

Fast and scalable implementation of energy management in factories through FI technologies

Smart Grid Stakeholder Group
Graz, Austria – May 20th, 2014
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Agenda

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- 1 The Demonstration-Factory in Aachen**
- 2 A Energy-Smart Factory as a Consumer in the Smart Grid**
- 3 Fast and scalable implementation through FI-WARE**
- 4 Experiences using the GEs, quick demo and wrap-up**

The Demonstration-Factory is a production facility in Aachen, Germany

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Outside view of the factory



Laser cutting machine



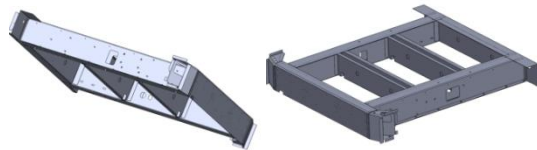
Bending machine

Produced goods are all made for the market and are sold to actual customers

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Electrical car: StreetScooter



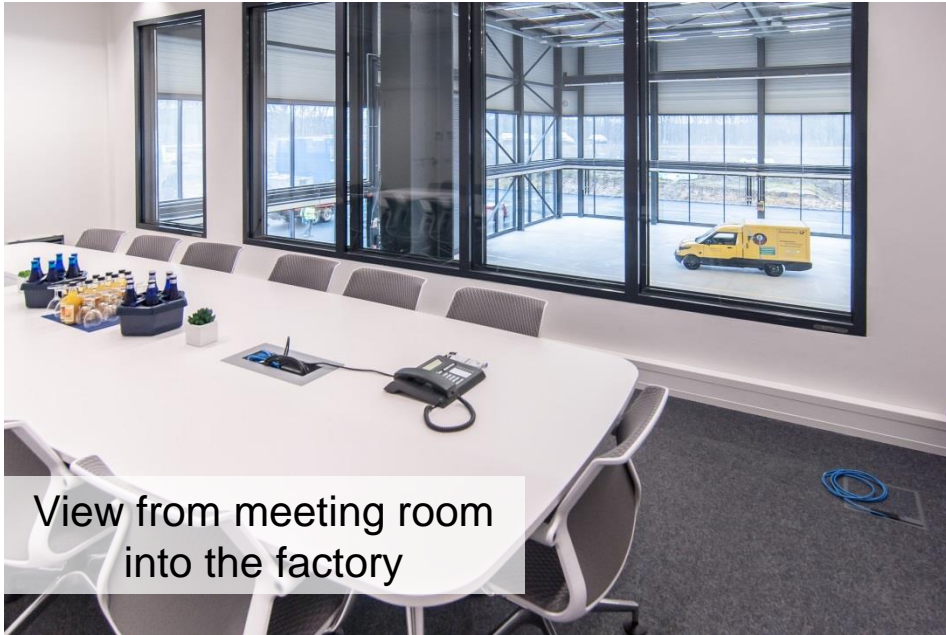
Underbody produced in the factory

Electrical go-cart: MaxE-Kart



The factory connects actual shopfloor access, visualisation and planning IT

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View from meeting room
into the factory

Goals of the Demonstration-Factory

- Research
- Experimental production
- Further education

Generating real production data for further analysis, test of different production scenarios and information technologies, and visualisation of results.

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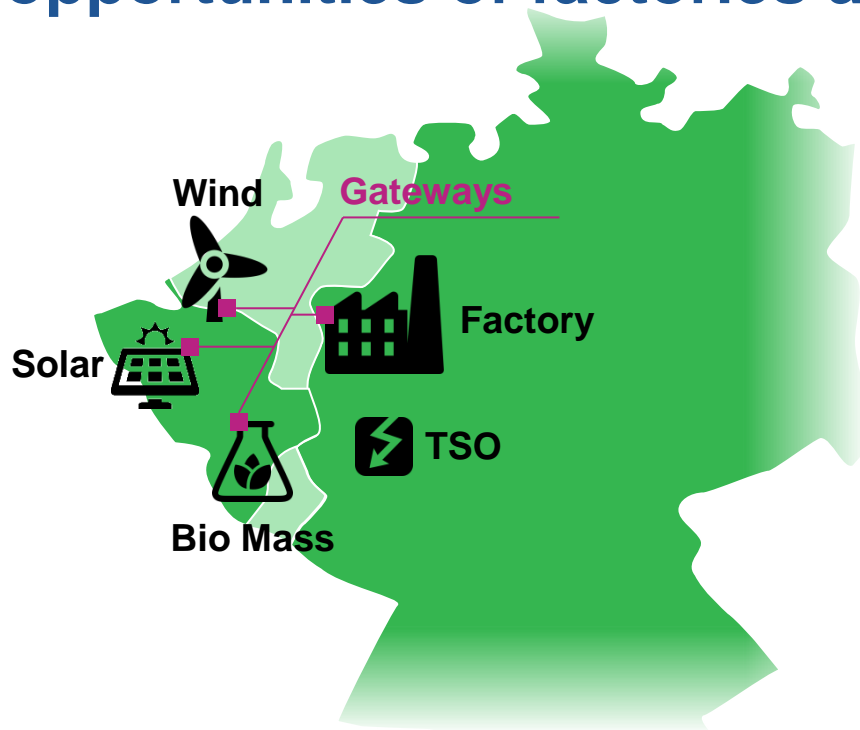


