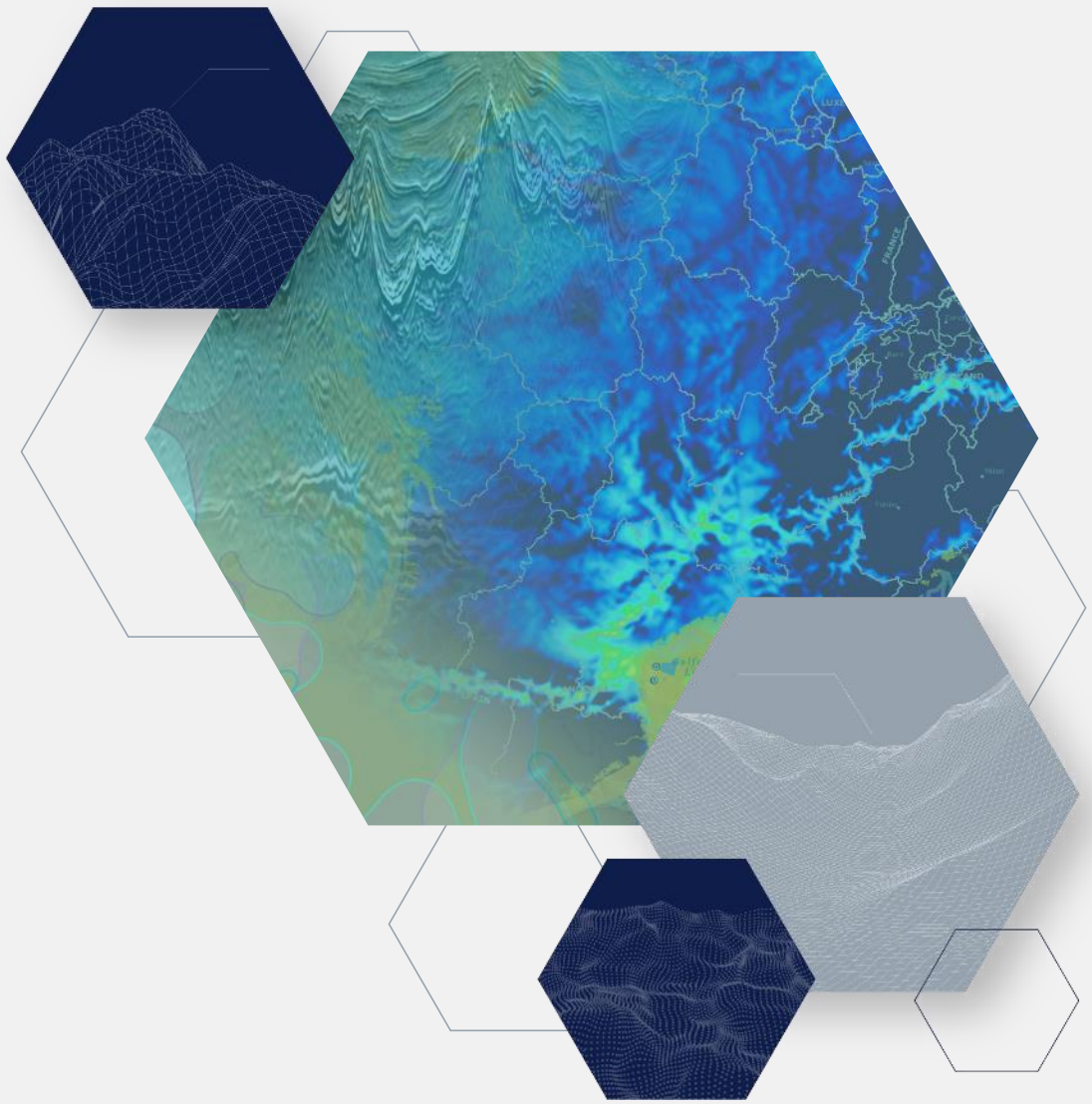


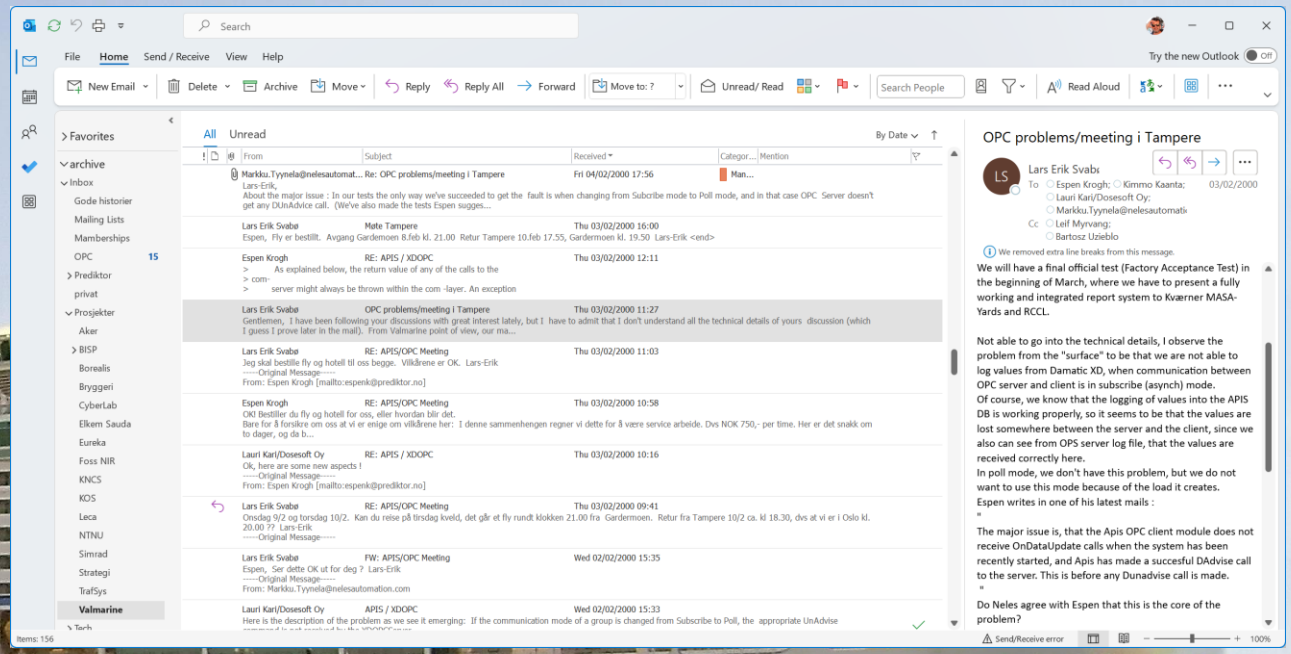
# OPC UA for Energy

OPC Day Finland 2023

**Espen Krogh,**

**Senior Technical Advisor, TGS**

# Voyager of the Seas, built at