



# Siemens Wind Power and Renewables Division

Florida Energy Systems Consortium March 23, 2016

# Wind Power and Renewables Division

## Facts at a glance

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### Siemens Wind Power facts

One of the world's leading suppliers of wind power solutions

Acquired Danish wind turbine manufacturer Bonus Energy A/S in 2004

Installed Base: > 16,300 turbines with ~ 31,000 MW capacity

Installed in FY 2015: > 1.970 turbines with > 5,6 GW capacity

~12,850 employees globally incl. Wind Service

Revenue in FY 2015: € 5,7 billion

# Wind Power and Renewables Division

## Market and locations

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### Market

Market growth for wind energy (installed capacity in MW) is estimated at 2% a year (2012 - 2018)\*:

- ▶ Onshore (2012 - 2018): 0.7% p.a.
- ▶ Offshore (2012 - 2018): 13.4% p.a.

Market position:

- ▶ No. 1 in offshore market
- ▶ No. 4 in global installations (2013)

### Locations

**Headquarters:** Hamburg, Germany

**Production locations:**

**Denmark**

- ▶ Nacelles: Brande
- ▶ Blades: Aalborg
- ▶ Blades: Engesvang

**China**

- ▶ Blades and Nacelles: Lingang City, Shanghai

**Americas**

- ▶ Nacelles: Hutchinson, Kansas, USA
- ▶ Blades: Fort Madison, Iowa, USA
- ▶ Blades: Tillsonburg, Ontario, Canada

**Sales and service centers worldwide**

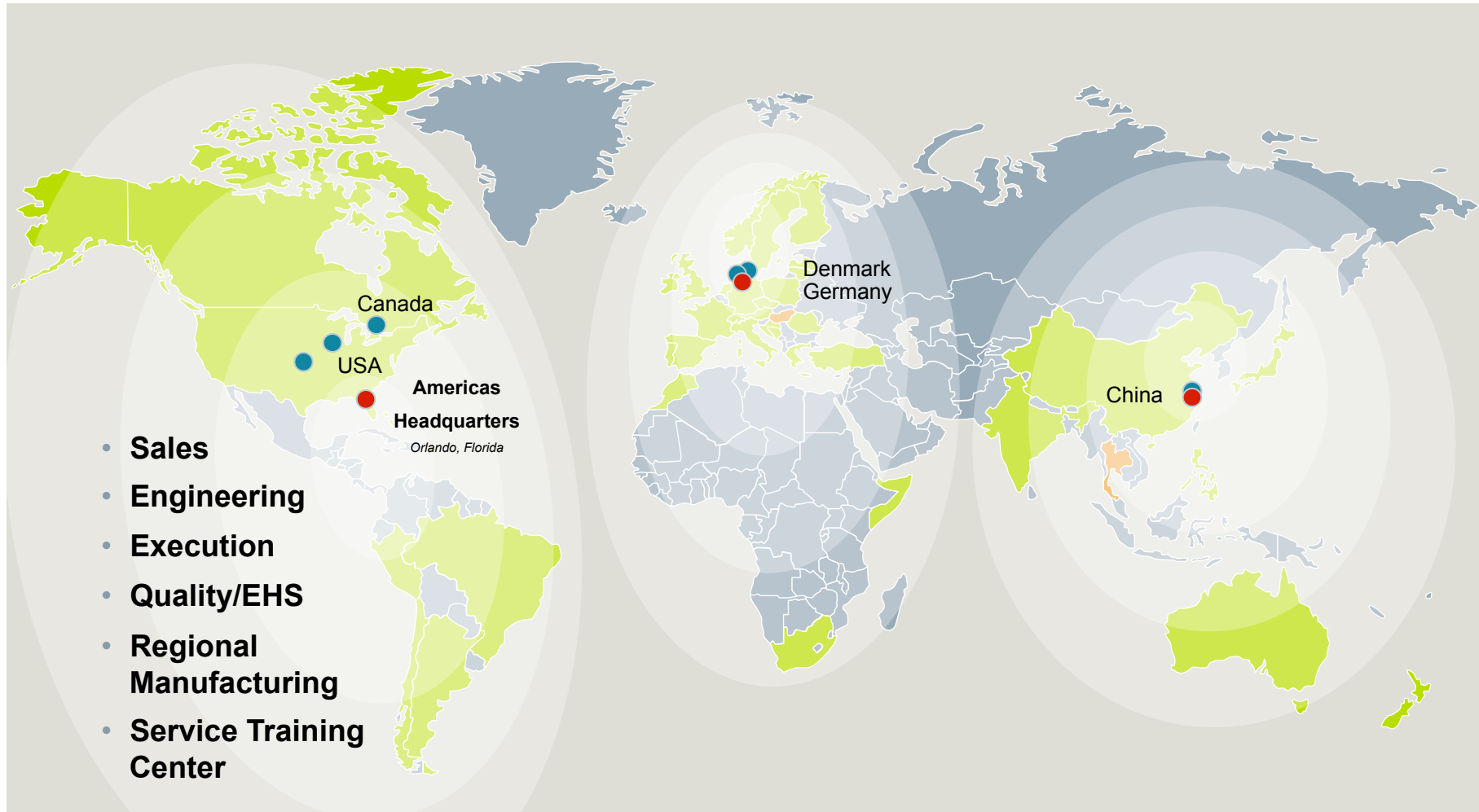


\* Market Update 2013

# Wind Power

## Customer focused regional set-up

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● Production ● Headquarters ⚡ installed projects ⚡ future projects

