Energy Manager
on Industrial Edge

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Energy Manager
on Industrial Edge App
Product Overview

Energy Manager on Industrial Edge
Transparency - Obtain the greatest value from data

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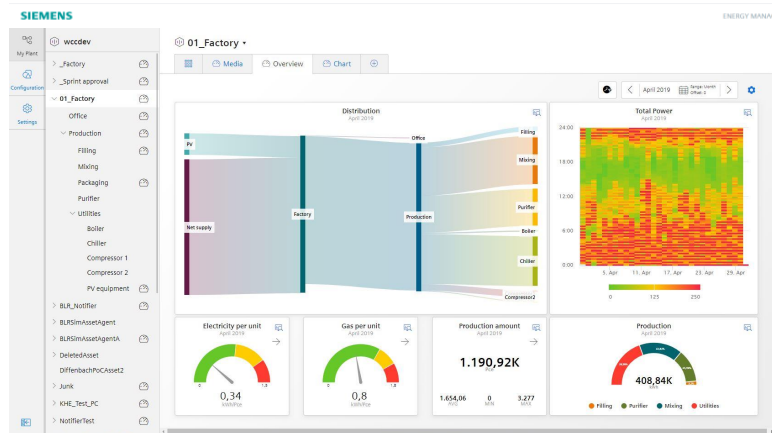
The Energy Manager allows to keep track energy consumers. No matter if we talk about machines, lines or whole sites.

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 the complete site

► 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 with detail views for fast analysis

► Support of different widgets (charts, pie, gauge, Sankey, heat map, value, duration curve) to visualize energy performance indicators

Industry focus

Cross industry based on flexible dashboard and KPI calculation

Energy Manager on Industrial Edge
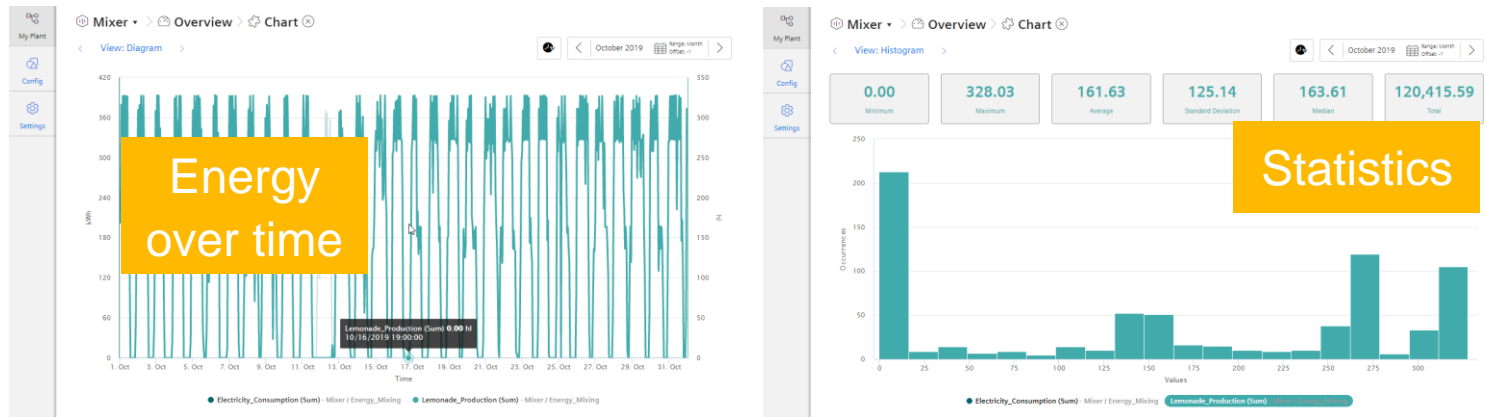## Dashboards - Transfer data to information
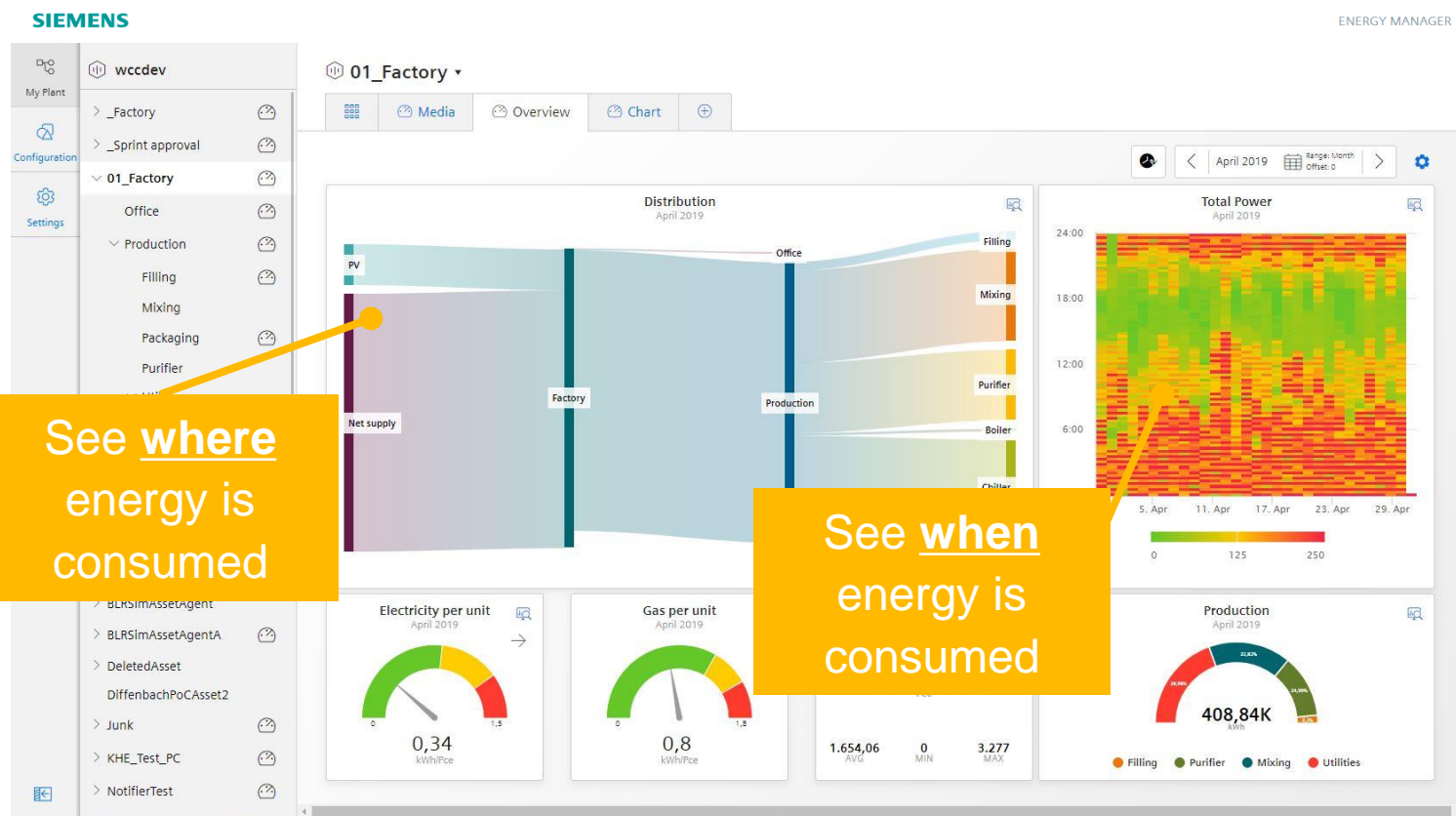
Benefits

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.

Energy Manager on Industrial Edge
Out of the box analytic

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Energy over time

Statistics

y = 0.66 x + 114.45
Formula

See relations and detect anomalies

Benefits

Detailed information for each widget in the dashboard

- The diagram view provides detailed information in a configurable resolution (e.g. 1h) to see any anomalies like peaks,..

- Statistic view provides a histogram for each parameter including the statistic. (min, max, average, median, standard deviation and sum)

- Regression view provides the possibility to display the data in a x-y chart including a trend representing the plant characteristic.
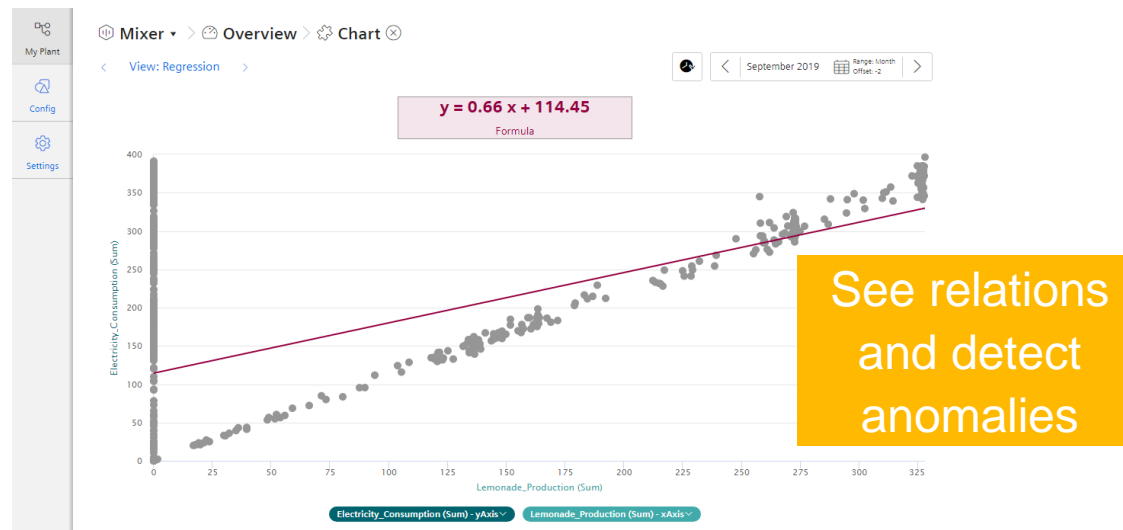
Energy Manager on Industrial Edge
Transparency on machine level

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This is the savings potential

Degree of efficiency

Red: Energy consumption in idling mode
= Energy wasted

Green: Energy consumption in working mode
= Energy used
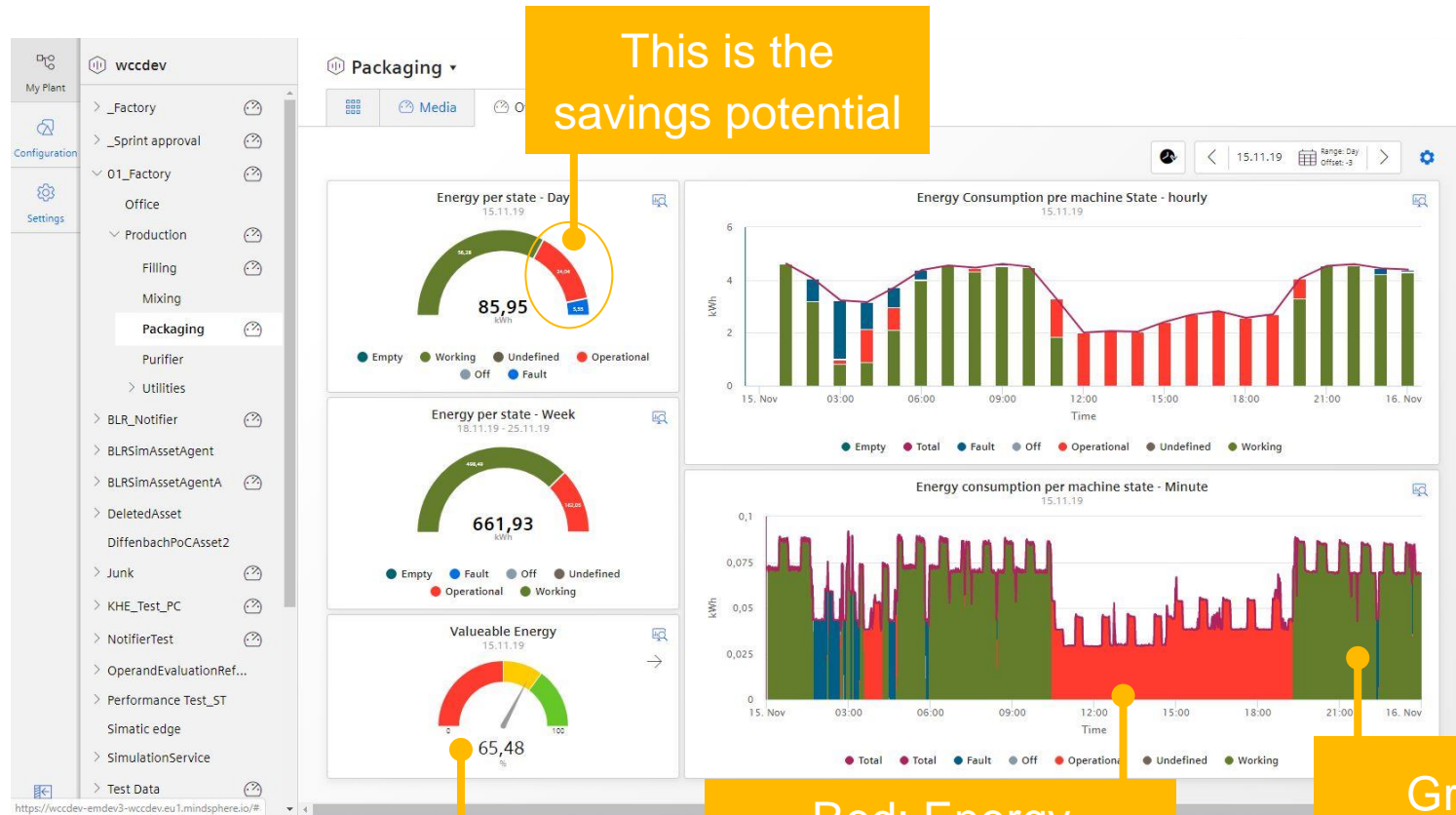
Benefits

