By Registered Mail

Dr. Stan R. Blecher MD, FCCMG
7 Fenton Lane
Port Hope
Ontario
L1A 0A3
6 September, 2013

Mr. Jim Bradley
Ontario Minister of the Environment
77 Wellesley Street
11th Floor, Ferguson Block
Toronto, Ontario
M7A 2T5

Dear Minister Bradley,

As a citizen of Port Hope who is passionate about our lovely town, I express here my grave concern about the request by the Company called Entech-Rem, to the Municipal Council of Port Hope, for permission to construct a garbage "Gasification" plant in the pristinely beautiful and tourist-friendly farm-land of the Wesleyville area in the Municipality of Port Hope. The site under consideration is about 2.8 kilometres, as the crow flies, from a sign on our picturesque nearby Lakeshore Road that reads "Designated Natural Area". In this letter I present the case against this application, based on factual information, and I appeal to you to support me and a very large proportion of the citizens of Port Hope in rejecting the proposal.

As a physician and medical scientist my concerns are primarily related to the health risks that such a plant would present. As a specialist in Medical Genetics I am in particular most conscious of the threat of genetic damage, called **mutations**, that would be caused by **mutagens** (substances that cause mutations) released into the environment by the plant, and the **cancer** and other terrible illnesses that would result, in children and adults of our community.

As I will show in the following, the Company bases its proposal on claims that are undocumented and undocumentable. In the material that follows I refute the Company's claims and I document my own statements with references, cited in **green** in the text. The sources cited in the text are provided in the list of **REFERENCES** at the end of the letter, and a brief description of how to read the citation information is given at the top of the list.

The text of this letter is in the following sections:

**REGULATION OF TOXIC EMISSIONS**

**FALLOUT THAT WOULD OCCUR FROM THE ENTECH-REM PROPOSAL**

**SUMMARY of facts about "Gasification"**

**SUMMARY of information specific to Entech-Rem**

The two Summaries provide overviews that might be found useful prior to reading the entire letter.

**CONCLUSION**

## REGULATION OF TOXIC EMISSIONS

The Company has stated that "facility emissions will be compliant to Canadian and Ontario Government regulations" (**THE NEWS NORTHUMBERLAND, Thursday July 4, 2013**). As I will document below, this statement is misleading, it is unsubstantiated, and it no way mitigates or addresses the health risks that the facility would present. I address this issue at three levels:

**First, the *total absence of regulations* for some toxins;**

**Second, the Company's claim in respect of those cases where there *are* Guidelines; and**

**Third, the *significance of existing official "Limits" or "Guidelines"* for poisonous substances.**

### Total *absence of regulations* for some toxins

The facility would emit in substantial amounts into the Port Hope atmosphere important contaminants **for which there are not only no government regulations, but not even government guidelines**. These include **CARBON DIOXIDE**, **the major greenhouse gas**, **NANOPARTICLES**, explained below, and innumerable other, undocumented toxins.

At an "Open House" held by the Company at the Port Hope Golf and Country Club on 27 June, 2013, I pointed out to a Company representative that the claim of "compliance to government regulations" was curious, when no regulations exist. The answer I received, in the presence of numerous other citizens, was that this was something I should be addressing with the government, rather than with the Company. This could give the impression that a loophole in the law is being exploited, and because this absence of regulations is not widely known to the public it could give a false impression of safety.

**NANOPARTICLES**, also known as ultrafine particles, are minute fragments of material, much too small to be visible to the naked eye, a few millionths the size of a pinhead. In the case of incinerators, including gasification plants, the term refers to minute particles of soot or ash contained in the plant's stack emissions. [In this letter I use the term "Incinerator" to include "gasification" plants, in accordance with international usage (**EUROPEAN PARLIAMENT, 2000**); I will clarify further, below, that the proposed plant is, by definition, an incinerator].

Because these particles are very small, they are able to get through the filter system in human lungs that prevents larger junk items from entering the body, and thus into the blood stream. Research on airborne nanoparticles from incinerators, as well as basic research on the fate of nanoparticles in the body and the resulting damage to health, have been performed on humans and in animal experiments,. These studies show that once in the blood, nanoparticles **can enter the lung, brain, heart, liver, spleen, kidney, testis, thymus - i.e. all organs studied (e.g. BENNINGHOFF, A.D. and HESSLER, W., 2008; DE JONG, W.H et al., 2008; BALBUS, J.M., et al., 2007; GUTIERREZ-CASTILLO, M.E., et al., 2006; PENN, A., et al., 2005; NEMMAR A., et al., 2004; CERNUSCHI, S. et al., 2012; SONG, Y. et al., 2009**). In these organs the particles can cause **grave disruption to health**, simply by their presence as foreign debris and also because they can carry the specific poisons they have been in contact with, such as carcinogenic (cancer-causing) furans and dioxins as well as lead, mercury and other toxins. **There are no regulatory standards or guidelines for release of nanoparticles anywhere in the world**, because scientists have only recently discovered the extent to which

they can invade the body organs and the damage they can cause, and environmental regulations have not yet caught up with this medical information.

**THE ENTECH SYSTEM RELEASES NANOPARTICLES, AND THERE IS NO WAY THIS CAN BE PREVENTED**. For documentation of this statement see **SYNERGETICS 2012b** in the reference list below. **SYNERGETICS 2012b** is a report developed by a company called SYNERGETICS Environmental Engineering, situated in Melbourne, Australia. SYNERGETICS was commissioned by another company, New Energy Corporation Pty Ltd, of Perth, Western Australia, to study and prepare a report on "**the potential for nanoparticle generation from the Entech process**" **(page 1 of Report)**. The following is cited directly from that source:

"… **THE CURRENT TECHNOLOGY AVAILABLE TO INDUSTRY DOES NOT HAVE THE CAPACITY TO EFFECTIVELY REMOVE ULTRAFINE OR NANOPARTICLE PARTICULATES**" **(page 4 of Report)**. I emphasise here that this statement refers **SPECIFICALLY TO THE ENTECH PROCESS** that the Company wishes to bring to Port Hope, and the statement that there is no way of preventing the nanoparticle contamination is **CURRENT AS PER 2012**.

There are also no guidelines relating to release of **CARBON DIOXIDE** (**$CO_2$**) (see, for example, Reference **IISD 2013**). **$CO_2$ is the main greenhouse gas**. Incinerators, including gasification plants, emit large amounts of $CO_2$, (e.g. **JOHNKE, B.**) and there are absolutely no regulatory restrictions on it. Incinerators including gasification plants are amongst the major agents of atmospheric $CO_2$ production, thus contributing significantly to the greenhouse effect. Indeed, biomass **gasification is actually used to produce carbon dioxide for use in greenhouses** (**DION, L-M., 2011**). The claim that a gasification plant would represent a source of "green energy" might be seen to be amusing, but for an unsuspecting public it could be seriously misleading.

Whereas the reason for the lack of regulation of nanoparticles is that scientific knowledge about their potential lethality is relatively recent, the reason for absence of guidelines on $CO_2$ is the world-wide political sensitivity of the issue.

## The Company's claim in respect of those cases where there *are* Guidelines

With respect to contaminations for which there **are** so-called "Standards", the company's claim that it would comply is totally unsubstantiated.

Entech - Rem, in their "Information Package" (**ENTECH-REM INFORMATION PACKAGE, 2013**), issued at their "Open House", 27 June 2013, gave a table of "Expected Emission Concentration from the Port Hope Facility as a Percentage of Ontario Guideline A7". This table gives "Ontario A7 Limits" and cites as its source Guideline 7 of the Environmental Protection Act of 1990.

It is disturbing that the Company also here provided misleading information to the public. To start with, the Company presents its own totally hypothetical "Expected Emission Concentrations". No documentation is given for these figures, and the Company has absolutely no basis for predicting these data, since they have no previous track record of running a plant of the type here proposed, processing waste on the scale proposed and under the North American conditions that here exist. **Theoretical "modelling" to arrive at predicted emissions is notoriously inaccurate** (**GREENYES ARCHIVES, 2008**). Next, they present these theoretical numbers for each contaminant as a percentage of the corresponding "Ontario A7 **Limit**" without informing the public that 1) that the "Ontario A7" figures **do not constitute "limits" or "regulations", only**

**"guidelines"**, and 2) the "Ontario A7 Guidelines" shown in the Entech-Rem table date back to **1990; more recent and more stringent guidelines have superceded those.**

For example, the Province of Ontario published an update, in the form of a "Decision on Policy", in 2010 (**ENVIRONMENTAL REGISTRY, GOVERNMENT OF ONTARIO, 2010**). This Update indicates, amongst other things, that **"Guideline A-7 is not a regulation. Limits and other recommendations in Guideline A-7 become enforceable when they are included as conditions in Certificates of Approval issued under the Environmental Protection Act". "Proponents are expected to do the best they can to strive towards environmental performance that is even better than the minimum recommended in the Guidelines".** Thus, aside from the important issues of nanoparticles and carbon dioxide, for which there are not even "Guidelines" (see above), there are, even for the substances for which there *are* "**Guidelines**", no published **Limits**, and since what the Company's actual emissions would be are totally unknown, here too the Company's statement that its "emissions will be compliant with Canadian and Ontario regulations" could lead to confusion in the public mind.

However, the web-site Gowlings Knowledge Centre (**ENVIRONMENT @ GOWLINGS, 2011**) gives the Air Emission Operational Requirements that the Environmental Assessment Act Approval stipulated for the plant recently approved for The Regional Municipalities of Durham and York. These requirements differ from those that Entech-Rem shows in its "Information Package". For example the Company shows the Ontario guideline for Dioxins and Furans as 80 picograms per cubic meter but the requirement for Durham is 60. For Nitrogen oxides the figures are respectively 198 ("Information Package") and 121 (Durham); for HCl 27/9; for lead 60/50; for mercury 20/15. While the limits for all of these potentially lethal substances should really be zero, these are yet further examples of the Company providing information that could be misleading to the public.

The Company has no data it can present that can show that they can comply with "Standards" in North America, because the Company has no track record in North America. Furthermore, though other companies have plants at the stages of "proposal", "development", "pilot", "testing", and "demonstration", more have failed and been closed down, and **neither Entech nor any other "gasification" plants are processing MSW (Municipal Solid Waste) commercially in North America at this time** (**US EPA , US Environmental Protection Agency, 2012, pages 35, 38, 39**). Gasification has no track record in North America to be proud of, and REM has no track record in gasification at all.

