Keep it simple: Aligning auction objectives for success

Report launch webinar
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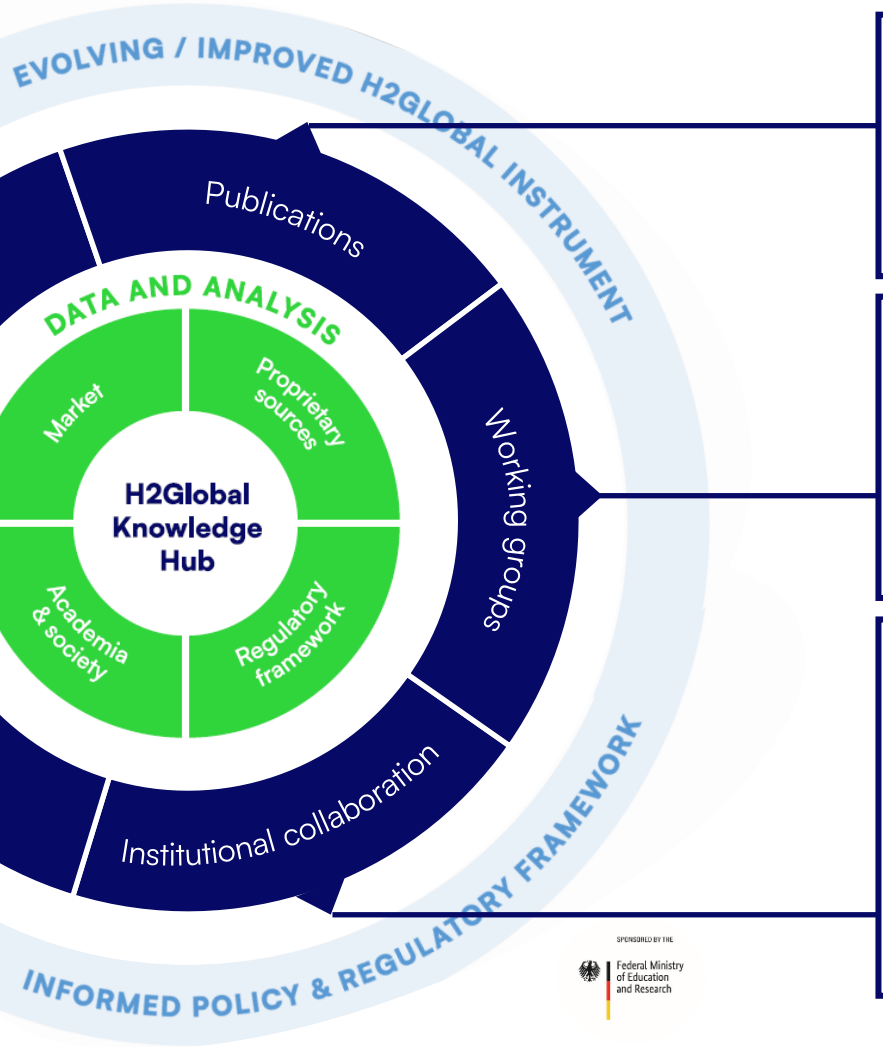
The report is part of the H2Global Knowledge Hub



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THREE PUBLICATIONS IN 2024

- Bridging the gap: Mobilizing investments in hydrogen infrastructure
- Unlocking potential: Scaling demand through hydrogen hubs
- Keep it simple: Aligning auction objectives for success

CONTRIBUTION OF INDUSTRY EXPERTS COVERING THE WHOLE HYDROGEN VALUE CHAIN

- Regular virtual knowledge exchanges and in-person workshops
- Representation from finance, supply, infrastructure, demand, and manufacturing

COLLABORATION WITH KNOWLEDGE PARTNERS FROM:

- Center on Global Energy Policies at Columbia University
- IRENA
- OECD
- Oxford Institute for Energy Studies
- World Bank

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Agenda

1 Challenge

- Aligning auction objectives for success

2 Analysis

- Identification and assessment of 22 auction objectives
- Translation of objectives to auction designs
- Case studies
- Discussion of unintended consequences

3 Recommendations

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The challenge

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Auctions are key to jumpstarting clean hydrogen markets, revealing prices and attracting investment

CHALLENGES

- No clear pricing signal on supply or demand for clean hydrogen and its derivatives
- Limited number of transactions
- Differences between cost & willingness to pay

AUCTIONS

- enable competitive price discovery
- connect hydrogen supply with demand
- allocate financial support

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Auctions are a flexible instrument
able to accommodate various policy objectives

Fiscal objectives

Industry policy objectives

Social objectives

Trade policy objectives

Environmental objectives

...