Masa Yards(Meyer Turku) in 1999

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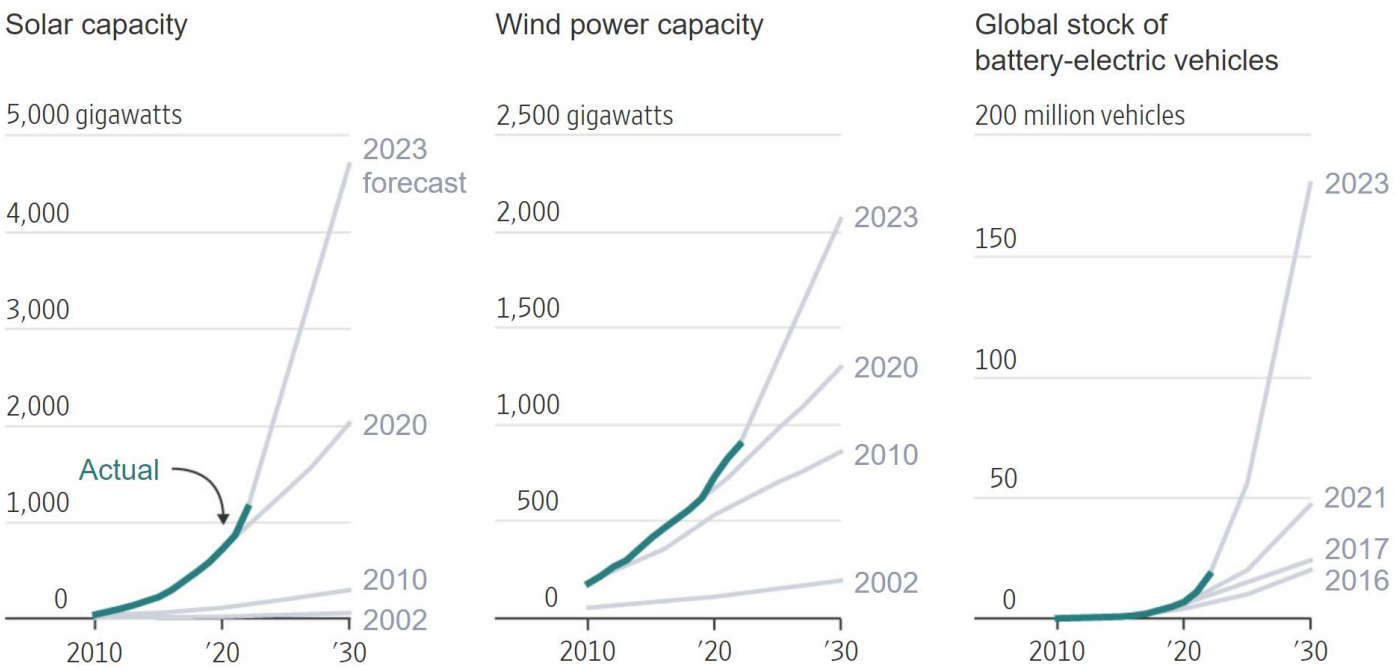
# **Good news 1:**
# Growth of key renewable technologies has outpaced forecasts




