



Empowering Communities

Renewable Energy and Grid Innovation at the Local Level

Case Studies from Scotland

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Community Energy Scotland

A Decentralised Electricity System – Myths and Facts
Brussels, 21st April 2015

Outline

- Introduction to CES
- Drivers for grid innovation
- Potential benefits to communities
- Case Studies:
 - Community microgrids
 - Demand Side Management
 - Energy storage

Our Mission

“To build confidence, resilience and wealth at community level in Scotland through sustainable energy development”



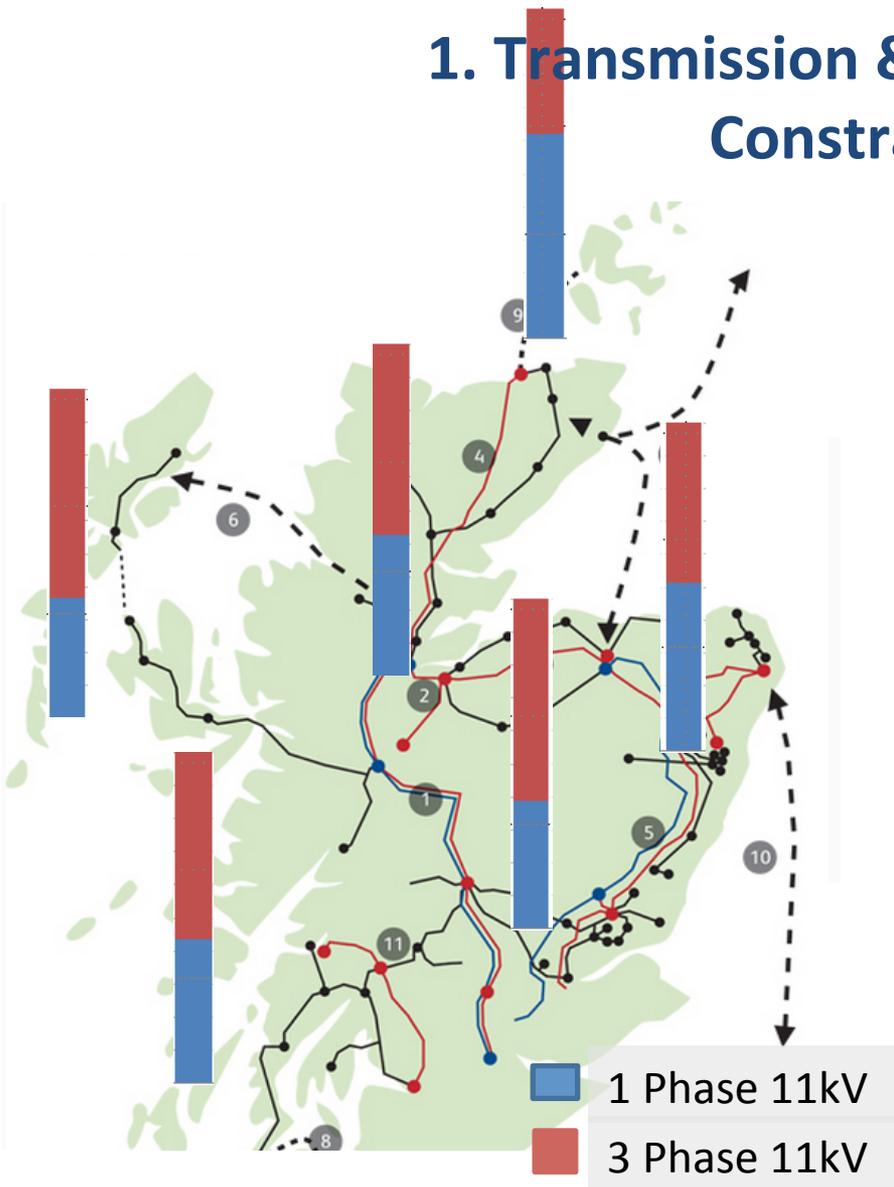
Community Energy Scotland



- Independent Scottish charity
- 19 FT staff spread across Scotland, inc Orkney and WI
- Over 400 members- mostly non-profit distributing community groups.
- Over 600 community energy installations > 35MW capacity
- Income and affordable energy for Local people >> £5 million per year

