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KIVI Energy meeting: AkzoNobel Green Hydrogen

Joost Sandberg
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Today's story

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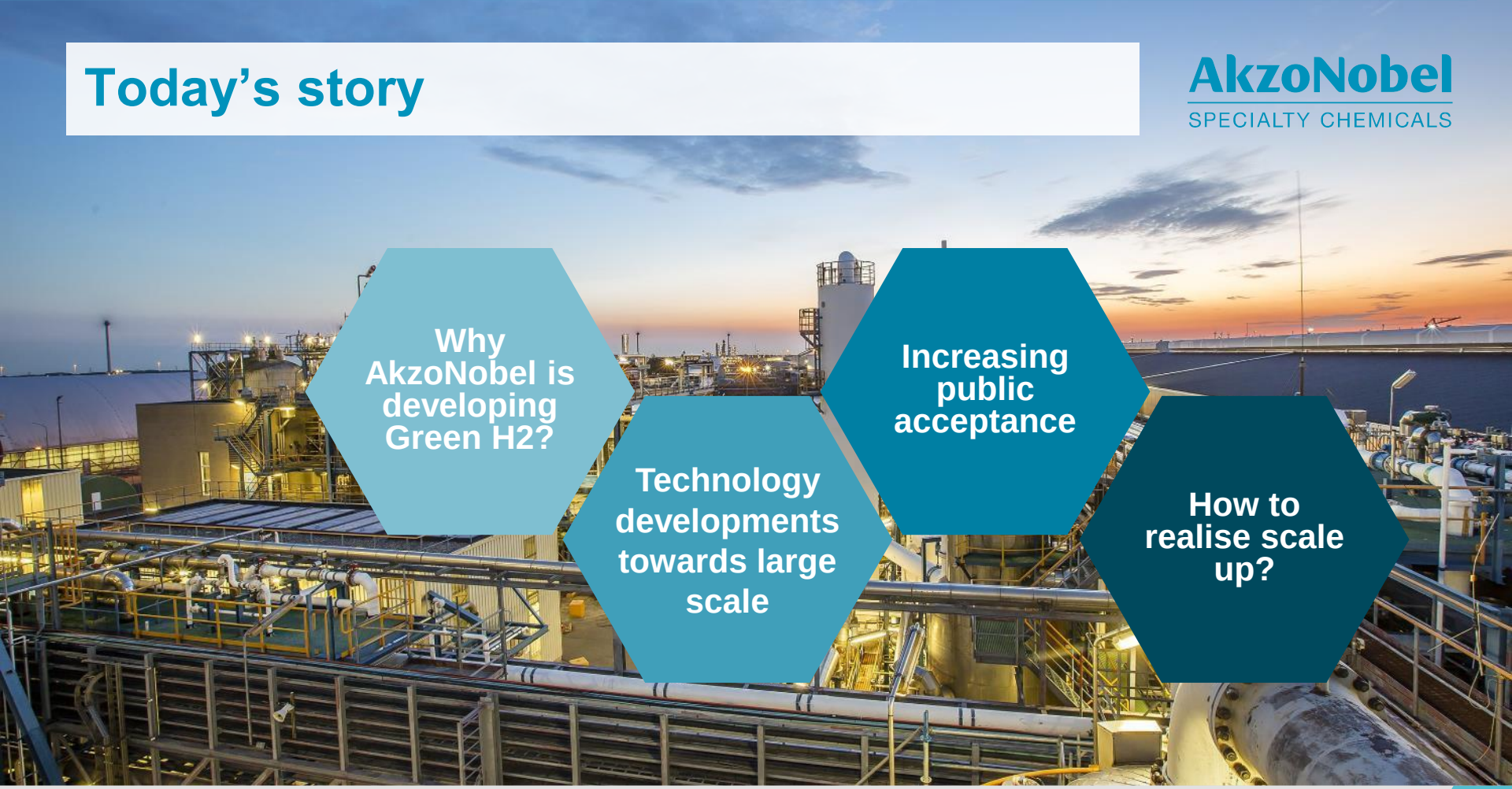

