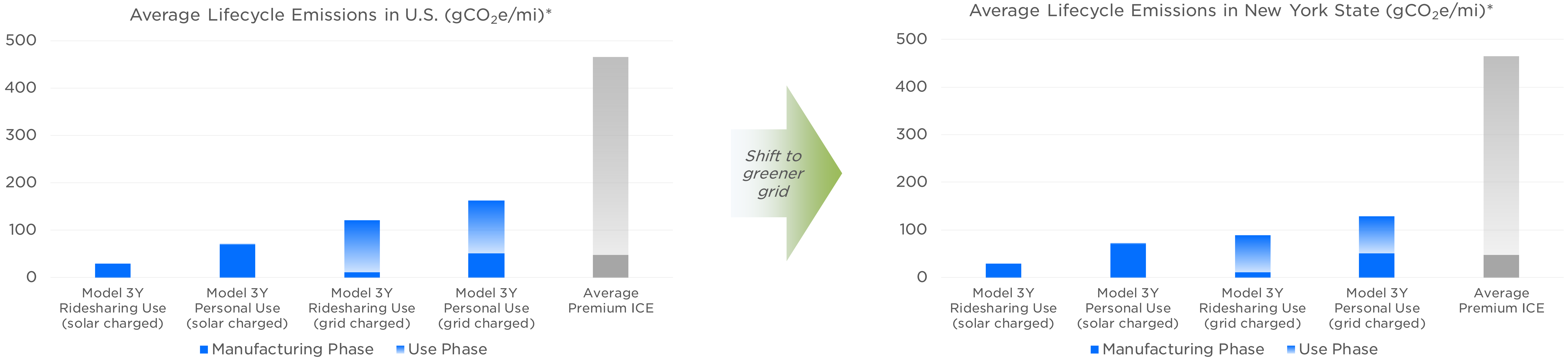
EV vs. ICE Vehicle Emissions per Mile

United States

The electricity grid keeps getting cleaner, while emissions from ICE vehicles do not

To put this in perspective, average GHG emissions from charging one New York-based Tesla vehicle equates to the emissions from an ICE vehicle with a fuel economy of 109 MPG (no such vehicle is on the market). Even when charging a Tesla in Michigan, where approximately 60% of energy comes from natural gas and coal, the emissions from our vehicles still equates to the emissions from an ICE vehicle with 52 real-world MPG (considerably more in terms of EPA rated MPG). As more regions adopt sustainable energy solutions to generate power, emissions related to charging an EV from the grid will decrease even further.

EV customers can increase their renewable energy mix by installing solar panels or a Solar Roof and an energy storage solution, such as Powerwall, in their homes. This dramatically reduces the lifetime carbon footprint of an EV, even when accounting for the carbon footprint of both the solar panel/Solar Roof and Powerwall manufacturing and upstream supply chain.



*gCO2e/mi = grams of CO_2-equivalent per mile driven

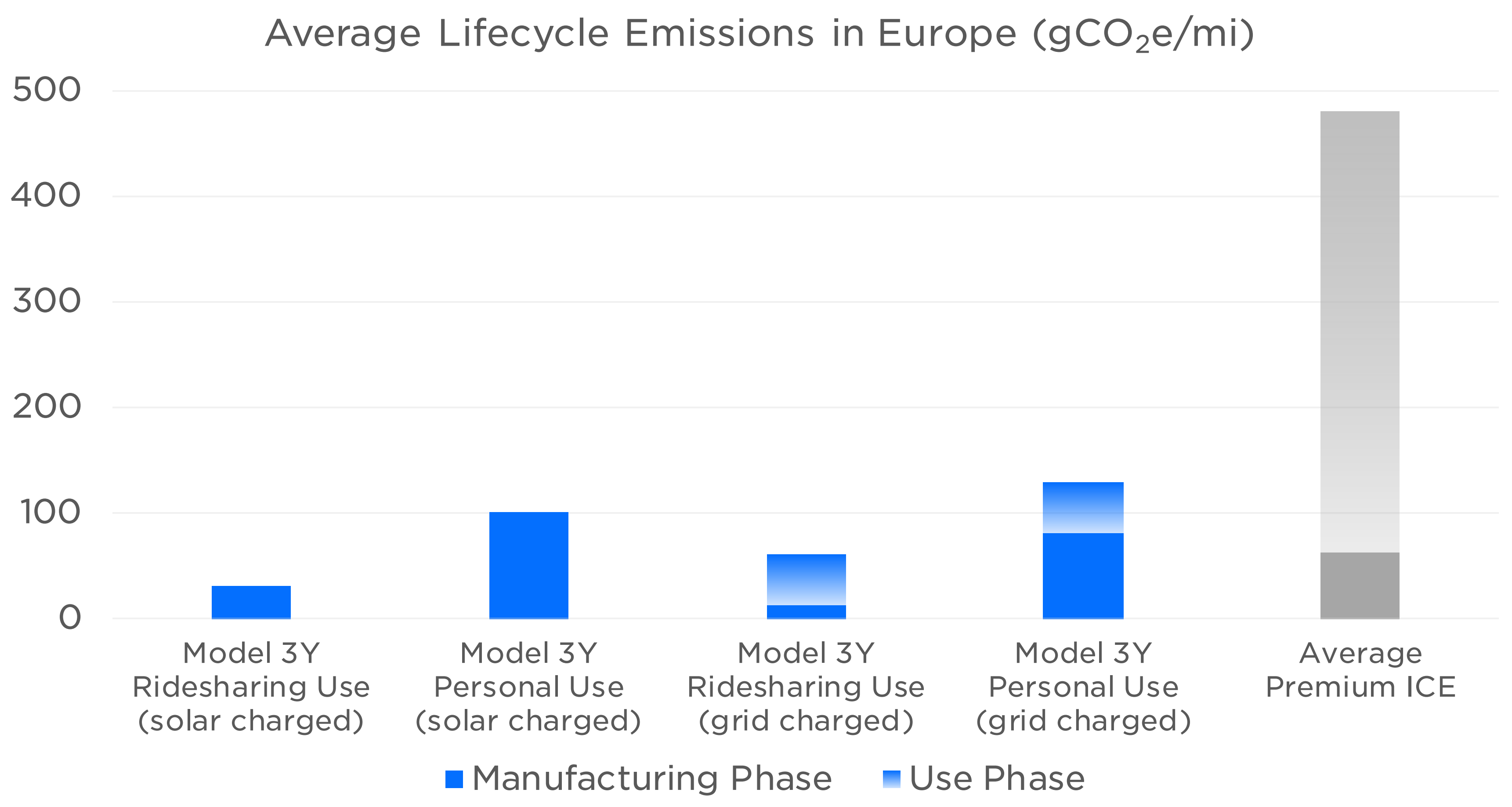
EV vs. ICE Vehicle Emissions per Mile
European Union, U.K. & EFTA

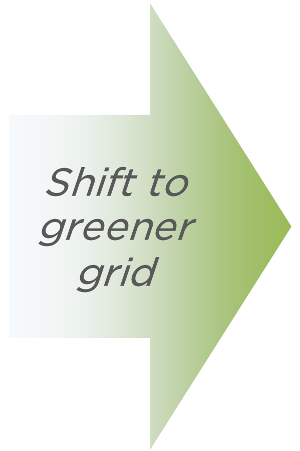
A cleaner grid in Europe means a bigger emissions gap between Model 3 and a comparable ICE vehicle

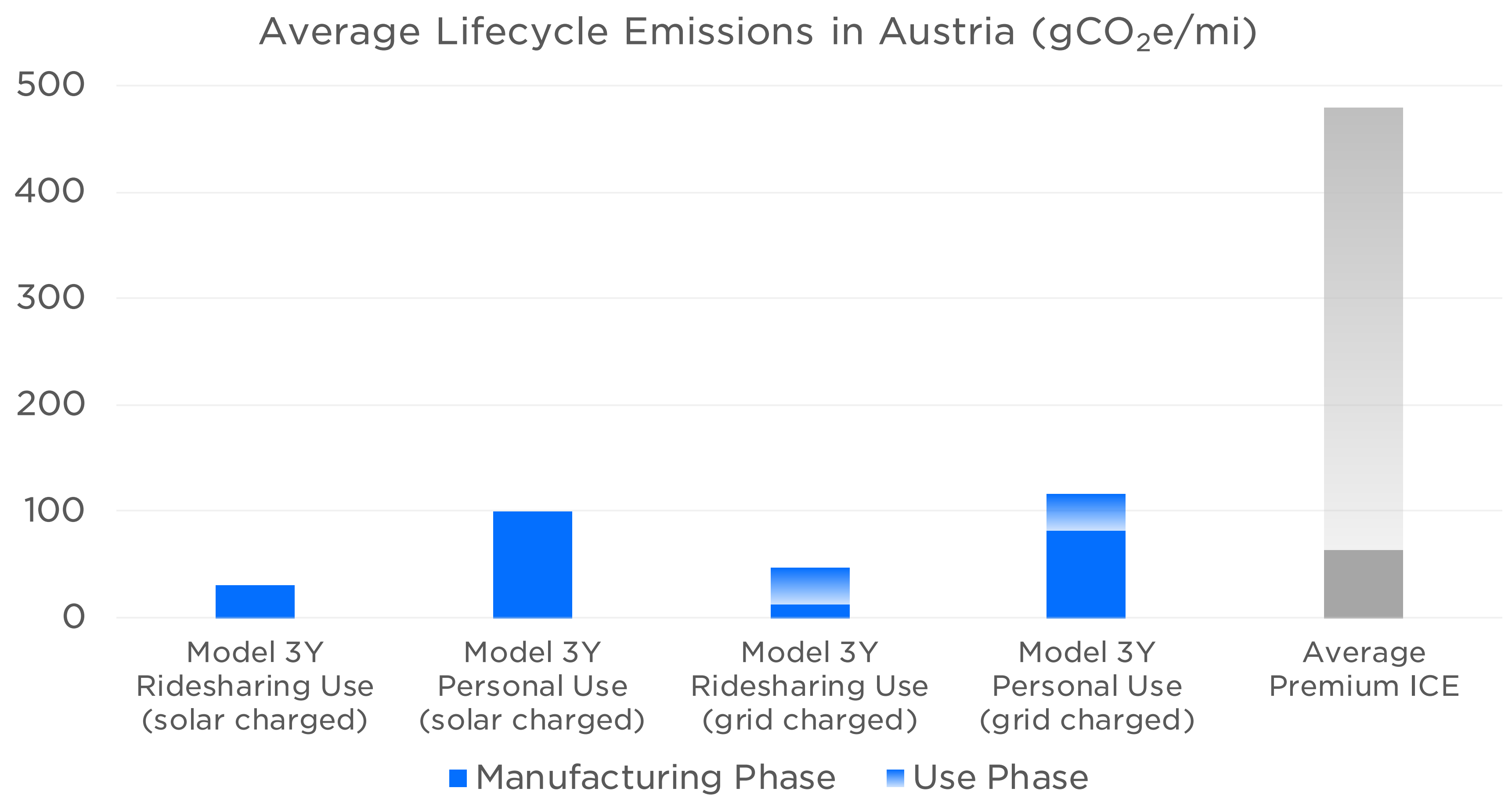
In Europe, the U.K. and EFTA (Iceland, Liechtenstein, Norway and Switzerland), larger portions of energy generation come from either renewable sources or nuclear, which means that in Europe the use-phase emissions gap between ICEs and EVs is even wider than it is in the U.S.

