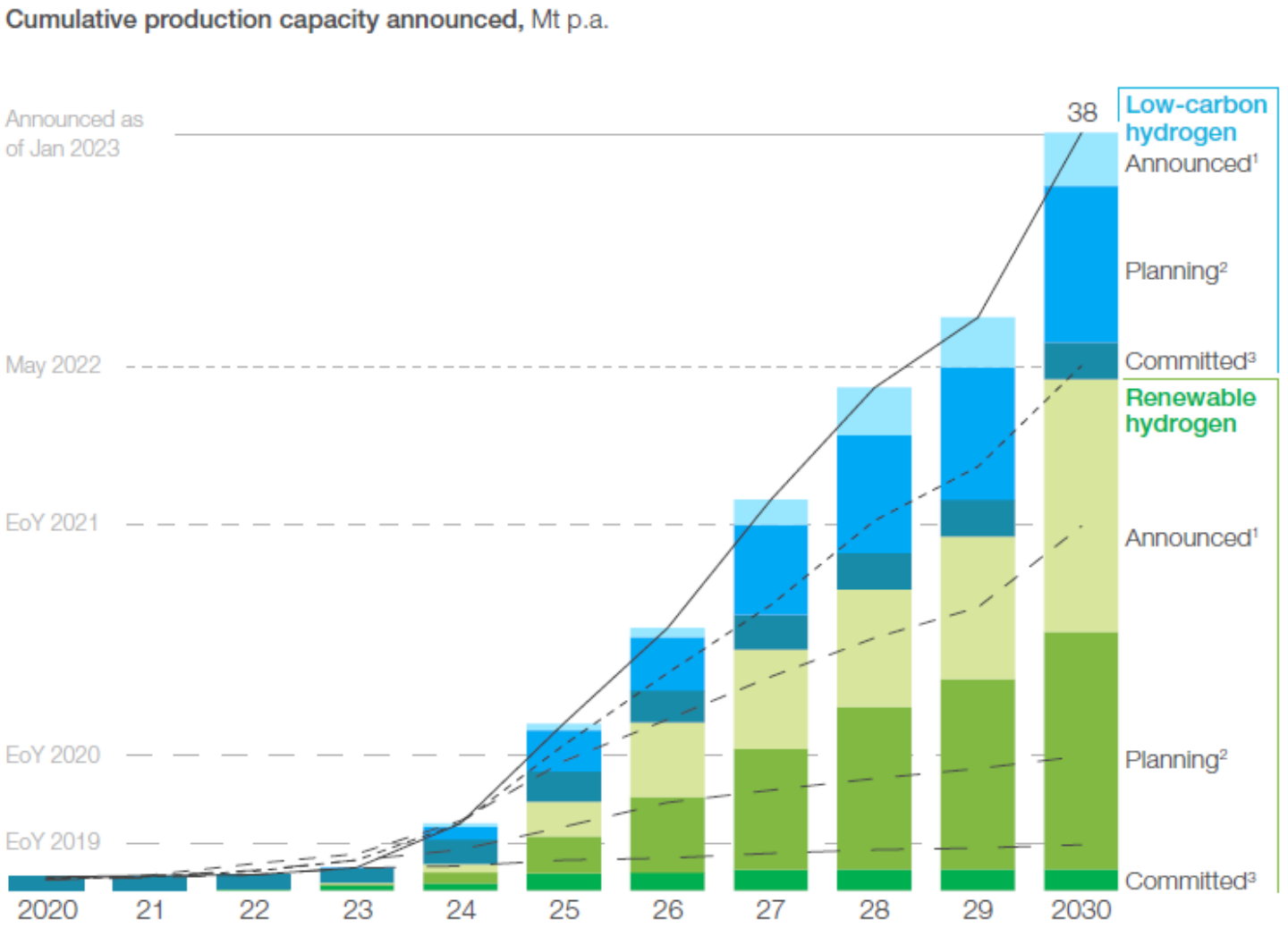

Hydrox
REINVENTING HYDROGEN STORAGE

38 Mt p.a. global clean hydrogen production capacity for 2030 (+40%)



With hydrogen production costs falling, hydrogen storage and transportation becomes the next frontier of the hydrogen economy.

