AVNET® EMBEDDED

**The Embedded Opportunity
For Electric Vehicle Charging**

If you are interested in learning more about the Electric Vehicle charging market and how you can maximise your opportunities, whether you are a fuel retailer or forecourt owner, commercial space owner or city and town planner, we have the answers you need.

This guide has been developed to help share information and opportunity around the largest disruption in the transportation space that we have seen in recent times and are likely to see for some time – the rise and rise of electric vehicles.

We've worked with IDC to gather information and statistics around the increasing pace of development in the electric vehicle charging market and help you understand the opportunity it represents for many different interested stakeholders.

Electric vehicles and the change they will bring about to how we all move around will be profound and will change not just the methods of transport, but the way we all plan and undertake journeys in the future.

Changes in the Electric Vehicle Market Driven by the Need for Energy Efficiency

We worked with IDC (International Data Corporation), to find out more about the trends, drivers and legislation affecting the Electric Vehicle (EV) charging market and what the potential opportunities could look like for a broad range of stakeholders.
Here are some of the key findings:

WHAT'S DRIVING THE EV CHARGING MARKET?

Transportation is the least diversified and most carbon-intensive sector of human activity in terms of energy demand. In 2010, **over 90% of its energy use came from oil** and 10 years later this is still the case. However, multiple factors are aligning to set the electric mobility revolution in motion, including shrinking battery costs, increased range, government net-zero ambitions, auto manufacturer commitments and consumer attention to their carbon footprint. These are turning what was niche demand for zero-emissions mobility only a couple of years ago into a mass market and will soon lead to an explosion in the number of EVs on our roads.

Despite the COVID-19 crisis, 2020 was the strongest year on record for EV sales, with about **3 million new electric cars registered globally**, a 5.6% market share. Government action is expected to significantly boost EV sales in the years to come, as low-emission vehicles are incentivized, and vehicle CO2 standards are raised further. In advanced markets like Norway, a decade of tax incentives and public investment in charging infrastructure has pushed the market share of fully electric vehicles beyond 50% in 2020.

In recent months, EV sales have accelerated past the 80% mark, as the country seeks to become the first nation to ban the sale of fossil fuel cars by 2025. Similar policies are driving sales in Sweden and the Netherlands, where respectively one in three and one in four cars sold in 2020 was an EV. Larger car markets are accelerating too. By the time petrol and diesel car sales are phased out in the UK, **in 2030, an estimated 11 million EVs will be circulating** on British roads, up from 450,000 today, growing to 36 million by 2040.

Globally, IDC Energy Insights expects up to 57 million electric cars to be sharing roads in 2025, 21 million of which in Europe alone.

The Future Charging Experience
– EV Charging as the next WiFi

As well as commitment to change from governments and manufacturers, the speed of development of the charging infrastructure will be the real pace setter of the EV revolution. While most charging tends to occur between home and work, roll-out of public and semipublic chargers will be a critical enabler of convenience, range, and autonomy for EV drivers. In fact, with consumer demand reaching critical mass, EV charging is set to become an essential service in urban and suburban environments, like parking itself, and a required amenity for commercial spaces, much like WiFi.

Charging infrastructure is growing at pace globally, with an estimated 1.3 million publicly accessible chargers at the end of 2020 (one third of which are fast chargers), up 45% compared to 2019. However, there are wide differences between regions and countries. Europe accounts for about one third of the global EV stock but only 20% of the global public charger tally with most countries lagging the targets set by the EU's Alternative Fuel Infrastructure Directive (AFID) of one public charger per 10 EVs in 2020. Interestingly, some of the countries where the EV market is picking up speed or has already entered its exponential phase are struggling to keep up. According to the IEA, five of Europe's seven fastest growing EV markets in 2020 (Iceland, Norway, Denmark, Portugal, and Sweden) rank at the bottom of the public charger ratio ranking.

