Ammonia Fueled Boilers for decarbonizing power.

Exploring co-firing, revamping and greenfield strategies.

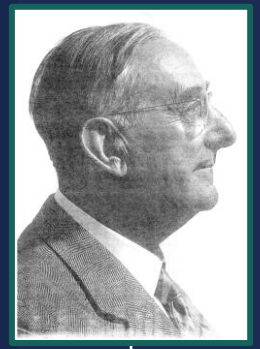
Tim Mulders – Business Development & Sales Manager Americas

Table of contents

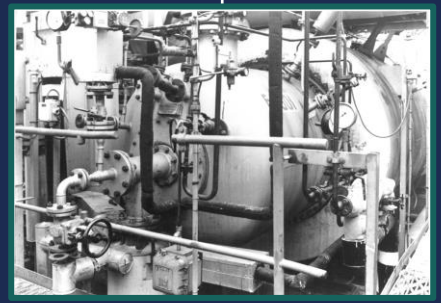
Duiker
CLEAN TECHNOLOGIES

Introduction to Duiker Clean Technologies

1919



1961

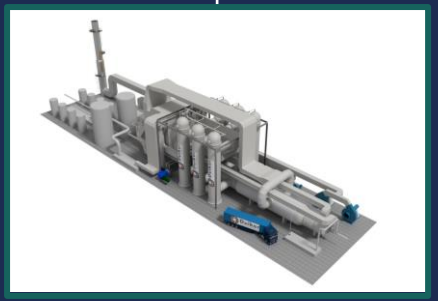


1972

2004

2009

2022



2023

Duiker
CLEAN TECHNOLOGIES

Focus on Clean Technologies

Duiker CLEAN TECHNOLOGIES

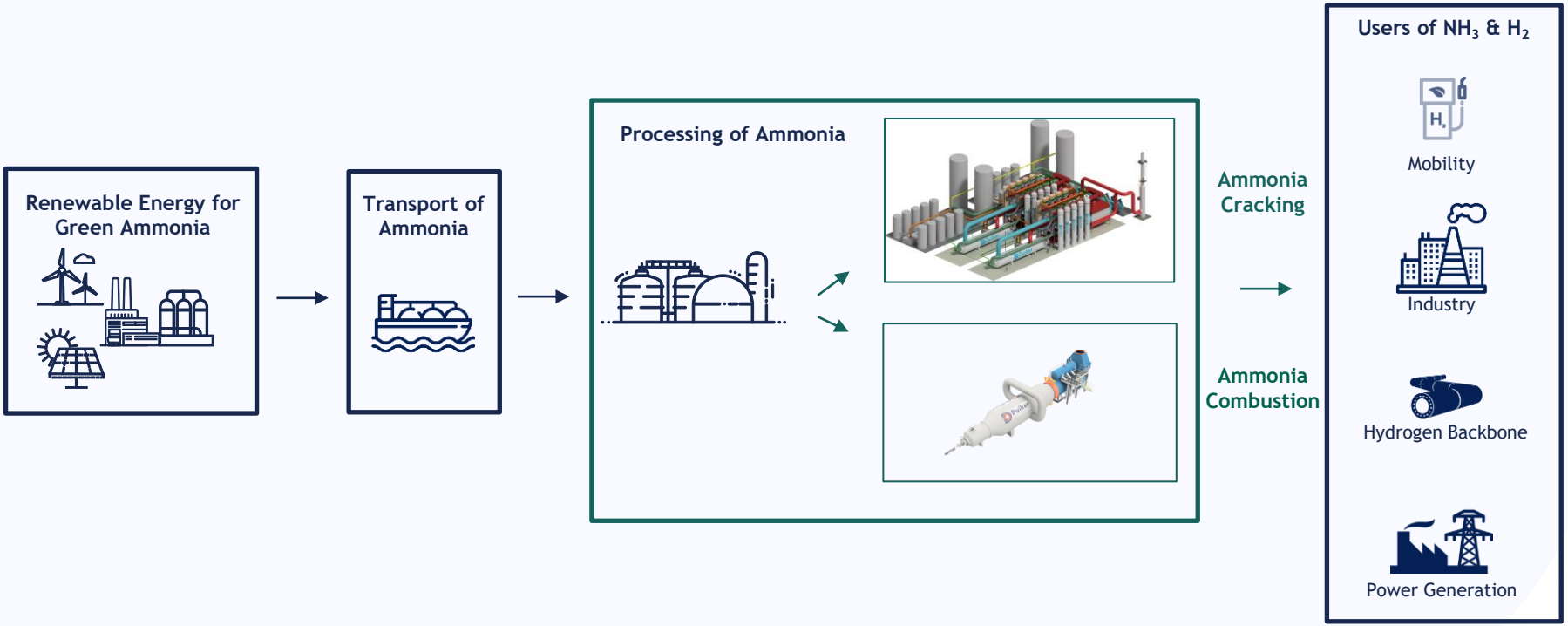
- **S** — Sulfur Solutions
- **CE** — Clean Energy
- **RE** — Reducing Emissions

Ammonia Fueled Boilers

Ammonia to Hydrogen (cracking)

?

