

25 July 2017

To Whom It May Concern

Consultation on RIIO-ED1 Innovation Roll-out Mechanism Submissions
UK Power Networks - LV Network Visibility and Control

Question 1: *Do you consider that any of the proposed roll-out will facilitate the Government's Carbon Plan and/or deliver wider environmental benefits?*

At Hitachi, we recognise the electricity market in the UK is currently undergoing a major transition from a traditional structure based on a few large scale generators and retailers selling electricity to a large number of mostly disengaged consumers to a system where generation is increasingly distributed, connected to distribution networks and where consumers start to become active market participants. Hitachi is committed supporting this transition and working with all stakeholders to unlock the technical, commercial and regulatory barriers to the achievement of rapid decarbonisation.

One area particularly impacted by this transition will be the distribution networks. DNOs are already facing challenges. Through Hitachi's broad range of experience of working with electricity network operators (DNOs and TSOs) around the world, we understand this new 'Smart Grid' approach to managing networks will, alongside re-enforcement, be an underpinning tool for DNOs to ensure the low carbon transition enabled rather than held back by the DNOs. For this to happen, DNOs need the ability to both monitor and control the increasing number of distributed assets connected at the low voltage network. We recognise that for DNOs this capacity is not yet there and that this proposal should be seen as a fundamental pillar to ensuring UKPN is an enabler of the government's carbon plan.

Some examples, of work Hitachi has undertaken and is currently delivery to unlocking potential barriers to the transition to EVs and low carbon generation are set out below:

Jump Smart Maui

Hitachi commenced its work with stakeholders on the Hawaiian Island of Maui in 2011. This was in recognition of their challenges at the time where, including transport, oil accounted for 90% of its energy consumption and resulting energy costs being up to twice those of the mainland US. To reduce this reliance on oil Hawaii set targets of 40% renewables by 2030 and 100% by 2045. At the end of 2015, RE on Maui already accounted for 33% of the total electricity demand of Hawaii with 72MW of wind and 74MW of PV.

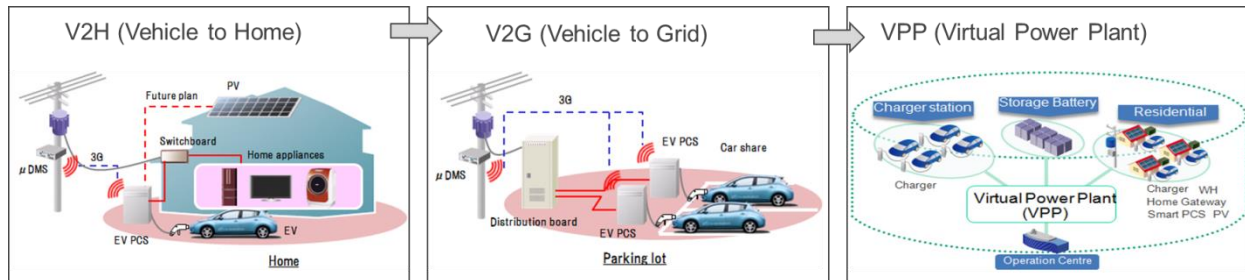


To achieve these goals Jump Smart Maui was established to demonstrate the potential of using the intelligent management of electric vehicles to both enable the deployment of RE and ensure a stable power supply. The project has been delivered in two phases:

- Phase 1 – deployment of 200 level-2 controllable AC chargers and 13 DC fast chargers to demonstrate the impact of managed charging

- Phase 2 – deployment of 80 bi-directional DC chargers to demonstrate V2H and V2G through a virtual power plant (below)

During the course of the project the number of EVs on the island increased from 60 to almost 700, with residents actively signing up and participating in the project. Both phases 1 & 2 are now complete having successfully demonstrated the key role both smart charging and V2G will play in managing the Islands energy system.



