

Leading the way with renewable solutions

Anders Nielsen

Chief Technology Officer

AGENDA

- 1 Vestas' current technology portfolio
- 2 Modular foundation
- 3 Onshore and offshore synergies
- 4 Future solutions



54+ GW
installed
since 2000

**2 MW
Platform**



51+ GW
installed
since 2010

**4 MW
Platform**



5+ GW
installed
since 2014

**9 MW
Platform**



5+ GW
Firm Order
Intake

Modular architecture

EnVentus™
Proven System
Designs



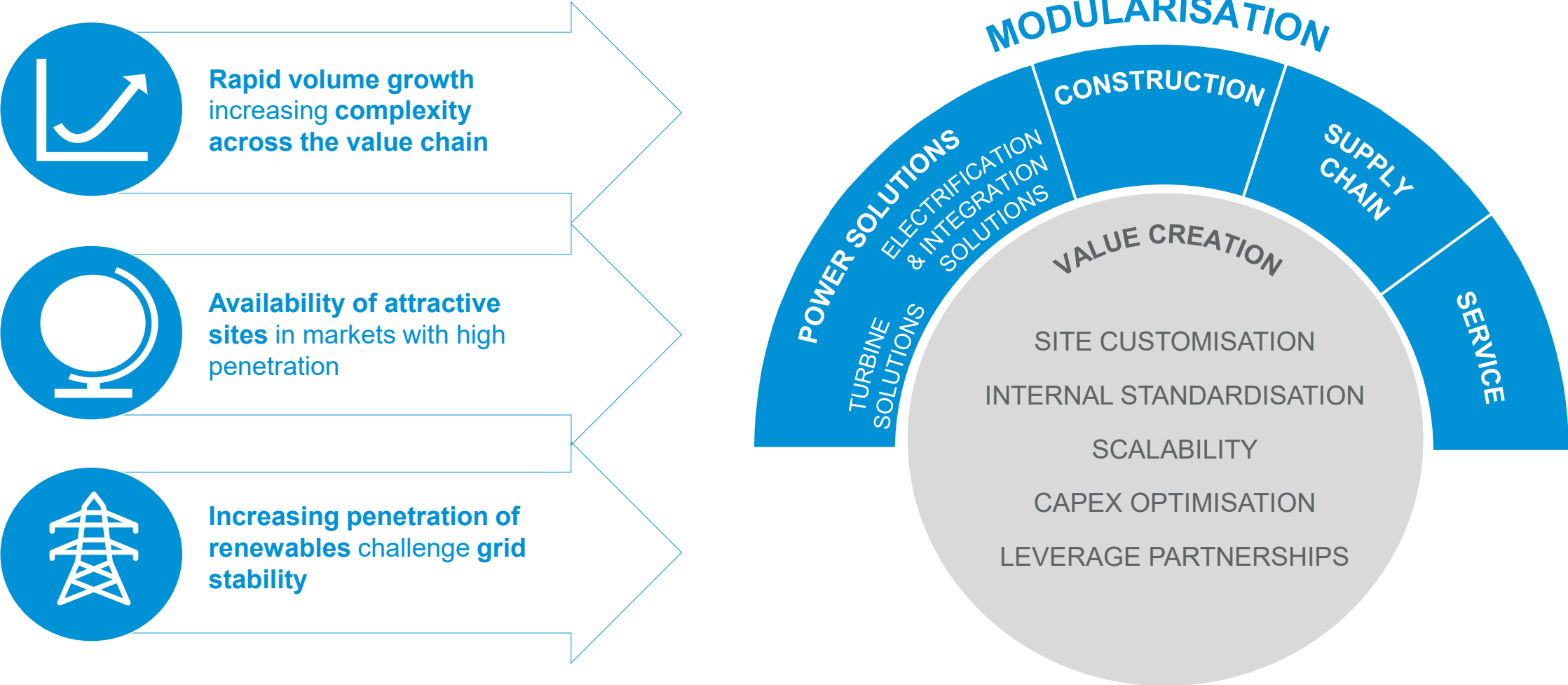
3 GW
Preferred
supplier
agreement

Modular architecture

**Next
generation
offshore
Designs**

INDUSTRY CALLS FOR NEW SOLUTIONS

Vestas’ modular approach as the foundation across the value chain



INCREASED CUSTOMISATION WITHOUT ADDING COMPLEXITY

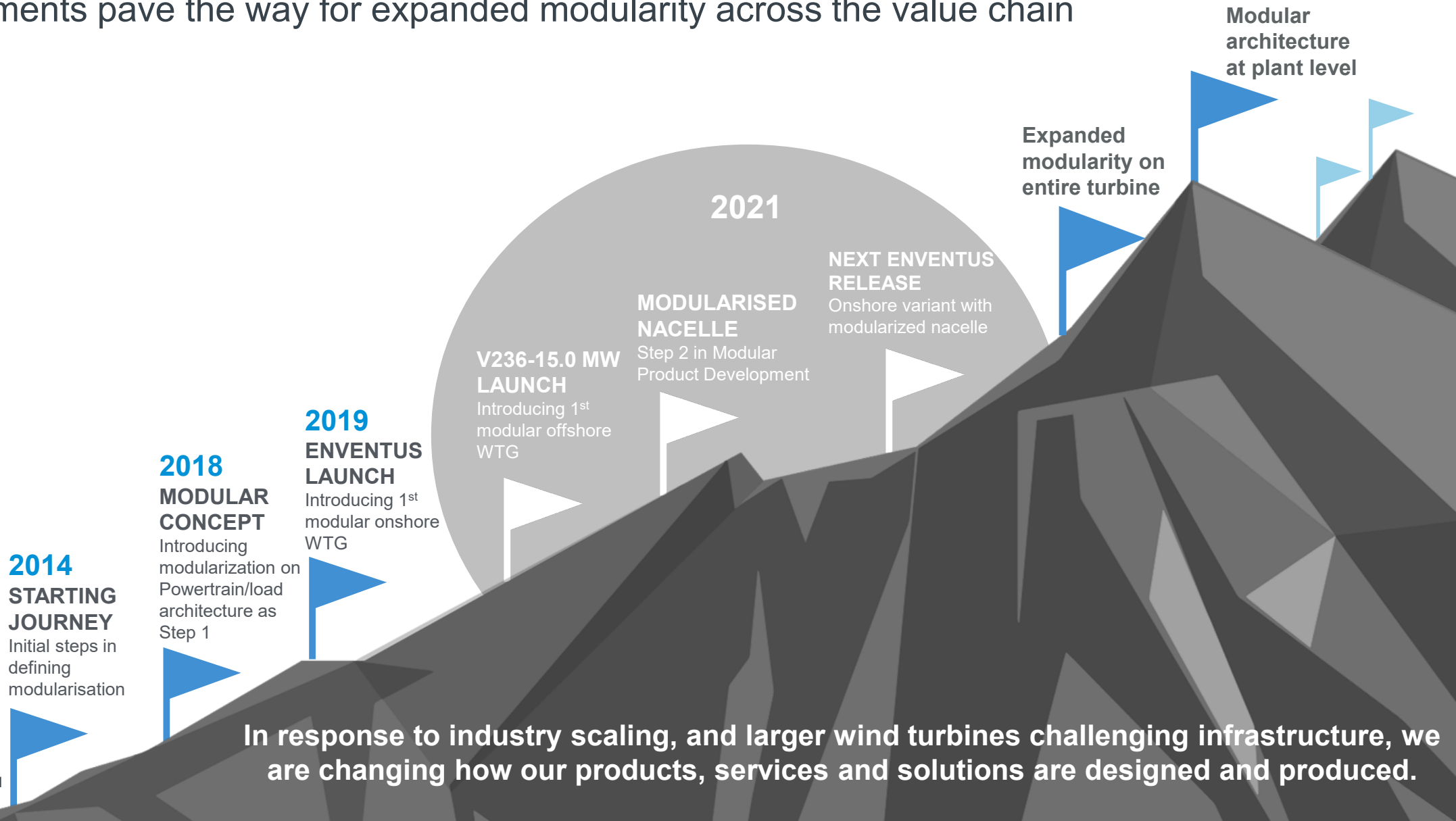
The larger no longer the better, modularisation to drive further value



Note: Illustrative number of modules and turbine variants

KEY MILESTONES ON VESTAS MODULARISATION JOURNEY

2021 achievements pave the way for expanded modularity across the value chain



In response to industry scaling, and larger wind turbines challenging infrastructure, we are changing how our products, services and solutions are designed and produced.

