

A close-up photograph of a person's hand in a beige sweater plugging a black charging cable into a charging station. The station has a green light. The background shows a blurred modern building with glass panels.

Global Charging Infrastructure Market Report

An analysis of investment in
the electric vehicle charging
infrastructure (EVCI) market



Foreword

As global warming increasingly affects the lives of billions of people around the world, many countries are looking to accelerate the transition from burning fossil fuels to meet our mobility needs. This transition is largely towards battery electric vehicles that also needs to be associated with electric vehicle charging infrastructure (EVCI). However, more investment is needed in EVCI.

The Global Charging Infrastructure Market Report is an analysis of investment readiness in countries across the world, including UK and Ireland, continental Europe, North America, Latin America and the Asia Pacific region. The market readiness for investments was analyzed against 5 parameters, made up of critical metrics, to examine what are the key identified challenges and opportunities in selected countries. The index is a snapshot in time and is expected to evolve as new information is available and country's market readiness evolves the market readiness of countries improves.

Use our interactive online comparison tool to compare the metrics measured for this report.

**Go to the interactive
online comparison tool**



We have been working with government authorities in cities and regions around the globe, providing EV strategies to help ensure communities are enabled to make the transition, including those in more rural areas. From supporting vehicle electrification transition of critical fleets such as police, military and other government organizations, we have provided EVCI planning and implementation while supporting Charge Point Developers and Operators in creating new EVCI assets that meet the needs of the local environment and their business models.

What we have found in implementing these projects is that three key catalysts for mass EV transition stand out: government leadership and incentives which includes bans on the sale of new petrol and diesel cars for example, EV market maturity which includes how many EV's there are, and EV charging infrastructure which includes how many chargers there are. This led to the publication of Arcadis' 2021 Global EV Catalyst Index. However, whilst engaging with the WBCSD on their Mobility Decarbonization initiative we also recognize that investment is critical to the success of this transition so we have expanded these parameters to include an assessment on the ease of doing business in these areas and the potential returns from the investment to create the Arcadis Global Charging Infrastructure Market Report as well as an online comparison tool with the aim creating a global roadmap to help accelerate investment in EVCI.



Simon Swan

Global New Mobility
Solutions Director

Executive Summary

The current global market volatility is having an impact on the manufacture of EV's and chargers due to microchip shortages attributable to Covid-19 and China's associated lockdowns which could result in a more linear increase in the number of EV's. This recent market unpredictability means that many of the gasoline price analysis is undertaken based on data from before the recent spike in prices and it's recognized that this is an ever-changing market. It should also be noted that new technologies are coming onto the market all the time. We have seen some fleets look to include wireless charging infrastructure as part of their solution, OEM's offering battery swap infrastructure with associated new concepts of "Battery-as-a-Service" and the rise of new offerings including "Charging-as-a-Service" through mobile charging technology. When these new technologies are considered with the fact that many people who have the benefit of off-street charging will look to always charge at home rather than at public charging infrastructure, and, with battery range increasing all the time, it makes it increasingly difficult to predict such important factors such as charge point utilization. When it comes to charging infrastructure, the market is moving at a considerable speed with new charging hubs opening daily, so this tool is a snapshot in time, and we hope that it provides an interesting and useful perspective on the global EVCI Investment Market.

All countries included in the report are making progress towards mobility decarbonization and at different speeds and focus areas, for example Turkey and Argentina are the only countries with no incentives or grants to support the roll out of EVs, while stralia and Mexico are also lagging behind the other countries in terms of regulation or tax deductions. However even in the slower to develop markets there is still progress. For example, all countries/states in the index have declared a net-zero declaration and in 2017, Istanbul introduced electric taxis for the first time. Since 2019, in Turkey, the head of the Electric and Hybrid Vehicles Association (TEHAD) has been calling out the government to provide some incentives, similarly in Australia there has been increased pressure on the government to bring in new regulations supporting EV transition especially as Australia is the only country in the research with no ban on petrol and diesel cars. Research by the Australian institute shows that over half of Australians (57%) support a ban on the sale of new fossil fuelled vehicles from 2035 and increased pressure has meant that new regulations are coming. At the time of writing a range of EV policy measures and ambitions have just been announced by the Australian Federal Government.

When it comes to actual number of EV's per capita Norway is ahead with 118 EVs per 1000 people market and a market share of 64.5%. The rest of Europe is catching up with a broad range of EV incentives meaning an average market share of 13% across the region, while other regions are behind such as APAC and Latin America with less than 2% of market share of EV's.

Infrastructure development is largely market led but it needs public funding to overcome the initial 'chicken and egg' situation of investing in charging infrastructure with few EVs on the roads. In respect to this most countries do have grants available for this although Thailand and Latin American countries are behind in terms of governments providing no charging infrastructure public funding, however there are incentives and grants to support the roll out of EVs.

Providing a clear strategy for charging infrastructure is needed at a national level and most countries do have one in place with again, Turkey and Thailand lagging in this regard but perhaps not for long, Turkey's EPDK are now looking at introducing new laws that will likely lead to associated EVCI strategy.

Existing Infrastructure Standards for EVs are present in most countries. These increasingly include stricter standards such as obligations for contracts to provide a charging station for new builds or properties that have been significantly renovated.

We must, of course, promote active travel such as walking and cycling as an alternative to car use which will reduce congestion and CO2 emissions further and provide greater benefits to improve quality of life. Mobility decarbonisation through electrification is just one way to reduce CO2 emission globally from transport and must apply to all forms of transport from bus and coach, LGV and HGV, to trains and the aviation and the maritime sectors. Hydrogen will have its place in many of these sectors and the business case for alternative fuels will change over time which must be assessed. We will see other new technologies provide opportunities for reducing congestion and CO2 emissions and we must also carefully and continually assess the true impact of these just as is needed with electrification which relies on the energy sector accelerating the transition from burning fossil fuels to renewable energy generation. We hope you find the tool useful to compare the progress of mobility decarbonisation being made across the globe.



The parameters and metrics used

Accelerating mobility decarbonization

As the world advances towards mobility decarbonization and countries accelerate their transition to enabling Electric Vehicles, Arcadis has determined that the most influential parameters suitable for measuring the country's EVCI market maturity are:

We consulted with WBCSD and their members and through participation in workshops, surveys and interviews we explored and agreed the parameters, the metrics and the scoring methodology to be included in the tool.

Government leadership and incentives



EV market maturity



Returns potential



Charging infrastructure



Ease of doing business within the country



Use our interactive online comparison tool to compare the metrics measured for this report.

Go to the interactive online comparison tool





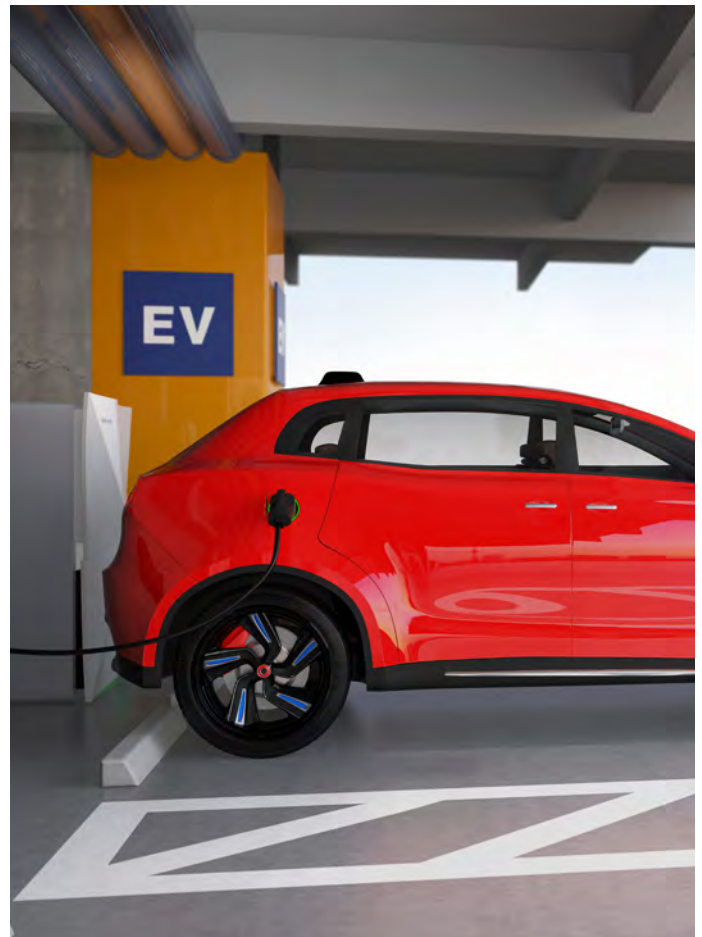
Government leadership and incentives

With society adapting to the need of clean energy, countries around world have started to implement a ban on internal combustion engines (ICE) vehicles starting as soon as 2030 as part of their plan to commit having a net zero target carbon emission in the future. Some countries have already transitioned some of their government fleet vehicles to EVs. Governments have also provided incentives such as reduced tax on EVs and grants to encourage people into transitioning. EV infrastructure strategies and associated implementation plans are being prepared at local and national levels to provide assurance to consumers that they will not face difficulties in terms of charge point availability across the country. Given the importance of this parameter we have identified several metrics within this including the number of EV incentives i.e grants and/or subsidies that governments offer for the EV market. We have also identified that regulations to support an EV transition such as national or state level policies, regulations, and legislation are very influential. Perhaps the most important factor is the ban on the sale of new ICE vehicles and if the country has declared any plans to ban ICE vehicles or not. Over the last few years, we have seen countries around the world react to the climate emergency and announce their commitments to Net Zero – all our contributors agreed this was an important metric to include in the assessment of a market as without a net zero target commitment it is unlikely that the government policies influencing investment in other areas such as sales of EV's would follow. We have seen the positive impact of funding being provided for charging infrastructure and this helps to create an equitable national roll-out, so this is the last metric we have included in this area.



