



Wind Investment Strategies for Brazil

Powered by  AMUN

October 2024



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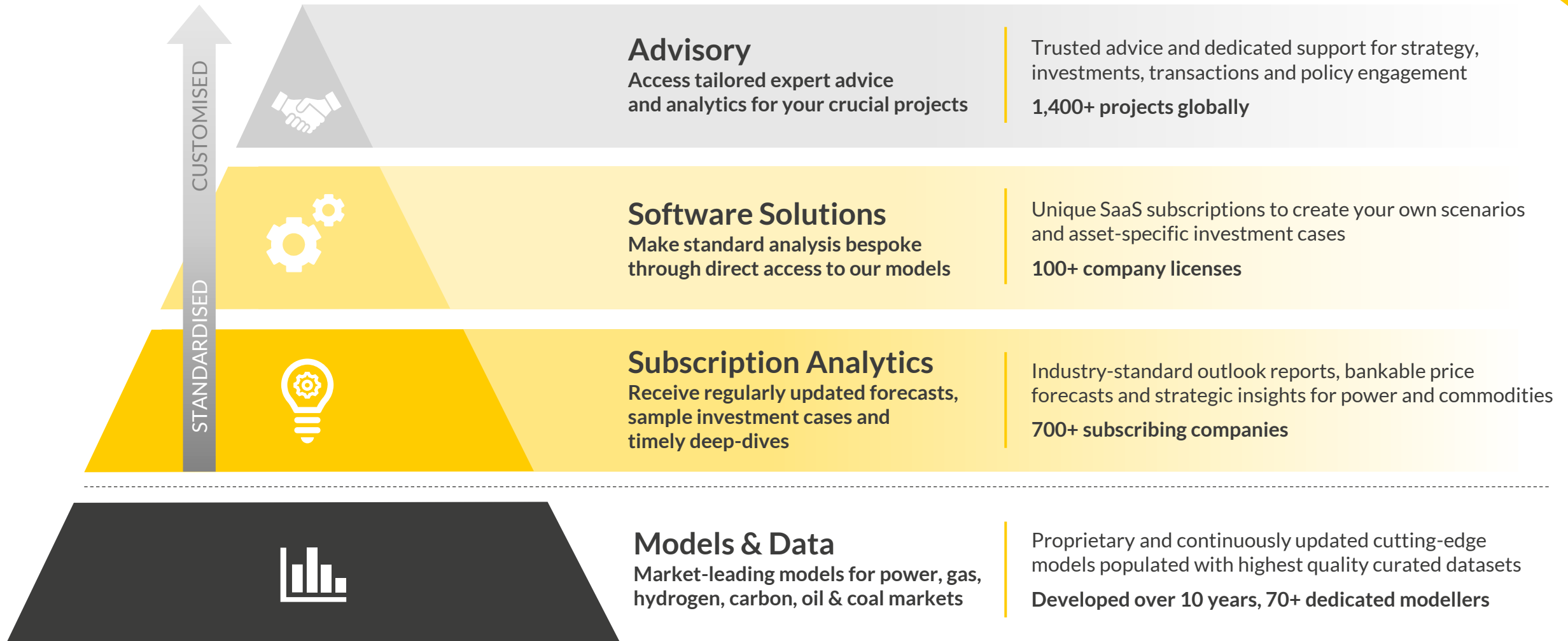
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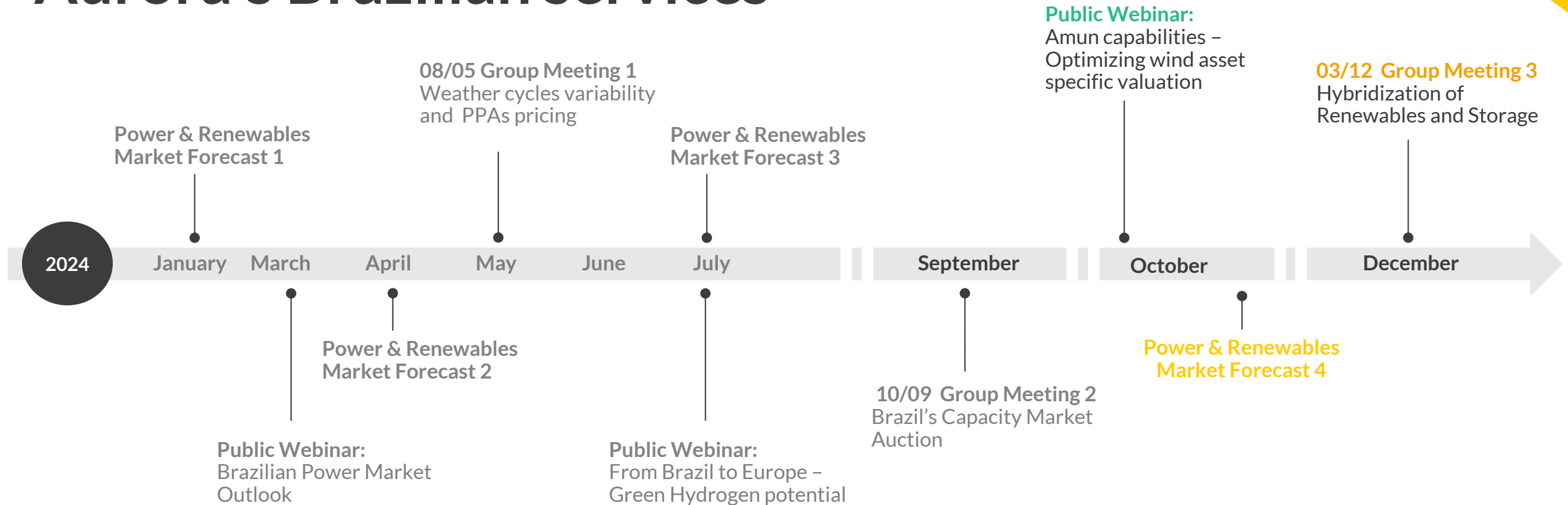
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Our market leading models underpin a range of integrated services to best suit your needs



Upcoming developments for Aurora's Brazilian services



- 2023**
- Previous releases**
- Green Hydrogen Potential in Brazil (R)¹
 - Offshore Wind Landscape (R)
 - Monthly Policy notes (R)
 - Data Dashboard (S)²

1) (R) = Report ; 2) (S) = Software

Upcoming software releases – Oct 2024



AMUN release for Brazil, allowing clients to forecast specific revenue for wind assets in minutes



AMUN

The true value of your wind site

Amun delivers bankable asset-specific revenue forecasts for wind assets in minutes

Over 80 subscribers across 17 markets including leading banks, funds, utilities, and developers

