Energy Twin report

Analyzed meter: Point 1

Generated at 2020.10.15 13:08:14

Metrics

The summary metrics calculated with the use of the mathematical model of the energy consumption profile are listed in the table below. For a detailed metrics description see the Metric manual.

Metric	Value
Setback Ratio	38.68%
Setback Flattening	67,412kWh
Setback 40% Scenario	-11,365kWh
Cooling Load Ratio	111%
Cooling Load (Occupied)	194kW
Cooling Load (Unoccupied)	215kW
Saturday - Sunday difference	36,037kW
Cooling Load 50% Scenario	61,955kW

Input data quality

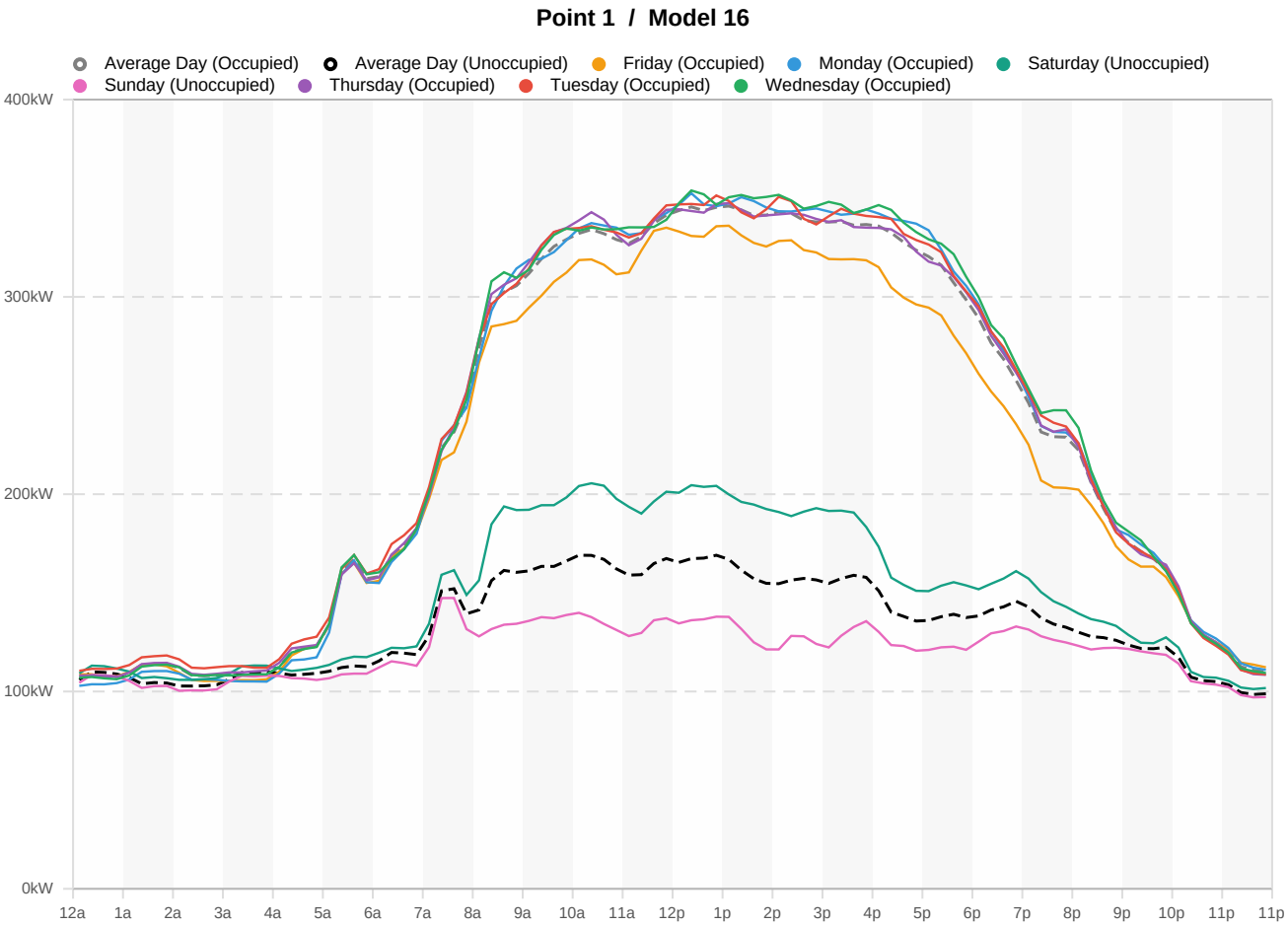
Data used for model identification were preprocessed. The results are shown in the table below.

Preprocessing metric		Action taken
Zero values	**0.051%**	No action taken
Negative values	**0%**	No action taken
Missing data	**0%**	No action taken
Outliers (Gaussian)	**0%**	No action taken
Invalid data	**0.038%**	Invalid values ignored
Outlier (Median filter)	**0%**	No action taken
Constant data (1 hour)	**0.001%**	No action taken
Constant data (6 hours)	**0%**	No action taken
Outlier (Q95 Filter)	**0%**	No action taken

Time-dependent load

The energy consumption of buildings is usually determined by two major factors: time of the week and weather. The Energy twin model enables investigation of the influence of the above-mentioned factors separately.

Below is the chart of typical daily profiles for different weekdays without the influence of the weather.



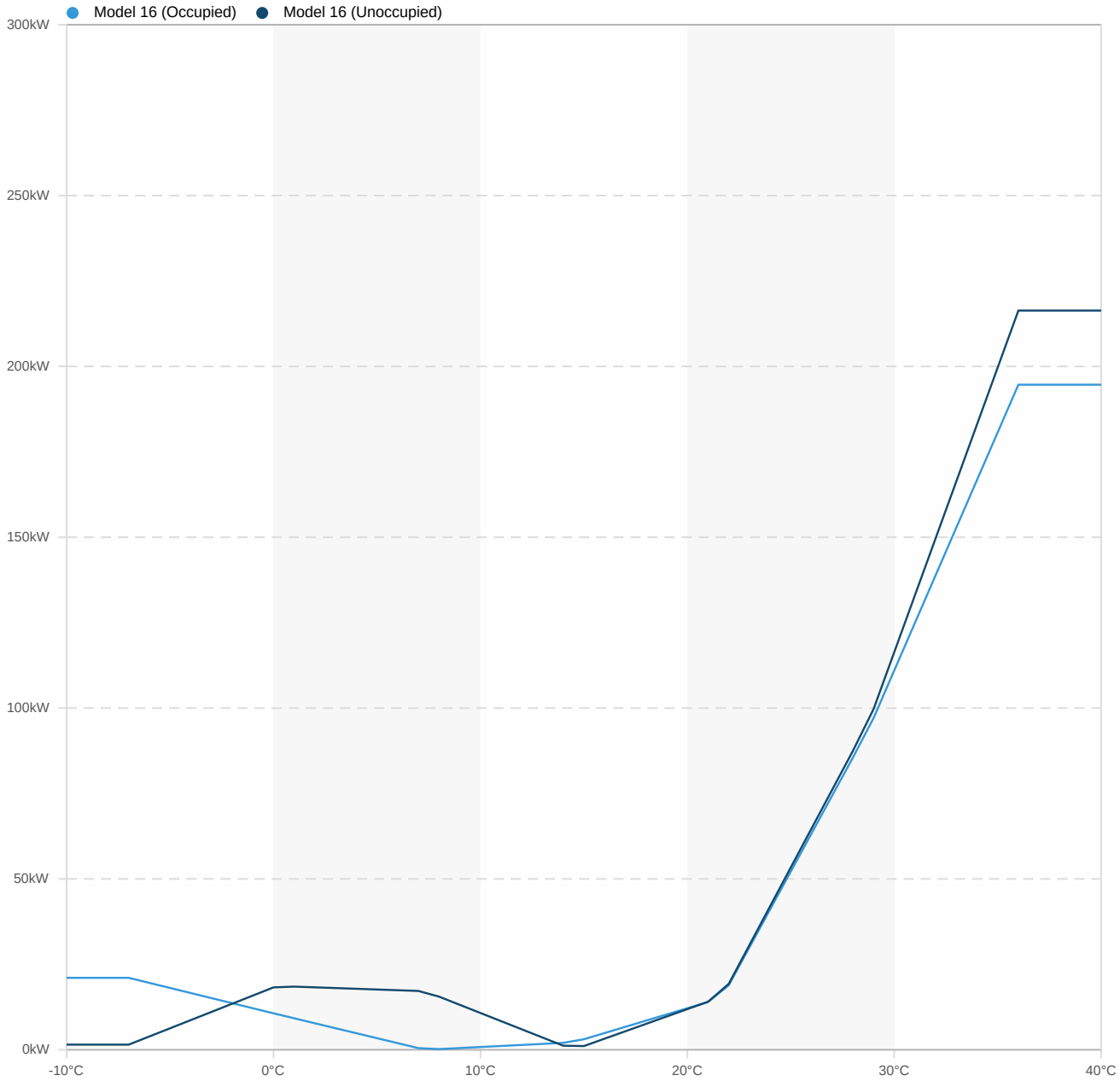
The tables below show the relative difference among individual weekdays days and the average day. The occupied days are shown in the upper table, the unoccupied days are shown in the lower table. Can you also see the lower energy consumption on Fridays?

