



Leveraging smart data for predictive maintenance in wind industry

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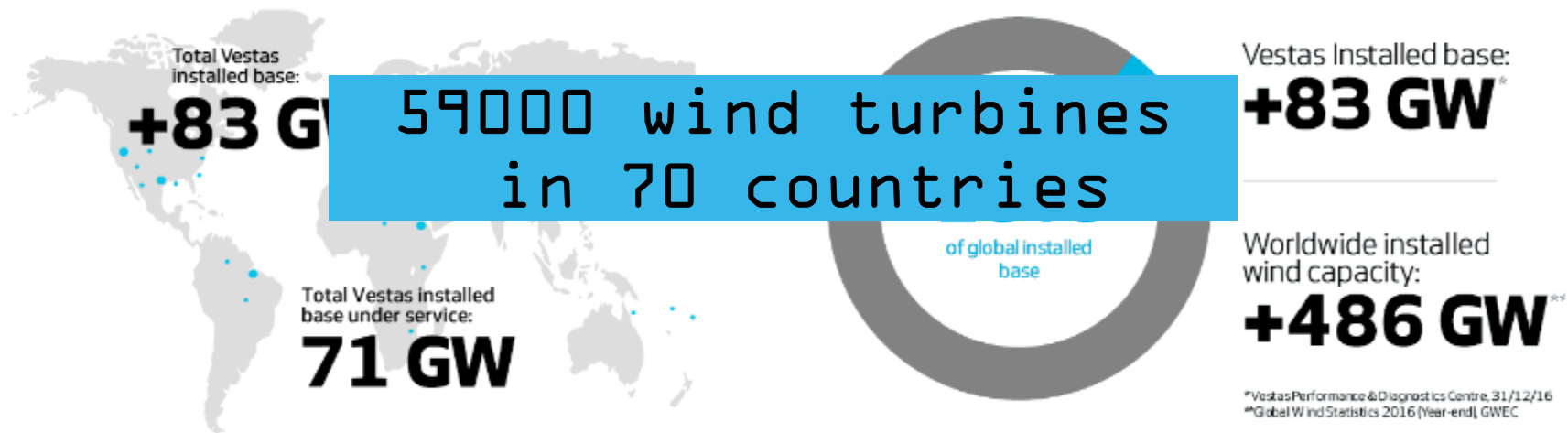
Head of asset management center China

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Agenda

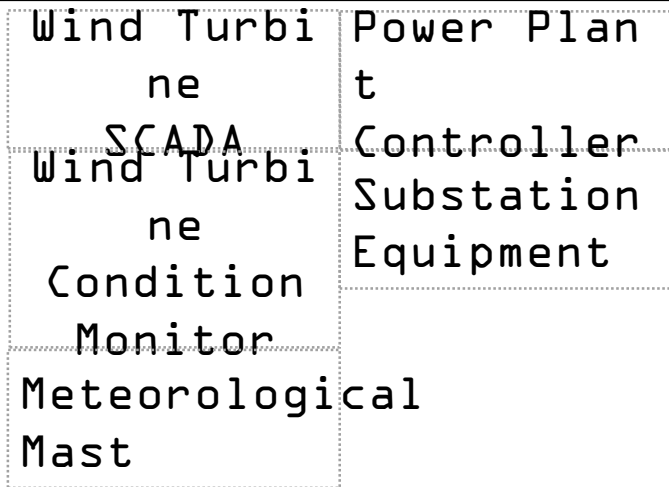
- Big data to smart data
- Vestas way to smart data
- Smart data for predictive maintenance in Vestas
- Vestas turbine monitor – a predictive tool for maintenance

Vestas facts



Big data to Smart data

Modern wind power plant produce more data than ever



Equipment:

- Vibration
- Temperatures
- Status signals

Performance:

- Production
- Reactive power
- Availability
- Error logs

Environmental:

- Wind speed
- Ambient temperatures
- Wind direction
etc..



