



One thing is for sure...

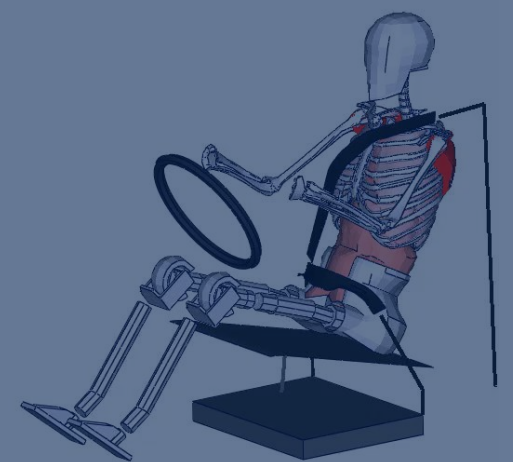
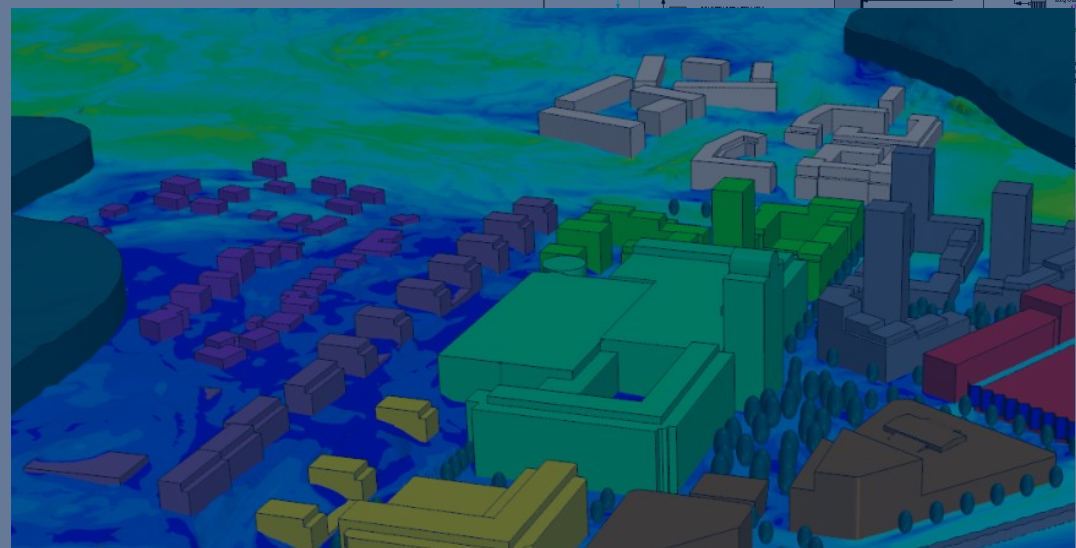
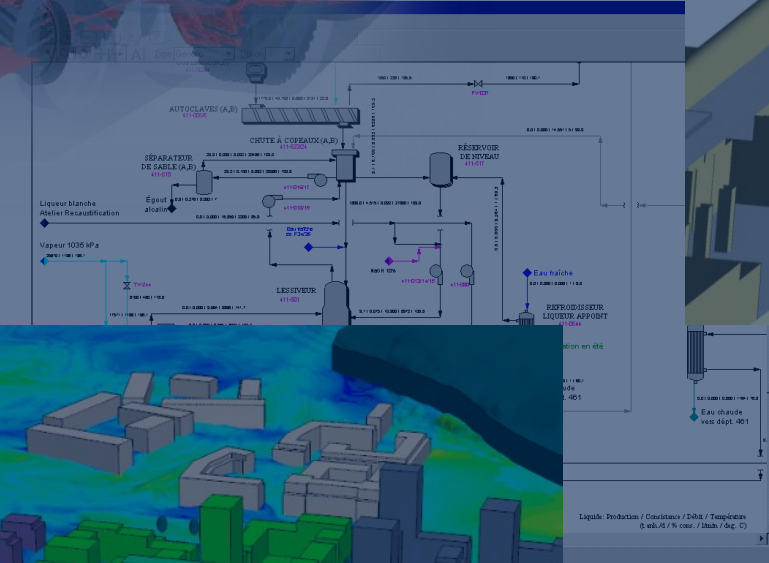
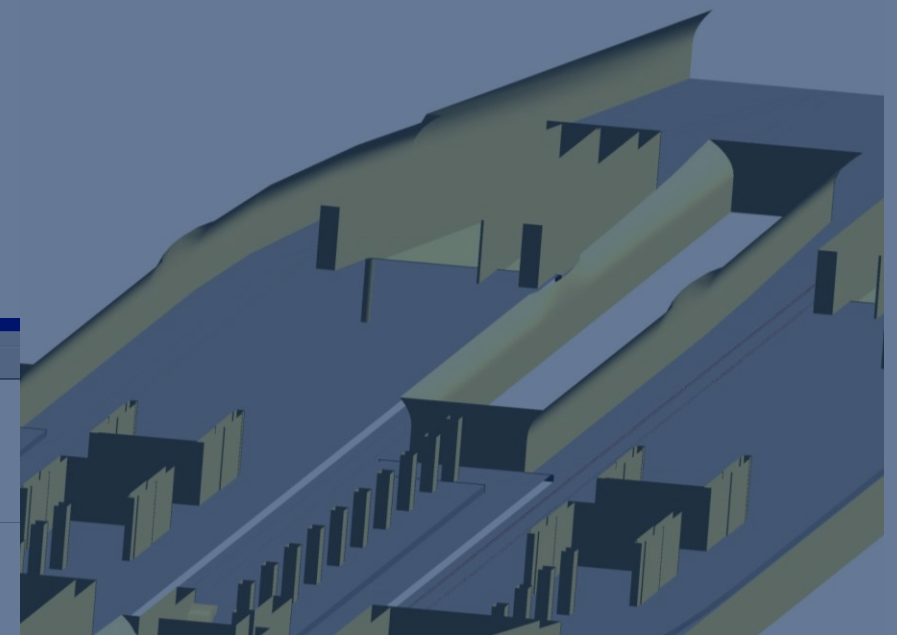
“few things are used in the way they are designed”