Different objectives may lead to **trade-offs**

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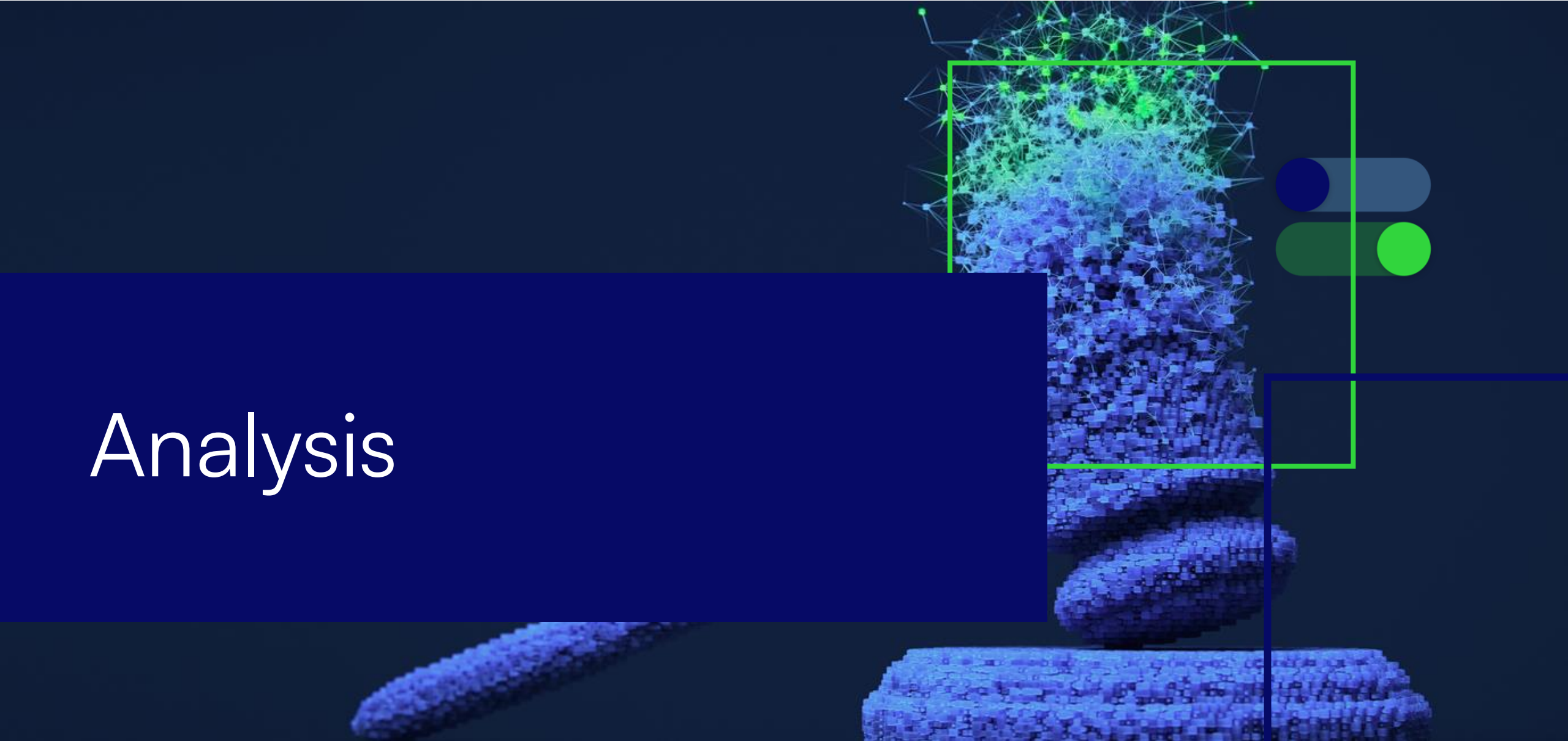
Analysis



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Assessment of 22 auction objectives and their interactions

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]
[1]	supporting H2 (derivative) market creation	0	2	2	2	3	-1	-2	-2	2	2	0	0	0	0	0	0	1	-1	-2	0	-2	2
[2]	reducing cost of H2 (derivatives) for offtakers	2	0	2	2	2	-1	-2	0	2	2	-1	-1	-1	0	2	0	2	-1	2	0	0	0
[3]	maximizing economies of scale	2	2	0	0	0	-1	-1	-2	2	2	1	-1	1	0	0	0	0	0	0	-2	-1	2
[4]	supporting value chain establishment	0	0	0	0	-2	0	0	2	0	0	1	0	0	0	0	0	0	2	2	1	-2	-1
[5]	increasing H2 (derivatives) market liquidity	3	0	0	-2	0	2	2	0	0	0	0	0	0	0	0	2	0	0	0	0	-1	-2
[6]	diversifying energy supply geographies	-1	-1	-1	0	2	0	2	0	2	0	0	2	1	-2	-1	0	0	0	0	0	-2	-1
[7]	diversifying energy supply companies	2	-2	-1	0	2	2	0	1	0	0	0	1	0	0	0	2	0	0	0	0	0	-2
[8]	ensuring project completion	2	-2	0	2	0	0	1	0	2	2	1	1	1	2	2	1	0	1	1	-2	-2	0
[9]	reducing global GHG emissions	2	2	2	0	0	0	0	2	0	-2	0	2	2	0	0	0	0	0	0	0	0	-1
[10]	reducing domestic GHG emissions	0	-2	0	0	0	0	0	2	-2	0	0	1	-1	2	1	0	0	0	0	0	0	-1
[11]	supporting social sustainability and local value creation	0	-1	0	0	0	0	0	0	0	0	0	1	2	0	0	2	0	0	1	-1	-1	-1
[12]	supporting environmental sustainability beyond GHG emissions	0	-1	-1	0	0	0	1	1	2	1	1	0	0	0	0	2	2	0	1	-1	-1	-1
[13]	supporting development policy targets	0	-1	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	-1	-2	-2
[14]	supporting domestic supply market development	0	0	0	0	0	-2	0	0	0	2	0	0	0	0	0	0	0	1	2	0	2	-1
[15]	enhancing national industrial competitiveness	0	2	0	0	0	0	0	-2	0	1	0	0	0	0	0	0	2	0	0	0	2	-2
[16]	supporting SMEs	0	0	0	0	2	0	2	1	0	0	2	0	0	0	0	0	0	0	0	1	0	0
[17]	fostering H2 (derivative) innovation	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	-2	-1	0	-1	1
[18]	developing specific technologies	0	-1	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	2	1	1	-1
[19]	developing specific (offtake) sectors	0	0	0	2	0	0	0	1	0	0	1	1	0	2	0	0	0	1	0	0	1	-2
[20]	minimizing time to delivery	0	0	-2	1	0	0	0	-2	0	0	-1	-1	-1	0	0	0	0	0	1	0	1	-2
[21]	minimizing duration of award procedure	-2	0	0	0	0	-2	0	-2	0	0	-1	-1	-2	2	0	0	0	0	0	1	0	0
[22]	maximizing fiscal efficiency	2	0	2	0	0	-1	0	0	-1	-1	-1	-1	-2	-1	2	0	0	-1	-1	0	0	0

