

SeaH4

ALGAE-BASED BIOFUELS

B  **ld**

The Innovation

Carbon neutral alternatives to fossil **fuels**, enabling full and continued use of the existing fossil fuel infrastructure, protected from GHG emissions levies, taxes and penalties, using a patentable algal-culture process*

* Enhancement of nutrient cycles - to be validated during the Prototype Phase

The Problem

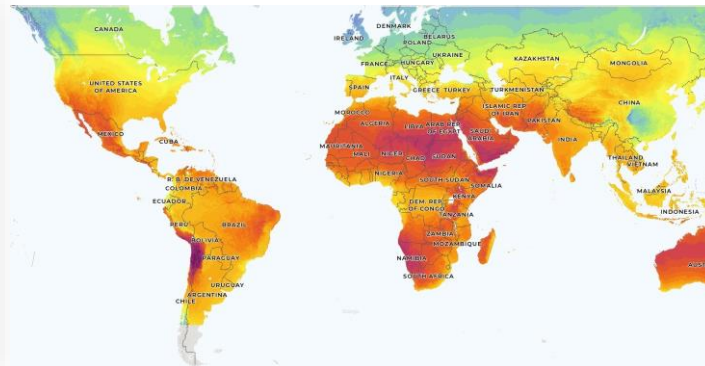
Efficiency gains alone will not achieve carbon neutrality.

Emerging fuels are either not sustainable, lack the energy density or are too expensive.

Ships built today will still operate in 2050



**Hydrogen ready
biofuel solution**





Unique Selling Points

- Solving the issue of **sustainable feedstock supply** at scale.
- **Indigenous seaweeds**, avoiding introduction of alien species
- Production and supply adjacent to **main trade routes** between Asia and Europe.
- Enabling the continued use of the established fossil **fuel infrastructure**, **carbon neutrally**.

Comparison to other green energy solutions

SeaH4
SUSTAINABLE BIOFUELS

H₂



NH₃

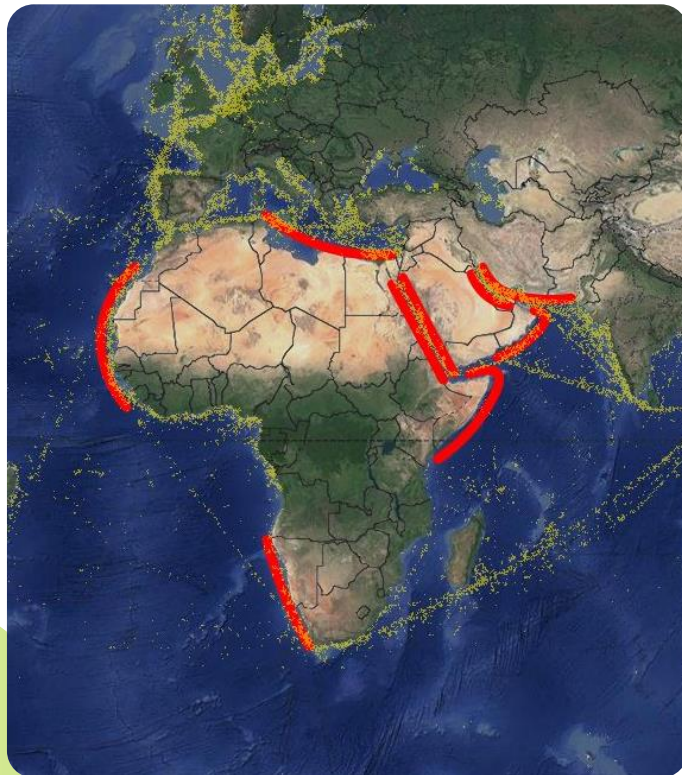


	Safe to Humans & Nature	No Competition with Food	Energy Density as blend-in Fuel	Ready to Go	Unlimited Scalability
SeaH4	✓	✓	✓	✓	✓
Green H2	✗	✓	✗	✗	✓
Batteries	✗	✓	✗	✓	?
Ammonia	✗	✓	✓	✓	✓
HVO	✓	✗	✓	✓	✗
Ethanol	✓	✗	✓	✓	✓
Lipid Extraction	✓	✓	✓	✗	?
Solar	✓	✓	✗	✓	?

