

New Holland, Holm 500kW



# WINDFLOW

Partner of Choice in  
Mid-Size Wind



## NEW CABLE? - Understanding the cost to connect renewable generation in Orkney

Hammer, Westray 500kW



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Presentation on behalf of the  
Orkney Renewable Energy Forum



[www.windflow.co.uk](http://www.windflow.co.uk)

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3. The Orkney Cable – Who Pays?
4. Who decides?
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Steep hill to climb.....we can do it together!



## 2. Who are we?

- Windflow Technology Limited.
- New Zealand company listed on NZAX since 2001.
- Design, development and manufacture of medium-size wind turbines.
- 97 further turbines installed 2006-2011.
- Achieved Type certification and ISO 9001 in 2010.
- 2003-2015 – Built 6 x 33m/500kW 1A turbines in UK.
- 2015 first 45m/500kW 2A commissioned in Texas .
- 2016 - 7 projects (11 turbines) UK pre-accredited, in financial closure.
- Windflow UK future – Wind Farms with Low Visibility Medium Scale Turbines.



# 3. Orkney Cable – who pays?

- The Terminology.....
  - Distribution (33kV and under) – Paid up front
    - Sole Use – solely for the generator paid up front.
    - Shared Use – infrastructure which benefits multiple users paid up front (some charged back to consumers via Use of System charges).
  - Transmission (greater than 33kV) – Paid annually
    - Sole Use – infrastructure designed and built solely for the generator paid by annually via TNUoS.
    - Shared Use – benefits multiple applicants paid by annually via TNUoS.
    - Wider Works – significant changes to Transmission works paid by annually via TNUoS.
  - TNUoS charges (Transmission Network Use of System)
    - No history in Orkney as we have always been Distribution connected only.
    - National Grid set these charges based on regulation from Ofgem and designed to reflect of getting electricity from generator to demand. They are then passed on to consumers and generators via supplier tariffs.
  - SSE (Scottish & Southern Energy plc) parent company of
    - SHEPD (Scottish Hydro Electric Power Distribution Limited)
    - SHETL (Scottish Hydro Electric Transmission Limited)



# 3. Orkney Cable – who pays?

- Generator or Consumer whether via subsidy support or grid charges?
- The simple answer depends on who and where your are.....
  - In the Scottish Hydro mainland area.
    - G83 Generator 16A per phase contribute nothing to upgrades.
    - Microgeneration between G83 & 1MW – contribute to Distribution Costs only.
    - Greater than 1MW – contribute to both Distribution and Transmission Costs.
- In Orkney the proposal is solely for generators.....
  - G83 Generator 16A per phase contribute nothing to upgrades.
  - Microgeneration between G83 & 50kW – contribute to Distribution Costs only.
  - Greater than 50kW – contribute to both Distribution and Transmission Costs.
- But we are in Policy flux.....
  - Ofgem consultations on High Cost Threshold Cap/Voltage Rule. (Ofgem - 17<sup>th</sup> Dec 14).
  - Ofgem Quicker and more efficient connections consultation. (Ofgem – 19<sup>th</sup> Feb 15).
  - Potential Charging arrangements at exporting Grid Supply Points (National Grid - 31<sup>st</sup> Oct 15).
  - Submarine Cable consultation (response forms in the room).



