GIDARA® ENERGY

Energy Transition and Circularity: Waste to Biofuels

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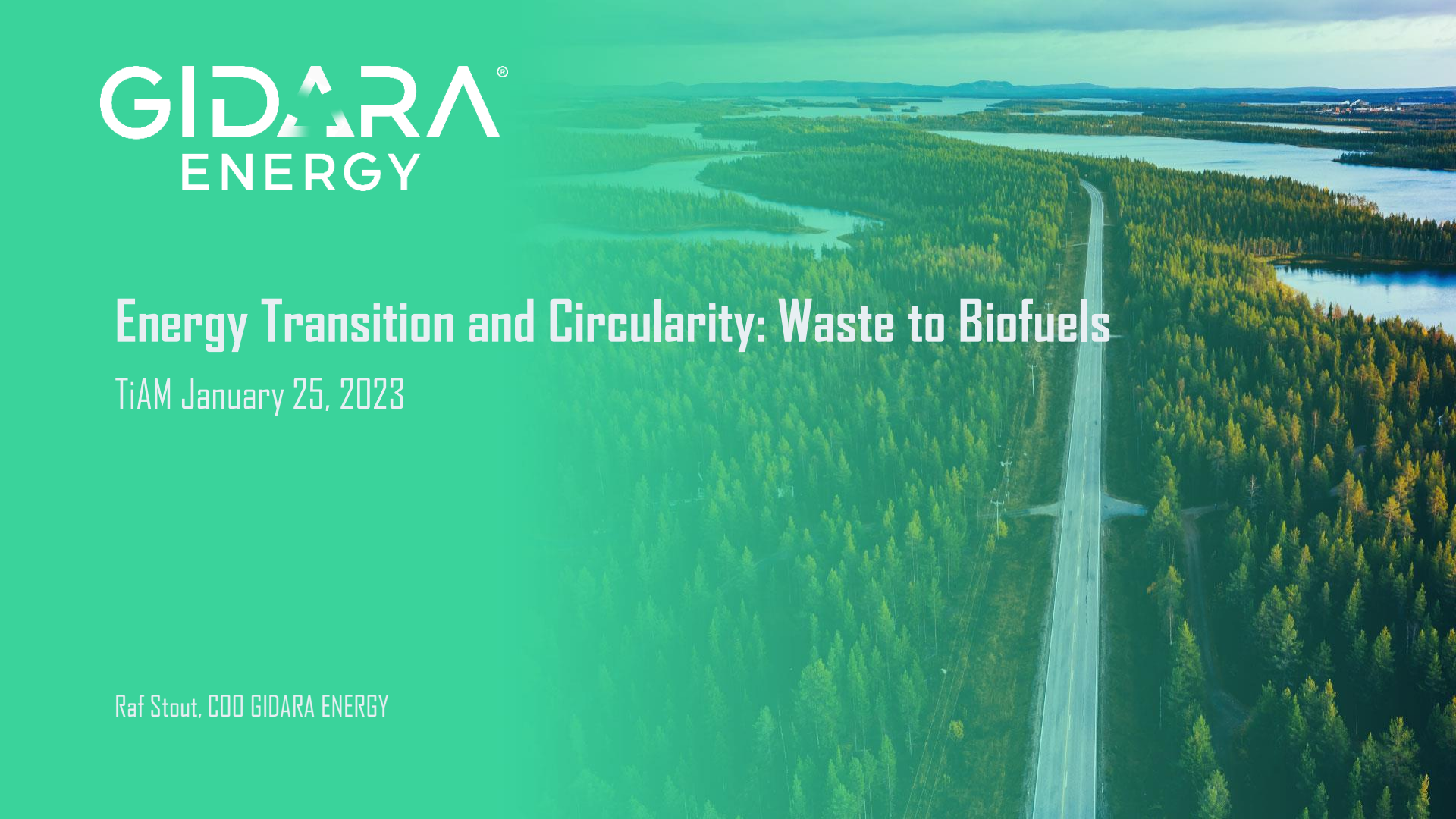
Raf Stout, COO GIDARA ENERGY



