A decorative graphic element consisting of a yellow hatched pattern and a solid orange square.

# eMobility Outlook 2024

UAE Edition



# Executive summary

The UAE has identified the electrification of mobility (eMobility) as a priority policy area and is now seven years into an ambitious plan to decarbonise its infrastructure and energy production. Under the Energy Strategy 2050, the country is pursuing a combination of renewable and nuclear energy sources to achieve carbon neutrality by the middle of this century. The adoption of electric vehicles (EVs) is a critical element in this transition to a low carbon economy, and this report is the first of our regional series that explores the challenges and opportunities in this sector for a sustainable and seamless future of mobility.

## The UAE's transition to eMobility

Public policy is a vital element in the UAE's transition to eMobility. The country has already converted 20% of its federal government agency vehicles to EV powertrains and initially set a target for at least 30% of public sector vehicles and 10% of all vehicles on the road to be electric (EV or hybrid) by 2030. That was supported by government incentives such as free registration, free parking and reduced charging and toll fees for EVs.<sup>1</sup>

This target was updated in 2023 when the UAE Minister of Energy and Infrastructure announced during COP28 that the UAE aimed to have electric and hybrid vehicles accounting for 50% of all vehicles on its roads by 2050, alongside the tripling of power generation capacity from renewables.<sup>2</sup>

Dubai in particular already has a rapidly growing number of EVs on the road. According to the Dubai Water and Electricity Authority (DEWA), there were 25,929 electric vehicles in Dubai by the end of December 2023, a sharp increase from the 15,100 EVs reported at the end of 2022<sup>3</sup>. Creating a sustainable environment and infrastructure is one of the six UAE policy priorities originally set out in 2014, with the release of UAE Vision 2021.







**This broad target has been developed into a series of detailed targets for 2030 and 2050, including the following targets on clean energy generation and electric vehicle EV adoption:**

Clean power generation targets under the UAE Energy Strategy 2050 include increasing the share of renewables, gas, clean coal and nuclear sources in electricity generation, with renewable sources to be tripled to 14 gigawatts (GW), clean energy capacity to be increased from 14.2 GW to 19.8 GW, and the share of clean energy generation to rise to 32%, all by 2030.

Dubai has introduced a Clean Energy Strategy 2050 and a Green Mobility Strategy 2030 including an EV Green Charger initiative to expand the EV charging network and encourage the use of pure electric and hybrid cars across Dubai. The clean energy transition is being steered by DEWA, which aims to increase the city's network of public Green Charging Stations by 170%, from 370 in 2023 to 1,000 by 2025. The number of EV owners registered under the Green Charger Initiative has increased from just 14 in 2015 to more than 11,000 by mid-2023 and Dubai aims to have more than 42,000 electric cars on its roads by 2030<sup>4</sup>. In Dubai, the sale of electricity from EV charging stations is regulated by a specific tariff set by the Dubai Government and enforced by DEWA<sup>5</sup>. Private developers or stakeholders are not authorised to set their own tariffs for EV charging.

Since 2015, Dubai's Green Chargers have already provided electricity sufficient to power a cumulative electric vehicle distance of over 66.3 million kilometres. In a longer-term target, the Dubai Roads and Transport Authority (RTA) has committed to achieving emissions-free public transport by 2050<sup>6</sup>.

Abu Dhabi has witnessed significant growth in its electric vehicle fleet, with 2,441 EVs, 4,138 hybrid vehicles, and 9,412 natural gas vehicles on its roads as of late 2023.

However, EVs still represent less than 1.3% of the total vehicles in the region. Currently, there are around 250 public EV charging stations in Abu Dhabi.

To meet the growing demand for EV charging infrastructure and support the transition to electric mobility, the Abu Dhabi National Oil Company (ADNOC) and Abu Dhabi National Energy Company (TAQA) have set an ambitious target to install 70,000 EV charge points in the emirate by 2030.

The UAE Ministry of Energy and Infrastructure (MoEI) and Etihad Water and Electricity (Etihad WE) have announced a pioneering joint venture, UAEV, to provide fast and accessible EV charging infrastructure across the UAE<sup>7</sup>.

Additionally, the UAE tech and telecom group e& has also launched the 'Charge&Go' network, anticipating an annual EV demand growth of 30% from 2022 to 2028<sup>8</sup>. In Dubai, DEWA is leading similar initiatives to build extensive charging capacities, underscoring that eMobility is sector convergent with various critical players contributing to its advancement.

