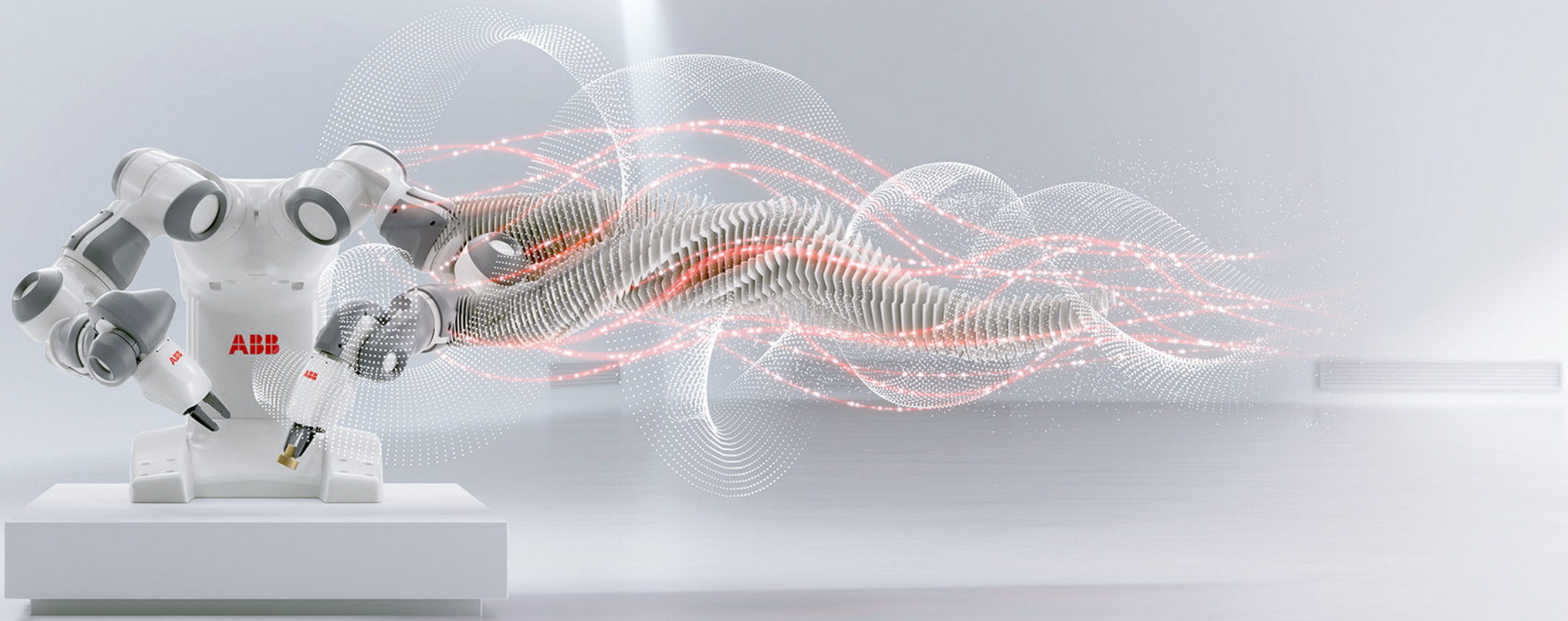


ABB OY SIMO SÄYNEVIRTA 2019-11-07

Digital Factory of the Future

Ecosystem way of Designing, Building and Operating

ABB: pioneering technology leader in digital industries

2nd industrial revolution

(19th century)

+ Electrification

+ Motion

3rd industrial revolution

(20th century)