Sources: Hydrogen Council, McKinsey (2023)

Hydrogen storage technology must be reinvented

Conventional hydrogen storage technologies require extreme conditions of compression and/or temperature and are therefore energy inefficient. They use toxic, flammable and/or explosive materials which are cumbersome and expensive to handle.

High OpEx

High CapEx

Complex & Hazardous Value Chain

Energy inefficient

Toxic

Flammable

Explosive

Hydro X meets the cost targets of the industry for hydrogen storage

<US$1

Below US$1 OpEx cost
to store and release 1 kg of hydrogen

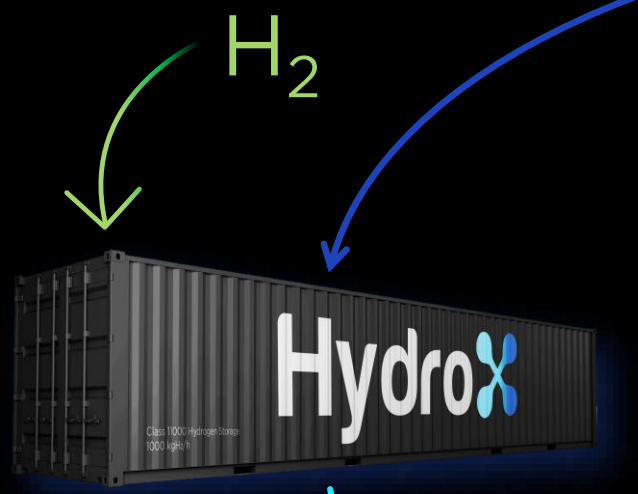
A disruptive hydrogen storage and transportation technology

Hydro X core technology breakthrough lies in both the catalyst and the process.

Formate-Bicarbonate Cycle for Hydrogen & Energy Storage

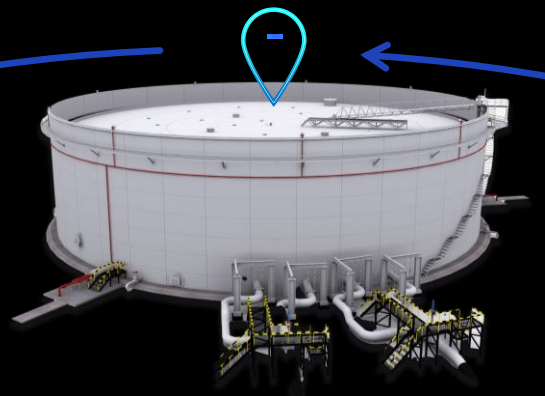
$KHCO_3$: Potassium Bicarbonate
$KHCO_2$: Potassium Formate

A circular process



H_2

Hydrogen Charging Unit
Hydrogenation
Exothermic process
Temperature: 35°C (95°F)
Pressure: 10 bar



Hydro X Discharged Liquid

Hydro X Charged Liquid

H_2

Hydrogen Discharging Unit
Dehydrogenation
Endothermic process
Temperature: 50-70°C (122-158°F)
Pressure : 1 bar

Water-based: completely safe

Uses water as a storage medium

Non-toxic

Non-flammable

Non-explosive

The process involves chemical charging of hydrogen on potassium bicarbonate (a commercially available material commonly known and used as “baking soda”) within Hydro X systems and converting it into an aqueous solution containing water and potassium formate, another commercially available material commonly used for de-icing of airplanes wings. Competitive technologies use dibenzyl toluene or toluene and other toxic and less safe materials.

Unparalleled energy efficiency

Close-to-Ambient Temperature and Pressure

Storage at **35°C and 10 bar** and release at **50-70°C and 1 bar** require a very small amount of energy

A Radical Disruption

Hydro X technology requires less than **2.5kWh** to store and release 1kg of hydrogen