On the other hand, since an average European driver covers fewer miles per year than a U.S. driver, emissions from the manufacturing phase are divided by fewer miles. While in the U.S., an average vehicle covers 200,000 miles before getting scrapped, in Europe, total mileage is closer to 150,000 miles.

We used Austria as an example of how use-phase emissions should evolve once the European grid becomes greener. As seen in the chart on the right, in Austria, all-in lifecycle emissions of a personal, grid-charged Model 3Y are over 3.5x lower than all-in lifecycle emissions of an equivalent ICE vehicle.







EV vs. ICE Vehicle Emissions per Mile

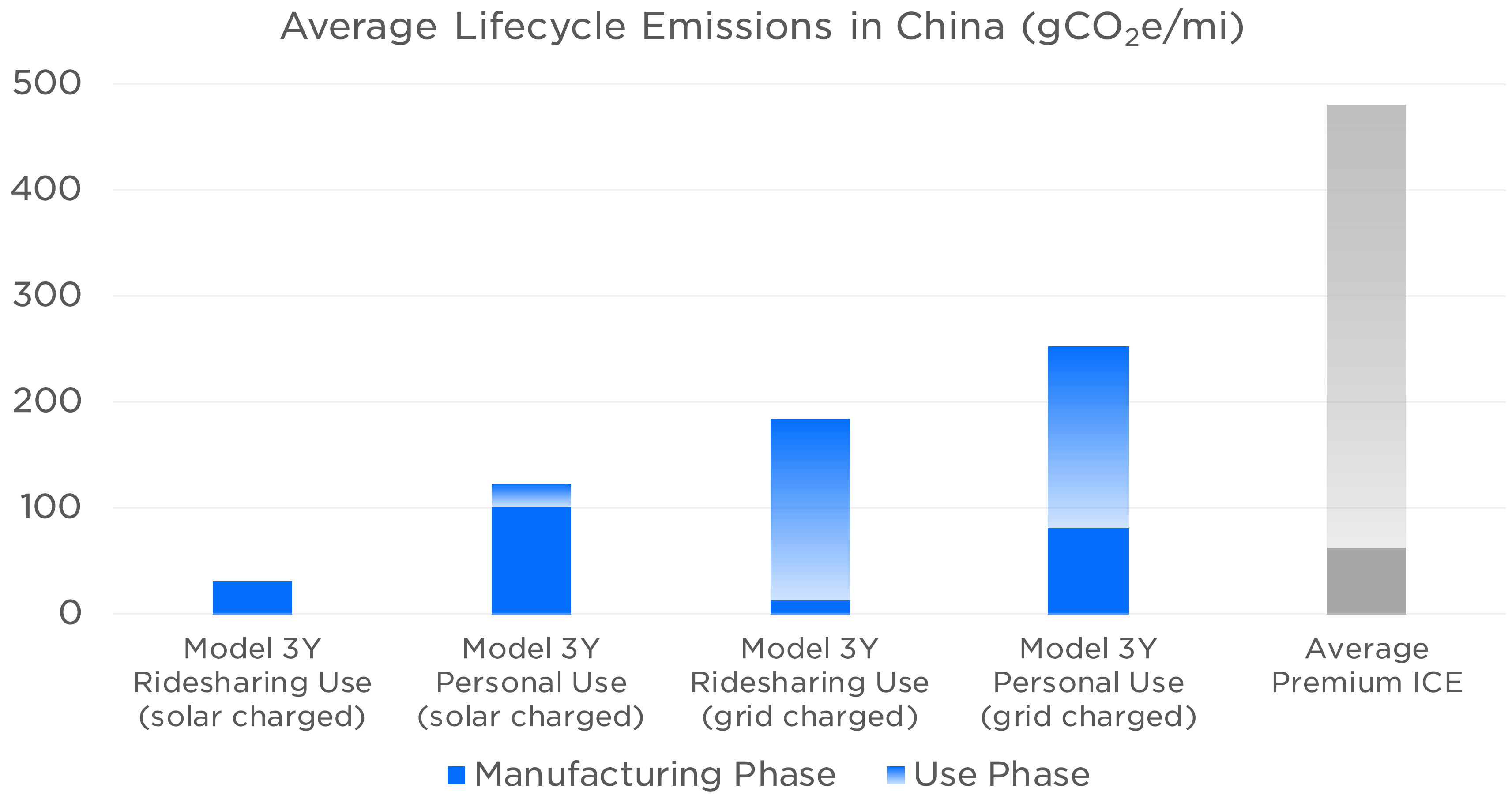
China

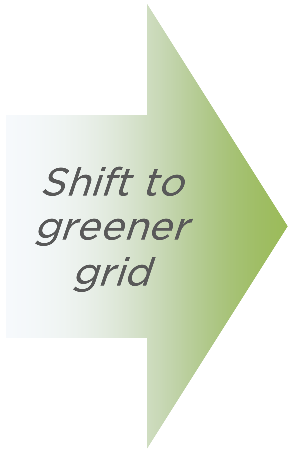
Despite a higher-emissions grid in China, Model 3 still has lower emissions than comparable ICE vehicles

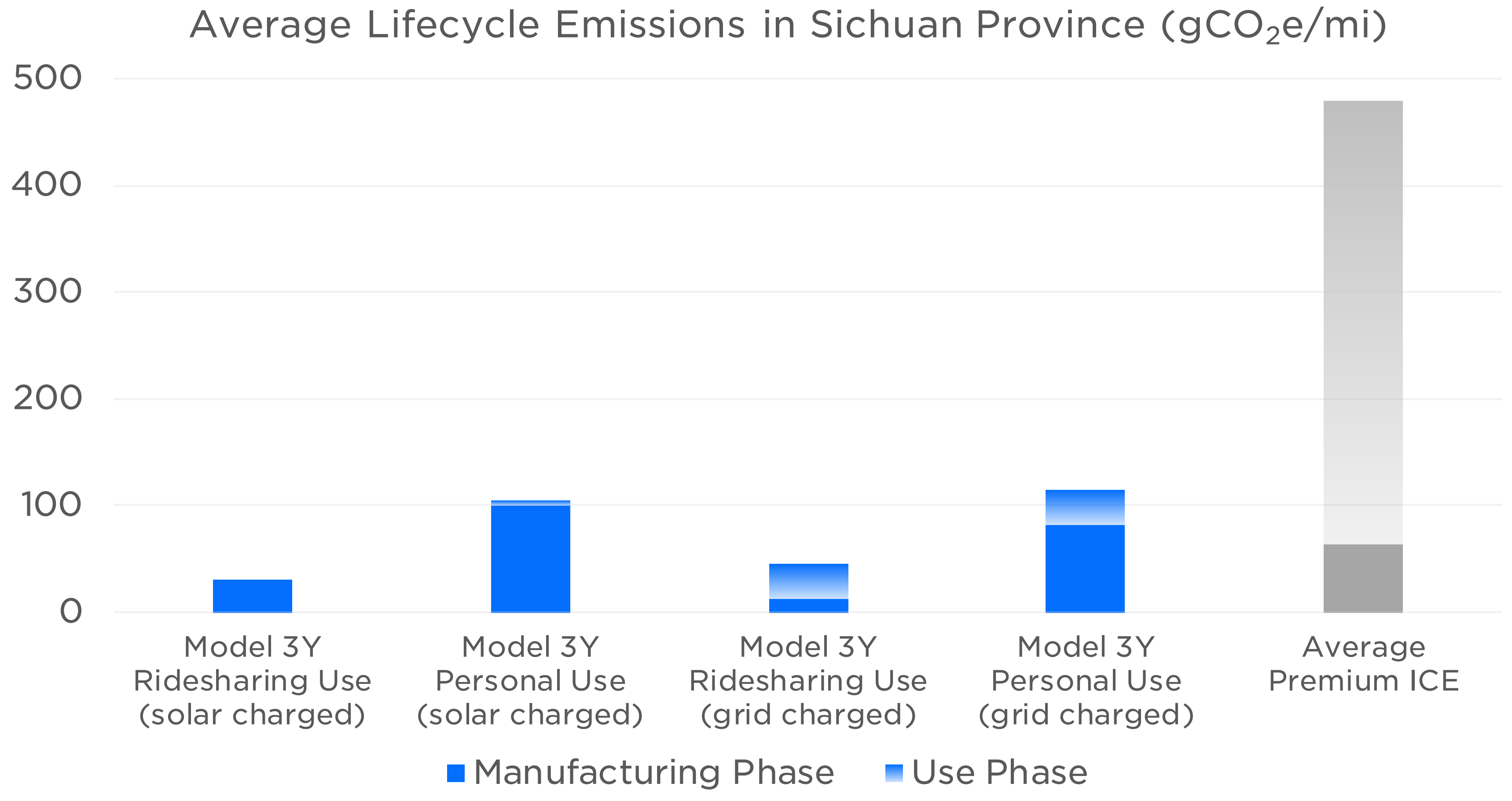
In China, much of the grid is powered by coal. That said, even in this scenario, charging a Tesla Model 3Y from the grid is still less emission intensive than running an ICE vehicle. Just like in Europe, we have assumed a vehicle lifetime of 150,000 miles.

We are expecting the grid mix in China to improve dramatically over time as China remains a dominant deployer and manufacturer of renewable energy. Sichuan Province (with a population of 81 million) is a great example of this. In this province, given the high percentage of renewable energy penetration, charging an EV from the grid is less polluting than charging an EV in most global countries or states.

In conclusion, even as of 2021, charging a Tesla Model 3Y in any of our major markets is more environmentally friendly than burning gasoline. Considering that vehicles are used for 17 to 20 years before getting scrapped, it is reasonable to assume that in the coming years, the gap in emissions per mile between EVs and ICEs will only get wider.







