Empresa de Pesquisa Energética

Offshore wind and energy planning in Brazil

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UK & Brazil Partners in Energy - 8th Edition
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MINISTÉRIO DE MINAS E ENERGIA

PÁTRIA AMADA BRASIL GOVERNO FEDERAL

1 About EPE

EPE – Energy Research Office

www.epe.gov.br

100% state-owned company that aims to support the Brazilian Ministry of Mines and Energy

Our purpose is to ensure the basis for the sustainable development of the country's energy infrastructure

Member of the National Energy Policy Council (CNPE)

Some of our products

Technical studies, statistics and reports

Webmap EPE

Informative videos

Educational content

Social networks

2 Offshore wind in EPE's studies

A recent trend in terms of energy planning in Brazil

bit.ly/OffshoreWorkshop

Workshop

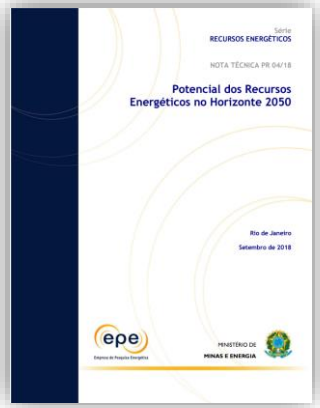
Ten-Year Energy Expansion Plan (PDE 2029)

bit.ly/PDE2029

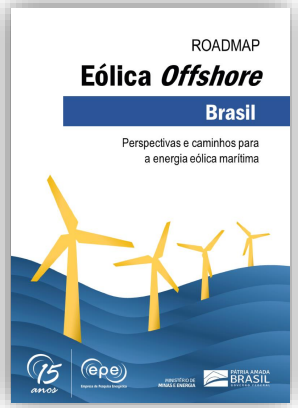
Ongoing discussions

2018 **2019** **2020** **2021**

National Energy Plan (PNE 2050)



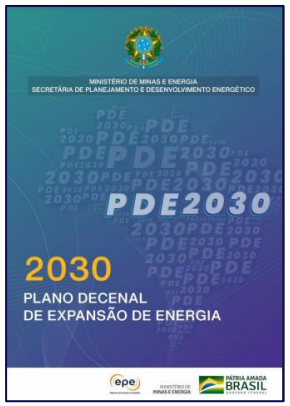
bit.ly/PNE2050EPE



bit.ly/EOLoffshoreBR

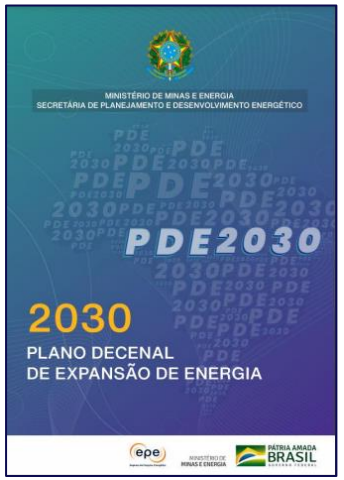
Brazilian Offshore Wind Roadmap

Ten-Year Energy Expansion Plan (PDE 2030)



bit.ly/PDE2030

Ten-Year Energy Expansion Plan (PDE 2030)

