

SUCCESSFULLY NAVIGATING THE EARLY STAGES

OFFSHORE WIND PROJECTS



**BUREAU
VERITAS**



OCT 2021

AGENDA

01

**BUREAU VERITAS
INTRODUCTION**

03

**EARLY STAGES OF WIND
TOP 5 CHALLENGES**

05

**FOCUS TOPIC
ENERGY YIELD**

02

**EARLY STAGES OF WIND
SECTOR ANALYSIS**

04

**HOW CAN
BUREAU VERITAS ASSIST?**





BUREAU VERITAS

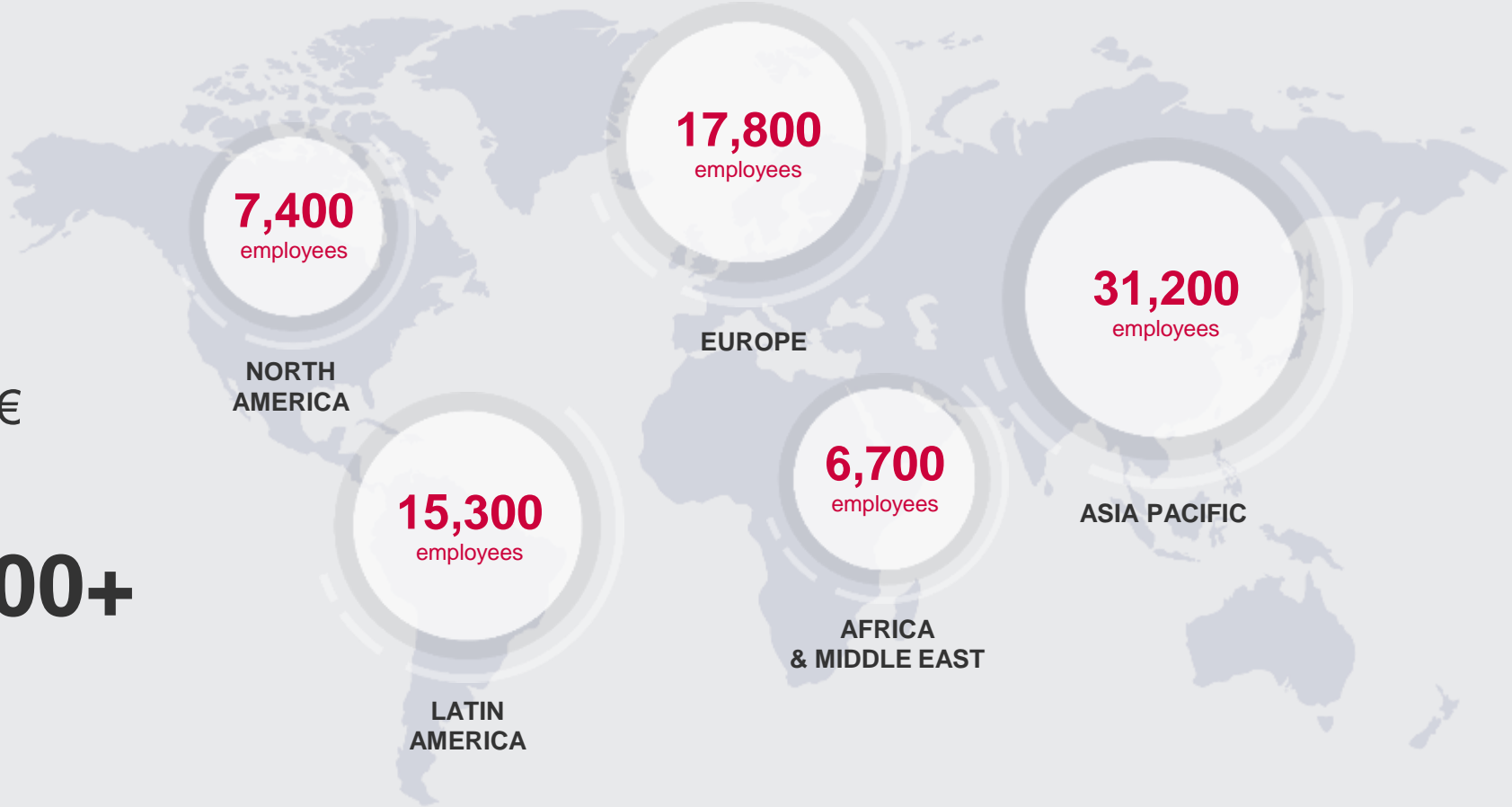
INTRODUCTION

Unique reach, unique scope

Unrivalled global presence and service portfolio

5.1 bn€
2019 revenue

78,000+
Employees



EXPERTISE



INDEPENDENCE



IMPARTIALITY



INTEGRITY

Testing, Inspection, Certification & Technical Services



Your trusted partner in the energy transition



In power since around

1905



7,500+

Power experts



18

Global power centers
of expertise



4,000+

Power clients



Power references in

100+

countries



A Global Energy and Renewables Leader

Key Figures



ONSHORE

120+

GW installed capacity

4500+

Onshore wind projects globally

15+

Years experience



OFFSHORE

25+

GW installed capacity

90+

Offshore wind projects globally

12+

Years experience



SOLAR

30+

GW installed capacity

300+

Solar utility-scale projects globally

15+

