

Hydrogen's missing link: enabling value chains to bridge the green premium

Report launch webinar

November 2026

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Agenda

1 Challenge

- Cost gap as the main barrier for hydrogen offtake

2 Value-chain analysis

- Fertiliser-to-plate value chain
- Steel-to-wind-turbine value chain

3 Instrument analysis

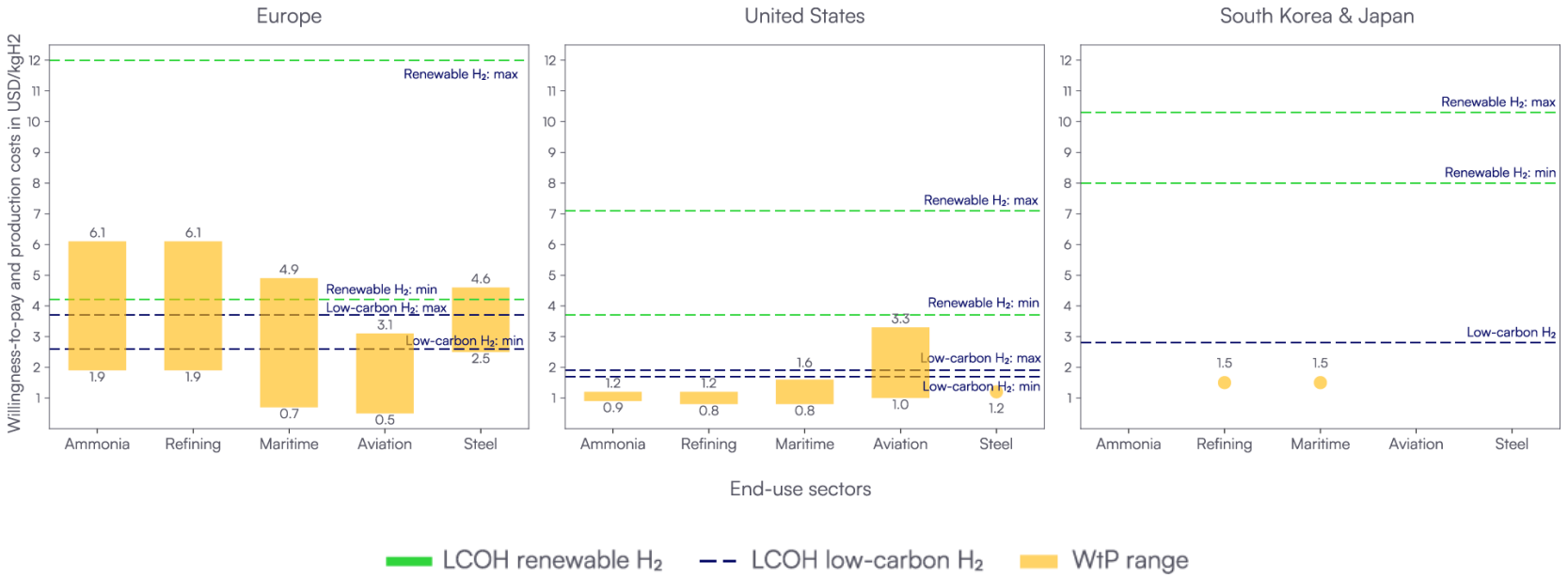
- Quotas
- Carbon pricing
- Double-sided auctions

4 Recommendations

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The challenge:
The cost gap remains the most significant barrier for hydrogen offtake

Cost of difference (CoD) assessment from our meta study in 2025



The CoD remains significant and varies by region and sector between **0.4 USD/kg to 11.5 USD/kg.**

Willingness-to-pay (WtP) is limited by

- Cost of **conventional alternatives** incl. carbon prices
- Under the condition of (international) **competition**
- The ability of customers of direct users to absorb higher prices (**price elasticity**)

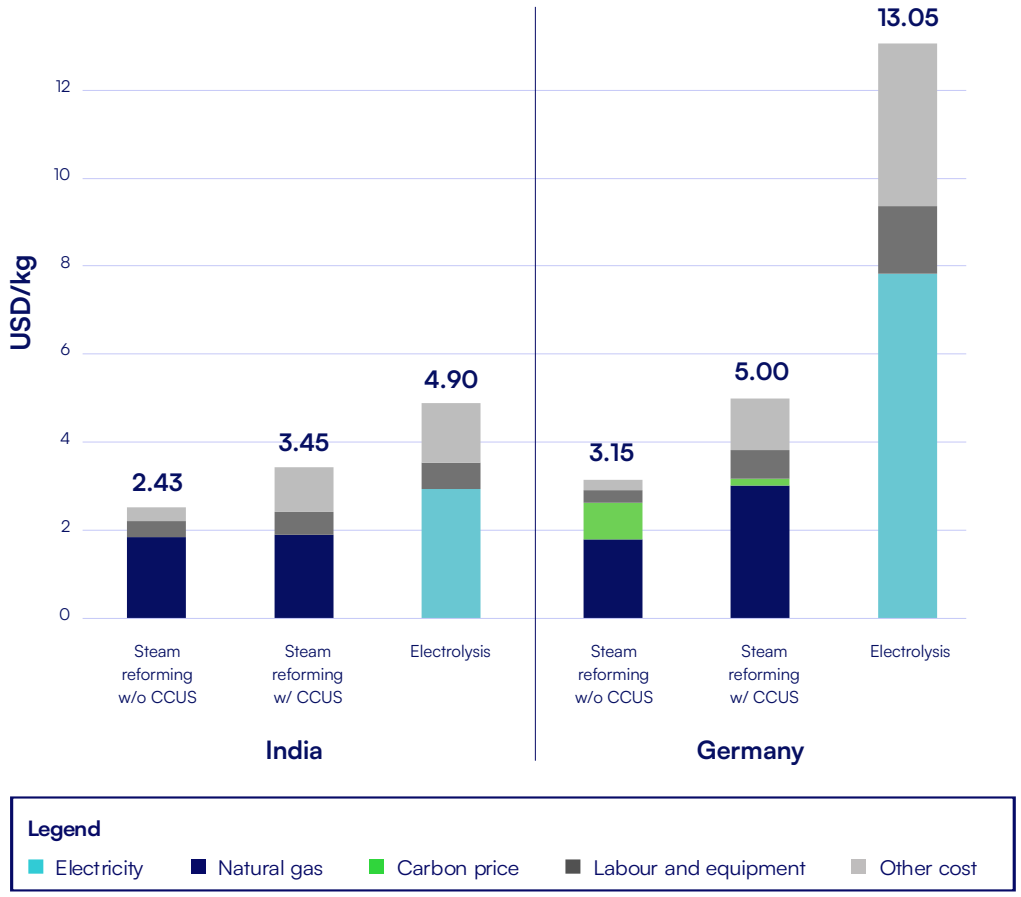
How can the green premium be passed down the value chain?