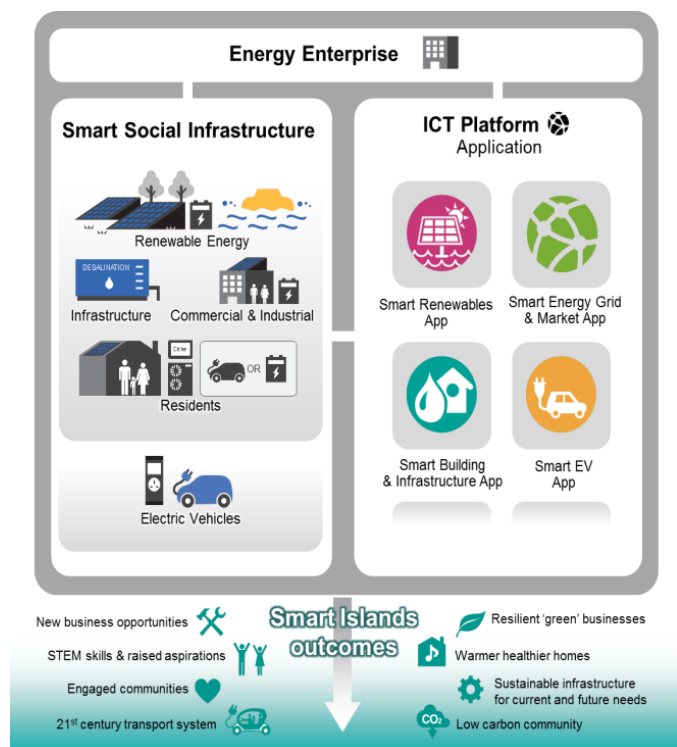
Smart Islands

The Smart Islands Programme was developed by Hitachi and local partners in 2015 to address a number of local issues but principally, similar to Maui, to enable the deployment of RE and in doing so reduce electricity bills for local people. A diagram setting out the key Smart Islands components is opposite.

The deployment of EVs underpinned this ambition with a target of 40% of the islands vehicles to be EVs by 2025. Through this deployment the key role that V2G enabled EVs would play in balancing the wider Islands energy system was identified.

Hitachi is currently leading a project within this programme to deploy an energy management solution (ICT platform) to enable these targets to be met, with V2G being a key part of this.

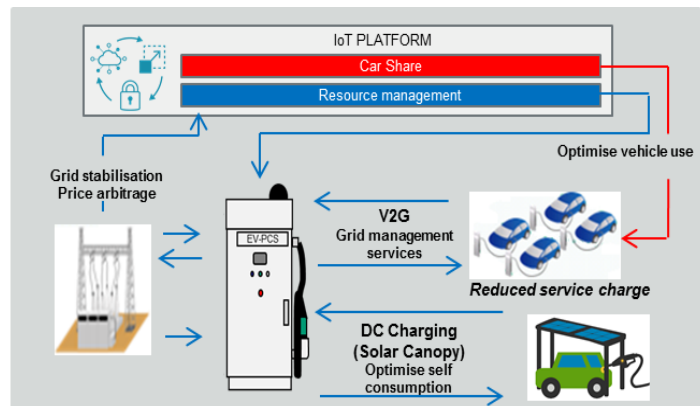
More specifically the EV component of this project will deploy a connected vehicle platform that integrates V2G (hardware & software) and car share in a single service model (below). The project will test the potential of a multi-use car share scheme where fleet owners (in this case the Council for the Isles of Scilly) optimise the use of their vehicles during evenings and weekends,



by allowing residents to use them. Through optimising fleet use and leveraging value from grid services this project will demonstrate new commercial models for connected EVs.

Hitachi and the Council for the Isles of Scilly will deploy 25 V2G chargers and a number of solar canopies, with partners in the final stage of securing funding for this element of the project.

