

# ‘100% local’? An analysis of local matching in the European Guarantees of Origin market

Prepared for Google, November 2024



# Executive Summary

This brief provides an overview of possible implications of 100% country-specific matching to Guarantees of Origin (GOs).

This '100% local' Sensitivity Scenario was developed for Google.

The presented '100% local' Sensitivity Scenario is a bespoke scenario; it does not represent Aurora's in-house views.

## I. Executive Summary

**Local matching requirements could greatly benefit GO suppliers and renewables developers in undersupplied markets, while the GO market value in historically exporting countries such as the Nordics would strongly decrease.**

- With exclusively local GO trade, prices in the historically most import-dependent countries (Germany, Ireland, the Netherlands) on average almost triple in 2025-30 when compared to a scenario where GO trade is allowed (Aurora Central).
- Simultaneously, prices in the biggest net exporting markets, such as Norway and Sweden, fall to 0.5 €/MWh, which is the minimum threshold that can be reached in the model.
- Correspondingly, for the markets most dependent on imports and thus most affected by trade constraints, the rate of GO undersupply approximately doubles.
- A closer look at Norway and Sweden as the biggest exporters of hydropower GOs shows a total reduction in their market value between 2025-30 of €2.0 billion compared to a scenario where trade is allowed, which would be redistributed amongst other markets where local GOs meet GO demand instead.

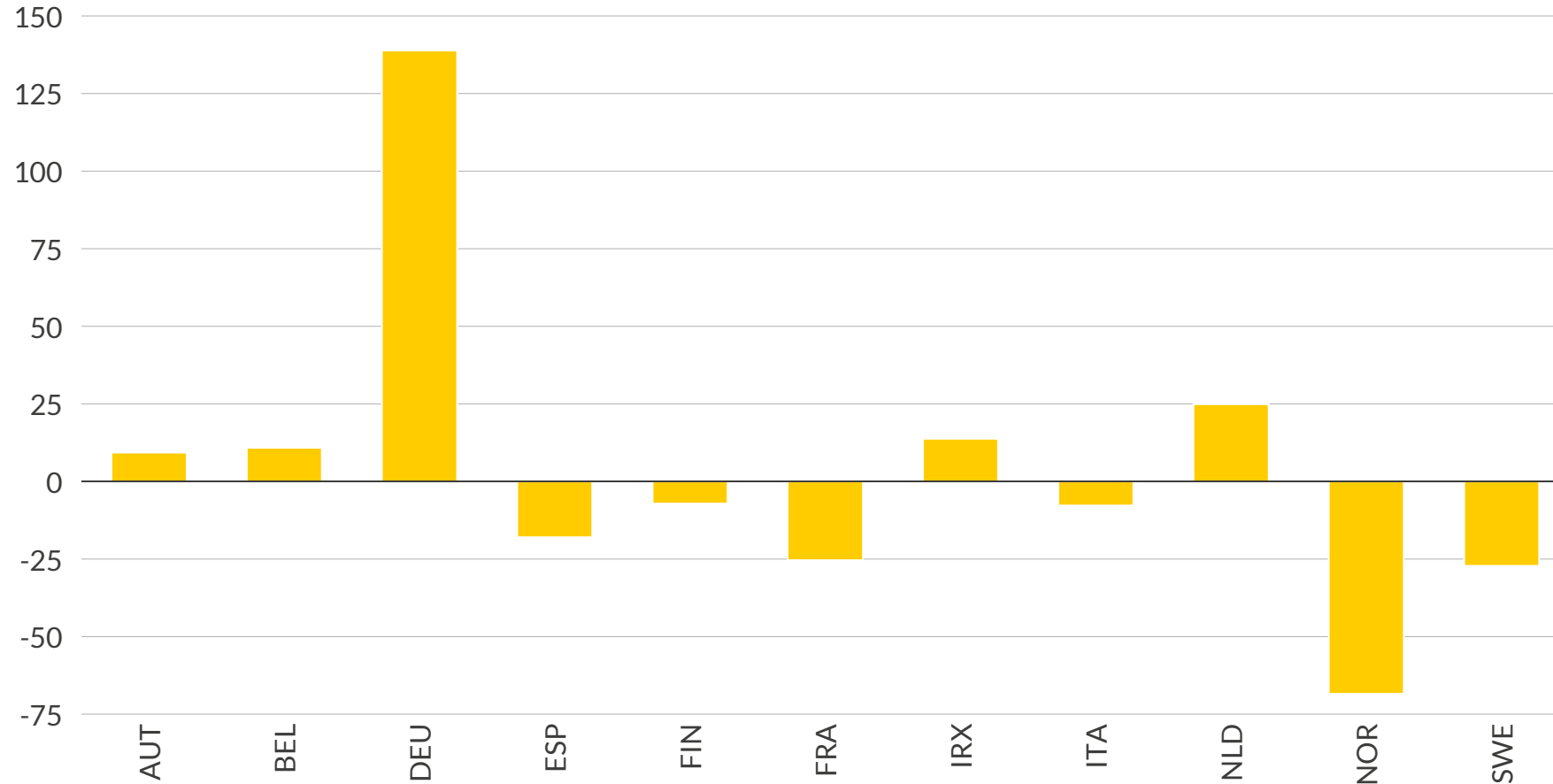
**Should there be a move to local GO matching, countries with restrictions on GO issuance may consider removing them to ensure sufficient supply, while moving to hourly matching could compensate Nordic GO for the value lost from local matching restrictions.**