Drivers for Innovation

1. Transmission & Distribution Constraints

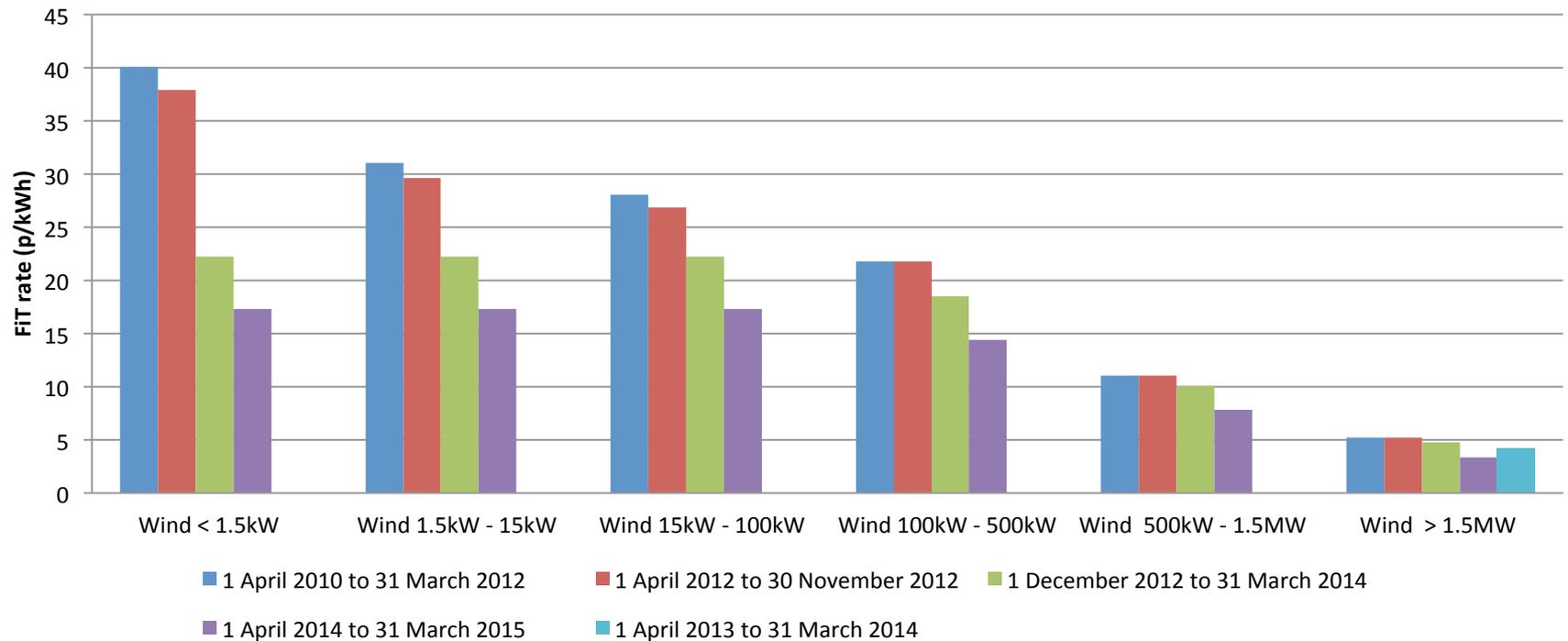


- Lead time for major transmission upgrade in Scotland is c 7 years
- Reinforcement only triggered when generators willing to pay upfront cost
- Small generators can't afford reinforcement costs
- 1 phase limited to 90kW generation connections
- Difficult to upgrade due to cost (**c.10 million km** of single phase OHL)

