



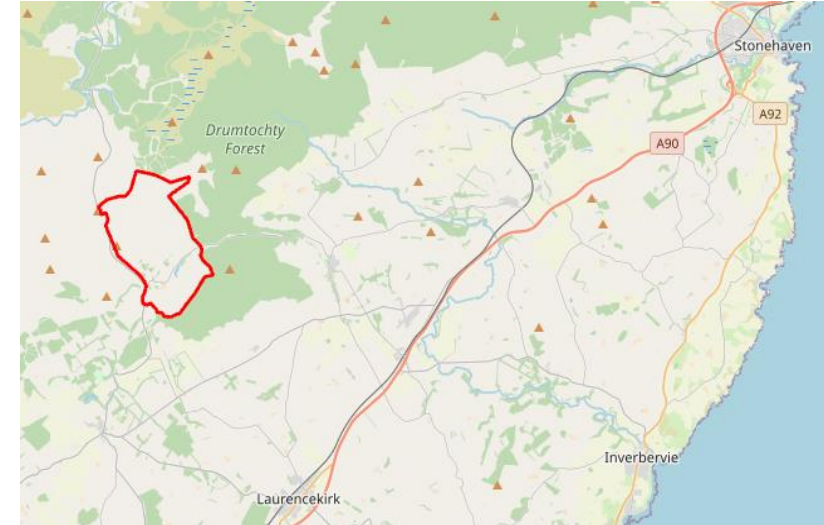
HydroGlen – realising the potential for green hydrogen in farming communities

Alison Hester



HydroGlen – introducing the project

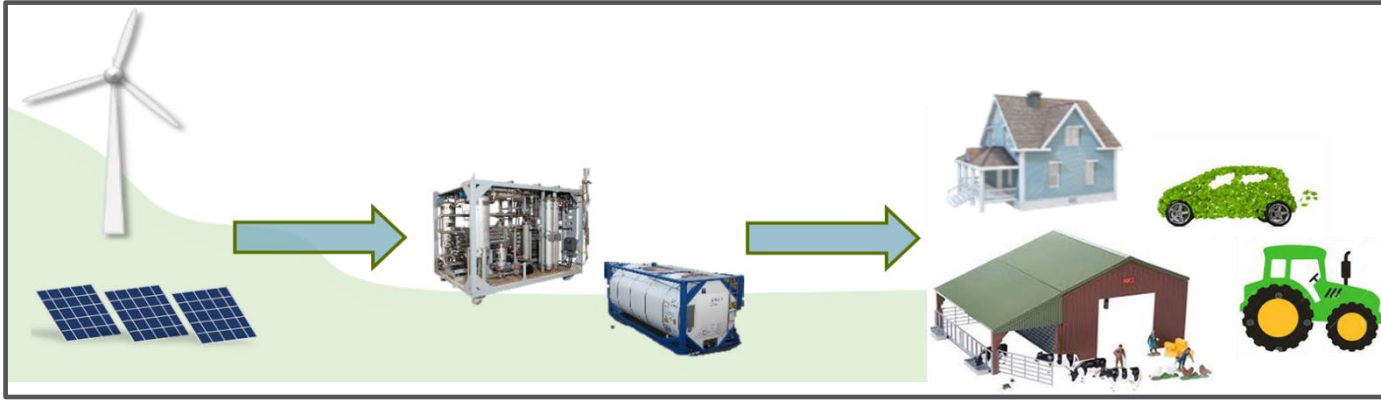
- *Research and demonstrator project* – how farming communities can become self-reliant, green-hydrogen energy producers, generating 100%+ of all energy requirements (electricity, heating, transport)
- Located at James Hutton Institute's Research Farm and community at Glensaugh
- HydroGlen Feasibility study (2021) funded by Scottish Government's Community and Renewable Energy Scheme (CARES)
- Oct 2022: awarded funding from Scottish Government Just Transition Fund for detailed design and build! 😊



