Siemens Renewable Energy

Offshore Wind: Exploring the Supply Chain Opportunities

Kevin Moloney – Head of Renewable Energy, Siemens Ireland

24th November 2011

Agenda

- About Siemens Wind Power
- Setting the scene – The context for Siemens
- The offshore industry challenges
- The future: Technology and “eyes on the prize”

Developing for tomorrow in 19 Divisions across 4 Sectors

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Sectors		Divisions	
Industry		▪ Industry Automation ▪ Drive Technologies ▪ Customer Service	
Energy		▪ Oil & Gas ▪ Fossil Power Generation ▪ ***Wind Power***	▪ Energy Service ▪ Power Transmission ▪ Solar & Hydro
Healthcare		▪ Imaging & Therapy Systems ▪ Customer Solutions ▪ Diagnostics	▪ Clinical Products
Infrastructure & Cities		▪ Rail Systems ▪ Mobility and Logistics ▪ Low and Medium Voltage	▪ Smart Grid ▪ Building Technologies ▪ OSRAM

Siemens Wind Power - Facts

- Currently 7800 employees (850 in 2004)
- Deliveries: 2,260 MW in 2009 (600 MW in 2004)
- Capacity: Grow to 4,500 MW in 2011
- Installed Base: >8,700 turbines with >11,000 MW capacity
- Target: To become Top 3 supplier in 2012
- No. 1 in new offshore orders in 2007, 2008, 2009, 2010

Market leader in offshore with > 2 GW installed

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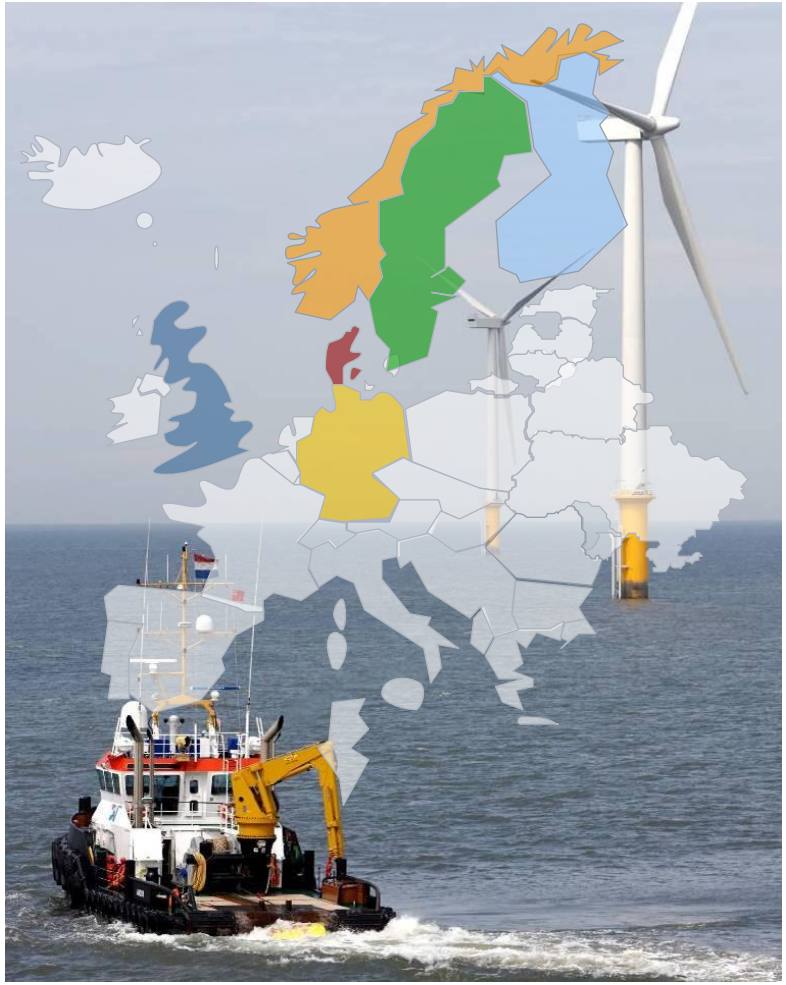
- Burbo Banks, UK → 25 x SWT-3.6-107 (2007)
- Lynn / Inner Dowsing, UK → 54 x SWT-3.6-107 (2008)
- Gunfleet Sands, UK → 48 x SWT-3.6-107 (2009)
- Rhyl Flats, UK → 25 x SWT-3.6-107 (2009)
- Pori, FIN → 1 x SWT-2.3-101 (2010)
- Baltic I, DE → 21 x SWT-2.3-93 (2010)



- Vindeby, DK → 11 x 0.45 MW (1991)
- Middelgrunden, DK → 20 x SWT-2.0-76 (2000)
- Samsø, DK → 10 x SWT-2.3-82 (2002)
- Rønland, DK → 4 x SWT-2.3-93 (2002)
- Rødsand/Nysted, DK → 72 x SWT-2.3-82 (2003)
- Frederikshavn, DK → 1 x SWT-2.3-82 (2003)
- Horns Rev II, DK → 91 x SWT-2.3-92 (2009)
- Rødsand II, DK → 90 x SWT-2.3-93 (2010)
- Lillgrund, SE → 48 x SWT-2.3-93 (2007)
- Hywind, NO → 1 x SWT-2.3-82 (2009)