Increased Business Value with Digital Twins

**The Energiforsk Annual Nuclear Conference 2018
2018-01-24**

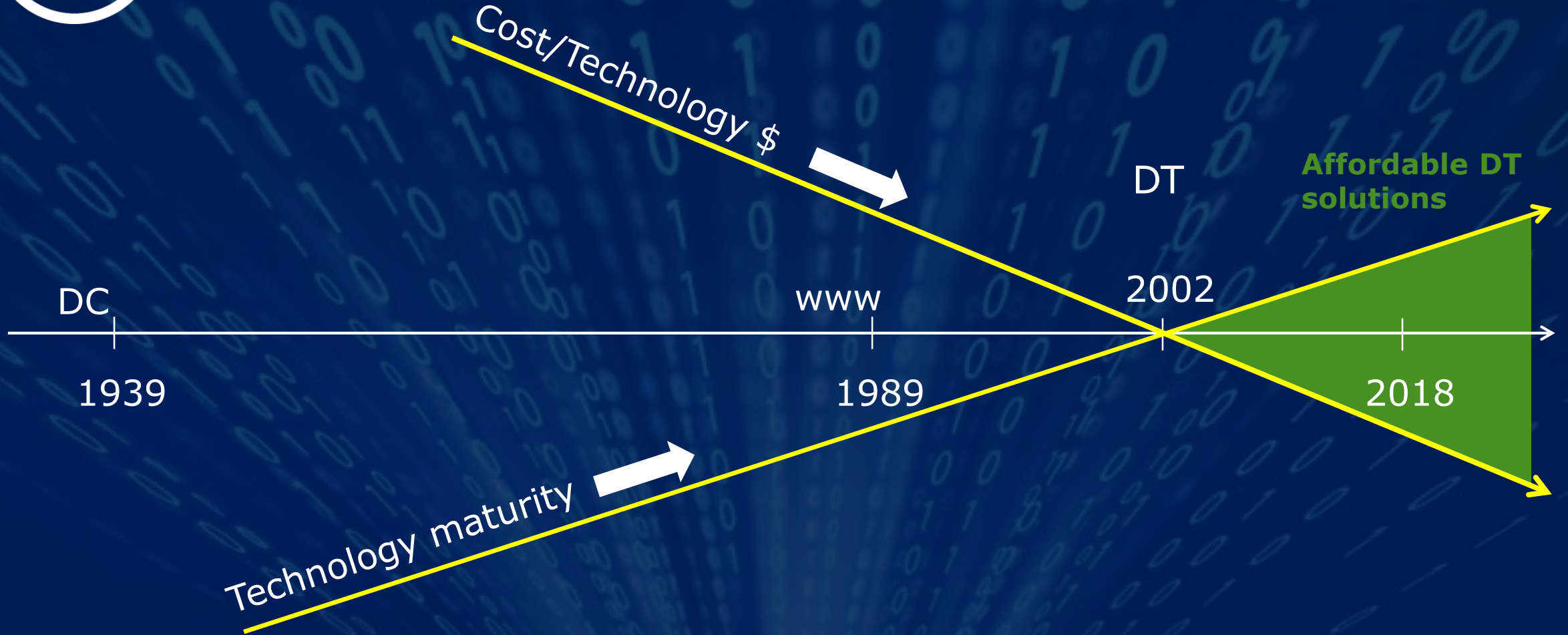
Hans Bjarnehed, ÅF
Jakob Dotevall, Vattenfall, Ringhals