Reducing Carbon Footprint Even Further

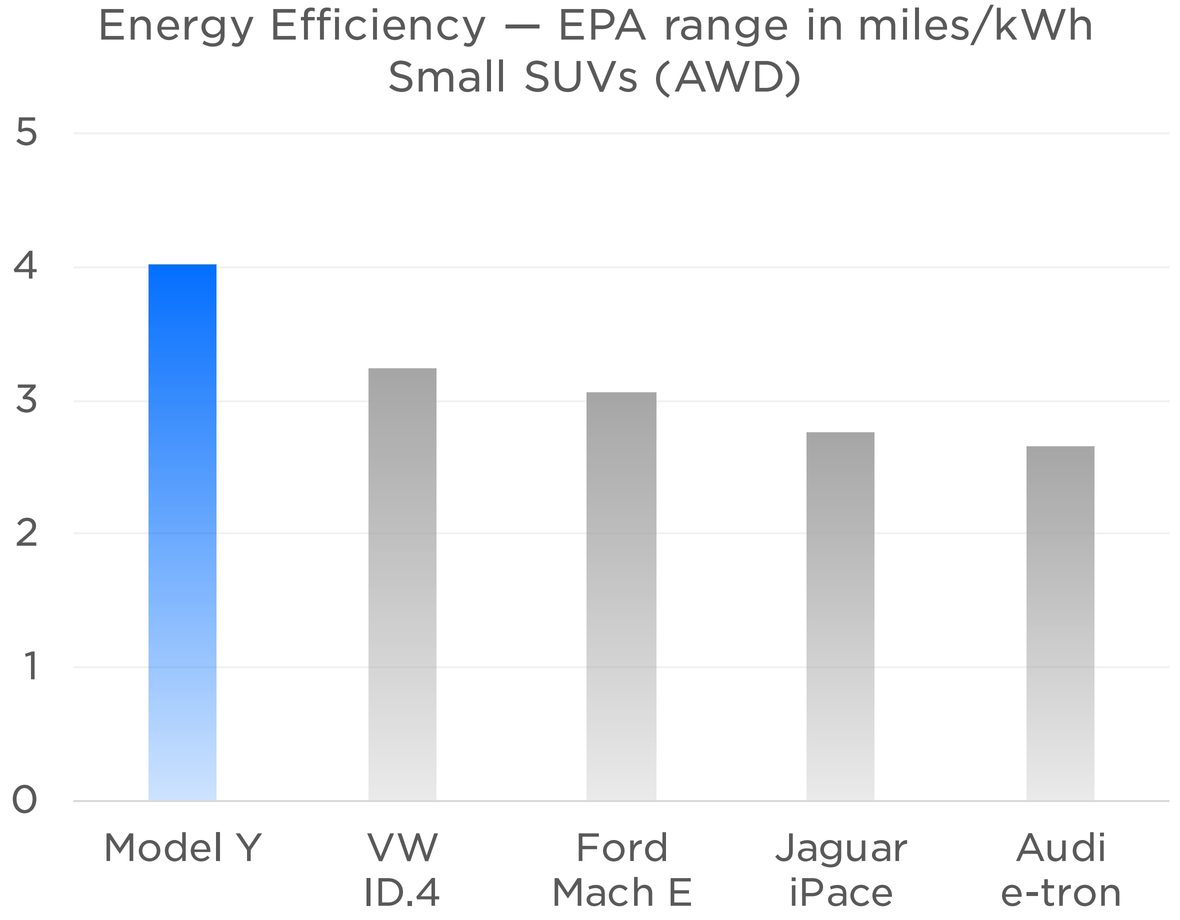
Improving Powertrain Efficiency

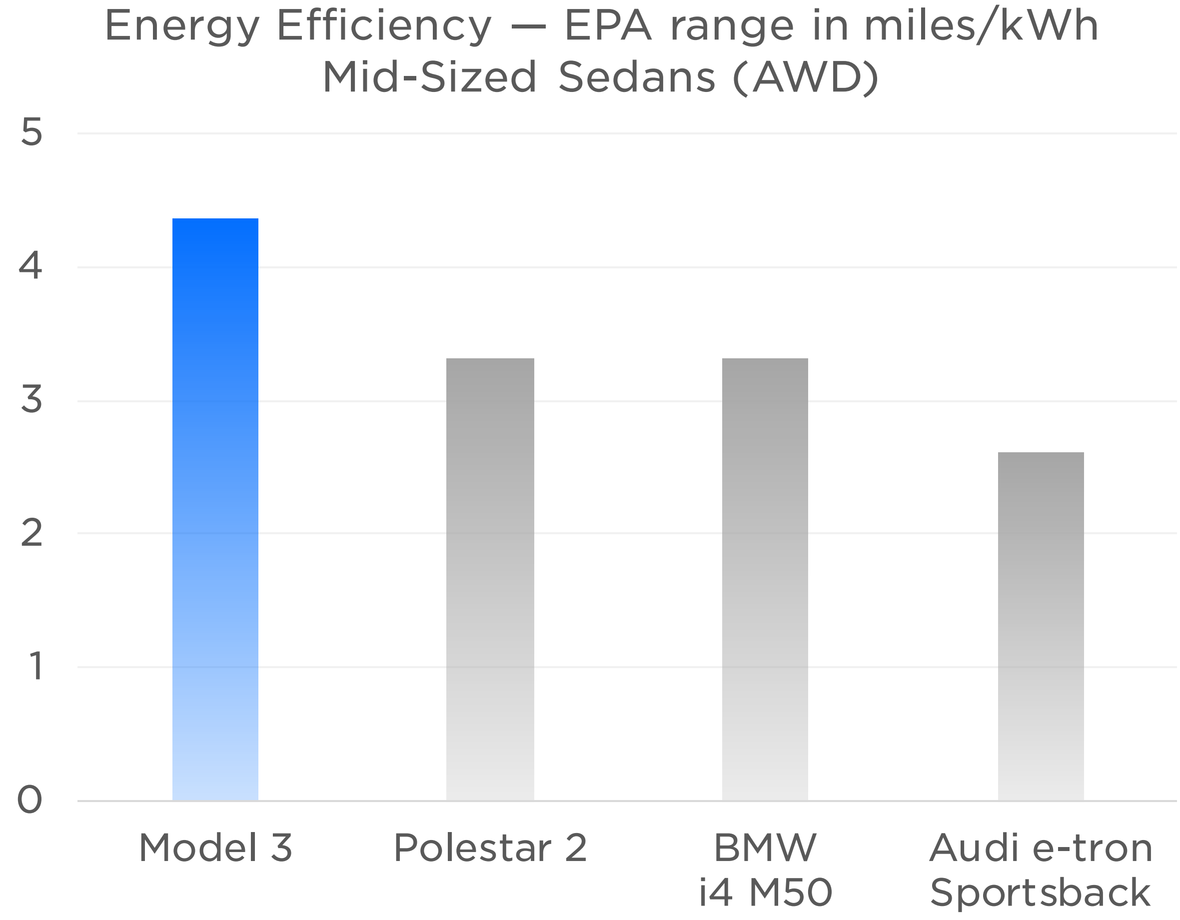
More efficiency than a Prius, performance of a Porsche

Tesla vehicles are among the most efficient EVs built to date. In the early days of Model S production, we were able to achieve energy efficiency of 3.1 EPA miles / kWh. Model Y All-Wheel Drive (AWD) achieves 4.1 EPA miles / kWh, which makes it the most efficient electric SUV produced to date. The gap between Tesla AWD vehicle efficiency continues to stand out compared to competitors in the same segment. While achieving the best-in-class energy efficiency, our AWD models can accelerate to 60 mph in just 4.2 seconds (4.8s for Model Y) and reach a top speed of 145 mph (135 mph for Model Y). In isolation, high energy efficiency is already difficult to achieve, but getting both performance and efficiency is the tricky part.

Tesla Robotaxis will be even more energy efficient

The energy efficiency of Tesla vehicles will continue to improve as we improve our technology and powertrain efficiency. It is also reasonable to assume that our high-mileage products, such as our future Tesla Robotaxis, will be designed for maximum energy efficiency as handling, acceleration and top speed become less relevant. This will minimize cost for our customers as well as reduce the carbon footprint per mile driven.





Source: OEM websites and other publicly available sources

Reducing Carbon Footprint Even Further

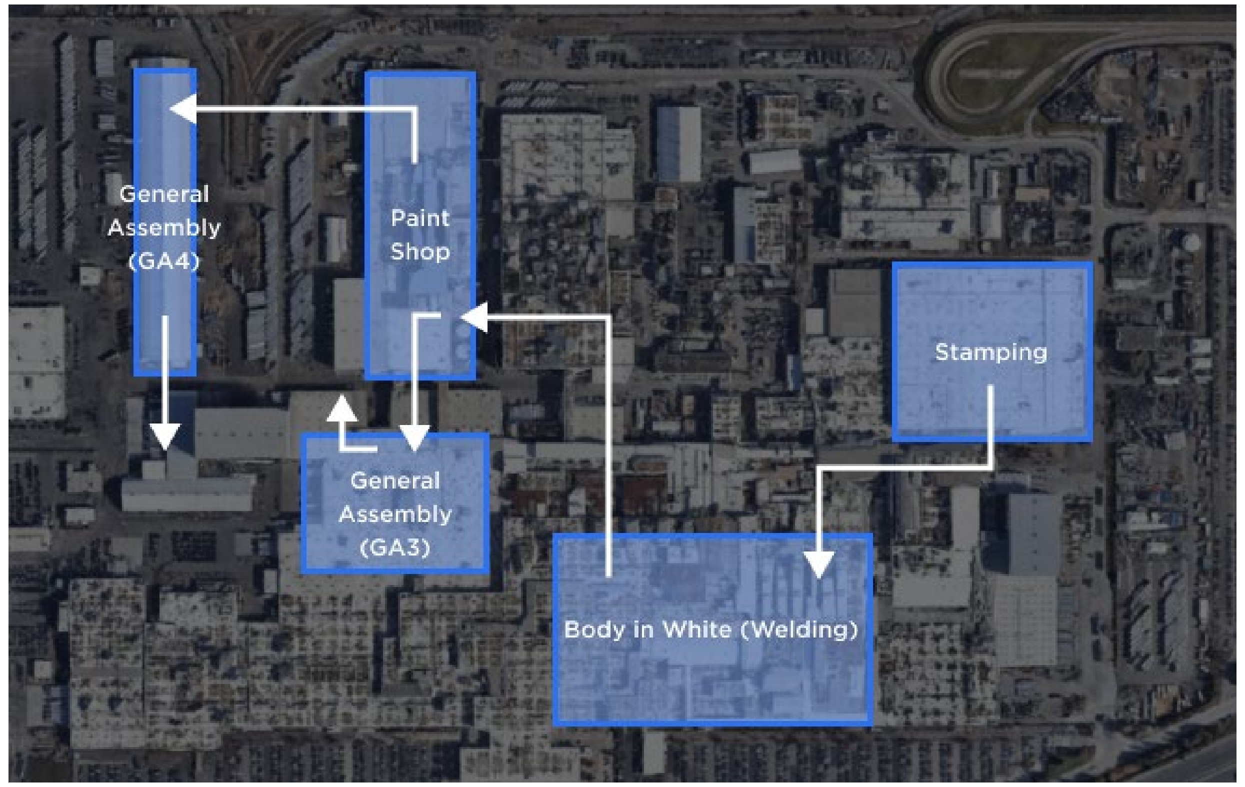
Tesla Manufacturing Footprint:
Current Actions

