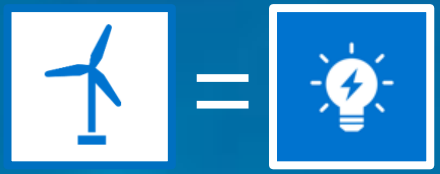


Ørsted Windfarm Site Operation with OSIsoft AF

Rikke Meyer Pedersen & Signe Bramming Andersen

Ørsted & SIMILIX

Abstract

- Ørsted has developed a Site Monitoring Center, SMC, for Wind Power.
  SMC is a critical web application supporting each Windfarm Site Manager in the decision making process with the exact insight needed for optimal planning and asset optimization at this specific Site.
- The users can configure their own threshold, like the max value of specific alarms before raising an event.
- The real-time infrastructure is provided by OSIsoft including the API for Asset Framework (AF) and PI Event Framework.
- OSIsoft provides performance and scalability for high frequent, near real time data, and PI AF specifically translates the sensor information into an asset structure, providing all relevant - but also only the relevant information to Site Managers.
- By integrating to Esri GIS, the information is visualized spatially in an intuitive way, thereby often adding even more information.
- Integration to SAP PM is translating a Notification into a Work Order, thereby translating insight into action.

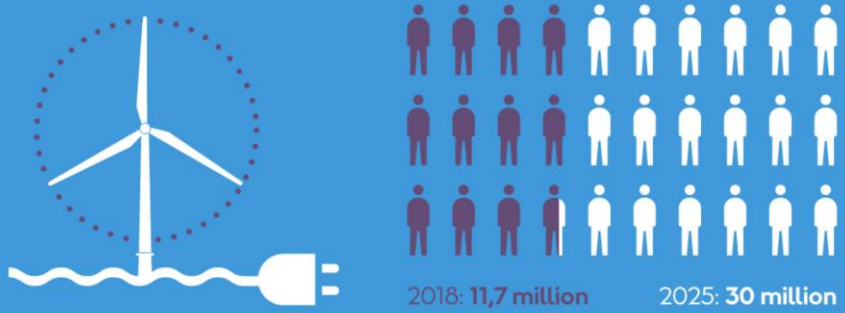
Ørsted Wind Power

Key Figures 2017

Revenue DKK 20.4 bill.
Power gen: 8.5 TWh

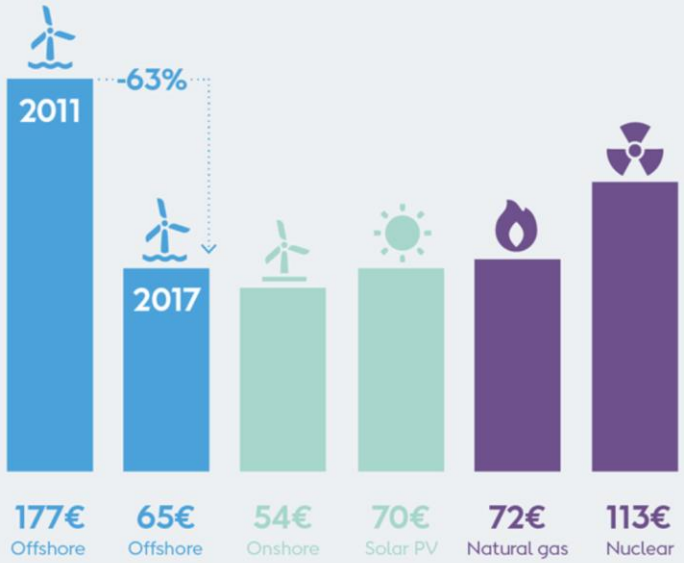
EBITDA DKK 20.6 billion
Employees (FTE): 2,253