Information provided by the Company for "gasification" plants functioning in other countries are not relevant to this country because:

**a.** Other countries, and specifically countries in the Far East, where almost all of the Company's existing plants exist, do not necessarily have the same "Standards" as exist in Canada. The Company's existing plants are in Hong Kong, Taiwan, Indonesia, Malaysia, Korea and Poland. In some documents the Company has also listed Australia as a place where it has a plant. However, information on this was sought from the Company's website (**ENTECH WEBSITE, 2013**) on 19 August 2013. In a Search Box at the Website the Search Information "Sites of Entech gasification plants" was entered. In response the Search Box showed six links, worded respectively: "entech-project-1.pdf"; "entech-project-2.pdf" etc. through to "entech-project-6.pdf". When opened, these six links showed respectively gasification plants in: 1. Malaysia; 2. Taiwan; 3. Poland; 4. Singapore; 5. Korea; and 6. Taiwan (again, as in # 2). No Australian plant was shown. If an established Australian plant existed this Australian company would likely list it; if such a plant now exists it can only have been approved very recently, and can therefore not have any track record.

**b.** Countries where almost all of the Company's existing plants exist do not necessarily exert rigorous scrutiny and control, even of the standards that they do have.

**c.** Where the plants **are** processing MSW it is important to note that MSW has different composition in different countries. Specifically, MSW in the Far East, where almost all of the Company's existing plants exist, have a much higher proportion of food remnants in the feedstock than does MSW in North America. (See for example **VISVANATHAN C. and TRANKLER J., 2004; ZURBRÜGG, C., 2002**). Food remnant content is much easier to process and should theoretically produce lower levels of noxious effluents.

**d.** The data that the Company has presented, from the plant in Kuznica, Poland, do not provide an appropriate basis for making a decision that might allow construction of a plant in Canada. In addition to the above-mentioned general concerns about rigor of the testing process, I quote, in the following, specific information on the test done on the Entech plant in Kuznica. This information comes from a Report done by the University of California, Riverside (see **UNIVERSITY OF CALIFORNIA, 2009** in list of References):

**1.** The data presented for the Kuznica plant are evidently based on one single assessment.

**2.** That one single assessment was done as a "Demo Test", i.e. on a pre-arranged date - the Company knew in advance that the test would be done. By analogy with drug testing of athletes, testing of waste processing plants can only provide meaningful data if done at unannounced and random times.

**3.** The test was done in 2004. Far more sensitive methods are now available than were at that time.

**4**. The stated functional capacity of the plant in Kuznica, Poland is given, in data provided by the Company, as 25 tons per day, but on the day the test was done only 3.5 tons were processed. Entech-Rem has informed the public that if it were allowed to establish a plant in Port Hope, it would process up to 165,000 tonnes per year (**ENTECH INFORMATION PACKAGE, 2013**) or 200,000 tonnes per year (**ENTECH-REM "Proposed Gasification Plant Fact Sheet", 2013 (blue sheet)**). This works out to 452 or 548 tonnes per day, depending on which Entech-Rem document is providing the correct information. Either way it is clear that the data for the plant's performance in **processing only 3.5 tons, on one day, in 2004, when the Company knew in advance that the tests were to be done,** are not a reasonable basis on which to base a critical decision for Port Hope's future today.

**5.** Notwithstanding all of the above factors that heavily biased the odds for that test's outcome in the Company's favour on the day of the Demo Test, the actual test results reveal that the Company's performance in this case did not compare favourably overall to the performance of other plants tested under similar circumstances, in the Far East, at about the same time. For example, the University of California, Riverside Report (**UNIVERSITY OF CALIFORNIA, 2009**), on the page preceding the Entech Kuznica results, gives data on a "Fluidized bed gasification/ash melting" plant, of a company called Ebara TwinRec, in Kawaguchi, Japan. Emissions, in mg/N-$M^3$ (milligrams pre cubic meter) @ 7% $O_2$ were respectively:

**for HCL [Hydrochloric acid]: Ebara less than 2.8; Entech 7.9;**

**for Nox [Nitrogen oxide]: Ebara 41; Entech 254;**

**for Sox [Sulphur oxides]: Ebara less than 4; Entech 51.0.**

**These figures are from pages 12 and 13 of the Reference UNIVERSITY OF CALIFORNIA, 2009**. The facts presented here do not give reason for any confidence in a Company that has absolutely no local track record to show that it can process anything at all over a protracted period.

## The *significance of existing official "Limits" or "Guidelines"* for poisonous substances

When it comes to considering the risks to members of the community of potentially highly toxic substances that may cause cancer and many other terrible diseases, the entire issue of "Limits" or "Standards" needs to

be reviewed in context. The following section (in blue text) is a citation from the Reference listed below as **SYNERGETICS, 2012a**:

"A recent discussion paper (**NEPC 2010 [National Environment Protection Council of Australia]**), suggests a number of modifications of air quality regulation in Australia in the next few years, as summarised below.

It is very likely that ***allowable exceedances will be gradually phased out*****.** The literature consistently demonstrates that PM10 and PM2.5 in particular (but also $NO_2$, CO and $SO_2$) ***exert consistent, measureable adverse health effects on humans even below the current limits*****.** Basically this means that ***any concentration, small as it may be, has some sort of health impact*****.** The NEPM [National Environment Protection Measure] discussion paper (NEPC 2010), states that for these pollutants "the standards have been adopted with the acknowledgement that there is a level of residual risk associated with those standards". Given that there appears to be a linear relationship between exposure to NEPM pollutants and adverse health effects, any increase in air pollution levels (even within the standards) will lead to an increase in risk to the health of the population." End of citation. [Emphasis added].

[The term "Linear relationship between exposure and effects" means that even very low doses cause damage; there is no "threshold" below which levels are safe (see below). PM means Particulate Matter; PM10 and PM2.5 refer respectively to particles 10 and 2.5 micrometres in diameter. Nanoparticles are only a few nanometers in size, and a nanometer is a thousandth of a micrometer. Thus nanoparticles are yet many times smaller than the particles mentioned here, and therefore many times more dangerous, because they can pass the filter in the lungs and enter the blood, and larger particles can not.]

The above passage quoted from the **NEPC of Australia** discussion paper mentions "an increase in risk to the health of the population" that the items such as $NO_2$, CO and $SO_2$ might cause. This may bring to mind, for example, the extremely painful caustic effects and resulting deadly swelling of the lungs of $NO_2$ or $SO_2$, or the sudden death that can result from the lethal gas CO. To this list could be added lead, chromium, mercury, cadmium and numerous other potentially lethal pollutants, and all of these are substances known to potentially cause **immediate** serious affects to health. But such immediate, short-term consequences would only be the tip of the iceberg. There is an invisible and much larger part of the iceberg: the **long term** consequences.

These are the **mutagenic** effects of most of the above mentioned poisons, and in addition the furans, dioxins, polychlorinated biphenyls (PCBs) and many more. These toxins can all cause genetic mutations, with resulting cancer, birth defects, heart disease, brain disease and much more, and the most important but little understood part of this issue is that **THERE IS NO SAFE DOSE OF MUTAGENS**; this includes both chemical mutagens and physical mutagens such as radiation. As indicated above, the statement in the NEPC of Australia document that there is "a linear relationship between exposure to....pollutants and adverse health effects" means, in genetic terms, exactly this. Genetic principles predict that cancer-producing mutation can occur when even only **one molecule** of mutagen binds directly to DNA. As Professor Wallace LeStourgeon, a distinguished molecular biologist of Vanderbilt University, points out: "There is simply no safe dose of mutagen. This is a central tenet in the fields of molecular toxicology and cancer epidemiology", and "One must conclude that a single molecule of mutagen may cause a single mutation". These citations and more information on the subject can be obtained from the web-site **The safe-dose myth** (**LeSTOURGEON, W., 2010**).

It has been known for many years that a change in the very smallest unit of a gene, a "single base" in the DNA, is enough to create a mutation (**e.g. ONLINE MENDELIAN INHERITANCE IN MAN (OMIM), 2013**).

Research has confirmed that molecules of cancer-producing mutagens such as furans do bind to the DNA in a dose-related manner, down to low dose level (**e.g. NEURWIRTH, C. et al., 2012; TRENT, J.O. et al., 1996**) and research has also confirmed the "Linear, no-threshold model" for a large variety of such mutagens. (**See, for example: ABRAMSON-ZETTERBERG, L., 2003; APPLETON, B.S., et al., 1982; BEACH, A.C. and GUPTA, R.C., 1994; CREBELLI, R., 2000; CREEK, M.R., et al.,1997; DUNN, B.N. 1983; PETO, R., et al., 1991; SCHNEIDER, U. et al., 2011**). (While occasional reports do appear in the literature disputing the "Linear, no threshold" rule for mutagenesis [the creation of mutations by mutagens] the consensus genetic opinion is that the rule in general applies, and the consensus medical view is "If in doubt, err on the side of caution").

That there is no lower limit level at which a pollutant is safe is a fact that industrial polluters notoriously fail to reveal to the public, by using misleading statements about "Safe Levels" and "Conformity to Standards". But it is in this context that the point made in the above extract from the Australian National Environment Protection Council document is so fundamentally important: as science progresses, the concept of "allowable upper limits" of highly toxic, cancer-producing substances becomes increasingly oxymoronic. **In the well-ordered society that we all hope we are moving toward there can be no "allowable" amount of carcinogens being emitted from waste-processing, *when alternative ways of dealing with waste that do not produce such emissions are becoming available***. The fact that the amount of poisons being emitted is below some arbitrary "Standard" is irrelevant.

When told of the fact that extremely low doses of common toxins can and do cause mutations, sceptical individuals have been known to comment that if that were so, doctors serving the community (for example those serving Port Hope) would soon notice an epidemic of cancer or birth defect cases. But a genetic epidemiological examination of the situation shows that this is not so. In the following I briefly explain this.

