AURORA ENERGY RESEARCH

Aurora CfD AR7 Service

Offering, Methodology and Results | Q1 2025

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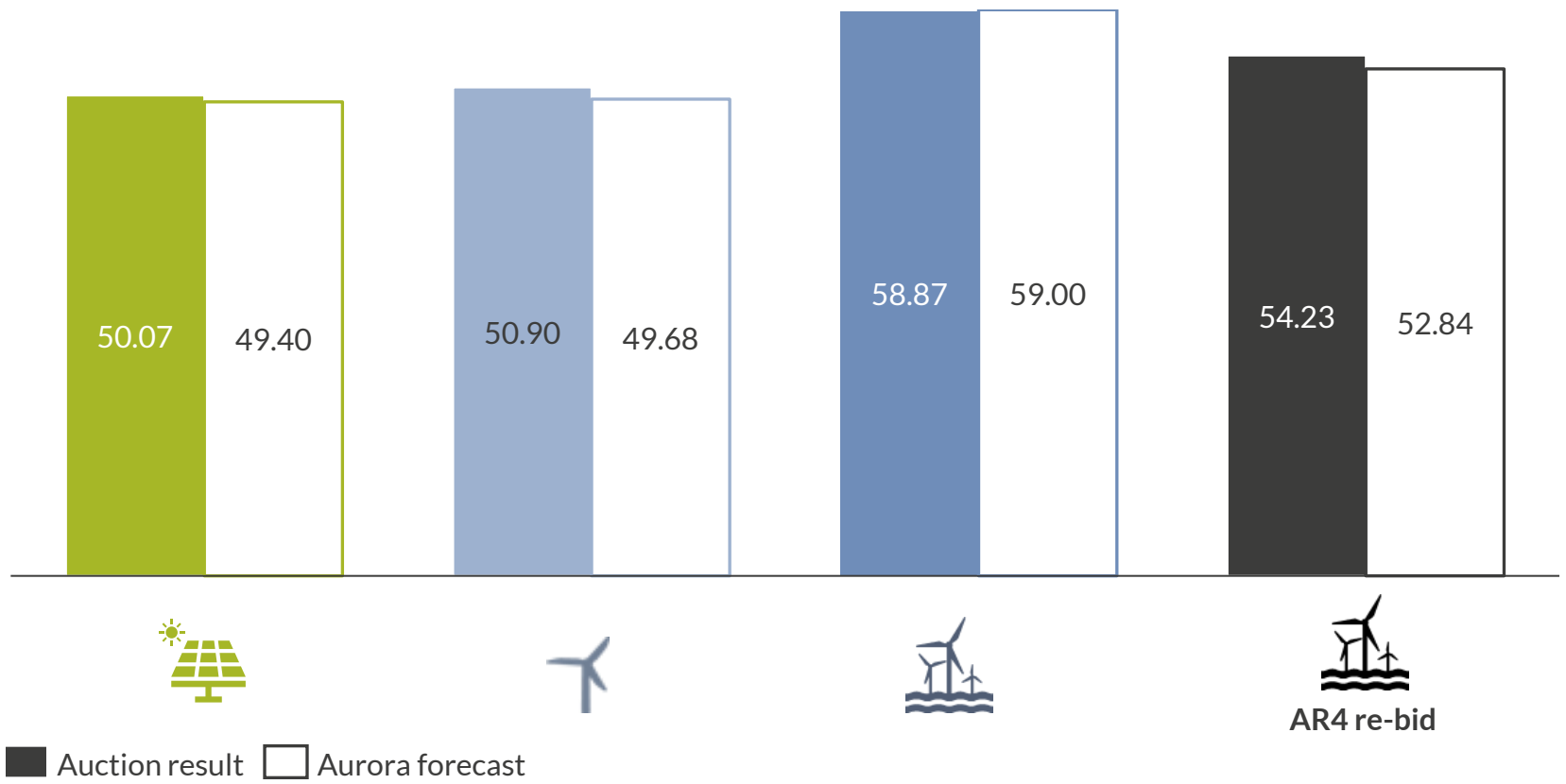
Aurora's plant-by-plant CfD AR6 forecast methodology yielded a very high degree of accuracy on clearing prices