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The report considers three scenarios for each value chain
and applies the same hydrogen cost assumptions to both value chains

Scenario	Acronym	Fertiliser-to-plate	Steel-to-wind-turbine
Conventional input scenario	**CIS**	Steam reforming of NG w/o CCUS	BF-BOF w/ coal
Low-emission scenario	**LES**	Steam reforming of NG w/ CCUS	DRI-EAF w/ NG
Renewable input scenario	**RIS**	Renewable H_2 input w/ external carbon source	DRI-EAF w/ renewable hydrogen

Cost of hydrogen applied to the scenarios



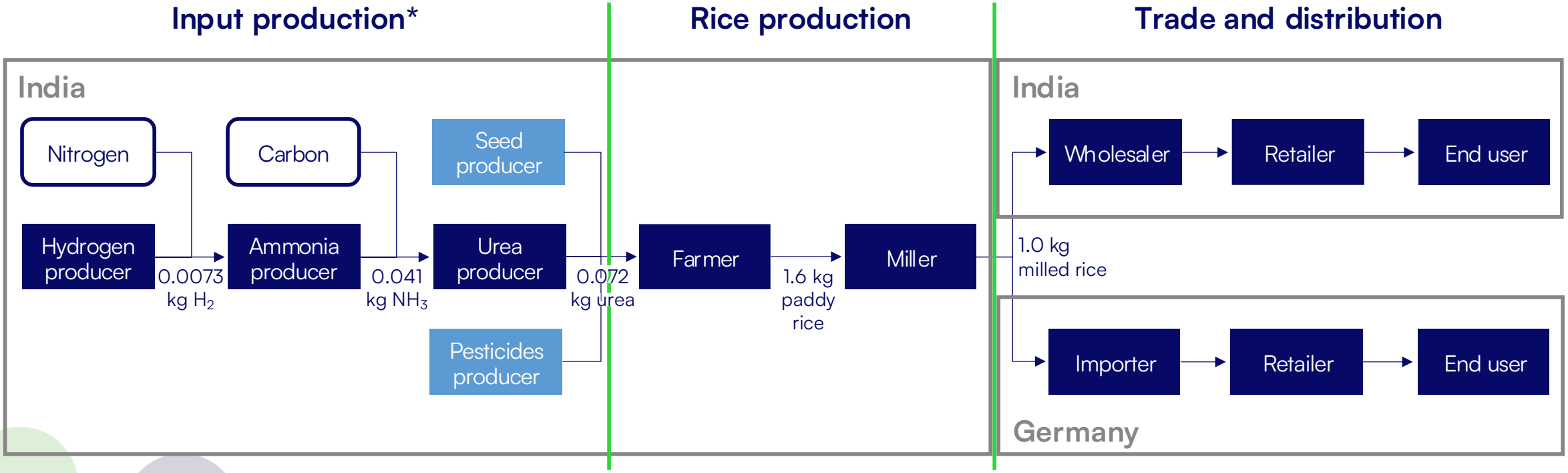
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Value chain analysis

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Delivering one kilogram of basmati rice requires six value-chain steps
and hydrogen affects all steps through the carried cost of fertiliser production