+ Industrial Automation

+ Robotics

4th industrial revolution

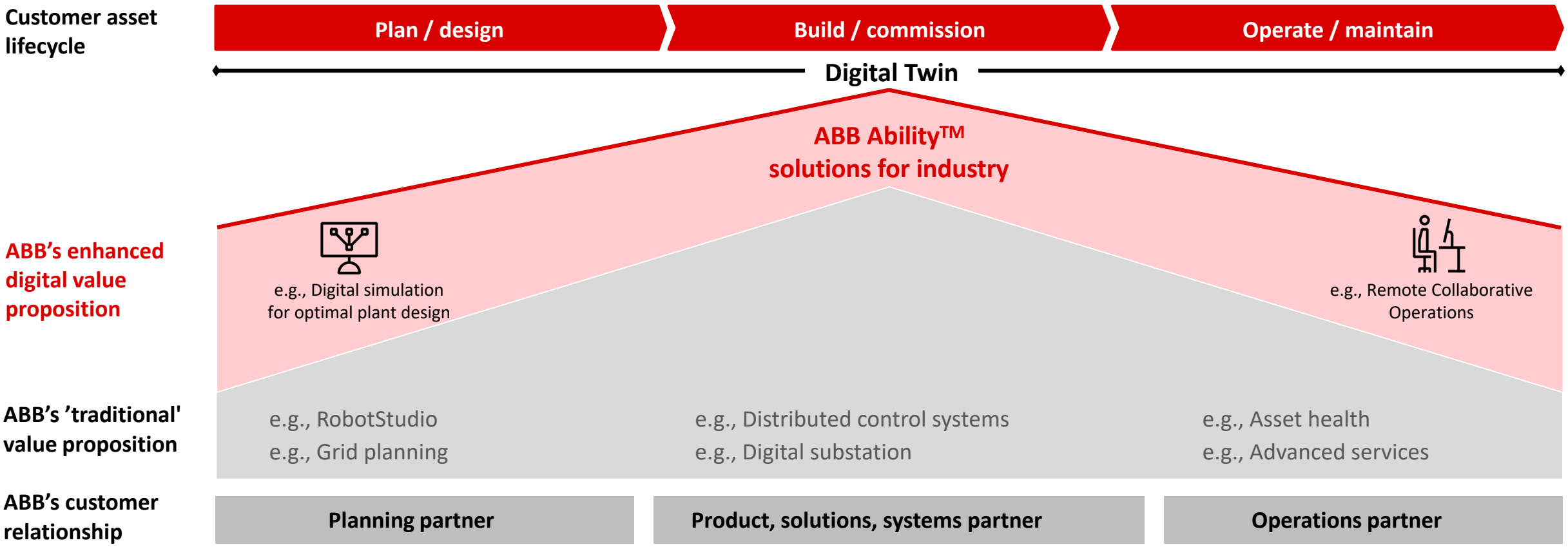
(21st century)

+ Digitalization

+ ABB Ability™

Digital technologies key to address complete asset lifecycle

Increasing customer value along the entire lifecycle with ABB Ability™



Electrification and Digitalization keys to address sustainability challenges

Need to manage and optimize increasingly dynamic, connected world

Energy systems

Renewable electrification

Smart distribution

Industry

Industry 4.0

Collaborative, Flexible Manufacturing

Real-time energy optimization

Transport & infrastructure

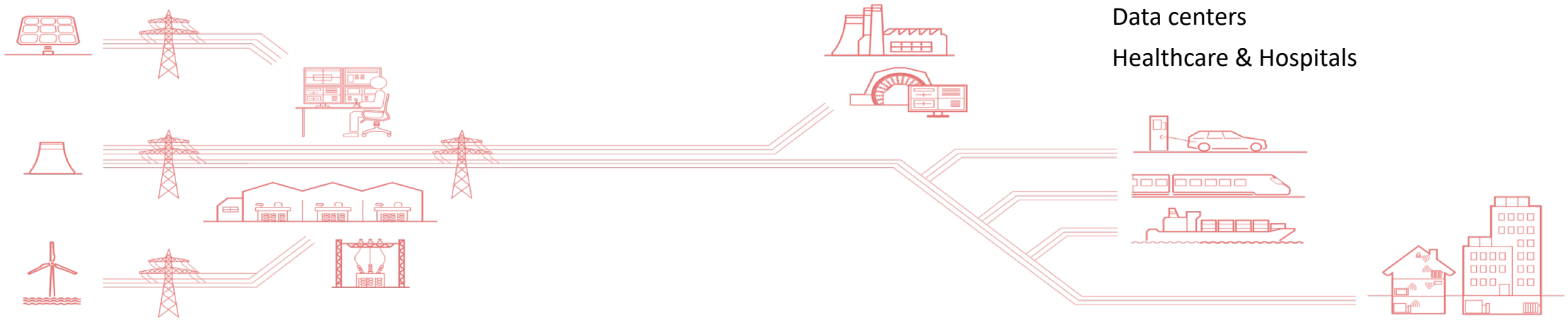
Smart Cities

E-Mobility

Mobility-as-a-Service

Data centers

Healthcare & Hospitals



Electric energy and digitalization are the common denominators

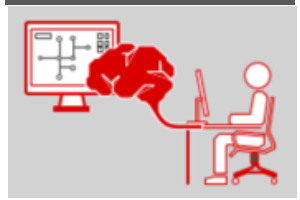
Why traditional way of working is not good enough?

Total system design rigid and inefficient due to system silos and stacking of the safety margins

Process design / System design

Process

Engineering



System design:
Selection of main concepts, process equipment , overall control principles etc.

