

Gamesa

Life Extension
from theory to reality



Life Extension

From concepts to reality

Gamesa



- **Life Extension concepts**

- ✓ Guaranteed revenues during the extended lifetime.
- ✓ Contained O&M costs.
- ✓ Guarantee of the safety of public, personnel and wind assets.



Life Extension

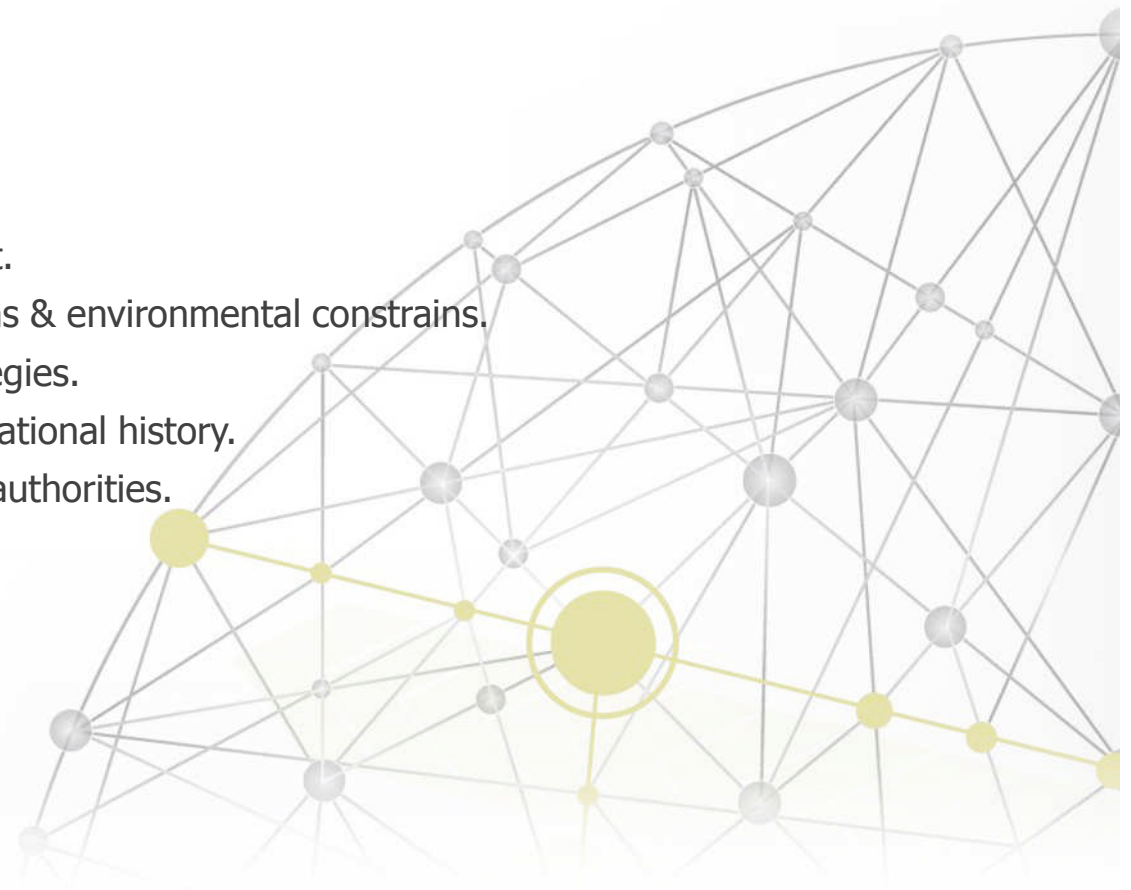
From concepts to reality

Gamesa



■ **Complex decision process**

- ✓ No past experience & risk management.
- ✓ Strong potential impact from regulations & environmental constrains.
- ✓ Owners and suppliers beliefs and strategies.
- ✓ Economics, wind site orography & operational history.
- ✓ Banks, insurance companies and local authorities.



Life Extension

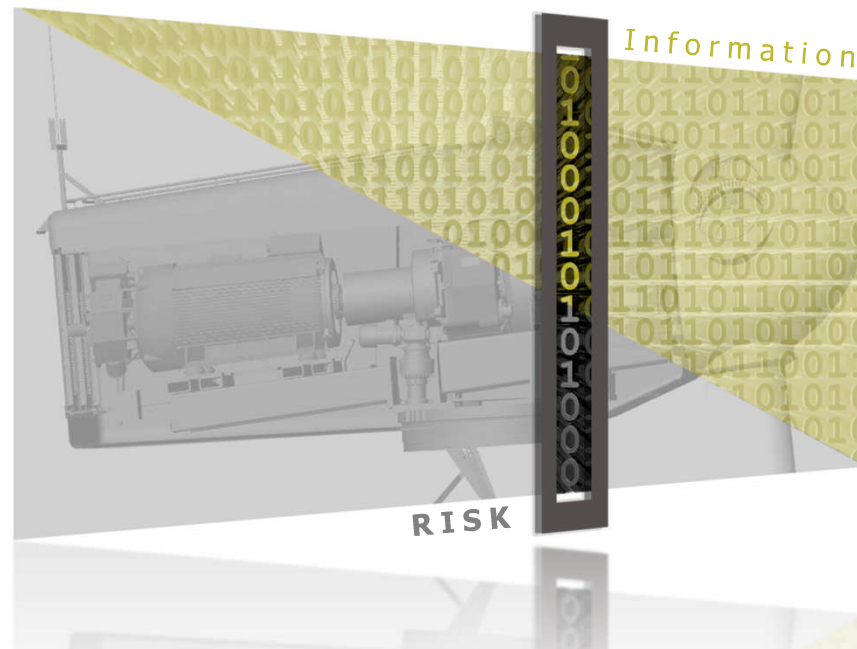
From concepts to reality



- **Full set of solution**

- **Risk**

- ✓ Combination of practical information & analytical analysis.
- ✓ The more information you have, less risk you face, increasing business case certainty.
- ✓ Wind farm specific.