## Siemens Wind Power: Americas Facts at a Glance

### Siemens Americas Wind Power facts

One of the world's leading suppliers of wind power solutions

Installed base in Americas: ~ 7,100 turbines with > 13,900 MW capacity <sup>1</sup>

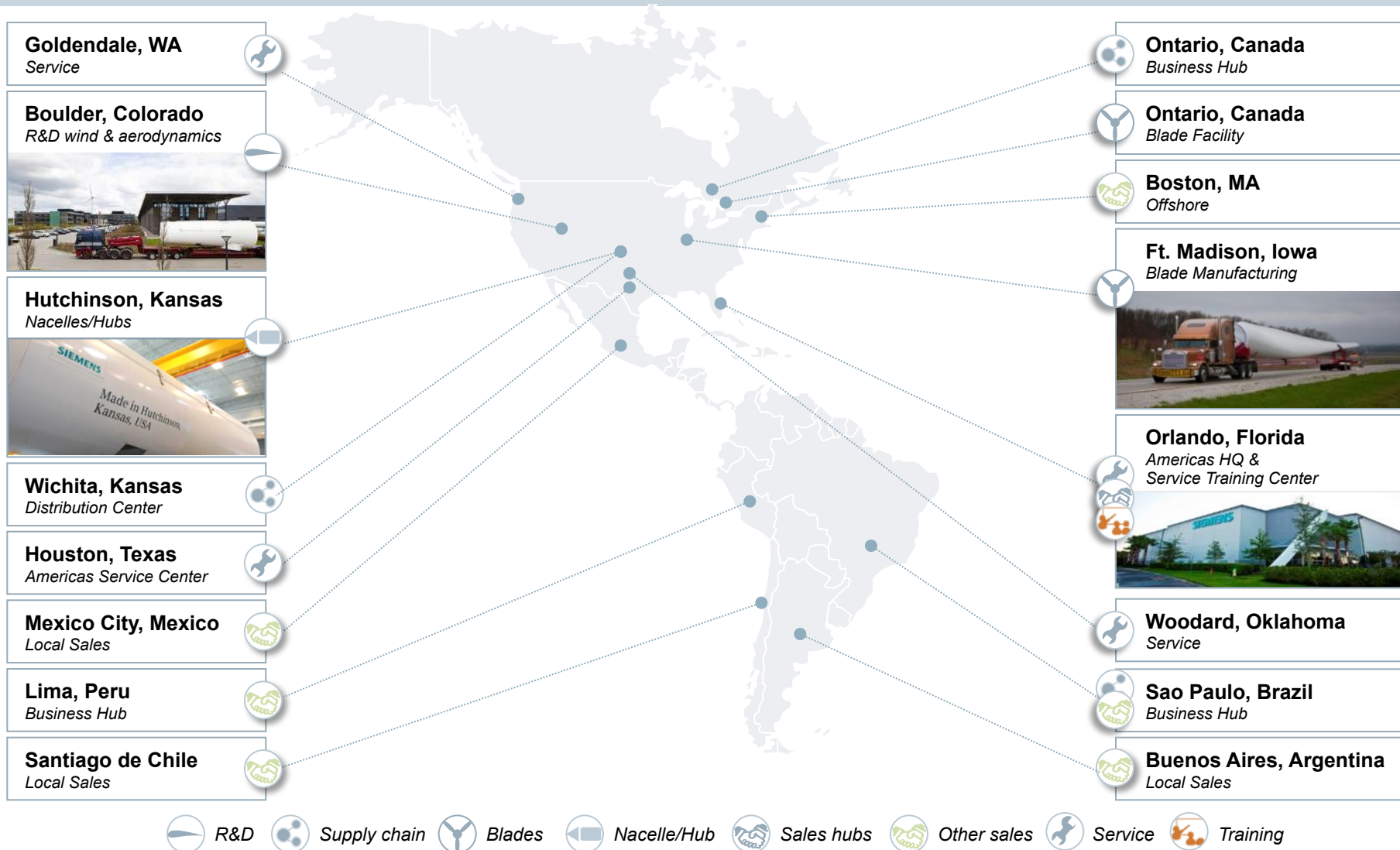
Installed in Americas: >7,200 MW in 2012 - 2015