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The B2B Energy Eco-System investigates opportunities of factories as smart loads

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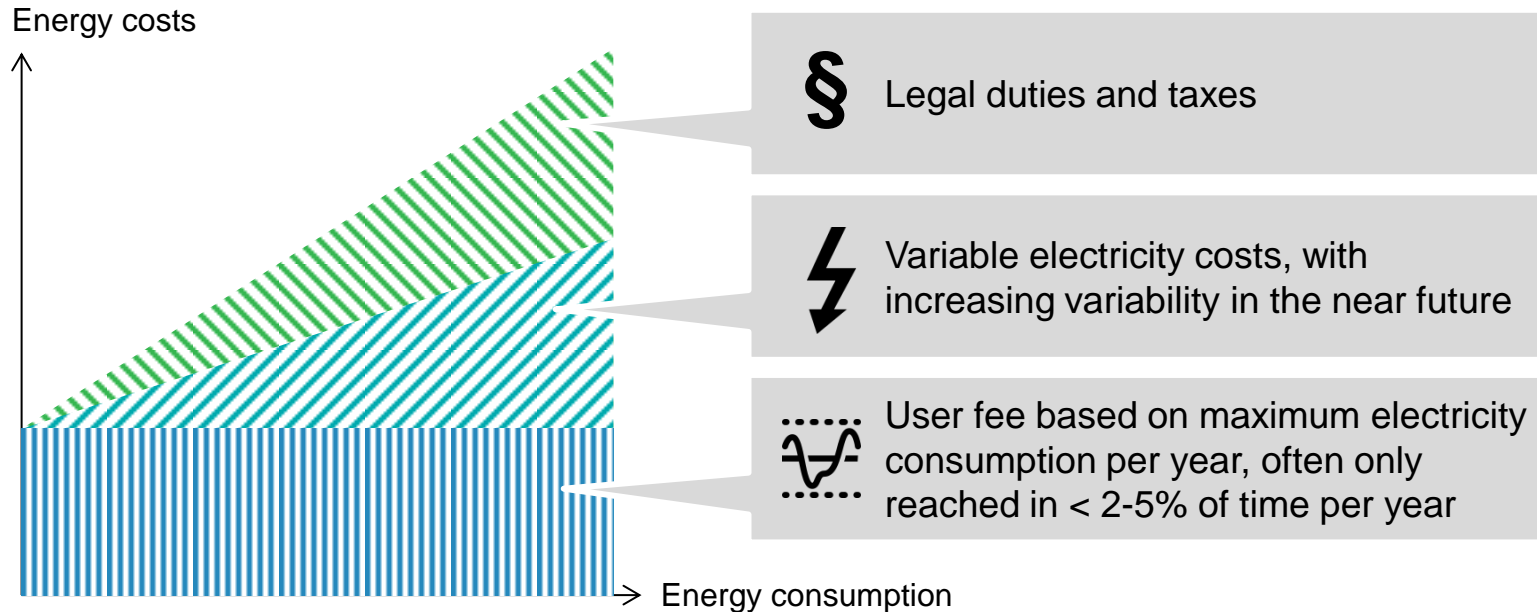
Trial setup

- Trial installation in Belgium and Germany
- ~10 renewable energy sources
- ~ 1 demand site

Objectives

- Combine renewable energy production with Demand Site Management to a Virtual Utility
- Combine different volatile energy production for CO₂-free certified energy
- Increase the part of renewable energy of the consumption of electrical energy

