Sub (7) 186 - 1

Karen Vaughey

From: Noeleen Keavey
Sent: 10 September 2004 09:26
To: Karen Vaughey; Ann Bosley / Tracey Berney
Subject: FW: Comments on Waste Licence Application - Indaver Ireland Ltd
Importance: High

-----Original Message-----
From: Process & Industrial Design Consultants [mailto:process.idc@indigo.ie]
Sent: 09 September 2004 15:56
To: n.keavey@epa.ie
Subject: Comments on Waste Licence Application - Indaver Ireland Ltd
Importance: High

Please see letter and comments attached. Hard copy in post.

Regards

Peter H North

N Keavey
EPA
Wastes Licensing Department
Johnstown Castle Estate
Co Wexford

9 September 2004

Re: Indaver Waste Management Facility, Ringaskiddy, No 186/1

Dear Ms. Keavey,

Please find attached some comments on the waste licence application and EIS for the above noted facility.

These comments are not exhaustive and are based on various published sources of information, few of which have been independently verified but are believed to be satisfactory.

It should be noted that there are a number of serious concerns raised in these comments, not least that related to the provision of false and misleading information. This could impact on an EPA director, and, in the interests of transparency, any consideration of the matter should be transferred to an external, independent, Competent Authority.

Furthermore, all the points raised in these comments should be either explicitly answered or fully reflected in any decision of the EPA, otherwise they will be raised elsewhere.

Finally, I must note that the positions of Project Manager and Operations Manager have been considered essential to the validity of the licence application, by Indaver. Therefore, until these positions are filled, and the CVs of the relevant persons available, the application should not be processed. I consider it essential to be able to comment on the qualifications, experience and competence of the holders of these positions.

Yours faithfully,

Peter H North

SUBMISSION AND COMMENTS ON THE WASTE

LICENCE APPLICATION FOR THE RINGASKIDDY

WASTE MANAGEMENT FACILITY OF INDAVER (IRELAND)

ON BEHALF OF

EAST CORK FOR A SAFE ENVIRONMENT

AND

CORK HARBOUR ALLIANCE FOR A SAFE ENVIRONMENT

(CHASE)

P H North
PIDC
Sept 2004

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1.0 INTRODUCTION:

These comments represent only a preliminary review of the Indaver application and related documents. A further, more comprehensive and researched review, particularly of background documents, referred to within the application or otherwise of relevance to an assessment of the application, will be published in a series of addenda in due course.

This further review is discussed later.

It must be noted at the outset that the EPA has not merely to consider the conditions of a licence but must also consider, most carefully in this case, whether a licence should be granted at all.

Even this preliminary review indicates that not merely are there substantive and substantial grounds for rejecting this application but that there must also be serious doubts as to whether any such facility should be licensed, in this or any other country (never mind county).

2.0 SCOPE AND COMPLEXITY:

2.1 Facility: the agency is required to consider and examine the environmental impacts and implications of a very wide range of activities, including:

- recycling park
- waste transfer station (which is itself a complex of activities)
- mixed hazardous and non-hazardous wastes incineration
- municipal wastes incineration
- off-gas treatment systems
- physical and chemical wastes pre-treatment
- hazardous wastes disposal
- transport
- energy production
- trans national shipment and foreign countries treatment and environmental impacts
- wastes storage
- storage and fire water treatment
- etc

Many of these activities are inter-related and must be considered on several levels – design (and selection of technologies), construction, commissioning, operation (start-up, shut-down and normal), and abnormal events (accidents, errors and faults). And, of course, decommissioning.

All of this must also be considered in the context of a dynamic, rather than static, national wastes handling and treatment situation. Many factors must be considered, such as:

Hazardous wastes

- impact of new EU directives (such as packaging, electronic and electrical goods, new chemical entities etc).
- changes in the pattern and scale of industrial manufacturing (eg. is Cork always going to account for 60% of off-site hazardous wastes arisings?).
- increase or decrease of on-site treatment and recovery.

Municipal wastes

- impact of source segregation.
- impact of recycling iniatives.
- impact of design changes by manufacturers.
- impact of increased population density and numbers.

Other considerations should also be included, such as:

- creation of district heating schemes or industries capable of utilizing low grade waste heat.

2.2 Underlying Documentation: there are numerous directives and statutory instruments which apply to this complex processing facility. In general, all such regulatory documents attempt to cover very broad fields and are therefore limited in terms of detail. Again, as befalls any legislation, considerable interpretation may be required and they tend to represent a severe political (socio-economic) compromise in terms of prescriptive standards. They are also generally technically dated (if not actually obsolescent) by the date of issue.

These directives and regulations thus represent a minimum level which must be applied to any facility.

It is not proposed to challenge any of these regulations at this juncture – though some are being reviewed, with a view to submission to the EU Commission for future changes.

However, numerous other documents are relevant and are to be challenged. These include:

- "Inventory of Dioxin and Furan Emissions to Air, Land and Water in Ireland for 2000 and 2010" EPA 2002
- Investigation on PCDDs / PCDFs and several PCBs in Milk Samples" FSA 2002
- "National Hazardous Waste Management Plan – Strategy Study" EPA, 1998
- "National Hazardous Waste Management Plan" EPA, 2001
- "National Waste Database Report for 1998" EPA,2000
- "Sustainable Development – A Strategy for Ireland" 1997
- "Health and Environmental Effects of Landfilling and Incineration of Wastes - A Literature Review" HRB, 2003
- "County Council, Waste Management Plan" various, 1997 – 2004
- etc

All of these documents have either been directly employed by Indaver in support of its application or have been employed by the EPA, DoE and Government ministers to support the concept of mass burn, mixed waste incineration.

None of these documents appears to have ever been subjected to a thorough, professional and critical review and all appear to be in desperate need of such a review. In general, they are superficial, erroneous, selective, deceptive, inadequate, out-dated and of low technical quality.

It is on such documents that the national waste management strategies and systems, for the next 20 or 30 years, are being based.

Because of the requirement for well-researched, constructive and independent reviews: (peer-review journal quality), financial support cannot be accepted from interested parties (on either side). These reviews, therefore, are being undertaken by specialist professionals as time and resources permit. A preliminary schedule for the principal review is currently as follows:

Dioxin inventory and other EPA/Irish reviews:	December 2004
National Waste Database:	February 2005
National Hazardous Waste Management Plan - Strategy Study:	June 2005

In addition, the following reviews: (discussed later) are also planned or in progress:

Hazardous Waste Treatment Options:	September 2005
Municipal Waste Treatment Options:	March 2005
Inherent Safety Health and Environmental Study of Mass Burn, Mixed Wastes Incineration and other Treatment Options:	December 2006
Life Cycle Analysis and Sustainability assessment of Treatment options:	March 2007

Should funding be obtained from EU or national sources, these studies can be completed considerably faster.

Preliminary analyses suggest that it would seem unwise to support the current fashion for mass burn, mixed waste incineration. Without pre-judging the conclusions, there appears to be reason to doubt that facilities of the type proposed by Indaver will be regarded as BAT, or even good practice, within 5 – 10 years.

2.3 Assessment Techniques: even Indaver has introduced, although not necessarily correctly applied, the concepts of Sustainability, BAT (NEEC)), Life Cycle Analysis (or Assessment) and Integrated Waste Management.

These, together with the concepts (or techniques) of "Inherent Safety, Health and Environment" (in design) and BPEO, have been assimilated into mainstream EU (and further afield) ideology.

However, the definition of some of these terms is difficult (eg. BATNEEC – what is excessive cost?) and for others a matter of some debate.

Nevertheless, there does not appear to have been any serious attempt to apply a rigorous analysis, utilizing many of these concepts, to wastes management in general and to mass burn, mixed wastes incineration (or other thermal and non-thermal technologies) in particular.

For example, Life Cycle Analyses have tended to be limited and selective and have utilized very dubious assumptions. Again, there has been no obvious examination of incineration under the concepts of inherent safety, health and environment.

If a technology is to be introduced, on a national basis, it must surely go through a proper and full examination, using all these accepted concepts, irrespective of whether the technology is in use elsewhere.

3.0 EPA:

3.1 Role: the role of the EPA is defined by Irish statutes only in general terms. As the Competent Authority for Ireland, it has responsibilities further defined by EU directives and agreements.

Within all this, however, it has considerable latitude – it is charged with responsibilities to protect the Irish environment (and global environment, as impacted by Ireland) which necessarily includes the human element.

It is thus more than simply a licensing and enforcement agency – though that is an important area of activity. In this regard it has taken on responsibility for advising the government on matters of policy – such as waste management - and acts as the repository of information and expertize. In this regard it has, to a limited extent, also undertaken research activities.

3.2 Capabilities and Competence: irrespective of the legal assumption of competence, it is entirely reasonable to question whether the agency has the resources to properly discharge its onerous responsibilities, and, indeed, whether it can be shown to be discharging those responsibilities to an acceptable level.

As noted earlier, the Indaver proposal must be evaluated within a complex and dynamic context. This must require a considerable level of expertize and experience from the EPA, in the form of a multi-disciplinary team with each member having the qualifications, training, experience and competence necessary to properly evaluate his own area.

In view of the limited budget, restricted areas of normal operation, the extraordinary level of environmental problems coming to light and the failure to gain public confidence, there must be some doubt as to whether the agency has the technical capabilities and resources to properly review the Indaver application and gain public confidence in its ability to monitor and enforce any licence that may be granted.

It must also be noted that the agency has had to call for external assistance and expertize to undertake reviews and studies. This, not to mention the quality of the expertize obtained and the resulting studies, does nothing to increase confidence in the agency.

If the agency does require additional expertize to review this application, which is probable, it would be well advised to obtain expertize that has the confidence and respect of many of the organisations representing public concern on the subject.

3.3 Review of the application: as noted earlier, the EPA must review the application, not merely within the relatively narrow confines of the Waste Licensing Regulations themselves, but in the far broader context of wastes management plans, policies and technical requirements, that the EPA has itself been partially instrumental in producing.

Many of these documents and technical strictures have been directly employed, or referenced, by Indaver and must therefore be employed in any assessment.

4.0 EU AND NATIONAL POLICY

4.1 Introduction: Indaver, as required by various directives and regulations, has attempted to justify its proposed facility on a number of grounds.

The first of these is that it fulfils Irish obligations under EU Directives and accords with EU and Irish National Policy. The obligations and policy objectives quoted include:

- Trans-frontier shipments: that each and every country is obliged to provide facilities for treatment and disposal of wastes so that exports can be phased out.
- Proximity: a principle which requires wastes to be treated as close to their source of generation as possible.

4.2 Trans-frontier Shipment: Indaver has made much of the concern that foreign countries could, at any time, refuse acceptance of Irish hazardous wastes for treatment and disposal. It has stated that there is an EU requirement, now embodied in Irish national policy, to eliminate the trans-frontier shipment of such wastes, by the provision of facilities in each and every country to handle any such wastes arising in that country.

This, of course, is a nonsense.

It is accepted that there should be an aspiration to provide hazardous waste facilities in each country – as appropriate and where economically and environmentally justifiable.

It is clearly ludicrous to contemplate establishment of any such all-embracing requirement. There is an enormous market in the trans-frontier shipment of wastes of all types, regulated and, indeed, encouraged by the EU. Even for Ireland this operates in both directions, with, for example, precious metal catalysts being imported for re-processing.

It is not economically viable for Ireland to establish facilities for the treatment (whether recycling or disposal) of wastes such as:

- fridges (containing CFCs)
- electrical and electronic equipment
- cars, tyres, and other scrap metal (the only such ferrous metal facility closed 2 years ago)
- most plastics
- solvents (except for limited cases)
- mercury (from lights)
- batteries
- etc

As far as a refusal to accept wastes is concerned, this remains a possibility for individual states (or, more usually, regions within those states) but is unlikely to be of concern and would generally involve considerable warning. The more serious concern is the financial costs of such disposal – but these have to be weighed against costs of disposal here.

It should also be remembered that , in the late 1980s or early 1990s, there were proposals for the National Hazardous Waste Incinerator to be located in Derry – the trans-frontier shipment problem did not seem to concern anybody then. Then again, until the An Bord Pleanala hearing, Indaver were intending to import wastes from Northern Ireland (and potentially from the rest of the UK).

Finally, the major part of the hazardous wastes, that Indaver plan to incinerate, is waste solvents. The following is extracted from " A Strategy Study for a National Hazardous Waste Management Plan – Strategy Study Report", June 1999, p 86.

"Since the export of solvents from Ireland concerns export for recovery, EU law demands a free, transboundary movement of goods for this waste type. Ireland thus has relatively few options to ensure indigenous treatment. Realization of Irish treatment capacity is thus a matter for free market development. Active intervention of authorities is not feasible. Since it concerns a waste stream that is recovered in state of the art facilities, and the continuity of treatment abroad is not endangered, a policy to ensure treatment in Ireland has little priority"

and from p 91 (on incinerable waste)

"On-site incineration complies with international standards, and apart from encouraging prevention and re-use of the waste via IPC-licences, the authorities have little power to force the firms in question to use other treatment technologies. Application as fuel is regarded as a recovery operation, and under EU law the authorities have no power to influence this. A large part of these 18880 tonnes would make a suitable substitute for fuel".

4.3 Proximity: this again is a principle, but not an absolute requirement. It derives from two concerns- first, it is obviously sensible to minimize transport (because of the waste of resources and environmental costs); second, that it is unfair for one part of the community to impose an obligation to treat its wastes on another part of the community (essentially the NIMBY argument).

The principle is widely accepted – but again, it must be tempered with realism in terms of economics and overall environmental costs.

Indaver has used this principle twice – first, to help justify an incinerator in Ireland and second, to justify location in Cork.

The first application of the principle would seem reasonable – but can be eliminated by other considerations (see below), the second application is incorrect –Cork does not comply with a proper assessment of the proximity principle.

6.4.3 Non-hazardous wastes –single step:

- anaerobic digestion
- thermophilic aerobic digestion
- wet air or supercritical water oxidation
- pyrolysis
- gasification
- incineration

6.4.4 Non-hazardous wastes – multi-step (complex)

- anaerobic digestion, separation, thermal treatment
- separation, thermal treatment, vitrification
- digestion, separation, physico-chemical stabilisation

- multi-step (green)

- digestion, landspread
- digestion, physico-chemical reduction, landfill

(other)

- separation, recycle, stabilisation
- separation, recycle, thermal treatment
- separation, recycle, landfill

6.5 Landfill: there is always going to be a residual, inorganic (and thus, essentially irreducible) waste – from incineration, digestion, recycling, recovery etc.

Whilst landfill is, perhaps, an admission of defeat, every system accepts that some material will end up being landfilled, albeit as little as possible.

However, there is (as usual) an alternative – though it may not be cost-effective or environmentally attractive in all cases. Once waste is reduced to an essentially stable, inorganic form, it can be employed as an inert material for some construction purpose – road base, concrete fill, (for kerbs, breakwaters and other non-structural purposes) etc.

At present, the problem is that landfill always contains significant quantities of organic matter and inorganics in a relatively soluble form. As this is reduced, the possibility of a future without significant landfill can be envisaged

6.6 Selection: there appears to have been no proper consideration or review of the various options available and certainly no attempt to challenge assumptions.

Indaver have assumed a single step approach to be the most appropriate, an assumption generally also behind the National Hazardous Waste Management Plan – despite claims to Integrated Wastes Management and professions of adherence to the wastes hierarchy.

7.0 TECHNOLOGY:

7.1 Introduction: the final stage in Indaver's justification process involves the selection of mass burn, mixed waste incineration as the most appropriate (BAT, BPT, BPEO etc) technology.

To reach this conclusion Indaver have rejected or ignored alternative technologies, whilst failing to properly analyse the incineration technology proposed. It is assumed that incineration of this type is acceptable because it is employed elsewhere and because it is one of the technologies noted in the National Hazardous Waste Management Plan.

