ECG
Business Intelligence

Prepping for the EV Invasion

IN FVL EUROPE

Contents

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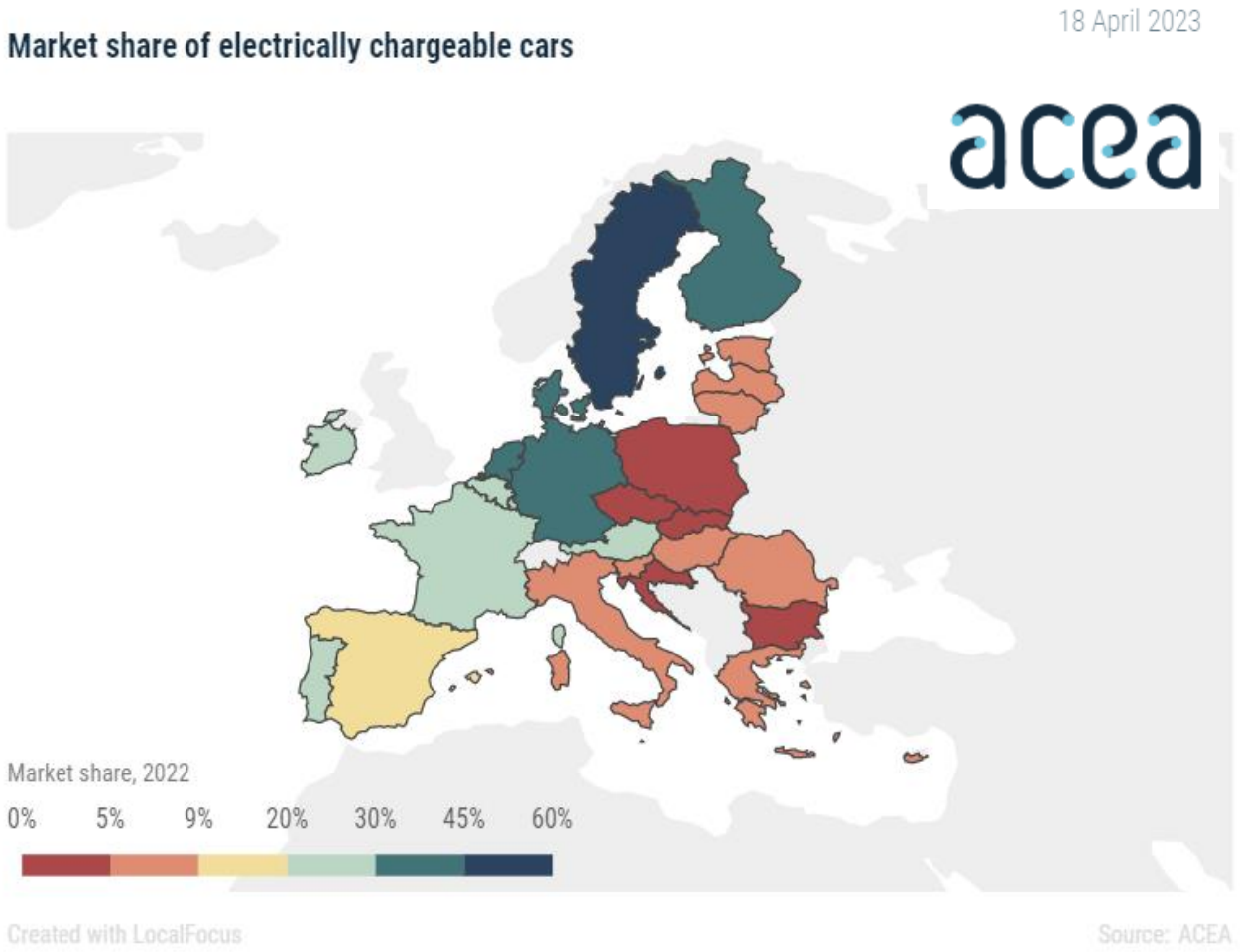
Part 1

EVs are coming, but WHO will SURVIVE?

Outlook for EV growth in Europe

Penetration of Electrically Chargeable Vehicles (ECV) in New Car Sales in 2022



Country	% ECV
Finland	37.6%
Sweden	56.1%
Estonia	5.4%
Latvia	8.1%
Lithuania	7.9%
Poland	5%
Czech Rep	3.9%
Slovakia	3.7%
Hungary	8.6%
Romania	9%
Bulgaria	4%
Greece	7.9%
Cyprus	5.4%
Italy	8.7%
France	21.5%
Spain	9.6%
Portugal	21.7%
Ireland	22.2%
Belgium	26.5%
Germany	31.4%
Denmark	38.6%
Netherlands	34.5%
Luxembourg	24.3%
Austria	22.1%
Slovenia	6.2%
Croatia	5%

Key Facts:

- ECVs account for **21.5%** of new cars in the EU in 2022
- But more than half EU member countries ECV market share **under 10%**
- **Disparity in affordability** affecting ECV penetration in Europe

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ECV = BEV (12.1%) + PHEV (9.4%)

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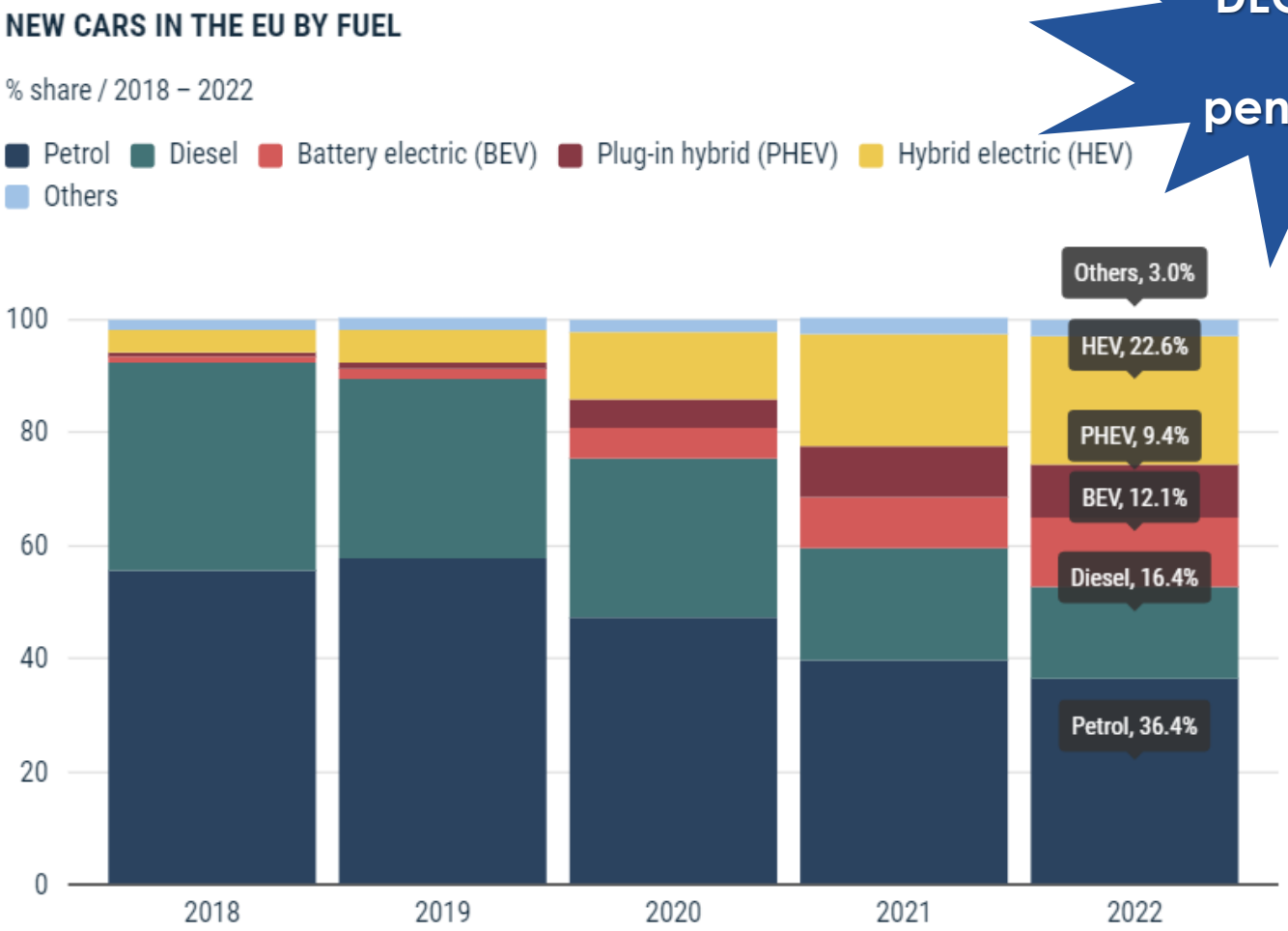
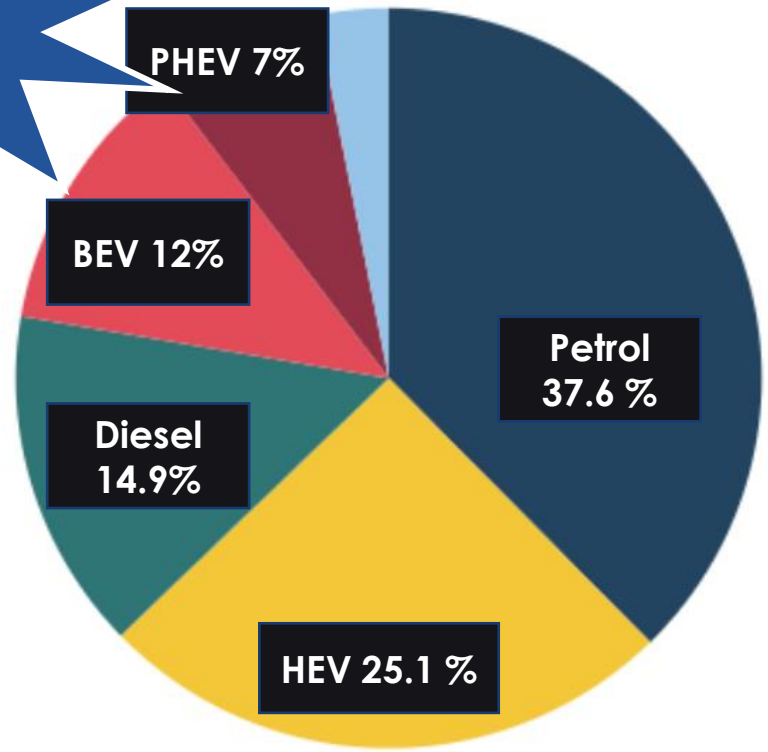
UK: BEV (16.9%) + PHEV (6.2%) = 23.1%
NORWAY: BEV (79.3%) + PHEV (8.5%) = 87.8%