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

Energy Manager on Industrial Edge
Energy transparency for all levels in the factory

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Detailed energy consumption per medium (water, gas, elecricity

Summary per media
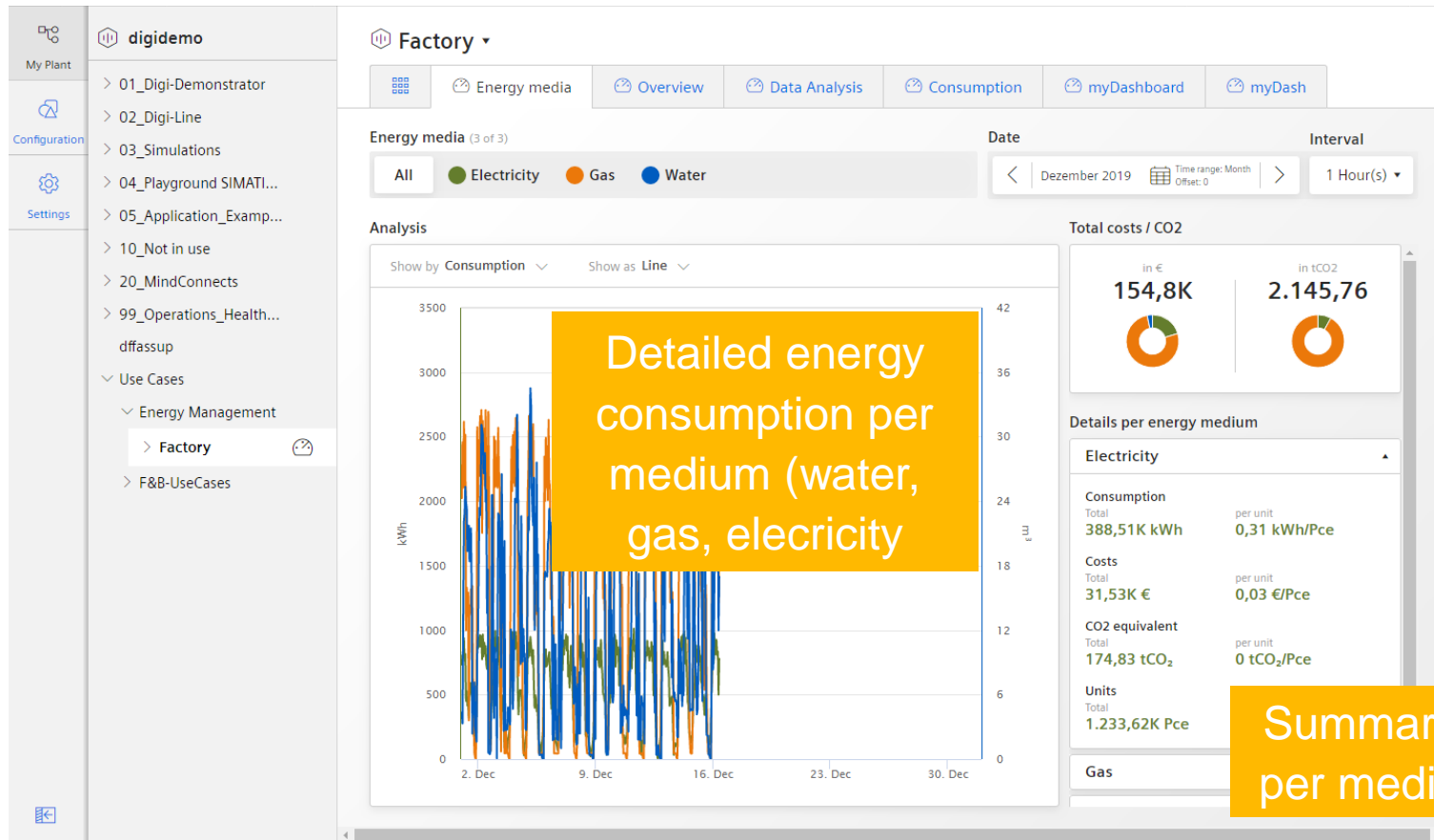
Benefits

Simple configuration providing with a high value

- Details about each consumed media in the chart (consumption, costs, CO_2 and these KPIs per unit)

- Summary of each media display the most important KPIs (consumption, costs, CO_2 and these KPIs per unit)

- The donut charts represents the total costs and the total CO_2 emission and the distribution to the several media

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User Management
Industrial Edge Management

Assign Roles to users & Add Apps to the User Groups
Assign Roles in Industrial Edge Management

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1 Open "My projects" in the Industrial Edge Management
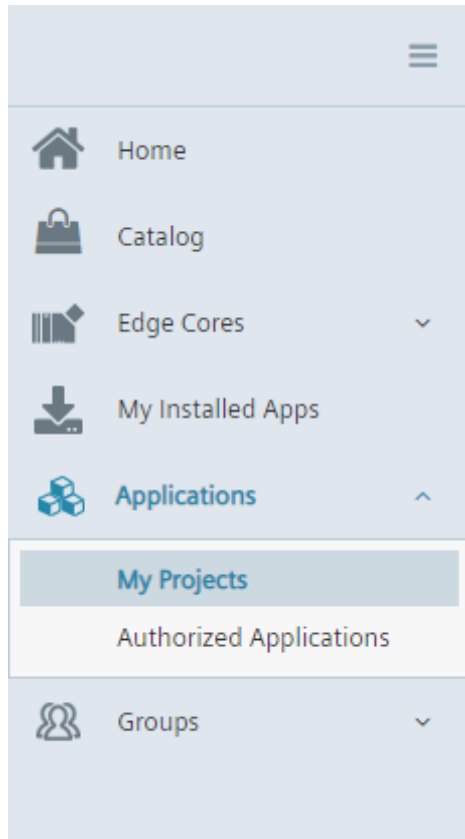
2 Check, that the Data Service is under "My Projects"
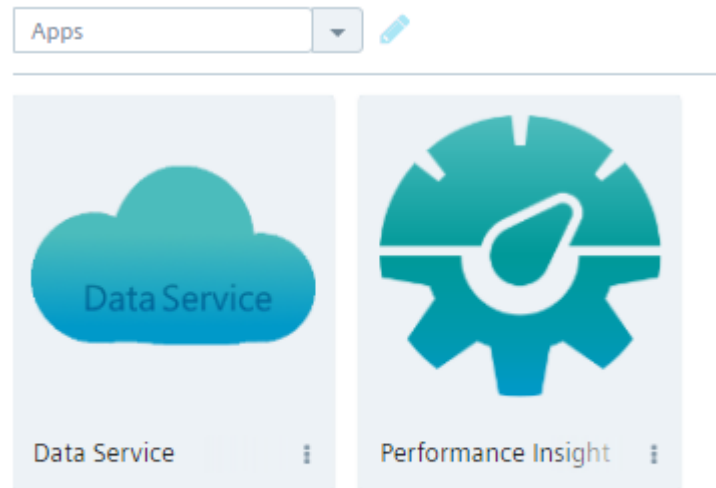
Make sure, that the App is available in "My Projects"

Assign Roles to users & Add Apps to the User Groups
Assign Roles in Industrial Edge Management

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Ingenuity for life

1 Open "My User Groups" in the Industrial Edge Management

Statistics

My User Groups

Catalog

2 Create User Groups and assign the roles

Industrial Edge Management

+ Create User Group ?

+ Add Application   👤+ Invite   👥 M

Create User Group   ? ×

Name
app.Demo

── Role ──────────────────────────────
app.co-admin   ⌄

app.co-admin
app.manager
app.user
device.co-admin

• app.uninstall
• app.update
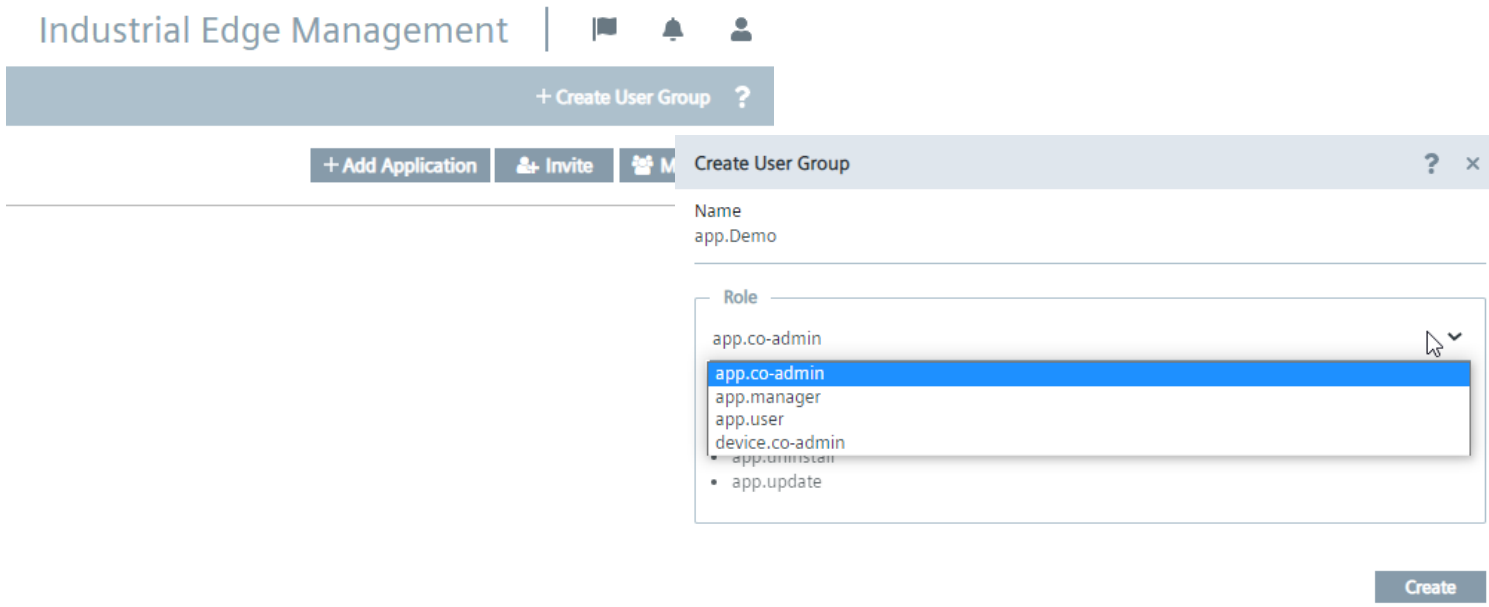
Create

A user with tenant admin privileges can assign the appropriate app to a Industrial Edge user

Following steps are required:
Open "My User Groups" in the Industrial Edge Management

• Create a User Group

• Admin role: app.co-admin

• User role: app.user

Assign Roles to users & Add Apps to the User Groups
Add Apps to the User Groups

3 Add the Application to the User Groups

+
Add Application

Click **?** for help.