VIDEO

VALUE CREATION THROUGH MODULAR APPROACH

Unlocking customer value while increasing value creation for Vestas

DESIGN

Reducing **time to market** and **development expenses** across onshore offshore

TRANSPORT

Breaking **transport cost curve** through smaller dimensions

We are **changing the energy system**, and we need to take **new steps** to be able to scale our technology **efficiently** to **meet the growing renewable energy demand** and **realise tomorrow's energy system**

CUSTOMER VALUE

Maximising AEP potential on constrained sites
Improved siteability and layout optimisation

PRODUCTION

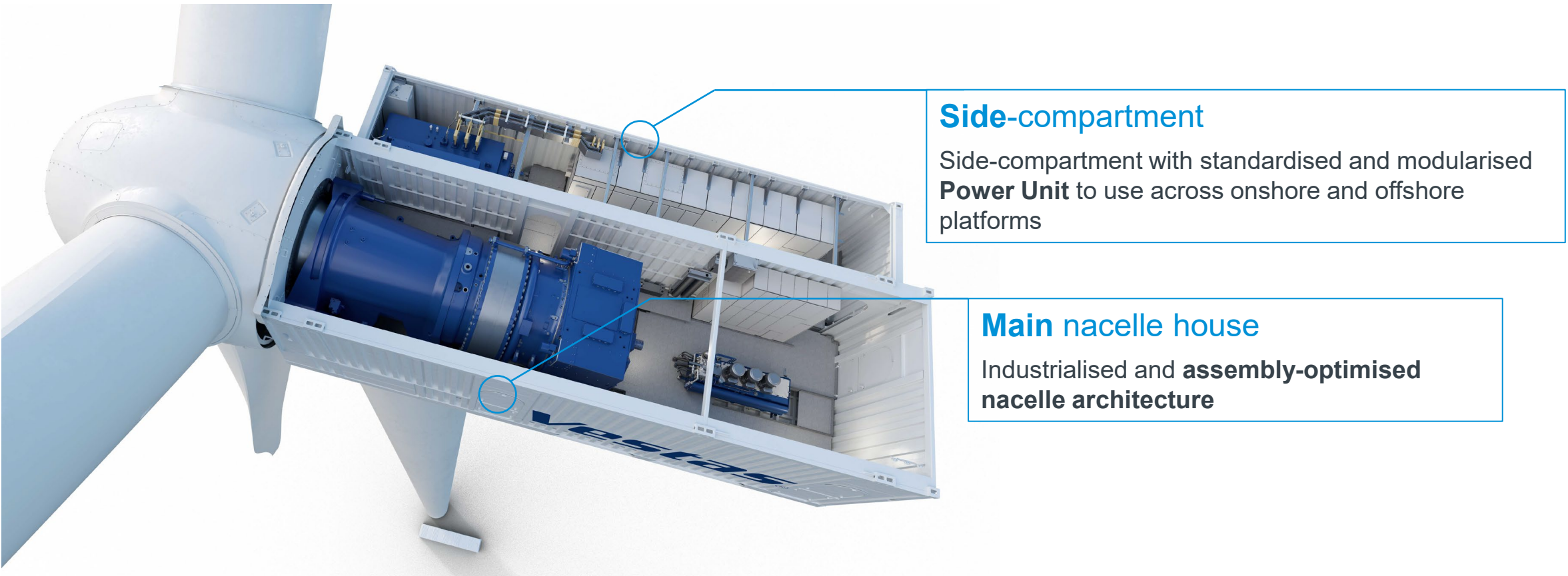
Improved **capex utilisation** while increasing product variety

QUALITY

Improving quality by **re-use of proven design elements**

MODULARISED NACELLE UNLOCKS MULTIPLE BENEFITS

New architecture with main nacelle house & side-compartment



Note: Illustrations and animations are for visualization purposes only and remain subject to final design and technical solutions.

INTERFACE DESIGN INCREASES FLEXIBILITY

Connecting main nacelle house and side-compartment

Click-on interface

- For upholding **vertical load**
- Cater and **optimise load distribution** in yaw motion
- **Eliminating stress** in material and structure

