

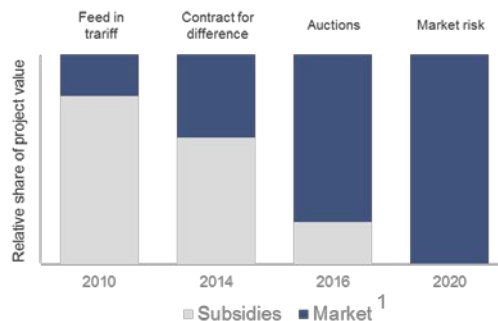
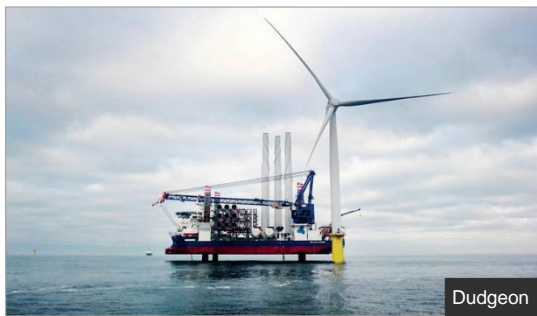
# Statoil – brukerperspektiver knyttet til digitalisering i offshore vind

Dr. Nenad Keseric  
Hywind Demo Operations Manager  
Statoil New Energy Solutions, Operational Excellence  
Industry meets Science – 15.6.2017



Statoil

# Sharpened strategy: Building a **profitable** new energy business



## Industrial approach

- Leverage core competence
- Scale & technology reduce costs
- Access to long-term projects

## Value driven

- From subsidies to markets
- 9-11% return range (real)
- Cash flow resilience

## Growth opportunities

- 15-20% of capex in 2030<sup>2</sup>
- Offshore wind and other options
- Low-carbon solutions

<sup>1</sup> Indicative for offshore wind projects

<sup>2</sup> Indicative, based on potential future corporate portfolio.

# Strømløseveranse fra offshore vind til >1 M husstander

Playing  
to  
our  
strengths



Offshore vind prosjekter i utvikling >1100 MW,  
og potensial for >5 M husstander