Sub system Design / component selection / dimensioning

Sub system 1

Component selection


Supplier a


Supplier b


Supplier c

Manufacturing components / Building the system

Sub system 2

Sub system n#

Detailed design
Design of subsystems
Selection of components

Running the systems

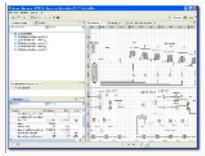
Poor efficiency

New way: Collaborative design-build-operate ecosystem

Digital twins enable simulation for optimal system and component design

Simultaneous optimization of process, electrical and automation systems

Process

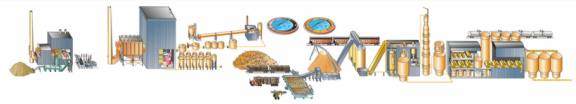


Pumping system

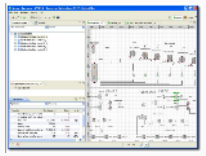
Drivetrain

Set-based modular design

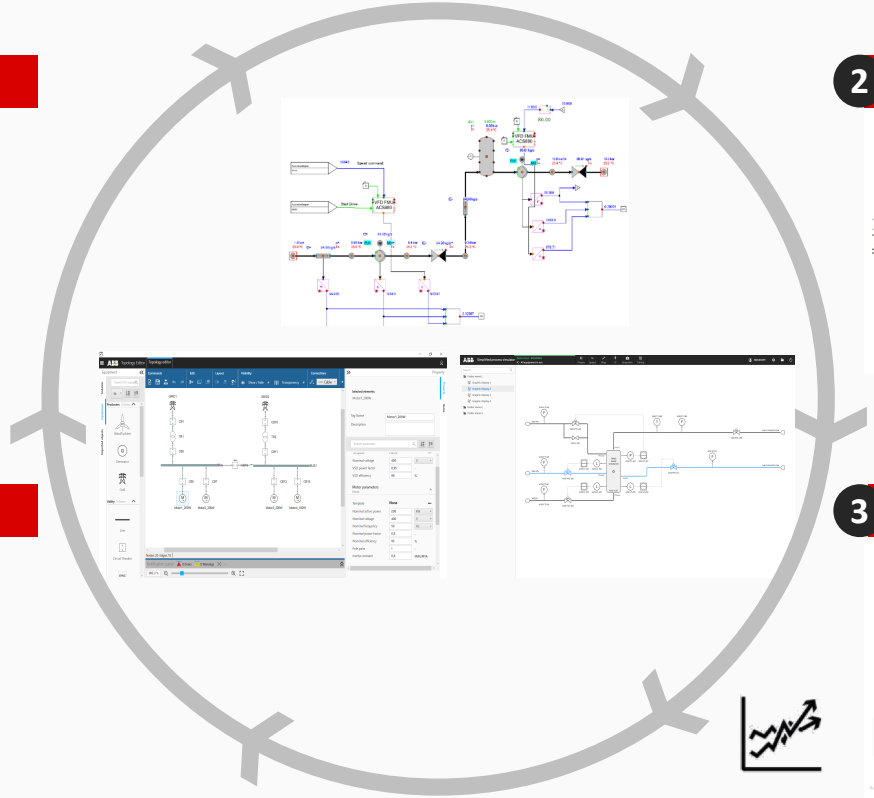
1 Process modelling



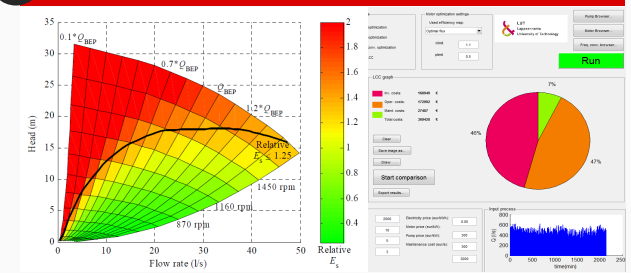
Process



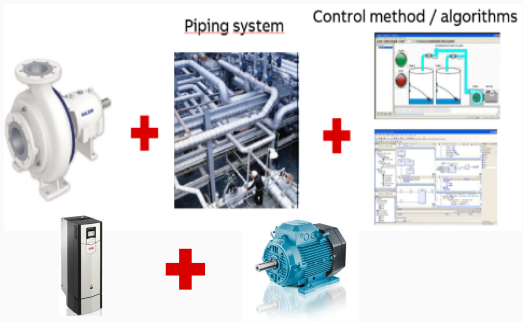
Engineering



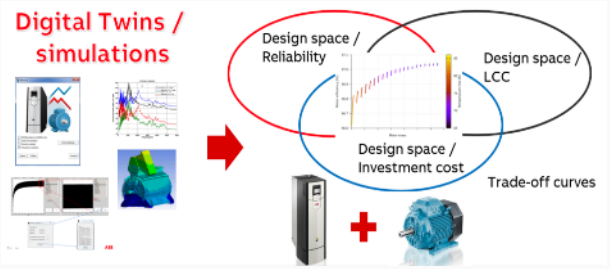
2 Scenarios and analysis



4 Equipment selection



3 Simulations

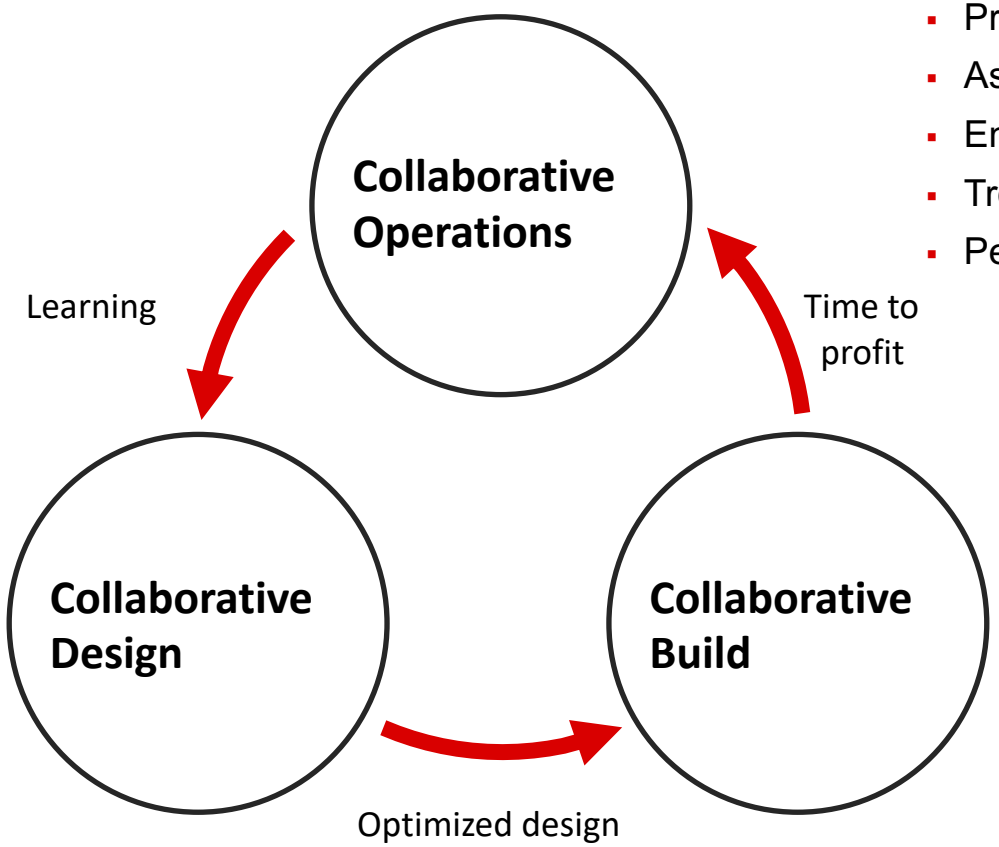


Optimization against criteria

New way: Collaborative Design-Build-Operate ecosystem

Optimization throughout the lifecycle

- Process and yield optimization
- Asset Management
- Energy Management
- Troubleshooting
- Performance and knowledge support

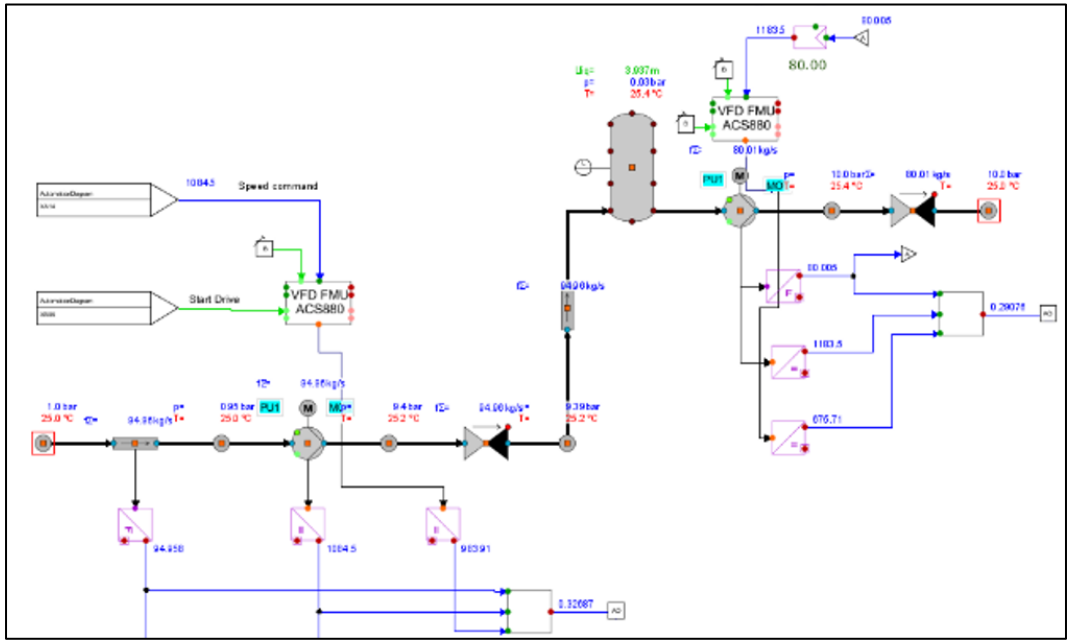


- Overall optimization
- Functional integration
- Project management
- Supply management
- Change management