Years experience



Track record in power

Our customers



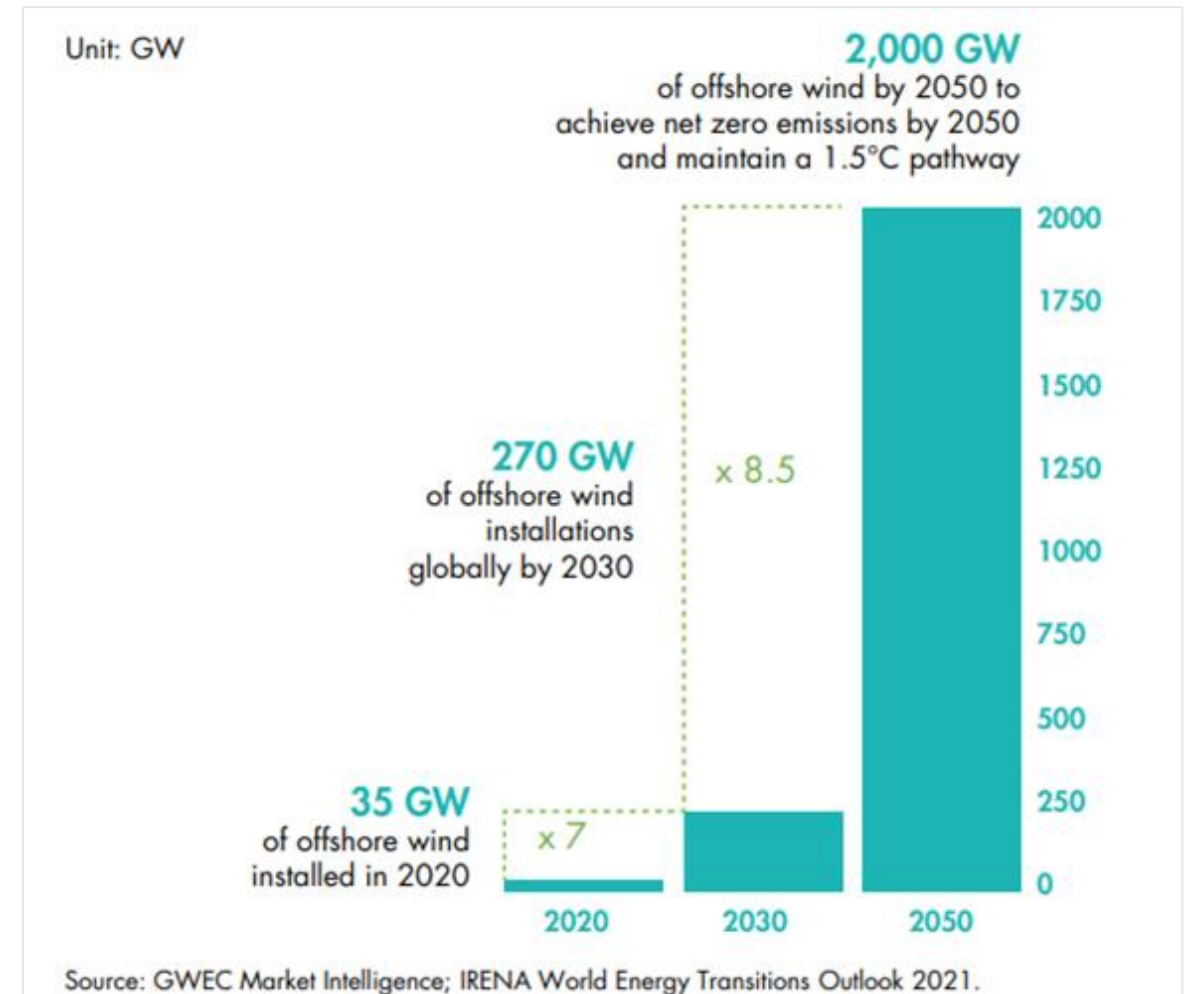


**EARLY STAGES
OF WIND:**

**SECTOR
ANALYSIS**

Early Stages of Wind Projects Sector

- IRENA targets **OF 2000GW by 2050** to reach carbon neutrality ambition.
- With 35GW installed by 2020, unprecedented industry effort on **new** (and relatively quick) **projects development.**
- **Paramount importance** and relatively low sector experience for **early stages of project development.**





**EARLY STAGES
OF WIND:**

**TOP 5
CHALLENGES**



Early Stages OF Wind Projects **TOP 5 CHALLENGES**

01

METEOCEAN CONDITIONS

- Wind, waves and currents characterization.
- As key input for feasibility studies.
- But also towards wind turbine configuration definition including ad-hoc designs (e.g. substructure).
- Importance of appropriate measurement campaign and later assessment. Utilization of nearby data.
- Impact on business case.

Example: 1% of AEP might represent >2% impact in IRR





Early Stages OF Wind Projects

TOP 5 CHALLENGES

02

GEOGRAPHICAL & GEOTECHNICAL CONDITIONS

- Seabed characterization.
- Including morphology and mobility, scour.
- Towards substructure ad-hoc design and appropriate construction requirements.
- Appropriate definition, follow-up and data processing of characterization campaign (first geogr, then geohec)





Early Stages OF Wind Projects

TOP 5 CHALLENGES

03

POWER GRID

- Developer-owned, TSO-owned or even external-owned.
- HVAC (more traditional, up to 100m) or HVDC technologies.
- Different cables in floating (more flexible) than in bottom-fixed.
- Sector experiencing unexpected costs due to cables failures and delays in planning.





Early Stages OF Wind Projects TOP 5 CHALLENGES

04

ENVIRONMENTAL STUDIES

- Environmental Impact Assessment is key project activator.
- Typical mandatory requirement towards permitting.
- But also enabler for international financing.
- High dependency on local requirements.
- Requires deep understanding of local flora and fauna.
- Local + international requirements (Equator Principles).
Example: >13GW currently in Japan in EIA process



Early Stages OF Wind Projects

TOP 5 CHALLENGES

05

PERMITTING

- Local knowledge of process and regulations.
- Importance of timing.
- Current bottleneck in many APAC countries (South Korea, Japan more than 10y), but also in other regions.

