



Hydrogen Hype vs Reality

What does really work?

June 2024



Thomas Füreder, CFA

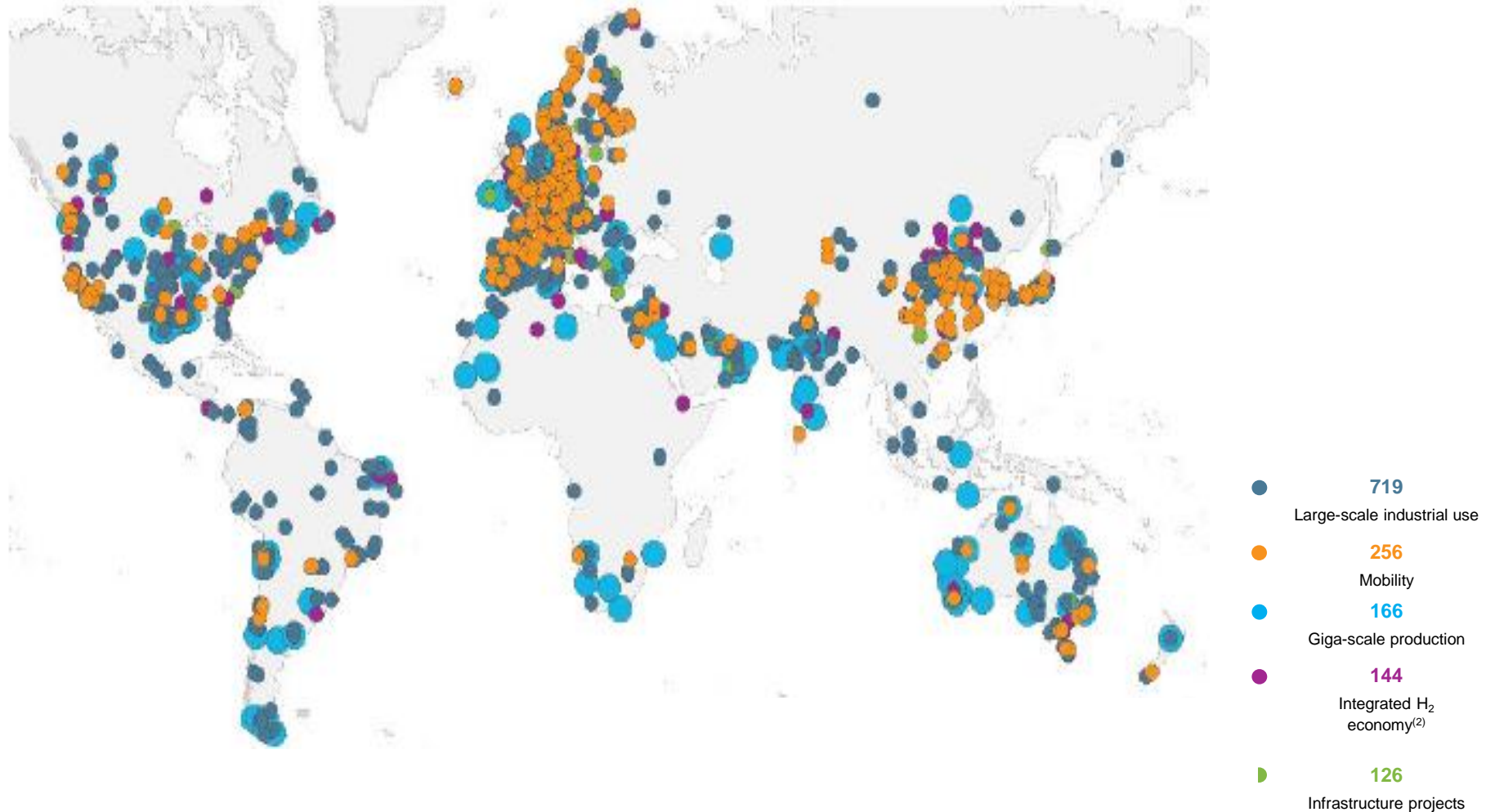
Managing Director
Power & Utilities

Barclays

Email: thomas.fureder@barclays.com

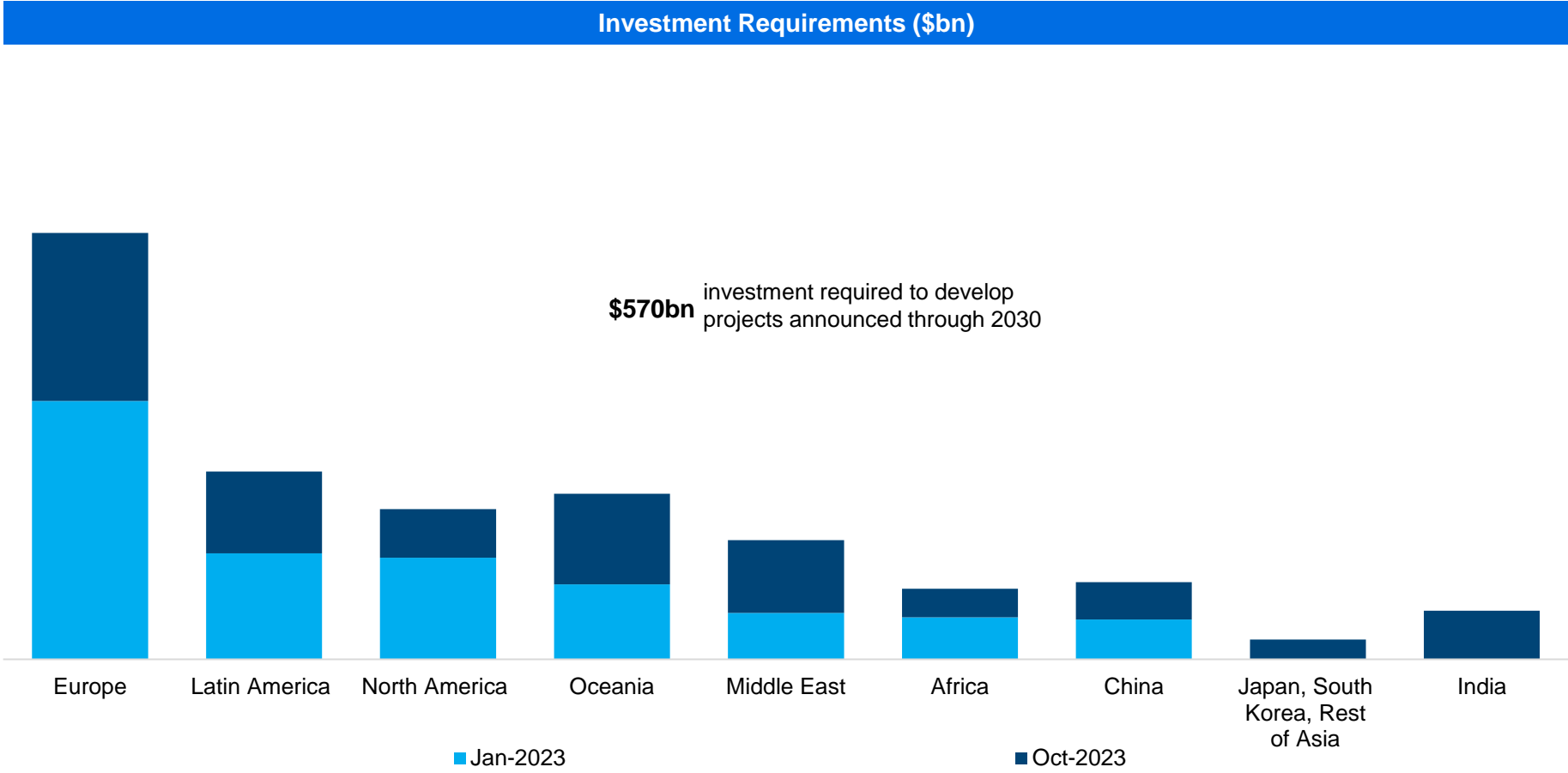
