REDACTED

AURORA ENERGY RESEARCH

European Renewable Energy Markets

Attractiveness Report

May 2022

Agenda

This is a redacted sample of the European Renewables Markets Attractiveness Report.

If you are interested in the full report, contact Luke Janes: luke.janes@auroraer.com.

Aurora's rating combines eight robust metrics to derive an overall attractiveness score for 18 European renewables markets

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The overall market attractiveness score for each European renewables market covers three categories and eight metrics, which are set out in detail in this report.

Categories and metrics	Weighting	Technology split	Rationale	Source of data
Market size, composition & outlook	**40%**			
1 RES[1] deployment to 2030	*40%*		Indicates expected future market size in the medium term	Aurora fundamental modelling*
2 PPA[2] market potential in 2030	*40%*		Indicates expected availability of commercial off-takers in the medium term to mitigate merchant risks	Aurora databases*
3 RES transaction volumes in 2021	*20%*	MIXED	Reflects present maturity of market for both greenfield and brownfield investment	Aurora analysis* and third party databases
Policy environment	**40%**			
4 Announced RES targets in 2030	*25%*		Demonstrates policy ambition for RES deployment over the medium term	Aurora analysis*
5 Historical auctioned capacity	*10%*		Indicates track record of government support for RES build-out and market size for refinancing	Aurora analysis*
6 Planned auctioned capacity till 2030	*25%*		Indicates expected government support for RES build-out	Aurora analysis*
7 Policy risks - support schemes, permitting, grid connection	*40%*		Reflects effect of key policy and regulatory risks on project development	Aurora analysis*
Project economics	**20%**			
8 Indicative merchant IRR for project starting in 2025	*100%*		Captures the commercial viability of new build merchant projects for final investment decisions in three years 'time	Aurora fundamental modelling*

(*) Detailed country power and renewables market subscriptions available in Aurora's Power and Renewables Market subscriptions.

1) Renewable Energy Systems 2) Power Purchase Agreement

Source: Aurora Energy Research

The most attractive European market for onshore wind is followed by

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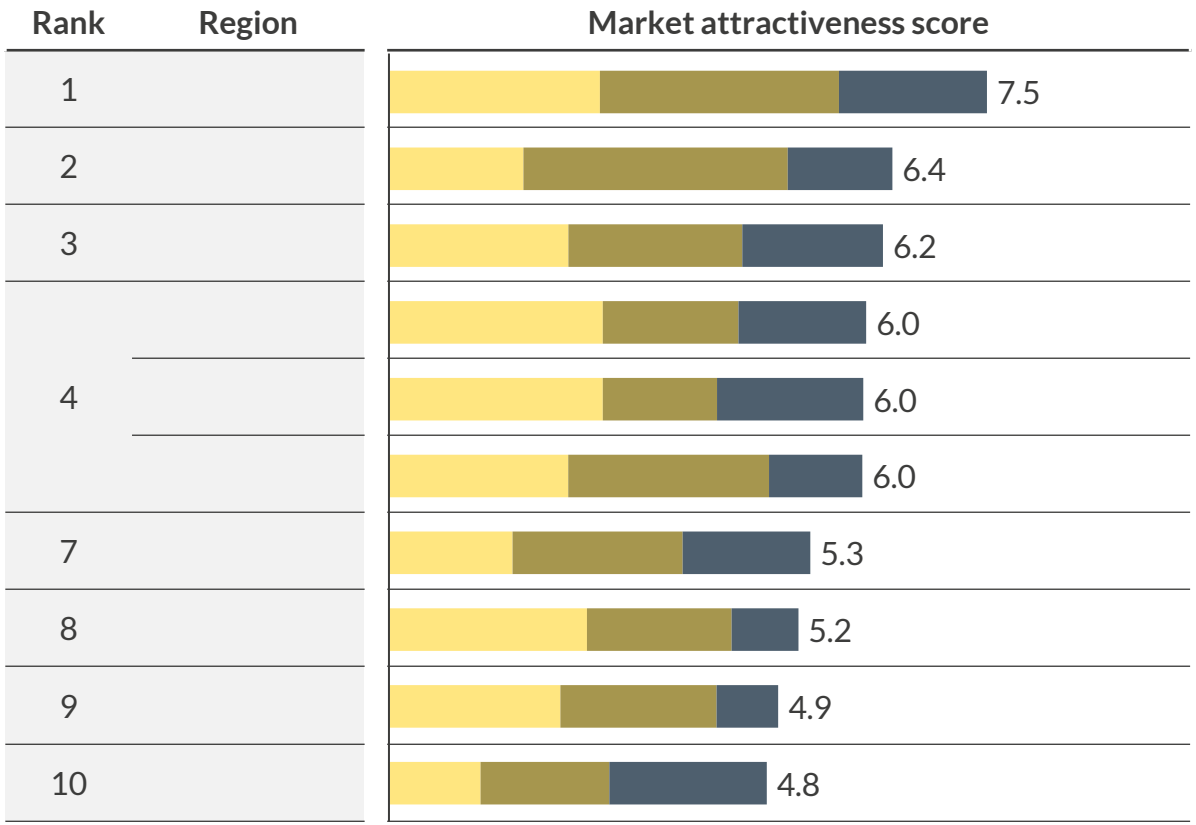
Onshore wind

Installed capacity of onshore wind across Europe currently stands at 203 GW, making up 18% of total installed capacity. It is projected to grow at least 1.6x by 2030, requiring EUR 119 billion CAPEX investment.



Top markets

- Due to its market size, favourable policy and excellent merchant economics, [redacted] is currently the most attractive market for onshore wind in Europe.
- Strong policy support in the form of a [redacted] GW onshore wind RES target and a generous premium feed-in tariff scheme make [redacted] an attractive market for onshore wind, despite lower than average merchant economics.
- [redacted] sees relatively strong scores across all indicators thus ranking as one of the most attractive markets in Europe, but is held back by permitting challenges; simplification of permitting processes is underway.

Markets to watch

- Despite substantial build out of onshore wind to date, [redacted] has not set a policy target for onshore wind build out going forward, and lower than expected auction volumes could lower its ranking in the future.
- Should [redacted] relax its permitting restrictions for onshore wind development, as is expected in 2022, its combination of large market size and good merchant economics will make it an increasingly attractive onshore wind market.

Source: Aurora Energy Research

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Renewable capacity buildout is driven by four key factors which cut across government policy and market forces

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1 Increasing power demand

- \+ As Europe looks to decarbonise and reach Net Zero emissions by 2050, it seeks to achieve this in large part through electrifying its economy, creating additional power demand that can be met by renewables to reduce emissions
- \+ In particular, increasing demand for PPAs drives investment in renewables
- − Improvements in energy efficiency put downwards pressure on power demand

2 Strong policy support and Government ambition

- \+ Government ambition through renewables deployment targets and strong policy support drives investor confidence and ultimately investment in renewables
- − Lack of policy support, or sudden changes in policy, can negatively impact investor confidence in renewables in a country

More in section IV of this report.

3 Rising fuel and carbon prices

- \+ Electricity prices in most markets across Europe are set by the marginal producing plant, which is most often gas CCGTs, such that the power price is highly correlated with the short run marginal cost of a CCGT
- \+ Therefore, the gas price is directly related to the baseload power price, and to the capture price of renewables
- − Some countries in Europe, such as Spain, are looking to introduce caps on the price of gas that can be passed through to the consumer when used to generate electricity, potentially lowering renewable capture price upside

4 Phase out of thermal capacity

- \+ As Europe phases out traditional thermal capacities such as coal and older, un-abated gas assets in its push to meet ambitious decarbonisation targets, this makes way for alternative, low-carbon generating capacities to fill the gap in order to meet Europe's increasing power demand.
- − Increasing retirement of thermal capacity places greater strain on meeting system requirements such as frequency and voltage control, that cannot be sustained through renewables alone.