Ammonia Value Chain



Duiker CLEAN TECHNOLOGIES

AFB Value Proposition Canvas for the Power Sector

Value Proposition

Products & Services

Ammonia Fueled Boiler (AFB) & Carbon Free Steam (CFS)

Gains Creators

Carbon Free Steam.
Increase lifespan of assets.
Existing infrastructure.
Full value stream.

Pain Relievers

Decarbonize their product.
Use existing infrastructure.

Customer Profile

Gains

Alternative for CFS.
$ < compared to alternatives.
Re-use existing infrastructure.
Carbon Credit.
Green Image.

Jobs

Produce steam.
Profitable for shareholders.
Provide energy to community.
Reduce emissions.

Pains

How to decarbonize.
High feedstock price.
Perceptions & Safety of NH_3.
Existing investments
NO_x & CO_2 emissions.

Duiker CLEAN TECHNOLOGIES

Proven Stoichiometry Controlled Oxidation (SCO) Technology for Ammonia Combustion

Proven in industrial applications

No CO_2 emissions

No soot or particulate emissions

Outlet NO_x 50ppmv @ 3% O_2, dry

Inlet NH_3: 50%-100%

Patented Technology

Duiker
CLEAN TECHNOLOGIES

NH_3 as fuel in boilers

Co-Fired
- ✓ Initial emissions mitigation
- ✓ Blending Ammonia with existing solutions
- ✓ Reduced CO_2 emissions compared to gas fueled boilers

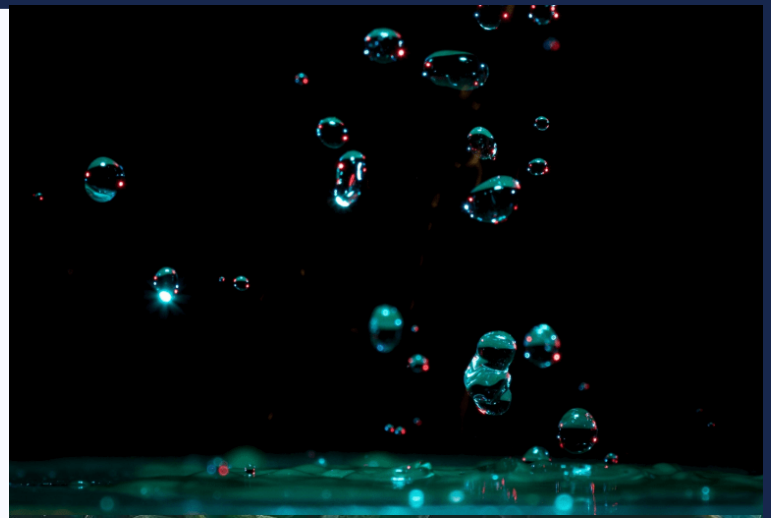
Revamp
- ✓ **No** CO_2 emissions
- ✓ Retrofit with minor changes to existing boilers
- ✓ Extend lifespan of existing equipment
- ✓ Project specific & lower CAPEX

Greenfield
- ✓ **No** CO_2 emissions
- ✓ Boiler efficiencies better than existing solutions for gas fueled boilers
- ✓ Comparable plot size
- ✓ Tailor-made solutions