* SeaH4's process is inherently different from Lipid extraction from micro-algae

Market

We have chosen the **maritime bunker market** (fuel for ships) as go to market as this is a well funded industry, with severe pressure to decarbonise. It will serve us to establish the first full scale plant, after which we can branch out into any fuels desired by strategic partners.



Scalability

The bunker LNG market is growing with a **40% CAGR**

30% of all new built vessels are **LNG powered**.

18,000 kms of desert shores MENA & South Africa, **geostrategically** located central to the Asia to Europe trade



Market Size

TAM: 300Mt – US\$ 300BN

Annual fuel consumption of global shipping fleet (@\$1000/t)

SAM: US\$ 25BN

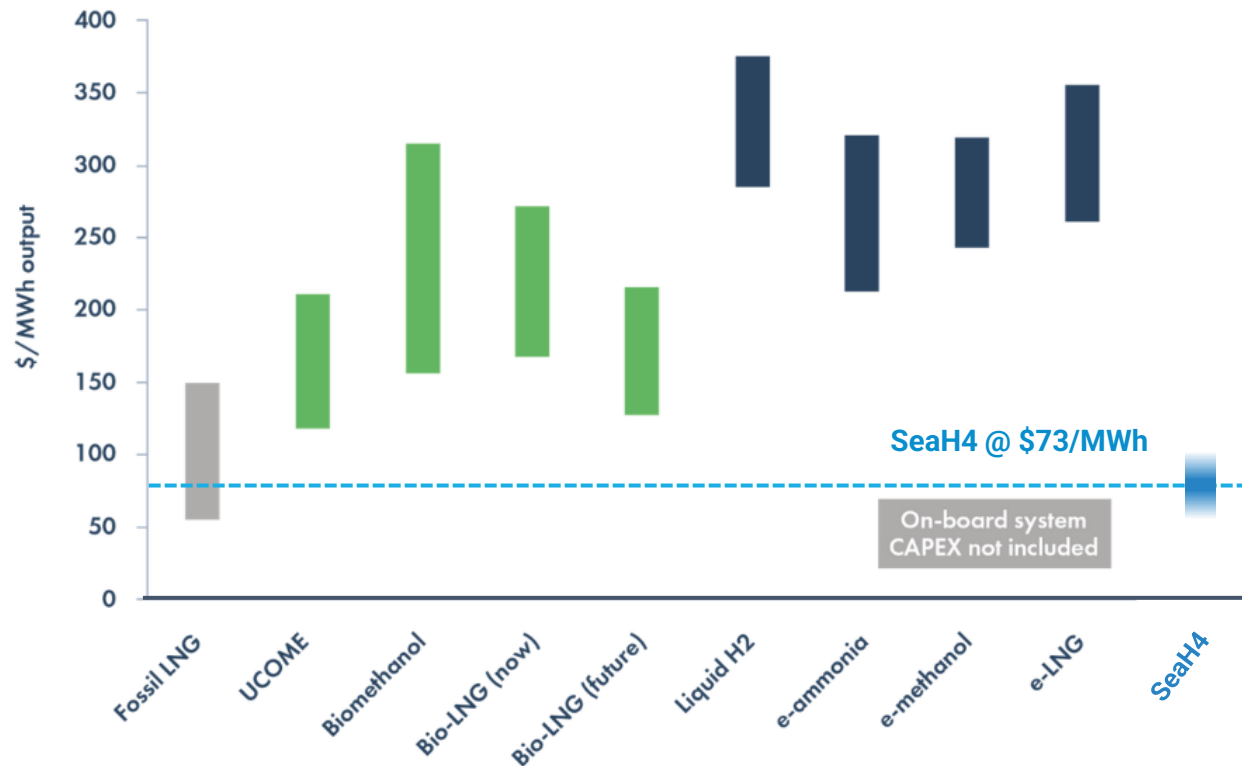
Size of the LNG bunker market

SOM: 1.2Mt – US\$ 1.2BN

Annual fuel demand of ships leaving Saldanha

Viability of cost & supply

Cost forecast on renewable bunker fuels for shipping



Source: www.sea-LNG.org + SeaH4



Cost :
US\$1 000/ton (US\$73/MWh)

SeaH4 competes with fossil fuels and other biomethane solutions.