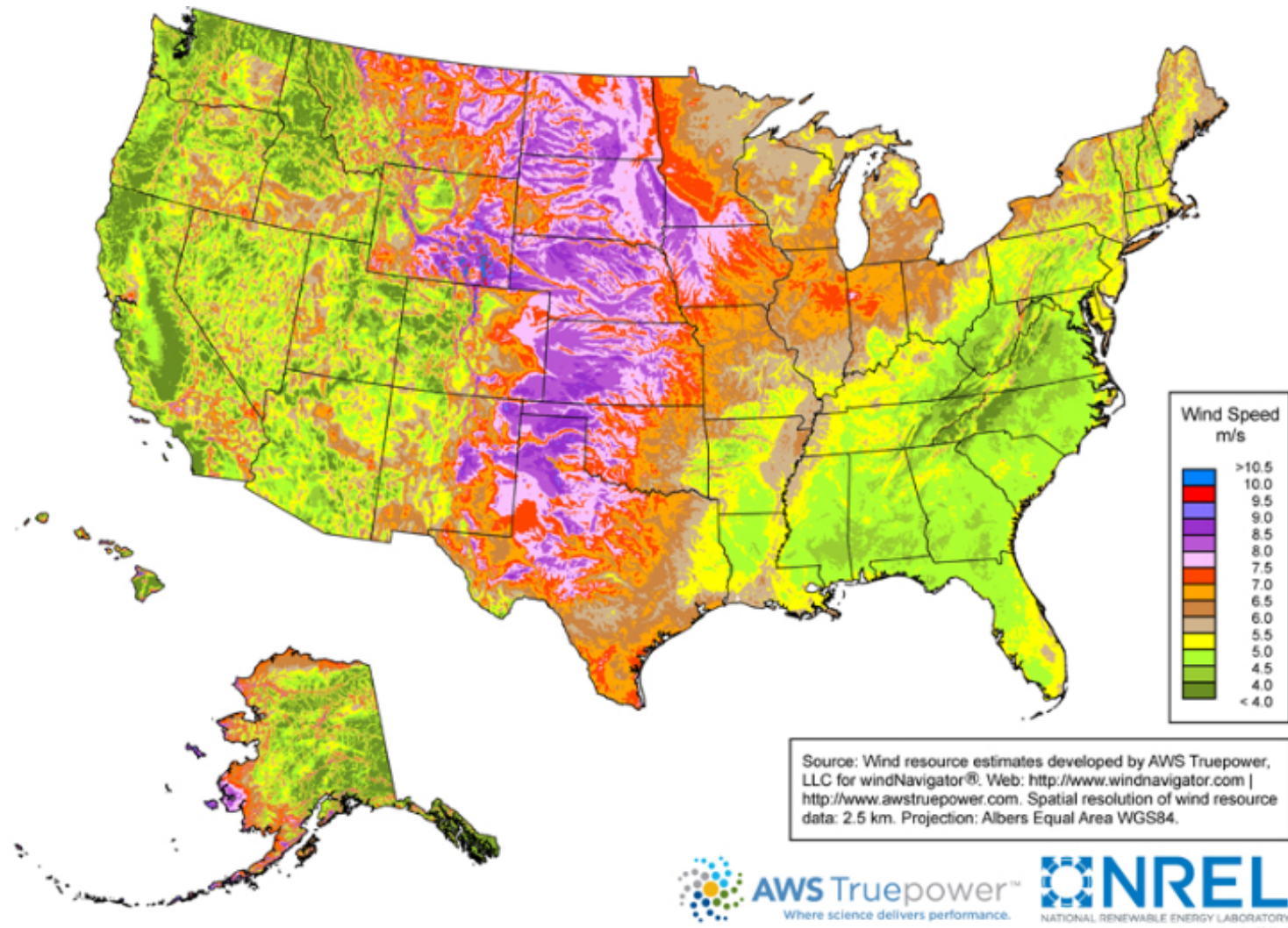
~1,800 Americas employees (~1,100 in manuf., ~550 in service)

Americas headquarters located in Orlando, FL



# Strong presence in key markets





# The Siemens Wind Power product platforms



## Platforms

**Siemens  
G2  
Platform**

**Siemens  
D3  
Platform**

**Siemens  
G4  
Platform**

**Siemens  
D6  
Platform**

## Products

SWT-2.3-101  
SWT-2.3-108

SWT-3.0-101  
SWT-3.2-101  
SWT-3.0-108  
SWT-3.2-108  
SWT-3.0-113  
SWT-3.2-113  
SWT-3.3-130

SWT-3.6-107  
SWT-3.6-120  
SWT-4.0-120  
SWT-4.0-130

SWT-6.0-154  
SWT-7.0-154

## Feature level

e.g. Net C onverter, Scada, TLM

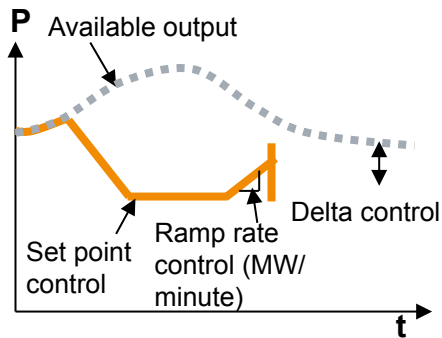


# NetConverter®

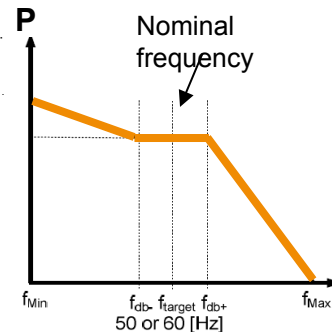
## Superior electrical capabilities

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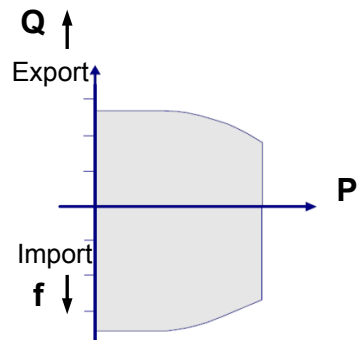
### Active power control



