Joe Reilly

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16 OCT 2007

From: Jonathan Derham
Sent: 15 October 2007 15:38
To: Joe Reilly
Subject: FW: W0232-01 Poolbeg Incinerator - further submission

Attachments: EPA submission - Narrative for Climate Critique JPMcC VJ.pdf

EPA submission - Narrative fo...

-----Original Message-----
From: Joe McCarthy [mailto:joe.mccarthy@arkaon.com]
Sent: 15 October 2007 15:32
To: Wexford Receptionist
Cc: Jonathan Derham
Subject: W0232-01 Poolbeg Incinerator - further submission

Dear Sirs,

Please find attached for the Office of Licensing & Guidance our further submission regarding the licensing application by Dublin City Council for an incinerator at Poolbeg, Dublin 4.

This submission contains a narrative to accompany the previous submission we made.

We would be grateful for an acknowledgement.

Joe can be contacted on 086 245 6788 and Valerie on 086 856 3614.

Regards,
Joe McCarthy & Valerie Jennings

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Poolbeg Incinerator

EIS Climate Models

A Critique

Notes to accompany PowerPoint presentation

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Joe McCarthy and Valerie Jennings
August 2007

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Table of Contents

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Introduction

An Analysis of the EIS Climate Chapter

Submission to the

Environmental Protection Agency

Waste Licence Application

W0232-01

Applicant:	Dublin City Council
Development:	Dublin Waste to Energy Facility
	Pigeon House Road
	Poolbeg Peninsula
	Dublin 4
Submission by:	Joe McCarthy & Valerie Jennings

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This critique is a detailed analysis of the Climate chapter and supporting models 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 Bord Pleanála
- W0232-01 EPA Licence application

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Agenda

- Three Poolbeg Models
  - Our Analysis
    - » of the first two models
    - » The Poolbeg 3 Model is not before the EPA as yet
  - Findings
  - Corrected Results
- Comparison of All Models
- Recent Climate Policy Changes
- Conclusion

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This is the agenda for the presentation:

- a detailed analysis of the three Poolbeg models presented by Dr Porter of AWN Consulting on behalf of DCC
- a comparison of those models together with his earlier models for Ringaskiddy and Meath and the IPCC model.
- our comments on recent climate policy changes.
- our conclusions

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We should emphasise that our analyses are not peer reviewed. Nor do we present ourselves as climate experts. Nevertheless we are able to do sums and we can check sources.

By doing both carefully we have found that the climate models presented by Dr Porter are fundamentally flawed. These models were commissioned from Dr Porter by Dublin City Council for the Poolbeg incinerator and by Indaver Ireland for the Meath incinerator planned for Carranstown.

Please review our rationale and our calculations for yourself. We are happy to stand corrected on any aspect of our critique.

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Poolbeg Climate Models

Poolbeg Climate Models

- Poolbeg 1
  - Published in the EIS
- Poolbeg 2
  - Submitted to Oral Hearing on 26th April 2007
  - Submitted to EPA via CD on 8th May 2007
- Poolbeg 3
  - Not submitted to the EPA as yet ?

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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 26th April 2007.
- The third one was submitted to the resumed ABP Oral Hearing in the Gresham Hotel on 28th May.

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Our Analysis

Our Analysis

- Checked back to sources
- Checked the sums
- Checked the assumptions
- Checked the results published

- We reran the models with corrections
  - We did not analyse every aspect of each model

  - Focussed on CO_2
  - Not N_2O or CH_4

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We have analysed each of the models to the extent that we could.

We checked each model for its inputs and its sources.

We checked the sums to see whether the arithmetic was correct.

We checked the assumptions used in developing the results and then we checked the results from the model against what was published in the EIS and in the Brief of Evidence.

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We reran the models with corrections.

We did not analyse every aspect of every model. That was too big a task.

We focussed on the CO_2 because it is by far the largest part of the emissions – it is about 97% of the problem.

We did not focus on the figures for nitrous oxide or for methane.

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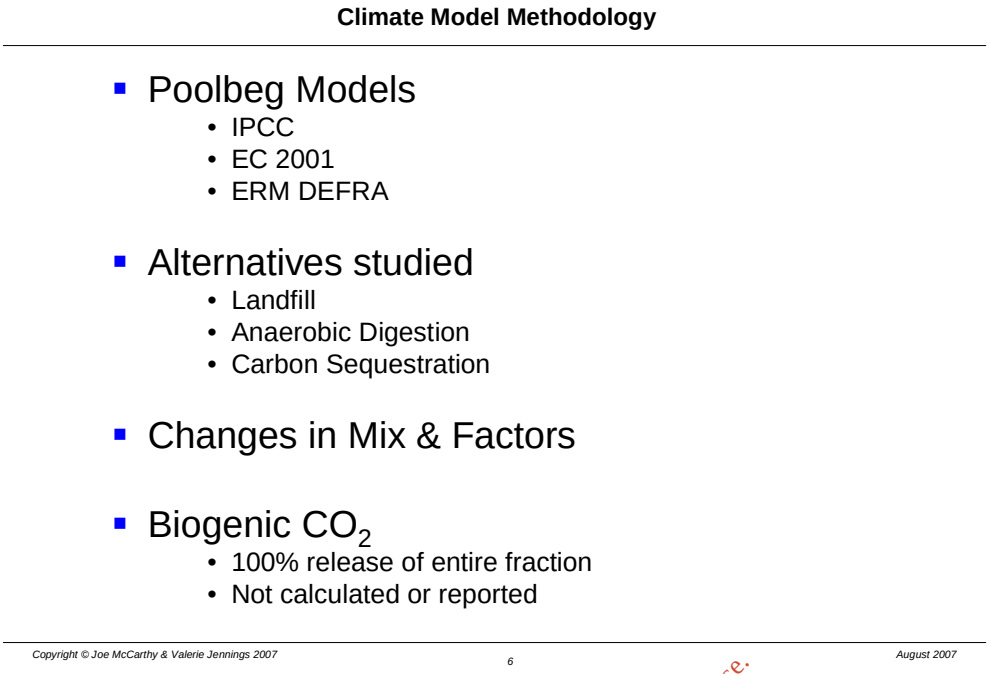
Climate Model Methodology



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The methodologies used by Dr Porter in the three Poolbeg models were based on recommendations from different sources but primarily from the IPCC.

Other sources were:

- the EC 2001 – Climate Options Report published in 2001
  "*Waste Management Options and Climate Change*" by AEA Technology

- the ERM report for DEFRA published in December 2006
  "*Carbon Balances and Energy Impacts of the Management of UK Wastes*"

- the ERM report for DEFRA published in January 2006
  "*Impact of Energy from Waste and Recycling Policy on UK Greenhouse Gas Emissions*"

Dr Porter studied alternatives to incineration:

- landfill with anaerobic digestion
- Carbon sequestration.

The impact of carbon sequestration was analysed by Dr Porter in the EIS but it was not emphasised in the EIS summaries or in the Non Technical Summary

In developing his various models, Dr Porter made changes in the waste mix and in the factors used for CCW and FCF.

- CCW is the carbon content for a given waste fraction
- FCF is the fossil carbon fraction of that particular waste fraction

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He did not study the emission of biogenic CO_2 even though this is a requirement of the IPCC protocol.

We make a short study of overall CO_2 emission and will present this at the end.

We believe this is the most important aspect of the emissions from this plant because of the immediate and short term impact on the climate.

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Poolbeg 1 – Assessment

Poolbeg 1 **Assessment**

- Waste Mix
  - Sources - EPA, EC 2001
  - CCW and FCF
  - "Other" fraction
- Electricity produced
  - Incorrect MW hours used
  - CCGT Factor
  - CO_2 avoided
- Mistakes in the sums
- Corrected Result

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We based our corrections on our own analysis and on the responses made by Dr Porter during our cross examination of him when he presented his Brief of Evidence.

We had disagreement with Dr Porter on the waste mix.

We had disagreement on electricity produced and the factors used for credit allowed for this electricity.

We found serious mistakes in Dr Porter's arithmetic.

We present the corrected results.

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Poolbeg 1 – Waste Mix – Error in Percentage Sums

Poolbeg 1 **Waste Mix – Error in Percentage Sums**

Per Table A8.2

	Composition	%carbon	CCW weighted	% fossil	FCF weighted	Should be
	a	b	a * b	c	a * c	a * b * c
Paper	24.5%	33%	8.1%	0%	0.0%	0.0%
Organics	36.7%	19%	7.0%	0%	0.0%	0.0%
Plastic	13.2%	61%	8.0%	100%	13.2%	8.0%
Glass	3.0%	0%	0.0%	0%	0.0%	0.0%
Metals	3.1%	0%	0.0%	0%	0.0%	0.0%
Textiles	8.1%	39%	3.2%	50%	4.0%	1.6%
Others	11.4%	24%	2.7%	29%	3.3%	0.8%
			29.0%		20.5%	10.4%
					5.95%	

Note: CCW and FCF factors taken directly from EC 2001 Waste Management Options and Climate Change

CO_2 emissions (tonnes/yr) = Si(IWi x CCWi x FCFi x EFi x 44/12)

Per Dr Porter	Waste	CCW	FCF	EF	Conv to CO_2	Result
	1,000	29%	20.6%	0.95	3.67	**208**
	600,000	29%	20.6%	0.95	3.67	**124,857**
			Average F C%			
			5.97%	a * b * a * c		

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This table A8.2 is the waste mix. We discovered a serious arithmetical error here.

The weighting factor for the waste composition was applied to the carbon content to calculate a weighted CCW.

However the composition weighting factor was applied a second time to the fossil percentage to calculate a weighted FCF.

This resulted in the composition weighting factor being applied twice as can be seen here in column a * b and column a * c.

When applied correctly the result for weighted FCF should be 10.4% as can be seen in column a * b * c.

However based on his calculations Dr Porter produced an average FC % of 5.9% about half of what it should be.

