

PUBLIC INQUIRY- SCOTTISH EXECUTIVE REPORTERS

ELECTRICITY ACT 1989 SECTION 37

PROPOSED BEAULY –DENNY TRANSMISSION LINE

CLOSING SUBMISSION BY SIR DONALD MILLER

A. INTRODUCTION

In this paper I am responding to the invitation dated 23 rd April from the Reporters to summarise the main points of my evidence as it has been amplified in cross examination. I wish to emphasise that it does not represent any change from the thrust of my evidence as presented in my original precognition and nor does this submission introduce any evidence that is not in my precognition, is not available in papers entered by the various parties before the Inquiry or has not been raised in cross examination.

B. COSTS OF WIND POWER FROM THE NORTH WEST

In Energy White Paper Cm 5671 page 16 (Doc LO5) Government set out targets for Renewable Energy and stated these are ‘subject to the costs being acceptable to the consumer’. This qualification has never been withdrawn but has been repeated elsewhere and when introducing energy papers to Parliament. In their 2005 report The National Audit Office stated ‘ the renewable subsidy will force up average electricity bills by at least 5.7% although this figure is likely to be higher once the costs of connecting up hundreds of new wind farms to the national grid has been factored in’. Similar concerns about transmission costs have been recently expressed by Government and by Ofgem; see BDLG 67.

My precognition shows the cost of bulk power from wind developments in the NW Highlands after discounting for carbon benefits as some £100.1 /MWhr (this is as corrected during the hearing from the £ 92.5/MWhr in my precognition), all of these costs

being paid by the consumer. This is almost four times the cost of bulk power in the market and raises the question as to what figure is required to trigger the Government qualification on acceptability.

It is my submission that £ 100/MWhr is far in excess of what most consumers would consider acceptable and that this is therefore something that the Inquiry should properly take into account in considering the question of need for new transmission lines from the NW for greater quantities of wind developments than can be accommodated using existing transmission capacity. This is especially relevant in that the proposal is catering for some three times the Executive 2020 target for renewable energy in Scotland.

C. ECONOMIC ANALYSIS

In my precognition I draw attention to the excessively high costs for constrained off energy employed by Ofgem in their economic justification for the Beaully –Denny line. Even higher figures are employed by the Applicant in their evidence.

Equally significant is the unjustified and incorrect assumption that the Beaully-Denny line will remove most of the need (and the costs) for constraining off generating plant. In reality as my precognition makes clear (P9 - National Grid Seven Year Statement) further heavy additional heavy expenditure is required for reinforcement of the cross border transmission to carry the wind generated energy to load centres in England. The costs of these works are as relevant to removing constraints as are those of the Beaully-Denny line and their exclusion invalidates the economic analysis provided by the Applicant.

In cross examination I was asked about the importance of VAR generation and accepted this is vital in any long distance transmission system. While MW must be balanced over the whole system, a long distance transmission system requires that there be a good balance of VAR generation and consumption over each section of the system. I accepted that new wind generators will be capable of VAR generation but it does not follow that this will always be distributed in accordance with system requirements. I went on to explain that the need to regulate VAR balances places a limitation on the amount of generation that can be constrained off in Central Scotland. The mid point is the most critical in a long distance transmission so that with insufficient generation in Central Scotland and a consequent VAR deficiency, stability limits for power transfers to England would be reduced, well below those quoted in the National Grid Seven Year

Statement, (see my Production P9).

I then made the point that a further limitation on constraining off generating plant in Central Scotland was the need to retain adequate balancing plant to cater for the large and rapid variations which occur in wind output. It takes 10hrs to load a Longannet generating unit from cold or six hours from warm so that it will be essential to keep at least two units operating at minimum load (approximately 200 MW per unit) at all times. This further increases export loadings and the consequent costs of providing further reinforcement of transmission capacity to load centres in England. The high costs of operating plant in this inefficient mode (see my precognition Sections C and D) and the costs of transmission to load centres in England, if properly included in the economic analysis would have increased the wind capacity in the NW required to justify a reinforcement such as the Beaully-Denny line to well above that in the Applicant's submission.