EV market maturity readiness

This metric is used to categorize the country's market maturity for EVs to understand the state of demand for charging infrastructure. There are several ways to measure the EV market maturity and we agreed that some of the most important metrics would include the number of EV registrations per capita i.e., the number of registered EVs in the country per 1000 people, the EV market share i.e the market share of BEV's and PHEVS vs ICE, the number of available EV models in the country and the growth of EVs forecast per capita expressed as a ratio of the number of EVs per 1000 people.





EV Returns potential

The pace at which charging infrastructure is rolled out needs to be optimized. Already we have seen entire existing rapid charging networks needing to be completely updated with replacement chargers and we have also seen infrastructure installed in places that are inappropriate or simply not maintained as they are never used due to being the wrong specification.

There are a plethora of external factors that influence or even combine to affect public EVCI utilization such as; the price to use the chargers, location and facilities available, oil price (petrol/diesel) price fluctuations, and electrical energy supply costs, amongst many others. This makes it a complicated picture which we have tried to simplify using a straight forward gauge based on the simple formula of: average miles per day driven in a given market multiplied by the number of registered EVs, all divided by the number of available chargers. This gives us a good proxy for utilization as it defines, on average, how many miles each charger is required to dispense each day: the more miles each charger is required to dispense each day, the higher in theory the utilization.

The returns potential from infrastructure is also affected by many variables in addition to the utilization, such as: electricity price, fossil fuel price, charging infrastructure capital expenditure and flexibility of services able to monetise such as vehicle to grid (V2G) initiatives. We have therefore included several metrics including a view of what the future charge point utilization rate could be (built on an outlook for average journey lengths, number of EVs and installed base of chargers in the future).



The energy price is important as this determines how much a driver will need to pay to recharge their car at home and will also affect the fees imposed by a CPO (this is measured as the energy price € per kWh of the country). Increasingly we will see volatility in the price of fuel as we reach peak demand globally and we have included this as a key metric (average gasoline price in the country).

Another important factor when looking at the returns potential is the cost of the infrastructure. We have chosen to focus on charging infrastructure capex costs and specifically the critical element of construction cost. The cost of the grid connections is also important but because this differs significantly across locations depending on the existing local distribution infrastructure and capacity at local substations we have not included this element in the charging infrastructure capex costs. Arcadis have recently launched the Global Construction Index and we have used the data from this to assess the cost of constructing the infrastructure in these countries.

The final metric we have looked at here is what we call “flexibility services able to monetize” and this is any mechanisms/distribution system that allows for additional revenue such as V2G.



EV Charging infrastructure



Ease of doing business

The charging infrastructure of a country is closely linked to its plans for supporting the adoption of EVs and the consumers will always consider the accessibility to charge points in their decision to transition to EVs. These charge points will either be available where they park their cars (on the street or in the garage or driveway), “on the road” and their destinations.

We have therefore included metrics such as public charge points available i.e. the number of public charging stations in the country, whether there is a EV charging strategy in place for each country, existing infrastructure standards for EV charging i.e. regulations to introduce minimum standards, or if none, any plans of the government to implement these standards in the future. We have also included a metric of forecast public charge points by 2030 – built using in house models or public sources by country.

EVCI developers will need to take advantage of technology improvements as the user experience of the charging infrastructure will increasingly matter and we see uptime of the chargers critical just like with the mobile phone networks and therefore there’s a close relationship between chargers and the transmission and distribution network. With this in mind we have included as a metric the Transmission / Distribution network reliability using international reliability indices for the electricity networks for the duration and quantity of system down time.

The venture capital and private equity effectiveness of a country is a huge factor determining the readiness of the country for investors to do business. The roll out of EV charging networks will be highly dependent on the economic and government stability of a country and its good business environment. The world bank also provides assessment of the risks of doing business with the country and given the depth of analysis within that analysis, we have included to form a tenant of our conclusions.





Government leadership and incentives

As the problem with carbon emissions arise, countries across the globe have developed new policies and rigorous environmental regulations. These implementations by the government will serve as a strong catalyst for a global EV transition.

Scoring metrics: Government leadership and incentives

Metrics	EV incentives	Regulations to support EV	Ban on ICE vehicles	Net zero declaration	Charging infrastructure public funding
Excellent (4)	With 2 or more incentives AND grants	With 2 or more EV regulations. There's also a tax exemption for EVs.	With existing ban on ICE vehicles and penalties on low emission zone	Declared net zero BEFORE 2050.	The governmental budget for charging infrastructure incentives is higher than the 0.08% of the GDP
Good (3)	With 1 grant and 1 incentive OR 2 grants OR 2 incentives	With EV regulation OR tax exemptions and deductions	"With a ban plan ONLY but with approved penalty/ congestion charging	Declared net zero by 2050. They also have an emission reduction target of 50% or more by 2030.	The governmental budget for charging infrastructure incentives is higher than 0.04% and lower than 0.08% of the GDP
Fair (2)	With either a grant OR an incentive	With pending regulations for EV OR with state-level regulations only plus tax discounts	Either a ban planned only or penalties/ congestion pricing plan only	Aims to achieve net zero on a conditional basis or reduction of emission by less than 50%	The governmental budget for charging infrastructure incentives is higher than 0.001% and lower than 0.04% of the GDP
Low (1)	No incentives nor grant for the EV market	No regulation to support EV nor tax deductions	no ban planned nor penalties	Did not declare net zero	No public funding

Scoring results: Government leadership and incentives

	EV incentives	Regulations to support EV	Ban on ICE vehicles	Net zero declaration	Charging Inf. Public Funded	Average total
	Score	Score	Score	Score	Score	Score
UK	4	4	4	3	4	3.8
Germany	4	4	2	4	4	3.6
Spain	4	3	3	3	4	3.4
Norway	4	4	4	2	2	3.2
France	4	3	4	3	2	3.2
Netherlands	4	3	4	2	2	3
Ireland	4	3	2	3	2	2.8
Italy	3	3	3	2	2	2.6
Turkey	1	3	no data	2	2	2
New York	4	4	3	3	2	3.2
California	4	3	3	4	2	3.2
Canada	4	3	4	3	2	3.2
Hong Kong	4	4	4	4	4	4
China	3	4	4	4	2	3.4
Singapore	3	3	4	2	2	2.8
Thailand	2	3	4	2	1	2.4
Australia	4	2	1	2	2	2.2
Brazil	4	4	3	3	1	3
Mexico	3	2	3	2	1	2.2
Argentina	1	3	3	3	1	2.2
Chile	3	3	2	2	1	2.2



EV market maturity and readiness

For investments in EVCI to work, a country needs to have a maturing EV market. Countries must have enough EVs on the road needing to be charged at public charging infrastructure for the infrastructure to generate a profit for the investors.



Scoring metrics: EV market maturity and readiness

Metrics	EV registrations	EV market share	EV models available	EV forecast per capita
				Ratio here refers to number of EVs per 1,000 people. Note: For countries with only 2025 data, parameters were adjusted accordingly. For countries with only 2030 data and countries with both 2025 and 2030 data, ONLY the 2030 data will be measured. Parameters were adjusted accordingly based on available data
Excellent (4)	Ratio should be more than 100 Evs per 1000 people	25% and above	200 or more models	Ratio should be more than 10.
Good (3)	Ratio should be more than 16 Evs per 1000 people	20% - 24%	100-199 models	Ratio should be between 5-10
Fair (2)	Ratio should be more than 11 Evs per 1000 people	10% - 19%	51-99 models	Ratio should be between 1-5
Low (1)	ratio is less than 1	less than 10%	less than 50 models	ratio is less than 1

Scoring results: EV market maturity

	EV registrations	EV market share	EV models available	EV forecast per capita	Average total
	Score	Score	Score	Score	Score
Netherlands	3	4	3	4	3.5
Norway	4	4	2	4	3.5
France	2	3	3	4	3
UK	2	2	3	4	2.8
Ireland	2	2	3	4	2.8
Germany	2	3	2	4	2.8
Spain	1	1	no data	4	2
Italy	1	1	2	4	2
Turkey	no data	1	2	3	2
California	2	2	2	4	2.5
New York	2	1	2	4	2.3
Canada	1	1	2	4	2
China	2	1	4	4	2.8
Hong Kong	2	1	3	no data	2
Thailand	2	1	1	4	2
Australia	1	1	1	4	1.8
Singapore	1	1	1	4	1.8
Brazil	1	1	1	4	1.8
Chile	1	1	1	3	1.5
Mexico	1	1	1	2	1.3
Argentina	1	1	1	No data	1
Singapore	1	1	1	4	1.8



EV Returns Potential

As the EV market grows across the globe, investor capital that is focused on securing long term stable revenue from the EVCI is required in greater volumes.