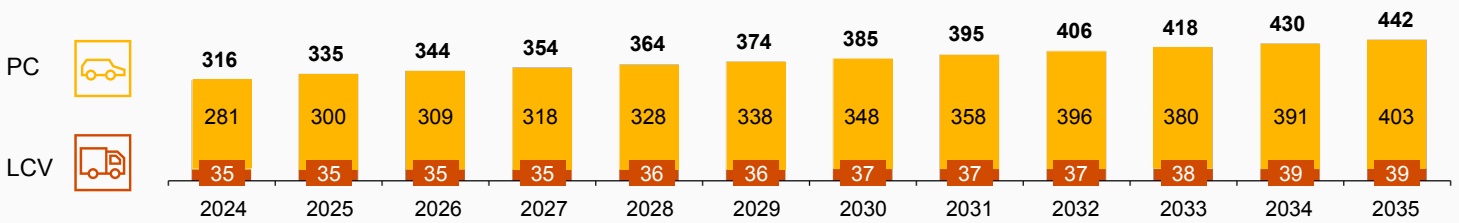


# Achieving ambitious EV targets

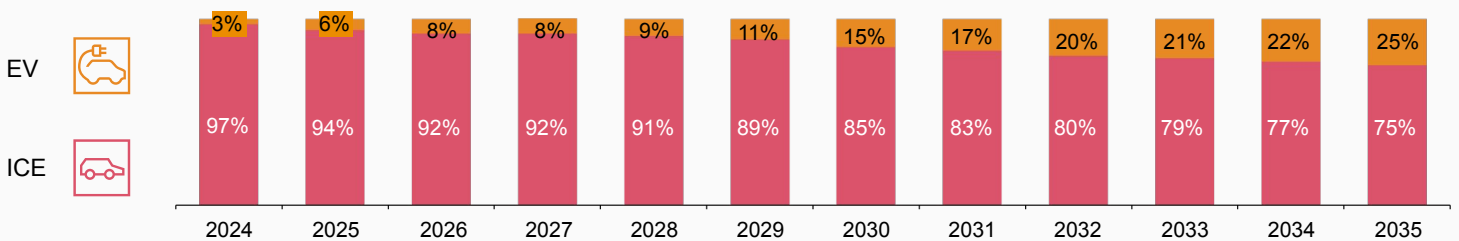
The UAE's electric vehicle (EV) sales outpace overall automotive market growth. The targets that the UAE has set for decarbonisation require a large-scale transition in the mobility economy that will reorient transportation away from internal combustion engine (ICE) vehicles and towards the adoption of EVs.

Across the UAE, PwC estimates that by 2030, EVs will have a market share of more than 15% (around 58,000 vehicles) of new passenger car (PC) and light commercial vehicle (LCV) sales, while by 2035, the share will have increased to 25%, the equivalent of around 110,500 vehicles.

**Total light duty vehicles sales in UAE (in thousands)**



**Share of Internal Combustion Engines and Electric Vehicles sold in UAE**



Source: PwC analysis, S&P Global





# Critical success factors

However, accelerating the share of new EV sales and achieving the targets outlined above will depend on several critical success factors:

Electric vehicles have to be **available in the mass market**.



EV charging **infrastructure** that can support the large-scale transition away from ICE vehicles must be developed.



Ensuring an **ideal operating temperature** to maximise the efficiency and range of electric vehicles.



The **energy generation mix** must shift to sustainable power generation, as EVs can only contribute to carbon emission reductions if the energy that powers them is also sustainable.



The **total cost of ownership (TCO)** of EVs (a combined measure of purchase and operating costs) must be sufficiently attractive to encourage drivers to change.



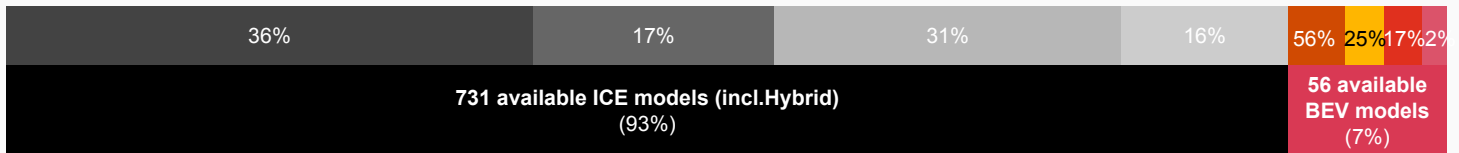


# Availability

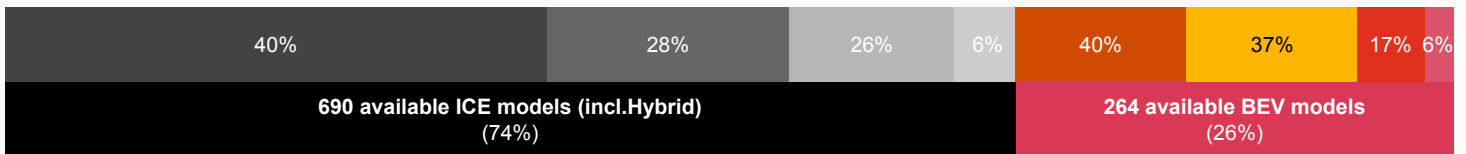
Only a small minority of the vehicle models currently offered by dealers in the UAE are EVs. More than 90% of all available models are ICE vehicles (including hybrids). By contrast in Europe, while ICE models still outnumber EVs, more than a quarter of all vehicles available are EVs and by 2030 it is forecast that more EVs than ICE vehicles will be available in the market.

Auto analysts believe this rapid evolution of the European EV market is due to government electrification targets and emission reduction rules (EU regulators<sup>9</sup> have set a target of zero emissions from passenger cars and light commercial vehicles by 2035).

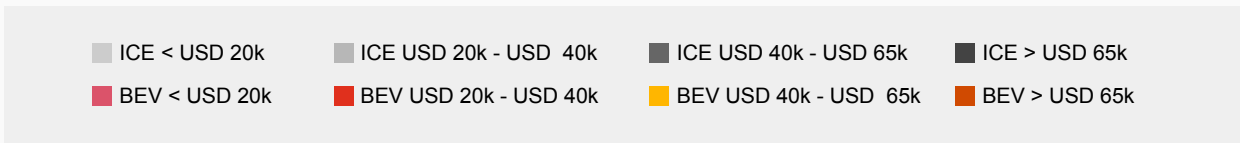
## Available ICE and BEV car models in UAE 2024