Fiscal efficiency is the objective with the most trade-offs

Legend

The table reads that the objectives in the rows impact those listed in the columns.

0 = no or ambiguous effect
>0 = synergistic/positive effect
<0 = negative effect

|1| = weak relation
|2| = intermediate relation
|3| = strong relation

Supporting SMEs is the only objective that has no negative relationship to any of the other objectives analyzed

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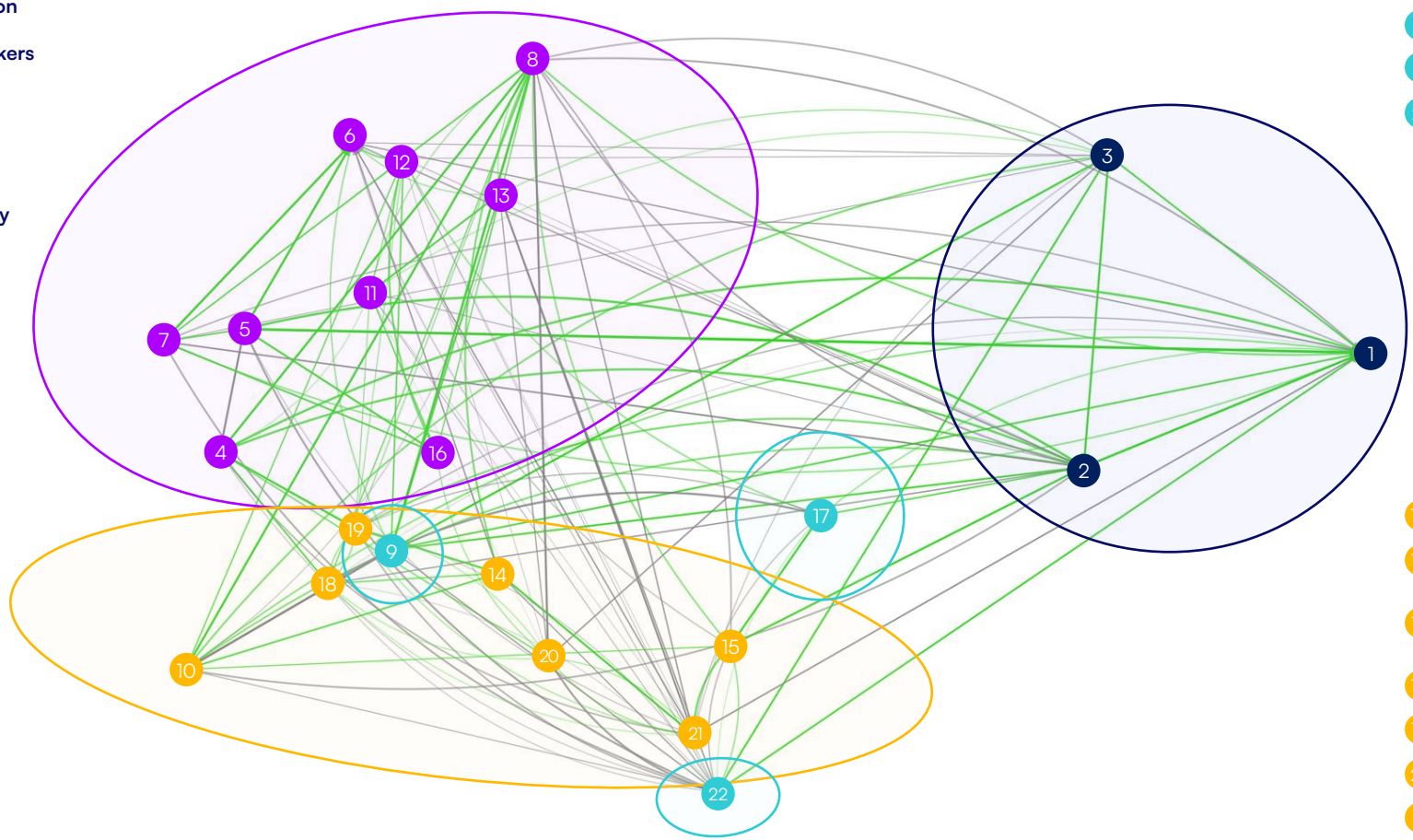
Four clusters allow auction designers to pick coherent objectives
with maximum synergies and minimum trade-offs