Source: SWP

Many projects to come….including beyond Europe…

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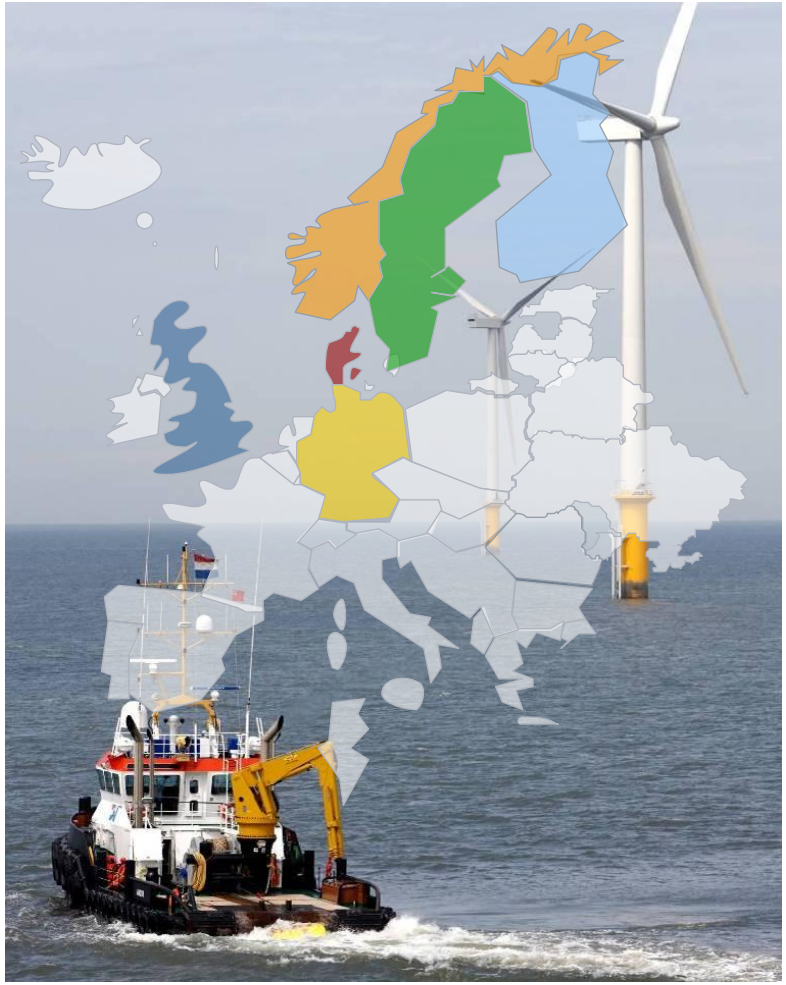
- Greater Gabbard, UK
  → 140 x SWT-3.6-107
- Sheringham Shoal, UK
  → 88 x SWT-3.6-107
- London Array, UK
  → 175 SWT-3.6-120
- Walney, UK
  → 51 x SWT-3.6-107
  → 51 x SWT-3.6-120
- Lincs, UK
  → 69 x SWT-3.6-120
- Gwynt Y Mor, UK
  → 160 x SWT-3.6-107
- West of Duddon Sands, UK
  → 108 x SWT-3.6-120
- Teesside, UK
  → 27 x SWT-2.3-93



- Anholt, DK
  → 111 x SWT-3.6-120
- Baltic 2, DE
  → 80 x SWT-3.6-120
- Borkum Riffgat, DE
  → 30 x SWT-3.6-107
- Dan-Tysk, DE
  → 80 x SWT-3.6-107
- Borkum Riffgrund 1, DE
  → 77 x SWT-3.6-120
- Meerwind Sud Ost, DE
  → 80 x SWT-3.6-120

- Rudong Intertidal, CHN
  → 21 x SWT-2.3-101

Source: SWP

SWP's strategy is defined by stepping up the learning curve

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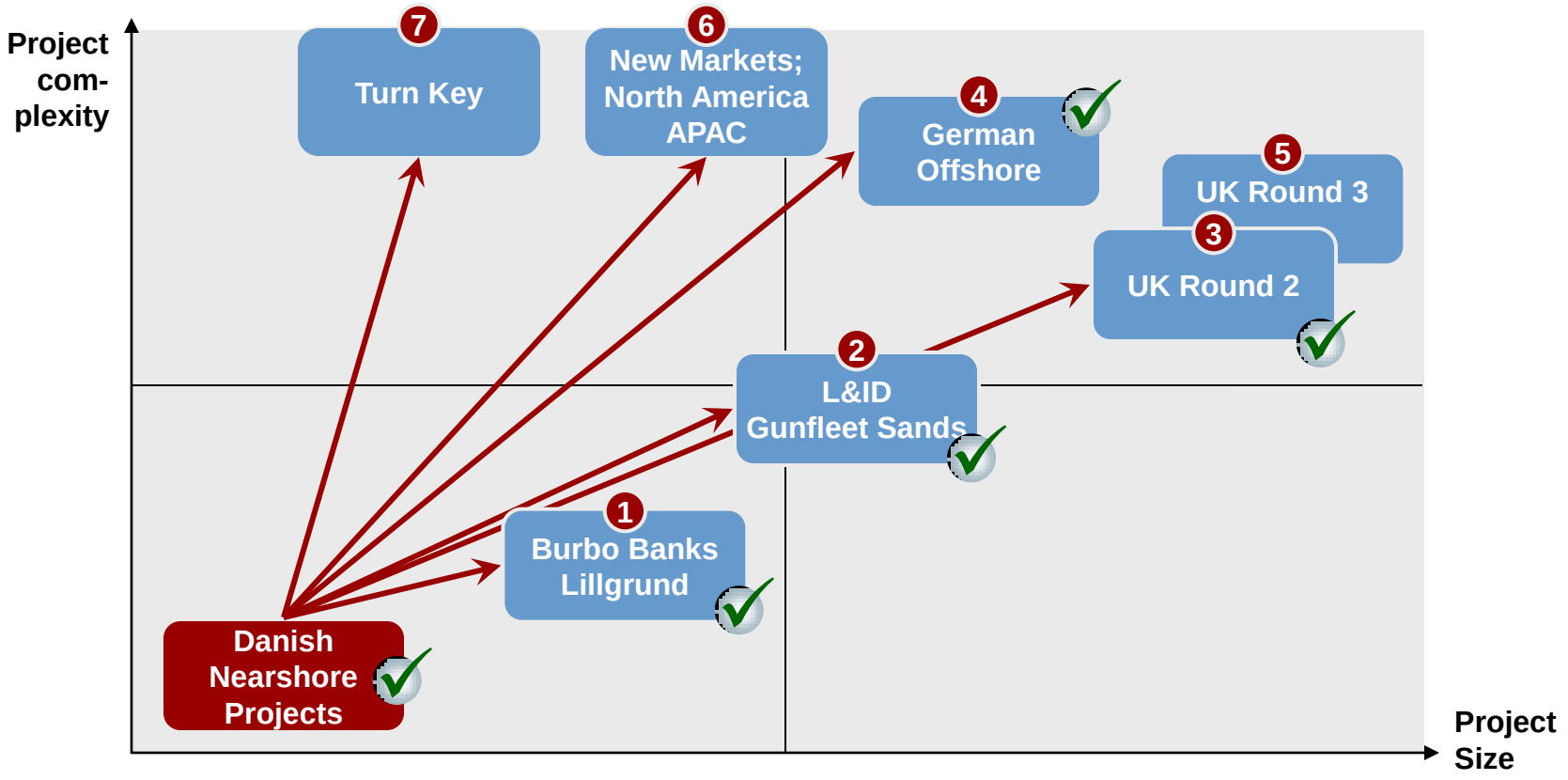