Duiker CLEAN TECHNOLOGIES

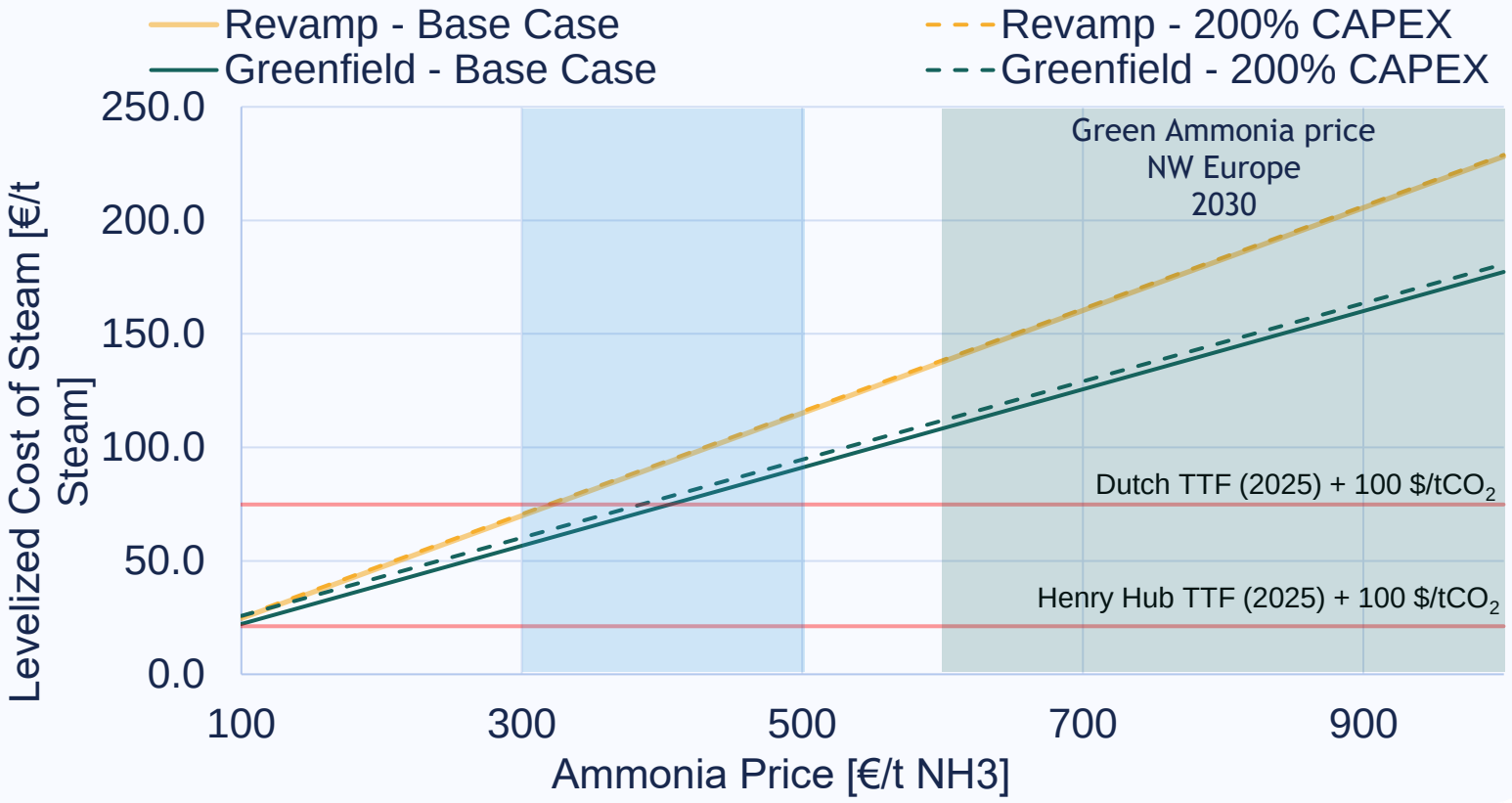
Ammonia Fueled Boilers
Example Case Study

	Revamp	Greenfield
Capacity	28.4 MW_{th}; 34 t/hr steam at 46.5 barg and 400°C	24.7 MW_{th}; 32 t/hr steam at 14 bar and 199°C
Boiler type	A-type	Custom
Capex	20%	100%
Efficiency	85%	97%
NO_x post-SCR	60 PPMV @ 3% O_2	5 PPMV @ 3% O_2
Footprint	Existing boiler + ~75 m^2	Site dependent



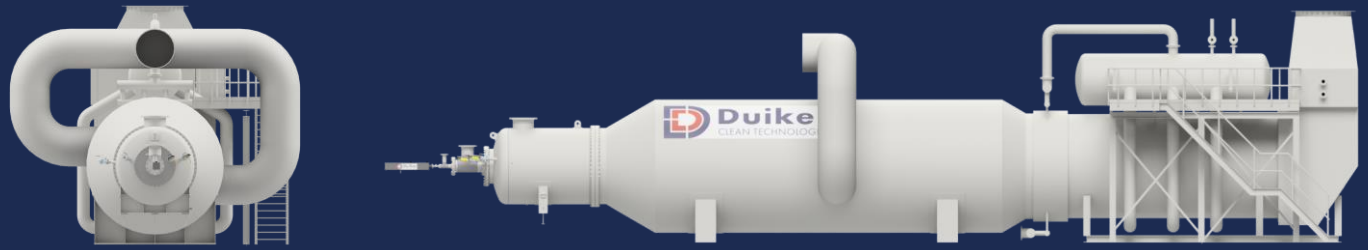
Duiker
CLEAN TECHNOLOGIES

What drives the choice for Revamp or New built?



Duiker CLEAN TECHNOLOGIES

Ammonia: Powering a Carbon Free Energy Future



Ammonia Fueled Boilers

100%
Ammonia is ready to be used in a stable and safe manner in combustion.

25%
Reduction in the average energy intensity of production by 2050 in scenarios by IEA.

0%
Ammonia Fueled Boilers enables CO2 emission reduction for existing boilers.

100%
Patented and industrially proven SCO technology at the heart of Ammonia Fueled Boilers.

3
Duiker offers ammonia fueled solutions for various types of boilers.

Duiker
CLEAN TECHNOLOGIES

Duiker
CLEAN TECHNOLOGIES

Questions?

Contact:
Tim Mulders
Mulders@duiker.com

Jebin James
James@duiker.com