TEINA Scenarios

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Introduction

The basis of the modeling work performed for the TEINA project is a set of three scenarios, described in
this document, which describe possible economic trajectories for the state. These scenarios are
deliberately constructed as narratives, in order to create a separation between the notional futures they
depict, and the modeling work that converts them into empirical projections for the needed electric
vehicle charging infrastructure in Oregon between 2020 and 2035. This separation allows the trajectory
of future events to be considered independently of actual EV adoption and charging infrastructure
deployment trends, which might otherwise become too much of a central focus for the scenarios and
anchor them to the world as it is, rather than opening them to the world than as it might be.

The scenarios revolve around the impact of the COVID-19 pandemic (hereafter referred to as “the
pandemic”) on the economy, because the vigor of the economy will largely dictate how confident
consumers feel about buying a new vehicle, and as a result, how willing utilities, EV charging network
operators (EVSPs), and the public sector will be to invest in charging infrastructure to support those
vehicles.

The purpose of the study is to bracket the likely future TE charging infrastructure needs of all modes of
electric transportation (including light duty vehicles, transit, delivery, freight, and micromobility
vehicles) measured at three points in time (2025, 2030, and 2035) in order to meet the goals articulated
under 2019 OR SB 1044. Those goals include:

- 50,000 registered ZEVs by 2020
- 250,000 registered ZEVs by 2025
- 25% of registered ZEVs and 50% of new vehicle sales by 2030
- 90% of new vehicle sales by 2035
- 25% of new light-duty vehicles purchased or leased by state agencies are targeted to be ZEVs by
  2025, with exceptions
- All new light-duty vehicle purchases or leases by state agencies are targeted to be ZEVs by 2029

Logically working back from those goals:
We must understand what the economic conditions would need to be in order for the requisite numbers of EVs to be adopted.

In order to understand the economic conditions, we must understand how the state might recover from the impact of the pandemic.

In order to understand the pace of recovery, we must imagine how the state and its citizens respond to the trajectories of infection, the availability and efficacy of vaccines, and the various forms of support and stimulus offered by the states and the federal government.

Scenario overview
Each of the three scenarios imagines a different trajectory for the Oregon economy between 2020 and 2035.

As a separate exercise, these scenarios will be used as a basis for a data model that depicts how EV adoption and charging infrastructure deployment might proceed under each scenario.

The scenarios contemplate a number of factors, such as:

- overall economic vigor and activity
- evolving technologies
- consumer preferences
- future policies
- the changing cost of charging
- potentially changing demographics
- the economic effects of the Covid-19 pandemic
- how utility tariffs and infrastructure investment programs might evolve to accommodate the growing demand for transportation electrification
- how utility tariffs and investments may feed back onto the transportation sector, potentially changing demand levels, costs, and charging behaviors.

A brief summary of each scenario follows.

**Scenario 1: Life as if the pandemic never happened**

Before the pandemic, EV adoption and charging infrastructure deployment in Oregon were proceeding nicely. In 2018, Oregon was the number three state in the union in EV market share, behind only California and Washington. Therefore, it makes sense to consider what the trajectories of electrification might look like had the pandemic never happened. In this study, we use this scenario as a baseline for comparison to the other two scenarios, and as a proxy for what a “business as usual” outlook might have been.

**Scenario 2: Rapid recovery**

This “rapid recovery” scenario assumes that one or more vaccines are widely deployed such that the overall U.S. economy quickly returns to its previous vigor by the end of 2021. Considering the current understanding that at least two vaccines offer high (~95%) levels of efficacy, with more vaccines on the way, as well as the current expectation is that enough of the vaccines can be manufactured, delivered,
and administered to enough of the U.S. population to achieve “herd immunity” at some point in 2021, this scenario will serve as a proxy for an “optimistic” outlook.

