# **Upscaling - the game changers**

Smart Installation and Service tool solutions

LIFTRA PROVIDES TAILOR-MADE SOLUTIONS FOR SPECIAL LIFTING AND TRANSPORTATION TASKS IN THE GLOBAL WIND TURBINE INDUSTRY

# 🕭 Liftra

### LIFTRA AT A GLANCE

#### **Purpose**

To expand the use of our technologies in the global wind industry by continuing to set new standards for the lifting and handling of wind turbine parts – all in order to lower the cost of wind energy.

### Liftra by the numbers

**16** years of industry experience

**36+** products with multiple patents and patents pending

### **170** employees across three continents

**700+** projects from small lifting brackets to stand-alone solutions

### We are members of



European Crane Standardization Committee in Denmark

S-353: Part of Danish Standard

ENERGY INNOVATION CLUSTER

### Management



Per Eske Fenger Co-founder, owner and CEO

Board member at Wind Denmark



Jens Mortensen Co-founder, owner and CEO

### Liftra Timeline

# 🤌 Liftra

2003 Ο Liftra is founded in Aalborg.



2003 First project is a Vestas V82 main shaft fixture.



Ο

2005 First selfpowered equipment, a MAN gantry carrier.

2008 Tianjin office opens.



2008 First patent granted (Tower Stacking Frames).



Bilbao office opens.

2009 Flexifit is developed, first solution for craneless component exchange.

2011 Blade Dragon is launched.

2011 Cincinnati office opens.



2013 Liftra Self-**Hoisting Crane** is launched.



Blade Eagle is launched.



2019 Blade Skylark is launched.



Promet is acquired.

2017 Blade Way is developed.



2018 LT1200 Liftra Self-Hoisting Crane is launched.

### TAILOR-MADE SOLUTIONS HAVE BEEN CORE TO OUR BUSINESS SINCE 2003



Blade yoke – horizontal to vertical



Tower and nacelle lifting yoke



Upending of 760 t jackets



Rigging for Winergy gearbox in Siemens 2.3 MW



350-ton nacelle transport frame



130-ton rotor yoke

MORE THAN 700 PRODUCTS DESIGNED OVER 16 YEARS



50-ton lifting yoke



Davit crane with 2.7 m reach



### **OUR EQUIPMENT PORTFOLIO** COVERS THE FULL TURBINE LIFECYCLE ON- AND OFFSHORE





DNV.GL

#### 1ST GEN. LAUNCHED IN 2005 | 3RD GEN. PATENTED IN 2008





Sea transportation



Being prepared for shipping



NEXT GENERATION Launched 2018 Up to 9.0 m and 200 tons Fewer components Patent pending

#### TOWER STACKING FRAMES

**Universal system:** Fits all towers from 2.3 to 6.0 m in diameter and up to 120 tons.

Track record of 600+ sets manufactured

Known technology, used by many OEMs.

Ships in 40-foot containers for easy return.

Third-party certification by DNV GL.







### Liftra Blade Yokes – Key Milestones

# 🕭 Liftra



### **Blade Installation**



### **STATE-OF-THE-ART BLADE YOKES**



BLADE HAWK HORIZONTAL

LAUNCHED IN 2007

Horizontal installation of 61.5 m blades.

12 m/s mean wind | 18 m/s peak wind

Complete third-party CG3 certification (Design Verification, Production Survey, Test Survey)







BLADE EAGLE TILT +30°/-60°

LAUNCHED IN 2015 PATENTED IN 2015

No use of turbine turning gear

12 m/s mean wind | 18 m/s peak wind

Complete third-party CG3 certification (Design Verification, Production Survey, Test Survey)





BLADE DRAGON ALL ANGLES

LAUNCHED IN 2011 PATENTED IN 2011

No use of turbine turning gear

12 m/s mean wind | 18 m/s peak wind

Complete third-party CG3 certification (Design Verification, Production Survey, Test Survey)









### Blade Eagle



DNV.GL

#### LAUNCHED IN 2015 | PATENTED IN 2015







#### **BLADE EAGLE**

No use of turbine turning gear: Turns the rotor itself and relies on turbine yaw motor.
One-point lifting: No tailing crane required.
Best solution for electric pitch turbines.
Complete third-party CG3 certification
12 m/s mean wind | 18 m/s peak wind



### Track record

200+ blades installed.

**6-7** hours per turbine (= **3** blades).

Used on **three** continents.

No breakdowns.

### NEXT GENERATION

C

Liftra is developing an upgraded Blade Eagle for installation of **107-meter blades**.

CURRENT 73.5 m	
UPGRADED YOKE 107 m	n



### **Tagline System**

# 🕭 Liftra

### TAGLINE SYSTEM

#### LAUNCHED IN 2005 PATENTED IN 2012

Compensates for external forces during lifts – including the wind.

Automatic stabilization: Measures angles rather than loads to ensure fast reactions, minimizing load impact.

Available as stand-alone yoke, as addon to other yokes or integrated into Liftra blade yokes.

Universal on- and offshore system.

SIEMENS Gamesa

Vestas







Liftra automatic stabilization controller is based on gyro sensor technology ensuring lower tagline forces into crane

### **Tagline System**

# 🕭 Liftra

### **TESTING TAGLINE LOADS VS ANGLE MOVEMENTS**

#### **TEST SETUP**

**CRANE**: Liebherr LG1750 with SLGS **BLADE**: 54 m blade (weight  $\approx$  12 t) **TAGLINES**: Liftra 2 TL – Tagline system



#### **TEST RESULTS**

The graph below compares tagline loads and the angle of the yoke.