Large and Growing Global Project Pipeline – Hype?

1,400+ Announced Project Proposals



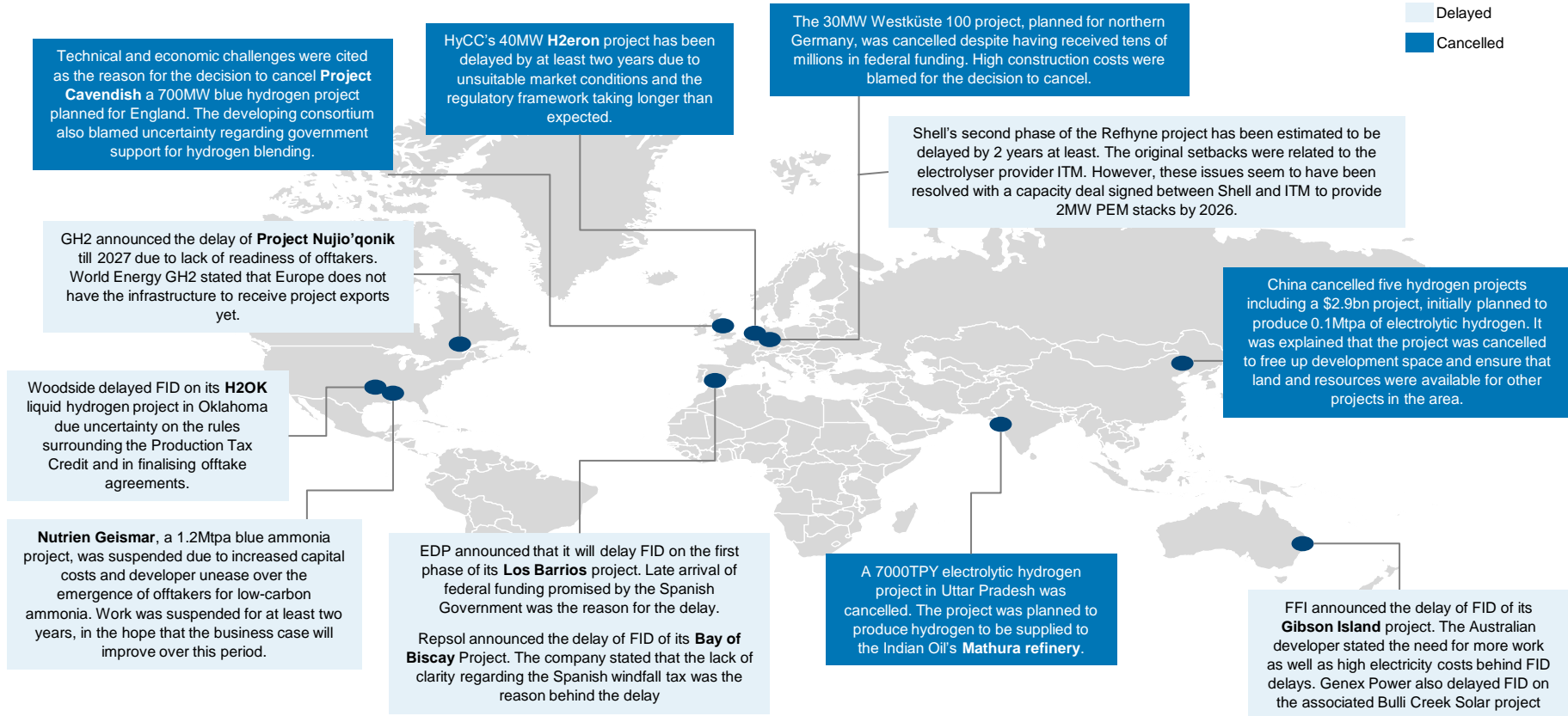
Source: Wood Mackenzie, Hydrogen Council, McKinsey & Company, Project and Investment tracker. Focus on project of >1MW.

