
THE CLIMATE CHANGE ADVISORY COMMITTEE WILL HOLD THIS MEETING
USING A VIRTUAL, ZOOM WEBINAR, PER GOVERNOR INSLEE'S
"STAY HOME, STAY HEALTHY" ORDERS

MEMBERS OF THE PUBLIC WILL BE ABLE TO CALL IN TO THE ZOOM MEETING.

PLEASE CLICK THE LINK BELOW TO JOIN THE WEBINAR:

[HTTPS://BAINBRIDGEWA.ZOOM.US/J/99375936465](https://bainbridgewa.zoom.us/j/99375936465)

OR TELEPHONE: 1-253-215-8782

WEBINAR ID: 993 7593 6465

AGENDA

- 5:30 CALL MEETING TO ORDER/ROLL CALL/ACCEPT OF MODIFY
AGENDA/CONFLICT OF INTEREST DISCLOSURE
- 5:35 APPROVE FEBRUARY 17TH MINUTES
- 5:40 PUBLIC COMMENT
- 5:50 UPDATES ON SUSTAINABLE TRANSPORTATION AND GREEN BUILDING
TASK FORCES AND SMP
- 6:05 IMPACT BIOENERGY – PRESENTATION AND DISCUSSION
- 6:30 CLIMATE ACTION PLAN UPDATES
 - CLIMATE OFFICER
 - GHG EMISSIONS INVENTORY
 - CLIMATE LENS PILOT SITE
 - COBI FLEET TRANSITION
 - GREEN ENERGY AND BUILDING FUND
 - WEB PRESENCE AND OUTREACH
 - CLIMATE EQUITY
 - PSE FRANCHISE
 - MEETING WITH PARKS
- 7:30 ADJOURN

MATERIALS

1. FEBRUARY MINUTES
2. CONCEPTUAL DESIGN OF A BI BIOENERGY PROJECT
3. INVITATION LETTER

Climate Change Advisory Committee
Minutes
Wednesday February 17, 2021

Present: Committee members Michael Cox, David McCaughey, Deborah Rudnick, Gary Lagerloef, Jens Boemer, Lara Hansen, Derik Broekhoff

Council Liaison: Joe Deets

City staff: Ron Logghe, Peter Best (for green building leg discussion)

Public: Andy Swayne, Kierra Phyfer. PSE

Call meeting to Order

5:34 pm

Jens will abstain to anything related to the PSE Franchise agreement discussion

Approve December 18th minutes

David moved to approve, Lara seconded, all agreed

Public Comment - none

CAC/UAC Subgroup Report on PSE Franchise Agreement

UAC has approved, Deb and Lara have worked with Mike on modifications. Scheduled to meet with council on the 24th of Feb to present recommendations and ask for next steps. Last night council talked about the franchise agreement process: 1-page public works memo provides brief timeline and overview. Director Wierzbicki mentioned using partnership agreements for items such as clean energy – Joe, Rasham and Kirsten will be a Council subgroup for the negotiations, and there will be outside legal consultant hired for the process. No more modifications suggested to the memo. Mike moves and Gary seconded the motion to approve the memo from UAC and CCAC on the franchise agreement; all approved except Jens abstained. Memo will move forward.

Climate Action Plan

-Council has approved our work plan, and Lara reports enthusiasm for the plan as presented. Mike will recirculate the work plan document.

City Utility Fees

Memo in attachments and discussion of whether utility tax could be used for a green building fund. Discussion with finance director suggested this 6% COBI tax is already utilized for several priorities and would probably not be available for something like the GBF. Group discussed how the equity component might be integrated, with David suggesting that the tax would be consistent, but the return could incentivize returns for lower income customers. Lara asks whether we could renegotiate our rates because our rates are higher than what many other ratepayers pay. Mike will reach out to UTC and PSE to inform our discussion next time.