Occupied Days	
Monday	101%
Tuesday	101%
Wednesday	102%
Thursday	101%
Friday	95.54%
Average Day	100%

Unoccupied Days	
Sunday	90.06%
Saturday	112%
Average Day	100%

Weather-dependent load

The analysis of the ambient temperature effect on energy consumption is shown in the chart below The y-axis corresponds to the relative increase in energy consumption as a function of ambient temperature (x-axis). Usually, one can observe a dead-band range around 10 °C where no extra energy is used. With increasing temperatures the energy demand also increases due to cooling. In the case of electrical heating, the energy consumption increase can be observed for lower temperatures as well. The weather-dependent load characteristic is modeled separately for occupied days and for unoccupied days.



Comparison of measurement and model prediction overview

Scope: **Point 1**
From: **01.01.2019**
To: **31.12.2019**

The table below shows overview of differences between prediction and measurement (negative value indicates energy savings). For detailed information see the monthly reports on the next pages.

Differences between measurement and prediction.

Month	All data relative	All data absolute	Occupied relative	Occupied absolute	Unoccupied relative	Unoccupied absolute
Jan-2019	-3.6%	-5,510kW	-3.7%	-3,232kW	-3.5%	-2,277kW
Feb-2019	-5.6%	-7,547kW	-6.9%	-5,219kW	-4%	-2,328kW
Mar-2019	-7.4%	-10,197kW	-8.2%	-6,151kW	-6.3%	-4,046kW
Apr-2019	-7.8%	-10,579kW	-6.4%	-4,966kW	-9.6%	-5,613kW
May-2019	-3.7%	-5,520kW	-2.4%	-2,084kW	-5.5%	-3,435kW
Jun-2019	3.3%	6,210kW	3.6%	3,601kW	2.9%	2,609kW
Jul-2019	5.6%	11,173kW	4.6%	5,370kW	7.1%	5,803kW
Aug-2019	-3.8%	-7,193kW	-4.9%	-5,082kW	-2.4%	-2,110kW
Sep-2019	-2.3%	-3,573kW	-0.7%	-664kW	-4.5%	-2,910kW
Oct-2019	2.3%	3,731kW	1.4%	1,294kW	3.6%	2,437kW
Nov-2019	9%	14,527kW	11.1%	10,113kW	6.3%	4,415kW
Dec-2019	8.8%	14,525kW	7.6%	6,415kW	10.1%	8,110kW
Total	**0%**	**76kW**	**-0.1%**	**-606kW**	**0.1%**	**682kW**

Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.01.2019**
To: **31.01.2019**

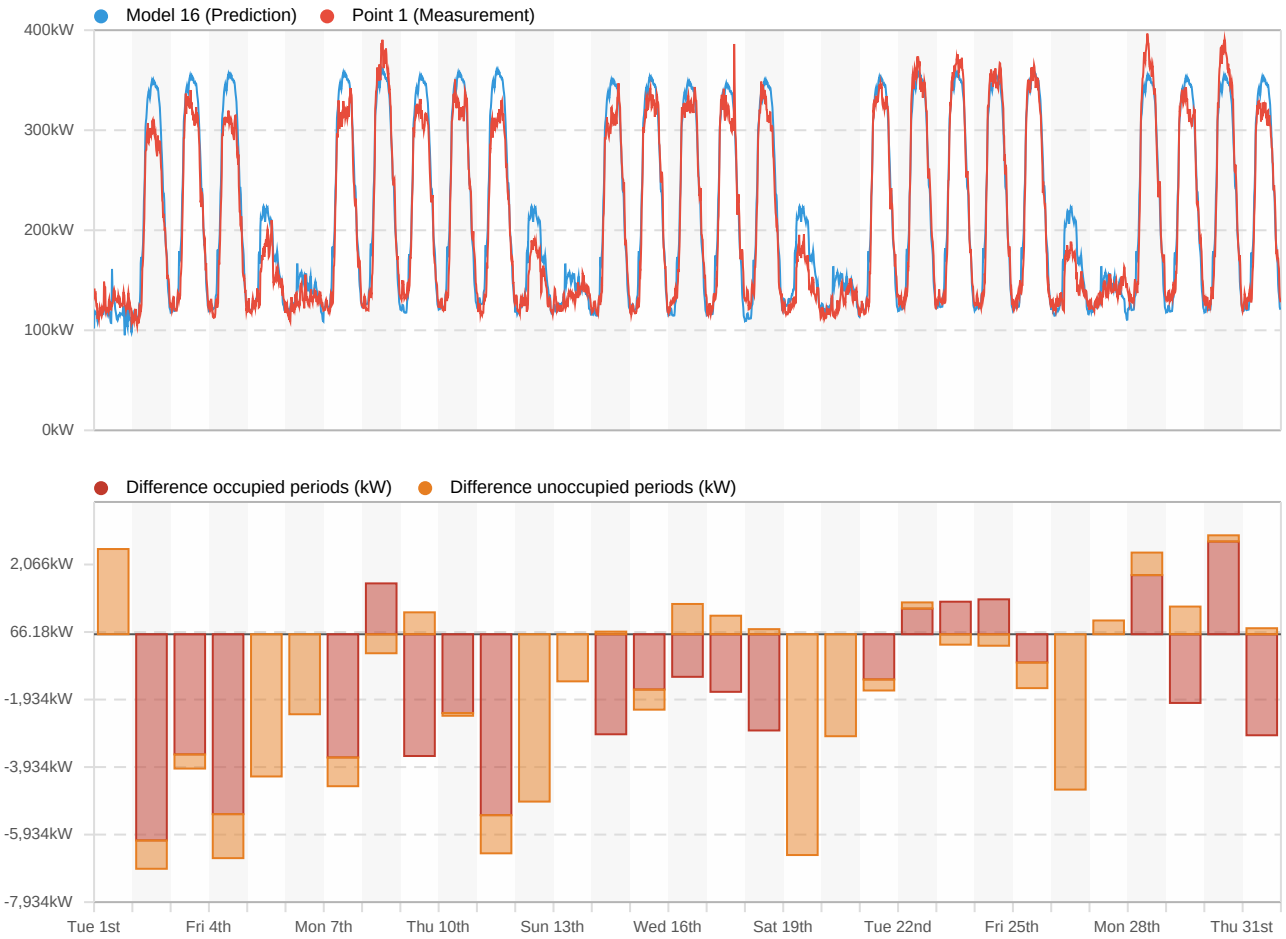
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	-3.6%	-5,510kW	153,598kW	159,108kW	0.03%
Occupied periods	-3.7%	-3,232kW	88,171kW	91,403kW	0%
Unoccupied periods	-3.5%	-2,277kW	65,428kW	67,705kW	0.05%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.02.2019**
To: **28.02.2019**

