

WASTE TO CHEMICAL TASK 33

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MAIRE TECNIMONT GROUP

OPERATING COMPANIES

PRESENCE IN THE WORLD



HYDROCARBONS

GREEN ENERGY

~9,100

EMPLOYEES & PROFESSIONALS

50

OPERATING COMPANIES

45

COUNTRIES

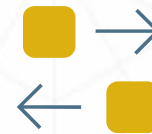
FY 2019 & 2020 RESULTS



REVENUES



EBITDA



BACKLOG

2020

€2.6 BLN

€172 MLN

€6.0 BLN

2021

€2.8 BLN

€174 MLN

€9.5 BLN



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A TECHNOLOGICAL APPROACH TO GREEN ENERGY

* Data are based on corporate analysis
** Completed

	HYDROCARBONS	PETROCHEMICALS	FERTILIZERS	OIL & GAS REFINING	ENERGETIC & NEW POWER
		WELL ROOTED TECHNOLOGY ORIENTATION: MARKET LEADER (#1) FOR INSTALLED CAPACITY (last 10ys)			
		30% MARKET SHARE IN POLYOLEFIN PLANTS	52% MARKET SHARE IN LICENSING UREA PLANTS TECHNOLOGY (#1 worldwide)*	WELL RECOGNIZED LEADERSHIP IN LICENSING HYDROGEN TECHNOLOGY AND IN LICENSING SULPHUR	21GW INSTALLED WORLDWIDE
		50% MARKET SHARE IN LDPE PLANTS	33% MARKET SHARE IN LICENSING UREA GRANULATION TECHNOLOGY (#2 worldwide)*	RECOVERY AND TAIL GAS TREATMENT TECHNOLOGY	7 th RANK ENR WORLD TOP-10 POWER MARKET ENGINEERING COMPANIES 2016
		Since 1970 MORE THAN 210 POLYETHYLENE AND POLYPROPYLENE PLANTS **	Since 1924 175 AMMONIA AND UREA PLANTS**	Since 1971 MORE THAN 250 HYDROGEN AND SULPHUR RECOVERY UNIT PROJECTS**	Since 1962 MORE THAN 280 POWER GENERATION PROJECTS

	GREEN ENERGY
	<ul style="list-style-type: none"> • PLASTIC UPCYCLING • PLASTIC CHEMICAL RECYCLING • WASTE TO CHEMICALS • GREEN CIRCULAR DISTRICT • BIO-POLYMERS
	<ul style="list-style-type: none"> • GREEN AMMONIA • UREA AND NITRIC ACID BASED ON SUSTAINABLE FEEDSTOCK
	<ul style="list-style-type: none"> • RENEWABLE DIESEL (HVO) • SUSTAINABLE AVIATION FUEL FROM HVO • 2G BIO-ETHANOL • CO₂ CAPTURE AND VALORIZATION
	<ul style="list-style-type: none"> • RENEWABLE ENERGY • GREEN HYDROGEN (ELECTROLYSIS) • ELECTRIC BLUE HYDROGEN (ELECTRICAL SMR) • ELECTROCHEMISTRY/POWER TO X • WASTE TO ENERGY
	TECHNOLOGIES FOR ENERGY TRANSITION: 5 PROPRIETARY 6 UNDER PARTNERSHIP FOR EXCLUSIVE LICENSING
	OVER 20 WITH A ROLE OF INTEGRATOR & EPC
	OVER 12 RESEARCH PROJECTS WITH A ROLE OF PARTNER / COORDINATOR

1,725 Cumulated Patents

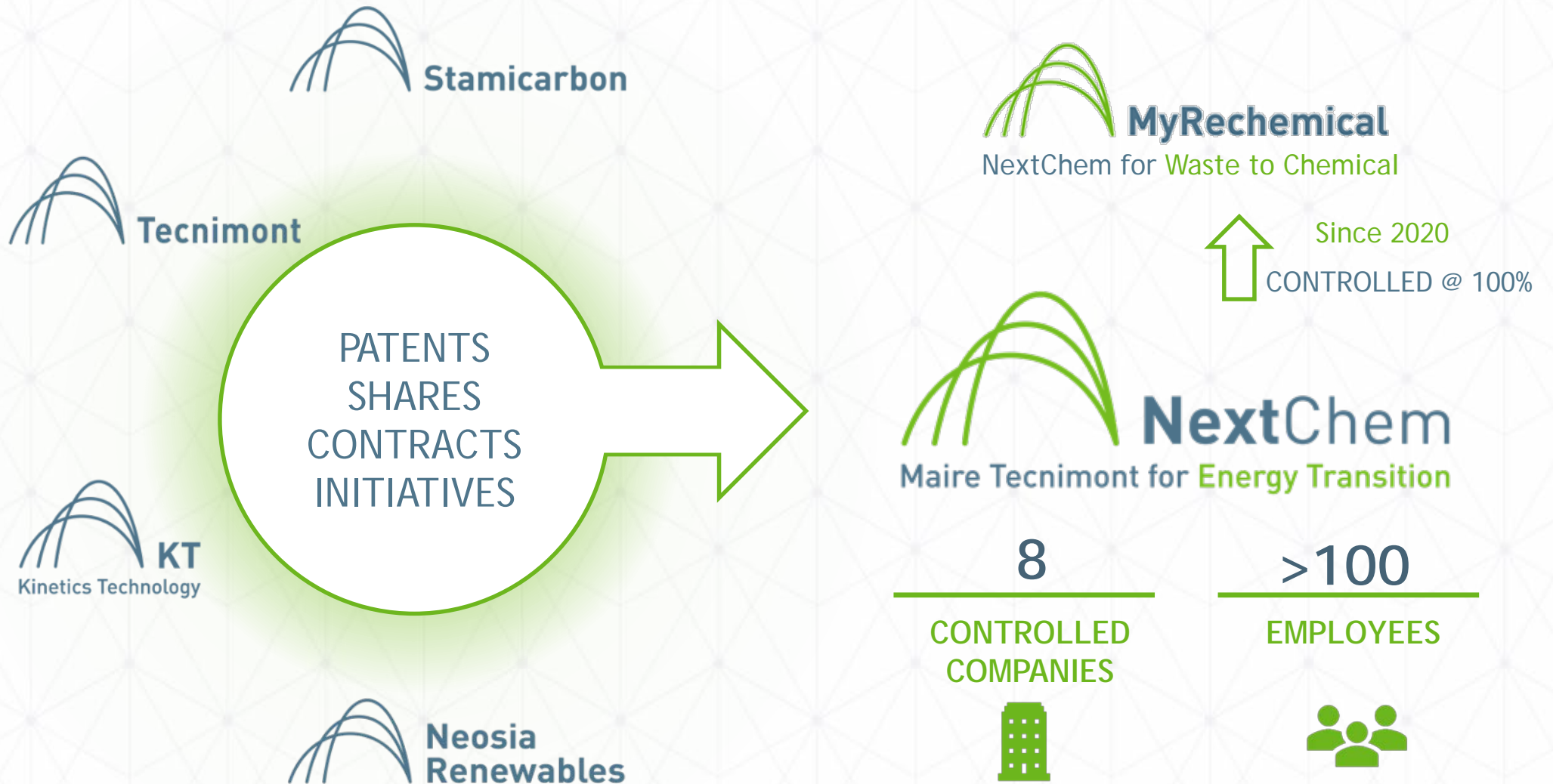
STRONG COMMITMENT TO TECHNOLOGY DEVELOPMENT