7.2 Non-thermal technologies: these have been given no consideration at all. For a single step solution (which is not necessarily the correct choice – see section 6), these are limited to a biological option or to an oxidation option.

For hazardous wastes, the oxidation option would seem more appropriate in that the quantities are small and the organics concentration high and generally toxic to micro organisms (at such concentrations).

For non-hazardous wastes, the biological option is feasible.

7.3 Thermal technologies: Pyrolysis and gasification technologies have been dismissed as not yet commercial. This, however, is not true – over 10 such facilities, of 6 or 7 different designs, are in commercial operation.

Whilst this number is small compared with the number of incinerators, it is growing.

Other thermal technologies, such as plasma processing, are also now commercialized, though with less experience.

In terms of incineration technologies, Indaver has accepted that the most common type for hazardous wastes could not be considered for cost reasons and Indaver has had to compromise, therefore, in its selection

7.4 Mass burn, mixed waste incineration: whilst this technology is common, it is readily accepted that it has been responsible for major environmental problems in the past. Only by the addition of ever more complex end-of pipe treatment systems, have these problems been reduced.

This, however, is not a preferred engineering solution – it is always better to address the source of the problem

Despite its problematic history and its selection in this case, this technology has not been subjected to up-to-date analytical reviews – using techniques such as Life Cycle Analysis, Inherent Safety Health and Environmental analysis etc.

Nor has it been demonstrated to be BAT, BPT or BPEO for the various, individual waste streams.

7.5 Dioxins and Environmental Impact: there is substantial discussion on dioxins elsewhere in this review and in Indaver's documentation. However, it should be ized that this facility will create substantial quantities of dioxins – it is the nature of this type of incineration.

Reduction of dioxins in air emissions merely re-directs the dioxins into solid wastes, which are then landfilled and, partially, returned to the ecological system through leachate.

Any failure of the flue gas treatment releases these dioxins to the air.

In addition, incineration generates considerable quantities of other gaseous and solid pollutants.

A proper assessment of the facility must include comparison of the total environmental impact of this facility with alternative technologies – and with landfill. This has not been done.

7.6 <u>Selection:</u> the selection process has not merely been flawed, it appears to have been deliberately biased in order to justify a pre-selected technology.

5.0 NECESSITY:

5.1 Introduction: this forms the second part of Indaver's justification of its facility – that the facility will fulfil certain national and local needs. These include:

- Hazardous waste: elimination of the major part of the export of hazardous wastes and provision of an essential service to the industrial sector.
- Municipal and non-hazardous waste: substantial reduction of land fill requirements.
- Energy: provision of significant power from renewable sources with beneficial effects on greenhouse gases and use of fossil fuels.

5.2 Hazardous Wastes: in reality, Indaver will incinerate <20% of the hazardous wastes generated in Ireland. Some 50% are already recovered or destroyed on site by the waste generators, whilst a further 25% are exported for materials recovery, which will continue.

Furthermore, more than 90% of the wastes to be incinerated by Indaver are currently sent to waste-to-energy facilities abroad – and energy recovery is regarded as a recovery process. Thus only 2% to 3% of Ireland's hazardous wastes are currently exported for incineration without energy recovery – and a proportion of this will continue to be exported because the Indaver facility will not be suitable (eg. PCBs, highly halogenated wastes etc) A requirement to export hazardous ash must also be noted – there are no hazardous waste landfills in Ireland.

Thus Indaver is not exactly essential. Furthermore, as a relatively small facility it is unlikely to be competitive in cost – so that Irish industry will actually be at a further disadvantage. Indaver will certainly not eliminate export of hazardous wastes to anything like the degree implied.

5.3 Municipal and non-hazardous wastes: there are over 11 million tonnes of such wastes generated every year, of which some 8 million is currently sent to landfill (legitimate) – both figures ignore the illegal waste disposal and unreported wastes arisings, which appear to have been significant in the past (perhaps of the order of 1 – 2 million tonnes/annum).

Of the 8 million tonnes /annum landfill, only some 2 million is municipal waste.

Indaver will process 150000 tonnes/annum of such wastes and generate some 35 to 45000 tonnes/annum of landfill waste. The net effect will be a reduction of some 100000 -110000 tonnes/a to landfill – ie. some 1.2%.

Even in the Cork region, Indaver will only reduce landfill quantities by perhaps 10% - 20%. Again, not exactly substantial.

Note that the 90% volume reduction quoted by Indaver is deliberately misleading – it refers to the volume of dry ash against the uncompacted volume of wastes brought in.

The real comparison should have been in terms of landfill space taken up after compaction and a few years degradation and absorption or loss of water. Even then the figure relates only to the wastes actually incinerated – not to total landfill volumes.

5.4 Energy: Indaver will export some 16 MWc, which is modest compared to normal power stations of 500 to 2000 MW or even some of the wind farms now being developed. It is also insignificant in terms of Irish power demand.

Even so, it might be attractive if it were not that it was very inefficiently generated – it represents some 20% of the thermal input.

Much of this energy comes from the waste solvents. If these were used as fuel for a CHP plant on any industrial site, the energy efficiency would be over 60%. Furthermore, by selection of the wastes, emissions treatment would be significantly reduced and a far better balance on greenhouse gas emissions obtained.

In terms of the greenhouse gas balance, Indaver is again deliberately misleading. No allowance is made for the treatment requirements of the ash (landfill treatment lasting decades) or the treatment requirements of the materials employed in the flue gas treatment process. A proper life cycle analysis is required.

6.0 OPTIONS:

6.1 Introduction: the third part of Indaver's justification is that it has considered, again as requested, other options, but that they are either non-existent, unproven, or –non-optimal.

Furthermore, the claim is made that this facility is part of an integrated waste management structure and conforms to the wastes hierarchy.

6.2 Options – existence: options certainly exist, as will be demonstrated below and throughout this submission. Furthermore, technically feasible options, which exclude any form of thermal treatment, also exist.

The EPA itself is at fault for failing to have designed the National Hazardous Waste Management Study (and an equivalent non-hazardous wastes study) to identify, evaluate and compare the following options:

(a) an optimum option (for treatment of each of hazardous and non-hazardous waste)which excludes any thermal treatment technology.
(b) An optimum option utilizing thermal treatment as the primary treatment technology.
(c) An optimum option, utilizing an appropriate mix of thermal and non-thermal technologies.

Of course, (a) or (b) may be such as to comprise (c) as well.

This would leave 4 to 6 options (2 or 3 each for hazardous and non-hazardous waste) and again similar options may apply to both hazardous and non-hazardous waste.

The optimum, in each case, would be based on a weighted assessment of factors, including:

Cost
Efficiency (destruction, recovery, volume reduction etc)
Environmental impact (air, water and land)

Then the selection of the final option(s) can be more clearly demonstrated, or, perhaps, given, to the community at large.

If the community desires to exclude thermal treatment it must have the right to do so – and it must be given the cost and impact of so doing. When faced with a proper, professional and objective analysis, the community is far better placed to make a reasoned judgement

If, though it may be unlikely, thermal treatment and incineration could demonstrate a clear and unequivocal advantage, the community might be less concerned and more supportive.

6.3 Options – general: both hazardous and non-hazardous wastes are complex mixtures of many individual wastes and waste streams. In each case there are two principal types of approach:

- single step: the "one-pot", or combined wastes treatment, whereby a single technology or treatment process is employed to modify the complex mixture.
- Multi-step: in this case the wastes are treated by one or more of a number of different treatment processes or technologies, as appropriate. This may involve a particular treatment for one component waste or waste stream or it may involve a sequence of treatments for a waste, waste stream or the entire complex mixture.

Each approach may have a number of options with regard to treatment technology.

It should also be noted that Indaver, and others, have made a number of assumptions that should be challenged, regarding the various wastes they propose to incinerate. They have assumed, for example:

- solvents: that any solvent, currently exported for disposal by incineration, cannot be further recovered, either on-site or off-site. This is certainly not true.
- Bio-sludges: that industrial bio-sludges cannot be further reduced, in terms of organics or water, or rendered acceptable for other purposes. Again this is not true.
- Municipal and other wastes: that significant reduction in quantity or quality cannot be effected by industry or the community. Again this is not true.

6.4 Options – specific:

6.4.1 Hazardous wastes – single step:

- continue to export to large scale, efficient material recovery or energy-to-waste facilities
- wet air oxidation or supercritical water oxidation
- pyrolysis
- gasification
- incineration

6.4.2 Hazardous wastes –multi-step (solvents)

- segregate, pre-treat, separate (various technologies)
- pre-treat, feed to refinery fraction
- pre-treat, use in lower grade manufacturing (eg. coatings)
- pre-treat, use as fuel in CHP

(halogenated solvents)

- segregate, dehalogenation, (as solvents)
- segregate, pre-treat, reprocess

(bio-sludges)

- physico-chemical pre-treatment, digest, landfill inorganics
- sequential anaerobic-aerobic digestion, fertilizer
- digestion, wet air oxidation

(solids – various)

- sequence of physico-chemical, thermal, biological, electrochemical processes, determined by waste.

8.0 WASTE APPLICATION:

8.1 Introduction: The following comments are not exhaustive. However, they do illustrate most of the principal faults, errors and areas of concern. The waste application, EIS and supporting documents are considered, in general, to be of very poor quality, with serious (and, possibly, fatal) flaws.

8.2 Potentially Fatal Flaws: there are a number of flaws which may be considered fatal from a legal standpoint, notwithstanding, in some cases, their apparent triviality.

8.2.1: Waste Licence Application Form p1: on at least two copies of the files obtained from Indaver or the EPA, as supposedly fair and accurate copies of the application, the first page of the application is for Waste Disposal Activities (landfill sites). All other pages are for Waste Disposal Activities (other than landfill).

This may be a trivial error but it should render the application invalid – even if the original document is correct. The application should be re-submitted in toto.

8.2.2: National Grid Reference: this is given on page 10/section B2, as 1790E, 0642N. However, a site plan is required on which the site grid reference can be read and confirmed. This is listed as being in Appendix 19.1. It is not.

First, it is in Appendix19.2.

Second, the grid reference cannot be read off the map.

Third, the grid reference given on the map is 791, 643 – which both differs from the earlier reference and is not in the correct 8 digit format.

Finally, the site is indicated to the west o grid line 79, suggesting a grid reference 178*E.

This error is serious and must be regarded as fatal to the application.

8.2.3 False and Misleading Information: on page 7 of the application form, the agency stipulates that "the provision of information in an application for a waste licence which is false or misleading is an offence…."

As will be shown in the following sections, there are numerous instances of breaches of this stipulation, which must be regarded as serious and upon which action should (and must) be taken.

8.2.4 Authentication: the application is presented by Ms Laura Burke on behalf of Indaver Ireland.

In the first place, Indaver Ireland should not be considered as the applicant – it does not have the size, resources or finance for such a venture. The true applicant must be considered to be its parent company – whose support is explicitly noted throughout the supporting documents.

In the second place, Ms Burke does not appear to be a director of Indaver NV (and I can find no reference to her being a director of Indaver Ireland). The application should be presented over the signature of a registered corporate officer or properly authorised person (ref. Appendix 19.3, 19.4).

8.2.5 Drawings: the application form (page 7) stipulates requirements for drawings. These requirements do not appear to have been followed – no drawing is signed (although originals may have, copies should show signatures) and there is no apparent provision for authentication or acceptance of electronic signatures.

A number of drawings appear to be undated, without a scale and, in some cases, do not indicate the direction of north.

8.3 Non-Technical Summary: (ref. Section 2 of reference document).

8.3.1 Planning: the EPA is directed to the fact that the facility has not yet received final planning, even for phase 1. However, it must also note that planning has not yet been submitted for phase 2 and Indaver themselves indicate that phase 2 may not go ahead.

The EPA must therefore consider phase 1 as a stand-alone facility, with the further addition of phase 2 as a possibility. This must have implications with regard to financial viability, as well as technical issues relating to the non-hazardous component of phase 1.

Furthermore, the facility will require additional permits for export of power and for the handling and incineration of specified risk material. The EPA should consider the impact of the failure to obtain such permits, as well as operation with such permits.

Failure to obtain a permit to export power (connection to the grid) would lead to the facility becoming a simple waste incineration plant, without energy recovery, and thus a very different proposition.

It must be suggested that a licence would have to stipulate that permits to export power are a pre-condition for authorization.

8.3.2 Activities:

8.3.2.1 Third Schedule: (7) physico-chemical treatment: this presumably relates to shredding of waste and the possible treatment of ash. The precise nature and extent of activities under this heading should be delineated.

8.3.2.2 Fourth Schedule: There should be a proper delineation of the activities planned for this site under sub-sections 1, 2, 3, 4, 6 and 9.

Whilst solvent recovery and biological transformation processes may be very desirable, they have implications regarding safety and environmental impact not covered by this application.

Use of waste principally as a fuel should exclude any solvent (or other liquid organic) stream contaminated with suspended or dissolved solids, halogens, high molecular weight organics (such as tars, polymers) or very toxic/bio-active compounds. Solid hazardous wastes should not be employed under this category.

8.3.3 Process Description:

8.3.3.1 General – Optimization / Up-to-date: it is categorically stated that the design has been optimized and includes the most up-to-date emissions control and flue gas cleaning technology.

Optimization is meaningless unless properly defined. First, the variable, for which the process is to be optimized, must be defined – eg. capital cost, operating cost, emissions, energy recovery, wastes reduction etc or a combination of some or all of these. Second, the variable must be quantifiable, so that optimization itself can be quantified.

In the present case, the design has clearly not been optimized with respect to any variable, simply because the design has not yet even been determined. There are a number of major design components for which significant options remain open, including:

- capacity: whether phase 2 is even to be built.
- fluid bed type: the type, let alone vendor, has not been selected.
- emissions control: several options remain open, in terms of technology.
- emissions control: several options remain open, in terms of chemicals.
- ash treatment: not yet determined.
- feed systems: options still remain under consideration.

Furthermore, optimization generally requires a compromise between variables – it is not usually possible to obtain several coincident optima. The statement regarding optimization is thus grossly misleading, if not patently false.

Similarly, "most up-to-date" also requires definition –eg. as of what date? It is even more difficult to define this phrase than it is to define optimization. Up-to-date may not equate to most effective or desirable.

In any case, without determining a selected option (as noted above), the most up-to-date system cannot have been included. (Furthermore, the options noted may well not include the most up-to-date systems – they certainly do not with regard to waste transfer station gaseous emissions treatment).

Again, this statement is grossly misleading (or false).

8.3.3.2 Waste Acceptance:

- radioactivity: there should be at least 2 and preferably 3 separate detectors to ensure that at least one is operational at all times.
- swipe cards: in view of the scandals over C1 document forgeries (not to mention extensive C1 and TFS errors), involving the active participation of waste brokers and transport companies, this procedure should not be employed until and unless acceptable safeguards can be put in place. It is, in any event, unnecessary.
- shut-down and storage: the bunker capacity is clearly designed for storage of up to 3 weeks (with both plants out of action). This correlates with normal (major) maintenance requirements. It is therefore disingenuous and misleading to talk of short periods of shut-down.

  Storage of wastes for weeks has not been properly considered anywhere.

- direct feed of liquids: pumping directly from road tankers to the secondary combustion chamber cannot and will not be accepted. Apart from earlier comments regarding quality of waste used as fuel, it is essential that any liquid feed be as homogeneous as possible. Tankers do not have agitators – this material must be transferred to storage tanks first.
  Again, this procedure is not necessary and potentially hazardous.

8.3.3.3 Incineration:

8.3.3.3.1 Operating Temperatures: although the temperature requirements are taken directly from the relevant directive, it should be noted that the 1% chlorine content limit derives from measurements showing that dioxin emissions remain constant below 1% chlorine (and non-zero), but increase as chlorine content increases above 1%.