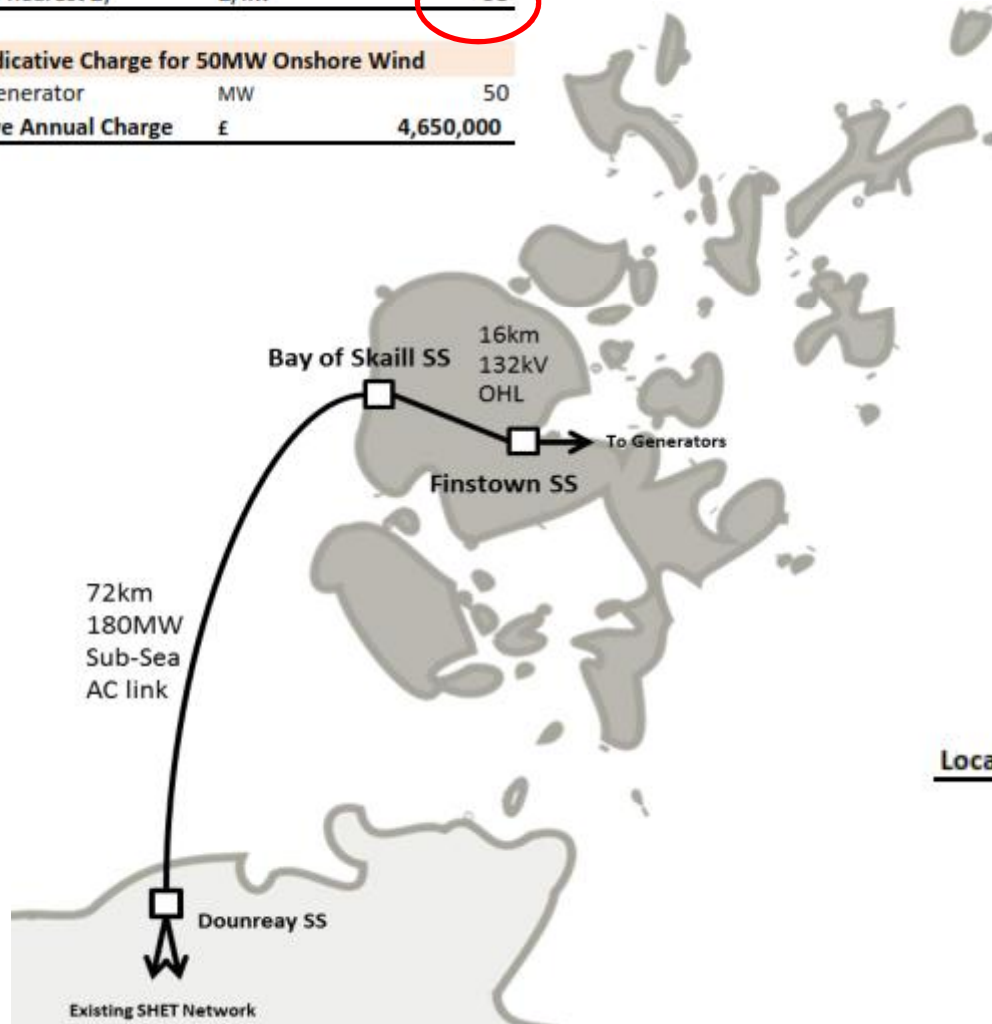
# 3. Orkney Cable – who pays?

- TNUoS Indication from National Grid.....

## INDICATIVE TOTALS (2022/23 prices)

Total Indicative Tariff for Onshore Wind		
Tariff (to nearest £)	£/kW	93

Total Indicative Charge for 50MW Onshore Wind		
TEC of generator	MW	50
Indicative Annual Charge	£	4,650,000



## Most recently published forecast for 19/20

System Peak	£/kW	1.53
Shared Year Round	£/kW	16.43
Not Shared Year Round	£/kW	21.83
Residual	£/kW	-2.97

Annual Load Factor % 40%  
For onshore wind

Wider Tariff (19/20)	£/kW	25.43
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RPI'ed forward 3% pa to 2022/23

Wider Tariff (22/23)	£/kW	27.79
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Substation Tariff (16/17)	£/kW	0.40
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RPI'ed forward 3% pa to 2022/23

Substation Tariff (22/23)	£/kW	0.48
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## Local Circuit Elements £/kW (22/23)

Subsea	61.36
Bay of Skail to Finstown	2.69
Finstown to Generator	0.84

Local Circuit Tariff (22/23)	£/kW	64.89
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# 3. Orkney Cable – who pays?

