

Energy Recovery From Waste

Presented by: Griffin Burns, Research Analyst



01

What is WTE?

02

Processes

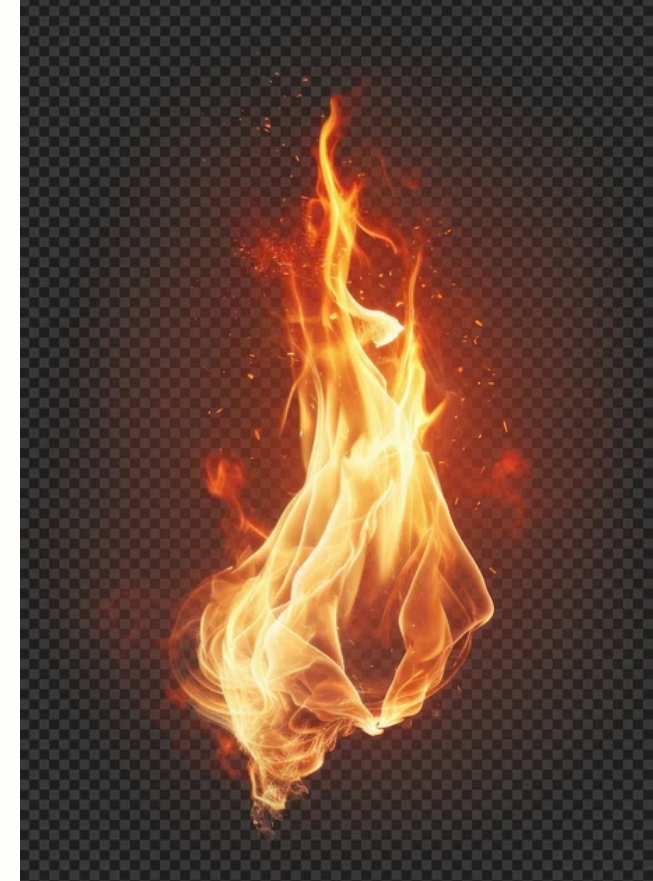
03

Global Usage



What is Energy Recovery from Waste?

- Energy recovery from waste, also known as waste-to-energy (WTE), is the conversion of waste materials into usable energy(heat, electricity, or fuel) through a variety of processes.
- Processes include: combustion, gasification, pyrolization, anerobic digestion, and landfill gas recovery.