\$590bn Global Project Funding Requirement up to 2030



Source: Wood Mackenzie, Hydrogen Council, McKinsey & Company, Project and Investment tracker. Focus on project of >1MW.

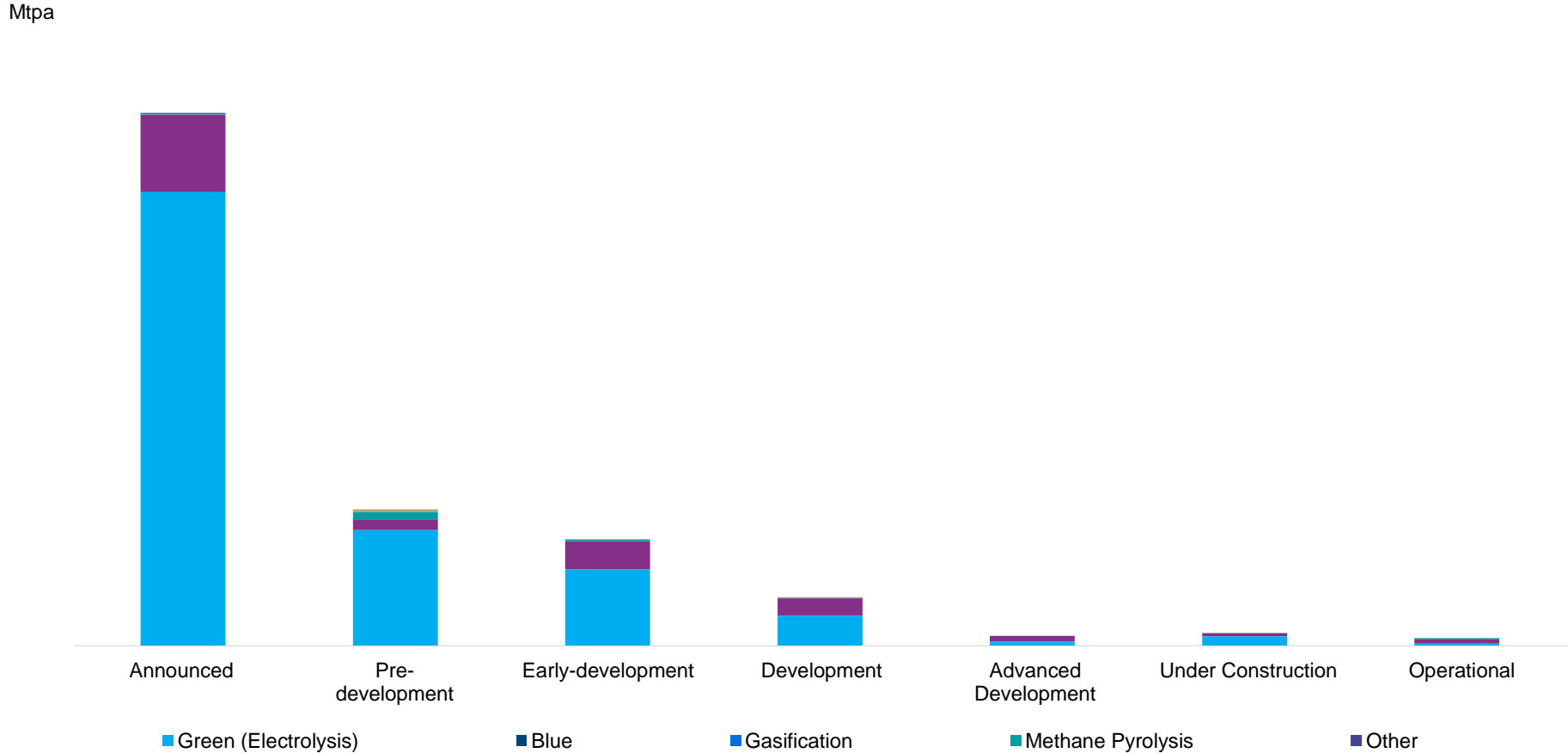
But Project Delays Were A Key Theme Of 2023



Source: Wood Mackenzie.

Hence: Only a Few Projects Beyond Development Stage ...