Big data to Smart data

Transfer big data to smart data

Vestas



Big data ≠ smart data

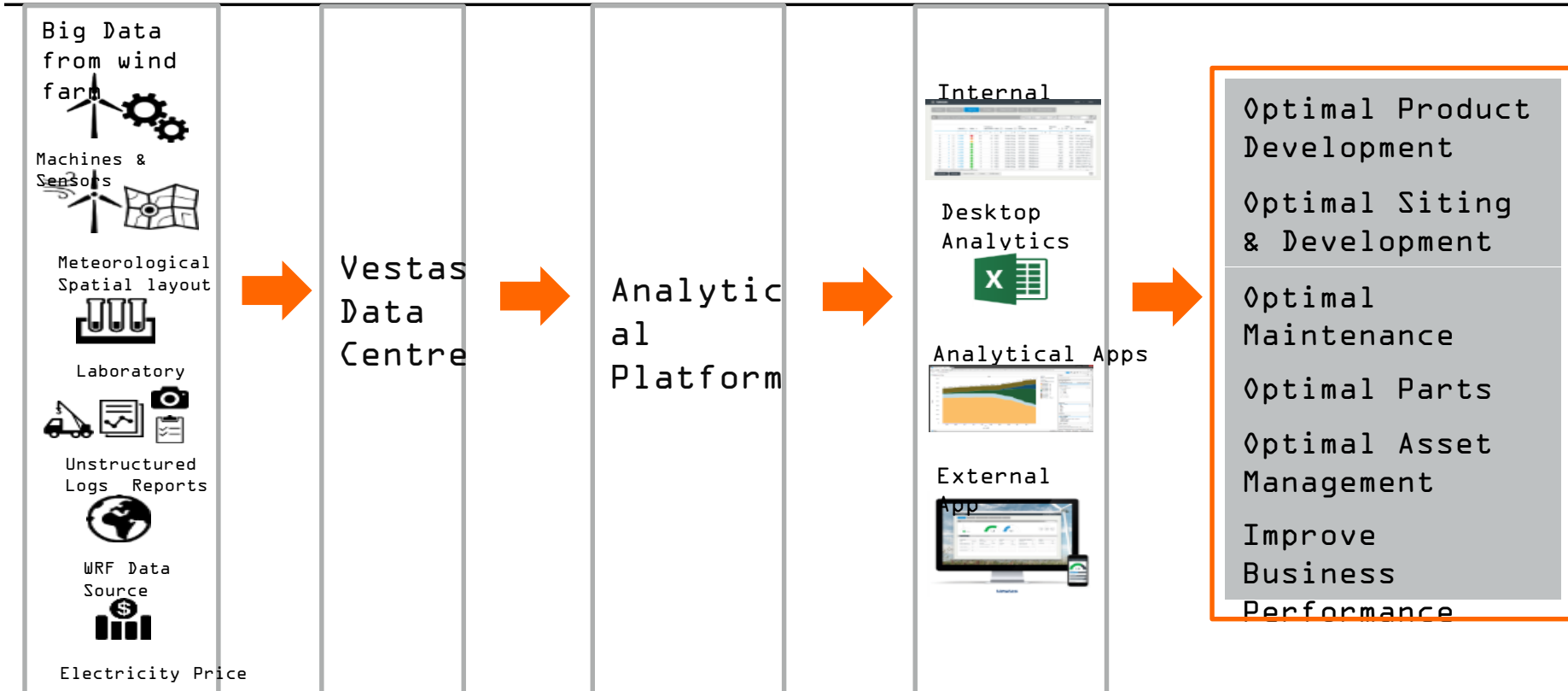
data → Value

Analytic

Big data to Smart data



From Big Data to Smart Data



