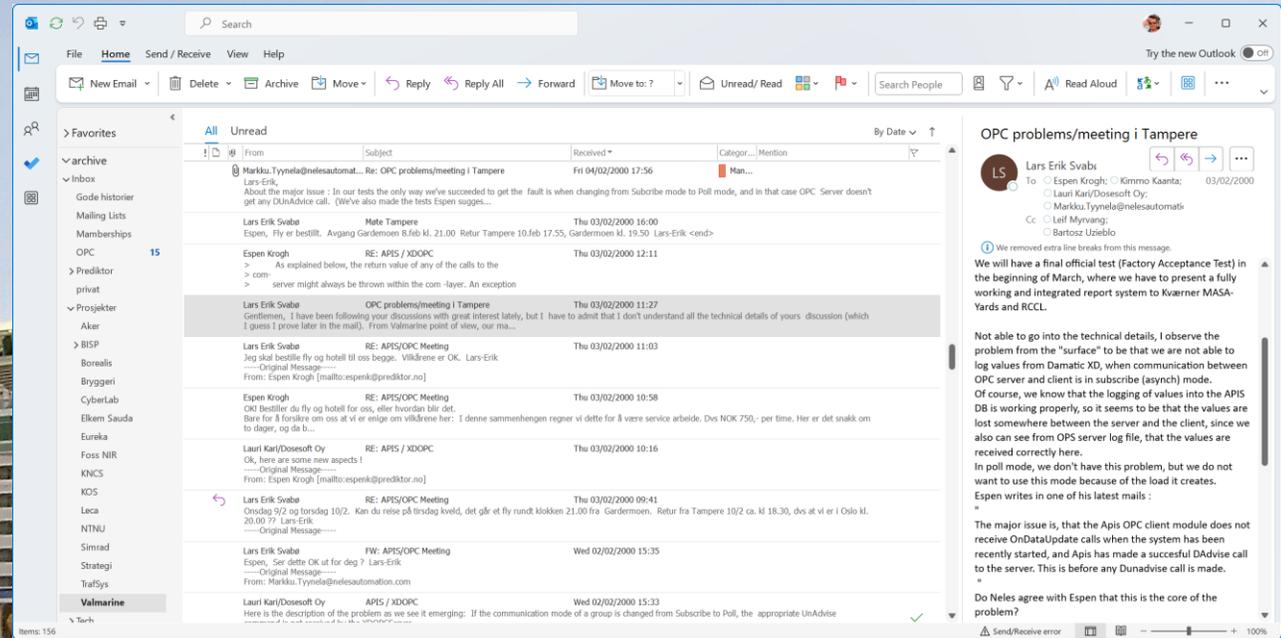


OPC UA for Energy

OPC Day Finland 2023

Espen Krogh,
Senior Technical Advisor, TGS

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



The screenshot shows an Outlook email client interface. The main window displays an email thread with the following content:

OPC problems/meeting i Tampere

Lars Erik Svabø
To: Espen Krogh; Kimmo Kaanta; Lauri Kari/Dosesoft Oy; Markku Tyymla@nelesautomat...
Cc: Leif Myrvang; Bartosz Uzieblo

We removed extra line breaks from this message.

We will have a final official test (Factory Acceptance Test) in the beginning of March, where we have to present a fully working and integrated report system to Kvaerner MASA-Yards and RCCL.

Not able to go into the technical details, I observe the problem from the "surface" to be that we are not able to log values from Damatic XD, when communication between OPC server and client is in subscribe (asynch) mode. Of course, we know that the logging of values into the APIS DB is working properly, so it seems to be that the values are lost somewhere between the server and the client, since we also can see from OPS server log file, that the values are received correctly here.