SWP has chosen an incremental learning approach to manage the risk on the supplier side, starting with a stringent project selection process

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Offshore wind is in a steep development phase

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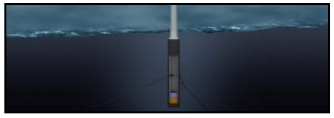
		1990s	2000s	2015-2030
	# countries with offshore wind	3	7	20+
	Avg. wind farm / project size	6 MW	90 MW	>500 MW
	Avg. yearly installed capacity	3 MW	230 MW	6.000 MW
	# Significant manufacturers	2	3	>8
	Avg. turbine size	< 0.5 MW	3 MW	5+ MW
	Avg. rotor diameter	37 m	98 m	125-170 m
	Avg. water depth	5 m	15 m	>30 m
	Customers	Scandinavian utilities	European utilities	Global utilities, large consortia, non-utility investors

Offshore: A growing market, but will feel impact of financial crisis in 2011

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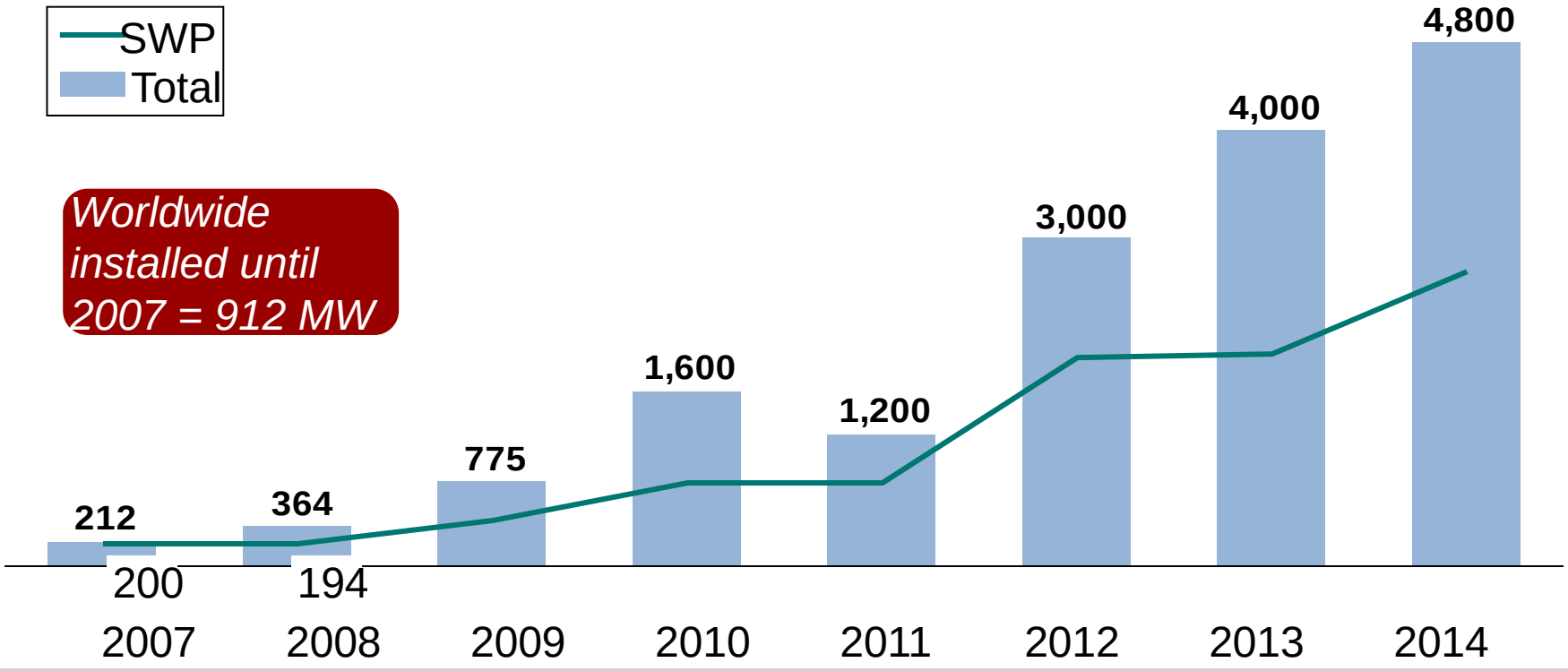
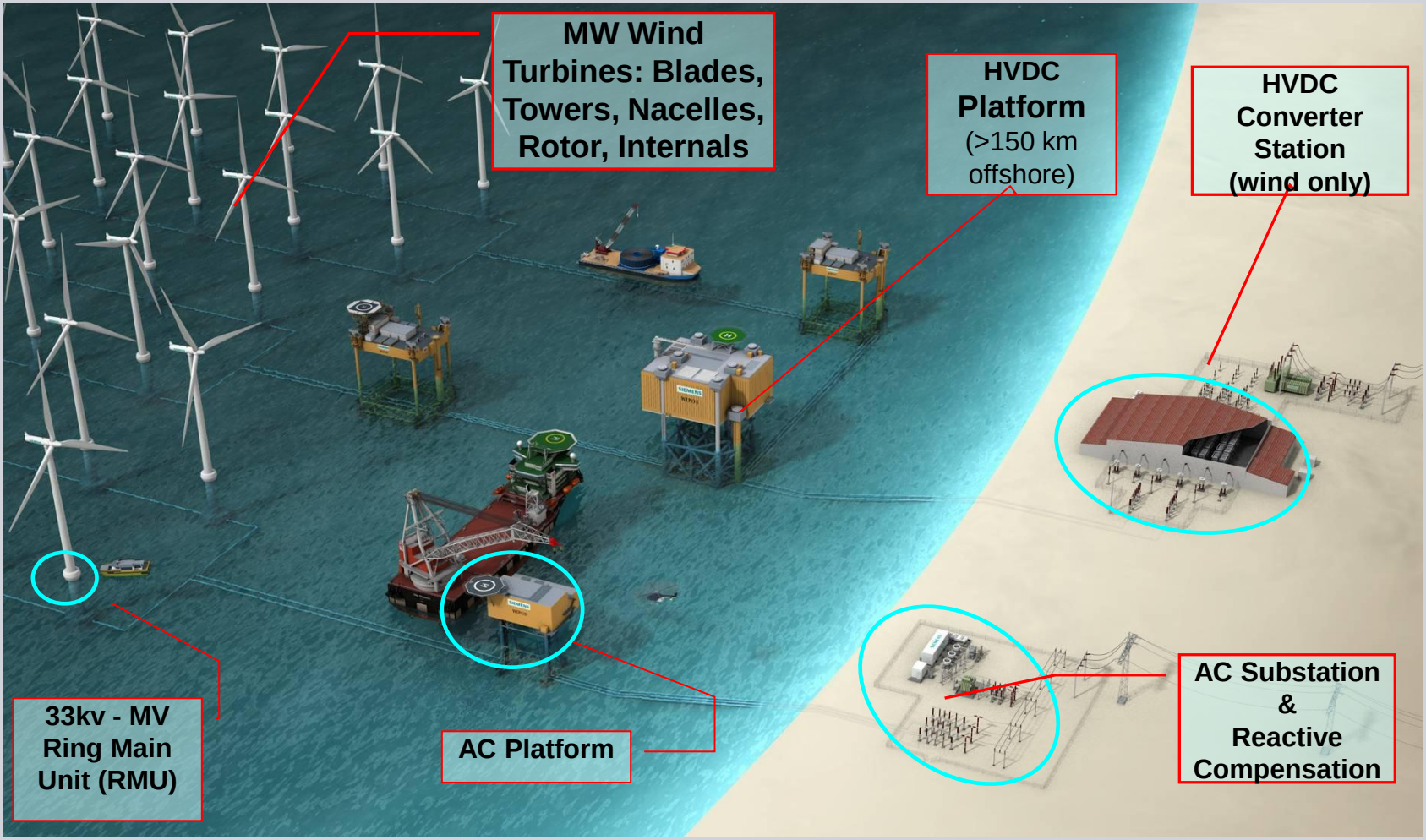
Estimated global annual offshore turbine installation in MW



