SIMATIC
Energy Management

Sustainability on machine level

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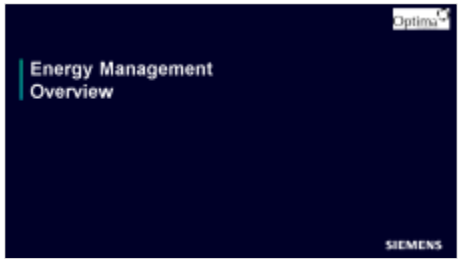
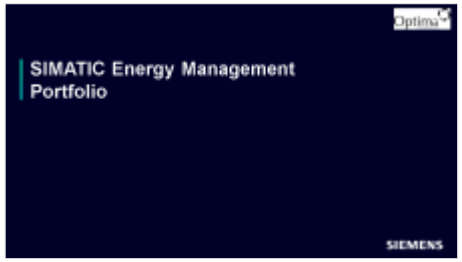
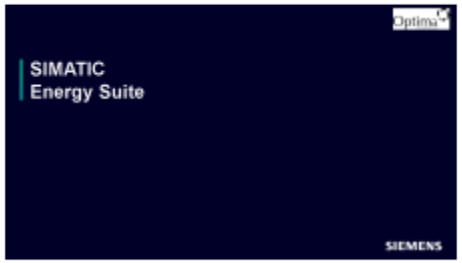
Agenda


Energy Management
Overview
SIEMENS


SIMATIC Energy Management
Portfolio
SIEMENS


Integrated
Energy Measurement
SIEMENS


SIMATIC
Energy Suite
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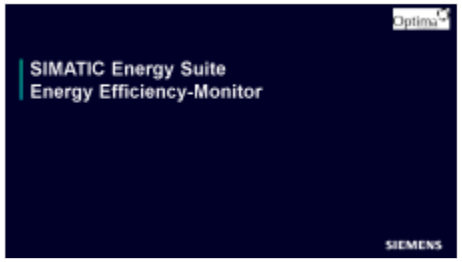
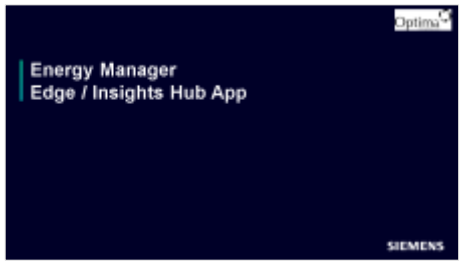
SIMATIC Energy Suite
Load management
SIEMENS

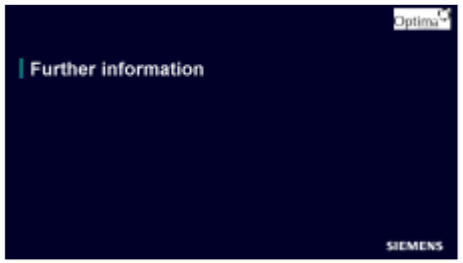

SIMATIC Energy Suite
Demo Project
SIEMENS


SIMATIC Energy Suite
Energy Efficiency-Monitor
SIEMENS


SIMATIC
Energy Manager
SIEMENS


Energy Manager
Edge / Insights Hub App
SIEMENS


CO2-Footprint
with SiGREEN
SIEMENS


Further information
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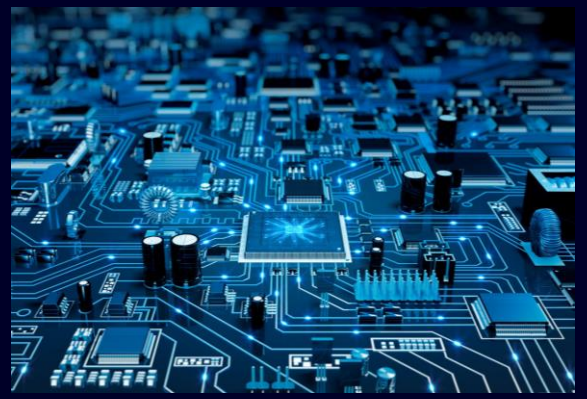
Energy Management Overview

Megatrends having impact on companies

Increasing resource costs

Climate change

Digitalization



Legal and contract requirements

Challenges

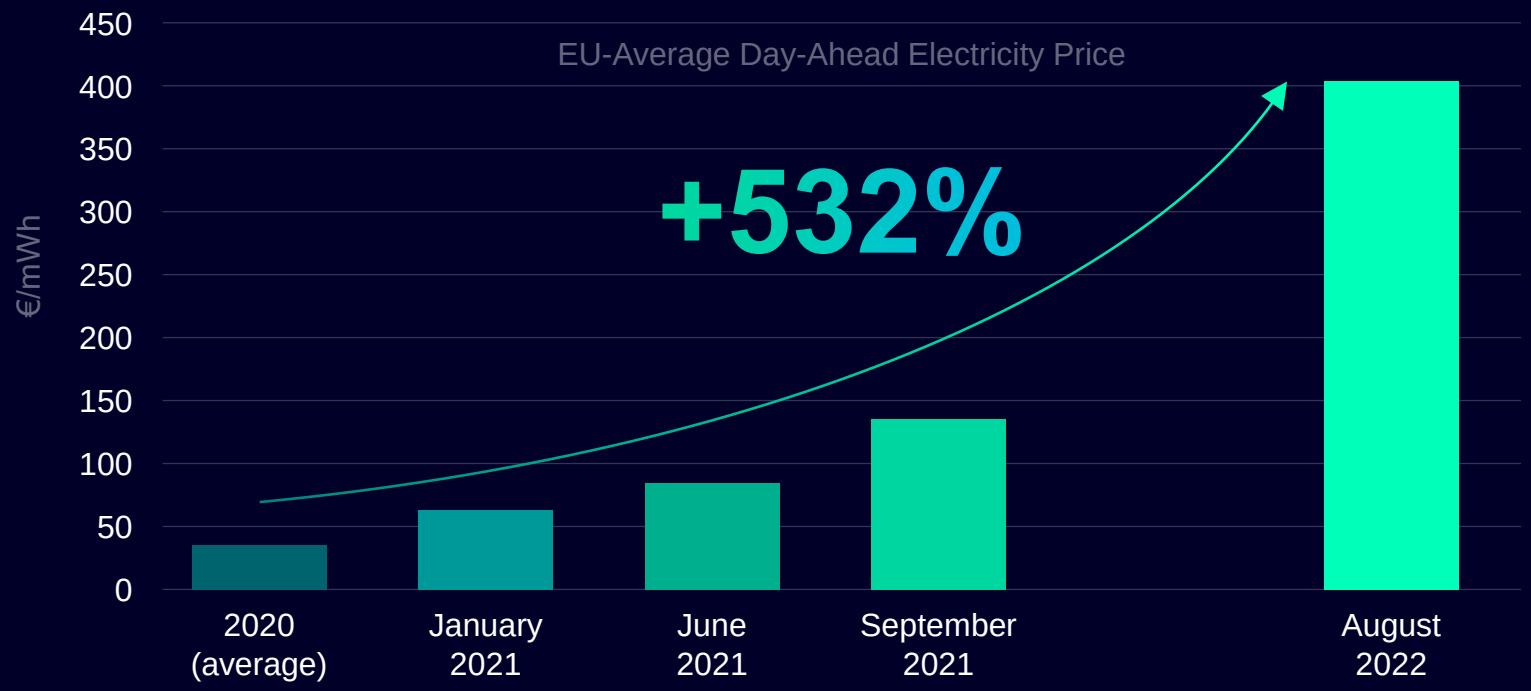
- Pressure to produce more, while reducing the inefficient use of resources
- Reduce energy costs
- Having to increase prices

- Reduce the environmental pollution and emission of CO_2
- Cope with shortage of all type of materials and resources
- Pressure from end consumer to offer sustainable products

- Lack of transparency resulting to delay in corrective actions
- Deal with systems complexity
- No/a lot of/too much raw data available cannot allow any meaningful conclusions for action
- IT/OT connectivity

- Follow the legal and contract requirements for all resources
- Being able to verify on own emissions certificate
- Pressure to make the Supply chain CO_2 neutral

The energy prices keep increasing, until when?



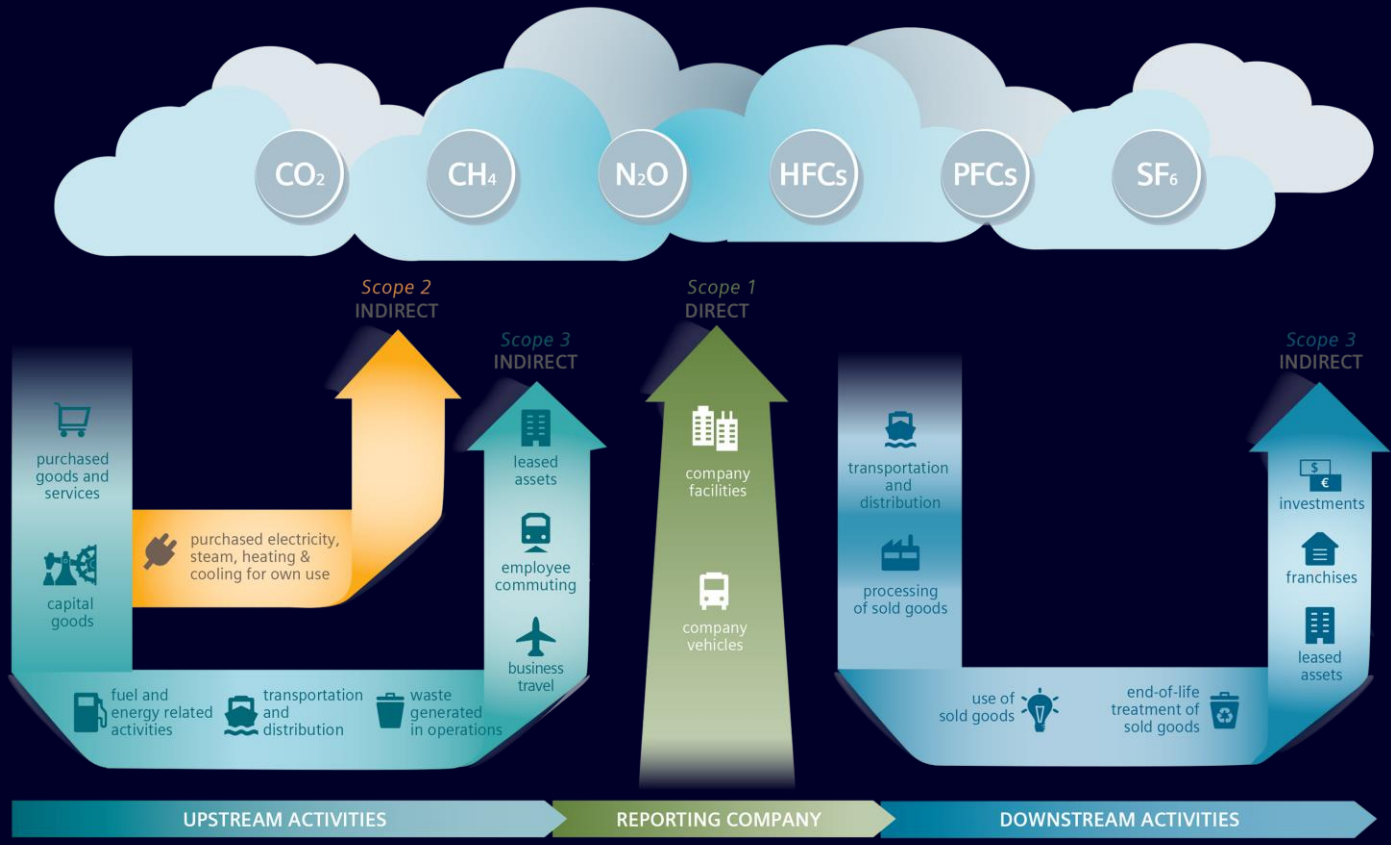
Europe, 2022:

The **energy transition** has stopped being “only” a matter of environmental and financial discipline and **has become a social and economic priority!**

Source: Eurelectric on ENTSO-E data, 2022

An end to the rise in energy prices is currently not to be expected

Motivation for energy management
The CO2 footprint is becoming increasingly important



The **carbon footprint** as a key figure to indicate the development of the commitment to sustainability

Investors evaluate **climate risks** and expect compliance with environmental and climate protection standards

Customers demand environmentally friendly products and include this in their **purchasing decisions**

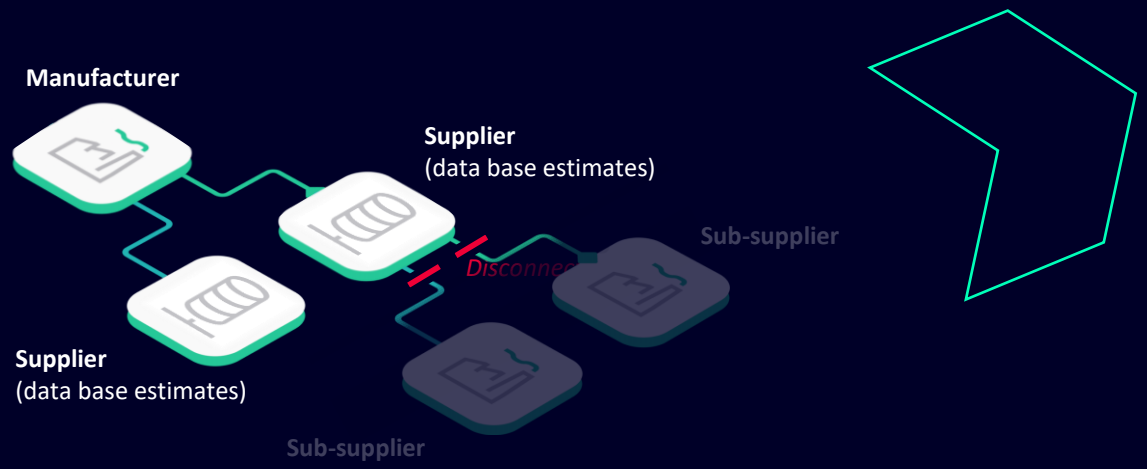
Increasing prices for **CO2 Certificates**
Feb 2022 > € 96 p.tCO2

Active, transparent handling of the CO2 issue is essential!
Managing your product carbon footprints with SiGREEN from SIEMENS

Source: SiGREEN (www.siemens.com/sigreen)

Moving from carbon footprint reporting to active PCF management

How dynamic PCFs turn carbon footprints into a management tool

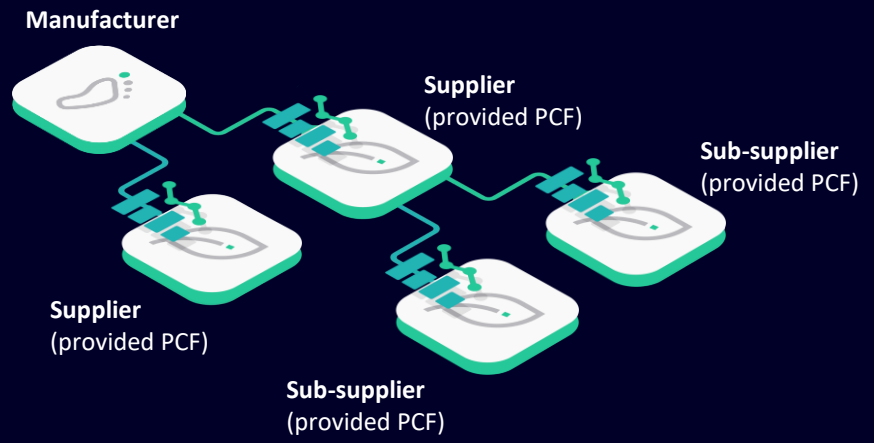


From static PCF reporting…

Conventional data base approach

..to dynamic PCF management

SiGREEN PCF chaining approach



- Efficient communication allows for frequent and pro-active updates that create dynamic PCF
- (Sub-) suppliers' improvements quantify in PCFs, making them a management tool

Upcoming and rising challenges in Industrial Energy Management

Fulfilling legal requirements

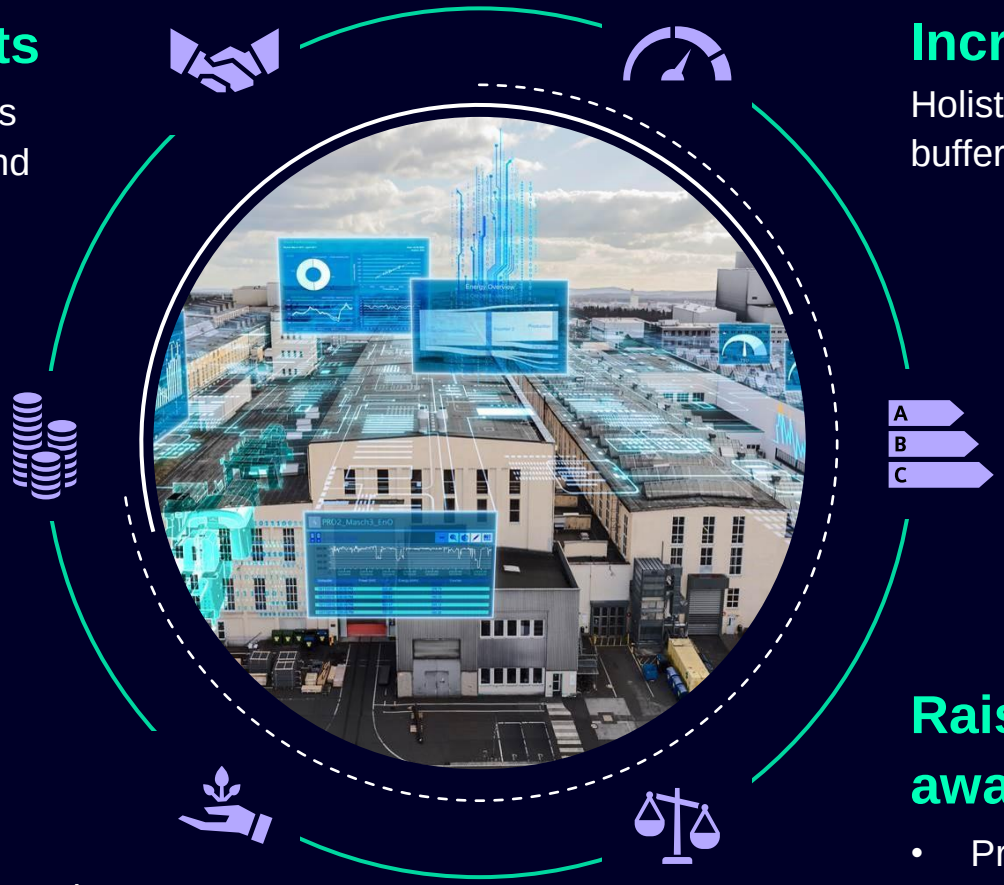
Comply to ISO 50001, meet requirements provided by the energy efficiency laws and participate on tax refunds

Cutting energy costs

- Shut down consumers to avoid load peaks
- Increase energy efficiency
- Optimized procurement

Reduce carbon footprint

Transparency about Corporate Carbon footprint



Increasing grid stability

Holistic concept for energy generation, buffering and consumption possible

Increasing energy efficiency

Increase the efficiency through detailed analysis based on KPIs related to production

Raising employee awareness

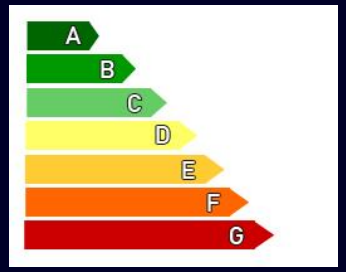
- Providing a holistic view as key to motivate employees
- Cost cause accounting with target settings

Energy efficiency cycle
based on energetic transparency and optimization

Acquired energy data

Acquisition of the measurement values

Checking and evaluation of the measures



Realization of the measures

Planning of energy efficiency measures

Analysis of the data

Improvement according to ISO 50001 with Plan – Do – Check – Act (PDCA)

SIMATIC Energy Management Portfolio

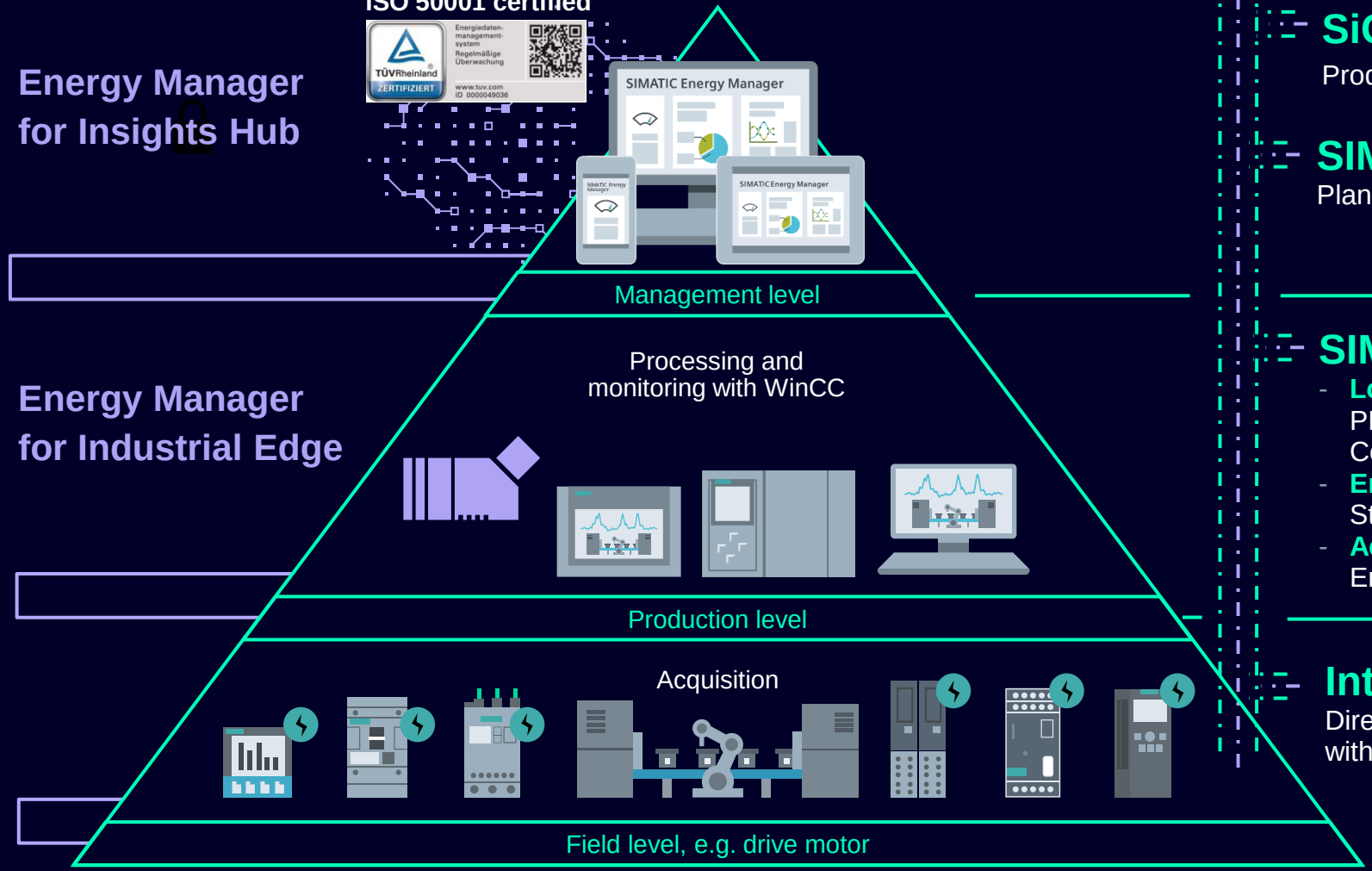
Sustainability and Energy Efficiency from machine to company level
SIMATIC Energy Management

Optima
www.optimacs.com

ISO 50001 certified

Energy Manager for Insights Hub

Energy Manager for Industrial Edge



SiGREEN
Product Carbon Footprint

SIMATIC Energy Manager
Plant and company-wide energy analysis

SIMATIC Energy Suite
- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency Monitor**
  Standardized efficiency evaluation of machines
- **Acquisition**
  Energy data acquisition

Integrated energy measurement
Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

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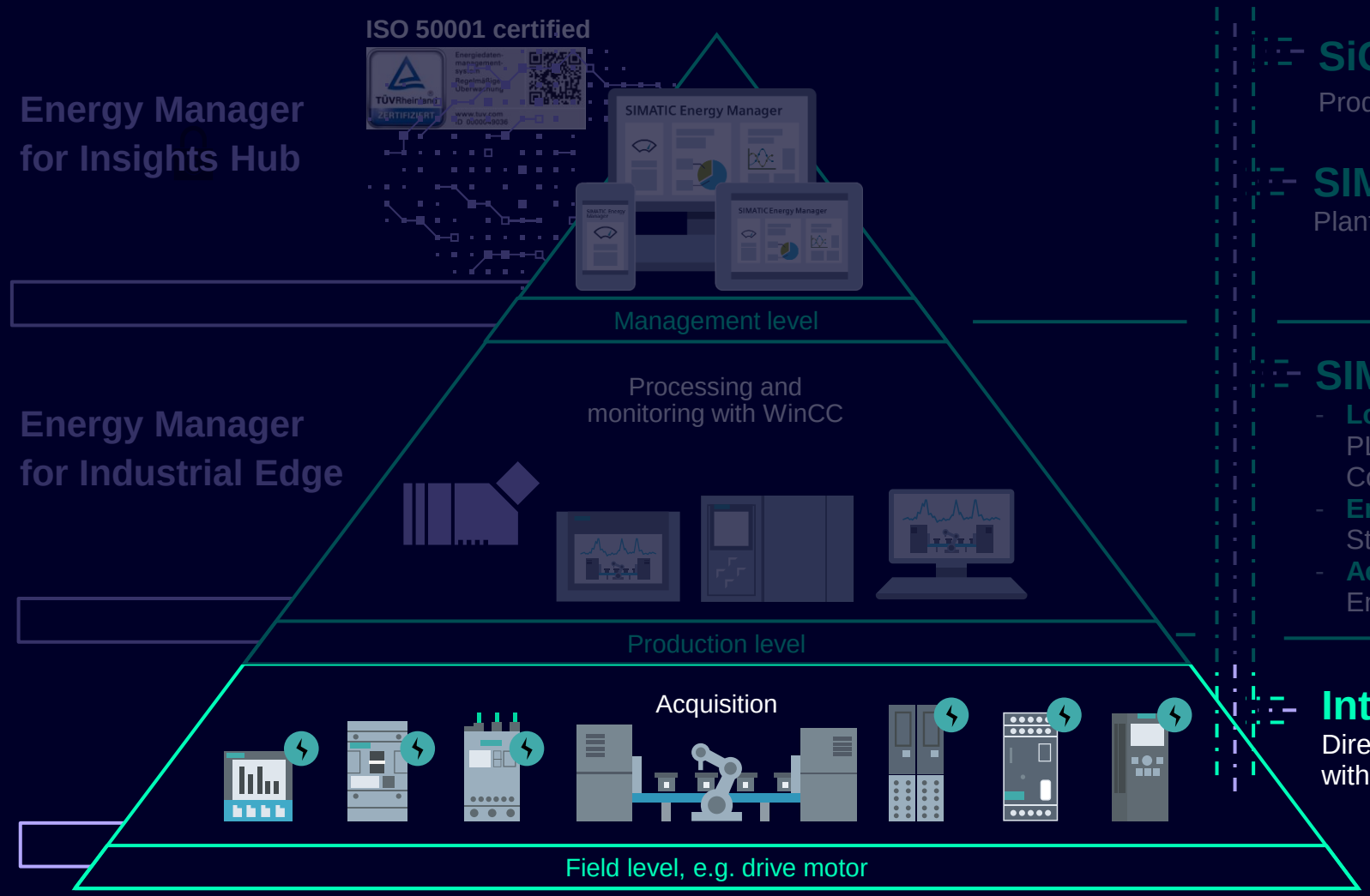
Integrated Energy Measurement

Resource Transparency
SIMATIC Integrated energy measurement



SiGREEN
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  Energy data acquisition

Integrated energy measurement
Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

Measuring all types of energy
Extensive portfolio simply integrated

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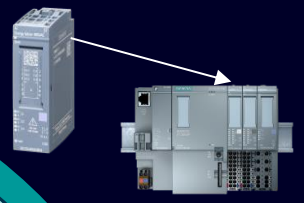
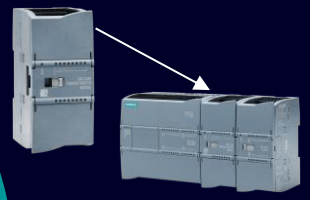
Meters

Electrical Energy



SIMATIC ET 200SP
Energy Meter



SIMATIC S7-1200
SM 1238

Sentron
7Kx PAC-Series

Non-electrical types of energy

SITRANS-Series
flow, pressure, temp,…

Water-amount
WFx 40

Metering incorporated in device

Electrical Energy

Molded Case
Circuit Breaker 3VA

SINAMICS-
converters

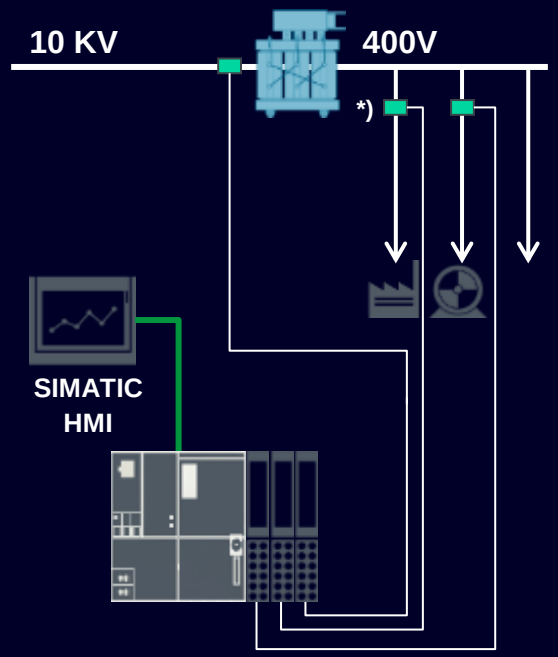
SIMOCODE pro
Motor
Management

SIEMENS

Measuring of electrical energy
Application examples

Measuring in control cabinets and in production

Energy distribution



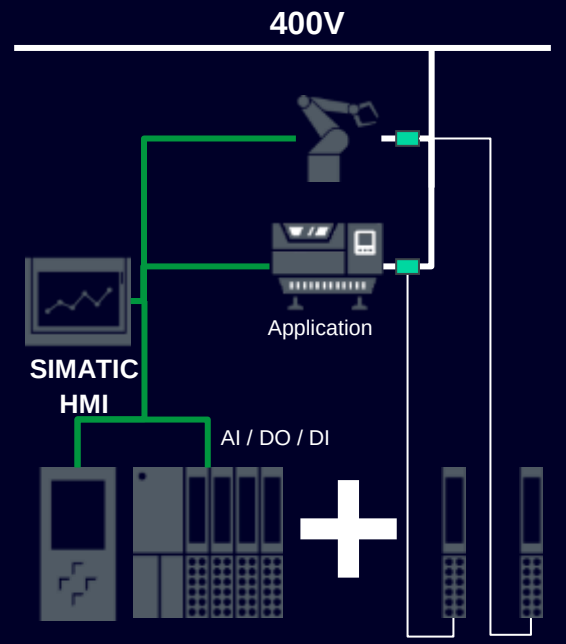
SIMATIC ET 200SP CPU & Energy Meter

*) current transformer

Advantages

Cost-saving thanks to the simplest integration in automation (TIA)
Values update to 50ms basis
Flexibility as support for voltage and current transformers
Simple configuration through diagnostics and limit monitoring in the meter
Cost-saving due to high ET 200SP channel density and use of only one HMI panel

Production machine



SIMATIC S7-1500 +
ET 200SP Periphery

SIMATIC ET 200SP
Energy Meter

Electrical energy measurement

Two types of the energy measurement module with extended network analysis

AI Energy Meter 480VAC CT HF
(6ES7 134-6PA01-0CU0)

Option 1 – for CT use:

- **CT**: **C**urrent **T**ransformer (typical 1A or 5A CTs)

Features Current Transformers:

- ⊕ Cost-efficient
- ⊕ Minimized mounting time and effort when split-core CTs are used

AI Energy Meter 480VAC RC HF
(6ES7 134-6PA21-0CU0)

Option 2 – for current measuring via RC

- **RC**: **R**ogowski **C**oil

Features Rogowski-Coil:

- ⊕ Easy and cost-effective mounting
- ⊕ Typical use in **brownfield** plants
- ⊕ Compares to SENTRON PAC4200

Special features of both alternatives

Measuring down to ~0VAC (phase-to-earth) and for TT, TN, **IT**-grids, due to 24VDC-supply

Grid analysis functionalities: Harmonics 1. ... 40. (current, voltage), analysis (overvoltage and –current, voltage drop), residual current (I1, I2, I3, IN), distortion factor

Electrical energy measurement

What are the advantages of the Integrated energy measurement?

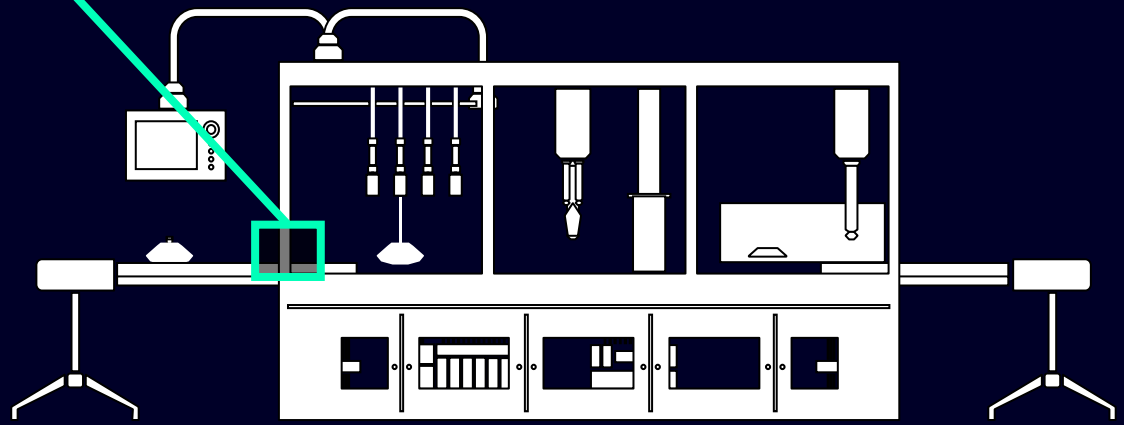
Correlation of Energy and further data possible (machine status / quantity)

Space-saving

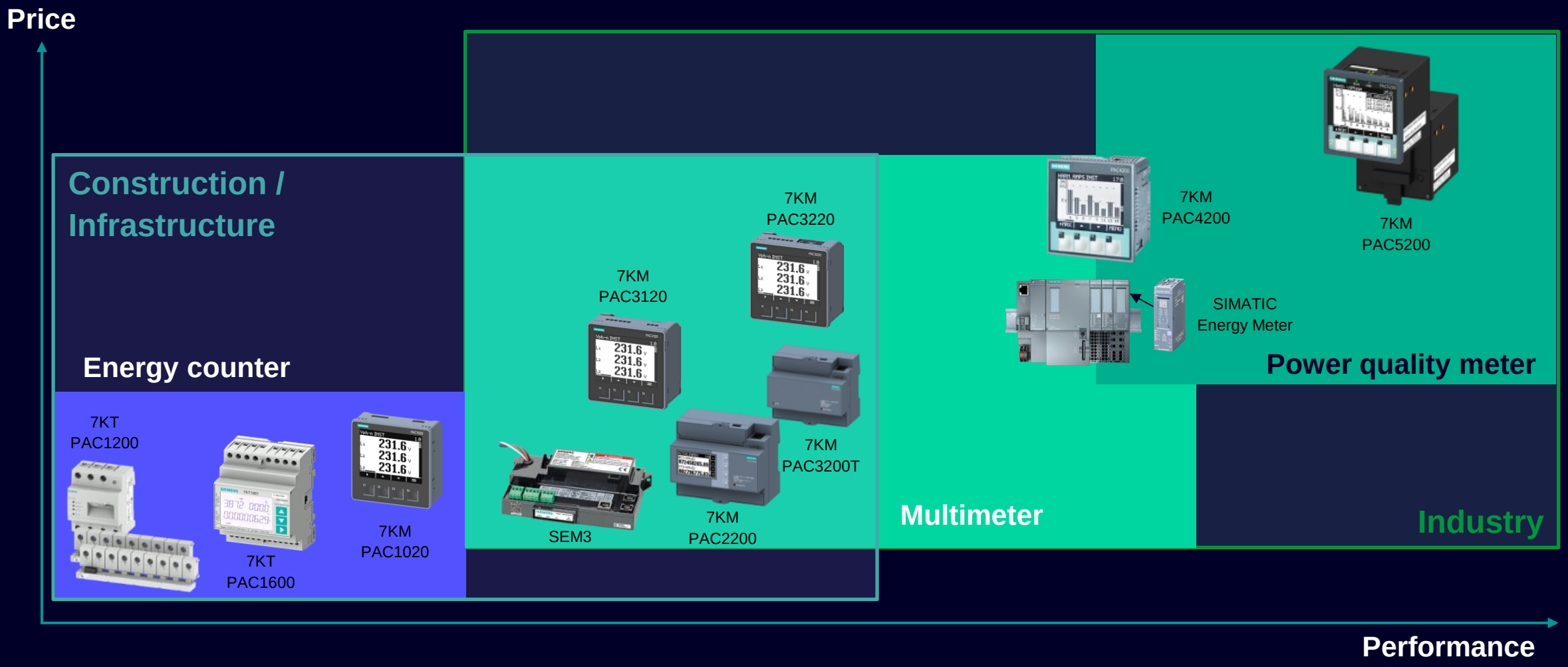
No additional IP-addresses necessary

Just one engineering tool: TIA Portal

Modular expandable: 1 to n measuring points



Electrical energy measurement
Price /performance overview of metering devices



Electrical energy measurement
Which products for which measurement tasks?

+ Power Quality
according to EN50160

+ THD-Value

Active energy
+ power factor

SENTRON
7KM PAC5200

SIMATIC
Energy Meter

SENTRON
7KM PAC4200

SENTRON
7KT PAC1600

SENTRON
7KM PAC1020

SENTRON
7KM PAC3120

SENTRON
7KM PAC3220

SENTRON
7KT PAC1200

SENTRON
SEM3

SENTRON
7KM PAC2200

SENTRON
7KM PAC3200T

SIRIUS controls for measuring and SIMOCODE energy monitoring

Type	SIMOCODE pro motor management	ET 200S High Feature Motor starter	ET 200SP Motor starter	ET 200pro Motor Starter High Feature	M200D Motor starter	Soft starters with communication	DC monitoring relays	Monitoring relays	Solid-state overload relay
Product image									
Designation	3UF7	3RK1301	3RK1308	3RK1304	3RK1315/25/95	3RW5	3UG5	3RR24	3RB24
Main field of application	Process/manufacturing industry	Manufacturing industry	Manufacturing industry	Manufacturing industry	Manufacturing industry	Manufacturing industry	DC manufacturing/ Infrastructure	Manufacturing industry	Manufacturing industry
Measuring function	U, I, P, cos phi, E, S, f	Current	Current	Current	Current	U, I, P, cos phi, E, f	I, U, Energy flow direction	U, I, cos phi, current monitoring	Current
Communication	PROFINET PROFIBUS Ethernet/IP Modbus RTU	PROFINET PROFIBUS	PROFINET PROFIBUS Ethernet/IP Modbus TCP	PROFINET PROFIBUS	PROFINET PROFIBUS AS-i	PROFINET PROFIBUS Ethernet/IP Modbus TCP	PROFINET	IO-Link	IO-Link
Energy Suite Driver for basic / advanced energy data	☑/☑		☑/-		☑/-	☑/☑			
PROFIenergy	✓	✓	✓	✓	✓				

Sentron/SIMATIC Measuring devices, energy monitoring and digitalization solutions

Type	PAC2200	PAC2020CLP	PAC3200T	PAC3120	PAC3220	PAC4200	PAC5200	Energy Meter
Designation	7KM 	7KM 	7KM 	7KM 	7KM 	7KM 	7KM 	
Location of use	Industry	Industry	Industry	Industry	Industry	Industry	Industry	Industry
Installation type	Standard mounting rail	Standard mounting rail	Standard mounting rail	Front mounting	Front mounting	Front mounting	Front mounting Standard mounting rail	Integrated in automation area (ET200SP)
Measured values	U, I, f, PF, P,Q,S, Ea, Er, Eap	U, I, f, PF, P,Q,S, Ea, Er, Eap	U, I, f, PF, P,Q,S, Ea, Er, Eap, THD	U, I, f, PF, cosφ P,Q,S, Ea, Er, Eap, THDu, THDi	U, I, f, PF, cosφ P,Q,S, Ea, Er, Eap, THDu, THDi	U, I, f, PF, cosφ P,Q,S, Ea, Er, Eap, THDu,THDi, Ih1-63,Uh1-63	U, I, f, PF, cosφ P,Q,S, Ea, Er, Eap, THDu,THDi, Ih1-40,Uh1-40	U, I, f, PF, cosφ P,Q,S, Ea, Er, Eap, THDu,THDi, Ih1-40,Uh1-40
Measuring function	Direct 65 A, I-Transformer 1A/5A U-Transformer	Direct 65 A, I-Transformer 1A/5A U-Transformer	I-Transformer 1A, 5A U-Transformer	I-Transformer 1A, 5A U-Transformer	I-Transformer 1A, 5A U-Transformer	I-Transformer 1A, 5A U-Transformer	I-Transformer 1A, 5A U-Transformer	I-Transformer 1A, 5A or Rogowski Coil / U-Transformer
Monitoring	-	-	Limits, Operating hours	Limits, Operating hours	Limits, Operating hours	Limits, Operating hours, Event log	Limits, PQ Event Recorder, Event log	Limits, Operating hours,
Communication	S0, M-Bus, Ethernet/Modbus TCP, RS485/ Modbus RTU	S0, Ethernet/ Modbus TCP,	S0, Ethernet with Modbus TCP,	S0, RS485/ Modbus RTU,	S0, Ethernet with Modbus TCP, PROFINET, PB	S0, Ethernet with Modbus TCP, PROFINET, PB	Ethernet with Modbus TCP	Ethernet with Modbus TCP, PROFINET, PB Ethernet/IP
Energy monitoring	SENTRON powermanager,- Powercenter 3000, powermind Web interface SIMATIC Energy Manager	SENTRON powermanager,- Powercenter 3000, powermind Web interface SIMATIC Energy Manager	SENTRON powermanager,- Powercenter 3000, powermind Web interface SIMATIC Energy Manager	SENTRON powermanager,- Powercenter 3000, powermind SIMATIC Energy Manager	SENTRON powermanager,- Powercenter 3000, powermind SIMATIC EnergySuite, Web interface SIMATIC Energy Manager	SENTRON powermanager,- Powercenter 3000, powermind SIMATIC EnergySuite, Web interface SIMATIC Energy Manager	SENTRON powermanager, Powercenter 3000, Web interface SIMATIC Energy Manager	SIMATIC Energy Manager

SENTRON measuring devices, energy monitoring and digitalization solutions

Optima
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Type	PAC1020	PAC1600	PAC1200	SEM3	Air circuit breaker	Molded case circuit breaker	Miniature circuit breaker COM	LV HRC fuse 3NA COM
Designation	7KM 	7KT 	7KT 		3WA 	3VA 	5SL6 COM, 5SV6 COM 	3NA COM 
Main field of application	Building & Infrastructure	Building & Infrastructure	Building & Infrastructure	Building & Infrastructure	Energy distribution	Energy distribution, feeder	Energy distribution, final circuit	Energy distribution
Installation type	Front mounting	Front mounting	Front mounting	Screw mounting	Fixed tray mounting	Fixed tray mounting	Standard mounting rail	LV HRC fuse base and fuse-switch-disconnector
Measured values	U, I, f, PF, P,Q, Ea, Er	U, I, f, PF, P,Q,S, Ea, Er, Eap	U, I, f, PF, P,Q,S, Ea, Er, Eap	U, I, f, PF, cosφ P,Q,S, Ea, Er, Eap,	U, I, F, P, cosφ, E, S, Q, THD, …	U, I, F, P, cosφ, E, S, Q, THD, …	U, I, f, P , cosφ, E, S, Q, temperature	I, temperature
Measuring function	Transformer 1 A, 5 A	Transformer 5 A, Direct 63/80 A MID	Transformer 5 A, Direct 40/63 A	Transformer 50…1200 A/0.1 A 1~ Variant	Integrated	Integrated	Integrated up to 32A	80 – 315A NH2 gG, gFF
Monitoring	-	Limits, Operating hours	-	Event log	Limits, Operating hours, Event log	Limits, Operating hours, Event log	Operating hours, Mechanical operating cycles, Short-circuit releases	Limits, operating hours, event logs
Communication	S0, RS485/ Modbus RTU,	S0, M-Bus, RS485/ Modbus RTU	Ethernet with Modbus TCP	Ethernet with Modbus TCP, RS485/Modbus RTU, BACnet	Ethernet with Modbus TCP, RS485/ Modbus RTU,	S0, Ethernet with Modbus TCP, RS485/Modbus RTU,	Wireless to the point of 7KN Powercenter 1000; from 7KN Powercenter 10000 with Modbus TCP	Wireless to the point of 7KN Powercenter 1000; from 7KN Powercenter 10000 with Modbus TCP
Energy monitoring	SENTRON powermanager, Powercenter 3000 SIMATIC Energy Manager	SENTRON powermanager, Powercenter 3000 SIMATIC Energy Manager	SENTRON powermanager, Powercenter 3000, Web interface SIMATIC Energy Manager	SENTRON powermanager, Powercenter 3000, Web interface SIMATIC Energy Manager	SENTRON powermanager,-, Powercenter 3000, powermind, SIMATIC EnergySuite, SIMATIC Energy Manager	SENTRON powermanager,-, Powercenter 3000, powermind, SIMATIC EnergySuite, SIMATIC Energy Manager	SENTRON powermanager, Powercenter 3000, powermind, Powerconfig App, and others via Modbus TCP SIMATIC Energy Manager	SENTRON powermanager, Powercenter 3000, powermind, Powerconfig App, and others via Modbus TCP SIMATIC Energy Manager

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Electrical energy measurement
Expansion of the measurement infrastructure - current transformers

Current transformers are a special form of transformers
These must be used where the expected current can't be measured directly (size, galvanic isolation).

Current transformer selection
... should be dimensioned according to the expected rated current in order to minimise the error

Accuracy
... for the system accuracy all errors of the components in the measuring system must be considered (transducer and measuring device)

Short circuiting current transformers
... the current transformer secondary circuit should not be opened under any circumstances when current is flowing in the primary circuit (destruction/danger of life).

	7KT120 ... *	3NJ69 ... – ... *	4NC5 … – ...*
			
Rated current Primary side	60 A ..150 A	50 A .. 600 A	50 A .. 1500 A
Rated current Secondary side	5 A	1 A/5 A	1 A/5 A
Accuracy class	1	0,5/1	1/3
Nominal load	1,25 VA … 3,75 VA	1,0 VA … 5 VA	2,5VA … 10 VA

https://support.industry.siemens.com/cs/document/85477190/

*compatible with Energy Meter 480VAC and Sentron PAC

Process instrumentation
for every customer need SITRANS product portfolio for other media at a glance

Flow Electromagnetic, Coriolis, Ultrasonic & Vortex

Temperature Rail, Field, Head, Sensor, Multipoint

Positioner

Level Capacitance, Radar and Guided wave radar, Ultrasonic

Pressure

Weighing

Software SITRANS Library, SIMATIC POM

Measuring non-electrical media
Selection depends on - qualitative and quantitative consideration

qualitative

Criteria for effectively selecting the right measurement

- Accuracy
- Cost
- Availability / Reliability
- Integration
- Monitoring
- Operation / parameterisation

quantitative

What number of measurements are necessary?

- Survey of existing operational measurements
- Percentage influence on energy management
- Efficiency increase through additional digital channels
- Stationary / Temporary

Measuring non-electrical media
Which measuring principle for which application

Measuring principle	Flow & heat can be detected with which measurement		
▪ Flow measurements * ▪ Heat meters * ▪ Temperature measurements * ▪ Pressure measurements ▪ Level measurements ▪ Weighing technology	Magnetic-inductive transducer	SITRANS FM	(flow)
	Vortex transducer	SITRANS FX	(pressure, temp & flow -> heat amount in one direction)
	Coriolis transducer	SITRANS FC	(Density, mass flow, temperature and fraction)
	Ultrasonic transducer	SITRANS FS	(flow – higher temperature up to 200°C)
	Ultrasonic clamp-on transducer	SITRANS FS	(flow – Very large nominal widths and retrofitting without intervention)
	Differential pressure transducer	SITRANS F P/O	(flow up to high pressure & temp)

* Mainly relevant for energy managem.

SITRANS FS: clamp-on ultrasonic flow measurement SITRANS FS220

The **external sensors** of the SITRANS F S clamp-on ultrasonic flowmeters can be **installed** quickly and easily **on the outside of the pipe**. This makes them **perfect for retrofitting** or for applications where opening the pipe is not possible due to corrosive or toxic liquids or high pressure.
The **cost-effective technology enables highly accurate measurements of liquids**
Suitable for liquids and gas measurements > 6 bar

- Cooling water, condensate water and glycol
- Chemicals (acids and alkalis)
- Crude oil and liquid gas

Installation without opening of pipes. No parts susceptible to dirt and wear. No pressure drop

Pipe diameter: DN 6 to DN 10000 with pipe wall thickness from 0.64 to 76.2 mm

Measurement accuracy: 1-2%

Communication possibilities:
Modbus RTU

SITRANS FM - electromagnetic flow measurement

The SITRANS F M electromagnetic flowmeters are designed to measure the flow rates of **electrically conductive liquids** such as

- water,
- chemicals,
- food and beverages,
- sludges, sewage and paper sludges and mining sludges containing magnetic particles.

Properties:
- Low-cost measurement if installation effort is manageable (otherwise clamp-on)
- **Communication modules can** be **easily exchanged or extended**
- **Self-sufficient use** through long-life battery supply (up to 10 years)
- **Wireless transmission** possible (e.g. GPRS/GSM modem)

Pipe diameter: DN 6 to DN 2000 mm

Measurement accuracy: 0.2 and 0.4% respectively

Communication possibilities:
Pulse output, 4-20 mA HART, Profibus PA/DP, Modbus RTU, Foundation Fieldbus

SITRANS FX - Vortex flow measurement
SITRANS FX330

Precise measurement of steam, gases, compressed air and conductive/non-conductive liquids
(no contamination/low viscosity/high flow velocity)

Properties:

- Completely redesigned to meet the **SIL 2/3 safety standard according to IEC 61508**
- Cost-effective energy calculation with **net heat quantity measurement by monitoring flow, pressure and temperature**
- **Integrated pressure and temperature compensation** for lower installation costs and higher accuracy
- Integrated nominal width reduction ensures high rangeability and thus more cost-effective installations and a lower risk of leakage

Pipe diameter: DN 15 to DN 300 mm
Measurement accuracy: 0.5%
Communication options:
4-20 mA HART, Profibus PA, Foundation Fieldbus

SITRANS FC (Coriolis - product family)
Mass flow measurement

Suitable for **gases and liquids with air inclusions - even with low flow velocity**

Properties:
- Space-saving due to small size
- Integrated temperature compensation
- **High measurement accuracy** over a wide flow measuring range
- Measurement of non-conductive liquids

Pipe diameter: DI 1.5 to DN 150 mm
Measurement accuracy: 0.1% **mass flow measurement**
Communication options:
4-20 mA HART, Profibus DP/PA and Modbus RTU

SITRANS P family
Pressure measurement without ifs and buts

Portfolio

SITRANS P is our portfolio for measuring **gauge pressure, differential pressure and absolute pressure**.
In addition to **high measurement accuracy and robustness**, the modular system is characterized by **outstanding user-friendliness** and functionality as well as a **perfect safety concept**.

Communication options:
4-20 mA HART, Profibus PA, Foundation Fieldbus

Innovations

SITRANS P320/420

- Faster control for more efficient processes
- New, larger and improved display acc. to Namur NE107 and quick start wizard
- Simple, advanced commissioning, patented Remote Safety Handling
- Communication protocol according to current HART 7 standard, including long tag support

SITRANS T family (temperature)
TS500 - Because every degree is important

The SITRANS T series are the professionals for temperature measurement, even under extreme conditions.
Whether in hot, cold or hazardous areas

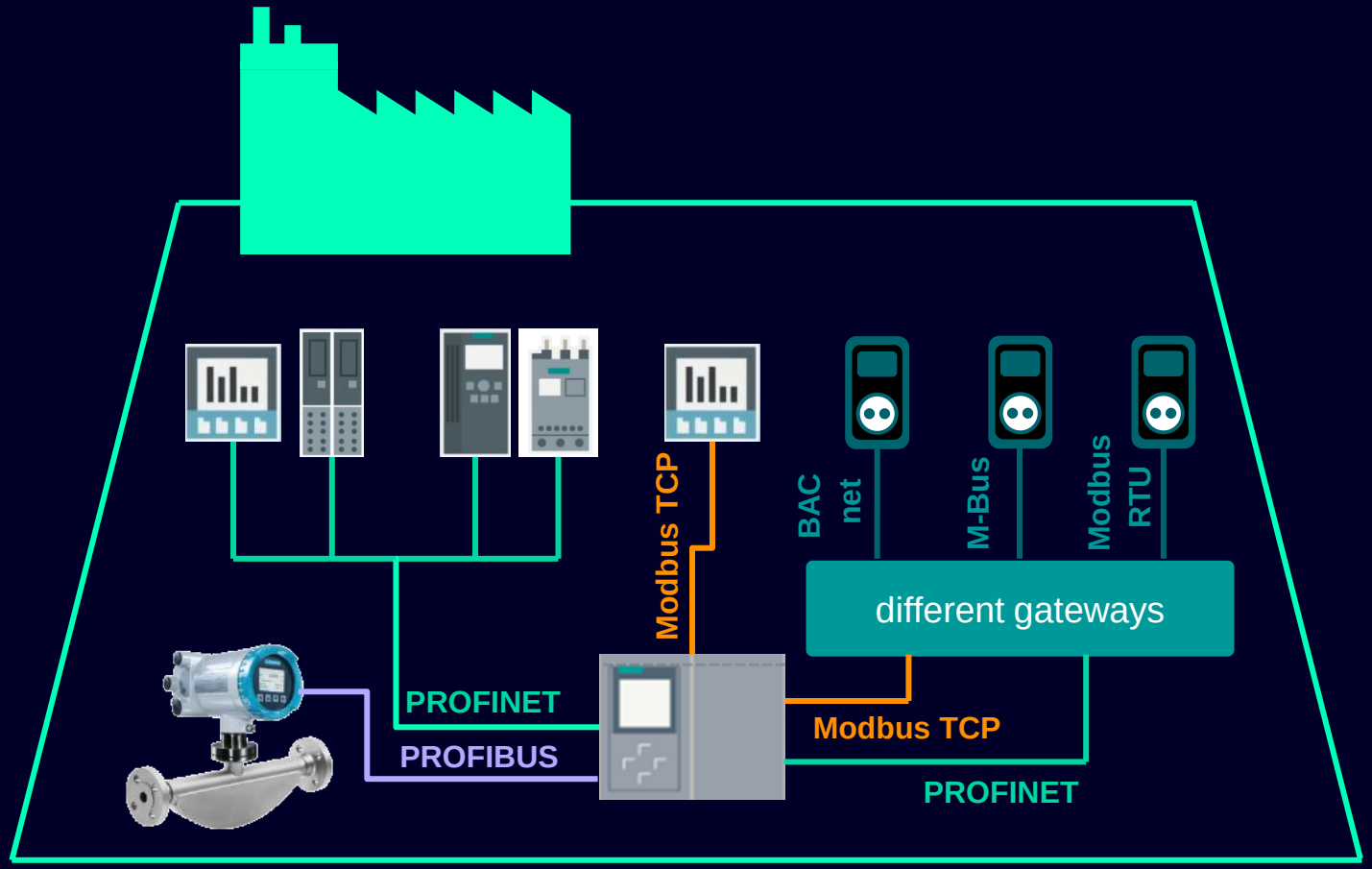
The communicative SITRANS T meets all the expectations, whatever the industry.

Whether you're looking for sensors, or transmitters for head, rail or field mounting – all are available as a complete measuring point or individually.

Our cost-effective SITRANS T transmitters offer high precision in every application and are quick and easy to connect to thermocouples or resistance thermometers.

Communication options:
4-20 mA HART, Profibus PA, Foundation Fieldbus

Connection of the measuring instruments



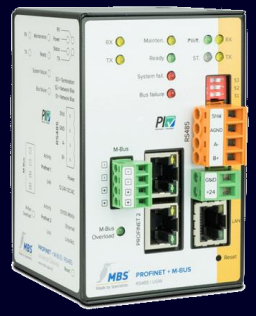
Step 2 – Acquisition of consumer

- Acquisition of the individual consumer or connection of the measuring instruments by means of an acquisition unit (e.g. S7-1500 CPU)
- Connection of SIEMENS field/measuring instruments via PROFINET, PROFIBUS, HART, Modbus
- Connection of third-party devices, if applicable via gateway; frequently used communication types:
  - BACnet (gateway required)
  - M-Bus (gateway required)
  - Modbus TCP (no gateway)
  - Modbus RTU (gateway required)

Connection of the measuring instruments
Examples of gateways for fast PROFINET communication

Siemens gateways M-Bus/BACnet – PROFINET

- Gateway for PN/BACnet – MLFB: 6BK1621-0AA00-0AA0
- Gateway for PN/M-Bus – MLFB: 6BK1622-0AA00-0AA0
- Configuration of the hardware in TIA Portal



MBS gateway M-Bus/BACnet - PROFINET

- Gateways from MBS are generally recommended by Siemens
- Double-X series converts M-Bus and BACnet signals into PROFINET telegrams
- Configuration via built-in web server

SIMATIC
Energy Suite

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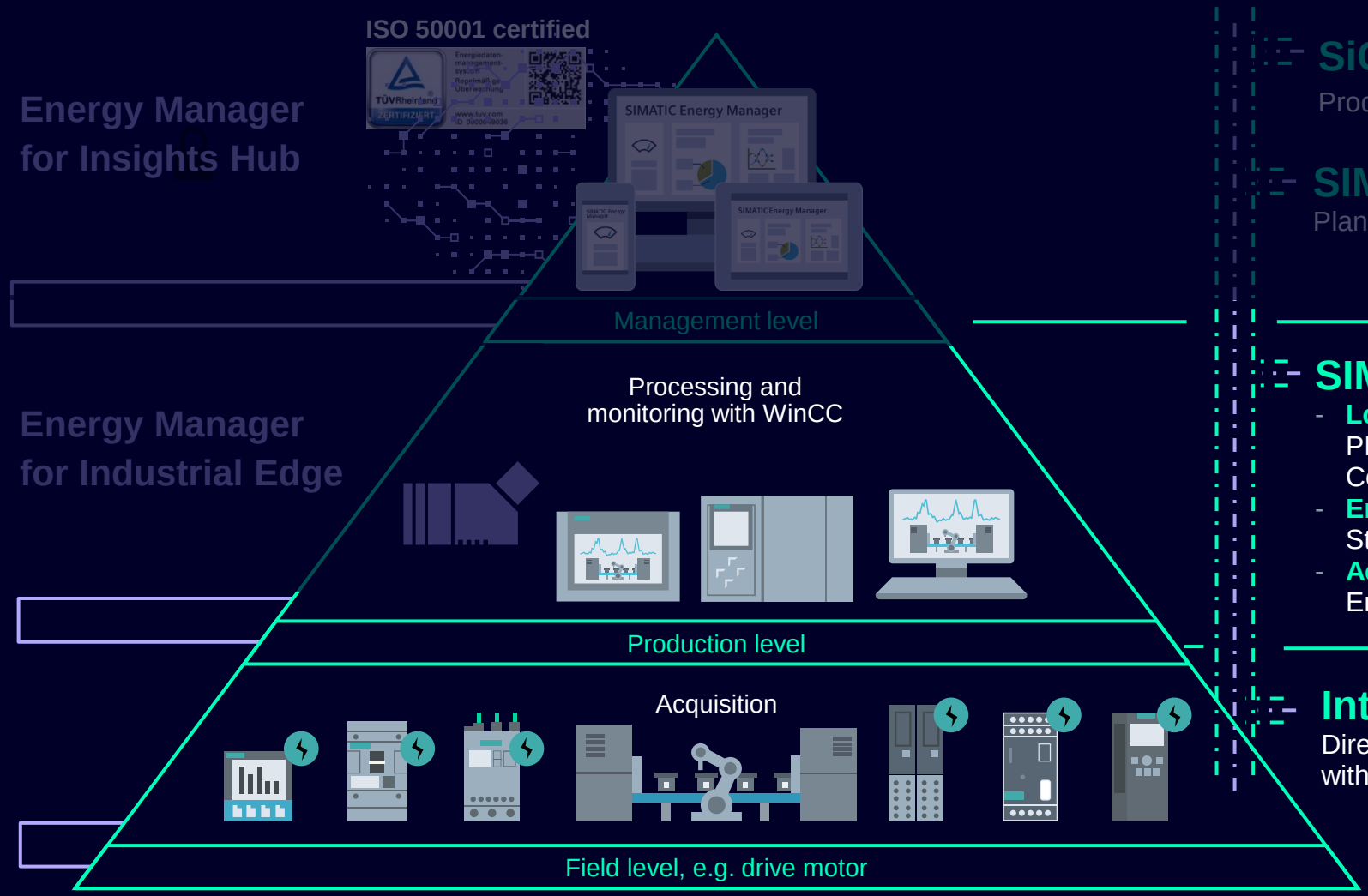
SIEMENS

Resource Transparency
SIMATIC Energy Suite - Acquisition



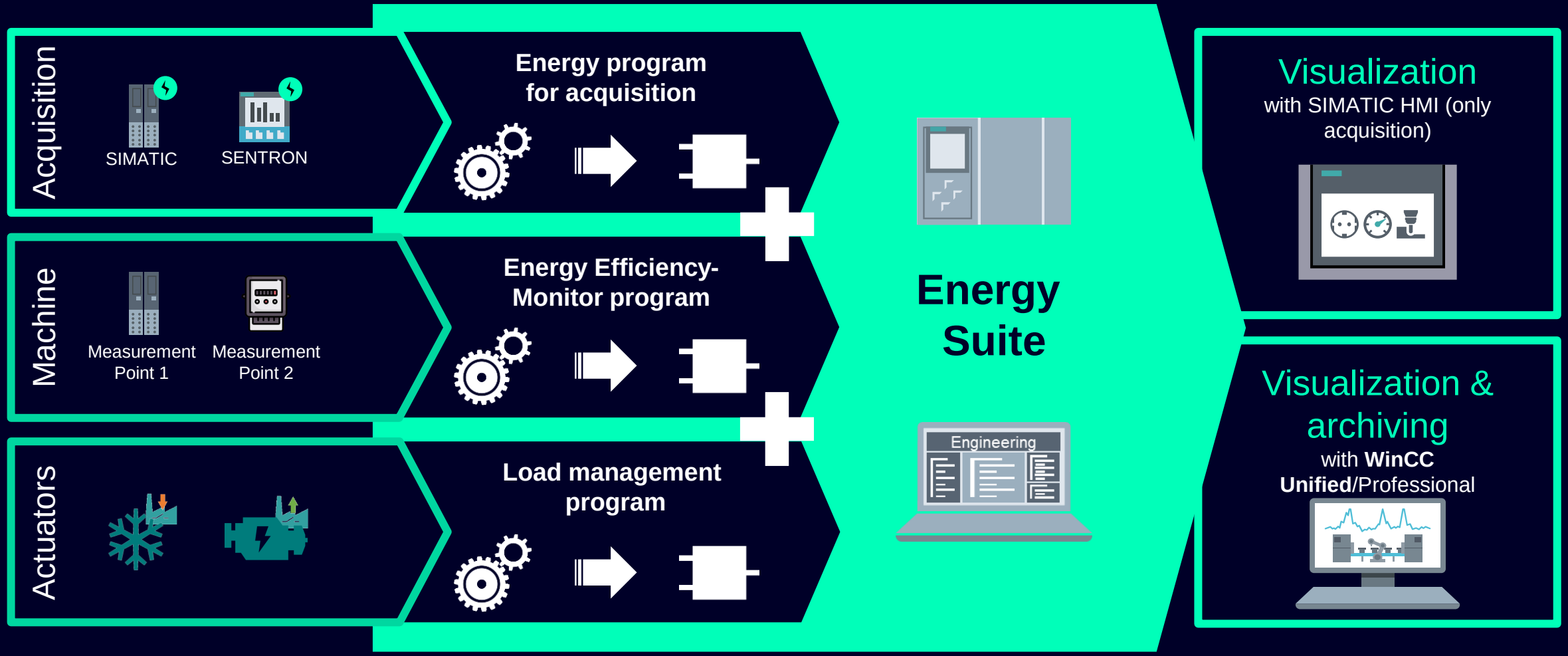
SiGREEN
Product Carbon Footprint

SIMATIC Energy Manager
Plant and company-wide energy analysis

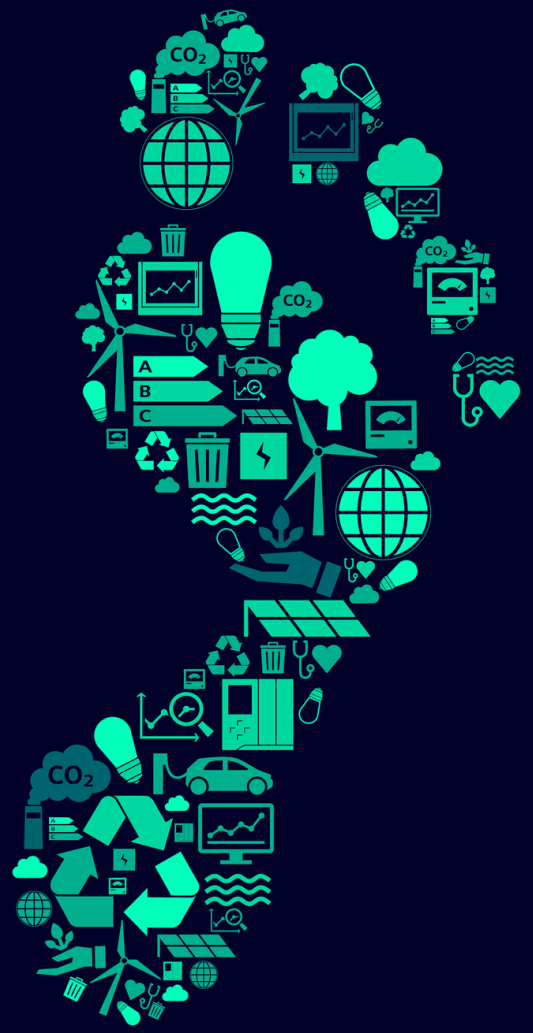
SIMATIC Energy Suite
- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency Monitor**
  Standardized efficiency evaluation of machines
- **Acquisition**
  Energy data acquisition

Integrated energy measurement
Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

Resource Transparency
Integration of data acquisition in the Energy Suite



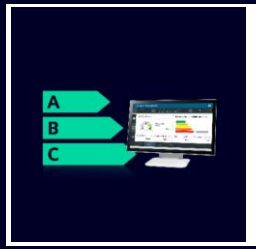
SIMATIC Energy Suite V19



ENERGY DATA ACQUISITION

To be able to plan and implement energy efficiency measures reasonably, continuous and reliable data collection is required. It is an essential prerequisite for a goal-oriented energy management system that supports the implementation of savings through the creation of data transparency.

The SIMATIC Energy Suite efficiently links energy management with automation and thus brings energy transparency to production. Its tasks include the acquisition and processing of energy data at the automation level, as well as their visualization using WinCC Comfort/Advanced or WinCC Unified/Professional.



ENERGY EFFICIENCY-MONITOR

Now that the goal of energy transparency has been achieved, the next step is to evaluate the collected data to define targeted savings measures. A buzzword in this context is the energy efficiency of machines or entire plants. The aim here is to optimize their operation and consume energy only when they are used productively.

The Energy Efficiency-Monitor for Machines is part of the Energy Suite. Based on energy values and machine status, the module generates status-related average consumption of up to ten measuring points of different media (electricity, flow, compressed air, etc.). This allows machines with similar functionality to be compared regarding their energy efficiency.

PEAK LOAD MANAGEMENT

The structure of energy costs in an industrial environment is different from that of households. One additional factor is the power price, which is calculated from the highest average consumption during a 15-minute period. To avoid that peaks a load management system can be used.
Peak load management can be used to control the power consumption of the infeed in such a way that it does not exceed a defined average value at the end of the calculation period. For this purpose, consumption values are analyzed in real time to be able to react to potential load peaks in the best way and at an early stage. These reactions consist of coordinated switching on and off, of actuators (loads, producers and buffers). The consumption and the actions can be visualized in WinCC Unified.

BASE LOAD MANAGEMENT

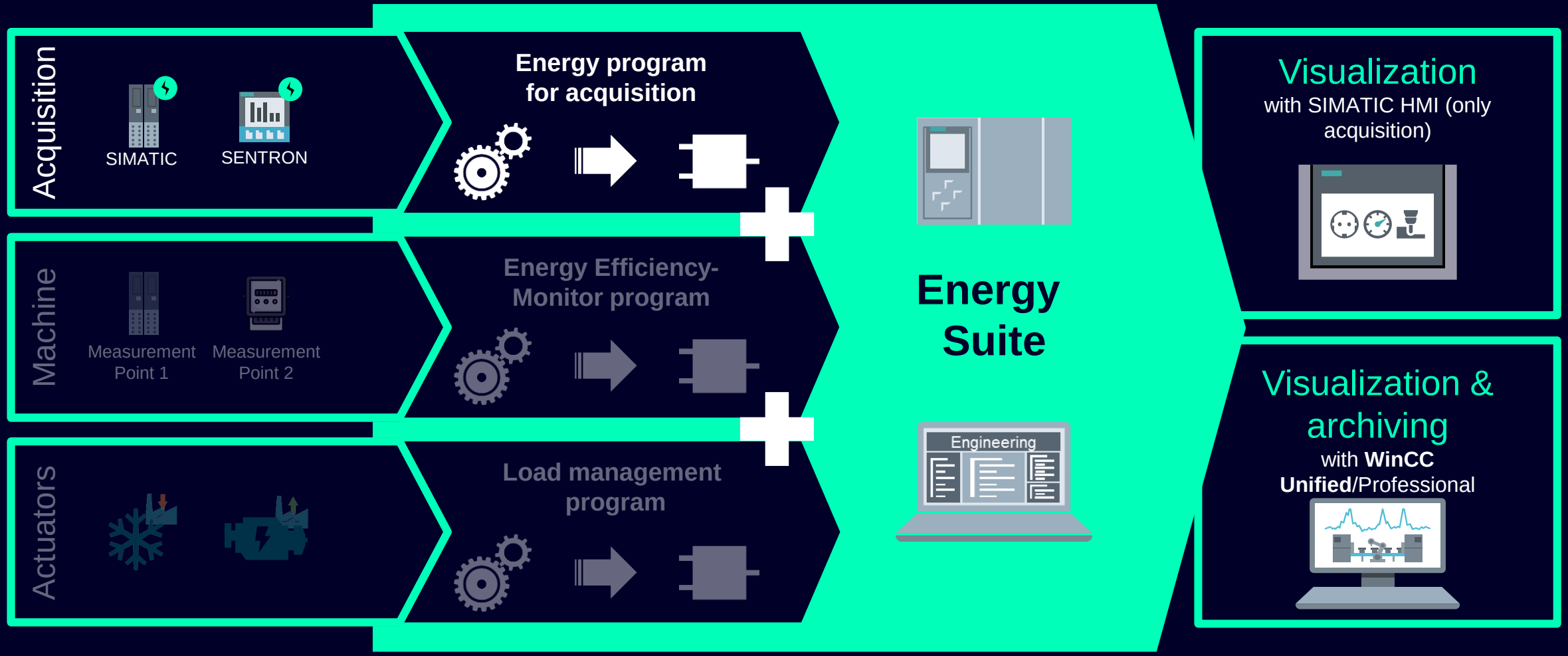
For certain applications, it is helpful to ensure that the load profile is as uniform as possible. The performance should be kept within a defined range between a maximum and a minimum value. The associated functionality is referred to as base load management.

Base load management is an additional functionality of the Energy Suite. This allows the power consumption of a specific application (e.g., a charging park) to be regulated in real time. To guarantee this behavior, the system switches user-defined consumers or generators. The consumption as well as the individual actions can be visualized in WinCC Unified.

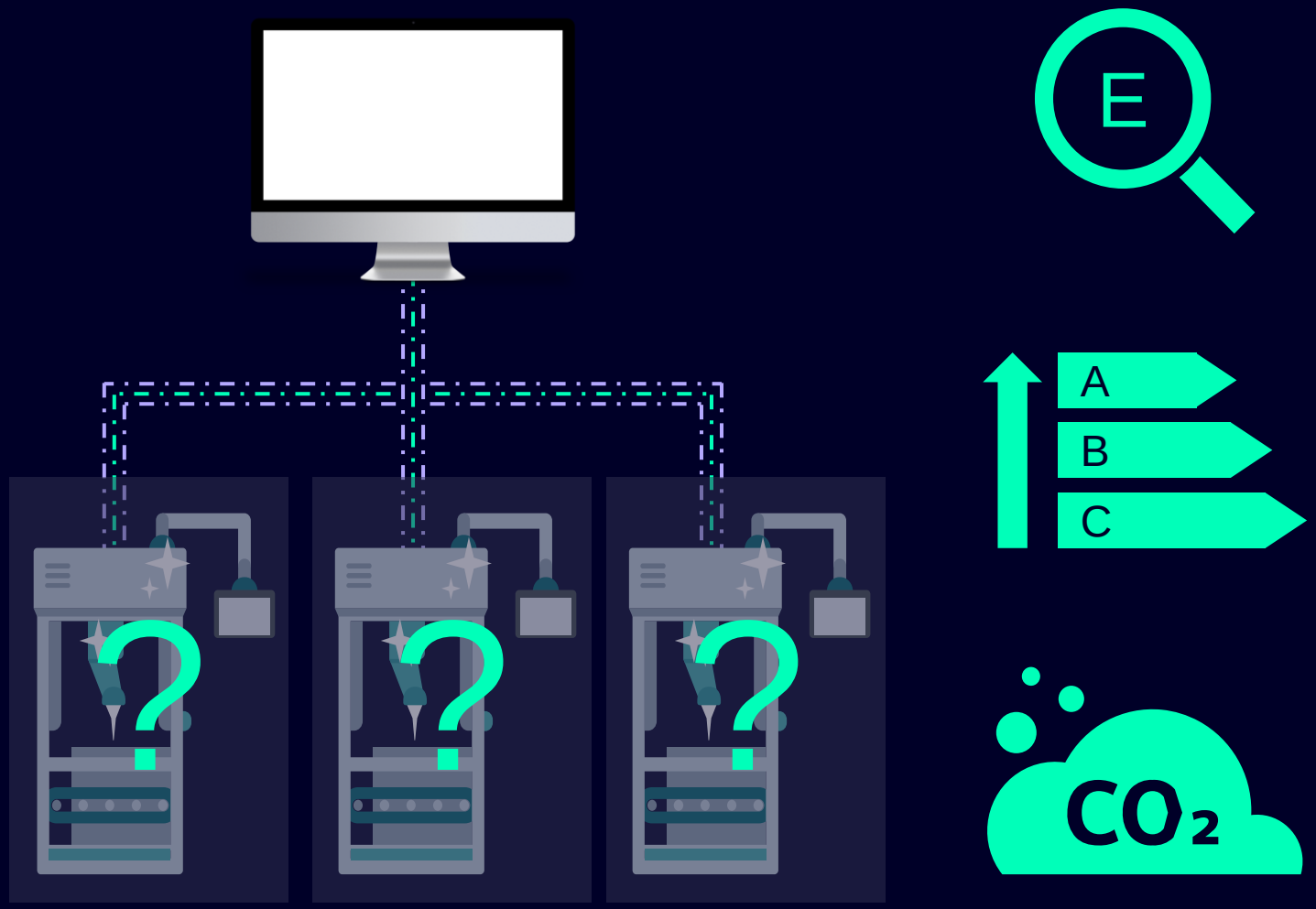
SIMATIC
Energy Suite Acquisition – Sales Slides

SIEMENS

Resource Transparency
Integration of data acquisition in the Energy Suite



Resource Transparency
is one of the keys to sustainability



Resource Transparency

Use Case scenario

- Due to rising energy prices, it is becoming increasingly important to have **transparency of the media consumption** of machines
- In addition, an **efficiency increase** must be provable
- **Carbon footprint** mandatory in the future, therefore energy consumption of machines is necessary

Challenge

- Transparency of all energy flows on machine level
- Comparable consumption data over all machines
- KPI calculation based on value add consumption and production
- Tracking of efficiency measures

Resource Transparency
Energy data acquisition and visualization

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Energy Transparency

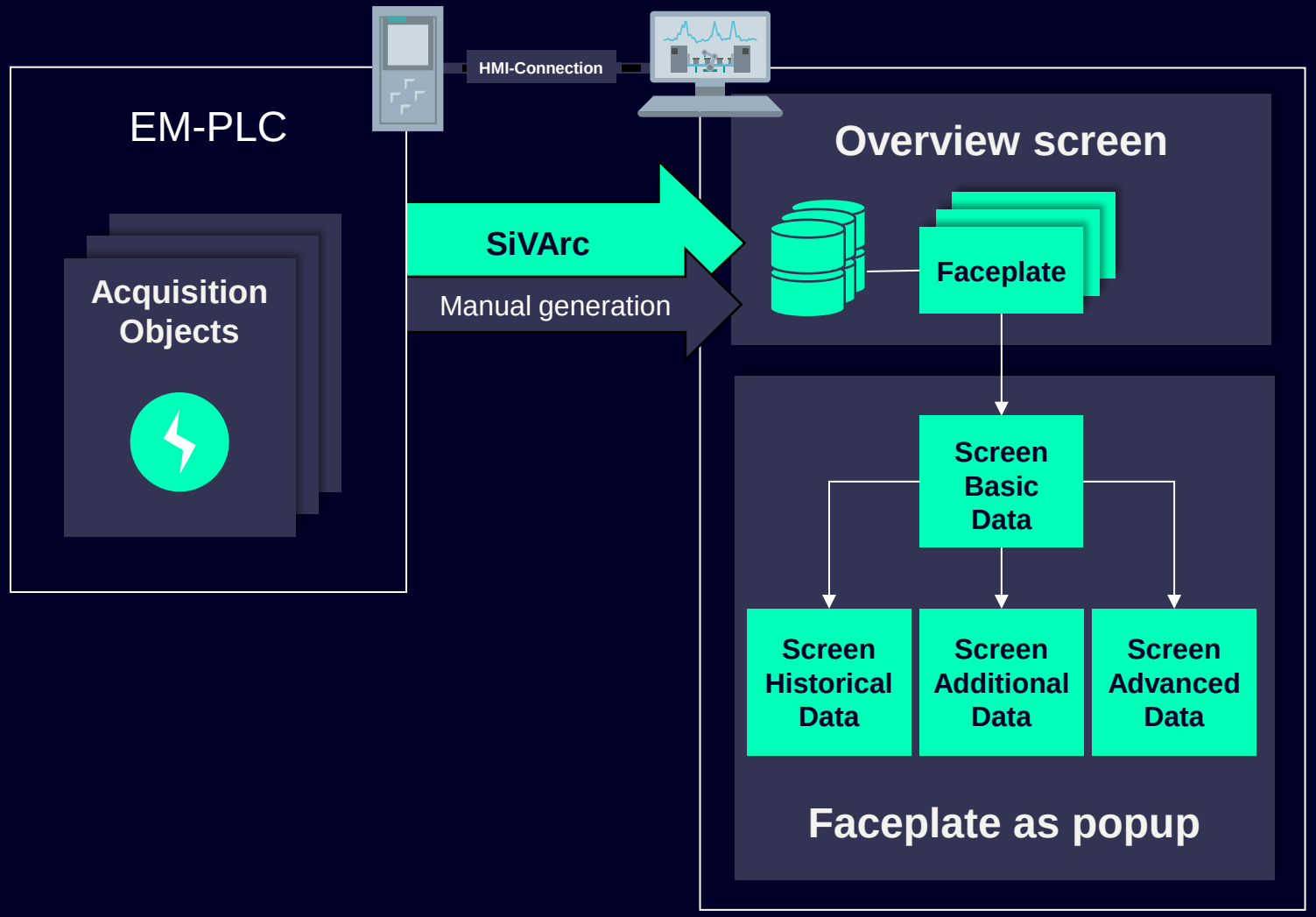
Situation
- No transparency on energy demand in production environment
- No clue how to increase energy efficiency

Requirements
- Energy transparency within the production by linking production and energy data
- Increased energy data availability through archiving and intelligent buffering

Benefits
- Consistency and scalability with integrated solution in automation
- Derive measures to increase energy efficiency

SIEMENS

Resource Transparency
Visualization of energy data in WinCC Unified

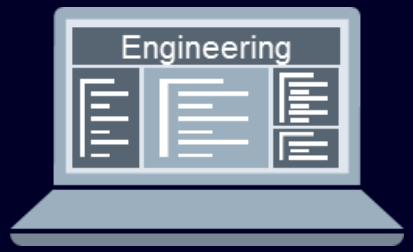


Energy Suite visualization with SiVArc for WinCC Unified

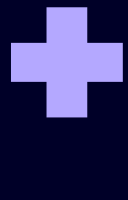
- Basic requirement: **Existing HMI-connection**
- All **screens** are realized as faceplates
- SiVArc rules for the Energy Suite can be **automatically generated**
- Tool generates one **faceplate** and the **data household** for **each** Acquisition Object
- **Detail view** of measurement point is opened in a **pop-up**
- Possibility to **open several faceplates** (i.e., acquisition objects) in parallel
- **Optimized design** and **architecture** for a perfect user experience in WinCC Unified

Transparency starts at the field level -
Licensing concept for acquisition in the Energy Suite

Engineering license



Runtime licenses



- Two packages to purchase Energy object licenses
  - Package of 5 EnOs
  - Package of 10 EnOs
- Currently not downloaded directly to the PLC
- Number of packages adjustable in hardware config

Licensing in two steps

- **Engineering license** to open and work with the Energy Suite in the TIA Portal (license needs to be activated in ALM)
- Second part are **runtime licenses** for acquisition objects on the PLC
- Concept: **“Energy Objects”** as **currency** to license acquisition and actuator objects
  - 1 Acquisition object ≙ **1** Energy object
  - **1 Actuator object** ≙ **9** Energy objects
- Engineering license already **includes 10 Energy object** license for a basic configuration
- SiVArc license and all runtime tags for WinCC Unified/Professional/Advanced included in Energy Suite license
- Logging tags needs to be licensed

SIMATIC Energy Suite
Load management – Sales Slides

Proactive load management in the production - Easy and integrated

SIEMENS

What are energy cost factors?