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Poolbeg 1 – Correction 1 – Waste Mix Percentage Sums

Poolbeg 1 **Correction 1 – Waste Mix Percentage Sums**

CO2 emissions (tonnes/yr) = Si(IWi x CCWi x FCFi x EFi x 44/12)

Per Dr Porter	Waste	CCW	FCF	EF	Conv to CO_2	Result
	1,000	29%	20.6%	0.95	3.67	208
	600,000	29%	20.6%	0.95	3.67	**124,857**
			Average F C%			
	Error		5.97%	a * b * a * c		

CO2 emissions (tonnes/yr) = Si(IWi x CCWi x FCFi x EFi x 44/12)

Per JPMcC	Waste	CCW & FCF	EF	Conv to CO_2	Result
	1,000	10.4%	0.95	3.67	363
	600,000	10.4%	0.95	3.67	**217,700**
		Average F C%			
		10.4%	a * b * c		

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The correction of this error is to adjust the calculated CO_2 emission from 124,857 tonnes per Dr Porter up to 217,700 tonnes per JPMcC.

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Poolbeg 1 – Error in CCW & FCF for "Other" Fraction

Poolbeg 1 **Error in CCW & FCF for "Other" Fraction**

Per Table A8.2

			CCW		FCF
	Composition	%carbon	weighted	% fossil	weighted
	a	b	a * b	c	a * c
Paper	24.5%	33%	8.1%	0%	0.0%
Organics	36.7%	19%	7.0%	0%	0.0%
Plastic	13.2%	61%	8.0%	100%	13.2%
Glass	3.0%	0%	0.0%	0%	0.0%
Metals	3.1%	0%	0.0%	0%	0.0%
Textiles	8.1%	39%	3.2%	50%	4.0%
Others	11.4%	24%	2.7%	29%	3.3%
			29.0%		20.5%

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There was a mistake by Dr Porter in his interpretation of the "Others" fraction.

Dr Porter used 24% and 29% for the CCW and FCF respectively.

His factors are based on a mistaken description for the "Others" fraction. See the next slide for a detailed analysis.

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Poolbeg 1 – Correction 2 – CCW & FCF for "Other" Fraction

Poolbeg 1 **Correction 2 – CCW & FCF for "Other" Fraction**

Per JPMcC

with adjusted CCW and FCF for "Other"

Waste input		1000							
	Composition	Tonnes IW	%carbon CCW	Carbon	% fossil FCF	Fossil Carbon	EF	Conv	Result
Paper	24.5%	245	33%	81	0%	0	0.95	3.67	0
Organics	36.7%	367	19%	70	0%	0	0.95	3.67	0
Plastic	13.2%	132	61%	80	100%	80	0.95	3.67	280
Glass	3.0%	30	0%	0	0%	0	0.95	3.67	0
Metals	3.1%	31	0%	0	0%	0	0.95	3.67	0
Textiles	8.1%	81	39%	32	50%	16	0.95	3.67	55
Others	11.4%	114	50%	57	75%	43	0.95	3.67	148
		1,000		319		139			**484**
Waste		600,000		191,684		83,302			**290,168**
					Real F C%				
					13.9%		Entire Carbon Emitted		667,700

Note: "Others" mainly refers to composites, fine elements such as ash, unclassified incombustibles and unclassified combustibles including wood wastes. [Dr Porter footnote to Table 8.3 in Appendix 8.2] [**EPA 1998**]

Others: Includes cooking oil, mineral oil, batteries, composite packaging, tyres and 70,139 tonnes of residues from mechanical treatment of mixed municipal waste shipped to Germany and Northern Ireland for recovery and recycling respectively. [**EPA 2004**]

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We correct these factors to 50 and 75% respectively. This is judgemental on our part and is based on the two notes detailed here:

1. The first note is the original note in the Irish EPA waste mix report from 1998. This note was quoted by Dr Porter in the climate model presented in the Ringaskiddy EIS. The note used in the Meath EIS was identical.

2. The actual description in EPA 2004 of the "Others" fraction is quoted in the second Note. It includes "*cooking oil, mineral oil, batteries, composite packaging, tyres and 70k tonnes of residues shipped to Germany and Northern Ireland*".

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Our assessment of this second description of "Others" indicates that it would have significant fossil carbon content given that it is mainly oil, batteries, tyres and composite packaging which would contain plastic.

We judged that the carbon content was 50% with an FCF of 75%.

Applying these corrections to Dr Porter's model results in the emission total rising to 290,168 tonnes per annum.

We also draw attention to the entire carbon fraction which is calculated here.

This is 319 tonnes of carbon per 1000 tonnes of waste which when multiplied by 0.95 and 3.67 to get CO_2 results in 667,700 tonnes CO_2 eq per annum

This is the total CO_2 – biogenic and fossil – emitted by this plant per annum.

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Poolbeg 1 – Corrected Calculation of CO_2 Emission

Poolbeg 1 **Corrected calculation of CO_2 emission**

Per IPCC 1996	Waste	CCW	FCF	EF	Conv to CO_2	Result
	1,000	40%	40.0%	0.95	3.67	557
	600,000	40%	40.0%	0.95	3.67	**334,400**

Average F C%
16.0%

Corrected Model **290,168**

Take mid point of IPCC and JPMcC estimates **310,000**

EIS amount 124,857

Dr Porter is out by a factor of **2.5**

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Using the IPCC 1996 factors results in an FCF of 16% yielding an emission of 334,400 tonnes.

Our corrected model from the previous slide produced 290,168 tonnes.

We took the midpoint of these two figures and we suggest that 310,000 tonnes per annum is the figure to contrast with Dr Porter's result of 124,857 tonnes.

Dr Porter is wrong by a factor of 2.5.

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Poolbeg 1 – Credit for Electricity Exported

Poolbeg 1 **Credit for Electricity Exported**

Per Dr Porter
Table 8.6

MW	Hours	MWhrs	Factor	CO_2 Avoided
60	8,760	525,600	0.4	**210,240**

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Dr Porter makes an assessment of electricity produced.

He uses 60 MW for a full year of 8,760 hours to get 525,600 MW hours.

He applies a credit factor of 0.4 tonnes per MWh – this is the CCGT factor - and he claims a credit of 210,240 tonnes avoided.

There are several mistakes in this calculation.

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Poolbeg 1 – Correction 3 - Electricity Exported

Poolbeg 1 **Correction 3 - Electricity Exported**

	MW (1)	Hours (2)	MWhrs	Factor	CO_2 Avoided
Per Dr Porter	60	8,760	525,600	0.4	**210,240**
Per C Norgaard	53.45	8,352	446,414	0.4	**178,566**

Error **31,674**

Corrections:

1. Internal electrical usage -6 MW
2. Planned and Forced Outages -17 days

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The plant designer, Mr Claus Norgaard, stated during cross examination that this plant would be out of service from time to time for two reasons:

- planned outages – 3 weeks of maintenance every 18 months – 14 days per annum
- forced outages – 3 outages of 1 to 3 days each per annum – 3 days

We therefore deduct 17 days per annum due to outages yielding the 8,352 hours which we apply here.

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Mr Norgaard stated that the turbine itself produces 59.45 MW. However the plant uses 6 MW for internal processes so we must deduct 6 MW from the 59.45 MW yielding 53.45 MW for export to the national grid.

The corrected CO_2 avoided is therefore 178,566 tonnes. This represents a reduction of 31,674 tonnes in the credit claimed for electricity.

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Poolbeg 1 – Net Position of Incineration after 3 Corrections

Poolbeg 1 **Net Position of Incineration after 3 Corrections**

	Incineration	CO2	Electricity MW Hours	CO2 Avoided	Net
Per Dr Porter	600,000	124,857	525,600	210,240	**-85,383**
As corrected	600,000	310,000	446,414	178,566	**131,434**
				Error	**216,817**

Corrections:

1. Waste mix % calculation error
2. Waste mix "Other" fraction
3. Internal electricity usage of 6 MW and Planned and Forced Outages of 17 days

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Dr Porter calculated the impact of incineration of 600,000 tonnes of MSW as being beneficial to the environment to the tune of -85,383 tonnes per annum.

When we correct for the 3 identified errors:

- the waste composition,
- the CO_2 fraction and
- the electricity credit,

we calculate that incineration is damaging to the environment by 131,434 tonnes pa.

The combined error in Dr Porter's calculations is some 217,000 tonnes per annum of CO_2.

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Poolbeg 1 – Scenarios

Poolbeg 1 **Scenarios**

- Incineration
  - Landfill
    + Carbon sequestration
  - Landfill with AD
    + Carbon sequestration

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The emissions from incineration are compared to alternatives in Scenarios presented by Dr Porter.

These are:

- Scenario 1 - landfill with or without carbon sequestration
- Scenario 2 - landfill and anaerobic digestion with or without carbon sequestration.

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Poolbeg 1 - Scenario 1 - Landfill

Poolbeg 1 **Scenario 1 - Landfill**

Per Dr Porter
Table 8.6

	Tonnes CO_2 Eq per annum
Landfill total emissions	173,600
Greenhouse gas avoid	-13,200
Total after allowing power generation	**160,400**
Greenhouse gas sequestered	-216,000
Total after power generation with carbon sequestration	**-55,600**

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Dr Porter has modelled the landfill emissions and greenhouse gas avoid for landfill and also for sequestered carbon.

These calculations remained the same from his model for Poolbeg 1 to his model for Poolbeg 2. Both are based on the US EPA LandGEM model.

For Poolbeg 3 he based his calculations on a variant of the gas emission model from the IPCC.

Both sources produce similar results which we did not further analyse.

However, Dr Porter did not apply the landfill with carbon sequestration analysis to his reported conclusions.

He initially compared and published as his first conclusion a comparison of the emissions from incineration with emissions from landfill alone. He claimed a beneficial differential of -245,783 tonnes in favour of incineration.

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Poolbeg 1 - Scenario 1 after Corrections

Poolbeg 1 **Scenario 1 after Corrections**

Incineration v Landfill

	Incineration	Landfill	Landfill + Carbon Sequestration	Net
Per Dr Porter	-85,383	160,400		**-245,783**
As corrected	131,434		-55,600	**187,034**
			Error	**432,817**

This model **proves** that landfill with carbon sequestration is **better** than incineration!

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Dr Porter should have compared incineration with the more favourable alternative namely landfill with carbon sequestration which is actually beneficial to the climate by -55,000 tonnes.

When this is compared to the corrected emissions from incineration the differential between the two shows incineration is damaging to the climate to the extent of 187,034 tonnes per annum by comparison to landfill with carbon sequestration.