- Indicative Distribution Offers.....
  - From £220k-£1.6M per MW + £93k/yr
  - Based on a 33kV Generator only solution and GSP at Finstown
  - Should we also be looking to relieve curtailment on existing network
  - Provide additional security of supply for existing consumers

500kW West Mainland  
£425k +  
£46.5k/annum

500kW Westray  
£800k +  
£46.5k/annum

3MW Rendall  
£670k +  
£297k/annum

10MW Stronsay  
£5.89M +  
£930k/annum

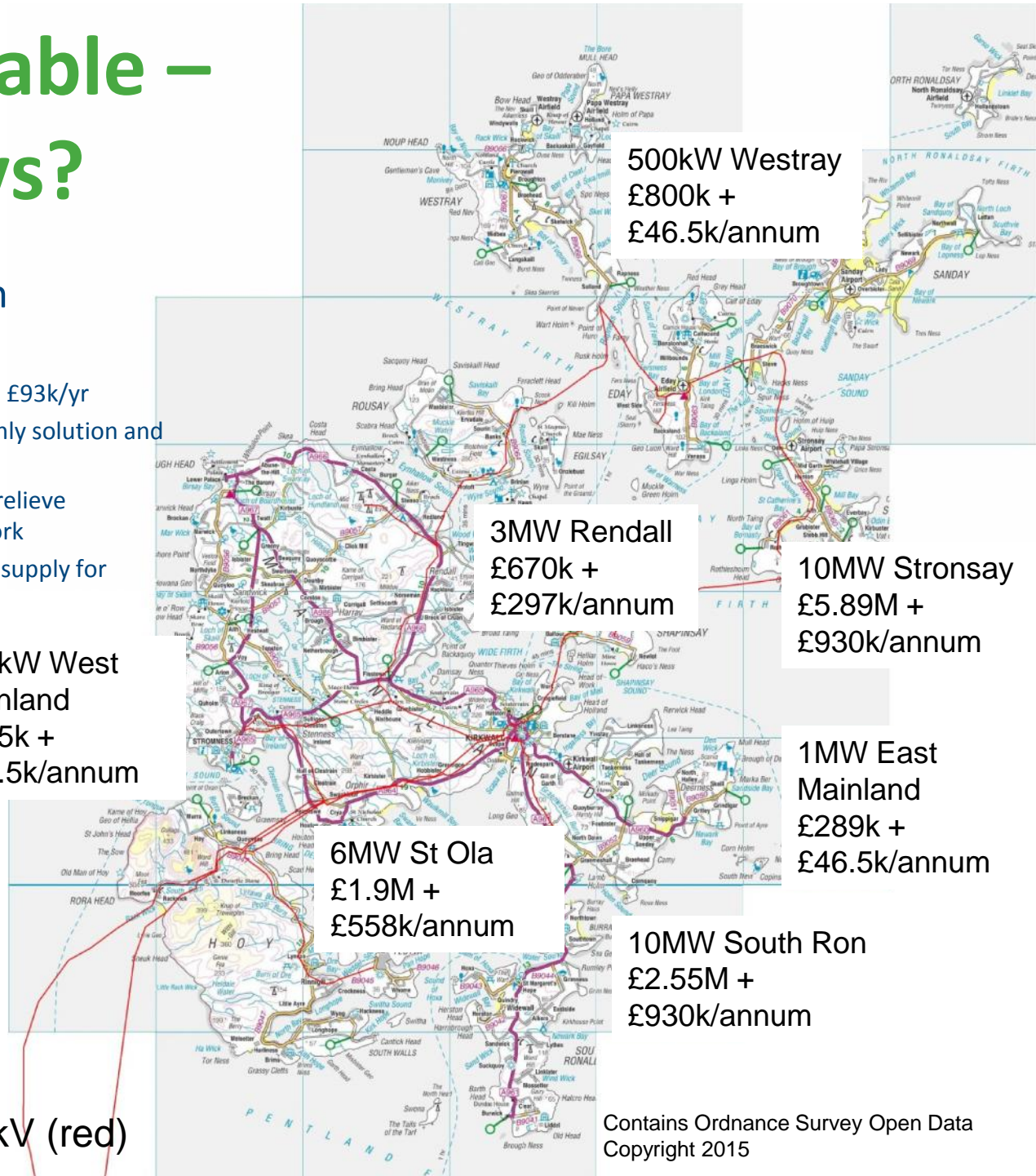
6MW St Ola  
£1.9M +  
£558k/annum

1MW East Mainland  
£289k +  
£46.5k/annum

10MW South Ron  
£2.55M +  
£930k/annum

33kV (red)

Contains Ordnance Survey Open Data  
Copyright 2015



# 3. Orkney Cable – who pays?

- Real Examples.....
  - 1MW shared asset connection at 400V (Sutherland)
    - Legal, Design and final connection charge - £13,667 exc VAT
    - Sole User - 3 span of overhead line, isolator, protection and 30m cable to generator into a 1500kVA transformer - £65,293
    - Network Reinforcement – Shared Asset 2.59km line rebuild. Cost apportionment at £200/kW and this is shared between SHEPD (to be charged to other customers) and generator according to ratio of 1MW generator application/2.4MW new line capacity. £116,633 paid by SHEPD & £83,166 by generator. Generator also pays for all additional costs above the £200/kW threshold which is a further £210,595.
    - Total cost £372,722 for 2.8km connection at LV.
  - Distribution Costs for 1MW shared asset connection at 400V (recent indicative Mainland Orkney offer)
    - Sole User – Not specified but will include a 33kV/400V 1500kVA transformer - £109,422.
    - Network Reinforcement – Assumes shared across generators only and sharing with consumers - £180,000.
