



# GE Repower Upgrades

IWEA – Irish Wind Energy Association

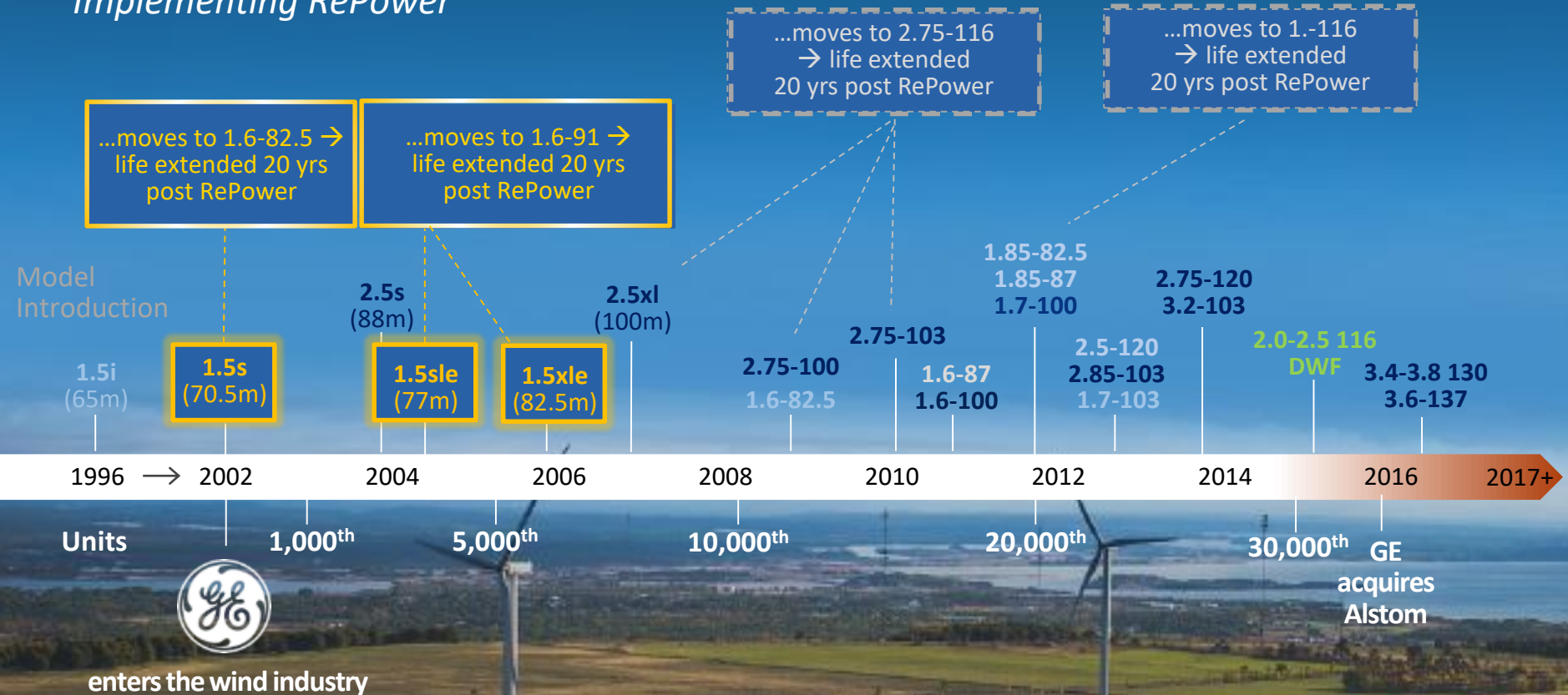
Breakout Session - Opportunities in Asset Management

October 2018

**Imagination at work.**

# Evolution of the GE wind portfolio

## Implementing RePower



**GE RePower can increase the performance of older fleet while extending the certified life an additional 20 years**



# RePowering with GE...

Bringing **value** back to the existing fleet



## Maximize

Increase rotor swept area for the existing site layout and support structure (tower & foundation)

- 1.5-77 to 1.6-91
  - 1,848m<sup>2</sup> (40%) increase
  - ➔ ~20-30% AEP\*
- 1.5-70 to 1.6-82.5
  - 1,498m<sup>2</sup> (39%) increase
  - ➔ ~14-25% AEP\*

## Analyze

Determine upgraded components required to support longer, larger blades

- Hub - pitch bearings
- Bedplate – Generator Frame
- Drivetrain updates
  - Gearbox
  - Main Bearing
  - Main Shaft
  - Flex Coupling
- Advanced Load Controls (HW&SW)

## Assess

Consider & examine all systems-component upgrades impacting reliability & availability

- Pitch System
- Slip Ring
- Converter (pre-2005)
- WindSCADA
- WindCONTROL
- Refurbished generator
- O&M improvements

## Evaluate

Examine all remaining systems-components for capability in new configuration with 20 year life extension