It is not clear whether this relates to destruction of existing dioxins or to the de novo synthesis or total dioxin levels. In any case, it should be shown that the lower operating temperature does not lead to an increase of dioxins, immediately preceding any flue gas treatment systems.

These arguments, of course, all assume an homogeneous feed – they do not take account of the wide variations in feed composition of municipal and industrial waste or the variations in concentration and type of halogenated material in hazardous wastes. They also ignore other thermally stable PAH/POP molecules.

It must be suggested that operating temperatures be maintained at or above 1100°C at all times.

8.3.3.3.2 Fluid beds: a major concern with fluid beds is the feeding of low melting inorganic solids and consequent formation of large, clinker- type agglomerations.

In general, fluid beds are not normally employed for this type of mixed waste and examples of their use for this application should be given.

8.3.3.3.3 Capacity: a maximum capacity, in terms of weight, can and must be set. All major equipment of this type has such a limit.

Within this limit, operation may also be limited by thermal input considerations.

8.3.3.3.4 Feed Errors: there is clearly no physical impediment, or automated control system, preventing wastes being placed in the wrong bunker compartment. Consideration has not been given to this possibility, though the impact may in general be minor.

Physical segregation on the loading floor should be considered – though this would not prevent operator errors.

8.3.3.4 Fire Water: it is not good practice to have primary fire water retention tank capacity below that of the fire water storage capacity, even though there are other areas designated for fire water retention, since additional fire water and/or liquids may be released.

Fire water containment within the main building, must take into account the possibility of immiscible solvents collecting at the surface, with potential toxic, fire and explosion hazards.

It is normal practice to site fire water containment well away from buildings and operational areas.

8.3.3.5 Process Control: a study showing the determination of Safety Integrity Levels (SIL) should be required.

8.3.3.6 Intake Tests: it is painfully clear that wastes will only be tested for compounds expected to be present. This implies a level of trust and confidence in waste generators that is probably seriously misplaced.

There have been numerous instances of errors and deliberate misrepresentations in this industry.

It is therefore imperative that a proper check procedure be developed to ensure compliance of both waste generators and Indaver.

8.3.3.7 Emissions to air:

8.3.3.7.1 Waste Transfer Station: sections 3.4.5 and 9.5.9 indicate that these emissions will be collected and treated.

8.3.3.7.2 Waste to Energy plant: section 9.5.9 again indicates that the bulk tanks will be vented to the PCC, with a vent treatment system as backup. The laboratory should be treated similarly.

8.3.3.7.3 Table 2.1: the use of directive limits to indicate maximum potential emissions is incorrect and misleading. An assessment of actual maximum levels is required – based on the obvious and plausible scenarios such as:

- accidental feed concentrations (eg. over 1% chlorine at 850°C)
- failure of emissions controls.
- incinerator malfunction.
- emergency vent.
- fire case.

8.3.3.7.4 Modelling: again, modelling was based on normal emissions, with both incinerators operating. This is by no means a maximum.

Furthermore, the claim that the impact will be insignificant is grossly misleading (as discussed later, in the relevant section).

8.3.3.8 Containment design (emissions to water): where facilities are built on land vulnerable to contamination, as in this case, and where there is a probability of leakage of substantial quantities of pollutant materials, again as in this case, good engineering practice dictates double containment of concrete bunds and process buildings. This permits continuous monitoring for leaks and ready inspection of primary containment.

In this case, all bunds, the waste bunkers and the main buildings should be constructed with a double containment concrete floor.

This is common practice, for example in South Africa, and has been employed throughout Europe and in Ireland, as at Merck Sharp & Dohme in Tipperary (tank farm).

It is particularly advisable in view of the use of bunkers and buildings for fire water containment and in view of the corrosive nature of wastes and propensity for damage to concrete containments. It is very common to find cracks and cavities in tank bunds and production buildings throughout the chemicals and wastes sectors.

If this is not employed, then all concrete areas must be thoroughly inspected annually, with full hydraulic leak tests every 2 or 3 years. This would necessitate, of course, the complete emptying, and cleaning, of the bunkers on an annual basis.

Monitoring through wells and test pits, so close to the harbour, is not likely to be satisfactory.

8.3.3.9 Solid Wastes: as noted later, it may be necessary to vitrify some of the solid wastes, in view of the level of contamination with metals and dioxins. None of the wastes can be reliably classified as non-hazardous, without proper testing, in view of the nature of the materials fed to the incinerator.

It is also unlikely that the gypsum could be recovered of a quality suitable for re-use.

It is ludicrous to state that the wastes from the facility are not expected to have any significant environmental impact – in view of the hazardous classification for some of these wastes and the fact that most of the dioxins created by the process end up in the solid wastes.

On a dioxin balance alone, the dioxins leaving in the wastes vastly exceed any dioxins entering with the feeds. This must be a significant impact, irrespective of any changes to other impacts.

8.3.3.10 BAT/BATNEEC:

8.3.3.10.1 BAT/BPEO: at no point does Indaver consider the fundamental question of what constitutes BAT (or, even more pertinent, BPEO) for each individual waste or waste stream taken as a feed stock for the incinerators. If there is to be any more than a pretence of Integrated Wastes Management, this question must be answered – if not by Indaver, then by the EPA or the wastes generators. (This point is considered further elsewhere.)

Only if it is then determined that incineration is the BAT/BPEO for a waste, should there be any consideration of BAT for the wastes incineration process itself.

8.3.3.10.2 BAT/BATNEEC for incineration: BAT is certainly not in evidence in the case of energy recovery nor in multi-stage flue gas cleaning (2 stage dioxin removal is included in flue gas cleaning) and on-line continuous sampling for dioxins is of dubious value, to say the least.

All of these points are considered in more detail later.

But it is extraordinary that neither Indaver nor its consultants appear to have come across the EPA's own Guidance Note for the wastes sector – which covers incineration (even if it is dated).

This omission alone tends to discredit the entire application documentation.

8.3.3.10.3 BATNEEC: the use of BATNEEC has generally been superseded, since NEEC has never been, nor can be, easily or reliably defined and is, in any case, implied within BAT.

Many of the examples of BATNEEC are either not BATNEEC or are relatively trivial examples of normal engineering practice.

8.3.3.11 Cleaner Technology and Energy Efficiency:

8.3.3.11.1 Liquid Wastes: if the liquid wastes are a substitute fuel, then Indaver should be paying the suppliers a price based on energy value. If, however, the wastes are properly classified as hazardous wastes, then they cannot be treated as a substitute fuel but must be processed as a hazardous waste.

In any case, liquid wastes can be employed as a fuel far more efficiently than as secondary fuel for an incinerator.

8.3.3.11.2 Energy: the plant is most certainly not efficient in the generation of energy. Less than 25% of the energy input is recovered as power and less than 18% is exportable.

Plume suppression is hardly an example of energy efficiency. Use of flue gas cleaning, for relatively clean fuels, is very wasteful.

8.3.3.12 Safety and Maintenance:

8.3.3.12.1 Safety: the plant and process should have undergone an Inherent Safety, Health and Environment Evaluation –an evaluation probably never before carried out on mass burn, mixed waste incineration.

As a Seveso site, rather more than HAZOP is required.

8.3.3.12.2 Maintenance: preventative maintenance is a concept that is two generations out of date – especially with regard to equipment of this nature.

8.3.3.13 Monitoring of Emissions:

8.3.3.13.1 Continuous monitoring: it is implied, in this section, that all of the components listed are monitored continuously, but many are not.

In particular, there is a deliberate confusion created over the term "monitoring", with regard to dioxins. Continuous monitoring of dioxins will not be carried out – although it may now be "state of the art".

The continuous sampling of dioxins is grossly misleading – samples will be taken for 14 days, but will then take a further 10 – 15 days for analysis. Thus dioxin measurements will be as much as one month out of date and problems could thus occur for this length of period without detection.

8.3.3.13.2 Sewer emissions: these should also be monitored for heavy metals and specific organics – such as dioxins or hormone disrupting chemicals.

8.3.3.13.3 Wastes testing: 4 to 6 samples would be inadequate, in view of the variable nature of the feeds to the incinerator. In fact, samples should be collected on at least a daily basis and, for a few days, several times in each 24 hour period, reflecting the short residence time of the incinerators.

8.3.3.13.4 Odour: olfactory assessment went out with the ark, as a serious method of monitoring odour. A proper, professional sampling and analysis system should be put in place.

8.4 Section B:

8.4.1 Section B1: only one page of the certificate of incorporation appears to have been provided and the company's registration number is not properly identified.

8.4.2 Section B2: this appears to be the only part of Ireland without a townland.

8.4.3 IPPC: it should be noted that, irrespective of this application, the facility must be subject to IPPC legislation and therefore an IPPC licence should also be required.

8.4.4 Waste quantities:

8.4.4.1 Recycling Park: whilst an accurate estimate of mix may not be possible, it is certainly possible to provide limits to the variation.

Section 3.3.1 copies 2.4.3 but both differ markedly from tables 3.3 and 3.4 – eg. electronic and electrical wastes, ferrous metals, wood, paint and paint tins etc.

Furthermore, some of these wastes are hazardous and could contaminate non-hazardous wastes.

Section 3.3.1 also notes that there will be no odours – however, cans and glass may be contaminated with food wastes and paints and oils certainly have an odour.

It should also be noted that this waste recycling park is designed to cater for only 10000 average visits but will be one of very few in the Cork area. Running costs of €150000/a indicate a cost/tonne of over €500 but recycling revenue is unlikely to exceed €100 - €200/tonne. This is not an economic proposition and the costs will be borne by industry or the local authorities, without their having been consulted or given permission. Indaver will not be bearing the cost – this is a gross deception.

8.4.4.2 Waste Transfer Station: the quantity estimated is 15000tpa, which appears somewhat low. However, storage is given as 1800 (200 l.) drums in the warehouse (section 2.4.3) but the building dimensions suggest that up to 10000 to 12000 could be stored. 1800 drums represents little more than 1 weeks average storage (even allowing for some bulk transfers).

Bulk tanks are to be of mild steel, double wall construction. This is idiotic – there can be no inspection of interstitial spaces for corrosion and many of the wastes will be corrosive to mild steel to some degree. There is, in any case, little justification for double wall construction – a single walled, stainless vessel would be better.

Again (3.4.2), the fire water retention tank is smaller than the fire water tank.

Table 3.5 notes that the maximum theoretical quantity is 15000 tons/a – no calculations support this (unless 15000 tpa is taken as a limit and it is argued that no single waste can exceed a limit, but this is not an acceptable derivation).

Table 3.6 lists asbestos, infectious wastes, meat and bone meal, agricultural and food wastes, combustion wastes (containing dioxins, obviously), electronic and electrical wastes, cytotoxic and cytostatic medicines. Storage and handling of these wastes is not described.

Table 3.7 lists sharps as non-infectious and septic tank sludge and food stuffs. There must be strong odour potential from this warehouse, yet no ventilation is noted.

It is noted that a number of errors in tables 3.7, 3.8, and 3.12 have been corrected in a later document.

Finally, 15000 tonnes may be reasonable for waste solvents, but this range of materials suggests that a figure in excess of 15000 tonnes/a may well be reached.

For further comments, see 8.5

8.4.4.3 Waste to Energy Plants: it is again noted that the calorific value of the waste and thermal load on the incinerators are not sufficient to define capacity. Waste quantities by weight must be given.

Table 3.10 (3.6.4) should be completed – it is interesting to note that hazardous waste quantities can be defined, but others cannot.

Table 3.11 shows the bulk of the hazardous wastes as being liquids - it should be noted halogenated wastes are minor and easily segregated at source and that aqueous wastes are capable of pre-treatment to eliminate most of the water, which wastes energy in incineration.

Furthermore, infectious healthcare wastes should be handled separately from other wastes, yet appear to be added to solids waste bunkers. This will lead to potential contamination and health problems.

Paints and resins may be both dusty and of very high dust explosion hazard potential. This has not been addressed.

Waste pharmaceutical batches can be reactive and highly toxic or bioactive. It is not clear that this is recognized.

Table 3.12 lists meat and bone material etc. as non-hazardous. Yet special licences are required.

8.4.5 Seveso directive:

The "Report on Hazard Identification and Evaluation Process for Major Accident Prevention" has been briefly reviewed.

A number of comments may be made:

- the assessment of the facility as a lower tier establishment must be challenged. A number of assumptions have been made which are certainly not conservative, but the major concern must be over the quantities of toxics

It is the opinion of this author that the facility will be an upper tier establishment and the HSA will be requested to review this assessment.

- the report does not present a structured, methodical hazard identification process, using at least 2 of the standard techniques, as recommended.
- The report does not provide a proper analysis of probabilities, but depends too heavily on literature assessments. In some cases, these assessments may not be relevant.
- The report employs some over-simplified calculations and unrealistic assumptions to support a number of hazard evaluations. Examples include dioxin releases from bunker fires and rocketing of drums.
- The report uses cut-off criteria and matrix evaluations that the HSA have strongly criticised or dismissed in other cases.
- The HAZID team's technical and professional credentials are not given, and, in some cases at least, may be inadequate or suspect.
- There are a number of errors in the report. One example is the statement in Section 7.4.1 that Appendix 5 provides a listing of historical accidents - it does not.
- No consideration has been given to deliberate acts of vandalism, sabotage or to deception by waste generators or to serious errors and omissions on the part of the plant personnel.
- No estimate is made of the time scales for major incidents and a realistic assessment of the response time to warnings.
- No consideration is given to environmental risks to Carrigrennan through erroneous discharges or to seepage through concrete bunker floors and bunds.
- No assessment is made of risks to drivers on the road passing the plant or to walkers visiting the Martello tower.
- The emphasis is very much on off-site effects. Little attention is given to on-site effects (especially at the office and recycling park).

This author has obtained the records of a large number of incidents in US and European waste installations. These show, contrary to the report, that there are a number of incidents that have not been explicitly considered.

The HSA have noted that the facility has not been comprehensively reviewed, but only for the purposes of land use planning – for the planning appeal.

Furthermore, the Seveso directive does not cover major hazards involving infectious organisms or non-fatal, bioactive materials (ie, not classified as toxic).

The waste transfer station is possibly the most hazardous area on the facility, in view of the wide range of hazardous materials and their juxtaposition and frequent handling.

The site design is appalling, primarily because of the ludicrous acceptance of a site including another, independent facility in its midst (Hammond Lane). One obvious serious or major hazard is the location of the warehouse between two site entrances, where neither site has a second emergency exit. A major fire, explosion or toxic release could inhibit use of both exits as well as threaten the administration building and passing traffic immediately adjacent to the warehouse.

Safety aspects of this site, including environmental, need further serious consideration.

Finally, the EPA should talk to the HSA - HAZOP studies, whilst of considerable value (if done properly, which is rare), are not regarded by the HSA as of much value in identification or assessment of major hazards.

8.5 Section C

Refer to comments on the EIS.

However, it should be noted that the EIS, at almost every turn, states that no adverse environmental impact is envisaged to occur at or beyond the site boundary (eg, Section 9p3, NO_2, SO_2, etc etc).

These observations relate solely to air quality standards. If related to actual, existing background levels, the contribution from Indaver is generally over 100% (varying from perhaps 30% to > 1000%). It is thus grossly misleading, to declare that there is no adverse environmental impact.

Ringaskiddy and surrounds may be changed from an extraordinarily clean rural environment to an environment more befitting a city centre or industrial area.

It should also be noted that the environmental standards, being quoted so freely, have not been determined on the objective basis of having no adverse health impact. Rather they have been selected on the rather more pragmatic basis that any adverse health impact can be accepted by society – albeit at the expense of the old, the young and the weak.

It should be no surprise that asthma and other such ailments have increased and are increasing throughout the industrialized world.

