



## Extended Teaser

May 2023

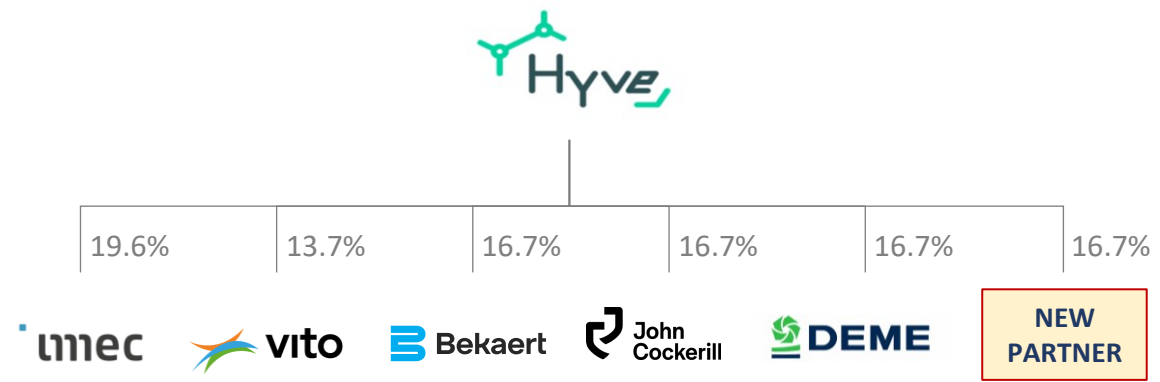
# Unique opportunity to invest in a breakthrough venture in electrolysis technology, backed by recognized research and industrial companies



## HYVE in a nutshell

- > Early-stage venture started in 2021 by a set of world class R&D and industrial partners who are global leaders in their respective sectors
- > Breakthrough electrolysis based on nanotechnology which provides higher output and higher efficiency than conventional technologies
- > No use of noble expensive materials for catalysts (e.g., Platinum and Iridium)
- > Developed a PFAS<sup>1</sup>-free membrane and patented it
- > Completed technology research and proof of principle, 5 million EUR spent so far
- > Recently secured a 10.7 million EUR grant from the Recovery and Resilience Fund (RRF) for Hyve's upcoming product development
- > Looking for a 6<sup>th</sup> partner to participate to Hyve's early growth

## Transaction structure



NEW PARTNER has the opportunity to buy 16.7% of the company, in exchange for a cash contribution for the shares and an investment commitment<sup>2</sup> of 1.3 million EUR for the next two years. NEW PARTNER will have the right to propose two directors to the board.

## Key metrics

**25 FTEs**  
on technology and  
process development

**15.9 million EUR<sup>3</sup>**  
secured for next two  
years of development

**Patent filed**  
early 2023 for the  
membrane

1. PFAS: per- and polyfluorinated substances that are potentially harmful to the environment and the human body  
2. 1.3million EUR commitment already made by Bekaert, John Cockerill and DEME; Imec and Vito contribute in-kind (i.e., IP, human and research resources)  
3. Sum of 10.7million EUR from RRF and the commitments made by Bekaert, John Cockerill, DEME and NEW PARTNER

# It is also an opportunity to be part of a unique set of complementary companies spanning the full value chain, from R&D to large-scale green hydrogen production



- > World leading electrolyzer manufacturer (~20% global market share in 2022)
- > Designs, builds and maintains pressurized alkaline electrolyzers of up to 6.5MW capacity stacks – among the world's largest



- > Deep hydrogen market experience, including 20+ years track record in Porous Transport Layers for PEM and preferred partner for large PEM OEM's
- > Global manufacturing capabilities
- > In-house engineering & scaling capabilities for high-tech products



- > Leading developer of green hydrogen and green ammonia production projects in Oman, Belgium, Egypt and Morocco
- > Its flagship *HYPORT® Duqm* (Oman) is one of the most-advanced large-scale green hydrogen projects globally



- > World-class independent Research and Innovation hub
- > Unique expertise in electrochemistry, surface engineering and nanomaterials enabling disruptive performance
- > Proven track record in bringing innovations to the market



