

1st Hydrogen Bank Auction

efuel Alliance webinar, 27 May 2024
Matthias Janssen, Lessons Learnt



Going once, going twice ...
1st Hydrogen Bank Auction for RFNBO
Results and Lessons Learnt

Monday, 27 May 24
14h00-15h00 CEST

eFuel alliance

We advise industrial clients, associations and public sector clients throughout Europe

1999

founded and grown steadily since then

70

COUNTRIES

Project experience in over 70 countries

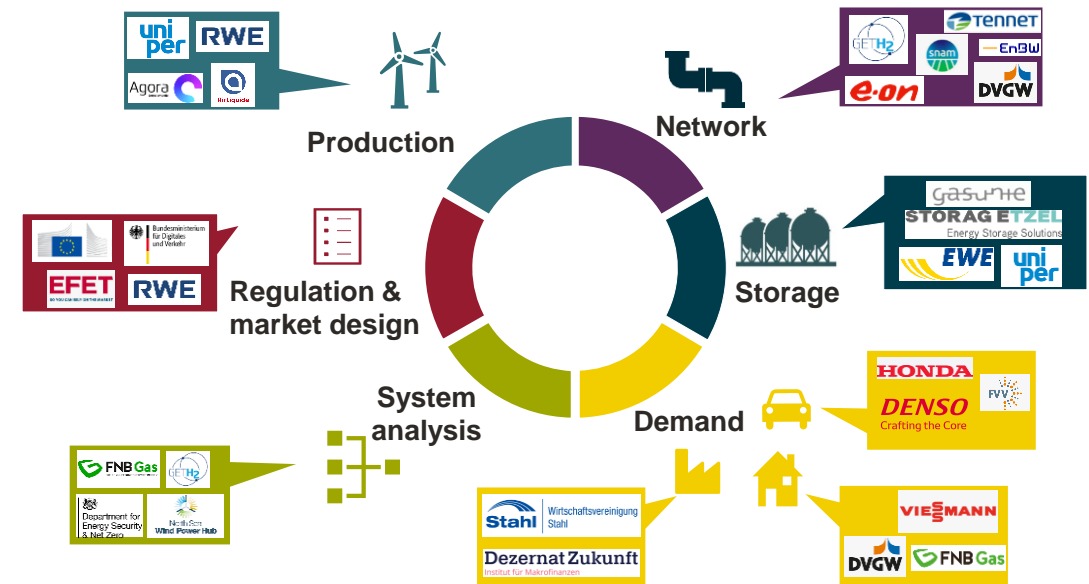
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LANGUAGES












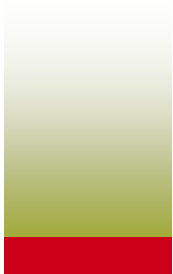

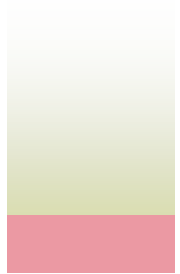
spoken by our employees



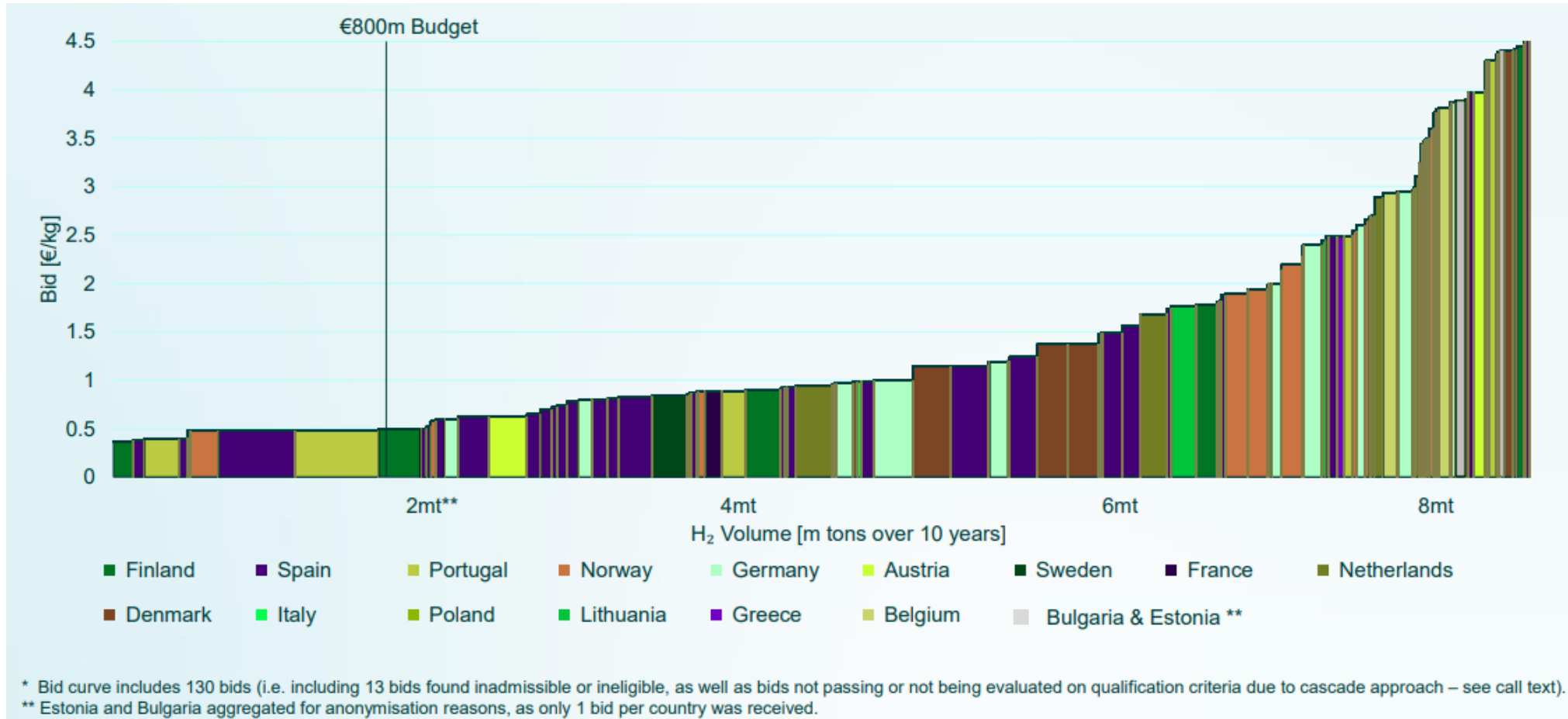
Comprehensive project experience along the entire hydrogen value chain



Winning bids in 1st Hydrogen Bank auctions of < €0.5/kg are lower than expected, and significantly lower than results in the UK (~€8/kg)