Therefore, it is essential to get the balance right between too much infrastructure and low utilization and under provided infrastructure versus too high utilization potentially creating “queues at the plug”. It’s also important that we remember that technology changes and countries don’t want to find themselves with an outdated infrastructure network

Scoring metrics: EV Returns Potential

Metrics	Charge point utilization rate	Energy price	Fossil Price	Charging infrastructure capex costs	Flexibility services able to monetize
Excellent (4)	Chargepoint utilisation rate of higher than 20,000	Energy price below €0.10 per KWh	Fossil price above €2.0 per litre	EV index between 85 and below	National and/or City/State Government, has invested or is investing in the promotion and/or roll out of V2G charging.
Good (3)	Chargepoint utilisation rate higher than 10,000 and lower than 20,000	Energy price between €0.10 - €0.15 per KWh	Fossil price between €1.50 - €2.0 per litre	EV index between 86-100	National and/or City/State Government has strategies and/or plans to promote and/or V2G charging
Fair (2)	Chargepoint utilisation rate higher than 1,000 and lower than 10,000	Energy price between €0.15 - €0.19 per KWh	Fossil price between €1.10 - €1.50 per litre	EV index between 101-115	National and/or City/State Government is exploring the V2G charging concept through research and/or study
Low (1)	Chargepoint utilisation rate lower than 1,000	Energy price above €0.19 per KWh	Fossil price below €1.10 per litre	EV index between 116 and above	No government regulations, incentives, or other initiatives but V2G chargers is existing because of private sectors

Scoring results: EV Returns Potential

	Charge point utilization rate	Energy price	Fossil Price	Charging infrastructure capex costs	Flexibility services able to monetize	Average total
	Score	Score	Score	Score	Score	Score
Netherlands	2	3	4	3	4	3.2
Spain	2	3	3	3	4	3
Norway	4	4	4	1	2	3
Turkey	no data	4	2	4	1	2.75
France	4	3	3	2	1	2.6
UK	3	1	3	1	4	2.4
Italy	2	1	3	3	3	2.4
Germany	2	1	3	2	4	2.4
Ireland	3	1	3	1	3	2.2
Canada	2	4	2	2	4	2.8
New York	2	3	1	2	2	2
California	3	3	1	1	2	2
China	4	4	2	4	3	3.4
Thailand	4	4	2	4	3	3.4
Australia	2	2	2	3	4	2.6
Singapore	no data	3	3	2	2	2.5
Hong Kong	1	3	4	1	no data	2.25
Argentina	no data	4	1	4	no data	3
Brazil	4	3	2	3	1	2.6
Mexico	no data	2	1	4	no data	2.33
Chile	1	3	2	3	1	2



EV Charging Infrastructure

The availability and accessibility of charge points will always be a major factor in the transition to EVs. The EVCI across the world has been growing at different rates and it has largely been affected by the EV market and the government incentives and leadership on offer.

Scoring metrics: EV charging infrastructure

Metrics	Public charge points available EV vehicles registered / public charge points available	EV charging strategy	Existing infrastructure standards for EV	Forecasted public charge points by 2030	Transmission / Distribution network reliability
Excellent (4)	Ratio of vehicle to charge point is 1-5 vehicles per charge point	Has national strategy backed by city/state government strategy including the country's capital city.	> 2 approved standard	Ratio of vehicle to charge point is 1-5 vehicles per charge point	No exceptional events included: 0≤SAIDI≤40 minutes/year 0≤SAIFI≤1 interruptions/year Exceptional events included: 0≤SAIDI≤60 minutes/year 0≤SAIFI≤1.5 interruptions/year
Good (3)	Ratio is 6-10 vehicles per charge point	Has country-wide strategy and some cities have their own strategy	1 to 2 approved minimum standard	Ratio is 6-10 vehicles per charge point	No exceptional events included: 40<SAIDI≤80 minutes/year 1<SAIFI≤2 interruptions/year Exceptional events included: 60<SAIDI≤120 minutes/year 1.5<SAIFI≤3 interruptions/year”
Fair (2)	Ratio is 11-15 vehicles per charge point	Has no countrywide strategy yet but key cities/states have their own strategy OR vice versa wherein they have a country-wide strategy but key cities don't have their own	With pending standards for approval OR with grant/ incentives in place	Ratio is 11-15 vehicles per charge point	No exceptional events included: 80<SAIDI≤120 minutes/year 2<SAIFI≤3 interruptions/year Exceptional events included: 120<SAIDI≤180 minutes/year 3<SAIFI≤4.5 interruptions/year
Low (1)	Ratio is 16 vehicles or more per charge point	Does not have national strategy set by the government	No pending standard for approval and no grants	Ratio is 16 vehicles or more per charge point	No exceptional events included: 120 minutes/year <SAIDI 3 interruptions/year <SAIFI Exceptional events included: 180 minutes/year <SAIDI 4.5 interruptions/year <SAIFI “

Scoring results: EV charging infrastructure

	Public charge points available Score	EV charging strategy available Score	Existing infrastructure standards for EV Score	Forecasted public charge points Score	Transmission / Distribution Network Reliability Score	Average total Score
Netherlands	3	4	4	3	3.5	3.5
Italy	4	4	4	1	4	3.4
UK	1	4	3	3	4	3
Spain	4	3	no data	1	4	3
France	1	2	4	4	4	3
Germany	3	2	4	2	4	3
Turkey	no data	1	4	4	1	2.5
Ireland	1	3	3	1	3.5	2.3
Norway	1	2	3	1	2.5	1.9



Scoring results: EV charging infrastructure

	Public charge points available	EV charging strategy available	Existing infrastructure standards for EV	Forecasted public charge points	Transmission / Distribution Network Reliability	Average total
	Score	Score	Score	Score	Score	Score
California	2	4	4	3	4	3.4
Canada	3	4	2	4	4	3.4
New York	2	4	4	1	4	3
China	3	4	3	4	3.5	3.5
Singapore	4	2	3	4	4	3.4
Hong Kong	3	2	2	no data	4	2.75
Australia	3	2	1	no data	3.5	2.38
Thailand	2	1	2	no data	4	2.25
Chile	3	2	1	no data	2.5	2.13
Mexico	1	2	1	no data	4	2
Argentina	1	2	1	no data	1	1.25
Brazil	1	2	1	no data	1	1.25



EV Ease of doing business

Strong government leadership allied with a robust legal system and regulatory policies together with strong GDP per capita demonstrates potential and attractiveness to invest in a country's growing EVCI market.

Scoring metrics: EV Ease of doing business

Metrics	Government Stability	GDP	Venture Capital & Private equity Country Attractiveness	Credit rating
	World Bank Index Voice and Accountability: <ul style="list-style-type: none"> Political Stability and Absence of Violence/Terrorism Regulatory Quality Rule of Law Control of Corruption 	GDP per Capita Formula: =GDP/Population	Entrepreneurial culture and deal opportunities, including indicators of innovation, corporate R&D, and the ease of starting, running and closing a business	Forward-looking opinions on the relative ability of an entity or obligation to meet financial commitments
Excellent (4)	Ranks 90-100	Has GDP per capita of €50,001 and above	Ranks 1-10	Has credit rating of AAA
Good (3)	Ranks 75-89	Has GDP per capita of €30,001-€50,000	Ranks 11-20	Has credit rating of +/- AA to +/- A
Fair (2)	Ranks 50-74	Has GDP per capita of €10,001-€30,000	Ranks 21-40	Has credit rating of +/- BBB to +/- BB
Low (1)	Ranks 1-49	Has GDP per capita of €10,000 and below	Ranks 41 and above	Has credit rating of CCC

Scoring results: Government leadership and incentives

	Government Stability	GDP per Capita	Venture Capital & Private Equity Country Attractiveness	Credit Rating	Average total
	Score	Score	Score	Score	Score
Netherlands	4	3	4	4	3.75
UK	3	3	4	3	3.25
Ireland	4	4	2	3	3.25
Spain	2	2	2	3	2.25
Italy	2	3	2	2	2.25
France	3	3	3	3	3.00
Turkey	1	1	1	2	1.25
Germany	3	3	4	4	3.50
Norway	4	4	3	4	3.75
New York	4	4	3	3	3.75
California	4	3	3	4	3.75
Canada	4	3	4	3	3.50
Australia	4	2	1	2	3.75
Singapore	3	3	4	2	3.75
China	3	4	4	4	2.50
Hongkong	4	4	4	4	3.00
Thailand	2	3	4	2	1.50
Mexico	1	1	2	2	1.50
Argentina	1	2	1	1	1.25
Brazil	1	1	1	2	1.25
Chile	3	2	1	3	2.25



Case study

Converting fleet to Electric Vehicles (EV) to help meet zero-emissions goals by 2035

Helping reduce Greenhouse Gas Emissions (GHG)

Transportation accounts for more than 50% of California Greenhouse Gas Emissions (GHG). A September 2020 Executive Order requires that, all new cars and passenger trucks sold in California be zero emission vehicles by 2035. The Executive Order would ban the sale of new vehicles that are powered by an internal combustion engine, which includes gasoline, diesel, and hybrid electric vehicles.