Climate Legislation

Mike gave a quick summary of last week's Climate and Energy forum and the bills discussed. Peter joined us to discuss how state legislation might assist with GBTF recommendations by addressing the state energy code pre-emption which states that the state energy code is both the minimum and the

maximum for energy regulations in residential construction. HB1084 would specifically authorize local governments to exceed the state energy code, and the option of a stretch code or their own requirements that could exceed the state energy code. Bill also includes a heat pump and electrification program. Peter asked for CCAC feedback on what the City role might be in supporting passage of this legislation and implementing the program, and Mike sent out a survey for Peter to ask about this. CCAC feedback from Deb, David and Jens is in perceiving high value of this bill and wanting to support it. Lara and Mike expressed their concern that work should move forward given that every building built represents a carbon commitment. Peter will write up a summary and run it by Mike and will be working with the GBTF moving forward on the mechanics of developing the recommendations.

Community Outreach

Deb, Mike, Lara and Julie met with Kristen Drew to develop some outreach pieces using COBI connects and CM report, following the subjects they are already focusing on and intersecting with CAP priorities. In March we are focusing on the waste component with a couple of articles; then moving on to other CAP areas. Mike Cox is going to pursue some leads with UW climate communications to possibly get involved with CAP outreach. Also working on the idea of a logo to motivate enthusiasm for the CAP.

Race Equity Advisory Committee meeting with CCAC

Lara and Mike reached out to an expert in Portland, Bill Beamer– meeting on March 4, 6pm to discuss race equity and climate with both groups. Mike will send out invite.

Bioenergy and green waste

Michael Smith from Impact Bioenergy- presented to Council in 2017. Potentially an opportunity or resource to explore. There is a larger version of our pilot on Vashon. Mike wants to ask them to attend our meeting in March.

Grant Opportunities

Nick Shiach discussed grant opportunities that he researched on climate change and sustainable transportation grant opportunities. Ron has shared with Ellen and this will clearly go to the climate person once they are hired. Mike will send out the spreadsheet.

Good of the Order

-Mike shared that Nash at BHS has gotten approval from principal to do a speaker series on climate change for students. He may be coming to us for a speaking engagement ☺

-Gary shared a proposed remediation project on Wyckoff regarding a large concrete project. Michael Cox will try to find some answers on this from EPA and circle back with group.

-Jens updated us that on DOE connected communities- they did not submit a concept paper by the deadline and will not be submitting a proposal. On looking into scope and grant requirements for Bainbridge Island, didn't find sufficient clarity in how the funding would make a big difference over and above PSE's current plans. Jens believes there will be other opportunities like the state CEF that can be explored.

-David updated that a group has submitted a concept paper that includes Bainbridge as part of the PSE service area and can add some additionality to what PSE is already planning.

-March 11: Interfaith climate change event. CAP and bigfoot carbon tracker, clergy will talk about climate and faith in their communities. Mike will share details when ready.

Adjourn

7:28 pm

Mike Cox, Co-Chair



PUGET
SOUND
ENERGY



CONCEPTUAL DESIGN OF A BAINBRIDGE ISLAND BIOENERGY PROJECT

TM Number 2:
INCLUDING ALL SOURCE SEPARATED ORGANIC WASTES



MARCH 17, 2021

*Distributed
Bioenergy
Solutions*

Summary

- Purpose
- Scope of this Study
- Summary Conclusions
- Discussion
 - Scale
 - Public/Private Partnering & Synergies
 - Benefit Summary
 - Capital Cost
 - Contracting, Implementation & Operations
 - Market Development of Soil Amendments

Purpose

- Explore the use of Anaerobic Digestion specifically sized for Bainbridge Island - to convert residential, commercial, and agricultural organic waste into locally-generated renewable energy and soil products with zero waste.
- This study is funded by and paid for by Puget Sound Energy. PSE is committed to promoting the expansion of renewable energy sources by funding studies like this; bringing together key stakeholders to facilitate discussion; and providing relevant expertise. PSE's intent is to help uncover viable project opportunities that developers and/or the community can move forward on Bainbridge Island to own and operate; with PSE as the interconnecting entity.