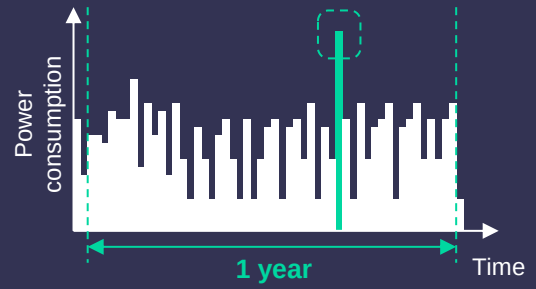
Taxes

- Energy and electricity taxes

Tax relief through ISO 50001 certification

Capacity charge

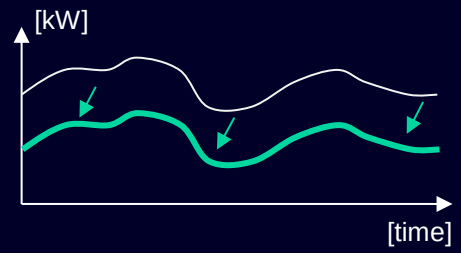
- Power supply company guarantees maximum load
- Capacity charge = largest 15 min. slice over a year x price per kW



Minimization of largest 15-minute-interval

Unit price

- Based on consumed energy
- Consumed energy x price per kWh
- Analogous to private households

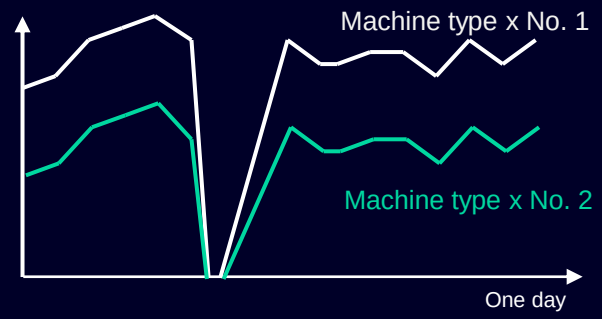


Reduction of the overall consumption

Transparency starts at the field level –
Analysis of the data and planning of actions

Machine optimization

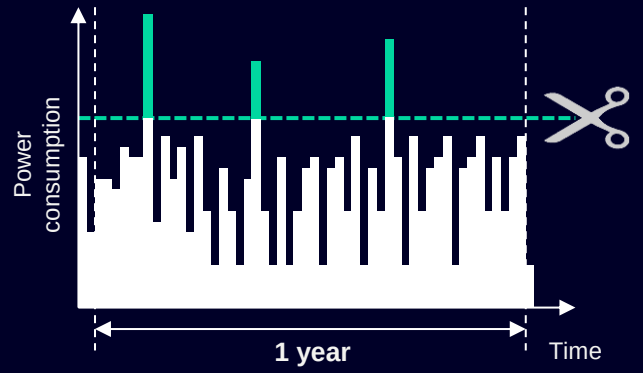
- Machine of the same type requires more energy for the same tasks



Optimization potential or preventive maintenance

Load peak once a year

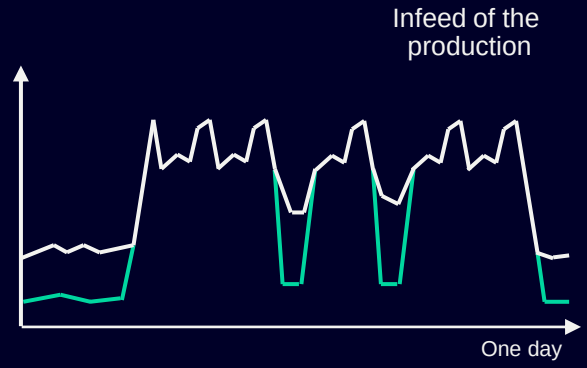
- High power price due to only one load peak in the whole year



Installation of a peak load management to lower the capacity charge

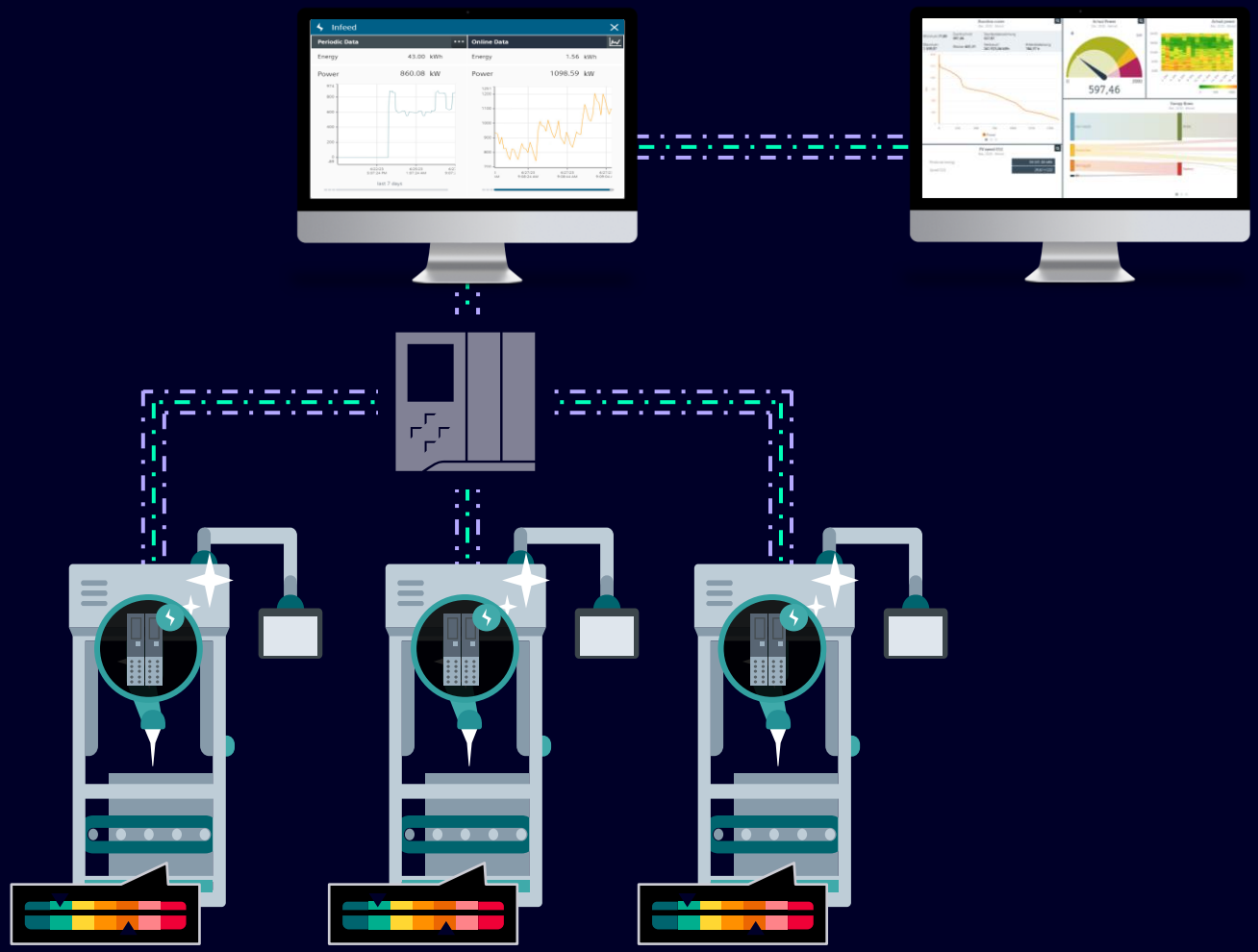
Non-productive times

- High energy consumption even during non-productive times



Switching off unneeded parts of the machine to reduce consumption

Resource Flexibility
is the key to optimize consumption



Resource Flexibility

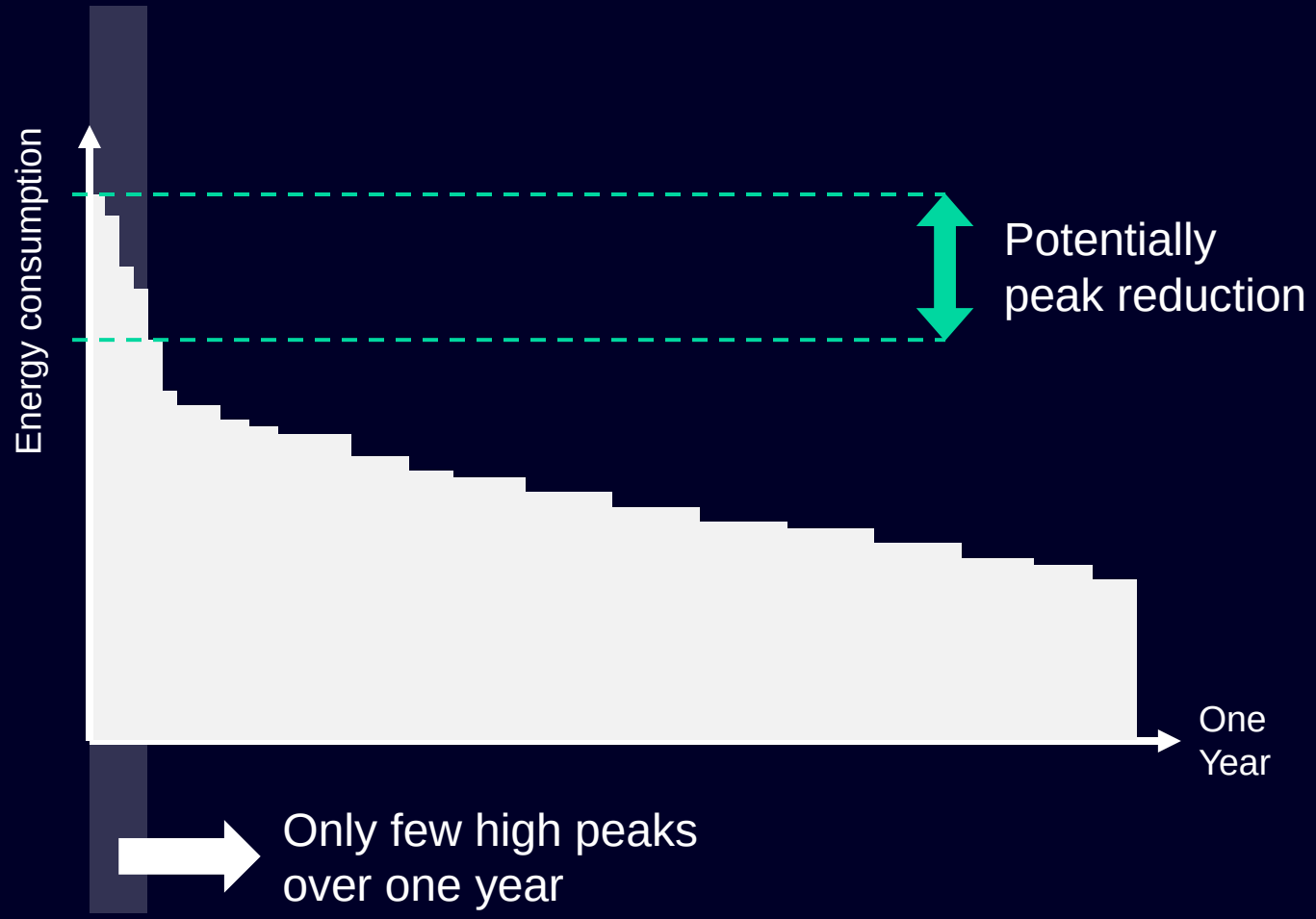
Use Case scenario

- Energy transparency and analysis installed in the factory
- After several months, customer wants to analyze the consumption to find ways to optimize energy costs
- Peak smoothing seems like a tool to avoid violating a power limit contracted with the energy supplier

Challenge

- Avoid violating average power limit
- Automated switching of aggregates to reduce stay within a certain power limit
- Include different kind of an aggregates to not influence the production during switching

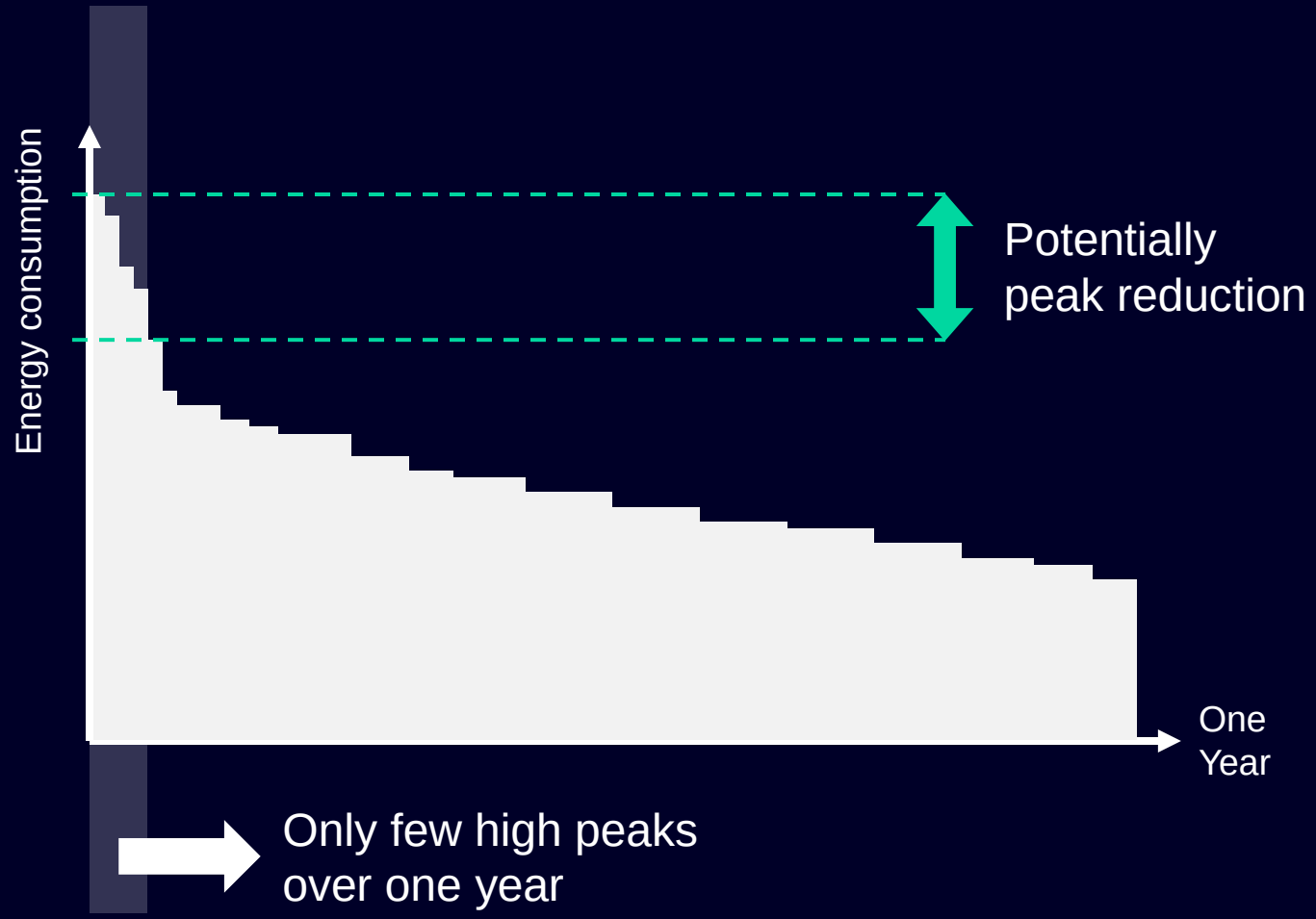
Peak Load Management
Requirements for peak load management systems



Application requirements for peak load management

- Analysis of suitability of peak load management for customer application after at least ½ - 1 year of data acquisition
- Duration curve of the infeed can be used for analysis
  - All 15-minute consumptions over certain period of time (best one year) on the x-axes
  - Consumed energy on the y-axes
  - 15-minute values sorted from the highest (left) to the lowest consumption (right)
- Criteria for suitability is a small peak of 15-minute values on the left ➔ This means, peaks rarely occur and can probably be prevented
- Flat curve means constant consumption ➔ Permanently used consumers needs to be switched off in case of LMGT

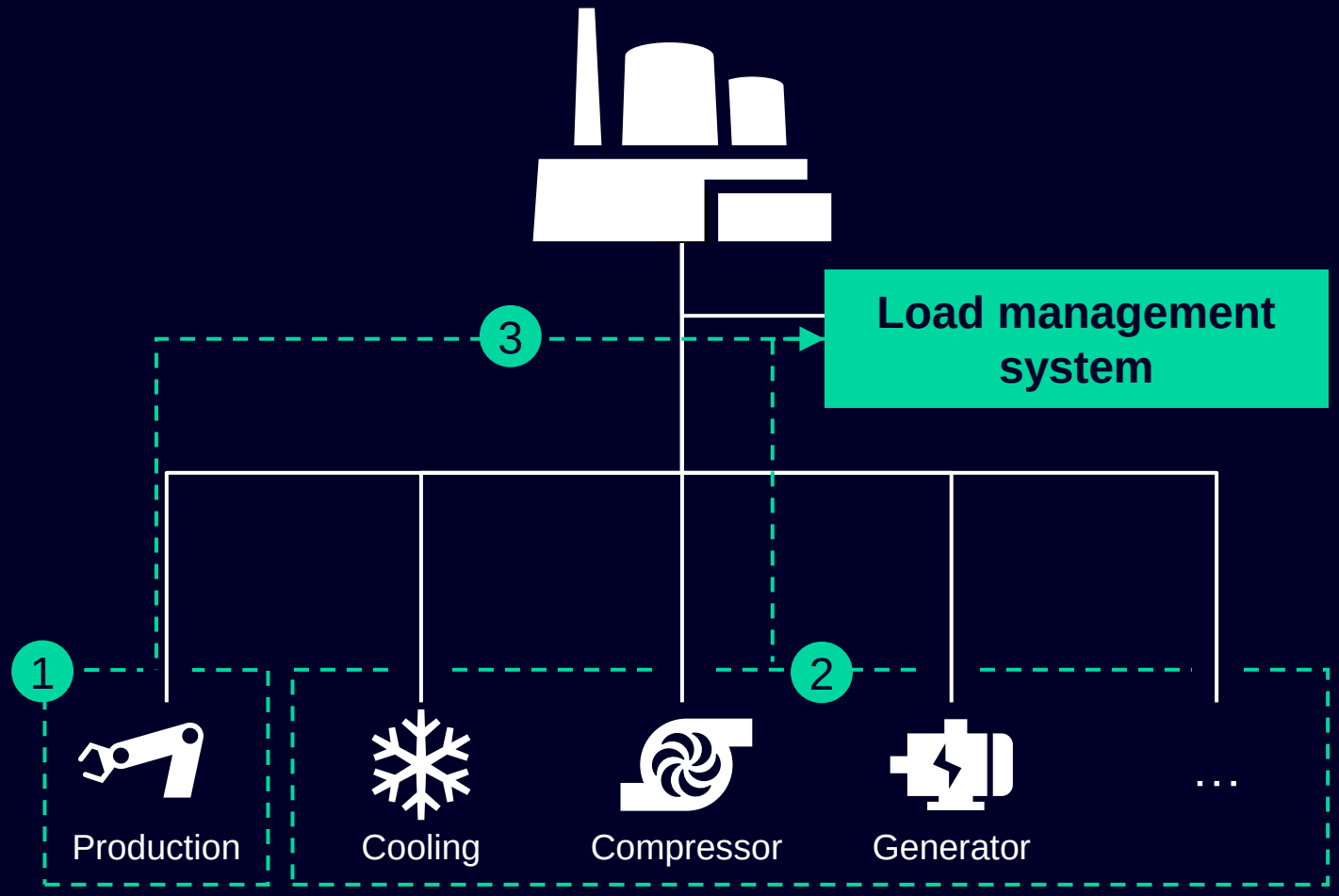
Peak Load Management
Possible saving potentials



Possible saving potentials – example calculation

Old peak value	5.0 MW
Reduction potential	5%
New peak limit in LMGT	4.75 MW
Price per kW	120 €/kW
Potential saving per year	250 kW * 120 € **30.000 €**

Peak Load Management
Functionality of a general peak load management system



Functionality of a general load management system

- Customer requirements for a peak load management system
  - Avoidance of load peaks by limit regulation
  - Integration of existing measuring points
  - High availability of the system
  - Scalability of the system, e.g. integration of future e-car charging areas
  - Production process should not be influenced by the system
- General functionality and advantages of a peak load management system
  1. Avoiding load peaks without influencing the production process
  2. Automatic regulation of the system by switching defined actuators
  3. Feedback of actuators to system

Peak Load Management
Switching of actuators

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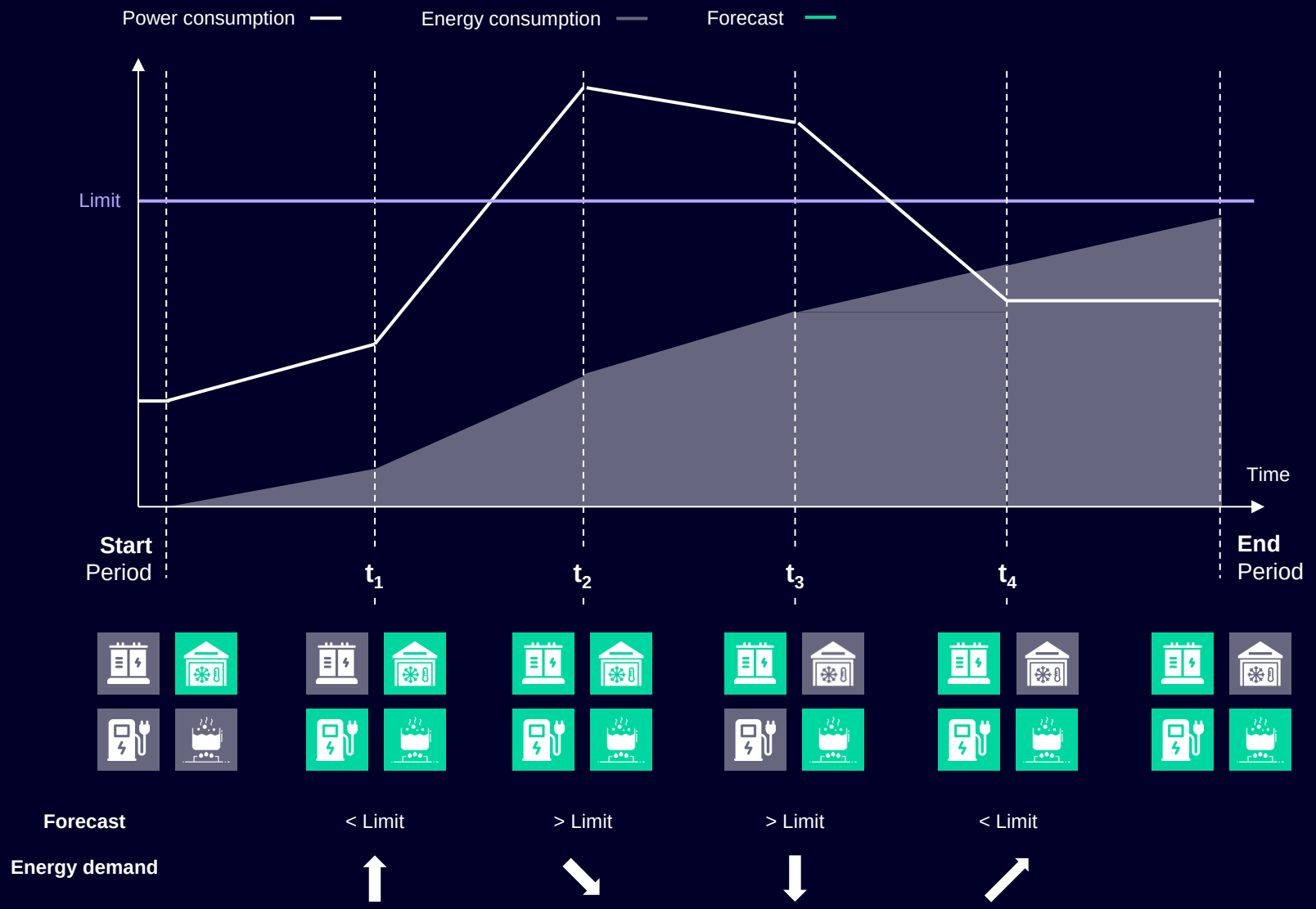
Actuators

1 Generator

2 Cooling Warehouse

3 eCar Charging

4 Water Boiling



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Base Load Management
General functionality of a load management system

Average value	> Upper limit	Allowed area	< Lower limit	Allowed area
Consumption level	↓	→	↑	→

Functionality of a base load management system

- Continuous analysis of the actual power value (resp. an average over the past i.e. 10 seconds)
- Regulation of the system according to relation between average value and the user-configured limits
  - Average > Upper limit
    ➔ Consumption level will be reduced
  - Average < Limit
    ➔ Consumption level can be increased
- Example:
  - t1 – Average > Upper limit ➔ Consumption ↓
  - t2 – Average = OK ➔ Consumption →
  - t3 – Average < Lower limit ➔ Consumption ↑
  - t4 – Average = OK ➔ Consumption →

Base Load Management
Switching of actuators

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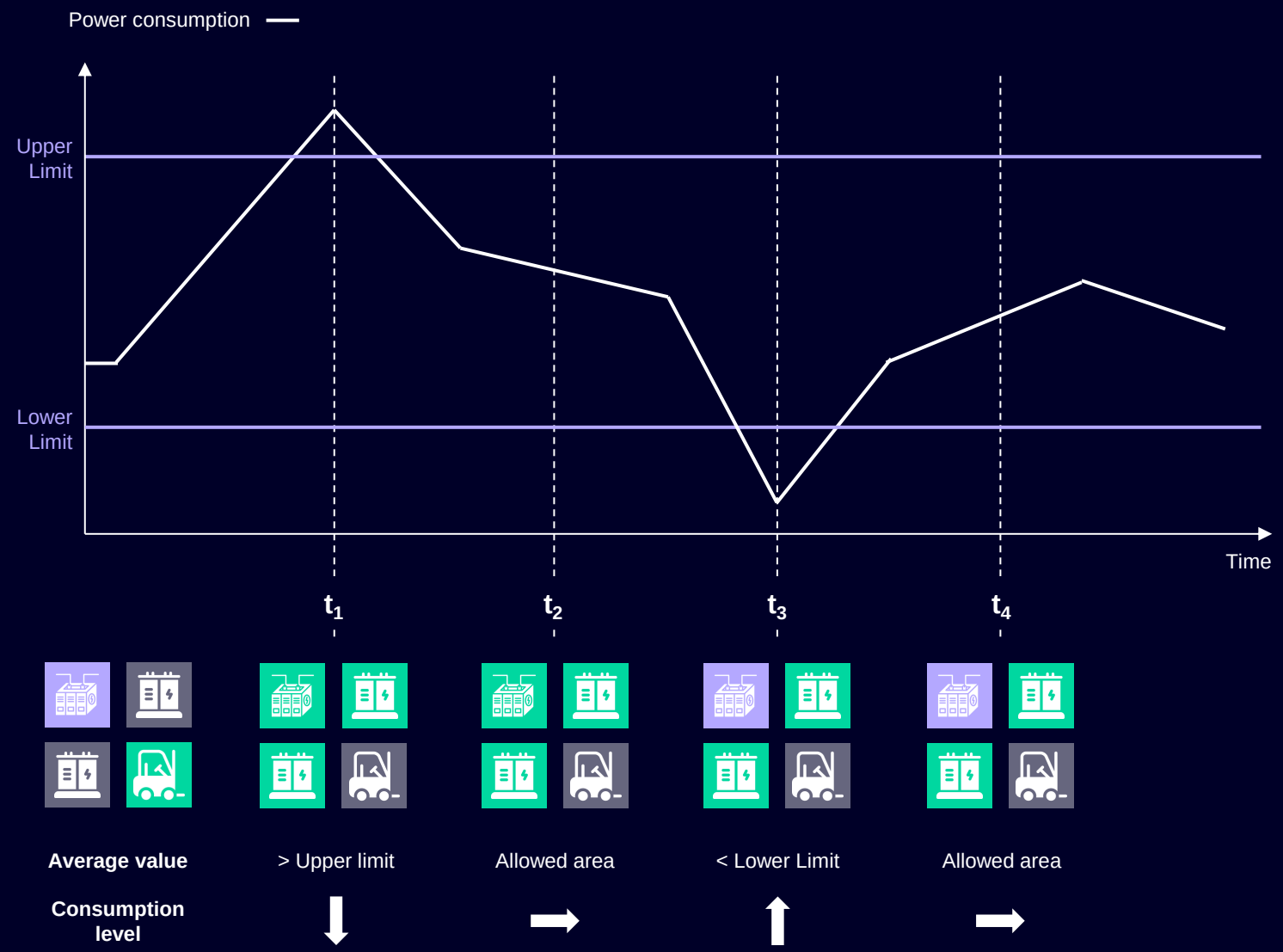
Actuators

- Battery storage
- Generator 1
- Generator 2
- Forklift charging



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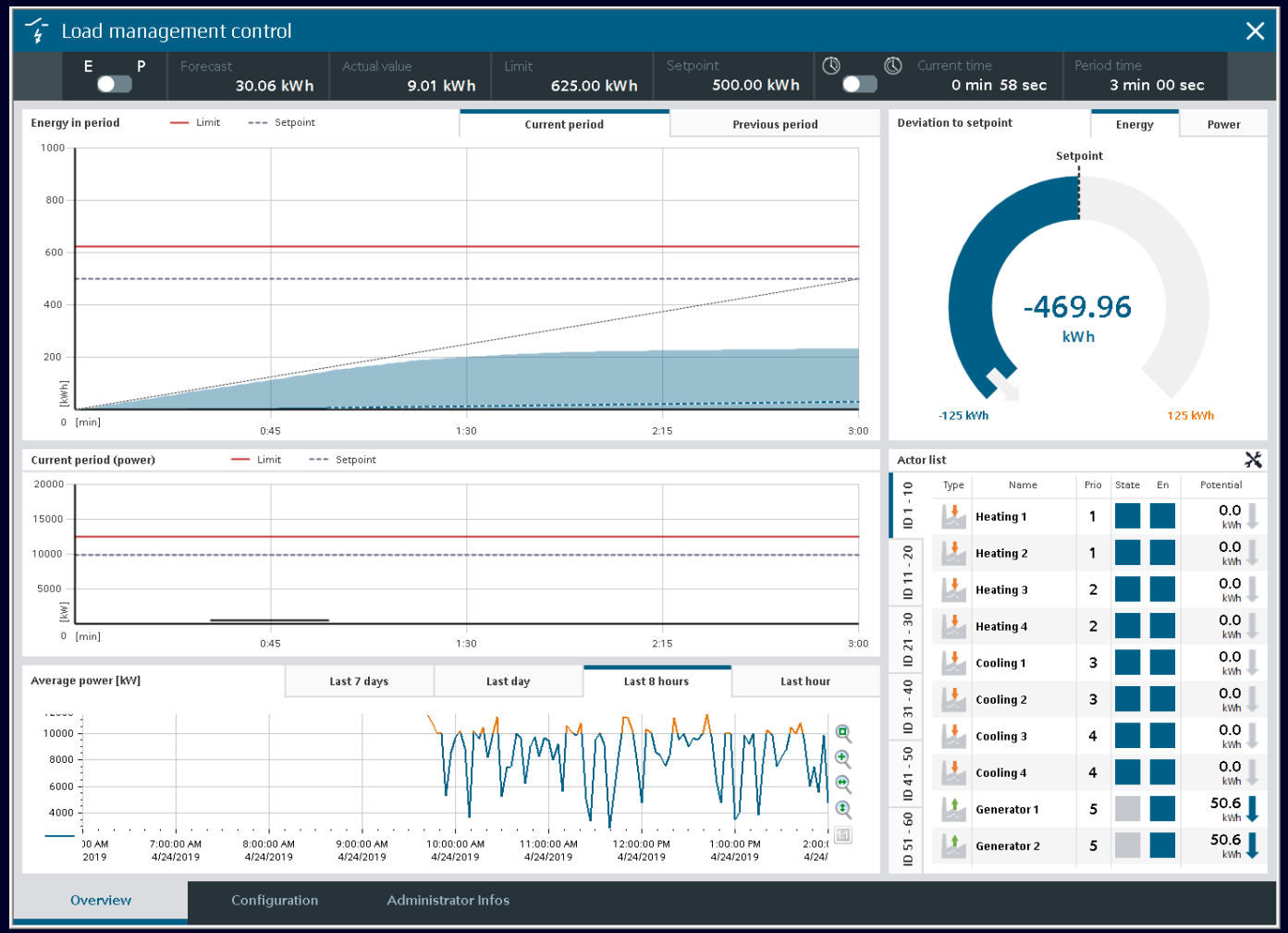
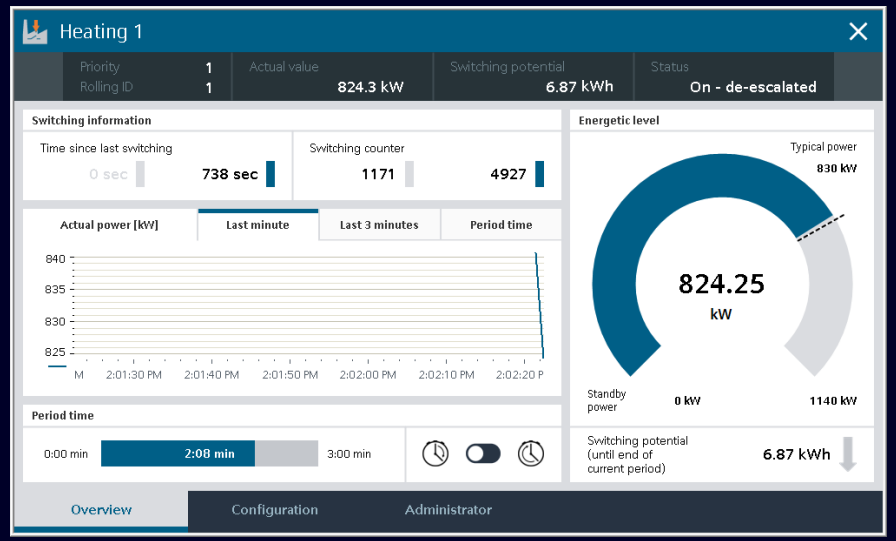
SIMATIC Energy Suite load management
Visualization example





Overview of the load management

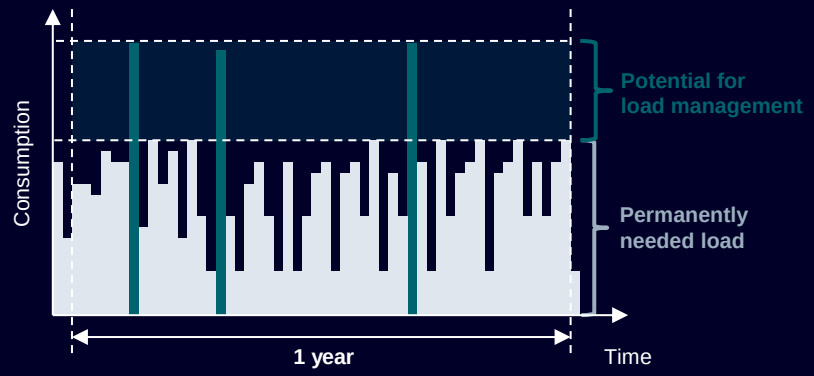
- Presentation of the previous and current period using a triangle diagram
- Historical values of the infeed up to 7 days
- List of all actors including status and configuration possibility

Detail view per actuator

- All relevant information at a glance
- Subsequent configuration possible
- Operation of the manual mode

SIMATIC Energy Suite load management –
When do I achieve the ROI?

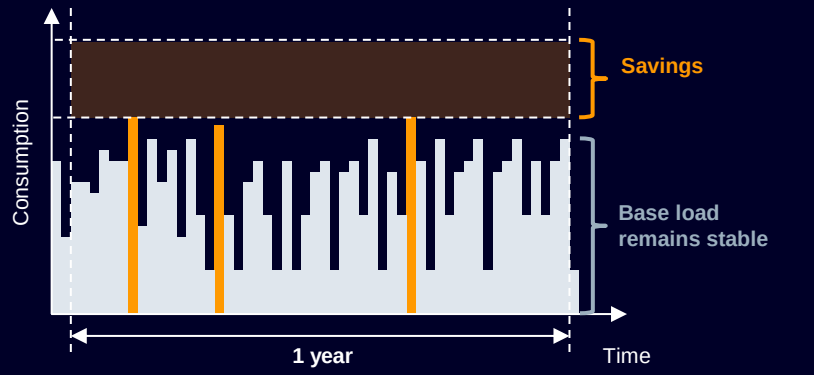
Exemplary use case



Highest load peak:	9.000 kW
Price per kW/year:	100,00 €/kW
Capacity Charge per year:	900.000,00 €

Costs of LMGT

Hardware (PLC, Server,…):	30.000,00 €
Software (EnS, WinCC):	5.000,00 €
Licenses for actuators (80x):	9.600,00 €

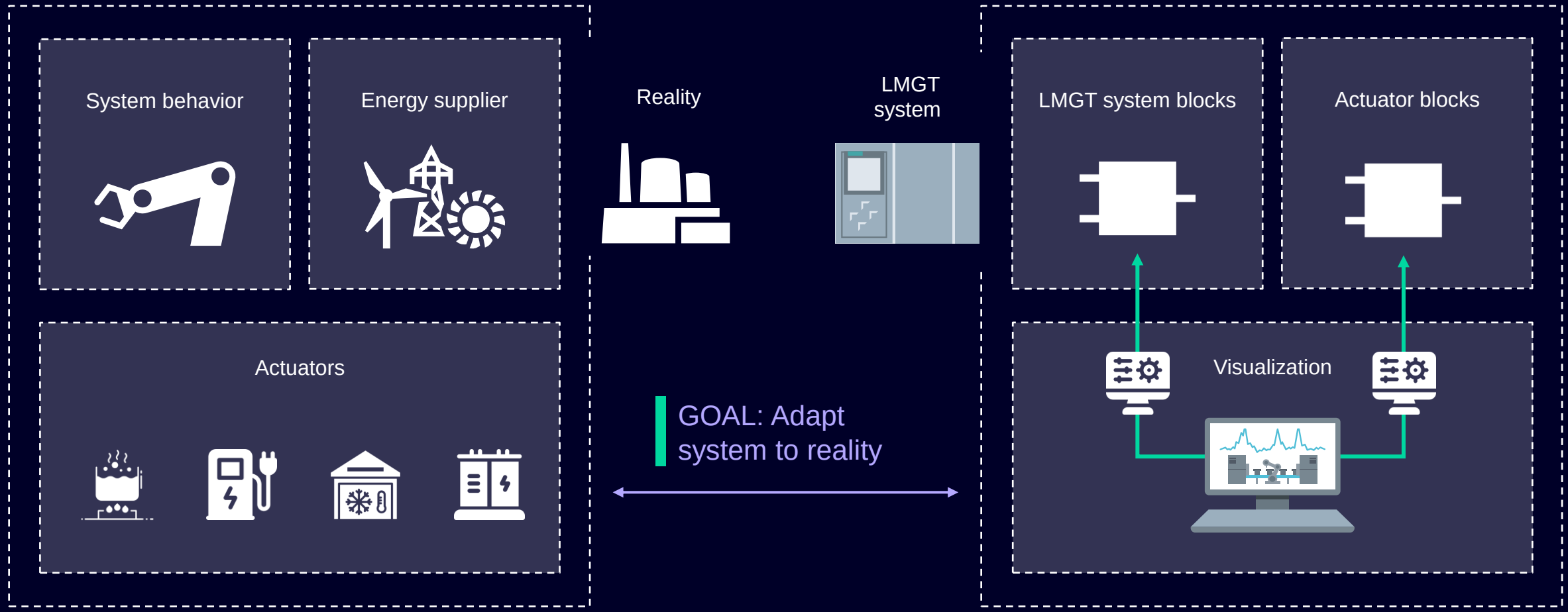


Highest load peak:	8.000 kW
Price per kW/year:	100,00 €/kW
Capacity Charge per year:	800.000,00 €

Return on Invest (ROI)

Savings per year:	100.000,00 €
Costs for LMGT:	44.600,00 €
Return of Invest (ROI):	0,45 years

Peak Load Management
Load management system must be adapted to reality



SIMATIC Energy Suite load management –
License concept

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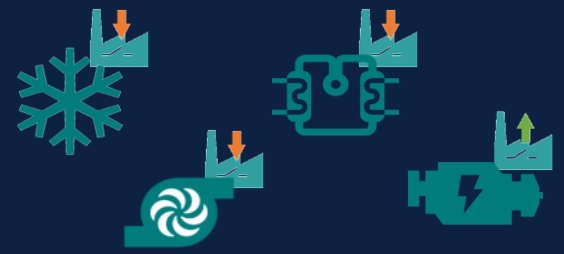
Concept

Acquisition objects

- **One** energy object license per acquisition object

CoL

Actuator object



- **Three** energy object licenses per actuator object

CoL

PLC

- Energy object licenses as a kind of "currency", usable for **acquisition objects as well as actuator objects**
- Licenses as **bundles of 5 or 10**

Example

24x Acquisition objects

➔ **24x** Energy object licenses

30x Actuator objects

➔ **270x** Energy object licenses

Total: **294x** EnO licenses

➔ e. g. **29x 10** bundle
+ **1x 5** bundle

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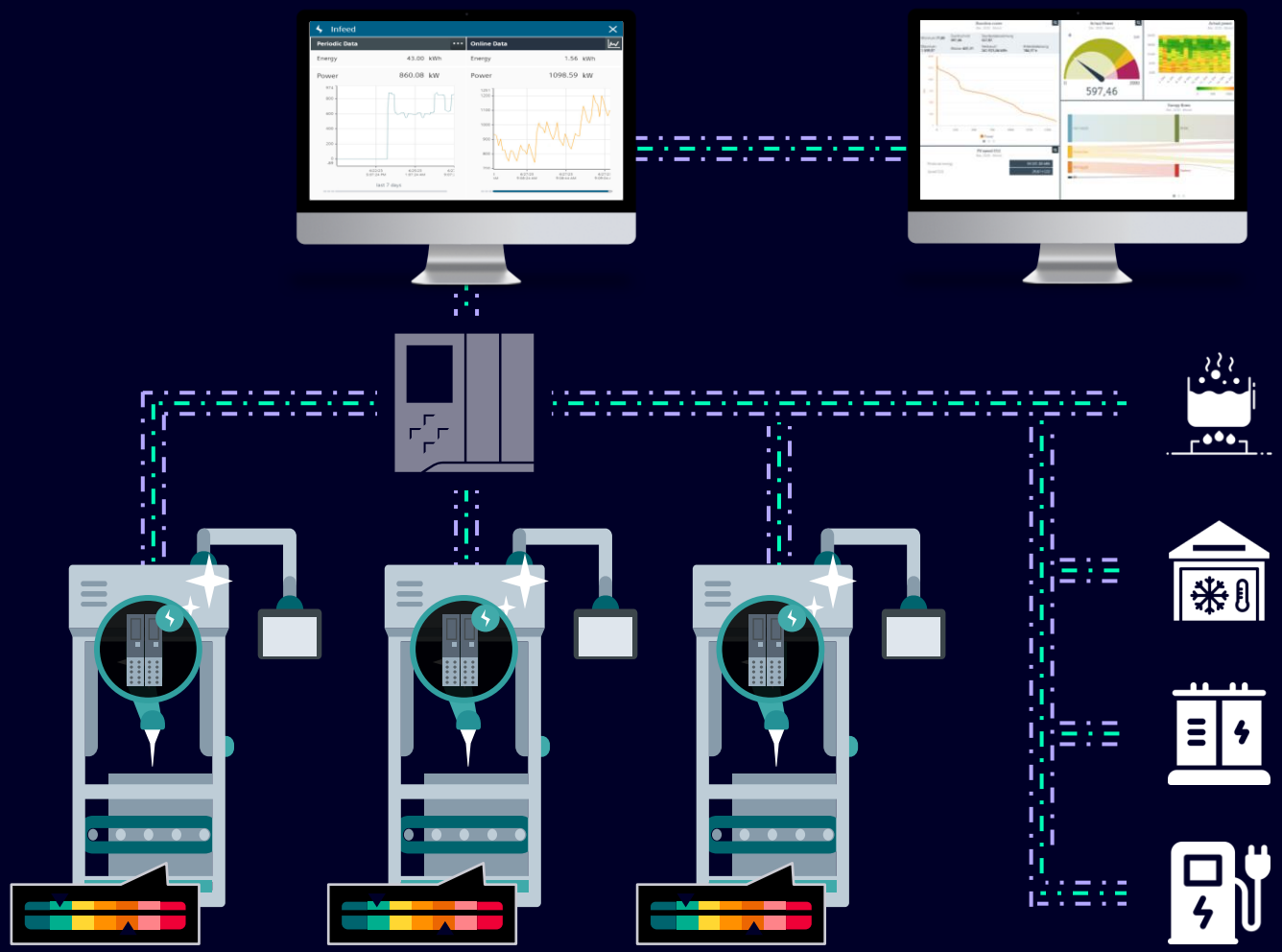
Resource Flexibility
is the key to optimize consumption



Resource Flexibility

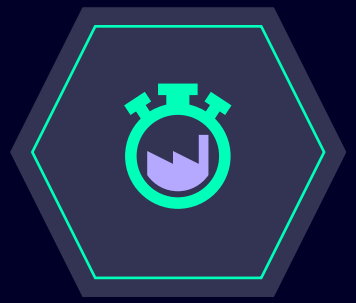
Use Case scenario

- Energy transparency and analysis installed in the factory
- After several months, customer wants to analyze the consumption to find ways to optimize energy costs
- Peak smoothing seems like a tool to avoid violating a power limit contracted with the energy supplier

Challenge

- ✓ Avoid violating average power limit
- ✓ Automated switching of aggregates to reduce stay within a certain power limit
- ✓ Include different kind of an aggregates to not influence the production during switching

Peak load management
Benefits and Values



Short amortization

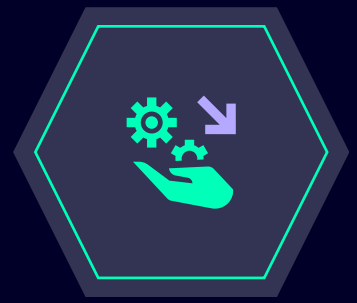
The limitation of the average power due to avoidance prevent contractual penalties leading to short amortization time

Ensured software quality

- Due to standardized software module and libraries.
- High flexibility for future expansion

Automated regulation

Limit based switching of defined aggregates inside a plant to keep the average power within a defined limit

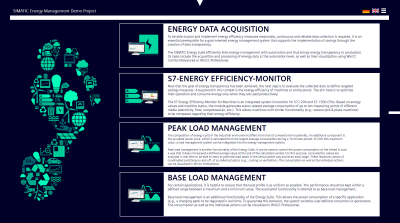


Less engineering effort

- Due to guided engineering, the system is easy to implement
- Easy know-how transfer for employees

Demo Project
Screen hierarchy

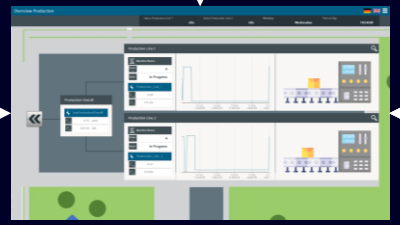
Start screen



Overview of the
Energy Suite products

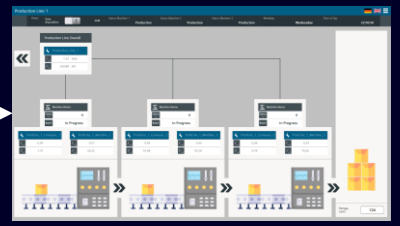
eCar loading park
Base load management

Factory overview
Peak load management
Data acquisition



Production lines overview

Production line 1
Energy Efficiency Monitor



Production line 2
Energy Efficiency Monitor

SIMATIC
Energy Suite – Tech Slides

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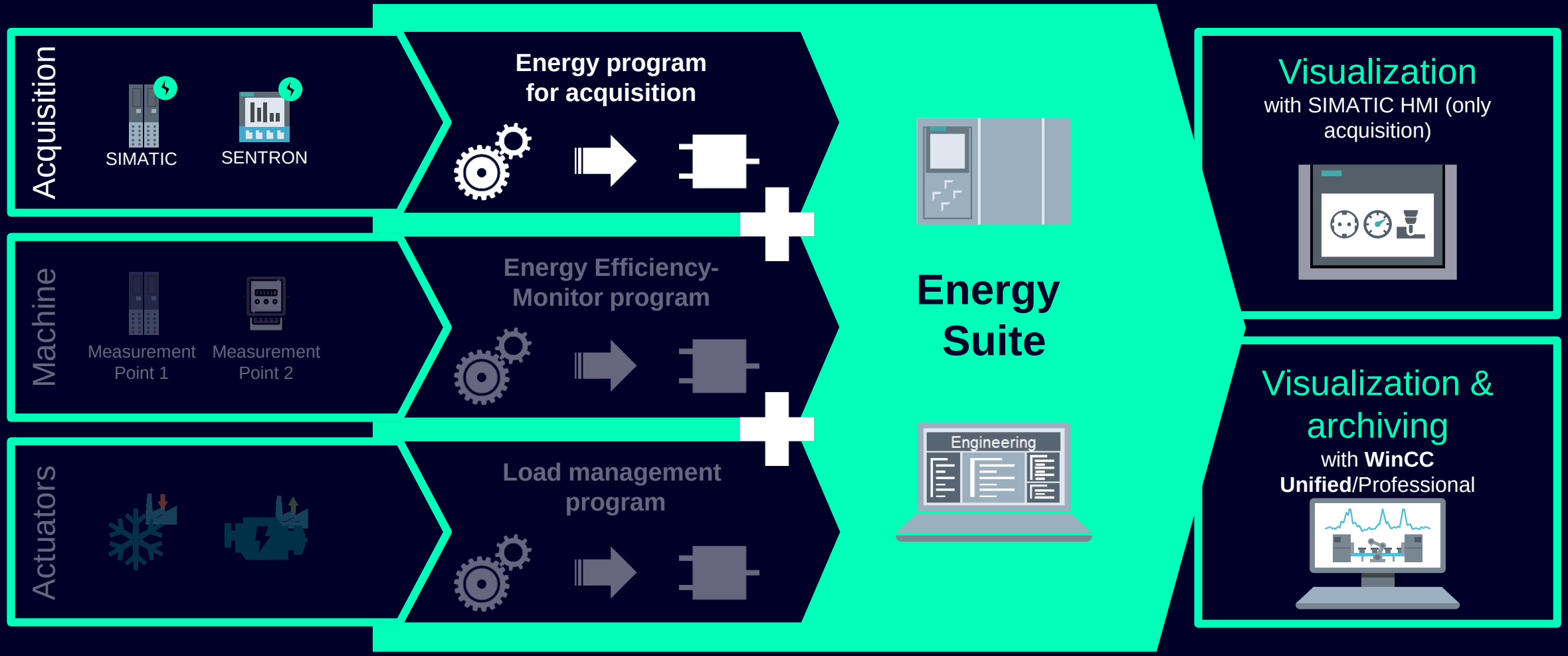
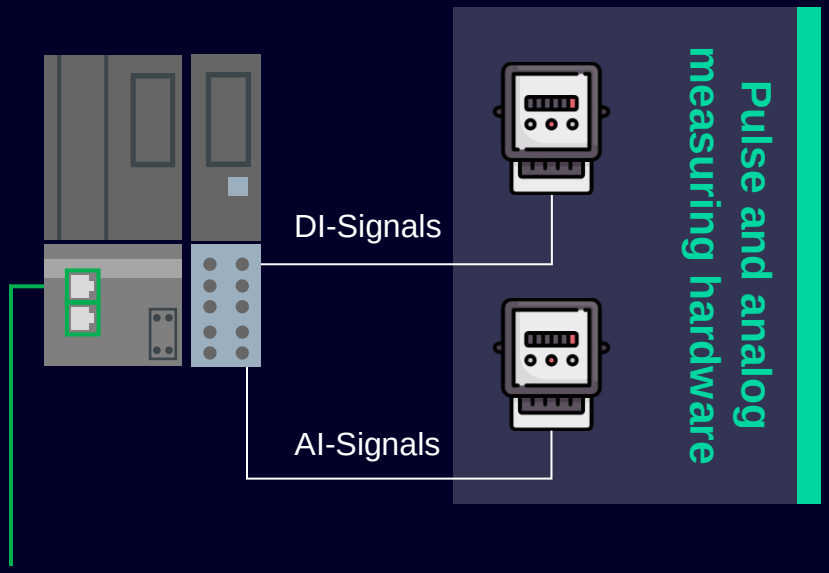
SIEMENS

Resource Transparency
Integration of data acquisition in the Energy Suite



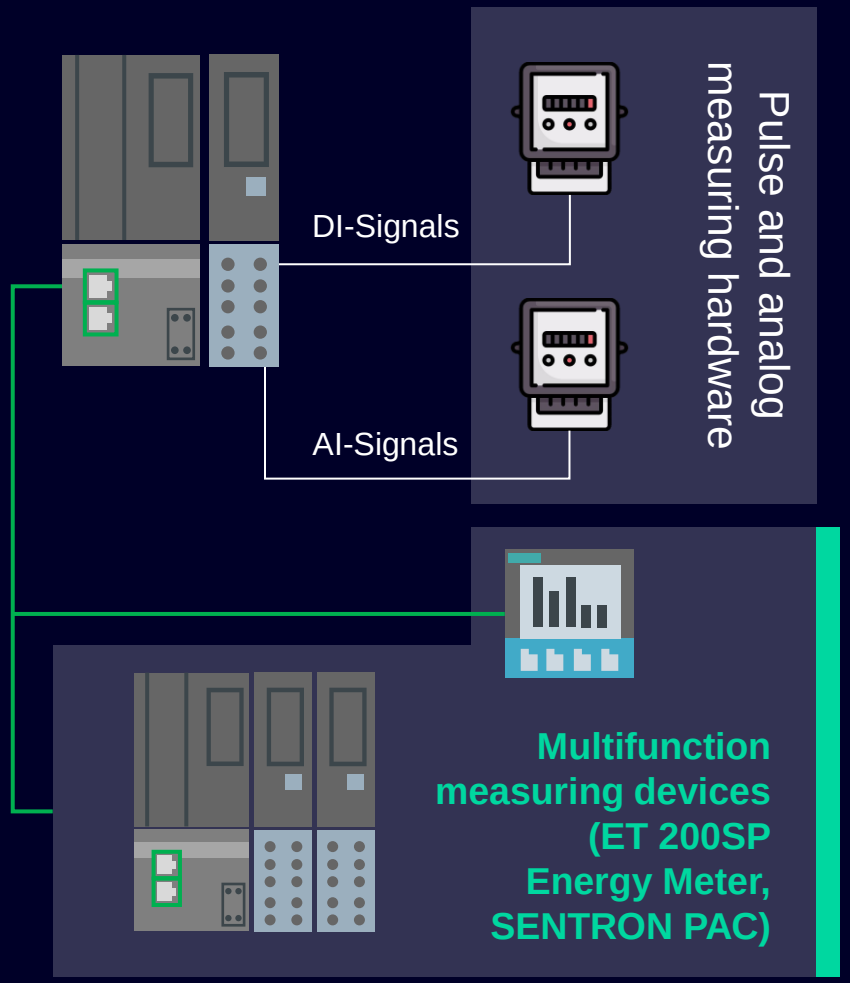
Transparency starts at the field level -
Energy data acquisition hardware concept



Hardware concept for energy data acquisition

- Integration of **existing** and **additional measurement hardware** in the SIMATIC Energy Suite
  - **Existing pulse** and **analog** value measurement devices with a decentralized periphery (DI- and AI-signals)

Transparency starts at the field level - Energy data acquisition hardware concept



Hardware concept for energy data acquisition

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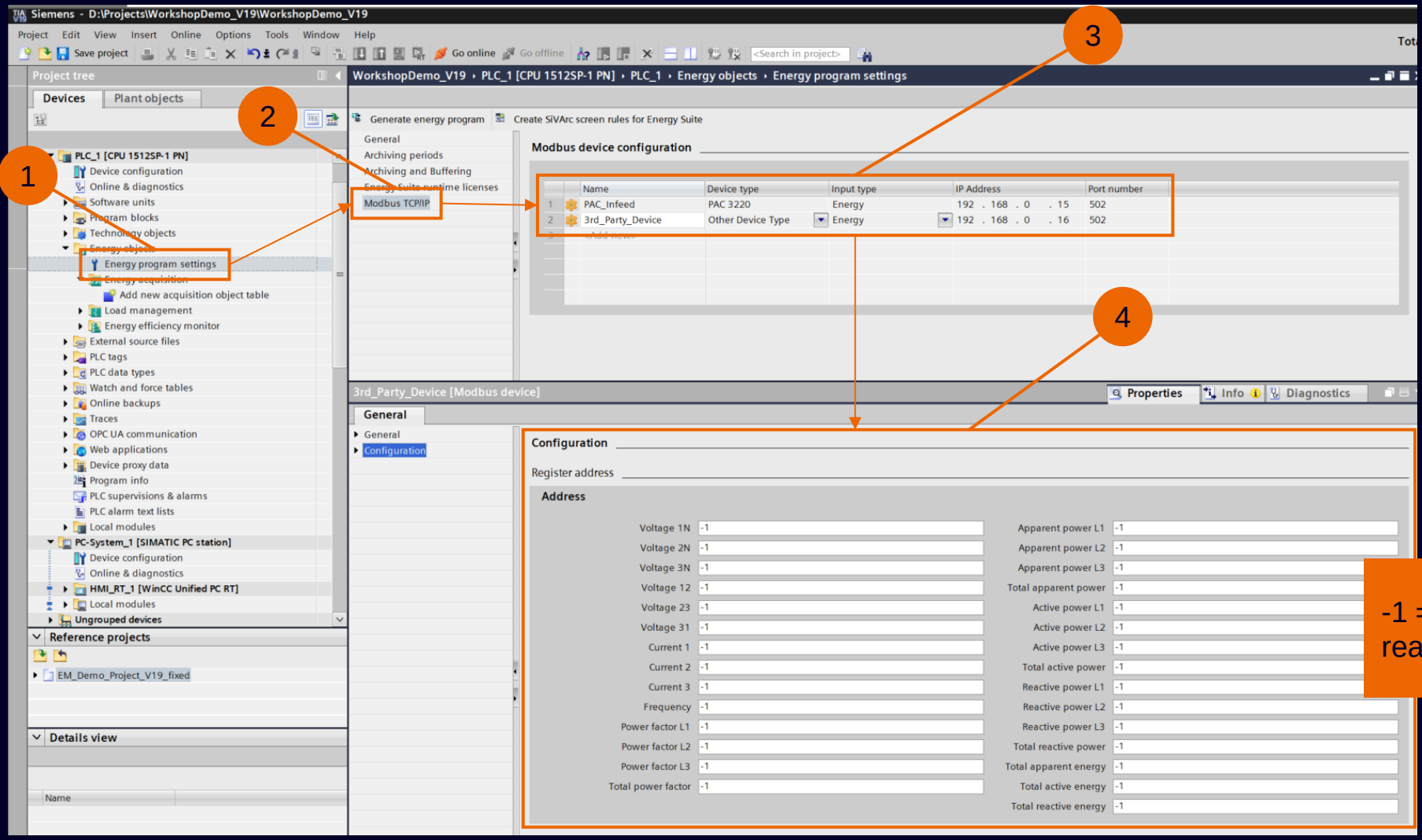
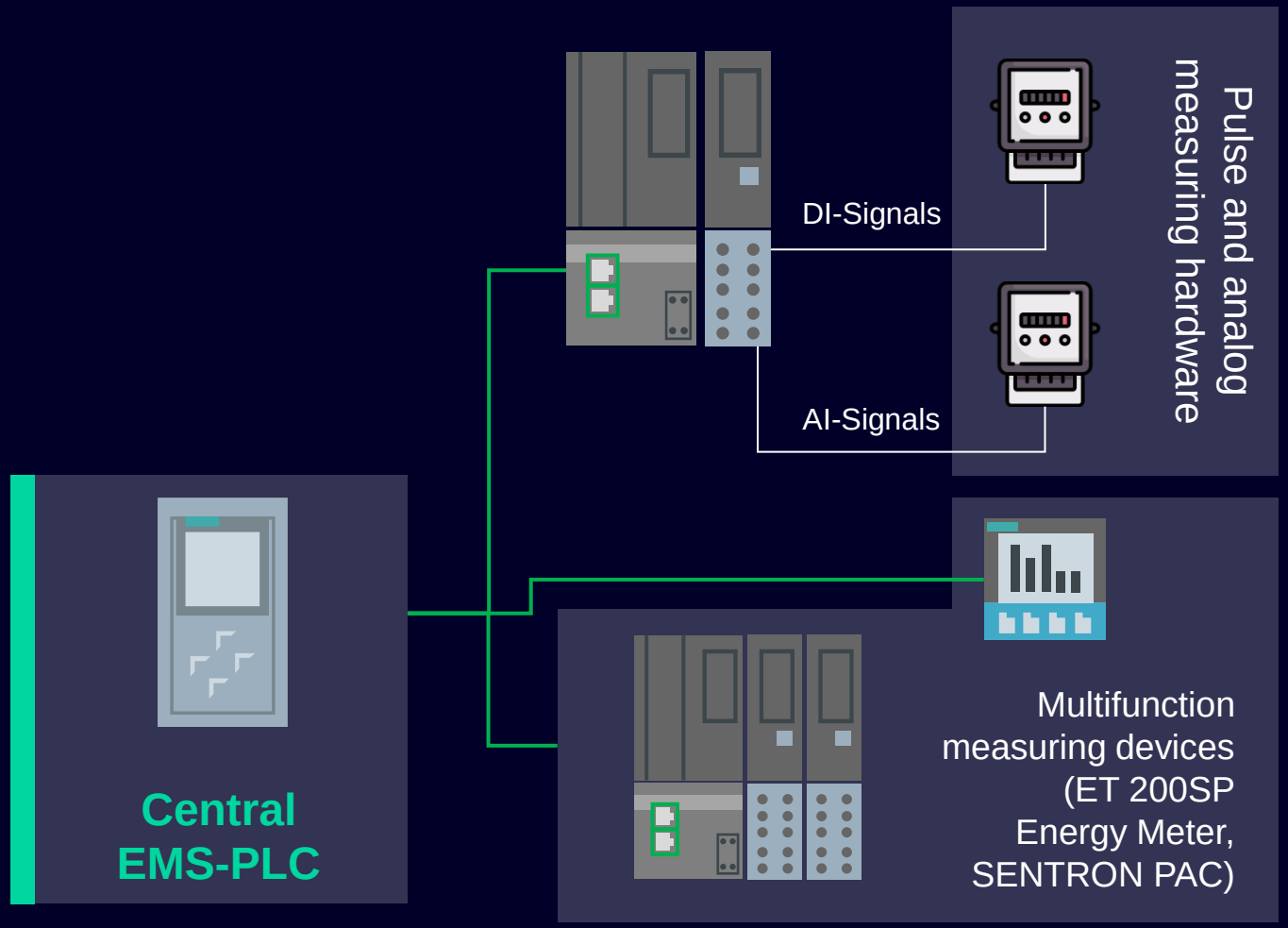
Resource Transparency
Configuration of Modbus TCP devices in the Energy Suite



-1 = value will not be read from the device

Transparency starts at the field level -
Energy data acquisition hardware concept



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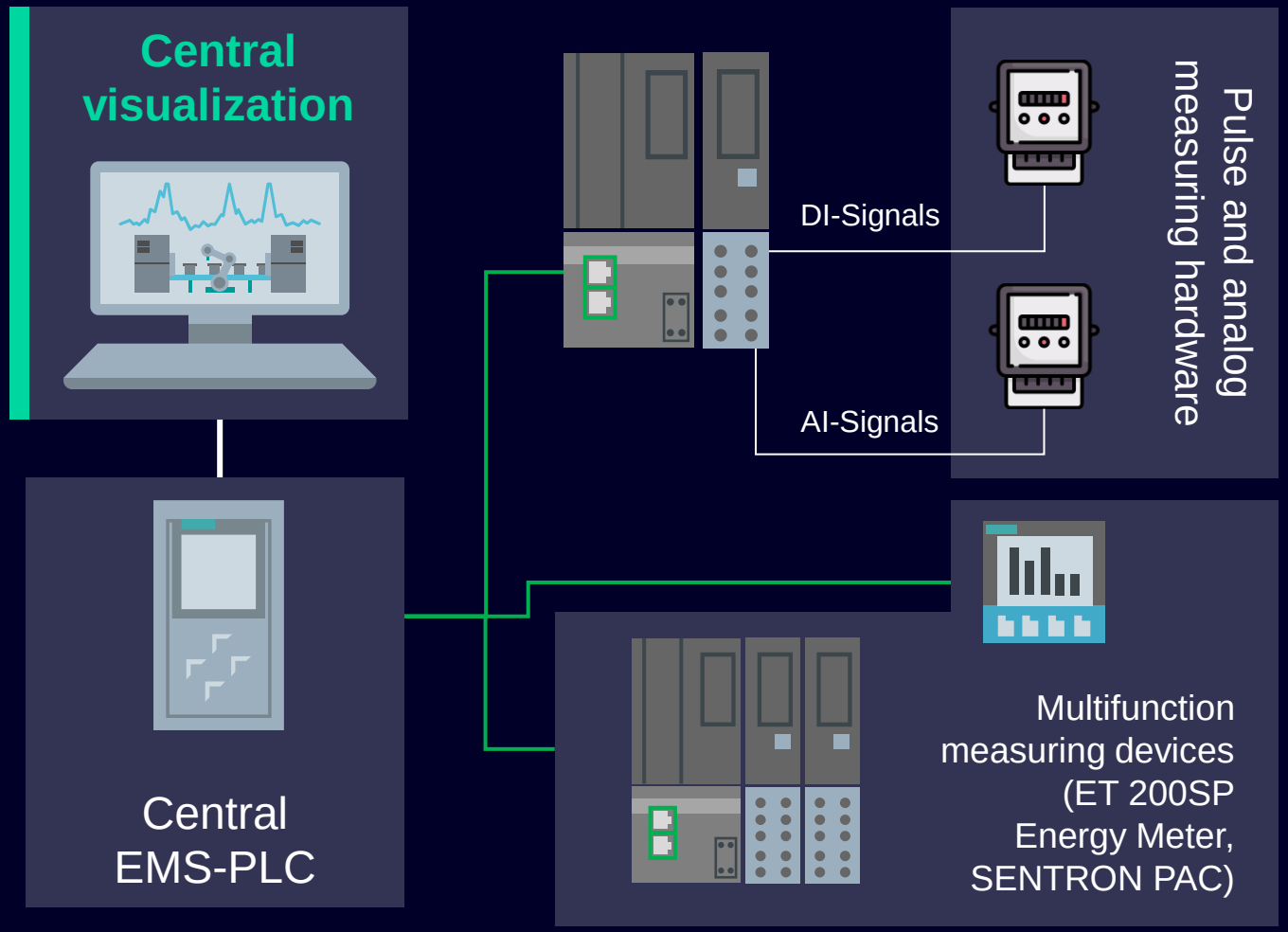
- **Central PLC** only for the energy management system, which acquires all data of the plant

Transparency starts at the field level -
Energy data acquisition hardware concept



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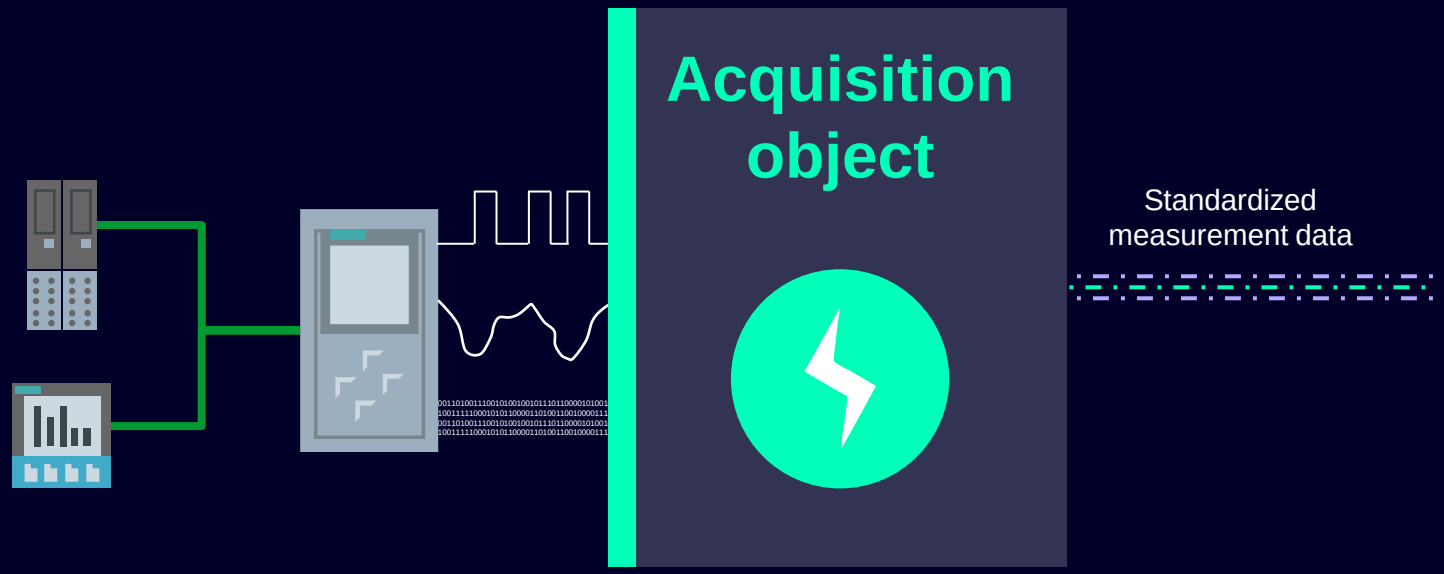
- **Central PLC** only for the energy management system, which acquires all data of the plant
- **Central visualization** for all consumptions of the plant including an **archiving** of the values in a data base

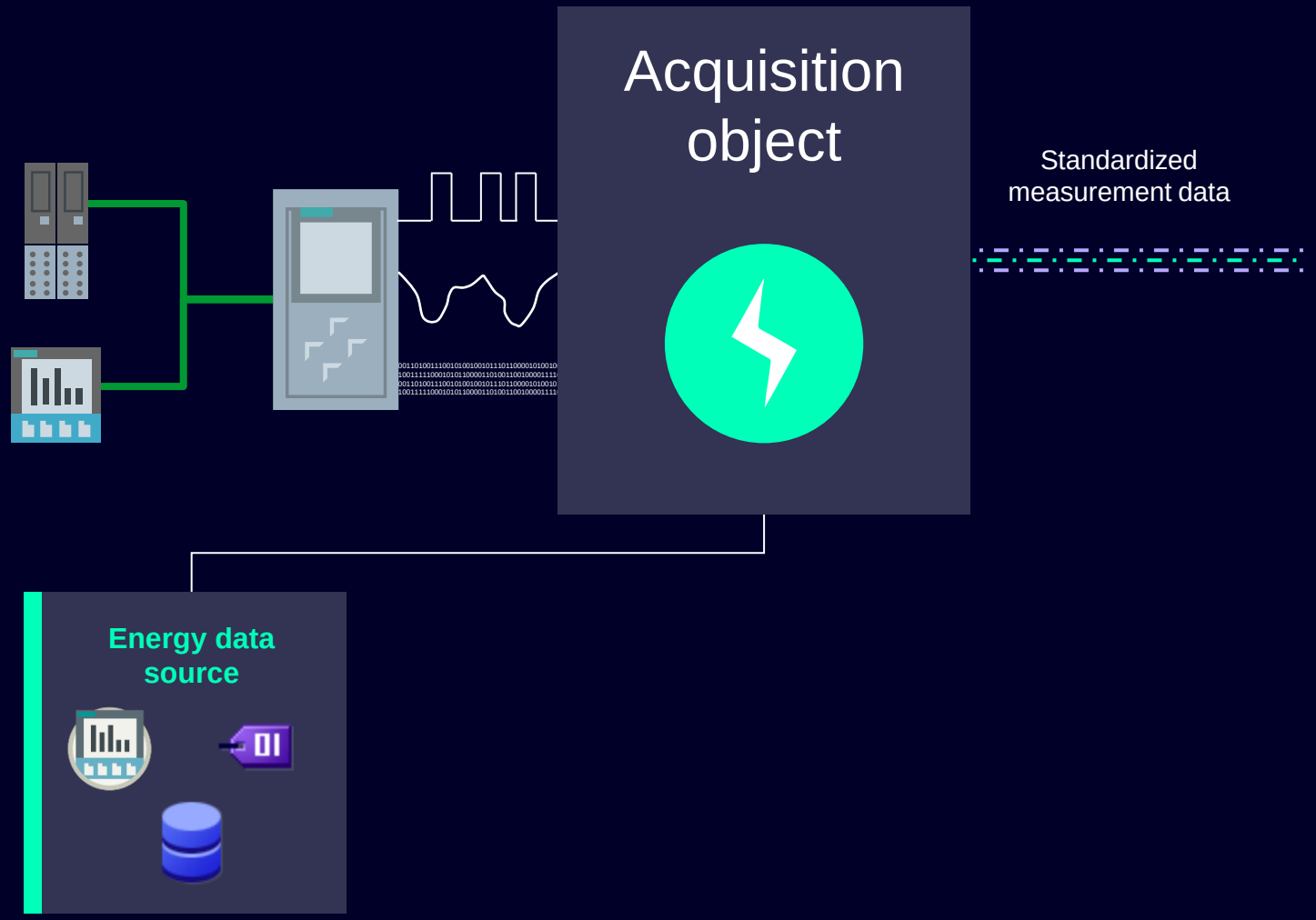
Resource Transparency
Energy data acquisition standardization of signals



Standardization of different input signals

- For **every physical measurement point**, there will be one software object in the Energy Suite, a so-called **Acquisition Object**
- For better processing of data, the different input signals will be **standardized in a defined data structure**
- An acquisition object **contains all relevant information** of the measurement point
- Based on this configuration, the energy program will be generated later on

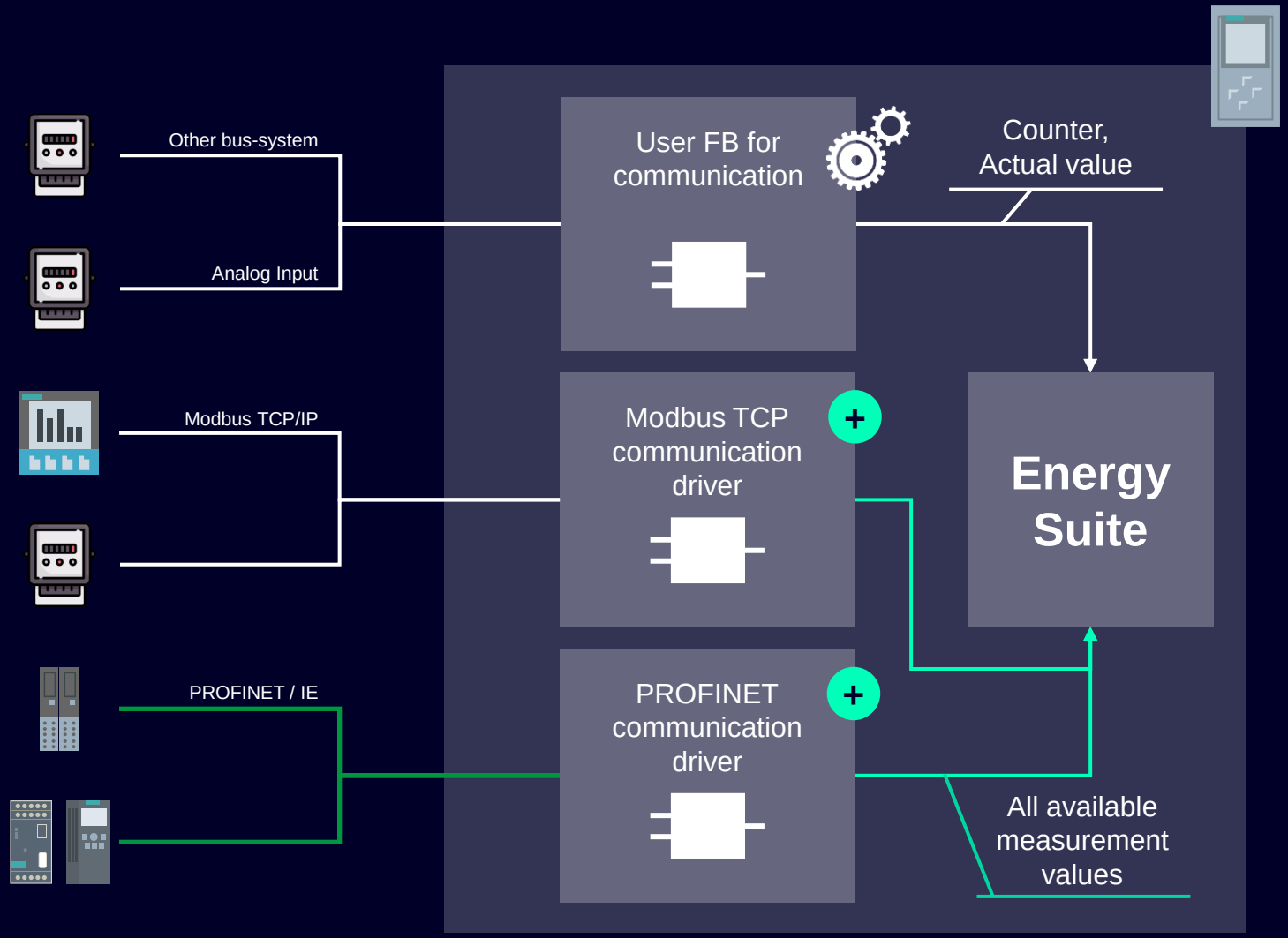
Resource Transparency
Energy data acquisition objects



Configuration and generation of acquisition objects

- For modelling the acquisition object and **adapt** it to the **physical measurement point**, the user has several configuration properties:
  - **Energy data source** (PLC-variable, DB-variable or Siemens measurement device)

Resource Transparency
Communication to measurement devices



Possibilities of energy data sources

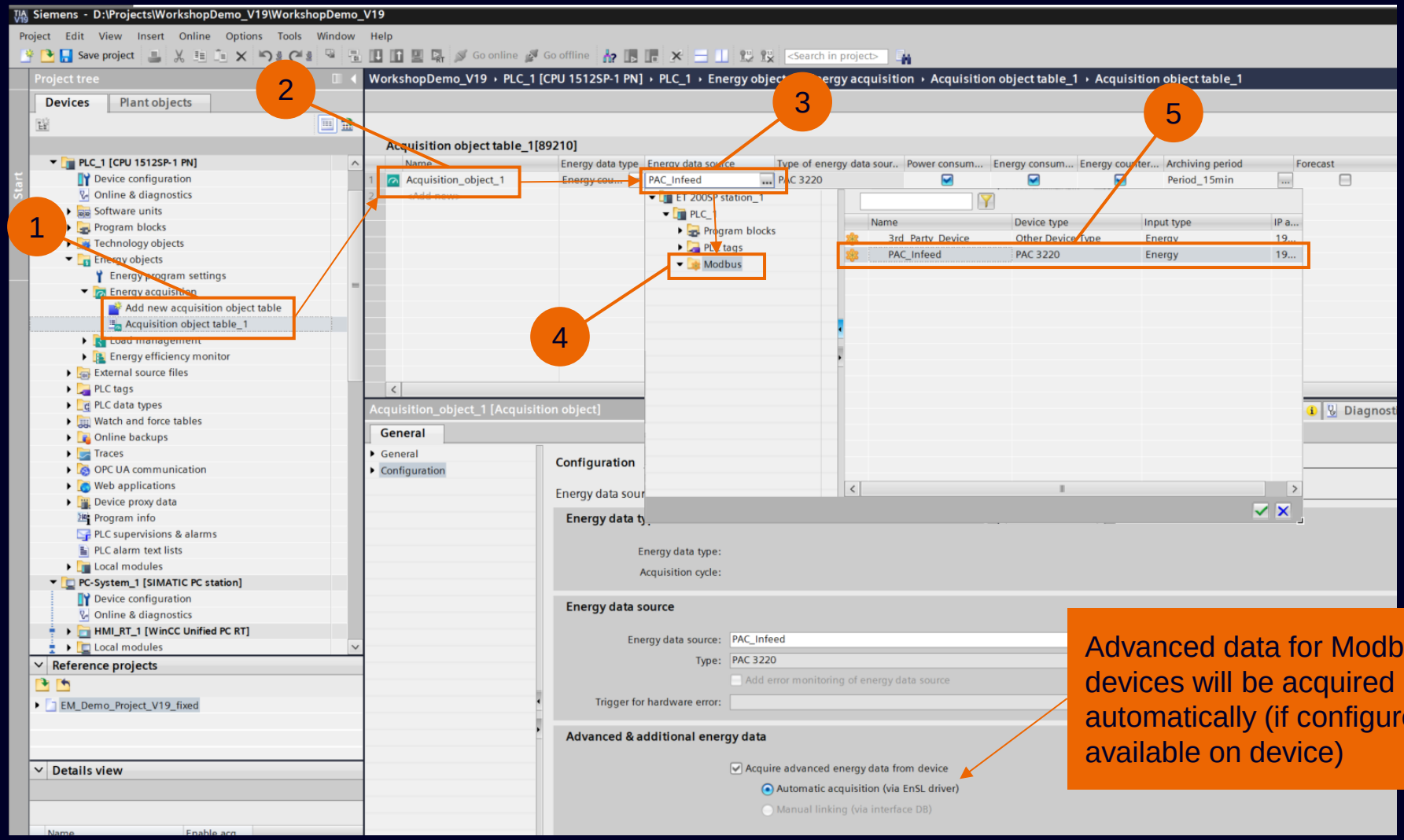
- Energy Suite divides the energy data source into three possibilities
  - Siemens device connected with PROFINET (only specific devices i. e. Energy Meter, SIMOCODE, SINAMICS)
  - SENTRON or 3rd party devices connected with Modbus TCP/IP
  - Any other bus system (digital or analog, native TCP/IP, …)
- Depending on the source, Energy Suite provides several advantages

+ **Automatically generated** blocks for **communication** between PLC and device

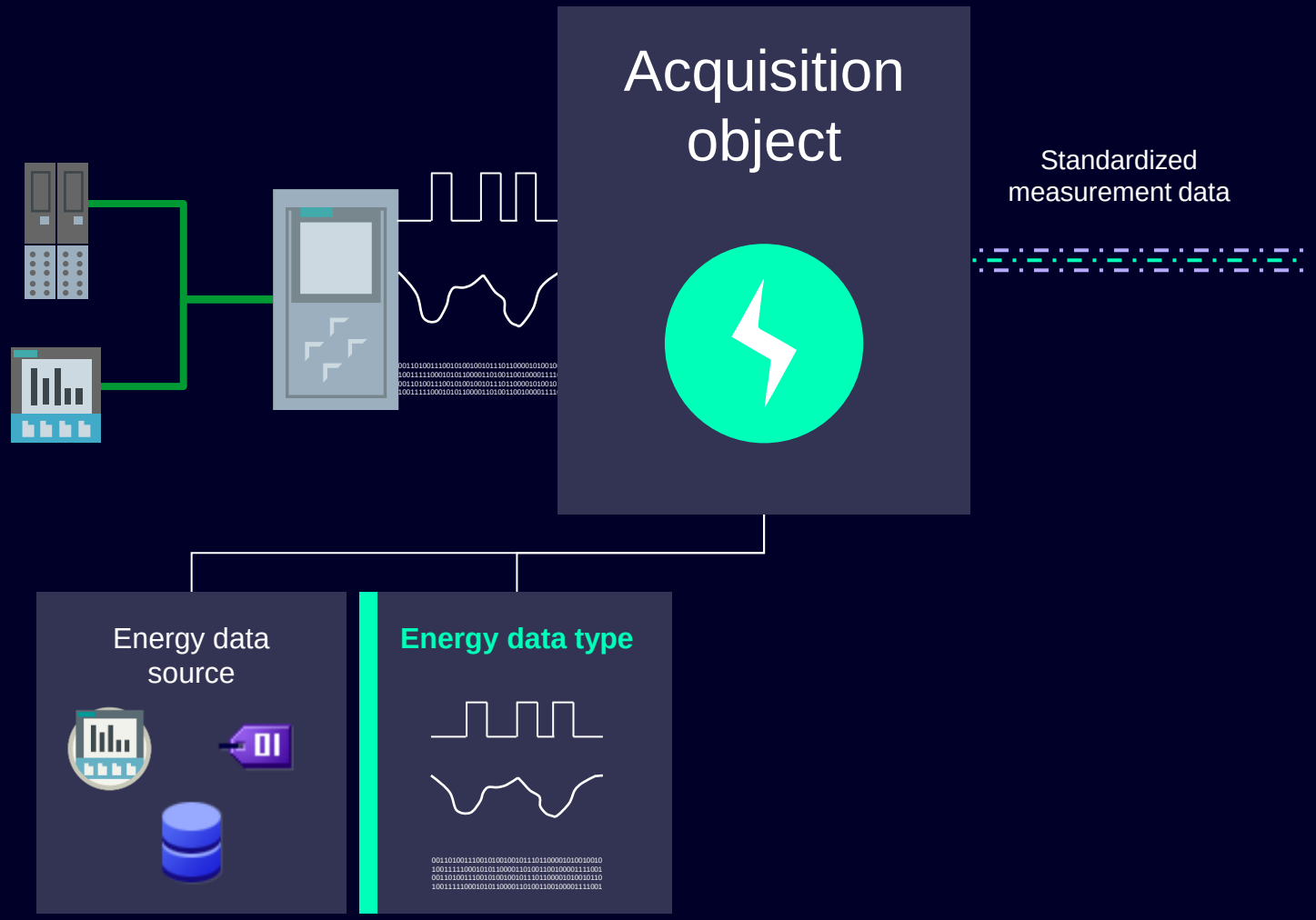
+ **Acquisition** of **all provided values** of the device (configuration of register necessary for 3rd party Modbus devices)

+ **All** available measurement **values** (voltage, current,…) **automatically forwarded** to EnS

Resource Transparency
Configuration of energy data source with Modbus



Resource Transparency
Energy data acquisition objects



Configuration and generation of acquisition objects

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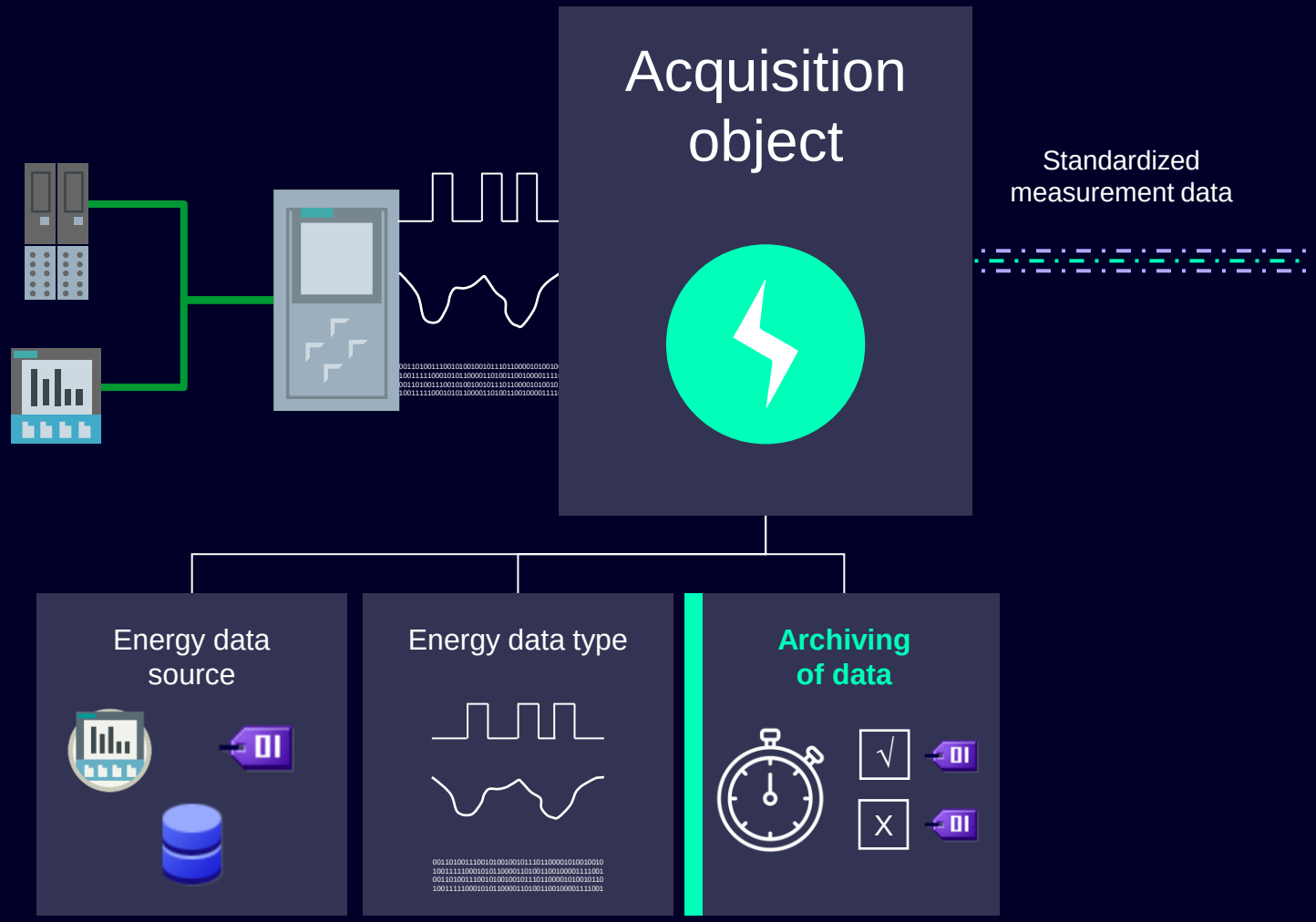
Resource Transparency
Energy data acquisition objects



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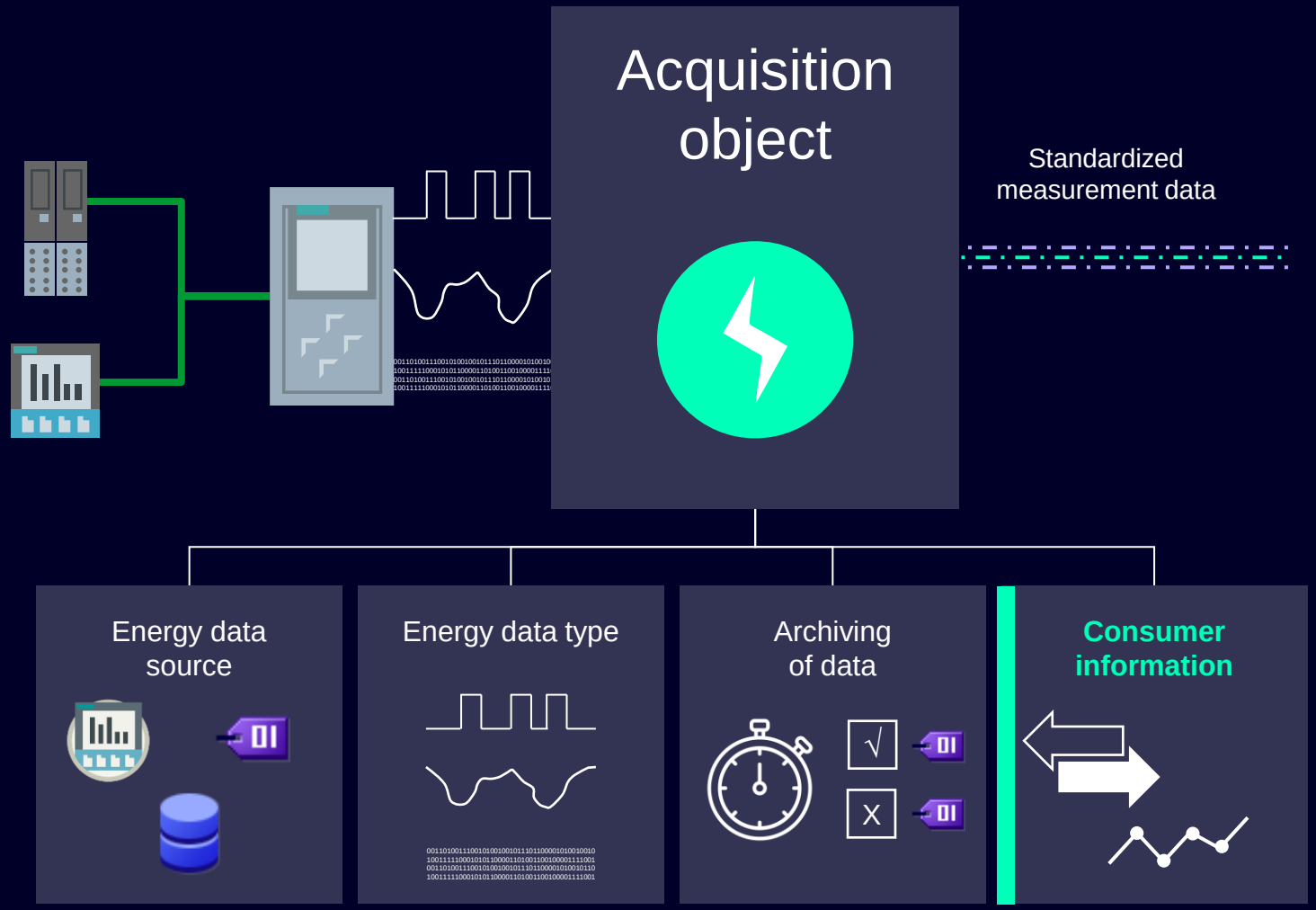
Resource Transparency
Energy data acquisition objects



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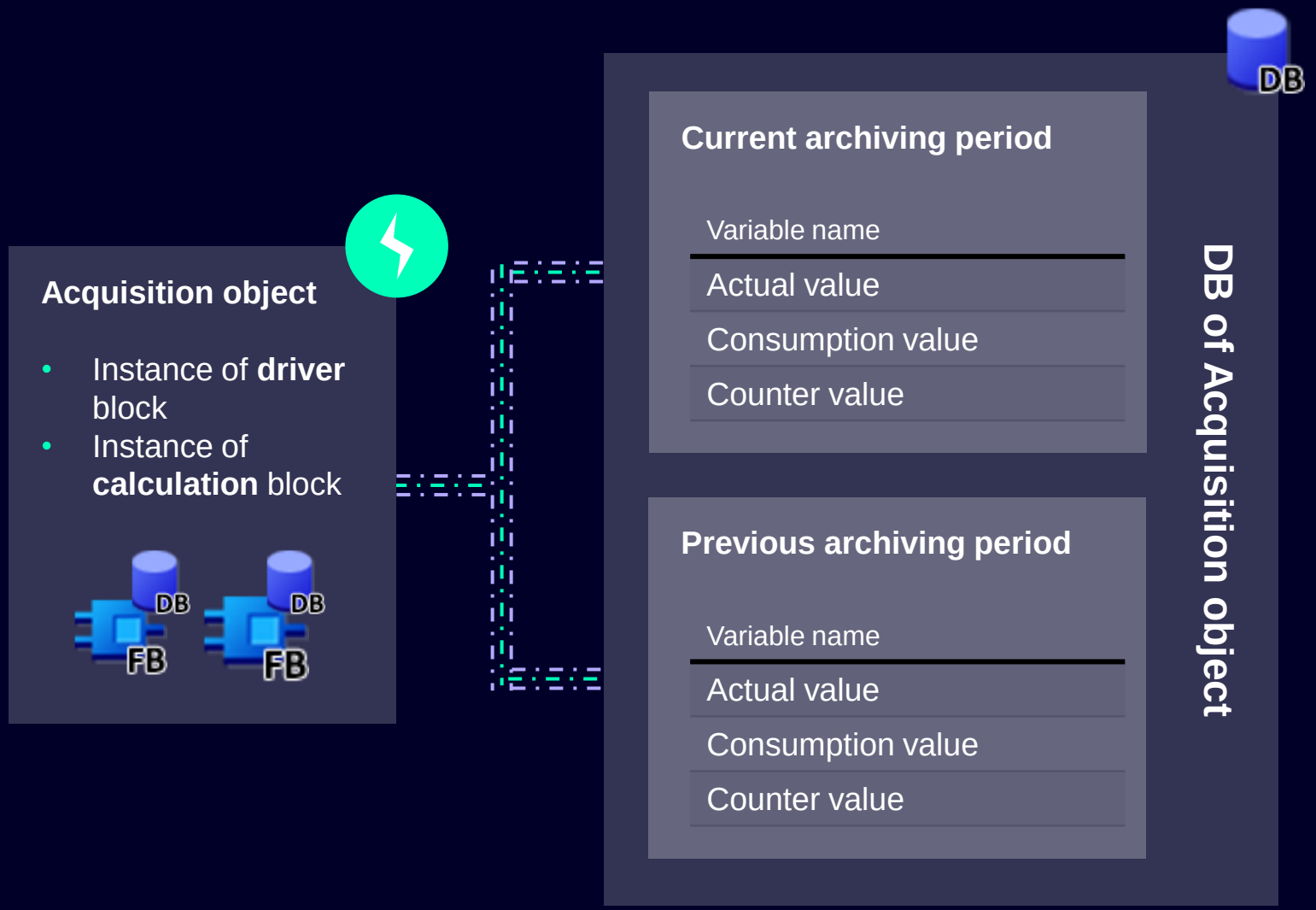
  - **Archiving of data** (archiving period, values to archive)
  - **Consumer information** (consumer or producer, weighting factor, unit)

Resource Transparency
Energy data acquisition objects



Standardized measurement data of an acquisition object

- In the energy program on the PLC, there are **instances** of a **driver block** (depending on energy data type) and a **calculation block** for each object
- For each acquisition object (independent of energy data type), an **actual value,** a **counter value** and a **consumption value** is calculated
- Values are provided for the **current** and the **previous archiving period**
- The standardized energy **data are stored in the DB** of the acquisition object (name of DB = name of acquisition object)

Resource Transparency
Data types of acquisition objects

Basic data

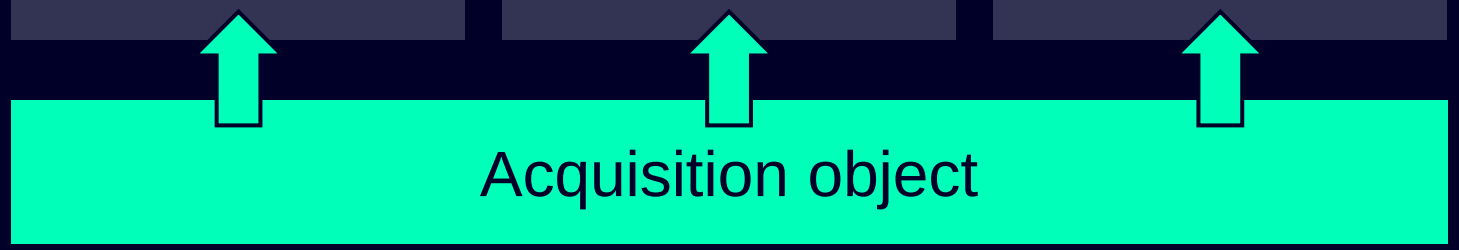
- All measurement devices
- Three calculated consumption values
- Monitoring over longer period (several days or more) ➔ slow values

Advanced data

- Multifunctional measurement devices
- 29 values in a predefined structure
- Monitoring of status ➔ fast values (acquisition every second)

Additional data

- Up to 12 user defined values (i.e. operating hours)
- Can be every type of data, not only energy data
- Acquisition cycle depends on the measurement value



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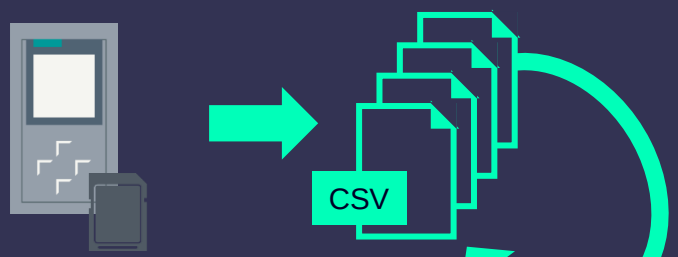
How to distinguish between measurement values in the EnS

- Every energy measurement device provides **at least one value**
- EnS calculates **basic energy data** based on this value **for every acquisition object**
- Multifunctional measurement devices provide **more values** like current, voltage,…
- These values can be forwarded to the acquisition object by using **advanced energy data**
- **Further values**, which are not part of the advanced data, can be included with the **additional energy data**

SIEMENS

Archiving on the PLC (SMC-card)



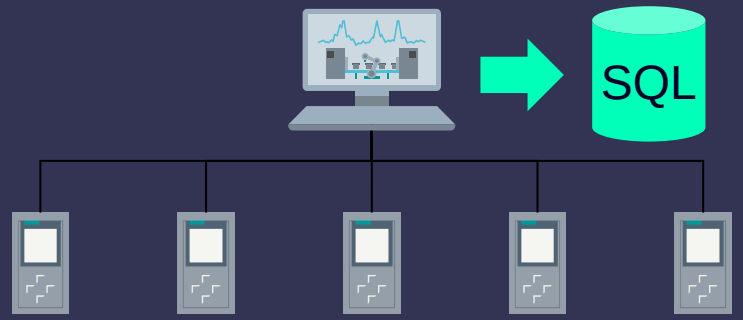
Can be used without a WinCC Unified/Professional system

Archiving of energy data

- Energy Suite offers two possibilities to archive data automatically
- Archiving on the PLC (SMC-card)
  - Data are stored in **CSV-files** on the SMC-card
  - Accessible via **PLC-webserver** (download)
  - CSV-files are used as a **ring buffer**
  - **Number** and **size** of the files is configurable

Archiving on PLC (SMC-card)

Archiving on WinCC Unified / Professional



Recommended to use for long-term storing of data

Archiving of energy data

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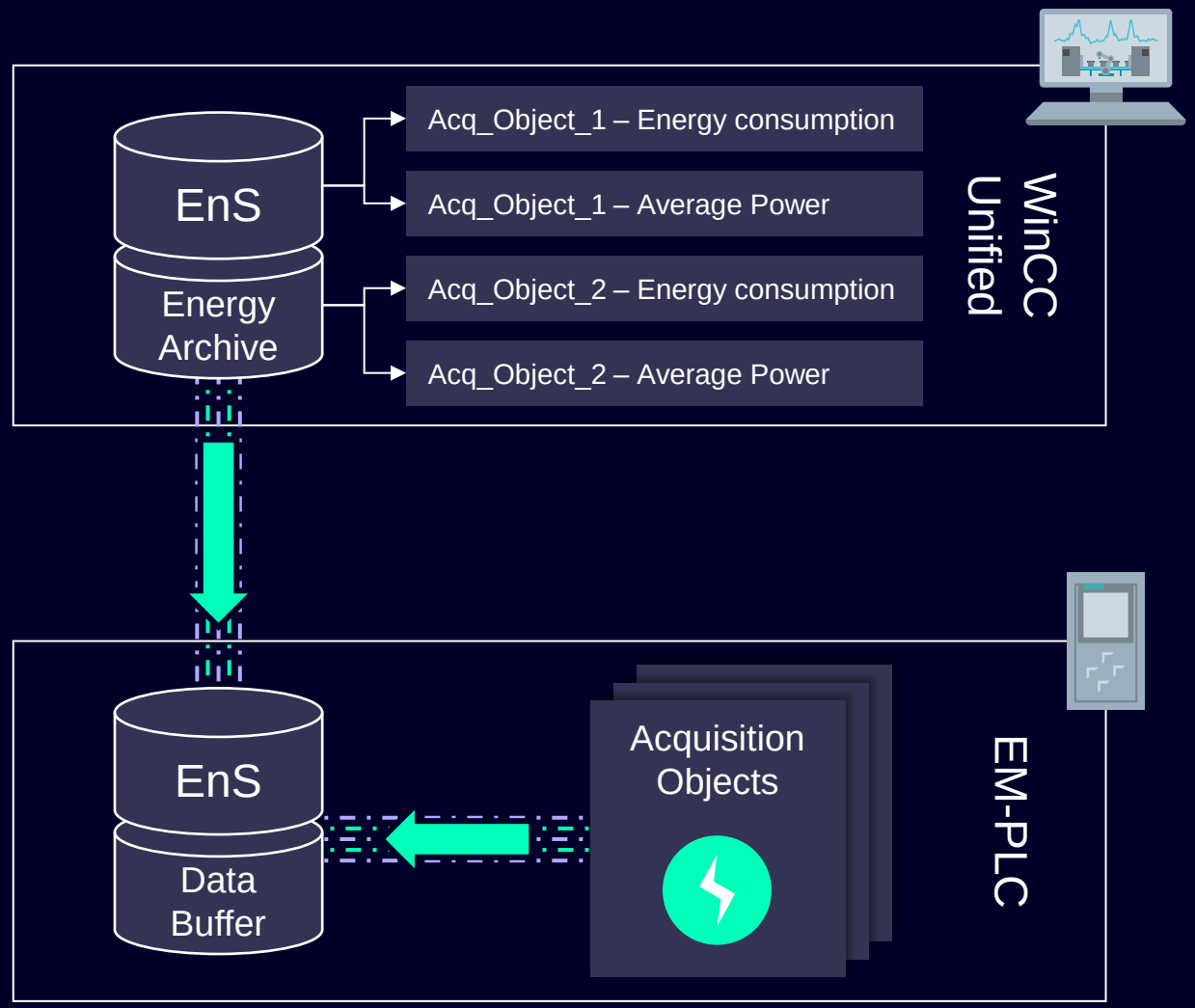
  - CSV-files are used as a **ring buffer**
  - **Number** and **size** of the files is configurable
- Archiving on WinCC Unified/Professional
  - Data are sent to the **tag-logging of WinCC**
  - Tag-logging is storing the data in a **SQL-database**
  - Up to **ten different PLCs** can be connected