Carbon neutrality adds up to **US\$300/t** to the value for customers.

Reliable, continuous supply adds **10%** over fossil prices for customers.

Value :
US\$1 400/ton

Trade advantage

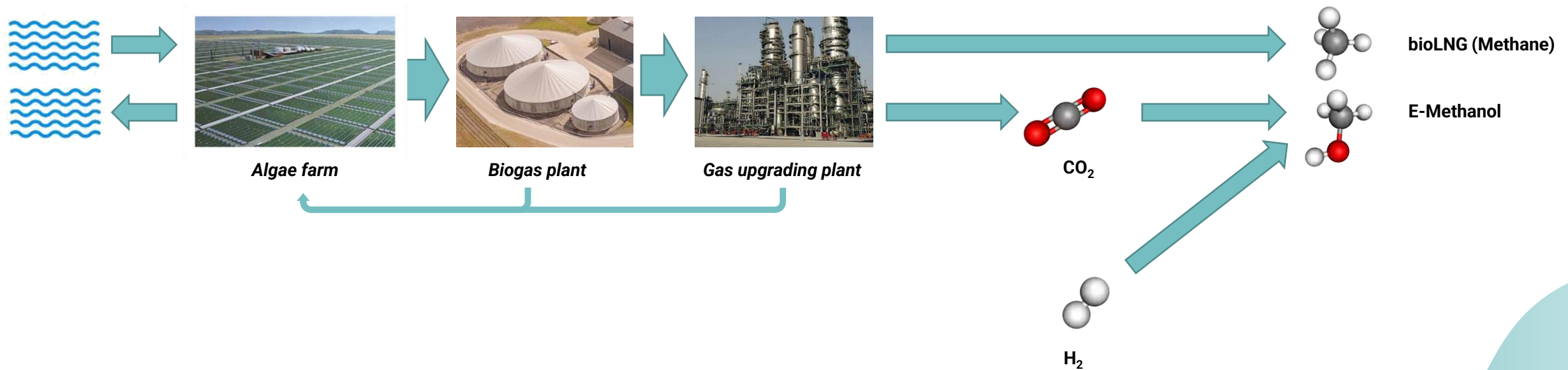
If a SeaH4 plant was owned by vessel operator	Jaques Saade
Life time (assumed)	14yrs
Life time CO₂ savings @ 80 EUR/t	1.400.000t 112mn EUR
Annual fuel cost savings @ 900EUR/t	33.4mn EUR
Required CAPEX in SeaH4 solution	320mn EUR
Simple Payback	9.5yrs



Plant metrics:

- **600ha, incl 400ha aquafarm | 130M EUR investment**
- **15k t of biomethane (CH₄)** annually in daily, steady output
- **13k t of high-grade CO₂** annually in daily, steady output
- **700-1000** permanent, sustainable **jobs** created per plant
- All process energy generated on site
- Deployment along most MENA shores and more
- **Fully independent** from pre-existing infrastructure to construct and operate