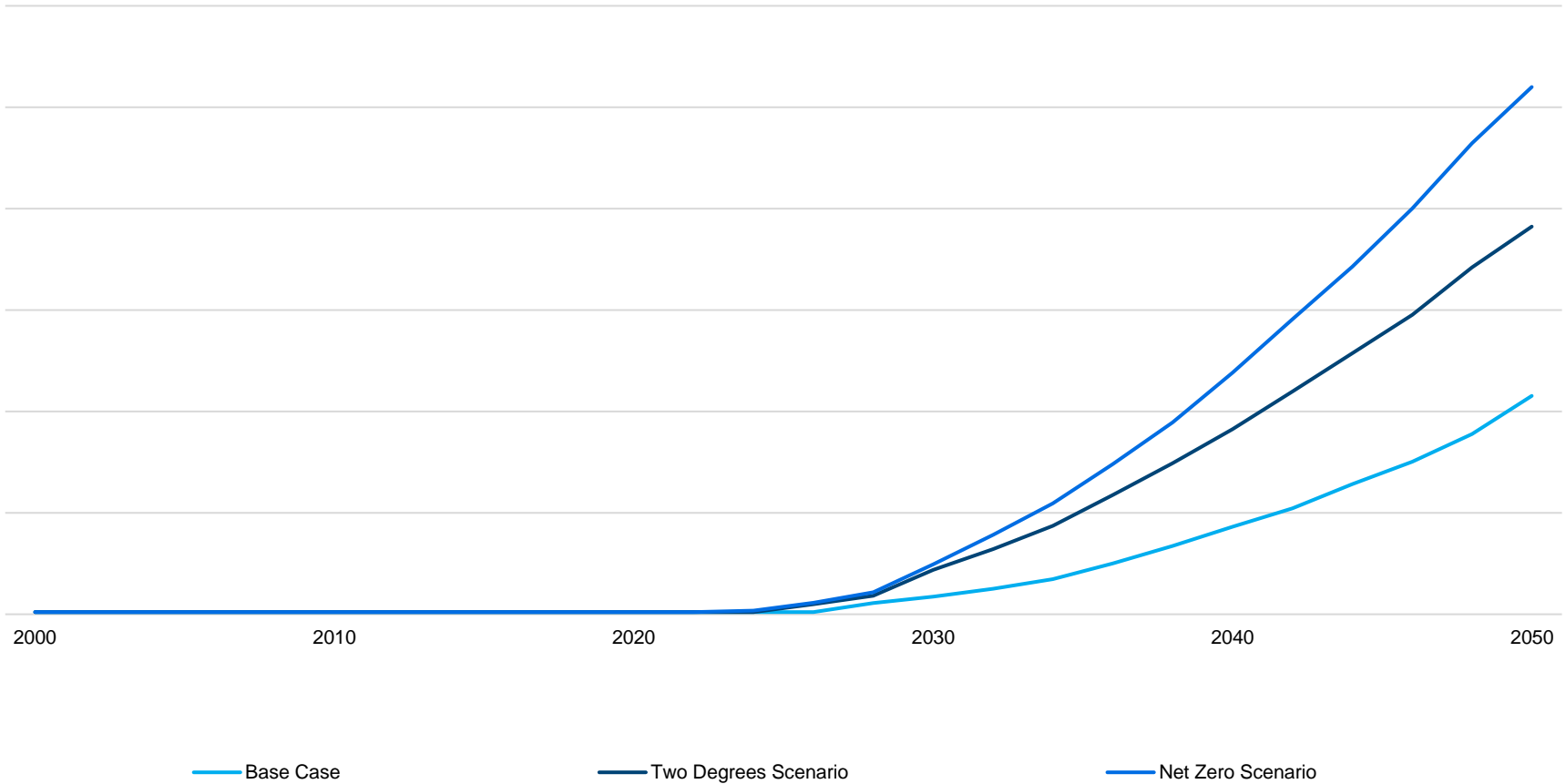
Announced Capacity by Stage of Development



Source: Wood Mackenzie Lens Hydrogen and Ammonia Service, Wood Mackenzie 2023 Energy Transition Outlook.

... Which Leads to Revised Ramp-up Curves

Low-carbon Hydrogen Production (Global) Scenarios



Sources: Wood Mackenzie, Energy Transition Outlook (September 2023), Energy Transition tool.

Why are the Curves so Different?

Key Drivers



Further De-industrialization?

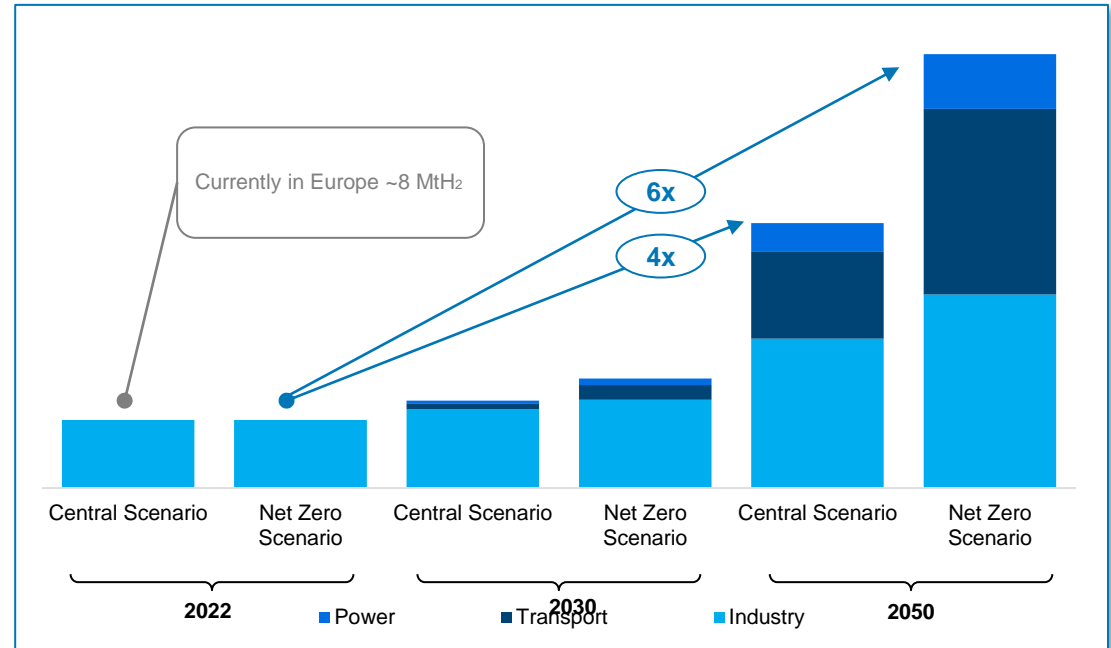


Larger Role in Power / Flexibility?

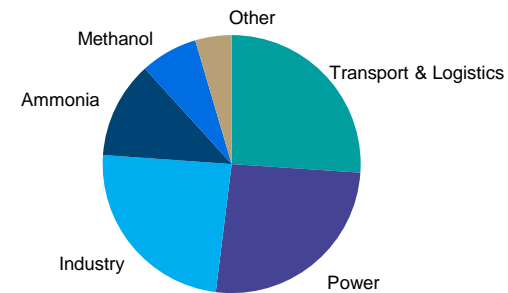


Transport: Use in Aviation and Maritime?

H₂ Demand in Europe

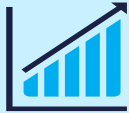


Global H₂ Demand 2050



Source: Consultant Research for Low and High Cases - Europe

What Are the Key Obstacles?



- Economics – limited willingness of customers to pay up
 - Niche applications
 - Reliance on subsidies – affordability debate?
 - “Quotas” and/ or RED III or similar regulations
- “Chicken and egg” problem for infrastructure build-out
- Emerging technology with no first mover advantage
- Higher interest rate environment

BUT ALSO:



Financial Investors – Area of Free Money is Over!