1 supporting H2 (derivatives) market creation
2 reducing cost of H2 (derivatives) for offtakers
3 maximizing economies of scale

4 supporting value chain establishment
5 increasing H2 (derivatives) market liquidity
6 diversifying energy supply geographies
7 diversifying energy supply companies
8 ensuring project completion
11 supporting social sustainability and local value creation
12 supporting environmental sustainability beyond GHG emissions
13 supporting development policy targets
16 supporting SMEs



9 reducing global GHG emissions
17 fostering H2 (derivatives) innovation
22 maximizing fiscal efficiency

10 reducing domestic GHG emissions
14 supporting domestic supply market development
15 enhancing national industrial competitiveness
18 developing specific technologies
19 reducing global GHG emissions
20 minimizing time to delivery
21 minimizing duration of award procedure

Arrow effects

→ Positive effect → Negative effect

Clusters

- Scale objectives
- Sustainability and resilience objectives
- Speed and domestic development objectives
- Efficiency objectives

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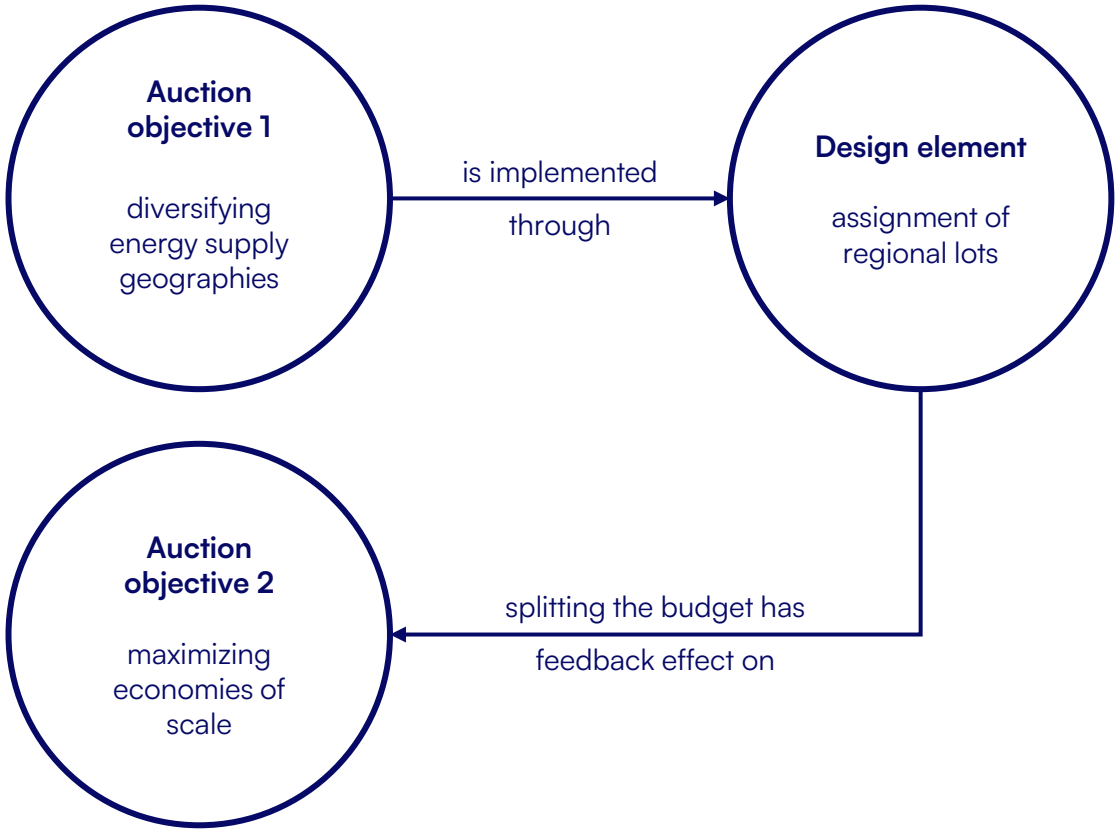
Auction design choices should take into consideration the feedback loops between objectives

Auction objective

Goal of an auction that allows the measurement of success

Design element

Concrete measure that defines practically how the auction is implemented



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Five key design elements

Price-only awarding vs. additional criteria

- Grant agreement vs. offtake contract
- Fixed premium vs. contract-for-difference

- Minimum annual turnover
- Existing expertise
- Etc.