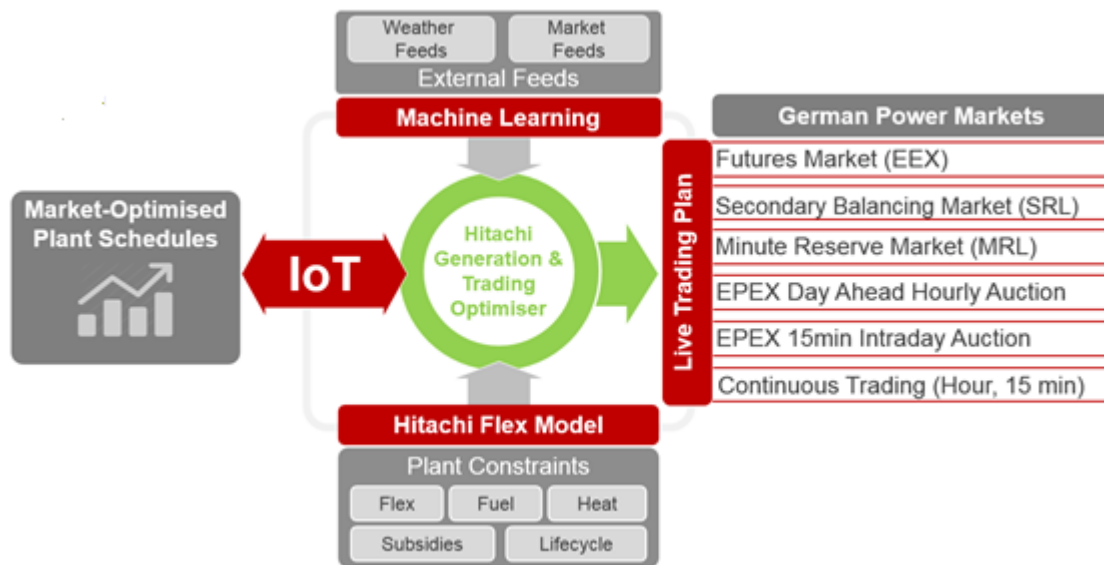
In addition to the decarbonisation of transport there are other major shifts including the electrification of heat and growing penetration of renewable energy which require similar solutions. Further examples of Hitachi's work in these areas include:



NEDO Manchester (Smart Community Demonstration Project)

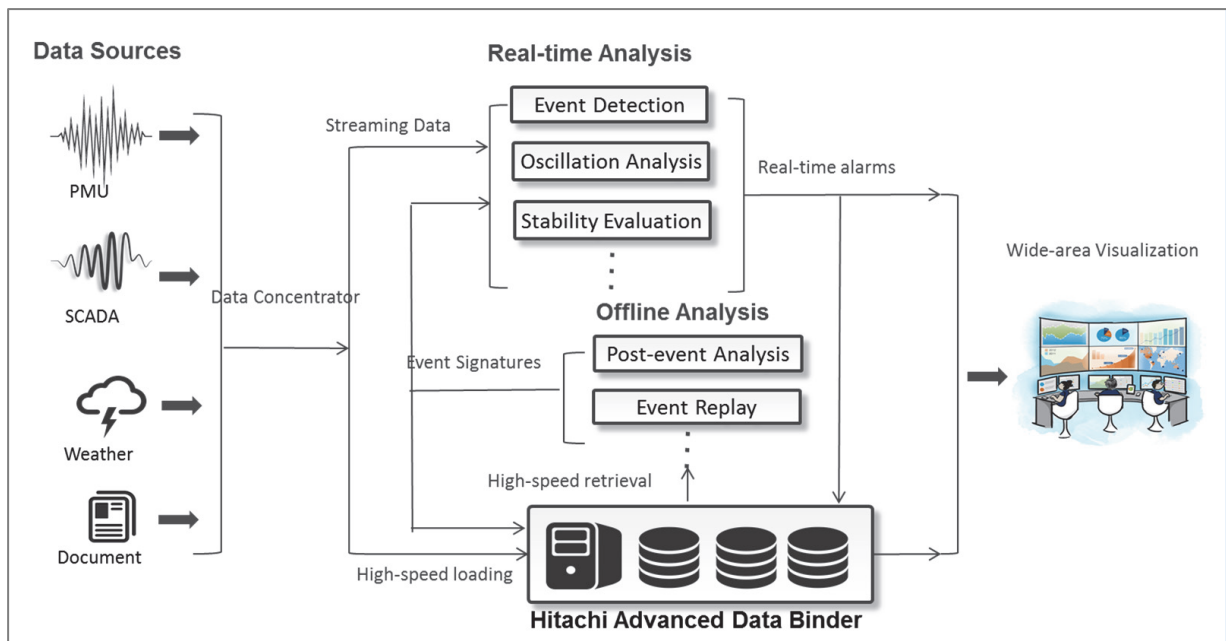
Hitachi led a consortium to deliver a Smart Community demonstration project in Greater Manchester with the aim of demonstrating the usability and efficiency of load-balancing aggregation technology and HEMS that focuses on the control of residential heating. Working with the Greater Manchester Combined Authority, Electricity North West and several housing associations, the project deployed over 550 heat pumps in social homes in the Greater Manchester area and an ICT solution that controlled and aggregated demand from these heat pumps. It is envisaged that with the electrification of heat, the number of heat pump installations will steadily increase over time, therefore the ability to aggregate demand from these heat pumps to provide DR services (such as peak shaving) will help defer reinforcement in the network and also provide value to other stakeholders in the value chain.