We want to accelerate the industrial transition from electrons to molecules & back

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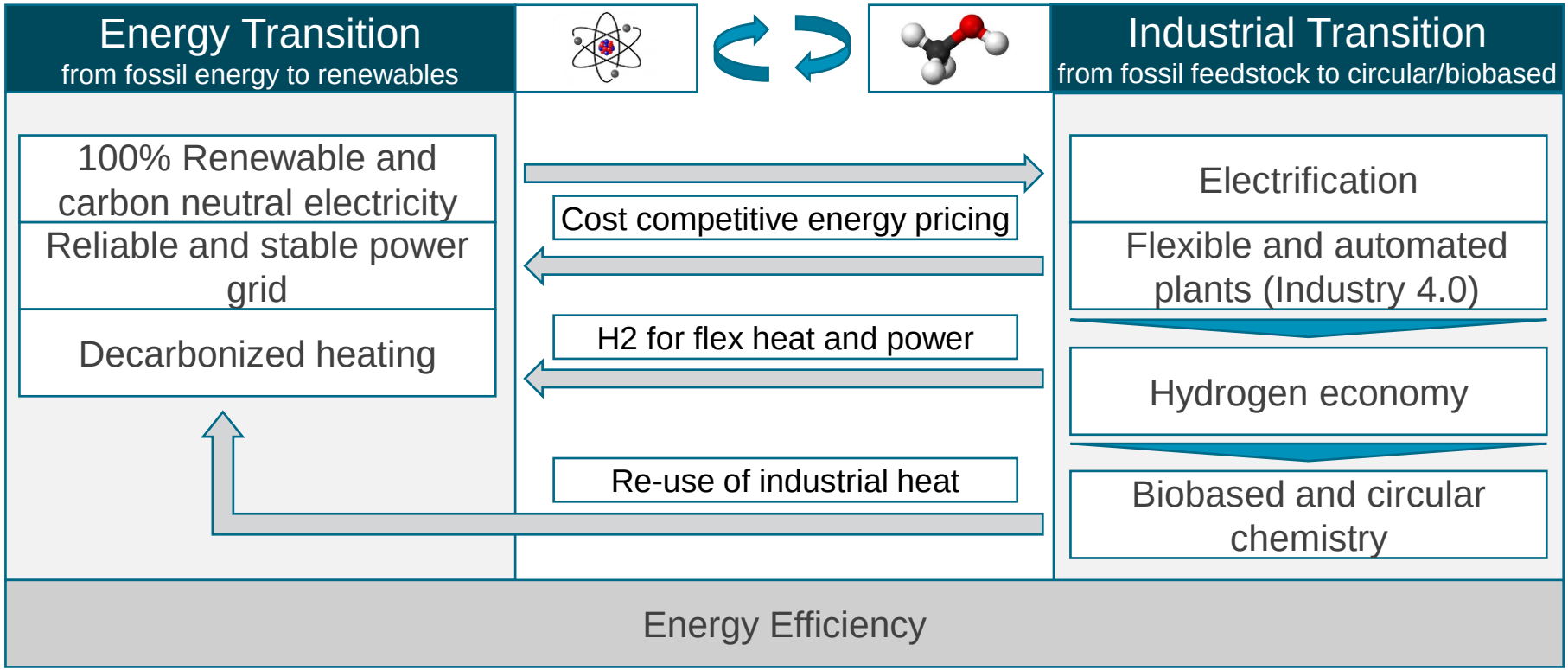