Source: Aurora Energy Research

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Rising PPA demand from utilities & corporates provides an opportunity for new build renewables to secure stable revenues

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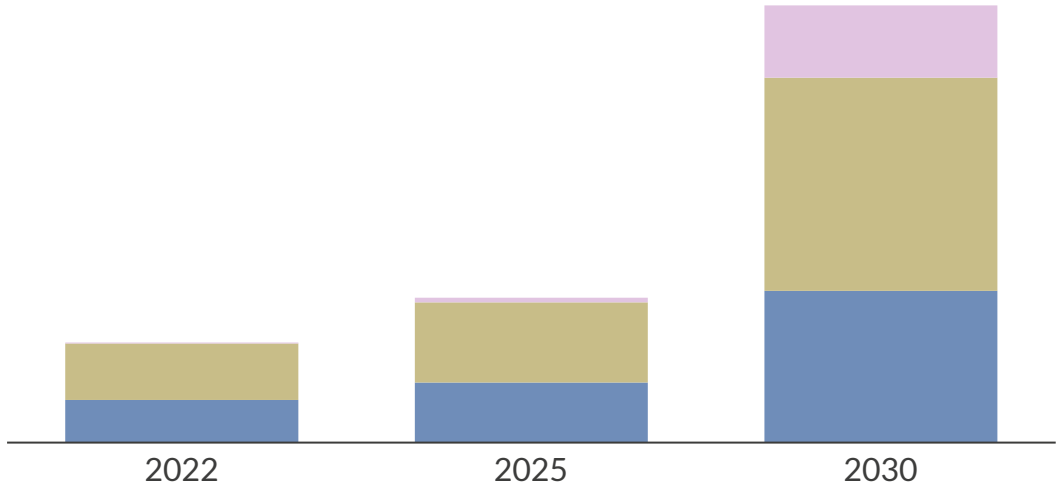
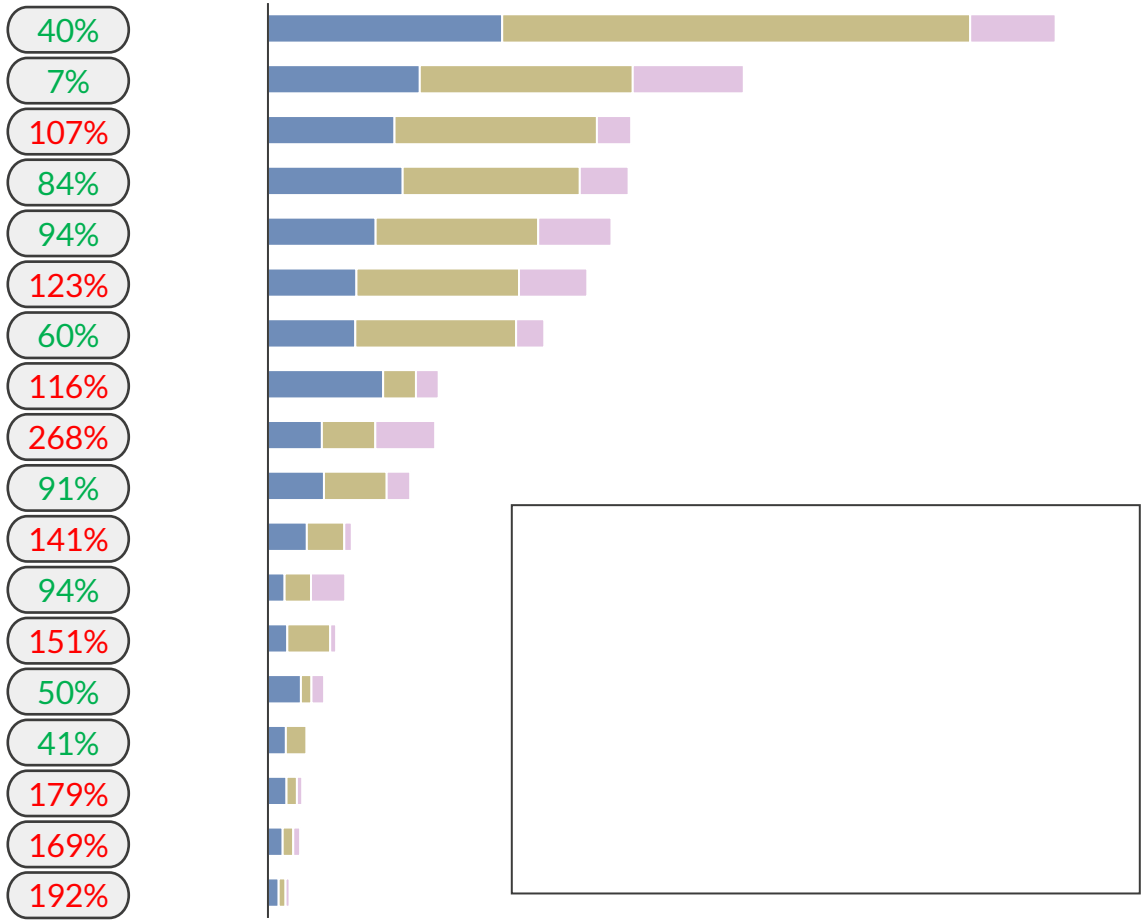
New build renewables PPA demand in Europe[1]
TWh



- PPA demand today is derived from Aurora's own PPA database, while future demand is estimated based on Aurora's forecast of sectoral power demand growth combined with assumptions around the share of each sector that will require a PPA and have the necessary creditworthiness ratings
- PPA demand is expected to [redacted] over the next decade, rising from [redacted], driven by Europe's strengthening decarbonisation targets and an increasingly discerning green consumer base

New build renewables PPA demand in 2030
TWh



1) Across Aurora's 18 modelled countries in Europe. Electrolyser demand estimated based on country targets.

Source: Aurora Energy Research

A Net Zero trajectory could see [redacted] GW additions of variable renewables by 2030 as Europe strives to decarbonise the economy

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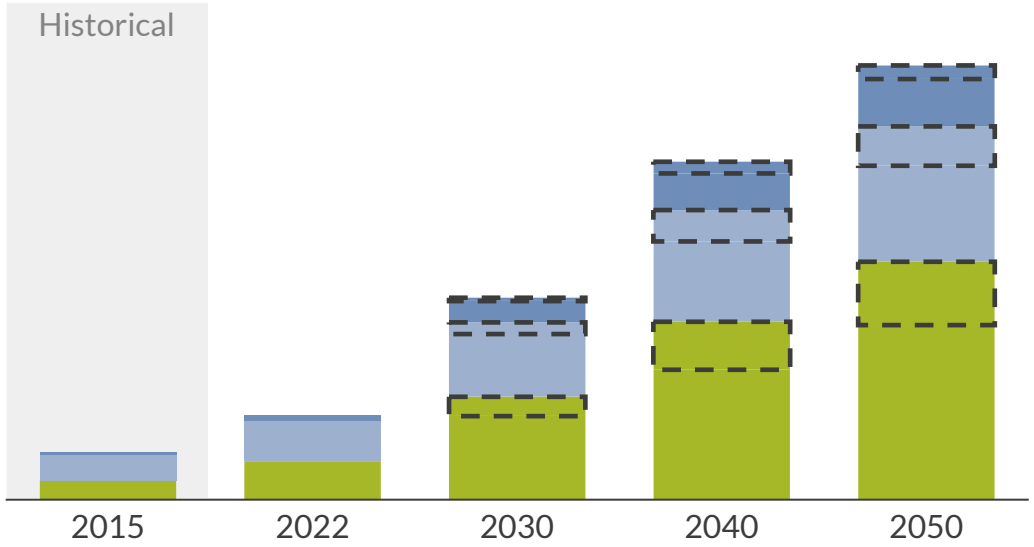
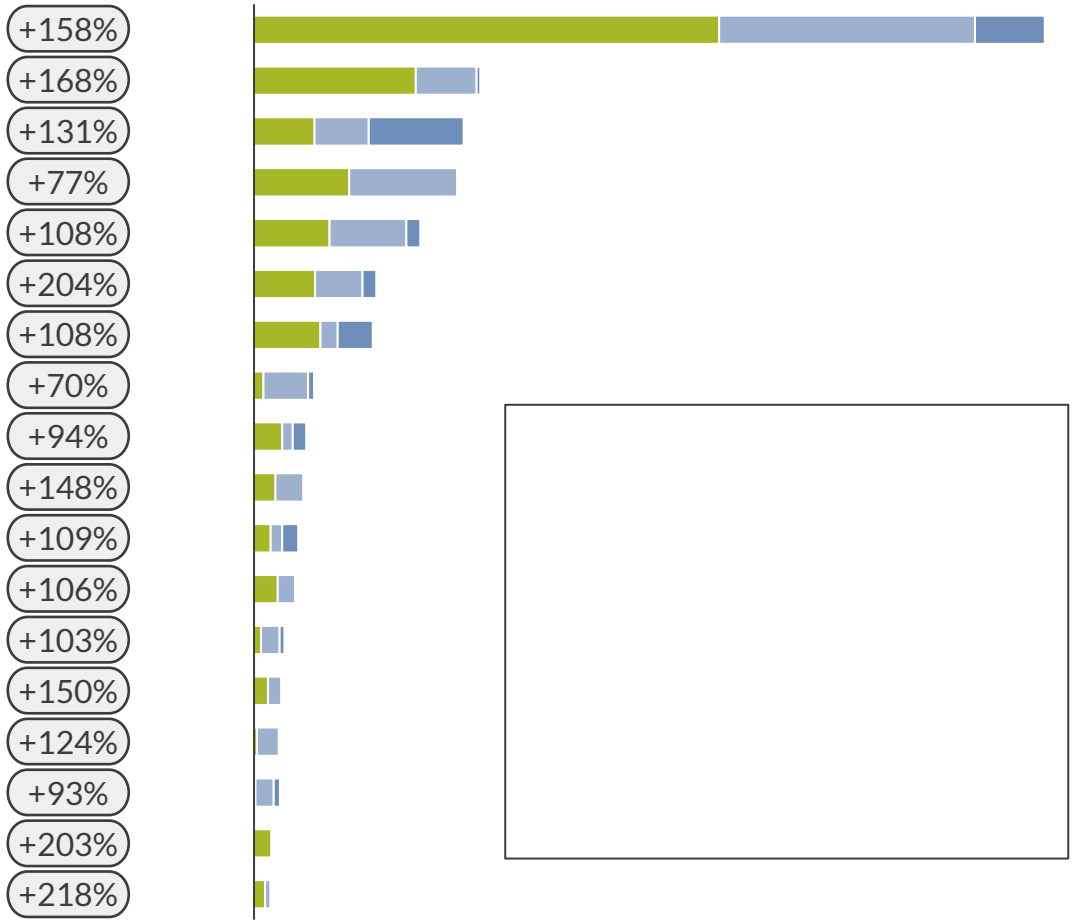
Installed variable renewable[1] capacity (Aurora Net Zero scenario)
GW