1. Building new, better designed and more efficient factories

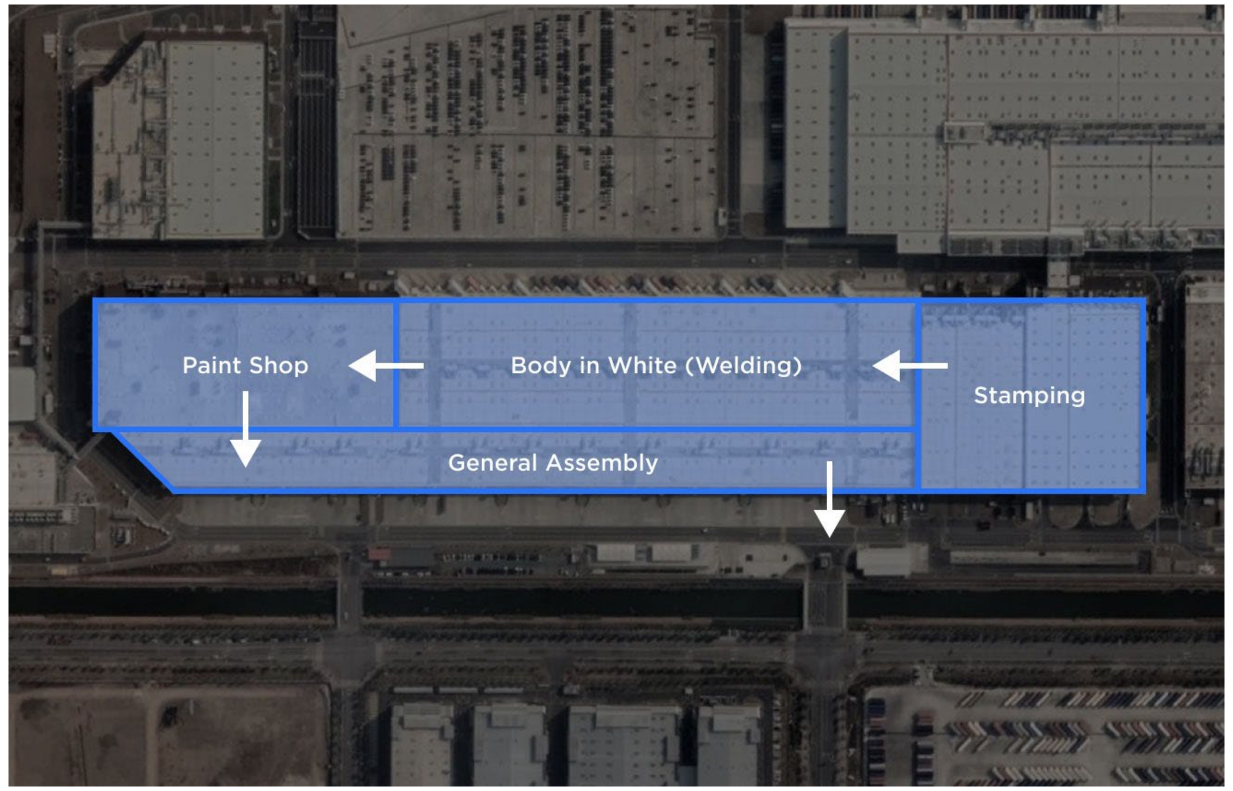
Building a factory from the ground up with sustainability in mind can have a material impact on reducing energy use. For each component that requires less movement around the factory, and as we use fewer robots in the vehicle production process, energy consumption declines.

In our quest for constant improvement, we build each new factory to be better and more sustainable than the previous one. For example, at Gigafactory Texas, we chose highly efficient, insulated, low emissivity windows to reduce building heating and cooling demand. In addition, waste heat recovery from our compressors alone will offset over 1 MW of natural gas consumption for process heating. While we have already completed substantial improvements at Gigafactory Shanghai, further improvements will continue at Gigafactory Berlin-Brandenburg and Gigafactory Texas.

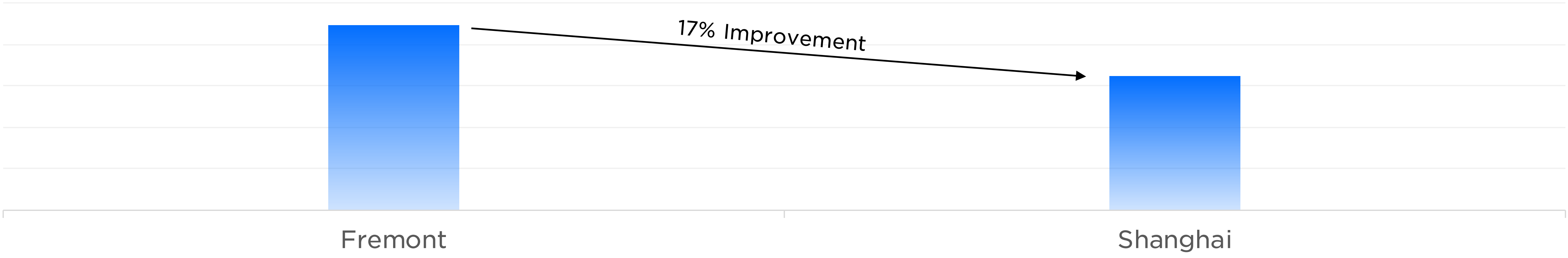
Model 3 in Fremont, CA



Model 3 in Gigafactory Shanghai



kWh of Energy per Vehicle Produced



Reducing Carbon Footprint Even Further

Tesla Manufacturing Footprint: Current Actions

2. Covering roof space with solar panels

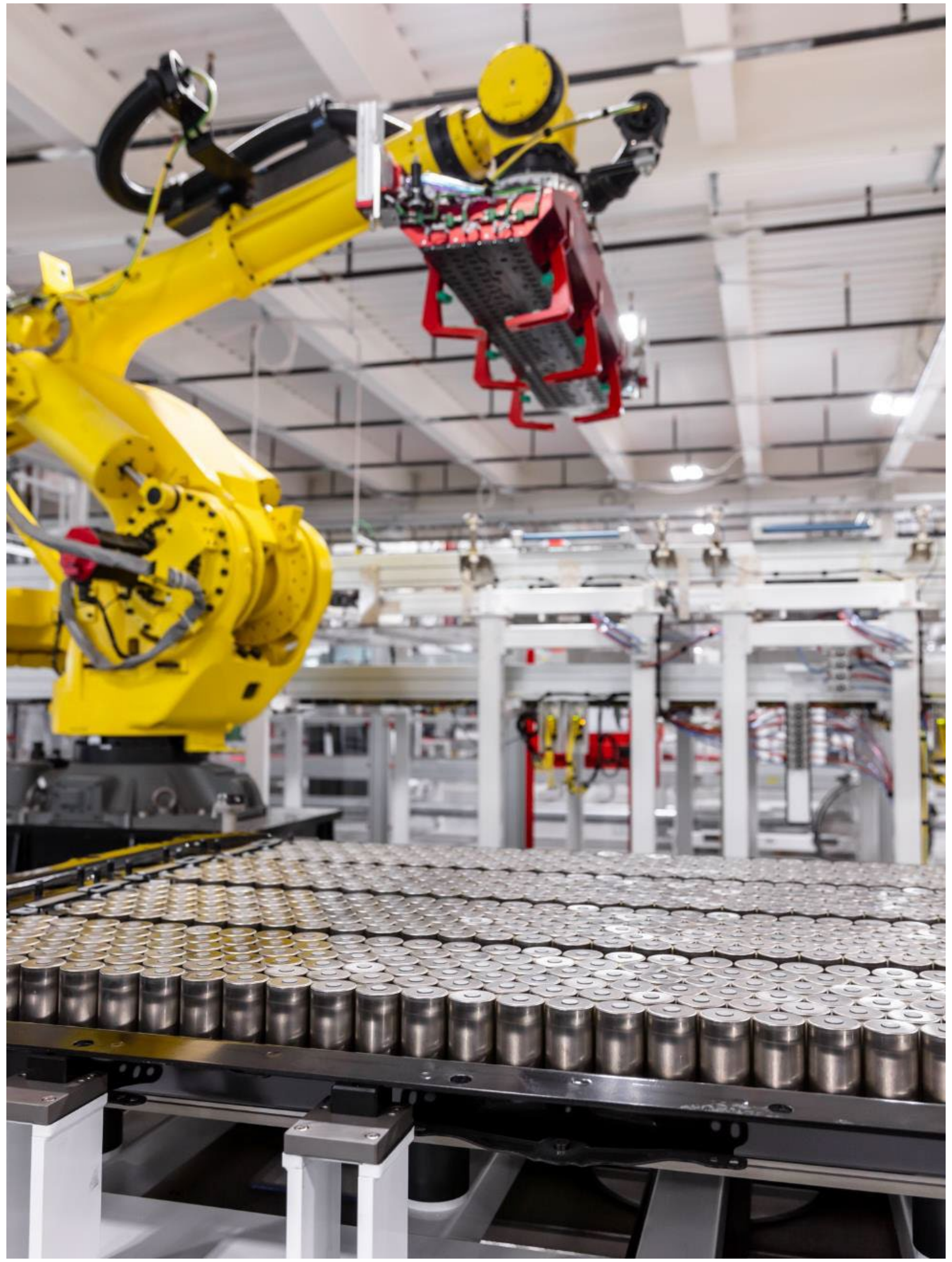
All our new factories are designed to be covered with solar panels. As of the end of 2021, we had installed solar panels with a capacity of 21,405 kW, with the vast majority installed on the roofs of Gigafactory Nevada, Gigafactory New York and our manufacturing facilities in California. We will continue to add more capacity to these and other facilities as space allows and as is economically feasible.

3. Leveraging AI to make our factories more efficient

We are leveraging six years of sensor data from Gigafactory Nevada to train an artificial intelligence (AI) program to safely control 195 interconnected HVAC units, accounting for 6MW of total electrical load. In its first full year of operation, we have measured significant load reduction compared to baseline usage. For such comparison, we look at actual energy usage for the HVAC system for the two modes under the same conditions (operations in the factory, time of year, external temperature, etc.). AI control is expected to achieve significant energy savings for Tesla as it is scaled up to control a majority share of HVAC equipment at Gigafactory Nevada as well as HVAC equipment at other Gigafactories.