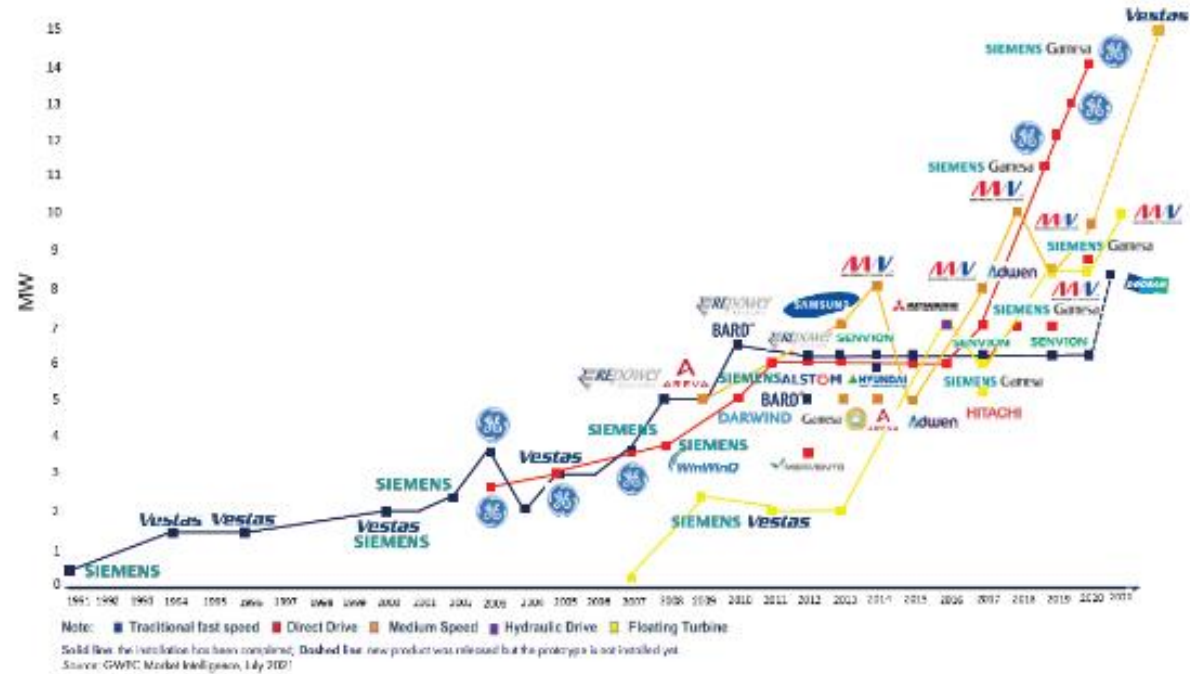


Early Stages OF Wind Projects TOP 5 CHALLENGES

5+1

PRODUCTS / TECHNOLOGIES / SUPPLY CHAIN

- Quick evolution of new products -> hockey stick curve in WT size.
- “Quick” localization of production (2nd, 3rd suppliers to minimize cost and fulfill local content) but potential pressure over Quality.





Early Stages OF Wind Projects TOP 5 CHALLENGES

5+1 PRODUCTS / TECHNOLOGIES / SUPPLY CHAIN

- Offshore wind dependency on steel, some suppliers recently including delivery clauses linked to steel index price.
- Logistics: vessels availability(*) and ports infrastructure.
- Shortage of components due to Covid-19 (**)
- Maximization of project life to increase IRR.

(*) Example: 2020 commissioning in China “limited” to 3GW due to vessels availability.

(**) Example: No new offshore projects were commissioned in 2020 in Taiwan and Vietnam due to Covid-19.





**HOW CAN
BUREAU VERITAS
ASSIST?**

How can Bureau Veritas assist?

Services Portfolio

BUREAU VERITAS in whole lifecycle of any ENERGY RENEWABLE ASSETS



CERTIFICATION

Component, product, project, management system...



TECHNICAL ADVISORY

Due Diligence, lender services, independent engineering, M&A...



ASSET OPERATION & MANAGEMENT

Inspection, performance analysis, asset integrity, end-of-warranty due diligence, cybersecurity assessment...



DEVELOPMENT

Feasibility studies, energy yield, environmental studies, geotechnical studies, grid connection, permitting, design review...



OWNERS ENGINEERING

Engineering, Procurement and Construction coordination

How can Bureau Veritas assist?

Value Proposition

○ DURING THE EARLY STAGES OF DEVELOPMENT IT IS USUAL THAT DEVELOPER / FINAL OWNER COUNTS WITH EXTERNAL SUPPORT...