Scenario 3: Slow recovery

This “slow recovery” scenario imagines a future in which economic activity remains depressed through the end of 2024, before quickly recovering to full vigor toward the end of the forecast period. This late, quick recovery is necessary in order to meet the objectives set out in SB 1044 by 2035, as all three of the scenarios must do.

This scenario contemplates possible logistical issues in distributing the vaccine (which have already occurred during the initial rollout); uncertain vaccine efficacy (which will probably not be known until the second quarter of 2021 or later); rapid mutations in dominant coronavirus strains (which we are already seeing) that render the vaccines less effective; severe and debilitating long-term effects of the virus (which we are already seeing in some “long haulers” who have been infected and ‘recovered’) that make it difficult for people to return to their work and their normal lives; and poor vaccine uptake among “anti-vaxxers” such that it is harder to achieve ‘herd immunity’ and restore the economy to full operation. As such, this scenario serves as a “pessimistic” outlook.

Scenarios in detail

Here we describe the scenarios in detail, and consider how each one might affect the factors we will consider in the modeling exercise.

Scenario 1: Business as usual—Life as if the pandemic never happened

This scenario uses the EV adoption and charging infrastructure trends that existed before 2020 as a basis, and then applies a classic technology adoption S-curve to depict how those trends might have continued through 2035 had the pandemic never happened. This scenario will function as a baseline for comparison to the other two scenarios, and as a proxy for what a “business as usual” outlook might have been. For example, if the economy reverts to the historical mean within two or three years, then the “rapid recovery” scenario would depict an unrealistically rapid economic recovery while the “slow recovery” scenario would depict an unrealistically slow economic recovery, and this scenario would offer a more accurate view of the future.

Narrative

A fundamental economic vitality drives Oregon forward through 2035 at the same rates it had from 2009–2019, with a CAGR for real GDP of 3.2% and a per-capita personal income growth rate of 4.1%. The largest industries in Oregon continue to grow at 2019 rates: finance, insurance, real estate, rental and leasing at 2.3%, and government and government enterprises at 1.7% real growth.

Population distribution is expected to remain roughly the same as it was in 2019, with no major changes in the balance between urban and rural. However, urban areas continue to attract young urban professionals moving from other states.

With roughly half the GDP provided by professional services, disposable income is strong enough to ensure steady and growing demand for personal vehicles from a significant population that largely supports taking personal action on climate.

EV sales continue to be strong. In 2018, Oregon ranked third in the country for EV market share, at 3.41% and 2019 sales should have grown beyond 2018 sales.
The strong EV adoption trends give EVSPs confidence in continuing to expand their charging networks throughout the state, and especially in the urban areas where EV adoption is highest and the numbers of EVs are the most concentrated. Growth of the charging networks is among the highest in the country, commensurate with EV adoption rates.

The strong support of the Oregon government and legislature for transportation electrification and reducing VMT of petroleum-fueled vehicles leads to increasing investment in bike- and pedestrian-friendly infrastructure in the urban areas, including protected lanes, exclusive rights-of-way, and urban redesign. These features enhance the reputation of Oregon cities as being bicycle and pedestrian friendly, and attract a growing population that is interested in those features for their quality of life attributes. This lends momentum to a virtuous cycle of expansion for modes of transportation that do not rely on petroleum fuels or personal cars.

It also sends a signal of confidence to all parties on the supply side of the market (EVSPs, utilities, auto dealers and auto service providers) and on the demand side (fleets, government agencies, and individuals). These industries and actors are all contributors to a strong and vital transportation electrification sector.

A large, growing, and dense population of young, active, and environmentally conscious citizens in the three largest major urban areas (Portland, Salem, and Eugene) leads to one of the highest adoption rates for micromobility in the country. People increasingly choose to stop owning cars in favor of electric bicycles and scooters for routine travel, and ridesharing and carsharing services for occasional longer-distance trips.

