

Experience from RCM and RDS-PP coding for offshore wind farms

EERA DeepWind 2017,
Trondheim 19th of January 2017

Man
forty-seven
most uneven age ever

Roger Sundal

Reelle løsninger på reelle problem. Alltid.

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52 655 Tags

609 Tags for each turbine

88 turbine

7531 transmissions Tags

RDS-PP on turbines

IEC 61346 on transmission assets

Reliability-Centered Maintenance

An analytical process used to determine appropriate **failure management** strategies to ensure safe and cost-effective operations of a physical asset in a specific operating environment.

Failure management can be to create preventive maintenance tasks, or to run the asset to failure

The main goal of RCM is to avoid or reduce failure
CONSEQUENCES - Not necessarily to avoid failures

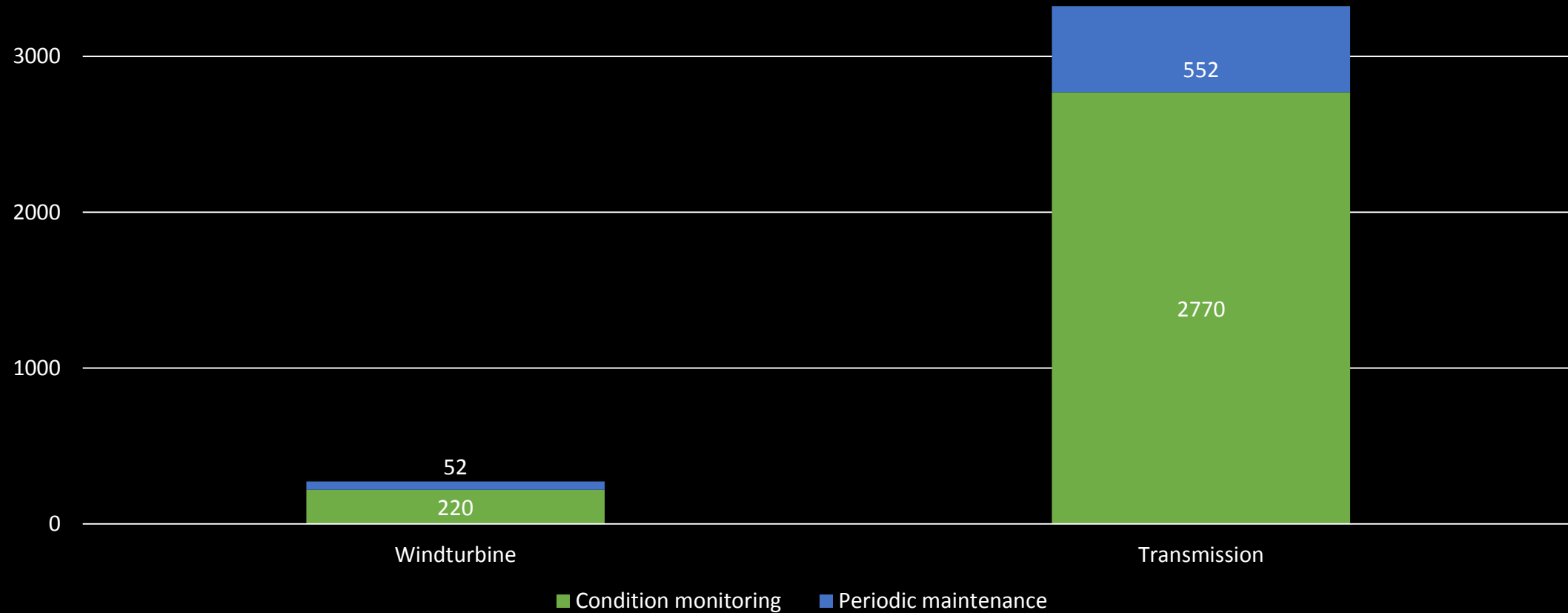
IEC 60300-3-11

Application guide Reliability-Centered maintenance

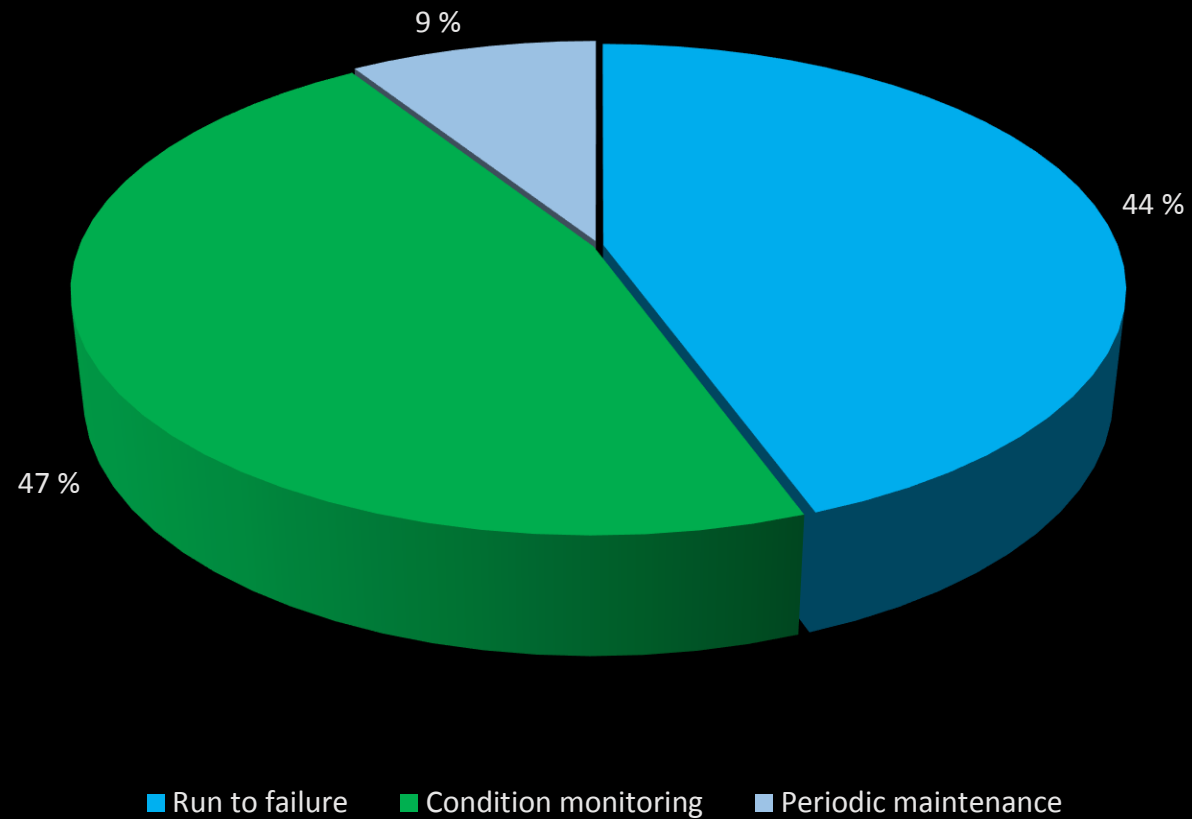
SAE JA 1011

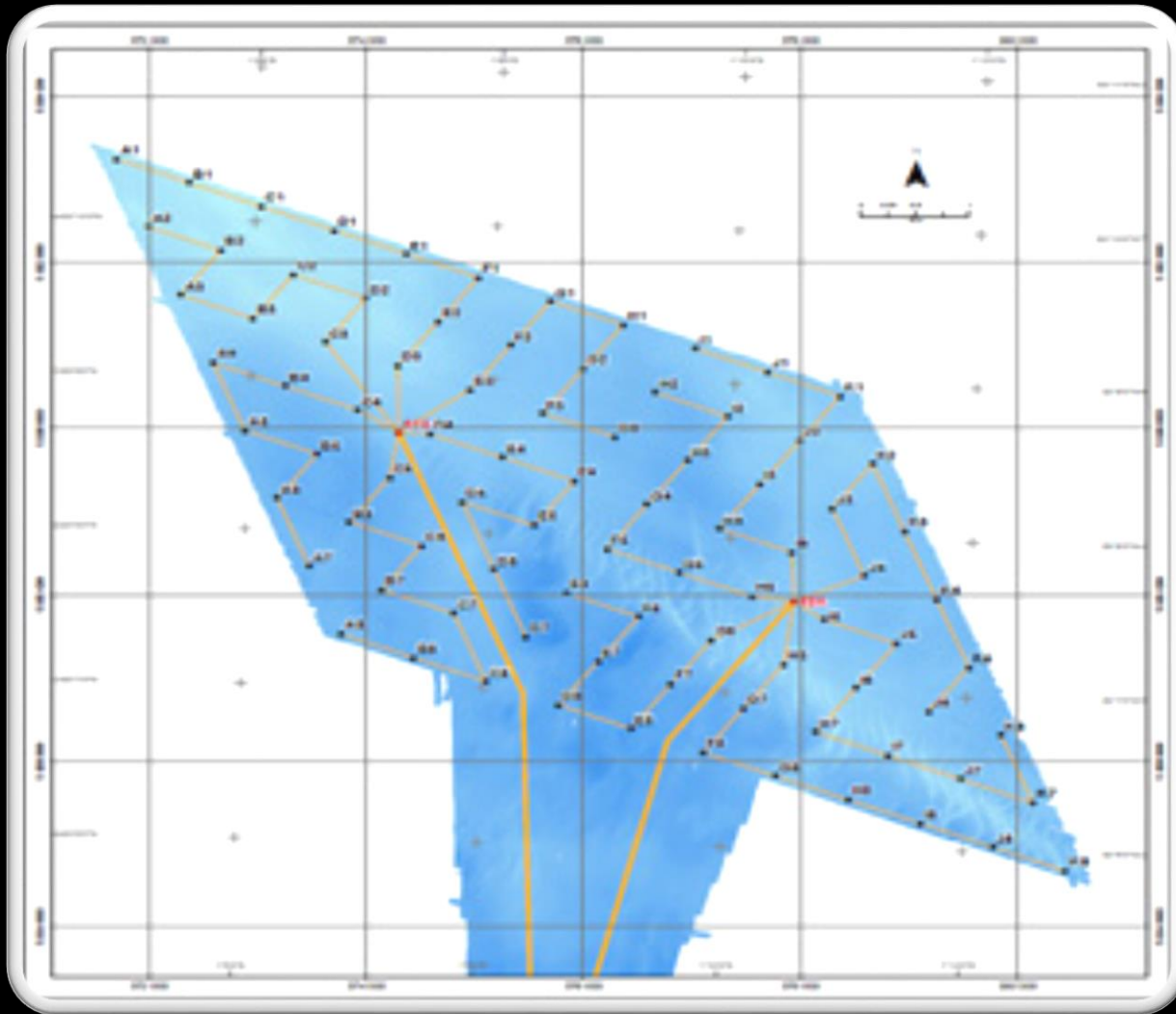
Evaluation criteria for Reliability-Centered Maintenance processes

