

Britain's First Smart Grid: *Sharing the Knowledge*

John Scott

john.scott@chilternpower.com

Overview

Where & Why...

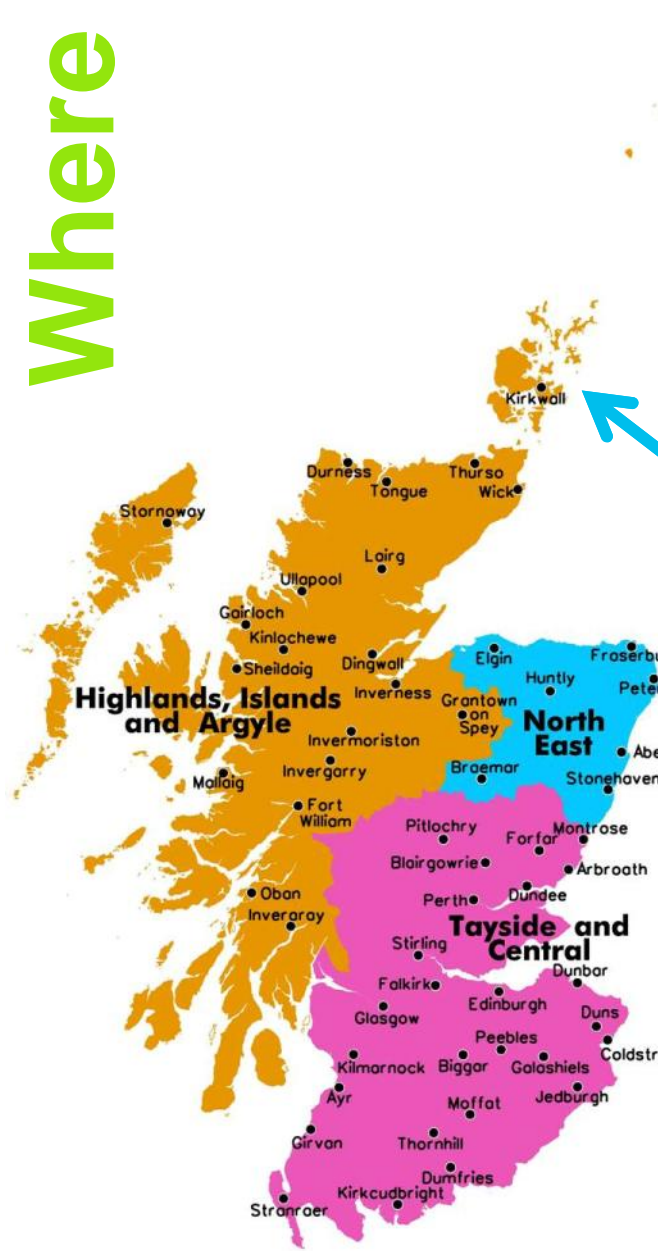
Technical and Commercial context...

Operational experience...