The History and Future of Digital Twins

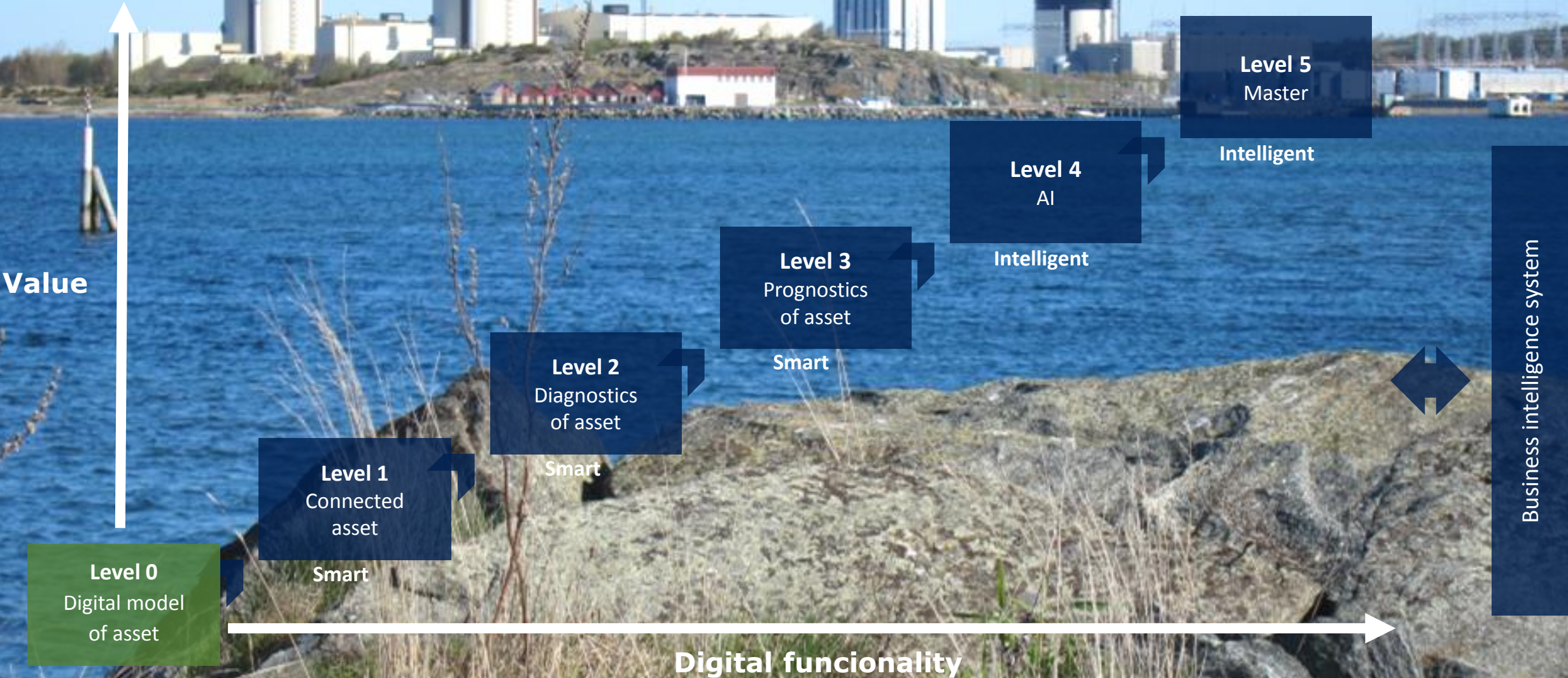