The word "epidemic" means "affecting many people, or more people than usual, at a given time" (**e.g. OXFORD ENGLISH DICTIONARY; DORLAND'S MEDICAL DICTIONARY**). The phrase "more" is vague, and In the scientific context it would only be meaningful if taken to mean "statistically significantly" more. But demonstration of statistical significance requires very large numbers. In a small community such as Port Hope it would not be possible to observe the changes being discussed here, and it would even be near impossible in a population the size of Canada's. I provide the calculations that lead to this conclusion in an **APPENDIX**, at the end of this letter. In the calculation I take, as an example, one group of cancers, the leukaemias, and I examine how the frequency of cases would change if mutagens were to be causing new cases to appear. The calculation shows that in Port Hope, a hypothetical increase of 10% of cases in the community would go totally unnoticed. By contrast, a 10% increase in cases of an infectious disease in the community would be much more readily apparent, both because there would be far more cases and because many such diseases are "reportable" - i.e. they must by law be reported by physicians to local health authorities (**e.g. COMMUNICABLE DISEASE REPORTING, 2011**). But in the case of leukaemia it would require not a 10 % but nearer to a 1,000 % increase to **barely** reach statistical significance, and even that would probably not be noticed by doctors in the area.

This does not mean that genetic mutations causing cancer are of less significance to the community than deadly infections. It only means that because each of the genetic-mutation diseases is quite rare compared to epidemic infectious diseases, increases in their frequency are hard to detect; but it is important to recall that there are many thousands of such genetic-mutation diseases, including cancers, and the overall effect of massive pollution by mutagens, though not immediately visible, would ultimately be vast.

This issue is compellingly important in the present discussion, because of the large list of highly toxic molecular species known to be emitted by the Entech system, and the possibly even larger list of equally and perhaps even more dangerous substances not yet identified in the effluent, in amounts lower than current "Standards" or "Limits". The list of ***known*** **pollutants, produced specifically by the Entech process** (sources: **UNIVERSITY OF CALIFORNIA, 2009; SYNERGETICS, 2012a: Appendix 13**) includes the following:

**Carbon monoxide;**

**Nitrous oxide;**

**Particulate matter (including nanoparticles);**

**Sulphur dioxide; Chlorine (as Hydrochloric acid);**

**Fluorine (as Hydrogen fluoride);**

**Organic carbon;**

**Dioxins;**

**Heavy metals including Lead; Manganese; Copper; Antimony; Mercury; Cadmium; Chromium; Arsenic.**

**Should there be "allowable amounts" of these lethal poisons?**

Industry proponents might argue that the **ALARA** rule should apply - that emissions should be reduced to a level **A**s **L**ow **A**s **R**easonably **A**chievable. But the word **R**easonable in this context refers to what the polluting industries will claim it is "Reasonable" for them to reduce to. The truly Reasonable demands of our grandchildren, children and ourselves is that we have the Reasonable right to be free of cancer-producing poisons, even if the risk is perceived by some to be small, **if alternative methods of waste disposal are available**. The state also has the reasonable right to prevent the predicted future health care costs that will overtake us, if we do not stem the trend to increased occurrence of pollution-caused illness (**DAVIS, D., 2009**).

As mentioned, the National Environment Protection Council of Australia has recognised, in an official document, that society is moving toward phasing out the concept of allowable limits for substances that are known to be or are potentially highly noxious. According to a report from the Conference Board of Canada (**CONFERENCE BOARD OF CANADA: MUNICIPAL WASTE GENERATION, 2013**) "Canada ranks in last place out of 17 countries and gets a "D" grade on the municipal waste generation report card", and "Canada needs to... [make] reduced environmental impact a top priority..[by reducing] the amount of solid waste generated while increasing the amount of wasted diverted from landfills through recycling..". There are however, some notable exceptions in Canada: Markham has already achieved over 80% diversion (**PERSICO, A. 2013**), and notable success is being achieved in for example Edmonton (**CITY OF EDMONTON., 2010**), Halifax (**CANADA.com, 2008; HALIFAX REGIONAL MUNICIPALITY, 2013a; HALIFAX REGIONAL MUNICIPALITY, 2013a ; OTTER LAKE WASTE FACILITY, 2013**), and even in Grafton, a small town close to Port Hope, where a modest start has been made (**NORTHUMBERLAND COUNTY, 2013**). There are numerous other places in Canada where initiatives are being taken.

With such a strong thrust in the direction of the waste management approaches of the future taking place all over Canada, it is hard to understand why Port Hope should consider the retrograde step of embracing the outmoded, toxin-producing technology of the past. The opportunity is here for **Ontario** to grasp the moment, take the initiative, even out-distance the advanced nations in this race such as Australia, and declare **zero tolerance for cancer-producing and other highly poisonous emissions**. Similarly, **Port Hope**, which is currently seeking to **re-brand its radioactivity-tarnished image**, has the chance to make its name

as a leader in waste management by embracing **Recycling**, rather than condoning a technology that is already now antiquated and will be perceived as archaic in five years time.

Representatives of Entech-Rem have, at their "Open Houses" in Port Hope, repeatedly cited the fact that Denmark and other Scandinavian countries, perceived to be advanced in such matters, have embraced incineration as the solution to waste management. But **in Denmark, a country known as "the world's champions of waste incineration", the environment minister recently announced a new strategy, declared as "a paradigm shift", that is "set to change the nation's priority from incineration to recycling" (RECYCLING INTERNATIONAL, 2013).** As far back as 2006 **UNESCO** (the **United Nations Educational, Scientific and Cultural Organization**), in its **Memorandum of the Paris Appeal**, published a list of Recommendations and Measures concerning "**diseases mainly related to chemical pollution: cancers, sterility, congenital malformations, obesity, diseases of the nervous system, allergies**...". A panel of 68 international experts drew up a list of 164 Recommendations, from which 9 are given as those the experts "**press for**", and this list of 9 includes: "**The recovery of wastes through selective sorting and recycling in place of incineration and co-incineration**" (**UNESCO, 2006, page 3**). This UNESCO document, and especially pages 3 and 80-85, make essential reading for all who wish to understand the compelling importance of enlightened waste management in prevention of environmental diseases such as cancer.

There are cases where the argument can be made that, even when the absolutely damaging effect of an agent is well known, its use is allowable in some specific situations, because the potential **benefits to humanity** can be seen to outweigh the otherwise proven harm. One of the very few clear examples of this is the use of medical X-irradiation in diagnosis and treatment. As mentioned above, as with other mutagens there is no safe dose of any form of radioactivity, and X-rays cause mutation and cancer even when used in diagnosis or in radiotherapy, and even in very low doses (**e.g. SCHNEIDER, U, et al., 2011; GROSOVSKY, A.J. and LITTLE, J.B., 1985; BRENNER, D.J. and SACHS, R.K., 2006.** For an intriguing and stirring account of the battle of the young Dr. Alice Stewart to confirm this, against the benighted forces of the medical, nuclear and administrative establishments of the 1950s, and her victory, see **GREENE, G., 1999.** Numerous other relevant references are also cited in that book. As mentioned above, occasional reports do claim non-linear relationships in some cases, often in studies funded by the nuclear industry, but from the medical point of view the Cautionary Principle should apply).

Even in the case of medical use of radiation, caution is exercised and exposure kept to a minimum, and the move toward replacing X-Rays with non-radiation based imaging methods such as Magnetic Resonance Imaging (MRI) and Ultrasound is being encouraged.

But in the present case of a garbage incinerator proposal, it is hard to see what potential **benefits to humanity** may exist that could outweigh the proven harm. With the developing upswell of interest, in Canada and world-wide, to deal with waste through the three Rs (Reduce, Re-use, Recycle) the ALARA rule is not a legitimate argument in defence of a potentially polluting and harmful plant in rural Port Hope.

## FALLOUT THAT WOULD OCCUR FROM THE ENTECH-REM PROPOSAL

In the event that this project were to be approved there would be extremely unpleasant and problematical fallout, both in the literal sense of poisonous substances falling out of the air and polluting all living and non-living things in the environment, and in the figurative sense of other unwanted side-effects.

**Decline in property values and possible loss of business opportunities**

The presence of a "Gasification" plant would likely have a serious negative effect on home and property sales and prices in Port Hope, and a spin-off effect on Port Hope industry in general. The effect of the perceived stigma created by the mere possibility has evidently already produced this effect.

Research on the issue has shown that not only the presence of a garbage incinerator but even hearsay of the coming of such a plant can significantly depress property prices and sales. **KIEL, K.A and McCLAIN, K.T., 1995a** found that appreciation rates in houses are affected as early as at the construction stage of an incinerator, and the effect continues several years after the facility has begun operation. **KIEL, K.A and McCLAIN, K.T., 1995b**, in an earlier study, found that even the "rumour" of such construction affects house prices. Many other studies (**e.g. CHAU, K.W. et al., 2003; BOYLE, M.A. and KIEL, K.A., 2001; FARBER, S., 1998**) have confirmed that the presence of air pollution, or even the perception of it in the public domain, is an important factor in depressing property values.

Confirmation of the latter point appears to be developing in Port Hope. A group of concerned citizens seeking to lobby the Municipal Council to support enlightened ways of dealing with the town's garbage, rather than to approve the Entech-Rem proposal, created an association to promote this view. They have designated themselves **Port Hope Residents 4 Managing Waste Responsibly (PHR4MWR)**. The group has made available signs to be posted in gardens or on sidewalks by citizens sympathetic to PHR4MWR's goals. The signs state "Say NO to Mega Incinerator", and a very substantial number of homes in Port Hope and surrounding areas in the county have already placed these signs.

Shortly after the signs began to appear, much concern was expressed by community home-owners who were trying to sell their property, that the signs might make sales difficult. Anecdotal hearsay held that property developers in the area were not pleased. The concerns appeared to be justified when a newspaper report in Port Hope in July, 2013 (**RELLINGER, P.J., 2013b**) quoted homeowners as indicating that the potential purchasers of their houses had pulled away from the sale because of the pending possibility of "the incinerator issue".

Shortly after that newspaper report appeared, another made the front page of a different local paper, stating that the citizens' group PHR4MWR had reported that anti-incinerator signs had been removed (**MACDONALD, V., 2013**). Evidently this was done by municipal employees (**NASMITH, C., 2013**). Although no information has become available regarding why the signs were removed, it is clear that there is deep concern about the effect construction of a garbage incinerator could have on property values in the town, and the influence that it could have on the business landscape in general.

It is clear from local experience and the published peer-reviewed literature cited, that the stigma of potential pollution may create a depression in the property market. The possible spin-off effects of such a stigma are considerable: other industries may be very reluctant to move their businesses to Port Hope if the town, already known as the radioactivity centre of the Province, also gets the reputation of being the garbage capital. One industry that likely would feel the effects quite immediately is the Tourist Industry.

