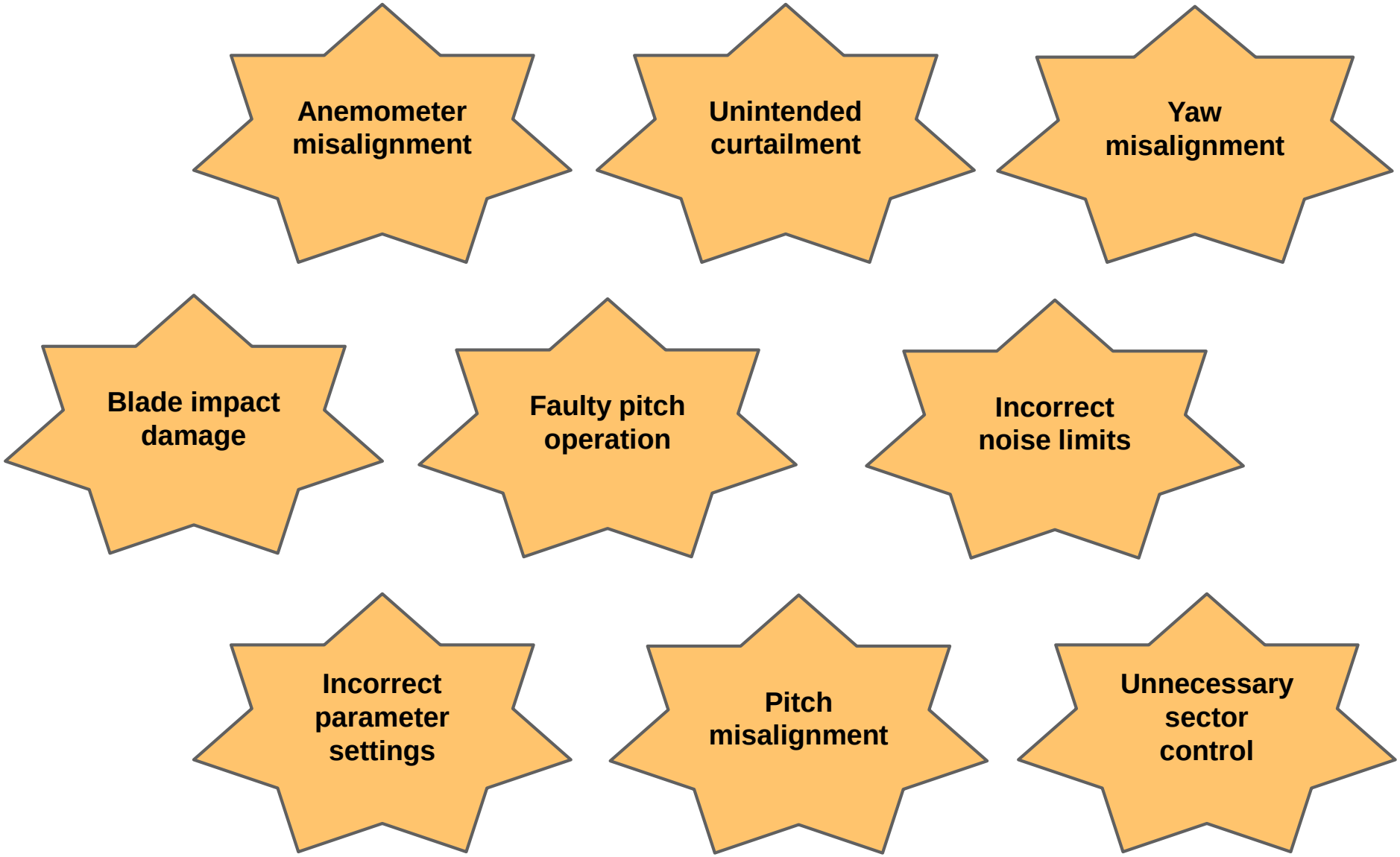
O2O Wind

Increase Power Output

Webinar 05.10.2017

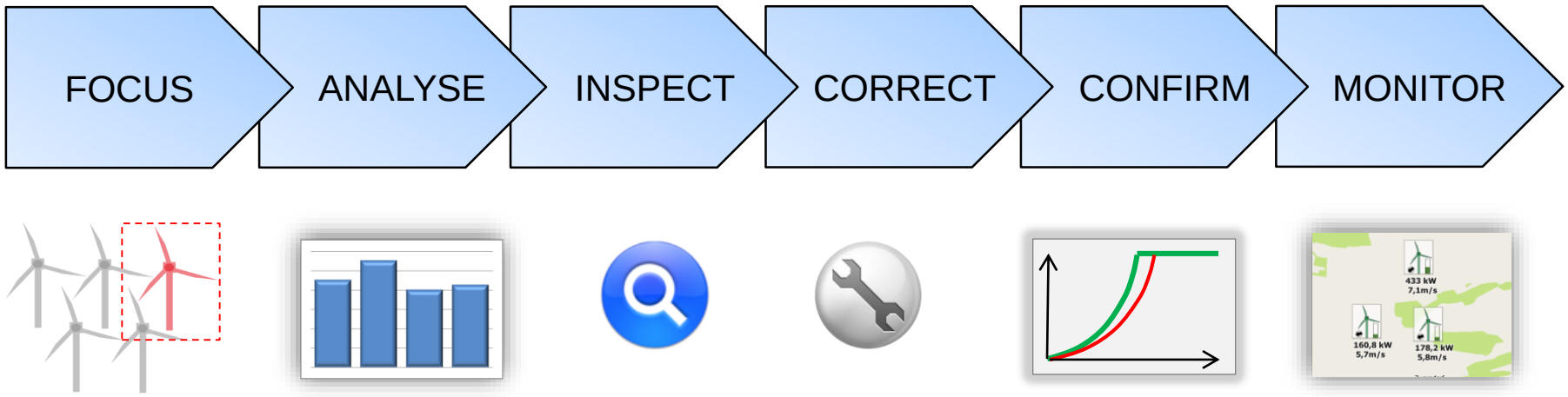
UPTIME ENGINEERING®

Known Problems Affecting Performance



Performance Optimisation Process

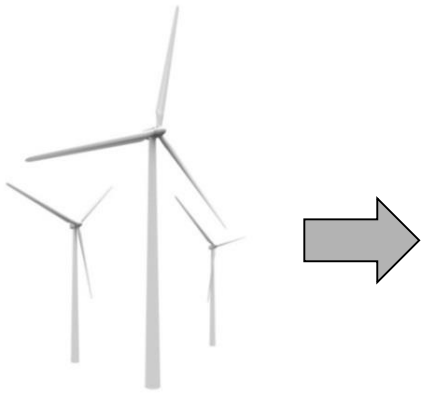
- A systematic process is required to efficiently identify and solve problems
- The main steps include analytical techniques as well as practical field work
- An investigative approach is required, applying technical understanding

