Workshop

THE NEED FOR A CLIMATE NEUTRAL INTEGRATED SYS-TEM PACKAGE FOR ENERGY

& Best Practice Fair

Renewables Grid Initiative

KEYNOTE

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 # EnergyPackage

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Building a sustainable and circular industry through partnerships

Workshop: The need for a Climate Neutral Integrated System Package for Energy

- **Brussels, Renewables Grid Initiative**
- **November 20st 2019**

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AkzoNobel
SPECIALTY CHEMICALS

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Together we can initiate, build and develop the sustainable solutions for our future economy

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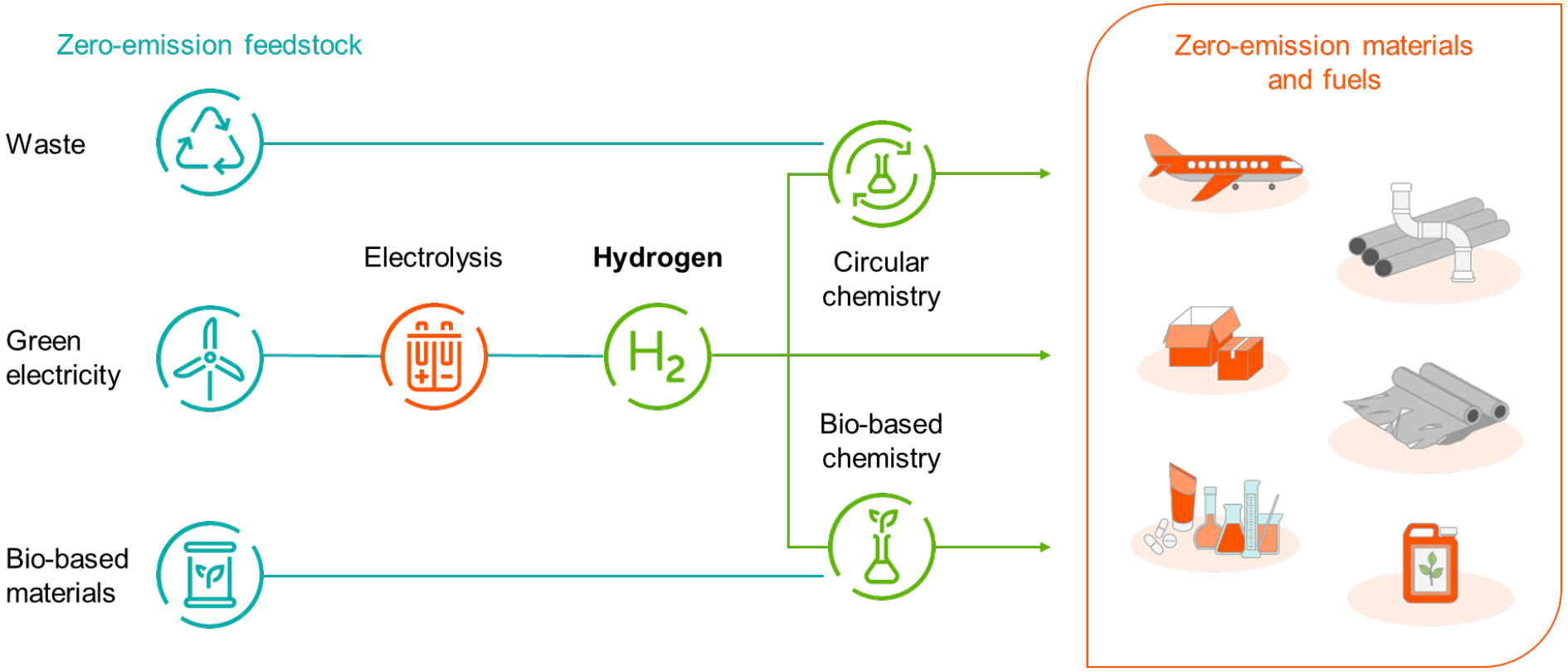
We are looking for and invite partners, along the value chains, to build location specific industrial scale solutions for zero emission materials and fuels.



Electrolysis is in the heart of our global business, the basis for green electrochemistry

Nouryon

Nouryon

Active in electrochemistry since 1899

Water electrolysis since 1940

50% share of renewable energy

Chlor-alkali	Sodium chlorate	Water electrolysis
		
Installed capacity: 380 MW H_2 production: 38 kta	Installed capacity: 620 MW H_2 production: 62 kta	Installed capacity: 10 MW H_2 production: 1.5 kta

Nouryon operates 1000 MW of electrolysis capacity

Through partnerships building the circular economy, a strong need for scale-up and innovation

Our development pipeline of green hydrogen projects

2 MW Carbon2Chem Duisburg (DE)	20 MW | 3kt H2 Delfzijl (NL)	40 MW | 6kt H2 Delfzijl (NL)	100 MW | 15kt H2 IJmuiden (NL)	250 MW | 45kt H2 Rotterdam (NL)
thyssenkrupp Nouryon	Nouryon gasunie BioMCN	Nouryon gasunie KLM SHV ENERGY SkyNRG	Nouryon TATA STEEL Port of Amsterdam	Nouryon bp Port of Rotterdam