€56MN INVESTED IN INNOVATION

70 R&D PROJECTS

IN GREEN ACCELERATION (LAST 5ys)

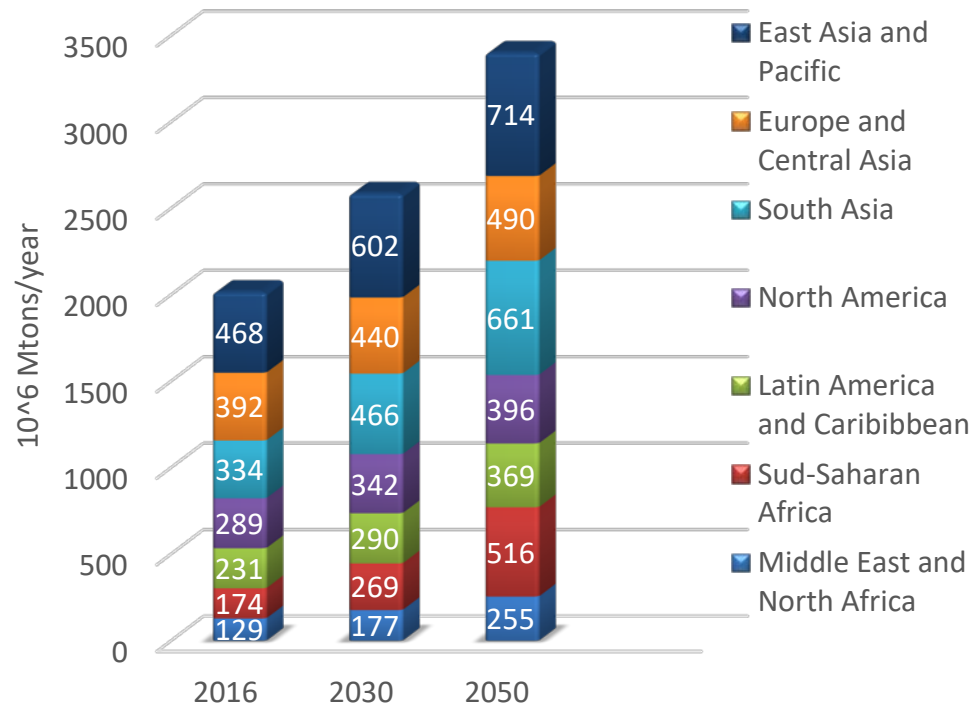
DEFINING THE GREEN PERIMETER: NEXTCHEM INCEPTION





WORLD MUNICIPAL SOLID WASTE PRODUCTION 2016-2050

WORLD PRODUCTION OF WASTE IS CLOSED TO 2 BILION MTONS PER YEAR.
DUE TO GROWTH OF POPULATION AND GDP, IT IS EXPECTED TO REACH 3,4 BILION MTON PER YEAR IN 2050 (WORLDBANK).



0.74 kg per day per capita
(but ranges widely, from 0.11 to 4.54)



REFUSE DERIVED FUEL

C	32-55% w
H	5-8% w
O	20-28% w
Cl	0.5-3% w
N	0.5-1.5% w
S	0.1-1% w
Moisture	10-20% w
Ashes	5-20% w

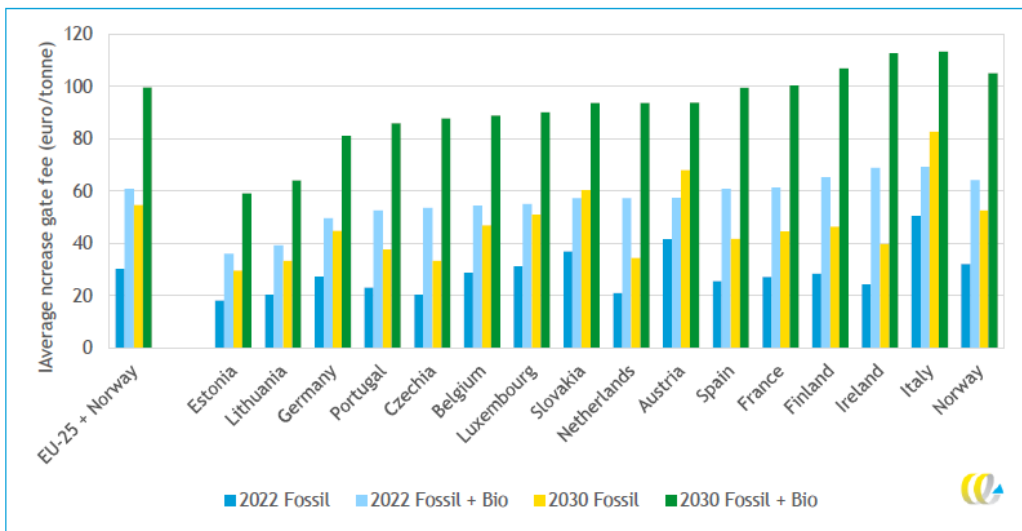


Non RECYCLABLE PLASTIC

C	47-61%
H	5-7%
O	14-20%
Cl	0.8-1.5%
N	0.2-0.5%
S	0.02-0.3%
Moisture	5-9%
Ashes	7-20%

WASTE MANAGEMENT ENTERING IN ETS SCHEME

PROPOSED INCLUSION OF MUNICIPAL WTE IN ETS



[ZWE_Delft_Oct21_Waste_Incineration_EUETS_Study.pdf \(zerowasteeurope.eu\)](#)

EU ETS CO2 PRICES



[Carbon Price Viewer - Ember \(ember-climate.org\)](#)

PROPOSED WTE INCLUSION IN ETS

As the official procedures at the European Parliament are moving towards the Committee votes on the revision of the EU Emissions Trading System Directive, ESWET – the European Suppliers of Waste to Energy Technology reflects on the necessity to safeguard the efficiency and sustainability of the waste management sector.

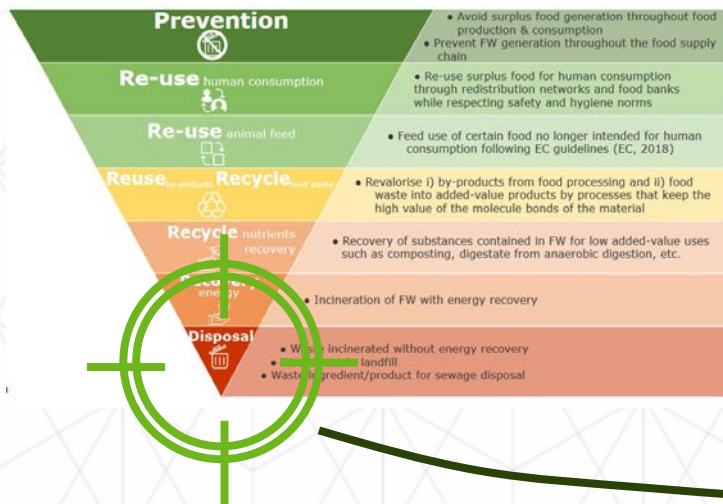
In his draft report, MEP Peter Liese has proposed the inclusion of municipal waste incineration in the ETS from 2028.

