Digital Solutions

Real-World Digital Solutions for Offshore Wind Competitiveness

September 2025 – Joost Janssen & Kayo Vanderheggen

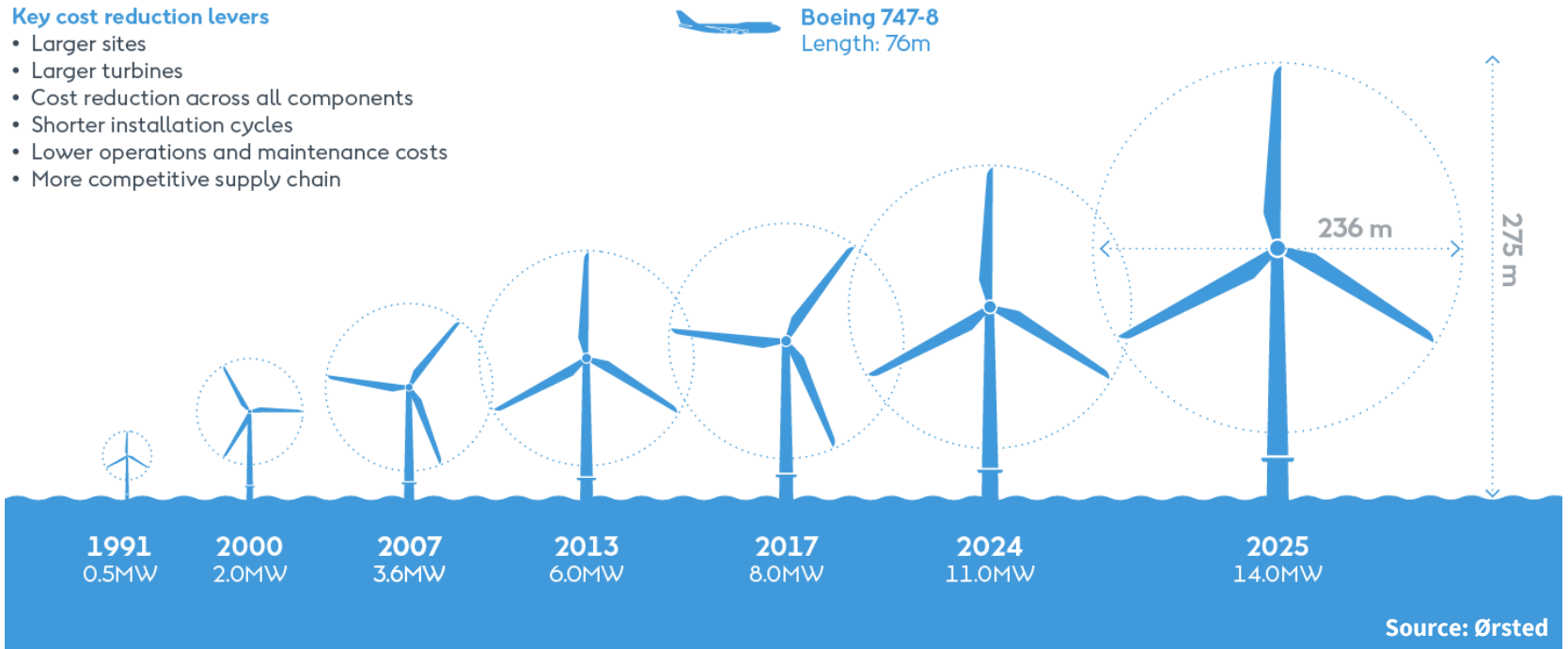
GustoMSC | NOV

Offshore Wind evolutions over time…

Developments in Offshore Fixed Wind

Installation Equipment and Wind Turbine Evolutions

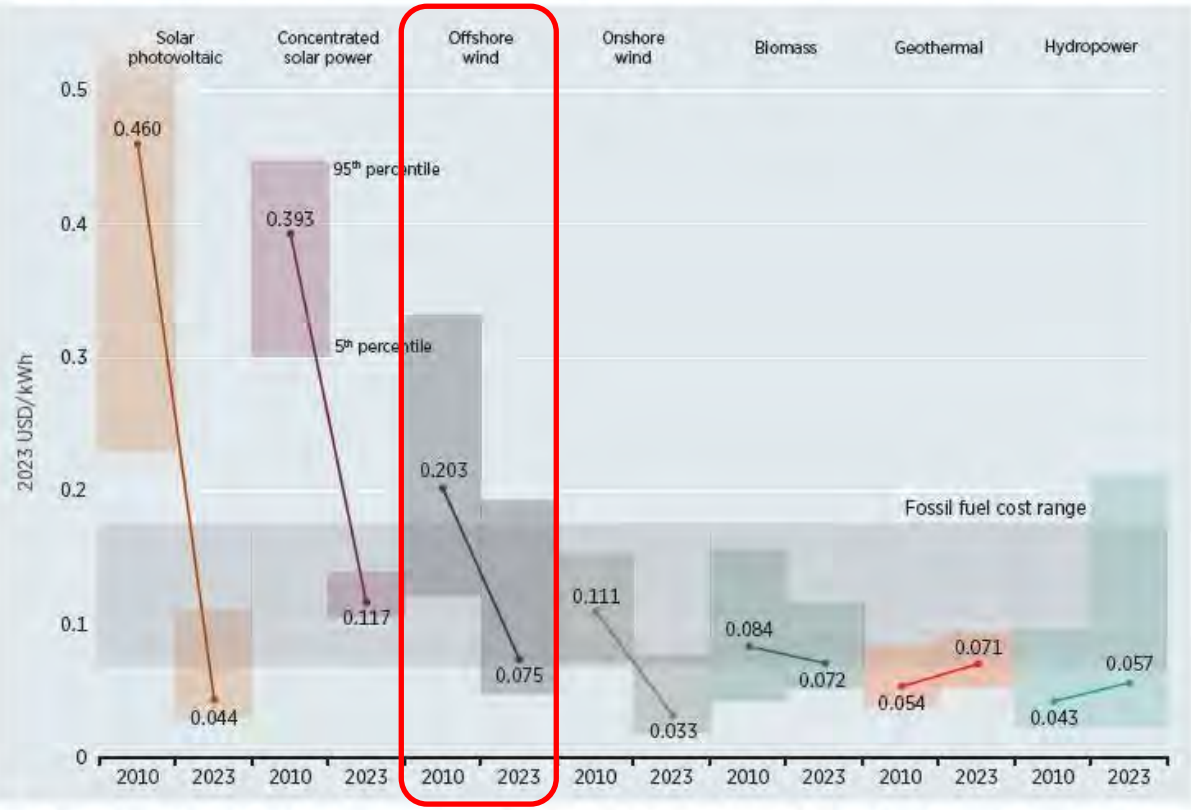
- Installation equipment: From multi-purpose jack-ups to dedicated WTIVs
- Wind Turbines: From 2 – 5 MW to 12 – 18 MW



Developments in Offshore Fixed Wind

Offshore Wind energy costs significantly reduced, but…

Figure S4 Global LCOE from newly-commissioned, utility-scale renewable power technologies, 2010 and 2023



Note: These data are for the year of commissioning. The thick lines are the global weighted average LCOE value derived from the individual plants commissioned in each year. The LCOE is calculated with project-specific installed costs and capacity factors, while the other assumptions, including weighted average cost of capital (WACC), are detailed in Annex I. The grey band represents the fossil fuel-fired power generation cost in 2023, while the bands for each technology and year represent the 5th and 95th percentile bands for renewable projects.

The **levelized cost of energy (LCOE)** is a metric used to assess the **average cost per unit of electricity** generated over the entire lifespan of an energy project. It is calculated by dividing the total lifecycle cost of a project by its total energy production over its lifetime, helping to determine the **viability and competitiveness** of electricity generation projects. LCOE is essential for comparing different methods of energy production on a consistent basis. eFinancialModels +3

Source: Irena

Developments in Offshore Fixed Wind

However, challenges in recent years

RENEWABLE ENERGY

Report: Offshore wind growth is 'slowing down'

McKinsey says technologies with the fastest expected growth are the ones most vulnerable to bottlenecks, such as wind and solar.

Ariana Hurtado Related To: McKinsey & Co. • Dec. 15, 2023 • 7 min read

1. Wind energy projects face lengthy delays for grid connection

Hundreds of wind energy projects are having to wait years for permits to connect to the power grid in Europe – and the backlog is slowing the move t

Germany's 2.5 GW Offshore Wind Tender Fails to Attract Bids

port by WindEurope.