FUEL TYPES OF NEW CARS IN EU

DECLINE in ECV penetration



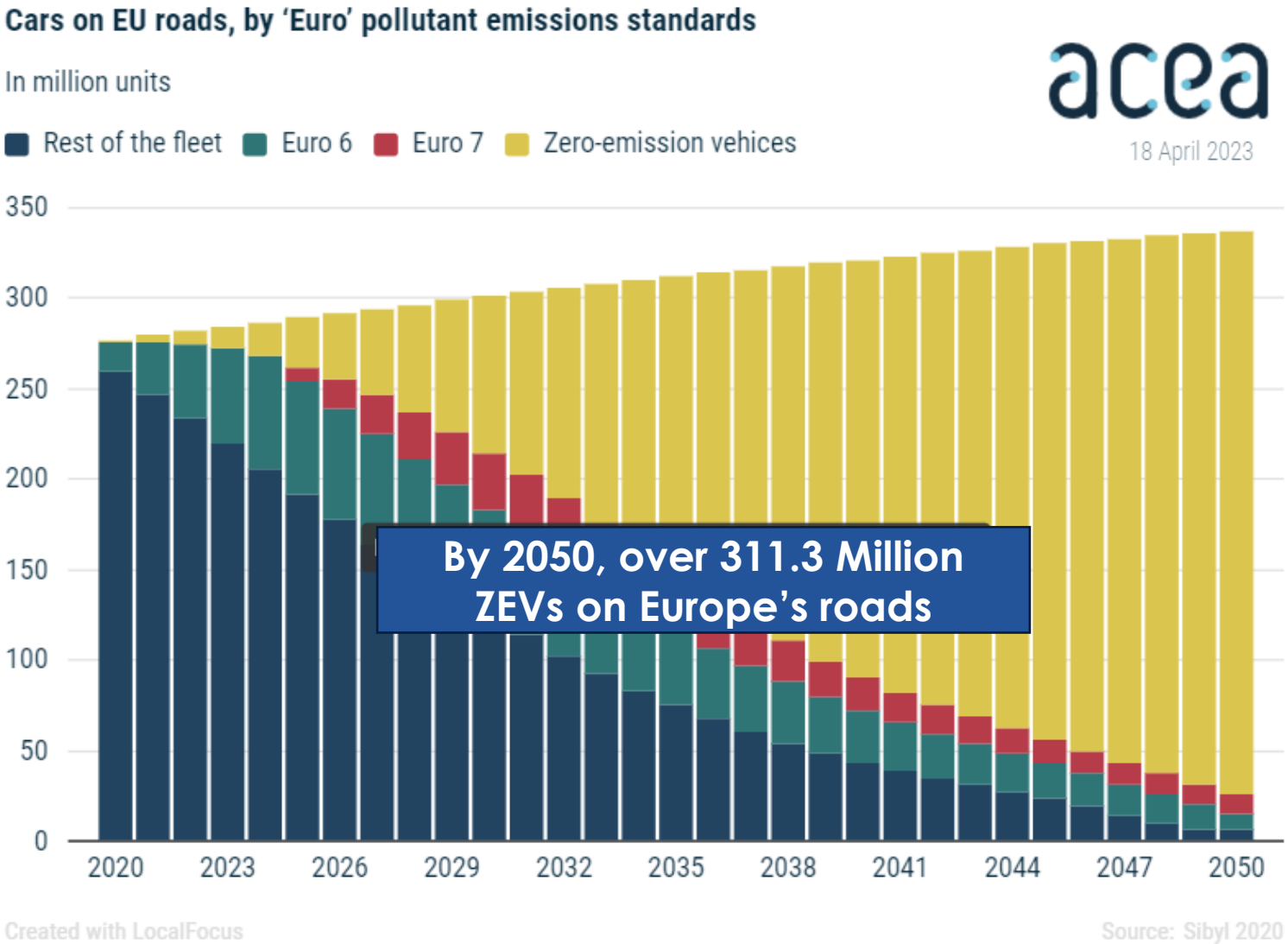


January-April 2023

2022: 21.6% OF NEW CARS WERE ECVs

January –April 2023: 19% OF NEW CARS ARE ECVS

Outlook for Zero Emission Vehicles (ZEV) in Europe



Year	ZEV (Zero Emission) in Million Units
2020	1.5
2021	3.6
2022	7.4
2023	12.5
2024	19.1
2025	27.1
2026	36.6
2027	47.4
2028	59.4
2029	72.7
2030	87.1
2031	101.8
2032	116.8
2033	132.1
2034	147.5
2035	162.8
2040	231
2045	273.5
2050	311.3

Zero Emission Vehicles set to rise from just **1.5 million** units in 2020 to **311.5 million** units in Europe by 2050.

By 2030, ZEVs will account for **87.1million** units in EU, around **29%** of market.

By 2050 ZEVs will account for **92.3%** of market in EU!

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ACEA definition of ZEV: Zero Emission Vehicle (ZEV) = Battery Electric Vehicle (EV) + Fuel Cell Electric Vehicle (FCEV) only.

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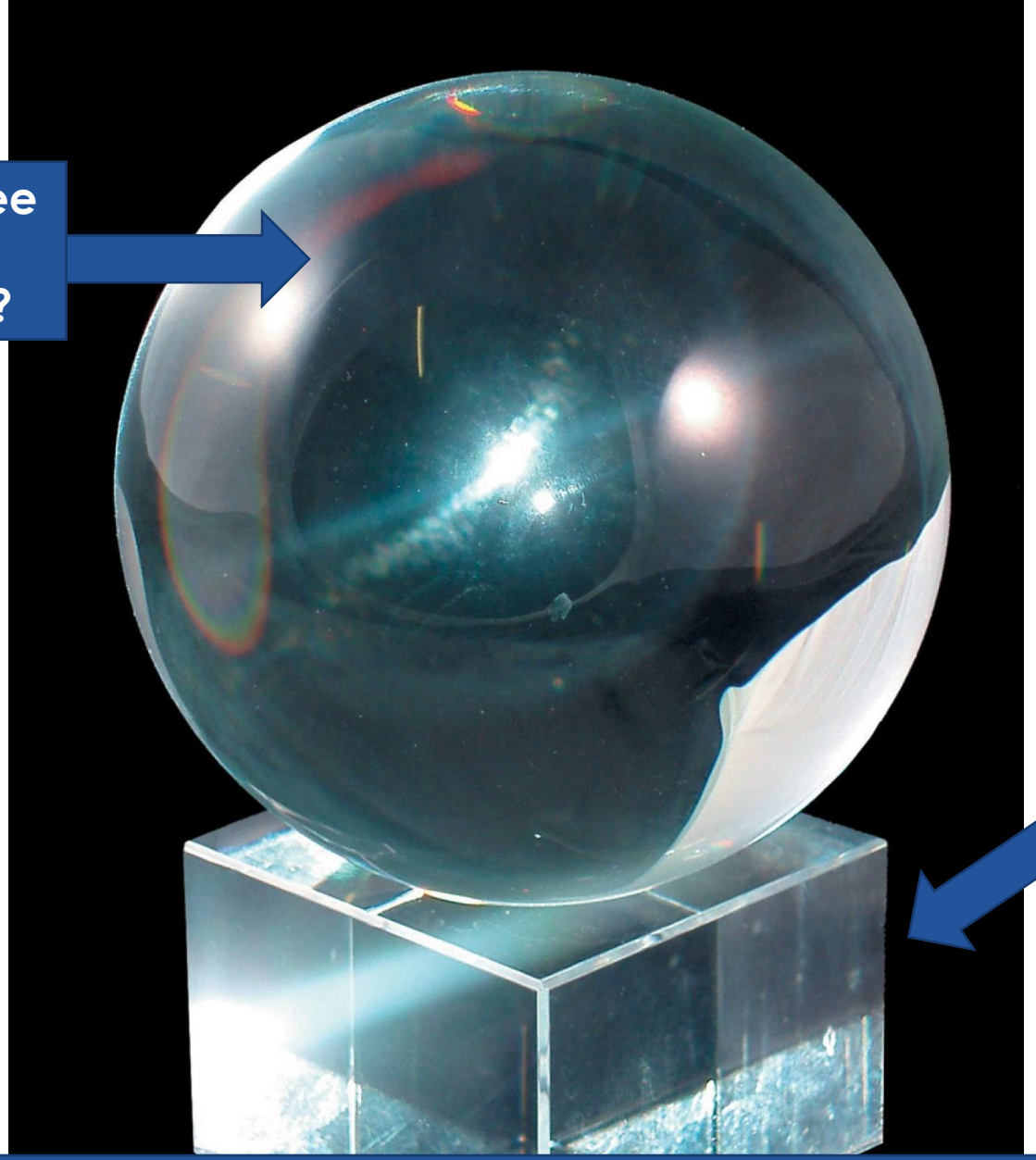
Can we see the Future!?!?