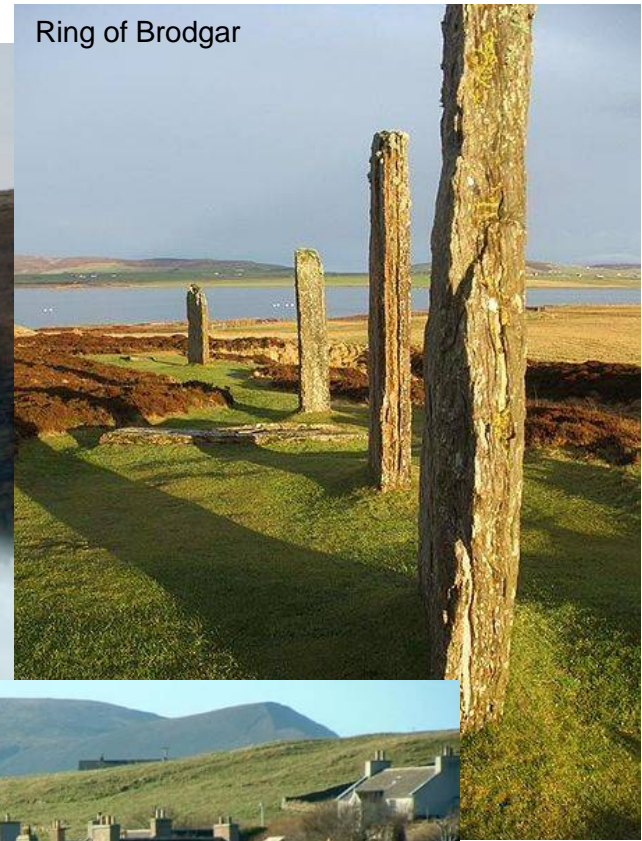
Where

Orkney

An archipelago of some 70 islands of which 20 are inhabited.
Population c. 20,000