An energy-efficient factory has to consider fixed and variable costs



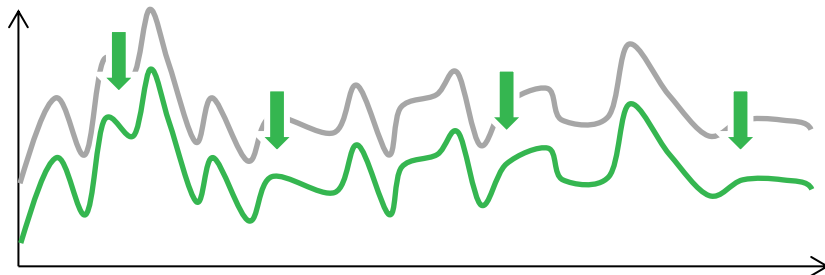
Energy efficiency means using either using energy less or more intelligently

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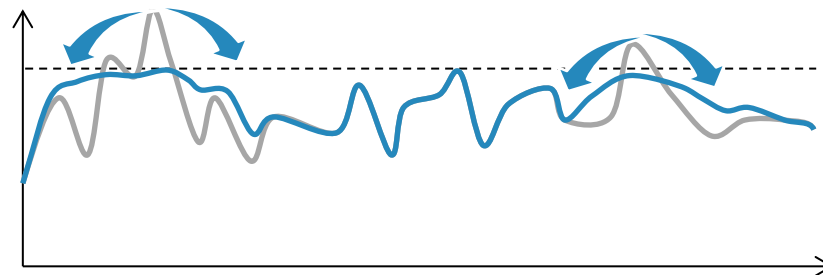
Minimization of variable electricity costs by process optimizations

- Reduction of overall consumption through optimization of technical processes and procedures
- Introducing energy-saving technologies
- Streamline inefficient process steps



Minimization of user fee and variable costs by intelligent production steering

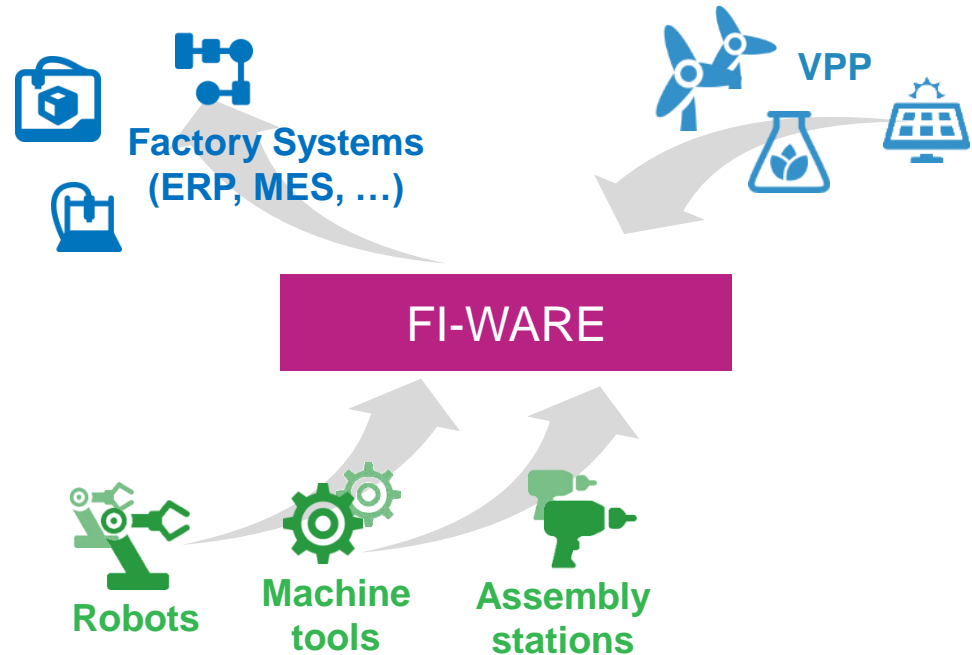
- Optimized distribution of energy consumption throughout the production program
- Identify potential energy-consumption peaks before they arise and try to shave-off consumption into troughs



The Demonstration-Factory uses ICT to support reliable and fast decision making

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Three scenarios to use the factory as a smart load

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Flexible loads

- Factory monitors own energy consumption (not necessarily in real-time)
- Factory makes prediction of energy consumption for different production schedules for next day
- Factory submits “accepted” load profiles to VPP



Price signals

- VPP predicts energy production for the next day
- VPP determines energy prices for 15 minute slots of the next day
- VPP submits these prices to factory
- Factory schedules production and notifies VPP



Fully connected

- Factory and VPP constantly communicate over prices and predicted energy consumption
- VPP has possibility to control certain machines (shut down etc.)