Siemens target:
40 - 50% worldwide market share in offshore installations

The offshore windfarm scope for Siemens



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Challenges in the offshore business

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Optimize technology for larger projects, farther offshore

Optimise installation technology and secure vessels

Industrialise logistics

Optimise service concepts

SCM Offshore Challenges

Key Questions for the Offshore Supply Chain Manager

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Offshore turbines and their components continue to grow in size and weight.

- How will I physically handle these big and heavy components?

Some of the components are facing severe supply bottlenecks. Few capable suppliers. Insufficient capacities.

- How will I ensure availability of all components in the required quantities?

Customer demand is always changing. And so are turbine designs.

- How will I keep the offshore facility flexible - being able to scale up or down as needed - while keeping the investments low?

The pressure to reduce costs is immense.

- How will I provide components at lowest cost and how will I increase cost efficiency in pre-assembly and installation?

Reliability of our offshore turbines is one of SIEMENS' major success factors.

- How will I answer all questions above and keep our quality at the required level?

An example of an offshore project's Turbine Supply Chain

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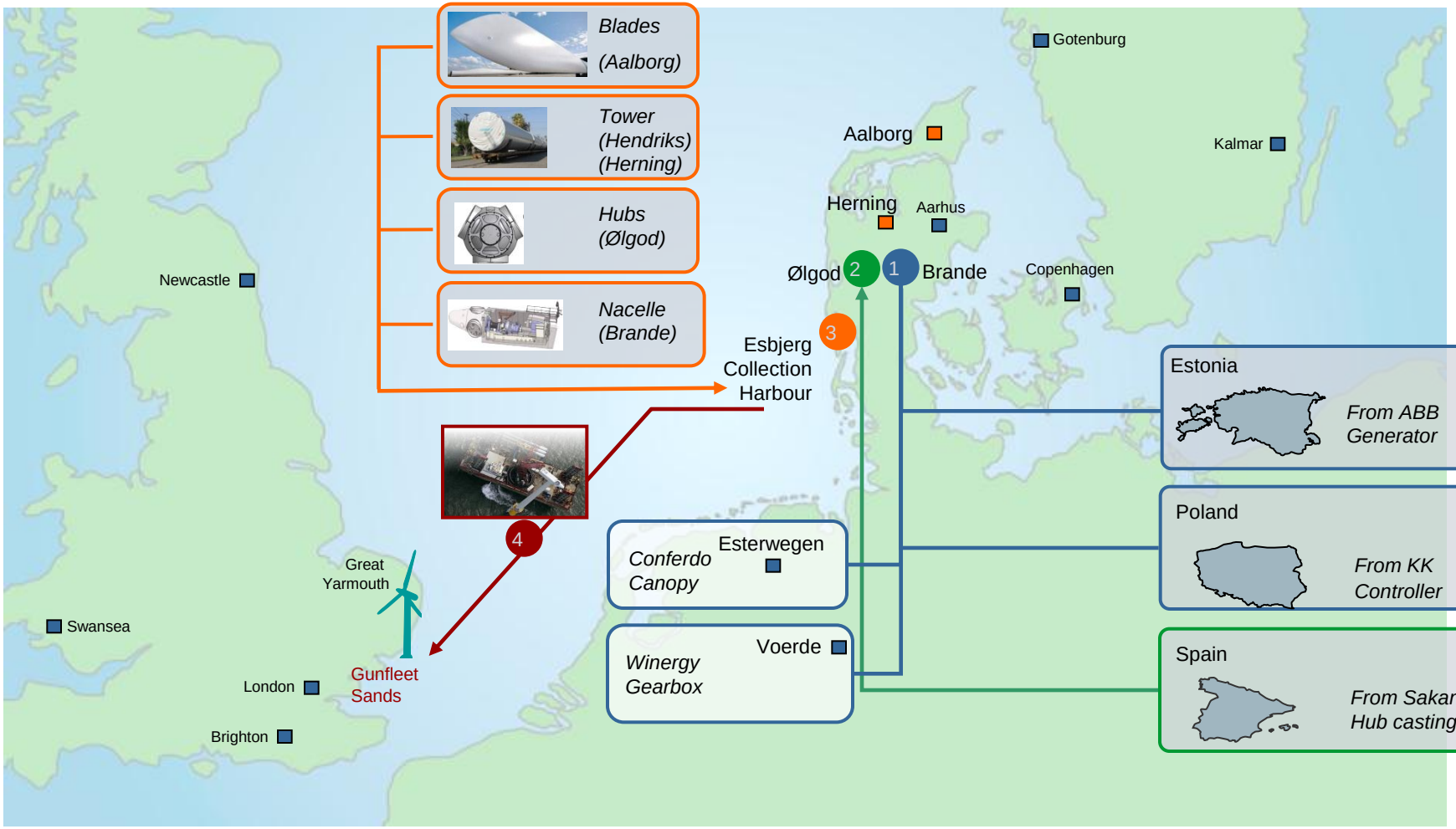
Gunfleet Sand's supply chain