This aggregation of energy demand is part of a wider push by Greater Manchester's Low Carbon Hub to pioneer smarter approaches to low carbon city management. The project aims to contribute to the shift from gas to electricity for UK domestic energy, as part of a necessary low carbon approach for the future energy market in the UK. In addition, the project will support the achievement of Greater Manchester's ambitious target to reduce CO2 emissions by 48% of by 2020 (compared to 1990 levels). The project was successfully closed in March 2017 and proved that building fabric can be used as a means to store heat, and DR services can be provided without the loss of comfort in the home.



LV Distribution Grid Monitoring and Diagnostics

Hitachi R&D have been building grid monitoring and diagnostics solutions using real-time data from PMUs on a LV grid. The PMUs stream 10-120 messages per second including location specific voltage magnitudes and phase angles.



The Hitachi solution searches the live PMU streams for anomalous patterns, e.g. based on spectral analysis, and compares against dynamic thresholds. Once an anomaly is detected, the solution searches for similar patterns in terabytes of historical PMU data and understand what happened the last time that pattern was seen. In this way the solution is able to successfully diagnose different anomalous patterns and rapidly suggest countermeasures.

Question 3: *Do you consider that any of the roll-outs will allow the licensees to receive commercial benefits within the price control period, ie will the roll-out lead to cost savings and/or incentive rewards, greater than the cost of the roll-out within the price control period?*

Our analysis of key areas that will have the largest impact on the LV networks such as the transition to EV's will occur from 2020. On this basis we believe that during ED1 there will be benefits to UKPN's customers, however, the most significant value will be in preparing UKPN for ED2 when we feel the networks will need these tools to both enable the low carbon transition and deliver the best possible value for their customers (as set out above).

Question 4: *Do you consider that the technologies that SPEN and UKPN wish to roll-out fall within the definitions of a Proven Innovation or Ordinary Business Arrangement as defined in the IRM licence condition?*

We understand the technology that is proposed is already utilised on UKPN's HV networks and has been used by network operators around the world.

We see this proposal as putting in place the enabling infrastructure which will then allow for the innovative IoT applications being developed by Hitachi and others to be deployed, creating create, new better value, solutions on UKPNs network.

Question 5: *What are your views on the merits of any of the proposed technology roll-outs?*

- *To what extent are the proposed roll-outs relevant to current and future challenges in relation to the distribution network?*
- *What improvements, if any, do you consider that the proposed technology roll-outs offer compared to the current situation?*

As in question 4 the technology recommended for deployment through this proposal, both hardware and software solutions are both suitable for the requirement and well tested. We are also aware that UKPN are well connected with the evolving market for these solutions so we assume will ensure the most suitable and best value solutions will be deployed throughout the delivery of this proposal.

Whilst we feel the proposal itself is robust and does not require any specific improvement, ensuring that the value that is leveraged through the insight and control this investment will bring at the LV network is fully utilised will be important. Hitachi's experience in these areas have shown that the IoT era requires new creative ways of working to harness the potential that benefits investments such as this will unlock. On this basis our advice would be more in the context of ensuring UKPN establishes new approaches to co-create the innovative digital energy solutions which this investment will enable.

