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Niche AM

NEWSLETTER

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ELECTRIC MOBILITY: NEWS & VIEWS

GOOD NEWS FROM THE NORDIC WATERS

Few weeks ago, the operator of the first all-electric ferry in Norway, the 'Ampere', reported some impressive statistics after operating the ship for over 2 years. The Ampere,built by Fjellstrand shipyard with Siemens and Corvus Energy, decreased emissions by 95% and costs by 80% (compared to standard ferries), as well as noise. It is the world's first electric-powered car ferry and generates zero emissions and minimum sound. The ferry was delivered in October 2014 and commercial operations began in May 2015.

With over a 1 MWh battery, two 450 kW electric motors from Siemens and 1.2 MW fast charging (used when loading/unloading), it's an excellent solution for the sea. The advanced vessel operates on a 5.7km crossing in the Sognefjord between the villages of Lavik and Oppedal. It makes approximately 34 trips a day, each trip requiring approximately 20 minutes, excluding the 10min of loading and unloading time for cars and passengers used to recharge. The ferry is 80m -long and 21m-wide with seven crew cabins and 140 chairs. It accommodates up to 120 cars and 360 passengers.

The new environment-friendly vessel annually cuts down the use of one million litres of diesel and offsets 570t of carbon dioxide and 15t of nitrogen oxide emissions compared to conventional ferries playing on the same route.

The project is the result of a competition launched by Norway's Ministry of Transport and Communications in 2011 to develop an environment-friendly ferry for providing service on the link between the two villages. Norled won the competition, which granted the company the concession rights to operate in the route through to 2025.

The new vessel established the viability of operating electric-powered ferries in 50 ferry routes within Norway and beyond.

Ampere: the world's first electric-powered ferry

According to latest reports, 53 similar ferries were ordered after Ampere led the way.

Unsurprisingly, the potential cost savings are attracting a lot of orders for new electric ferries and for the conversion of existing diesel-powered ferries.

Now Fjord1, a major Norwegian transport conglomerate which operates 75 ships, placed an order of 7 ferries with the Havyard Group to build a fleet of battery-electric ferries. The maritime transport is well on its way to go electric and ferries are at the forefront.

The Norwegian authorities have demanded zero-emission technology solutions as part of the effort to reduce emissions from the country's ferry fleet, which is one of the most important in the world.

The fact that ferries operate on relatively short routes between the same ports, where charging infrastructure can be installed, makes it a lot easier to go electric than with cargo ships, which can have more complicated and longer routes.

Furthermore, just as Fjord1 and Havyard have announced this major battery-electric ferry contracts, Stena Line, which operates the Stena Jutlandica ferry between Frederikshavn (Denmark) and Gothenburg (Sweden), announced that they will convert the Stena Jutlandica to electric propulsion.

They will install a massive 1 MWh battery pack to power the 185-meter long ship – making it the largest electric ships in the world.

Stena Line: it's going to be the biggest full-electric ship

EARLY BIRDS

Avinor, a state-owned company that operates most of the civil airports in Norway under the Ministry of Transport and Communications, has recently communicated the ambition to have short-haul flights all -electric by 2040 .

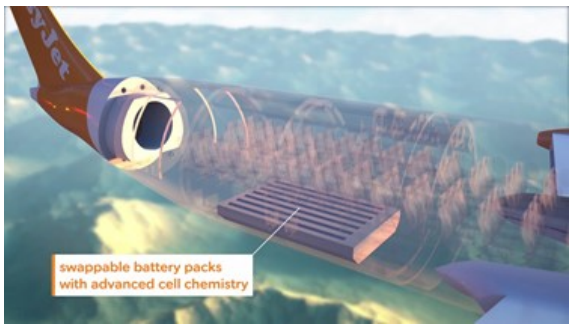
Dag Falk-Petersen, Avinor's chief executive, believes that all-electric planes will be powerful enough to replace all regional planes in the relatively small country. "We think that all flights lasting up to 1.5 hours can be flown by aircraft that are entirely electric", he said.