ESWET understands the proposal for inclusion, albeit they find there is room for improvements.

EU suppliers of WTES are aiming to technology improvement to reduce CO2 emissions by WTE (i.e. carbon capture) to keep competitiveness outcoming impact of inclusion in ETS scheme.

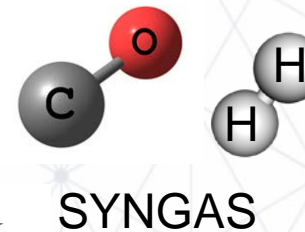
WTE TECHNOLOGIES PERMIT MUCH LOWER CO2 EMISSION PER TON OF WASTE FEEDSTOCK BY CAPTURING PART OF THE CARBON IN THE PRODUCT.

CHEMICAL CONVERSION OF WASTE, HIGHLIGHTS



Stabilization Zone

1000-1200°C



Reaction Zone

600-800°C

Melting Zone

1600-2000°C

RDF, PLASMIX

Slag

Vitrified inert fraction (granulate)



Ceramic Industry



Rockwool

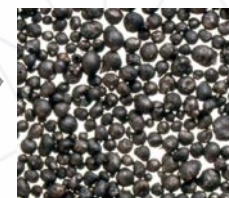


Civil application

INERTS
 ≈ 10% in mass
 ≈ 1% in volume



METALS
 ≈ 1% in mass
 ≈ 0,15% in volume

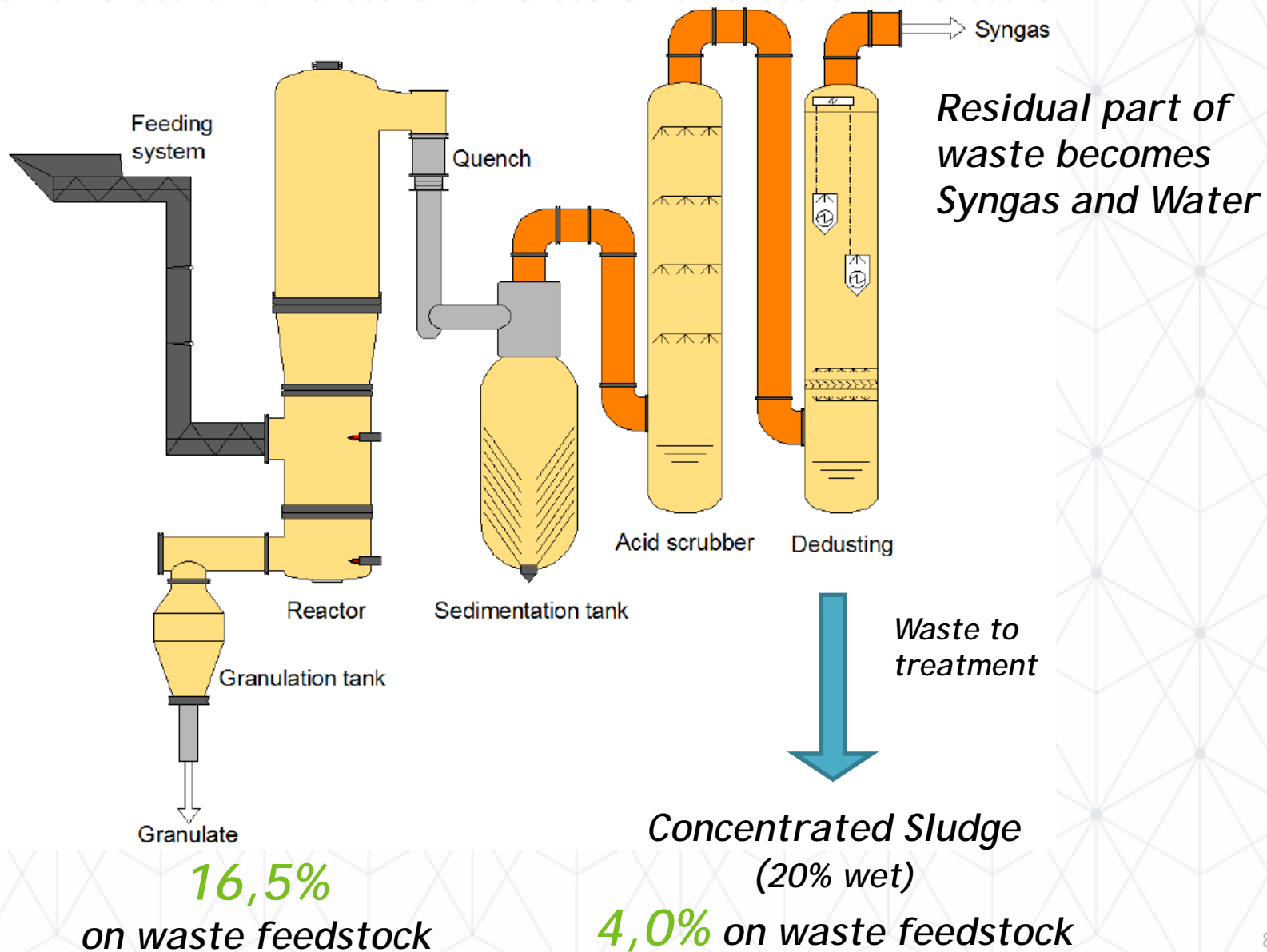


Steel production

WASTE TO CHEMICAL TECHNOLOGY - OVERALL BALANCE

Waste composition

C	38,88 %
H	5,38 %
O	21,54 %
N	0,85 %
S	0,20 %
Cl	0,93%
Moisture	15,70 %
Fly ashes	16,52 %



INERT VETRIFIED GRANULATE

Studies carried out by the University of Modena and Reggio Emilia "**UNIMORE**" have shown the following results:

- ✓ Chemical analysis classified the granulate as an **INERT AMORPHOUS MATERIAL** (vetrified)
- ✓ Elution test passed. It can acquire the qualification of "product". **IT IS NOT A WASTE.**
- ✓ The material is suitable for use in the field of bricks, steels, cements and abrasives

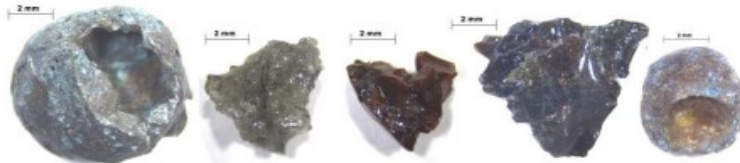


UNIMORE
UNIVERSITÀ DEGLI STUDI DI
MODENA E REGGIO EMILIA

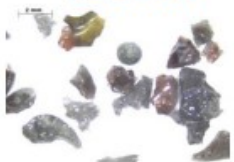
GRANULATO VETRIFICATO

FORTE ETEROGENEITA'