Agenda

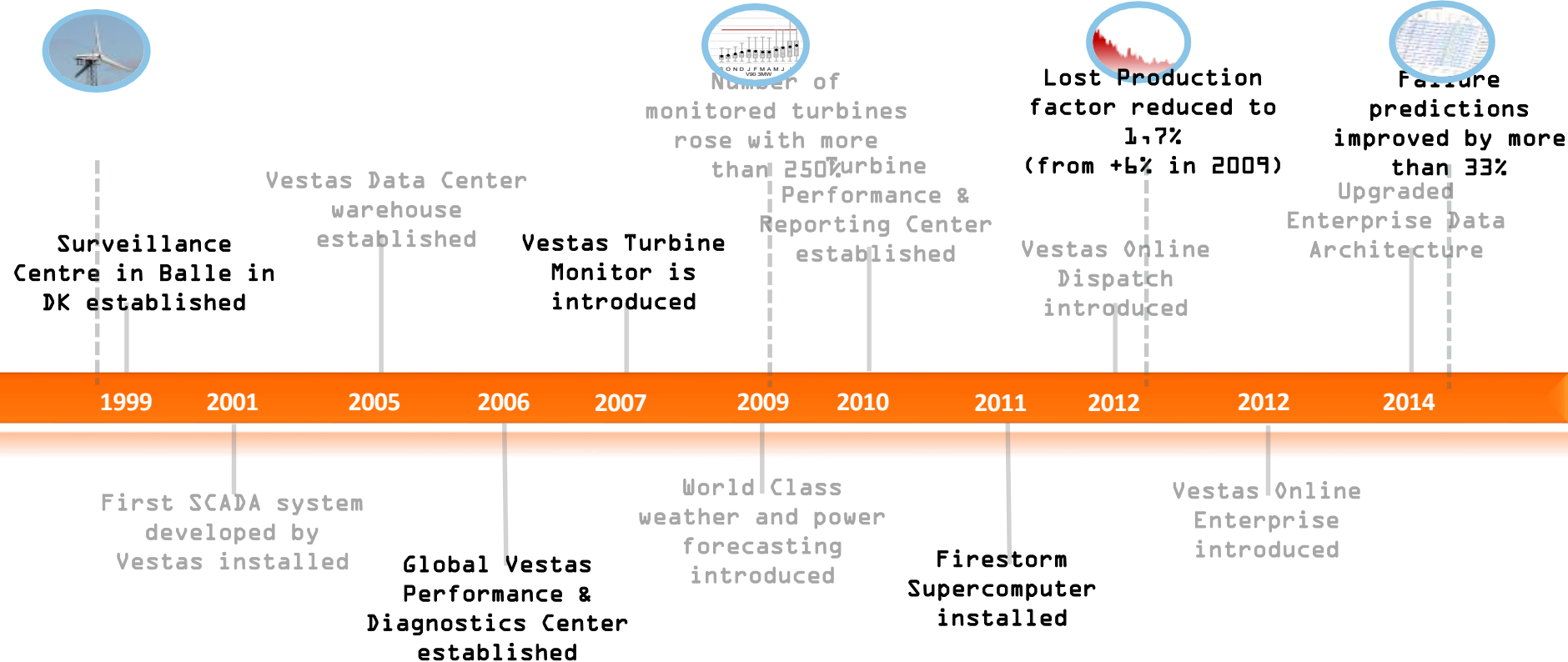


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Vestas way to smart data



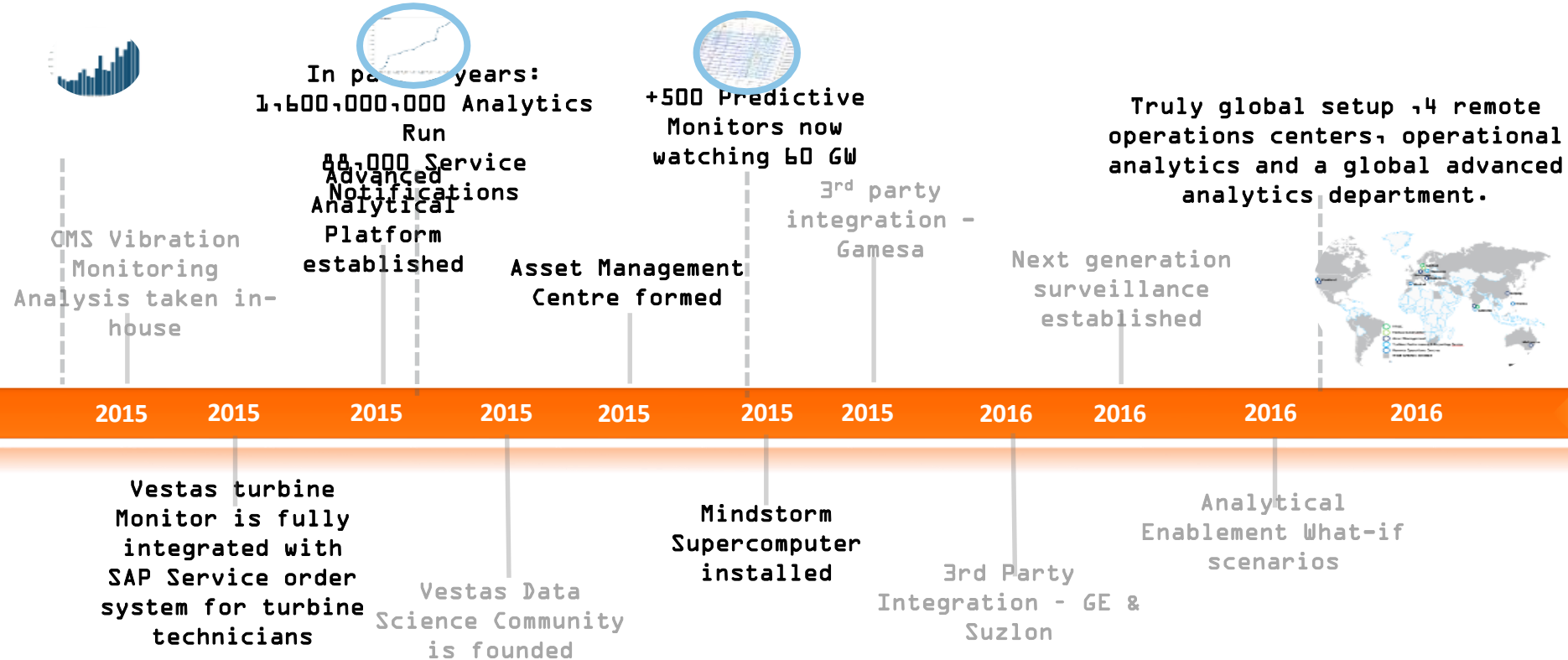
Vestas Data history at a glance (1/2)