Reducing Carbon Footprint Even Further

Tesla Manufacturing Footprint:
Upcoming Plans



We will not be content until all our factories are carbon neutral, and there are other projects that we are working on to further reduce emissions. In order to reduce the cost of our vehicles and batteries, we also need to use less energy to produce them. Many of the projects created to achieve this goal were showcased at our Battery Day presentation in September 2020.

4. Transitioning to in-house manufactured 4680 Tesla cells, whose production process can reduce energy consumption by more than 70%

At Tesla's 2020 Battery Day, we presented a novel way that cells can be manufactured using a dry electrode process. Current electrode production processes involve mixing liquids with cathode or anode powders and using massive machinery to coat and dry the electrode. Since this process involves large ovens, today's cell production consumes a lot of energy. The new dry-electrode process allows for the direct transition from a cathode or anode powder to an electrode film, reducing energy consumption in the overall cell manufacturing phase by more than 70% based on our latest analysis.

5. Utilizing renewable energy as much as possible throughout all our operations

We plan to shift energy consumption toward renewables as quickly as possible throughout our operations, whether it is at our factories, sales, service or delivery locations or through our Supercharger network.

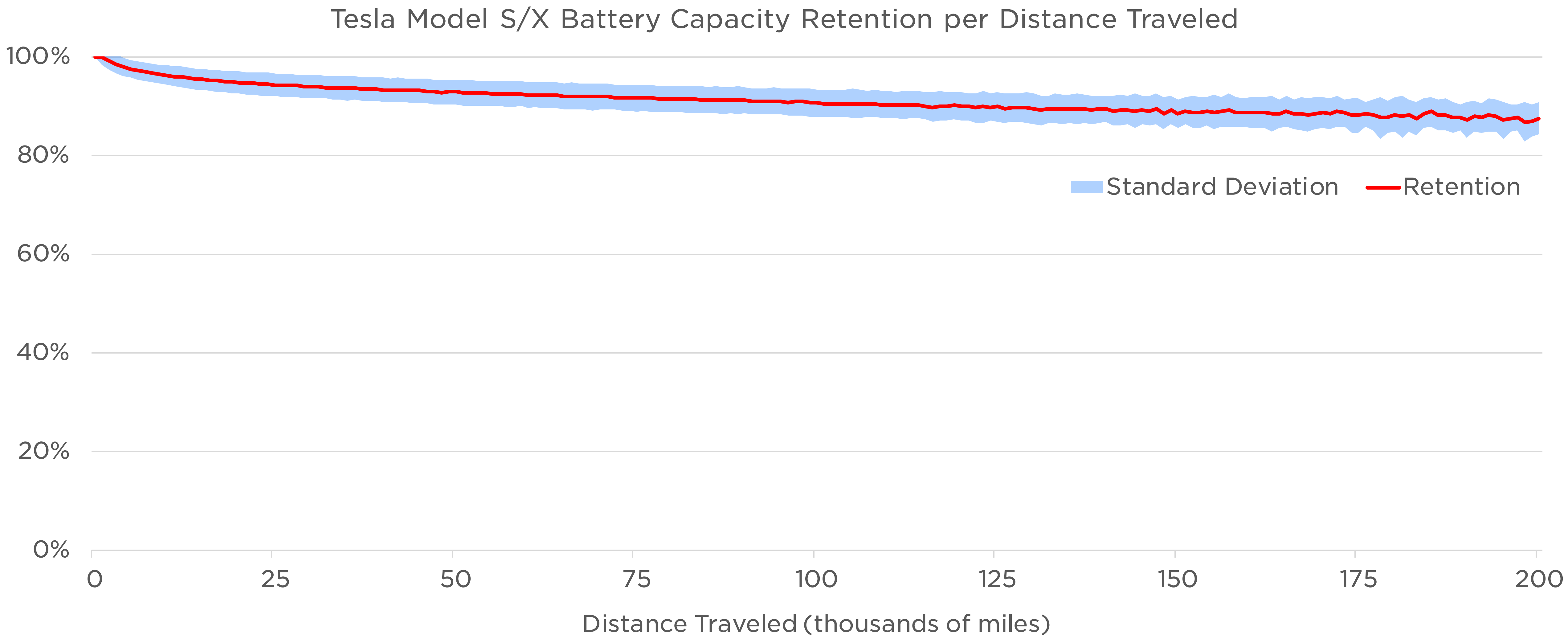
Reducing Carbon Footprint Even Further

Increasing Vehicle Utilization

Our batteries are designed to function for the entire life of the vehicle

Tesla's battery packs are designed to outlast the vehicle. We estimate that a vehicle gets scrapped after approximately 200,000 miles of usage in the U.S. and roughly 150,000 miles in Europe. Creating a battery that could last for 1,000,000 miles (4,000 charging cycles) would dramatically reduce the emissions per mile driven for high-mileage vehicles such as taxis, delivery vans or trucks.

Producing Robotaxis is a core part of our mission. All vehicles in the world combined travel trillions of miles every year. A relatively small number of vehicles, such as taxis, delivery vans, trucks and buses account for a disproportionate amount of vehicle miles and, as a result, a disproportionate amount of emissions. A single future Tesla vehicle with a million-mile battery could be utilized over five-times more than an average vehicle in the U.S. After being fully optimized, and even once it is scrapped, a battery can still be recycled and its materials used in a brand-new battery.



Note: Mileage is only one factor in battery capacity retention; battery age is also a major factor. Retention figures at lower mileages above likely reflect the impact of age while higher mileage values, which come from high-utilization vehicles, likely reflect less influence from battery age. Performance of newer chemistries (not yet shown here) can vary and we plan to expand disclosure once we have sufficient data.

GHG Emissions
Scope 1, 2 and 3

We can make the biggest impact on GHG emissions by selling as many of our products as possible. Undoubtedly, the use-phase of our products avoids more lifetime emissions than either our operations or our supply chain could. However, in support of our mission, we track and try to minimize emissions that result from our full value chain, including our supply chain, manufacturing processes as well as our sales, service and delivery activities.

In 2021, we began measuring our Scope 1 and Scope 2 GHG emissions considering the principles and guidance of the GHG Protocol. We used the operational control approach methodology – accounting for GHG emissions from operations under our control. For detailed information on the scope of our calculations, please see page 139-142 of this report.

While our total Scope 1 and Scope 2 emissions may increase on an absolute basis in the near term as we continue to open new factories, our goal is to reduce the emissions intensity from production as we push the boundaries of sustainable manufacturing and improve the efficiency of our operations. As part of our commitment to reducing our overall emissions in the long term we signed up for the Science-Based Target Initiative (SBTi) in 2021.

Metric	Unit of Measure	Manufacturing	SSD[1]	Other[2]	TOTAL
Scope 1 GHG emissions	tCO_2e	124,000	31,000	30,000	185,000*
Scope 2 GHG emissions (location-based)	tCO_2e	342,000	35,000	26,000	403,000*
Scope 3 | Category 11: Use of Sold Products (EV charging)	tCO_2e				1,954,000

[1] SSD = Sales, Service & Delivery
[2] Other includes sites that conduct research & development, administration, energy product warehousing and deployment, and other mixed-used warehousing.
*PwC performed an attest review engagement on this metric. See their report on page 138.

GHG Emissions
Scope 3 Emissions

Scope 3 GHG emissions calculations are highly academic, even those widely used and accepted like the GHG Protocol. Most companies lack primary data as it relates to their supply chain, product use and so on. Therefore, most Scope 3 GHG emissions reporting is done using lofty assumptions as well as estimates from databases – this can lead to figures that are magnitudes off from the actual impact. Tesla has begun to measure the two largest categories within our Scope 3 emissions: those from use of product and our supply chain.

Use of product emissions

Tesla has access to primary data from our over two million vehicles on the road and our fleet of solar and storage products — we can calculate our emissions at a much higher level of accuracy than most manufactures and can therefore develop emissions reduction solutions to match. This also means that we can calculate our use of product emissions year on year — we do not have to estimate emissions over the lifetime of the vehicle because we have primary data.

Supply chain emissions

Prioritizing our supply chain is crucial and we have a lot of work to do to incentivize suppliers to provide energy and emissions data for us to report on. We have already started to identify which materials and processes in our supply chain are key emitters so we can prioritize engagement and projects to address these emissions — see the Supply Chain section for more detail.

The good thing for us is that Tesla's high level of vertical integration and our direct sourcing relationships mean we are positioned to manage upstream emissions better than most.

100% Renewable Supercharger network

Efficiency of an ICE vehicle does not improve throughout its lifetime. EVs will get cleaner over their lifetime as the grid becomes greener. We will continue to look for ways to enable our customers to further reduce their emissions beyond our vehicles — through solar and storage products and software to help differentiate when the grid is greener and pulling more renewable energy like solar or wind.

The global Supercharger network was 100% renewable in 2021, achieved through a combination of onsite resources and annual renewable matching. Additionally, all home charging in California was 100% renewable through annual renewable matching. Therefore, the only emissions from the use of Tesla vehicles were a result of home charging outside of California and use of third-party charging networks.

NO_x, Particulates and Other Pollutants

Pollution from burning fossil fuels leads to eight million premature deaths globally each year

According to recently published research in *Environmental Research* by Harvard University, in collaboration with the University of Birmingham, the University of Leicester and University College London, air pollution causes over eight million premature deaths annually. That is double the previous estimate of deaths from the negative effects of fine-particle pollution and would account for one-in-five premature deaths worldwide. This is a major advantage of EVs that is often forgotten about as the overall EV debate tends to focus on greenhouse gases. EVs are not just about the future of our planet, but very much about addressing preventable deaths today.

While air-quality is often categorized as a problem in developing countries, Nitrogen oxide (NO_x) and other PM2.5 particulates* cause significant issues in developed countries as well. In Europe alone, almost 800,000 people die prematurely every year due to pollution-related illnesses. EVs not only reduce the world's total carbon footprint, but also help to reduce city pollution.

Fine Particulate Air Pollution in Europe (2022)

Tesla Semi

Reducing Fleetwide Emissions

Tesla Semi is critical to our mission to accelerate the world's transition to sustainable energy. Right now, cell availability is the limiting factor for production – a Tesla Semi requires multiple times more cells than a passenger vehicle.