HydroGlen – basic operating model

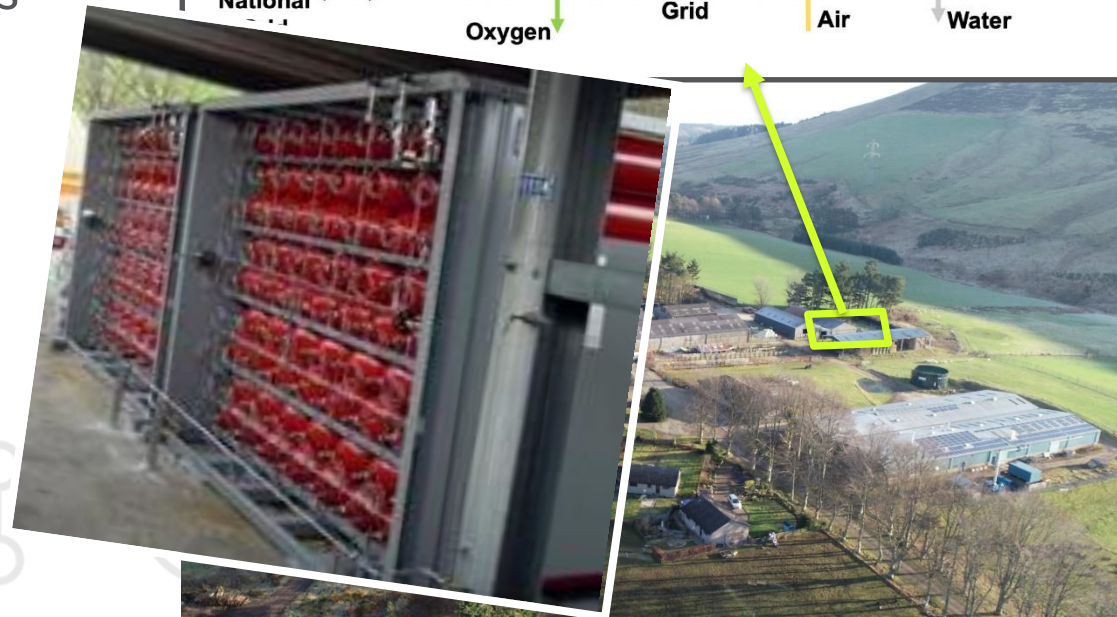
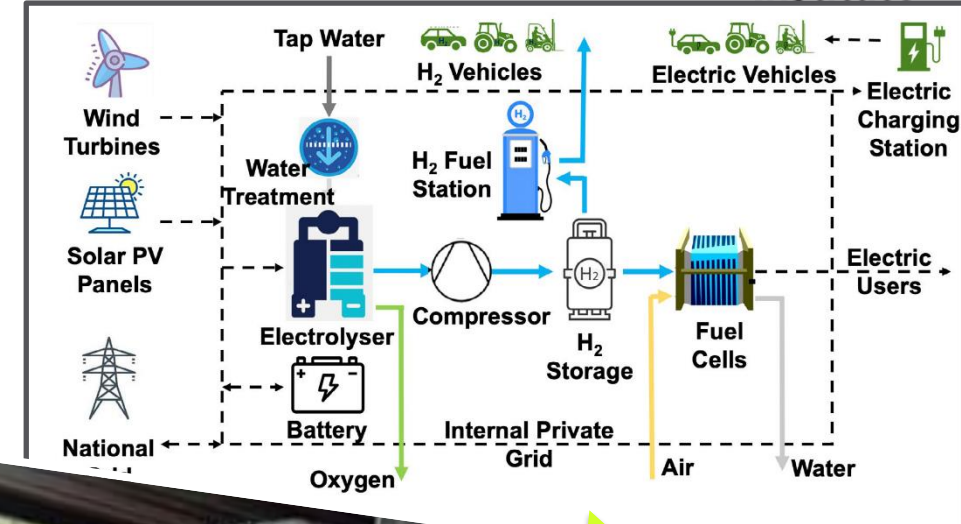


The James
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Important elements:

- 'Build-ready' – uses commercially available technologies
- Different hydrogen / battery EV vehicle combinations modelled
- Replicability - both on- and off-grid systems designed
- Modular and scalable components...