Not all movements in the yoke result in increased wire loads.

Loads measured in wires do not necessarily reflect movement of the yoke.



1 degree equals approximately 0.3 m in the current setup.

### Liftra Self-Hoisting Crane

# Liftra

### **CRANELESS** REPLACEMENT OF MAJOR COMPONENTS SINCE 2013





### MULTI-BRAND COMPATIBILITY

Turbine-specific adapter sets continually being developed. 24 ton WLL, 18 m/s peak wind.



### 600+ GEARBOX REPLACEMENTS

Gearbox replacement in 4-5 days. 8 cranes currently operated by independent service providers in the USA and Canada.



#### MINIMAL MOBILIZATION

Significant savings on mobile cranes. Only 3 vehicles required on-site: 40-foot crane container, 12-foot tool container and gearbox truck.



















#### **SELF-HOISTING CRANE COMPATIBILITY MATRIX**

Wind Turbine	Installed	<b>LT1000</b> (WLL 24 t)	<b>LT1200</b> (WLL 78 t)	
Acciona AW3000	1,500		@= +□ ~   🐨 📫	
Gamesa 2 MW platform, G8x G9x	14,000		∉ (⊐ ) Y	Ene
GE 1.5 - 70.5 77 82.5 87 GE 1.6 - 77 82.5 87 GE 1.68 - 82.5 GE 1.85 - 82.5 87	20,000	@ =	@ @ ~ \ ♥ ᆗ	repl
GE 1.6 - 100 103 GE 1.7 - 100 103 GE 1.79 - 100	6,000	♣ ⊕ ∽	@	Allete BP Duke
GE 2.x MW	6,500		@──│⋎॒ф	E.ON
Mitsubishi MWT1000a	2,500	d⊟ - 🛱 °°° =‡t 🚶		EDPR
Nordex 2.5 MW Gamma	4,500		@= ॑;; ← ;;   🌱 🥎	Enbri Enel (
Nordex Delta4000		-	∉ (⊒ Щ) ~ 📫 🛛 🥎	Exelo
Siemens 2.3 MW	10,000	48 47 ~   ** ≠	@╗~үџ	iberu
Siemens 2.625 MW G2-Mk4	240			Eur
Suzion S88	4,000	4 - The second s	·- ♥ +	l .
Vestas 2 MW platform	21,000	d <b>⊟ +⊡ ~ `@`  </b>	@ @ ₩ ~   ?	
Vestas V82 NEG Micon NM72, NM82	4,500	n 🖶 🕂 📥 🖕 👋 🗐 🕴	∉ * ? \ ?	d)
Vestas V112	9,000		∉ 🕁 🛄 〜 🕽 🔗 📫	Gearbox
Total	103,000	Component can be cha	nged now 🔵 Under development	

#### 600+ Components replaced

Statkraft

Main shaft

Horizontal

Vertical

**Energy companies that have had components** replaced by Liftra Self-Hoisting Cranes:

USA	
Allete Clean Energy	Invenergy
BP	Leeward Renewable Energy
Duke Energy	Mid-American Energy
E.ON	NextEra Energy Resources
EDF Renewables	NRG Energy Inc.
EDPR	Pattern Energy
Enbridge	Portland General Electric
Enel Green Power	RES Americas
Exelon	Transalta
Iberdrola Renewables	Westar Energy

Eurowind

Transformer

Europe

Aquila Capital

-67

Generator

OEMs that have ordered development of and purchased crane base equipment :

e Energy	SIEMENS Gamesa
gy ources	
ectric	Vestas.
t	(BE)
) Single blade	Single blade Rotor Hub

w/o blades

w/ blades

### LT1200 Liftra Self-Hoisting Crane

### NEXT GENERATION OF THE SELF-HOISTING CRANE







Liftra

### LT1200 SELF-HOISTING CRANE

#### LAUNCHES IN 2019

Capacity of **45 tons** at 6 meter reach Capacity of **78 tons** at 3 meter reach

Offshore concept

Single 40-foot container

### **NEXT GENERATION OF THE SELF-HOISTING CRANE**









Spec	LT1000	LT1200
WLL, 3 m	24 t	78 t
WLL, 5.2 m	24 t	50 t
WLL, 6 m	N/A	45 t
WLL, 7 m	N/A	35 t
Weight of crane	5.5 t	9.5 t
Total weight of container and crane	22 t	23.5 t

EUDP

### Scaling up Liftra blade yokes

# Liftra

### **NEXT GENERATION OF ANGLED BLADE INSTALLATION OFFSHORE**





Spec	Blade Eagle	Blade Eagle II	Blade Eagle III (Single C)
WLL	30 t	60 t	30 t
Installation	+/- 30°	+/- 30°	+/- 30°
Weight of yoke	55 t	160 t	25 t
Blade length	73.5 m	107 m	77 m

### What is the next gamechanger

# 🕭 Liftra

# **CRANELESS COMPONENT REPLACEMENT OFFSHORE** Possible to change gearboxes, generators, and transformers up to 45 ton.

WLL, crane	45 t
CTV transport capacity	80 t
Installation of turbine interface	16 h
Installation of crane	3 h
Change of gearbox	8 h
Total days to change a gearbox	4 days



Thank you

# 🕭 Liftra



ESTABLISHED 2003

www.liftra.comliftra@liftra.com