7X

Cost Advantage

Other startup technologies require 13-40 kWh

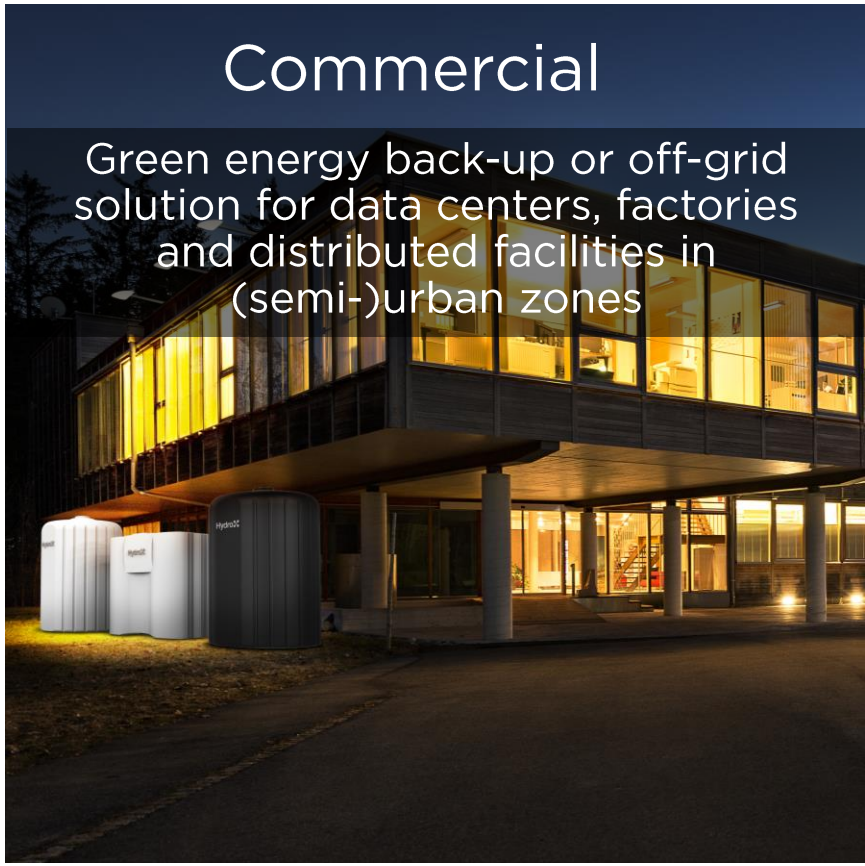
Clear competitive advantages

	Hydro X technology	Compressed hydrogen	Liquified hydrogen	Ammonia	LOHCs
Leading vendors	Hydro X	Linde, Air Liquide, Air Products, Hexagon Composites, Plastic Omnium, Worthington Industries, Faurecia, Iljin Composites, NPROXX			Hydrogenious LOHC Technologies, Chiyoda Corporation
Form	Liquid/powder	Compressed gas	Liquefied gas	Liquefied gas	Oily liquid
Safety	Totally safe				
Storage manner	Water tanks/bottles	Very high pressure in expensive tanks	Cryogenic and pressurized in very expensive tanks	Low pressure tanks with strict safety restrictions	Container
Storage duration	Years	Limited	Daily evaporation	Years	Years
Temperature	35-70°C (95-158°F)	Room Temperature	-252,87°C	-33°C to 25°C	300°C
Compression	1-10 bar	200-850 bar	1 bar (maintained by ventilation every 2 days)	1-10 bar	1–50 bar
Process energy consumption (for 1kg of hydrogen)	<2.5 kWh	1.85–6.55 kWh	10–13.3 kWh	>11 kWh	11-13.3 kWh
Storage & Release OpEx cost	<1$/kg	1.2 - 3.2$/kg	6.7$/kg	5.9$/kg	7.3$/kg

Source: https://www.researchgate.net/figure/Levelized-cost-of-hydrogen-storage-and-typical-storage-duration-Bloomberg-H2Plus-2019_fig32_339500296

Hydrogen stationary storage

Hydro X technology enables **safe and efficient stationary storage of hydrogen.**
Even cheaper than salt caverns for long-term storage.



Hydrogen transportation

Hydro X technology enables **safe and efficient hydrogen transportation.**
Much (4x) cheaper than ammonia for long-distance ship transportation.

Trucks

Safe, efficient hydrogen transportation on regular trucks. No hazardous material constraints.