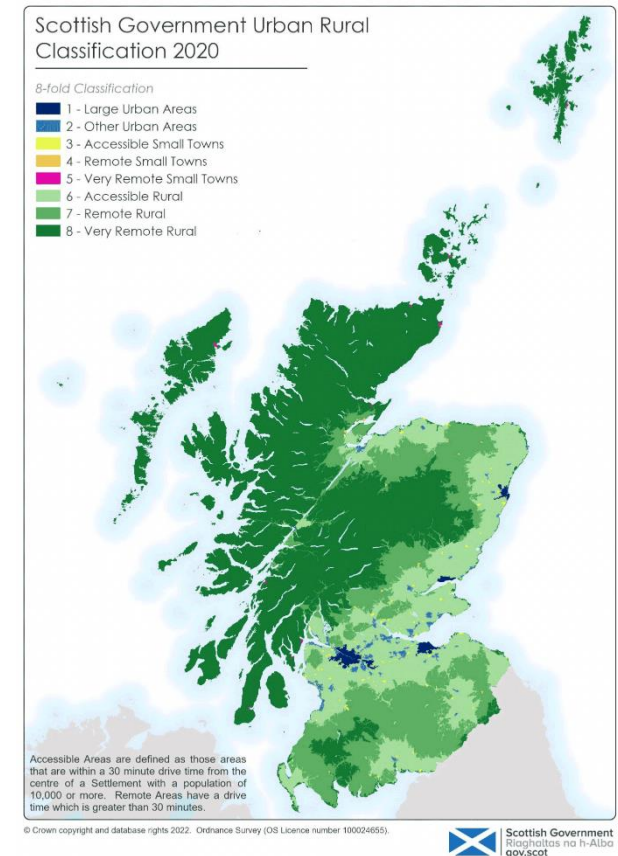
HydroGlen - working in partnership to maximise benefits...

- **From inception:** wide engagement to maximise relevance – co-development with hydrogen experts, Aberdeenshire Council, Scotland's Hydrogen Accelerator, Scottish Govt hydrogen team, etc...
- **Project build:** partnership working with SAOS, NFUS, NESCAN, Kincardineshire Development Partnership, hydrogen vehicle manufacturers and others...
- **Linked research and development:** (a) energy system calculators, (b) technological developments, (c) skills training, (d) associated revenue, (e) green jobs (direct and downstream), etc...
- **SAOS and NFUS particular role:** powerful outreach and action to realise the potential (social and economic) through cooperation and collective procurement (SAOS agri-co-ops; NFUS 8.5k membership).



HydroGlen – importance as a demonstrator (1)

- Scotland's rural areas still depend heavily on oil and gas. Vast renewable resources give potential for green hydrogen production to bring *energy-independence, efficiency and economic benefits...*
- **HydroGlen** demonstrates how farming communities can contribute to the energy transition through green hydrogen production, storage and use, representing a *significant decarbonisation step for this sector...*
- Green hydrogen provides a particularly promising decarbonisation strategy for the *heavy-duty vehicles* used in farming systems...



HydroGlen – importance as a demonstrator (2)



Scottish Government's Hydrogen Action Plan (Dec 22)

- Support hydrogen demonstration and innovation projects, grow Scottish skills and evidence base...
- Need *multiple scales, centralised and decentralised* green hydrogen production systems...
- HydroGlen provides *replicable model for networks of smaller producers across Scotland's rural areas*
 - Energy-independence brings increased resilience (e.g. to extreme events and fuel prices)
 - Collective procurement provides strong economic case for deployment.

Part 4 – Scotland's Hydrogen Actions

To ensure Scotland is in the best possible position to achieve our ambition of 5 GW of renewable and low-carbon hydrogen capacity by 2030, we will focus actions to support meeting the following six key challenges:

Scale up hydrogen production in Scotland Support the acceleration of Scottish renewable and low-carbon hydrogen projects and work with others to address potential barriers and constraints	Facilitate the development of a domestic market Stimulate demand in domestic use aligned to the scale up of local and regional hydrogen production	Maximise benefits of integrating hydrogen into the energy system Create an integrated energy system, that includes hydrogen electrolysis, to enable better management of the supply and demand of energy
Growing and transitioning Scotland's supply chain and workforce Support the growth and transition of companies and workforce skills development that will underpin our future hydrogen economy	Establish and strengthen international partnerships and markets Ensure Scotland is prepared to play a key role in meeting the growing demand for hydrogen from import countries in Europe	Strengthen research and innovation Drive critical research and technological advancements and stimulate collaboration and knowledge sharing