		 EU Hydrogen Bank (Pilot) <small>Decisions announced 30 April 2024</small>	 UK (HAR1) <small>Decisions announced 14 December 2023</small>	 Denmark <small>Decisions announced 27 October 2023</small>
	Support	Budget <ul style="list-style-type: none"> €800 mn EU-wide + €350 mn for German projects (Auction-as-a-Service) 	<ul style="list-style-type: none"> ~€2.3 billion 	<ul style="list-style-type: none"> ~€177 million
		Scheme <ul style="list-style-type: none"> Fixed premium 	<ul style="list-style-type: none"> Contract for Difference 	<ul style="list-style-type: none"> Fixed premium
	Volumes / Size	<ul style="list-style-type: none"> 7 projects with total electrolysis capacity of 1,500 MW: <ul style="list-style-type: none"> 87% of capacity located in ES & PO, incl. 2 projects of 500 MW each 	<ul style="list-style-type: none"> 11 projects with total electrolysis capacity of 125 MW <ul style="list-style-type: none"> Capacity range 5.2 – 24.5 MW 	<ul style="list-style-type: none"> 6 projects with total electrolysis capacity of 280 MW* <ul style="list-style-type: none"> 3 projects with 9-10 MW capacity; 2 projects 100-150 MW capacity
	Countries	   		
	Prices	<p>Total cost of winning bids not publicly known</p>  <p>Expected sales revenues of winning bids not publicly known</p> <p>€0.46/kg weighted-average fix premium (=subsidy);</p>	<p>€11/kg weighted-average strike price (= total cost proxy)</p>  <p>€3/kg expected sales revenues</p> <p>€8/kg Difference payment (= subsidy)</p>	<p>Total cost not publicly known</p>  <p>Expected sales revenues not publicly known</p> <p>€0.6/kg weighted-average fix premium (=subsidy);</p> <p>bid cap €2/kg</p>

EU bidding curve reveals lots of bids substantially below the bid cap of €4.5/kg

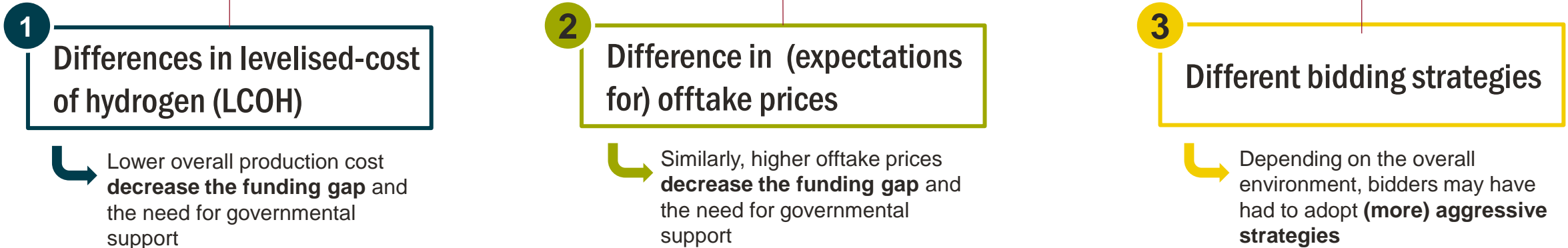


Source: [European Commission](#)

There are several possible explanations for lower bids in EU auction compared to UK