Total output of Ørsted-built offshore wind farms



Cost of offshore wind energy compared to other sources

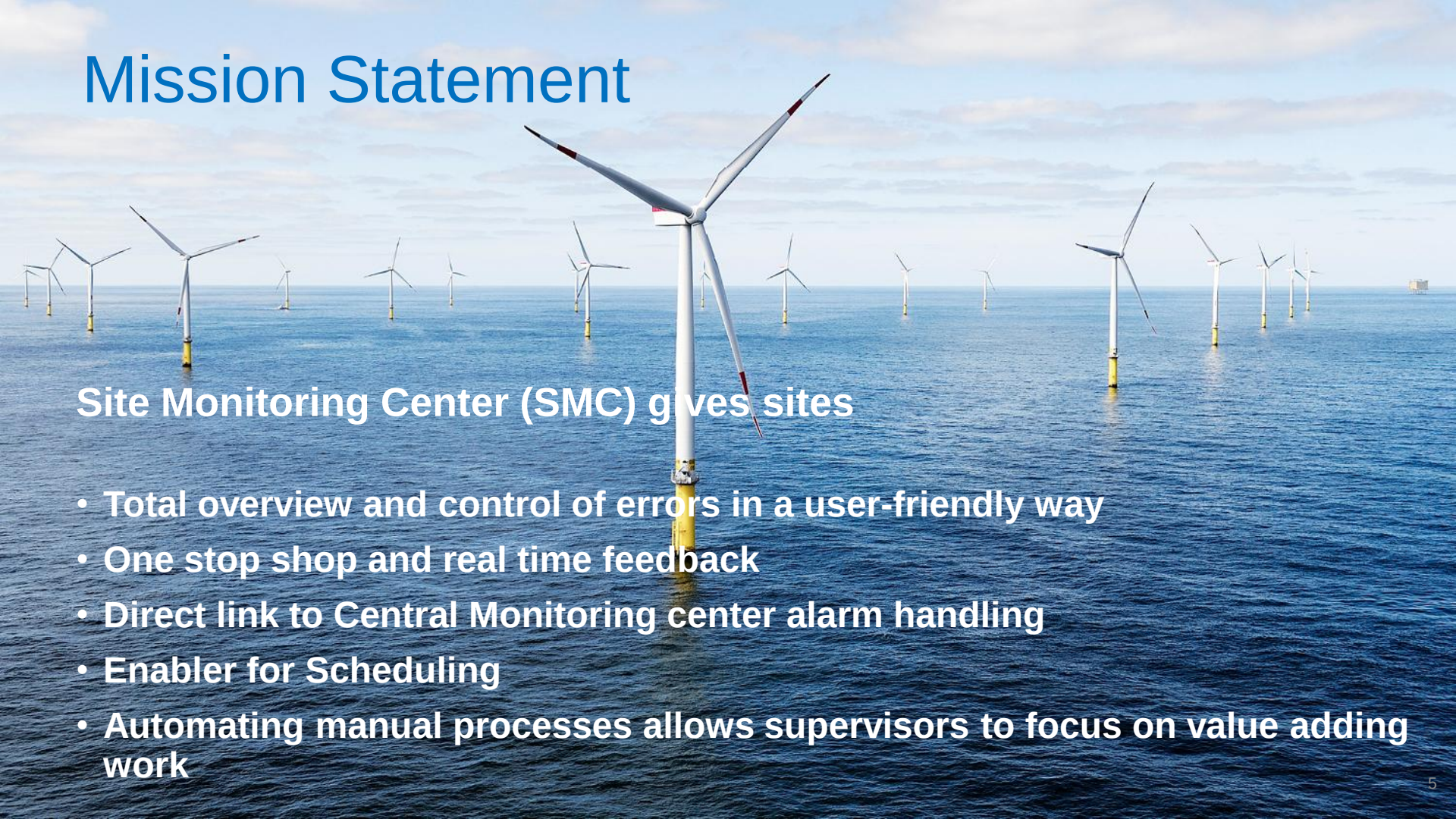
(EUR per MWh, year of FID)



Ambition: Better IT support for site operation

- Process improvement for Tech Leads, who had to work their way through several applications and Excel sheets before finally sending an order to technicians
  - Digitalization of white boards and Excel sheets
  - Consolidation of several local systems into single version of truth and operational excellence
- High quality near-real time information on site, where operation is executed
- Optimized planning for wind turbines, that are only accessible part of the day and part of the month – some months as few as 4 days are weather days
- Minimizing costly downtime – and heat-up time