PLANNING & PERMITTING

August 6, 2025, by Adnan Memija

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ecuring access to the electricity gr

ng renewables at scale.

too slowly to absorb more capacity

in many countries, some projects

o attract any bids, leading the German Offshore Wind erhaul of the auction design.

overed two sites, N-10.1 and N-10.2. A total capacity of 2.5 o supply nearly all households in Cologne, according to SH).

g companies with too many risks. However, the legal for investments in offshore wind projects in Germany. The ond their control without any protection," said **Stefan**

is currently not attractive to investors, resulting in missed y and across Europe. He said that the industry would with the right regulatory framework.

Trump administration cancels plans for new wind energy projects in federal waters

Nation Jul 31, 2025 1:46 PM EDT

The Trump administration is canceling plans to use large areas of federal waters for new offshore wind development, the latest step to suppress the industry in the United States.

More than 3.5 million acres had been designated wind energy areas, the offshore locations deemed most suitable for wind energy development. The Bureau of Ocean Energy Management is now rescinding all designated wind energy areas in federal waters, announcing on Wednesday an end to setting aside large areas for "speculative wind development."

The supply chain limitations facing the wind turbine market

The fragmentation of the wind turbine supply chain poses an existentia threat to global wind power expansion.

Claire Jenns | April 24, 2025

in the global energy mix, and supply in tandem.

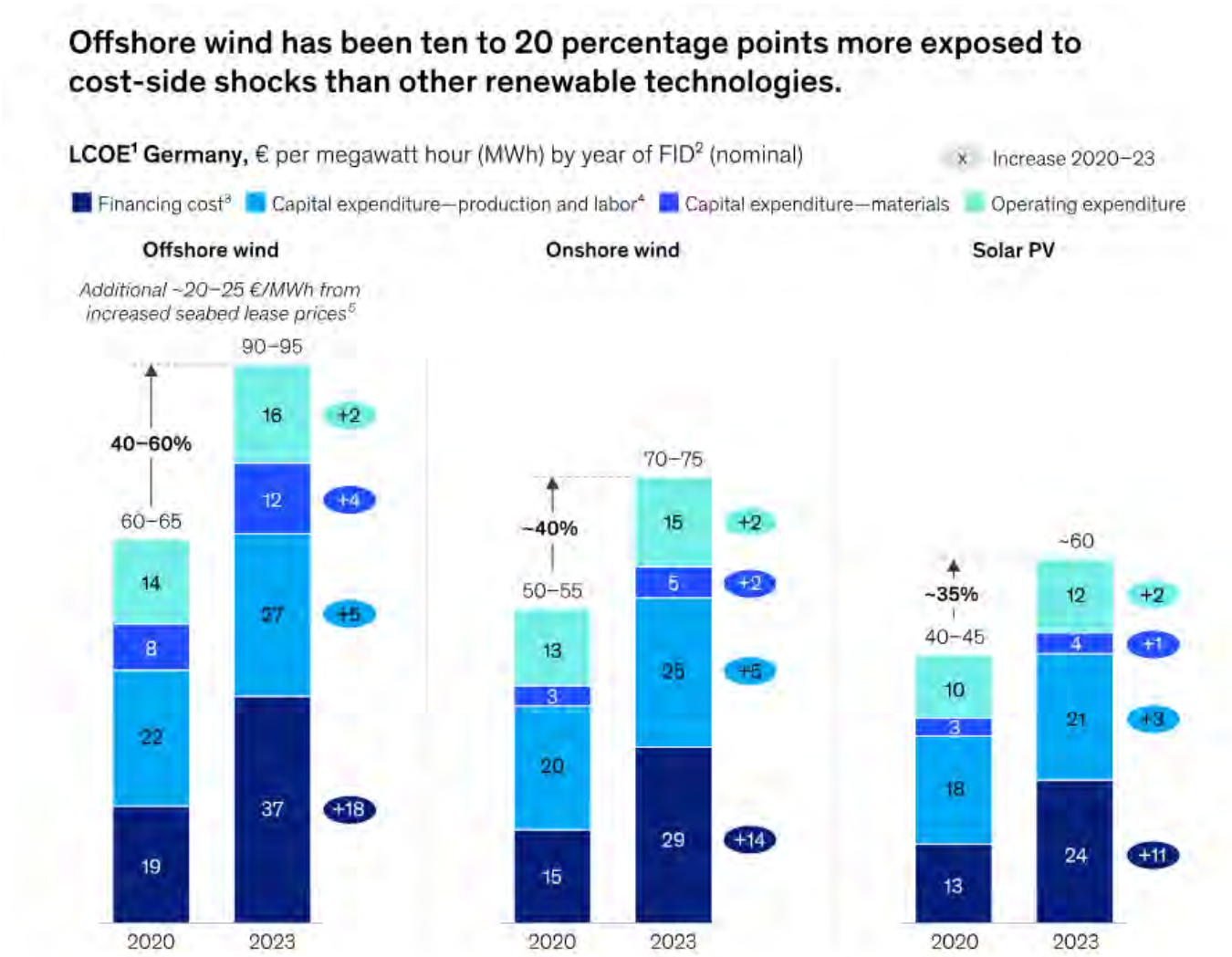
elled into the technology as part of the ies, including oil and gas giants such as o diversify their portfolios.