Access an unlimited number of offshore/onshore valuations

With greenfield and operational assets

Backed by Aurora data and supported by experts

Used on Europe's largest wind deals, auctions and financings

Powered by the highly accurate proprietary wind atlas



Transactions



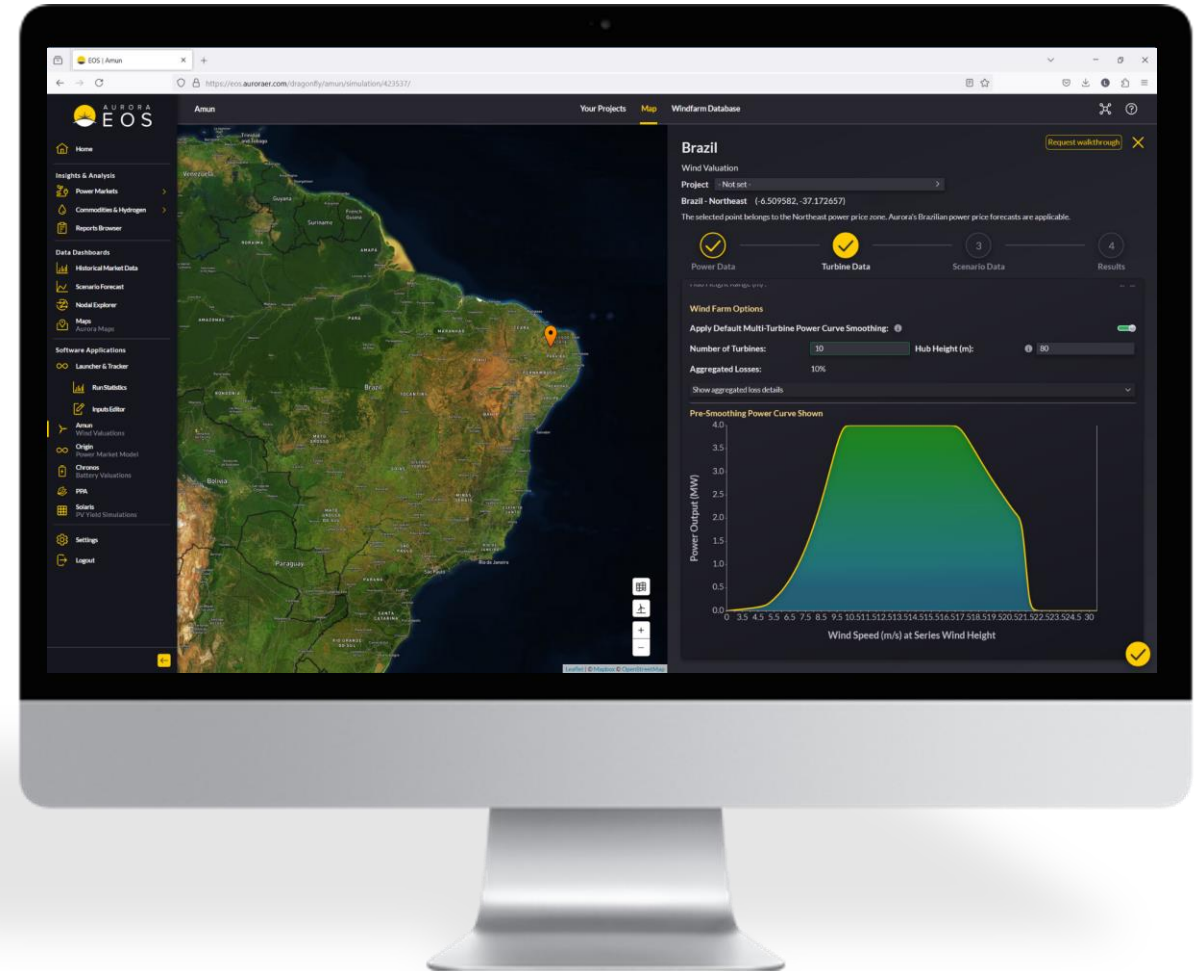
Site Selection
and Optimization



Portfolio
Valuation



PPAs



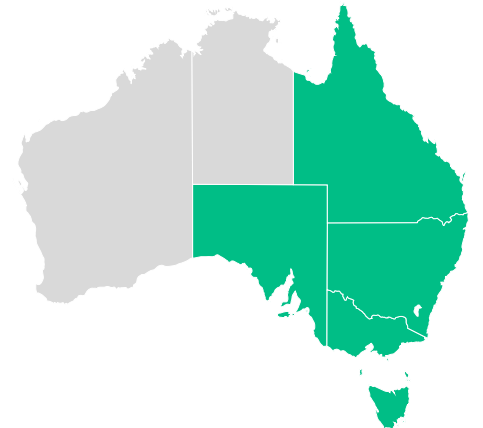
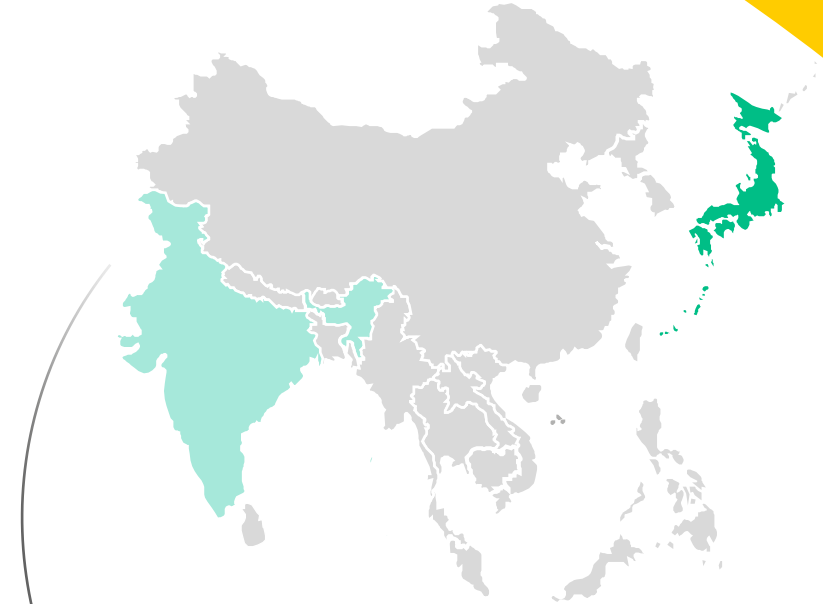
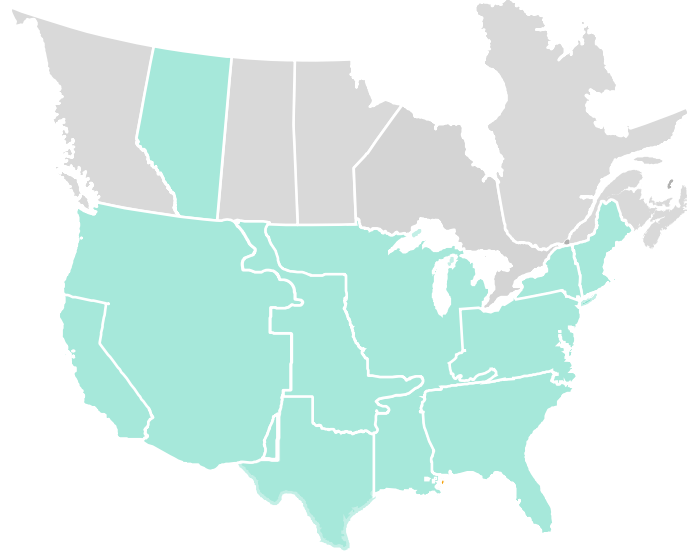
Where can you find **Amun**



CURRENTLY AVAILABLE



COMING SOON...