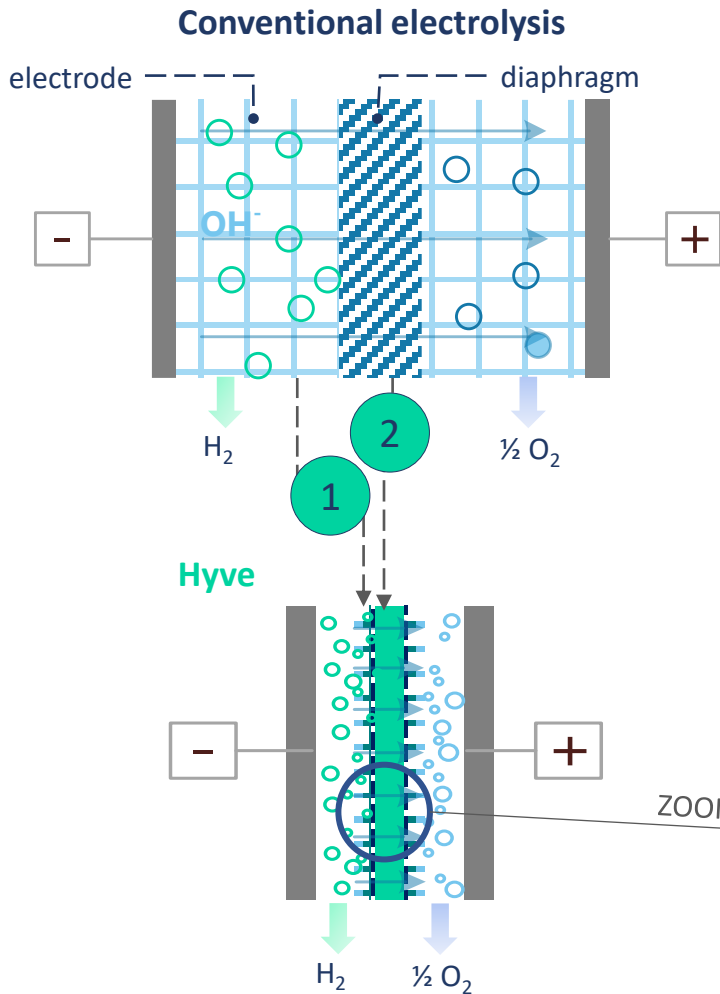
- Independent research organization with deep expertise in :
- > Hydrogen engineering processes / safety
  - > Membrane casting and stack building
  - > High-pressure high-temperature testing equipment
  - > membrane industrialization



**Hyve is looking for a 6<sup>th</sup> shareholder to support Hyve in its development and play an important role in the promising green hydrogen economy**

# Hyve innovates two key electrolysis components to bring patented solutions to the market with a significant impact on the Levelised Cost of Hydrogen

Hyve is bringing two new innovations based on nanotechnology to the market...

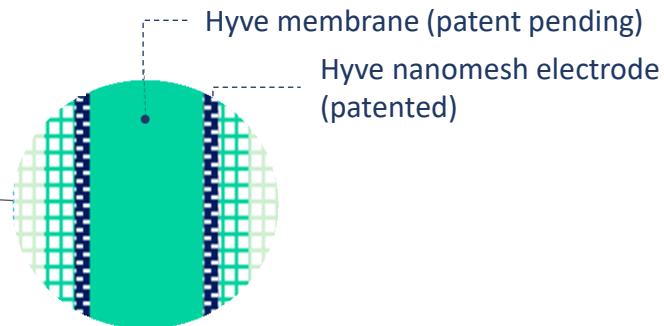


**1** The conventional electrodes are replaced with a **cutting-edge nanomesh** that yields:

- > 10x increase in the electrode surface
- > 10x decrease of the ionic path
- > embedded performance stability

**2** The diaphragm is replaced with an **ultra-thin membrane** that yields:

- > 10x reduction of the gas crossover while ensuring safe operation at high yield
- > 2x increase of the  $OH^-$  conductivity



...that both have significant impact (LCOH)

Impact on  
**OPEX**

up to 20% less energy<sup>1</sup>  
consumption versus  
Alkaline and PEM

Lowest performance  
degradation saving on  
energy input and stack  
replacement

Operating flexibility and  
load range conform  
with PEM

No pollution risk thanks  
to PFAS-free membrane

Impact on  
**CAPEX**

Higher current density  
enables 5x higher  
output<sup>2</sup>

Integrated compact  
design reduces material  
usage and footprint  
(e.g., ideal for offshore)

Lower application  
Capex for cooling and  
RE-production thanks  
to high efficiency