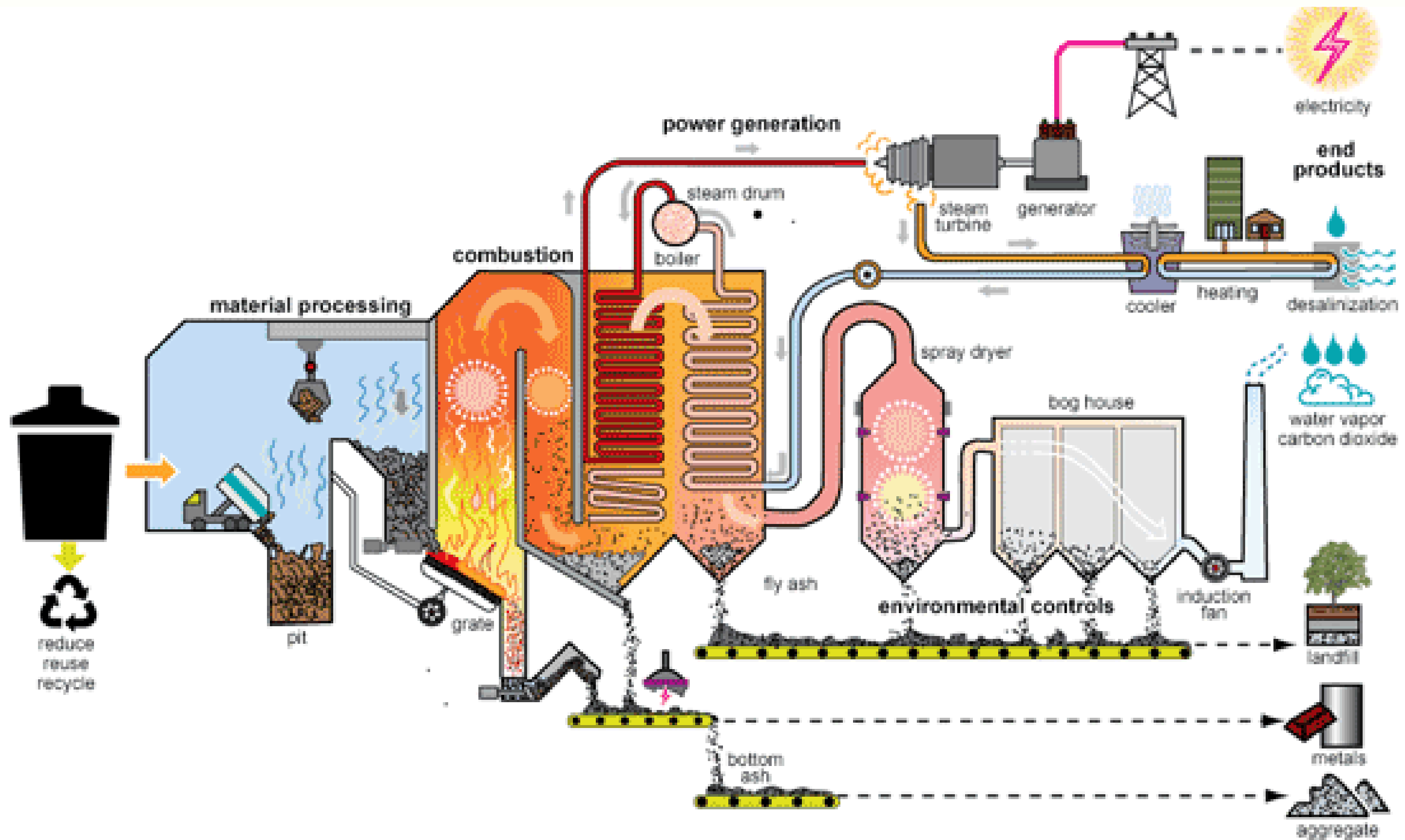


Combustion

- **Municipal solid waste is burned in an incinerator with a boiler. The boiler produces steam that powers a turbine generator.**
- **As of 2025, there are 75 combustion generators in the US still in operation.**