Source: Scottish Government's Hydrogen Action Plan (Dec 22)



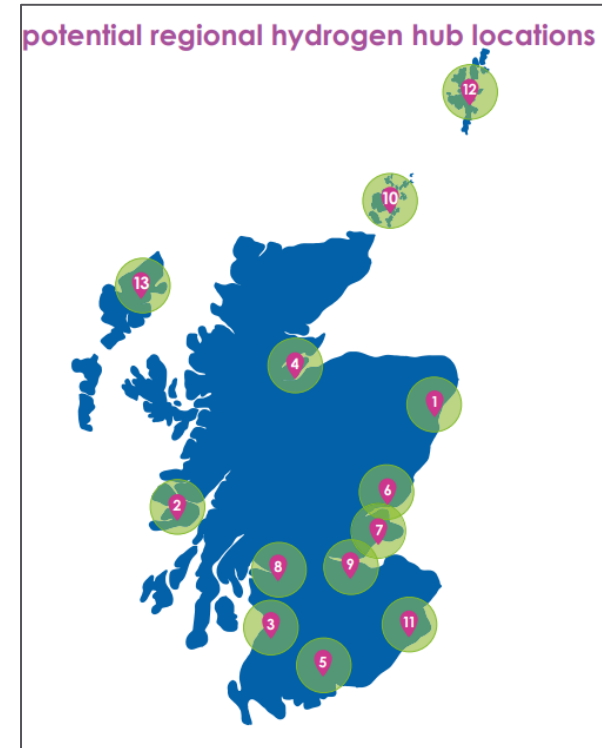
Scotland's Hydrogen Action Plan - *vision for Scotland to become a leading Hydrogen Nation*

- Drive Scotland's hydrogen production capability to meet ambition of 5GW by 2030 and 25GW by 2045
- Address barriers to uptake of hydrogen including high production costs
- Support growth of Regional Hydrogen Energy Hubs
- Encourage demand for hydrogen by supporting use and developing supply chain capability
- Support realisation of economic benefits of Scotland's hydrogen export potential
- Secure economic benefit from public and private sector support for development of regional hydrogen production and use
- Encourage development of strong hydrogen sector in Scotland that supports a just transition to net zero.



HydroGlen – contribution to Scotland's decarbonisation plans

- ***Realising benefits of hydrogen across Scotland's regions and local communities*** - support for Regional Hydrogen Energy Hubs, recognising variations in natural assets, skills and potential applications in different areas.
- ***Ambition for more onshore and island wind*** to support “development of a range of small- and large-scale renewable hydrogen projects” (co-located with demand)
 - “hydrogen production is a very attractive enabler” for the significant proportion of turbines “hindered by grid-limitations” or not able to grid-connect...
- ***Scottish Hydrogen Assessment Scenario 3: Focused Hydrogen*** – “Hydrogen plays supporting role in decarbonising the energy system in sectors hard to decarbonise by other means. Hydrogen is produced near to where used.”



Source: Scottish Government's Hydrogen Action Plan (Dec 22)



HydroGlen – summary - and some numbers to fuel discussion...

- **Green hydrogen in rural energy systems offers an exciting solution to intermittency of renewable energy supply -- a transformative model for contributing to Scotland's net-zero ambitions -- and new potential revenue streams...**
- HydroGlen primarily targets the agricultural sector which emits c 18% of Scotland's GHG emissions, with an urgent requirement to reduce emissions...
- Scotland has >50k farms and >900k people in rural areas – modular, flexible and **local** energy production gives a compelling route to decarbonisation and energy independence...
- **HydroGlen will provide a demonstrator** for Govt, farming communities and cooperatives, scientists and others to visit, assess, acquire knowledge, inform development of regulatory/funding support for rural green hydrogen production... 😊





Peatland restoration /
moorland
management

Regenerative
catchment /
water
management

Red Deer
Farm

Wind
Energy

New
Woodland



New Woodland



Agroforestry



Green Hydrogen
/ EV Hub



Solar PV



Climate Incubator Hub



THANK YOU

<https://glensaugh.hutton.ac.uk/>

Rotational/mob grazing
Species-rich pasture



Biomass heating



New Woodland



2D

