

Commemorative Speech at CEWEP 2016 Congress (June 16.
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Waste-to-Energy from a Global Perspective

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“I must confess that I was thrilled when Ella Stengler informed me that I would be the recipient of the 2016 Phoenix Award. CEWEP and the hundreds of European WTE plants it represents are the torch bearers of the global waste to energy technology.

I am a newcomer in this field, as compared to many people in the CEWEP 2016 Congress. Liliana and I attended our first WTE meeting in Florida at the beginning of this century. Since then, I have visited many WTEs and also many sanitary landfills. Two weeks ago, I presented a lecture in Florence, in connection with the new WTE they will build at Casa Paserina. A reporter from *Repubblica* asked me what should be done to inform some people in Florence who are still opposing this WTE. I said, and it was published, “take them on a visit of the Brescia WTE and of any landfill in Italy”.

The largest part of my career was on environmental ways to extract metals from the earth. And how has this been done for thousands of years? By the use of fire. Also, in the last thirty years, waste management and extractive metallurgy have literally joined hands, as over 50% of the steel, copper, and lead production are based on the recycling of used metals. Again, how is this done? By the use of fire.

In fact, the ancient Greeks believed that fire was a gift, stolen from the Gods. And they were right, because without fire we could not have the nice meals served tonight, nor the metals

which are the bones of our civilization, nor the motion of the automobiles, trains and planes which have carried us to this Congress.

Because of my background in metallurgy, once I made the comparison between WTE and landfilling, which, to me, became as clear as comparing day to night, I could not understand the deep enmity of some people and organizations against “fire” and “incineration”. In my adopted hometown of New York City, people have actually shouted at public meetings “the devil burns, the Lord recycles”.

Early on, I learned that one reason for this animosity was that the results of **early waste incineration** were an environmental disaster, as stated in the book *Metabolism of the Anthroposphere* by Prof. Paul Brunner of the Technical University of Vienna. It took several years of environmental activism, legislation, science, and technology for the global WTE industry to transform from “incineration” to waste-to-energy. WTE by now has been acknowledged, even by International Panel for Change, in their 2014 Assessment Report, as an integral part of **sustainable** waste management.

But the prejudices and misinformation continue, even among scientists who should know better. In 2006, I was invited to the island of Mauritius where they had run out of land for landfilling and all was ready for building a WTE. But it was opposed by a highly respected French scientist, on the grounds that it would generate dioxins (It would actually reduce them by the closing of existing incinerators medical wastes).

Because of the Mauritius experience, I thought that maybe French WTEs were still emitting dioxins but a study we made in 2009 showed that, all together, the 126 French WTEs emitted less than one gram TEQ dioxins/year. I sent our publication to

the famous French scientist. This year Mauritius issued a new call for a WTE plant.

The same story happens at many places in the world. The lack of adequate information, and the spread of misinformation, delay the construction of WTE plants for many years. The dissemination of science-based information is one of the objectives of our Global WTER Council which by now has sister academic organization in twelve nations, including China and India.

The modern WTE plants bear as much similarity to the incinerators of the early 20th century as the electric trains of today bear to the coal-fired trains of the distant past. A good way to press this point is by the E.U. WTE industry and governments to stop using the words incinerators, incineration, "incineration", etc. to describe the WTE, or EFW plants of today. These power plants are fuelled by solid wastes, recover electricity, heat, metals, and construction minerals and are equipped by air pollution control systems that are superior to any other high temperature industrial process.

So it is time to move from a negative and inaccurate association to an obviously positive message, that energy is recovered from so-called "wastes".

Despite the evident environmental superiority of modern WTE plants over the best of modern landfills, our studies have shown that about one billion tons of recorded municipal solid wastes are landfilled, globally. In contrast, less than one quarter billion tons are processed in WTE plants. The World Bank projects that the generation of MSW will double by 2030, so there will be room for growth of both industries. But what are the most evident environmental impacts of continued landfilling?

The first one is the conversion of virgin land to landfills. We have estimated that if all the existing landfills of the world were to be located at one place, about 100 square kilometers of land would be used up in one year. This is equal to the surface area of metropolitan Paris and would be clearly visible from outer space. There is talk and a lot of money spent on the notion of colonizing Mars. What would be the cost of creating 100 square kilometers of Earth-like space on Mars? Which we convert to landfills each year.

The second “external” environmental cost of landfilling, vs WTE is the generation of about one ton of CO₂ per ton of MSW. Therefore, the current potential for global mitigation of GHG is one billion tons of CO₂, i.e. about 3% of the total emissions of CO₂.

If these two external costs, of land use and GHG emissions, were to be priced, WTE would become more economic than landfilling, even in the short term. However, until the world starts counting these costs, what can the WTE industry do to improve its competitive position? This will be the last subject of my talk tonight.

Contrary to the usual industrial “experience curve”, where the cost of producing an item decreases as more items are manufactured, the capital cost of WTE plants, in dollars per annual ton of capacity, has not decreased with time, on the contrary, it has increased. At present time, this cost is about \$700 per annual ton of capacity and the annual repayment of this capital is the major cost item of the gate fee that WTEs have to charge per ton of MSW combusted.

Our studies have also shown that a notable exception is that of recent WTE plants in China, which were built at a capital cost of one third of E.U. and U.S. I have visited recently built Chinese

plants in the last three years and I can assure you that, esthetically and environmentally, they are as good as EU/US plants.

It may be that Chinese plants are less costly because they have the benefit of “mass production”: In recent years, China has built about thirty new WTEs each year. It remains to be seen if Chinese companies, in collaboration with western companies can build such low cost plants in other Asian countries.

Apart from trying to reduce capital costs, new EU and US WTE plants should try to take advantage of benefits already realized in the Netherlands and other northern Europe countries: Co-generation of district heating; co-combustion of medical wastes and wastewater sludge; increased metal recovery; and beneficial use of bottom ash.

In closing I would like to thank CEWEP for this Award which I share tonight with Liliana who has climbed up with me many WTEs, listened to “n” lectures on waste management, and acted as the mother hen of my graduate students whose work was quoted again and again tonight. Thank you all.

Nickolas J. Themelis

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