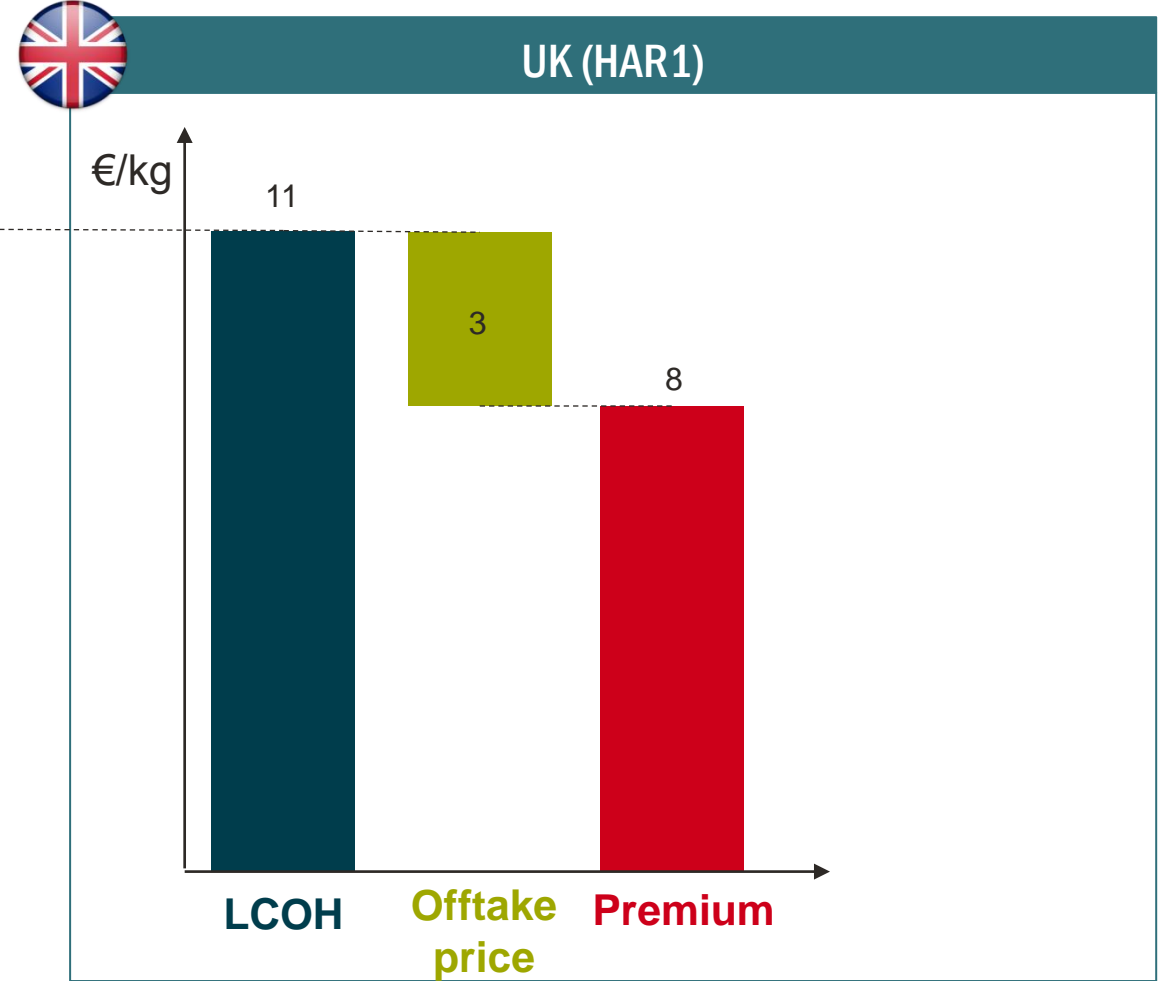
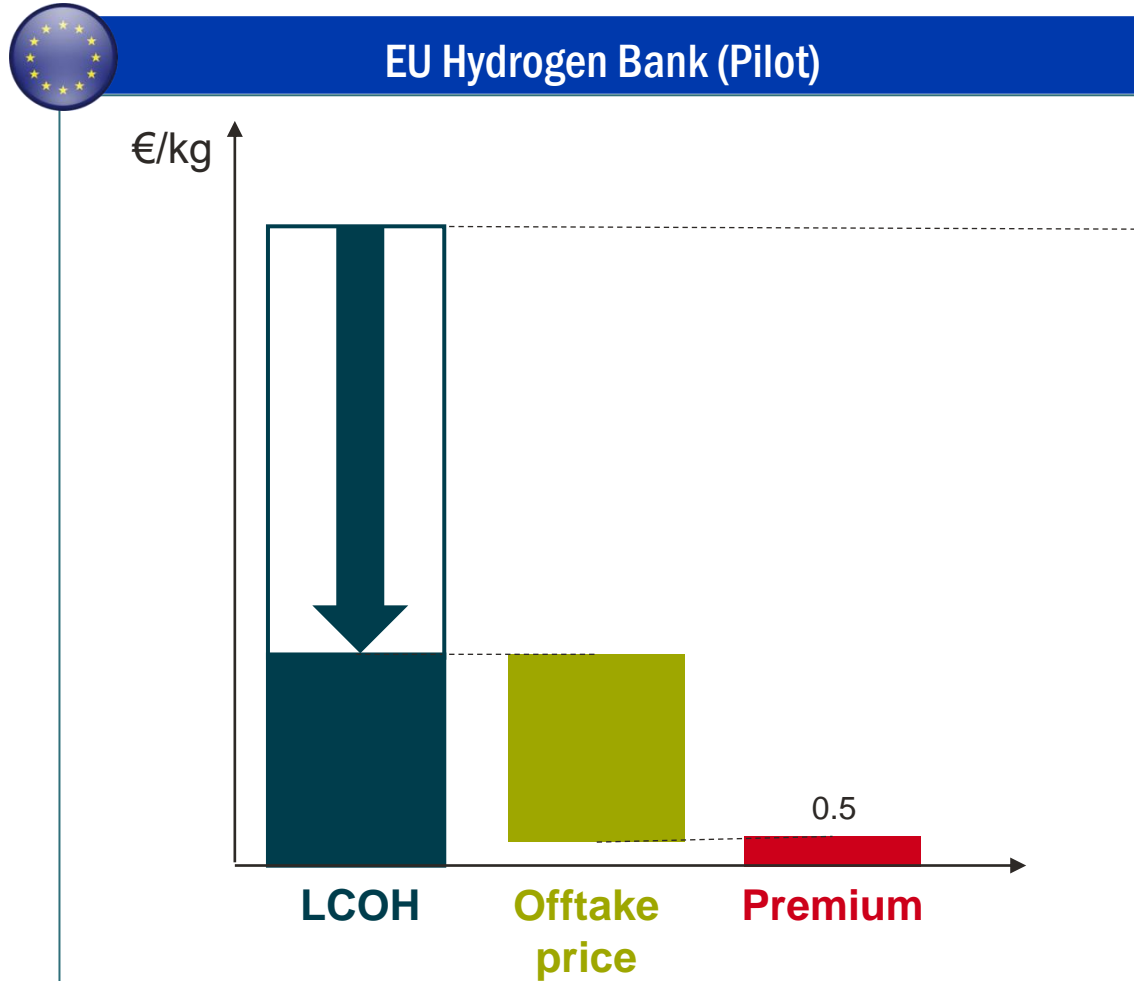


Difference in auction outcomes



There are several possible explanations for lower bids in EU auction compared to UK

1 Lower levelised-cost of hydrogen (LCOH) in the EU (?)



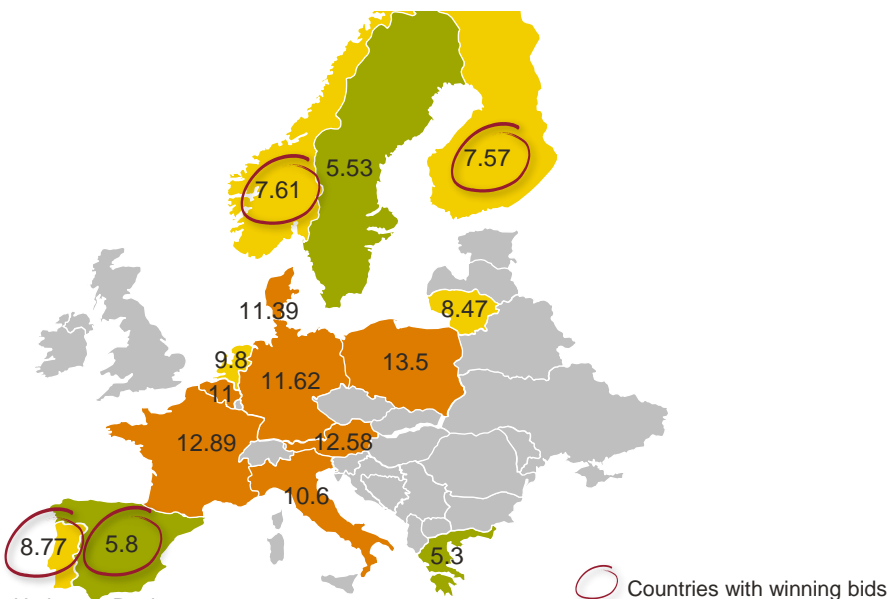
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Lower H2 production costs may be one explanation for the low bids in the EU vs UK



EU Hydrogen Bank (Pilot)

Average LCOH of bidders in 4 winning EU countries were **€5.8** (ES) to **€8.8/kg** (PO), with winning bids likely on the lower end



UK (HAR1)

Average strike price (=LCOH proxy) of UK winning bids was **~€11/kg** (= GBP 241/MW)



1a Better renewable conditions (?)