Distribution of tasks on task types



Failure management decision





88 similar turbines



Logistics are different offshore

Consequence

- Function Breakdown
 - TR --- Substation
 - WT --- Windturbine
 - WT01 --- Windturbine all groups
 - BG --- Position indicator
 - BS --- Vibration sensor
 - BX --- Telephone
 - BZ --- Sensor, combined tasks
 - CM --- Accumulator, tank
 - EA --- Lighting
 - EQ --- Cooler
 - FL --- Relief valve
 - FM --- Extinguisher
 - FN
 - FQ --- Personal protection like r...
 - FR --- Cathodic protection
 - FS --- Covers
 - GA --- Generator
 - GF --- Generate signal like tran...
 - GM --- Service crane, tackle
 - GP --- Pump
 - GT --- Lubrication
 - HQ --- Filter element (mechanic...
 - HS --- Filter element (magnetic)

- Filter
 - Tags
 - Criticality
 - System
 - Equipment Category
 - Rough Sorting
 - Equipment Group

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Func Brkdwn								
Rekke	Function Id	System	Criticality	Tag Id	Description	Parent		
1	WT-WT01-BG	Structures in wind turbine syst	10	2500.A01=UMD79BG001	Twist monitoring system	2500.A01=UMD79	Statkr	
2	WT-WT01-BG	Blade adjustment	8	2500.A01=MDC11BG001	Pitch encoder blade	2500.A01=MDC11	Statkr	
3	WT-WT01-BG	Blade adjustment	8	2500.A01=MDC12BG001	Pitch encoder blade	2500.A01=MDC12	Statkr	
4	WT-WT01-BG	Blade adjustment	8	2500.A01=MDC13BG001	Pitch encoder blade	2500.A01=MDC13	Statkr	
5	WT-WT01-BG	Warning systems	6	2500.A01=XSD80BG001	GPS Antenna	2500.A01=XSD80	Statkr	
6	WT-WT01-BG	Yaw system	4	2500.A01=MDL62BG001	Yaw indicator	2500.A01=MDL62	Statkr	
7	WT-WT01-BG	Rotor structure, Hub and Blad	0	2500.A01=MDA11BG001	Tip measurer calibration	2500.A01=MDA11	Statkr	
8	WT-WT01-BG	Rotor structure, Hub and Blad	0	2500.A01=MDA12BG001	Tip measurer calibration	2500.A01=MDA12	Statkr	
9	WT-WT01-BG	Rotor structure, Hub and Blad	0	2500.A01=MDA13BG001	Tip measurer calibration	2500.A01=MDA13	Statkr	

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Sorting					RCM del			
Rekke	Function Id	System	Function	Failuremode	Failure effect	PF Interval	PF Un	
1	WT-WT01-BG	Blade adjustment	Forbinder encoder til vinge	Løs del	Feil på måling og stopp			
2	WT-WT01-BG	Blade adjustment	Tilbakemelde vingeposisjon	Feil justering	Redusert effekt			
3	WT-WT01-BG	Blade adjustment	Tilbakemelde vingeposisjon	Ledningsbrudd	Ingen regulering, stopp			
4	WT-WT01-BG	Blade adjustment	Tilbakemelde vingeposisjon	Defekt komponent	Ingen regulering, stopp			
5	WT-WT01-BG	Blade adjustment	Forbinde encoder til vinge	Løs del	Feil på måling og stopp			
6	WT-WT01-BG	Yaw system	Posisjongiver yaw system	Defekt komponent	Stopp av vindmølle			

Benefit from others work – apply a standard

RDS-PP – find your level

Remember: Failures you want to register on a low level, preventive work on a higher level

Thank you for your attention!



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