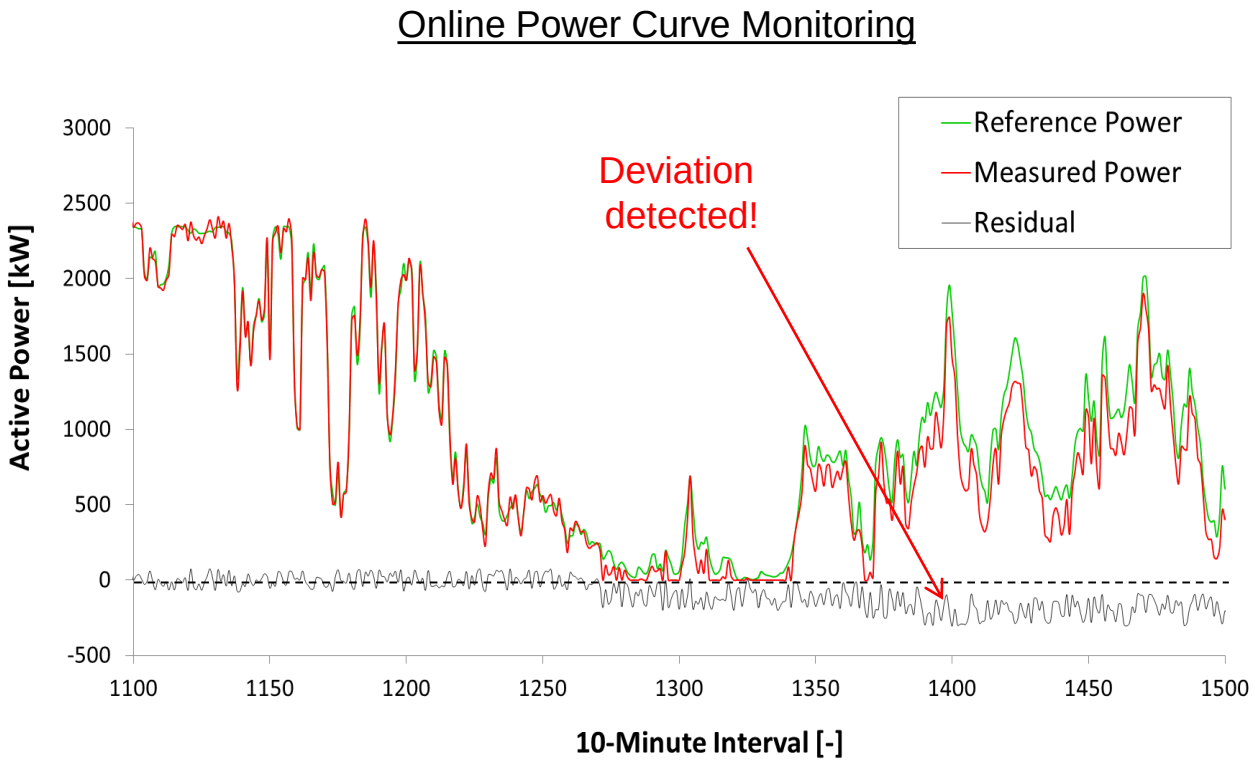


The improvement process must be systematic and efficient to keep costs down

Automated Monitoring

- Automated data analysis systems for reduced effort
- Manual reporting replaced by online monitoring and events generation





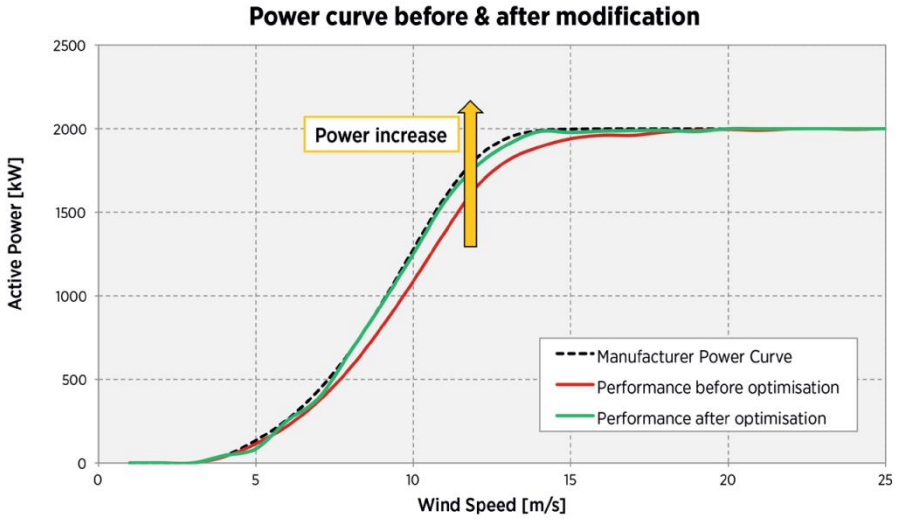
Software and automated analysis is used to increase quality and reduce human effort

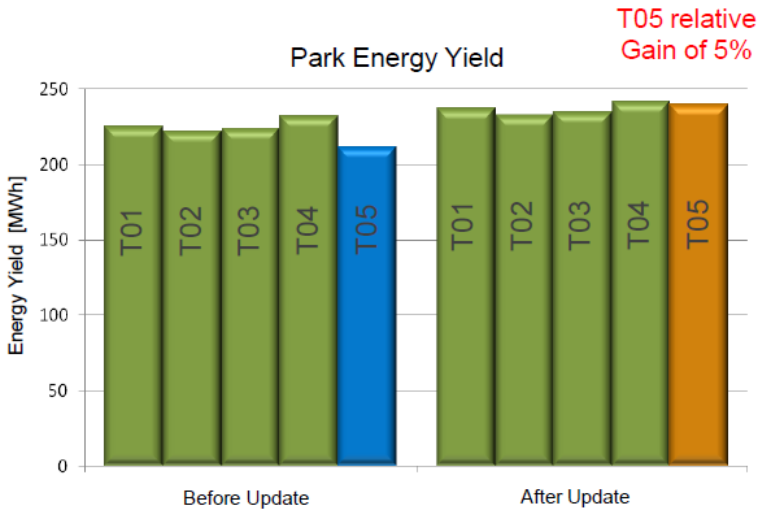
Power Optimisation: A wide Range of Possibilities