Add Application to User Group - app.demo   ✕

☐ Applications

Notifier

✓ Performance Insight

SIMATIC Flow Creator

Add
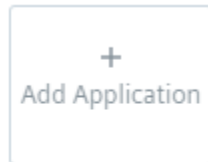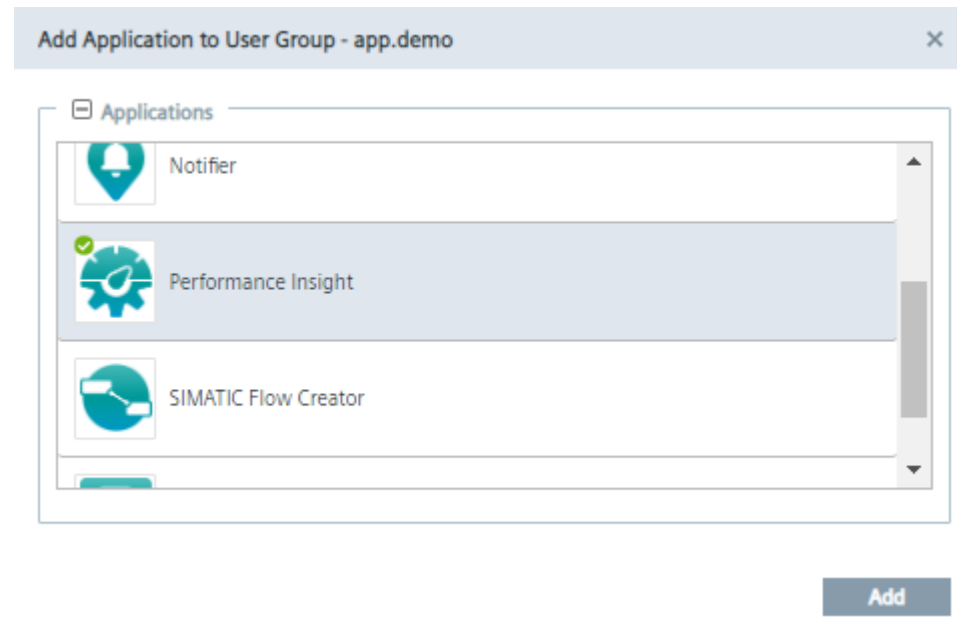
The Apps must be available in "My projects"

- Add a new App

- Select the App from the selection

Assign Roles to users & Add Apps to the User Groups
Add Apps to the User Groups

4 Invite the User to the Group

Industrial Edge Management

+ Create User Group ?

+ Add Application &+ Invite Members

Invite to User Group - app.Monitor ✕

Email +

Email	Action
test@test.com	🗑

Invite

Invite the members to the Group

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Install and start the Apps on the Unified Comfort Panel
Overview

Install the App on the Unified Comfort Panel
Install Offline

1 Click the "Install Offline" Button

2 Browse the *.app file
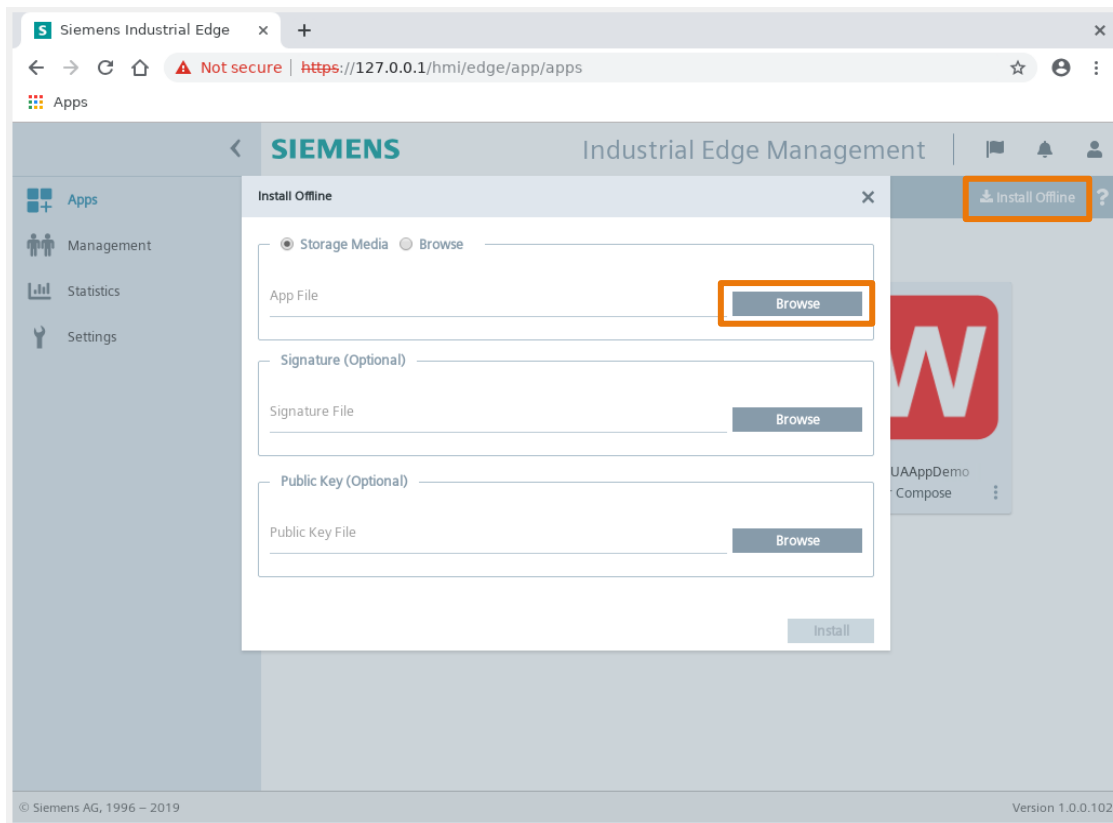
To install the App on the Unified Comfort Panel you need to save the *.app file on the USB Stick and plug it into the slot

- Click on "install Offline"
- Browse the *.app File

Install the App on the Unified Comfort Panel
Install Offline

3   Select the *.app file

4   Open the *.app file
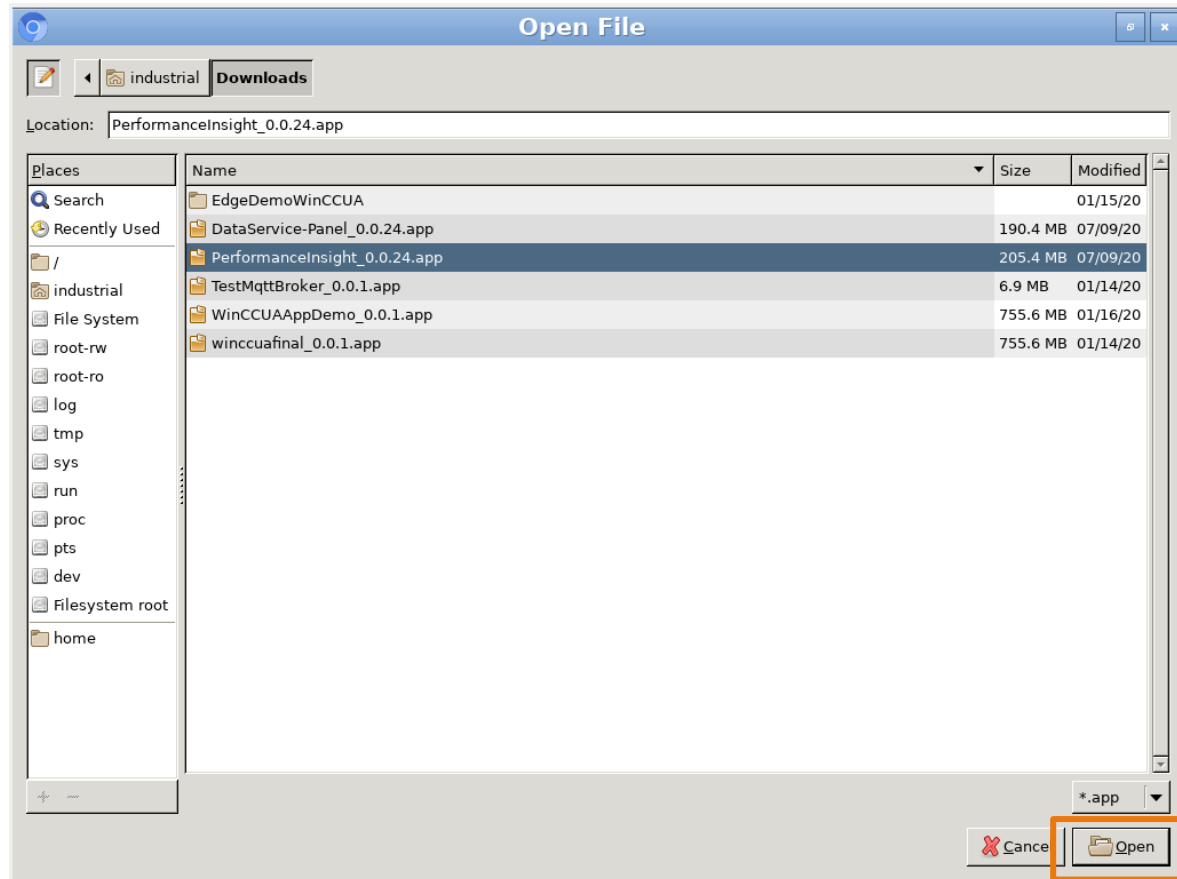
To install the App on the Unified Comfort Panel you need to select and open the *.app file.

Install the App on the Unified Comfort Panel
Install Offline

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5 Install the *.app file
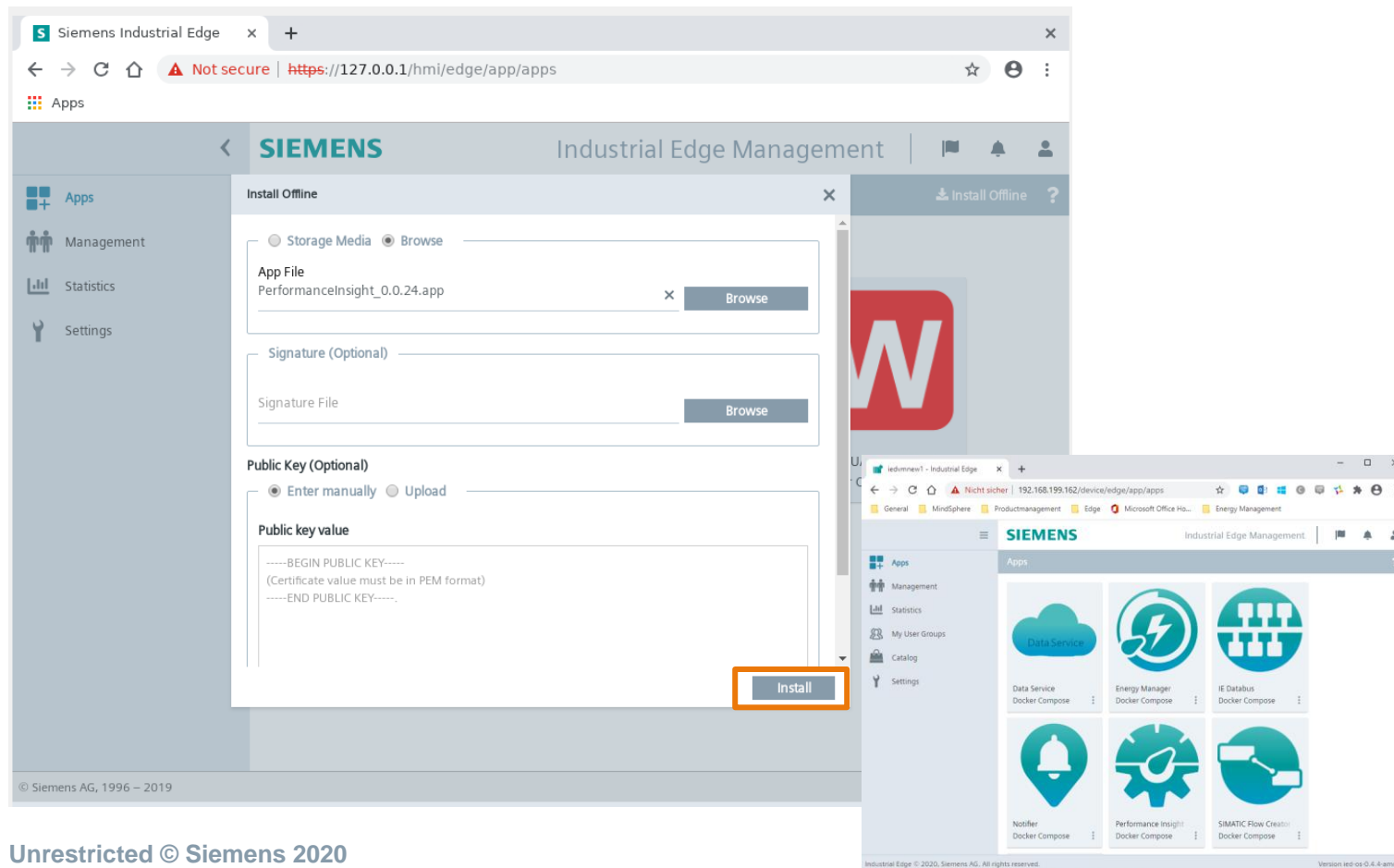
To install the App on the Unified Comfort Panel you need to install the App on the UCP.

After the successful installation, the App Home screen appears

Start the App on the Unified Comfort Panel
Start the App

6 Start the App

To start the App, go to the "Management" view and start the App.

