POWER FORWARD CHALLENGE

Trade Delegation Visit – 18 February 2019

Innovation in the UK Power Sector
Selected Insights

29/03/2019

Event Agenda

The event was held at Carbon Trust offices in London on 18 February 2019 and covered 5 themes

	Theme	Company	Mins.
11:25	**Welcome Address**	Carbon Trust	5
11:30 – 12:30	**Theme 1:** Overview of the UK energy market	Mott McDonald	15
	Theme 2: Funding innovation in electricity networks	Ofgem innovation team	15
	Theme 3: Distribution network evolution to meet the low carbon challenge	UKPN	15
	Panel - Q&A	For First Three Themes	15
12:30 – 12:45	**Coffee Break**		
12:45 – 13:30	**Theme 4:** SME engagement with energy innovation	InnovateUK	15
		Energy Systems Catapult	15
	Panel – for Q&A	For Theme 4	15
13:30 – 14:15	**Lunch**		
14:15 – 15:!5	**Theme 5:** Experience in developing innovative smart energy solutions in the UK	Electron	15
		Hildebrand	15
		Moixa	15
	Panel – for Q&A	For Theme 5	15
15:15 – 15:30	**Closing Remarks**	Carbon Trust	15

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Trends in the UK Energy Market

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Trends in the UK market

Key Trends in the UK Market

1. Intermittent Renewables	2. Decarbonising Heat	3. Decarbonising Transport	4. Storage & DSR
Increasing the spread of energy prices and opportunities for flexibility	Potential move away from current technology of natural gas boilers. Heat Pumps, Hybrid Boilers, Hydrogen heating, CHP all potential solutions.	Rapid uptake of EVs and charging networks being rolled out – 178,000 plug-in EVs in the UK in Sep. 2018	Available capacity and ancillary markets (e.g. FFR, EFR) for storage assets and aggregators.

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Routes-to-Market and Support

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Routes-to-Market and Support

Ofgem Innovation Funding

Network Innovation Allowance (NIA)		Network Innovation Competition (NIC)		Innovation Roll-out Mechanism (IRM)		Beyond 2021
Projects	Budget	Projects	Budget	Projects	Budget	Next round of price controls
• Small Projects • Pre-commercial • TRL 2-8 • 2013 – 2023	• £140m spent by 2018 • £500 total • Approx. £1-5m allowances (NIA & NIC)	• Annual Competition • Later stage • TRL 4-8 • 2013 – 2023	• £225m sent by 2018 • - £70m pa Elec • - £20m pa Gas • £720m total • Approx. £1-5m allowances (NIA & NIC)	• Innovation rollout/commercialisation • TRL 8-9 • 2013 – 2021	• No Cap	• IRM Removal • New funding with focus on network challenges

Delegation Question: *Does a company have to be a UK based to be eligible for funding? Does the activity have to take place in the UK?*

Answer: *The funding can only be giving to a network company. They have to be the lead on those projects; however, they can collaborate with other businesses. You want to get a UK partner with a UK NO to tap into the funding.*

Routes-to-Market and Support

Innovation Support

Innovate UK

- InnovateUK facilitates public grant funding to innovation projects across multiple sectors.
- Key support areas including:
  - Smarter energy systems
  - Transforming construction
  - Offshore wind
- Interested in future sectors as well.
- InnovateUK offers thematic competitions and more open competitions such as Energy Catalyst which offers funding for early, mid and late-stage projects focused on the themes of cost reduction, emissions and security of supply.
- Investment is also provided for Energy Systems Catapult that offers supporting business services and test facilities/sites to assist in the commercialisation of new technologies and innovation projects.