8.6 Section D and Reference Document 3.3 – 3.14

8.6.1 Infrastructure table: a wheel wash should be included – hazardous waste spillage could be picked up by transport.

8.6.2 Recycling park: emissions from a fire within the park should be considered.

8.6.3 Waste transportation:

8.6.3.1 Transfer to incineration: wastes are bulked to tanks, loaded on to tankers, driven to the waste-to-energy plant and unloaded to tanks. This is solely the result of the plant layout. It would obviously be safer, simpler and more environmentally acceptable to transfer by pipe – which could be built.

The additional traffic does not appear to have been included in traffic analyses.

8.6.3.2 Off-site disposal: waste water and waste packaging etc are shown going for off-site disposal, but the location is not given.

8.6.3.3 Waste acceptance: radioactivity must be checked in both waste transfer and waste-to-energy plants, with 2 or 3 units in each. Explosives are not accepted, but there is no note of how these are detected.

Consignments appear to receive only a documentation check. This is not acceptable – errors and fraud are certainly not unknown in this industry. If Indaver are to prepare C1/TFS documentation then they must become responsible for checking and testing all packages and consignments.

It is noted that the testing protocols, especially ASTM D5058, are generally reasonable. They must be applied, however, to each and every package. Furthermore, because of separation of immiscible liquids and sedimentation of solids, each package must be thoroughly mixed before attempting to obtain a representative sample.

The drum washing and repackaging facility must be classified as a high hazard facility – in view of chemical hazards such as toxics, water reactives, explosible dusts, infectious materials, etc.

Storage tanks should have agitators and heating/cooling capabilities.

It is noted that Indaver's procedures for its Dublin facility appear to be reasonably comprehensive, but do not appear to cover all the concerns noted. There is also the obvious problem, common in industry, that operating procedures are frequently ignored or short-circuited.

8.6.3.4 Emissions: these must include toxic gas or vapour release from human error in inappropriate mixing of wastes, as well as from loss of containment. This is a very serious potential hazard.

8.6.4 Waste to Energy facility:

8.6.4.1 Layout: whilst recognizing that the project is at an early stage of design, there are a few obvious comments to be made.

It does not appear very feasible to remove major items of equipment for maintenance off-site or replacement. Most maintenance will involve items such as filter bags or in-situ repairs, nevertheless it is normal to allow for equipment removal – even if this is removable walls or roof sections.

Dioxin filter replacement may release dioxin laden materials. The filters should be in a separate enclosure, unless clean side replacement is contemplated.

There does not appear to be an emergency exit from the turbine building and the main entrance is opposite the storage area for 2000 tonnes of flammable solvents.

8.6.4.2 Reliability: as noted earlier, the reliability, of the complex, multi-stage flue gas cleaning and dioxin removal system, is likely to be below that of the incinerators. A full stand-by system, common to both incinerators, should be installed. This would be BAT, up-to-date and good engineering practice.

It is likely that emissions, during the period before a failure is noted (which could be up to 4 weeks for dioxins) and the incinerators shut down, could be 10 to 10000 times normal levels.

Similarly, a single turbine is regarded as unusual, given that it must be sized for both incinerators and full turndown to minimum load of one incinerator, yet a second incinerator may not be built.

Loss of a turbine would return the facility to a simple waste incineration plant.

It is assumed that cooling is adequate for removal of all heat generated by the incinerators (ie. 80MW th.).

8.6.4.3 Ammonia / urea: it is noted that ammonia is both flammable and toxic. No note has been taken of the possibility of ammonia emissions from the incinerators, due to overdosing or poor reaction.

Similarly, a simple error may allow connection of ammonia/urea direct to the incinerators. Whilst it will be combusted in the PCC, the resultant levels of NO_x could be significantly in excess of licence.

8.6.4.4 Solid wastes handling:

8.6.4.4.1 Effluent sludge: this is unlikely to be fresh on arrival and may then be stored for days or weeks in a bunker. A number of gases and vapours will be generated, including:

H_2S	-	toxic and very flammable
CH_4	-	very flammable
VOC	-	such as acetic acid and other solvents, from chemical plant effluent sludges.

These sludges may initially behave as solids. However, many will arrive as, or rapidly degenerate into, a semi-fluid state which cannot be handled as a solid.

8.6.4.4.2 Shredder: it should be noted that there were some 46 accidents reported in France alone, on wastes incineration plants between 1992 and 2000. Of those involving explosions, most occurred or involved shredders or other comminution equipment.

Manual retrieval of metal and wood seems both crude and dangerous.

8.6.4.4.3 Wastes bunkers: the bulk density is given as 0.3 to 0.4 tonnes/m^3. This is uncompacted. Given that the bunkers are nearly 20 m deep , the wastes at the bottom will have a much higher density.

Total capacity is likely to be closer to 10000 tonnes.

Using cranes to mix wastes, and ensure a minimal retention time in a bunker, is not very effective. Screws should be used to mix, and, preferably, to deliver material from the bottom of the bunkers to the feed hoppers.

8.6.4.4.4 Wastes feed hoppers: the screw and pump will only seal if there is waste in them. Waste should not be left in an inactive screw or pump for any length of time – it may be affected by the heat and cause failure of the equipment on restart.

Also, at least one major explosion has occurred because of a failure of the water jacket on a feed hopper.

8.6.4.5 Liquid wastes handling:

8..6.4.5.1 Filtration: a sieve is a rather coarse filter. Particulates in waste solvents are generally too fine for most filters and the solvents have usually already been filtered.

8.6.4.5.1 Agitation: a pump around loop is inadequate for agitation – an agitator should be installed.

8.6.4.5.2 Decantation: it would appear that Indaver have no experience of this operation. Sedimentation of most pharmaceutical liquid wastes will be very poor and the resulting solids phase probably no more than 2% - 5% solids.

This should certainly not be added to a bunker.

8.6.4.5.3 Bulk storage: again, double walled mild steel is not acceptable.

In addition, a design pressure of at least 1 barg will allow normal breathing without consumption of N_2 or emission of vapours. Again, this is BAT and good engineering practice (not to say common in the chemical sector).

8.6.4.5.4 Control: LEL detectors must also be suitable for detecting many other flammable gases and vapours.

Smoke detectors may be of little use because of the levels of dust and fumes given off by such facilities.

Air flow through the feeders will certainly not prevent flames propagating backwards under all circumstances.

8.6.4.5.5 Tanker cleaning: the use of high pressure water sprays in solvent tankers is potentially dangerous. This does not appear to have been noted.

8.6.4.6 Combustion:

8.6.4.6.1 Temperature and halogens: there is no independent check that any waste stream has less than 1% halogen. Unless such an independent and tamper-proof check can be introduced, operation below 1100°C should be prohibited. (Note that 3.8.3 gives the operating temperature of the moving grate incinerator as 1200°C).

8.6.4.6.2 Wastes containing dioxins: some wastes, such as sewage sludge, are known to have significant dioxin content from the start. These require temperatures in excess of 1100°C, for efficient destruction.

8.6.4.6.3 Control: the listed control parameters are totally inadequate. Air flow, feed flow, ash quantities (and composition), gas flow and gas composition pre- and post-treatment, are all relevant to assessment of incinerator operation.

The combustion efficiency should also be specified – for hazardous wastes it should be at least 99.9999%.

8.6.4.6.4 Feed hazards: 3.8.8 makes the extraordinary statement that a large gas cylinder could enter the moving grate furnace undetected! If this can get in, what else? (Has anybody considered that this would be an excellent method for paramilitaries to decommission their weapons and explosives?).

8.6.4.6.5 Shutdown: the incinerators will take up to 18 hours to shutdown under controlled conditions.

At best it will take 1 to 3 hours before combustion is sufficiently complete to ensure emissions are no longer of concern.

The plant is not therefore capable of rapid response to a serious failure.

8.6.4.7 Energy recovery and dioxins: the energy recovery system is conventional and energy recovery poor (discussed later).

However, the impact of energy recovery on dioxin de novo formation is deliberately, and inexcusably, not given. This is especially relevant to hazardous wastes treatment.

Particulates removal from the boiler surfaces is poor and ignores the high particulates load in the flue gas itself. Rapid cooling through the critical temperature range is not achieved. – 30 seconds is very slow.

Dioxin formation is likely to be 100 to 1000 (or more) times that achieved by direct and very rapid (milliseconds) quenching of combustion gases, employed in incinerators without energy recovery.

An explicit determination of the environmental impact of the energy recovery should be given, in terms of total dioxin formation. Only then can the value of the energy be properly assessed.

8.6.4.8 Flue Gas System:

8.6.4.8.1 Evaporating spray tower: the diameter is given as 2 – 8 m. Hopefully, this is yet another typographical error and the diameter has been determined rather more accurately. (For an optimized plant there does seem to be a lot of choices here – up/down flow, water/lime and atomiser/spray nozzle).

Note that the water will have dissolved solids and will tend to plug nozzles of any description.

The use of bags at a temperature of 140° to 170°C should also be reviewed – especially as hot ash can reach this stage.

Total failure of water should be considered – not just the odd nozzle. A weekly changeover of nozzles implies shutdown of the entire system – which should certainly not be required or permitted.

8.6.4.8.2 Ash systems: again, there appear to be innumerable variations to be considered. It is difficult to determine whether a process is BAT/BATNEEC/BPEO or good engineering practice (never mind optimized) when it has not yet been defined.

Note also that numerous serious incidents have occurred where ash is quenched with water.

Boiler ash silo is to be equipped with HEPA filters – the changing and disposal of these filters must be identified.

Solidification is suggested as a possibility. As noted later, vitrification is regarded as BAT.

It must be noted once again that this plant requires the existence of an hazardous waste landfill. If solidification (or vitrification) is required it must be on-site – to avoid the need for transport of yet more hazardous wastes around and through Cork.

8.6.4.8.3 Gypsum: gypsum is a most unpleasant material to recover and a vacuum belt filter will not give a well-dewatered product.

Furthermore, the gypsum will be contaminated with a range of other compounds, including ash and dioxins.

8.6.4.8.4 Solidification: this process does not produce an inert material. Dioxins remain adsorbed - they do not bind with the ash – and will leach out over time.

8.6.4.9 Utilities:

8.6.4.9.1 Table 3.14: 50%caustic is not readily available in Ireland – 30% is standard.

Both lime and caustic absorb CO_2 from the flue gas very quickly and change to calcium and sodium carbonates. It is therefore pointless using lime or caustic. Sodium carbonate should have been considered in preference to caustic.

It should also be noted that milk of lime is only partially dissolved calcium salt, but absorption only takes place in the aqueous phase. There will be significant differences in scrubbing efficiency, which should have been identified.

8.6.4.9.2 Cooling water: primary combustion air, drawn through the bunker, is likely to be laden with dust, water vapour and other contaminants.

It is not a good idea to put this air into a heat exchanger.

8.6.4.9.3 Laboratory: the laboratory should be required to gain accreditation.

It is, in any case, inadequately equipped if the list of equipment is as shown.

8.6.5 Emissions to air (section 9, reference document):

8.6.5.1 Waste Transfer Station:

8.6.5.1.1 Room extracts: the flow and concentration will be determined by the type of extract. Generally, the volume should be relatively high and the concentration low, if emissions are to be properly collected.

8.6.5.1.2 Tank vents: the flow from the tanks will be very low and the concentration very high. Relief valves should not be connected to an abatement system – it is presumed that the reference should be to vent valves.

It would be better to use higher pressure tanks, as noted.

8.6.5.1.3 Abatement: none of the systems mentioned should be employed.

Activated carbon systems will become saturated with water vapour (from washing), have very different adsorption characteristics for the different organics, do not always give licence emission limits and are prone to fires if overloaded. They are not recommended where a large range of organic vapours may be encountered.

Vapour condensers would be idiotic in a high moisture environment, since the temperatures required to ensure removal of volatile organics (such as methylene chloride etc) at licence limits, would lead to freezing and blockage.

Catalytic oxidizers are prone to poisoning and have to be operated at their higher limit temperatures to ensure that all organics are destroyed. Again not suitable for such a mixed range.

Numerous other technologies could have been considered. However, the best is a simple, regenerative thermal oxidizer.

Of course, these emissions <u>should</u> have been routed to the incinerators – if the site layout was better arranged.

Table 9.1 does not reflect emissions from an oxidizer.

8.6.5.2 <u>Waste to Energy plant</u>:

8.6.5.2.1 <u>Operating year</u>: tables 9.2 and 9.3 give the operating year as 7500 h vs. 8760 for 365 d/24h. The plant is thus offline for 7.5 weeks a year or 2 months. This is unusual – a 2 week staggered shutdown would normally be expected, with at least one plant online for 50 to 51 weeks a year.

All emissions quantities should be assumed for 8760h/a rather than 7500.

8.6.5.2.2 <u>Tables 9.4 and 9.5</u>: these figures are generally fictitious (partly guesswork, partly wishful thinking) and, in one major respect, deliberately misleading. Maximum discharge figures are based on 110% of normal load and 7500h/a. At the very least they should be based on 120% or maximum waste throughput and 8760h/a. Even better would be a proper and realistic estimate of short term peaks (start-up, step changes and treatment faults or reduced efficiencies).

For example, filter efficiency generally degrades as filters block or bags wear or due to variations in lime and carbon injection. Similarly, scrubber efficiency will vary with flue gas rate and pollutant load, as well as due to deterioration of the liquor and blockage of nozzles.

Here, maximum discharge concentrations simply reflect directive limits for normal or long-term operation.

Emission levels prior to treatment are similarly dubious –HCl maximum, for example, reflects a figure of 1% of nominal feed rate. Dioxin levels, prior to treatment, would actually be expected to range up to 100 to 1000 ng/m^3.

Similarly, the efficiencies of the treatment processes vary wildly - HCl at 99.95%, HF at 90%, SO_2 at 98% but NO_x only 50%, under normal conditions. At maximum loads – HCl at 97%, HF at 98%, SO_2 at 97.5% and NO_x at 67%.

Note also that HF levels are virtually the same at normal and maximum loads.

It is also worth noting that the emissions, pre-treatment, from both hazardous and non-hazardous waste streams are nearly identical, explaining the similarity of treatment systems, but also begging the question as to how different incineration requirements can be justified. Perhaps the designation of municipal waste as non-hazardous should be reviewed.

8.6.5.2.3 Table 9.8: a bunker fire is identified but not quantified.

A number of comments can be made:

- a fire involving one full large compartment (ca. 3800 m^3 and using a density of 1000 kg/m^3) should be considered as highly credible.
- a fire involving all bunkers, at 75% capacity (ca. 9000m^3 or 9000 tonnes), is credible if improbable (major shutdown or emergency).
- air flow can be estimated from natural convection calculations and experience of other such fires. Duration of such large fires could extend over 24- 48 hours.
- pollutant concentrations would be generally dissimilar (and usually higher) to those found in incineration. For example, the EPA's own "Inventory of dioxin and furan emissions to air, land and water in Ireland for 2000 and 2010" states (section 4.6.2.2) that dioxin emissions from landfill fires can be up to 1000μg TEQ/tonne waste burned (UNEP tool kit). Thus for 3800 tonnes burned emissions could be as high as 3.8 g TEQ and for 9000 tonnes, as high as 9 g. This compares with total national annual emissions to air of 34 g TEQ (2000).

I would suggest a more likely figure of 0.5 to 2.0 g TEQ might be released. However, even this represents between 200% and 700% of the total normal dioxin emissions over the life of both incinerators (calculation below).

{flow(73139+92661)Nm^3/h*7500h/a*0.01ng/Nm^3*25y =0.311g}

A fire in a bunker more closely resembles a landfill fire than incineration.

And Indaver proposes, for small fires, to open roof vents, thereby improving the draught and ensuring dispersal of dioxins over the neighbouring communities.

Of course, the fire should be detected and extinguished – so the probability should be low. But it still depends on human intervention and mechanical equipment.

Similarly, a release of untreated flue gases is posited. Again a number of comments are appropriate:

- some of these faults may not be detected for hours, days or even weeks.
- untreated flue gas pollutant levels may be substantially higher than indicated by Indaver.