User Management
Unified Comfort Panel

Add Users to the Panel and open the Edge Management
Add Users to the Panel

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1 Create the User in the TIA Portal project

2 Download the project to the Panel

3 Open the SIMATIC Edge on the Unified Comfort Panel

SIMATIC HMI Unified Comfort

Apps \ SIMATIC Edge

SIMATIC Edge

☑ Enable SIMATIC Edge

Open edge management
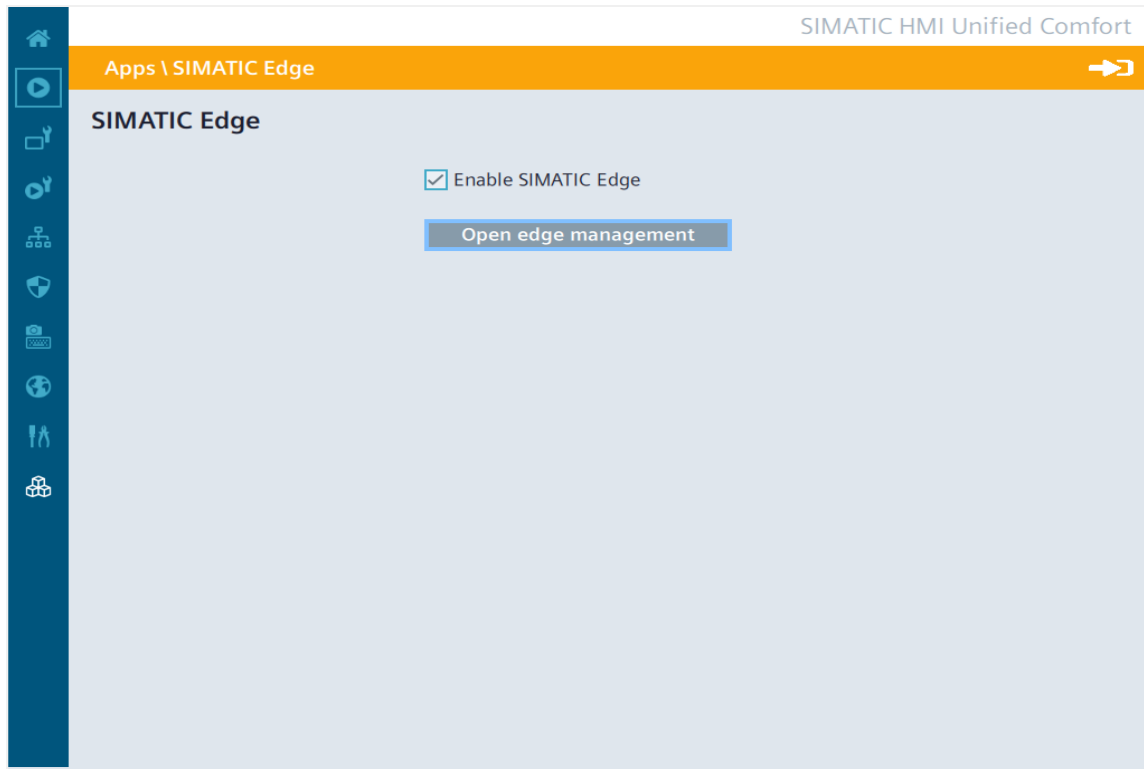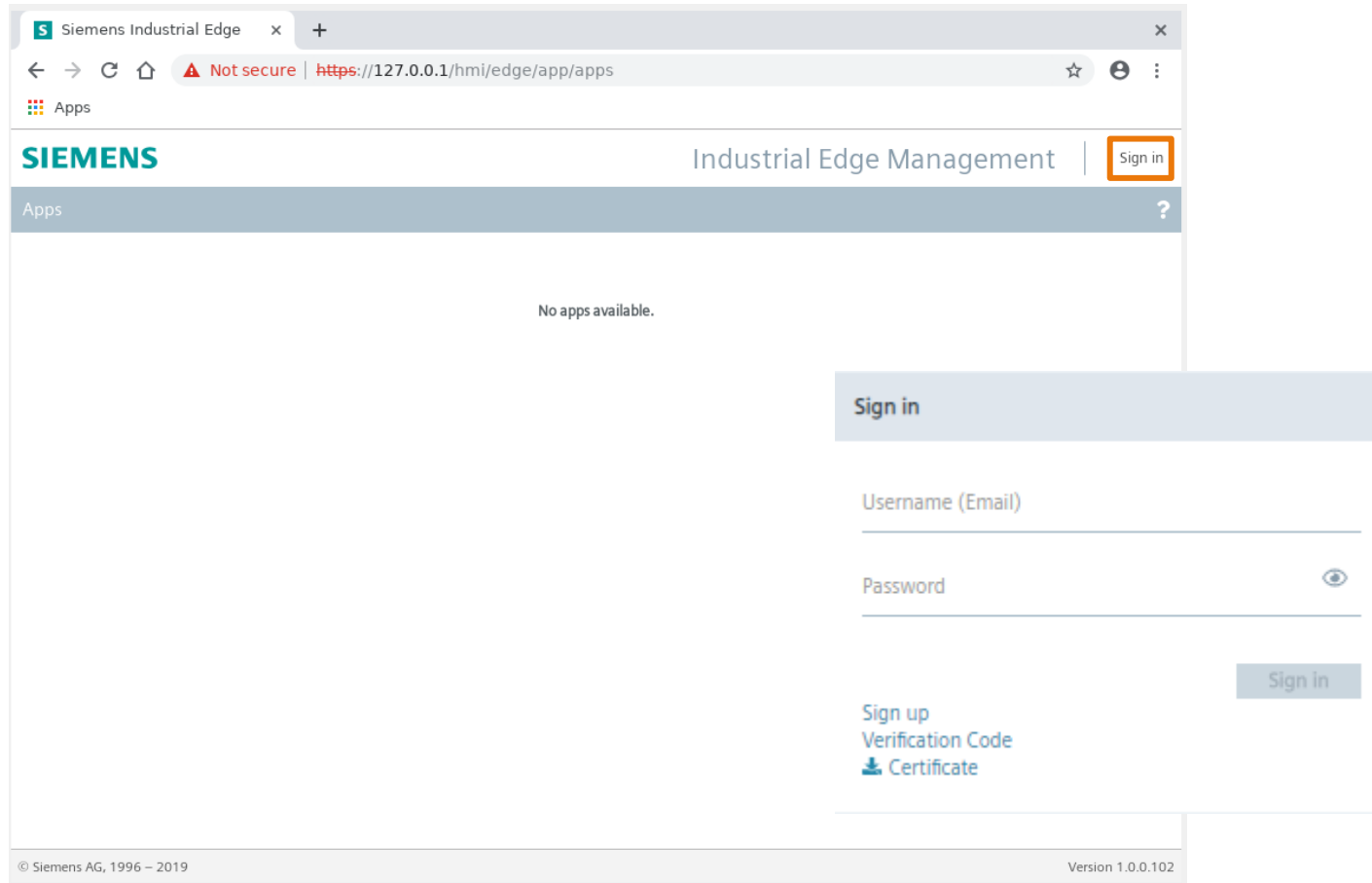
The Users for the Apps on the Unified Comfort Panel need to be created in the TIA Portal project.

The Industrial Edge Management is opened via the Board.

Add Users to the Panel and open the Edge Management
Login to the Industrial Edge Management

4 Login to the Unified Comfort Panel

The Users created in the TIA Portal project are the same Users that the apps on the Unified Comfort Panel work with.

User Management
Energy Manager

Energy Manager on Industrial Edge
Settings

Module "Settings"

- The topics as follows can be addressed in the settings area

- User information

- Usage information

- User list (only visible with admin privileges)

Energy Manager on Industrial Edge
Settings/ User Information

Module "Settings/User information"

- The user gets following information:

- User information

- Selected language

- Selected locale defining the data/time format and the separator

- Roles for usage of the app (admin or user)

- User has the possibility to deregister from the app

Page 23

Energy Manager on Industrial Edge
Settings / User list

Module "Settings/User list"

- After first login, user information is stored in the app data base.

- The app administrator gets an overview of all registered users and has the option to edit these users.

Data Analysis
"My Plant "

Energy Manager on Industrial Edge
My Plant / Energy media dashboard

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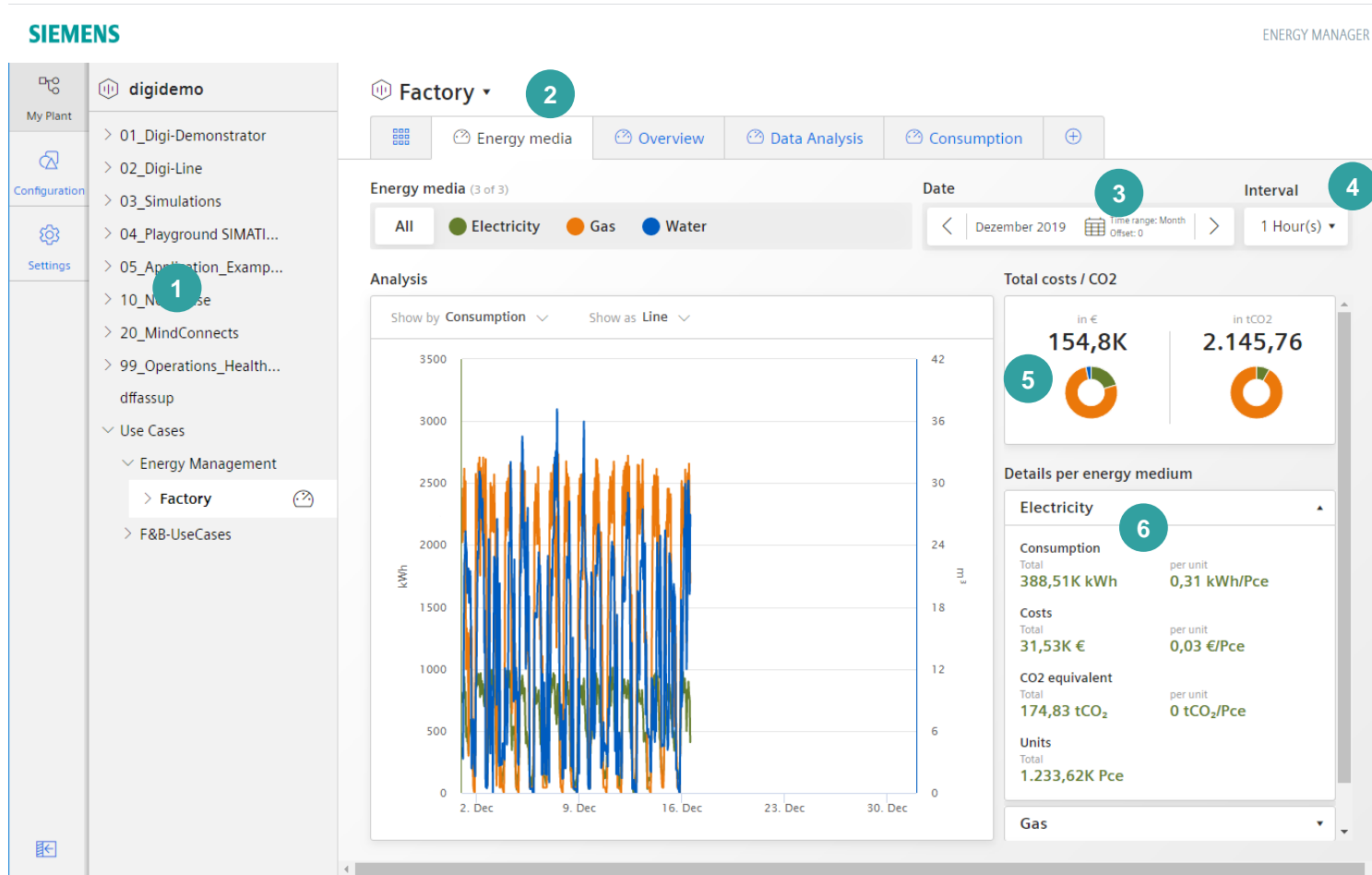
1. Asset model (as defined in the data service)
2. Pre defined Dashboard Media Analysis
3. Dashboard time picker
4. Interval in which the data is displayed
5. Balance for total costs and total CO_2 emission
6. Balance for one individual media

