



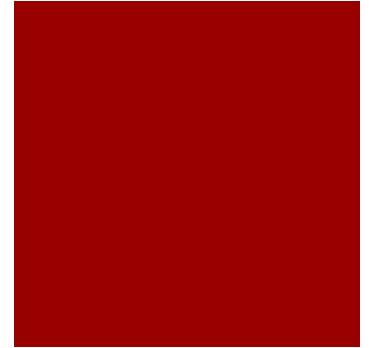
# Municipal Solid Waste Disposal and Landfill Alternatives in the United States

Analyzing the past, present and future of  
waste disposal and landfills throughout  
the United States

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# Contents

- Brief History of Municipal Solid Waste Disposal in the United States
- Current Municipal Solid Waste Challenges
- The Future of Municipal Solid Waste Disposal
- Final Thoughts



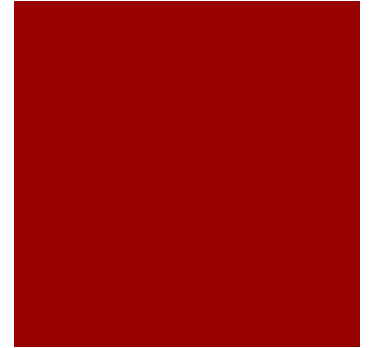
# A Brief History

- The Beginning of U.S. Waste Management
  - 1885 – First Incinerators built on Governor's Island, NY
  - 1898 – First recycling program enacted
  - 1902 – Municipal solid waste management was normal in most cities



# A Brief History

- The Emergence of Landfills and Waste-To-Energy Facilities
  - 1959 – ASCE publishes *Sanitary Landfilling*
  - 1970 – Resource Recovery Act, EPA founded
  - 1972 – First WTE Facility built in Harrisburg, PA
  - 1976 – Resource Conservation and Recovery Act



# A Brief History

- The Emergence of Landfills and Waste-To-Energy Facilities continued
- 1988 – Waste-to-energy facility construction hits peak

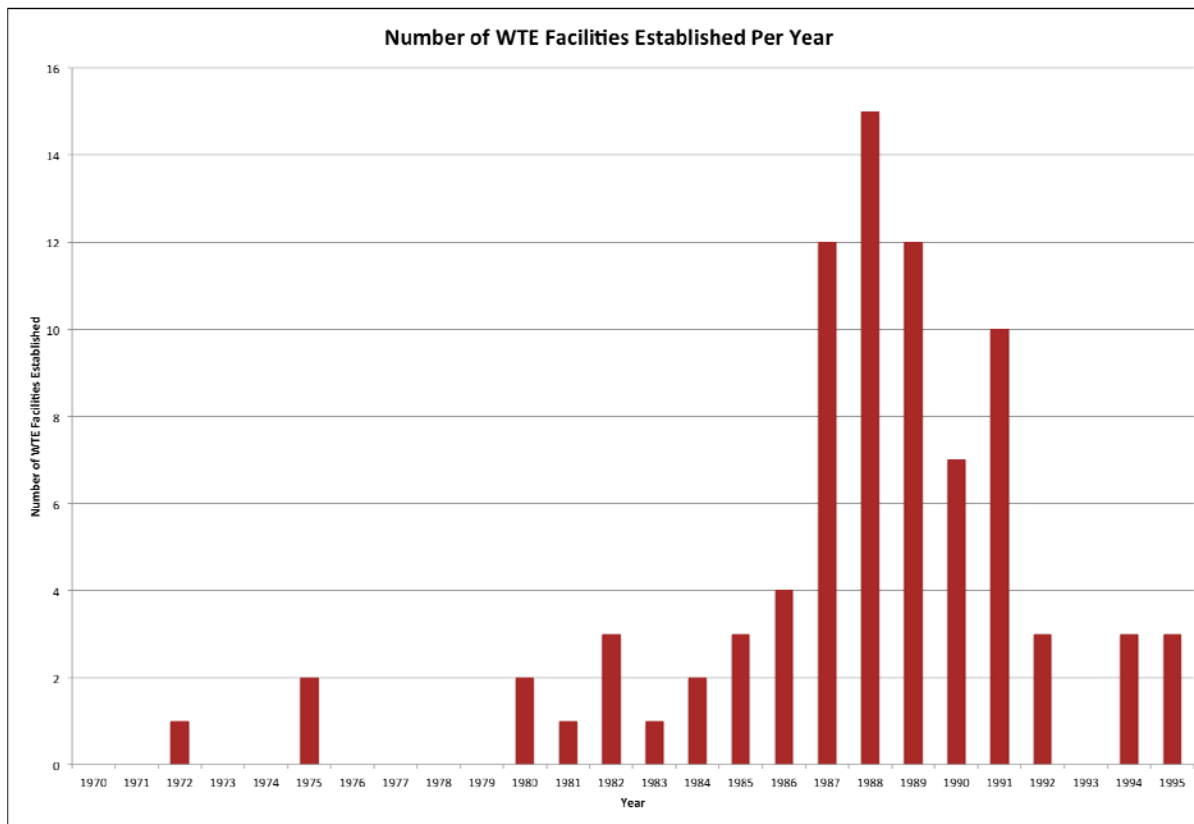
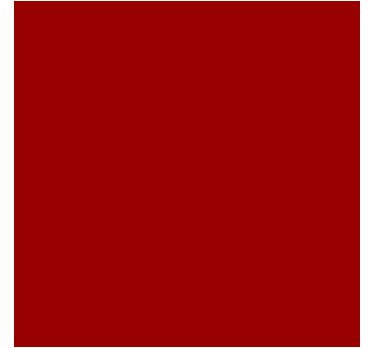