We believe that this calculation, which is based entirely on Dr Porter's model as corrected, proves that landfill with sequestration is better than incineration.

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Poolbeg 1 - Scenario 2 – Landfill & Anaerobic Digestion

Poolbeg 1 **Scenario 2 – Landfill & Anaerobic Digestion**

Per Dr Porter
Table 8.10

	CO2 Tonnes Eq per annum
Landfill 357,780 tonnes	44,000
Greenhouse Gas Avoid	-7,871
Net Flux from AD of 242,220 tonnes	-5,087
Total	**31,042**
Carbon Sequestered –AD	-1,696
Carbon Sequestered –Landfill	-128,000
Total after electricity avoid and carbon sequestration	**-98,653**

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In Scenario 2 Dr Porter assesses emissions from two processes:

- Anaerobic Digestion of 242,220 tonnes of putrescible waste
- Landfill of the balance of the MSW - 357,780 tonnes

We accept the figures that Dr Porter has published in Table 8.10:

- 31,042 tonnes CO_2 eq from Landfill with AD
- -98,000 tonnes CO_2 eq from Landfill with AD with carbon sequestration

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Poolbeg 1 - Scenario 2 after Corrections

Poolbeg 1 **Scenario 2 after corrections**

Incineration v Landfill & Anaerobic Digestion

	Incineration	Landfill & AD	Landfill & AD with Carbon Sequestration	Net
Per Dr Porter	-85,383	31,042		**- 116,425**
As corrected	131,434		-98,653	**230,087**
			Error	**346,512**

This model **proves** that landfill & AD with carbon sequestration is **much better** than incineration!

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Dr Porter still claims that emissions from incineration are beneficial to the extent of -116,425 tonnes per annum.

However the more advantageous alternative this time of LF +AD +sequestration is even better than the previous scenario but again Dr Porter chooses not to compare incineration to this alternative.

When we take the corrected incineration emissions of 131,434 tonnes and compare to the -98,653 tonnes from the better alternative, the differential shows that incineration is damaging to the climate by nearly a quarter million tonnes per annum.

We believe that this model proves that landfill with AD with carbon sequestration is *much* better than incineration.

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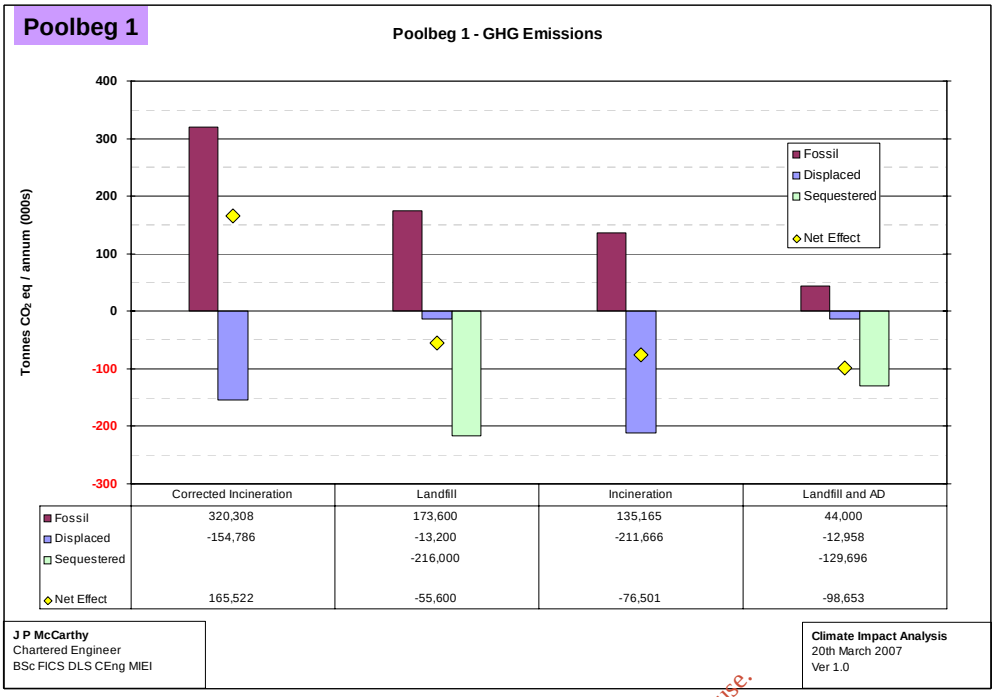
Poolbeg 1 – GHG Emissions



This graph was produced from an earlier analysis of the Poolbeg 1 model as published in the EIS.

The yellow diamonds show the net position for each scenario.

The third set is the incineration position as claimed by DCC with a claim that incineration was beneficial to the environment. Contrast this claim with the corrected emission shown in the first set where the yellow diamond is above the line (and therefore damaging to the climate).

The light green columns below the axis represent the carbon sink where carbon is sequestered in the landfill.

Sequestration helps make the net effect of landfill by itself beneficial at -55,600 tonnes. Sequestration also helps make landfill with AD even more beneficial at -98,653 tonnes per annum.

The net position for either landfill option is beneficial.

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Poolbeg 2 – Assessment

Poolbeg 2 **Assessment**

- Waste Mix
  - Sources - EPA, EC 2001
  - CCW and FCF
  - "Other" fraction
- Electricity produced
  - Incorrect MW hours used
  - CCGT Factor
  - CO_2 avoided
- Corrected Result

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We applied the same techniques to analyse the Poolbeg 2 Model as were used in analysing Poolbeg 1:

- the waste mix
- the carbon fractions
- the electricity produced
- the avoided CO_2

We produced a corrected result after adjusting for Dr Porter's mistakes and his errors in interpretation.

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Poolbeg 2 – Waste Mix & Factors

Poolbeg 2 **Waste Mix & Factors**

From sheet "incineration calculations"

2005 Scenario						600000
	Tonnage	Waste Fraction	% Dry Matter Content	Total Carbon Content (Dry)	Fossil Carbon Fraction	CO2 Emissions (Tonnes/Annum)
Paper	449,957	24.7%	90.0%	35.4%	0.0%	
Glass	53,461	2.9%	100.0%	0.3%	0.0%	
Plastic	241,423	13.2%	100.0%	51.3%	100.0%	149,375
Ferrous	24,204	1.3%	100.0%	0.0%	0.0%	
Aluminium	20,280	1.1%	100.0%	0.0%	0.0%	
Other Metals	12,521	0.7%	100.0%	0.0%	0.0%	
Textiles	146,790	8.0%	80.0%	24.9%	50.0%	17,633
Organics	667,513	36.6%	40.0%	35.8%	0.2%	231
WEEE	12,312	0.7%	100.0%	0.0%	0.0%	
Wood	13,939	0.8%	85.0%	50.0%	0.0%	
Others	181,665	10.0%	90.0%	11.0%	50.0%	10,796
Total Fossil Fuel	367,501					
Total Non-Fossil Fuel	1,456,564					
Total	1,824,065	100.0%	72.9%	32.1%	22.3%	**178,036**

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The errors made by Dr Porter are highlighted in yellow on this chart.

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Textiles CCW 24.9%

The source percentages for CCW and FCF for "Textiles" used by Dr Porter were taken from ERM DEFRA "*Impact of Energy from Waste and Recycling Policy on UK Greenhouse Gas Emissions*" January 2006

The basis for these figures is found in Table 1.2 *Waste Fraction Carbon Content* on page D1.

Dr Porter made an interpretation error from this source material because the figure for textiles was already assessed by ERM DEFRA as the fossil fraction.

Therefore his use of 50% for FCF should not be applied. Rather the carbon content of 24.9% must be used directly (effectively using an FCF of 100%).

Plastic CCW 51.3%

We take issue with the decision by Dr Porter to reduce the carbon content for plastic from 61% to 51%.

Dr Porter took this figure from page A38 of the ERM DEFRA report "*Carbon Balances and Energy Impacts of the Management of UK Wastes*" produced in December 2006.

The table from page A38 is reproduced below:

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Table A1.26 Estimated UK MSW Composition

Waste Fraction	England ('000 Tonnes, 2003/04 Arisings)	Wales ('000 Tonnes, 2003/04 Arisings)	Scotland ('000 Tonnes, 2003/04 Arisings)	Northern Ireland ('000 Tonnes, 2003/04 Arisings)	Total	% of Total	% Carbon (Biogenic)[2]	% Carbon (Fossil)[2]	Gross Calorific Value (MJ/kg)[2]
Paper and card	5234	381	660	187	6462	18%	32%		12.6
Plastic film	780	51	107	31	969	3%		48%	23.6
Dense plastic	1012	82	166	54	1313	4%		55%	26.7
Textiles	703	33	121	19	876	2%	20%	20%	16.0
Absorbent hygiene products	650	42	92	24	807	2%	15%	4%	8.0
Wood	918	51	73	29	1070	3%	44%		18.3
Other combustibles[1]	433	127	138	73	771	2%	19%	19%	15.6
Non-combustibles	3574	145	481	62	4262	12%	3.5%	3.5%	2.8
Glass	1934	105	184	68	2291	6%	0.3%		1.5
Ferrous metal	469	85	127	38	719	2%			
Non-ferrous metal	125	15	38	9	186	1%			
Kitchen waste	5016	323	552	204	6095	17%	14%		5.3
Green waste	5601	231	305	145	6282	18%	17%		6.5
Fine material <10mm	1176	94	69	56	1395	4%	7%	7%	4.8
Waste Electrical and Electronic Equipment	1305	36	32	21	1394	4%		16%	7.6
Hazardous Household Waste Items (inc. batteries)	180	15	171	8	374	1%		30%[3]	12.4[3]
Total	**29,109**	**1815**	**3317**	**1027**	**35,268**	**100%**	**14%**	**6%**	**8.4**

Sources:

- The Composition of Municipal Waste in Wales. National Assembly for Wales (NAW)/ AEAT Technology - December 2003.
- Parfitt, J. (2002). Analysis of household waste composition and factors driving waste increases. WRAP, Banbury. http://www.number-10.gov.uk/su/waste/report/downloads/composition.pdf
- SEPA (2005) Waste Data Digest 5. http://www.sepa.org.uk/pdf/publications/wds/wdd_5.pdf
- Assessment of the Best Practicable Environmental Option for Waste Management in Northern Ireland: Development and Analysis (ERM 2005)
- Towards Resource Management (EHSNI, 2005), Annex 2 "Waste stream summaries"

Notes:

1. Includes furniture
2. Source: National Household Waste Analysis Programme NHWAP (1992/3). UK Department of Environment
3. Average values for the category used.

