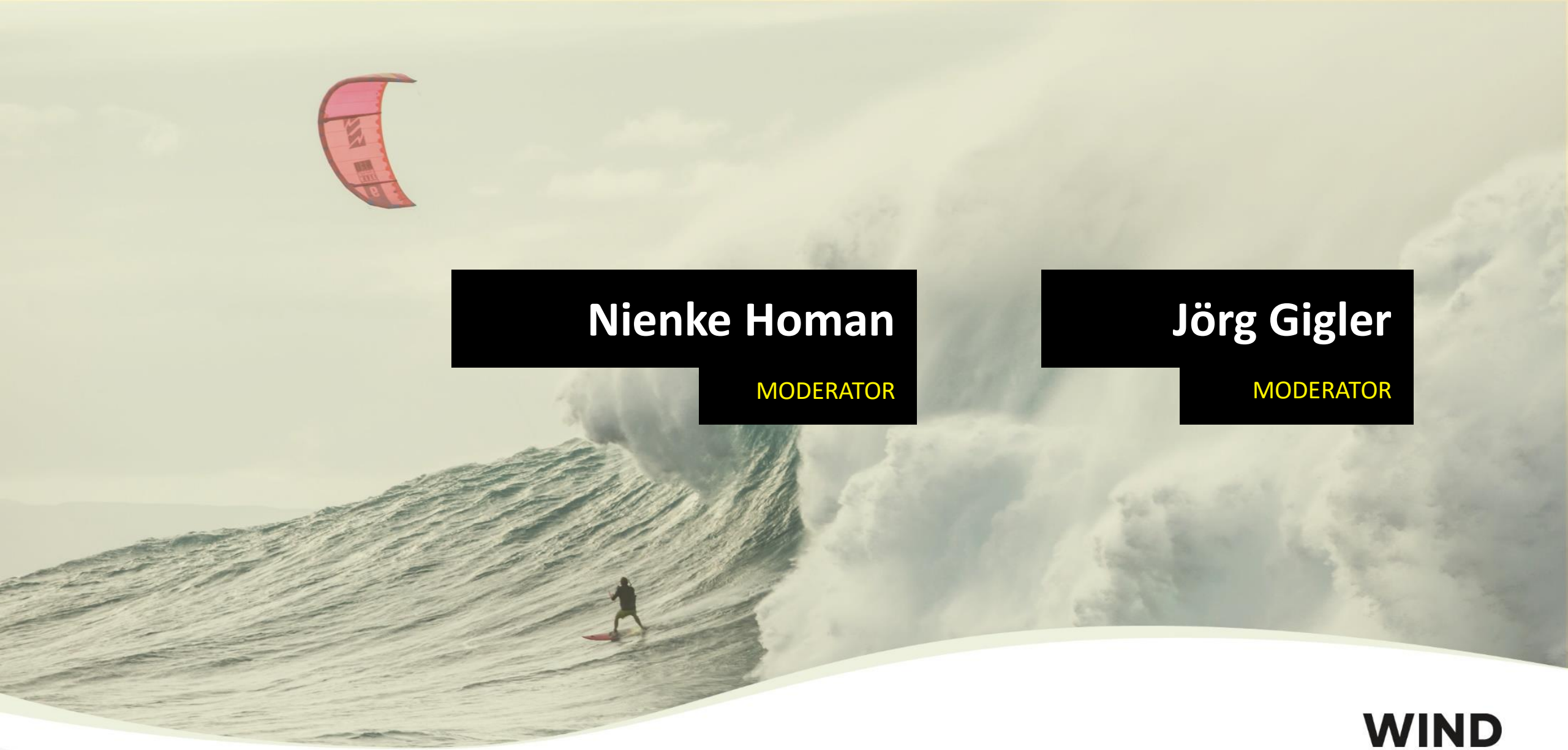
North Sea United towards net-zero

#WMG2023

New Energy Coalition

Drivers of Change



Nienke Homan

MODERATOR

Jörg Gigler

MODERATOR

WIND MEETS GAS.

Marieke Abbink

CEO NEW ENERGY COALITION

WIND MEETS GAS.

Sandor Gaastra

Secretary General Economic affairs and climate

WIND MEETS GAS.

North Sea United towards net-zero

#WMG2023

New Energy Coalition

Drivers of Change

Focco Vijselaar

General manager VNO-NCW

WIND MEETS GAS.

Jonathan Elkind

Centre on Global Energy Policy

WIND MEETS GAS.

Center on Global Energy Policy at COLUMBIA | SIPA

American Clean Energy Development

Jonathan Elkind

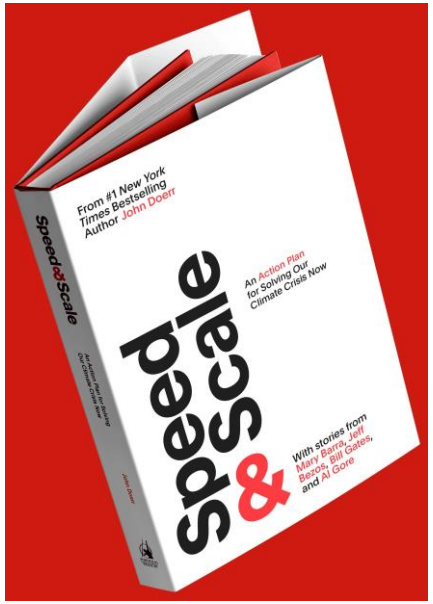
Wind meets Gas Conference
Groningen, Netherlands
October 12, 2023

Agenda

1. Nature of the Challenge
   -- Seeking speed and scale, but also durability
2. Statutory Progress
   -- Long-awaited progress
   -- Ambition
3. Hallmarks of Biden Climate Policy
   -- Comprehensiveness
   -- Prompt investment response
   -- Technology neutrality
   -- Carrots… and sticks as well
4. Challenges Ahead
   -- “Routine” headwinds
   -- Managing Relations with China
   -- Trade policy meets climate policy
   -- Politics, always

Nature of the challenge

The need for speed, scale, *and* durability



John Doerr, Author; Published by Penguin Random House

Timely climate solutions (**speed**) are vital to avoid accumulation of GHGs in atmosphere

- And the United States is slow off the starting blocks

Also need economy-wide climate solutions, and global solutions (**scale**) to promote effectiveness and contain costs

- Again, we have lots of unfinished business (as Global Stocktake underscores)

Cannot forget: we also need enduring climate solutions (**durability**)

- We need climate solutions that sustain public support, and that engender confidence and greater ambition

Statutory Progress (1 of 2)

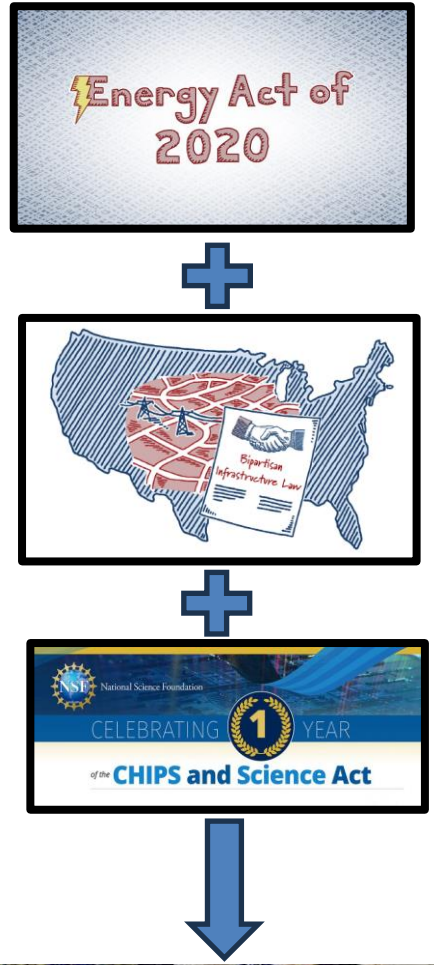
Inflation Reduction Act builds on three critical precursors

Energy Act of 2020 – December 2020
- Wide-ranging *authorization* bill that enabled work on countless clean energy technologies
- Built into the Consolidated Appropriations Act for 2021 (a "must-pass" bill)

Infrastructure Investment & Jobs Act ("Bipartisan Infrastructure Law") – Nov 2021
- Authorization for clean energy activities including: clean transport, clean energy demos, EV charging, orphan wells, CCUS, nuclear, efficiency, clean H2, storage

CHIPS and Science Act – August 2022
- Extensive focus on semi-conductors *plus* broad provisions on R&D (including clean energy), critical minerals, innovation and clean energy demo programs