SCM Offshore Challenges : Increased Focus on Installation and Logistics Cost

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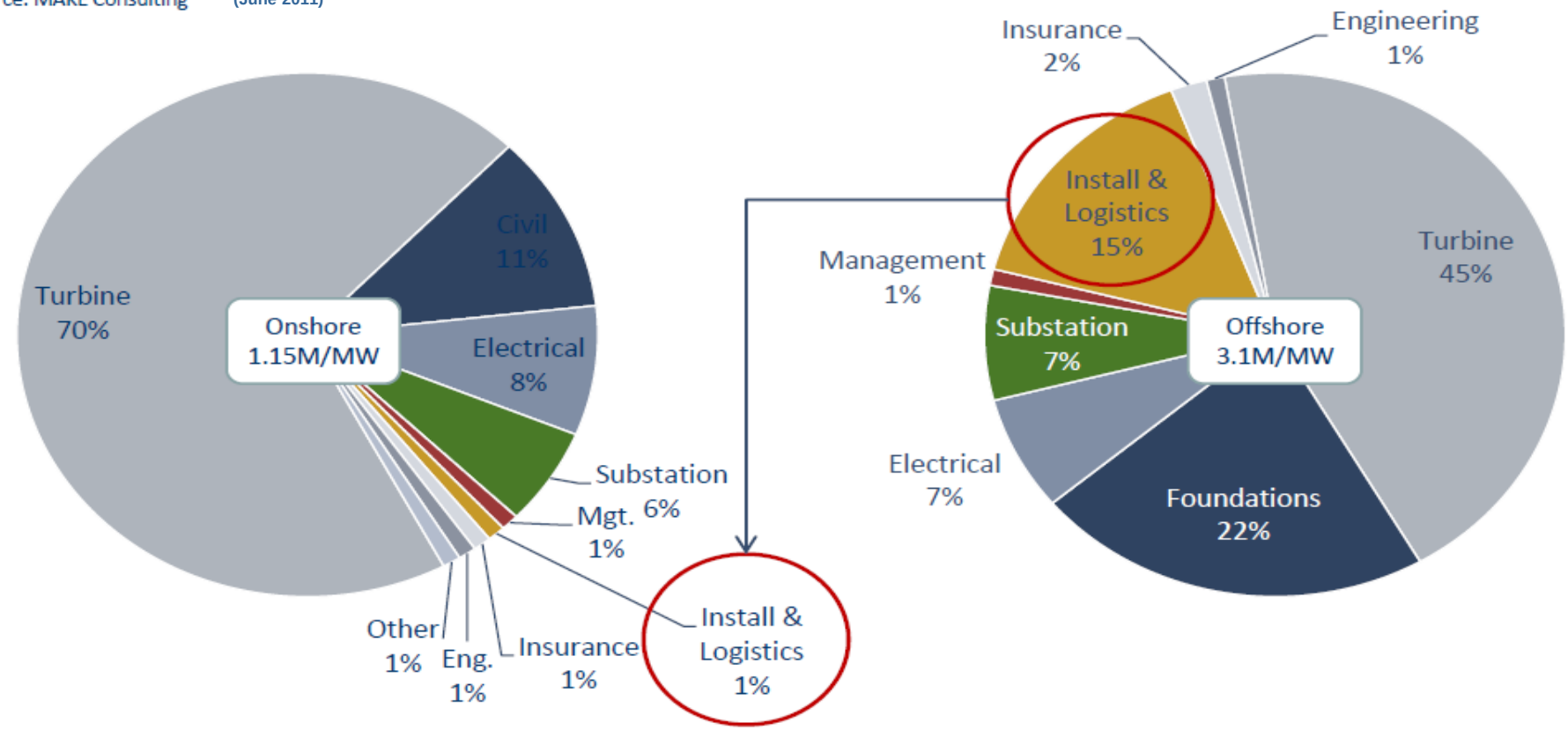
"Typical" Onshore versus Offshore Wind Capital Cost Breakdown (EUR)

Source: MAKE Consulting (June 2011)



Cost reduction is imperative within the offshore wind space to ensure its long term success against alternate power generation technologies … logistics will be a key focus area.