Sources: Boston Consulting Group; projections from International Energy Agency (stated policies scenarios); historical data from International Renewable Energy Agency (wind, solar) and IEA (BEVs, 2022 solar figure)



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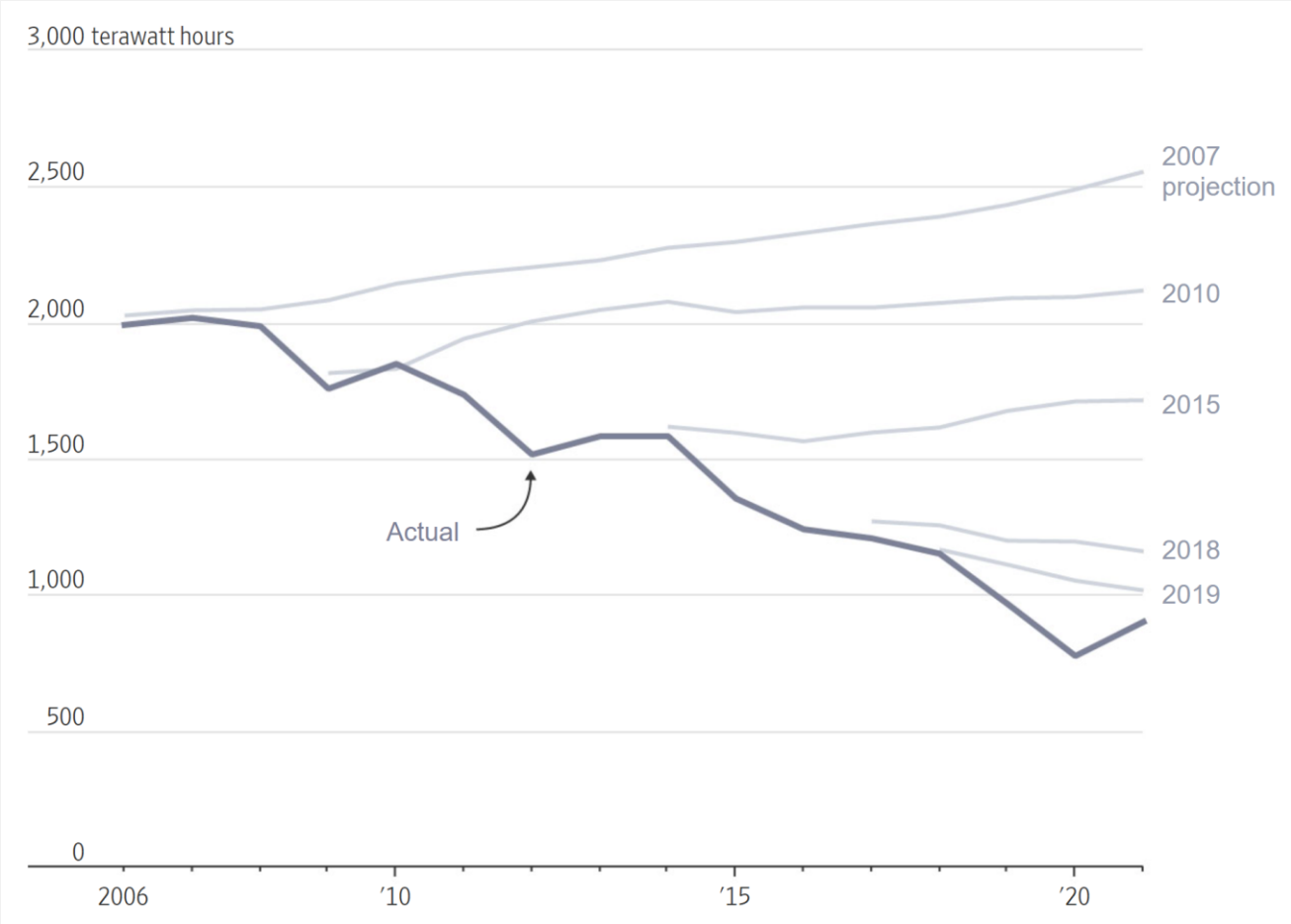
# Projections for U.S. coal generation compared with reality



