

NABRAJOINT®: THE SOLUTION FOR XXL BLADES SEGMENTATION

Wind Turbine Blade Manufacture 2017
Düsseldorf
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PPT-0721 Rev. A

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- Team

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- Market Evolution
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- Conclusions

1 COMPANY INTRODUCTION

History

NABRAWIND TECHNOLOGIES

Advanced Wind Technologies



Drastic Cost Reduction



Modularity



Proven Technologies



Modular Blade Joint



Self Erected Tower

SHAREHOLDERS



Nabrawind



Barinaga y Alberdi



SODENA

2014

2015

2016

2017

2018



IP Development & Protection



Public Funding



1st Design

Prototypes

Commercial Preserials

Technology Projects Development

Nabrawind
Founded

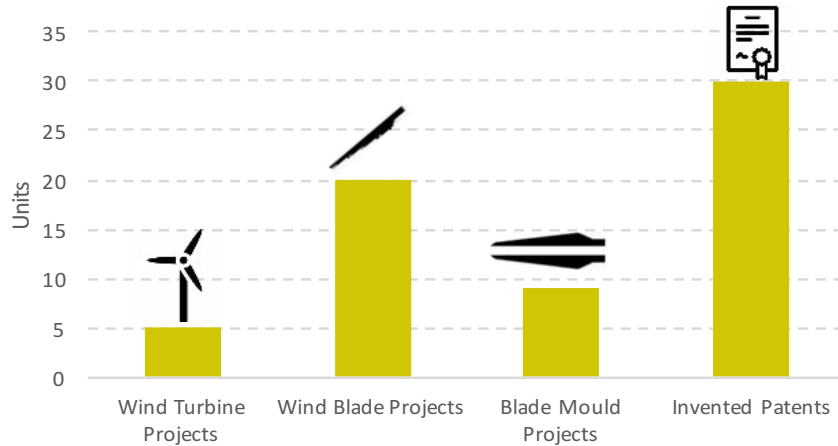
Nabrawind Technologies
Founded



1 COMPANY INTRODUCTION

Team

Long Experienced Team



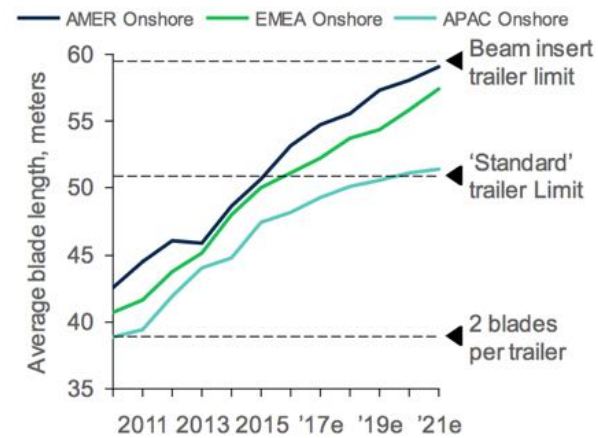
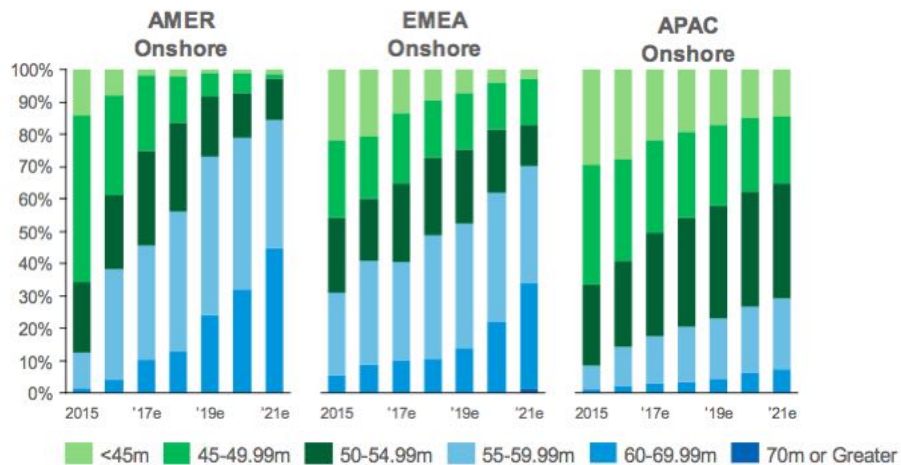
Wind Environment Headquarters

