EXECUTIVE SUMMARY:
Waste-to-Energy Technology Markets
Renewable Power and Heat Generation from Municipal Solid Waste: Market Outlook, Technology Assessments, and Capacity and Revenue Forecasts

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Section 1
EXECUTIVE SUMMARY

1.1 Overview

Waste-to-energy (WTE) or energy-from-waste (EfW) – encompassing methods by which to extract the valuable energy contained in waste streams for the production of electricity and heat – represents a vastly underutilized resource throughout the world. In 2011, the world’s rapidly increasing urban population generated nearly 2 billion tons of municipal solid waste (MSW). Pike Research estimates show that this number will climb to at least 2.9 billion tons by 2022, representing an estimated 240 GW of untapped potential.

Currently, nearly three-quarters of the trash discarded worldwide in 2011 ended up in landfills or open pits. Close to 205 million tons – just 11% of the global MSW stream – were utilized as a source of fuel in WTE plants. With many countries facing dramatic population growth, rapid urbanization, rising levels of affluence, and resource scarcity, WTE is reestablishing itself as an attractive technology option to promote low carbon growth in the crowded renewable energy landscape.

As waste management policies evolve, it is no longer sufficient to discard trash. Crowded landfills are making it increasingly difficult to ship trash out-of-sight, out-of-mind. Resource scarcity necessitates the use of trash streams like MSW as a strategic fuel source. Today, more than 800 thermal WTE plants operate in nearly 40 countries around the globe. Led by Asia-Pacific and Europe, this number is expected to grow rapidly over the next decade, potentially treating 396 million tons of MSW annually by 2022 with an estimated output of 151 terawatt hours (TWh) of electricity.

This report examines the market dynamics and technology issues that will impact the WTE industry over the next decade, provides growth projections through 2022, and analyzes key markets and players across the industry value chain. Evolving integrated waste management policies within key markets were considered in order to assess the market potential for WTE technologies as a strategy for reducing waste volumes and landfilling. As such, the following thermal and biological technology segments are examined:

- Incinerators and combustion applications
- Advanced thermal technologies
- Anaerobic digesters

1.2 Main Findings

Heading into the next decade, policymakers are faced with the difficult choice of either expanding existing landfill capacity or investing in new WTE capacity. The decision necessitates the consideration of long-term strategies, a luxury that slips further out of reach as jurisdictions face steadily increasing volumes of MSW. Illustrative of this point, China, which recently surpassed the United States as the leading generator of MSW, is at or near capacity for many of its estimated ~400 landfills. As an alternative to long-term landfill storage, WTE offers three key benefits: reduction of waste volumes by at least 90%, recovery of metals and other materials, and the generation of renewable base load energy.

Waste management policies vary dramatically across regions – even among Member States within the EU and jurisdictions within the United States. Taking the long view,
emerging policies in many developed countries embrace integrated waste management solutions, which aim to increase diversion rates away from landfills. Waste management infrastructure in developing countries is less mature, which suggests that integrated waste management solutions will be slower to advance.

Despite these efforts, landfilling remains the world’s preferred method for managing and treating waste, despite its negative impact on the environment. In 2011, an estimated 1.4 billion tons of MSW was landfilled or dumped in open pits worldwide. A shift away from this trend over the next decade will necessitate considerable economic and political will. Given the scale of the challenge, the preference for landfilling is expected to remain mostly unchanged over the next decade, even under Pike Research’s more optimistic WTE forecasts.

**Chart 1.1**  
**MSW Management by Disposal Method, World Markets: 2010-2022**

Despite landfilling’s dominance, innovative waste management policies, coupled with changing economic conditions, are driving the growth of WTE capacity worldwide. This trend creates attractive business opportunities for providers of WTE technologies and related components. Although public opposition to incineration projects is still a major barrier to more widespread WTE deployment, today’s mass burn facilities are far more advanced than the incinerators of old. Equipped with innovative emission control technology not possible just a decade ago, these facilities are getting a second look.
1.3 Emerging Trends

- Led by strong growth in China, the Asia Pacific region has emerged as ground zero for WTE activity. It is projected to capture half of the global market by 2018.

- The EU market remains hot, but with portions of the market saturated, growth is confined to a handful of Member States.