To facilitate an effective conversion of its fleet of internal combustion engine (ICE) vehicles to EVs fleet to meet its sustainability objectives and California targets, Arcadis was retained to develop a fleet electrification plan for a large California utility that provides water service. This study was developed to support the utility's inaugural Sustainability Plan, a roadmap for the utility's forward-looking sustainability efforts.

The water utility currently operates a mixed-use fleet of approximately 225 vehicles. Vehicles are based at one of the utility's four facilities where charging infrastructure needs to be developed.

Developing a Fleet Sustainability Plan

Our fleet electrification plan investigated conversions from every angle and provided a baseline assessment of vehicle use, issues, operational constraints, and facility needs potentially impacting EV adoption.

Coordination with EV manufacturers allowed the team to develop a list of currently available and soon to be available electric vehicles that could potentially replace the utility ICE equivalents. Insights from manufacturers also formed the basis of cost of ownership analyses for major vehicle classes in each of their four facilities.

The collection of findings allowed us to assess the infrastructure needs and energy requirements to support the transition including charging station infrastructure concept plans showing charger locations, layouts, and power supply improvements. Then an alternative energy sources study was performed with a solar power feasibility assessment for roof top, canopy and ground mount systems supports fleet electrification power needs. 

Budgetary cost estimates for a pilot program and future implementation were developed to provide a detailed roadmap, schedule, and financial plan to transition to EVs. Costs covered the planning study, design and engineering work, construction, and implementation, additional operational costs compared to the current operation.

Finding the best EVs to 100% zero-emissions

With this complete roadmap, the utility has its foundation for vehicle electrification. The roadmap will help the utility transition to EVs and meet its target to 100% fleet electrification before 2035 which will reduce GHG and improve residents health in California.

Insights from around the world



Europe

France

Achievements

The French government has established wide-ranging incentives and policies to improve the EV market growth. The government incentives cover used and new private BEVs and PHEVs. On top of this, grants allow people from low-income households or with employment issues to access long-term rental and rent-to-purchase agreements on low-emission vehicles.

Government regulations has an increase tax on diesel and petrol fuels, plus the ban of ICE vehicle sales by 2040. On the infrastructure side, there are firm standards in place to make new and existing buildings EV ready. France's progressive incentives and policies is reflected on their EV market share. In February 2021, BEVs and PHEVs had a combined market share of 24.3% – higher than the UK's. France is poised to be one of the most progressive EV markets in the world.

Opportunities

France is planning to install least 7 million charge points by 2030. As of this reporting period, however, they only have 31,206 public charge points in Metropolitan France and 1,780 fast chargers. To meet their goal, they will need to ramp up public charge point availability, especially

fast charger availability. They will also need to consider the possibility of chip shortages in the manufacturing of EVs and for charging infrastructure. As well as the on going events in China that may impact manufacturing as a result we may see a linear increase in the number of EVs moving forward.

With their incentives and policies, France is doing their best to encourage individuals and businesses to transition to EV and equitably. Eventually, however, they may need to speed up their public charging infrastructure plans to ease the transition and meet the growing EV sales. Rural France, in particular, will need strategically located hubs to cater for those travelling long distances across the country.

France EVs by the numbers

- Market share of EVs: 24.3
- France is aiming to ban new sales of petrol and diesel vehicles by 2040
- Gas Price per Liter €1.752 Energy Price per Kwh €0.125 (Average 9.2 Liters consumed per 100km : 15kwh consumed per 100km)
- Gas Price consumption per 100km €16.2. Energy price consumption per 100km €1.87



Germany

Spotlight market insight:

Strong early government engagement in the transition has kick started the market but lack of clarity is beginning to cause worries over long term development.

Achievements


Germany has one of the stronger strategies to incentivize the development of the EVCI market as it is backed by EUR 3.9 billion worth of funds by the government. The policy also stipulates that all petrol stations in Germany are required to also accommodate EV charging stations and they also have new legislative tax incentives favoring EVs. With these plans being implemented by the government we assess Germany as one of the leading markets acting proactively to ease the transition to electric vehicles.

Opportunities

Unlike other European countries Germany has no announced plans banning the sale of ICE vehicles in the future. This is reflected in the lack of EV models available in the country. Germany has 81 models available compared to the other European countries like Netherlands, UK, France and Ireland have more than 100 models for people to choose from.

The challenges Germany faces is that of a complicated political landscape in so far as some lawmakers support the transition of EVs, however other political figures are opposed to an ICE vehicle ban in the country. Recent political events meant their net zero target date was moved from 2050 to 2045 and this upheaval within the government may create uncertainty in the automotive industry and may affect the decisions of those wishing to transition to electric vehicles and thus investors looking to secure sound financial EVCI opportunities.

Germany EVs by the numbers

- Market share of EVs: 22.5%
- Germany has not yet announced a plan to ban ICE vehicles but has a net zero target date of 2045
- Gasoline price per liter: €1.978, Energy Price per kWh: €0.247
- Gas Price consumption per 100km €18.2. Energy price consumption per 100km €3.7 



Ireland

Achievements

Ireland's expanding EV market is nascent but gaining in strength due to targeted government regulations and charging infrastructure standards. Key policies include the need for future buildings, major renovations and existing properties with certain volumes of parking space to have EV charge points. The government offers incentives to encourage EV adoption in the country such as residential and public charge points, relief on vehicle registration tax and grants for the taxi/hackney and limousine sector.

Opportunities

Ireland will need to focus on some areas such as; increasing public charge points, setting ultra-low emission zones and they still have not yet declared the banning of ICE vehicles however they are aiming that by 2030 they would have finished transitioning to electric vehicles. The government also announced recently that there will be reduction in the incentives transitioning to EV which poses a problem as it is one of the most powerful mechanisms that can be used by the government in convincing the people to transition to EVs.

Ireland EVs by the numbers:

- Market share of EVs: 5.87%
- They have not yet declared a ban on ICE vehicles but they have a net zero target date 2050
- Gasoline price per liter: €1.8, Energy Price per kWh: €0.19
- Gas Price consumption per 100km €15.56 Energy price consumption per 100km €2.85



Italy

Achievements

Italy's EV market is still in the early stages, but the government is committed to support its growth. Back in 2016 the Italian Ministry of Transport and Infrastructure regulated the possibility to convert conventional vehicles into electric vehicles. After the regulation they have set a target to replace 25% of government fleets into EVs, hybrid and natural gas vehicles. They have also set policies for new and renovated properties to include EV charge points. Italy made strong progress in transitioning to EV back in 2020 due to the increase of government incentives. The transition of transport has also been given support from cities like Milan and Rome with plans including banning ICE vehicles and Florence having granted 70% of new taxi licenses to EV fleets.

Opportunities

There is no official announcement yet in their net zero emission target date and there is also no plan for banning vehicles with exhaust fumes. Their policies can also improve by having more EV specific rules and regulations. A low BEV and PHEV market share is possibly linked with them having low volume of public charging points i.e. due to lack of visible EVCI people are discouraged to buy an EV. With limited charging points available for the country it could affect the future of their EV market.

Italy EVs by the numbers:

- Market share of EVs: 4.4%
- No plans on banning ICE vehicles but has are planning to cut 60% of carbon emissions by 2030
- Gasoline price per liter: €1.76, Energy Price per kWh: €0.19
- Gas Price consumption per 100km €16.19 Energy price consumption per 100km €2.85



Netherlands

Spotlight market insight:

A leader in EV development in Europe based on a wealthy driver base, but energy affordability issues may limit future development


Achievements

Netherlands ranks at the top of our metrics as it is the most advanced country when it comes to the EV transition as per the parameters set. The government provided an ample amount of tax incentives of EV sales, and they have a plan to ban ICE vehicles by 2030 which is many years ahead of some other countries. They scored highly in the returns potential as the data shows that they have 41 charge points per 100km and therefore with this many charge points in the country people will not have a problem in transitioning to EV.

Opportunities

While having a leading EV market, Netherlands could improve with their regulations addressing fuel retailers and existing infrastructure. They also do not have a net zero target date but instead they have a 49% target for reduced greenhouse gas emissions by 2030. These areas provide great opportunities for a progressive EV market.

Netherlands EVs by the numbers:

- Market share of EVs: 25%
- By 2030 Netherlands plans to have no carbon emissions, but they have not yet released a zero target date
- Gasoline price per liter: €1.76, Energy Price per kWh: €0.19
- Gas Price consumption per 100km €16.19 Energy price consumption per 100km €2.85 



Spain


Achievements

Spain has supported the EV market by creating new regulations and providing about €800 million worth of incentives. They also plan to invest €4.3 billion for their EV market for production and batteries and €1 billion will be allotted in boosting their public charging stations. They also have a reliable and stable distribution network which is a good building block for EVCI, averaging only 30minutes of SAIDI/SAIFI.

Opportunities

Spain will need to make improvements in their public charge points. Currently they are averaging 3 charge points per 100km which may limit the growth in people wishing to transition to EV. Providing the people and fleet operators more information on EV models, charging requirements and adding its locations may convince potential buyers to transition to EV.

Spain EVs by the numbers:

- Market share of EVs: 4.8%
- Spain has declared a ban on ICEs by 2040 and a zero target date of 2050
- Gasoline price per liter: €1.80, Energy Price per kWh: €0.11
- Gas Price consumption per 100km €16.56 Energy price consumption per 100km €1.65 





United Kingdom

Spotlight market insight:

UK government has a clear strategy with milestones and a plethora of public funded schemes to incentivise infrastructure indicating a bright long-term future which has increased the index score. Physical roll out currently lagging, slowing market growth in the near term.