Mission Statement

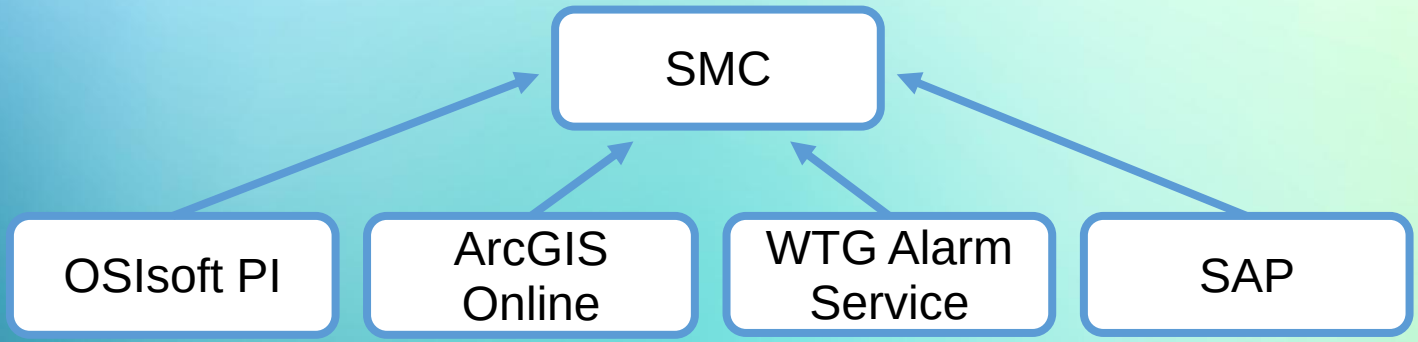


Site Monitoring Center (SMC) gives sites

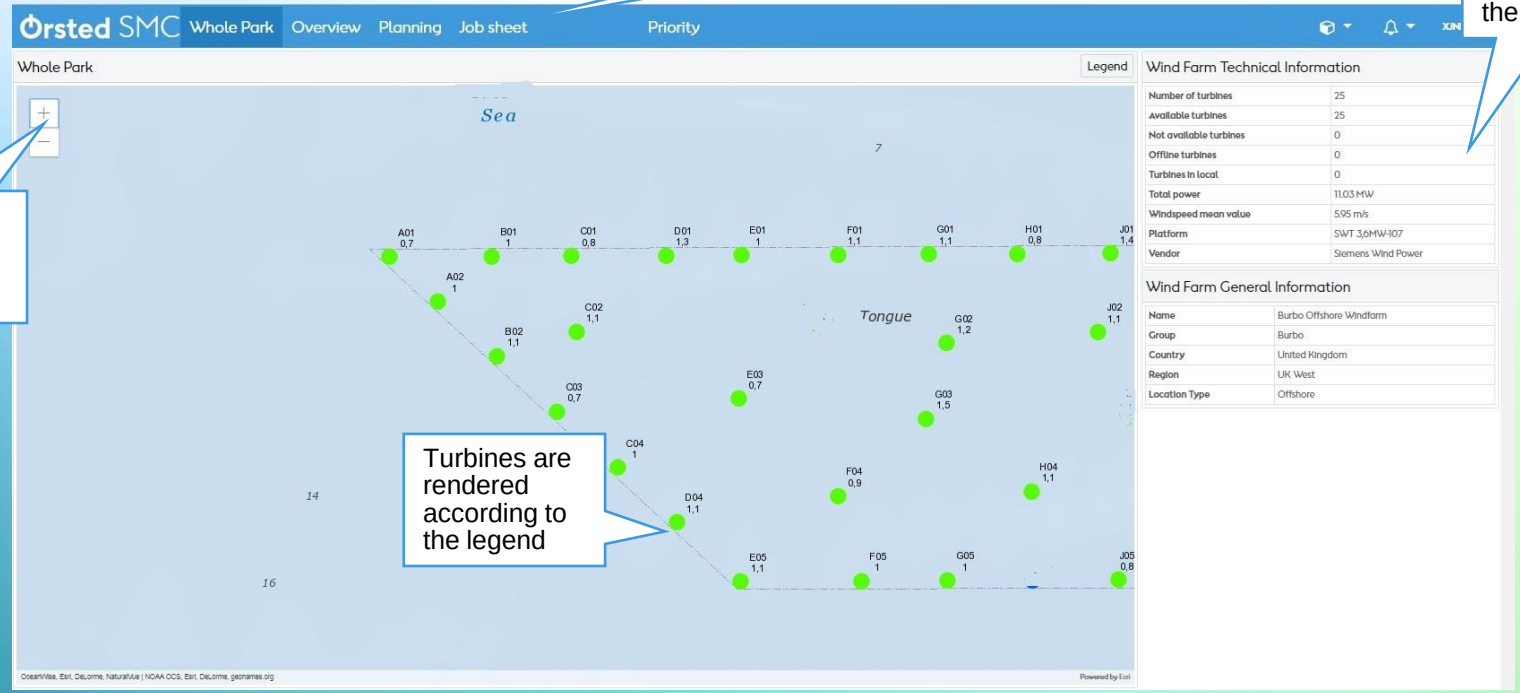
- **Total overview and control of errors in a user-friendly way**
- **One stop shop and real time feedback**
- **Direct link to Central Monitoring center alarm handling**
- **Enabler for Scheduling**
- **Automating manual processes allows supervisors to focus on value adding work**