The Place



Kirkwall

Stromness



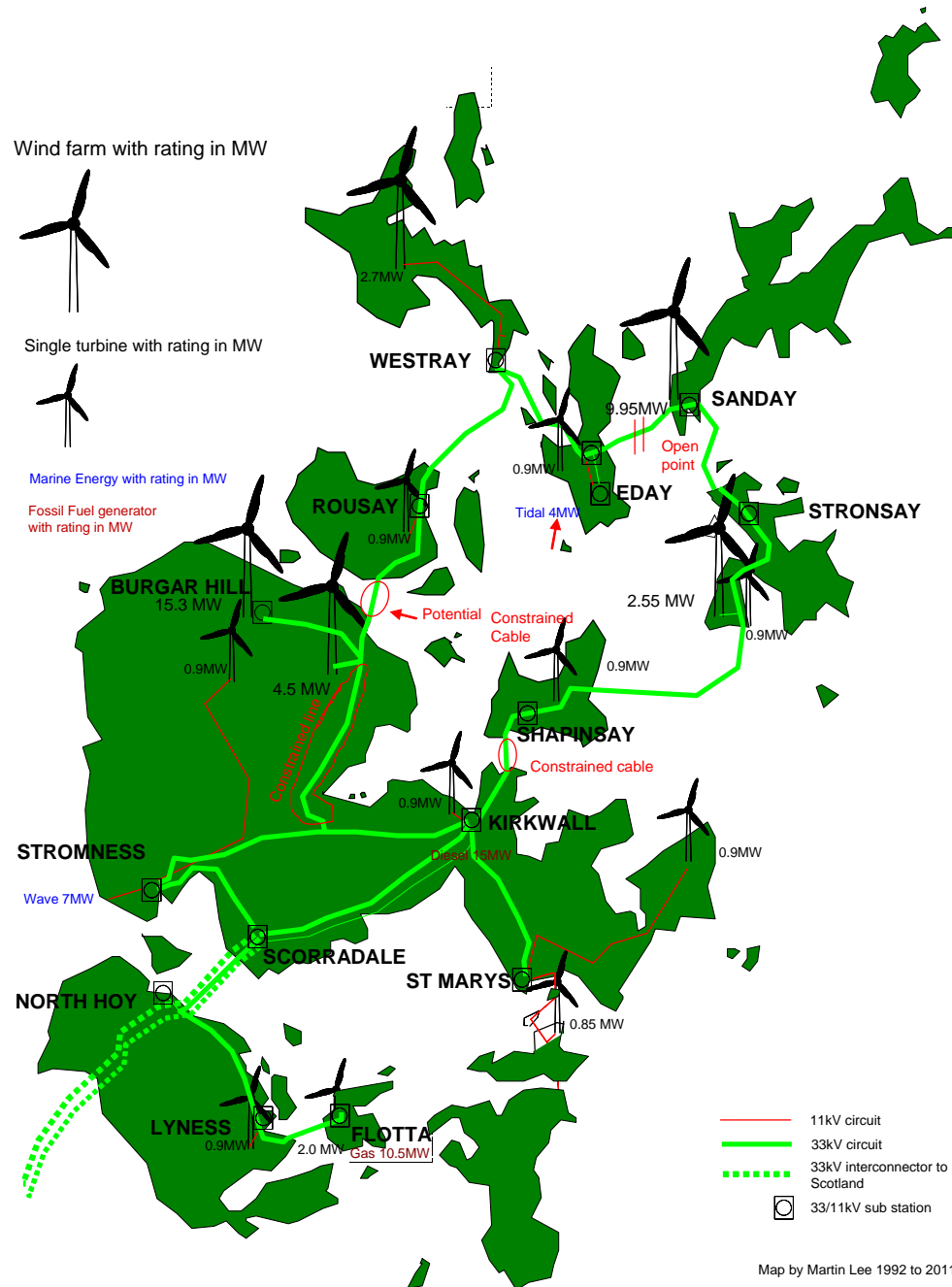
Not just windfarms



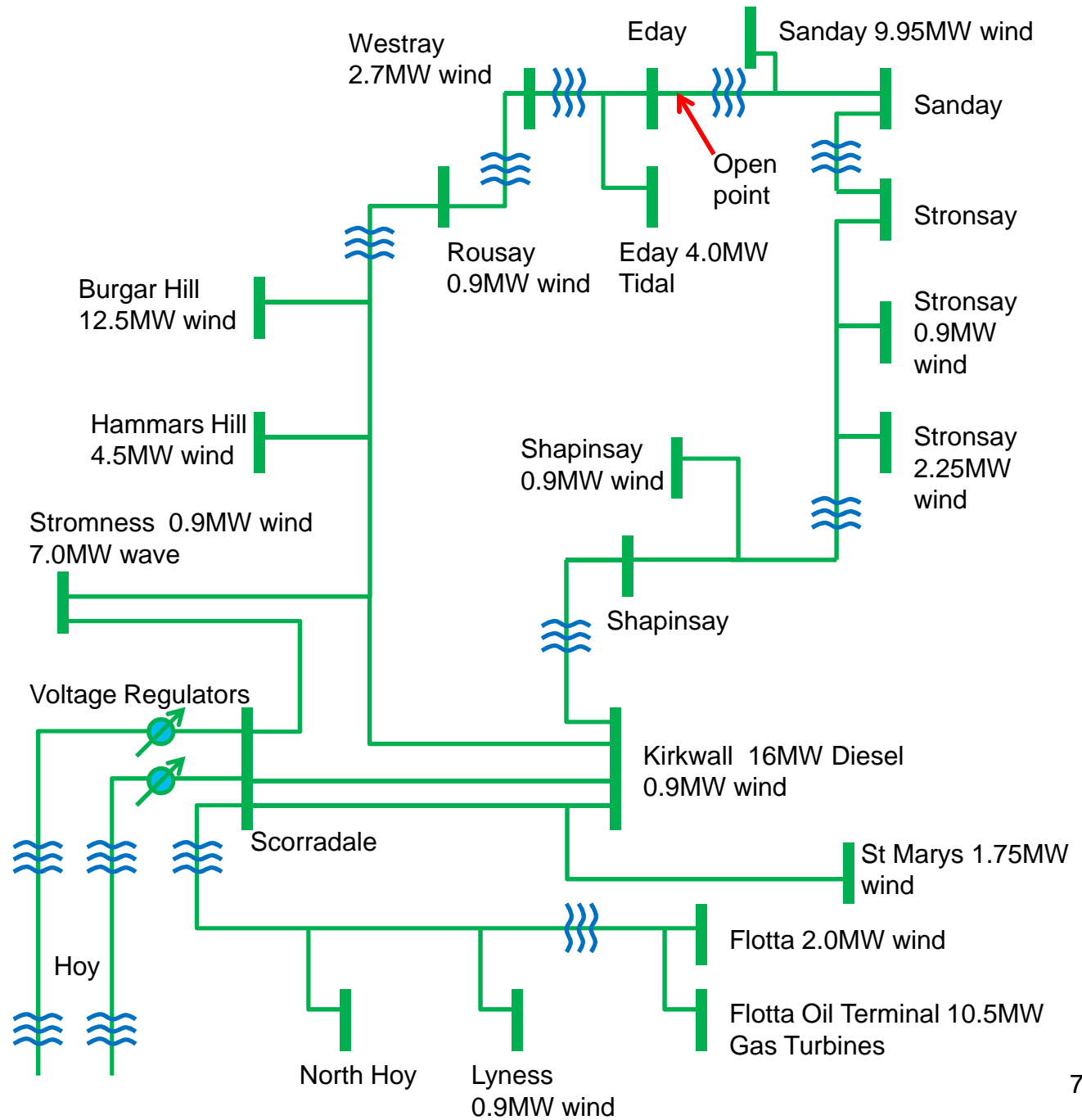
European Marine Energy Centre (EMEC) is a Scottish Government-backed research facility that has installed a wave testing system at Billia Croo on the Orkney Mainland and a tidal power testing station on the island of Eday.