The Company has indicated (**ENTECH-REM IN THE COMMUNITY, 2013**) that "Concerns will be addressed on a case-by-case basis during sale of the subject property". However, it is not clear whether the concerns reported in the local press have so far been addressed, and it is in any event not clear whether

consideration of concerns on a "case-by-case basis" could mitigate the larger problem of the town's image for the future.

**Effects on crops, with resulting effects on livestock and through the food chain to human consumption**

It is well known to science that toxic pollutants of industrial origin, in air, water and soil, are a major potential threat to human health, being implicated in cancer **(e.g. MCCORMACK, V.A. and SCHUZ, J., 2012**), heart disease (**e.g. BROOK, R.D., et al., 2010**), diabetes (**e.g. LEE, D-H., et al., 20210; LEE, D-H. and JACOBS, D., 2011**) and much more (**e.g. DeYOUNG, M., 2012**). The attempts of industry to deny responsibility and to disparage the research are also known to the public, thanks to the famous book The Secret History of the War on Cancer by Debra Davis **(DAVIS, D., 2009** ).

A more recent discovery is that a major route to human poisoning is the transfer of toxicants of the air, through the food chain, to human consumption. This is unquestionably true of many of the noxious substances, such as mercury, lead, nitrous oxide and others released by gasification plants; here I will mention two that have been studied: Dioxins and Nanoparticles.

Dioxins are highly toxic pollutants that are produced as by-products of industrial processes, and are released into the environment mainly by solid waste incineration (**WHO [World Health Organization], 2010**). Like their chemical cousins the furans and PCBs (polychlorinated biphenyls), they contain chlorine; the term "dioxins" is commonly used to include all of these (**WHO [World Health Organization], 2010**). What has only relatively recently been researched is that dioxins can be carried great distances in the air, that they contaminate crops, and that through use of such contaminated vegetation as food and as livestock feed these toxins enter the human food chain. It is now estimated that over 90% of human contamination by dioxins is through this pathway (**FRANZBLAU, A. et al., 2010**). It is also estimated that dioxin intake creates a life-time cancer risk in the USA population that is 500 - 1000 times greater than the "acceptable" one-in-a-million risk (**COMMONER, B., et al., 1996**).

The chain of events is as follows. The major source of dioxins is incinerators (**WHO [World Health Organization], 2010; HEALTH CANADA 2013;**) and particularly those incinerators that burn municipal and medical waste (**COMMONER, B., et al., 1996**). The main components of incinerator feedstock that are responsible are common MHW items such as food remnants, certain plastics, paper, wood, and old clothes - largely what Entech-Rem states they would processing if allowed to establish their plant (**REM, 2013. Spiral-bound booklet**). From incinerators, dioxins and other pollutants are carried in the air, and deposited to enter the soil locally (**e.g. FRANZBLAU, A. et al., 2010**) or carried far. Dioxins originating in Florida have been identified in the Great Lakes (**COMMONER, B., et al., 1996**). These authors state that "dioxin travels in the air thousands of miles, creating a toxic fallout that settles out everywhere - contaminating not only water, fish and wildlife in the Great lakes, but the farms where cattle are raised to produce milk, dairy products and beef as well" (**COMMONER, B., et al., 1996**).

More importantly, the dioxins do not merely settle, they are actually absorbed in to the vegetation and crops that become food and livestock feed, and they appear in the milk and meat that are destined for human consumption (**MCLACHLAN, M.S., et al., 1990; FRIES, G.F., 1995; LORBER et al., 1994; HUWE, J.K. and LARSEN, G.L., 2005; FRANZBLAU, A. et al., 2010**). Most importantly, the poisons **ACCUMULATE** in the crops and in the livestock over time (**e.g. WHO [World Health Organization], 2010; COMMONER, B., et al., 1996**), further underscoring the point that the claim that only "low levels" are emitted by an incinerator, "within Standards", is **totally meaningless**. As with other mutagens, there is no lower limit below which dioxins can not cause cancer (**ENERGY JUSTICE NETWORK, 2012**).

A study from the USA (**FRANZBLAU, A. et al., 2010**) reports a case that may be of particular interest to Port Hope residents. Dioxin levels were measured in a man who had raised vegetables and cattle in the flood plains of a river known to be contaminated with dioxins. The man had consumed his own produce and been a supplier to others in the area. High levels of dioxin were found in the man himself and amongst the others who had consumed his produce.

According to Mr. D. Starr, Executive Vice President, Renewable Energy Management (REM), the feedstock of an Entech-Rem plant would include both MSW (Municipal Solid Waste - household Waste) as well as IC&I (Industrial, Commercial & Institutional) Waste (**STARR, D., 2013. Personal Communication by e-mail to PHR4MWR**). MSW, according to a REM booklet (**REM, 2013. Spiral-bound booklet**) "includes **but is not limited to** [emphasis added] paper, cardboard, film plastic, rigid plastic, rubber, tires, tin, steel, aluminum, glass, organic matter, foodwaste, yard waste etc., and small amounts of inert materials such as sand, small rocks etc.". **Thus the REM list of intended feedstock for the Port Hope plant comprises largely *material that could be composted* and *material that could be recycled*, and *materials that are the sources of poisonous dioxins, furans and heavy metals*. Furthermore, the list is open-ended and *could include unlimited amounts of other toxic items*.** The description of IC&I Waste given in the booklet is even more open-ended and potentially loaded with problematical feedstock.

The World Health Organization Fact Sheet quoted above (**WHO [World Health Organization], 2010**), states: "In terms of dioxin release into the environment, uncontrolled waste incinerators (solid waste and hospital waste) are often the worst culprits, **due to incomplete burning**" [emphasis added]. Entech-Rem have emphasised that in their form of incineration ("gasification"), waste is converted to a mixture of gases called Syngas at **lower temperatures** than is used in other incinerators (**ENTECH-REM WEBSITE, 2013**). The information in this WHO report might suggest that the incompleteness of the burning in the Entech process may render the risk of dioxin production and its resulting concentration in the syngas **even higher** than it would be with high temperature incineration.

As mentioned, while the pathway from air pollution source, over distance and through crops and animals to human food, has been well studied for dioxins, it certainly applies to the other toxins as well. Here I mention some early research on the most recently discovered of the noxious agents that incinerators, including specifically Entech gasification plants (**SYNERGETICS 2012b**), pollute the air with, namely Nanoparticles.

Incinerators are not only the major producers of dioxins and furans, as discussed above; they are also major sources of "suspended particulate" (**ENVIRONMENT CANADA: Air Quality Trends, 2001**). It has been known for many years that air contamination with particles of micron size (a thousandth of a pinhead) can under certain circumstances cause lung and heart illness (**DONALDSON et al., 2001**). But because the "filter" openings in the lungs and blood vessels that allow oxygen in, and filter many contaminants out, are extremely small, only the so-called ultrafine or nanoparticles, which are a **millionth** the size of a pinhead, can easily enter the blood and organs and even cross the so-called blood-brain barrier.

It has very recently been shown experimentally that when a crop plant (soybean) was grown in soil deliberately contaminated with nanoparticles, the crop accumulated the particles, and the particles also stunted growth of bacteria that naturally fertilize the soil with nitrogen (**PRIESTER, J.H., et al., 2012**). The implications of this are far-reaching: it makes the progress of incinerator nanoparticles along the chain described above for dioxins highly probable.

In other very recent research, scientists studied cells obtained from the linings of the human airway passages that carry oxygen to the lungs. Exposure of the cells to synthetically prepared nanoparticles caused a change in the cells that characteristically leads to autoimmune disease such as rheumatoid arthritis (**MOHAMED, B.M. et al., 2012**). Discoveries such as these are so recent that it is not surprising that governments have not yet reacted, but the writing is on the wall, and pre-emptive action is called for.

There appears to be a major groundswell of opposition to the idea of allowing a garbage incinerator to be built in the Wesleyville area of the Municipality. This is evidenced, for example, by the substantial number of anti-incinerator signs posted all over Port Hope, and many in surrounding towns, as well as the very high attendance, very active audience participation and virtually unanimous vocal opposition expressed at the three public meetings so far held on the topic. Nevertheless there are a few dissenting voices, some of whom appear to have accepted the Company's claims that the plant would provide employment opportunities for Port Hopers, or that it offers an acceptable solution to the town's waste disposal issue.

Amongst those few who think this way, one or two have accused some of the farmers potentially affected, and others living nearby the proposed site who have been active in opposition to the incinerator, of crying "**NIMBY**" (**N**ot **I**n **M**y **B**ack **Y**ard). It is easy to understand that if one is unaware of the facts, and accepts the Company's version of reality, this could appear to be the case.

But as explained above, those who are actively against this proposal do not want it in **ANYONE'S** back yard. A plant of this kind would affect the health of **all**, no matter where in the town, or even out of the town, it might be placed. We all breath in the air that would be polluted by such a plant, and we all eat the food grown and cultivated in our area that would be poisoned. We are all mutually dependent on the prosperity of our industries, including agriculture and farming, the apple and other fruit-growing industries of our region, the wine industry not far from us, and the supply by our neighbours of products to Toronto markets. It should be clear that this incinerator would be a disaster not just for those in whose back yard it would be placed, but for the entire community of Port Hope and far beyond.

**Loss of jobs and ultimately of an entire industry sector in Port Hope**

Northumberland County, and in particular Port Hope and the surrounding area, has a rich history in farming. Descendants of several of the founding families of the Town, with a tradition behind them of centuries of praiseworthy and honourable labour and contribution to the community, still proudly cultivate the land and supply produce and meat of the finest grade to the citizens and butchers of not only Northumberland County but of Toronto as well. As a casual glance at any book on the History of Port Hope shows, many of the current farming families' ancestors played leadership roles in the establishment of the town, as participants in the administration and as generous benefactors to many projects and individuals. Members of the farming community of Port Hope are, with excellent reason and with a wealth of successful achievement behind them, extremely proud of their heritage and the roles their families have played in the town's development.