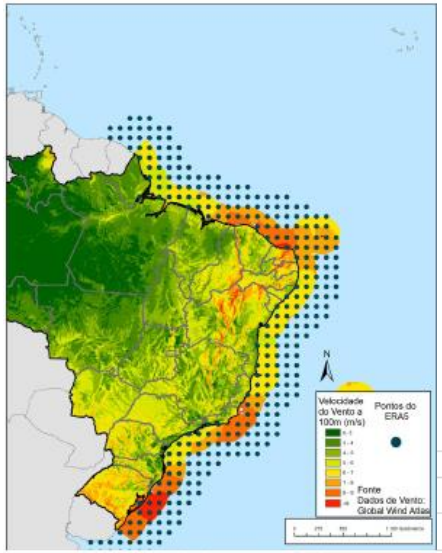


bit.ly/PDE2030

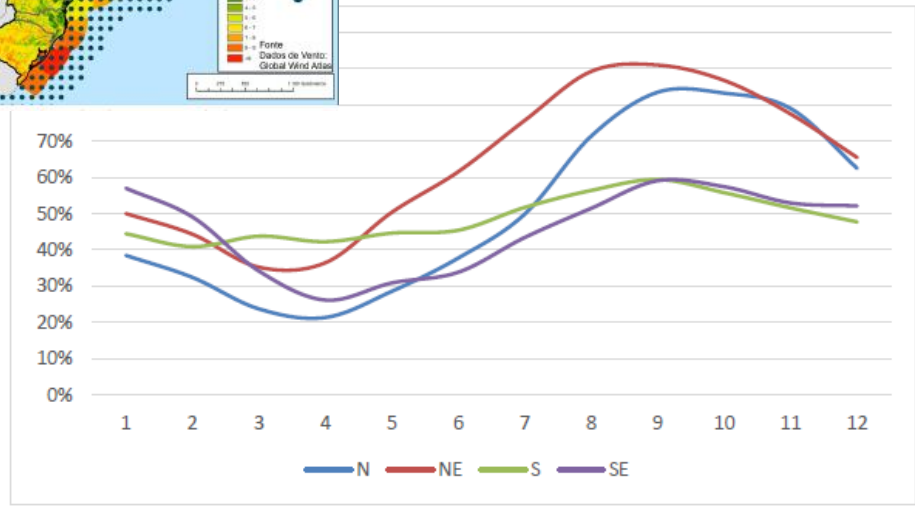
Economic parameters

Tipo de Oferta	Vida útil econômica [anos]	Faixas de CAPEX, mín e máx [R$/kW]	CAPEX Referência, sem JDC [R$/kW]	Fator de Capacidade médio [9]	O&M [R$/kW/ano]	Encargos/ Impostos [R$/kW/ano]	Tempo médio de desembolso [meses]
Armazenamento – Baterias [10]	20	6.000 a 9.800	7.350	-	70	310	12
Biomassa (Bagaço de Cana)	20	2.000 a 5.500	4.000	30%	90	190	24
Biomassa (Cavaco de Madeira)	20	4.000 a 8.000	6.000	30%	120	250	36
Biogás [11]	20	3.000 a 10.000	7.500	80%	500	300	24
Biogás (RSU) [12]	20	14.500 a 27.000	19.600	70%	600	750	36
Carvão Nacional	25	8.000 a 13.500	9.800	-	160	620	48
Eólica *Onshore*	20	3.200 a 5.500	4.500	38% - 47%	90	180	24
Eólica *Offshore*	20	9.800 a 18.600	12.250	32% - 62%	490	450	36
Fotovoltaica	20	3.000 a 5.000	4.000	30%	50	150	12

(9) Média calculada a partir dos valores mensais sazonalizados de cada fonte, utilizados no MDI. A expectativa de geração para fontes despacháveis (UTEs a Gás Natural, a Carvão, Hidrelétricas) é um resultado das simulações (não são premissas para o MDI).

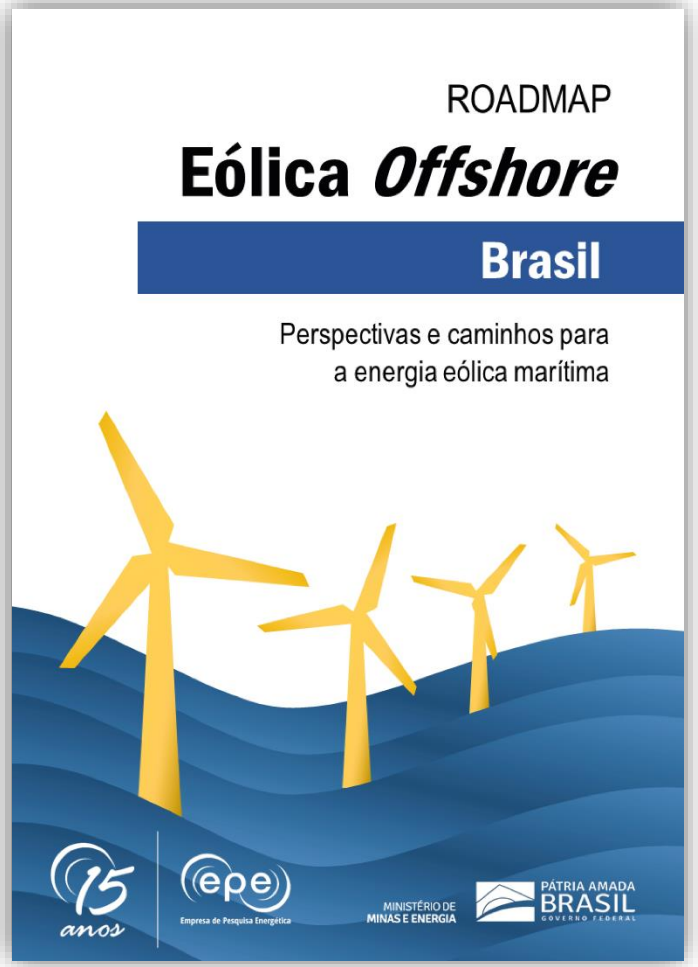


Energy contribution



bit.ly/inputsEOL-UFV

Brazilian Offshore Wind Roadmap



Available at: http://bit.ly/EOLoffshoreBR

Which actions should Brazil take in order to develop the offshore wind market?