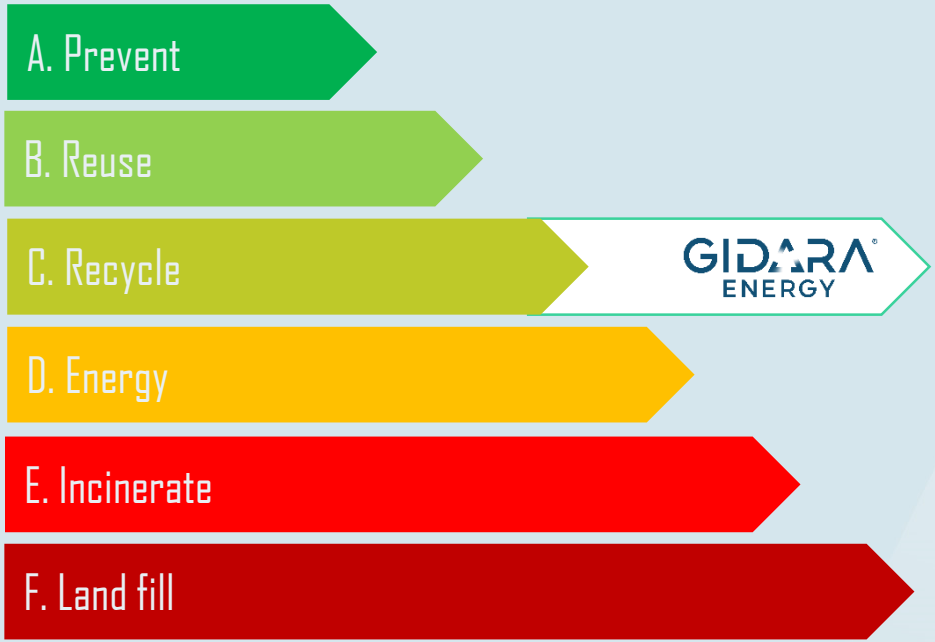
What we do

Non-Recyclable Waste

Syngas

Advanced Biofuels

Waste treatment hierarchy



Circular

Waste Disposal
- Banned by politics and public
- Taxed to discourage

Flexibility to adapt to fast-changing environment

The waste issue

- Wood Waste 
- Sewage Sludge 
- Municipal Solid Waste 
- Non-Recyclable Plastics 
- Waste Paper 
- Agricultural Residue 
- Construction & Demolition Waste 

HTW® Technology

Emission reductions

Road Transport Fuels

- Green Gasoline
- Biomethanol
- Renewable Diesel
- Green Hydrogen
- Renewable Natural Gas (CNG, LNG)
- Bio-mmtpa

Marine Fuels

- Biomethanol
- Bio-Ammonia
- Bio-DME
- Renewable Natural Gas (CNG, LNG)

Sustainable Aviation Fuels

High Growth End Markets (e.g. Chemicals)

Technology proven and applied for more than 10 years and with mixed feedstock

1970s

Rheinbraun & ThyssenKrupp developed the pressurized version of the gasifier known as the High Temperature Winkler (HTW) process