Attraktive  
markeder



\* All capacity figures on 100% basis

# New energy solutions: Høy aktivitet i 2017



SHERINGHAM SHOAL - UK



DUDGEON - UK



HYWIND SCOTLAND



ARKONA - GERMANY



NEW YORK - US



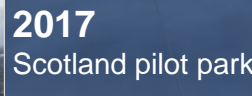
DOGGER BANK - UK

# Hywind Scotland Pilot Park



**2018**

Batwind: Adding battery storage



**2017**

Scotland pilot park: World's first

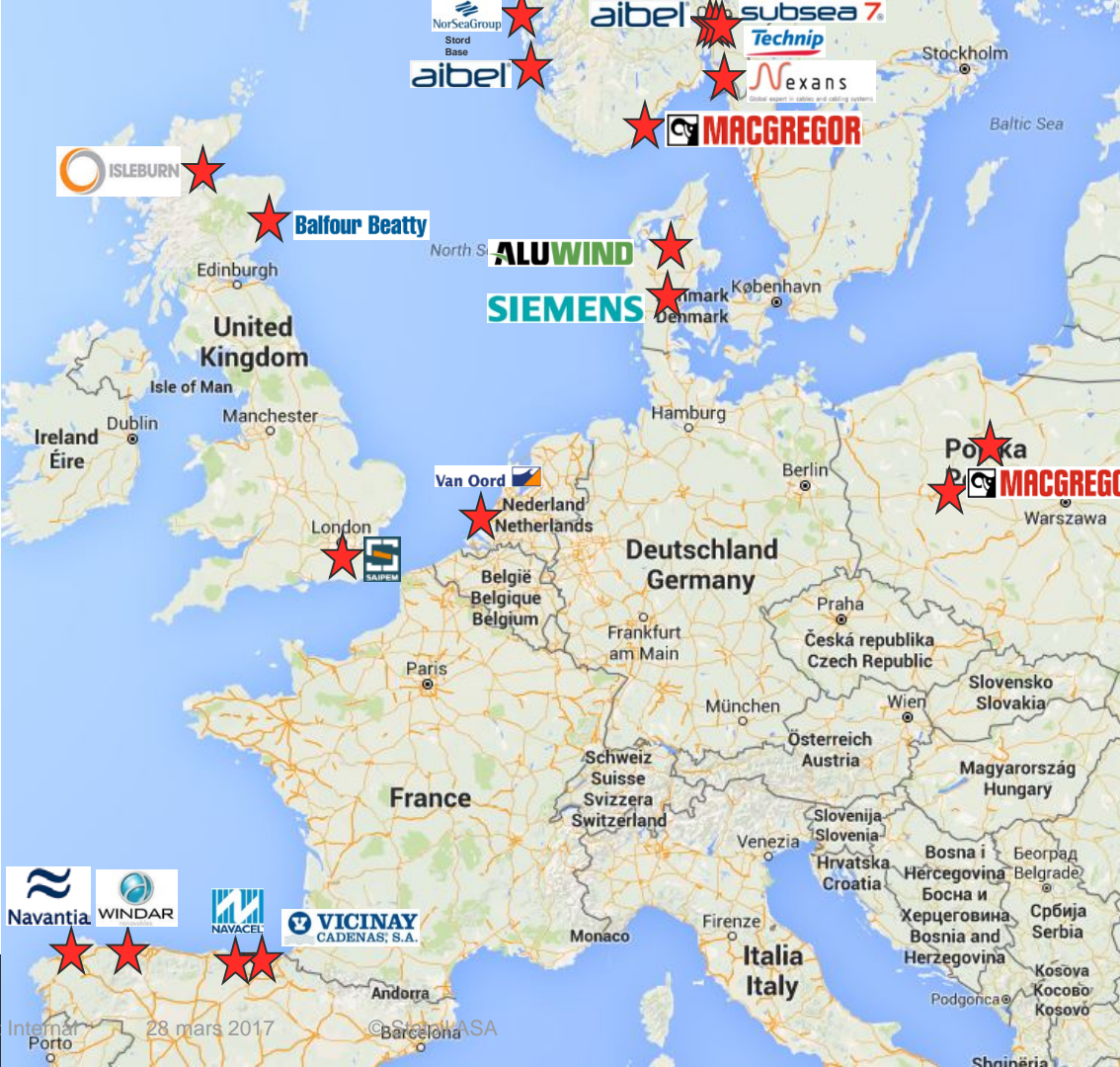


**2009**

Demo: Proven in the North Sea



- De positive resultatene som er oppnådd på Hywind Demo har ført til at Statoil nå ser at tiden er inne til å ta et ytterligere steg mot en kommersiell offshore vindpark.
- Hywind Demo brukes til fortsatt til test/ demonstrasjoner av fartøyer og aksess systemer for å sikre best mulig tilkomst løsning
- Statoil jobber med å forbedre konseptet ytterligere og industrialisere løsningen slik at vi kan konkurrere i markedet for fornybar energi.
- Statoil ser det derfor som svært viktig å opprettholde driften på Hywind Demo for å kunne tiltrekke seg viktige aktører innenfor leverandørkjeden og opprettholde det videre arbeidet med å optimalisere Hywind konseptet



# Hywind Demo hovedaktiviteter siden 2009

1. Etablert O&M base hos Skude Industri i Skudeneshavn, benytter lokale leverandører
2. Testet båter og aksess systemer bl.a.: Fob Trim, Buddy, Fob Swath1 m/Undertun prototype gangvei, Bayard 3 m/ MaXccess, Island Crown med Uptime/MA gangvei, Fjellstrand WindServer 25 / 30, A+D Vessel Motion Measurement System, Stinger MicroROV, etc
3. HMS kurs/øvelser, demonstrasjon og testing av nye teknologier og systemer, forskning og testing på turbin kontroll systemer, **Digitalisering**