Service life extension

First life extension in Spain

▪ **Case of a Gamesa turbine**

- ✓ Spanish wind farm.
- ✓ 14 years old.
- ✓ maintained by the OEM and then by the owner ISP.
- ✓ Turbines have been constantly upgraded to the latest version with the support of the OEM.
- ✓ Wind site conditions are favorable, on average below wind site classification.

Blade aluring issue and change of regulations forced the customer to take a decision, either repair and upgrade affected blades to the latest design, either initiate the life extension program.

▪ **Customers objectives**

- ✓ Full certainty of the business case to comply the new financing scheme.
- ✓ Keep the option of a repowering before the 30 years life time.

Service life extension

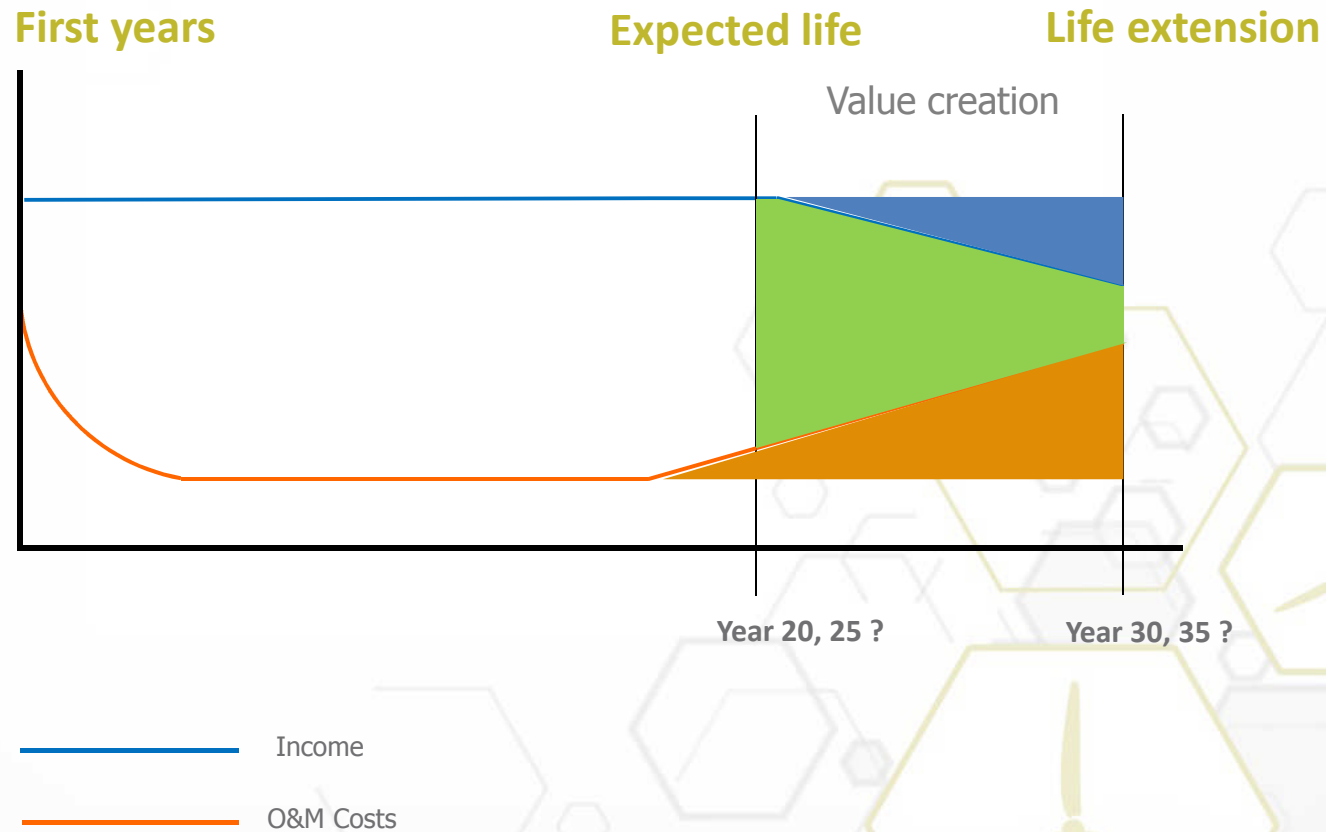
Gamesa turbine

■ Solution

- ✓ Detailed inspection of turbines and data.
- ✓ Upgrade to latest design.
- ✓ Full service contract up to year 30 with the option to end the contract at any time.

Service life extension

Possible evolution of key parameters



Life Extension

Key Learning

- **Life extension is wind farm specific**
 - ✓ Technically.
 - ✓ Financially.
 - ✓ Stakeholders.
- **Anticipating is key**
 - ✓ Permitting.
 - ✓ Systematic upgrades to contain O&M cost over the long term.
 - ✓ Quality of the maintenance.
- **Safety first**
 - ✓ Analysis of fatigue reserves with qualified teams.
 - ✓ Get extended guarantees (full service contracts, certificates, etc.)



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Thank you!