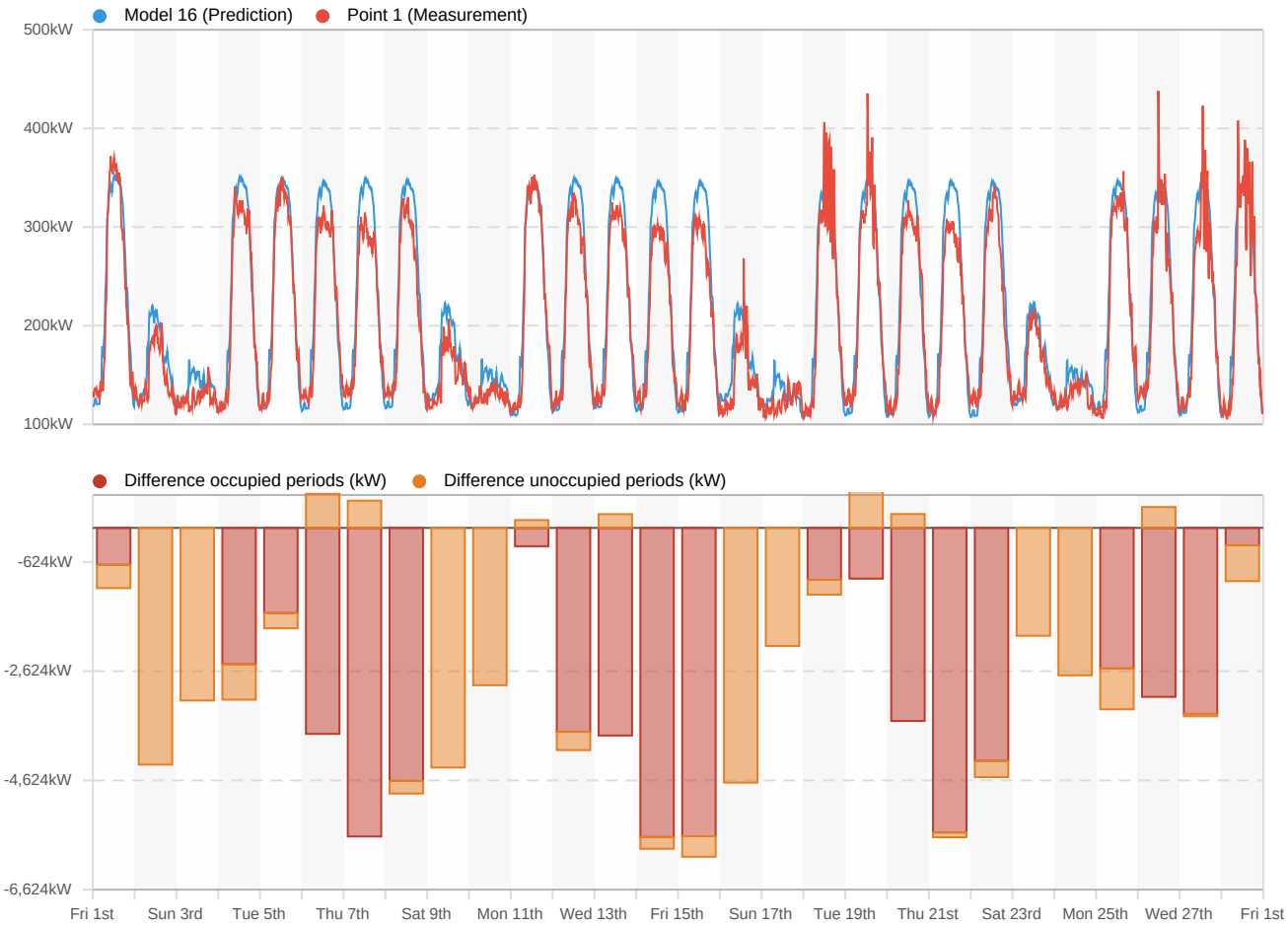
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	-5.6%	-7,547kW	133,580kW	141,127kW	0.02%
Occupied periods	-6.9%	-5,219kW	75,972kW	81,191kW	0%
Unoccupied periods	-4%	-2,328kW	57,608kW	59,936kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.03.2019**
To: **30.03.2019**

