
HYDROCARBON PROCESSING®
IRPC
October 2-3, 2024 | DoubleTree by Hilton, Greenway Plaza, Houston, TX

2024.10.02

Sanjiv Dabee
VP Engineering

Innovating Around Fischer-Tropsch Technology:

Breakthrough Technology Enabling Scalable, Feedstock Flexible, and Economical Sustainable Fuels

Aether Fuels

Company Intro

Vision:

Enable a net zero world through drop-in sustainable liquid fuels

Focused on "hard-to-abate" applications of liquid fuels like aviation and ocean shipping which produce 6% of global GHGs today

About:

Incubated by Xora Innovation; now backed by a world class investor syndicate and team

Seed funded in June 2022 by Xora Innovation, an early-stage deep tech investment platform of Temasek

Highly experienced and proven successful leadership team

Recent Series A led by AP Ventures with strategic investments by Chevron, JetBlue and others

Approach:

Lowest cost, highest yield, and most flexible platform for sustainable aviation fuel (SAF) and diesel

Novel catalysts, equipment, and process flow that dramatically reduces CapEx and drives down feedstock costs vs alternatives – with key innovations licensed from Chicago-area-based technology development partner GTI Energy

XORA A TEMASEK fund

APVentures ADVANCE & PIONEER

Chevron

jetBlue ventures

TechEnergy Ventures

foothill ventures

DORAL Tech Ventures

cdp CDP Venture Capital Sgr

zeon ventures

TTV TWIN TOWERS VENTURES

Aether Fuels

Exploding Gap in Supply - Demand

→ **Massive demand coming that requires a "next gen" solution capable of economically converting abundant sources of carbon into sustainable fuels**

Public Net Zero Pledges

Government policies and ESG momentum are *catalyzing pledges*

Examples of sustainable fuel policies: EU REDII, ReFuel EU Aviation, Fuel EU Maritime, CORSIA, RFS, LCFS

Scalability Limit of HEFA/FAME for Aviation and Ocean Shipping

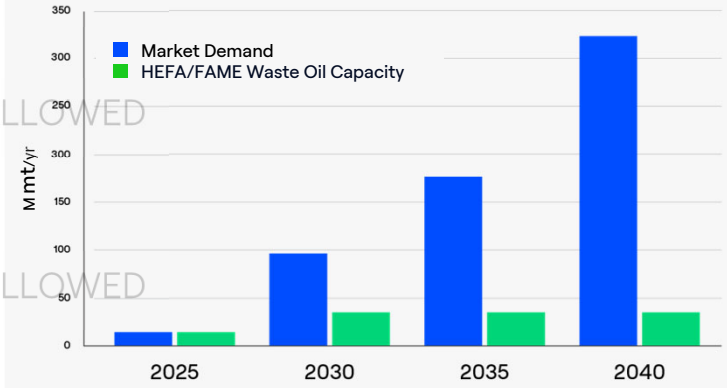


Chart source:
Aether calculations based on public pledges; feedstock availability estimate from 2020 World Economic Forum report "Clean Skies for Tomorrow" prepared by McKinsey

Aether Fuels

Leadership







Conor Madigan

Sanjiv Dabee

Steve Liang
(Asia Team)

Elie Fayad

Claudio Bertelli
Development

Brian Norris

Ric Redman
Government Affairs

- Raised $300M+ in venture and growth capital
- Princeton Elec Eng B.S. & MIT M.S./Ph.D.
- Designed/built >$10B in synthetic fuel plants, including FOAKs
- Started career at leading FT Co Sasol
- Chem Eng B.S.E. & M.S.E.
- Led many pilot and FOAK plant projects successfully
- Pet Eng B.S.E. & M.B.A.
- Previously led Naphtha and Aromatics R&D at UOP
- Chem B.S., M.S., Ph.D.
- Led Global Technical Sales for $400M/yr refining and petrochem biz at UOP
- Chem Eng B.S.-M.S. & Booth M.B.A.
- Previously led Summit Power Group building $10B in energy projects
- Successful career as energy lawyer before Summit
- Chair of the Global CCS Institute
- Harvard Govt A.B. & Harvard J.D.

Experts in new technology innovation and scale-up, with experience building $60B+ of operating syngas and energy projects

Leadership

Conor Madigan

Founder and CEO

- Successful serial deep tech entrepreneur
- Previously founded/ran a leading OLED manufacturing equipment maker
- Raised $300M+ in venture and growth capital
- Princeton Elec Eng B.S. & MIT M.S./Ph.D.