bioMethane & E-Methanol from CO₂ + H₂

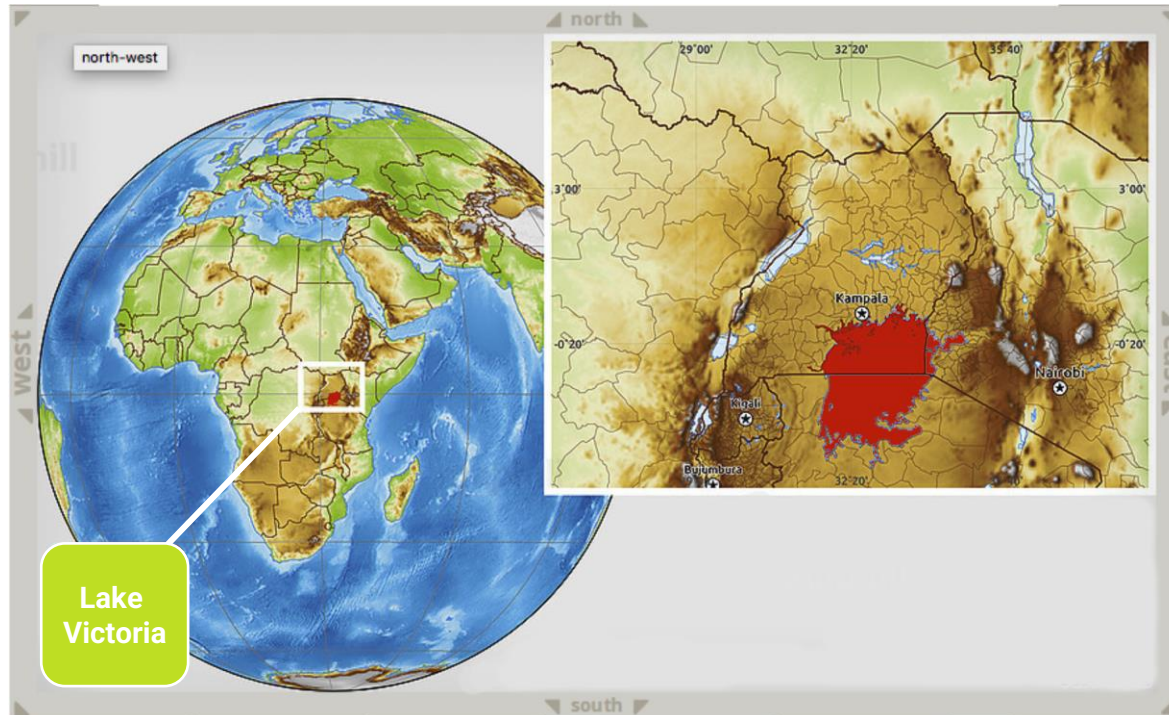




SeaH4 BioLNG: the smart energy option




SeaH4 biofuel is produced along desert shores,





- **without** detrimental **impact** on **food** production,
- **without fresh water** requirement and
- **without** requirement for **pre-existing infrastructure**.

An area the size of **Lake Victoria** will satisfy **66% of global shipping** fleet's fuel demand:



Energy Balance		GJ _{fuel} /GJ _{process}
SeaH4		2
e-fuels		0,5

Energy Yield		GJ/(ha*a)
SeaH4		1200
Ethanol (Corn)		80
Biogas (Corn)		300

Energy return on CAPEX		GJ/USD
SeaH4		57
Wind		25
Solar		25-50
e-fuels		4

Established Partners



**Sidley Austin LLP,
Switzerland**
Legal Support



**Blue Ocean
Leading Drivers,
Spain**
Finance Facilitators



**Global Energy,
South Africa**
*Biogas Specialists, Lab
Support*



**UK Climate
Finance Accelerator,
UK/RSA**
Cohort Member 2022



OceanHub Africa
Cohort Member 2022



**Energy Invest
Village,
South Africa**
*Pitcher at 2022 Green
Energy Africa Summit*



**Blue Invest Africa,
Seychelles**
*Pitcher at 2022 Summit,
selected and sponsored
by GIZ and the European
Commission*



**Cleantech Open,
USA**
Alum 2022



**GREEN VOYAGE
2050**



transport

Department:
Transport
REPUBLIC OF SOUTH AFRICA

IMO's GreenVoyage2050 & South African Dep. of Transport
National Pilot to facilitate the decarbonisation of Shipping

Details of Funding Requirements

2023

PROTOTYPE PHASE

600,000 EUR

Likely led by grant/CSR funding

MILESTONES:

- Secure and expand team
- Build and operate test farm for 2 yrs
- Get the company and solution ready for next raise

2025

PILOT PHASE B

2M EUR

Interest by DFIs

MILESTONES:

- Finance the plant hardware & construction
- Achieve revenue 3 years from prototype investment