Aurora's Advisory–led AR6 competitive analysis product accurately forecasted all clearing prices within 2.5% , missing the new-build offshore wind clearing price by only 13p

Forecast and actual AR6 clearing prices[1]
2012 £/MWh



1) Excludes Pot 2 and Other RES in Pot 1

Sources: Aurora Energy Research, Low Carbon Contracts Company, DESNZ

Pot 1

- **Onshore wind:** Accurate within 2%, forecasted in-the-money clearing prices
- **Solar PV:** Accurate within 1%, forecasted in-the-money clearing prices

Pot 3

- Accurately predicted Hornsea 4's fleet leading economics for new-build plants, and the success of AR4 re-bids at a lower strike price
- Accurate to within 20p for new-build plants

The service includes a configurable databook with eligible plant cashflows, bid prices, and auction outcomes delivered alongside a report and workshop

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CfD AR7 service

1 Step 1: AR7 Competing project list

- **REPD scrape:** creation of the full list of AR7 competing projects for Pot 1 and Pot 3 based on the qualification criteria[1]

2 Step 2: Key financial metrics

- **Calculate key financial metrics**: annual cashflow forecasts, LCOE[2] and implied CfD strike price for each project under Aurora Central Scenario[3]

3 Step 3: Bid stack & competitor analysis

- **Solve AR7 Bid Stack:** auction clearing price, capacity and budget impact based on AR7 final framework

Aurora's-3 step process provided detailed analysis on all potential AR7 applicants, and used this to understand the competitiveness of the bid stack

Delivery April 2025

Competitor analysis databook

A configurable **MS-Excel databook** containing **annual cashflow forecasts, LCOE, implied CfD bid price and IRR** (pre-tax real) for **AR7 competing projects**

Delivery TBD (est. May 2025)

Auction bid stack forecast

Upon publication of auction parameters, an update of the **MS-Excel databook** with AR7 forecast outcomes detailed the positioning of all applicants in the stack, clearing price, and capacity

4 hours of Aurora advisory support

Aurora includes up to **4 hours of ad-hoc Q+A support** to provide guidance throughout the application process / creating bespoke scenarios using the tool

Workshop and report

A 1-hour workshop and report discussing **key trends** and **answer questions**

1) Aurora will use the Q1 2025 Renewable Planning Database (REPD) release to generate the list of competing projects for AR7. Aurora focused on the key technologies in Pots 1 and 3: Offshore wind, Remote island wind, Onshore wind and Solar PV. 2) Levelised cost of energy. 3) Aurora's Central Scenario from Q2 2025, April release.

Source: Aurora Energy Research

Summary of Aurora's CfD AR7 Competitor Analysis data deliverables

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Cashflow databook

- The **MS-Excel databook** included the following results:

List of input criteria for all AR7 projects[1]	
Criteria	**Description**
Project name and developer	As listed in REPD[2]
Capacity and technology	As listed in REPD, configurable
Location (post code) and Eligibility	As listed in REPD and determined by CfD rules
Transmission or Distribution and zone	From project planning application
CAPEX, Fixed O&M, Variable O&M	Aurora Central view, configurable
RtM costs/discount rates	Aurora Central view, configurable

Key economic vectors		
Economic vector per MW of project	**Unit**	**Aggregation of forecast (all annual)**
Annual generation[4]	MWh	Forecast per applicant, configurable
Annual capture price[4]	£/MWh	Forecast per applicant
Annual Wholesale market revenue	£/MWh	Forecast per applicant
Annual REGOs[5] revenue	£/MWh	One REGOs forecast for Aurora Central
Annual Balancing Mechanism revenue	£/MWh	Forecast per technology (wind only)
Annual Capacity Market revenue	£/MWh	Forecast per technology (post-subsidy)
Annual embedded benefits	£/MWh	Forecast per applicant
Annual network charges	£/MWh	Forecast per applicant
Annual imbalance costs	£/MWh	Forecast per technology
Annual ORPS[6] revenues	£/MWh	Forecast for offshore wind only
Annual cash flows - fully merchant	£/MWh	Combined annual cashflows per project
Annual cash flows - CfD	£/MWh	Combined annual cashflows per project