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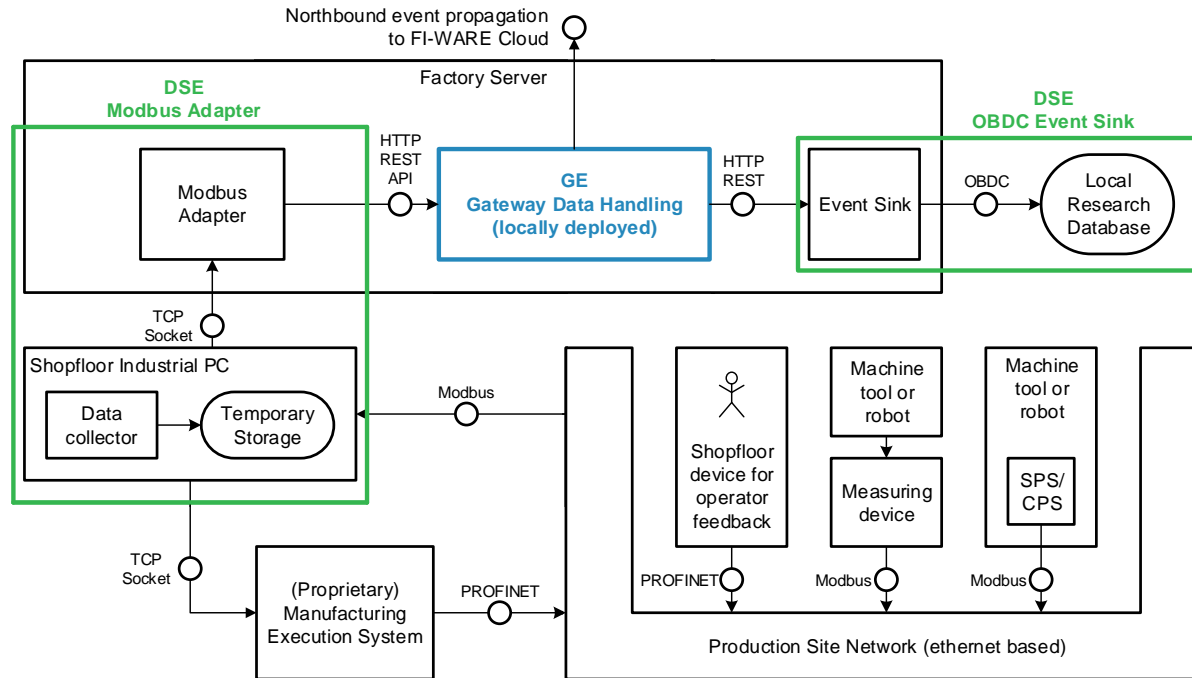
Event-driven architectures allow for high flexibility and real-time solutions

Goal	Architecture layer	GEs and DSEs
<ul style="list-style-type: none">Use data for production planning and control, and communication with VPP	Data exploitation layer	<ul style="list-style-type: none">GE Application MashupDSE Production Planning and Control System Integrator
<ul style="list-style-type: none">Analyse and interpret data	Data interpretation layer	<ul style="list-style-type: none">GE Complex Event ProcessingGE Publish/Subscribe BrokerGE Big Data AnalysisGE Object Storage
<ul style="list-style-type: none">Collect data from different sources within the factory	Data gathering layer	<ul style="list-style-type: none">GE Gateway Data HandlingDSE OBDC Event SinkDSE Modbus Adapter

The technical architecture of the Energy Management System is event-oriented

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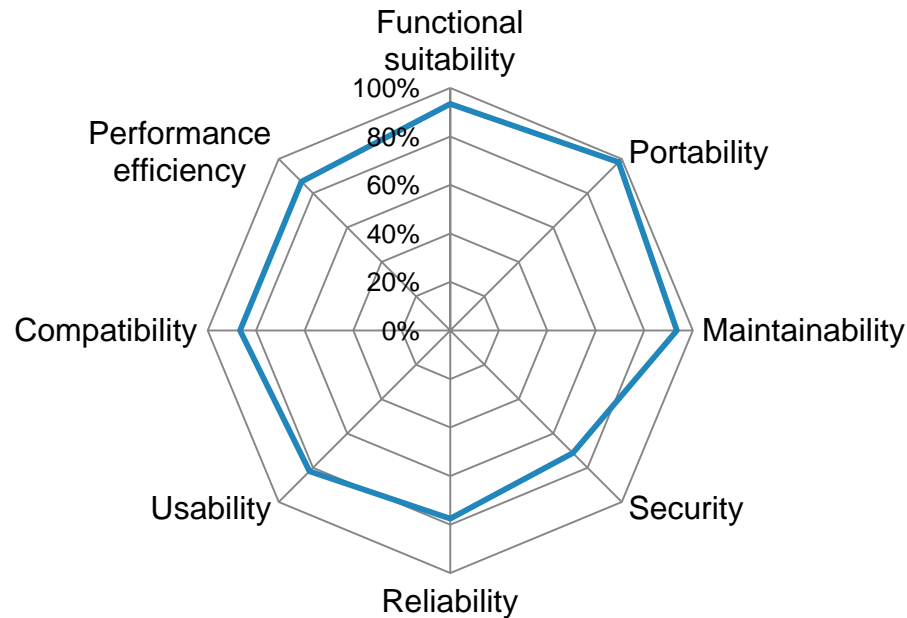
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FI technology is reliable, scalable and state-of-the-art