Energy Manager on Industrial Edge
My Plant / custom Dashboard

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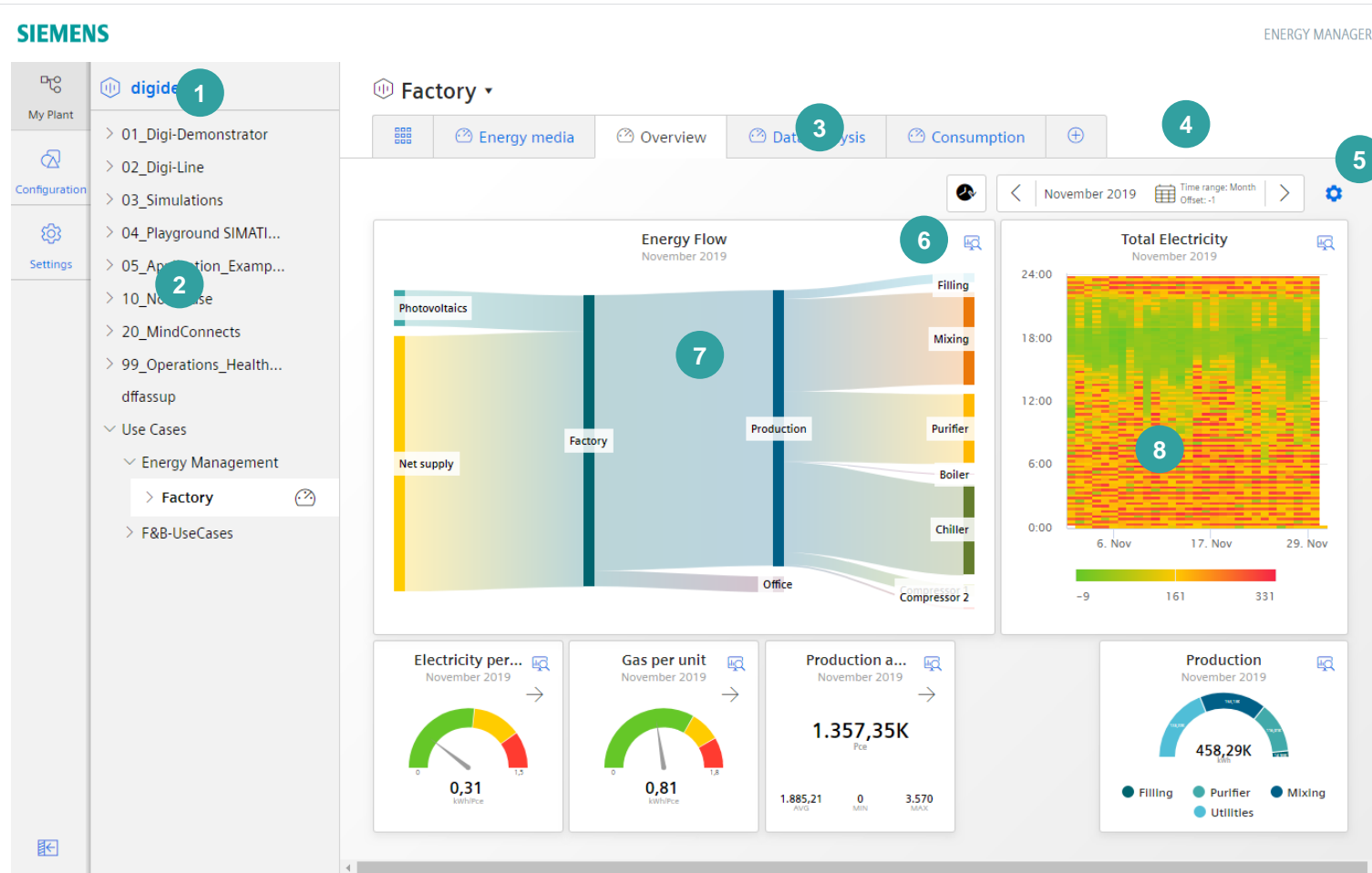
1. IOT Value Plan Name (Tenant)
2. Asset model (as defined in the MindSphere asset manager)
3. Up to five Dashboards per Asset
4. Dashboard time picker
5. Change to Dashboard edit mode
6. Open Detail view for the widget
7. Sankey Widget
8. Heat map Widget

Energy Manager on Industrial Edge
Dashboard (edit mode)

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In Dashboard edit mode the user can:

- Configure the Dashboard settings (name, time picker)

- Add, modify or delete widgets

- Change the size of the widgets

- Move widgets

Energy Manager on Industrial Edge
My Plant & Dashboard (detailed view)

To open the "detailed view", click on the icon in the right top corner

Energy Manager on Industrial Edge
My Plant & Dashboard (detailed view)

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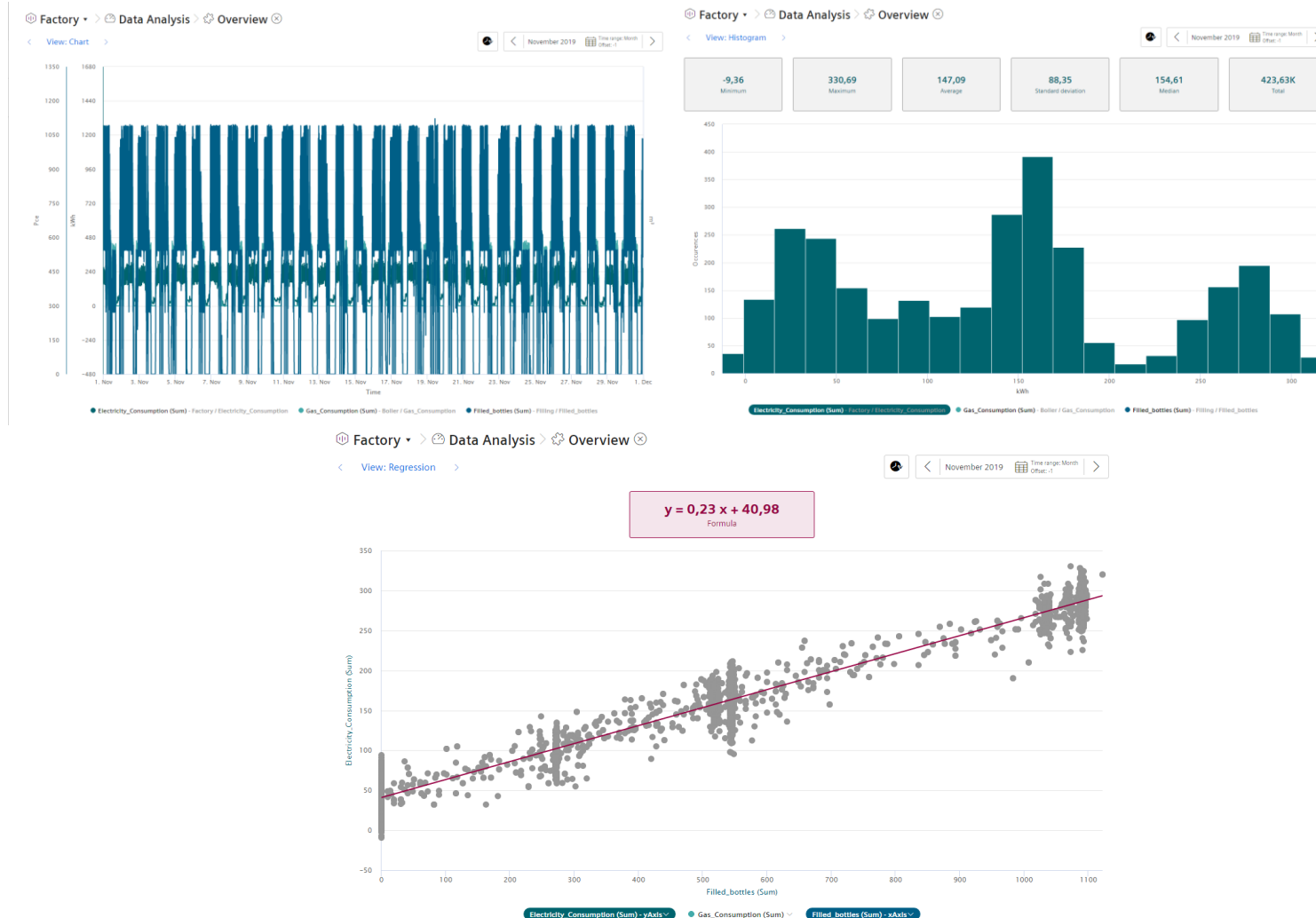
The following detail views are available

- Main view in full screen for widgets where it provides added value (Chart, Heatmap, Sankey)

- Chart view

- Statistic / Histogram

- Regression analysis for widgets holding more then one parameter

![SIEMENS Ingenuity for life]

General settings
"Configuration/Status mappings

Energy Manager on Industrial Edge
Configuration / Status Mapping - Overview

List of all status mapping tables

- Admin Users can add, modify or delete a status mapping table which is used in Gantt chart widgets.

Energy Manager on Industrial Edge
Add or modify status mapping table

Add or modify a status mapping table

- Admin users can add a status with a color, a value, a label and optionally a description.

- If no match between the received value and the definition in the status mapping table is given, a state "undefined" with color white is used.

- User can change the order in the status list to define the order in the Gantt chart detailed view.

General settings
"Configuration/Energy media

Energy Manager on Industrial Edge
Energy Media configuration

List of all configured media

- Admin Users can add, modify or delete a energy media

- The media is defined by a name, a unit of measure and a color

- It is used in the media analysis

General settings
"Configuration/KPI Type"

Energy Manager on Industrial Edge
KPI Type

List of all KPI Types
Admin Users can add, modify or delete a KPI Type

Note:
A KPI Type can only be deleted if there is no linked KPI Instance available

Energy Manager on Industrial Edge
KPI Type to reuse the algorithm several times with less effort

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A KPI Type is defined by its Name, its unit of measure and its formula
Within the formula the user can add operands, constants and calculation operations
Example:
"Valuable energy" = Working / Total *100
The name of the operands can be changed as well. An operand can be copied to be used several times in the same formula.
Operands are placeholders for the real variable assigned in the KPI Instance.

Configuration in My plant
Asset configuration for media analysis

Energy Manager on Industrial Edge
Asset configuration - Settings for media analysis

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In the Asset Configuration, the admin user can define the settings for the media analysis

- Assign the consumed media and link the parameter representing the consumption as well as the reference for calculating the unit consumption. Optionally, the parameter can also be calculated by summing up the sub assets

- Define the costs and CO_2 equivalent for each individual media in the section "Contract information"

Energy Manager on Industrial Edge
Asset configuration - Define the contract information

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The admin user can define the costs as well as the CO2 equivalents for each media

- The contract consists of a Contract valid from date, a Currency, the costs and the CO2 Equivalent.

- The unit of measure is given by the media in combination with the currency.

- The contract is inherited to all sub assets. The contract for an asset can also be unlinked in case if another setting for the asset including the sub assets is required

Configuration in My plant
Parameter view / Variable Configuration / KPI Instance

Performance Insight on Industrial Edge
Parameter view

In the Parameter view you can see all the Variables of the Assets. And you can see all the KPI-Instances which are created in this asset.

You can edit the Uploaded Variables and the KPI-Instances.

Performance Insight on Industrial Edge
Parameter view – Variable settings

Define additional variable settings

- The admin user can define a new unit, if the unit is not defined well

- The acquisition category allows a classification which is linked to a default aggregation algorithm

- Define if the value is aggregated or not

- If the value is not aggregated, the values are continuously (actual values) transferred to the Data Service when the value changes. The transferred value is valid until the next value is transferred to the Data Service.

- If the value is aggregated, the value represents a period, e.g. 15 minutes.

Performance Insight on Industrial Edge
Parameter view – Variable settings (Counter)

Define the settings for a counter (Acquisition category "Counter")

- Define the installation date/time
- Define the counter constant
- Define the counter type
- Define the overflow behaviour
- Triggerd reset means that the counter starts from 0 without an overflow limit consideration
- If you define the start and end range, the overflow takes place at the overflow limit.
- Define the value at installation and value at replacement if necessary

KPI Instances
Create KPI Instance

To create an KPI instance go to the tab "parameter" in the module "My Plant"

KPI Instances
Different typed and type less KPI Instance

On basis of a KPI type
You can create a KPI-Instance on base of a KPI-Type. This is when you need one calculation in different KPI-Instances.

Without KPI type
When you need the Calculation only one time, you can use a type less KPI. So you don't have to create a KPI-Type.

KPI Instances
Edit / Delete

User can edit the KPI Instances.

It is possible to link the operands to other parameters.

It is also possible to delete the KPI-Instances, when it isn't in use anymore.

Backup Information
Aggregation algorithm - KPI Calculation

Performance Insight on Industrial Edge
Available aggregation algorithm

Algorithm	Description
Average	Calculates the time-weighted average value of the read values.
Min, Max	Minimum, Maximum value in time range
Sum	Summarize all values
Last	Last value in time range
Counter	Counts all positive value changes; Counter difference (last – first value) considering counter resets.
Timer	The Timer calculates the time interval in which the variable was not 0. Unit = milliseconds.
EnergyToPower	A consumption value can be converted into power. This aggregation function can only be selected in combination with the acquisition category consumption value (Energy) and Counter.
PowerToEnergy	Power can be converted into a consumption value. This aggregation function can only be selected in combination with the acquisition category power value (Power).
AmountToFlow	An amount (per hour) can be converted directly into a flow value. This aggregation function can only be selected in combination with the acquisition category amount value (Amount) and Counter.
FlowToAmount	A flow value (amount/h) can be converted directly into an amount value. This aggregation function can only be selected in combination with the acquisition category flow value (Flow).