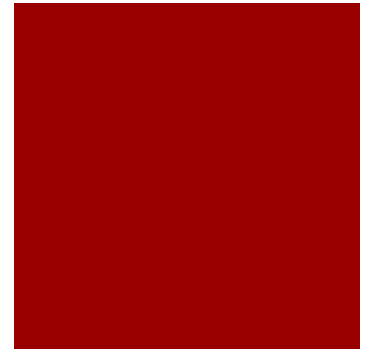
Figure 1: Number of WTE Facilities Established Per Year (EPA)

# A Brief History

- Maximum Achievable Control Technologies, Subtitle D, and U.S. Municipal Solid Waste Today
  - 1990 – EPA enacts Maximum Achievable Control Technologies
  - Today – 84 waste-to-energy facilities in the United States, countless landfills



# Current Municipal Solid Waste Challenges



- Chemical Emissions and Contamination Concerns

- Atmospheric Challenges:

- Methane Gas

- Water Challenges:

- Leachates

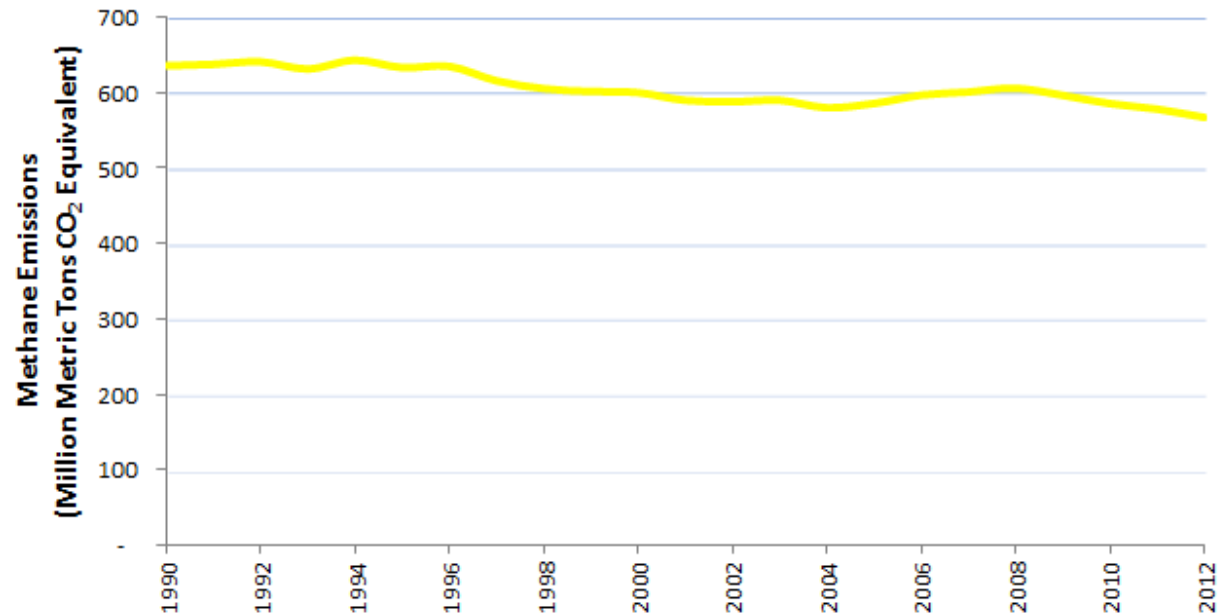
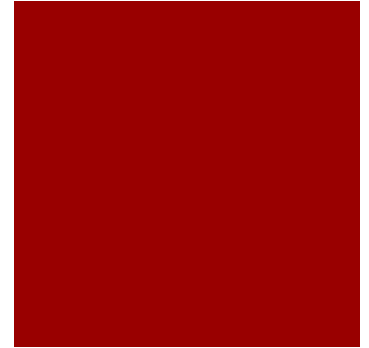


