

# **Poolbeg Incinerator**

## **EIS Climate Models**

### **A Critique of the Poolbeg 3 Model**

Notes to accompany PowerPoint presentation

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## Introduction

This critique is a detailed analysis of the third climate model presented by Dublin City Council in support of their application for a waste licence and permission to build a 600,000 tonne per annum incinerator in Poolbeg Dublin.

References for this incinerator:

- Case EF 2022            An Bórd Pleanála
- W0232-01            EPA Licence application

Please refer to our earlier critique of the Climate chapter and the first two models – Poolbeg 1 and Poolbeg 2. The presentation and narrative are available on [www.fiasco.ie](http://www.fiasco.ie) and also on the EPA website. These models were produced by Dr Edward Porter of AWN Consulting for DCC.

## Poolbeg Climate Models

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### Poolbeg Climate Models

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- Poolbeg 1
  - Published in the EIS
- Poolbeg 2
  - Submitted to Oral Hearing on 26<sup>th</sup> April 2007
- Poolbeg 3
  - Submitted to Oral Hearing on 28<sup>th</sup> May 2007

There are three Poolbeg climate models:

- One is published in the EIS itself.
- The second one was submitted to the ABP Oral Hearing in Croke Park on 26<sup>th</sup> April 2007.
- The third one was submitted to the resumed ABP Oral Hearing in the Gresham Hotel on 28<sup>th</sup> May.

The third model was submitted to the EPA on 24<sup>th</sup> July 2007.

In this document we analyse this third model.

## Poolbeg 3 – Assessment

**Poolbeg 3****Assessment**

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- **Waste Mix**
  - Sources – EPA & Dublin Waste Strategy
  - CCW and FCF
  - “Other” fraction
  
- **Electricity produced**
  - Incorrect MW hours used
  - CCGT Factor
  - CO2 avoided
  
- **Corrected Result**

We examined the waste mix. There were some differences in our assessment.

We looked at the electricity produced and we again had the same disagreement with Dr Porter on assessing the amount of electricity generated by the plant.

We produce a corrected result.

## Poolbeg 3 – Errors Found

### Poolbeg 3

### Errors Found

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- Waste Mix & Fractions
  
- Electricity Figures
  - Used directly
  - C Norgaard combustion calculation ignored
  - Without proven foundation
  
- Hours of operation
  - Uses 8000 for Electricity
  - Uses 8537 for District Heating

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The errors found in Dr Porter's model include:

- the waste mix which is dealt with on the next slide
- the figures for electricity have no derivation. That is to say they are straight numbers placed directly into his spreadsheet – for example 59.2 megawatts.

The calculation which was used in the previous model is now absent from the spreadsheet. There was an incinerator sheet in the earlier workbook for Poolbeg 2 and it quite properly led to an electricity output from the turbine of just under 60 MW.

In his statement of evidence Dr Porter says that the electricity generated is now 66 MW but this is an assertion without proper calculations to support it.

This assertion suggests that the furnace and the boiler would have to be sized even larger than the current design as described by Mr Norgaard. His current design is equal to the largest of such plants in Europe – the same size as the new incinerator in Line 6 in Vestforbraending.