Routes-to-Market and Support

Innovation Support

Innovate UK

BEIS FleX Competition (Link)	
Projects	**Budget**

• Flexibility exchange solutions (domestic or commercial)
  ○ Energy Storage
  ○ DSR
  ○ Generation
• Proposal submission 18 April 2019
	• Up to **$4 million** over 2019 – 2021
	• To support 3 demonstration exchange projects
	• Completed by March 2021

Storage at Scale Competition (Link)	
Projects	**Budget**
• Alternative storage technologies • Min power of 30MW or capacity of 50MWh and Power-to-X with min input power of 5MW • Proposal submission 26 April 2019	• Up to **£20 million** over 2019 – 2021 • To support 3 demonstration projects • Completed by March 2021

Delegation Question: *Are these funding pots available for international companies?*
Answer: *BEIS yes, innovateUK yes, other organisations more specific.*

Delegation Question: *Are there payback requirements for funding?*
Answer: *InnovateUK is doing loans as well as grants. Depends on government agenda at the time.*

Routes-to-Market and Support

Innovation Support

- There are 10 Catapult centres across the UK they are designed to work at the interface of public, private and academic institutions.
- The Energy Systems Catapult is about overcoming barriers to energy innovation in products and services to meet the UK's clean growth ambitions, while taking into account the point of view of consumers.
- It does this via its 'Innovation support platform', providing universal, incubation and acceleration support.
  - **Universal Support:** standardised support accessible by all SMEs including access to ESC partner relationships (e.g. reports, knowledge exchange, events).
  - **Incubation Support:** Tailored support for selected SMEs utilising ESC assets and delivery partner offerings (e.g. workshops, business models, consumer insights, concept testing).
  - **Acceleration Support:** Scale-up support for selected high-impact potential SMEs and links to investors (e.g. demonstration environment access, corporate partner engagement).
- The international team aims to promote UK exports and foreign investment (demo projects), as well as leverage ESC's assets/capabilities to support overseas countries.

Interest Areas	Capabilities and Assets	Service Platforms
Digital Energy	Modelling	Energy Town
Smart Heating and Cooling	Consumer Insight	Innovator Support Platform
Smart Buildings	Digital Data	Modern Energy Partners
	Systems Integration	Insights and Evidence
	Infrastructure and Engineering	International Support
		Energy Revolutions Integration Services

Routes-to-Market and Support

Innovation Support

Delegation Question: What technically constitutes a UK company?

Answer (InnovateUK): Registered on Companies House (wholly owned subsidiary - don't have to be ltd., can be a partnership, can be not-for-profit). InnovateUk need to be able to show that there is a benefit to the countries involved and to international relationships.

Delegation Question: What is the Energy Systems Catapult living lab (and by extension Energy town)?

Answer (ESCatapult): Energy monitoring in 100 real homes, with innovative technologies. Funded by the government. It's rolling every two years. Energy Town is going to be simulating future markets as well.

Follow-up Question: Are microgrids being tested in this context?

Answer: No but the will in the future.

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SME Lessons Learnt

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SME Lessons Learnt

- Lessons Learnt in Innovation (Electron and Moixa)

1. Commercialisation should be discussed with funders and incubators from day 1
2. Identify and engage with key stakeholders (e.g. regulator and government) continuously from project initiation.
3. If promoting a system-wide solution, segment the solution into multiple sub-projects as these are easier to promote to smaller stakeholder groups.
4. Be specific with your needs and make use of support services (e.g. incubation support) as well as funding.
5. Design work packages for operational issues as well as for the technical bid – be pessimistic with your timeline forecasts
6. TEPCO of Japan has invested in both Electron and Moixa. As an island market, it faces similar flexibility challenges to the UK and could represent an additional market for relevant solutions commercialised in the UK.

SME Lessons Learnt

- Lessons Learnt for Energy Monitoring Solutions (Hildebrand)

1. Energy is not a high priority in most businesses.
   - Value needs to be demonstrated in the benefits of the solution to the operations of the business as a whole (e.g. better quality lights, temperature, security of supply, fridge maintenance)

2. Buyers and users of energy are two different people in businesses
   - Communication and expectation setting between them helps to bridge the financial incentives with the consumption patterns

3. Capital constraints and short ROI requirements
   - Sharing evidence on ROI is critical, including scenario analysis for each business case

4. Complex stakeholder concerns with no one key role
   - Must influence multiple actors to manage energy

SME Lessons Learnt

- Advice from a DNO (UKPN)

1. Partner with a UK company.
2. Perception is that utility players want to go slow; however, since new innovation funding rounds this has changed and so has their attitude towards start-ups.
3. Pitch content to address specific challenges in targeted sectors and locations.
4. DNOs are increasingly interested to learn from other sectors and are open to discussions.

Routes-to-Market and Support

Delegation Question: What is Hildebrand's business model?