- Aurora's Net Zero scenarios assume a higher level of policy ambition that is more in line with stated climate policy ambitions
- Pursuing Net Zero goals will require more than doubling the rate of deployment since 2015 to build an additional [redacted] more than Aurora's Central scenario by 2030
- The total increase of [redacted] by 2030 will require investment of ca. [redacted], the largest share of which will be invested in

Installed variable renewable capacity in 2030 (Aurora Net Zero scenario)
GW



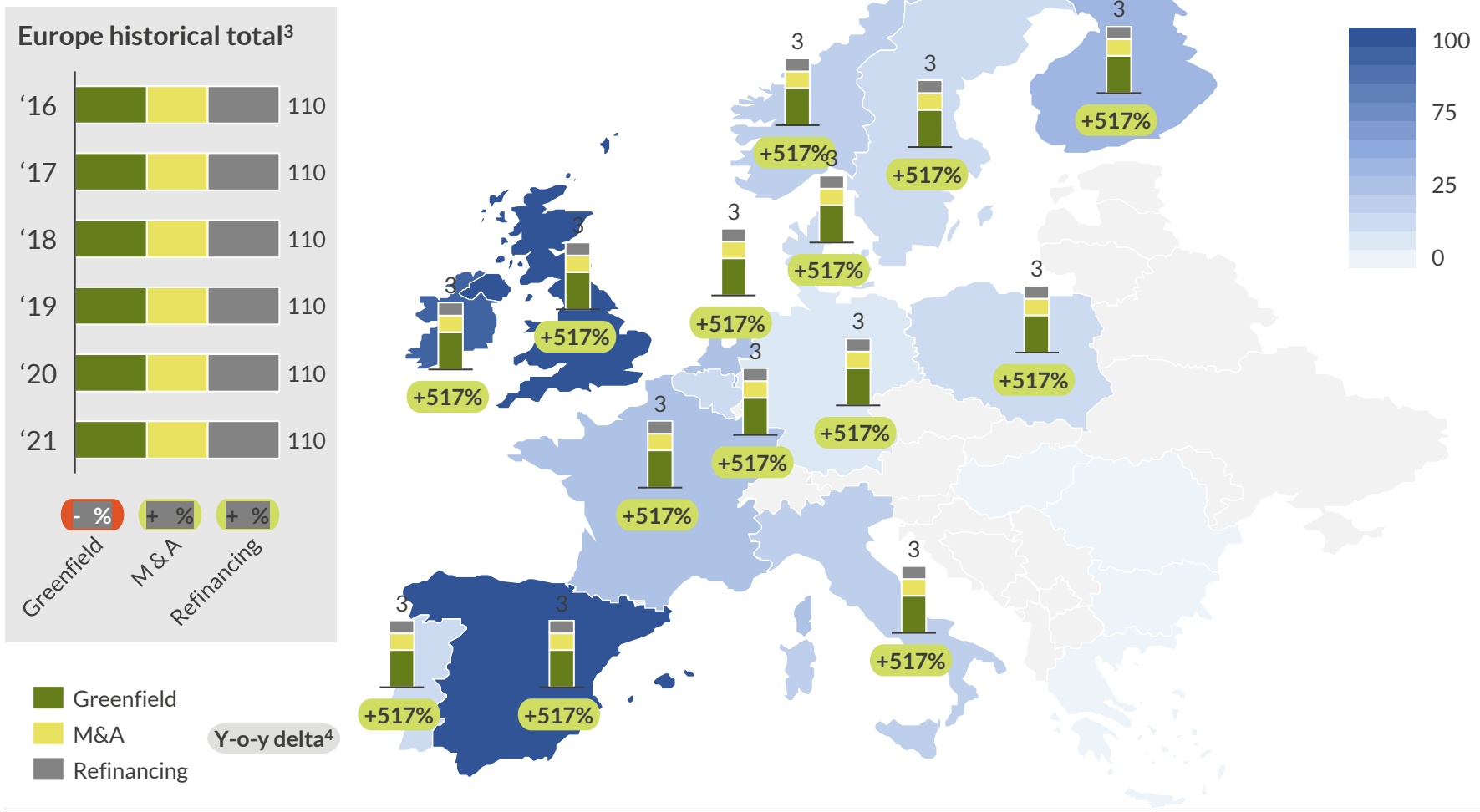
Historical · Onshore wind · Net Zero
Solar PV · Offshore wind[2]
[redacted]% Relative capacity additions 2022-30 (GW)

1) Defined as solar PV, onshore wind and offshore wind. 2) Includes fixed bottom and floating offshore wind.

Sources: Aurora Energy Research, Eurostat

[redacted] saw the most renewables transaction activity in 2021, making up [redacted], two thirds of Europe's total

Renewable transaction value (in 2021)[1]
EUR billions (real 2021)[2]



1) Aggregate value of greenfield, M & A and refinancing transactions. Greenfield refers to construction of new infrastructure, refinancing refers to raising fresh debt to finance existing projects. 2) Converted from USD using EUR/USD rate of 1.165 from March 2022. 3) EU27 plus UK, Norway and Switzerland. 4) Delta in closed transaction value in 2021 vs 2020.
Sources: Aurora Energy Research, Eurostat, Infralogic

[redacted] leads on market size for offshore wind and ties with [redacted] for onshore wind, while [redacted] leads for solar PV

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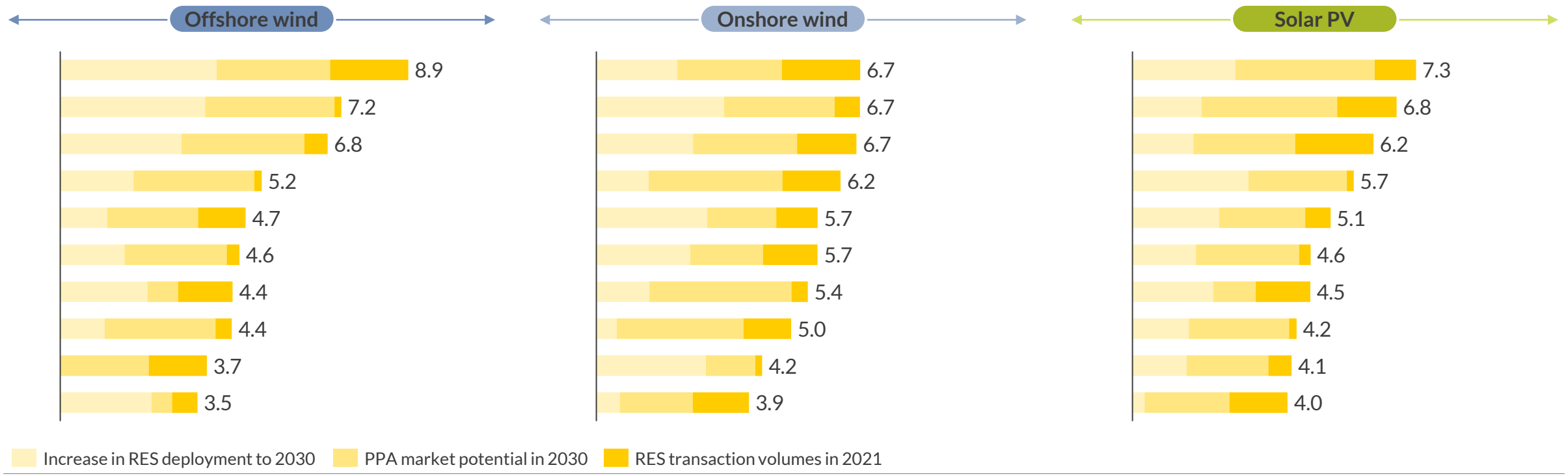
Market size, composition & outlook

Countries are assessed in terms of their market size and outlook for renewables between 2022-2030, based on three metrics shown below. An overall score for the market size indicator is assigned between 0-10 reflecting the specified weighting of the three metrics.