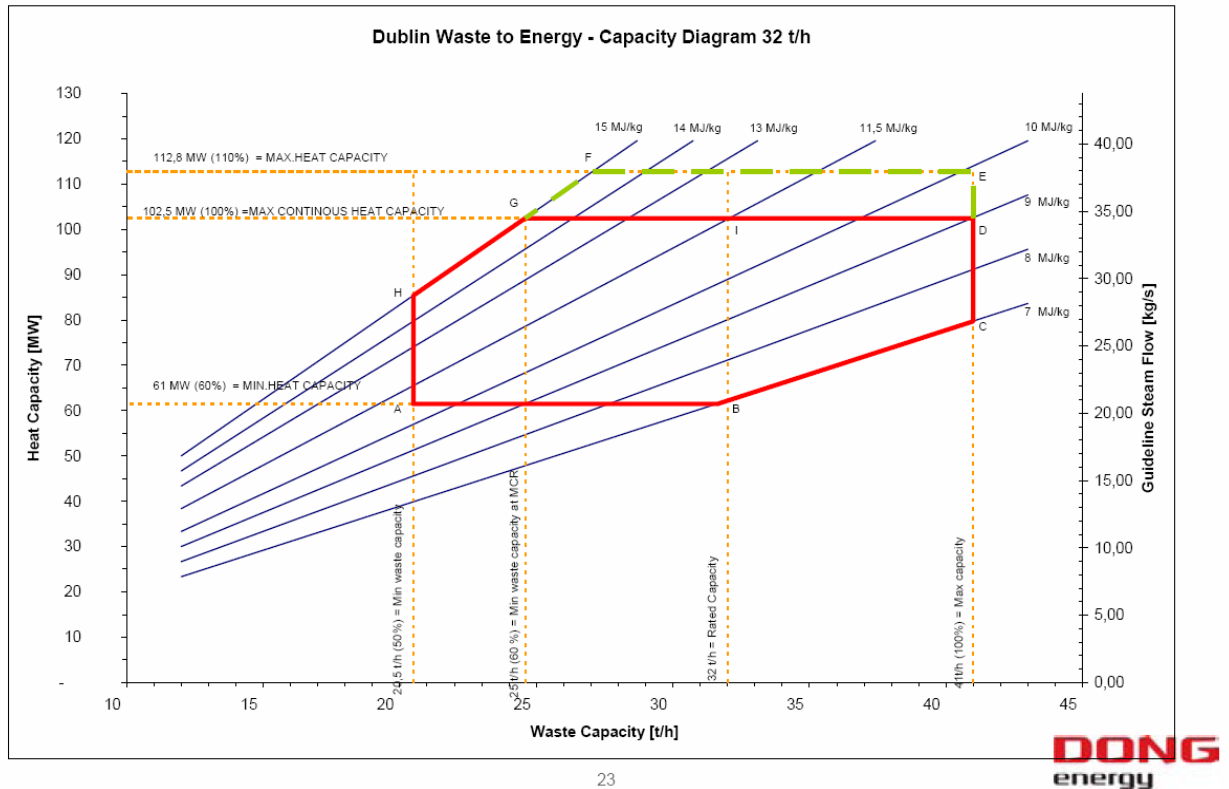
His current design is also at the maximum size of the AEB plant in Amsterdam where they are at the limit of modern incineration science and engineering.

However Dr Porter is asserting that he can produce more electricity than these plants.

This assertion is unbelievable. We would prefer to have these figures confirmed by the combustion design engineer which we presume would be Mr Norgaard.

The assertion made here for the electricity generated is without foundation and does not make sense in terms of the analysis already presented to the oral hearing by Mr Norgaard.

### Capacity diagram



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We carefully examined the capacity diagram which was presented by Mr Norgaard and we quizzed him on the physical capacity of his design.

He confirmed that the capacity diagram shows the maximum heat out put of the boiler is 102.5 MW. There are 2 boilers in this plant and therefore 205 MW is the maximum heat available. When this is multiplied by an ambitious efficiency factor of 29% provided by Mr Norgaard the result is 59.45 MW of electricity generated at the turbine.

In this model Dr Porter changed the hours of operation to 8,000 for electricity but he left it at 8,537 hours for his analysis district heating. This shows inconsistency and poor practice in his handling of the basic input figures for his modelling.