- Identify possible barriers and challenges
- Point out some recommendations from the planner's perspective
- Better understand relevant aspects related to the source

It is not a proposal of incentives or policy for offshore wind

Roadmap content

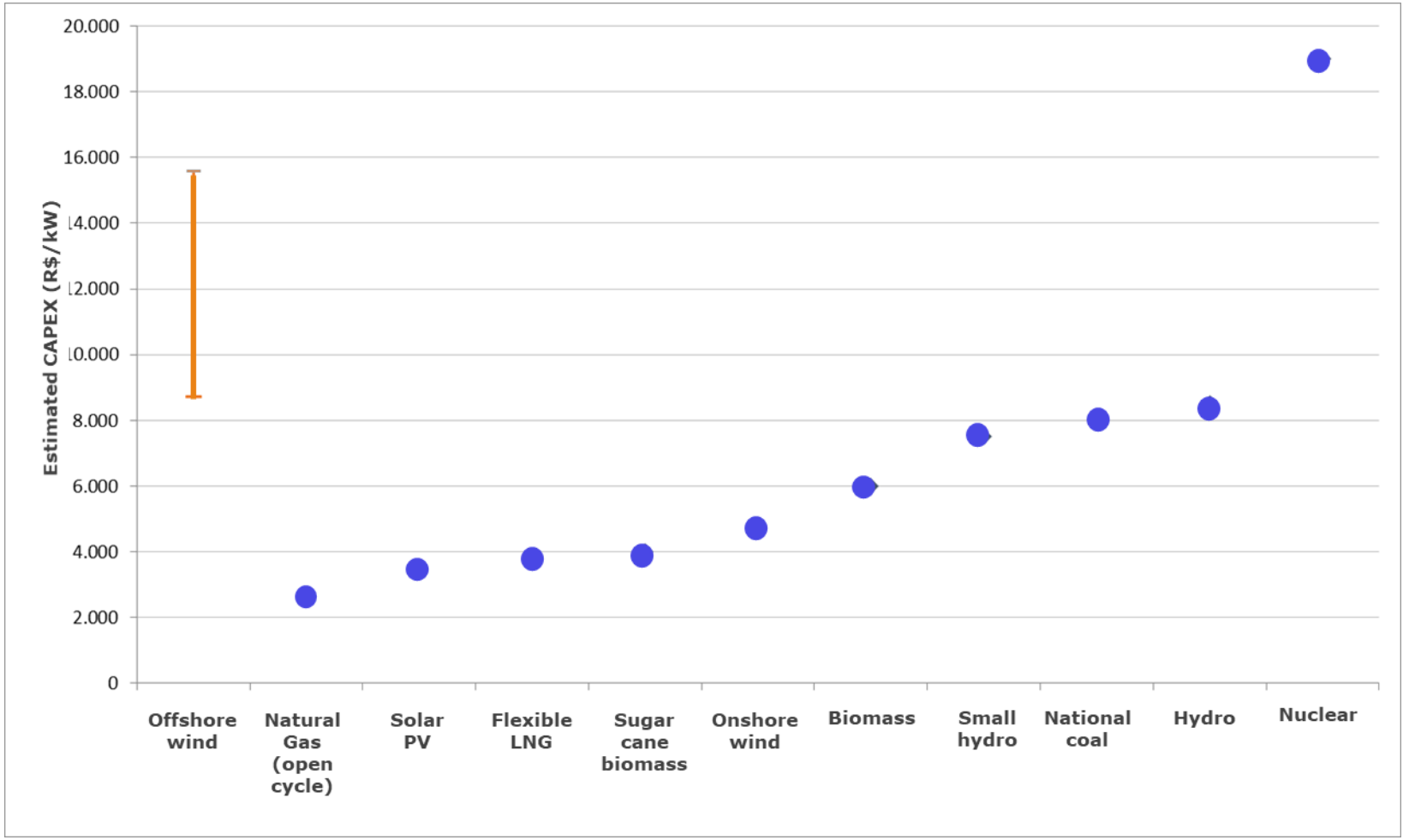
Offshore wind potential	Legal and regulatory aspects	Technological aspects and costs
Environmental aspects	Grid connection	Building a future for OW in Brazil
Challenges and Actions		

Interactive content available in

Portuguese

Englsih

Technological aspects and costs



- ✓ CAPEX reduction worldwide
- ✓ High dependence on ports infrastructure and logistics
- ✓ Higher foundation, installation and of transporting structures costs

Even with recent price drops, offshore wind remains not competitive when compared to other well stablished technologies in Brazil

Main challenges identified for Brazil

3 Post Roadmap discussions

International cooperation

Environmental and socioeconomic impacts

Infrastructure (ports, transmission, supply chain, PPAs)

Legal framework proposal

Investors' guide (2021)

Meetings with MME, ANEEL, ANP, SPU, Ministry of Infrastructure, IBAMA, and others