Applying the right strategy is an essential lever, especially in the procurement and transport driven wind industry

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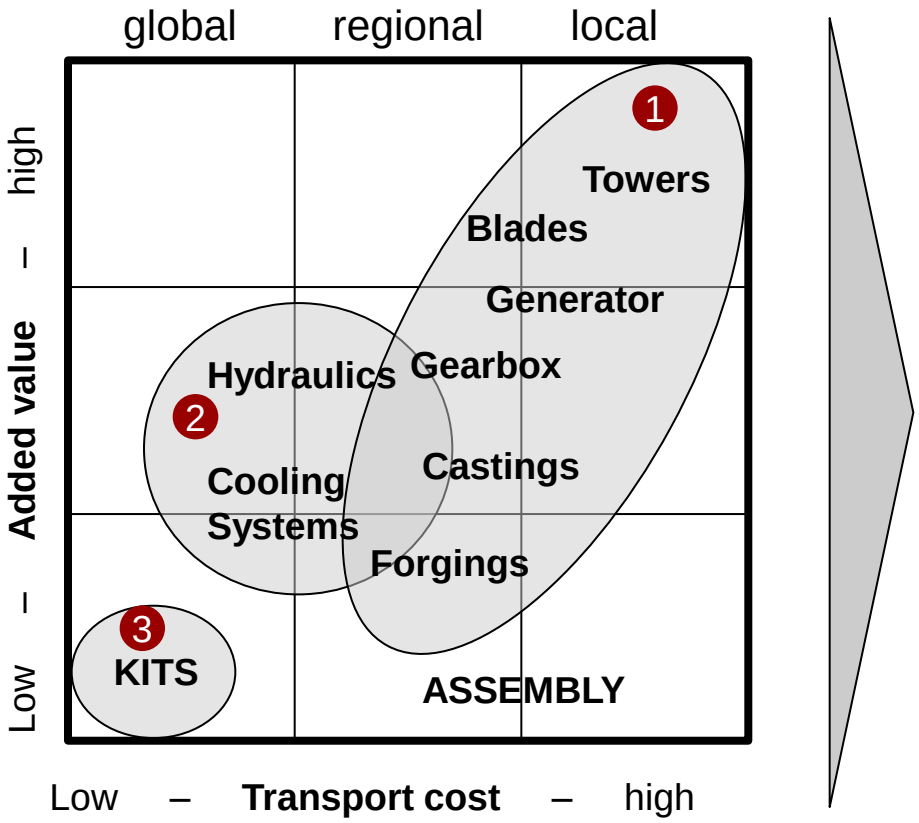
SCM's procurement strategy



1. **Heavy and large components**
   - Regional supply
   - Depending on industrial infrastructure
   - Supporting development
   - Regional suppliers supporting global
   - Lead supplier for quality
2. **Systems**
   - Global Centers of Competence
   - Local production if needed
3. **Kits**
   - Global provider
   - Potentially, with local presence

SCM strategy is to have sustaining relationships with best in class suppliers who support global AND local demands

In the future, logistical excellence will be the key differentiator

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	Past	Now	Future
Demand	**Demand > Supply** • Growth • Global spread • Local content • Larger turbines	**Demand < Supply** • Shift of projects • Price reductions • Long term agreements • Reliable partners (offshore) • Local content	**Demand = Supply** • **Turbine is a commodity** • New turbine types (DD) • Faster-to-market • Value added options • Offshore Growth
Supply	• Capacity constraints • Shortages • Price increases • Heavy investments of Suppliers	• **Stabilise, improve and prepare** • Raw material prices. • Overcapacity • Supplier instability • Reduction in costs	• **Logistical excellence** • Global/regional/**local** • Fast reaction • Optimised supply • System supply/ (standard) modules • Assembly at harbour

SCM: Opportunities and Success Factors – Local Setup

- Harbor location
  - deep sea harbor, direct quay access
  - sufficient size of land, expansion potential
  - ability to reach different wind farm (also future locations)
- Infrastructure
  - good inland transport connections
  - existing technical infrastructure at site
- Long-term commitment to location
  - skilled work force, permanent jobs = consistent performance
- Flexible set-up at harbor site, easy to adjust to changing demand
  - Simple, basic set-up, relatively low investment
  - possibly additional satellites at other sites with reduced scope

SCM: Opportunities and Success Factors – Local Value Creation vs Global Low Cost Sourcing

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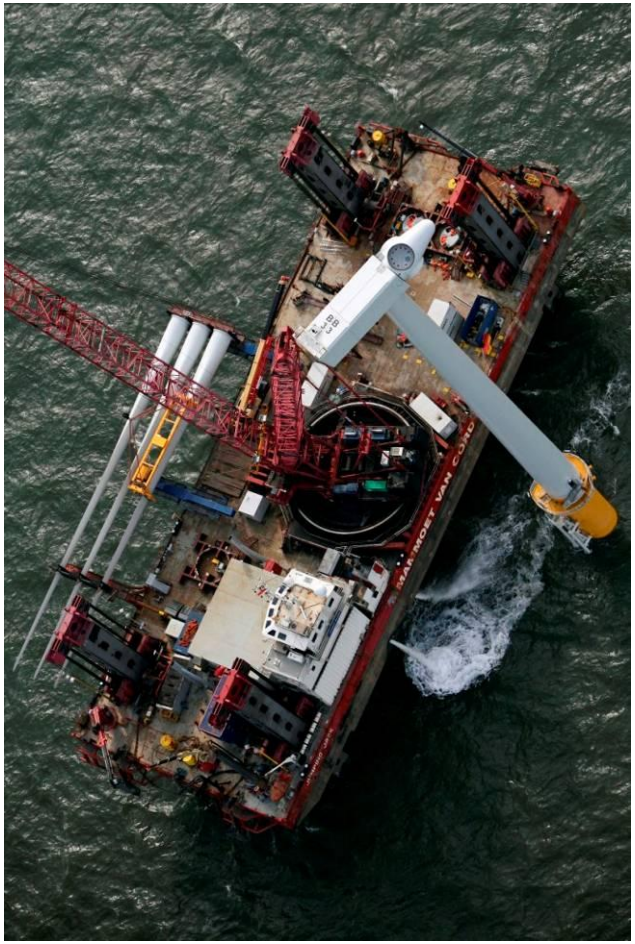
<u>Finding the optimal balance between local value creation vs. global low cost sourcing</u>