Vestas way to smart data



Vestas Data history at a glance (2/2)



Agenda



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Smart data for predictive maintenance in Vestas

From reactive to proactive



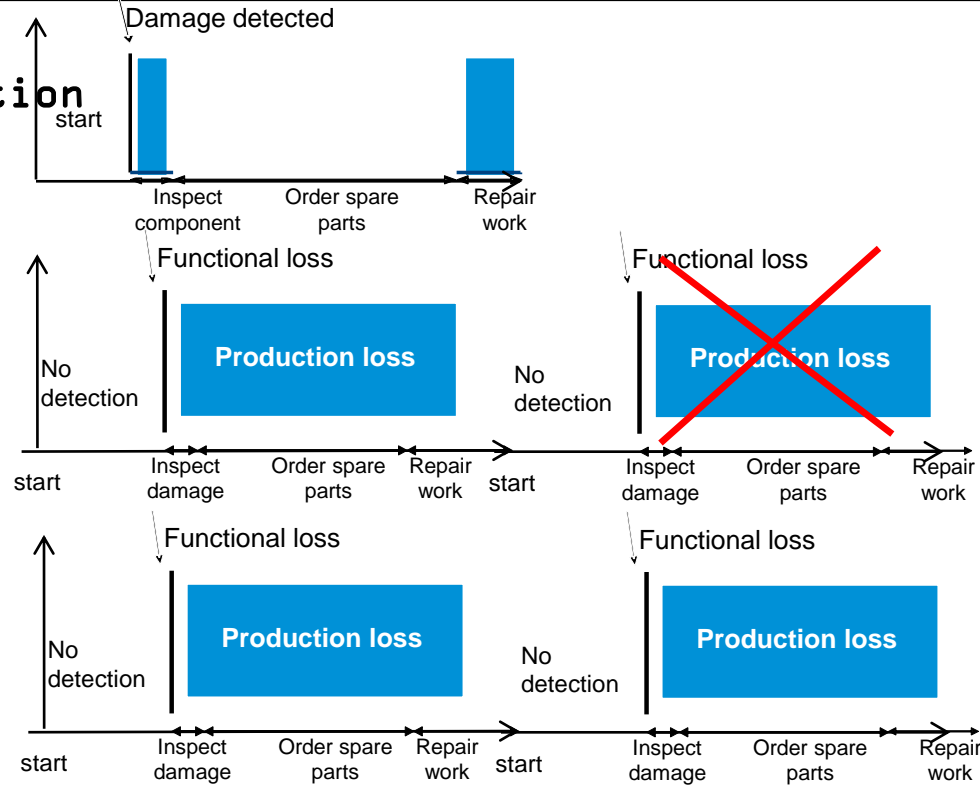
Prevention Through Prediction



Prevention Reoccurrence



Reactive



Smart data for predictive maintenance in Vestas

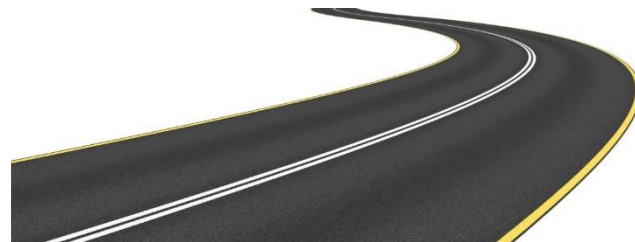
A combination of different methodologies