The Problem

- **Wasted Resource:** On Bainbridge Island – the food waste rate is 40% of all food produced (i.e. US avg)
- **Export to Landfills and Composting:** On Bainbridge Island approximately \$600,000 is spent moving 11,000 tons of waste over Agate Pass by truck annually. Traffic = approximately 2,750 truck trips annually on the main traffic corridor.
- **Grid Energy:** Growing infrastructure demand and inefficiencies require more innovation to keep the island competitive and sustainable
- **Soil & Water:** 23 different pesticides have been measured in Puget Sound from petrochemical run-off (farm and landscape chemicals)



This Project: Bioenergy + Biofertilizer Generation

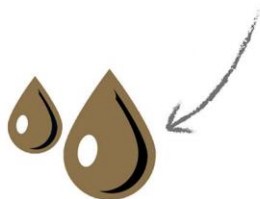
FOOD WASTE IN



LIQUID WASTE IN



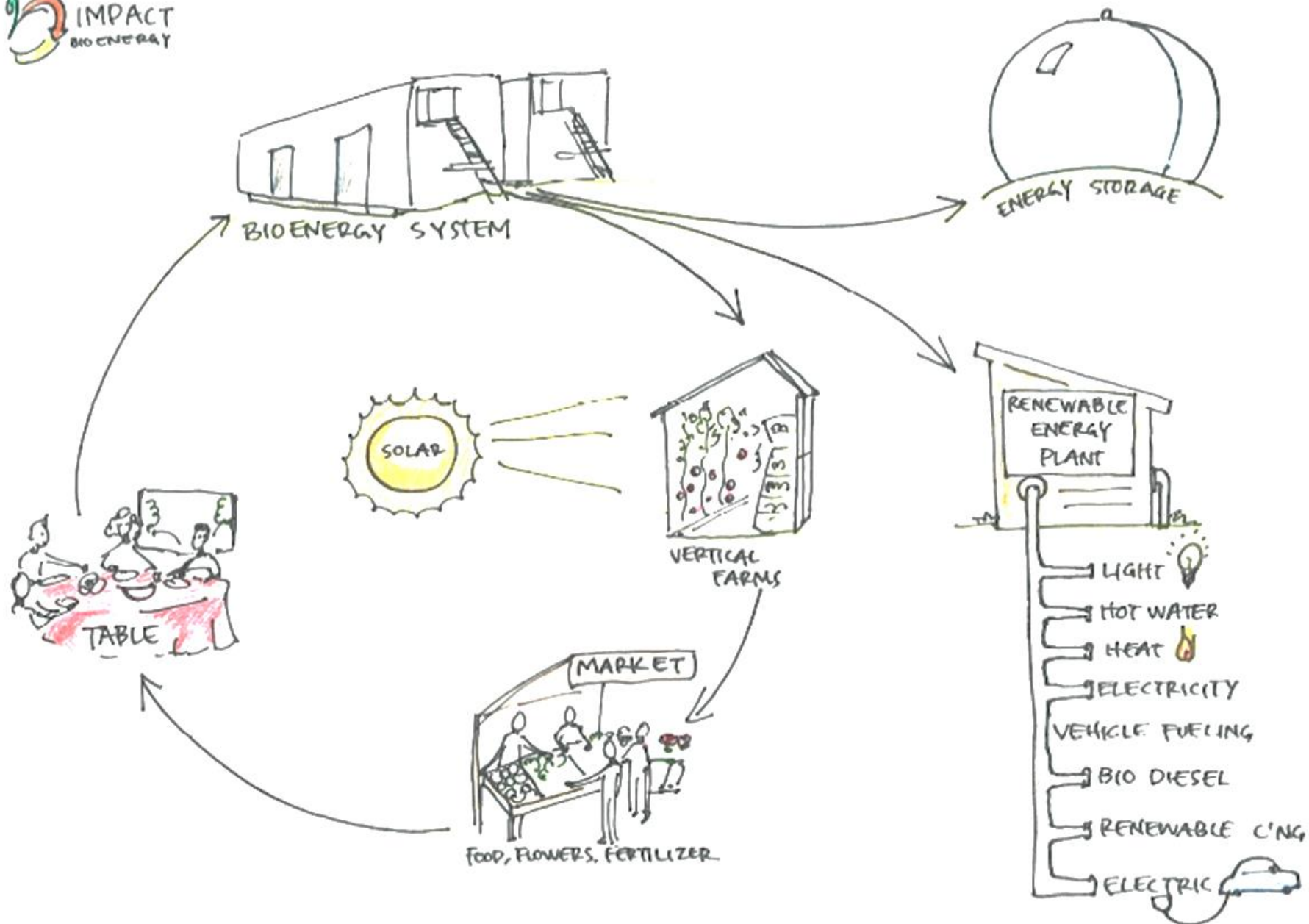
Onsite Bioenergy

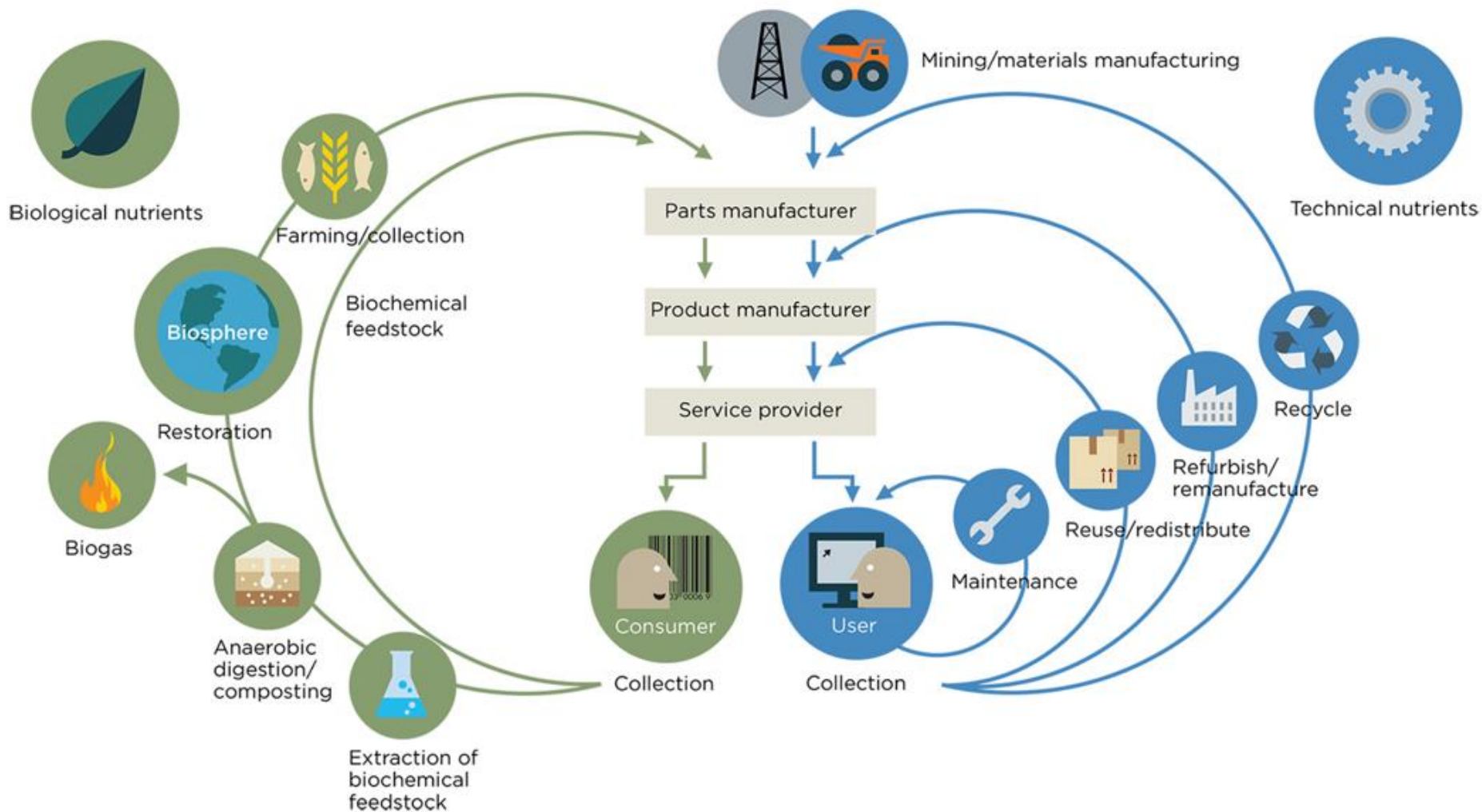


FERTILIZER OUT



ENERGY OUT





Scope of this Technical Memo