Combustion

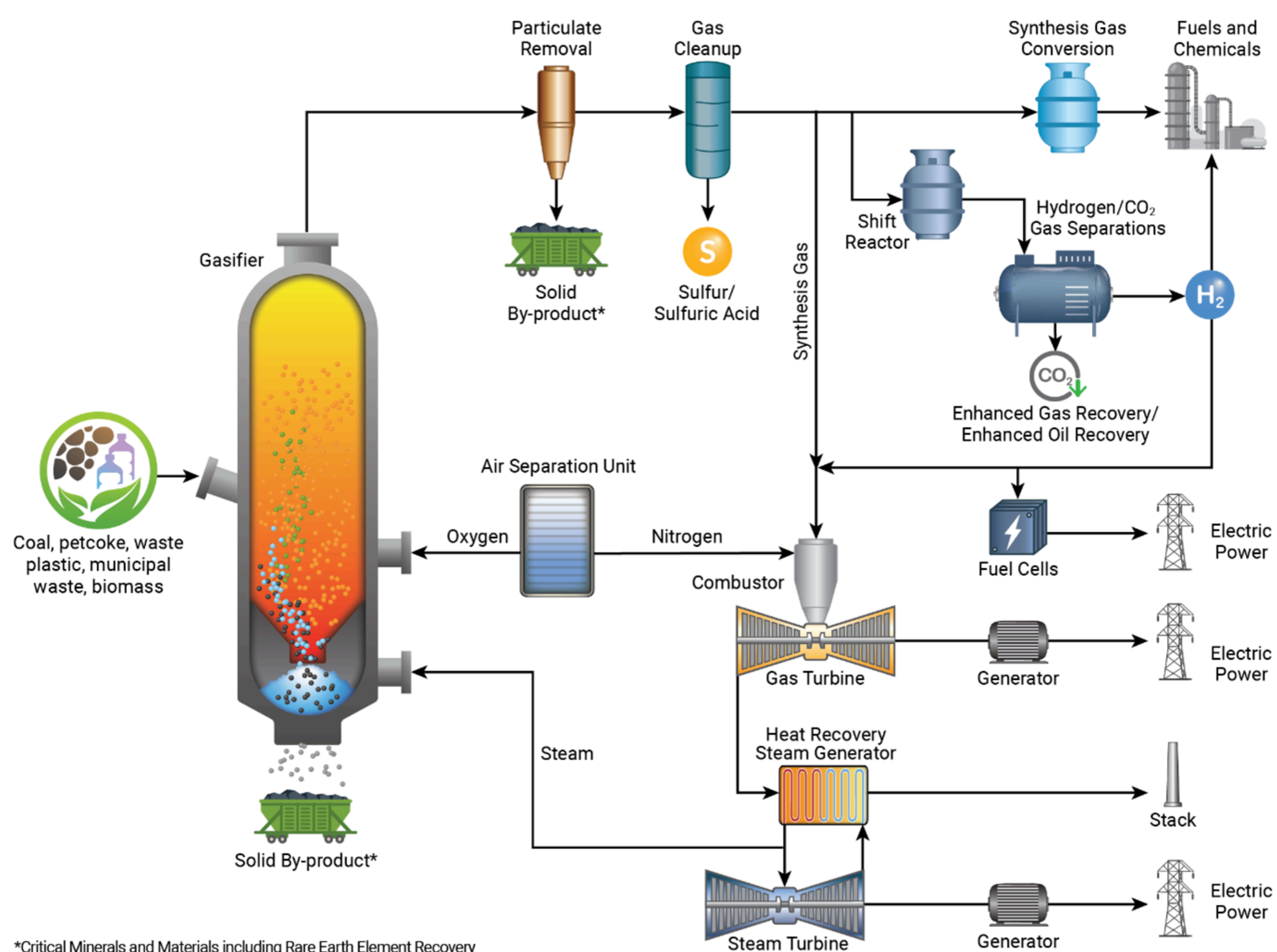


Gasification

- Gasification is the process in which waste is heated in a low-oxygen environment and converted into a mixture of gases called “Syngas” (methane, carbon dioxide, carbon monoxide, hydrogen, and tars). Syngas can be used to produce electricity or used as a fuel for heating and combustion.
- FastOx Gasification System