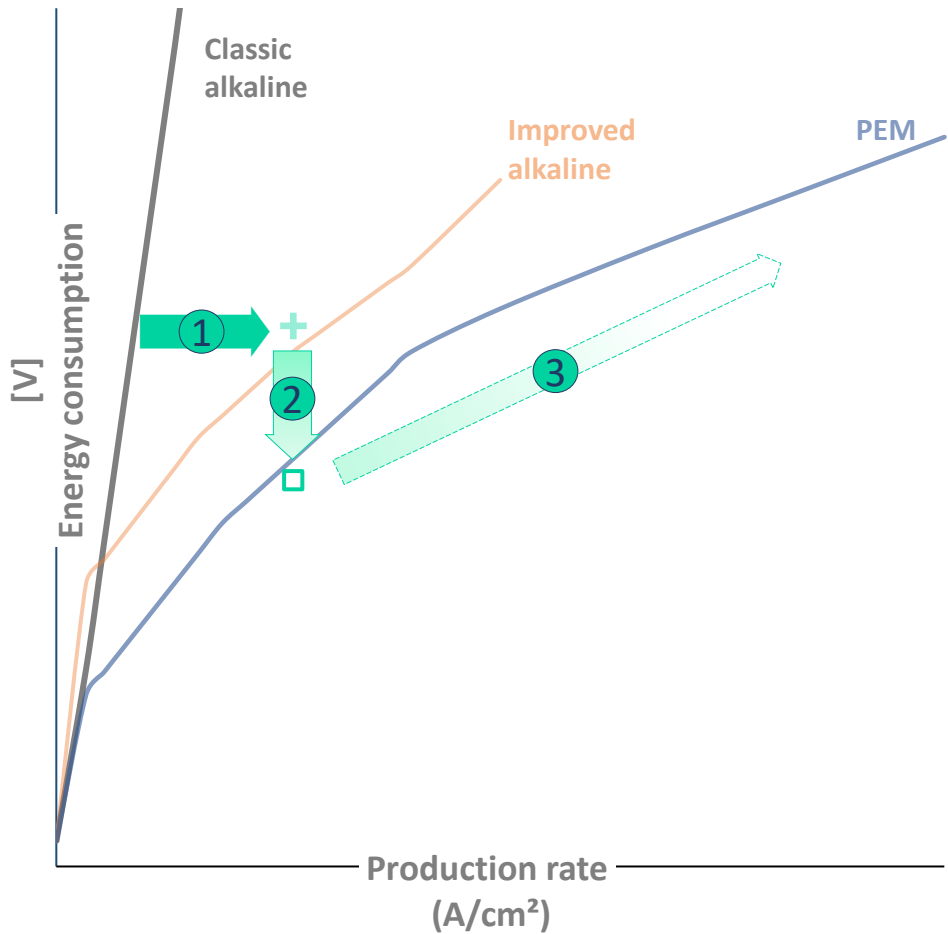
Does not require noble  
materials for catalysts,  
such as Pt and  $Ir^3$

1. The Hyve target is to reach 44kWh/kg  $H_2$  at cell level

2. Compared to classic alkaline operating at current densities of 0.4A/cm<sup>2</sup>

3. For PEM electrolysis Pt and Ir are needed catalysts with limited global sources

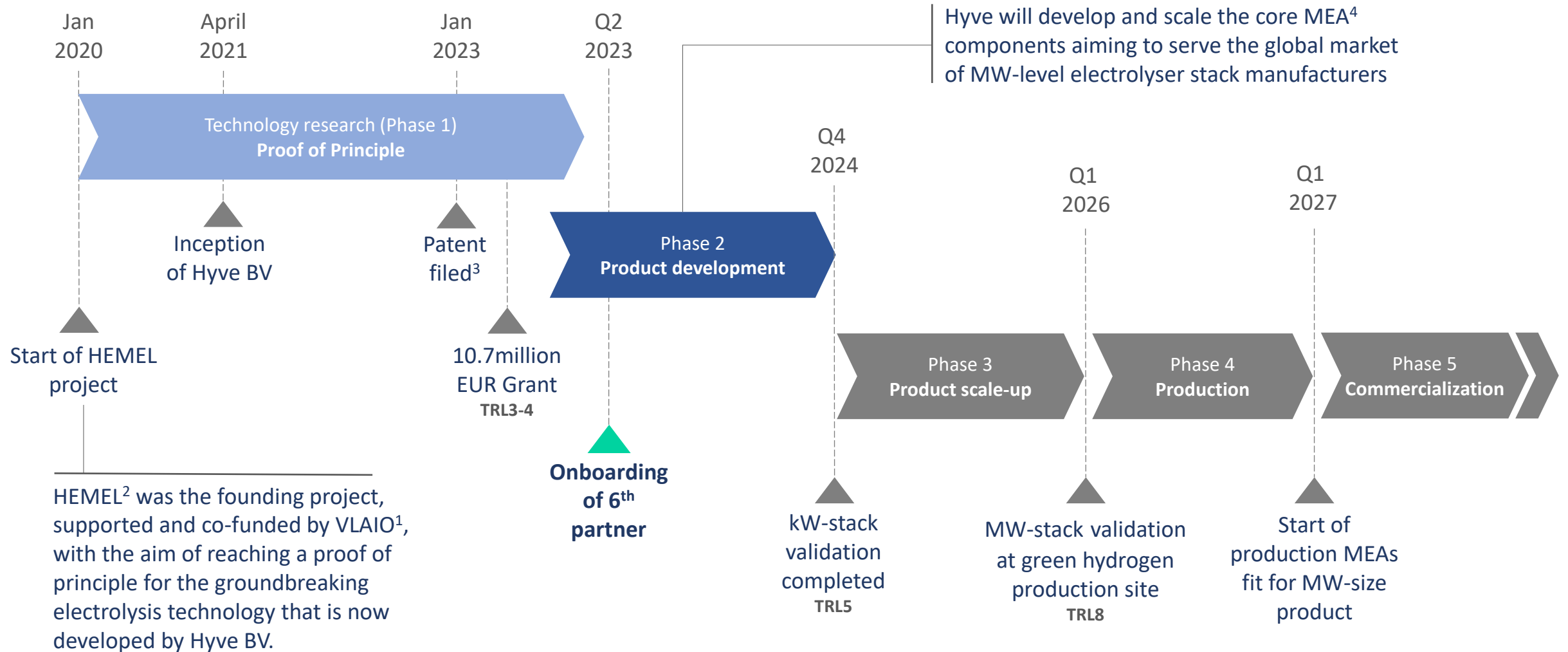
# Hyve has proven to yield superior efficiency and output compared to conventional electrolysis technologies