According to Eurelectric, for Europe to stick to its carbon neutrality plans, public EV charging infrastructure needs to more than triple from an estimated 290,000 points at the end of 2020 to more than 1 million in 2025. Luckily, the investment tap is now fully open in the form of direct public funding, tax incentives and subsidies, public-private partnerships, and innovative business models (e.g., landlord-operator partnership) and private investment (from utilities, automotive manufacturers, and specialized companies). This will support the development of personal, municipal, and regional charging infrastructure, including electric motorways and highways, as well as commercial and destination charging points.
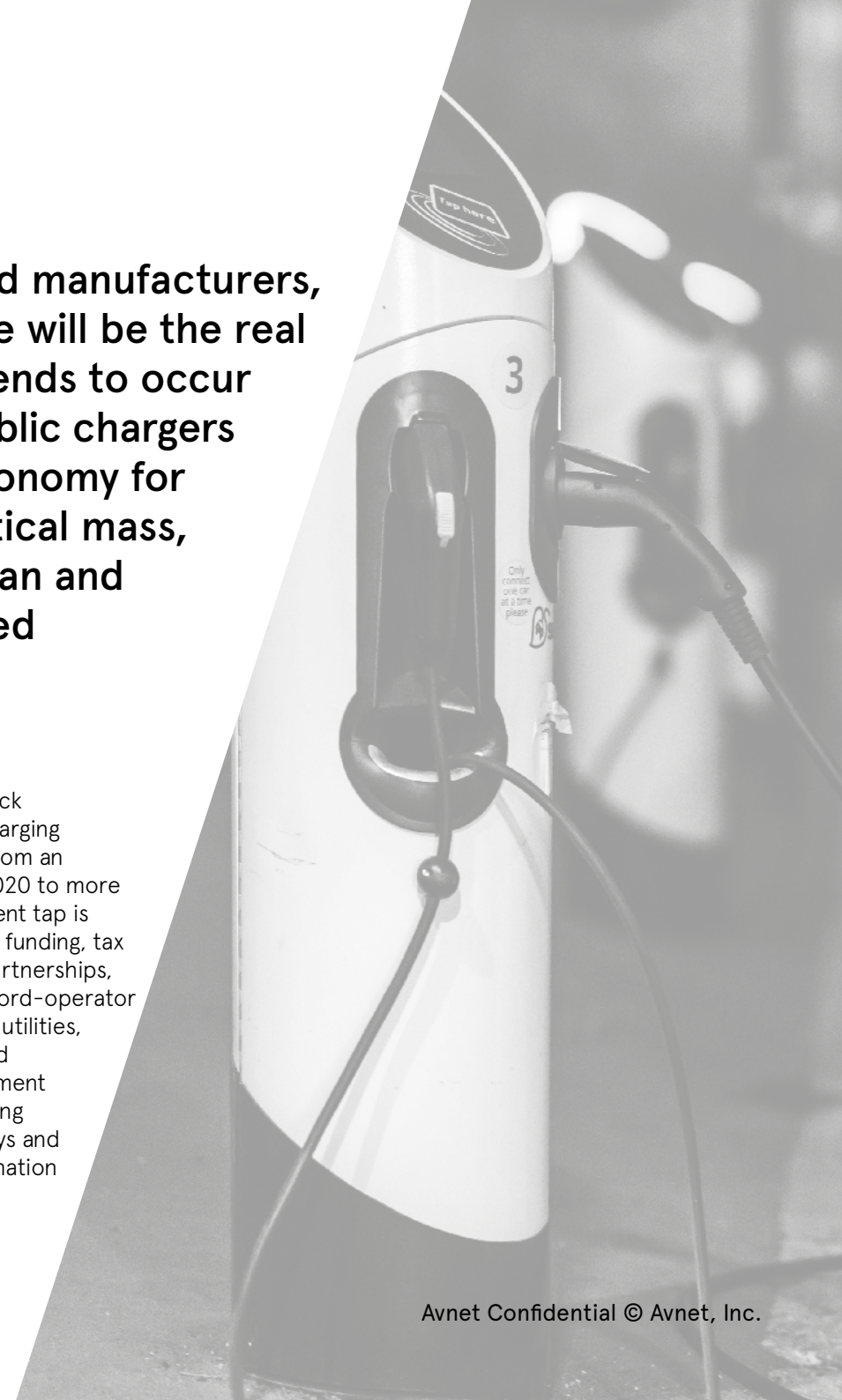
Charging Infrastructure
– Opportunities for New Stakeholders

