The future is electric

A report on the conclusions from our Electric Vehicles Investor Conference

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1 Introduction

Electric vehicles have been around for a very long time. In fact, the first auto race held in the United States in 1896 saw two electric vehicles (EVs) take first and second place, beating all three internal combustion engines (ICEs). Although it has taken over 100 years for the technology to resurface, it is now very certain that the automotive industry is destined to become electrified. But why now?

Like any market, government policy has played a significant role. As global authorities increasingly focus on reducing emissions and tackling climate change, vehicle electrification has been pushed higher up the political agenda.

This is embodied by the targets being set by governments around the world – most have pledged for all petrol and diesel cars to be banned as early as 2040, while Chancellor Philip Hammond launched a £400 million charging infrastructure fund in his November 2017. These targets have been underpinned by rapid technological advancements which are driving the affordability of EVs.

Source: Guardian and Independent

From an investment standpoint, these statements and advancements have rapidly elevated companies across the EV supply chain.

Indeed, some notable private and public investments include Toyota, who in January this year through it's trading arm, agreed on a $224m deal to take a 15% stake in Orocobre, an Australian company producing lithium in Argentina; as well as Honda, Nissan and Mitsubishi (amongst 80 companies) selected by Innovate UK to receive funds for "Vehicle 2 Grid" charging from the Department of Business, Energy and Industrial Strategy (BEIS) and the Office of Low Emission Vehicles (OLEV)

However, despite the investment pouring in, there remains significant uncertainty among investors about who the winners and losers of the electric car revolution will be.

This is unsurprising considering the broad range of competing technologies and opinions in the market. Plus, with news headlines changing on a daily basis, it is difficult to keep track of where the changes are leading and what regulation might look like in the future:

Why carbon emissions from new cars are going up despite the crackdown on 'dirty' diesel

27 Feb 2018, 12:01am

Greens electric car push: end sale of petrol and diesel vehicles by 2030

12 Mar 2018

Source: The Daily Telegraph // The Guardian

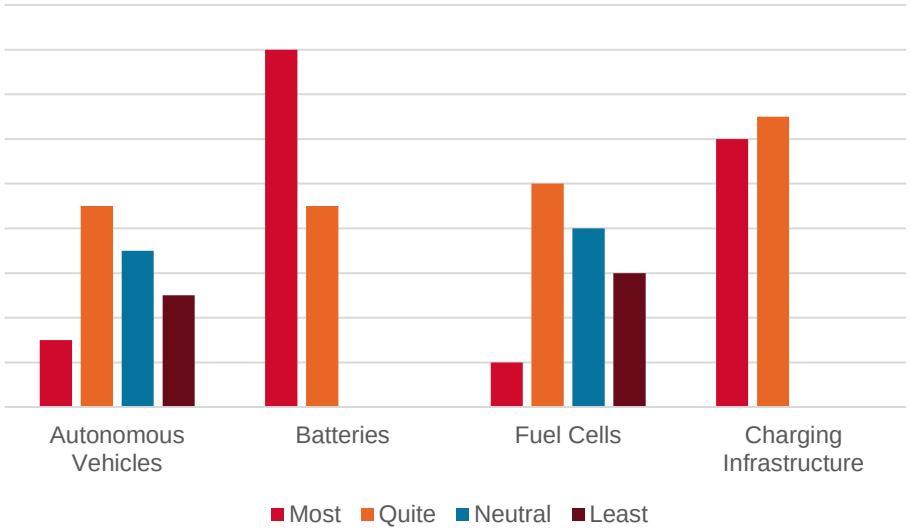
Enter the Redleaf Communications' Electric Vehicles Conference, focused on providing intelligent insights to strengthen investor understanding on the sector. We invited six industry experts to speak to investors, media and research analysts at an Electric Vehicles event on Wednesday 25th April 2018.

Our speakers and the topics they covered were as follows:

- Chris Jones, Canalys – "Autonomous Vehicles",
- Stephen Irish, Hyperdrive Innovation – "Battery Technology",
- Keith Allaun, PowerHouse Energy Group – "Fuel Cells and Hydrogen",
- Jon Forster, Impax Environmental Markets – "An investor's view",
- Tom Callow, Chargemaster – "Charging infrastructure in the UK" and
- Paul McNamara, Williams Advanced Engineering – "The challenges of vehicle electrification".

