Our geographic reach

- 650 renewable energy staff, in 35 locations, across 18 countries
- Wind, Wave, Tidal and Solar
Asset Management and Optimisation Services (AMOS)

25 Professionals worldwide (7 UK based)

- Performance Monitoring
- Fault diagnostics and forensic analysis of SCADA data
- Post-construction energy forecasts
- Warranty calculations
- End of warranty inspections
- O&M advice
- Performance profiling and benchmarking

Over 15 GW of operating plant assessed worldwide
Performance Optimisation
- Not just a question of availability but efficiency!

Turbine stopped for 3% of the time
- Main focus of contractors

Turbine running for 97% of the time*
- But how efficiently?

* Observed Availability Trends, Harman, Walker, EWEC 08
### Case study 1

**Availability: Liquidated damages claim (UK)**

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<tr>
<th>Status description</th>
<th>A01</th>
<th>A02</th>
<th>A03</th>
<th>A04</th>
<th>A05</th>
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All other statuses

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</table>

- Availability warranty liquidated damages claim calculated by manufacturer at £35k (~5M¥)
- GH review of SCADA data and service records reveals incorrect downtime allocation
- Eventually claim paid at £300k (~45M¥)
Case study 2
Efficiency: De-rating losses (UK)

- Wind farm not producing budgeted energy despite good wind speeds
- Analysis identified periods of de-rating and quantified energy losses
- £200k (~30M¥) lost revenue due to manual de-rating of the turbines
- De-rating now kept to a minimum through regular monitoring
Case study 3
Efficiency: Controller malfunction (France)

- Malfunction of controller identified through analysis of SCADA data
- Manufacturer informed and remedial action taken
- If undetected losses would have continued in excess of €30k (~4M¥) per year for a single turbine
Case study 4
Efficiency: Wind vane alignment (UK)

- Wind vane misalignment identified through analysis of SCADA data and confirmed by inspection
- New more accurate method for alignment provided and implemented in collaboration with manufacturer
- Estimated £150k (~20M¥) annual losses avoided with remedy a small fraction of the remediation costs
Case study 5
Direction calibration for wind sector management (UK)

• Wind sector management required for certification
• Existing calibration had low accuracy
• Some turbines running in restricted sector and switched off in unrestricted sector
• New calibration method established and implemented in collaboration with manufacturer

Before calibration

After calibration

Nacelle direction [deg]

Time

N

Turbine 2

Turbine 1

Narrow 20 degree shutdown sector requires accurate calibration
Concluding remarks

• Make the best use of the SCADA data to optimise performance

• Don’t just focus on availability – the turbines are running for 97% of the time, but how efficiently?

• Think of minimizing turbine loading as well as maximising energy and profits

• Don’t rely on contractual arrangements to claim back losses

Regularly monitor your wind farm efficiency to ensure that the turbines are operating as they were designed to!
Thank you
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www.garradhassan.com/services/amos