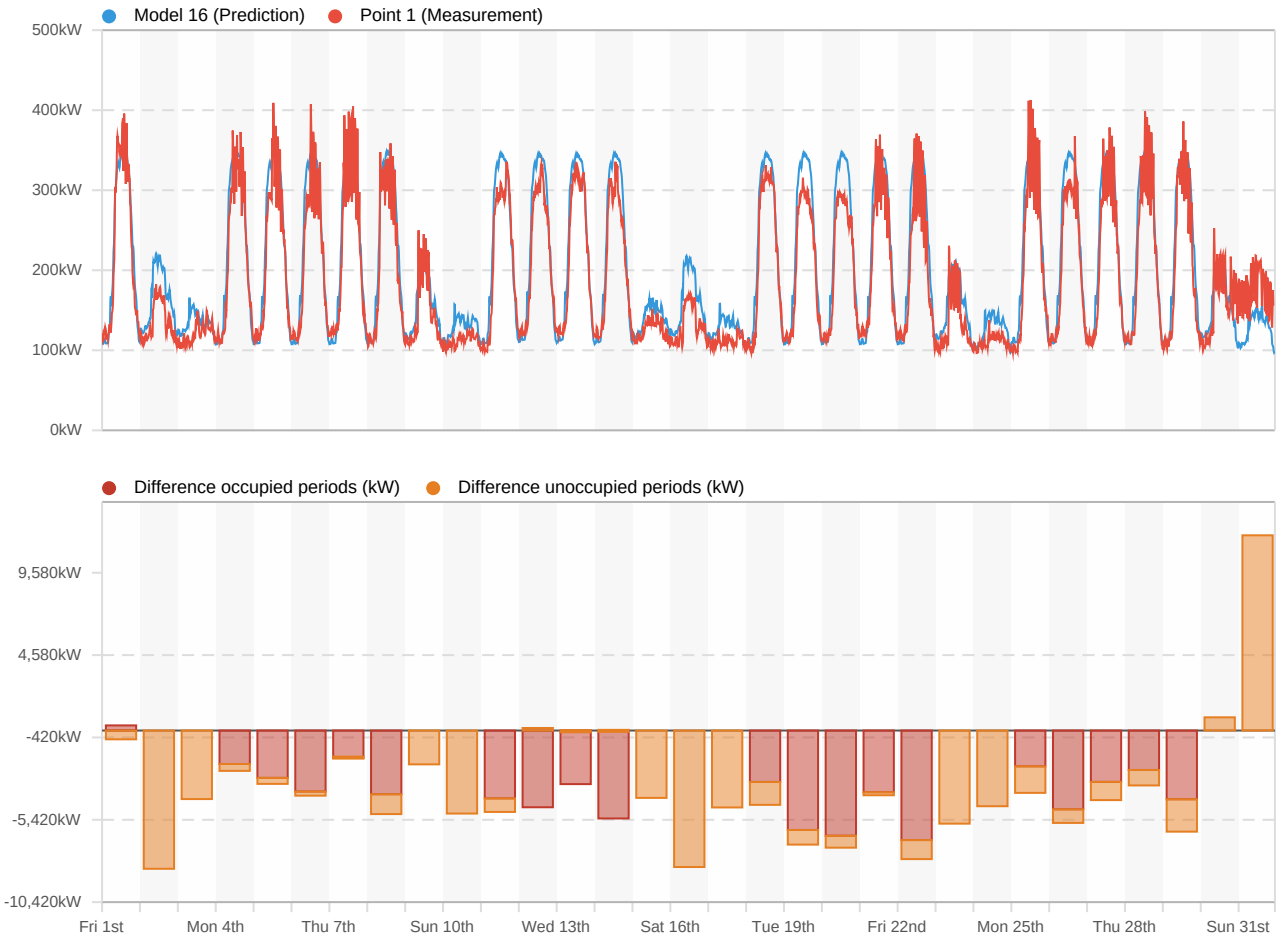
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	-7.4%	-10,197kW	138,612kW	148,809kW	0.03%
Occupied periods	-8.2%	-6,151kW	74,694kW	80,845kW	0%
Unoccupied periods	-6.3%	-4,046kW	63,918kW	67,964kW	0.05%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.04.2019**
To: **30.04.2019**

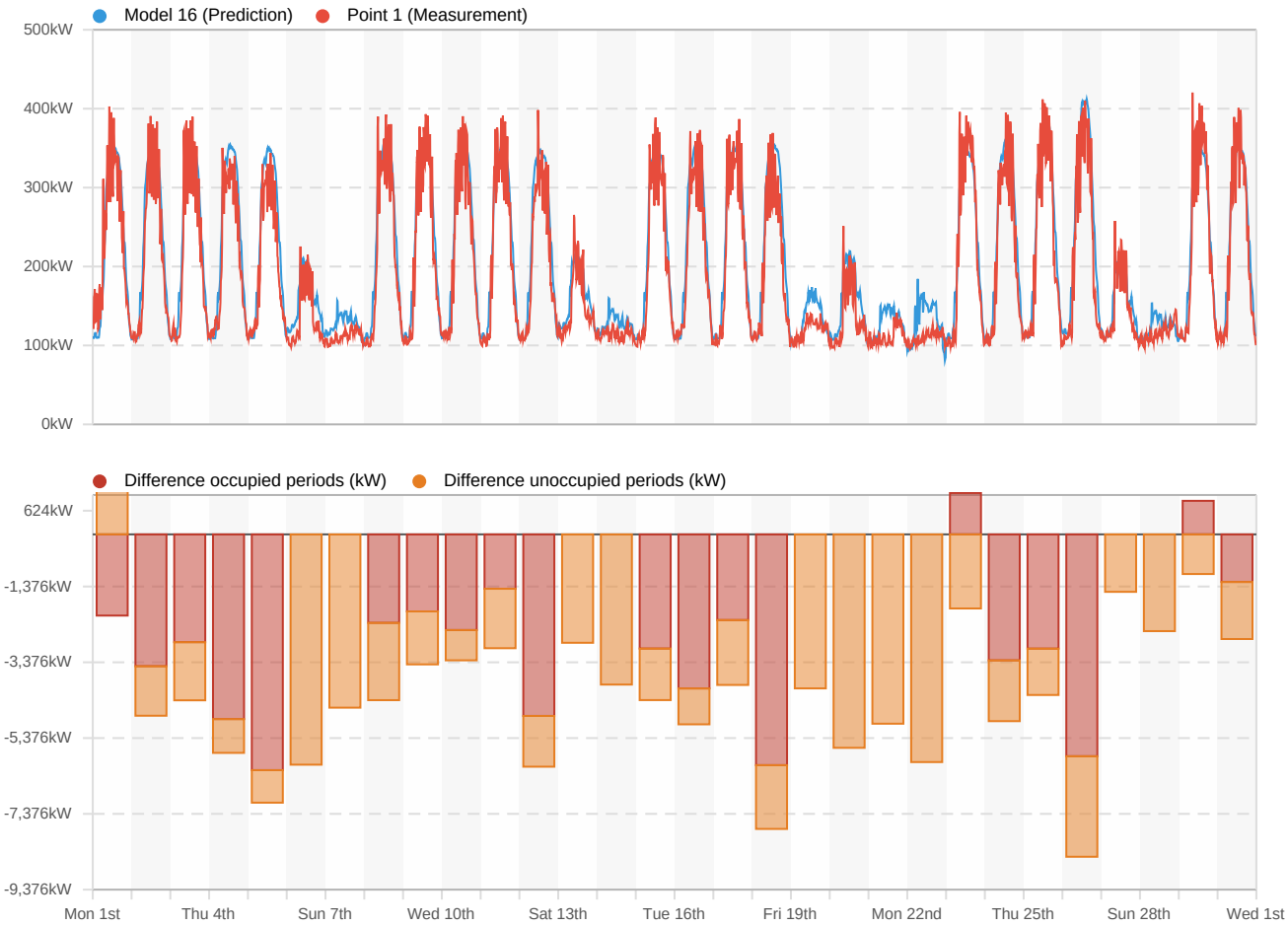
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	-7.8%	-10,579kW	135,738kW	146,317kW	0.03%
Occupied periods	-6.4%	-4,966kW	77,461kW	82,427kW	0%
Unoccupied periods	-9.6%	-5,613kW	58,277kW	63,890kW	0.05%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.05.2019**
To: **31.05.2019**