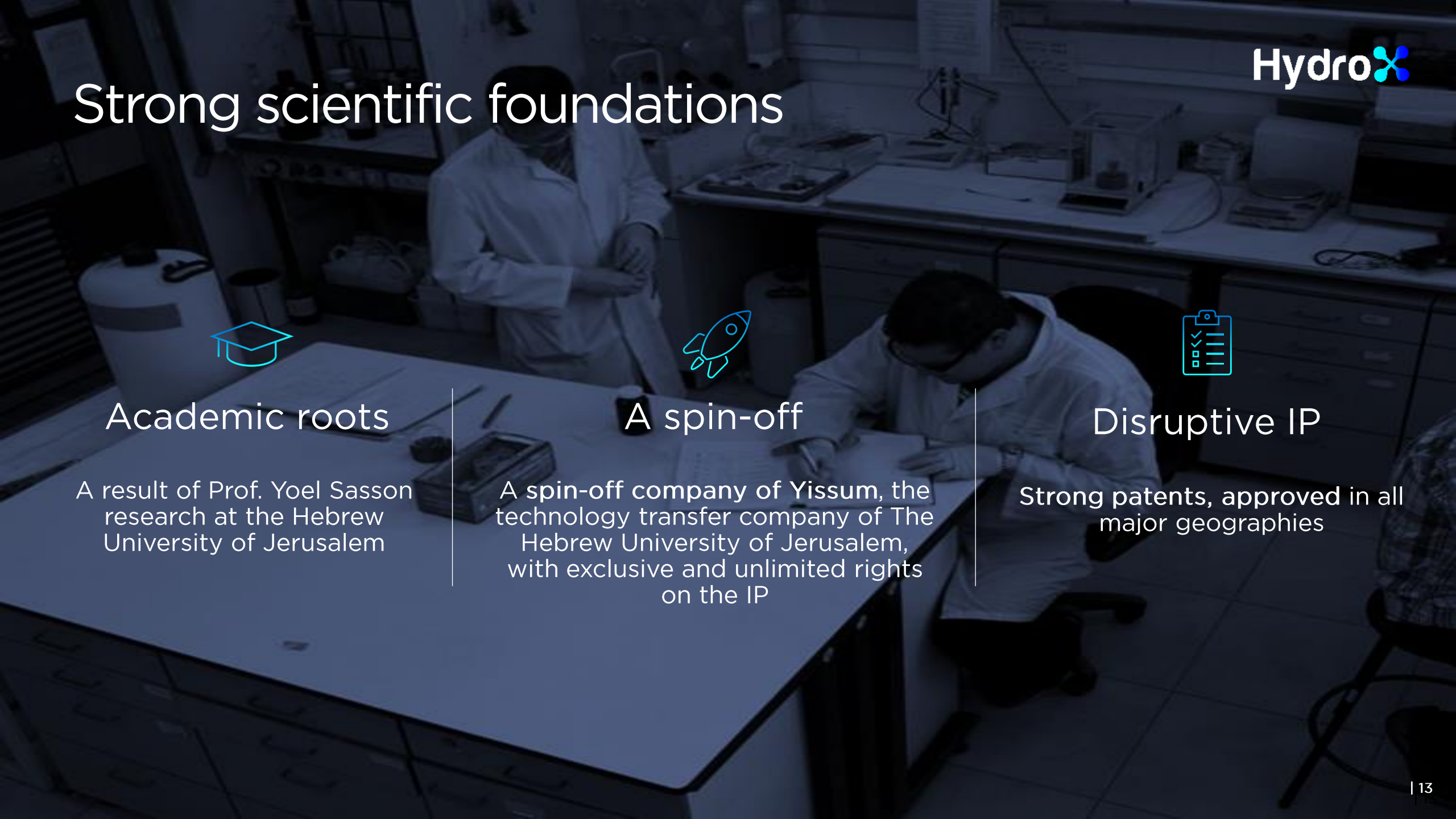
Ships

OpEx and CapEx cost-efficient and safe transportation of hydrogen over long distances

Pipelines

Cost-effective, safe and efficient transportation of hydrogen via (water) pipelines.

Strong scientific foundations



Academic roots

A result of Prof. Yoel Sasson research at the Hebrew University of Jerusalem

A spin-off

A **spin-off company of Yissum**, the technology transfer company of The Hebrew University of Jerusalem, with exclusive and unlimited rights on the IP

Disruptive IP

Strong patents, approved in all major geographies

A multi-disciplinary leadership

Deep tech and domain expertise

Assaf Sayada
CEO

A seasoned executive with 25 years of management experience in corporate and business development, strategic partnerships, fund raising, M&A and strategy for startups and multinational tech companies. A native of Paris and graduate of HEC-Paris.