Offshore Wind Held Up By The Inflation Storm

Vattenfall have suspended development of their 1.4 GW Norfolk Boreas wind farm, in a major blow for the offshore wind industry. They cited inflation driving up costs by 40% within a year. Just one year ago, Vattenfall was awarded a record-low Contract-for-Difference (CfD) for the wind farm at £37.35 /MWh, which is £51.10 /MWh in today's money. After more than a decade of being in development, the project is now halted – although not cancelled – at a cost of £415m to Vattenfall. The project was due to use 100 of Siemens Gamesa's massive 14 MW turbines (with rotors nearly a quarter of a kilometre in diameter). Norfolk Boreas is part of a wind farm cluster developed by Vattenfall, which leased seabed rights from the Crown Estate in 2010. The adjacent 2.8 GW Norfolk Vanguard wind farm is still being developed, having received approval in February 2022.

Developments in Offshore Fixed Wind

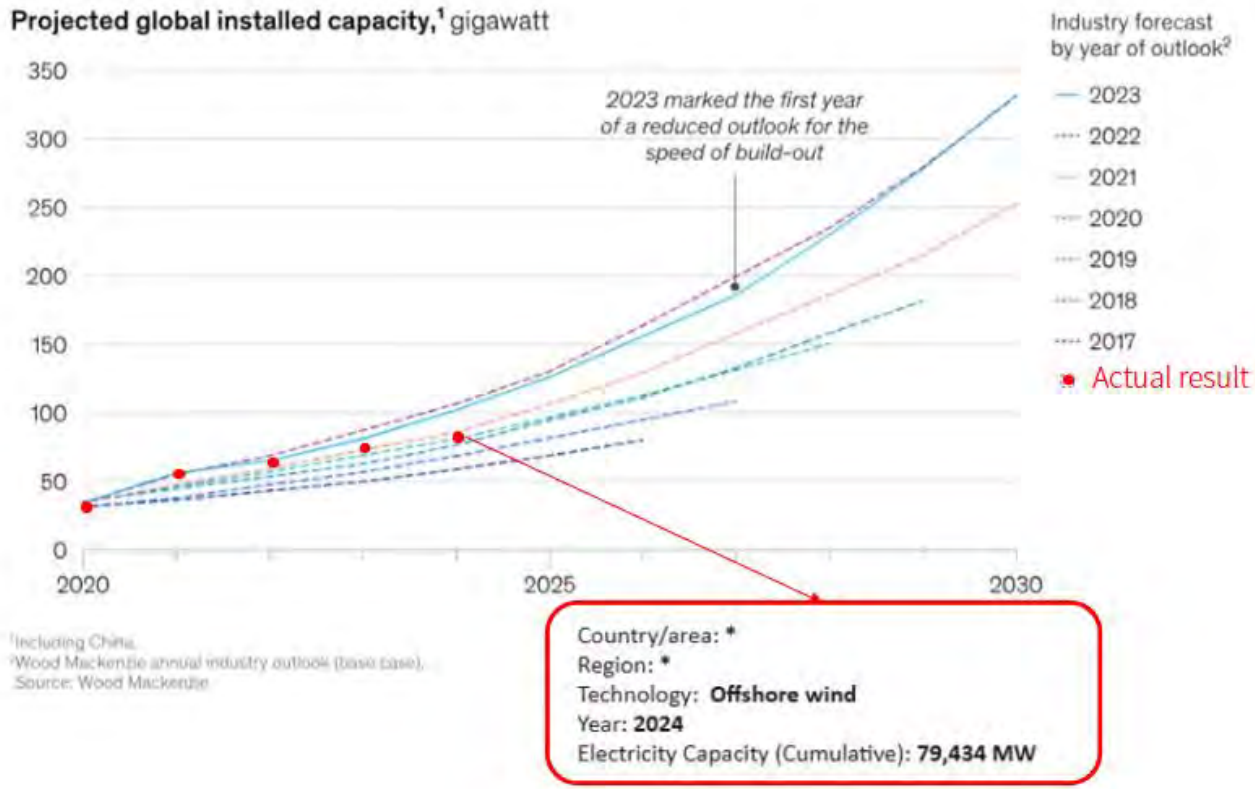
Increased LCOE for Offshore Wind in recent years