In poll mode, we don't have this problem, but we do not want to use this mode because of the load it creates. Espen writes in one of his latest mails:

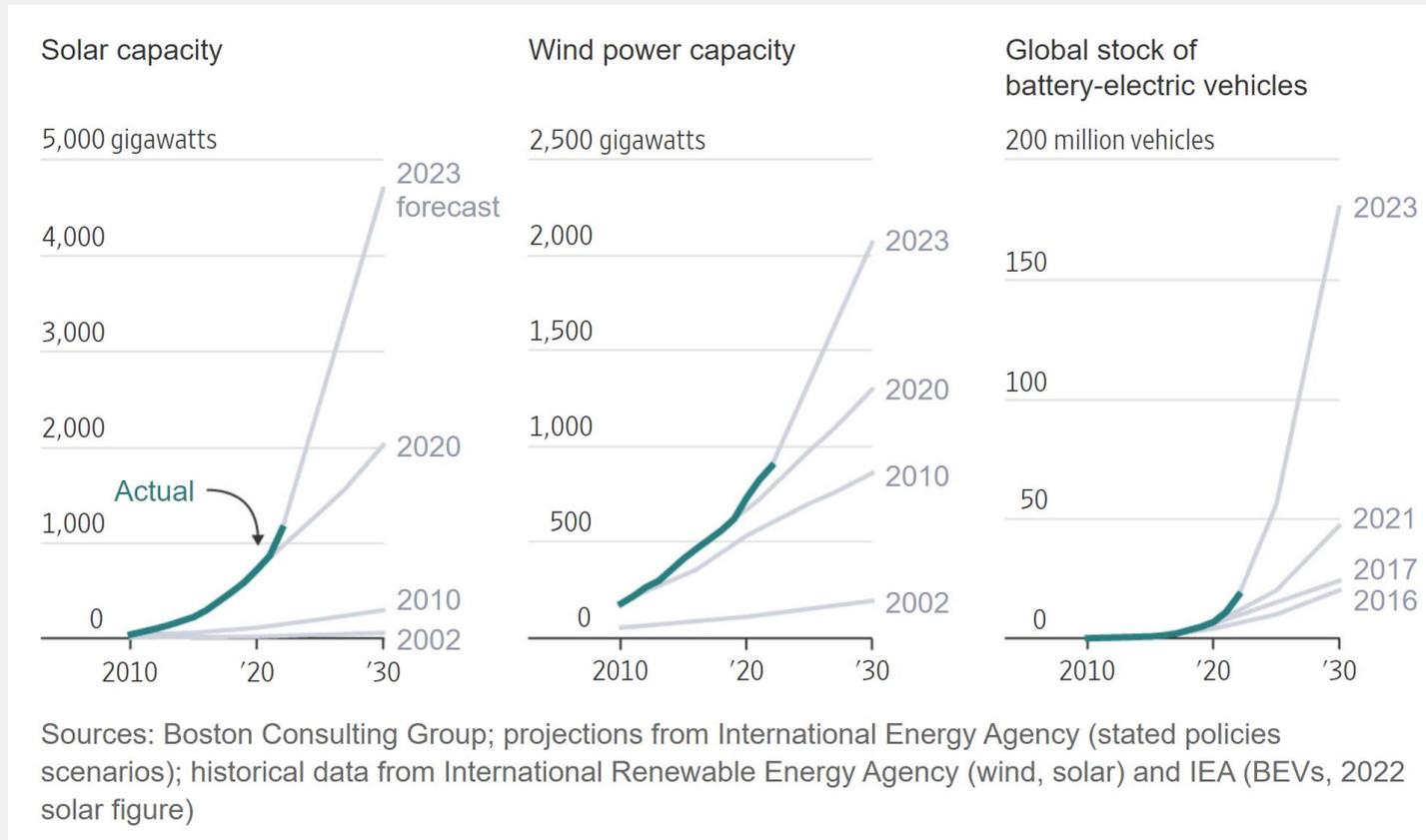
The major issue is, that the Apis OPC client module does not receive onDataChange calls when the system has been recently started, and Apis has made a successful DAdvise call to the server. This is before any Dunadvice call is made.

Do Neles agree with Espen that this is the core of the problem?