The farmers of today are, in addition to being good citizens and key contributors to community life, also an intelligent and educated cohort. The facts relating to the potential harm that the existence of a polluting "gasification" plant could bring to cultivation of their agricultural land, to livestock and to their livelihoods, have not escaped the Port Hope farmers. As reported in a local newspaper (**RELLINGER, P.J., 2013a**), the prospect of this harmful step actually occurring has already caused local farmers to realise that if the plant

were to materialise, they would have to uproot their farming activities and move. As one farmer indicated, he and his colleagues would not have the luxury of continuing as if all were normal, and waiting until concrete evidence of harm to their product causes their business to collapse. Evidently farmers perceive the stigma itself as a threat to their livelihoods. A recent update in the same newspaper stated that an "informal" online poll done by the paper asked readers "if they'd ever buy beef from a farm near a gasification plant", and "more than 80 per cent of respondents indicated that they would not" (**THE NEWS NORTHUMBERLAND, page 8, Thursday August 29, 2013**). **The stigma that would attach from their being such a plant in ground zero of the farmland would create a cloud over the prosperity of the community.**

Entech-Rem has indicated that their plant would benefit the community by being a source of jobs. It is estimated that the plant would employ about 35 people. It is not clear that any would necessarily be Port Hope citizens. Notwithstanding that, the problems that this incinerator would present for farmers **could lead to the loss of far more farm jobs than would be created in garbage-processing jobs,** and **it is possible that the entire farming industry of Port Hope would be destroyed**, a potentially tragic outcome for the rich heritage of farming in this area.

**Hazards of transportation of waste (garbage)**

If this project were to materialize we, the citizens of Port Hope, and our elected representatives, the Municipal Council, would have no control over the content of the garbage that would arrive here or its transport from outlying areas to our **Designated Natural Area** in Wesleyville. It should hardly be necessary to point out that garbage attracts all kinds of vermin and pests. This includes flies, bedbugs, maggots, mosquitoes, rats, snakes and other scavengers (**WHO, 2011. Water, Sanitation, Hygiene and Health Unit**). Neither the Company nor any authority would have any knowledge of, not to mention control over, what goes into the innumerable garbage dumps from where waste would be collected and delivered to the plant, nor how long the garbage would have been standing prior to collection and what, by way of organisms and poisons, would have entered it. The Company has stated that incoming material would be sorted prior to "gasification". If the intention is to sort out maggot eggs, fly eggs, and rats, mice and snakes etc., they have provided no documentation for how this would be done, but even if they did, this would not address the possibility of escape during transportation and delivery. This includes the risk of spills (**MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY, 2013**) and, of course, that the flies, mosquitoes and other insects would fly out of trucks, the fly and maggot etc. eggs would be carried by air and be deposited in the area, and there would be a risk of rats and other disease-carrying animals being released in the wild. The Company has declared that there would be no odour from the plant; this is also undocumented - the Company has no past experience with North American garbage - but aside from that, it would have no control over odour emanating from the 5 trucks per hour (one every 12 minutes) that would be expected to be bringing malodourous rubbish to Wesleyville, nor control over the prevailing Westerly breezes that would carry the smell in to the town. Aside from this, the effect of wear and tear on our roads of a giant garbage truck every 12 minutes is also a cause for serious consideration.

## SUMMARY OF FACTS ABOUT "GASIFICATION"

"Gasification", which as documented below is a form of incineration, has not been successfully used anywhere in North America. There are no plants commercially processing MHW on the continent at this time, and though there are a few that are in a "pilot" or "demonstration" phase, there are evidently fewer of these than there are plants that historically were established and then failed and were closed down (**USEPA, US Environmental Protection Agency, 2012**).

The fact that so many MHW gasification plants have closed down, and that there are **none** functioning commercially in North America, should give pause to anyone in the community who might believe there is any merit in planning to bring such an enterprise to Port Hope, and especially to bring a plant being offered by a company with no North American track record. It warrants consideration of who would foot the bills of close-down, of maintenance of an abandoned site, of subsequent demolition and of ultimate clean-up. Port Hope has an issue at present with another clean-up problem, that of radioactive waste; the stigma of being the garbage capital of the province could hang over the town long after the odours of the garbage trucks have receded.

Gasification produces emissions of toxic and lethal substances, including heavy metals, nanoparticles and phthalates. The latter, like dioxins, are derived from plastics (**WARGO, J. ENVIRONMENT & HUMAN HEALTH, INC., 2008**). Phthalates have hormone-like effects and can interfere in the reproductive development of children (**DEHNEL, L. T., 2008**). With respect to release of toxins, gasification does not differ qualitatively from other forms of incineration (**e.g. THE BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE, 2009**), and any quantitative differences that may exist are irrelevant, because even minute amounts of mutagens can cause cancer-mutations, and because, as described above, in their passage through the food chain the small amounts of poisons accumulate in farmers' consumable products.

A study released in 2008 by the Tellus Institute, commissioned by the Massachusetts Department of Environmental Protection (**GREENYES ARCHIVES, 2008**) found that "gasification and pyrolysis facilities are unlikely to play a major role in MSW management in Massachusetts by 2020." The reasons for this included that "For....waste-to energy incinerators, as well as the **gasification** and pyrolysis **plants**, the **emission factors** used to compare environmental performance are **based largely on modeling and/or vendor claims** for modern, state-of-the art facilities, **as opposed to actual operational data from real world experience**. For example, actual operating performance for Massachusetts WTE [Waste to energy] facilities has been shown to produce far **higher emissions than the modeled figures**. Similarly, there remains significant uncertainty as to whether commercial scale gasification/ pyrolysis facilities processing MSW and generating energy can perform as well as the vendor claims or modeled emissions" and other reasons include "**the relatively small benefit with respect to greenhouse gas emissions** compared to diversion or landfilling". [Emphasis added].

## SUMMARY OF FACTS ABOUT ENTECH-REM

In the text of this letter I have mentioned some examples of statements issued by the Company that could be misleading to citizens who do not themselves have the time to check the facts. Here, in order to have them grouped in one place, I provide a summary of some of the more important of these statements, and others made by the Company, and I provide rebuttals with documentation. The Company's statements are given in Red and my comments are in **Black** text.

1. The Company has stated that "Facility emissions will be compliant to Canadian and Ontario environmental regulations" (**THE NEWS NORTHUMBERLAND, page 5, Thursday July 4, 2013**). **As explained in detail above, this statement does not provide citizens with the relevant facts. The Ontario government does not have general Regulations; it only gives Guidelines. For some of the most important contaminants there are not even guidelines. These include the *potentially deadly* nanoparticles, and carbon dioxide, the most important greenhouse gas. The Entech process notoriously produces nanoparticles and there is no known technology that can deal with these** (**SYNERGETICS 2012b**). **As also described above, even for those poisons for which there are "guidelines" there is no safe level; there is no amount so small that it could not potentially have lethal consequences, both by causing genetic mutations and because the toxins accumulate in the food chain.**

2. In an "Information Package" issued at an Open House in Port Hope, the Company provides a Table in which Entech-Rem's so-called "Expected Emissions" for a number of toxins are compared to the corresponding so-called "Ontario A7 Limit" for each of the substances (**ENTECH-REM INFORMATION PACKAGE, 2013**). **As mentioned, the use of the word Limit is incorrect - only Provincial Guidelines exist. More importantly, it is misleading for the Company to be providing the public with figures for "Expected Emissions" when absolutely no documentation for these so-called Expectations is given, and no documentation can be given, for the following reasons: the company REM itself (without Entech) has evidently not previously provided the kind of service here referred to; the Entech process has not been used anywhere in North America - neither on North American MHW or any other feedstock; the Entech plant that the Municipality of Port Hope viewed in its "due diligence" is the one in Kuznica, Poland, the available test data for which are based on a Demo run using 3.5 tons of feedstock, whereas the Company has spoken of processing up to 548 tons a day if it were allowed to function here. Entech-Rem has therefore no justification for giving the public the impression that it knows how great emissions would be.**

3. Entech-Rem states that its garbage-incinerating facilities "will comprise state of the art...technologies" (**ENTECH-REM INFORMATION PACKAGE, 2013**). **"State of the art" waste management, in this day and age, is Reduction, Diversion, Recycling and Composting** (**e.g. SEADON, J.K., 2010; GAJALAKSHMI, S. and ABBASI, S.A., 2008**). **It is not relevant to current thinking to call this outmoded, polluting, incineration option "state of the art".**

4. The company provides statements on present and future issues in waste management. In the booklet **REM, 2013a** the following is indicated, concerning Municipal Solid Waste (MSW): "It is notoriously difficult to separate and there is a limit to the percentage of this complex waste that can be separated at source by the householder". Concerning the fact that other jurisdictions have adopted recycling systems, it is stated that "..this method has proved limiting, expensive and still results in a medium to low percentage of materials actually being recovered, with a significant proportion of the materials still ending up in landfills". In another of the Company's documents (**ENTECH-REM INFORMATION PACKAGE, 2013**) a Section on "Current Trends" in waste management fails to mention Recycling of any type at all. **These statements could give a reader who is new to the topic an incorrect impression. There is no documentation for the statement that separation is "notoriously difficult". The comment that recycling "still results in a medium to low percentage of materials actually being recovered, with a significant proportion of the materials still ending up in landfills" does not quite fit with the facts. For example, our neighbouring Ontario town, Markham, now achieves over 80% diversion (PERSICO, A., 2013), many other Canadian towns and cities are joining the stream (e.g. NORTHUMBERLAND COUNTY, 2013; CITY OF EDMONTON, 2010; GUELPH PIONEERS WORLD-CLASS RECYCLING PROGRAM, 1999; WASTE MANAGEMENT OF CANADA, 2012) and everything points to it soon developing into a tidal wave of truly enlightened "Three Rs" waste management in Canada.**

**Our neighbours to the South are also in on the act: San Francisco hit the 80% diversion mark a year ago (October 2012), and has set a goal of achieving 100% by 2020 (ESPINAS, J., 2012). As mentioned above, in Denmark, a country known as "the world's champions of waste incineration", environment minister Ida Auken has announced a new strategy, declared as "a paradigm shift", that is set to "change the nation's priority from incineration to recycling" (RECYCLING INTERNATIONAL, 2013). As long ago as 2006 UNESCO recommended that recycling should replace incineration, for prevention of environmental diseases such as cancer (UNESCO, 2006). Readers of the Entech-Rem "information" package could get a completely incorrect impression of the state of the art of the 3Rs.**

5. In a "Fact Sheet" the Company asks the rhetorical question "Is this a tested technology?" and answers, for Port Hope readers, in the affirmative, citing a 15-year history in the Far East and Europe (**ENTECH-REM, 2013 "Proposed Gasification Plant Fact Sheet", (blue sheet)**). **The Entech process has never been used anywhere in North America, nor has any other MHW gasification system been successfully commercialised in North America (US EPA, 2012. United States Environmental Protection Agency). It is reasonable to speculate that if this system had been successful in the developing countries where it has been used (its European experience is in Poland), it is likely that it would have been employed in North America by now. An internet search for data on the Entech system's performance record only reveals the single "Demo" test done on a single day at Kuznica, Poland, in 2004, with a 3.5 tonne load. The questionable performance details of this test are discussed earlier in this letter. The Company REM appears to have no previous experience in waste processing. Thus the Company has no track record to show in this country, no advantageous track record elsewhere, and the Entech-Rem proposal for Port Hope represents a plan to make Port Hope a guinea-pig.**