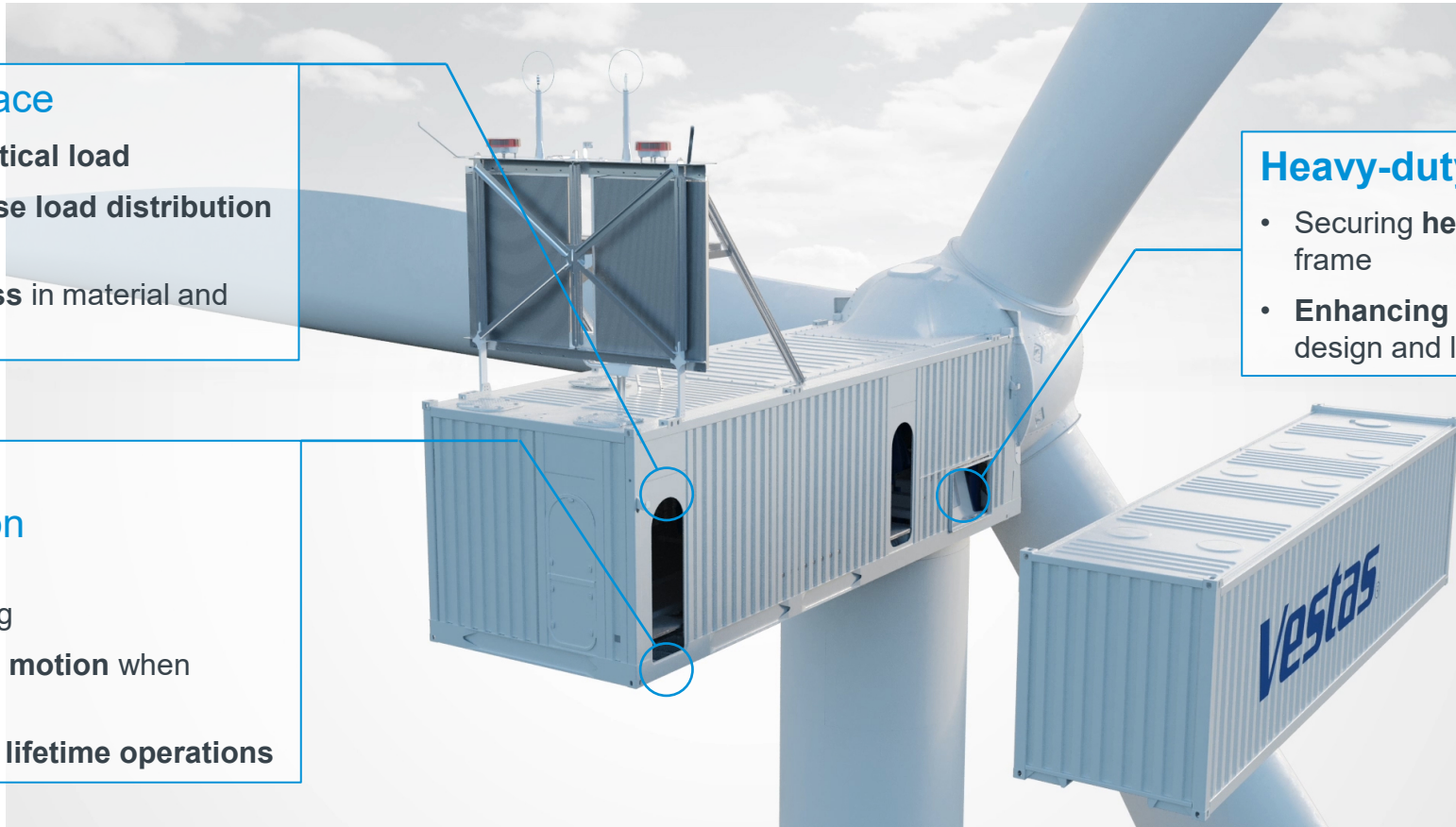
Single-axis Locking Solution

(outward motion)

- No weight carrying
- **Prevent outward motion** when yawing
- Ensuring **reliable lifetime operations**

Heavy-duty interface

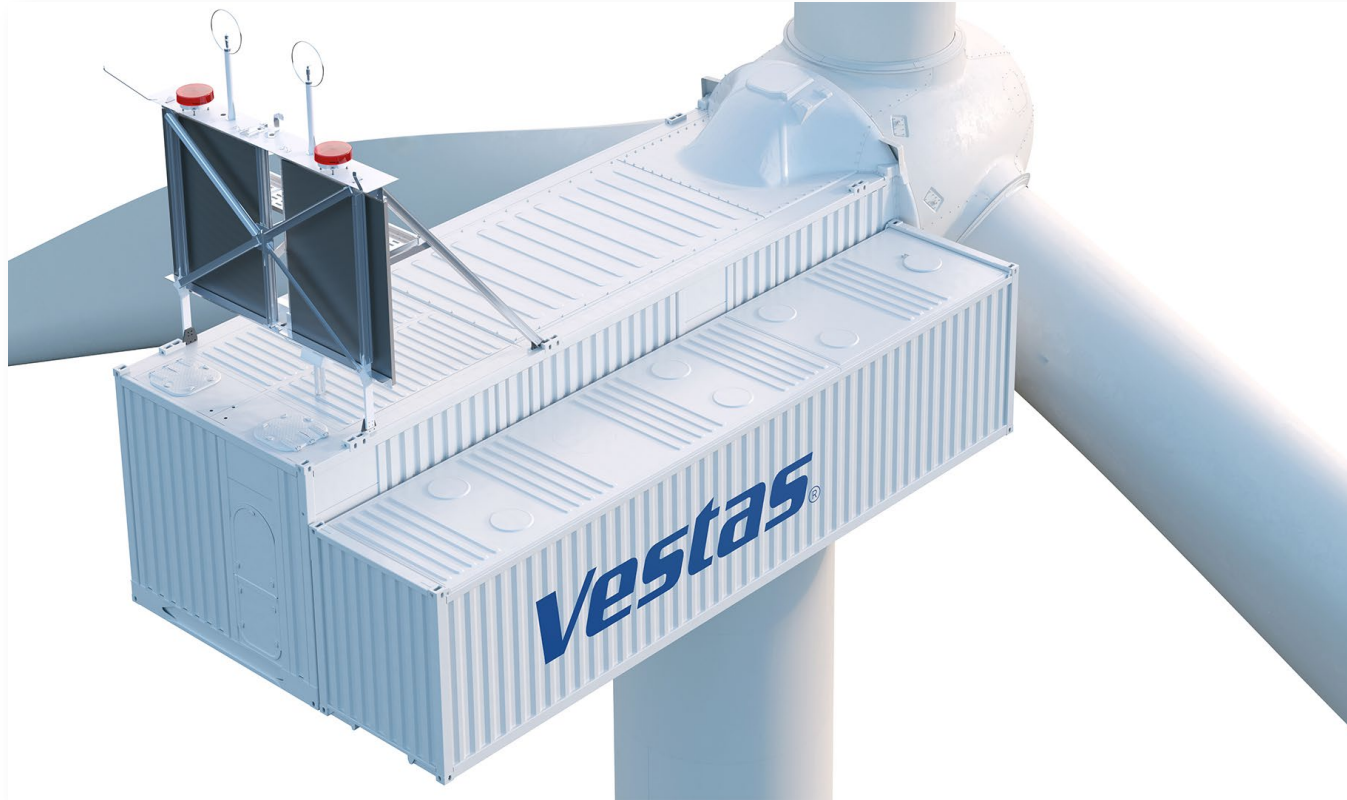
- Securing **heavy loads** directly to base frame
- **Enhancing reliability** in product design and lifetime operations



Note: Illustrations and animations are for visualization purposes only and remain subject to final design and technical solutions.

SYNERGIES ACROSS ONSHORE & OFFSHORE

Shared side-compartment and main components



Shared
architecture

Standardised
connection interface

Common
Power Unit

Standardised
transportation

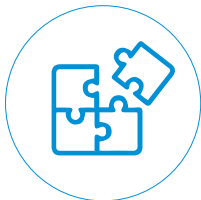
Optimised positioning
of heavy components