TECHNOLOGY

An effective combination of methodologies to detect abnormal behaviors and potential risks in the turbines

Proactive Maintenance



Online data

vibrations

scalar data

oil analysis

Any other data automatically collected



Ad-hoc data

endoscopies

motor tester

Blade care

Any other data



Fully integrated with business

ERP integration

Agenda

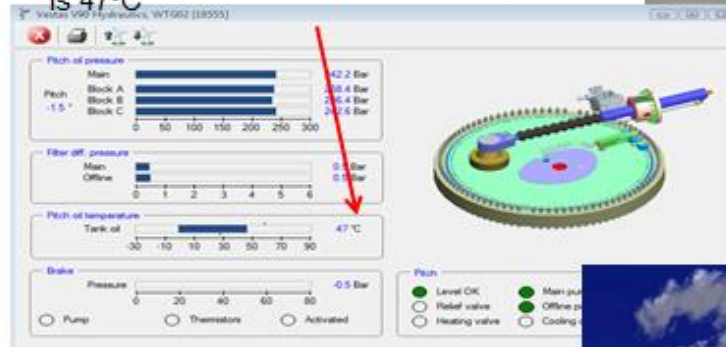


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Turbine Monitoring Applications

TRADITIONAL APPROACH

- We used VOB to connect to a park
- We selected one turbine
- Checking temperatures, pressures, etc
- In this case the pitch oil system temperature is 47°C

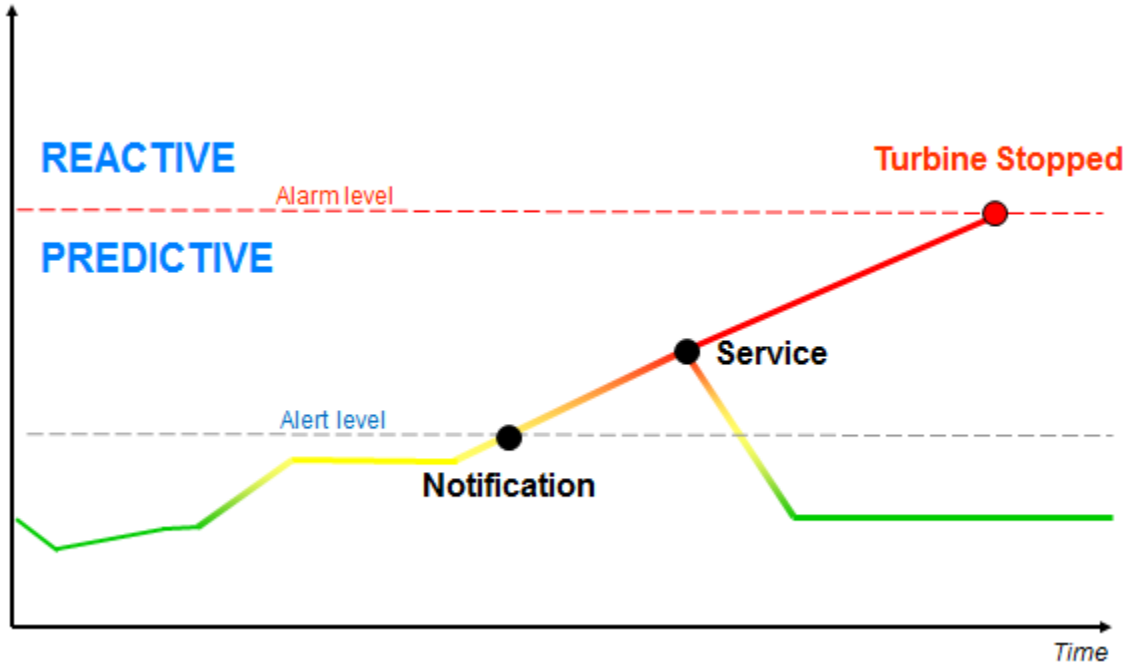


Is this correct?