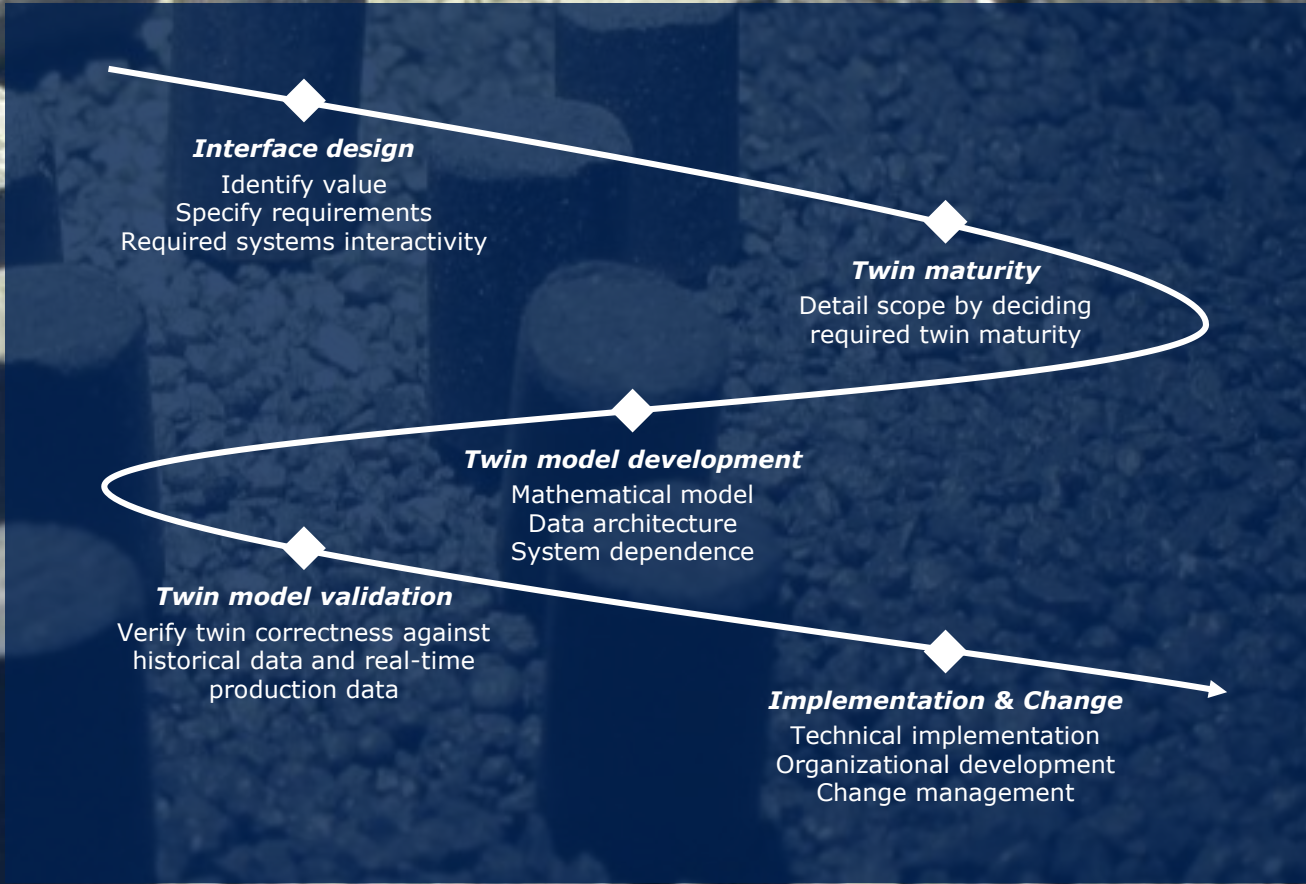