ADVANCED MODULARITY ENABLES SCALABILITY

Future renewable solutions to build on the modular foundation

CURRENT SOLUTIONS

Modular Nacelle



Transport solutions



Service crane



FUTURE POSSIBILITIES



Future Innovation



Grid Capability



Battery Storage

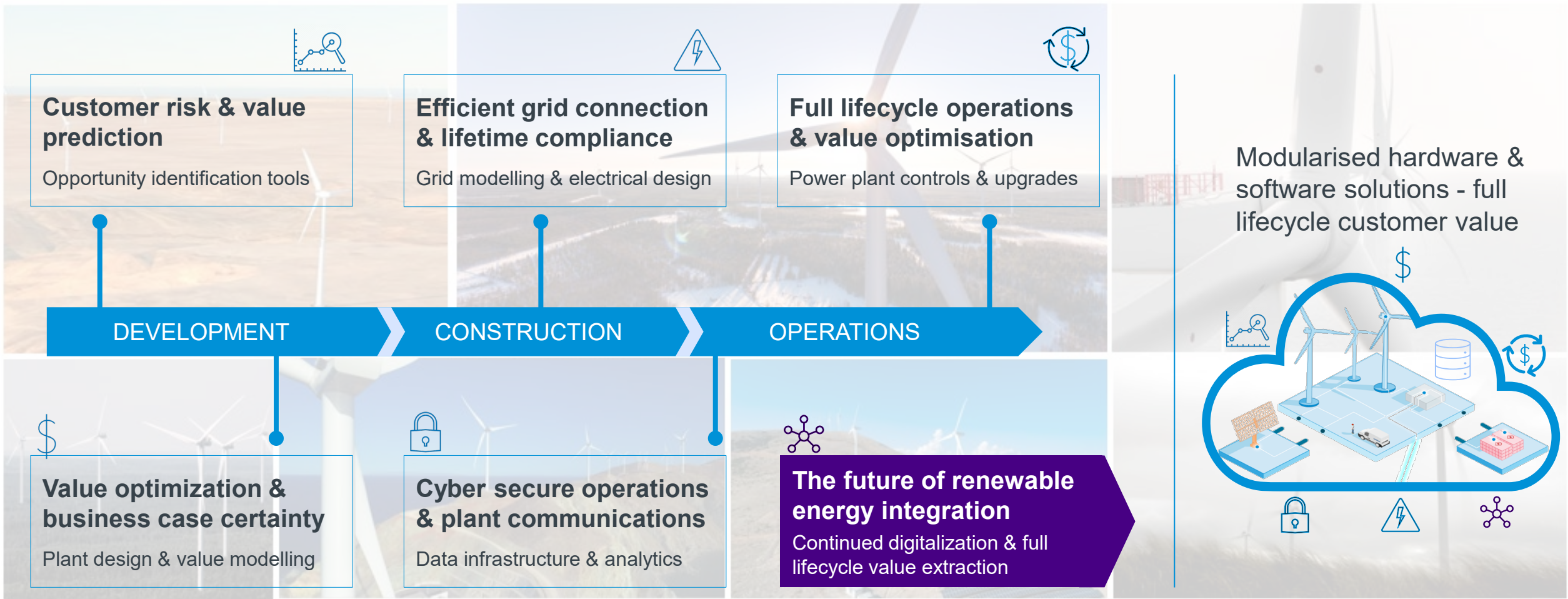


Power To X

Note: This overview is only a representation of the concept vision. The P2X, Battery Storage are NOT released for sale.

VALUE CREATION THROUGH PLANT & ENERGY SOLUTIONS

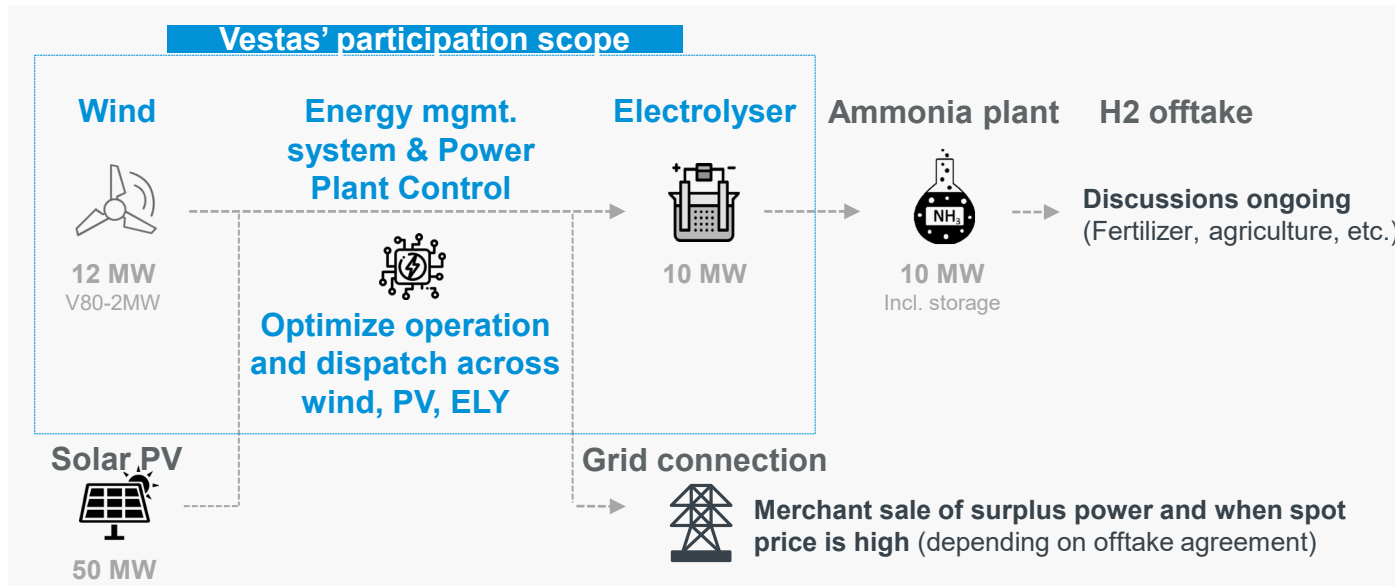
Platform of industry leading power plant and system integration capabilities



CASE STUDY: FIRST DYNAMIC WIND-TO-AMMONIA PLANT

Partnering to shape the future wind-to-hydrogen opportunity

World's 1st commercial green ammonia plant



- **Commercial operation in 2023** without grid support – retrofit of existing site
- **Fully behind-the-meter solution** (avoid grid-tariffs) with **dual offtake opportunity** to achieve highest price

Vestas playing a crucial role

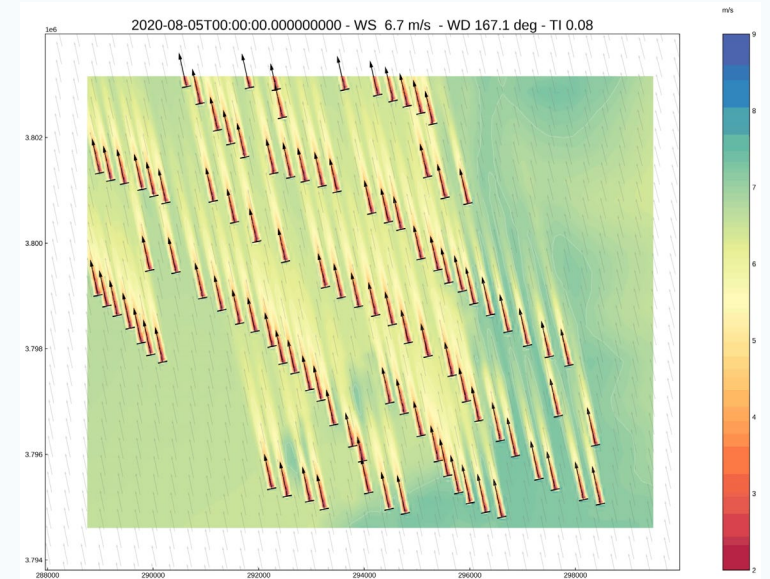
- **Integrate power generation** (wind & PV) with grid and electrolysis, incl.
 - Development of hybrid power plant control
 - Development of energy mgmt. system and dispatch strategy
- **Co-develop** specification of electrolysis and procurement
- **Operation** of wind, PV, electrolyzer and BoP

CASE STUDY: VESTAS PARTNERS WITH INDUSTRY LEADERS

Award winning AI operation to optimise overall plant production



Conquering the largest source of operational losses with AI



KEY TAKEAWAYS

LEADING TURBINE SOLUTIONS

1

Enventus and V236 leveraging on strong synergies and paving the way for the next generation modular turbine solutions

SCALABILITY

2

Modular approach is the solution to scalability and sustainably expanding the technology portfolio of product offerings while optimizing the value chain

RENEWABLE INTEGRATION

3

New energy solutions are needed to enable the integration of RE in the grid through balancing and optimising the energy production