Blade Aerofoil Riblets	Cable unwinding optimisation			
Vortex Control Strips	Storm Control	Active wake control	Individual pitch control	Optimised noise settings
Trailing Edge Strips	Passive yaw offset correction	Low density optimisation	Sector control	Curtailment reduction
Lidar Active Pitch Control	Active yaw offset correction	Production based availability	Cut-in optimisation	Network loss minimisation
Aerodynamic pitch balancing	Mechanical pitch balancing	Pitch offset correction	Reduced auxiliary consumption	Commercial availability

Confirming and Quantifying Improvement

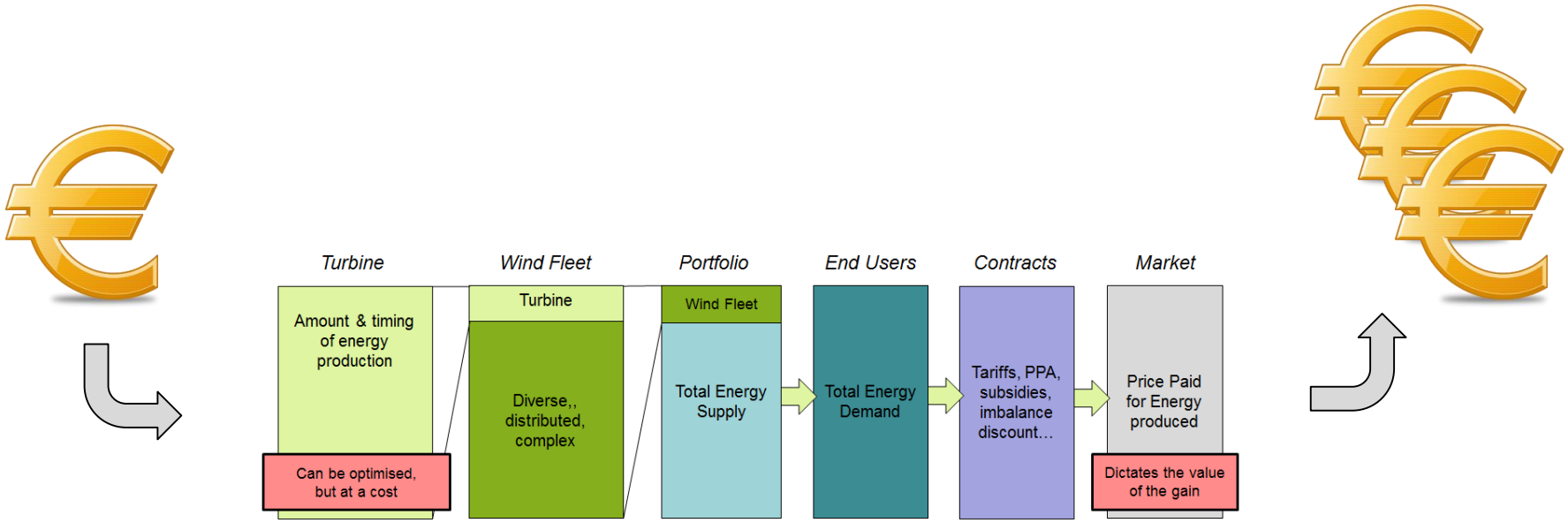
- Following turbine modifications, performance analysis should be repeated
- Quantify improvements, both technically and financially
- Checks can only be made once sufficient post-fix data is available (2 months?)
- Improvement can be defined by benchmarking versus a reference turbine





Financial Assessment & Optimisation

- Performance optimisation can bring significant and sustainable revenue gains
- Even a lean process is relatively complex and can be costly
- The value of the gains can be difficult to measure, especially in complex markets
- Prioritise sites with most potential (high energy value, high optimisation potential)
- Monitor costs and gains, look for the break-even



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