# Statoil's digital roadmap

1. Digital safety, security & sustainability

2. Process digitalisation

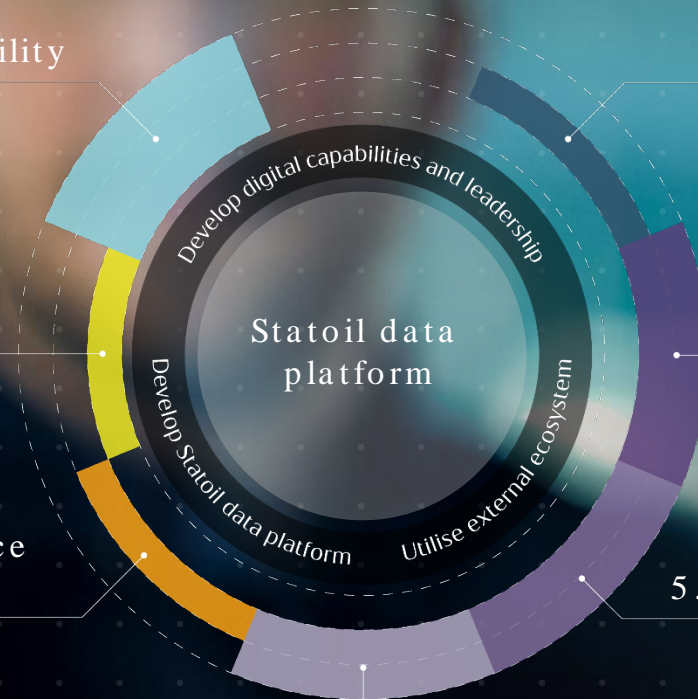
3. Predictive/ Subsurface analytics

4. Next generation well/ renewables

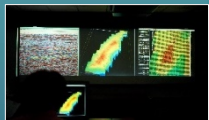
7. Commercial insights

6. Data driven operations

5. Wind park of the future

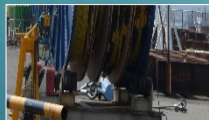






### 1970's:

Mainframe computers to process seismic data



### 1990-2000:

Tampnet - Subsea fiber optics for offshore installations, enabling big data transmissions



### 2005:

Real time streaming of drilling data and monitoring in Real Time Center



### 2015:

Åsgard subsea compression goes live



### 1998-2003:

Score project – common platforms for subsurface data, new IT-tools like 3D visualization rooms



### 2015:

Valemon on stream, partly unmanned operations from onshore Central Control Room



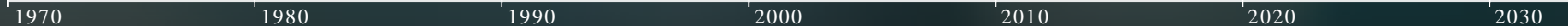
### 2017:

- Statoil NES- CBM project with Kongsberg Digital  
- Kongsberg, Statoil og Fred. Olsen sammen om «digital vindrevolusjon»



### By 2025:

AI, cloud, Big data, high capacity computing, robotics



# Building tools and developing competence

Our **Strategic belief:**

**Data and algorithms will be core strategic assets.**

Corporate effort to improve operations across Statoil to build the foundation to realise ambition