- This Technical Memorandum evaluates the potential of commingling the three organic feedstocks into a single recycling process. The service would include an anaerobic digester on Bainbridge Island to accept:
 - Commingled food, paper products, compostable foodservice products (including compostable tableware), landscape waste and animal bedding
 - Commercial, residential, and agricultural organic wastes in a commingled state (not just commercial as described in TM No. 1)
- This service could be configured as an Island-only option, or an island-plus Poulsbo and Clearwater Casino option. It would also include the concept of a finishing facility for the digester output, which uses drying, composting, screening, bagging, and soil blending. The concept design herein includes a summary of feedstock potentials, corresponding energy production possibilities, and other outputs with costs and/or revenue streams.

Summary Conclusions

- Recycling Potential 7,200 – 11,000 TPY
 - 1,800 – 2,750 truck trips per year off island
- Energy Potential 0.23 – 3.5 MW
 - 160 – 1,100 homes per year on island
- Fertilizer Potential
 - 8,400 – 11,300 CY per year
 - 8 tons per year dry product
 - 18,000 gallons per year liquid product
- Capital Bandwidth \$3.9 -10.9 MM



Scale

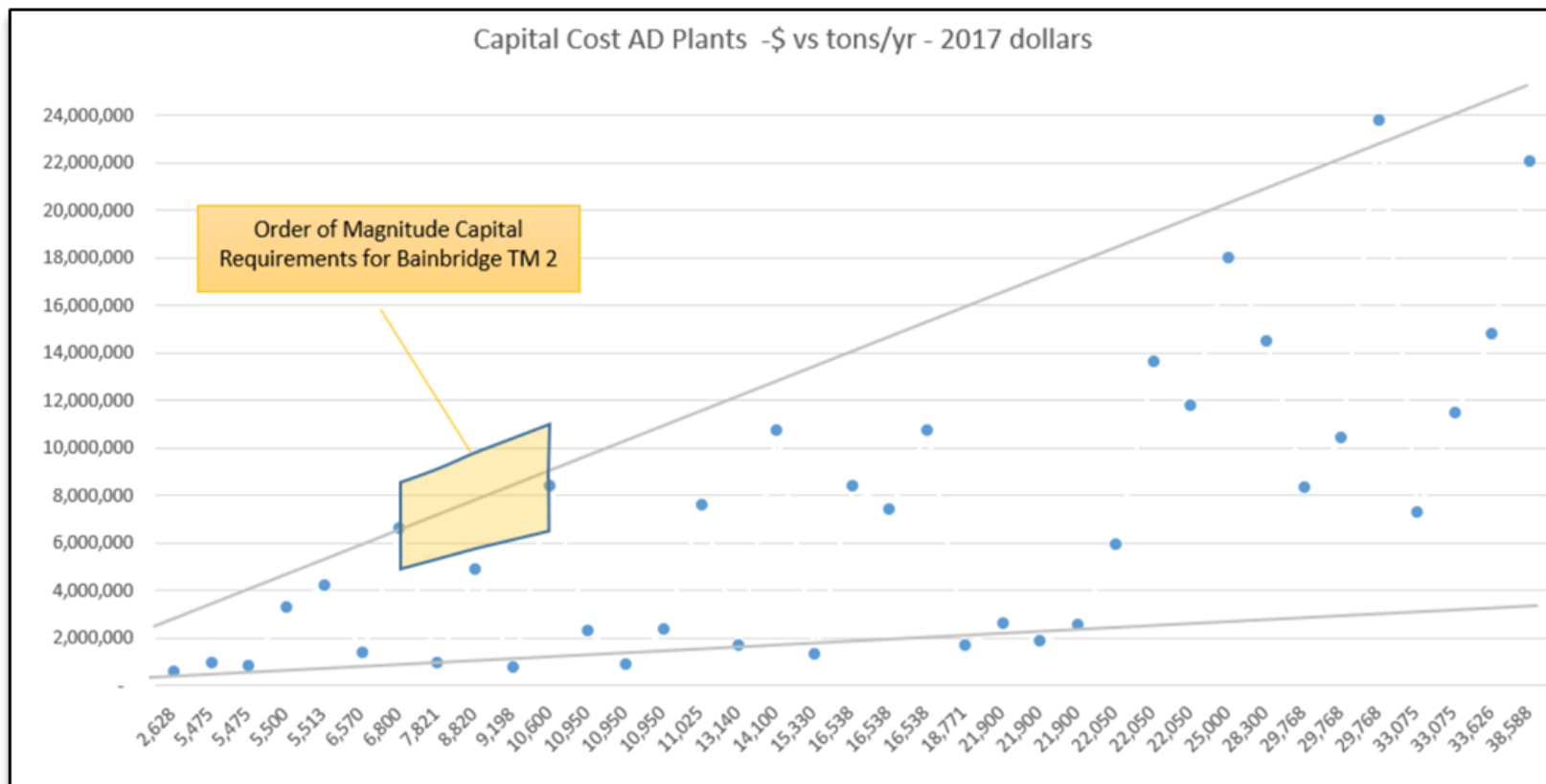
- The concept was first applied to a smaller Bainbridge Island facility without off-island organic materials or municipal biosolids. This is the minimum effective planning size (7,200 tons per year of Tier 2 feedstock).
- Then the Poulsbo area and a portion of the municipal biosolids were added for the maximum effective planning size (11,000 tons per year Tier 2 feedstock). This approach provides a bandwidth of potential capacity in the year 2035 that has been used for capital cost opinion and land requirements.
- This approach assumes Tier 1 feedstock (4,200 tons per year) is being processed by others.