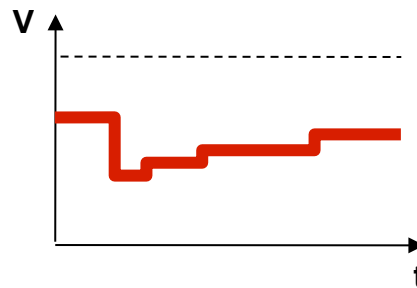
### Frequency regulation



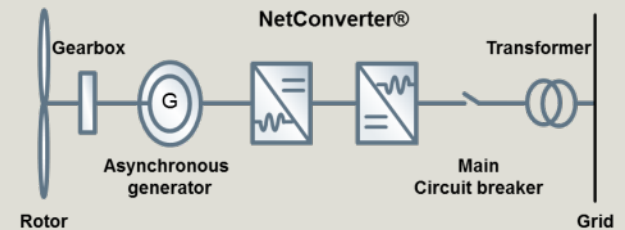
### Reactive power capability



### Low voltage ride through



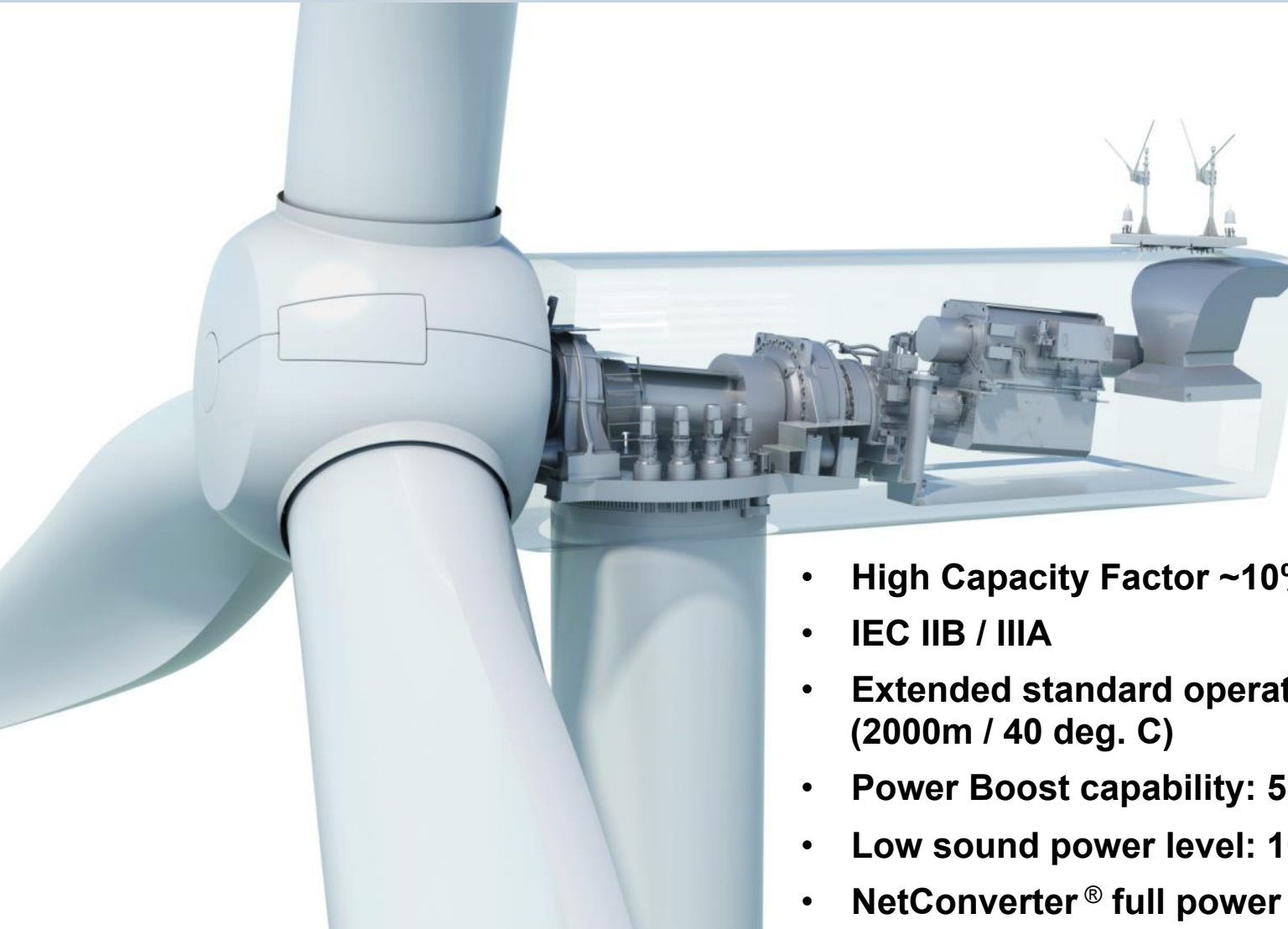
- Maximum flexibility to comply with different grid codes.
- Low OPEX due to less wear and tear of components
- Potential remuneration from ancillary services