Financial metrics for all AR7 competing projects[1]	
Key financial output	**Unit**
LCOE[7]	£/MWh
Implied CfD bid price	£/MWh
IRR if fully merchant	%
IRR if CfD	%

Auction results

Step 3 deliverables included:

- A **MS-Excel databook** of the **AR7 bid stack outcome** detailing the positioning of all applicants in the stack

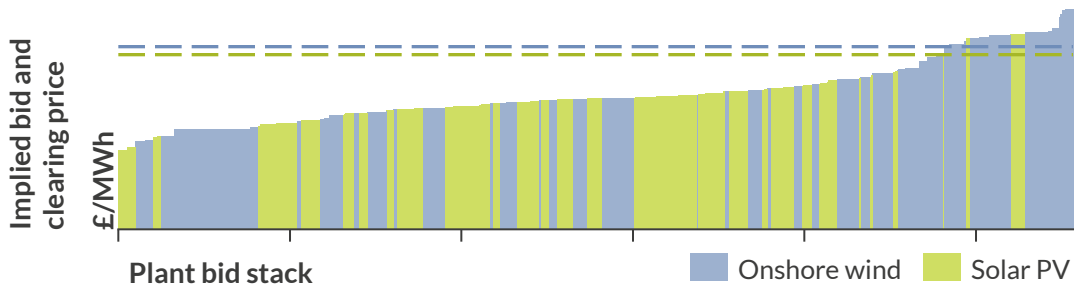
Overview of bid stack outcome (illustrative)

Pot 1 bid stack detail, AR7, Aurora central case

Site name	Installed capacity	Bid capacity	Initial bid	Budget impact at close	Final bid status	Cumulative impact
	MW	*MW*	*2012 £/MWh*	*2012 £*		
Plant 1	50	50	£ 38.20	£ 2,377,588.10	accepted	£ 2,377,588
Plant 2	50	50	£ 40.81	£ 4,160,779.17	accepted	£ 6,538,367
Plant 3	50	50	£ 41.23	£ 11,465,059.73	accepted	£ 18,003,427
Plant 4	50	50	£ 43.38	£ 4,755,176.20	accepted	£ 22,758,603
Plant 5	50	50	£ 43.77	£ 1,237,553.02	accepted	£ 23,996,156
Plant 6	50	50	£ 44.25	£ 12,400,330.84	accepted	£ 36,396,487
Plant 7	50	50	£ 44.54	£ 2,773,852.78	accepted	£ 39,170,340
Plant 8	50	50	£ 45.71	£ 1,237,553.02	accepted	£ 40,407,893
Plant 9	50	50	£ 45.71	£ 1,237,553.02	accepted	£ 41,645,446
Plant 10	50	50	£ 45.81	£ 13,076,734.54	accepted	£ 54,722,180

Pot 1 bid stack capacity vs price, AR7, Aurora central case

£/MWh (2012)



1) Aurora will focus on the key technologies in Pots 1 and 3: Offshore wind, Remote island wind, Onshore wind and Solar PV. 2) Renewable Planning Database (REPD). 3) Fixed offshore wind projects that received AR4 CfD contracts and could pull out of, or reduce capacity in, AR4 will be included in the competing project list. 4) Calculated for **each onshore and offshore wind project** using **Aurora's AMUN tool; Solar PV projects** will be aggregated into **10 unique solar regions** for calculating these vectors. 5) Renewable Obligation. 6) Obligatory Reactive Power Service. 7) Levelised cost of electricity.

