Repowering: understanding technical, tax and contractual considerations in repowering and how they impact availability of financing

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RePower Overview
- What is RePowering?
- Benefits
- Results to date

Overview

- Repowering : Retrofit vs. “Full scrape”
- Conversion of legacy turbines → improve output, reliability and extend life

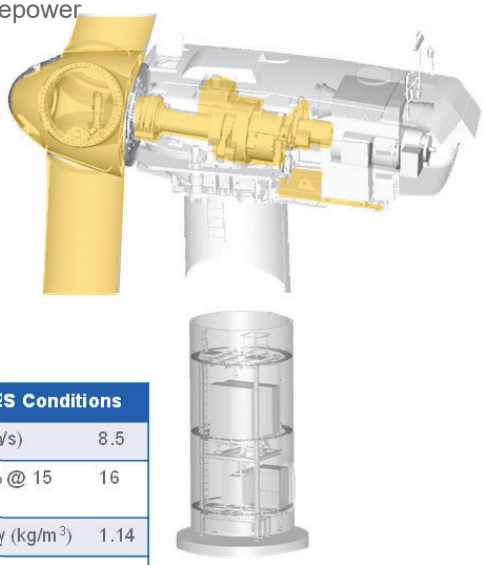
GE examples:

Legacy Unit	Repowered Configuration Options
1.5 S (70.5m rotor)	1.5/1.62 (77m, 82.5m, or 91m rotor)
1.5 SLE (77m rotor)	1.5/1.62 (87m or 91m rotor)
1.5 XLE (82.5m rotor)	1.5/1.62 (91m rotor)
Clipper C96-2.5 (96m rotor)	GE 2.5 (116m rotor)

- **Basis:** leverage existing current mechanical configurations (1.x and 2.x platforms)
- **Re-use:** Components evaluated to new wind conditions & 20 years of additional life from repower COD: Towers, Foundation, BOP and existing siting, other
- **Replace**: Components being used in other GE new unit designs

Scope of replaced and reused components

Example scope based on 1.5 SLE Repower



IEC 2S Conditions	
V_{avg} (m/s)	8.5
CTI (% @ 15 m/s)	16
Density (kg/m^3)	1.14
V_{ref} (m/s)	40
Shear	0.2

Component	Re-Use	Replace	Warranty	Description
Blade		✓	✓	LM42 Blade Design
Pitch bearing		✓	✓	AR500, Gleitmo Pitch Bearing
Pitch system		✓	✓	Non-ESS 575V GE Pitch System w/ Spline
Hub		✓	✓	Current 1.85-87 Hub
Main shaft		✓	✓	Current 1.85-87 Main Shaft
Main bearing		✓	✓	Current 1.85-87 Main Bearing
Gearbox		✓	✓	1.6-100 GBX with Non-ESS Auxiliaries
Flex Coupling		✓	✓	Current 1.85-87 Coupling
Slipring		✓	✓	Non-ESS compatible slip ring
Bedplate	✓			No change to existing component
Gen Frame		✓	✓	Modified gen frame with shear plates
Yaw system	✓			No change to existing component
Nacelle	✓			No change to existing component
Top Box	✓		New IO	Retrofit Kit for compatibility with GE Pitch
Tower	✓			No change to existing component
DTA	✓			On site Upgrade/Refurbishment
Generator		✓	✓	On site refurbishment kit
Electrical Power Path	✓			No change to existing component
Controls HW	✓	✓	✓	Upgrade to MC205
Controls SW		✓	✓	New SW to have equivalent capability of the MK6e GEN1 controller as well as the newly required retrofit

Title search: Repowering: understanding technical, tax and contractual considerations in repowering and how they impact availability of financing

Also available as part of the eCourse
Recent Developments in Wind Energy: Wind Generation in SPP and Repowering Wind Projects

First appeared as part of the conference materials for the
2019 Renewable Energy Law session
"Repowering Wind Projects"