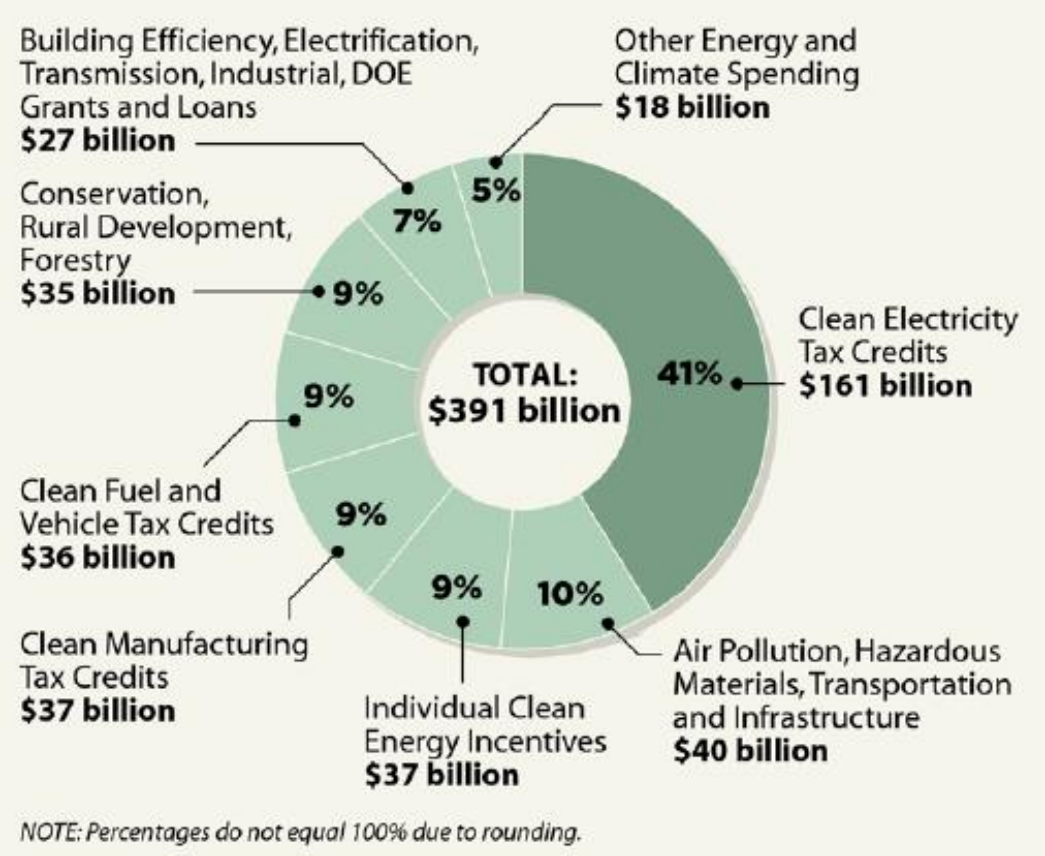
Inflation Reduction Act – August 2022
- An appropriations (spending) bill – passed under expedited procedures
- All elements in the bill had to be nominally fiscal in nature



Top two graphics – ClearPath.org; lower two – energy.gov

Statutory Progress (2 of 2)

IRA's Ambition is its Core Strength *and* its Challenge



Inside Climate News, using CBO data

A cornerstone of Biden's climate agenda

- Projected to translate into 43% reduction in US GHG emissions by 2030 – US NDC calls for reductions of 50-52%

Massive influx of funding for DOE and certain other US agencies

- DOE budget at $151B for FY2023, compared with roughly $42 for FY2021 and 2022

IRA passed with only Democratic votes

- In a politicized Washington, IRA's opponents bitterly criticize the law, call for its repeal

Critical question: Are IRA's provisions meant to reduce emissions, reconstruct US manufacturing, or both?

- Source of persisting frictions (Chmn Manchin, Republican Senators)

Hallmarks of Biden Policy (1 of 4)

Administration takes *comprehensive* approach to clean energy

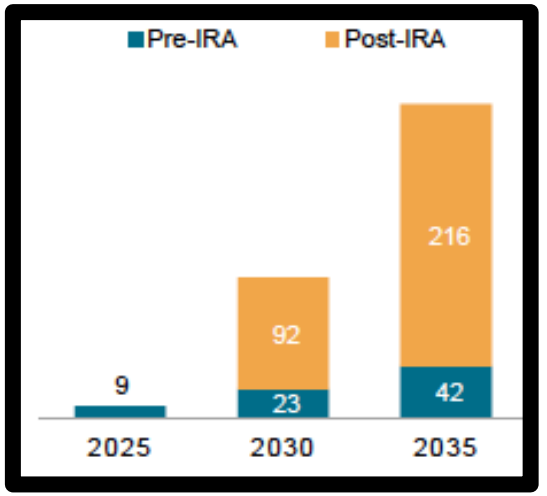
Stark reality: Early-stage ***innovation*** does ***not automatically*** lead to wide commercial ***deployment***;

- Biden focuses on all aspects of research-development-implementation-commercial deployment;
- Extensive strategy development and road-mapping, informed by consultations with industry and other stakeholders;

In regard to ***clean hydrogen***, a ***portfolio*** of tools:

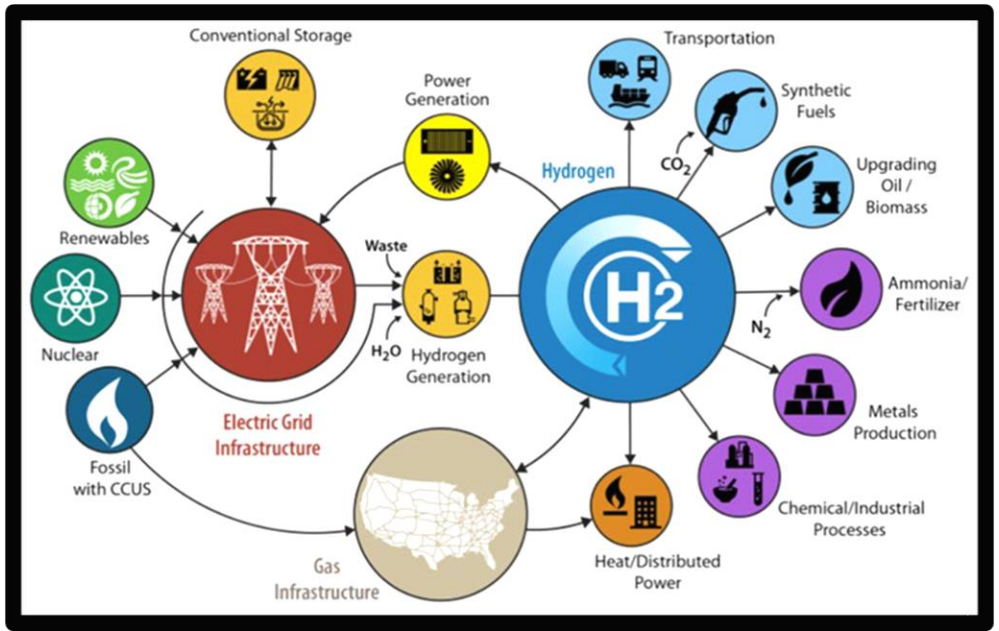
- Hydrogen Shot R&D goal → $1/kg within one decade;
- R&D funds via DOE's H2 research program;
- Cost-shared regional hydrogen hubs to be developed (up to $7B from IIJA for 6-10 hubs):
- Fiscal incentives under IRA for 10 yrs (45V);
- DOE Loan Programs: $5-8 B of low-c H2 projects under review;
- Demand-side support -- Aug 2023 notice: DOE to commit up to $1B to help foster demand e.g. advanced mkt commitments;
- International collaborations to speed progress.

Massive growth ahead (shown here: GWh of electrolyzer capacity)



S&P Global, August 2023

DOE focuses on drivers of supply *and* demand growth – here summarized as "H2@Scale"



Hallmarks of Biden Policy (2 of 4)

IRA and other statutes are triggering a *speedy investment* response

Many **big corporates** – both US- and foreign-domiciled – see US as a key target market:

- Money was waiting on the sidelines.