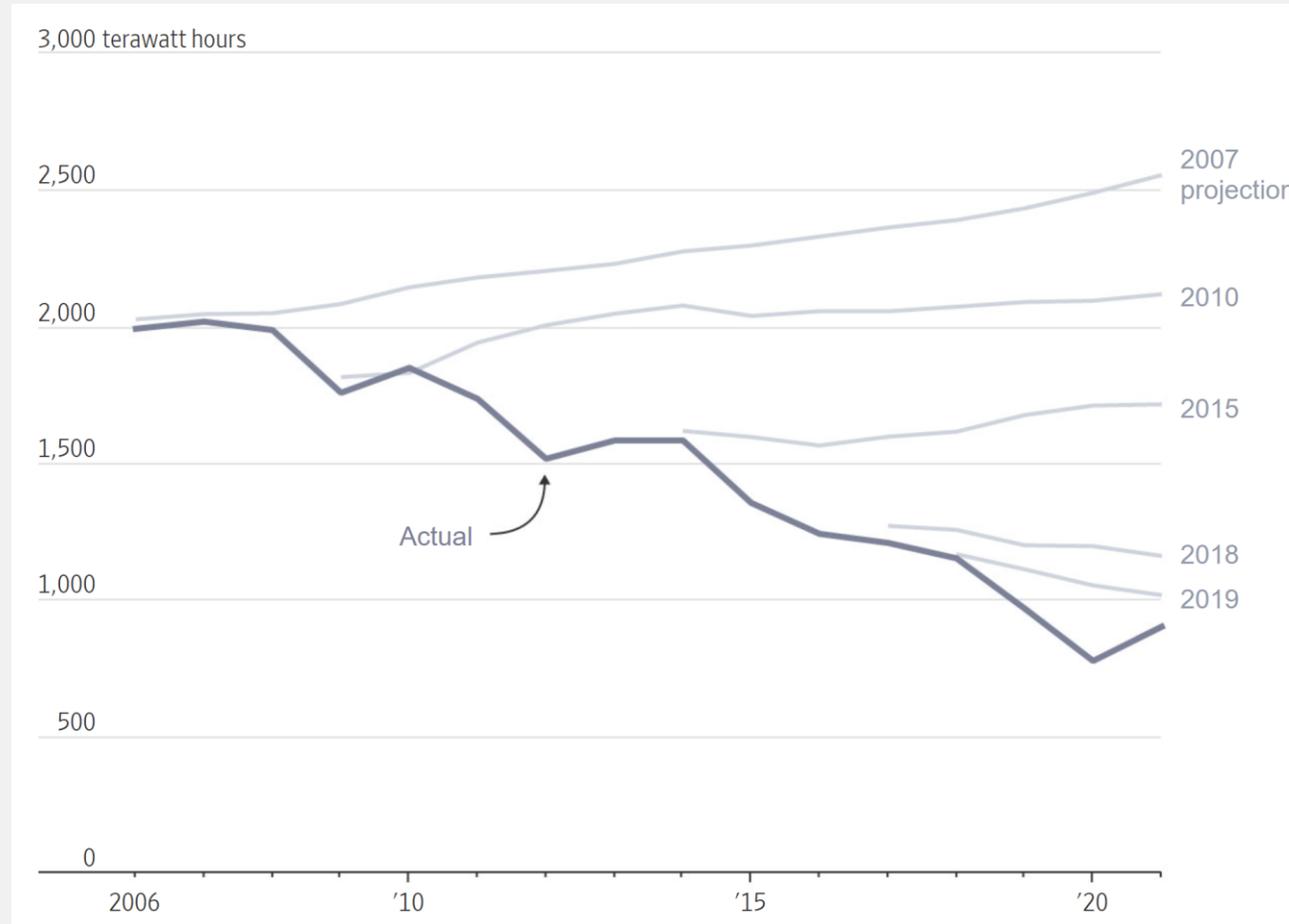
Items: 156

From	Subject	Received	Categor...	Mentions
Markku Tyymla@nelesautomat...	Re: OPC problems/meeting i Tampere	Fri 04/02/2000 17:56		Man...
Lars Erik Svabø	Re: OPC problems/meeting i Tampere	Fri 04/02/2000 17:56		
Lars Erik Svabø	Møte Tampere	Thu 03/02/2000 16:00		
Espen Krogh	RE: APIS / XDOPC	Thu 03/02/2000 12:11		
Lars Erik Svabø	OPC problems/meeting i Tampere	Thu 03/02/2000 11:27		
Lars Erik Svabø	RE: APIS/OPC Meeting	Thu 03/02/2000 11:03		
Espen Krogh	RE: APIS/OPC Meeting	Thu 03/02/2000 10:58		
Lauri Kari/Dosesoft Oy	RE: APIS / XDOPC	Thu 03/02/2000 10:16		
Lars Erik Svabø	RE: APIS/OPC Meeting	Thu 03/02/2000 09:41		
Lars Erik Svabø	FW: APIS/OPC Meeting	Wed 02/02/2000 15:35		
Lauri Kari/Dosesoft Oy	APIS / XDOPC	Wed 02/02/2000 15:33		

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



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



SSE RENEWABLES

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.



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)