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The column headings on the right of the table show three columns – one for biogenic carbon, one for fossil carbon and one for gross calorific value – each of which has a footnote of 2.

Although this report is published in 2006, footnote 2 indicates – "Source: National Household Waste Analysis Programme NHWAP (1992/3). UK Department of Environment".

This figure for CCW of plastic is criticised on page 113 of the report "*Waste Management Options and Climate Change*" by AEA Technology for the EC in 2001.

Page 113 is reproduced below:

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Appendix 3. Incineration Final Report

Carbon contents were derived mainly from the UK analysis of household waste [44]. However, the carbon content of plastic waste derived from this study (52%) seemed low in comparison with other estimates and was therefore adjusted on the basis of more recent figures shown in Table A3.34. The composition of EU plastic waste (the mix of resins) was taken from APME data [49]. The carbon content of pure resins was worked out based on their chemical formulae, and the net calorific value of the resins were taken from [50]. The carbon content and calorific value of wet waste was then worked out assuming a typical 10% water content.

Table A3.34 Carbon content and calorific value of plastic waste. See references 49 & 50.

		Pure resin		Wet waste	
Plastic	% of EU plastic waste	carbon content	Net CV MJ/kg	carbon content	Net CV MJ/kg
LDPE[a]	21%	86%	45	70%	38.68
HDPE	18%	86%	45	70%	38.68
PP	20%	86%	46	70%	38.68
PVC	9%	38%	18	39%	18.08
PET	9%	63%	22	55%	22.7
PS	11%	92%	41	70%	34.75
PU	3%	58%	25	52%	22.26
Others	9%	75%	35	61%	31
Weighted average	**100%**	**78%**	**35**	**61%**	**31**

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APME is the Association of Plastics Manufacturers in Europe.

Note the column for carbon content of plastic where the AEA authors derive a percentage of 61%. This is the CCW we use in our corrected model.

We point out that Dr Porter used the 61% figure in his Poolbeg 1 model. Having put our criticism as detailed above to Dr Porter during his cross examination we were surprised to note that he retained the 51% figure in his Poolbeg 3 model. He has not provided a solid rationale for continuing to use this low figure in his Poolbeg 3 model

Others CCW 11%

A similar error to that made in Poolbeg 1 was made by Dr Porter when interpreting the CCW and FCF factors for the "Others" waste fraction. The mix for "Others" used by him is unchanged from the Poolbeg 1 Model.

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Poolbeg 2 – Correction 1 - Waste Mix & Factors

Poolbeg 2 **Correction 1 - Waste Mix & Factors**

From sheet "incineration calculations"

2005 Scenario						600000
	Tonnage	**Waste Fraction**	**% Dry Matter Content**	**Total Carbon Content (Dry)**	**Fossil Carbon Fraction**	**CO2 Emissions (Tonnes/Annum)**
Paper	449,957	24.7%	90.0%	35.4%	0.0%	
Glass	53,461	2.9%	100.0%	0.3%	0.0%	
Plastic	241,423	13.2%	100.0%	61%	100.0%	177,620
Ferrous	24,204	1.3%	100.0%	0.0%	0.0%	
Aluminium	20,280	1.1%	100.0%	0.0%	0.0%	
Other Metals	12,521	0.7%	100.0%	0.0%	0.0%	
Textiles	146,790	8.0%	80.0%	24.9%	100.0%	35,267
Organics	667,513	36.6%	40.0%	35.8%	0.2%	231
WEEE	12,312	0.7%	100.0%	0.0%	0.0%	
Wood	13,939	0.8%	85.0%	50.0%	0.0%	
Others	181,665	10.0%	90.0%	50.0%	100.0%	98,598
Total Fossil Fuel	367,501					
Total Non-Fossil Fuel	1,456,564					
Total	1,824,065	100.0%	72.9%	32.1%	22.3%	**311,715**

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Our corrections of Dr Porter's figures are shown in green on this chart.

- We correct the 51% to 61% for plastic
- We correct the 50% to 100% for the fossil fraction of the "Textiles" fraction
- We reinterpret as we did for Poolbeg 1 the content of "Others" for carbon because of the difference in the waste description by the EPA.

The bottom line CO_2 eq emission calculated by Dr Porter was 178,036 tonnes per annum whereas after correction the GWP stands at 311,715 tonnes per annum.

This is a significant increase.

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Poolbeg 2 – Credit for Electricity Exported

Poolbeg 2 **Credit for Electricity Exported**

Per Dr Porter
Table 8.6

MW (1)	Hours (2)	MWhrs	Factor	CO_2 Avoided
59.45	8760	520,782	0.567	**295,283**

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Dr Porter claims 59.45 MW as the electricity generated by the plant and he also claims the plant produces this quantity of electricity for 8,760 hours per annum.

8760 hours is 365 * 24 so Dr Porter does not allow for planned and forced outages when the plant will not be running.

Dr Porter here uses a much higher factor of 0.567 for credit for CO_2 avoided. This factor is based on the SEI average electricity mix for the country adjusted for application in 2012.

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Poolbeg 2 – Correction 2 - Electricity Exported

Poolbeg 2 **Correction 2 - Electricity Exported**

	MW (1)	Hours (2)	MWhrs	Factor	CO_2 Avoided
Per Dr Porter	59.45	8760	520,782	0.567	**295,283**
Per C Norgaard	53.45	8,352	446,414	0.4	**178,566**
				Error	**116,718**

Corrections:

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

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There is an important question to be decided by the Board as to whether the credit for electricity avoided should be credited as displaced electricity or marginal electricity.

- Displaced electricity is produced by coal and peat plants.
- Marginal electricity in this country today is CCGT and renewable.

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However in the Irish market, where electricity demand is rising, displacement does not take place at all.

We suggest that credit should only be allowed at the GWP cost of marginal electricity.

Thus the credit should not be at 0.567. It should be at 0.2 which is the average of 0.0 for renewables and 0.4 for CCGT.

In our correction we used the 0.4 factor but we recommend that the 0.2 factor should be considered in the context of redeveloping a full climate model for this proposed plant.

Our corrections for electricity exported therefore are:

1. We corrected the electricity produced from 59.45 MW to 53.45 MW by taking into account the 6 MW consumed internally by the plant.
2. We corrected the number of hours per annum to 8,352 which takes into account the 17 days of planned outages and forced outages as confirmed by Mr Claus Norgaard.
3. We corrected the credit factor from 0.567 to 0.4.

Dr Porter's claimed credit of 295,000 tonnes per annum of CO_2 eq drops to 178,000 tonnes per annum.

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Poolbeg 2 – Net Position of Incineration after 2 Corrections

Poolbeg 2 **Net position of Incineration after 2 Corrections**

	Incineration	CO2	Electricity MW Hours	CO2 Avoided	Net
Per Dr Porter	600,000	178,036	520,782	295,283	**-117,247**
As corrected	600,000	311,715	446,414	178,566	**133,149**
				Error	**250,397**

Corrections:

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

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Dr Porter claims that incineration is beneficial to the environment by -117,247 CO_2 eq tonnes per annum.

When corrected we show that incineration is damaging to the environment by 133,149 CO_2 eq tonnes per annum.

This is a difference of ¼ million tonnes per annum.

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Poolbeg 2 – Scenarios

Poolbeg 2 **Scenarios**

- Scenario 1 – Incineration v Landfilling
- Scenario 2 – Incineration v Landfilling & AD
- Scenario 3 – Incineration v Landfilling
  - with reducing tonnages
- Scenario 4 – Incineration v Landfilling
  - with reducing biogenic content
- Scenario 5 – Incineration v Landfilling
  - As Scenario 4 with reducing gas capture
- Scenario 6 – Incineration v Landfilling & AD
  - with carbon sequestration
- Scenario 7 – Incineration v Landfilling
  - with 80,000 tonnes sludge
- Scenario 8 – Incineration v Landfilling & AD
  - with carbon sequestration and District Heating

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In his Poolbeg 2 model Dr Porter presents a large number of scenarios.

We have chosen to evaluate two in detail:

- "Incineration and Landfill" and
- "Incineration and Landfill with Anaerobic Digestion".

These two scenarios are analysed with and without the effect of carbon sequestration.

There is some merit in examining the impact of reducing tonnages and the impact of reducing biogenic content. However these changes make small differences and we believe the many scenarios only serve to distract from the main point:

- Incineration of this volume of waste in the proposed incinerator is damaging to the environment as opposed to being beneficial.

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Poolbeg 2 – Scenario 1 – Landfill

Poolbeg 2 **Scenario 1 - Landfill**

Per Dr Porter
Scenario 1 from spreadsheet

	Tonnes CO_2 Eq per annum
Landfill total emissions	170,245
Greenhouse gas avoid	-13,200
Total after allowing power generation	**157,045**
Greenhouse gas sequestered [from Anaerobic Digestion sheet]	-201,667
	- 44,622

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These are Dr Porter's landfill calculations and sequestration calculations as published.