## Available ICE and BEV car models in Europe 2024



## Available ICE and BEV car models in Europe 2030





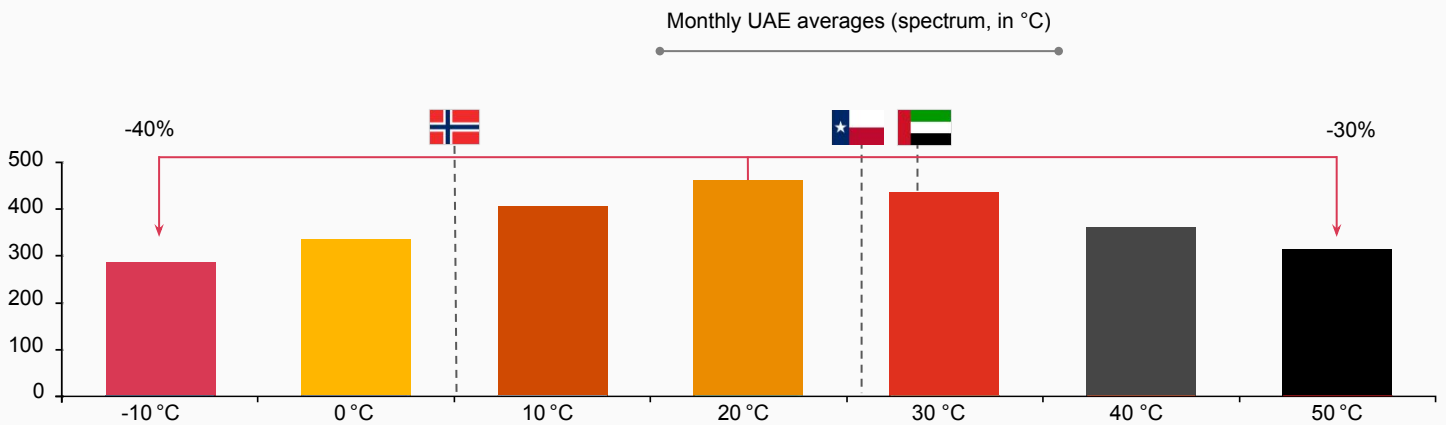


# Temperature

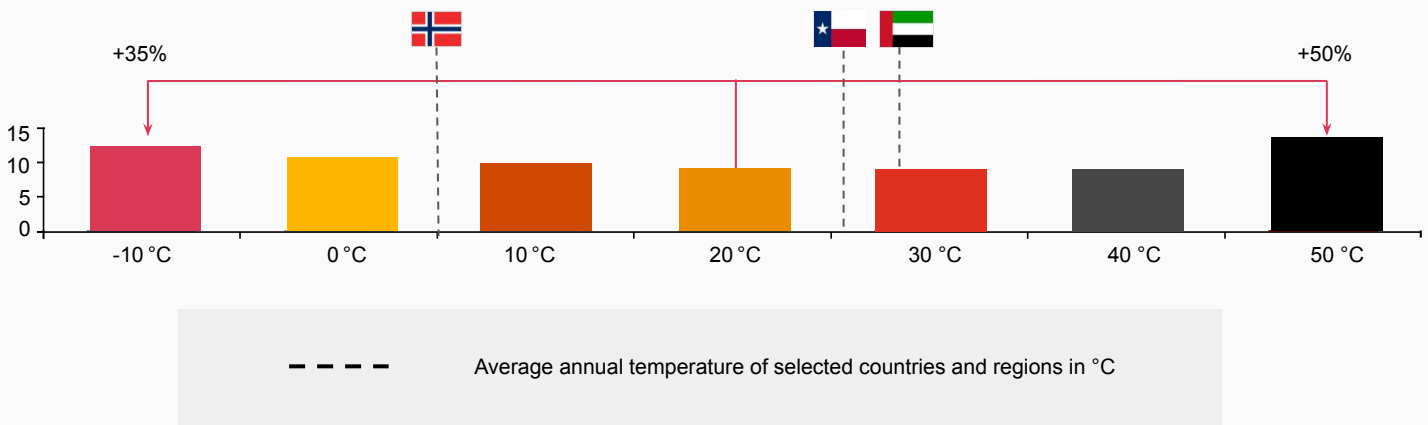
Electric vehicles are highly efficient but need an optimal operating temperature for maximum efficiency. Temperature fluctuations can significantly affect EV range and battery life: at high temperatures (which are common in the UAE summers), the electric vehicle will need to cool down its batteries for optimal performance which can impact its range and charging speed; similar at lower temperatures, EV will need to pre-heat the internals of the vehicle, such as battery, for delivering optimum performance. Therefore we need to ensure an ideal operating temperature to maximise the efficiency and range of EVs.

EVs perform best around 20 °C, where minimal energy is needed for climate control. However, at higher temperatures, such as 40 °C, the demand for cooling increases, and the total range of the vehicle decreases by almost 23%. For example, an EV that can typically travel 460 kilometers on a full battery at 20 °C might see its range drop to 360 kilometers at 40 °C due to the additional energy required for cooling, reflecting a nearly 23% reduction in total range.

## Average range in kilometres at different ambient temperatures\*



## Charging time for 100 km in minutes at different battery temperature\*\*



\*Example based on Tesla Model Y Battery size: 79 kWh Optimal consumption@20 °C: 0.17 kWh/km

\*\*Rated charging power: 150 kW, Consumption: 0.25 kWh/km (average); battery temperature not necessarily equal to ambient temperature due to battery thermal management system

