

# Innovation – Onwards and Upwards for Game Changers

Innovation is always a major theme at the Summit, but this year there was a real sense of technologies on the cusp of break-through, especially electric vehicles. The New Energy Pioneers showcased a range of further ground-breaking technologies, whose disruptive nature means their adoption can fundamentally change the status quo, with far-reaching consequences. Innovation cannot, therefore, exist in isolation. For game-changing ideas to succeed, they need to interact with other technologies, regulation, access to finance and public attitudes. **Mike Scott** reports.

The electric vehicle sector is a prime example of these factors and this was reflected in the strategy breakfast The Transportation Evolution: From Hybrid to Plug-in Hybrid to Electric Vehicle, where there was a real sense of a technology on the cusp of fulfilment. Driving this is the realisation that to meet the 2050 target of an 80% reduction in emissions from transport, we have to move beyond hybrid cars, according to Jonathan Dixon, global business development manager of zero-emission strategic planning at Nissan. “The vehicles of the future must be zero-emission at the tailpipe,” he said.

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The perception is that electric vehicles are still a futuristic concept. “EVs have been a 10-year idea for some time, but 2010 is the year we finally break through,” said Dixon. Nissan’s Leaf should be on the road later this year and by early 2013, the company’s EV figurehead will be in mass production in Japan, North America and the UK.

Most of the other big carmakers will also offer EVs, ranging from BMW’s Mini-e to GM’s Chevy Volt, along with niche models such as the Tesla electric sports car. The Summit’s view was that EVs would become mainstream by 2014 and that by 2020, 20% of vehicles would be electric.

The success of vehicles such as the Leaf “will be a bellwether of things to come,” said David Vieau, president and chief executive officer of battery maker A123 Systems. “Early successes are a big deal,” he explained.

This will help to meet the Mayor of London’s target of having 100,000 EVs on London roads by 2020, about 5% of the fleet, said Marie-Barbe Girard, principal associate in Transport for London’s Delivery Unit. She highlighted the many advantages of EVs in helping to address noise and air quality issues and pointed out that they are particularly well-suited to urban living.



She also dispelled a myth – that EVs are only as clean as the power that charges them. While it is clearly more environmentally beneficial for EVs to be charged using renewable energy, “even with the current grid mix, EVs are 40% more efficient than cars that run on fossil fuels,” she said.

Despite this rosy picture, the panellists were under no illusion as to the scale of the task ahead. There are many significant issues to address and a host of unknowns when it comes to the roll-out of EVs. The view of Summit participants was that significant government support would be needed to make EVs a “game-changing” technology, particularly in the early stages – when debt markets are likely to steer clear because of the risk – and when it comes to infrastructure.

One of the biggest barriers, according to Mike Bissonette, senior vice-president and general manager of efficient energy systems at charger maker AeroVironment, is drivers’ fear of being stranded, known as “range anxiety”.

The panel agreed that this is primarily a psychological barrier. The average car journey in London is no more than four miles, and early adopters are expected to be able to top up their batteries at home or at work. Trials involving the Mini-e showed that users recharged just once every three days.

Nonetheless, until there is a widespread on-road charging infrastructure, consumer resistance is likely to remain. Making it possible for people to recharge quickly is one way of overcoming this resistance, and AeroVironment has focused more heavily on fast chargers to meet this need, said Bissonette.



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There is an infrastructure “chicken and egg” situation for EVs. London is planning to have sufficient chargers in place – not just on the street but also in places such as supermarket, train station and public car parks – before EVs become widespread, to ensure that lack of charging facilities does not delay EV take-up.

Another issue for drivers, even if they mostly drive only short distances, is that they want to know that they can make longer trips if they want to or have to. Peugeot has come up with one solution to this, offering a free subscription to car clubs for EV owners.

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A more dramatic response to range anxiety was unveiled at the Summit. A group of students from London's Imperial College is planning to drive the 26,000km length of the Pan-American Highway, the longest road in the world, in an electric racing car. Team member Andrew Hadland explained that the students wanted to dispel the negative public perception of electric vehicles as slow unattractive cars with a limited range. “If we can drive this car from Alaska

to the bottom of South America, it should show that people can be confident using electric cars in everyday life,” he said.

One of the great unknowns about EVs is their impact on the electricity system, just one of the key issues for Bloomberg New Energy Finance's Consortium on Digital Energy (CODE). Michael Wilshire, head of energy analysis, explained the consortium's work looking at how all the different elements of a digital energy system fit together. This is about more than just the grid – the digital energy system will have to incorporate a whole range of changes including smart meters, smart appliances, energy management systems in green buildings, electric vehicles, micro-generation, on-site and grid level energy storage.

