

Hydrothermal Processing (HTP)

Presentation to



James Oyler, President
Genifuel Corporation
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Background

**Process developed over 40 years by the US Dept. of Energy at Pacific Northwest National Laboratory;
Genifuel formed 2006 and works closely with PNNL**



Use With All Kinds of Wastes



Wastewater Solids



Drink and Food Processing



Animal Waste



Chemical Waste



Organic MSW

And many others, including co-processing

Clear Disposition of Outputs

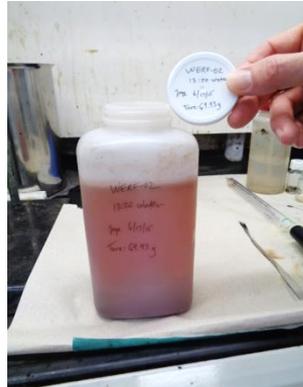
HTL Stage



Solids with
Phosphorus



HTL Oil



Effluent
Water

CHG Stage



Methane



Water

Highly Efficient Process



**>85% of feedstock carbon to oil and gas—
15% of produced fuel energy runs the process**

**Water is sterile, clear, and
conserved; contains plant nutrients**



Outputs Convert to Finished Fuels



Biocrude is upgraded and refined, or blended directly with diesel fuel



Renewable Natural Gas goes into gas pipeline—no sulfur or siloxanes

HTP Technical Status

- **Process clearly works and scales well**
 - Hundreds of tests on dozens of feedstocks
 - Extensively published in journals and DOE publications
- **Quality of raw and upgraded HTL oil fully documented**
- **CHG process works and provides the “cleanup” step**
 - CHG catalyst life needs further improvement
- **The remaining step to full commercialization is to show industrial reliability in 24/7 operation at operating sites**

Project 1: Processing Algae Since 2017



Project 2: Containerized System, 2019



Onsite tests with various wastes—e.g. dairy cow manure

Project 3: 2020 Startup



**Wastewater Processing
Vancouver, Canada
2 dry metric tons per day**

**Metro Vancouver;
Refining Partner
is Parkland Fuel**



Project 4: 2021 Startup



Central Contra Costa Sanitary District, Martinez, CA
3 dry metric tons per day

Regulatory Status Proceeding Well

Regulation	Status
CEQA	California Environmental Quality Act will use existing permit
Air Quality	Information provided and preliminary meeting scheduled
Water Quality	Testing shows no adverse environmental effects but UV issues
Site	Soil samples taken; no current issues
Blowdown Solids	Take to fertilizer manufacturer
Fuel Credits	Eligible for D3 RINS and LCFS—Carbon Index 23

Plus 21 other regulatory requirements

Raw and Hydrotreated HTL Oil



Raw HTL Biocrude



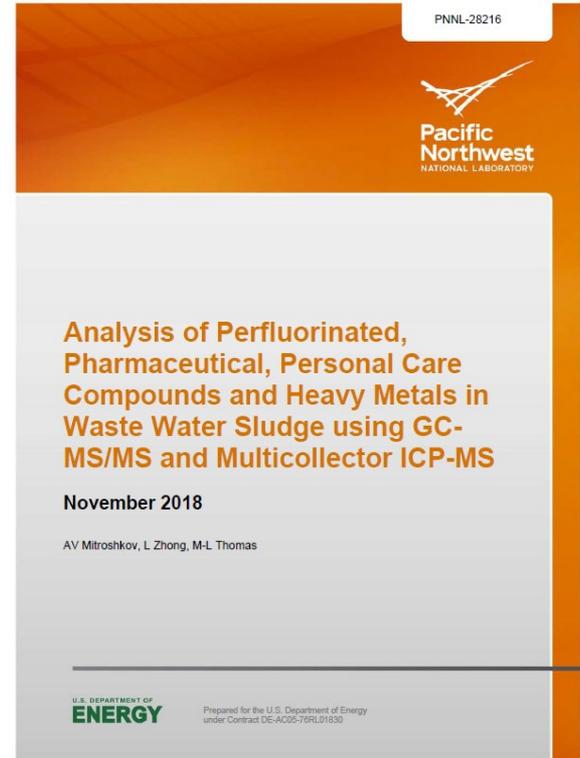
Upgraded HTL Oil

Upgraded Oil Very High Quality

	Unit	Upgraded Product	Biocrude
H:C Ratio	Mol ratio	2.03	1.6
O	Wt%	1.0%	6.2%
N	Wt%	<0.05%	4.7%
S	ppm	9	11,000
TAN	mgKOH/g	<0.01	59
Density	g/cm ³	0.79	0.98
Viscosity	cSt @ 40°C	2.7	400

HTP Addresses PFAS, PPCP

- **HTL substantially destroys PFAS (per/poly-fluorinated alkyl substances)**
- **HTL substantially destroys PPCP (pharmaceutical and personal care products)**
- **Final certification awaits publication of standards and testing methods**



Acknowledgements



Thank You!