Achievements

The UK has made great progress in their country EV strategies and city plans and legislations. The UK has been the fastest nation in G7 in their actions to decarbonize cars and other vehicles stating that all new petrol and diesel vehicles will be phased out by 2030. The UK is committed to funding their EV charging infrastructure with a €2.5 billion funds. With its strategies in place it will greatly increase their current public charging infrastructure with a ratio of 41 charge points per 100km and by 2030 it's expected to increase by at least 51 charge points per 1km.

Opportunities

Currently the UK is still behind other European countries when it comes to the volume of public charge points available across the country. To alleviate problems in transitioning to EVs the UK will need to have more available public charge points and encourage people to charge at home and work. Local governments can partner with consultants and charge point providers to map where EV chargers are needed and what support the government can offer. Another concern is the availability of suitable EV's in the marketplace as there is often up to a year wait for some models and not all of the market is accommodated for.

UK EVs by the numbers

- Market share of EVs: 6.9%
- In 2030 UK will ban all new ICE vehicles and have a Net Zero target date of 2050
- Gasoline price per liter: €1.96, Energy Price per kWh: €0.23
- Gas Price consumption per 100km €18.03 Energy price consumption per 100km €3.45 

Turkey

Spotlight market insight:

The market is heavily dominated by ICE vehicles with little incentive to currently invest in EV charging. However, shoots are beginning to be seen with government initiatives and with a strong standards framework, the market could be in a place to grow quickly.

Spotlight Market Insight: The market is heavily dominated by ICE vehicles with little incentive to currently invest in EV charging. However, shoots are beginning to be seen with government initiatives and with a strong standards framework, the market could be in a place to grow quickly.

Achievements

Turkey's own EV brand has launched and is being promoted by their president, President Erdoğan, kicking off what could be the backbone of the Turkish EV market. TOGG will go into series production in the 4th quarter of 2022. This has a potential to attract those who value homegrown brands.

In addition, Turkey has policies that will help EV charging infrastructure in parking lots, fuel stations and other suitable places to build EV chargers if they have the positive opinion of the relevant electricity authority. They also have a green tariff which allows consumers to access renewable energy source for their EV chargers should charging station operators apply for it. If these policies will be utilized properly by the Turkish government, there's a possibility that this can boost buying decisions for those looking to convert to EVs.

Opportunities

Turkey's EV market is still in its infancy so there is still a lot of room for improvement. Firstly, setting up a more concrete net zero goal would be a good first step and to have a clearer timeline of when they will impose policies. They ratified their net zero goal, moving it to 2053, 3 years after the target set at the Paris Climate Accords. Secondly, they have raised the tax on EVs which could hamper buying decisions. In addition, there's no indication yet of any diesel/petrol car sales ban target. These factors, if resolved, can further improve the current EV market share in the country which is at almost 9%. If there's no incentives, then policies and regulations are the next thing that can help promote the EV market. For now, it seems, a lot of work needs to be done before the Turkish EV market can really thrive.

Turkey EVs by Numbers

- Market Share of EVs: 8.7%
- Turkey does not yet have a ban on ICE vehicles but declared a net zero target date of 2053
- Gasoline price per liter: €1.21, Energy Price per kWh: €0.06
- Gas Price consumption per 100km €11.13 Energy price consumption per 100km €0.9

Norway

Achievements

Norway's EV market is ahead of its time and impressively so. Their EV market growth can be credited to their car tax system which makes EV models cheaper to buy compared to a similar petrol model. The Norwegian parliament is confident that by 2025, all car sales will be either electric or hydrogen thanks to their strengthened green car tax system. Another accomplishment for Norway is their capital's wireless charging for electric taxis trial, making it more efficient for taxis to charge. Lastly, another important factor for their advancement could be their early net zero goal for 2025 with their capital, Oslo, targeting net zero as early as 2023. This gives a clearer timeline for setting up charging infrastructure and EV plans.

Opportunities

Despite the strong green tax system in place, diesel and petrol car conservatives can continue to use their cars especially since there's no usage ban at all. In Oslo, conservatives don't agree to the ban of petrol and diesel cars.

Companies in Norway are adapting their business models and offering EV charging infrastructure but there's no minimum standards yet requiring stations and new buildings to have EV chargers. The Norwegian government can take advantage of this by introducing policies/regulations to encourage more businesses to install EV chargers on their premises. Right now, data suggests there's at least 30 EVs per charge point in Norway and 75% of EV owners experience regular charging queues, highlighting the need for more chargers in the country to meet demand.

Norway EVs by Numbers

- Market Share of EVs: 86.5%
- Norway has banned all ICE vehicles by 2025, they currently have no net zero date
- Gasoline price per liter: €2.24, Energy Price per kWh: €0.10
- Gas Price consumption per 100km €20.61 Energy price consumption per 100km €1.5

With the National Grid forecasting 11 million electric vehicles on UK roads by 2030 (and over 30m by 2040), there is a clear role for local government in EV infrastructure planning and installation to address ever-increasing demand

Arcadis was commissioned by Carmarthenshire County Council (CCC) to prepare a countywide Electric Vehicle (EV) Strategy that complemented local and national initiatives. The strategy aimed to promote EV uptake through proposed EV charge points and complementary measures to meet EV charging demand for residents, employees, and visitors.

Client Challenge

CCC required a regional EV strategy and technical evidence base that supported the transition to zero emission vehicles, with the aim of becoming an early leader in the field.

Like many local authorities across the UK, CCC must adapt to cope with the rising demand for EVs. CCC had already begun work to accelerate this transition through the installation of fast and rapid chargers available for public use but lacked a coherent and unifying countywide strategy.

Our role & solutions

Baselining

Drawing upon our expertise conducting extensive EV policy reviews across the UK, we provided a holistic overview of current policies and trends to inform strategy development.

Forecasting

In agreement with CCC, we integrated Welsh Government forecasts for electric vehicle uptake, traffic forecasts, journey purposes and journey lengths.

Solutions Option Development & Assessment

A range of evidence-led solutions were identified including infrastructure and complementary solutions to support uptake. Challenges and opportunities for each solution were identified to inform holistic recommendations. Appraisal followed WelTAG principles and policy objectives locally and nationally.

Client

Carmarthenshire County Council

Key Arcadis Staff and / or Client Reference

Daniel Parr (Arcadis)
Thomas Evans (Carmarthenshire County Council)

Products & Services

Consultancy
Transport Planning
EV Strategy

Project dates

July – October 2021

Project Deliverables

Carmarthenshire County Council EV Strategy
Key Milestones Objectives (5 & 10 years)

Innovation

We used digital mapping tools including the application of Geographic Information Systems (GIS) to visualise existing Electric Vehicle Charging Point (EVCP) infrastructure and available energy capacity across the study area.

Existing EVCPs were each illustrated with a mile buffer, enabling the identification of gaps in Carmarthenshire's network provision. In turn, this enabled us to make recommendations for potential future locations to install charge-points, with the aim of developing a stronger, well distributed EVCP network.



A 'use case scenario' was subsequently devised which assessed grid capacity. This scenario simulated the implementation of Rapid EV chargers to develop a baseline energy analysis of primary substations and the demand headroom across the Carmarthenshire area. This analysis enabled us to make assumptions on areas across the county in need of infrastructure upgrades to meet demand.

Sustainability

By encouraging future growth in EV use, we have assisted CCC in futureproofing the transport network, which ultimately will contribute to local and global pollution reductions and improve quality of life.

In addition, accelerating the rollout of EV charging infrastructure constitutes a specific component in the roadmap to achieve Welsh Public Sector net zero greenhouse gas emissions by 2030. The deployment of efficient EV fleets and sustainable charging infrastructure will be integral to achieving this.

An emphasis was also placed on ensuring that less-populated rural areas across Carmarthenshire are not excluded from EV use by lack of infrastructure in order to create an inclusive user experience across the region.

Outcomes

After stakeholder engagement, this EV strategy has now been adopted. The client is proud of the work we carried out on their behalf and have raised this on a regional level.

This project has enabled a regional piece of work for CCC and three surrounding local authorities to be commissioned directly to Arcadis, comprising further forecasting of EV and EVCP uptake based on a bespoke-led Arcadis forecast model.

Finally, this work has helped to raise awareness of what is required in Carmarthenshire to provide for an uptake in EVs, and has helped senior decision makers buy in to a delivery plan for the future, available at.

"I was very proud to lead the delivery of Carmarthenshire's EV Strategy setting out a delivery plan for transition to EVs over the next ten years. We worked closely with the client to understand their needs, which helped us to meet tight timescales with deliverables right first time"



Daniel Parr

Associate Technical Director –
Arcadis Sustainability Mobility
and Technologies (SM&T)



North America

Canada


Achievements

Canada has invested about €570 million euros in their charging infrastructure and to make EVs more affordable for its consumers. These investments include the establishment of fast chargers coast to coast and installment of public charge points in localized areas where they live, work and play. Canada scored highly in our metrics for ease of doing business having good GDP and private equity it proves that doing business with the country has low risk potential. With its good governance they have provided an ample amount of incentives to encourage its citizens to transition to EVs.