For example, dioxin levels of 100 ng/m^3 are feasible and emissions would then be 1000 times higher than permitted and undetected for up to 4 weeks. (At this level emissions would be 0.24 cf. g/d national total emissions of 34 g/a = 0.09 g/d). Over 4 weeks this would give a total a total emission of 6.7 g or 20% of the national annual total.

Again, it is perhaps pessimistic to assume that such a fault would go unnoticed for so long, with such devastating consequences. Unfortunately, it is undoubtedly credible.

It has already been noted that a complete standby flue gas/dioxin treatment system might be advisable.

8.6.5.2.4 Ammonia/Urea injection: the process proposed is SNCR (selective non-catalytic reduction). However, SCR (selective catalytic reduction) is a more up-to-date technology (and considerably more efficient).

It should be noted that NH_3 concentrations should also be monitored – it is easy to overdose or for variations to occur in the efficiency of reduction. NH_3 limits are generally more restrictive than NO_x (5 to 10 mg/Nm^3 cf. 200 mg/Nm^3).

It should also be noted that NH_3will react with other acid gases (eg. HCl, HF, SO_2) and that some of these compounds (such as NH_4Cl) can be more difficult to remove.

8.6.5.2.5 Activated carbon and lime injection: a number of comments should be noted:

- both carbon and lime (as raw materials) may be contaminated with dioxins, depending on their origin and method of production. A dioxin balance on the incinerator facility should include measurement of dioxins in all input streams.
- injection of this material into the flue gas stream can be problematic. Uniform dispersion requires uniform, small particle size and high energy mixing.

Effective adsorption requires adequate contact time and high turbulence.

The proposed injection system is poorly defined and does not inspire confidence.

8.6.5.2.6 Baghouse: unless ceramic filter elements are being proposed, which is unlikely, there is an high probability of a baghouse fire. These are not as uncommon as they should be.

The baghouse requires fire detection and fire protection.

8.6.5.2.7 Wet Scrubbing: first, most heavy metals will be in the form of oxides and most of these are insoluble in water or alkalis. Some metal oxides may be removed through impingement of the particulates on which they are adsorbed.

Second, absorption of HF is not easy – it may form a mist that can be difficult to remove.

Third, as noted earlier, calcium salts must first dissolve before they can react. Mass transfer limitations may result.

Fourth, the use of packed towers increases the potential for a blockage of the flue gas stream and major problems for the incinerators. Blockages, of salt or particulates , may occur gradually but not be noticed until only a short time before the blockage becomes total. Since bypass venting is not desirable, a different type of scrubber is recommended.

Spray towers are difficult to operate effectively – serious consideration should be given to a venturi or similar type of scrubber.

Gypsum will be contaminated with other salts (chloride, nitrate and carbonate predominantly), ash, heavy metals and dioxins. It is unlikely to be retrieved as a 90% w/w solid and saleable.

If a scrubber is quenched it must still be operating – making maintenance problematic, except in very minor respects.

The control proposed will not work in practice – there will still be a build-up of salts and periodic deposition in the system.

In addition to the possibility of melting the scrubber (on fluid failure) and blockage with salts there is also the risk of flooding - because an emergency water supply has been permanently connected and interlocked to operate automatically. If water gets back to the incinerator there may be a major steam explosion.

8.6.5.2.8 Dioxin removal: option 1 suffers from the same problems outlined earlier, together with the potential for condensation of water and blockage.

Option 2 should be operated under dry conditions and is an adsorber not an absorber. However, it is likely to experience significant condensation and water carry over and will operate in a wet condition. This will be a high pressure drop system and prone to blockage.

8.6.6 Technology Options (EIS sections 2.4 and 2.5):

These comments relate only to thermal conversion technologies. Non-thermal options and general discussions on wastes and wastes treatment options are covered in other sections.

8.6.6.1 Kalina cycle: this is only one example of a number of new (or relatively new) developments in energy recovery and power generation technologies. It is not, as suggested, still in the development stage – it was successfully demonstrated in the USA in 1991 – 5 and commercial plants have been built and operated in Japan and Iceland.

It employs well-proven components and increases energy recovery by 10% - 15%. It is not limited to waste treatment plants, but could easily be employed in this facility – although consideration would have to be given to the quantities of ammonia employed.

8.6.6.2 Pyrolysis and Gasification: the IEA CADDET report was already dated when the EIS was compiled – it dates from 1998, reflecting work and experience up to 1995 – 7. It was also a limited report and did not address the subject particularly well – it failed to note that several plants already existed in Japan, that more were already being built and that there are 5 or 6 processes now commercialized. One small plant had even been running in Europe since the late 1980's.

It is not proposed to provide an extensive evaluation of these technologies – it is sufficient to note that Indaver were incorrect in dismissing them. They have significant environmental advantages, both in terms of reduced total dioxin creation and in terms of the solid wastes produced – generally fused and recyclable. Power outputs are comparable.

(One such installation has demonstrated dioxin levels in the stack of <0.006 ng-TEQ/Nm^3).

In particular, some of these technologies demonstrate compliance with Article 9 of Directive 200/76/EC far better than conventional incineration, as proposed by Indaver.

The main drawback will be an increased technical complexity, though this should not be of any real concern.

It would appear that Indaver have made no real attempt to consider the alternative thermal technologies, but have merely sought excuses to justify their pre-ordained choice. This, again, may be regarded as an attempt at deception and subversion of the requirements of several Directives as well as of the principles of integrated wastes management

8.6.6.3 Incineration furnace selection: by far the commonest type for hazardous wastes is the rotary kiln. Fluid bed incinerators are not often even listed as suitable for such wastes. However, provided the wastes are suitably prepared and step-changes of feed quality are avoided, fluid bed incinerators should be usable. Indaver should be requested to provide examples of fluid bed incinerators, of the type selected, in use with similar hazardous and non-hazardous wastes elsewhere.

Moving grate furnaces are common for municipal waste incinerators.

8.6.6.4 Solvents wastes: Indaver notes that 80% of the hazardous wastes will be waste solvents (currently incinerated overseas). 90%+ of hydrocarbon solvents can be recovered, after relatively simple and minor pre-treatment to remove the bulk of chlorinated solvents, water and solids. These mixed solvents should also be segregated into their simpler streams on site. Then the solvents should be sent to an oil refinery for insertion at a suitable point in the process (most will have started life in refineries). The bulk will probably turn up in petrol and other fuels, with some returning as solvent base stocks.

The quantities would be insignificant to a refinery, their processing simple and very economic and the environmental impact far less than from incineration.

This would also accord with EU principles, in that they would be returned from whence they came (more or less).

8.6.7 Materials on site (reference document sections 15.3, 15.4):

8.6.7.1 Liquid wastes: residues are to be added to the hazardous solids wastes bunker. These wastes will be very solvent wet (high vapour pressure) and include tars and fines. Adding these will substantially increase hazards in the bunker – of vapour/air explosions, fires and toxic vapours.

Furthermore, most of the solids will remain in the liquids as very fine suspended solids or as dissolved solids.

Warehouse sumps are used to collect spills. These must be emptied as soon as possible, to avoid vapour concentrations reaching dangerous levels. Ventilation of the warehouse should be provided – with treatment if necessary.

8.6.7.2 Bulk tanks: the double –walled design has already been criticised. It should be noted that it does not provide secondary containment in any real sense – it is generally used to reduce the risk of external damage (eg. from fire) and provide some containment in the event of inner shell corrosion.

Failure of a vessel wall is extremely rare (usually regarded as incredible). Most loss of containment (non-fire related) occurs through nozzles below the liquid level. The double skin does not address this problem.

Section 15.4.2 mentions tank mixers – previously it has been indicated that mixing was by external pump loops.

It is also noted that the tanks are equipped with water sprays (water curtains is an incorrect terminology) to cool the shell. No other facility in Ireland employs both double walled construction and water sprays on ordinary solvents in low pressure tanks.

8.7 Section E

8.7.1 Other wastes: Table E2.4 of the EPA's own application form lists wastes from incineration or pyrolysis of municipal (and other) wastes. Indaver have indicated that pyrolysis (and gasification) are not yet in use.

8.7.2 Procedures: neither the application form nor the relevant guidance notes provide for any dispensations regarding the failure to provide operating procedures. Procedures, whether finalized or not (and reference has been made to existing procedures at other facilities), must be provided. This is a serious omission.

8.7.3 Materials: several materials have been incorrectly noted as not covered by Seveso, such as: hydrogen chloride and methane. Quantities are small certainly.

A number of laboratory reagents have been similarly classified.

8.8 Section F (Section 7 of reference document)

8.8.1 Birds: birds will get into the facility through the large doorways. They are likely to be killed by the high temperatures in the incinerator building and may be sucked into systems if air velocities are too high. Some protection will be required to minimize the problem.

8.8.2 Vehicles: uncovered vehicles are to be deterred – will they be turned away and sent back uncovered?

8.8.3 Odour control: the only way to suppress odours is to block the material with an impermeable coating. It is presumed that Indaver means odour masking chemicals, which are not odour suppressants.

8.8.4 Traffic control: delaying opening time of the facility will not affect HGV traffic arriving during peak periods. In order to maximize their revenue, HGV drivers will arrive as early as possible and park outside, - possibly overnight. This is a common complaint about other transfer stations.

Furthermore, there will be significant queues on a regular basis.

Traffic loads at the waste transfer station do not tally with the annual throughput figures.

8.8.5 Vermin: kitchen wastes may not intentionally be accepted at the recycling park. However, dirty containers will attract vermin.

Vermin will be a major problem in the waste transfer station and waste- to-energy facility, since agricultural, food, infectious healthcare, meat and bone meal and other such wastes are being accepted. It is difficult to keep rats and mice down without also killing voles, shrews and other wildlife.

8.9 Section H:

Refer to section 9 of this document for evaluation of the EIS.

8.9.1 Emergency response (section 15.2 of reference document)

8.9.1.1 Seveso/COMAH: this hazard identification and evaluation study has been discussed briefly, elsewhere. However, it should also be noted that:

- there was a major (and inadequately quantified) release from an Indaver incinerator in Belgium, ostensibly due to replacement burners. This should have been identified as a risk during modification risk assessments, but there was no explanation as to how the emissions by-passed or overloaded the flue gas treatment systems.
- A recent study in the UK has shown the hazardous wastes sector to be extremely poor, confirming similar observations in other countries.
- This author has recently reviewed a number of Seveso sites and has found previously unidentified major accident hazards in all of them.
- Comments earlier in this review have indicated that the Indaver study may not have been adequate.
- Finally, the EPA itself is aware of the appalling record of the wastes sector in Ireland and the number of problems that have come to light over the last few years.

It would be interesting to know what modifications were made to the design as a result of the study – the design appears poor enough as it is!

8.9.2 SOPs: it should be noted that even in the pharmaceutical sector, with all its checks and controls, SOPs are frequently ignored or improperly applied.

Indaver has not adequately identified any procedure for ensuring compliance with procedures – an internal auditing function.

This auditing procedure would then itself have to be audited by the EPA and HSA – a difficult enough task.

8.9.3 Site Management: (refer to section 8.10 for discussion on personnel). Indaver note that the site will be staffed by persons of appropriate qualifications and expertize and that, outside normal working hours response teams will be on call.

The EPA make note of technical competence (L2, guidance note), but nowhere is there any definition of appropriate qualifications or technical competence.

It should be noted that for 128 h out of 168 h in a week, the site will be managed by a supervisor, whose only qualification may be a Leaving Certificate and who may have minimal experience of such a facility, though having received some training.

There will generally be no technically qualified, experienced engineer on site nor on call (unless there are at least four such personnel , which does not appear to be planned)). Callouts may take 1 to 2 hours to arrive.

Indaver's comments regarding their own experience may or may not be entirely relevant – depending on the definition of "biggest risk". The frequency of incidents may well be highest during normal working hours, but the probability of a major incident may be independent of time, or even greater outside normal working hours. The potential scale of a major incident may then be exacerbated by the delay in obtaining competent technical support, outside normal working hours. Certainly there is plenty of experience of serious and major accidents occurring at night or at week-ends, when supervision (and attention) may be at their weakest.

This author does not consider that a complex, high hazard, process (as opposed to storage) facility should be operated without a qualified, experienced, trained and competent engineer in attendance at all times. (this may be taken to mean capable of response to an alarm or call within 1 minute and capable of reaching the source of the problem or the control room in 5 to 10 minutes).

8.9.4 Emergency shutdown: the analysis of emergency shutdowns is poor and does not reflect the level of experience claimed by Indaver.

For example, fluidized bed burn-out is expected to be completed within 10 minutes, even under significantly reduced airflow. However, in section 3.8.1 the residence time may by up to 1 hour, with full air flow.

There appears to be no stand-by fan, so that fan seizure or other failure leaves the furnaces without forced draught. The possibility of bag house fires is not even considered.

Comments on the efficiency of the flue gas treatment systems, without scrubbing or lime/carbon dosing, are not credible.

There must also be concern that the fluid bed, if left without significant air flow for any length of time, could solidify through ash aggregating and fusing.

Finally, emissions monitoring equipment must have sufficient UPS back-up to cover a full system cool-down to temperatures of less than 200°C

8.9.5 Plant design: there are a small number of international engineering companies, with experience in the design of this type of facility, who have and can provide good track records and experienced and competent teams. None of these appear to have been involved so far and, as far as this author is aware, do not currently operate in Ireland.

This author has 35 years of experience in the design, engineering and safety analysis of chemical and other facilities, including incinerators, and notes, with regret, that there are few enough qualified , trained, experienced, competent professional engineers , who could be entrusted with such a design or safety review.

Indaver may thus have some difficulty in fulfilling its promises under this heading.

8.9.6 Sludge bunker: it is good engineering practice to classify this area as Zone 2 – hence all electrical equipment should be explosion proof or intrinsically safe.

In fact, the entire storage area should be considered for similar zoning.

It is presumed that a SIL analysis will be carried out on the plant. LEL instruments are not noted for exceptional reliability.

8.10 Section I (section 18 of reference document)

8.10.1 Operations / Project Manager: Ms Burke has also been appointed Project and (from section 18.2, it would appear) Construction Manager.
These are clearly defined, professional roles, neither of which is Ms Burke remotely experienced or qualified to undertake.

A Project Manager for a €100 million project, should be a chemical or mechanical engineer, with at least 8 – 10 years experience as a design specialist (process or mechanical engineering) and then a further 10 -15 years experience as a project engineer and manager of ever larger projects.

Fortunately, Ms Burke will probably not actually be the Project Manager – this role will be taken by an engineer from the company appointed to design and build the facility. Whoever is the actual Project Manager should have the requisite experience and competence.

However, Ms Burke does not even have the experience to operate as the client Project Manager, whose role is to coordinate and control both the client (Indaver) and the Engineering company.

As Operations Manager, Ms Burke again does not have anything like the experience required for the role – for the Operation Manager controls Production and Engineering and is primarily the responsible person for safety and environmental matters. This role is normally taken by an engineer with 20 or more years experience in production and engineering management , with at least10 years experience in a similar facility or technology – in this case, waste incineration, power stations or the like.

Whilst Ms Burke is a chemical engineer, she must be considered very much a lightweight, whereas the roles require heavyweights.

It must also be said that it reflects poorly on both Indaver and Ms Burke that these appointments were made and accepted.

(With the resignation of Ms Burke, a replacement must be identified before the application can be assessed. Furthermore, relevant details regarding this replacement must be published).

8.10.2 Compliance Manager: Mr Miller appears to be poorly qualified and is again something of a light weight.

The role is a very onerous and responsible one and requires a person capable of exerting considerable authority , rather than merely a bureaucrat.

8.10.3 QESH Manager: Mr McGrath appears to have no qualifications relating to QESH and also appears to have inadequate experience – especially with regard to the management of safety on a facility of this scale and type.

8.10.4 Plant Manager: it is essential that this person has an engineering degree (chemical, mechanical or electrical), at least 20 years experience and at least 10 years in incineration or power generation, together with managerial experience.