# Good news 2:

BBC Home News Sport Earth Reel Worklife Travel

NEWS

Home | Israel-Gaza war | War in Ukraine | Climate | Video | World | UK | Business | Tech | More

Science

England | Regions | Humberside

## Largest offshore wind farm celebrates power milestone

10 October


The first of 277 turbines is up and running at Dogger Bank wind farm

**The world's largest offshore wind farm has started producing electricity for the first time.**

Power from the first turbine at the Dogger Bank project, which is construction in the North Sea, is now being sent to the UK's national grid.

In total 277 turbines will be powered-up at the location, situated between 81 and 124 miles (130-200km) off the Yorkshire coast.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We are building an enormous amount of industrial scale energy plants the next few years

900 Offshore wind projects

(1000 GW)

1800 Onshore wind projects

(500 GW)

Installed capacity 2023

8 GW

60 GW

80 GW

2 GW

3000 Solar PV projects

(900 GW)

900 Energy storage projects

(300 GW)

*All are named future projects*

*November 23 in the EIC DB*

EIC DataStream

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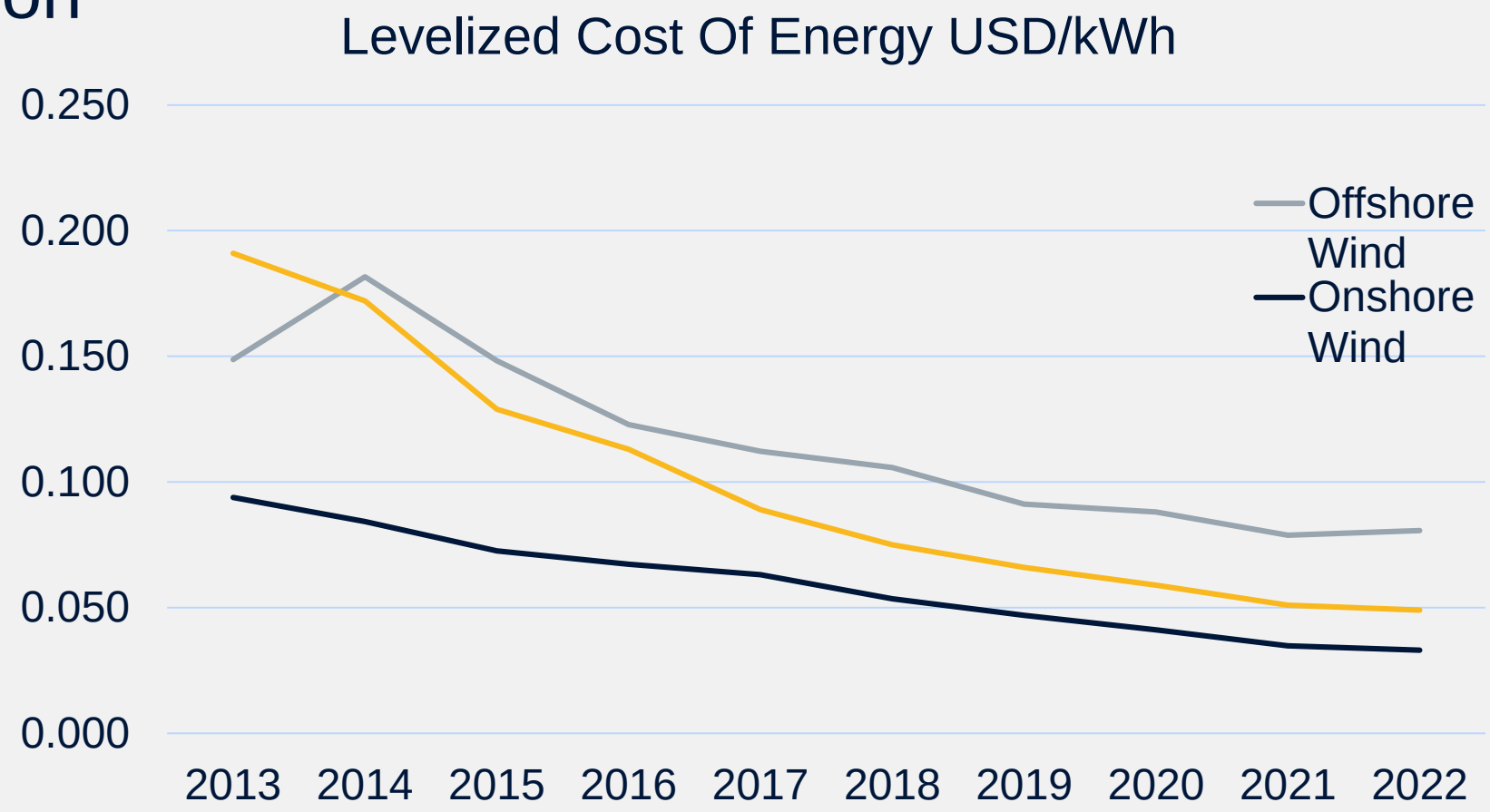
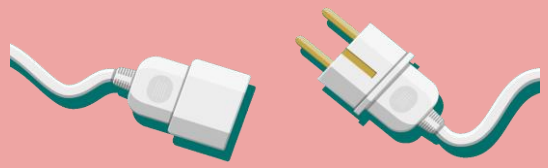
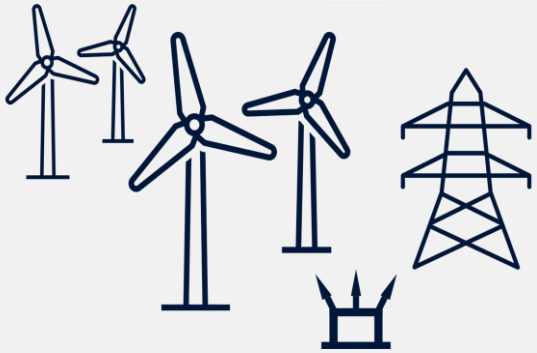
# There is a continuous race to cut costs of renewable energy production