Elements to Achieve a Successful Project

The key elements for success in this type of project are shown below.

- Adequate financial capital to build and operate the facility
- A suitable real property site that is compatible with traffic, utilities, and land use
- A collection system that addresses economics, source separation education, and contaminant control
- A practical plan for the beneficial use of the renewable energy
- A practical plan for the beneficial use of the organic matter, water, nutrients and probiotics in the digestate or compost or soil products
- A strong partnership with local farmers and the land and landscape

Capital Cost



Capital Cost

Using the upper and lower boundaries in the following chart; our cost opinion reveals a wide variability in capital estimates. As the design process progresses the upper and lower boundaries can be brought closer together with greater confidence. The table and graph below show the lower and upper estimated cost.

Order of Magnitude Capital Cost Opinion

	calculated	min	max
small	\$ 6,597,368	\$ 5,100,000	\$ 8,600,000
large	\$ 8,411,457	\$ 6,500,000	\$ 10,900,000

Significance of Product Marketing

- It should be noted that this conceptual design is presented as a zero waste plan with only the disposal of incidental contaminants. All the outputs from the facility are monetized.
- This is expected to be possible for Bainbridge Island and vicinity. The interest in community supported agriculture and sustainable practices is high. The income and avoided costs show a value stream for recycling services, renewable energy, carbon credits, and plant food/soil amendment sales.
- These together represent a significant value stream to offset capital and operating costs.

Significance of Product Marketing

- We have conducted a market survey of plant food/soil amendments marketed at the retail level.
 - Liquid products are often concentrated and represent a dehydrated version of what might be discharged directly from the digester. The pricing ranges from \$18 to \$140 per gallon.
 - Likewise the retail pricing for comparable dry fertilizer product is \$2 to \$7 per lb., and the retail pricing of compost is \$30 to \$40 per cubic yard.
- This illustrates the potential for value-added marketing and branding of a new liquid product into this market.
 - This concept design illuminates a noteworthy water conservation dynamic for Bainbridge Island. These organic products may be valuable in the overall sustainability and irrigation demand dynamics during the dry summer months on Bainbridge Island. It can reduce demand on potable and groundwater sources. More discussion on this can be found in the Market Development of Soil Amendments below.