- After 15 years of dormancy, WTE activity is heating up in the United States, but growth is expected to trail Asia Pacific and the EU.

- WTE facilities are benefitting from improved public acceptance with an increasing number of facilities being sited in urban centers.

- Although tipping fees are on the rise, WTE is not yet financially competitive in a number of markets, which is likely to stifle more aggressive growth aspirations. If recent shale gas discoveries prove as prolific as estimates forecast, lower natural gas prices in the United States (and potentially Europe and China) are expected to choke off more widespread WTE expansion over the projection period.

1.4 Forecast Overview

Based on in-depth analysis of population growth, urbanization trends, and waste generation rates across key regions, Pike Research estimates that, at minimum, 261 million tons per year of WTE capacity will come online worldwide by 2022. Under an optimistic forecast scenario, this number could rise to as much as 396 million tons per year. The global market for thermal and biological WTE technologies will reach at least $6.2 billion in 2012 and grow to $29.2 billion by 2022 under a conservative forecast. Market value could reach $80.6 billion by 2022 under the optimistic forecast. Accounting for 98% of the market today, mass burn, or as-received combustion, dominates the WTE market and will continue to do so through the forecast period. Advanced thermal treatment technologies and the biological treatment segment could reach at least $8 billion by 2022.

Chart 1.2 WTE Market Value by Forecast Scenario, World Markets: 2010-2022

(Source: Pike Research)
## Section 10

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# Waste-to-Energy Technology Markets

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  - Fluidized Beds
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### 4.4 Biological Treatment

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### 4.5 Air Pollution Control Technologies

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- Chemical Cleaning

### 4.6 Residue Management

### 4.7 Energy Recovery

## Section 5: Key Industry Players

### 5.1 Thermal WTE Players

- ABB
- Babcock & Wilcox Volund

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Additional sections and topics mentioned are as follows:

- WTE Market Barriers
- WTE Economics
- WTE Mandates, Regulations, and Incentives
- Renewable Power Production
- Feed-in Tariffs
- Tax Credits
- Policy Uncertainty

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SCOPE OF STUDY

Pike Research has prepared this report to provide participants at all levels of the WTE market, including equipment and waste haulers, investors, researchers, and market players, with a study analyzing the global market outlook through 2022. The objective of the report is to identify and evaluate the major opportunities and challenges facing the industry as well as the potential revenue that could be generated by new trends, economic developments, policies, and regulations. This report also provides a review of key market players and established technologies, as well as market contenders and emerging technologies, including both thermal and biological WTE conversion pathways.

The report's purpose is not to provide an exhaustive technical assessment of the technologies and markets covered, but rather a strategic examination from an overall tactical business perspective. Pike Research strives to identify and examine new market segments to aid readers in the development of their business models. All major global regions are included.

SOURCES AND METHODOLOGY

Pike Research’s industry analysts utilize a variety of research sources in preparing Research Reports. The key component of Pike Research’s analysis is primary research gained from phone and in-person interviews with industry leaders including executives, engineers, and marketing professionals. Analysts are diligent in ensuring that they speak with representatives from every part of the value chain, including but not limited to technology companies, utilities and other service providers, industry associations, government agencies, and the investment community.

Additional analysis includes secondary research conducted by Pike Research’s analysts and the firm’s staff of research assistants. Where applicable, all secondary research sources are appropriately cited within this report.

These primary and secondary research sources, combined with the analyst’s industry expertise, are synthesized into the qualitative and quantitative analysis presented in Pike Research’s reports. Great care is taken in making sure that all analysis is well-supported by facts, but where the facts are unknown and assumptions must be made, analysts document their assumptions and are prepared to explain their methodology, both within the body of a report and in direct conversations with clients.

Pike Research is an independent market research firm whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. The firm is not beholden to any special interests and is thus able to offer clear, actionable advice to help clients succeed in the industry, unfettered by technology hype, political agendas, or emotional factors that are inherent in cleantech markets.
NOTES

CAGR refers to compound average annual growth rate, using the formula:

\[ \text{CAGR} = \left( \frac{\text{End Year Value}}{\text{Start Year Value}} \right)^{\frac{1}{\text{steps}}} - 1. \]

CAGRs presented in the tables are for the entire timeframe in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter timeframes may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2012 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.