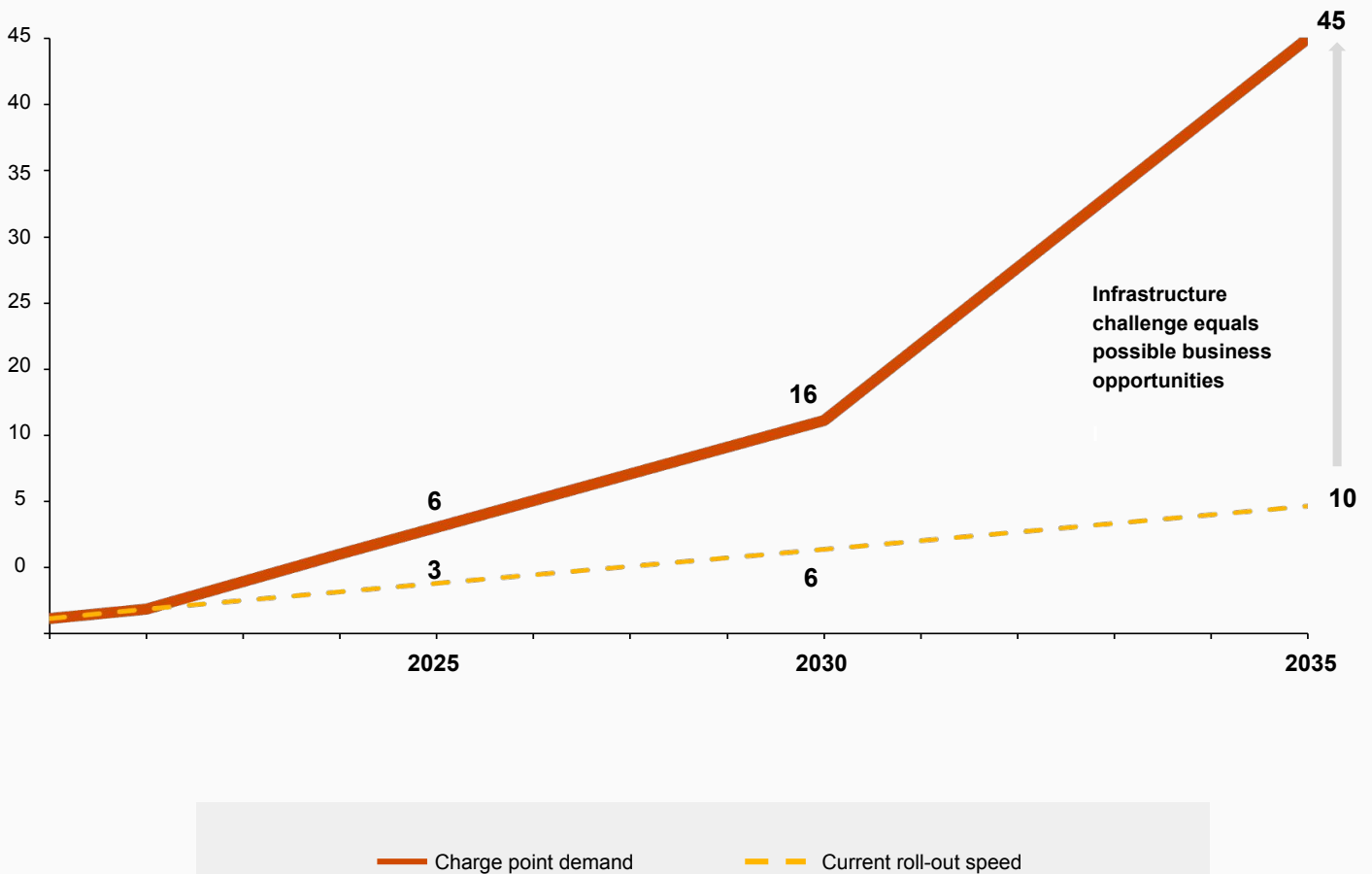


## Infrastructure

Public charging infrastructure is the most significant bottleneck for rapid EV adoption in the UAE, however at the current rollout pace, charge point availability continues to fall behind demand. Although the UAE has been investing heavily in renewable energy projects with a target of becoming carbon neutral by 2050, as of 2023, there were only around 2,000 public charge points deployed in UAE, and more than 65% of those were slow chargers.

The gap between the current roll-out speed of public charging infrastructure and demand is set to grow. Demand is forecast to reach 45,000 charge points by 2035 if the UAE's National Electric Vehicles Policy target for the share of EVs on the road is to be met. However, at the current rate of rollout there will only be 10,000 charge points in the UAE by 2035.

Public charge point demand vs. availability in the UAE (in thousands)