**Solid data models and access to data is essential**

Digitalisation focus to use enabling technologies and analytics to ensure

**Production increase from improved forecasting and cost reduction from optimal maintenance**

Once foundation is in place we can **explore new business models**



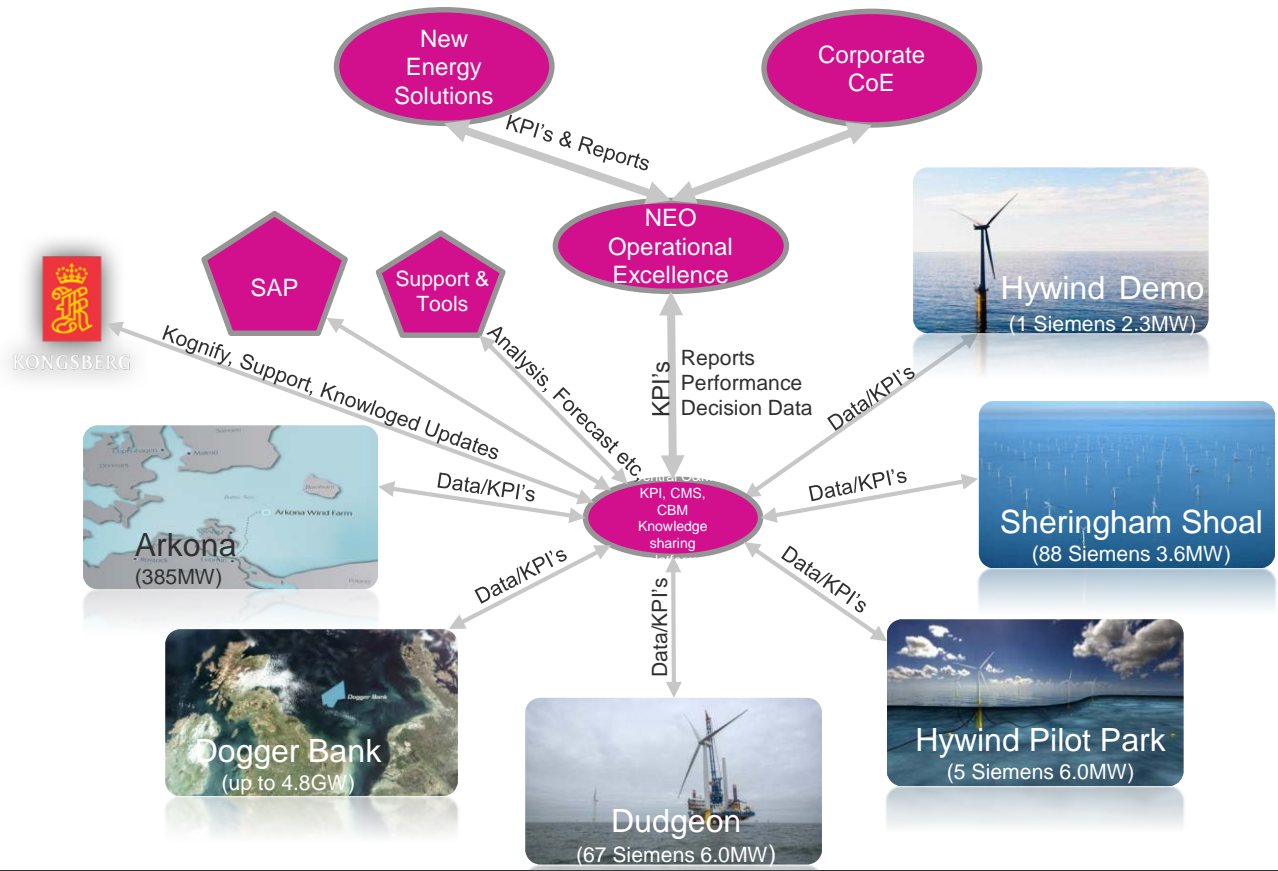
# Big Data Value proposition for Wind O&M