    - Total cost £289,422 for connection at LV from dedicated 33kV system for generators.
  - TNUoS Costs for 1MW shared asset connection at 400V (recent indicative National Grid)
    - Sole User – Assumes 5km to generator in example - £0.84/kW/annum.
    - Network Reinforcement – Substation £0.48/kW/annum + Overland Orkney £2.69/kW/annum + Subsea to Dounreay £61.36/kW/annum + Wider Tariff further South £27.79/kW/annum
    - Total cost £93/kW/annum or £93,000 per annum.
  - Total Cost is £289,422 up front + £1.86M (£93,000/yr x 20 years) = £2.15M (Securities required).
  - This is approx more than 6 times more expensive than developing in Caithness/Sutherland





# 4. Who decides?

- Generator.....
  - Distribution Network Operator provide regulated Section 16 quotes within a 65 working day period.
  - This has to be for specific capacity otherwise charged for feasibility work.
  - Lowest cost of connection offered along with an indicative timetable for connection.
  - Increasing levels of competition in connections.
  - Grid constraints occur when next generator triggers the full distribution connection reinforcement.
  - In Okney SSE have already offered Inter-trip connections and ANM as solutions other than reinforcement.
  - Assuming there are no Transmission Works required, the generator can decide alone.
- Regulator IF Transmission Works are triggered.....
  - and not part of the agreed price control between the Transmission Operator then a special needs case must be made and approved by Ofgem which requires generator commitment.
  - For example
    - Caithness to Moray (inc Loch Buidhe) approved in Dec 14 for a £1,118M spend on a 1.2GW link by 2030. 795MW to be delivered in the short term by 2018. Considers Economic Assessment; Visual Amenity & Wider Benefits and Risk.