Avinor announced that it is working on a tender offer for a small electric plane with 19 seats to be tested on commercial routes by 2025.

Airbus, Boeing, Roll-Royce and many other players in the market are on projects for hybrid or pure electric airplanes.

Wright Electric, a start-up (click here to visit the company website), announced it's building an 150-seat plane to disrupt the 737 market. It's struck a partnership with budget British airline EasyJet.

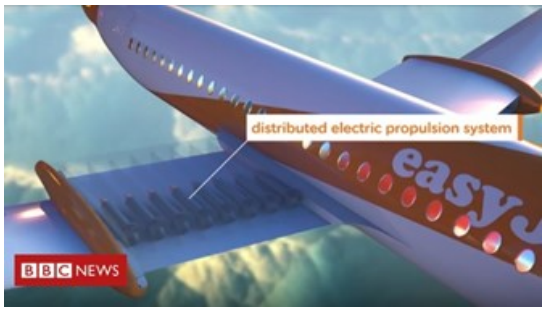
Considering flights under 300 miles consist of 30% of flights and that Boeing and Airbus sold close to 1,000 of those regional airplanes for about $90 million each last year, it's definitely a huge market. Even if the starting price is higher, the cost of fuel is such a significant portion of the operating cost for airlines that the return on investment could be quick.



Wright Electric: full-electric airplane concept

Wright Electric doesn't plan on developing its own battery technology, but it wants to develop the architecture for an electric plane and to add the battery from suppliers as technlogy improves.

Tesla CEO Elon Musk, who revealed having his own design for a VTOL electric plane, says that such a system becomes possible once battery energy density reaches over 400 Wh/kg, while his Tesla vehicles are believed to be currently powered by battery cells with ~250 Wh/kg. It's improving every year and several new technologies are promising much higher energy density. SION POWER, the Arizona-based company acquired by BASF in 2012, announced that production of its ground-breaking Licerium lithium batteries, that sport 500 Wh/kg energy density, will begin in late 2018 at its Tucson facility.



Wright Electric: full-electric airplane concept

Buckle up!

Hyundai Kona electric: here comes the sun

"Kona electric produces one of those tipping point moments when excuses to dismiss the BEV get thin on the ground." Tom Ford for TopGear

The fully-electric subcompact SUV made by Hyundai offers a 39kWh 'small battery' version that can travel around 320 km on a single charge, while the 64kWh model manages another 160 km on top of that. Yes, 480 km! Those are very impressive numbers by any EV's standards, let alone one of this size. It's also worth pointing out that those figures are calculated based on the tougher WLTP economy test that's being introduced later this year – so they should be more achievable in the real world.

The probably the most outrageously styled Hyundai the world has ever seen comes in two flavours, both essentially the same apart from the battery pack. The 39kWh model has a 134bhp electric motor, while the 64kWh edition beefs that up to 201bhp. Both powertrain versions deliver 395 Nm of immediate torque, offering the driver of Kona Electric great fun-to-drive, having the full power available from the first second. Standstill to 100km/h takes 7.6 seconds. That's enough for decent performance.


Hyundai Kona

The 480 km range version costs 40k euro before subsidies. If we consider the average subsidy in Europe (4,000 euro) and the 20,000€ of fuel savings*, the price moves to 16k euro vs 25k euro that a VW Polo GTI costs, the closest peer in terms of performance and size. This significant discount versus its peer comes before the savings on maintenance (40% lower than the ICE model) and the intangible benefits (city centre access, parking, etc).

Charging the lithium-ion polymer battery up to 80% only takes about 54 minutes using a 100-kW direct current (DC) fast charger. With the 7.2 kW on-board-charger, charging at home with alternating current (AC) takes 9 hours 35 minutes for the long-range battery pack and 6 hours 10 minutes for the standard.


Hyundai Kona

**battery warranty in thousands of Km (200) multiplied by the cost of fuel you save every 1,000 km, i.e. about 100€*

BMW i3: the kid becomes an adult, at last!