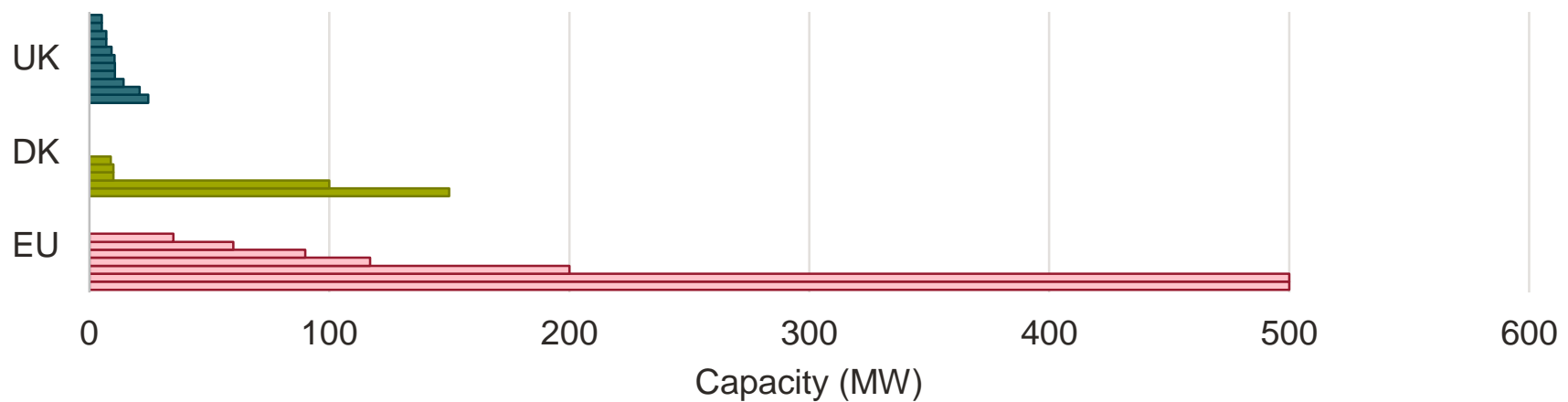
1b Larger project size (?)

1c Less strict conditions (?)

1b

Lower hydrogen production costs through differences in project size (?)

Size of winning projects in EU auction significantly larger than in the UK (and, to a lesser extent, in DK)



Implying lower LCOH due to economies of scale

- Electrolyser’s CAPEX – and thus LCOH – decrease with size of the electrolysers
- Winning projects in the UK are **small scale (pilot) projects**, laid out for testing and demonstration purposes rather than maximum efficiency
- On the contrary, winning projects in the EU are laid out for **industrial scale production**

Source: Lazard, 2021 <https://www.lazard.com/media/erzb5rkv/lazards-levelized-cost-of-hydrogen-analysis-version-20-vf.pdf>

*Assuming about 3600 FLH per year.

1c Lower hydrogen production costs through more flexibility in rules in the EU (?)

EU Hydrogen Bank (Pilot)

UK (HAR1)

Time to operation

- 5 years (= 2029)

- 2 years (= 2025)

Temporal correlation

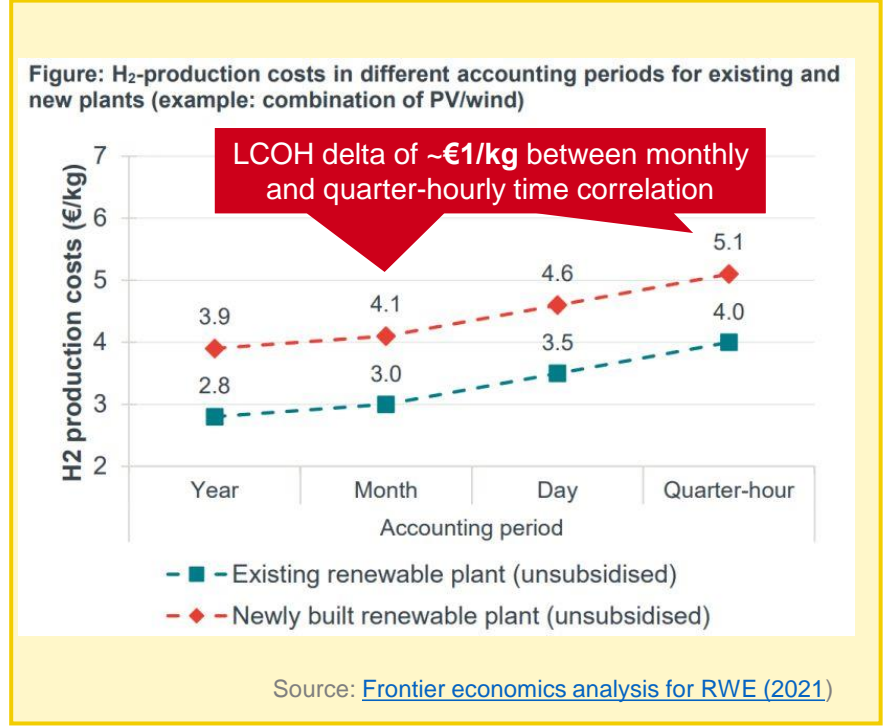
- Monthly correlation until 2029
- Hourly correlation from 2030 onwards

- Half-hourly correlation¹

Additionality

- No additionality requirement for installations coming into operation before 1 January 2028