- In a system with higher local requirements for GOs, countries may consider loosening or removing restrictions on GO issuance to ensure sufficient supply and to decrease cost for offtakers.
- The reduction in value of Nordic hydro GOs could be compensated through a move towards hourly matching of GO issuance and cancellation (with limited trading). The GO value of Nordic hydropower could then function more in line with physical flows of electricity than under the current system.
- Some initiatives on implementing first systems are already under way, such as the Energy Track and Trace initiative, which could help facilitate first trades.

## The GO market is characterized by trade between markets, particularly between Norway and Germany

Historical net GO imports<sup>1</sup> by country during 2021-23

TWh



- The European GO market allows for cross-border trade of Gos between member states of the Association of Issuing Bodies
- Historically, Germany, Ireland and the Netherlands have relied on imported GOs the most. Norway has been the largest exporter of certificates
- The fact that GOs can be traded separately from the underlying power means that more GOs can be exported or imported from a market than physical power
- This is particularly noticeable in the case of Norway, which has exported on average four times more GOs than power via physical interconnectors on average from 2021-23

1) Average of data from 2021 to and including 2023 (Greece joined the AIB in 2023 and is hence not presented).

# The '100% local' Sensitivity Scenario assumes a European GO market without any trades with neighbouring markets



## Aurora Central

*Accurate representation of current European GO regulation*

- GO trade between AIB members is allowed
- Current member-specific regulation is taken into account
- The future developments of the GO market are based on historic developments as recorded by the AIB<sup>1</sup>

Trade flows between historic net im- and exporters allows for GO prices to remain stable across markets



## '100% local' Sensitivity

*Sensitivity of Aurora Central with only local GO consumption*

- GO trade between AIB members is impossible; demand must be met through locally issued GOs
- Other member-specific regulation, as well as other inputs informing future GO market developments, remains unchanged<sup>1</sup>

With trade flows eliminated, stark differences in GO prices between markets with a GO surplus vs. shortage occur<sup>2</sup>

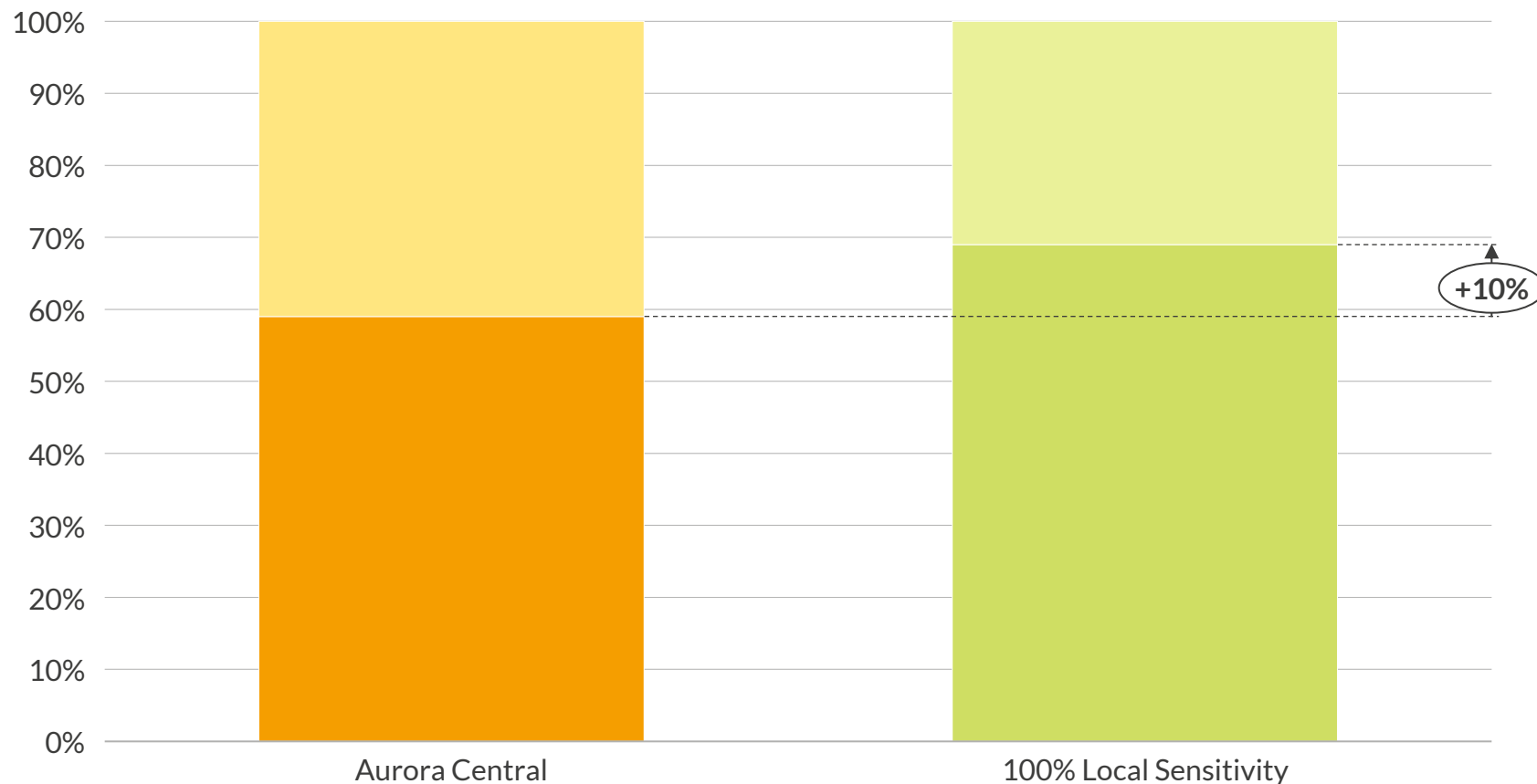
Initially based on Aurora's central view on GO market developments from 2025-30, the '100% local' Sensitivity Scenario prohibits GO trade between countries, thereby introducing local GO markets with different GO prices.