Strong foundation?

We need a **'CRYSTAL BALL'** to know who will **SURVIVE**,
Who will win market share, who will disappear….

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THE FUTURE OF AUTOS

CNN BUSINESS

The great electric car race is just beginning

Established carmakers around the world are ripping up their business models in the hope of adapting to a new world in which electricity replaces gasoline and diesel…

False starts

History isn't the best indicator of who will emerge from this battle victorious. The industry has a poor track record with electric cars…

Who Will Survive Among the Legacy vs. Startup Auto OEMs?

evadoption

Only 10 carmakers will survive global EV battle, says Tesla rival Xpeng

FINANCIAL TIMES

APRIL 25 2023

Bloomberg

BYD's welcome in Europe worries local automakers

"To be in that '3mn club' you cannot be a China-only player, you have to be a global player. We think in that scenario, maybe close to half your volume is coming from outside of China," Gu said in an interview with the Financial Times.

The **Dragonfly** which flew away—OR will it return???

Zombie Cars Are All Around Us, and More Are on the Way

4 May 2023

Bloomberg

Who will survive the EV sales crash?

March 7, 2023

Investors' Chronicle

EV Price War

Stellantis to Unveil €25,000 EV in Fight for Mass-Market Buyers

Bloomberg

- Citroën brand to start sales of Europe-made e-C3 early 2024
- Carmakers struggle to produce returns on affordable EVs

15 June 2023

European Automakers Face Hurdles In 2023 As China Threat Looms

Forbes

Tesla triggers new electric car price war

Le Monde

The American carmaker lowered the prices of its cheapest models. This is the second time this year, and it is starting to pose a major problem for competitors.

April 21, 2023,

'Not every car manufacturer will survive the Chinese revolution'

26 Apr 2023 Auto Express

Nio Plans Europe Expansion as China's EV Price War Intensifies

18 April 2023 Bloomberg

Established European car brands braced for Chinese EV 'price war'

24/02/2023 AM Online Automotive Management

Tesla cuts prices by up to a fifth in US and Europe as EV price war starts

The Guardian

Which 10 Automakers Will Survive The Coming Carpocalypse In The EV Era?

CARSCOOPS

China's Xpeng predicts that fewer than 10 automakers will still be around in a decade. Who will make it?

Stellantis CEO Tavares warns of 'terrible fight' with Chinese automakers

Automotive News Europe

Brands in Europe selling EVs: Current & Upcoming

Brand
Abarth
Aiways
Audi
BMW
BYD
Citroen
CUPRA
Dacia
DS
Fiat
Fiat
Fisker
Ford
Genesis


Abarth 500e


Aiways U6


Audi e-tron GT RS


BYD Tang


Fisker Ocean One

Brand
Honda
Hongqi
Hyundai
Jaguar
Jeep
Kia
Lexus
Lotus
Lucid
Maserati
Maxus
Mazda
Mercedes
MG


Honda eAdvance


Hongqi E-HS9


Jeep Avenger Electric


Lucid Air


MG ZS

Brand
Mini
NIO
Nissan
Opel
ORA
Peugeot
Polestar
Porsche
Renault
Rolls-Royce
Seres
Skoda
Smart
Ssangyong


Mini Cooper SE


NIO ET5


Polestar 2


Rolls Royce Spectre

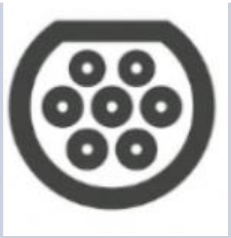
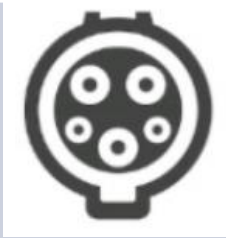
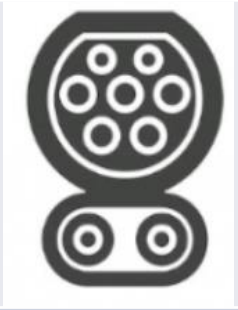
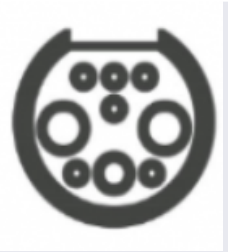

Seres 3

Brand
Subaru
Tesla
Toyota
VinFast
Volkswagen
Volvo
Xpeng

Standardising Charging

Uniform Charging Points essential for fast deployment

Need to Standardise Charging

	Europe	North America	China	Japan
Alternating Current (AC)				
	Type 2	Type 1 –J1772	GB/T	Type 1—J1772
Direct Current (DC)				
	CCS –Type 2	CCS—Type 1	GB/T	CHAdeMO

What is CCS ?

- The Combined Charging System (CCS) is a standard for EV charging. It can use CCS1 or CC2 connectors

- These Type 1 & Type 2 connectors, with the two additional direct current (DC) contacts allow DC fast charging. The CCS also allows for alternating current (AC) using Type 1 and Type 2 connectors depending on geographical location.

- Electric Vehicles are generally CCS capable and support AC or DC charging.

- OEMs supporting CCS include BMW, Daimler, Hyundai, Tesla…

Note: CCS are not compatible with CHAdeMO and GB / T charging stations

Type 2 CCS plug and socket = Type 2 (or Mennekes) AC plug + CCS

Type 1 CCS plug and socket: Type 1 (or J1772) AC plug + CCS

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What is NACS?

TESLA

The Tesla charging connector offers AC charging and up to 1 MW DC charging in one package. It has no moving parts, is half the size, and twice as powerful as Combined Charging System (CCS) connectors.

Tesla has invited charging network operators and vehicle manufacturers to put the Tesla charging connector and charge port, now called the North American Charging Standard (NACS), on their equipment and vehicles.

TESLA

Here in Europe its different:

TESLA

Supercharger Support

www.tesla.com/en_EU/support/supercharger

Can all Tesla owners use the Supercharger network in Europe? TESLA

Yes, the Supercharger network is available to all Tesla owners.

All V3 Superchargers in Europe feature single-cable CCS technology that is compatible with every Model 3, Model Y and Model S or Model X from May 2019 onwards. To access V3 Supercharging with a pre-May 2019 Model S or Model X vehicle, please request a CCS Combo 2 Upgrade quote from your local Service Center.

All V2 Superchargers in Europe feature dual-cable posts to accommodate both DC Type 2 and CCS Combo 2 charge-ports.

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Standardizing Charging

- GM to integrate NACS in new EVs starting 2025
- GM customers to be able to access Tesla Superchargers from early 2024

"Our vision of the all-electric future means producing millions of world-class EVs across categories and price points, while creating an ecosystem that will accelerate mass EV adoption," said GM Chair and CEO Mary Barra.

- Ford EV customers to access Tesla Superchargers from 2024
- New Ford EVs to be fitted with NACS connector from 2025

Jim Farley, Ford president and CEO. "Widespread access to fast-charging is absolutely vital to our growth as an EV brand…"

June 2023 News

- **A Tesla developed adaptor will provide vehicles fitted with the Combined Charging System (CCS) port to access Tesla Superchargers.**
- **From 2025 new generation EVs from Ford & GM will be fitted with NACS chargepoints, removing the need for the adaptor.**

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Part 2

Speaking to the Industry

Prepping for EVs in FVL Europe

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In Conversation with International Car Operators (ICO)

Northern Inlet Terminal (NIT)
Quay 405-410 (Zeebrugge)

Southern Inlet Terminal (NIT)
Quay 501-525 (Zeebrugge)

ICO

www.icoterminals.com

Vrasene Terminal
Quay 1235-1241 (Antwerp)

In conversation with Marc Adriansens, Managing Director, ICO Terminals

Marc Adriansens, Managing Director, International Car Operators (ICO)

As ICO is a global market leader in port handling and storage for ro-ro cargo—please could you share how ICO has adapted to meet the needs of electric vehicle (EV) OEMs:

- With greater volumes of EVs coming in to ICO terminals have you had to install specific charging infrastructure for these vehicles?

Marc Adriansens, Managing Director, ICO: "Yes, we installed 11 windmills with a capacity of 44 megawatt and 308 charging stations of 11 kilowatt each."

- Can all brands of EVs use the same charging infrastructure or is it brand specific?

Marc Adriansens: "Yes, all car products can use the infrastructure if they require AC chargers. Some brands request DC chargers (i.e. trucks and vans) and for those we are installing 4 DC chargers."

- What is the % that EVs have to be charged when off loaded from ro-ro vessels, and before the proceed on their onward journey?

Marc Adriansens: "This is variable as per OEM's request. Some request 100% charging, others only request charging of the units which are below 20%."

In conversation with Marc Adriansens, Managing Director, ICO Terminals …cont'd

- With EVs arriving in European ports from far away production bases such as Asia, do you find that some arrive with no charge? That is, they are 'dead'. If so, how do you move these EVs from the vessels?

Marc Adriansens, ICO: "Yes, it happens frequently that dead cars are on board. We invested in special equipment to lift the cars and hoist them from the ship."

In conversation with Marc Adriansens, Managing Director, ICO Terminals…cont'd

- At ICO terminals have you had to make special port compound areas reserved for EVs?

Marc Adriansens, ICO: "Yes, we have reserved EV charging point areas on each terminal. We bring the cars from the stock area to that area for charging. Afterwards we put them in the truck loading base."

- Are these port compound areas fitted with EV chargers?

Marc Adriansens, ICO: "Yes, all our compounds have EV chargers now."