Ørsted Site Monitoring Center (SMC)

- 400 users monitoring
- 1200 wind turbines from
- Any device with
- Authorizations per site

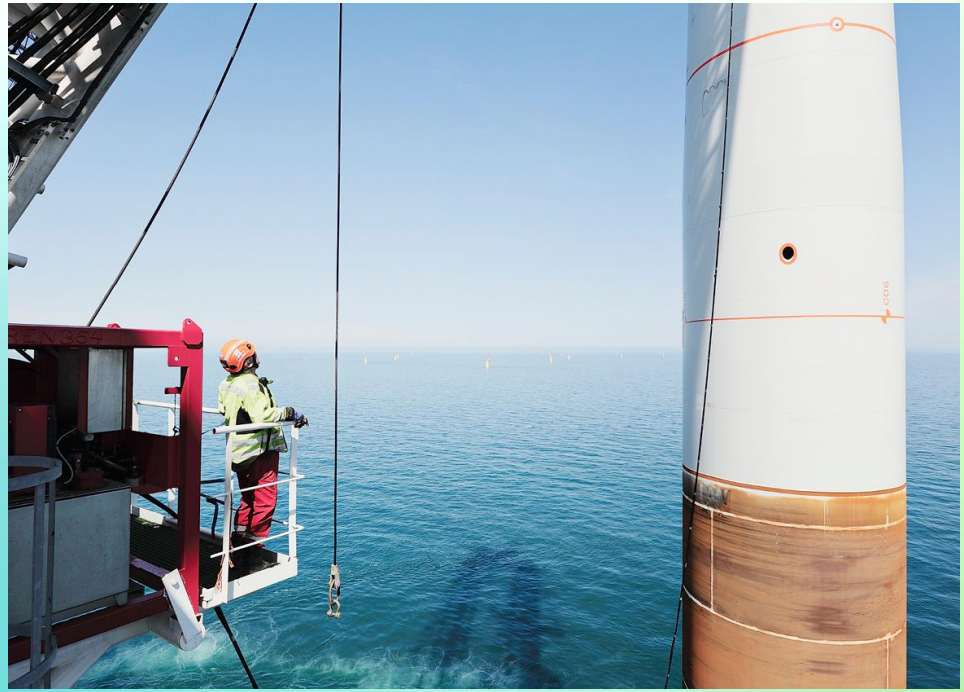


Park health and production at a glance

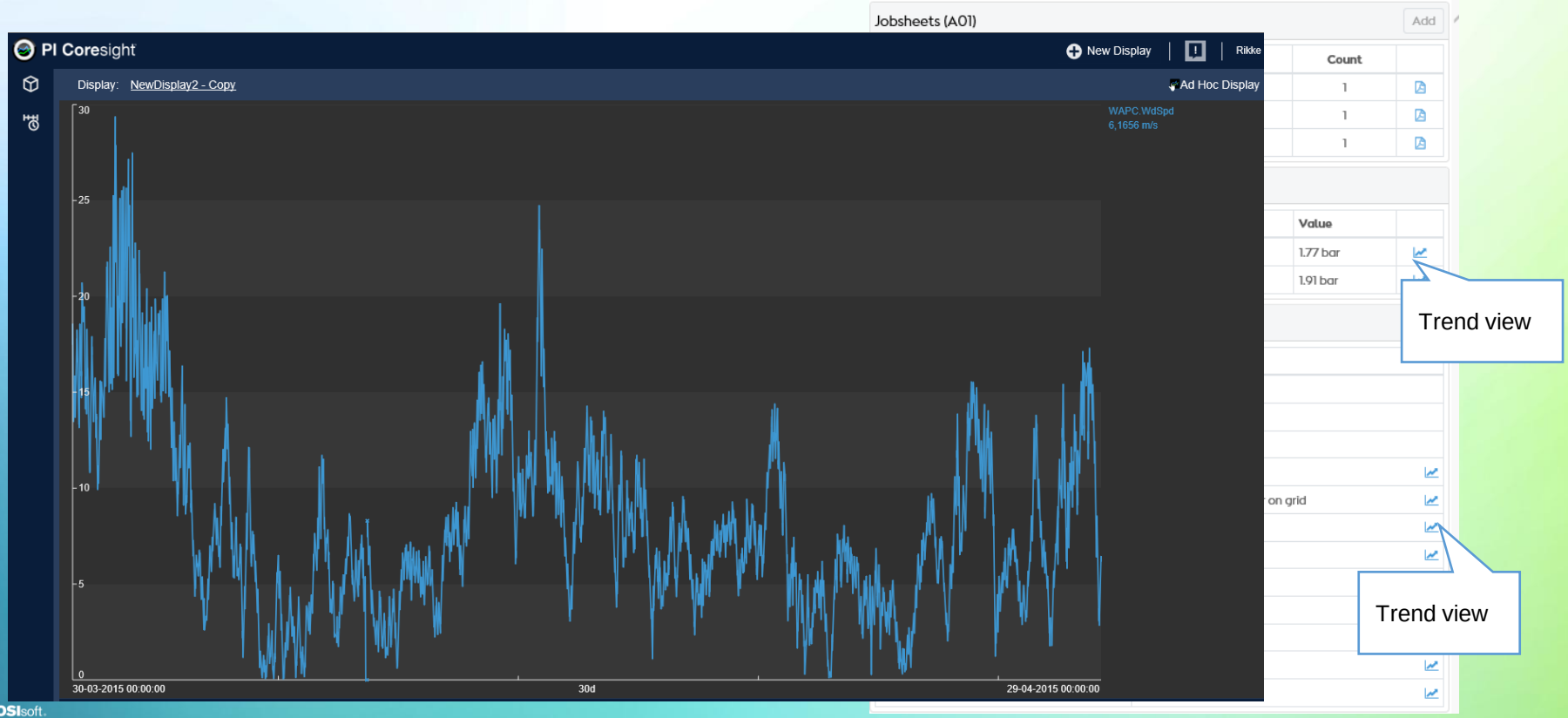


Single click on WTG to reveal turbine info

- Errors
  - Down Turbine Errors
  - Running Errors
  - Running Error Notifications
- Service
  - Additional Work
  - Project Orders
  - Modifications
  - Corrective Maintenance
  - Preventive Maintenance
  - Job Sheets
- System Monitoring
- General Information
- Restrictions