Redleaf surveyed the 61 attendees and this report is an analysis of that survey and a reminder of the questions posed by the audience to each presenter.

2 Which technology is most likely to succeed?



Source: Redleaf survey from conference audience

There is clearly no doubt that investors believe in the importance and likely success of batteries. The logical next area to succeed will be charging infrastructure – there were many questions about whether the UK grid would cope, how far have we already come, how much further have we got to go and what the current realities are?

Vehicle electrification is still a complex process. There are many challenges around battery technology as well as the design of the car – this was an area that drew a lot of questions from the audience. Investors were keen to know what the resource availability is for batteries and other components, how much they cost to produce and how effective they are on a relative scale. There was also a question about the possibility of interchanging batteries as a way of refuelling a car.

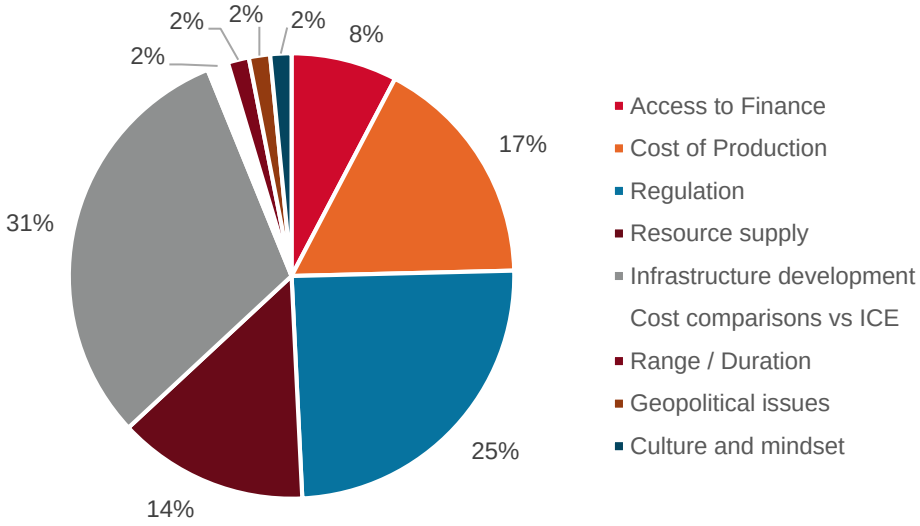
What was most interesting to see is what state sentiment is in regarding Fuel Cells. There is clearly some knowledge about the potential for Hydrogen as a fuel for vehicles and strong levels of interest too. There were many questions about supply, cost and distribution, the efficiency of the fuel vs electricity, as well as asking why consumers would choose this over the more established technology in BEVs.

Lastly, in spite of much recent coverage about Autonomous Vehicles, there is still a lot of scepticism out there about the technology and how soon it will develop into an investable area. Questions were raised about the commitment of the Telecoms and Satellite operators, specifically looking at what point we might reach suitable coverage to make this worthwhile. There were also concerns about safety, political issues surrounding the jobs market (how it will evolve) and technological advances (focusing on data processing speeds). Tesla was cited often as being the leader in this field. However, whether it was ultimately worth investing in is another question entirely.

3 The challenges facing the industry

The biggest challenge affecting the UK's infrastructure is getting access to new sites and whether the National Grid will cope. A prominent question asked was how soon will the Grid have to be strengthened? Chargemaster believe that the Grid will be able to cope until 2050, however Impax believe that the grid will need to be strengthened sooner, when the market reaches 10% EV penetration. The chart below highlights investor sentiment following the conference:

Main challenges and barriers to entry facing the industry



Source: Redleaf survey from conference audience

The additional challenge of regulation, whether that comes in the form of planning permission for individual sites, or future taxes amongst other aspects, is also seen as a major issue. There were a number of questions about Government subsidies too – how much they are worth, how much they are taken up, is the bureaucracy worth it?