Answer (Hildebrand): Some hardware, and also their IoT platform with sensor integration to make data more accessible for solutions

Delegation Question: Does data flow one way or is there downstream controls in the equipment?

Answer (Hildebrand): Depends on the type of hardware. There is interests in putting controls in the device. They can do it bidirectional for some devices.

Delegation Question: Does Moixa license their business model?

Answer (Moixa): They have patents on their technologies. They can license their software and can do joint offerings. Issues of how do you keep innovating decade on decade for software and hardware? How do you make technologies persist? They take the approach that the maths of energy might be a more sustainable angle for a business in today's energy system.

Delegation Question: What are the role of Standards for tech?

Answer (Moixa): The role is critical. The UK should be using global standards so that they can be better integrated. EVs are a long way off persistent standards. "Smart homes are a nightmare."

Answer (Electron): Data models and standards need to be optimised. However, this shouldn't be making new standards but building on what exists and really defining those.

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Appendix: Delegates' Questions

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Appendix: Delegates' Questions

#	Theme	Question	Company	Answer
T1.1	**Theme 1:** Overview of the UK energy market	How does the UK get its gas?	Mott MacDonald	Majority of gas comes from Norway, some from the North Sea, and a smaller proportion from other places (e.g. Qatar).
T1.2	**Theme 1:** Overview of the UK energy market	Are there incentives for decarbonising heat?	Mott MacDonald	Not entirely sure. He is an electricity man.
T1.3	**Theme 1:** Overview of the UK energy market	Is charging at work being explore?	Mott MacDonald	Not significantly at the moment.
T1.4	**Theme 1:** Overview of the UK energy market	Is charging optimal at night or not?	Mott MacDonald	The UK is not California where solar surplus means charging in the day works, but balancing services for charging in the day in UK are being explored.
T1.5	**Theme 1:** Overview of the UK energy market	How hard is it to enter capacity and ancillary markets for storage and DSR?	Mott MacDonald	Barriers exist for entry into ancillary markets. You can get through aggregators but not at the level of a home battery yet. Capacity markets have big incentives for DSR and energy storage. Ancillary services have a limit, however energy trading is increasing.
T1.6	**Theme 1:** Overview of the UK energy market	Of all of these trends what is making money?	Mott MacDonald	Capacity and frequency response markets work.
T1.7	**Theme 1:** Overview of the UK energy market	But what size do you have to be for these markets (capacity and frequency?	Mott MacDonald	1MW or over
T2.1	**Theme 2:** Funding innovation in electricity networks	What constitutes a 'network innovation'? Are behind the meter projects eligible (for funding) (aggregation of assets do impact networks)?	Ofgem	Ofgem assesses projects on a case by case basis; so yes, that is possible.

Appendix: Delegates' Questions

	Theme	Question	Company	Answer
T2.2	**Theme 2:** Funding innovation in electricity networks	Does a company have to be a UK based to be eligible for funding? Does the activity have to take place in the UK?	Ofgem	The funding can only be giving to a network company. They have to be the lead on the project; however, they can collaborate with other businesses. Advice: You want to get a UK partner with a UK NO to tap into the funding.
T3.1	**Theme 3:** Distribution network evolution to meet the low carbon challenge	What is the average electricity bill?	UKPN	£1100p/a
T3.2	**Theme 3:** Distribution network evolution to meet the low carbon challenge	How vertically integrated are DNOs?	UKPN	Private companies exist separately for infrastructure such as private networks, railways etc.
P1.1	**Panel 1** (Theme 1, 2 and 3)	Trends in heat transition – where is it going?	Mott MacDonald	Going slowly. Heat pump uptake is marginal. Hydrogen uptake is not being trialled at scale. There is general industry acknowledgement that regulation needs to shift to better facilitate this.
P1.2			UKPN	Comes up in a lot of discussions, but there is no clear directives that have been given and thus no action; however, it is rising in the policy agenda.
P1.3			Ofgem	Government is leading on this and currently considering what the government's role in heat should be in the 2020s. It's on the radar of the policy sectors.
P1.4	**Panel 1** (Theme 1, 2 and 3)	Electric Vehicles - What is happening?	UKPN	UKPN is not deploying infrastructure themselves for EVs. Working with local government for planning and seeing how they can facilitate change i.e. in London the priority is the electrification of taxis and buses. Trying to find the smartest way to invest in the market. They are working with heat maps to find where to deploy capacity. Updating them close to real time is the goal - Data analytics and data visualisation are areas of focus