Pamplona (Spain) HEADQUARTER



2 XXL BLADES CHALLENGES

Market Evolution



Source: MAKE



2 XXL BLADES CHALLENGES

Modular Blade Solution



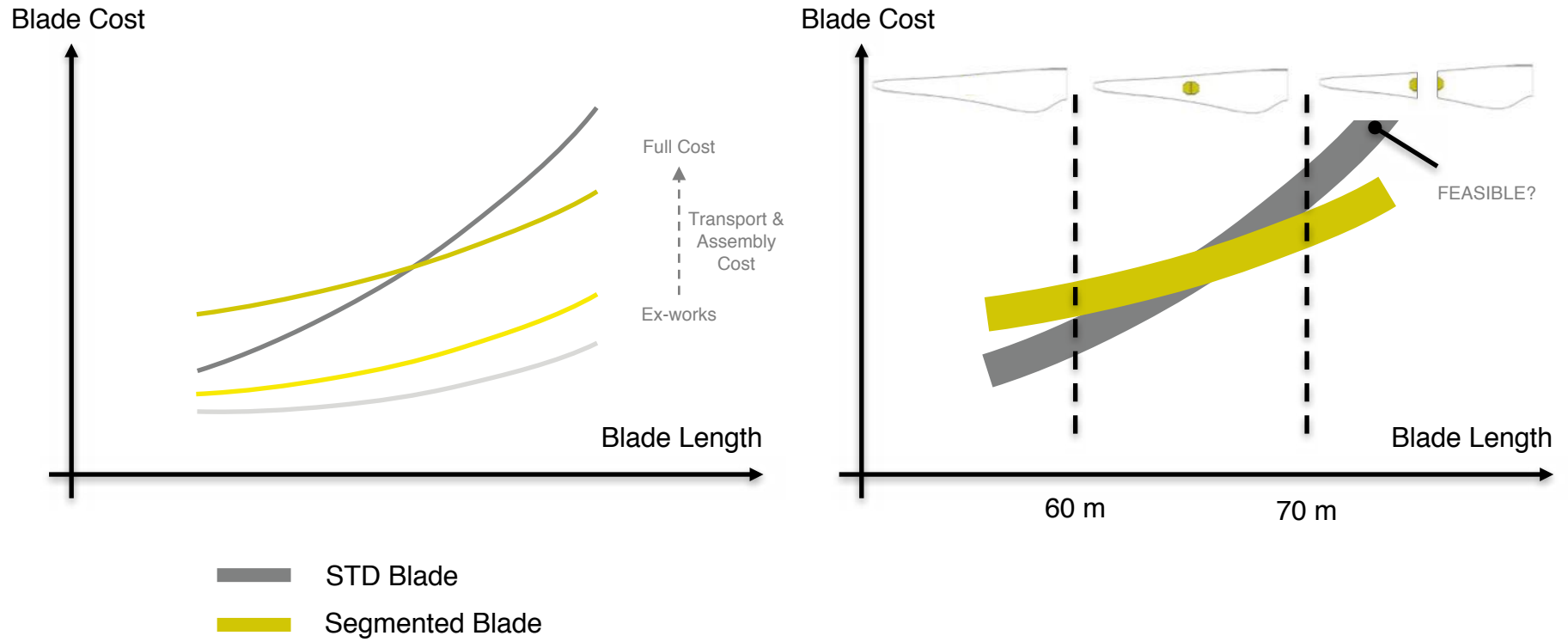
Source: NABRAWIND



Source: NABRAWIND

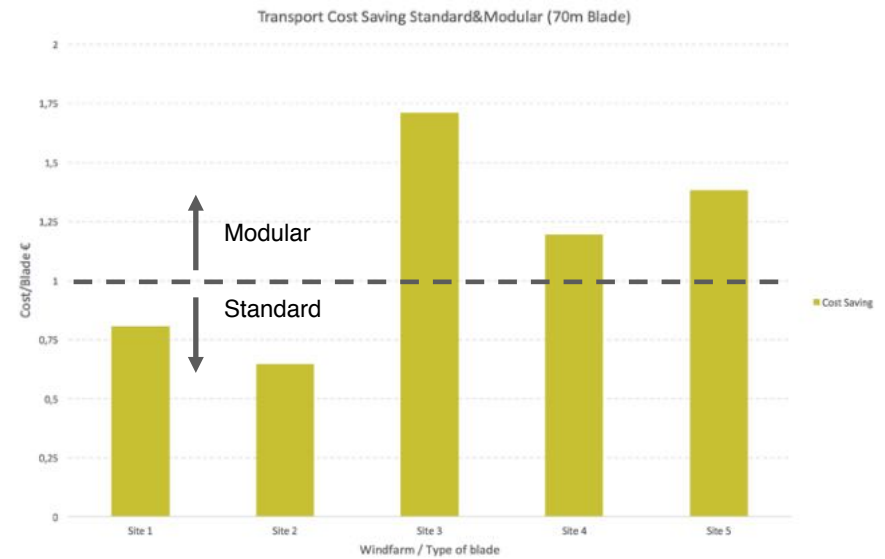
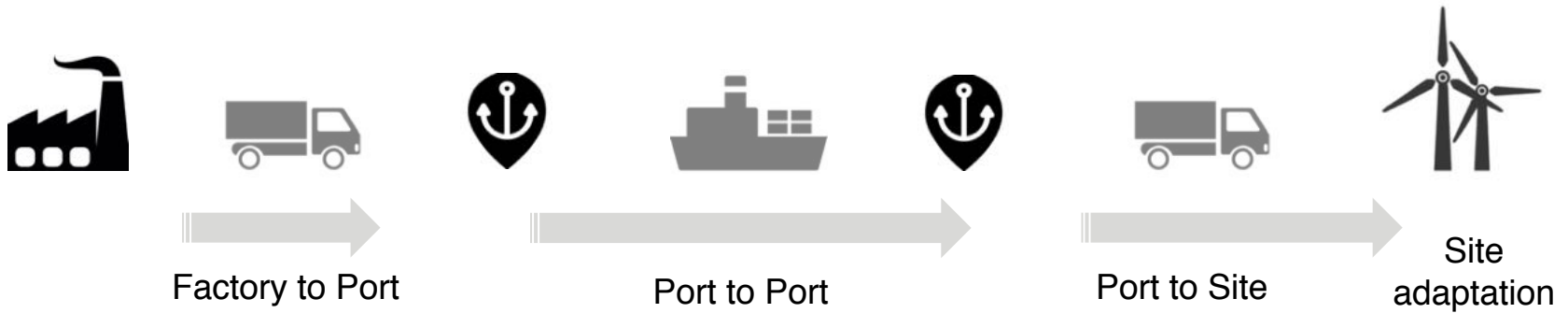
2 XXL BLADES CHALLENGES