Drivers for Innovation

2. Feed in Tariff Degression

Wind FIT Degression April 2010 - March 2015

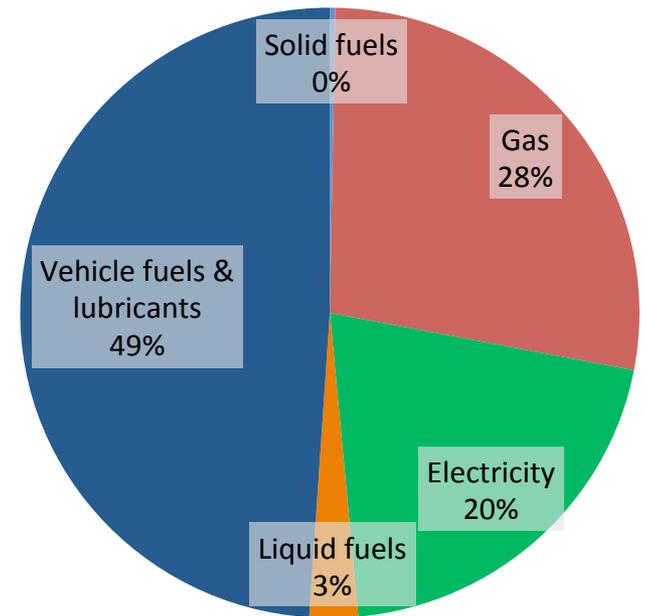


Drivers for Innovation

3. Rising Fuel Costs



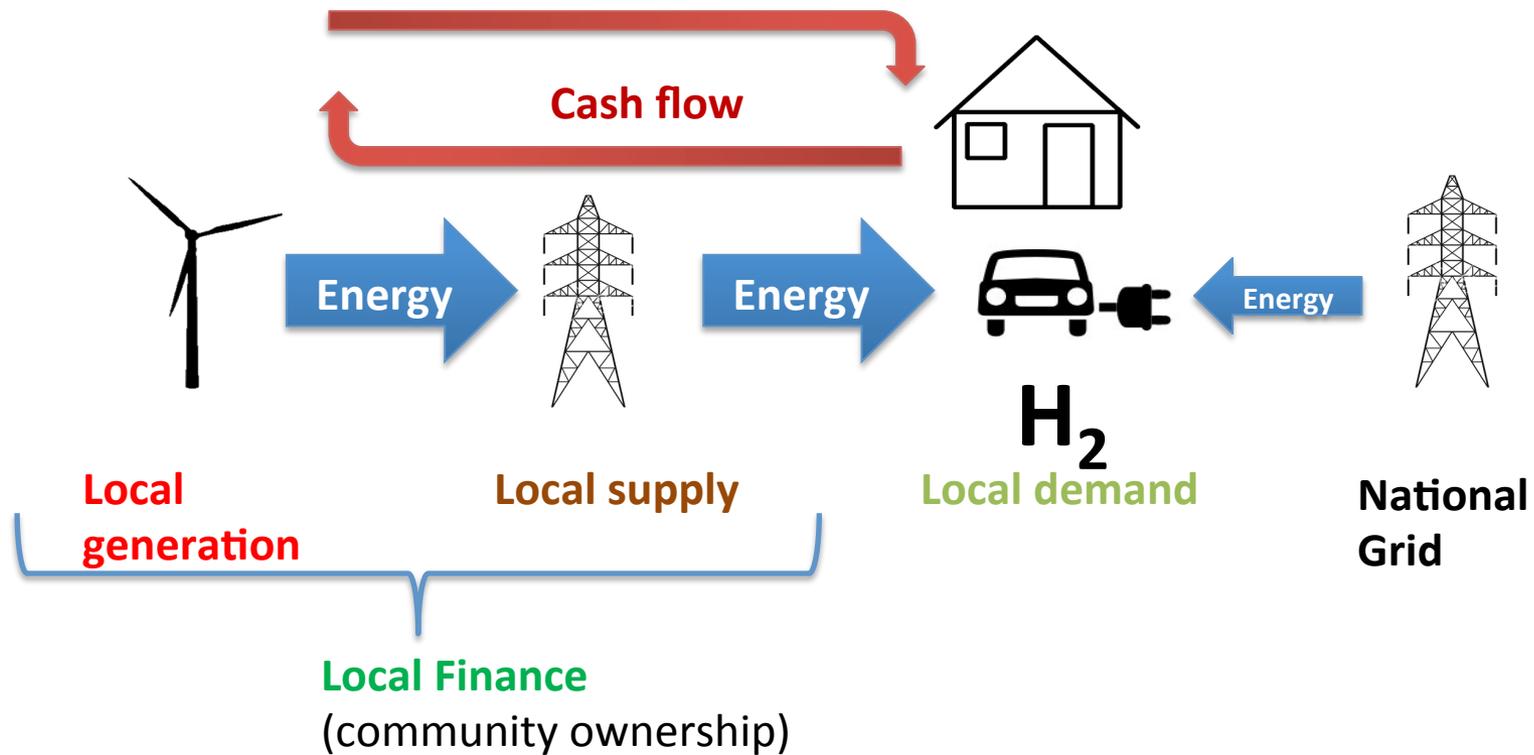
Heating Oil (£/1000 L)