Appendix: Delegates' Questions

	Theme	Question	Company	Answer
P1.5	**Panel 1** (Theme 1, 2 and 3)	Does the charging company then get to see the heat maps? (P1.4)	UKPN	Yes
P1.6	**Panel 1** (Theme 1, 2 and 3)	Is UKPN still looking for partners for existing projects?	UKPN	Yes. As the projects develop they acquire more partners
P1.7	**Panel 1** (Theme 1, 2 and 3)	Other than at substations how do you measure the system?	UKPN	Higher voltage areas have good coverage in London as they are automated. Low voltage, however, doesn't have much visibility. It wasn't needed. Smart meters are being rolled out. Data from smart meters is aggregated and then provided to DNOs, they do not flow directly to them.
P1.8	**Panel 1** (Theme 1, 2 and 3)	Do DNOs get access to the data?	UKPN	DNOs have to submit a data protection plan and then they can buy the data. It is provided as aggregated data.
P1.9	**Panel 1** (Theme 1, 2 and 3)	Is there bi-directional measuring?	UKPN	All energy suppliers must offer smart meters to all homeowners, however, they are not required to take that up. 100% is the target for the roll-out. Smart meters are owned by suppliers not DNOs. Before rollout, you have to work with existing infrastructure. You have to retrofit to measure.
T4.1	**Theme 4:** SME engagement with energy innovation	Are funding pots available for international companies?	InnovateUK	Yes for BEIS and innovateUK. Other organisations have more specific requirements.
T4.2	**Theme 4:** SME engagement with energy innovation	Are there payback requirements for funding?	InnovateUK	InnovateUK is doing loans as well as grants. Depends on government agenda at the time.
P2.1	**Panel 2** (Theme 4)	What technically constitutes a UK company?	InnovateUK	Registered at Companies House (wholly owned subsidiary - don't have to be a ltd., can be a partnership or not-for-profit). InnovateUk needs to be able to show that there is a benefit to the countries involved and to international relationships.

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	Theme	Question	Company	Answer
P2.2	**Panel 2** (Theme 4)	What is the Energy Systems Catapult living lab (and by extension Energy Town)?	Energy Systems Catapult	Energy monitoring in 100 real homes, with innovative technologies. Funded by government. It's rolling every two years. Energy town is going to be simulating future markets as well.
P2.3	**Panel 2** (Theme 4)	Are microgrids being tested in this context? (P2.2)	Energy Systems Catapult	Not currently but will in the future.
T5.1	**Theme 5:** Experience in developing innovative smart energy solutions in the UK	TEPCO's investment in Electron. How is the platform relevant to the Japanese market?	Electron	TEPCO is looking at curtailment issues facing new, cleaner generation and using Electron's product to do so.
P3.1	**Panel 3** (Theme 5)	What is Hildebrand's business model?	Hildebrand	Some hardware, and also their IoT platform with sensor integration to make data more accessible for solutions.
P3.2	**Panel 3** (Theme 5)	Does data flow one way or are there downstream controls in the equipment?	Hildebrand	Depends on the type of hardware. There is interests in putting controls in the device. They can do it bidirectional for some devices.
P3.3	**Panel 3** (Theme 5)	Does Moixa license their business model?	Moixa	They have patents on their technologies. They can license their software and can do joint offerings. Issues of how do you keep innovating decade on decade for software and hardware? How do you make technologies persist? Moixa takes the approach that the maths of energy might be a more sustainable angle for a business in today's energy system. Important to ask where is the payer in the business model? Behind the meter is a daily payer. Substation is an occasional payer.

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	Theme	Question	Company	Answer
P3.4	**Panel 3** (Theme 5)	What are the role of Standards for tech?	Moixa	The role is critical. The UK should be using global standards so that they can be better integrated. EVs are a long way off persistent standards. "Smart homes are a nightmare"
P3.5	**Panel 3** (Theme 5)		Electron	Data models and standards need to be optimised; however, this shouldn't be making new standards but building on what exists and really defining those.