Logistic Considerations



2 XXL BLADES CHALLENGES

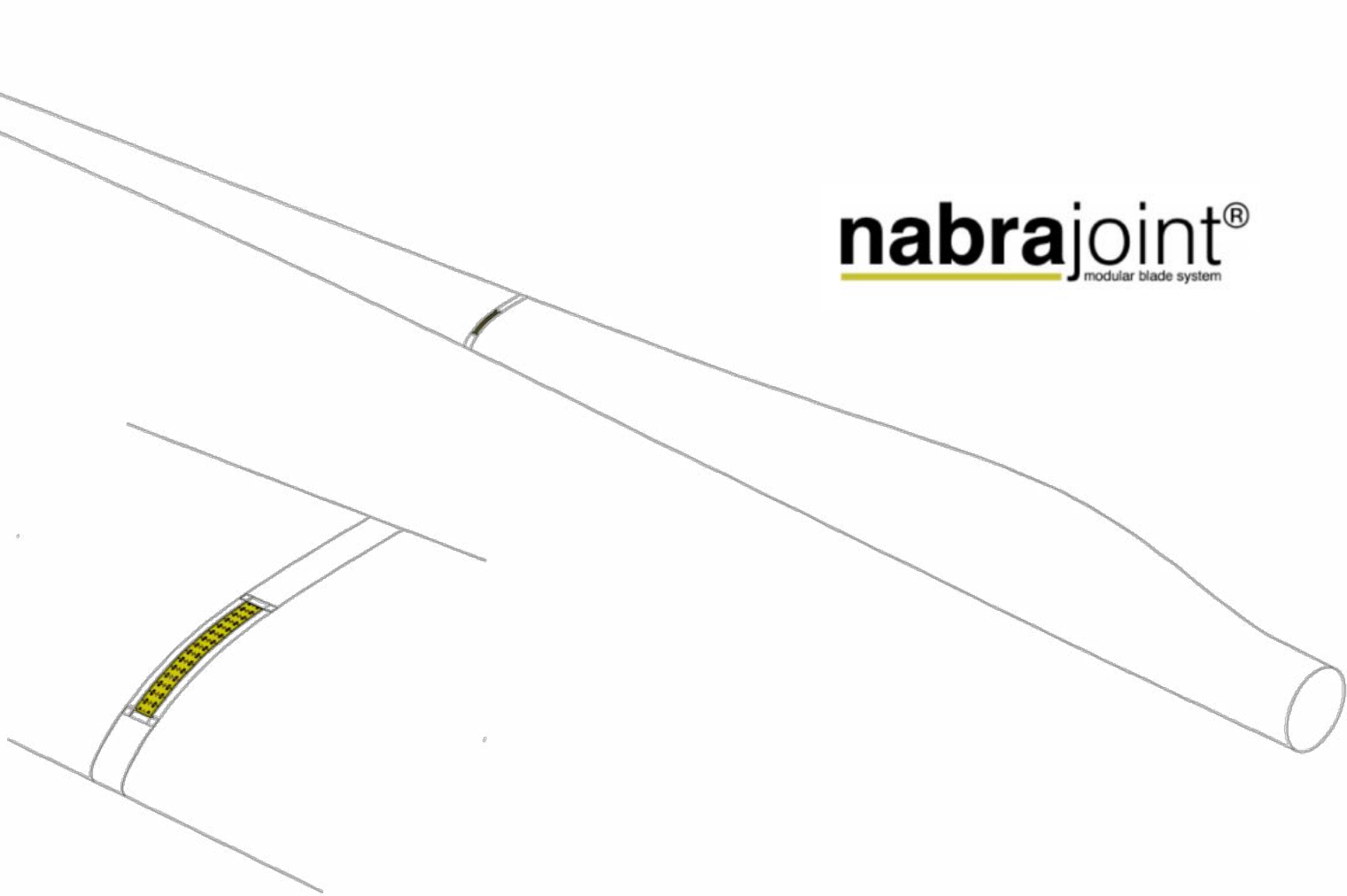
Logistic Model Analysis





3 NABRAJOINT® Product Description

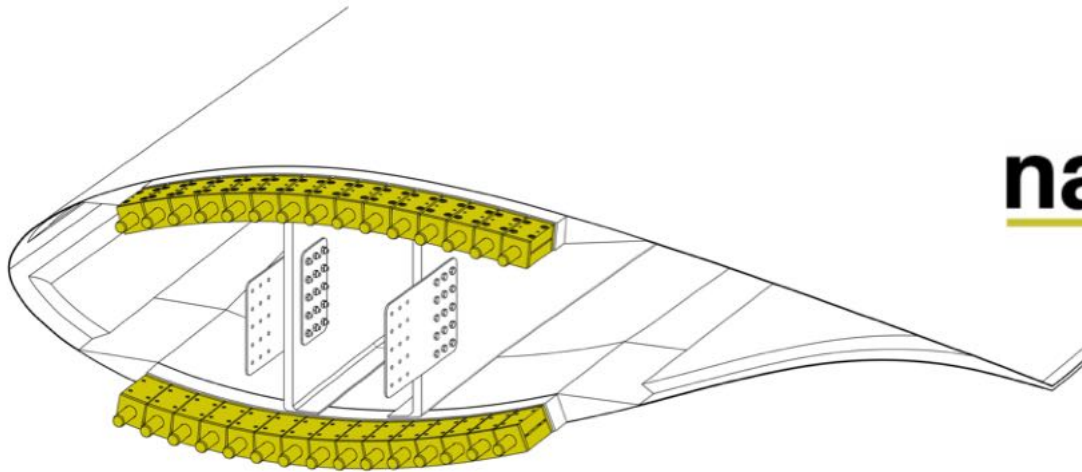
nabrajoint®
modular blade system



3 NABRAJOINT®

