EVERGREEN TECHNOLOGY
Simpler, Cleaner, Revolutionary Waste Management
by VOsPS

Ottawa UTOC 500 tpd, 340MM Energy From Waste Project Outline

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Context

Values herein are preliminary pending identification of preferred scope and results of detailed designs / calculations of associated project quantities / CAPEX / expenses / carbon tax and-or credit benefits / revenues / cost offsets / tariff impacts.

This UTOC Project Outline responds to Ottawa's initiative at https://www.wastetodaymagazine.com/news/ottawa-canada-identifies-waste-to-energy-facility-as-suitable-option-to-handle-increasing-waste-volumes/

VOsPS Inc., incorporated in and operating out of Manitoba, is the developer, owner and sole international supplier of UTOC https://www.vosps.co/ **technology.**

Abstract

Based on a 12.5 year remaining "new deposits" average capacity of 225,000 tonnes / year (**tpy**) a **~$140 million, 500 tpd, 340MM** (4 of 85MM modules) UTOC Energy From Waste plant completed in 2029 will extend the Trail Waste Facility (**TWF**) life to 2053 for **less than ½ the low end of the $439 to $761 million "new landfill" budget range**. **A UTOC Energy From Waste (EFW) plant can be operational in 2029 if project is approved in 2027**.

Remaining TWF 2024-2035 capacity at future deposits averaging 225,000 tpy is 12.5 x 225,000 = ~2,800,000 tonnes. City garbage production is estimated increasing from 201,000 tpy in 2024 to 267,600 tpy in 2053 or (267,600 - 201,000) / (2053 - 2024) = 2,297 tpy (average).

When the UTOC plant goes into operation in 2029, city production will be 201,000 + (2029 – 2024) x 2,297 = ~212,485 tpy. Landfill remaining capacity will have reduced from 2,800,000 to 2,800,000 – (5 x 201,000) – (5 x 2,297] = ~1,783,500 tonnes at 1,783,500 / (2053 – 2029) = ~74,300 tpy.

The 2029 expandable UTOC plant will be sized for 5th year capacity (end of 2034). Daily city production in 2034 (estimated) 201,000 + [(2034-2024) x 2,297) = ~224,000 tonnes / year LESS 74,300 tpy deposited into landfill = 149,700 tpy; ~**410 tonnes / day** (**tpd**). **UTOC Energy From Waste system is sized for 455 tpd** MSW **plus ~45 tpd** of landfill methane (50% of ~4,450,000 ft^3 / day) and pass through of ~125 tpd of CO_2 (50% of total). The ~11% residual UTOC system capacity accommodates scheduled and unexpected maintenance without reducing annual plant output targets.

Electricity output from steam turbine generators in the 340MM UTOC EFW plant will be ~24MW / hour; ~7 (30%) from landfill CH_4 plus ~17 (70%) from MSW. Approximately 43MW of residual heat from turbine steam condenser will be available for plant / site / district / etc. heating.

Energy from the plant UTOC system is an ~87,000 lb / hour ~1,340°C UTOC gas stream consisting of ~20.6% water vapour, ~27.0% CO_2 (~45% of which is in the landfill gas input), ~51.6% N_2, ~0.8% O_2, ~25 mg/m^3 NO_x (as NO_2), zero organic particulate, zero CO, zero CH_4.

UTOC System Inputs

- **455 tpd** of Municipal Solid Waste from Ottawa
- **45 tpd of methane,** 50% of the ~4,450,000 ft^3 CH_4 / CO_2 gas mixture from the TWF landfill collection system
- **~160,000 USgal / day** of UTOC temperature control waste water (**leachate** / raw sewage / etc.)
- **~29,000 USgal / day** of turbine steam condenser cooling tower makeup water
- **plant odour control**: ~50,000 cfm exhaust from the feedstock receiving / preparation / handling area is UTOC combustion air

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Plant Outputs

- **~24 MW_e / hour electric power;** steam turbine generated
- **~43 MW_t / hour residual useful heat** from turbine steam condensing system for the plant / site / district / etc. heating
- **~29 tonne dry ash / day** (an agricultural land nutrient or asphalt / concrete aggregate, depending on post processing to remove metals ***and laboratory analyses***)

Site and Building

- ~5 acres
- 236' long, 356' wide (84,016 ft^2, ~2 acres), 30' to 45' clear, column supported height; minimal insulation
- 236' x 134' (31,264 ft^2) under floor heated feedstock receiving / shredding / surge hopper filling / UTOC shredded feedstock injection equipment area with one drive thru lane plus adjacent, parallel merge lane and ~50,000 cfm exhaust used as combustion air for the 4 UTOC modules provides ~2.5 air changes / hour
- 236' x 222' (52,392 ft^2) UTOC Energy From Waste system equipment heated area containing sewage sludge and hazardous material tanks / steam turbine electric power generation / hydronic heat distribution / ash handling / electric telehandler charging / staff facilities / maintenance shop / spare parts room / site equipment garage / and like spaces-rooms with drive thru lane

Feedstock Receiving / Preparation / Handling

- Garbage / sludge / hazardous solid waste delivery trucks (conventional compaction and rear dump trailer configurations) back diagonally into 1 of 3 bunker areas and discharge their loads
- 2 electric telehandlers (e.g. JCB 525-60E at https://www.jcb.com/en-gb/products/telescopic-handlers/525-60e-hi-viz) manage bunker garbage inventories and load 4 feedstock shredders, each of which supplies a UTOC module via inclined screw conveyor that discharges into a surge hopper with top horizontal distribution auger and live bottom discharge
- telehandler operators are vigilant for items that are inappropriate for processing or contain heavier metal fractions (than strollers / hand carts / etc.) that will be transferred to a disassembly location for removal thereof before loading remaining materials into shredders