Question 6: *What are your views on the timing of the proposed roll-outs?*

- *What would happen if any of the proposed roll-outs didn't occur until the next distribution price control starting in 2023?*
- *Does the timing of any of the proposed roll-outs have a significant effect on the expected level of benefits?*

The uptake of low carbon technologies are notoriously difficult to predict influenced by a range of technical, policy and commercial factors. Question 1 provides examples of Hitachi's work in developing solutions to manage the transition to distributed low carbon generation, electric vehicles and the electrification of heat. Of these we see the pace of change in the electric vehicle industry being the fastest. Electric vehicles will also have one of the most significant impacts to the LV distribution networks and it is for this reason Hitachi is investing in developing

the solutions to manage the EVs to ensure they become an asset to the grid rather than a challenge.

It is in this context that we believe 2023 will be around the time when we will begin to see the uptake of EVs build significant momentum. These investments will allow solutions such as those being developed by Hitachi to be utilised as a part of UKPNs business as the uptake of EVs (and other low carbon technologies). We believe the necessary lead time to deploy and ultimately refine this type of solution would mean deployment in 2023 would miss the current window of opportunity for UKPN to prepare both in terms of putting in place the infrastructure in the area which will benefit in the short term and in building the internal expertise and capacity to develop the most effective solution when rolled out across UKPNs network.

Question 7: *To what extent will the proposed roll-out facilitate the Carbon Plan?*

- *Please explain what aspects of the Carbon Plan you consider the proposed roll-out will facilitate.*
- *What is your view of the claims made by the licensees regarding the contribution the proposed roll-out will make to these aspects of the Carbon Plan?*
- *Will any of the proposed roll-outs deliver benefits more quickly than the business as usual methods used across Great Britain (GB)?*

This question is answered in the questions above, which in our view we hope demonstrate the key role we feel digital energy solutions will have in both supporting and expediting the low carbon transition. Underpinning this is the ability to monitoring and control capabilities connected assets to the network. In this context we feel this proposal is an important and very timely intervention by UKPN.

Question 8: *To what extent will the proposed roll-out deliver wider environmental benefits?*

- *Please explain what, if any, environmental benefits you consider the proposed roll-outs will deliver.*
- *What is your view of the claims made by the licensees regarding the environmental benefits their projects will deliver?*
- *Will any of the proposed roll-outs deliver benefits more quickly than the business as usual methods used across GB?*

As also set out in the above questions this proposed roll out will unlock the ability for UKPN to use new innovative solutions to build a modern IoT enabled energy grid. This is essential if we are to meet our carbon plans, in addition to other environmental benefits such as for example meeting air quality requirements through enabling the uptake of EVs.

Question 9: *To what extent will any of the proposed roll-outs deliver value for money to consumers?*

- *Please explain whether you consider the cost and scale of any of the proposed roll-outs is justified in relation to the benefits each will deliver.*
- *What proportion of the potential benefits from the proposed roll-outs do you consider will accrue to the network compared to other elements in the energy supply chain?*

As set out in question 2 this investment will deliver positive benefits in the short term and pave the way for significant savings in the long term, through laying the foundations for ED2 and thus we feel will deliver value for money to consumers.

We also see UKPN and the UK as a whole adopting a smarter grid as business as usual as a very positive step for the wider supply chain and global leadership the UK is building in IoT

enabled digital energy solutions. The examples in question 1 highlight the investments Hitachi is making in developing this area. We therefore welcome this investment in the context of demonstrating to solution providers such as Hitachi that the UK will continue to be at the leading edge of this industry.

Question 10: *With reference to the IRM licence condition, do you have any significant concerns about funding any of the proposed roll-outs under the IRM? For example, do you consider it is reasonable to expect the licensee to carry out the work anyway as part of business as usual?*

As set out above in question 6 we see this as a very timely intervention and responsive to the changing low carbon landscape. In question 6 we identify EVs as an example of how the technology, policy and as a result commercial case can grow in a relatively short period of time. We feel that whilst the case for this investment could have potentially been made then 3 to 4 years ago during ED1 planning the case is now much stronger.

We also identify in our answers above that the investment is for an established solution which will ensure the transition to a smart LV network is started at the correct time in response to the rapidly evolving energy landscape. On this basis Hitachi believes the investment plan set out by UKPN is well justified.

Kind regards,

Alex Holland

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