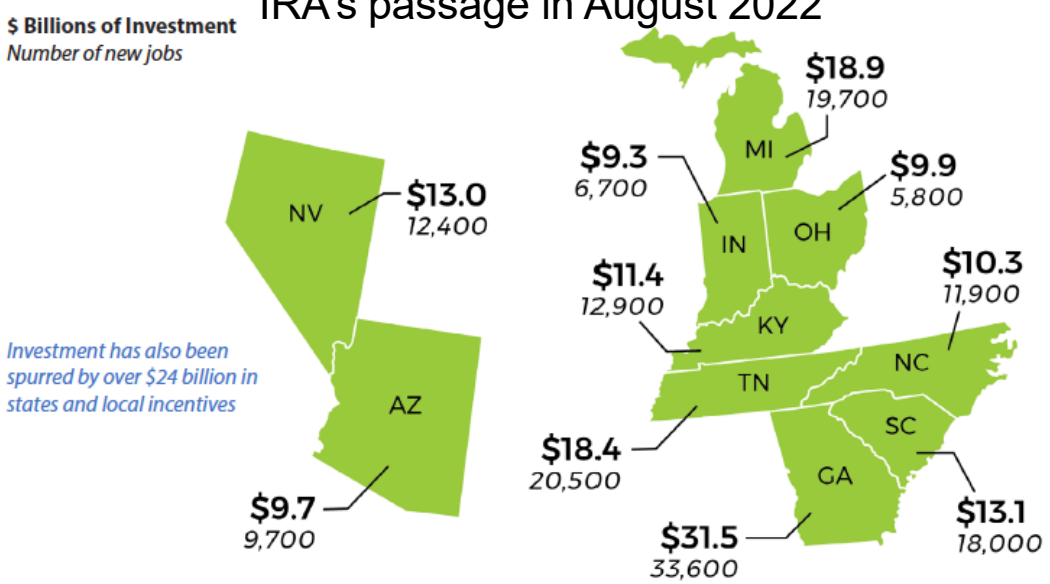
Favorable fiscal treatment offers (relative) administrative simplicity for investors;

- Many investments into states led by climate-skeptical elected officials (>80%, per FT);
- Transferrable credits, and credits for non-profits and state/local govts, are key innovations;
- Key Federal regulatory decisions still ahead.

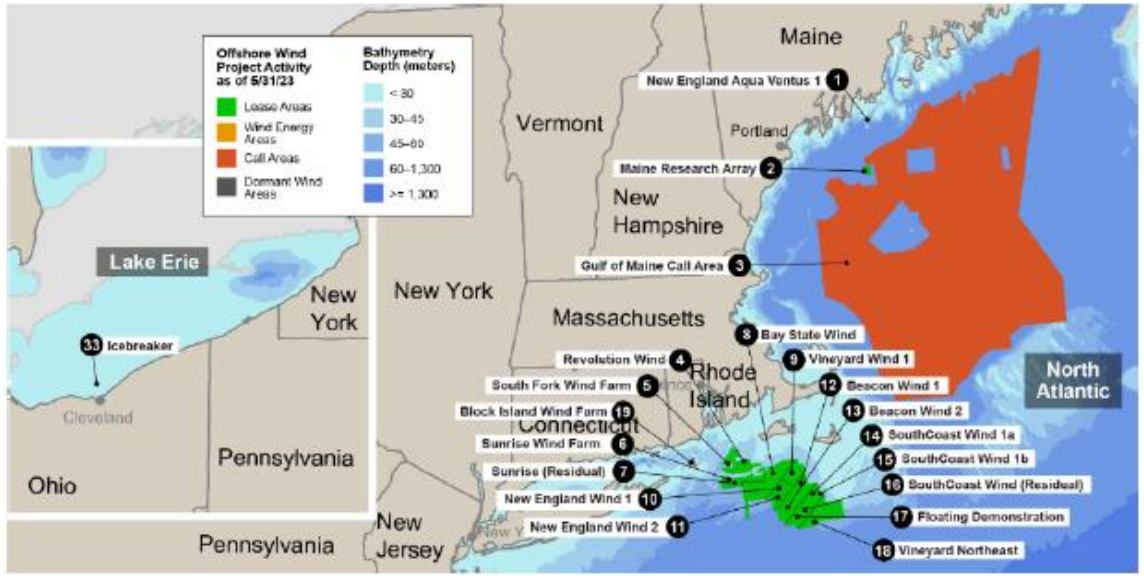
Significant **surge of investment** occurring in a wide range of core clean energy technology areas:

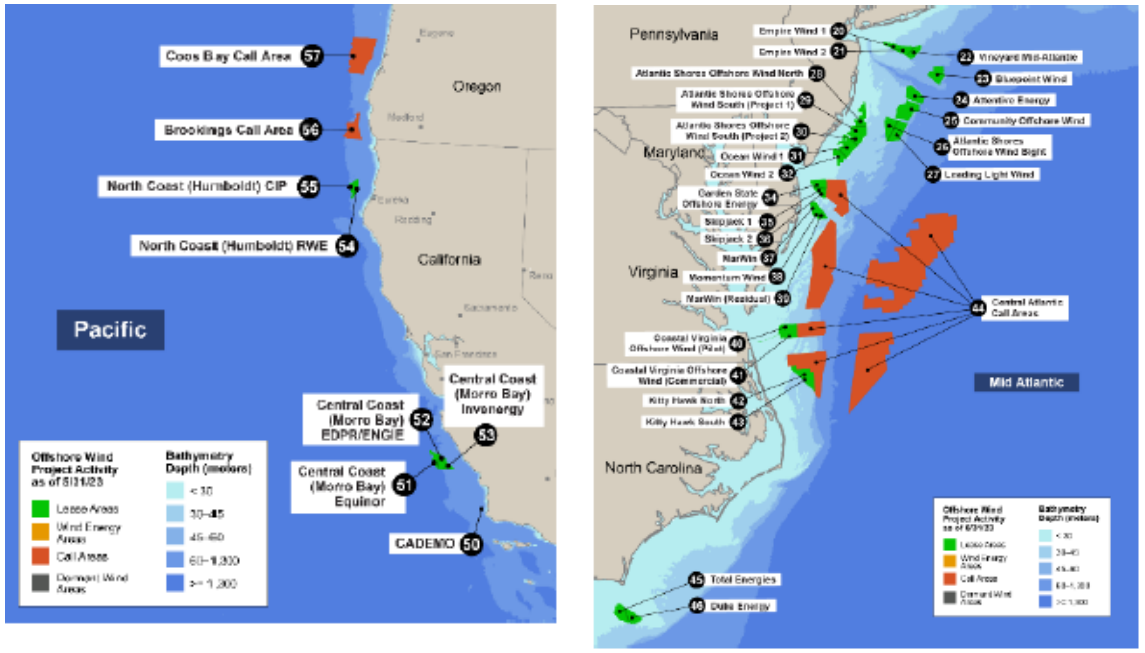
- Batteries and electric vehicle manufacturing;
- Offshore wind;
- Carbon capture and storage / direct air capture.

EV and battery manufacturing announced since IRA's passage in August 2022



Environmental Defense Fund, Aug 2023





DOE/NREL Offshore Wind Market Report 2023

Hallmarks of Biden Policy (3 of 4)

***Technology neutrality* -- Pressing forward aggressively on all low-carbon fronts**

Different resource bases yield different clean energy opportunities around the US:

- **Offshore wind** along Atlantic Seaboard, and maybe deep-water West Coast (recent headaches -- inflation and capital costs!);
- **Small modular reactors** being piloted in Mountain West and Great Plains;
- **CCUS** and **DAC** mostly along Gulf of Mexico;
- **Onshore wind** (finally being facilitated by some new transmission grid capacity in the Great Plains and Mountain West);
- **Storage** under widespread development – including new battery chemistries and forms;
- Controversial for some: Effort to significantly reduce **CH4** emissions from oil and gas sector, on assumption of persisting natgas demand.

Hallmarks of Biden Policy (4 of 4)

Many *"carrots"* for market incentives, but *"sticks"* are also used for regulatory firmness

The regulatory **"sticks"** are a serious component of US climate policy:

- Automobile and other equipment efficiency standards;
- Methane emissions (though many smaller producers are exempt);
- Clean Air Act requirements (CO2 is stated explicitly as a "pollutant");
- But… recent Supreme Court decisions place stout pressure against expansive legal interpretations.

The incentive **"carrots"** are new and improved:

- Ten-year runway for most of the fiscal incentives (rather than past annual sunsets for solar/wind ITC and PTC);
- Many IRA incentives are technology neutral, allowing market response by investors;
- Certain IRA incentives are transferrable and can be taken in the form of upfront cash equivalents, easing capital-raising for new projects;
- But a tricky aspect exists: Hard to place an upper limit on budget impacts -- $369B… or $500B?... Or more?

Many Challenges Ahead (1 of 4)

"Routine" headwinds (and now higher cost of capital) pose a panoply of obstacles to US decarbonization agenda

Permitting

- NIMBYism is alive and well all across the United States;
- Interconnection and permitting processes facilitate legal challenges and looooooong decision-making processes (12-15 years not uncommon);
- Modest possibility of bipartisan support for streamlined procedures.

Workforce

- Low overall unemployment levels in US; hostility toward immigration, despite long US history of welcoming immigrants;
- Need to improve, and sharpen the focus, of educational system, from high schools to community colleges to universities.

Supply chains

- Critical materials – capital, technology, time, and people are all essential if we are to change existing reliance on a handful of countries, esp. China;
- Mining and mineral processing industries did not excel in environmental protection historically.