Illustrative content of AR7 Competitor Analysis report

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I. Results summary

Pot 1 clears [redacted] GW of solar PV and [redacted] MW of wind, while Pot 3 sees [redacted] GW clearing

Pot 1

Strike prices and capacity procured under A

Technology	Procured capacity MW	Clearin 2012 £
Solar Photovoltaics	[redacted]	
Wind Onshore	[redacted]	
Remote Island Wind	[redacted]	
Total	3495.3	

1) Under a scenario in which either no flexible bids or economic flexible

Sources: Aurora Energy Research

II. Pot 1 bid price analysis — Comparison of technologies

Onshore wind plants show a greater variation in their bid prices relative to solar, reflecting a higher variance of wind load factors

Eligible Solar and Onshore Wind Plants
Cumulative capacity, MW

Solar PV Wind Onshore

1) Load factors are determined by site specific wind data using Amun W of the wind dataset used and not an input error; 2) Includes network cha

Sources: Aurora Energy Research

7. Bid price sensitivities – Risk-free rate

Macroeconomic outcomes changing the risk-free rate by 0.5% can necessitate bid price changes of ± £[redacted]/MWh[1] on average

Minimum Economic Bid Price for AR7 Assets U
2012 £/MWh

Plant Plant Plant Plant Plant

1) 2012 prices

Sources: Aurora Energy Research

II. Pot 1 bid price analysis — Locational effects

The bid prices of onshore wind assets are inversely related to their load factors, with a wider variance seen

Minimum Economic Bid Price of Onshore Wind Assets, *excluding network charges*
2012 £/MWh

0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60

Load Factor

Inverse fit

Average Wind Speed by Location, Aurora Amun Wind Atlas[2]
m/s

Onshore wind plants

3.2 11.5

1) Does not include network charges or any additional revenues, includes route-to-market costs, and CAPEX variation; 2) Load factors are determined by site specific wind data using Amun Wind Atlas, which has a granularity of 1km. Edge cases were investigated to ensure that low load factor results are a function of the wind dataset used and not an input error

Sources: Aurora Energy Research

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Deep dive: Load factor

Methodology

- Xx

Analysis

- Xx

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Aurora forecasts the results of Pot 1 and Pot 3 as pay-as-clear auctions against a budget using the valuation formula set by DESNZ

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1 **Technologies are divided into pots and compete for a pre-defined budget. This year, offshore wind was allocated an exclusive pot**

Pot 1 – Established Technologies

- Solar PV
- Onshore wind
- Other[1]

Pot 2 – Emerging Technologies[2]

- Floating offshore wind
- Tidal & wave
- Geothermal
- Other[3]

Pot 3 – Offshore wind

- Fixed offshore wind[1]

2 **The total allocated budget for AR6 was £1.55bn, of which £1.1bn has been allocated to offshore wind**