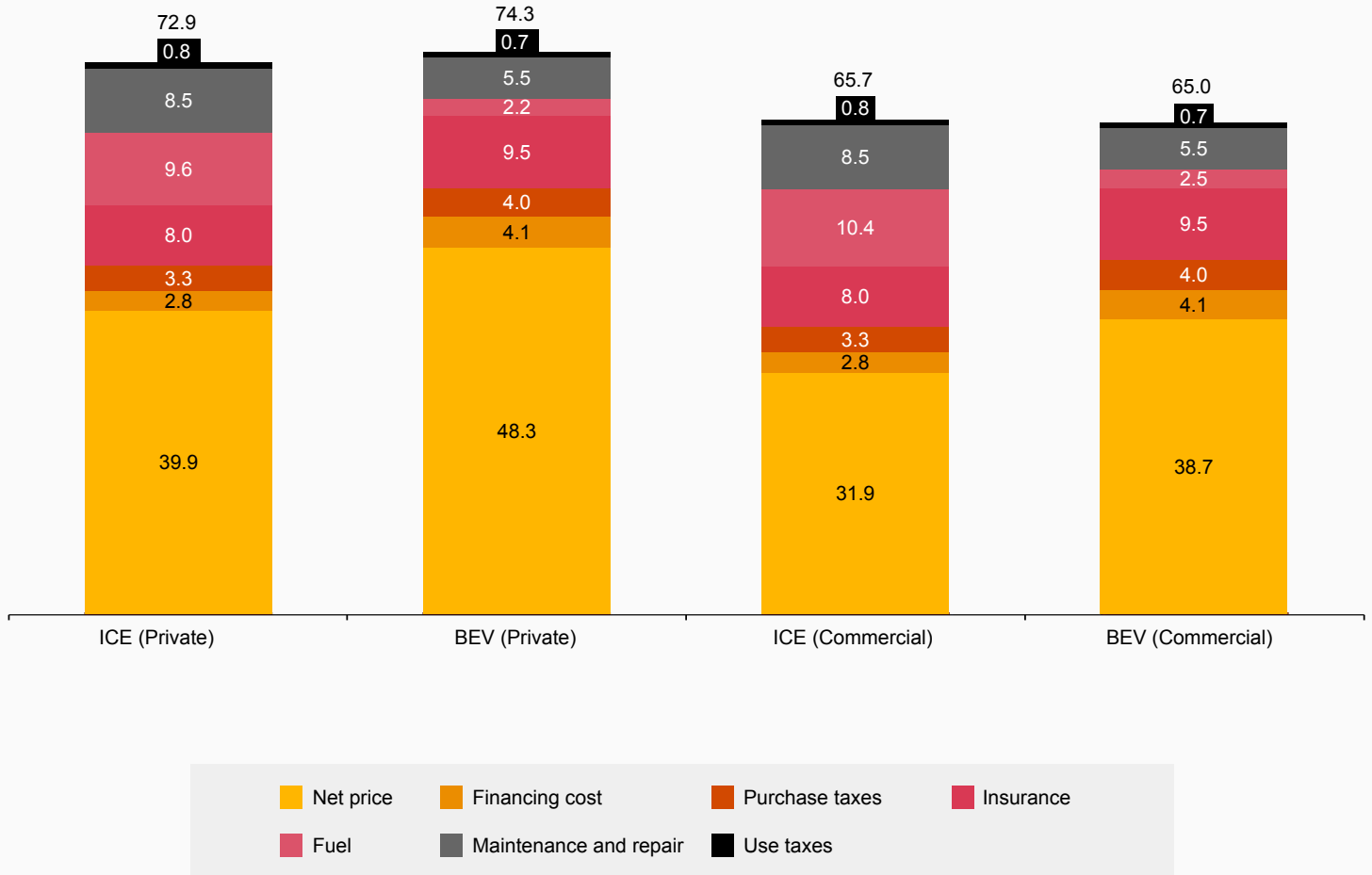


# Cost

In the UAE, the total cost of ownership of privately owned EVs is marginally higher than the cost of ICE vehicles despite the lower cost of energy, primarily because the initial cost and the insurance cost is higher for EVs. However, for commercial buyers there is now a cost advantage in EVs, as vehicles are typically discounted, particularly for fleet customers who are regarded as pivotal clients and enjoy even greater discounts.

The market is seeing a number of new entrants to the commercial EV market, intensifying price competition and increasing discounting as the new entrants specifically target major fleet operators.

## Total cost of ownership, ICE vs EVs (in thousand US Dollars)



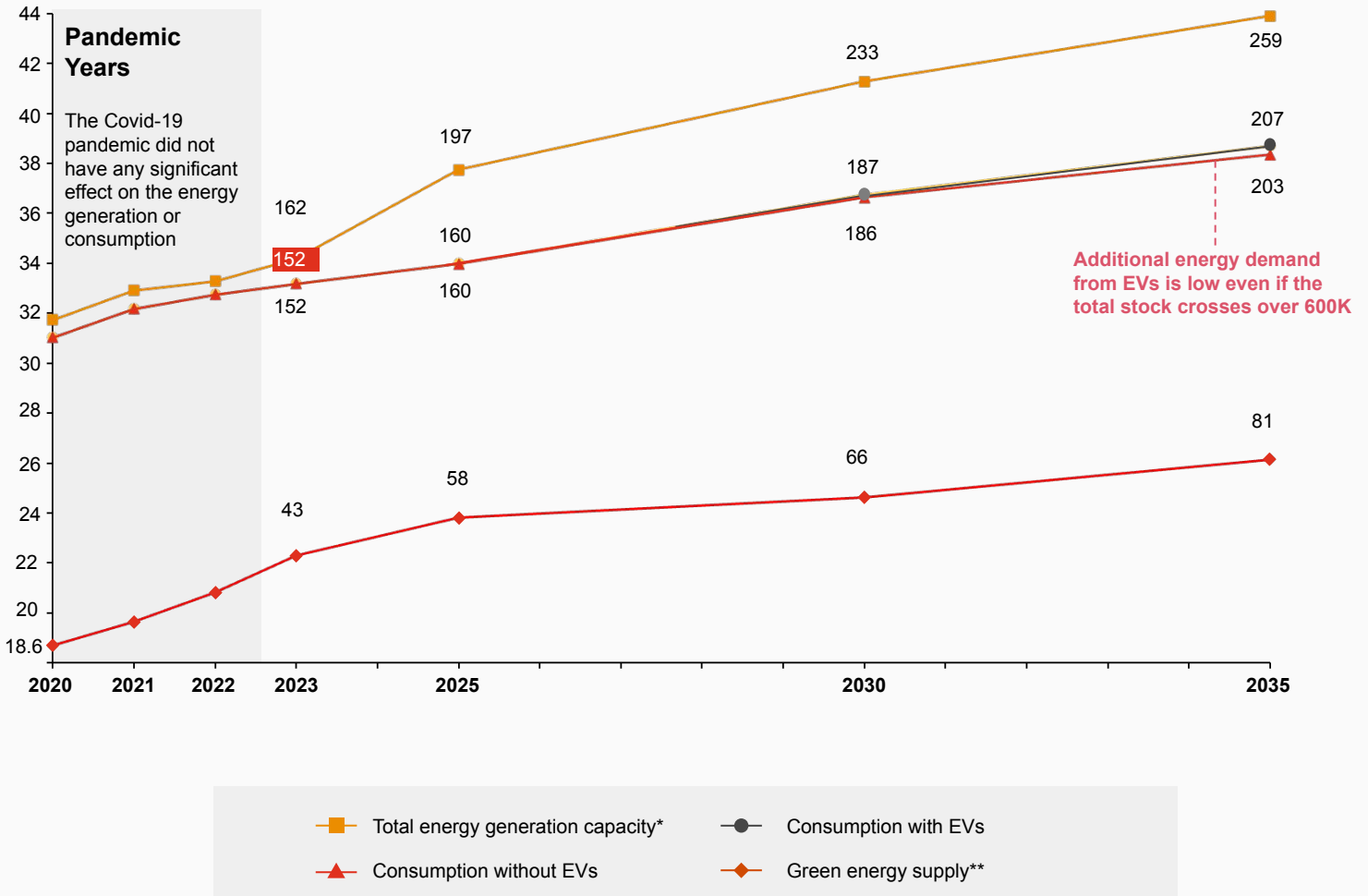


# Energy transition

The UAE's future electricity generation capacity outstrips forecast energy demand. There is already more than sufficient electricity generation capacity to meet demand from an increasing number of EVs on the road.