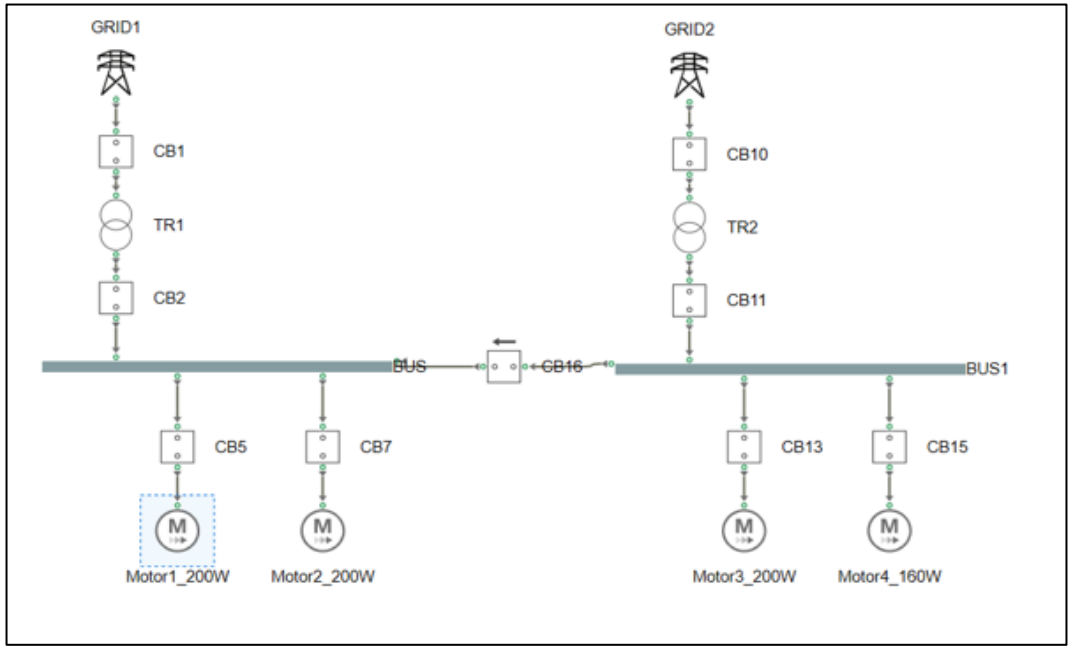
- Site management
- Supply logistics
- Equipment installation
- Commissioning and Start-up
- Accelerated ramp-up

Example of simplified Process => 2 scenarios – cases simulated => Optimal Es

Process simulation



Power system simulation

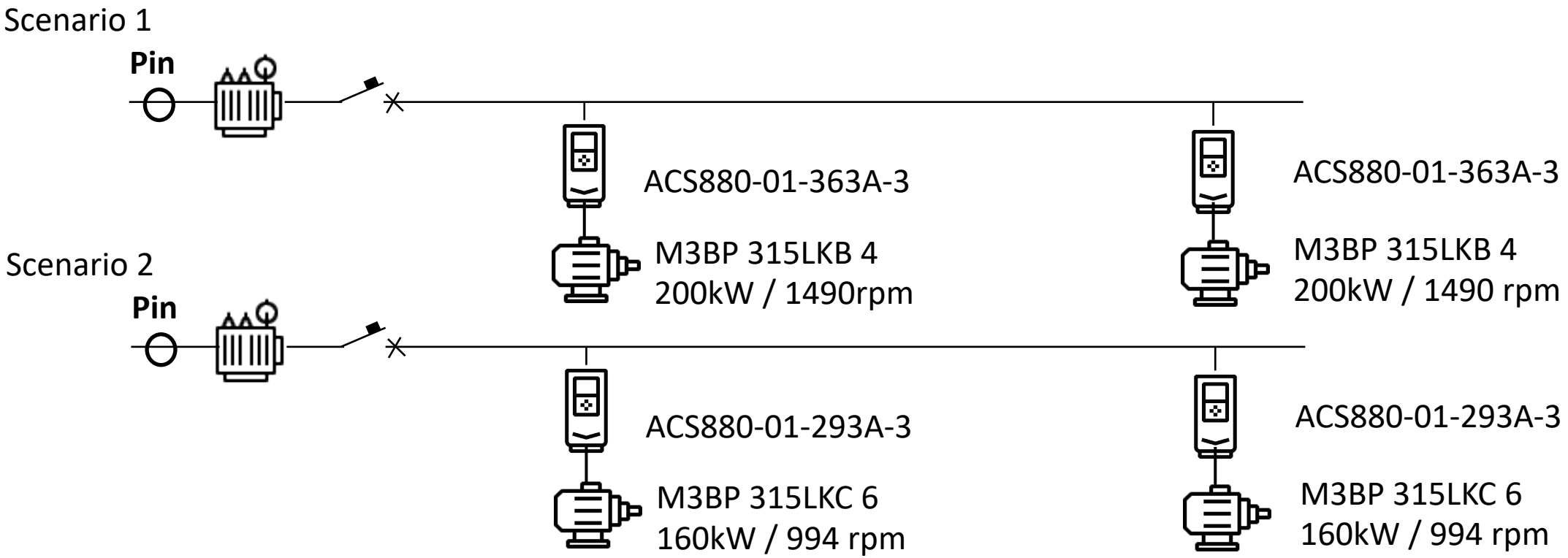


Scenario 1 : Equipment selection based on peak power need – Typical overdimensioning case because lack of accurate data

