LDST – Large Diameter Steel Tower

Vestas Technology & Service Solutions

Tower Engineering

Dansk Ståldag 10th November 2016

About Vestas Tower Engineering and Casper Lyngsø

X 6

X 2

Vestas Tower Engineering

- **40 Engineers in 3 countries (DK, Germany, India)**
- **Designing all towers (2016: 600.000 MT)**
- **Designing all foundations (2016: 1.7m CM)**

Casper Lyngsø

- **Manager for Tower & Foundation Load Carrying Structure**
- **19 Engineers in 3 countries (DK, Germany, India)**
- **5 years in Vestas**
- **15 years Civil Engineer (CONCRETE!)**

Content

Background

Setting the Scene

Increasing request for higher towers

Multiple requests for higher towers above HH 120 m in CEU and NEU for the new 3 MW variants with large rotors

Std. tower is reaching its limit

Traditional steel towers for 3MW are reaching their limits of cost optimal designs

Tower Concepts?

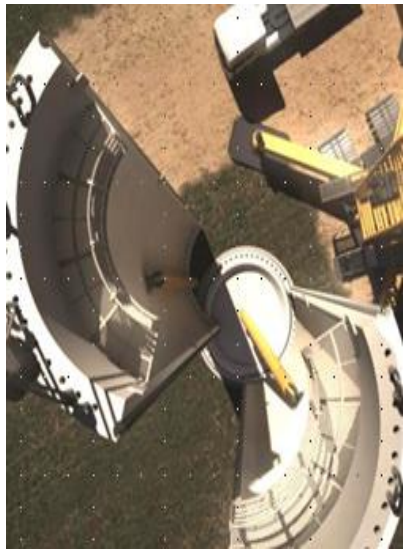
2 overall requirements: fit for purpose for the duration of the lifetime + cheapest total landed costs