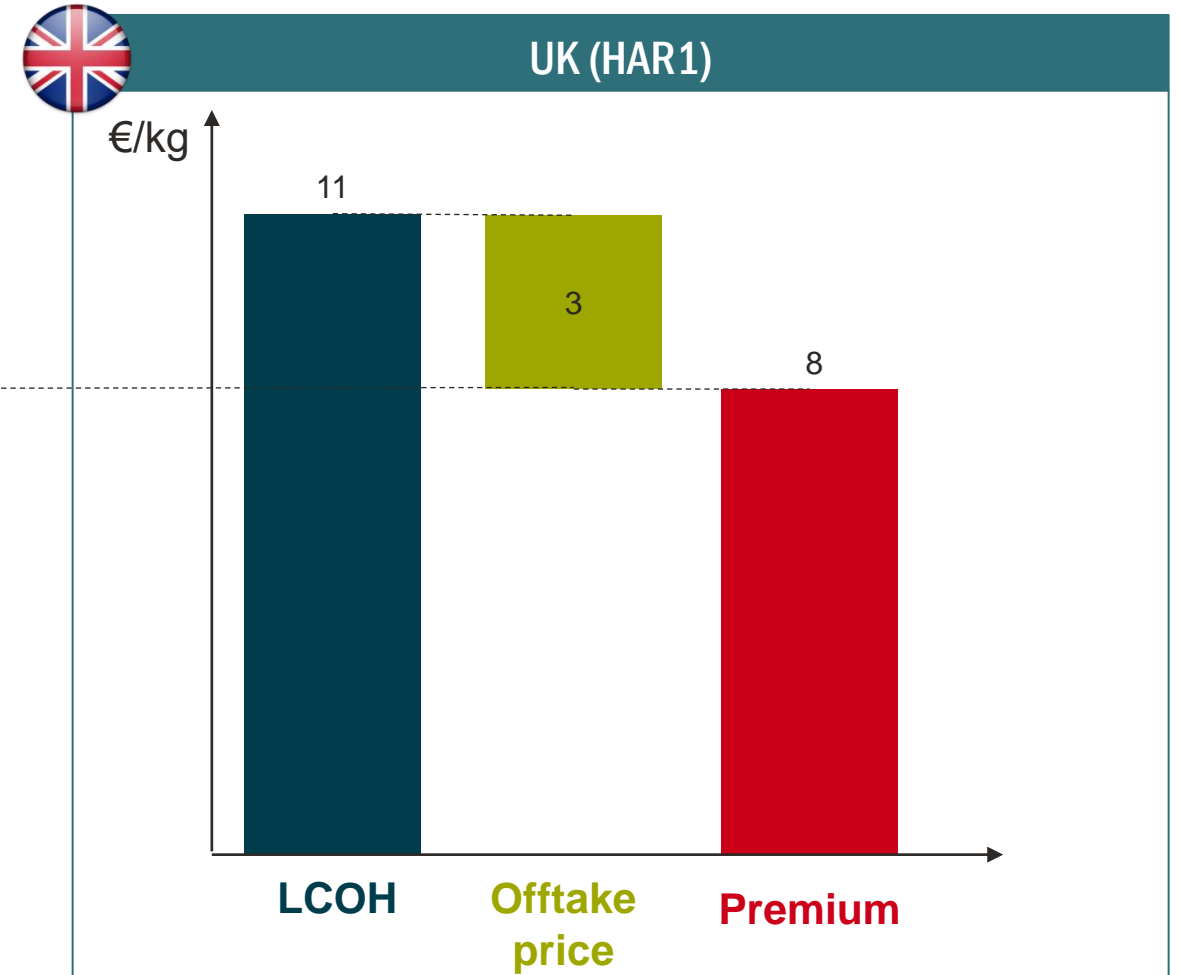
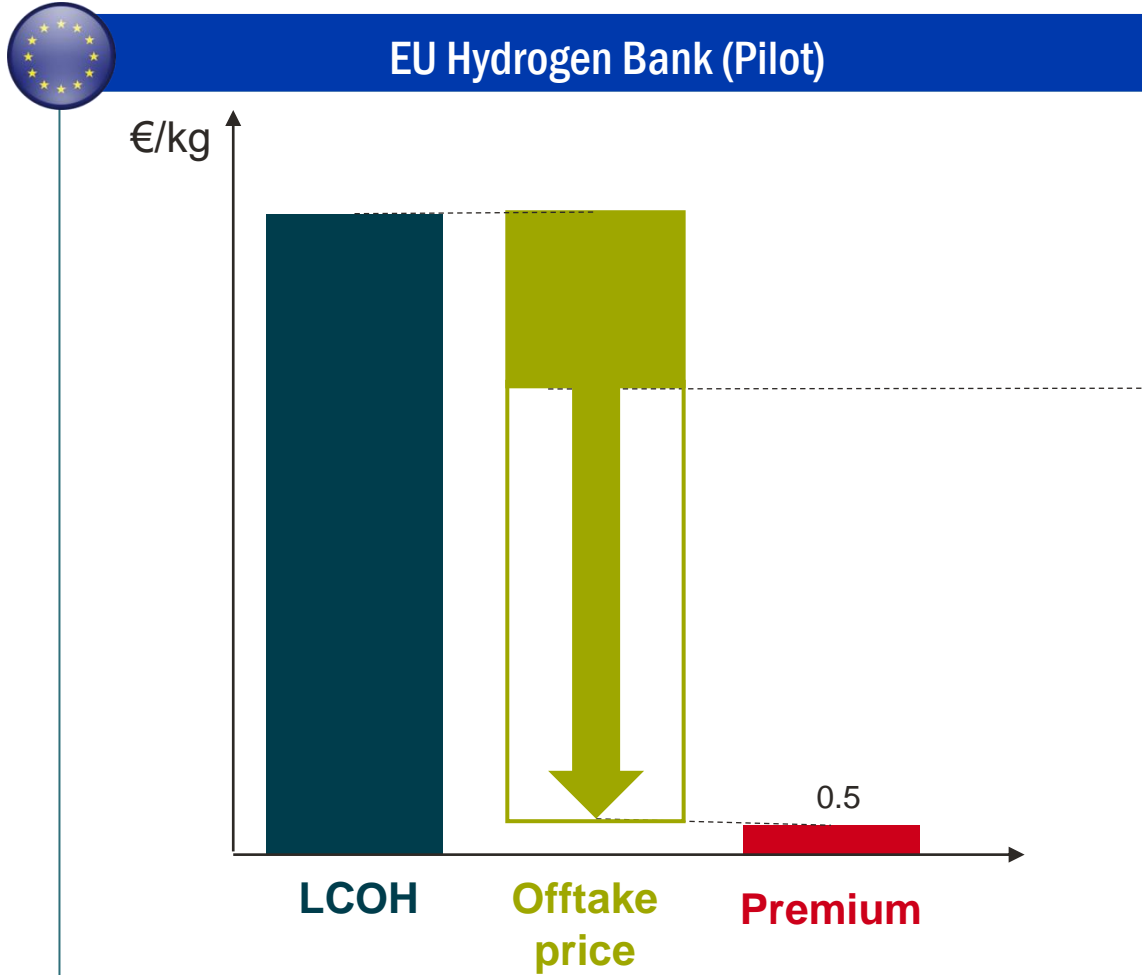
- Additionality is not a formal requirement, but is part of the assessment criteria
 - To achieve the highest scores, projects must have plans to meet additionality principles by COD or by 2025



Source: ¹ <https://www.gov.uk/government/publications/hydrogen-business-model-and-net-zero-hydrogen-fund-electrolytic-allocation-round-2022/clarification-questions-with-responses-added-9-august-2022>

There are several possible explanations for lower bids in EU auction compared to UK

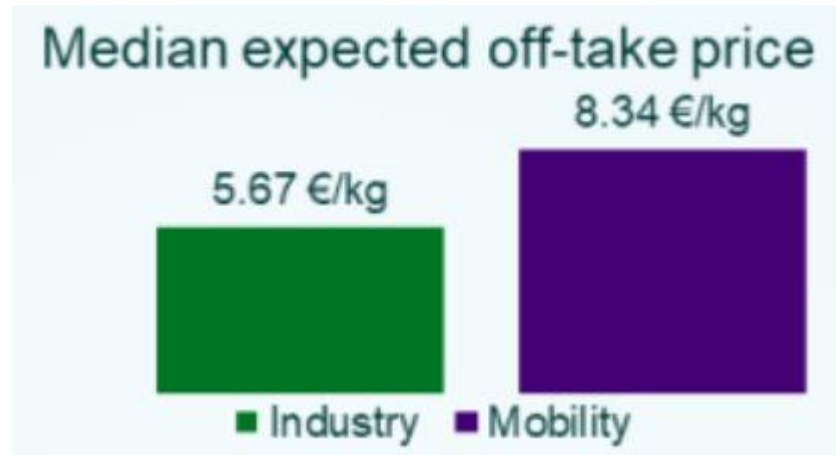
2 Higher (expectations for) offtake prices in EU auction (?)