Study tours

International experience

Resource assessment

Ports infrastructure

Labor training

GWEC
GLOBAL WIND ENERGY COUNCIL

ESMAP
Energy Sector Management Assistance Program

WORLD BANK GROUP
THE WORLD BANK
IFC

Other Brazilian institutions' publications

DIÁRIO OFICIAL DA UNIÃO

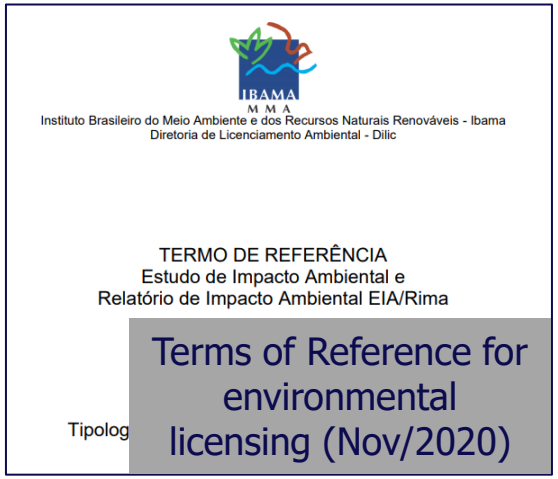
Publicado em: 23/10/2020 | Edição: 204 | Seção: 1 | Página: 420

...nomia/Secretaria Especial de Desestatização, Desinvestimento e Mercados/Secretaria de Coordenação e Governança do Patrimônio da União

INSTRUÇÃO NORMATIVA Nº 87, DE 1º DE SETEMBRO DE 2020

Dispõe sobre os... e contratos, ... processos de c... em condições ... propriedade da...

Conditions for State areas permission (Sep/2020)



IBAMA
MMA
Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - Ibama
Diretoria de Licenciamento Ambiental - Dilic

TERMO DE REFERÊNCIA
Estudo de Impacto Ambiental e
Relatório de Impacto Ambiental EIA/Rima

Tipolog...

Terms of Reference for environmental licensing (Nov/2020)

Minuta

PROJETO DE LEI Nº , DE 2021

Disciplina a outorga de autorizações para aproveitamento de potencial energético *offshore*.

O CONGRESSO NACIONAL decreta:

Art. ...União para geraç... como sobre as at...

Law proposal for offshore wind permitting process (Feb/2021)

NORMAS DA AUTORIDADE MARÍTIMA PARA AUXÍLIOS À NAVEGAÇÃO

NORMAM-17/DHN

Navy rules for offshore wind (Oct/2020)

Presidência da República
Secretaria-Geral
Subchefia para Assuntos Jurídicos

DECRETO Nº 10.544, DE 16 DE NOVEMBRO DE 2020

Aprova o X Plano Setorial para os Recursos do Mar.

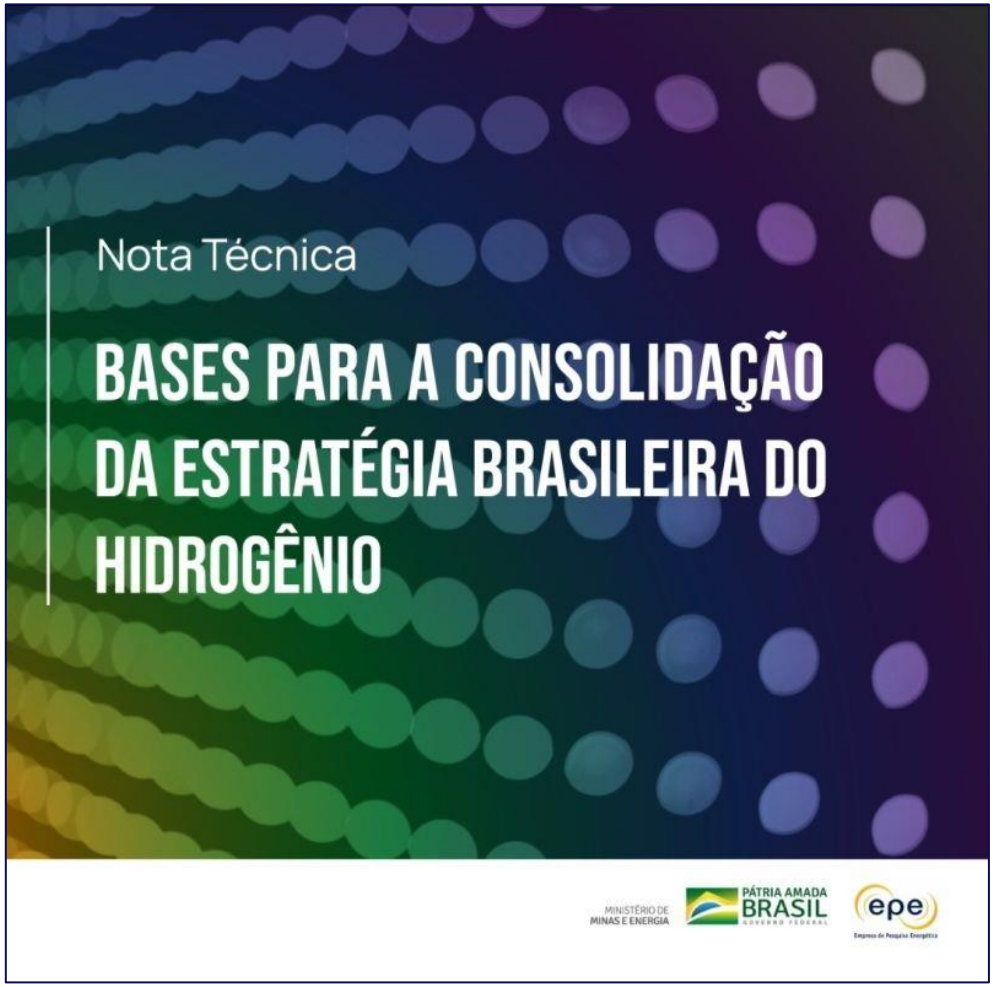
O PRESIDENTE DA REPÚBLICA, no uso das atribuições que lhe confere o art. 84, **caput**, incisos IV e VI, alínea "a", da Constituição, e tendo em vista o disposto na Lei nº 8.617, de 4 de janeiro de 1993,