- ...to understand the local constraints
- ...to identify and characterize the most suitable location
- ...to cover potential internal gaps
- ...to validate assumptions and mature business case
- ...to provide additional confidence towards lenders
- etc

○ IMPORTANT TO COUNT WITH EXTERNAL PARTNER WITH...

- ...global experience and local presence
- ...experience in whole value chain (hypothesis and results might influence later)
- ...proven expertise



How Bureau Veritas can assist?

Bureau Veritas Flexible Approach

○ STANDARD BUT ALSO AD-HOC SERVICES AS PER SPECIFIC CLIENT NEEDS, Examples for Early Stages:

- Meteocean analysis (wind, waves and current, offshore & nearshore/coastal)
- Site assessments (Energy Yield, Wind Turbine Suitability, micrositing / layout optimization)
- Geotechnical & geographical studies
- Grid connection studies
- Regulatory support
- Environmental (and Social) Impact Assessment (EIA/ESIA). Including but not limited to preliminary desk top studies (e.g. natural reserves, special human and biological activities, oceanographic and underwater environment, social aspects, regulation frame)
- Installation Vessels support
- Marine Warranty Survey
- Cybersecurity (Project based security roadmap, Concept design review, Threat modeling)
- Risk Assessments
- Others, as client discussion





Bureau Veritas Example on Early Stages Meteocean Studies / Geotechnical Studies

○ SCOPE

- Support on the selection of supplier for measurement campaign
- Attend measurement campaign to assure quality and reliability of the measurements including verification on:
 - test and calibration methods
 - equipment
 - measurement traceability
 - assurance of the quality of test and calibration results
 - reporting of the results;
- Comparison of measured data with adjacent or similar sites
- Definition of inputs and recommendations for the design, site preparation and construction

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Secure identification of site conditions

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Bureau Veritas Example on Early Stages Marine Warranty Survey (MWS)



○ SCOPE

- 3rd Party verification service to de-risk marine operations
- Certified by the Society of Offshore Marine Warranty Surveyors (SOMWS)
- Focuses on transportation and installation aspects
- Satisfies the warranty clause on insurance policies
- Combined approach MWS and certification-IVB-CVA
- Technical documentation review
- Attendance of the loadout, seafastening, transportation and installation of major components and structures
- Review of cable spooling and installation operations including lay, hook up and pull-in at termination





Bureau Veritas Example on Early Stages Installation Vessels Support

SCOPE

- Study and definition of operational strategies from the beginning: downtime assessment, tow masters, seafastening, client representation, anchor handling and kedging, etc
- Identification and planning of upgrades and modifications from the very beginning related to stability and hydrodynamics analysis, propulsion and seakeeping, dynamic positioning, mission-specific equipment, etc
- Safety and Compliance through verification and approval, engineering compliant solutions, HSE consultancy, risks assessments, etc

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Cost-effective solutions towards safety and operability enhancement of installation vessels

”

Offshore wind Selected references



Maryland USA

- 270 MW

BV ROLE:

- Project certification (CVA)
- Project management
- Manufacturing surveillance
- Installation supervision



Fecamp France

- 498 MW

BV ROLE:

- Project certification (acc. to IEC 61400-22)
- HSE protection coordination
- Regulatory control
- Supply chain quality management



East Anglia I UK

- 714 MW (102 x 7 MW SWT-7.0 Siemens)

BV ROLE:

- Project certification (acc. to IEC 61400-22) of offshore substation



Borkum Riffgrund II Germany

- 450 MW (56 x 8 MW V164-8.0 MHI Vestas)

BV ROLE:

- Project certification (acc. to IEC 61400 and BSH); Dual process
- wind turbine manufacturing surveillance, manufacturing surveillance of suction bucket jackets (in Poland), design evaluation of offshore substation



Jiangsu Dafeng II China

- 300 MW (75 x 4.0 MW EN4.0-136 Envision)

BV ROLE:

- Owner's representative
- Project management support
- Construction supervision
- Cost & schedule management
- On-site HSE + Quality control, sub-contractor management
- Supply chain quality management



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