Summary of Project Benefits

- Production of continuous, onsite, renewable energy. The energy can be stored at night and used during the day if necessary. It does not depend upon sunlight or wind for production.
- Elimination of foodwaste dumpsters with the associated odor, birds, flies, rodents, insects, and leakage that foodwaste can produce.
- Elimination of the hauling, fuel use, and traffic impacts associated with trucking waste from the city to a distant processing facility. This reduces urban traffic congestion as well as truck exhaust emissions.
- Conversion of the organic materials into valuable plant food, compost, and fertilizer. This can be returned to the soil to improve the sustainability of local gardening.

Summary of Project Benefits

- New employment of people in the conversion of waste to bioenergy, commercial products, and the local food supply chain industry, sometimes referred to as a circular economy.
- Collaboration with local educational curriculums such as culinary arts, horticulture, sustainable agriculture, viticulture and wine technology, engineering, environmental science, business, biology, and education.
- Achieving significant diversion of waste from disposal, moving the city closer to zero-waste goals.
- Improving the local soil-water-air ecosystem by returning carbon to the soil and displacing the need for chemical fertilizers, pesticides, and herbicides.
- Improving the opportunities for farm-to-table food production and healthy food networks which will improve the well-being of its communities.

Thank You

Scale

population	24000	10000	34000	43000
AD ONLY + PRIVATE COMPOSTING Selected for TM 2 Design	Bainbridge tons/yr	Poulsbo tons/yr	Total tons/yr	2035 tons/yr
commercial food waste	1,500	500	2,000	2,500
commercial paper waste	450	250	700	900
commercial landscape waste	200	50	250	300
residential food waste	1,000	-	1,000	1,300
residential paper waste	200	-	200	300
residential landscape waste	1,100	-	1,100	1,400
manure and bedding	500	-	500	500
biosolids	3,800	-	3,800	3,800
Subtotal Bainbridge Island only	4,950		5,750	7,200
Subtotal with Poulsbo & Biosolids	8,750	800	9,550	11,000
tons by sector	Bainbridge tons/yr	Poulsbo tons/yr	Total tons/yr	2035 tons/yr
commercial	2,150	800	2,950	3,700
residential	2,300	-	2,300	3,000
manure	500	-	500	500
biosolids	3,800	-	3,800	3,800
Subtotal	8,750	800	9,550	11,000
Min size, tons/yr	7,200			7,200
Max size, tons/yr	11,000			11,000

Energy Potential

CHP sizing	Small Concept	Large Concept
tons/yr	6,810	10,610
BTU/hr gross	2,516,976	3,921,456
gross kW	737	1,148
electric efficiency assumed	38.5%	38.5%
kW output typical, 24-7 basis	284	442
heat output typical btu/hr	1,065,939	1,660,737
heat output typical therm/day	256	399
thermal efficiency	42%	42%
no of CHP units	2	2
peak output kW all units	600	900

Daily High Efficiency Generation Rate	6,800	10,600	kWh per day
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Examples of Generator Sizing in KW

Generation Alternatives		Smaller	Larger	
Electric only	low efficiency	230	360	24/7 baseload
CHP (heat not shown) base case	high efficiency	280	440	24/7 baseload
CHP (heat not shown)	high efficiency	840	1,300	8 hr/day peak
CHP (heat not shown)	high efficiency	2,200	3,500	3 hr/day peak

Organic Product Potential

- The conversion of the soil amendments into commercially valuable products is equally important to the renewable energy generation. The table below shows the expected annual finished product value stream for both the small and large concepts.

Finished Product	Small Concept	Large Concept	
Compost	8,400	11,300	CY/yr
Dried Fertilizer 80%	8	8	tons/yr
Liquid Plant Food 20%	18,000	18,000	gal/yr

Value Engineering

A value engineering exercise was performed to evaluate opportunities to manage costs down if necessary. The capital cost could be lowered using any or all of these changes in the overall basis of design.

- Separating the composting/finishing process from the bioenergy process, with composting of Tier 2 feedstock discharged by the anaerobic digestion system to be performed by an existing third party contractor at a different location.
- Phasing the scale of development into two distinct phases between now and 2035. This would de-risk the capital investment to some degree by insuring full potential and appropriate scale is reached initially.
- Elimination or delay of the liquid CSTR digester. Presuming the liquids can be initially managed within the continuous HSAD digester.
- Reduction of the size of the gas storage elements in the bioenergy process. The current concept allows for a 24 hours of biogas production to be stored for energy generation. If this were reduced the cost of gas storage could be reduced proportionately.
- Innovative contracting methods with incentives for cost underruns and collective risk minimization may reduce the overall capital cost. Developing win-win contract terms can sometimes yield quicker and more cost-effective construction without reducing quality.

