



ANALYSIS OF THE ENERGY PERFORMANCE OF PILOT SITES AFTER RENOVATIONS.

D.4.11



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TABLE OF CONTENTS

1	EXECUTIVE SUMMARY.....	1
2	ENERGY PERFORMANCE ATER 2nd BUILDING BEFORE RENOVATION.	3
2.1	INITIAL INFORMATION.	3
2.2	ENERGY CONSUMPTION DESCRIPTION.	3
2.3	ENERGY BASELINE CALCULATION.....	6
2.3.1	<i>Individual Electricity consumption baseline for a selected group of tenants.....</i>	<i>6</i>
2.3.2	<i>Individual Heating and DHW baseline for a selected group of tenants</i>	<i>9</i>
2.4	SAVINGS CALCULATION.....	9
2.4.1	<i>Individual Electricity consumption savings for a selected group of tenants</i>	<i>9</i>
2.4.2	<i>Individual Heating and DHW baseline for a selected group of tenants</i>	<i>29</i>
2.4.3	<i>Communal Services Energy savings calculation</i>	<i>41</i>
2.5	PHOTOVOLTAIC INSTALLATION ANALYSIS.....	42
2.6	ECONOMIC SAVINGS CALCULATION	44
2.7	ENERGY SAVINGS CALCULATION CONCLUSIONS	45
3	ENERGY PERFORMANCE PADIHAM PILOT BEFORE RENOVATIONS.....	47
3.1	INITIAL INFORMATION	47
3.2	ENERGY CONSUMPTION DESCRIPTION	48
3.2.1	<i>ENERGY CONSUMPTION DISTRIBUTION</i>	<i>48</i>
3.2.2	<i>HEATING SYSTEM</i>	<i>50</i>
3.2.3	<i>DOMESTIC HOT WATER (DHW).....</i>	<i>51</i>
3.2.4	<i>Appliances and lighting (Others).....</i>	<i>54</i>
3.3	BASELINE CALCULATION.....	55
3.4	SAVINGS CALCULATION.....	55
3.4.1	<i>Analysis for dwelling D1</i>	<i>55</i>
3.4.2	<i>Analysis for dwelling D2</i>	<i>57</i>
3.4.3	<i>Analysis for dwelling D3</i>	<i>58</i>
3.4.4	<i>Analysis for dwelling D4</i>	<i>58</i>
3.4.5	<i>Analysis for dwelling D5</i>	<i>59</i>
3.4.6	<i>Analysis for dwelling D6</i>	<i>60</i>
3.4.7	<i>Analysis for dwelling D7</i>	<i>61</i>
3.4.8	<i>Analysis for dwelling D8</i>	<i>62</i>
3.4.9	<i>Analysis for dwelling D9</i>	<i>62</i>
3.5	ECONOMIC SAVINGS	63
3.6	ENERGY SAVINGS CALCULATION CONCLUSIONS	67
4	ENERGY PERFORMANCE NETTELBECKPLATZ-_ 1892 BUILDING BEFORE RENOVATION. 70	
4.1	INITIAL INFORMATION.	70
4.2	Energy consumption description.....	73
4.2.1	<i>District Heating System (Heating Thermal Consumption).....</i>	<i>73</i>
4.2.2	<i>District Heating System (Hot Water Thermal Consumption)</i>	<i>74</i>

4.2.3	<i>Communal Electric Consumption</i>	75
4.3	Baseline Calculation.....	78
4.3.1	<i>District Heating System (Heating Thermal Consumption)</i>	78
4.3.2	<i>District Heating System (Hot Water Thermal Consumption)</i>	85
4.3.3	<i>Communal Electric Consumption</i>	87
4.4	Savings Calculation	87
4.4.1	<i>District Heating System (Heating Thermal Consumption)</i>	87
4.4.2	<i>District Heating System (Hot Water Thermal Consumption)</i>	88
4.4.3	<i>Communal Electric Consumption</i>	88
4.5	ECONOMIC SAVINGS	95
4.6	ENERGY SAVINGS CALCULATION CONCLUSIONS	97
5	GENERAL CONCLUSIONS	97
5.1	MONITORING INSTALLATION	97
5.2	BASLINE CALCULATION AND ENERGY SAVINGS.	98
5.3	RESULTS OF SAVINGS OBTAINED.....	99

Table Index

Table 1:	ATER Treviso 2 nd pilot Initial information.....	3
Table 2:	Energy consumption data from gas bills A Tower	4
Table 3:	Energy consumption data from gas bills B Tower	4
Table 4:	Energy consumption data from electricity bills A Tower	5
Table 5:	Energy consumption data from electricity bills B Tower	5
Table 6:	Reference period for the calculation of the baseline in Treviso (Tower A and Tower B)...	6
Table 7:	<i>Occupation time data of Treviso apartments</i>	7
Table 8:	Reference period for the calculation of the heating and DHW baseline in Treviso	9
Table 9:	Reporting period for the calculation of electricity savings in Treviso tower A	9
Table 10:	Savings electricity consumption in the apartments of tower A of Treviso	10
Table 11:	Summary savings electricity consumption Tower A (kWh).....	16
Table 12:	Summary savings electricity consumption Tower A (%).....	16
Table 13:	Total electricity savings Tower A (kWh)	16
Table 14:	Annual electricity savings in A Tower (kWh)	17
Table 15:	Reporting period for the calculation of electricity savings in Treviso Tower B	18
Table 16:	Savings electricity consumption in the apartments of tower B of Treviso	18

Table 17: Summary savings electricity consumption Tower B (kWh)	27
Table 18: Summary savings electricity consumption Tower B (%)	27
Table 19: Total electricity savings Tower B (kWh and %)	28
Table 20: Estimated annual electricity savings in B Tower (kWh)	28
Table 21: Gas savings period for tower A in Treviso.....	29
Table 22: Savings gas consumption in the apartments of tower A of Treviso	29
Table 23: Summary savings GAS consumption Tower A (m ³)	33
Table 24: Summary savings GAS consumption Tower A (%)	33
Table 25: Total gas savings Tower A (m ³ , kWh and %)	33
Table 26: Estimated annual gas Savings in A Tower.....	34
Table 27: Gas savings period for Tower B in Treviso.....	34
Table 28: Savings gas consumption in the apartments of tower B of Treviso.....	35
Table 29: Summary savings GAS consumption Tower B (m ³)	40
Table 30: Summary savings GAS consumption Tower B (%)	40
Table 31: Total gas savings Tower B (m ³ , kWh and %).....	41
Table 32: Estimated annual gas Savings in B Tower B	41
Table 33: Savings period for communal services Tower A in Treviso	41
Table 34: Savings results for communal services Tower A in Treviso.....	41
Table 35: Savings period for communal services Tower B in Treviso	42
Table 36: Savings results for communal services Tower B in Treviso.....	42
Table 37: Economic gas and electricity savings in Treviso during the demonstrative period.....	45
Table 38: Annual economic gas and electricity savings in Treviso	45
Table 39: Dwelling characteristics	47
Table 40: Electric savings calculated in dwelling 1.....	56
Table 41: Estimated annual electricity savings.....	56
Table 42: Gas savings calculated in dwelling 1	56
Table 43: Electricity savings calculated in dwelling 2	57
Table 44: Estimated annual electricity savings in dwelling 2	57
Table 45: Electricity savings calculated in dwelling 3	58
Table 46: Estimated annual electricity savings	58

Table 47: Electric savings calculated in dwelling 4	58
Table 48: Estimated annual electricity savings	59
Table 49: Electricity savings calculated in dwelling 5	59
Table 50: Estimated annual electricity savings	60
Table 51: Gas savings calculated in dwelling 5	60
Table 52: Electricity savings calculated in dwelling 6	61
Table 53: Estimated annual electricity savings	61
Table 54: Electricity savings calculated in dwelling 8	62
Table 55: Estimated annual electricity savings	62
Table 56: Electricity savings calculated in dwelling 9	63
Table 57: Estimated annual electricity savings	63
Table 58: Economic gas and electricity savings (GBP)	65
Table 59: Economic gas and electricity savings (€).....	66
Table 60: Total Padiham Pilot savings (GPB)	69
Table 61: Total Padiham Pilot savings (€)	69
Table 62: Reference period for the calculation of the heating system baseline in Pasewalker 7...	78
Table 63: Data used baseline calculation Heating Pasewalker 7 (HDD 16)	78
Table 64: Data used baseline calculation Heating Pasewalker 7 (HDD 17).....	79
Table 65: Data used baseline calculation Heating Pasewalker 7 (HDD 18)	80
Table 66: Data used baseline calculation Heating Pasewalker 7 (HDD 19)	80
Table 67: Data used baseline calculation Heating Pasewalker 7 (HDD 20).....	81
Table 68: Reference period for the calculation of the heating system baseline in Pasewalker 8..	82
Table 69: Data used baseline calculation Heating Pasewalker 8 (HDD 16).....	82
Table 70: Data used baseline calculation Heating Pasewalker 8 (HDD 17).....	82
Table 71: Data used baseline calculation Heating Pasewalker 8 (HDD 18)	83
Table 72: Data used baseline calculation Heating Pasewalker 8 (HDD 19).....	84
Table 73: Data used baseline calculation Heating Pasewalker 8 (HDD 20)	84
Table 53: Number of unoccupied dwellings.....	86
Table 74: Thermal Consumption Heating Pasewalker 7 (HDD 17) savings calculation	87
Table 75: Thermal Consumption Heating Pasewalker 8 (HDD 17) savings calculation	88

Table 76: Hot water Thermal Consumption Pasewalker 6 and 7 savings calculation.....	88
Table 77: Hot water Thermal Consumption Pasewalker 8 savings calculation.....	88
Table 78: Electric Consumption Adolfstrase 3 savings calculation.....	89
Table 79: Electric Consumption Adolfstrase 2 savings calculation.....	89
Table 80: Electric Consumption Pasewalker Str 7 (Main Meter) savings calculation.....	89
Table 81: Electric Consumption Pasewalker Str 7 (Meeting Room Meter) savings calculation.....	89
Table 82: Electricity Consumption Pasewalker Str 8 (Main Meter) savings calculation.....	90
Table 83: Electric Consumption Adolfstrase 1 (Main Meter) savings calculation	90
Table 84: Economic savings Berlin pilot.....	96
Table 85: Economic gas and electricity savings in Treviso	99
Table 86: Economic gas and electricity savings in Padiham	101
Table 87: Summary energy and economic savings in Berlin	102

Figure Index

Figure 1: Via BORGO FURO 35/A (Tower A).....	9
Figure 2: V.le FRANCIA 1 (Tower B).....	18
Figure 3: Photovoltaic geographical information system	43
Figure 4: Monthly energy output from tracking PV system.....	43
Figure 5: Monthly in-plane irradiation for fixed angle.....	44
Figure 6: PV System estimates of solar electricity generation	44
Figure 7 Pilot site map showing Dwellings with monitoring kit Installed	47
Figure 8: Total energy consumption by category.....	49
Figure 9: Monthly total consumption-Sept.2018 to Feb. 2019 (kWh).....	49
Figure 10: Heating system breakdown	50
Figure 11: Monthly heating system consumption (kWh)-Sept.2018 to Feb.2019	50
Figure 12: DHW Off Peak Timer.....	51
Figure 13: Shower heater thermostat	51
Figure 14: Domestic Hot Water distribution	52
Figure 15: Monthly DHW consumption (kWh)	52