3 targeted steps towards world-class efficiency at high yield			
Step	Dates	Key targets/achievements	Status
1	2021-2022	> Doubling the current density (0.4A/cm² to <b>0.8A/cm²</b> ) for classic alkaline water electrolysis <b>proven</b> at single <b>cell</b> level <b>50cm²</b> , reaching already <b>81%</b> efficiency	✓
2	2023	> Further innovation and development of the technology targeting <b>90%</b> efficiency at the same current intensity <b>0.8A/cm²</b> > The proof-of-principle is planned in <b>2023</b>	✓
3	2024 - 2027	> Product development of an optimized MEA <sup>1</sup> with integrated nanomesh-based electrode component and thin gas tight membrane > First Hyve KW stack targeted to operate at 2A/cm², to be validated intensively inhouse as well as in a relevant field environment (2025) > Product- and supply chain scaling to reach commercialization of multi-MW-products (2027) > New innovative concepts for gapless electrolyzers (potentially KOH-free)	next phase

1. MEA stands for Membrane Electrode Assembly

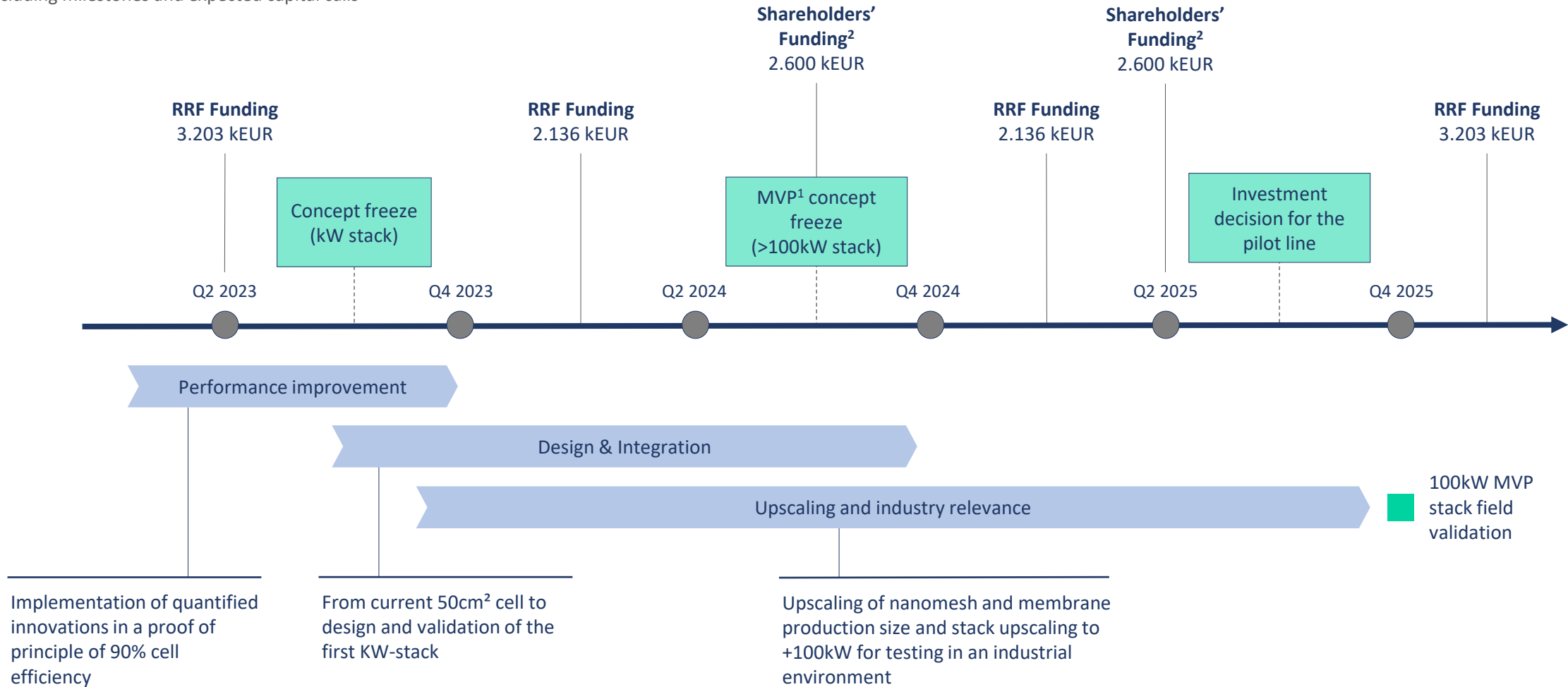
# Hyve's next phase of development, supported by a recently secured 10.7 million EUR public grant, is part of a well-defined roadmap to commercialization