1) The last update of Aurora's Guarantees of Origin forecast is from January 2024; 2) Please note that this is a rather extreme scenario. A more moderate scenario could i.e. entail limiting the flows of GOs across borders to available interconnector capacities to match electricity flows. This would require appropriate tracking mechanisms in place.

## A move to fully local GO trade would change the composition of the GO market in favour of solar and wind technologies

Share of GO market captured by solar and wind between 2025-2030  
% market value

Other technologies Solar and wind



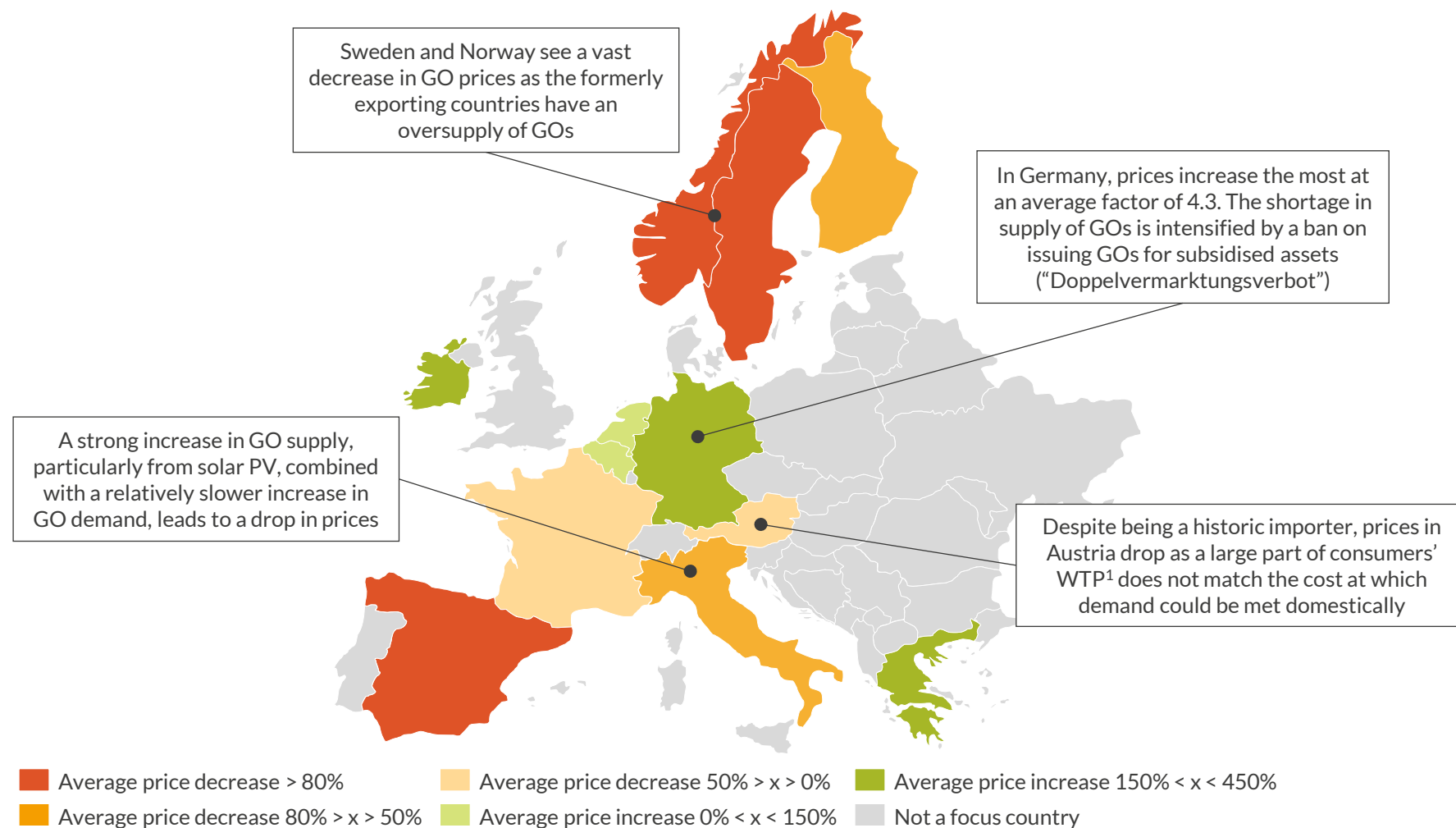
- A shift to local matching of GOs would lead to solar and wind technologies capturing a higher share of the GO market, due to the reduction in exports of primarily hydro from Nordic markets
- Solar and wind would increase their share of the European GO market from 59% in Aurora's Central scenario to around 69% under 100% local matching conditions, an increase of 10 percentage points or 17 per cent
- This is likely a conservative estimate, as less demand is satisfied under 100% local matching conditions, due to temporarily insufficient solar and wind supply available to meet local demand in some markets