- Optimal split between Make & Buy
  - strategic components produced by Siemens
  - large components sourced from suppliers nearby
  - strategic suppliers to possibly co-locate at main hub
  - basic components from existing local suppliers
- Sourcing decisions based on landed costs (incl. transport)
  - components produced in low cost countries ….
  - …. vs. locally produced components
  - dual sourcing to avoid bottlenecks
- Improved flow of material to reduce logistics costs



SCM: Opportunities and Success Factors – Industrialised Setup at Main Harbour Site

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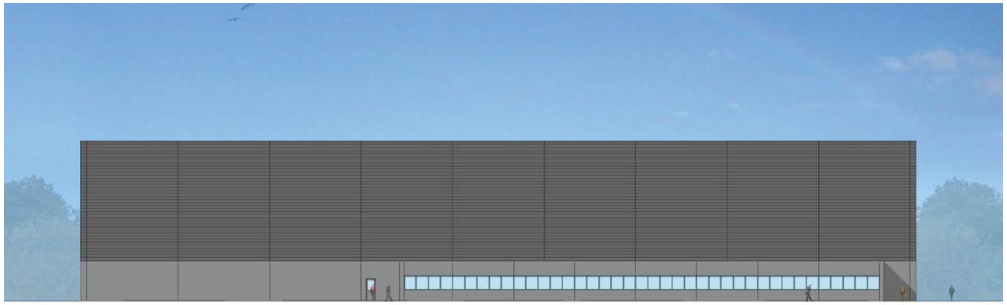
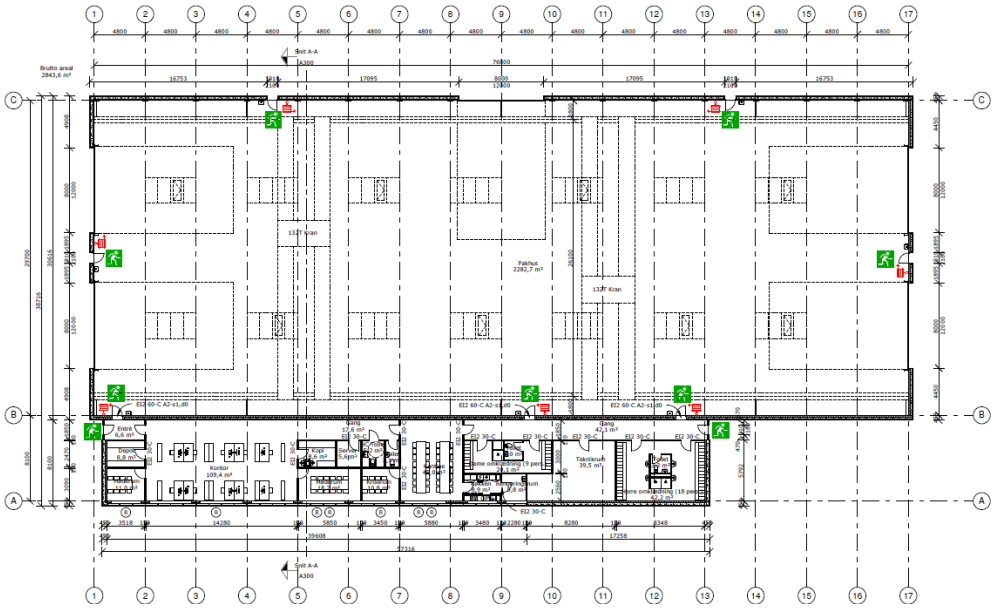
- Process oriented set-up, optimal flow of material
- Improved onshore processes
  - vertical integration of nacelle assembly and project pre-assembly
  - effective use of installation vessel by optimizing on-land pre-assembly
  - accurately defined, checked and tested components from all internal and external suppliers
- Sophisticated vessel loading
  - optimized loading process
  - minimal distance from nacelle assembly factory to pre-assembly to vessel
- Integration of supply chain partners
  - collaboration & best practice sharing with other offshore industries (oil & gas)
  - establish “supplier cluster” at main hub

Local pre-assembly harbour setup





Changes in local harbour requirements over time:

- Future turbines will be significantly bigger
- Requirement for assembly facilities
- Full test and inspection before load out
- Scope and complexity of work in local harbours will increase

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Future Technology: The new SWT-6.0-120 wind turbine; a combination of innovative Direct Drive and proven rotor technology

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SWT-6.0-120

4. Optimized offshore turbine design

- **Direct Drive** wind turbine with **6 MW** rated power and a **120 m rotor** diameter designed specifically for the harsh offshore environment
- Simple and straightforward design based on and benefiting from experience with smaller Siemens Direct Drive turbines
- Towerhead mass less than **350 tons** – a new low-weight standard for offshore turbines. This will contribute significantly to reduced cost of offshore wind energy, including Balance of Plant
- Low-risk approach by **reusing well-proven key technologies** such as the B58 blade from SWT-3.6-120 and standard NetConverter

Prototype installation Høvsøre, Denmark

The SWT-6.0-120 Direct Drive turbine is designed to reduce the cost of energy offshore

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SWT-6.0-120

4. Optimized offshore turbine design

- Turbine design **optimized** for offshore installation and commissioning
- High emphasis on safe and comfortable **working environment,** and **cost effective service and maintenance**
- **Advanced diagnostics** system to reduce customer risk and enable maximum reliability and availability
- First onshore prototype installed **May 2011** at the Høvsøre test site (DK), several more prototypes to come. Pre-series production planned for 2012, serial production planned for 2014
- **150+ m rotor** to be tested in 2012

Prototype installation Høvsøre, Denmark

Within Siemens Wind Power's scope, installation and service are key employment drivers