Electrolysis at AkzoNobel Specialty Chemicals: already at 100 MW scale

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Chlor-alkali

Installed capacity: 380 MW
H_2 production: 38 kta

Sodium chlorate

Installed capacity: 620 MW
H_2 production: 62 kta

Water electrolysis

Installed capacity: 10 MW
H_2 production: 1.5 kta

Technology evaluation for a large scale H2O electrolysis plant

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	Atmospheric alkaline	Pressurized alkaline	PEM
Capital costs*	**0**	**+**	**-**
Plant efficiency* (at nominal load)	**0**	**+**	**-**
Flexibility	**-/0**	**+**	**+**
Gas purity	**+**	**0**	**0/+**
Footprint	**0**	**0/+**	**+**
Development opportunities	• Supply chain improvements • Improved electrode coatings, separators and cell design for efficient high current density operation	• Supply chain improvements • Improved electrode coatings, separators and cell design for efficient high current density operation	• Supply chain improvements • Reduced noble metal content in electrode coatings and thinner membranes

There is significant cost reduction potential from technology improvement and scale-up

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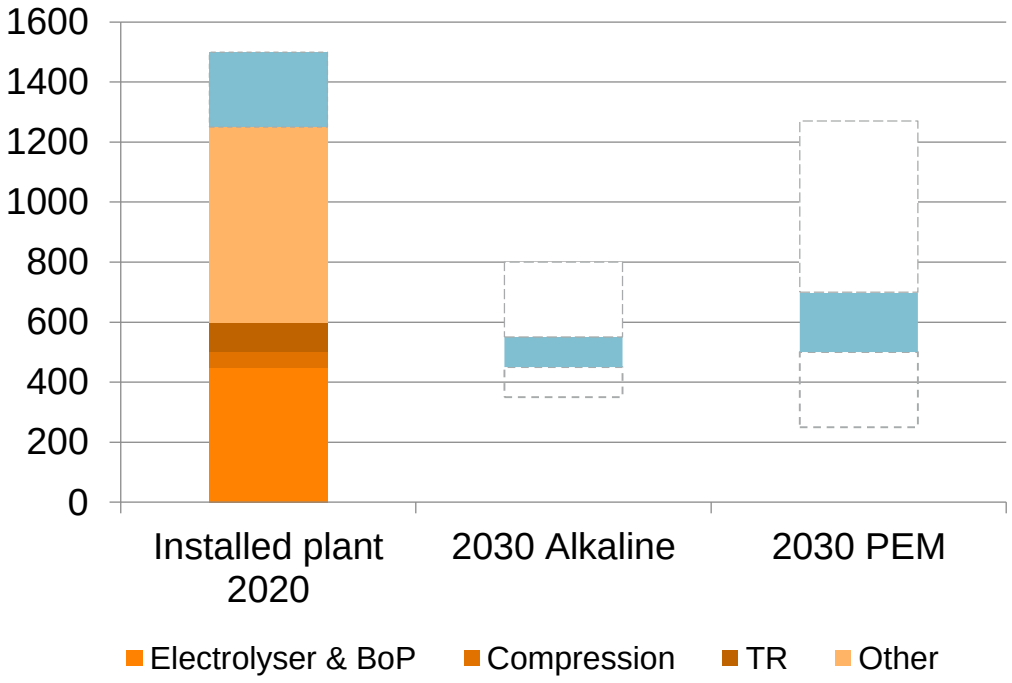
Development of investment costs (Euro / kW installed)



Drivers of cost decline

Technology:

- Increase current density
- Larger cells and transformers

Scale up:

- Supply chain developments
- Automation of assembly lines
- Reduced costs for balance of plant / buildings etc due to economies of scale

AkzoNobel is participating is several programs to improve technology and realise scale up

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Projects in execution	**Bus pilot Delfzijl** Qbuzz, ov bureau, provincie groningen, GRONINGEN SEAPORTS, PITPOINT	**Certification of green H2** CertifHy, FCH, AIR PRODUCTS	**Carbon2Chem technology** thyssenkrupp, Fraunhofer	**Policy studies** WORLD ENERGY COUNCIL, TKI GAS Topsector Energie
Under development	**H2-Bus Scale up** gasunie new energy, ov bureau	**DZL 20 MW H2O electrolyser** gasunie new energy, ChemCom industries, BioMCN, TEIJIN	**Waste2Chemistry** Port of Rotterdam, Enerkem, Air Liquide	**> 100 MW electrolysers** ISPT