6. Entech-Rem informed the Port Hope public that its process would produce a synthetic gas [Syngas] "that consists mainly of water vapour", and that "The gas is combusted in a separate combustion chamber..." (**THE NEWS NORTHUMBERLAND, page 4, Thursday July 4, 2013**). **Syngas comprises mainly carbon monoxide, a lethal gas, and hydrogen, which is highly explosive (e.g. WIKIPEDIA, 2013), and depending on the contents of the feedstock could contain numerous other toxic and dangerous substances. A gas that "consists mainly of water vapour" could not be "combusted" - water does not burn. The public has the right to know that, in the event of a leak, a deadly gas and a highly explosive gas could be released.**

7. The Company states that the Entech system "is not an incineration process" **(REM "Proposed Gasification Plant Fact Sheet", 2013 (white sheet)). There is a consensus among English dictionaries (OXFORD ENGLISH DICTIONARY;COLLINS DICTIONARY;) American dictionaries (WEBSTER'S; FUNK AND WAGNALL'S;) and medical scientific dictionaries (e.g. DORLAND'S MEDICAL DICTIONARY) that incineration is the process of producing ash by burning. The Entech-Rem plant would produce ash by burning. It is an incinerator. The European Parliament Council on Incineration of Waste also classifies "Gasification plants" as incinerators (EUROPEAN PARLIAMENT, (2000): Council on Incineration of Waste). At the Ontario Ministry of the Environment Web Page, a search under the key word "gasification" takes one to a document, "Guideline A7", in which the following statement is found: "Thermal treatment includes incineration, gasification, pyrolysis or plasma arc treatment" (ONTARIO MINISTRY OF THE ENVIRONMENT, 2013.). Thus the Ontario government also groups "gasification" along with other incineration as thermal treatment of waste. The Company's statement that their plant is not an incinerator could mislead people into believing that, unlike an incinerator, a "gasification" plant does not produce toxic emissions. As discussed in detail above, this would be seriously incorrect.**

8. The Company informs citizens that its process would produce "Clean" energy, and that it would offset the harmful greenhouse gases of landfills (**ENTECH-REM INFORMATION PACKAGE, 2013**). **As described in detail above, the Entech process notoriously produces nanopraticles, and there is no technology available to prevent this (SYNERGETICS 2012b), and it produces a whole swarm of toxic molecules. The fact that these may be in amounts below present guidelines is irrelevant: there is no lower limit to the amount of a mutagen that can damage DNA, and the toxins, passing through the food chain, accumulate in crops and livestock, ending up on our dinner plates in scary amounts. The Company's comment about greenhouse gases should be read in the context of the fact that their process will emit carbon dioxide, the *major* greenhouse gas, in *unrestricted* amounts.**

9. The company indicates that it would provide job opportunities. We are informed that they would employ "35+ full-time employees" (**ENTECH-REM INFORMATION PACKAGE, 2013**). **It is not stated, and it is not clear, whether employees would be Port Hope citizens; be that as it may, as discussed earlier in this letter there are very strong and ominous indications that if this experiment were to materialise, employment positions in the farming industry would be seriously threatened, and the community's entire farming sector could be in jeopardy (RELLINGER, P.J., 2013a; THE NEWS NORTHUMBERLAND, page 8, Thursday August 29, 2013).**

10. Entech-Rem informs readers of one of its "Fact Sheets" that the ash its plant would produce would be "clean, inert and non-toxic" and that it could be used "in secondary markets in various applications such as a construction aggregate for concrete and asphalt" (**ENTECH-REM, 2013 "Proposed Gasification Plant Fact Sheet", (blue sheet)**). **The company provides no documentation for this statement. An internet search for further information on this topic produced, amongst others, a document entitled "WASTE INCINERATION: A DYING TECHNOLOGY, 2003". This document contains, on page 25, a report from the town of Newcastle, UK , from which I quote here [emphasis by underlining inserted by me]:**

**"Incinerator ash, particularly fly ash, is highly hazardous and must be treated with care, like any other hazardous waste. In an attempt to minimize the dangers of incineration, however, incinerator manufacuters and operators routinely downplay the hazardous nature of the ash. Some even go so far as to bill it as an "inert" material that can be reused for construction or roadbuilding. As a result, incinerator ash is routinely mismanged, and severe risks to public health often result."**

**The report goes on to state that in Newcastle, England, ash from the Byker municipal waste incinerator was regularly spread on pathways, parks and school playing fields. A concerned citizen, despite being accused of scaremongering, arranged for tests to be conducted, and these revealed high levels of dioxins, arsenic, mercury and lead. As a result of the initial "resident sponsored" tests, Newcastle University sought help from German scientists, who did further tests which revealed "dioxin concentrations as high as 9,500 nanogram I-TEQ/kg, compared to "target values" of under 5 nanogram I-TEQ/kg. These dioxin levels were amongst the highest ever recorded. Heavy metal contamination was similarly stratospheric" the report continues, "including mercury 2,406 percent, cadmium at 785 percent and lead at 136 percent above background levels".**

## CONCLUSION

I have gathered, presented and documented the relevant facts, in the matter of the Entech-Rem proposal, to the best of my ability. I have given careful thought to these facts. I believe they compellingly show that the best way forward in respect of Waste Management for Port Hope, and the Province, is the Three Rs of Reduce, Reuse and Recycle. I have carefully reviewed what I have written, in my best efforts to ensure accuracy, and I believe that it does not contain error, but I also believe, in matters of human health and well-being, that if one is to err it is best to err on the side of caution. When the health and prosperity of my fellow citizens, children, women and men, are at stake, as they surely are at this time, I believe it is better to be safe than sorry, and I appeal to you, Minister Bradley, to support me and my fellow citizens in this viewpoint.

Yours sincerely,

Dr. Stan R. Blecher MD, FCCMG
Fellow of the Canadian College of Medical Geneticists
Professor Emeritus, Molecular Biology and Genetics, and
Director Emeritus, School of Human Biology
University of Guelph, Guelph, Ontario

Present address: Port Hope, Ontario

c.c. Premier of Ontario
Ontario Minister of Health
MPP (Northumberland-Quinte West)
Mayor of Port Hope
Municipal Counsellors of Port Hope
Port Hope Municipal Administration: Chief Administrative Officer; Director of Planning Development Services; Director of Planning and Tourism; Director of Parks, Recreation and Culture, Port Hope; Municipal Planner.
Medical Officer of Health, Port Hope
Chairperson, Ratepayers Association, Port Hope
Port Hope Residents 4 Managing Waste Responsibly (PHR4MWR)
Doctors of Port Hope
Doctors of Cobourg
Port Hope Citizens
The News Northumberland
Northumberland Today

## APPENDIX: Frequency estimates

In the following I make some simple calculations. Because in some cases totally accurate data are unavailable, the calculations involve some best available approximations and assumptions. From these I derive reasonable best estimates which I believe are within the statistical "range of standard error". Accordingly, notwithstanding the impossibility of total accuracy, the basis for the resulting conclusions is fundamentally sound.

The frequency of leukaemias world-wide varies between countries and ethnic groups, and is also dependent on other factors. Also, different studies have given different estimates, but after consulting several (**WIKIPEDIA, 2013**) it appears that a reasonable guestimate of an average is about 40 new cases diagnosed per million persons per year. What follows makes the assumption that Port Hope should, **in the absence of any factor that might alter mutation frequency**, more or less conform to this average. Taking Port Hope's population as 16,500 this would lead to the prediction that 0.66 new cases would "normally" be expected to be diagnosed in the community per year. I round this up to 0.7.

It is difficult to ascertain the number of physicians servicing Port Hope community; local estimates among some doctors is that it is about ~ 70 and I use this here as a reasonable approximation. On the assumption that the diagnosis of new cases of cancer could be made by any local physician this leads to the probability estimate of 0.7/70 = 0.01 cases per physician per year or, to put it another way, in terms of probability, for each physician to see one case would take approximately 100 years.

The above is as mentioned the estimate based on the assumption of there being no factor that might alter mutation frequency. Let us now assume that there is **a factor that increases the frequency of leukaemia by 10 %.** Instead of a predicted 0.66 cases per year there would now be 0.66 x 1.10 = 0.726. This again rounds to 0.7. To examine for significant difference, a $\chi^2$ (Chi Squared) test of Goodness of Fit can be performed (e.g. **CROXTON, 1953; MORONEY, M.J., 1962**). Using the unrounded figures (0.66 and 0.726), a $\chi^2$ test shows that, as expected, there is absolutely no statistical difference. To approach statistical significance, one needs to postulate not a 10% increase but an increase to **10 times** the original amount (i.e. to 6.6 cases per year), which in percentage terms approaches a **1,000 %** increase. The $\chi^2$ for increase from 0.66 to 6.6 cases per year gives a probability of 0.05, which is considered to be "probably significant". (0.01 is considered "significant" and 0.001 "highly significant" (**MORONEY, M.J., 1962**)).

A population the size of Canada's is needed for a 10 % increase to show significance, and that would only be demonstrable by launching a major scientific project that would require enormous funds and human resources, and many years of intensive research. As for a study within the Port Hope area, even the above mentioned funds, resources and time would not suffice - such research would be fraught with insuperable obstacles, such as migration to and from the area, diagnoses being made by doctors outside of the area, and many other complicating factors, and in the end the results would not tell us more than we now know, which is that emissions of mutagens causes disastrous health problems in communities.

Quite aside from the inherent statistical problems explained above, study of cause and effect relationships in genetic damage are also rendered difficult to document by the fact that there can be and often is delay of years, and even of generations, before effects of harmful mutations are manifested.

Thus in summary, although the effects of carcinogenic mutagens would be extremely significant in human terms, the effects would not be noticeable by casual scrutiny of occurrence of illness in the community, and not even careful study would be able to document it. It would be a wise policy to follow the Cautionary Principle and not allow the problem to develop in the first instance.

