



NABRALIFT INTRODUCTION

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 **Winterwind**
INTERNATIONAL WIND ENERGY CONFERENCE

FIND NABRAWIND IN INNOENERGY BOOTH (#34)

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NABRAWIND TECHNOLOGIES

Advanced Wind Technologies



Drastic Cost Reduction



Modularity



Proven Technologies



Modular Blade Joint



Self Erected Tower



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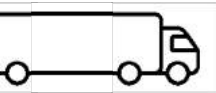
NABRALIFT® XXL Towers Challenges



Cost Increase

Exponential Cost

Most Expensive Component HH>120



Logistics

Roads / Bridges Limiting Concepts

High Logistic Cost



Assembly Cranes

Lack of Availability

Large Mobilization and Rental Costs



Installation Rates

Slow Wind Farm Installation Rates

Inefficiency Time Increase



WTG Integration

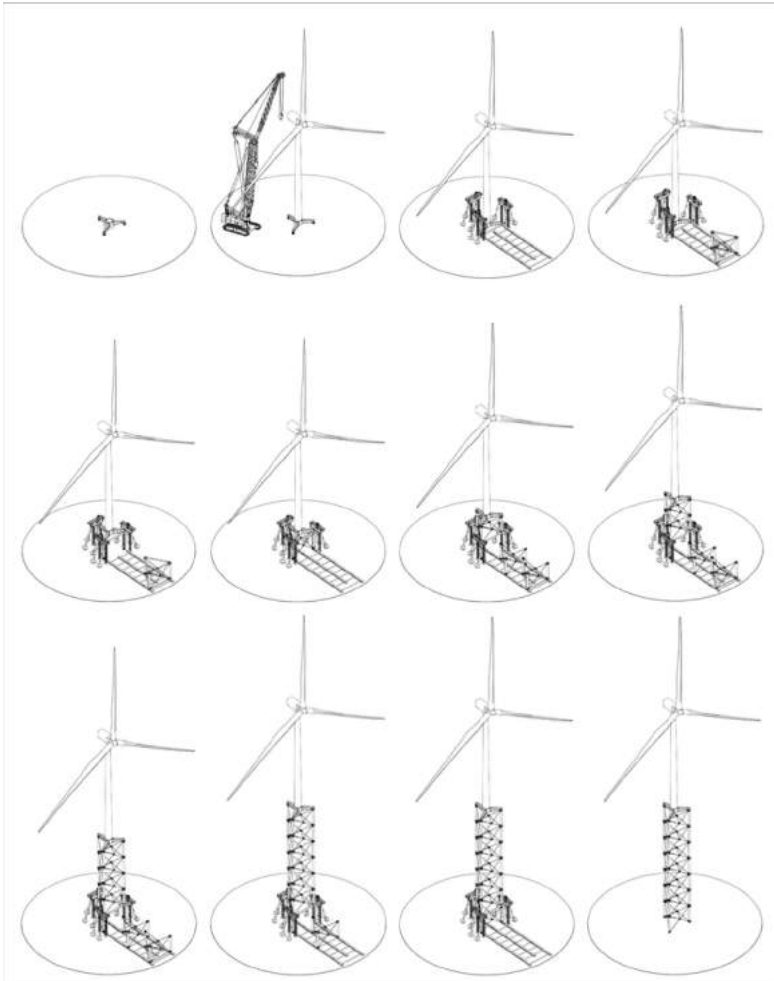
Control Challenges in Soft-Soft Towers

Soft-Stiff Unfeasible for XXL Steel Tow.