A new BMW i3 and i3s model is expected to be launched towards the end of this year and the beginning of next year, boasting an increase in range. The i3 120Ah will have a bigger capacity battery pack and, according to NEDC, will have a standard range of over 400 km, around 250 miles. At present, the BMW achieves around 187 miles (300 km) on a single charge. 400 km of driving range NEDC (likely to be 330 km WLTP) will make this sophisticated car a viable solution for most of consumers.

The i3 was originally launched back in 2013. The last upgrade to the i3 battery pack was in 2016 when it went from 60 Ah cells with a 180 km NEDC range to the actual 94 Ah cells and 300 km of range. The battery pack size grew from 22kWh to 33kWh.

With the claimed 120Ah upgrade the battery pack is expected to grow to around 42kWh.

The price of the new model is expected to be similar to the actual 33KWh with range extender (about

BMW i3s

42,000€, before subsidies and 16,000€ worth of fuel savings*). In consideration of the good driving range achieved, this new model is not likely to offer a range extender as optional. The sporty version "s" will be, on the contrary, still available with an additional charge of 3,000€ and should get you to 100km/h in about 6.4s. While it's not rabid, it's punchy enough!

**battery warranty in thousands of Km (160) multiplied by the cost of fuel you save every 1,000 km, i.e. about 100€*

BMW iNEXT

The iNext, BMW's tech flagship, will bring cutting-edge innovations in infotainment and interior technology, as well as the brand's latest electric powertrain and well-documented driverless tech. BMW originally announced in 2016 that it had joined the race to produce fully autonomous cars and has teamed up with tech firms Intel and Mobileye in a bid to offer its first fully self-driving car in 2021. BMW now claims that 'level 3.5' autonomy will be possible from the car. The SUV will enter production in 2021.


BMW: front design of Vision iNEXT concept

Electric Royal Wedding

Prince Harry drove his new bride Meghan Markle away in an iconic Jaguar E-Type, in the new environmentally friendly concept zero model. The Jaguar E-Type was built between 1961 and 1975 with Enzo Ferrari calling it "the most beautiful car ever made".

Jaguar e-type concept zero

Prince Harry and Meghan Markle drove off in a 1968 silver blue E-Type although the Concept Zero version is an adapted version to make it electric, which Jaguar Land Rover converted last year.

Prince William and Kate Middleton left Buckingham Palace after their wedding in 2011 in a vintage Aston Martin DB6. Last year Pippa Middleton and hubby James Matthews sped off in Britain's oldest surviving Jaguar E-Type following their wedding ceremony at St Mark's Church in Englefield, Berks.

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From NEDC to WLTP to EPA...

It happens to find different and confusing acronyms when we try to assess the autonomy of an electric vehicle, a central issue for a new buyer or an investor. For example, the iX3 SUV has a range of 400 km according the WLTP and 500 km according the NECD standard. Let's dig up a bit.

The **New European Driving Cycle (NEDC)** is a driving cycle, designed to assess the emission levels of car engines, fuel economy and electric range in hybrid and full electric vehicles.

The NEDC, which is supposed to represent the typical usage of a car in Europe, is repeatedly criticised for delivering economy-figures which are unachievable in reality. It consists of four repeated ECE-15 urban driving cycles (UDC) and one Extra-Urban driving cycle (EUDC).

It is maintained by the UNECE World Forum for Harmonization of Vehicle Regulations which also worked on its successor, the WLTP.

