King County

Port of Seattle

Municipal Solid Waste-to-Fuels (SAF) Techno-Economic Study Findings

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PORT OF SEATTLE
SEA AIRPORT


KING COUNTY
SOLID WASTE DIVISION

Study Objectives:

1. Technology review
2. MSW supply and volume
3. Facility siting options
4. Financing & risk mitigation
5. Partnership opportunities
6. Conclusions

MSW-TO-SAF | TECHNOLOGIES & RECENT FACILITIES

Two available technologies: waste-to-crude; and waste-to-alcohol

No MSW-TO-SAF facilities operating today.

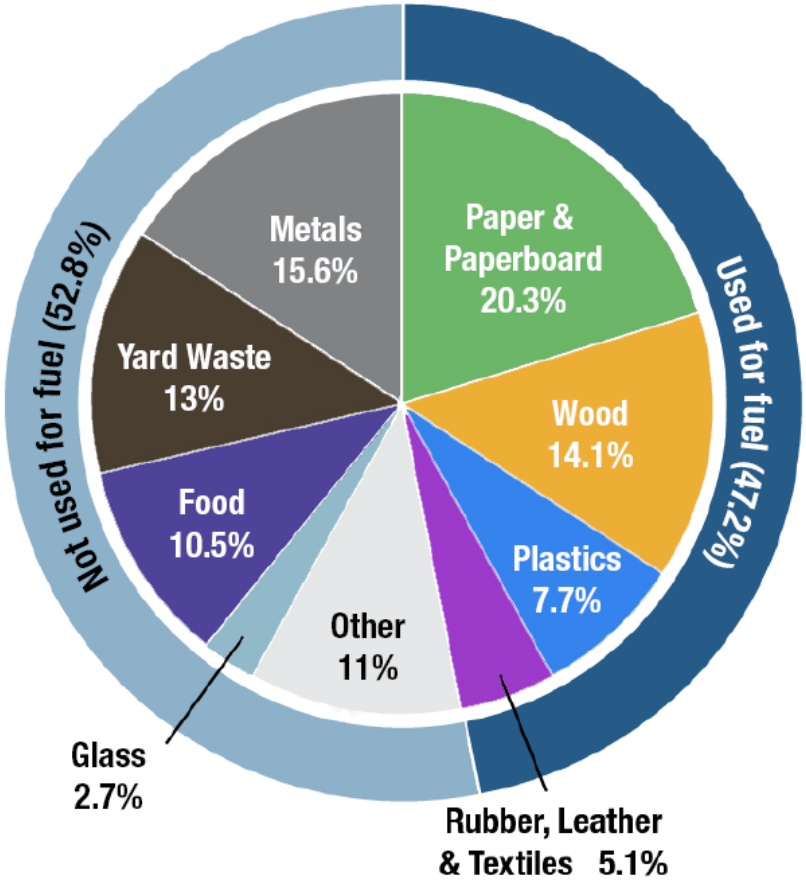
Fulcrum Sierra Biofuels
Reno, NV
MSW-to-Synthetic Crude
Closed in May 2024

Enerkem Alberta Biofuels
Edmonton, AB
MSW-to-Alcohol only
Closed in January 2024

LanzaTech Freedom Pines
Soperton, GA
Alcohol-to-Jet only
No connection to MSW

MSW-TO-SAF | MSW COMPONENTS USED TO MAKE SAF

Less than half of typical MSW is SAF feedstock.