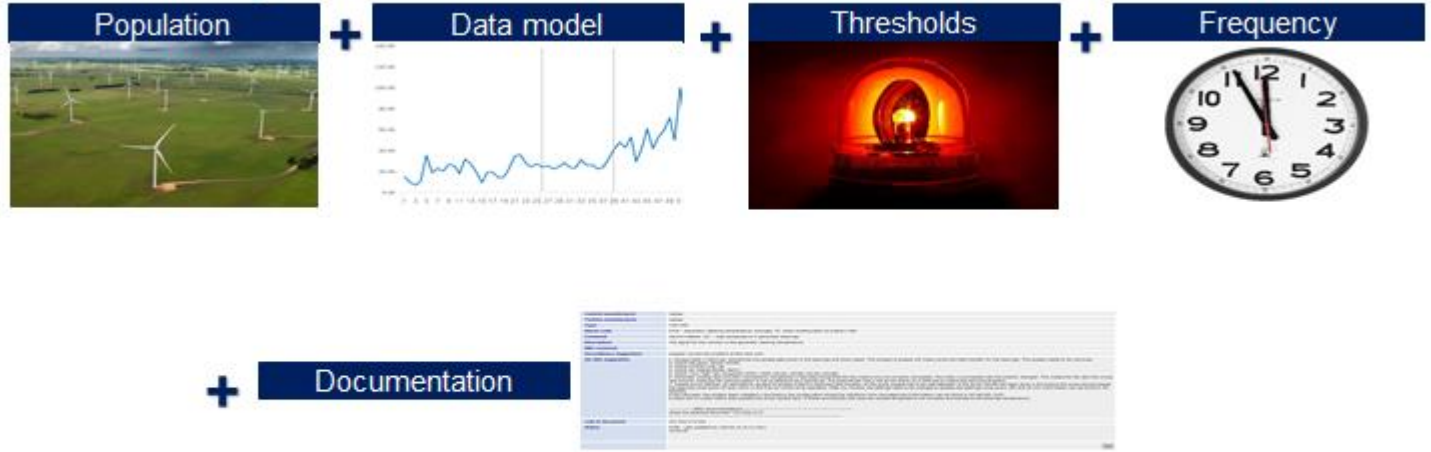
Turbine Monitoring Applications

Concept of Vestas Turbine Monitor (VTM)

Readings



Monitor components

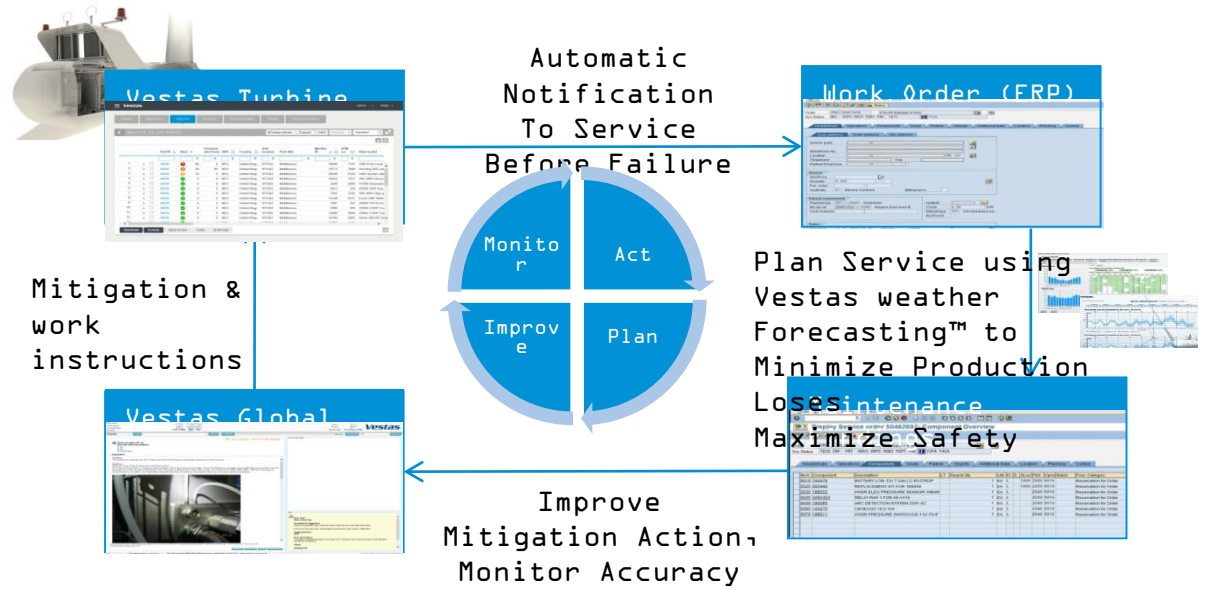


Turbine Monitoring Applications



Turbine Monitoring Applications

A part of full business optimization (X)