- Do you already prepare areas with different EV chargers, or will the OEM request the type of chargers?

Marc Adriansens, ICO: "All OEMs accept the same charging equipment. Often new OEMs ask for a specific percentage of charging, which is why we install new software equipment so we can charge each car to a required level and invoice accordingly."

- Does the OEM work directly with ICO to provide the charging infrastructure?

Marc Adriansens, ICO: "Yes, instructions for charging infrastructure are coming from the OEMs directly."

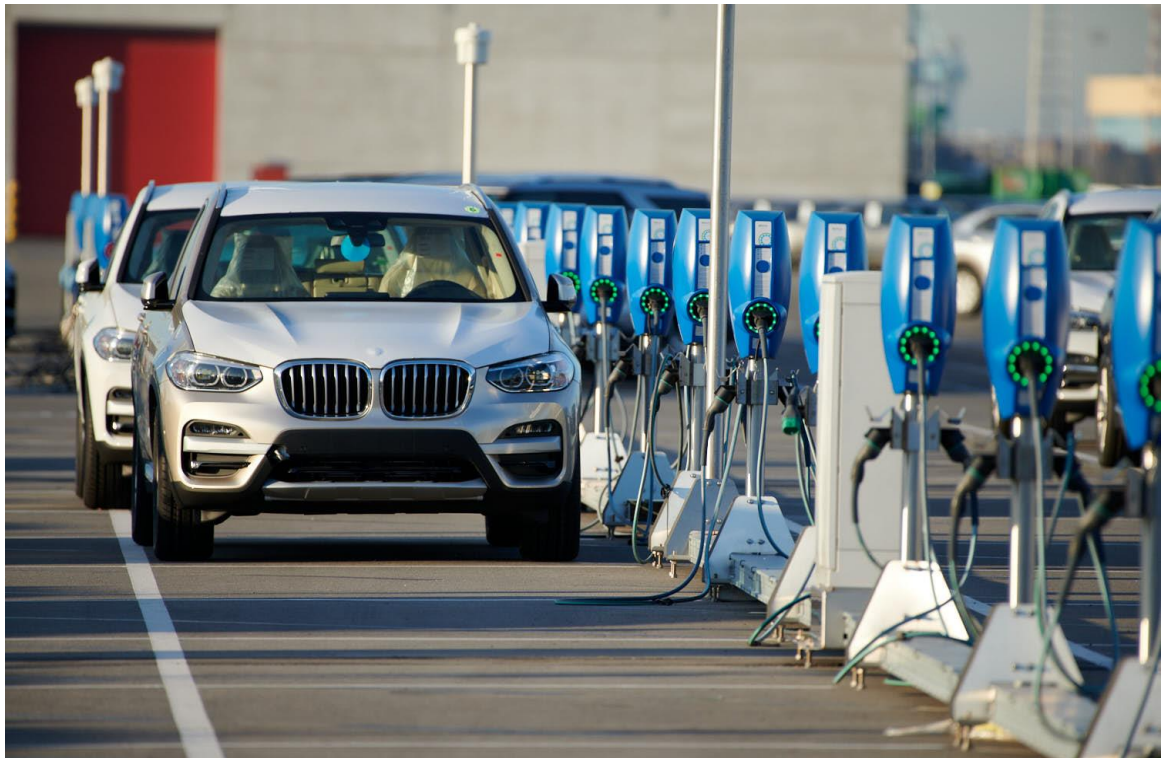
In conversation with Marc Adriansens, Managing Director, ICO Terminals…cont'd

What other preparations do you have to make to accommodate more EVs arriving at your port terminals?

Marc Adriansens: " More software and energy management systems need to be installed. We are also investigating to install batteries for energy storage and energy optimisation when there is no wind."

- Anything else?

Marc Adriansens: " We are further investing in 112 charging stations of 22 kilowatt (= 2 x 11 kilowatt) and 2 stations of 200 kilowatt DC chargers as more and more EVs are coming our way."



In conversation with MOSOLF

MOSOLF

www.mosolf.com

In conversation with Tobias Spannbauer, MOSOLF

Tobias Spannbauer, Head of Sales OEM bei MOSOLF

As MOSOLF is a leading logistics service provider for the international automotive industry please could you share some challenges and changes you have had to make at your compounds in preparation for electric vehicles:
Tobias Spannbauer: "We are facing some challenges with EVs loading infrastructure and future preparations (avoiding wrong investments), mainly resulting from a lack of clear information about prospective volumes and the services required for those vehicles by our customer. We just recently did a survey with our customers with poor feedback regarding the content.

Has MOSOLF installed EV chargers at its compounds in Europe?
Tobias Spannbauer: "Yes, we do have EV chargers on our compounds installed (22 kW and Fast charging stations)."

Is there a special section of the compound reserved for EVs?
Tobias Spannbauer: "No."

How does MOSOLF deal with 'dead' EVs when they arrive on a car carrier with no charge?
Tobias Spannbauer: "For the time being we have no issue with "dead" EVs on our trucks. But at the same time there is no process description from our customers. So, this will become a case-by-case discussion with our customers and the involved dealer."

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In conversation with MOSOLF …cont'd

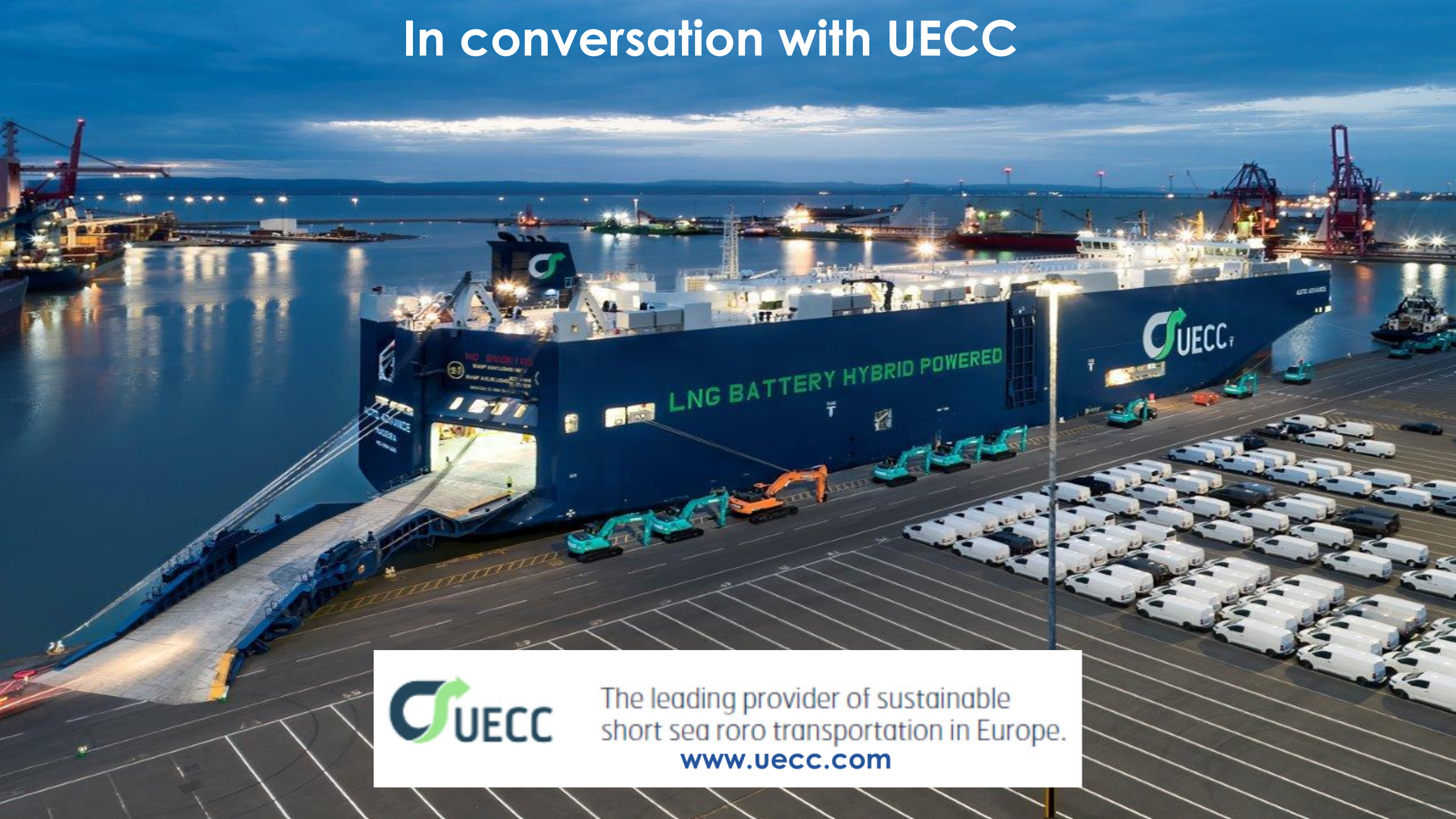
Has MOSOLF had to install any OEM specific infrastructure? For example, can this infrastructure be used by other OEMs with EVs or is it OEM specific?
Tobias Spannbauer: " For the time being there are only requirements regarding the loading capacity / speed. All our chargers can be used with type 2 connections or CCS. Some OEMs share a preferred infrastructure / proposal."

When you are provided with inflated OEM volumes, for example, a new OEM could state they expect annual sales in Europe of 20K units of EVs in Year 1, but actually they only deliver 5K units in Year 1—how does this create problems for you at MOSOLF?
Tobias Spannbauer: "High request and less realized volumes are critical. Why? Investment in trucks, equipment, drivers cannot get compensated on a pay per use model. So, we are at a high risk of making a loss.