It is estimated by PwC Middle East that if there were more than 600,000 EVs on the roads in the UAE by 2035 that would only add around 1.6% to overall electricity demand.

### Energy generation vs demand - with and without EV in the UAE (in TWh)



\*Theoretical energy that can be generated within UAE by the existing power plant park in years under consideration

\*\*Green energy supply includes renewable and nuclear energy

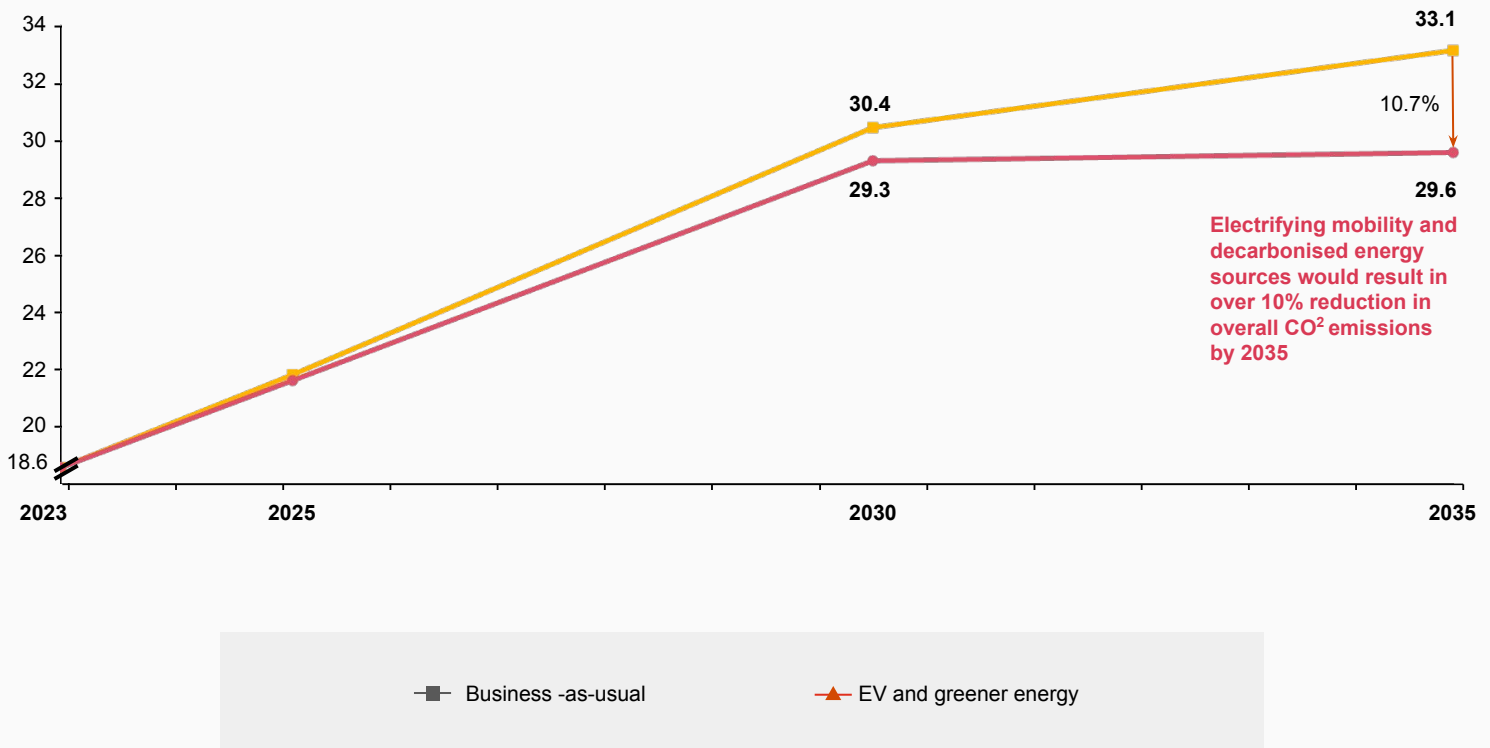


## Energy transition

However, while forecast electricity generation is more than adequate to meet rising demand due to an increase in the proportion of EVs in the national vehicle fleet, the energy mix remains biased towards fossil fuels and as a result, the introduction of a greater proportion of EVs may not significantly reduce the country's overall carbon emissions. To achieve significant emissions cuts the UAE will need to increase the share of green energy sources including renewables and nuclear power.

If the UAE's EV targets for 2035 are achieved it is estimated that emissions will be almost 11% lower than if the national fleet was purely made up of ICE vehicles. Overall vehicle emissions in the country will still be higher than today however, indicating a higher proportion of EVs would be needed to bring down emissions levels

### Total annual CO2 emissions of passenger cars & light commercial vehicles in the UAE (in Mn tons)







# Recommended key strategies

The introduction of zero tailpipe emission EVs in mobility markets represents an attractive solution to the challenge of decarbonisation - in principle. However in practice, EVs can only contribute to decarbonisation if they are widely available and attractive to buyers, if there is a charging infrastructure to support them, if the costs of ownership are competitive,

and if the energy generation mix contains enough low emission power so that EVs do not merely end up creating emissions at the energy generation stage. Creating these conditions is a policy challenge for all governments.

01

Prioritising availability and diversifying model range



02

Need for robust public EV charging infrastructure



03

Lowering costs, to make eMobility attractive



04

Increasing range and charging capacity



05

Investing in smart and bidirectional charging



06

Focusing on improved consumer experiences





## Prioritising availability and diversifying model range

Electric vehicles offer a compelling solution to reduce the UAE's carbon footprint and improve the air quality due to their zero-emission nature. However, there are challenges that hinder their widespread adoption, such as limited availability of models. The challenge for policymakers is one of encouraging reputable manufacturers to bring more models to the market, and to address initial purchase cost barriers. It is also important to assuage 'range anxiety' among buyers concerned that they will not be able to fuel their vehicles in a way that matches ICE vehicles.