Gasification



*Critical Minerals and Materials including Rare Earth Element Recovery


Pyrolysis

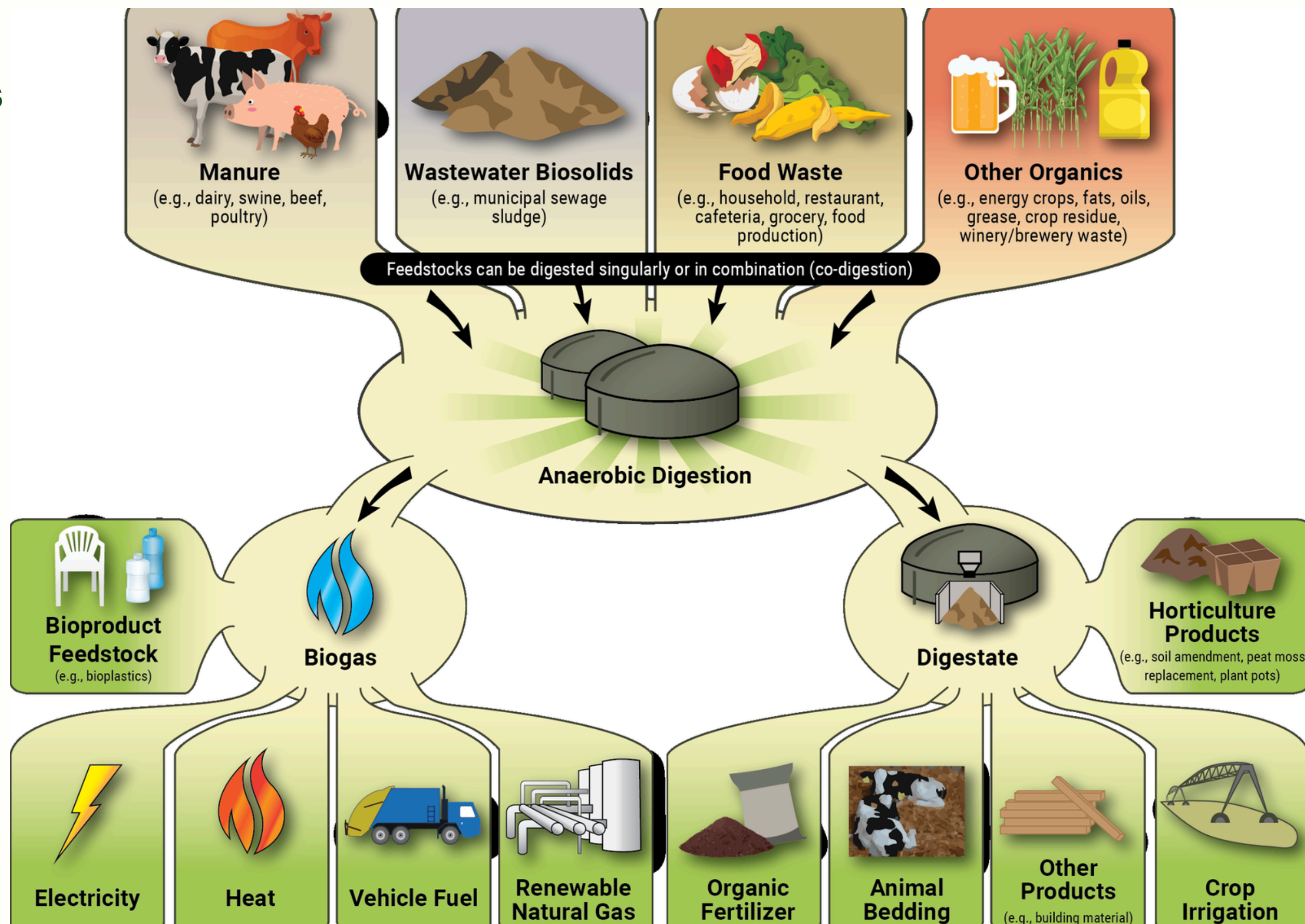
- Pyrolysis is the process in which waste, biomass or plastic is thermochemically decomposed in an oxygen-free environment.
- Utilizing high temperatures(300-700°C), pyrolysis can produce bio-oil, syngas, and biochar.
- In the US, there are a few small-scale pilot projects specializing in plastic feedstock.