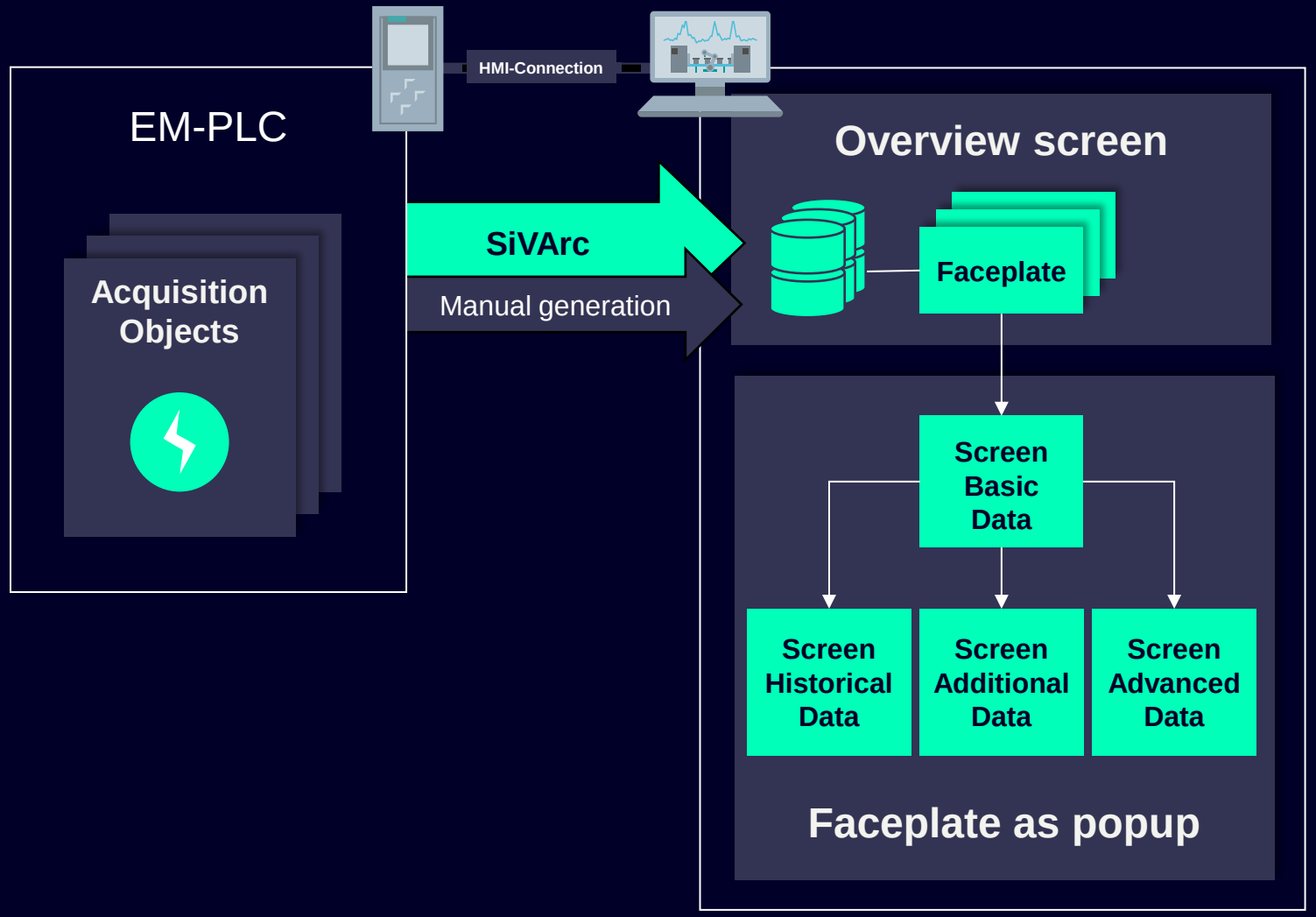
Resource Transparency
Archiving of energy data in WinCC Unified



Archiving mechanism for WinCC Unified / Professional

- **Buffer** on the PLC to **bypass** short connection losses
- **Data archive** on WinCC is **generated automatically**
- **Contains all variables**, which are configured to be archived in the PLC
- **Normal** archiving mechanism: **WinCC reads** value cyclically **from the PLC**
- **Two** big **problems** for energy data:
  - **Timestamp** is inaccurate
  - **No data** in case of **connection loss**
- **Special** mechanism of the EnS: **PLC writes** data in the WinCC **archive** with the correct timestamp

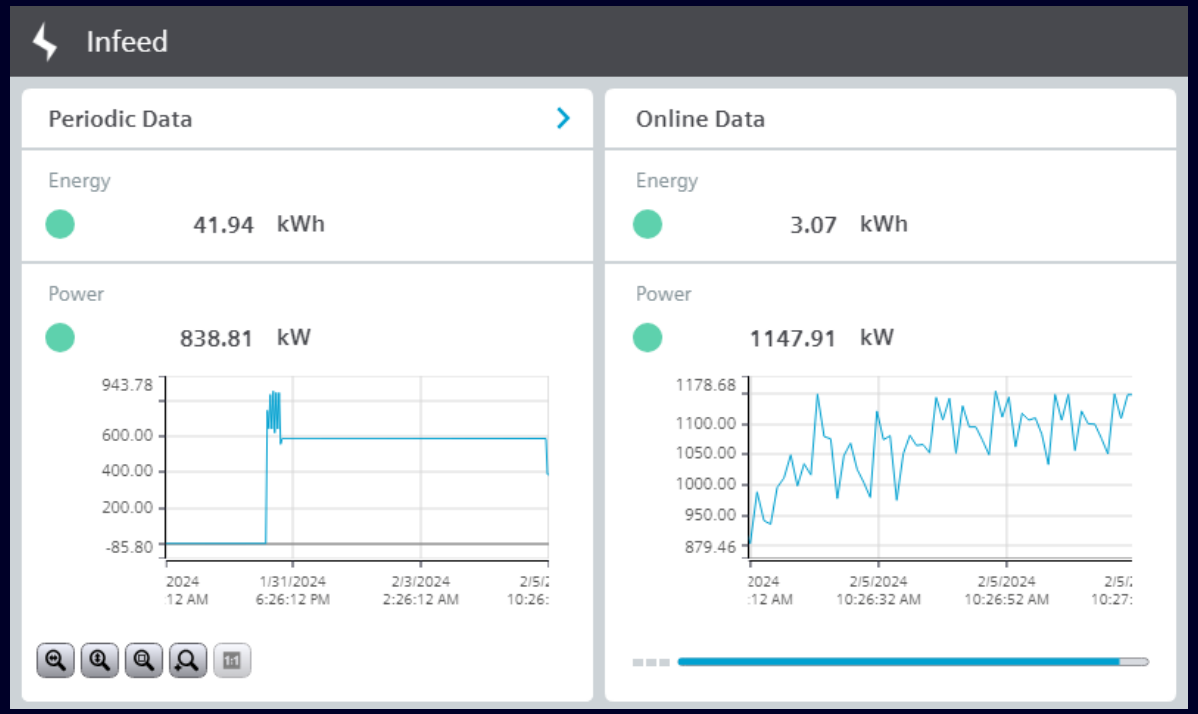
Resource Transparency
Visualization of energy data in WinCC Unified



Energy Suite visualization with SiVArc for WinCC Unified

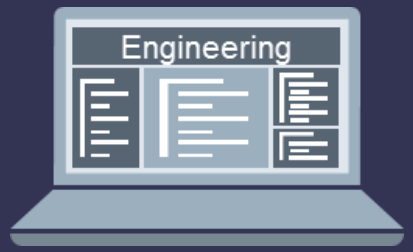
- Basic requirement: **Existing HMI-connection**
- All **screens** are realized as faceplates
- SiVArc rules for the Energy Suite can be **automatically generated**
- Tool generates one **faceplate** and the **data household** for **each** Acquisition Object
- **Detail view** of measurement point is opened in a **pop-up**
- Possibility to **open several faceplates** (i.e., acquisition objects) in parallel
- **Optimized design** and **architecture** for a perfect user experience in WinCC Unified

Resource Transparency
Visualization of energy data in WinCC Unified

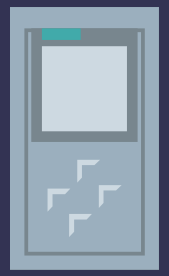


Resource Transparency
Licensing concept for acquisition in the Energy Suite

Engineering license



Runtime licenses

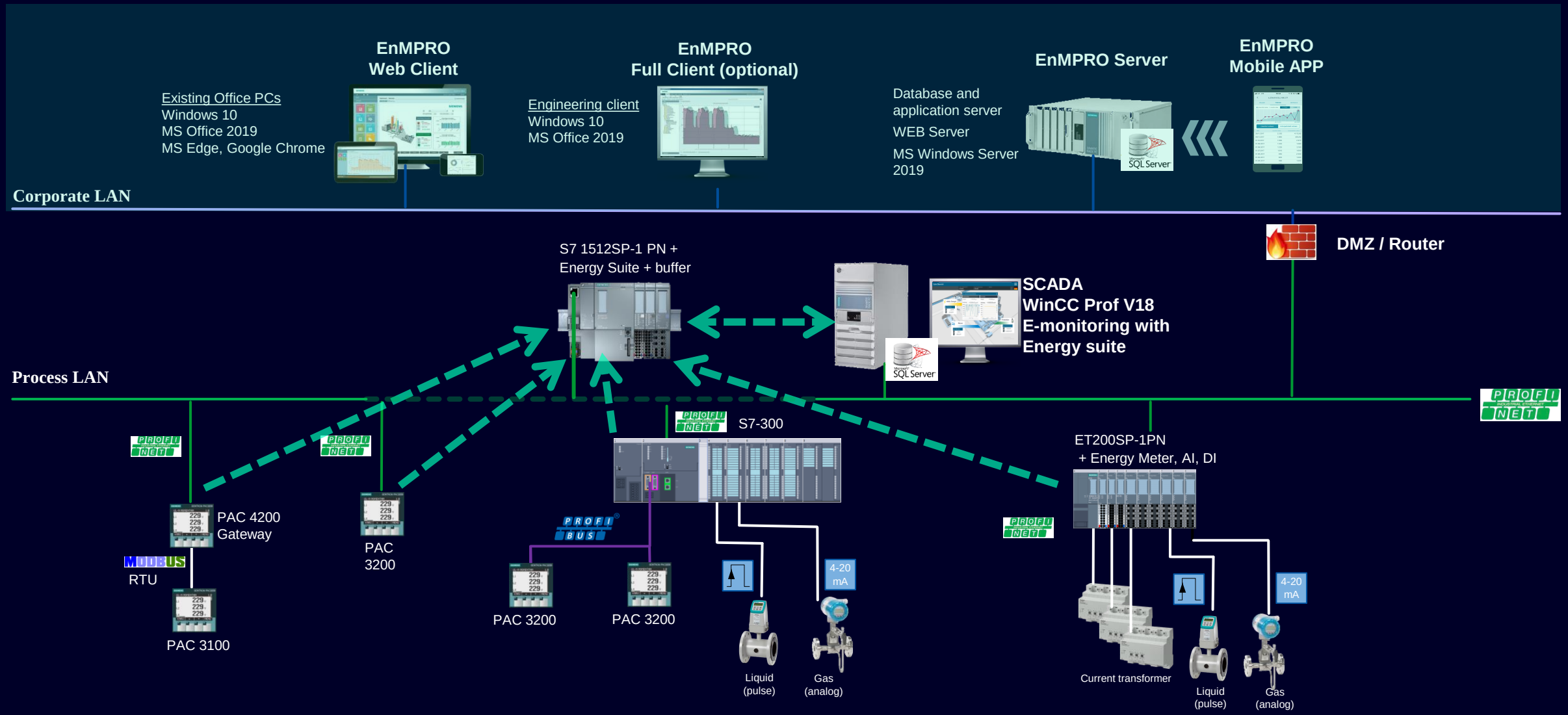


- **Two packages** to purchase Energy object licenses
  - Package of **5 EnOs**
  - Package of **10 EnOs**
- Currently **not downloaded** directly to the PLC
- Number of packages **adjustable** in **hardware config**

Licensing in two steps

- **Engineering license** to open and work with the Energy Suite in the TIA Portal (license needs to be activated in ALM)
- Second part are **runtime licenses** for acquisition objects on the PLC
- Concept: **“Energy Objects”** as **currency** to license acquisition and actuator objects
  - **1 Acquisition object** ≙ **1** Energy object
  - **1 Actuator object** ≙ **9** Energy objects
- Engineering license already **includes 10 Energy object** license for a basic configuration
- SiVArc license and all runtime tags for WinCC Unified/Professional/Advanced included in Energy Suite license
- Logging tags needs to be licensed

SIMATIC Energy Management
Architecture examples, energy data acquisition, archiving and monitoring



SIMATIC Energy Management
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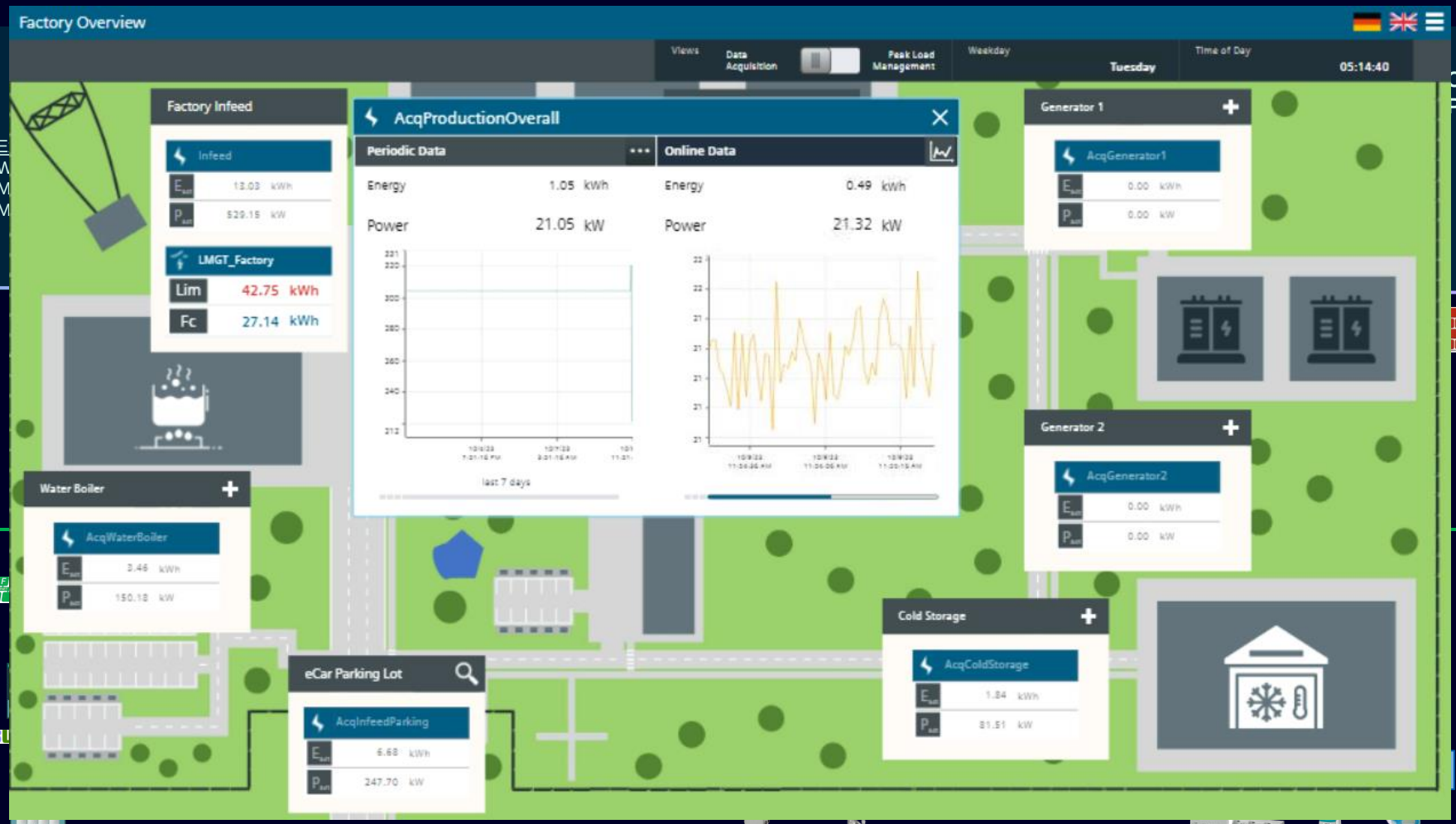


Corporate LAN

Process LAN

DMZ / Router

RTU

PAC 3100

Liquid (pulse)

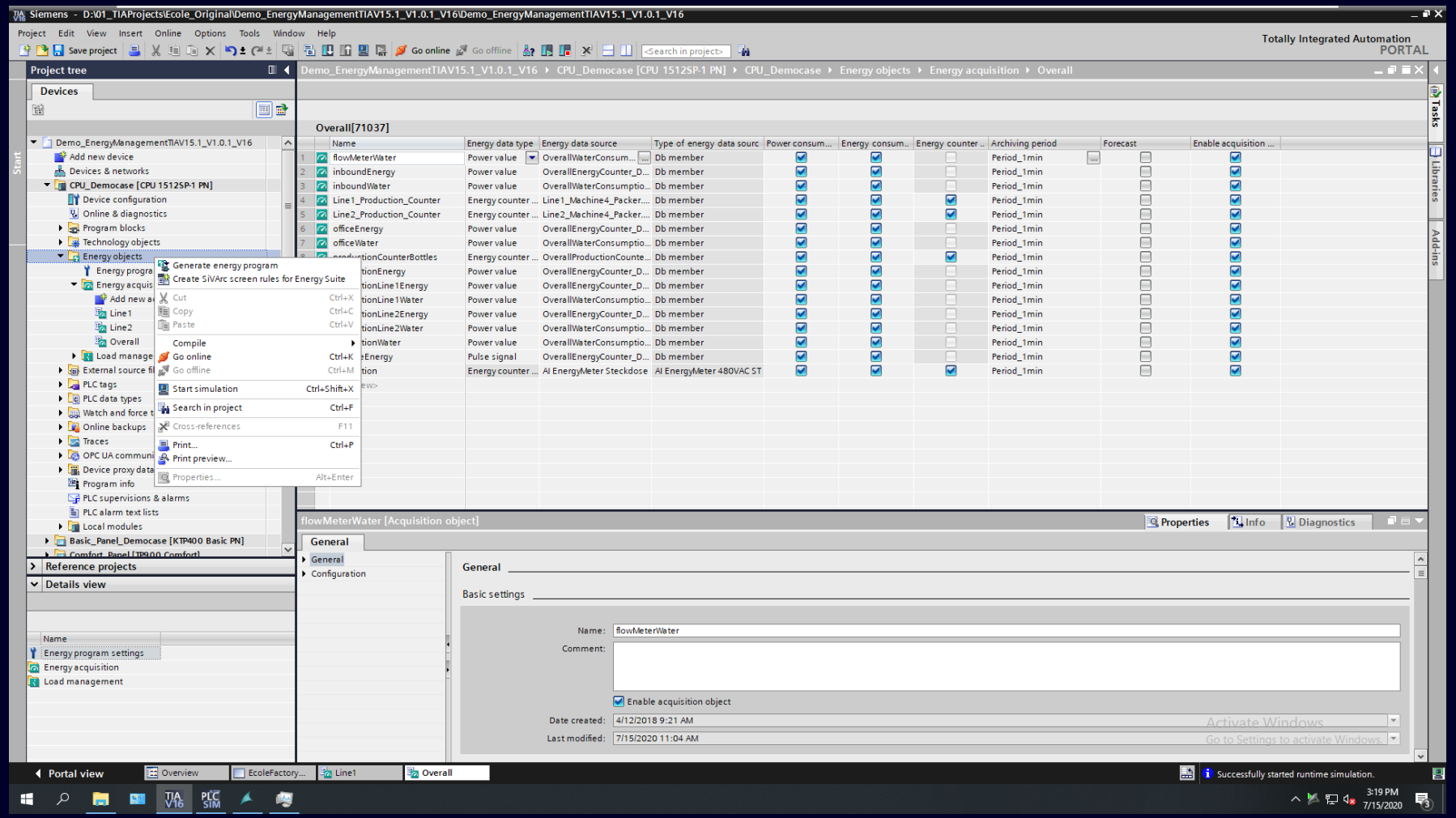
Gas (analog)

Current transformer

Liquid (pulse)

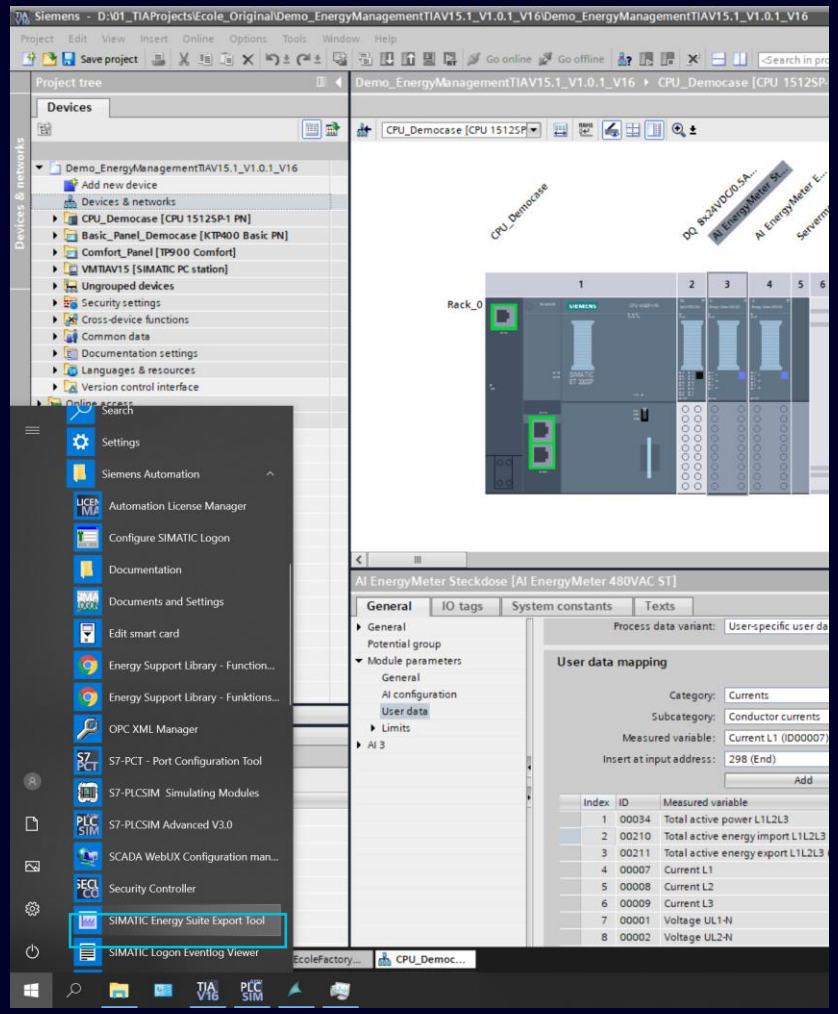
Gas (analog)

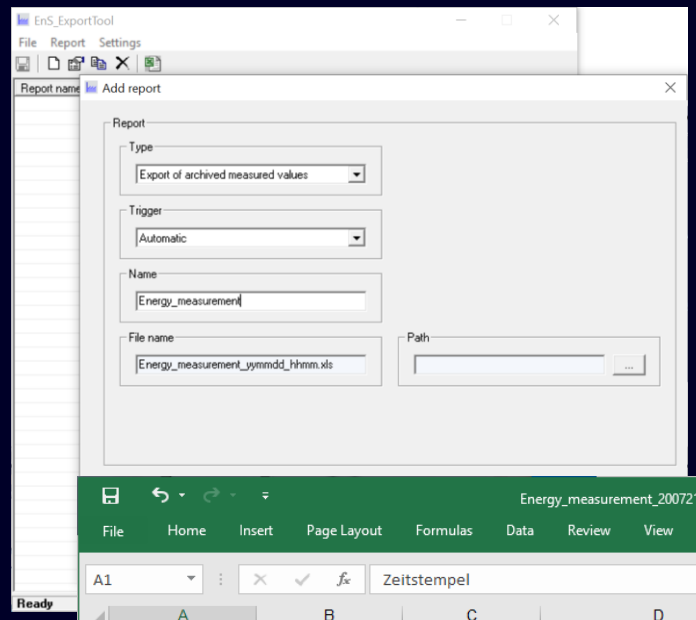
Energy data acquisition with the SIMATIC Energy Suite
Control program configuration instead of programming

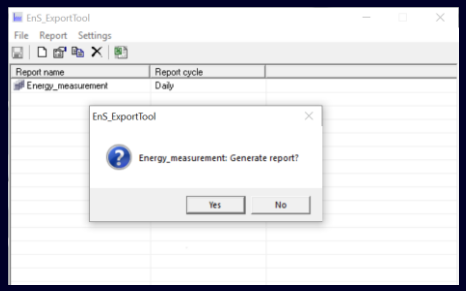


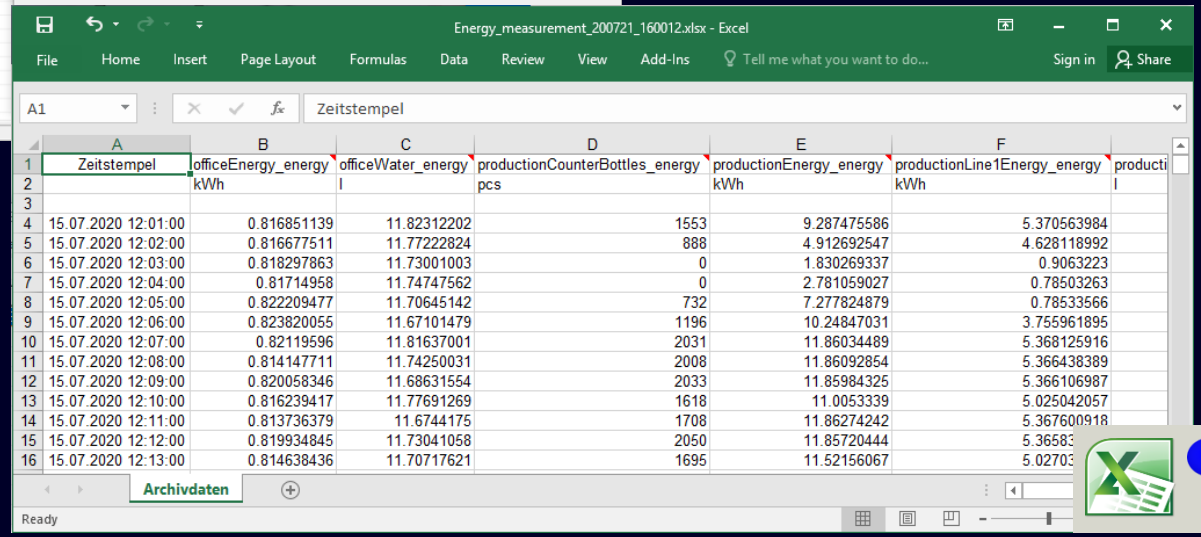
SIMATIC Energy Suite - Providing energy data available externally

Data export from the SCADA archive









	A	B	C	D	E	F	
1	Zeitstempel	officeEnergy_energy	officeWater_energy	productionCounterBottles_energy	productionEnergy_energy	productionLine1Energy_energy	producti
2		kWh	l	pcs	kWh	kWh	l
3							
4	15.07.2020 12:01:00	0.816851139	11.82312202	1553	9.287475586	5.370563984	
5	15.07.2020 12:02:00	0.816677511	11.77222824	888	4.912692547	4.628118992	
6	15.07.2020 12:03:00	0.818297863	11.73001003	0	1.830269337	0.9063223	
7	15.07.2020 12:04:00	0.81714958	11.74747562	0	2.781059027	0.78503263	
8	15.07.2020 12:05:00	0.822209477	11.70645142	732	7.277824879	0.78533566	
9	15.07.2020 12:06:00	0.823820055	11.67101479	1196	10.24847031	3.755961895	
10	15.07.2020 12:07:00	0.82119596	11.81637001	2031	11.86034489	5.368125916	
11	15.07.2020 12:08:00	0.814147711	11.74250031	2008	11.86092854	5.366438389	
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16	15.07.2020 12:13:00	0.814638436	11.70717621	1695	11.52156067	5.02703	

From version MS Excel 2010

SIMATIC Energy Suite
Load management

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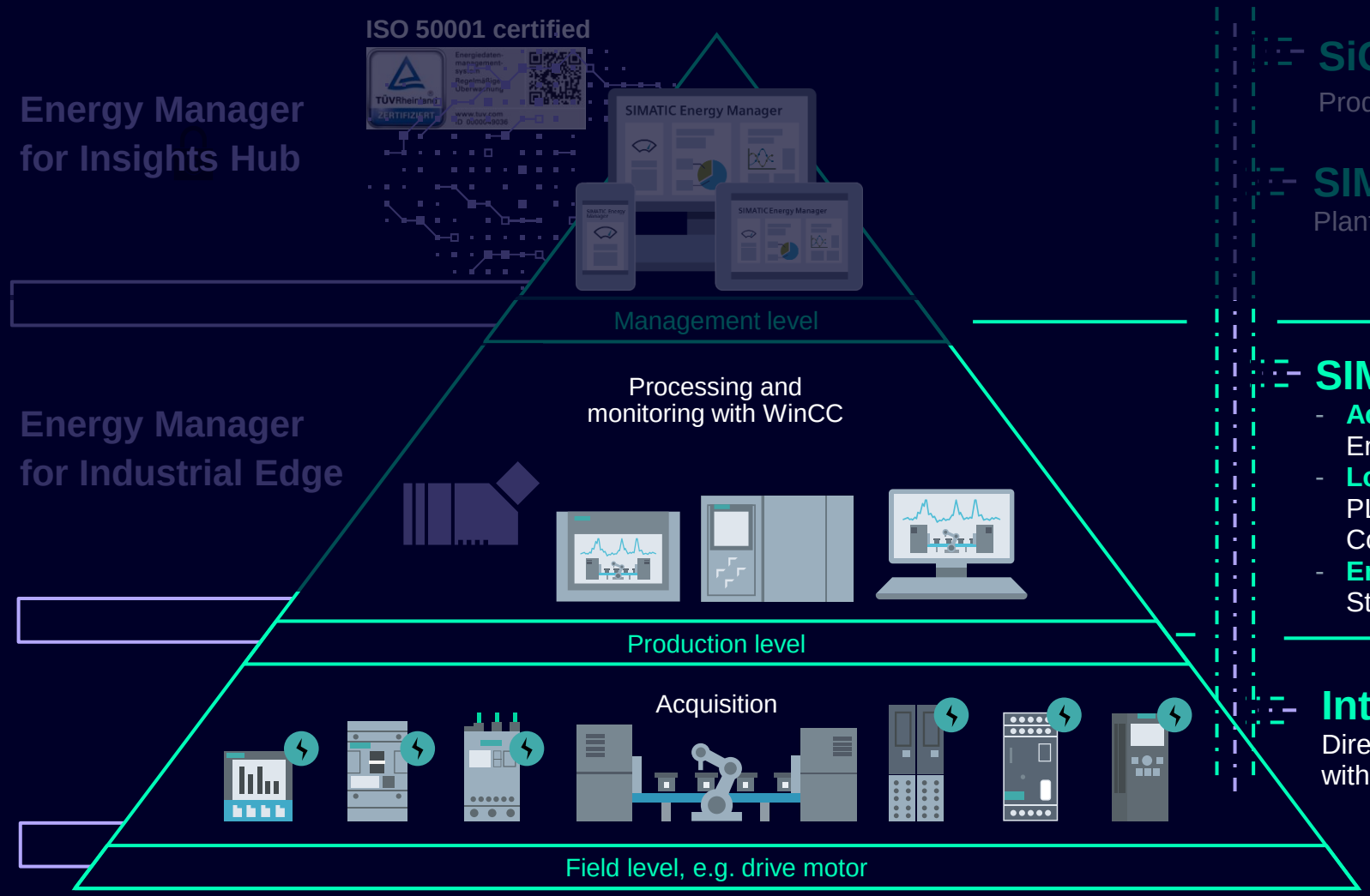
Resource Transparency
SIMATIC Energy Suite



SiGREEN
Product Carbon Footprint

SIMATIC Energy Manager
Plant and company-wide energy analysis

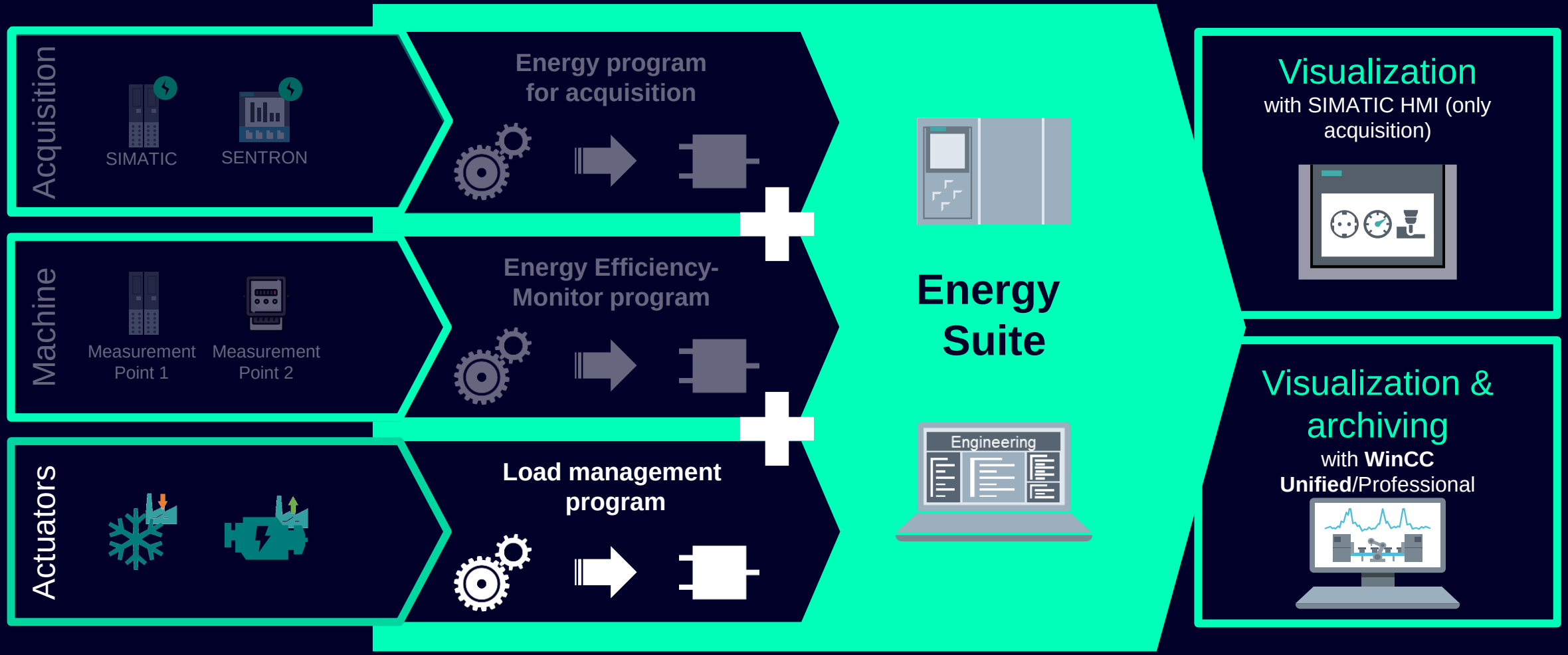
SIMATIC Energy Suite
- **Acquisition**
  Energy data acquisition
- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency Monitor**
  Standardized efficiency evaluation of machines

Integrated energy measurement
Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

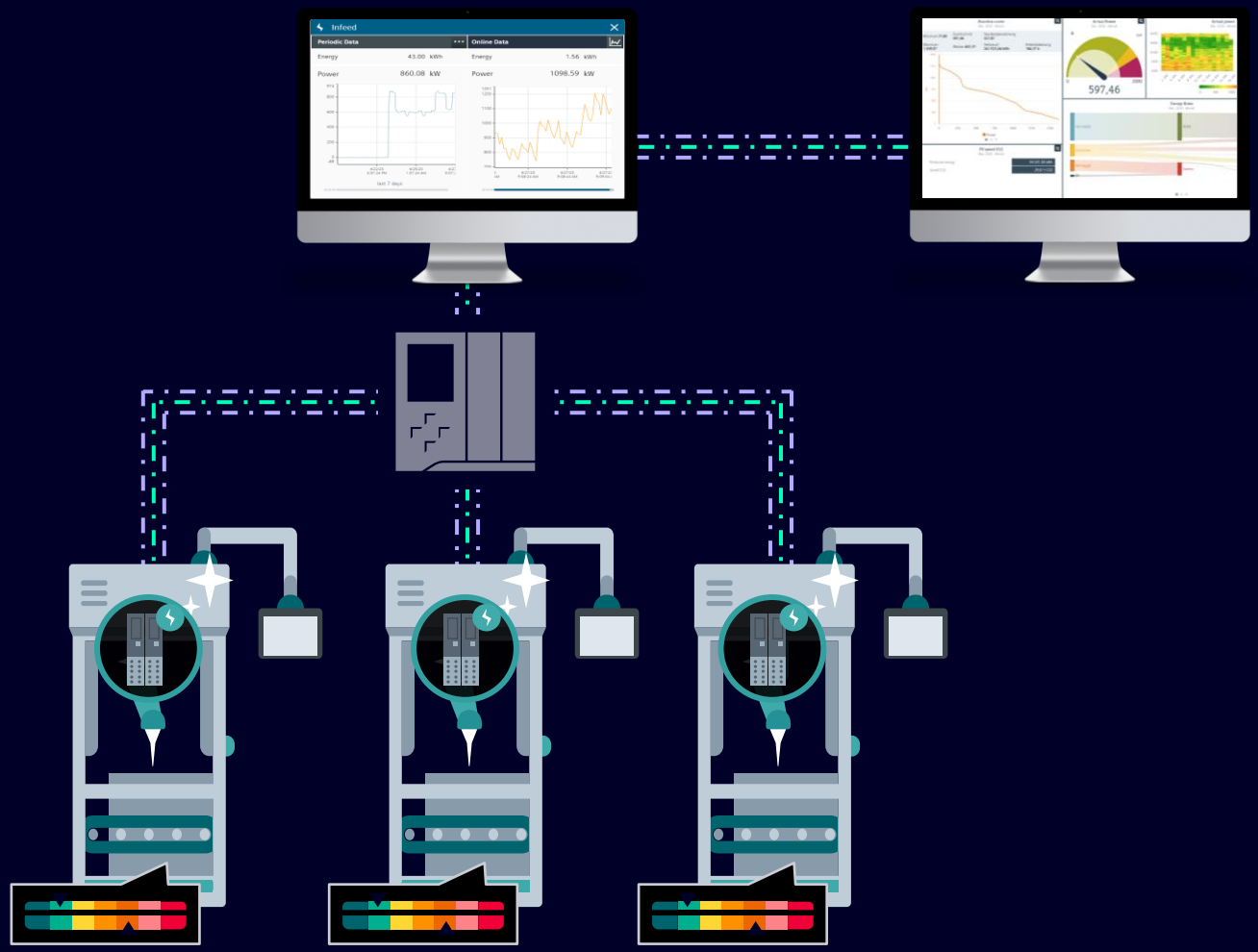
SIMATIC Energy Suite
Peak Load management – Tech Slides

SIEMENS

Resource Transparency
Integration of data acquisition in the Energy Suite



Resource Flexibility
is the key to optimize consumption



Resource Flexibility

Use Case scenario

- Energy transparency and analysis installed in the factory
- After several months, customer wants to analyze the consumption to find ways to optimize energy costs

What are energy cost factors?

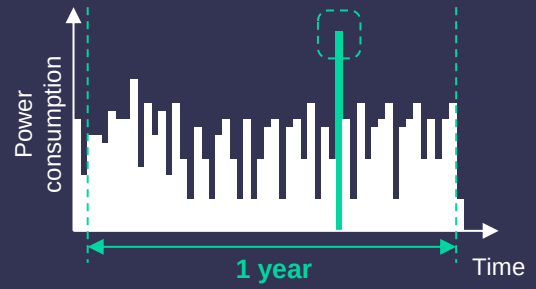
Taxes

- Energy and electricity taxes

Tax relief through ISO 50001 certification

Capacity charge

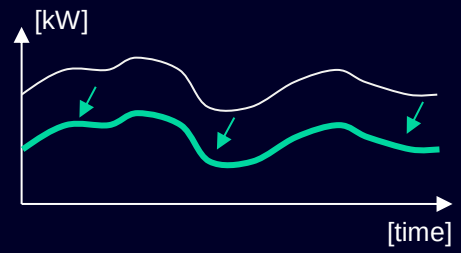
- Power supply company guarantees maximum load
- Capacity charge = largest 15 min. slice over a year x price per kW



Minimization of largest 15-minute-interval

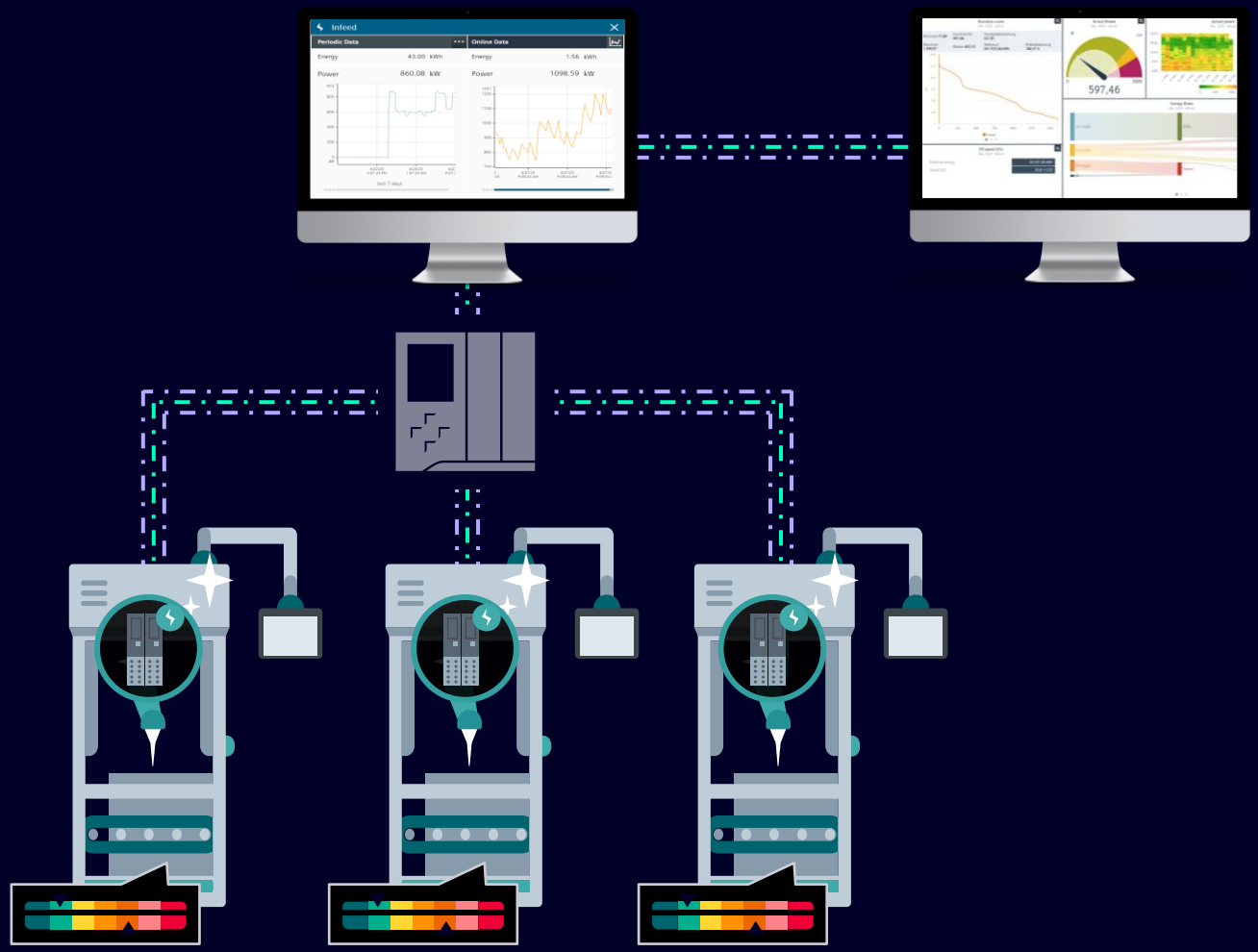
Unit price

- Based on consumed energy
- Consumed energy x price per kWh
- Analogous to private households



Reduction of the overall consumption

Resource Flexibility
is the key to optimize consumption



Resource Flexibility

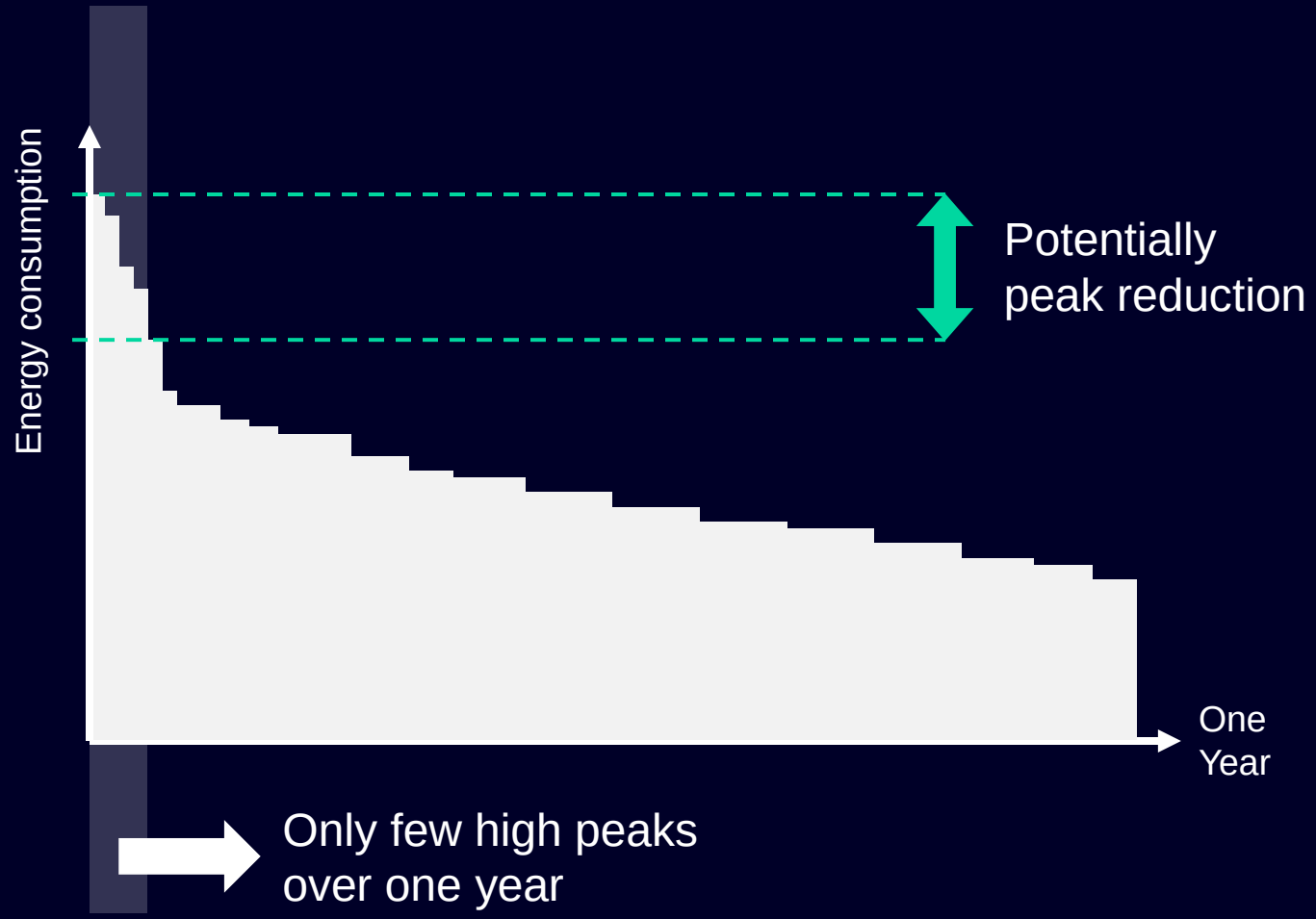
Use Case scenario

- Energy transparency and analysis installed in the factory
- After several months, customer wants to analyze the consumption to find ways to optimize energy costs
- Peak smoothing seems like a tool to avoid violating a power limit contracted with the energy supplier

Challenge

- Avoid violating average power limit
- Automated switching of aggregates to reduce stay within a certain power limit
- Include different kind of an aggregates to not influence the production during switching

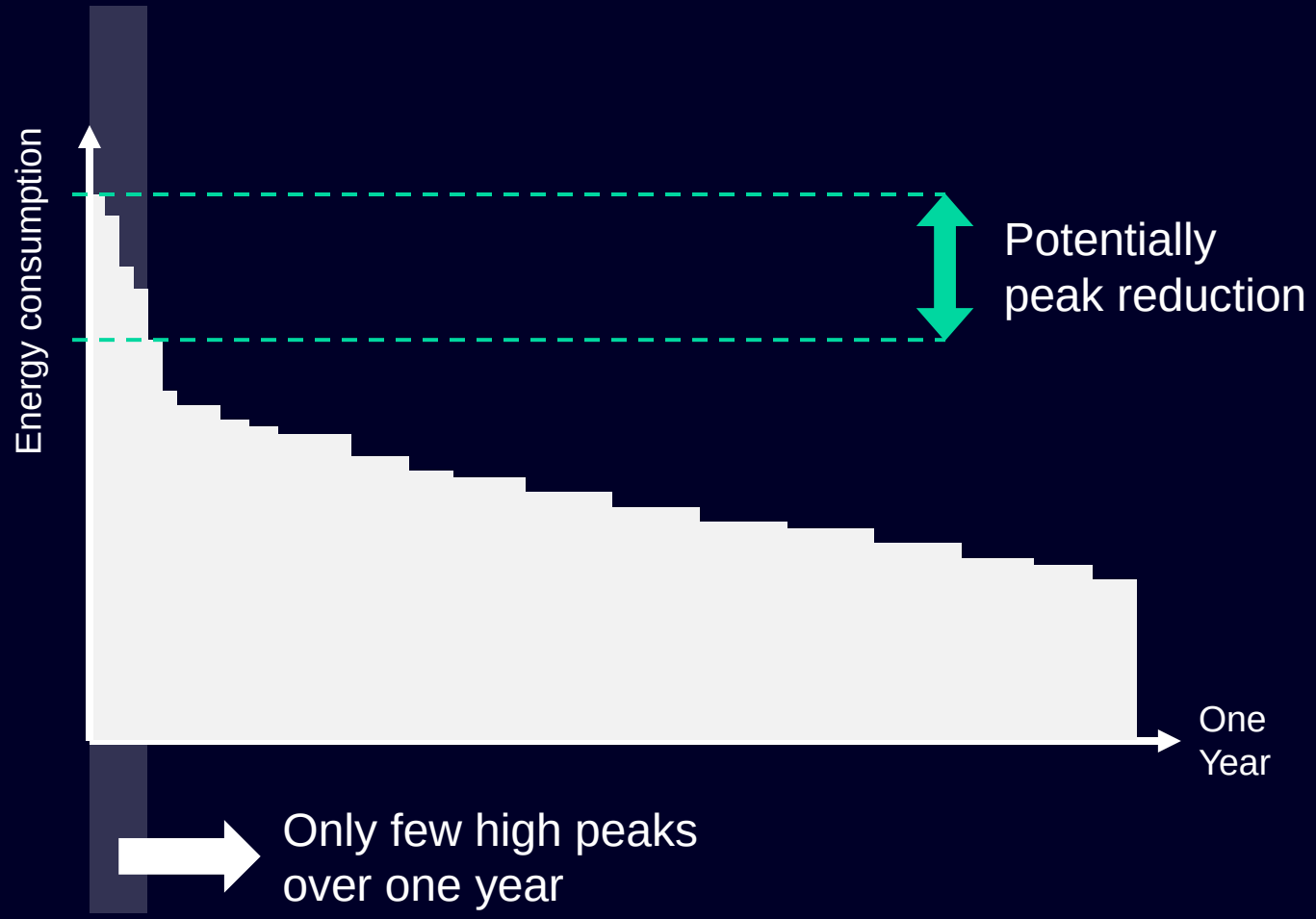
Peak Load Management
Requirements for peak load management systems



Application requirements for peak load management

- Analysis of suitability of peak load management for customer application after at least ½ - 1 year of data acquisition
- Duration curve of the infeed can be used for analysis
  - All 15-minute consumptions over certain period of time (best one year) on the x-axes
  - Consumed energy on the y-axes
  - 15-minute values sorted from the highest (left) to the lowest consumption (right)
- Criteria for suitability is a small peak of 15-minute values on the left ➔ This means, peaks rarely occur and can probably be prevented
- Flat curve means constant consumption ➔ Permanently used consumers needs to be switched off in case of LMGT

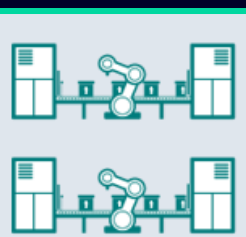
Peak Load Management
Possible saving potentials



Possible saving potentials – example calculation

Old peak value	5.0 MW
Reduction potential	5%
New peak limit in LMGT	4.75 MW
Price per kW	120 €/kW
Potential saving per year	250 kW * 120 € **30.000 €**

SIMATIC Energy Suite Load Management –
Basic preconditions

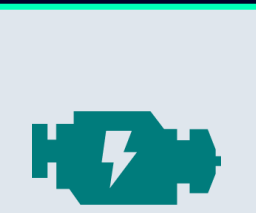


Production process

- Should **not** be influenced
- **Base load**

Consumers

- Can be **switched off**
- **Variable** power (e. g. chiller, heating, compressor, …)



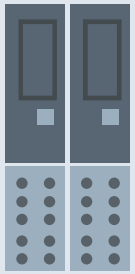
Producer

- Can be **switched on**
- **Variable** power (e. g. generators, …)

Measurement value

Feedback of the actuator

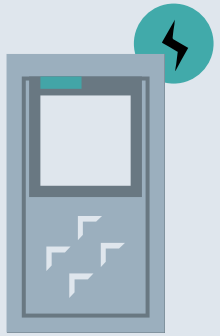
Control via relay or analog value



Acquisition of the infeed

- Captures the **total consumption** of all actuators and production
- Measurement device **should** provide an **energy counter** in best case
- Alternatively a power value can also be provided

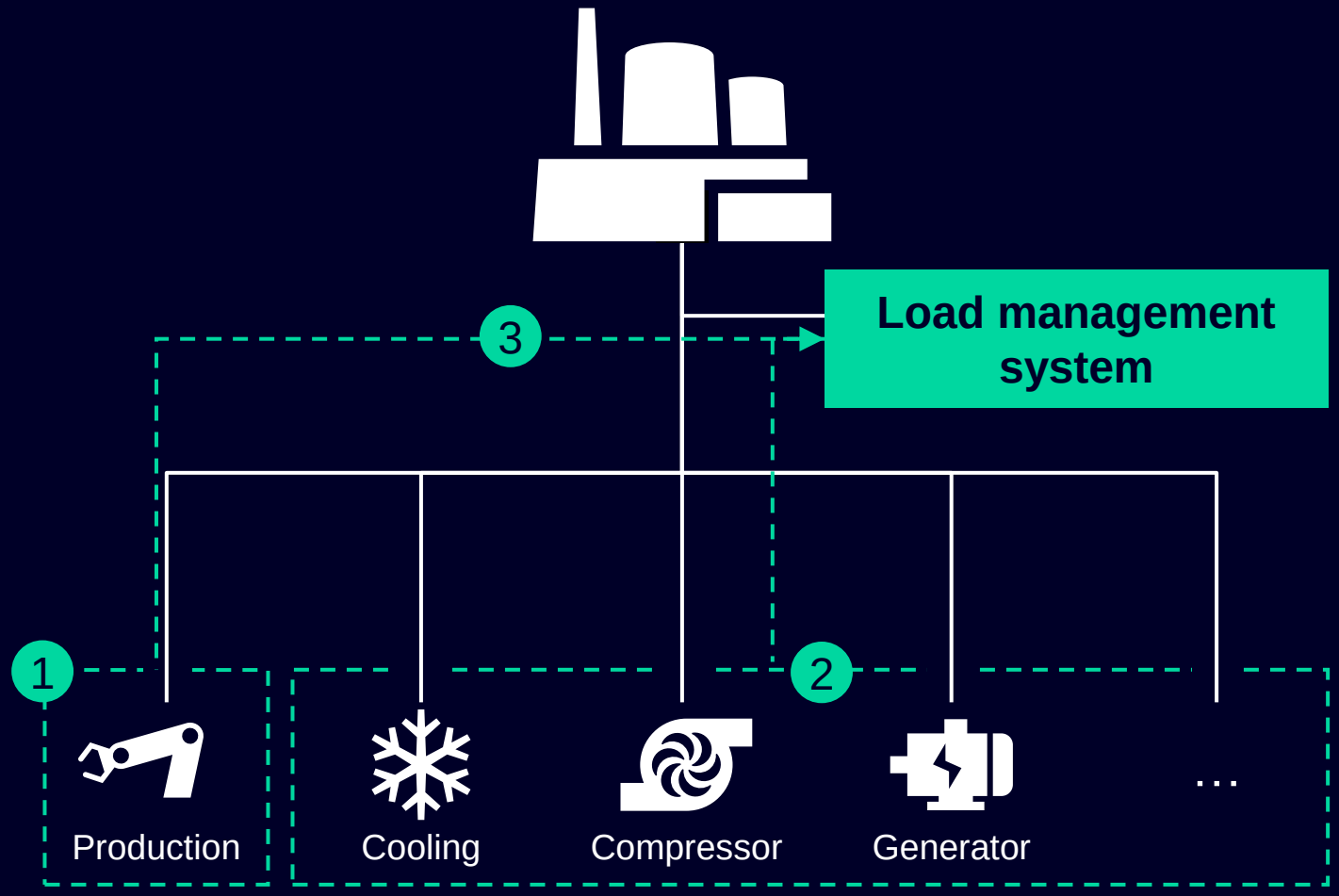
Energy counter



Data processing and preparation

- **S7-1500** PLC
- **SIMATIC Energy Suite** must be available
- An **energy object** is generated of the acquired data of the device
- **Archiving period** of the energy object specifies the monitoring period of the load management

Peak Load Management
Functionality of a general peak load management system



Functionality of a general load management system

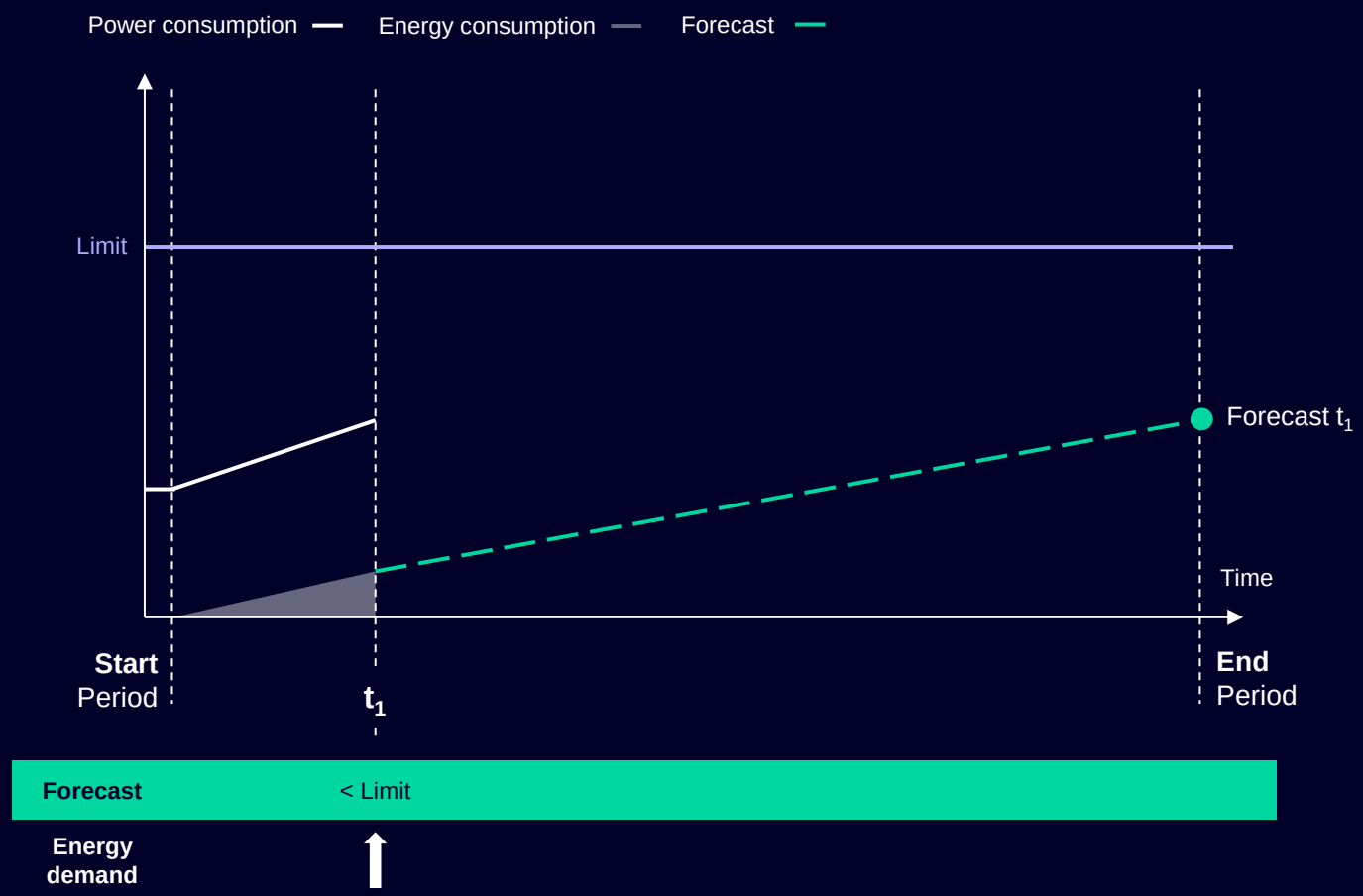
- Customer requirements for a peak load management system
  - Avoidance of load peaks by limit regulation
  - Integration of existing measuring points
  - High availability of the system
  - Scalability of the system, e.g. integration of future e-car charging areas
  - Production process should not be influenced by the system
- General functionality and advantages of a peak load management system
  1. Avoiding load peaks without influencing the production process
  2. Automatic regulation of the system by switching defined actuators
  3. Feedback of actuators to system

Peak Load Management
General functionality of a load management system

Functionality of a peak load management system

- Analysis of the energy consumption over a defined period of time (normally 15 minutes)
- Consumption at the end of the period is calculated with an algorithm (forecast)
- Regulation of the system according to relation between forecast and a user-configured limit
  - Forecast > Limit
    ➔ Energy level will be reduced
  - Forecast < Limit
    ➔ Energy level can be increased
- Example:

Peak Load Management
General functionality of a load management system



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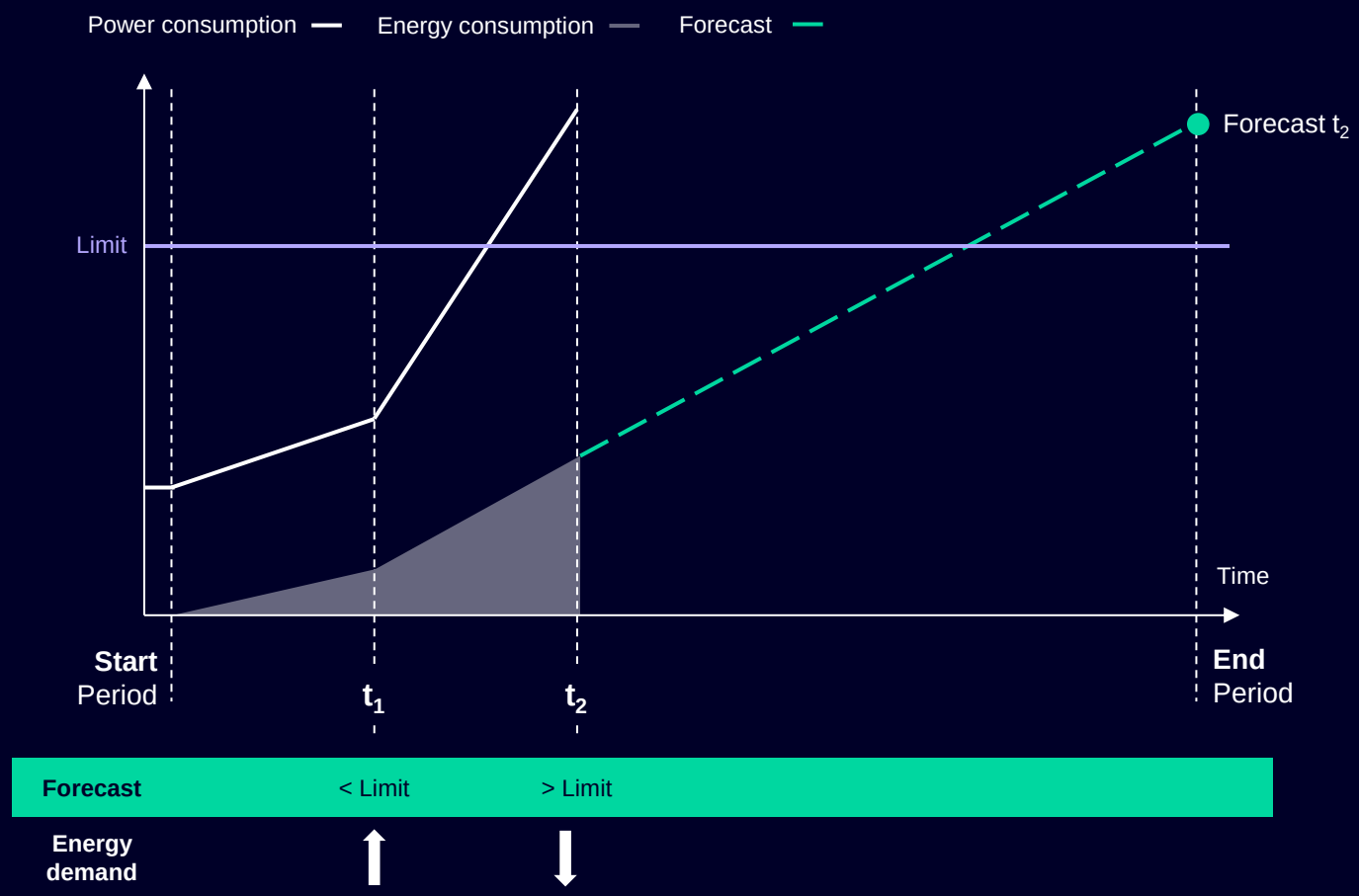

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  - t2 – Forecast >> Limit ➔ Energy level ↓

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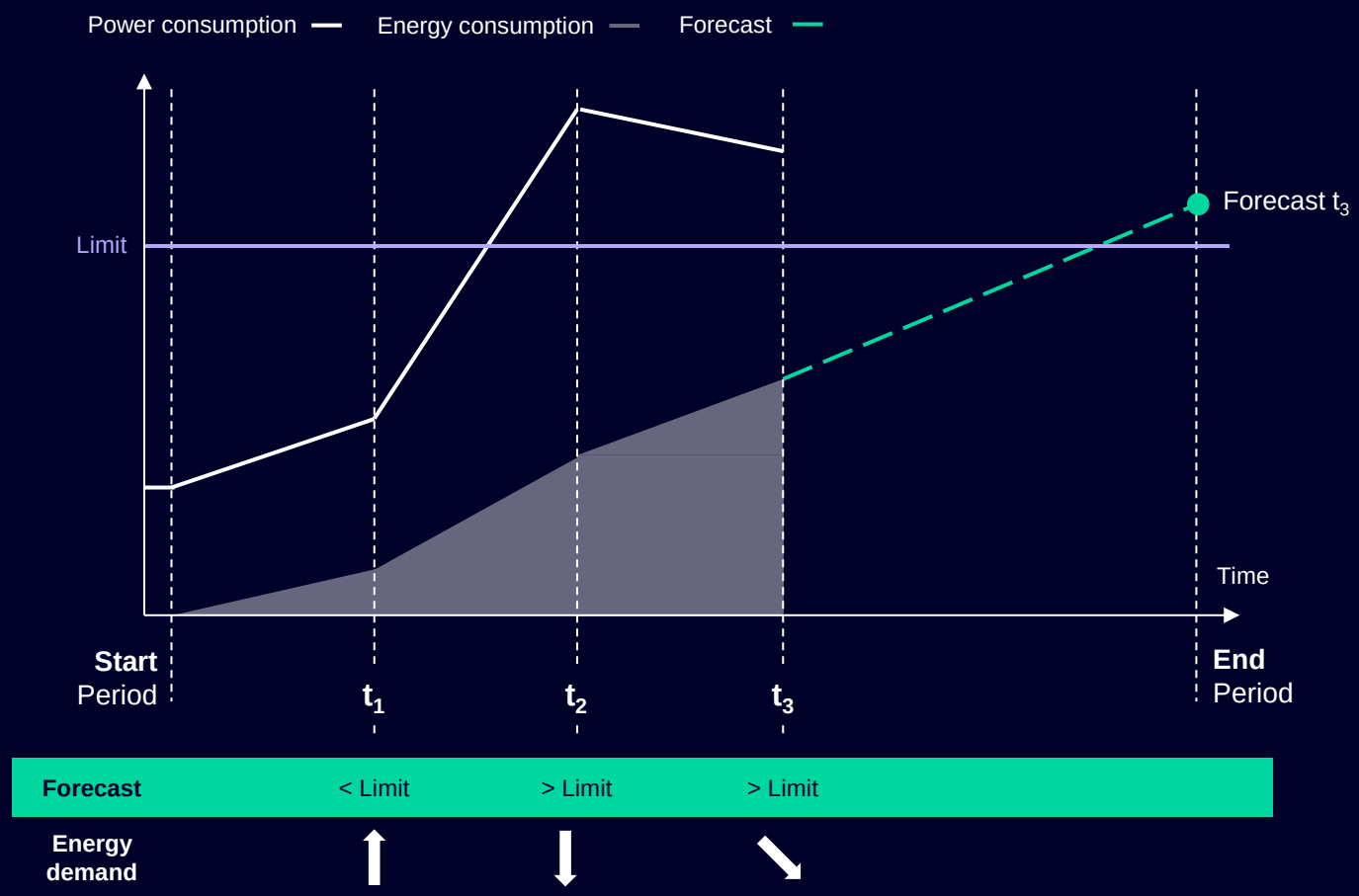
General functionality of a load management system



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  - t3 – Forecast > Limit ➔ Energy level ↘

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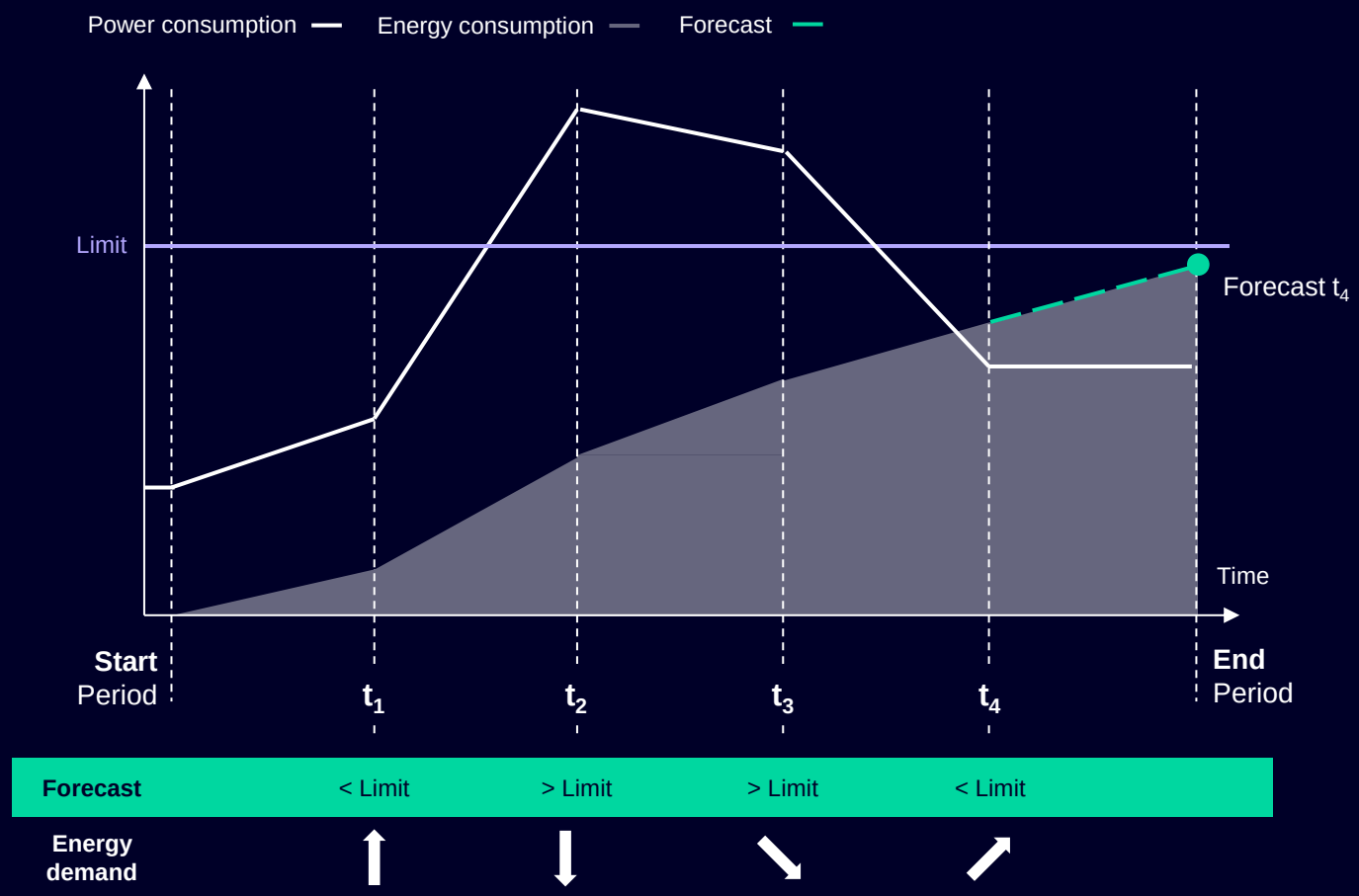
General functionality of a load management system



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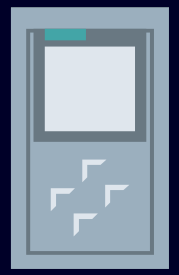
  - t4 – Forecast < Limit ➔ Energy level ↗

Peak Load Management
Hardware concept

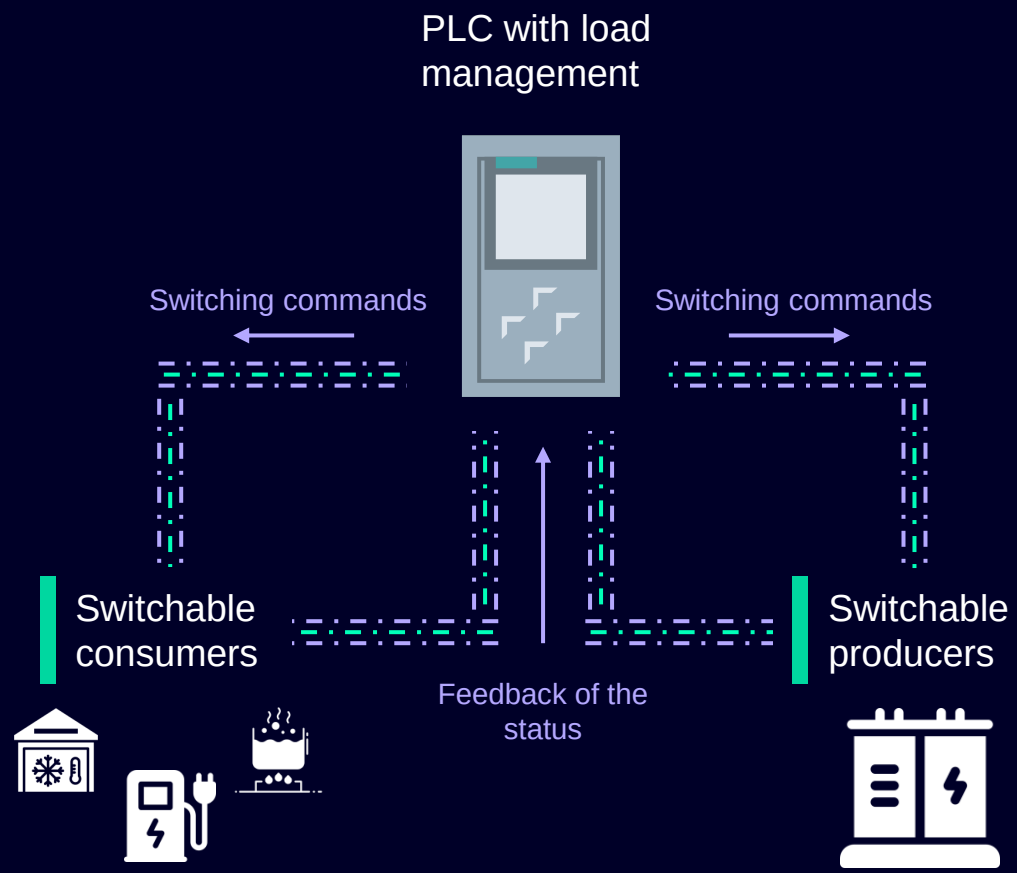
PLC with load management



Hardware concept for a LMGT system

- Central PLC with load management system (normally at least CPU 1516 with SMC of 256MB)

Peak Load Management
Hardware concept



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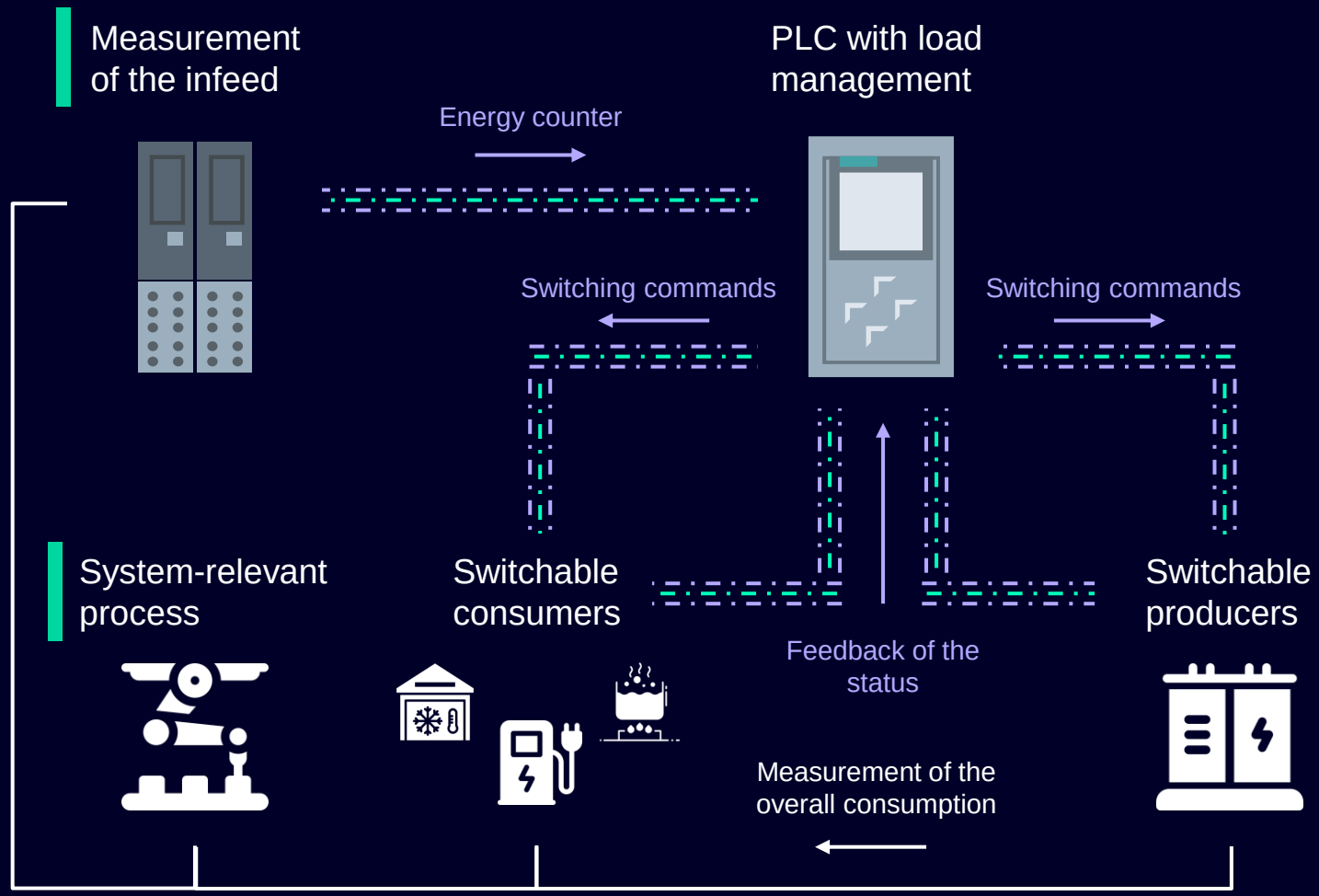
  - Physical connection from PLC to actuators to signal switching commands
  - Feedback of the actuator status after switching command

Peak Load Management
Hardware concept



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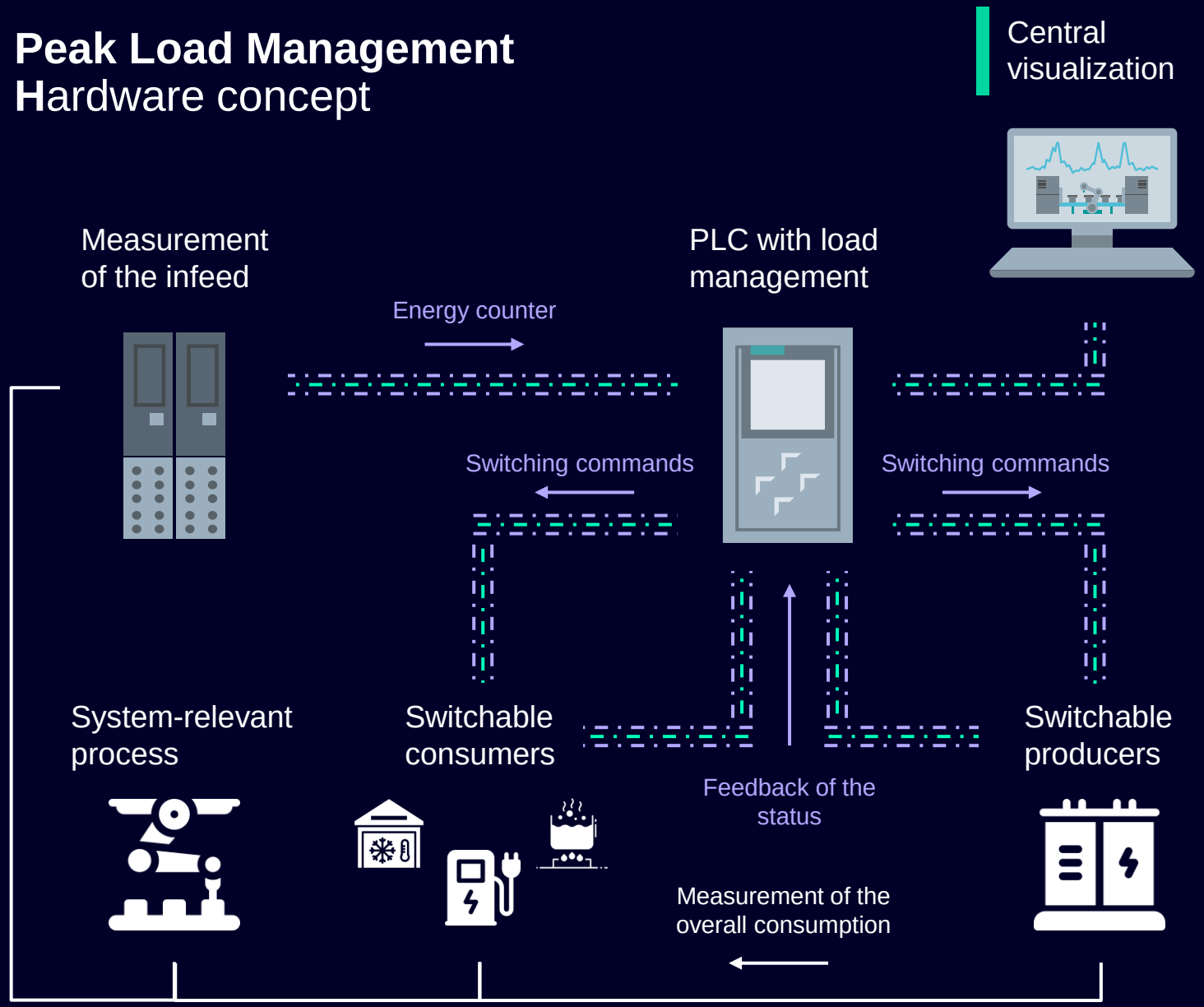
Peak Load Management
Hardware concept



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  - Feedback of the actuator status after switching command
- For consumption forecast, measurement of the overall infeed is necessary. Value provided to the PLC
- Operating and monitoring with central visualization system

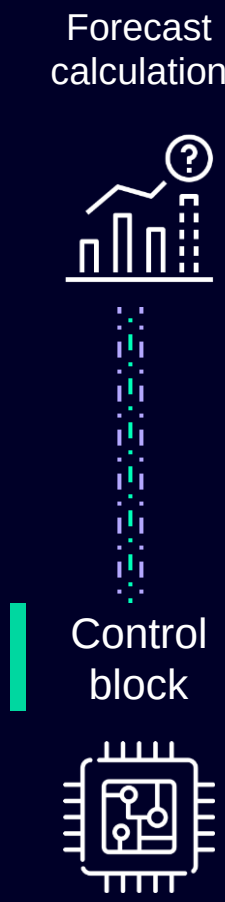
Peak Load Management
Software concept

Forecast calculation

Software concept of the LMGT in the Energy Suite

- Measurement of infeed needs to be provided by the Energy Suite as acquisition object
- Function block calculates the forecast for the end of the period with interpolation algorithm

Peak Load Management
Software concept



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Peak Load Management
Software concept

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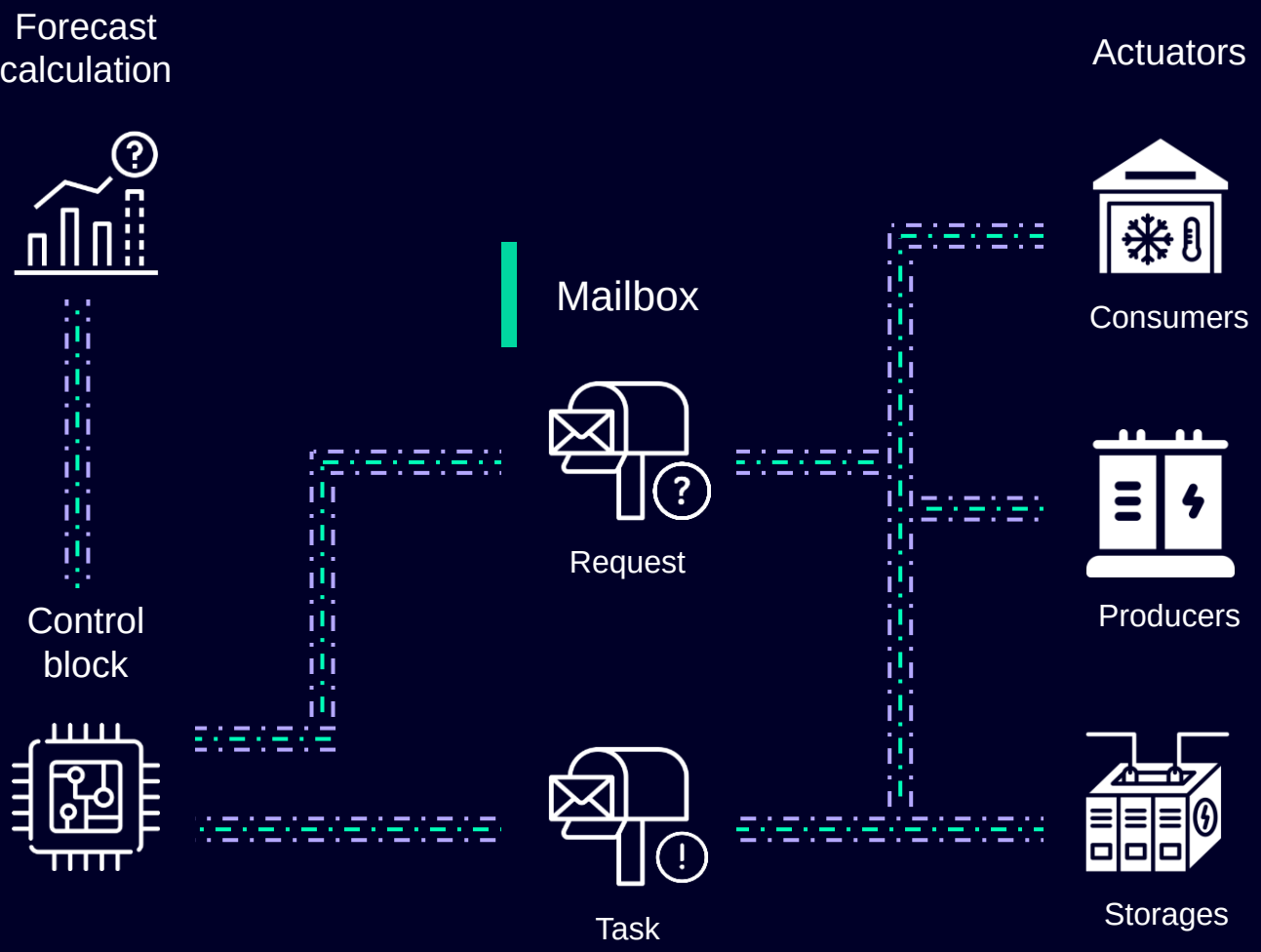
Peak Load Management
Software concept



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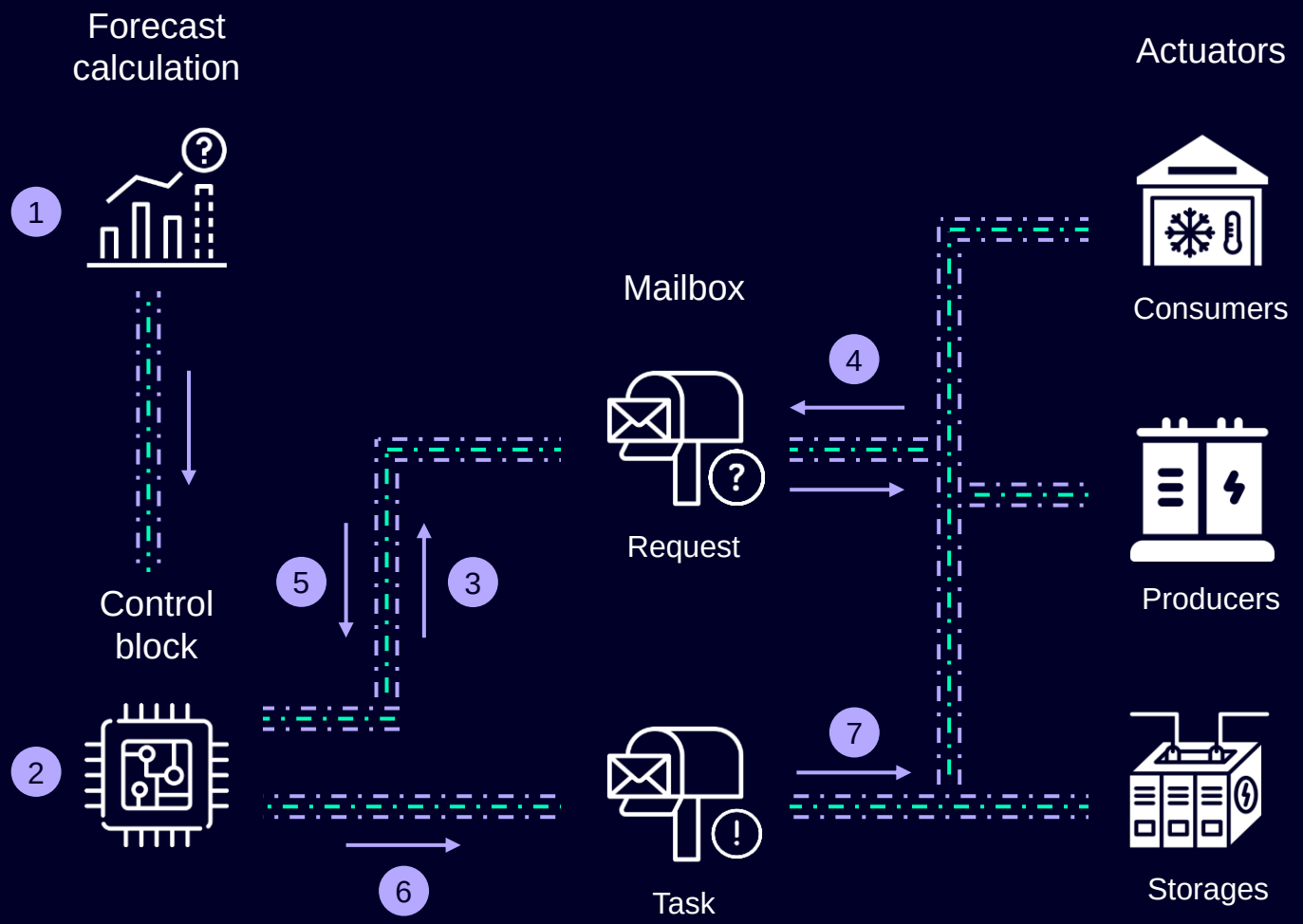
  - Request mailbox for status update of the actuators
  - Task mailbox for delivering switching tasks to the actuators

