SPARCS

Real building:
Sello shopping center

3D BIM model
Energy & HVAC measurements
Background picture source: Siemens

Picture by VTT Technical Research Centre of Finland Ltd.

DEMO DISTRICT

Espoo - Sello building block (Leppävaara center)

PARTNERS INVOLVED

VTT

COMPLETION DATE

2021

KEY NUMBERS

Number of simulations: 1800

Accuracy between forecasted and measured hourly data for electricity 0,1*
district heating 0,05*
PV production 0,19*
*NRMSE = normalised root mean squared error

CO$_2$ REDUCTION POTENTIAL

Medium:
enables reducing energy demand during peak demand times via energy flexibility

CONTACT PERSON AND LINKS

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Sello's digital twin

Short description

- "Looks the same" and "behaves the same" but is a digital copy of the real Sello building block
- Sello's model "behaves the same" from a building energy use point of view which includes limited 3D BIM-based "looks the same" related features
- focuses on all energy demands (electricity, district heating) and on-site electricity production from PV
- Inclusion of electricity battery, EV charging and participation to the electricity market (FCR-N) as well as heat performance and storing energy to building structures is optional
- Virtual twin visualises the measurement values and the results in 3D building model (BIM).

Key results during the project lifecycle

- VTT's digital twin predicts online the electricity and heating demand, as well as PV production and EV charging in Sello for the next 24 hours (with the smallest possible difference to monitored data).
- The used digital twins are artificial neural networks (ANN) models which are learned and validated with related learning and test datasets.
- The virtual twin and related predictions are running on VTT's server and can be used via REST interfaces or online dashboards