# SWT-2.3-120

## The new standard

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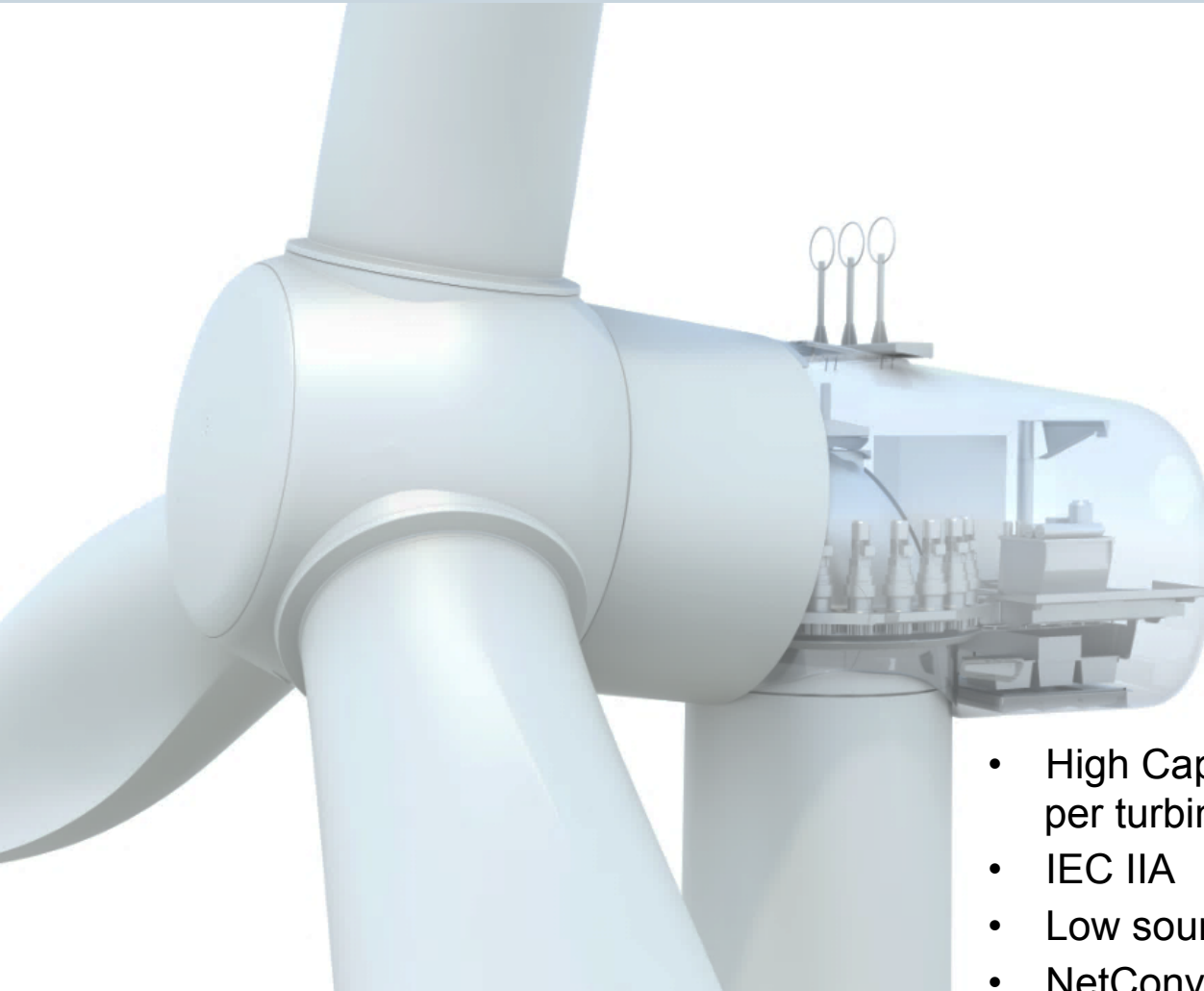


- **High Capacity Factor ~10% more AEP**
- **IEC IIB / IIIA**
- **Extended standard operating conditions (2000m / 40 deg. C)**
- **Power Boost capability: 5%**
- **Low sound power level: 106 dBA**
- **NetConverter® full power conversion**

## D3: SWT-3.3-130

Simplicity remains keys success criteria.

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- High Capacity Factor ~12% more AEP per turbine
- IEC IIA
- Low sound power level: 106 dBA
- NetConverter® full power conversion

# Aeroelastically Tailored Blades in the Siemens Product Portfolio

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## ATB Blade Design



### Recent Siemens Blades

ATB technology is featured in Siemens most recent products (gold). Larger ATB blades have replaced smaller traditional straight blades on existing wind turbines.