The 33kV network



Schematic



Background

The ANM

- *The Active Network Management scheme is a smart grid solution to Orkney network congestion*

Beyond BAU

- *Conventionally, further generation would have required a new submarine cable to the mainland*

Outcome

- *Generation connections beyond traditional 'firm capacity' limits have been enabled*

Context

- *Implemented in a commercial environment*
- *With close stakeholder engagement*

Background

BAU

- *Conventional inter-tripping arrangements enabled 21MW of additional capacity to be connected*

ANM

- *A further 20 MW of renewable generation has been enabled by the ANM scheme*

£££

- *Cost of ANM scheme c. £500k*
- *Cost of subsea cable reinforcement c. £30m*

Time

- *5 years from concept to active operation*

Technical outline

ANM

- *The scheme monitors the network and curtails generation to maintain network security*

Design

- *Fail-safe was the design mantra: for plant, staff, connected consumers and the wider public*

PLCs

- *The controller utilises Programmable Logic Controllers (PLCs)*

Not SCADA

- *Decision-making in real time cannot readily be provided by SCADA systems*

ANM Scheme control point



Measurements and Generators



Commercial outline

LIFO

- *A range of alternatives was considered*
- *Curtailment is on a LIFO basis (Last in First out)*
- *It is simple and has a 'feels fair' quality*

Analysis

- *The curtailment analysis was accepted by lenders for the commercial investment cases*

Choices

- *Alternatives to LIFO could be explored but there will likely be 'devil in the detail'*

Commercial outline

Queues

- *A place in the LIFO stack is key to generators but is complex where there are many parties*

Entry

- *Clear requirements for queue entry needed*
- *Planning consent confirmation and a deposit*

Engagement

- *Local stakeholders have collaborated with commercial ventures*
- *Hammars Hill Energy Ltd (4.5MW) includes local share ownership*

5 x 900kW Enercon wind turbines



Regulatory outline

RPZ

- *At the time of scheme conception Ofgem operated the Registered Power Zone (RPZ) incentive arrangements*

Bounding

- *The RPZ status was considered helpful*
- *It bounded the special arrangements*