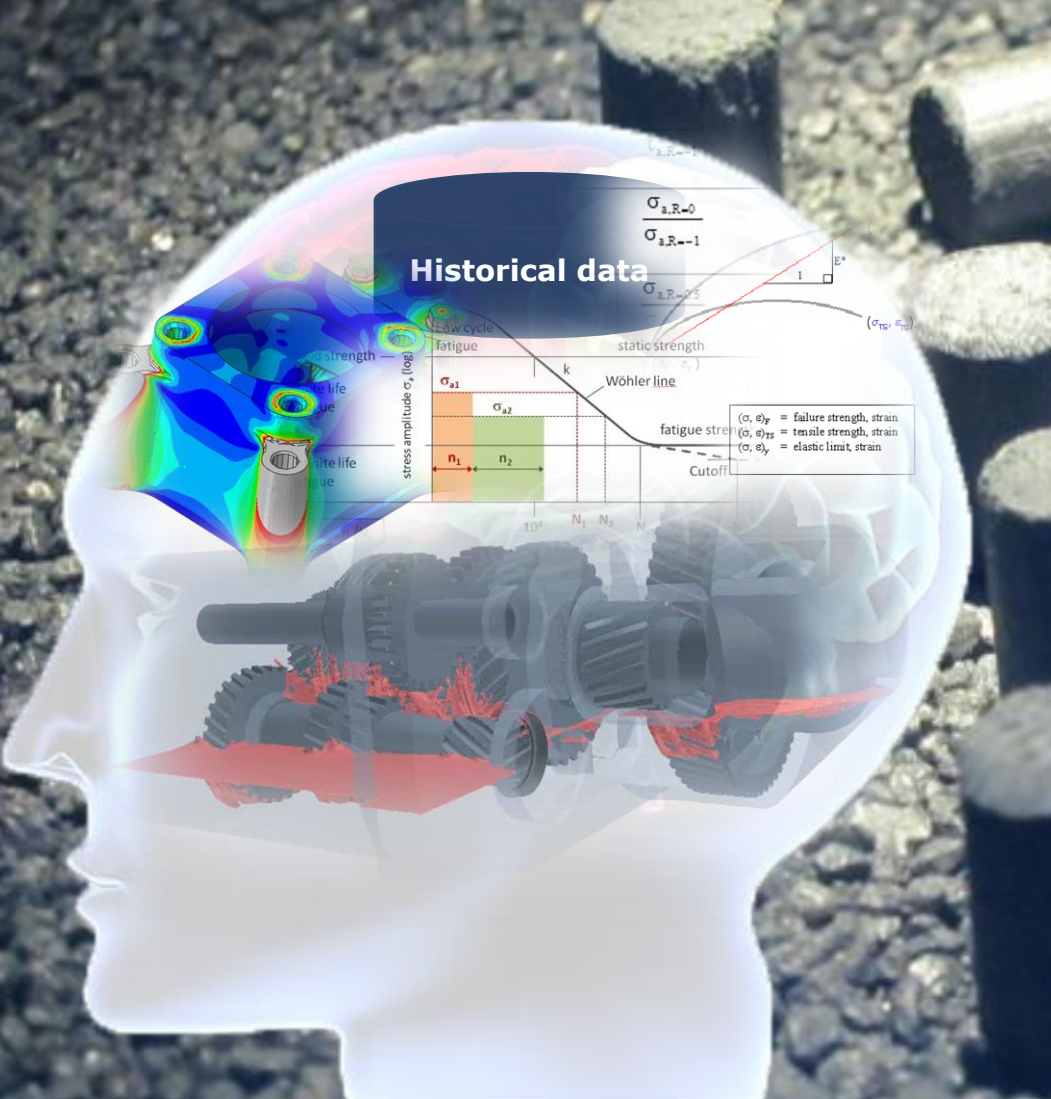
Business values