Figure 2: U.S. Methane Emissions from 1990 to 2012 (EPA)

# Current Municipal Solid Waste Challenges



- Population Growth
- New Federal and State Legislature
  - Updating the Resource Conservation and Recovery Act
  - EPA Revision Checklists



Figure 3: United States Population (U.S. Census Data) vs Waste Production (EPA)



# The Future of Municipal Solid Waste Disposal

- Solid Waste Management Hierarchy



Figure 4: Waste Management Hierarchy Pyramid (EPA)

# The Future of Municipal Solid Waste Disposal

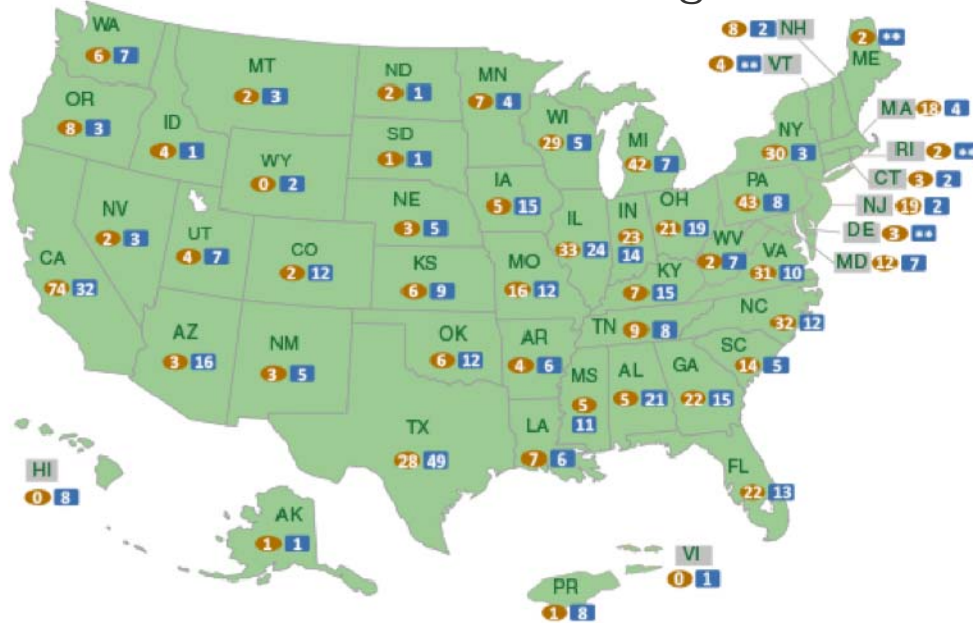
- Landfill Alternatives
  - Landfill Solar Energy Cover