Building the future supply chain

Tommy Rahbek Nielsen

Chief Operating Officer

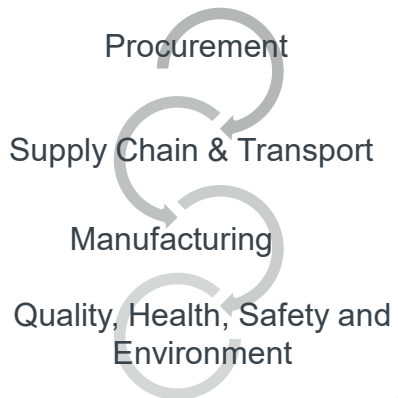


AGENDA

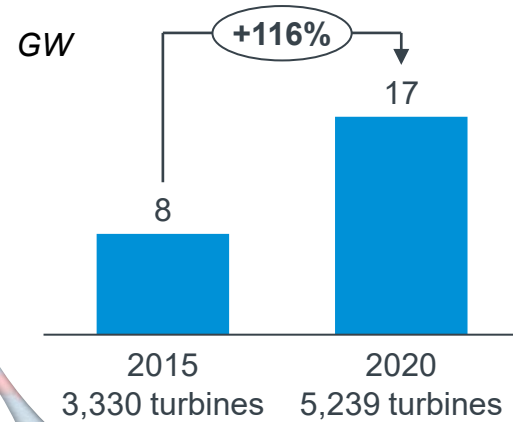
- 1 Business starts with Safety & Quality
- 2 Volatility & cost headwinds
- 3 Shaping the future supply chain

VESTAS GLOBAL OPERATIONS AT A GLANCE

Four areas within the COO organisation



Turbine deliveries



Manufacturing across +15 countries



21 internal & 92 external
factories across the world

+400k shipments from 41
different countries

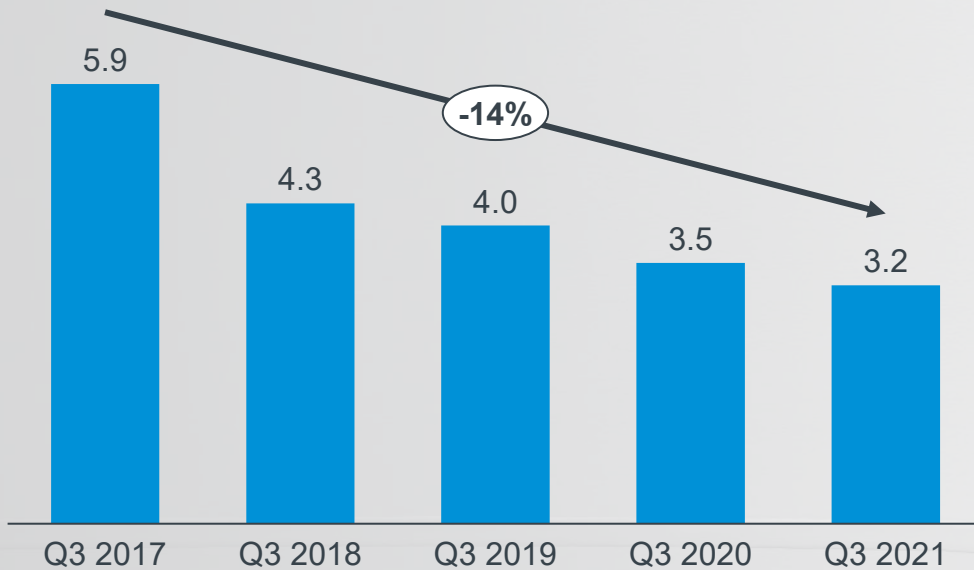
600+ vessels used

SAFETY ALWAYS COMES FIRST

Going the extra mile in challenging times

Trend of total recordable injuries

Per million working hours



Remaining safe during a pandemic

- Continued operations as **critical infrastructure**
- COVID-19 protocol enforcement **anchored with leadership**
- Cross-functional global & local **Crisis Management Teams**
- Global governance – **local response**
- Additional measures on top of national legislation to **protect staff**
- Close **cooperation with suppliers** to ensure customer deliveries
- **No long-term factory shutdowns**

QUALITY LEADERSHIP TO CONTINUE AS PARTNER OF CHOICE

Concrete quality programs launched and anchored throughout the organisation

FROM

Following Quality

- Product quality only
- Internal focus
- QSE department responsible for quality
- Limited ownership for quality performance
- Many new variants adding complexity



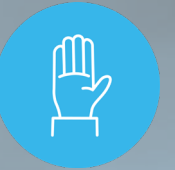
TO

Living Quality

- Increase customer value
- “Quality starts with me”
- Quality ownership in the full value chain
- Modularisation enabling standardisation