## HSE/Safety/Security: Remote, Minimizing on-/offshore tri

- Reduce risks
- Save man-hours per turbine
- Less visits/physical interaction





# HYWIND Demo- Kongsberg Digital CBM project

Supported by ENOVA

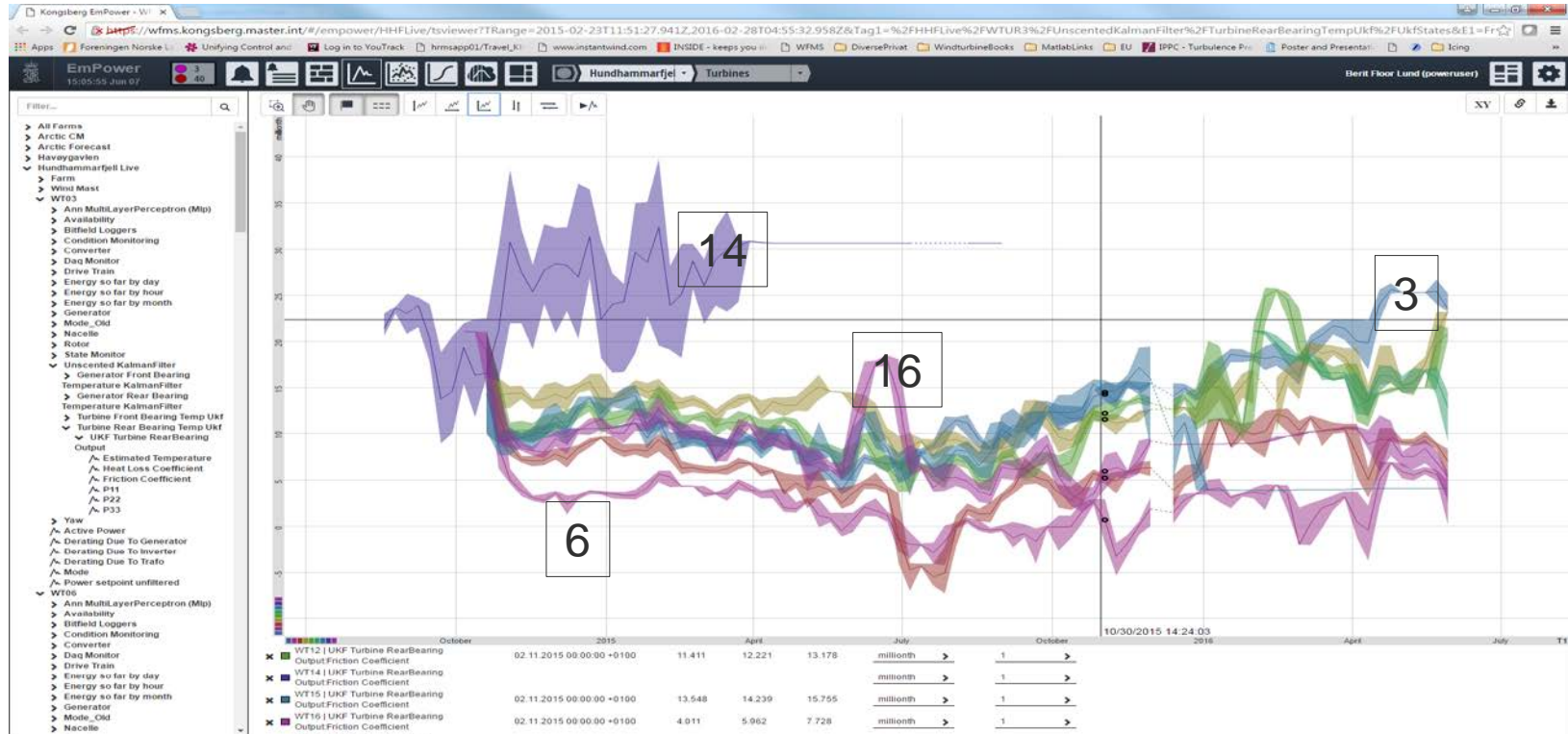
*“For Hywind Demo Statoil sees a large potential in predicting failures and initiating mitigating activities prior to standstill of the turbine.”*

## Project Objectives:

1. Better understanding of **degradation mechanisms**
2. **Early warning** of component underperformance/ degradation
3. **Fault recognition** and root cause identification techniques
4. **Remaining operational lifetime (RUL)** calculations for major component classes
5. **O&M: Introduce CBM methodology**