Domestic production vs. import-orientation

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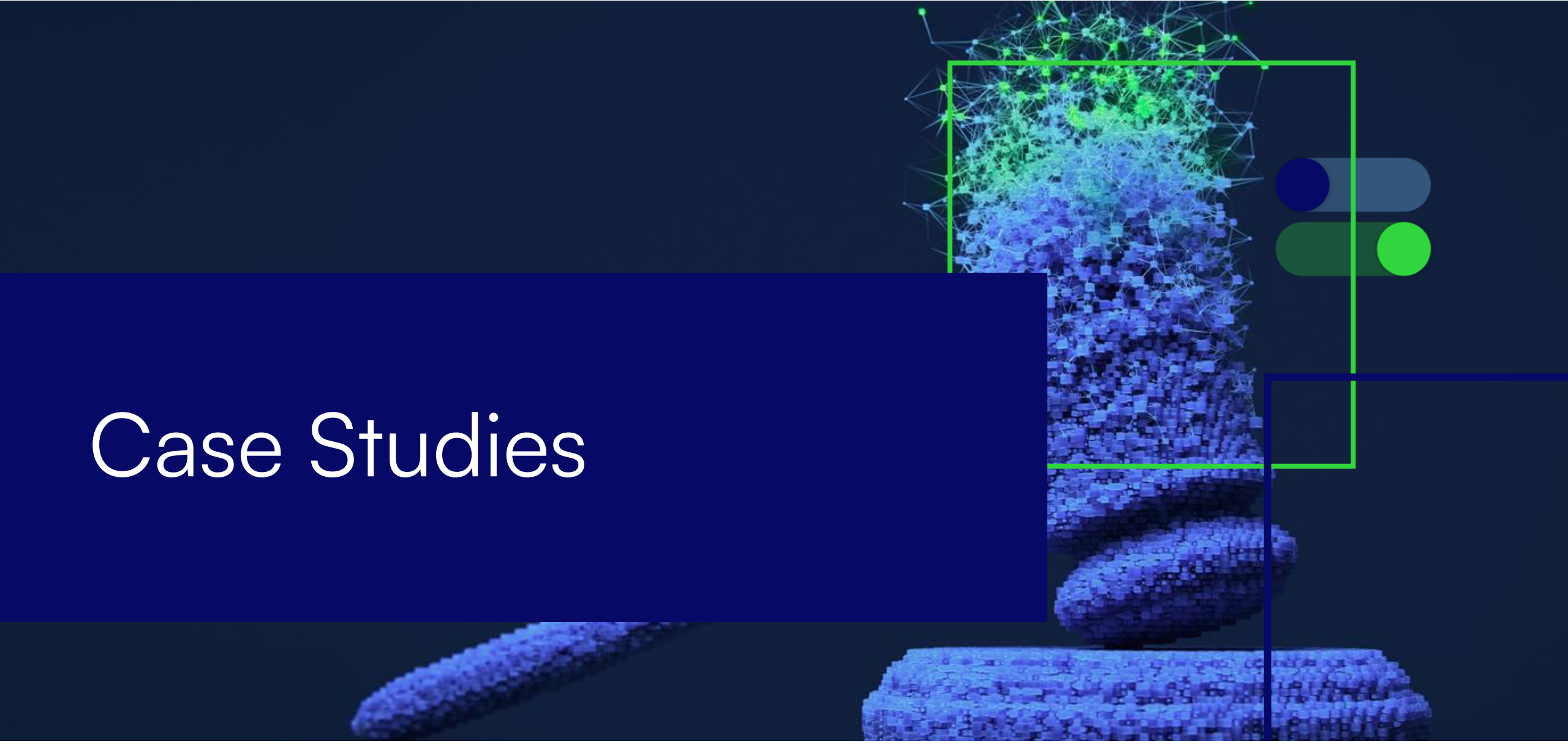
Case Studies



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The Danish PtX Tender
targets the least number of objectives

SET-UP

4 objectives

from 3 clusters

Despite cluster variety, few inherent trade-offs through careful selection

Trade-offs between scale and sustainability and resilience clusters to be expected

DESIGN

PtX products

Domestic market

Grant agreement

Fixed premium

Low pre-qualification criteria

Single-sided auction

Pay-as-bid award

RESULTS

6 winners

dropout(s) 1

280 MW of electrolysis capacity

0.73 EUR/kg subsidy
No information on product price

Subsidy does not correlate to project size because of product variety

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The UK's Hydrogen Allocation Round 1 (HAR1)
features few, but opposed, objectives

SET-UP

5 objectives

from 4 clusters

Trade-off between scale, project diversification and project completion to be expected

Number of trade-offs likely to impact duration of the award procedure

DESIGN

Renewable hydrogen

Domestic market

Grant agreement

Dynamic support (CfD-style)

Low pre-qualification criteria

Single-sided auction

Pay-as-bid award

RESULTS

11 winners

dropout(s) 0

125 MW of electrolysis capacity

6.8 EUR/kg subsidy
11.9 EUR/kg product price

Expected trade-offs materialized

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The European Hydrogen Bank Pilot Tender
features more objectives, with an internal priorization for speed in practice

SET-UP

7 objectives

from 3 clusters

Inherent trade-offs are managed by giving priority to speed of award procedure and high completion guarantees

DESIGN

Renewable hydrogen

Domestic market

Grant agreement

Fixed premium

Low pre-qualification criteria

Single-sided auction

Pay-as-bid award

RESULTS

7 winners

dropout(s) 1

1502 MW of electrolysis capacity

0.48 EUR/kg subsidy
5.3-13.5 EUR/kg product price*

Most winning projects pursue captive business models

*range of average LCOH per country

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The H2Global Pilot Auction for Renewable Ammonia
has the largest number of objectives

SET-UP

11 objectives

from 4 clusters

Focus on
multiple objectives from the sustainability and resilience cluster likely leads to a long award procedure