The rapidly evolving energy transition means asset-specific revenue forecasts become critical

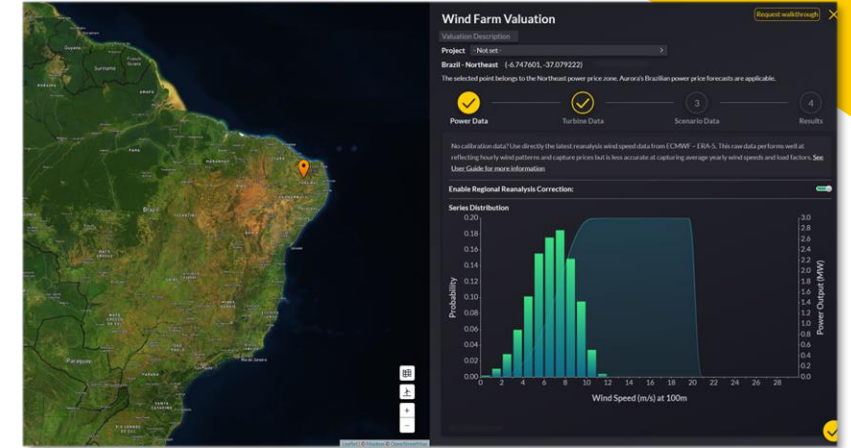
Price cannibalization is ballooning due to rapid wind deployment

Wind assets are increasingly at merchant risk as subsidies wane

Location is hugely important for future capture prices

Using baseload or market-wide prices can vastly over- or under-estimate your revenue forecasts

Fierce competition for assets and PPA contracts makes appreciating location-specific value critical



A global benchmark trusted by industry leaders



Vestas



CORIO

INFINERGY

Jera



AMUN

BLACKFINCH

Ørsted

BLACKROCK

Statkraft

BARCLAYS



IMCO
Investment Management
Corporation of Ontario

GLOBAL
INFRASTRUCTURE
PARTNERS

MUFG

CIP
Copenhagen Infrastructure Partners

Cubico
SUSTAINABLE INVESTMENTS

BANKS
Group

GREENCOAT
CAPITAL

TotalEnergies

skyborn

Foresight
FOR A SMARTER FUTURE

MAPLE
POWER

PGGM

Triodos Bank

Santander

Commerce Bank
Member FDIC

EDF



Green
Investment
Group

OW
OCEAN WINDS

ONTARIO
TEACHERS'
PENSION PLAN

octopusenergy

BlueFloat
ENERGY

Eurus Energy

equitix

enel

Iberdrola

acciona

low
carbon

MARTIFER
GROUP

CTG

ESB

sse

VENTIENT
ENERGY

80+ subscribing companies
across 17 markets

Supports the largest
transactions globally

Values the biggest wind
portfolios

Underpins major debt
financings

Sets prices for wind
PPA deals

Used by leading developers
for site selection and
optimization

Our **Wind Atlas** is available for Brazil

Data from north-east states are bias- corrected

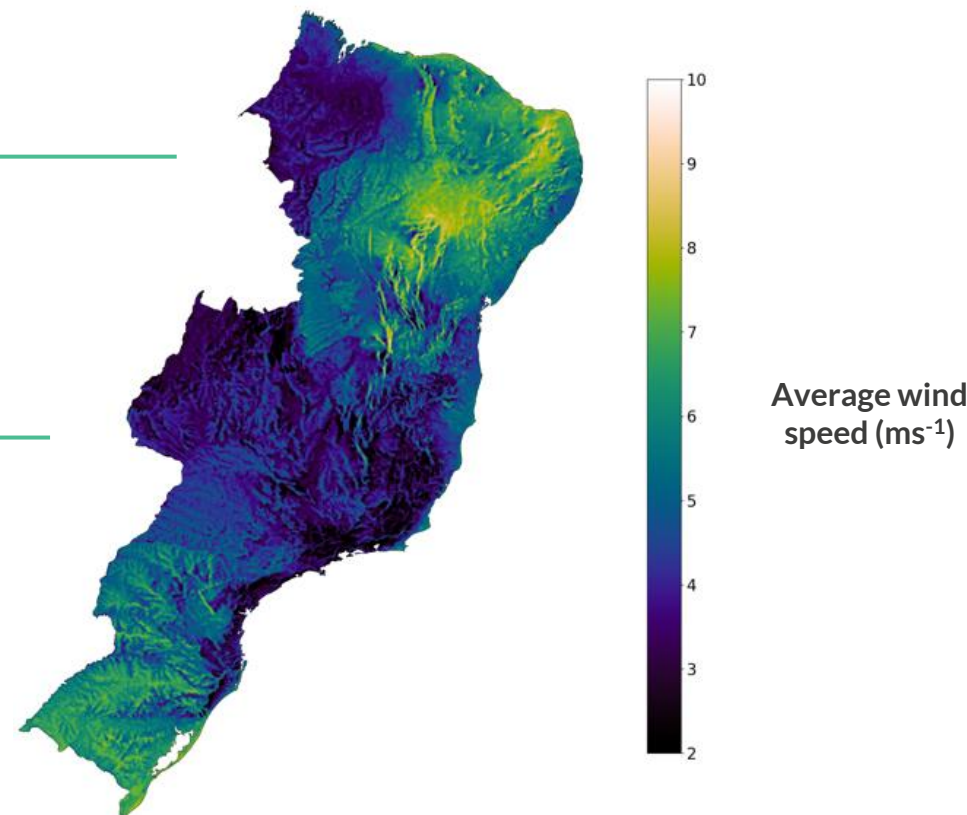
(Maranhão, Piauí, Ceará, Rio Grando do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia)

Due to few observations, central states use downscaled ERA-5 and GWA average wind speeds

(Goiás, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Brasília)