- Overview of current status
- Predictive Maintenance
- Predictive Investments
- Optimal operation

The Digital Twin Levels



The ÅF Digital Twin Creation Process





One other thing is for sure...

“the winner will be the one who master the data”

A DIGITAL TWIN AT RINGHALS NPP

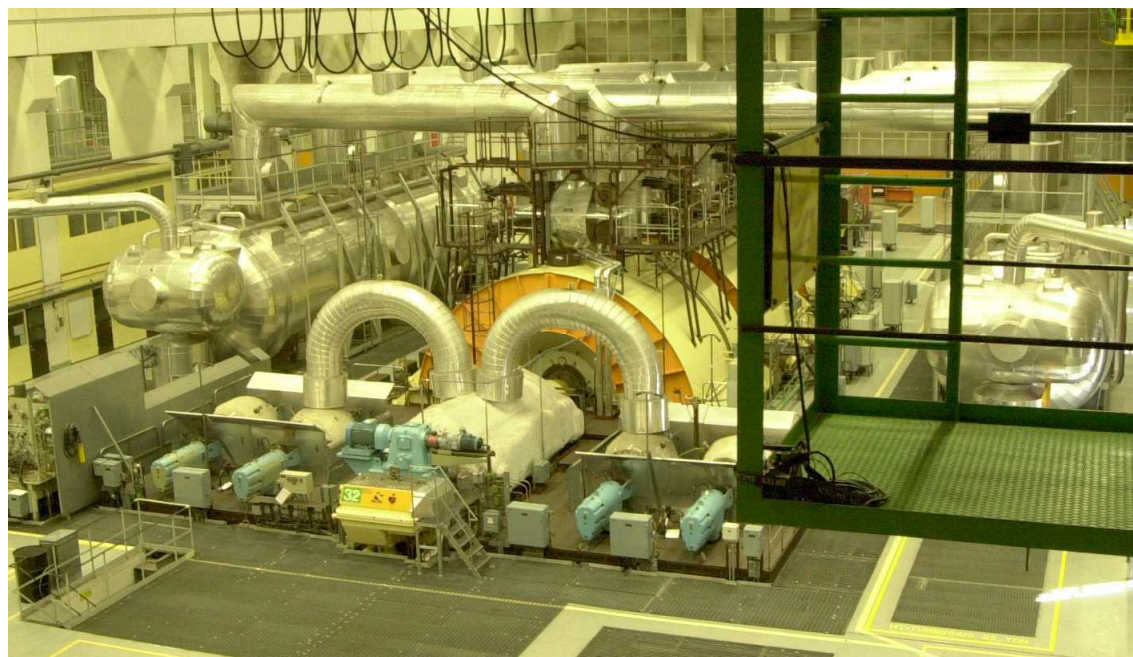
Energiforsk Annual Nuclear Conference 2018