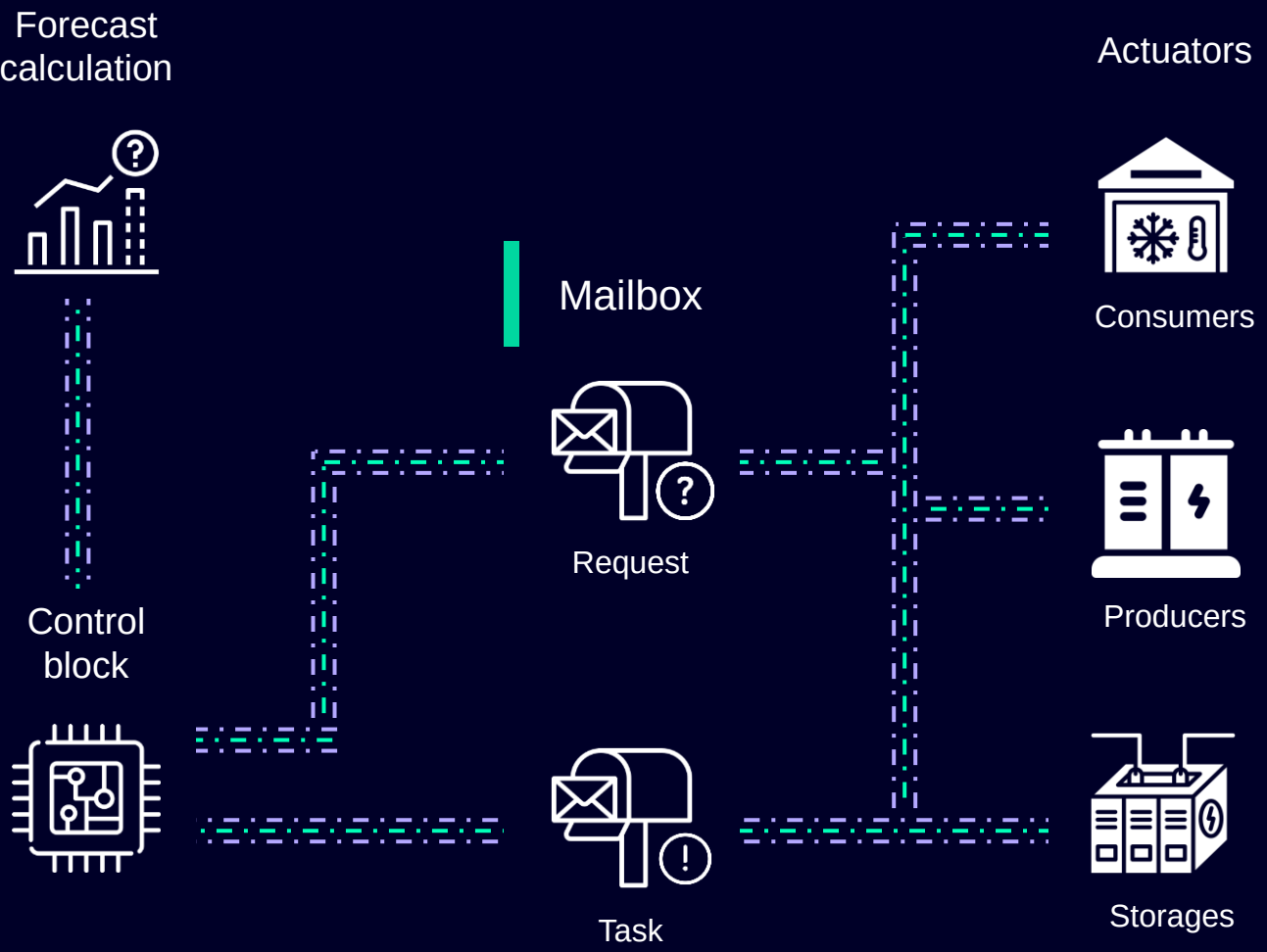
Peak Load Management
Software concept



Software concept of the LMGT in the Energy Suite

- Process of a typical switching cycle in peak load management
  1. Calculation of forecast and update of value
  2. Analysis of forecast and setpoint of control block
  3. Request of control block to update current status of actuators in request mailbox
  4. Actuators get request and update their current status in the request mailbox
  5. Selection of actuators to be switched based on request mailbox information by the control block
  6. Task updated in the mailbox
  7. Actuators read task mailbox and switch if necessary

Peak Load Management
Software concept



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Peak Load Management
Switching of actuators

Optima
www.optimacs.com

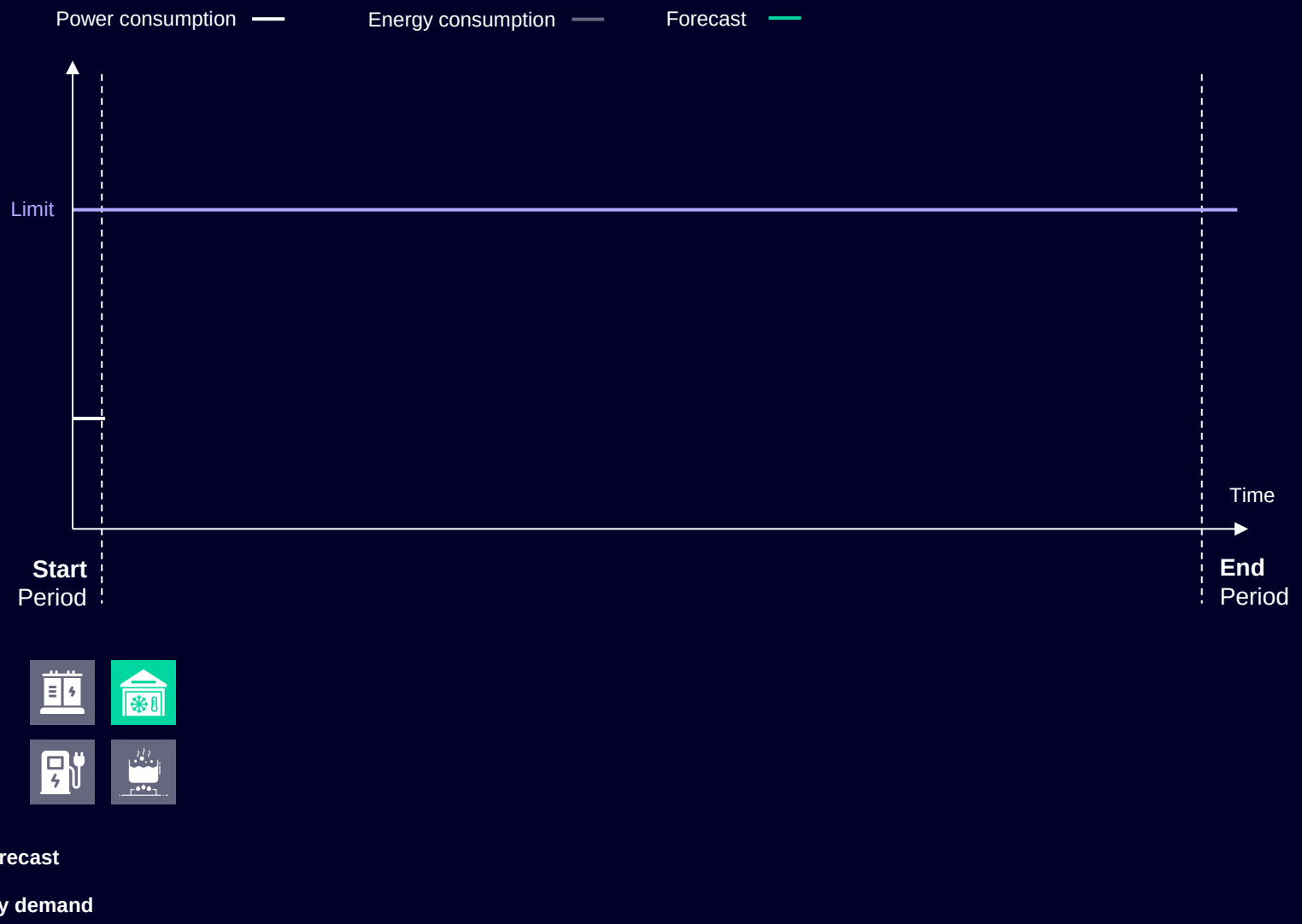
Actuators

1 Generator

2 Cooling Warehouse

3 eCar Charging

4 Water Boiling



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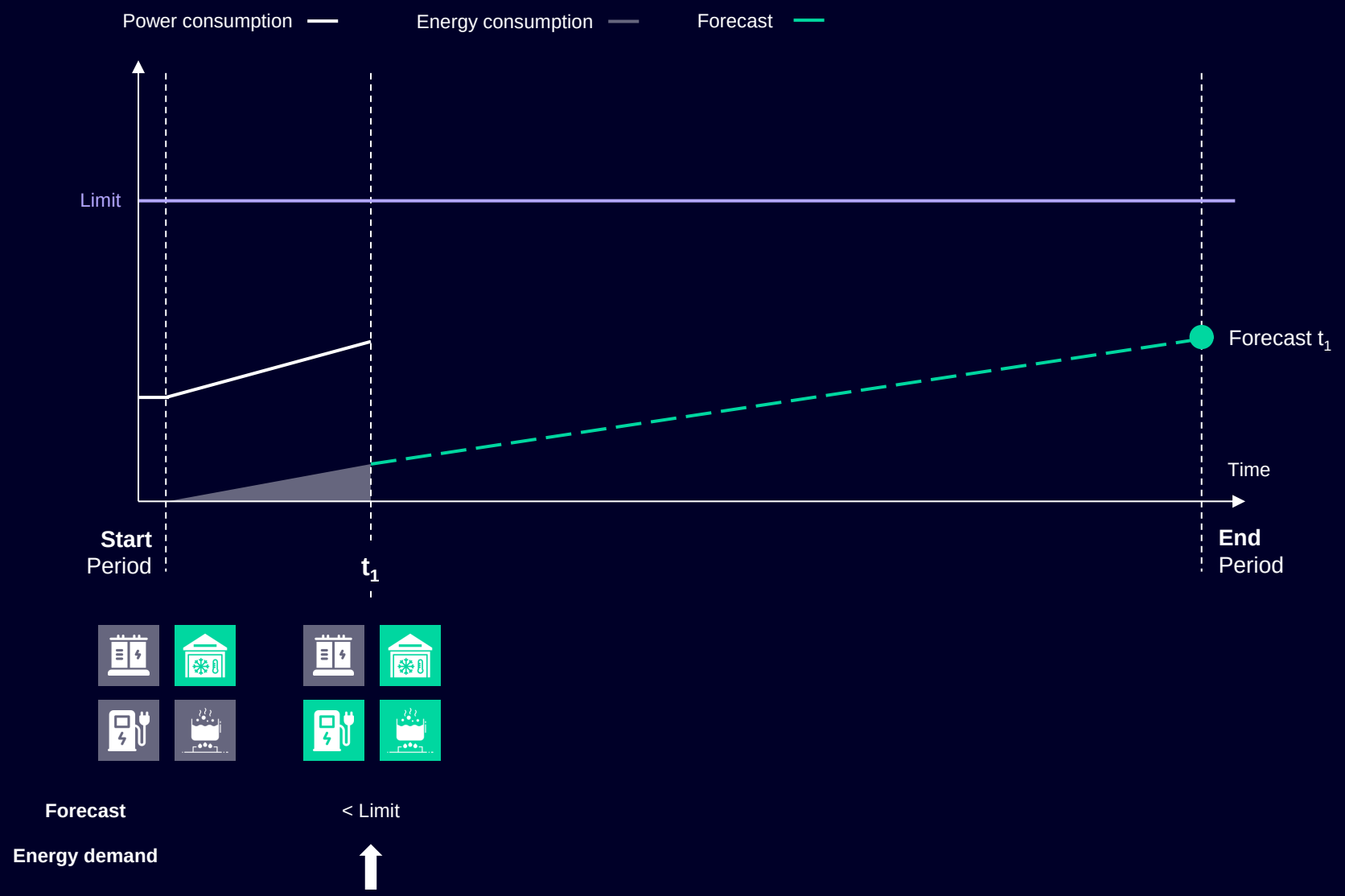

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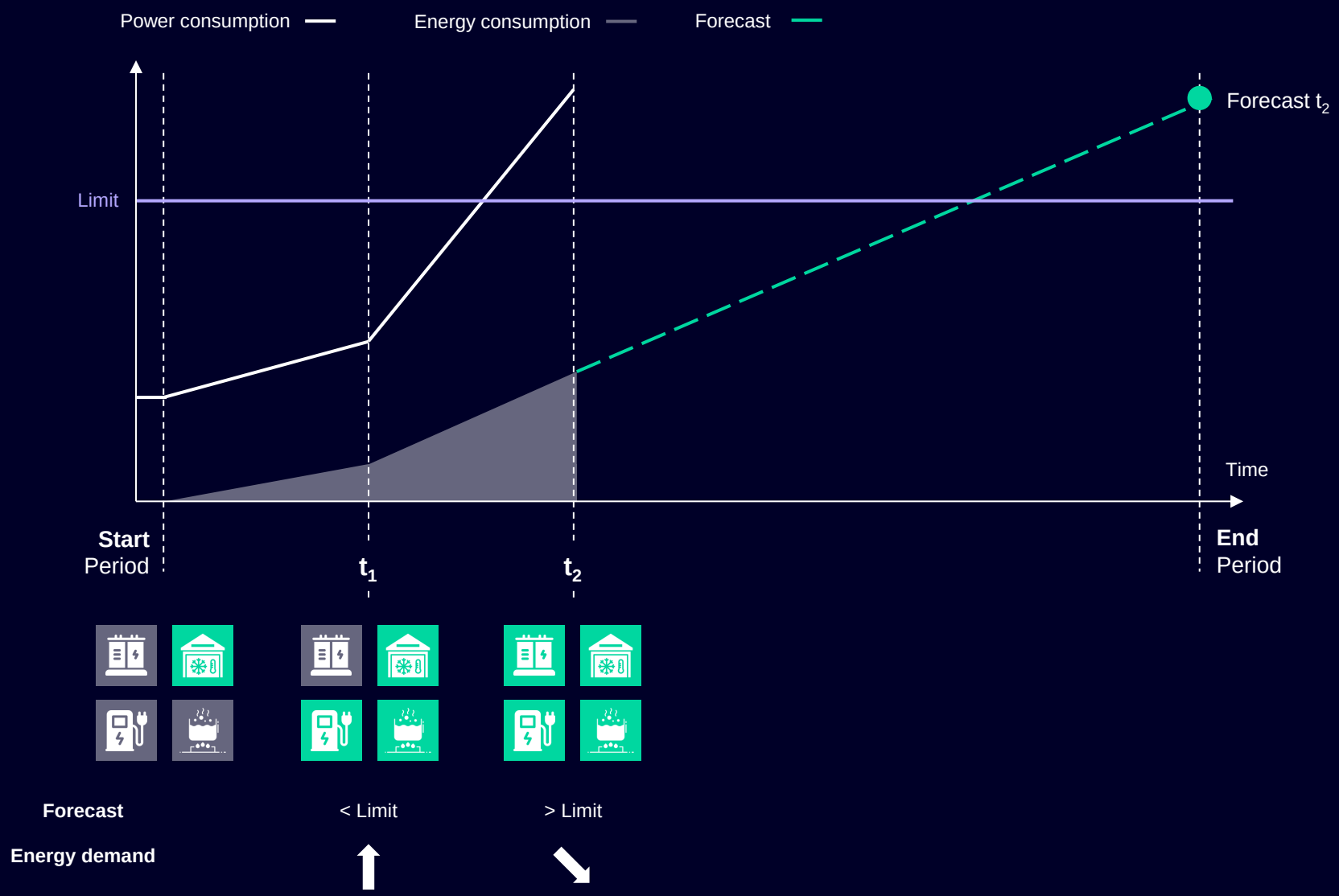

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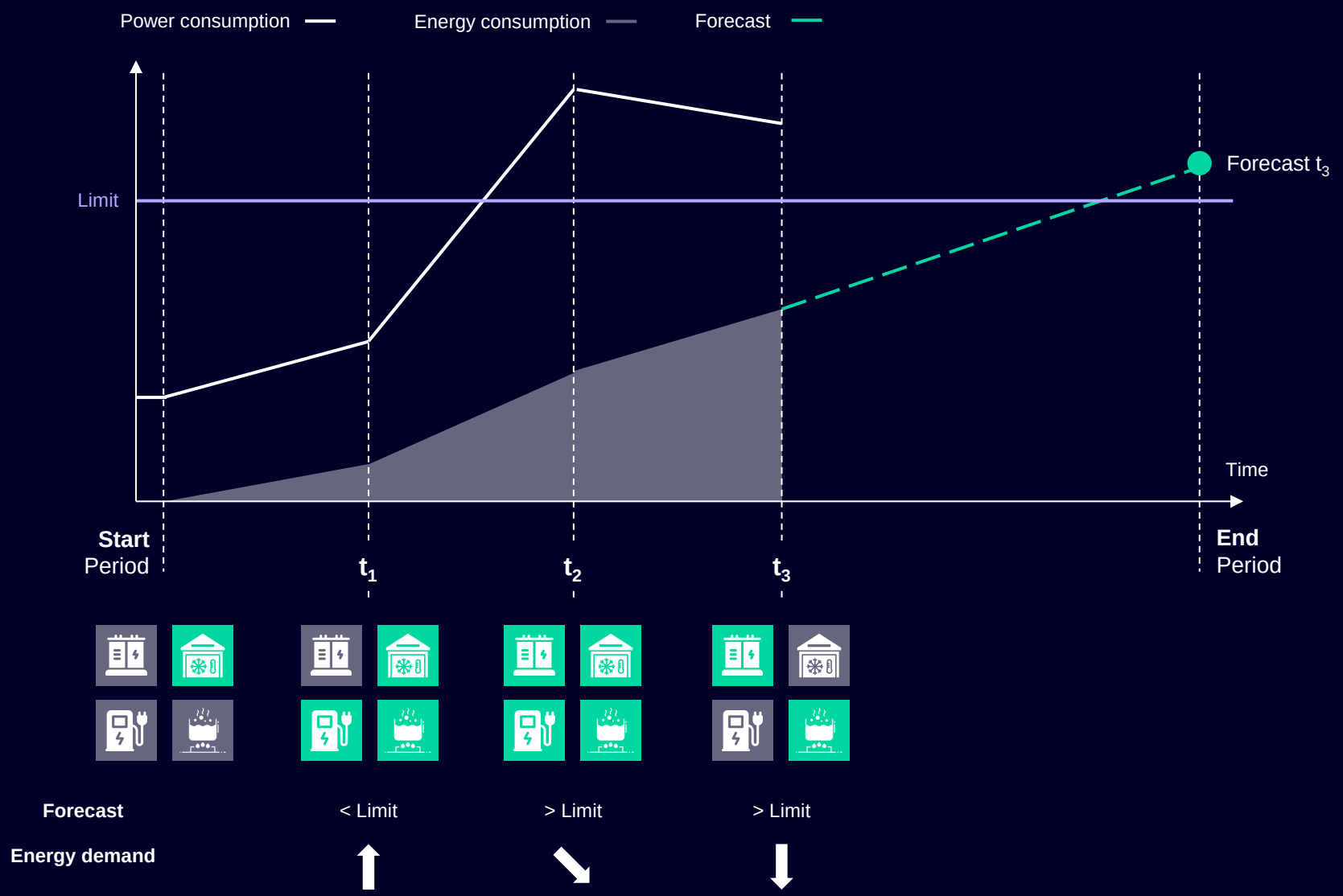

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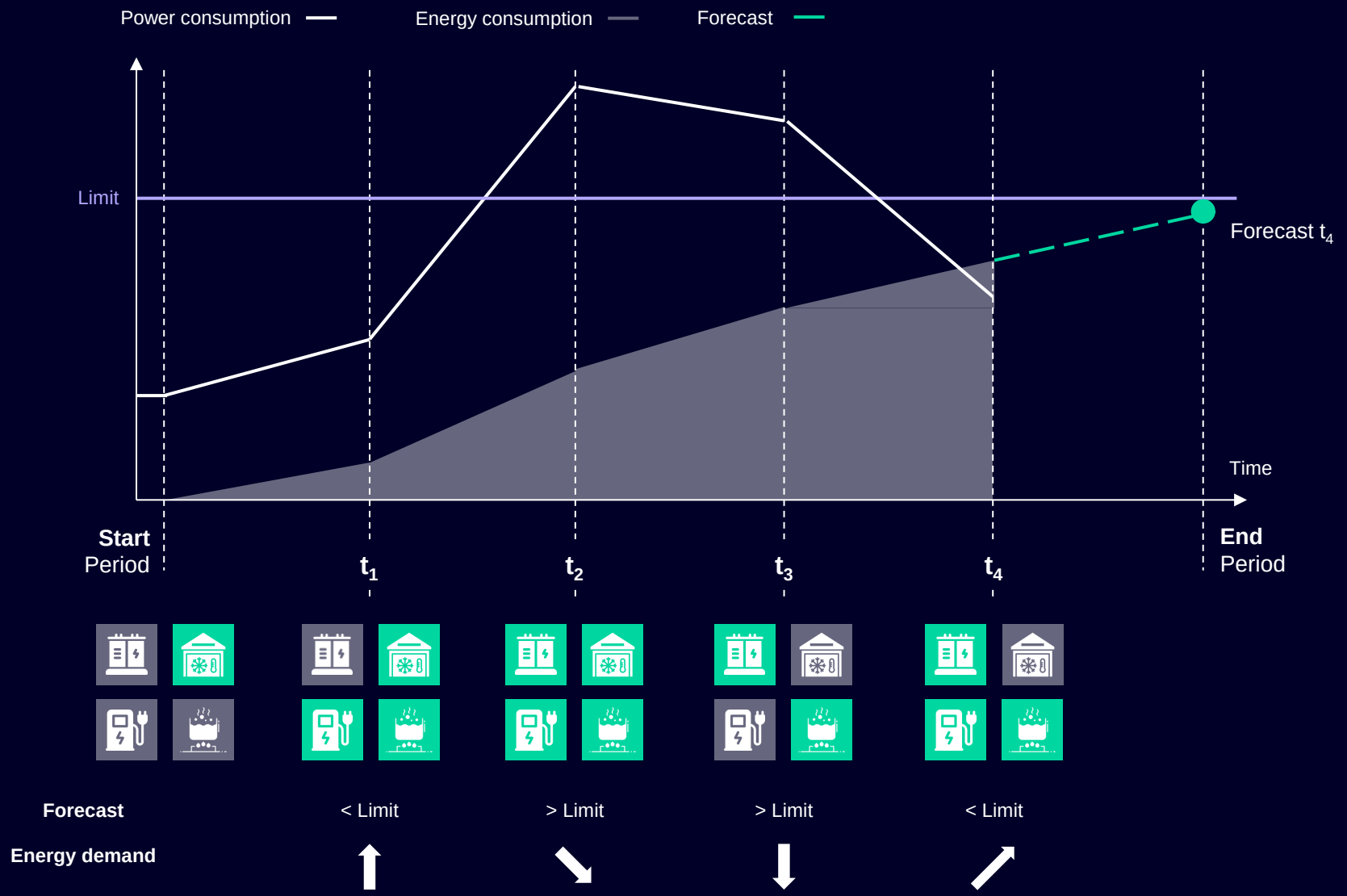

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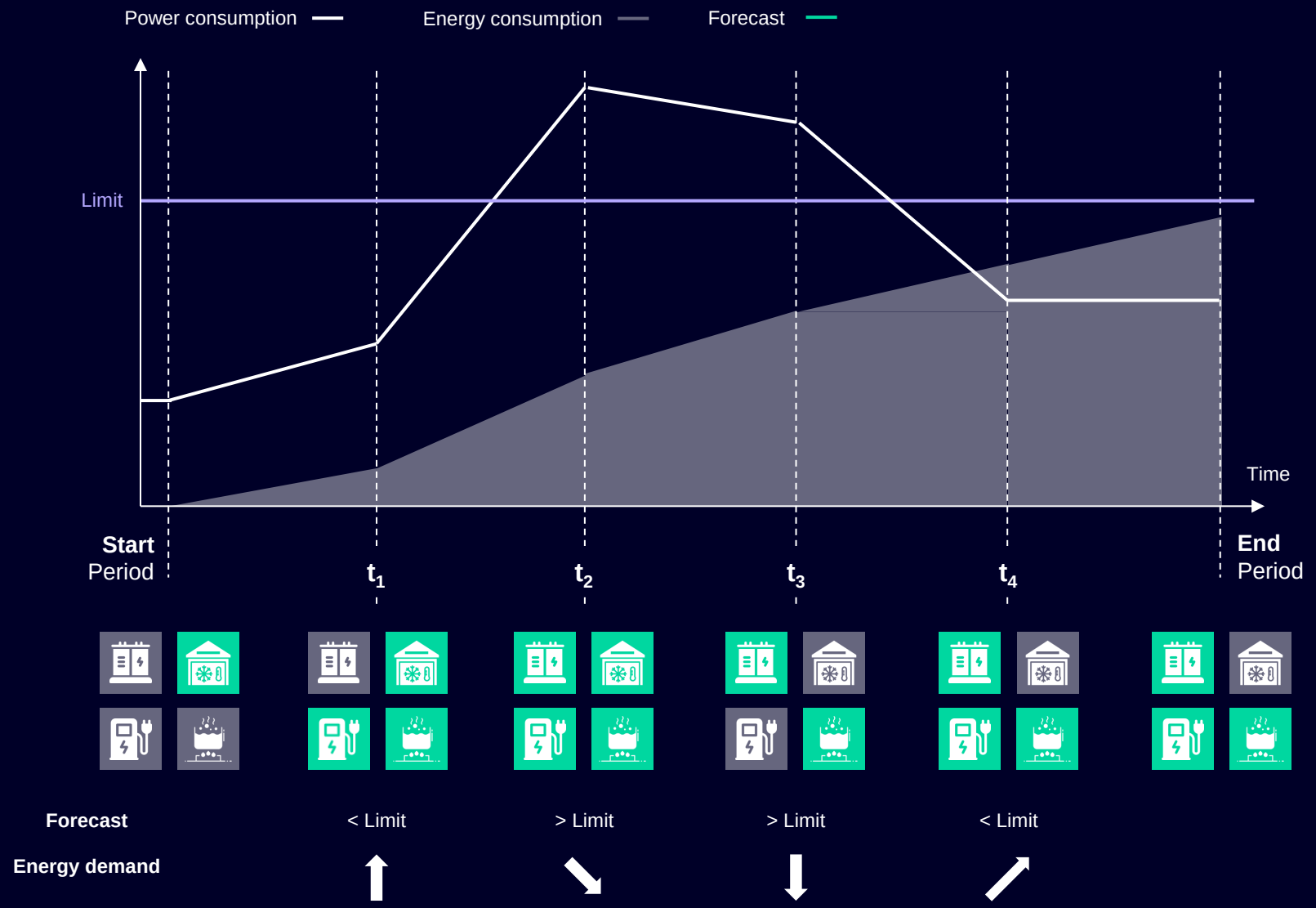

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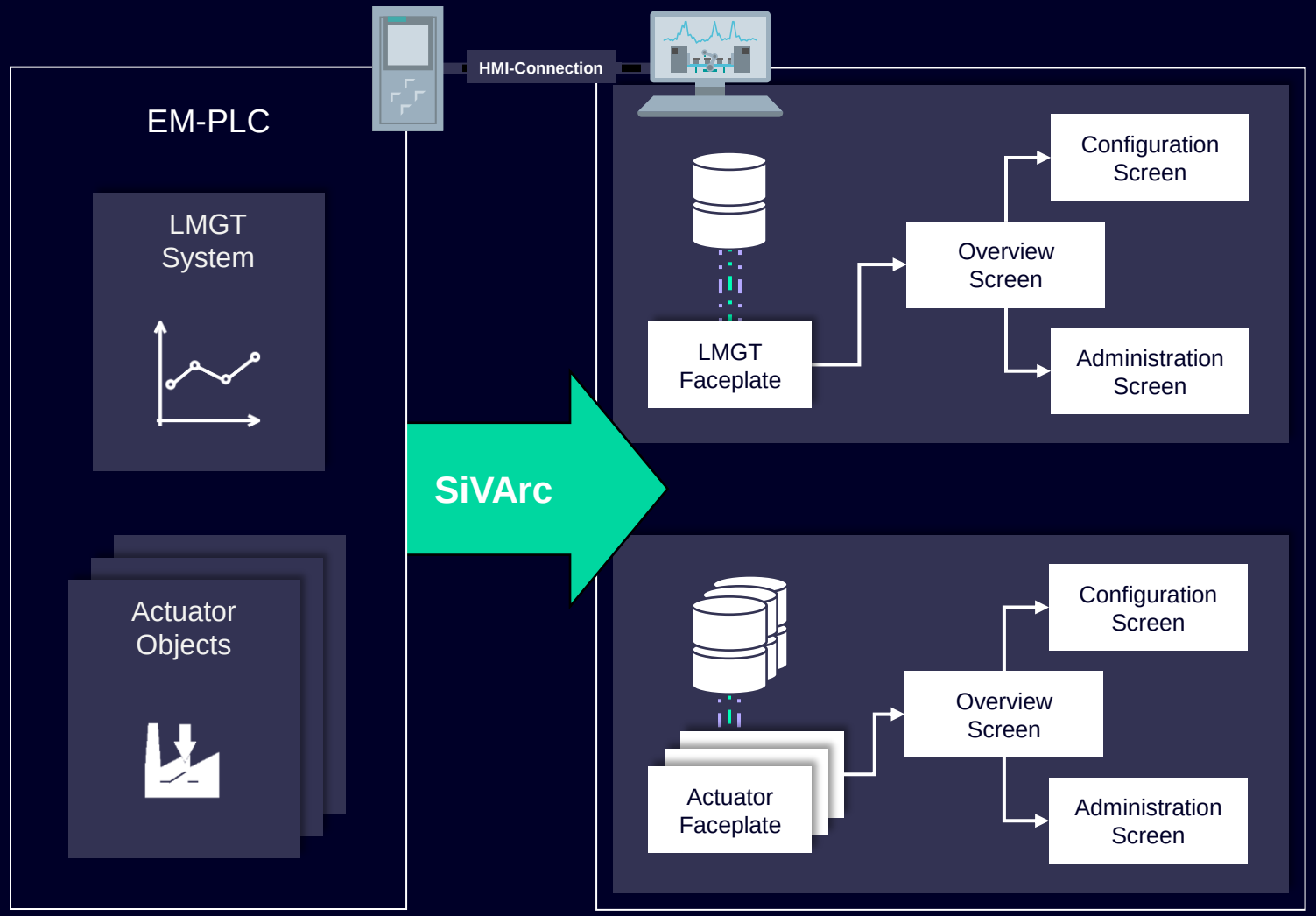
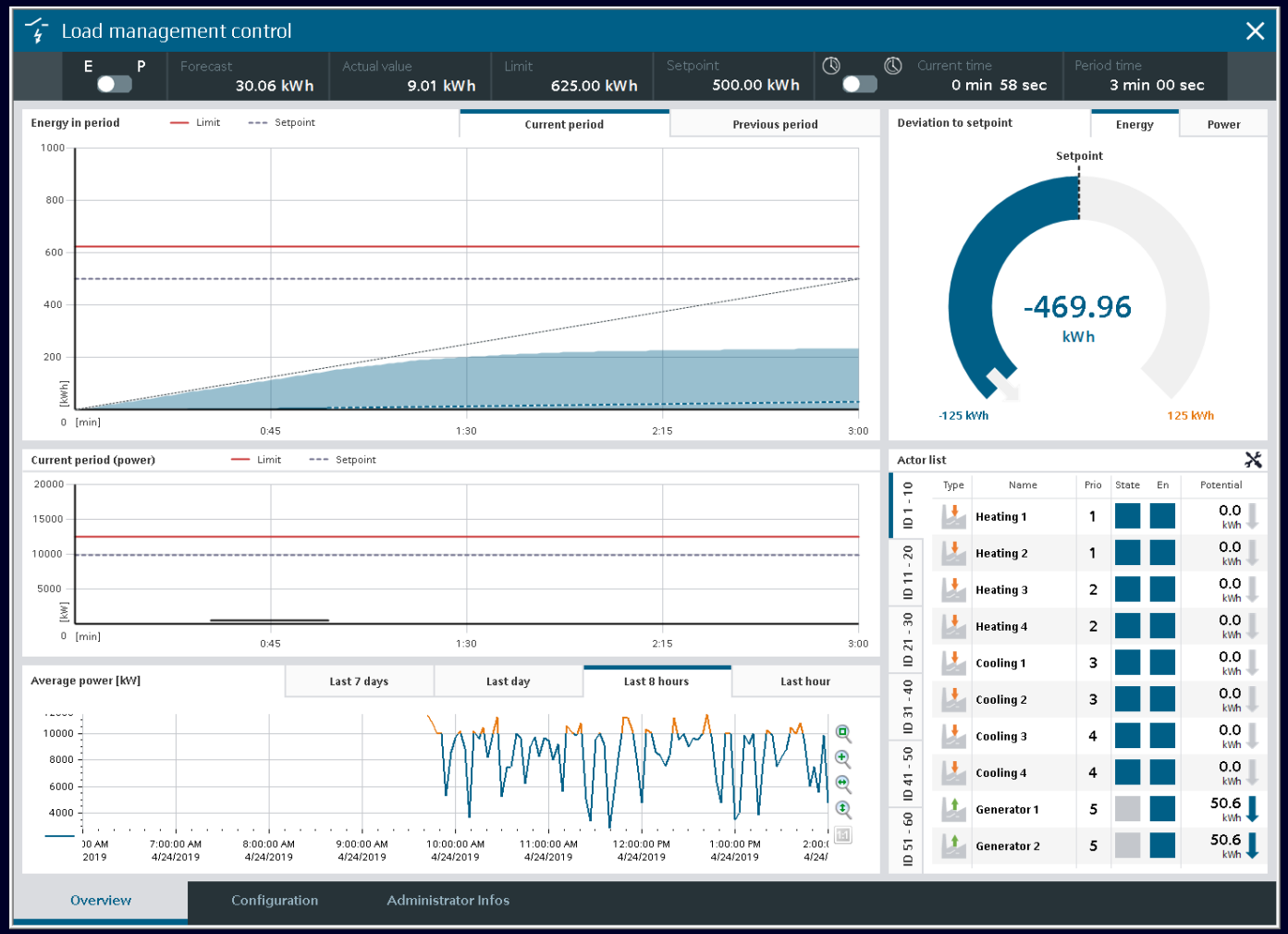
Peak Load Management
Visualization of load management in WinCC Unified

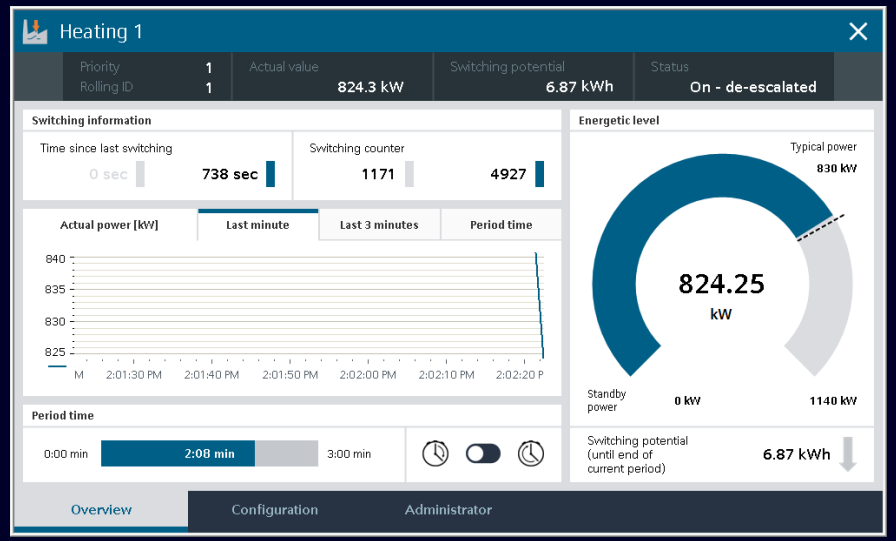


LMGT visualization with SiVArc for WinCC Unified

- Basic requirement: **Existing HMI-connection**
- All **screens** are **only copied once**
- SiVArc rules for the Energy Suite can be **automatically generated**
- Tool generates the visualization for the general load management system and all actuator objects
  - LMGT system: One **faceplate** and the **data household**
  - Actuators: One **faceplate** and the **data household** for **each** Actuator Object
- **Faceplate** sets the **tag prefix** of the screen window
- Screens get **access** to correct instance **data household** when opened

SIMATIC Energy Suite load management
Visualization example





Overview of the load management

- Presentation of the previous and current period using a triangle diagram
- Historical values of the infeed up to 7 days
- List of all actors including status and configuration possibility

Detail view per actuator

- All relevant information at a glance
- Subsequent configuration possible
- Operation of the manual mode

SIMATIC Energy Suite load management –
License concept

Optima
www.optimacs.com

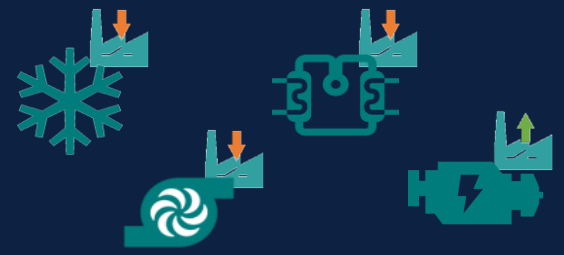
Concept

Acquisition objects

- **One** energy object license per acquisition object

CoL

Actuator object



- **Three** energy object licenses per actuator object

CoL

PLC

- Energy object licenses as a kind of "currency", usable for **acquisition objects as well as actuator objects**
- Licenses as **bundles of 5 or 10**

Example

24x Acquisition objects

➔ **24x** Energy object licenses

30x Actuator objects

➔ **270x** Energy object licenses

Total: **294x** EnO licenses

➔ e. g. **29x 10** bundle
+ **1x 5** bundle

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SIMATIC Energy Suite V19
License concept

Lizenzname	Artikel Nr. Download = ⬇ /DVD = 💿	L1-Preis
Engineering		
SIMATIC Energy Suite V19 Engineering inkl. 10 Energy Objects (2 x 5 EnO)	6AV2108-0AA02-3AH5 ⬇ 6AV2108-0AA02-3AA5 💿	865,- € 1038,- €
SIMATIC Energy Suite V19 Engineering, Upgrade V14..V18 -> V19	6AV2108-3AA02-3AK5 ⬇ 6AV2108-3AA02-3AE5 💿	260,- € 312,- €
SIMATIC Energy Suite V19 Engineering Trial	**SIOS: 109761410** 6AV2108-0AA02-3AA7 💿	29,15,- €
SIMATIC Energy Suite Engineering, SW Update Service	6AV2108-0AA00-0AY0 ⬇ 6AV2108-0AA00-0AL0 💿	129,- € 145,- €
Runtime - SIMATIC Energy Suite S7-1500		
5 Energy Objects (1x 5 EnO)	6AV2108-0CF00-0BH0 ⬇ 6AV2108-0CF00-0BB0 💿	216,- € 242,- €
10 Energy Objects (2x 5 EnO)	6AV2108-0DF00-0BH0 ⬇ 6AV2108-0DF00-0BB0 💿	432,- € 485,- €
50 Energy Objects (5x 10 EnO)	6AV2108-0FH00-0BH0 ⬇ 6AV2108-0FH00-0BB0 💿	2162,- € 2426,- €
100 Energy Objects (10x 10 EnO)	6AV2108-0HH00-0BH0 ⬇ 6AV2108-0HH00-0BB0 💿	4325,- € 4853,- €

Benefits for the customer:

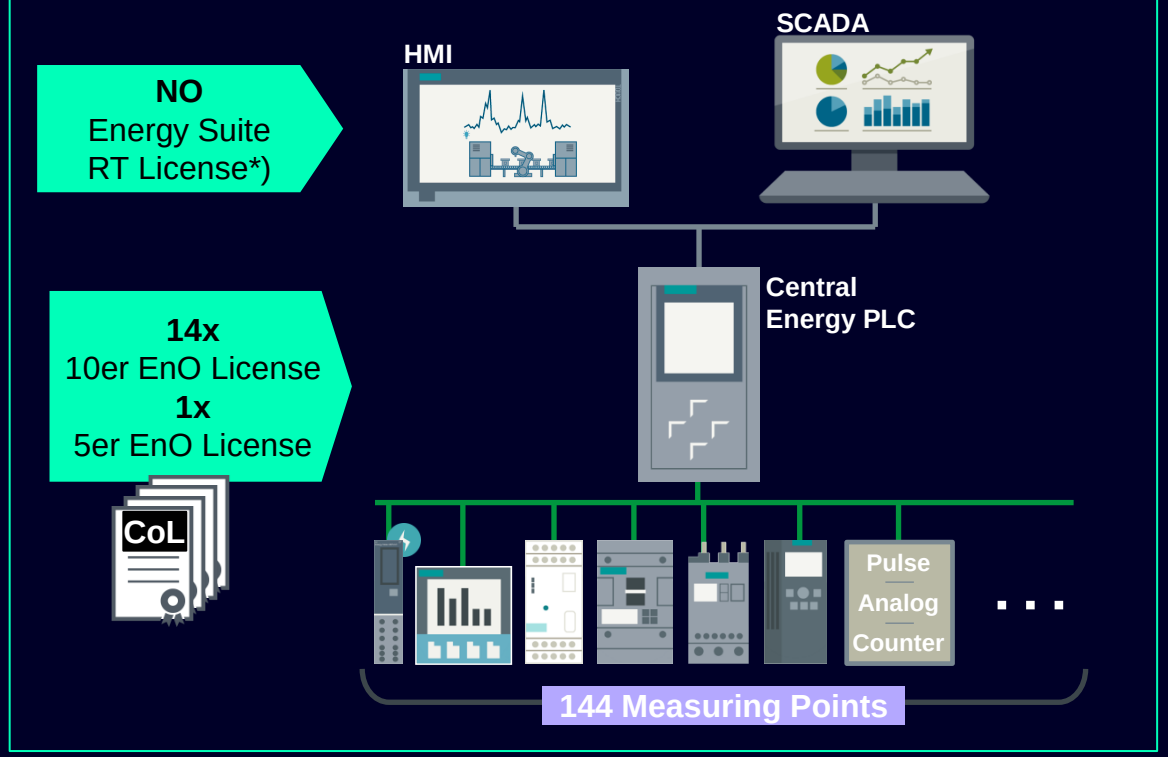
- **Cost sensitive entry**
  even for small applications
- **Scalable**
  Customer only has to buy what he needs
- **Future-proof**
  RT-License is version-independent
- **Flexible**
  Licenses can be distributed in the site

Note: All Runtime Licenses are countable and version neutral, Runtime Licenses are provided as CoL

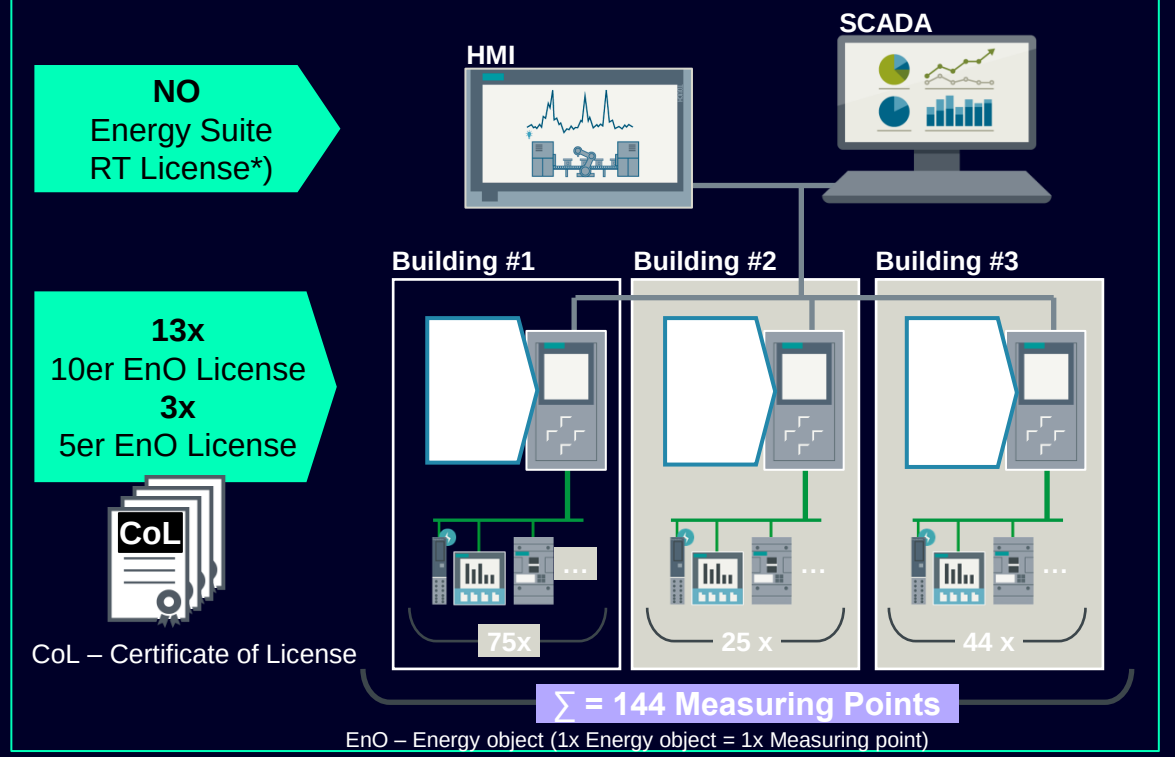
EnO – Energy object | **CoL** – Certificate of License

SIMATIC Energy Suite
Licensing examples

Customer A - Typ: »central«



Customer B - Typ: »distributed«

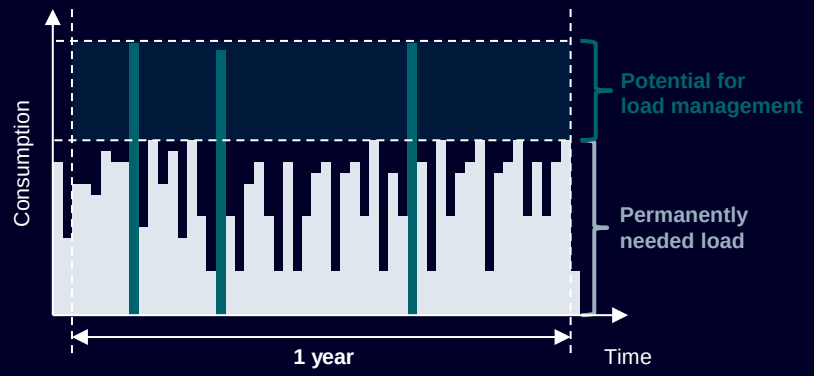


Flexible license concept offers individual licensing and allows licensing of the most important customer scenarios: Distributed systems and continuous expansion

SIMATIC Energy Suite load management –
When do I achieve the ROI?

Optima
www.optimacs.com

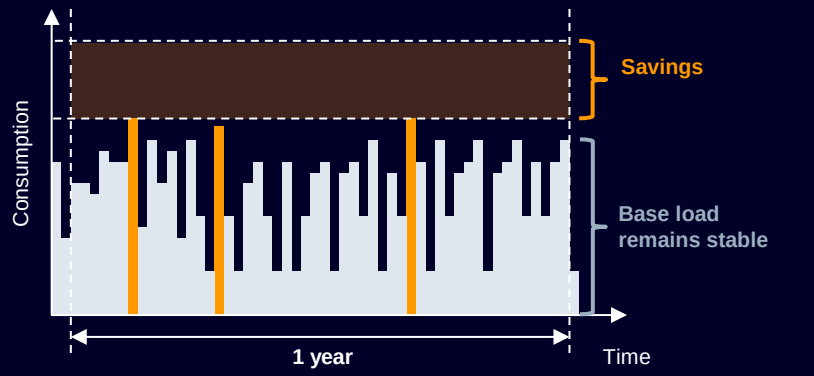
Exemplary use case



Highest load peak:	9.000 kW
Price per kW/year:	100,00 €/kW
Capacity Charge per year:	900.000,00 €

Costs of LMGT

Hardware (PLC, Server,…):	30.000,00 €
Software (EnS, WinCC):	5.000,00 €
Licenses for actuators (80x):	9.600,00 €



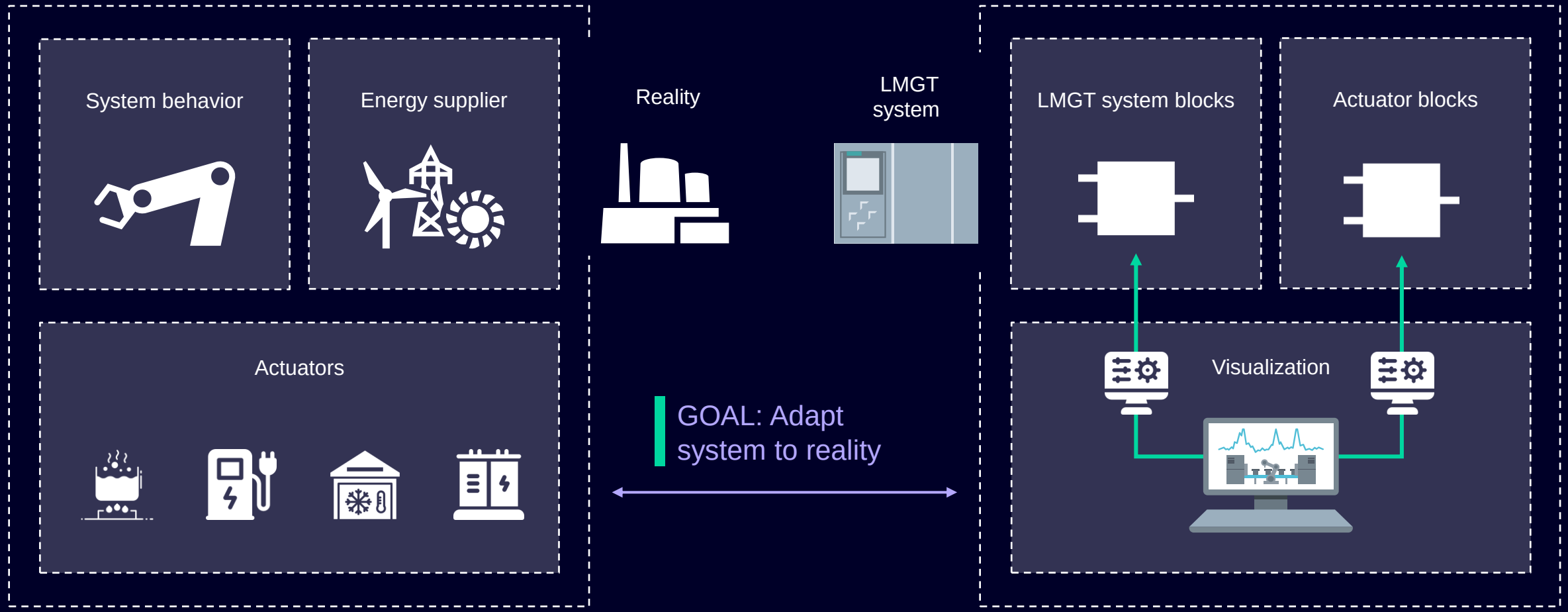
Highest load peak:	8.000 kW
Price per kW/year:	100,00 €/kW
Capacity Charge per year:	800.000,00 €

Return on Invest (ROI)

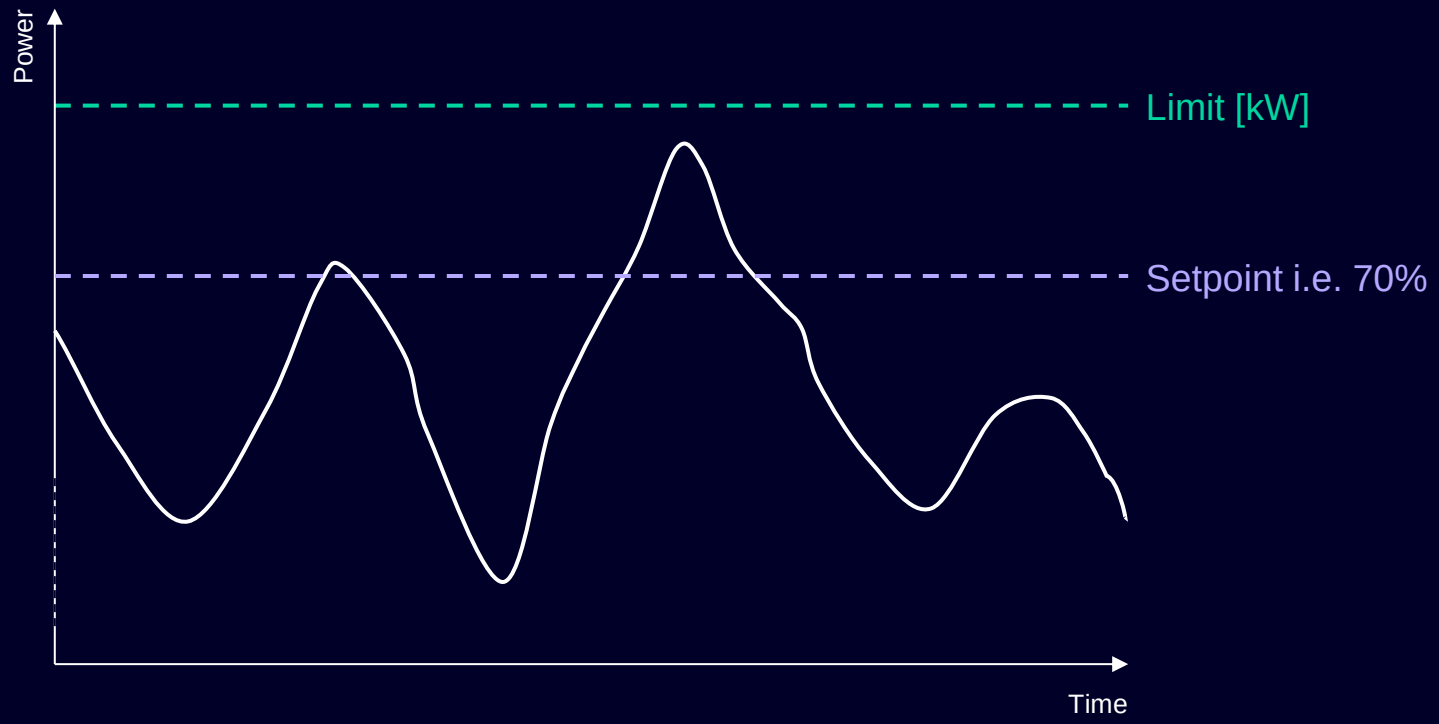
Savings per year:	100.000,00 €
Costs for LMGT:	44.600,00 €
Return of Invest (ROI):	0,45 years

SIEMENS

Peak Load Management
Load management system must be adapted to reality



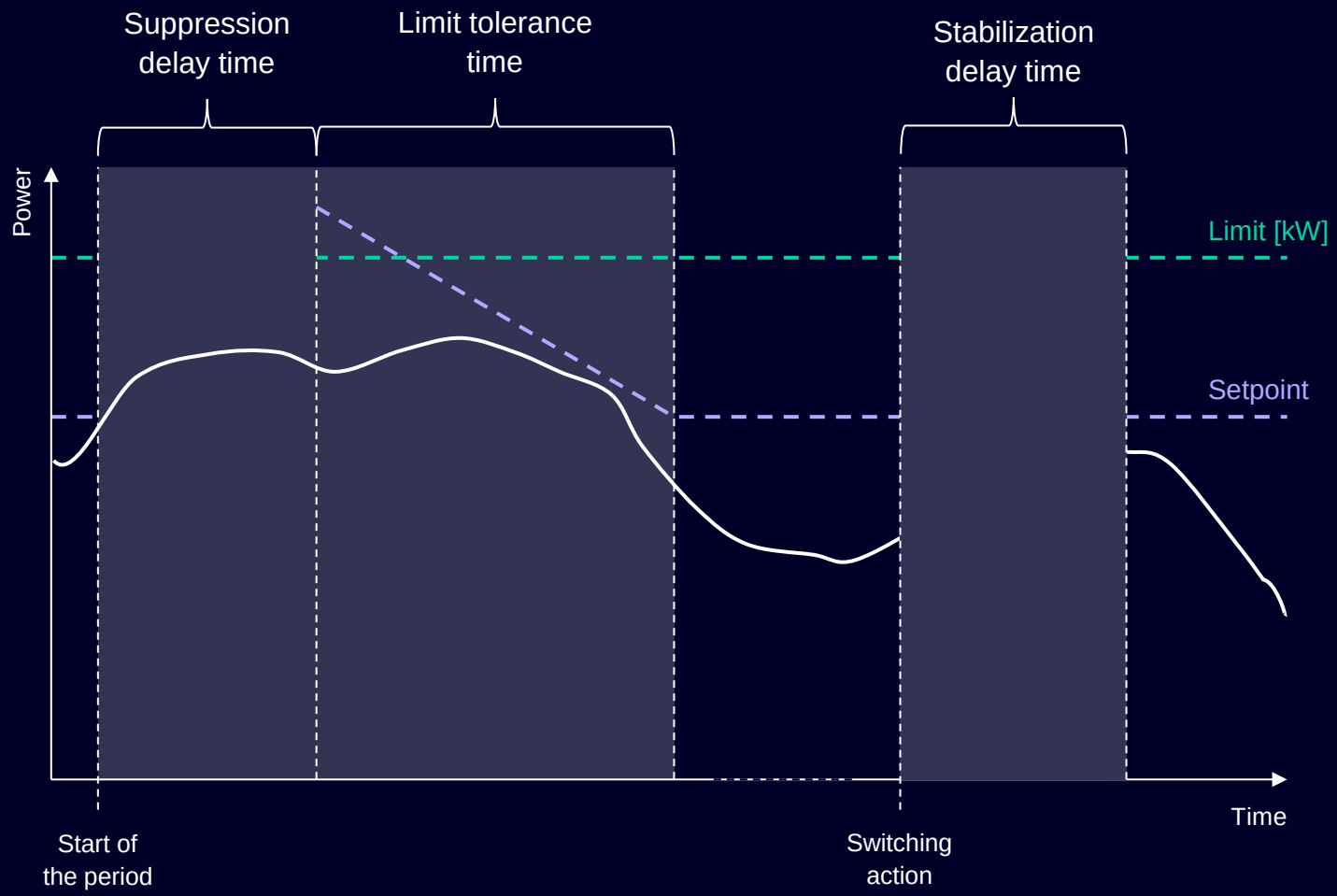
Peak Load Management
Configuration of the load management system



Configuration of the LMGT system in WinCC Unified

- Energy supply company
  - Contractually agreed limit [in kW]
  - Setpoint for switching actions [in % of limit]

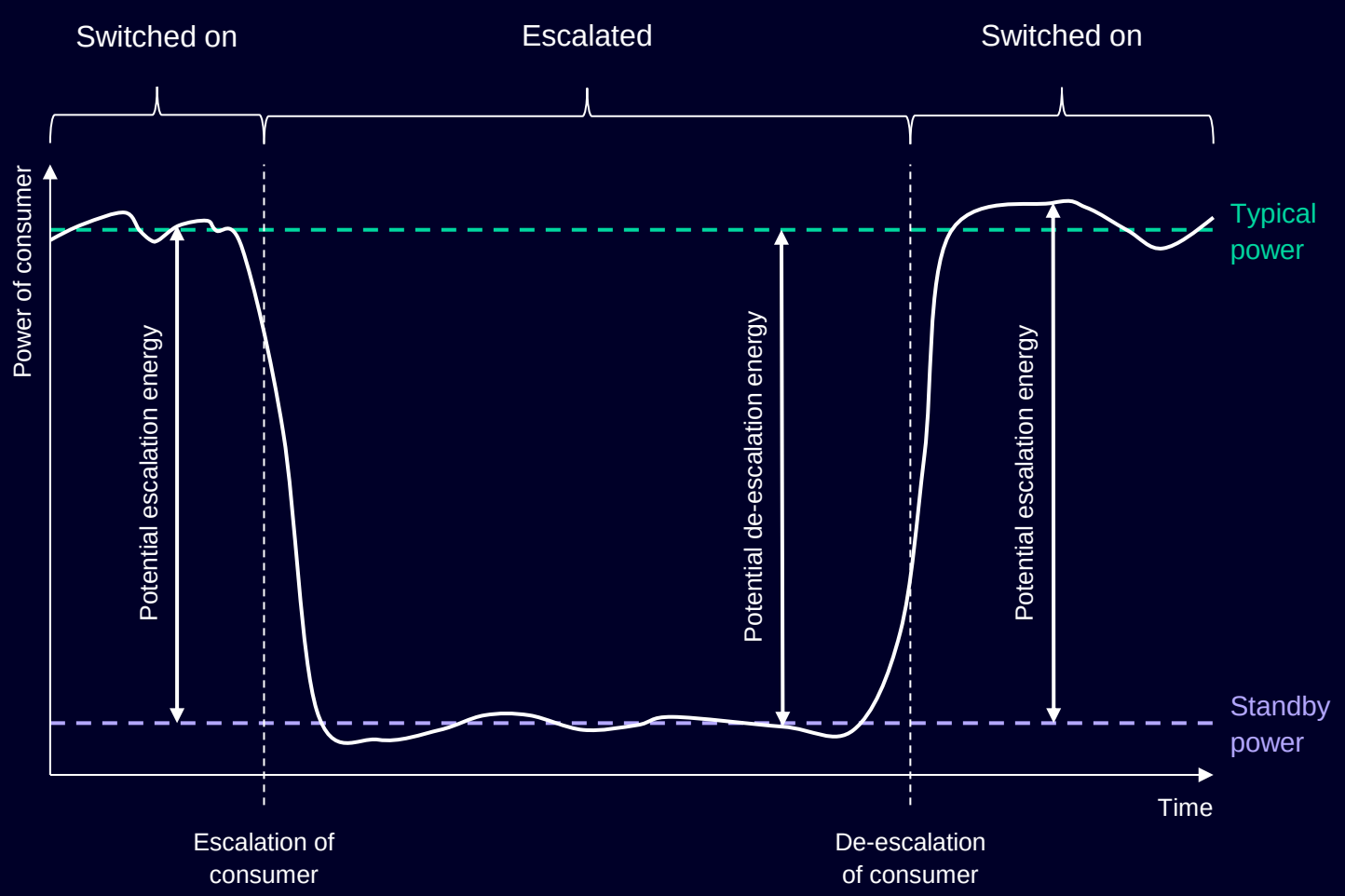
Peak Load Management
Configuration of the load management system



Configuration of the LMGT system in WinCC Unified

- Energy supply company
- Customer system behavior
  - Suppression delay time (settling of system after start of the period, limit and setpoint not active during this time)
  - Limit tolerance time and value (ramping of setpoint after start of the period to avoid unnecessary switching actions)
  - Stabilization delay time (no analysis of forecast after switching action)

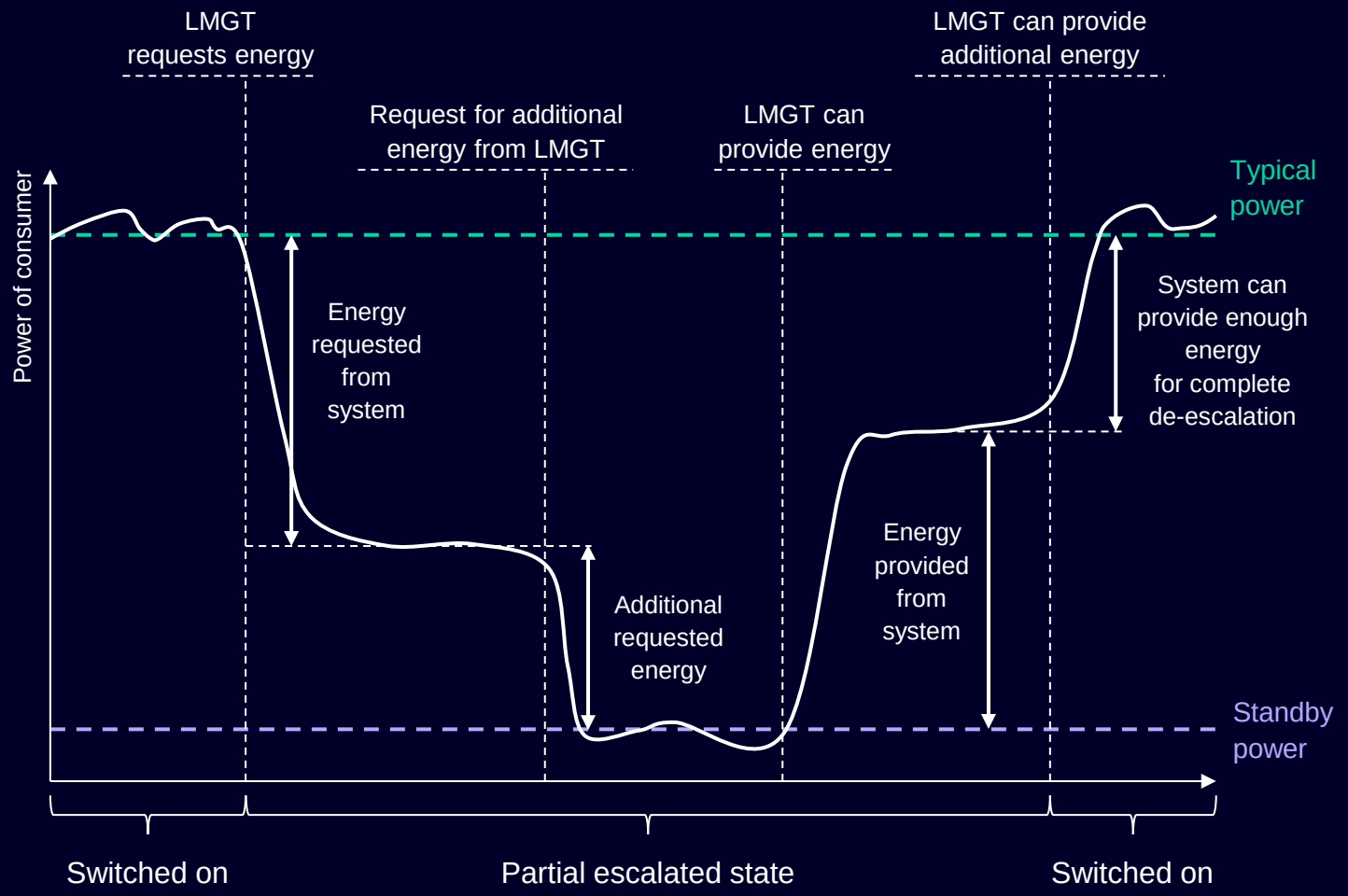
Peak Load Management
Configuration of the load management system



Configuration of the LMGT system in WinCC Unified

- Energy supply company
- Customer system behavior
- Actuator behavior
  - Typical power (consumption of device, when switched on)
  - Standby power (consumption of device, when switched off)
  - Timing factors (maximum time in escalation state, minimum time to stay de-escalated,…)
  - Partial consumption possible (no = only two consumption levels, yes = any consumption level between typical and standby)
- Continuous calculation of potential escalation and de-escalation energy depending on actual value in relation to the configured power levels

Peak Load Management
Configuration of the load management system



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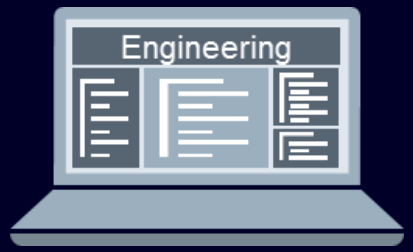
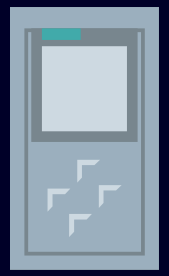
Peak Load Management
Licensing concept for load management in the Energy Suite

Engineering license



Runtime licenses

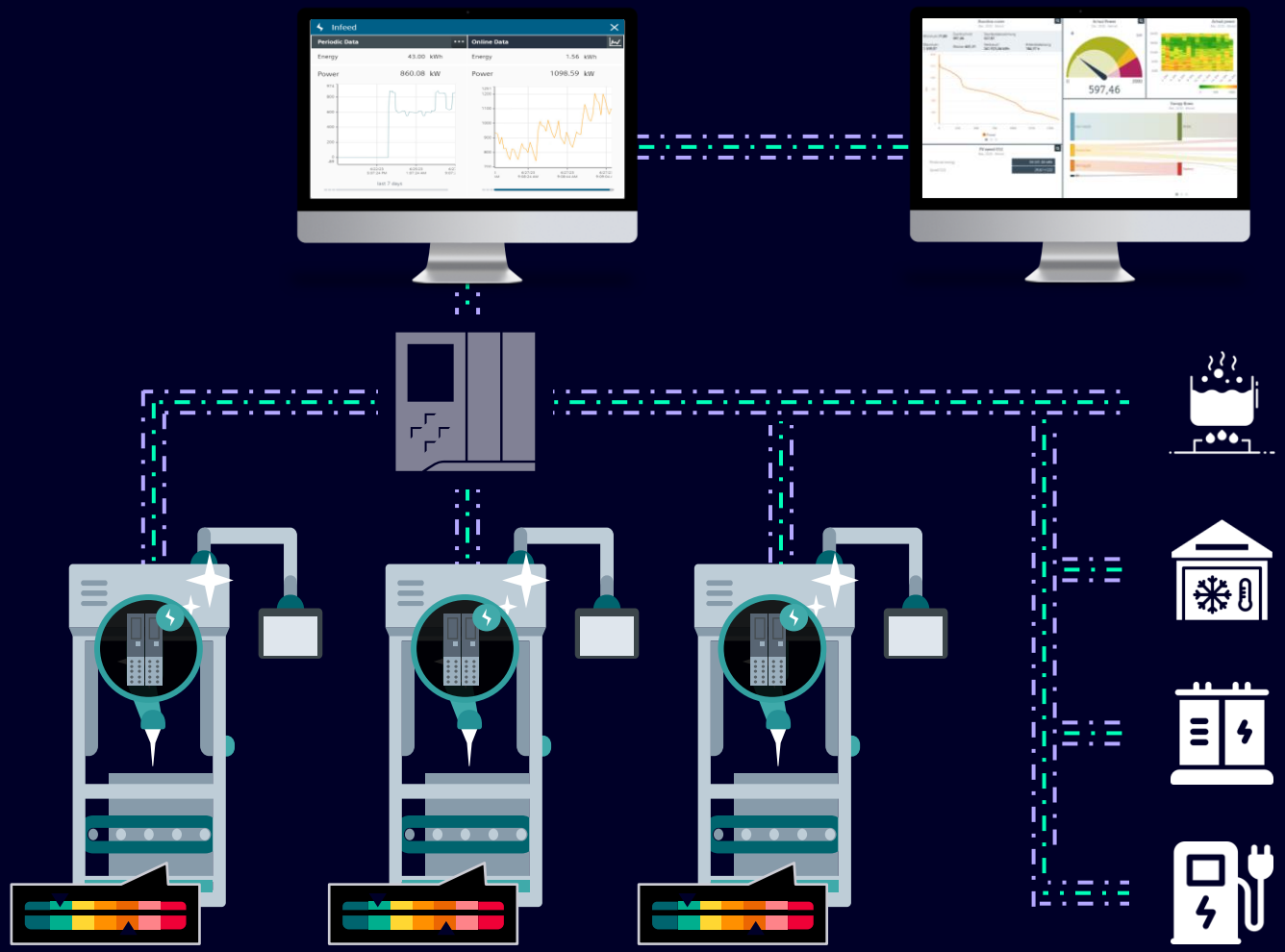


- Two packages to purchase Energy object licenses
  - Package of 5 EnOs
  - Package of 10 EnOs
- Currently not downloaded directly to the PLC
- Number of packages adjustable in hardware config

Licensing in two steps

- **Engineering license** to open and work with the Energy Suite in the TIA Portal (license needs to be activated in ALM)
- Second part are **runtime licenses** for acquisition objects on the PLC
- Concept: **“Energy Objects”** as **currency** to license acquisition and actuator objects
  - 1 Acquisition object ≙ **1** Energy object
  - **1 Actuator object** ≙ **9** Energy objects
- Engineering license already **includes 10 Energy object** license for a basic configuration
- SiVArc license and all runtime tags for WinCC Unified/Professional/Advanced included in Energy Suite license
- Logging tags needs to be licensed

Resource Flexibility
is the key to optimize consumption



Resource Flexibility

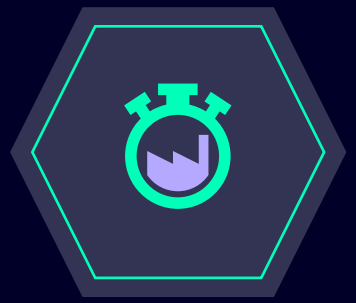
Use Case scenario

- Energy transparency and analysis installed in the factory
- After several months, customer wants to analyze the consumption to find ways to optimize energy costs
- Peak smoothing seems like a tool to avoid violating a power limit contracted with the energy supplier

Challenge

- ✓ Avoid violating average power limit
- ✓ Automated switching of aggregates to reduce stay within a certain power limit
- ✓ Include different kind of an aggregates to not influence the production during switching

Peak load management
Benefits and Values



Short amortization

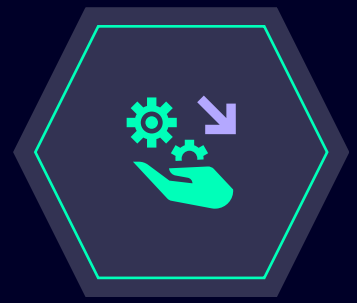
The limitation of the average power due to avoidance prevent contractual penalties leading to short amortization time

Ensured software quality

- Due to standardized software module and libraries.
- High flexibility for future expansion

Automated regulation

Limit based switching of defined aggregates inside a plant to keep the average power within a defined limit

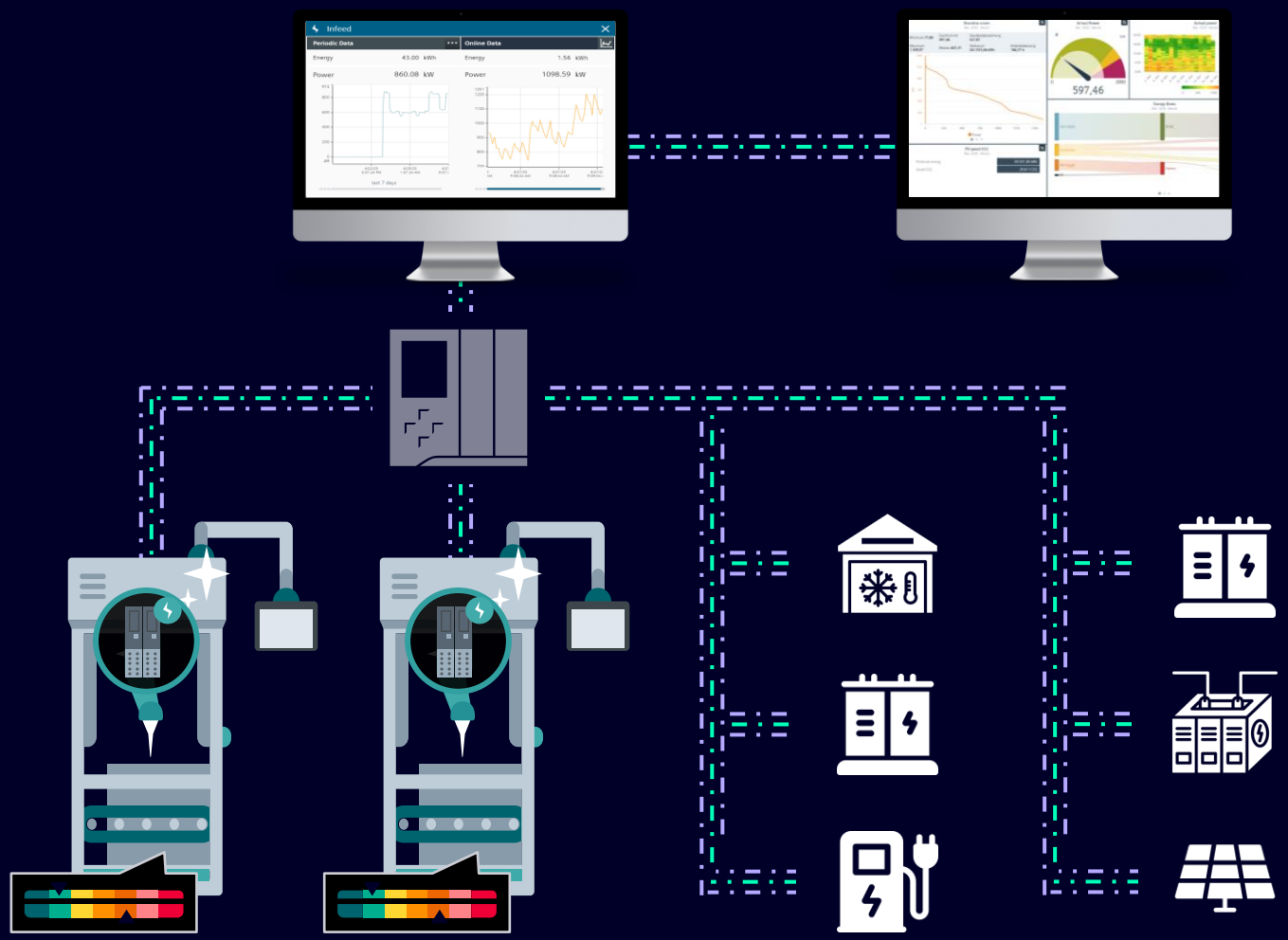


Less engineering effort

- Due to guided engineering, the system is easy to implement
- Easy know-how transfer for employees

SIMATIC Energy Suite
Base Load management

Resource Flexibility
is the key to optimize consumption



Resource Flexibility

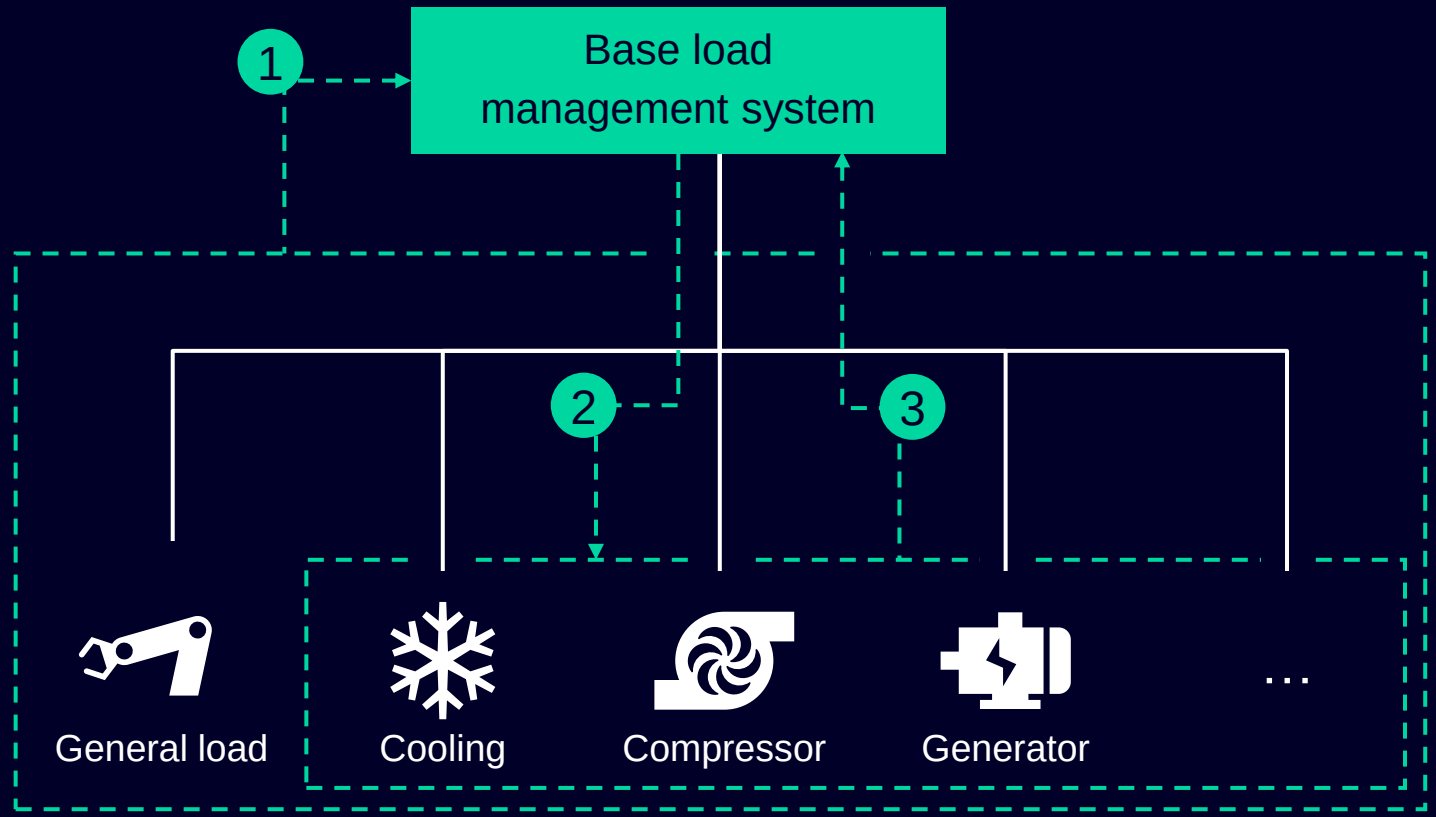
Use Case scenario

- Rising energy prices increase attractivity of self-produced energy as an alternative
- Short-term production-related changes lead to unpredictable energy consumption
- Produced energy should be used to compensate spontaneous load peaks

Challenge

- Intelligent usage of self generated sustainable energy supply to reduce external supply
- To get a more planning security the consumption of the plant need to stay within a defined area
- Automated switching of aggregates to stay within configured area

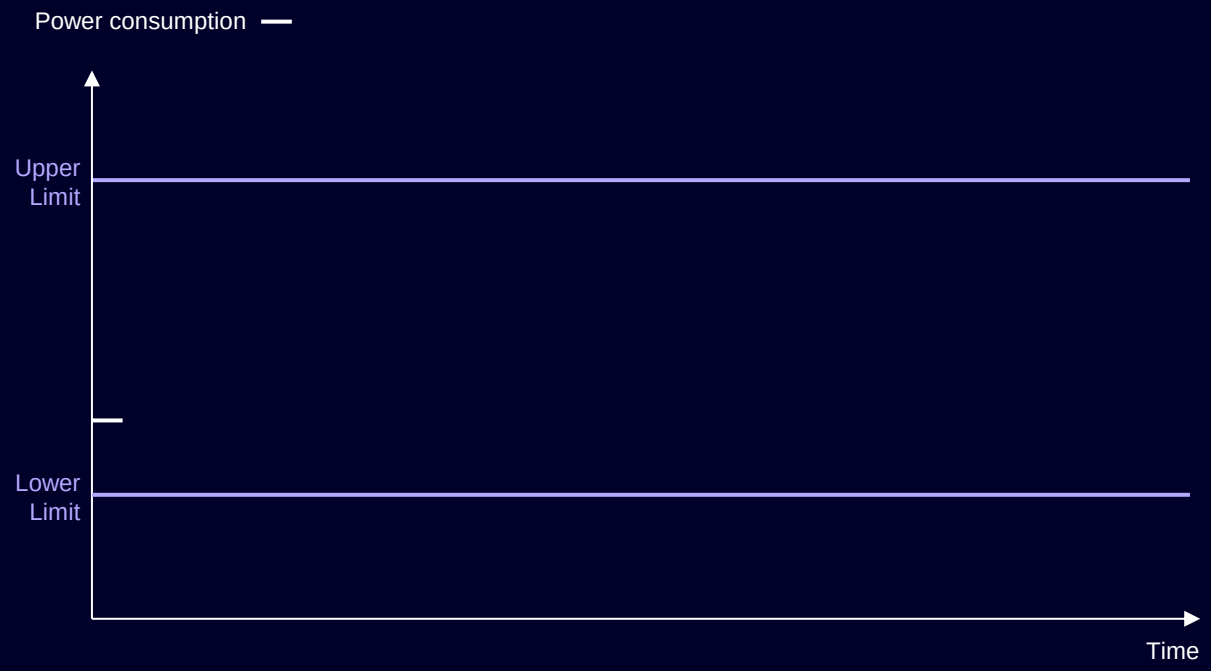
Base Load Management
Functionality of a general base load management system



Functionality of a general base load management system

- Customer requirements for a base load management system
  - Monitoring of configured limits and automatic regulation of system
  - Integration of existing measuring points
  - High availability and scalability of the system
- General functionality and advantages of a base load management system
  1. Smoothing of the overall consumption curve of the application
  2. Automatic regulation of the system by switching defined actuators
  3. Switching actions based on the feedback of actuators to the system

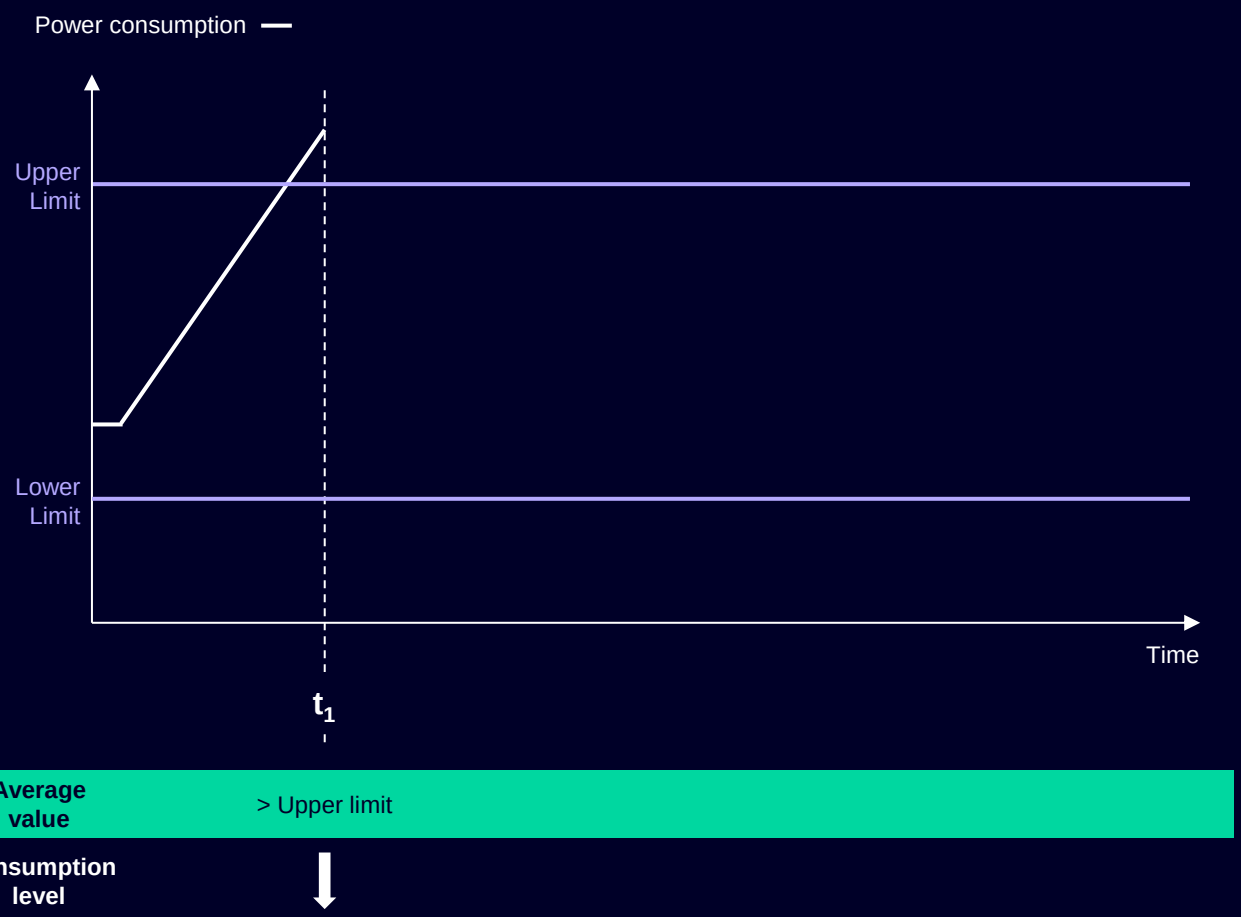
Base Load Management
General functionality of a load management system



Functionality of a base load management system

- Continuous analysis of the actual power value (resp. an average over the past i.e. 10 seconds)
- Regulation of the system according to relation between average value and the user-configured limits
  - Average > Upper limit
    ➔ Consumption level will be reduced
  - Average < Limit
    ➔ Consumption level can be increased

Base Load Management
General functionality of a load management system



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- Example:
  - t1 – Average > Upper limit ➔ Consumption ↓

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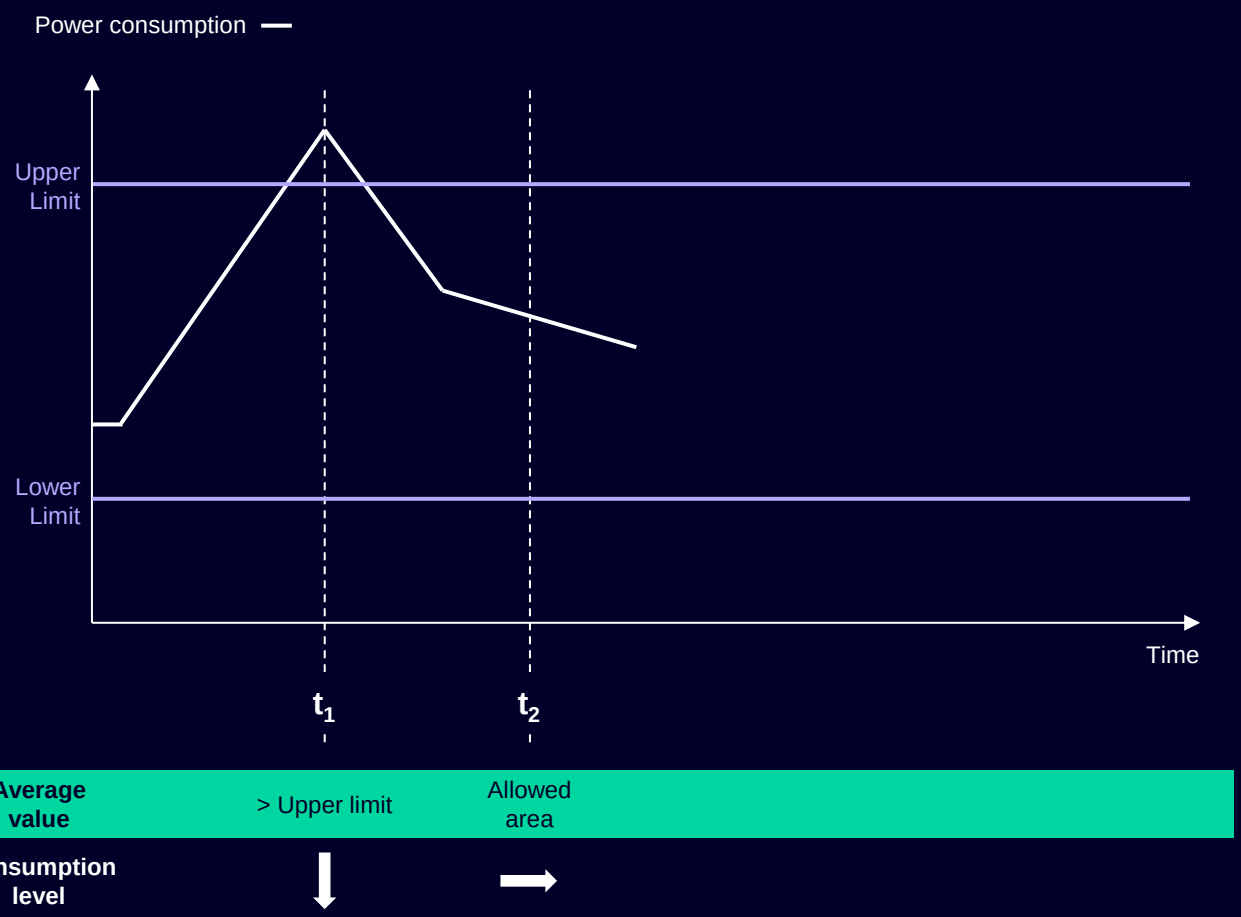

