

**From:** [Sam Imperati](#)  
**To:** [Benton County Talks Trash](#)  
**Subject:** FW: Relative Path Forward - Benton County Talks Trash  
**Date:** Tuesday, October 4, 2022 8:07:51 PM  
**Attachments:** [image001.png](#)  
[Relative Path Forward Benton County Talks Trash Waste to Energy 10-2-2022.docx](#)

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**Subject:** Relative Path Forward - Benton County Talks Trash

My apology for the belated email for Waste to Energy for a possible common understanding for the Benton County Talks Trash workgroup.

If it is possible for me to assist further with sub-committee 1) Landfill Size/Capacity/ Longevity Subcommittee, I greatly appreciate the opportunity.

Thanks.

Chuck

Chuck Gilbert  
[REDACTED]

Chuck Gilbert  
Member of Benton County  
10/02/2022  
The Relative Path Forward  
Benton County Talks Trash Workgroup

*In the great dark void, God created the heavens and stars, and then She rested.*

*Zeus reached to the stars and received the gift of light.*

*Prometheus bequeathed a spark of light in the form of fire to mortals.*

*Thus, begins the resource of fire as a tenet of sustainability.*

*A lofty goal finally obtained for humanity.*

*But a price was ill paid with Pandora's box, yet hope remains, if only unchained.*

“Sustainability” means using, developing, and protecting resources in a manner that enables people to meet current needs and provides that future generations can also meet future needs, from the joint perspective of environmental, economic and community objectives.

A. The Relative Path Forward

The relative path forward requires first to briefly revisit the common resources of solid waste in the memo “Synchronization of Solid Waste Disposal Resources and Alternative Path Forward”, dated 9/30/2022 and submitted to the workgroup.

If the axioms of resources stay consistent with the assumed timelines of Cells 5D/5E with service life expectancy of 4 years ending in 2025, and the need to push Knife River quarry operations out by 8 years for Cell 6 with a disposal start date of Year 2029 is still necessary, then a relative path forward may be examined with the cause-effect relationship with the common resources first.

1. Within this framework, the major common resource of the landfill north of Coffin Butte would expel the minor common resource of Knife River quarry operations and assume disposal operations in Year 2026, after Cells 5D/5E close in Year 2025.

This would allow continuity of disposal in Cell 6 in start of Year 2026 for only 13 years.

This action however at first glance appears myopic, that lost instead valuable resources which are aggregates for the community at present and future with disposal capacity equally diminished by the early expulsion of Knife River.

In the long run, the solid waste disposal capacity to be reached is shorter than Year-2039 or 13-years life expectancy, rather than if equilibrium was maintained between the two resources for full life expectancy and thereby preserve the sustainability of the resources to their maximums.

2. The second resource is the landfill area south of Coffin Butte Road. This area appears limited in design and focus not currently reflecting any engineering conceptual plans for considering sustainability of solid waste disposal goals and tenets.

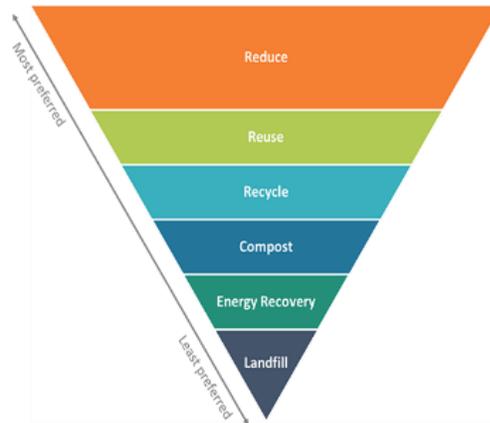
In other words, the enumeration of cells, statuses, and capacities eventually needs documented in a similar report as presented by Geo-Logic Associates, professional engineers of Bend, Oregon for the site development plan of Coffin Butte Landfill - North, updated December 2021 for Valley Landfills. The report is electronically filed with Benton County solid waste management library.

The above report sets the standard for the Coffin Butte Landfill – South with the needed attributes for considering a review and approval of any Landfill expansion plan which may require an issuance of a letter of acceptance, hopefully, by SWAC/DSAP to Benton County Planning Commission, Benton County Commissioners, and Oregon Department of Environmental Quality, if conditions warrant advancement.