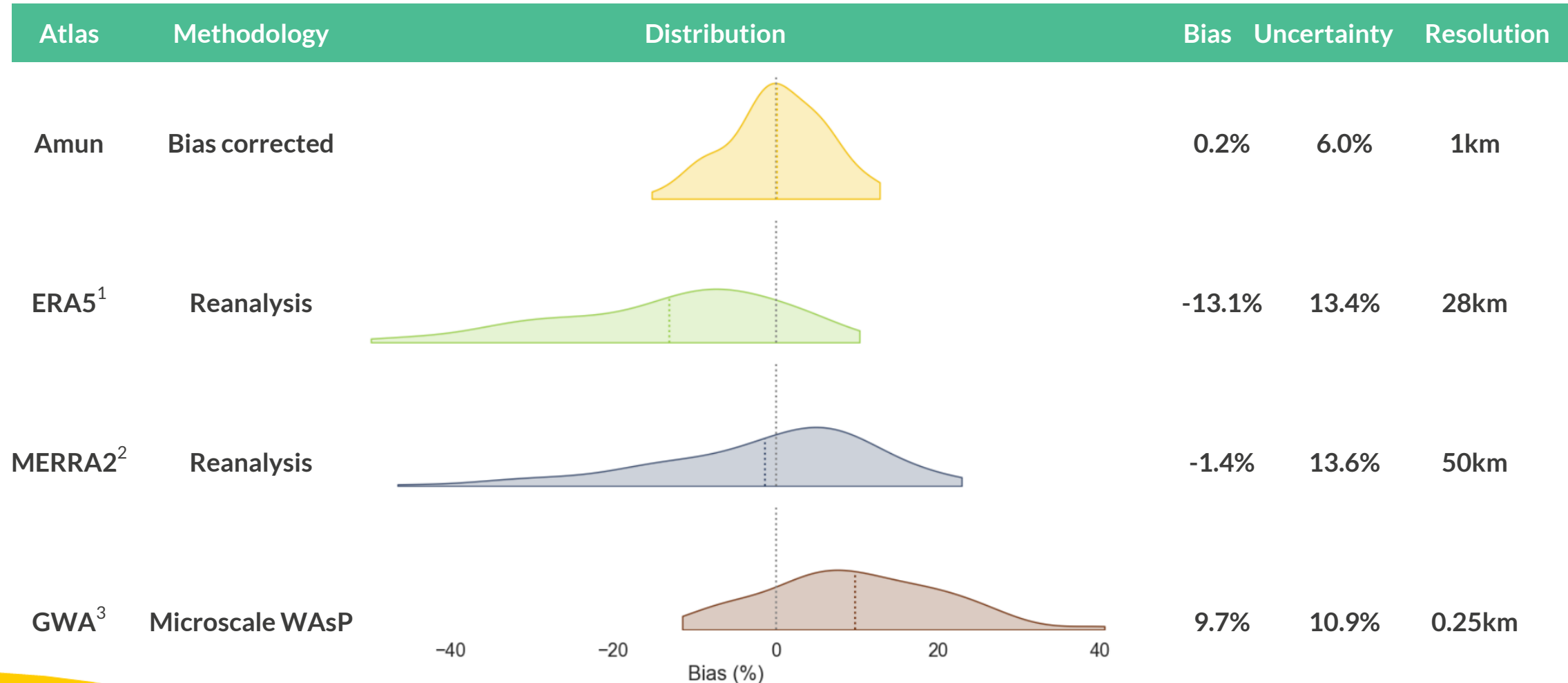
Data from south states are bias- corrected

(Rio Grande do Sul, Santa Catrina, Paraná)



Brazil Wind Atlas

The Brazilian **Amun** outperforms other wind atlases because it is bias corrected



1) Generated using Copernicus Atmosphere Monitoring Service information, 2022.

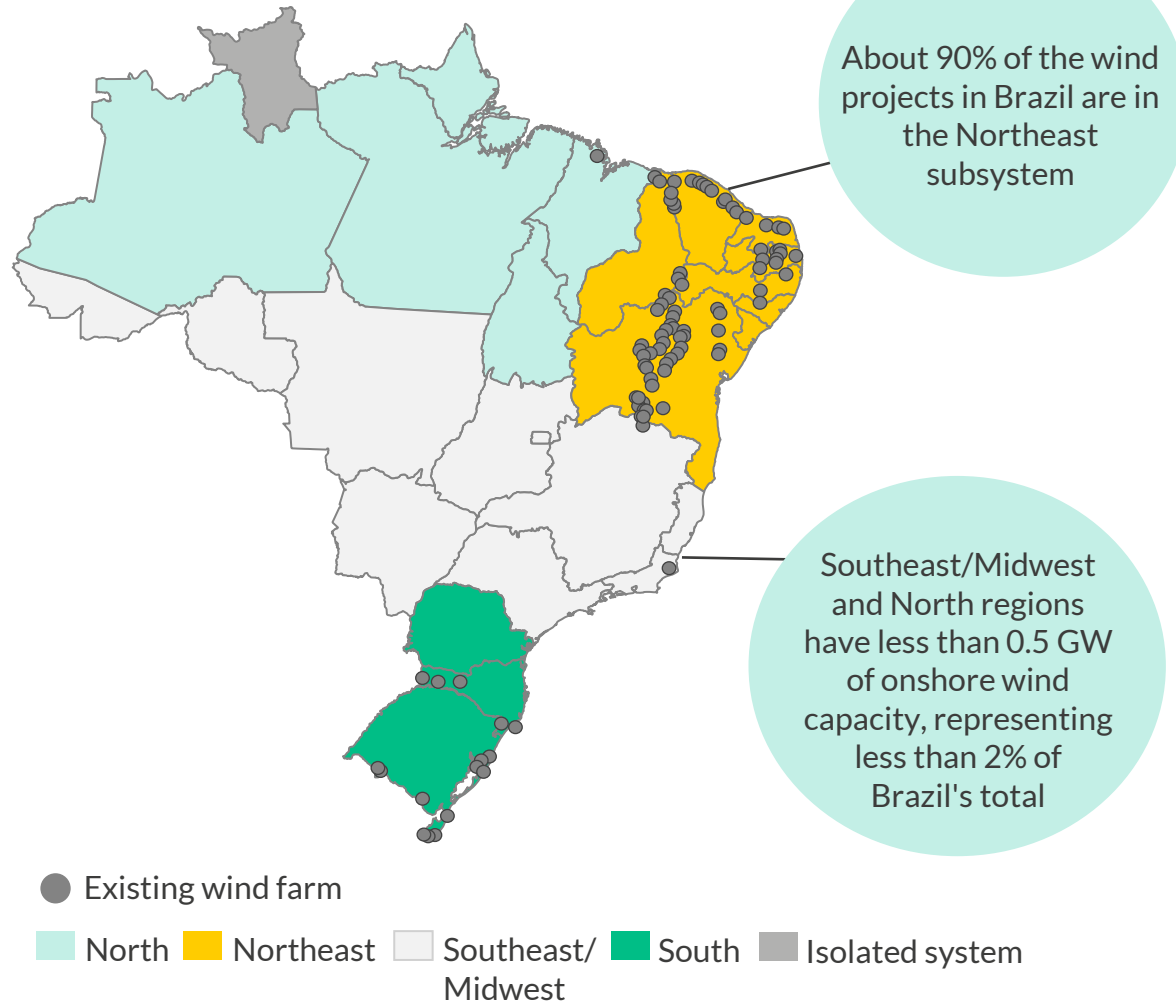
2) Data published by NASA Global Modelling and Assimilation Office, 2015. <https://doi.org/10.5067/3Z173KIE2TPD>

3) Data obtained from the Global Wind Atlas 3.0, a free, web-based application developed, owned and operated by the Technical University of Denmark (DTU).