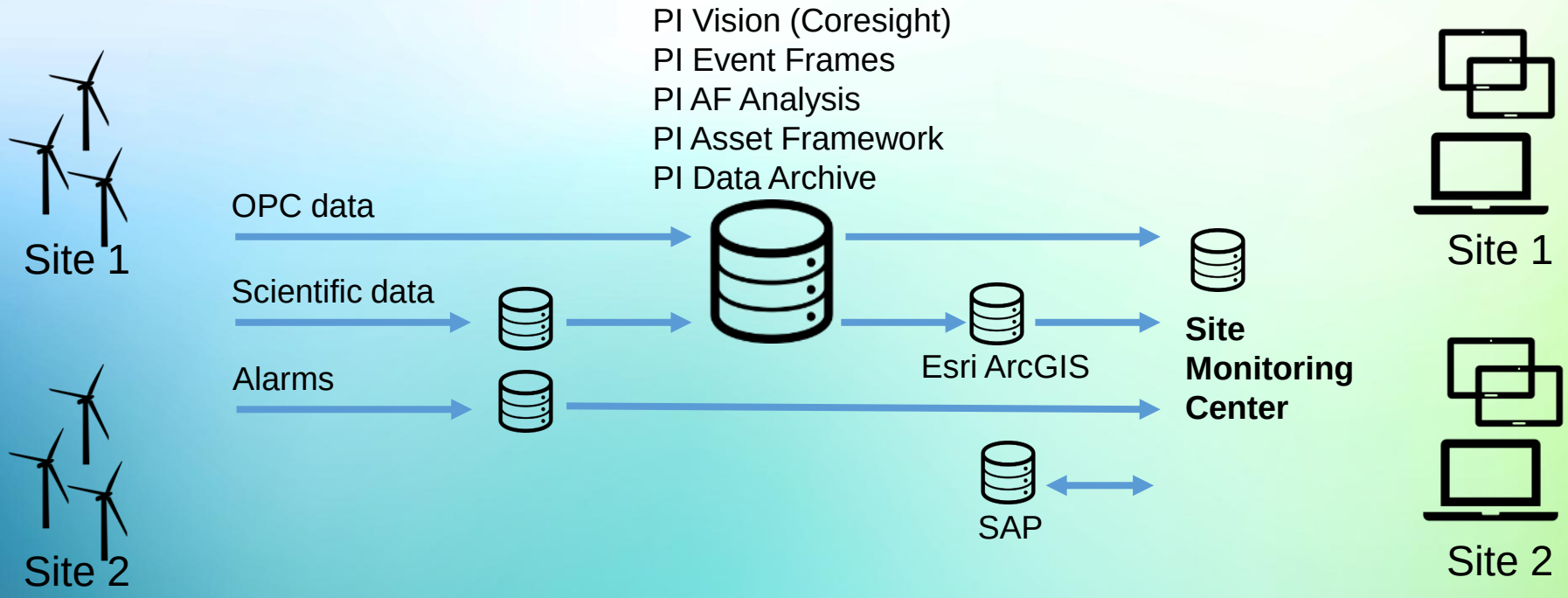
Trend view – all the best of PI at your fingertips