Aggregation algorithm:

The user can define the aggregation algorithm at each place where the variable can be selected.

- Widget configuration
- Asset media assignment
- KPI Instance configuration

KPI Instances
Consequence of "value is aggregated"

"Counter" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
Calculation example: The calculation period is from 00:10 to 00:50. Result: 1 + 1 + 1 + 1 = 4	Calculation example: The calculation period is from 00:10 to 00:50. Result: 1 + 1 + 1 + 1 = 4

"Average" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
Calculation example: The calculation period is from 00:10 to 00:50. (10 + 20 + 30 + 40) / 40 = 2.5 (average value across the calculation period)	Calculation example: The calculation period is from 00:10 to 00:50. (20 + 30 + 40 + 50) / 40 = 3.5 (average value across the calculation period)

"Min", "Max" and "Last" aggregation functions

"Sum" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
Calculation example: The calculation period is from 00:10 to 00:50. 1 + 2 + 3 + 4 = 10	Calculation example: The calculation period is from 00:10 to 00:50. 2 + 3 + 4 + 5 = 14

What does "value is aggregated mean

- If the value is not aggregated, the values are continuously (actual values) transferred to the Data Service when the value changes. The transferred value is valid until the next value is available
- If the value is aggregated, the value represents a period, e.g. 15 minutes. The timestamp is always at the end of the period

Performance Insight on Industrial Edge
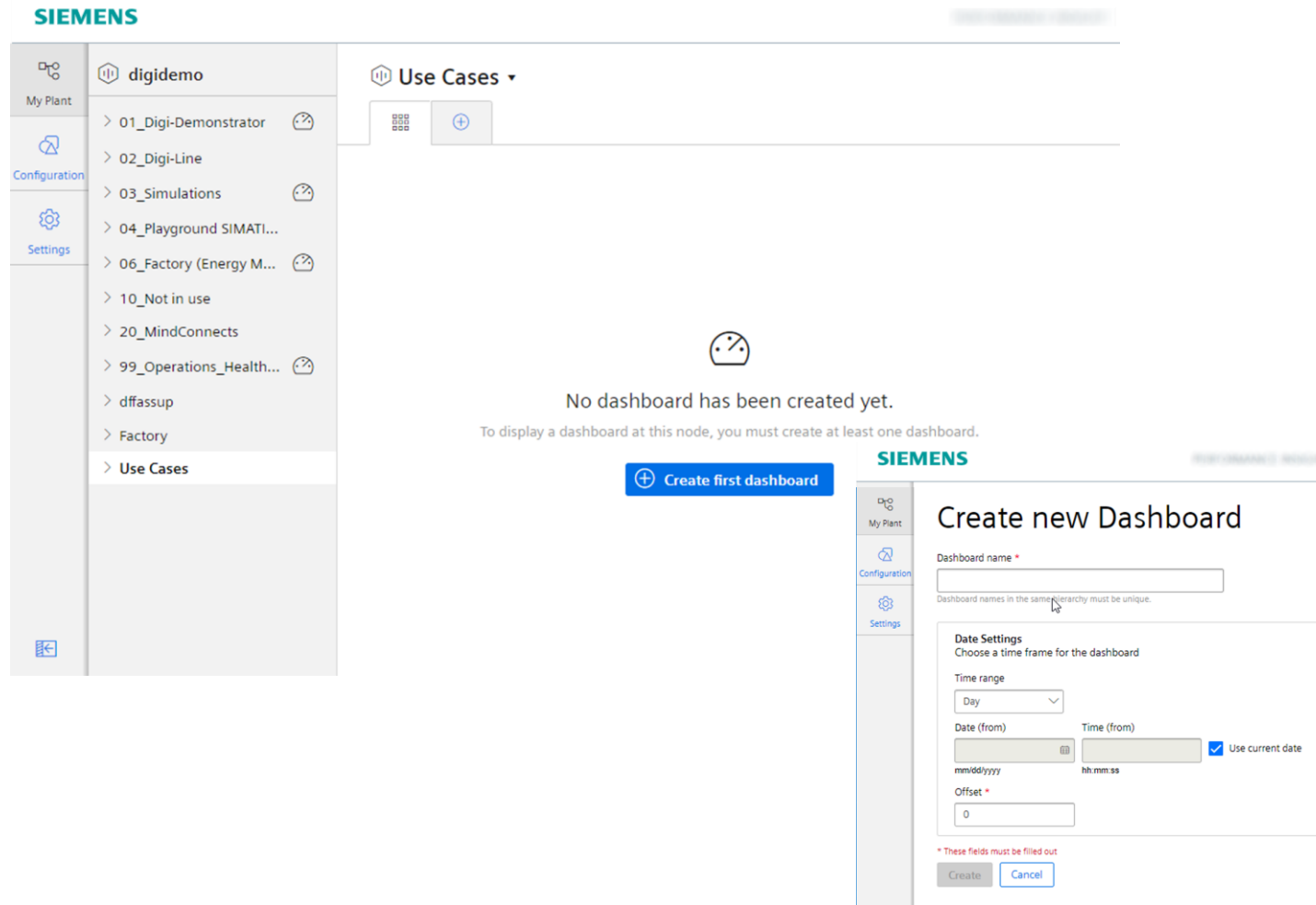# Data reduction algorithm
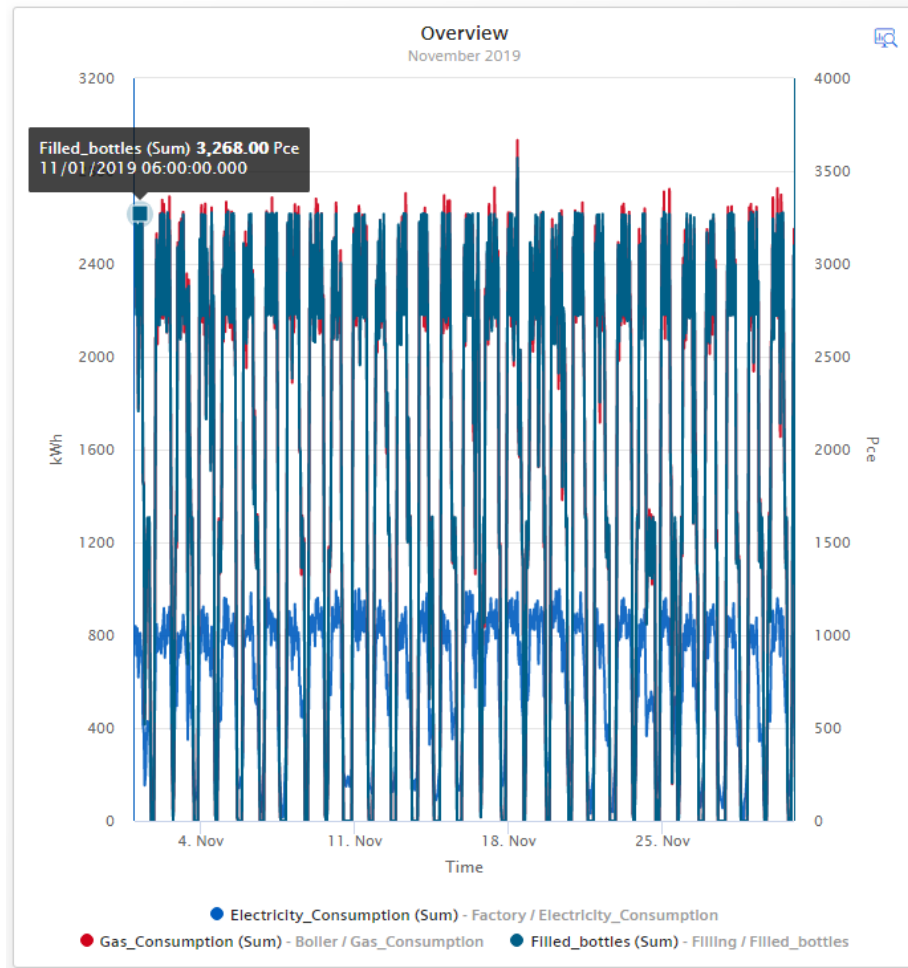
Example scenario:

The user is interested in a large time range with high frequency data

- A variable value is stored every minute in the Data Service. (Values per day = 1440; Values per year = 512640 ~ half million).
- To reduce the amount of transferred data a reduction algorithm is applied which takes the available pixel into account.
- To reduce the amount of data the requested time range is divided into sections (number of pixels). From each of this sections the minimum and the maximum value is calculated and transferred

Dashboard and Widgets

New Dashboard
Add a Dashboard

The plant structure is defined by the Data Service asset model. For each asset you can define up to 5 dashboards

Creating a dashboard:
- Click the button "Create first dashboard" or click the + in the tab.
- Define the name of the dashboard.
- Define the time picker settings. With the Offset you can move the time range to the past.

New Dashboard
Time Picker

Time picker for showing the dashboard in the desired time range
The initial time picker configuration can be defined in the dashboard configuration
Supported time ranges:

- User-defined: the begin & end date incl. time can be defined

- Day: 00:00 – 00:00

- Week: Monday – Sunday

- Month: 1st – last day of month

- Year: January – December

- The last 3 hours, last 7 days, last 14 days, last 30 days

Add Widgets to the dashboard
New Widget
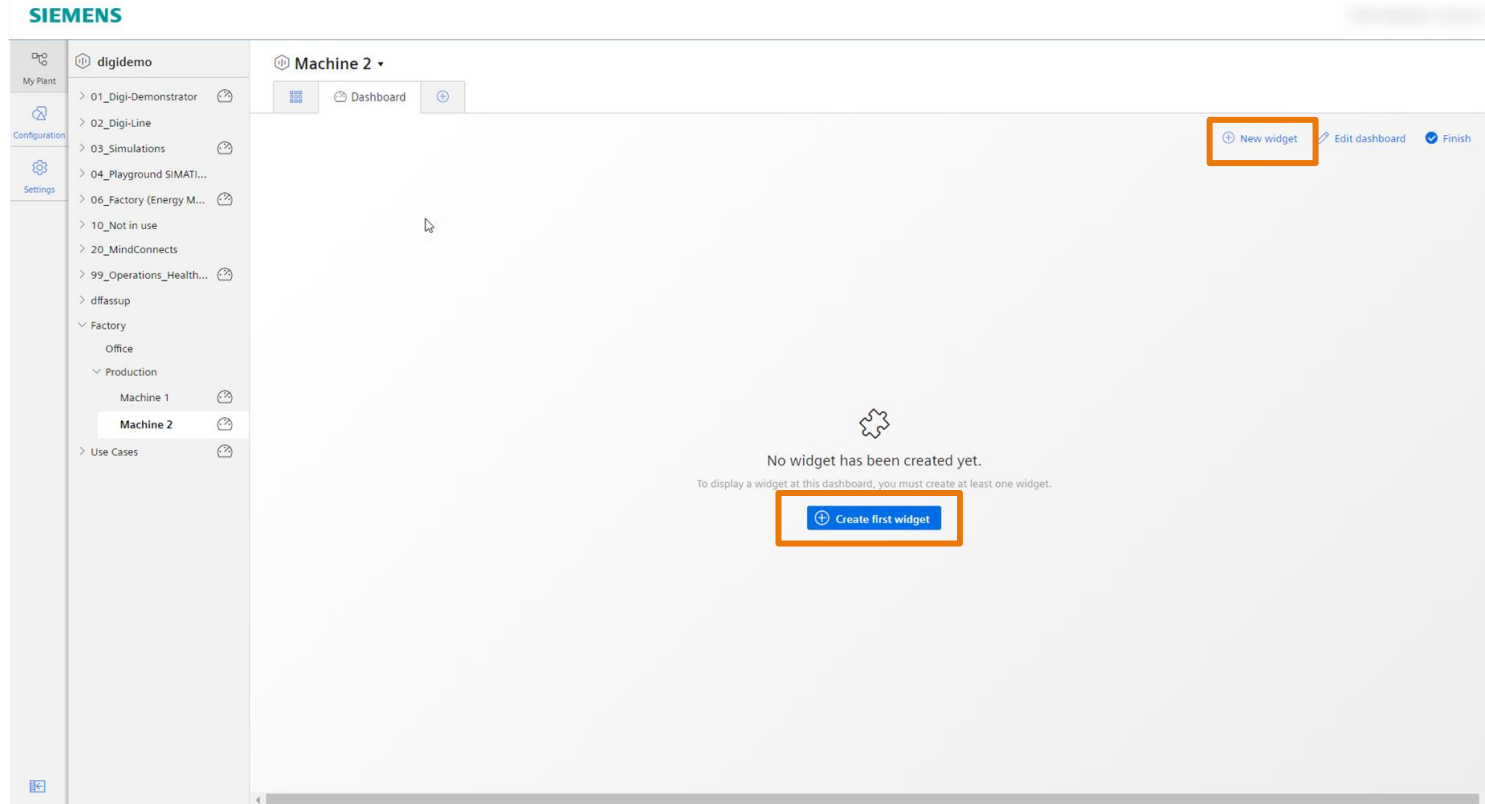
To add a widget press the button "Create first widget" or change to the dashboard edit mode and click the button "New widget"