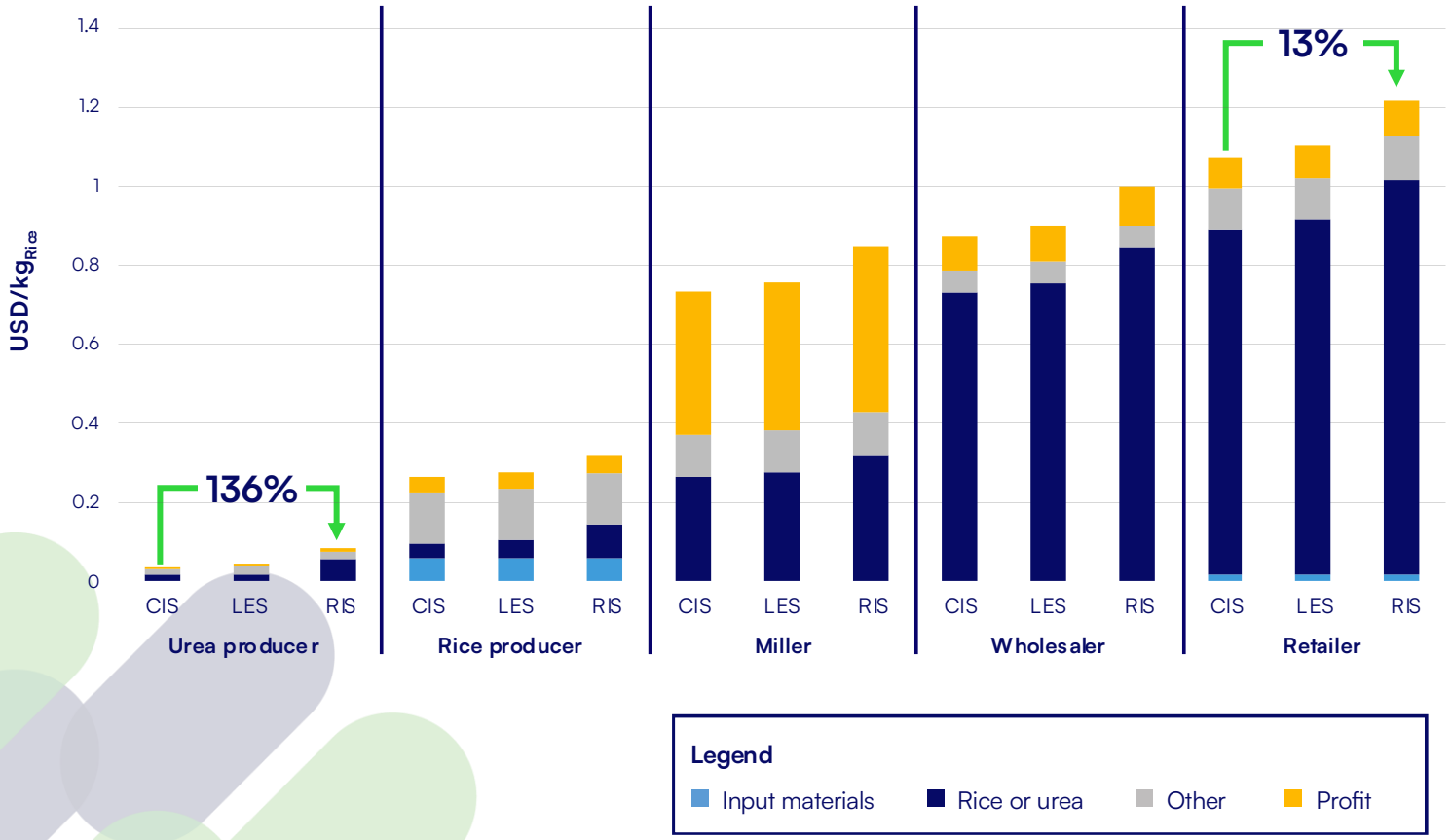


The analysis focuses on the value-chain segments highlighted in dark blue.
*Hydrogen, ammonia and urea production can be integrated in one plant, depending on the production technology and business model of the producer(s). Urea application rates and yields in India are based on data collected by APEDA in Punjab, Uttar Pradesh, Uttarakhand, and Haryana, averaging 230 kg of urea per hectare and 4.5 tonnes of paddy rice per hectare respectively. The milling conversion rate is 1.6 kg of paddy rice for each kg of milled rice. Each kg of ammonia requires 0.178 kg of hydrogen, while each kg of urea requires 0.569 kg of ammonia.

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Without India's maximum retail price for fertilizers
end-consumers in India face a steep increase in the final price of rice

Rice cost in India



22% **premium for farmers,** with very narrow profits to absorb the premium

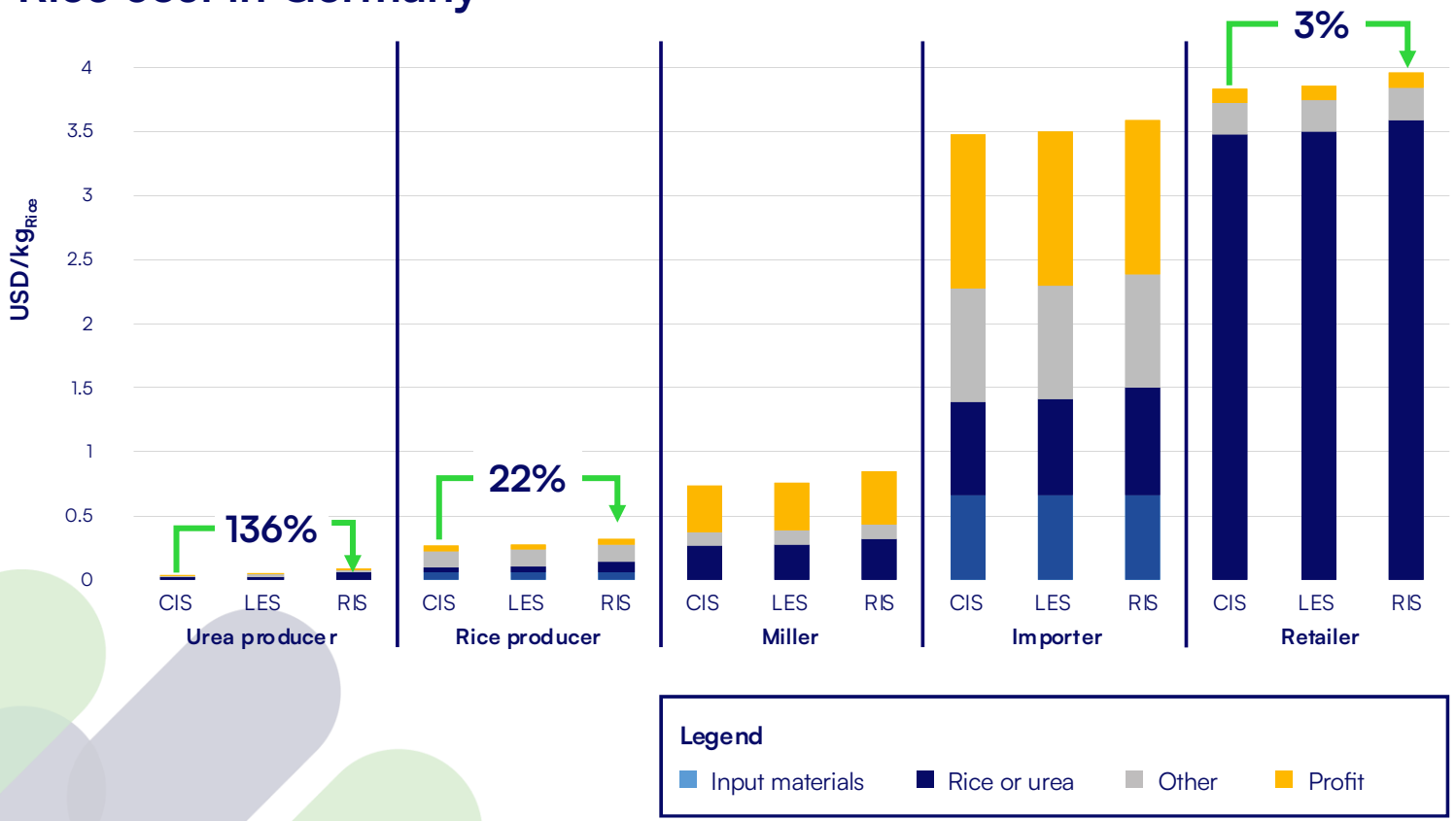
3-13% **premium for end consumer**

1.22 USD/kg final basmati rice price

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German end consumers only face a 3% increase for basmati rice
—well within the range of normal price fluctuations in supermarkets

