

# Wraxall & Failand Parish Council



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Energy and Climate Change Committee  
House of Commons  
London  
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30 Oct 2015

Your Reference :

Dear Sir/Madam,

## **Low carbon network infrastructure inquiry**

We respond to your invitation to comment on the above as follows:-

By way of introduction, you may be aware of a bitter battle being fought in Somerset over the last 7 years to persuade National Grid to install low carbon technology when designing the new Transmission infrastructure especially when it is for a new connection. The decision is pending from the Secretary of State.

For further background information, we would refer you to the Wraxall and Failand Parish Council website where a number of reports and data can be found or from one of the manufacturers.

<http://www.wraxallandfailand-pc.gov.uk/Pylons.aspx>

<http://www.energy.siemens.com/hq/en/power-transmission/gas-insulated-transmission-lines.htm>

In addition there are reports of meetings etc and newspaper articles available on the internet.

**You may consider it expedient for your committee to examine this particular case by means of a hearing to better appreciate the real savings that can be made in UK's carbon footprint. Dr. Hugh Pratt and Mr. Chris Ambrose CEng are willing to appear should you so request.**

### **Summary of Key points from the Hinkley C Connection "Consultation":**

1. National Grid has 7,200km of overhead lines and 690km of underground lines.
2. National Grid had decided on a conventional solution and knew the likely build costs, of overhead and underground lines, prior to 2009.
3. National Grid finally admitted, in 2015, that it was 3 times not 20 times more expensive to underground compared to overhead lines, (Vol 8.8.1 2.21.2.5).
4. National Grid's preferred option is called PC4P consisting of 49km overhead line and 8.5km of undergrounded line with substantial sealing end compounds at the joint between the overhead and underground lines.
5. National Grid proposes a brand new untried T pylon whose development costs we await.

6. National Grid does not include any socio-economic, lifestyle, human or historic damage in their costings. Please note that such costs are taken into account in other infrastructure projects.
7. National Grid calculations include errors for the 40 year transmission losses, Appendix A.
8. Wraxall & Failand PC have provided revised costs, supported by Prof. Neumann, Siemens and Arup Engineering for construction of a formed tunnel adjacent to the M5.
9. Addressing your questions :- The following suggests that there are numerous and wide ranging benefits e.g. that there is the potential to save 3.0% of our electricity bill whilst reducing our emissions, establish a manufacturing base for GIL in the UK thereby increasing the nations wealth generation.
10. To achieve this requires a paradigm shift in thinking by NG/OFGEM/DECC to engage with advances in technology and introduce competition in the industry.

**Key conclusion:**

**The PC4P design, carbon footprint, produces an additional 40,558t of CO<sup>2</sup> and is more expensive than undergrounded GIL when National Grid's 40 year transmission losses are reworked, see below.**

**We give below an extract from W&FPC final submission to the Planning Inspectorate (dated 9 July 2015)**

**COSTS**

<b>NGs Hybrid overhead line</b> with undergrounding as proposed PC4P	£750m
Outstanding, Other and T Pylon costs awaited	£ ? m
40 year transmission losses, (Appendix A)	£347m
<b><u>TOTAL PC4P and 40 year transmission losses</u></b>	<b><u>£1,097m</u></b>

<b>A1) Underground with GIL</b> in a formed tunnel adjacent to M5, 6 tubes	£900m
Other costs including land (contingency)	£ 45m
40 year transmission losses, (Appendix A)	£152m
<b><u>TOTAL underground GIL (6 tubes) and 40 year transmission losses</u></b>	<b><u>£1,097m</u></b>

<b>A2) Underground with GIL</b> in a formed tunnel adjacent to M5, 4 tubes	£634m
Other costs including land (contingency)	£ 45m
40 year transmission losses, (Appendix A)	£152m
<b><u>TOTAL underground GIL (4 tubes) tubes and 40 year transmission losses</u></b>	<b><u>£ 831m</u></b>

**Outstanding questions from W&FPC Final submission:**

- a) We still await a written reply to a total cost question, Deadline 6.
- b) We fail to understand why cost comparisons, Document 7.4 para 6.3, were made at 4GW not 6.38GW.

## **BUILD TIME**

Hybrid PC4P overhead line with undergrounding as proposed	7 to 8 years
Underground with GIL a formed tunnel adjacent to M5	5.9 years
(No planning requirement to underground and this will minimise any delay)	

## **Impact benefits of GIL compared to PC4P proposal**

1. Reduces CO2 emissions by 40,558t of CO<sub>2</sub>, see Appendix B.
2. Removes Electrical Fields and reduces Magnetic Fields dramatically.
3. Considerably reduced transmission losses (3.0% paid for by tax payer on their electricity bill).
4. Is safe to be close to.
5. Is safe in a failure state.
6. Causes minimal damage to the environment.
7. Causes minimal damage to wild life habitat.
8. No birds are injured in flight.
9. No visual impact on the landscape.
10. No impact on tourism.
11. No impact on property values.
12. No impact on socio-economic issues.
13. Takes substantially less space to construct.
14. NO land costs for GIL if M5 corridor is used.
15. Potential for manufacturing in UK (increases UK wealth creation)
16. Does not require planning approval.
17. Is virtually invisible when completed.
18. Can be accessed 24 hours a day for maintenance.
19. Can readily accept additional capacity.
20. Not affected by adverse weather.
21. Less vulnerable to acts of terrorism.
22. Easily monitored 24/7 remotely.
23. Inspections of installation carried out remotely 24/7.
24. Reduces time and cost of maintenance.
25. Less, (recorded at 0%), downtime in 30 years' use.
26. Duct available to run other services such as media/broadband cables etc.
27. Potential new cycle track from Bridgwater to Avonmouth.
28. Less disruption to local residents and visitors over the 7 year build.
29. No daily EMF affects such as Cadbury Camp Lane residents

This brief closing document is the culmination of a highly demanding 6 years of unpaid work, discussion and negotiation with National Grid. We have submitted evidence for all that we claim.