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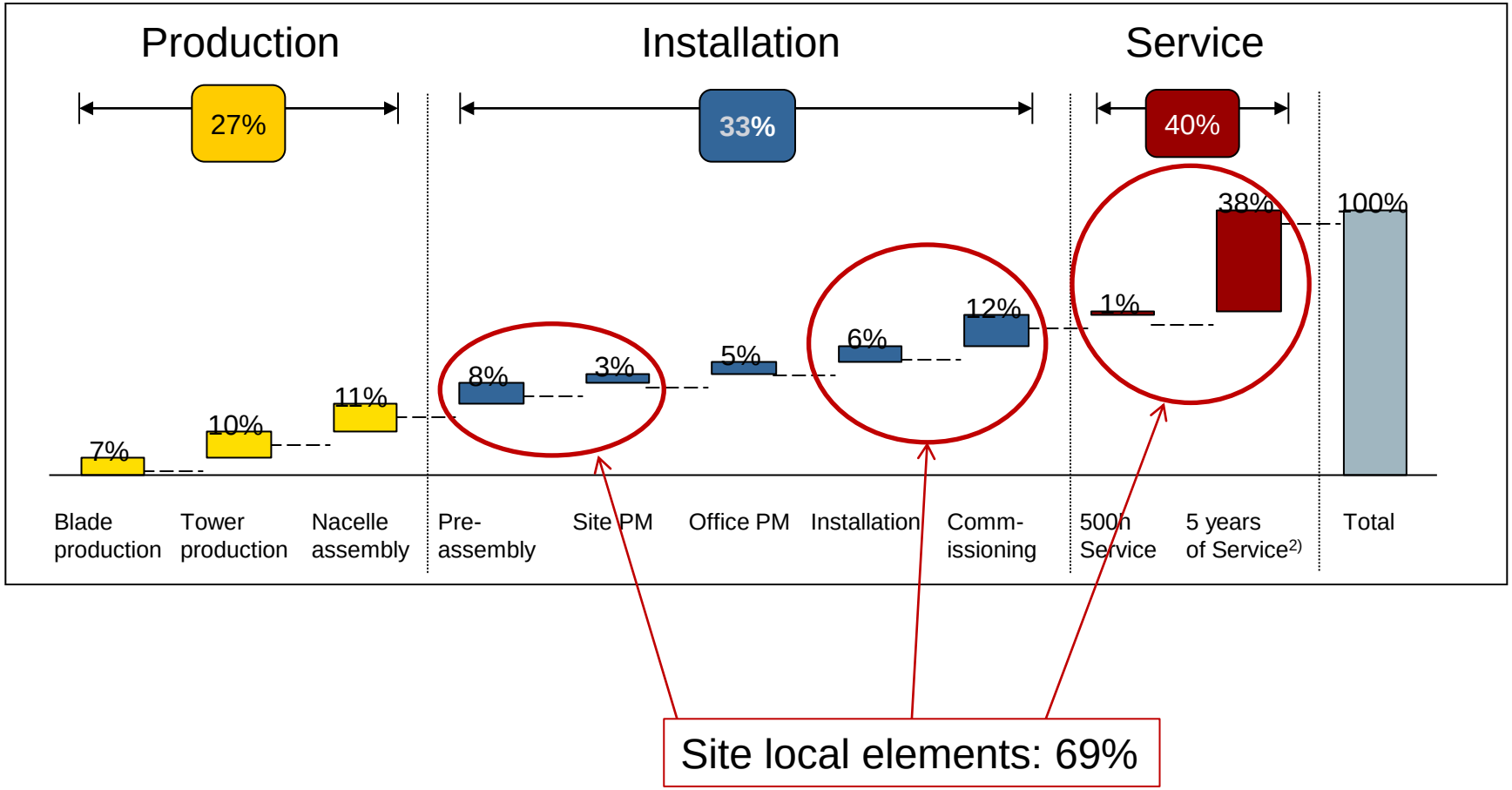
Est. man-hour breakdown, Siemens Wind Power typical scope for a 3.6MW project



...All the while delivering what our customers require

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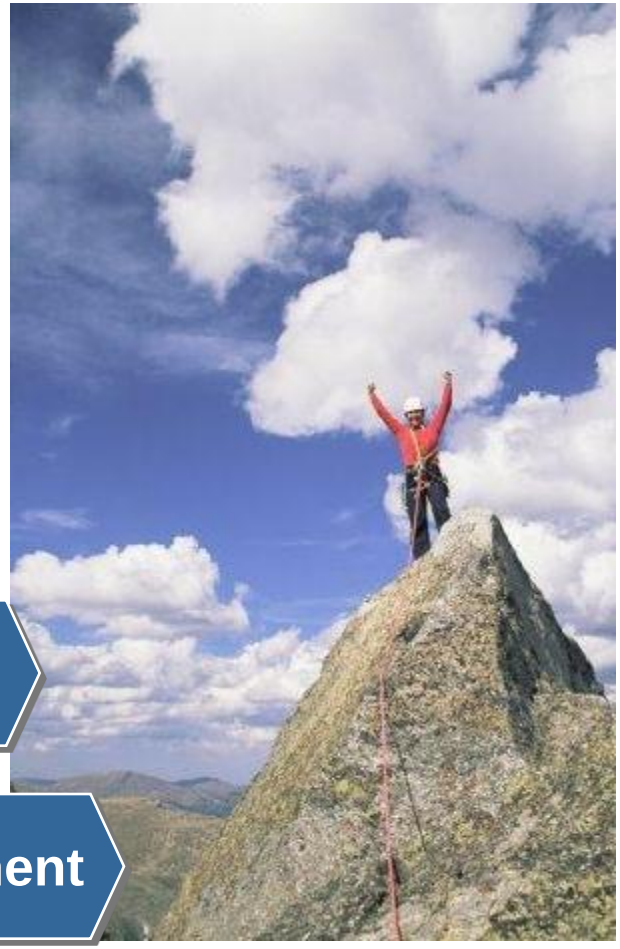
1. Increasing Quality
2. Lowest Total Cost
3. Optimised Supply Chain
4. Innovative Products
5. Improved Project Management



Our message for you…

- Grow with us!
  - Strengthen your global reach or presence
- Logistics is an important lever for our success
  - Integrate logistics in the design early
- Industrialise through “Rigid Lean” philosophy
  - Bring cost down
- Build flexibility in your supply chain
- Innovate: Learn from us or teach us!