2018-01-24, Jakob Dotevall

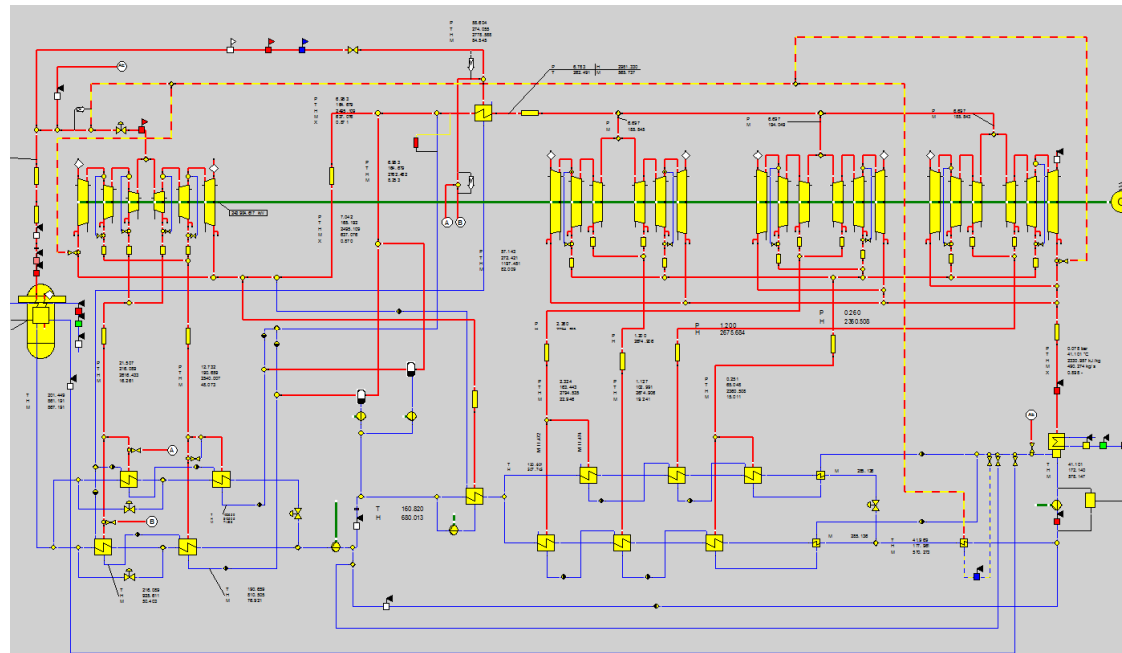
DIGITAL TWINS AT RINGHALS?



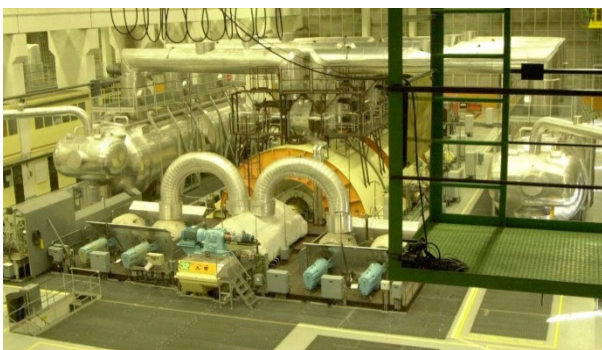
TURBINE PLANT AT RINGHALS UNIT 3



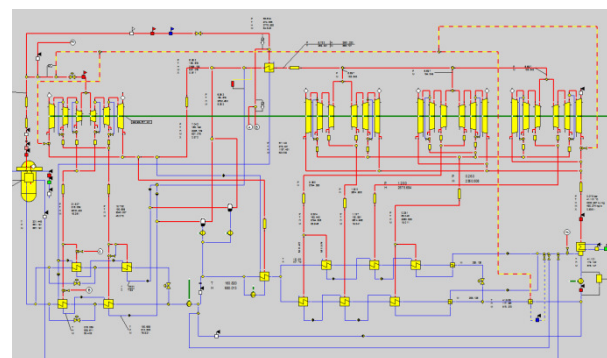
SIMULATION MODEL



WHY A DIGITAL TWIN?