# 4. Who decides?

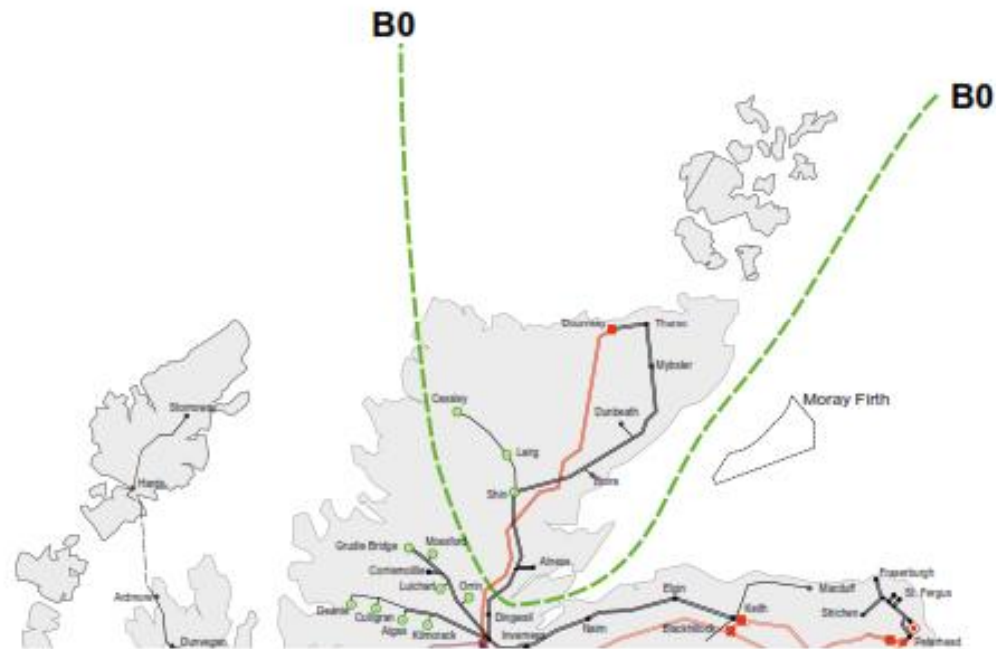
- We have been given an option by SSE with agreement of Ofgem
- This is called a Section 22 process.....
  - Allows SSE to;
    - Utilise an up-front application fee of £250, offer period open from 1<sup>st</sup> December 2015 to the 1<sup>st</sup> February 2016;
    - Take a more 'holistic' view of the consortia, with regards to shared reinforcements and design solution;
    - Avoid interactivity between applicants (i.e. One applicant triggers all the cost);
    - Have an acceptance deposit that is out-with the normal charging methodology (normally £10,000 deposit but reduced to £2,000 at 11kV and £3,250 at 33kV).
    - Quotes out 1<sup>st</sup> May 2016 and acceptance by 2<sup>nd</sup> August 2016.
    - Confirmation from National Grid then on Securities & Liabilities further 30 days to accept this.
    - Payment of liabilities from March 2017 (42% of securities until planning then 10%)
    - 2023 likely connection date.
  - However, it also means;
    - There are no Guaranteed Standards of Performance (although our target date is same as Section 16 of 65 working days);
    - Ofgem determination does not apply to this type of quote (like it does in Section 16).



# 4. What size?

## Boundary B0 – Upper North SHE Transmission

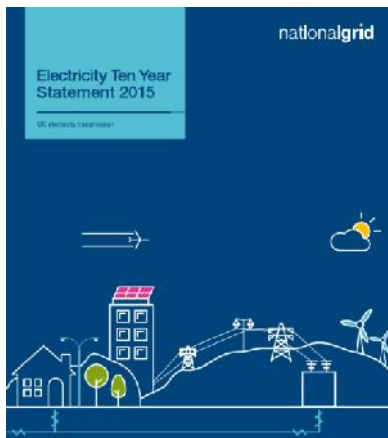
Figure B0.1  
Geographic representation of boundary B0



Boundary B0 separates the area north of Beauly, comprising north Highland, Caithness, Sutherland and Orkney. The existing transmission infrastructure north of Beauly is relatively sparse.