3000 Solar PV projects
(900 GW)

900 Energy storage projects
(300 GW)

Installed capacity 2023

8 GW

60 GW

80 GW

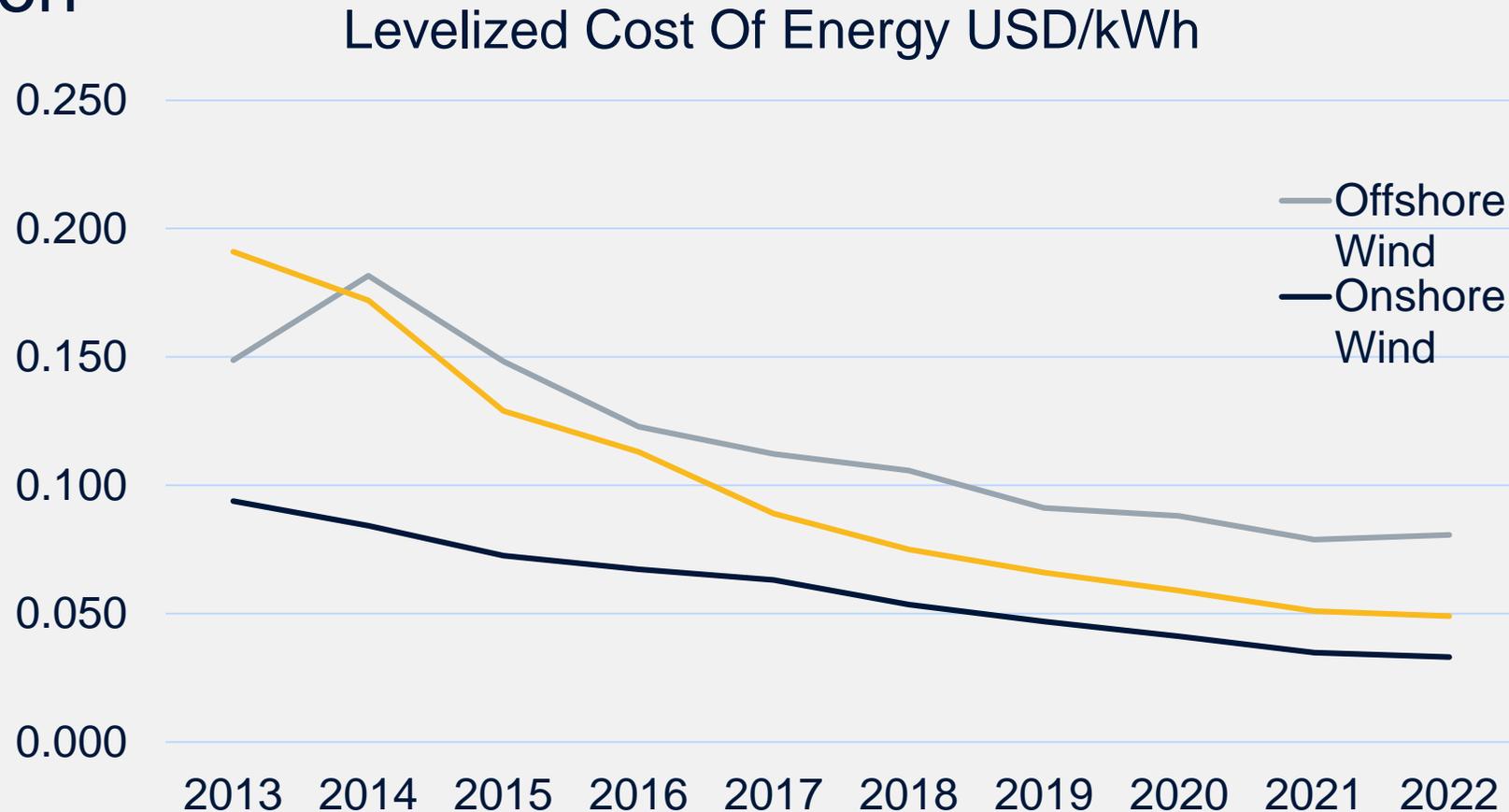
2 GW



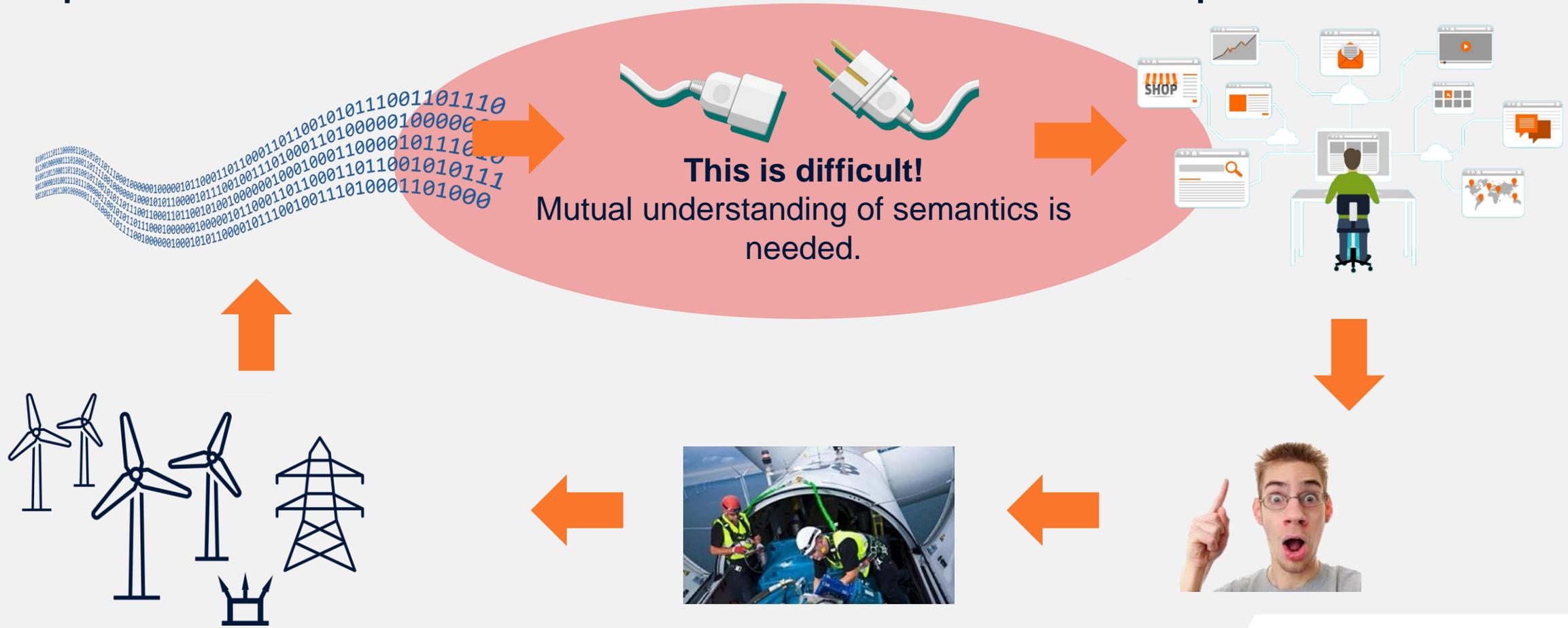
All are named future projects
November 23 in the EIC DB