8.10.5 Supervisors: as noted earlier, it is not acceptable to leave persons, without formal engineering qualifications, in sole charge of a facility of this scale and type.

8.10.6 Process Engineers: these are likely to be inexperienced, junior engineers. Diploma status is inadequate (unless combined with 20+ years practical experience) and process engineering qualifications are not, in the opinion of this author, of any value - they may relate to courses which have merely been re-badged from dairy science or food engineering.

At least one of the engineers must be an electrical engineer – this facility includes an 18 MW power plant.

8.10.7 General: there is no Engineering Manager – an extraordinary omission for a facility of this magnitude – and there appears to be only one experienced, qualified engineer attached to the facility (the Plant Manager).

In his absence, the plant is left in the hands of unqualified supervisors or inexperienced engineers – it is difficult to decide which of these represents the greater hazard. (The author's opinion would probably lean towards the inexperienced engineers as being the greater hazard).

The staffing suggests that the statements noting the support of Indaver NV is little more than a charade – this facility is clearly an Indaver Ireland operation and Indaver Ireland obviously does not have the resources or expertize.

The facility cannot be operated from Belgium – though that may be the safest place to be.

8.10.8 Accreditation: Indaver and Minchem are accredited to various international standards. However, in this author's experience, this provides no guarantee of performance – only of documentation and bureaucracy.

Auditing is only ever of systems – not the underlying performance.

8.11 Section M (Miscellaneous sections of reference document).

8.11.1 Indaver NV (reference document section 1.4, 1.5): Indaver claims to handle 900 000 tpa of waste (reference document was written in 2003) and recycle or recover 50%.

The Cork facility, ca 200 000 tpa, will recycle or recover 0% (excluding the waste transfer facility and recycling park, which are trivial). The 200 000 tpa which is incinerated represents a ca 50% increase in the waste incinerated by Indaver. Indaver does not therefore appear to have the size, or be offering the integrated waste management, that has been inferred.

It also claims to treat chlorinated wastes, but does not explain how. There are various dechlorination processes, which would be of interest to Cork, but it is presumed to be an incinerative process.

8.11.2 Soil investigation (Appendix A6.1): it is somewhat disconcerting to observe that a number of laboratory errors were made – although apparently detected and resampled. An accredited laboratory should not be making these sorts of errors - internal check samples should eliminate this. It is difficult to trust any of the results.

The EPA would be advised to review this subject.

8.11.3 Dioxin soil analysis (Appendix A6.3):

8.11.3.1 Sampling locations: whilst sampling was understandably restricted by the Foot and Mouth Disease outbreak, it should have been repeated after the end of the outbreak at the locations originally selected.

8.11.3.2 TEFs: it is noted that TEFs for EPA analyses were not available to AWN. The EPA should check and note any discrepancies.

8.11.3.3 Trends: the conclusion that dioxin levels have decreased significantly must be disregarded. It is based on far too little data and does not take account of changes in sampling techniques, sample storage variations, analytical techniques and analytical accuracies.

It may well be true – but it remains unproven.

8.11.3.4 Limits: comparison with other countries and regions is of no real value.

There are no generally accepted limits relating dioxin concentrations to impacts on human health. It is generally accepted that there is no safe limit and the lower the value the better.

Limits set in Germany, the Netherlands and elsewhere are purely pragmatic acknowledgements that their background levels are already high. It would be impractical to remediate significant percentages of the land area of any country. These limits will be brought down as (and when and if) background levels are seen to decline.

8.11.3.5 EPA studies: these will be the subject of a separate review. Suffice it to say that Ireland has a very poor record in monitoring of dioxins.

8.11.4 Impact of emissions (section 9.10, Appendix 9 of reference document): refer also to section 9 of this review, on the EIS.

8.11.4.1 Baseline: to describe the baseline survey as extensive is a gross exaggeration – the survey involved very limited measurements over an 8 – 12 week period. An extensive survey would probably require rather more measurements over a full 12 month period (or even over several years).

The monitoring methodology for arsenic and cadmium could not even reach the proposed ambient standard levels, so was, to a large extent, useless.

High levels of nickel were not traced to source and were summarily dismissed – based on the assumption that they were due to ISPAT, which was then in the process of closure. This should have been confirmed through subsequent repeat tests.

The ambient air quality was shown to be generally that of a very clean rural environment.

8.11.4.2 Modelling: Whilst the models used are certainly those recommended, comparative studies have shown that no two models give closely similar results. It would have been desirable to have first demonstrated these models by application to existing, reasonably defined, emission sources and compared the output of the model with actual survey results.

It must also be noted that none of the results quote an accuracy, which must lead to the modelling being treated with understandable suspicion and concern (although predictions of milk and meat contamination appear good).

As noted elsewhere, the maximum emissions were derived by assumption of limiting concentrations as listed in Directive 2000/76/EC. This is technically unsustainable and grossly misleading. Maximum emissions must be determined from considerations of operational parameters under credible worst-case normal and abnormal conditions. This may involve emissions 10 to 1000 times normal levels for some periods of time.

(See also comments on accident scenarios, such as bunker fires, where emissions may be even higher).

8.11.4.3 Conclusions: again, it must be noted that the conclusions that the impact of Indaver will be minor and not significant are grossly misleading and a deliberate deception.

It may be of interest to note that the environment will meet air quality standards and WHO guidance values, but this is not relevant to a discussion of relative impact on an existing environment.

When compared with the very clean, rural quality currently to be found, Indaver will have sufficient impact as to reduce the quality to that of a moderately clean urban environment. This cannot be described as insignificant or minor.

8.11.5 Classification of wastes (reference document section 12.4): it should be noted that the composition of all the various types of ash will vary significantly in accordance with variations in incinerator feed stock composition - which itself may vary significantly from day to day and even hour to hour.

These residues should therefore be more frequently and thoroughly analyzed – especially for dioxins.

Composite samples should only be permitted if feed composition remains constant.

8.11.6 Environmental Considerations (section 14 of reference document):

8.11.6.1 BAT/BATNEEC: general comments have already been made on this subject. Indaver has not demonstrated BAT or BATNEEC with regard to selection of waste treatment process for any or each waste stream, nor has it demonstrated BAT or BATNEEC with regard to the selection of thermal treatment, incineration or any of the component parts.

For example, energy recovery is poor – not only is heat recovery not employed but even the power generation is not BAT (see comments on the Kalina cycle).

Then, rather than concentrate on suppression of dioxin formation (which is BAT), the emphasis is on end-of-pipe treatment. Even this is not BAT, since, for example, SNCR treatment of NO_x is preferred to SCR.

Even on monitoring BAT is not met. Continuous dioxin sampling is of dubious value, when it means that the analytical cycle is 4 weeks (and there are technical criticisms of the accuracy of continuous sampling versus 6 – 8 hour tests, in the technical literature). Other emissions, such as mercury and odour, are either not measured continuously, even though instruments exist, or are monitored using outdated methods (odour is monitored by the local staff, who may not be very sensitive to odours, rather than using instrumentation).

The comment concerning Indaver's experience in Belgium should be evaluated against recent plant problems admitted by Indaver.

Finally, it is again observed that Indaver and its consultants appear to be unaware of the EPA's own BATNEEC Guidance note LC7 on the Wastes Sector.

8.11.6.2 Cleaner technology: some of the examples here are clearly inappropriate, others stretch the definition of clean technology to its limits.

- elimination of aqueous effluent would be laudable, if it were not for the fact that considerable amounts of energy are being expended in order to evaporate water. This energy is accompanied, of course, by copious amounts of CO_2.
- Since contaminated water can be employed, it could be suggested that Indaver should abstract this water from the municipal sewer, rather than from a water main or diversion of clean rain water.
- Air cooled condensers, as opposed to standard cooling water systems, are a minor improvement. Cleaner technology would involve the recovery of the thermal energy for some useful purpose (CHP).
- Use of liquid wastes is hardly cleaner technology when they could either be recovered or utilized more efficiently. Natural gas is, indeed, cleaner than oil or coal but it is a fossil fuel and a limited resource. Furthermore removal of water from the low calorific value wastes would be more energy efficient.
- The use of odorous and contaminated air is desirable but the use of less air would be even more desirable (see comments re: technology).

8.11.6.3 Energy efficiency: (see further comments in section 9 on EIS)

This facility certainly does not represent an optimization of energy yield – see comments on Kalina cycle and CHP etc.

Plume suppression, whilst perhaps desirable from a visual perspective, represents a waste of energy, however it is done.

8.11.6.4 International Comments:

- WHO: now 8 years old. Incineration is not a disposal strategy, merely a volume reduction and chemical modification (oxidation) technology.
- It is an over-generalization (and very subjective)to state that incineration necessarily reduces the potential to pollute or minimizes potential for harm.
- EU: most would be uncontentious – however, again incineration is mislabelled a disposal technology.
  It is typical of general documents such as this to talk of "safe" destruction or "close as possible" to generation, without defining precisely what is meant and how it is determined. Incineration can hardly be described as safe, when account is taken of the health implications of emissions and solid wastes. "Close as possible" has to be considered in an economic and technical feasibility context.
- Dioxins: it is not true to say that uncontrolled waste incineration has been the dominant source, but it has been significant. EU Directives do not reduce the generation of dioxins significantly, though they do reduce the emissions to atmosphere by re-routing them to solid wastes.
- EPA: these documents are currently the subject of a critical analysis. The hazardous waste plan is aspirational and does not properly consider economic feasibility. It is, in any case, putting the cart before the horse to acquire incineration capacity before constructing an hazardous waste landfill to take the ash.
  The inventory of dioxins is not an inventory. The contribution of incineration to dioxins is a design aspiration and represents something of a sleight of hand – there will be significant additional dioxins sent to landfill. As noted above, there is no suitable landfill.
- FSA: existing industrial incineration is trivial and generally would not create significant dioxin levels anyway. Thus the conclusion is false.
- HRB: Irish agencies and organizations seem to be overly fond of desk studies and literature reviews, which often seem to feed each other,. Again, the same comments apply as to the EPA studies, except that the statement regarding an absence of breaches of IPC licences is not true (and probably never was – the companies were simply not caught). However, the comment about operation in accordance with design standards is correct – if the EU Directive standards are the only yardstick.
  Unfortunately the waste industry (and industry in general) has a poor record in terms of adherence to any standards.

The note on epidemiological studies assumes a simple quantitative relationship between emission levels and health – this is not proven.
Finally, 15 months for a literature review?

8.11.7 Accidental emissions (Section 15 of the reference document)

A minor matter, but indicative – 15.7.2 states that the total volume of fire water storage on-site is 1500 m^3. 3.5.10 states that there will be two tanks of capacity 2000 m^3.

The same section also notes that the water cannon can operate for 10 hours before flooding the bunker. This assumes a voidage of 50%, which could be high. However, it is also noted that the cannon usage is 300 m^3/hour – ensuring that fire water will run out in 5 hours.

There is no mention of additional fire water capacity from external sources.

8.11.8 Seveso notification: (Appendix 5, reference document):

8.11.8.1 Bulking of materials: the quantity of toxics (83.5 tonnes) does not appear to take into consideration the affects of bulking the drums into storage tanks. This will create, in many cases, a significant increase in toxic materials, through the contamination of non-toxic materials.

Similar considerations may apply to other catogories.

8.11.8.2 Ash: some of the ash, because of the heavy metals and dioxin levels, may itself be classified as either toxic or dangerous to the aquatic environment. Again the larger quantity must be considered.

8.11.8.3 Formaldehyde: many of the waste shipments may be <90% but in the range of 20% to 90%. Most companies take the conservative view and use the formaldehyde content, expressed as a 90% solution, in their estimate for formaldehyde inventory. On this basis, Indaver will have considerable more than 20 kg.

8.11.8.4 Maximum quantities: since storage capacity is significant and Indaver has no control over the waste generators, it would seem prudent to assume maxima based on capacity rather than anticipated inventories.

The precautionary principle would suggest that the site be classified upper tier until and unless shown to be lower tier.

The site also includes parking areas – these again must be included in any calculation.

8.11.8.5 Signature: the copy of the notification is not signed. A valid notification, properly signed, should have been included.

8.11.8.6 HSA letter:

- double skin construction of tanks does not rule out catastrophic failure – it may actually increase the risk of failure, depending on design.
- The screening process is solely to detect delayed exotherms. There is no screening for increased toxicity.
- Locating bulk hydrochloric acid and ammonia tanks in the buildings is unnecessary and indeed may be regarded as poor engineering practice, if not actually imbecilic.
  Quite apart from the increased hazards to personnel, the acid tends to cause rapid corrosion to building structures (leaks are inevitable and common) and ammonia, once it escapes, rapidly rises and escapes from the building anyway. External storage is standard practice.
- bunding requirements must take account of jet leaks, hydraulic phenomena, rain water accumulation etc. The 110% rule has been questioned and may be changed. However, the most significant concern must be that of manifolding outlet lines – if tanks are manifolded a single failure may lead to loss of containment >> 110% of one tank.
- Perhaps the most extraordinary oversight is allowing the storage warehouse to be built against the road. It should be located as far as possible from the road and the (single) points of entry to both the recycling park/waste transfer station and Hammond Lane.

9.0 ENVIRONMENTAL IMPACT STATEMENT

9.1 Non-technical Summery

9.1.1 Waste arisings: the NHWM Plan is due a revision, as it is more than 5 years since it was conceived (although not actually released until 2001, the process commenced in mid 1997 – based on 1995 data).

It should be noted that the waste exported for incineration (some 60000 tonnes in 1999) is generally sent for incineration with energy recovery – which, as accepted by the EU, EPA and Indaver, is actually a recovery process and thus not subject to the same levels of concern as wastes exported for disposal (landfill) or incineration without energy recovery.

Furthermore, merely because it was (or is currently) exported for incineration does not mean that recovery is not feasible or that incineration has been selected as the BAT/BPEO for any individual waste stream. It generally means only that it is cheaper, more convenient and less trouble to burn it.

The conclusion, that a thermal treatment facility for hazardous waste could be justified, was not based on any proper feasibility study and financial analysis. The study was directed solely at hazardous wastes – so that conclusions cannot be extended to cover municipal wastes.

Finally, there are a number of processes available for dealing with waste biological sludges. Such sludges are largely water, with the remaining material split between organic solids and inorganics. Sludges can be substantially reduced in volume or, eventually, reduced to their inorganic content, using a variety of process techniques – including techniques such as wet air oxidation, supercritical oxidation and a sequence of physico–chemical and biological treatments.

9.1.2 Landfill: whilst landfill has its problems, it must be noted that incineration generates substantial quantities for landfill. It is also possible to construct landfills as very large digestors, with much more efficient gas collection, treatment and energy recovery. Once the organic matter has been destroyed, the landfill could be mined for its inorganic constituents. This is not so far fetched – 19th century landfills have been mined for materials then regarded as waste, but now in some demand.

However, landfill must remain at the base of the hierarchy - but only just.

9.1.3 Volume reduction: Indaver juxtaposes the 435000 tpa generated in Cork City and County with a claim of 90% volume reduction.

First, incineration does not reduce volumes by 90% - this does not account for compaction in landfill or the re-absorption of water by the ash.

Second, Indaver will only treat 150000 tpa of municipal waste.

Third, not all of the 435000 tpa would need to go to landfill - already some is being recycled.

9.1.4 Site selection: the claim that Cork generates 60% (and will continue to generate 60%) has been challenged and generally disproven. In any case, proximity would locate the plant in Tipperary, using simple mathematical analysis.

This author also recollects a proposal to locate the National Hazardous Wastes Incinerator in Derry – without a murmur from any Government department or agency.

Proximity would have been an interesting question.

Indaver also note their criteria – these did not seem to include obeisance to a County Development Plan, which has now to be changed. The statement that the location of the facility in Ringaskiddy complies with this plan is not true.