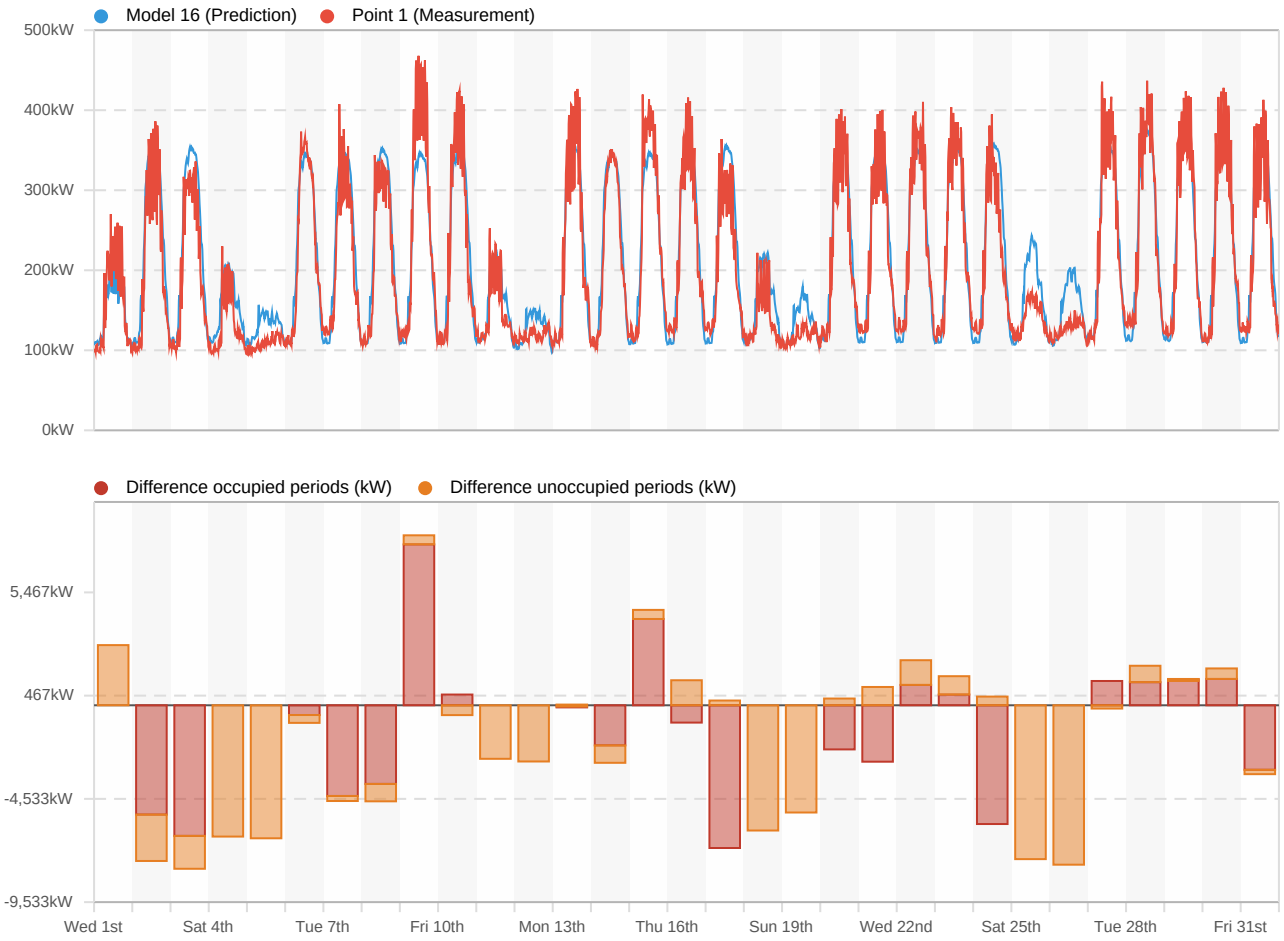
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	-3.7%	-5,520kW	150,651kW	156,171kW	0.02%
Occupied periods	-2.4%	-2,084kW	88,465kW	90,549kW	0%
Unoccupied periods	-5.5%	-3,435kW	62,186kW	65,621kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.06.2019**
To: **30.06.2019**

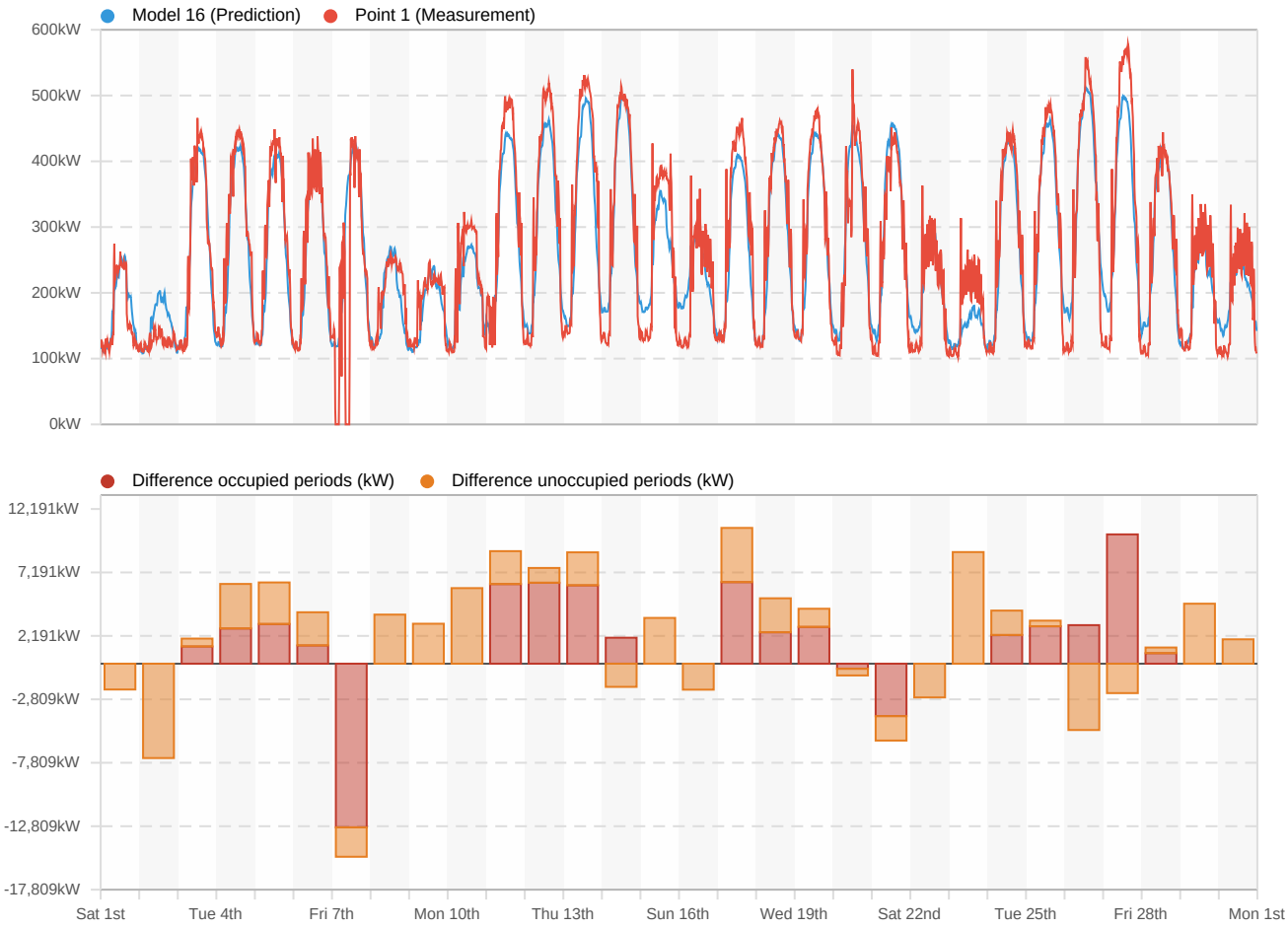
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	3.3%	6,210kW	189,739kW	183,528kW	0.02%
Occupied periods	3.6%	3,601kW	100,378kW	96,777kW	0%
Unoccupied periods	2.9%	2,609kW	89,360kW	86,751kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.07.2019**
To: **31.07.2019**