"GFT" refers to the *Gasification Fischer/Tropsch* conversion process

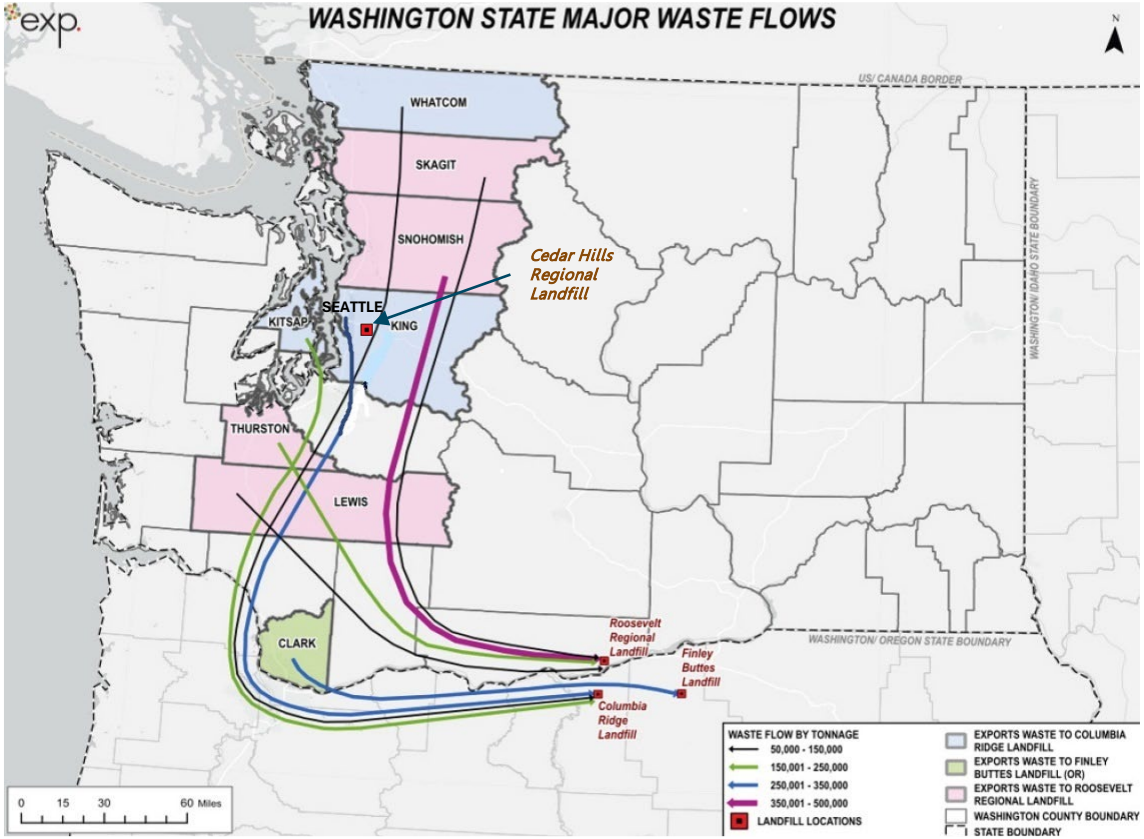
MSW-TO-SAF | SOURCES OF MSW

King County Cedar Hills Landfill:
- Projected to close in 2040
- 0.8 million tons MSW per year

Columbia Ridge Landfill:
- Projected lifetime to 2145
- 3 million tons MSW per year

Roosevelt Landfill:
- Projected lifetime to 2060
- 2.3 million tons MSW per year

Finley Buttes Landfill:
- Projected lifetime to 2300
- 450,000 tons MSW per year



***The blue arrow to Finley Buttes represents City of Seattle MSW.**

Factors:

- Proximity to MSW & Transportation Linkages
- Industrial Areas
- Regulatory Requirements
- Community Acceptance
- Site Utilities

Regions:

- Columbia River area sites with proximity to large landfills
- Industrial/brownfield areas in western Washington along Interstate 5
- Northwest Washington areas near refineries

The Port and King County concur with these findings but do not have a recommended specific site at this time, as more study would need to be done by a project developer to understand each of the factors further and at a detailed level to attract investors.

MSW-TO-SAF| FUEL PRICING

- Four scenarios explored how facility size and technology impact fuel costs.
- Using only the waste currently going to Cedar Hills Landfill results in fuel costs $2-3/gal higher than using large-scale waste (like Columbia Ridge).

800,000 tons MSW/year
= $10.11/gal

2M tons/year MSW
= $7.72/gal

- Fossil fuel-based jet fuel costs about $2.50/gal (mid-2024 pricing).
- Incentives and credits can lower SAF cost to approach Fossil jet cost.

MSW-TO-SAF | FINANCING AND RISK MITIGATION

Every project's financing is unique and challenging.

Financing Challenges:

- Significantly more risk compared to established industries
- Higher technology and permitting risks which concern investors

Risk Mitigation:

- **Government Policy**: SAF production, incentives and tax credits, act as credit guarantor, etc.
- **Strategic Partnerships**: waste haulers, landfills, landowners, airlines, etc. partners are beneficial to obtain project financing

MSW-TO-SAF| FINDINGS and SUMMARY

Technology Summary:

- No proven viable technologies are available. 2 promising facilities closed in 2024. Lots of interest in SAF, so watch for new projects coming online in 5-10 yrs.

Feedstock Summary:

- King County's waste alone is not enough to support an economically viable SAF facility.
- Requires aggregated waste at large landfills near Oregon border to lower price.

Siting Summary:

- The most strategic locations for a facility are adjacent to large southern landfills, at brownfield sites mid-state, and near refineries to the north.

Financing/Risk Mitigation Summary:

- Every project is unique and very challenging. No standard financing model.
- County/Port can look at policy and partnership models to reduce financing risk.

MSW-TO-SAF | NEXT STEPS FOR KING COUNTY

- No further MSW-to-SAF projects at this time for King County SWD.
- Share report findings:
  - At industry groups, conferences, etc.
  - On websites – King County's and the Port of Seattle's
- Continued research, monitoring, and appropriate support of the SAF industry:
  - Research & development centers
  - Private industry activities
- Update SWD's Comprehensive Solid Waste Management Plan:
  - MSW-to-fuel is one of five options being evaluated

MSW-TO-SAF| NEXT STEPS FOR PORT OF SEATTLE

- Federal & state policy advocacy for production (and use) of SAF in WA state.
- Re-examine SAF blending and integration into airport.
- Continue to develop relationships with RNG-to-SAF (SkyNRG) and e-fuel SAF (Twelve) producers.
- Continue to examine options for pilot projects to bring more SAF to SEA in near-term.

Thank you.