- Slow new infrastructure fund raisings
- Significantly reduced risk appetite
- Higher hurdle rates



Corporates – Renewables Build-out no longer Centre Stage!

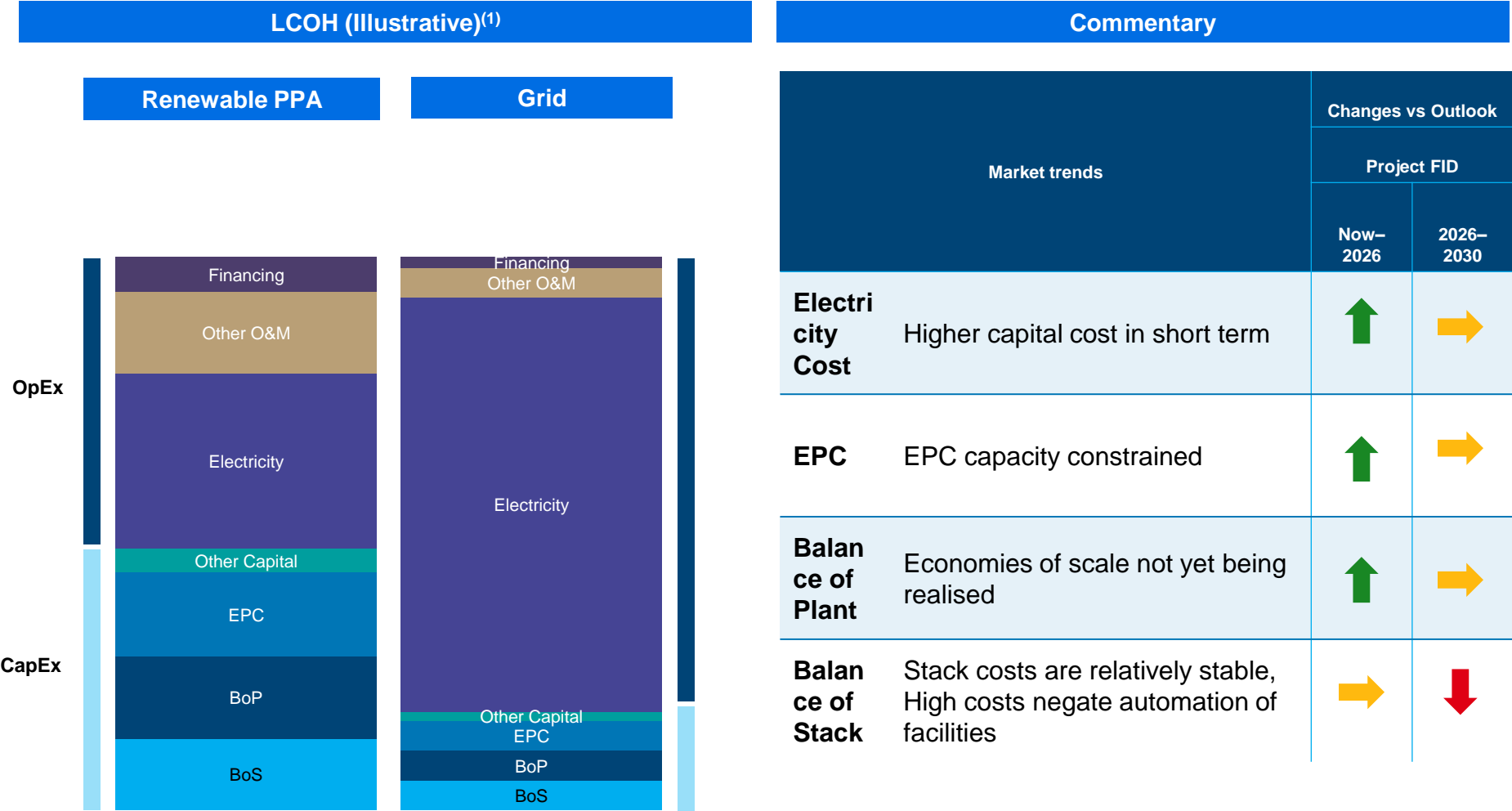
- Ample of growth in “regulated” space, less focus on renewables and “new technologies”
- Detailed project scrutiny



Banks

- Still developing legal frameworks for key contract interfaces
- Insurance cover issues
- Deals heavily relying on ECAs and similar institutions

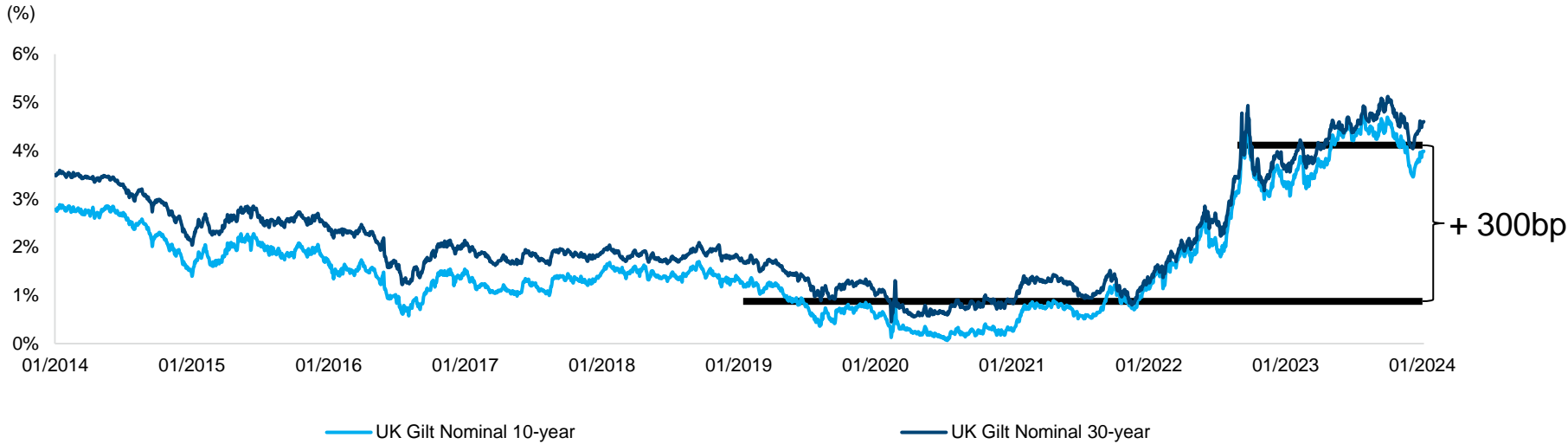
LCOH – Power Price, CAPEX Cost and Efficiency!