Figure 16: Monthly Appliances and Light consumption (kWh).....	54
Figure 17: Photovoltaic generation in Dwelling 6 (kWh).....	64
Figure 18: Comparison of indoor temperature D1 between January 2017 and January 2019.....	67
Figure 19: Comparison of indoor temperature D4 between January 2017 and January 2019.....	68
Figure 20: Heating Thermal Consumption Pasewalker 7 evolution (2010-2017).....	73
Figure 21: Heating Thermal Consumption Pasewalker 8 evolution (2010-2017).....	73
Figure 22: Heating Thermal Consumption Pasewalker 6 evolution (2010-2017).....	74
Figure 23: Hot water Thermal Consumption Pasewalker 7 evolution (2010-2018).....	74
Figure 24: Hot water Thermal Consumption Pasewalker 8 evolution (2010-2018).....	75
Figure 25: Electricity Consumption Adolfstr.1 evolution (2010-2017).....	75
Figure 26: Electricity Consumption Adolfstr.2 Main Meter evolution (2010-2017).....	76
Figure 27: Electricity Consumption Adolfstr.2 Guest apartment evolution (2010-2017).....	76
Figure 28: Electricity Consumption Adolfstr.3 evolution (2010-2017).....	76
Figure 29: Electricity Consumption Pasewalker Str.6 evolution (2010-2017).....	77
Figure 30: Electricity Consumption Pasewalker Str.7 Main Meter evolution (2010-2017).....	77
Figure 31: Electricity Consumption Pasewalker Str.7 Washhouse meter evolution (2010-2017).....	77
Figure 32: Electricity Consumption Pasewalker Str.8 evolution (2010-2017).....	78
Figure 33: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 16).....	79
Figure 34: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 17).....	79
Figure 35: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 18).....	80
Figure 36: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 19).....	81
Figure 37: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 20).....	81
Figure 38: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 16).....	82
Figure 39: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 17).....	83

Figure 40: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 18).....	83
Figure 41: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 19).....	84
Figure 42: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 20)	85
Figure 43: Hot water Thermal Consumption Pasewalker 7 evolution (2010-2016).....	86
Figure 44: Hot water Thermal Consumption Pasewalker 8 evolution (2010-2016)	87
Figure 45: kWh / day obtained in each of the measurement months in Adolfstr.3	89
Figure 46: 4 separate PV systems are built, including one Renewable Energy Community	91
Figure 47: PV System estimates of solar electricity generation (Adolftrase 1, 2 and Pasewalker 7) ..	91
Figure 48: Monthly energy output from fix-angle PV system (Adolftrase 1, 2 and Pasewalker 7) ..	92
Figure 49: Monthly in-plane irradiation for fixed-angle(Adolftrase 1, 2 and Pasewalker 7).....	93
Figure 50: PV System estimates of solar electricity generation (Adolftrase 3)	93
Figure 51: Monthly energy output from fix-angle PV system (Adolftrase 3)	94
Figure 52: Monthly in-plane irradiation for fixed-angle (Adolftrase 3).....	94

1 EXECUTIVE SUMMARY

The following document includes the information, procedure and explanations to characterize the energy consumption of the different Pilot Buildings considered in the Dreeam Project.

The report is divided in three main chapters corresponding to the pilot building of each Housing Company Partner: Ater Treviso, Places for People and 1892. The information for each Pilot building is described using the same structure with three main sections:

- Summary of information available and information collected.

For each building a table is provided that indicates the typology of the data and the agent or procedure used to collect the historic data. The minimum information requested was one year but in some cases there are more than one years of data and, in other cases there is no data at all. Regarding the information initially available and the different agents that can provide the information, it is important to remark that in general terms it is very difficult to collect information through utilities and most of the tenants. Finally in order to collect information from tenants it has been required to select a group of collaborative tenants that are willing to participate in the interviews (social evaluation) and to provide their energy bills.

- Energy Consumption Description.

This section describes the use of the energy from the different active systems. There is a description of the main energy consuming systems. The main systems are Heating, Domestic Hot Water (DHW), electricity consumption in communal areas and Tenants' electricity consumption. The objective of this section is to determine the use of energy of each system. Every pilot site has different systems including: District Heating, Central Boilers, electric heating and individual boilers, but in all of them SinCeO2 have analysed the data in order to get a detailed and accurate breakdown for each system.

- Energy Baseline.

In all the pilot Buildings, the consumption Energy Baseline for the main systems has been calculated: Heating, Domestic hot Water, electricity consumption in communal areas and Tenants' electricity consumption.

The objective of the energy baseline is to calculate the mathematical function that includes the variables that affect the consumption. This energy baseline is a normalised consumption that allows the comparison of the energy consumption in different periods (before and after renovations). The variables that mainly affect the consumption is weather conditions and the variable most representative is Heating Degree Days (HDD). For each baseline, we have considered different HDD bases since in each home there is a different setpoint temperature.

In addition, in some pilots, the variables of hours of occupation, measurement days or days of reading have also been included.

- Savings calculation.

In all the pilot Buildings, the energy and economic savings for the main systems have been calculated including: Heating, Domestic Hot Water, electricity consumption in communal areas and Tenants' electricity consumption.

Regarding tenants' electricity consumption that is not from heating and domestic hot water, additional analysis has been performed in order to identify if they are using auxiliary heating systems.

The highlights and the working process of consumptions energy baseline in each pilot is summarized in the following points:

Ater Treviso, Italy 1st Pilot Building

- In this pilot building there is an accurate baseline for heating and Domestic Hot Water.
- For electricity consumption of Communal Heating system it is possible to relate to the weather variability during winter time but not for the rest of the year.
- The tenants' electricity consumption has not been completed because the plan for monitoring equipment was stopped when Ater had to change the pilot building.

Ater Treviso, Italy 2nd Pilot Building

- In this pilot, there is little initial available data from some tenants.
- This report includes an initial description of the energy consumption of tenants.
- The production of heating and DHW is performed by an individual boiler, therefore the information from tenants meters is essential.

PfP, UK Pilot Building

- In this pilot building there was no initial available information about energy consumption of the dwellings.
- Thanks to the monitoring equipment it has been possible to collect detailed information of the energy consumption for the different active systems.
- The period evaluated in this report is from mid-September 2018 to mid-February 2019. In this initial evaluation for winter time baselines for the different systems in nine selected dwellings have been calculated.

LandsKronahem, Sweden Pilot Building

- In this pilot, there is complete information to evaluate the whole consumption of the four buildings included in the project. These buildings are supplied by district heating and the heating substation is equipped with a Building Management System (BMS) that has recorded the consumption data during the last three years.
- In addition the electricity consumption of the communal areas and the aggregated consumption of the tenants have been collected through the collaboration of Landskrona-energy and Landskronahem, being the only pilot where the utility has been collaborative.
- The energy baselines for the whole buildings and the different systems have been calculated.
- The tenant's electricity consumption has not been measured because the plan for monitoring equipment was stopped when it was necessary to change the pilot building. This pilot was not continued in the project.

1892 Berlin Pilot Building

- In this pilot building there was no initial available information about energy consumption of the communal areas.
- Energy consumption baselines based on several years covering the thermal consumption data (Heating and DHW) collected by 1892 (before renovations) of the 6 buildings (dwellings and common areas).
- Energy consumption baselines based on several years period covering the electricity consumption data collected by 1892 (before renovations) of the 6 buildings (common areas only).

2 ENERGY PERFORMANCE ATER 2nd BUILDING BEFORE RENOVATION.

2.1 INITIAL INFORMATION.

The following Table summarizes the information collected to perform the calculation of the baseline.

Table 1: ATER Treviso 2nd pilot Initial information.

ATER TREVISIO 2nd PILOT INITIAL INFORMATION REQUESTED.				
Information	Initial Availability	Agent Involved	Other Agent requested	information Provided
ENERGY CONSUMPTIONS				
Electric consumptions comunal Areas	NO	Ater/building manager	NA	1 year
Electric consumptions tenants	NO	Ater	NA	11 Tenants 1 year
Gas consumptions tenants	NO	Ater	NA	10 Tenants 1 year
BUILDING DESCRIPTION. (drawings technical description)				
Arquitectonical	YES			Basic description.
Electric installation	NO			Information collected in field visit.
HAVC installation.	YES			Basic description
SOCIOLOGICAL CHARACTERISITC				
Number of tenants per dwelling	NO	Ater/Savills		Ater/
Family status.	NO	Ater/Savills		Savills Interviews

Currently and thanks to the collaboration with Ater, gas readings are available for all apartments, from the beginning of the project until the month of July 2019. Tenant bills updated to 2019 are not yet available.

2.2 ENERGY CONSUMPTION DESCRIPTION.

- HEATING AND DOMESTIC HOT WATER.

Each apartment has an independent heating system for the production of hot water for heating and DHW. The independent boiler is running on natural gas and has 25 kW of thermal power. The boiler is connected to the apartment gas network that also supplies the cooking system. The first objective of this section is to calculate the energy consumption for each component: Heating, DHW and cooking. Initially the monitoring plan was developed to get the data for the gas meters every 15 minutes. With such a detailed data it would be possible to calculate accurately the consumption of the three systems that are supplied by gas. Due to the lack of collaboration from the gas supplier, it was not been possible to install the gas monitoring equipment, so the following procedure was used for calculate the energy of the different systems.

Collect the monthly gas consumption of at least 10 months to identify the DHW consumption during the months when heating system is off. Considering that the level of use for DHW is similar throughout the year and will only could have some variations related to the net water temperature has allowed us to calculate the monthly DHW consumption.

For the heating system, thanks to the collaboration of Ater, the gas meter readings have been collected during the winter in order to have daily gas consumption with different weather conditions.

Finally the gas consumption due to the cooking system will be analysed through the information provided during the tenants interviews. Tenants had to answer some question regarding their pattern of gas usage for cooking. However in order to perform the comparison before and after renovations this consumption will be considered as not a variable parameter.

The following tables shows the initial basic estimation for a year of the energy consumption from gas supplied in each apartment, using the small amount of data available from bills.

Table 2: Energy consumption data from gas bills A Tower

COD.	n Persons	TYPE	FLOOR	BOW WINDOW	SQM	AIR COND	1 YEAR GAS BILLS	SOME MONTHS GAS BILLS	KWht/year (Estimation)
AT1FA1	1	A1	1	X	79,44			6	6.554
AT1FA2	3	A2	1	X	94,35			11	29.712
AT1FA3	2	A3	1	X	82,97	1		2	11.291
AT2FA1	1	A1	2	X	79,44	1			
AT2FA2	4	A2	2	X	94,35			4	15.640
AT2FA3	1	A3	2	X	82,97			10	20.215
AT3FA1	1	A1	3		79,44	1		2	7.780
AT3FA2	3	A2	3	X	94,35	1		8	11.404
AT3FA3	4	A3	3	X	82,97			10	10.770
AT4FA1	3	A1	4	X	79,44			11	10.203
AT4FA2	2	A2	4	X	94,35			11	18.949
AT4FA3	2	A3	4	X	82,97		X		11.168
AT5FA1	1	A1	5	X	79,44	1		10	13.924
AT5FA2	2	A2	5	X	94,35			10	10.952
AT5FA3	2	A3	5	X	82,97	1		3	10.939
AT6FA1	2	A1	6		79,44	1		4	24.654
AT6FA2	2	A2	6	X	94,35	1			
AT6FA3	6	A3	6		82,97				

Table 3: Energy consumption data from gas bills B Tower

COD	n Persons	TYPE	FLOOR	BOW WINDOW	air cond	SQM	1 YEAR GAS BILLS	SOME MONTHS GAS BILLS	KWht/year (estimation)
BT1FA1		B1	1	X		79,44			
BT1FA2	4	B2	1	X	1	94,35	X		1.658
BT1FA3	3	B3	1			82,97			
BT2FA1	5	B1	2		1	79,44			
BT2FA2	1	B2	2	X	1	94,35	X		20.536
BT2FA3	2	B3	2	X	1	82,97			
BT3FA1	2	B1	3	X		79,44	X		14.551
BT3FA2	3	B2	3		1	94,35			
BT3FA3	2	B3	3		1	82,97		10	18.883
BT4FA1	1	B1	4	X		79,44		10	12.240
BT4FA2	5	B2	4	X	1	94,35	X		9.122
BT4FA3	2	B3	4	X	1	82,97	X		13.939
BT5FA1	3	B1	5			79,44		8	9.065
BT5FA2	3	B2	5	X	1	94,35		10	1.380
BT5FA3	2	B3	5		1	82,97		10	7.513
BT6FA1	1	B1	6	X	1	79,44			
BT6FA2	2	B2	6	X		94,35			
BT6FA3	4	B3	6	X	1	82,97	X		16.332

- TENANTS ELECTRIC CONSUMPTION.