The common resources referenced above are not superior nor was it the intent to diminish or exclude natural resources, aquatic-life resources, atmospheric resources, farmland resources, timber land resources, wildlife resources, or fresh-water resources for the review process, but instead first examine the cause-effect relationship between specific resources and their attributes to determine a common understanding of the processes of solid waste management collectively within sustainable goals and tenets which all resources would need to be considered with an expansion of the landfill and would need to be included in a plan set were conditions of resources prevail with equilibrium.

## B. Waste to Energy Conversion

The sustainability mantra is reduce, reuse, recycle, compost, recovery, and then landfill.



The U.S. Environmental Agency as well as State of Oregon agencies are providing a waste management plan which includes material handling goals for sustainability.

The need is to stretch goals beyond just recycling, in order to use material sustainability upstream to reduce raw material manufacturing into products as well as downstream at the landfills to reduce refuse going into landfills by using waste to energy technologies.

This creates alternative paths forward through energy recovery of waste stream resource into an economical, sustainable, and usable energy resource stream.

Historically, legacy equipment still captures methane gas at landfills to use the gas to generate electricity. Nonetheless, EPA reports that methane gas releases at landfills are still problematic.

A paradigm shift now exists with a thermochemical conversion process known as “pyrolysis” which is being used for waste to energy conversion with newer technologies.

The term ‘pyrolysis’ has Greek roots and can be roughly translated as “fire separating”. Generally, substances, i.e., refuse in landfills, which are subjected to pyrolysis undergo a chemical decomposition reaction and break down into multiple useful product compounds.

1. Pyrolysis can be divided into three categories with differing temperature ranges.
  - a. Low temperature (700 - 900 c) fire with abundant oxygen (air) present.
  - b. Low- medium (1000 -1600 c) temperature fire with controlled oxygen (air) present.
  - c. High temperature (3500 -5000 c) plasma with controlled oxygen(air) present.
2. Open Pit Burning

Open pit garbage burning is generally in the low temperature range with unrestrained emissions into the air.

Likewise, a campfire burning alder wood with campers surrounding the campfire in camp chairs roasting marshmallows, smoke follows beauty, is still open pit burning in the low temperature range.

Both examples still use pyrolysis to decompose the feedstock of garbage or alder wood rendering charcoal or ash as residue.

### 3. Incinerators

Incinerators is an apparatus with conveyors, burner, bag house filters, heat exchanger for steam generator for producing electricity, and emission chimney with scrubbers.

Incinerators burn solid waste with low to low-medium temperatures rendering bottom ash and fly ash as residue.

Covanta is an incinerator in Marion County, Oregon that processes solid waste for energy conversion of electricity to the electrical grid.

4. Agricultural Bio-char, charcoal, is generally produced by a burner apparatus with Low-to-Low Medium temperatures without oxygen present thereby not burning the feedstock material but with pyrolysis to decompose the feedstock to residue of charcoal. Although, there are other processes such microorganisms that are also used to manufacture Bio-char, these processes are not yet to commercial scale.
5. Plasma torches - plasma torches are a result of over 30 years of development. In the 1980's the technology was initially developed in collaboration with NASA to simulate space vehicle re-entry conditions of high temperatures. Plasma torch technology is used for a variety of applications, including the gasification of municipal and hazardous waste.
6. Gasification - Gasification is a process that converts biomass or fossil fuel-based carbonaceous materials into gases, including as the largest fractions: nitrogen (N<sub>2</sub>), carbon monoxide (CO), hydrogen (H<sub>2</sub>), and carbon dioxide (CO<sub>2</sub>).

This is achieved by reacting the feedstock material at high temperatures (typically >700 °C), without combustion, via controlling the amount of oxygen and/or steam present in the reaction.

The resulting gas mixture is called syngas (from synthesis gas) or producer gas and is itself a fuel due to the flammability of the H<sub>2</sub> and CO of which the gas is largely composed.

Power can be derived from the subsequent combustion of the resultant gas and is considered to be a source of renewable energy if the gasified compounds were obtained from biomass feedstock.

7. Transfer Station - means a fixed or mobile facility other than a collection vehicle where solid waste is deposited temporarily after being removed from the site of generation but before being transported to a final disposal location.

In the event of an interruption of common resources at Coffin Butte, a transfer of solid waste requires an alternate plan such as but not limited to a transfer of solid waste to another landfill or energy conversion facility.

### C. Plasma Gasification

Plasma (from Ancient Greek πλάσμα (plásma) 'moldable substance') is one of the four fundamental states of matter.