UTOC Combustion Air and Supply

- a 14,000 cfm Feedstock Receiving Area variable speed exhaust fan maintains +1.0" water column in the combustion air plenum for each of four, 85MM UTOC modules

Feedstock Area Heating & Ventilating

- heating to 55F ~10 million Btuh **|** ventilation ~50,000 cfm ~6 million Btuh

Energy Systems Area Heating & Ventilating

- heating to 70F ~18 million Btuh supplied by radiant heat from UTOC systems and combustion gasses ductwork
- ample gravity ventilation by 230' of continuous, damper controlled, roof ridge vent openings and matching low level sidewall openings to release excess heat from UTOC modules and high level combustion gas ductwork
- individual heating / cooling / ventilation controlled office / occupied spaces

Energy Systems

- 4 of UTOC organic waste-to-1,340C gas stream modules
- 8 of Heat Recovery Steam Generators
- 24MW / hour steam turbine driven electric generator set
- 95C (50% glycol) building / ventilation / paved surfaces snow melt / hydronic heating system
- excess UTOC Energy From Waste plant heat rejection cooling tower

Energy systems provide electric power and heating (reducing cooling tower load) for UTOC Energy From Waste plant, site / district heating, and / or Multiple Effect Distillation water purification

Financials (CA$)

The preliminary Class 4 (https://www.processengineer.com/insights/capital-cost-estimate-classes) project CAPEX estimate (excluding taxes and tariffs) is **CA$140,000,000.** Costs of project site property, electric utility connection, site / district heating, and / or Multiple Effect Distillation water purification system are not included.

Annual Project Revenues and Cost Offsets Estimate

1.	eliminates leachate treatment project financed over 30 years at 5%	$ 2,561,700
2.	MSW / sludge / dead animal disposal (420 tpd at **$150/**tonne); 153,300 tonne/year]	$ 22,995,000
3.	24 Mw_e / hour (210,240,000 kW_e / year) at $0.08 / kWh	$ 16,819,200
4.	40% of steam condensing heat value (150,000,000 kW_e / year) at $0.0922 / kWh	$ 14,000,000
5.	landfill CO_2e credits @ $160/tonne*; **estimating ¼** of 28% of MSW qualifies	$ 13,392,000
6.	VO_sPS inc. annual UTOC system O&M support fee	$ 238,000
7.	annual payroll for 20 plant O&M personnel mostly labour entry & eqpt operators)	$ 1,300,000
8.	annual plant maintenance	$ 3,500,000
	Net annual revenues/cost offsets	$ 64,729,900
		$5,394,158/ month

* $160/tonne 30 year average of rise to $170/tonne by 2030, constant thereafter (https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/carbon-pollution-pricing-federal-benchmark-information.html). Using only ¼ of biomass portion of emissions in consideration of product life cycle fossil fuel inputs to the biomass materials fraction and "landfill emissions benchmarking". CALCULATION: Total CO_2equivalent emissions from anaerobic decay of dry biomass (e.g. in landfills) is 9.60 Tonne CO_2equivalent Gas/Tonne of Dry Biomass compared with 1.8 TG/TDB when biomass is burned (aerobic decomposition); a saving of 7.8 TG/TDB. Approximately 28% of 32% water content Municipal Solid Waste is biomass materials. THUS: ¼ x 0.28 x 420 tpd x 365 days / year x 7.8 TG/TDB x $160/tonne CO_2equivalent = $13,392,288 estimated carbon benefit qualifications.

** **Subject to carbon credits/tax consultant audit.**

Project ROI Estimates

CAPEX estimate $140,000,000 financed over 30 years at 5% = $268,980,102

At net annual revenues / cost offsets of $64,729,900; **Project Payback = 4.2 years**

Project mortgage payments over 30 years: ~$747,167 / month

NET 30 year ROI estimate ~$4,646,991 / month; ~$1.6 billion

Conclusion

This transformative UTOC** (thermal equivalent of first aircraft to break the sound barrier) **option checks all the Ottawa Trail Waste Facility initiative boxes <u>and more</u> for less than 1/3 the current lowest cost ($439 million) new landfill option.

As for all "next generation" technologies, a pilot (~10% of total project cost) is a low risk approach to familiarizing stakeholders with unprecedented new UTOC features, personalities, and operation.

We at VOsPS would welcome the opportunity to provide a quotation (within 5 work days) for the supply of a 10 tonne / day UTOC pilot system for the Ottawa TWF UTOC project. The pilot would include:

- feedstock shredder
- all material handling components from shredder thru injection into UTOC inlet
- induced draft fan and ductwork, including stack.
- heated Quonset enclosure for feedstock equipment and systems
- feedstock and ash handling equipment
- hydronic boiler
- packaged Organic Rankin Cycle electric power generation (~80kW/hour) / excess UTOC heat rejection equipment
- landfill gas and leachate UTOC temperature control injection control mechanisms
- automated ash extraction assembly.
- UTOC automation system design / assembly / software development / supply / installation / commissioning / operator training / operations support

The UTOC pilot system would be supplied within 6 months of authorization. Expedited pilot project approval could have associated orders / contracts let by November 2025 with system operational as early as June 2026, allowing 6-12 months operation by Ottawa personnel as required for confidence to proceed with the project outlined herein before the end of 2027.

The 500 tpd UTOC project as outlined herein can be completed and operational within 24 months of authorization, before the end of 2029 if authorized in 2027.

The pilot can be retained as a specialty feedstock processing system (medical waste, hazardous fluids, etc.) or sold to a small community / industrial user after the project herein is operating; as could the existing ~6MW landfill gas fuelled engine generating system.