The electricity consumption of the apartments is due to appliances, lighting system and air conditioning. The electricity consumption of each apartment was monitored through monitoring equipment, therefore there is available data to characterize the electricity consumption of the tenants. The consumption of the air conditioning was recorded during the summer period.

The following tables shows the initial basic estimation for a year of the energy consumption from electricity consumption in each apartment, according to the small amount of data available from bills.

Table 4: Energy consumption data from electricity bills A Tower

COD.	n Persons	TYPE	FLOOR	BOW WINDOW	SQM	AIR COND	1 YEAR ELECTRIC BILLS	SOME MONTHS ELECTRIC BILLS	kWhe/YEAR (Estimation)	kWhe/year (BILL)
AT1FA1	1	A1	1	X	79,44					
AT1FA2	3	A2	1	X	94,35			11	1.950	
AT1FA3	2	A3	1	X	82,97	1		1	1.940	
AT2FA1	1	A1	2	X	79,44	1				
AT2FA2	4	A2	2	X	94,35			9	1.762	1.794
AT2FA3	1	A3	2	X	82,97			10	3.380	
AT3FA1	1	A1	3		79,44	1		2	1.461	
AT3FA2	3	A2	3	X	94,35	1		4	374	
AT3FA3	4	A3	3	X	82,97			10	3.898	
AT4FA1	3	A1	4	X	79,44			2	1.217	
AT4FA2	2	A2	4	X	94,35			2	1.624	1.556
AT4FA3	2	A3	4	X	82,97		X		1.537	
AT5FA1	1	A1	5	X	79,44	1		10	1.169	1.339
AT5FA2	2	A2	5	X	94,35			1	2.790	
AT5FA3	2	A3	5	X	82,97	1		2	3.723	
AT6FA1	2	A1	6		79,44	1				
AT6FA2	2	A2	6	X	94,35	1		11	2.427	
AT6FA3	6	A3	6		82,97					

Table 5: Energy consumption data from electricity bills B Tower

COD	n Persons	TYPE	FLOOR	BOW WINDOW	air cond	SQM	1 YEAR ELECTRIC BILLS	SOME MONTHS ELECTRIC BILLS	kWhe/year (estimation)	KWhe/year (BILLS)
BT1FA1		B1	1	X		79,44				
BT1FA2	4	B2	1	X	1	94,35	X		3.045	
BT1FA3	3	B3	1			82,97				
BT2FA1	5	B1	2		1	79,44				
BT2FA2	1	B2	2	X	1	94,35		4	894	
BT2FA3	2	B3	2	X	1	82,97				
BT3FA1	2	B1	3	X		79,44	X		2.242	
BT3FA2	3	B2	3		1	94,35				
BT3FA3	2	B3	3		1	82,97		11	1.759	1.901
BT4FA1	1	B1	4	X		79,44		10	1.467	
BT4FA2	5	B2	4	X	1	94,35	X		2.077	
BT4FA3	2	B3	4	X	1	82,97	X		1.832	1.832
BT5FA1	3	B1	5			79,44		6	2.338	584
BT5FA2	3	B2	5	X	1	94,35		X	1.494	1.820
BT5FA3	2	B3	5		1	82,97		6	1.285	1.476
BT6FA1	1	B1	6	X	1	79,44				
BT6FA2	2	B2	6	X		94,35				
BT6FA3	4	B3	6	X	1	82,97		11	3.136	

- COMMUNAL SERVICES ENERGY CONSUMPTION.

The energy consumption of the communal services is due to the elevator and the lighting system. These components as well as the future systems implemented during renovations, were monitored with monitoring equipment and there is enough data for a complete analysis. The consumptions of the current systems it is already available through the billings.

	kWh/year
COMMUNAL SERVICES TOWER A	2.378
COMMUNAL SERVICES TOWER B	2.779

2.3 ENERGY BASELINE CALCULATION.

This section includes the analysis of the calculation of the baselines, for the following cases:

- Individual heating baseline for a selected group of tenants
- Individual DHW baseline for a selected group of tenants
- Individual electricity consumption baseline for a selected group of tenants
- Communal services energy Baseline

2.3.1 Individual Electricity consumption baseline for a selected group of tenants

Electricity Data from monitoring equipment of 36 Dwellings in the 2 towers between April 2017 and July 2019. From these data, the months between April 2017 to December 2017 have been used to calculate the baseline. These months correspond to the reference period, which is the period prior to the renewal.

275 measured days included in the baseline of each apartment & common areas.

The data collected during the works are not relevant for calculating the energy savings from the works (from January 1st 2018 till October 31st 2018 in tower B and till May 2019 in tower A).

Table 6: Reference period for the calculation of the baseline in Treviso (Tower A and Tower B)

Baseline period	
From April 2017	Till December 2017

The relationship between energy consumption and variables does not have to be linear, and could be adjusted to another type of function, such as exponential, quadratic, logarithmic, etc. In those facilities where variations in energy consumption may depend on more than one variable, the formula that could relate them would be:

$$F(x, y, z, \dots, n) = Ax + By + Cz + \dots + Nn + D$$

Where:

- X is the independent variable number 1 (for example degrees day, hours of use, etc.) and A is the coefficient corresponding to the independent variable X.
- Y is the independent variable number 2 (for example degrees day, hours of use, etc.) and B is the coefficient corresponding to the independent variable Y.
- Z is the independent variable number 3 (for example degrees day, hours of use, etc.) and C is the coefficient corresponding to the independent variable Z (So on with all independent variables that are part of the baseline).
- D is the value of the ordinate at the origin.

In this case, the dependent variable is the monitored electricity consumption. In addition, three independent variables have been used for the calculation of the baseline: cooling degrees day (CDD), hours of occupation and days of measurement.

To calculate the cooling degree days, the data collected from the external probe being monitored has been used as the outside temperature and as a base temperature of 26°C selected.

To contribute to the calculation system, the hours of activity in the home has been used. To do this, based on the fifteen minute recordings of power demand, it is established whether there is activity or not, comparing the registered power with the power in the average moments of "non-activity", which correspond to the night periods, that is, if during day, "the same" power is recorded than during the night, it is considered that at that time, there was no activity in the house.

Thus, the total hours of activity or hours, in which consumption occurs in the homes over the months, have been set, and this value has been used as a variable to be considered.

Table 7: *Occupation time data of Treviso apartments*

Month	1 (AR1-TB-A01)	2 (AR1-TB-A02)	3 (AR1-TB-A03)	4 (AR2-TB-04)
	Hours of use (h) 1	Hours of use (h) 2	Hours of use (h) 3	Hours of use (h) 4
abr-17	119,75	99,5	197	194
may-17	192,25	127,25	211,5	195,75
jun-17	162,5	114	302,5	188,75
jul-17	253,75	134	293,25	223
ago-17	249,5	124	439	294,25
sep-17	241	92,25	209,75	184,25
oct-17	396,5	109,25	208,75	179,5
nov-17	363	321,25	270,75	188,5
dic-17	410	346,5	332,5	223,25

Finally, the third variable used was the one with metered data days within each month, since it was not always possible to have constant records during the project, due to communication failures with to 3G coverage problems.

In this context, a multivariate regression analysis has been performed with the monthly parameters. Based on the three variables, the mathematical function that relates them to the energy consumption has been calculated, according to the function:

$$F(x, y, z, \dots, n) = Ax + By + Cz + \dots + Nn + D$$

Where:

- X is the independent variable number 1 (for example degrees day, hours of use, etc.) and A is the coefficient corresponding to the independent variable X.
- Y is the independent variable number 2 (for example degrees day, hours of use, etc.) and B is the coefficient corresponding to the independent variable Y.
- Z is the independent variable number 3 (for example degrees day, hours of use, etc.) and C is the coefficient corresponding to the independent variable Z (So on with all independent variables that are part of the baseline).
- D is the value of the ordinate at the origin.

Or in the case of household consumption:

$$\text{Monthly energy consumption (kWh)} = A (\text{Degree Days}) + B (\text{Hours of activity}) + C (\text{Registration days}) + D$$

2.3.2 Individual Heating and DHW baseline for a selected group of tenants

Gas meter readings from 36 Dwellings were recorded from January 2017 until April 2019. From these data, the consumptions between April 2017 until December 2017 have been used to calculate the baseline. It is the reference period, time before the renovation of the reforms.

Between 217 and 226 reading days included in the Baseline of each apartment.

The data collected during the reforms are not relevant to calculate the energy savings of these reforms (from January 1st 2018 till October 31st 2018 in tower B and until the end of May 2019 in tower A when the thermal solar panels were operative).

The data collected from November 1st 2018 until the end of the project was used to calculate the energy savings (only for Tower B). There are readings from November 2018 till April 2019 to calculate the savings.

Table 8: Reference period for the calculation of the heating and DHW baseline in Treviso

Baseline period	
From April 2017	Till December 2017

2.4 SAVINGS CALCULATION

2.4.1 Individual Electricity consumption savings for a selected group of tenants

2.4.1.1 Calculation of electricity savings in Tower A

In Tower A, in which the works were completed on May 1, 2019, a demonstration period of savings, from May 1, 2019 until July 31, 2019 has been taken.



Figure 1: Via BORGO FURO 35/A (Tower A)

Table 9: Reporting period for the calculation of electricity savings in Treviso tower A

Reporting period	
From May 2019	Till July 2019

Tables with the savings calculated for each of the apartments are shown below. These savings are those corresponding to the three months used as a demonstration period (from May 2019 to August 2019 for Tower A):

Where:

- CDD (Cooling Degree Days): The Cooling Degree Days are those in which the temperature is above a base temperature, from which it is considered necessary to utilise cooling equipment to maintain comfort inside the building. As a base temperature, the temperature at which the best regression value is obtained has been used in each dwelling.
- Hours of use(h): Time in which it is considered that there is activity in the house.
- Reading days: reading days within each month, since it was not always possible to have constant records since during the project there were communication failures due to 3G coverage problems.