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- Example:
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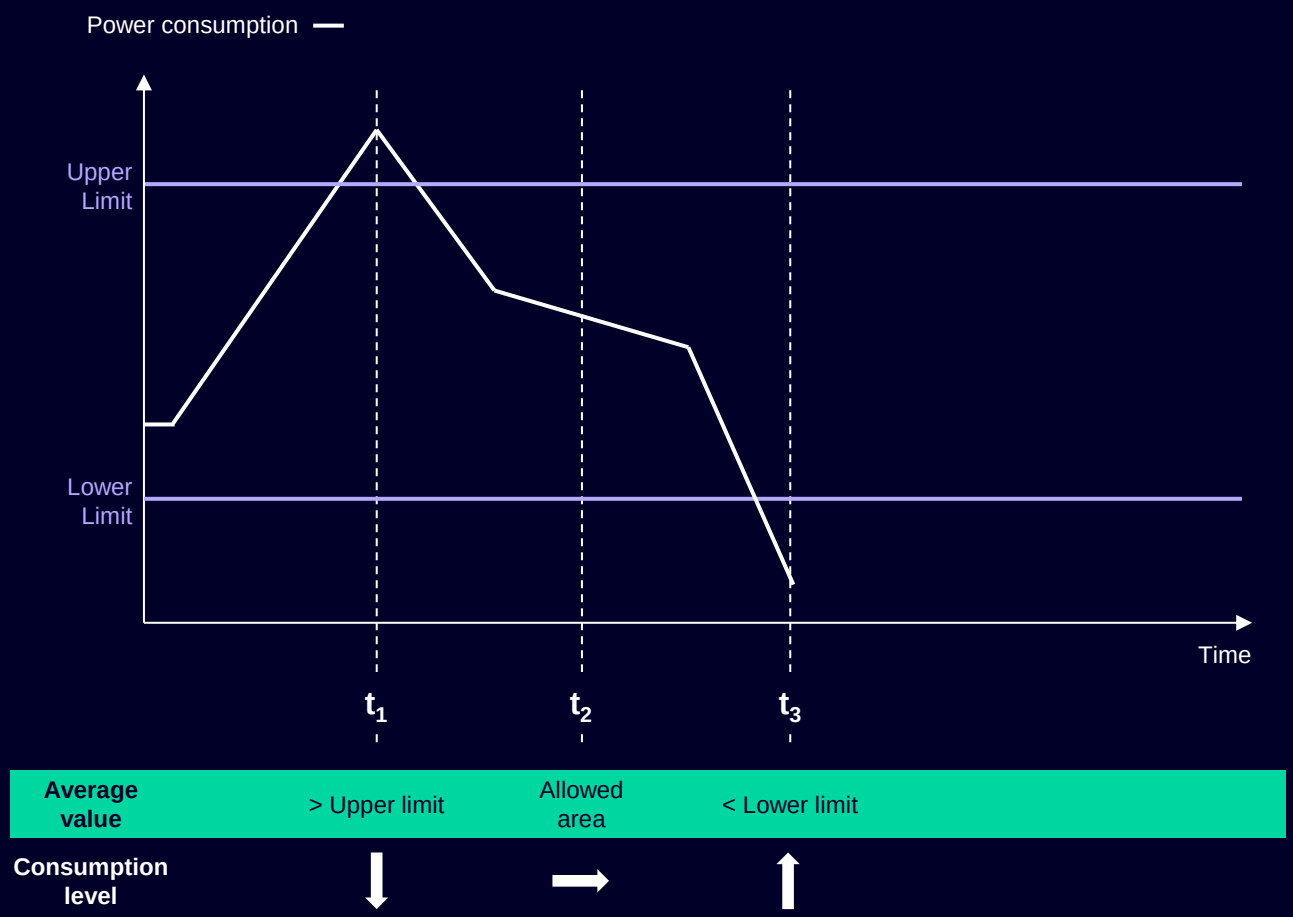
  - t2 – Average = OK ➔ Consumption →

Base Load Management
General functionality of a load management system



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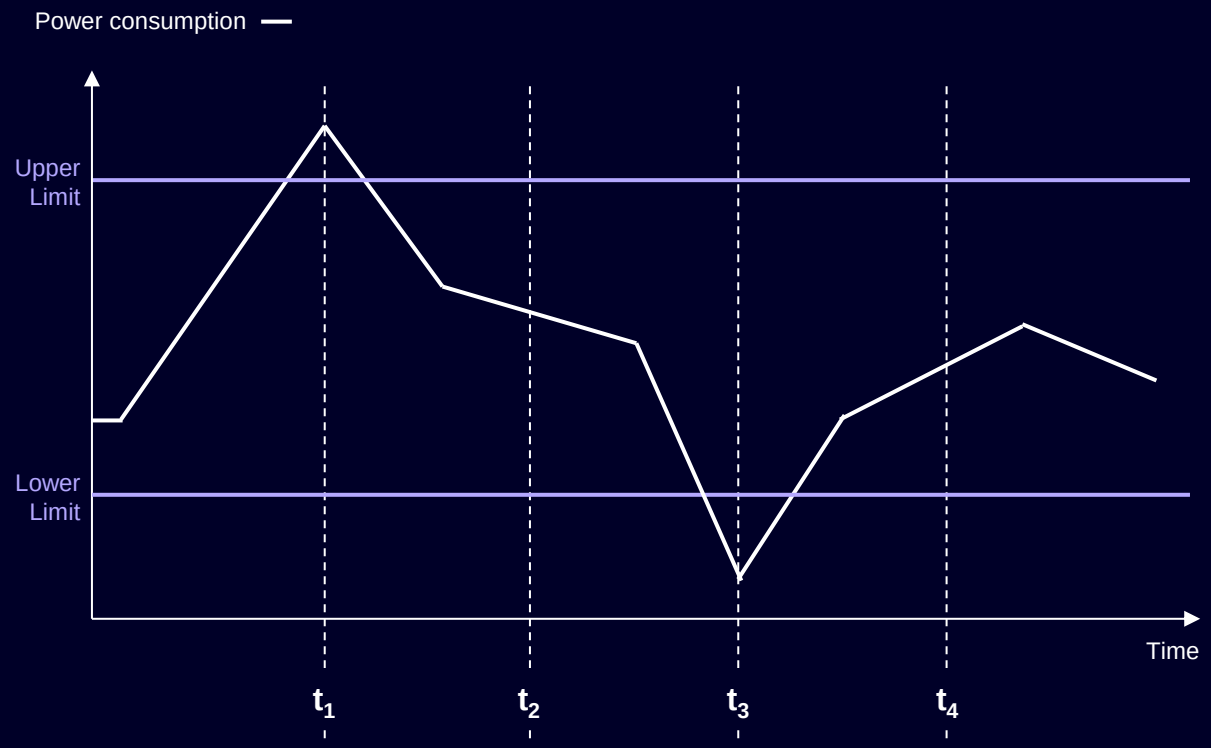
- Example:
  - t1 – Average > Upper limit ➔ Consumption ↓
  - t2 – Average = OK ➔ Consumption →
  - t3 – Average < Lower limit ➔ Consumption ↑

Base Load Management
General functionality of a load management system



Average value	> Upper limit	Allowed area	< Lower limit	Allowed area
Consumption level	↓	→	↑	→

Functionality of a base load management system

- Continuous analysis of the actual power value (resp. an average over the past i.e. 10 seconds)
- Regulation of the system according to relation between average value and the user-configured limits
  - Average > Upper limit
    ➔ Consumption level will be reduced
  - Average < Limit
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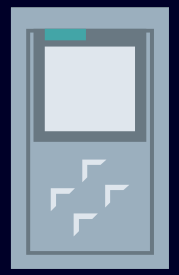
- Example:
  - t1 – Average > Upper limit ➔ Consumption ↓
  - t2 – Average = OK ➔ Consumption →
  - t3 – Average < Lower limit ➔ Consumption ↑
  - t4 – Average = OK ➔ Consumption →

Base Load Management
Hardware concept

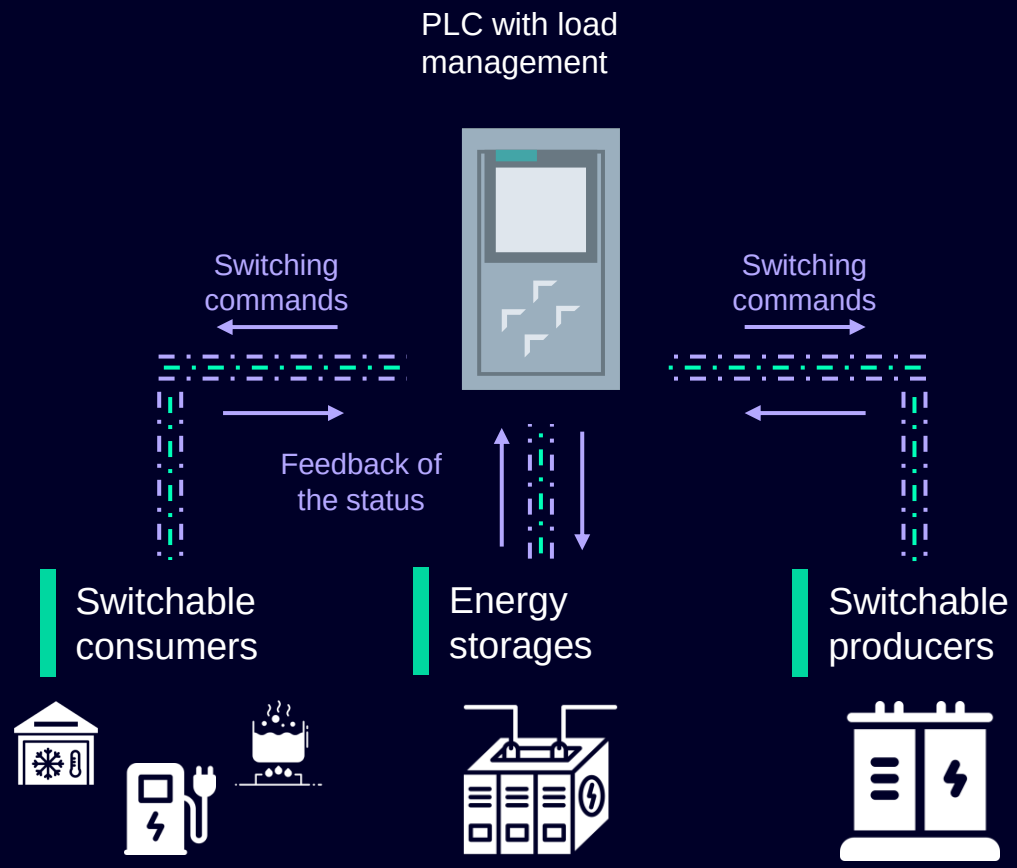
PLC with load management



Hardware concept for a base LMGT system

- Central PLC with base load management system (normally at least CPU 1516 with SMC of 256MB)

Base Load Management
Hardware concept



Hardware concept for a base LMGT system

- Central PLC with base load management system (normally at least CPU 1516 with SMC of 256MB)
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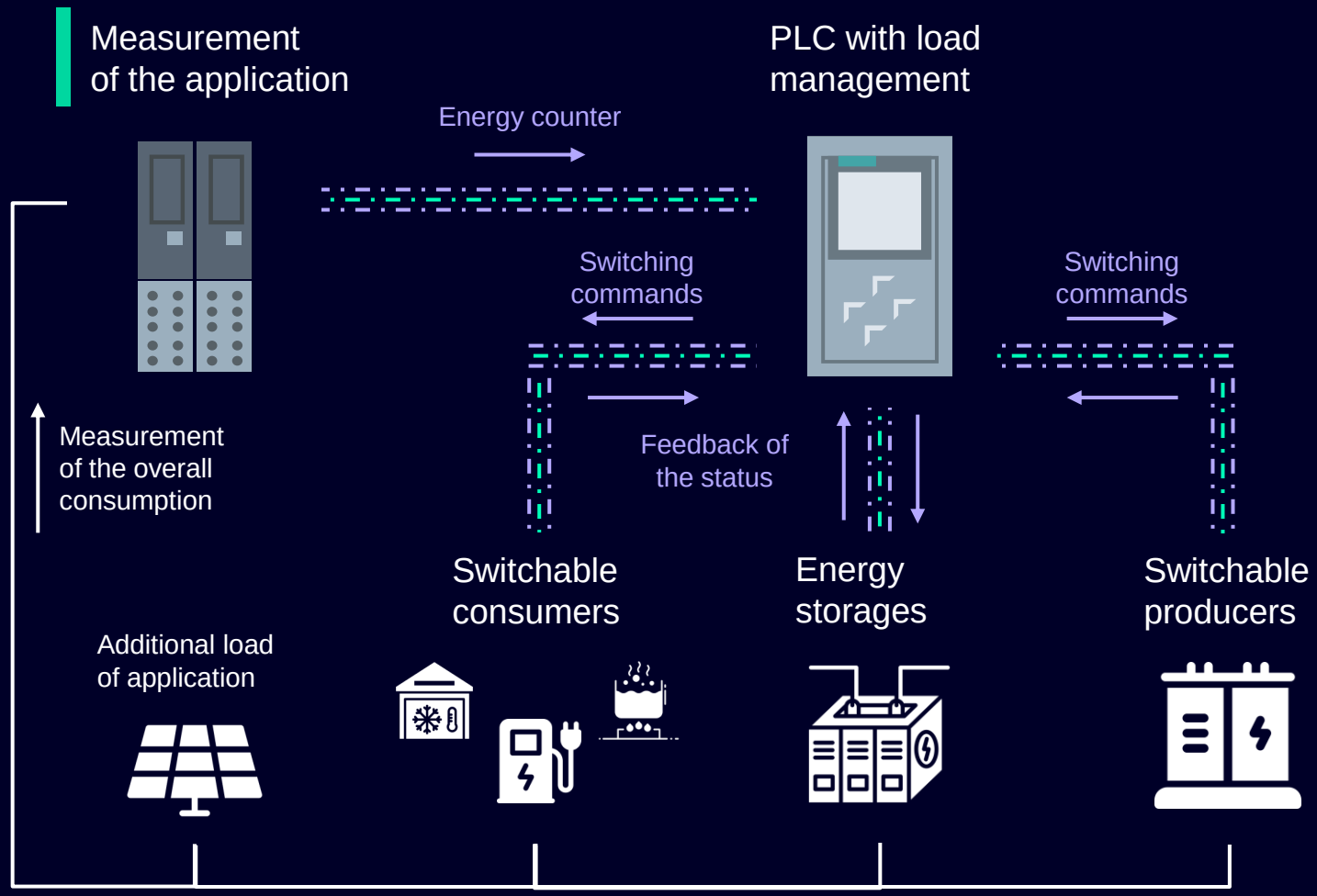
  - Physical connection from PLC to actuators to signal switching commands
  - Feedback of the actuator status after switching command

Base Load Management
Hardware concept



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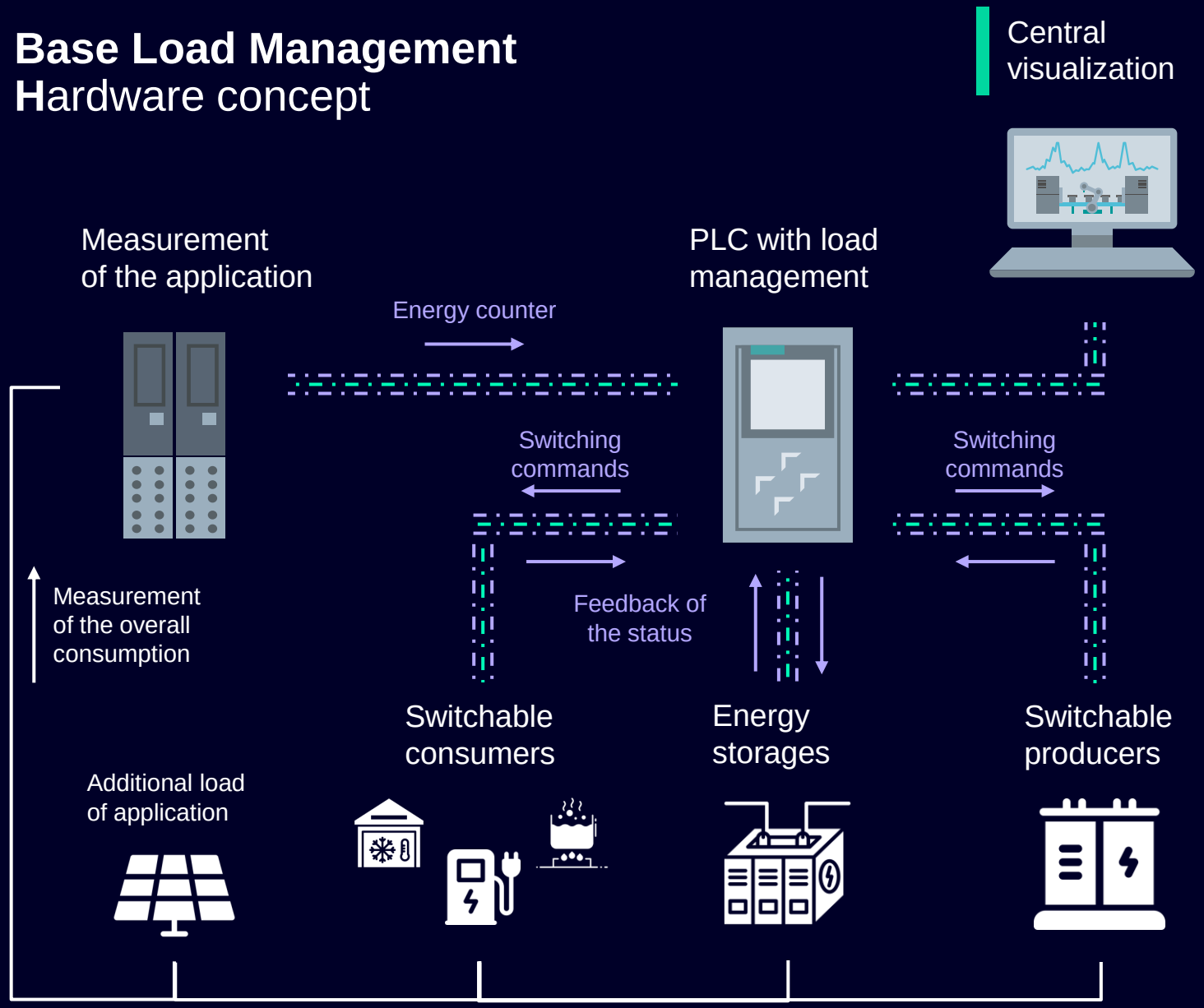
Base Load Management
Hardware concept



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- Switchable actuators (consumers, producers or storages) for regulation of limits
  - Physical connection from PLC to actuators to signal switching commands
  - Feedback of the actuator status after switching command
- For calculation of average value, measurement of the complete application is necessary. Value provided to the PLC
- Operating and monitoring with central visualization system

Base Load Management
Switching of actuators

Optima
www.optimacs.com

Actuators

- Battery storage
- Generator 1
- Generator 2
- Forklift charging

SIEMENS

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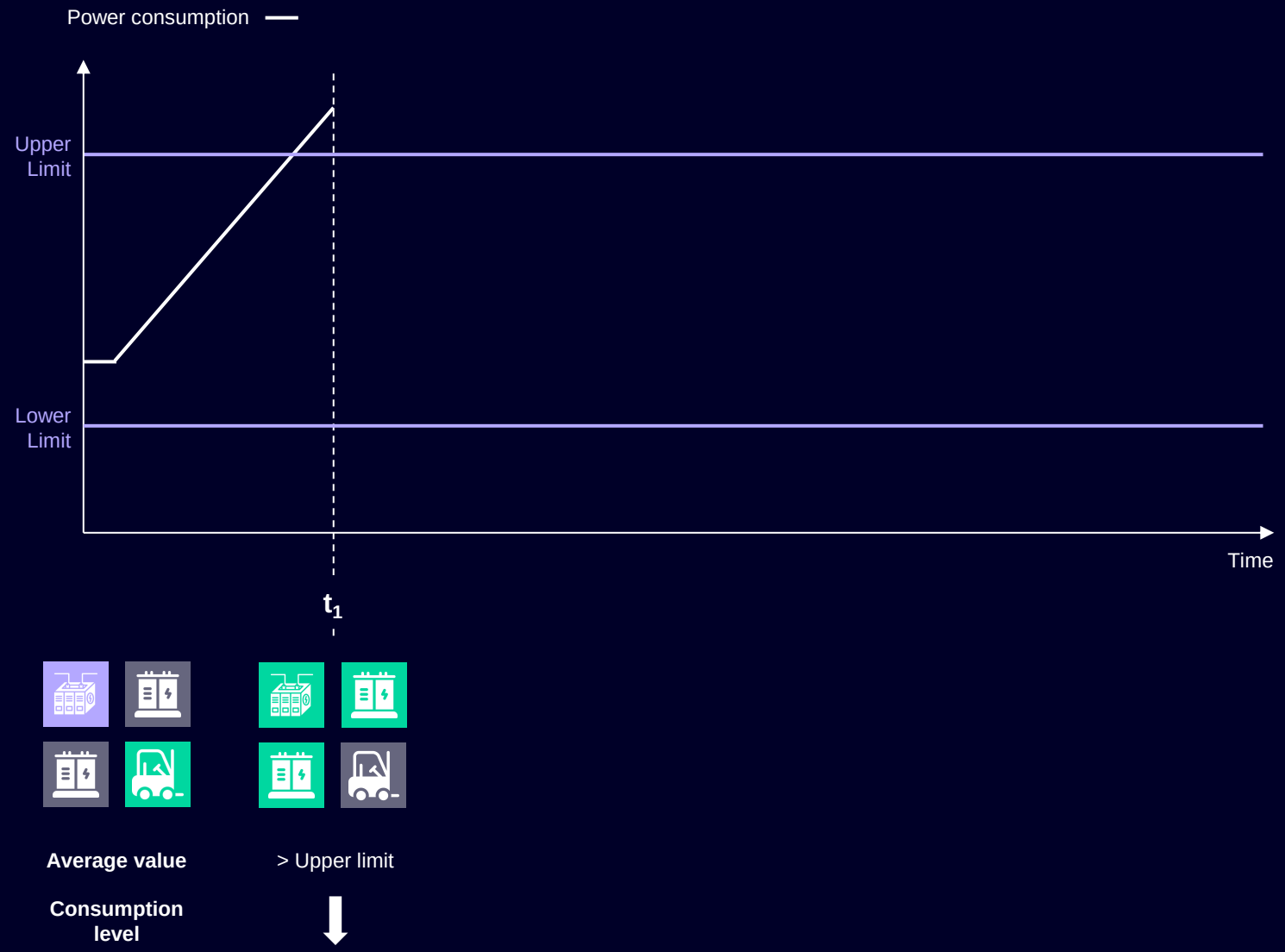

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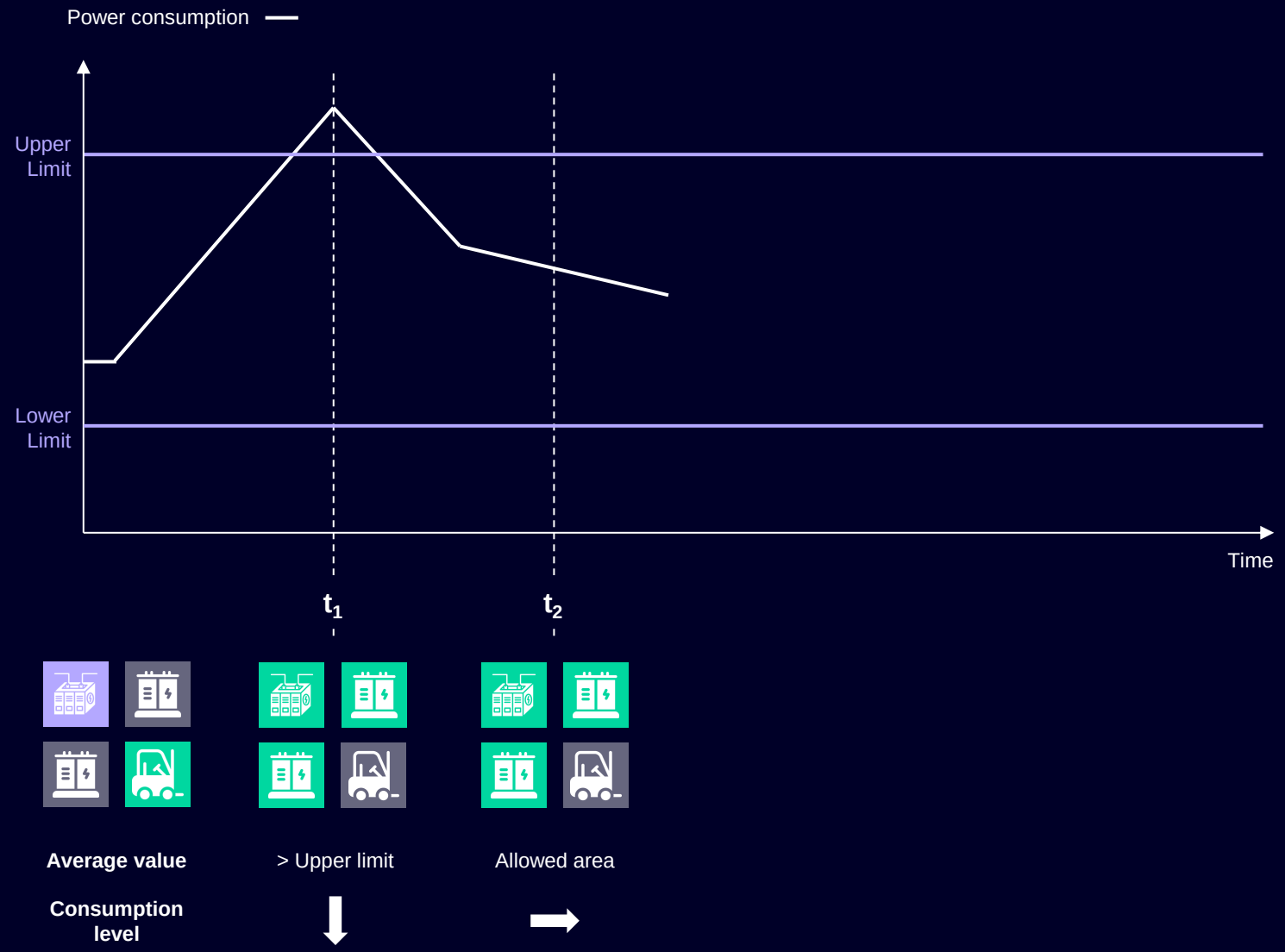

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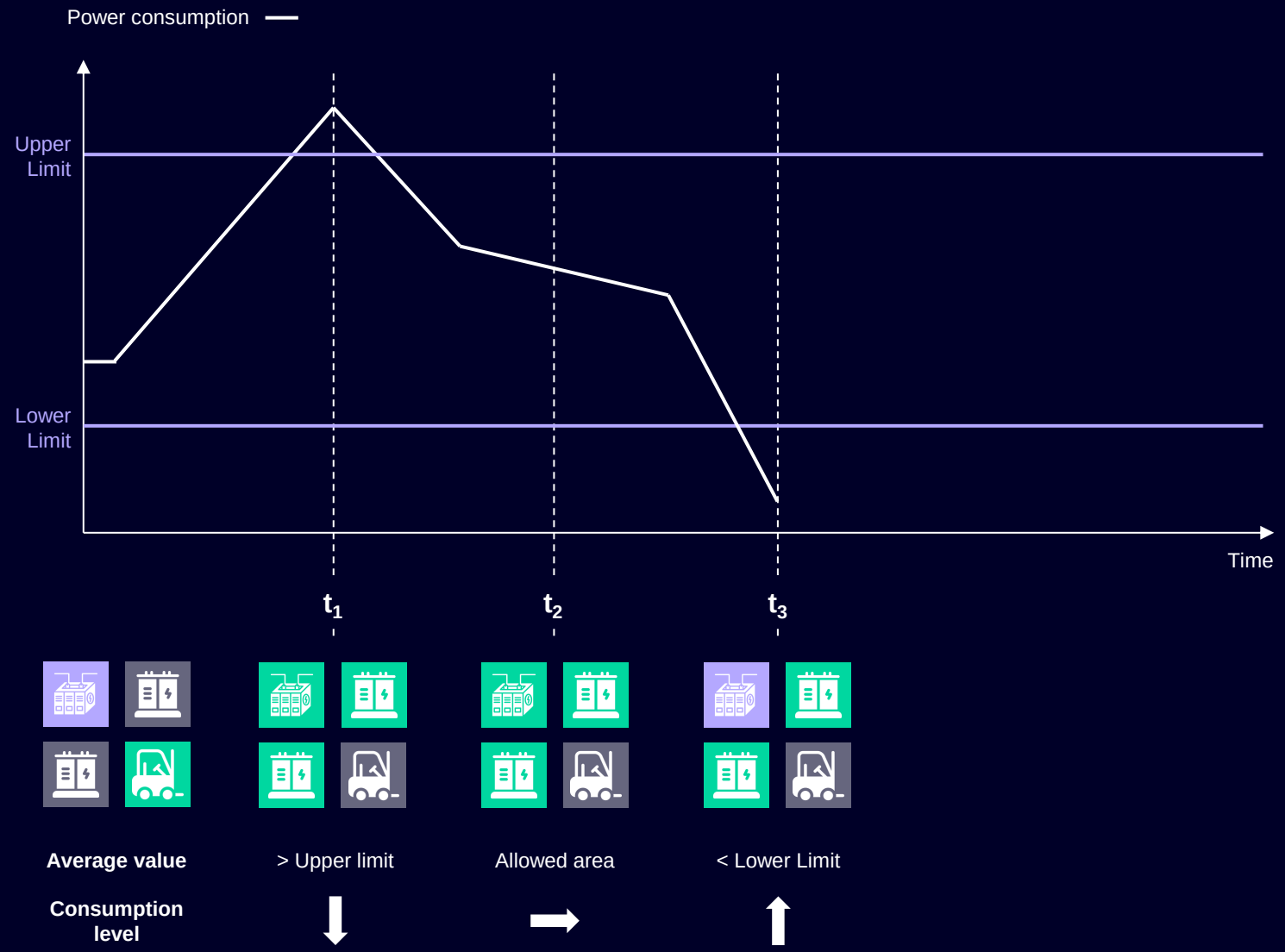

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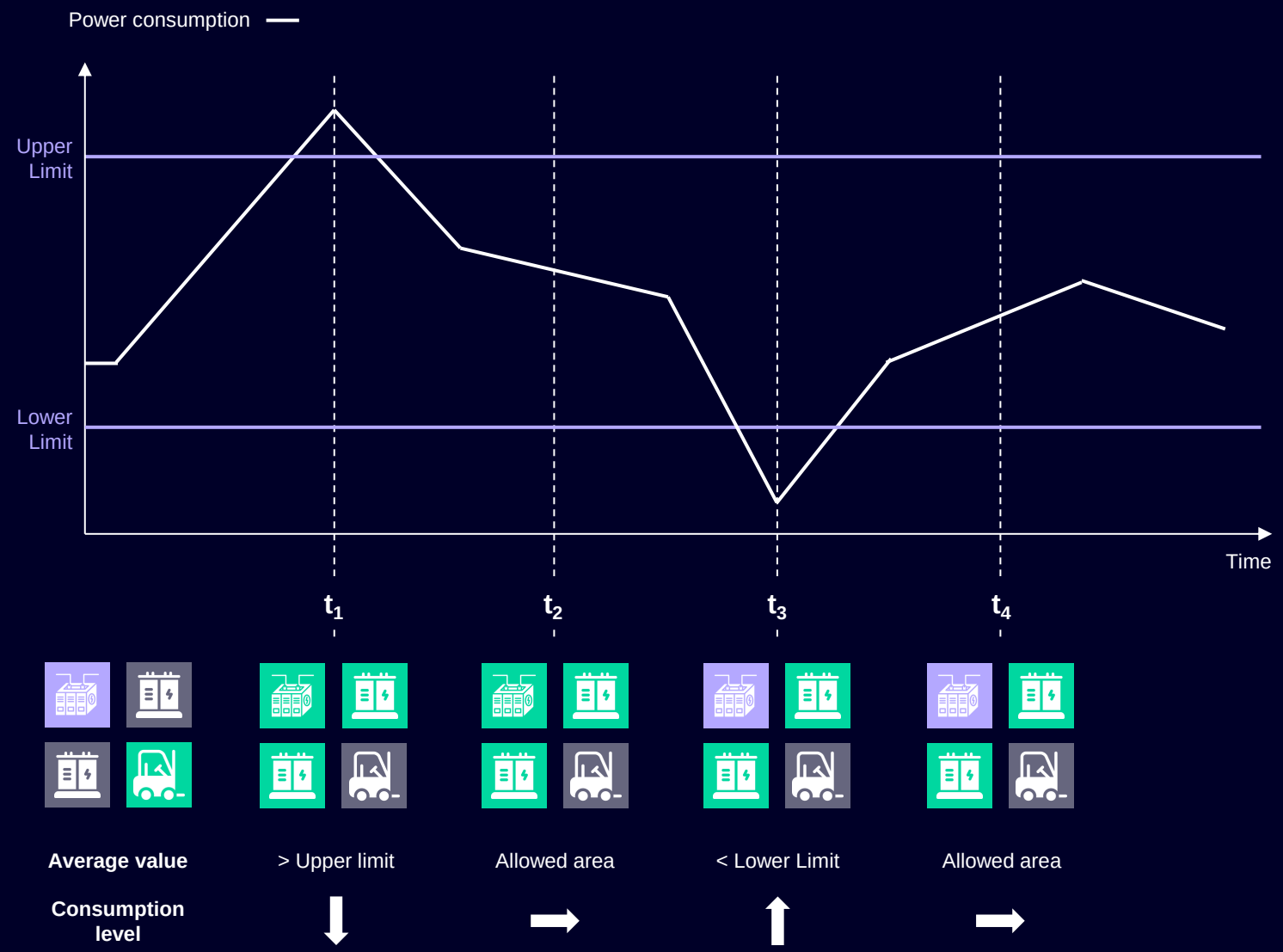
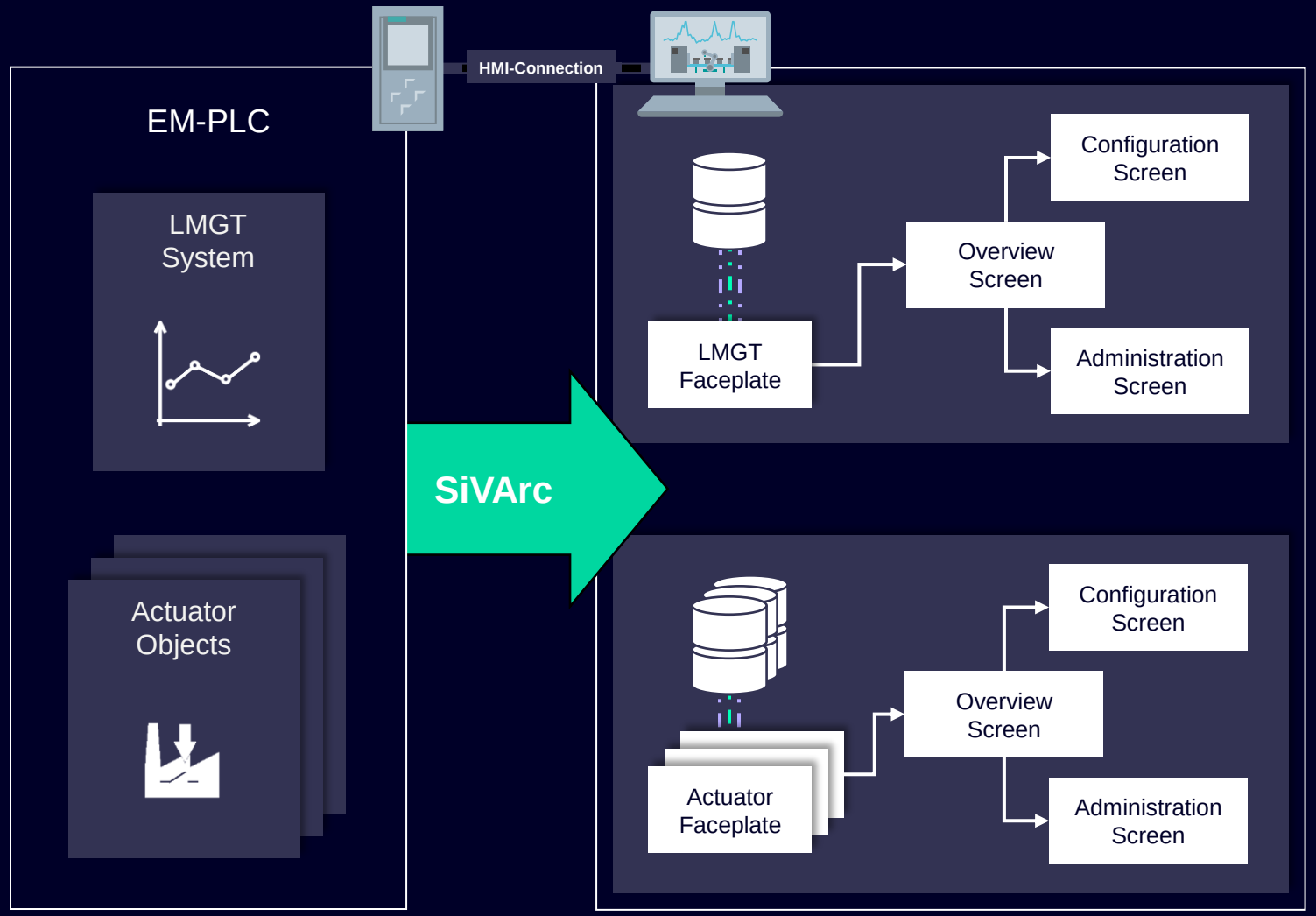


SIEMENS

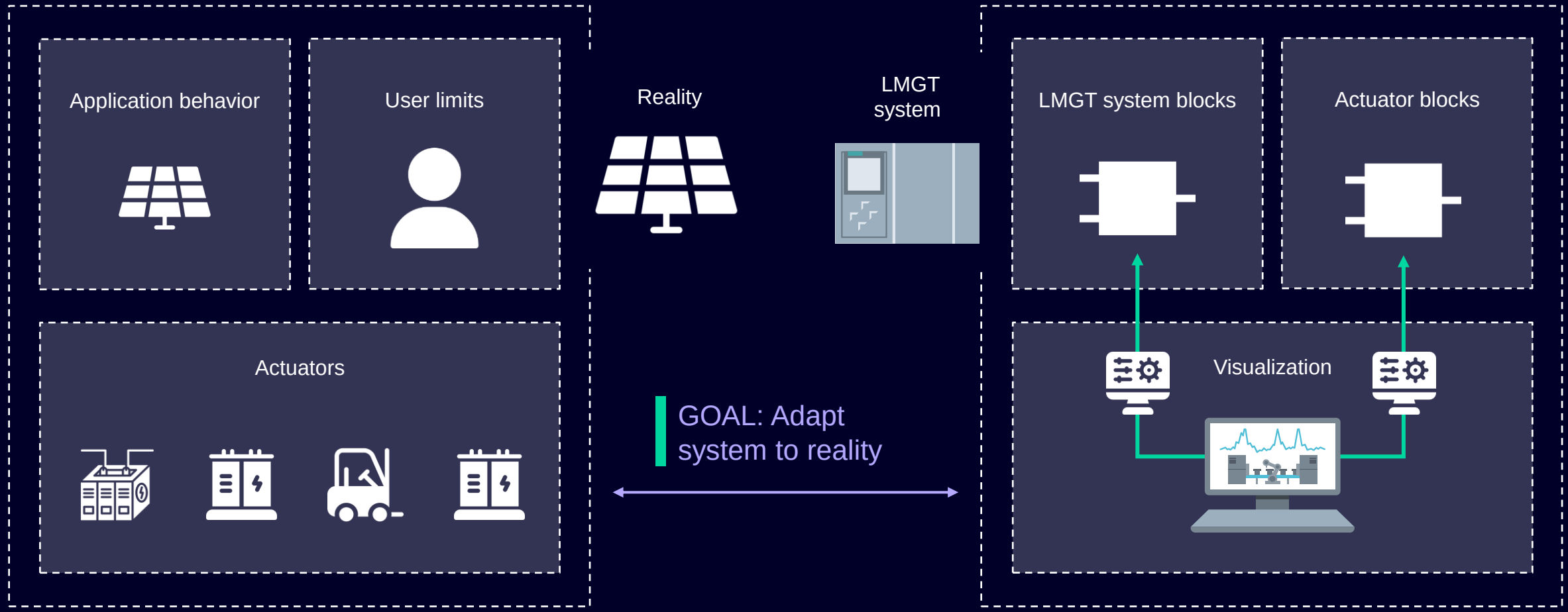
Base Load Management
Visualization of load management in WinCC Unified



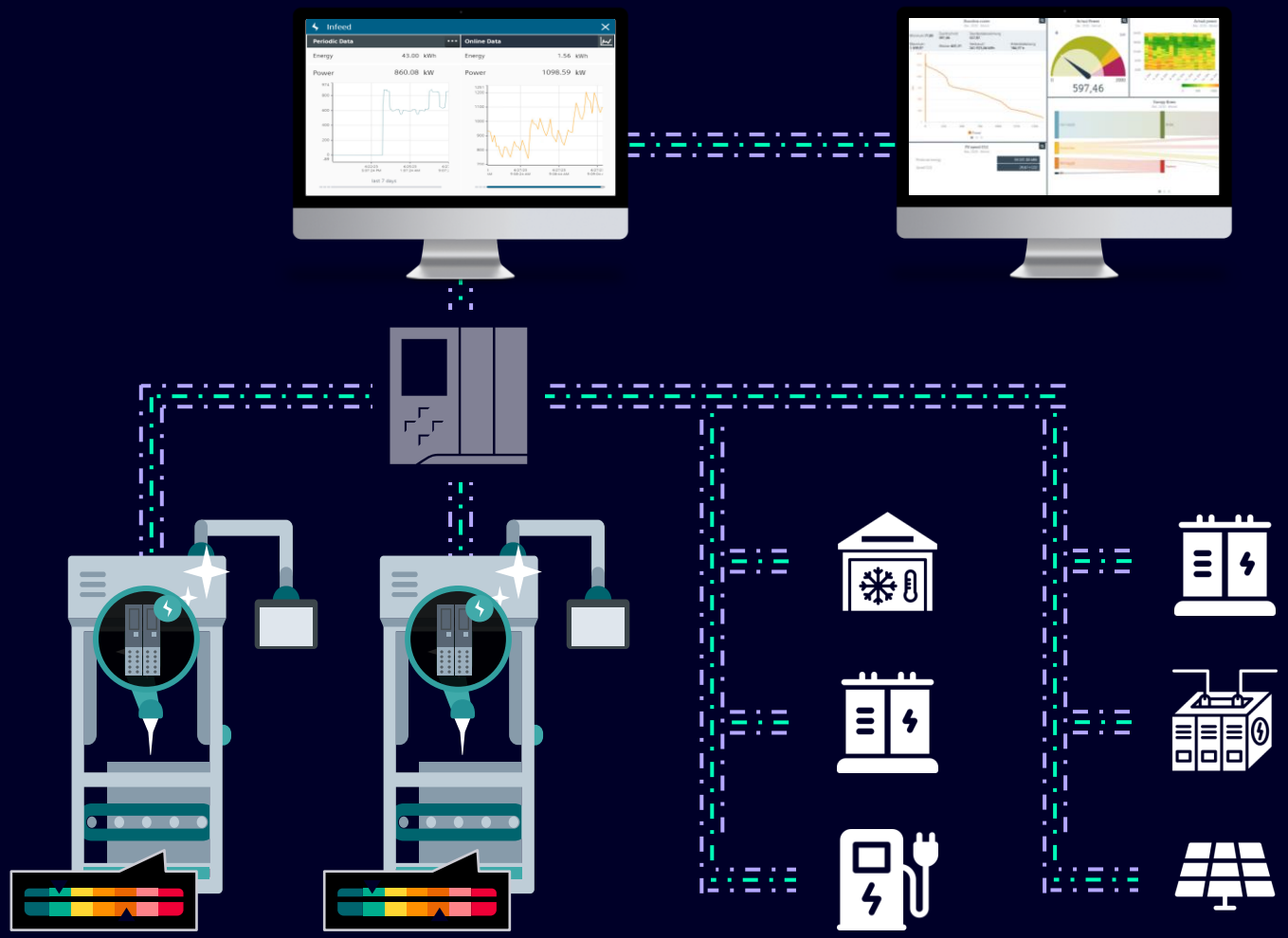
LMGT visualization with SiVArc for WinCC Unified

- Basic requirement: **Existing HMI-connection**
- All **screens** are **only copied once**
- SiVArc rules for the Energy Suite can be **automatically generated**
- Tool generates the visualization for the general load management system and all actuator objects
  - LMGT system: One **faceplate** and the **data household**
  - Actuators: One **faceplate** and the **data household** for **each** Actuator Object
- **Faceplate** sets the **tag prefix** of the screen window
- Screens get **access** to correct instance **data household** when opened

Base Load Management
Load management system must be adapted to reality



Resource Flexibility
is the key to optimize consumption



Resource Flexibility

Use Case scenario

- Rising energy prices increase attractivity of self-produced energy as an alternative
- Short-term production-related changes lead to unpredictable energy consumption
- Produced energy should be used to compensate spontaneous load peaks

Challenge

- ✓ Intelligent usage of self generated sustainable energy supply to reduce external supply
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SIMATIC Energy Suite
Demo Project

Optima
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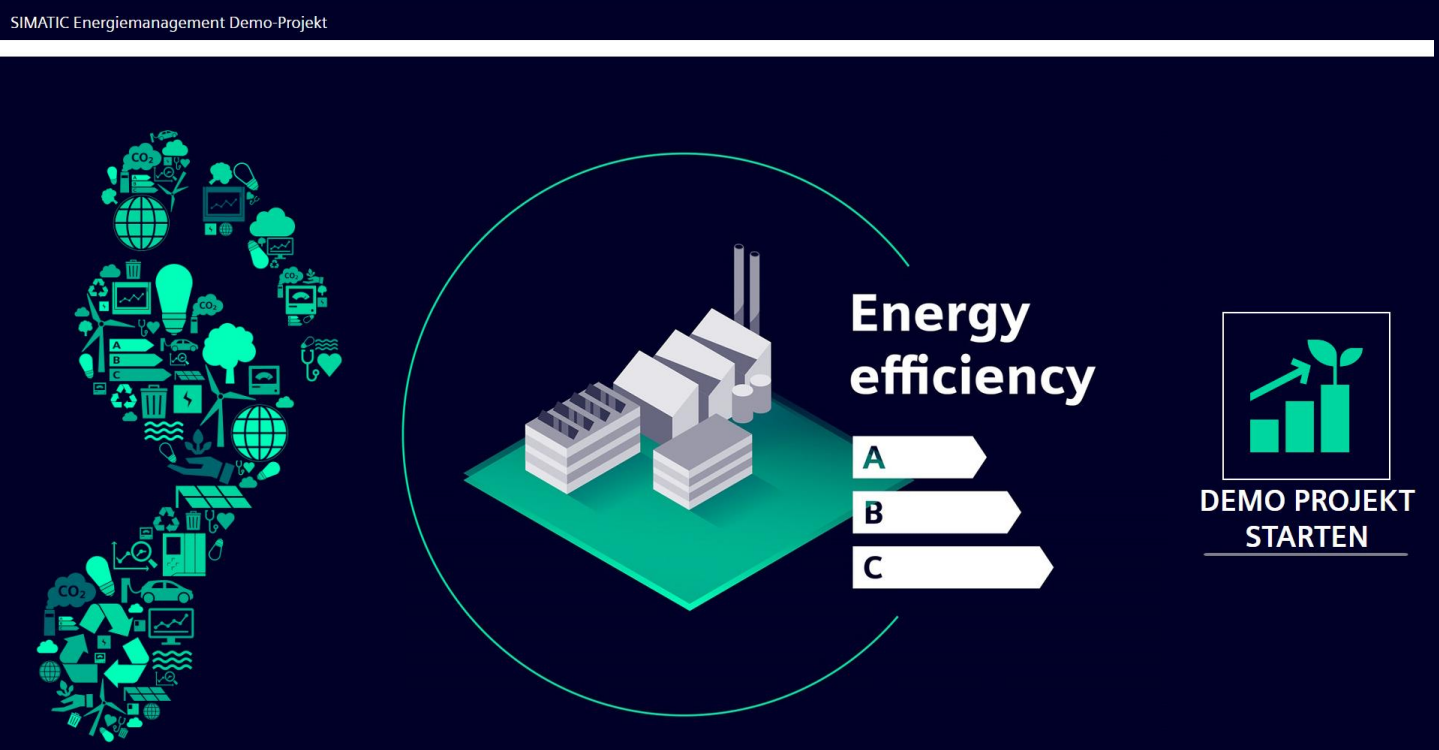
Demo Project
General information



General information of the demo project

- Factory will install energy management system including optimization measures
- Production of sparkling water
- Three different parts of the overall factory
  - Factory overview
  - Production (Detail view available)
  - eCar loading park (Detail view available)
- General information
  - All values automatically simulated
  - Dependency on daytime and weekdays
  - Production working two shifts
  - Time is simulated and speeded up (1 second real time = 20 seconds in demo project)
  - Archiving period 3 minutes (1 hour simulated time)

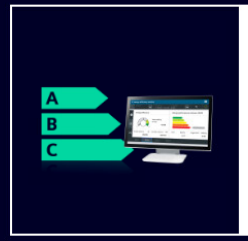
Demo Project
Energy Suite products

SIMATIC Energy Management Demo Project

ENERGY DATA ACQUISITION

To be able to plan and implement energy efficiency measures reasonably, continuous and reliable data collection is required. It is an essential prerequisite for a goal-oriented energy management system that supports the implementation of savings through the creation of data transparency.

The SIMATIC Energy Suite efficiently links energy management with automation and thus brings energy transparency to production. Its tasks include the acquisition and processing of energy data at the automation level, as well as their visualization using WinCC Comfort/Advanced or WinCC Professional.



S7-ENERGY EFFICIENCY-MONITOR

Now that the goal of energy transparency has been achieved, the next step is to evaluate the collected data to define targeted savings measures. A buzzword in this context is the energy efficiency of machines or entire plants. The aim here is to optimize their operation and consume energy only when they are used productively.

The S7 Energy Efficiency-Monitor for Machines is an integrated system instruction for S7-1200 and S7-1500 CPUs. Based on energy values and machine status, the module generates status-related average consumption of up to ten measuring points of different media (electricity, flow, compressed air, etc.). This allows machines with similar functionality (e.g., several pick & place machines) to be compared regarding their energy efficiency.

PEAK LOAD MANAGEMENT

The composition of energy costs in the industrial environment differs from that of conventional households. An additional component is the so-called power price, which is calculated from the largest average consumption during a 15-minute period. To limit this maximum value, a load management system can be integrated into the energy management system.

Peak load management is another functionality of the Energy Suite. It can be used to control the power consumption of the infeed in such a way that it does not exceed a defined average value at the end of the calculation period. For this purpose, consumption values are analyzed in real time to be able to react to potential load peaks in the best possible way and at an early stage. These reactions consist of coordinated switching on and off, of so-called actuators (e.g., cooling or ventilation). The consumption as well as the individual actions can be visualized in WinCC Professional.

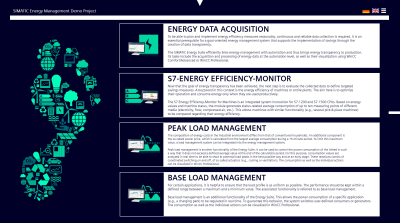
BASE LOAD MANAGEMENT

For certain applications, it is helpful to ensure that the load profile is as uniform as possible. The performance should be kept within a defined range between a maximum and a minimum value. The associated functionality is referred to as base load management.

Base load management is an additional functionality of the Energy Suite. This allows the power consumption of a specific application (e.g., a charging park) to be regulated in real time. To guarantee this behavior, the system switches user-defined consumers or generators. The consumption as well as the individual actions can be visualized in WinCC Professional.

Demo Project
Screen hierarchy

Start screen



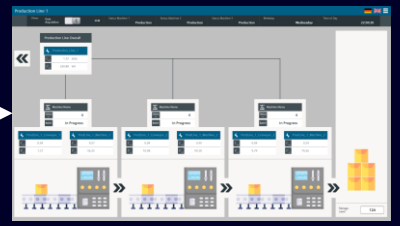
Overview of the
Energy Suite products

eCar loading park
Base load management

Factory overview
Peak load management
Data acquisition

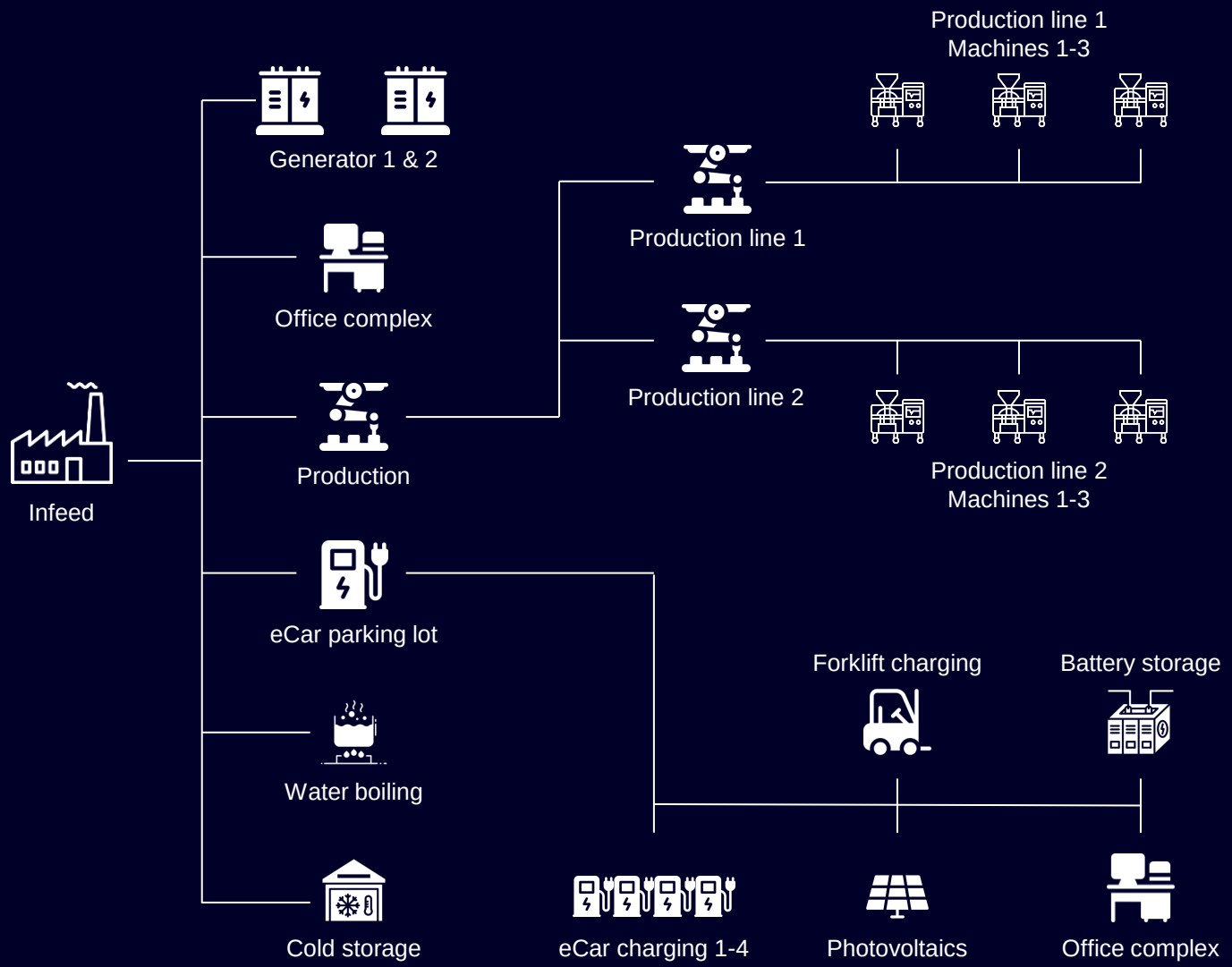
Production lines overview

Production line 1
Energy Efficiency Monitor



Production line 2
Energy Efficiency Monitor

Demo Project
Energy Suite data acquisition



Energy Suite
Data acquisition

- Every measurement point in the factory has an acquisition object
- Advanced data available for every measurement point
- Archiving period 3 minutes

SIMATIC Energy Suite
Energy Efficiency-Monitor

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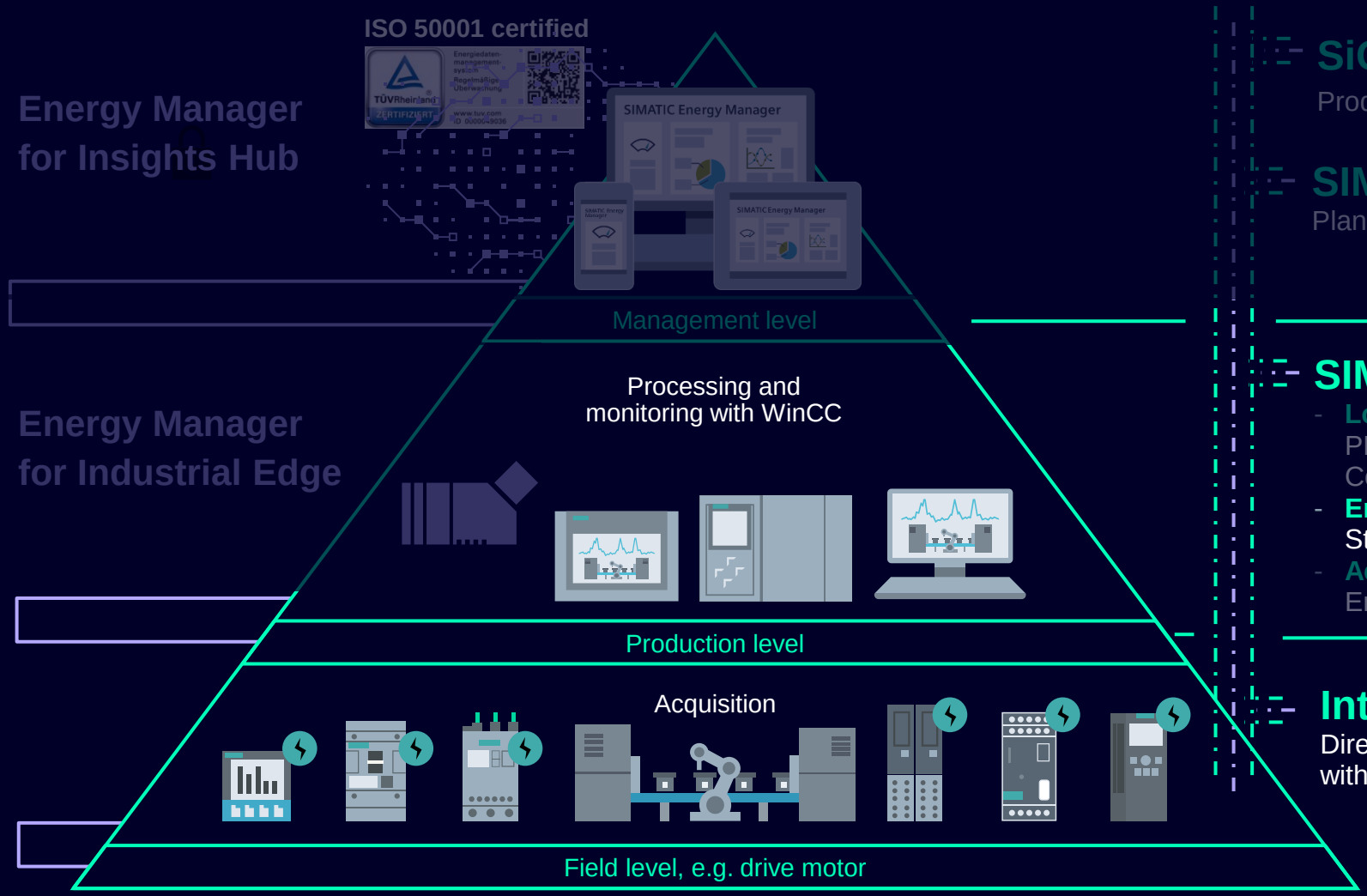
SIEMENS

SIMATIC Energy Suite
Energy Efficiency-Monitor – Sales Slides

SIEMENS

Resource Transparency
SIMATIC Energy Suite – Energy Efficiency-Monitor



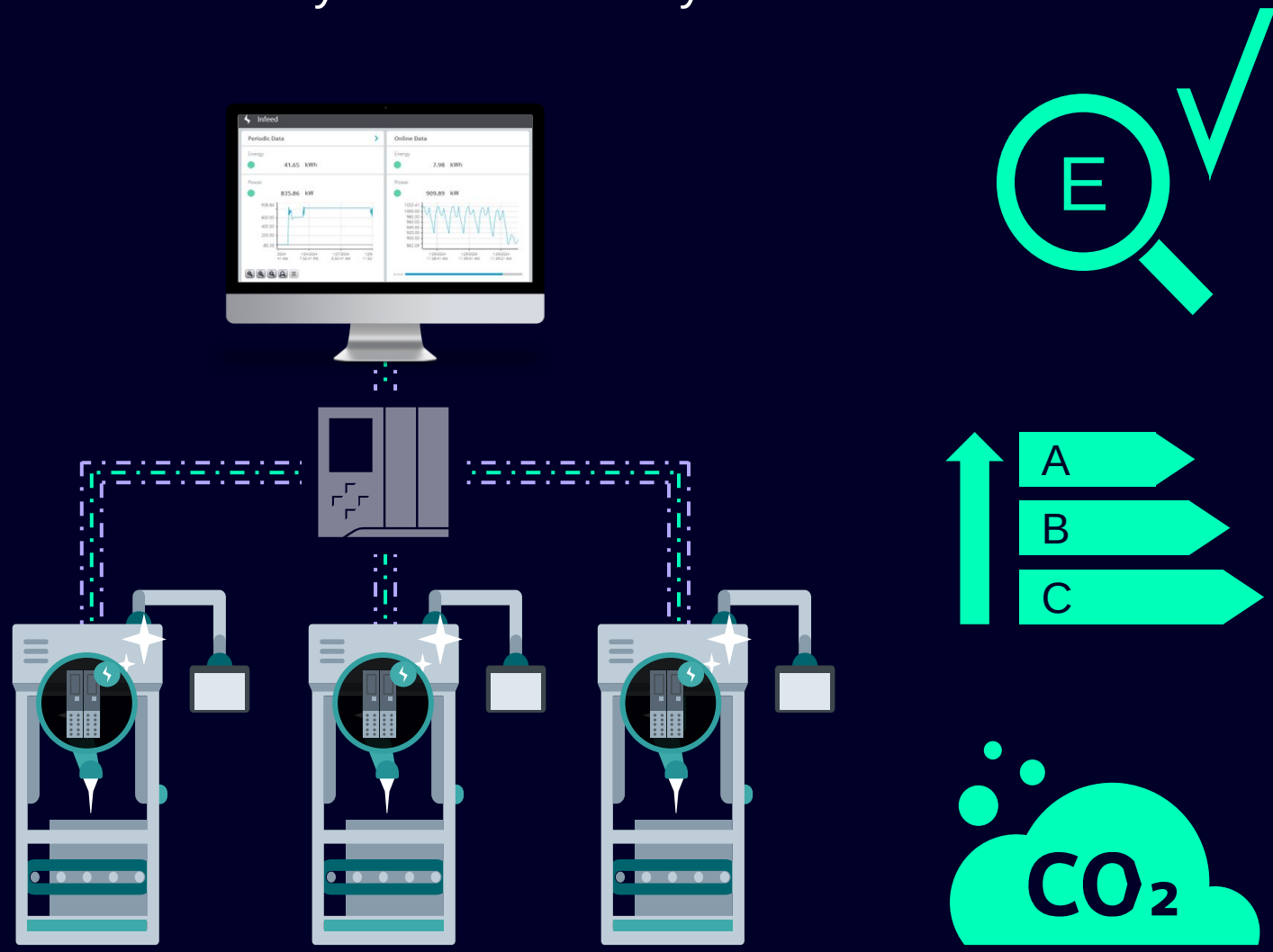
SiGREEN
Product Carbon Footprint

SIMATIC Energy Manager
Plant and company-wide energy analysis

SIMATIC Energy Suite
- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency-Monitor**
  Standardized efficiency evaluation of machines
- **Acquisition**
  Energy data acquisition

Integrated energy measurement
Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

Resource Transparency
is one of the keys to sustainability



Resource Transparency

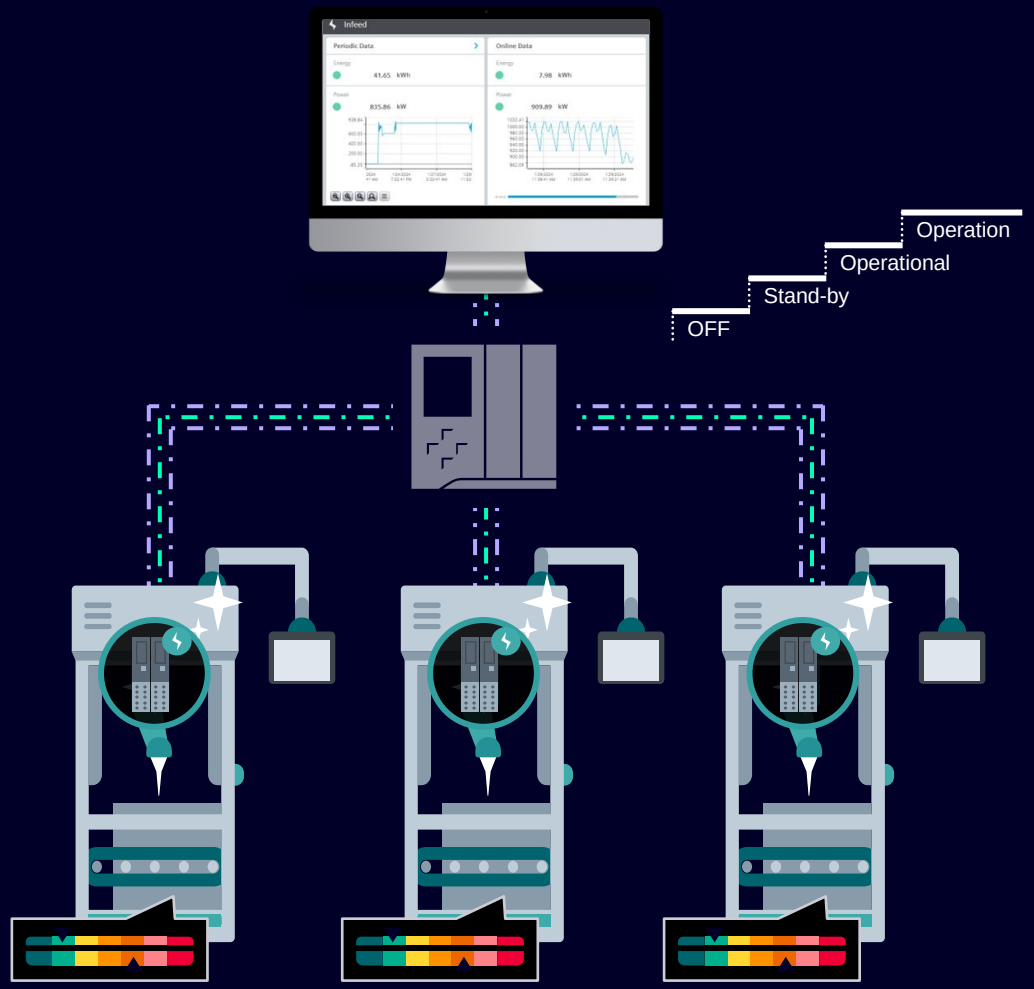
Use Case scenario

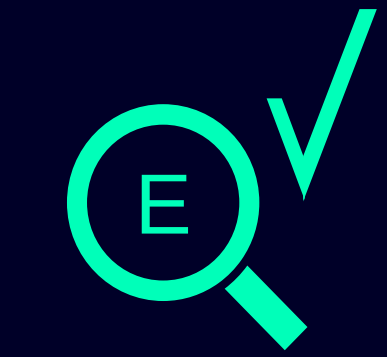
- Due to rising energy prices, it is becoming increasingly important to have **transparency of the media consumption** of machines
- In addition, an **efficiency increase** must be provable
- **Carbon footprint** mandatory in the future, therefore energy consumption of machines is necessary

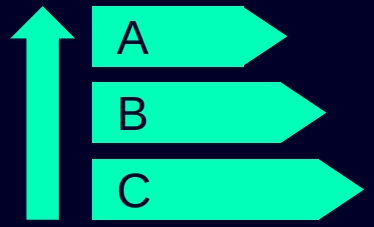
Challenge

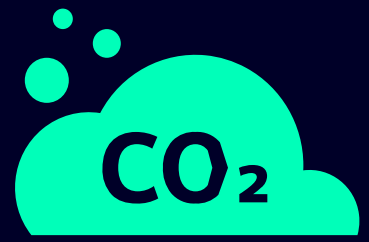
- ✓ Transparency of all energy flows on machine level
- Comparable consumption data over all machines
- KPI calculation based on value-add consumption and production
- Tracking of efficiency measures

Machine efficiency
Improve your production efficiency









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STEP 2 - Machine efficiency

Situation

- How can the efficiency of an industrial machine be determined?
- How can the energy efficiency of machines be compared?

Requirements

- Vendor-independent machine analysis in accordance with specification VDMA 34179
- Easy energy acceptance process due to standardized evaluation and uniform acceptance form

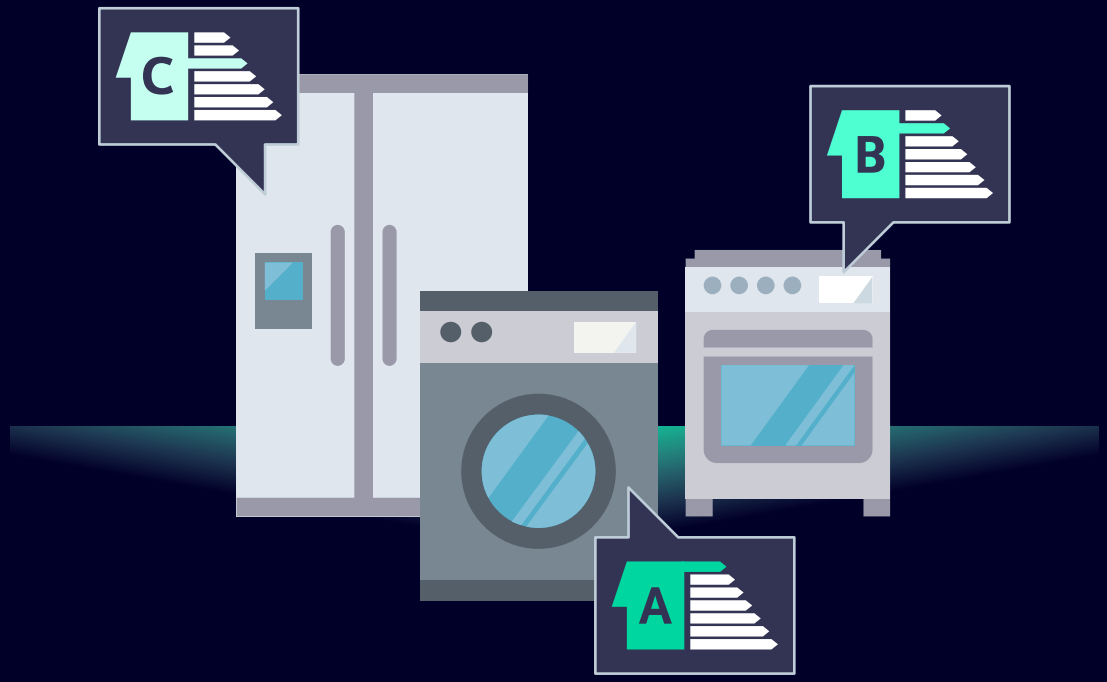
Benefits

- **Identification** of **savings potentials** through status-related analysis
- **Increase employee's awareness** of energy consumption

SIEMENS

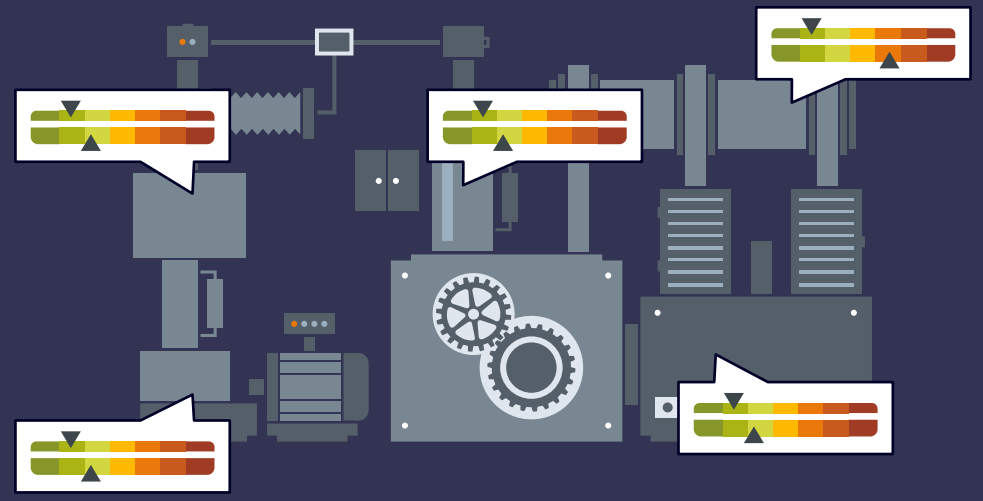
Machine efficiency
How can the energy efficiency of machines be compared?

The evaluation of the efficiency
of household appliances has already been standardized



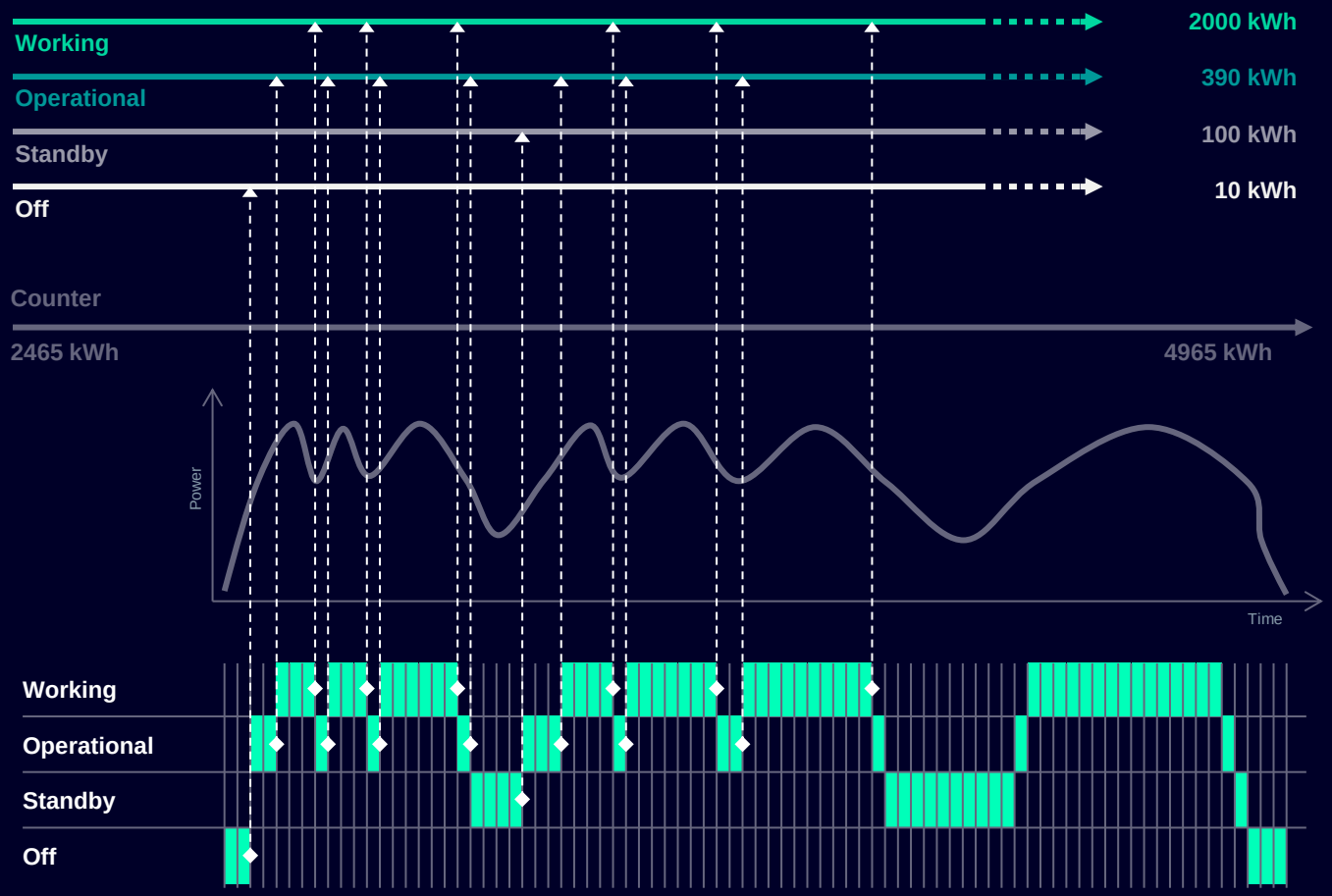
How can the

efficiency of industrial machines be compared?



Energy Efficiency-Monitor

Machine efficiency
Why is status-based energy data evaluation so important



The result is the energetic transparency of your machine

Where is the advantage by using a status-based evaluation?

- Efficiency index (EnPI) of machines/ lines/ cost centers **consistent and comparable**
- Energy consumption and **cost evaluation** on machine and cost center level
- Energy consumption and energy costs **per piece/ shift**
- **Benchmark** of similar machines/ products even from different manufacturers

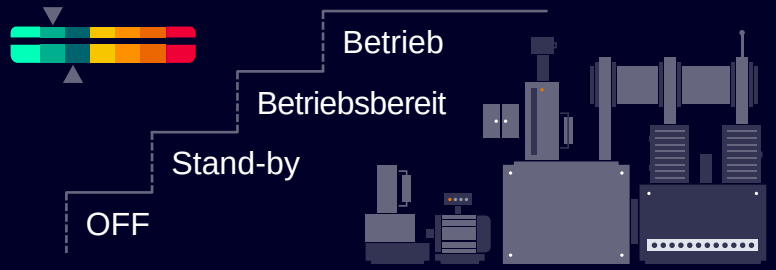
Requirements for a comparative and valid energy efficiency assessment

Continuous analysis

Monitoring the energy efficiency of the machine and, above all, the efficient operation of this machine

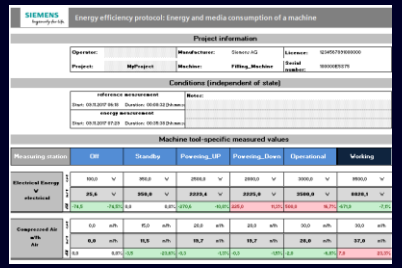
Status-related energy analysis

From switched-off status to running operation



Energy profile

And acceptance form based on VDMA standard 34179 and energy efficiency protocol for detailed evaluation



Energy efficiency assessment

Analysis

Independent of the machine type... through S7 instructions for production-related and standardized determination of energy consumption in machines

Energy evaluation

Already in the procurement phase (low life cycle costs)

Determined average power values

Can be checked repeatedly during production (automatic long-term measurement as an integral part of the TIA Portal)

Machine efficiency

The standardized path to increased energy efficiency in production

Standardization

Uniform energy benchmarks

Procurement

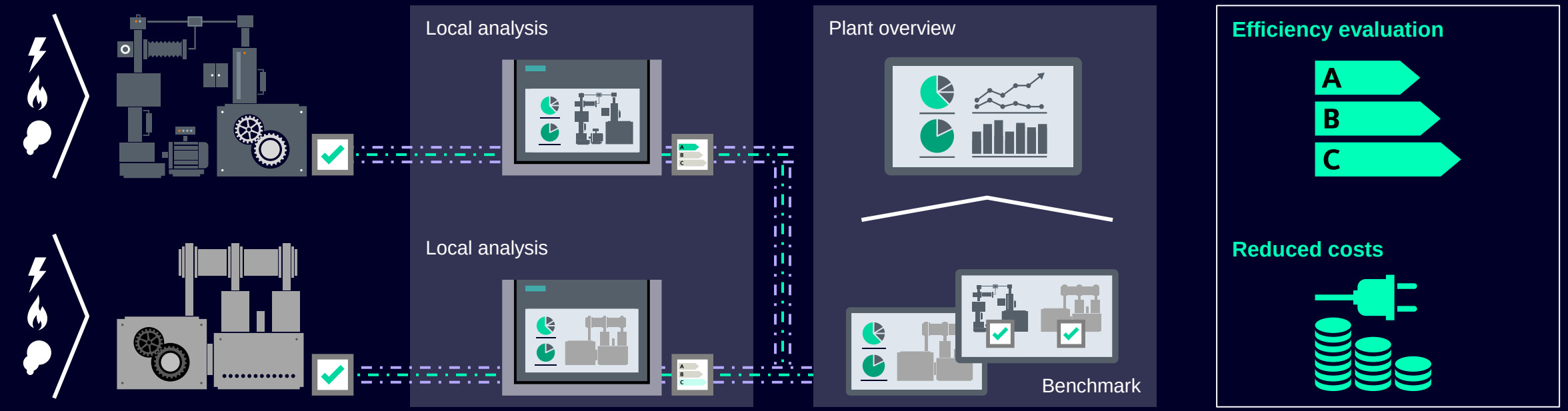
Energy acceptance form for comparison purposes

Operation

Continuous monitoring (energy per mode, for all sorts of energy)

Optimization

Analysis and evaluation
Optimization measures



Vendor-independent concept according to measuring specification VDMA34179

Two-stage overall concept
Energy efficiency monitor and Energy Manager PRO

1. Local evaluation

Energy Efficiency Monitor
- Status-related analysis of energy data
- Standard function blocks for S7-1200/S7-1500 in TIA Portal V19
- A standardized energy efficiency acceptance form for different types of machine

2. Central evaluation

Energy Manager PRO
- Continuous monitoring of machine efficiency metrics and benchmarks
- Automatic data transfer from the communication module of the EE monitor via wizard
- Machine-specific templates for automatic assignment to other machines of the same type

Machine builders

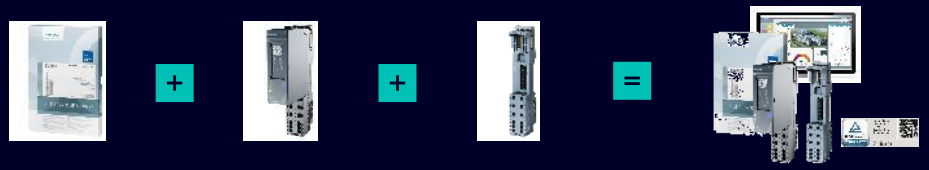
Machine operator

SIMATIC Energy Efficiency Package(s)
For sustainable energy management in production

SIMATIC Energy Efficiency Package (EM)

1

The SIMATIC Energy Efficiency Package (EM) includes the following components:



SIMATIC Energy Manager PRO Consumer incl. S7 EE-Monitor V7 (6AV6372-2DF67-1AX0)

AI Energy Meter 480 V ET200SP (6ES7134-6PA01-0BU0)

Base Unit ET200SP (6ES7193-6BP00-0BU0)

Energy Efficiency Package (EM) **(6AV6372-3DF67-1AA1)** **Listenpreis: 535 €**

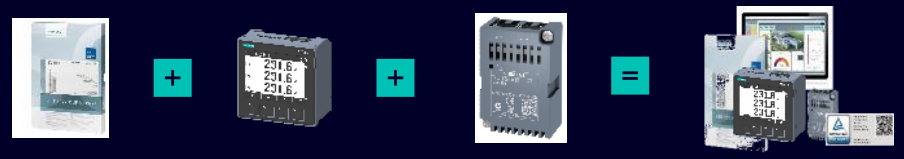
All-round carefree packages - advantages at a glance

- Licenses included: For the production machine and connection to an existing SIMATIC Energy Manager PRO Server1
- Measuring hardware (SIMATIC Energy Meter or Sentron PAC 3220)
- All components: ISO 50001-compliant tested with TÜV certificate
- Low-effort implementation of energy management in production via the equipment regulation for operators
- Price advantage compared to purchasing individual products

SIMATIC Energy Efficiency Package (PAC)

2

The SIMATIC Energy Efficiency Package (PAC) includes the following components:



SIMATIC Energy Manager PRO Consumer incl. S7 EE-Monitor V7 (6AV6372-2DF67-1AX0)

Sentron PAC 3220

(7KM3220-0BA01-1DA0)

Erweiterungsmodul Switched Ethernet PROFINET (7KM9300-0AE02-0AA0)

Energy Efficiency Package (PAC) **(6AV6372-3DF67-1AA2)** **Listprice: 864 €**

Advantages for mechanical engineers

Facilitates energy-related acceptance of machines

Exportable acceptance report

Efficiency evaluation according to VDMA 34179 standard sheet on the machine2

Determination of machine availability

Marketing option "Machine ready for energy management"

Advantages for end users

Basis for continuous optimization

Simplified ISO 50001 certification

Can be used across suppliers (VDMA standard)

Simple integration of machines1

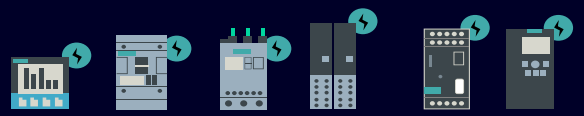
1 SIMATIC Energy Manager PRO Server license required (6AV6372-2DF07-2AH0) | 2 Visualization via Industry Online Support Portal: Contribution 109753230SIMATIC Energy Management - DI FA

Energy Efficiency Monitor
System and hardware requirements

When is it possible to use the EE-Monitor:

- Machine has different operating states
- Electrical consumption and/or other media are recorded in the machine

Measurement technology
- up to 10 measuring points any media



\+

SIMATIC CPU
- S7-1200/1500 controller

\+

TIA Portal V19 / STEP 7
- Activation via license pro machine

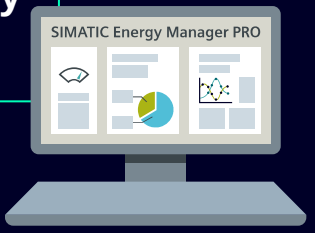
\+

SIMATIC HMI
- Visualization directly on the panel

License name	Article Nr.	L1-Price
EE-Monitor for Machines S7-1500/1200 [1)]	6AV2108-1CF00-0BH0 6AV2108-1CF00-0BB0	216,- € 259,- €

1) The correct number of existing license certificates must be configured in the properties of the CPU hardware in the TIA Portal

Optional: SIMATIC Energy Manager PRO



Machine transparency
Benefits and Values

Resource tracking

Get full transparency over the media consumption per status and per produced piece

Establish comparability

- Track the performance of a machine over time
- Monitor the effectiveness of efficiency measures
- Compare similar machines from different vendors

Reduction of waste

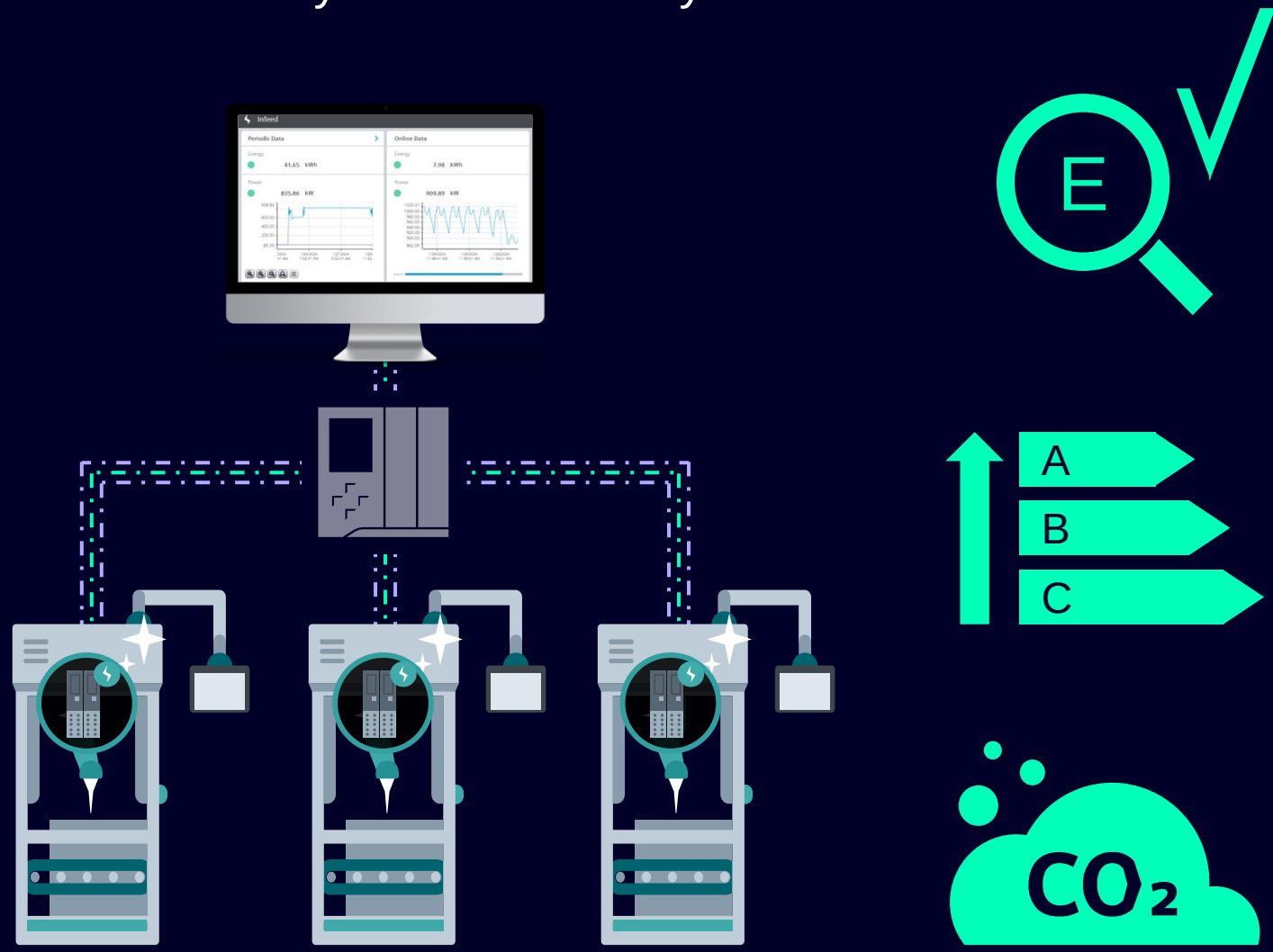
Media consumption during non-value adding times is shown

Identify potential for efficiency measures

- If media consumption is increasing over time this could be an indicator e.g., for tool wear
- The amortization period for e.g., a new motor can be calculated exactly based on the EEM data

SIMATIC Energy Suite
Energy Efficiency-Monitor – Tech Slides

Resource Transparency
is one of the keys to sustainability



Resource Transparency

Use Case scenario

- Due to rising energy prices, it is becoming increasingly important to have **transparency of the media consumption** of machines
- In addition, an **efficiency increase** must be provable
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Challenge

- ✓ Transparency of all energy flows on machine level
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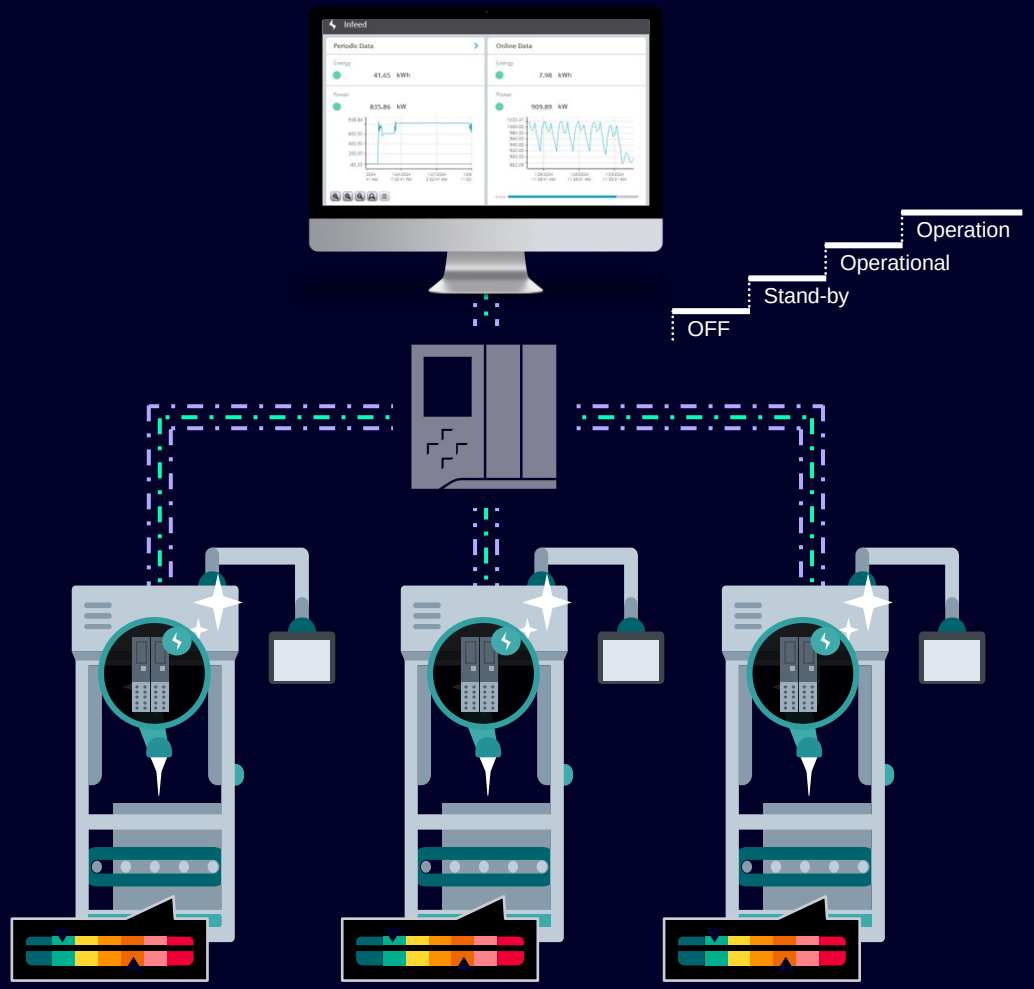
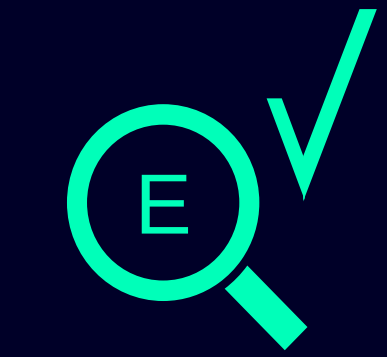
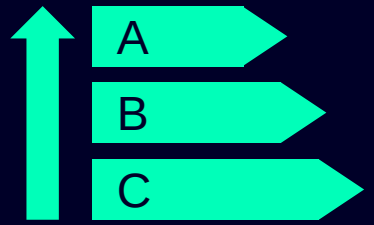
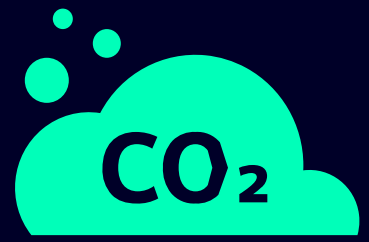
Machine efficiency
Improve your production efficiency









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STEP 2 - Machine efficiency

Situation

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- How can the energy efficiency of machines be compared?