2 Higher (expectations for) offtake prices may also explain lower bids in the EU auction

EU Hydrogen Bank (Pilot)

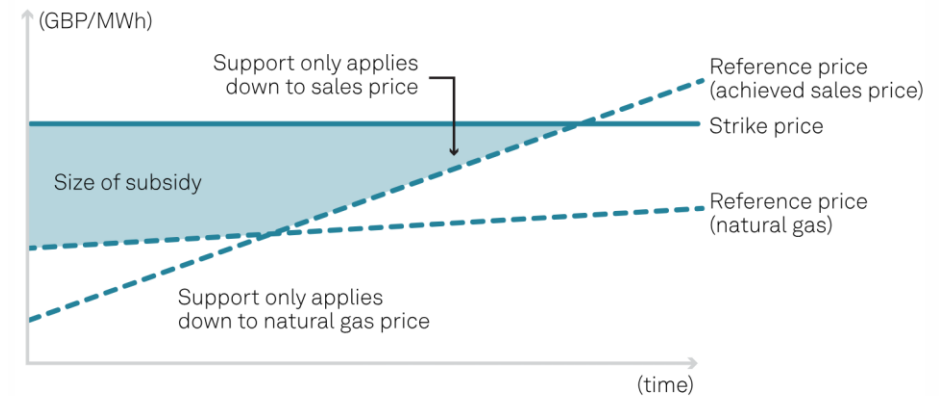
Expected offtake prices of winning bidders not publicly known, but median expected offtake prices of all bidders were **€5.7/kg (industry)** and **€8.3/kg (mobility)**



UK (HAR1)

Expected offtake prices of winning bidders not publicly known, but reference price (based on natural gas) is **~€3/kg** at the beginning. This can be outperformed by higher actual sales prices, though.

Hydrogen strike price vs reference price



Source: DESNZ

2a

Actually higher offtake prices in EU than in UK (?)

2b

Actual UK offtake prices higher than €3/kg (?)

2c

EU offtake price expectations overestimated ('winner's curse') (?)

2 Higher (expectations for) offtake prices may also explain lower bids in the EU auction

2a

Actually higher offtake prices in EU than in UK (?)

Value of green hydrogen and thus willingness to pay may actually be higher in the EU than in UK, e.g. due to

- Higher CO2 prices (€75/tCO2 in EU £40/tCO2 in UK)
- Further incentives, e.g. due to RED II/III quota in EU → The two largest projects (1 GW in total) in EU auction are producing H2 for **green ammonia** production to substitute grey H2

Higher CO2 price in EU than in UK



2b

Actual UK offtake prices > €3/kg (?)

- Under the assumption of primarily substituting natural gas by H2, the reference price for sales revenues in UK CfD is based on natural gas prices, and equivalent to €3/kg at current gas prices
- However, **actual offtake prices may be higher than that**, which would mean that the actual CfD premium would be lower than €8/kg, as (most part) of higher actually achieved sales price is deducted from premium

2c

EU offtake prices overestimated (?)

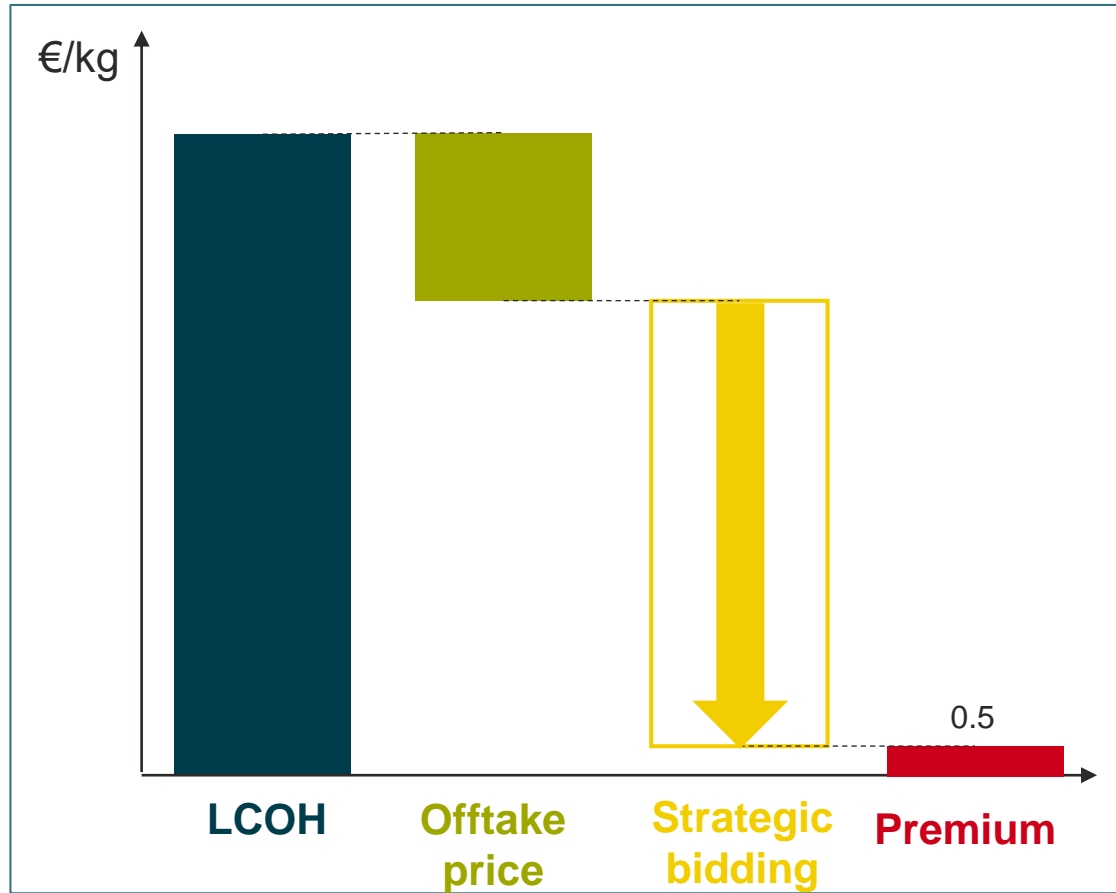
- The CfD design in the **UK** limits the impact of offtake price expectations on bid levels, as the **variable premium** tops up offtake revenues to the individual strike price (~LCOH);
- **In the EU fixed premium auction**, bidders estimate sales revenues (that are topped up by the fixed premium).
 - Bidders with most optimistic expectations about offtakers' willingness to pay are likely to win the auction, making it significantly more prone to "**winner's curse**".
 - This is limited by need to show offtake Lol/MoU for 60% of volumes, but also allowed for "internal offtake"