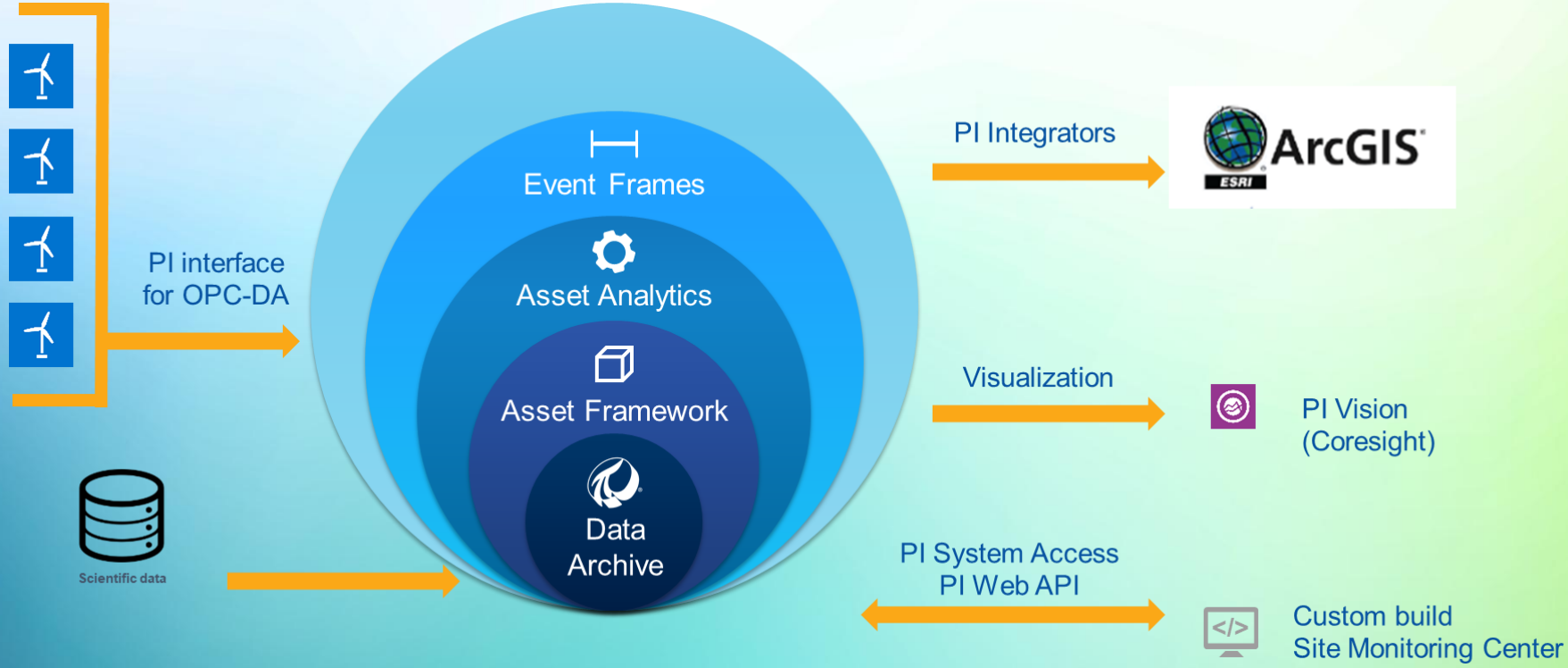
The application

- HTML5 single-page application
- Supporting the 5 most common browsers
- Can run on a 4G mobile connection
- ASP.NET and Angular hosted on web server
- Bootstrap used for layout, Kendo UI for tables
- Service oriented architecture relying on web services providing information from several underlying sources
- Runs inside the Ørsted domain and provides single sign-on
- Windows authentication providing specific user groups specific rights

The architecture



PI system components involved



Use of PI Asset framework

- Turbine signals are monitored using AF
- AF Analysis is evaluating if monitored AF Attributes are exceeding specified limits
- AF Event Frames generated when limits are exceeded
- AF Event Frames are closed, when AF Attribute values falls under specified limits
- SMC is highlighting turbines with open AF Event Frames

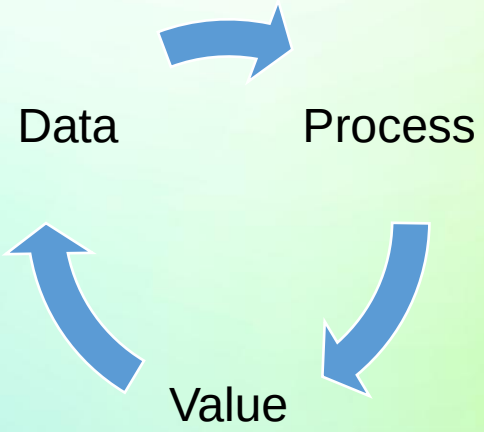
Benefits

- Tangible
  - Prevent downtime (Contractual Yield)
  - Improve security (LTIF)
  - Reduce maintenance cost (CoE contribution)
- Intangible
  - Productivity improvements
  - Asset lifecycle management
  - Predictability
  - Happy colleagues ☺

The team behind

Working cross competences as one team

Subject Matter Experts	**Data Scientists**	**Software Engineers**
Ideas, insight Use cases	Algorithms Analyses	Process support Implementation
Asset & process expertise	MATLAB, Python, R	Applications Data backbone



Outlook

- Competing regimes
  - Optimized production versus asset lifecycle cost
    - e.g. yaw optimization results in more vibrations when position against wind is imperfect
  - Central-decentral operation
- Mixed reality/AR
- 3D scans

Ørsted

Windfarm Site Operation with OSIsoft AF

CHALLENGE

Operating critical infrastructures without optimal decision support

- Site managers working their way through several applications and excel sheets to plan work on a wind turbine

SOLUTION

Strong OSIsoft Data Backbone seamlessly integrated to SAP PM and Esri ArcGIS

- High quality, near real-time information on sites, where operation is executed
- Available on any device

RESULTS

Operational Excellence

- Prioritizing the most important tasks to reduce downtime and asset lifecycle cost
- Reducing cost by combining predictive and urgent maintenance

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Questions?

Please wait for the **microphone**

State your **name & company**

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