Metric	Weighting	Rationale
1 RES deployment to 2030	40%	Indicates expected future market size in the medium term
2 PPA market potential in 2030	40%	Indicates expected availability of commercial off-takers to mitigate merchant risks
3 RES transaction volumes in 2021	20%	Reflects present maturity of market for both greenfield and brownfield investment



Source: Aurora Energy Research

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Key nuances and support scheme rules across different regions have impacted the deployment of renewables (1/2)

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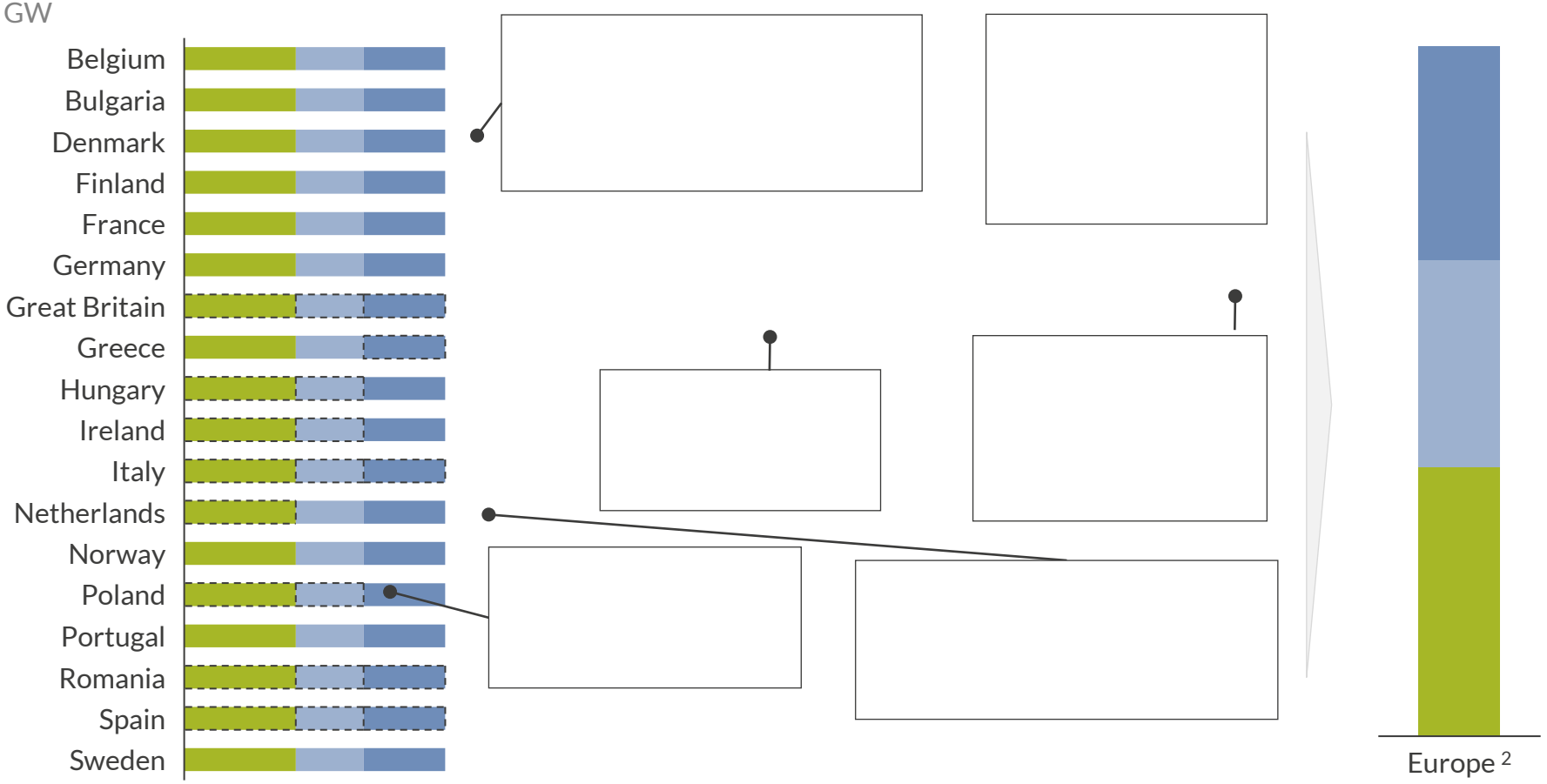
Region	Current main scheme	Relevant technologies	Positives and nuances
			✓ Supplier and grid operator legal obligation to purchase certificates guarantees demand ✗ Not well suited for deployment of offshore wind
			✓ New scheme created to drive offshore wind buildout, auction volumes of 3.5 GW set ✗ Delay in finalising the scheme mechanism causing uncertainty for developers
	Subsidies not currently offered		
			✓ Auctions are frequent and open to all technologies, separate offshore wind tendering ✗ Limited auction volumes announced
	Subsidies no longer offered		
			✓ EUR 30.5 billion aid approved to boost renewables, 22 GW to be procured ✗ Production caps specified, after which projects are not remunerated anymore
			✓ Generators receive auctioned value as support level, no paybacks required ✗ Support is expected to end with the phase-out of coal[2]
			✓ Dedicated support for offshore wind, driving rapid deployment toward Govt. targets ✗ Limited participation and allocation for solar and onshore wind in auction rounds
			✓ Generators are able to keep market upside, no paybacks required ✗ Currently not available for offshore wind, set to end in 2025
			✓ New scheme introduced more flexible prices for projects after 2017 ✗ Wind projects are not eligible for support

Source: Aurora Energy Research

At least [redacted] GW of RES is set to be procured through committed auctions to 2030 with a new focus on

Planned capacity procurement through announced auctions till 2030

GW



Volumes shown represent announced and confirmed auctions as of April 2022 and is not an exhaustive representation of potential auctions in the period to 2030

Offshore wind | Onshore wind | Solar PV | Estimated[3]

1) Offshore capacity offered through tenders in the Nordics despite a lack of subsidies. The capacities will be deployed on merchant/PPA basis. 2) Represents Aurora's 18 modelled countries. 3) Where explicit capacity targets have not been announced, capacity is estimated based on relevant announcements of budgetary allocations, generation targets and total auction targets.