Rice cost in Germany



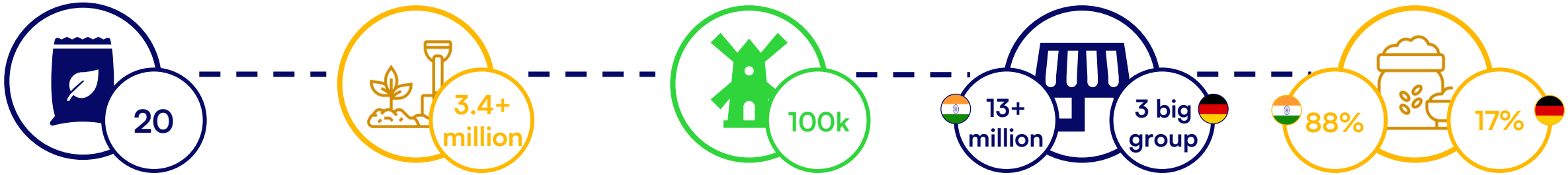
22% **premium for farmers,** with very narrow profits to absorb the premium

1-3% **premium for end-consumers** as import cost take up a large share of the cost

3.96 USD/kg final basmati rice price

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Large number of decentralized players in the Indian value chain complicates tracking low-carbon attributes through to end consumers.



urea producing companies in India

marginal and small basmati rice farmers in India

mills across India

retailers in India and Germany respectively

of Indian and European consumers are willing to pay more for sustainable products respectively.

Moderately concentrated market, with 4 producers accounting for +50% production.

Millions of farmers, **none** of whom hold **significant market power**.

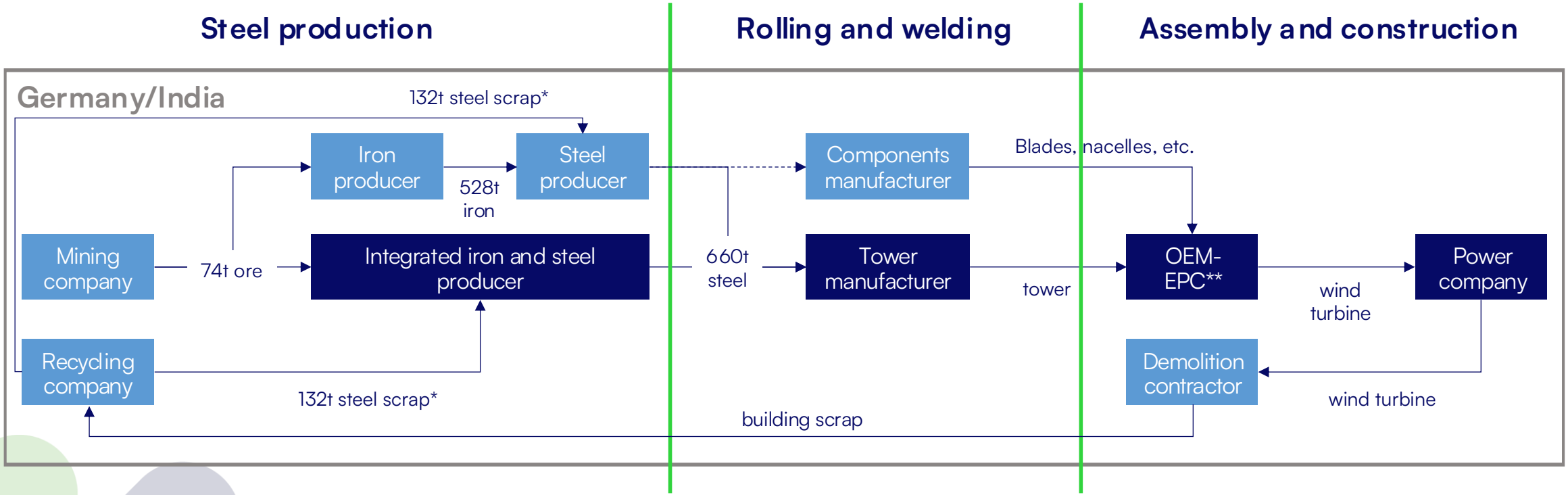
Large food companies operate their own mills and procure rice through contract farming

India: Decentralized structure. Dispersed market power.
Germany: Centralized structure. Concentrated market power.

Reported WtP premiums of **5 and 9.7%**, respectively. The estimated **premium exceeds WtP in India.**

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With integrated iron- and steelmaking, the value-chain for a 6 MW onshore wind turbine is short but requires significant steel volumes per tower