The leading utilities in Oregon, which have already demonstrated leadership in offering co-investment in charging infrastructure and progressive tariffs that are supportive of transportation electrification, significantly ramp up their offerings. Investments in charging infrastructure at all levels of power demand and favorable tariffs become regular features of integrated resource plans.

As government, private sector providers, and utilities continue to make larger investments in transportation electrification and mode-switching away from personal internal combustion engine (ICE) vehicles, personal transportation based on light duty EVs and electrified micromobility takes ever-growing market share year after year. This steadily drives down the per-mile cost of electrified personal mobility and drives up the cost of ICE-based personal mobility over the forecast period.

By 2025

EVs have reached sticker-price parity with ICE vehicles, driving a spike in consumer interest. The market share for EVs is 8%, commensurate with the 2025 goal of SB 1044. Charging networks have expanded significantly. Public DCFC are now available within a 50 mile radius of anywhere in the state, and Level 2 chargers increasingly getting installed in public, workplace and MUD parking lots. “Range anxiety” about the availability of charging stations isn’t really something anyone feels anxious about anymore.

In keeping with the SB 1044 targets, 250,000 ZEVs are registered in the state and 25% of new light-duty vehicles purchased or leased by state agencies are ZEVs. 95% of these vehicles are EVs with the remainder being hydrogen fuel cell vehicles.

By 2030

The market share of EVs is over 30% and it’s obvious to all that EVs are the future. Driven by the electrification trends in the urban areas and the significant price advantage that EVs now have over ICE vehicles, EV adoption spreads out from the urban cores to the rural areas of the state, led by electrified pickups and electrified farm equipment.
In keeping with the SB 1044 targets, 25% of registered vehicles and at least 50% of new vehicle sales are ZEVs. All new light-duty vehicle purchases or leases by state agencies are ZEVs. EVs make up 95% of these vehicles.

**By 2035**

Gasoline stations have started disappearing from the state, making it less convenient and more expensive to own a personal ICE vehicle. Gasoline station coverage has largely shrunk toward the major highway corridors. Rising state taxes on carbon-emitting fuels as part of the state’s overall climate policies, and a shrinking global oil industry also put upward pressure on gasoline and diesel prices. EVs have become dominant in all vehicle classes.

It is becoming clear to all that using ICE vehicles will become increasingly inconvenient, and much more expensive than EVs. EVs account for 90% of new vehicle sales.

**Scenario 2: Rapid recovery**

This scenario will use the EV adoption and charging infrastructure trends that existed through the end of 2019, then hold EV sales and charger deployment flat throughout 2020 (unless 2020 data can be obtained in a timely fashion) and into the third quarter of 2021. We assume that no significant recovery in EV sales or charger deployment will begin until Q4 2021, because not enough of the population can be vaccinated to restore normal, unfettered economic activity until late in the summer of 2021, even under a best-case scenario for vaccination.

Beginning with Q4 2021, we will apply the same technology adoption S-curve we used in Scenario 1. The difference with Scenario 2 is that the S curve will start at a lower absolute level, after approximately two years of flat EV sales and charger deployment, and the early part of the curve will have a steeper inflection than in Scenario 1, assuming a surge of pent-up demand is unleashed as the economy rebounds.

**Narrative**

In 2019, wages and salaries in Oregon grew by an average of 1.35% from quarter to quarter. With the onset of the pandemic, wages and salaries fell by 6.3% in Q2 2020, then rebounded by 5.9% in Q3. The loss of wages in Q2 was offset by personal transfer payments (such as stimulus or other relief payments), which allowed personal income to grow for each quarter of 2020 on a year-over-year basis. Personal income per capita in Q3 2020 was 8.1% higher than Q3 2019, and if that level of income were to persist through Q4 2020, 2020 would be an above-average year in terms of personal income per capita. Leaving aside transfer payments, wages in Q3 2020 were about even with wages in Q4 of 2019. On the whole, the economic data reflect an economy that is already rebounding to 2019 levels or higher.
Accordingly, it’s reasonable to expect 2019 levels of economic growth or higher to resume in 2021. Since we have entered 2021 with most Oregon counties, including the most populous counties, in a state of “Extreme” COVID-19 risk according to state data, we assume personal income per capita levels will hold at Q4 2020 levels through Q1 and Q2 of 2021, with the likelihood of additional transfer payments offsetting any additional declines in wages and salaries.