Source: Aurora Energy Research

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- Across Europe, auctions for subsidy schemes have been announced and planned out for the next few years with a minimum target procurement of [redacted] GW through to 2030
- Historically, subsidy schemes have brought forward more significant volumes of solar and onshore wind capacities while offshore wind remained a nascent technology
- Planned procurement of subsidised capacities over the next few years see a focus on [redacted], making up [redacted]% of planned capacity procurement
- [redacted] still see high volumes of capacity set to be procured but are lower than historical trends due to the advent of merchant models

Lengthy and complex permitting procedures limit deployment of renewables, particularly for onshore wind

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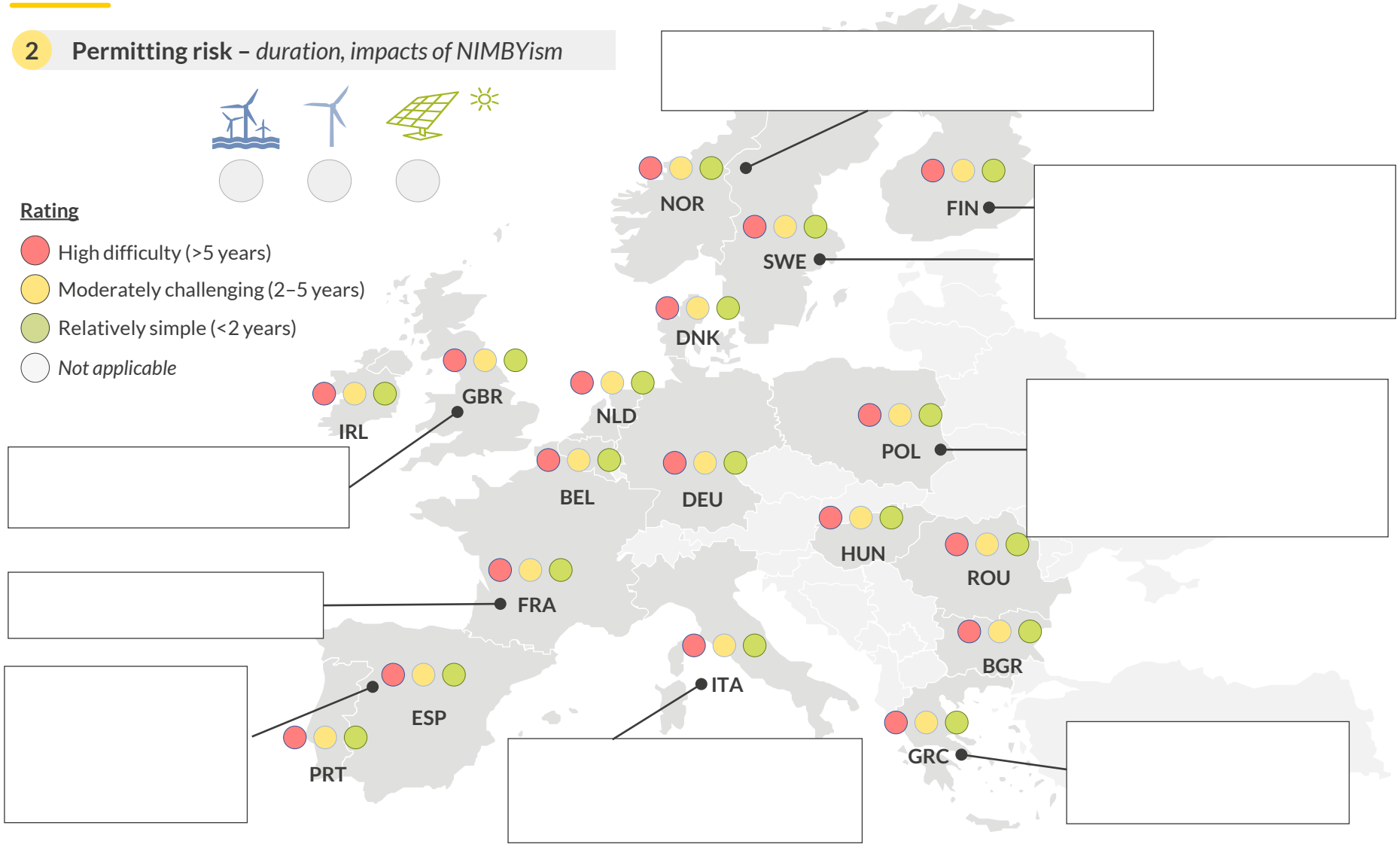

- Accelerated deployment of renewable (RES) projects is key to Europe's decarbonisation
- Lengthy and complex
- RES permitting could take up to
- Administrative processes are now the biggest
- The European Commission has launched a public consultation on how to improve permit-granting procedures for renewables projects and facilitating Power Purchase Agreements (PPAs)

Source: Aurora Energy Research

[redacted] sees the most attractive policy environment for renewables deployment, followed by

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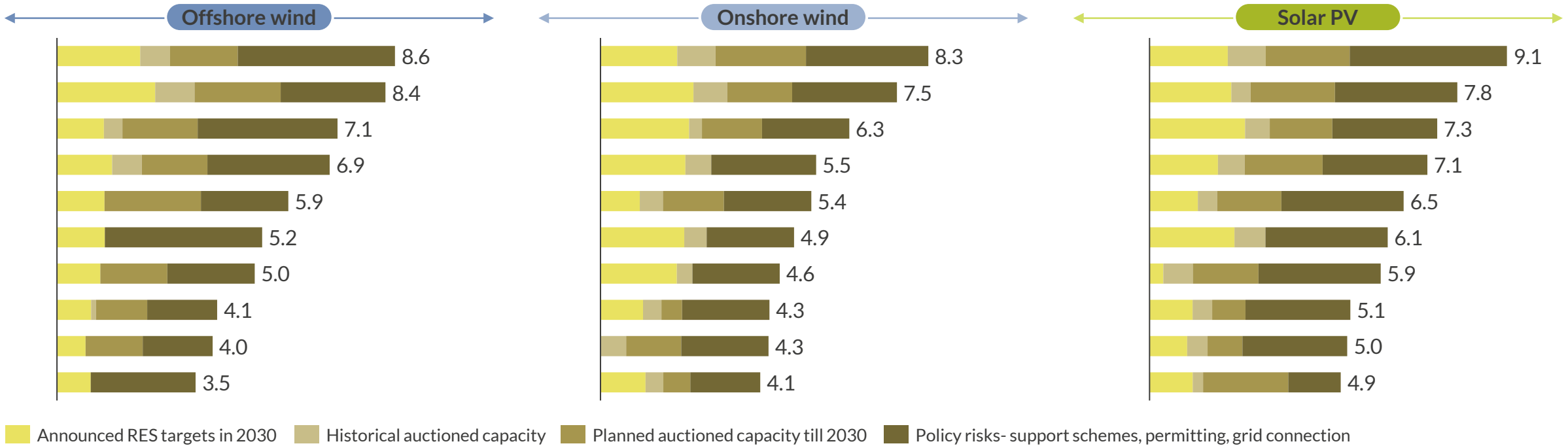
Policy environment

Countries are assessed in terms of their policy environment for renewables between 2022-2030, based on four criteria shown below. An overall score between 0-10 is assigned for each renewable technology reflecting the following weighting of assessment criteria.

Metric	Weighting	Rationale
4 Announced RES targets in 2030	25%	Demonstrates policy ambition for RES deployment over the medium term
5 Historical auctioned capacity	10%	Indicates track record of government support for RES build-out
6 Planned auctioned capacity till 2030	25%	Indicates expected government support for RES build-out and market size for refinancing
7 Policy risks - support schemes, permitting, grid connection	40%	Reflects effect of key policy and regulatory risks on project development



Source: Aurora Energy Research

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[redacted] CAPEX are maturing, while [redacted] sees significant scope for cost reductions