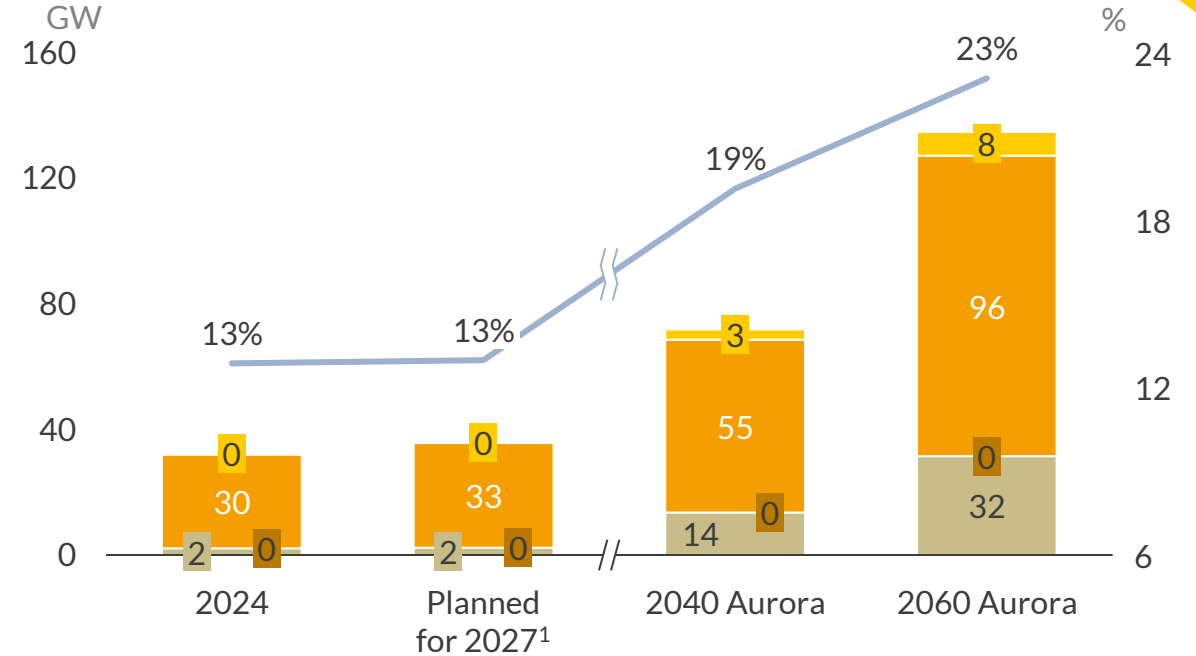
90% of onshore wind is located in the Northeast

By 2060, this technology is expected to become the second-largest by capacity

Existing onshore wind farms by subsystem



Onshore wind capacity by subsystem



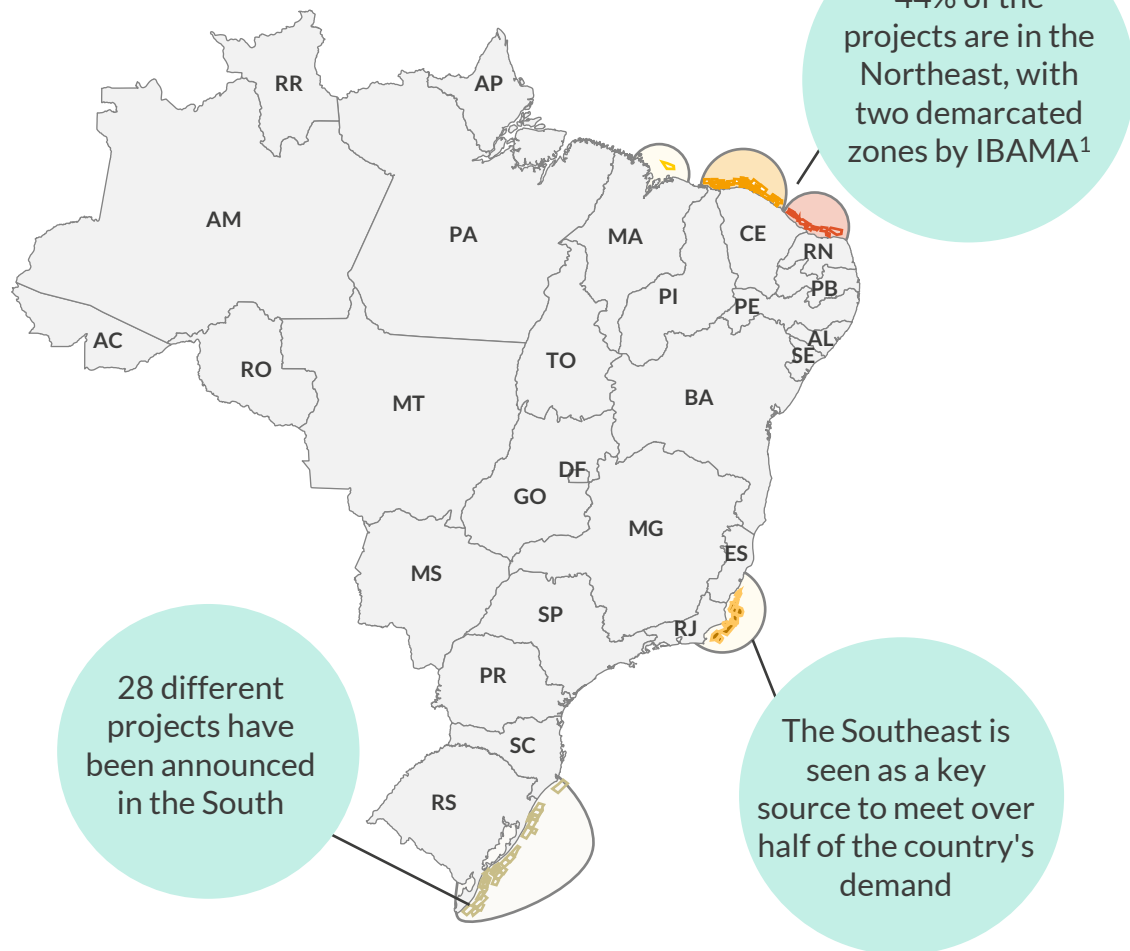
- Northeast onshore wind capacity is projected to triple by 2060, getting close to 100 GW. In contrast, Southeast and North regions have no announced projects in the pipeline and are expected to see minimal growth in the coming years.
- Costs of these technologies are also expected to decline significantly, enabling its further deployment. Cost decrease despite larger turbines and higher hub heights for onshore wind are projected to reduce the Levelized Cost of Electricity (LCOE)² by 20% between 2026 and 2040.

1) Planned capacity based solely on ANEEL pipeline of projects under construction as of September 2024. 2) LCOE serves as a key metric to compare the economic competitiveness of utility-scale renewable technologies entering the market at different times. Assumptions: 100 MW utility scale, Northeast subsystem, 45-49% load factor, 27-year lifetime, 10% subsidized WACC.