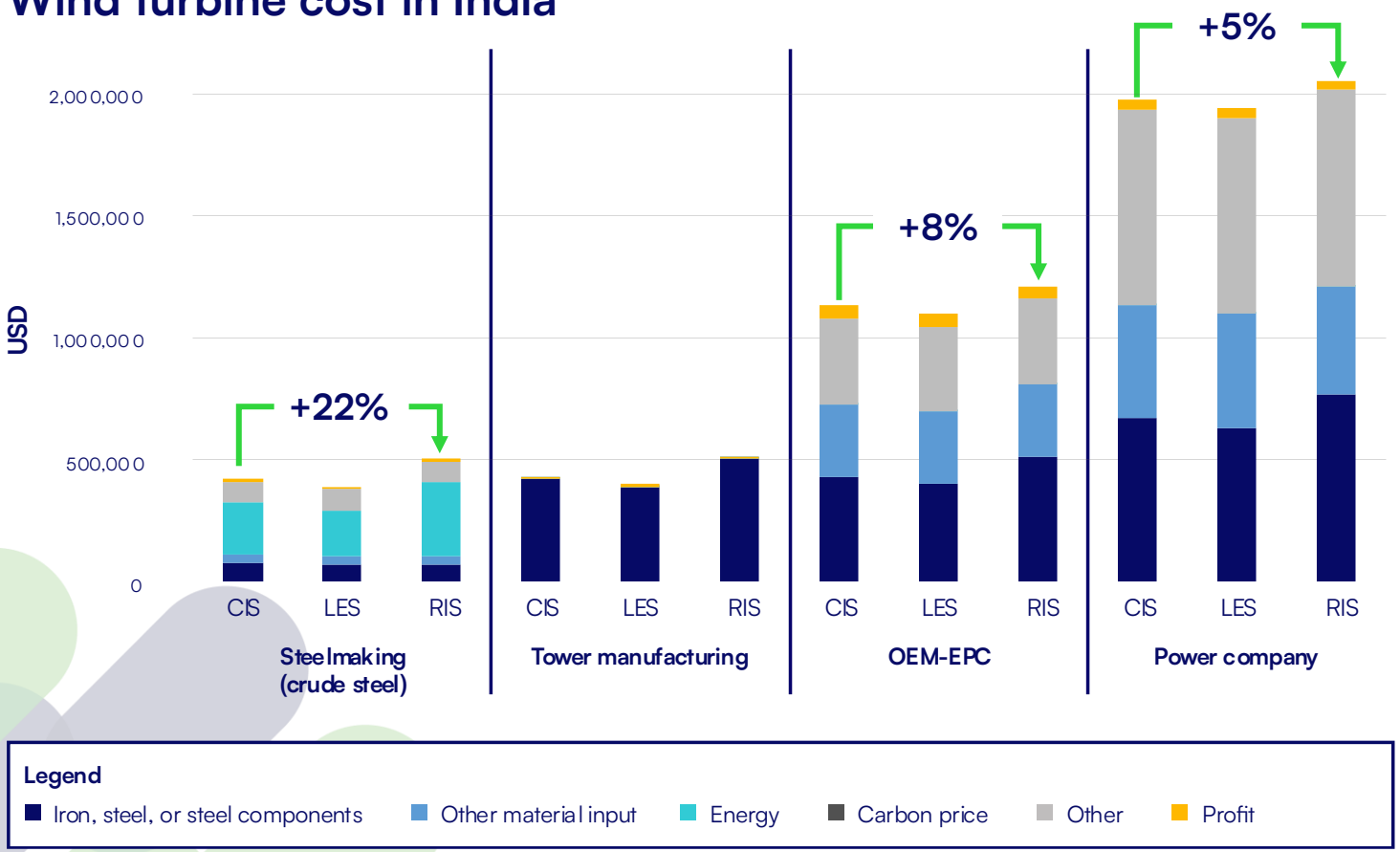


The analysis focuses on the value-chain segments highlighted in dark blue.
*Assuming a recycling rate of 20%
**For onshore wind turbines, a majority of OEMs include EPC services in their offer

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The use of hydrogen strongly increases the cost of steelmaking
but non-material cost dominate total wind turbine cost in India