Source: McKinsey

Developments in Offshore Fixed Wind

Reductions in projected global installed capacity



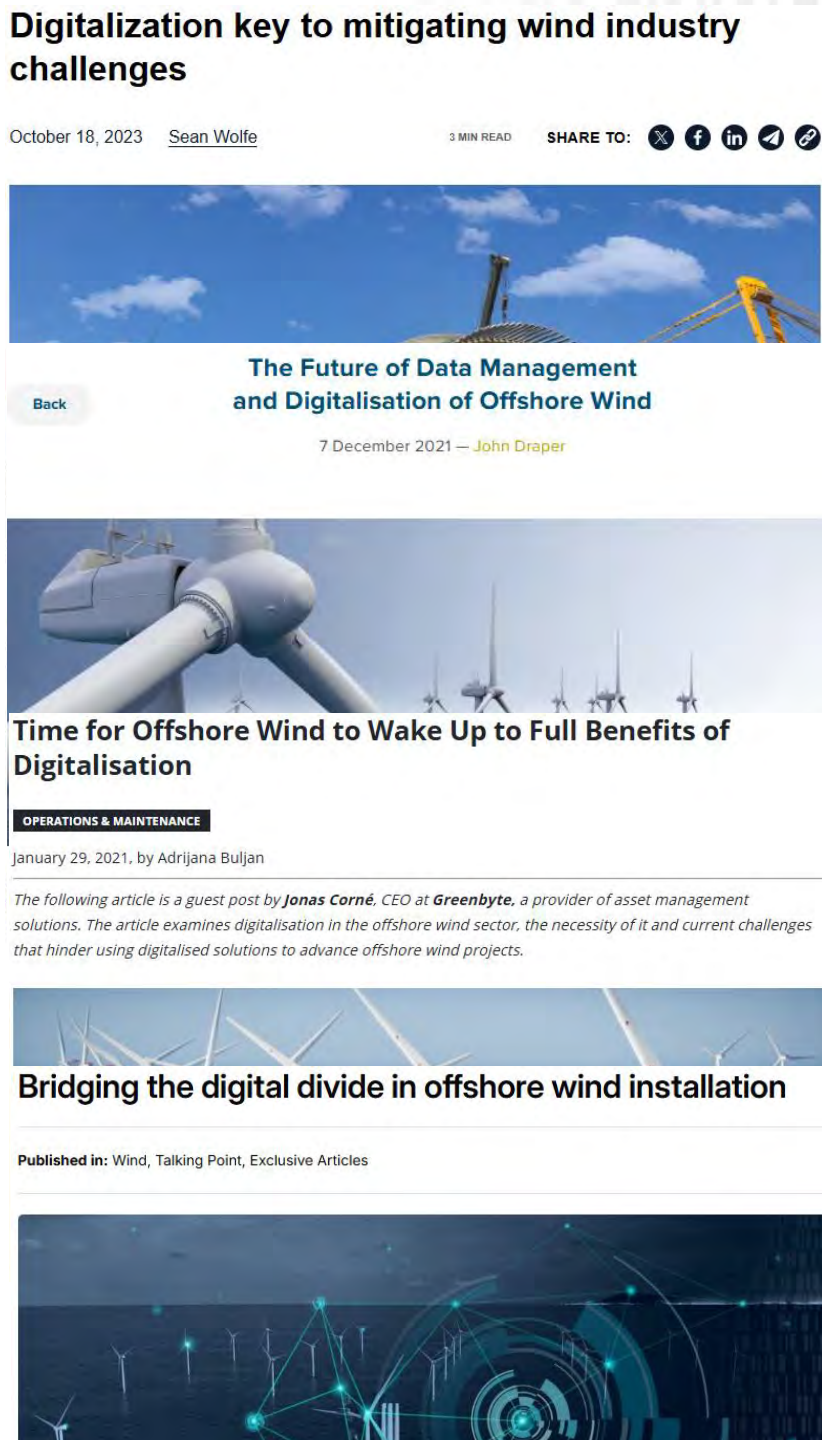
Source: McKinsey

Developments in Offshore Fixed Wind

Digitization need to stay competitive

Reduce LCOE for Offshore Wind through Digitization

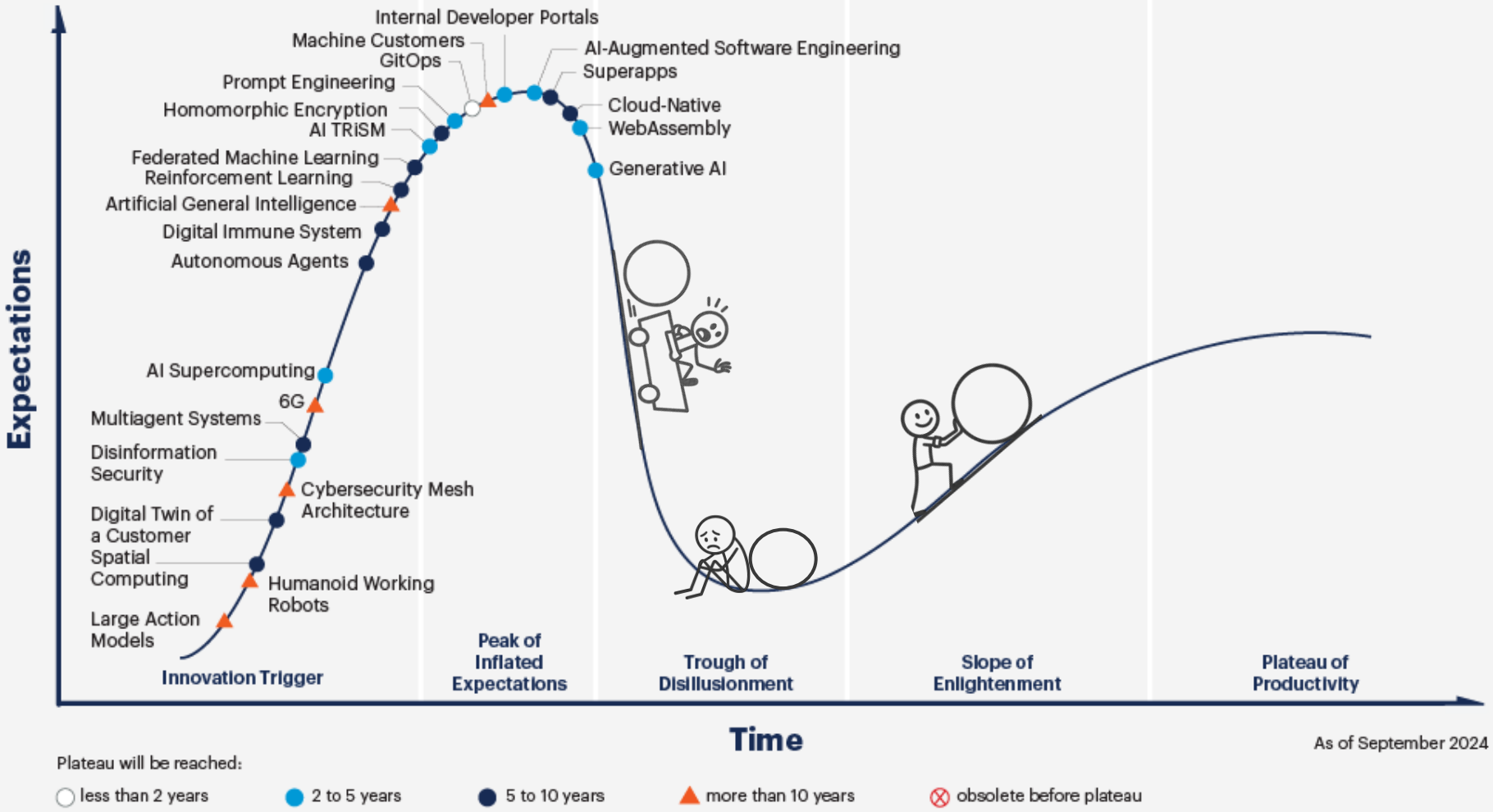
- **Improve Operational Efficiency**
  - Digital monitoring to identify inefficiencies; Task automations; Enhance collaboration through real-time data; Data-informed decision making
- **Improve Safety of Operations**
  - Automation for fewer errors and incidents; Better tracking of equipment status lowers safety risks/incidents
- **Improve Equipment uptime**
  - Trouble shooting remotely and data-supported for quicker resolution; Condition monitoring for pro-active maintenance and reduce time-based inspections
- **Improve Equipment lifetime**
  - Identify inefficient use from data; Identify and prevent overuse; Understand usage sensitivities on lifetime



Offshore wind must cut costs significantly to remain competitive with other (renewable) energy sources.