2027

FULL SCALE PRODUCTION

125M EUR

Equity & Debt funding

MILESTONES:

- Procure, fabricate and construct 600ha plant
- Upskill required staff
- 20M EUR EBITDA

2024

PILOT PHASE A

4M EUR

Interest by DFI, VC-, Strategic- & Impact Equity

MILESTONES:

- Detailed design
- Secure land &
- all licenses / permits in for pilot and full scale

2025

Middle East / Pan-African BRANCH OUT

250K EUR PER COUNTRY

Strategic Equity / Subsidies

MILESTONES:

- Enable the rapid upscaling in other countries after successful pilot operation

Prototype Phase (Seed)

Current Raise

Raise: **600,000 EURO**, comprised of

- **50k EUR** – Secure immediate **Founding Team**
- **180k EUR** – Test farm: **hardware**
- **120k EUR** – Test farm: **Construction & 2yr Operation**
- **250k EUR** – **Runway** to Equity-based Pilot Phase

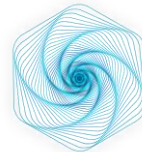
Technical Validation to Date (Self-funded):

- ➔ All 3 subprocesses are in large scale **commercial use**, globally
- ➔ 3rd party **PhD thesis** on biogas potential of SeaH4 selected seaweed (ulva)
- ➔ **Benchtop prototype** built and operated
- ➔ Selected seaweed in **3rd party lab** for biogas potential analysis
- ➔ Biogas to shipping fuel is widely **accepted by the industry**
- ➔ **Ongoing review** of SeaH4 process by academia and industry experts

Detailed information is available upon request



FREEPORT
SALDANHA



Saldanha Bay
Innovation Campus



130km from
CAPE TOWN

Test Farm

- Cost: EUR 350 000 (part of EUR600k seed raise)
- Unlocking Pilot Phase Detail Design after 3 months
- Size: 500m²
- Project Duration: 24months
- Staff: 2x Scientists
- Free Port of Saldanha (1hr north of Cape Town)

SeaH4

SUSTAINABLE BIOFUELS

For more information please contact:

Johannes Bochdalofsky



+27 63 12 66 202



jb@seah4.co.za



www.seah4.co.za

Industry Validation



Ocean Innovation Africa, RSA
Pitch Competition, Runner Up 2021



Freeport Saldanha, South Africa
Continued support including through their Innovation Campus. Provider of land required for SeaH4's test farm.



DG mare, European Commission
Ongoing discussions around the opportunity to use SeaH4's fuel to decarbonise the European fishing fleet



50 most promising ClimateTech Start-Up in Sub-Saharan Africa
Selected by HolonIQ, 2022



Startup Basecamp, USA
*Top 5 Start-Ups to watch, Nov 2021
Climate tech Start-Ups to watch in Africa, 2022*



Liberian Ship Registry
Ongoing discussions between LSR's sustainability office and SeaH4, to align efforts, get early insights in terms of maritime and decarbonisation



Sea-LNG
Ongoing discussions to align SeaH4's development with that of the e-LNG/bioLNG bunker industry for maritime



Reliance Capital Group, Belgium
Continued support by RLG for financeability & marketing strategies

“**SeaH4** as a blend-in fuel to lower the carbon content of fuel is a great way of managing the requirement of the decarbonization journey in a measured and sustainable way, growing with the development and maturity of supply sources.”

- The Captain's Table

“**SeaH4**, in less than 2 years from establishment, has emerged as one of the Top 50 climate tech companies in Africa.”

- HolonIQ, 2022



Pioneering **socio-economic development** in underdeveloped, low-to-no value natural areas

Transformative impact on SDGs



Affordable & Clean Energy

This is at the core of our business. **15k t of carbon neutral fuel/a**, sold at long term stable prices competing with 2021 fossil prices



Climate Action

Our solution saves **42k tons/a CO2e** emissions per plant otherwise caused by burning fossil fuels, turns desert into aqua-farmland



Life under Water

If SDG 7 is at the heart of our project, SDG14 is its soul. Our solution was developed to reduce poaching of ocean resources –rock lobsters. It reduces ocean acidification by removing **13k t of dissolved CO2** directly, with positive effects for calcifier populations, such as corals, mussels and rock lobsters. Our chosen algae is indigenous along most shores.