Requirements

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Benefits

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SIEMENS

Machine efficiency
How can the energy efficiency of machines be compared?

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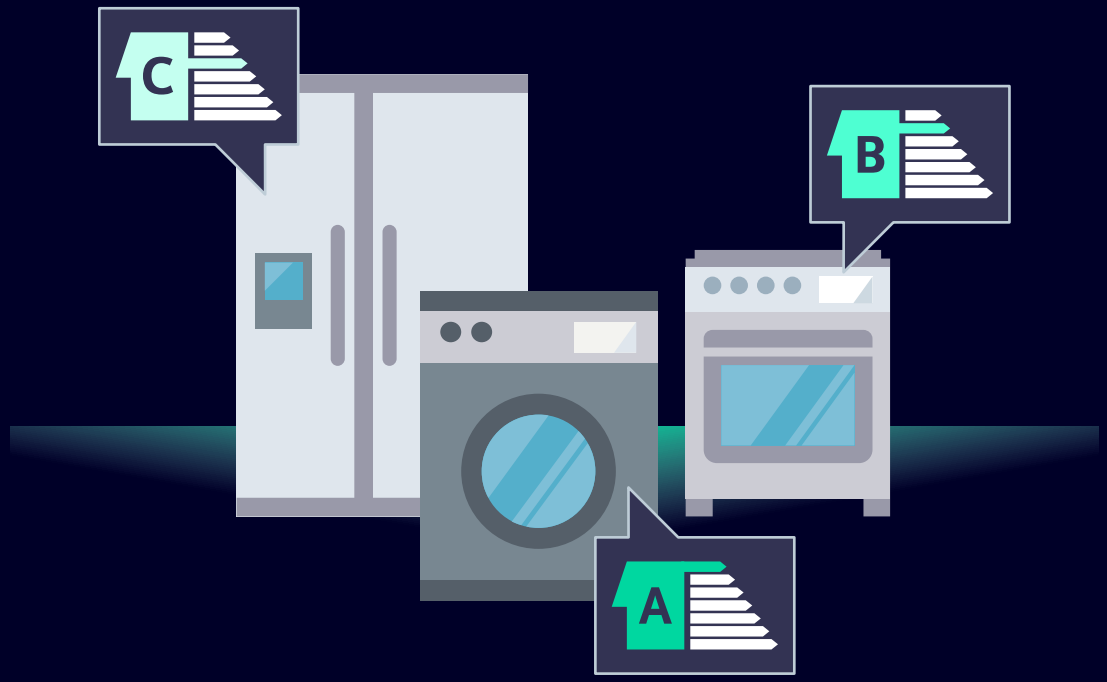
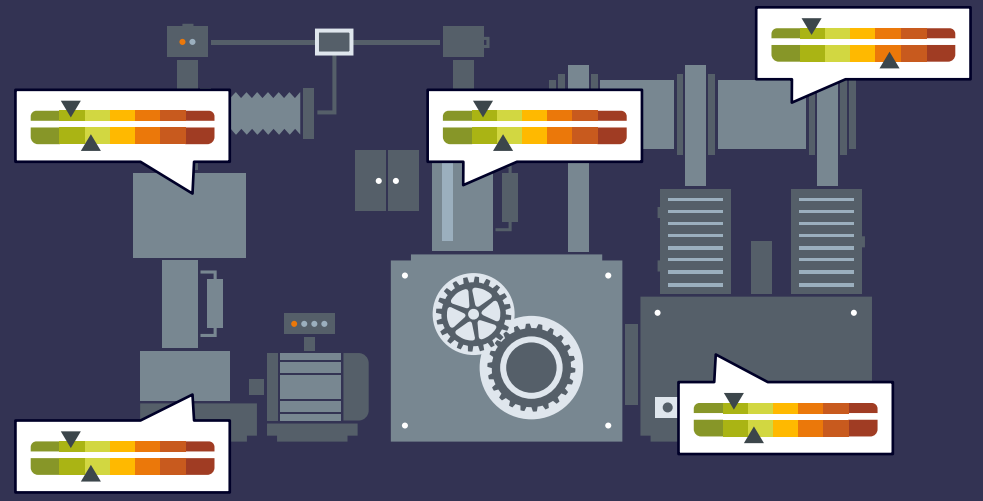


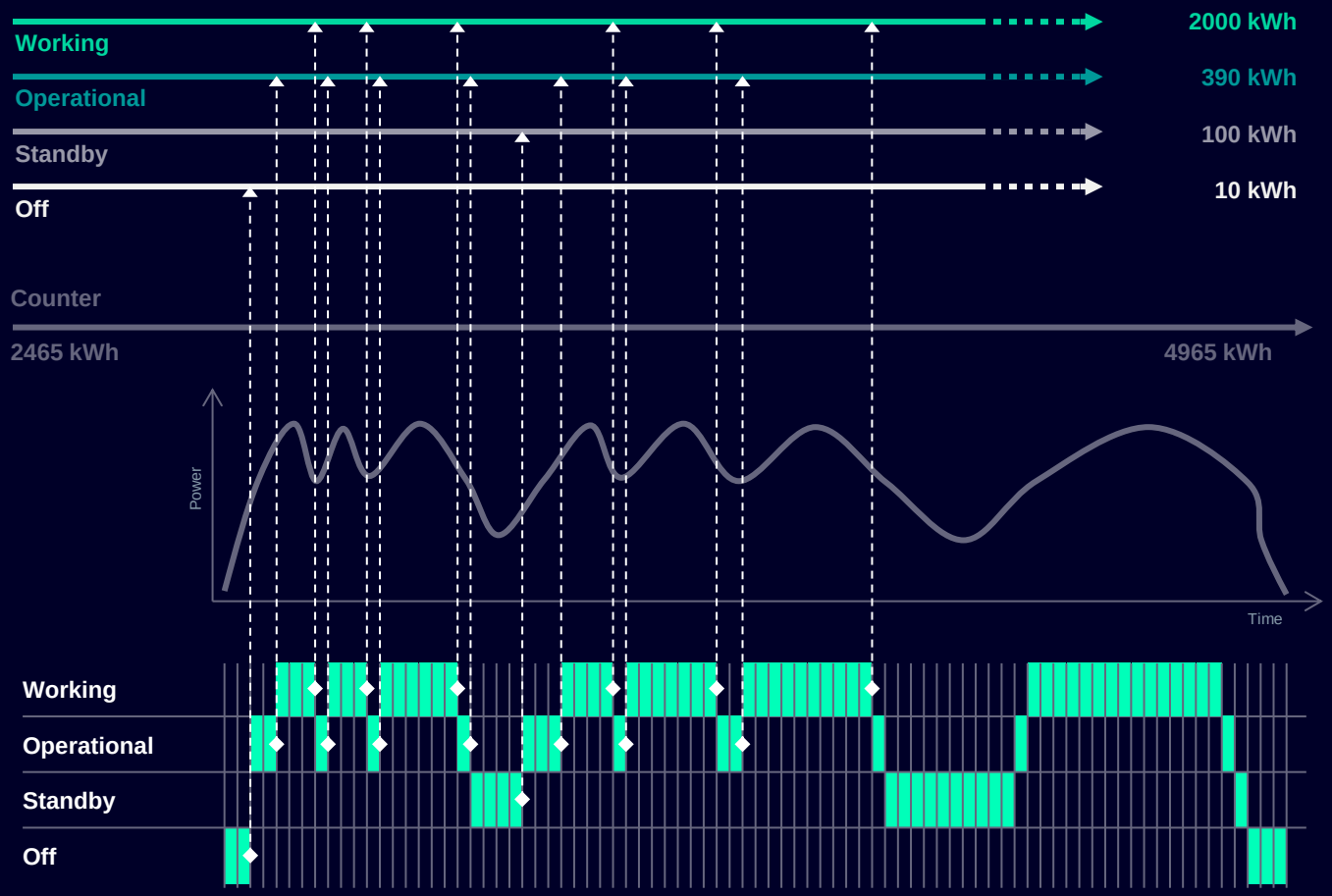
How can the

efficiency of industrial machines be compared?



Energy Efficiency-Monitor

Machine efficiency
Why is status-based energy data evaluation so important



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Machine efficiency

The standardized path to increased energy efficiency in production

Standardization

Uniform energy benchmarks

Procurement

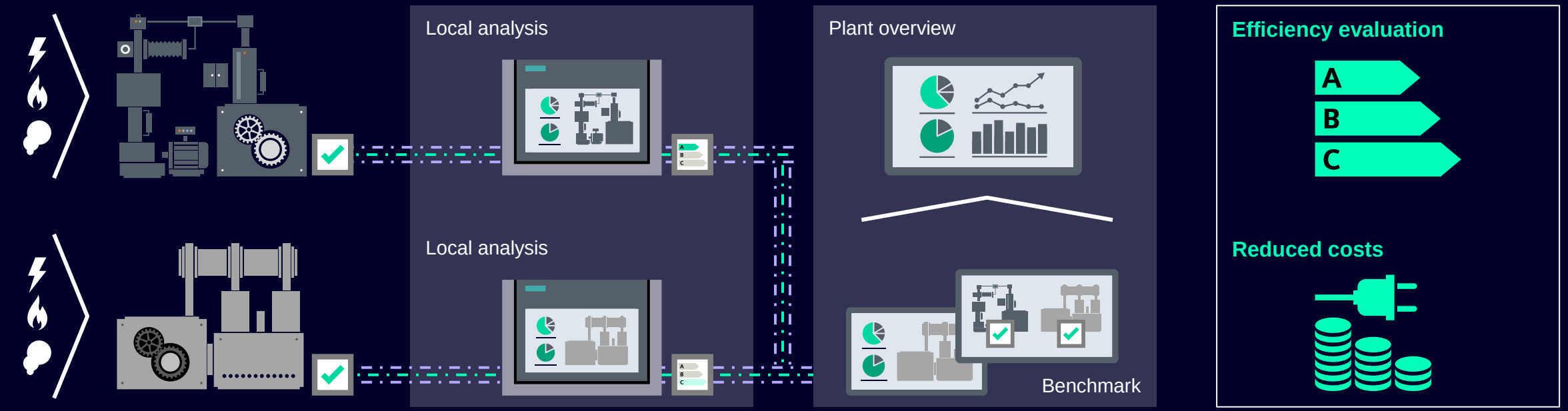
Energy acceptance form for comparison purposes

Operation

Continuous monitoring (energy per mode, for all sorts of energy)

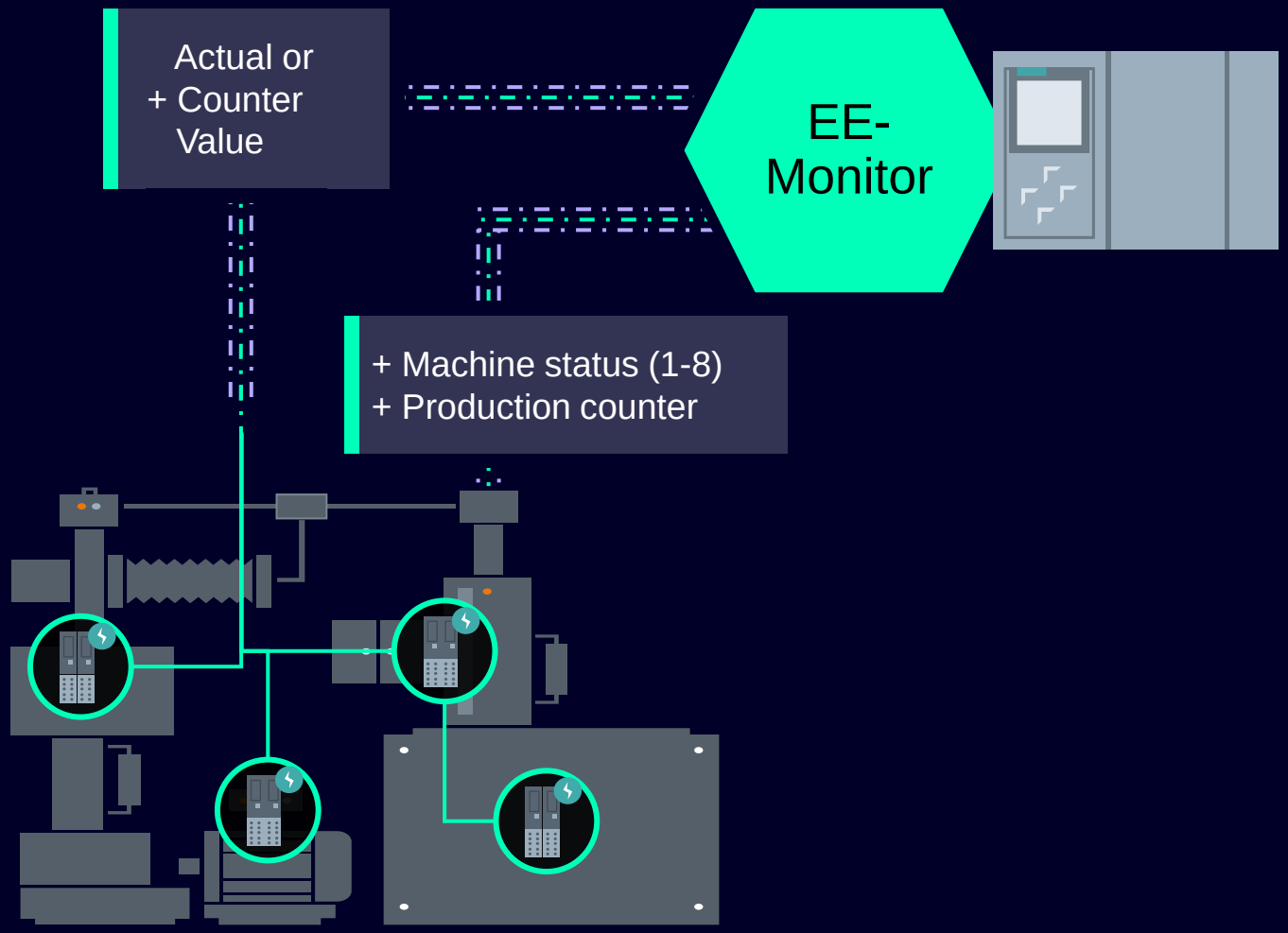
Optimization

Analysis and evaluation
Optimization measures



Vendor-independent concept according to measuring specification VDMA34179

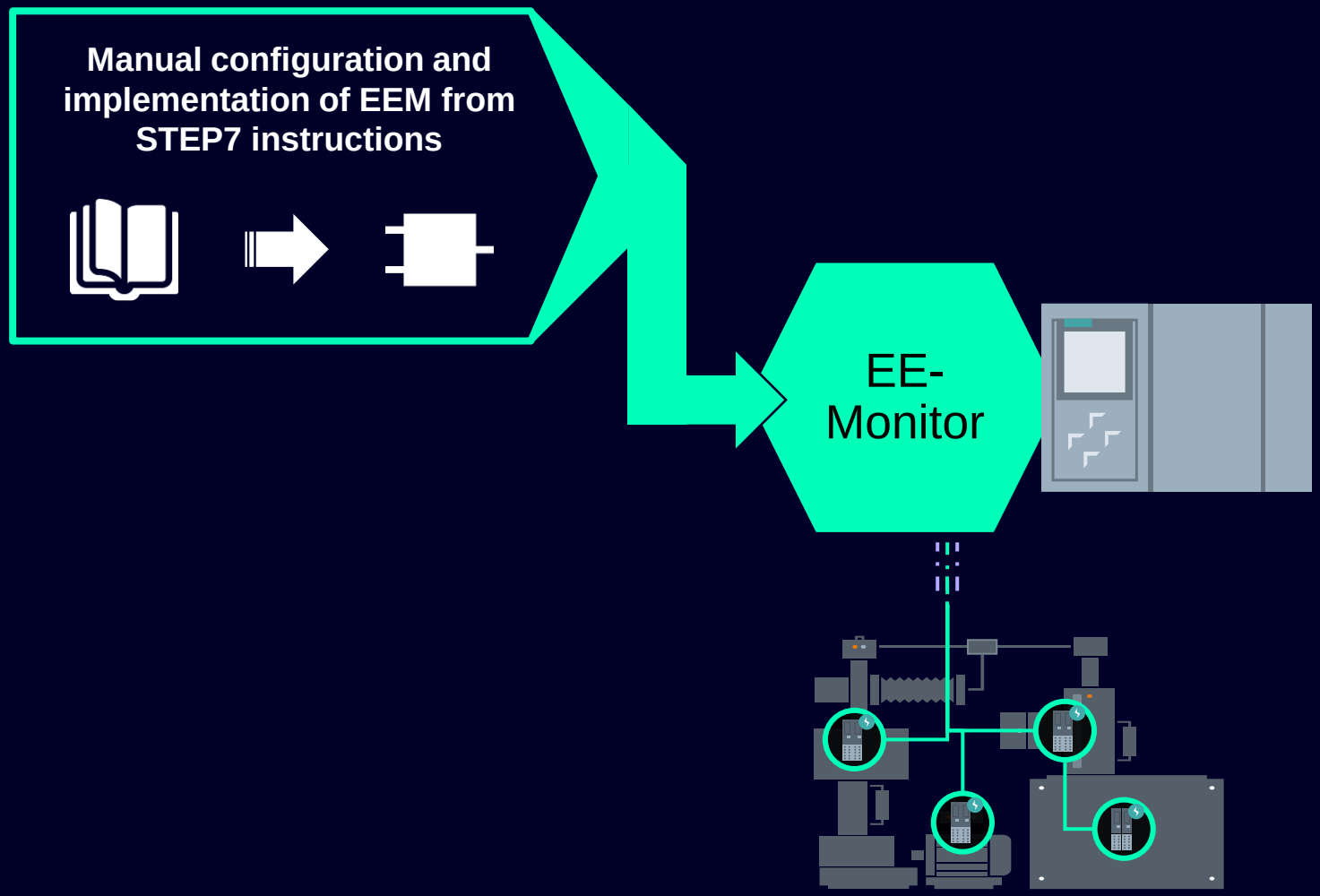
Machine efficiency
Requirements of EE-Monitor on the PLC



Requirements for the EE-Monitor on the PLC

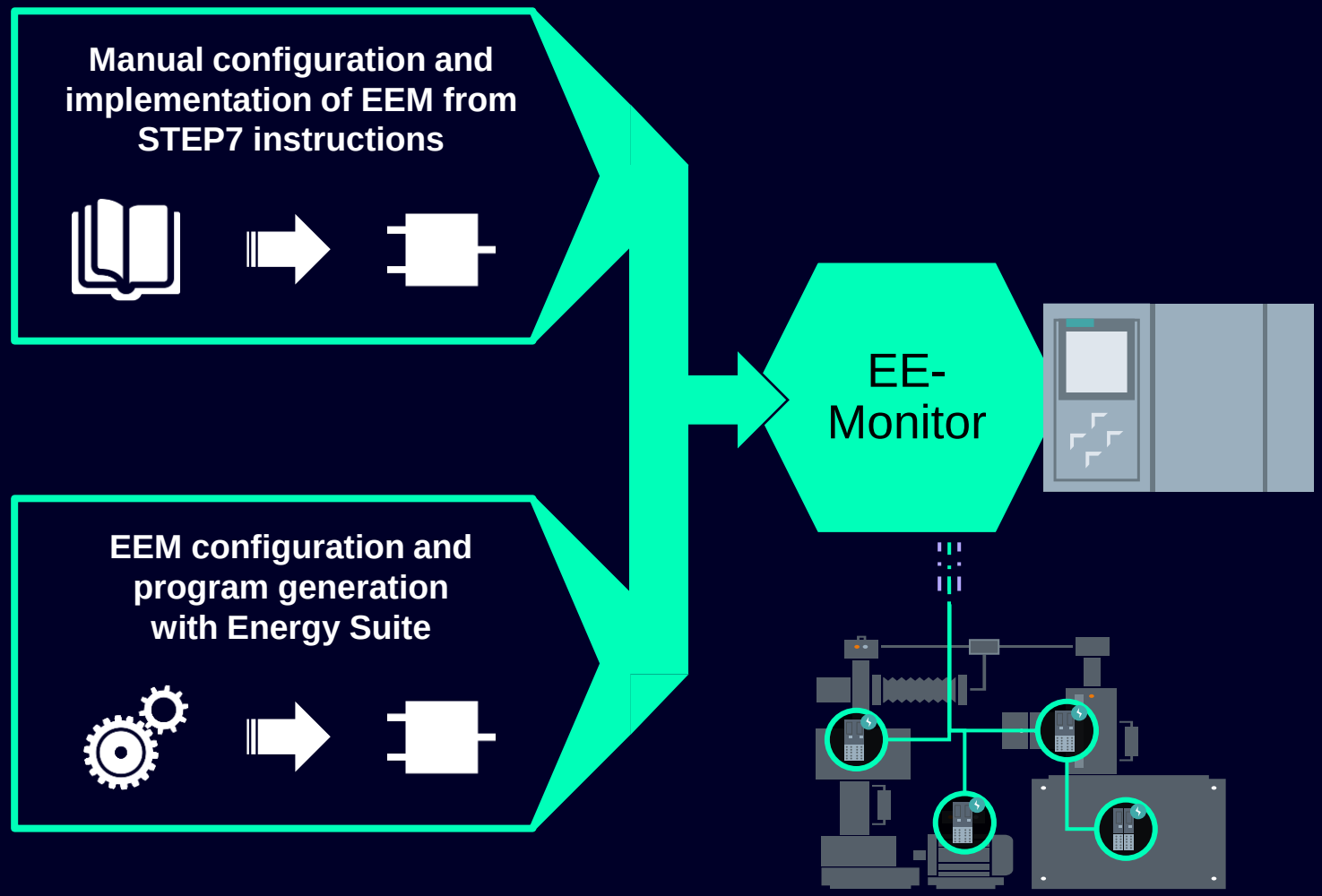
- Available for any **S7-1500** or **S7-1200** PLC
- **EEM** can be located either on the machine or the line PLC
- **Information** needed from the **machine**
  - **Machine status** – Should be the same states for all machines, to make them comparable (max. 8 states, default config according to VDMA 34179)
  - **Production counter** – The produced pieces of the machine (needed for EnPI-calculation)
- **Information** needed from **measurement devices**
  - Actual or counter value of the measurement point
  - Up to ten measurement points per machine

Machine efficiency
Implementation of the EEM on the PLC



Implementation of the EEM on the PLC without Energy Suite

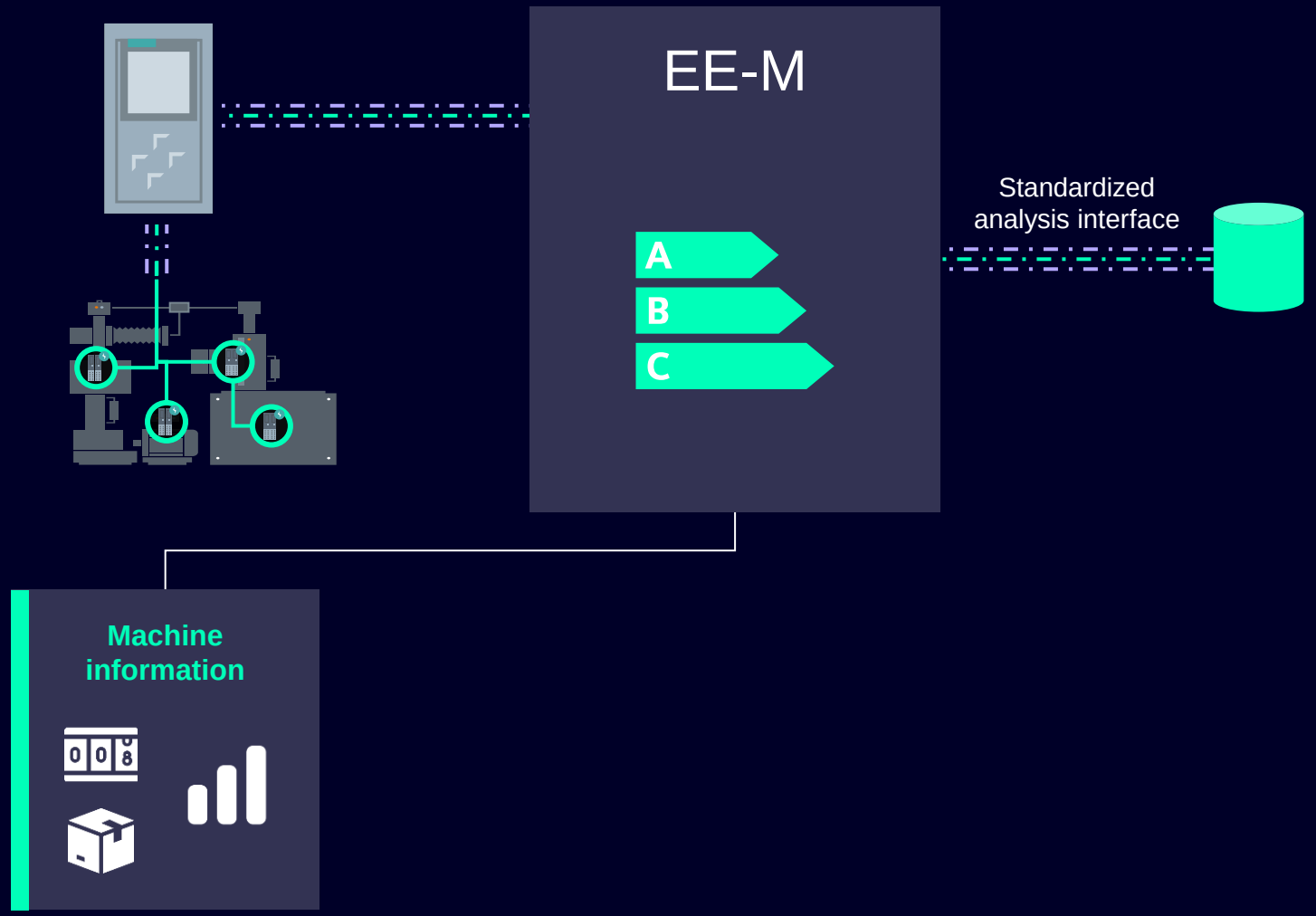
- Energy Efficiency-Monitor available in the STEP7 system instructions since TIA Portal V15
- No integration in Energy Suite, manual implementation of the PLC program necessary
  - Setup of data household with included system UDTs
  - Manual calling of system functions in OBs and connecting of machine variables to the correct entries in the DBs
  - Manual initialization of the whole EEM settings
- No additional Energy Suite installation required for implementation



Implementation of the EEM on the PLC with Energy Suite

- Since **Energy Suite V19**, Energy Efficiency-Monitor is **fully integrated** in the engineering
- Configuration of the EEM in the Energy Suite with **automatic generation** of the PLC program
  - Generation of **data household** including interface for visualization
  - Generation of the **PLC program** with the calls for the blocks and functions
  - **No manual** coding necessary
- Additional **generation** of the **visualization** for WinCC Unified with SiVArc
- Manual implementation without Energy Suite still possible (**compatibility** to old versions guaranteed)

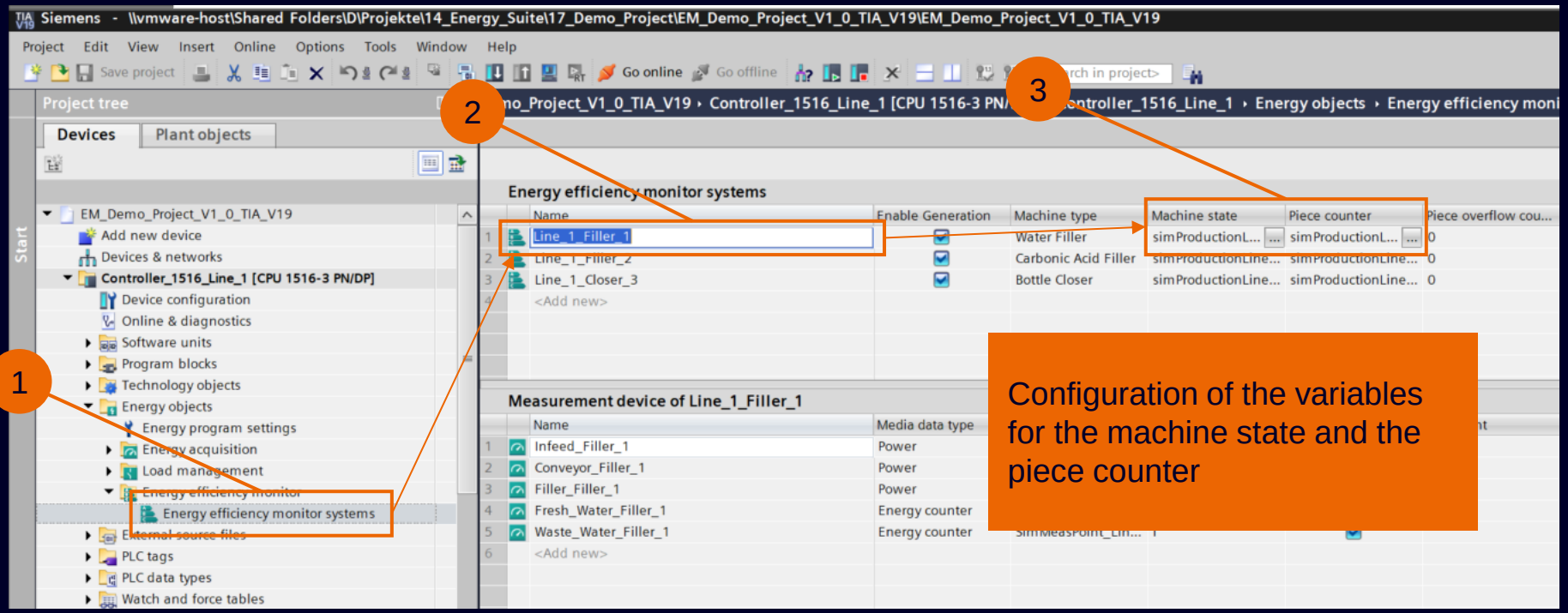
Machine efficiency
Configuration of EEM since Energy Suite V19



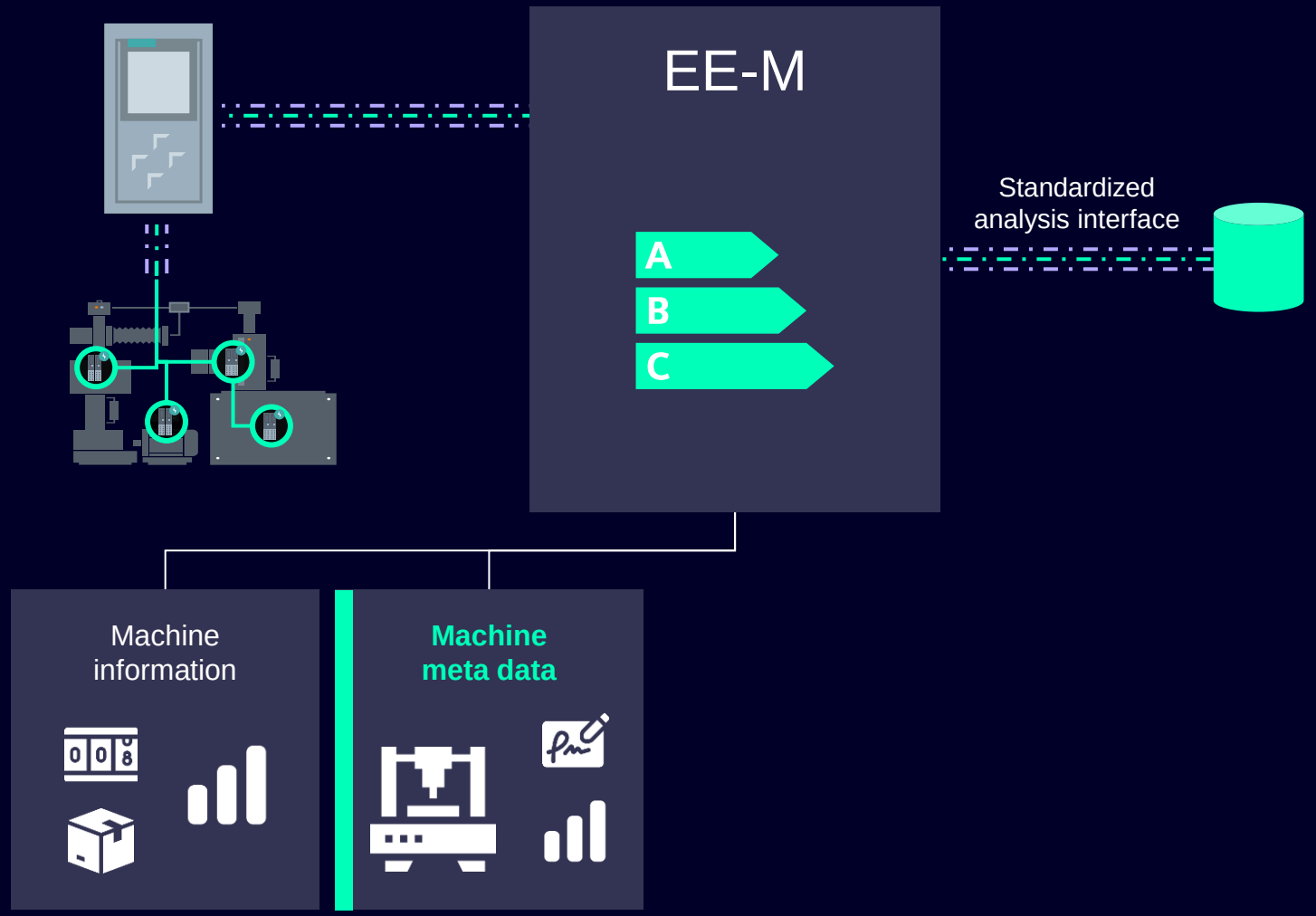
Configuration of EEM since Energy Suite V19

- For modelling the EEM and **adapt** it to the **physical machine**, the user has several configuration properties:
  - **Machine information** (variables for production counter and machine status)

Machine efficiency
Configuration of EEM since Energy Suite V19



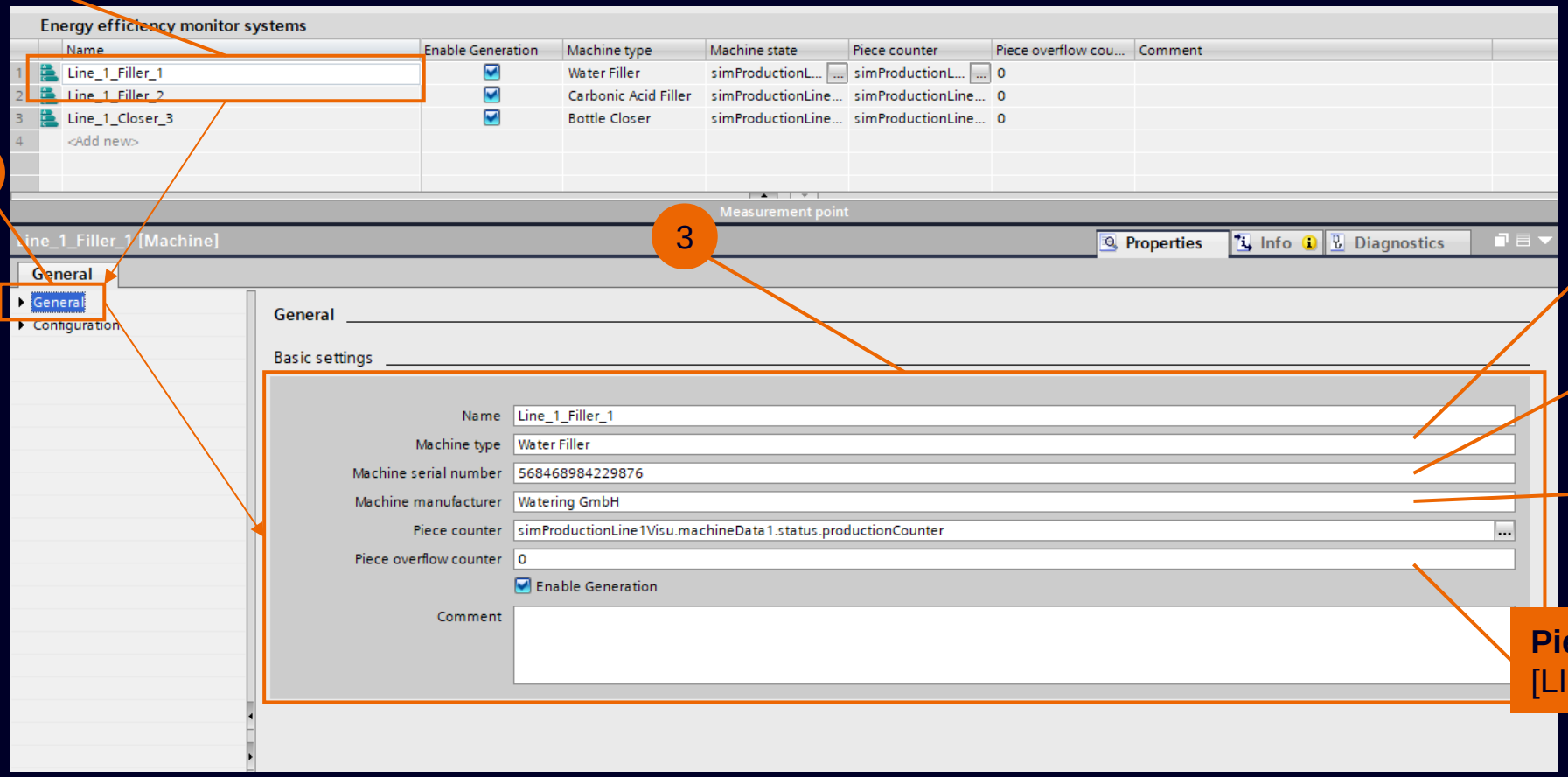
Machine efficiency
Configuration of EEM since Energy Suite V19



Configuration of EEM since Energy Suite V19

- For modelling the EEM and **adapt** it to the **physical machine**, the user has several configuration properties:
  - **Machine information** (variables for production counter and machine status)
  - **Machine meta data** (name, serial number, name of status, machine type)

Machine efficiency
Configuration of EEM since Energy Suite V19



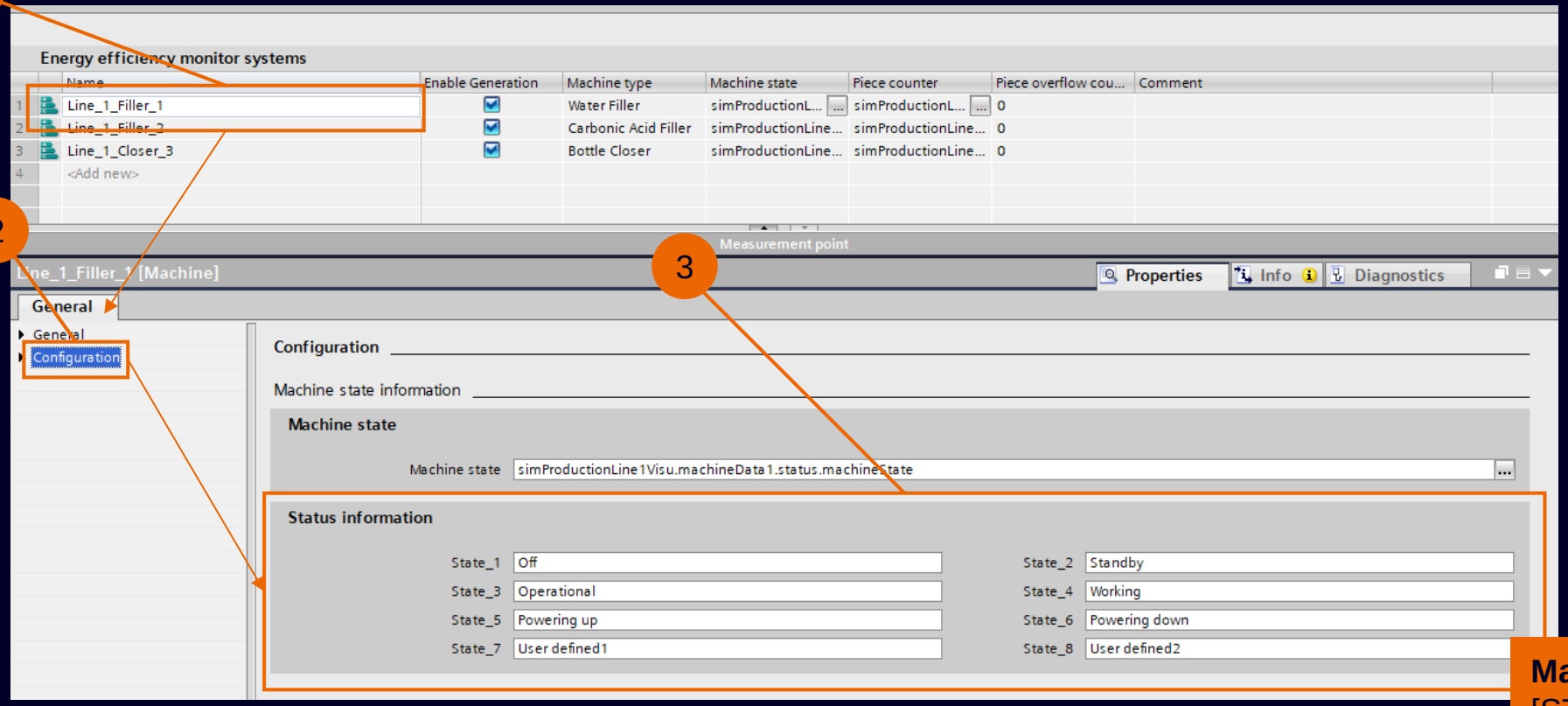
Machine type
[String]

Machine serial
[String]

Machine manufacturer
[String]

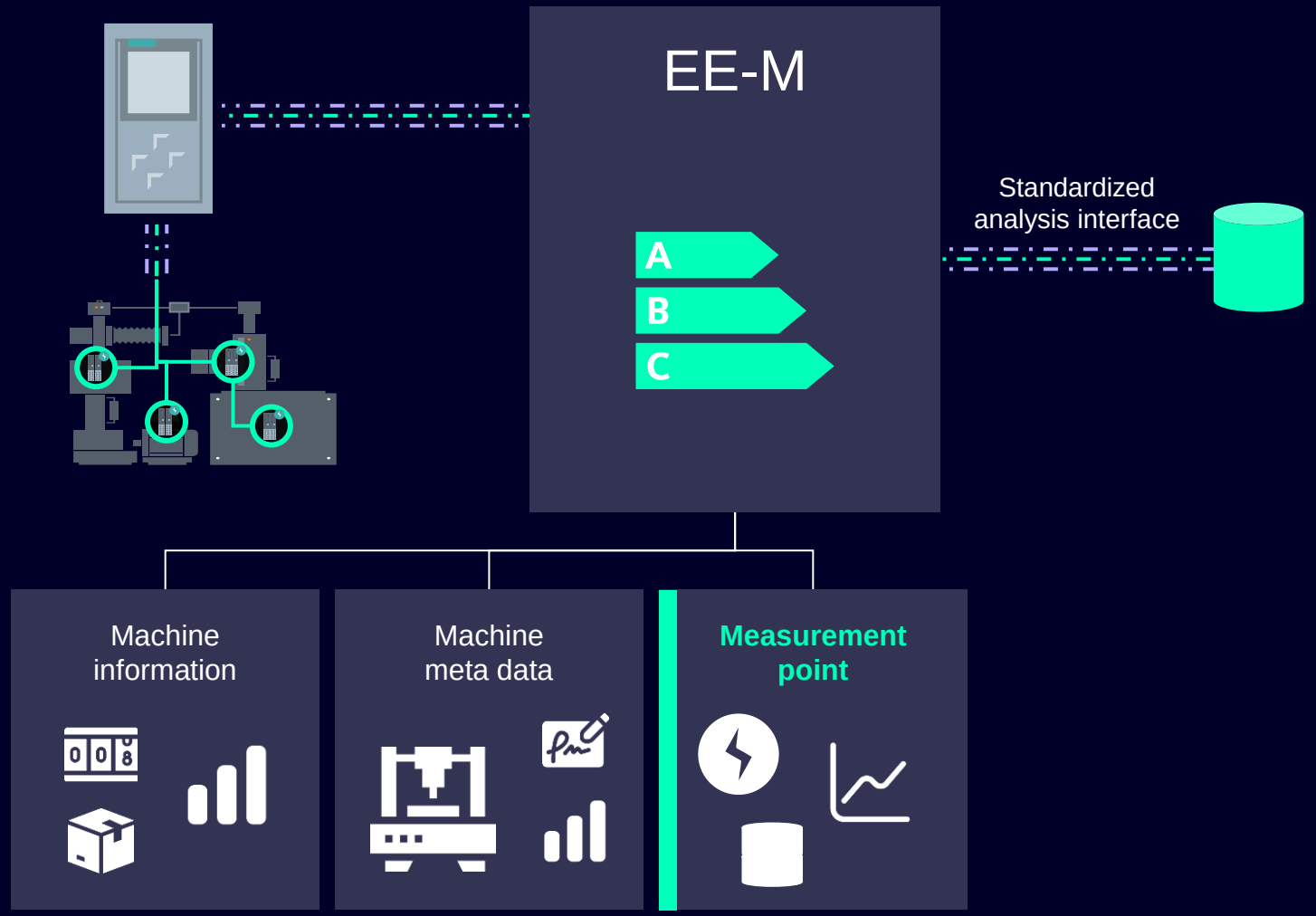
Piece counter overflow value
[LINT]

Machine efficiency
Configuration of EEM since Energy Suite V19



Machine state 1-8
[STRING[14]]

Machine efficiency
Configuration of EEM since Energy Suite V19



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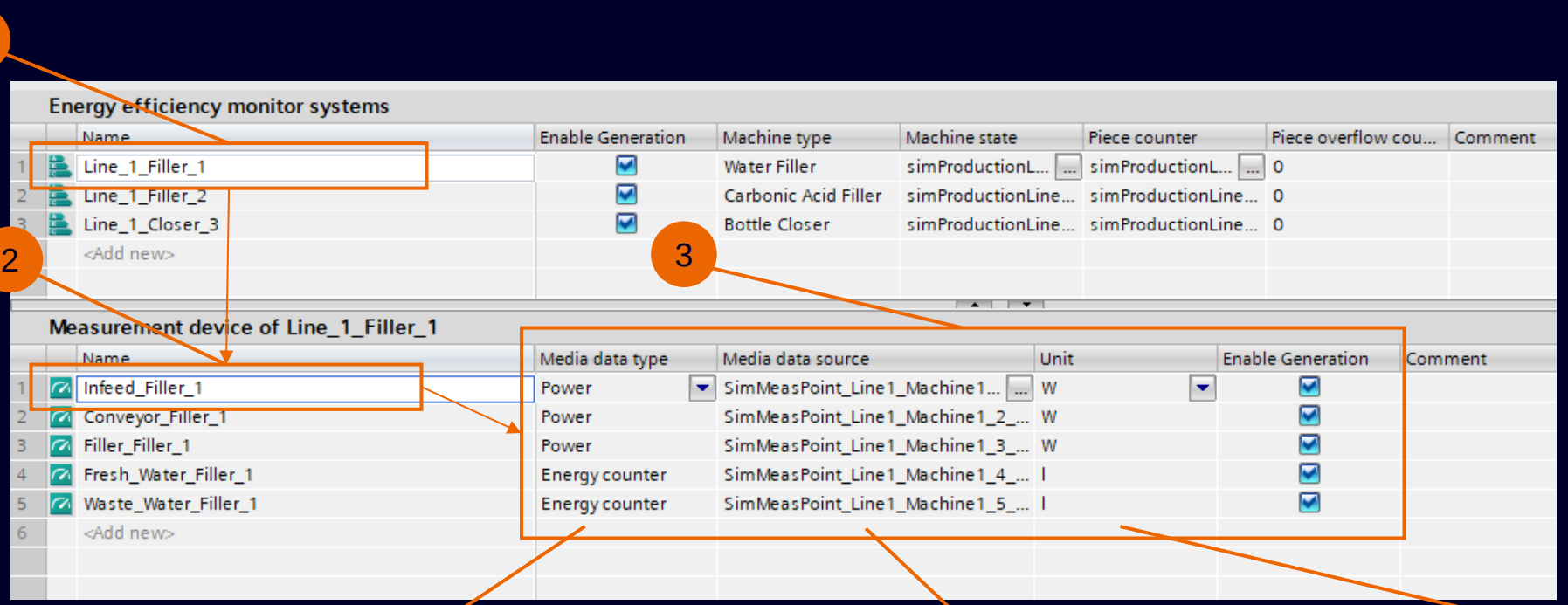
  - **Measurement point** (type of measurement point)

Machine efficiency
Configuration of EEM since Energy Suite V19

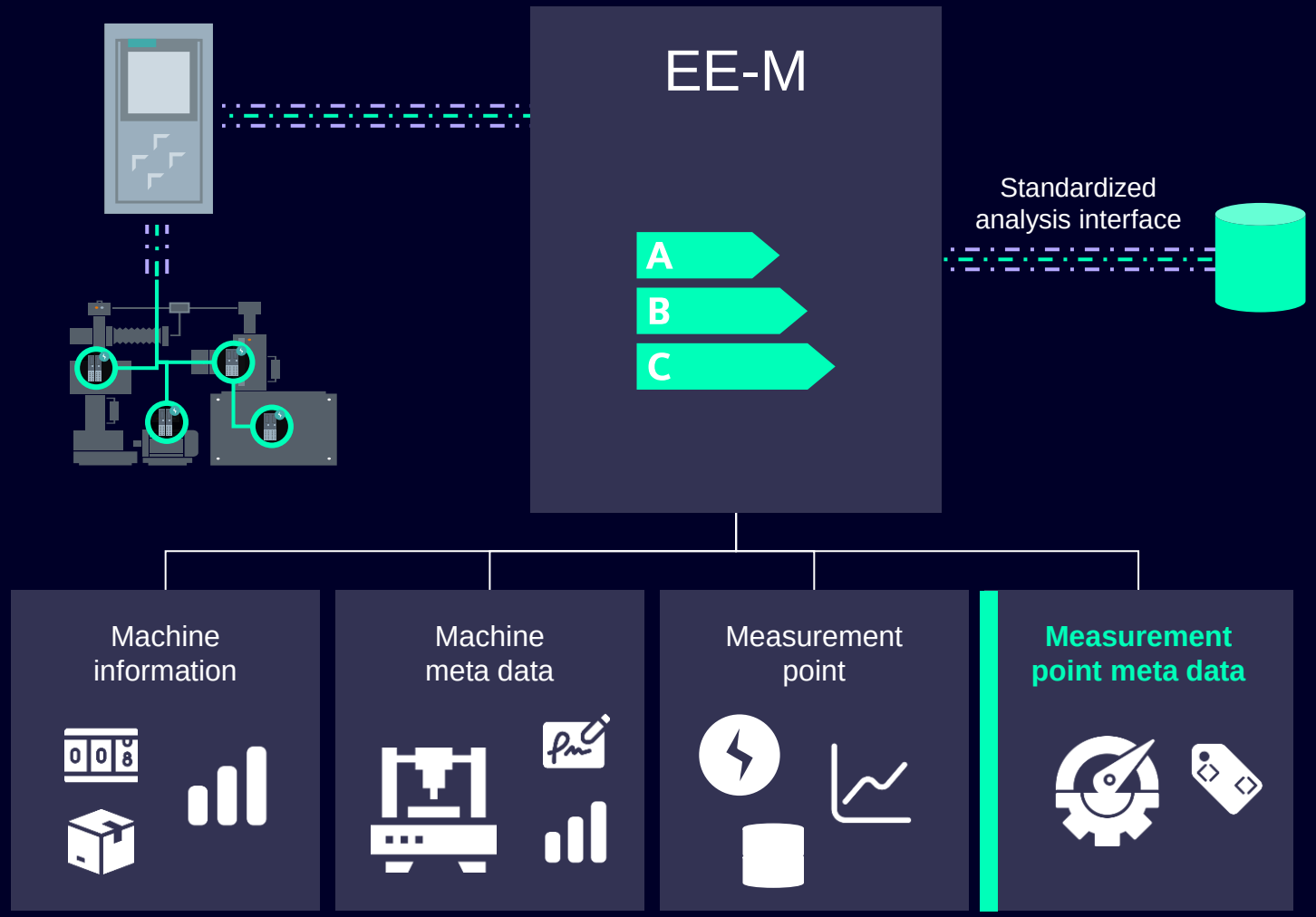


Media data type
- Power
- Energy counter
- Acquisition object

Media data source
- Variable (for type Power or Energy counter)
- Acquisition object (for type Acquisition object)

Unit
Choose the unit of the measurement point with dropdown (no effect on any calculation)

Machine efficiency
Configuration of EEM since Energy Suite V19



Configuration of EEM since Energy Suite V19

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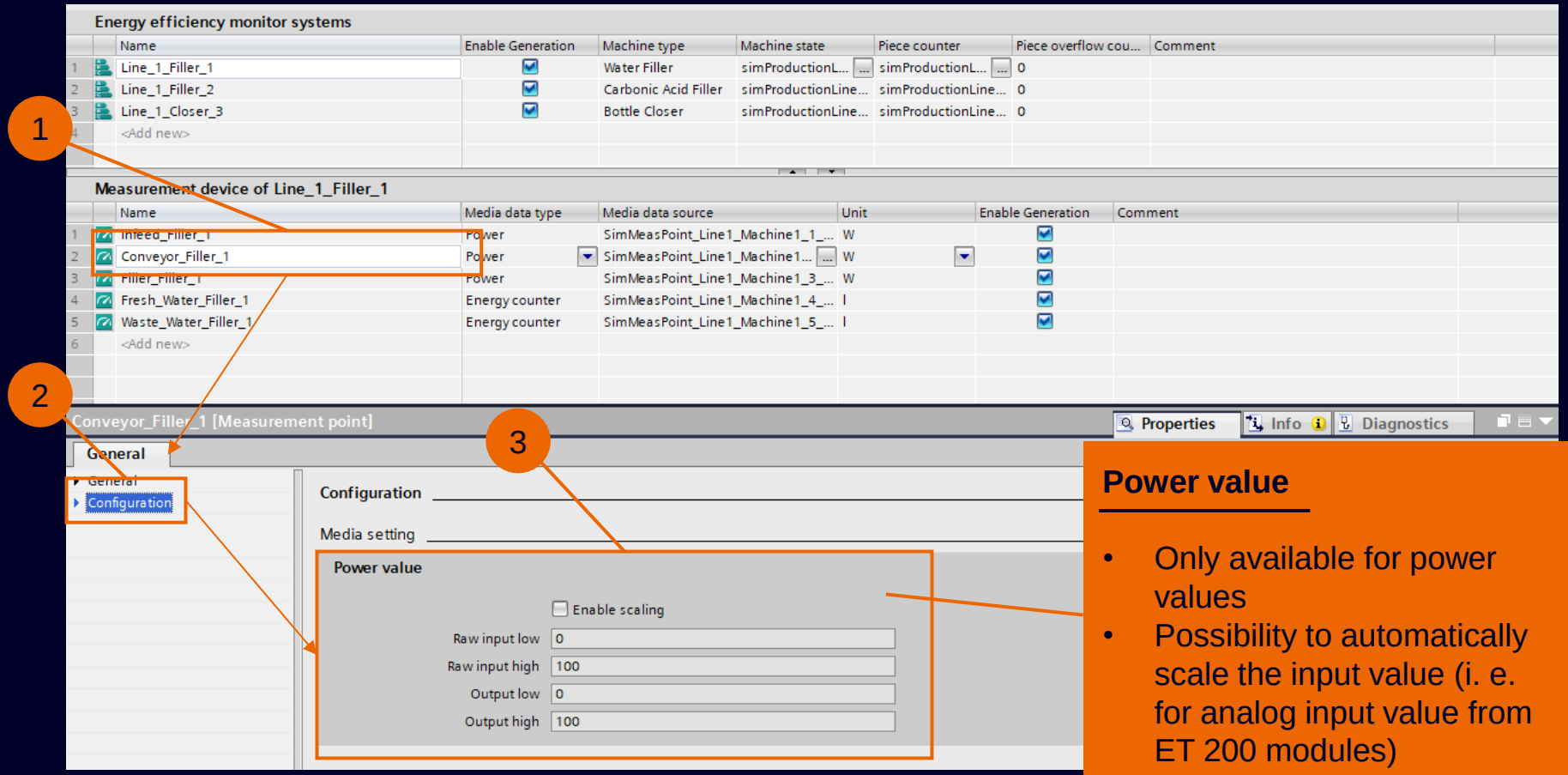
  - **Machine information** (variables for production counter and machine status)
  - **Machine meta data** (name, serial number, name of status, machine type)
  - **Measurement point** (type of measurement point)
  - **Measurement point meta data** (name, unit)

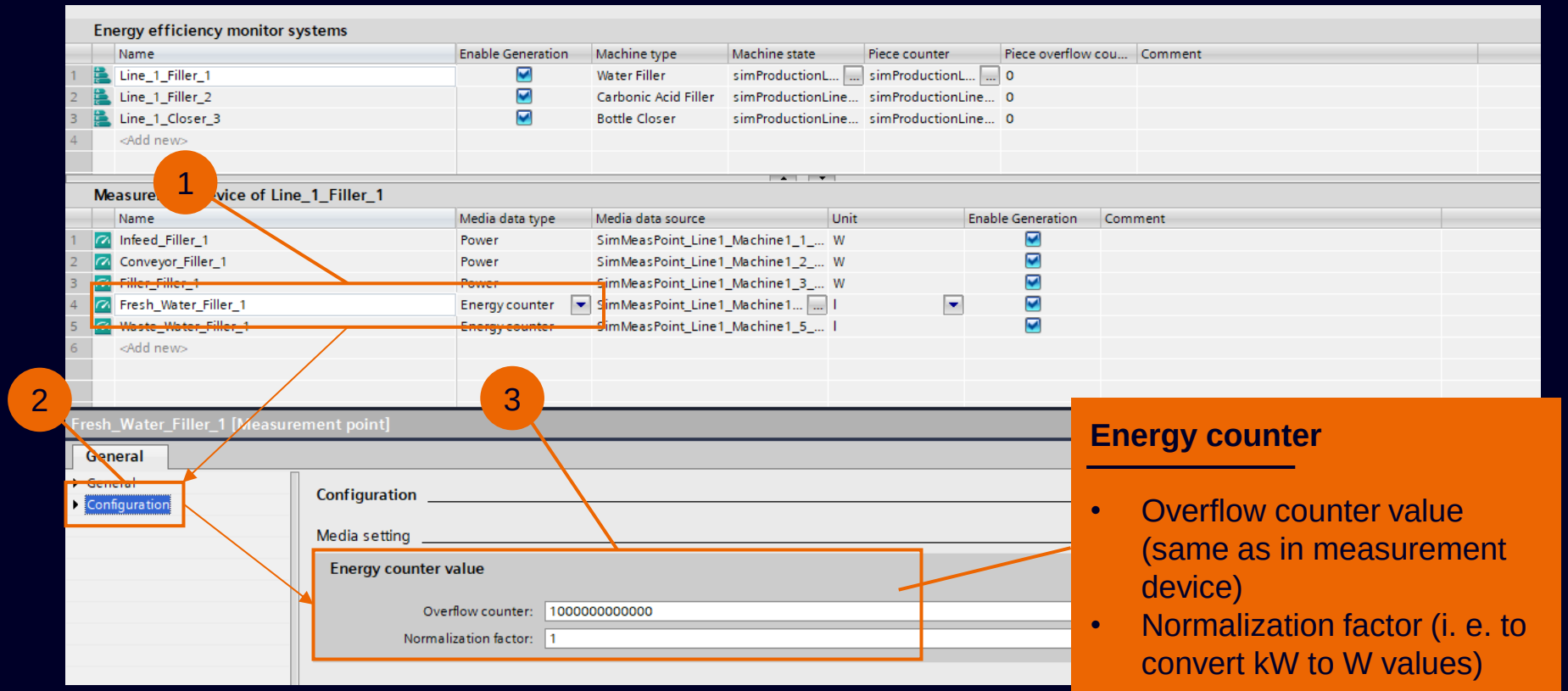
Machine efficiency
Configuration of EEM since Energy Suite V19



Power value

- Only available for power values
- Possibility to automatically scale the input value (i. e. for analog input value from ET 200 modules)

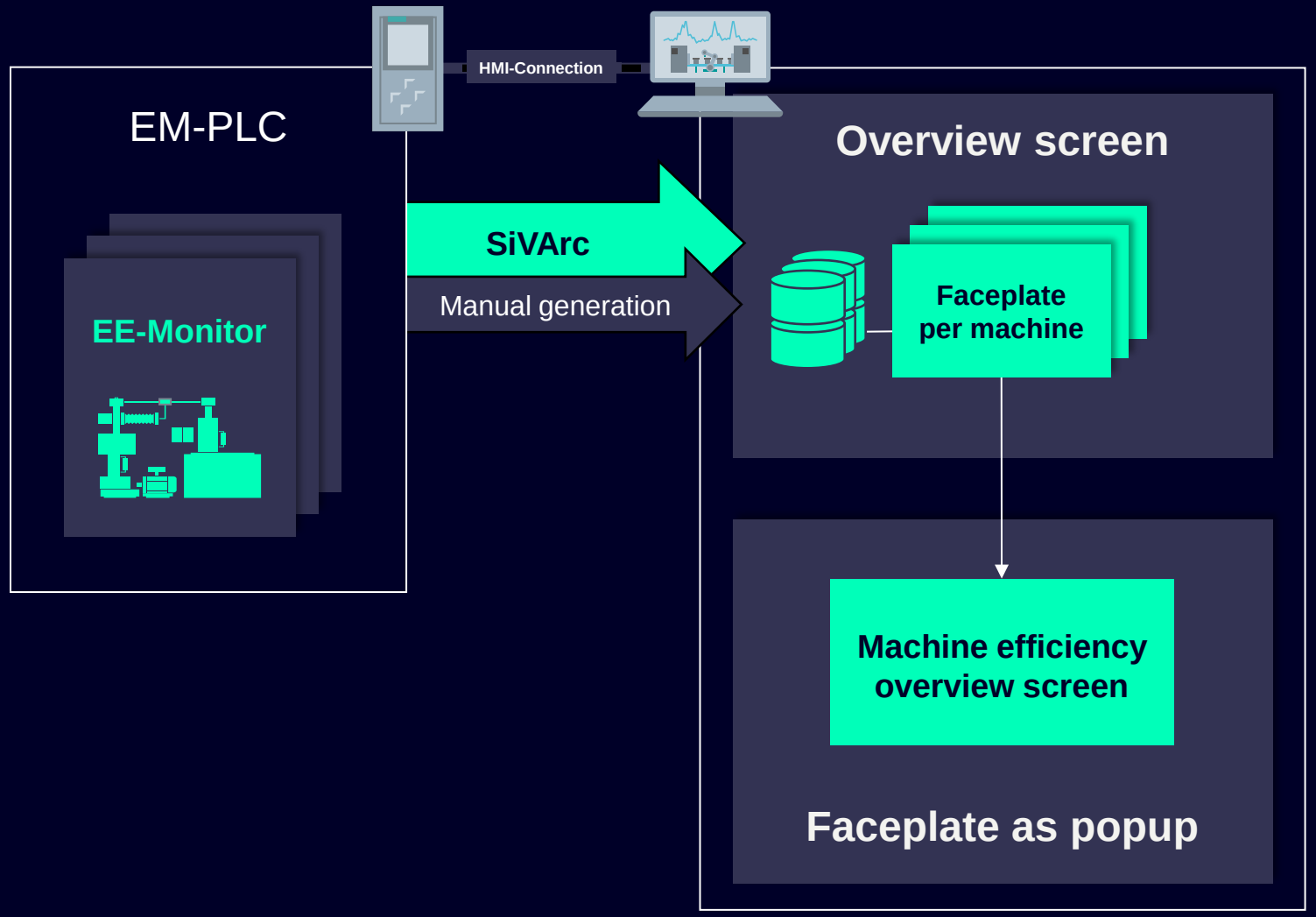
Machine efficiency
Configuration of EEM since Energy Suite V19



Energy counter

- Overflow counter value (same as in measurement device)
- Normalization factor (i. e. to convert kW to W values)

Machine efficiency
Visualization of EE-Monitor in WinCC Unified



Energy Suite visualization with SiVArc for WinCC Unified

- Basic requirement: **Existing HMI-connection**
- All **screens** are realized as faceplates
- SiVArc rules for the Energy Suite can be **automatically generated**
- Tool generates one **faceplate** and the **data household** for **each** EE-Monitor instance
- **Overview screen** for detailed machine efficiency analyses is opened in a **pop-up**
- **Optimized design** and **architecture** for a perfect user experience in WinCC Unified

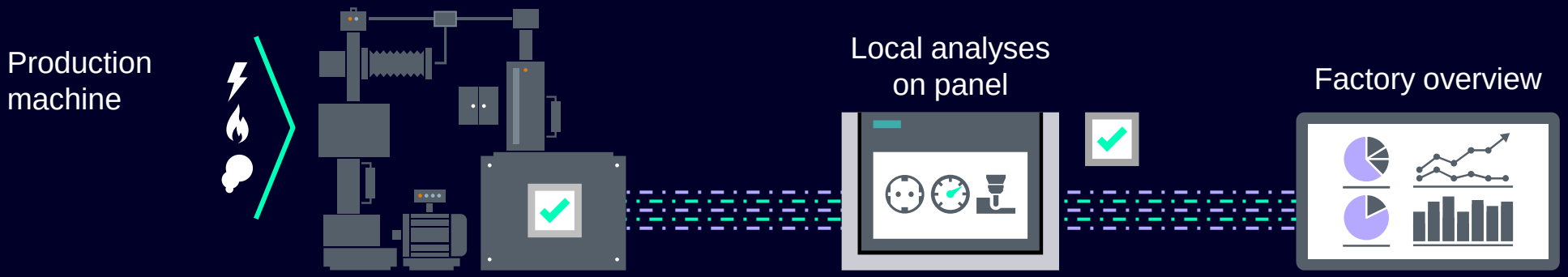
Machine efficiency
Extended machine analysis with Energy Manager PRO

1. Energy Efficiency-Monitor on PLC

- Automatic generation of the machine efficiency data
- **Configuration** of the Energy Manager PRO **connection data** in the visualization
- **Driver** for the automatic **communication** between the EEM and EnM PRO integrated in generated code (since Energy Suite V19 Update 2)

2. Energy Manager PRO

- **Most simple connection of machines**
- **Efficient configuration**
  - Generating of instances from machines by using templates
- **Continuous efficiency monitoring**
  - Dashboard
  - Reports (cost center)
- **Direct communication to the S7-PLC**



Machine builder: **Local evaluation**

Machine operator: **Central Evaluation**

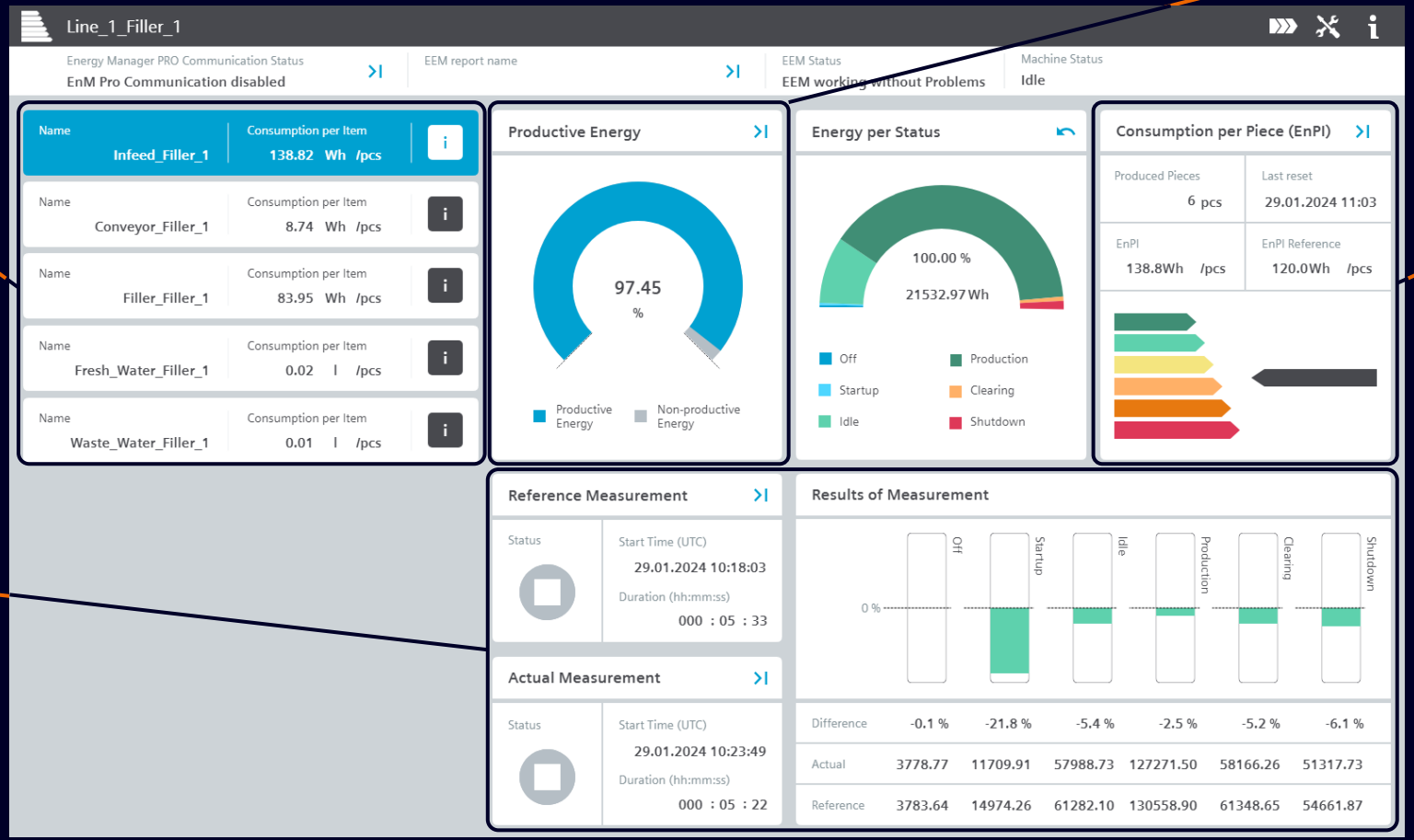
Machine efficiency
Visualization of the EE-M in WinCC Unified

Widget for productivity of the machine

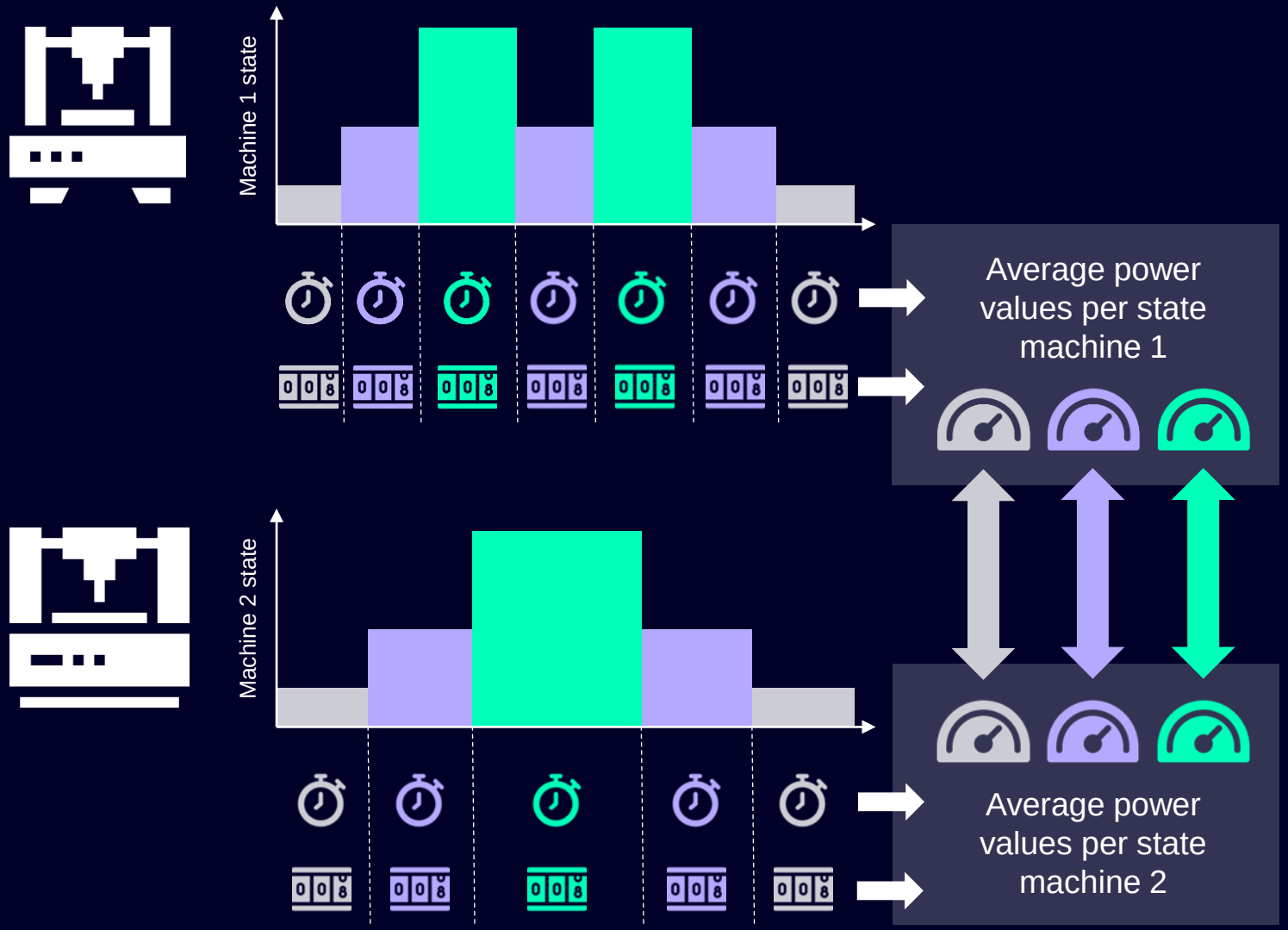
List of available measurement points in the machine

Widget for the efficiency of the production

Widget for actual and reference measurement for evaluation of efficiency measures



Machine efficiency
UC for the EE-M – State-based energy data calculation

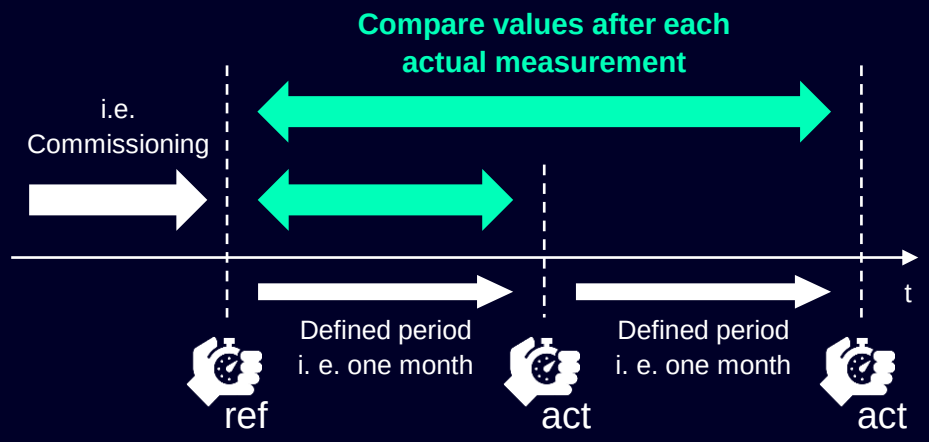


Use cases for the EE-M – State-based energy data calculation

- One single energy counter for every machine state (per measurement point)
- Time measurement for duration of every machine state
- Calculation of the average power per machine state

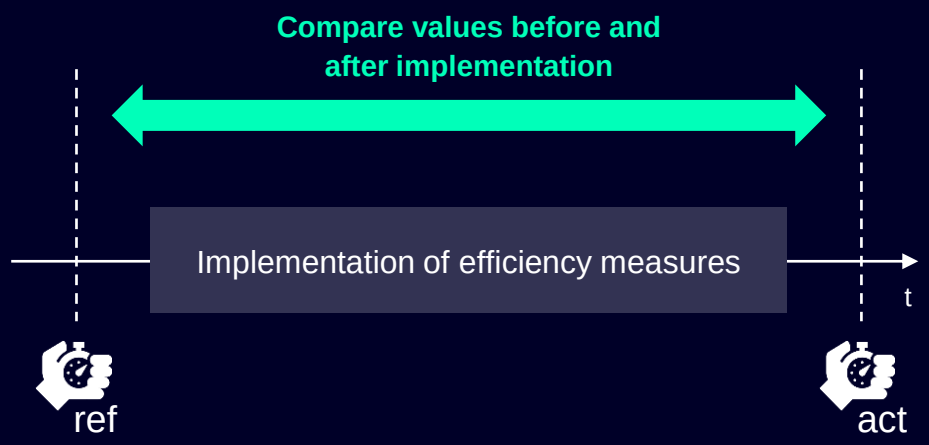
➔ Base for manufacturer-independent machine analysis (requirement: unified states for all machines)

Machine efficiency
UC for the EE-M – Evaluation of efficiency measures



Use case for **„continuous analysis“**

Statement about the efficiency development



Use case “evaluation of efficiency measures”

Evaluation about effect of efficiency development

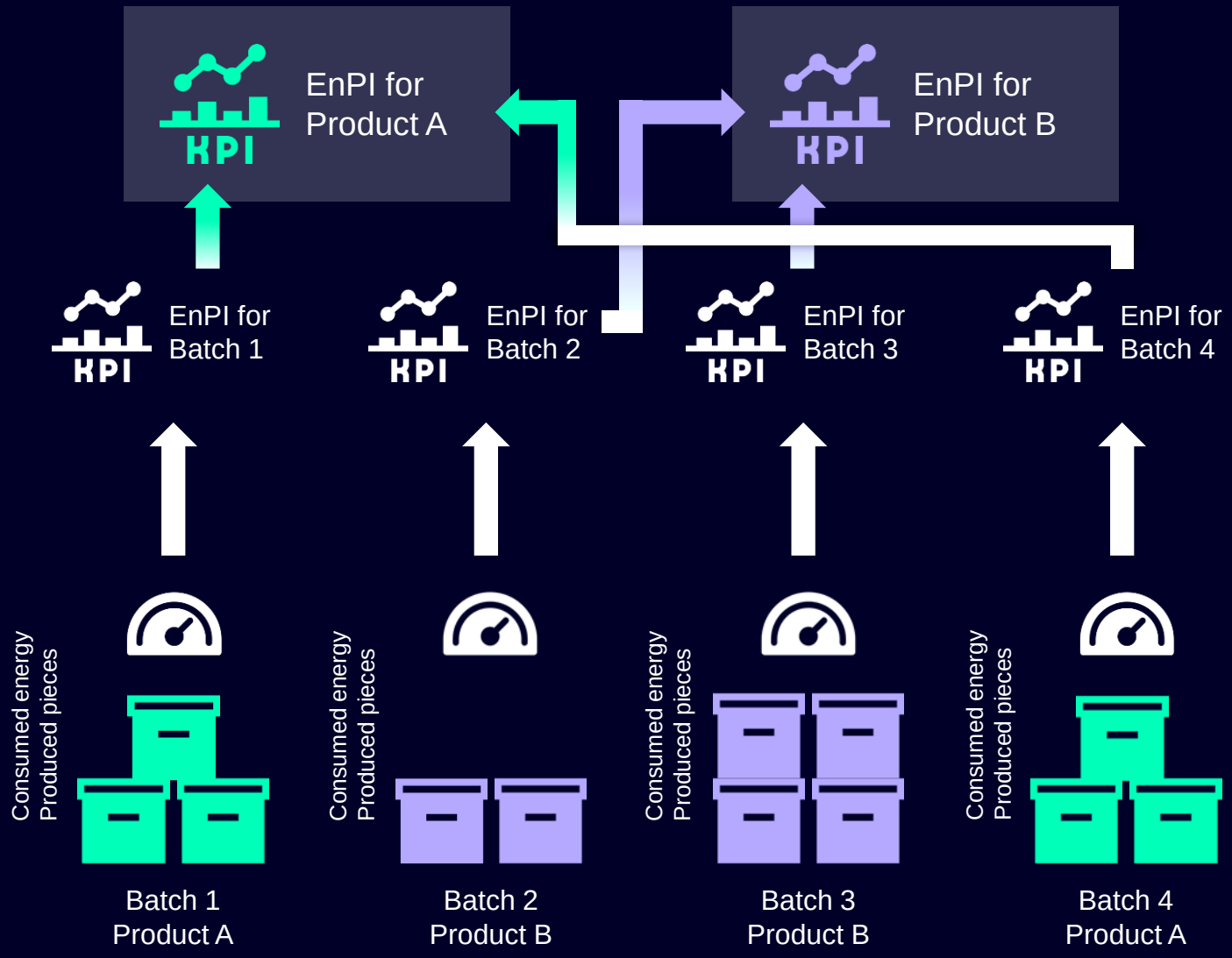
Optima
www.optimacs.com

Use cases for the EE-M – Evaluation of efficiency measures

- Two possible recoding types: **Actual** and **reference** measurement
- UC for **continuous efficiency analysis**
  - A **reference** measurement serves as **fix comparative** value at a defined time, e. g. after the commissioning
  - The **actual** measurement can be used as **continuous analysis** for the progress of efficiency by measuring and analyzing in regular periods
- UC for the **evaluation of efficiency measures**
  - Efficiency measures can be evaluated by **measuring before** and **after** their **implementation**
  - Protocol can be generated for results of reference and actual measurement

SIEMENS

Machine efficiency
UC for the EE-M – Calculation of EnPI



Optima
www.optimacs.com

Use cases for the EE-M – Calculation of EnPI

- Formula for EnPI calculation

$$\frac{Consumed\ energy}{Produced\ pieces}$$

- Machine states, which will be taken into consideration regarding the consumed energy, can be manually selected
- Information about production efficiency of the machine
- Basic data for future calculation of product-related or batch-related carbon footprint
- Visualization of the values in already known „energy efficiency“ form

SIEMENS

Machine transparency
Benefits and Values

Resource tracking

Get full transparency over the media consumption per status and per produced piece

Establish comparability

- Track the performance of a machine over time
- Monitor the effectiveness of efficiency measures
- Compare similar machines from different vendors

Reduction of waste

Media consumption during non-value adding times is shown

Identify potential for efficiency measures

- If media consumption is increasing over time this could be an indicator e.g., for tool wear
- The amortization period for e.g., a new motor can be calculated exactly based on the EEM data

SIMATIC
Energy Manager

SIMATIC
Energy Manager – Sales Slide

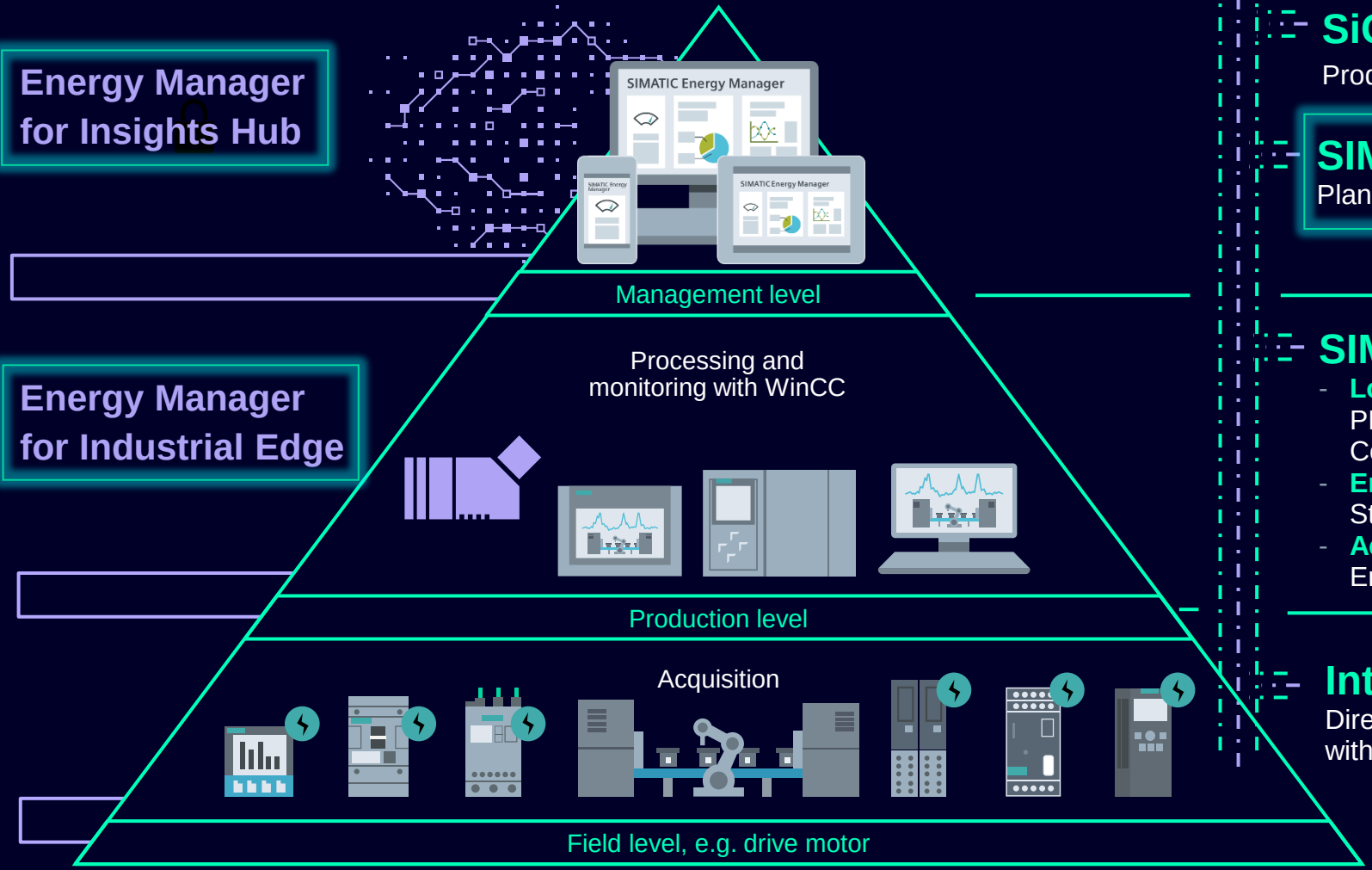
SIMATIC Energy Management

Transparency and efficiency from machine to company level

Optima
www.optimacs.com

Energy Manager for Insights Hub

Energy Manager for Industrial Edge



SiGREEN

Product Carbon Footprint

SIMATIC Energy Manager

Plant and company-wide energy analysis

SIMATIC Energy Suite

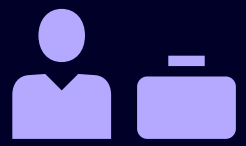
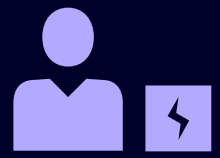
- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency Monitor**
  Standardized efficiency evaluation of machines
- **Acquisition**
  Energy data acquisition

Integrated energy measurement

Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

SIEMENS

We understand that each stakeholder has unique challenges

	CXO – Business	Sustainability Mgr.	Energy Manager	Operators
				
Focus	Company growth, ROI, reputation, sustainability	Sustainability goals, energy strategy, energy milestones	Energy efficiency solutions, operation of energy systems	Transparency, low costs, flexibility, easy maintenance

There are numerous requirements for company-wide energy analysis

1 | Fulfill legal requirements efficiently

... by means of TÜV-tested energy management system in accordance with ISO 50001

2 | Secure competitive advantages & meet sustainability targets

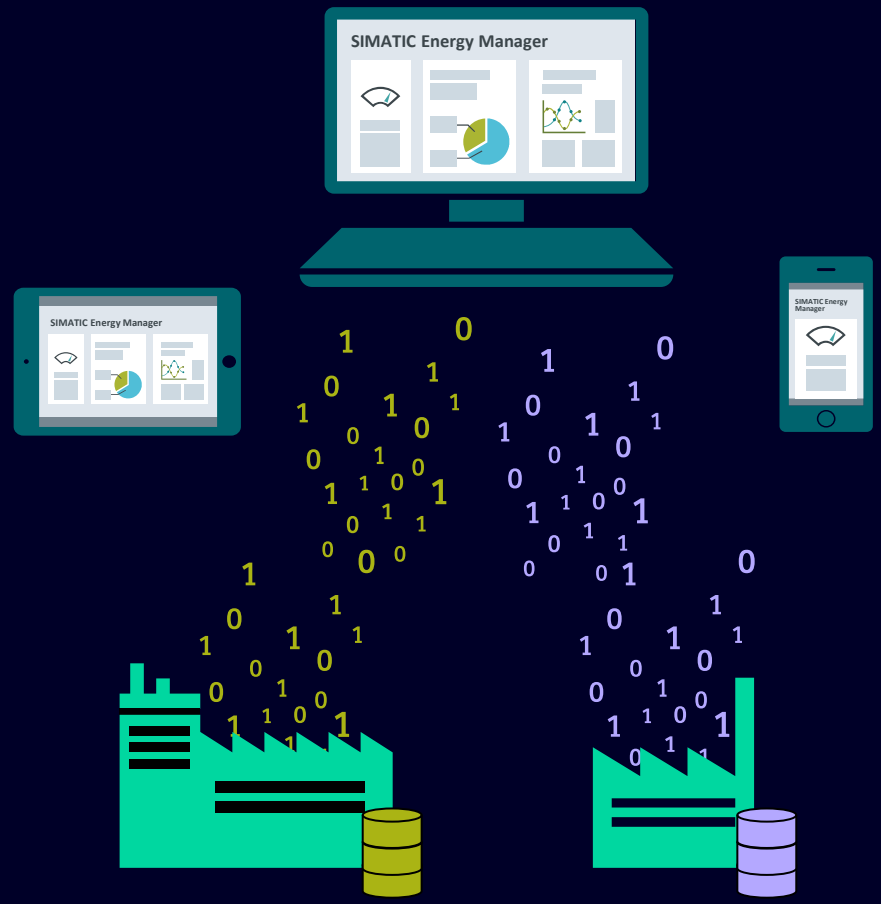
... by means of the sustainable use of energy and resources with reduced CO_2 emissions

3 | Exploit results and potential

… by utilizing transparency to identify and implement potential for optimization and to track the resulting measures

4 | Exploit changes in the energy price

… by optimizing purchasing through reliable energy forecasts



Focus on the “environment” requirement in the Corporate Sustainability Reporting Directive (CSRD) and significance for energy management

Environment… is one of the three pillars addressed by the CSRD.

- ESRS E1-E5 Environment
- ESRS G1 Governance
- ESRS S1-S4 Social

Climate change

Environmental pollution

Water & Ocean

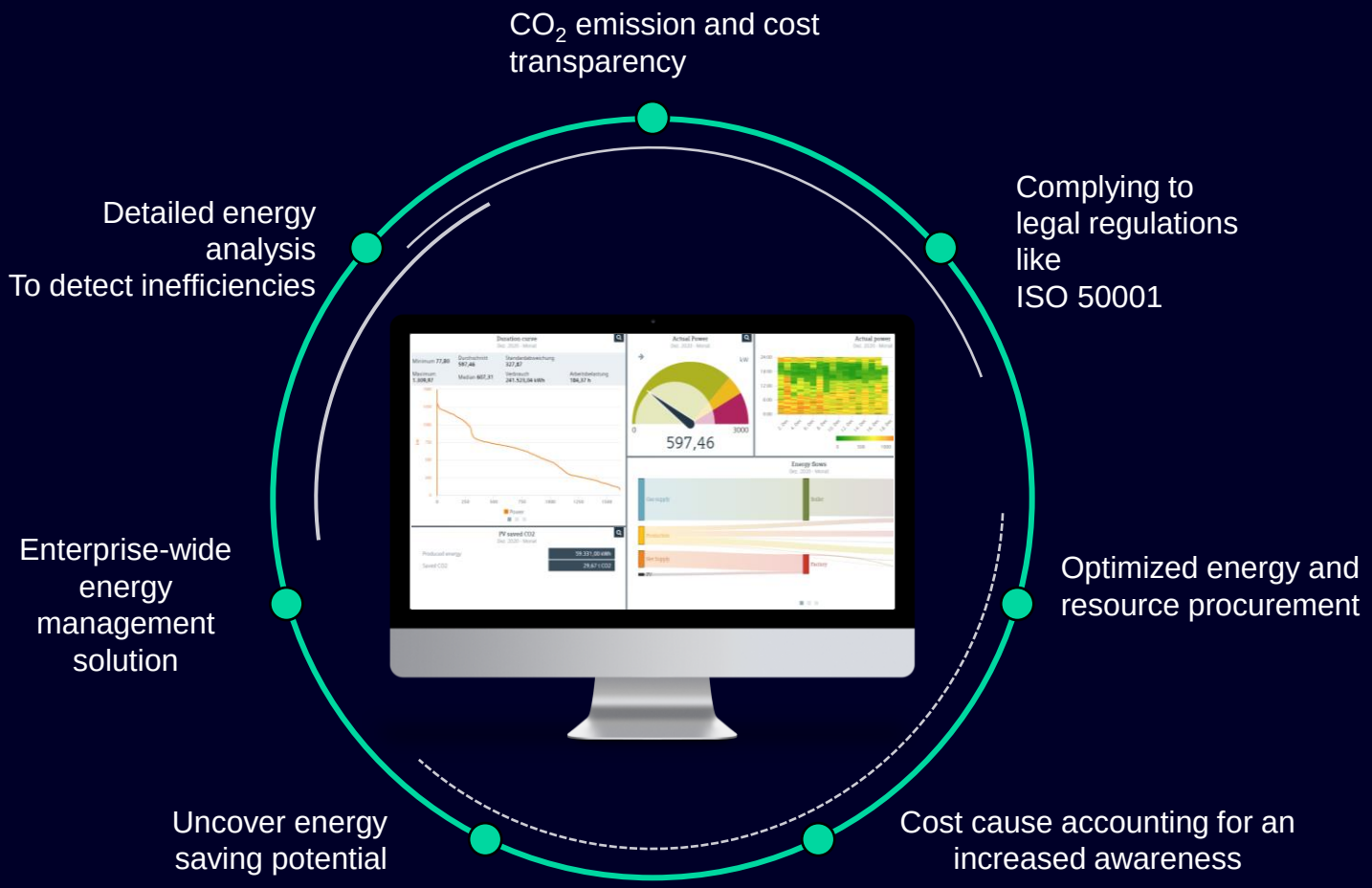
Biodiversity & Ecosystem

Resources & Circular economy

Our Energy Management portfolio can make a significant contribution like

- Key Performance Indicators (KPIs),
- Transparent consumption determination
- Digitalization of the value chain, the product life cycle, circular economy

SIMATIC Energy Manager
Obtain the greatest value from transparency



Transform data to information for quick decision-making

What are the challenges?