## Desertec: Mirage or Reality?

The ambitious Desertec project to generate solar and wind power in the deserts of North Africa and the Middle East garnered a lot of attention during the Summit. “People are fascinated by this idea,” said Thomas Rueschen, chairman of the board for the project, which was started by a group of mainly German companies.

The consortium includes bankers, insurers and legal experts as well as more traditional engineering concerns such as Siemens and ABB, utilities such as Italy's Enel, and grid operators such as REE of Spain. Recent additions to the consortium, including Moroccan utility Nareva, have been unveiled in response to criticism that the initiative was too German. “This is not colonialism,” Rueschen asserted. “It will only work if it is win-win for everyone. The Middle Eastern and North African countries will get jobs, energy and water from desalination plants.” Their own power systems will also become more resilient and efficient by being linked in to a larger network.

Perhaps the most significant addition to the consortium is First Solar, the thin-film giant that became the first dedicated PV player to get involved. Bloomberg New Energy Finance solar analyst Jenny Chase said this makes the project slightly more likely to become a reality, because PV is a cheaper and more mature technology than solar thermal electricity generation, which was initially the focus of the initiative.

Desertec hopes to build 100GW of capacity by 2015, but Rueschen acknowledged that significant investment in infrastructure is needed, including the development of a “supergrid”. The entire project is estimated to cost a massive €400bn, but spread over 40 years.



There are significant opportunities in the digital energy system, in areas ranging from demand response and energy management to grid efficiency and the integration of distributed and renewable energy. However, Wilshire pointed out that there are significant barriers too, including closed markets, regulation and misaligned incentives – for example on building storage capacity, limitations on what utilities can do and inequitable distribution of costs and benefits. Fundamental changes will need to be made throughout the system – in the type of infrastructure we need, the way energy is supplied, pricing structures, regulation and business models.

These themes were also discussed in the studio discussion that followed – Digital Energy: Does Intelligence Lead to Happiness? – which examined exactly how to introduce an intelligent power network. Virtually all consumers are ignorant of their energy consumption, pointed out Miguel Stilwell Andrade, executive board member of EDP, and while many benefits will flow from integrating EVs and renewable energy into the grid, and the spread of energy efficiency and demand-side management, “you have to prove the business case first – it is a very conservative industry,” he said.

A clear aim is vital, said Richard Postance, leader of smart grid solutions at Ernst & Young. “We need to understand what the objectives are and create the right incentives. We also need to bring certainty, for example by imposing a carbon floor price,” he said, adding: “These are not assets that will pay back in three to four years but over 15–20 years, so we also need a long-term time horizon.”

At the same time, the smart grid will not work without consumer acceptance, said Klaus Heimann, senior vice-president of service industries at SAP. “Consumers will not make money from the smart grid, but I think they would be happy if they broke even.”

However, “data privacy and security could be a show-stopper,” added Heimann. “Utilities are not used to handling the huge amount of data that the smart grid will generate – and they are not used to allowing customers access to the data that they do hold.” There is also an issue of ownership. “We are told that data belongs to the customer. If consumers actually get their hands on that data, it will be a huge shift,” said Andrew Bud, executive chairman of mBlox.



Another crucial success factor is standards that allow interoperability and make the smart grid, overall, more affordable. “Different equipment needs to be able to talk to each other. It is the only way for costs to come down,” said Andrade. This applies in areas ranging from EV batteries to smart meters to smart appliances but, if the mobile phone industry is anything to go by, it may be some time before a common set of standards is agreed.

## The Changing Face of Nuclear Energy

Nuclear is increasingly being embraced as a low-carbon baseload technology: 44 reactors are currently under construction worldwide. As Nicholas Swetchine, Areva International & Marketing vice president, said: “The nuclear renaissance has started. Nuclear is complementary to renewable energy, not competing with it, and they are both CO<sub>2</sub> free. Its real competitor is coal.”

But nuclear is no longer just about large baseload. Hyperion Power Generation, for example, is one of several venture capital funded companies building small modular nuclear reactors – 25MWe – targeted at markets where there is no electricity, or where more power is needed in remote areas. As John ‘Grizz’ Deal, Hyperion’s CEO, said: “It’s like an iPod in a world of mainframes.”

Venture capital-funded NuScale Power is developing 45MW scalable nuclear reactors that can be stacked together to create, for example, a 450MW power station using 10 reactors. NuScale has consciously designed its reactor with speed to market in mind and is hoping to get a licence in 2015.

Venture capitalists also see great opportunity in nuclear fusion, a technology that operates with tiny quantities of nuclear matter. Richard MacKellar, managing director of Chrysalix, explained why the company has invested in General Fusion, which plans to build a full-scale reactor generating net energy for \$50m within the next five years: “There is no doubt that fusion is disruptive and is the holy grail for alternative energy. There is a massive dislocation in opportunity.”