Quality



Stop & speak up



Adhere to processes



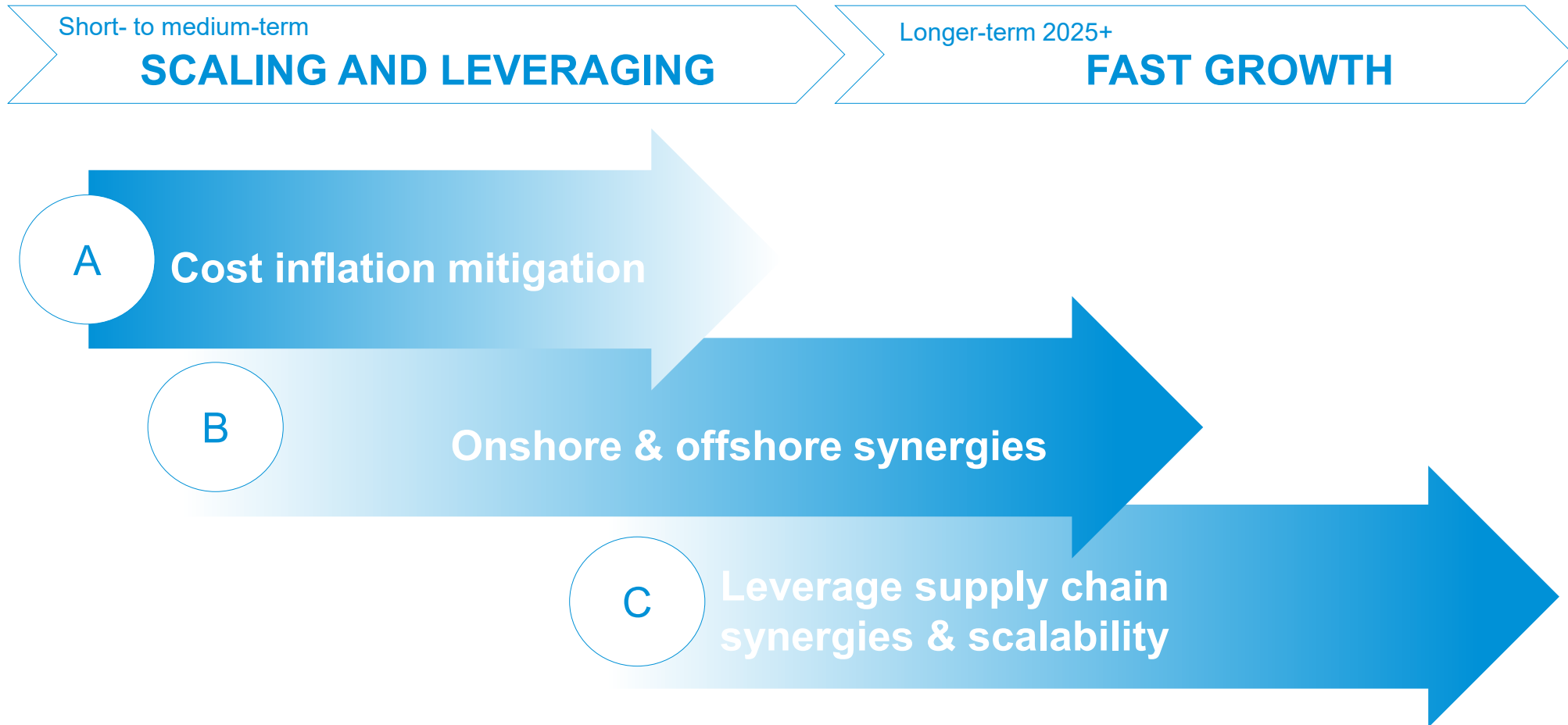
Do it right first time



Learn from mistakes

PREPARING FOUNDATION FOR LONG-TERM GROWTH

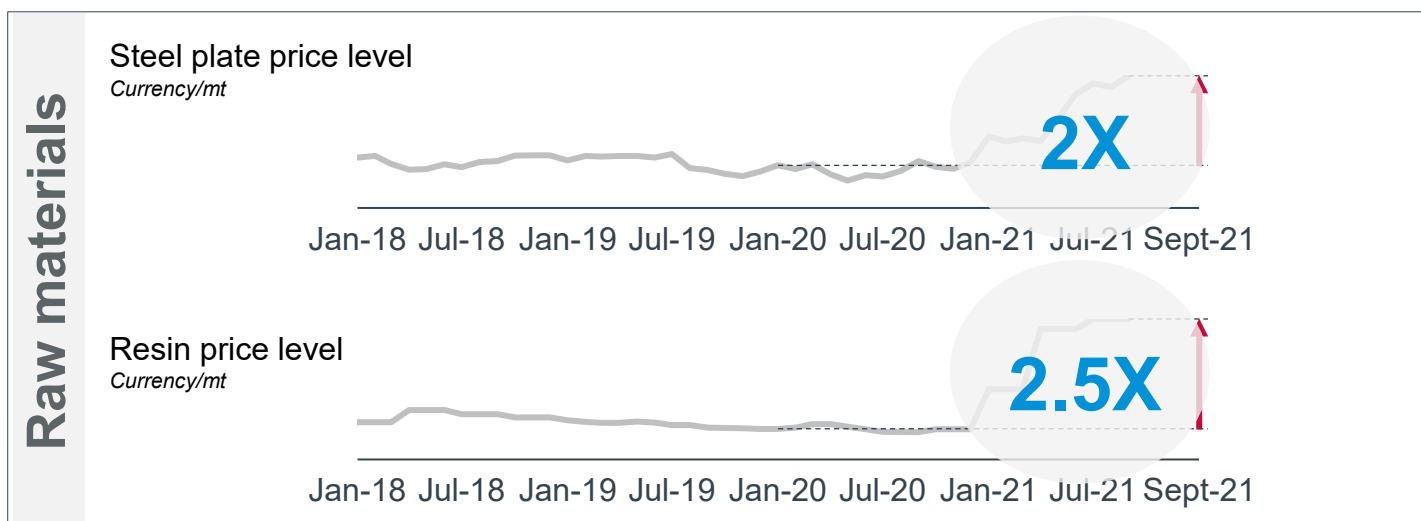
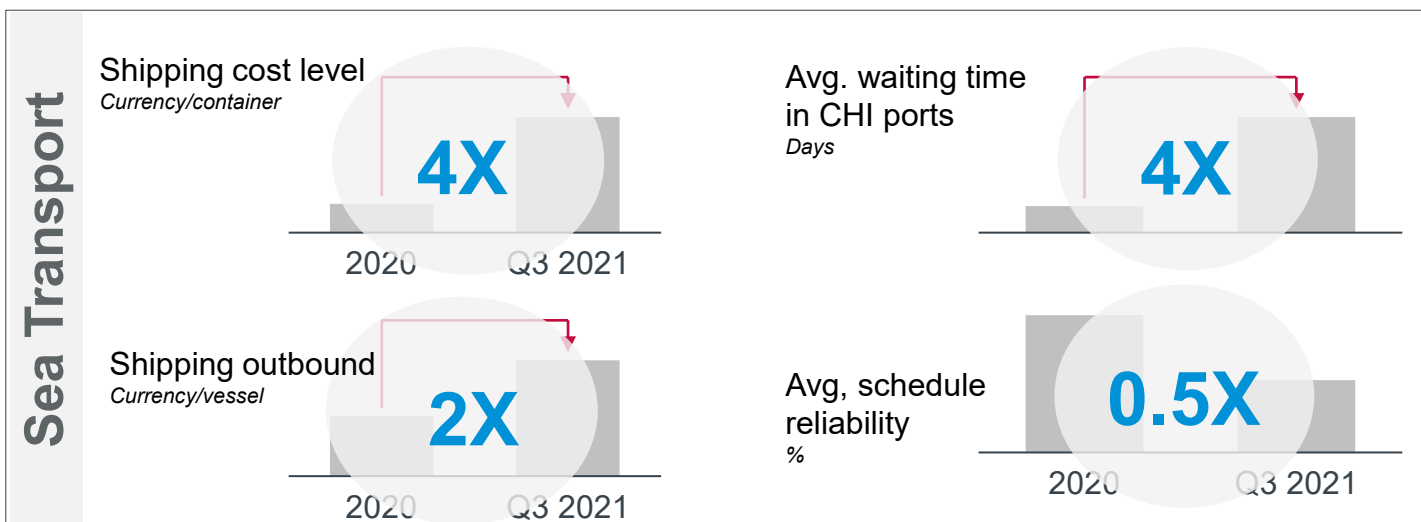
While managing uncertainty on short term - three key operational priorities



GLOBAL HEADWINDS INCREASE COST



Partnerships to alleviate some of the impact



MITIGATIONS

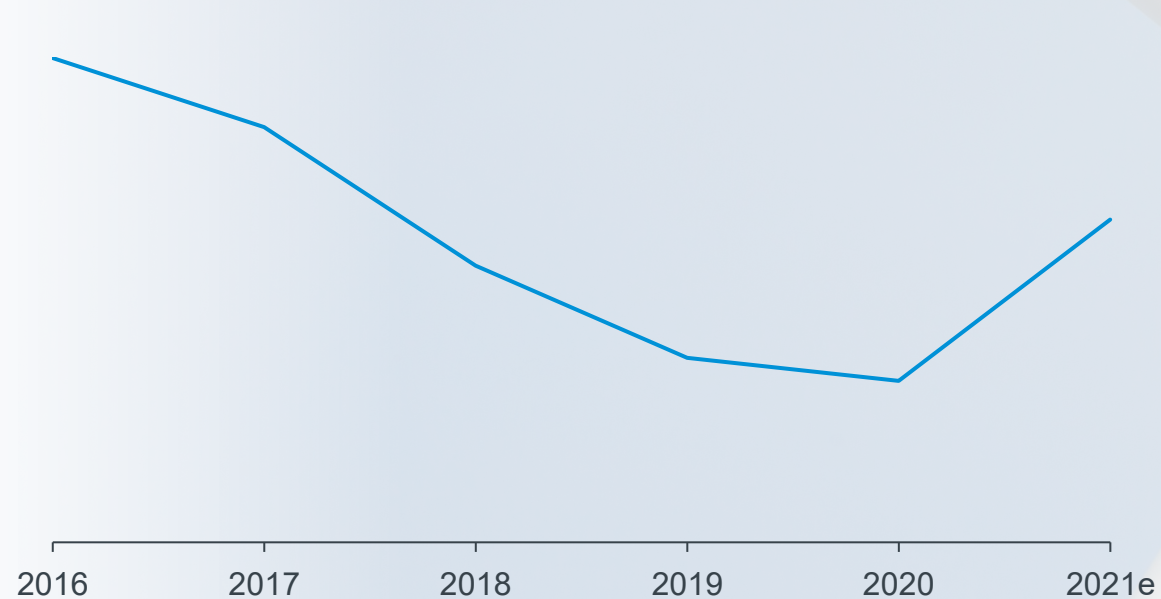
- **Partnerships**
Partnership with Maersk to ensure flexibility throughout the inbound container transport and delivery
- **Portfolio visibility**
Longer terms capacity commitments with strategic partners
- **Vessel indexation**
Pursuing indexation clauses in both down and upstream contracts
- **Raw materials locking**
Signing fixed price agreements to protect against raw material movements
- **Raw materials clauses**
Strengthening clauses and indexation in selective supplier agreements
- **Financial hedging**
Financial hedging of steel