Asa Ziv
VP R&D & co-founder

A serial entrepreneur and seasoned international high-tech executive. Established a world leading laser plant. A physicist and engineer.

Prof. Yoel Sasson
Chief Scientist & co-founder

Former Head of the School of Applied Chemistry at the Hebrew University and Chairman of the Institute of Chemistry. The founder of multiple start-up companies based on IP generated in his labs.

Dr Ariel Givant

A chemistry senior researcher and expert in the fields of green chemistry, organic synthesis, catalysis, alternative energy, protein chemistry and polymers. Experienced in process scale up, material sciences nano-encapsulation and development of analytical methods. PhD in chemistry from the Hebrew University under the supervision of Prof. Yoel Sasson on the topic of 'formate-bicarbonate cycle as a platform for hydrogen and energy storage'.

Eviatar Golan

An experienced manager and scientist specialized in material engineering. Past experience include senior researcher roles at HP Indigo and Stratasys, R&D and process manager at Civan and engineering and technology scouting for LG. Proficient with methodically translating problems to chemical/physical properties and evaluating them, enjoys building and leading strong team work to deliver results.

Dr Shmuel Gonen

Ph.D. in chemistry. Expert researcher in the fields of electrocatalysis and chemical catalysis for energy applications. (Co-)author of 12 award winning publications. Highly experienced in the fields of physical chemistry, electrochemistry, organometallic and carbon-based materials, electron microscopy, physical and chemical analysis and spectroscopy. Specialist in hydrogen-based energy systems

Tier-1 Partners and Investors

Incubated from the Hebrew University of Jerusalem, Hydro X is supported by Israel Ministry of Energy and Innovation Authority.
Investors and partners include the energy investment house OSEG, Asian energy giant CLP and (through ESIL), renewable global leader EDF-Renewables, chemicals and sustainability multinational Johnson Matthey and Israel's largest refining and petrochemicals group Bazan.