Many Challenges Ahead (2 of 4)

Managing Relations with *China* – No Task More Important

Under current leadership, China poses **comprehensive challenge** – in terms of politics, economics, and security:

- Beijing is testing established norms in human rights (Xinjiang), political rights (Hong Kong), regional security (South China Sea, Taiwan), global economics (predatory trade and commercial practices), international security (cyber attacks) and more.

At the same time, no **workable global solution** on climate unless China is part of that solution;

- China itself faces considerable climate vulnerability (extreme temps and storms, inland and coastal flooding, drought, food insecurity);
- China is simultaneously providing clean energy leadership *and* is adding to the challenge;
- Worth recalling Détente Era US-Soviet S&T collaborations.

Many Challenges Ahead (3 of 4)

Trade – Essential for Climate Solutions, but Badly Needs Updating

In United States, deep **loss of faith** in international trading regime:

- Virtual consensus that China's WTO accession did not result in even playing field, true market access for non-Chinese companies – due to concealed provincial and national subsidies, obligatory tech transfer and theft of intellectual property represent top sensitivities and more;
- Most Americans conclude that global trade system needs serious repair;
- Grudging recognition that we need trade to facilitate the movement of goods and services for decarbonization -- a topic for a second Biden term?

US-EU tensions on trade seem likely to grow more difficult:

- Admin. looking for interpretive flexibility on "Made in America" provisions of IRA, but numerous Congressional leaders oppose such flexibility;
- CBAM raising numerous questions in Washington; no easy solution is evident;
- End-October deadline for GASSA approaching fast!
- EU's investigation into Chinese EVs suggests Brussels sees significance of threat from Beijing's policies, but solutions via WTO will take years to play out.

Many Challenges Ahead (4 of 4)

Politics, always politics

Limited US law-making until 2025:

- Only (1) grandstanding, (2) a few “must-pass” bills, and (3) emergency legislation;
- No time for nuance: For example, super hard to secure vital support for funding to enable the US government to work with others to facilitate clean energy investment in the developing world.

On-going support for investment and job creation:

- Roll-back of IRA funding is *possible*, if both houses of Congress change majority parties;
- But a rollback is *unlikely*, even in a time of culture wars.

Alternative presidential priorities on climate?

- Cannot rule out a total change in direction!

Center on Global Energy Policy at COLUMBIA | SIPA

Thank you

Jonathan Elkind
Senior Research Scholar
Columbia University
Center on Global Energy Policy
jonathan.elkind@columbia.edu

Appendix

Main clean energy provisions in Inflation Reduction Act (1 of 2)

Production tax credits

Clean electricity
Up to 1.5 cents per kWh of renewable or zero-carbon electricity

Advanced manufacturing
Variable unit credits for solar components, wind turbine and offshore wind components, inverters, certain battery components, critical minerals

Clean hydrogen
Up to $3 per kilogram of clean hydrogen produced*

Nuclear power
Up to 1.5 cents per kWh of electricity produced from nuclear energy

Investment tax credits

Clean electricity and energy projects
Up to 30% of investment in certain renewable or low-carbon energy projects

Geothermal heating
Up to 30% of investment in geothermal heat pump projects

Advanced energy projects
Up to 30% of investment in industrial heat, carbon capture, recycling, waste reduction and energy efficiency and other projects

Production, investment tax credit bonuses

American-made
Up to 10% bonus for meeting certain domestic manufacturing requirements

Energy communities
Up to 10% bonus for projects located in brownfields or communities in fossil fuel industry

Low-income communities
Up to 10% bonus for projects located in low-income communities or on tribal lands; up to 20% for projects in low-income residential buildings

S&P Global, August 2023

Appendix

Main clean energy provisions in Inflation Reduction Act (2 of 2)

Carbon capture tax credits

Industrial facilities and power plants
Up to $85 per metric ton of CO_2 captured and stored; up to $60 per metric ton of CO_2 utilized

Direct air capture facilities
Up to $180 per metric ton of CO_2 captured and stored; up to $130 per metric ton of CO_2 utilized

Offshore wind

Fossil fuel tie
A year prior to offshore wind lease issuance, at least 60 million acres must be offered in oil and gas lease sale

Fuel tax credits

Clean fuels
Up to $1 per gallon of low-carbon transportation fuel produced

Sustainable aviation fuel
Up to $1.75 per gallon of sustainable aviation fuel produced

Residential tax credits

Clean energy
Up to 30% of investment in residential solar, wind, geothermal, biomass and battery storage projects

Energy efficiency
Up to 30% of investment in projects that improve energy efficiency

Clean vehicle tax credits

Consumer vehicles
Up to $7,500 for purchase of electric vehicle, plug-in hybrid or hydrogen fuel cell vehicle

Used vehicles
Up to $4,000 for purchase of used EV or plug-in hybrid

Commercial vehicles
Up to $40,000 for purchase of clean vehicle weighing over 14,000 pounds; Up to $7,500 for vehicle weighing less than 14,000 pounds

Charging stations
Up to 30% of cost of charging station or alternative fuel refueling station

Electric transmission

Financing
$2 billion to Department of Energy (DOE) for loans financing transmission lines determined to be in the national interest

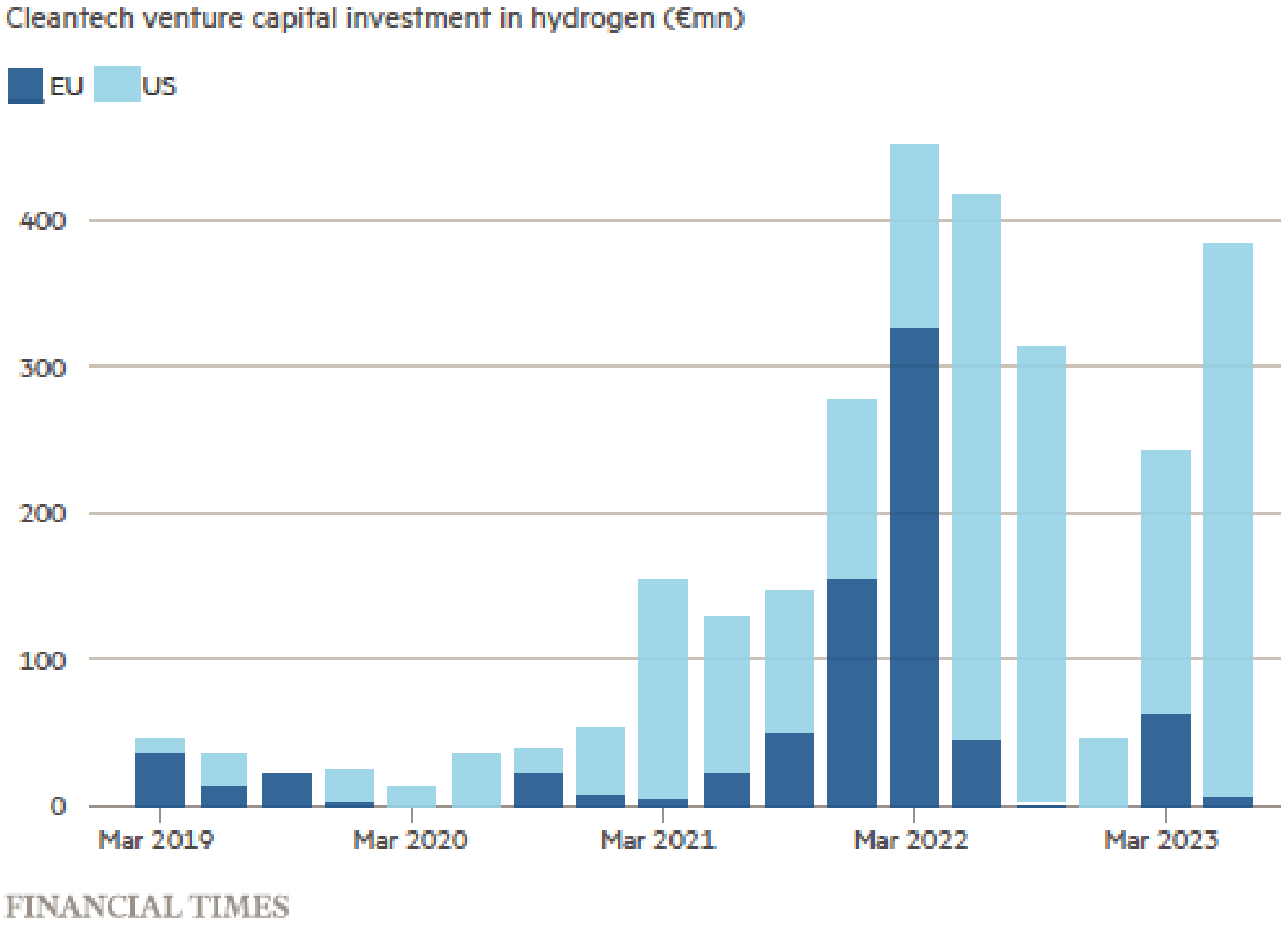
Siting
$760 million to DOE for grants to states to help with siting transmission lines