## Poolbeg 3 - Waste Mix & Fractions

**Poolbeg 3**

### Waste Mix & Fractions

	Waste Totals	Waste Fraction	% Dry Matter Content	Total Carbon Content (Dry)	Fossil Carbon Fraction	600000 CO2 Emissions (Tonnes/An num)
Paper	184,800	30.8%	90%	35%	0%	
Glass	16,200	2.7%	100%	0%	0%	
Plastic	87,600	14.6%	100%	51%	100%	163,812
Ferrous	8,400	1.4%	100%			
Aluminium	6,000	1.0%	100%			
Other Metals	6,000	1.0%	100%			
Textiles	41,400	6.9%	80%	50%	50%	37,950
Organics	178,200	29.7%	40%	44%	0%	577
WEEE	4,200	0.7%	100%			
Wood	4,800	0.8%	85%	50%	0%	
Others	62,400	10.4%	80%	50%	50%	57,200
						<b>259,539</b>

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Dr Porter changed the input waste model from Poolbeg 2 to Poolbeg 3 by introducing the waste composition used in the Dublin Waste Strategy model rather than the EPA waste mix. This change makes it difficult to retain like for like comparisons. We would prefer if he had been consistent.

Recall that Dr Porter's first calculation for Poolbeg 1 was 124,000 tonnes and the calculation using the IPCC defaults is 330,000 tonnes.

Dr Porter has reached 259,000 tonnes in Poolbeg 3. So he is moving towards the accepted norms found elsewhere by acknowledging some of the corrections put to him during cross examination.

However he has not accepted the correction of the CCW 51% factor for "Plastic" which should be 61% and the correction of what "Others" means as described by the EPA.

The factors of 51% and 50% highlighted in yellow are the same factors analysed in our critique of the Poolbeg 2 model so we correct them to 61% and 100% respectively.

That is a matter for judgement but we suggest that the "Others" fraction has a much higher fossil carbon fraction than he has allowed.

## Poolbeg 3 - Correction 1 - Waste Mix & Fractions

### Poolbeg 3

### Correction 1 - Waste Mix & Fractions

	Waste Totals	Waste Fraction	% Dry Matter Content	Total Carbon Content (Dry)	Fossil Carbon Fraction	600000 CO2 Emissions (Tonnes/An num)
Paper	184,800	30.8%	90%	35%	0%	
Glass	16,200	2.7%	100%	0%	0%	
Plastic	87,600	14.6%	100%	61%	100%	195,932
Ferrous	8,400	1.4%	100%			
Aluminium	6,000	1.0%	100%			
Other Metals	6,000	1.0%	100%			
Textiles	41,400	6.9%	80%	50%	50%	37,950
Organics	178,200	29.7%	40%	44%	0%	577
WEEE	4,200	0.7%	100%			
Wood	4,800	0.8%	85%	50%	0%	
Others	62,400	10.4%	80%	50%	100%	85,800
						<b>320,259</b>

**Error 60,720**

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The corrected figures are used here.

We have corrected the figures to CCW 61% for “Plastic” and FCF 100% for “Others”.

The bottom line when corrected is now 320,000 tonnes – a good deal higher than Dr Porter calculates.



## Poolbeg 3 - Correction 2 - Electricity Exported

### Poolbeg 3

### Correction 2 - Electricity Exported

Similar analysis to Poolbeg 2

	MW (1)	Hours (2)	MWhrs	Factor	CO <sub>2</sub> Avoided
Per Dr Porter	59.2	8,000	473,600	0.567	268,531
Corrected	53.2	8,000	425,600	0.4	170,240

**Error 98,291**

#### Corrections:

1. Internal electrical usage -6 MW
2. Planned and Forced Outages -17 days
3. Factor for avoided electricity

The second correction we apply is to the credit for electricity exported.

Dr Porter claims 59.2 MW but Mr Norgaard has told us that 6 MW are used in the plant therefore the net electricity for export is 53.2 MW not 59.2 MW.

The hours used are the same.

We have the same issues about which credit factor to allow for generated electricity as we discussed in our critique of Poolbeg 2.

Dr Porter claims a credit of 268,531 tonnes and we calculate a credit of much less at 170,240 tonnes – a difference of about 98,000 tonnes.