Consumers' Expenditure on Energy

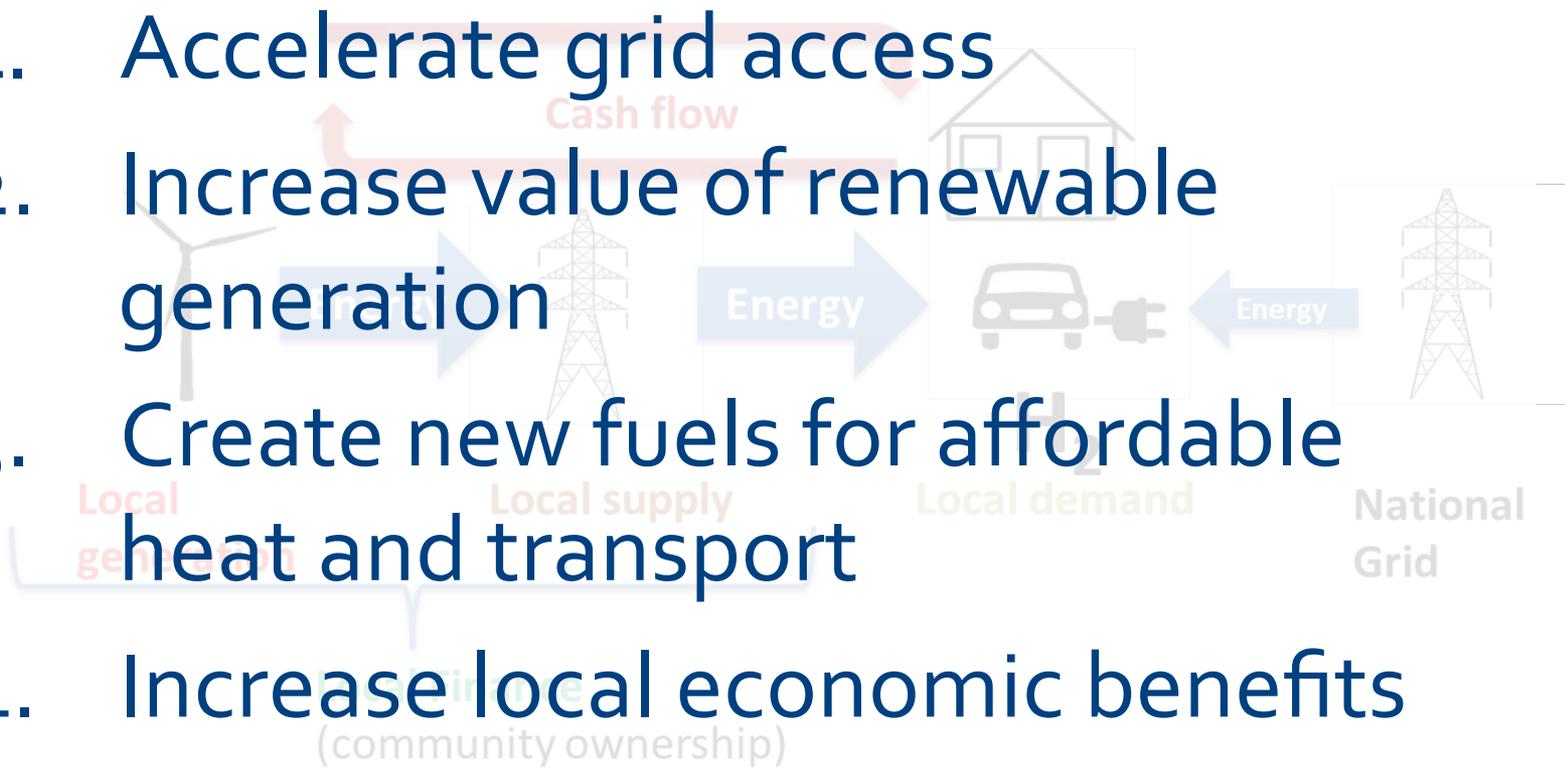
2011 prices

Local Energy Economies - Concept

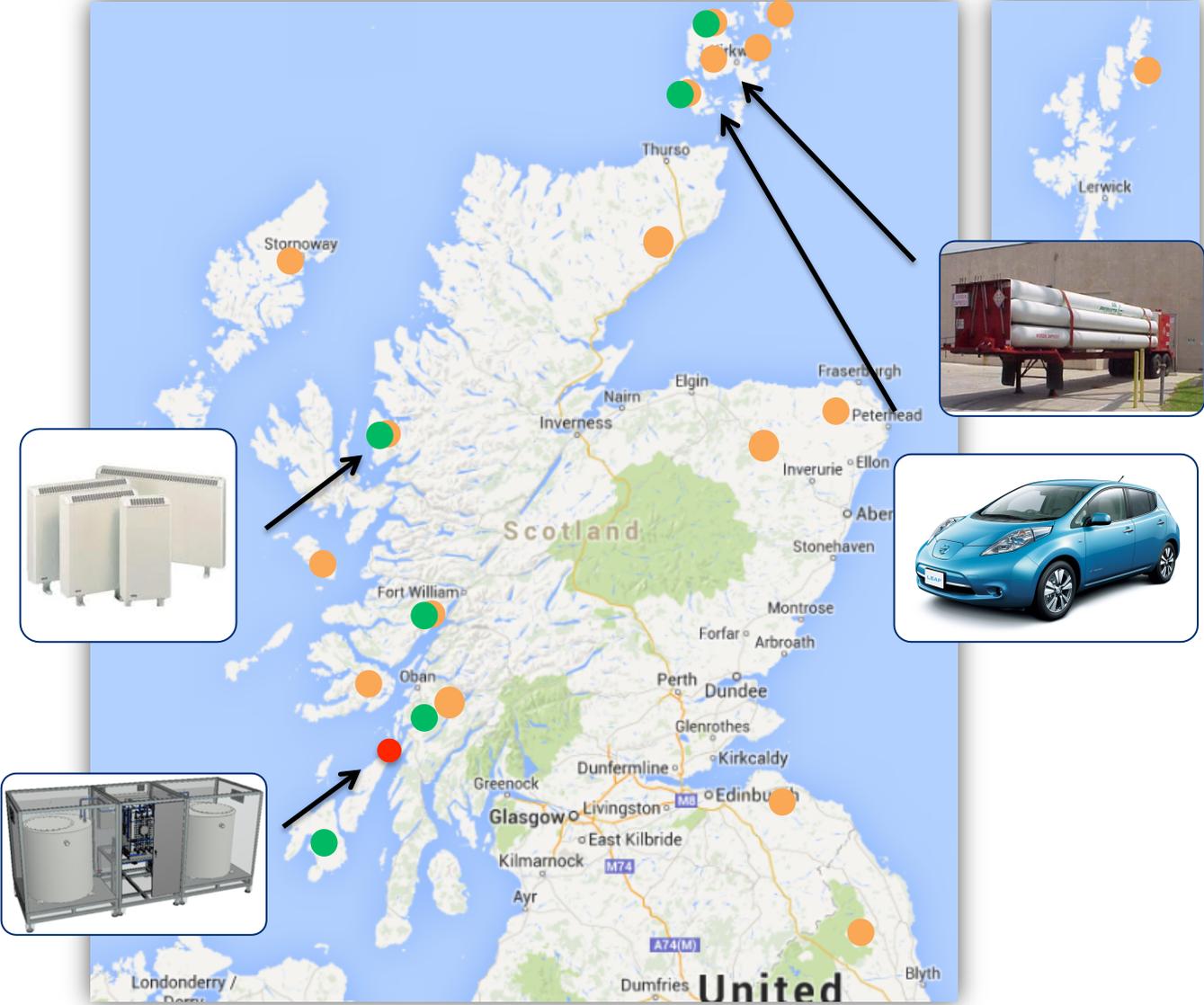


Potential benefits of grid innovation

1. Accelerate grid access
2. Increase value of renewable generation
3. Create new fuels for affordable heat and transport
4. Increase local economic benefits
(community ownership)