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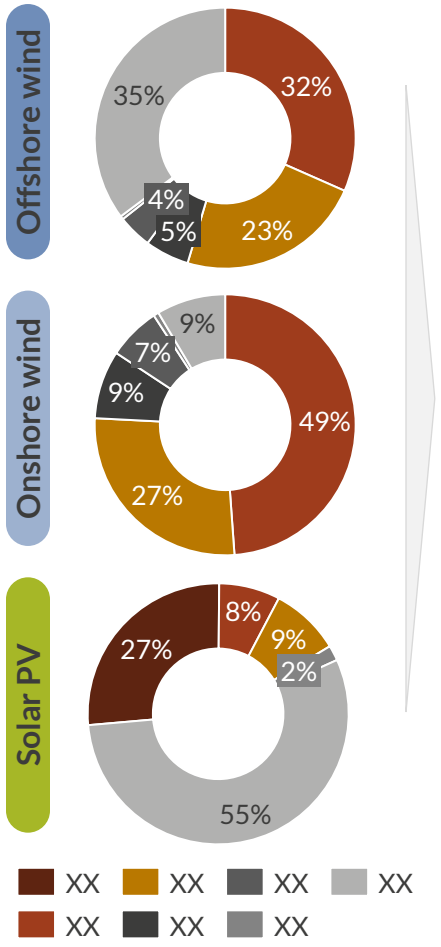
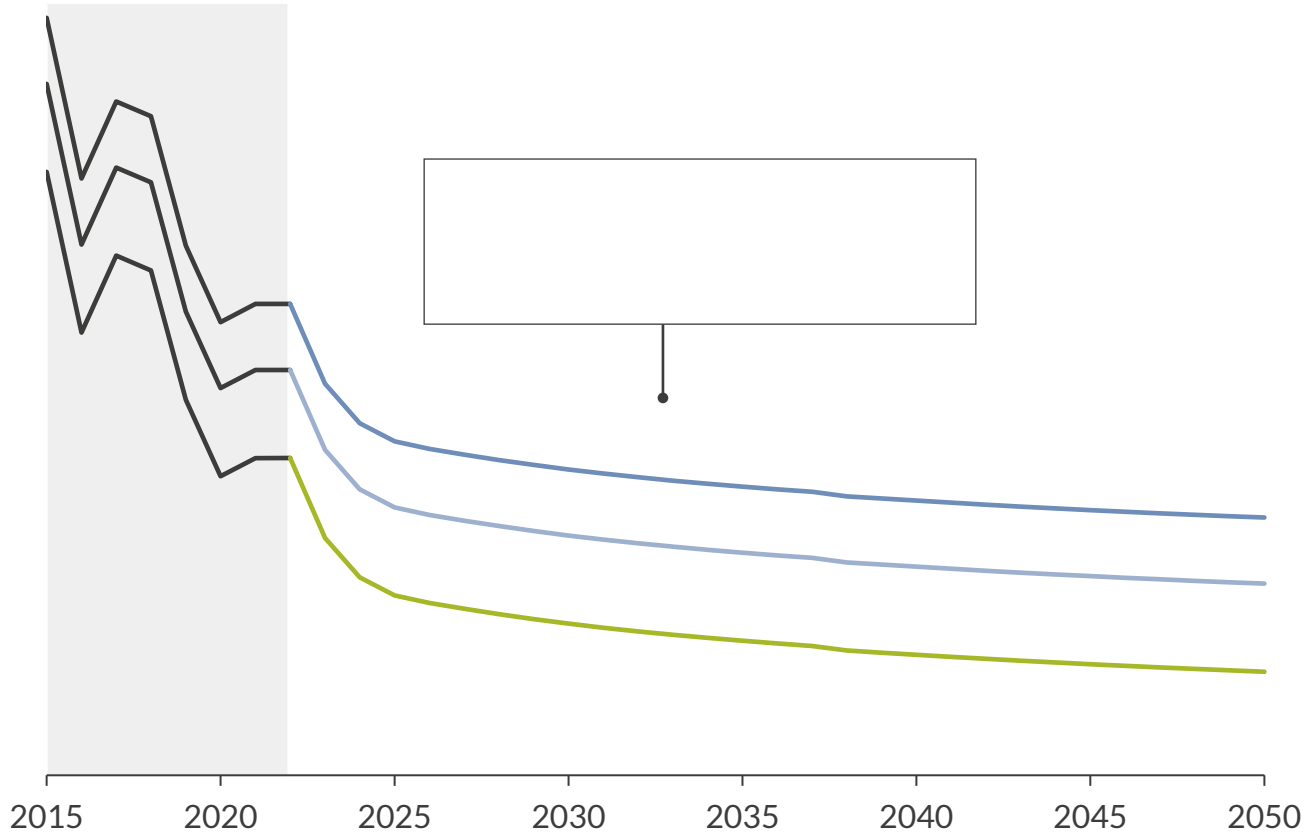
Raw materials as a share of total CAPEX, %



Renewables CAPEX trajectories[1]*
Indexed



Short term trends

- Raw materials like [redacted] make up a significant share of total technology
- The price increases [redacted] are [redacted], based on historical trends and expected increases in production

Long term trends

- Technological advancements drive cost reductions over time across all technologies; [redacted] sees significant scope for cost reductions due to
- Capital costs are broadly similar across Europe, but variations

(*) Detailed country data available in Aurora's power and renewables market subscriptions

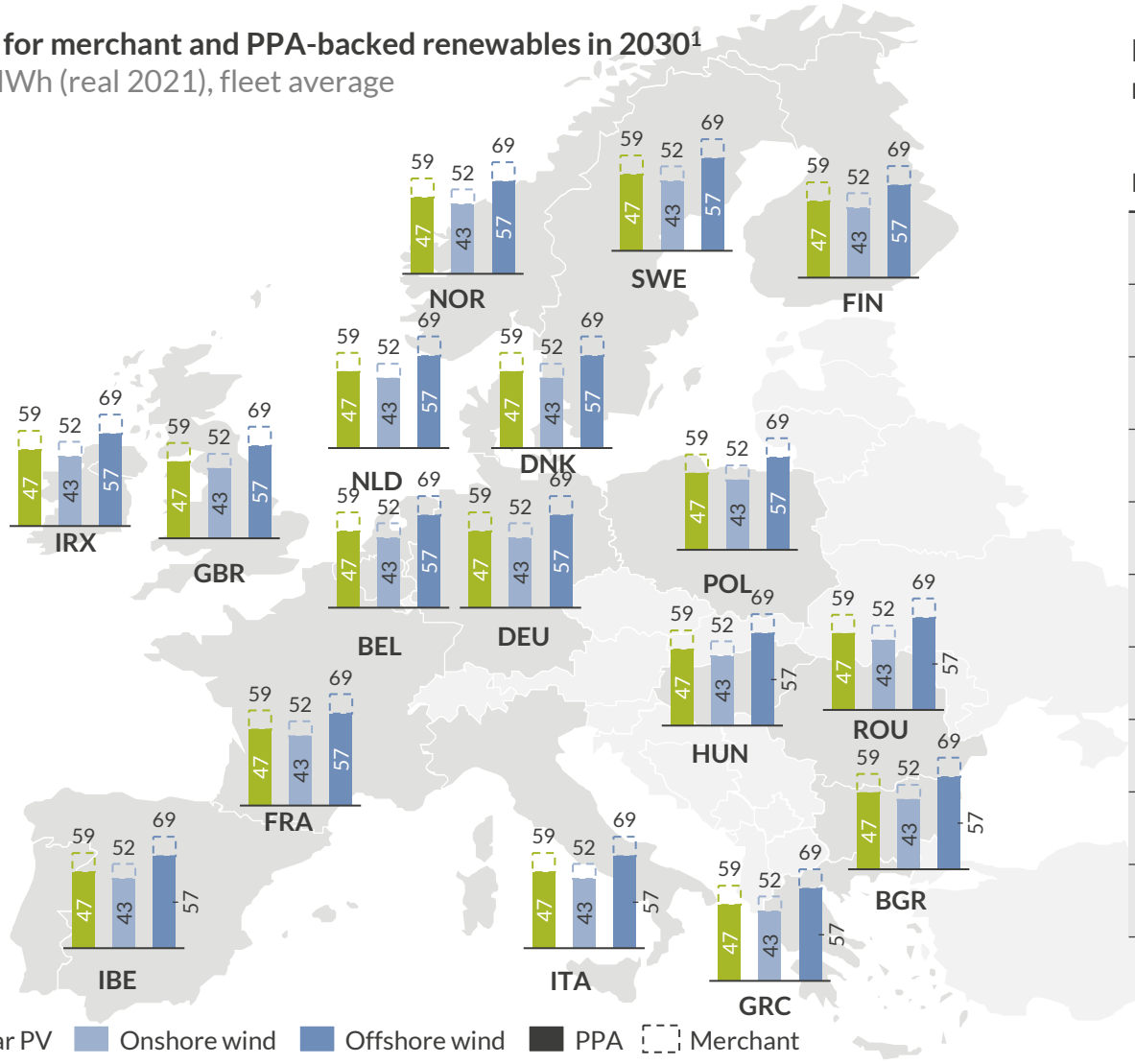
1) Representative EU trajectories

Sources: Aurora Energy Research, IRENA

LCOEs vary materially across Europe due to regional differences in capital costs and load factors; [redacted] see lowest wind costs

LCOEs for merchant and PPA-backed renewables in 2030[1]

EUR/MWh (real 2021), fleet average



Ranking of country LCOEs for merchant renewables in 2030[1]

Rank[2]	Solar PV	Onshore wind	Offshore wind[3]
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

- Levelised cost of energy is the ratio of the total discounted costs and discounted energy production over the project lifetime
- Load factors and CAPEX differences are the main determinants for LCOE variation across Europe
- By 2030, [redacted] achieves the lowest LCOE in most countries apart from those with
- PPA-backed projects have

1) Assumptions detailed in appendix. 2) Ranked merchant LCOEs from 1 = lowest LCOE to 10 = highest LCOE. 3) Represents fixed bottom projects except in [redacted] where floating projects are most feasible.