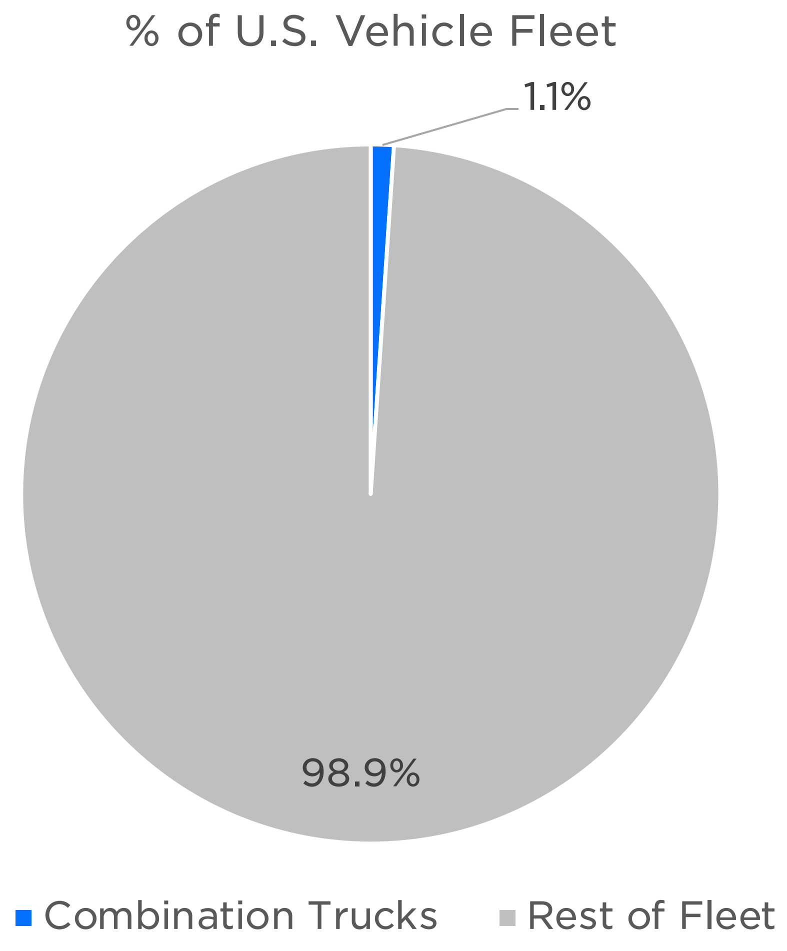
Semi offers an opportunity to have an outsized impact on GHG emissions from transport

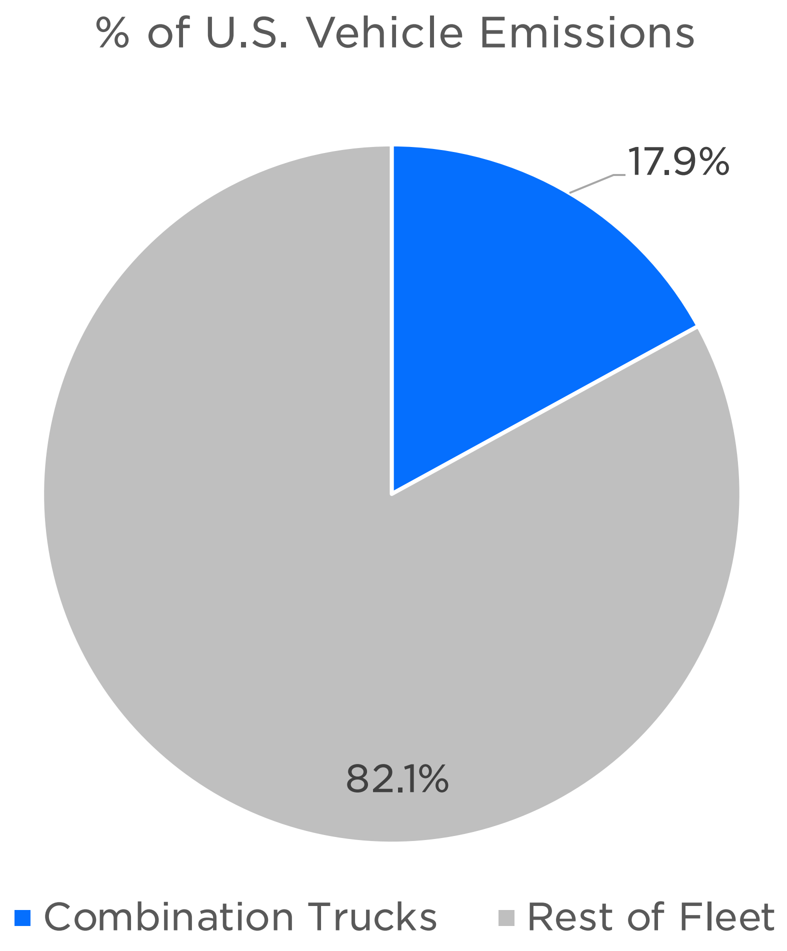
Combination trucks – of which the vast majority are semi trucks – in the U.S. account for just 1.1% of the total fleet of vehicles on the road. That said, because combination trucks have high fuel consumption due to their weight and heavy utilization, they account for approximately 18% of all U.S. vehicle emissions. Electrifying the heavy-duty truck segment is an essential part of transitioning the world to sustainable energy.

Payload equal to a diesel truck

With both the U.S. and E.U. having approved higher weight allowances for electric heavy-duty trucks, we expect the payload to be at least as high as it would be for a diesel truck. In the E.U., electric semi trucks are allowed to be 2 tons (~4,400 pounds) heavier than diesel equivalents, and in the U.S. the allowance is 0.9 tons (2,000 pounds). When fully loaded, the Tesla Semi should be able to achieve over 500 miles of range, achieved through aerodynamics and highly efficient motors. This truck will be able to reach an efficiency of over 0.5 miles per kWh.

While most heavy trucking journeys are shorter than 500 miles, we want long-distance hauling to also be sustainable. We are in the process of developing a Semi charger network at trucking rest stops across the U.S. and Europe, where each Tesla Semi could top up their range.





Waste Generated Per Vehicle Manufactured

As we build more efficient factories, our waste per vehicle decreases

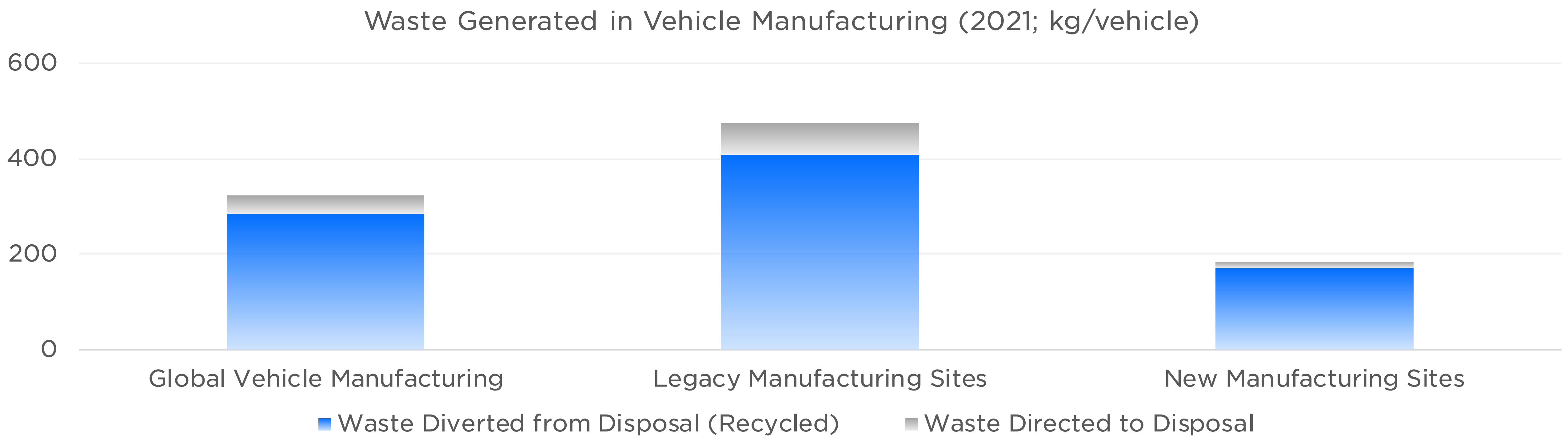
Building localized factories both makes sense economically and reduces waste. First, because the automotive supply chain doesn't have a strong presence on the West Coast of the U.S., many components need to be shipped from long distances, requiring excessive packaging and creating more waste than necessary.

Second, modern factories are better designed for material flow. Trailer entry points surround the whole factory, which means that components can be offloaded precisely at the part of the factory where they are needed. Less material flow results in less waste, because a shorter journey requires less protective packaging. The chart below shows that waste generation per vehicle at Gigafactory Shanghai is less than half of what it is in the U.S. We are expecting our upcoming factories such as Gigafactory Berlin-Brandenburg and Gigafactory Texas to continue the same trend.

Any materials that are possible to recycle, we recycle

The vast majority of generated waste, such as paper, plastics and metals, is recyclable. At Gigafactory Shanghai, for example, just 7% of total waste generated in 2021 was not recyclable.

We push for innovative approaches to reducing waste, which includes reduction of non-recyclable materials in the first place, learning from local factories and deploying improvements globally or working with our logistics team to minimize shipments and packaging per vehicle.



- Global Vehicle Manufacturing = all major factories dedicated to vehicle manufacturing, including the Fremont Factory and supporting facilities, Gigafactory Nevada and Gigafactory Shanghai.
- Legacy Manufacturing Sites = Gigafactory Nevada, Fremont Factory and supporting facilities.
- New Manufacturing Sites = Gigafactory Shanghai.