VESTAS INITIATIVES DRIVING EFFICIENCY GAINS

But only partially mitigating the impact from cost headwinds short term

Cost per MW historical overview (manufacturing & transport)

2016 = index 100



Improvement drivers

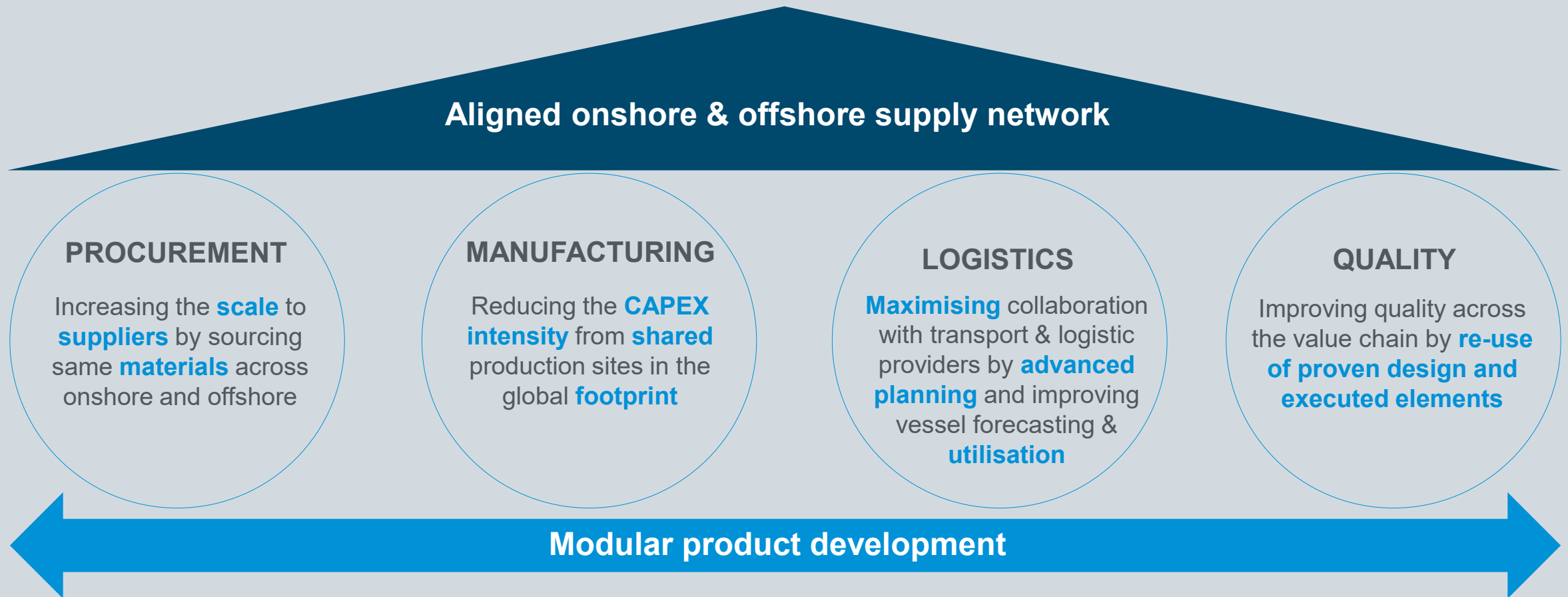
- Standard work and **efficiency programs**
- Supply chain maturity and scale
- **Transport partnerships** and portfolio visibility
- **Outsourcing** of main components
- Establishment of supply chains in best cost countries



REALISING SYNERGIES ACROSS ONSHORE AND OFFSHORE

B

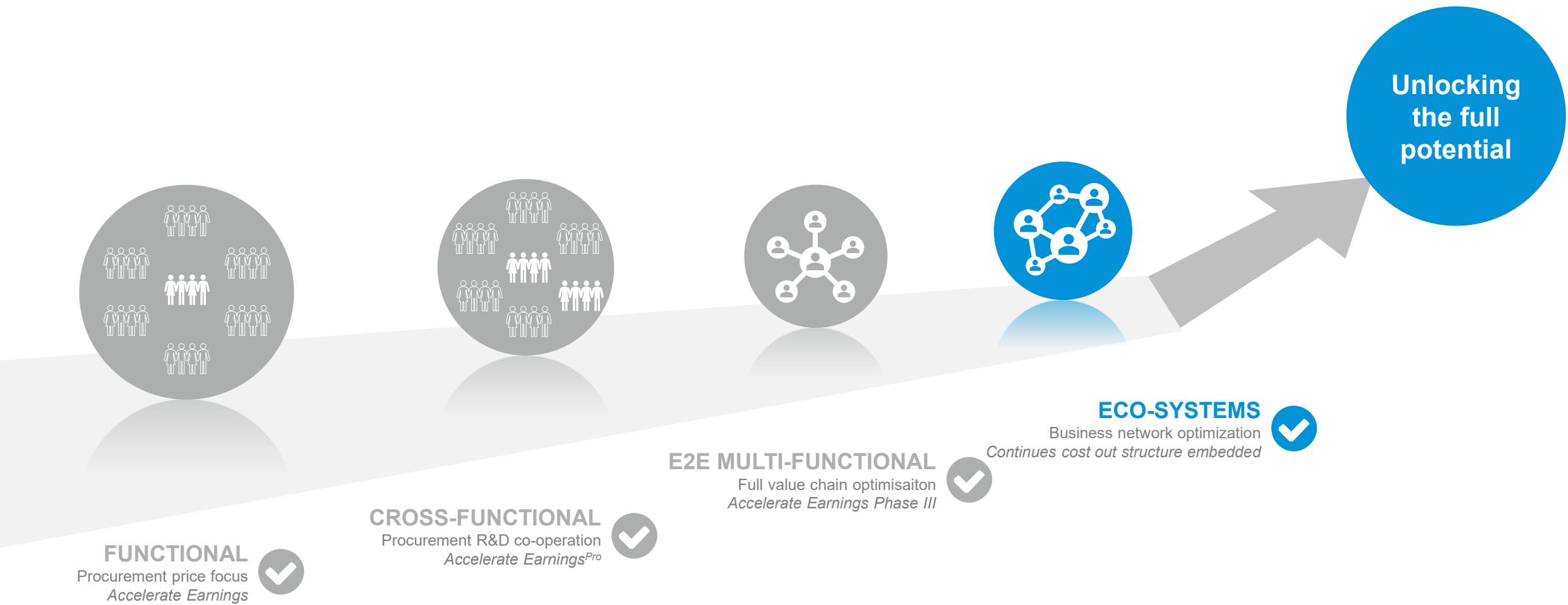
Through designing an integrated supply network across the value chain