There are several possible explanations for lower bids in EU auction compared to UK

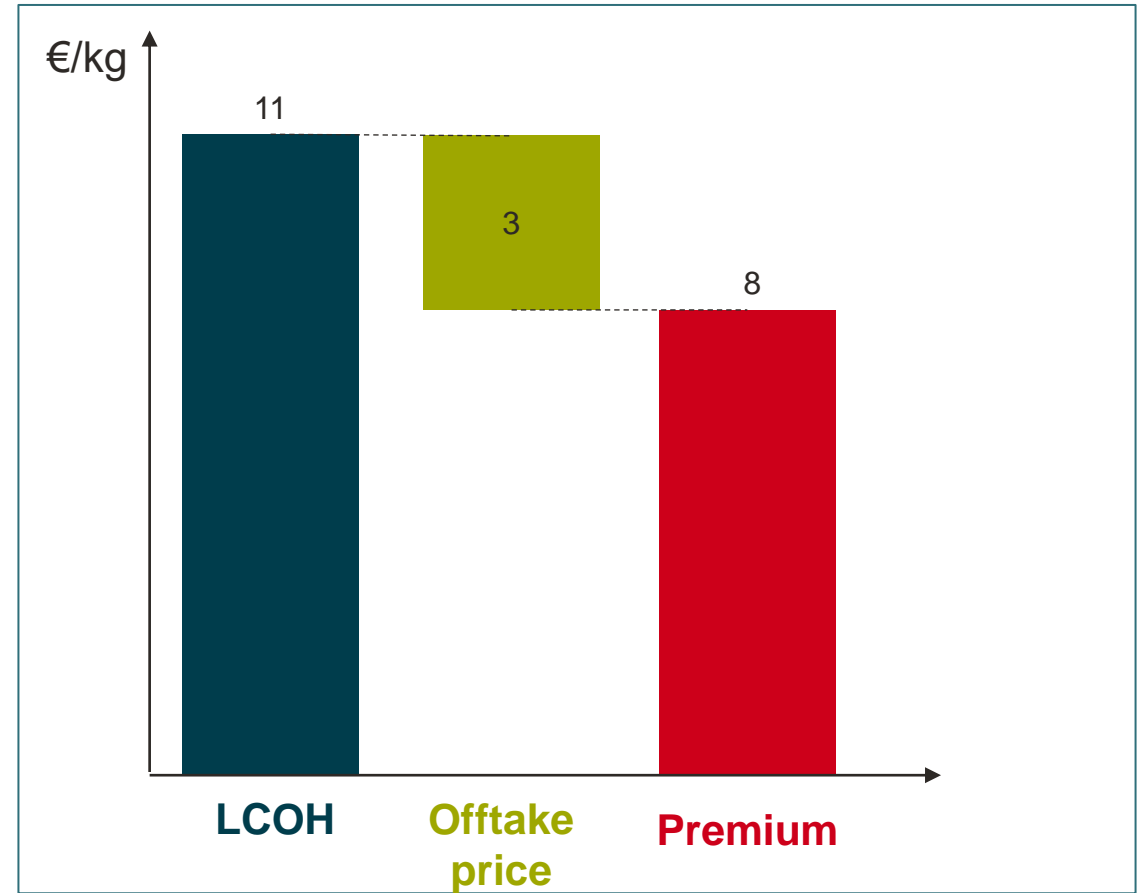
3 Strategic bidding in EU auction (?)



EU Hydrogen Bank (Pilot)



UK (HAR1)



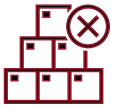
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It is likely that the EU fixed premium auction rules led to projects underbidding to secure funding



Maximum bid size

- In the UK, no cap on the individual grant amount
- The EU **limits the funding for one action to 1/3 of the total budget** (267m EUR).
- **For a 500 MW electrolyser**, this amounts to funding of about **0.50 EUR/kg** hydrogen produced over 10 years (assuming about 3600 FLH per year)



Cumulative funding

- In the **UK**, projects could **not receive government support from multiple sources** (i.e. from both Net Zero Hydrogen Fund and Industrial Energy Transformation Fund) for the same eligible costs
- The **EU** limits the funding for one action to one grant, however other **grants can be combined** for other elements of a project (i.e. cost items not covered by the RFNBO funding)