Opportunities

Though Canada has plans in improving their charging infrastructure, the land mass of the country makes it quite a challenge. As their citizens are spread out across the country the charging availability is notably low as result the market for EVs is also affected. Increasing the public charge points will greatly affect the decisions of potential EV consumers with concerns on how they will be able to recharge their vehicles while on the road.

Canada EVs by the numbers:

- Market share of EVs: 3.52%
- Canada has set the ban of ICE vehicles in 2035 and has a net zero target date of 2050
- Gasoline price per liter: €1.40, Energy Price per kWh: €0.09
- Gas Price consumption per 100km €12.88 Energy price consumption per 100km €1.35 



United States: California

Achievements


The Biden administration has allocated €4.75 billion amount of funding for the development of the country's charging infrastructure on top that, the California state government has the California electric vehicle infrastructure project (CALeVIP) which will address the regional needs of charging infrastructure throughout California while supporting state goals to improve their air quality and combat climate change and reduce the use of petrol. California state has provided multiple incentives relating to EVs with its good governance and high GDP they prove to have low risk for investors wanting to invest in the country.

Opportunities

California is one of the largest states in America with one of the highest density of people, it will be a great opportunity to speed up the improvement of their public charge points. The charging infrastructure is one of the main reasons to consider for the people to transition to EVs. As gas prices increase more and more people will consider in purchasing an EV. To ease the transition, they will need to mobilize more quickly the California Electric Vehicle infrastructure project.

California has been leading the transition to EV in the United States including but not limited to vehicle annual sales and all other zero emission vehicle metrics i.e., funding, market share percentage, most extensive public charging infrastructure in the country.

California EVs by the numbers:

- Market share of EVs: -8.1%
- California is banning ICE vehicles by 2035 and have a net zero target date of 2045
- Gasoline price per liter: €1.10, Energy Price per kWh: €0.11
- Gas Price consumption per 100km €10.12 Energy price consumption per 100km €1.65 



United States: New York


Achievements

In Addition to the national plans of the Biden administration throughout the US in improving the public charging stations, the state of New York has also released its plans of improvement. The EVolve NY is a plan of the state government in adapting to electric vehicles across the state. The program creates private-sector partnerships to expand fast-charging infrastructure and make EVs more user-friendly for all New Yorkers. NYPA is installing fast chargers along major interstate corridors, in five major cities and at New York City airports. The state government of New York also offers huge amounts of incentives and developed policies in support of the EV Market.

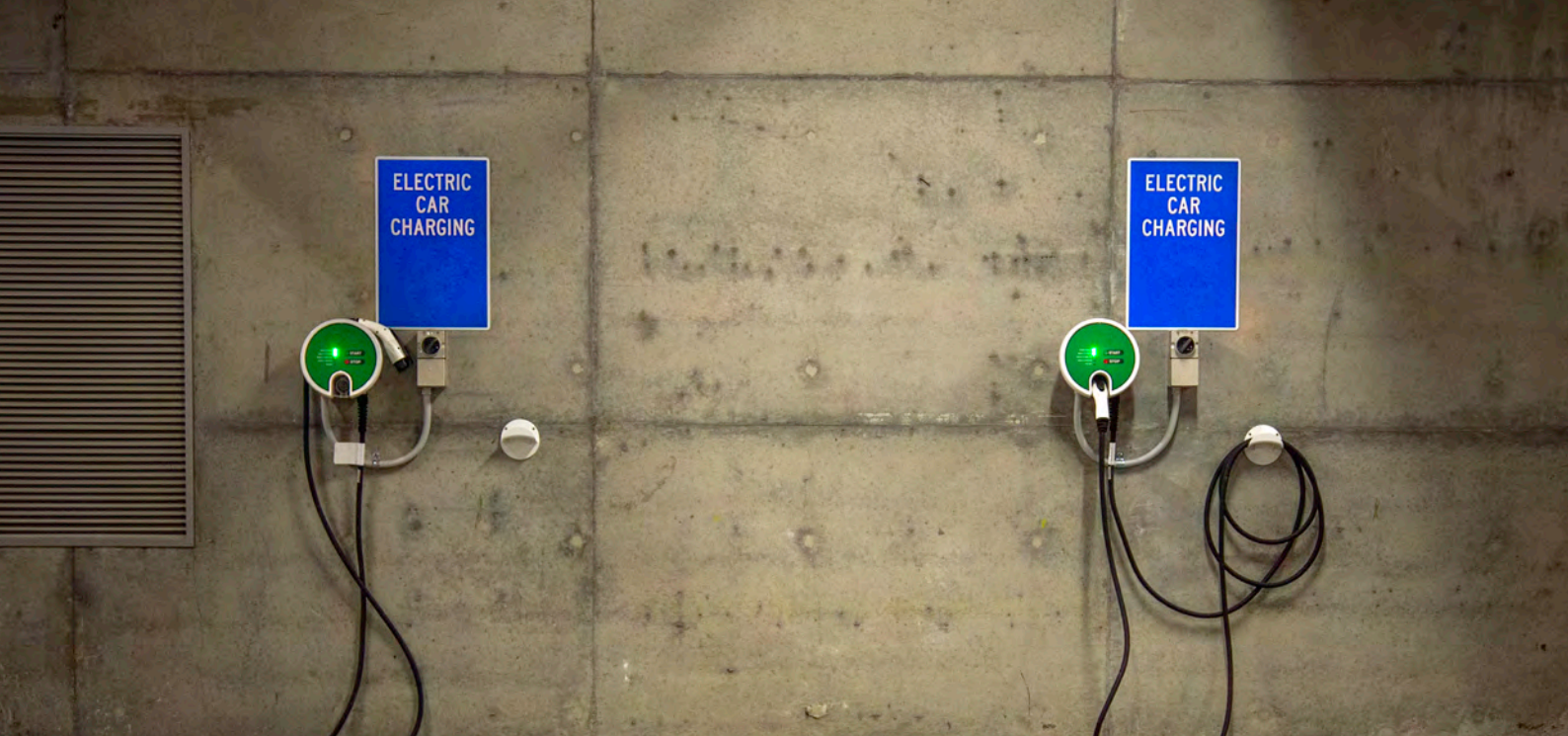
Opportunities

Even though the state of New York has provided good incentives, implementation plans for charging infrastructure and their market maturity scoring is fair in our metrics, their EV market share is significantly low. Convincing New Yorkers to adopt EVs is crucial, but not the only avenue for improvement. With so many city residents in New York City depending on taxis, electrifying those fleets could help with EV goals. More models will need to be approved, though.

New York EVs by the numbers:

- Market share of EVs: -0.67%
- New York has banned all ICE vehicles by 2035 and a net zero target of 2050
- Gasoline price per liter: €1.10, Energy Price per kWh: €0.11
- Gas Price consumption per 100km €10.12 Energy price consumption per 100km €1.65 






Asia Pacific

Australia

Achievements

The Australian government has provided a \$16.5 million AUD worth of funds for grants to pay for battery electric vehicle fast-charging stations across capital cities and key regional centers. They also allocated \$40m in support for the improvement of their charging infrastructure and are holding a two-year EV trial for a government fleet. Each province in Australia has their own plans in place to support the people in transitioning to EVs. The Australian government also invested in the Clean Energy Finance Corporation (CEFC) to accelerate the Jet charge roll out of EV charging infrastructures.

As of 1st August 2022 a range of EV policy measures and ambitions have been announced by Australian Federal Government which includes:


- Amendment to Fringe Benefits Tax Assessment Act to exempt zero or low emission vehicles, including eligible plug-in hybrid models
- Removal of a 5% tariff for eligible electric cars with a customs value below that luxury car tax threshold for fuel efficient vehicles
- Intention for \$500 million investment to boost national charging infrastructure
- Target for 75% of new Commonwealth government fleet purchases to be electric by 2025
- Promised National Electric Vehicle strategy, which broadly targets 89% of new cars sales to be electric by 2030, and 15% of all vehicles on the road 

Whilst the actual tax and tariff changes further incentivise EV purchases, they aren't dramatic – and there remains no penalty for polluting vehicles (as exists in Europe and elsewhere) – the broader intent around EVCI investment and government fleet transition are possibly more significant to the Australian EV market.

Opportunities

Though the government has allocated funds in support of the EV charging infrastructure and grants. They have yet to release any national policy and regulations in support of the EV Market. This may also be one of the reasons why their EV market share is considerably low. The Australian government has not yet announced a ban of sale of ICE vehicles which is one of the factors leading to a low market share for EVs.

Australia EVs by the numbers:

- Market share of EVs: 0.7%
- Australia does not have a plan to ban ICE vehicles but have a net zero target date of 2050
- Gasoline price per liter: €1.13, Energy Price per kWh: €0.18
- Gas Price consumption per 100km €10.40 Energy price consumption per 100km €2.7 

China

Spotlight market insight:

Huge market size and need to limit pollution in cities has given both public and private stakeholders reason to invest in the market – however the business environment for foreign companies remains difficult to navigate.


Achievements

China is one of the very first countries to participate in the EV market and it has been consistent ever since the beginning. The country has spent at least \$60 billion in support of the electric car industry such as research and development, tax exemptions and financing for battery charging. The Chinese government has allocated €361 million in the development of their charging infrastructure in support of the EV industry. They also have multiple strategies in place for key cities regarding the charging infrastructure to help with the transition to EVs. The commitment of the Chinese government in support of the EV industry shows as they have more than 200 fast chargers 100km and multiple regulations in local governments around charging infrastructure for new properties and other infrastructure projects.