Sanjiv Dabee

Engineering (Americas Team)

- Expert in syngas generation and conversion
- 25 yrs experience
- Previously the top syngas domain expert at Fluor
- Designed/built >$10B in innovative fuel plants
- Started career at leading FT Co Sasol
- Chem Eng B.S.E. & M.S.E.

Steve Liang

Engineering (Asia Team)

- Expert in liquids production from syngas
- 40 yrs experience
- Previously GM of >$40B in syngas to liquids assets in China
- Led many pilot and FOAK plant projects successfully
- Pet Eng B.S.E. & M.B.A.

Elie Fayad

R&D

- Expert in commercial R&D of hydrocarbon catalysis technologies
- 14 yrs experience
- Previously led Naphtha and Aromatics R&D at UOP
- Chem B.S., M.S., Ph.D.

Claudio Bertelli

Business Development

- Expert in sustainable fuels biz dev
- 25 yrs experience
- Previously led BD at sustainable ethanol pioneer LanzaTech
- Led Global Technical Sales for $400M/yr refining and petro chem biz at UOP
- Chem Eng B.S./M.S. & Booth M.B.A.

Brian Norris

Carbon Sourcing

- Expert in carbon supply chains
- Previously ran procurement and supply chain for six Enviva plants
- GM for four Georgia Pacific plants before Enviva
- Began career as a USDA Forestry Engineer
- Env. Sci B.S. & Bus. Admin M.S.

Ric Redman

Corp Strategy and Government Affairs

- Expert in govt affairs and energy proj development
- 40 yrs experience
- Previously led Summit Power Group building $10B in energy projects
- Successful career as energy lawyer before Summit
- Chair of the Global CCS Institute
- Harvard Govt A.B. & Harvard J.D.

Competitive Landscape

Fischer Tropsch (FT) Fuel

Syngas Generation → FT Synthesis → Upgrading →

VELOCYS · INERATEC · Axens · Shell · GIDARA ENERGY · TRI · SunGas Renewables · Enerkem · JM · TOPSOE · sasol ecoFT · INFINIUM · twelve

Alcohol to Fuel

Syngas Generation → Alcohol Synthesis → Ethylene Synthesis → Oligomer Formation →

gevo · praj · HIF · LanzaTech · SunGas Renewables · GIDARA ENERGY · TOPSOE · LanzaJet · ExxonMobil

Direct CO_2 Hydrogenation

CO2 Hydrogenation → Ethylene Synthesis →

OXCCU AIR COMPANY

Biomass Pyrolysis

Pyrolysis → Impurity Removal → Deoxy-genation →

Shell (Shell IH²) · ALDER RENEWABLES

Our (FT) solution delivers the most flexibility and lowest fuel cost

Aether Fuels

Introducing:

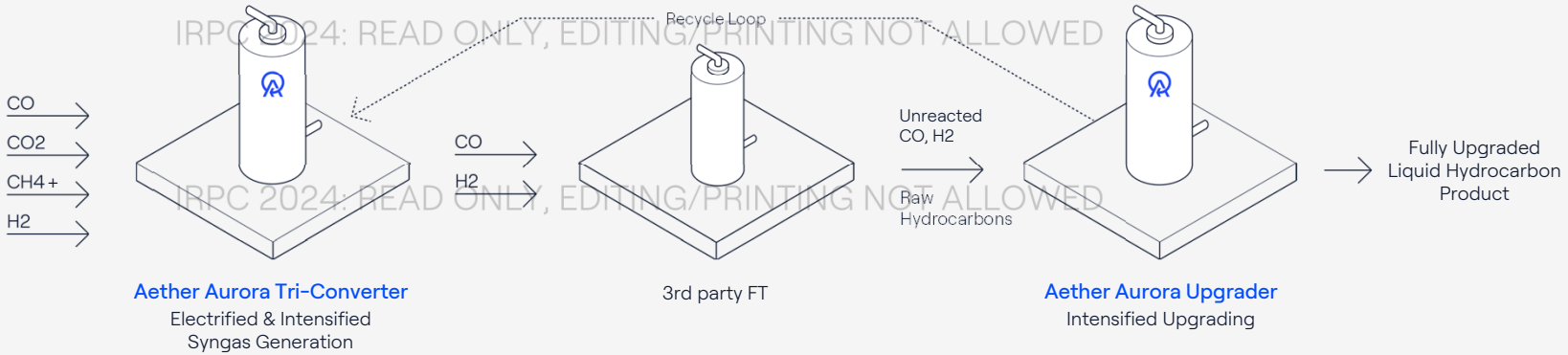
Aether Aurora

- Aether Fuels' proprietary Aurora technology slashes CapEx while simultaneously delivering high yield and broad feedstock support