### SWT-2.3-120: Optimized for G2 Platform - North American Market

- Designed in Boulder, CO
- Manufactured in Ft. Madison, IA
- Designed w/ Vortex Generators & DinoTails™ for robust performance in the American Plains

# National Wind Technology Center – Boulder CO





# NREL-Siemens CRADA

(Cooperative Research and Development Agreement )

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- DOE/NREL and Siemens Wind Power
- SWT-2.3-101 wind turbine is erected at NWTTC, Boulder Colorado
- Initial Budget: DOE/NREL \$5M ---- Siemens \$9M
- Initial Agreement: Jan 2009- Jan 2013
- Recently extended until Jan 2018
- New 108m rotor installed late 2013

Close cooperation between NREL and Siemens on testing campaigns and data Analysis.



# National Wind Technology Center– Siemens 2.3-108 wind turbine

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- Have a purchase power agreement with Public Service of Colorado
- Initial Service Date of 2010
- Get paid when and if available
- Interconnection through NREL system to the local utility interface



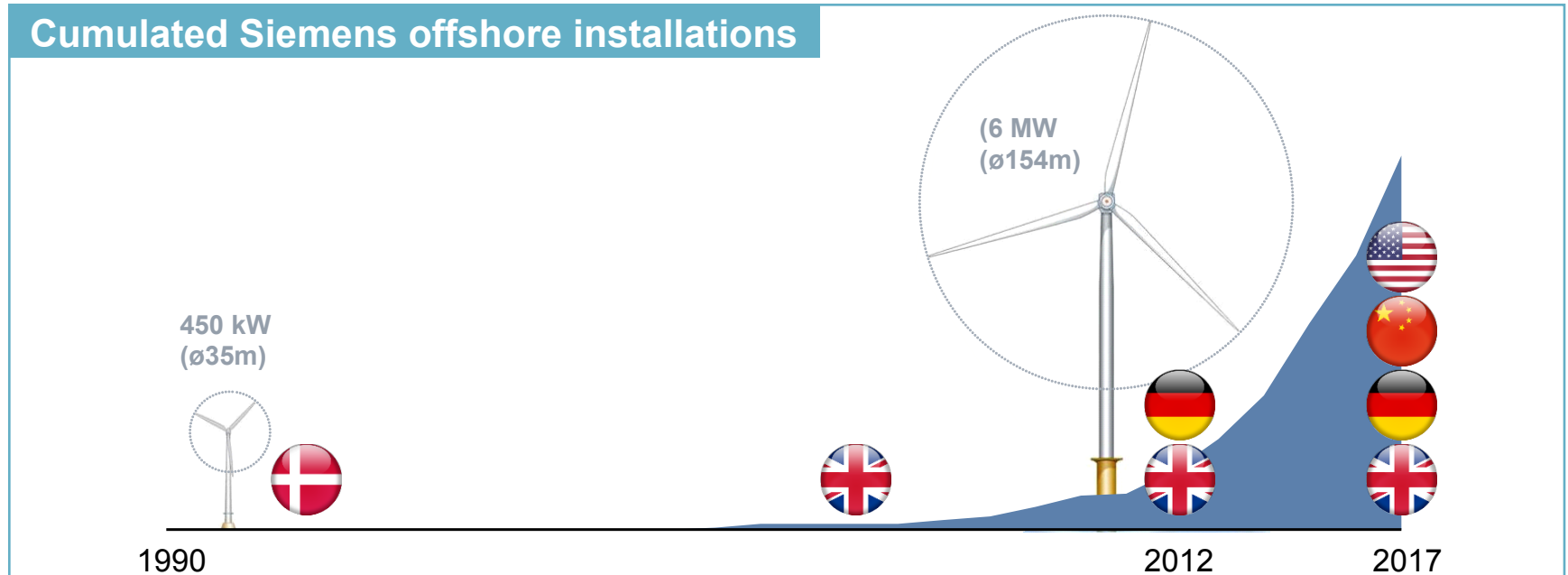
## Concrete tower prototype



# Offshore – Leading player in strongest growing market

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## Cumulated Siemens offshore installations