DESIGN

Renewable ammonia

International market

Offtake contract
Dynamic support (CfD style)

High pre-qualification criteria

Double-sided auction

1st price sealed bid (winner-takes-all)

RESULTS

1 winners

dropout(s) 0

100 MW of electrolysis capacity

Subsidy tbd after
demand-side auctions
3.7 EUR/kg product price*

Including synthesis in the offtake contract limits the nominal electrolysis capacity

*Calculation by H2Global team as the official bid contained an ammonia price

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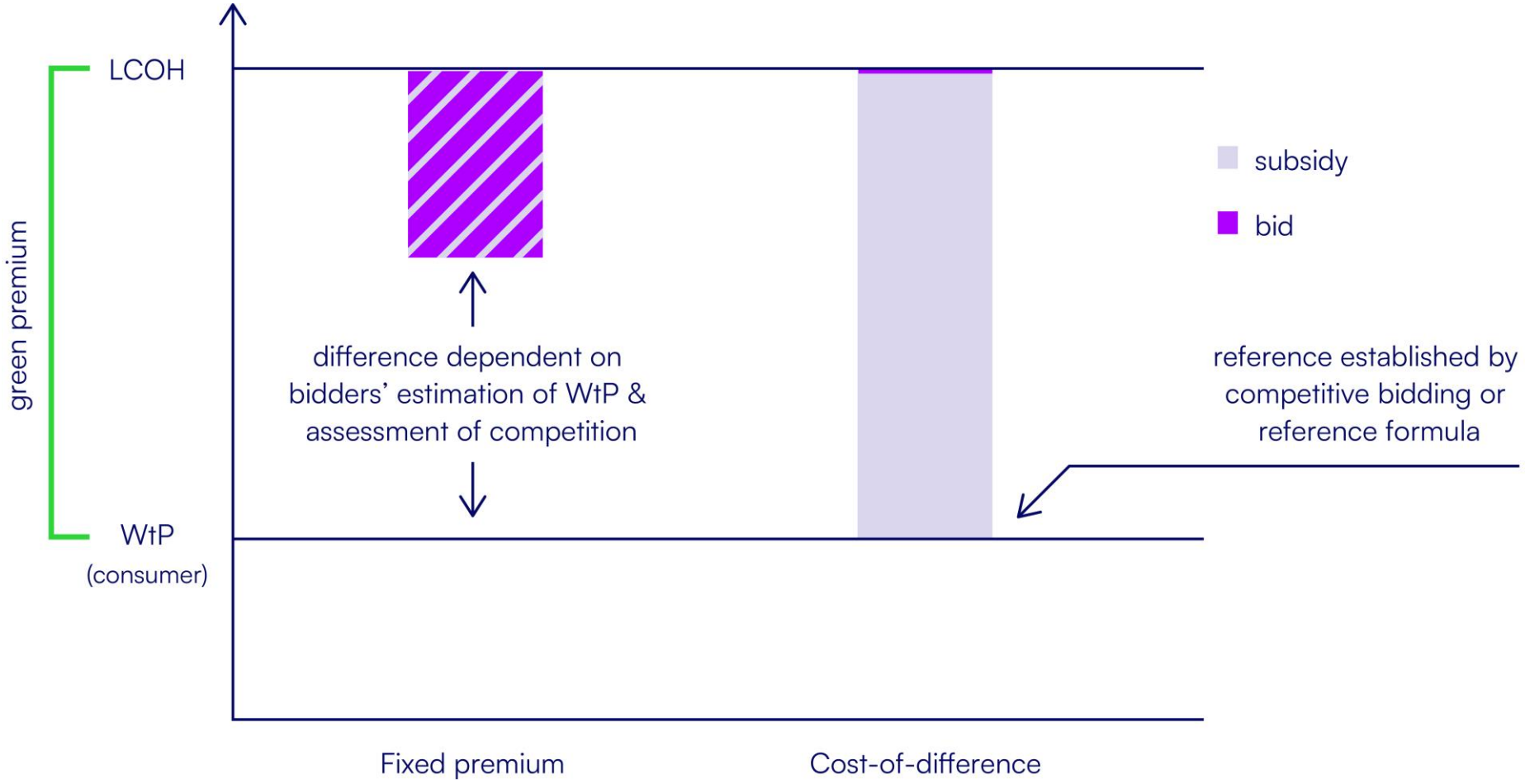
Comparing the auctions
must be interpreted in light of diverging objectives