234 GW of new offshore projects announced

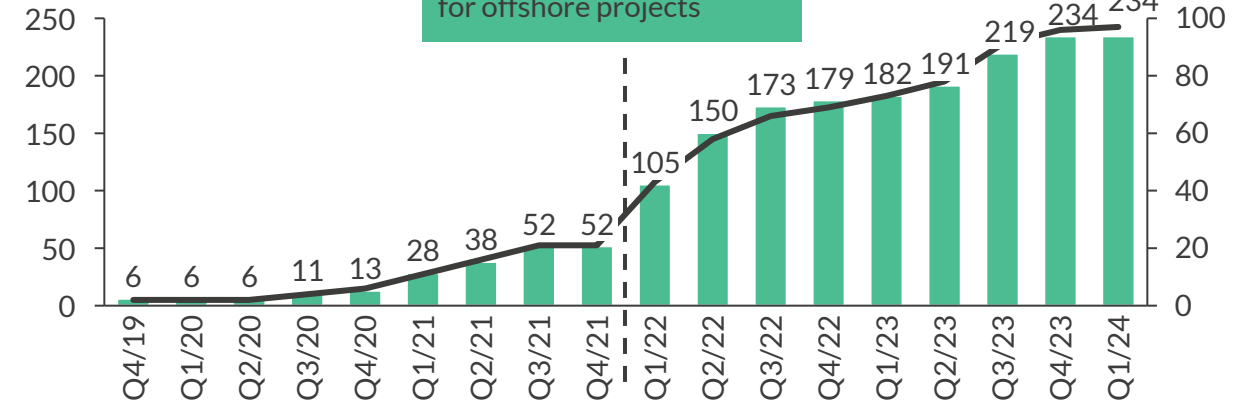
These projects are currently awaiting approval of the regulatory framework

Offshore Wind Projects by authorised zones

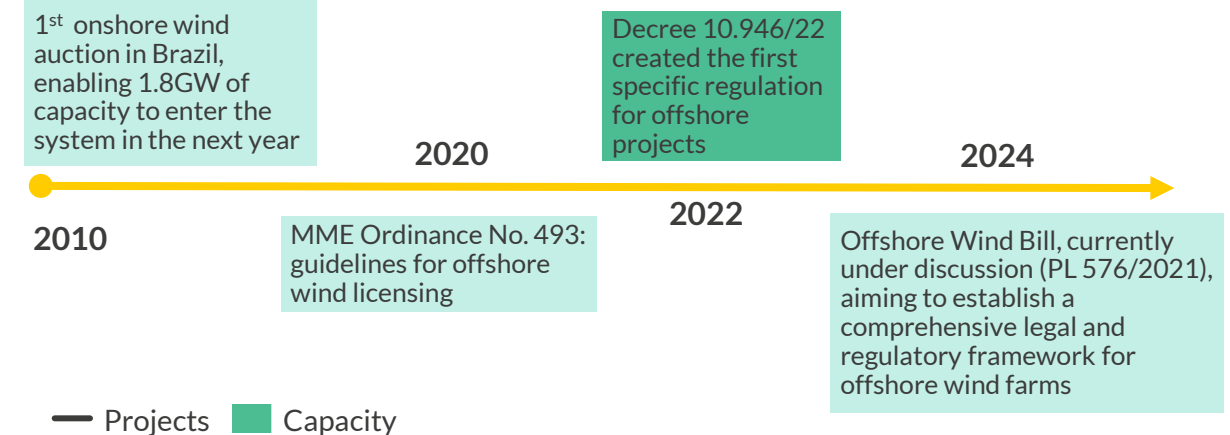


Pipeline of projects

Capacity (GW)



Regulatory Timeline



1) Independent developers have been seeking approval for environmental studies in areas of their interest. Multiple developers might be interested in the same space, leading to overlapping areas of study

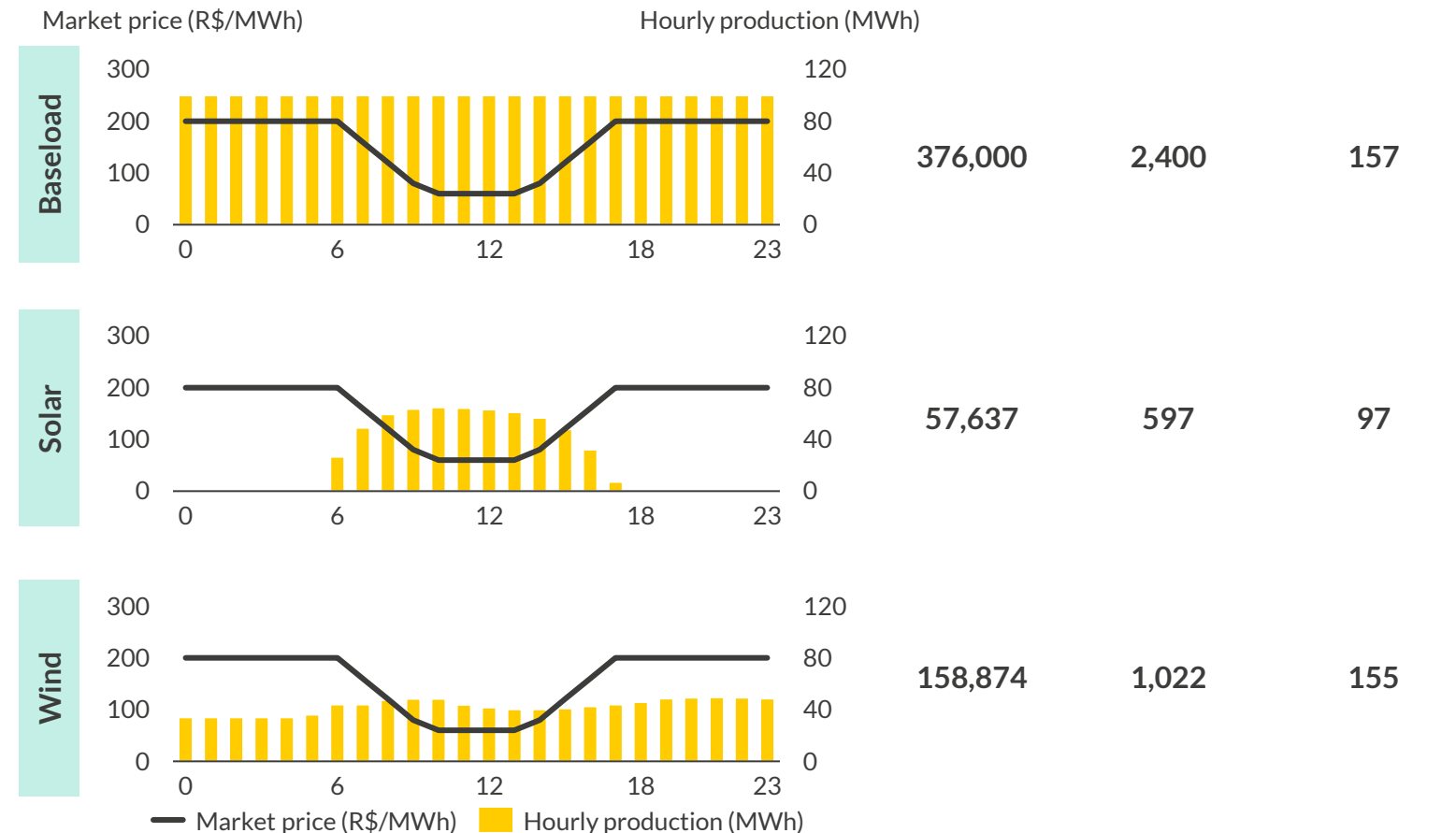
Revenues achieved by different types of technologies can be significantly different from baseload prices