# To be able to stay profitable with fierce competition, energy operators must become masters of data driven operations



**This is difficult!**
Mutual understanding of semantics is needed.



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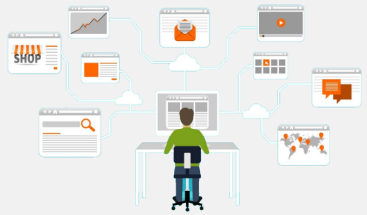
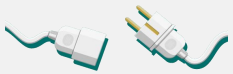
# The concepts involved and needed



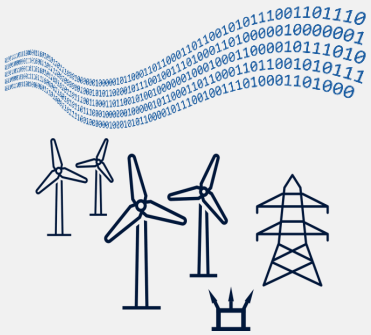

## Smart Apps

- That understand the industry defined **types** and selected protocol or API
- Plug & Play - no engineering needed to get data into the apps



## Open protocols / APIs

- Need protocols that also can host **information models** and their **types**
- Must be: **Cybersecure, robust**



## Standardized context

- For plant data across all assets
- Map to **typed objects** organized in a set of well defined **information models**

## New and existing investments in assets and

- Numerous critical plant systems
- From a wide range of suppliers, over many years
- With little / unplanned / coincidental context  and **untyped** meta data



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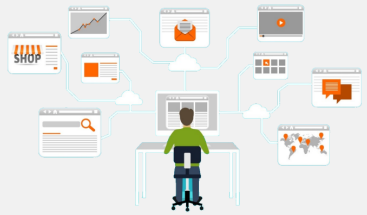
# Wind power plants example