Source: Aurora Energy Research

Capture prices tend to decrease over time, with [redacted] seeing the greatest decrease to 2050 due to highly correlated generation

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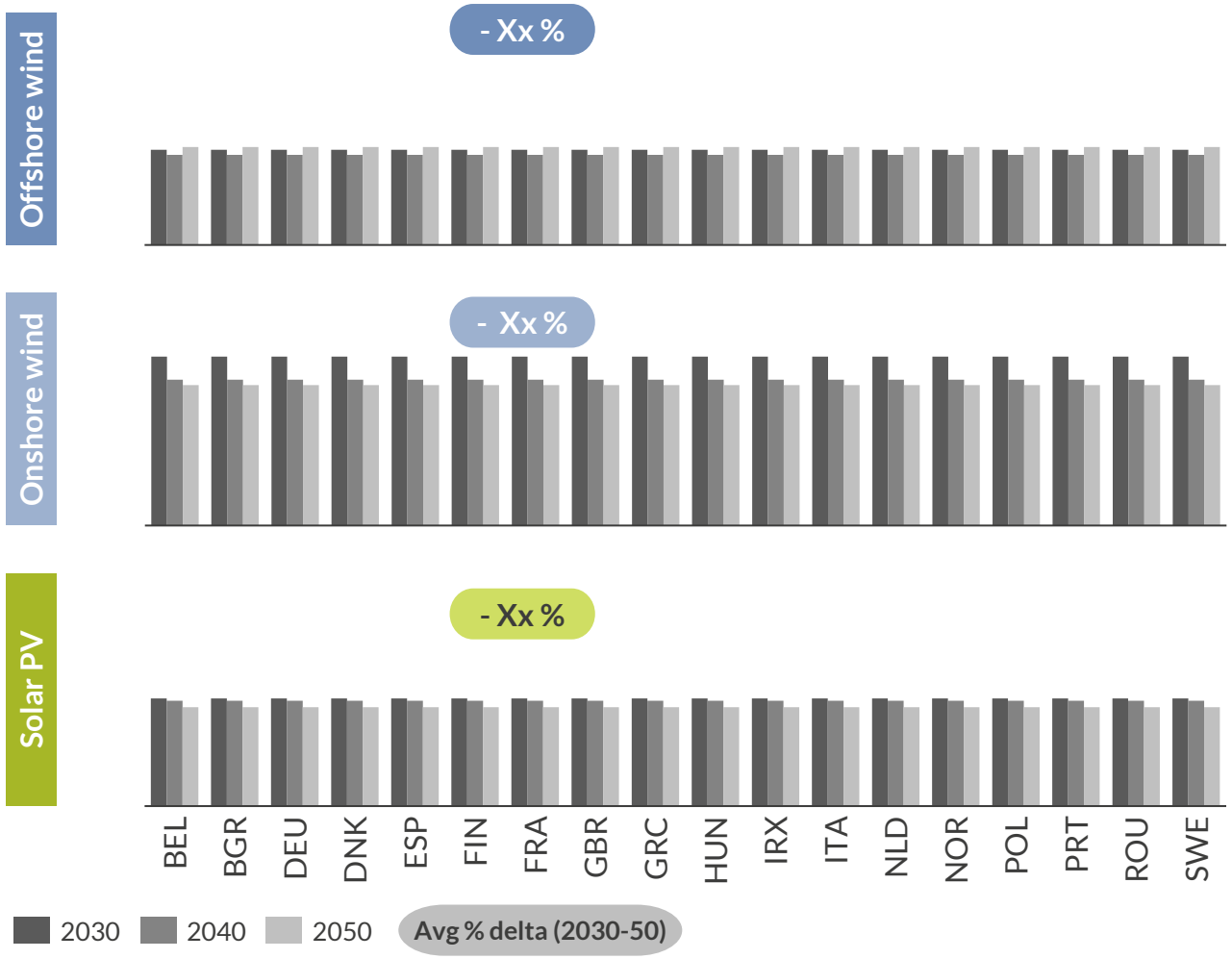
Renewables capture prices* [1]
EUR/MWh (real 2021), Central scenario



Capture prices are projected to fall by up to xx% between 2030-2050 across Aurora's 18 modelled regions in Europe, depending largely on the underlying technology

In each region, a variety of factors combine to determine the long term trend in the power price captured by renewables plants.

+ Drivers of increasing capture prices

- Increasing fuel and carbon prices
  - While thermal plants remain marginal, rising fuel and carbon prices raise the baseload power price by increasing the short run marginal cost of the marginal plant (often thermal)
- Increasing power demand
  - Europe's continued push for electrification increases demand and shifts the marginal plant higher up the merit order (all other factors being equal)
  - Increased flexibility of demand through the buildout of battery storage and hydrogen electrolysers also drives prices upward

– Drivers of decreasing capture prices

- Increasing renewables buildout
  - Leading to greater amounts of correlated generation, which depresses the system price and cannibalises renewables capture prices

1) Prices shown assuming no economic curtailment i.e. plants continue to generate during negative price periods

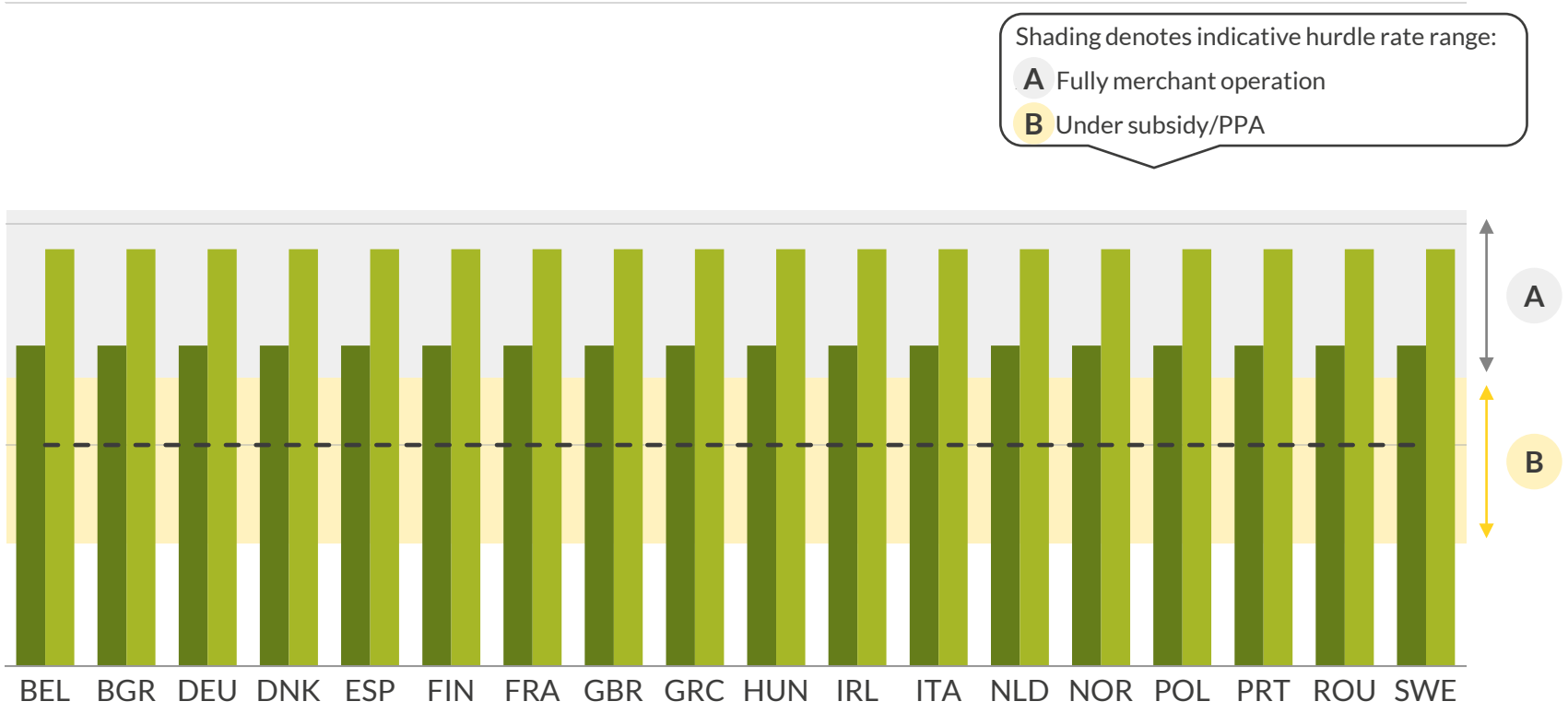
Source: Aurora Energy Research

[redacted] see the highest IRRs for solar PV in the short term due to excellent irradiation and low price cannibalisation

IRRs presented reflect a typical, fully merchant project in each country (i.e. without subsidies or PPAs), such that individual sites will over- or under-perform based on site-specific considerations of load factor and locational benefits or costs.