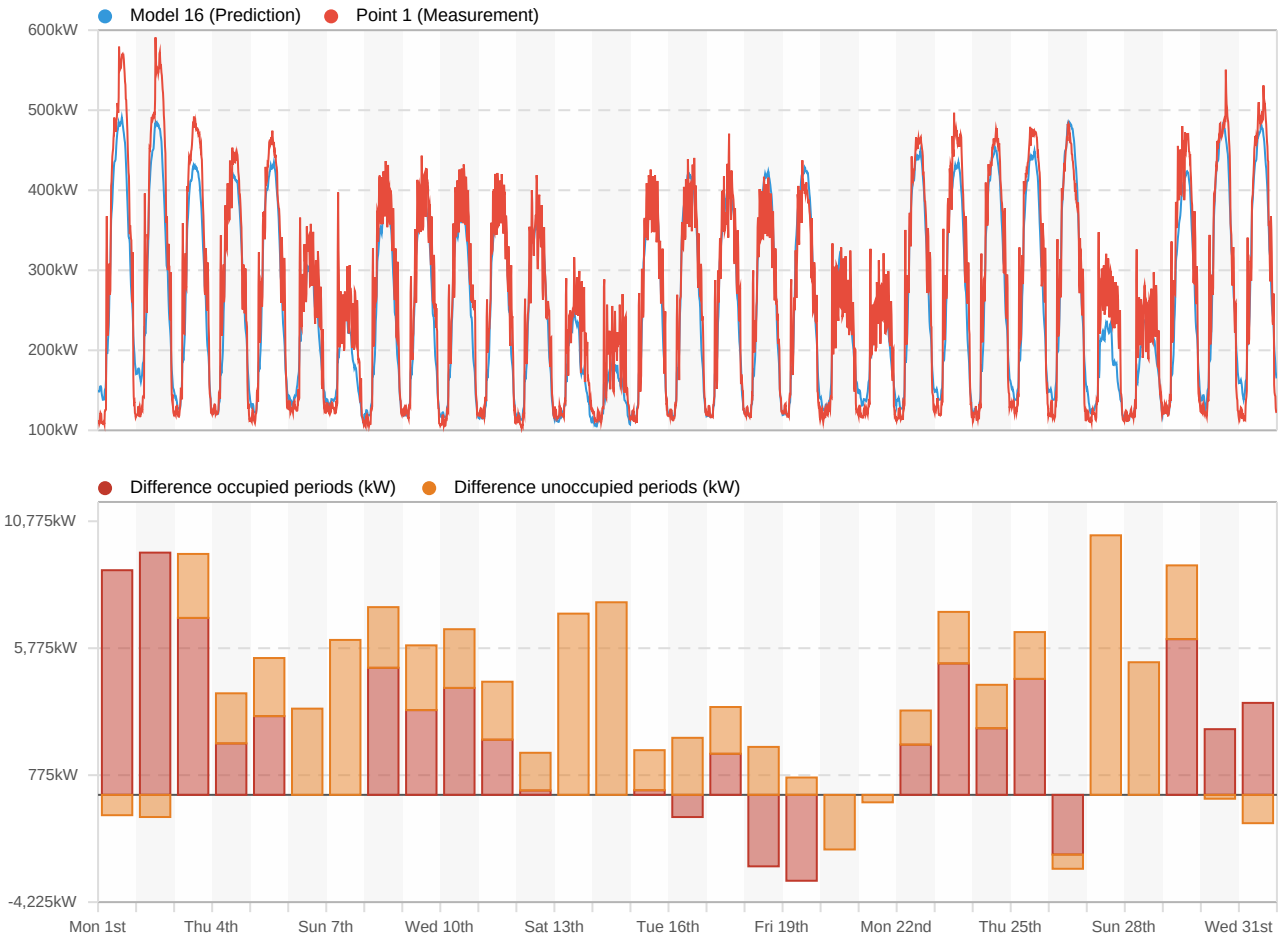
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	5.6%	11,173kW	199,484kW	188,311kW	0.02%
Occupied periods	4.6%	5,370kW	117,214kW	111,844kW	0%
Unoccupied periods	7.1%	5,803kW	82,270kW	76,467kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.08.2019**
To: **31.08.2019**

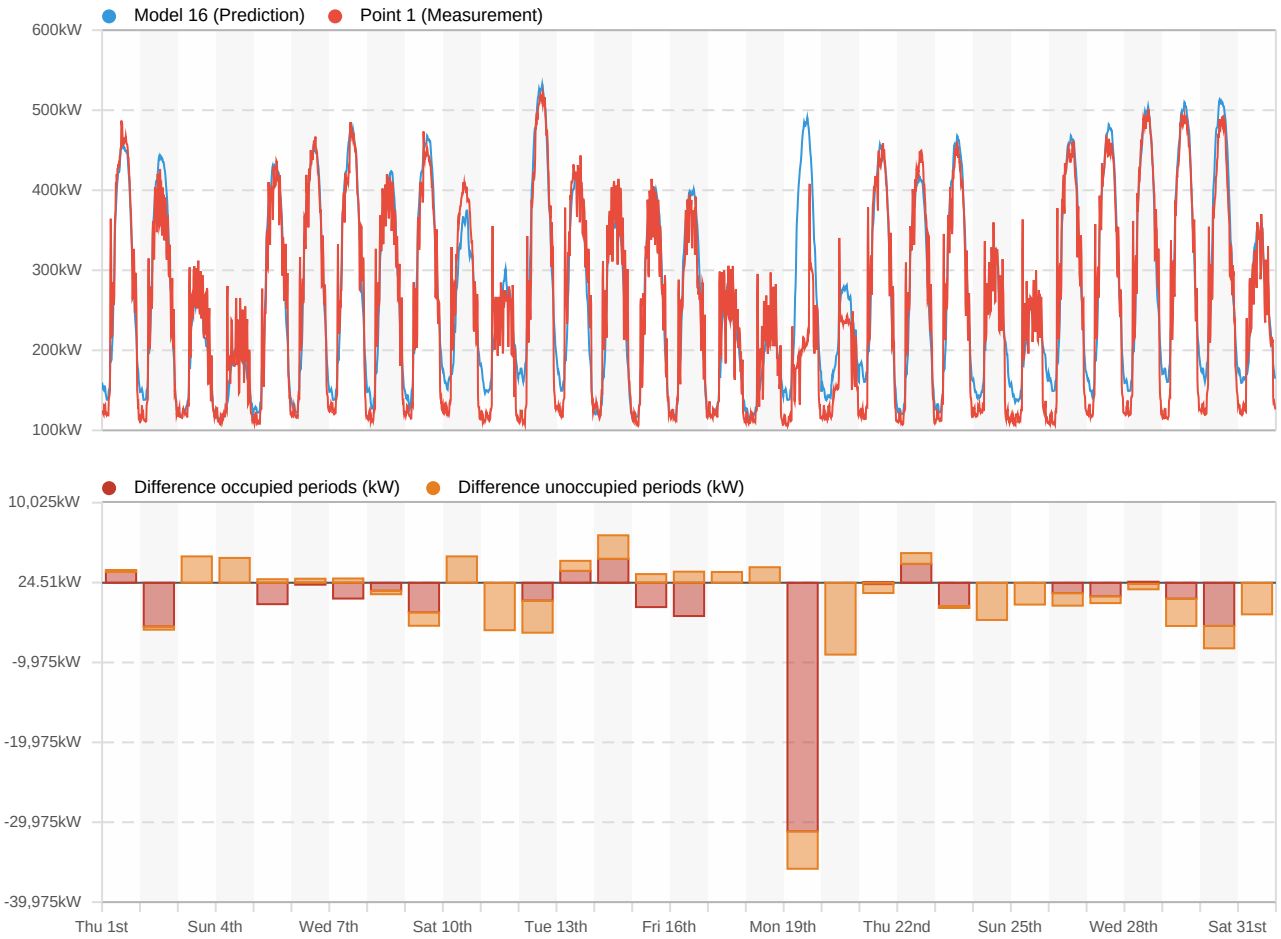
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	-3.8%	-7,193kW	191,632kW	198,825kW	0.02%
Occupied periods	-4.9%	-5,082kW	103,189kW	108,271kW	0%
Unoccupied periods	-2.4%	-2,110kW	88,443kW	90,554kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.09.2019**
To: **30.09.2019**