1. Flanders Innovation & Entrepreneurship; which is the governmental support and investment vehicle for entrepreneurs in Flanders.
2. HEMEL: Design and proof-of-concept of a novel electrolyzer technology for green hydrogen with state-of-the-art performance based on Hydroxyl Exchange Membranes and innovative nanomesh Electrodes
3. Patent filed for Hyve membrane under 'separator for electrochemical devices'
4. MEA stands for Membrane Electrode Assembly

# Phase 2 focuses on stack development and proof of concept over a 3-year period and is expected to require a total of 1,3 million EUR funding per partner

ROADMAP SPECIFIC TO PHASE 2  
including milestones and expected capital calls

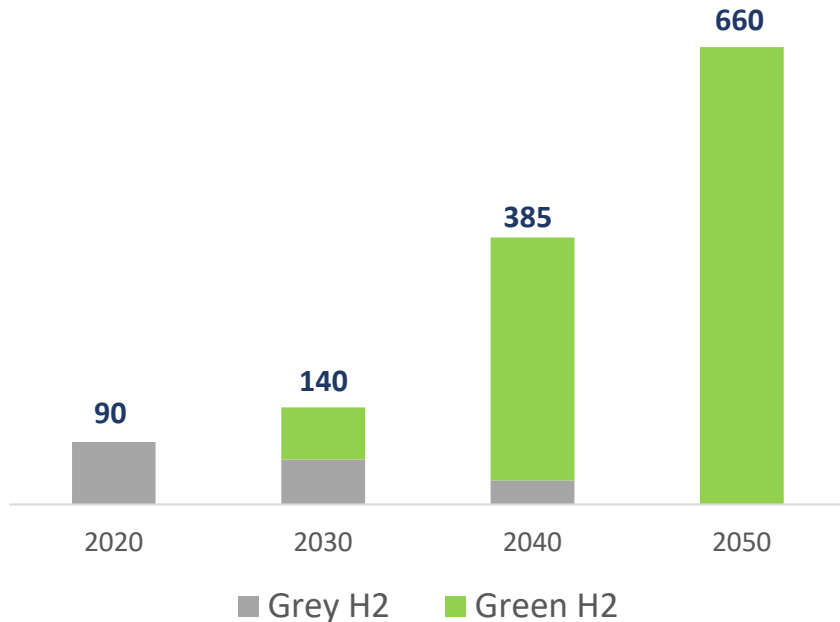


1. MVP: Minimum Viable Product  
2. Four industrial shareholders only (John Cockerill, Bekaert, DEME, NEW PARTNER); because funding from the two R&D shareholders (Imec and Vito) is made 'in-kind'

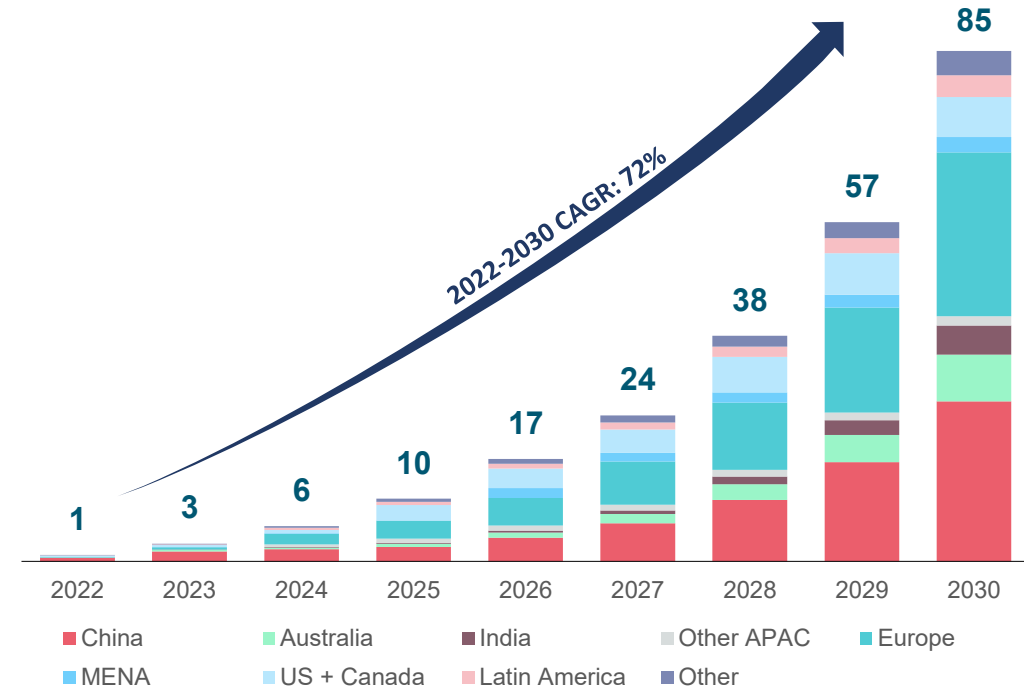
# There is a massive growth anticipated for green hydrogen and electrolyzers demand, which Hyve intends to leverage over the next decade

Exponential demand for Green hydrogen to enable countries and industries to meet their net-zero emission targets by 2050...