## Smart Apps

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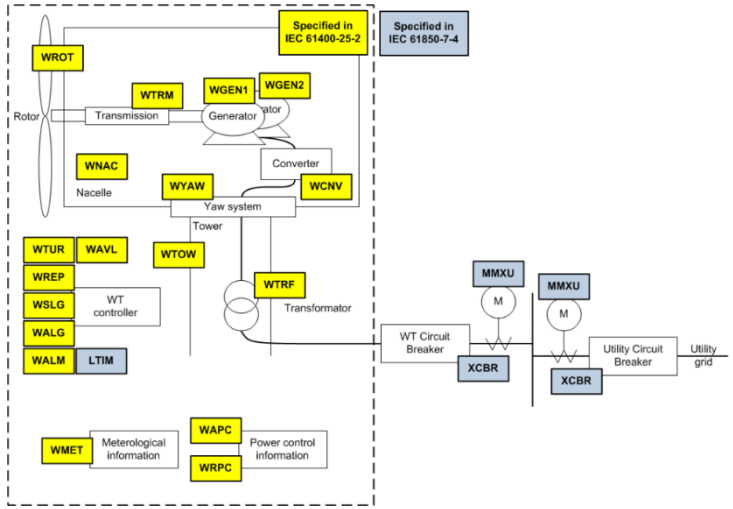
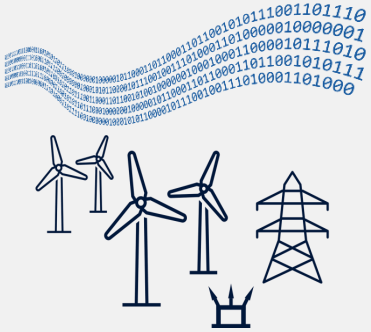
- With little / unplanned / coincidental context and **untyped** meta data

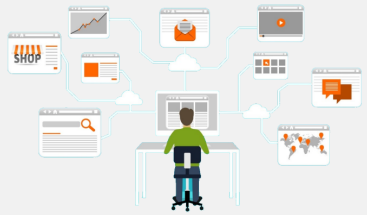
Provides standardized definitions and semantics for monitoring and control of wind power plants, and protocols for field and plant level communication.



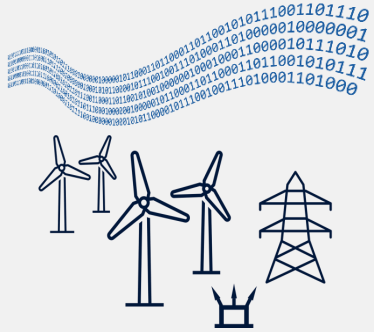




# Wind power plants example







Cross-platform, open-source, IEC62541 standard for data exchange from sensors to cloud applications developed by the OPC Foundation

- Can host any semantic model
- Various protocols for field, OT/IT or cloud communication
- Cybersecure
- Robust
- Across industries, the most supported open data exchange standard on the planet
  - ➢ 5,200 suppliers
  - ➢ 42,000 different OPC products
  - ➢ more than 52 million applications

**New and existing investments in assets and**

- Numerous critical plant systems
- From a wide range of suppliers, over many years
- With little / unplanned / coincidental context and **untyped** meta data



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# The missing pieces – together they form a **companion specification**



## Open protocols / APIs

- Need protocols that also can host **information models** and their **types**
- Must be: **Cybersecure, robust, real-time capable, cloud friendly**

## Standardized context

- For plant data across all assets
- Map to **typed objects** organized in a set of well defined **information models**



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# The energy sector -

- Represents **the world's biggest interconnected industrial systems,** each with thousands of energy generators, transmission systems, distribution systems and energy consumers operating in complex networks together in real-time.
- Is undergoing **a dramatic extension and transformation globally** with enormous private and governmental investments to avoid a climate catastrophe.
- Must undergo **a complete digital transformation** of all energy systems in parallel to secure viable investments and transformation

# Good news 3:

OPC Foundation understand it’s role in the digital transformation of the energy sector



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# OPC Foundation has in 2023 established several working groups to create domain specific companion specifications for the energy sector