The shift to electric mobility has already brought significant change to the automotive industry and will have profound effects on the environment, consumer behavior, the livability of cities and numerous other aspects of human life.

The expansion of electric vehicles and the changes in our journeys that these will create, will present new opportunities for a range of new stakeholders. To date, fuelling vehicles has been dominated by an ecosystem linked to fuel companies.

Now, users will want to charge their vehicles before and after their journeys as well as enroute, this means that anywhere vehicles stop, or park can become a charging point. This is one of the most significant commercial shifts since the invention of the automobile more than a century ago.

Stakeholders that could now provide EV charging infrastructure have expanded to include commercial space owners, utility companies, municipalities and local councils, as well as fuel retailers. You do not have to be an oil company to develop a charging point network or start an EV charging service. And you do not have to master the complex logistics of fuel retail to offer customers the convenience of recharging when shopping, going to see a movie, visiting a restaurant, or staying at a hotel.

Charging Infrastructure
– Opportunities for New Stakeholders continued

The commercial opportunity around EV charging — be it one of business expansion, diversification, or outright portfolio transformation — is sizeable and multifaceted.

COMMERCIAL SPACE OWNERS

Today, EV charging can be a tool for diversifying, enhancing the brand image and the customer experience for EV owners. Gradually, it will become a driver for loyalty, increased footfall, and new revenue streams, as well as a strategy for future-proofing operations. In fact, to meet consumer demand, on-site commercial charging will become a must-have facility within the decade. The Climate Group's EV100 Initiative is a great example of corporates getting ahead of the e-mobility curve. It brings together 110 companies in 80 markets committed to switching their fleets to EVs and installing EV chargers for staff and customers by 2030. IKEA, one of the EV100's most prominent members, has recently reached its goal of providing access to EV charging at all its stores' car parks, as it looks to become climate positive by the end of the decade.

UTILITY COMPANIES

"Electric cars are a good idea for an electric company" — the CEO of Enel famously said in 2017, adding that utilities who trail the EV revolution do so at their own risk. For power utilities and electricity suppliers, EVs not only bring a healthy expansion of the core business, but also an opportunity to integrate downstream into mobility services. Utilities are actively becoming charge point operator (CPOs) for cities and towns, commercial spaces, and private companies as well as e-mobility service providers (EMSP) for individuals and fleet operators. Finnish utility Fortum, with its Charge & Drive and PlugSurfing brands is a perfect case in point.

MUNICIPALITIES AND COUNCILS / CITY AND TOWN PLANNING

Offering EV charging means promoting modern, sustainable mobility, improving air quality and livability standards while generating new income for citizens. Regulators and city planners are already integrating EV infrastructure development in building-design and urban-planning standards to make public EV charging more scalable, accessible, and affordable. In the EU, in addition to national incentives, a "Right to Plug" is being proposed allowing citizens to request the installation of charging points in or near their building of residence or workplace. In addition, the Energy Performance of Buildings Directive (EPBD III) contains provisions to ensure that buildings with more than 10 parking spaces are progressively equipped with EV chargers.

FUEL RETAILERS

Forecourt electrification is quickly turning from a necessary portfolio diversification strategy to one of survival, as it becomes a core source of revenue substitution. In fact, mass-market rollout of EV charging stations now sits at the very core of oil companies' energy transition vision. To put the sheer scale of the investment in context, Europe's largest oil companies — BP, Shell, and Total — have announced plans to deploy a combined 700,000 chargers globally by the middle of the decade.