# The Future of Municipal Solid Waste Disposal



- Landfill Alternatives
  - Landfill Methane Outreach Program



**Nationwide Summary**

**636 OPERATIONAL Projects**  
(1,978 MW and 305 mmscfd)

**~440 CANDIDATE Landfills**  
(885 MW or 490 mmscfd,  
40 MMTCO<sub>2</sub>e/yr Potential)

OPERATIONAL PROJECTS

CANDIDATE LANDFILLS\*

\*Landfill is accepting waste or has been closed 5 years or less, has at least 1 mm tons of waste, and does not have an operational, under-construction, or planned project; can also be designated based on actual interest by the site.

These data are from LMOP's database as of July 22, 2014.

\*\* LMOP does not have any information on candidate landfills in this state.

Figure 5: Landfill Methane Outreach Program 2014 Data (EPA)

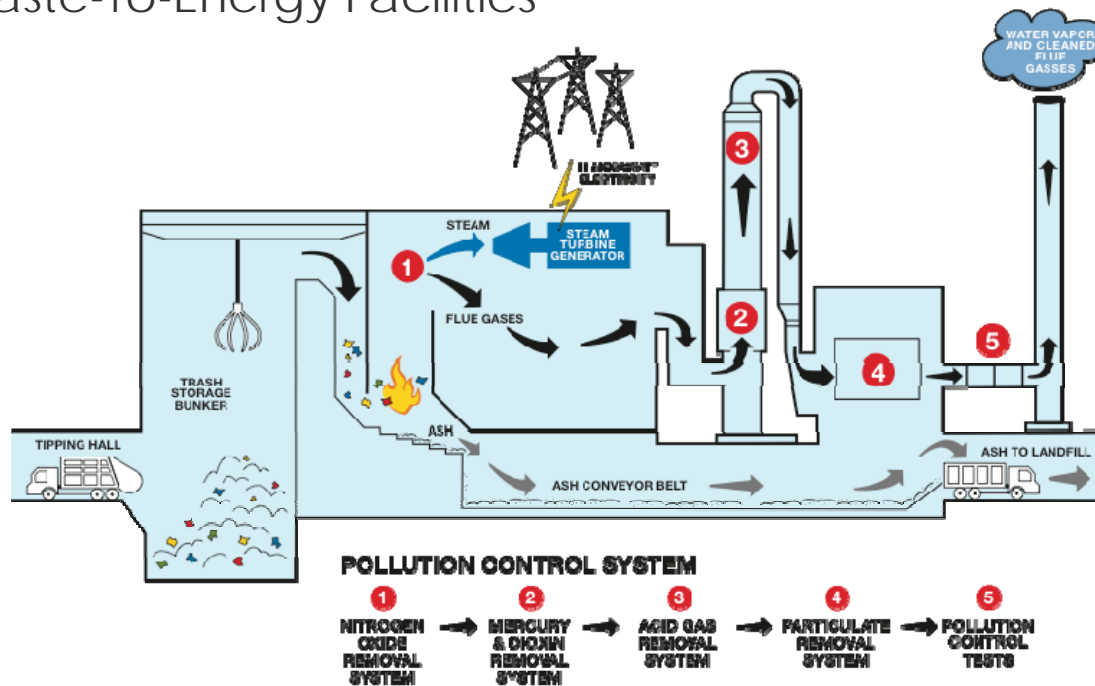
# The Future of Municipal Solid Waste Disposal