DECRETA:

Art. 1º Fica aprovad... forma do Anexo, com o obj... setor no período de 2020 a...

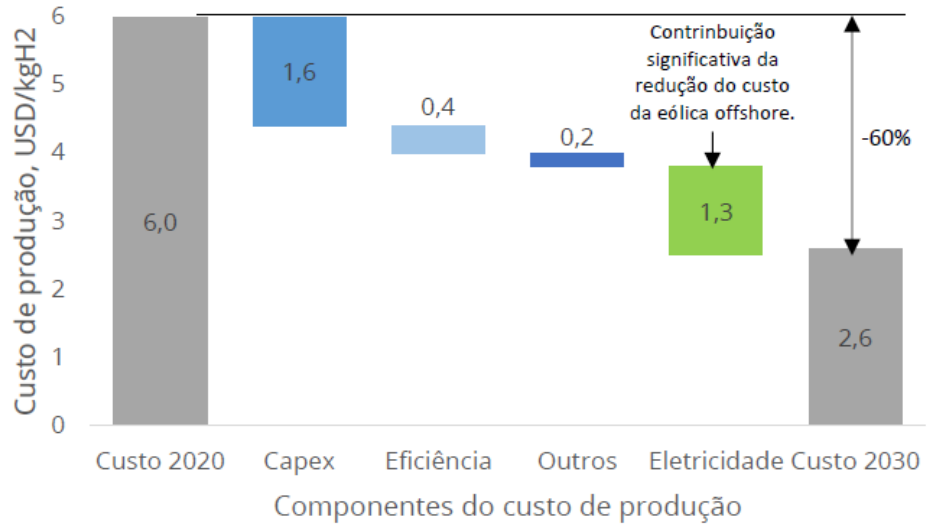
Ocean resources plan (Nov/2020)

Conditions for the Brazilian hydrogen strategy



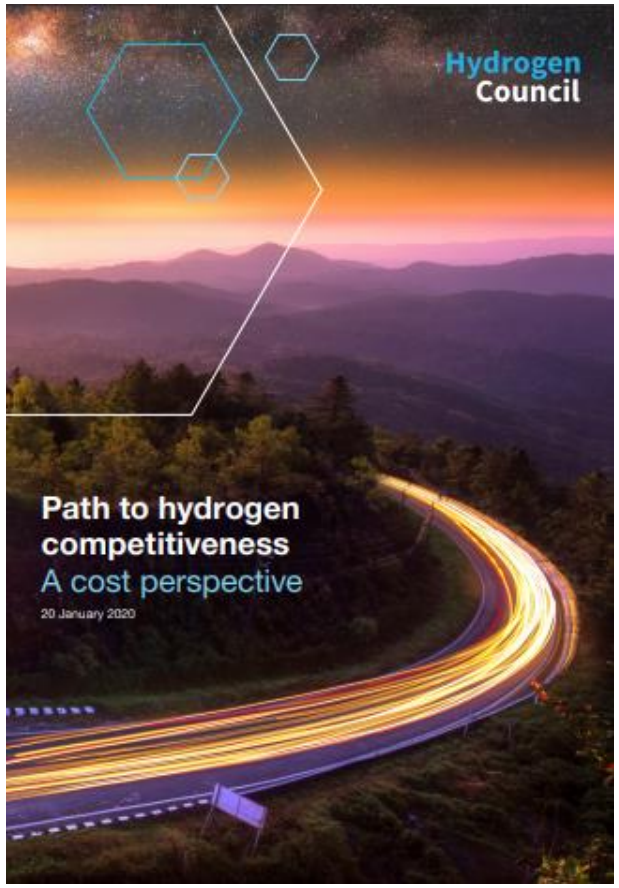
bit.ly/H2-EPE

- ✓ Published in February/2021
- ✓ "Rainbow" strategy
- ✓ Green H2: competitiveness of wind and solar
- ✓ Logistic and operational synergies with offshore wind