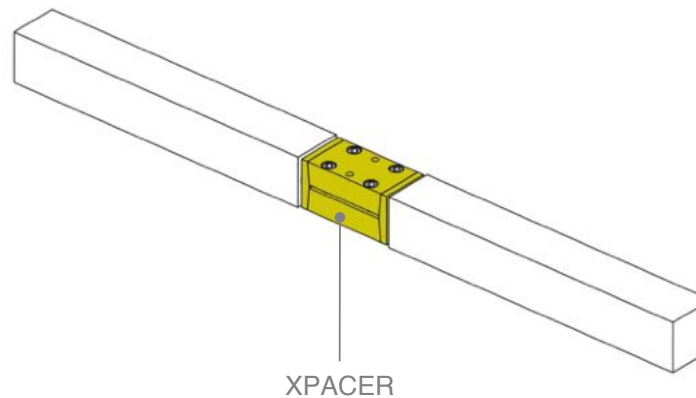
Product Description

- MBJ Details. General view



nabrajoint®
modular blade system

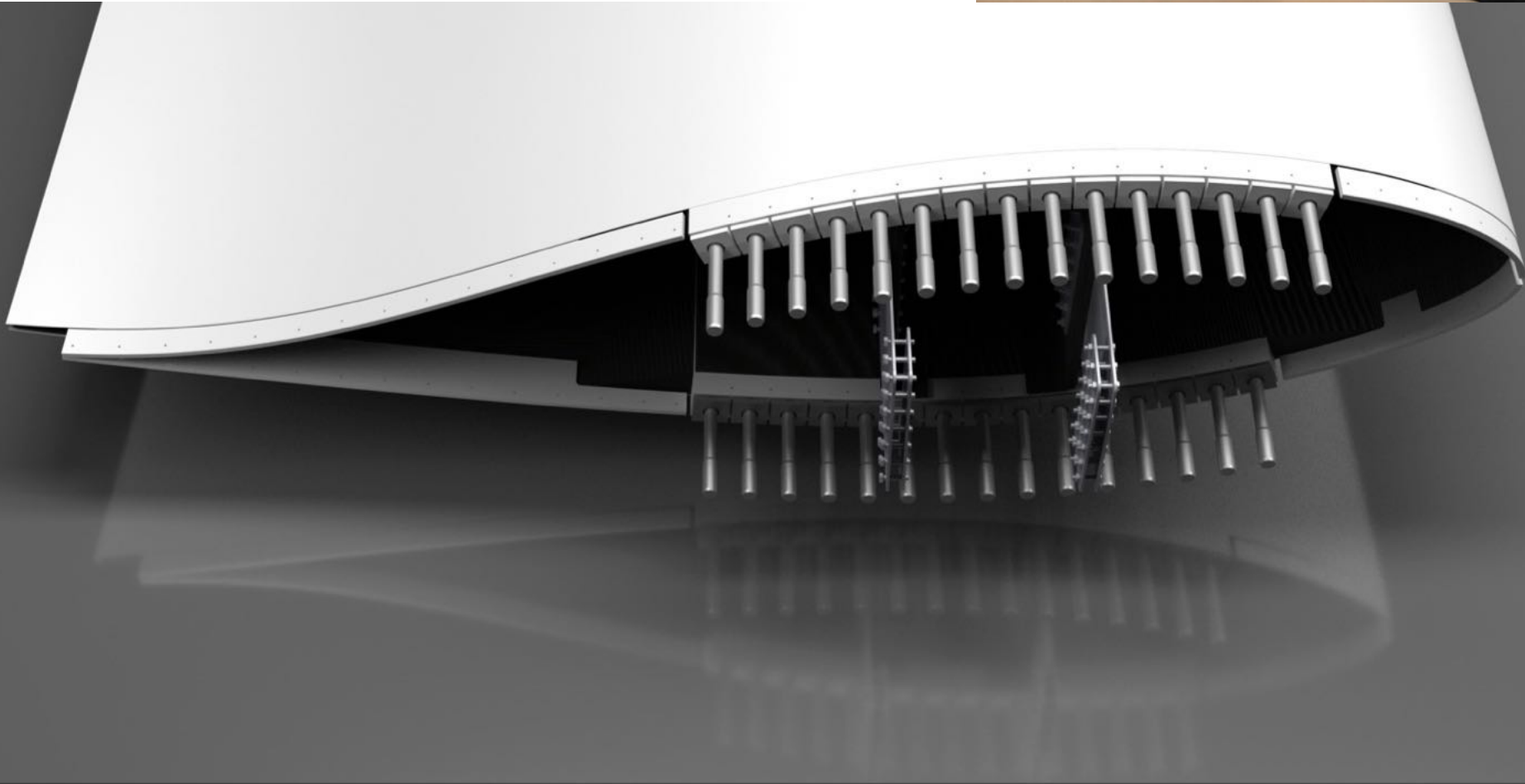
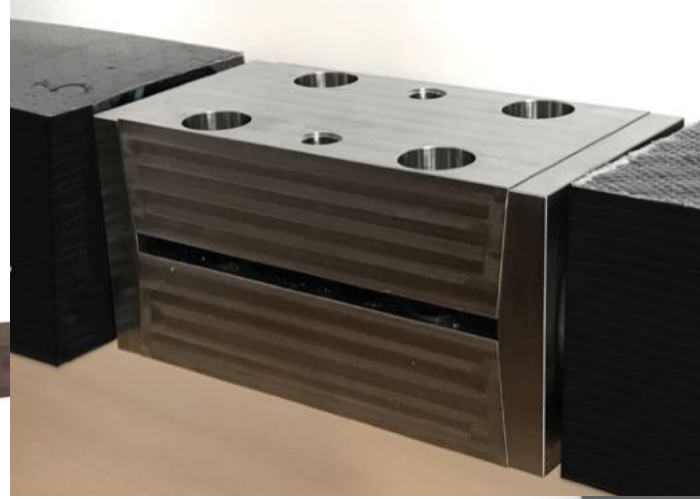
- Single element detail