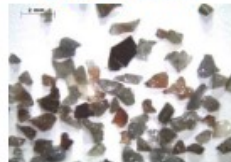
FRAZIONE 4-8 mm



FRAZIONE 1-2 mm



FRAZIONE 0.5-1 mm



FRAZIONE 0.25-0.5 mm



ANALISI CHIMICA

Metodo	Parametro	Valore
UNI14346	Residuo 105°C (%)	100
IRSAQ64	Residuo 550°C (%)	100
UNI13657+UNI11885	Alluminio (mg/kg)	75000 *
UNI13657+UNI11885	Antimonio (mg/kg)	<5
UNI13656+APAT3130A	Calcio (mg/kg)	94000 *
UNI13657+UNI11885	Arsenico (mg/kg)	8
UNI13657+UNI11885	Bario (mg/kg)	1800
UNI13657+UNI11885	Berillio (mg/kg)	<1
UNI13657+UNI11885	Ferro (mg/kg)	130000 *
UNI13657+UNI11885	Cadmio (mg/kg)	<5
UNI13657+UNI11885	Cobalto (mg/kg)	76
UNI13657+UNI11885	Cromo totale (mg/kg)	3100
IRSAQ64	Cromo VI (mg/kg)	<5
UNI13657+UNI11885	Fosforo (mg/kg)	3900
UNI13657+UNI11885	Magnesio (mg/kg)	8100

Metodo	Parametro	Valore
UNI13657+UNI11885	Manganese (mg/kg)	2500
UNI13657+EPA6010	Mercurio (mg/kg)	<1
UNI13657+UNI11885	Nichel (mg/kg)	1300
UNI13657+UNI11885	Piombo (mg/kg)	290
UNI13657+UNI11885	Rame (mg/kg)	6000
UNI13657+UNI11885	Silicio (mg/kg)	260000 *
UNI13657+UNI11885	Selenio (mg/kg)	<5
UNI13657+UNI11885	Stagno (mg/kg)	160
UNI13657+UNI11885	Titanio (mg/kg)	3300
UNI13657+UNI11885	Vanadio (mg/kg)	54
UNI13657+UNI11885	Zinco (mg/kg)	2200
EPA3010+APAT3240A	Potassio (mg/kg)	2100
EPA3010+APAT3270A	Sodio (mg/kg)	8100
EPA5050+EPA9056A	Cloro totale (%)	0.23
EPA5050+EPA9056A	Zolfo totale (%)	0.10

* ELEMENTI PRINCIPALI

WASTE CONVERSION TO H2, CHEMICALS, FUELS, FERTILIZERS, GREEN STEEL

Waste Co

Almost all kind of WASTE, SLUDGES, BIOFEEDSTOCKS (WOOD)