... will push annual electrolyzer installations from ~1GW today to 85GW by 2030 for Giga-scale markets, including the promising offshore wind to hydrogen market.



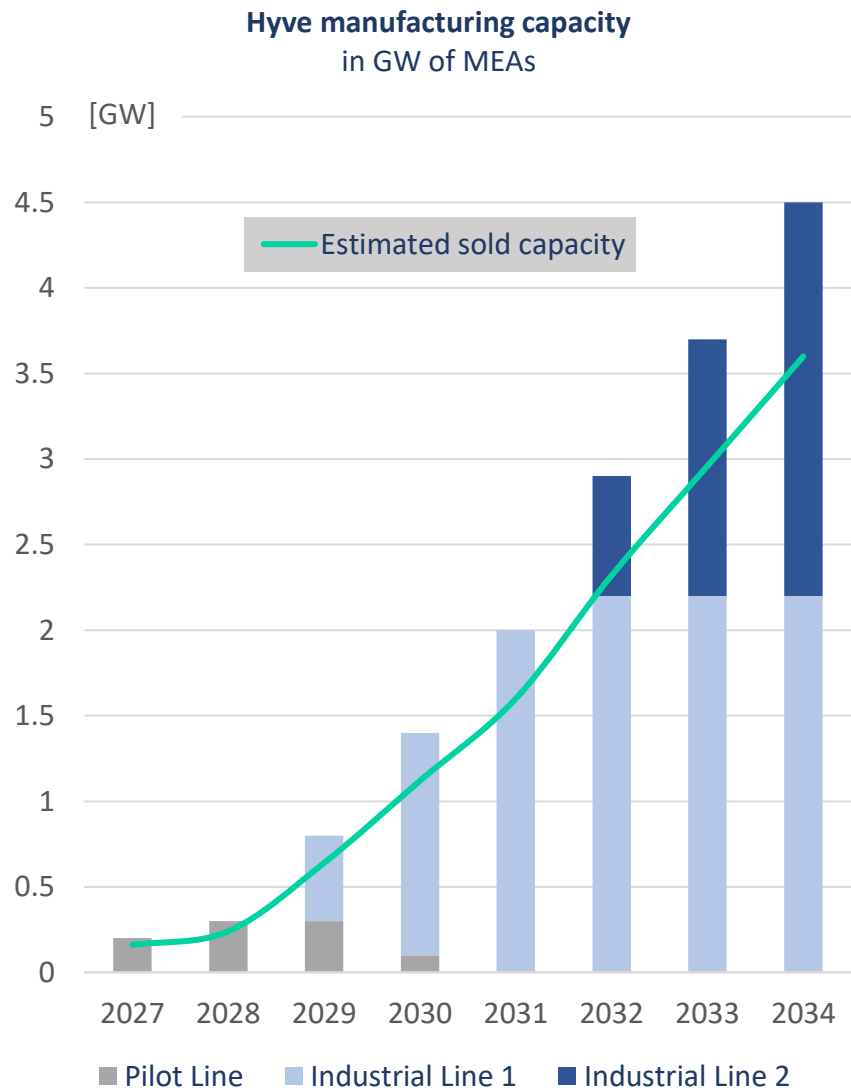
In million Tons  
Sources: Public Information, Hydrogen Council, McKinsey & Company (October 2022)



Source: BloombergNEF



# Hyve to reach €230m of annual revenues by 2034 with sale of MEAs



## Plan for manufacturing capacity

- > Pilot line installed in 2026, with MEA capacity up to **300MW** by 2028
- > First industrial line installed in 2029, with MEA capacity up to **2,2GW** by 2032
- > Second industrial line installed in 2032, with MEA capacity up to **2,3GW** by **2034**

## Expected sold capacity

Investment decisions and capacity will be ramped up and aligned with the Hyve sales plan ensuring 80% utilization of our capacity every year. This results in MEA sales of 1GW+ by 2030 and 3,5GW+ by 2034.

## Projected revenues

- > Hyve will generate revenues by selling the MEAs to stack manufacturers
- > Assuming BloombergNEF stack price forecasts, and the MEA to represent ~70% of the stack cost<sup>1</sup>
- > We expect Hyve revenues to reach 100 million EUR by 2030 and 230 million EUR by 2034.