INTRODUCING VALUE ALIGNED ECO SYSTEMS



Unlocking profitability and scalability through partnership networks

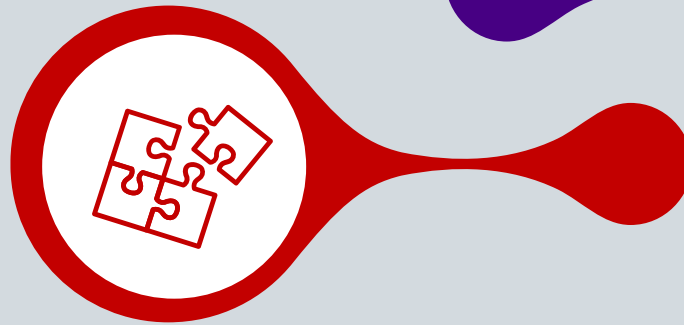


LEVERAGING VALUE ALIGNED PARTNERSHIPS

To enable joint sustainable growth, and cost efficiencies within eco-systems

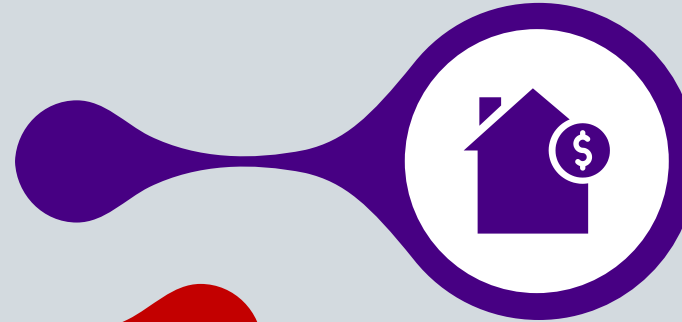
Enabling Modularisation

Modularisation enables utilisation of suppliers' eco-systems leading to suppliers to become system-providers



Strategic Alliances

Strategic important for Vestas and partners to develop long-term relationship



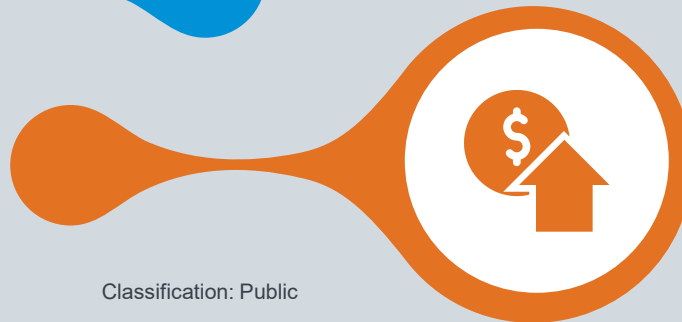
Few, Bigger, Better Companies

Invest in development, competences and capacity to mature industry for global, industrial approach leading to supplier base consolidation



Shared Vision & Objectives

Joint operational model and activities incl. development, sustainability etc. captured in individual account plans

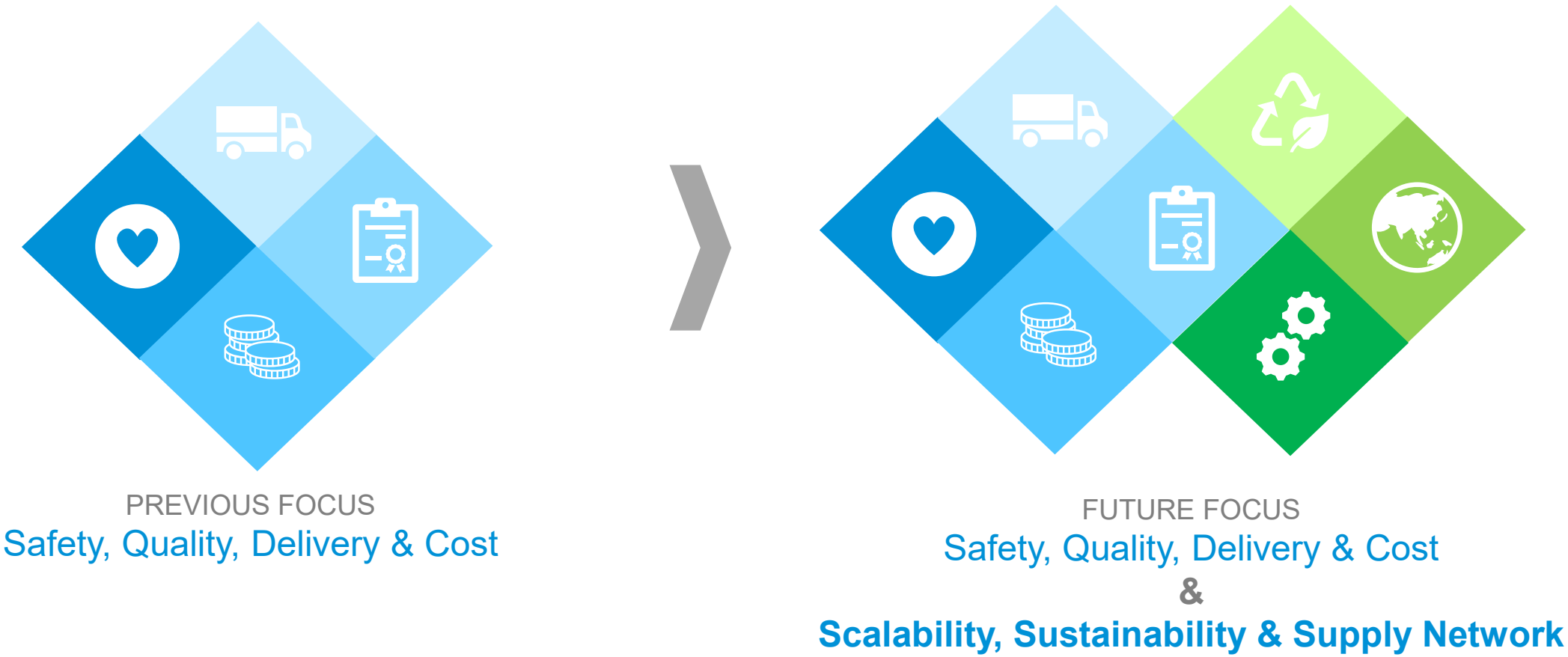


Joint Growth

Partnership to enable growth for both Vestas and partners hereunder develop new business opportunities

TRANSFORMING OUR SUPPLY CHAIN

Increased collaboration to drive both scalability and sustainability



KEY TAKEAWAYS

MANAGING COMPLEXITY

1

*Increased variants
managed by
modularisation and
standardisation*

SUPPLY CHAIN EVOLVEMENT

2

*Supply chain
maturity must evolve to
next level within 5-10
years*

SUPPLIER PARTNERSHIPS

3

*The future
supplier is competitive,
sustainable & scalable
integrated into Vestas'
supply network*

Q&A