i.e. RDF (refused derived fuel) and unrecyclable plastic

Gasification

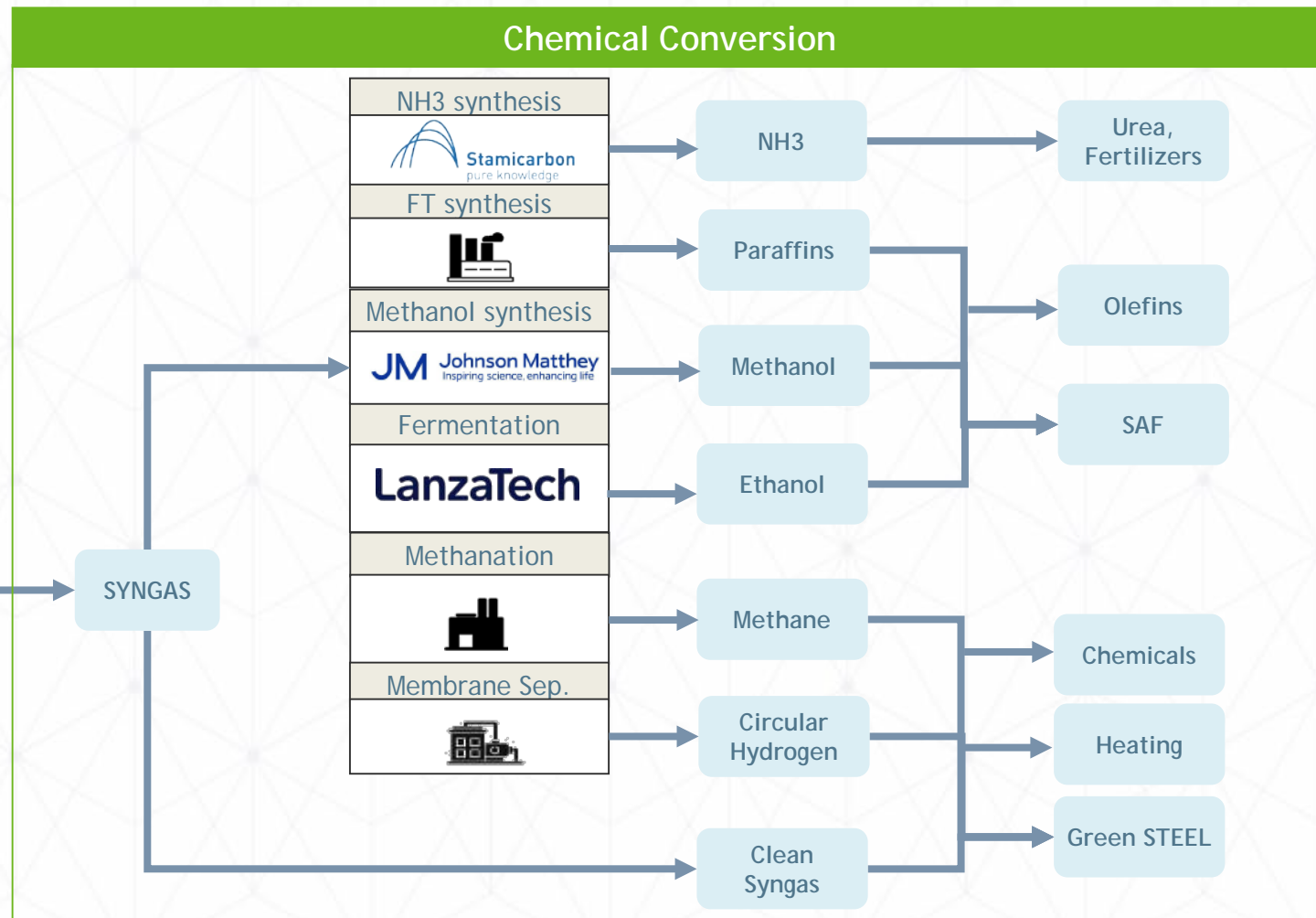


23 years of industrial operation

14 lines in 6 sites

Fully integrated technology
SINGLE POINT ACCOUNTABILITY
from license to EPC

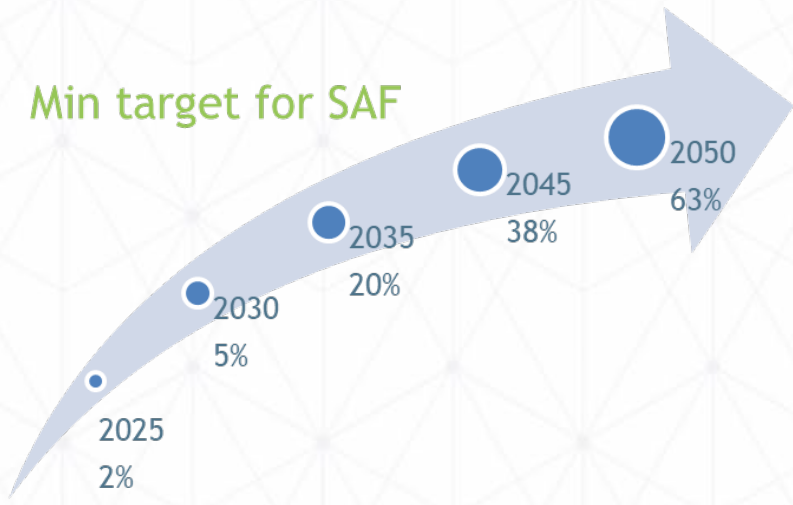
Chemical Conversion



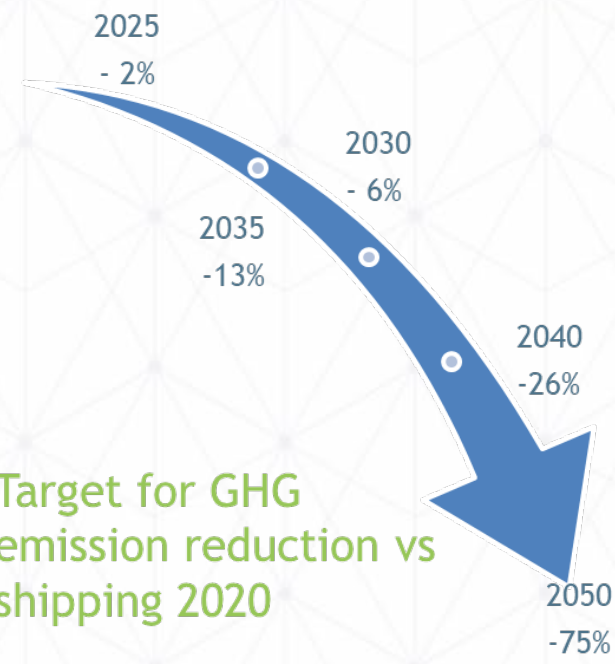


EU MARKET DRIVERS- FUELS REGULATION

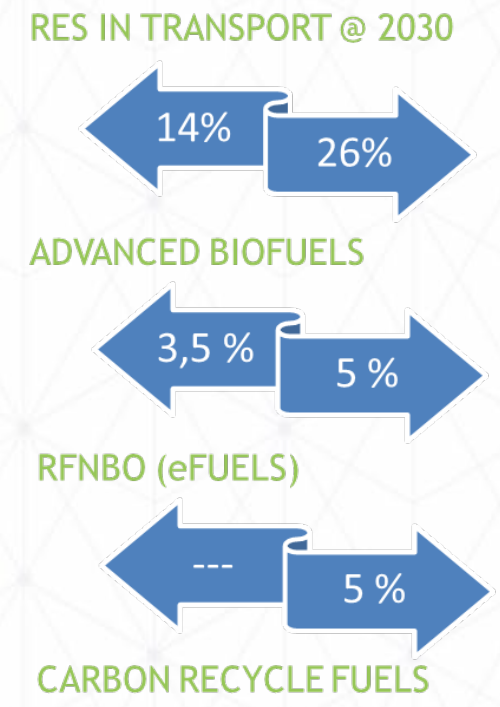
✓ ReFuelEU Aviation
sustainable aviation fuels
(14.07.2021)



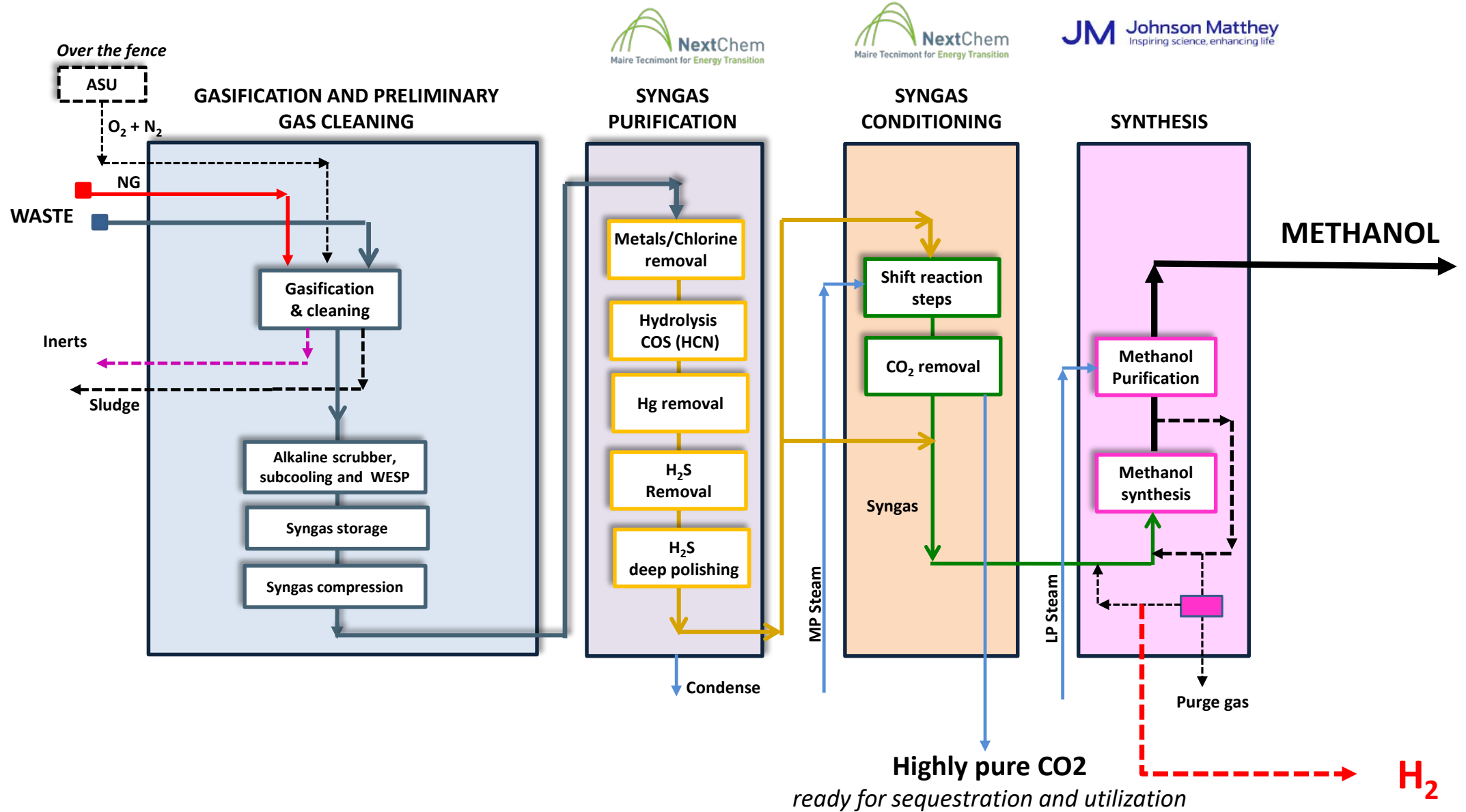
✓ ReFuelEU Maritime
green European maritime space
(14.07.2021)