## REFERENCES

In this list, citation information on peer-reviewed scientific articles - i.e. articles peer-reviewed by official research journals - is given in the following sequence: **AUTHOR(S) NAME(S) IN UPPER CASE GREEN LETTERS (The abbreviation "et al." denotes the presence of additional authors other than the lead author mentioned)**; **year of publication in green; the title of the article, in black text**; and, **in green**, the ***journal's name (italicised)* followed by the volume number of the journal and, separated by a semicolon, the page numbers**. For other citations, author names or information sources and dates are also given in **GREEN UPPERCASE**, and titles are also given in **black**, and **web links are given after the other citation information.**


**ABRAMSON-ZETTERBERG, L., 2003. The dose-response relationship at very low doses of acrylamide is linear in the flow-cytometer-based mouse micronucleus assay. *Mutation Research/Genetic Toxicology and Environmental Mutagenesis* 535; 215-222.**

**APPLETON, B.S., et al., 1982. Linear dose-response curve for the hepatic macromolecular binding of aflatoxin B1 in rats at very low exposures. *Cancer Research* 42; 3659-3662.**

**BALBUS, J.M., et al., 2007. Meeting Report: Hazard Assessment for Nanoparticles - Report from an interdisciplinary workshop. *Environmental Health Perspectives* 115; 1654-1659.**

**BEACH, A.C. and GUPTA, R.C., 1994. DNA adducts of the ubiquitous environmental contaminant cyclopenta[*cd*]pyrene. *Carcinogenesis* 15; 1065-1072.**

**BENNINGHOFF, A.D. and HESSLER, W 2008. Nanoparticles damage brain cells. *Environmental Health News. org.* Synopsis of peer-reviewed article: WANG, J. et al, 2008. Time-dependent translocation and potential impairment on central nervous system by intranasally instilled $TiO_2$ nanoparticles. *Toxicology* 854-90.**

http://www.environmentalhealthnews.org/ehs/newscience/nanoparticles-damage-brain-cells/

**BOYLE, M.A., and KIEL, K.A., 2001. A survey of house price hedonic studies of the impact of environmental externalities. *Journal of Real Estate Literature* 9; 117-144.**

**BRENNER, D.J., and SACHS, K.R., 2006. Estimating radiation-induced cancer risks at very low doses: rationale for using a linear no-threshold approach. *Radiation and Environmental Biophysics* 44; 253-256.**

**BROOK, R.D., et al., 2010. Particulate matter air pollution and cardiovascular disease. *Circulation* 121; 2331-2378.**

**CANADA.com, 2008. Why Halifax is a king of trash.**

http://www.canada.com/ottawacitizen/news/story.html?id=b455ddd2-de2a-491e-81ce-786e05ff3ba5

**CERNUSCHI, S. et al., 2012. Number concentration and chemical composition of ultrafine and nanoparticles from WTE (waste to energy) plants. *Science of the Total Environment* 420; 319-326.**

**CHAU, K.W., 2003. Hedonic price modelling of environmental attributes: a review of the literature and a Hong Kong case study. *Welfare Economics and Sustainable Development* Vol II.**

**CITY OF EDMONTON, 2010. Sustainable Waste Management.**

http://www.edmonton.ca/city_government/documents/Discussion_Paper_10_Sustainable_Waste_Management.pdf

**COLLINS DICTIONARY - Collins New Gem Dictionary, Collins, London.**

**COMMONER, B., et al., 1996. Dioxin fallout in the great lakes. Center for the Biology of Natural Systems, Queens College, CUNY, Flushing, New York.**

http://www.ejnet.org/dioxin/dxnsum.html

**COMMUNICABLE DISEASE REPORTING, 2011**

http://www.toronto.ca/health/cdc/communicable_disease_surveillance/monitoring/pdf/reportablediseases.pdf

**CONFERENCE BOARD OF CANADA: MUNICIPAL WASTE GENERATION, 2013.**

http://www.conferenceboard.ca/hcp/details/environment/municipal-waste-generation.aspx

**CREBELLI, R., 2000. Threshold-mediated mechanisms in mutagenesis: implications in the classification and regulation of chemical mutagens. *Mutation Research/Genetic Toxicology and Environmental Mutagenesis* 464; 129-135.**

**CREEK, M.R. et al., 1997. Tissue distribution and macromolecular binding of extremely low doses of ($14^{c}$)-benzene in B6C3F1 mice. *Carcinogenesis* 18; 2421-2427.**

**CROXTON, F.E. , 1953. Elementary Statistics. Dover Publications Inc., New York.**

**DAVIS, D., 2009. The secret history of the war on cancer. Published by Basic Books; Paperback edition 2009.**

**DEHNEL, L. T., 2008. The effect of phthalates on the male reproductive system. Thesis for degree of Master of Chemical and Life Sciences, University of Maryland, College Park, Maryland.**

http://www.docstoc.com/docs/38380688/PHTHALATES-AND-THE-MALE-REPRODUCTIVE-SYSTEM

**DE JONG, W.H et al., 2008. Particle-size dependent organ distribution of gold nanoparticles after intravenous administration. *Biomaterials* 29; 1912-1919.**

**DeYOUNG, M., 2012. Primer on toxic substances. Published by Pollution Probe.**

**DION, Louis-Martin, 2011. Biomass gasification for carbon dioxide enrichment in greenhouses. Thesis, McGill University, Montreal, Canada.**
http://digitool.library.mcgill.ca/R/?func=dbin-jump-full&object_id=103689&local_base=GEN01-MCG02

**DONALDSON et al., 2001. Ambient particle inhalation and the cardiovascular system: potential mechanisms. *Environmental Health Perspectives* 109;523-527.**

**DORLAND'S MEDICAL DICTIONARY . W.B. Saunders Company, Philadelphia.**

**DUNN, B.N. 1983. Wide-range linear dose-response curve for DNA binding of orally administered benzo(*a*)pyrene in mice. *Cancer Research* 43; 2654-2658.**

**ENERGY JUSTICE NETWORK, 2012. Dioxins & Furans: The Most Toxic Chemicals Known to Science.**
http://www.ejnet.org/dioxin/

**ENTECH-REM, 2013. "Proposed Gasification Plant Fact Sheet" (blue sheet).**

**ENTECH-REM INFORMATION PACKAGE, 2013. Distributed at Public Information Open House #3; Thursday June 27, 2013, at Port Hope Golf and Country Club, Port Hope, Ontario.**

**ENTECH-REM IN THE COMMUNITY, 2013.**
http://www.rem-wesleyville.com/pdf/DownloadDocuments/ENTECH-REM_PIOH3FAQ_07.08.13.pdf)

**ENTECH-REM WEBSITE, 2013**
http://www.rem-energysolutions.com/index.html

**ENTECH WEBSITE, 2013. Entech Renewable Energy Solutions.**
http://www.entech-res.com/

**ENVIRONMENTAL REGISTRY, GOVERNMENT OF ONTARIO, 2010. Decision on Policy.**
http://www.ebr.gov.on.ca/ERSWEBExternal/displaynoticecontent.do?noticeId=MTA1Nzkw&statusId=MTY0MTY3

**ENVIRONMENT @ GOWLINGS, 2011. Guideline A-7; Waste to energy facility receives approval.**
http://www.gowlings.com/KnowledgeCentre/enewsletters/environ/HtmFiles/V8N01_20110107.en.html

**ENVIRONMENT CANADA, 2001: Air Quality Trends.**
http://www.etc-cte.ec.gc.ca/organization/aaqd/aqfact_e.html

**ESPINAS, J., 2012. San Francisco hits Landmark 80% diversion rate. Green Ideal.**

http://www.greenerideal.com/politics/1009-san-francisco-hits-landmark-80-diversion-rate/

**EUROPEAN PARLIAMENT, (2000).** Council on Incineration of Waste, Art 3.4 Directive [2000/76/EC].

**FARBER, S., 1998.** Undesirable facilities and property values: a summary of empirical studies. *Ecological Economics* 24; 1-14.

**FRANZBLAU, A. et al., 2010.** Case report: The University of Michigan dioxin exposure study: a follow-up investigation of a case with high serum concentration of 2,3,4,7,8-pentachlorodibenzofuran. *Environmental Health Perspectives* 118; 1313-1317.

**FRIES, G.F., 1995.** A review of the significance of animal food products as potential pathways of human exposures to dioxins. *Journal of Animal Science* 73; 1639-1650.

**FUNK & WAGNALL'S STANDARD DESK DICTIONARY. Funk & Wagnall's Inc.**

**GAJALAKSHMI, S. and ABBASI, S.A., 2008.** Solid Waste Management by Composting: State of the Art. *Critical Reviews in Environmental Science and Technology* 38; 311-400.

**GREENYES ARCHIVES, 2008.** Tellus Institute Study: Commissioned by the Massachusetts Department of Environmental Protection.
http://greenyes.grrn.org/2008/12/msg00080.html

**GREENE, G., 1999.** The woman who knew too much: Alice Stewart and the secrets of radiation. University of Michigan Press, Ann Arbor.

**GROSOVSKY, A.J., and LITTLE, J.B., 1985.** Evidence for linear response for the induction of mutations in human cells by x-ray exposures below 10 rads. *Proceedings of the National Academy of Sciences, USA.* 82; 2092-2095.

**GUELPH PIONEERS WORLD-CLASS RECYCLING PROGRAM, 1999.**
http://cupe.ca/environmental-issues/BE4643

**GUTIERREZ-CASTILLO, M.E., et al., 2006.** Effect of chemical composition on the induction of DNA damage by urban airborne particulate matter. *Environmental and Molecular Mutagenesis* 47; 199-211.