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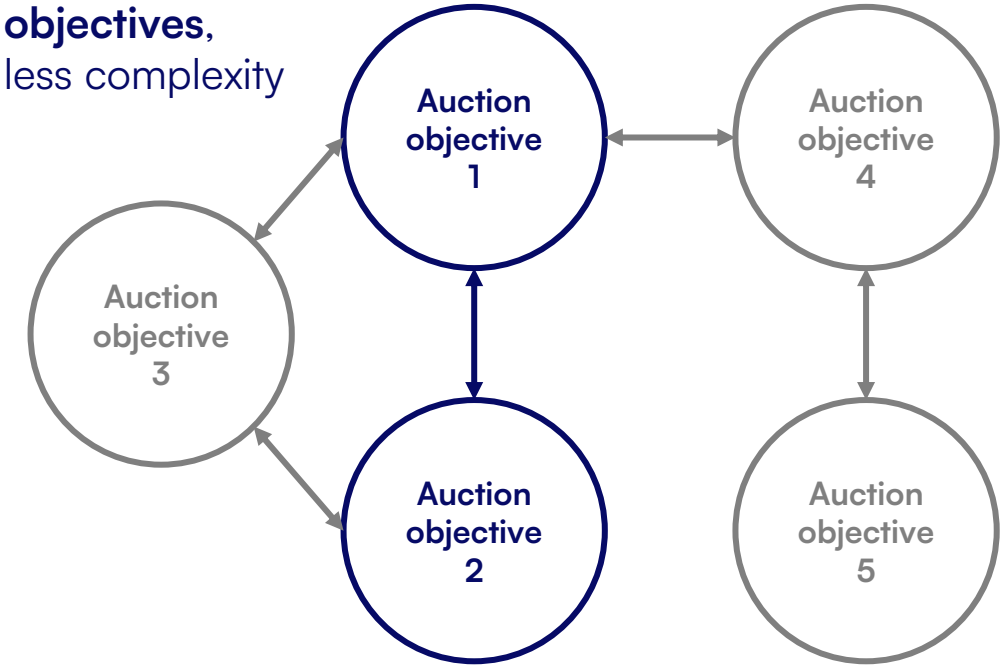
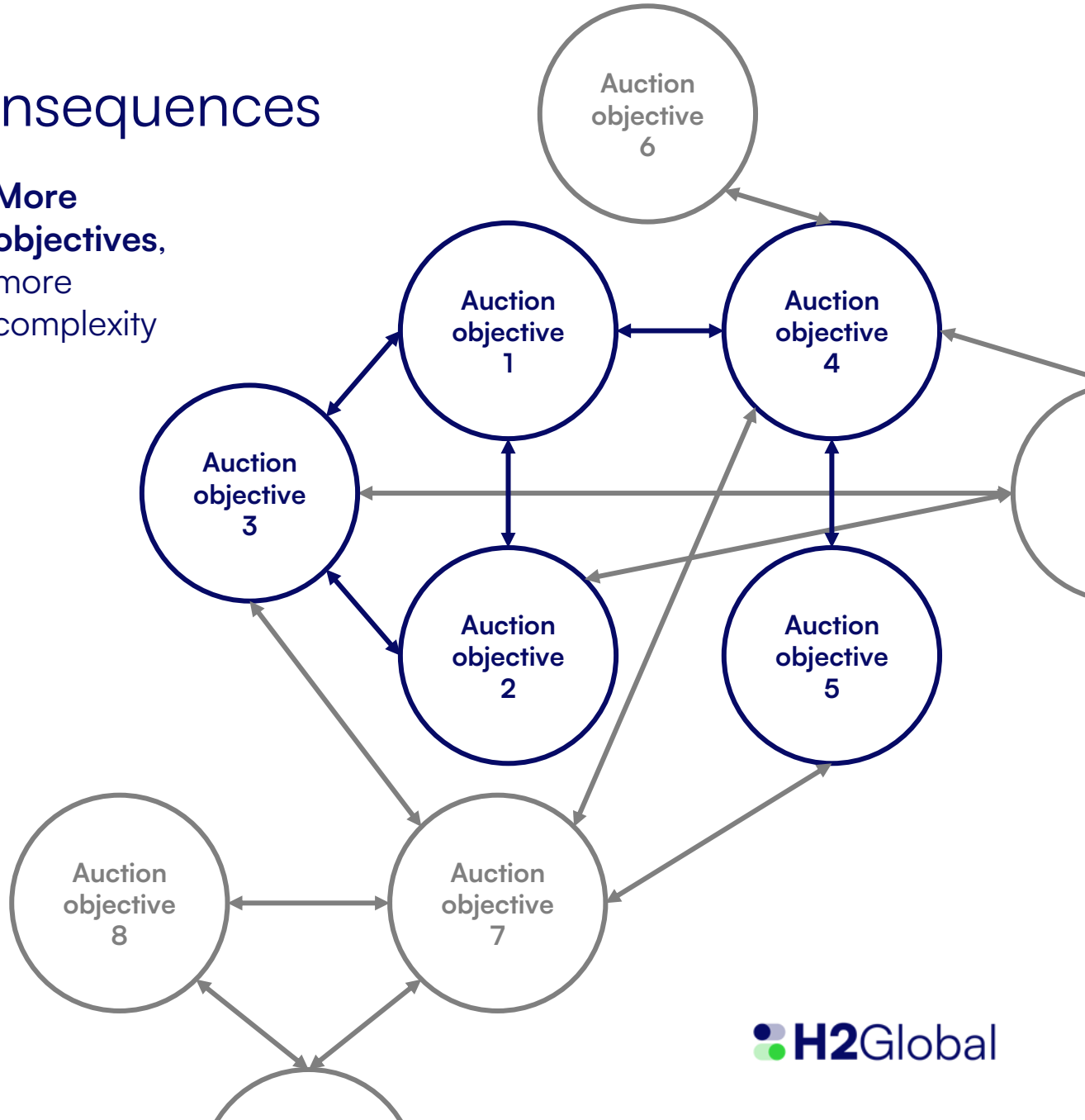
Comparing the auctions
reveals potential for unintended consequences

Fewer objectives,
less complexity



other objectives can be taken care of through policy and/or legislation

More objectives,
more complexity



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Awarding process delays
can be an unintended consequence

START OF AUCTION

Objectives **(WITHOUT PRE-CERTIFICATION)**

Fiscal efficiency
Geographies
…

Award of winner(s)

Policy exceptions can be provided for immature markets, like hydrogen, to limit uncertainty and delay

Objectives **(WITH PRE-CERTIFICATION)**

Sustainability criteria

Financial qualification criteria

…

Award of winner(s)

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Underbidding & underbuilding
can be unintended consequences

POTENTIAL CAUSES OF UNDERBIDDING & UNDERBUILDING

Pre-award incentives

Support recipient

Awarding support directly to bidders provides an option to choose between higher support & chance to win.