Research & enablers

Bus pilot Delfzijl (NL)	Certification of green hydrogen (EU)	H2 for biofuels Sweden	HydroHub (NL)	Hypos Germany
Qbuzz ov bureau provincie groningen PITPOINT GRONINGEN SEAPORTS Nouryon	CertifHy Hydrogen Europe Nouryon	Swedish Energy Agency RI. SE Nouryon	ISPT Nouryon YARA	HYPOS Nouryon

Waste to Chemicals Rotterdam: Building a circular value chain with a strong industrial consortium

Production in 2022:

- 220,000 tons of methanol from 309,000 tons of waste
- CO_2 reduction: 300,000 ton
- Est. Investment: > €240 million

Partners:

Enerkem

Port of Rotterdam

Shell

Air Liquide

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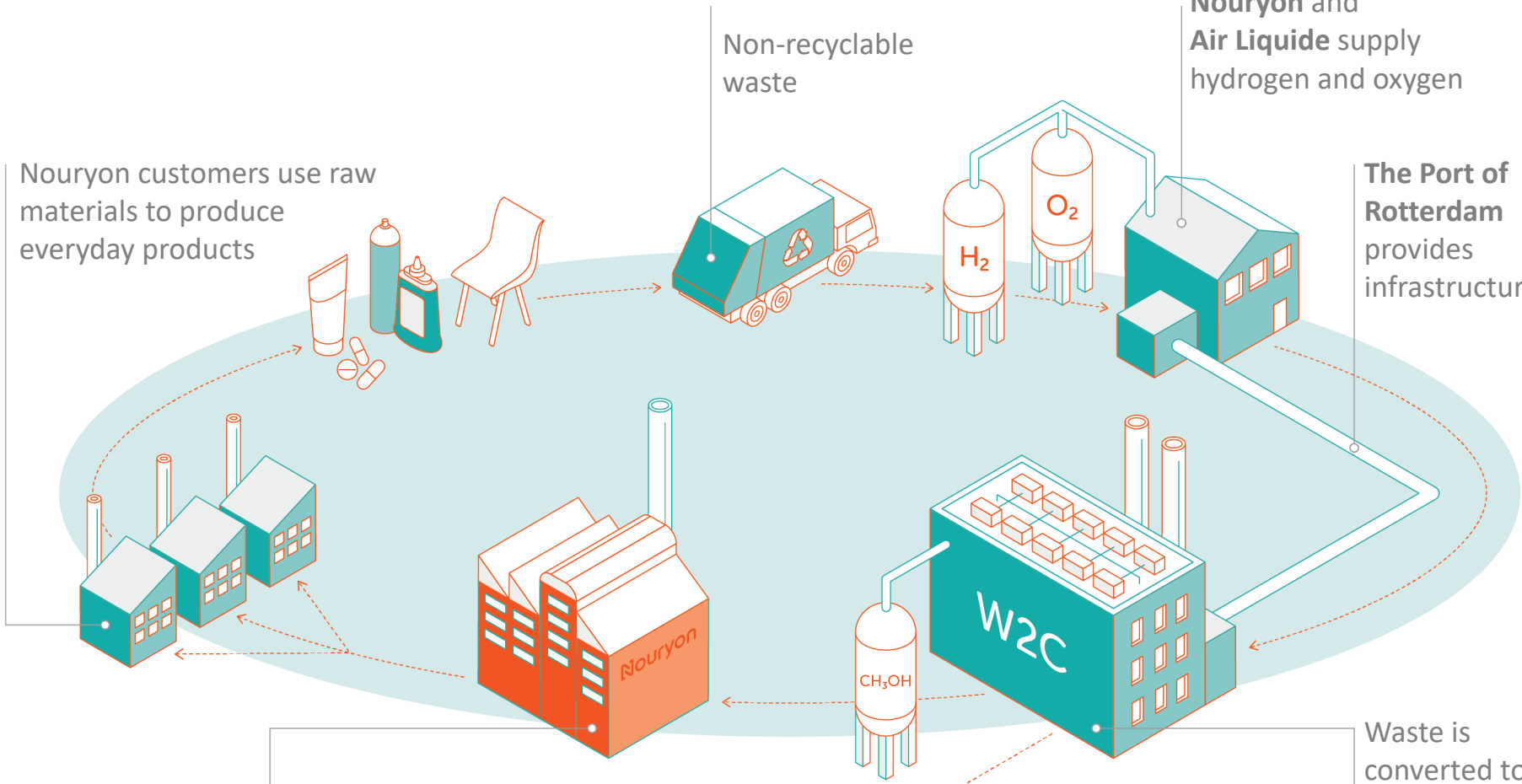

An integrated value chain to enable industrial decarbonization and balance the energy system