9.1.5 Schematic – Phase 1: this option, with cyclones between the fluidised bed and after burner, would be in clear and serious contravention of both the Wastes Incineration Directive and good engineering practice.

Materials requiring high temperature destruction (halogenated wastes for example) would not necessarily reach the after burner and the cyclone ash would tend to be heavily contaminated with the products of incomplete combustion.

9.1.6 Planning and policy: most of the documents are vague and do not overtly endorse incineration. Many have not been professionally and critically reviewed and are based on very dubious and unchallenged assumptions and data.

The summary statements are, in some cases, deliberately distorted and thereby misleading. For example:

- self-sufficiency: aspirational but not essential. Logic (and economics) must concur.
- Integrated solution: a thermal dustbin, emptied into an hazardous waste landfill, is not quite what "integrated" means. Wastes must receive a sequence of treatments appropriate to each individual waste arising, as far as is practicable.
- Energy recovery: only where environmentally acceptable – CO_2 emissions must be balanced against the total pollution created by the incineration process.
- Proximity: aspirational – but again with limits. Location in a major city suburb is clearly undesirable.

9.1.7 Roads and traffic: the planning tribunal examined this item in some detail. A single day, in winter, is hardly sufficient to define traffic patterns – though this sort of analysis might explain why road designs always grossly underestimate traffic flows.

It was also noted that the ferry was not running – a serious omission.

This sort of casual sloppiness tends to discredit the entire EIS, which may not be fair to some of those involved in its compilation. On the other hand, it may be typical.

Predictions are for some 150 truck movements in a 9 hour day – one every 3 or 4 minutes – but with periodic variations. This does not include a further 75 to 100 vehicles /day, generally staggered towards beginning and end of the working day.

This is a heavy traffic load, much of which will also have to pass through or around Cork city.

9.1.8 Air modelling: see detailed reviews elsewhere. It is a serious misrepresentation to merely state the impact of emissions in terms of % of air quality limit values and use this to determine the level of impact.

The correct and true comparison must be with existing air quality measurements – by which standard, the impact is far from minor.

9.1.9 Flora and fauna: again the study was limited to two brief periods in early summer – hardly deserving of the description of "study".

Furthermore, no study was made of fungi or lichens – probably because of the time of year, although some species are visible at this time. This must be a serious omission.

Finally, there is no mention of sentinel species.

9.1.10 Material Assets: the proportion of hazardous waste being exported must include allowance for the possible export of ash. This reduces the impact of the facility considerably.

Furthermore, a distinction must be made between hazardous wastes exported for disposal and wastes exported for recovery (including energy recovery). On this basis, and including the potential export of ash, the hazardous waste exports for disposal might actually increase.

The reduction in landfill of non-hazardous wastes should be calculated properly, allowing for volume compaction, incinerator residues etc.

On this basis, the reduction is not particularly significant, taken against the quantity going to landfill in Co Cork.

9.1.11 Impact on humans: it is stated that continued industrial development of Ringaskiddy is inevitable and will occur irrespective of the existence of Indaver.

However, elsewhere Indaver and others, have attempted to connect the existence of Indaver with such future development and have stated that without Indaver, development of industry will be damaged.

Indaver cannot have it both ways.

The statement regarding waste incinerators and dioxins is an interesting admission. This clearly implies that failure of the flue gas systems must lead to significant dioxin emissions – contrary to comments elsewhere in their submissions.

Furthermore, end-of-pipe treatment is not regarded as BAT.

The connection between the existing incinerators and dioxins in milk has been criticized elsewhere in these comments. Many of the incinerators would not be expected to generate significant dioxin loads – they generally handle liquids and/or non-halogenated wastes, for part or all of the time.

9.1.12 Impact on climate: the calculations supporting these claims are grossly oversimplified. No Life Cycle Analyses have been carried out, so that no allowance is made for the impact of the extraction of limestone and processing of chemicals used in the plant.

There is also no allowance for the treatment of landfill leachate required for landfills taking the ash from the incinerators. Nor is there any allowance for improvements in waste collection (especially of green or organic wastes) or in hazardous wastes pre-treatment.

9.2 Background to the project:

9.2.1 Hazardous waste arisings: the 1998 National Waste Database report is now well out of date –and is not without its faults. Using the figures noted in table 2.2, however:

- only some 33% of reported hazardous wastes are exported.
- only some 18% are exported for disposal (with >90%of this going for energy recovery).

At best, then, Indaver will handle <18% of hazardous wastes in its incinerators and reduce exports by <50%. It will have a negligible impact on hazardous wastes if the exports for energy recovery are also discounted.

It should also be noted that the total of reported hazardous waste in table 2.1 (ca 219000 tonnes) is significantly less than that from table 2.2 (ca 296000 tonnes). On the latter basis, the 137000 tonnes for Cork is < 50%.

However, it is surprising that nobody actually checked any of these figures against the copious amounts of documentation available.

There is also no allowance for the variations in recovery across the country – the proportion recovered in Cork is higher than that recovered elsewhere, so again the estimate that Cork accounts for 63% of exports is inaccurate.

Finally, if the EPA is to be quoted, it should be in context. With regard to thermal treatment the EPA also stated:

"(The table) does not represent any preference on the part of the Agency towards any particular thermal treatment technology. The selection and licensing of any thermal treatment technology will be contingent on it representing best available techniques."

9.2.2 Non-hazardous wastes: the National Waste Database report assesses non-agricultural arisings at 15.4 million tonnes (1998). It also estimates landfill at over 8 million tonnes and municipal waste at some 2 million tonnes. All figures clearly underestimate the enormous illegal waste dumping uncovered over the last few years.

Indaver's impact (in terms of volume reduction value) must be assessed against the overall picture – especially that of >8 million tonnes of landfill/a. This would suggest the country would need at least 10 such incinerators for municipal waste alone – and more for those other wastes that can be reduced by incineration.

It is admitted later (section 4.4.2 EIS) that MSW incinerators should be 250 000 to 750 000 tpa to be economic (1995). The figure is nearer a minimum400 000 tpa now (with projections of Cork County wastes reaching 750 000 tpa by 2020)

If a MSW incinerator is to be built, it must be of an economic size – and the environmental impact is more or less proportionate to capacity - and, more importantly, any solution must address the whole problem and not merely a minor part of it.

Indaver will thus have a very minor impact on the landfill problem, whilst at the same time having a very significant impact on the local environment.

9.2.3 IPPC: Indaver notes that waste prevention and minimization is an important focus of the IPC (now IPPC) licensing system – yet Indaver has selected to avoid seeking an IPPC licence.

9.2.4 Other countries: figure 2.3 has some interesting aspects:

- there is no indication of wastes arisings/person or some similar measure. Thus there is no measure of waste elimination, minimization etc etc.
- Austria and Baden- Wurttemburg seem to have reached an interesting balance, with much reduced landfill but limited incineration.
- Combining the best recycling with the best composting and other treatments (mechanical – biological) can account for some 65% - 75%, leaving at most 30% for landfill and/or incineration. If incineration is disallowed then 30% goes to landfill. Current Irish landfill is at 90%, so this would represent a 66% reduction in landfill – without any incineration. Furthermore, there can be no suggestion that even this picture has been optimized.

It would seem possible therefore to reduce landfill by >75% without any incineration.

9.2.5 Energy Recovery:

9.2.5.1 CHP: the Irish governments of the last 20 years (and especially the last 10) have been seriously remiss in their failure to encourage or advocate the installation of district heating infrastructure to all new major housing developments and designated areas for housing developments. With the increased densities and large numbers of new houses being built, district heating would certainly be energy efficient.

In Indaver's case, however, housing would be of less concern. Ringaskiddy is designated for industrial development. Contrary to Indaver's assertion, there are several large heat energy consumers in the area, at least one of which has been able to justify CHP on its own site.

However, Indaver could have been somewhat more adventurous and permitted the encouragement of a facility adjacent to their own site and designed to utilize large quantities of waste heat.

9.2.5.2 Integrated utilities export/reduced emissions: a little more imagination and the facility could be integrated into the industrial community, whilst also reducing emissions. For example:

- many plants, including Indaver, require N_2 and source this from PSA systems. These systems reject an enriched O_2 stream. Combustion uses O_2, leaving N_2 to convey and dilute the emissions. By recycling a major part of the flue gas (essentially depleted air, with 6% - 8% O_2) and enriching it with PSA reject O_2, the incinerator flue gas volume is reduced (and with it the mass flow of emissions).
- the volume of O_2 required would be large. But by producing large volumes of N_2 and exporting this to other plants, the balance could be achieved.
- Waste heat could be employed to run adsorption refrigeration, producing refrigeration for export.
- Then the site could export power, steam, refrigeration and N_2 to local pharmaceutical plants. The cost of installing the requisite infrastructure would be spread over 4 utilities. This infrastructure (pipe rack or underground conduit) could also permit bulk solvent wastes to be transported by pipe, rather than tankers.

Of course, such a scenario would require a comprehensive feasibility study – but such studies have been carried out before and shown to be feasible, depending on contract terms.

This would be an example of proper integration and energy management – as well as reducing emissions. It might even qualify as BAT and state-of the-art.

9.2.5.3 Incineration with/without energy recovery: EU and government policy is never explicit and is always open to interpretation. Incineration, with or without energy recovery, is at the base of the hierarchy, just above landfill, and is only to be considered if shown to be the best option. If the environmental impact is too severe, then incineration is not to be considered – there are many other techniques (thermal and non-thermal) for treating residual waste before landfill.

It may even be preferable to employ incineration without energy recovery if the energy recovery leads to severely increased emissions. For example, heavily halogenated wastes (and other difficult materials) are generally incinerated without energy recovery for this reason.

9.2.5.4 Energy as justification: Indaver, and others, misrepresent the relative positions of energy and incineration. Energy recovery is not a reason to incinerate – rather, the position is that if there has to be incineration then it is generally preferable to obtain some return in the form of energy. But incineration must first be justified.

9.2.6 Landfill:

9.2.6.1 Gas generation: landfills are increasingly refusing organic wastes, the source of most landfill gas. In future, landfills should accept only inorganic wastes so that gas release will be much reduced.

9.2.6.2 Gas treatment: the gas engines, flaring and venting common on most landfills, especially in Ireland, are not state-of the-art or BAT. Regenerative thermal oxidation can economically extract energy from land fill gas containing as little as

0.5% - 1% v/v methane and can then be used to oxidize remaining gas for the life of the facility at minimum (but not zero) cost.

9.2.6.3 Leachate: this does need to be treated, but once the landfill is full and sealed, leachate volumes drop dramatically.

9.2.6.4 Incineration: the incinerator produces hazardous and non-hazardous ash requiring landfill (though other thermal technologies can produce a vitrified waste that can be re-used), so that there is considerable sense in locating an incinerator on, or adjacent to, a landfill.

There is even more sense when the landfill is generating gas that can be used, or combusted, in the incinerator to reduce the use of natural gas.

This is an example of integrated waste management as well as an example of the proximity principle.

9.2.7 Integrated waste management: (see 9.2.6.4 above) Figure 2.4 omits domestic sewage, fuel and chemicals to the incinerator , air emissions and effluent from composting, agriculture and industry. It also omits the product design process and other waste elimination, minimization and re-use practices.

Apart from that, it does illustrate some of the principles of integration. Indaver, of course, is providing only the incineration – others are expected to provide the rest. Indaver's claims to integration involve a recycling park of trivial impact and excessive cost and a waste transfer station.

9.2.8 Advanced Thermal Conversion: it has already been noted (in section 8) that the Kalina cycle, pyrolysis and gasification are all now commercialized. This subject should therefore be re-evaluated.

It should also be noted that the comments regarding the gaseous products of pyrolysis and gasification are ludicrous – these gases are a fuel (as is natural gas) so that their flammable nature is desirable but leaks will be as dangerous as a gas leak. Their toxicity is no more serious than the toxicity of untreated incineration flue gas. These comments are deliberately misleading and pathetic scaremongering at its worst.

Finally, the multi-purpose nature of the Indaver facility is precisely what is wrong with it. It is attempting a one-pot solution when the better approach is to treat the separate waste streams by means of a multi-step sequence of appropriate treatments.

9.2.9 Furnace selection: this has also been discussed in section 8. Again there are a number of disputable comments:

- rotary kiln: where incineration is employed to treat hazardous wastes, a rotary kiln is the common selection. Indaver notes that it is not economic for the quantities involved, yet argue that it is economic to treat hazardous waste in Ireland.

  It is also incorrect to state that the rotary kiln is not suitable for sludges – rotary kilns have been used on sludges for decades (often for drying, but also incineration).

- Liquid injection: this is not suitable for liquid wastes containing hazardous organic solids. The temperature, time and turbulence requirement is for completion of combustion of gaseous and vaporous materials. Solids require a longer residence time to ensure complete combustion.

- Fluid beds: Indaver notes three types but has not yet selected one. They have significant differences and are each designed for a relatively specific type of waste.

  It should also be noted that they have been around since the 1960's – they are not necessarily state-of the-art.

- Herhof Stabilat Process: this is a pre-treatment process and is not a complete solution either. However, it does reduce volumes and can be combined with other technologies.

  The main concern is that it involves mixing of wastes which should be segregated and treated separately. It is essentially an anaerobic digestion technology.

9.2.10 Site Selection: the full site selection report is not included in this EIS.

- Cork County: restriction of the search to County Cork has already been criticized. The 24 sites are not named and the thoroughness of the search cannot be evaluated.
- Sensitive locations: the site selected does not meet this criterion, in that the Maritime Training Centre is <500 m away.
- Bottlehill: it is surprising that this, or any other landfill site, was not even considered.
- Ringaskiddy: the IDA is a state agency yet does not appear to support a project supposedly supported by government and in the best interests of industry. This seems more than a little odd.
  The advantages proposed for Ringaskiddy (section 2.6.7) are somewhat forced, for example:
  - existing incinerators: should be closed and replaced by Indaver, but will not be. Why should incinerators be grouped together?
  - Skilled workforce – of limited use to Indaver and generally overstretched. Would have to poach from other plants.
  - Close to main sources: not when recycling and existing incineration is considered

The best site, on the analysis presented, would actually appear to be site 2, not site 1. Its size is adequate and there is no evidence of contamination –this should have been checked. If contaminated, Indaver would have been in an ideal position to remediate it.

- Little Island: sites adjacent to the new effluent treatment plant or behind Mitsui Denman would have been worth considering and would meet all of the criteria.
- Carrigtwohill: Indaver claims government support, yet the IDA and Cork County Council are permitted to block every avenue? The Youghal Carpets site was available.
- Whitegate: now the ESB, another semi-state body, is allowed to interfere. Whitegate was considered in the early 1990's by several

groups (including this author) for the location of a National Hazardous Waste Treatment facility (in the case of this author, a non-thermal facility combined with the refinery). The refinery, at this time, was still in State hands – again refusing to cooperate. Existing pylons can be relocated or put underground, but planned pylons are far easier to move. Hardly a reason to dismiss a site.

- Carrigaline: the County Council would be correct.
- Conclusion: it appears that Indaver did not request Cork County Council Planning department to propose suitable sites.
  For a project supposedly of national importance and supported by government, the site selection appears to have been very badly managed.

9.2.11 Objectives: "foreseeable future standards" are indefinable – this author can foresee standards that the current Indaver proposal could not meet.

A policy of apportioning an undefined aliquot of income to community environmental projects is similarly unacceptable – it must be defined and must not lead to an increase in charges simply to cover it.

9.2.12 Design Basis: it must be noted that, under the Waste-to-Energy Plant, the requirement to handle chlorinated solvents is the only explicit reference to halogenated wastes in the submission.

9.3 SITE AND SCHEME DESCRIPTION

9.3.1 Education: it is particularly instructive that Indaver should here advocate the use of a range of technologies to manage waste most effectively. On this point, this author and probably everybody else would agree.

Yet Indaver is not proposing a range of technologies – only one, incineration.