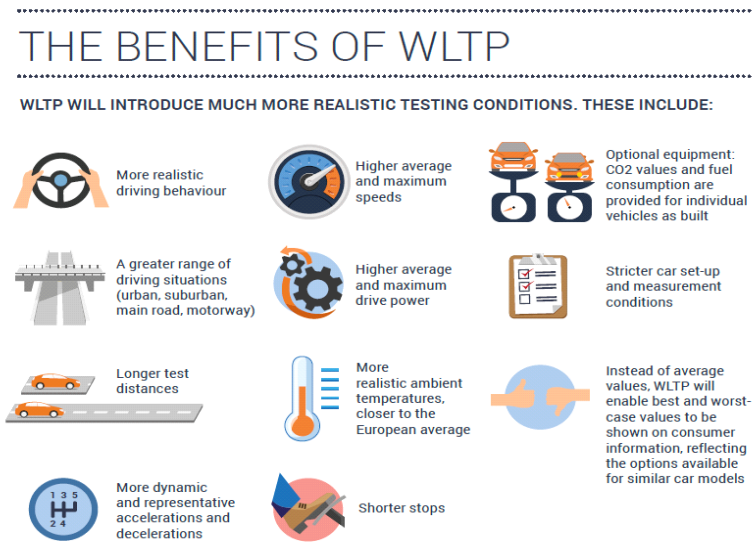
The NEDC was designed in the 1980s and became outdated today due to several evolutions in technology and driving conditions.

The European Union has therefore prepared a new test, called the **Worldwide Harmonised Light Vehicle Test Procedure (WLTP)** that applies from September 2017.

Because of all these improvements, WLTP will provide a much more accurate basis for calculating EV driving range. This will ensure that lab measurements better reflect the on-road performance of a car.

From September 2017 both these data have to be provided for new models, while only NEDC will remain legally binding for old models. While from the 1st of January 2019 the WLTP will become in one shot the only indicator legally required.

EPA (Environmental Protection Agency) is the American standard to calculate car's fuel consumption, EV driving range and emissions. With reference to EV driving range its results are not far from those of WLTP.



Source: UNECE

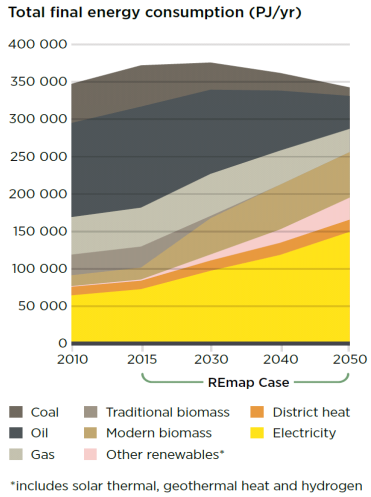
ARE EVS REALLY CLEAN?

Often people argue that EV gets the power from electricity and this is produced out of fossil fuels. Therefore, EV is as dirty as ICE vehicles. Here we make the point to clarify the issue.

1) Today globally 40% of the electricity is produced from 0 emissions sources. And growing. In 2030 IRENA estimates that globally more than 70% of electricity will come from clean sources (85% in 2050). This means that today we can save 40% of the pollutants using EVs and in 12 years the EVs will be 70% clean.

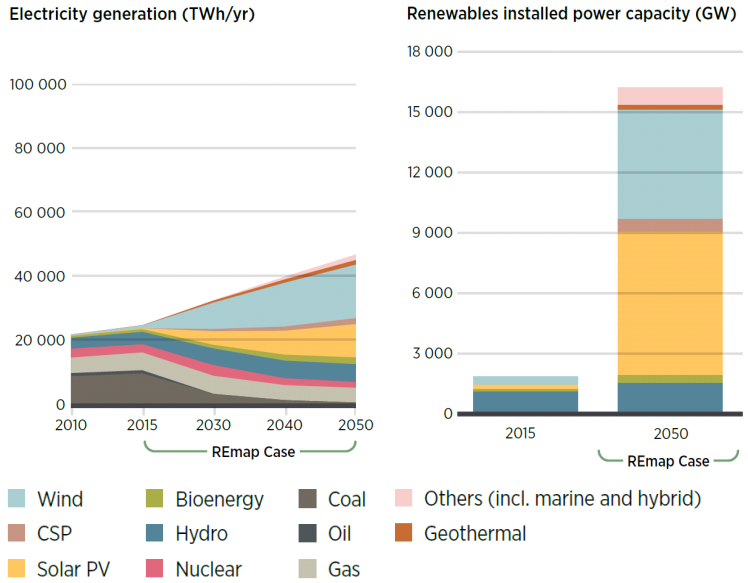
2) Even considering the part of electricity we produce from fossil sources there is an advantage using EVs as we move the pollution from the cities, where the levels of CO2 are worryingly high, to areas less polluted and populated.