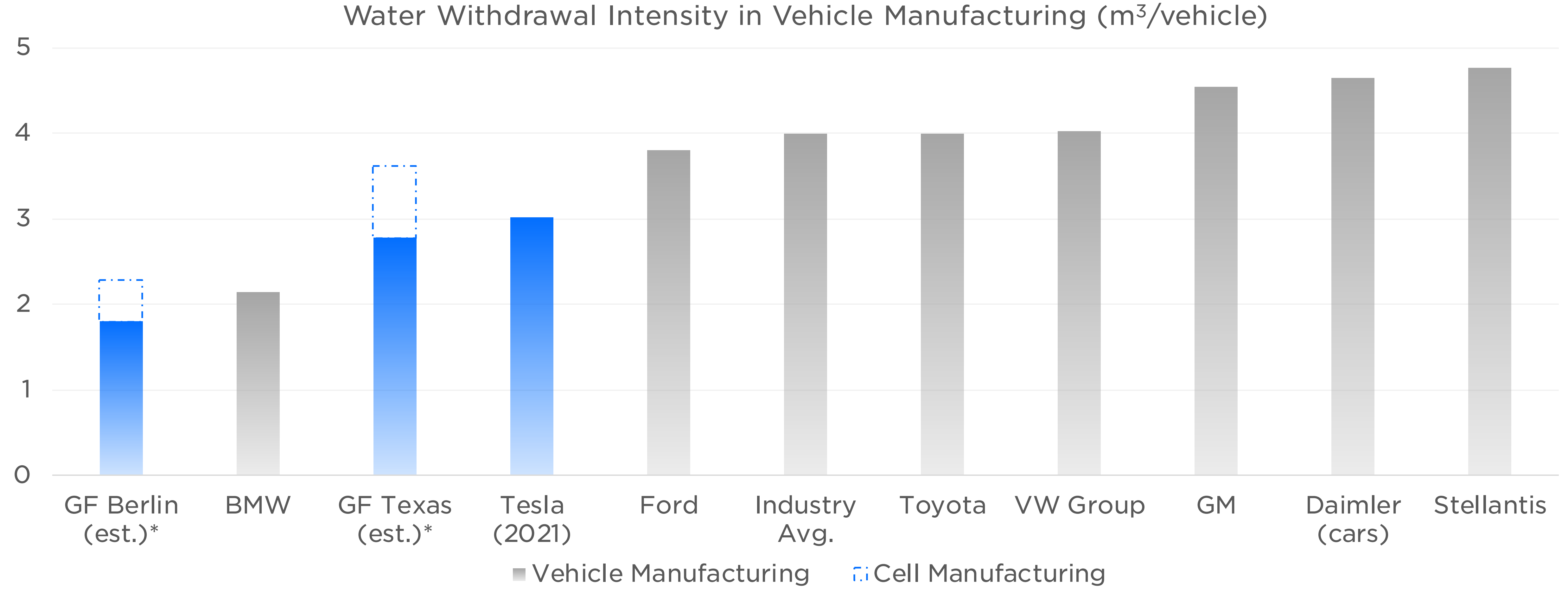
Water Used Per Vehicle Manufactured
Current State

We currently use less water per vehicle than almost any ICE carmaker

There is a misconception that producing an EV requires more water than producing an ICE vehicle. Our data shows this is not the case. While each automaker may draw their boundaries slightly differently (depending on how vertically integrated they are), according to the latest publicly available figures, Tesla withdrew less water at facilities dedicated to vehicle manufacturing per vehicle produced than the majority of established carmakers. Furthermore, the efficient manufacturing design we are implementing at our new factories in Texas and Berlin-Brandenburg will result in further reductions in our water usage per vehicle. Our goal is to have industry-leading low water usage per vehicle, even when accounting for cell manufacturing. The below chart includes our latest estimates for water usage per vehicle at those facilities.

Water usage and power generation

While many recognize the impact that power generation has on GHG emissions, its impact on water consumption is less appreciated. Power generation is one of the leading causes of water withdrawal in the U.S., as water for thermoelectric power is used to generate electricity with steam-driven turbine generators and to cool power-producing equipment. This means that every kilowatt-hour (kWh) of clean solar energy produced not only lowers GHG emissions, but also lowers water consumption.



*Latest estimate for water consumption based on factory design. Actual production figures will not be known until factories are ramped to full production speed.

Water Used Per Vehicle Manufactured

Initiatives at Our Factories

Tesla factories are setting a new standard of water use per vehicle

Water is becoming increasingly scarce as the climate changes. That is why we are reducing our water usage throughout our operations as much as possible. We have prioritized direct use in manufacturing and will continue to explore the rest of our impact throughout the supply chain and in sales, service and delivery.

The “cooling tower makeup” is the single biggest contributor to water usage in any car factory after paint operations. As water that cools machinery evaporates, it needs to be topped up regularly. The total cooling tower makeup could be offset entirely by non-potable sources such as rainwater or wastewater. These are some of the initiatives we are taking at Gigafactory Berlin-Brandenburg and/or Gigafactory Texas in order to reduce water consumption per complete vehicle (including cells).

1. Water intensive process optimization: We are constantly looking into reducing water consumption by optimizing or eliminating water intensive production processes across our operations. At Gigafactory Berlin-Brandenburg, we use hybrid cooling towers, have eliminated quench tanks in casting and introduced cascade rinsing systems in the paint shop and battery can wash process for cell manufacturing.

2. Rainwater and condensate harvesting and reuse: We are planning to capture at least 25% of roof runoff (1 million square feet) to a central underground storage system within Gigafactory Texas. Rainwater will be recycled for use in the cooling of manufacturing equipment. In an average year, such systems should save an estimated 7.5 million gallons of potable city water. Additionally, as hot, humid outdoor air is conditioned, water condenses out of the air. Typically, this condensate is discarded as wastewater. At Gigafactory Texas, we reuse this condensate in our cooling towers and process water systems to offset incoming site water.

3. Reclaimed and recycled water (wastewater reuse): Using local treated wastewater could result in offsetting the entire annual cooling tower makeup water demand with non-drinkable uses. At Gigafactory Texas, this could result in an estimated 40 million gallons of potable city water conserved annually. Reclaimed water is available and under investigation for use at both Gigafactory Texas and Gigafactory Berlin-Brandenburg.

Emissions Credits

Accelerating Deployment of New Factories

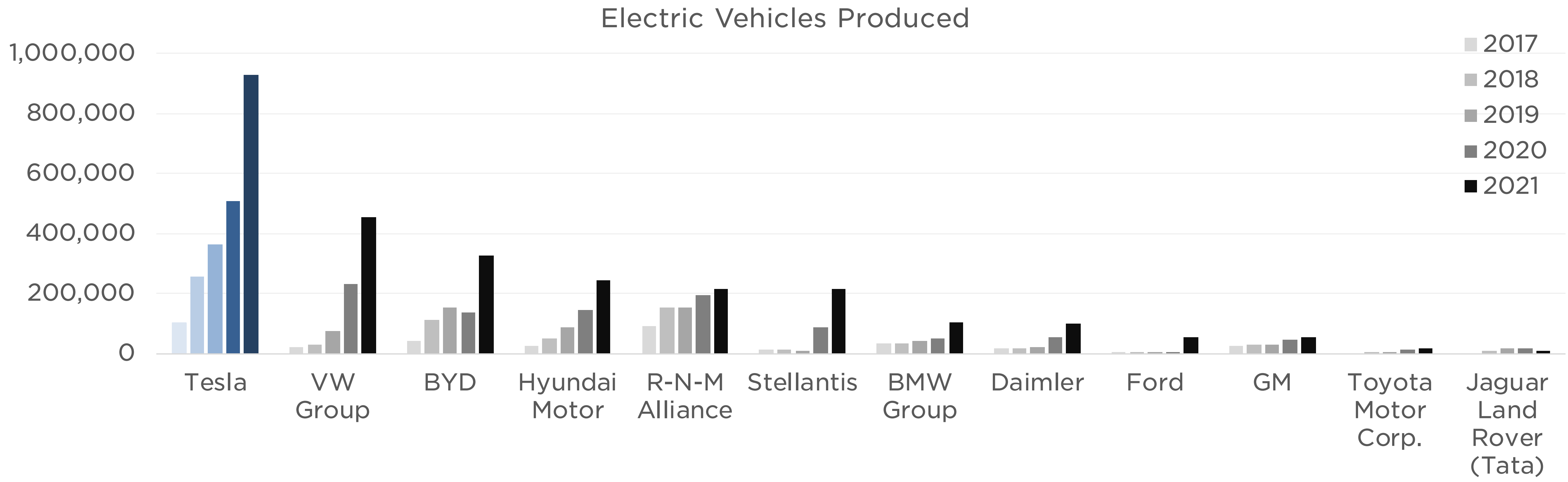
Emissions credit systems around the world are designed to economically benefit companies with non-polluting products by allowing them to sell their credits to polluting companies. In order to meet various countries' emission targets and avoid government fines, polluting companies pay non-polluting companies through credit purchases. The goal of this system is for every OEM to be incentivized to reduce emissions and themselves become non-polluting by selling more of their own manufactured EVs instead of paying another company for their non-polluting credits.

Emissions credit revenue is used for EV capacity expansion, which in turn displaces ICEs

In 2021, we generated almost $1.5 billion in revenue selling zero-emission regulatory credits to other OEMs. Proceeds from such sales will go towards building new factories to produce EVs that will continue to displace ICE vehicles. While it is common practice today for ICE vehicle OEMs to purchase regulatory credits from other companies (such as Tesla) to offset their total GHG emissions, it is not a sustainable strategy. In order to meet increasingly strict regulatory requirements across the world, OEMs will be forced to develop truly competitive EVs.

EV sales by all carmakers need to accelerate, taking market share from ICEs

In 2021, Tesla delivered almost 1 million EVs globally. We hope that every car manufacturer will strive to produce hundreds of thousands of EVs per year, as significant reduction of emissions will only be achieved if all carmakers push for an industry-wide shift to EVs.



Source: EV-volumes.com; Micro-cars not included. Tesla data are production volumes; other OEMs sales and delivery volumes are assumed to approximate their production for the year.

Supply Chain

Supply Chain
Introduction

What do we see as impact?

Protecting human rights and the environment is core to our procurement strategy. Tesla creates our products from many different materials and components, some of which we purchase from our direct (Tier 1) suppliers. Many of our Tier 1 suppliers do not purchase all their raw materials directly, rather they get them from their suppliers and sub-suppliers around the world through a complex supply chain. Though we believe that battery recycling will play a critical role in supplying a portion of these materials to enable a closed loop supply chain, we recognize that global battery cell production will continue to rely heavily on primary, mined materials to meet the growing demand for our products.