- Tower
- Foundation
- Electrical system
- Bedplate / nacelle
- Yaw System



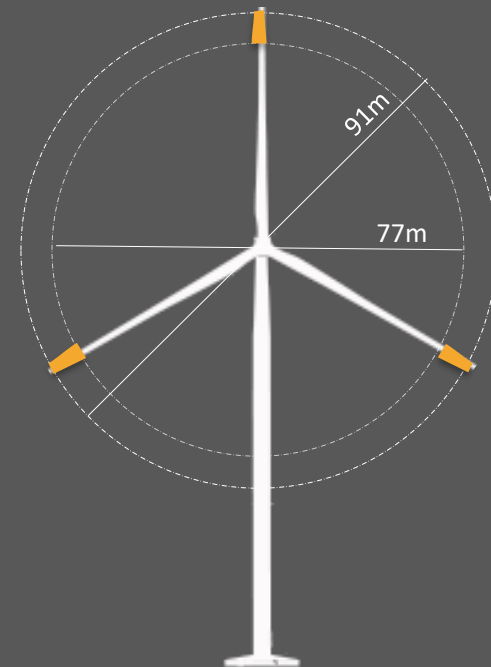
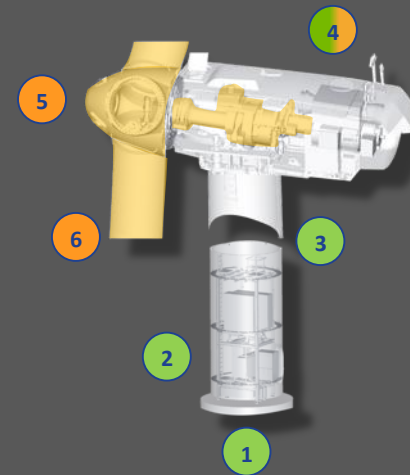
\* site/wind dependent

# GE 1.5-77 to 1.6-91 New Rotor & Drivetrain

- 1 Foundation
- 2 Down Tower Assembly
- 3 Tower
- 4 Nacelle
- 5 Hub
- 6 Blade



Orange circle = component replaced  
Green circle = original components





**40% increase**  
in swept area

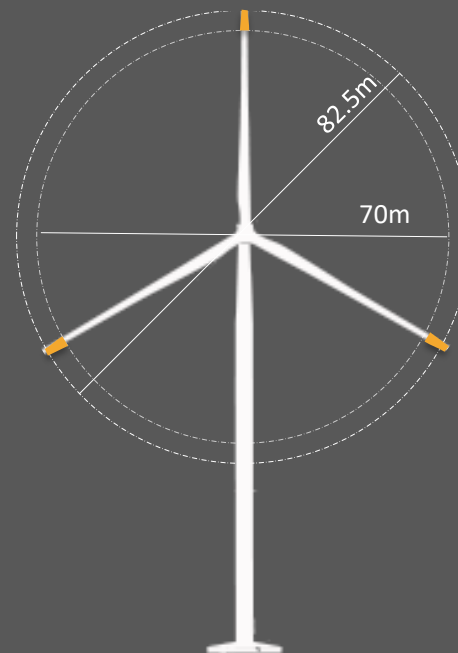
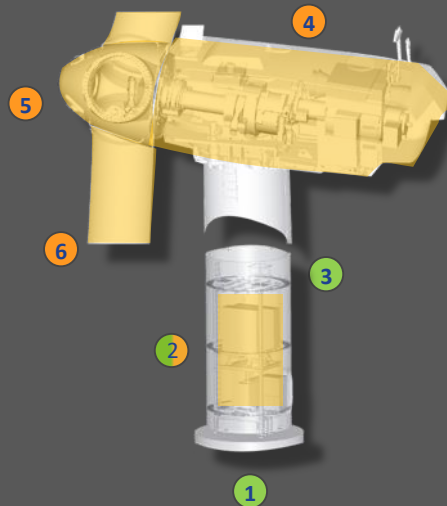
# GE 1.5-70 to 1.6-82.5

## New Rotor & Machine Head

- 1 Foundation
- 2 Down Tower Assembly
- 3 Tower
- 4 Nacelle
- 5 Hub
- 6 Blade



 = component replaced  
 = original components



**39% increase**  
in swept area



# GE's Repower Program

## Increasing energy production and extending wind farm life

- 1,363 RePower upgrades completed in 2017-1H2018
  - 4 customers, 17 wind farms
  - 3 GE repower ADA certifications complete
    - 1.6-87Rp...initial upgrade for 1.5-77 fleet
    - 1.6-91Rp...increased rotor to maximize AEP
    - 1.5-82.5Rp...upgrade for 1.5-70 fleet
- 20% average increase in Annual Energy Production
- (7) IEC Power Curve tests complete for 1.6-87Rp... >102%
- (5) IEC Power Curve tests in progress for 1.6-91Rp
- 98.2% fleet availability
  - +1.5% improvement from pre-repower performance
- 2018-2020: >3,000 RePower units planned
  - 6 additional customers
  - +50 new wind farms
  - Capability to repower non GE wind turbines