The UAE market primarily relies on imported BEV models, predominantly sourced from Europe and the US, often falling within higher price brackets. To attract Original Equipment Manufacturers (OEMs) to the UAE market, collaboration among various industry stakeholders is crucial.

This involves:

### Tailored financial support:

The government can offer tailored financial support packages to meet the specific requirements of manufacturing projects. These packages may include tax incentives, land grants, infrastructure development aid, and workforce training programmes.

01

### Local manufacturing and assembly:

Establishment of local manufacturing and assembly plants for EVs can help lower costs and increase affordability for consumers. Early-stage manufacturing investments are already underway in the UAE. In Abu Dhabi green mobility technology developer NWTN has announced plans for an EV assembly plant in collaboration with logistics operator Abu Dhabi Ports, while Dutch solar EV developer Lightyear is developing solar powered vehicle concepts in the Sharjah Research, Technology and Innovation Park<sup>10</sup>. In Sharjah, established waste recycling specialist Beeah Recycling has signed an agreement with the UAE Ministry of Energy and Infrastructure and the American University of Sharjah to create the UAE's first recycling plant for end-of-life EV batteries<sup>11</sup>.

02

### Engagement with local stakeholders:

Collaboration with local industry associations, universities, and suppliers can help with leveraging their expertise and resources to create a supportive ecosystem for OEMs entering the market.

03

### Focus on all-income consumer segments:

Existing mass market players like BYD and premium auto manufacturers, such as Polestar, should focus on addressing all-income consumer segments to broaden the EV market.

04

### Establishment of R&D Centres:

Setting up Research and Development (R&D) centers dedicated to advancing EV technologies, improving manufacturing processes, and advancing the skills of the local workforce through training programmes and apprenticeships can drive innovation and competitiveness in the EV sector.

China's rapid advancement in the EV sector is a combination of a massive industrial policy effort. Large subsidies for innovation and research, an open-door policy welcoming foreign industry leaders, funding for production facilities, favourable loan terms to domestic manufacturers and subsidies for consumers have enabled companies, such as BYD and Tesla to invest in state-of-the-art production facilities, R&D initiatives, and supply chain optimisation. This has resulted in a rapid scale-up of EV production, with China now producing 54% total EVs globally and an even higher share for EV batteries.

05



## Need for robust public EV charging infrastructure

A robust charging infrastructure is necessary to meet local demand for EV sales, as the region transitions towards a net zero economy. Identifying strategic locations for setting up public chargers could be done through an AI-based operational expansion roadmap, using big data analysis on demographics, population density, parking spaces, traffic flows, and purchasing power datasets.

Encouraging faster growth in EV charging infrastructure requires a combination of public-private partnerships and direct investments. Collaborations among charge point operators (CPOs), utilities, eMobility service providers, and public entities is essential to ramp up charging infrastructure sustainably in the region.

Drawing lessons from successful EV charging infrastructure deployments in countries like China and Norway, there are some clear observations as outlined below.

Internationally, European countries are comparable to the US and Canada in EV-to-public charge point ratios, with approximately 13 and 17 EVs per public charge point, respectively. However, the infrastructure in both Europe and North America is way behind China, which has approximately six EVs per public charge point.

### Prioritising charging infrastructure

Expansion of public charging infrastructure should be prioritised in less populated and rural areas to help address concerns on range anxiety and enhance the appeal of EV adoption outside urban regions.

01

### Incentives

Providing incentives and subsidies to businesses and municipalities, such as tax breaks, grants, and low-interest loans, can offset installation costs and accelerate the rollout of public charging infrastructure.

02

### Destination charging

Implementing destination charging at locations where EV owners spend extended periods, such as supermarkets, shopping malls, public parking lots or restaurants and cafes.

03

### Regulatory support

Regulatory support from responsible ministries is crucial for enforcing uniform charging standards, mandating charging infrastructure inclusion in new construction projects, commercial buildings, parking lots, restaurants, and highways. Regulating the deployment of faster and cheaper EV charging stations with the aim of decreasing charging times will enable maintaining efficiency and competitive pricing.

04





## Lowering costs, to make eMobility attractive

Economic conditions within a region can influence attitudes towards EVs. Initial purchase price of electric cars in the UAE is relatively high due to factors, such as expensive insurance, higher battery and charging equipment costs and increased maintenance expenses due to lack of trained professionals.

A recent survey and academic analysis published in the journal *Sustainability*<sup>12</sup> by researchers from the UAE University and the National High School of Engineering in Tunisia found that cost is the main driver of EV purchase decisions for UAE consumers, but that there were sharp differences in the propensity to buy EVs based on geographic location.

The survey found that consumers across all income levels are attracted by the potential of EVs to save fuel costs, but interest in saving money on car maintenance and the initial cost of purchase was stronger for consumers at higher income levels.

Preferences for EVs were stronger in Dubai and Abu Dhabi, but weaker in areas with lower populations, such as Ras Al Khaimah and Umm al Quwain, suggesting that policy support will be vital to promote EV adoption in more rural areas.

Most the leading countries in terms of EV sales, such as those in Europe, the USA, and China, offer significant monetary incentives that lower the upfront cost and attract consumers to switch to EVs.

The availability of more affordable EVs can broaden the appeal of eMobility across broader demographic groups, benefiting all income brackets and contributing to the UAE's economy. To accelerate the transition towards electric mobility, there needs to be a collaboration among automakers, government, utilities, charging infrastructure providers, financial and research institutions, supply partners, and consumers.

### Lowering the costs of EVs is key, and this can be achieved through:

Government subsidies and incentives for consumers can help offset the higher upfront costs

01

Adopting cost-saving measures including reduced shipping and import costs, shorter supply chains, and easier access to regional components and materials can make locally manufactured EVs more cost-competitive compared to imported models

04

Offering favorable financing options, such as leasing programmes and low-interest loans can further encourage consumers to make the switch.