## Wind Power Plants

espen.Krogh@tgs.com
bertram.lange@bachmann.info

## Hydro Power Plants

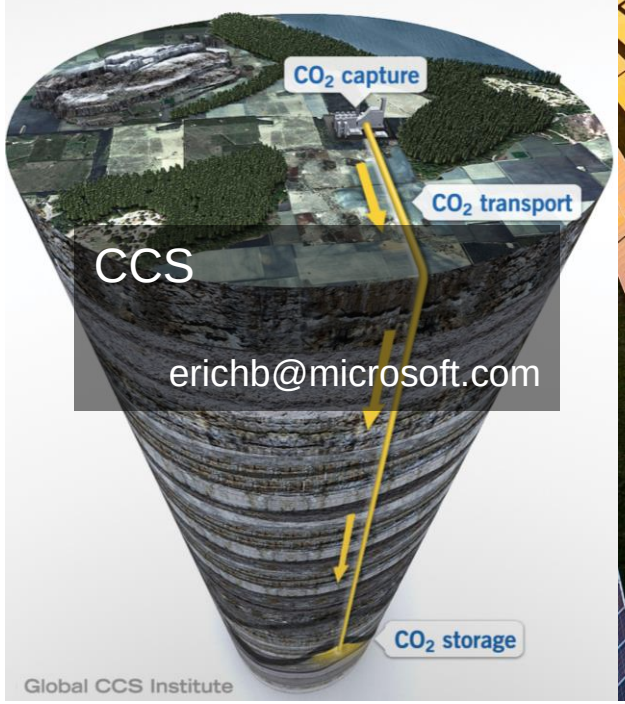
*Pending*
(espen.Krogh@tgs.com)

## Oil & Gas

*Pending*
(espen.Krogh@tgs.com)

## Energy Harmonization

chrism@c-labs.com
espen.Krogh@tgs.com




## CCS

erichb@microsoft.com

## Solar PV

chrism@c-labs.com
espen.Krogh@tgs.com

## Power Consumption

heiko.herden@vdma.org

## Battery Energy Systems

*Pending*
(espen.Krogh@tgs.com)

# OPC UA for Wind Power Plants has been formed

*OPC Foundation* and the *IEC 61400-25 User Group* has joined forces to create OPC UA Companion specification for monitoring and control of wind power plants































# OPC UA for Wind Power Plants

- The working group is creating and OPC UA semantic model by mapping definitions in IEC 61850 and IEC 61400-25 to OPC UA modelling concepts
- Earlier done work by *IEC 61400-25 User Group, Equinor* and *TGS Prediktor* has been donated to the working group
- One goal is to make a **draft release before year-end**
- A range of use cases within monitoring and control of wind power plants are targeted

- The Doggerbank project is currently being commissioned with an early version of the standard



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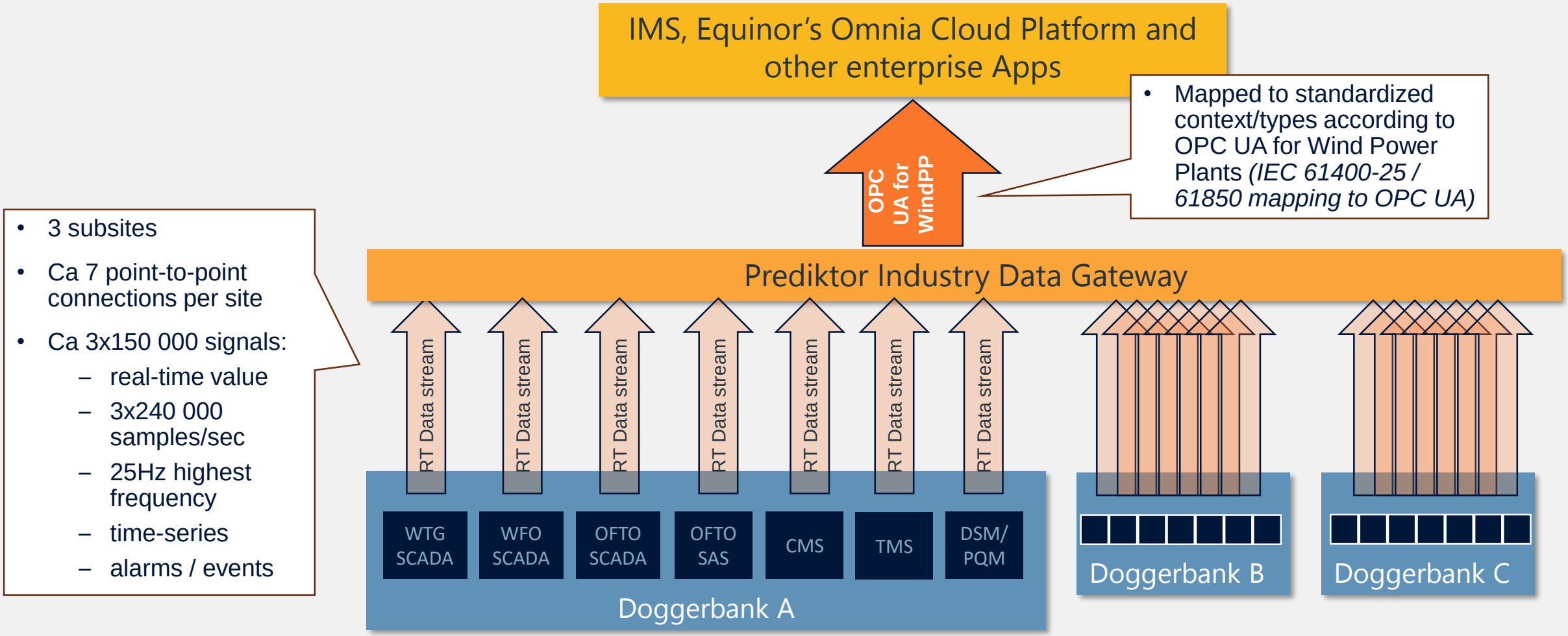
Let’s go back to Doggerbank,
and take a closer look on what happens here!