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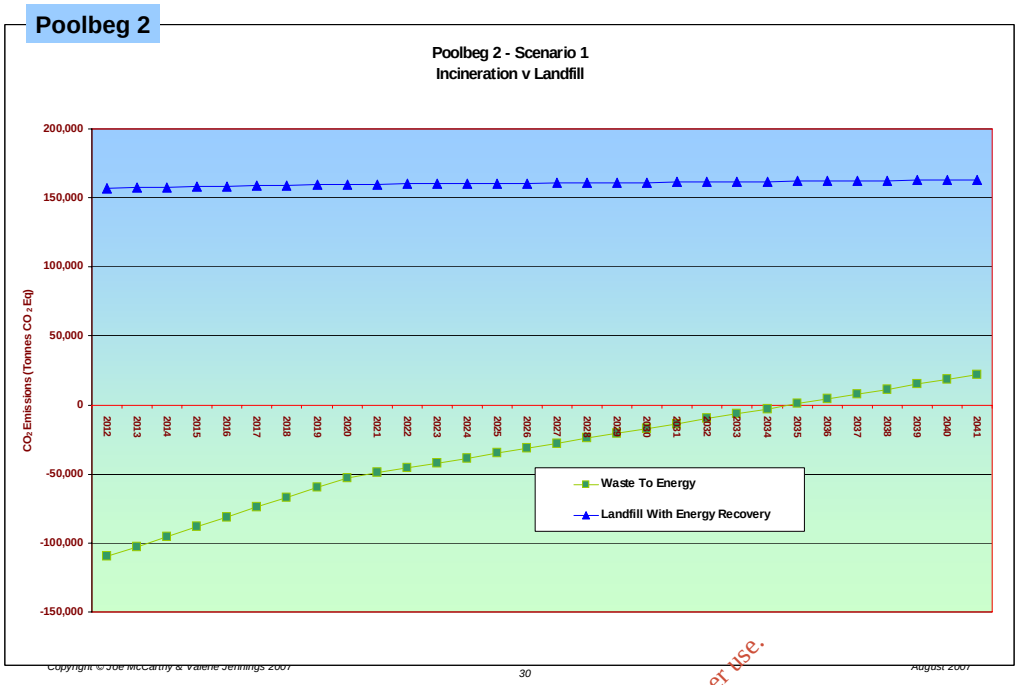
Poolbeg 2 – Scenario 1 – Landfill - Graph



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August 2007

This is the original graph published by Dr Porter for Scenario 1 in his Croke Park submission to ABP.

This graph shows the Waste to Energy line as a green line which starts well below the x-axis indicating it is beneficial to the environment.

As time goes by its credit diminishes because the electricity being displaced in Dr Porter's approach is getting less and less good. Eventually incineration becomes damaging to the environment by a small amount.

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Poolbeg 2 – Scenario 1 after Corrections

Poolbeg 2 **Scenario 1 after corrections**

Incineration v Landfill

	Incineration	Landfill	Landfill with Carbon Sequestration	Net
Per Dr Porter	-117,247	157,045		**-274,292**
As corrected	133,149		-44,622	**177,771**
			Error	**452,063**

This model **proves** that landfill is **better** than incineration!

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We correct Dr Porter's factors where he started with a difference of -274,292 tonnes.

Our new figures are based on:

- correction 1 for incineration and
- including the benefit of carbon sequestration for landfill

The difference in the figures is 452,063 tonnes per annum.

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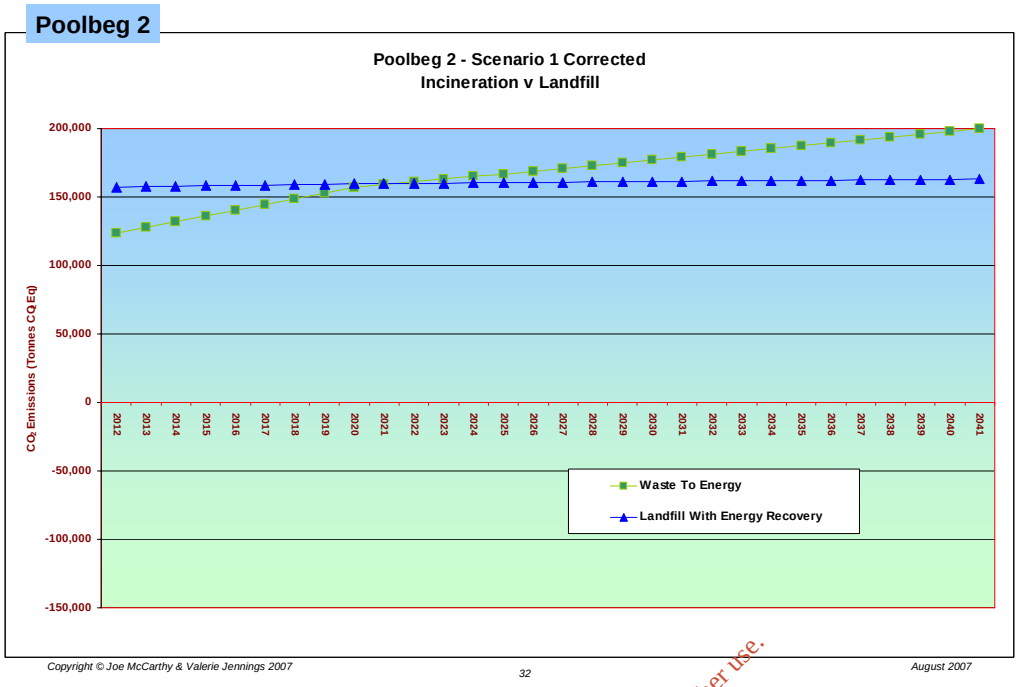
Poolbeg 2 – Scenario 1 after Corrections – Revised Graph



This revised graph compares incineration with landfill.

We see the landfill line where it was but now the incineration line is well above the x-axis.

There is little difference between incineration and landfill

The line for incineration starts being a little bit better than landfill.
This is only because incineration is getting credit at 0.4 for the electricity generated.

If the credit was calculated at 0.2, as we suggest, this graph would show the green line for incineration being much higher than landfill.

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Poolbeg 2 – Scenarios 2 & 6 – Landfill & Anaerobic Digestion

Poolbeg 2 **Scenarios 2 & 6 – Landfill & Anaerobic Digestion**

Per Dr Porter

	CO2 Tonnes Eq per annum
Landfill 357,780 tonnes	66,600
Greenhouse Gas Avoid	-7,871
Net Flux from AD of 242,220 tonnes	-31,776
Total	**27,552**
Carbon Sequestered – AD & Landfill	-101,896
Total after electricity avoid and carbon sequestration	**- 74,344**

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The more advantageous comparison in this Poolbeg 2 model is with the carbon sequestration taken into account.

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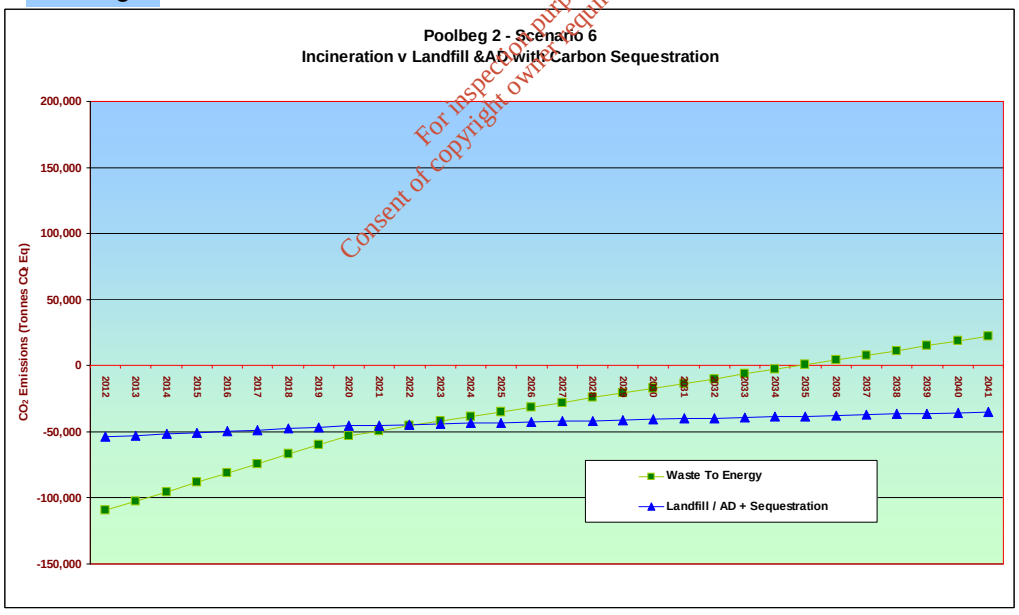
Poolbeg 2



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Dr Porter published a graph with sequestration showing that in due course landfill got better than incineration. We see here that the incineration green line starts quite low and it rises over time. However this time the blue landfill line which had been at the top of the graph is now down at -50,000.

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Poolbeg 2 – Scenarios 2 & 6 after Corrections

Poolbeg 2 **Scenarios 2 & 6 after corrections**

Incineration v Landfill & Anaerobic Digestion

	Incineration	Landfill & AD	Landfill & AD with Carbon Sequestration	Net
Per Dr Porter	-117,247	27,552		**-144,799**
As corrected	133,149		-74,344	**207,493**
			Error	**352,292**

This model **proves** that landfill and AD is **much better** than incineration!

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We then correct the model by applying the factors shown here:

- Reinterpretation of the incineration output
- Reinterpretation for the electricity credit

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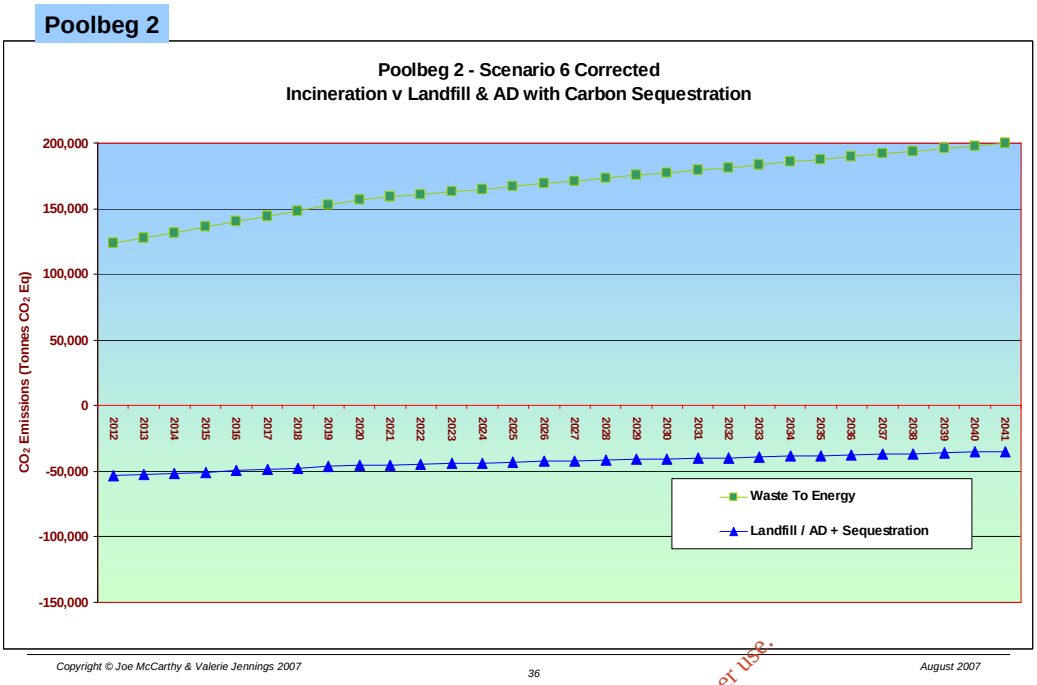
Poolbeg 2 – Scenarios 2 & 6 after Corrections – Revised Graph



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With both corrections taken into account, the graph is much different.