**HALIFAX REGIONAL MUNICIPALITY, 2013a.** Event Greening in HRM.
http://www.halifax.ca/wrms/EventGreening.html

**HALIFAX REGIONAL MUNICIPALITY, 2013b.** Halifax Regional Municipality Materials Recycling Facility.
http://www.halifax.ca/wrms/mrf.html

**HEALTH CANADA 2013.** **Environmental Health: Dioxin and Furans.**
http://hc-sc.gc.ca/hl-vs/iyh-vsv/environ/dioxin-eng.php

**HUWE, J.K. and LARSEN, G.L., 2005.** **Polychlorinated dioxins, furans, and biphenyls, and polybrominated diphenyl ethers in a U.S. meat market basket and estimates of dietary intake.** ***Environmental Science and Technology*** **39; 5605-5611.**

**IISD, 2013 (INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT).** **Regulating Carbon Emissions in Canada.**
http://www.iisd.org/climate/north_american/regulating_carbon.aspx

**JOHNKE, B:** **EMISSIONS FROM WASTE INCINERATION. Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.**
http://www.docstoc.com/docs/94296558/EMISSIONS-FROM-WASTE-INCINERATION

**KIEL, K.A and McCLAIN, K.T., 1995a.** **The effect of an incinerator siting on housing appreciation rates.** ***Journal of Urban Economics*** **37; 311-323.**

**KIEL, K.A and McCLAIN, K.T., 1995b.** **House prices during siting decision stages: The case of an incinerator from rumor through operation.** ***Journal of Environmental Economics and Management*** **28; 221-255.**

**LEE, D-H., et al., 20210.** **Low dose of some persistent organic pollutants predicts type 2 diabetes: a nested case-control study.** ***Environmental Health Perspectives*** **118; 1235-1242.**

**LEE, D-H. and JACOBS, D., 2011.** **Can low dose persistent organic pollutants explain the current epidemic of type 2 diabetes?** ***Epidemiology*** **22; S148.**

**LeSTOURGEON, W., 2010.** **The safe-dose myth.**
http://www.stopwestnilesprayingnow.org/SafeDoseMyth.html

**LORBER et al., 1994.** **Development and validation of an air-to-beef food chain model for dioxin-like compounds.** ***The Science of the Total Environment*** **156; 39-65.**

**MACDONALD, V., 2013.** **Anti-incinerator signs removed: citizens group.** **Northumberland Today, May 1 2013.**

**MCCORMACK, V.A. and SCHUZ, J., 2012.** **Africa's growing cancer burden: environmental and occupational contributions.** ***Cancer Epidemiology*** **36;1-7.**

**MCLACHLAN, M.S., et al., 1990.** **PCCD/F in an agricultural food chain. Part 1: PCCD/F mass balance of a lactating cow. [PCCD/F = Polychlorinated dibenzo dioxins/furans].** ***Chemosphere*** **20; 1013-1020.**

**MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY, 2013. Basic solid waste collection, storage, and transportation requirements for businesses and other commercial entities in Mississippi.**
http://www.deq.state.ms.us/MDEQ.nsf/pdf/SW_BSWCS06092010/$File/BASIC%20SOLID%20WASTE%20COLLECTION%20AND%20STORAGE.pdf?OpenElement

**MOHAMED, B.M. et al., 2012. Citrullination of proteins: a common post-translational modification pathway induced by different nanoparticles in vitro and in vivo. *Nanomedicine* 7; 1181-1195 DOI: 10.2217/nnm.11.177.**

**MORONEY, M.J., 1962. Facts from figures. Penguin books, Harmondsworth, Middlesex.**

**NASMITH, C., 2013. Port Hope council tackles a whodunit. Northumberland Today May 1, 2013.**
http://www.northumberlandtoday.com/2013/05/01/port-hope-council-tackles-a-whodunit

**NEMMAR A., et al., 2004. Possible mechanisms of the cardiovascular effects of inhaled particles: systemic translocation and prothrombotic effects. *Toxicology Letters* 149; 243-253.**

**NEPC, 2010. Review of the National Environment Protection (Air Quality) Measure - Discussion paper, air quality standards. National Environment Protection Council (NEPC) of Australia, Adelaide, SA.**

**NEURWIRTH, C. et al., 2012. Furan carcinogenicity: DNA binding and genotoxicity of furan in rats in vivo. *Molecular Nutrition and Food Research* 56;1361-1374.**

**NORTHUMBERLAND COUNTY, 2013. Material Recovery Facility.**
http://www.northumberlandcounty.ca/en/departments_publicworks/materialrecoveryfacility.asp

**ONLINE MENDELIAN INHERITANCE IN MAN (OMIM), 2013. Sickle cell anemia.**
http://omim.org/entry/603903

**ONTARIO MINISTRY OF THE ENVIRONMENT, 2013.**
http://www.ene.gov.on.ca/environment/en/index.htm

**OTTER LAKE WASTE FACILITY, 2013.**
http://www.dexter.ca/projects/otter-lake-waste-facility

**OXFORD ENGLISH DICTIONARY - Pocket Oxford: Oxford, at the Clarendon Press.**

**PENN, A., et al., 2005. Combustion-derived ultrafine particles transport organic toxicants to target respiratory cells. *Environmental Health Perspectives* 113; 956-963.**

**PERSICO, A., 2013: Markham tops 80% waste diversion rate. Yorkregion.com.**

http://www.yorkregion.com/news-story/4031697-markham-tops-80-waste-diversion-rate/

**PETO, R., et al., 1991. Effects on 4080 rats of chronic ingestion of *N*-nitrosodiethylamine: a detailed dose-response study. *Cancer Research* 42;6415-6451.**

**RECYCLING INTERNATIONAL, 2013. Denmark to retreat as incineration 'champion'?**

http://www.recyclinginternational.com/recycling-news/7326/other-news/denmark/denmark-retreat-incineration-039-champion-039

**RELLINGER, P.J., 2013a. Farmers see red over REM proposal. The News Northumberland, Friday August 23, 2013.**

**RELLINGER, P.J., 2013b. Property sale incinerated: Couple blames gasification proposal for loss of sale. The News Northumberland, Thursday July 4, 2013.**

**REM, 2013a. Spiral-bound booklet entitled: REM Renewable Energy Management Inc.**

**"The most sustainable waste management system".**

www.rem-energysolutions.com

**REM, 2013b. "Proposed Gasification Plant Fact Sheet" (white sheet).**

**SEADON, J.K., 2010. Sustainable waste management systems. *Journal of Cleaner Production* 18; 1639-1651.**

**SCHNEIDER, U, et al., 2011. Dose response relationships for breast cancer induction at radiotherapy dose. *Radiation Oncology* 6;67.**

**SONG, Y. et al., 2009. Exposure to nanoparticles is related to pleural effusion, pulmonary fibrosis and granuloma. *European Respiratory Journal* 34;559-567.**

**STARR, D., 2013. Personal Communication by e-mail to Port Hope Residents 4 Managing Waste Responsibly (PHR4MWR), 23 July, 2013, from Mr. Doug Starr, Executive Vice President Renewable Energy Management REM).**

**SYNERGETICS, 2012a Appendix 13. Public Environmental Review, Boodarie Waste to Energy and Materials Recovery. Port Hedland.**
http://www.bing.com/search?q=Appendix+13%3A+Air+Quality+Impact+Assessment+%28Synergetics%2C+2012a%29&go=&qs=bs&form=QBRE&filt=all

**SYNERGETICS, 2012b Appendix 18. Public Environmental Review, Boodarie Waste to Energy and Materials Recovery. Port Hedland.**

http://www.newenergycorp.com.au/assets/per-port-hedland/Appendix-18-Nanoparticle-Literature-Review-Synergetics-2012b.pdf

**THE BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE, 2009. Waste gasification: Impacts on the environment and public health.**

http://www.bredl.org/pdf/wastegasification.pdf

**THE NEWS NORTHUMBERLAND, page 4, Thursday July 4, 2013.**

**THE NEWS NORTHUMBERLAND, page 5, Thursday July 4, 2013.**

**THE NEWS NORTHUMBERLAND, page 8, Thursday August 29, 2013.**

**TRENT, J.O. et al., 1996. Targeting the minor groove of DNA: crystal structures of two complexes between furan derivatives and the DNA dodecamer d(CGCGAATTCGCG)2. *Journal of Medicinal Chemistry* 39; 4554-4562.**

**UNESCO, 2006. (United Nations Educational, Scientific and Cultural Organisation). Memorandum of the Paris Appeal: Environmental and Sustainable Health.**

http://90plan.ovh.net/~artac/images/telechargement/MemorandumAPen090107.pdf

**UNIVERSITY OF CALIFORNIA, 2009. Evaluation of Emissions from Thermal Conversion Technologies Processing Municipal Solid Waste and Biomass. Final Report, Prepared by University of California, Riverside, California for: Bioenergy Producers Association.**

http://bioenergyproducers.org/documents/ucr_emissions_report.pdf

**US EPA, 2012. United States Environmental Protection Agency. State of Practice for Emerging Waste Conversion Technologies. EPA 600/R-12/705 October 2012. www.epa.gov/org**
http://nepis.epa.gov/Adobe/PDF/P100FBUS.pdf

**VISVANATHAN C. and TRANKLER J. 2004. Municipal Solid Waste Management in Asia: A Comparative Analysis. PDF.**

http://www.swlf.ait.ac.th/data/Kasetsart%20University%20National%20Seminar%20on%20Solid%20Waste%20Landfill%20Ma/MSWM%20in%20Asia-final.pdf

**WARGO, J. ENVIRONMENT & HUMAN HEALTH, INC., 2008.**
http://www.ehhi.org/reports/plastics/phthalates_intro.shtml

**WASTE INCINERATION: A DYING TECHNOLOGY, 2003 page 25: Incinerator Ash Re-use: The Example of Byker, Newcastle, UK.**

http://www.no-burn.org/downloads/Waste%20Incineration%20-%20A%20Dying%20Technology.pdf

**WASTE MANAGEMENT OF CANADA, 2012**

http://www.newswire.ca/en/story/1073053/waste-management-of-canada-launches-largest-state-of-the-art-recycling-centre-in-ontario

**WEBSTER'S NEW IDEAL DICTIONARY - G. and C. Merriam Co.**

**WHO [World Health Organization], 2010. Dioxins and their effects on human health. Fact sheet N°225 May 2010**

http://www.who.int/mediacentre/factsheets/fs225/en/

**WHO [World Health Organization], 2011. Solid waste management in emergencies. Water, Sanitation, Hygiene and Health Unit.**

http://www.who.int/water_sanitation_health/publications/2011/tn7_waste_mangt_en.pdf

**WIKIPEDIA, 2013.**
http://www.bing.com/search?q=wikipedia&qs=n&form=QBLH&filt=all&pq=wikipedia&sc=8-9&sp=-1&sk=

**ZURBRÜGG, Christian, 2002. Urban Solid Waste Management in Low-Income Countries of Asia: How to Cope with the Garbage Crisis. Presented for: Scientific Committee on Problems of the Environment (SCOPE) Urban Solid Waste Management Review Session, Durban, South Africa, November 2002.**
http://www.bvsde.paho.org/bvsacd/cd48/crisis.pdf

f/n: Incinerator - LETTER TO MOE - MASTER.docx 5/9.18:00