CfD AR6 Budget

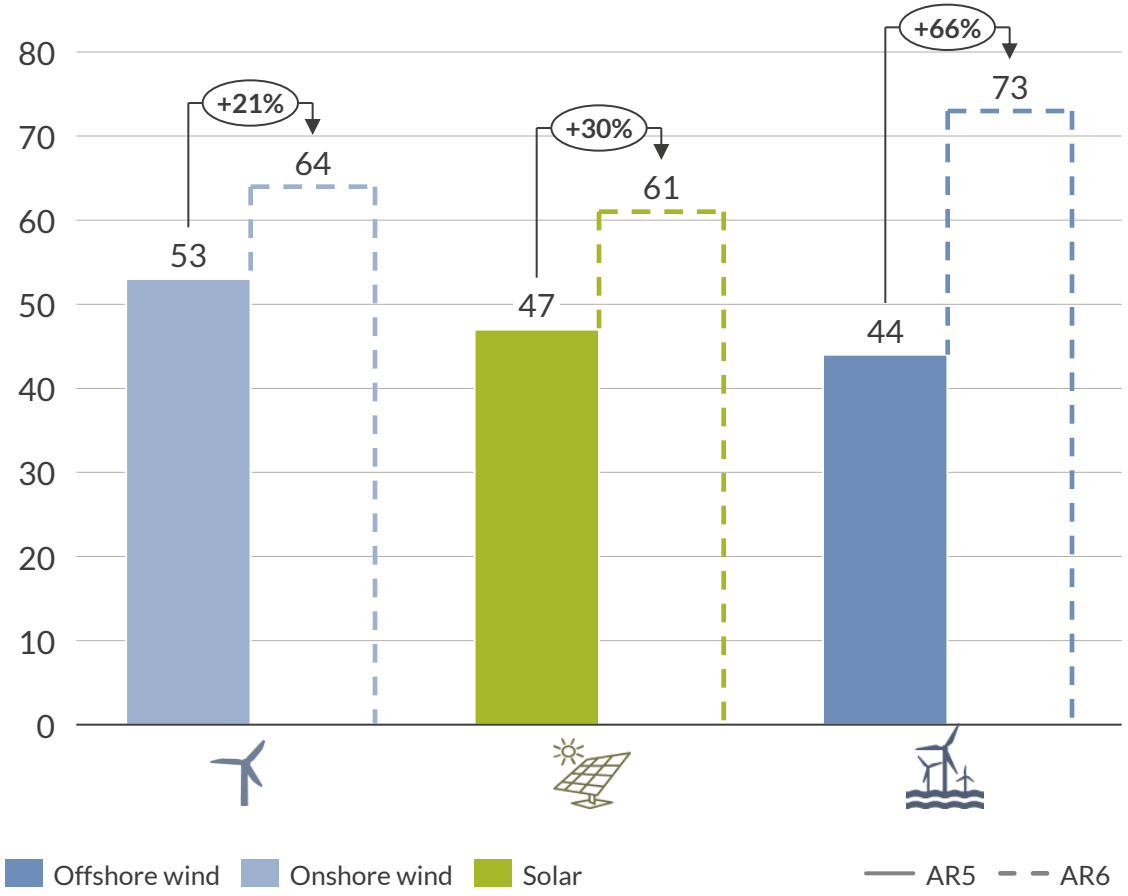
	Delivery and Valuation Years				
Budget (£ million, real 2011/12)	**2026/27**	**2027/28**	**2028/29**	**2029/30**	**2030/31**
Pot 1	185	185	185	185	-
Pot 2	-	270	270	270	270
Pot 3	-	1100	1100	1100	1100

Delivery Year Valuation Year

3 **Alongside an exclusive pot, the ASP for offshore wind has also increased by 66%, from £43/MWh to £73/MWh**

Administrative Strike Price in AR5 and AR6

£/MWh (real 2012)



1) Not considered in this analysis, includes Energy from Waste with CHP, Hydro (>5MW and <50MW), Landfill Gas, Remote Island Wind (>5MW) and Sewage Gas; 2) Not considered within this analysis, 3) Advanced Conversion Technologies, Anaerobic Digestion (>5MW), Dedicated Biomass with CHP

Sources: Aurora Energy Research, DESNZ, NGESO

Aurora calculates the minimum economic bid price for each plant using a breakeven approach considering all revenues and costs

Context: Aurora uses the following approach to calculate the £/MWh level of support needed for an individual project to meet its hurdle rates. This approach captures all project costs and revenue streams outside of the subsidised period, essentially finding the level of support needed under a CfD to make the project NPV equal to zero.

$$\textit{Minimum economic bid price}\ (\textit{£/MWh, real 2012}) = \frac{NPV_{costs}\ (\textit{£, real 2012}) - \left(NPV_{post\text{-}subsidy\ revenue}\ (\textit{£, real 2012}) + NPV_{add'l\ revenues\ during\ subsidy}\ (\textit{£, real 2012})\right)}{NPV_{subsidised\ generation}\ (\textit{MWh})}$$

NPV_{costs}

Net present value of lifetime project costs

- CAPEX
- OPEX (fixed+variable)
- Network charges
- OFTO charges (offshore wind only)
- Route-to-market cost

$NPV_{post\text{-}subsidy\ revenue}$

Net present value of all post-subsidy revenues

- Wholesale
- Capacity Market
- Balancing Mechanism (wind only)
- ORPS (offshore wind only)