D. EAST COAST ALTERNATIVE

In cross examination I made the point that the East Coast Alternative proposed in my precognition differs in essential respects from those considered by the Applicant in his paper APL4/5, principally in the construction of a new 400KV line from Beaully to Keith as a first step to reinforce the NW boundary. I noted also that the schematic diagram (Fig 2 of APL4/5) omitted many of the relevant transmission lines. The corrected diagram is appended as P12, which also shows the East Coast Alternative as in my precognition.

I was asked whether I had examined all the boundaries listed by the Applicant as well as that for the North West. I confirmed that I had prepared assessments for all of these as well as some additional ones in case they should prove limiting and that none need impose any limitation on the export of the wind power even in the excessive quantities proposed by the Applicant. I attach P13 and P14 showing these boundaries and capabilities. The requirements are those specified by the Applicant and are before constraining off any hydro or pumped storage generation.

Also under cross examination I pointed out the discrepancy between the Applicant's failure to take advantage of the presence of hydro and pumped storage to manage high

transmission system flows from wind generation and the assessment published in the Statutory Seven Year Statement by National Grid in conjunction with the Applicant and tabled as P9 of my precognition. In this assessment for year 2012 with some 6000MW of installed wind capacity in Scotland (assumed to be operating at 60% capacity), the output of conventional generation operating on a UK order of merit basis has been superimposed to give the appropriate N-D transmission loadings. This assessment is prepared on the basis that both Foyers and Cruachan pumped storage stations are not generating, being used to manage peak wind flows and that some 500MW of hydro (approximately half in the North West and half in West Perthshire) has been constrained off. Under cross examination I added that detailed analysis shows that this hydro has been carefully allocated to those stations with substantial storage and where any changes to the hydraulic regimes downstream can be accommodated. The effect of employing pumped storage and hydro to manage peak wind outputs in this way is to increase the NW boundary capability by some 440MW increasing to 700MW if advantage is taken of the pumping facility.

I was further challenged on my estimated cost for the E Coast Alternative and was referred to Para 3.15.4 of APL4/5 where the cost of an E Coast alternative is given as £520 m compared with £350m for the Beaully-Denny Alternative. On questioning the basis for the £520 I was referred by the Applicant to Table 3-8. The items of cost in this table which go to make up the costs of the first stage of my E Coast Alternative are Option 1 or 3 (New Beaully-Keith line) plus Option 2 (Upgrade Kintore /Kincardine/Tealing), a total of some £300m .This is the cost of the first stage E Coast reinforcement and is to be compared with the first stage of the Beaully-Denny proposal costing £350m. The applicant accepted this without comment and did not pursue the matter. Even greater savings accrue with the second stages of the plans, and these are further enhanced in that the E Coast Alternative allows phasing of the reinforcement expenditure as the amount of wind capacity increases. This facility is not available in the case of the Beaully-Denny line.

I further drew attention to the fact that the Applicant makes no mention of the costs for upgrading the Keith-Kintore section of the route (some £30m) although it appears that this figure may have been included in the costs quoted for the new Beaully-Keith line (£230 m for 110Km against £350m for 220Km for Beaully –Denny with its significantly greater substation costs).

Under cross examination it was suggested to me that Scottish Power had dismissed the alternative of an East Coast connection to Kincardine. In fact the only connections Scottish Power has considered in their evidence are in relation to terminating the Beaully-Denny line. No consideration has been given to any alternative scheme such as the E Coast route. I further stated that connecting in wind power from the North and West of the Shelt area via the East Coast to Kincardine appeared to fit well with Scottish Power's plans for system development in their area. Kincardine is to be the main 400KV switching station in the NE of the Scottish Power area with strong 400KV connections onwards via Smeaton and Torness to the cross border links to England. These links are planned to have considerably greater capacity than those in the West.

In response to a question from Mr Scott, the Technical Assessor, as to why the Applicant might propose the higher cost alternative, I drew attention to the situation pre-privatisation when with three generating/transmission Companies, excess investment would react adversely on that Company's tariffs. Under the present system there is no such differential effect; instead, profits for the investing Transmission Company are enhanced and the financial discipline which previously existed no longer applies.