Wind turbine cost in India



22% **premium for steelmaker,** with very narrow profits to absorb the premium

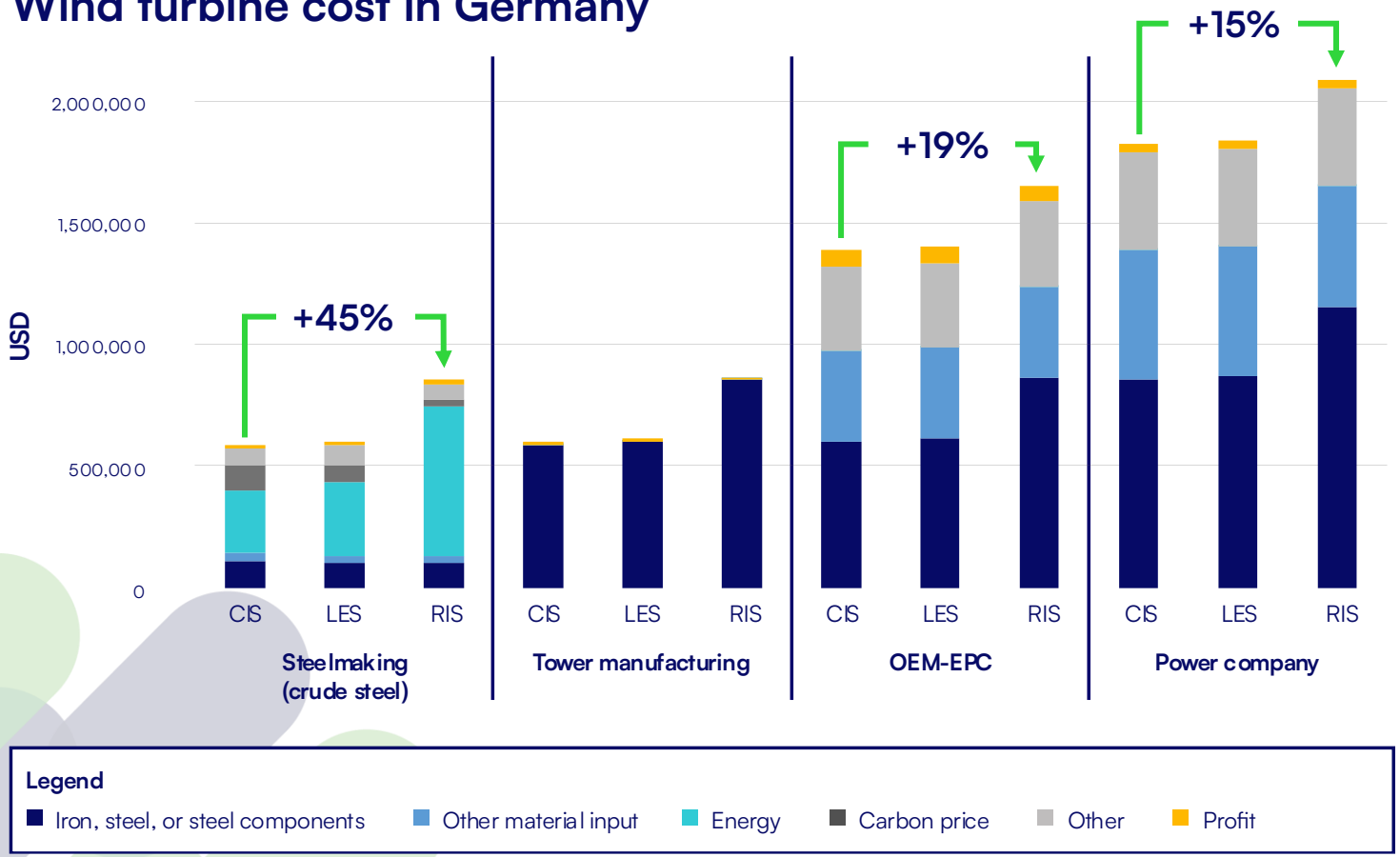
5% **premium for power companies**

USD 1.9-2.1 million
final wind turbine price

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Steelmaking in Germany is strongly affected by hydrogen cost
affecting total wind turbine cost three times as much compared to India

Wind turbine cost in Germany



45% **premium for steelmakers,** with very narrow profits to absorb the premium

15% **premium for power company**

USD 1.8-2.1 million
final wind turbine cost

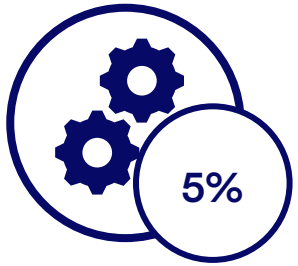
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All steps of the value-chain are subject to international competition
with the largest pressure being put on steelmakers due to global overcapacities



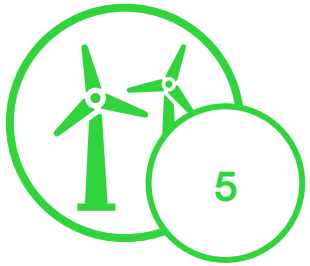
Companies producing >1 Mt/a

Highly competitive market with overcapacities and Chinese market dominance



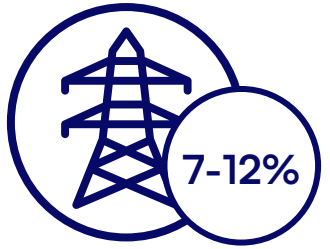
more imports if the price increases by 1%

Competitive market with **OEMs partially invested** in tower manufacturers



OEMs share 2/3 of the onshore-wind turbine market

Highly competitive, dynamic market despite concentration; import substitution is limited due to the size of parts



Growth of wind-turbine orders by power companies

Declining cost in Asia and regulatory incentives in Europe drive interest in capacity expansion

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Instruments

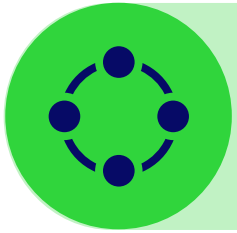
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Standards and certification are essential enabling conditions for effective demand-support instruments



1 Enable traceability of low-emission attributes

Standards and certification systems enable the tracking and verification of low-emission attributes throughout the value chain, supporting informed decisions by end users.



2 Internationally compatible standards and certification systems

International alignment of standards and certification systems is particularly important for commodities expected to be traded globally, ensuring compatibility across regions.



3 Enable allocation of green premium

Standards and certification systems enable verified attribution of green premiums to end products.

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Carbon pricing, quotas and mandates and market instruments, stand out as highly effective government-sponsored instruments

Instrument group	Effectiveness score 2025	Government-sponsored instrument	Included for modelling
Quota, mandates, bans	4.4	yes	yes
Carbon pricing (ETS, CBAM, carbon tax)	4.0	yes	yes
Political risk insurance	3.8	no	no
DSA, CfD	3.4	yes	yes
(Private) demand aggregation	3.3	no	no

Selected instruments for modelling

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Quotas provide the clearest route to creating clean hydrogen demand, but their cost implications differ substantially across value chains

Quotas

- 11.2%: India National Hydrogen Mission on NH_3 substitution
- 25%: EU Industrial Acceleration Act
- 42%: EU Renewable Energy Directive