Anerobic Digestion

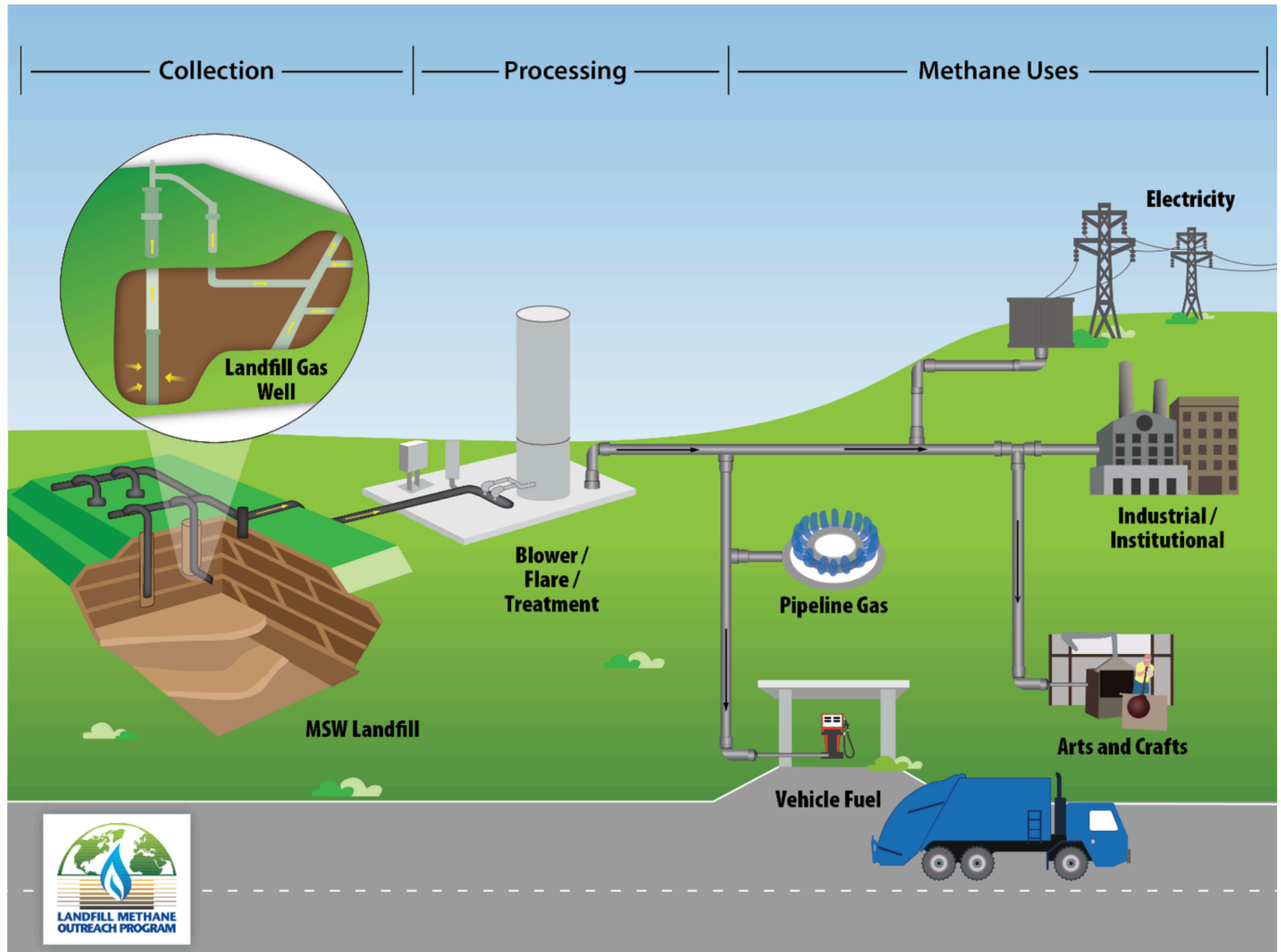
- Anerobic Digestion is the process in which microorganisms breakdown organic waste in an oxygen-free environment to produce biogas or digestate.

- Manure= \$\$\$ & 



Landfill Gas Recovery

- Landfills with equipped pipelines installed can capture methane and carbon dioxide as waste decomposes.
- Two active projects in Montana, Flathead County Landfill (Electricity Generation) & Billings Regional Landfill (Renewable Natural Gas).



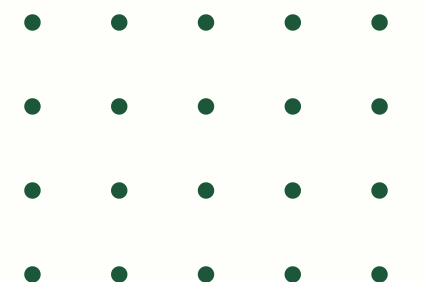
Global Usage

- 70-75% of WTE operations occur outside of the US.
- European countries and Japan have the most WTE plants. Roughly 30-50% of waste is managed by WTE in Europe. In Japan, 80% of waste is managed by WTE.
- WTE is more predominant outside of the US due to high population density, land scarcity, and landfill bans in certain countries.





Conclusion

- **WTE is an option within an integrated waste management strategy that recovers energy.**
 - **Its effectiveness depends on economic feasibility, available feedstock, technology, and regulatory climate.**
- 



Questions?