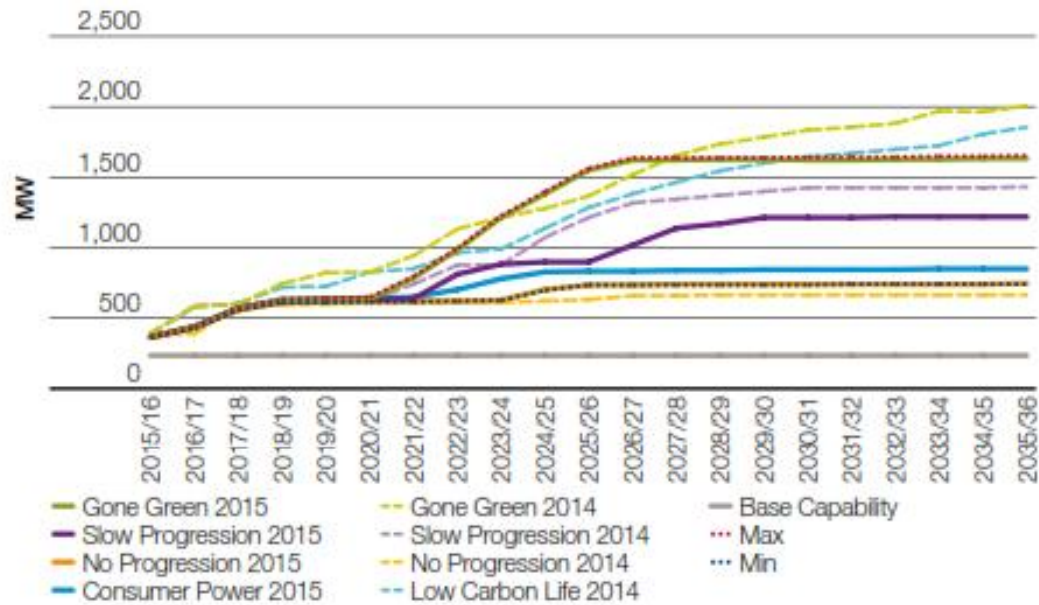
The boundary cuts across the existing 275kV double circuit and 132kV double

circuits extending north from Beauly. The 275kV overhead line takes a direct route north from Beauly to Dounreay, while the 132kV overhead line takes a longer route along the east coast and serves the local grid supply points at Alness, Shin, Brora, Mybster and Thurso. The Orkney demand is fed via a 33kV subsea link from Thurso.



# 4. What size?

**Figure B0.2**  
Required transfer and base capability for boundary B0



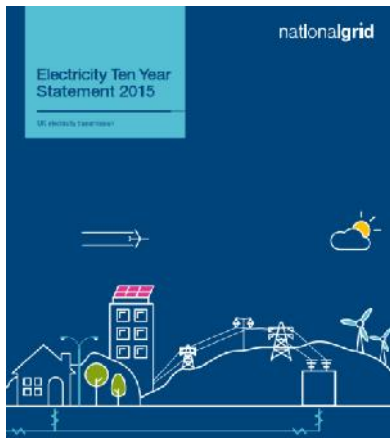
### Boundary requirements and capability

Figure B0.2 above shows the required boundary transfers for B0 from 2015 to 2035. The boundary capability is currently 0.25GW.

The power transfer through B0 is increasing due to the substantial growth of renewable generation north of the boundary. This generation is primarily onshore wind, with the prospect of significant marine generation resource in the Pentland Firth and Orkney waters in the longer term.

Reinforcement of boundary B0 is required and the Caithness–Moray reinforcement project is

presently being implemented to achieve this. This approved project is due for completion in 2018 and comprises an HVDC link between a new substation at Spittal in Caithness and Blackhillock in Moray, along with associated onshore reinforcement works. The onshore works include rebuilding the 132kV double circuit line between Dounreay and Spittal at 275kV, a short section of new 132kV line between Spittal and Mybster, new 275/132kV substations at Fyrish (near Ainess), Loch Buidhe (to the east of Shin), Spittal (5km north of Mybster) and Thurso.