Adapted from Hydrogen Council (2020)

Green H2 from offshore wind



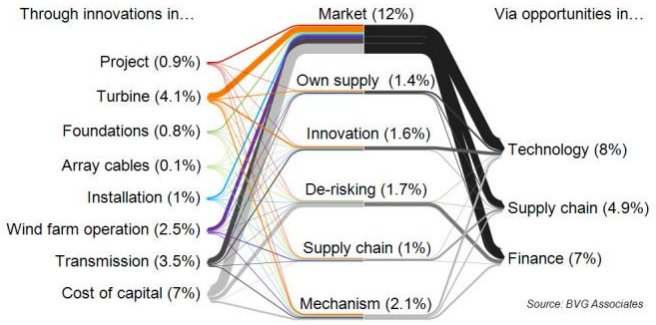
Recent subsidy-free offshore wind auctions in Europe *and bids close to or below USD 20 per megawatt hour (MWh) for solar photovoltaics (PV) and onshore wind plants* ***have been seen****.* ***This downward cost trajectory for renewables should continue****, with 14 times more solar capacity projected to become available in 2030 than was previously estimated. At the same time,* ***electrolysis capacity has also started to accelerate****, with at least 55 times more capacity expected by 2025 versus 2015,* ***which will result in a similar cost drop in electrolysis capex****.*

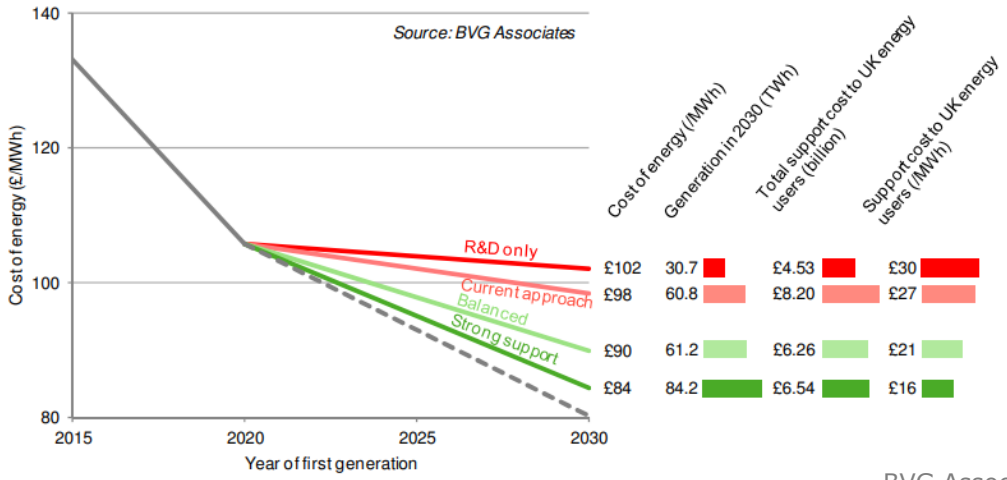
The cost of renewable hydrogen produced from offshore wind in Europe *starts at about USD 6 per kg in 2020. This rate* ***is expected to decline by about 60 per cent by 2030*** *to approximately USD 2.50 per kg, driven by scale in electrolyser manufacturing, larger systems, and lower-cost renewables.*

Hydrogen Council (2020)

4 How can offshore wind be competitive?

Cost reduction: a common goal





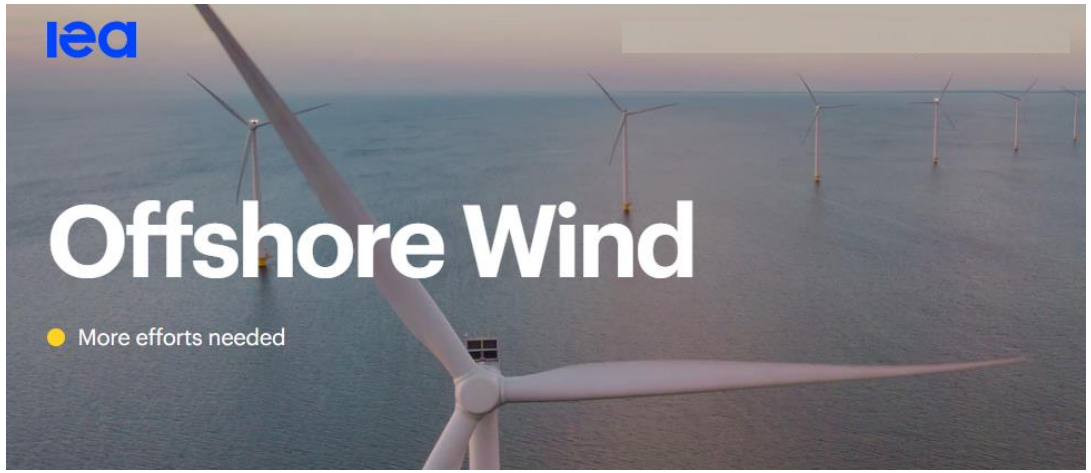
BVG Associates 2015

Regional cooperation and program management to attract supply chain investment and competition will further drive cost reduction.