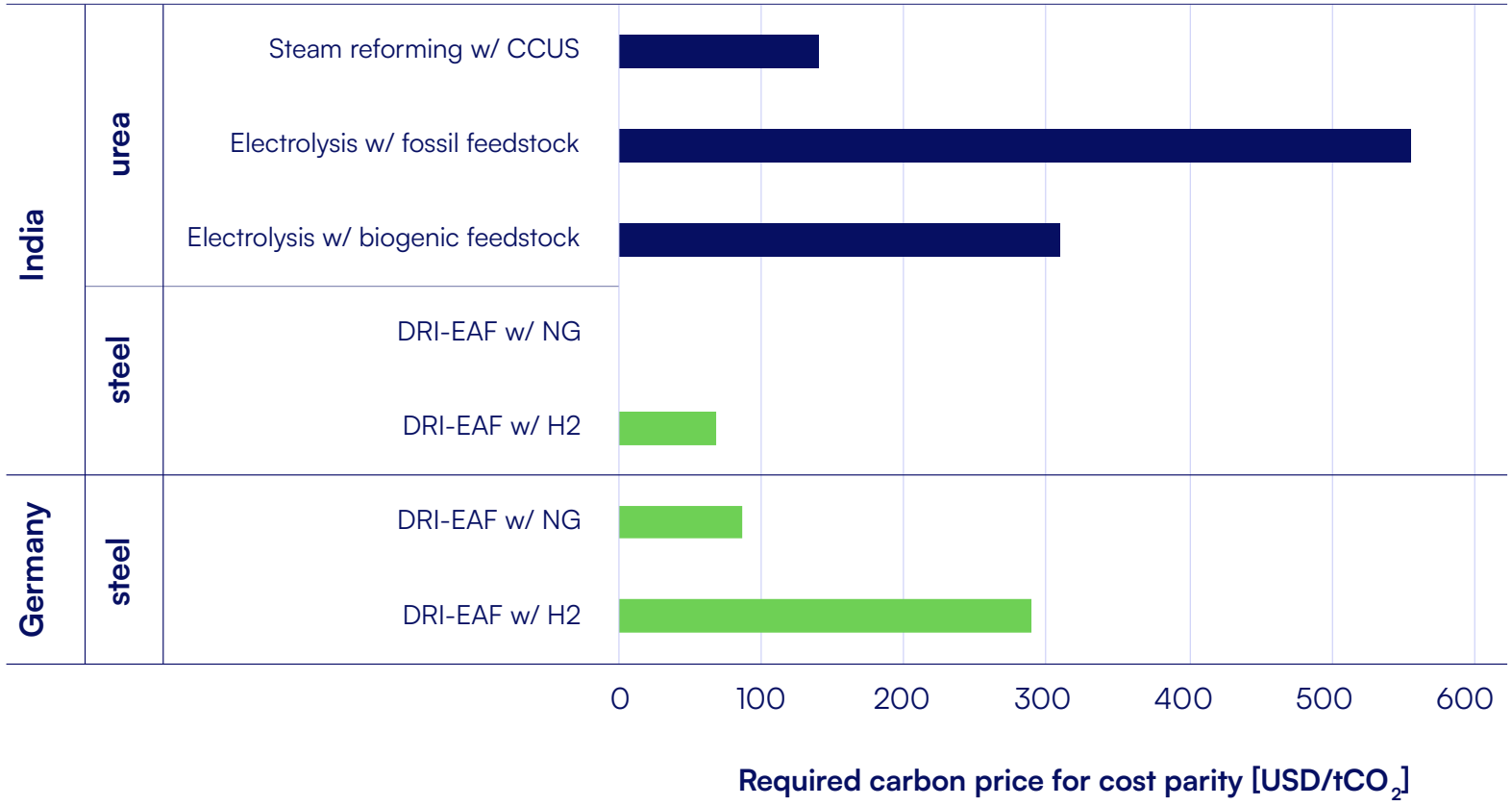
- quota on urea production
- the proposed quotas would cost **USD 1.78-6.71 billion** and **generate 0.3-1.2 Mt of H_2** demand, at less than half of India's planned urea subsidy budget.



- quota on steel procured by OEMs
- the proposed quotas would cost **USD 41-155 billion** (India) and **USD 84-318 billion** (Germany) and generate **16-60 Mt of H_2** demand

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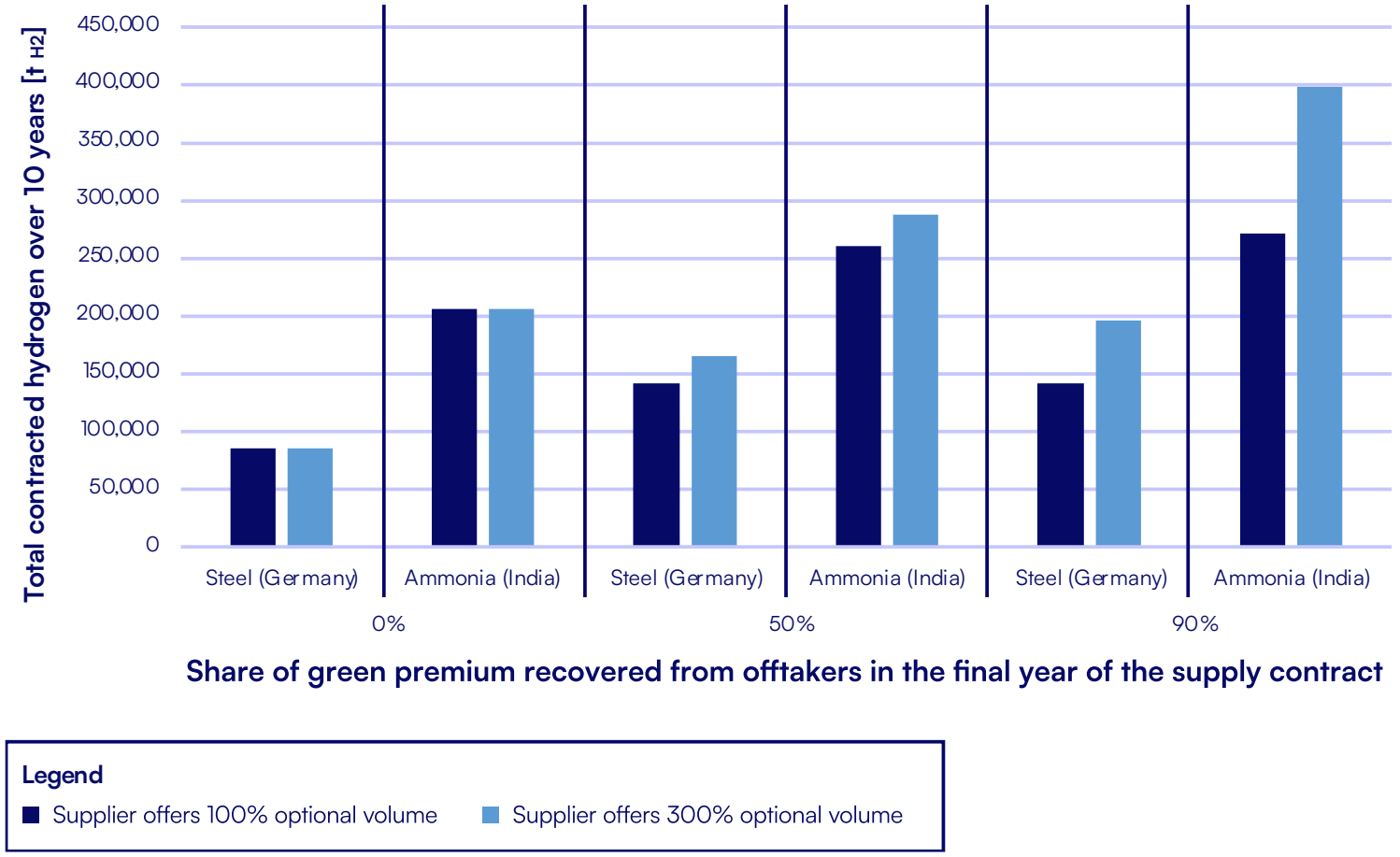
Green steel requires lower carbon prices in India than in Germany, while external CO_2 sourcing raises the threshold for green urea