I submit therefore that nothing has emerged in cross examination to affect my overall conclusion that the East Coast Alternative offers a technically effective and robust means of transmitting wind power from the North West and at costs between £50m and £100m lower than with the Beaully-Denny proposal.

E. CONNECTION OF WIND GENERATION IN THE WEST OF SHEL T AREA.

Under cross examination I drew attention to the many defects in the Applicant's paper 5/12. These I summarised as follows:-

- a. The wind capacity to be connected into the Beaully/Ft Augustus area is distributed from the Monaliaths to Skye and The Western Isles so there can be no justification for using a higher factor for transmission planning than the 60% normally used for widely distributed wind generation.
- b. It is accepted that there will be only limited wind capacity connected in the Errochty area; this will be well within the capacity of the existing 9 -132 KV circuits. A further

circuit could be achieved at low cost by stringing the second side of the Errochty –Killin line. Only two of these circuits are shown in the Applicant’s evidence (Fig 2 of PL5/12); the corrected diagram is appended as P12.

c. The analysis neglects the presence of the high capacity double circuit 275KV Cruachan line in the South of the area together with the impending Inverarnan 132/275KV substation This system is ideally placed for feeding wind power from south of Errochty in the Shelt system into the SPT major switching station at Windyhill.

d. The approach adopted is philosophically incorrect in that it examines what transmission lines would be needed in the absence of both the Beaully –Denny line and the E Coast Alternative. The costs of these works, which are entirely superfluous with either the E Coast Alternative or the Beaully-Denny proposal are then added to those of the E Coast Alternative but not to the Beaully-Denny proposal. This is in spite of the fact that the E Coast Alternative would provide a low impedance path to Central Scotland just as effective as would the Beaully-Denny line.

I concluded in the light of these considerations that there are no significant differential costs for the E Coast Alternative for connecting in wind capacity in the West compared with the Beaully-Denny line.

F. INQUIRY PROCEDURE WHICH HAS WRONGLY PREVENTED

EXAMINATION OF MATERIAL FACTS.

The Reporters did not allow me to present a paper giving the detail of my evidence on boundary capabilities of my East Coast Alternative. As a result, I was obliged to present orally under cross examination, evidence which it would be difficult even for a technical person to appreciate without written material and impossible for a non-technical person to understand. I have therefore prepared this submission on the basis of omitting the disallowed papers apart from P12, P13 and P14. These deal with the boundary capabilities which were questioned by the Applicant in cross examination. These papers are referred to in this submission and are produced here in view of their importance.

In order for me to prepare the detail of my East Coast Proposal it was necessary to carry out a great deal of work in analysing the National Grid Seven year Statement amounting to some 1000 pages of text and diagrams. This work could not begin before having access to the Applicant’s evidence which took the form of numerous long and detailed precognitions, requiring some weeks to thoroughly digest. My precognition was required

to be lodged at the same time as those of the Applicant in early January. It was totally unrealistic to expect these precognitions (and the lengthy and complex documents referred to in them) to be analysed in the detail required and to prepare a full technical comment and analysis before the start of the Inquiry on 6th Feb far less the final date for addendums on 23rd January. Nor was it even possible before this work had been completed to know whether there were grounds for submitting an addendum to my precognition or a detailed rebuttal of the Applicant's evidence. Notwithstanding the amount of work involved, my detailed analysis and additional papers were completed by the end March well before my scheduled appearance at the Inquiry in early May.