Planning
$100 million to DOE through Sept. 30, 2031, for planning and modeling interregional and offshore wind transmission

S&P Global, August 2023

Appendix

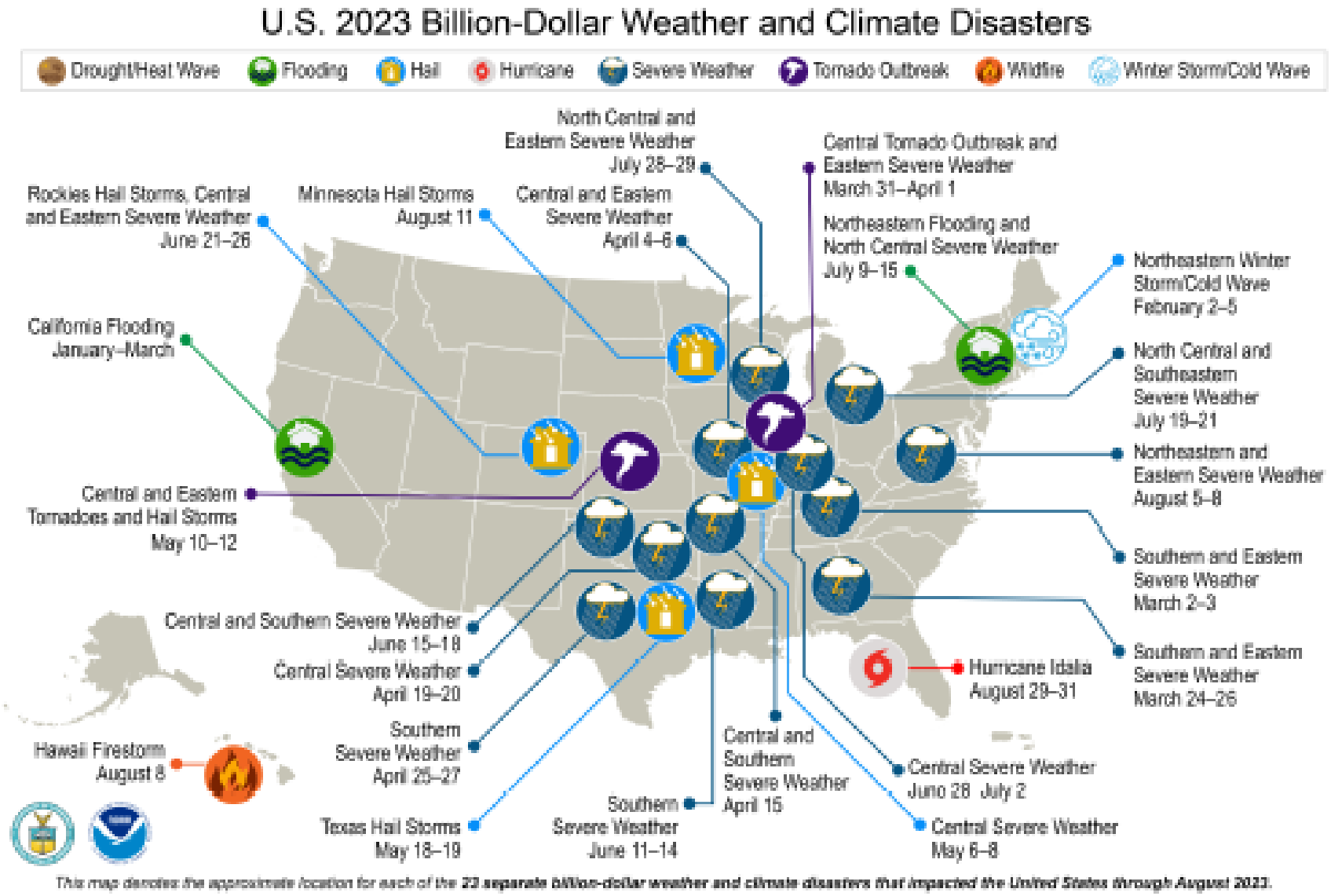
Inbound investments in green H2 – before & after IRA



Appendix

Cannot ignore impacts of a changing climate:

- **23 disasters with damages >$1B each in first 9 months of 2023**



National Centers for Environmental Information, NOAA

Appendix

Competitors, Partners, or Dung Beetles?

Dung beetles spend hours rolling up balls of dung to attract females. But there are some very smart dung beetles that just sit by the side and watch while others do hard work. Then they shoot in, take the dung ball, take the girl and run away with everything. That's Joe Biden.

[1]

Jorgo Chatzimarkakis, Hydrogen Europe
As quoted in Politico, July 5, 2023

Break

10.50 - 11.20

North Sea United towards net-zero

#WMG2023

New Energy Coalition

Drivers of Change

Tim Boersma

Partner Brabers Corporate Council

WIND MEETS GAS.

Wind Meets Gas conference

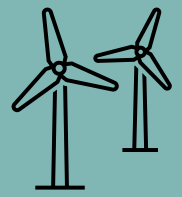
Tim Boersma

October 12, 2023

Introduction

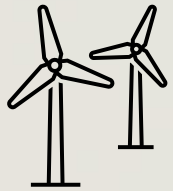
- Brabers corporate counsel
- Brookings Institution
- Columbia University
- ABN AMRO
- Brabers corporate counsel
- GDIP – and what Pink Floyd, Run DMC and Elvis have to do with it…

North Sea (offshore)wind energy and global hydrogen

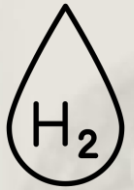
		
Installed capacity / production (2022)	32 GW	95 Mt (grey) <1 Mt low-carbon <100 kt electrolysis
Ambition 2030	60 GW	20 Mt
Ambition 2050	300 GW	>600 Mt
Significant mineral intensity	Copper, Zinc, Manganese Rare earth elements (esp. Neodymium, Praseodymium)	Nickel, Zirconium vs. Platinum, Palladium, Iridium
Other material input	Steel, cement	Fuel cells (depending on technology)

Sources: IEA and World Bank

Key bottlenecks



- Inflation
- Supply chain bottlenecks
- Mechanical issues with turbines
- Logistical challenges preventing hauling of needed parts for new wind farms



- Rise in equipment and financial cost
- Slow implementation of support schemes
- Regulatory and certification uncertainty
- Electrolyser manufacturing expansion delays
- Modest focus on demand, specifically in existing applications

- Lack of infrastructure
- Multiple financial uncertainties throughout the supply chain, leading to sizeable risk premium
- Technological uncertainty amongst EPC contractors

Source: IEA, BNEF

Green Deal Industrial Plan

Predictable and simplified regulatory environment	Faster access to funding	Open trade for resilient supply chains	Skills
Net Zero Industry Act	**National funding**	**Trade openness**	**Focus on green & digital skills**
Industrial manufacturing through simplified regulation	Adapt state aid rules by: • Simplifying rules for renewable energy & industrial decarbonization • Supporting investment in net zero tech • Aiding major new production projects • Expand flexibility on notification of state aid • Simplifying IPCEI	• Support WTO • FTAs • EU-US Taskforce on IRA • Sustainable Investment Facilitation Agreements and Global Gateway	• European Skills Agenda • European Education Area • European Year of Skills 2023
Critical Raw Materials Act	**EU funding**	**New initiatives**	
Diversify sourcing, processing, recycling	• REPowerEU (grants, mostly loans) • InvestEU (guarantees) • Innovation Fund (first-of-a-kind)	• Critical Raw Materials Club, with like-minded partners • Clean Tech / Net-Zero Industrial Partnerships • Export credits strategy • Regulation on Foreign Subsidies • International procurement instrument • EU framework for screening of foreign direct investment • Anti-Coercion Instrument	
Energy	**Private funding**		
Reform power markets, regulatory framework for batteries, unified energy label, infrastructure	Capital Markets Union action plan		

Challenges that we may solve…

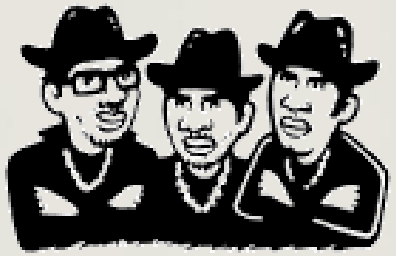
- Simplify rules, to an extent (also because of RED III, e.g. renewable acceleration areas, permitting < 1 year) but not anytime soon…
- Improve access to public funding
- Create demand for H_2, e.g. through mandates / public procurement rules (but, be pragmatic)
- Become a bit more geo-savvy, including continued international dialogues

And the ones that remain on the table

- Member states vs EU, endless shades of green not helping investment climate (carbon intensity!)
- Fact-based public debate about energy transition, and no, it will not be easy and cheap
- Dependencies change, but do not disappear
- The role of industry, now and in the future
- Can we find political momentum to rethink ‘additionality’
- Money costs money again
- What are the most effective financial support schemes (opex vs. capex)
- Politics: who is driving this transition?
- The road to 2050: less focus on 2050, and more on the road
- How to facilitate regional initiatives

‘You are young and life is long, and there is time to kill today. And then one day you find that ten years go behind you. No one told you when to run, you missed the starting gun.’

