

The role of Waste-to-Energy (WTE) in a circular economy society

A.C. (Thanos) Bourtsalas

Earth Engineering Center, Columbia University, New York, USA

The only proven alternative to landfilling for the management of the wastes, that cannot be recycled, is thermal treatment for the recovery of energy, (waste-to-energy or WTE). The benefits of WTE over landfilling are mainly associated with the destruction of pathogens, the volume reduction of the municipal solid waste (MSW) by 90%, the production of about 0.5 MWh of electricity and more than 0.6 MWh of district heating per ton of MSW combusted; the savings of about 0.5 to 1 ton of Greenhouse Gases emissions per ton of MSW, and the preservation of about 1 sq. meter of land for every 10 tons of MSW.

However, there is continuing opposition to WTE based on the early history of incineration, mainly associated with dioxins and other harmful to public health emissions. The Earth Engineering Center of Columbia University (EEC-CU) conducted detailed studies of four nations, i.e. USA, France, S. Korea and China, annual WTE dioxin emissions and concluded that the emissions were significant below the national established limits. In addition to this scientific argument, another EEC-CU study found that the about 1,000 WTE plants worldwide are located on an average distance of 5 km from the city center that these serve: therefore, within the city boundaries.

The second part of the presentation is associated with the global picture of waste management, where over two thirds of the global MSW is currently landfilled, mostly in non-sanitary landfills. China indicated a phenomenal growth in the development of state-of-the-art WTE plants, from 36 plants in 2001 to ~400 plants in 2020, as a result of strong incentives that were provided by the government through a renewable energy credit of \$30/MWh of electricity produced by WTE as compared to coal power plants; similar to the advocacy of the EU through the renewable energy law. The main finding from the global assessment was that developed nations took several decades to reach their present state of development and achievement in sustainable waste management. On the other hand, developing nations can use the European and Chinese example to accelerate the application of WTE technology and the phasing out of landfilling.