**Method**
**TRL 3**

NTNU

# Gearbox Vulnerability Map

## Innovation description

- A reliability-based inspection and maintenance map for wind turbine gearboxes was developed by a NTNU PhD candidate.
- The map is developed based on the fatigue damage ranking of the drivetrain components.
- The comparison between this map developed for a 750 kW drivetrain with the real failure data showed very good agreement.

## Impact

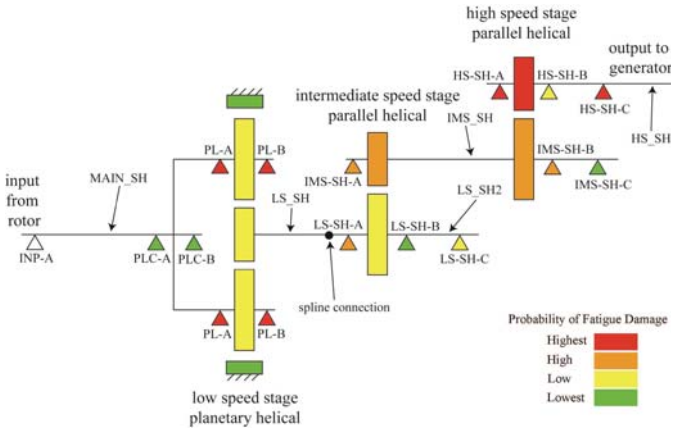
- This can have impact on monitoring and inspection of those components which holds higher probability of damage. It can reduce the downtime for fault detection and routine inspection.
- It can be used in conjunction with the condition monitoring system to monitor those components with higher probability of damage.
- Positive feedback was received from the industry.

## Further development

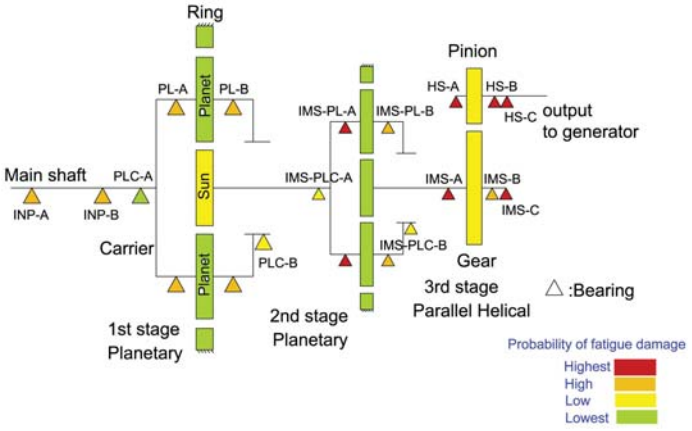
- Further plan is to promote the method within the wind turbine industry. It has already received positive feedback, but the gearbox manufacturer are those who should be encouraged to produce such maps.

## References


- Nejad A.R., Gao Z., Moan T. (2014). Fatigue reliability-based inspection and maintenance planning of gearbox
- components in wind turbine drivetrains. Energy Procedia, 53, 248–257.
- Nejad A.R., Gao Z., Moan T. (2014). On long-term fatigue damage and reliability analysis of gears under wind loads in offshore wind turbine drivetrains. International Journal of Fatigue, 61, 116-128.


Vulnerability map – 750 kW drivetrain




Vulnerability map – 5 MW drivetrain