Key reference plant

1986 - 1997

Commercial plant
Berrenrath, Germany

Fossil, Biomass and Waste feedstock to Methanol

1988 - 1994

Commercial plant
Oulu, Finland

Fossil and Biomass feedstock to Ammonia

1989 - 1992

High-pressure plant
Wesseling, Germany

Fossil feedstock to Syngas

1999 - 2002

Demonstration plant
Niihama, Japan

Waste feedstock to Syngas

Key reference plant

2020 - current

Demonstration plant
TU Darmstadt, Germany

Biomass and waste feedstock to Syngas

Purpose/learnings of the plant

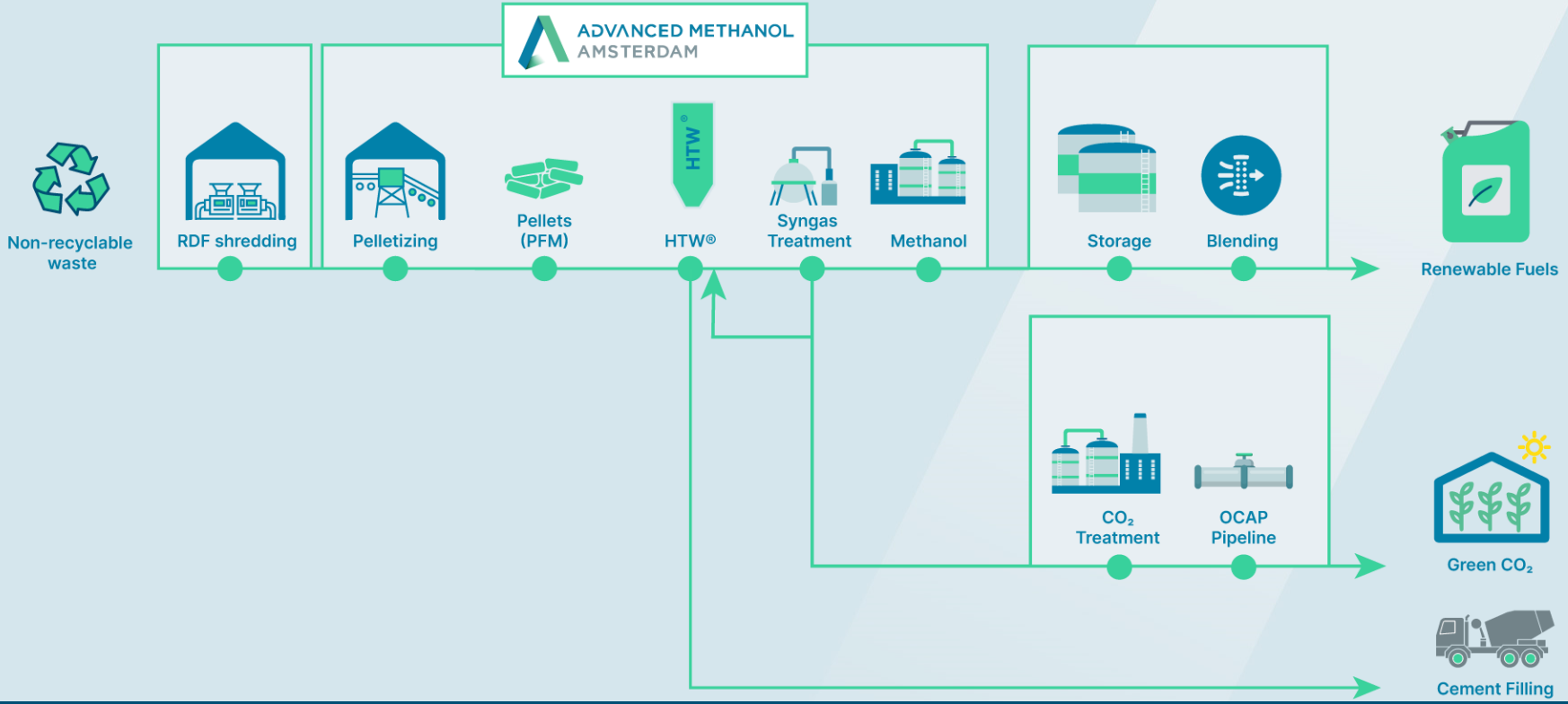
- ✓ Feedstock testing and continuous research and development on HTW technology
- ✓ Full production including methanol

Today

Proven track record of multiple HTW projects, strong market demand and regulatory tailwinds make HTW technology an economically viable option for biofuels

Flagship Facility "Advanced Methanol Amsterdam (AMA)"

HTW®-to-BioMethanol Plant: Process Flow Diagram



Twin facilities

Amsterdam 2025

ADVANCED METHANOL

Rotterdam 2026

Circularity in Design, Operations and Maintenance

- Replicable business model
  - Identical ISBL units
  - Capitalize on existing utilities in brownfield locations
- Synergies for Operations and Maintenance across sites
  - Training and exchange of personnel
  - Standardize Operations and Maintenance procedures, learning
  - Common sourcing, spare parts
- Circular business model
  - Bio-methanol fit for different markets evolutions 2025 - 2050+
  - Availability of Green Utilities improve GHG savings
  - Clean Syngas can be converted into new end products

General trends in energy transition

- Modular design
  - Design one, build many, (re)use standard components
- Portfolio management
  - Standardization, Sharing, Partnerships
- Re-purposing / share Brownfield locations
  - Advantaged access to utilities, CCU/CCS, supply/offtake, logistics
- Manage non-continuous operation
  - Flexible maintenance strategy adapted to variability
- Increasing electrification
  - Increasing need for electrical expertise

We make sure
our waste isn't wasted

gidara-energy.com

advancedmethanol.com

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