		2027	2028	2029	2030	2031	2032	2033	2034
Stack price <sup>2</sup>	€/kW	204	177	155	137	122	110	100	92
MEA price as % of Stack	%	70%	70%	70%	70%	70%	70%	70%	70%
<b>Hyve</b>									
MEA price	€/kW	143	124	108	96	85	77	70	64
Production	GW	0,16	0,24	0,64	1,12	1,6	2,32	2,96	3,6
Projected revenues	€m	23	30	69	107	137	179	207	231

1. Cost Forecast for Low-Temperature Electrolysis, Fraunhofer ISE, Clean Air Task Force – Assumption that Hyve produces the MEA and associated Porous Transport Layers (PTLs)

2. BloombergNEF forecast. Converted from USD to EUR considering a 1.1/1 exchange rate

# Experienced and dedicated management team to bring Hyve to the next level



## CEO



### Rik Vreys, ir. MBA

CEO at Hyve

Rik has +20 years International industry and renewable energy experience. At ZF Wind Power he was responsible for New Product and New Technology introductions (+20 projects of >100mEUR revenues), sales and KAM (100mEUR), Service and Green Field plant development (3 plants, mEUR 110-200 investments, Belgium, India, China). At Hydrogenics he was responsible for business development for industrial electrolyzers. He holds a master in engineering (KUL) and an MBA (Vlerick)



## Steering committee



### Inge Schildermans, Dr. ir.

SVP Fiber Technologies at Bekaert,  
Chairwoman of Hyve daily management and board member



### Bart Verboomen, ir.

Head of Engineering and Technology at Green Hydrogen Division of DEME Concessions



### Sébastien Borguet, Dr. ir.

Research & Innovation Group Leader at John Cockerill Hydrogen



### Bart Onsia, ing.

Business Development Manager Energy at imec



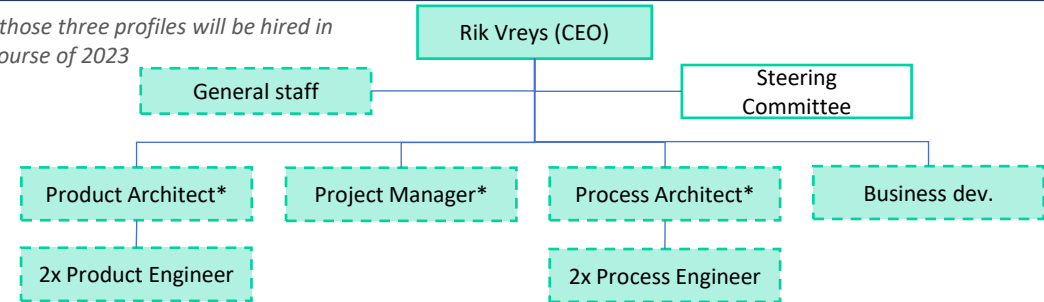
### Bénédicte Haven

Corporate Secretary of and legal advisor to the Management committee and Board of Directors of Hyve



## Structure and team development up to 2025 (10FTE)

*\*those three profiles will be hired in course of 2023*



## R&D / technical expertise



**Jan Vaes, Prof. Dr. ir.,** Program Manager Sustainable Chemistry at Vito, Research co-coordinator Power-to-Molecules at EnergyVille



With a PhD in electrochemistry at KUL, Jan started as consultant at METALogic and R&D engineer at imec in the area of semiconductor and solar cell manufacturing. He was also Technology Director at Hydrogenics (2012) where he led the development and engineering of alkaline and PEM water electrolysis systems. At Vito's Sustainable Chemistry BU he steers the innovations for electrosynthesis of chemicals and e-fuels for energy storage technologies. Since 2022 Jan is a Guest Professor at UGent within the department of solid-state physics.



**Philippe Vereecken, Prof. Dr.,** Fellow at imec, Professor at KULeuven at faculty of bioscience engineering, Research co-coordinator Power-to-Molecules at EnergyVille



After his PhD in chemistry at Ghent University (Belgium) in 1998, Philippe did a postdoc in material science at The Johns Hopkins University (Baltimore, USA) and subsequently worked for IBM (Yorktown Heights, NY, USA) as Research Staff Member. He joined imec in 2005 where he is currently Scientific director electrochemical storage and conversion. His expertise is found in combination of nanomaterials, electrochemistry and energy. He is (co-)author of +185 publications and (co-)inventor of +55 patent applications. He is listed in the top 2% of scientists worldwide in the "Updated science-wide author databases of standardized citation indicators" published by Stanford.

# Hyve has a reliable and efficient governance structure on the back of a clear shareholder agreement

**HYVE has a transparent governance model, that revolves around three main bodies:**

> General assembly

It is composed of two classes of shareholders: industrial shareholders<sup>1</sup> and research shareholders<sup>2</sup>. Both classes benefit from the same rights and privileges; each share carries 1 vote. Decision can be taken when all shareholder are present (or represented) on a unanimous basis. As a deadlock mechanism, the matter will be escalated to the shareholders' respective CEO.