Increase public acceptance through transparancy and visibility

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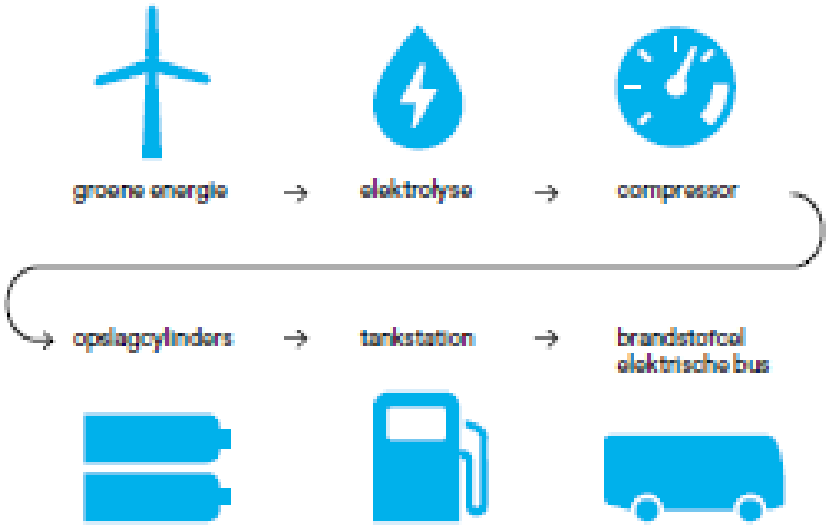
H2 buspilot Delfzijl: showcase zero emission well-to-wheel public transport



We're developing a 20 MW H2O Electrolyser in Delfzijl with customers…

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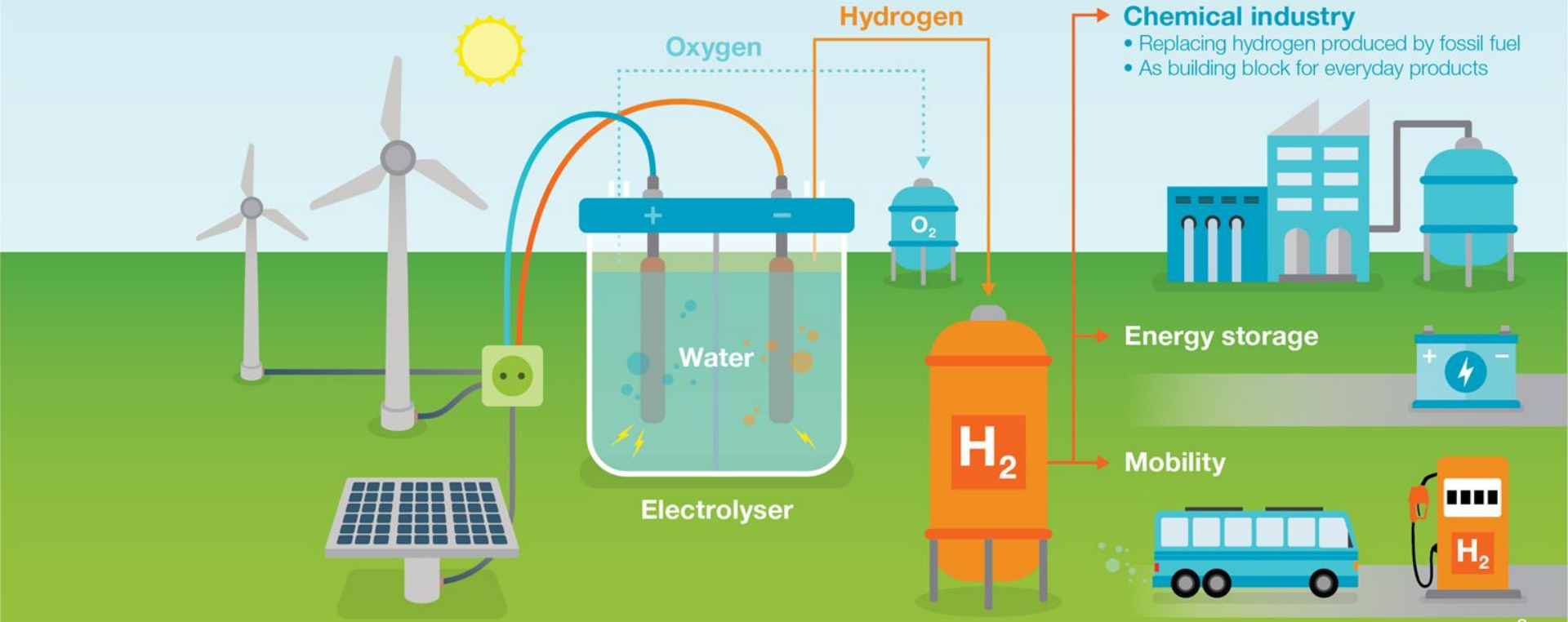