Introducing:

Aether Aurora

In partnership with GTI ENERGY

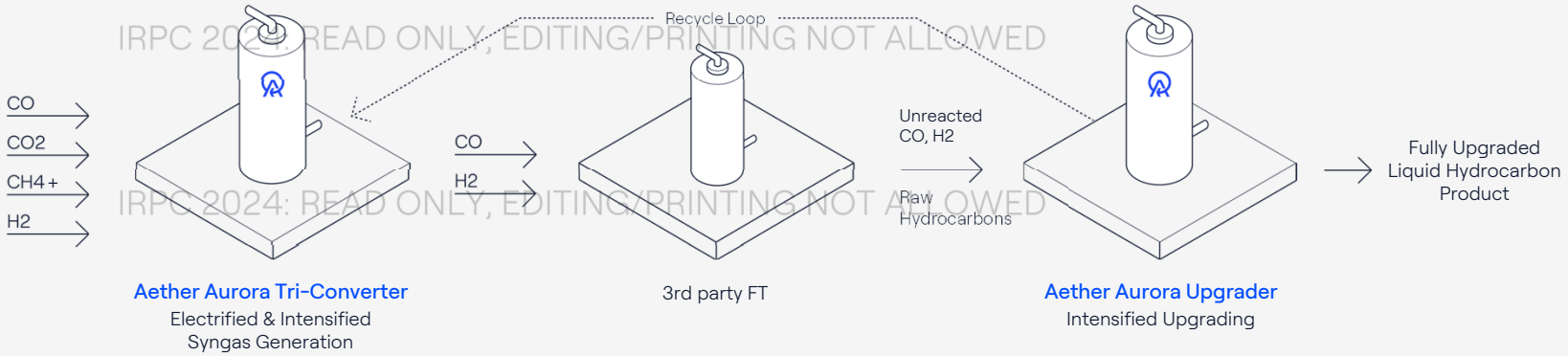


- **Electrified Syngas Generation** Our novel electric thermochemical reactor provides higher yield, higher energy efficiency, and a smaller reactor footprint
- **Intensified Syngas Generation** Our Fewer reactors and steps enabled by our novel catalyst
- **Compatible with 3rd Party FT** Aether Aurora builds on two decades of technical progress by integrating with leading FT vendors
- **Intensified Upgrading** Less equipment and higher energy efficiency enabled by our two novel catalysts that eliminate expensive separations

Introducing:

Aether Aurora

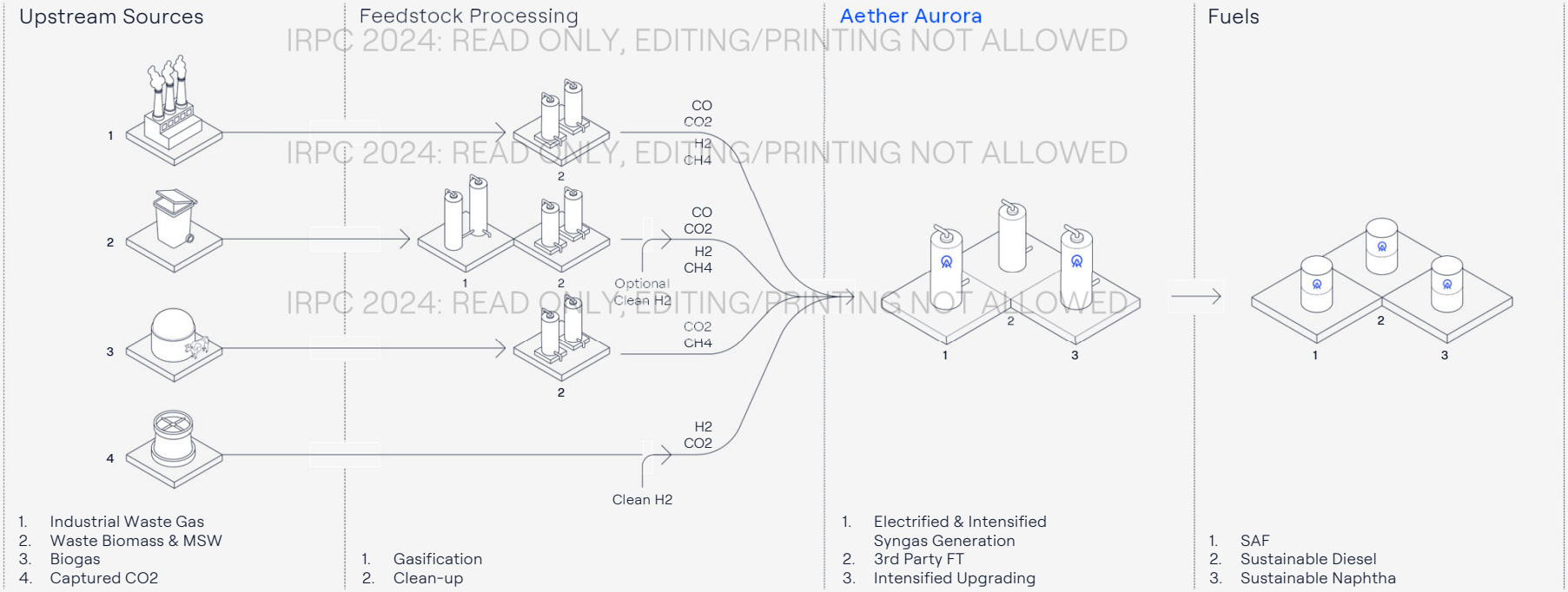
In partnership with GTI ENERGY



- **Near ideal carbon conversion efficiency** to liquid hydrocarbon products (95+% possible) due to complete wax conversion and recycling of all light end by products
- **Dramatically lower CapEx** compared to other commercial or near commercial routes – crucially, as FT costs have come down for medium scale plants, we now address the critical need to cost optimize the syngas generation and upgrading sections
- **Intrinsic feedstock flexibility** — from the start we engineered our solution to convert carbon from CO_2, CO, and hydrocarbons (i.e. CH4 as well as other light hydrocarbons) without requiring any extra steps or equipment

Our Feedstock Flexibility

→ Flexibility drives greater scalability (more available feedstock) and crucially the ability to adapt to a changing regulatory landscape



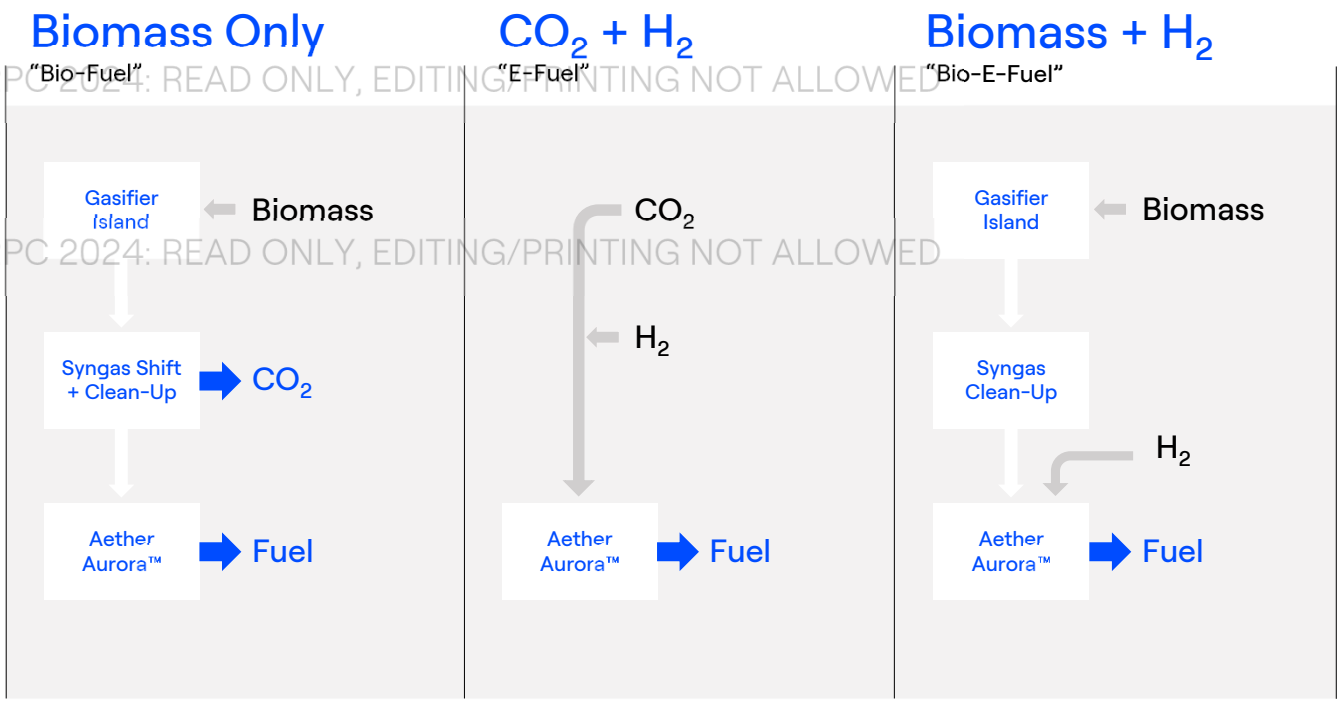
1. Industrial Waste Gas
2. Waste Biomass & MSW
3. Biogas
4. Captured CO2