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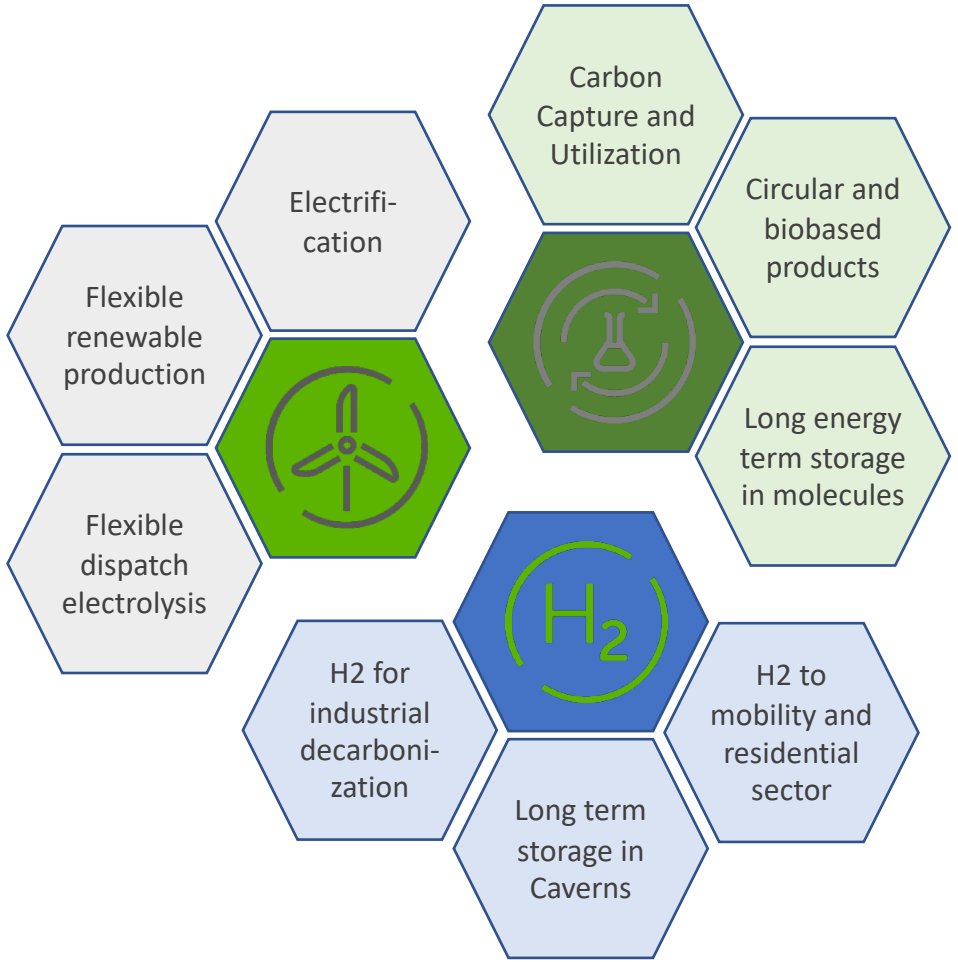
Acceleration of renewable energy production to directly decarbonize our economy and be the feedstock for molecules

Scale-up H2 production to reduce emissions in our existing economy but also create our new industry, while supporting the electricity system and give long term storage



Building new value streams from the carbon molecule with the combination of hydrogen, forming the basis of the green, biobased and circular economy

Current market model is not supporting the transition, it creates unpredictable and variating prices…

	Marginal pricing Market Model
Basis for pricing	Marginal unit in merit curve
Included in pricing	Climate cost included such as ETS, levies, taxes and grid costs
Main benefits / risks	High, unpredictable and variating price setting
Effect	Effective market, but hurdle in transition

…while most renewable energy production is based on high capital investments and limited operational costs

	Capital pricing Market Model
Basis for pricing	Cost plus
Included in pricing	Primarily capital cost based, main climate costs excluded
Main benefits / risks	Moderate and long term predictable price setting
Effect	Supporting transition but less effective market

An adapted market model is needed to drive the transition

	Marginal pricing Market Model	Hybrid pricing Market Model	Capital pricing Market Model
Basis for pricing	Marginal unit in merit curve	Normal market conditions will continue with the exception of specific projects using green electricity essential in the energy transition aimed at: • Electrification • Green Hydrogen • Power to Heat	Cost plus
Included in pricing	Climate cost included such as ETS, levies, taxes and grid costs		Primarily capital cost based, main climate costs excluded
Main benefits / risks	High, unpredictable and variating price setting		Moderate and long term predictable price setting
Effect	Effective market, but hurdle in transition		Supporting transition but less effective market
Considerations	Limiting the volumes affecting the marginal pricing		Mechanism to facilitate high load hours while support security of supply (balancing)

The full transition should benefit all, only through cooperation we can secure our future

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Create jobs and economic development

- Build future-proof industry
- Development of renewable energy
- New infrastructure

Build greener industries

- Low-carbon
- Circular
- Bio-based

Develop sustainable materials and fuels