How Avnet Embedded Can Help You Develop EV Charging Experiences

Avnet Embedded brings together its rugged compute, display and software technology to become the perfect partner for the design, manufacture and management of electric vehicle (EV) charging solutions all over the world. User experience is critical when designing new product offerings but identifying the right embedded and display technologies to power your next innovation can be complex, time consuming and expensive.

With a leading track record in delivering human/machine interface (HMI) devices that combine compute and display for a range of different organisations, Avnet Embedded is ideally positioned to help with EV charging, whatever the requirement. Working with original equipment manufacturers (OEMs), power companies, governments and local authorities as well as commercial and private space owners, our team has the experience and capabilities to deliver EV charging technology solutions at any scale.

Avnet Embedded's experience in display, compute and software means the development and build of EV charging solutions can be supported and fulfilled, whatever your needs. From the forecourt to the cloud, experienced teams can fill in the blanks in your skillset and supply chain and get your EV charging requirements deployed faster, better and stronger.

We make it easy from the very beginning. Our design expertise will help you find the perfect technology for your application, and we'll work with you to plan all elements of manufacturing, support and product lifecycle planning.

How Avnet Embedded Can Help
You Develop EV Charging Experiences continued

Application Ready embedded and display platforms can assist you to meet the ever-changing demands of the EV market, for any application within the EV charging ecosystem. All our offerings are available with industry standard compliance certification, coupled with board support packages, software services and edge to cloud IOT connectivity options.

Our partnership with other Avnet businesses means we can also provide comprehensive hardware support as well as interconnect, passive and electro-mechanical components, bringing the whole solution together. This helps to improve your user experience and provide limitless design possibilities. Importantly, we will cut your time-to-market and reduce your risk by leveraging proven designs.

THE BENEFITS OF AVNET'S EV CHARGING EMBEDDED AND DISPLAY SOLUTIONS:

· Reduce your time to market by taking you from idea to solution quickly
· Allow selection and configuration, with no extra development needed for standard products
· Standard or custom cooling solutions to meet harsh environments
· Seamless Embedded, Wireless, Display and Software offerings Ecosystem
· Built-in versatility by utilising many customization options
· ARM and x86 scalability including AI acceleration capabilities
· Optimized designs for low production cost and simple customization
· Industrial temperature range from -40°C to +85°C
· EMEA wide support teams

With EV charging solutions that balance cost with capability, Avnet Embedded can help you to identify the right embedded and display technologies for your needs, as well as working with you through manufacturing, support, and product lifecycle planning. This tailored approach to embedded and display technologies is fast, flexible, low-risk and proven to improve user experience.

SPECIFICALLY, AVNET EMBEDDED OFFERS INTEGRATED SOLUTIONS ACROSS:

COMMERCIAL
Ideal for businesses offering parking as a service, commercial units feature all the benefits of a public EV point, but charge at a significantly higher speed. We can also support a wide range of display capabilities which build in the potential for advertising and wider engagement with users and partners.

PUBLIC
Robust, paid charging units suitable for public facilities, with large display areas for advertising, payment systems LTE and WiFi.

HOME/OFFICE
Personal/business use charge points with simple functionality. Ideal for installation alongside new home and office builds but can also be added to existing constructions.

Avnet Embedded – Why We're the Perfect Partner for EV Charging

Avnet Embedded's leadership in display, compute and software technology makes us the perfect partner for developing your EV charging solution. From the forecourt to the cloud, our team can fill in the blanks in your skillset and supply chain and get your EV charging requirements deployed faster, better and stronger.

WE CAN HELP IN 4 KEY AREAS:

DISPLAY

Avnet Embedded specializes in rugged displays for demanding environments. With a proven track record designing and supplying displays for outdoor kiosks, ticket machines, ATMs and vending machines, our display experts know what will work in every temperature, rain or sun (or snow). We can design and assemble the whole display from touch surface to chassis.