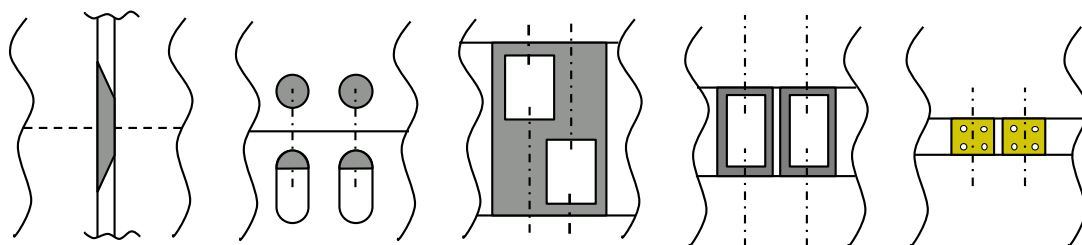


3

NABRAJOINT® Product Description



Modular Blade Joints Alternatives



Bonded

T-Bolt

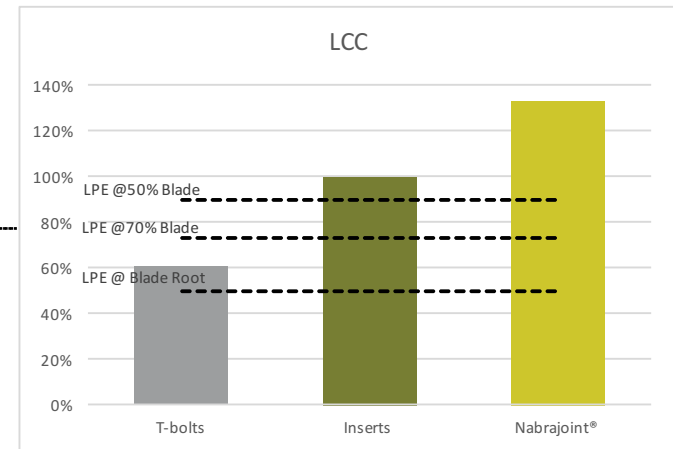
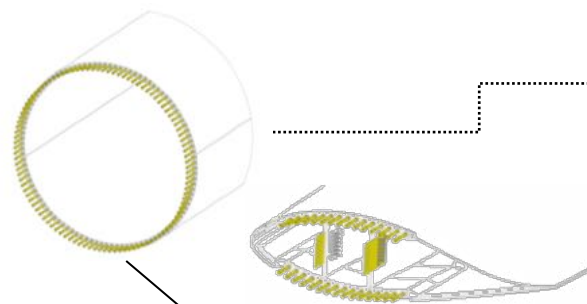
Double
Fitting

Bath Fitting

nabrajoint®

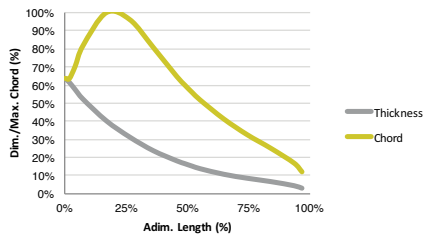
Strength / bolt sizing	●	○	◐	◐	◐
Mass & Cost	●	◐	◐	◐	◐
Assembly on Site	○	◐	◐	◐	◐
Maintenance	●	◐	◐	●	●
Reliability	○	◐	◐	◐	●

3 NABRAJOINT® Product Description

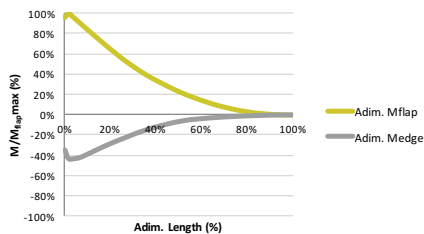


LCC: Load Carrying Capacity (kN/mm)
LPE: Max. Load per Element (kN/mm)