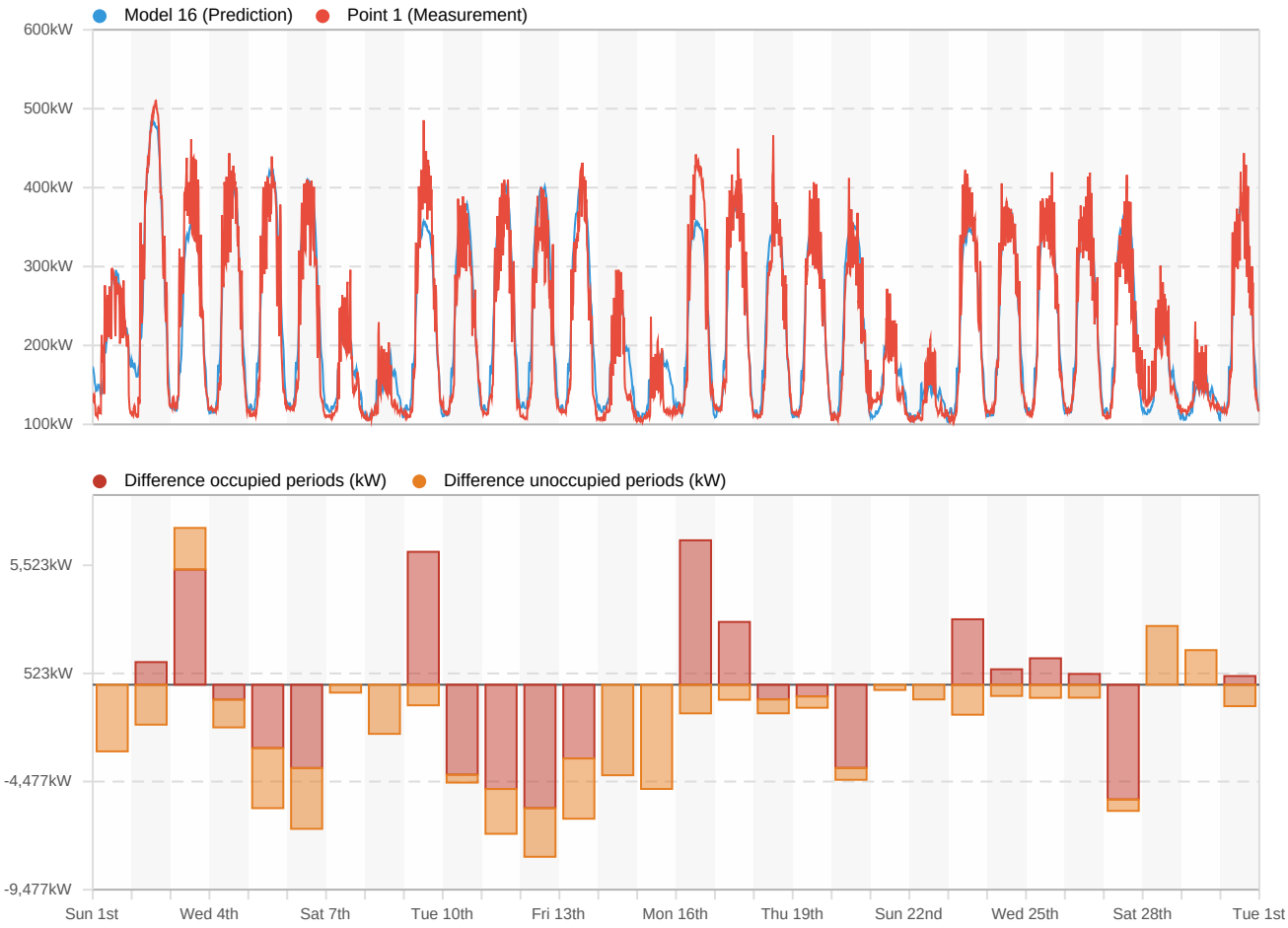
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	-2.3%	-3,573kW	155,596kW	159,170kW	0.02%
Occupied periods	-0.7%	-664kW	90,713kW	91,377kW	0%
Unoccupied periods	-4.5%	-2,910kW	64,883kW	67,793kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.10.2019**
To: **31.10.2019**