AMUN is a key tool for addressing this

Not all technologies will be able to “capture” hourly prices equally, so prices need to be weighted according to the production profile

- Generation-weighted average prices, or capture prices, represent the average market price earned by power generators over a certain period
- These prices vary can significantly depending on the hourly production profile: a baseload asset will have a price significantly different than the generators of intermittent sources like wind and solar
- To calculate capture prices:
 1. Multiply each period's electricity price by the amount generated
 2. Sum these values to obtain the gross revenue
 3. Divide by the total electricity produced to obtain the capture price

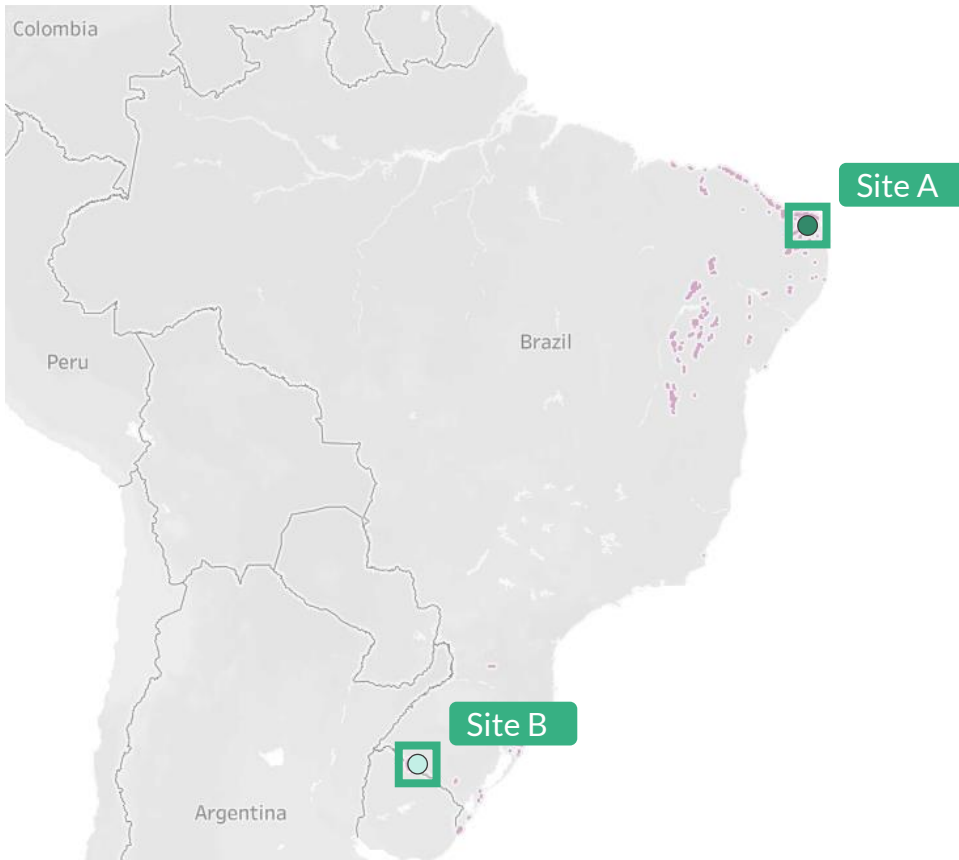
Illustrative examples of generation-weighted average (GWA) prices for different hourly profiles for a 100 MW asset



Amun forecasting capabilities in Brazil

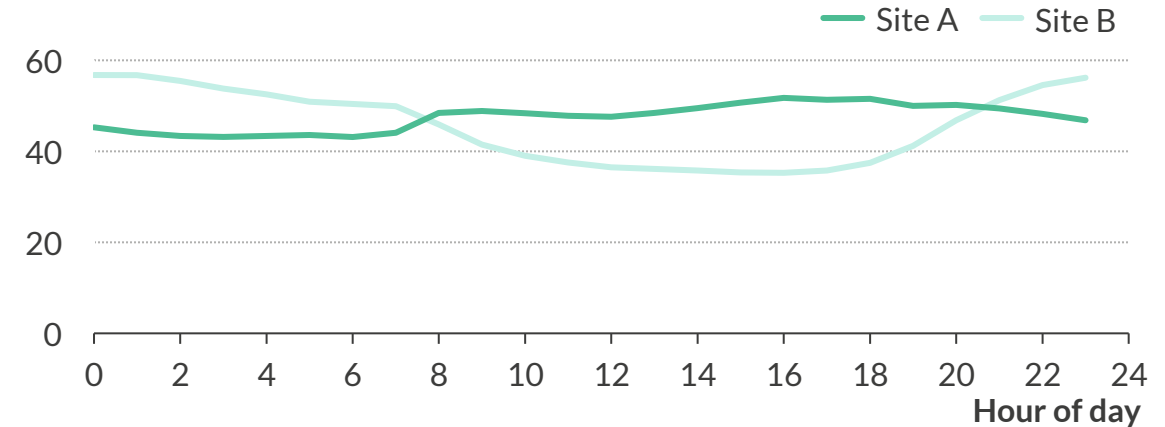
Onshore wind capture prices vary based on location and technology

Map of two onshore wind locations

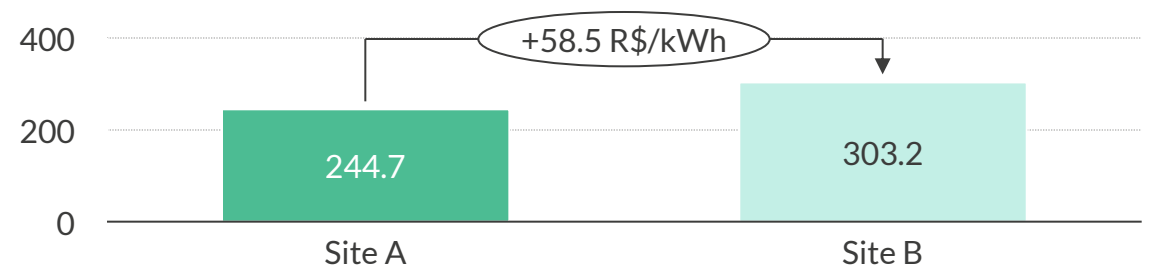


- Capture price is affected not only by price zone, but also by correlation of generation with other wind farms including onshore (cannibalization)