Support type

Fixed support types without dynamic elements incentivize bidding low and shift market assessment to bidders.

Optimistic market assessment

Bidders misjudge the need for subsidies based on their expectations of cost development.

Lack of contractual or legal consequences

if project does not become operational.

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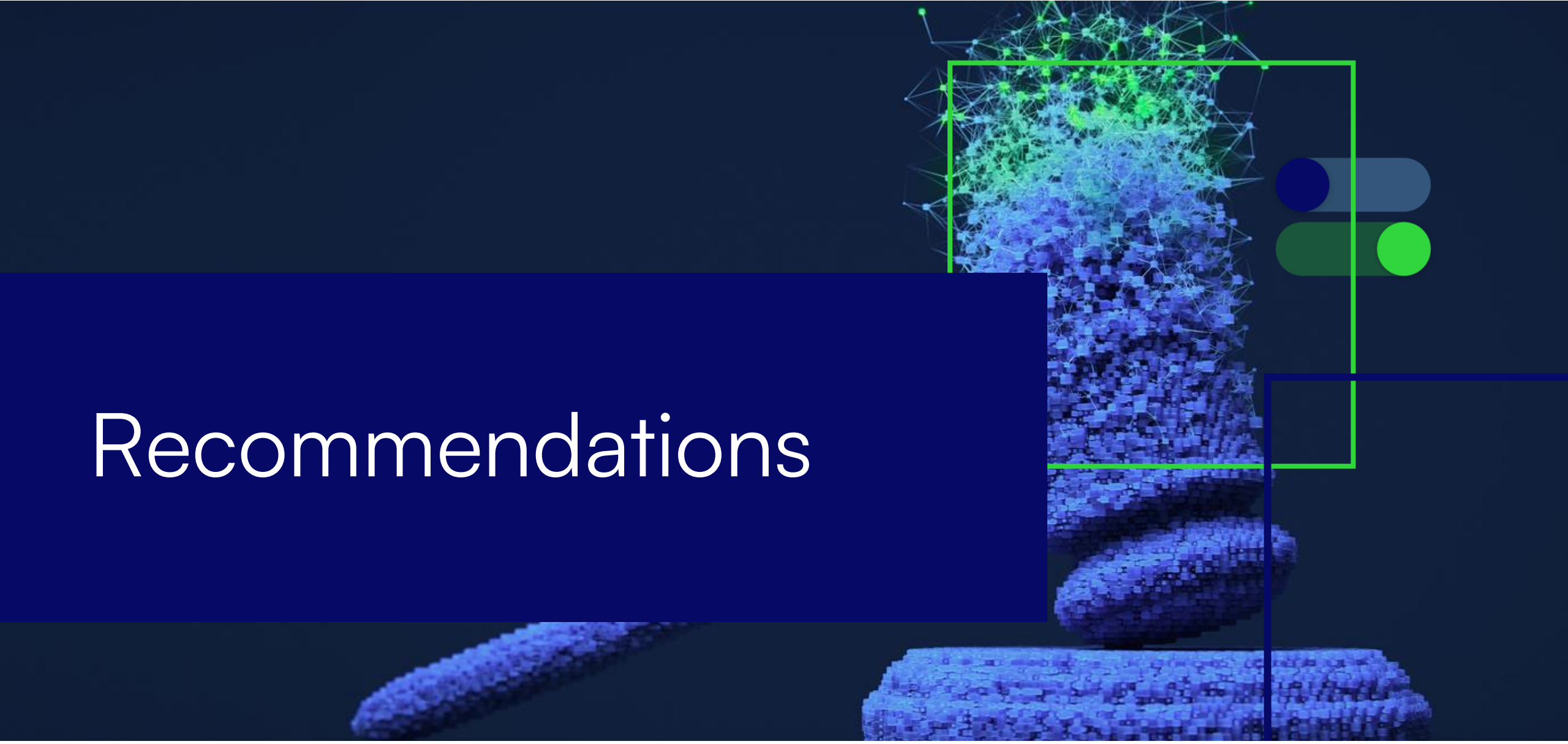
Recommendations



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Recommendations

*Non-exhaustive list

KEY CHALLENGES ARE...*

- False equivalence between dissimilar auction processes
- Inherent trade-offs of multiple objectives
- Immature clean hydrogen markets

SOLUTIONS INCLUDE...*

- Use of coherent sets of auction objectives & like-for-like comparison based on objectives
- Reduction of incentives for underbidding & underbuilding
- Implementation of general political goals through policies (not forcing them into auctions)
- Enabling of regulatory exceptions for immature market settings

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