- **Green steel:** in Germany, carbon prices would need to more than double current EU ETS levels to achieve cost parity, while India could reach parity at carbon prices close to the ones under the EU ETS.
- **Green fertilizers:** renewable urea would require carbon prices x3 to x5 current EU ETS levels to achieve cost parity, largely due to the additional cost of sourcing CO_2 externally.

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Double-sided auctions can mobilize meaningful hydrogen volumes, while their efficiency increases as offtakers absorb the green premium



- Exemplary calculation for a USD 1 billion tender in the style of the H2Global Pilot auction
- Due to different prices for steel and ammonia, DSAs will recover different volumes in HSA auctions, resulting in distinct hydrogen volumes that can be mobilized (~2.5x at 0% WtP for the green premium)

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Recommendations

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Five areas for accelerating green premium absorption

Establish **internationally interoperable standards** and traceability across the full value chain

Use **carbon pricing as the long-term backbone**—but do not rely on it to close the cost gap alone

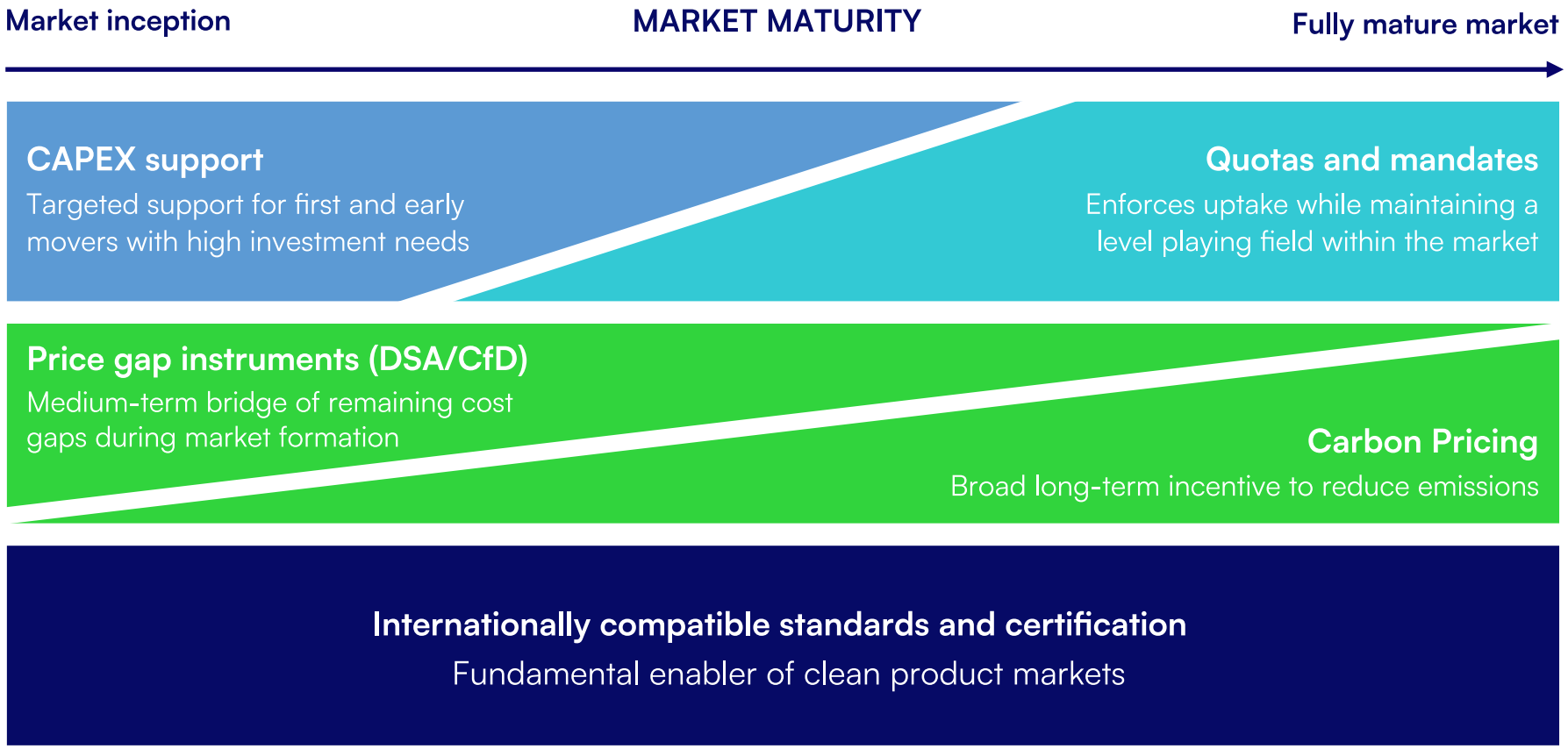
Create **predictable market** conditions through gradually increasing **quotas and mandates**

Bridge the remaining cost gap with competitive, **market-based instruments**

Target scarce **public funding at first movers** and at **value-chain bottlenecks** that cannot pass the premium on

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Hydrogen value chains require a nested approach by policy makers to enable them to bridge the green premium effectively



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