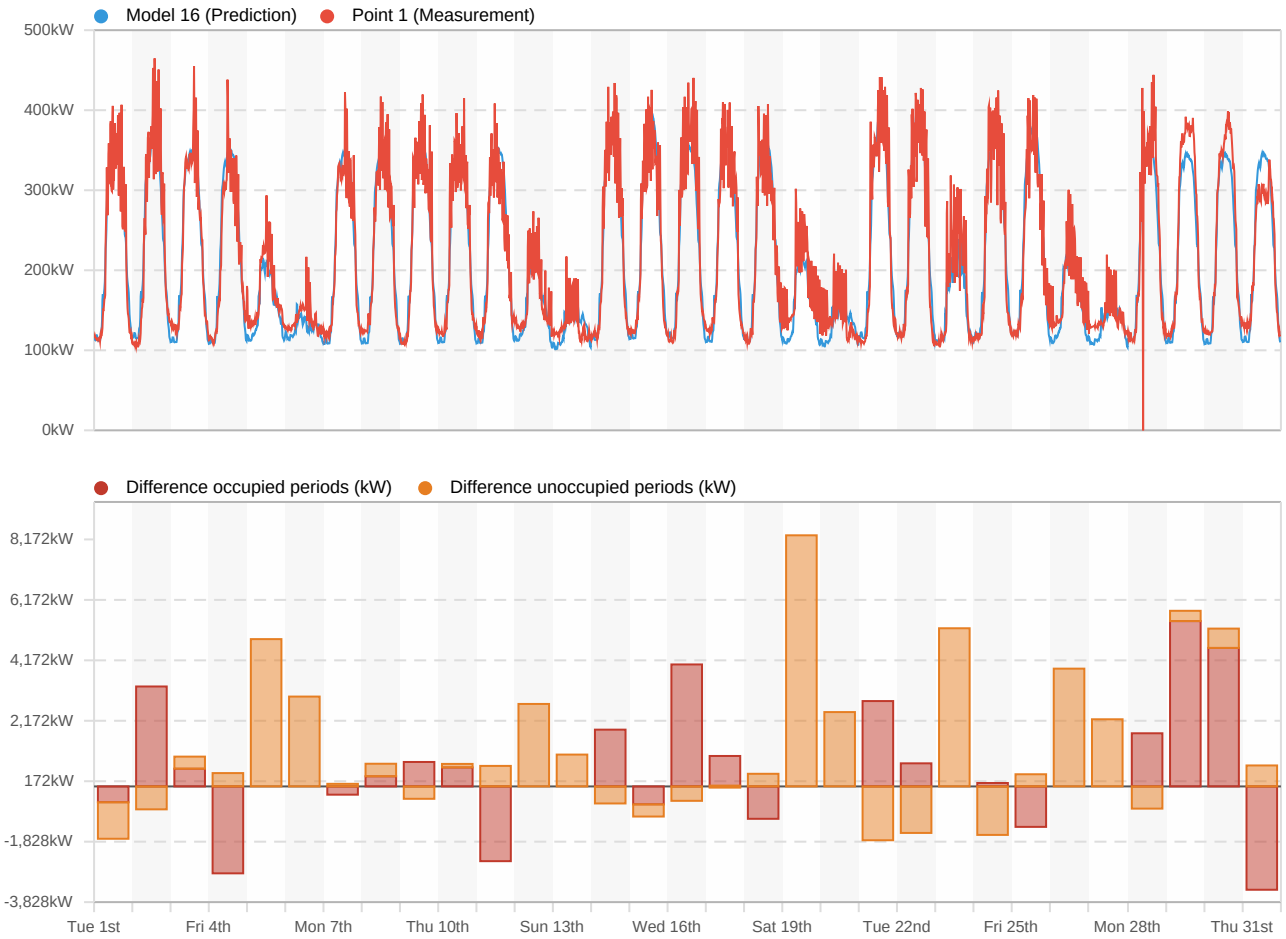
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	2.3%	3,731kW	161,092kW	157,361kW	0.02%
Occupied periods	1.4%	1,294kW	92,806kW	91,512kW	0%
Unoccupied periods	3.6%	2,437kW	68,286kW	65,849kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.11.2019**
To: **30.11.2019**

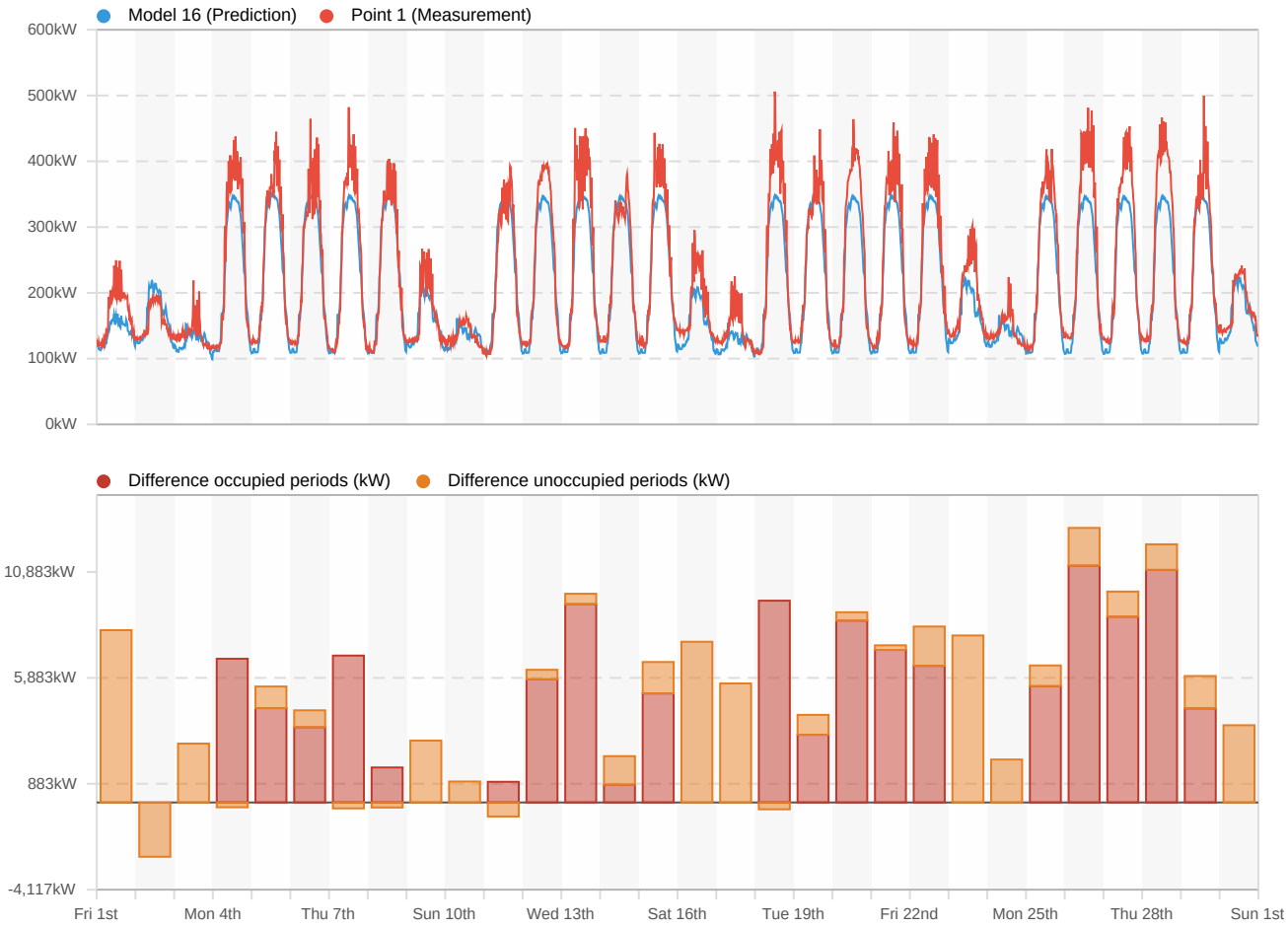
The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	9%	14,527kW	160,730kW	146,203kW	0.02%
Occupied periods	11.1%	10,113kW	90,908kW	80,796kW	0%
Unoccupied periods	6.3%	4,415kW	69,822kW	65,407kW	0.04%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.



Comparison of measurement and model prediction

Scope: **Point 1**
From: **01.12.2019**
To: **31.12.2019**

The model prediction is compared with measurement in order to detect and quantify deviations from the expected energy consumption profile. Time periods, when a building is occupied and unoccupied, are distinguished in the comparison. Negative difference values represent energy savings (i.e. measured consumption is lower than expected by the model).

Table with summary data for the entire analyzed time period.

Scope	Relative difference	Absolute difference	Measurement	Prediction	Missing values ratio
All data	8.8%	14,525kW	164,641kW	150,117kW	0.02%
Occupied periods	7.6%	6,415kW	84,214kW	77,799kW	0%
Unoccupied periods	10.1%	8,110kW	80,427kW	72,318kW	0.03%

Predicted and measured profiles are shown in the upper chart.

Daily sums of difference between measured and predicted values are shown in the lower chart. Sums are calculated for occupied and unoccupied periods separately.