Table 10: Savings electricity consumption in the apartments of tower A of Treviso

1 (AR1-TA-A01)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	1,739218584	Hours of use (h)	-0,275887341	CDD 17	-23,8703346	Reading days	127,7556945
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 17	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	135,54	411	15,61	30	122,59	-12,94	-11%
jun-19	177,41	512	255,45	31	207,35	29,94	14%
jul-19	215,53	558	262,54	31	284,96	69,43	24%
TOTAL	528,47	1.481	533,59	92	614,90	86,43	14%

2 (AR1-TA-A02)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,347231069	Hours of use (h)	0,58187551	CDD 26	-1,325073301	Reading days	19,72877264
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 26	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	103,23	439	0,00	30	132,41	29,18	22%
jun-19	86,91	279	21,53	31	88,06	1,15	1%
jul-19	116,78	383	22,27	31	124,51	7,73	6%
TOTAL	306,92	1.101	43,80	92	344,98	38,06	11%

3 (AR1-TA-A03)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,676256632	Hours of use (h)	-0,137402043	CDD 19	0,266554448	Reading days	-142,4724509
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 19	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	94,03	281	2,57	30	55,03	-39,00	-71%
jun-19	94,92	389	195,45	31	102,17	7,25	7%
jul-19	100,95	429	200,54	31	128,18	27,23	21%
TOTAL	289,90	1.099	398,56	92	285,38	-4,52	-2%

4 (AR2-TA-04)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,249327496	Hours of use (h)	0,330372611	CDD 27	5,508042389	Reading days	-141,9164748
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 27	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	101,418	218	0	30	77,68	-23,74	-31%
jun-19	91,582	272,25	56	31	115,21	23,63	21%
jul-19	97,27	330,5	49	31	127,42	30,15	24%
TOTAL	290,27	821	105	92	320,32	30,05	9%

5 (AR2-TA-05)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,260451892	Hours of use (h)	-0,032383989	CDD 25	2,008772186	Reading days	-4,462524355
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 25	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	90,32	121	0,00	30	87,38	-2,94	-3%
jun-19	93,37	129	37,39	31	90,26	-3,11	-3%
jul-19	97,74	134	37,26	31	91,37	-6,37	-7%
TOTAL	281,44	384	74,66	92	269,02	-12,42	-5%

6 (AR2-TA-06)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,39048146	Hours of use (h)	0,060130297	CDD 17	-1,919479821	Reading days	103,1503976
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 17	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	163,54	258	15,61	30	147,15	-16,39	-11%
jun-19	129,25	159	255,45	31	121,09	-8,16	-7%
jul-19	136,12	195	262,54	31	135,58	-0,54	0%
TOTAL	428,91	612	533,59	92	403,82	-25,09	-6%

7 (AR3-TA-07)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,695170313	Hours of use (h)	-0,1723872	CDD 17	10,48234134	Reading days	-185,4889555
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	172,25	76	15,61	30	178,95	6,70	4%
jun-19	192,55	91	255,45	31	158,51	-34,03	-21%
jul-19	344,33	241	262,54	31	261,92	-82,42	-31%
TOTAL	709,13	408	533,59	92	599,38	-109,75	-18%

8 (AR3-TA-08)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,416396093	Hours of use (h)	1,438335992	CDD 22	-11,10937622	Reading days	366,7763255
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 22	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	190,30	416	0,00	30	206,51	16,21	8%
jun-19	397,35	508	107,76	31	388,91	-8,43	-2%
jul-19	391,36	521	108,12	31	394,74	3,37	1%
TOTAL	979,00	1.444	215,88	92	990,16	11,15	1%

9 (AR3-TA-09)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,518767668	Hours of use (h)	0,145949844	CDD 21	12,74923924	Reading days	-363,7823039
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 21	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	269,64	441	0,00	30	247,21	-22,43	-9%
jun-19	249,14	445	135,64	31	282,22	33,08	12%
jul-19	388,17	502	138,54	31	311,96	-76,22	-24%
TOTAL	906,96	1.388	274,18	92	841,39	-65,57	-8%

10 (AR4-TA-A10)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,782999674	Hours of use (h)	1,059080722	CDD 25	-7,298227227	Reading days	203,054911
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 25	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	165,29	232	0,00	30	165,96	0,66	0%
jun-19	227,45	335	37,39	31	278,52	51,07	18%
jul-19	297,49	465	37,26	31	380,17	82,69	22%
TOTAL	690,23	1.032	74,66	92	824,66	134,43	16%

11 (AR4-TA-A11)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,677296653	Hours of use (h)	0,276133756	CDD 25	3,431469673	Reading days	-27,74721891
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 25	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	254,17	308	0,00	30	283,47	29,29	10%
jun-19	196,13	236	37,39	31	248,46	52,33	21%
jul-19	200,50	264	37,26	31	267,72	67,23	25%
TOTAL	650,80	807	74,66	92	799,65	148,85	19%

12 (AR4-TA-A12)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,512165048	Hours of use (h)	0,464066696	CDD 27	1,549867557	Reading days	-0,378832824
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 27	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	76,22	52	0,00	30	72,49	-3,72	-5%
jun-19	86,26	43	2,40	31	70,55	-15,71	-22%
jul-19	98,05	59	0,83	31	78,27	-19,78	-25%
TOTAL	260,52	153	3,22	92	221,31	-39,22	-18%

13 (AR5-TA-A13)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,30829865	Hours of use (h)	2,816318103	CDD 28	6,061668328	Reading days	-123,7732947
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 28	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	89,55	83	0,00	30	83,74	-5,80	-7%
jun-19	92,74	46	6,10	31	95,34	2,60	3%
jul-19	97,30	45	4,16	31	89,74	-7,56	-8%
TOTAL	279,59	174	10,26	92	268,82	-10,77	-4%

14 (AR5-TA-A14)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	1,745368496	Hours of use (h)	0,168818386	CDD 23	8,828494676	Reading days	-209,4098738
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 23	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	220,46	110	0,00	30	246,56	26,10	11%
jun-19	200,36	85	82,13	31	226,93	26,58	12%
jul-19	206,28	80	80,71	31	217,09	10,81	5%
TOTAL	627,09	275	162,84	92	690,59	63,49	9%

15 (AR5-TA-A15)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,515960368	Hours of use (h)	1,323651301	CDD 27	-7,666236318	Reading days	149,2220575
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 27	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	181,37	501	0,00	30	177,73	-3,64	-2%
jun-19	140,26	415	11,87	31	141,15	0,89	1%
jul-19	167,30	519	10,99	31	193,77	26,47	14%
TOTAL	488,93	1.434	22,86	92	512,65	23,72	5%

16 (AR6-TA-A16)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,154318851	Hours of use (h)	1,978488506	CDD 29	3,929920019	Reading days	-49,47011083
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 29	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	93,27	227	0,00	30	103,42	10,15	10%
jun-19	101,70	282	2,40	31	120,54	18,84	16%
jul-19	112,27	354	0,83	31	128,62	16,35	13%
TOTAL	307,24	862	3,22	92	352,58	45,34	13%

17 (AR6-TA-A17)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,467548313	Hours of use (h)	1,498405516	CDD 21	1,179781738	Reading days	86,4587912
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 21	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	218,66	220	0,00	30	224,60	5,93	3%
jun-19	221,20	171	135,64	31	406,35	185,15	46%
jul-19	324,66	322	138,54	31	481,16	156,51	33%
TOTAL	764,52	713	274,18	92	1.112,11	347,59	31%

18 (AR6-TA-A18)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,564348048	Hours of use (h)	-0,027957234	CDD 24	3,329222026	Reading days	-73,47690444
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 24	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
may-19	115,38	157	0,00	30	114,72	-0,66	-1%
jun-19	121,15	166	58,60	31	121,91	0,76	1%
jul-19	128,37	173	56,68	31	125,64	-2,74	-2%
TOTAL	364,91	496	115,28	92	362,27	-2,64	-1%

The summary of Tower A of Treviso apartment electricity savings is shown below:

Table 11: Summary savings electricity consumption Tower A (kWh)

kWh ELECTRIC SAVINGS																			
Month	1 (AR1-TA-A01)	2 (AR1-TA-A02)	3 (AR1-TA-A03)	4 (AR2-TA-A04)	5 (AR2-TA-A05)	6 (AR2-TA-A06)	7 (AR3-TA-A07)	8 (AR3-TA-A08)	9 (AR3-TA-A09)	10 (AR4-TA-A10)	11 (AR4-TA-A11)	12 (AR4-TA-A12)	13 (AR5-TA-A13)	14 (AR5-TA-A14)	15 (AR5-TA-A15)	16 (AR6-TA-A16)	17 (AR6-TA-A17)	18 (AR6-TA-A18)	TOTAL
may-19	-12,94	29,18	-39,00	-23,74	-2,94	-16,39	6,70	16,21	-22,43	0,66	29,29	-3,72	-5,80	26,10	-3,64	10,15	5,93	-0,66	-7,04
jun-19	29,94	1,15	7,25	23,63	-3,11	-8,16	-34,03	-8,43	33,08	51,07	52,33	-15,71	2,60	26,58	0,89	18,84	185,15	0,76	363,81
jul-19	69,43	7,73	27,23	30,15	-6,37	-0,54	-82,42	3,37	-76,22	82,69	67,23	-19,78	-7,56	10,81	26,47	16,35	156,51	-2,74	302,36
TOTAL (kWh)	86,43	38,06	-4,52	30,05	-12,42	-25,09	-109,75	11,15	-65,57	134,43	148,85	-39,22	-10,77	63,49	23,72	45,34	347,59	-2,64	659,13

Table 12: Summary savings electricity consumption Tower A (%)

% ELECTRIC SAVINGS																			
Month	1 (AR1-TA-A01)	2 (AR1-TA-A02)	3 (AR1-TA-A03)	4 (AR2-TA-04)	5 (AR2-TA-05)	6 (AR2-TA-06)	7 (AR3-TA-07)	8 (AR3-TA-08)	9 (AR3-TA-09)	10 (AR4-TA-A10)	11 (AR4-TA-A11)	12 (AR4-TA-A12)	13 (AR5-TA-A13)	14 (AR5-TA-A14)	15 (AR5-TA-A15)	16 (AR6-TA-A16)	17 (AR6-TA-A17)	18 (AR6-TA-A18)	TOTAL
may-19	-11%	22%	-71%	-31%	-3%	-11%	4%	8%	-9%	0%	10%	-5%	-7%	11%	-2%	10%	3%	-1%	
jun-19	14%	1%	7%	21%	-3%	-7%	-21%	-2%	12%	18%	21%	-22%	3%	12%	1%	16%	46%	1%	
jul-19	24%	6%	21%	24%	-7%	0%	-31%	1%	-24%	22%	25%	-25%	-8%	5%	14%	13%	33%	-2%	
TOTAL	14%	11%	-2%	9%	-5%	-6%	-18%	1%	-8%	16%	19%	-18%	-4%	9%	5%	13%	31%	-1%	7%

As mentioned above, these savings are corresponding to the three months used as a demonstration period. The savings derived from photovoltaic generation have not been taken into account since it is not yet operational.

Table 13: Total electricity savings Tower A (kWh)

Total electrical savings A Treviso Tower		
TOTAL REFERENCE ELECTRIC CONSUMPTION (kWh)		9.814
TOTAL ELECTRIC SAVING (kWh)		659
TOTAL ELECTRIC SAVING (%)		7%

In Tower A of Treviso a 7% electricity saving has been obtained. This percentage of savings is low since the reforms undertaken in the Treviso facilities do not directly affect the electricity consumption of the dwellings (the energy generated by the photovoltaic installation affects the electricity consumption of the common areas).

Some homes that have electricity over-consumption are the ones with the largest number of inhabitants and the largest area, being able to affirm that they are factors that affect the electricity consumption of a house.