Scenario 2 : Equipment selection based on iterative , simulated optimal flow and power need – combining **Process - Automation, Drives motors and Process electrical power simulations -> control strategy for energy efficiency and LCC optimization -> smaller field devices and power network**

Electrical process power simulation

Electrical equipment and load profile



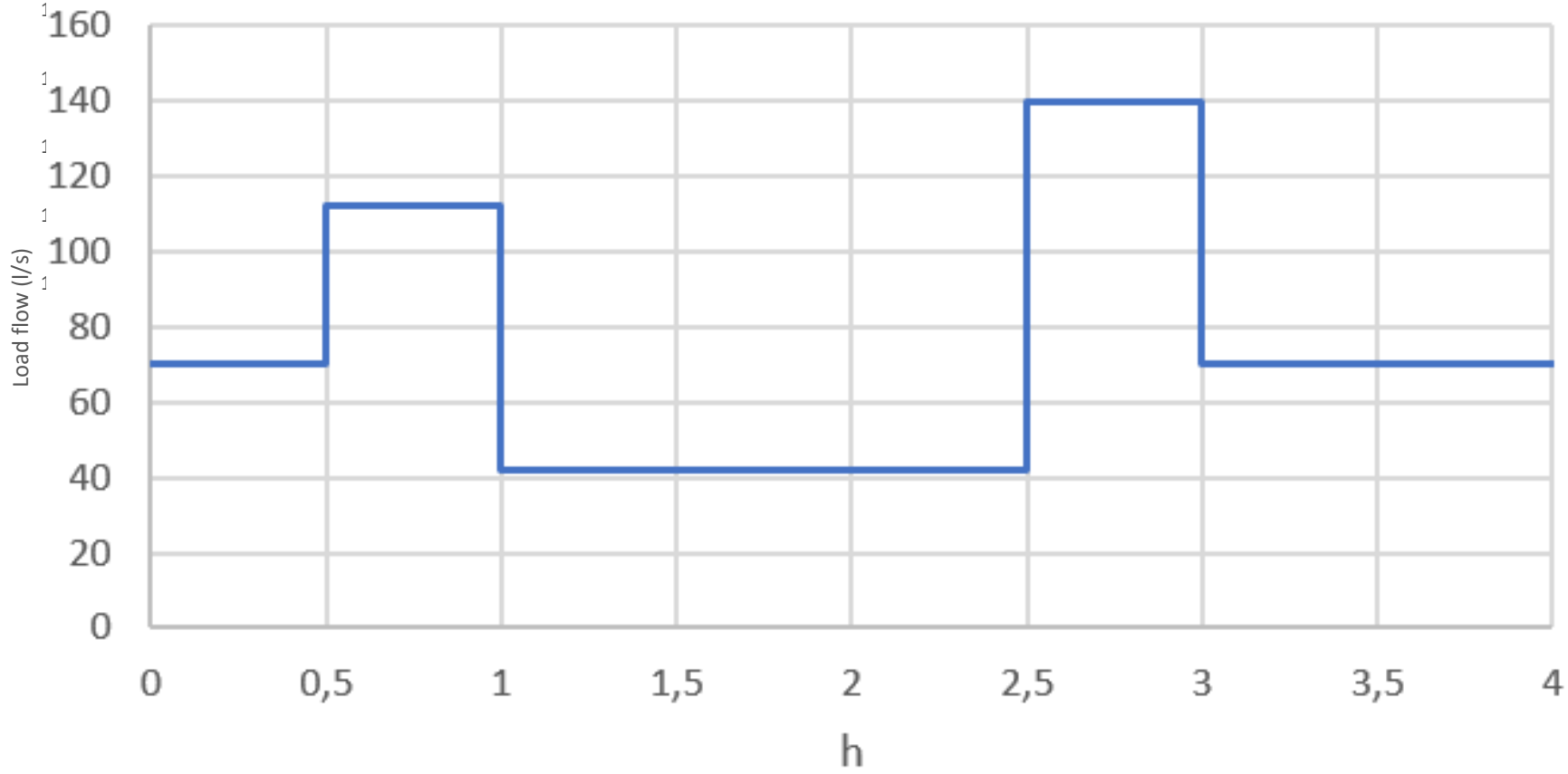
Both scenarios outcome is 1058m^3 in 4 hours