1) Average of data from 2021 to and including 2023 (Greece joined the AIB in 2023 and is hence not presented).



# Within the '100% local' Sensitivity, GO prices spike in countries with GO undersupply while plummeting in those with oversupply

Price change relative to Aurora Central Scenario in '100% local' Sensitivity Scenario, 2025-30



1) Willingness to pay, 2) The size of each consumer group and its willingness to pay depends on the projected development in each respective market.

## Former importing markets generally show a price increase.

- Germany and Ireland stand out as two major European markets that prohibit subsidised renewables assets from issuing GOs
- In a first draft version, REDIII included a paragraph which would have required states to issue GOs for generation from all RES assets, including subsidised ones. This paragraph was removed as part of negotiations on EU level

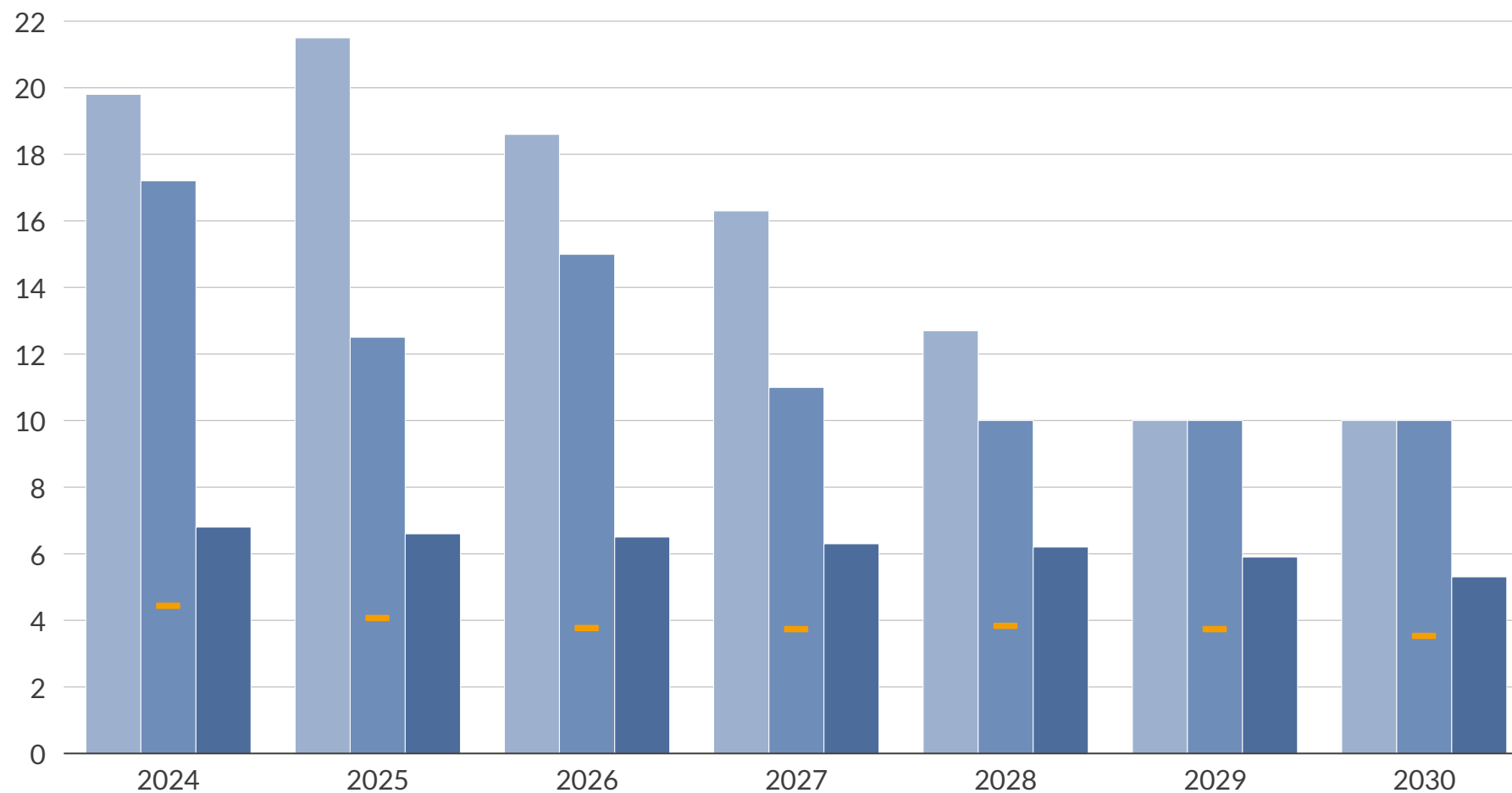
## Prices in exporting markets drop, also in those with smaller historic net export margins.