Pink Floyd
– Time



‘Love won’t buy you clothes’, and worries such as bills and violence demand a cool and collected head

Run DMC
– It’s Like That

‘A little less conversation, a little more action, please
All this aggravation ain't satisfactioning me
A little more bite and a little less bark
A little less fight and a little more spark’

Elvis Presley
– A Little Less Conversation

Tim Boersma

boersma@brabers.nl

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New Energy Coalition

Drivers of Change

Nordic Powerhouse

Jarl Frijs-Madsen

Embassy of Denmark to The Netherlands

Kristin Myskja

Norwegian Ministry of Petroleum and Energy

Anne Vasare

Ministry of Foreign Affairs of Finland

Workshops 13:30 – 15:30

Session A: Building the European Hydrogen Value Chain, a regional perspective
Forum Groningen – Rabostudio

Session B: How to harvest wind: an interdisciplinary approach to offshore system integration in the North Sea
Forum Groningen – Camera 2

Session C: Challenges for turning the North Sea into Europe's green power plant: the need for international collaboration
Martinikerk – de Kapel

Session D: Nordic-Dutch connectioncs: The role of ports & shipping for the future hydrogen economy
Martinikerk – de Librije

Session E: The champagne of energy transition – developing a hydrogen economy in the UK and the Netherlands
Forum Groningen - Newsroom

WIND MEETS GAS.

Lunch

12.30 - 13.30

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Matchmaking

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Cas König

CEO Groningen Seaports

North Sea United towards net-zero

#WMG2023

WIND MEETS GAS.

Developments Delfzijl and Eemshaven

Wind meets Gas | 12 October

Cas König | ceo Groningen Seaports

Northern Netherlands

Hydrogen Capital of Europe

Sustainable Energy Transition

Best connected in Europe

High-skilled labour force

Groningen: city of Talent

Delfzijl and Eemshaven

Delfzijl

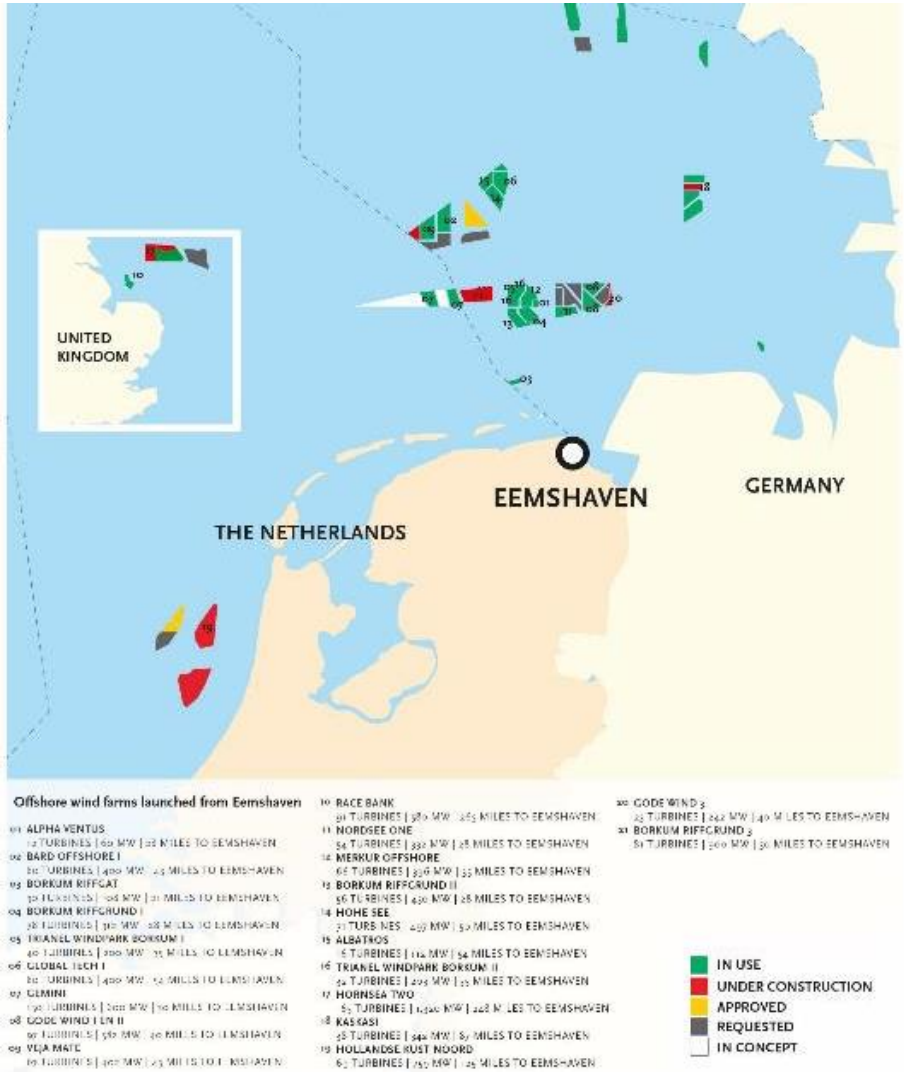
Circular economy and biobased chemicals

Eemshaven

Offshore wind and energy & data

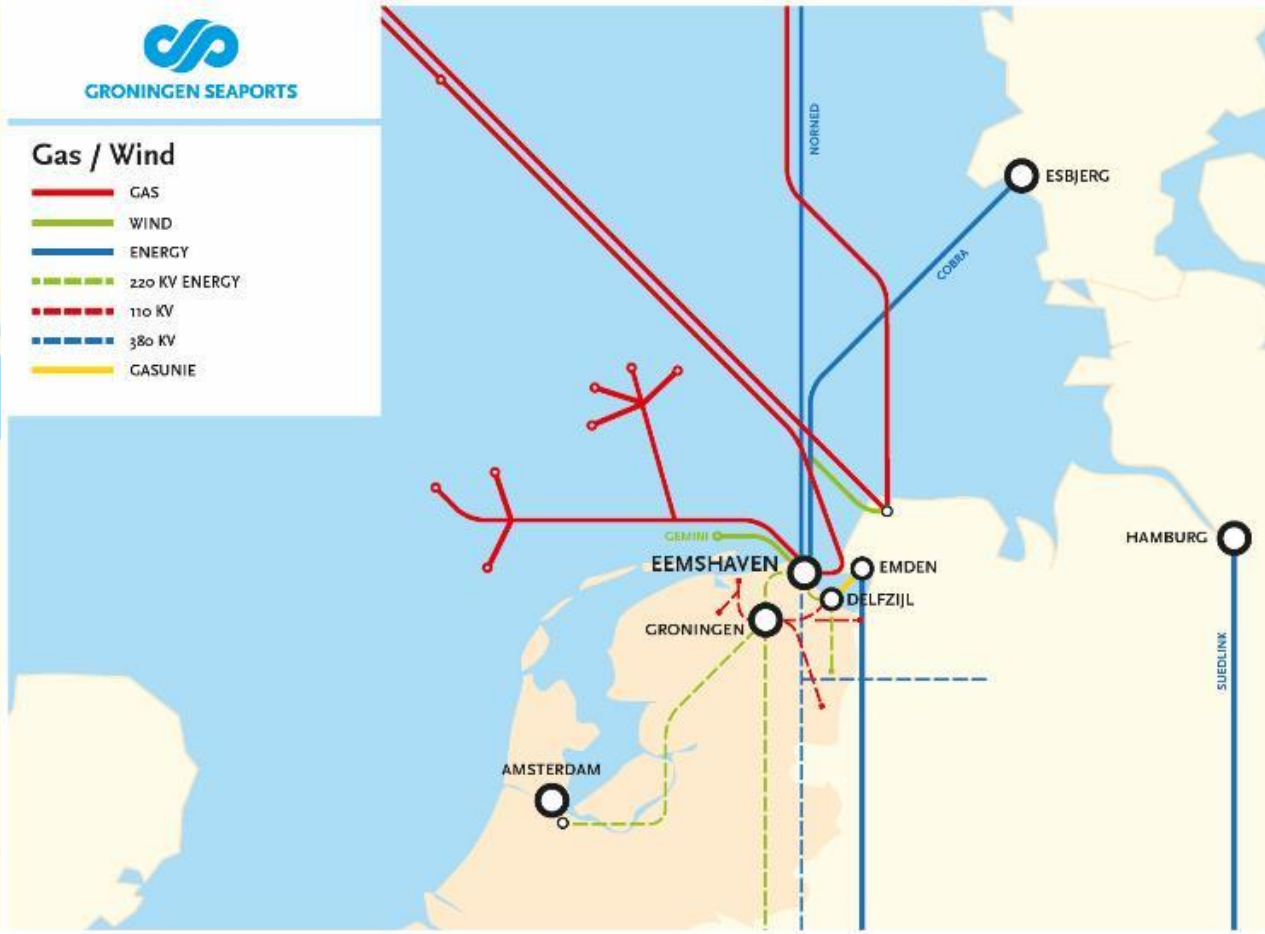
Energyport of Europe: power (8,000 MW) & balancing hub

