OPINION: How India can rejuvenate its Waste-to-Energy sector

By Bidisha Banerjee

Introduction

India generates an enormous amount of waste, including municipal solid waste (MSW), industrial waste, hazardous waste, and biological waste. According to the State of India's Environment 2023 report, MSW generation in India is estimated to be around 150,000 tonne per day (TPD). To harness the energy potential of this waste and reduce reliance on landfills, waste-to-energy (WTE) processes are being explored across India. The process involves converting garbage into heat and electricity, thereby providing renewable energy (RE). As on November 2022, India had 12 operational and 8 non-operational WTE plants in 10 states. In most WTE plants, MSW is burned to generate steam, which powers electric generators. India has the potential to generate 5,690 MW of power from industrial waste and MSW. However, as on May 2023, the installed capacity stood at 556 MW, indicating the untapped potential of WTE.

Need to rejuvenate the WTE sector

Rejuvenating India's WTE sector offers several compelling benefits, such as reduced reliance on fossil fuels, a diversified energy mix, and enhanced energy security. Further, WTE plants effectively manage solid waste by alleviating strain on limited landfill space and addressing the growing waste generation challenge. Such plants also create job opportunities, supporting the local economy and livelihoods. By harnessing untapped waste resources, reducing greenhouse gas (GHG) emissions, alleviating health risks, and combating climate change, WTE aligns with the Sustainable Development Goals and promotes a circular economy.

Obstacles hindering the WTE sector's effectiveness

However, there are numerous obstacles to the feasibility and efficacy of WTE plants in India. For instance, less expensive power-producing options challenge the viability of these plants. Further, India's high percentage of wet solid waste than dry solid waste presents financial and technological challenges for WTE plants. The absence of regulations is another issue, particularly when it comes to the Environmental Impact Assessment (EIA) requirement for WTE plants.

The solution

The effectiveness of India's WTE sector can be enhanced by the adoption of advanced WTE solutions, including plasma gasification, hydrothermal carbonisation (HTC), and refused-derived fuel (RDF). Various types of wastes, including hazardous waste, can be handled through plasma gasification, which also reduces waste volume significantly. This technology utilises high temperatures to convert waste into a clean synthetic gas, which is suitable for electricity generation or chemical production. A plasma-gasification-based hazardous WTE plant in Pune with a capacity of 700 TPD showcases the commercial use of this technology for waste disposal.

Further, HTC can process diverse waste types, reduce waste volume, and generate fuel for boilers or gasifiers. The technology involves heating wet organic waste with water to produce hydrochar — a high-energy-density solid fuel. However, research and development (R&D) regarding the effective implementation of HTC in India is still underway.

Shredding and drying MSW produces RDF — a fuel source for industrial processes, such as cement kilns, and power plants. Apart from offering RE, RDF aids in reducing landfill waste and GHG emissions. India boasts multiple RDF-based WTE plants, including Delhi's Timarpur-Okhla Waste Management Company Limited and Ghazipur WTE Power Plant, Hyderabad's plant set up by Greater Hyderabad Municipal Corporation (GHMC) and Ramky Enviro Engineers Limited, and Bengaluru's plant managed by Bruhat Bengaluru Mahanagara Palike (BBMP). These sites approximately generate a combined power of 107 MW, with capacities from 1,000 to 5,000 TPD.

In addition to these technologies, strategies such as public education on waste segregation, proper disposal practices, increased investment in WTE infrastructure, supportive policies, and private sector incentives are essential. Developing a robust regulatory framework, integrating the informal sector, and fostering R&D will further drive advancements in WTE technologies, promoting sustainability and cost-effectiveness.

Government initiatives

The Ministry of New and Renewable Energy (MNRE) supports the WTE sector through several programmes, which focus on waste management and the promotion of RE production. Launched in 2014, the Swachh Bharat Abhiyan or Clean India Mission promotes WTE as a component of waste management plans. The use of WTE technologies in commercial and demonstration projects is additionally encouraged by initiatives like the National Biogas and Manure Management Programme (NBMMP), which promotes the use of biogas and organic manure produced from urban, industrial, and agricultural waste. The programme provides RE, improves sanitation, and offers subsidies for biogas plant setup, creating job opportunities in waste management.

Conclusion

India's population continues to grow, and so does the amount of waste generated. The WTE sector has immense potential in terms of waste management and sustainable energy production. By implementing enhanced and innovative approaches and involving the government, private sector, civil society, and the public, India can unlock its untapped potential and effectively tackle the challenges posed by the escalating waste generation.

[This piece was written exclusively for ETEnergyworld by Bidisha Banerjee. She works in the area of renewable energy and energy efficiency at the Center for Study of Science, Technology and Policy (CSTEP), a research-based think tank]