No Poverty

We will pay **enabling salaries**, facilitating generational uplift



Good Health

The fuels not only burn carbon neutrally, they burn virtually **particle free, NOx and sulphur free** – especially in ports near cities this will decrease pollution



Decent Work & Economic Growth

Our plants are designed to become the **spearheads for economic hubs**, bringing work and income to otherwise disenfranchised communities. This will contribute to **job creation** on the continent.



Reduced Inequalities

We have designed our solution to be deployed in **areas that have little to no access to the economy, bringing jobs to the people** and GDP generation to the municipalities. This is applicable in a local context, eg West coast vs metros, but also globally, eg Africa vs the global north



Accelerate energy access for people of Africa and ensure a **Just Energy Transition** to low carbon economies.



Reduce emissions & health burden

SeaH4 is **carbon neutral**, saving 2.8t CO₂e/t of LNG. Additionally it burns particle-, sulphur- and NOx free, **reducing the health burden on poorer communities**, typically living near economic hubs.



Improve GDP & trade balance

Fuel imports in Africa result in **US\$ 130bn in capital** leaving the continent. Producing fuel locally improves trade balance and creates **economic opportunities**.



Creating pull for deep sea trade

Offering carbon neutral fuels will increase a port's attraction of passing trade vessels, **increasing trade volumes**.



Impact on the Labour market

Maximising social **impact per dollar** by creating 1000 jobs per plant & **transferring technical skills** readily available, unlearned labour force

Background & Social Needs of the Innovation

3Gt of CO₂e are emitted by shipping, aviation and trucks annually. No alternative to the combustion engine has been identified, which could provide the required energy density.

Africa's ports underperform as trade hubs, struggling to provide reliable infrastructure and harnessing their economic potential.

SeaH4
ALGAE-BASED BIOFUELS



Inequality

Energy access & ownership are very concentrated



Dependency

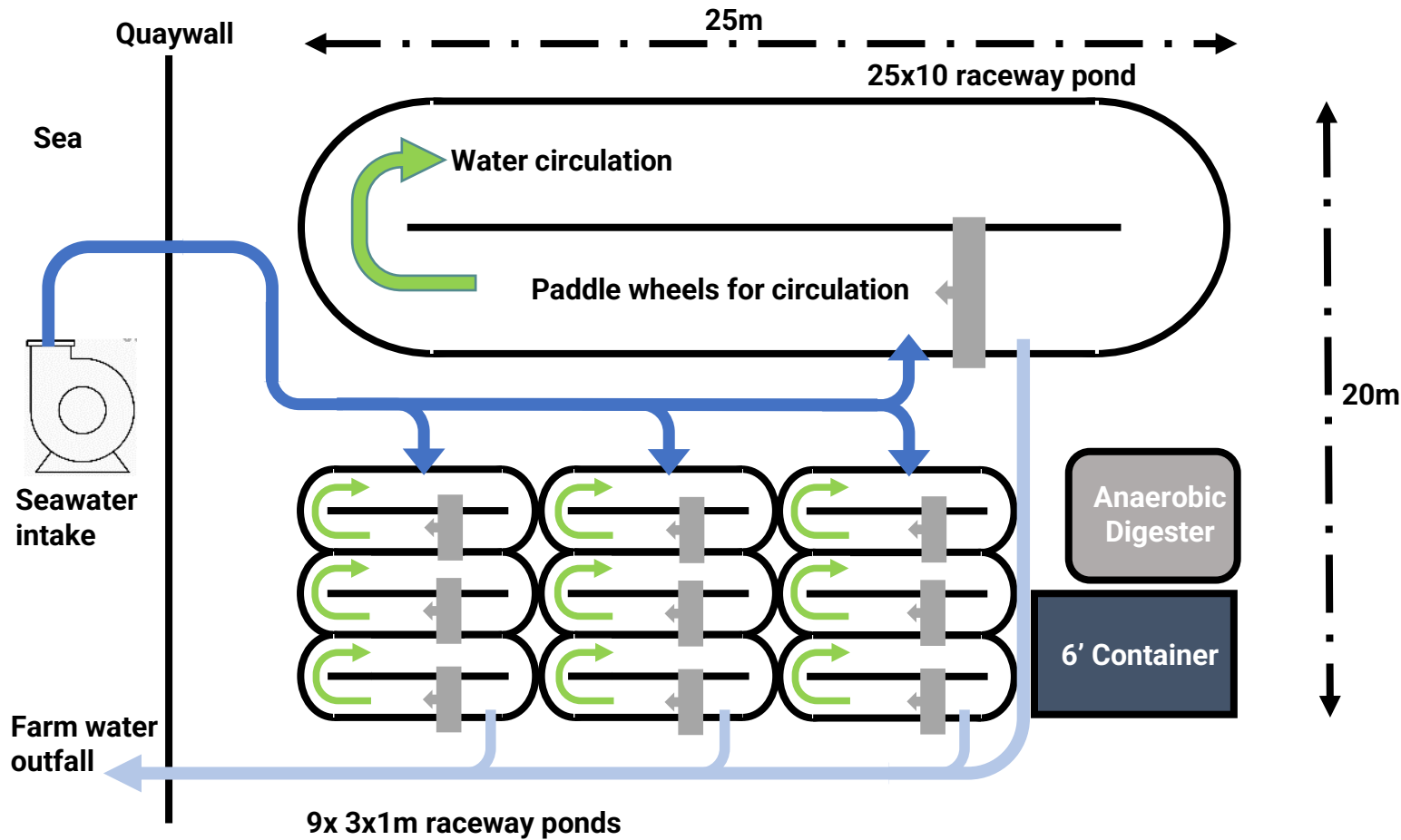
300 Mt of fuels consumed by shipping annually



