



Prospering from the Energy Revolution

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ReFLEX Orkney

Project fact sheet

ReFLEX Orkney set out to pioneer an integrated, affordable, low-carbon energy system using a disruptive, progressive and all-encompassing approach.



Picture: Colin Keldie

The Prospering from the Energy Revolution challenge programme ran from 2018 to 2023.
For more in-depth information on the programme and the projects see:
<https://www.ukri.org/what-we-offer/browse-our-areas-of-investment-and-support/prospering-from-the-energy-revolution/>

ReFLEX Orkney

Dates: April 2019 – March 2023	Project partners: European Marine Energy Centre (EMEC) (lead) Aquatara SMS Community Energy Scotland Heriot-Watt University Orkney Islands Council	SLES components: Electric vehicles and smart charging (collective network) Smart grid optimisation Behind the meter generation Energy storage Community engagement
UKRI funding: £6.6m		
Link: www.reflexorkney.co.uk/		

What is the project?	ReFLEX Orkney set out to pioneer an integrated, affordable, low-carbon energy system. The project aimed to create a smart local energy system (SLES) in Orkney, Scotland, interlinking local electricity, transport and heat networks into one controllable, overarching system, digitally connecting distributed and variable renewable generation to flexible storage and demand. This ‘whole systems’ approach requires disruptive, progressive and all-encompassing systems spanning technical innovations, new financial models, changes to consumer behaviour, and the way energy companies and regulators operate. ReFLEX has uncovered critical interdependencies between different aspects of the system. Progress has been slower than anticipated due to inertia within the current energy system and the need to accommodate radical and disruptive change in a real-life setting.
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What has been delivered? What has been successful?	<ul style="list-style-type: none">✓ Exceptional levels of engagement and participation: ReFLEX Orkney membership had grown to circa 1,000 by the end of 2022 (5% of the total Orkney population).✓ Significant uptake of decarbonised transport: including an increase of over 210 electric vehicles (EVs) on Orkney, almost 150 domestic EV charge points, and enrolment of over 200 people in the local car club.✓ Demonstration of aggregated demand and control of EV chargers to support curtailment avoidance: aligned EV demand with periods of distribution network driven curtailment through control of nearly 40 smart chargers in response to grid and wind conditions.✓ Improved understanding of carbon emissions and energy use across Orkney: through completion of over 300 carbon footprints and deployment of energy monitors in 115 properties.✓ Integrated Energy System control platform developed and deployed.
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Barriers encountered and outcomes

Barrier	Existing regulations limit the ability of SLES to deliver benefit to customers in generation constrained areas like Orkney where, during periods of curtailment, consumers do not have a right to supply their own demand from renewable generation behind their own meter.
Outcome	Through discussion with Ofgem and the DNO this issue is now clearly defined and identified as a major barrier to the delivery of SLES in generation-constrained areas. This leads to exclusion of disadvantaged consumers from the potential benefits of SLES.
Barrier	Bilateral arrangements between consumers and the multiple organisations involved in delivery of technologies and services limit the ability to develop a simple customer journey.
Outcome	Original plans for a one-stop shop model had to be adapted, to the project providing customers with support in engaging with suppliers rather than acting as a single point of contact for all services.
Barrier	Long payback periods of 15 years or more combined with significant debt risk for investors affected the financial viability of the ‘no-upfront-cost model’ for domestic solar photovoltaic (PV) and battery systems.
Outcome	Delivery of domestic solar photovoltaic and battery systems were descope but ReFLEX delivered a clear understanding of the factors affecting financial and regulatory viability of future projects.

Impacts	Forecast GHG savings in 2032:	91.1% (Range: 86.1% to 93.7%)
	Forecast energy and network savings in 2032:	£0.16m (Range: £0.14m to £0.17m)
	Match funding:	£3.8m

Top lessons learnt	<ol style="list-style-type: none">1. Energy and commercial regulations are not currently designed to support delivery of integrated, innovative SLES projects; future projects need great regulatory flexibility and freedom to deliver.2. The importance of taking a whole system approach to SLES cannot be over emphasised and needs to take account of technical, social, behavioural, financial, data, and local considerations.3. Pursuing a disruptive, transformational innovation and demonstration project through a series of unprecedented social, economic and political challenges is extremely hard.
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What's next?	<ul style="list-style-type: none">• ReFLEX Orkney Ltd has been set up as a special purpose vehicle to continue development and delivery of the ReFLEX model and support members in contributing to SLES developments.• The ReFLEX learning achieved has created an excellent advanced-stage launch pad for other complementary and onward building research, innovation, demonstration and projects.
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