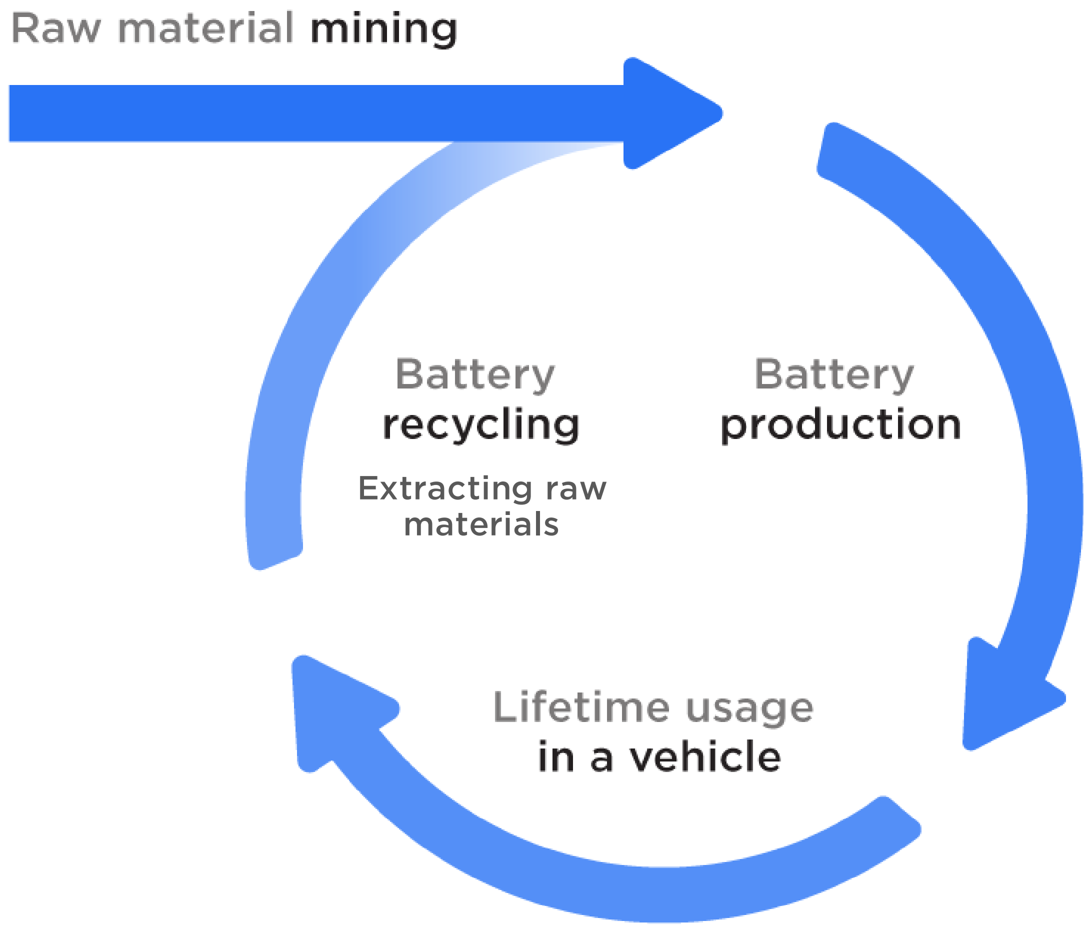
In line with our mission to accelerate the world’s transition to sustainable energy, Tesla is committed to ensuring that companies in our supply chain respect human rights and protect the environment. Our goal is that where Tesla’s supply chain touches, local conditions for stakeholders continuously improve as a result of our purchases. Our responsible sourcing strategy has the following objectives:

1. Increase the share of materials we source directly from suppliers, and those closer to our factories (supply chain localization); and
2. Continue to source globally, to contribute to the improvement of local conditions in our sourcing communities.

Mapping GHG emissions in the battery supply chain is one of our top priorities

Upstream GHG emissions from manufacturing an EV battery – from raw material extraction through refining and transportation of materials – can be meaningful. We estimate that these specific activities cause up to ~80% of the total emissions of a Model 3 battery pack, with the largest contributors at the chemical processing stage. Our battery supply chain GHG emissions hotspot analysis – an industry first – is on page 104 of this report.

Supply Chain
Recycling



A common question we receive is: "What happens to Tesla battery packs once they reach the end of their life?" An important distinction between fossil fuels and lithium-ion batteries as an energy source is that while fossil fuels are extracted and used once, the materials in a lithium-ion battery are recyclable. When petroleum is pumped out of the ground, chemically refined and then burned, it releases toxic emissions into the atmosphere that are not recoverable for reuse. Battery materials, in contrast, are refined and put into a cell and will remain in the cell at the end of their life when they can be recycled to recover valuable materials for reuse, repeatedly.

Longer battery longevity is the most sustainable option

Battery pack life extension is the superior option to recycling for both environmental and business reasons. Before decommissioning and recycling a consumer battery pack, Tesla does everything it can to extend the useful life of each pack, including sending out over-the-air software updates to Tesla vehicles to improve battery efficiency when our engineers find new ways to do so. In addition, any battery that is no longer meeting a customer's needs can be serviced at a Tesla Service Center.

Every battery used in R&D or returned from the field that cannot be re-manufactured is recycled

Tesla batteries, including the battery packs in our vehicles and our energy storage products, are made to last many years, and therefore, we have received a limited number of them back from the field. Most batteries that Tesla recycles today are pre-consumer, coming to us through R&D and quality control. None of our scrapped lithium-ion batteries go to landfills and 100% are recycled. Furthermore, Tesla has an established internal ecosystem to re-manufacture batteries coming from the field to our Service Centers. We actively implement circular economy principles and consider all other options before opting for battery recycling.

The small number of post-consumer batteries that we receive are primarily generated from our fleet of vehicles on the road, predominantly from taxi-like vehicles. Since we have only been producing Model S (our oldest model) for approximately ten years, and our energy storage products for even less time, it will likely be some time before we start receiving back vehicle batteries in larger volumes.

Supply Chain
Recycling

Global annual amount of lithium-ion battery metals sent for recycling

1,500
Tons of Nickel

300
Tons of Copper

200
Tons of Cobalt

A closed-loop battery recycling process presents a compelling solution to move energy supply away from the fossil-fuel based practice of take, make and burn, to a more circular model of recycling end-of-life batteries for reuse over and over again.

While Tesla works with third-party recyclers, we also recycle in-house

In 2020, Tesla successfully installed the first phase of our cell recycling facility at Gigafactory Nevada for in-house processing of both battery manufacturing scrap and end-of-life batteries. While Tesla has worked for years with third-party battery recyclers to ensure our batteries do not end up in a landfill, we understand the importance of also building recycling capacity in-house to supplement these relationships. On-site recycling brings us one step closer to closing the loop on materials generation, allowing for raw material transfer straight to our nickel and cobalt suppliers. The facility unlocks the cycle of innovation for battery recycling at scale, allowing Tesla to rapidly improve current designs through operational learnings and to perform process testing of R&D products. By the end of 2021, this facility achieved a production rate of over 50 tons of recycled material per week.

Every Tesla battery factory will recycle batteries on-site

As the manufacturer of our in-house cell program, we are best positioned to recycle our products efficiently to maximize key battery material recovery. With the implementation of in-house cell manufacturing at Gigafactory Berlin-Brandenburg and Gigafactory Texas, we expect substantial increases in manufacturing scrap globally. We intend to tailor recycling solutions to each location and thereby re-introduce valuable materials back into our manufacturing process. Our goal is to develop a safe recycling process with high recovery rates, low costs and low environmental impact. From an economic perspective, we expect to recognize significant savings over the long term as the costs associated with large-scale battery material recovery and recycling will be far lower than purchasing additional raw materials for cell manufacturing.

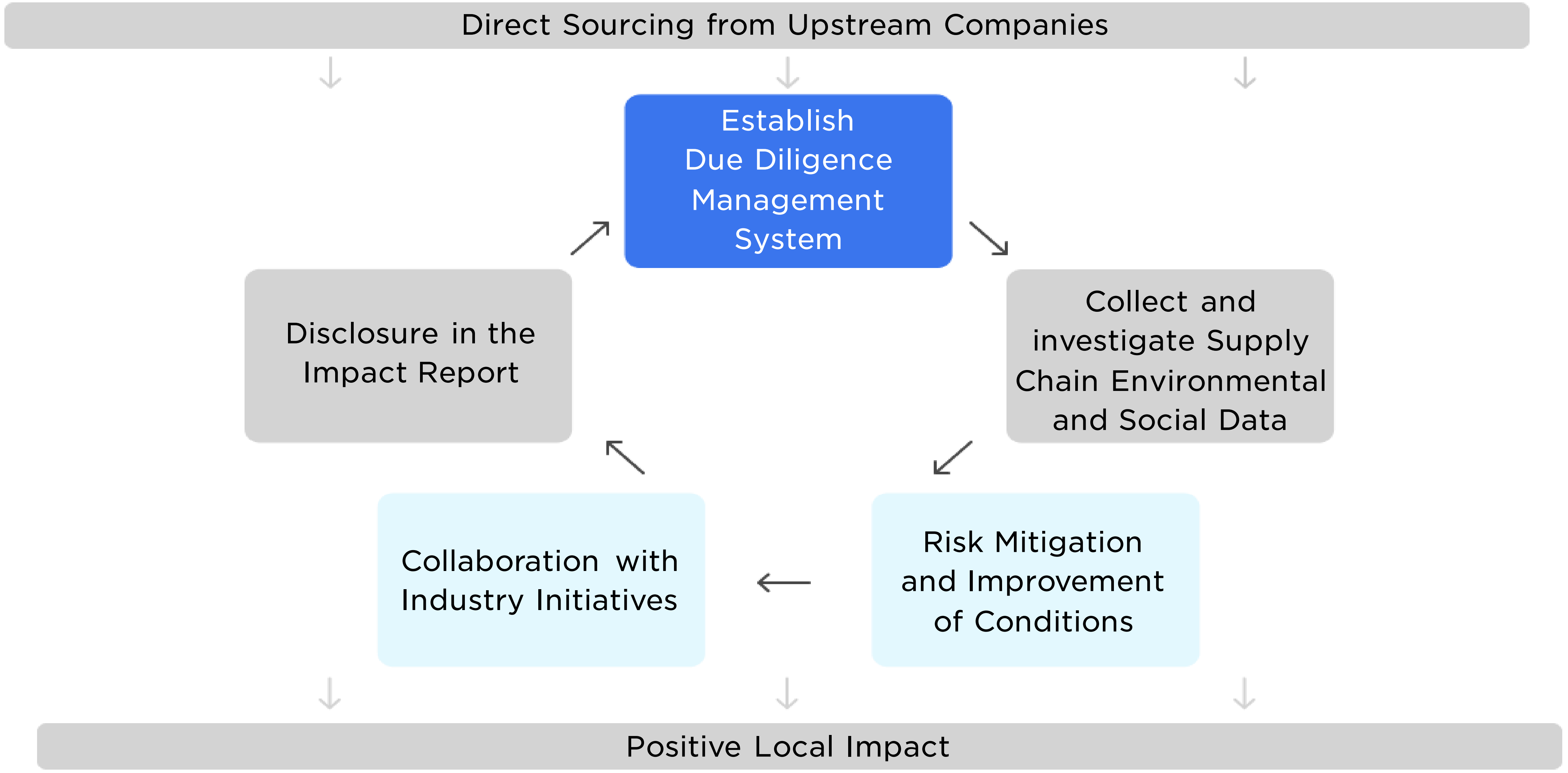
Supply Chain
Alignment with Best Practices

We have high expectations for our suppliers

Tesla is committed to ensuring that our suppliers operate responsibly. We do this by proactively identifying and addressing potential risks in our supply chains. The Tesla Supplier Code of Conduct, Human Rights Policy and Responsible Materials Policy outline Tesla's expectations for suppliers.

We established a responsible sourcing program based on international best practices

Our responsible sourcing program is based on the OECD Due Diligence Guidance for Responsible Mineral Supply Chains. Tesla collects data from its supply chain (including through audits), translates this data into on-the-ground actions and discloses the outcomes in our annual Impact Report.



The next sections will detail how we undertake each of the five steps laid out above, starting with our management system approach.