Additionally, we are optimizing our network by balancing flows. If one flow e.g. import is planned high and not delivering the volume and at the same time we have won an export flow to the same port our balance is gone and leading to higher transport costs. MOSOLF is mainly working on long-term contracts and a one-sided change of volume or flows can create huge impacts.
Operationally, of course, less volume means more drop off points and longer distances compared to the initial calculation and pricing."

How often are forecast volumes incorrect?
Tobias Spannbauer: "Forecasts are always deviating. But there is a huge spread of deviations. Short term forecasts 1 day to 1 week are almost accurate. Up to 1 month there are even more discrepancies and a yearly forecast (split per month / important for investment plans) is deviating most.
Since the COVID, material shortage and logistics capacity crises we are far away from the forecasting results compared to year 2020. Some customers still do not provide any forecast."

In conversation with UECC



In conversation with Jason Cummings, UECC

Jason Cummings, Cargo Handling Manager, UECC

- The new UECC Electric Vehicle Carriage documentation ***https://uecc.com/media/1628/uecc-electric-vehicle-carriage.pdf*** clearly states procedures for the movement of EVs on UECC vessels, when was this introduced? Why did UECC consider introducing this?

Jason Cummings: "UECC established its first EV guide in 2021, one of the first in our industry, which has since been updated to the current version released 12th June 2023. Updates come following continued discussions with OEMs, other Marine Carriers, and industry experts on the carriage of EVs.
Our UECC Electric Vehicle Carriage documentation was introduced as a proactive and informative measure to our customers and service providers outlining our requirements to ensure UECC maintains its high marine carriage safety processes."

- Do all EVs transported by UECC vessels have to be charged to a certain level?

Jason Cummings, UECC: "UECC has a policy that all EVs are to carry a maximum 50% charge. This is set to avoid unnecessary carriage of charge and power during the marine carriage. We also recommend that the minimum charge is 20%. This is to ensure there is sufficient power to discharge the vehicles on arrival in the port of discharge."

In conversation with UECC, cont'd …

- Do OEMs charge their vehicles for the transportation journey?

Jason Cummings, UECC: "It is expected that OEMs charge their vehicles to a necessary level to cover the duration of the transport chain from factory to dealership. The longer the transportation journey, the higher the charge.
Some OEMs may also have agreements for 'intermediate' charging in ports of transhipment or in the port of destination, prior to delivery out to dealerships. UECC does not charge EVs on behalf of OEMs."

- Are EVs stored in a designated area on UECC vessels?

Jason Cummings, UECC: "EVs do not have defined designated areas on UECC vessels. However, subject to the weight of the EVs, the units may be stowed in positions which do not affect vessel deck strength or vessel stability."

- Are charging devices installed on UECC vessels?

Jason Cummings, UECC: "No. UECC does not permit charging of vehicles during the sea-passage."

- How are 'dead' EVs moved from UECC vessels?

Jason Cummings: "All vehicles are to be received fully functional, self-propelled, safe to drive, damage free, and within the set State of Charge levels, thus we do not expect to have 'dead' EV's.
However, if at any time required, all our vessels are equipped with 'go-jacks' to move 'dead' vehicles away from operational areas and into safe zones, where they can then be towed off the vessel in accordance with the OEM's handling requirements."

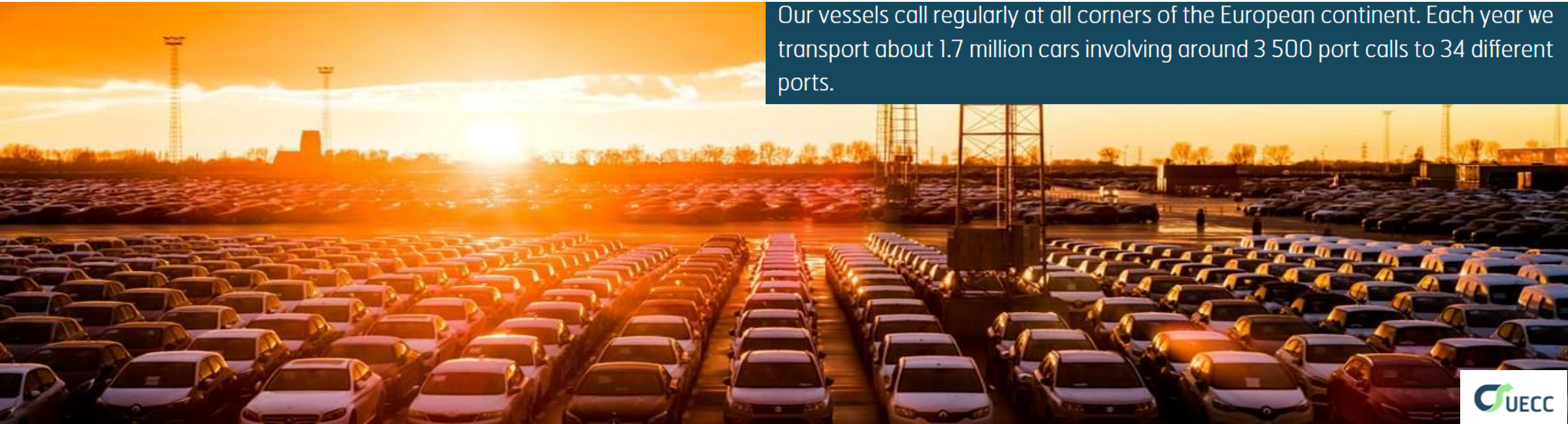
In conversation with UECC, cont'd …

- What future changes do you anticipate will be needed for the smooth transportation of a greater volume of EVs in Europe?

Jason Cummings: "Communication, communication, communication, is the key for the future. For OEMs and all logistics providers to ensure smooth transitions between each layer of the logistics chain, to ensure ease of vehicle handling, avoid delays and congestion, its necessary to find and offer solutions for each other and build better working relationships together."

- Anything else?

Jason Cummings: "UECC actively participates in various EV Quality and Safety forums with industry experts within the Maritime business."



In conversation with Kar-Tainer

In conversation with Vegard Synnes, Kar-Tainer International

Vegard Synnes, Marketing Director, Asia, Kar-Tainer International

Kar-Tainer is a solution provider for transport of vehicles in containers, what are the hazards involved when transporting electric vehicles in containers?

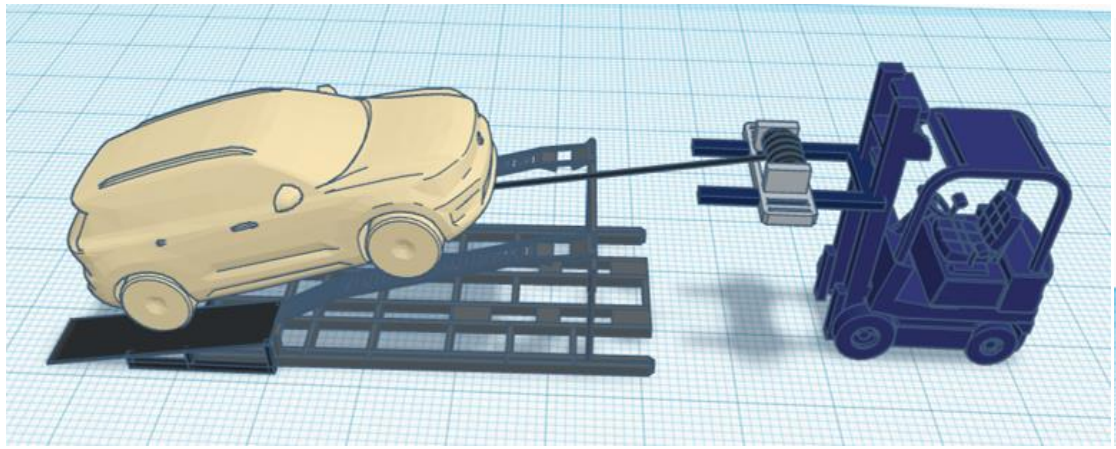
Vegard Synnes, Kar-Tainer: "Shipping electric vehicles (EVs) poses certain hazards, primarily related to the cars' battery systems, which store large amounts of energy. Here are some potential hazards associated with shipping EVs:

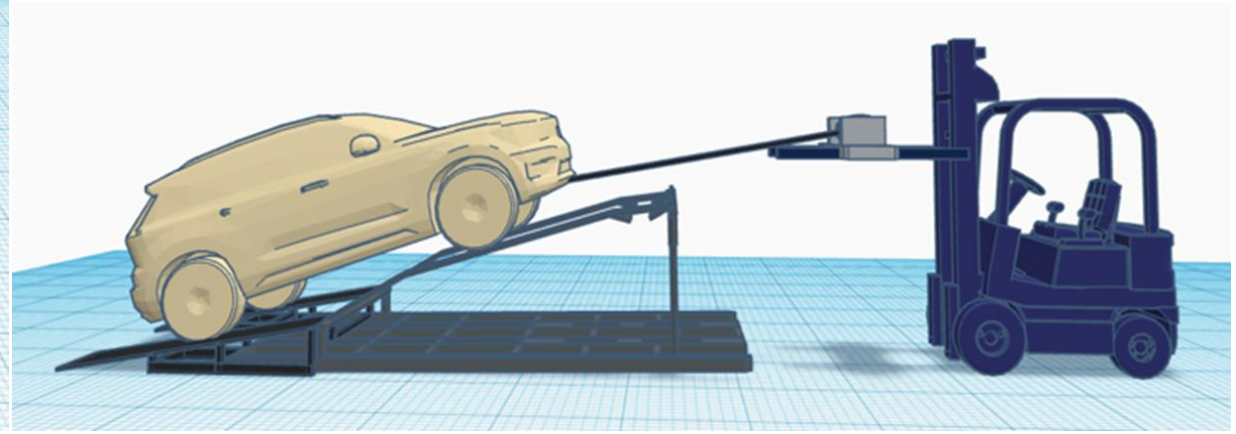
1. **Fire: EV batteries can be damaged during shipping, which may result in a fire. EV batteries contain flammable electrolyte fluids and, if they ignite, they can be difficult to extinguish.**
2. **Damage to the battery: The battery pack in an EV is heavy and can be easily damaged if the vehicle is not handled properly during shipping. A damaged battery can potentially cause a short circuit or leak, leading to a hazardous situation.**
3. **Overheating: During shipping, EVs can experience extreme temperature changes. If the battery overheats it can cause a thermal runaway, which is a chain reaction of increasing heat that can damage the battery and create a hazardous situation.**
4. **Electrochemical reactions: The battery chemistry in EVs can lead to electrochemical reactions if the battery is damaged or if the vehicle is exposed to water. These reactions can produce hazardous gases, such as hydrogen and oxygen, which can be explosive.**
5. **Transportation regulations: There are specific regulations that apply to the transportation of EVs in containers due to their hazardous nature. Shipping companies must comply with these regulations to ensure the safe transportation of EVs."**

In conversation with Kar-Tainer cont'd

What are your suggestions to mitigate risks associated with transporting EVs?