✓ Amendment of the*
Renewable Energy Directive
(RED)

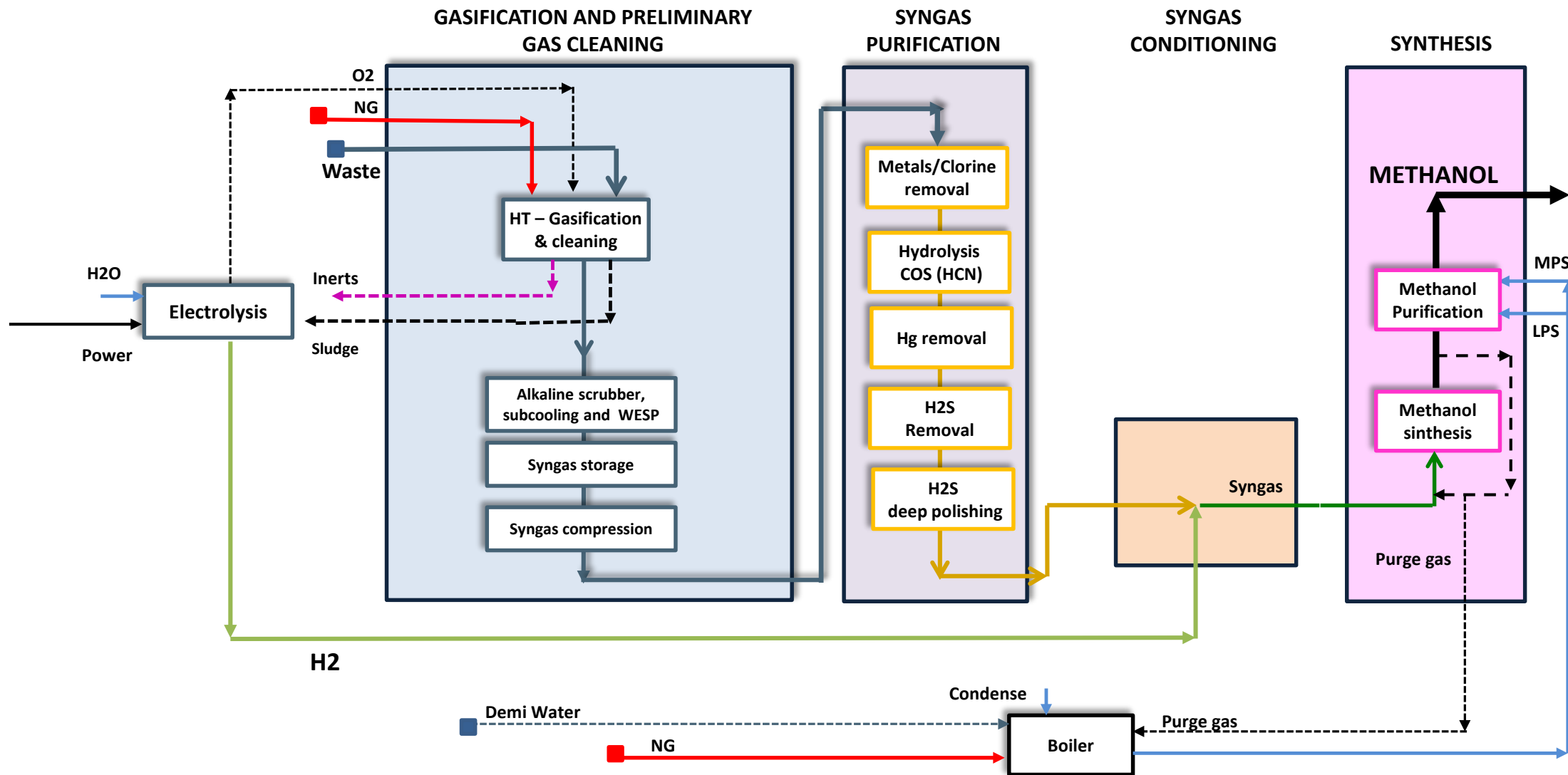


WASTE TO METHANOL AND H2

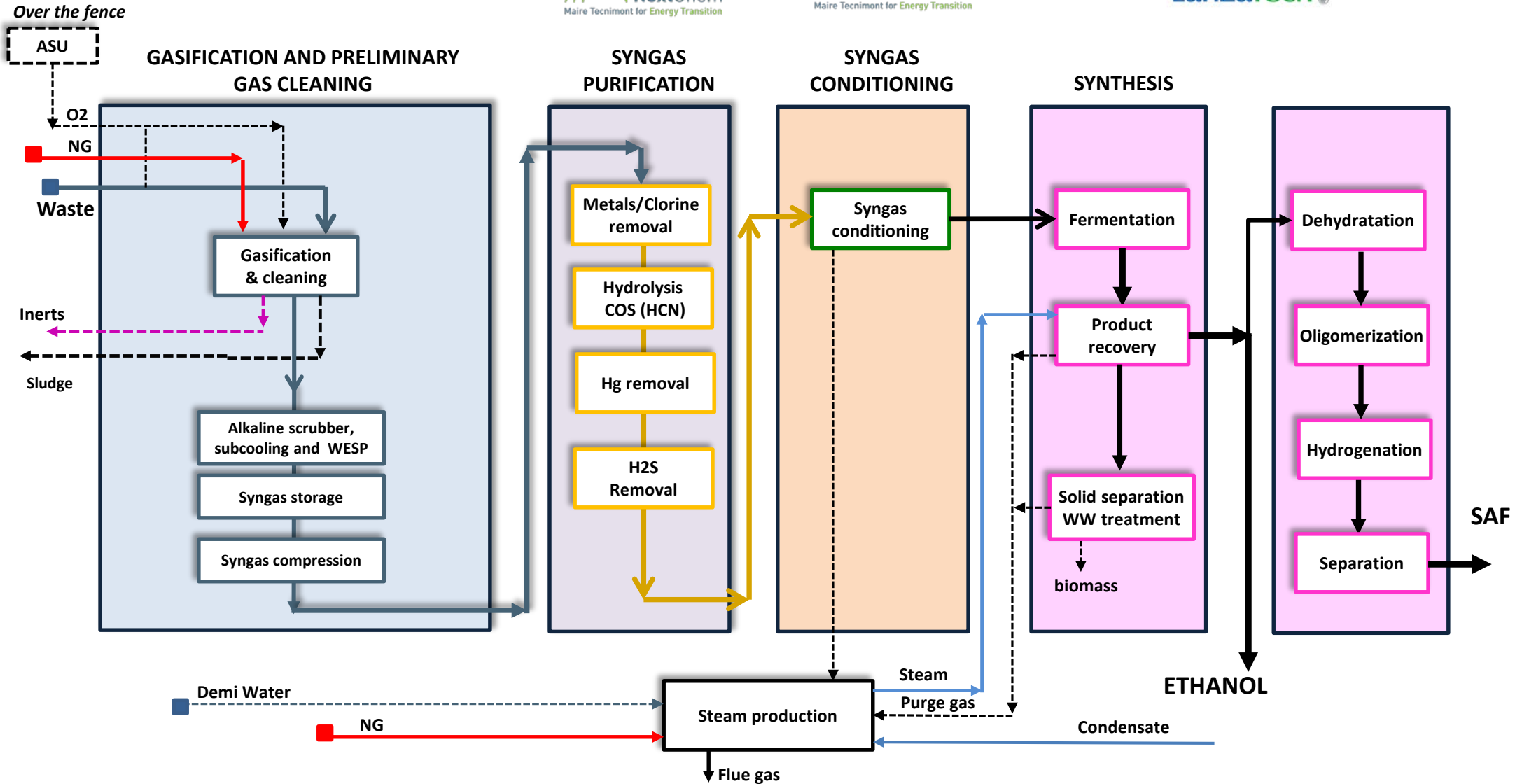


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WASTE TO METHANOL + ELECTROLYSIS