- GO prices decrease due to GO oversupply and a mismatch with consumer WTP<sup>1</sup>, which is different per market<sup>2</sup>

# RES operators in Germany, Ireland and Netherlands could benefit from much higher GO prices, a noteworthy business case upside

GO prices for major historically importing markets, '100% local' Sensitivity Scenario

€/MWh



Germany Ireland Netherlands Three-market average, Aurora Central

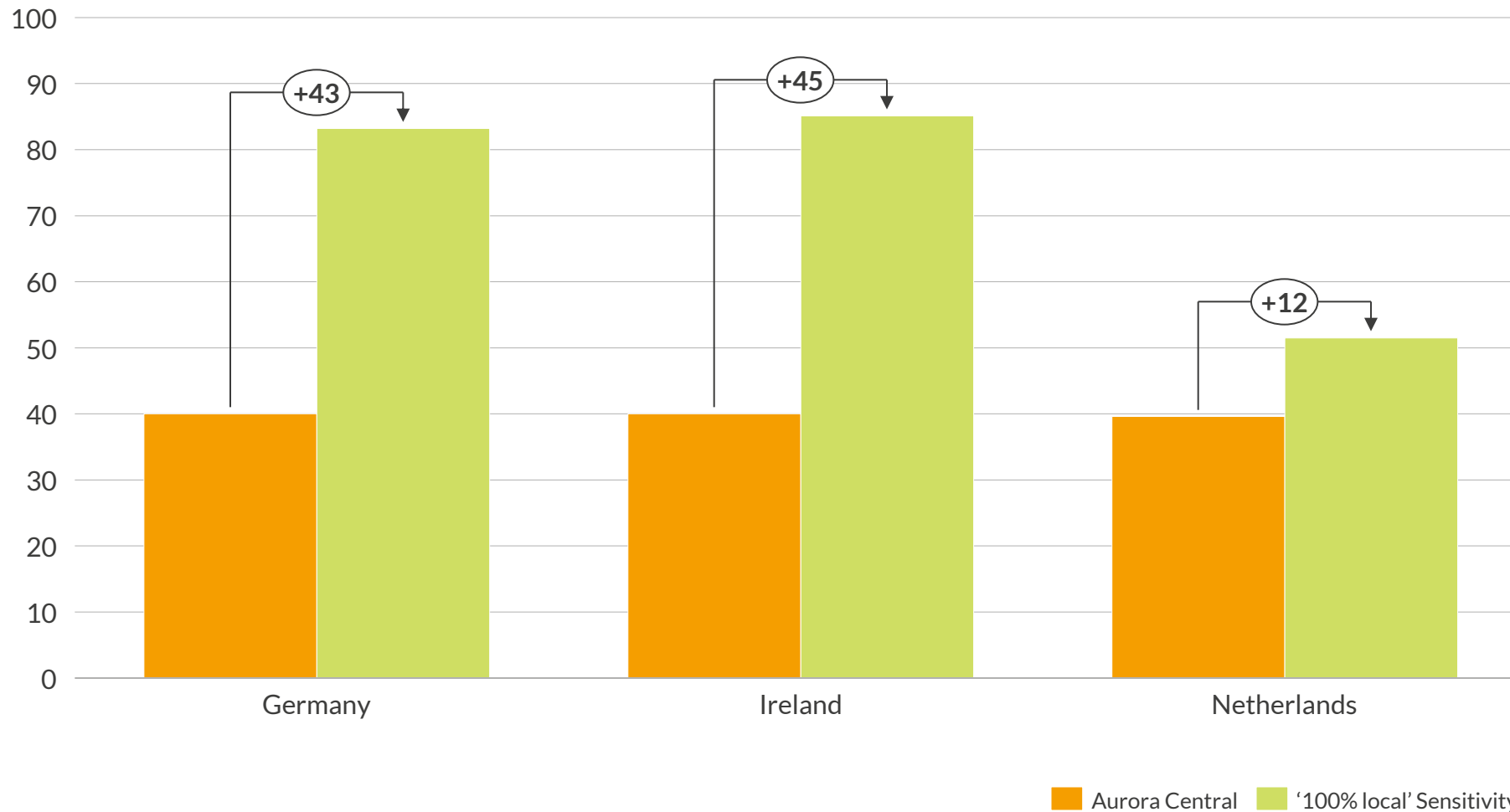
1) Whether renewable assets receiving any kind of subsidy are allowed to issue GOs depends on the jurisdiction of the respective country.