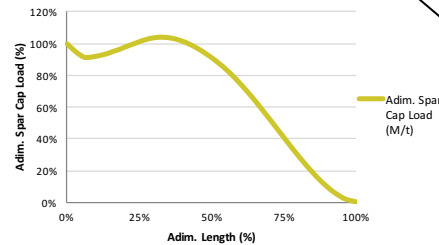
Blade Geometry



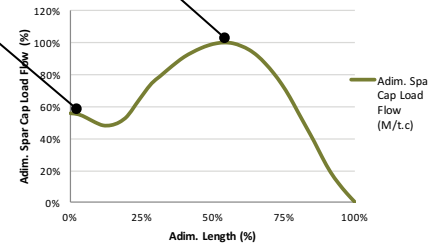
Blade Loads



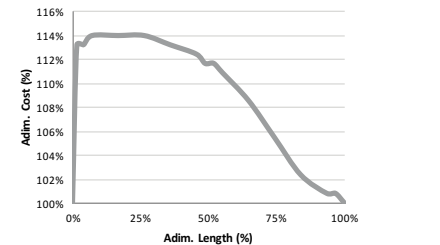
Spar Cap Unitary Load



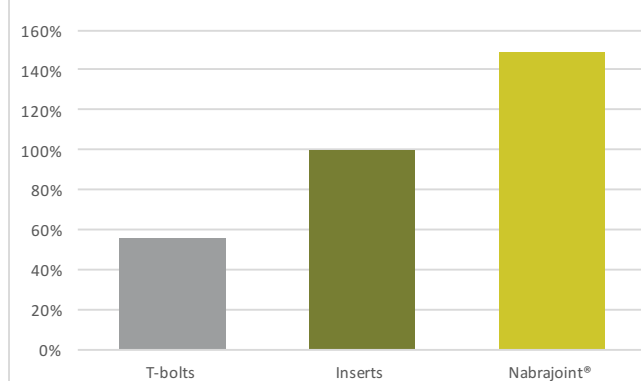
Spar Cap Load Flow



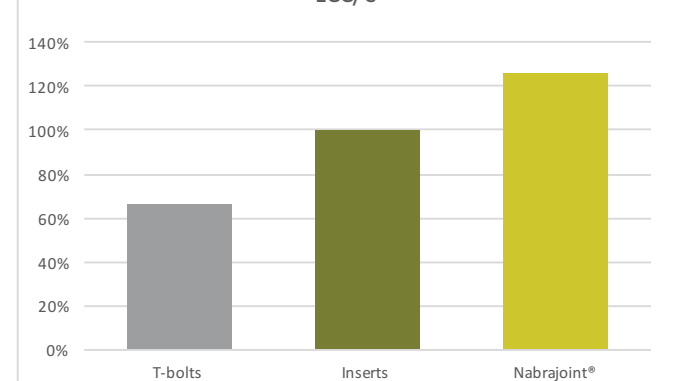
Joint Module Cost



LCC/kg



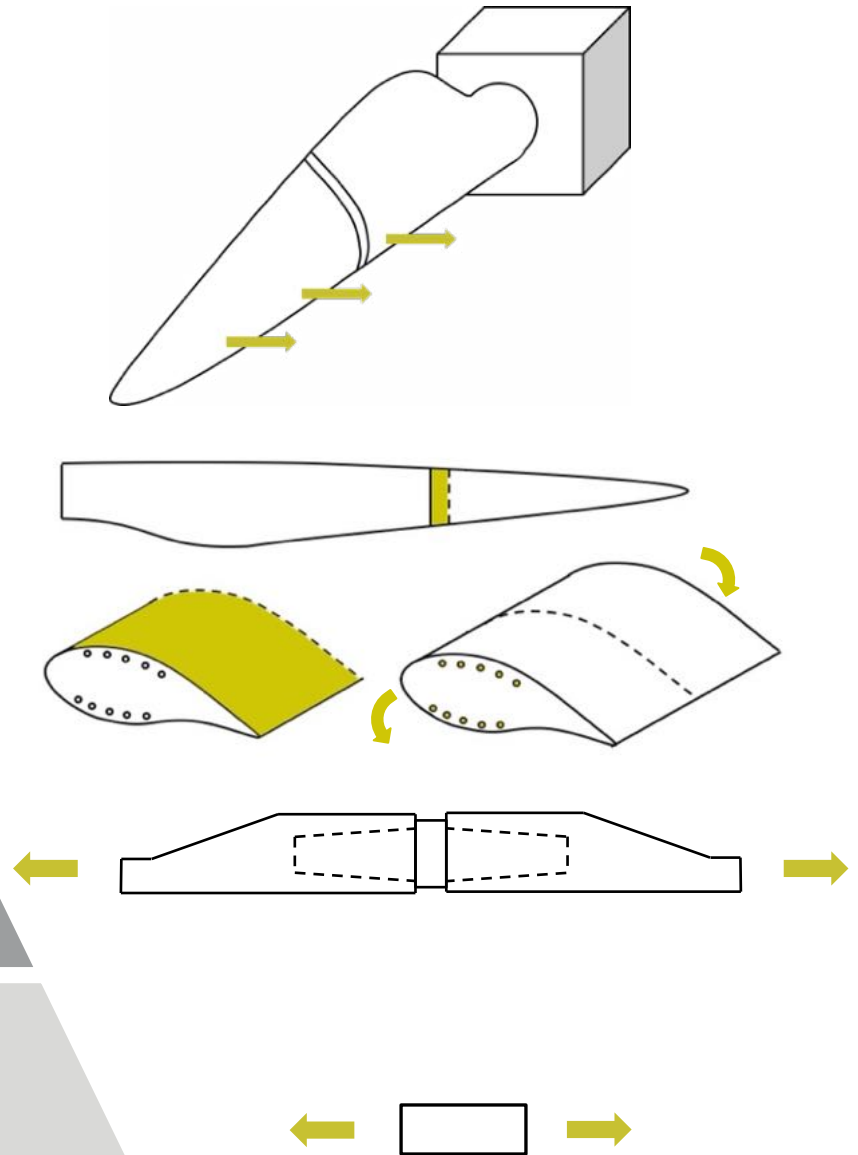
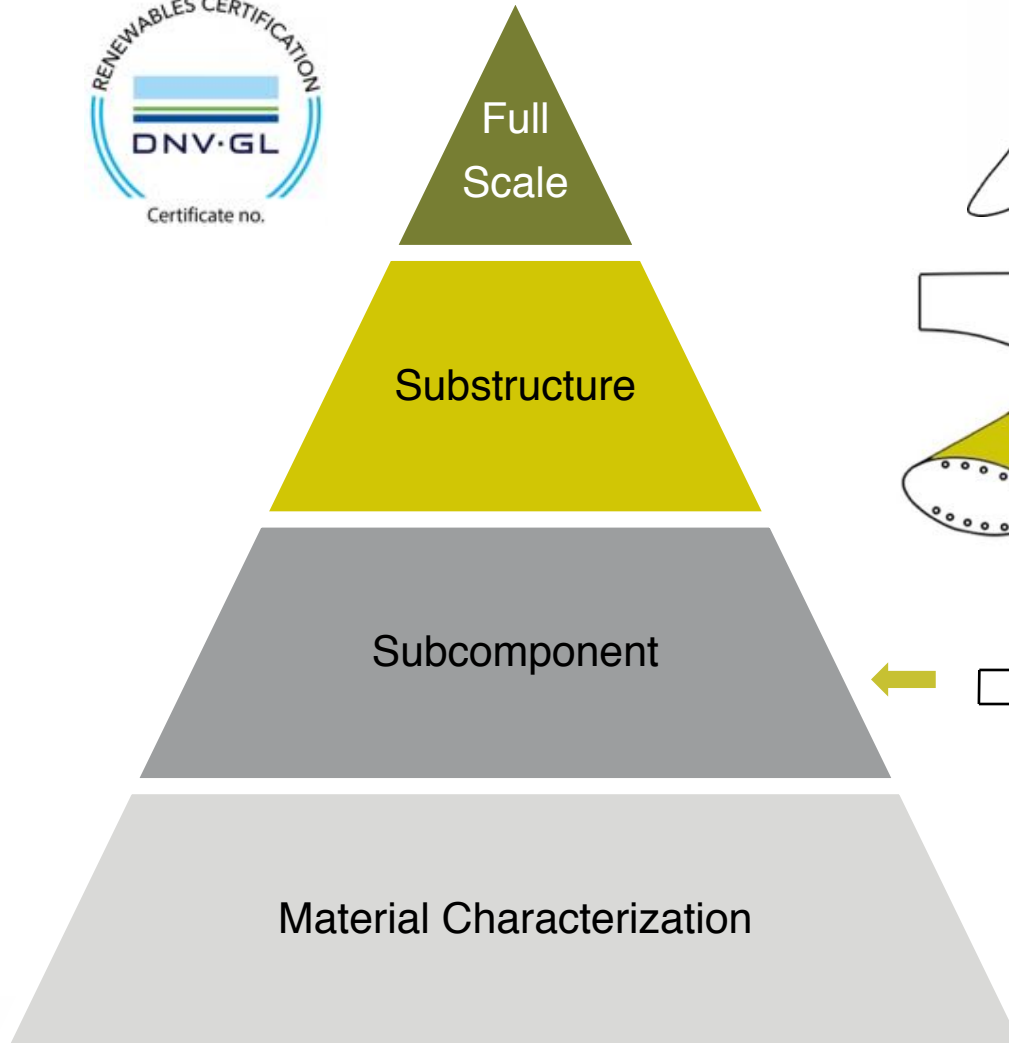
LCC/€