3) The fossil fuels used to produce electricity in developed countries is mainly natural gas while it is coal in emerging countries. Thermic transportation uses mainly oil.



Source: IRENA 2018 report

Natural gas is relatively clean while new technologies can be applied to coal processing to reduce the emissions. Oil-derived gasoline is burned by cars, spreading in the air noxious substances as CO2 or NO2 that cannot be totally captured by vehicles filters. Moreover, oil is daily spilled in the oceans creating enormous damages. Hence, also the EVs using the dirtiest electricity are an improvement in respect to ICE vehicles.



Source: IRENA 2018 report. Remap Case is the level needed to limit the rise in global warming to below 2% above pre-industrial levels by the end of the century (with 65% probability), in line with the Kyoto protocol

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According to the last wedding, the electric wave has now reached the royal family!

Out went the car's six-cylinder XK engine and gearbox and replaced with a 220kw battery and motor, with a reduction gearbox. The old analogue dials have been removed and replaced with digital ones. The conversion will be fully reversible and can be applied to any 6-cylinder E-type engine. Buying it will set you back a bit, 350k £.

Click here to see the video

https://www.nio.io/about

Founded in 2014 in Shanghai, China, NIO has quickly grown to become a major industry player, establishing itself as a force to be reckoned with in the world of electric vehicles and self-driving technology.

Boasting over 2,000 employees spread out over 13 locations globally, NIO is known for creations like Eve, a forward-thinking autonomous concept, and the ES8, a seven-passenger high-performance all-electric SUV, as well as its involvement in the Formula E championship with powertrain support for the NIO 003 race car.

However, the start-up is best known for the EP9, a high-performance all-electric speed machine. The NIO EP9 is street legal, but has made a name for itself setting some very impressive records on the track.

Its characteristics are amazing:

- 1,341 horsepower (1 megawatt)
- 1,092 pound-feet of torque
- Four independent electric motors
- Four separate gearboxes
- 0 to 60 mph in 2.7 seconds
- Top speed is 195 mph
- Can replace the battery pack in 8 minutes
- Full charge in 45 minutes
- 265 miles per charge

Less than 20 units have been sold to wealthy amateur. Price tag $1.48 million.

NIO started selling its first industrial vehicle, the ES8 SUV, in December 2017. The vehicle comes with a price tag of 448,000 yuan ($65,000) before incentives.

As of Aug. 28, NIO had delivered more than 1,300 ES8s and had reservations for another 15,700 more. The company plans to begin selling another electric SUV, the ES6, by the end of 2018, with initial deliveries in the first half of 2019.

The company, backed by Chinese tech heavyweight Tencent Holdings Ltd, applied for a float of up to $1.5 billion including overallotment according to its filing with the Securities and Exchange Commission, offering 160 million American depositary shares at $6.25 to $8.25 each, and landing a valuation between 6.4 and 8.5 Usd billion for the whole company. While the valuation immediately looks outrageous for a car company that booked $7 million in revenue for the 12 months ended June 30, 2018, it becomes more understandable

NIO ES8

when you find out that it is a technological company operating in highly promising fields like EV batteries and autonomous cars systems.

Nio has lost a net $1.6bn in the past three years, it had $668m of cash at the end of June and spent $461m in the first half of this year. The group's own IPO documents show that costs "will increase significantly in the future", with plans to spend $600m next year and $1.8bn over the next three years. This means that unless it curbs the scale of its ambitions a new capital increase could be needed in the next few years

It plans to go public on the New York Stock Exchange under the symbol "NIO".