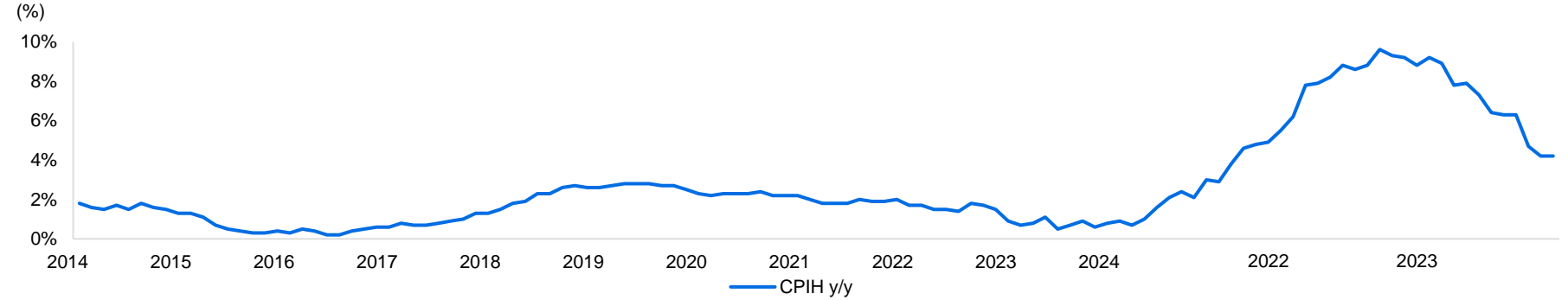
Source: Wood Mackenzie Lens Hydrogen. 1. FID Year: 2025, Germany, 20MW scale.

Benchmarks up with no Return to “Free Money” Expected

Nominal 10-year and 30-year Gilt Curves

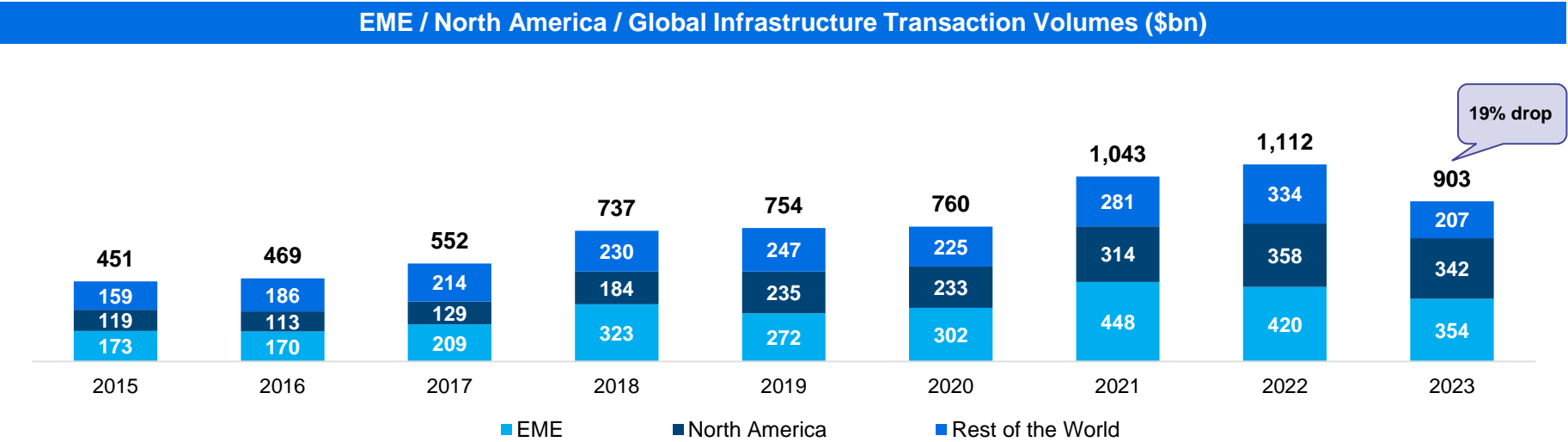
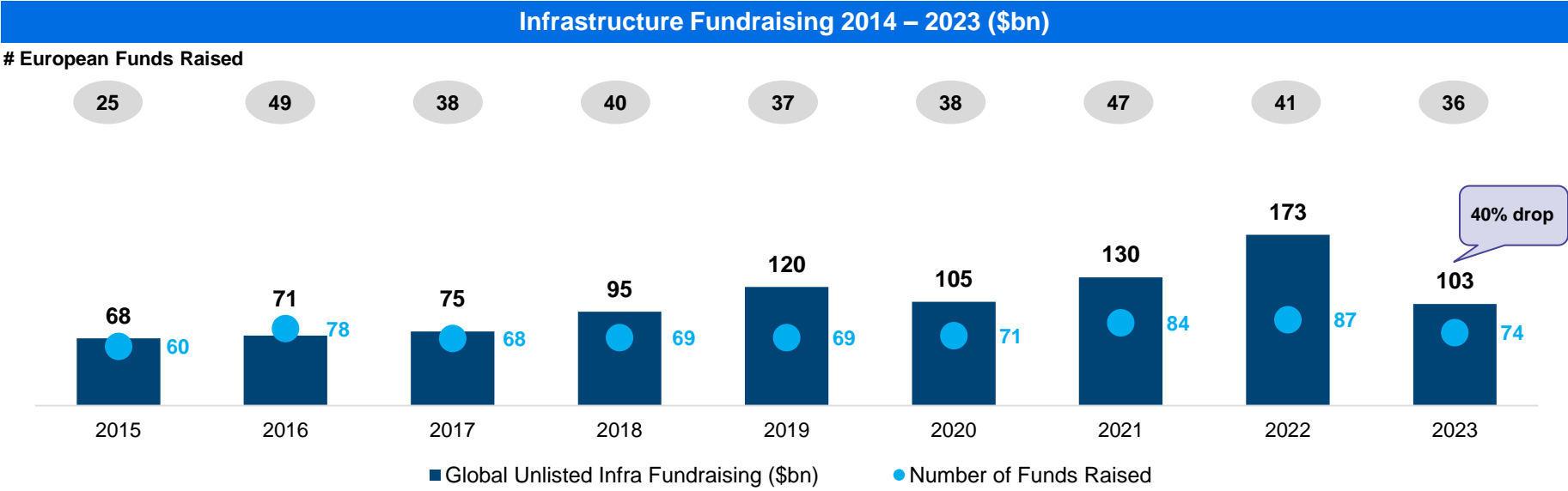