Value Engineering

- Applying the compounded potential of all five elements described above creates a Cumulative Potential in reducing Capital Cost. The overall potential is shown below – representing a focal point to strive for, for cost management. This may not be completely feasible given the specific evolution of the project but illustrates how to manage capital cost.
- The land requirements for both the small and large versions of this concept design range from 1.4 to 1.6 acres. Site diagrams were prepared to show the relative size of each element and what the facility might look like in plan view.
- Cumulative Potential Results of Value Engineering

Order of Magnitude Capital Cost Opinion

	calculated		min		max	
small	\$	3,958,421	\$	3,000,000	\$	5,100,000
large	\$	5,772,510	\$	4,400,000	\$	7,500,000



Announcement

Invitation for Expressions of Interest

Beta Test of a Breakthrough Campus-Community Scale Bioenergy System

Letters invited on or before March 31, 2021

Impact Bioenergy, a leader in small scale organic processing facilities and Thoeni North America, leader in high solids anaerobic digestion systems invite corporations, non-profits, colleges, universities, and government agencies to respond with their interest to this announcement.

We are offering a breakthrough distributed-scale bioenergy system (named the OX), that can digest commingled food, fats, paper products, cardboard, wood, compostable plastics, and landscape waste materials simultaneously.

The system uses solid-phase continuous flow anaerobic digestion together with feedstock preparation, organic product finishing, and odor control to enable a distributed approach to zero waste practices onsite or within a small campus or community. The modular system is scalable and pre-engineered in a size range from 20 to 180 tons per month. This is the first time such a technology for food waste fermentation and bioenergy generation has been scaled down to a community or campus scale. Until now, the minimum scale and capital cost to obtain this technology has been closer to 3,000 tons per month at a cost of no less than \$20,000,000.

Impact Bioenergy and Thoeni North America have delivered over 150 Bioenergy and Biogas projects globally. This is the embodiment of the best of both our organizations.

We have developed a Beta-Version Containerized/Packaged Plant that includes both AD and second-stage compost finishing. Sizing and footprint are flexible.

We will collaborate with you to optimize the sizing for available waste, ground space, and finishing specifications. Near zero geotechnical and site civil improvements are needed. Beta Test partners would be expected to provide financial commitments that are consistent with the benefits and cost of construction. A complete drawdown statement will be delivered during operation to fully express carbon negative benefits, as well as social, financial, ESG, and other environmental attributes. A sample site plan is shown below for reference.

For reference, our companion [NAUTILUS wet technology](#) with integrated indoor farm offers a drawdown benefit of negative 12,500 MTCO₂e/yr.

Summary: the OX is a living system that converts organic waste materials into renewable energy and high-carbon soil products with zero waste. Renewable energy is generated onsite and can be used for

www.impactbioenergy.com

<https://www.thoeni.com/en/energy-engineering>

heating, cooking, hot water generation, electricity generation, combined heat and power, or other energy-based processes. Finished organic products can be liquid extract, dried soil amendment, compost, manufactured soil products, or granular fertilizer products. CEA indoor farming and year-round food production can be incorporated into the design at the customer's option.

These systems have minimal moving parts, labor costs, or other operating costs. They are designed to be compatible with dense urban environments and can be adapted to a variety of architectural themes.

Interested parties are invited to submit their interest with their geographic location, available ground space, type of wastes that are available, and their vision of what success means to them for such a Beta Test.

This represents a locally available and affordable way for individual organizations and businesses to make a real and lasting drawdown of their carbon emissions and waste generation. It also creates the foundation for local circular economies around healthy food. Imagine a way to do this with new job creation that is local and meaningful. This is it.

Letters should be delivered to jan.a@impactbioenergy.com

Subject: Beta-Version OX.

Concept Site Plan - Complete OX Bioenergy Facility