The landfill line remains below the x-axis - down around -50,000 tonnes whereas incineration is up at 140,000 tonnes.

Incineration reaches 205,000 tonnes at the end of the period.

The difference between incineration and the best alternative is readily seen on this graph.

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Criticisms

Criticisms

- Dr Porter changes his models
  - 3 different attempts for this EIS
- Inconsistent sources
  - EPA, DEFRA, EC 2001, IPCC
  - Why were factors replaced?
- Electricity Avoid Factor
  - CCGT 0.4 or Renewable 0.0
- Models were not peer reviewed
  - His models were accepted at face value
  - Ringaskiddy
  - Meath 1 and Meath 2
  - Poolbeg 1

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Our criticisms of Dr Porter are listed here.

He made three different attempts to put a climate model before ABP.

Essentially these models are the same:

- Assess the incoming waste quantities
- Assess how much carbon is in this waste
- Calculate the Co2 emitted
- Assess the electricity generated
- Allow credit for electricity avoided
- Derive a net position

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We are particularly concerned over the inconsistency in his use of sources.

For example Dr Porter originally used the 61% CCW factor for plastic throughout all his earlier models but he replaced the factor with 51% in his latest model. We question why.

Dr Porter has used widely different factors for electricity credit:

- 0.37 in Ringaskiddy
- 0.40 in Meath
- 0.40 in Meath 2
- 0.40 in Poolbeg 1
- 0.567 in Poolbeg 2
- 0.567 in Poolbeg 3

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We wonder why those factors were replaced. In each case the change made was beneficial to the case for incineration.

The electricity avoidance factor or credit factor for electricity generated at the margin must be at least as good as CCGT plants which is 0.4. It can be argued that it should be at the same level as renewable sources which is 0.0.

We are also concerned that Dr Porter's models were not peer reviewed. His models were accepted at face value.

His models for Ringaskiddy, Meath 1 and Meath 2 were not subjected to detailed analysis. We can show that the errors inherent in his Poolbeg models are also present in the Meath 2 model. This is an important case because it is before An Bórd Pleanála at present for decision.

Our detailed analysis has revealed serious flaws in Dr Porter's models.

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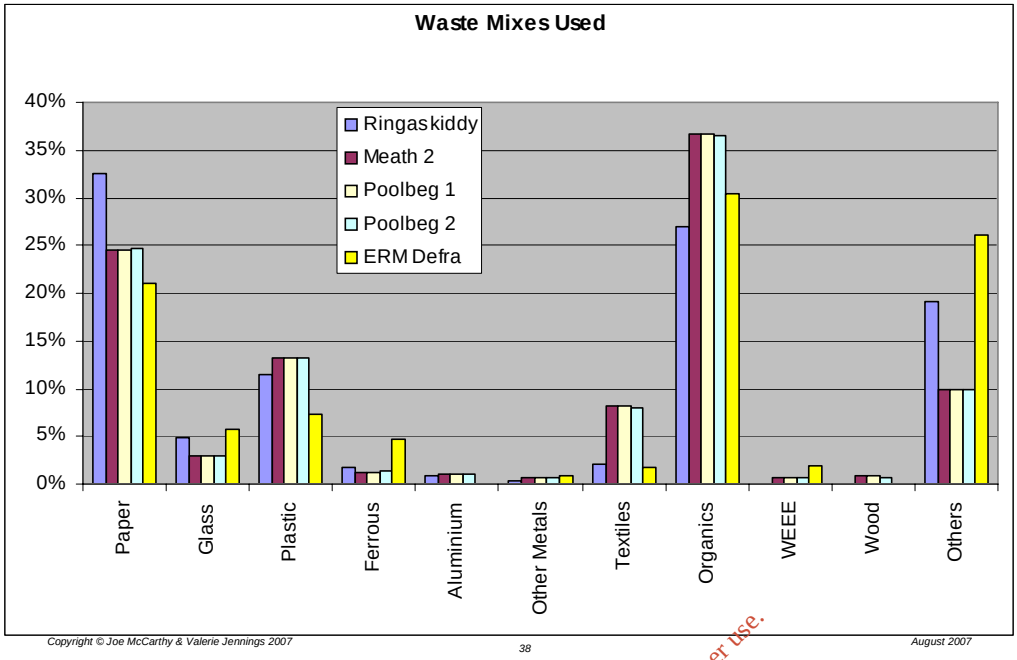
Waste Mixes Used



This graph contrasts the percentages of waste mix used by Dr Porter with the waste mix from the UK ERM DEFRA.

This graph shows - in yellow - the contrast for the ERM waste mix in the UK from the waste mixes in Ireland.

The central three colours – the maroon, the light yellow and the light blue – are the waste fractions for Meath 2, Poolbeg 1 and Poolbeg 2 respectively. The reason these three are the same is because they come from the same EPA waste composition analysis published in 2004. They show the same mix for the paper, plastic, textiles and others fractions.

There is a very distinct difference in the ERM data for "Plastic", in the ERM data for "Textiles" – which is very small, and in the ERM data for "Others" – it is much higher.

These three differences are so stark that they negate the suggestion by Dr Porter that the ERM DEFRA mix is close to the Irish mix and therefore could be used directly by him as a basis for the CCW and FCF factors.

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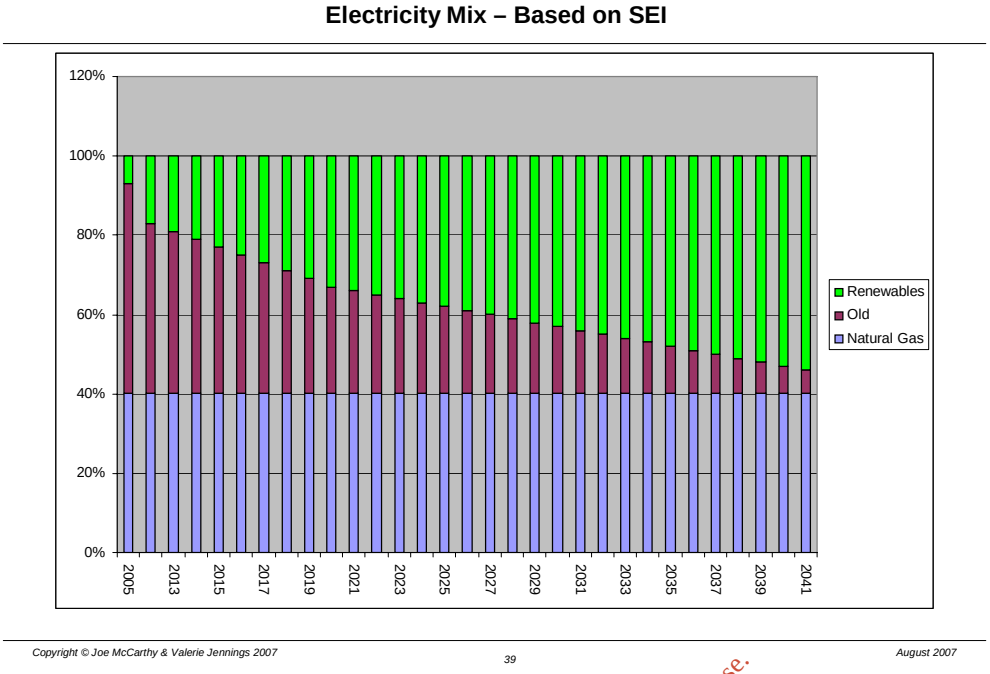
Electricity Mix – Based on SEI



On this graph we show the electricity mix as it stands today based on the recent SEI report "*Energy in Ireland 1990 – 2005 Trends, issues, forecasts and indicators*" published in November 2006.

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About 40% of the Irish electricity produced today is CCGT. There is a small contribution by renewables – around 7% and growing. There is a stated intention by government that renewable generation should grow very fast and that is illustrated here in green.

CCGT plants in our opinion are likely to remain in service for some time and are unlikely to be retired because they are so cost effective.

The older plants burning peat and coal and the fuel oil plants will be retired steadily over the period.

These considerations were not taken into account by Dr Porter in his second and third Poolbeg models.

There is an argument that this power plant will not displace any older plant. It will generate energy that will be used to meet additional demand. This energy should only be assessed at the marginal cost of what other additional energy might cost.

Additional energy in this country today is either CCGT or renewable.

That means the factor to be used is 0.4 or less.