Inflation (UK CPIH y/y)



Source: FactSet as of 29 January 2024.

Challenging Fundraising Reduces Appetite for Risk



Source: Inframation.

Renewables Are Getting More Expensive!

- Renewables transactions over last few years have consistently pointed to 6-8% equity IRRs
- Return expectations have increased by 200-300bp

| Methodology | Description | Illustrative Data Points |
|--|---|---|
| 1 Precedent European Renewables Transactions | <ul style="list-style-type: none"> • Estimated equity returns based on market insights from previous transactions up to 2023 | <p>6.00% 8.00%</p> <p><i>Rising rates and higher inflationary context is increasing return by 200-300bp</i></p> |
| 2 Current Shareholder Return for Listed Renewables Funds | <ul style="list-style-type: none"> • Barclays Research's estimated nominal return based on publicly available data | <p>6.60% 9.00%</p> |
| 3 Portfolio Discount Rate for Listed Renewables Funds | <ul style="list-style-type: none"> • The latest publicly announced discount rates by listed renewable funds to value the portfolio/NAV | <p>7.20% 9.50%</p> |

OK ... but, Where to Invest?

| 1 | 2 | 3 | 4 | 5 |
|---|--|---|---|--|
| Subsidized Generation | Industrial Projects | Transportation | Network Infrastructure | Heating / Power |
| Electrolysers <ul style="list-style-type: none">• Subsidy tenders for green H₂ capacity build-out Renewables <ul style="list-style-type: none">• Using support regimes for H₂ production to de-risk merchant renewables build-out | Partnerships <ul style="list-style-type: none">• Joining forces with refining or chemical industry subject to grey H₂ quotas• P2X tenders Decarbonisation <ul style="list-style-type: none">• Decarbonisation of industrial processes<ul style="list-style-type: none">• Niche application• Subsidies | Mobility <ul style="list-style-type: none">• Benefit from incentives to introduce H₂ in transportation• Municipal tenders Heavy-duty Logistics <ul style="list-style-type: none">• Build-out of H₂-fillingstation network on inter-European transit routes | Transmission <ul style="list-style-type: none">• Hydrogen backbone initiatives• Landing terminal infrastructure Storage <ul style="list-style-type: none">• Repurposed salt caverns• However missing support regime in many countries | Gas Network <ul style="list-style-type: none">• Blending of natural gas with up to 20% hydrogen Heating <ul style="list-style-type: none">• H₂ ready gas turbines• H₂ in District Heating decarbonisation initiatives |

Disclaimer

This document is being made available by Barclays for information purposes only and for the sole and exclusive use of the addressee in connection with the matter or possible transaction to which this document relates. This document is incomplete without reference to, and should be assessed solely in conjunction with, the oral briefing provided by Barclays. This document is strictly confidential and remains the property of Barclays. You agree that you shall only use this document for the purpose of evaluating and considering the matter or possible transaction to which this document relates. This document may not be distributed, published, reproduced, or disclosed, in whole or in part, to any other person, nor relied upon by you or any other person, nor used for any other purpose at any time, in each case without the prior written consent of Barclays. "Barclays" means any entity within the Barclays Group of companies, where "Barclays Group" means Barclays Bank PLC, Barclays PLC and any of their subsidiaries, affiliates, ultimate holding company and subsidiaries of the holding company. Barclays shall not be obliged by having made this document available to you to provide any financial advisory services (whether in relation to the matter or possible transaction to which this document relates or otherwise) or to sell, acquire, place or underwrite any securities or to lend moneys or to provide any other commitment, facility, product, risk management solution or service, nor does Barclays represent by providing this document to you that it will be possible for Barclays to provide, arrange or undertake any of the aforementioned services, activities, products or solutions. Any commitment by Barclays to provide, arrange or undertake any of the aforementioned services, activities, products or solutions would be subject to Barclays signing appropriate documentation, obtaining all necessary internal approvals and completing due diligence, in each case in a manner satisfactory to Barclays.

This document does not constitute nor does it form part of an offer to sell or purchase, or the solicitation of an offer to sell or purchase, any securities or any of the businesses or assets described herein or an offer or recommendation to enter into any transaction described herein nor does this document constitute an offer or commitment to provide, arrange or underwrite any financing. You are responsible for making your own independent investigation and appraisal of the risks, benefits, appropriateness and suitability of any transaction or matter contemplated by this document. The decision to proceed with any transaction or action contemplated by this document must be made by you in the light of your own commercial assessments and Barclays will not be responsible for such assessments.