WASTE TO ETHANOL → SAF



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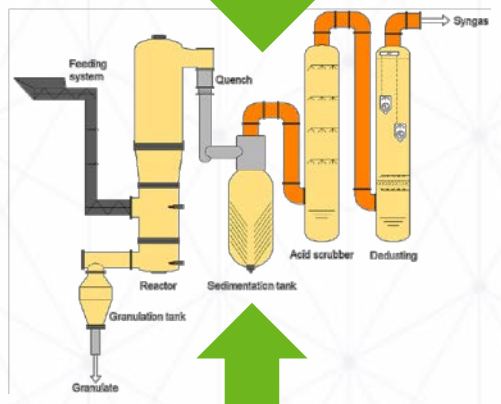
PROJECT DEVELOPMENT

 **MyRechemical**
 SINGLE POINT
 ACCOUNTABILITY
 (FROM LICENSE TO EPC)
 INTERFACE MANAGEMENT
 DERISKING

Fit for
%55
 FAVOURABLE REGULATORY
 ENVIRONMENT


 GREEN FINANCE /
 EQUITY INVESTORS

WASTE MANAGEMENT
 COMPANY
 ASSURING FEEDSTOCK
 SUPPLY CHAIN



 **CATALYST EUROPE**
 INNOVATION FUND
 programme

 PUBLIC FUNDING


 PRODUCT OFF-TAKER
 ASSURING PRODUCT
 OFF-TAKING

 **Maire
 Tecnimont**
 MET DEVELOPMENT STRATEGY
 FOR GREEN PROJECTS


 Production Operator
 ASSURING PLANT
 OPERATION AND HSE

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IPCEI - HY2USE

GRANT OF €194 MILLION ASSIGNED TO NEXTCHEM AS PART OF THE “IPCEI Hy2USE” EU PROJECT FOR THE DEVELOPMENT OF THE FIRST WASTE TO HYDROGEN PLANT IN THE WORLD

Waste to Chemicals

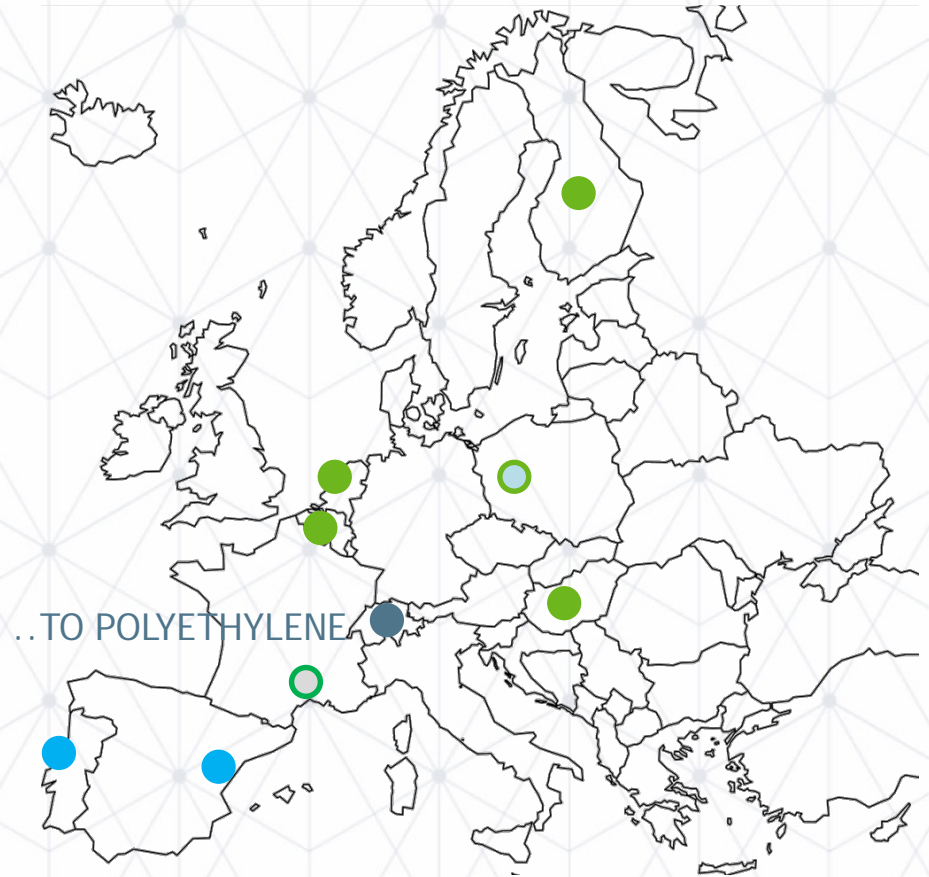
NextChem's **Waste to Chemicals** technology, commercialized through MyRechemical, represents the state of the art for the recover of non-recyclable waste.

The recent award of €194 MN grant by the IPCEI EU Project for the Hydrogen Valley of Rome has demonstrated how **Waste to Chemicals overcomes waste-to-energy**.

The European Commission has decreed that Waste to Chemicals and the H₂ produced through this technology are perfectly **compatible with European decarbonization policies** and therefore considered **Taxonomy Compliant**.