$NPV_{add'l\ revenues\ during\ subsidy}$

Net present value of additional revenues during subsidy

- Balancing Mechanism (wind only)
- ORPS (offshore wind only)

$NPV_{subsidised\ generation}$

Net present value of generation during subsidy period

- Forecast using site specific load factors for wind, and zonal load factors for solar PV against Aurora's Central Scenario

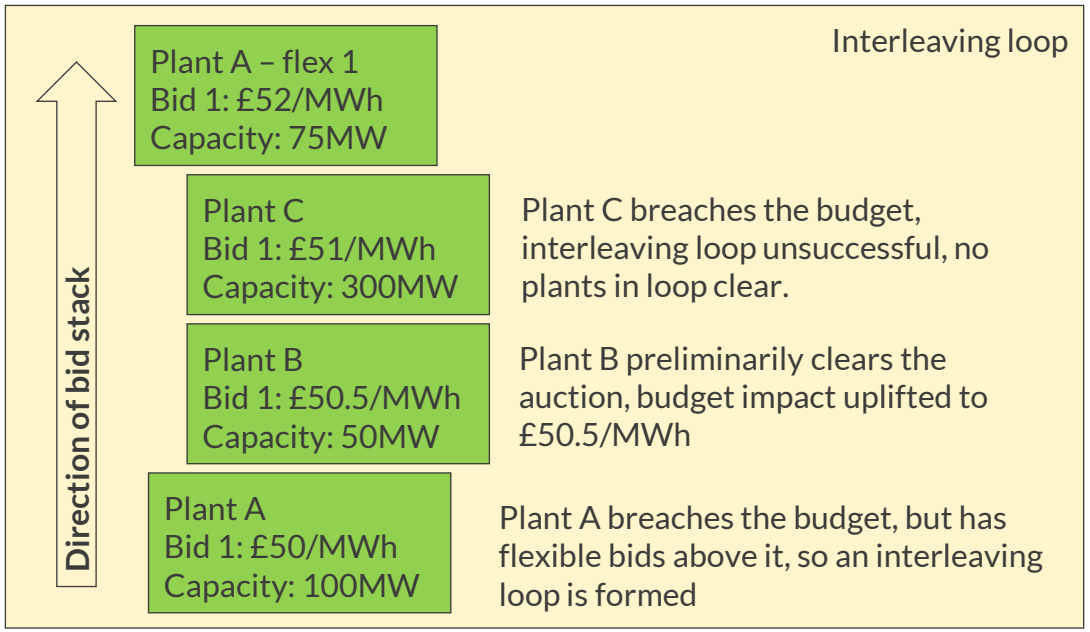
Flexible bids allow plants to submit up to four different bids, two in each delivery year, which are only considered if the initial bid breaches the budget

Context: Plants may submit up to four bids, two in each delivery year. An initial bid considers the maximum capacity a plant is willing to bid in the auction at the lowest price. All subsequent flexible bids must be for the same or less capacity at a higher price

Purpose of flexible bids and interleaving loops

- Flexible bids are only considered if the initial bid from a plant breaches the monetary budget and is the "marginal plant"
- They allow the plant to seek to reduce its budget impact while increasing its strike price to an acceptable level of support
  - All bids between the initial bid and the plant's subsequent flexible bid are considered first
- They also provide an opportunity to secure a contract at the margin of the auction, which informs potential flexible bidding strategies

Simple demonstration of an interleaving loop



Sources: Aurora Energy Research, LCCC

Flexible bids are considered for plants in both Pot 1 and Pot 3 under two methodologies to inform bidding strategies

Context: Plants may submit up to four bids, two in each delivery year. An initial bid considers the maximum capacity a plant is willing to bid in the auction at the lowest price. All subsequent flexible bids must be for the same or less capacity at a higher price

1 **Flexible Bid Strategy 1: economic behaviour**

Redacted

2 **Flexible Bid Strategy 2: non-economic behaviour**

Redacted

Sources: Aurora Energy Research, LCCC

Details and disclaimer

Aurora AR7 Competitive Analysis:
Business Development Material

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For any questions or for further information regarding these deliverables, please reach out to:

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