As prices continue to drop, offshore wind is increasingly gaining traction in emerging markets

World Bank 2019

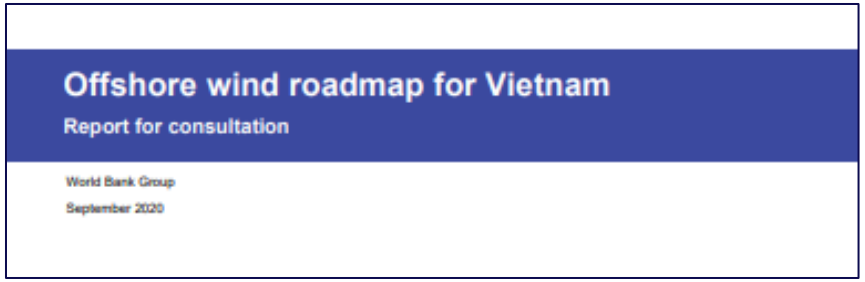
Cost reduction: a common goal

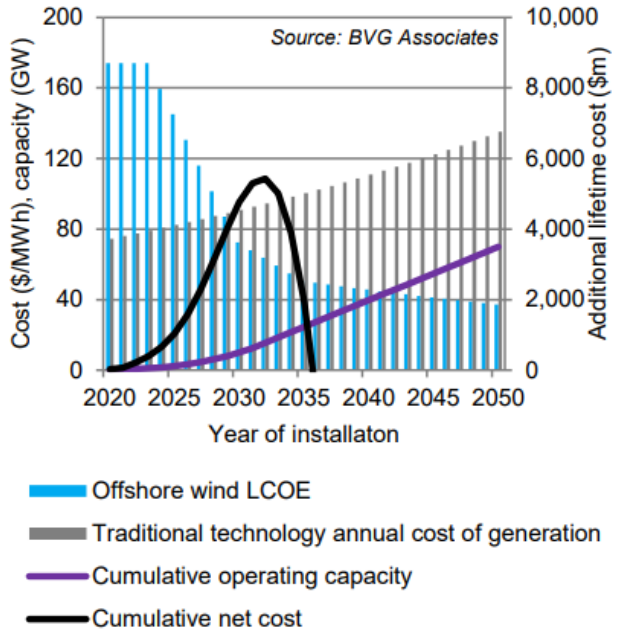


The cost reductions, technology improvements and rapid deployment achieved in Europe need to be extended to other regions.

Recent EU auction results indicate cost reductions of 45-50% in the next five years owing to economy-of-scale advantages, standardisation and clustering.

IEA 2021





World Bank Group (2020)

General recommendations the literature

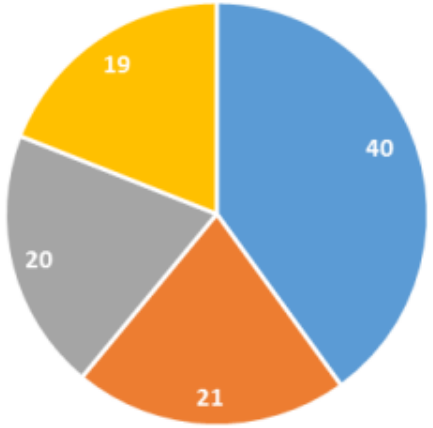
- ✓ Government commitments:
  - ✓ Installation targets
  - ✓ Clear guidance that protects the interests of the environment and communities
  - ✓ Support schemes (FiT or CfD)

Commitments must be aligned with the national energy policies

- ✓ Reduction in WACC due to reduction in risk
  - ✓ Requires stable, transparent and robust frameworks and regulations
- ✓ Competition, innovation and learning
- ✓ Improving technology and processes, increasing turbine size, and increasing farm size
- ✓ Speed of cost reduction depends on the growth rate