Load factor of two sites in Northeast and South, %



Average capture price (2040–2060), R\$/kWh (real 2022)

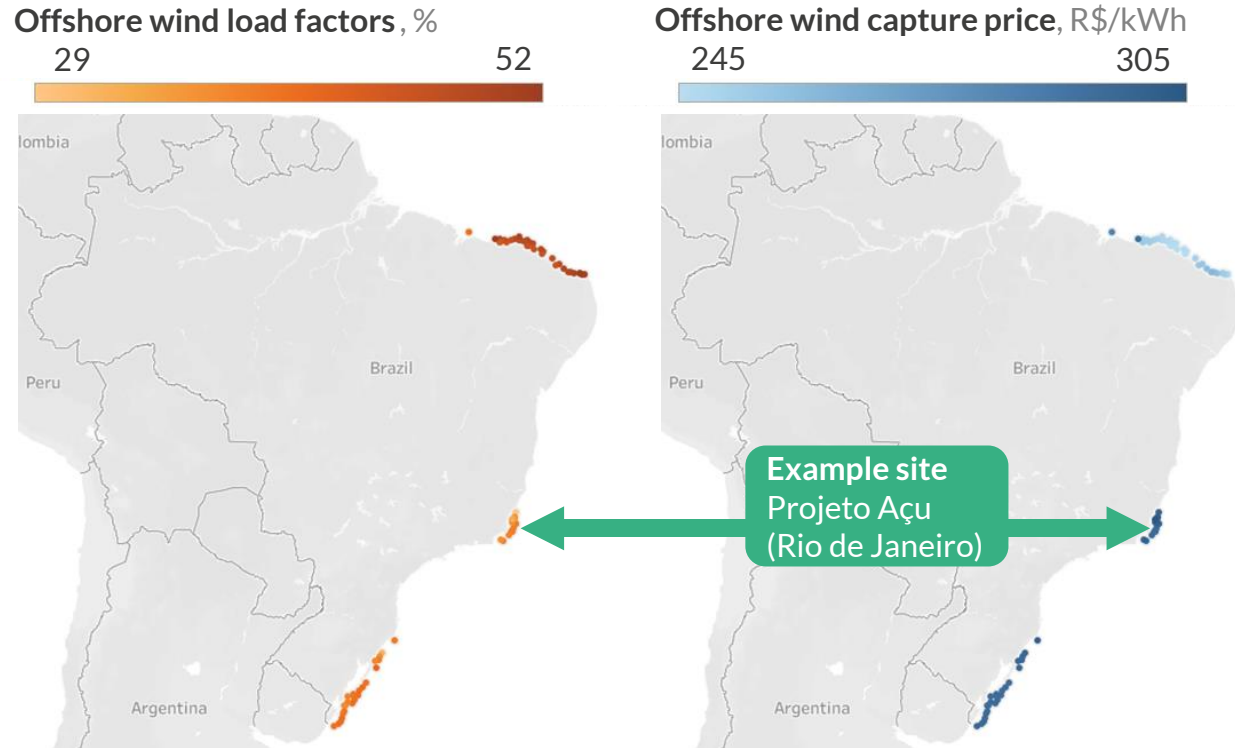


- According to **Amun's Brazilian Wind Atlas**, Site A has the same average load factor as site B. However, it's average intraday generation profile is different
- Site B generation profile has a low correlation with the onshore fleet and solar leading to higher price cannibalisation and therefore lower capture prices

Technology: hub height: 117m, rated capacity: 3.45MW, rotor diameter: 126m

Amun forecasting capabilities in Brazil

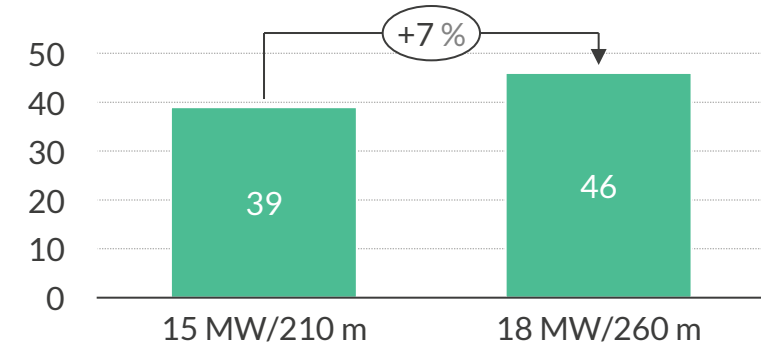
Capture prices vary by 64 R\$/kWh across potential offshore sites—strongly depending on location and turbine choice



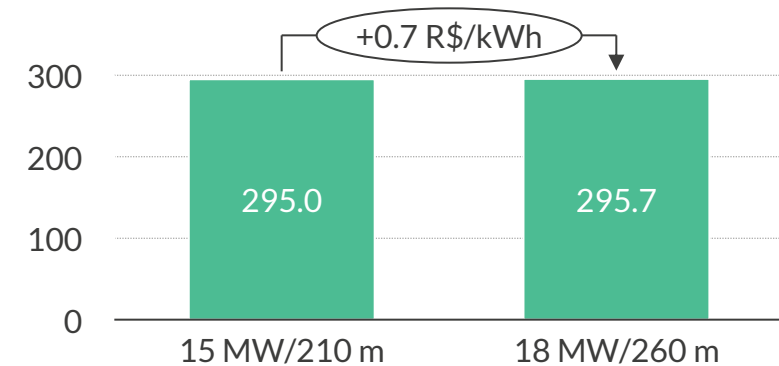
Technology: hub height: 135m, rated capacity: 15MW, rotor diameter: 210m

- Capture price is affected not only by price zone, but also by correlation of generation with other wind farms including onshore (cannibalization)
 - Offshore load factors vary by over 25% in ERA5 data, with EYA offering more detailed insights

Load factor of Projeto Açú site using different turbines, %



Average capture price (2040-2060), R\$/kWh (real 2023)



- Increasing the turbine's rotor diameter and hub height increases the load factor during hours of low wind speed
- This results in a shift of generation towards hours of higher wholesale price

Amun Customer Success: Getting started, made easy!

Comprehensive support from our dedicated team of Amun wind experts

Getting Started

Amun is designed to be user-friendly, and user-centric, requiring minimal training

- Join training sessions tailored to your needs
- Integrate **Amun** into internal tooling with API
- Create and maintain your entire wind farm portfolio

Ongoing Support

Our global network of Amun experts are on-hand to help you unlock business value

- Receive regular guidance & support
- Have your valuations checked by our **Amun** experts
- Use checked **Amun** valuations in transactions, financing and strategy

Community Events

Participate in regular sessions where we learn from you, and you learn from each other

- Network with local, regional and global peers
- Attend online and offline events
- Contribute to our **Amun** development roadmap

Any questions?

LEARN MORE



OR REACH OUT FOR YOUR FREE TRIAL:

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