Vegard Synnes: "The vehicle itself is by many considered the safest container of a battery during transportation, and unless batteries are produced locally and the vehicles are shipped in SKD state without the battery installed, the battery has to be transported into the markets where vehicles are sold in some form or manner anyway. However, should there be a need to ship cars without the batteries installed, Kar-Tainer has a solution for this. Once a vehicle is loaded onto our cassettes the whole system with the car on top can freely be moved around with a forklift. We have contrived a device which allows us to load an EV without battery on to our standard cassettes without any hassle. As the vehicle cannot be driven onto the cassette, a pulley system attached to a forklift is used to pull the vehicle onto it."





"The vehicle is positioned on the ground in front of the cassette and a driver steers the car while the pulley system pulls it onto the cassette. This way a finished built car with only the battery missing would be able to move at ease all the way from the factory to a final assembly site in the country of import."

In conversation with Kar-Tainer cont'd

Are most of the EVs you move transported with or without batteries?
Vegard Synnes: "At this point in time we are not transporting any EVs without batteries, all have their batteries already fitted."

What is the difference in loading EVs and ICE vehicles?
Vegard Synnes: "Main thing is the weight distribution, this is different in an EV to an ICE. In an ICE the engine is upfront so the bulk of the weight is upfront. When loading more than two cars into a shipping container, some cars will have to be elevated. This is usually done by tilting the bonnet up towards the roof of the container. For ICE vehicles having the heavy front end of the vehicle in an elevated position can cause the loaded car and container to be more affected to sway and other force applied to the container throughout transportation and handling which slightly increases the risk of cars moving within the container. With new larger ICE cars that are bigger and heavier, the issue is how to fit them on to the cassette.
With EV cars weight is more balanced and spread out as the battery, most of the time, covers the floor area of the car. This negates the concern of weight distribution throughout the car and inside the container, and the vehicle will generally sit more anchored onto our cassettes during transport and handling."

As Kar-Tainer is a solution provider to move cars by containers, please explain whether you also provide the containers and whether you deal with the shipping lines, the ports and so on?
Vegard Synnes: "Normally, we at Kar-Tainer, stay clear of the logistics - our customers are logistics service providers or freight forwarders who deal with this. We provide the solution (the equipment) and know-how and teach them the skill necessary to load and unload cars into containers. We work on a lease basis, typically hand in hand with our partners. We go out for training, quality checks and so on - we like to say we offer some 'peace of mind' to our customers."

In conversation with Kar-Tainer cont'd

In Europe we are hearing about many containers filled with cars piling up at ports. Why is it sometimes difficult to unload cars from containers?

Vegard Synnes: " There are companies that offer to fit cars in containers using cheaper wooden structures, ropes and one way steel structures. Often there is no way to unload these cars and its more trouble than OEMs bargained for. They are not using professional equipment to load the cars in containers, these improvised loading solutions might work in the second-hand car market, but for new production cars/OEM shipments, this type of solution has no place. A good comparison would be if you try to build up wooden structures on a normal cargo truck to load cars onto, no-one would do that! You would ship with a car carrier."

Have you ever had to help in such a situation and offload the cars which have been fitted using these 'cheaper' but hazardous methods?

Vegard Synnes: "Yes, we've had cases like this happen in South Africa where some 40 cars were stuck in containers fitted with wood and ropes and no way to get them out. The local handling company approached us for help as they couldn't get the cars out, and due to the good relationship between the local handling company and our team in South Africa we went out to support. However, normally we would only support in cases where our equipment is used."

This year what type of companies have been contacting you for your services?

Vegard Synnes: " Recently most of the requests are out of China. But not the big OEMs, it is smaller logistics companies and trading companies who ask about using containers for one off shipments of 400 - 500 cars. In the last 6 months OEM interest is spiking. Several OEMs are now asking if they can implement the use of containers to fill lanes where there is a lack of ro-ro capacity."

In Conversation with Eurogate

www.eurogate.eu

In conversation with Eurogate

Michael Dannen
General Manager Sales
bei Eurogate GmbH

Michael Albers
General Manager
Admin & Sales
Eurogate GmbH

- What preparations have you made at Eurogate to accept electric vehicle (EV) cargo coming in in containers?

Eurogate: "As container terminal: We are working on increasing the capacity for storing IMO container with EV or battery in co-operation with the local authorities."

- Are there any specific investments Eurogate has made for EVs? For example, did you have to set up any charging infrastructure?

Eurogate: "Investments for our own workers, plus a significant amount of charging points have been installed.
For company cars: we invested in electric company cars, especially for transporting people on the terminal site. Also charging infrastructure has been installed for that.
For Customer Cargo: Nothing at terminal site necessary, as we are handling the container, not the cargo.
CFS: no charging points necessary for example, as all cars go to BLG => referring to BLG Autoterminal Bremerhaven."

In conversation with Eurogate…cont'd

- How easy is it to unload EVs from containers? Is it exactly the same as unloading an ICE car?

Eurogate: "It´s similar to unload EV, so far we had no problems with these cars. Battery was so far not causing any problems."

- There are stories floating around our industry of containers with EV cars piling up at ports—is this true?

Eurogate: "No containers are piling up in Bremerhaven so far with containers with EV, but we have noticed delays in delivery of EV from ports to dealers as the cars are not getting sold as much as it was planned from the OEMs from China."

- Is this due to the cars being incorrectly loaded into containers with makeshift bamboo poles and rope?

Eurogate: "No, it´s not because of that. Loading so far was fine, but can be optimized in some containers, where single use rack systems are being used to squeeze 3 cars into 1 container."

- Is this due to the EV cars being 'dead' and therefore cannot then be driven onto car carriers for onward journey?

Eurogate: "No, so far we only had this once, but we were able to bridge the battery. If battery is low, you need external energy to help start the battery of the car. We have mobile chargers available as well as installed charging stations distributed on the terminal site"

- What do you feel is the best methods of loading and unloading EVs in containers?

Eurogate: "Best method would be using car-skids made out of wood or metal and them being reused. Best Quality for car and easiest way of handling for workers."

In Conclusion

& some guidance

In Conclusion: Prepping for EVs in FVL Europe

- **Check, Clarify, Confirm:**
  - Check the OEM - is it a new startup, a zombie brand, a legacy autobrand?
  - Clarify Volumes - are volumes achievable, margin for delusion or illusion?
  - Confirm voyage dates and volumes

- **Verify Method of Transport & Packing:**
  - Will OEMs be responsible for loading and unloading if using unconventional methods?
  - Will Port or Carriers be able to load and unload if using unconventional methods?
  - Verify OEM plans and check feasibility

- **Alive or Dead: responsibility for bringing dead EVs back to life rests with WHO?**
  - EV charging status on vessel - verify % charge requirement, verify default system to offload if 'dead'
  - EV charging status on car carrier - verify % charge requirement responsibility - OEM or carrier, or Port
  - EV charging status in container - verify % charge requirement, default system in place to offload if dead

Always follow safety guidelines for transport of ELECTRIC VEHICLES.

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24/05/2023	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	Comments
EUKOR											New or used vehicles or H&H have to be between 20% and 50%, with a recommneded SoC being at 35%. There is no physical check of the SoC - we rely on the OEMs to follow our requirements
Euro-Marine Logistics											If unit is out of this range, it will not be accepted onboard.
Finnlines											We follow EMSA guidance on the carriage of AFVs in RO-RO spaces and IMDG guidelines
Grimaldi Group											If unit's SoC is over 50%, we simply do not accept it onboard unless the customer is able to bring SoC within the allowed limits.
Höegh Autoliners											If the vehicle is not within our acceptance limits the SOC must either be lowered or the vehicle will have to be left behind
MCCL											Maximum SoC for deep sea: in the range of 40-50% Maximum SoC for short sea: in the range of 30-35% The minimum level depends on the clients' quality standards
MOL											If unit is out of this range, it will not be accepted on board
Neptune Lines											For all the EVs we recommend to have the SoC within the 20%-50% range. However, at the moment there are no defined mechanisms in port operations to control and ensure that the charging levels of the vehicles lie within said limits prior loading on the vessels.
NYK											Acceptable range is 25%-50%. If the SoC exceeds 50%, customer should inform NYK in advance with reason to get acceptance.
Suardiaz											
Toyofuji											
UECC											
Wallenius Wilhelmsen											New or used vehicles or H&H have to be between 20% and 50%, with a recommneded SoC being at 35%. There is no physical check of the SoC - we rely on the OEMs to follow our requirements