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✕ Cancel ① Type ② Details ③ Parameter Continue ›

1. Select widget type

Select one of the widget types to visualize your data.

| Diagram | Value | Gantt | Gauge | Pie |

| Heatmap | Sankey | Duration Curve |

My Plant

Configuration

Settings

"Create first widget" or change to the dashboard edit mode and click the button "New widget"

Create the widget:
Select the widget Type
Define the details like name and time picker behavior
Select the parameter which should be displayed
Define the parameter specific settings like limits, color, decimal places or an alternative name
Define the widget specific settings like line type, visibility or if the lines shall be stacked

Add Widgets to the dashboard
2. Define the details

Step 2: Define the details
Enter a unique name for the widget
Define the date/time settings:

- Use the date settings from the dashboard
- Dedicated date & time definition by selecting the time range and optionally an Offset.
- The interval for the time range is used for the KPI calculation or the Variable aggregation

Add Widgets to the dashboard
3. Select the parameter

Step 3: Select parameter
The user can select one or several variables or KPI instances based on the widget type Variable

- Available variables can be selected

- For the variable the user can select the aggregation algorithm. NONE means displaying the raw data which is only applicable in the chart

KPI Instances

- If there is no matching KPI Instance a new KPI Instance can be created

Add Widgets to the dashboard
4. Define the display options

Step 4:
The User can define general settings for each parameter in the Widget:

- Set an alternative label which is used in e.g. the legend

- Set the number of decimal places

- Set the color of the graphs

- Set the lower and higher limits

Add Widgets to the dashboard
5. Define display options

Step 5:

The User can set the display option for each parameter in the Widget:

- Line Type (Line, Spline, Area, Bar, Scatter)
- Visibility
- Stacked

The user can define up to 5 y-axis and can configure the scaling option

- Autoscaling (two blank fields)
- 0 Point scaling (Lower Limit = 0)
- Fix Range (e.g lower limit, 10 upper limit 100)

Widgettypes

Widgettypes
Diagram - Chart widget
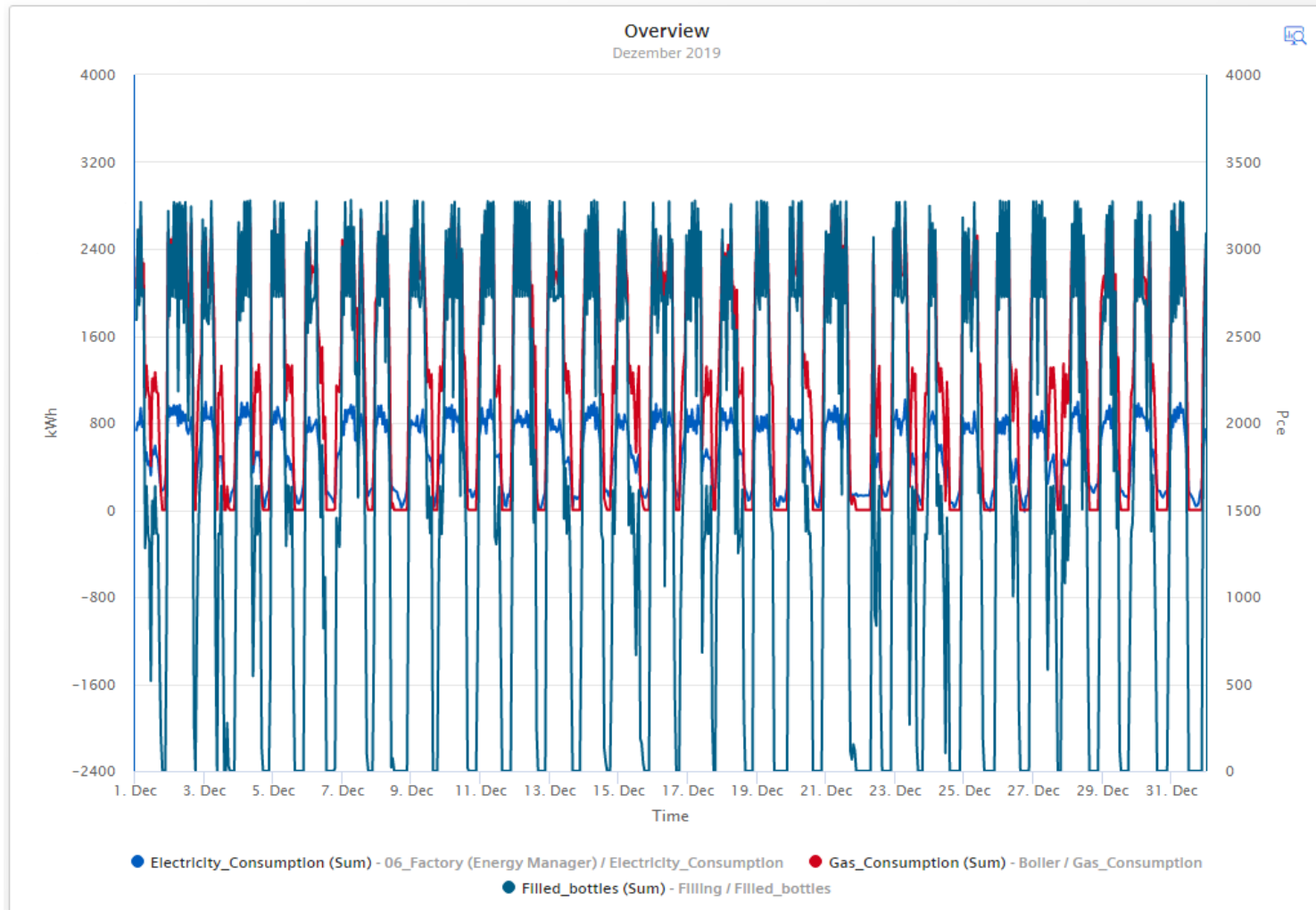
User can perform data analysis by using the functions as follows:

- Changing time range, Using the zoom functionality

- Hide or unhide a graph; show the limits for an individual parameter

- Use the tooltip for the exact value

- Using up to 10 variables and up to 5 Y-Axis

The following detailed views are available

- Chart displaying detailed data

- Histogram including statistic values

- Regression analysis

Widgettypes
Value widget

User overview about the KPI or aggregated variable:
- Display the statistic (Note: The statistic is based on the KPI or variable aggregation based on the interval for the time range)
- The arrow represent the trend of the displayed value compared to the previous period

The following detailed views are available
- Chart displaying detailed data
- Histogram including statistic values
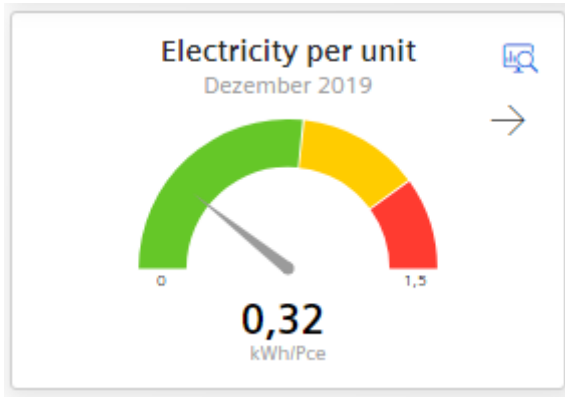
With the Gauge Widget the user gets an overview about higher and upper limits of values

- The user can define the limits for the sections whereby the limits for the parameter are used.
- The arrow represent the trend of the displayed value compared to the previous period

The following detailed views are available

- Chart displaying detailed data
- Histogram including statistic values

Widgettypes
Pie widget
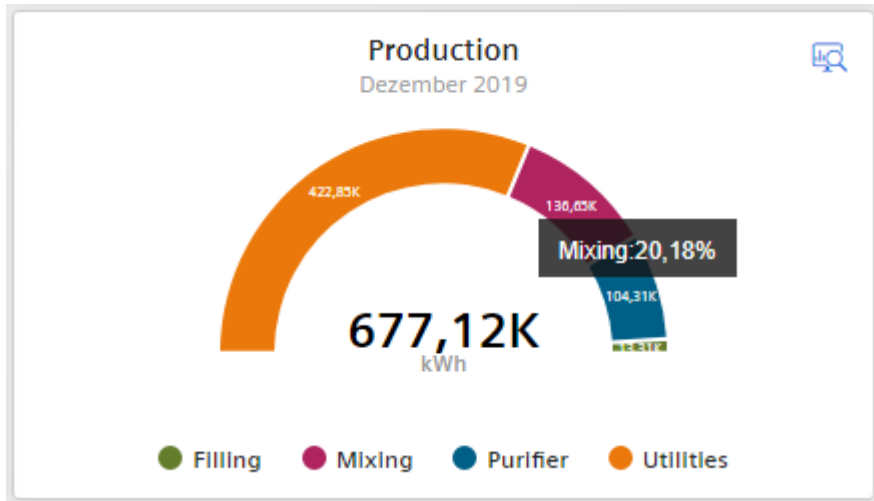
With the Pie Widget the user gets an overview about the distribution of quantities

- With a click on the section the section is highlighted and user gets the corresponding value

The following detailed views are available

- Chart displaying detailed data
- Histogram including statistic values
- Regression analysis

Widgettypes
Heatmap
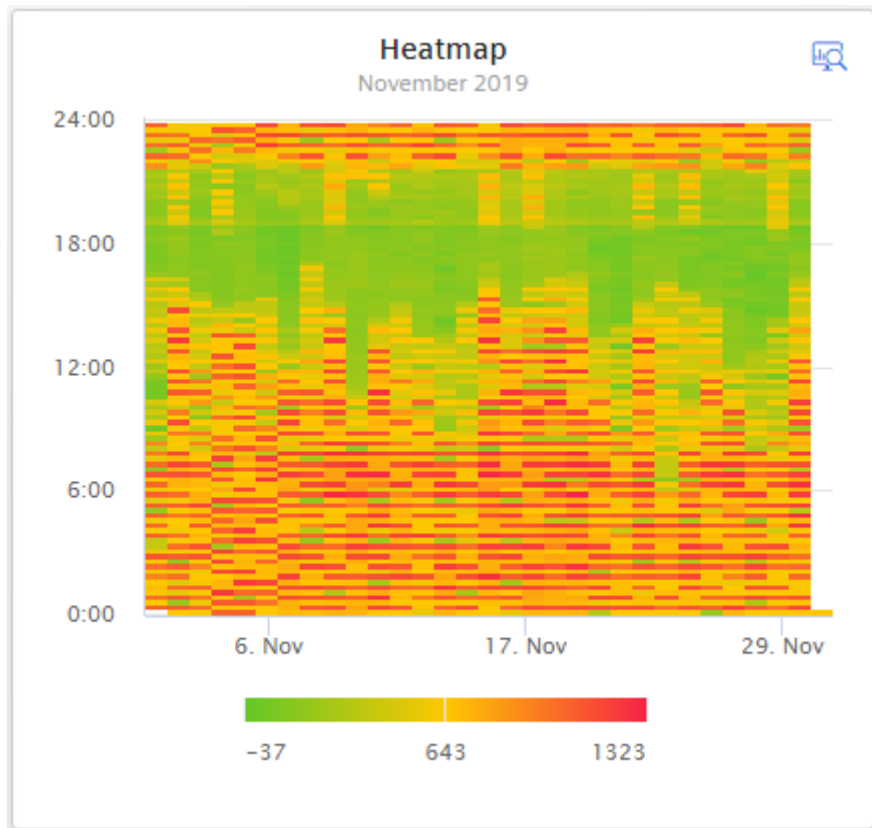
With the Heatmap Widget the user gets an overview about when (time of the day) the peaks appear. The value is represented by a color
- Zoom in to get details
- A tooltip provides the exact value

The following detailed view is available
- Heatmap
- Chart displaying detailed data
- Histogram including statistic values