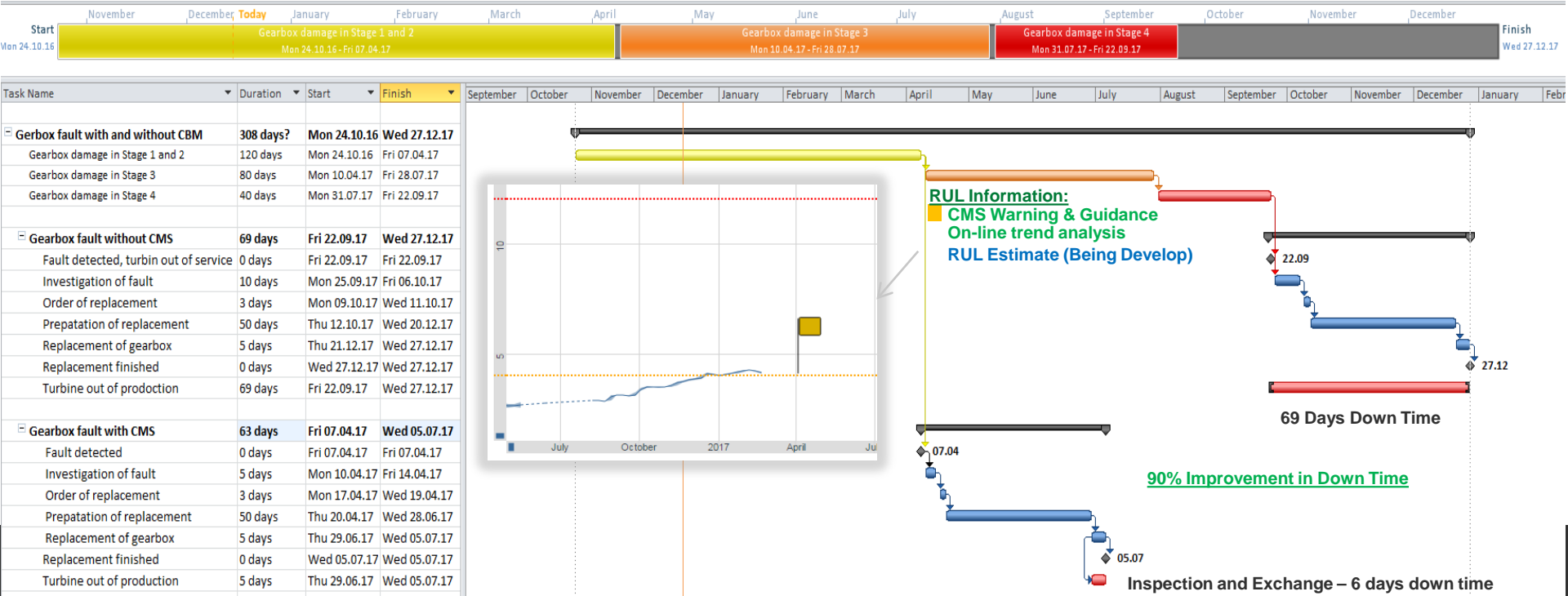


# Kognifi and EmPower Methods



# Predictive Analytics - Main Component/ Gearbox fault

- Example: Gearbox fault Detected 6 months before it causes a production stop.
- Corrective Maintenance: Fault not detected before production stop. Inspection and repair parts has to be ordered and executed during production stop. Inspection and maintenance might be delayed due to weather conditions.
- Predictive Maintenance: Fault detected 6 months before it cause production stop. Pre on-line analysis, Inspection, Repair parts and maintenance can be executed and ordered during production. A proper weather window is selected effective maintenance.