1. Gasification
2. Clean-up

1. Electrified & Intensified Syngas Generation
2. 3rd Party FT
3. Intensified Upgrading

1. SAF
2. Sustainable Diesel
3. Sustainable Naphtha

Detail Main Aether Aurora Route Comparison



Detail Main Aether Aurora Route Comparison

Biomass Only	$CO_2 + H_2$	Biomass + H_2
"Bio-Fuel"	"E-Fuel"	"Bio-E-Fuel"
Advantage • It does not require clean hydrogen import • Minimum electrical power requirement	**Advantage** • It does not require access to biomass	**Advantage** • High biomass conversion yield • Moderate clean hydrogen import
Must have • Access to large volume of low-cost biomass feedstock	**Must have** • Access to large quantity of renewable power • Access to large volume of CO2	**Must have** • Access to moderate volume of biomass • Clean hydrogen

Fuel Price Targets

➔ Our first commercial plants will be cost competitive with HEFA, but without the feedstock supply limitations

Note: If hydrogen prices fall enough over time, can eventually get to fossil parity

Phase 1

Parity with waste-lipid HEFA, but without feedstock supply limitations

↓

$2-3K /mt

Phase 2

Premium to fossil fuel of $300 per mt of CO_2 avoid for 80% GHG reduction fuel

↓

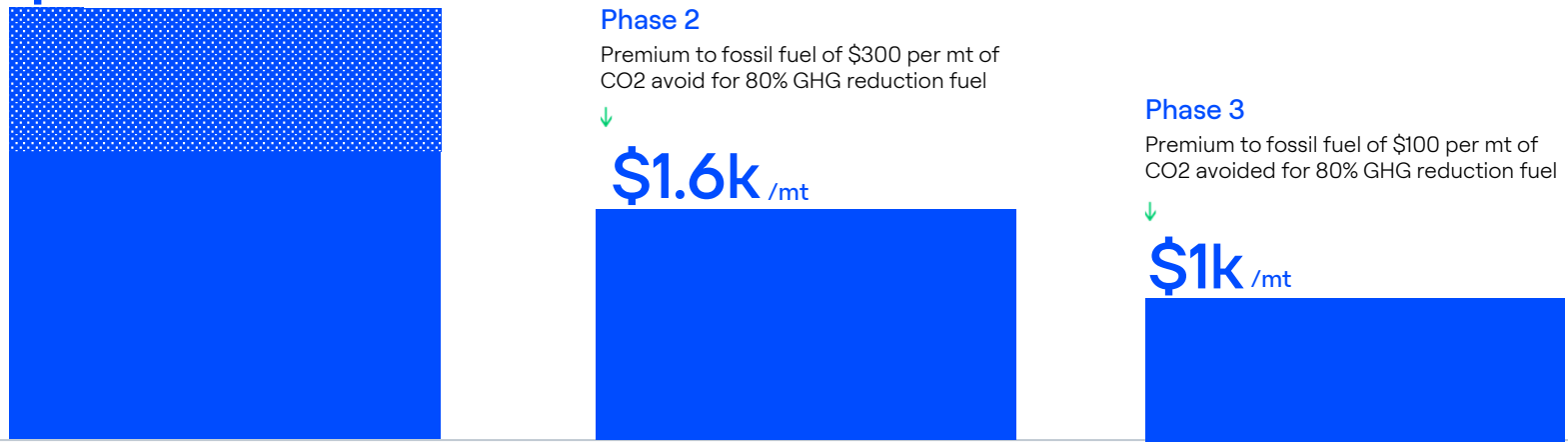
$1.6k /mt

Phase 3

Premium to fossil fuel of $100 per mt of CO_2 avoided for 80% GHG reduction fuel

↓

$1k /mt



Aether Fuels

Aether Fuels Signs MOU with JetBlue

Agreement creates pathway for Aether to supply sustainable aviation fuel to JetBlue