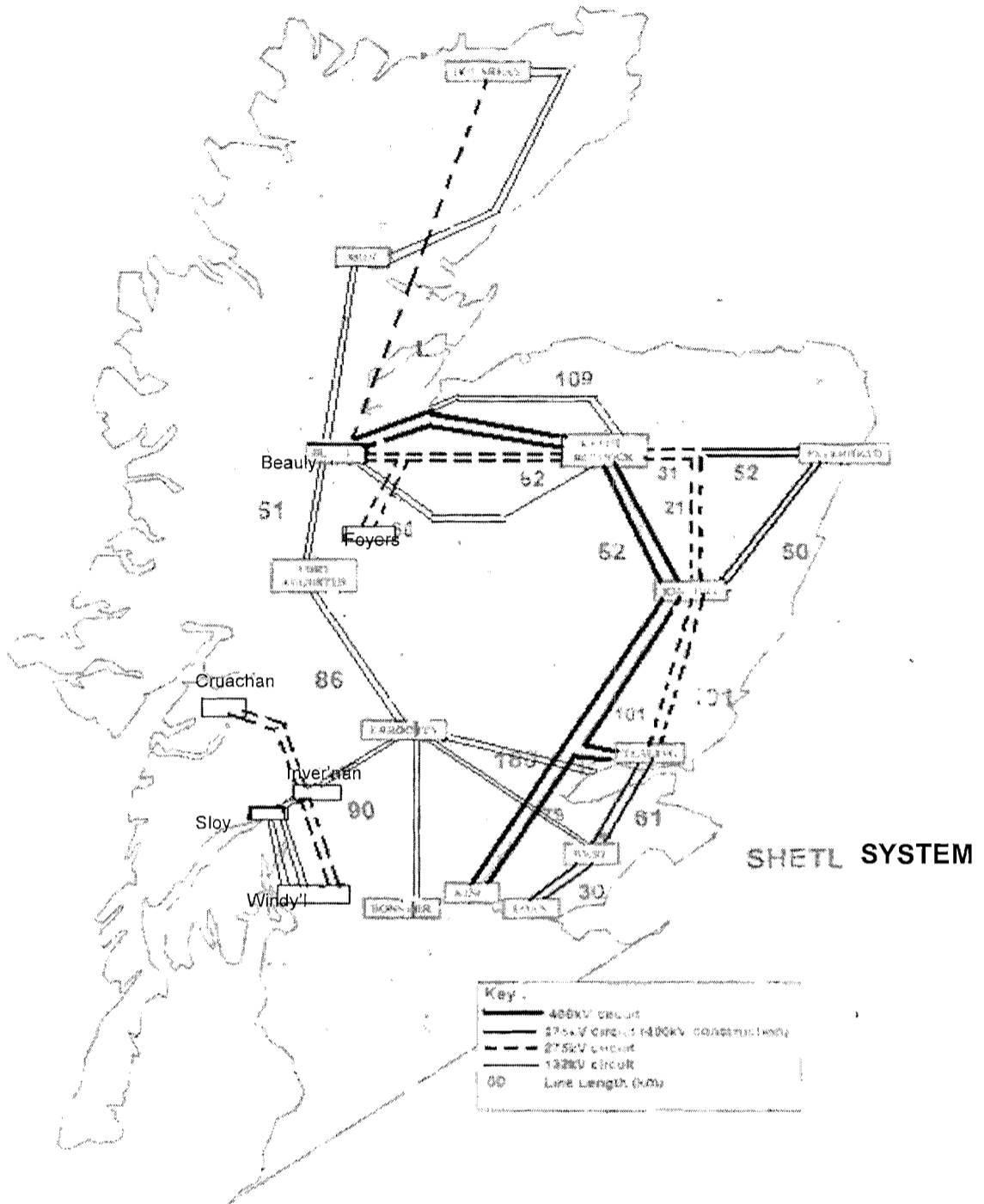
The effect of the Reporters' ruling has therefore been to prevent me from lodging the written detail of my evidence and supporting material which contradict the Applicant's evidence in ways which are fundamental to their application.

If the purpose of this Inquiry is to carry out in good faith an examination of the facts relating to the Applicant's proposal, including the question of need, the procedure adopted by the Reporters, leading to my evidence being disallowed, has prevented the achievement of that purpose. I profoundly regret this and remain willing to present the disallowed documents and to be cross examined on them.

G. CONCLUSION

It is my submission that the proposal has not been justified economically, it has not properly examined lower cost alternative reinforcements and in that it is catering for wind power installations in Scotland which are three times the 2020 Executive target, it represents excessive investment to the detriment of the electricity consumer and would result in lasting damage to a sensitive part of the Highland landscape. The application should therefore be refused.