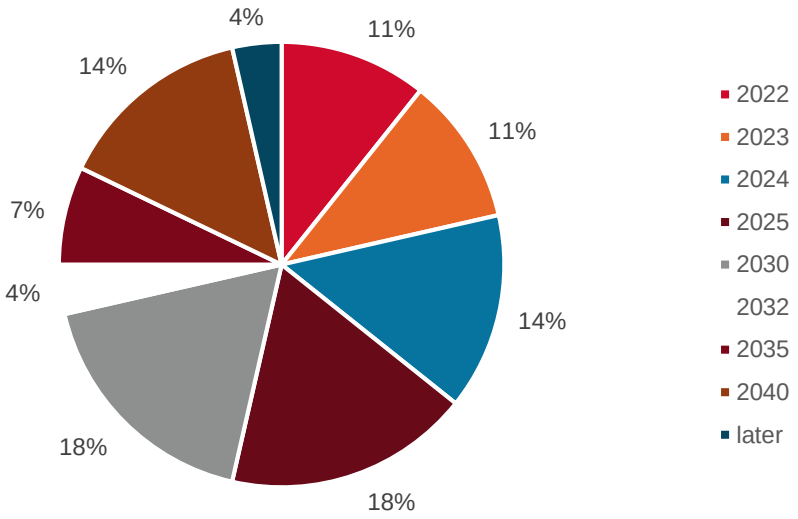
The possibility of a technology that can create a new energy supply that is separate from existing sources was positively received by the investors in the room.

Finally, some of the speakers were challenged on their environmental credentials and whether their product or solution is environmentally beneficial. Chargemaster have contracts with OVO Energy so that they use carbon-neutral electricity, otherwise there is no environmental benefit to going electric. PowerHouse Energy's process is carbon negative.

4 Key drivers of change

Most attendees believe that we are only at most 6-7 years away from the point when Battery Electric Vehicle (BEV) and Fuel Cell Electric Vehicle (FCEV) sales will have reached parity with existing ICE sales.

Battery EV and Fuel Cell EV sales reaching parity with Petrol/Diesel sales



Source: Redleaf survey from conference audience

The main question that is therefore driving change is “will Electricity or Hydrogen power cars in the future?”

Returning back to the chart on page 5, we have seen that of those surveyed in the conference there is some scepticism about the technology and capability of Hydrogen, yet an increasing number of people are interested in it.

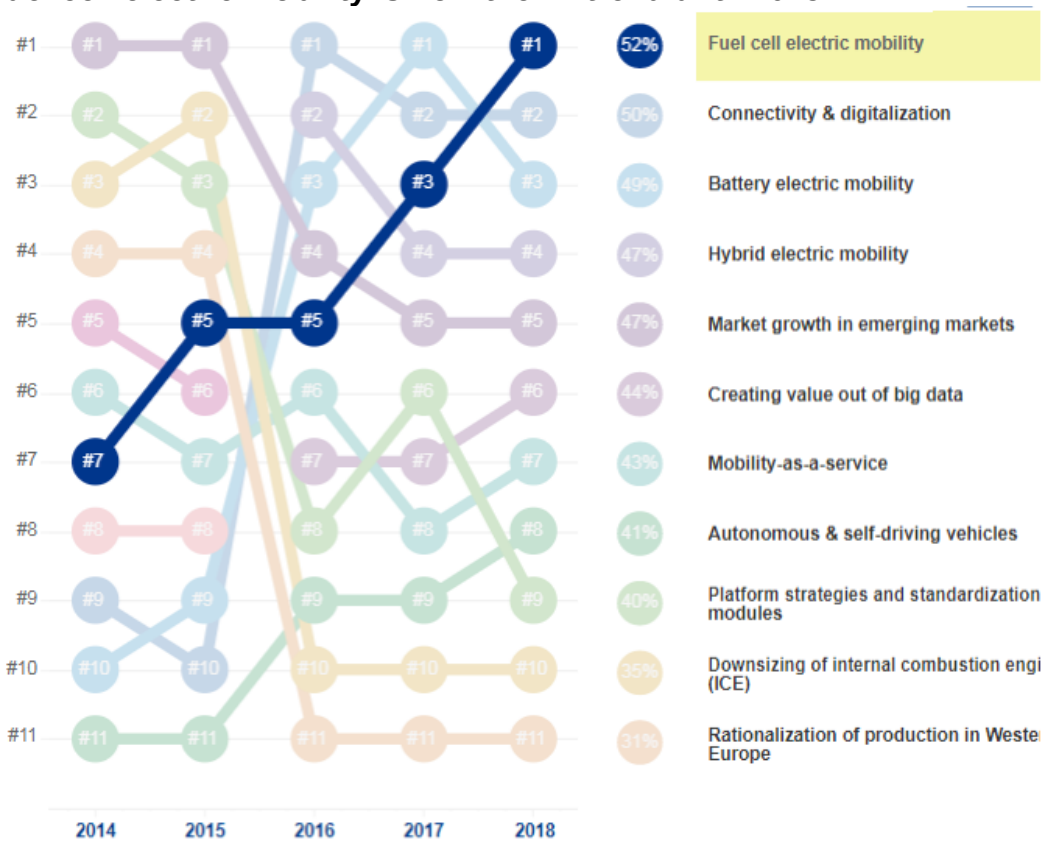
Additionally, the split between rural and urban requirements will affect consumer choices – particularly how easy it would be to have a home charging system if you live in a block of flats, or how reliable is electricity as a power source if you are in your vehicle for most hours of the day and need increased range versus a commuter who uses the car to travel to and from work.