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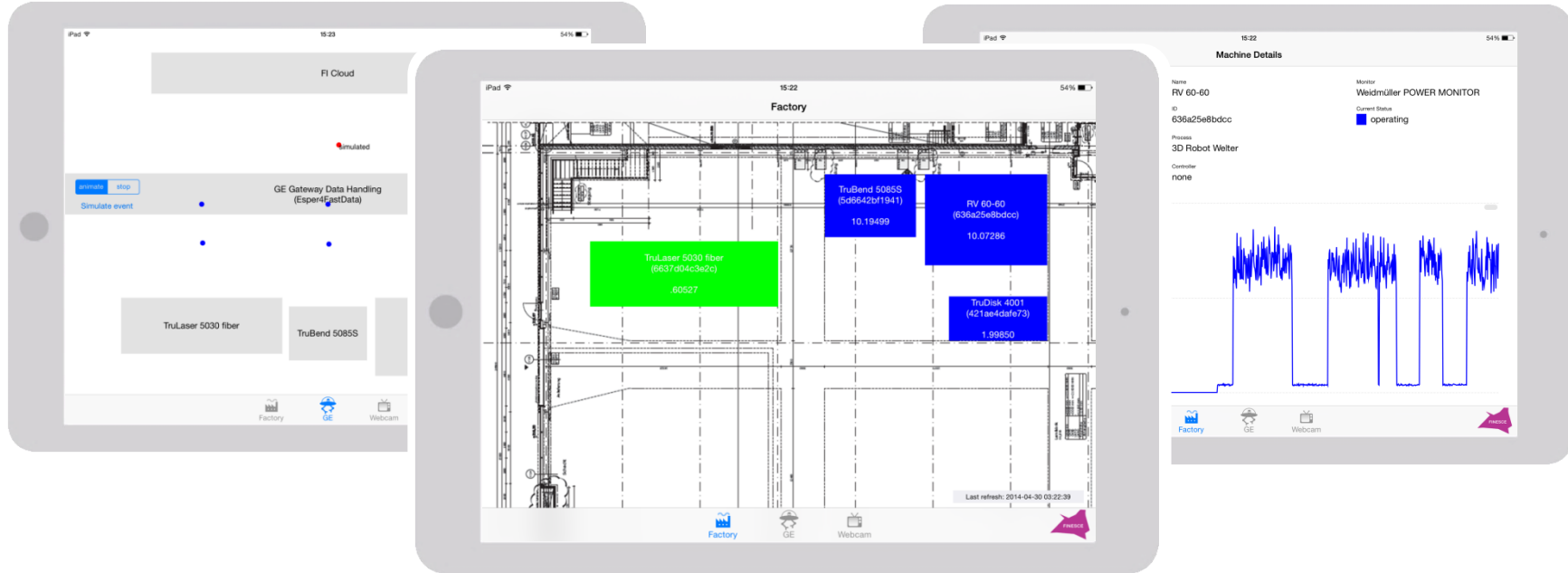
Experience using FI

- Most GEs offer distinct and useful functionality
- Communication with the GE vendors is very good
- Interconnection of the GEs is mainly good and reliable
- Scalability through the FI yields benefits for using in a production network

The information are fed into modern, flexible frontends

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The FI technologies allow for a fast and scalable development

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- 1 Energy management for factories is a feasible and attractive domain, especially in combination with non-grid related benefits
- 2 FI technologies are agile and scalable, and hence a central enabler for bringing energy management to the industry
- 3 Interest in energy management is rising in industry, for very diverse motivations

Thank you

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