… and are creating new value chains

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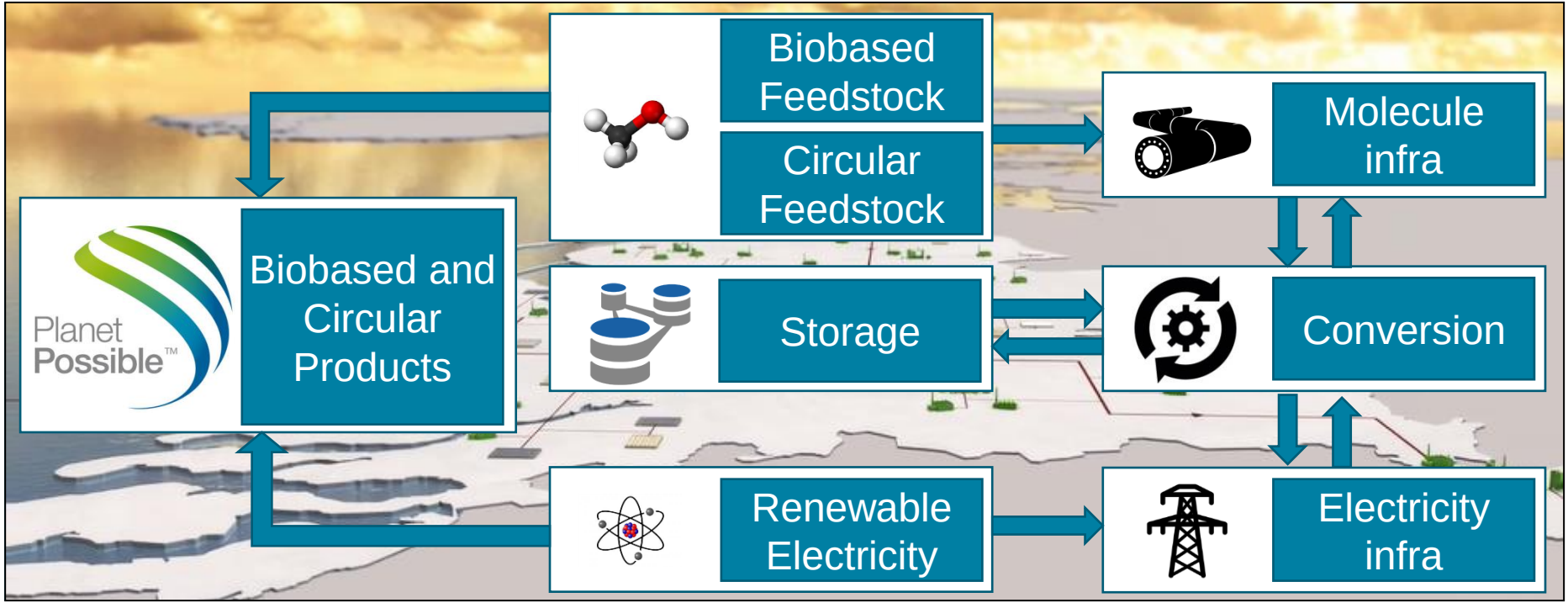
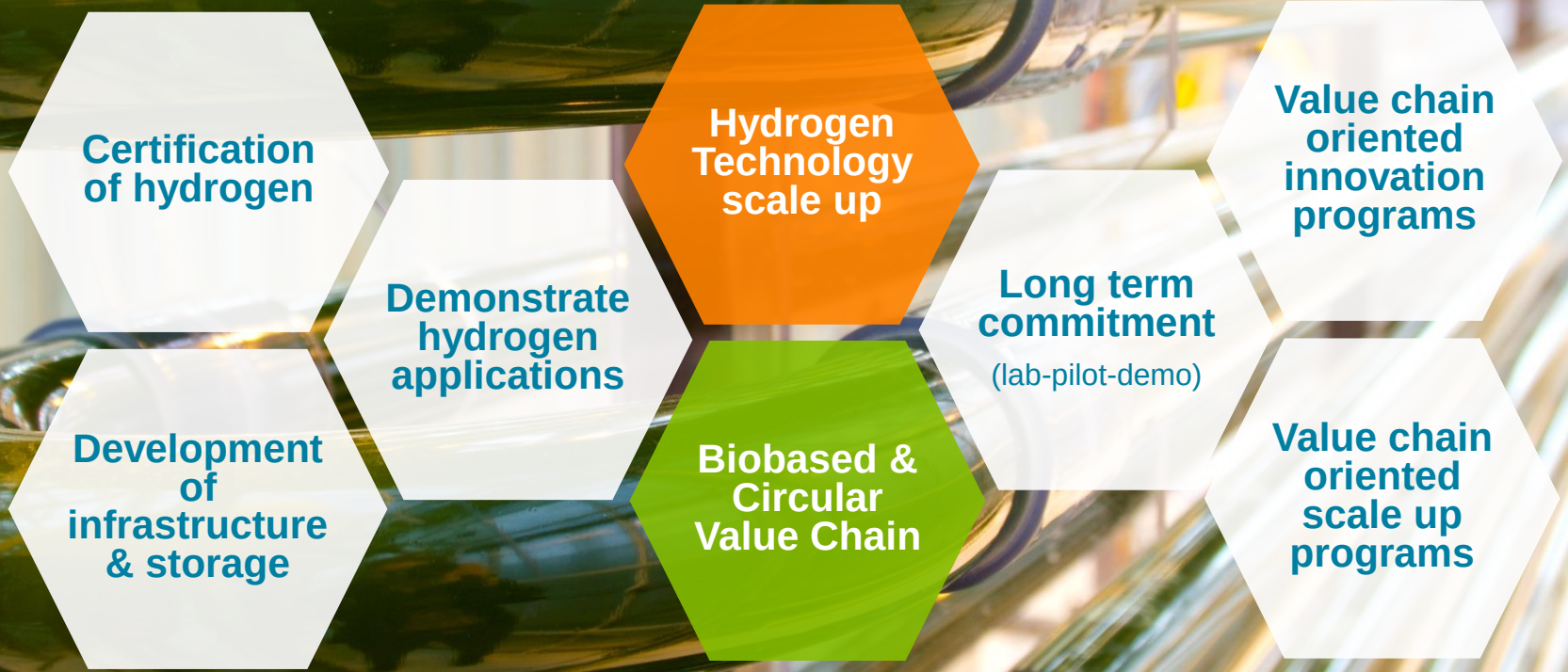


To solve the challenges in scale up of new value chains, LT commitments are needed



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Thank you for your attention

You can reach me on:

joost.sandberg@akzonobel.com

06 - 23 90 72 10