Production cycle scenario

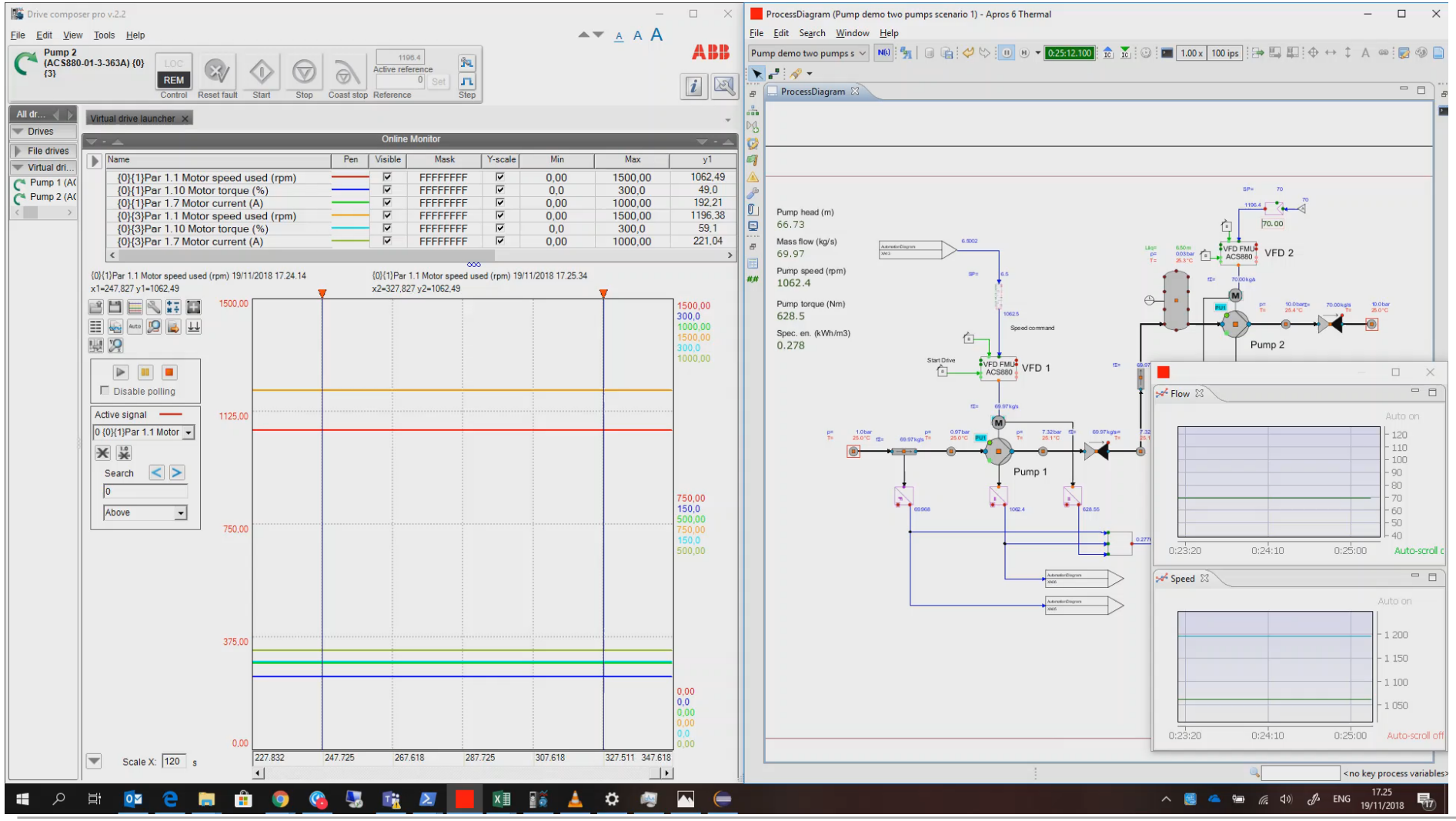
Variable outflow

Production flow rate cycle for the tank outlet

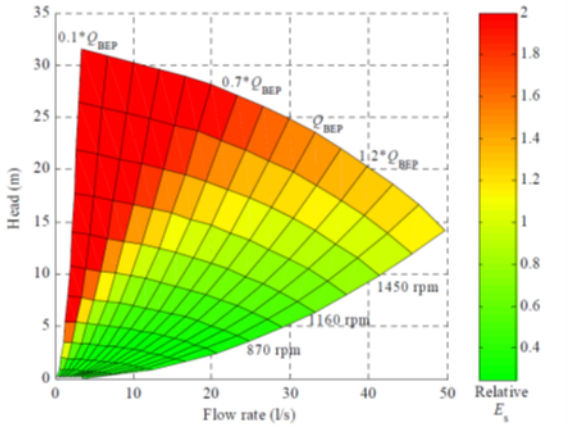
4-hour cycle with two 0.5-hour spikes



Collaborative design demonstration video



Optimal Collaborative Design saves both CAPEX and OPEX



$$Es = Pin/Q = \int Pin\ dt / V_{total}$$

Scenario 1 : Equipment selection based on peak power need – Typical overdimensioning case because lack of accurate data