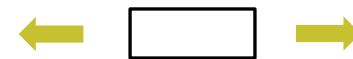
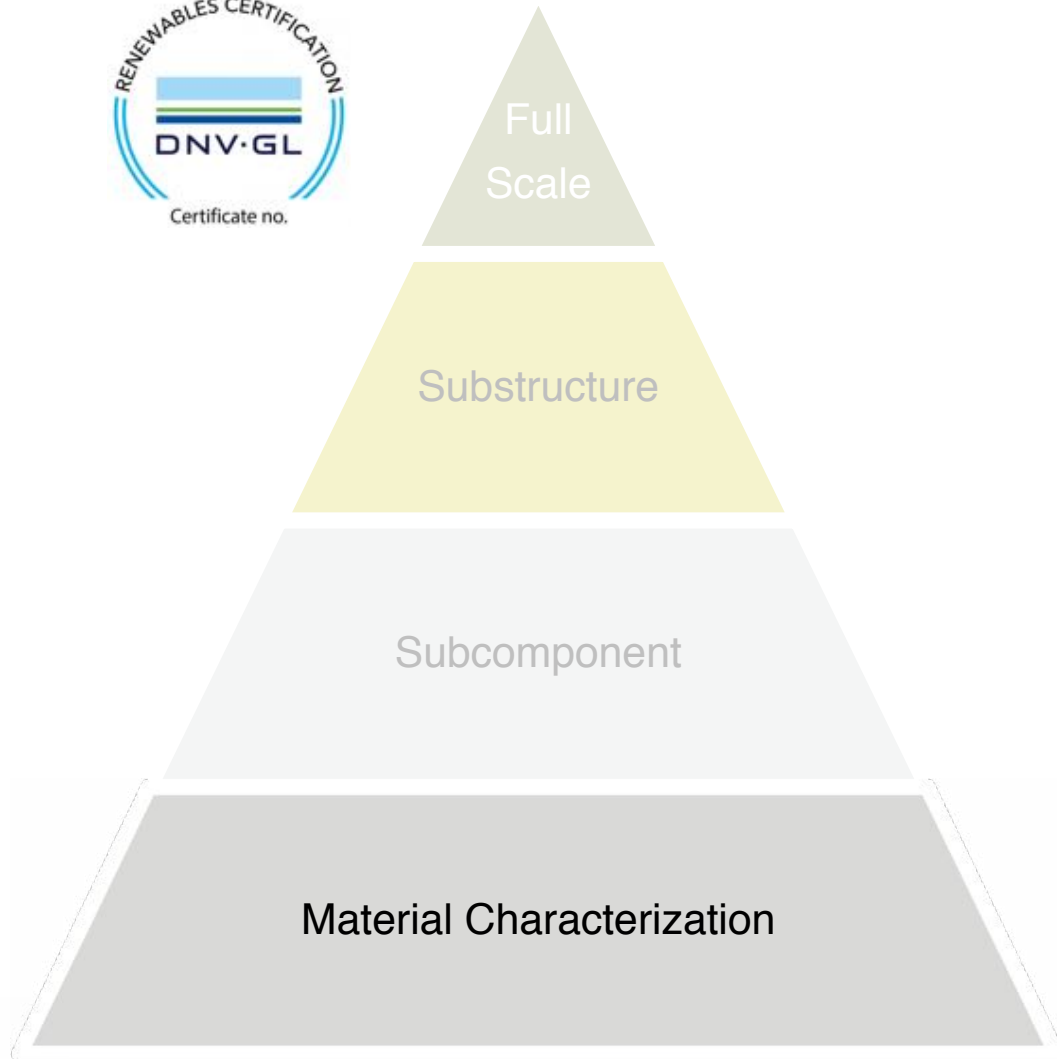


3

NABRAJOINT® Certification Strategy



3 NABRAJOINT® Certification Strategy



3 NABRAJOINT® Certification Strategy

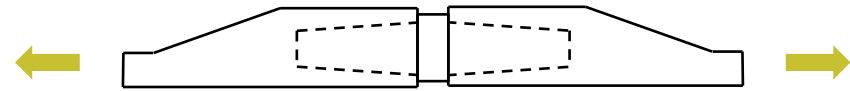


Full
Scale

Substructure

Subcomponent

Material Characterization





3 NABRAJOINT® Certification Strategy

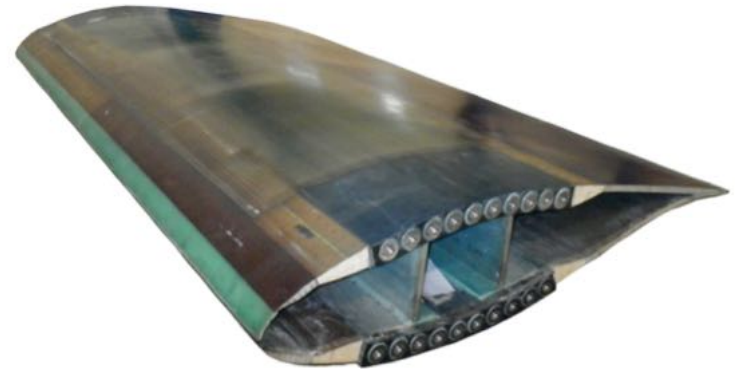
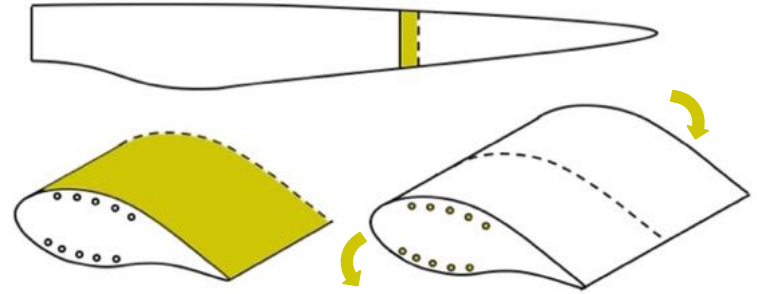