- Providing a holistic view about the energy and resource consumption
- Comprehensive analysis functions to investigate and improve of energy efficiency
- Transparency of energy costs and CO2 emission from different plants worldwide
- Comply to legal obligations like ISO 50001,..
- Take care about data quality and create a reliable system
- Optimize Energy Procurement and reduce costs for energy

SIMATIC Energy Manager options for different applications

Energy Manager for company-wide energy analysis

Easy access – „Energy Manager Basic“

Web engineering

- Configuration with the Web Client
- Easy Dashboard- and report configuration
- Interfaces like OPC, Energy Suite, WinCC, Modbus/TCP
- Easy user management
- Available languages are DE, EN, IT, FR, ES, CN
- Upgrade possibility to EnMPRO with License key
- Installation of all software components on one PC

Customer benefit

- Easy and fast entry to energy data management
- Intuitive Web engineering
- Scalable solution thanks to easy upgrade to the Energy Manager PRO

For typical standard applications

Upgrade possible at any time

Energy Manager PRO

Web engineering + Full Client configuration for advanced topics

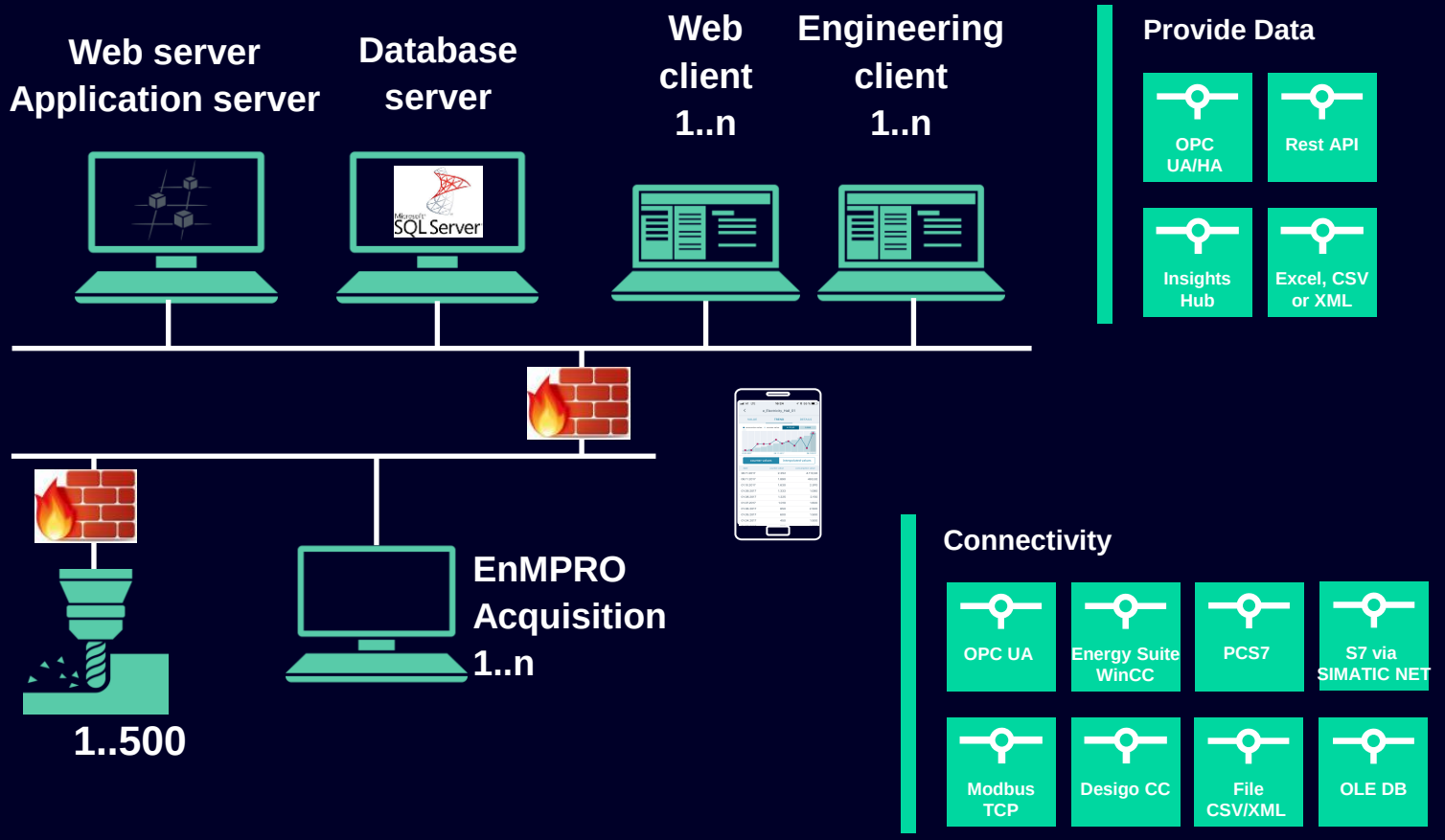
- Full client configuration (total functional scope)
- advanced reporting with global template
- Batch and material analysis, Forecasting possibilities
- EE Monitor interface including template and instance concept
- Energy efficiency measures
- Additional Interfaces: OLE DB, S7, S7-EE Monitor
- Additional data acquisitions (further locations)

Customer benefit

- Individually adaptable energy management system
- Baseline management
- Cross-disciplinary machine analysis/ calculation of key performance indicators
- Benchmark of machines

Detailed analyses worldwide and over different sites

SIMATIC Energy Manager
Scalable architecture



The right architecture for the customers need!

Flexible architecture combined with openness!

- Scalable architecture with up to 30.000 tags
- Distributed Acquisition components (multi sites support)
- Support Virtualization (ESXi, Azure, AWS)
- Connectivity (WinCC, PCS7, DesigoCC, Modbus TCP, OLE DB, CSV/XML,
- Provide data via OPC UA Server or Rest API
- Manual data collection using the mobile app or enter the data directly into energy manager

SIMATIC Energy Manager V2.0
IOS and Android App for a mobile data acquisition

Functions

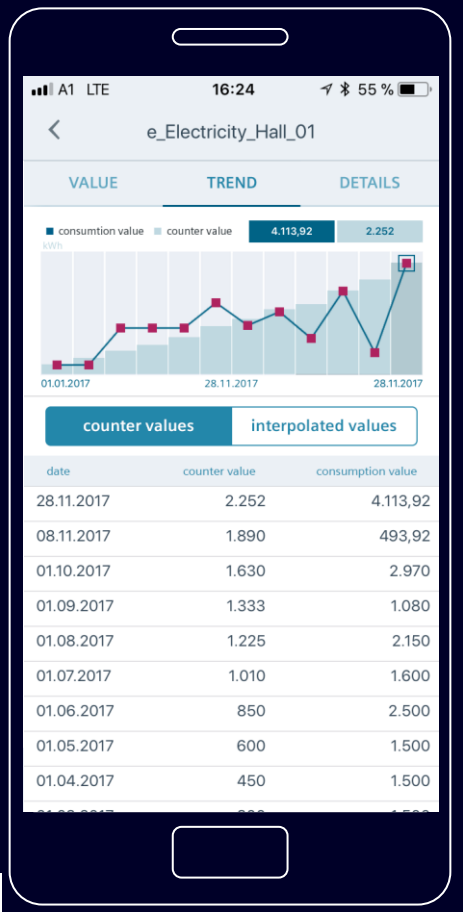
- **Synchronization** of the route and the corresponding data point configuration as well as the plausibility settings
- Counter identification with scanning of the **QR- or Barcode**
- **Plausibility review** during the data entry
- Translation of the counter value into a consumption value
- Value correction of the different acquisition cycles (28., 3., 5. of the month)
- **Graphical trend representation** of the last 12 acquired as well as interpolated values
- **Offline mode** – data acquisition possibility
- Support of **encrypted communication** (https)

Customer benefit

- Full transparency of the energy consumption
- Increase of data quality through plausibility review and counter identification
- Easy and intuitive handling

Apple App-Store:

Google Play-Store:



GAS-HALL-01

SIMATIC Energy Management
Distributed Data Architecture for additional locations + Cloud

EnMPRO Mobile APP

EnMPRO Full Client

- Existing Office-PC
- Windows 10,11
- MS Office 365
- MS Internet Explorer 11, Edge, Chrome, Safari, Firefox

EnMPRO WEB Clients

- Existing Office-PC
- Windows 10,11
- MS Office 365
- MS Internet Explorer 11, Edge, Chrome, Safari, Firefox

EnMPRO Server

- EnMPRO Server
- MS WIN Server 2022, IIS
- MS Office 365
- SQL Server 2017 Standard Edition in EnMPRO included

MindConnect-Lib

IH Apps

Insights Hub

Ethernet (TCP/IP)

WAN/LAN

Corporate-LAN

Site A

Data Aquisition
NanoBox IPC227E

EnMPRO (Aquisitioncomponent)

Router/Firewall

Router/Firewall

Site B

Ethernet (TCP/IP)

Process – LAN

Sentron PAC 4200
MODBUS TCP

Sentron
PAC 3210/1600
MODBUS RTU

3

Gas

Electrical Energy

PAC 1500 (MID)

Data Aquisition
PLC S71510SP-1PN
AI Energy Meter, DI
Simatic ET 200 SP

Gas
Compressed air
Cold water
Hot water

3
3
3
3

Electrical Energy

Production data server (OPC UA)

SCADA

EnMPRO
(Aquisition-object)

License overview – Energy Manager
Basic licenses and Tag Packages

SIMATIC Energy Manager **V7.5**	MLFB for Download	MLFB	Download-Price
SIMATIC Energy Manager Basic (incl. 50 Tags) [1)]	6AV6372-1DF07-5AH0	6AV6372-1DF07-5AX0	3 244,0 €
SIMATIC Energy Manager PRO (incl.50 Tags) [1)]	6AV6372-2DF07-5AH0	6AV6372-2DF07-5AX0	6 487,0 €
SIMATIC Energy Manager Powerpack Basic -> PRO	6AV6372-2DF00-0AH3		3 244,0 €
SIMATIC Energy Manager Tag Packages	**MLFB for Download**	**MLFB**	**Download-Price**
SIMATIC Energy Manager Tag Package 50 [2)]	6AV6372-2DF07-0CH0	6AV6372-2DF07-0CX0	4 325,0 €
SIMATIC Energy Manager PRO Tag Package 100 [2)]	6AV6372-2DF07-0DH0	6AV6372-2DF07-0DX0	7 568,0 €
SIMATIC Energy Manager PRO Tag Package 250 [2)]	6AV6372-2DF07-0EH0	6AV6372-2DF07-0EX0	10 812,0 €
SIMATIC Energy Manager PRO Tag Package 500 [2)]	6AV6372-2DF07-0FH0	6AV6372-2DF07-0FX0	15 137,0 €
SIMATIC Energy Manager PRO Tag Package 1000 [2)]	6AV6372-2DF07-0GH0	6AV6372-2DF07-0GX0	25 949,0 €
SIMATIC Energy Manager PRO Tag Package 5000 [2)]	6AV6372-2DF07-0HH0	6AV6372-2DF07-0HX0	30 274,0 €
SIMATIC Energy Manager PRO Tag Package 30000 [2)]	6AV6372-2DF07-0JH0	6AV6372-2DF07-0JX0	36 761,0 €

Note

1. Included components: 1 Acquisition, 1 Client, 1 Web-Client, Mobile Data acquisition; embedded database: Microsoft SQL Server 2022 Standard Edition embedded
2. With the tag packages the number of tags can be extended dynamically. The total number of tags is extended by the number of tags in the tag package

License overview – Energy Manager
Extension- and SUS licenses

Extensions	MLFB for Download	MLFB	Download-Price
SIMATIC Energy Manager 3 Web Clients 1)	6AV6372-2DF27-0AH0	6AV6372-2DF27-0AX0	2 162,0 €
SIMATIC Energy Manager 20 Web Clients 1)	6AV6372-2DF27-0BH0	6AV6372-2DF27-0BX0	8 109,0 €
SIMATIC Energy Manager 60 Web Clients 1)	6AV6372-2DF27-0CH0	6AV6372-2DF27-0CX0	16 218,0 €
SIMATIC Energy Manager PRO Client 1	6AV6372-2DF37-0AH0	6AV6372-2DF37-0AX0	1 406,0 €
SIMATIC Energy Manager PRO Planning & Prognosis 3)	6AV6372-2DF47-0AH0	6AV6372-2DF47-0AX0	6 487,0 €
SIMATIC Energy Manager PRO Acquisition component 2)	6AV6372-2DF57-0AH0	6AV6372-2DF57-0AX0	2 162,0 €
SUS up to 50 Tags and/or 1 Consumer Package	6AV6372-2DF00-0CY0	6AV6372-2DF00-0CL0	1 297,0 €
SUS up to 100 Tags and/or 5 Consumer Package	6AV6372-2DF00-0DY0	6AV6372-2DF00-0DL0	1 946,0 €
SUS up 500 Tags and/or 25 Consumer Package	6AV6372-2DF00-0FY0	6AV6372-2DF00-0FL0	3 892,0 €
SUS up to 5000 Tags and/or 100 Consumer Package	6AV6372-2DF00-0HY0	6AV6372-2DF00-0HL0	6 487,0 €
SUS > 5000 Tags and/or more than 100 Consumer Packages	6AV6372-2DF70-0XY0	6AV6372-2DF70-0XL0	8 650,0 €

Note

In general, licenses are placed on the EnMPRO Application-Server with the Automation License Manager (ALM).

1. All Full Client as well as Web Client licenses are Floating licenses. The number of clients can be increases in the same way like the Tag Packages
2. Additional Acquisition components for further data acquisition (always related to PC hardware)
3. Is JUST needed to use the production plan manager (prediction based on a production plan)

Energy Manager
Licensing

Upgrade Lizenz

Energy Manager Basic -> Energy Manager PRO

Energy Manager Basic

- Tag Packages
- Web Client
- SUS

Energy Manager PRO

- Tag Packages
- Web Client
- SUS
- Further options

Tag Package and Web Client can be used for both products

SUS can be used for both products. The 50 tags from the start package are included

Option: further components

1. Energy Manager PRO Client
2. Energy Manager PRO Acquisition
3. Energy Manager PRO Prognosis & Planning

Option: Consumer licenses

4. Energy Manager PRO Consumer Package 1 (excl. EE Monitor)
5. Energy Manager PRO Consumer Package 5 (excl. EE Monitor)
6. Energy Manager PRO Consumer Package 25 (excl. EE Monitor)
7. Energy Manager PRO Consumer Package 1 (incl. EE Monitor)
8. Energy Manager PRO Consumer Package 5 (incl. EE Monitor)
9. Energy Manager PRO Consumer Package 25 (incl. EE Monitor)

Energy Manager PRO 7.5
S7 EE-Monitor // EE@Transline

The OEM is the motivator

Variant 1

Only EE-Monitor

EE-Monitor license **216,- €**

Each Machine

Variant 2

Optional: Extension to EnMPRO

EnMPRO Server (Start Package) **6.487,- €**

EnMPRO Consumer (TIA) license excl. S7 EE-Monitor **270,- €**

Tag Packages

SUS

Options

Service

Each machine

The end customer is the motivator

Variant 3

Consumer + S7 EE-Monitor

EnMPRO Server (Start Package) **6.487,- €**

EnMPRO Consumer license Incl. S7 EE-Monitor **432,- €**

Tag Packages

SUS

Options

Service

Each machine

Energy Manager PRO 7.5
Included tags at Consumer License

	Consumer incl. EE-Monitor	Consumer excl. EE-Monitor
EE-Monitor / EE@Transline	COL can be used to unlock the S7 EE monitor on the PLC	
	up to 72 tags included	up to 72 tags included
	Type instance concept can be used directly via the interface wizard (machine)	Type instance concept can be used directly via the interface wizard (machine)
Type – Instance Without S7-PLC blocks	up to 15 tags included UC 1: 5 tags per machine - No additional tags needed UC 2: 25 tags per machine. 10 tags are deducted from the tag packages	up to 15 tags included UC 1: 5 tags per machine - No additional tags needed UC 2: 25 tags per machine. 10 tags are deducted from the tag packages

Licenses (1 Consumer is included)

0	EnMPRO has incl. 1 License	€ 0 ,-
1	Consumer incl. S7 EE-Monitor	€ 432 ,-
2	Consumer excl. S7 EE-Monitor	€ 270,-

License overview – Energy Manager
Consumer und Upgrade licenses

Consumer instance for Energy Manager	MLFB for Download	MLFB	Download-Price
Consumer Package 1 incl. EE Monitor 1)	6AV6372-2DF67-1AH0	6AV6372-2DF67-1AX0	432,0 €
Consumer Package 5 incl. EE Monitor 1)	6AV6372-2DF67-1BH0	6AV6372-2DF67-1BX0	2 162,0 €
Consumer Package 25 incl. EE Monitor 1)	6AV6372-2DF67-1CH0	6AV6372-2DF67-1CX0	10 812,0 €
Consumer Package 1 excl. EE Monitor 1)	6AV6372-2DF77-1AH0	6AV6372-2DF77-1AX0	270,0 €
Consumer Package 5 excl. EE Monitor 1)	6AV6372-2DF77-1BH0	6AV6372-2DF77-1BX0	1 352,0 €
Consumer Package 25 excl. EE Monitor 1)	6AV6372-2DF77-1CH0	6AV6372-2DF77-1CX0	6 758,0 €
Upgrade licenses from V7.4 -> V7.5	**MLFB for Download**	**MLFB**	**Download-Price**
Upgrade of systems with up to 50 Tags and/or 1 Consumer Package	6AV6372-2DF07-5CH4	6AV6372-2DF07-5CX4	2 595,0 €
Upgrade of systems with up to 100 Tags and/or 5 Consumer Package	6AV6372-2DF07-5DH4	6AV6372-2DF07-5DX4	3 784,0 €
Upgrade of systems with up to 500 Tags and/or 25 Consumer Package	6AV6372-2DF07-5FH4	6AV6372-2DF07-5FX4	7 568,0 €
Upgrade of systems with up to 5000 Tags and/or 100 Consumer Package	6AV6372-2DF07-5HH4	6AV6372-2DF07-5HX4	12 974,0 €
Upgrade of systems with more than 5000 Tags and/or more than 100 Consumer Packages	6AV6372-2DF77-5XH4	6AV6372-2DF77-5XX4	17 299,0 €

Note

In general, licenses are placed on the EnMPRO Application-Server with the Automation License Manager (ALM).

1. With the consumer licenses the machine instance functionality is available. With the Consumer Package licenses the number of consumers can be dynamically increased in the same way like the Tag Packages
2. All upgrade packages cover additional the 50 tags of the basic package (e.g. “Upgrade up to 100 Tags” covers 150 license tags)

SIMATIC Energy Manager
Advantages at a glance

Legal Obligations

It fulfills the legal obligations for monitoring of and reporting on greenhouse gas emissions (CO2 emissions) through automatic power reporting.

Comply to ISO 50001

Supports customers in continuously improving energy efficiency through integrated energy efficiency measures management.

Transparency

It creates enterprise-wide transparency, thanks to continuous energy & resource balancing.

Decision making

Makes well-founded statements about increasing energy efficiency based on key figures.

Planning reliability

Provides planning reliability thanks to production-related forecasts.

Energy purchasing

Supports the purchasing department in the optimization of the energy procurement.

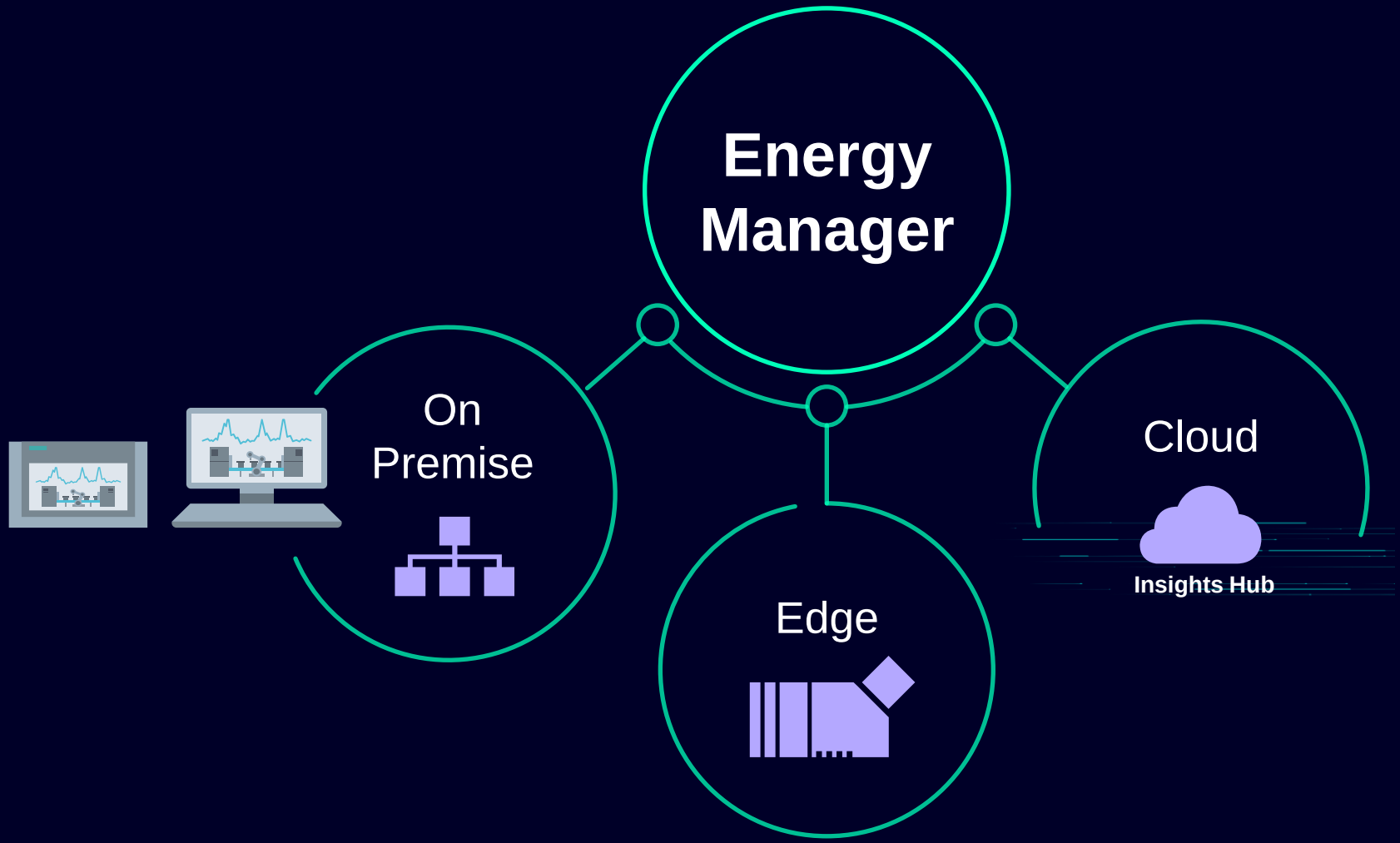
Cost Cause Accounting

Enables cost-by-cause energy cost allocation and facilitates connection to the accounting system. (e.g. SAP R/3).

SIMATIC
Energy Manager – Tech Slide

SIEMENS

SIMATIC Energy Manager – Fit for all use cases

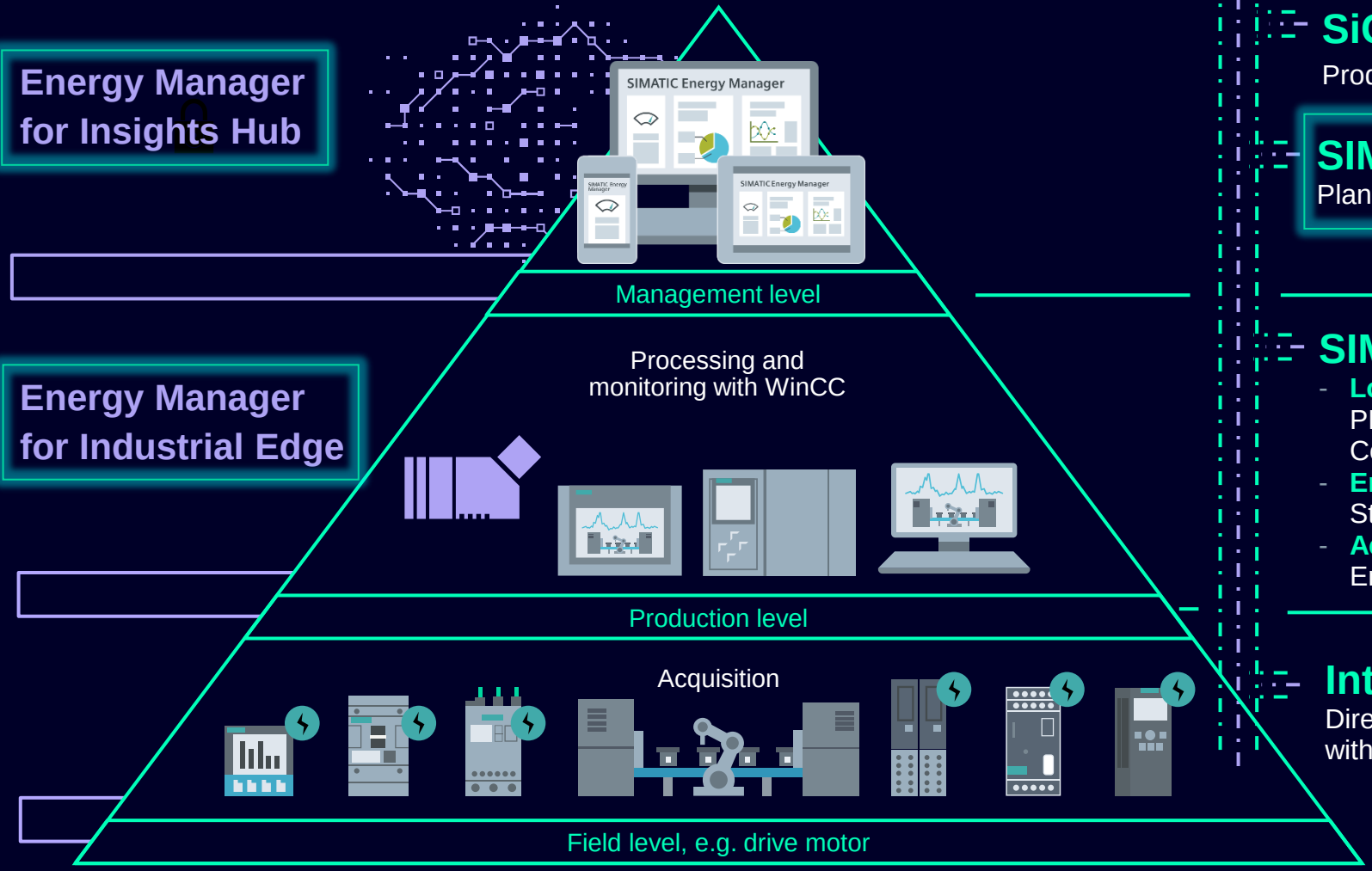


NEWS SIMATIC Energy Management

Transparency and efficiency from machine to company level

Energy Manager for Insights Hub

Energy Manager for Industrial Edge



SiGREEN

Product Carbon Footprint

SIMATIC Energy Manager

Plant and company-wide energy analysis

SIMATIC Energy Suite

- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency Monitor**
  Standardized efficiency evaluation of machines
- **Acquisition**
  Energy data acquisition

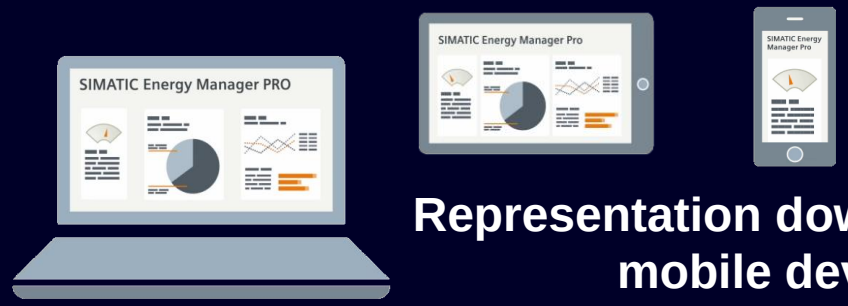
Integrated energy measurement

Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

SIMATIC Energy Manager
Data become information

How can I generate information from data?

- Flexible KPI/EnPI definition
- User-specific data preparation
- Integrated statistics functions
- Access to the "right" information with one click
- KPI definition using the drag-and-drop function and flexible representation (widget)



Representation down to mobile devices

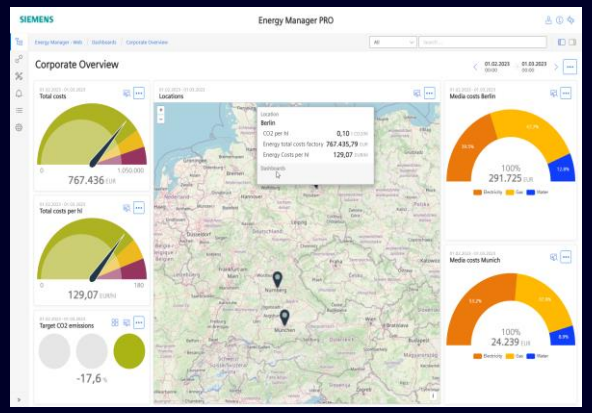
Representation of parameters

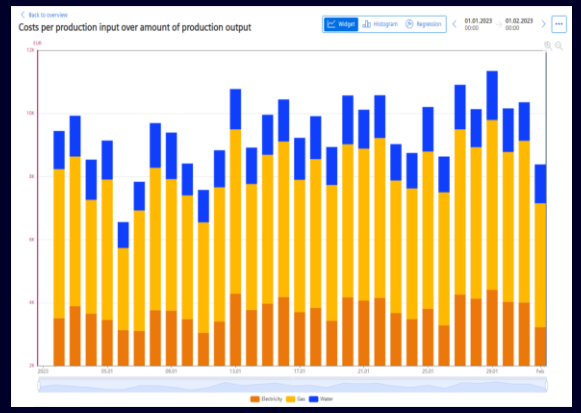
Display of the data for quick decision-making

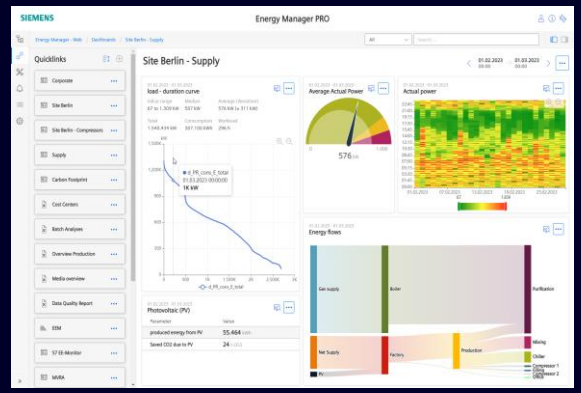
Optima
www.optimacs.com

Advantage of a simple Energy Monitoring?

- Cross-location evaluation down to the level of a single machine analysis
- Simple display and configuration in the web client with integrated analysis function
- Low engineering effort
- Make energy visible (main consumers, energy behaviour, standby consumption)







The first step establish basic transparency

SIEMENS

Why cost causer accounting!

- Change the behavior through cost assignment
- From simple to complex cost assignment models
- Automatic transfer of KPIs to the ERP level.
- Provision of Information through email or Web Client

SIEMENS

Kostenaufstellung

Period: 01.09.2011 01.10.2011
Author: BDATA_SYS Date: 1.26.2012 5:32:43 PM

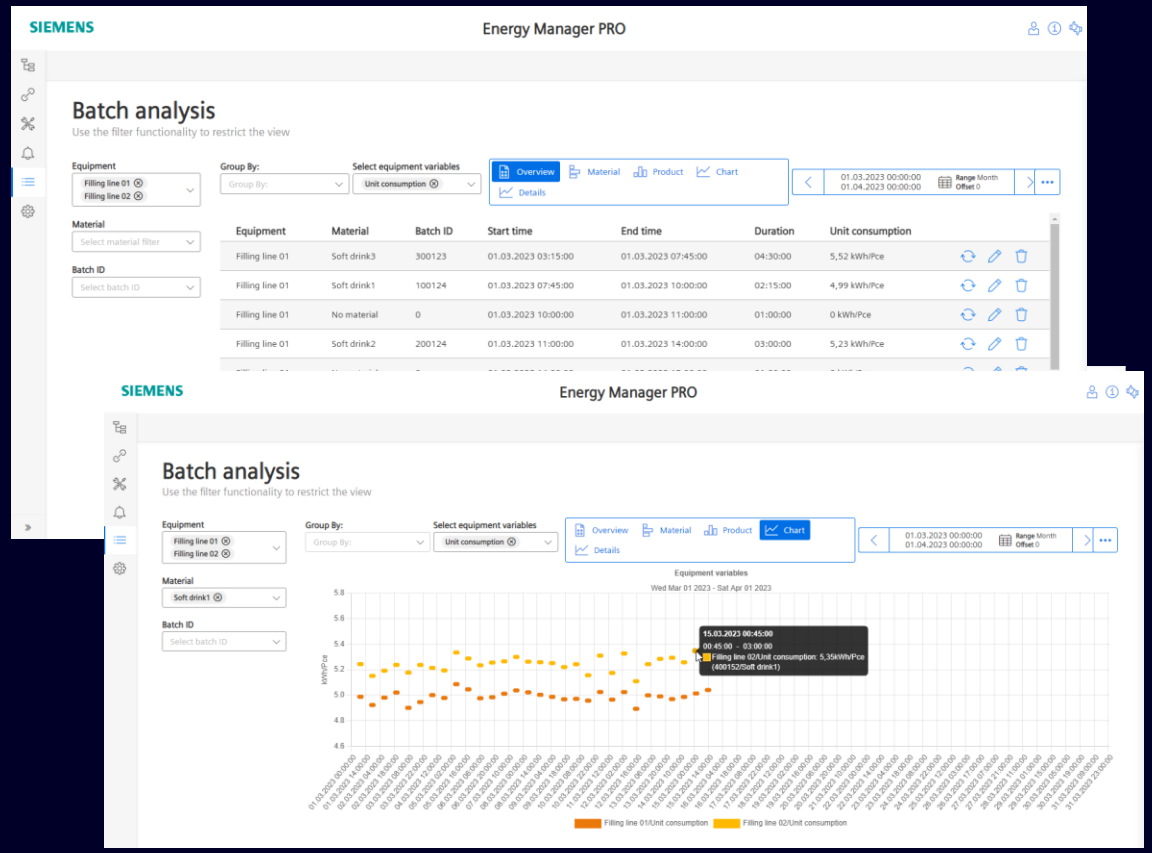
	BDATA_SYS		Gesamtkosten 70.829.424 €		Gesamtwerk						
	Medium	Energy Costs		Unit	Zellstoff-erzeugung	Stoff-aufbereitung	Papier Produktion	Finishing	Kraftwerk	Abwasser-aufbereitung	Rest
CC 100 % measured	Electrical Energy 81,13%	absolut	57.464.656	€	5.737.315	2.392.838	1.464.065	17.385.802	19.215.889	10.161.547	**1.107.199**
		percentage			10,0%	4,2%	2,5%	30,3%	33,4%	17,7%	1,9%
	Technical Heat 15,97%	absolut	11.311.006	€	621.873	160.079	3.196.412	4.305.899	2.193.153	48.688	**784.903**
		percentage			5,5%	1,4%	28,3%	38,1%	19,4%	0,4%	6,9%
	Room Heat 2,30%	absolut	1.630.400	€	1.061.127	11.576	308.657	85.811	62.658	5.065	**95.506**
		percentage			65,1%	0,7%	18,9%	5,3%	3,8%	0,3%	5,9%
	Natural Gas 0,02%	absolut	17.600	€	1.760	1.467	1.760	3.755	2.933	2.933	**2.992**
		percentage			10,0%	8,3%	10,0%	21,3%	16,7%	16,7%	17,0%
	Sum Rest I	absolut			338.402	59.718	238.872	597.180	557.368	199.060	1.990.599
	Staff Factor I	percentage			17%	3%	12%	30%	28%	10%	
CC < 100 % measured	Compressed Air 0,19%	absolut	131.940	€	397	26.438	39.681	19.345	19.841	19.841	**6.399**
		percentage			0,3%	20,0%	30,1%	14,7%	15,0%	15,0%	4,8%
	Portable Water 0,04%	absolut	28.917	€	53	1.285	3.909	9.639	12.852	129	**1.051**
		percentage			0,2%	4,4%	13,5%	33,3%	44,4%	0,4%	3,6%
	Waste Water 0,35%	absolut	244.906	€	2.675	2.666	210.461	7.786	11.542	7.594	**2.182**
		percentage			1,1%	1,1%	85,9%	3,2%	4,7%	3,1%	0,9%
	Sum Rest II	absolut			258.778	159.248	497.650	398.120	398.120	278.684	9.632
	Staff Factor II	percentage			13%	8%	25%	20%	20%	14%	
	Total Sum	**absolut**	**70.829.424**	**€**	**8.022.381**	**2.815.314**	**5.961.467**	**22.813.334**	**22.474.356**	**10.723.539**	
		percentage			12,44%	48,31%	16,22%	10,03%	3,91%	4,12%	

Cost transparency as fundament for optimization measures

Optima
www.optimacs.com

Data analysis on batch, product, or equipment level

- Data analysis based on equipment or materials
- Comparison of products produced by different lines
- Batch related energy balance across the production process
- Total energy balance and energetic differences between different products
- After product analysis, production plan-related forecast also possible



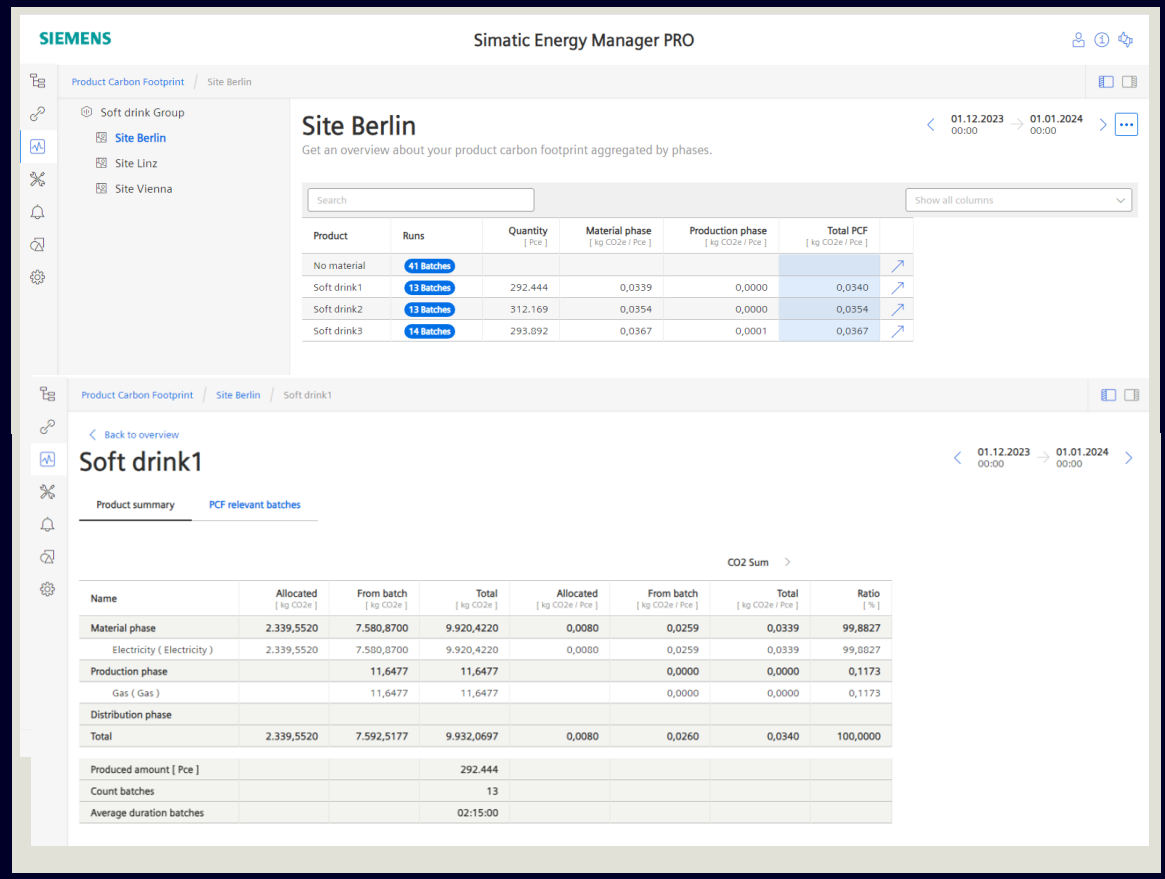
Energy consumption on product level allows CO2 food print calculations

SIEMENS

SIMATIC Energy Manager
CO2 cockpit – > product CO2 footprint

CO2 cockpit provides an overview of the products and per location

- PCF per product at site level with an indication of the average own CO2 emissions per production quantity.
- Drill down to each product with information such as CO2/unit p. activity and drill down to batch level
- Guided by assistants and in accordance with standards



How to get a CO2 emission calculation about the products of your production

SIMATIC Energy Manager
Baseline Management

Optima
www.optimacs.com

Get the baseline for your plant or equipment

- The baseline is the theoretical energy consumption considering the actual circumstances
- Verifying the deviation between baseline and actual consumption
- Cumulative sum of this deviation shows changes in the energy efficiency
- Baseline model can also be used for further energy forecasting

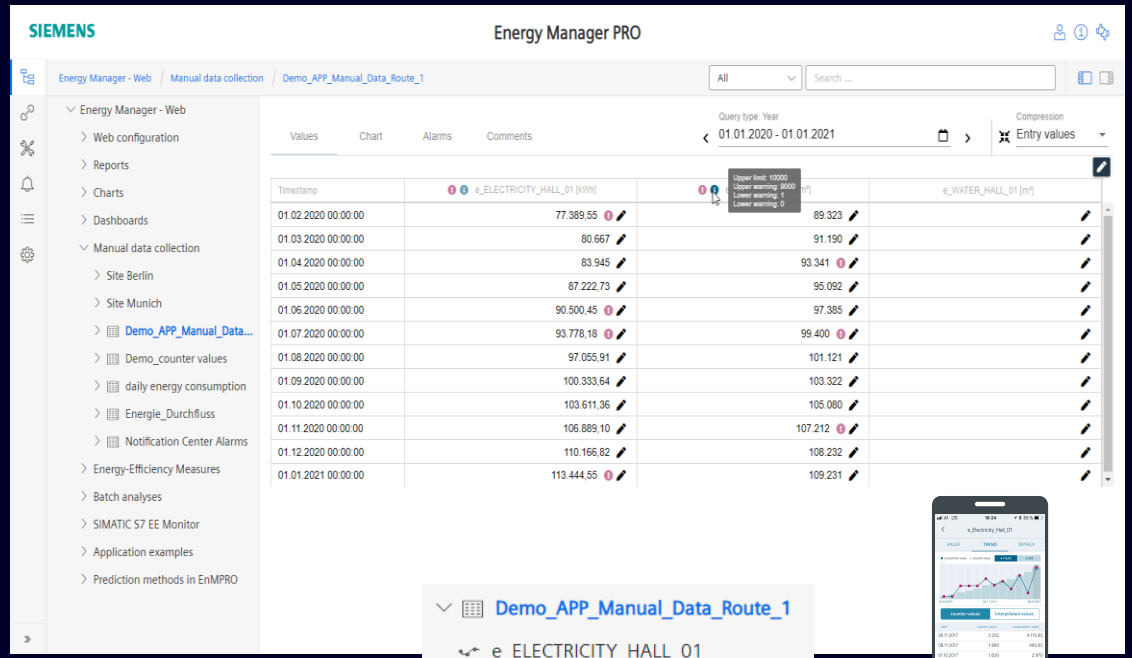
Based on the baseline you can immediately detect inefficiencies

SIEMENS

How data can be collected manually?

Not all data is available in an automatic way. Production figures or consumption data can also be entered manually

- Mobile Data Recording (Smart App)
- Matrix (Web, Full Client)
- Automatic data reading from MS Excel

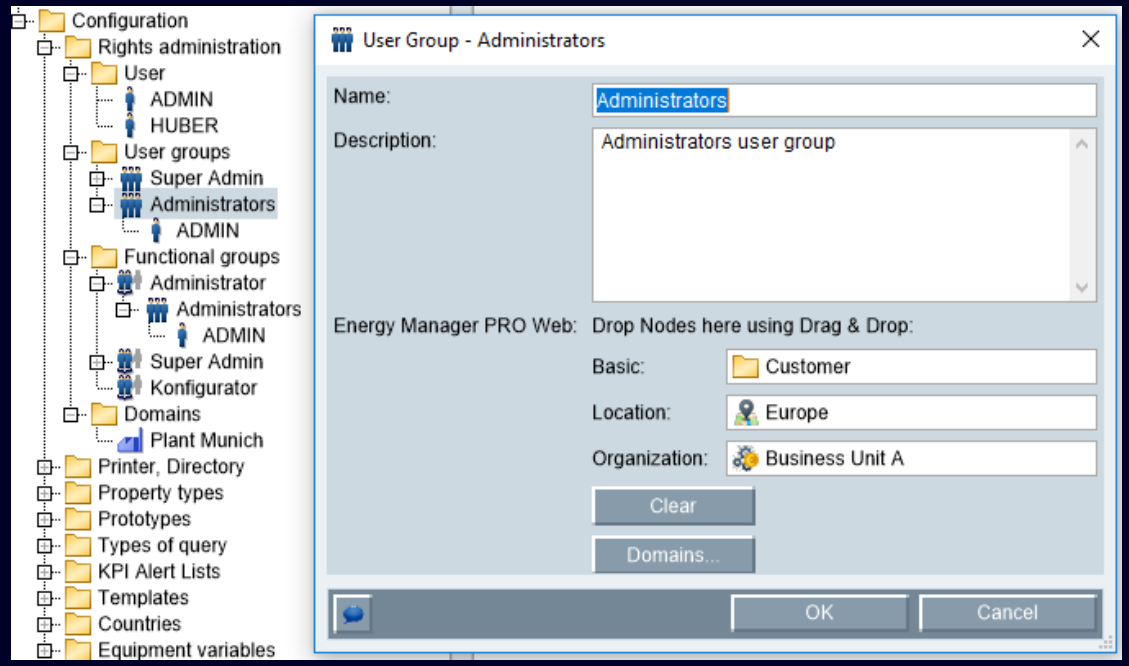


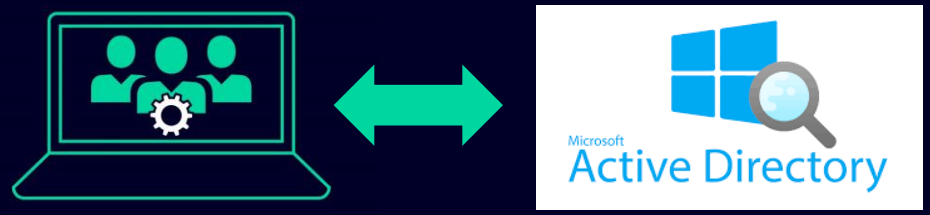
Energy Manager Smart APP

An automatic data recording is not mandatory

Comprehensive authority concept

- Restricting the view to the information –
  The user shall only see what is provided for him
- Restricting the functionality –
  The user shall only do what is provided for him
- User Management via
  Microsoft Active Directory



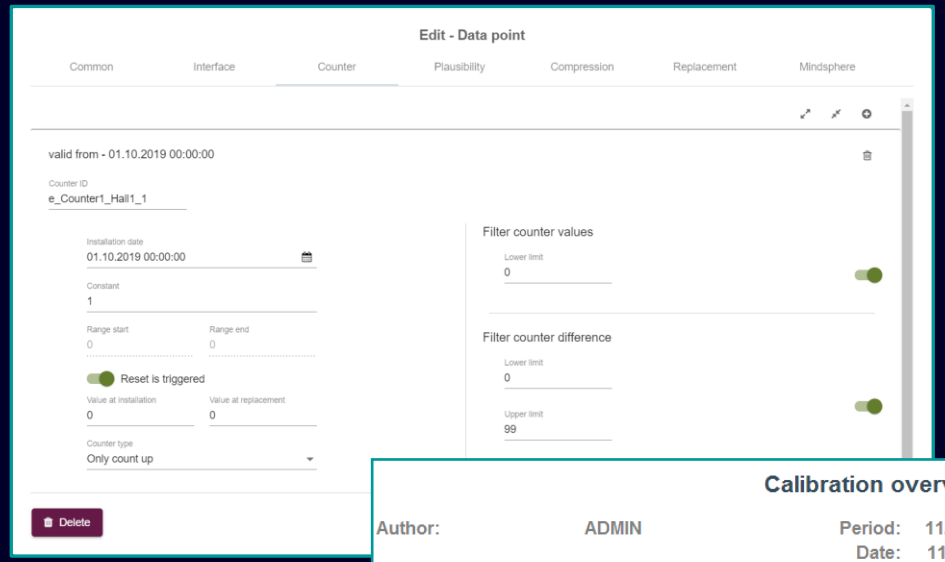


Different views to the system increase the system acceptance

Optima
www.optimacs.com

Integrated Counter Management

- Configuration and consideration of counter overflows, counter changes,…
- Automatic calculation of consumption and power from the counter value
- Report including the information when the next counter calibration shall take place



Calibration overview of devices

Author: ADMIN

Period: 11/1/2015 12/1/2015
Date: 11/4/2015 10:51:23 AM

Overview Calibration Date

	last calibration	next calibration	
d_counter1_electricity_hall1	10/13/2015	10/13/2018	No calibration necessary
d_counter2_electricity_hall2	10/13/2012	10/13/2015	Calibration necessary
d_counter3_electricity_supply	10/13/2012	10/13/2015	Calibration necessary
d_counter4_gas_hall1	10/13/2012	10/13/2015	Calibration necessary
d_counter5_gas_hall2	10/13/2012	10/13/2015	Calibration necessary

Increasing data quality via the integrated counter management

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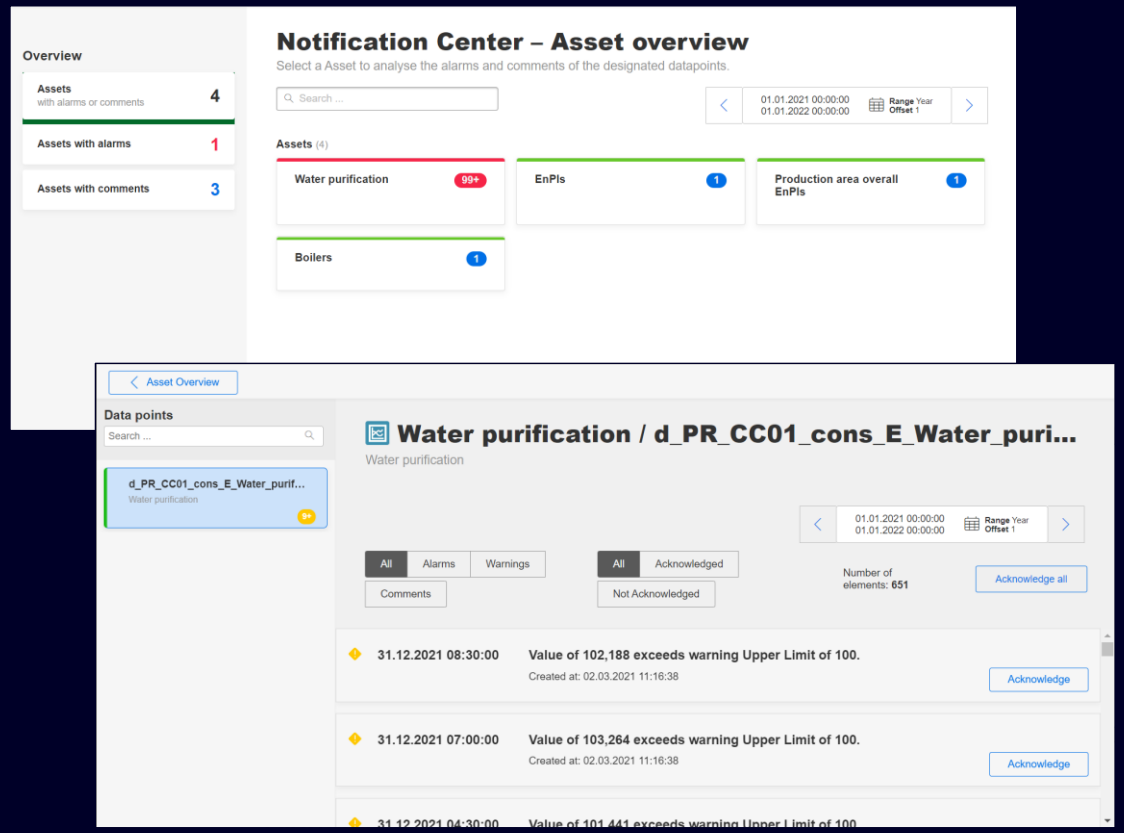
Data monitoring and alarming

- Definition of plausibility limits
- Notification center for total overview of all messages/maintenance comments
- Gap detection of collected data and monitoring of KPI/EnPI-Limits
- Alarming via E-Mail
- Data validation report shows data quality in the system



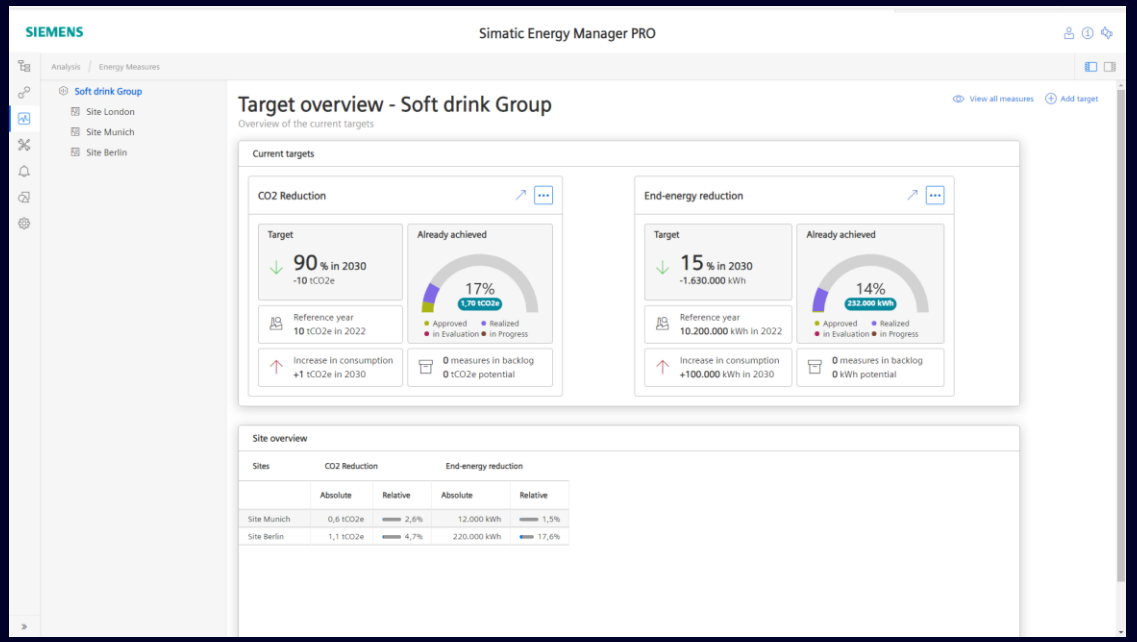
Quick reaction through early fault detection

SIEMENS

SIMATIC Energy Manager
Energy Efficiency Measure Management – Target Cockpit

Comply to ISO 50001 Measure Management

- ISO 50001 compliance
- Setting and pursuing goals (group and plant)
- Overview of all efficiency measures (Group and Work)
- Log the actual impact of the action
- Overview of the potentials for management

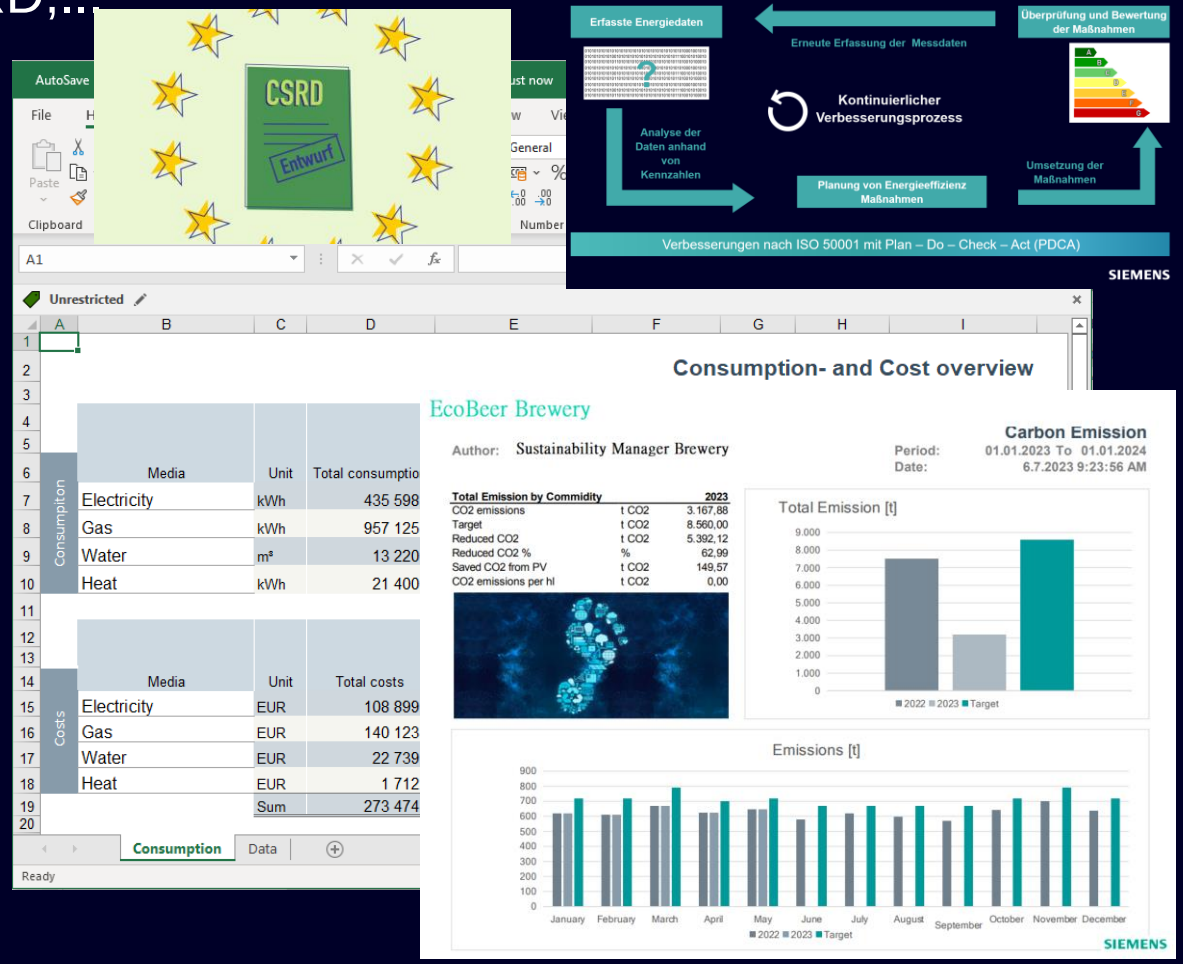


This will give you an answer as to where it is best to make the investment

SIMATIC Energy Manager
Group Energy Reports, Environmental Report, CSRD,...

Integrated reporting

- Clean documentation and verification requirements
- Preparation of important KPIs:
  - Energy consumption/production volume
  - Emissions/production volume
- Compliance with ISO 50001, ISO 14001 and the sustainability report (CSRD)
- The report is automatically generated in PDF/Excel format in the familiar corporate design and distributed to e.g. management, sustainability officers and production managers.

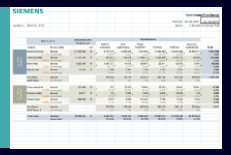


Automated reporting saves manpower and time

SIMATIC Energy Manager
Horizontal integration of the value chain

Optima
www.optimacs.com

Reporting



Data analysis with chart

Dashboard

Monitoring

Accounting

Controlling

Prognosis Purchase

EE-Measure Management (ISO 50001)

Supported Functionality

- Key Performance Indicators
- Counter management (overflow, change, ...)
- Alarming
- Replacement strategy
- Authority concept

Data collection across all divisions

Supply → Transformation → Distribution → Consumption → Disposal

SIEMENS

SIMATIC Energy Manager - Basic
A new product for an easy access

Easy access – „Energy Manager Basic“

- Configuration with the Web Client
- Easy Dashboard- and report configuration
- Interfaces like OPC, Energy Suite, WinCC, Modbus/TCP
- Easy user management
- Available languages are DE, EN, IT, FR, ES, CN
- Upgrade possibility to EnMPRO with License key
- Installation of all software components on one PC

Customer benefit

- Easy and fast entry to energy data management
- Intuitive Web engineering
- Scalable solution thanks to easy upgrade
  to the Energy Manager PRO

SIMATIC Energy Manager - PRO
Enhanced functionality by upgrading to Energy Manager PRO

Energy Manager PRO

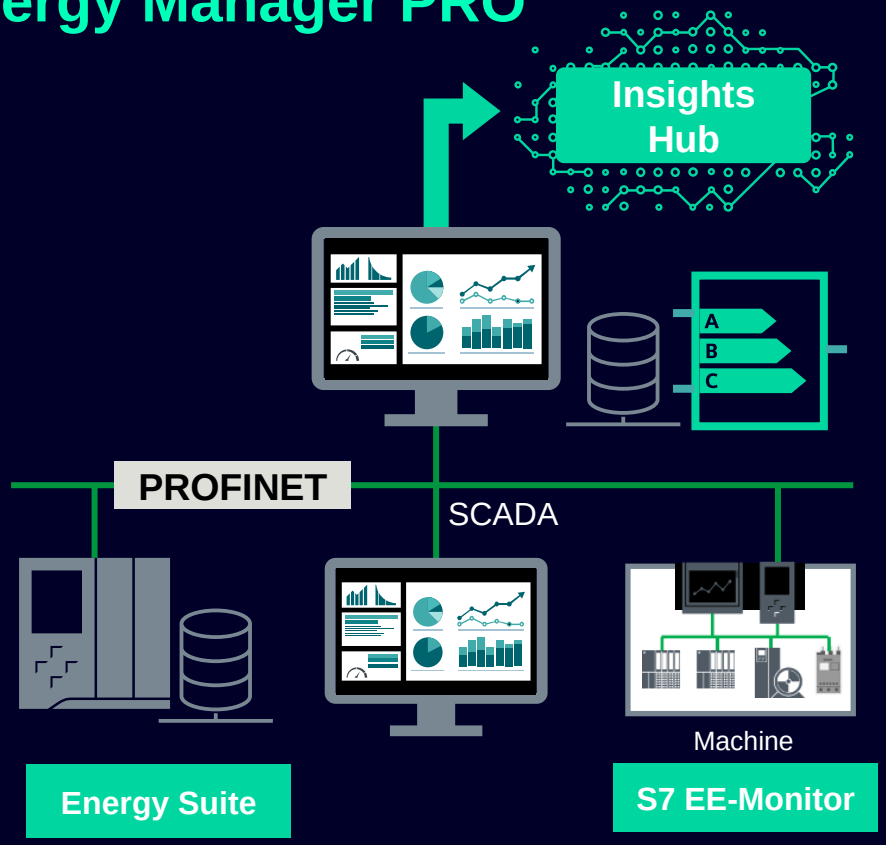
Additional functions:

- Full client configuration (total functional scope)
- advanced reporting with global template
- Batch and material analysis, Forecasting possibilities
- S7 EE Monitor interface including template and instance concept
- Energy efficiency measures
- Additional Interfaces: OLE DB, S7, S7-EE Monitor
- Additional data acquisitions (further locations)

Customer benefit

- Individually adaptable energy management system
- Baseline management
- Cross-disciplinary machine analysis/ calculation of key performance indicators
- Benchmark of machines

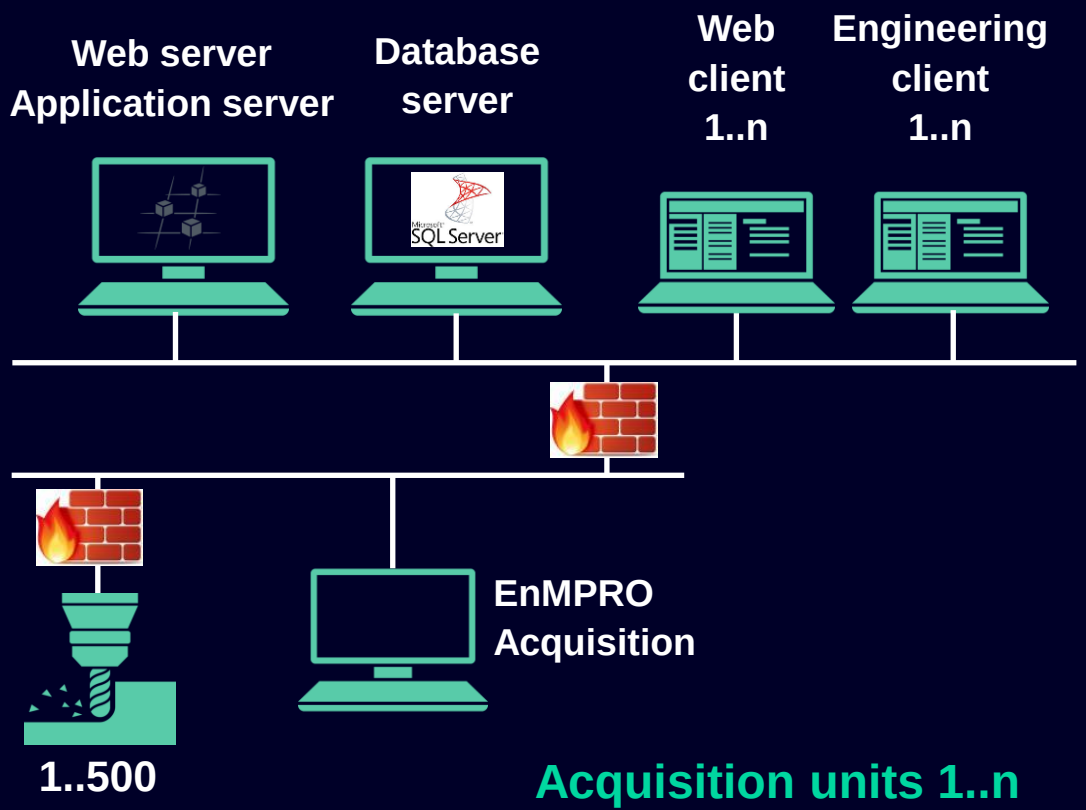
Energy Manager PRO



Energy Manager PRO
Scalable architecture

How does the system architecture look like?

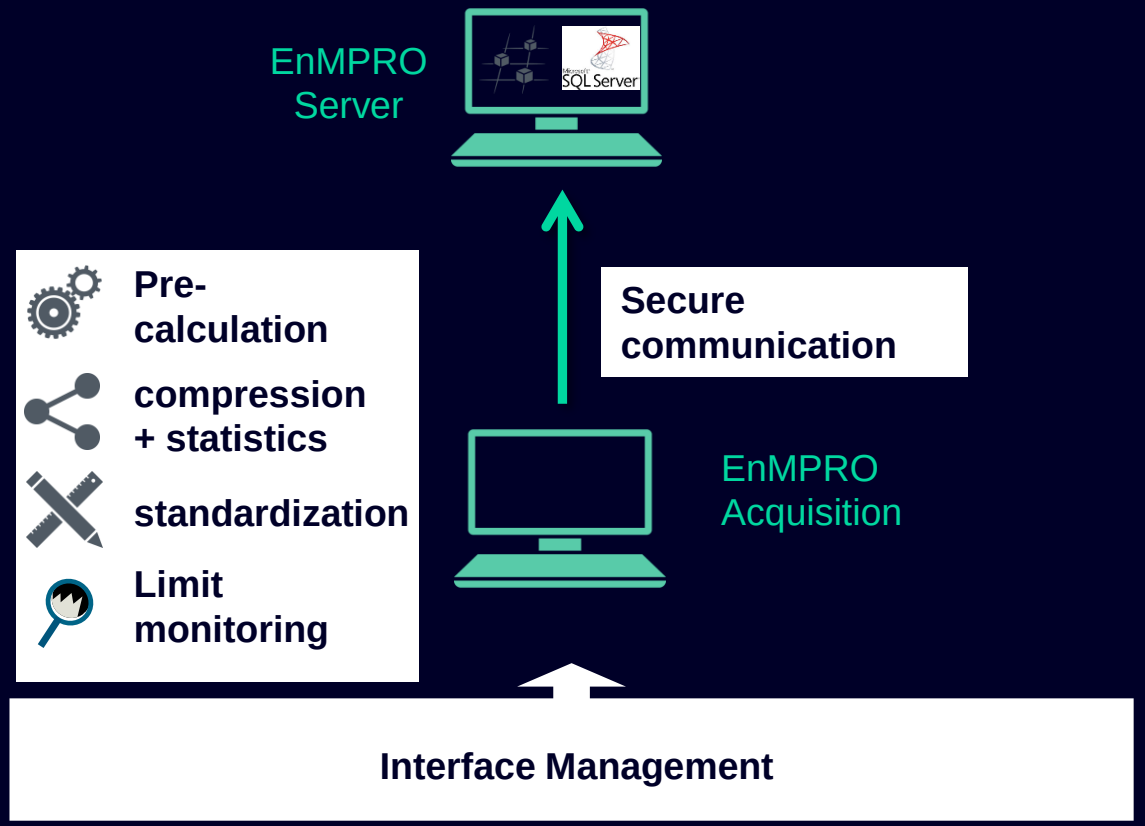
- Scalable architecture with up to 30.000 tags
- Distributed Acquisition units (more sites)
- Windows Server 2022 operating system
- SQL Server 2017 Standard Edition



The suitable architecture for any requirement from a single station to a distributed architecture

Advantage of decentralized data acquisition

- Pre-calculation of data (non-linear correlation)
- Standardization of data (counter, consumption, power)
- Compression of data and additional calculation of statistical values
- Limit monitoring ++
- Secure data transfer (3DES 256-Bit)

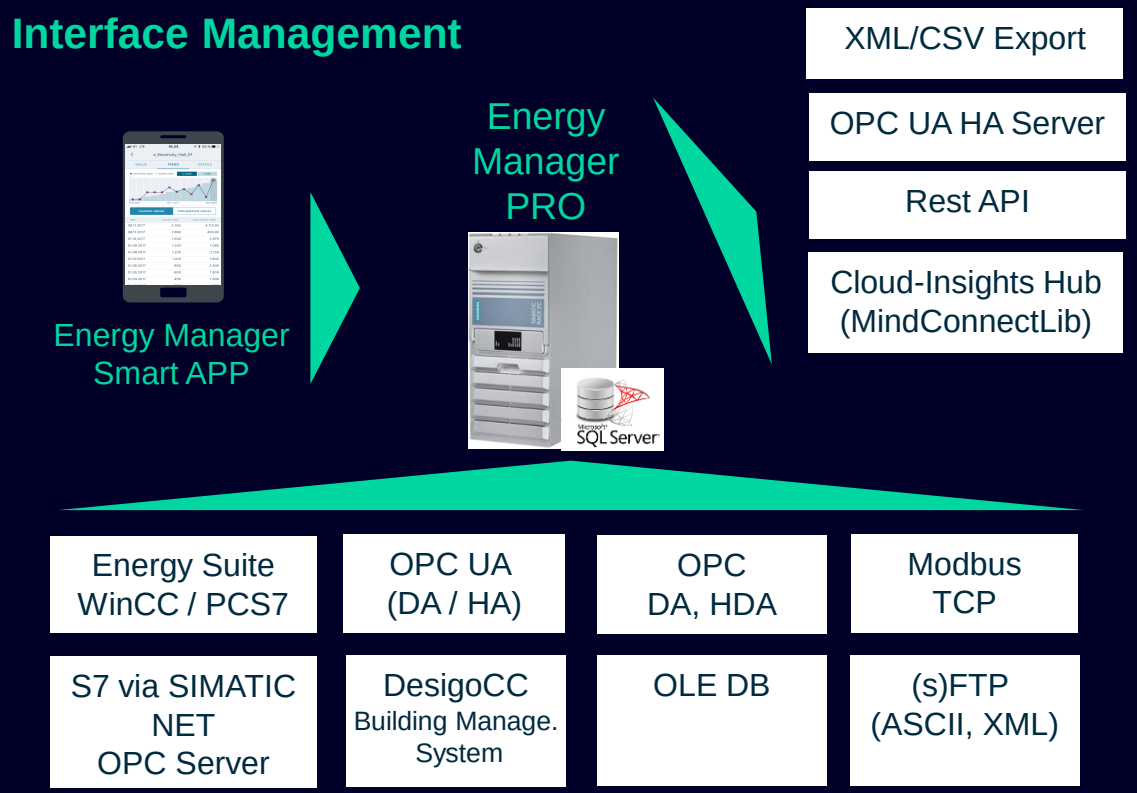


Preparation of data starts at the (decentralized) data acquisition

SIMATIC Energy Manager PRO
Interface Architecture

„Connectivity“ in main focus

- Numerous data interfaces to collect the necessary information
- Support of int. standards like OPC UA,..
- Open system to calculate e.g. KPIs/EnPI or costs and provide the results to other systems
- Mobile data acquisition



Openness to collect data for global transparency and export possibility of results

SIMATIC Energy Manager V2.0
IOS and Android App for a mobile data acquisition

Functions

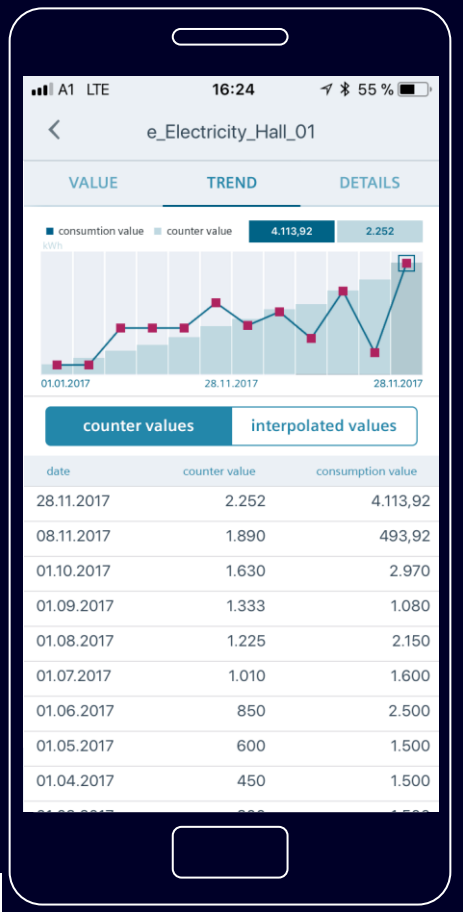
- **Synchronization** of the route and the corresponding data point configuration as well as the plausibility settings
- Counter identification with scanning of the **QR- or Barcode**
- **Plausibility review** during the data entry
- Translation of the counter value into a consumption value
- Value correction of the different acquisition cycles (28., 3., 5. of the month)
- **Graphical trend representation** of the last 12 acquired as well as interpolated values
- **Offline mode** – data acquisition possibility
- Support of **encrypted communication** (https)

Customer benefit

- Full transparency of the energy consumption
- Increase of data quality through plausibility review and counter identification
- Easy and intuitive handling

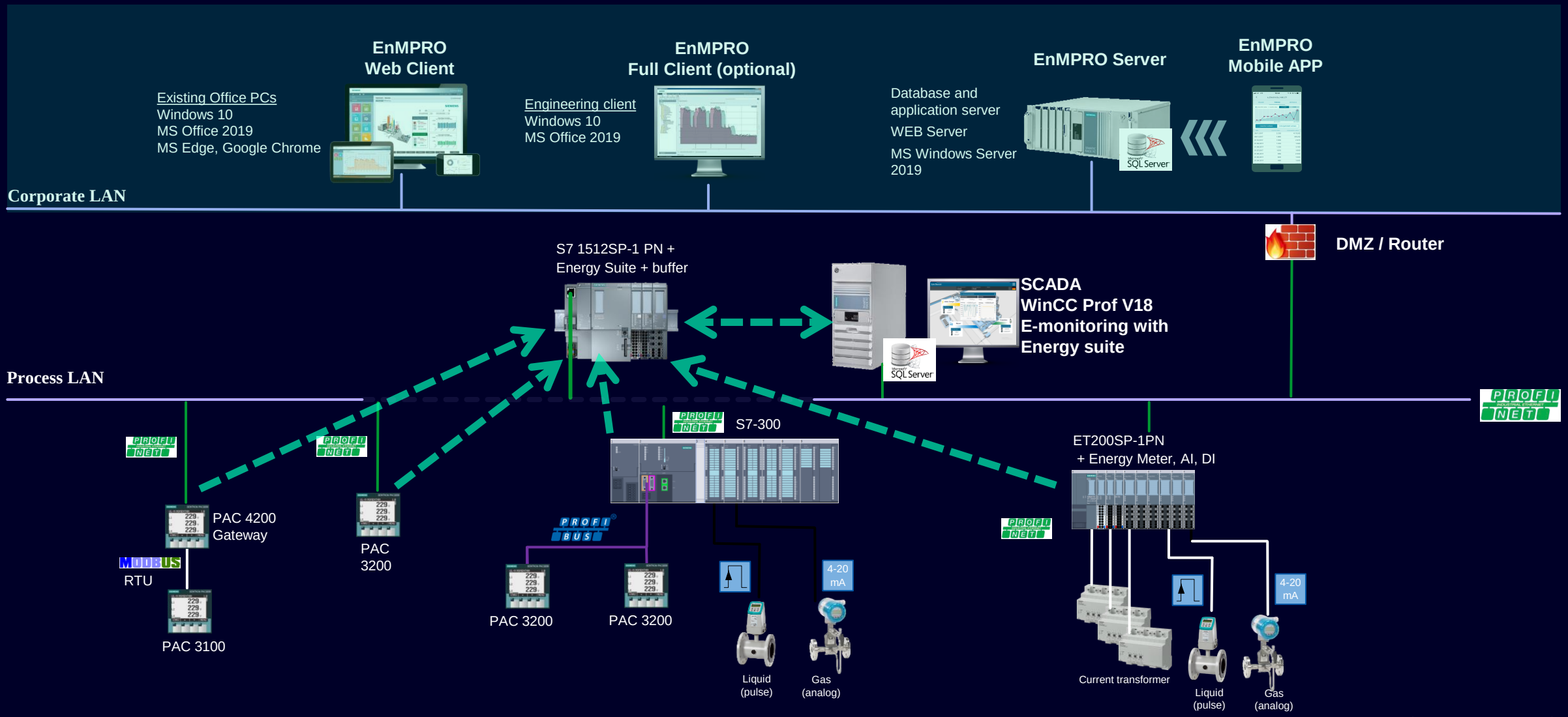
Apple App-Store:

Google Play-Store:



GAS-HALL-01

SIMATIC Energy Data Management
Energy Acquisition / Energy Monitoring / Energy Management



SIMATIC Energy Management
Distributed Data Architecture for additional locations + Cloud

EnMPRO Mobile APP

EnMPRO Full Client

- Existing Office-PC
- Windows 10,11
- MS Office 365
- MS Internet Explorer 11, Edge, Chrome, Safari, Firefox

EnMPRO WEB Clients

- Existing Office-PC
- Windows 10,11
- MS Office 365
- MS Internet Explorer 11, Edge, Chrome, Safari, Firefox

EnMPRO Server

- EnMPRO Server
- MS WIN Server 2022, IIS
- MS Office 365
- SQL Server 2017 Standard Edition in EnMPRO included

MindConnect-Lib

Insights Hub

Ethernet (TCP/IP)

WAN/LAN

Corporate-LAN

Site A

Data Aquisition
NanoBox IPC227E

EnMPRO (Aquisitioncomponent)

Router/Firewall

Site B

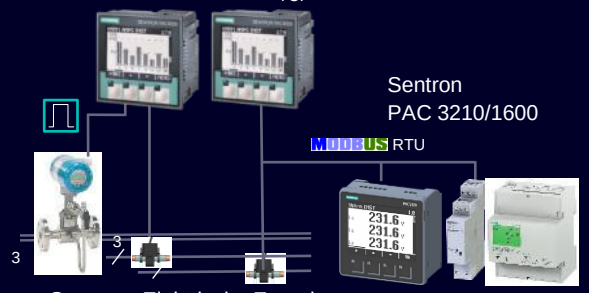
Router/Firewall

Ethernet (TCP/IP)

Prozess – LAN

Sentron PAC 4200
MODBUS TCP

Sentron
PAC 3210/1600
MODBUS RTU

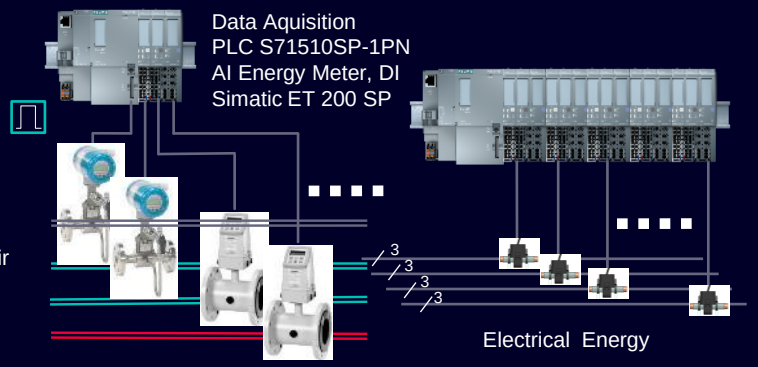


Gas

Elektrische Energie

PAC 1500 (MID)

Data Aquisition
PLC S71510SP-1PN
AI Energy Meter, DI
Simatic ET 200 SP



Gas
Compressed air
Cold water
Hot water

Electrical Energy

Produktions data server (OPC UA)

SCADA

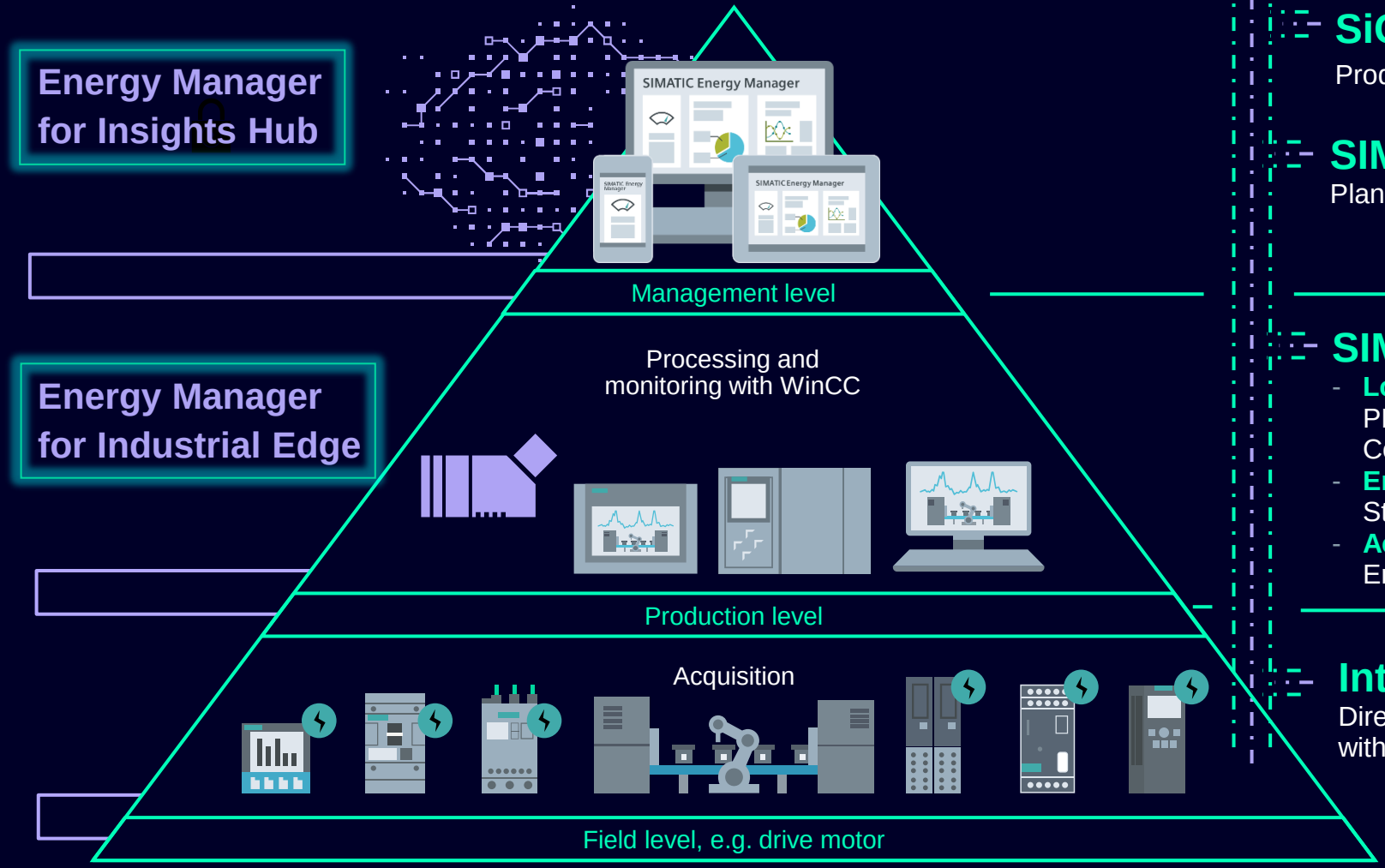
EnMPRO
(Aquisition-object)

Energy Manager
Edge / Insights Hub App

SIMATIC Energy Management
Transparency and efficiency from machine to company level

Energy Manager for Insights Hub

Energy Manager for Industrial Edge



SiGREEN
Product Carbon Footprint

SIMATIC Energy Manager
Plant and company-wide energy analysis

SIMATIC Energy Suite
- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency Monitor**
  Standardized efficiency evaluation of machines
- **Acquisition**
  Energy data acquisition

Integrated energy measurement
Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

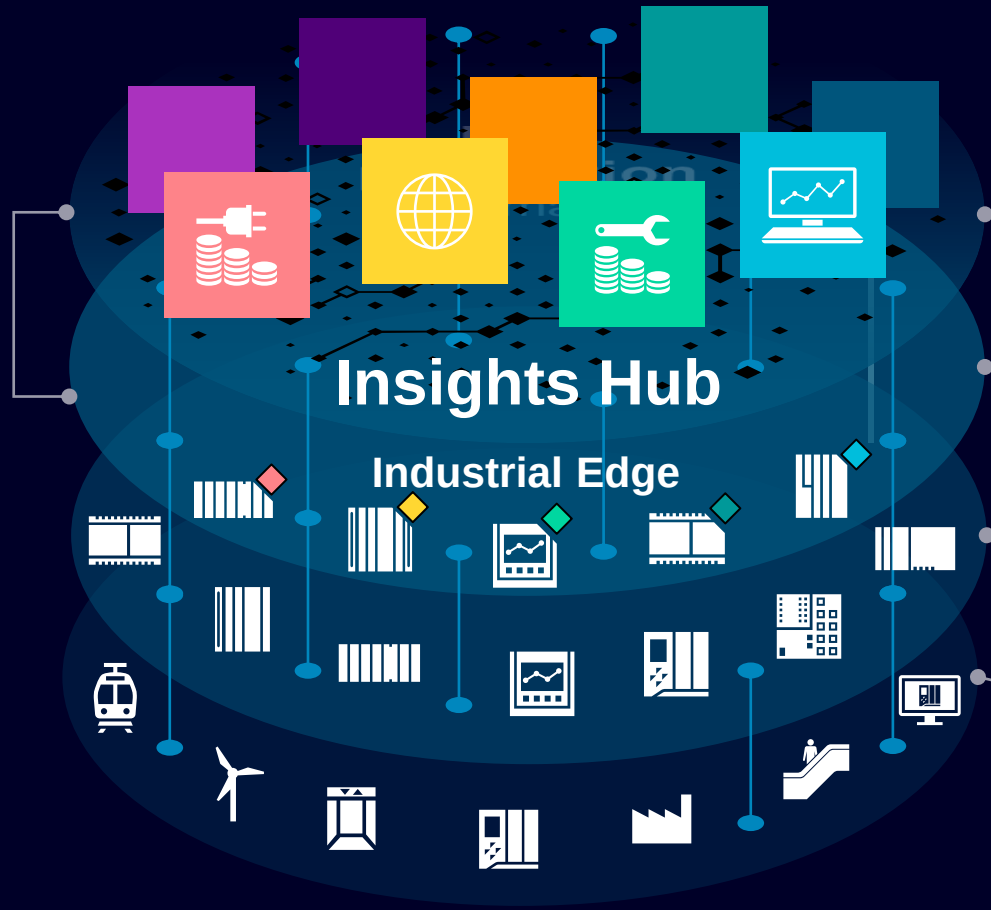
The big picture

We enable our customers to deploy applications everywhere based on their needs

mx mendix

Low-Code platform

Build apps faster for Cloud, On-Premises or Hybrid infrastructures



Cloud Computing

Apps for centralized compute and storage

Edge Computing

Management, Runtime, Apps for decentral compute & storage

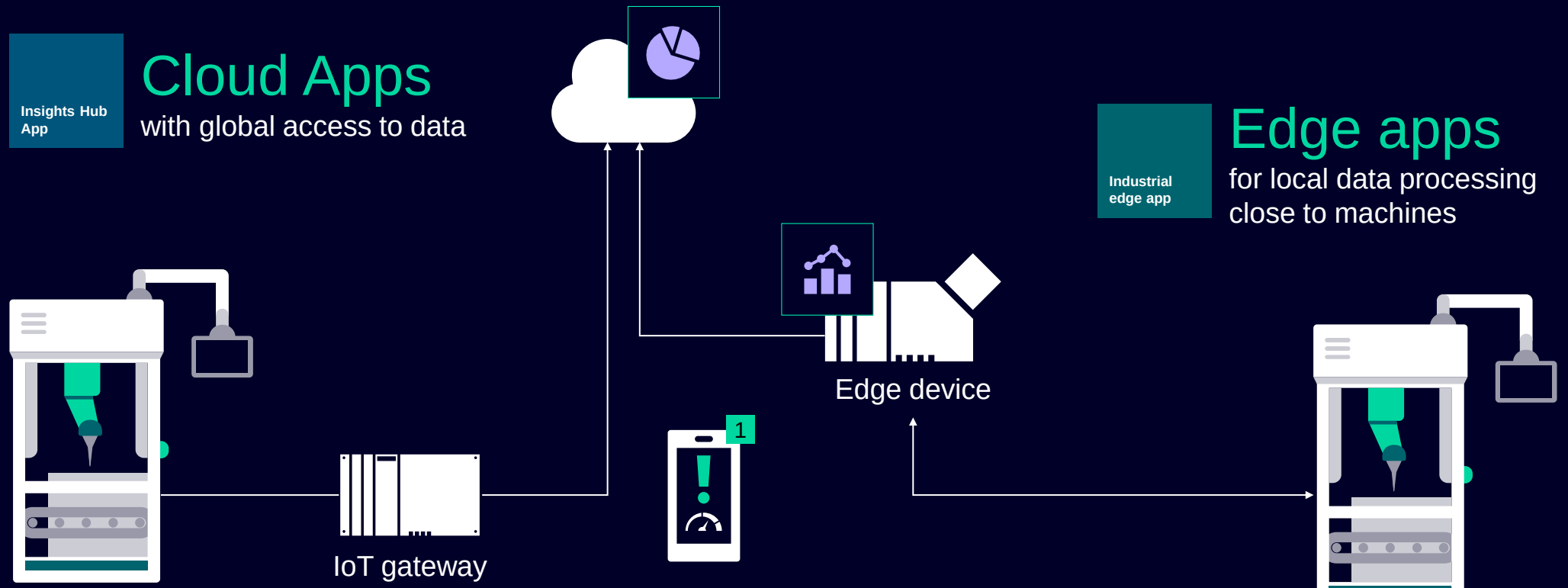
Controller

Runtime and automation engineering

Field devices

Applications with a strong need for responsiveness, privacy, reliability and cost-efficiency can now be additionally deployed **on-premise** with Edge Computing, while still benefitting of the available IT and OT-technology

Industrial IoT apps add value to our open IoT ecosystem around Insights Hub and Siemens Industrial Edge



1 Mobile Client apps in addition to Cloud or Edge apps

Industrial Cloud/Edge – Application for production machines and - plant

Optima
www.optimacs.com

Transparency on consumption with **Energy Manager**

Easy Dashboarding with **Performance Insight**

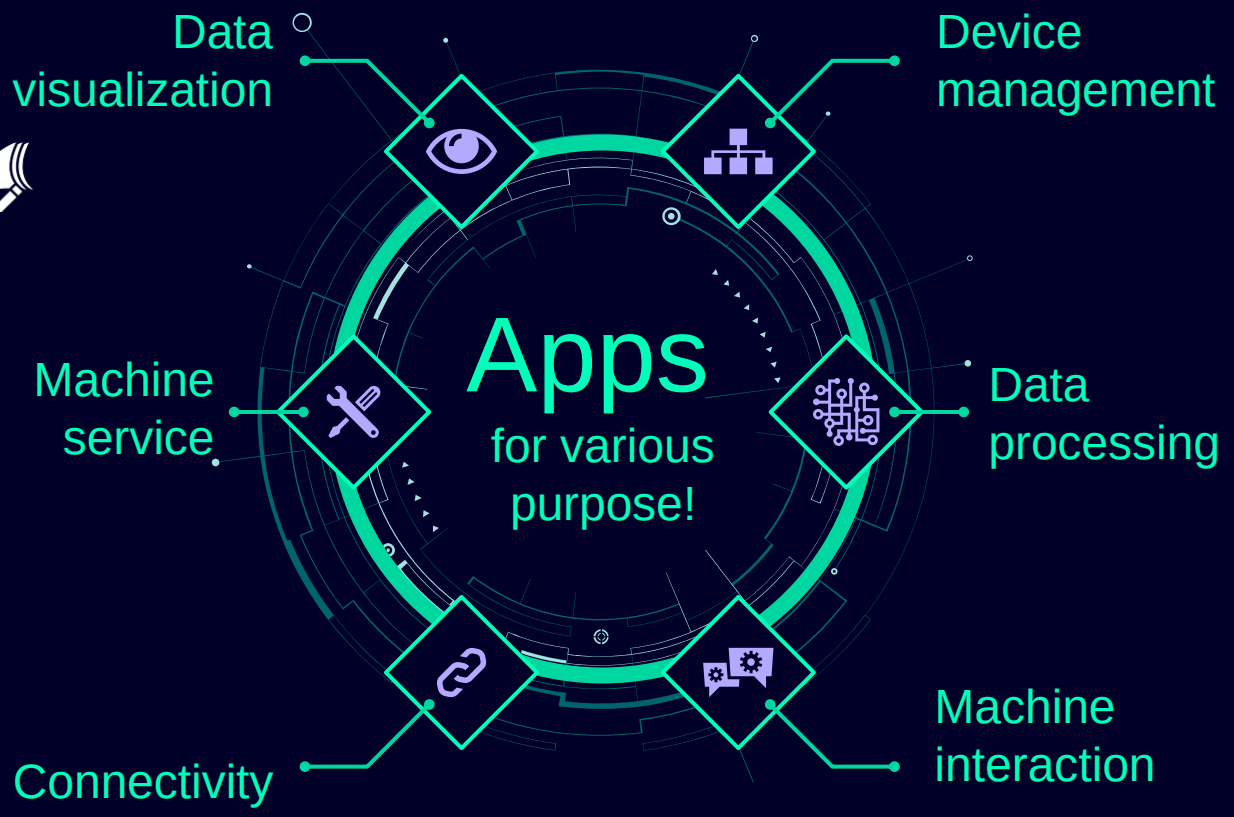
HMI application for operation and monitoring with **WinCC Unified**

Digital maintenance cockpit in **Machine Monitor**

Error and alarm logbook in **Machine Insight**

Automatic anomaly detection using AI with **Anomaly Detection**

Connect the shopfloor with Industrial Edge **Connectors**



Scan and stock your network with **Inventory**

Update your systems with **SIMATIC Automation Tool**

Structure and store **machine data** with Data Service

Flow based data preprocessing with **Flow Creator**

Run FMU simulations on your machine with **LiveTwin**

Receive Push notifications from machines with **Notifier**

Talk to your machines with **SAM**

Root Cause analysis with **Collaboration Board**

Details (link)

SIEMENS

SIMATIC Energy Management System
Fit for all use cases

Energy Manager - Apps for production machines and plants - Global (siemens.com)

SIMATIC Energy Manager Basic/PRO

- Comprehensive Energy Management solution for a factory or multiple sites
- ISO 50001 certified including Baseline Management according ISO 50006
- Supporting Carbon Footprint
- Advanced Reporting, Invoice Verification, Prediction, Baseline Management
- Advanced meter management including data cleansing functionality

Energy Manager for Industrial Edge

- Easy to use app with a out of the box Energy Media analysis Dashboard
- ISO 50001 certified including Baseline Management according ISO 50006
- Using the data model as well as the timeseries data provided by Data Service
- Simple extension with other apps to support further use cases like Flow Creator, Performance Insight,..