We trust that the balance of evidence is firmly in favour of GIL on the basis of carbon footprint, planning or OFGEM regulations.

Principally GIL is good for the country, countryside, communities and even National Grid.

We ask the Energy and Climate Change Committee to request the Secretary of State to require NG to properly consider the alternative proposal of GIL in a formed tunnel adjacent to the M5.

Yours faithfully

Freda Shattock, Clerk to W&FPC per pro

Chris Ambrose CEng, Dr Hugh Pratt

## APPENDIX A

National Grid's calculations have been taken from Document 7.4. However a more detailed study would account for the shorter direct length for GIL and difference in resistance between 4 and 6 tubes.

### E.7 [Original]

For this "Med" category example, the total resistance for each technology option is calculated (from information in Appendix D, Table D.10) as follows:

$$\text{Overhead Line} = 0.0184\Omega/\text{km} \times 40 \text{ km} = 0.736 \Omega$$

$$\text{Cable Circuit21} = 0.0065\Omega/\text{km} \times 40 \text{ km} = 0.26 \Omega$$

$$\text{Gas Insulated Line} = 0.0086 \Omega / \text{km} \times 40 \text{ km} = 0.344 \Omega$$

**Should read for comparison of PC4P and PC4 GIL as incorrect distances used.**

### E.7 [Corrected]

For this "Med" category example, the total resistance for each technology option is calculated (from information in Appendix D, Table D.10) as follows:

$$\text{Overhead Line} = 0.0184\Omega/\text{km} \times 49 \text{ km} = 0.902 \Omega$$

$$\text{Cable Circuit21} = 0.0065\Omega/\text{km} \times 8.5 \text{ km} = 0.06 \Omega$$

$$\text{Gas Insulated Line} = 0.0086 \Omega / \text{km} \times 57 \text{ km} = 0.49 \Omega$$

**Therefore we can rework E10:**

### E.10 [Original]

The same methodology is applied for the other AC technology option types for the "Med" category example considered in this Appendix. The following is a summary of the instantaneous total losses that were assessed for each technology option:

$$\text{Overhead Lines} = (2 \times 3) \times 1,565.52 \times 0.736 = 10.8 \text{ MW}$$

$$\text{Cables} = (2 \times 3) \times 1,565.52 \times 0.26 + (6 \times 0.4) = 6.2 \text{ MW}$$

$$\text{Gas Insulated Lines} = (2 \times 3) \times 1,565.52 \times 0.344 = 5.1 \text{ MW}$$

**Should now read for comparison of PC4P and PC4 GIL**

### E.10 [Corrected]

The same methodology is applied for the other AC technology option types for the "Med" category example considered in this Appendix. The following is a summary of the instantaneous total losses that were assessed for each technology option:

$$\text{Overhead Lines} = (2 \times 3) \times 1,565.5^2 \times 0.902 = 13.24 \text{ MW}$$

$$\text{Cables} = (2 \times 3) \times 1,565.5^2 \times 0.06 + (6 \times 0.4) = 3.28 \text{ MW}$$

$$\text{Gas Insulated Lines} = (2 \times 3) \times 1,565.5^2 \times 0.344 = 7.26 \text{ MW}$$

But remember the losses for PC4P are OHL + Cable = 13.24 MW + 3.28 MW = 16.52 MW

Compared to PC4 for GIL = 7.26 MW

**PC4P (OHL + Cable) has 9.26 MW greater losses than PC4 (GIL)**

**Hence using values from D.48**

D.48 An annual loss figure can be calculated from the instantaneous loss. National Grid multiplies the instantaneous loss figure by the number of hours in a year and also

by the cost of energy. National Grid uses £60/MWhr which is the cost of energy derived in the Ofgem “project discovery” document.

### **We can calculate**

Remember again the cost of the losses for PC4P is OHL + Cable

$$= 40 \times 365 \times 24 \text{ (hrs)} \times £60/\text{MWhr} \times 16.52 \text{ MW} = £347\text{m}$$

Compared to PC4 for GIL  $40 \times 365 \times 24 \text{ (hrs)} \times £60/\text{MWhr} \times 7.26 \text{ MW} = £152\text{m}$

**PC4P (OHL + Cable) has £195m greater losses than PC4 (GIL)**

## APPENDIX B

National Grid own 7,200km of overhead lines and 690km of underground lines or 7,890km in total.

So the proposed PC4P of 57km represents some 0.8% of the total lines.

There are various calculators to determine carbon footprint. However from Appendix A there is a 9.26MW differential between PC4P and undergrounded GIL as;

PC4P (OHL + Cable) has 9.26 MW greater losses than PC4 (GIL)

Hence:

We understand that the extra carbon footprint from 9.26MW of transmission losses, (Joule), to heating the air from a 57km overhead powerline is calculated as:

$9.26\text{MW} \times 24\text{hrs} \times 365\text{days} \times 0.5$  factor equates to 40,558tons of CO<sub>2</sub> per year.

**PC4P (OHL + Cable) creates an extra 40,558t of CO<sub>2</sub> more than PC4 ( GIL)**

This 57km would generate an extra 5.6 million tonnes of CO<sub>2</sub> compared with the alternative of an undergrounded GIL.

If National Grid replaced all their lines with undergrounded GIL, 7890 km nationally, it would represent a significant saving of 0.5% of UK total carbon footprint.