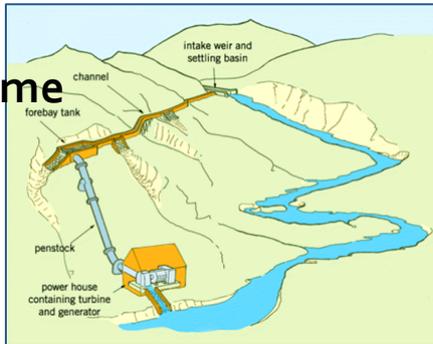


Grid Innovation Demonstration Projects



Community microgrid Applecross District Heating

Community
Hydro- Scheme
90kW



Smart Heating Control
Communication Link



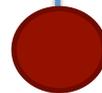
50kW grid
connection



Community Owned Distribution Network

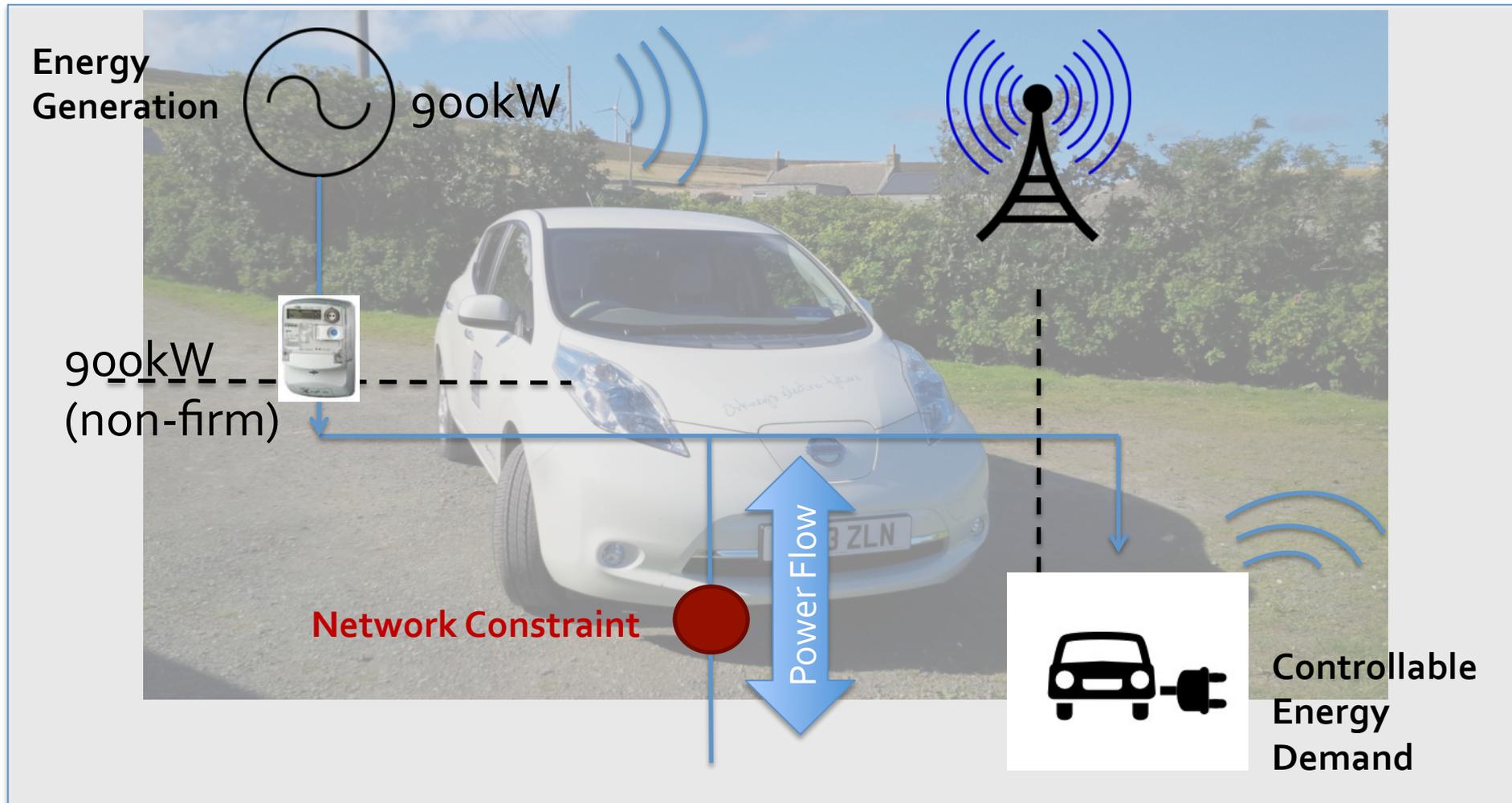
Public Distribution Network

Network Constraint



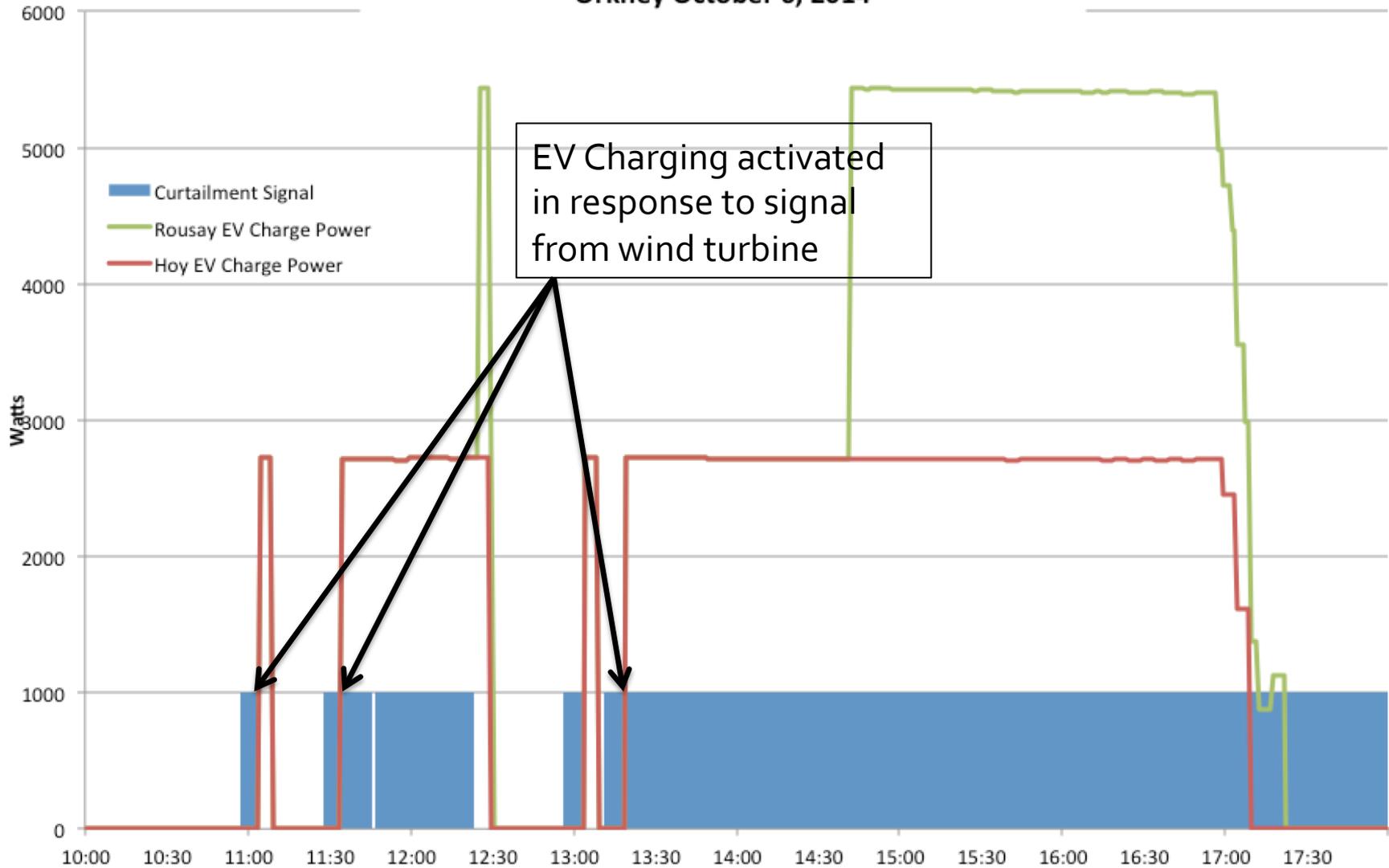
Smart Heating Demand

Demand Side Management Orkney Electric Vehicles



It works!

Curtailed Signal and EV Charging Dispatch
Orkney October 6, 2014

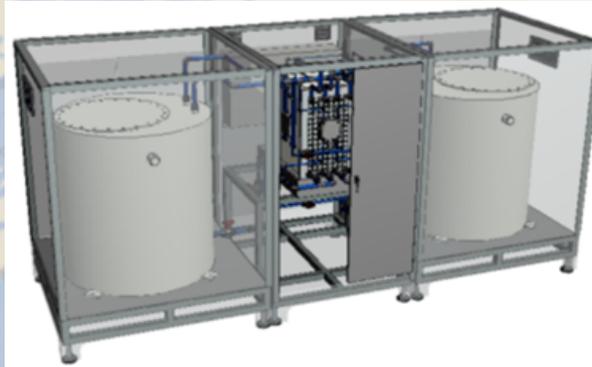


Energy storage Gigha Battery

Energy
Generation
330kW



225kW



1.26MWh Vanadium Flow battery

Network Constraint

Power Flow

- ✓ Captures Constrained Energy
- ✓ Allows Gigha to run as a μ grid
- ✓ Provides Stabilization for local Wind Turbines