Scenario 2 : Equipment selection based on iterative , simulated optimal flow and power need – combining **Process - Automation, Drives motors and Process electrical power simulations -> control strategy for energy efficiency and LCC optimization -> smaller field devices and power network**

Capex reduction: ~20…25%
Opex reduction: ~10%

Scenario 1

- Mechanical power 708 kWh
- Electrical power 771 kWh

⇒ Specific Energy **0,67** kWh/m3

Scenario 2

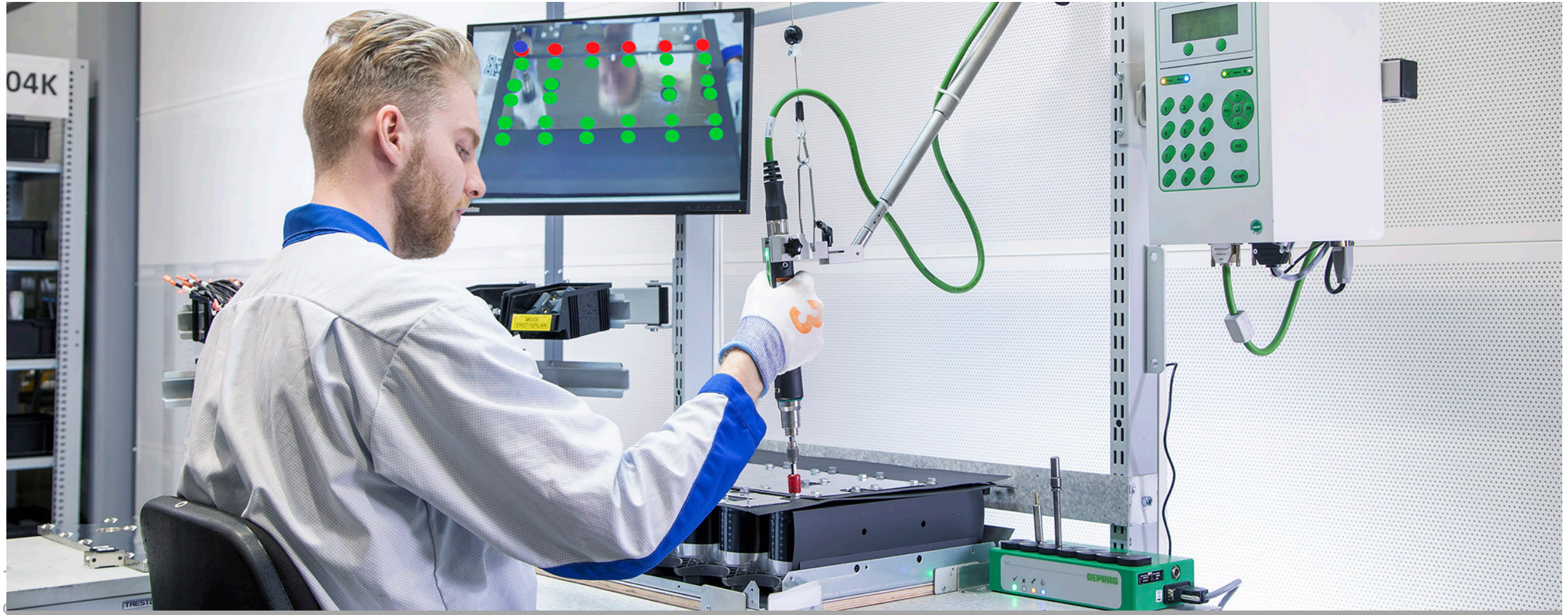
- Mechanical power 635 kWh

⇒ Electrical power 692 kWh

⇒ Specific Energy **0,60** kWh/m3

Digital Factory of the Future - today

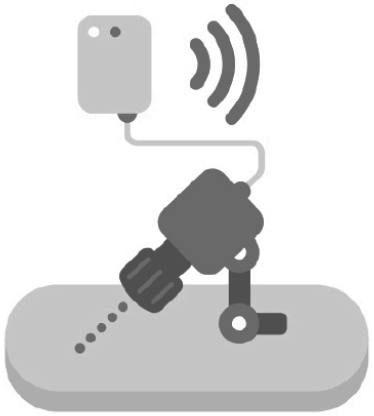
World’s first industrial AI 5G application



Real-time quality control with 5G enabled hybrid cloud AI application

This is how 5G enabled AI application supports work at ABB Drives

1. Worker is assembling drives module



2. Machine vision application is supervising the work

3. Application connects to the cloud backend at the datacenter using 5G wireless network connection

4. Analytics application gives immediate feedback to the worker in case of possible deviations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