Turbular steel

LDST

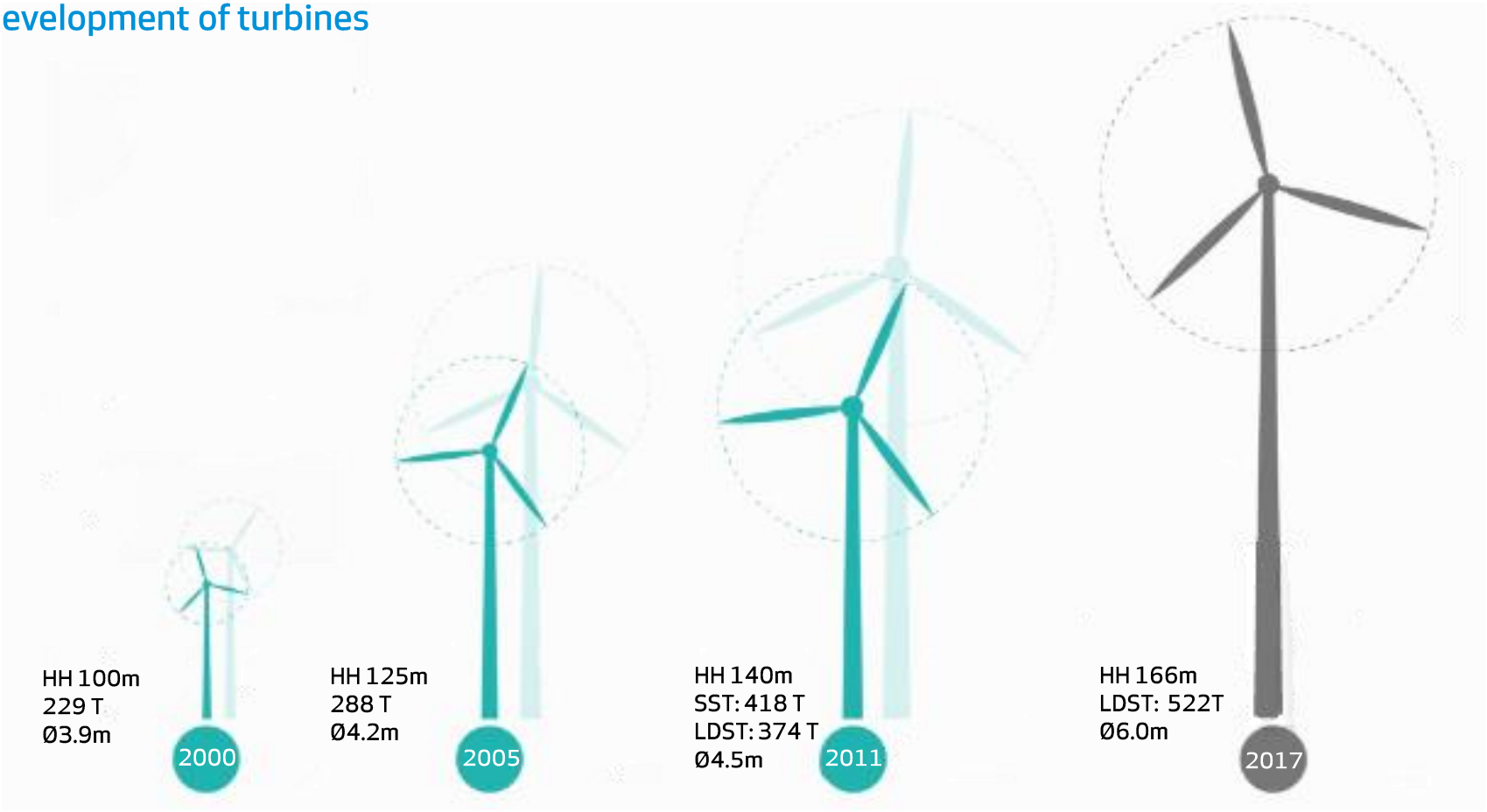
Hybrid tower

Concrete tower



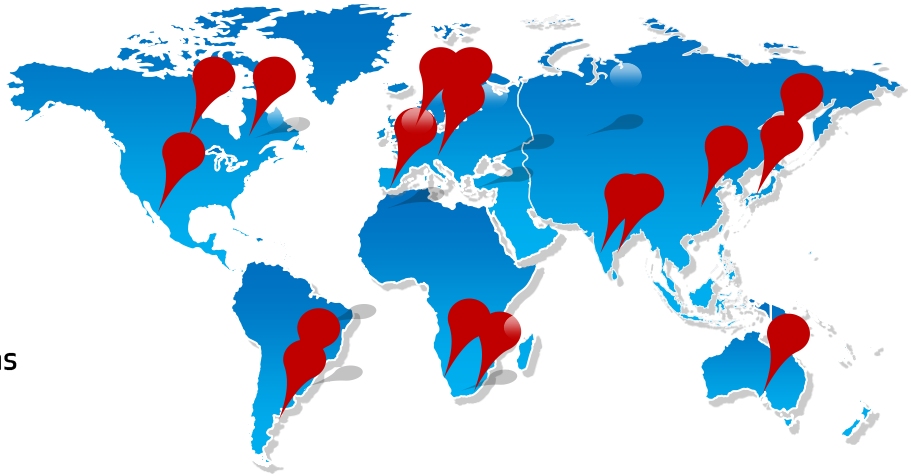
Background

Development of turbines



Content

Supply Chain



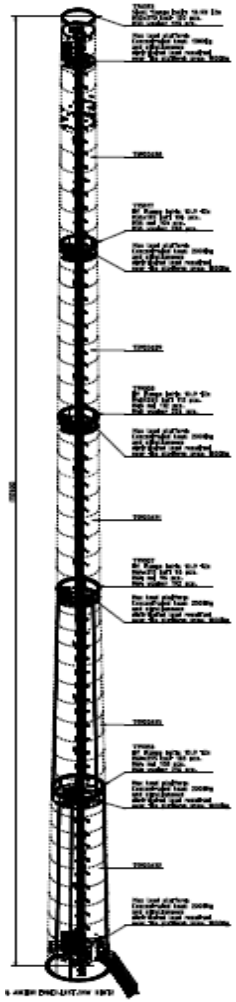
Supplier Locations

Content

What is a Large Diameter Steel Tower (LDST)?

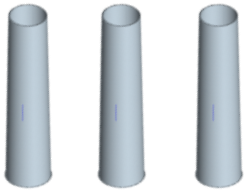
LDST is a tower consisting of standard tower sections in the middle and upper part and special sections (typically 2) with a larger diameter, the so-called LDST sections, in the lower part

LDST



A Large Diameter Steel Tower (LDST) is a tower consisting of standard tower sections in the middle and upper part and special sections (typically 2) with a larger diameter, the so-called LDST sections, in the lower part:

Standard tower sections **x 3**



LDST sections (segmented) **x 2**

Segmented section (1)

Segmented section (2)

https://www.youtube.com/watch?v=QK1hr_xCa_4

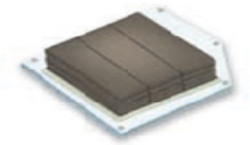
Content

Manufacturing Processes Comparison

LDST has a longer manufacturing process than a standard steel tower due to welding of vertical and horizontal flanges as well as cutting the LDST sections into segments and afterwards handling

Common manufacturing processes

1

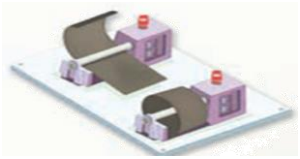


Material supply

2

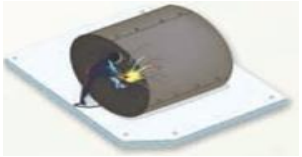
Cutting & bevelling

3



Rolling

4



Single-section welding

5

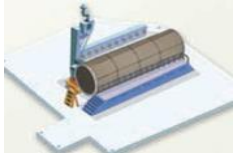
Sub-section welding & assembly

Standard steel tower specific processes

6

NDT & inspection

7



Sand blasting

8

Painting

9

Assembly & instalment of internals

In addition to the LDST specific processes, LDST also consists of a number of standard steel sections, which follows the standard steel tower specific processes

LDST specific processes

6

Welding vertical /horizontal flanges in

7

NDT & inspection

8

Cut LDST-sections into 3 segments

9

Sand blasting

10

Painting

11

Assembly & instalment of internals in upper sections*

Note: * The assembly of the LDST-sections as well as the assembly and instalment of internals in the LDST-sections are done at site

Content

Re-assembly of LDST at Site

On high-level, the re-assembly of one LDST section begins with the placement of two roller beds, moves on to placing and bolting segments together one at the time until a full section is complete

1

Check the hardstand for flatness and place the two roller beds appropriately

2

Lift the first segment from the ground and place it on the roller beds

3

Lift and turn the second segment from the ground and attach initially to the first segment using mountings and bolts

4

Turn the two attached segments using the roller beds. Connect the two segments by bolting the pre-attached aluminium bars between the longitudinal flanges together

5

Lift and place the final segment from the ground and attach initially to the two connected segments using mountings and bolts

6

Turn the construction. Bolt the pre-attached aluminium bars between the longitudinal flanges together (x2). Mount internals

Note:

Source: KP, MIVBR, BMN

Thank you for your attention