Opportunities

Though China is one of the earliest to participate in the EV industry their market share is still considerably low even though they have a solid charging infrastructure in place. The government will need to develop new strategies to convince its people to swap their ICE for a BEV. As it stands they need to improve their grants and subsidies to help the growth of their EV market.

China EVs by the numbers:

- Market share of EVs : 5.9%
- China has planned that their public sector vehicles will all be EVs by 2035 and net zero target by 2060
- Gasoline price per liter: €1.37, Energy Price per kWh: €0.09
- Gas Price consumption per 100km €12.60 Energy price consumption per 100km €1.35 



Singapore


Achievements

Despite having a small land mass, the country has an ample number of charging stations to support EVs. The Singapore government has provided grants and subsidies in support of the EV market. They have also set aside \$30 million worth of funds for the next 5 years for any initiatives related to EV. The country has also provided policies in making charging stations a mandatory aspect in parks, new buildings and other certain types of infrastructure. They have a plan to roll out 60,000 EV charging stations across the country by 2030 and released a ban date for sale of new ICE vehicles by 2040.

Opportunities

Though the Singapore government is doing their part in improving their EV market, they have very low Market Share for EVs. Having better strategies around grants and subsidies could potentially convince its people in transitioning to EVs. Providing more models to choose from can also be considered in the growth of their EV Market.

Singapore EVs by the numbers:

- Market share of EVs : 0.2%
- Singapore plans to phase out ICE vehicles by 2040 but does not have a net zero target date
- Gasoline price per liter: €1.20, Energy Price per kWh: €0.14
- Gas Price consumption per 100km €11.04 Energy price consumption per 100km €2.1 

Thailand


Achievements

The government of Thailand has released a \$164 million PHEV and BEV projects to help establish their initiative to transition to EVs. They also have a plan to produce 1.051 million EV units by 2025 and a long term goal of producing 6.22 million EV units by 2030. They are set to sell zero-emission only vehicles by 2035. Thailand aims to develop a Smart Grid and smart EV charging system as well as implementing a “vehicle to grid” (V2G) electricity system to ensure more efficient power distribution to support EV usage.

Opportunities

The Thailand government currently has no plans to fund public charge points but instead is highly dependent on private investments. The government will need to create a strategy moving forward to improve their public charging station if they want to have a smooth transition to EVs. Being able to recharge your vehicle on the road while travelling is one of the key elements to consider of the consumers if they want to adopt to EVs. The lack of government initiatives regarding these aspects may hinder their plans for the future of the EV industry in their country.

Thailand EVs by the numbers:

- Market share of EVs: No Data Available
- Thailand is banning ICE vehicles by 2035 and but does not have net zero target date
- Gasoline price per liter: €1.29, Energy Price per kWh: €0.10
- Gas Price consumption per 100km €11.87 Energy price consumption per 100km €1.5 



Hong Kong

Achievements


Despite being on its early stages, Hong Kong’s EV market is evidently growing thanks to their government’s support. Hong Kong has a comprehensive EV roadmap plan which consists of important EV factors such as funding, EV policies, innovation plans and charging infrastructures. Within their plans, they are utilizing their country’s demographical setup where a lot of their residents stay in residential buildings. For instance, the EV-charging at Home Subsidy Scheme is a smart move to help EV owners easily charge their cars at their residential parking lots. In addition, Hong Kong has setup millions in funding for electric bus fleets so they can test it under their local conditions. They also have \$200 million Green Tech Fund to fund research and development (R&D) of green technologies, including EV projects.

In the long run, we can see Hong Kong’s plan boosting EV sales further in the country and can potentially make them one of the attractive EV markets out there.

Opportunities

There are many factors that could improve the EV market which is still in the feasibility stage, this includes requiring fuel stations to have EV charging capacity as well as electrifying their taxi fleets. It has been pointed out that their taxis operate 22 hours a day. It seems that what Hong Kong needs are fast chargers or wireless chargers to support the electrification of taxi fleets. What they can do is speed up the feasibility study in this area and look at innovations of other countries like in the UK where they have EV chargers on their lamp posts and in Norway where they have wireless charging systems for their electric taxis, offering a quick charging solution. Establishing a wider EV charging network for both private and public sector can be just what Hong Kong needs to boost their EV market even further

Hong Kong EVs by the numbers:

- Market share of EVs: 0.7%
- Hong Kong will stop new registration of fuel-propelled private cars, including plug-in hybrids and hybrids in 2035 and a net zero target date of 2050
- Gasoline price per liter: €2.66, Energy Price per kWh: €0.14
- Gas Price consumption per 100km €24.47 Energy price consumption per 100km €2.1 



Case study

Feasibility Study for Forecourt EV Chargers, Solar PV and Battery Energy Storage Sustainable solutions

Client: Confidential

Background

Arcadis was engaged by a confidential client who manages Australia's largest petrol and convenience network with a history spanning over 120 years. This client, with the support of government grant funding, is taking the first step to transition their business from a traditional hydrocarbons-based transport fuels provider into renewable energy retailer to the public, representing a significant transformation of their business model. A condition of the applicable government funding was that the recipient was required to abide by a fixed delivery schedule that necessitated seamless project design and execution.

The role of Arcadis


Arcadis was responsible for developing a feasibility design study for the integration of forecourt EV chargers, solar PV and battery energy storage at the 121 sites across Australia.

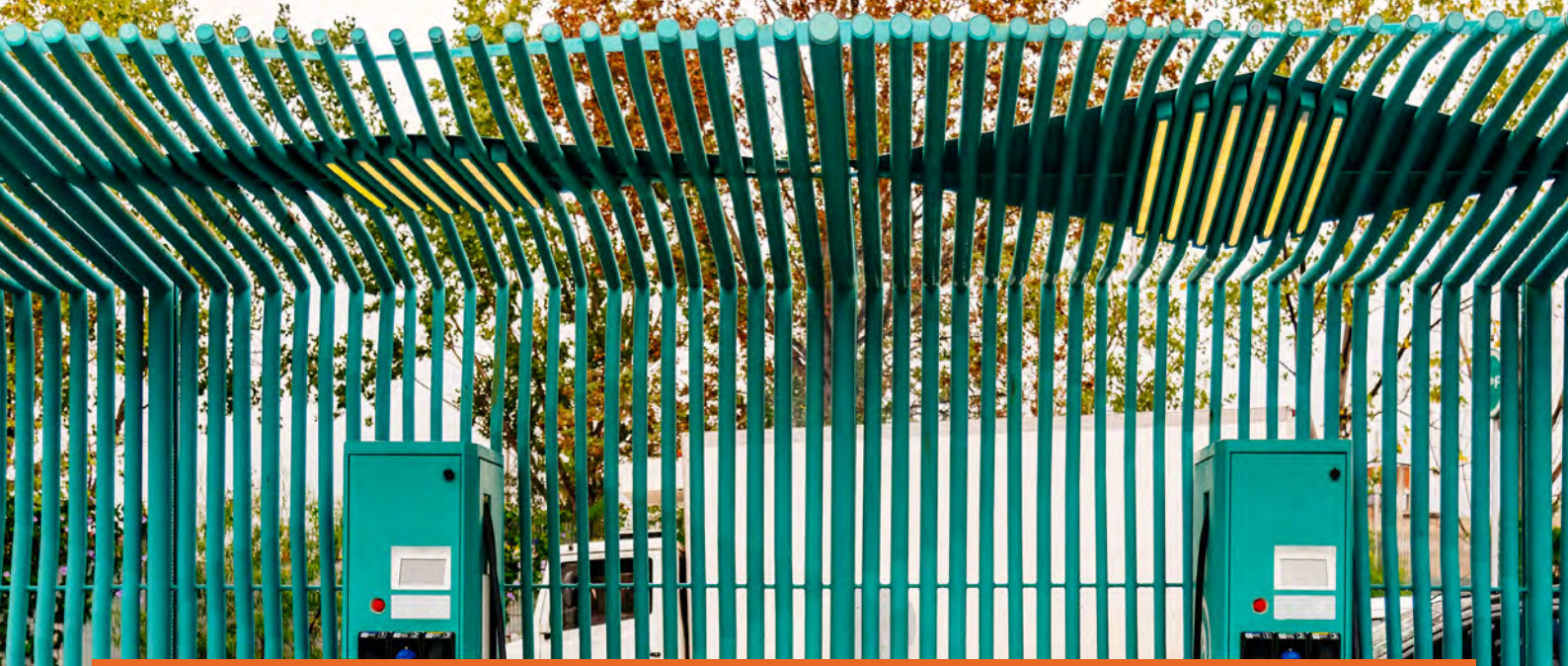
Results for our client

Arcadis developed a standardised model enabling scalable and repeatable designs to be implemented across multiple sites, minimising the requirement for bespoke solutions. Our cost estimation team developed a comprehensive

model that compares site upgrade costs and assisted with investment prioritisation. To meet the tight schedule and de-risk the project, the Arcadis team developed a series of innovative methods. One such method was a GIS based solution enabling real-time reporting based on a customised reporting application that could be used by the Arcadis field and design teams. This nationwide GIS platform was used in conjunction with site inspection and a reporting platform to allow real-time reporting and quality assurance for data collection and design. This solution was shared with the client to enable effective collaboration.