**First project**



**MW turbines**



**GW project**

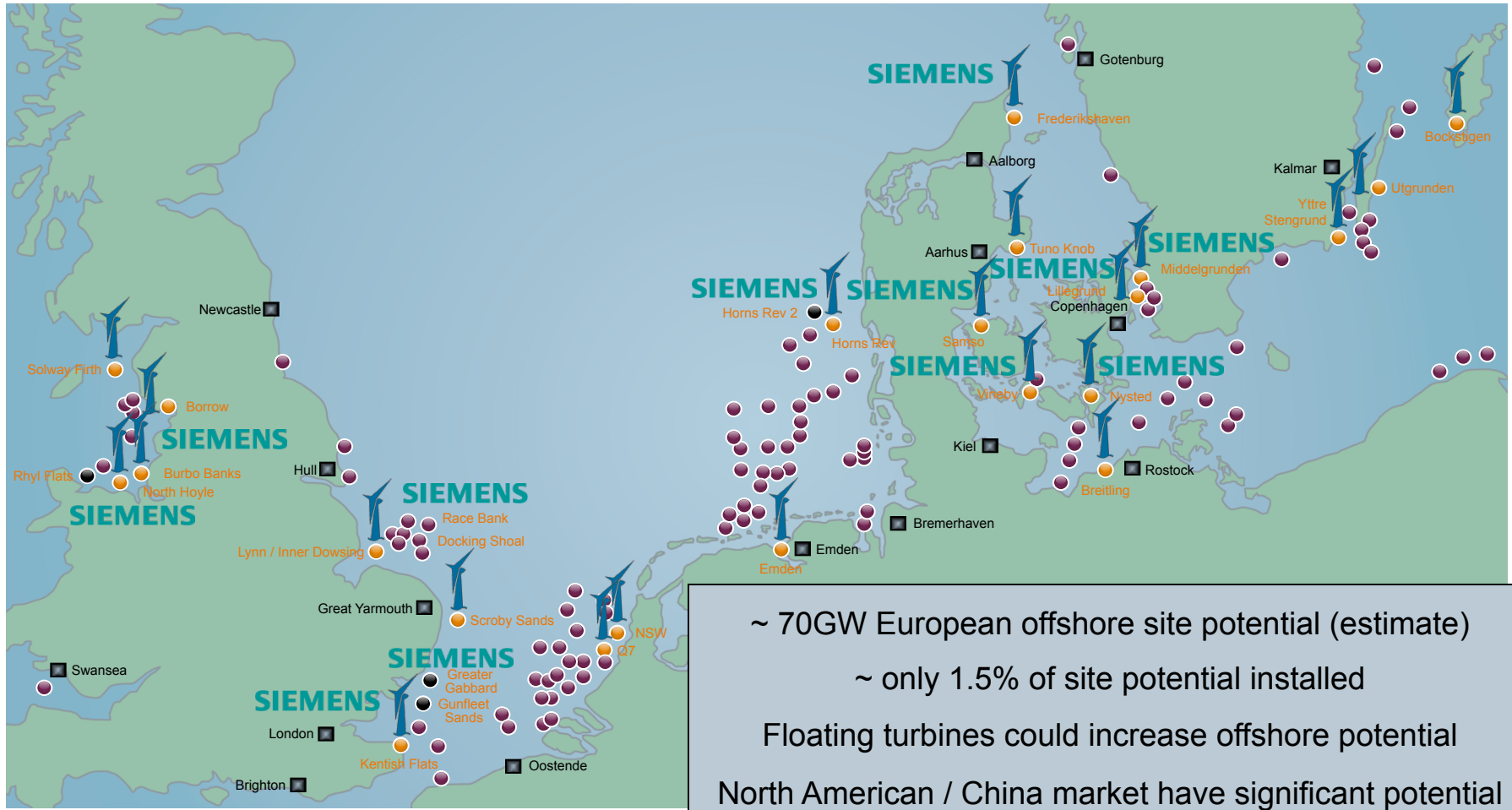


**UK Round 3**





# Offshore potential is “unlimited”



● Installed site - offshore wind farm   
 ● Received order   
 ● Potential for site installation

Source: Sector Energy



# Getting the costs of energy down by innovation

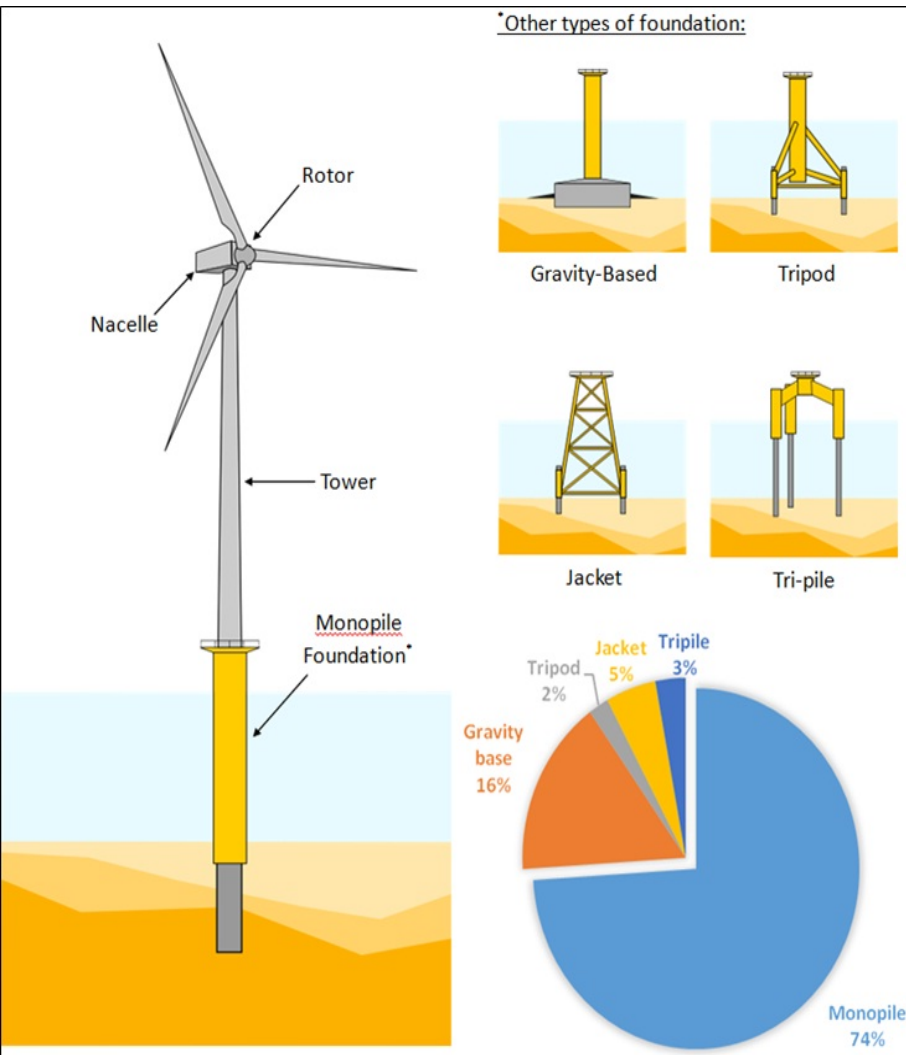
## B75 – one of the world's largest rotor blades