- Renewables benefit from higher GO prices because the sale of GOs can provide an additional revenue stream to those renewable assets that are eligible to issue GOs, often merchant assets<sup>1</sup>
- Within the forecasted period, the GO price in the three countries which have historically been most dependent on imports increase by a factor of up to >5
- The business case for (merchant) renewables is therefore improved as potential revenues from GOs increase strongly
- In markets where subsidised assets receive GO revenues, this could lead to a reduction in required government funding for RES subsidy schemes

## A move to fully local GO trade implies that market liquidity in currently net importing countries will reduce temporarily

### Unmet demand share for Germany, Ireland and the Netherlands

Avg. 2025-30; %



- Historically, Germany, Ireland and the Netherlands have relied on imported GOs the most. Norway has been the largest exporter of certificates
- Allowing only for the consumption of locally produced GOs in the '100% local' Sensitivity implies that, in 2025-30, 43 percentage points more, or around 80% of demand, remains unmet in Germany and Ireland, with unmet demand being just above 50% in the Netherlands
- The 'Doppelvermarktungsverbot' or prohibition on double marketing in Germany exacerbates the GO shortage under local matching conditions

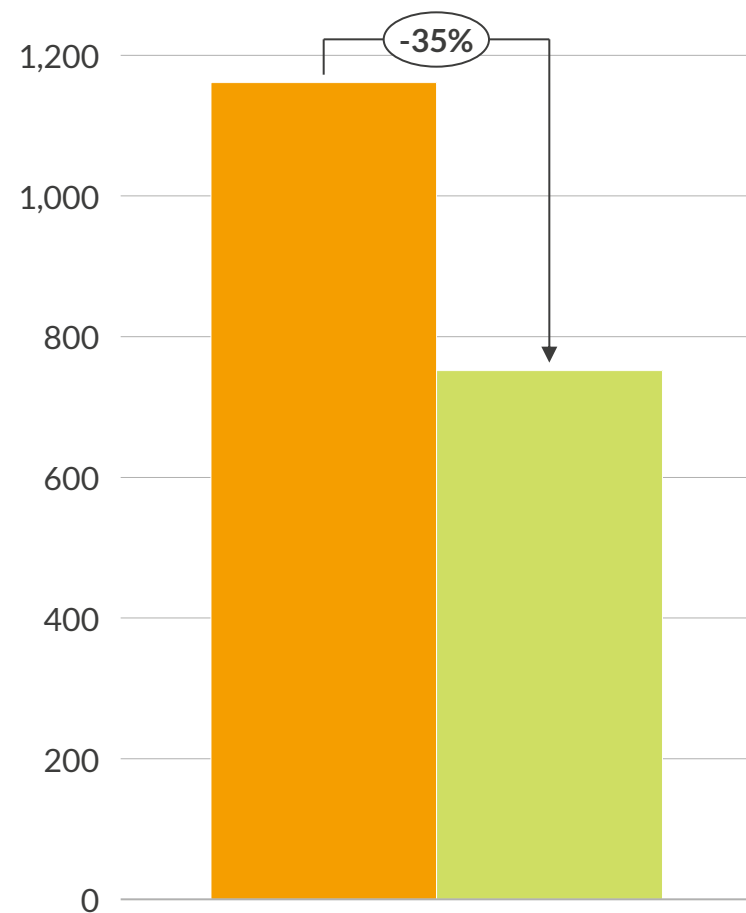
1) Average of data from 2021 to and including 2023 (Greece joined the AIB in 2023 and is hence not presented).