To account for the effect of pent-up demand being unleashed once normality returns, we assume above-normal CAGRs for Q4 2020, on the order of 5% for real GDP and 7% for per-capita personal income growth. (These numbers are not intended to be used in calculations for the modeling of this scenario. Rather, they are provided merely as a notional backdrop for the modeling, which concerns EV adoption and charging infrastructure deployment. The modeled results for those outcomes are not directly calculated from the background economic data, since there are no established relationships between economic indicators and EV purchasing or charger deployment.)

Non-farm wages and salaries declined sharply in Q2 and rebounded sharply in Q3 2020.
The two largest industries in Oregon—real estate, rental and leasing; and government and government enterprises—reflected this trend. *Inter alia*, the real estate sector saw record levels of business transacted in 2020 nationally, driven by the ultra-low interest rates the Federal Reserve implemented as part of its response to the economic damage of the pandemic. The other largest non-farm industry in Oregon, finance and insurance, posted strong growth in Q2 and modest growth in Q3, which may reflect the effect of transfer payments. By contrast, farm wages and salaries posted modest 0.4 to 2.5% growth in every quarter of 2020, reflecting the fact that it is an essential sector of the economy.⁸

Accordingly, we assume that EV sales trends in rural farming counties will be largely unaffected by the pandemic, whereas they will rebound more vigorously in urban professional counties. For the purposes of this scenario, we might expect the recovery to produce a more pronounced surge in EV adoption and charger deployment in urban areas than in the rural areas.

Although the rebounding economy should stimulate sales of EVs and ICE vehicles alike, the sticker prices of EVs will continue to fall, driven by the long-running decline in battery costs. By 2024, most electric LDVs will reach sticker price parity with ICE equivalents. With the economy growing at above-historical rates by 2022, this might lead to ICE vehicle sales taking as much or more market share as they had before the pandemic, but only for a year or two. Then they will lose market share to EVs relatively quickly beginning in 2024.

As in Scenario 1, the increasing adoption of EVs steadily drives down the per-mile cost of electrified personal mobility and drives up the cost of ICE-based personal mobility over the forecast period.

*Source: Oregon Office of Economic Analysis⁷*
Population distribution is expected to shift modestly from urban to rural areas, reflecting national trends seen during the pandemic. Many workers in professional industries who worked from home in 2020 and will be able to continue doing so have opted to move to less-congested, more rural locations. Although this scenario features an economic rebound, we do not expect it to reverse these trends, because many people who chose to move did so for quality of life reasons, and not because of changes in their income. The influx of young urban professionals to major population centers in Oregon that has been seen in recent years may temper somewhat, as those workers are drawn to more rural areas instead. Accordingly, this demographic shift may increase interest in EV adoption in rural counties over the levels seen before the pandemic, and more robust deployment of chargers in rural than in urban areas. However, the chargers deployed in rural areas are more likely to be privately owned than part of EVSP networks.

With roughly half the state’s GDP provided by professional services and a strong rebound in the sector, disposable income is strong enough to support growing demand for personal vehicles. Oregon may be expected to maintain its position in the top five states in terms of EV adoption.