The savings shown above correspond to the three months that have been used as a demonstration period (from May 2019 to July 2019). It has been estimated how much would be saved annually:

Table 14: Annual electricity savings in A Tower (kWh)

Total electrical savings A Treviso Tower		
TOTAL REFERENCE ELECTRIC CONSUMPTION (kWh)		27.112
TOTAL ELECTRIC SAVING (kWh)		2.213
TOTAL ELECTRIC SAVING (%)		8%

2.4.1.2 Calculation of electricity savings in Tower B

The electricity savings for Tower B have been calculated in the same way that was used for Tower A.



Figure 2: V.le FRANCIA 1 (Tower B)

In the case of Treviso Tower B, a demonstration period of savings, from November 2018, the month in which the reforms ended (finished in October 2018), until July 2019 has been taken.

In the calculation of electricity savings for Tower B, it should be noted that in the case of apartment 7 (SinCeO2 nomenclature) there is no data, since there was no one living in that apartment.

In addition, due to data reception problems on the platform, in apartments 13 and 18 (Sinceo2 nomenclature) only data are available from April to July, so they have only been taken as a demonstration period these months in these apartments.

Table 15: Reporting period for the calculation of electricity savings in Treviso Tower B

Reporting period	
From November 2018	Till July 2019

Table 16: Savings electricity consumption in the apartments of tower B of Treviso

1 (AR1-TB-A01)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,347986555	Hours of use (h)	0,479269814	CDD 22	11,54478038	Reading days	-263,070399
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 22	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	225,56	416,5	0	30	228,21	2,65	1%
dic-18	208,244	379,5	0	31	226,88	18,63	8%
ene-19	194,544	323,75	0	31	207,48	12,93	6%
feb-19	174,038	274,5	0	28	155,71	-18,33	-12%
mar-19	153,561	204,25	0	31	165,89	12,33	7%
abr-19	131,916	166,25	0	30	141,13	9,21	7%
may-19	152,016	188,75	0	31	160,50	8,48	5%
jun-19	250,04	259,5	107,8	30	225,22	-24,82	-11%
jul-19	229,1712857	258,5	108,1	31	236,59	7,42	3%
TOTAL	1.719,1	2.471,5	215,9	273,0	1.747,6	28,5	2%

2 (AR1-TB-A02)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	1,428331052	Hours of use (h)	-0,146666657	CDD 17	-15,4801146	Reading days	441,3500425
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 17	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	123,1	130,8	0,0	30,0	163,70	40,59	25%
dic-18	134,8	141,5	0,0	31,0	163,58	28,83	18%
ene-19	136,0	148,5	0,0	31,0	173,57	37,54	22%
feb-19	143,2	133,3	0,0	28,0	198,23	55,06	28%
mar-19	132,3	120,8	0,0	31,0	133,94	1,63	1%
abr-19	120,1	96,0	15,0	30,0	111,86	-8,29	-7%
may-19	120,7	106,0	15,6	31,0	110,58	-10,15	-9%
jun-19	104,4	100,5	255,4	30,0	83,03	-21,41	-26%
jul-19	117,6	135,8	262,5	31,0	116,86	-0,69	-1%
TOTAL	1.132,2	1.113,0	548,6	273,0	1.255,3	123,1	10%

3 (AR1-TB-A03)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,481420825	Hours of use (h)	26,75367257	CDD 30	5,723556387	Reading days	-62,92679374
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 30	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	241,0	269,8	0,0	30,0	238,64	-2,33	-1%
dic-18	297,4	362,3	0,0	31,0	288,90	-8,50	-3%
ene-19	269,3	313,3	0,0	31,0	265,31	-4,00	-2%
feb-19	233,6	253,0	0,0	28,0	219,13	-14,43	-7%
mar-19	229,7	242,0	0,0	31,0	231,01	1,28	1%
abr-19	221,4	239,5	0,0	30,0	224,08	2,69	1%
may-19	206,5	208,8	0,0	31,0	215,00	8,52	4%
jun-19	272,4	286,3	0,4	30,0	256,85	-15,58	-6%
jul-19	274,7	303,0	0,0	31,0	260,37	-14,35	-6%
TOTAL	2.246,0	2.477,8	0,4	273,0	2.199,3	-46,7	-2%

4 (AR2-TB-04)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,679729202	Hours of use (h)	-1,919880724	CDD 27	-3,829286848	Reading days	151,7978052
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 27	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	138,0	68,5	0,0	30,0	83,48	-54,48	-65%
dic-18	156,0	75,3	0,0	31,0	84,24	-71,79	-85%
ene-19	160,0	76,5	0,0	31,0	85,09	-74,90	-88%
feb-19	147,0	70,5	0,0	28,0	92,50	-54,51	-59%
mar-19	168,9	157,5	0,0	31,0	140,15	-28,74	-21%
abr-19	162,1	242,8	0,0	30,0	201,92	39,78	20%
may-19	144,3	130,0	0,0	31,0	121,45	-22,86	-19%
jun-19	170,4	282,8	11,9	30,0	206,32	35,91	17%
jul-19	184,2	272,8	11,0	31,0	197,39	13,14	7%
TOTAL	1.431,0	1.376,5	22,9	273,0	1.212,5	-218,5	-18%

5 (AR2-TB-05)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,243045814	Hours of use (h)	5,888384496	CDD 29	2,145575027	Reading days	-39,95588089
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 29	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	106,0	147,3	0,0	30,0	60,20	-45,84	-76%
dic-18	116,2	146,8	0,0	31,0	62,22	-54,02	-87%
ene-19	124,2	161,0	0,0	31,0	65,69	-58,52	-89%
feb-19	97,2	138,5	0,0	28,0	53,78	-43,46	-81%
mar-19	108,8	360,3	0,0	31,0	114,11	5,29	5%
abr-19	102,2	501,0	0,0	30,0	146,18	43,96	30%
may-19	101,7	544,5	0,0	31,0	158,90	57,17	36%
jun-19	136,0	644,0	2,4	30,0	195,05	59,03	30%
jul-19	176,2	708,0	0,8	31,0	203,49	27,31	13%
TOTAL	1.068,7	3.351,3	3,2	273,0	1.059,6	-9,1	-1%

6 (AR2-TB-06)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,786738658	Hours of use (h)	3,952223301	CDD 27	0,716399571	Reading days	25,90146336
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 27	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	80,1	38,5	0,0	30,0	77,68	-2,39	-3%
dic-18	98,0	49,3	0,0	31,0	86,86	-11,17	-13%
ene-19	93,0	46,5	0,0	31,0	84,69	-8,31	-10%
feb-19	69,0	33,8	0,0	28,0	72,51	3,51	5%
mar-19	74,9	33,8	0,0	31,0	74,66	-0,25	0%
abr-19	76,0	32,3	0,0	30,0	72,77	-3,23	-4%
may-19	76,1	29,3	0,0	31,0	71,12	-5,01	-7%
jun-19	244,0	236,3	11,9	30,0	280,18	36,15	13%
jul-19	244,1	230,0	11,0	31,0	272,49	28,42	10%
TOTAL	1.055,2	729,5	22,9	273,0	1.093,0	37,7	3%

8 (AR3-TB-08)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,699933319	Hours of use (h)	0,785057735	CDD 26	1,250826294	Reading days	147,4465579
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 26	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	107,4	18,5	0,0	30,0	197,92	90,50	46%
dic-18	79,1	11,5	0,0	31,0	194,27	115,21	59%
ene-19	90,3	11,0	0,0	31,0	193,92	103,65	53%
feb-19	87,8	11,8	0,0	28,0	190,69	102,90	54%
mar-19	78,2	7,8	0,0	31,0	191,65	113,41	59%
abr-19	87,6	11,0	0,0	30,0	192,67	105,02	55%
may-19	97,3	19,0	0,0	31,0	199,52	102,24	51%
jun-19	96,2	15,3	21,5	30,0	212,55	116,39	55%
jul-19	124,5	24,3	22,3	31,0	220,68	96,14	44%
TOTAL	848,4	130,0	43,8	273,0	1.793,9	945,5	53%

9 (AR3-TB-09)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,292680938	Hours of use (h)	-0,883928486	CDD 25	3,784634487	Reading days	-44,37882832
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 25	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	183,9	261,0	0,0	30,0	145,55	-38,31	-26%
dic-18	189,9	271,5	0,0	31,0	152,41	-37,53	-25%
ene-19	191,5	288,3	0,0	31,0	157,31	-34,22	-22%
feb-19	152,4	237,3	0,0	28,0	131,03	-21,38	-16%
mar-19	170,3	333,5	0,0	31,0	170,55	0,28	0%
abr-19	173,3	350,8	0,0	30,0	171,82	-1,48	-1%
may-19	171,9	362,5	0,0	31,0	179,04	7,11	4%
jun-19	142,3	360,8	37,4	30,0	141,69	-0,66	0%
jul-19	106,7	257,0	37,3	31,0	115,22	8,54	7%
TOTAL	1.482,3	2.722,5	74,7	273,0	1.364,6	-117,6	-9%

10 (AR4-TB-A10)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,428111654	Hours of use (h)	-0,085610405	CDD 17	-0,670648381	Reading days	-0,86119661
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 17	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	119,8	286,3	0,0	30,0	101,57	-18,26	-18%
dic-18	147,3	291,8	0,0	31,0	103,25	-44,05	-43%
ene-19	151,5	292,0	0,0	31,0	103,36	-48,13	-47%
feb-19	114,7	243,5	0,0	28,0	84,61	-30,08	-36%
mar-19	117,8	312,8	0,0	31,0	112,24	-5,51	-5%
abr-19	95,8	285,0	15,0	30,0	99,74	3,95	4%
may-19	102,0	331,0	15,6	31,0	118,72	16,71	14%
jun-19	82,5	310,0	255,4	30,0	89,87	7,32	8%
jul-19	84,7	325,0	262,5	31,0	95,01	10,31	11%
TOTAL	1.016,1	2.677,3	548,6	273,0	908,4	-107,8	-12%

11 (AR4-TB-A11)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,521026047	Hours of use (h)	3,11845028	CDD 29	11,78931116	Reading days	-299,2485963
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 29	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	302,4	459,8	0,0	30,0	293,97	-8,41	-3%
dic-18	319,6	476,3	0,0	31,0	314,36	-5,20	-2%
ene-19	274,5	452,5	0,0	31,0	301,98	27,47	9%
feb-19	275,8	405,5	0,0	28,0	242,13	-33,71	-14%
mar-19	291,9	429,0	0,0	31,0	289,74	-2,18	-1%
abr-19	261,7	367,5	0,0	30,0	245,91	-15,74	-6%
may-19	243,3	319,3	0,0	31,0	232,56	-10,78	-5%
jun-19	288,9	492,5	2,4	30,0	318,51	29,64	9%
jul-19	287,3	588,0	0,8	31,0	375,16	87,87	23%
TOTAL	2.545,4	3.990,3	3,2	273,0	2.614,3	69,0	3%

12 (AR4-TB-A12)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,538693207	Hours of use (h)	0,140101897	CDD 18	-0,871740537	Reading days	56,02394063
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 18	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	123,6	178,8	0,0	30,0	126,16	2,54	2%
dic-18	132,2	187,8	0,0	31,0	130,14	-2,01	-2%
ene-19	129,8	195,3	0,0	31,0	134,18	4,39	3%
feb-19	129,6	178,0	0,0	28,0	127,50	-2,10	-2%
mar-19	136,7	180,5	0,0	31,0	126,23	-10,42	-8%
abr-19	132,8	172,5	4,8	30,0	123,46	-9,35	-8%
may-19	141,4	184,8	7,5	31,0	129,57	-11,79	-9%
jun-19	220,1	306,0	225,4	30,0	226,30	6,23	3%
jul-19	184,6	213,8	231,5	31,0	176,58	-7,97	-5%
TOTAL	1.330,6	1.797,3	469,2	273,0	1.300,1	-30,5	-2%