# Cancellations of Nordic hydro GOs would drop by 36%, significantly reducing their role in the market

Total cancellations of Nordic hydropower<sup>1</sup>

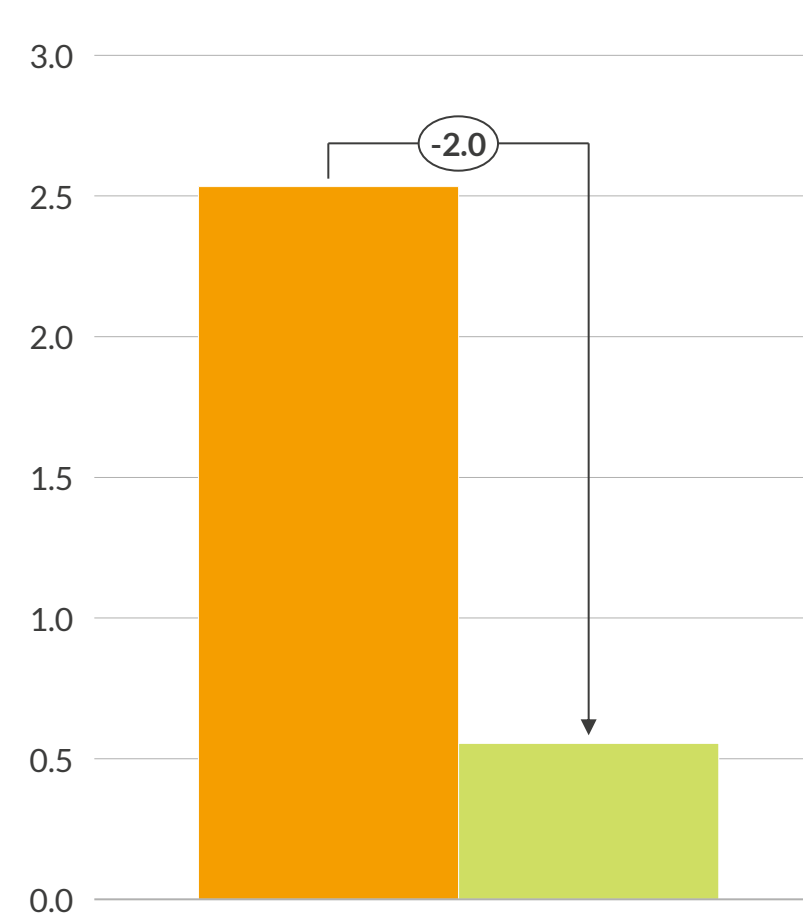
TWh, 2025-30



Aurora Central 100% local' Sensitivity

Aggregate GO market value (all techs) in the Nordics

bln €, 2025-30

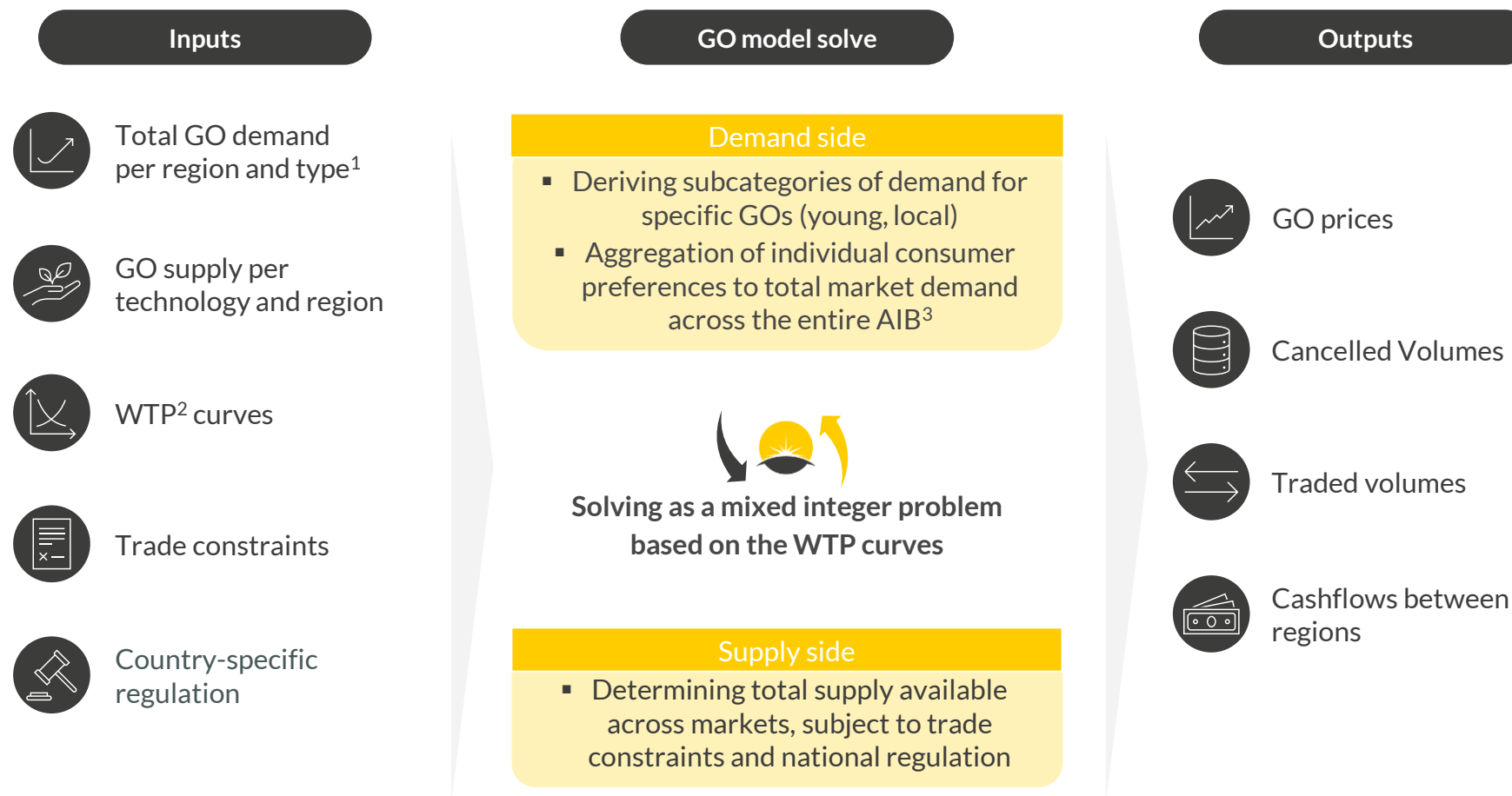


- Within the '100% local' Sensitivity Scenario, Nordic hydropower GOs can no longer be sold to the biggest importing markets, such as Germany
- As a result, total cancellations of Nordic hydropower GOs between 2025-30 drop by 35%
- This results in a drop in market value of bln €2.0, or close to 80%, across the forecast period, which would be redistributed amongst other markets where local GOs meet GO demand instead.
- Moving to an hourly matching system with limited trading, i.e. reflecting limitations of physical power flows, could, on the other hand, enable Nordic hydro to retain some of its value and align its GO issuance more with temporal and physical flows of electricity

1) Cancellations of GOs from Swedish and Norwegian hydropower. Assumes all issued GOs are cancelled in Aurora Central.

# Aurora's GO model clears the market, considering trade constraints and national regulation on cross-border flows

## Overview of Aurora's GO model



- All major AIB countries are modelled, with non-focus countries modelled as one larger aggregated region<sup>3</sup>
- Markets for which we do not publish price forecasts, but which are part of the AIB get treated as a single additional region to account for potential impacts of these on the supply and demand imbalance
- The model solves each year as a discrete interval, assuming certificates cannot be taken over between periods
- Trade constraints, such as issuance of non-EECS certificates which cannot be exported (e.g. in Spain), are accounted for

1) Referring to GOs from an asset of a specific age, technology or location; 2) Willingness-to-pay; 3) With the exception of Luxembourg, Slovakia, Iceland, Cyprus and Czech Republic. Cancellations from these regions make up less than 5% of total AIB GO demand.