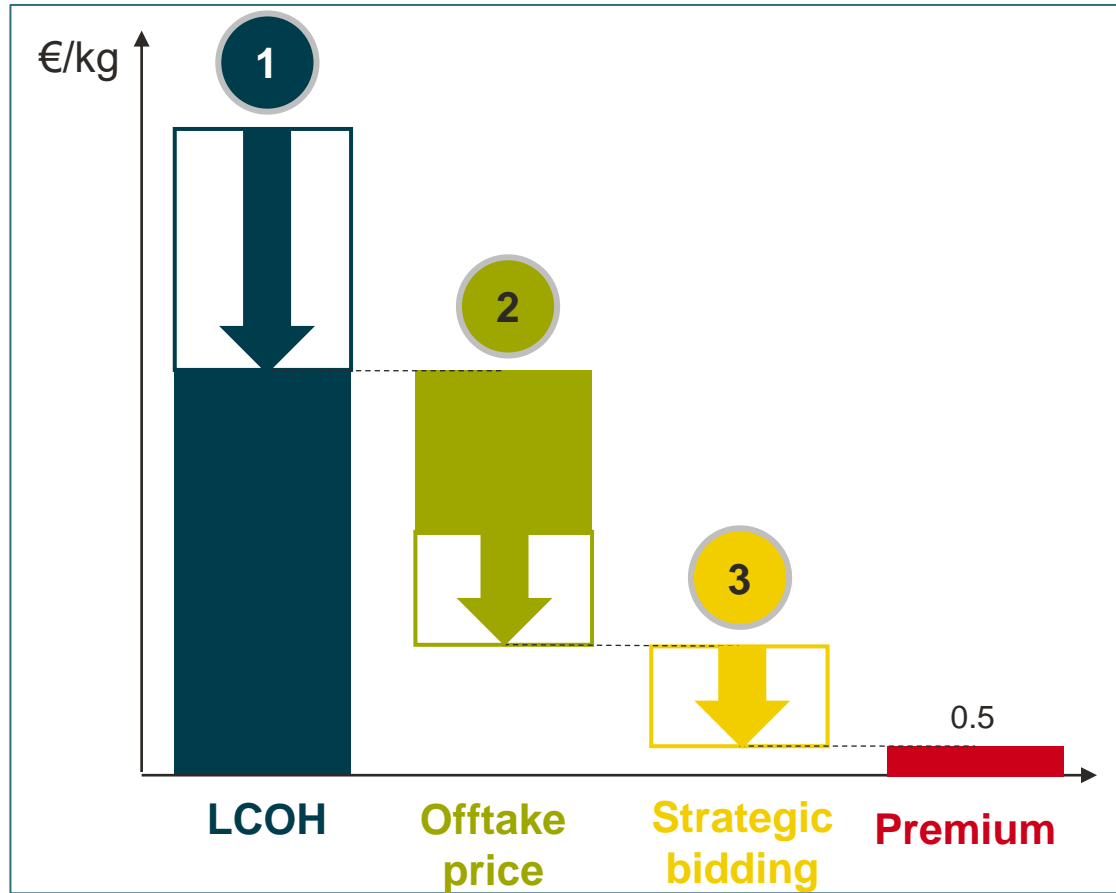
Outside funding options

- Across Europe, it is currently **uncertain** to what extent **national funding** will supplement European funding (e.g. DK, DE with Auction-as-a-Service)
 - Denmark ran its own auction, Germany used Auction-as-a-Service in HB auction
 - Other countries do **not** have national schemes (yet)
 - ➔ Bidders in these countries may have chosen their bid to **secure some form of funding**

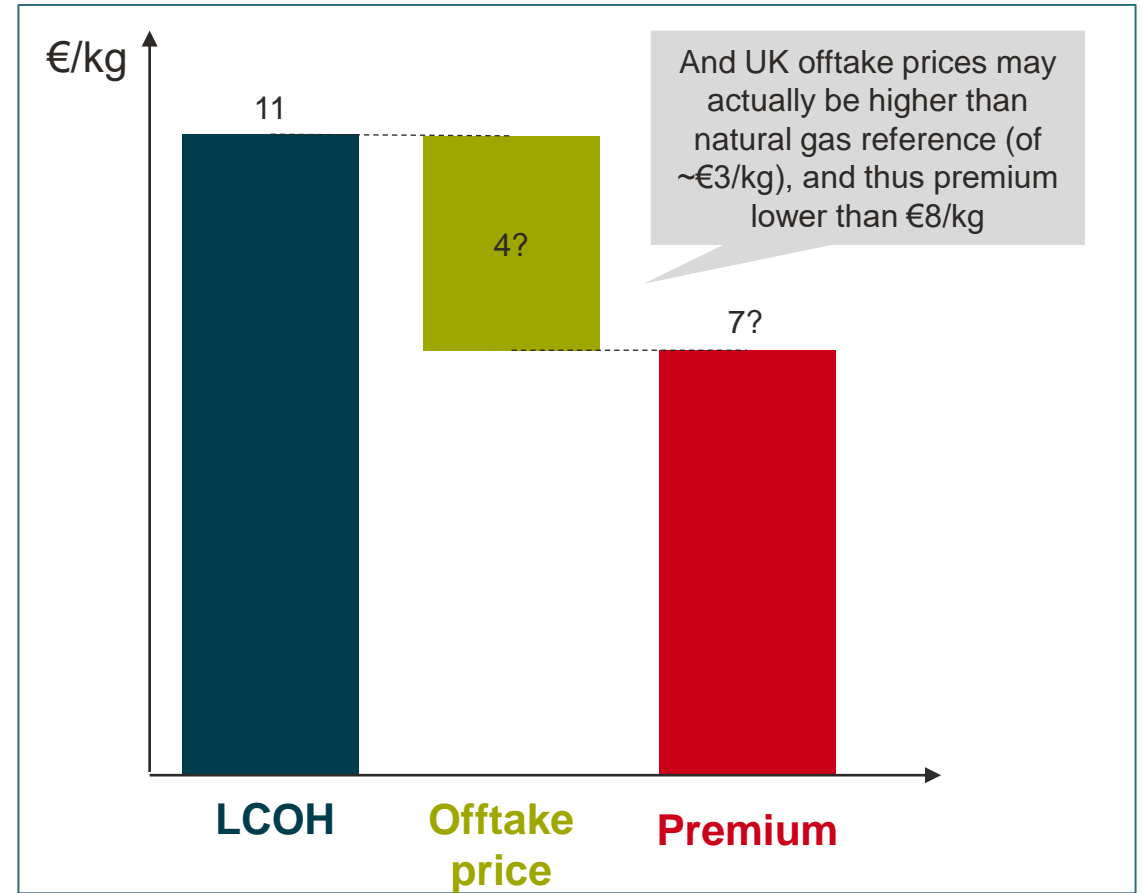
Conclusion: Lower premia in EU auction are likely to be a combination of lower LCOH, higher offtake price expectations and strategic interest to win the auction



EU Hydrogen Bank (Pilot)



UK (HAR1)



Key take-aways from 1st EU auction and lessons for future auction rounds



	Take-away from 1 st EU round	Planned change for 2 nd round	Comments / questions
 Project realisation	<ul style="list-style-type: none"> 1.5 GW auction awards is impressive, but auction award ≠ realised project RES auction experience tells that project realisation rates can be low 	<ul style="list-style-type: none"> Increase of completion guarantee from 4% to 10% Reduce lead time from 5 to 3 years 	<ul style="list-style-type: none"> Will increase project realisation likelihood But also increase bid prices (substantially)
 Budget	<ul style="list-style-type: none"> Low bid prices lead to (unexpected) high capacity (1.5 GW) and hydrogen production, but still only low share of EU H2 production target 	<ul style="list-style-type: none"> Increase in total subsidy volume from 800 million to 2.2 bn EUR (TBC) 	<ul style="list-style-type: none"> Step in right direction But: Even IF bid prices equal to 1st round, total H2 production of 0.7 mn tons < 10% of EU 2030 target (10 mn tons)
 Prices	<ul style="list-style-type: none"> Low bids, but not necessarily representative and likely to increase (transition in DA, 'winner's curse'?) 	<ul style="list-style-type: none"> Reduction of bid cap from 4.5 to 3.5 EUR/kg 	<ul style="list-style-type: none"> Only marginal reduction of bid cap suggests that the EC does not expect the auction's low prices to be representative
 Imports	<ul style="list-style-type: none"> LCOH information reveal significant regional differences within Europe; suggests further lower-cost H2 potential outside Europe (subject to transport cost) 	<ul style="list-style-type: none"> No changes 2nd round will continue to be limited to domestic European production 	<ul style="list-style-type: none"> Open (this or similar) mechanism to imports to EU (import leg of Hydrogen Bank / H2Global)?

Trade-off!

Source: Draft Terms and Conditions for 2nd round available [here](#).

With many thanks for their support to...



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