> Board of Directors

Each shareholder is entitled to propose two persons to be appointed in the Board of Directors, in which all directors have equal voting rights. The Board of Directors convenes at least four times a year. Decision can be taken when at least one director of each shareholder is present (or represented) on a unanimous basis.

> Management

It is steered by Hyve's CEO, who is currently supported by a Steering Committee of several well-defined experts from the various shareholders. Hyve's management will be further elaborated in 2023 with the addition of a product architect, a project manager and a process architect. The management will work in a professional, efficient and lean way in close communication with the Board of Directors.

**The transfer of shares** is subject to a lock-up period of 3 years, after which customary pre-emption and transfer rights apply. Exception of free transfer to affiliates. Change within a group to which a shareholder belongs which would have a material adverse effect on HYVE can be subject to forced transfer of shares.

**On information rights to the shareholders**, the following applies, next to specific legal requirements:

- > quarterly unaudited management reports, and
  - > within ninety (90) calendar days after the end of each financial year, unaudited balance sheet and unaudited statements of income and cash flow for the ongoing financial year, and
  - > any material adverse event, litigation or circumstance affecting the Company, and
  - > such other information or reports reasonably requested from time to time by the Shareholders.
- > Other specific clauses:
- > Dividend payments to be decided by the shareholders, no special voting quora
  - > IP, non-compete and confidentiality requirements in place
  - > Shareholders agreement duration 10 years from closing

1. i.e., John Cockerill, Bekaert, DEME and NEW PARTNER

2. i.e., Imec and Vito

# In addition to its patented membrane, Hyve has all IP rights needed for the development of its products thanks to a transparent IP agreement

The IP agreement defines three types of IP...

Foreground Type 1	Any intellectual property developed in the context of <b>combining</b> the nanomesh <b>electrodes</b> and the <b>membrane</b> , together forming the <b>MEA</b> (i.e., IP <b>related to the MEA</b> ).
Foreground Type 2	Any intellectual property developed to further improve any <b>individual component</b> (process, technology or any other related improvement) along the development of the Hyve products.
Needed Background	Any intellectual property developed by any of the parties, <b>before</b> the <b>start</b> of the collaboration, that would be <b>needed</b> as part of the <b>development</b> of the <b>Hyve</b> products.

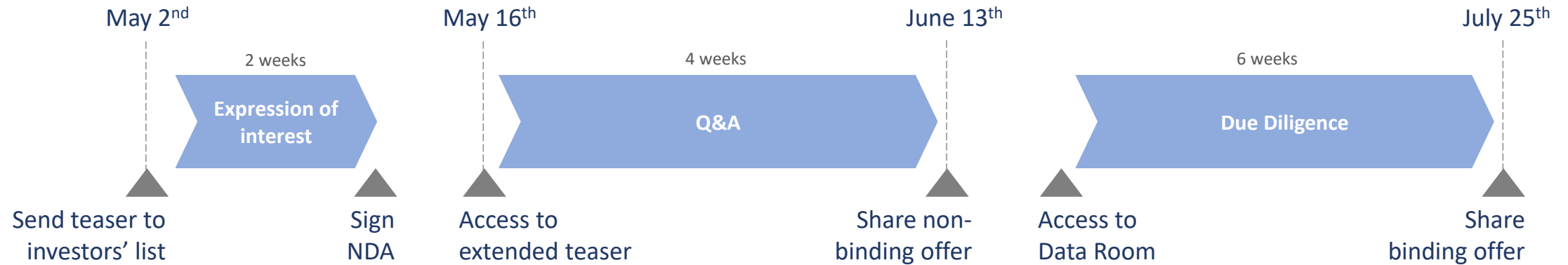
**Hyve owns** all IP developed in the HEMEL<sup>1</sup> project of **Type 1** and **has the exclusive right** to exploit this IP in the Hyve-products.

**Hyve has a non-exclusive right to exploit** all IP developed in the HEMEL-project of **Type 2**.

Additionally, Hyve has a **guaranteed option** on the **Background** (owned by all parties involved in the HEMEL project) **needed** for further development and exploitation of the **Hyve products** for alkaline water electrolysis to make green hydrogen, under **conditions to be agreed upon**.

1. HEMEL: Design and proof-of-concept of a novel electrolyzer technology for green hydrogen with state-of-the-art performance based on Hydroxyl Exchange Membranes and innovative nanomesh Electrodes

# A simple and efficient process to make this transaction a success for all parties



## Content of the non-binding offer

It is expected that NEW PARTNER makes:

- i. An offer in cash for 16.7% of Hyve's shares
- ii. An investment commitment of 1.3 million EUR, to be spent over the next two years

## Contact details

Any questions or communications shall be sent to:  
[Hyve.investor@hyve.be](mailto:Hyve.investor@hyve.be)

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