

Conversion of Municipal Solid Waste to Energy  
(Technical Report)

Resistance to the Dakota Access Pipeline  
(STS Research Paper)

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Bachelor of Science in Chemical Engineering

by

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## Preface

How may U.S. energy sustainability be improved? In the U.S., the greatest shares of greenhouse gas emissions are from transportation and electrical power, respectively, at over a quarter each. More than 90 percent of transportation emissions are from petroleum fuels; almost two-thirds of electric power emissions are from natural gas and coal.

Approximately 75 percent of energy-dense recyclables in the U.S. are destined for landfills, where they can pollute groundwater. Conventional combustion of recovered recyclables yields useful energy. For cleaner energy, municipal solid waste may be converted to syngas through gasification for use in conjunction with a water-gas-shift reactor, and in electrolysis within a solid oxide fuel cell. A Rankine Cycle may be employed downstream for heat recovery, and exhaust may be cleansed with carbon capture technology. This approach yields significantly more energy per unit-mass than conventional combustion and reduces greenhouse gas emission, though at prohibitive cost. These units were integrated into a conceptual waste-to-energy syngas plant and evaluated for economic efficacy.

The Dakota Access Pipeline exacerbates longstanding distrust between indigenous peoples and the U.S. government. To its critics, the pipeline is a manifestation of settler colonialism and perpetuates dependency on fossil fuels. While defenders of the pipeline contend it is less susceptible to spillage than other means of oil shipment, critics warn that the impact is severer; spillage threatens adjacent land from agricultural production. Pipeline advocates' successes demonstrate corporate influence in public policy.