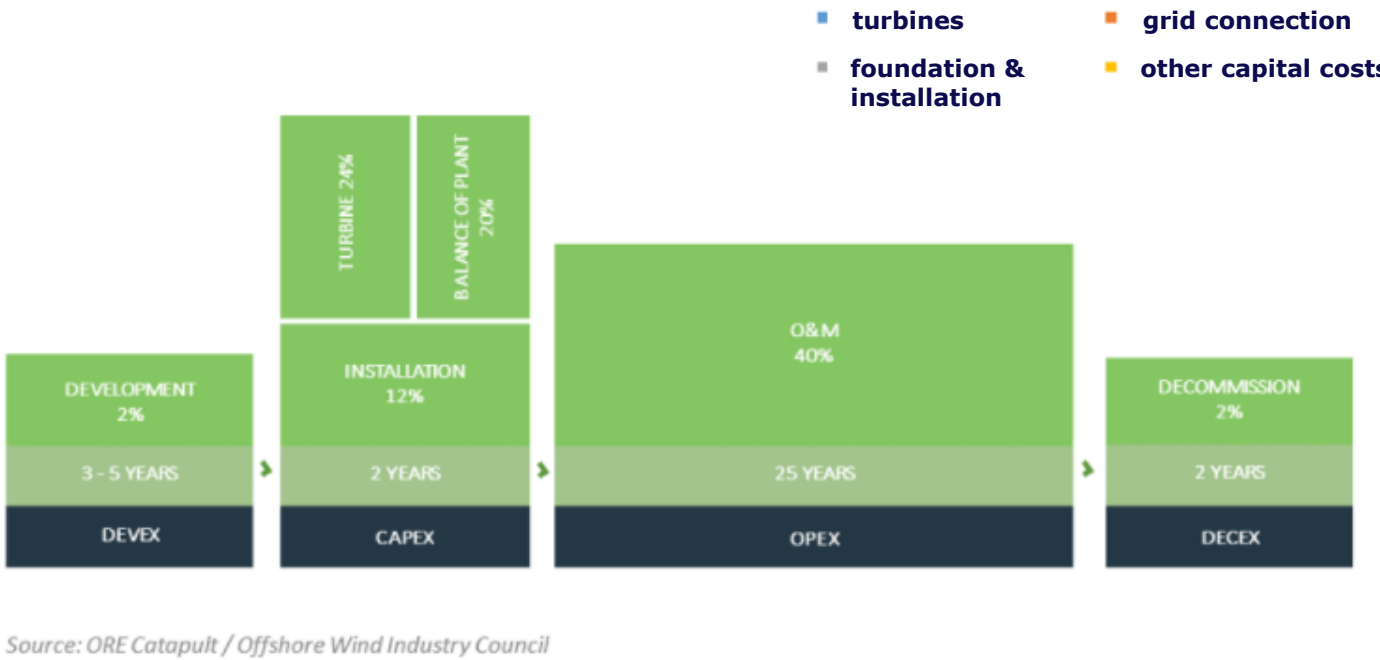
from Irena (2012)

Cost analysis in the Brazilian Roadmap



Brazilian Offshore Wind Roadmap

The competitiveness for the project development of this source are mainly associated with cost reduction in the turbines acquisition, foundations, and transmission assets.



Source: ORE Catapult / Offshore Wind Industry Council

Cost reduction in the Brazilian Roadmap

Scaling

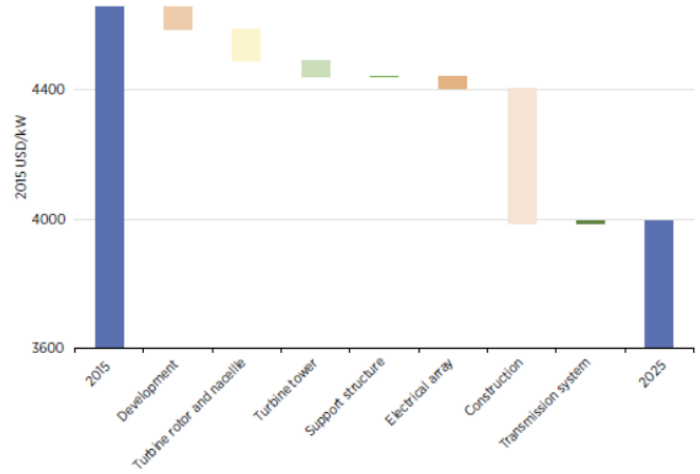
- ✓ Ships
- ✓ Labor
- ✓ Reducing installation time
- ✓ Pre-assembling at ports
- ✓ Know the sea bed
- ✓ Floating structures: more expensive, but costs are decreasing
- ✓ Modular blades

Grid connection

- ✓ Long distances: HVDC (less losses)
- ✓ More (small) substations

O&M

- ✓ Plan the visits
- ✓ Digitalization



Offshore cost reduction (Irena, 2016)

Other important factors for cost reduction

Capital costs

- ✓ Brazil has well-structured financial instruments for renewables
- ✓ Foreign investment can lower WACC
- ✓ Lower uncertainties = lower capital cost

Impact of policies

- ✓ Stable policies and legal framework can reduce uncertainties for investors
- ✓ International experience: goals and projects pipeline
- ✓ Long-term PPA's and bankability

4 Final remarks

Some takeaway messages

- ✓ Competitiveness is a key challenge for offshore wind in Brazil
- ✓ PNE 2050: how to manage abundance and diversity of energy resources, mainly renewables
- ✓ Power sector reform is currently underway in Brazil
- ✓ Remove barriers and create a regulatory framework to attract investments

From EWEA / PETR NOVAK

Thank you!

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