Energy Manager for Insights Hub

- Easy to use app with a out of the box Energy Media analysis Dashboard
- ISO 50001 certified including Baseline Management according ISO 50006
- Using the data model as well as the timeseries data provided by Insights Hub
- Simple extension with other apps to support further use cases like Flow Creator, Performance Insight,..

Depending on the use case the appropriate platform can be selected

If a customer has a high maturity about Energy Management and data must stay within the company.

Business model: Perpetual - One-time costs + SUS to get further updates

Customer who likes the idea of Edge and would like to increase the energy efficiency of an asset/line

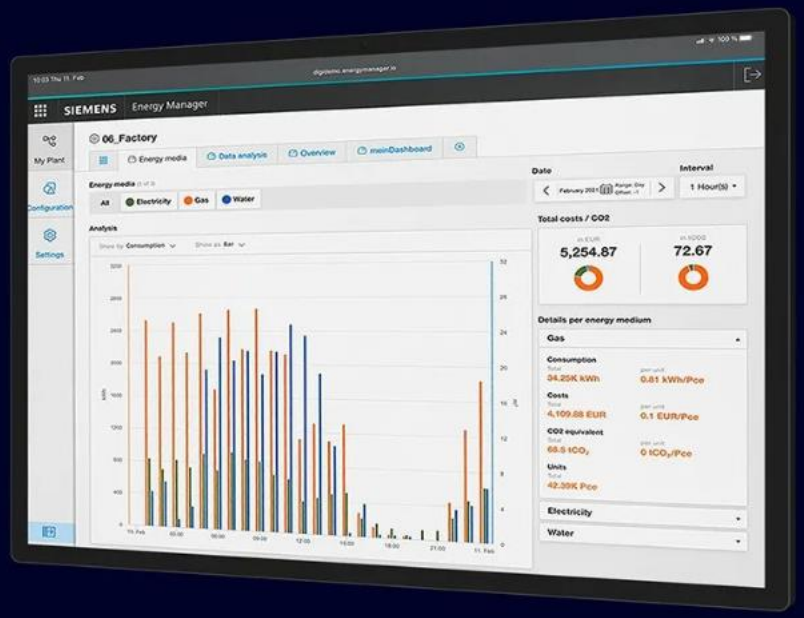
If the time resolution is < 1min and/or a data preparation is required.

Business model: Subscription model based on annual costs

Insights Hub customers who wants to have a global view about all energy related information.

Business model: SaaS – Subscription model based on annual costs.

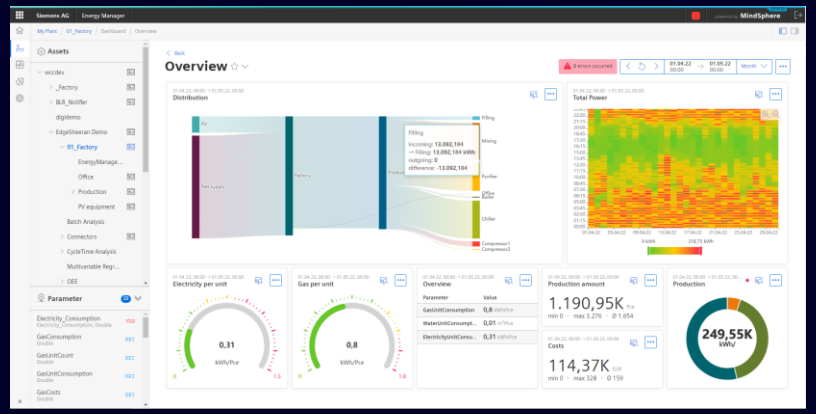
Energy Manager
High level feature comparison



	EM for Ind. Edge / Insights Hub	EM On-premise	
		PRO	Basic
Counter (Meter) Management	✓	✓	✓
KPI Calculation	✓	✓	✓
Dashboard	✓	✓	✓
Reporting	✓	✓	✓
Batch analysis	✓	✓*	✗
Baseline Management	✓	✓*	✓
Prediction functionality	✗	✓*	✗
Extended authority concept	✗	✓*	✗
Manual data collection	✓	✓	✓
Out-of-the-box media analysis	✓	✗	✗

SIEMENS

SIMATIC Energy Manager Insights Hub app
Transparency - Obtain the greatest value from data



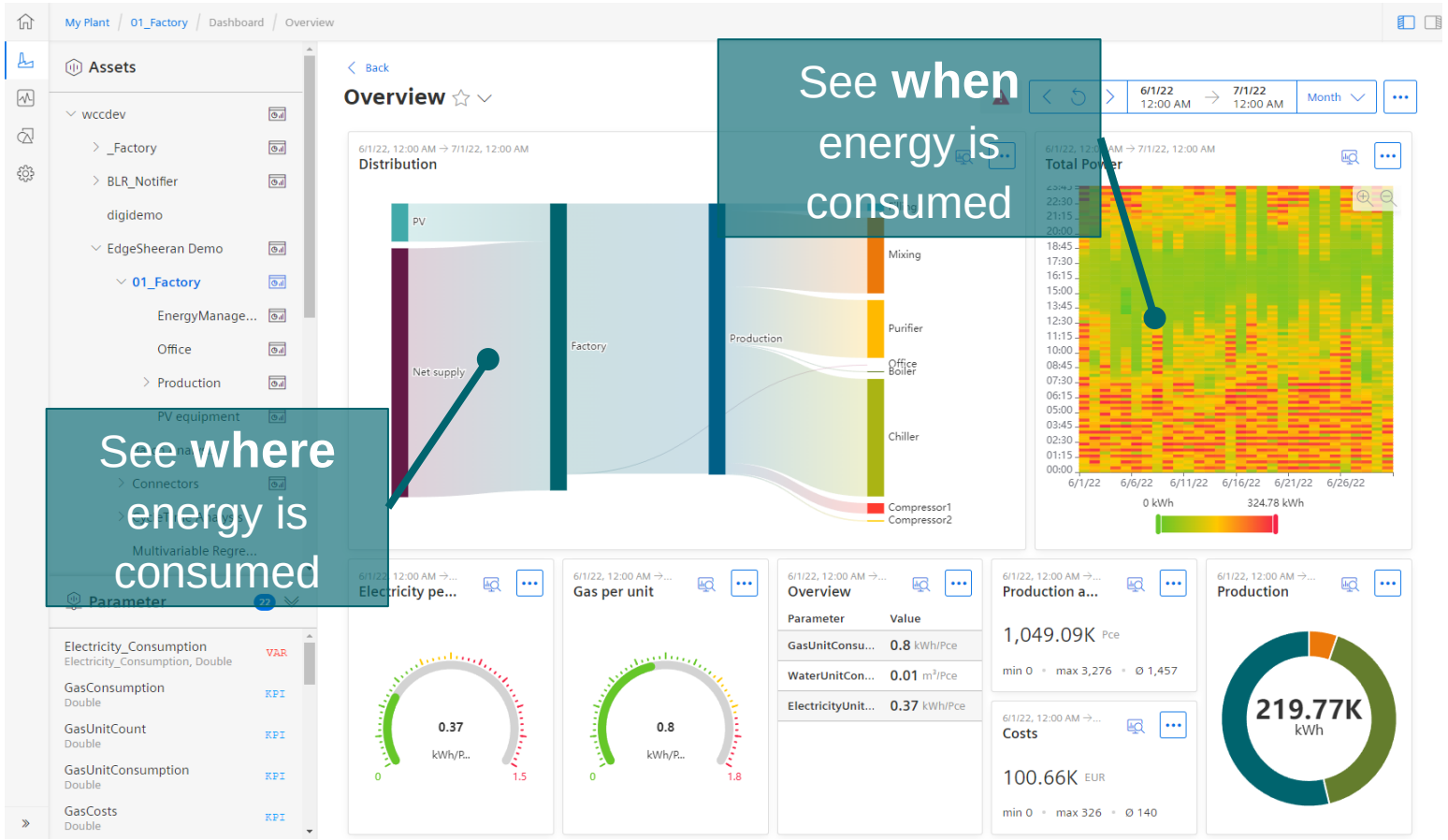
The SIMATIC Energy Manager Insights Hub app allows to keep track over global distributed energy consumers. No matter if we talk about machines, lines or whole sites - Everything can be connected to Insights Hub and can be accessed worldwide to benchmark energy consumers and to visualize optimization potential.

Benefits

- Energy transparency supporting ISO 50001
- Flexible KPI definition and user specific dashboards providing a holistic view about the energy consumption and can be used to derive energy efficiency measures
- Transparency about energy costs, consumption and CO_2 Emission from the machine level to your sites worldwide
- Get the most valuable information for precise decision-making to optimize energy efficiency
- **Features**
- Out of the box energy media analysis (consumption, costs, CO_2 Emission)
- Flexible dashboard configuration by widget technology with detail views for fast analysis of data
- Reporting of consumption, costs and CO2 emissions
- **Industry focus**

Cross industry based on flexible dashboard and KPI calculation

SIMATIC Energy Manager App
Dashboards - Transfer data to information



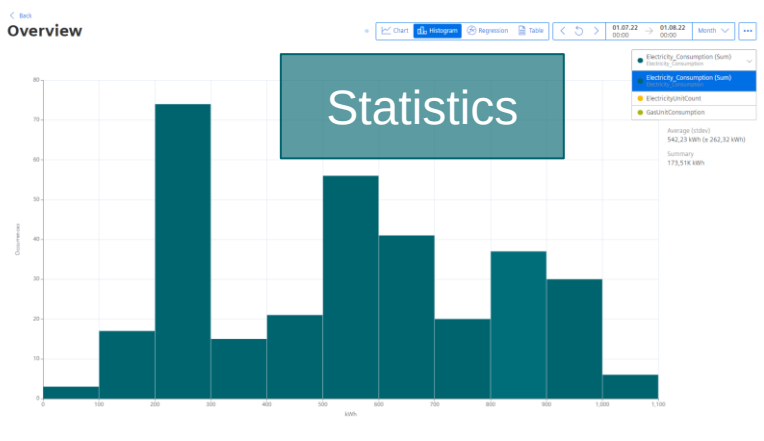
Benefits:

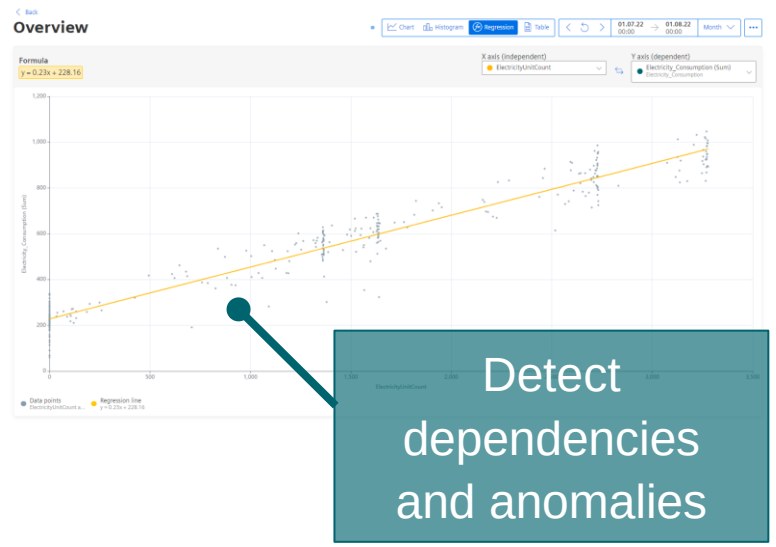
Using custom dashboard with energy related widgets to transfer data to information

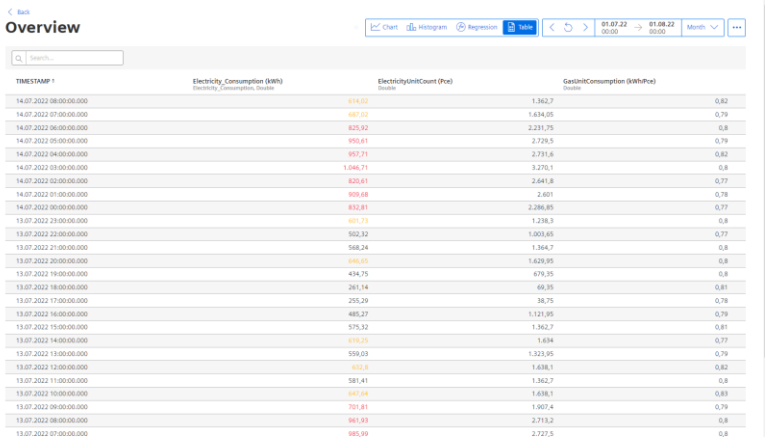
- Sankey Diagram provides an overview about the energy flow → see where energy is consumed
- In the heat map the value is represented as color. → see when energy is consumed.
- Additional Widget types like Gauge, Pie Chart, Value, Chart are used to display KPIs in a way that measures can derived immediately.

SIEMENS

SIMATIC Energy Manager App
Out of the Box – Media analysis







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Using custom dashboard with energy related widgets to transfer data to information

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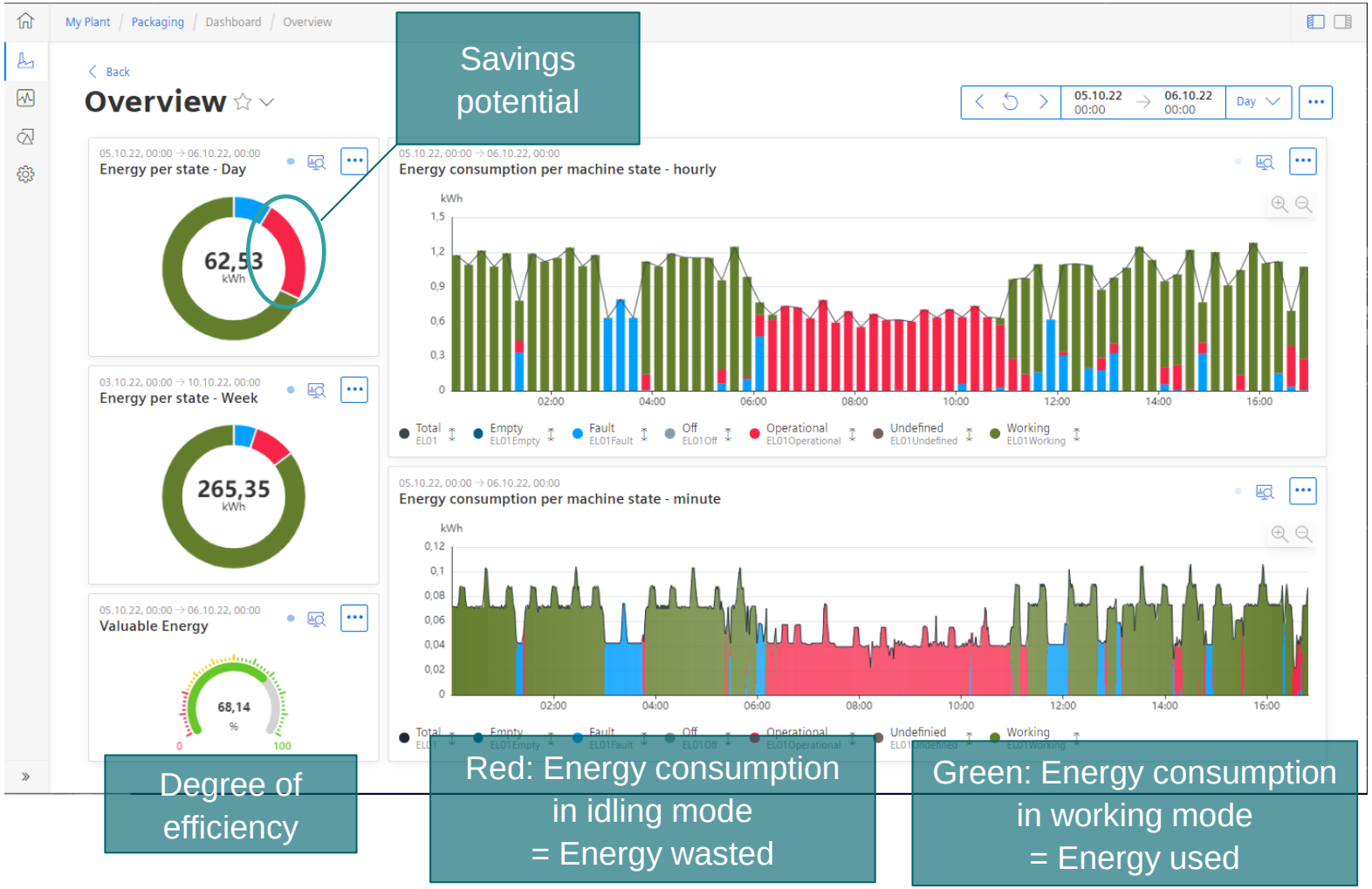
SIEMENS

SIMATIC Energy Manager App
Transparency on machine level



Benefits – Machine analysis

Transparency about energy consumption in the different machine states
(Working, Operational, Standby, Off,..)

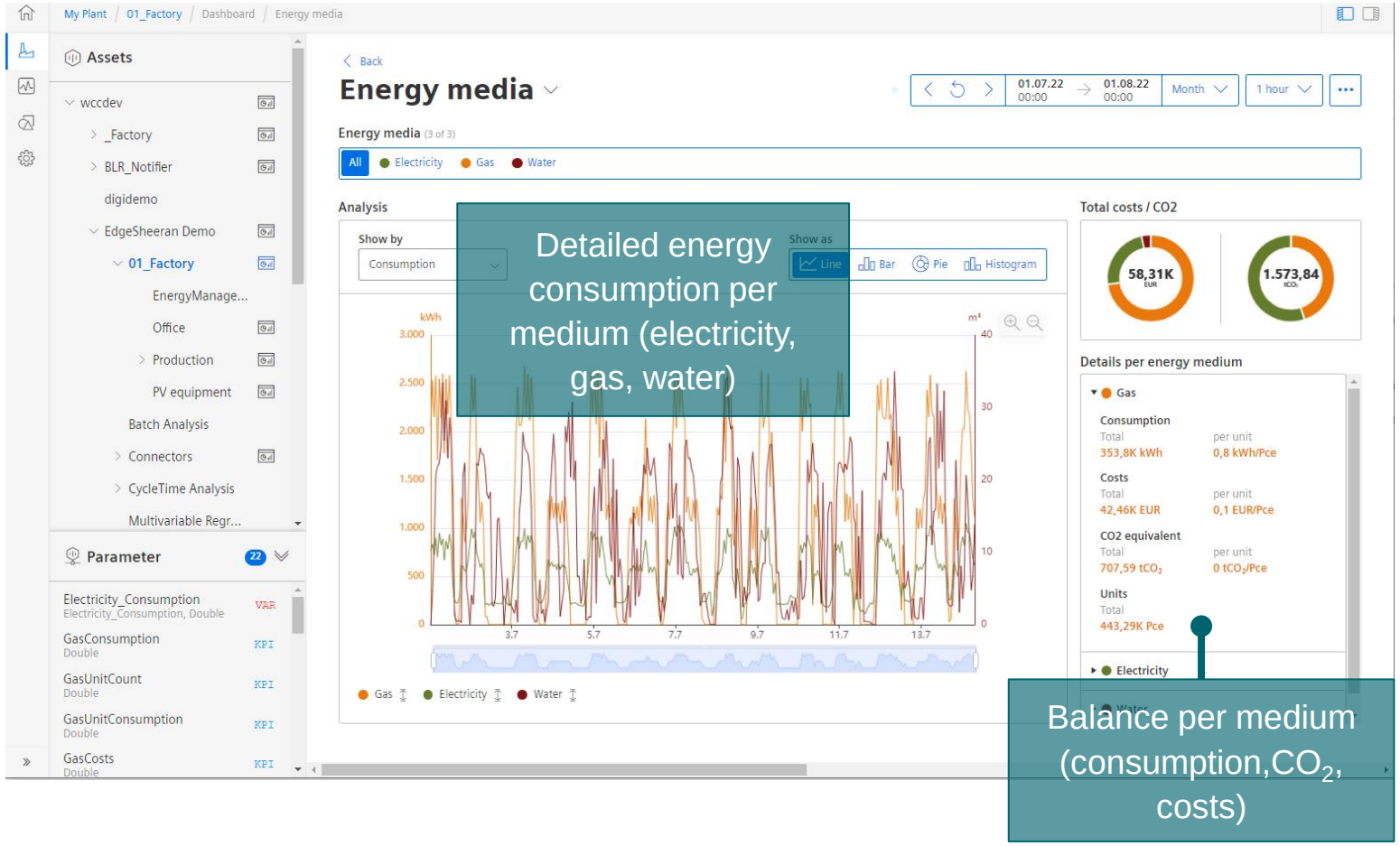
KPI representing the operation of the individual machine.

- Valuable energy (Working / Total)
- Losses caused by inefficient machine operation

SIEMENS

SIMATIC Energy Manager App

Media Analysis – Transparency about consumption, costs and CO2



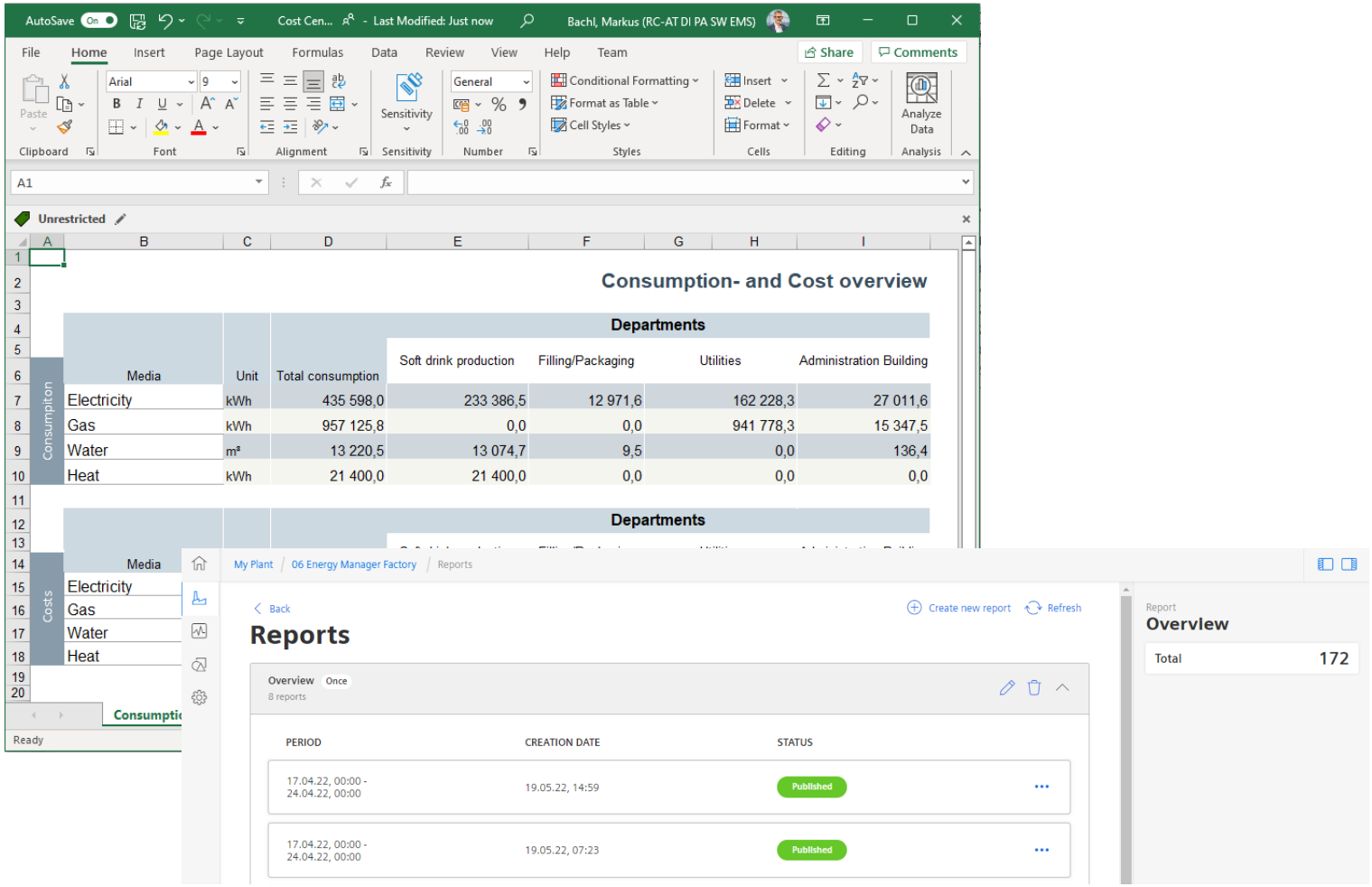
Benefits:

Ready-to-use Media Analysis helps to visualize energy consumption, costs and CO2 equivalent

- The pre-defined dashboard calculates the values for each produced unit
- This helps fulfilling Energy standards like ISO 50001

SIEMENS

SIMATIC Energy Manager App
Reporting capabilities



Situation

- For documentation and information sharing purposes it is necessary to provide important KPIs in an Excel spreadsheet
- The effort to prepare an Excel Report is often very high.

Requirements

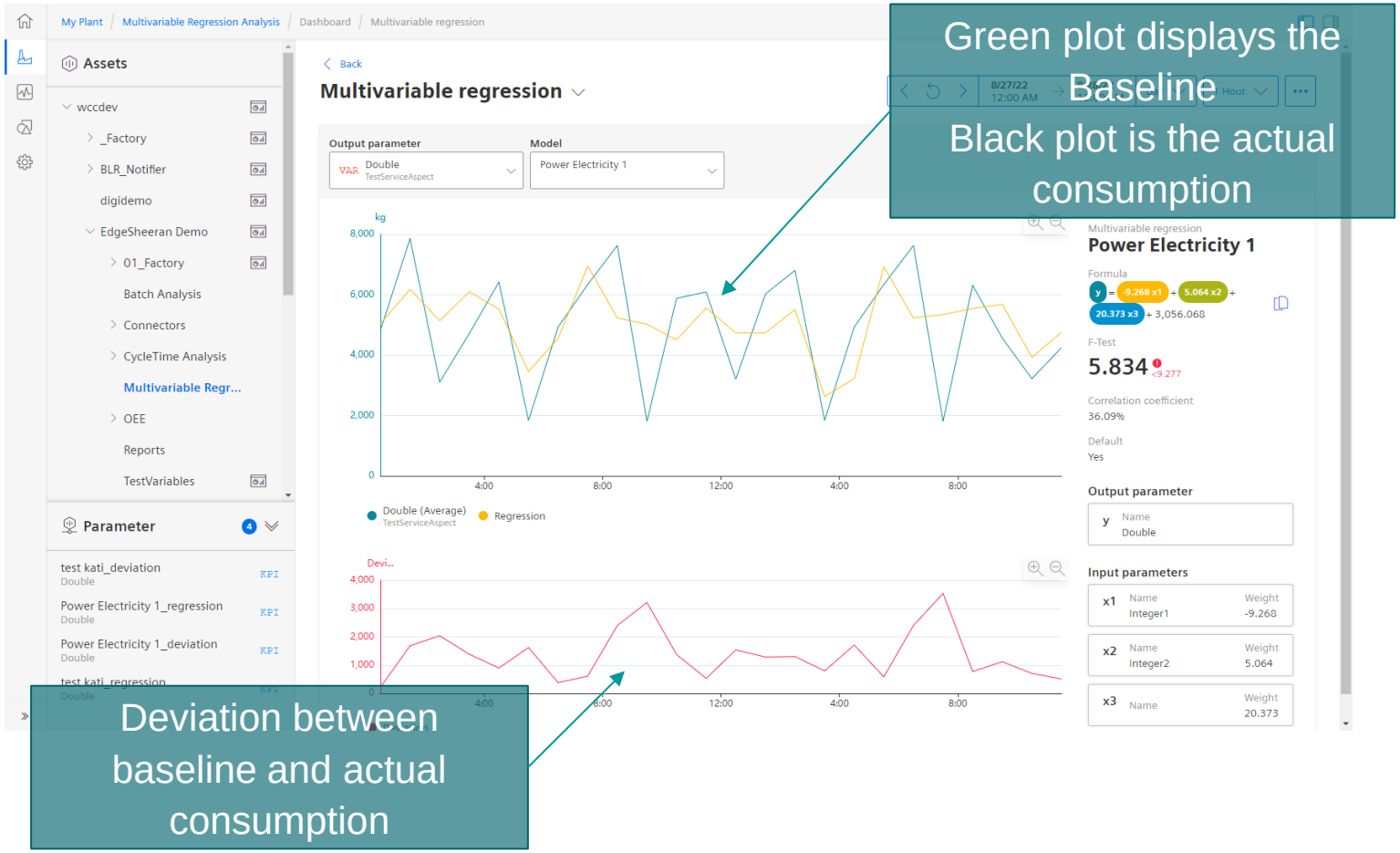
- Provide Excel reporting capabilities
- User has to be able to define custom reports with full flexibility in terms of layout and content.

Benefits

- Easy to use reporting capabilities
- Reduce the effort for information sharing
- Complies to ISO 50001

SIEMENS

SIMATIC Energy Manager App
Baseline Management (Multi Variable Regression Analysis)



Situation

- The basic transparency is available
- How ever the user is not able to do decision based on standard KPIs because of missing consideration of the holistic situation like environmental parameters

Requirements

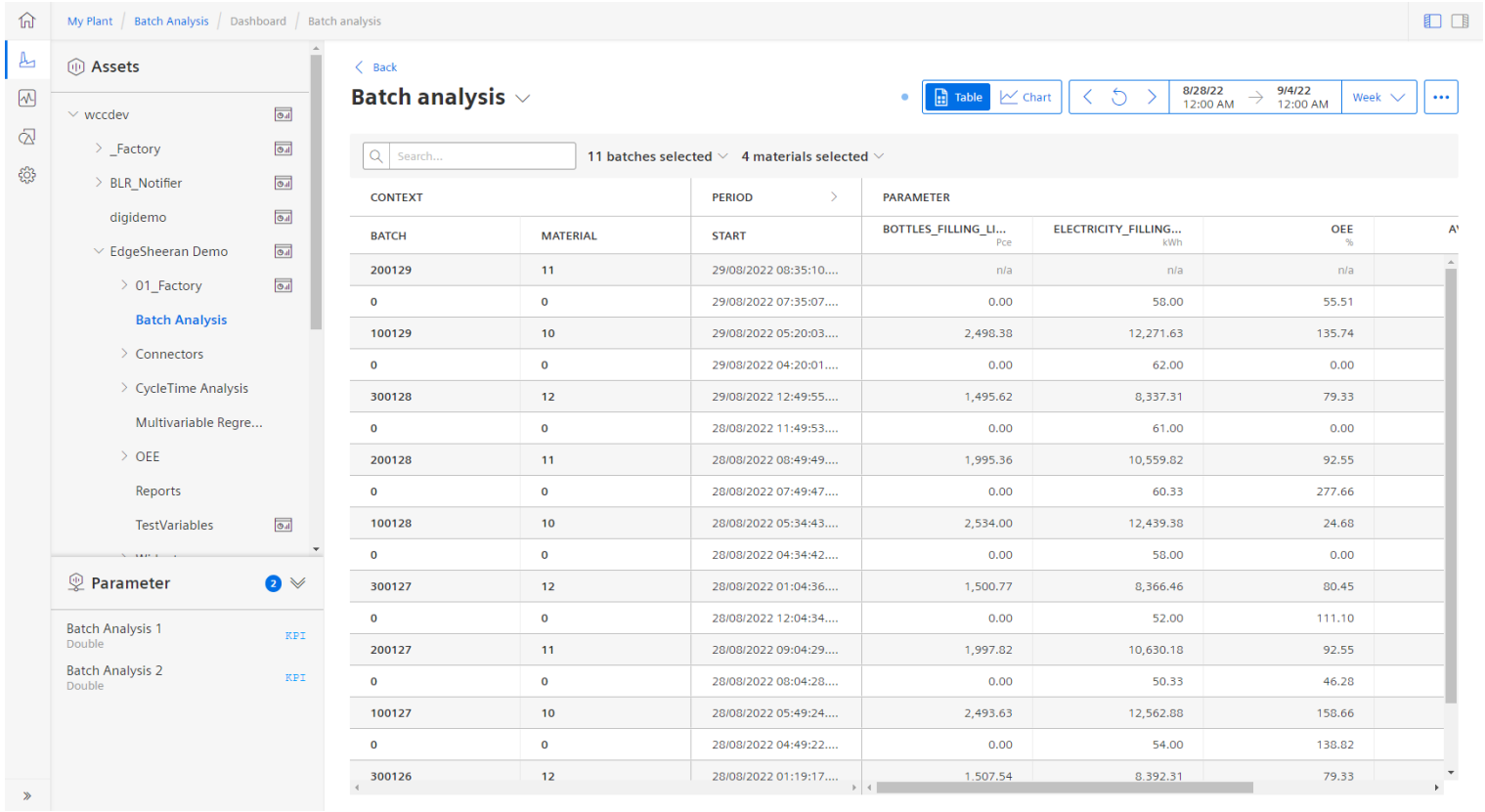
- Easy to use without being a data scientist
- Provide a baseline considering the environmental parameter
- Inform the user if the deviation between baseline and actual value e.g. consumption exceed a configurable limit

Benefits

- Easy to use analysis capabilities
- Detect inefficiencies considering Parameter influencing the e. g. consumption
- Approach complies to ISO 50006

SIEMENS

SIMATIC Energy Manager App
Batch analysis



Situation

- The basic transparency is there
- However, the user cannot integrate contextual data into his production data

Requirements

- Easy configuration and integration of batch and material information
- Provide a table result with statistical data on the duration of a batch production
- "Out of the box" dashboard analysis for easy access to calculated data

Benefits

- Easy-to-use analysis of batch data
- Detect inefficiencies within your production processes

SIEMENS

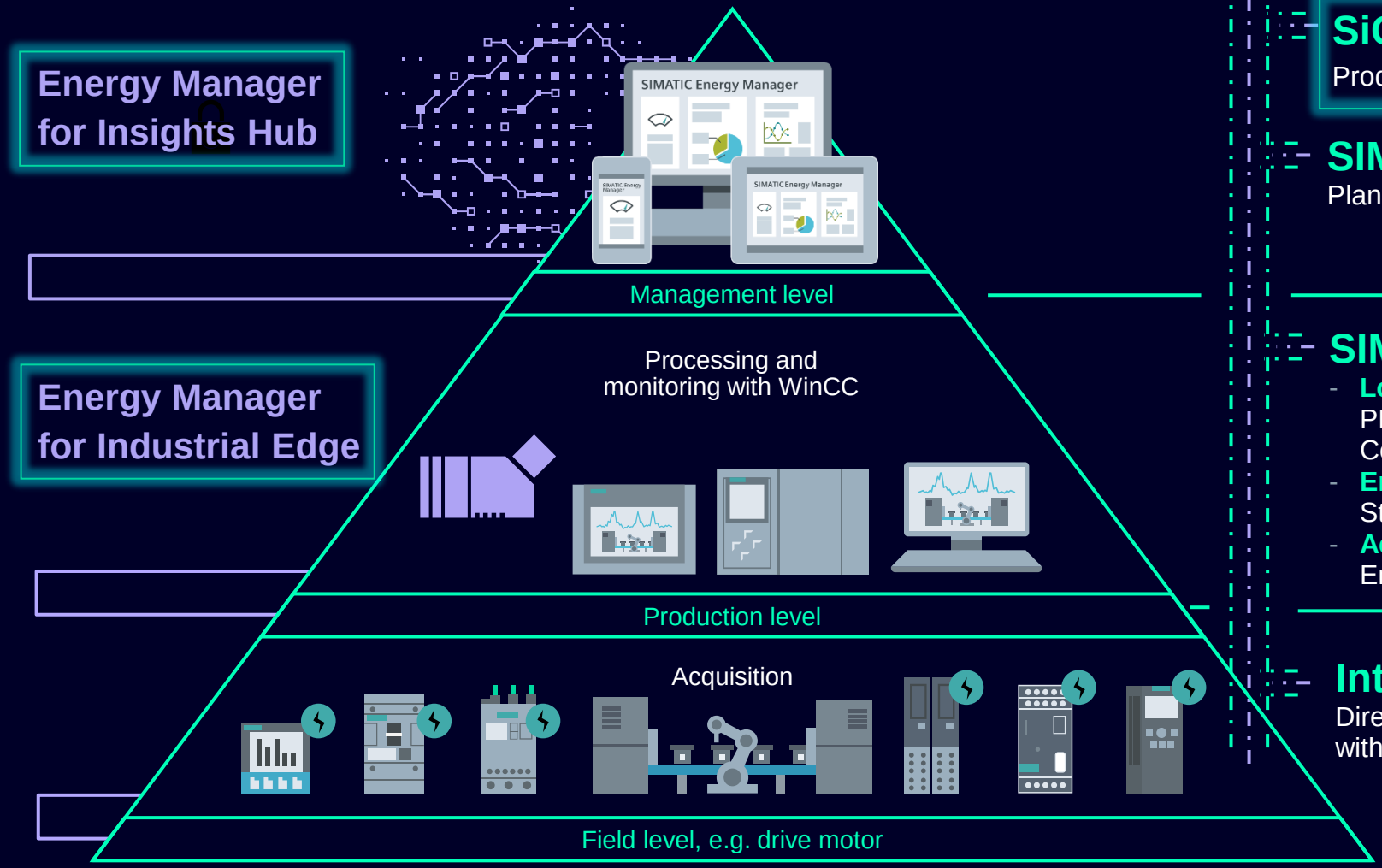
CO2-Footprint with SiGREEN

Managing and optimising the carbon footprint made easy

SIMATIC Energy Management
Transparency and efficiency from machine to company level

Energy Manager for Insights Hub

Energy Manager for Industrial Edge



SiGREEN
Product Carbon Footprint

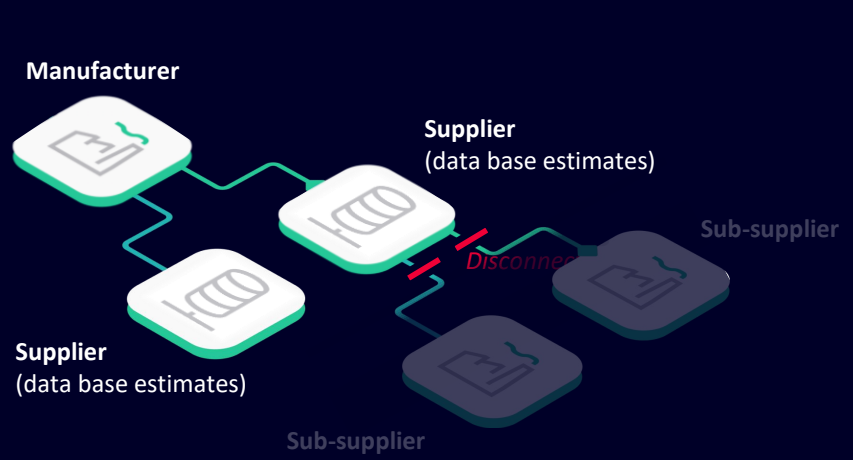
SIMATIC Energy Manager
Plant and company-wide energy analysis

SIMATIC Energy Suite
- **Load management**
  PLC based Peak- and Base-load management for Consumers, Producers and Storages
- **Energy Efficiency Monitor**
  Standardized efficiency evaluation of machines
- **Acquisition**
  Energy data acquisition

Integrated energy measurement
Directly in the field: For example with SIMATIC Energy Meter (ET 200SP)

Moving from carbon footprint reporting to active PCF management

How dynamic PCFs turn carbon footprints into a management tool

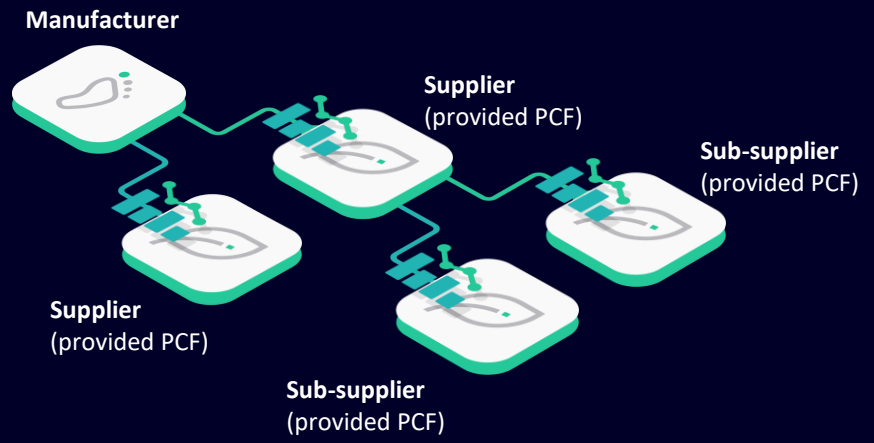


From static PCF reporting…

Conventional data base approach

..to dynamic PCF management

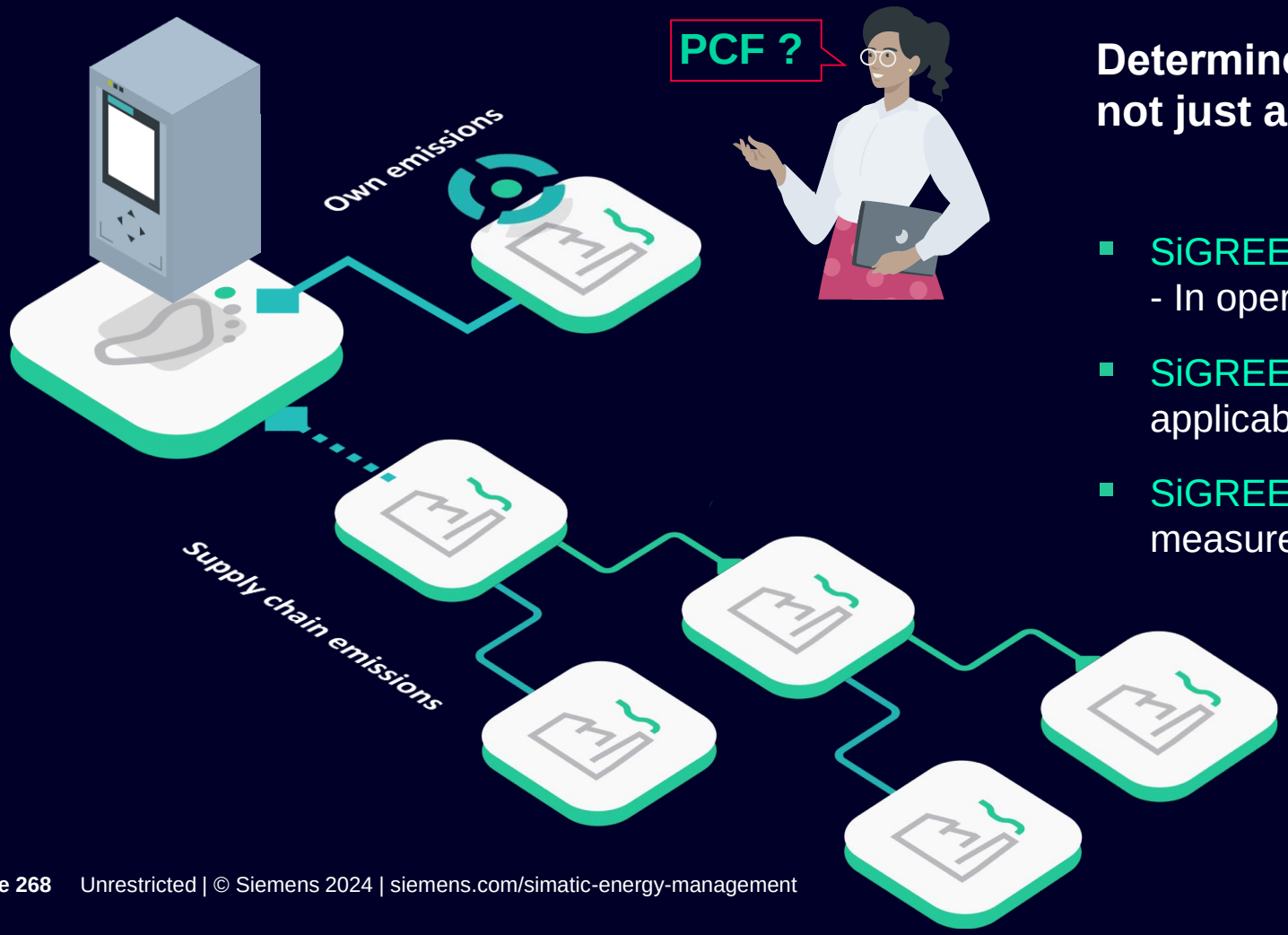
SiGREEN PCF chaining approach



- Efficient communication allows for frequent and pro-active updates that create dynamic PCF
- (Sub-) suppliers' improvements quantify in PCFs, making them a management tool

Profound decisions need real values, not estimates

How SiGREEN enables targeted, data-driven decarbonization measures

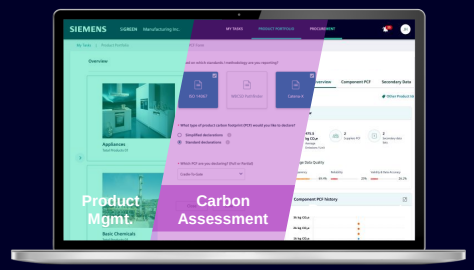


Determine YOUR product's carbon footprint, not just any average

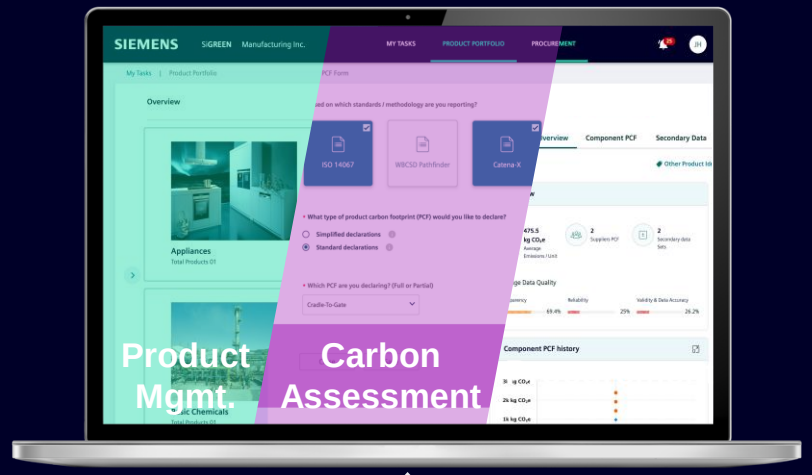
- SiGREEN **collects data where emissions occur**
  - In operations along the value chain itself
- SiGREEN works with **primary data** wherever applicable and reasonable
- SiGREEN enables **targeted improvement** measures with **quantifiable impact**

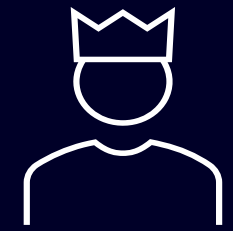
Carbon Footprint based on SiGREEN and Simatic Energy Manager Pro
SiGREEN combines emissions from own production with trusted supplier data

Certifier (e.g. TÜV,…)



Supplier

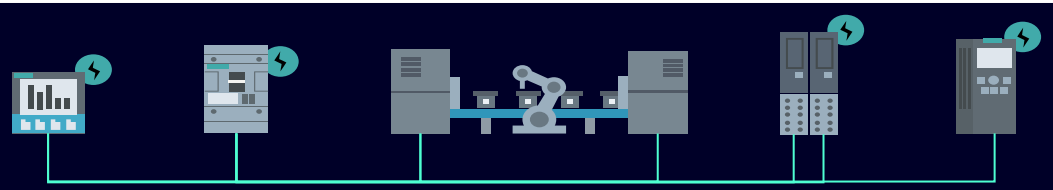




Customer

Simatic Energy Manager Pro

- Measured energy and other media consumption data
- Batch and production data



Architecture / Ecosystem / Total Solution - SiGREEN & CO2 Cockpit

Optima
www.optimacs.com

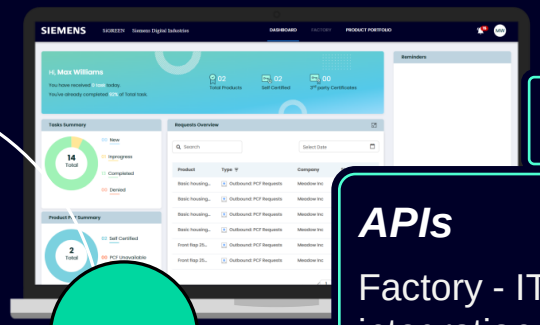
Suppliers

Customers

ESTAINIUM **Network**

Emission factors

Certifier



SiGREEN

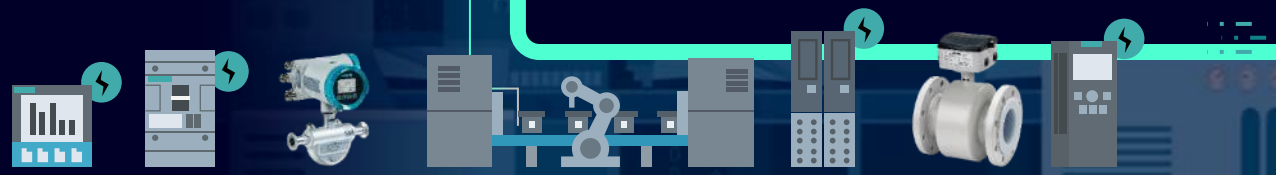
APIs

Factory - IT and OT integration for autom. data acquisition

ERP[1] Systems
Database systems
Material data, Procurement data

CO_2-Cockpit - Energy Management System Simatic Energy Manager Pro

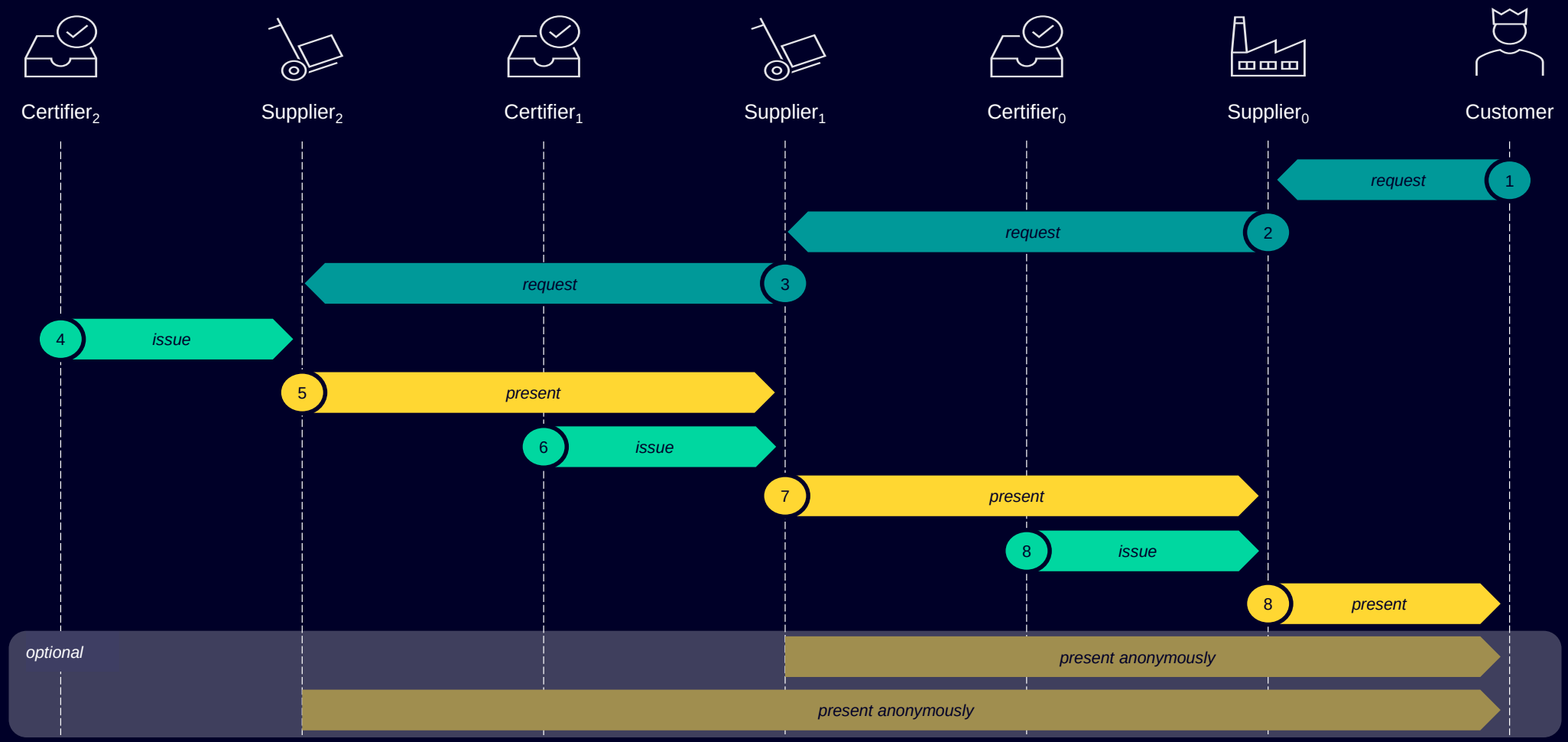
+) Energy and other media consumption data from the system
+) Batch and production data
→ Own manufacturing emissions - Gradle-to-Gate



1) Enterprise Resource Planning

SIEMENS

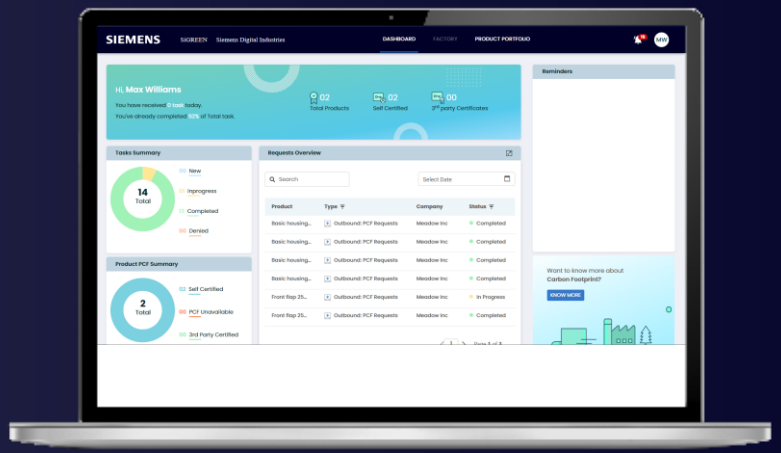
SiGREEN enables exchange and verification of PCFs across company boundaries



SiGREEN Connect

Digital technologies for calculating, checking and minimising one's own carbon footprint

SiGREEN

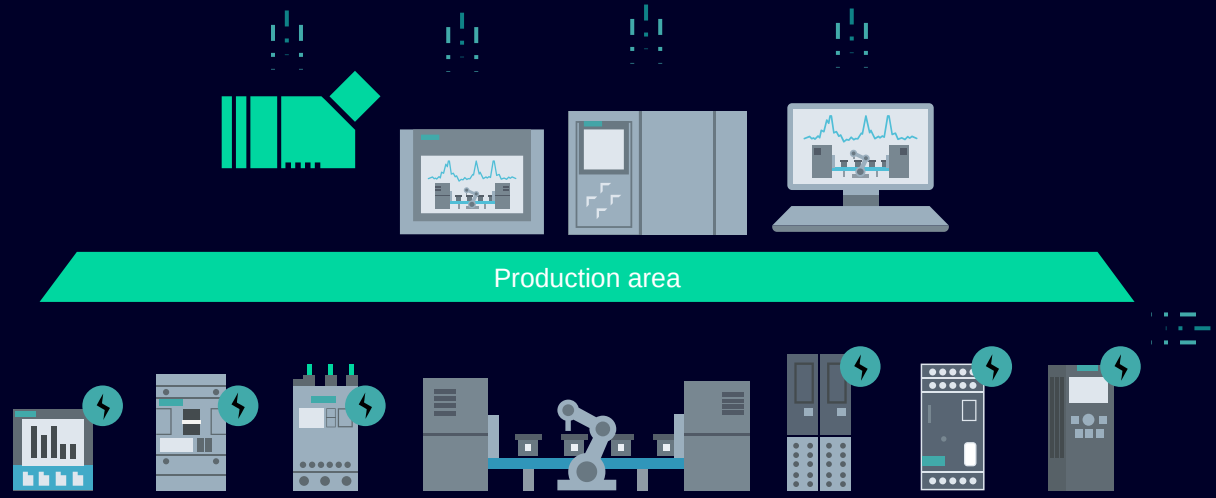


interface under development

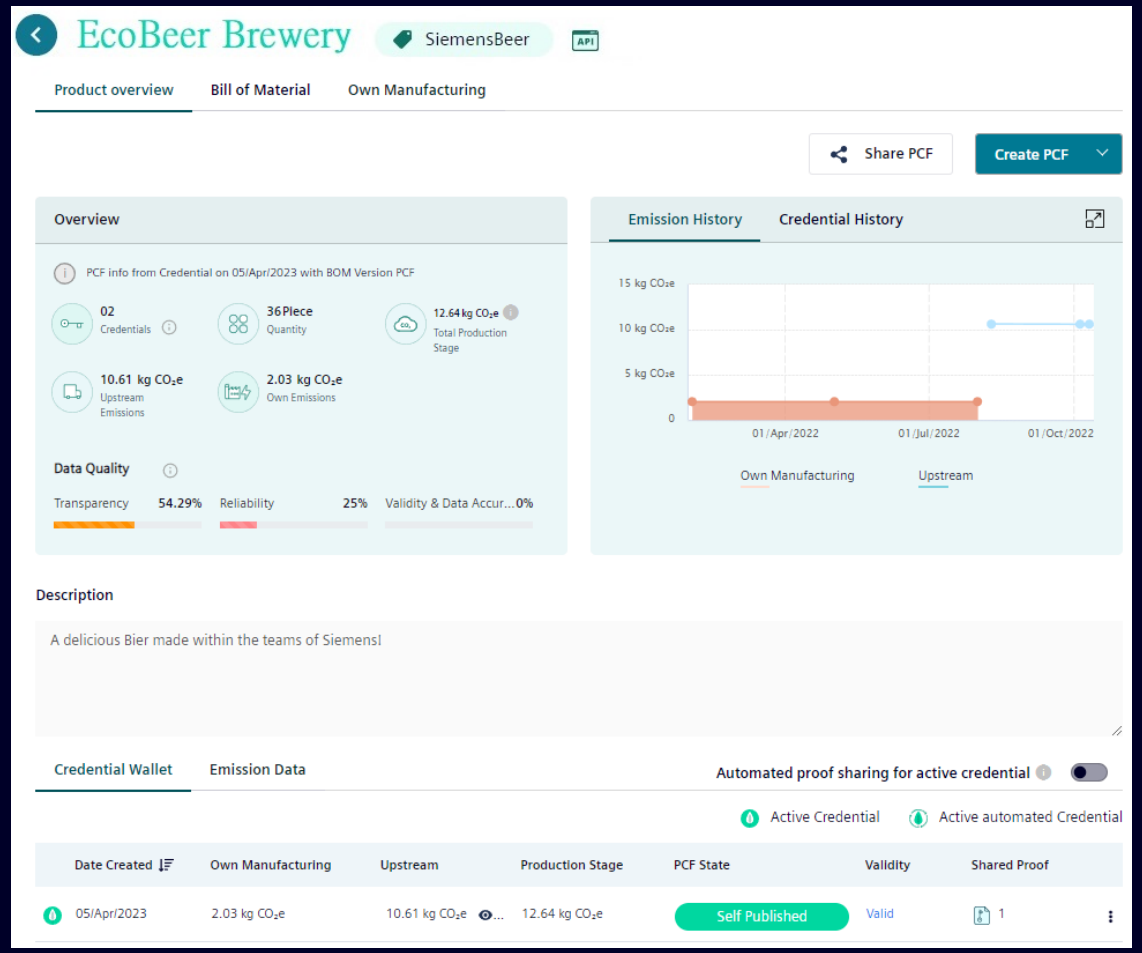
Energy Manager PRO

Focus on own emissions

Contextualized KPIs	Forecast	Transparency	ISO 50001
CO2 emissions per product	Optimized energy procurement and budget planning	Data collection, processing and display in dashboards and reports	Energy Management



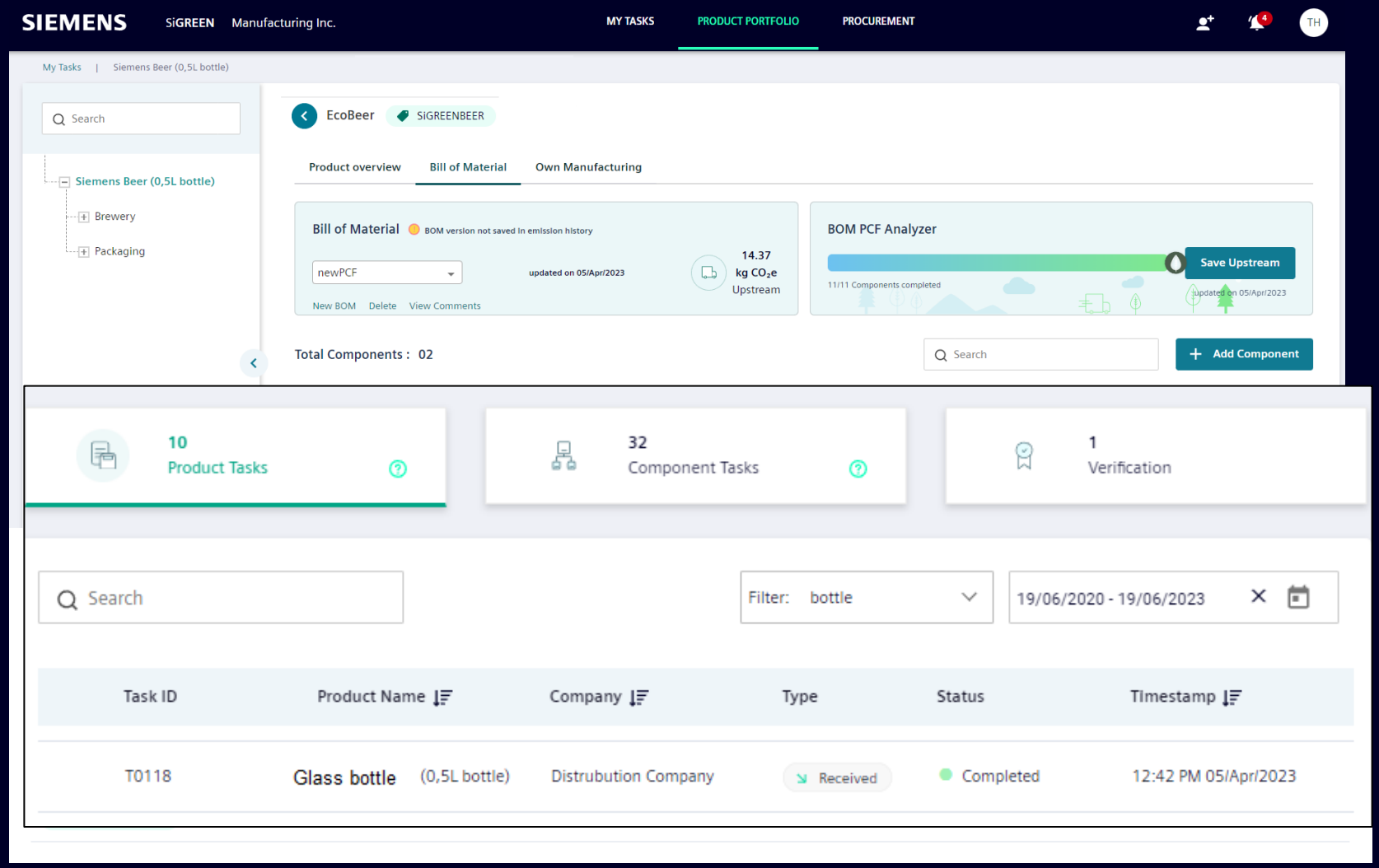
SiGREEN
Product Carbon Footprint (PCF)



SIGREEN provides an overview of the entire PCF of the company

- Upstream emissions
- Own emissions
- Data quality
- Issue history
- Legitimacy folder / history
- Guided by wizards and various implemented standards

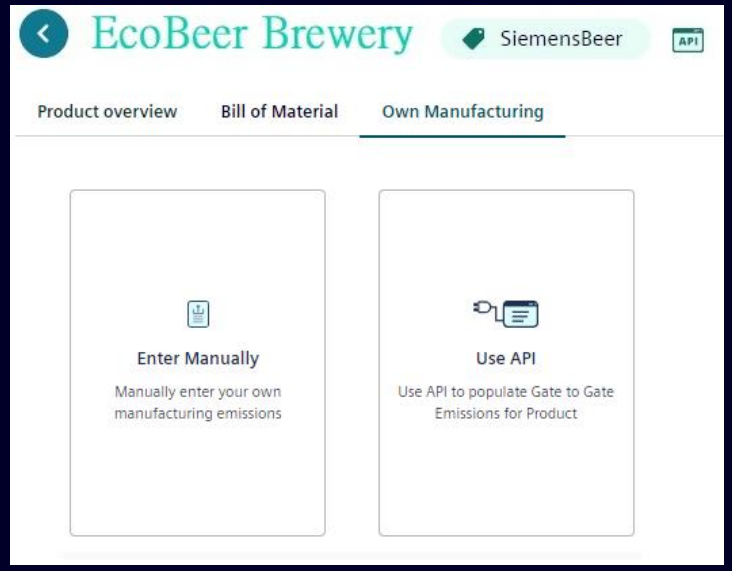
SiGREEN
Product Carbon Footprint (PCF)

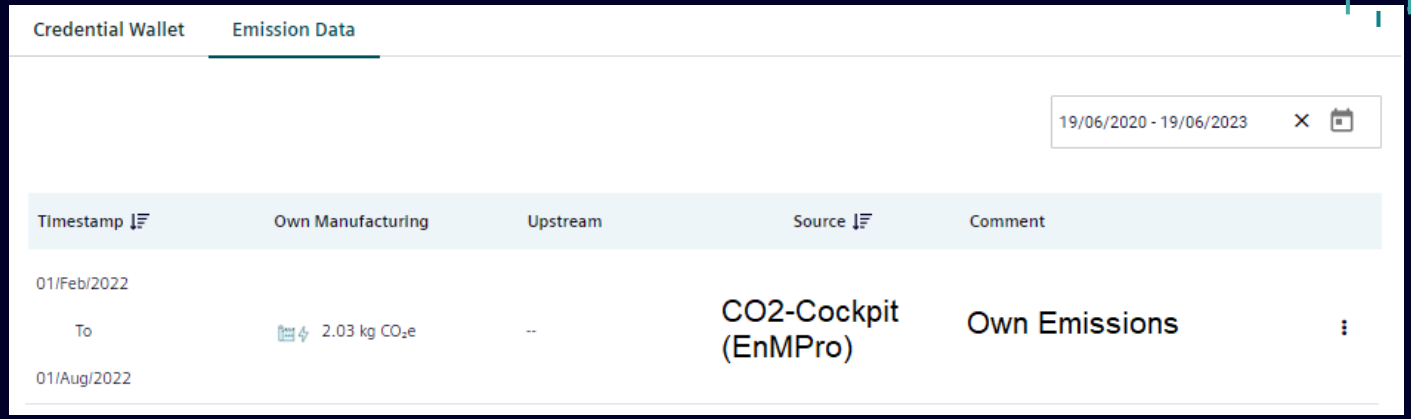


SIGREEN provides an overview of BOM

- Average CO2 emissions per item
- Query data from individual suppliers (glass bottles,...)
- Tasks and status tracking

SiGREEN + Energy Manager PRO CO2-Cockpit
Product Carbon Footprint (PCF)





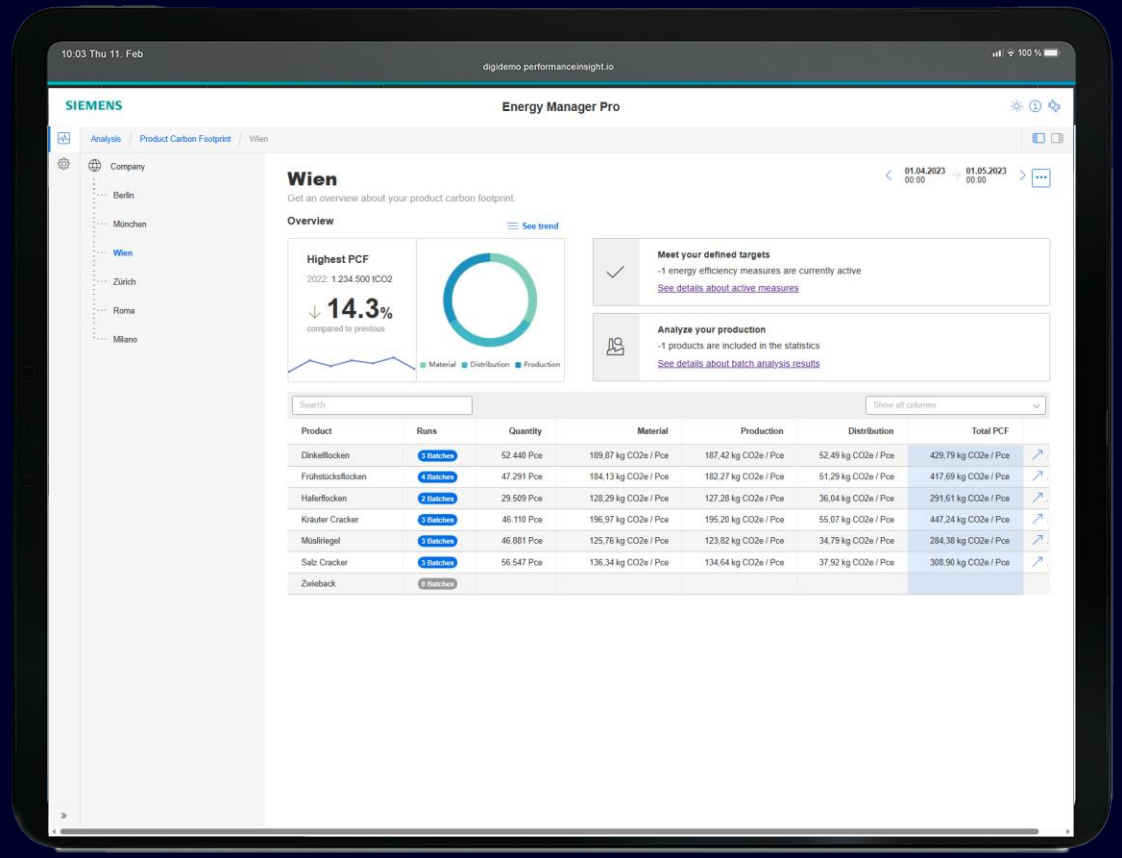
SiGREEN collects data from its own production

- Provision of the API for CO2 Cockpit
- Data processing – average own CO2 emissions per product

CO2-Cockpit delivers data from the production

- Connection via API to SiGREEN
- Provision of batch data from production (field level)

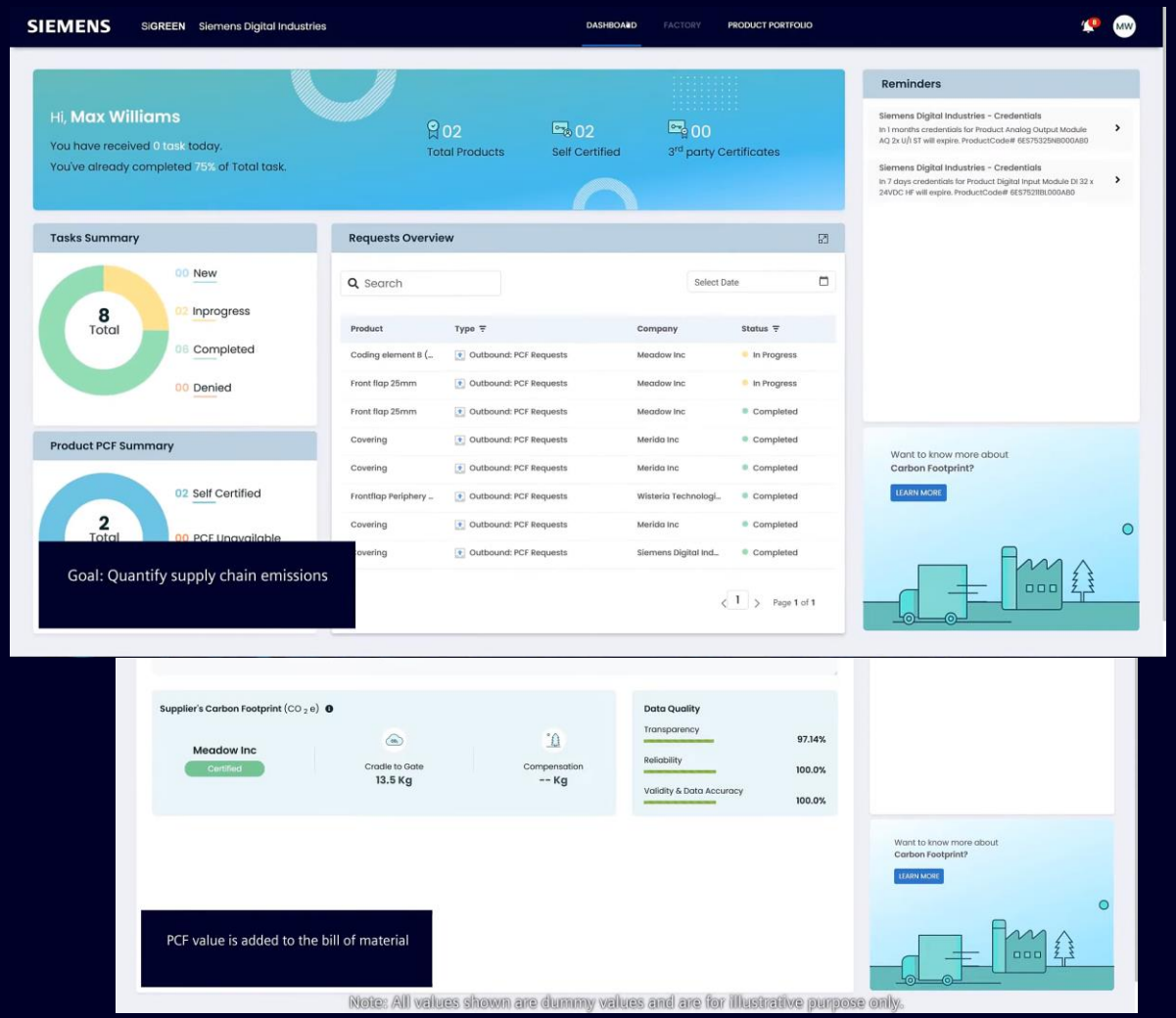
SIMATIC Energy Manager PRO
Own emissions - CO2-Cockpit



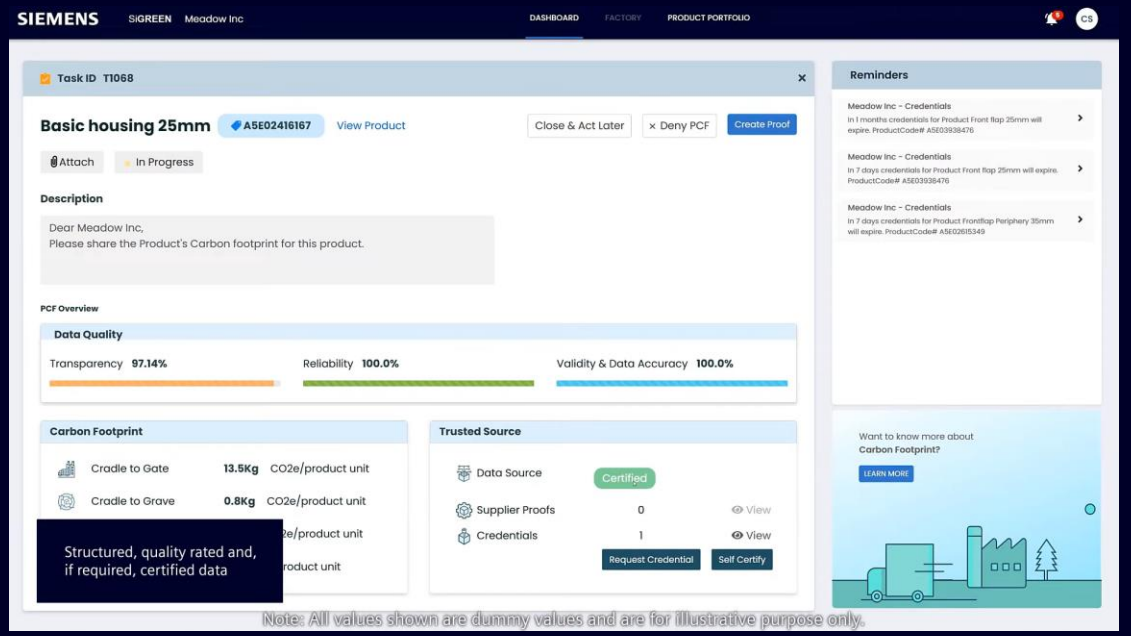
CO2-Cockpit Provides an overview of the material per location

- PCF per product at site level with indication of the average own CO2 emission per production quantity.
- Drill down to each product with information such as CO2/unit p. activity and further drill down to batch level
- Guided by assistants and according to standards

Active management of the product carbon footprint (PCF)
SiGREEN PCF chaining approach

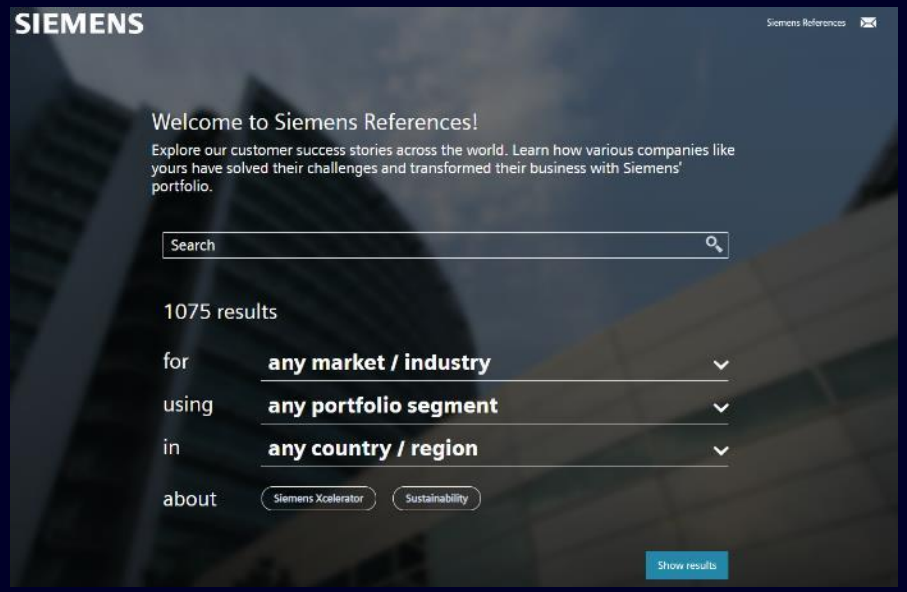


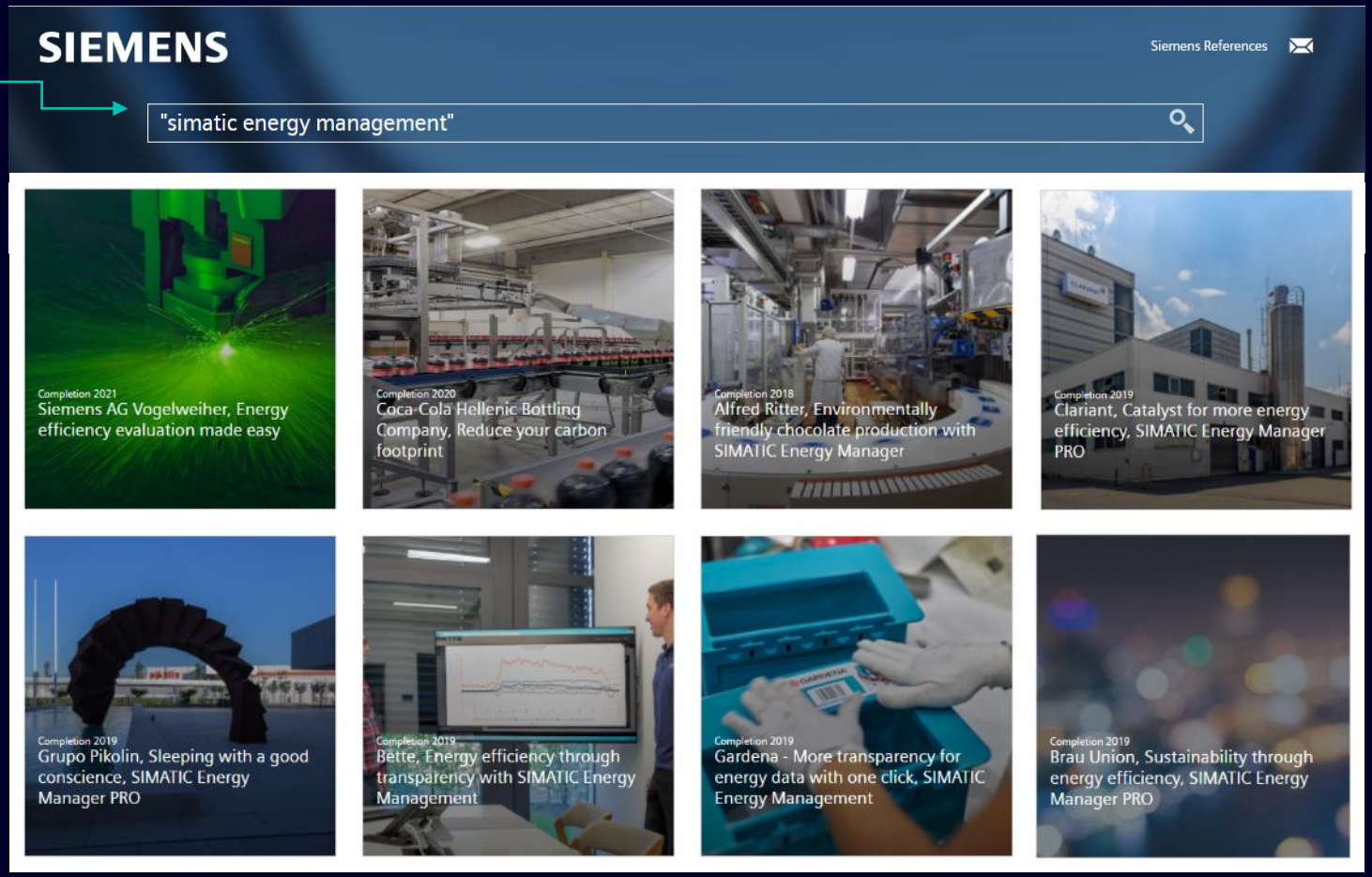
..direct secured and certified data exchange from the manufacturer to the sub-supplier via the SiGREEN platform from SIEMENS
https://youtu.be/b7pqHq5Yc38



References
SIMATIC Energy Management

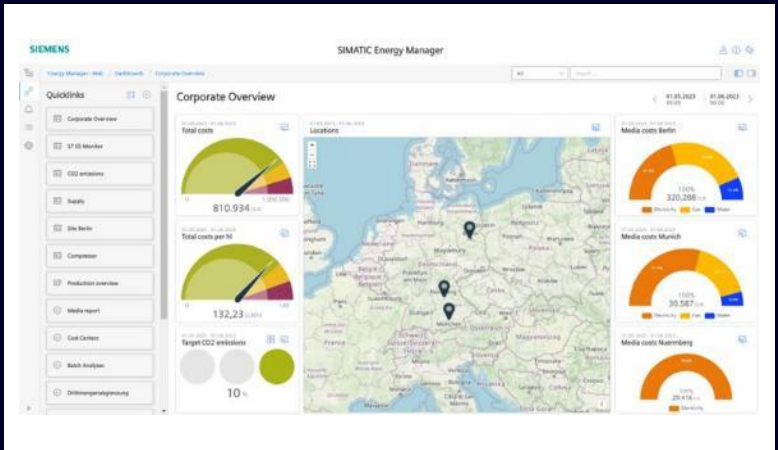
References – click here





Further information

SIMATIC Energy Manager
Online – Demo Server



Webseite for Login-Request

www.siemens.com/energymanager

Energy Management Media System

All information in one place

- Content
  - Product information
  - Tutorial videos
  - Links to application examples
  - Links to manuals
  - References
- Updated continuously

SIMATIC Energy Management

With the modular product portfolio for energy transparency of Siemens throughout the whole company.

Energy measurement

Energy measuring is the base of every energy management system and is ideal for integrating into the automation environment.

Energy data acquisition

Reliable energy data acquisition is a requirement for every energy management system.

Energy efficiency evaluation for machines

The standardized efficiency evaluation enables integration of status-based analysis of energy data into machines without great effort.

Energy analysis

In addition to increasing the efficiency of production, energy analysis must also meet legal requirements. Monitoring, archiving and documentation are important criteria for this.

Customer references

Learn more about the SIMATIC energy management projects.

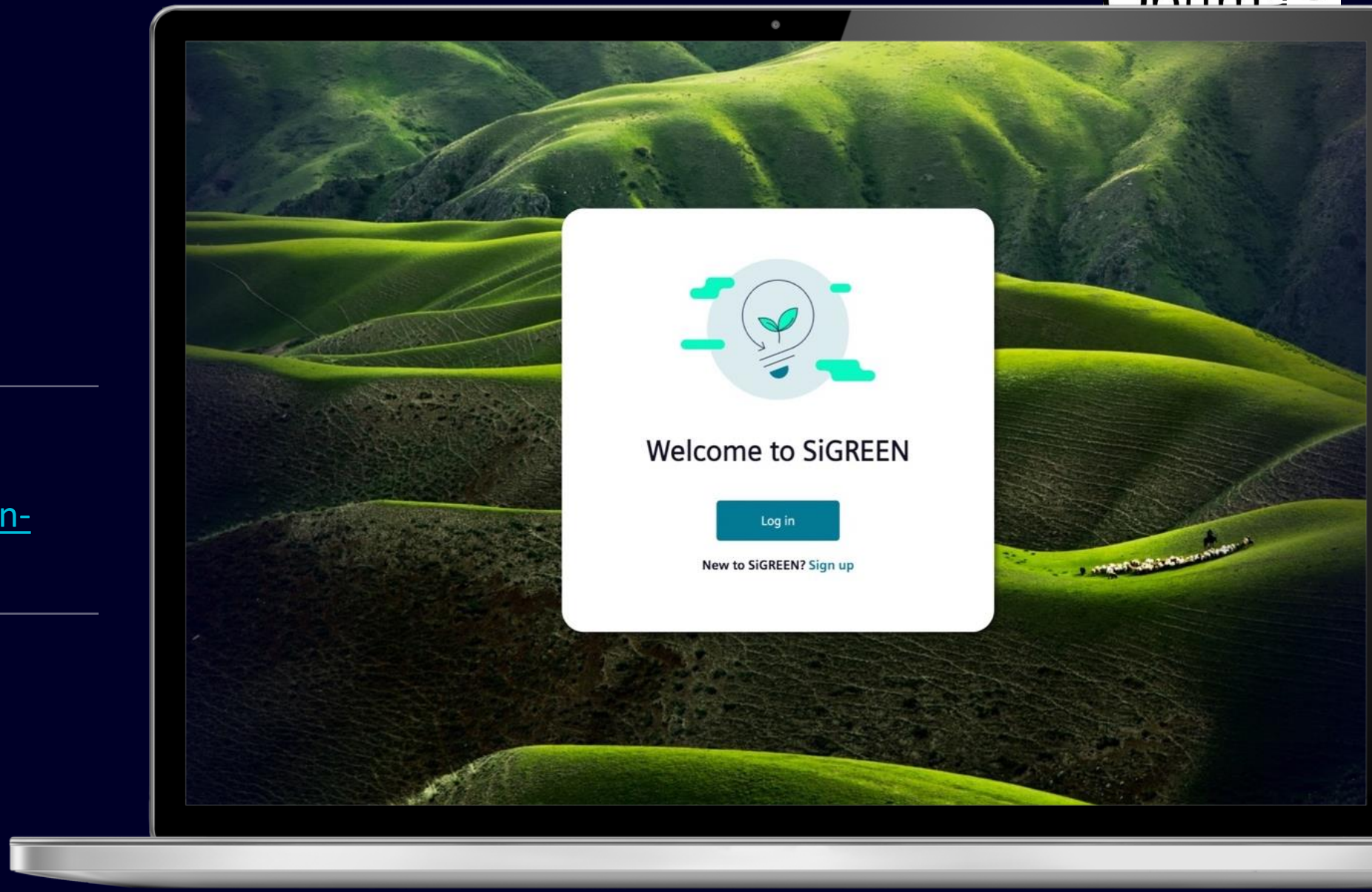
https://support.industry.siemens.com/cs/de/en/view/109765100

SiGREEN
Further Links

Website
siemens.com/sigreen

Demo
https://app-demo-ext.sigreen-playground.siemens.cloud/

Get started
app.sigreen.siemens.com



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SIMATIC Energy Management
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