These existing consumer habits and future requirements will play a major part in the growth of both BEV and FCEV sales. A key point that was highlighted in the conference is how quickly can you fill up with hydrogen vs charge a battery. However, this is only relevant to vehicle usage (commuting versus commercial driving) and whether refuelling can be done overnight or, in the same fashion as refuelling with petrol/diesel.

It is quite clear therefore that there will not be a dominance of either technology that will take hold in the marketplace as mobility trends change. Automotive industry executives were surveyed (by KPMG) on what they believe these trends are likely to be and the

results have changed year on year. The most strident change is that Fuel Cells are becoming vastly more important in their view as seen in the following chart:

Fuel cell electric mobility is now the #1 trend until 2025



Source: KPMG Global Automotive Executive Survey is the compound input from 1000 executives from the automotive industry

These executives project the split by 2040 for the following technologies will be:

- BEVs 26%
- FCEVs 25%
- ICEs 25%
- Hybrids 24%

Tesla was occasionally referenced by many speakers – such is the ubiquity of the company in everyone's minds – yet not often in very favourable terms.

It is true that they lead the way in many areas of engineering and desire, yet from a fundamental basis there are still some flaws: a valuation of 122x is hard to justify by many and the production issues in the news now show how over-ambition is affecting confidence. What the future of the company looks like will depend on when the existing OEMs compete on a level platform.

Finally, investors were also interested in the power of the Chinese market (24m out of 84m vehicles are sold here), Chinese government policies and the likelihood of China becoming the leading producer of electric vehicles. Many in the audience were interested to know what the industry thought of political risk and government interference, particularly from China.

5 The unanswered questions

There are still many factors that we cannot yet consider as this industry develops. Some of the questions are more straightforward, others less so and will only appear as we reach certain points in technological development. The conference answered many questions, but it also raised many others that were raised in further discussion afterwards:

- What are the trends in range for BEVs and FCEVs likely to be?
- Which technology and which fuel is likely to be the most efficient?
- How will government regulate the industry?
- What will they do to replace the lost revenue from fuel duty?
- How will they change road tax?
- How will the major insurers adapt to vehicle autonomy?
- What will the new model of ownership look like as ride sharing increases?
- What is the future for jobs in the market and will the UK be able to adapt its education system to provide highly skilled enough people for this industry?
- What will car companies do with the data collected?
- How will they manage this data, and will they be able to protect themselves from cyber-attacks?
- What other potential political risks might affect the industry, particularly concerning resource supply?

6 Conclusion

Investors are most concerned now about cost of production, infrastructure development and what government regulation is going to do to the industry as they get more involved.

There is a clear belief that Battery Electric Vehicles will be the dominant force in this revolution. However, as other technologies come to the fore, this dominance could well be diminished. The issue of vehicle autonomy, and its likelihood of success, will depend on how governments choose to regulate this area and how public transport providers will influence technological development through their requirements.

It is fair to say that each area discussed in the conference will have a strong bearing on the others and each will combine to ensure that vehicles are ever more efficient. But most importantly and currently, the main area to follow will be the most reliable, cost effective and deployable fuel source (be it hydrogen or electricity). Industry experts currently believe that the market will be split equally amongst various technologies by 2040. Yet as alternative fuel supplies are developed and become more accessible, and as the second-hand market develops, it will be down to the choices consumers make and how governments choose to tax the industry that will provide the clearest indication of the future.