רשות החדשנות
Israel Innovation Authority

Yissum
Hebrew University Technology Transfer

Ministry of Energy
www.energy.gov.il

OTHER SOURCES ENERGY GROUP

CLP 中電

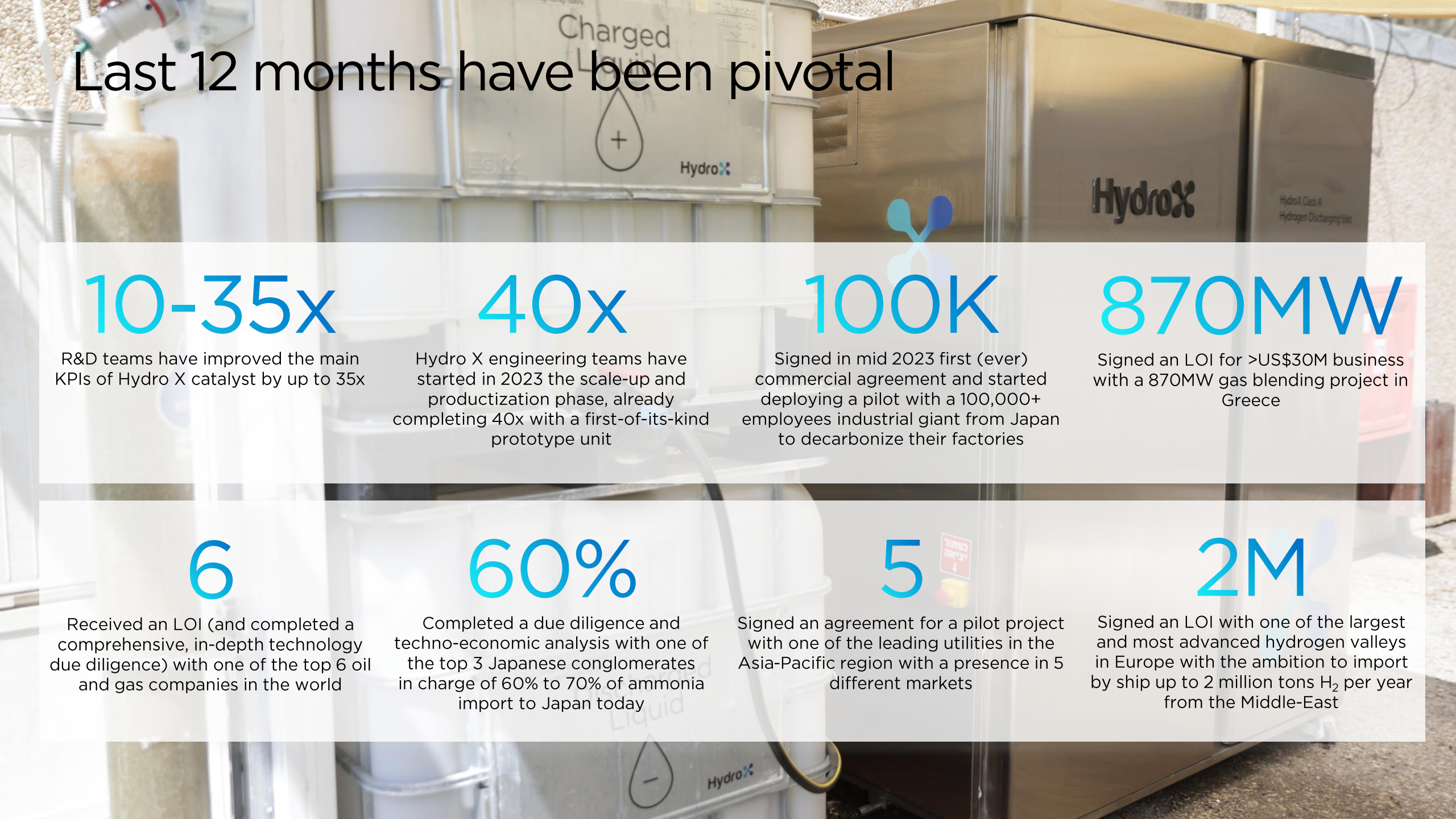
ESIL

eDF renewables

JM

BAZAN GROUP

Last 12 months have been pivotal



10-35x

R&D teams have improved the main KPIs of Hydro X catalyst by up to 35x

40x

Hydro X engineering teams have started in 2023 the scale-up and productization phase, already completing 40x with a first-of-its-kind prototype unit

100K

Signed in mid 2023 first (ever) commercial agreement and started deploying a pilot with a 100,000+ employees industrial giant from Japan to decarbonize their factories

870MW

Signed an LOI for >US$30M business with a 870MW gas blending project in Greece

6

Received an LOI (and completed a comprehensive, in-depth technology due diligence) with one of the top 6 oil and gas companies in the world

60%

Completed a due diligence and techno-economic analysis with one of the top 3 Japanese conglomerates in charge of 60% to 70% of ammonia import to Japan today

5

Signed an agreement for a pilot project with one of the leading utilities in the Asia-Pacific region with a presence in 5 different markets

2M

Signed an LOI with one of the largest and most advanced hydrogen valleys in Europe with the ambition to import by ship up to 2 million tons H_2 per year from the Middle-East

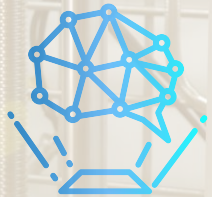
Now raising a Series-A round to empower roadmap and growth strategy

POCs & Pilots

Deploy first POCs and pilots

Products

Accelerate productization to launch first products within a year



R&D

Deepen technology leadership

BD & Marketing

Position as a global leader in the hydrogen storage market

Hydro X
Class 100 Hydrogen Charging

Configuration

Hydrogen capacity	1,100 Nm^3/h
	100 kgH_2/h
	1,110,000 l/h
Energy capacity	3MW
Required utilities	power supply, water, data, drain, nitrogen

Dimensions (20’ Container, without tanks)

footprint	14.88 m^2
height	2.59 m
depth	2.44 m
length	6.10 m

Hydro X
Class 100 Hydrogen Discharging

Configuration

Hydrogen outlet	1,100 Nm^3/h
	100 kgH_2/h
	1,110,000 l/h
Energy capacity	3MW
Required utilities	power supply, water, data, drain, nitrogen

Dimensions (20’ Container, without tanks)

footprint	14.88 m^2
height	2.59 m
depth	2.44 m
length	6.10 m

Hydro

Lower OpEx

Lower CapEx

Energy efficient

Non-toxic

Non-flammable

Non-explosive

Leveraging existing oil
or water infrastructure

HydroX.earth