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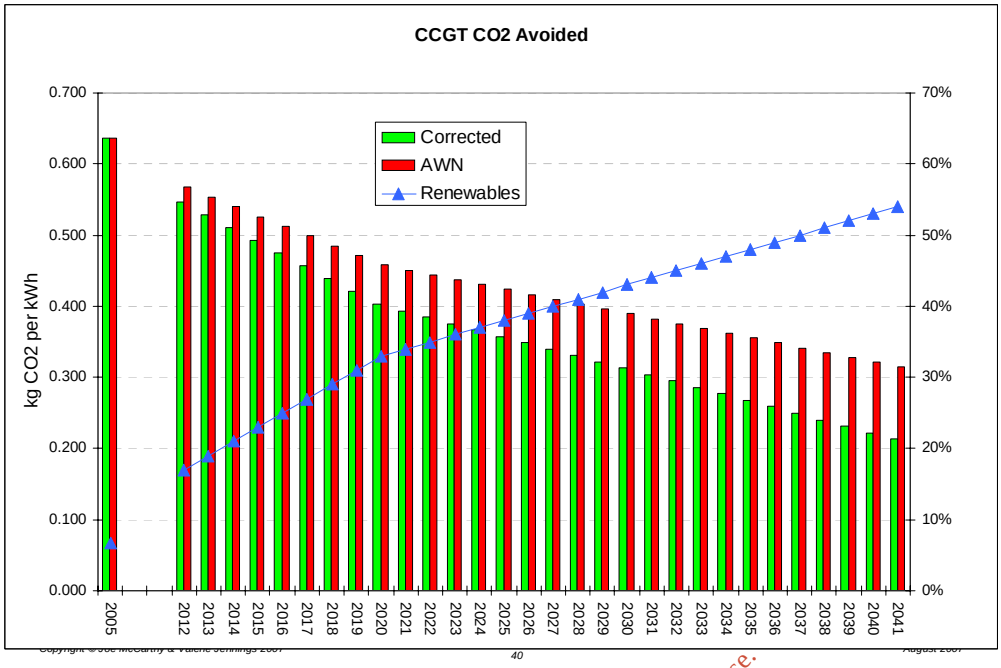
CCGT CO_2 Avoided



Dr Porter used the reducing red bars for the electricity credit in Poolbeg 2.

He presented an increasing percentage of renewables seen above as the green bars. He accordingly reduced the marginal electricity mix from just over 0.6 to the 0.567 number that he used here in 2012 and then it diminished steadily until it becomes 0.314 at the end of the period.

We have illustrated what happens when we keep the CCGT factor constant. The credit drops faster over the period because displacing older more polluting sources are displaced and the factor then drops to 0.214.

This graph illustrates the basis for our suggestion that 0.2 be used as the credit factor in a fully reworked model.

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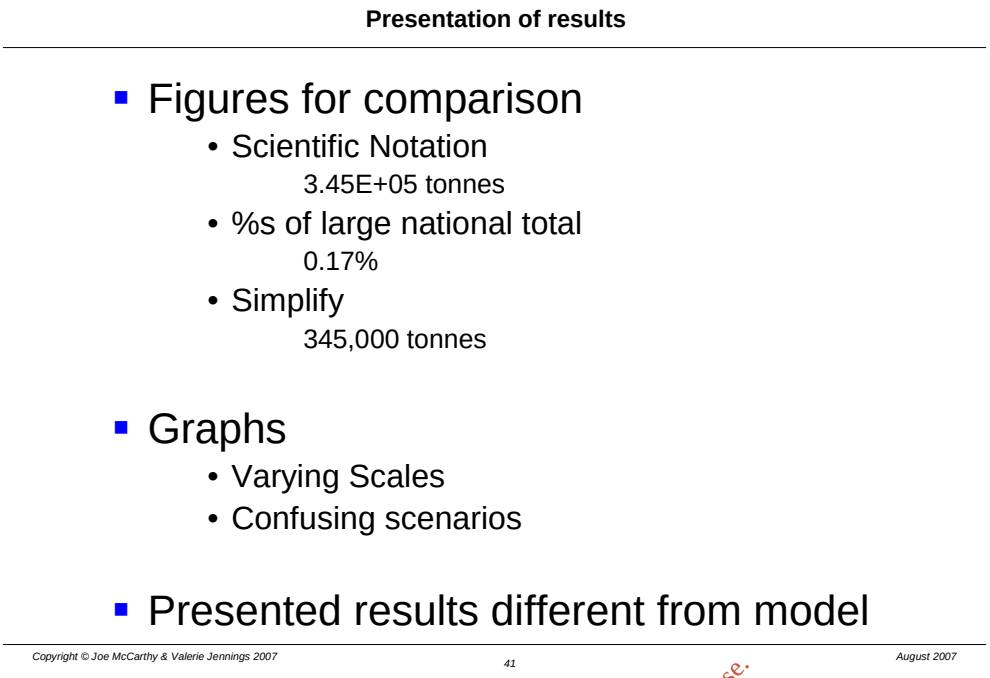
Presentation of results



Dr Porter's models makes for difficult reading due to the awkward presentation used by him.

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Figures
He presents figures for comparison to the board and he expresses them in two different ways:

- scientific notation
- percentage of a large national total

The first technique used it to express amounts in scientific notation such as 3.45E+05 tonnes. One has to be familiar with the notation to know that is 3.45 multiplied by 10 to the power 5. This technique requires care in adding successive figures as one tries to follow his calculations. For example if adding a figure at E+05 to a figure at E+06 it is not easy to interpret this even when presented in written form.

The second technique used by Dr Porter is the use of percentages. He used percentages of a large national total based on the Kyoto target of 710,000 tonnes (or the revised equivalent annual total). The base for the percentages varies in his models.

This technique makes it very difficult to see differences between, for example, 0.17% and 0.14% as being substantial because one is interpreting the second place of a decimal %.

If the figure were expressed as a straight ratio between two integer values it would be much more visible. A 20% difference expressed as a small % is hard to interpret.

We simplified all of our presentation to the Board by using plain tonnes making the various totals and the comparisons between them much more visible.

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Graphs

We criticise Dr Porter's graphs because he uses varying scales.

With varying scales in a comparative document it is impossible to make judgements between one graph and the next because the visual position of the lines on the graph seems to be intuitive to the eye.

This interpretation is however incorrect. Unless one pays very careful attention to the scale one ends up not comparing like with like.

Scenarios

We have already criticised Dr Porter's scenarios – he presented so many different scenarios that they can be quite confusing.

Results different from Model

Dr Porter presented to ABP different results on paper in his presentation from the equivalent results found in the supporting spreadsheets. Theses errors, confirmed during cross examination, indicate lack of attention to detail perhaps caused by rushing the analysis to a particular conclusion.

There is a distinct lack of precision in providing accurate information to the board.

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Trends in interpretation

Trends in interpretation

- Porter Models
  - Ringaskiddy
  - Meath 1
  - Meath 2
  - Poolbeg 1
  - Poolbeg 2
  - Poolbeg 3 – not submitted to the EPA
- Corrected Models
  - Poolbeg 1
  - Poolbeg 2
  - Poolbeg 3

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We have observed trends in Dr Porter's six published models:

- Ringaskiddy
- Meath 1
- Meath 2
- Poolbeg 1
- Poolbeg 2
- Poolbeg 3 – (not submitted to the EPA at the time of writing)

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We compare these trends to the results from our three corrected models for the Poolbeg EIS.

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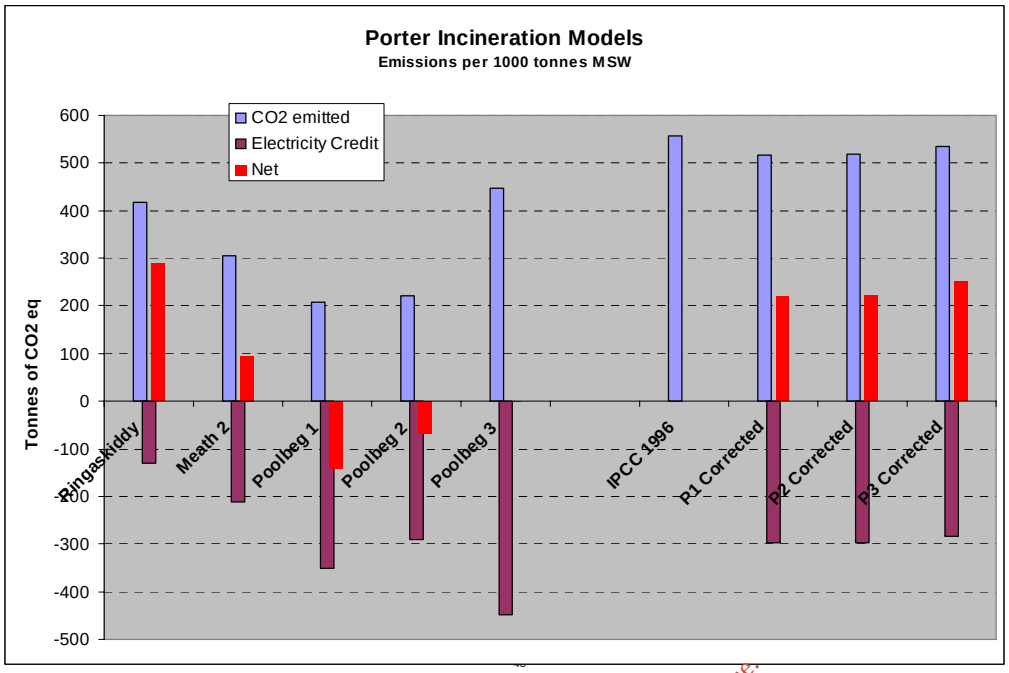
Porter Incineration Models



The graph

This graph shows the results from Dr Porter's models as published for the proposed incinerators in Ringaskiddy, Meath and Poolbeg. We also show the results from our three corrected models for the Poolbeg EIS. We also separate these with the results from the IPCC 1996 model.

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The 6 models, the IPCC model and our 3 corrected models are all illustrated on this one single graph.

This graph is normalised for 1,000 tonnes being the only way to compare incinerators of different capacities. The Ringaskiddy plant is designed for 150,000 tonnes waste per annum; the Meath plant is 200,000 tonnes pa and the Poolbeg plant is 600,000 tonnes pa.

The bars

The emissions are in blue and should be compared the whole way across.

The blue bars represent the actual fossil CO_2 eq emitted – this CO_2 goes up the chimney.

Dr Porter has much lower blue bars in Poolbeg 1 and 2. We believe the blue bar in Meath was low because he used an incorrect CCW factor of 0.29. He used a factor of 0.206 in Poolbeg 1

He corrected it slightly in Poolbeg 2 and after cross examination by us he corrected it properly for Poolbeg 3. However he still has errors; for example we note that he is still using a CCW of 51% for plastic instead of 61%.

The maroon bars, which are below the x-axis, are the credits claimed for electricity.

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Our credits on the right of the graph are all the same – at about -300 tonnes per annum.

The net position
The net position for incineration (shown in red) claimed by Dr Porter was damaging to the environment in Ringaskiddy. It was less damaging to the environment in Meath.

However it was significantly beneficial to the environment in Poolbeg 1.

