

Wraxall & Failand Parish Council



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9 July 2015

Your Reference EN020001

Dear Sir,

Re: Application by National Grid for an Order Granting Development Consent for the Hinkley Point C Connection Project

Update on direct comparison of key components of proposed scheme by National Grid and the Pratt/Ambrose alternatives.

Summary of assumptions:

1. National Grid has 7,200km of overhead lines and 690km of underground lines.
2. National Grid knew the 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.
7. National Grid calculations have errors for the 40 year transmission losses, Appendix A.
8. Wraxall & Failand have provided revised costs, supported by Prof. Neumann, Siemens and Arup Engineering for construction of a duct adjacent to the M5.

Key conclusion:

The PC4P design produces an extra 40,558t of CO², carbon footprint, and is more expensive than undergrounded GIL when National Grid's 40 year transmission losses are reworked, see below.

COSTS

Hybrid overhead line with undergrounding as proposed PC4P	£750m
Outstanding, Other and T Pylon costs awaited	£ ? m
40 year transmission losses, (Appendix A)	£347m

TOTAL PC4P and 40 year transmission losses **£1097m**

A1) Underground with GIL in a formed tunnel adjacent to M5, 6 tubes	£900m
Other costs including land (contingency)	£ 45m
40 year transmission losses, (Appendix A)	£152m

TOTAL underground GIL (6 tubes) and 40 year transmission losses **£1097m**

A2) Underground with GIL in a formed tunnel adjacent to M5, 4 tubes	£634m
Other costs including land (contingency)	£ 45m
40 year transmission losses, (Appendix A)	£152m

TOTAL underground GIL (4 tubes) tubes and 40 year transmission losses £ 831m

Outstanding questions Final submission:

- a) We still are awaiting 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 CO₂, see Appendix B.
2. Removes Electrical Fields and reduces Magnetic Fields dramatically.
3. Considerably reduced transmission losses (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 planning or OFGEM regulations.

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

We ask the IPC 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 CO₂ per year.

PC4P (OHL + Cable) creates an extra 40,558t of CO₂ more than PC4 (GIL)

This 57km would generate an extra 5.6 million tonnes of CO₂ 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.