Energy storage: H2

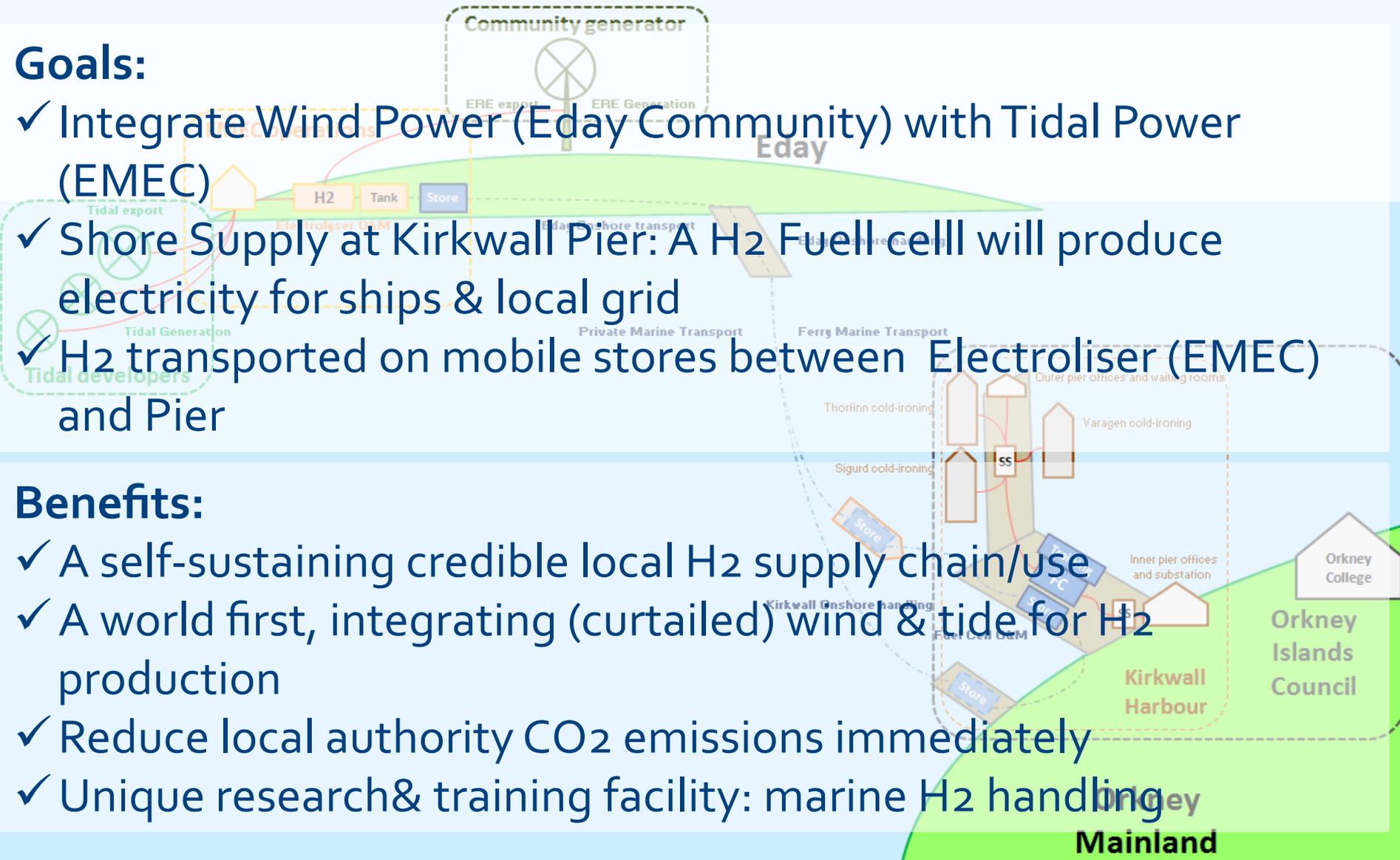
Orkney 'Surf and Turf'

Goals:

- ✓ Integrate Wind Power (Eday Community) with Tidal Power (EMEC)
- ✓ Shore Supply at Kirkwall Pier: A H2 Fuel cell will produce electricity for ships & local grid
- ✓ H2 transported on mobile stores between Electroliser (EMEC) and Pier

Benefits:

- ✓ A self-sustaining credible local H2 supply chain/use
- ✓ A world first, integrating (curtailed) wind & tide for H2 production
- ✓ Reduce local authority CO2 emissions immediately
- ✓ Unique research & training facility: marine H2 handling



Conclusions

1. Innovative grid solutions are a practical requirement for increasing community energy generation
2. Policy integration and wider regulatory change is required to implement more widely
3. Local grid ownership and management boost development, community empowerment and innovation.

Contact

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