# 4. What size?

## Conclusions

### *“Option 1 – Transmission reinforcement”:*

- Presently there is insufficient certainty surrounding the deployment of the current contracted marine generation to justify early investment in transmission reinforcement.
- The 220MW of interest is not sufficiently advanced through the grid application or planning process in order to support the case for reinforcement. However, transmission reinforcement looks likely to be the most viable option to provide the anticipated final level of MW capacity.
- The current transmission developments are not sufficient to accommodate the 220MW in addition to the current contracted marine developments.
- It may be possible to manage uncertainty of both marine and onshore wind by connecting via a transmission Active Network Management arrangement.

### *“Option 2 – Distribution reinforcement”:*

- A distribution solution may offer additional capacity to a part of the existing distribution network on Orkney, but would not provide a solution for the network as a whole.
- A distribution solution would be unlikely to be an appropriate or technically viable solution to a significant element of the 220MW.
- New distribution connections could not be made before 2020 under the current GB queue arrangements due to the need to await completion of wider transmission reinforcement works on the mainland.

### *“Option 3 – Making best use of the existing network”:*

- Presently Orkney is at the forefront of electricity network innovation and smart grids. SSEPD is currently developing for consideration Seasonal Line Ratings to increase network capacity, beyond this there is no other short term solution.

# 5. Viability?

- Income

- A 1 MW project with 40% Capacity Factor, 95% availability – 3,328MWh
- Export at 4.5 p/kWh is £149k per annum
- Approx £3M for 20 years.
- Total without subsidy £3M over 20 years
  
- Will there be a Feed in Tariff in 2023?
- Consultation paper rate for 50-1500kW proposed to be 4.04p/kWh in Q1 2019, decision in January?
- Island Onshore CfD around 9.5p/kWh?

- Expenditure

- Lease approx £150k over 20 years
- Overheads approx £120k over 20 years
- Operation & Maintenance approx 560k
- TNUoS £93k/yr x 20 = £1.86M
- Capital cost including grid costs = £1.5M
- Total without financing costs £4.19M over 20 years.



# 5. Viability?

- Risks.....
  - Policy Uncertainty (FiT Review, ROCs ending and no clarity on Island Onshore CfD)
  - Regulatory Uncertainty (Ofgem and National Grid Consultations)
  - Political Uncertainty (Disparity between Paris Climate Deal and UK Government Cuts)
  - Planning Uncertainty (Impact of the Introduction of the Orkney Landscape Capacity Study, no guidance as yet on Onshore Infrastructure, Draft Wind Energy Supplementary Guidance due Feb 16)
  - Public Support and Understanding (Nationally Onshore Wind Energy is getting a bad press, impacting locally?)
  - Who pays (Consumer or Generator, Bill Levy or taxation)
  - Additional security of supply versus burdens on the fuel pool
- However between now and May 2016 many of these issues will be clearer.
- Therefore is the £250 application fee a barrier?



## 6. Alternatives?

- Orkney has been in this position previously before being offered ANM connections.
- Orkney moratorium on Distribution grid connections since 2012.
- Large scale generators progress with Transmission option but now need help from small generators to justify needs case.
- Work with SSE on Section 22 process to look again at all options or
- Go with small scale G83 connections or
- Develop off grid solutions instead.
  
- We need to continue our history of innovation and be willing to try.





# 7. Next Steps?

- Please submit your formal grid applications to;
  - To [mcc@sse.com](mailto:mcc@sse.com);
  - Between 01/12/15 and 01/02/16;
  - And include £250 application fee per project.

Include 'Orkney Isles Consortia' in the subject field of all applications

Applications must include Single Line Diagram; Completed System Planning Data Sheet; Landowner Authorisation and Land Ownership Boundary.

- Discussion – What can you do with OREF beyond discussing results in May?