The strong EV adoption trends give EVSPs confidence in continuing to expand their charging networks throughout the state, and especially in the urban areas where LDV EV adoption is highest and the numbers of EVs are the most concentrated. Growth of the charging networks is among the highest in the country, commensurate with EV adoption rates. All parties on the supply side of the market (EVSPs, utilities, auto dealers and auto service providers) and on the demand side (fleets, government agencies, and individuals) may be expected to seize the opportunity to accelerate electrification efforts, starting with light duty EVs and chargers for them. However, owing to the increased interest in rural parts of the state, and increased shipping activity in and out of the state driven by the sharp rebound, investment in chargers for vehicles of all classes will be strong. Expected investments in corridor chargers for transport trucks, chargers for farm equipment in rural counties, and other investments that were thought to be years in the future might be pulled more into the present.

To support the increased demand for EVs of all weight classes, leading utilities in Oregon accelerate investments in charging infrastructure at all levels of power demand, and offer tariffs that are favorable to EVSPs.

Investments in infrastructure and rights-of-way for bike- and pedestrian-friendly infrastructure, including micromobility options, could be less robust in urban areas under this scenario than in Scenarios 1 and 3, driven by a perception that everything is quickly going “back to normal” and the in-migration of young urban professionals falls off from the pace of the pre-pandemic era. Major cities may find that the counterbalancing effect of out-migration to other states or to more rural areas has reduced their tax revenues and are no longer able to fund investments into modes of transportation that do not rely on petroleum fuels or personal cars as they had planned prior to the pandemic. In this scenario, the trends away from personal vehicle ownership that had existed before the pandemic could lose momentum or actually reverse, as more people now living in more rural areas now have to drive instead of taking public transit or other non-driving options. Transportation network companies (TNCs) like Uber and Lyft could flounder in this scenario as the growth in ridership they experienced before the pandemic fails does not return.

By 2025

EVs have reached sticker-price parity with ICE vehicles, driving a spike in consumer interest. The market share for EVs is 15%—stronger than in Scenario 1 and well over the 1.15% share in 2020. Charging networks for light duty EVs have expanded significantly. As in Scenario 1, public DCFC are available within a 50 mile radius of anywhere in the state, and Level 2 chargers increasingly getting installed in
public, workplace and MUD parking lots. “Range anxiety” about the availability of charging stations isn’t really something anyone feels anxious about anymore. Proposed upgrades to underpowered chargers and expansion of charging stations along the West Coast Electric Highway have been made, and the 2025 targets in the West Coast Clean Transit Corridor Initiative have been fully met, including eight sites along I-5 in Oregon. Preparations are being made to align with California’s Advanced Clean Trucks (ACT) rule, which will require new Class 7-8 semi truck sales to be 30% zero-emission by 2030, and 40% by 2035.

EV adoption is running slightly ahead of the SB 1044 targets, with 300,000 ZEVs registered in the state. Adoption by state agencies is also ahead of the targets, with 30% of new light-duty vehicles purchased or leased by state agencies being ZEVs. 95% of these vehicles are EVs with the remainder being hydrogen fuel cell vehicles.

By 2030

Driven by their superior economics, the market share of light duty EVs is nearing 60% and EVs are quickly gaining share in all other market segments. There is broad support for adopting EVs wherever vehicles are suitable for the use-case, in both urban and rural environments. For specialized applications where EVs have far lower costs of ownership, like refuse trucks and forklifts, electric models enjoy very high (90% or higher) market shares. Electrified pickups and electrified farm equipment are commonplace and no longer regarded as novel in rural communities, but are not yet dominant in the overall rolling stock.

Adoption of EVs is above the SB 1044 targets for 2030, with 35% of registered vehicles being ZEVs. All new light-duty vehicle purchases or leases by state agencies are ZEVs. EVs make up 95% of these vehicles.

By 2035

As in Scenario 1, gasoline stations have started disappearing from the state, making it less convenient and more expensive to own a personal ICE vehicle. Gasoline station coverage has largely shrunk toward the major highway corridors. Rising state taxes on carbon-emitting fuels as part of the state’s overall climate policies, and a shrinking global oil industry also put upward pressure on gasoline and diesel prices. EVs have become dominant in all vehicle classes.