Insights and learnings

- The digital twin can help to run a Virtual Power Plant in Sello.
- 3D BIM based monitoring of energy and HVAC data
- Optimising local energy use
- can be used to improve the energy performance optimisation and to detect possible faults and inefficient performances of the building energy systems.
- the selected data and results of the digital twin can be visualised in a building related 3D BIM model.
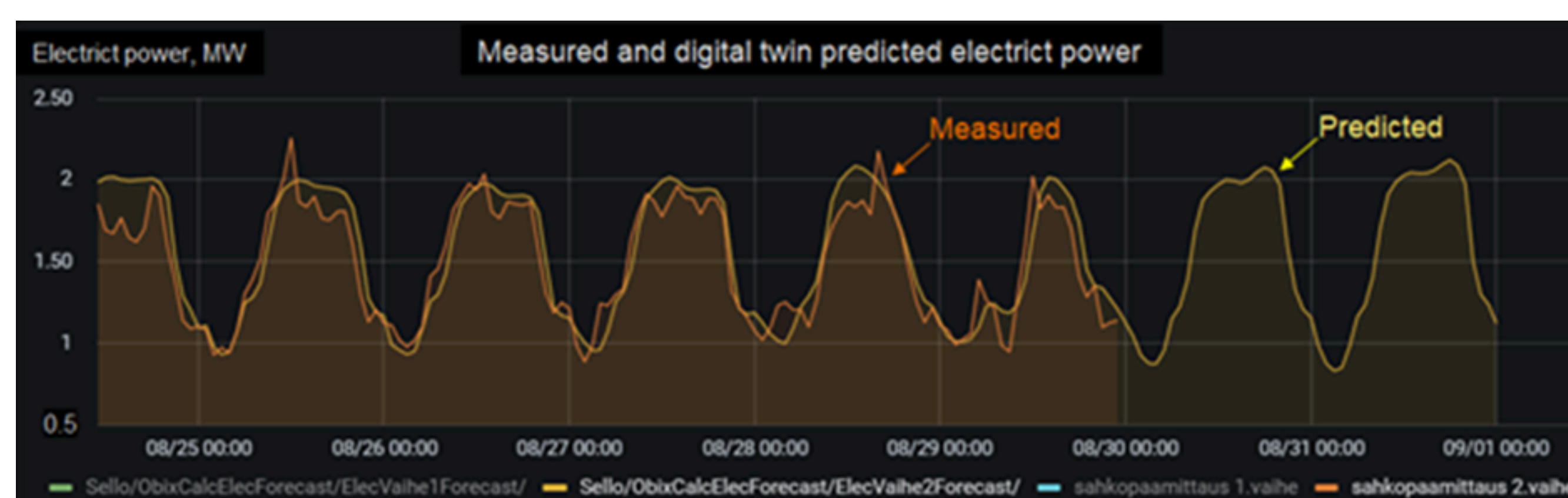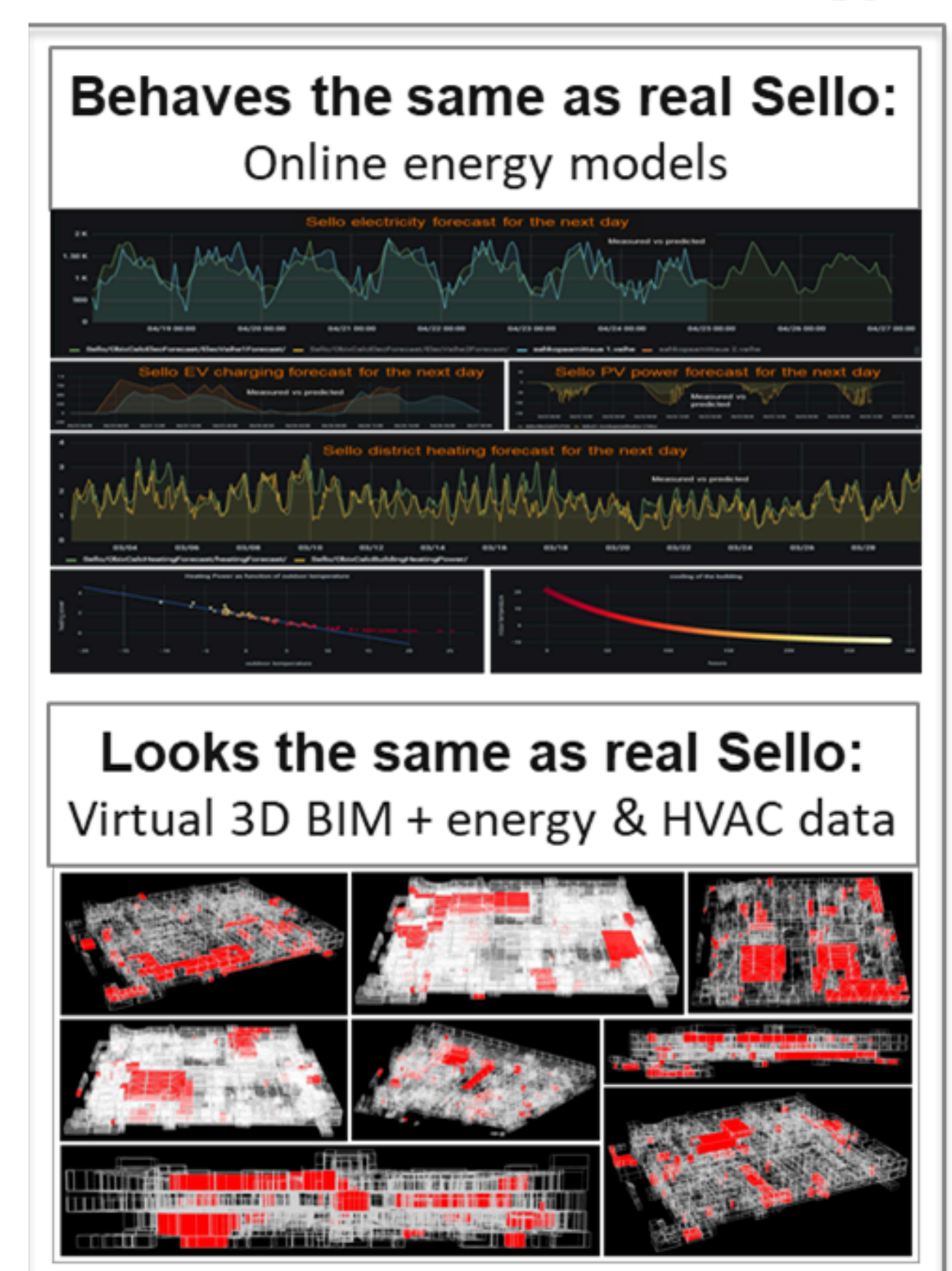
Challenges

- Additional efforts needed to make a BIM model of the building in order to be able to do visualisations

Plans for replication

- Digital twin runs in OBIX research platform, which is VTT's research instrument that can be adapted to various research and technical development projects.
- The aim is to advance research and development in the field.
- This research instrument opens various possibilities to support companies to develop related solutions.

Virtual Twin: case energy

Behaves the same as real Sello:
Online energy models

Looks the same as real Sello:
Virtual 3D BIM + energy & HVAC data

Electrict power, MW — Measured and digital twin predicted electrict power

Questions and comments from partners

Comments to be added during poster session at Consortium meeting in Leipzig