It contains a significant portion of charged particles – ions and/or electrons. The presence of these charged particles is what primarily sets plasma apart from the other fundamental states of matter.

It is the most abundant form of ordinary matter in the universe, being mostly associated with stars, including the Sun.

Plasma can be artificially generated by heating a neutral gas or subjecting it to a strong electromagnetic field.

A plasma gasifier is an oxygen-controlled vessel that is operated at the very high temperature (3,000 °C) easily achievable with plasma torches.

Because the environment inside the vessel is oxygen controlled, feedstock that is processed in the gasifier is not combusted.

Rather, the high temperature heat melts the feedstock down into gases, including as the largest fractions: nitrogen, carbon monoxide, hydrogen, and carbon dioxide.

The main gas that is created is called synthesis gas or “syngas”.

The primary products from plasma gasification are two: synthetic gas “syngas”, and slag/vitrified rock.

Both of these products have value, with syngas being the primary product with greater value.

Plasma gasification differs from non-plasma gasification in one key area – temperature. Non-plasma gasifiers typically operate between 800 and 900 °C.

The temperatures inside Plasma's gasifier reach over 3000 °C. The syngas exits the gasifier at 950 °C.

The slag flows out of the gasifier at 1650 °C.

The higher temperatures inside the plasma gasifier result in the complete destruction of tars, something that is not achievable with non-plasma technologies.

It is not feasible to remove tars downstream of the gasifier and therefore the utility of the syngas produced by non-plasma gasifiers is very limited.

Cross Section of Plasma Vessel



## Products and Yields

The plasma gasifier within a plasma gasification plant produces syngas which can subsequently be converted into numerous types of energy including electricity and liquids fuels.

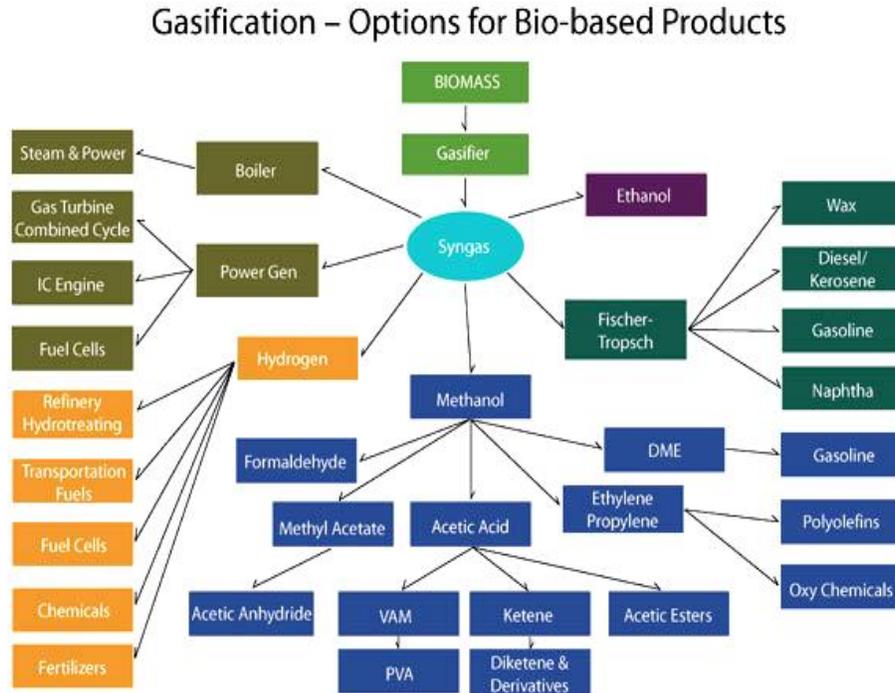
The amount of end product, such as electricity, depends on the type of feedstock used and the capacity of the plant. Higher energy feedstocks such as tires will produce more units of energy products than lower energy value feedstocks such as municipal solid waste.

As an example, a plasma gasification plant that processes a municipal solid waste that has undergone a rough sorting to remove inorganics like metal and glass could send to the electricity grid about 900-1000 kWh per ton of feedstock.