All of these factors accelerate transportation electrification as ICE vehicles become increasingly inconvenient and much more expensive than EVs. EVs account for over 90% of new vehicle sales.

Scenario 3: Slow recovery

In this scenario, rapid mutations of the coronavirus require ongoing innovation in vaccines; issues with distributing and administering the vaccines make it difficult to vaccinate enough of the population to reach ‘herd immunity’ levels and restore normal unfettered economic activity; immunity effects prove to be short-lived, requiring annual vaccinations of at least 70% of the population to maintain protection; and a significant share of those who ‘recovered’ from COVID-19 experience chronic health issues that prevent them from returning to normal full employment. Humanity does not finally get the virus under control such that normal life can resume until 2025. From 2021-2024, a severe recession is firmly in place.

To model this scenario, the levels of EV adoption and charging infrastructure deployment that existed at the end of 2020 will be held flat throughout 2024. No significant increase in EV sales or charger deployment will occur until 2025.
After four years of economic stasis marked by recurring lockdowns imposed in response to waves of new infection, by the end of 2024 the economy is weak, unemployment rates are high, and the ability of federal and state coffers to cover the shortfalls and support the unemployed is wearing thin. Everyone is looking to the federal government to pull the economy out of its slump, using printed money if necessary.

However, because all three scenarios must achieve the targets set forth in SB 1044, an extremely rapid transition to EVs commences in 2025, with very steep adoption curves for EVs and very aggressive investments in charging infrastructure in both the public and private sectors. These investments in electrification are not only driven by the motivations that existed before the pandemic; they are now considered to be vital economic stimulus programs as well, with surging federal and state investment to reinvigorate a moribund economy that has sustained significant damage.

Beginning with 2025, we will apply steeper S-curves than we used in Scenario 1 to model a rapid transition to EVs and the requisite charging infrastructure to support them.

Narrative

For the period 2021–2024, all economic indicators in Oregon will show no significant growth. Wages will be stagnant, and personal income per capita will slowly decline throughout the period as more workers lose their jobs. We will assume that the federal aid received in 2020 as transfer payments will not be repeated, apart from occasional efforts to stanch the bleeding in various sectors of the economy. By the end of 2024, 20% of the eligible workforce will be unemployed, the Federal Reserve will not be able to stimulate economic growth with further monetary stimulus, Oregon will have run its reserves dry, and any attempts to provide further federal aid to individuals will have to overcome the opposition of those who are concerned about the rising mountain of national debt. Many businesses will have failed, especially in the sectors of the economy that suffered most in 2020, and both the public and private sectors will find it difficult to raise investment capital for transportation electrification.

New vehicle sales of all weight classes and all kinds (both EVs and ICE vehicles) will be depressed until 2025. Fleet managers and individual personal vehicle owners alike will try to keep their existing vehicles on the road a bit longer to avoid the cost of buying a new vehicle. In the absence of vigorous and growing EV market, EVSPs will likewise scale back their deployment plans for new chargers, and wait for the economy to recover and new vehicle sales to rebound.

Although new vehicle sales will be anemic, auto manufacturers will remain committed to the EV strategies they had adopted before the pandemic. Their continued efforts to squeeze out the costs of EVs, especially in battery components, will yield results and EVs will still achieve sticker price parity with ICE equivalents by 2025. Accordingly, EVs will slowly increase their market share, albeit in a lackluster market.

When the virus is finally brought under control by the end of 2024 and normal economic activity can resume, only a major federal stimulus program will have the power to reinvigorate the economy. In 2025, the United States Congress takes aggressive action and embarks on an infrastructure investment program that dwarfs the New Deal, putting tens of millions of people to work. Part of the program is a “cash for clunkers” program designed to replace every light duty ICE vehicle older than 5 years with an EV. It also offers substantial rebates and tax credits aimed at electrifying medium- and heavy-duty vehicles, and creates funding channels that provide federal dollars directly to utilities to support the expansion of charging infrastructure across the country.