13 (AR5-TB-A13)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,275819757	Hours of use (h)	-1,378777436	CDD 29	-0,268278165	Reading days	15,26718254
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 29	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
abr-19	99,09	400	0	30	117,5467405	18,46173027	16%
may-19	98,96	431	0	31	125,8288748	26,86529927	21%
jun-19	124,50	431	2,396784314	30	122,7925208	-1,704116684	-1%
jul-19	131,18	431	0,825478927	31	124,6907231	-6,485506105	-5%
TOTAL	453,7	1.701,8	3,2	122,0	490,9	37,1	8%

14 (AR5-TB-A14)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,253693206	Hours of use (h)	-0,082798746	CDD 17	4,323808457	Reading days	-119,2459264
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 17	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	103,0	400,0	0,0	30,0	111,95	8,98	8%
dic-18	112,0	400,0	0,0	31,0	116,27	4,25	4%
ene-19	117,0	400,0	0,0	31,0	116,27	-0,75	-1%
feb-19	93,2	400,0	0,0	28,0	103,30	10,05	10%
mar-19	108,8	400,0	0,0	31,0	116,27	7,46	6%
abr-19	98,2	400,0	15,0	30,0	110,70	12,47	11%
may-19	91,6	400,0	15,6	31,0	114,98	23,43	20%
jun-19	97,5	400,0	255,4	30,0	90,79	-6,73	-7%
jul-19	103,6	400,0	262,5	31,0	94,53	-9,11	-10%
TOTAL	925,0	3.600,0	548,6	273,0	975,1	50,1	5%

15 (AR5-TB-A15)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,247693126	Hours of use (h)	-0,244395642	CDD 17	9,455965317	Reading days	-229,9259465
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 17	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	154,1	116,3	0,0	30,0	82,55	-71,58	-87%
dic-18	167,8	126,5	0,0	31,0	94,54	-73,27	-77%
ene-19	162,1	121,3	0,0	31,0	93,24	-68,82	-74%
feb-19	126,0	103,8	0,0	28,0	60,54	-65,41	-108%
mar-19	136,6	530,8	0,0	31,0	194,67	58,10	30%
abr-19	137,9	720,0	15,0	30,0	228,42	90,51	40%
may-19	138,5	744,0	15,6	31,0	243,68	105,21	43%
jun-19	125,0	720,0	255,4	30,0	169,66	44,62	26%
jul-19	132,5	744,0	262,5	31,0	183,33	50,82	28%
TOTAL	1.280,5	3.935,8	548,6	273,0	1.350,6	70,2	5%

16 (AR6-TB-A16)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,501823719	Hours of use (h)	1,442868737	CDD 24	-4,749843986	Reading days	256,4967448
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 24	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	204,7	184,3	0,0	30,0	206,46	1,77	1%
dic-18	212,6	198,5	0,0	31,0	208,86	-3,70	-2%
ene-19	208,3	200,0	0,0	31,0	209,62	1,31	1%
feb-19	175,0	157,5	0,0	28,0	202,54	27,59	14%
mar-19	188,8	175,3	0,0	31,0	197,20	8,37	4%
abr-19	192,8	182,5	0,0	30,0	205,58	12,76	6%
may-19	190,0	180,0	0,0	31,0	199,58	9,58	5%
jun-19	188,3	190,5	58,6	30,0	294,15	105,86	36%
jul-19	185,2	148,0	56,7	31,0	265,30	80,12	30%
TOTAL	1.745,6	1.616,5	115,3	273,0	1.989,3	243,7	12%

17 (AR6-TB-A17)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,179102985	Hours of use (h)	14,09629823	CDD 30	-0,111356613	Reading days	40,50171353
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 30	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
nov-18	53,2	82,0	0,0	30,0	51,85	-1,32	-3%
dic-18	60,0	111,0	0,0	31,0	56,93	-3,03	-5%
ene-19	70,1	164,3	0,0	31,0	66,47	-3,61	-5%
feb-19	58,4	129,5	0,0	28,0	60,58	2,15	4%
mar-19	62,8	106,0	0,0	31,0	56,03	-6,75	-12%
abr-19	62,6	102,3	0,0	30,0	55,47	-7,14	-13%
may-19	57,4	71,0	0,0	31,0	49,77	-7,68	-15%
jun-19	59,9	78,5	0,4	30,0	56,63	-3,27	-6%
jul-19	65,3	104,0	0,0	31,0	55,68	-9,58	-17%
TOTAL	549,6	948,5	0,4	273,0	509,4	-40,2	-8%

18 (AR6-TB-A18)							
Y=	B1*	X1+	B2*	X2+	B3*	X3+	I
Total Electricity Consumption (kWh)	0,298539869	Hours of use (h)	-0,89760017	CDD 25	6,042896812	Reading days	-114,7962645
Month	Total Electricity Consumption (kWh)	Hours of use (h)	CDD 25	Reading days	Adjusted baseline consumption	Electric Energy Saving	Percentage of energy savings
abr-19	170,25	359	0	30	173,67	3,42	2%
may-19	168,38	394,75	0	31	190,38	22,00	12%
jun-19	139,88	373	37,3942	30	144,28	4,40	3%
jul-19	104,99	268,5	37,2642	31	119,24	14,25	12%
TOTAL	583,5	1395,25	74,65843	122	627,57	44,07	7%

The summary of Tower B of Treviso apartment electricity savings are presented below:

Table 17: Summary savings electricity consumption Tower B (kWh)

kWh ELECTRIC SAVINGS																				
Month	1 (AR1-TB-A01)	2 (AR1-TB-A02)	3 (AR1-TB-A03)	4 (AR2-TB-04)	5 (AR2-TB-05)	6 (AR2-TB-06)	7 (AR3-TB-07)	8 (AR3-TB-08)	9 (AR3-TB-09)	10 (AR4-TB-A10)	11 (AR4-TB-A11)	12 (AR4-TB-A12)	13 (AR5-TB-A13)	14 (AR5-TB-A14)	15 (AR5-TB-A15)	16 (AR6-TB-A16)	17 (AR6-TB-A17)	18 (AR6-TB-A18)	TOTAL	
nov-18	2,65	40,59	-2,33	-54,48	-45,84	-2,39	0,00	90,50	-38,31	-18,26	-8,41	2,54	0,00	8,98	-71,58	1,77	-1,32	0,00	-95,89	
dic-18	18,63	28,83	-8,50	-71,79	-54,02	-11,17	0,00	115,21	-37,53	-44,05	-5,20	-2,01	0,00	4,25	-73,27	-3,70	-3,03	0,00	-147,36	
ene-19	12,93	37,54	-4,00	-74,90	-58,52	-8,31	0,00	103,65	-34,22	-48,13	27,47	4,39	0,00	-0,75	-68,82	1,31	-3,61	0,00	-113,98	
feb-19	-18,33	55,06	-14,43	-54,51	-43,46	3,51	0,00	102,90	-21,38	-30,08	-33,71	-2,10	0,00	10,05	-65,41	27,59	2,15	0,00	-82,14	
mar-19	12,33	1,63	1,28	-28,74	5,29	-0,25	0,00	113,41	0,28	-5,51	-2,18	-10,42	0,00	7,46	58,10	8,37	-6,75	0,00	154,31	
abr-19	9,21	-8,29	2,69	39,78	43,96	-3,23	0,00	105,02	-1,48	3,95	-15,74	-9,35	18,46	12,47	90,51	12,76	-7,14	3,42	296,99	
may-19	8,48	-10,15	8,52	-22,86	57,17	-5,01	0,00	102,24	7,11	16,71	-10,78	-11,79	26,87	23,43	105,21	9,58	-7,68	22,00	319,04	
jun-19	-24,82	-21,41	-15,58	35,91	59,03	36,15	0,00	116,39	-0,66	7,32	29,64	6,23	-1,70	-6,73	44,62	105,86	-3,27	4,40	371,39	
jul-19	7,42	-0,69	-14,35	13,14	27,31	28,42	0,00	96,14	8,54	10,31	87,87	-7,97	-6,49	-9,11	50,82	80,12	-9,58	14,25	376,14	
TOTAL	28,52	123,11	-46,70	-218,46	-9,08	37,73	0,00	945,46	-117,65	-107,76	68,96	-30,48	37,14	50,05	70,16	243,66	-40,23	44,07	1078,51	

Table 18: Summary savings electricity consumption Tower B (%)

% ELECTRIC SAVINGS																		
Month	1 (AR1-TB-A01)	2 (AR1-TB-A02)	3 (AR1-TB-A03)	4 (AR2-TB-04)	5 (AR2-TB-05)	6 (AR2-TB-06)	8 (AR3-TB-08)	9 (AR3-TB-09)	10 (AR4-TB-A10)	11 (AR4-TB-A11)	12 (AR4-TB-A12)	13 (AR5-TB-A13)	14 (AR5-TB-A14)	15 (AR5-TB-A15)	16 (AR6-TB-A16)	17 (AR6-TB-A17)	18 (AR6-TB-A18)	TOTAL
1	1%	25%	-1%	-65%	-76%	-3%	46%	-26%	-18%	-3%	2%	0%	8%	-87%	1%	-3%	0%	
2	8%	18%	-3%	-85%	-87%	-13%	59%	-25%	-43%	-2%	-2%	0%	4%	-77%	-2%	-5%	0%	
3	6%	22%	-2%	-88%	-89%	-10%	53%	-22%	-47%	9%	3%	0%	-1%	-74%	1%	-5%	0%	
4	-12%	28%	-7%	-59%	-81%	5%	54%	-16%	-36%	-14%	-2%	0%	10%	-108%	14%	4%	0%	
5	7%	1%	1%	-21%	5%	0%	59%	0%	-5%	-1%	-8%	0%	6%	30%	4%	-12%	0%	
6	7%	-7%	1%	20%	30%	-4%	55%	-1%	4%	-6%	-8%	16%	11%	40%	6%	-13%	2%	
7	5%	-9%	4%	-19%	36%	-7%	51%	4%	14%	-5%	-9%	21%	20%	43%	5%	-15%	12%	
8	-11%	-26%	-6%	17%	30%	13%	55%	0%	8%	9%	3%	-1%	-7%	26%	36%	-6%	3%	
9	3%	-1%	-6%	7%	13%	10%	44%	7%	11%	23%	-5%	-5%	-10%	28%	30%	-17%	12%	
TOTAL	2%	10%	-2%	-18%	-1%	3%	53%	-9%	-12%	3%	-2%	8%	5%	5%	12%	-8%	7%	5%

As mentioned above, these savings correspond to the nine months used as a demonstration period.

Table 19: Total electricity savings Tower B (kWh and %)

Total electrical savings B Treviso Tower	
TOTAL REFERENCE ELECTRICAL CONSUMPTION (kWh)	22.491
TOTAL ELECTRIC SAVING (kWh)	1.079
TOTAL ELECTRIC SAVING (%)	5%

In Tower B of Treviso a 5% electricity saving has been obtained. This percentage of savings is low since the reforms undertaken in the Treviso facilities do not directly affect the electricity consumption of the dwellings (the energy generated by the photovoltaic installation affects the electricity consumption of the common areas).

Some homes that have electricity over-consumption are the ones with the largest number of inhabitants and the largest area, confirming that they are factors that affect the electricity consumption of a dwelling.