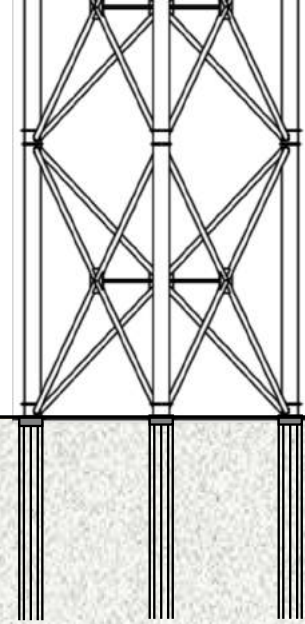
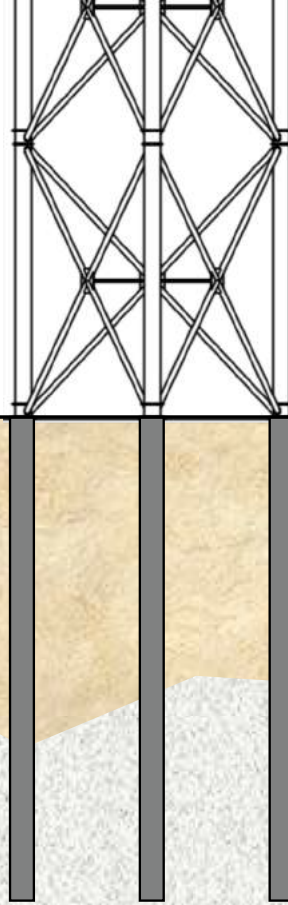
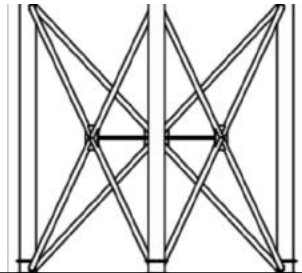
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NABRALIFT® Nabralift Description



2

NABRALIFT® Nabralift Description - Foundation



Foundation Portfolio



Gravitational Foundation
Standard Wind Solution



Pile Foundation
Standard Soil



Anchor Rock
Bedrock in Surface

Deep Foundations
Fast & Disruptive Cost

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NABRALIFT® Project Overview

GAILDORF (ALE)

178m



RENANIA (ALE)

164m



ESLAVA (SPN)