Non-farm sector jobs in Oregon have contracted to pre-2019 levels as the pandemic has raged on, and while they do rebound in response to the new stimulus investments, the majority of the federal aid
flows to sectors like construction and engineering that are directly involved in infrastructure projects. Farming and ranching jobs will not have sustained as much contraction or damage as the professional sector, because they are critical jobs sustaining the flow of food and other essentials.

With more disposable income available to them, workers in rural farming and ranching counties may be more able to buy new vehicles than workers in largely urban professional counties, and EV sales and charger deployment may rebound more strongly in rural than in urban counties for the first few years. However, once the professional classes get back on their feet circa 2027, they are likely to lead in EV adoption and urban areas will see more pronounced activity in charger deployment.

As in the other two scenarios, the increasing adoption of EVs steadily drives down the per-mile cost of electrified personal mobility and drives up the cost of ICE-based personal mobility over the forecast period, only these effects start later due to the economic damage of the pandemic through 2024.

Population distribution will shift asymmetrically. During the 2021-2014 recession, wealthier citizens who can afford it will seek refuge from the pandemic in more remote and rural areas where they can continue working from home and enjoy a slower-paced, higher quality of life. Whereas low and middle income citizens and early-career professionals may find it easier to live in cities where they can rely on walking, micromobility, and public transportation instead of owning their own cars. Car-dependent suburbs may experience net outflows of residents as a result, accompanied by declining property values, at least until the stimulus-driven rebound kicks in.

Because micromobility options are so much cheaper than owning a car or using ride-hailing services, they experience a surge of popularity in the 2021-2024 period within cities. Cities begin planning to accommodate this shift in mobility. Effectively, the longer it takes to restore normality, the less likely it is that we’ll rebound to the way things were, and the more opportunity there will be for new or changed modes of living and mobility to gain traction.

To support the increased demand for EVs of all weight classes, and supported by the infusion of federal infrastructure spending, leading utilities in Oregon make larger investments in charging infrastructure than in the other two scenarios, at all levels of charger power demand. They also offer tariffs that are favorable to EVSPs, and launch co-investment programs with site hosts to reduce the capital cost of building chargers.

By 2025

Driven by the increasing popularity of transportation modes that do not rely on cars, cities devote a significant share of their federal infrastructure dollars to investments in infrastructure and rights-of-way for bicycles, pedestrians, and other micromobility modes instead of rebuilding all of the automobile-based infrastructure. Lanes or entire streets are permanently repurposed for these modes. Urban parks, public squares, and shopping areas catering to pedestrian traffic spring up around them. Personal vehicle ownership as a whole starts to decline, albeit at a very gradual pace.

To meet the remaining need for car-based mobility, TNCs gain significant market share. When the economic rebound begins in 2025, many people who switched to micromobility options don’t switch back to car ownership, so new vehicle sales to those citizens remain low. Instead, when they need a car, they turn to TNCs and car-sharing and car-rental services, which experience sharp growth starting in 2025. Enabled by federal stimulus and infrastructure spending, autonomous vehicle technology is deployed in Oregon cities by 2026, and over the subsequent five years, scales to full commercial levels.

EVs have reached sticker-price parity with ICE vehicles, attracting strong consumer interest from those who still wish to own a personal vehicle. The market share for EVs is 25%—stronger than in the other two scenarios—albeit at lower absolute sales levels.
To meet the increased demand for ride-hailing services, there is more demand for high-speed public charging stations. Level 2 charging, especially at residential and workplace locations, grows less quickly than public DCFC. Public DCFC are being deployed in much greater numbers, and are available within a 25 mile radius of anywhere in the state. The market for Level 2 chargers is still mostly residential, as public DCFC run away with the public charging market, and workplace charging stations start to look like infrastructure at risk of being stranded as TNC use and autonomous vehicles become more common.