9.3.2 Figure 3.8: this schematic does not appear to illustrate the design actually proposed for this project. Furthermore, the techniques for transferring hazardous wastes from drums and washing of drums are most definitely not state-of the-art or BAT. The operator should be operating in some form of containment booth, if not using a glove box system. It is poor industrial hygiene.

On a minor, but irritating and illustrative point, the figure, as with much of Indaver's presentation, appears to have been poorly proofread (if at all). "Schemematic" should be "Schematic"

9.3.3 Process: The EIS is supposed to reflect the process and plant to be installed. There are numerous differences between the process described in the EIS and that described in the reference documents accompanying the waste licence application. Some of these changes must and do impact on the environmental impact. Examples of these changes include:

- fluid bed flow diagram
- explicit reference to highly chlorinated liquid wastes (EIS 3.6.5)
- manual control of solids feed
- packing in the scrubbers
- caustic solution as scrubbing medium
- UPS back-up

In addition, there remain, of course, a number of open options.

Under such circumstances one or other document (EIS or application) must be withdrawn, corrected and resubmitted.

9.3.4 Dioxin and furan removal: again it must be noted that the statement that "the plant has been designed to minimize the formation of dioxins" is not true. The plant has been designed to control normal releases of dioxins, but minimization of formation would preclude energy recovery or would require separate flue gas pathways for halogenated and non-halogenated incineration.

9.3.5 Acid gases: mention should be made of bromine (or hydrogen bromide) and phosphorus (as an oxide), both of which are acidic and will be present.

Sodium hydroxide solution is also considered, in the application, as a scrubbing medium. Packing has been suggested as an option in the application.

9.3.6 Transport of Hazardous Wastes: comments regarding the transport of these wastes as being "strictly" regulated are grossly misleading. Considerable evidence is available to show that the regulation is singularly lax and inept.

For example, most County Councils do not check any C1 or TFS forms. Some 25% of hazardous waste shipments destined for export in 2000/200l. appear to have involved forged or fraudulent C1 forms; and this author has found serious errors and irregularities on almost all TFS/C1 documents (relating to exports) examined.

UK studies have confirmed this appalling state of affairs is common to the UK as well..

In reality, the C1/TFS system is a ludicrous anachronism in this digital era and needs urgent overhaul.

Many, if not all, waste brokers and transport companies (and some waste generators) have been found to be involved in such irregularities.

9.3.7 Classification: the IMDG and ADR classifications are complex and extensive. It is relatively simple to classify a raw material or pure compound but can be very difficult to classify wastes. Many generators and brokers appear to have some difficulty with this system – not least because the properties of many wastes are not fully defined.

9.3.8 Seveso: EIS 3.17.2 states that a detailed study of the hazards of the operation has been completed. It is not a detailed review – it is a relatively superficial review..

9.3.9 Decommissioning: in the event that the buildings are not re-used, they should be recycled. They should therefore be designed for maximum recycling, but there is no indication that this has been considered.

9.4 Planning and Policy:

9.4.1 Directive 1999/31: Article 6 is quoted. Conversion of a non-hazardous waste to an hazardous waste, albeit of reduced volume, does not appear to meet the spirit of the directive. This, of course, may occur when non-hazardous municipal or industrial wastes are incinerated – the ash may be hazardous by dint of dioxins or heavy metals (some of which are oxidized from insoluble forms to more soluble forms).

9.4.2 Directive 2000/76: it is disingenuous in the extreme for Indaver to write of promoting the objectives of the directive. Indaver are simply obliged to comply.

But note that the directive does not seek to promote incineration, merely to control it.

Continuous sampling of dioxins is not a requirement of the directive – because its value has not yet been demonstrated. Sampling alone is of little use – continuous monitoring (analysis) would be of much more use.

9.4.3 National Development Plan: the facility will not form a major part of anything. The reduction in export of wastes is minor.

9.4.4 Changing our ways: this document needs revision. Waste-to-energy incineration plays a significant part in some EU countries, but not in others. Indaver will not be diverting a significant percentage of waste from landfill and the relative environmental impacts of incineration and landfill have not been explicitly examined in a quantitative manner.

The admission that waste companies have a legacy of historic poor performance is important – there is no evidence that the culture of such companies has changed. In fact, the opposite is the case – waste management companies are still poor performers.

Opposition is to be mitigated by good planning, careful site selection and a policy of transparency! This application and EIS do not appear to be in accord with these concepts.

9.4.5 National Plan: first of all, the Plan is not a proscriptive document – it is only a plan

Second, there is no EU requirement for self-sufficiency – it is an aspiration, to be tempered by reality. Likewise, the proximity principle has no absolute definition.

In general, it is illogical to determine such technical matters by reference to the vagaries of history or vicissitudes of politics. If the island of Ireland is considered as a whole or, even more interestingly, if Ireland and the UK were still a single political entity, would the political imperative of an Irish incinerator still hold sway (and would it have to be in Cork).

If the answer is "no", - and it almost certainly would be – then it should still be "no" even under the present political status. The proper determinants should be physical geography and the size of the market – essentially the reality of market economics, adjusted, as required, by environmental costs.

It must be noted that nobody has suggested that Ireland should be self-sufficient in metals recovery, electrical goods recycling, mercury recovery from lights, solvents reprocessing, paper / cardboard / glass recycling etc. etc. These are all subject to normal commercial forces.

9.4.6 Sustainable development: this advocates minimization, cleaner production process development, life cycle analysis etc. These have not been formally applied, in almost every case, to the wastes Indaver is proposing to accept, but nor have they been applied to the waste treatment process itself – nor even to the incineration option.

Again, Indaver brings up the integrated approach – but integrating the incinerators with what?

9.4.7 Cork County Development Plan: Indaver is claiming conformance – yet a material change is required in order to permit Indaver to operate.

9.4.8 Waste Management Strategy for Cork: this is now 10 years old and being replaced. It did not recommend incineration, but it did note the high cost, large scale required and its inflexibility, as well as its wastes.

9.4.9 Waste Management Plan – Cork County: does not include incineration in its plan but does note the increasing popularity of incineration with energy recovery. This popularity is only to be found amongst operators and local and national authority waste management managers – not amongst the public. And, even then, few, if any, of its advocates realise the penalty being paid in additional dioxins creation through the addition of energy recovery.

9.4.10 Sludge Management plan: this study, like most others, has not been subjected to a thorough, professional, critical review.

There are a number of other technologies that can be employed to reduce volumes or even to permit recovery of materials (and energy).

Incineration is inefficient because of the energy wasted in evaporating water and the high inorganics content of the dry solids fraction.

Manufacturing residues are minimal and can easily be reduced even further, but it is other contaminants, such as heavy metals, that mitigates against final use in intensive agriculture – and these contaminants occur in sewage sludges (as do dioxins).

The interest in such sludges for Indaver , of course, is that industry (especially pharmaceutical manufacturers) can be made to pay extortionate amounts for wastes disposal – especially if exports are prohibited once the incinerator is commissioned.

In hazardous wastes treatment Indaver will effectively (and in reality) hold and operate a monopoly. This would then be contrary to other EU directives.

9.5 Landscape and Visual Impact:

The buildings are of a significant size and cannot be hidden. The facility will be particularly noticeable from the harbour itself, which is a major amenity area and attracts large numbers of tourists.

Perhaps the most deceptive sequence of photographs is that showing the development against the backdrop (or foreground) of the ISPAT facility. This was unintentional, since it was not known that ISPAT would close.

However, if the ISPAT facility is removed, which it will be eventually, then the facility would be considerably more intrusive. Even more so, if ISPAT were to be replaced by housing.

Photo montages should be prepared with ISPAT removed.

9.6 Roads and Traffic:

(see also earlier comments and planning tribunal record).

This is a most impressive analysis - for a single 18 hours observation period. This alone would be sufficient to reject the EIS.

Note that there is no consideration of wider impacts - for example, on the Lee tunnel or Kinsale road roundabout, both of which will see increased HGV traffic.

9.7 Noise and vibrations:

Again, a survey was conducted over a period of one day – a Tuesday in June. Evidence should be presented to demonstrate that such a survey is statistically valid as representative of the entire year.

The survey was conducted at three locations and modelling was carried out for 10 locations. The survey locations did not coincide with the modelling locations – "close" or "equivalent" are not good enough.

Indaver's policy with regard to equipment is to restrict noise levels, at 1 m from the source, to 82 dB(A) for a specific item and 85 dB(A) for a composite of items, with external noise limited to 65 dB(A) at 5 m.

It is common and good engineering practice, as well as technically feasible, to restrict equipment noise to 80dB(A) at 1 m.

9.8 Air Quality Study:

9.8.1 General: in general, this study was flawed in its selection of maximum operating conditions. It did not include credible abnormal operation or failures and has therefore grossly underestimated potential short-term exposures and impacts.

However, even worse than this, it has deliberately attempted to deceive, by comparing operating impacts with air quality standards (some of decidedly dubious value) rather than with existing, surveyed air quality.

The conclusion, that there will be no adverse environmental impact, or that the impact will be minor, is seen to be clearly untrue.

9.8.2 Baseline study: this is described as "extensive". A survey covering 8 – 12 weeks between March and June is hardly extensive and may not be representative of the average for the year or include true maxima and minima. For example, winter will produce increased levels of particulates, SO_2, NO_x etc from increased domestic fires. In Ireland, March may herald summer and June seem like winter – nothing less than a full 12 months survey is acceptable

9.8.3 PSD Classification: the study classifies Ringskiddy as a class 3 area (industrialized), yet existing ambient air quality is shown to be rural. A correct classification would be class 2 – the industrial mix in Ringaskiddy is atypical and generally is of low impact in environmental terms, especially since the closure of ISPAT.

This change of class impacts on the PSD increments to be employed - which is why the class 3 was selected, of course.

9.8.4 Baseline monitoring report: no explanation is given as to why almost every pollutant was monitored on a different basis (frequency, time, location).

There is also no explanation as to why dioxin measurements should vary so dramatically (lower limit 0.1 to 12.7 fg/m^3, upper limit 3.3 to 35.5 fg/m^3) or HCl (from <0.0003 to 0.134 μg/m^3), whilst others vary so little.

Averaging is fine – but error or deviation should be noted.

Similarly, heavy metals measurements exhibit some strange behaviour, strongly suggestive of sampling or analysis errors.

9.8.5 Specific impacts: (examples only)

- NO_2: baseline 10 μg/m^3 – Indaver contribution 12 to 17 μg/m^3 (average) and maximum 104 to 153 μg/m^3. These mean an increase of 100% to 200% over baseline on average and 1000 -1500% for peaks.

This can hardly be described as "minor" or "not adverse".

Even when considered at receptor locations the impact is not minor.

It must also not be forgotten that the Indaver contributions under worst-case conditions have been grossly underestimated.

- dioxins: referring to tables 9.49 /9.50, these again show a very substantial increase over baseline levels. In concentration terms, 5% to 20% on average to 50% - 200% at maximum, but in deposition terms a maximum of 2000%

Results for SO_4, HCl etc show a similar pattern.

The summary then compares results with major urban areas in the UK and the Continent – rather than with the baseline situation.

It is also incorrect to state (EIS 9.8.5) that occasional short-term excursions above the TDI would have no health consequences provided the long-term average was not exceeded. This is not proven – there is little evidence at all.

9.8.6 ISCST3 and AERMOD models: these models, whilst probably the best available, involve hundreds (or thousands) of assumptions, approximations and estimates – in reality, the problem they attempt to solve is equivalent to predictions of weather, but worse because weather patterns are an input to the models.

There is no sensitivity analysis or estimated accuracy, which makes the results of doubtful value. (There may be a difference between the models of a factor 5)

The models do not even account for phenomena such as inversion (see comments below), never mind chemical changes to the emissions (such as photo chemical) or agglomeration, condensation and absorption in rain.

They are also steady state, rather than dynamic models.

The models considered only a 3 km radius – 8 to 10 km would have been more desirable.

9.8.7 Other plants: in modelling the dispersion from nearby sites, it appears that licence data only was employed. This does not necessarily reflect actual emissions, which should have been available from the plants themselves.

The EPA's attention is drawn to tables A-9.20 to A-9.24.

Quoted stack velocities vary from the extremely low to the abnormally high – well outside the range of recommended stack velocities. These should be investigated.

Table A-9.24 only accounts for one stack on a site with at least 4 main plants and a number of additional stacks.

9.8.8 Cavity and Fumigation Study: SCREEN3 is used to model inversion. It should be noted that inversion is not unusual in the Cork harbour area. For example:

- IFI: exceptionally high concentrations of ammonia could be regularly found on high ground west of Carrigtwohill, more than 3 km away.

- IDL: obnoxious odours from IDL can be frequently detected in Cloyne some 8 – 10 km away.

9.9 Flora and Fauna: in addition to earlier comments, it should be noted that a facility of this size will impact on the fauna, in particular, and the flora over an area considerably greater than the site itself.

A proper EIS study should therefore have considered an area extending at least 1 km in all directions.

Furthermore, a review of the foreshore, inter-tidal and nearby marine areas should also have been undertaken. An EIS has to provide a baseline against which future impacts or damage can be assessed.

9.10 Archaeology: it should be noted that any archaeological survey must itself be closely monitored. This author is aware of developments where required archaeological surveys were either not carried out at all or not carried out in accordance with the planning conditions.

9.11 Impact on humans:

9.11.1 Dioxins: some comments

- formation of dioxins are independent of chlorine concentration, below 1% w/w chlorine – but it is certainly not zero. The 1% limit is a pragmatic construct in terms of selection of operating temperature.
- Precautionary principle would suggest that PCBs (and other POPs) should have been considered.
- The review obviously omits the EPA inventory report – which was not published until 2002.
- 1995 milk study compared samples from locations close to incinerators with those distant from incinerators. Unfortunately it did not note that the incinerators were not likely to be significant dioxin sources anyway. The conclusion was thus invalid.
- Second assessment noted a 16% reduction in levels of dioxin in milk. This was not statistically significant, especially considering the variation in sampling and analytical techniques – never mind the substantial variations in levels in each survey and an absence of accuracy estimates.
- Hospital incinerators were shut down but had been operating incorrectly for years. Some authority or agency was responsible for monitoring these incinerators.
- Ringaskiddy incinerators. These cannot be compared with Indaver and do not prove that incineration is environmentally benign.

9.12 Climate: the Greenhouse gas emissions calculations are inadequate. They are based on estimates and default values and yet do not include any estimates of accuracy. Furthermore they omit the CO_2 emissions involved in preparation of chemicals used for flue gas treatment or in transport for disposal of incinerator ash.

10. COMMISSIONING, OPERATION AND BREACHES OF LICENCE CONDITIONS

10.1 Commissioning: this has not been discussed anywhere.

It is suggested that at least two, and probably more, trial runs should be required over a 2 to 3 year commissioning period.

For the first 12 months the facility should not be permitted to handle any halogenated wastes, specified risk materials, healthcare wastes or very toxic materials. This will permit the availability, reliability and operability of the facility to be assessed, at minimum risk to the environment and local population.

Only after a review should the more hazardous materials be gradually introduced to the facility, by means of further trial runs.

10.2 Breaches of licence conditions: the EPA is advised to insist that, in the event of a major incident or a specified number (2 or 3) of breaches of the licence (within a specified period – 12 months, for example), the facility must undergo a re-commissioning and trial burn period.

For example, if dioxin levels exceed the licence limits 2 or 3 times in a 12 month period, the facility should revert to non-halogenated wastes for 6 months and then gradually re-introduce such wastes under monitored conditions.

Furthermore, a policy of 3 strikes and out should be specified.

If re-commissioning has to be undertaken 2 times, then the facility should have its licence modified (for example, chlorinated wastes removed) or, if the breaches are general, revoked, - until further modifications or systems are installed, following a proper period of public review and discussion. If such modifications cannot be employed, permanent closure should be enforced.