## Poolbeg 3 - Net position of Incineration after 2 Corrections

### Poolbeg 3

### Net position of Incineration after 2 Corrections

	Incineration	CO2	Electricity MW Hours	CO2 Avoided	Net
<b>Per Dr Porter</b>	600,000	259,539	473,600	268,531	<b>-8,992</b>
<b>As corrected</b>	600,000	320,259	425,600	170,240	<b>150,019</b>

**Error** **159,011**

#### Corrections:

1. Waste mix
  - Plastic CCW% to 61%
  - Textile FCF 50% to 100% and
  - Other to CCW 50% and FCF 100%
2. Internal electrical usage
  - 6 MW
  - Planned and Forced Outages -17 days
  - Factor for avoided electricity

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The net position after applying both corrections is as follows:

- Dr Porter has incineration just marginally beneficial. In his model the figure is actually -1,048 tonnes. We show it as -8,992 because we have ignored the contributions of methane and the N<sub>2</sub>O.
- We calculate that incineration actually emits 150,019 tonnes.

## Poolbeg 3 – Scenarios

### Poolbeg 3

### Scenarios

- Scenario 1 – Incineration v Landfilling
  - with reducing biogenic content
- Scenario 2 – Incineration v Landfilling
  - with reduced tonnage
- Scenario 3 – Incineration v Landfilling & AD
- Scenario 4 – Incineration v Landfilling & AD
  - with 50% gas capture
- Scenario 5 – Incineration v Landfilling & AD
  - with 50% gas capture and District Heating

These scenarios **cannot** be compared with those in **Poolbeg 1** or **Poolbeg 2**.  
And note that **carbon sequestration** has not been assessed.

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We now compare his scenarios with the alternatives.

Dr Porter did not include any assessment of sequestered carbon in the Poolbeg 3 Model.

Also note that the scenarios themselves are different because the initial waste mix for Scenario 1 in Model 3 has reduced biogenics so it is not the same as Scenario 1 in Model 2 and it is not the same as Scenario 1 in Model 1.

It is misleading to suggest that Scenario 1 is the same throughout these models.

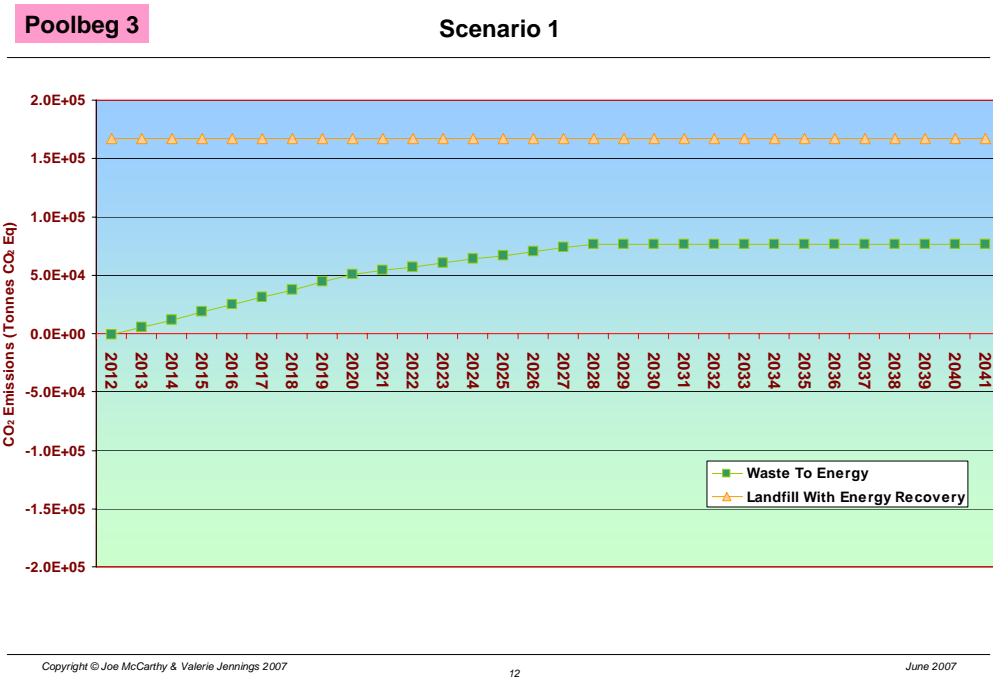
Hence the footnote on this slide. These scenarios can not be compared to those of Poolbeg 1 or Poolbeg 2 because there are different waste assumptions in each.