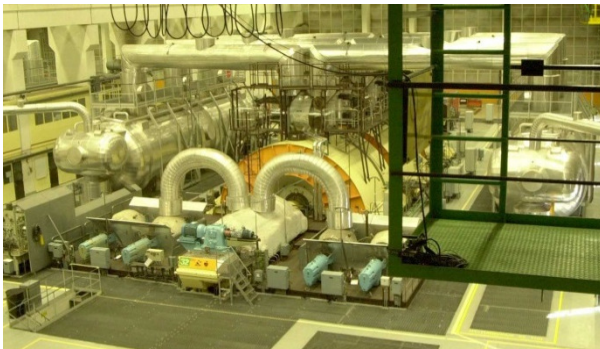
Input from measurements



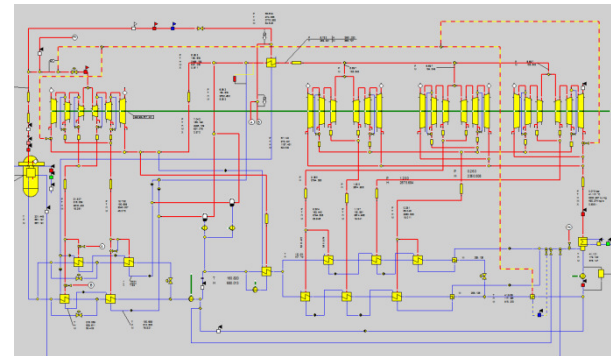
Theoretical power output

LEVEL 1

WHY A DIGITAL TWIN?



Measured power output

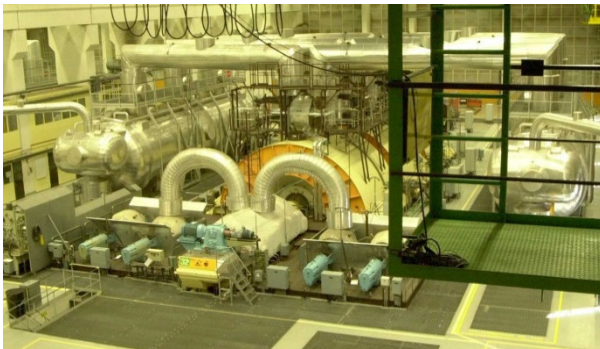


Theoretical power output

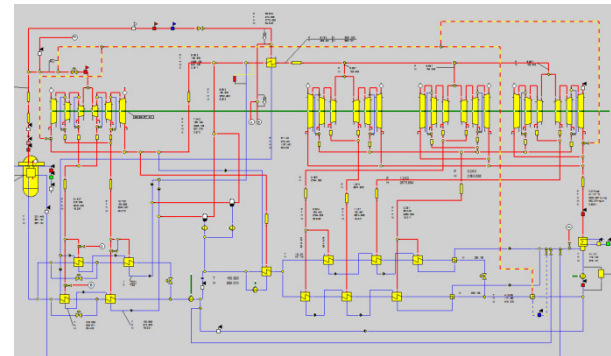
Diagnosing turbine state

LEVEL 2

WHY A DIGITAL TWIN?



Measured power output



Theoretical power output

Diagnosing turbine state

Forecasting

LEVEL 3

OPINIONS

What value do you see with the digital twin of the turbine plant?

"At several times the models have been very useful for detecting faults in the plants in an early phase. The early detection of faults means that it is easier to plan and perform necessary repairs."

Lars Ewald,
specialist turbine analysis

"We see the model as a tool to achieve the best possible efficiency for the turbine plants."

The turbine operators use the model daily to trend the efficiency and to counter any reductions."

Magnus Kruse,
turbine operation

"In my role as operation manager I can track the performance of the plant and react to changes in the process to prevent any production losses."

"In short, we have benefited greatly from the model."

Olafur Olafsson,
operation management



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