- Landfill Alternatives
  - Landfill Mining



# The Future of Municipal Solid Waste Disposal

- Landfill Alternatives
  - Waste-To-Energy Facilities



## Waste-to-Energy

- 80% reduction of trash volume
- Power generation
- Pollution control

**ecomaine**  
the future of regional waste systems  
[www.ecomaine.org](http://www.ecomaine.org)

Figure 6: Mass Burn Waste-to-Energy Facility Diagram (EPA/ecomaine)

# The Future of Municipal Solid Waste Disposal

- Landfill Alternatives
  - Waste-To-Energy Facilities: Gasification

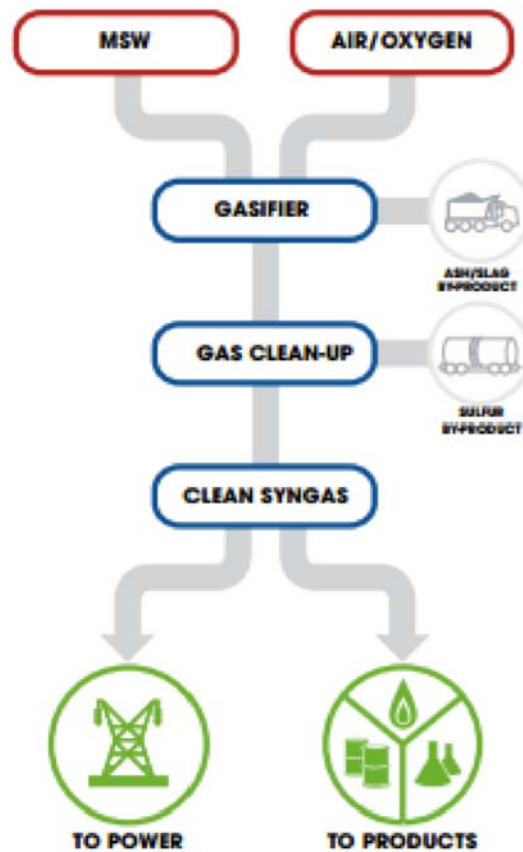
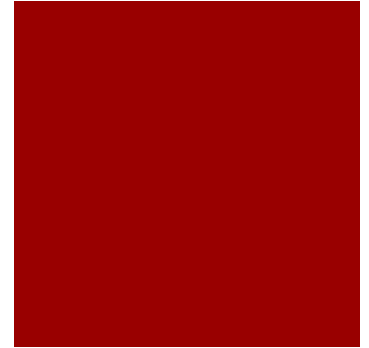


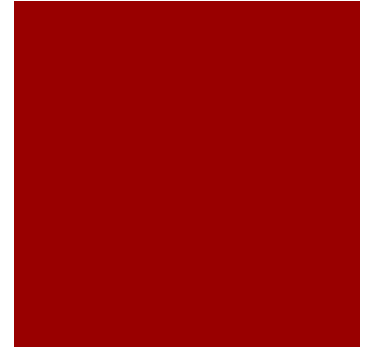
Figure 7: Gasification Process (Gasification Council)

# Final Thoughts

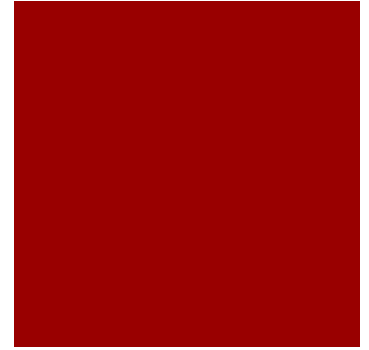
- No one option will be the ultimate solution
- All options are effective, must take a diverse approach to municipal solid waste disposal in each community
- The United States is already on the right track



Questions?







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