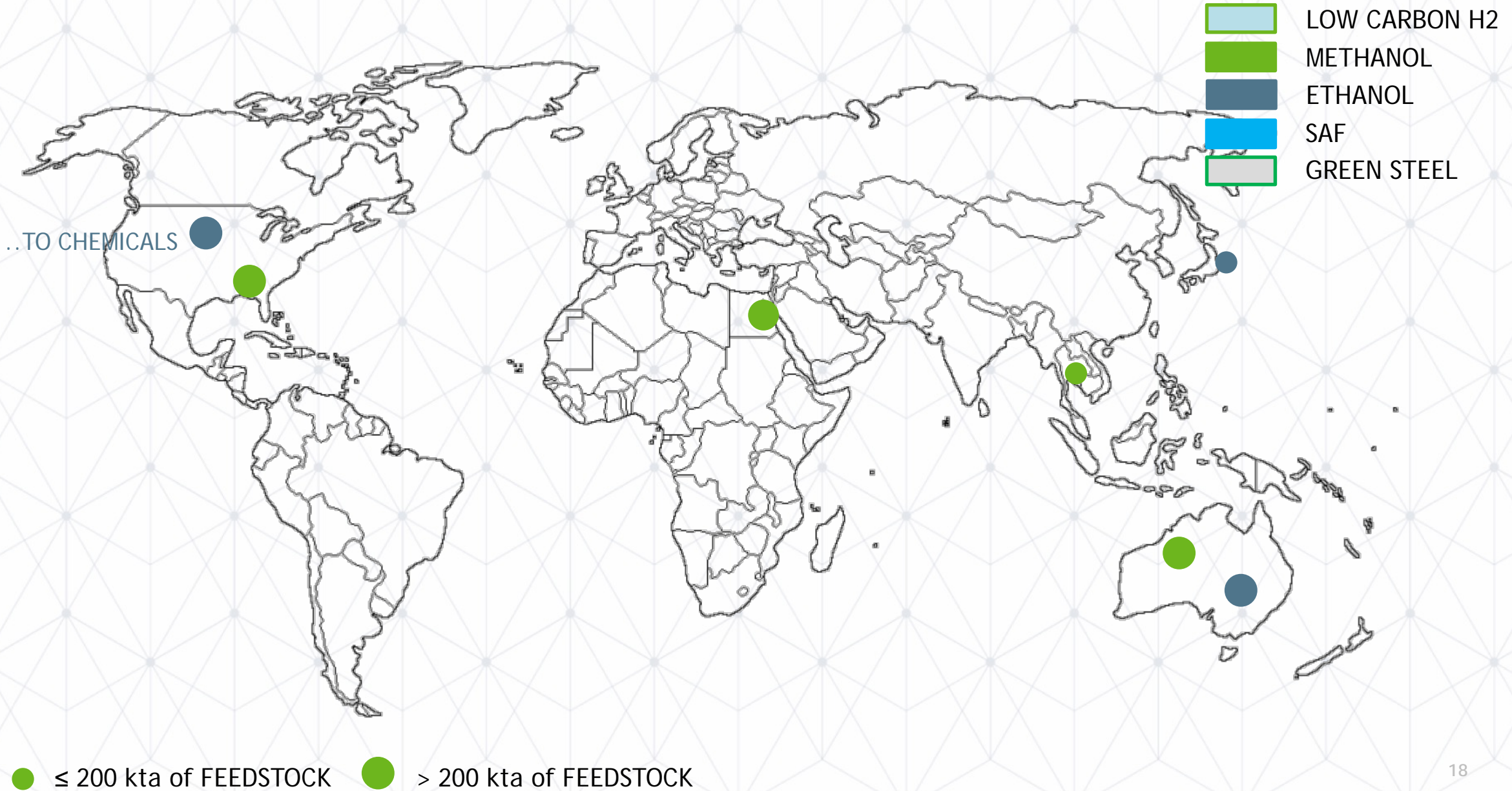
WASTE TO CHEMICAL, MAIN INITIATIVES IN BUSINESS PIPELINE



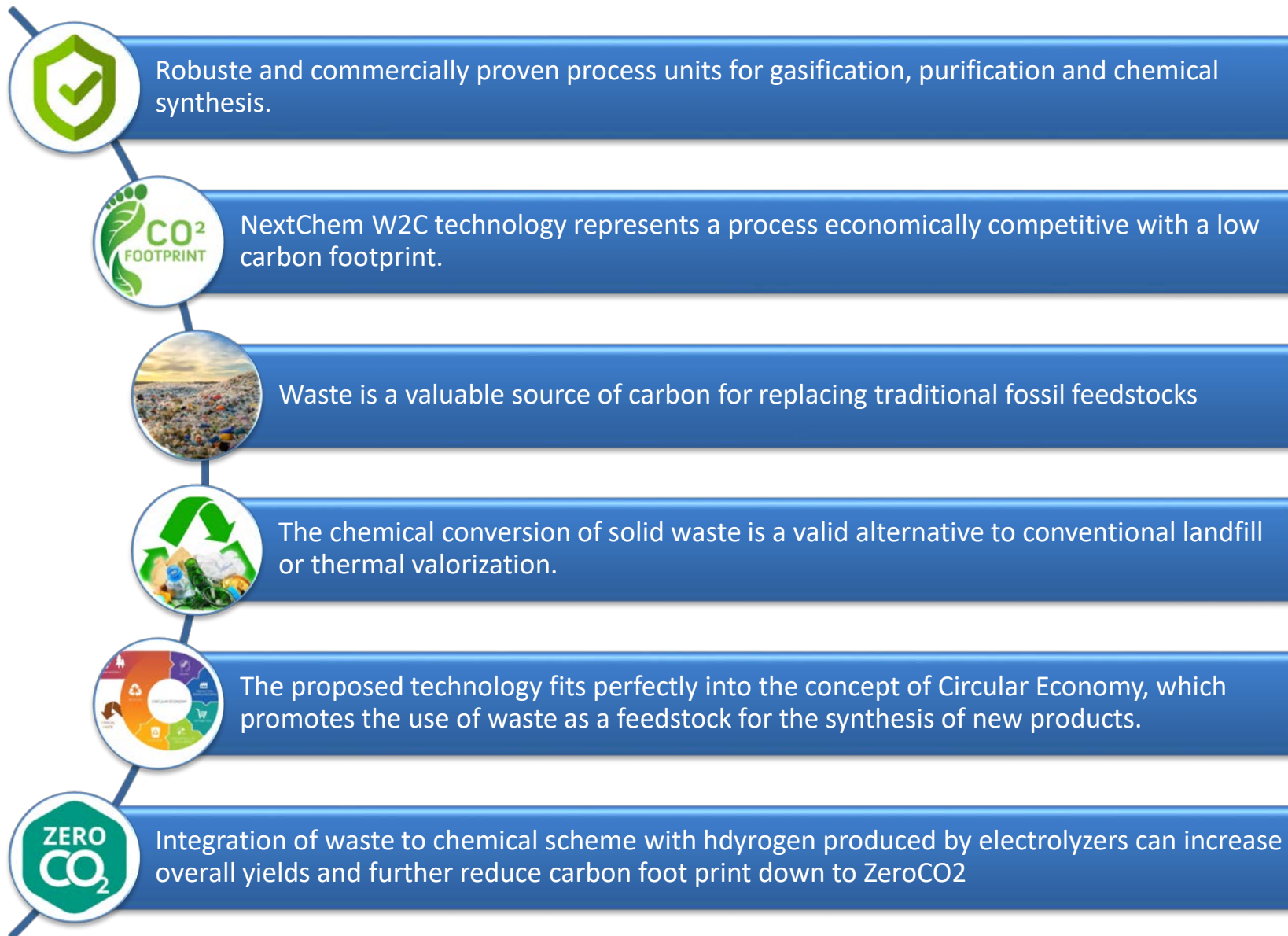
● ≤ 200 kta of FEEDSTOCK
 ● > 200 kta of FEEDSTOCK

- LOW CARBON H2
- METHANOL
- ETHANOL
- SAF
- GREEN STEEL

WASTE TO CHEMICAL, MAIN INITIATIVES



CONCLUSIONS



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