# O&M CBM Process and Savings

Early warning Fault or Deviation (3-12 Month)

Prioritize for Analysis

Site and Operational Excellence (On-line analysis of turbine data and cross comparison)

Prioritize Activities

Order Inspection  
Order spares and tools  
Order logistics

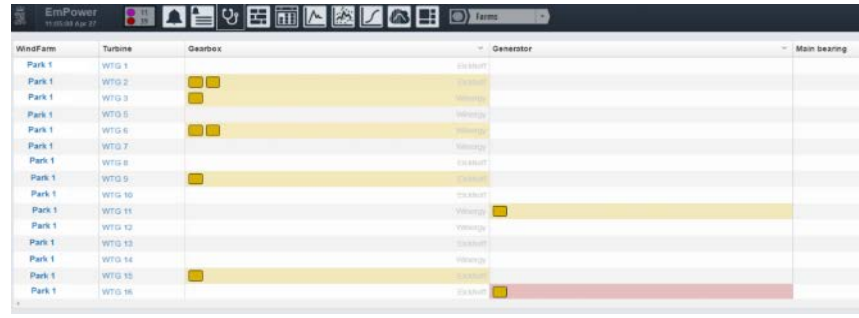
Maintenance Planning

Evaluate:  
-Weather Conditions  
-Include already Planned Maintenance  
-Actions for continuous production until low wind. Derating, Section Control, lubrication

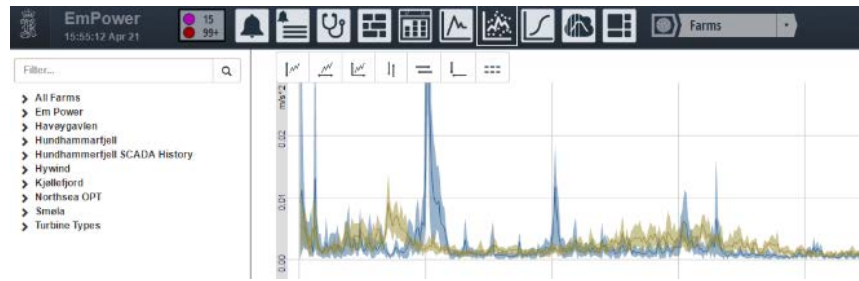
**Savings:**  
Travel Time  
Inspection time  
Turbine downtime