160m





Transition Bolted Assembly
1-Day Installation



Simple Tower Interface
Conventional Tower Flange

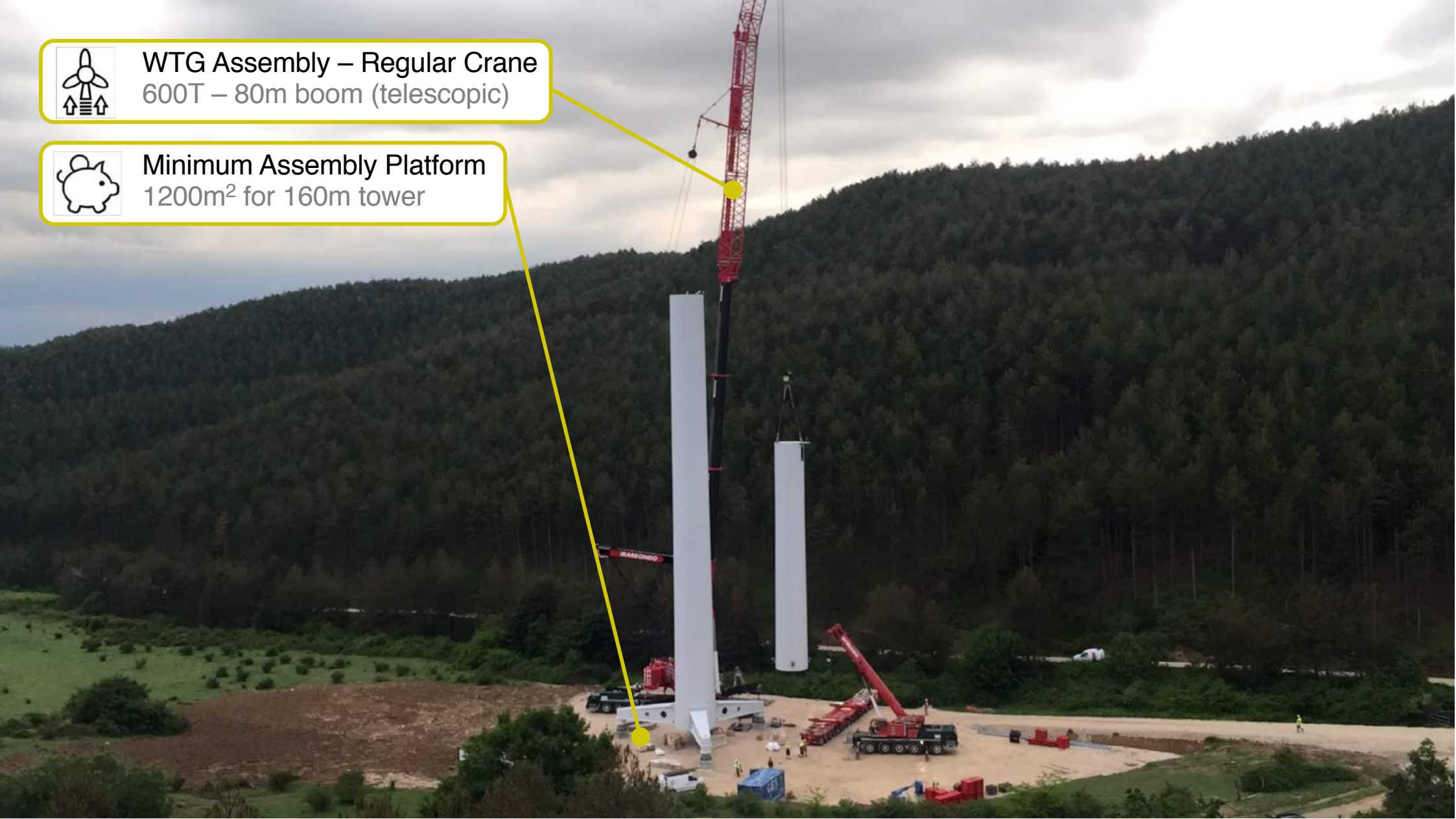




WTG Assembly – Regular Crane
600T – 80m boom (telescopic)