It was a little less beneficial in Poolbeg 2.

It was a tiny amount – not visible on this graph at some -1,000 tonnes per annum – for Poolbeg 3.

The trend
Having adjusted in Poolbeg 3 the amount of carbon being produced by the incinerator, Dr Porter needs to claim a much increased credit in order to keep the net position for incineration below the x-axis, and therefore beneficial to the climate.

He does this by claiming a massive credit of 420 tonnes per 1,000 tonnes for the electricity produced. This is simply wrong.

He never claimed this credit before but he does claim it here in Poolbeg 3.

We show the corrected credit on the right.

It is arguable that credit for electricity produced should not be credited at the displacement rate. It should be only credited at the marginal rate. If it is only credited at the marginal rate then these purple lines are halved making the net position for incineration much worse.

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Selective choice of factors
There is a challenge with scientific modelling. Selective choice of factors will produce different results. One has to be extremely careful and precise in determining the input factors and then compare like for like all the way through the analysis.

In Dr Porter's case he has three different models with three different sets of assumptions and three different set of interpretations. This makes it impossible to reach a well founded conclusion.

This graph shows the trends across all of Dr Porter's models and this is the best way of seeing what has happened over the years.

The IPCC factors, our corrected factors, and indeed Dr Porter's Poolbeg 3 model now show that the amount of CO_2 emitted per tonne is high.

At the same time Dr Porter has adopted a massive credit for electricity generated in his attempt to balance the high CO_2 being emitted.

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Conclusion

Conclusion

- Dr Porter's climate models are wrong
- EIS statements on climate are wrong
- Entire carbon fraction assessment omitted
- Policy on climate has changed
- The EPA should refuse licence

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We draw the following conclusions from our analysis:

- Dr Porter's climate models are wrong
- EIS statements on climate are wrong
- Entire carbon fraction assessment omitted
- Policy on climate has changed
- The EPA should refuse licence

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Conclusion – Models

Conclusion - Models

- Dr Porter's climate models are wrong
  - Wrong sums
  - Wrong waste mix
  - Wrong carbon fractions
  - Wrong credit for electricity
- Dr Porter's result 124,000 tonnes
- Corrected result 310,000 tonnes

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Dr Porter's climate models are wrong for the factors that we have detailed above.

For example, Dr Porter's original model (Poolbeg 1) showed an emission of 124,000 tonnes CO_2 eq per annum whereas the correct emission is 310,000 tonnes CO_2 eq pa.

He has now arrived at a figure closer to that in Poolbeg 3 but he is still claiming an unjustifiably large credit for electricity avoided which leads to the EIS statements being wrong.

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Conclusion – EIS Statements

Conclusion – EIS Statements

- EIS statements on climate are wrong
- Non Technical Summary is wrong

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As a consequence of the models being wrong the many statements in the EIS are wrong.

There are some 19 statements to be found throughout the EIS which claim that incineration is beneficial to the climate:

- In the main body of the EIS itself
- In all the appendices
- In the additional evidence submitted to the board

All these statements are based on Dr Porter's models and they claim that incineration is beneficial to the environment.

Our analysis shows that the analysis is faulty; incineration is damaging to the environment; and therefore the statements are no longer true.

In particular the Non Technical Summary is wrong.

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Conclusion – Entire Carbon Fraction

Conclusion – Entire carbon fraction

- Entire carbon fraction not assessed
- Required by IPCC 2006 Rules
- Incineration 667,700 tonnes pa

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Dr Porter did not study the emission of the entire carbon fraction at all. This is required by the IPCC 2006 Guidelines - which he stated that he follows – whereby when incineration of waste is used for energy the biogenic fraction should be reported for information.

The biogenic fraction is not reported in the national totals for Kyoto purposes but it is required by the IPCC for information.

Incineration of 600,000 tonnes of waste produces about 2/3 of a million tonnes of CO_2 eq pa - that is biogenic CO_2 and fossil CO_2 together.

The entire CO_2 fraction goes up the chimney.

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Cost of CO_2 Emitted

Cost of CO2 emitted

Tonnes	Price per tonne	Cost per annum
667,700	€ 20	€ 13,354,008
	€ 50	€ 33,385,019

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If this CO_2 eq were priced at €20 per tonne or at € 50 per tonne it would increase the cost of incineration by between €13m and €33m per annum.

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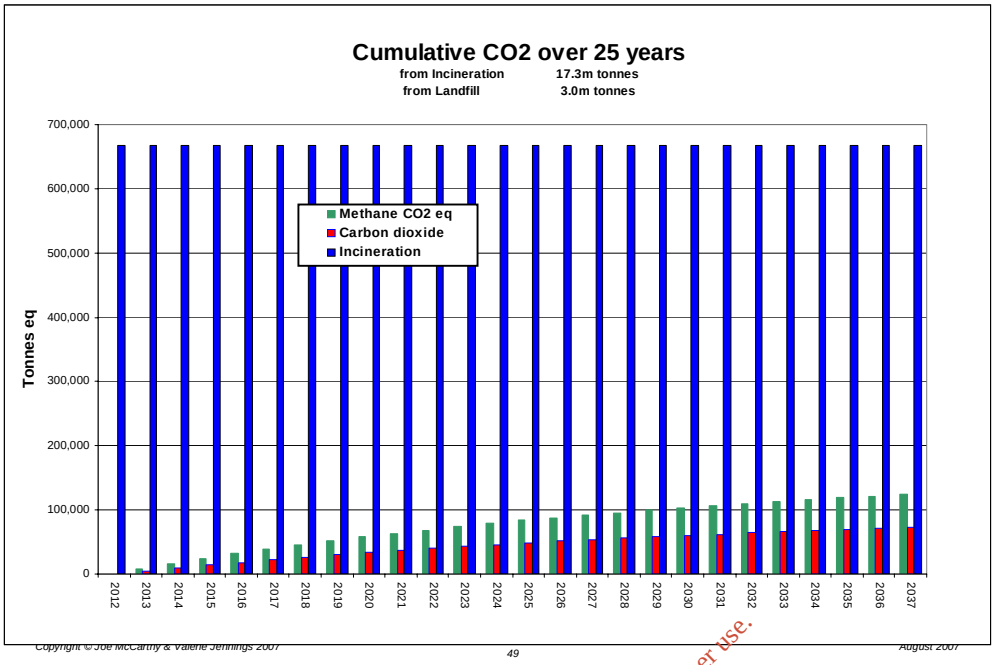
Cumulative CO_2 over 25 years



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We developed a graph of the CO_2 eq emitted by the incinerator versus the CO_2 eq resulting from landfill.

The bottom bars of green and red are the actual figures for release of methane and carbon dioxide as published by Dr Porter in the EIS. These are taken from the LandGEM gas model.

On the one scale we show the incinerator emitting all of the CO_2 - 667,700 tonnes in the first year – the blue bars.

The landfill emits a much lower amount – the red and green bars - after the first year. These are taken from the LandGEM calculations.

After the second year there is more in the landfill and these emissions continue to grow over the 25 years illustrated here.

The sum of all of the CO_2 emitted by the incinerator over the period of 25 years is 17.3 million tonnes – the sum of all the blue bars.

The sum of all the methane and CO_2 from landfill over the same 25 years is 3 million tonnes.

The incinerator is therefore about 6 times worse for the environment than the landfill.

The reason this is important is the immediate release of CO_2 by the incinerator for the next quarter of a century is a serious issue for the climate impact which is challenging the planet.

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In light of these figures we have to assess whether an incinerator should be permitted or not. This is as much a political or bureaucratic decision as a scientific decision

The country does not need the incinerator for the electricity. It may be argued that we need it to manage the waste. However we must take into account that if we permit an incinerator it will continue to release up to ¾ million tonnes CO_2 every year all the time.

We could choose not to do that. We could choose to process the waste in a safer manner where it would slowly release a much smaller amount of CO_2 over the next 25 years while the governments and the economies of the world cope with the challenges of climate change.

We emphasise again that the IPCC itself requires the reporting of biogenic carbon where waste is incinerated for the production of energy.

This has not been done in Dr Porter's model. Nor has it been done in the EIS assessment.

The atmosphere does not distinguish whether the molecules of CO_2 are biogenic or fossil.

This incinerator will produce an enormous amount of CO_2 immediately. The board must take note of the total emissions.

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Climate Policy Drivers

Climate Policy Drivers

- Stern Report
  - Economic crisis
- NCCS in Ireland
- IPCC Reports
  - Urgent Action Required
- EU Heads of Government
  - 20% target announced for 2020
  - To become 30% with agreement

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We have had a sequence of reports recently.

- The Stern report in 2006 emphasised that climate change is an economic crisis facing the world.
- The NCCS in Ireland
- the IPCC reports
- the EU Heads of Government

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Conclusion – Policy Changes

Conclusion – Policy Changes

- Policy on climate has changed
- EC Heads of Government
  - 20% reduction by 2020
  - 30% if US, China and India agree
- Drastic change in policy
- Kyoto target of 63mt drops to 48mt

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The Taoiseach has stated that there is a new target of 20% agreed to be implemented by 2020 to continue from Kyoto which runs to 2012. This target may become a 30% target if agreement is reached with the US, China and India.

These policy changes are happening now. They are happening in the context of the climate change challenge.

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No analysis of the actual CO_2 released - biogenic and fossil together – has been done.

It should have been analysed. It is required by the IPCC.

The world is not neutral to the release of biogenic CO_2. If a large amount of biogenic CO_2 is released by this incinerator then the world will suffer.

The release of the entire carbon fraction must be taken into account in a scientific manner. It simply hasn't been done by the applicant.

We believe that the single biggest danger from this incinerator is the fact that it will instantly release all of the CO_2 contained in the waste.

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Conclusion

Conclusion

- The EPA should refuse a licence
  - Take climate policy changes into account
  - Require DCC to produce a correct climate model
  - Require DCC to assess 100% carbon release
  - Require DCC to submit a fully revised EIS
  - Allow the public to submit further objections

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Our conclusion is that the EPA should refuse a licence for this plant:

- Take climate policy changes into account
- Require DCC to produce a correct climate model
- Require DCC to assess 100% carbon release
- Require DCC to submit a fully revised EIS
- Allow the public to submit further objections

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