Neither Barclays nor any of its directors, officers, employees, representatives or agents, accepts any liability whatsoever for any direct, indirect or consequential losses (in contract, tort or otherwise) arising from the use of this document or its contents or reliance on the information contained herein, except to the extent this would be prohibited by law or regulation.

Barclays does not provide, and has not provided, any investment advice or personal recommendation to you in relation to the transaction and/or any related securities described herein and is not responsible for providing or arranging for the provision of any specialist advice, including legal, regulatory, structuring, actuarial, accounting, model auditing or taxation advice or services in relation to the transaction and/or any related securities described herein. Barclays is under no obligation to, and shall not, determine the suitability for you of the transaction described herein. You must determine, on your own behalf or through independent professional advice, the risks, benefits, appropriateness and suitability to and for you of the transaction described herein.

This document was prepared on the basis of information and data, obtained from publicly available sources and, where applicable, from you and/or any other entity that may be involved in any transaction or matter contemplated by this document (and/or any of your or the aforementioned entities' affiliates), in each case prior to or on the date hereof. The information in this document has not been independently verified by Barclays. Barclays has relied on any information provided by you or from third party or public sources as complete, true, fair, accurate and not misleading. With respect to any financial or operating forecasts and analyses provided to it, Barclays has assumed that they are achievable and have been reasonably and properly prepared on bases reflecting the best currently available information, estimates and judgments as to the future financial performance of the entity(ies) to which they relate and that such forecasts or analyses would be realised in the amounts and time periods contemplated thereby. Barclays does not make any warranty or representation, express or implied, as to the accuracy, completeness or reasonableness of the information (including projections and assumptions) contained in this document whether obtained from or based upon third party or public sources or otherwise. This document is given as at the date hereof, may not be final, is based on information available to Barclays as at the date hereof, is subject to any assumptions set out therein and is subject to change without notice. Accordingly, this document may be based on (a) data and information that may no longer be current and (b) estimates that may involve highly subjective assessments. It should be understood that subsequent developments may affect this document and Barclays does not undertake any obligation to provide any additional information or to update any of the information or the conclusions contained herein or to correct any inaccuracies which may become apparent. Any data or information regarding, or based on, past performance is no indication of future performance.

This document is being directed at persons who are professionals and is not intended for retail customer use.

Members of the Barclays Group are involved in a wide range of commercial banking, investment banking and other activities out of which conflicting interests or duties may arise. In the ordinary course of its business, the Barclays Group may provide services to any other entity or person whether or not a member of the same group as you (a "Third Party"), engage in any transaction (whether on its own account, on behalf of any Third Party or otherwise, and including any transaction or matter contemplated by this document), notwithstanding that such services, transactions or actions may be adverse to you or any member of your group, and the Barclays Group may retain for its own benefit any related remuneration or profit. The Barclays Group operates in accordance with a conflicts of interest policy which identifies conflicts of interest it faces in the ordinary course of its business, and establishes organisational and procedural measures to manage those conflicts where it is reasonably able to do so. Neither Barclays nor any other part of the Barclays Group shall have any duty to disclose to you or utilise for your benefit any non-public information acquired in the course of providing services to any other person, engaging in any transaction (on its own account or otherwise) or otherwise carrying on its business. Barclays may at any time acquire, hold or dispose of long or short positions (including hedging and trading positions) and trade or otherwise effect transactions for their own account or the account of their customers in the securities referred to herein which may impact the performance of the securities described herein. Barclays does not have any duty to disclose to you or utilise for your benefit any non-public information acquired in the course of providing services to any other person, engaging in any transaction (on its own account or otherwise) or otherwise carrying on its business.

This material has not been produced by Barclays research department and does not constitute investment research or investment recommendations for the purposes of the Financial Conduct Authority rules or a research report under U.S. law. Barclays' research analysts and research departments are independent from Barclays' banking business ("Banking") and are subject to certain regulations and internal policies. Barclays' research analysts may hold and make statements or investment recommendations and/or publish research reports with respect to any company referred to herein, the transactions contemplated herein or any person involved therein or related thereto that differ from or are inconsistent with the views or advice communicated by Banking. Furthermore, any preliminary valuation summary presented herein represents the views of Banking. In the course of vetting potential transactions and pursuant to Barclays' internal preliminary valuation, diligence and compliance procedures, Banking may obtain the independent views of our firm's research department regarding the company and merits of a proposed transaction. However, our research department is independent and, in accordance with U.S. rules, Banking is not permitted to make any representation regarding the views of the research analyst who has been, or may be, assigned by research management to independently evaluate the company and any proposed transaction. Accordingly, you should not infer that any preliminary valuation summary presented by Banking reflects the views of the research department and nothing herein or otherwise should be construed as a promise or offer of favourable coverage or an indication of a specific rating or price target that may be assigned in the future by any Barclays' research analyst. Please note that the Australian Securities and Investments Commission ("ASIC") has provided certain exemptions to Barclays Bank PLC under paragraph 911A(2)(l) of the Corporations Act 2001 (the "Corporations Act") from the requirement to hold an Australian financial services licence ("AFSL") in respect of financial services provided to Australian wholesale clients (as defined by the Corporations Act), on the basis that Barclays Bank PLC is authorised by the Prudential Regulation Authority of the United Kingdom ("PRA") and regulated by the Financial Conduct Authority ("FCA") of the United Kingdom and the PRA under United Kingdom laws. United Kingdom laws differ from Australian laws. When providing financial services to Australian wholesale clients, Barclays Bank PLC relies on the relevant exemption from the requirement to hold an AFSL. Accordingly, Barclays Bank PLC does not hold an AFSL.

Barclays offers premier investment banking products and services to its clients through Barclays Bank PLC. Barclays Bank PLC is authorised by the PRA and regulated by the FCA and the PRA and is a member of the London Stock Exchange. Barclays Bank PLC is registered in England No. 1026167 with its registered office at 1 Churchill Place, London E14 5HP.

Copyright Barclays PLC, 2024 (all rights reserved).