Eemshaven Leading Offshore Wind Port



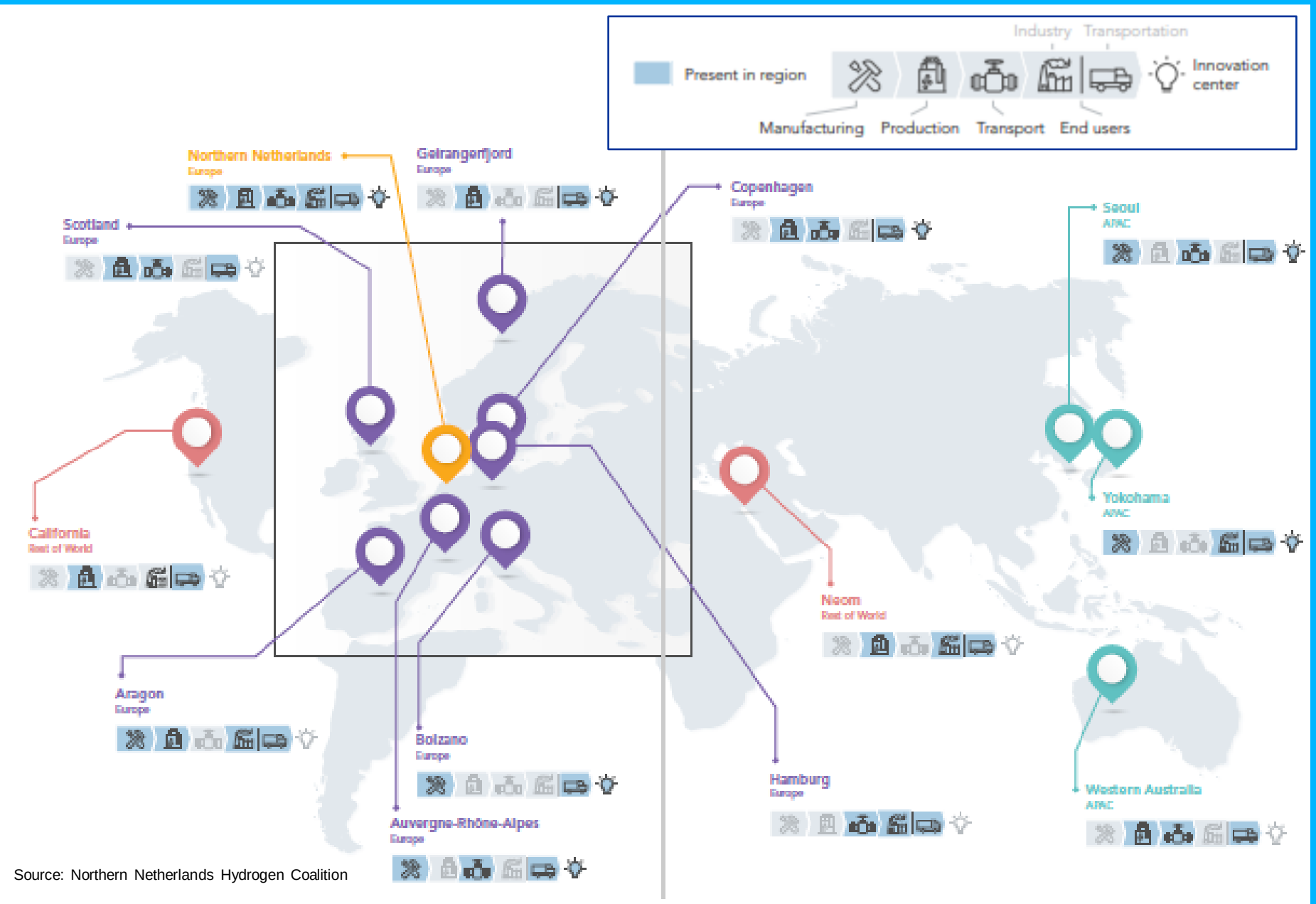
Eemshaven excellent connected

International glass fiber



Landing point green power/H2

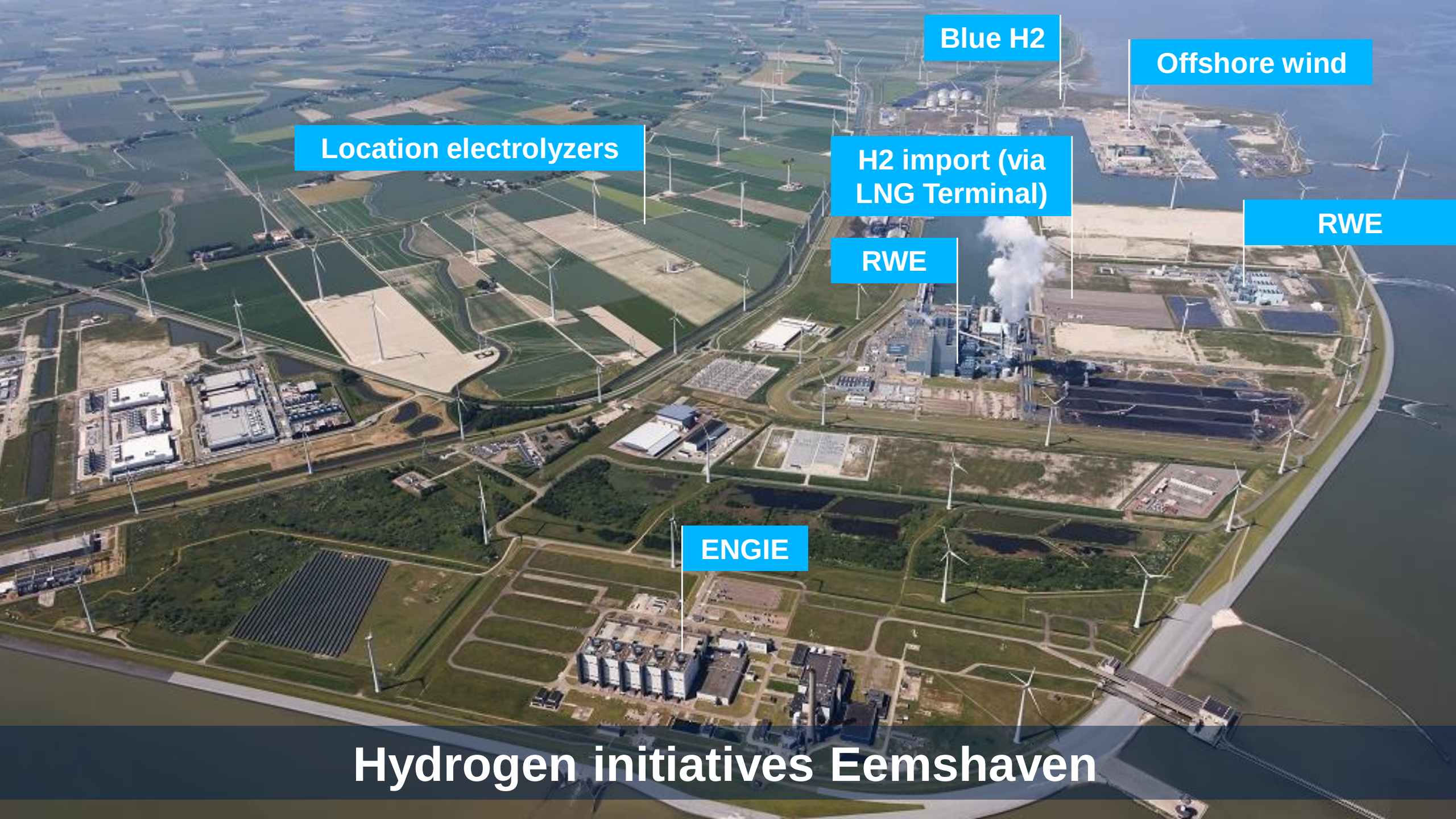
Hydrogen Ecosystem Northern Netherlands unique



Source: Northern Netherlands Hydrogen Coalition

WHY HERE?