Digital Solutions
Moving beyond the buzz …

Hype Cycle for Emerging Technologies, 2024



Source: Gartner

Gartner®

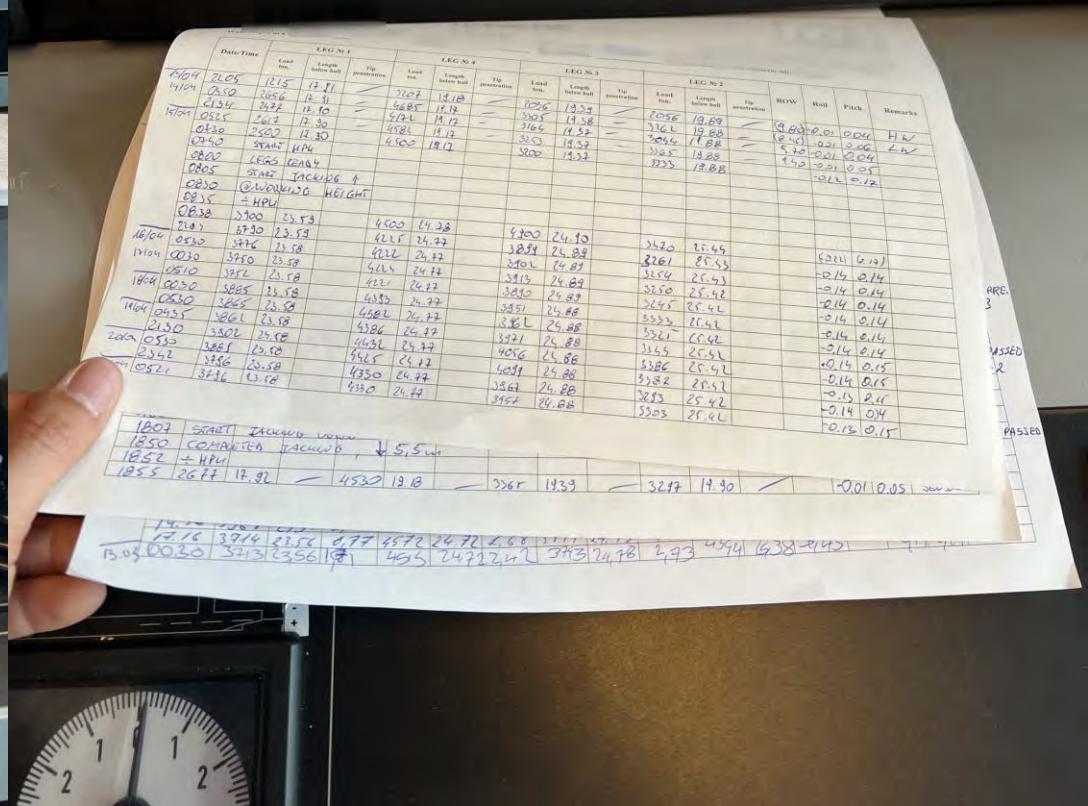
An example of a disillusion:

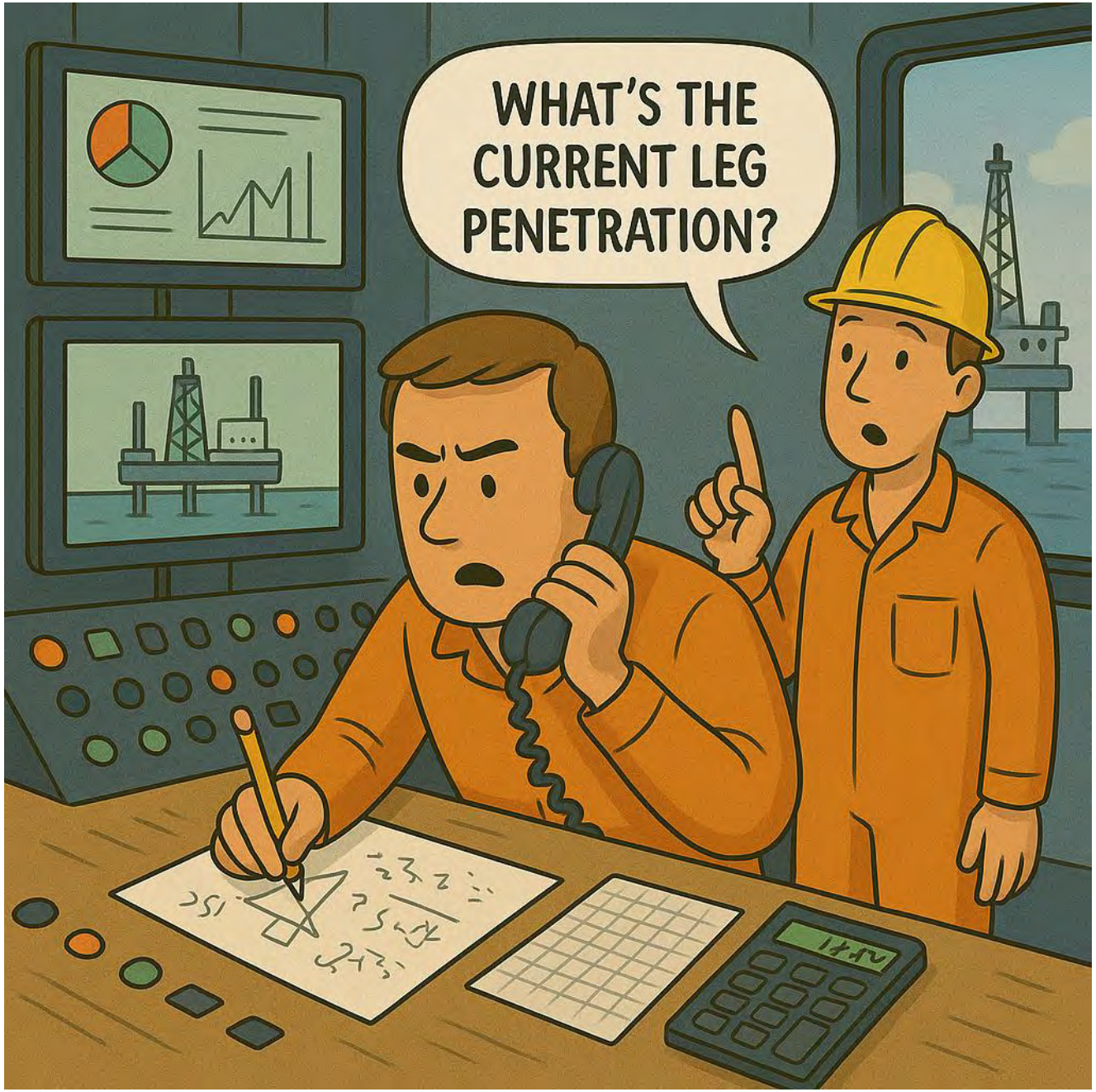
“I can’t believe that in 2025 I am still using scrap paper and estimated data to jack a 600 MEUR vessel.”

Contractor
Crew


GustoMSC
DO NOT OPERATE LOCKED OUT
Do not operate
VESSEL ANGLE TRANSVERSE
VESSEL ANGLE LONGITUDINAL
LEG PS AFT
PIN IN
PIN OUT
YOKE UP
YOKE DOWN
PISTON DOWN
menu
BRILLIANCE
ON/OFF


SELECT
OFF
SERVO PUMP 2
SERVO PUMP 1
FLUSH PUMP
NOT RFU
HPU PUMP 5 + 6
HPU PUMP 3 + 4
HPU PUMP 1 + 2
20.4 ° C
HPU FORE
HPU AFT
HOME
PREVIOUS
LEG SB FORE
LEG PS FORE
menu
BRILLIANCE





Operator Support System

Events – digital reporting and compliance

Challenges:

- Manual data collection
- Low digital integration
- Limited automation

Solution:
The **Events Application** automates process tracking and reporting, captures real-time offshore equipment data, reduces crew admin workload, and delivers timely, accurate decision-making insights.

Impact:
Automation of reporting and compliance reduces time and effort. While the full impact for this application remains to be proven, even a 1% efficiency gain translates to €1M annual savings per modern unit.