The float comes as the firm, founded by Chinese entrepreneur William Li in 2014, and other Chinese EV makers seek fresh capital to develop new products and finance investments in areas including autonomous driving and battery technologies.

The offering has been structured to ensure voting rights remain concentrated with founder William Li and technology company Tencent. After the IPO, Li will own 14.5 percent of the electric-car maker and have 48.3 percent of the voting power through Class C shares. The Class B stock owned by Tencent and related entities after the offering will represent 12.9 percent of NIO and 21.5 percent of the voting power, according to the prospectus.

Other shareholders include Baidu Capital, Sequoia Capital and TPG Global.

FULL COST OF EV OWNERSHIP

While EV performance and comfort are way superior to ICE vehicles, the range anxiety is getting addressed fast thanks to better battery chemistry and a growing network of chargers. What is still difficult to assess exactly are the economics to buy an electric vehicle.
Here different factors come to play:

1) Distance driven per year
2) Vehicle depreciation
3) Circulation limits
4) State contribution

1) The more you drive the more you save if you go electric. It's a no brainer. For a correct calculation we should know the price of electricity you pay. Where you recharge (home, public rechargers, fast rechargers). What model of car you drive. The cost of the fuel in your country. As a rule of thumb, we can say that on average driving an EV will save you about 40% of maintenance costs and about 1000€ in fuel every 10,000km driven.

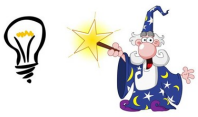
2) It is not easy to calculate any differential between Electric and ICE vehicles in term of loss of value due to depreciation. Till recently the fast dynamic of batteries technology weighted heavily on EV, while now the brunt is moving to ICE cars, that will be gradually excluded from circulating in cities and burdened with taxes.

3) As mentioned, the intangible costs like not being able to enter the city centre, to park in some areas or to drive in high-occupancy lanes, are mounting.

4) Direct contributions or tax relief is granted in many states for the environmentally friendly EV drivers.

To sum up, it is not easy to compare the economics of the electric vs the ICE vehicles even if regulation is clearly tilting the balance in EV favour. And this distance will continue to grow. For now, remember there is much more than the purchase price.

BITS OF ELECTRIC MOBILITY PHISICS



Referring to EV batteries characteristics we can find different information, Ah, voltage, KW, KWh, Wh/kg. Let's try to understand.
Energy is a measure of how much fuel is contained within something or used by something over a specific period.

The **kWh is a unit of energy**.

Power is the rate at which energy is generated or used. The rate at which for example electrical appliances use energy is their power (or load or demand).

The **kW is a unit of power**.

An **ampere hour** (abbreviated **Ah**, or sometimes **amp hour**) is the cell capacity or the amount of energy charge in a battery that will allow one ampere of current to flow for one hour. It is called the capacity curve.

Electrical voltage is defined as electric potential difference between two points of an electric field.

Using water pipe analogy, we can visualize the voltage as height difference that makes the water flow down.
kWh (1000Wh) can be calculated as battery voltage multiplied by Ah (V*A*h = Wh). In general kWh is unit to measure energy used.

Another important concept in the battery evolution is the energy density. The higher the density the lighter and more efficient the battery as the battery weight is one of the main problems of the electric mobility.
To calculate the energy density of a battery is just a matter of integrating the cell voltage vs. capacity and dividing it by the mass of active material.
Battery nominal voltage (V) x battery capacity rating (Ah) / battery weight (kg)=specific energy or energy density **(Wh/kg)**

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Niche AM is the innovative investment boutique meant to enrich, and bring new ideas to, the asset management industry.

Newly set up, Niche AM provides investors with a different and unique service based on niche investing. The aim is to spot and anticipate trends inversions, technology disruptions and, in general, significant changes that the market does not see (yet), and the industry does not adequately cover (yet), giving the clients more opportunities to invest.

Niche AM's aim is to apply its approach to the traditional business as well as to create an innovative and imaginative one: Niche Jungle.

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