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



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

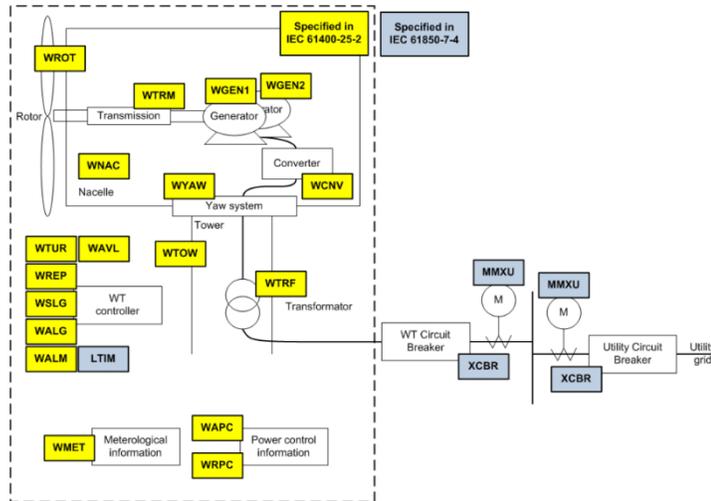
Wind power plants example



Smart Apps

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

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



Ne

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

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

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**

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



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 an 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