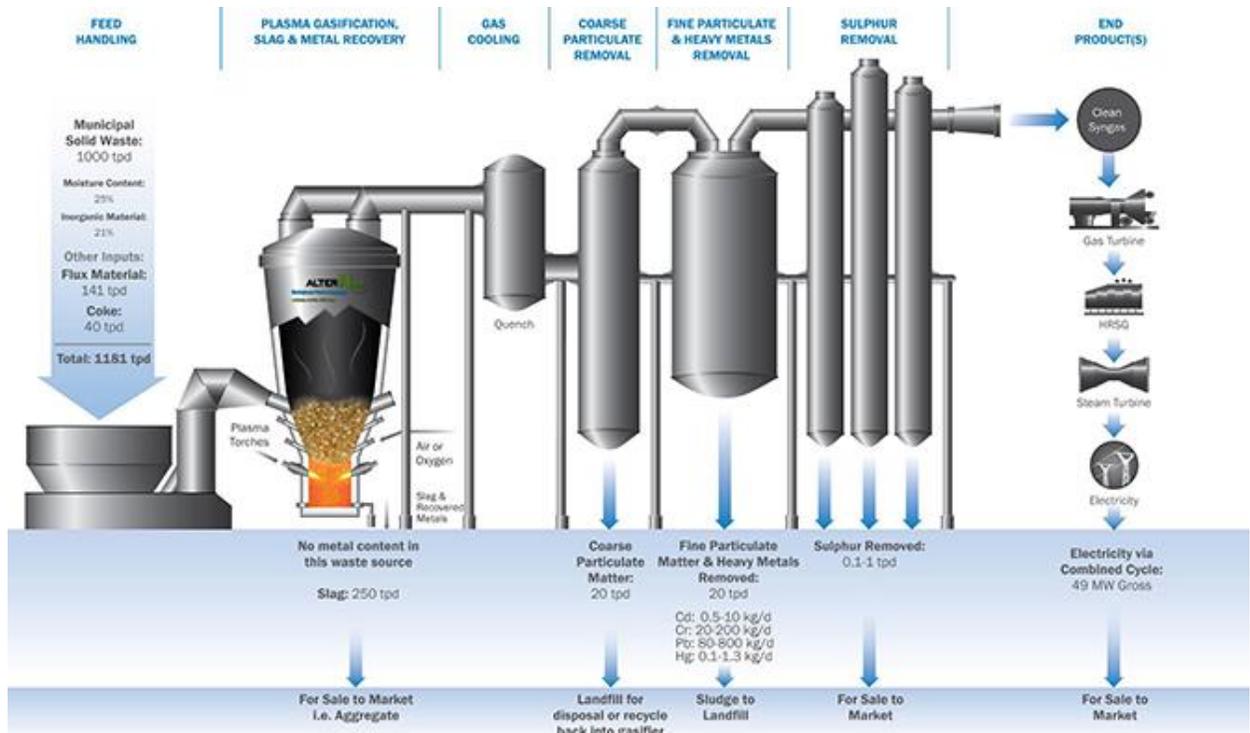
Inorganics, like metals, glass, and concrete, within the feedstock are melted and converted into a glassy aggregate. The amount of aggregate depends on the amount of inorganic material in the feedstock. A plasma gasification plant that processes municipal solid waste that has

undergone a rough sorting to remove inorganics like metal and glass, could produce about 200-250 kg (550lbs) of slag per ton of feedstock.

The diversification of products that can be produced with gasification of biomass are reflected in the following depiction.



A typical cross-section of a plasma gasification facility production per 1,000 tons per day of MSW being processed.



Case Study – The City of Lancaster, Ca. signed an agreement to host and co-own with SGH2 Energy to process solid waste scrap paper and scrap plastics using plasma gasification to produce hydrogen fuel.

Because of time restraints a more in-depth coverage of the Case Study can be made under another memo report topic.

#### D. Benton County Solid Waste Management - Relative Path Forward

The need is to stretch goals beyond just recycling, in order to use material sustainability upstream to reduce raw material manufacturing into products as well as downstream at the landfills to reduce refuse going into landfills by using waste to energy technologies.

- Disposal Sites and Solid Waste Facilities
- a. Coffin Butte Landfill - Corvallis OR 97330

- b. Columbia Ridge Landfill – Arlington, OR 97812
- c. Finley Buttes Regional Landfill – Boardman, OR
- d. Roosevelt Regional Landfill - Roosevelt , WA
- e. Georgia-Pacific Juno Technology Waste Recovery – Toledo, OR

Because of time restraints, another more in depth coverage of comparable landfill resources can be made in the event of possible solid waste transfer needed for interrupts of service at Coffin Butte.