In total Dr Porter presents:

- two scenarios in Poolbeg 1
- twelve individual scenarios in Poolbeg 2
- five scenarios in Poolbeg 3

These various scenarios need to be straightened out, realigned, put on the same scale and then compared. Otherwise it is extremely difficult to compare like with like.

### Poolbeg 3 – Scenario 1

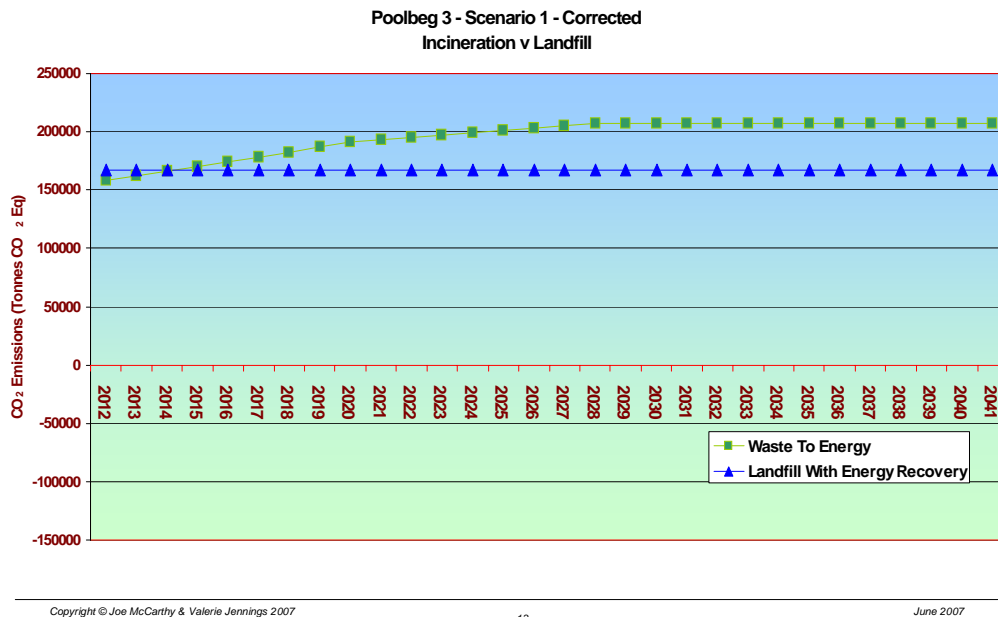


We were able to analyse just one graph because we had the graph for Scenario 1 – this is as published. It shows incineration on the green line as being just barely beneficial in 2012 and then becoming damaging over the period.

Landfill is shown without any calculation of the effects of carbon sequestration.

## Poolbeg 3 – Scenario 1 - Corrected

### Poolbeg 3



We recalculated Dr Porter's model with the corrections noted above and the difference in the green line for incineration line is significant.

Because Dr Porter omitted carbon sequestration in his Poolbeg 3 Model we were unable to run any comparison on this aspect.

This is a significant omission by him.

## Conclusion

We suggest that this third Poolbeg model is quite unreliable:

- Dr Porter has errors in the waste mix
- Dr Porter has errors in the electricity credit taken
- Dr Porter ignores the contribution of carbon sequestration

He has chosen to ignore the biogenic fraction even though the IPCC guidelines require him to report on this emission.

The model should be re-assessed by Dublin City Council, the statements in the EIS should be rewritten in the light of the corrected emissions and the EIS should be resubmitted to An Bórd Pleanála and the EPA.