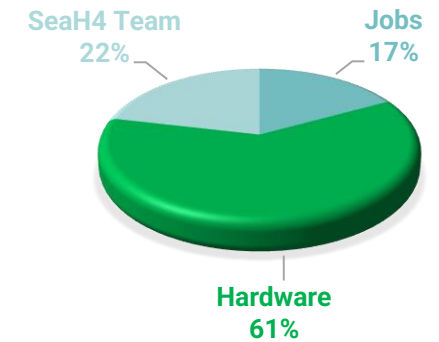
Economy

2050's infrastructure is built today

Prototype - Layout



COST DISTRIBUTION OF 350K EUR PROTOTYPE



Test Farm Outcomes:

- ➔ Patentable IP
- ➔ Design metrics for Gas Plant
- ➔ Design metrics for full scale ponds
- ➔ Accelerate EIA application
- ➔ Reduction in process energy
- ➔ University collaboration / MSc

Detailed presentation is available upon request

Growth & Development Path

2023

PROTOTYPE PHASE

2x Scientists & 6x management

Outcome:

IP | Detail design for next phase

2025

PILOT PHASE B

125x full staff range

Outcome:

First revenue | Launch of commercial products | Kickoff full scale plant installation | Industry validation

Revenue:

1t of CH₄ | 1t of CO₂ daily

2027

FULL SCALE PRODUCTION

700 - 1 000 full staff range

Outcome:

Achieving profitable operation

Revenue:

15k t/a LNG
13k t/a CO₂
42k t carbon savings/a

2024

PILOT PHASE A

25x management & design

Outcome:

Site selection & procurement | EIA | Licenses & permits for pilot and full scale

2025

PAN-AFRICAN BRANCH OUT

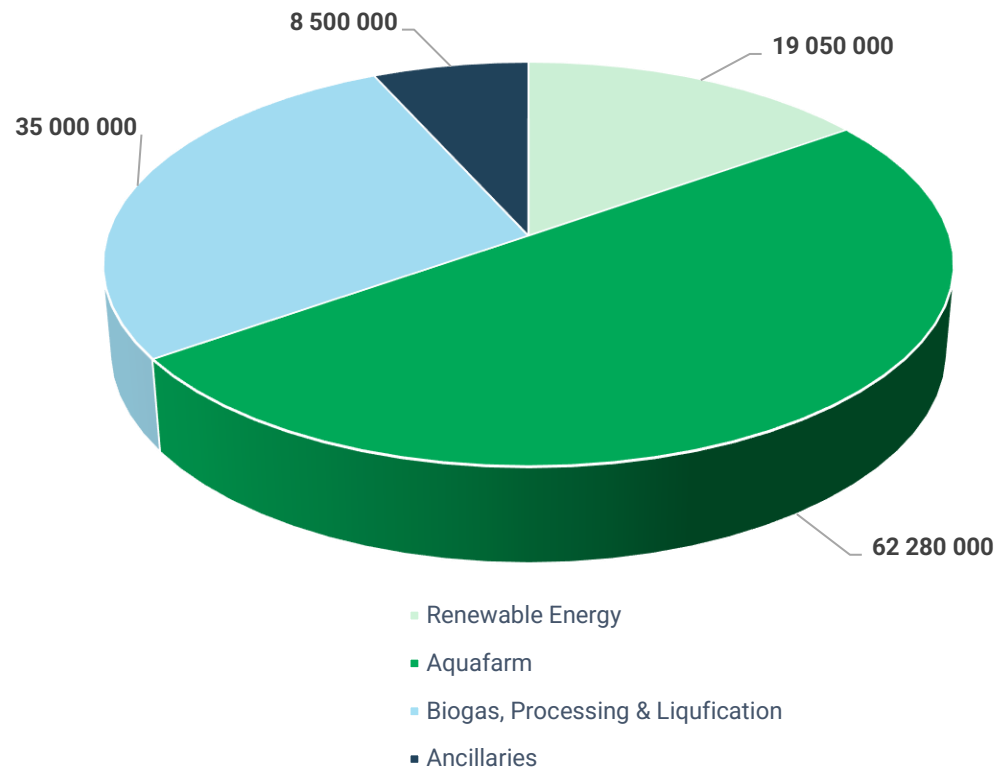
5x development team per country

Outcome:

Breaking ground for additional plants globally to accelerate scale up in MENA region

Financial Overview

CAPEX FULL SCALE PLANT (in EURO)*



- Highly eligible, but not relying on subsidies
- Wide range of additional income potential to be developed after pilot phase**

METRICS THAT MATTER

- 600ha plant
- 1000 permanent jobs
- EURO 131M cost

Products:

- 15k t of bioLNG @ US\$ 1 000/t,
- 13k t of CO₂ @ US\$ 390/t

Carbon Credits:

- Saving 42k t of CO₂ emissions annually,
- Removing 13k t of CO₂ directly from the ocean

*Detailed financial model is available upon request

**Ask us about parallel income stream potential, ranging from farming to pharma

Executive Management and Advisors



Carelle Ossinga

Biogas Lead

MEng Chemical Engineering with
3 years experience in Biogas



Theo Batik

Data / Finance

3 years experience in maths,
physics, computational modelling
and finance



Johannes Bochdalofsky

Co-Founder & PM

17 years experience as engineer
and PM in marine and maritime



Gcobisa Nosilela

Co-Founder & Director

18 years experience in business
administration



Raymond Kalley

Business Strategist

45+years in maritime sector &
business development



Bas de Vos

Algae Specialist

10 years experience in
aquafarming, PhD candidate
(aquafarming)



Krassi Fotev

CEO 13mari

CTO mentor to SeaH4



Moubarak Moukaila

BOAD/UNFCC

Carbon Finance Expert
OHA mentor to SeaH4



Cpt. Nick Sloane, FNI

*President of ISU & Director of
Resolve Marine*
Advisor to SeaH4



N. A.

*Managing Partner at xyz Venture
Fund*

Advisor to SeaH4
TO BE CONFIRMED



Naomi Sander

Master of Law

*Legal counsel for African Energy
Company*
OHA mentor to SeaH4



Roger Kranenburg

*VP strategy & policy
EVERSOURCE Energy*
CTO mentor to SeaH4