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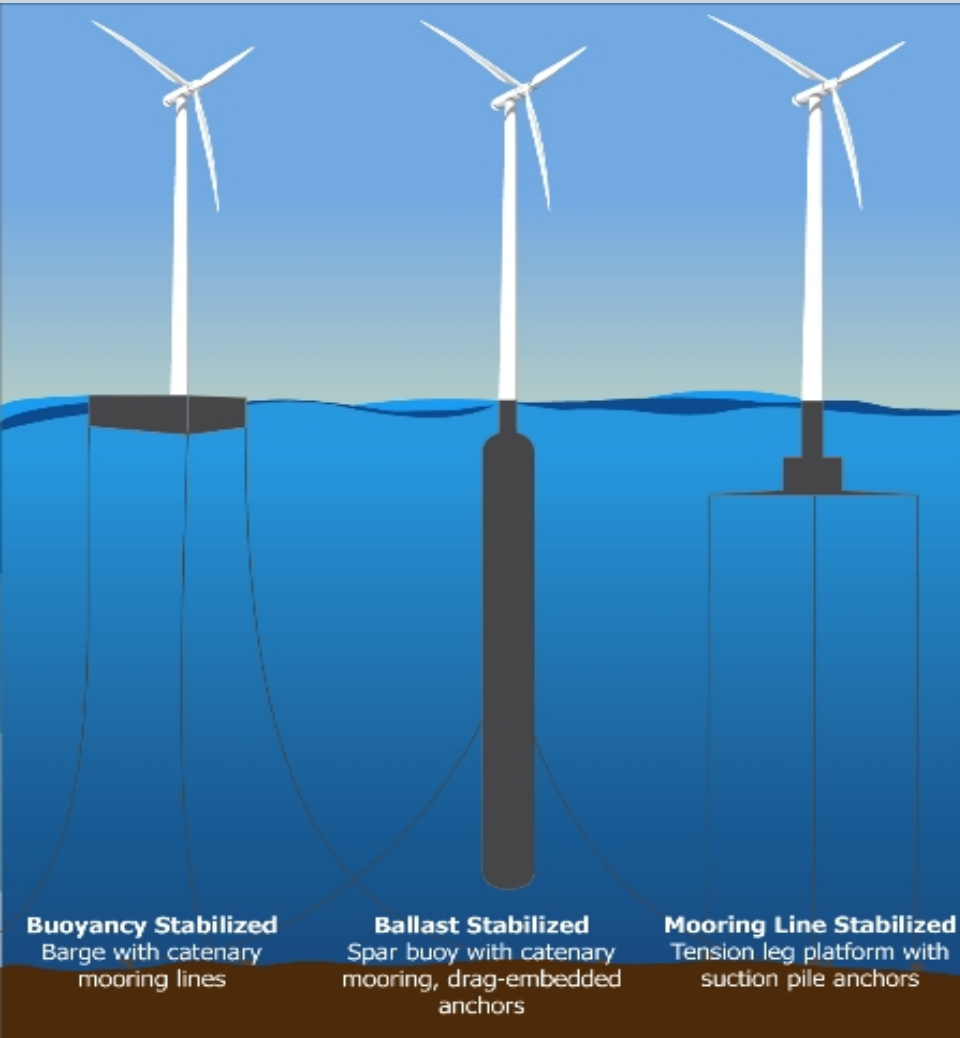
- Increased rotor-swept area harvests more wind and is thus crucial for the annual energy yield of the turbine.
- IntegralBlade-Technology: the world's largest fiberglass component cast in one piece.
- No seams or glued joints and no adhesive, all of which saves weight.

# Offshore Fixed Foundation Types



- Most offshore foundations are fixed to the bottom the of the ocean.
- Normally located in water no more than 60 meters of depth
- Most common foundation is Monopile but large turbines are using jacket foundations

# Floating Foundation Types



- Many variations of floating offshore platform
- Siemens experience with Spar Buoy
- Most applications will come in the Pacific Ocean in deep water
- Large challenge with cable systems under the water.

# The World's first floating turbine

## Hywind

- Cooperation on technology with Statoil Hydro to develop World's first floating off-shore installation
- In 2009 Siemens installed the first turbine in Norway at a water depth of about 220 meters
- Floating offshore turbines could be installed at sites with greater water depths
- New Project off Scotland with five SWP 6 MW wind turbines





# Thank You.....

**SIEMENS**