# Our analysis is based on a series of assumptions on how the European GO market will develop, including local sensitivity modifications

**1 The '100% local' Sensitivity Scenario requires issuing and cancellation market to be the same**  
Within this sensitivity scenario, we assume that all demand for GOs is fully local, where no consumer is willing to buy from another market. This is done on a country basis.

**2 Market value is defined by a respective market's GO cancellations**  
We define the market value in a specific market through the product of the cancellations (in MWh) and the GO price (in €/MWh) in said market. The market that a GO gets attributed to is hence dependent on where it was cancelled, not on where it was issued.

**3 The maximum GO price is defined through a mixed price approach**  
We assume that the highest GO price possible in a market is either a) the highest observed market price to our knowledge thus far, 10€/MWh in the Netherlands, or b) the difference between the market's RES LCOE and the capture price with the underlying assumption that if this threshold was exceeded, a consumer might build the issuing asset themselves. Whichever price of the two is higher is assumed the maximum local price.

**4 All electrolyzers will aim to produce green hydrogen**  
We assume for electrolyzers to try and cover 100% of their electricity consumption with GOs from young and local assets, in line with requirements for the production of green hydrogen.

**5 The uptake of PPAs will not affect the GO supply/demand imbalance**  
While we do assume for PPA volumes to increase going forward, we are working under the assumption that GOs locked in as part of PPAs will be taken out of both the supply and the demand side, thus not affecting the net imbalance.

**6 Demand for annual GOs will reduce when grids are highly decarbonised**  
If a market's electricity grid becomes highly decarbonised over the course of the forecast, we do assume for the demand for annual GOs to steadily reduce over the course of time.

**7 Supply is inelastic**  
We assume for supply in each scenario not to react to prices (i.e. more assets issuing GOs when prices are high) but will instead vary the supply through different issuance share assumptions.

## Details and disclaimer

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