# Overall architecture in Equinor's Dogger Bank project

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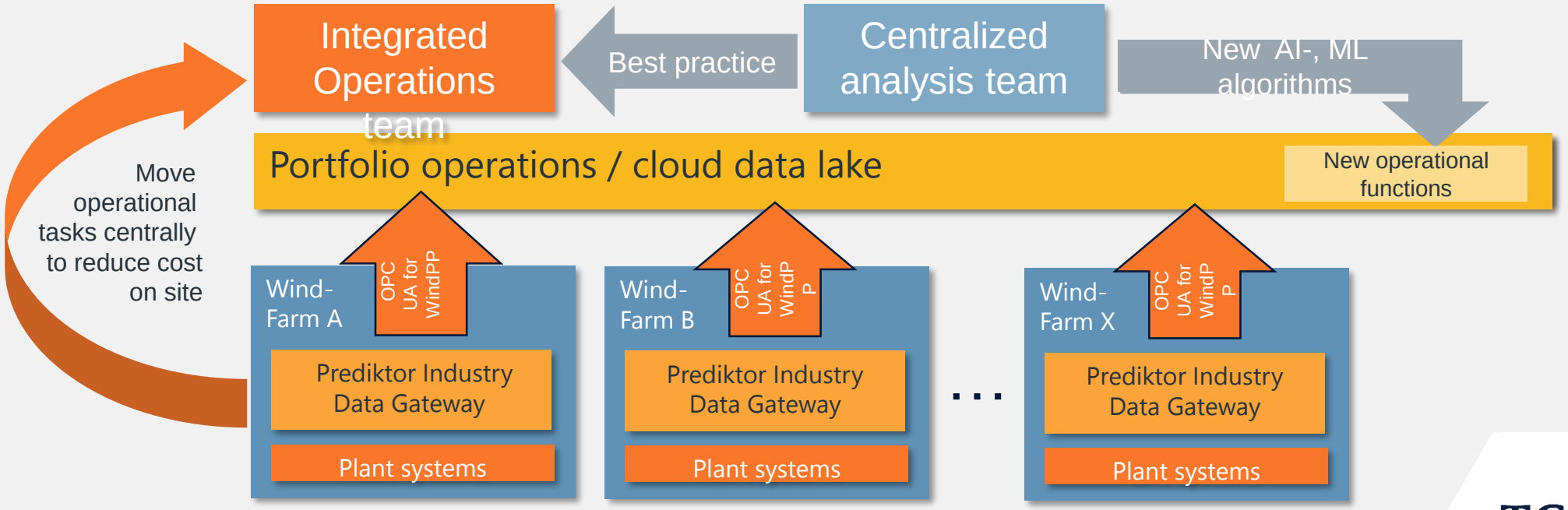
# Standards-based real-time data management solution for windfarm O&M across portfolio of plants

- All windfarm power plants have **the same digital skin across the portfolio**, independent of equipment supplier, EPC or year built
- Facilitates:
  - Highest quality and security for wind powerplant portfolio operational data
  - Efficient AI and ML on all assets without data engineering/wrangling hassles
  - Scaling of new operational functions across portfolio
  - Easy consolidation of new powerplants to the portfolio



# Thank You!

- TGS Prediktor is a provider of software solutions for:
  - Technical asset management
  - Real-time data management

- https://www.prediktor.com/

- Contact:
  - espen.krogh@tgs.com
  - +47 91 83 87 90