1. Hydrogen offtake markets
2. Offshore wind potential
3. Strategic production locations
4. Available and dense infrastructure
5. Storage in salt caverns
6. Knowledge and innovation hubs



Hydrogen initiatives Eemshaven

Site EemsEnergyTerminal (LNG terminal)

Existing infrastructure

Route indication infrastructure to be built

Future extension

Hydrogen filling station (buses)

H2 Hub 'De Delta' (vessels)

SKYNRG

DJEWELS 2

BIO MCN

EVONIK

TEIJIN ARAMID

DJEWELS 1

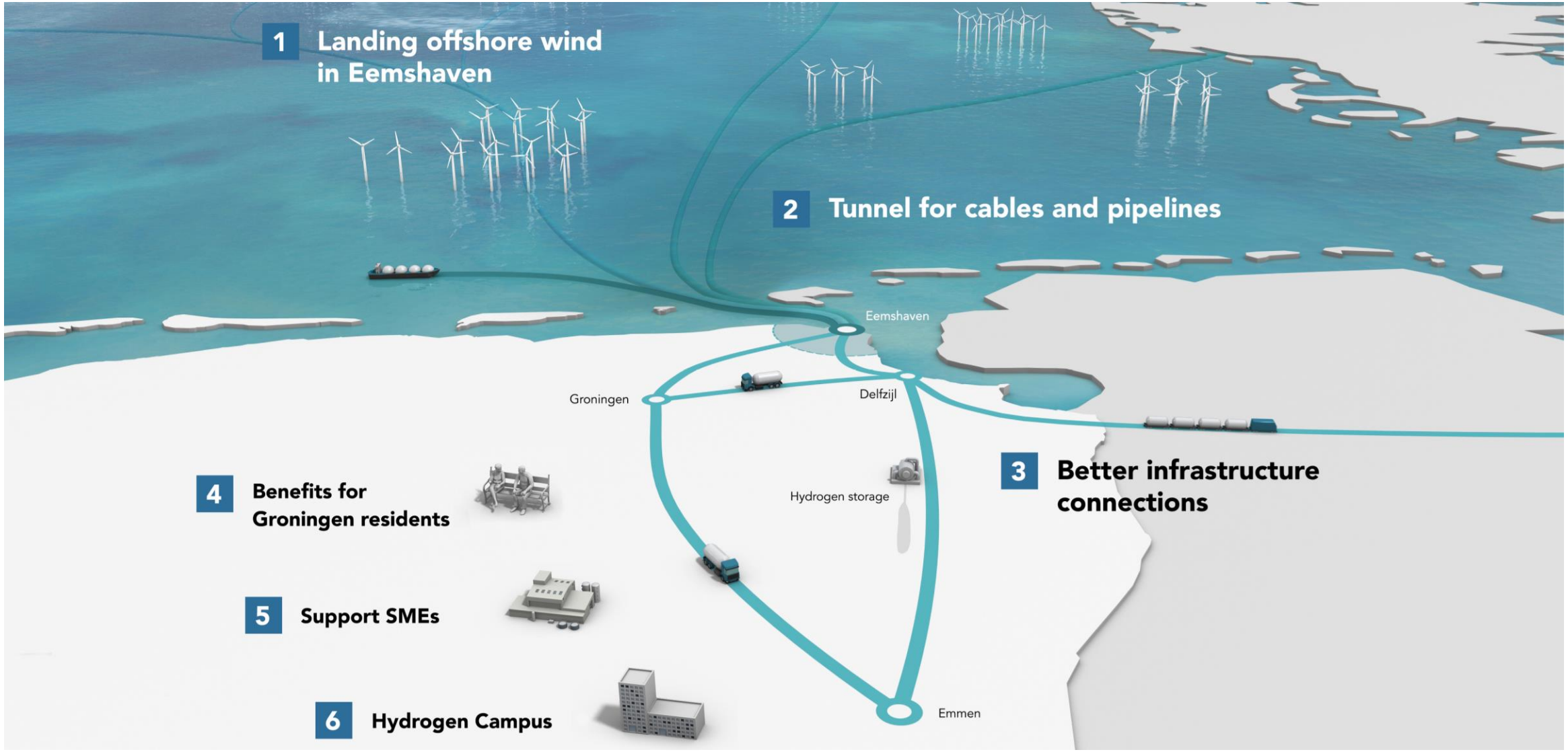
Hydrogen initiatives Delfzijl

Kickstarter

- **Kickstarter**
- **Connection <16 bar**
- **Production in Eemshaven (ENGIE/RWE)**
- **Consumption in Delfzijl (7 potential consumers)**
- **2 flexible 6”pipelines = 150 MW H2**

Tunnel under Wadden Sea to connect wind farms on land?

Future of Groningen



Thank you for your attention

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North Sea United towards net-zero

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New Energy Coalition

Drivers of Change

Tilman Wilhelm

Head of Regulatory Policy, Press and Public Relations - DVGW

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WIND MEETS GAS.

Henrik Solgaard Andersen

VP Global Hydrogen - Equinor

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WIND MEETS GAS.

Equinor – A leading company in the energy transition

NET ZERO BY 2050

15-30 MILLION TONNES PER ANNUM

CO_2 transport and storage capacity by 2035

Equinor share

3-5 MAJOR INDUSTRIAL CLUSTERS

Low carbon hydrogen projects by 2035

50 % OF GROSS INVESTMENTS

Renewables and low carbon solutions by 2030

Decarbonise Northwest European Industry based on proven and referenced solutions at mega-scale

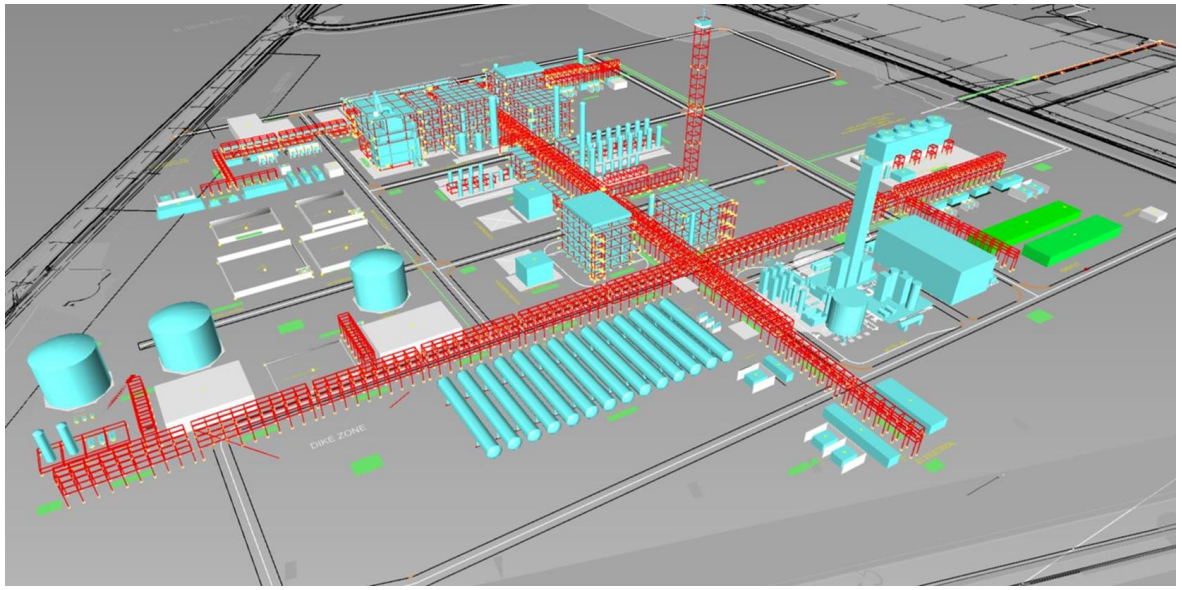
Reliable, competitive, safe and clean solutions is what we offer

A robust project pipeline towards 2030:

- 25-30 MTPA CO2 storage incl pipeline and shipping
- 10 GW hydrogen projects
- 10-18 GW H2 pipeline connecting Norway with Europe

H2M Eemshaven a European flagship hydrogen and CCS project

- 1000 MW low-carbon hydrogen plant with a CO2 shipping solution to Norway
- Customers: industry and power in the Netherlands and Germany
- Strategic located at Eemshaven positioning Groningen in the forefront of developing hydrogen and CCS value-chains.
- A complex cross-border value-chain: Norway-Netherlands-Germany ➔ collaboration is key
- Status: FEED ready aiming at FID in 2025 targetting start-up 2029
- Biggest challenge: lack of clear policy and framework



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WIND
MEETS
GAS.
The European Green Deal
Industrial Plan
#WINDMEETSGAS23

NEDERLAND WATERSTOFLAND 2030

TeamNL

missieH2.nl

partner van TeamNL

Missie H2 is supported by

Gasunie · Shell · Eneco · Vopak · remeha · TOYOTA · Port of Amsterdam · Groningen Seaports

Matchmaking

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See you tomorrow!

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