Display solutions perfect for EV Charging stations include:

· Tamper-proof displays
· Weather-proof displays
· Passive displays
· OLED / TFT displays
· All-weather touch screens

COMPUTE

Avnet Embedded's industrial embedded computing platform is perfect for EV Charging. Building on success with self-service machines including vending, ticket machines and other customer-facing systems designed to operate flawlessly 24 hours per day and coupled with our extended lifespan support of up to 30 years, Avnet Embedded can meet all your compute needs for EV Charging.

Our EV Charging compute solutions include:

· Rugged compute design and manufacturing
· Security and tamper hardening
· Visual AI solutions for forecourt management
· Video processing and storage for security
· Wired and wireless connectivity
· Power management

We have partnered with Intel on compute solutions for EV Charging and can provide compute solutions in both x86 and ARM architectures. Our advanced embedded compute designs also provide capability for advanced functionality like vehicle recognition, tamper detection, biometrics and more, ensuring your EV Charging network will be world-class.

Avnet Embedded – Why We're
the Perfect Partner for EV Charging continued

SOFTWARE

Avnet Embedded's Software design team manages everything from Operating System (OS) customization to Graphical User Interface (GUI) design and beyond. If you need the support of our in-house experts, we can provide it. We've designed customer interaction solutions for everything from coffee machines to aircraft.
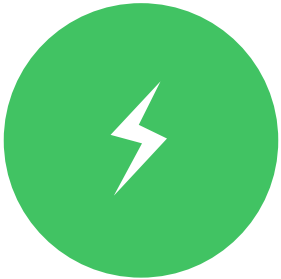
IP&E

Not only can Avnet Embedded handle the compute, displays and software, but by combining strengths with other teams in the Avnet stable, we can also provide comprehensive hardware support for interconnect, passive and electro-mechanical components, bringing the whole EV charging solution together. All you need to do is tell us where to ship the finished unit!

Software solutions we provide for EV Charging include:

· Payment systems
· User management
· GUI Design
· Functional reporting
· Remote management
· IoT connectivity
· Power consumption tracking and prediction

Conclusion –
The Time for Action is Now!

The EV revolution is upon us. Companies that choose to ignore it do so at their own risk. Organizations that understand its scale, strategic significance and commercial potential may only have a few years before adoption enters the exponential phase in their markets.

IF YOU ARE PLANNING YOUR FUTURE POSITIONING IN THE NEW EXPANDED MOBILITY SERVICES ECOSYSTEM, YOU SHOULD CONSIDER THE FOLLOWING ADVICE FROM IDC:

· **Plan your EV charging point deployment with based on immediate demand.** Align your minimum viable charging service to your customers' immediate needs in terms of charging behavior, equipment type and payment options.

· **Think of your EV charging experience requirements in the future.** How does EV charging align with your brand and business strategy? Plan to leverage intelligent technology to transform your operations and expand on your core customer experience.

• **Integrate EV charging into your capital and urban planning process,** standardizing, and building out the enabling infrastructure during greenfield and renovation projects to avoid expensive retrofits in the future.

• **Become an EV charging advisor to your customers.** Help large public and commercial clients electrify their fleets and host EV charging capacity in the most cost-effective manner, focusing on open-charging protocols and charger interoperability. Provide private customers with standard, easy to use solutions to support their transition.

• **Think of solutions that integrate onsite generation, storage and active energy and load management** technology to keep up with demand and use flexibility to minimize the cost of owning an EV and providing charging services.

Want to Find Out How to Get Your Electric Vehicle Charging Project to Market Faster?

AVNET EMBEDDED

Whether you're looking for a complete solution, elements of your build or just help bringing your design innovation to life, Avnet Embedded can fill in the blanks in your skillset and supply chain and get your EV charging requirements deployed faster, better and stronger.

You can see more information about our EV charging offer here:

www.embedded.avnet.com/ev-charging/

If you'd like to download the full IDC whitepaper, you can also do that here: xxx

Let's talk!

Contact our team on avnetembedded@avnet.com
to find out more and discuss how we can help
make your EV charging ideas a reality.