EV adoption overall is still below the SB 1044 target for 2025, but has started growing strongly. With the support of federal stimulus money, adoption by state agencies is ahead of the targets, with 50% of new light-duty vehicles purchased or leased by state agencies being ZEVs. All of these vehicles are EVs, because in the 2021-2024 recession, the hydrogen sector has been unable to mobilize the capital needed to create a viable hydrogen production and distribution network for vehicles.

By 2030

The long-expected conversion of drivers to riders in autonomous vehicles arrives by 2030, but the mix of TNC riders and new EV owners leads to a different topology of charging infrastructure than in the other two scenarios. EV owners largely depend on Level 2 charging at home, and use public DCFC for longer trips. Those who have elected not to own a personal vehicle anymore are now served by autonomous vehicles provided through TNC services. Because those vehicles are autonomous, and the cost of recharging them is trivial, they increasingly use charging depots that are not located on expensive real estate in city centers, as they were when they were driven by professional drivers. Instead, their charging depots are located where provisioning high levels of utility power is cheapest, such as former brownfield industrial sites equipped with high-capacity grid power, or in proximity to utility substations or even power plants. These industrial charging depots may even become fully automated, using wireless charging or some other technology to eliminate the need for charging attendants to connect and disconnect charging cables.

Driven by the federal stimulus spending in infrastructure, all highway corridors are being outfitted with DCFC every 10 miles or so. Medium- and heavy-duty vehicles are replaced with electric models at a rapid clip under the federal “cash for clunkers” program. Like the West Coast Electric Highway and the West Coast Clean Transit Corridor Initiative programs on steroids, large charging depots catering to fleets of transport trucks are being constructed at key junctions across the state, with the intent of eliminating all ICE vehicles of all classes by 2035.

Driven by their superior economics and efficiencies of scale arising from the electrification of all vehicle classes and use-cases at once (instead of being largely led by light duty vehicles), the cost of EVs plummets. EVs quickly start to eclipse the market for ICE vehicles, with the market share of light duty EVs at 70% and EVs quickly gaining market share in all other vehicle classes. There is broad support for adopting EVs wherever vehicles are suitable for the use-case, in both urban and rural environments. As in Scenario 2, electrified pickups and electrified farm equipment are commonplace and no longer regarded as novel in rural communities.

Adoption of EVs is still slightly below the SB 1044 targets for 2030, with 30% of registered vehicles being ZEVs. However, they are quickly on their way to exceeding the 2030 target thanks to their outsized market share. All new light-duty vehicle purchases or leases by state agencies are ZEVs. The cost of EVs has fallen so sharply that there is no longer an opportunity for hydrogen fuel cell vehicles to catch up, and all of the vehicles purchased by state agencies are EVs.
By 2035

By 2035, gasoline stations have become virtually non-existent. Charging infrastructure is so ubiquitous that only hobbyists and enthusiasts still own petroleum-burners. Personal vehicle ownership has plummeted to levels not seen in a century. EVs have become utterly dominant, with 95% market share in all vehicle classes. In part owing to the reduced cost of transportation across the board, the economy is roaring. State and federal stimulus spending is no longer needed. Instead of focusing on how to reinvigorate the economy, state agencies are thinking about ways to optimize the new arrangements of vehicles and charging infrastructure, such as novel mobility services dispatched on demand. These new services may begin displacing transit buses and light-duty inner city trains. There are few actual drivers anymore, as autonomous technology has become a feature of all new vehicles.

2 Economic Profile for Oregon, BEA. https://apps.bea.gov/regional/bearfacts/statebf.cfm
4 Sales data for EVs in Oregon in 2019 are only available through October 2019 from Auto Alliance. 2020 data has not yet been located. https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/
8 SQINC7N Wages and Salaries by NAICS Industry, BEA. https://apps.bea.gov/iTable/iTable.cfm?acrdn=2&isuri=1&reqid=70&step=1#reqid=70&step=1&isuri=1&acrdn=2