P12- SCHEMATIC DIAGRAM OF SHELTL SYSTEM



P13. REINFORCED E COAST BOUNDARY CAPABILITIES (MW)

STAGE 1- 400KV DOUBLE CIRCUIT LINE BEAULY-BLACKHILLOCK –

KINTORE- TEALING –KINCARDINE.

Boundary	Circuits	Totals	N-D	N-1	Requirement (Table 3.9 APL 4/5)	
					Wind Capacity (3200MW)	(5400MW)

NW

New 400KV line Beauly-Keith)					
2-275KV	1050	1050	1050		
5-132	650	650	650		
2-400	<u>4000</u>	-	<u>2000</u>		
	5700	1700	3700	(1350)	(2124)

Keith/ Kintore

Reconnect Peterhead T to old 275KV line And uprate newer line to 400KV					
2-275	1050	1050	1050		
2-132	260	260	260		
2-400	<u>3170</u>	-	<u>1585</u>		
	4480	1310	2895	(1350)	(2124)

Keith-Peterhead/ Kintore

As above					
2-275	1050	1050	1050		
2-275	2180	2180	2180		
2-132	260	260	260		
2-400	<u>3170</u>	-	<u>1585</u>		
	6660	3490	5075		

N/ S . Kintore –Tealing

Newer line uprated to 400KV					
2-275	1390	1390	1390		
3-132	390	390	390		
2-400	<u>2810</u>	-	<u>1405</u>		
	4590	1780	3185	(2000MW)	(3040 MW)

SSE -- SP

Kincardine cable ends uprated Newer line uprated to 400KV					
2-275	1910	1910	1910		
2-132	260	260	260		
2-400	<u>2810</u>	-	<u>1405</u>		
	4980	2170	3575	(2500MW)	(3700MW)

Add Sloy + Cruachan Circuits Generation circuits so N-1 applies					
4-132	520	520	520		
2-275	<u>1520</u>	<u>1520</u>	<u>1520</u>		
	7020	4210	5615		

P14. REINFORCED E COAST BOUNDARY CAPABILITIES (MW)

(AS P13. BUT WITH ADDITIONS AS NOTED)

<u>Boundary</u>	<u>Circuits</u>	<u>Totals</u>	<u>N-D</u>	<u>N-1</u>	<u>Requirement (Table 3.9 APL 4/5)</u>
					<u>Wind Capacity (3200MW) (5400MW)</u>

NW

4 00KV line partly on 132KV route & 275KV line reconducted					
2-275KV	1390	1390	1390		
3-132	390	390	390		
2-400	4000	-	2000		
	<u>5780</u>	<u>1780</u>	<u>3780</u>	(1350)	(2124)

Keith/ Kintore

275KV line reconducted					
2-275	1390	1390	1390		
2-132	260	260	260		
2-400	3170	-	1585		
	<u>4820</u>	<u>1650</u>	<u>3235</u>	(1350)	(2124)

Keith-Peterhead/ Kintore

As above					
2-275	1390	1390	1390		
2-275	2180	2180	2180		
2-132	260	260	260		
2-400	3170	-	1585		
	<u>7000</u>	<u>3830</u>	<u>5415</u>		

N/ S . Kintore –Tealing

Reconstruct older 275KV line for 400/275KV					
1-275	1375	1375	1375		
3-132	390	390	390		
1-400	2000	-	-		
2-400	2810	1405	2810		
	<u>6575</u>	<u>3170</u>	<u>4575</u>	(2000MW)	(3040 MW)

SSE -- SP

Uprate Tealing-Longannet-Kincardine line for 400KV/275KV					
1-275*	955	955	955		
2-132	260	260	260		
1-400	1405	1405	1405		
2-400	2810	-	1405		
	<u>5430</u>	<u>2620*</u>	<u>4025</u>	(2500MW)	(3700MW)

Add Sloy Circuits and Cruachan circuits

Generation only so N-1 applies

4-132	520	520	520		
2-275	1520	1520	1520		
	<u>7470</u>	<u>4660</u>	<u>6065</u>		

Note* 3070MW with both circuits at 400KV