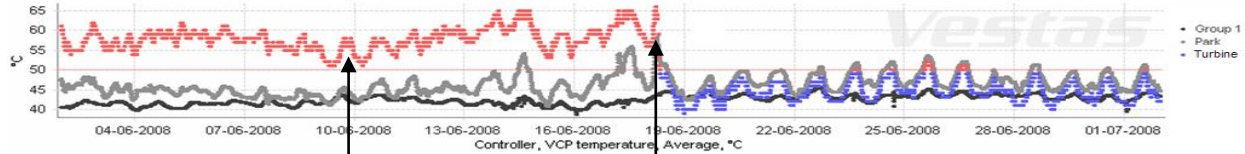
Turbine Monitoring Applications

Case: Controller temperature



CASE HISTORY
High controller temperature

POSSIBLE CONSEQUENCIES
Damaged component and turbine stopped



REACTIVE MAINTENANCE	PROACTIVE MAINTENANCE
Problem not detected until a major issue causes a stop and an expensive replacement: 1.000 € and a long stop	Service takes in advantage the next scheduled inspection, they identify the root cause, the replacement part cost 15 € and we optimize the maintenance

turbine

Turbine Monitoring Applications

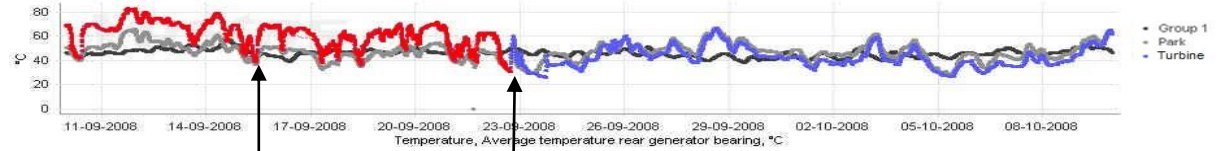
Case : Bearing Temperature

CASE HISTORY

High bearing temperature

POSSIBLE CONSEQUENCES

Damaged Gen bearing and turbine stopped



REACTIVE MAINTENANCE

Problem not detected until a major issue occurs, which causes a stop and an expensive replacement: 7.000 € and a 3 days minimum stop

PROACTIVE MAINTENANCE

Service takes in advantage the next scheduled inspection, they identify the root cause, the consumed material cost 1000 € and we optimize the maintenance

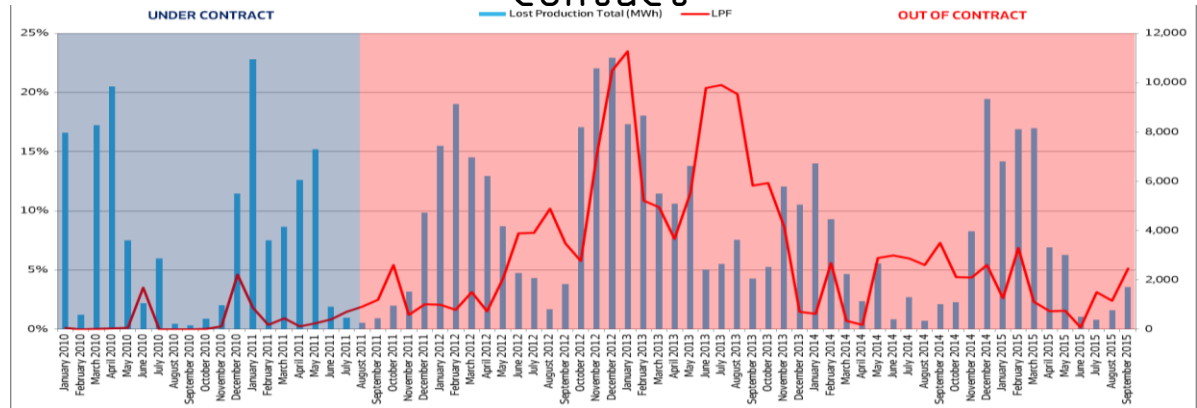
turbine



Performance before and after VTM



2 first years using Turbine Monitor and consequences of terminating the VTM contact



- Big data needs to be transferred to smart data to bring value
- Vestas never stops the steps of improving the smart data capabilities
- The wind farm maintenance is transforming from reactive to proactive



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attention

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