03



## Investing in smart and bidirectional charging

EVs are poised to play a crucial role in shaping a sustainable future. They aim to revolutionise not just transportation but also energy systems, becoming integral parts of our homes and ecosystems.

Smart energy management will optimise the charging infrastructure by efficiently delivering available power to EVs, and shifting charging loads across chargers and energy sources to safely deliver electricity without interfering with the power needs of buildings, homes, or other power consumers.

Smart charging for electric vehicles (EVs) is pivotal in unlocking synergies between the clean transport sector and low-carbon electricity.

It minimises the load impact from EVs and unlocks the flexibility to use more solar and wind power and renewable energy generation mix.

01

It includes different pricing and technical charging options, including time-of-use pricing, which will encourage consumers to move their charging from peak to off-peak periods, and advanced smart charging approaches, such as direct control mechanisms. This will be necessary as a long-term solution at higher penetration levels and for the delivery of close-to-real-time balancing and ancillary services.

02

With bidirectional charging, EVs can become grid-connected storage units. This allows users to save money by charging during off-peak hours and earn money by selling stored energy during periods of oversupply.

03

However, data privacy, data availability and data economy need to be ensured for all business models, for which, it is crucial that relevant standards for communication between all entities are in place along with technical and regulatory guidelines in order to guarantee the processing of the entire chain from load control to billing.

04





## Increasing range and charging capacity

Having battery electric vehicles (BEV) with increased range and charging capacity is crucial, especially for consumers who rely on their vehicles for long-distance travel or have limited access to charging infrastructure.

Also, in the Middle East, countries like UAE, can have extreme temperatures. This poses a challenge for BEVs which may struggle to maintain optimal performance in summer. Maintaining the battery temperature within the optimal range of 20 to 35°C is crucial for ensuring efficient operation. This can be achieved through a battery management system equipped with a thermal system, which regulates the temperature during driving and charging.

Additionally, excessive temperatures may require adjustments in charging power to prevent battery damage. EV manufacturers need to tailor vehicle components to withstand and thrive in such conditions, particularly optimising battery cooling systems to combat the heat and ensure consistent performance and prolong battery lifespan.

Owners should also be mindful of temperature conditions to optimise their vehicle's performance and longevity. Following guidelines for charging behaviour, such as using shaded charge points, can further mitigate temperature-related issues.

As per our analysis, if the ambient temperature rises to 40°C, the total range of the vehicle decreases by almost 23%. Therefore, EV and battery manufacturers should address the range limitations issues in this region to attract more buyers and accelerate the transition to electric mobility.

### OEMs should focus on:

Utilising heat-resistant materials for the construction of battery enclosures, cooling systems that are vulnerable to heat exposure

01

Developing and implementing advanced battery thermal management systems to effectively regulate the temperature of the battery pack

02

Collaborate with energy providers to develop innovative solutions for managing energy demand and optimising charging patterns in hot climates. This can include time-of-use charging programmes, smart grid integration, and renewable energy integration to reduce environmental impact.

03

Building batteries with higher capacities or other materials, such as as Li-Ion battery which are better for higher temperatures. This would enable users to benefit from higher charging capacities and greater ranges.

04







## Focusing on improved consumer experiences

As sustainability becomes a core value in the UAE, driving an electric vehicle will serve a tangible way for individuals to contribute to the larger narrative of responsible living and environmental stewardship. Potential EV buyers today anticipate a seamless and user-friendly experience every step of the way.

A major hurdle in the adoption and optimisation of EVs is the transfer of knowledge from the dealer to the consumer.

To address this, sales and service staff need to be well trained to stay abreast on the basics of EV terminology, EV charging levels, how to charge an electric car, how far a vehicle can travel before charging, what effect cold weather has on a battery, what the resale value may be and everything else a customer may want to know prior to making a purchase. Advanced battery technologies and smart charging systems, integrated with AI and connectivity features, enhance the driving experience, aligning EVs with the region's futuristic vision.

Integrating electric buses into the public transportation system supports broader urban sustainability goals, such as reducing carbon emissions and improving air quality. This move offers convenient and cost-effective options for residents reliant on public transit, while also lowering operational costs in the long term.

01

The transition from fossil-fuel to electrified mobility is one of the biggest industrial and market changes of our time. As the eMobility market in the UAE matures, a combination of constructive policy and continued technology innovation to lower costs and increase efficiency has the potential to give electric vehicles a leading role in the race to meet full net zero targets by 2050.

02

Lastly, OEMs should employ innovative digital campaigns to educate and reach prospective EV customers, particularly in less populated areas where misconceptions about EV suitability may exist for longer journeys.

03

# Resources

1. <https://www.trade.gov/country-commercial-guides/united-arab-emirates-smart-and-sustainable-mobility>
2. <https://gulfnews.com/uae/environment/50-electric-hybrid-cars-on-uae-roads-by-2050-minister-1.99661948>
3. <https://www.thenationalnews.com/business/energy/2024/02/04/dubai-ev-numbers-hit-nearly-26000-in-2023-amid-green-mobility-drive/#:~:text=The%20number%20of%20electric%20vehicles,Dewa%20statement%20reported%20last%20February>
4. <https://mediaoffice.ae/en/news/2023/July/09-07/Dubai-green-mobility>
5. <https://dubaievhub.ae/government-framework/regulations/>
6. <https://mediaoffice.ae/en/news/2023/July/09-07/Dubai-green-mobility>
7. [https://www.tradearabia.com/news/IND\\_422266.html](https://www.tradearabia.com/news/IND_422266.html)
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10. <https://www.agbi.com/manufacturing/2022/09/abu-dhabi-bids-to-become-electric-vehicle-manufacturing-hub/>
11. <https://www.agbi.com/sustainability/2023/01/uae-plans-to-build-its-first-electric-vehicle-battery-recycling-facility/>
12. <https://www.mdpi.com/2071-1050/16/2/770>



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To learn more about how we are helping organisations accelerate sustainable mobility.



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