Widgettypes
Gantt chart

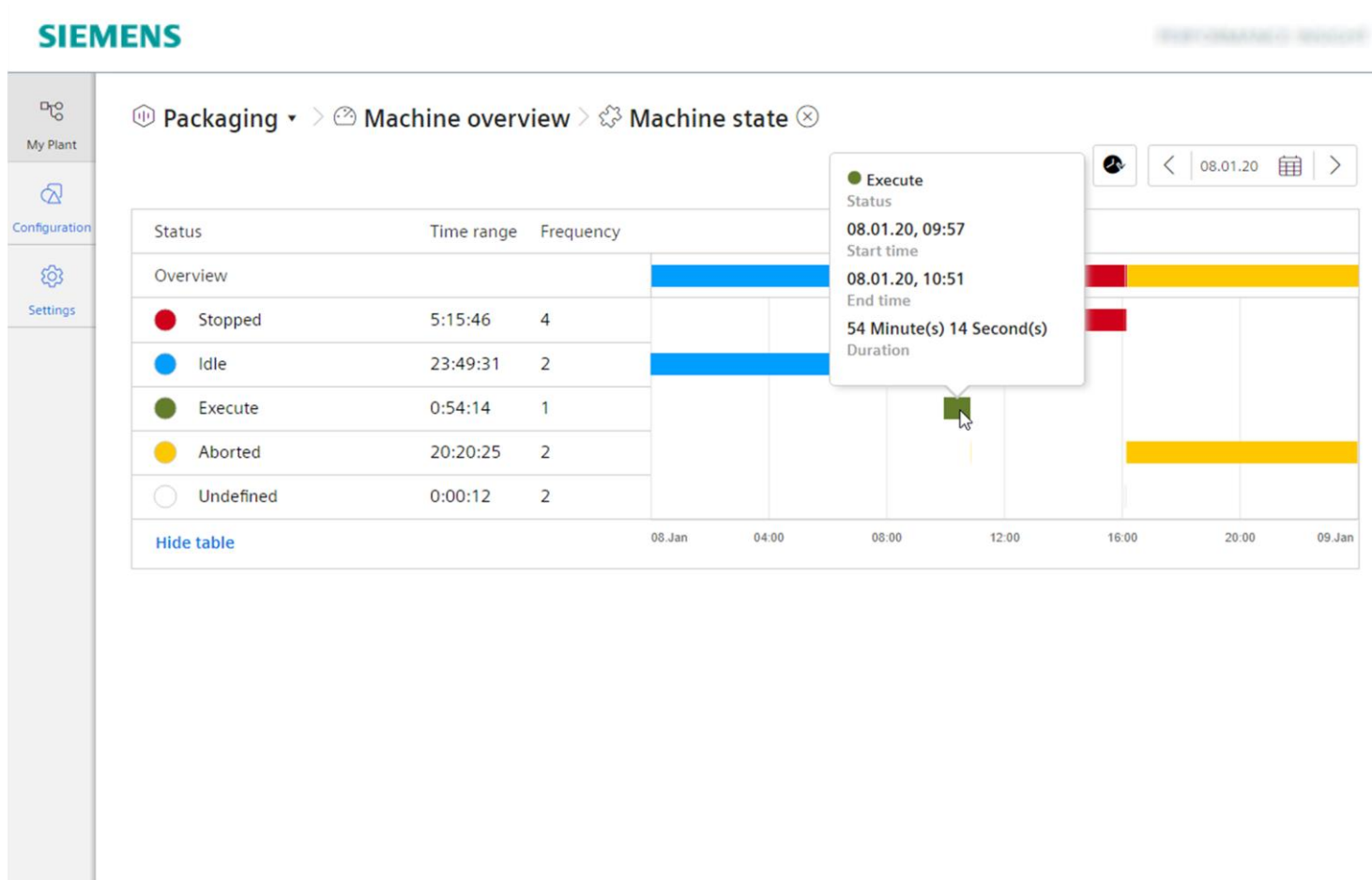With the Gantt Chart Widget the user gets an overview about the machine state

- User can change the time range
- Use the tooltip for the exact values
- Use the Advanced Gantt View to see in detail, how often and how long the machine was in the different defined machine states
- Use "Show table" to show the time range and frequency

Note: For the first and the last state period, the actual start and end time is used. Also in cases if this is out of the observation period. This is the reason why the sum of all time ranges can be greater than the observation period.

Energy Manager on Industrial Edge
Overview – Duration curve
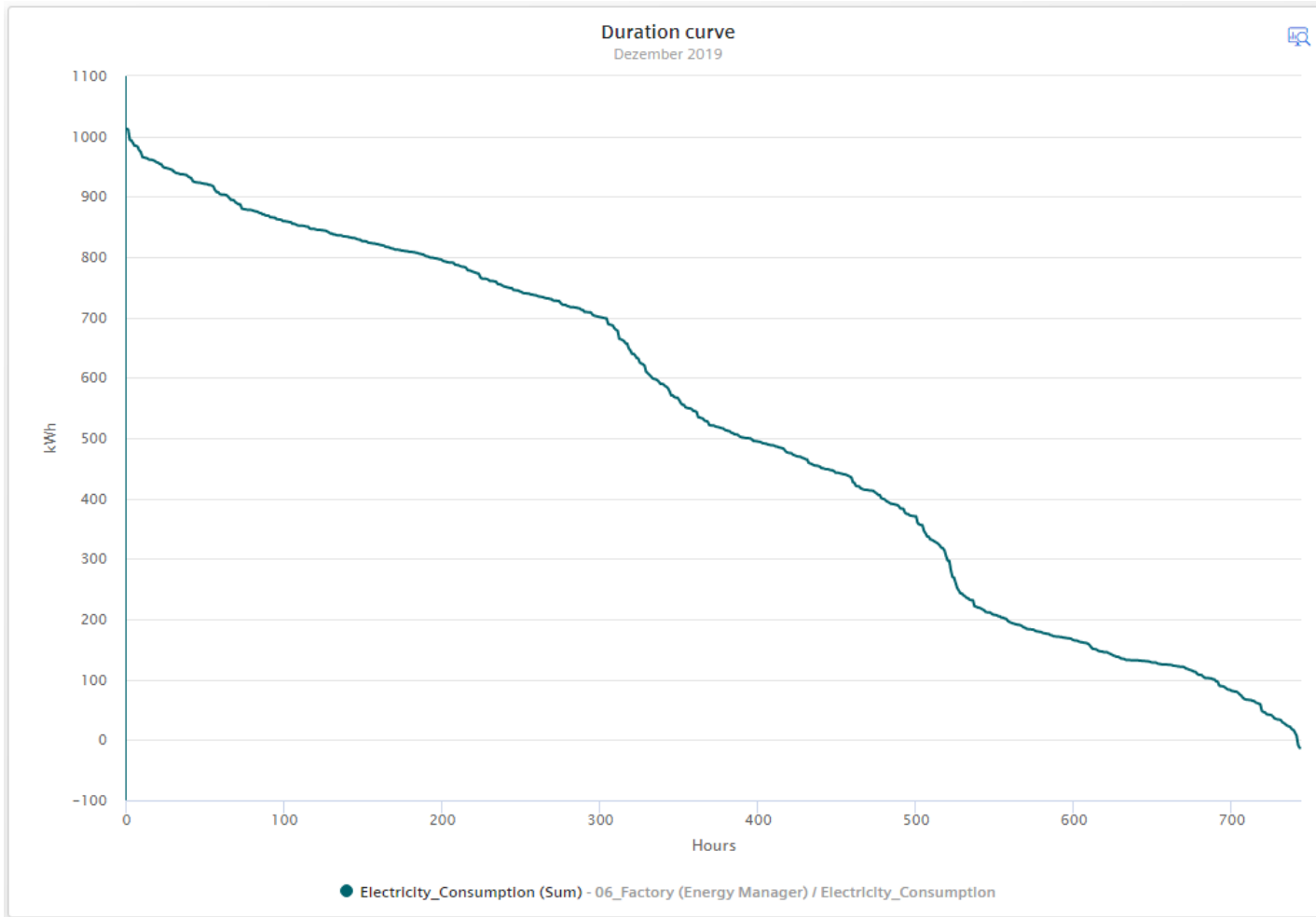
With the Duration curve Widget the user gets a sorted load curve. The highest value is on the top left and the lowest value is on the right bottom
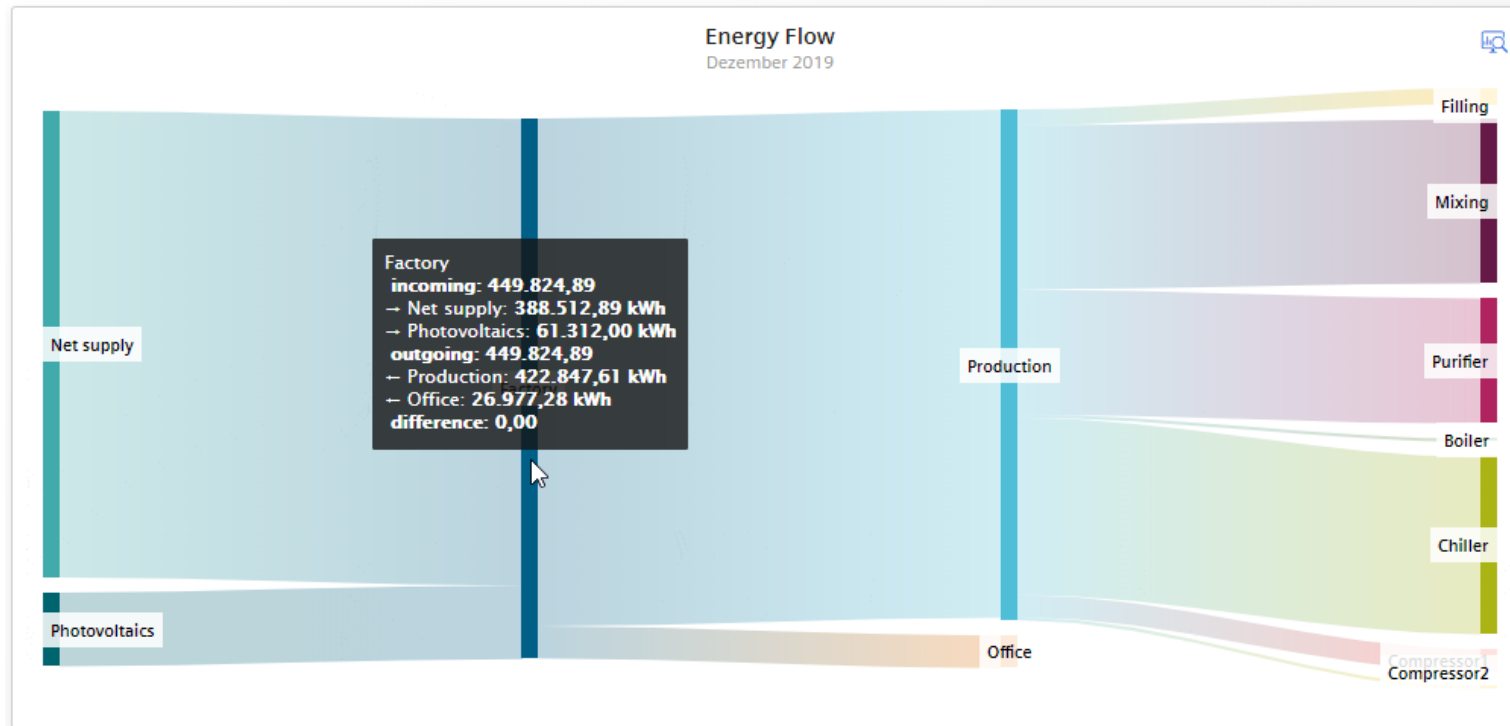
- Zoom in to get details
- A tooltip provides the exact value

The following detailed view is available

- Chart displaying the sorted load curve but only the top n values. The amount of displayed values can be configured in the widget configuration

Energy Manager on Industrial Edge
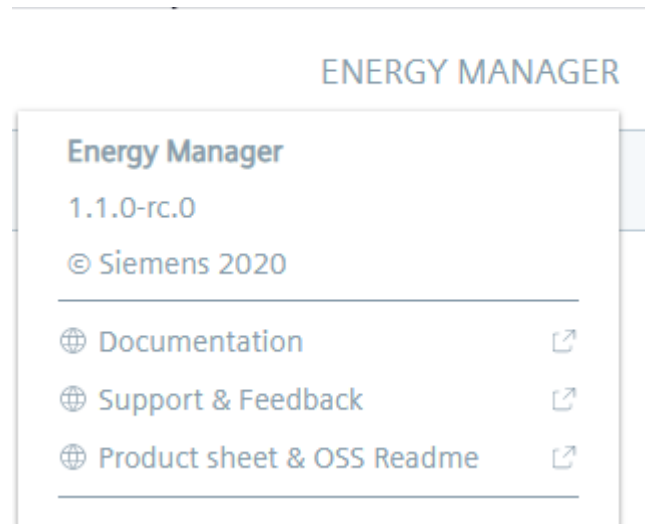## Overview – Sankey diagram

With the Sankey Widget the user gets an overview about the energy flow

- The width of the bar represents the value
- The user can configure nodes which are connected by links
- A link represents a parameter (Variable or KPI)
- A tooltip provides the additional information

Edge App OS bar

Energy Manager on Industrial Edge
Edge App OS Bar

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ENERGY MANAGER

Energy Manager

1.1.0-rc.0

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