https://www.ecgassociation.eu/publications-and-reports/ev-soc-requirements/

State of Charge (SoC) required by Shipping Lines

24/05/2023	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	Update in 2023
BMW											The cars send a “charge me” message in the combi-instrument when 2,5A/h is reached. Charging for 0,5 hour.
Ford											If the HV battery SoC goes below 20% the LSPs will have to charge these back to 50% before delivery to the dealer. Intent is for vehicle to arrive at dealer w/ 20% SoC.
Glovis											Max SoC level: 45-50% on hybrid battery at the end of the line Minimum SoC Level: 15% of SOC level is optimal; <15% is critical; <5% is not possible to start the engine.
Honda											we have Honda e from JPN factory to UK & EU with 10-15% and we will charge up to 20% for cars to go to dealers. New full EV will come soon - info will be updated then
JLR											If the vehicles are below 11% SoC they are charged back to 19% Maximum charge target/ assumption is 40%
Mazda											Vessel transport: over 39% **Arrival at port: over 33%** **Depart from port: over 4%** **Arrival at dealer: over 1%** Charge to 10% if SOC is too low at port or in inland transport
Mercedes											Vehicles leave the production/plant with 26.5% SoC. At display of the message (ca. 19% SoC) charge to 30-55%, although the max. charge level in the supply chain will be 30%
Mitsubishi											Minimum level is 10%, if 11% is reached, charge up to 30%-40%.
Stellantis											All vehicles must enter the logistics flow with 35% SoC. If the SoC is at 15% charge the vehicle to 35%. There are no differences between the different brands
Renault											The Renault vehicles come out of the factories with a 20-50% range of battery charge, depending on the battery size and the intrinsic energy consumtion of the vehicle. In the supply chain when the battery charge is lower than the minimum SOC established for that partiular model, the battery has to be charged to the min. SoC of the model (this is between 30-50%)
Tesla											From the factory to Service Center, we are trying to be at 80% SoC From the factory to Port we are charging at 60% SoC
Volvo											Volvo is considering adopting the 20-50% range recommended by EMSA, but in future models the SoC might be less, at around 10%. When a BEV car today leaves the Volvo plant the average SoC is around 27%. If a HV battery needs to be charged in the distribution chain we charge it to minimum of 25% and a maximum of 40% SoC.
Volkswagen											The vehicle leaves the factory at around 30%, if the SoC gets under 10% in the supply chain, the battery has to be charged to 20%

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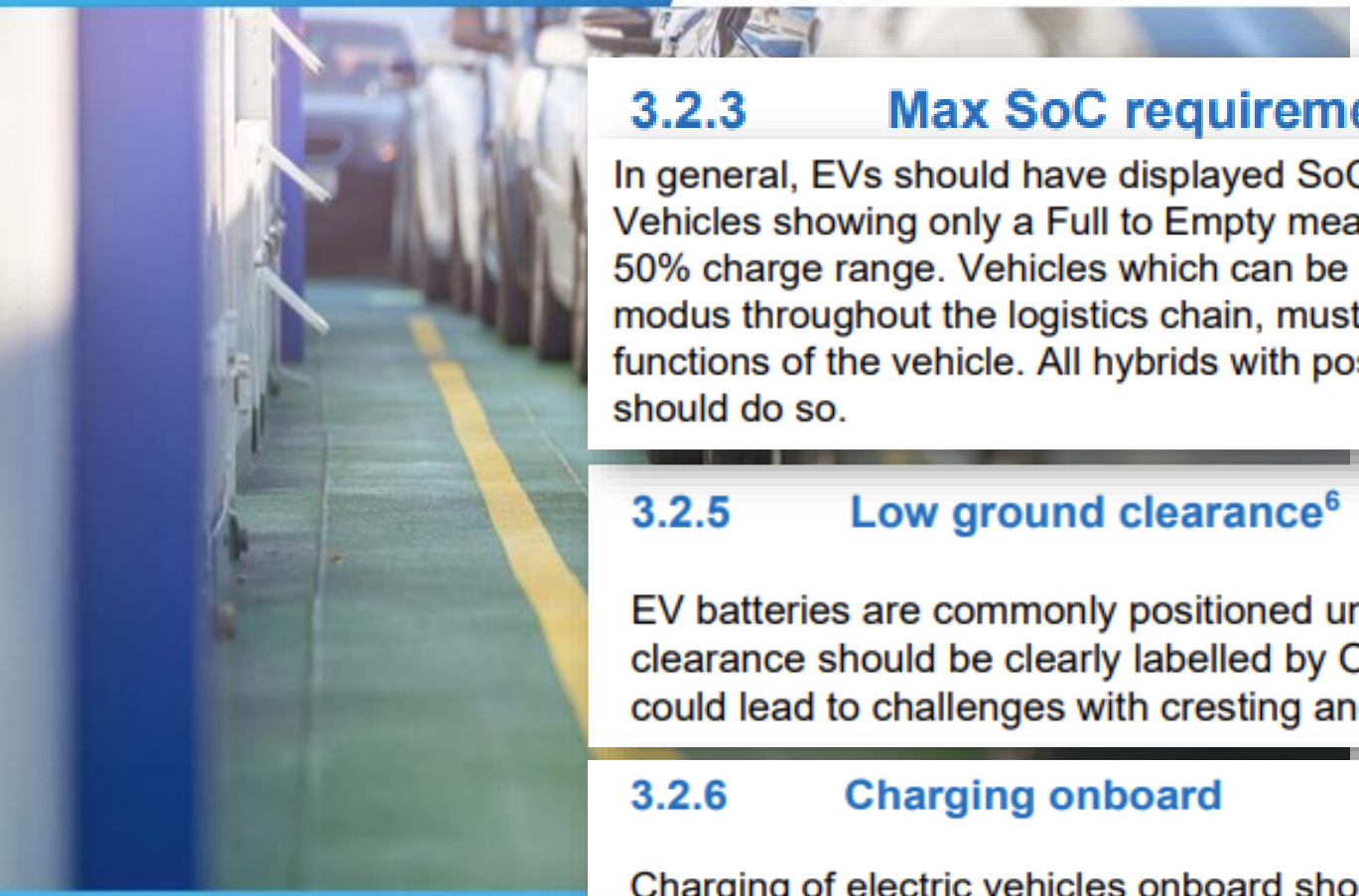
SoC by OEM



European Maritime Safety Agency

Guidance from EMSA

EMSA
European Maritime Safety Agency

3.2.3 Max SoC requirement

In general, EVs should have displayed SoC values within the respective 20%-50% charge range. Vehicles showing only a Full to Empty measurement gauge should have a level indicating within the 20%-50% charge range. Vehicles which can be set in to a 'transport mode', which run on a 'power down' modus throughout the logistics chain, must have sufficient battery power to safely operate the basic functions of the vehicle. All hybrids with possibility to drive on the 'ICE' with the electric mode disengaged, should do so.

3.2.5 Low ground clearance[6]

EV batteries are commonly positioned under the vehicle between the 2 axles. Vehicles with low ground clearance should be clearly labelled by OEMs to draw attention to low ground clearance batteries which could lead to challenges with cresting and break-over angles on vessel ramps and inner slopes.

3.2.6 Charging onboard

Charging of electric vehicles onboard should not be allowed. Charging onboard should only be allowed if an EV with a flat battery needs to be moved to allow the unloading of other vehicles. In such case, charging should be performed by the stevedores, following the approval of the Chief Officer.

GUIDANCE ON THE CARRIAGE OF AFVs IN RO-RO SPACES

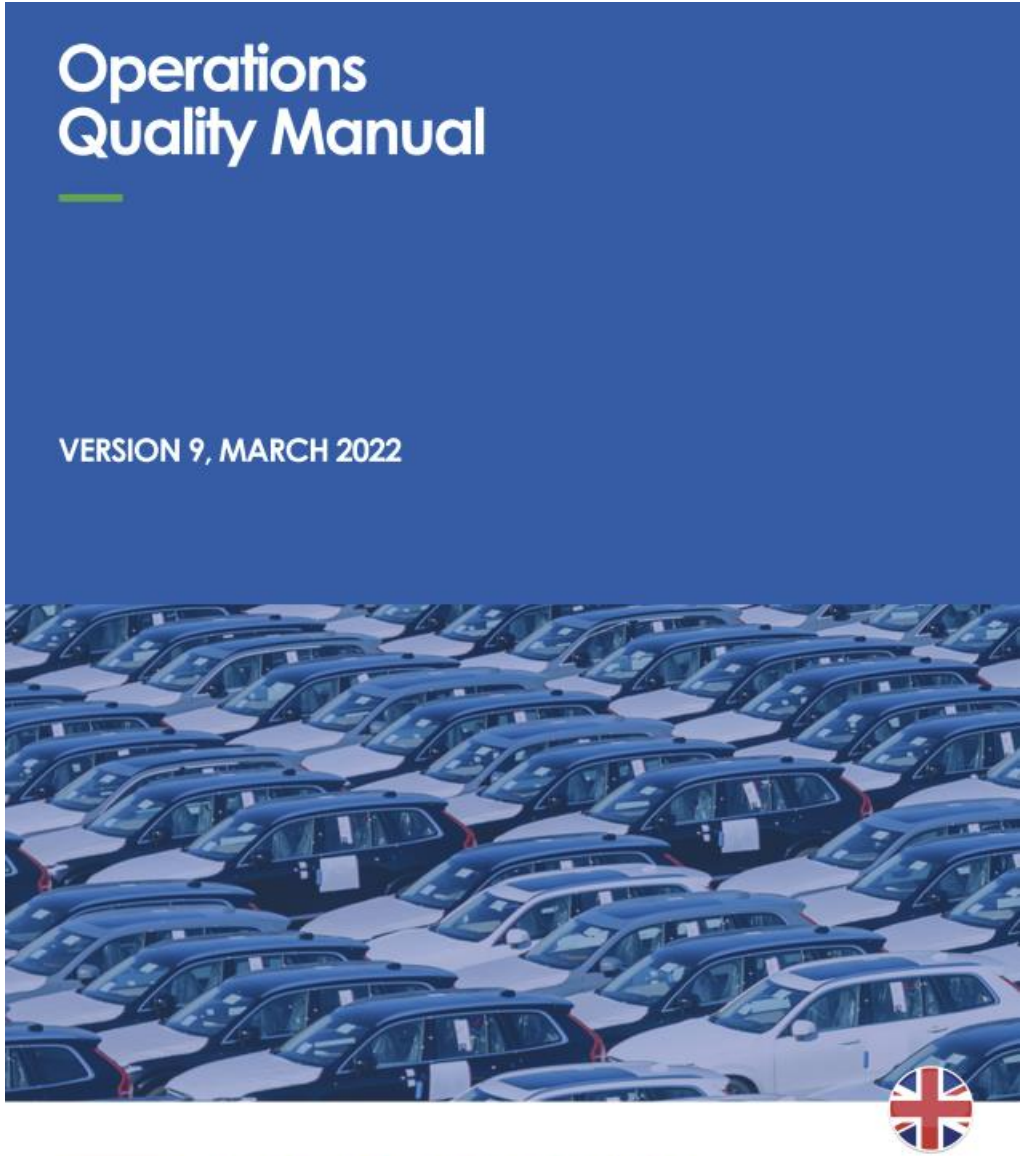
https://emsa.europa.eu/publications/reports/item/4729-guidance-on-the-carriage-of-afvs-in-ro-ro-spaces.html