Other important factors in saving electricity consumption in a dwelling are the consumption habits of each tenant and the awareness they have about the use of resources.

The savings shown above correspond to the nine months that have been used as a demonstration period (from November 2018 to July 2019). From that it has been estimated how much would be saved annually:

Table 20: Estimated annual electricity savings in B Tower (kWh)

Total electrical savings B Treviso Tower	
TOTAL REFERENCE ELECTRICAL CONSUMPTION (kWh)	32.860
TOTAL ELECTRIC SAVING (kWh)	2.857
TOTAL ELECTRIC SAVING (%)	9%

2.4.2 Individual Heating and DHW baseline for a selected group of tenants

2.4.2.1 Calculation of gas savings in Tower A

For the calculation of the gas supply savings in Tower A, the months of May and June 2019 have been used. There is only meter reading data available at the time of the report, since the meter readings for the months of July and August are collected in the month of September.

Table 21: Gas savings period for tower A in Treviso

Reporting period	
From May 2019	Till Jun 2019

Below is the calculated savings for each of the apartments in Tower A:

Table 22: Savings gas consumption in the apartments of tower A of Treviso

APARTMENT 1 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 17	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	75,73	30	411,25	31	40,73	-35,00	-86%
01/06/2019	30/06/2019	4,99	29	511,75	0	2,51	-2,48	-99%
TOTAL		80,72	59,00	923,00	31,39	43,24	-37,48	-87%

APARTMENT 2 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 10	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	4,68	30	439	0	23,67	18,99	80%
01/06/2019	30/06/2019	1,35	29	279	0	12,27	10,92	89%
TOTAL		6,03	59,00	718,00	0,00	35,94	29,91	83%

APARTMENT 3 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 20	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	24,11	30	280,75	108	65,88	41,77	63%
01/06/2019	30/06/2019	3,06	29	389,25	0	0,54	-2,52	-463%
TOTAL		27,17	59,00	670,00	108,13	66,43	39,26	59%

APARTMENT 4 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 18	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	87,91	30	218	54	126,14	38,23	30%
01/06/2019	30/06/2019	11,43	29	272,25	0	54,20	42,77	79%
TOTAL		99,34	59,00	490,25	54,25	180,34	81,00	45%

APARTMENT 5 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	39,54	30	121,25	16	44,74	5,20	12%
01/06/2019	30/06/2019	9,88	29	129,25	0	36,42	26,54	73%
TOTAL		49,42	59,00	250,50	15,90	81,16	31,74	39%

APARTMENT 6 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 15	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	15,21	30	257,75	7	26,78	11,57	43%
01/06/2019	30/06/2019	3,81	29	159	0	23,34	19,53	84%
TOTAL		19,02	59,00	416,75	7,47	50,13	31,11	62%

APARTMENT 7 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 14	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	41,53	30	75,75	3	54,95	13,42	24%
01/06/2019	30/06/2019	11,43	29	90,75	0	49,47	38,04	77%
TOTAL		52,96	59,00	166,50	2,51	104,41	51,45	49%

APARTMENT 8 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 13	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	25,64	30	415,5	0	23,16	-2,48	-11%
01/06/2019	30/06/2019	10,67	29	508	0	20,63	9,96	48%
TOTAL		36,31	59,00	923,50	0,45	43,79	7,48	17%

APARTMENT 9 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 14	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	37,94	30	440,5	3	48,60	10,66	22%
01/06/2019	30/06/2019	17,29	29	445,25	0	44,62	27,33	61%
TOTAL		55,23	59,00	885,75	2,51	93,21	37,98	41%

APARTMENT 10 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 13	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	21,46	30	232,25	0	26,71	5,25	20%
01/06/2019	30/06/2019	9,15	29	334,75	0	21,03	11,88	56%
TOTAL		30,61	59,00	567,00	0,45	47,74	17,13	36%

APARTMENT 11 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	40,25	30	307,5	16	33,64	-6,61	-20%
01/06/2019	30/06/2019	12,48	29	235,5	0	24,13	11,65	48%
TOTAL		52,73	59,00	543,00	15,90	57,76	5,03	9%

APARTMENT 12 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 15	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	28,01	30	51,5	7	33,7	5,71	17%
01/06/2019	30/06/2019	5,32	29	42,5	0	30,1	24,80	82%
TOTAL		33,33	59,00	94,00	7,47	63,8	30,51	48%

APARTMENT 13 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	19,82	30	83,25	16	20,15	0,33	2%
01/06/2019	30/06/2019	3,52	29	45,5	0	10,38	6,86	66%
TOTAL		23,34	59,00	128,75	15,90	30,52	7,18	24%

APARTMENT 14 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	38,69	30	109,5	16	50,54	11,85	23%
01/06/2019	30/06/2019	6,88	29	85,25	0	42,47	35,59	84%
TOTAL		45,57	59,00	194,75	15,90	93,01	47,44	51%

APARTMENT 15 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 15	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	31,11	30	501	7	22,53	-8,58	-38%
01/06/2019	30/06/2019	23,58	29	414,5	0	19,58	-4,00	-20%
TOTAL		54,69	59,00	915,50	7,47	42,11	-12,58	-30%

APARTMENT 16 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 14	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	29,72	30	226,75	3	61,63	31,91	52%
01/06/2019	30/06/2019	6,96	29	281,5	0	43,26	36,30	84%
TOTAL		36,68	59,00	508,25	2,51	104,89	68,21	65%

APARTMENT 17 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 17	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	64,53	30	219,75	31	65,66	1,13	2%
01/06/2019	30/06/2019	3,46	29	171,25	0	37,37	33,91	91%
TOTAL		67,99	59,00	391,00	31,39	103,03	35,04	34%

APARTMENT 18 TOWER A								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 19	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/05/2019	31/05/2019	51,35	30	156,5	80	48,68	-2,67	-5%
01/06/2019	30/06/2019	9,38	29	166,25	0	23,68	14,30	60%
TOTAL		60,73	59,00	322,75	80,35	72,37	11,64	16%

The summary of Tower A of Treviso apartment gas savings is shown below:

Table 23: Summary savings GAS consumption Tower A (m³)

m ³ GAS SAVINGS TOWER A																		
Month	1 (AR1-TA-A01)	2 (AR1-TA-A02)	3 (AR1-TA-A03)	4 (AR2-TA-A04)	5 (AR2-TA-A05)	6 (AR2-TA-A06)	8 (AR3-TA-A08)	9 (AR3-TA-A09)	10 (AR4-TA-A10)	11 (AR4-TA-A11)	12 (AR4-TA-A12)	13 (AR5-TA-A13)	14 (AR5-TA-A14)	15 (AR5-TA-A15)	16 (AR6-TA-A16)	17 (AR6-TA-A17)	18 (AR6-TA-A18)	TOTAL
may-19	-35,00	18,99	41,77	38,23	5,20	11,57	-2,48	10,66	5,25	-6,61	5,71	0,33	11,85	-8,58	31,91	1,13	-2,67	140,67
jun-19	-2,48	10,92	-2,52	42,77	26,54	19,53	9,96	27,33	11,88	11,65	24,80	6,86	35,59	-4,00	36,30	33,91	14,30	341,37
TOTAL	-37,48	29,91	39,26	81,00	31,74	31,11	7,48	37,98	17,13	5,03	30,51	7,18	47,44	-12,58	68,21	35,04	11,64	482,04

Table 24: Summary savings GAS consumption Tower A (%)

% GAS SAVINGS TOWER A																		
Month	1 (AR1-TA-A01)	2 (AR1-TA-A02)	3 (AR1-TA-A03)	4 (AR2-TA-A04)	5 (AR2-TA-A05)	6 (AR2-TA-A06)	8 (AR3-TA-A08)	9 (AR3-TA-A09)	10 (AR4-TA-A10)	11 (AR4-TA-A11)	12 (AR4-TA-A12)	13 (AR5-TA-A13)	14 (AR5-TA-A14)	15 (AR5-TA-A15)	16 (AR6-TA-A16)	17 (AR6-TA-A17)	18 (AR6-TA-A18)	TOTAL
may-19	-86%	80%	63%	30%	12%	43%	-11%	22%	20%	-20%	17%	2%	23%	-38%	52%	2%	-5%	
jun-19	-99%	89%	-463%	79%	73%	84%	48%	61%	56%	48%	82%	66%	84%	-20%	84%	91%	60%	
TOTAL	-87%	83%	59%	45%	39%	62%	17%	41%	36%	9%	48%	24%	51%	-30%	65%	34%	55%	37%

These savings are corresponding to the two months that have been used as a demonstration period.

Table 25: Total gas savings Tower A (m³, kWh and %)

TOTAL GAS SAVINGS TOWER A	
TOTAL REFERENCE GAS CONSUMPTION (m3)	1313,91
TOTAL GAS SAVING (m3)	482,04
TOTAL GAS SAVING (%)	37%
TOTAL REFERENCE GAS CONSUMPTION (kWh)	15.372,8
TOTAL GAS SAVING (kWh)	5.639,9
TOTAL GAS SAVING (%)	37%

*Conversion factor of natural gas used (from m³ to kWh)=11.7 kWh/m³ (Reference extracted from the company Unión Fenosa Gas)

In Tower A, a 37% saving in gas has been obtained. It is important to note that as a demonstration period of savings, only the months of May and June have been used (the reforms ended in April and the invoices for July and August are not available until September). Even so, compared to the electricity savings shown in Table 10, the gas savings are much higher. This is because the reforms carried out mainly affect thermal consumption.

It is important to recognise that these are months in which the heating demand is at a minimum, so it is not a representative saving. To get a more representative estimate of savings it would be necessary to extend the demonstration period of savings over the winter months.

As for the dwellings where there is an over-consumption (apartment 1 and 15), this may be due to different specific factors such as an increase in the interior temperature of the house or an increase in the number of occupants of the house.

In the specific case of apartment 15 of tower A, it should be borne in mind that it is a dwelling of type A2, which are the homes that have the largest area (94.35 square metres). Transmission losses through enclosures depend on the size of the homes, larger dwellings need more heating and, therefore, their energy consumption is higher.

The savings shown above correspond to the two months that have been used as a demonstration period (from May 2019 to June 2019). It has been estimated how much would be saved annually:

Table 26: Estimated annual gas Savings in A Tower

TOTAL GAS SAVINGS TOWER A	
TOTAL REFERENCE GAS CONSUMPTION (kWh)	185.831,3
TOTAL GAS SAVING (kWh)	89.543,0
TOTAL GAS SAVING (%)	48%

2.4.2.2 Calculation of gas savings in Tower B

For the calculation of the gas supply savings in Tower B, the same months have been used as in the case of electricity savings (except July, because there is no data).

In the calculation of gas savings of Tower B, it noted that in the case of apartment 7 (SinCeO2 nomenclature) there is no data, since there was no one living in that apartment.

In addition, due to data reception problems on the platform, in apartments 13 and 18 (Sinceo2 nomenclature) only data are available from April to July is available, so these have been used as the demonstration period for these apartments.