CHICAGO, Illinois, Sep. 23, 2024—Aether Fuels (Aether), a venture-backed climate technology company, today announced that it has signed a Memorandum of Understanding (MOU) with JetBlue (NASDAQ: JBLU). Aether has developed a breakthrough technology that utilizes a diverse array of waste feedstocks to produce sustainable liquid fuels at a lower cost and greater scale than existing approaches. The agreement creates a pathway for Aether to supply JetBlue with sustainable aviation fuel (SAF) when commercial production begins.

➔ **Agreement creates pathway for Aether to supply sustainable aviation fuel to JetBlue**

➔ "Scaling up production of SAF is the essential challenge to solve for the decarbonization of aviation," said Sara Bogdan, Managing Director of Sustainability and ESG at JetBlue. "Aether Fuels' technology targets a key need. By enabling access to a much wider range of feedstocks than previously available, the new technology shows incredible promise to help SAF reach the commercial scale needed for the industry transition to renewable fuels. As our investment via JetBlue Ventures demonstrates, we are believers in the Aether technology and team, and we look forward to being part of that journey."

➔"JetBlue is a leader in proactively transitioning to SAF so their interest in the company and the Aether Aurora technology is gratifying," said Conor Madigan, Co-founder and CEO at Aether. "For a disruptive technology like ours, early and informed input from potential users, including airlines, can accelerate the ramp from R&D to commercialization. We are excited to engage with JetBlue and look forward to supporting their SAF vision."

Our 1.5 gpd Pilot Plant

In partnership with GTI ENERGY

- Operational since 2021
- Fully integrated line with capability to run 24/7 campaigns
- High quality liquid hydrocarbon product

Summary

- Aether Aurora is a sustainable fuels breakthrough, delivering low CapEx, high yield, and broad feedstock flexibility

- This technology enables much lower unit economics and multiple routes to large scale deployment

- We are scaling up for commercialization together with the strong support of our investors and partners – including Xora (Temasek), GTI Energy and JetBlue

- Recently took delivery of a 100 gpd scale electric Tri-Converter (image on the right)

Aether Fuels


Thank You

Our History and Backers

7 years and $12M of R&D investment to date

GTI ENERGY

U.S. DEPARTMENT OF ENERGY

XORA

jetBlue ventures

foothill ventures

TechEnergy Ventures

DORAL Tech Ventures

APVentures ADVANCE & PIONEER

Chevron

cdp CDP Venture Capital Sgr

zeon ventures

TTV TWIN TOWERS VENTURES

2016

GTI Energy engineers initiate R&D program

2017

GTI Energy secures first DOE grant

Original catalysts invented based on micro-reactor screening studies

2019

Benchtop (0.15 gal per day) line demonstrated and first liquid hydrocarbons produced

2021

Small pilot (1.5 gal per day) line operational, incl novel electric reactor; completed 500 hr stable, continuous run

2022

Xora and GTI Energy initiate partnership partnership

TEA studies demonstrate breakthrough unit economics

Aether Fuels launched to drive commercialization

2023

100 gpd scale electric reactor design completed

2nd generation CoolGTL catalysts developed

JetBlue, Foothill Ventures, TechEnergy Ventures, and Doral join Xora as investors

2024

100 gpd scale electric syngas generator delivered

Introduction of the Aether Aurora solution

Signed offtake MOU with JetBlue

The Challenge of Smaller Scale Plants

Feedstocks limit Sustainable Fuel Plants to much smaller scale than typical Oil & Gas Refineries

➔ We must optimize CapEx efficiency — but without sacrificing on yield and feedstock flexibility

Fossil Fuels

Fossil oil (and coal) are easily transported and economical to aggregate — allowing for massive scale

↓

100k+ BPD

Sustainable Fuels

Feedstocks (like H_2, biomass, and waste gases) are distributed and expensive to aggregate — limiting scale

↓

1-10k BPD