6. Handling of Alternative Fuel Vehicles (AFVs)

Largely amended and increased

6.1. General

- This chapter covers Alternative Fuel Vehicles (AFVs), which include Electric vehicles (EVs), Plug-in Hybrid Electric Vehicles (PHEVs), Hydrogen Fuel Cell Vehicles (FCEVs), Compressed Natural Gas (CNG) vehicles and Liquefied Petroleum Gas (LPG) vehicles.
- Unlike internal combustion engine (ICE) vehicles, in EVs and PHEVs fitted with high voltage batteries 100% of torque is immediately available and therefore care must be taken to avoid rapid acceleration.
- EVs and PHEVs are much heavier than the equivalent ICE models (they can exceed 3 tonnes). Any equipment (car transporters, ships, rail wagons, barges) used to handle these vehicles must therefore be designed to have sufficient structural strength and must only be loaded within applicable legal weight limits.
- These vehicles might also have a very low ground clearance and thus special attention must be paid when loading/unloading.
- Vehicles should be left in Park mode. Always ensure this mode is engaged as even a slight press on the accelerator pedal can cause the vehicle to move quickly.
- Some vehicles (EV, Hybrid or Hydrogen Fuel Cell Vehicle) are silent so there is no engine sound to indicate that it is activated.
- Never touch, cut or open any orange high voltage cable or high voltage component in an Electric, Hybrid or Hydrogen Fuel Cell Vehicle. These cables and the battery pack are also marked with a high voltage sign.



https://www.ecgassociation.eu/publications-and-reports/quality-manuals/

Appendix

Overview of EV variants on offer in Europe

Sorted by Most Viewed

Courtesy: EV Database
www.ev-database.org

Electric Vehicle Database

TRUCK

SHIP

COMPOUND

RAIL

BARGE

ECG Business Intelligence

Brand	Model Variant	SOS	Price
Tesla	Model Y Long Range	Feb 2022	Euro 59,017
Tesla	Model 3	Dec 2021	Euro 44,668
Tesla	Model Y	Nov 2022	Euro 47,567
Volvo	EX30 Single Motor ER	June 2023	Euro 41,790
Tesla	Model 3 Long Range	Nov 2021	Euro 53,668
BYD	ATTO 3	Aug 2022	Euro 44,625
MG	MG4 Electric (64kWh)	Oct 2022	Euro 39,990
BMW	i4 eDrive 40	Nov 2021	Euro 59,200
Tesla	Model S Plaid	Nov 2022	Euro 130,490
Tesla	Model Y Performance	Mar 2022	Euro 63,667
Volvo	EX30 Twin Motor	June 2023	Euro 48,490
BMW	iX xDrive40	Oct 2021	Euro 77,300
BMW	iX xDrive30	Nov 2022	Euro 55,000
Volvo	EX30 Single Motor	June 2023	Euro 33,795
Kia	Niro EV	June 2022	Euro 47,590

Prices are current OEM retail prices before incentives.
1-July-2023

Electric Vehicle Database

For full list please visit: **www.EV-Database.org**

Prices as per EV Database on 1.7.2023

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Brand	Model Variant	SOS	Price
MG	MG4 Electric 51 kWh	Oct 2022	Euro 34,990
Tesla	Model 3 Performance	Feb 2022	Euro 57,668
Mercedes	EQS 450	Oct 2021	Euro 109,551
BYD	Han	Mar 2023	Euro 70,805
Smart	Smart #1	Mar 2023	Euro 42,490
Mercedes	EQE 350+	Apr 2022	Euro 82,028
Skoda	Enyaq iV 80	Apr 2021	Euro 48,900
Volkswagen	ID. Buzz Pro	Sept 2022	Euro 64,581
Tesla	Model S Dual Motor	Jan 2023	Euro 105,490
Hyundai	Kona Electric 64 kWh	June 2021	Euro 42,900
BMW	i4 M50	Nov 2021	Euro 70,800
BMW	iX3	Sept 2021	Euro 67,300
BMW	i4 eDrive35	Nov 2022	Euro 56,500
Audi	e-tron GT RS	Mar 2021	Euro 146,050
BMW	i7 xDrive60	Nov 2022	Euro 139,900

Prices are current OEM retail prices before incentives.

Electric Vehicle Database

For full list please visit: **www.EV-Database.org**

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Prices as per EV Database on 1.7.2023

Brand	Model Variant	SOS	Price
BYD	Tang	Aug 2022	Euro 71,400
Kia	EV6 GT	Apr 2022	Euro 72,990
Hyundai	IONIQ 6 Long Range AWD	Nov 2022	Euro 61,100
MG	MG5 Electric Long Range	Mar 2022	Euro 38,490
Volkswagen	ID.4 Pro	Feb 2022	Euro 51,990
Audi	Q4 e-tron 40	Jun 2021	Euro 51,900
MG	ZS EV Long Range	Nov 2021	Euro 37,990
Fiat	500e Hatchback 42 kWh	Nov 2020	Euro 34,990
BMW	iX xDrive 50	Nov 2021	Euro 100,100
Renault	Megane E-Tech EV60	Apr 2022	Euro 46,600
Mercedes	EQC 400 4MATIC	Nov 2020	Euro 66,069
Audi	Q8 e-tron 55 Quatro	Dec 2022	Euro 85,300
Nissan	Leaf	Mar 2022	Euro 33,400
Dacia	Spring Electric 45	Jul 2022	Euro 22,550

Prices are current OEM retail prices before incentives.

Electric Vehicle Database

For full list please visit: **www.EV-Database.org**

ECG Business Intelligence

Prices as per EV Database on 1.7.2023

Brand	Model Variant	SOS	Price
Renault	Zoe ZE50 R110	Nov 2019	Euro 36,840
BMW	iX M60	Apr 2022	Euro 136,100
Volkswagen	ID.4 Pro Performance	Jan 2021	Euro 46,335
Toyota	bZ4X	Jun 2022	Euro 47,490
Kia	EV6 Long Range 2WD	Oct 2021	Euro 51,990
Opel	Astra Electric	Jun 2023	Euro 40,000*
Hyundai	IONIQ 6 Long Range	Dec 2022	Euro 54,000
Hyundai	IONIQ 5 Long Range	Apr 2022	Euro 47,900
Mercedes	EQS 580 4MATIC	Oct 2021	Euro 141,705
Volvo	XC40	Oct 2022	Euro 47,500
Volkswagen	ID.3 Pro	Mar 2023	Euro 39,995
Jeep	Avenger Electric	Jan 2023	Euro 37,000
Volkswagen	ID.7 Pro S	Oct 2023	Euro 60,000*
Nissan	Ariya 87kWh	Jul 2022	Euro 58,990

Prices are current OEM retail prices before incentives.

Electric Vehicle Database

For full list please visit: **www.EV-Database.org**

Prices as per EV Database on 1.7.2023

ECG Business Intelligence

Brand	Model Variant	SOS	Price
Hongqi	E-HS9 99kWh	Dec 2022	Euro 94,590
Skoda	Enyaq iV 60	Apr 2021	Euro 48,990
Mini Cooper	SE	Mar 2021	Euro 35,700
Porsche	Taycan Turbo S	Jan 2020	Euro 186,668
Volkswagen	ID.4 Pure	Feb 2021	Euro 42,940
Peugeot	e-208	Nov 2021	Euro 39,100
Cupra	Born	Oct 2021	Euro 39,370
Volkswagen	ID.7 Pro	Oct 2023	Euro 55,000*
Tesla	Model X Dual Motor	Jan 2023	Euro 113,490
Mercedes	EQA 250+	Jun 2022	Euro 52,205
Rolls-Royce	Spectre	Nov 2023	Euro 400,000*
Mercedes	EQB 250	Mar 2022	Euro 52,550
Lexus	RZ 450e	Feb 2023	Euro 68,000
Mercedes	EQB 350 4MATIC	Feb 2022	Euro 58,197

Prices are current OEM retail prices before incentives.

Electric Vehicle Database

For full list please visit: **www.EV-Database.org**

Prices as per EV Database on 1.7.2023

ECG Business Intelligence

Thank You