Minimum Assembly Platform
1200m² for 160m tower





Frame Designed for Logistics
HxWxL as per standard trucks





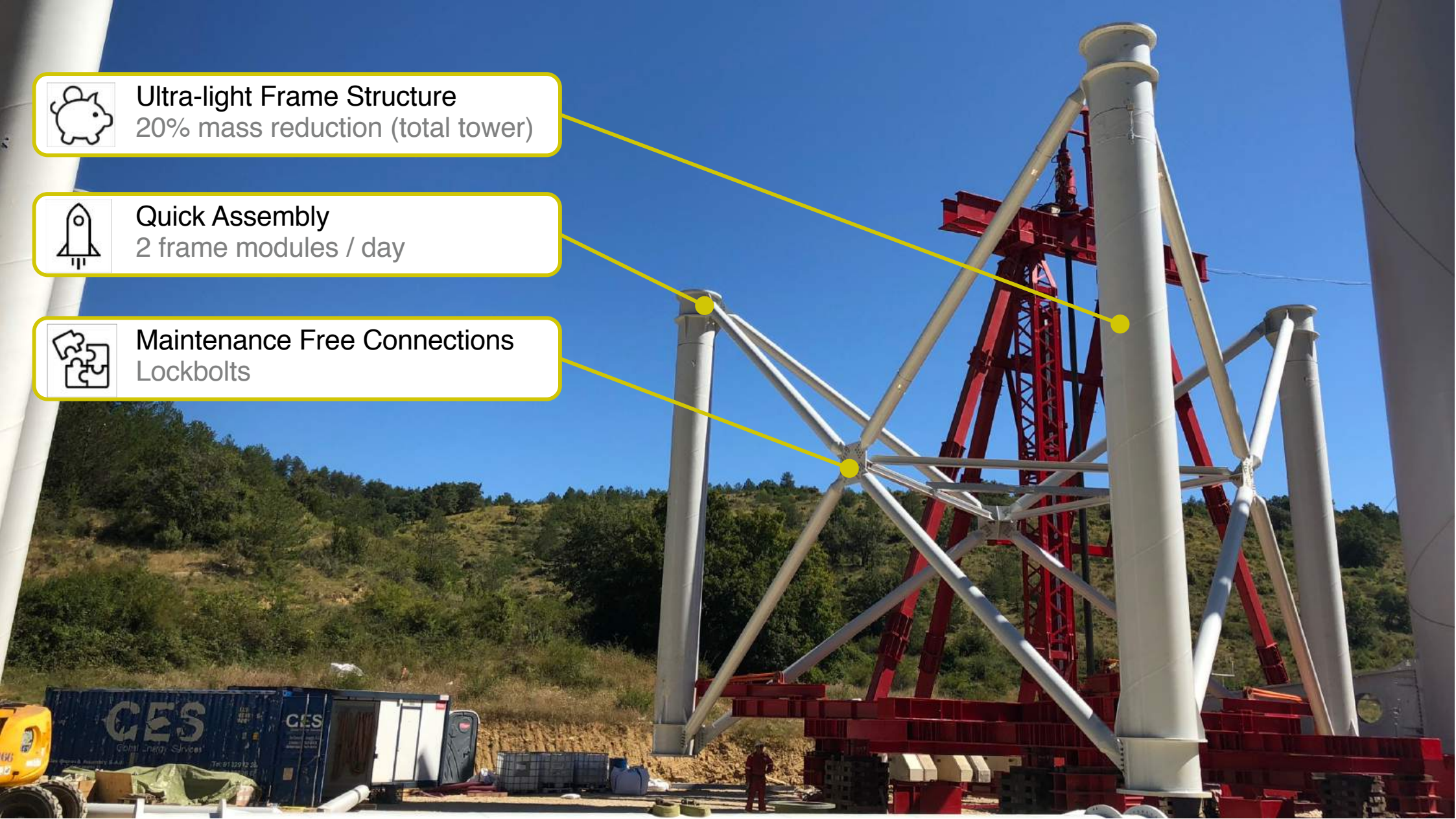
Ultra-light Frame Structure
20% mass reduction (total tower)



Quick Assembly
2 frame modules / day



Maintenance Free Connections
Lockbolts





Quick Erection

2 frame modules / day



Low Wind Sensitivity

Designed to operate up to 15m/s



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NABRALIFT® Nabralift Description



Ultra Low Cost

Foundation / Tower Components

Logistics / Assembly



Minimum Logistics

Sized for Standard Containers

Optimum Packaging



Self Erection

No Large Cranes

Low Occupation of Small Cranes



Fast Assembly

Self-Erection in 3 days / Prefab Found.

Higher Wind Speeds for Erection



Easy Integration

Soft-Stiff for HH>180m

Standard Interface

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NABRALIFT INTO COLD-CLIMATE SITES
LT + IEA Class 2



3 NABRALIFT INTO COLD-CLIMATE SITES

LT + IEA Class 2



Ice accretion in lower structure

Negligible load increase (as per ISO-12494)

- Additional stresses <2%
- No effect on tower frequency
- Stiff structure able to cope with loads caused by ice on blades



Materials compatible with Low Temperatures

Metallic structure with high toughness

- Low steel thickness



Tower internals adapted to Cold Climates

- Internals adapted for LT
- Minimum non-operative time of elevator due to icing (solution ongoing)



Installation process optimum for Cold Climate

- Pile foundation suitable to be manufactured in winter
- Erection feasible in cold conditions
- Erection feasible in high wind speed (15m/s)



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NABRALIFT® SERIAL PRODUCTION Project Overview: 2019-2020

Commercial Orders



Preserial Orders: 3 to 7 towers in 2019 (135m to 200m)

Serial to start in 2020

Production Centres



Production Centre in Spain: 30WTG/year

Serial Self-Erecting-System Construction



NABRAWIND

ADVANCED WIND TECHNOLOGIES

Thanks for Your Attention

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