Project IRR[1] (fully merchant operation, fleet-wide average, unlevered)
%, pre-tax (real 2021), Central scenario

Solar PV



1) Assumptions detailed in appendix. Internal rate of return for an indicative merchant project in each country. Revenues limited to capture prices, excludes additional revenues such as distributed benefits or GoOs. Costs include CAPEX and OPEX, excludes additional, site-specific costs such as network charges.

Source: Aurora Energy Research

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- Across all technologies, solar PV sees [redacted] due to the mature nature of the technology and relatively low costs
- Average solar PV IRRs across Europe under Aurora's Central scenario are projected to [redacted] by 2025
- [redacted] projects however tend to suffer from higher levels of price cannibalisation
- [redacted] see the highest IRRs for solar PV in the short term due to excellent irradiation and low price cannibalisation
- IRRs are likely to

[redacted] countries see Europe's best merchant economics for renewables, particularly

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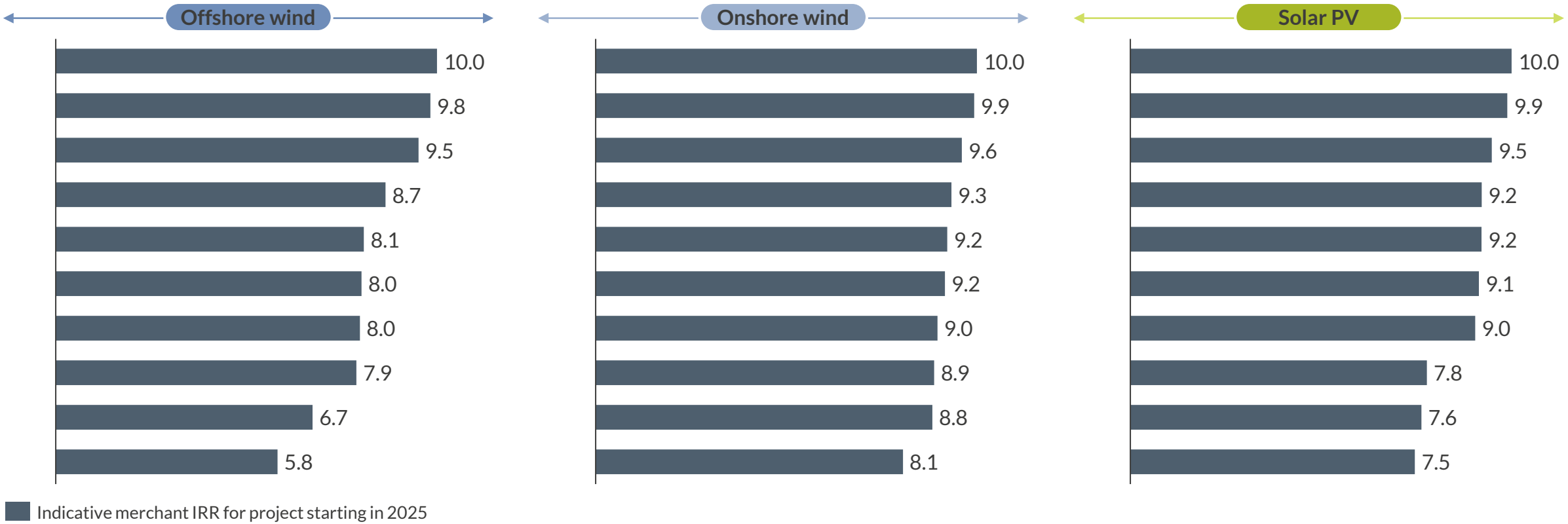
Project economics

Countries are assessed in terms of their economic outlook for renewables, reflected through indicative fully merchant IRRs, with scores assigned between 0-10 where the maximum IRR = 10 and minimum = 0.

Metric	Weighting	Rationale
8 Indicative merchant IRR for project starting in 2025	100%	Captures the commercial viability of new build projects for final investment decisions in three years' time based on fully merchant business models



Source: Aurora Energy Research

Amun is the leading software solution addressing the critical need for asset-specific wind valuation

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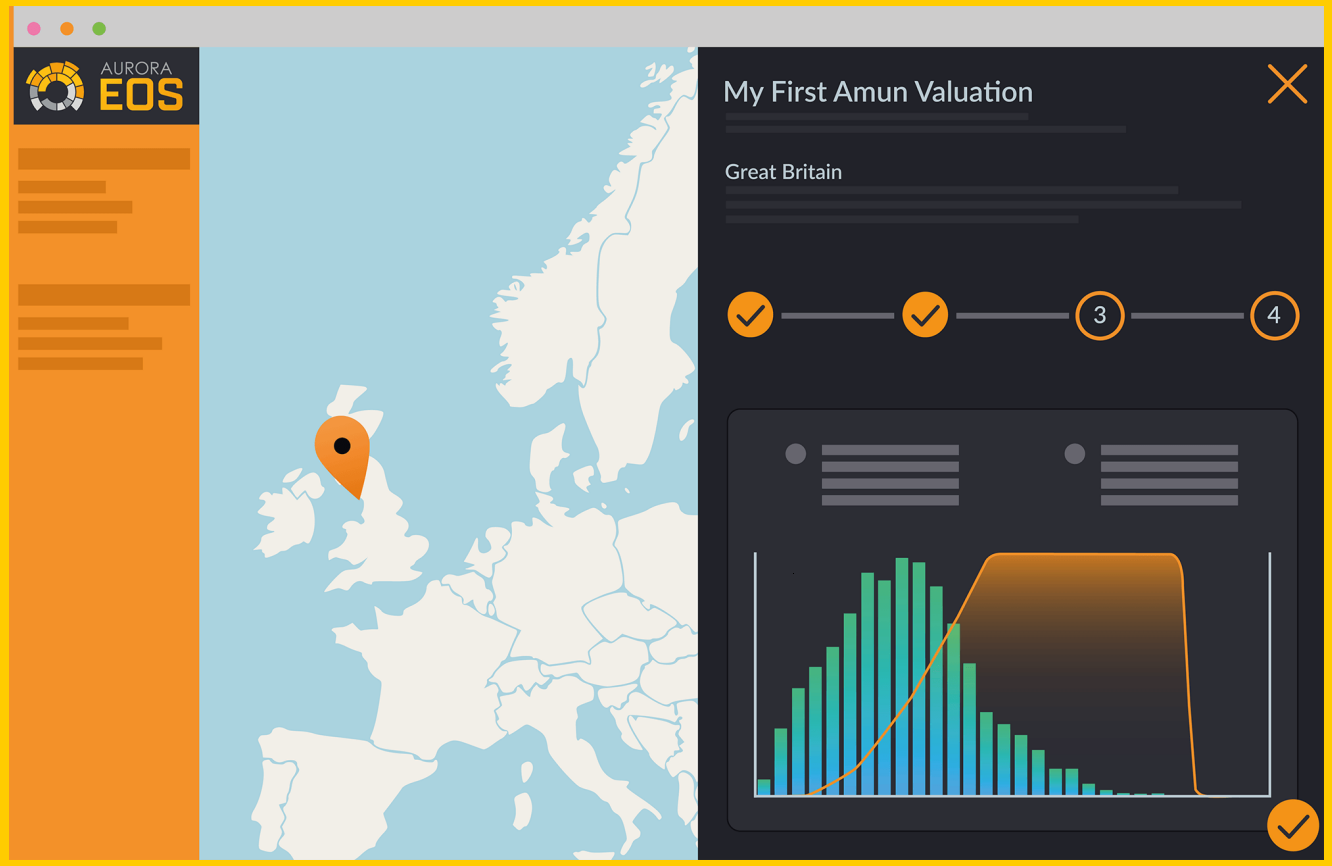
Transactions

Site Selection

Portfolio Management

PPAs



1 The indispensable tool trusted by Europe's leading banks, funds, utilities and developers

2 Asset-specific, bankable price and revenue forecasts in minutes

3 Unlimited access – making one-off consultancy fees history

4 Supporting the biggest wind transactions and valuing the largest portfolios

5 Backed by Aurora's data and models, and supported by our wind and market experts

Sources: Aurora Energy Research

Details and disclaimer

Publication
European Renewables Report

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May 2022

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