**Savings:**  
Downtime. Do planning while running!

**Savings:**  
Downtime, waiting time for technician and equipment



Aggregated Condition Information



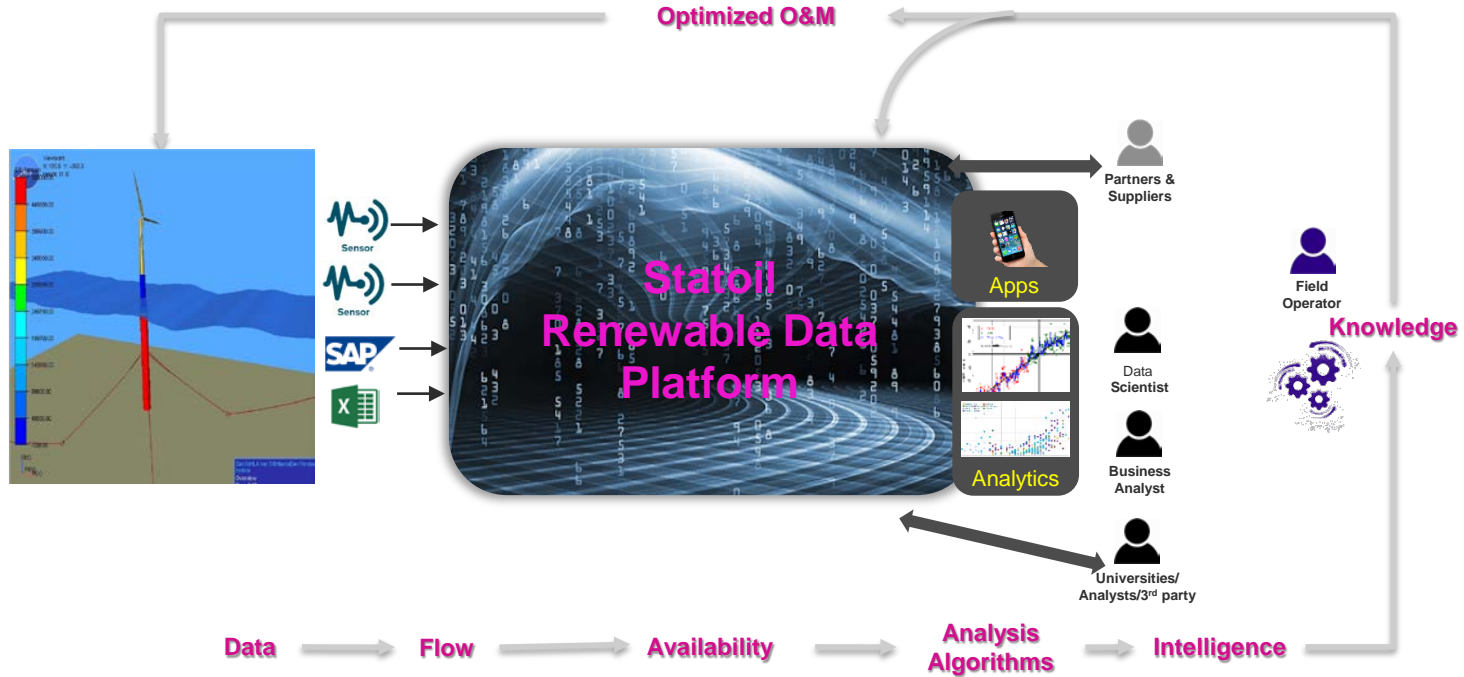
On-line root cause analysis



20-40% Estimated reduction in Downtime with CBM  
 – further analysis needed  
 2-6% Reduction in OPEX with CBM



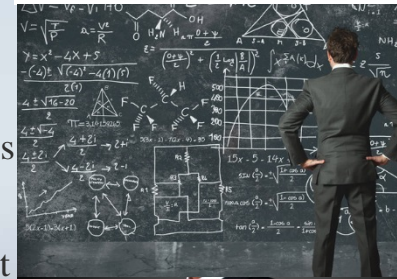
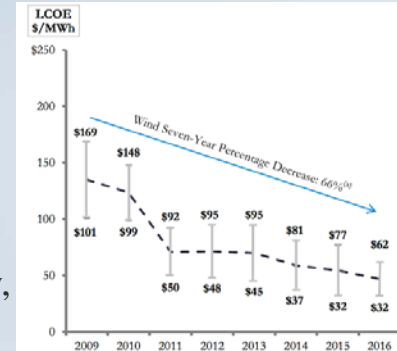
# The Vision - Cloud data Platform



*Make data, and business features, easily available for those who need them, when they need them, where they are, on the device they have; in "real time".*

# Wind O&M legacy and Digital future

- O&M is a serious business and cost a lot of money. Not maintaining costs even more!
- Constantly chasing lower cost of energy (COE/ LCOE). All areas are important and Operation & Maintenance (O&M) in particular because it accounts for up to 30% of COE
- Like it or not, the maintenance business is being forced to change. Pressure to continually work smarter, cut costs and be more productive. Solutions and forums are available to help. Ultimately, change is inevitable and constant, and should be embraced in order to improve
- Siemens continuously monitors 24 Million different parameters (pressure, temperatures, vibration patterns). That translates into about 3,200 individual measurement values for each WTG continuously collected and updated. In 2015 the database contained around 300 terabytes of data
- Industry cannot longer rely on Excel for logging and analyzing data. Software is a not a barrier but access to data is still a barrier.
- We own Big data! **Sharing it is better than locking. Technology allows sharing wind data to improve performance. Industry generated knowledge is the key to create competitive industry** → learning together & Share best practice



Thank you!

**Dr. Nenad Keseric**

**NES NEO Operational Excellence**

**nenk@statoil.com**

**+47 954 33 483**