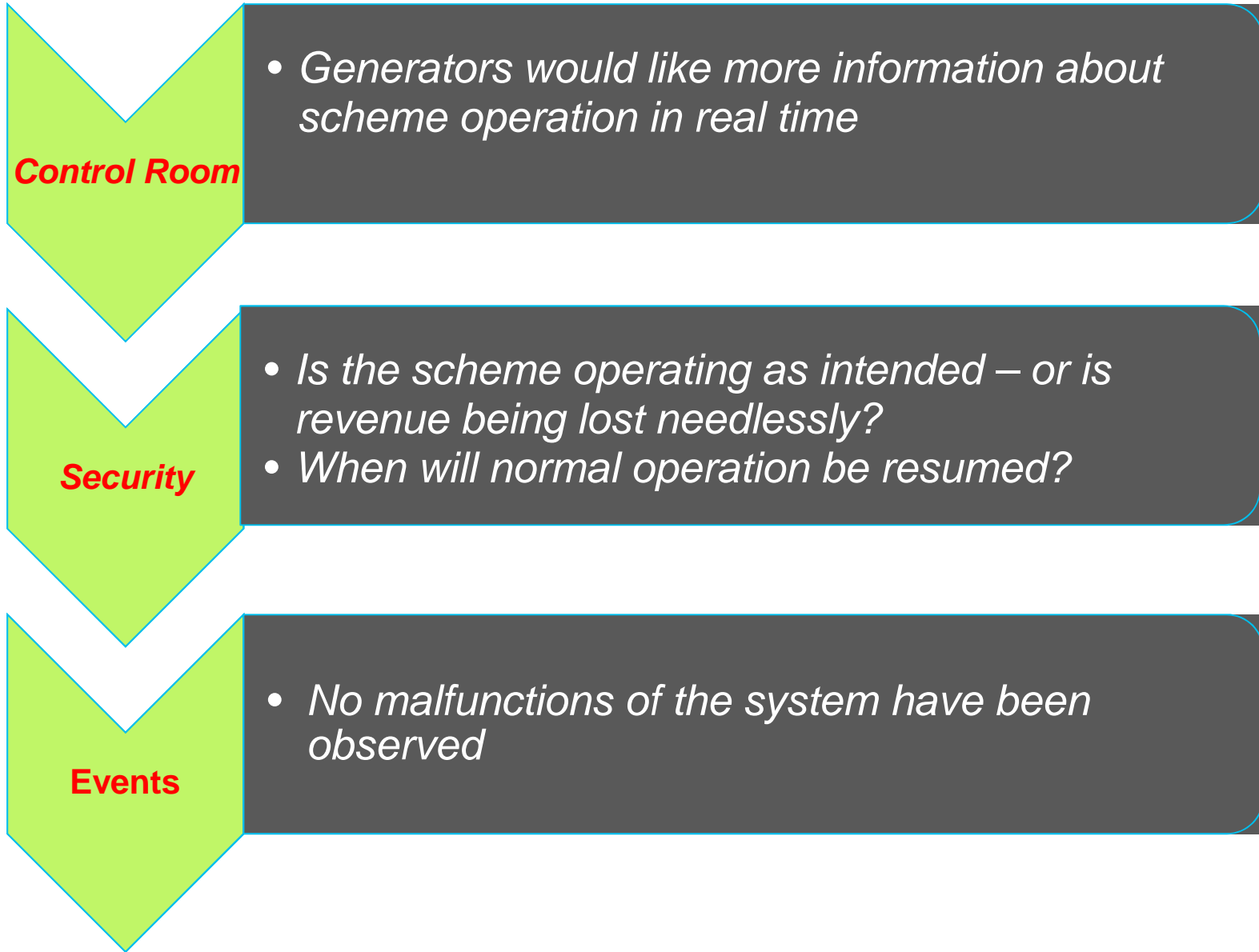
LIFO

- *Ofgem indicated their support for a simple LIFO arrangement for this project*

Its Operation



Its Operation



Learning Points

Design

- *Redundancy wise for communications channels*
- *Consider remote IT access for contractors*

Response

- *When the scheme goes to fail safe mode, capability for self-restart on resolution is helpful*
- *Pinpoint the failed element where a third party provides a key service*

Stakeholders

- *Messaging in plain language benefits all parties*
- *Induction training is important, with periodic refreshment, especially in community schemes*

Development

Extend

- *Opportunities identified to extend the scheme further eg State Estimation, DSM, Storage*

Integrate

- *Reactive power management of the wind turbines could be incorporated in the control strategy*

Platforms

- *There is scope to develop the processing architecture (a Java platform perhaps)*

KEMA's summary

EXPECTATIONS of Stakeholders:	NOT MET	FELL SHORT	MET	EXCEEDED
SHEPD – operational				
SHEPD – commercial				
SHEPD – support from Design partner (UoS)				
SHEPD – support from Delivery partner (SGS)				
Regulatory framework				
Customers – generators				
Wider stakeholders – Orkney islands				
Delivery by 3 rd Party Communications providers				

Break up into Streams

- **Commercial stream: Remain in Riverside Room**
- **Technical stream : Move to Faraday Room**

Britain's First Smart Grid: *Sharing the Knowledge*

Thank you for your attention

John Scott

www.chilternpower.com

+44 7771 975 623



Chiltern Power

www.dnvkema.com