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

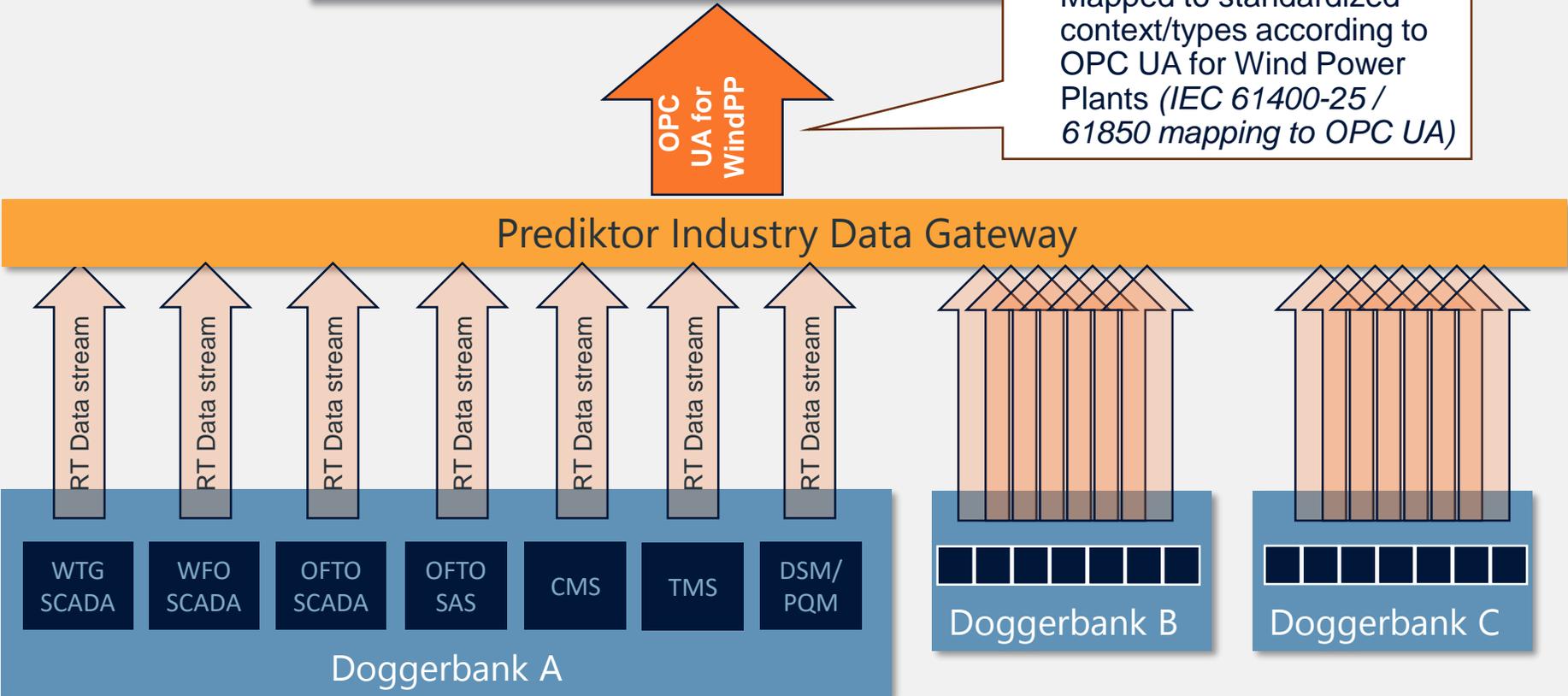


Overall architecture in Equinor's Dogger Bank project

IMS, Equinor's Omnia Cloud Platform and other enterprise Apps

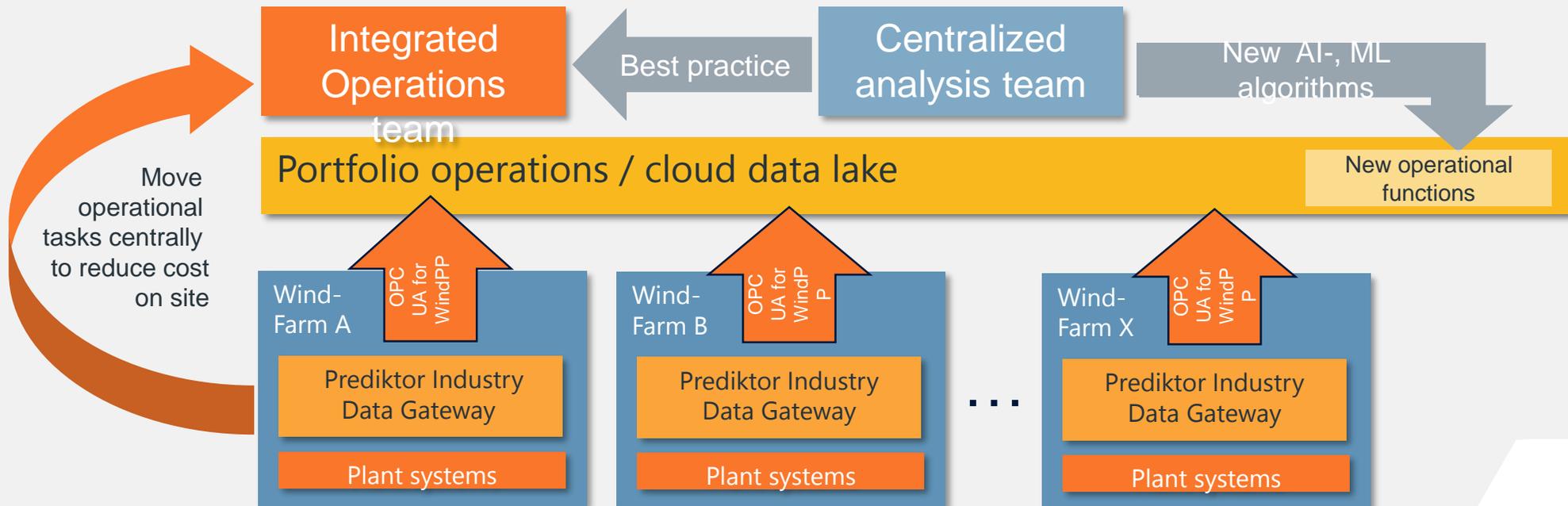
• Mapped to standardized context/types according to OPC UA for Wind Power Plants (IEC 61400-25 / 61850 mapping to OPC UA)

- 3 subsites
- Ca 7 point-to-point connections per site
- Ca 3x150 000 signals:
 - real-time value
 - 3x240 000 samples/sec
 - 25Hz highest frequency
 - time-series
 - alarms / events



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:
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 - +47 91 83 87 90