Relevance to this project

- Assisting our clients with a clear path forward – Arcadis delivered a feasibility study that set out a plan to deliver a relatively new technology
- At the forefront of sustainable solutions – This project is an example of how Arcadis is leading energy transition in the transport sector, which is the key to help achieve greener, cleaner and better environment for generations to come.
- Experience providing project-developed models to our clients – Arcadis developed modelling tools that were refined and quality assured for ongoing use 



Asia Pacific

Mexico

Spotlight market insight:

A market with little current EVCI development and little certainty on returns, on the other hand it has a strong underlying infrastructure (networks) means that investors should keep an eye on this as a development opportunity.

Achievements


Even if Mexico is only a developing market for EVs, they have imposed several incentives to boost the roll out of EVs in their country. To show more initiative, Mexico's Ministry of Economy has signed an agreement to ban the sale of ICE vehicle from 2040 within the framework of the UN's COP 26 and have committed to sell only zero-emission vehicles from the year 2040. In addition, Mexico also has a program called "Hoy no circula" which targets the reduction of vehicle emission in Mexico City and State of Mexico through penalty over a specific time. On top of this, the city also has its "Taxi Improvement Program - Request for Support

and/or Financing for Vehicle Replacement 2021" which offers financial support to those qualified vehicle owners who wish to transition their vehicle to EV. If all these initiatives will indeed be effective, it can somehow help attract consumers to consider acquiring electric vehicles.

Opportunities

National Association of Electric Vehicles (ANVES) is working with public and private sector and the government at the national level to be able to establish the Mexican Official Standard for the conversion of ICE vehicles to 100% electric vehicle. To meet the country's emission targets, however, they need to speed up this standard discussion and alongside this, implement strong EV policies that will attract citizens and corporations to use EVs. Mexico also needs to rush the development of their National Electric Mobility Strategy and implement it in order eliminate decision barriers related to acquiring an EV. This strategy is a key element in the successful rollout of EV in the country as this will tackle investments, legal framework, infrastructure, incentives and educating the consumer.

Mexico EVs by the numbers:

- Market share of EVs vs ICE: 4.6% vs (Lorem Ipsum)%
- Mexico has declared the ban of ICE vehicles by 2040 but has yet to declare a zero target date
- Gasoline price per liter: €1.09, Energy Price per kWh: €0.15
- Gas Price consumption per 100km €10.03 Energy price consumption per 100km €2.25 



Punto
eléctrico

Argentina

Spotlight market insight:

A very nascent market that is seeing little development in EV penetration or investment infrastructure, however, relatively low costs of developing infrastructure means it could be a market with early investment potential.

Achievements

The government of Argentina is currently proposing a new bill in favor of EVs, which will allow the consumers to own EVs and their utilities with less cost and reduced tax. The government has also implemented annual fees for internal combustion engine vehicles in entering the downtown areas of the country to discourage and lessen the use of ICE vehicles in busy-wide areas to lessen the gas emission it produces. There has been an increase of EV users in the country since the


market for EV exploded back in 2017 when the tariff reduction was introduced for their importation. The government of Argentina has been very supportive in favor of the electronic vehicles and will have more plans for it in the coming future as they have a net zero target date in 2050.

Opportunities

Currently the major cities in Argentina are lacking the charging points for Electronic Vehicles and this serves as a great opportunity for the market in adding these charging points to the busy-wide areas of the country. They also have quite a low number of people using EVs currently and with the plans of the government proposing the plan on focusing the usage of electronic vehicles there would be a surge of demand in the market. Though their rankings in the maturity of their EV Market are low their returns potential gives out fair results.

Argentina EVs by the numbers:

Market share of EVs: 1.7%

- Argentina has declared the ban of ICE vehicles by 2041 and a net zero target date of 2050
- Gasoline price per liter: €0.93, Energy Price per kWh: €0.04
- Gas Price consumption per 100km €8.56 Energy price consumption per 100km €0.6 

Brazil

Spotlight market insight:

A market that is at the low end of the development and adoption curve. Strong government incentives have positioned it for strong growth in the future.

Achievements

Brazil's path to electrification is still developing and the number of electric cars is still low, however, the Brazilian government is set to promote the transition to electric vehicles. They are ramping up the support to the EV market through its electric mobility programs, fiscal policies, research and development (R&D) initiatives, and other regulations created to encourage adaptation of e-mobility. Among these initiatives, Brazil is focusing on its R&D programs as its EV market is still at its early stage. The leading public institution conducting R&D projects on e-mobility is the Brazilian National Electric Energy Agency (ANEEL). A strategic program established by the ANEEL called ANEEL R&D – Call 22, aims to generate business and foster solutions to the e-mobility market within a 4-year period (2020-2024). This strategic call program for e-mobility has an allocated investment of approximately R\$620 million for this project. These programs help to promote the EV market in Brazil and by 2030, studies estimated that the country will have 8 million EV cars in their road.

Opportunities

Currently Brazil has very limited public charge points only having an average of 3 public charge points per 100km. The government currently has no plans for funding public charge points for the masses and this poses a problem for the people that want to transition to EV as they might not consider it due to the lack of public charging stations and affecting its convenience. Most of Brazil's public charge points only came from private investors. The government will need to develop a proper plan if they want to have a smooth transition to EVs.

Brazil EVs by the numbers:

- Market share of EVs: 0.3%
- Brazil has banned the sale of ICE vehicles by 2030 and a net zero target date of 2050
- Gasoline price per liter: €1.44, Energy Price per kWh: €0.15
- Gas Price consumption per 100km €13.25 Energy price consumption per 100km €2.25

Chile


Achievements

Chile is advancing the electric mobility for its public transport, with a goal to transition all its public transit fleets to zero emissions by 2040. They are one of the countries with largest number of electric buses in the world with a total of 814 e-buses. Santiago, Chile's capital city, has a fleet of more than 700 e-buses and growing, the largest outside of China. (By comparison, there were about 650 e-buses in the entire United States in 2020, although political momentum seems to be building for an investment in the sector.) Santiago is aiming for a zero-emission fleet by 2035. They also have a good ratio of charging infrastructure when compared with the rest of the countries in Latin America. In addition to that, Chile also has government programs supporting the electrification of its fleet. The latest program is the Ministry of Energy 2022 Public-Private Electromobility Agreement. This agreement has summons 142 institutions and companies and has grouped the actions committed in the 4 axes of the National Electromobility Strategy, where they could join one or more of these axes including Sustainable means of transportation and financing, Charging infrastructure and regulation, Research and human capital, and Dissemination, information and articulation. Chile's goal to decarbonise its transportation will accelerate through this government strategy to collaborate with institutions and private companies.

Opportunities

Chile has made notable progress on the electrification of its public transport; however, they also need to improve their strategies in promoting private electric vehicles. Chile lacks national regulations and EV incentive schemes that will boost the attractiveness of electric cars. Chilean government could speed up its National Electromobility Strategy especially the creation of incentives including subsidies to purchase and recharge electric cars.

Chile EVs by the numbers:

- Market share of EVs: 0.1%
- Chile has declared ban on ICE vehicles by 2035 and a net zero target date of 2050
- Gasoline price per liter: €1.30, Energy Price per kWh: €0.11
- Gas Price consumption per 100km €11.96 Energy price consumption per 100km €1.65 



Conclusion

Thinking about investing in EV infrastructure?

The maturity of the EV markets in countries you are thinking of investing in will act as a guide and but if your organization is actively thinking about investing in a particular location or real estate portfolio please get in touch with our EV Investment Advisory team to explore the opportunity in more detail where we can support with data, insights and technical due diligence.

Actively planning for investment in EVs now will not only align your organization for the forthcoming regulations and incentives, EVs can be a key tactic for achieving ESG objectives, improving regional air quality and meeting larger net zero goals.

We help the public and private sector bring their EV visions to life with support for every phase of the journey from strategy building to executing fleet implementations and charging infrastructure construction to the supply, operation and maintenance of the infrastructure. The variety of projects that we have been involved with provides unique insight into what's hindering global EV adoption and how to get on the path to a successful EV transition.

For more on how we can help with EV and charging infrastructure strategies, fleet transitions and charging network implementations, connect with us today.





Methodology

As the world advances towards the future of clean energy emission and countries transitioning to EVs. Arcadis has determined that the most influential categories suitable for measuring the maturity of the countries market for EVs are: Government leadership and incentives, Charging infrastructure, Returns potential and Ease of doing business with the country.

Following a workshop and numerous interviews and engagement with multiple members of the WBCSD the parameters were validated and a scoring matrix developed and organized as can be seen in the section above and with the data available publicly from multiple sources it was put together by the research team within Arcadis. All research was then validated by Arcadis employees based in those countries and other members of the WBCSD.

The data gathered was used to measure the performance of each country against the scoring matrix developed. The results were studied and reviewed and developed into an assessment for each country defining their achievements in transitioning to EVs and opportunities moving forward.

Members and organizations that contributed in the workshop and in interviews included: Arcadis, Comfordelgro, Daloop, EATON, EBRD , IEA, ENEL, E-REDES, RAP, DIDI and in-country validation from Arcadians around the world.

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