Full
Scale

Substructure

Subcomponent

Material Characterization



2016

2017

2018

2019

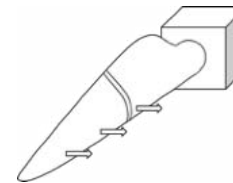
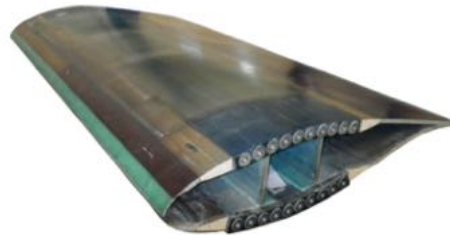
MBJ Technology
Development



Segment Tests

F-S Static and Fatigue
Tests

Modular Blade
Preserials



Design
Certificate



Blade Joint
Certificate



Blade
Certificate

3 NABRAJOINT®

Product Description



Cost-Effective Solution

Single Bolt per Joint Element

Smart Intermediate Spacer



Minimum Weight

Ultra High Load Carrying Capacity

Hybrid Carbon-Glass Fiber Module



Fast Assembly

Simple Segments Coordination

Automatic Pretension Tooling



Reliable Solution

Robust Assembly Process

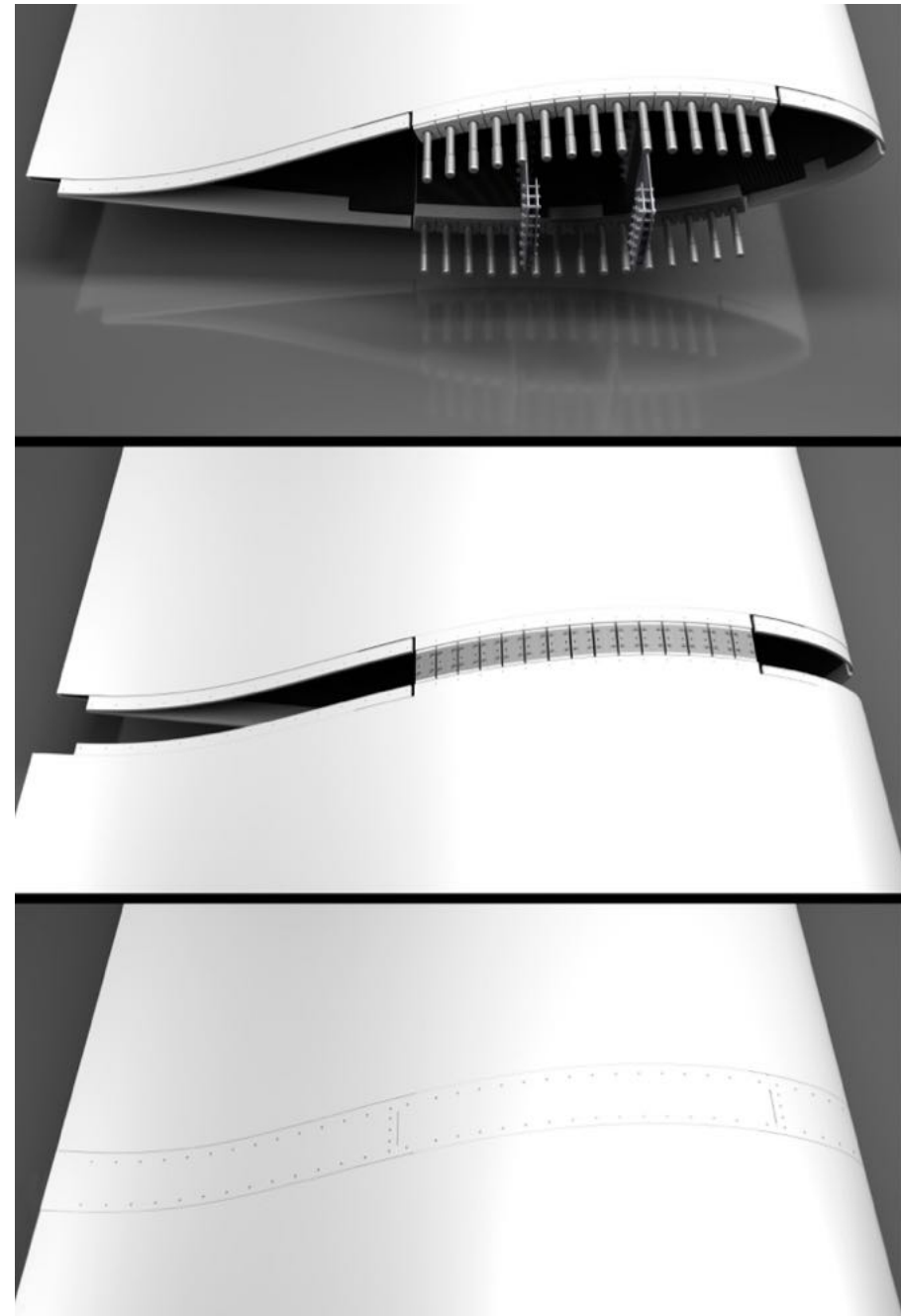
Maintenance Free



First Class Technology

DNV-GL Certification Process

Long Track Record Team



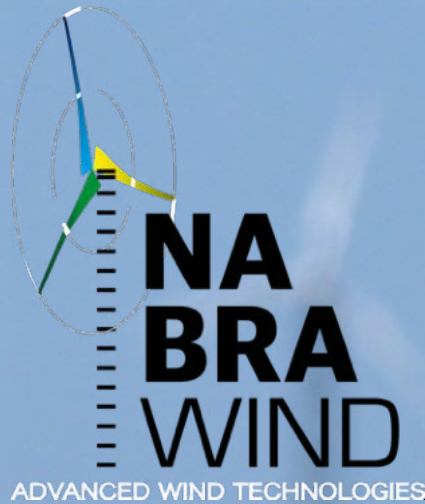


CONCLUSIONS



Ready for integration in commercial blade models





Thanks for your attention

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