Table 27: Gas savings period for Tower B in Treviso

Reporting period

From Nov 2018	Till Jun 2019
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Below is the calculated savings for each of the apartments in Tower B:

Table 28: Savings gas consumption in the apartments of tower B of Treviso

APARTMENT 1 TOWER B (AR1-TB-A01)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 18	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	80,16	29	416,5	187	99,70	19,54	20%
01/12/2018	31/12/2018	139,61	30	379,5	383	218,02	78,41	36%
01/01/2019	31/01/2019	146,02	30	323,75	408	239,33	93,31	39%
01/02/2019	28/02/2019	85,41	27	274,5	347	205,60	120,19	58%
01/03/2019	31/03/2019	71,33	30	204,25	216	142,84	71,51	50%
01/04/2019	30/04/2019	19,59	29	166,25	36	42,62	23,03	54%
01/05/2019	31/05/2019	10,82	30	188,75	54	51,87	41,05	79%
01/06/2019	30/06/2019	5,06	29	259,5	0	10,76	5,70	53%
TOTAL		451,20	116,00	1394,25	1324,28	762,65	311,45	41%

APARTMENT 2 TOWER B (AR1-TB-A02)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 15	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	60,8	29	130,75	107	100,76	39,96	40%
01/12/2018	31/12/2018	136,9	30	141,5	293	230,62	93,70	41%
01/01/2019	31/01/2019	152,2	30	148,5	318	248,88	96,66	39%
01/02/2019	28/02/2019	75,0	27	133,25	266	209,72	134,71	64%
01/03/2019	31/03/2019	29,4	30	120,75	126	113,05	83,68	74%
01/04/2019	30/04/2019	20,9	29	96	2	24,77	3,91	16%
01/05/2019	31/05/2019	20,7	30	106	7	29,94	9,24	31%
01/06/2019	30/06/2019	10,6	29	100,5	0	23,79	13,22	56%
TOTAL		506,4	234,00	977,25	1118,28	981,51	475,07	48%

APARTMENT 3 TOWER B (AR1-TB-A03)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	31	29	269,75	132	141,18	110,58	78%
01/12/2018	31/12/2018	57	30	362,25	323	294,27	237,72	81%
01/01/2019	31/01/2019	72	30	313,25	348	312,41	240,23	77%
01/02/2019	28/02/2019	37	27	253	293	263,78	226,65	86%
01/03/2019	31/03/2019	25	30	242	156	159,93	134,55	84%
01/04/2019	30/04/2019	21	29	239,5	6	42,14	21,28	50%
01/05/2019	31/05/2019	23	30	208,75	16	49,96	26,80	54%
01/06/2019	30/06/2019	10	29	286,25	0	39,13	28,98	74%
TOTAL		276,00	234,00	2174,75	1272,12	1302,79	1026,79	79%

APARTMENT 4 TOWER B (AR2-TB-A04)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 17	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	84	29	68,5	158	167,38	83,75	50%
01/12/2018	31/12/2018	169	30	75,25	353	288,19	119,05	41%
01/01/2019	31/01/2019	202	30	76,5	378	303,56	101,93	34%
01/02/2019	28/02/2019	141	27	70,5	320	260,28	119,32	46%
01/03/2019	31/03/2019	94	30	157,5	186	169,65	76,13	45%
01/04/2019	30/04/2019	35	29	242,75	17	46,89	12,32	26%
01/05/2019	31/05/2019	20	30	130	31	80,46	60,50	75%
01/06/2019	30/06/2019	9	29	282,75	0	28,49	19,14	67%
TOTAL		752,76	234,00	272,75	1442,43	1344,90	592,13	44%

APARTMENT 5 TOWER B (AR2-TB-A05)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 14	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	45	29	92,5	84	132,77	88,14	66%
01/12/2018	31/12/2018	105	30	101,25	263	294,01	188,92	64%
01/01/2019	31/01/2019	129	30	113,25	288	315,24	186,73	59%
01/02/2019	28/02/2019	68	27	88,5	239	266,98	198,95	75%
01/03/2019	31/03/2019	33	30	111,5	97	144,36	111,75	77%
01/04/2019	30/04/2019	11	29	159,5	0	48,82	37,66	77%
01/05/2019	31/05/2019	9	30	111	3	59,49	50,48	85%
01/06/2019	30/06/2019	5	29	202	0	42,82	37,74	88%
TOTAL		404,12	234,00	979,50	973,42	1304,51	900,38	69%

APARTMENT 6 TOWER B (AR2-TB-A06)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 17	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	62,38	29	38,5	158	109,01	46,63	43%
01/12/2018	31/12/2018	96,20	30	49,25	353	218,28	122,08	56%
01/01/2019	31/01/2019	95,53	30	46,5	378	232,66	137,13	59%
01/02/2019	28/02/2019	53,37	27	33,75	320	198,19	144,82	73%
01/03/2019	31/03/2019	22,45	30	33,75	186	125,30	102,85	82%
01/04/2019	30/04/2019	17,48	29	32,25	17	30,28	12,80	42%
01/05/2019	31/05/2019	16,9	30	29,25	31	39,09	22,19	57%
01/06/2019	30/06/2019	3,38	29	236,25	0	11,95	8,57	72%
TOTAL		367,69	234,00	499,50	1442,43	964,76	597,07	62%

APARTMENT 8 TOWER B (AR3-TB-A08)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 20	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	8,775	29	264	245	32,915	24,14	73%
01/12/2018	31/12/2018	42,193	30	164,75	443	50,274	8,08	16%
01/01/2019	31/01/2019	91,510	30	207,5	468	51,119	-40,39	-79%
01/02/2019	28/02/2019	79,680	27	229	401	43,498	-36,18	-83%
01/03/2019	31/03/2019	15,73	30	174,5	276	37,948	22,22	59%
01/04/2019	30/04/2019	8,22	29	192,25	89	23,294	15,07	65%
01/05/2019	31/05/2019	12,35	30	197	108	25,299	12,95	51%
01/06/2019	30/06/2019	5,28	29	231	0	15,928	10,65	67%
TOTAL		263,74	234,00	1660,00	2029,13	280,28	16,54	6%

APARTMENT 9 TOWER B (AR3-TB-A09)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	82,34	29	261	132	80,0	-2,37	-3%
01/12/2018	31/12/2018	145,03	30	271,5	323	169,1	24,03	14%
01/01/2019	31/01/2019	179,51	30	288,25	348	181,5	2,02	1%
01/02/2019	28/02/2019	138,58	27	237,25	293	153,0	14,47	9%
01/03/2019	31/03/2019	117,68	30	333,5	156	94,2	-23,43	-25%
01/04/2019	30/04/2019	50,59	29	350,75	6	25,4	-25,15	-99%
01/05/2019	31/05/2019	27,25	30	362,5	16	30,8	3,53	11%
01/06/2019	30/06/2019	10,6	29	360,75	0	23,1	12,51	54%
TOTAL		751,58	234,00	2465,50	1272,12	757,17	5,59	1%

APARTMENT 10 TOWER B (AR4-TB-A10)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 17	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	52,71	29	286,25	158	80,01	27,30	34%
01/12/2018	31/12/2018	95,58	30	291,75	353	147,97	52,39	35%
01/01/2019	31/01/2019	105,29	30	292,00	378	156,67	51,38	33%
01/02/2019	28/02/2019	76,57	27	243,50	320	135,73	59,16	44%
01/03/2019	31/03/2019	61,43	30	312,75	186	88,75	27,32	31%
01/04/2019	30/04/2019	26,7	29	285,00	17	31,79	5,09	16%
01/05/2019	31/05/2019	19,16	30	331,00	31	34,21	15,05	44%
01/06/2019	30/06/2019	7,24	29	310,00	0	23,59	16,35	69%
TOTAL		444,68	234,00	2352,25	1442,43	698,72	254,04	36%

APARTMENT 11 TOWER B (AR4-TB-A11)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 15	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	85,3	29	459,75	107	115,56	30,24	26%
01/12/2018	31/12/2018	182,3	30	476,25	293	265,38	83,08	31%
01/01/2019	31/01/2019	228,7	30	452,5	318	286,59	57,87	20%
01/02/2019	28/02/2019	150,6	27	405,5	266	241,49	90,92	38%
01/03/2019	31/03/2019	97,28	30	429	126	132,82	35,54	27%
01/04/2019	30/04/2019	38,46	29	367,5	2	34,15	-4,31	-13%
01/05/2019	31/05/2019	36,13	30	319,25	7	41,61	5,48	13%
01/06/2019	30/06/2019	12,63	29	492,5	0	28,45	15,82	56%
TOTAL		831,4	234,0	3402,3	1118,3	1146,0	314,6	27%

APARTMENT 12 TOWER B (AR4-TB-A12)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 18	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	66,58	29	178,75	187	123,59	57,02	46%
01/12/2018	31/12/2018	119,40	30	187,75	383	231,99	112,58	49%
01/01/2019	31/01/2019	135,88	30	195,25	408	246,02	110,14	45%
01/02/2019	28/02/2019	92,49	27	178	347	210,03	117,54	56%
01/03/2019	31/03/2019	64,68	30	180,5	216	139,93	75,25	54%
01/04/2019	30/04/2019	31,36	29	172,5	36	40,26	8,90	22%
01/05/2019	31/05/2019	39,72	30	184,75	54	51,06	11,34	22%
01/06/2019	30/06/2019	7,32	29	306	0	20,67	13,35	65%
TOTAL		557,43	234,00	1583,50	1630,01	1063,55	506,12	48%

APARTMENT 13 TOWER B (AR5-TB-A13)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/04/2019	30/04/2019	37,26	29	102,25	6	39,28	2,02	5%
01/05/2019	31/05/2019	13,73	30	89,75	16	45,62	31,89	70%
01/06/2019	30/06/2019	10,17	29	106,25	0	36,35	26,18	72%
TOTAL		61,16	88,00	298,25	21,82	121,24	60,08	50%

APARTMENT 14 TOWER B (AR5-TB-A14 (A))								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 17	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	132,88	29	105	158	170,135	37,25	22%
01/12/2018	31/12/2018	201,29	30	117,5	353	334,406	133,12	40%
01/01/2019	31/01/2019	225,95	30	124	378	355,409	129,46	36%
01/02/2019	28/02/2019	166,05	27	98,25	320	303,372	137,32	45%
01/03/2019	31/03/2019	128,8	30	102,75	186	194,788	65,99	34%
01/04/2019	30/04/2019	74,69	29	106,5	17	51,481	-23,21	-45%
01/05/2019	31/05/2019	52,49	30	103,75	31	65,040	12,55	19%
01/06/2019	30/06/2019	5,66	29	98,5	0	37,470	31,81	85%
TOTAL		987,81	234,00	856,25	1442,43	1512,10	524,29	35%

APARTMENT 15 TOWER B (AR5-TB-A15)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 16	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	70,94	29	116,25	132	160,9	90,00	56%
01/12/2018	31/12/2018	123,68	30	126,5	323	278,8	155,13	56%
01/01/2019	31/01/2019	140,95	30	121,25	348	295,1	154,18	52%
01/02/2019	28/02/2019	83,60	27	103,75	293	253,9	170,33	67%
01/03/2019	31/03/2019	54,24	30	530,75	156	112,0	57,74	52%
TOTAL		473,41	146,00	998,50	1250,30	1100,79	627,38	57%

APARTMENT 16 TOWER B (AR6-TB-A16)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 14	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	58,71	29	184,25	84	77,88	19,17	25%
01/12/2018	31/12/2018	101,95	30	198,5	263	164,19	62,24	38%
01/01/2019	31/01/2019	106,79	30	200	288	176,30	69,51	39%
01/02/2019	28/02/2019	53,50	27	157,5	239	149,83	96,33	64%
01/03/2019	31/03/2019	49,79	30	175,25	97	86,09	36,30	42%
01/04/2019	30/04/2019	32,82	29	182,5	0	37,89	5,07	13%
01/05/2019	31/05/2019	22,17	30	180	3	40,56	18,39	45%
01/06/2019	30/06/2019	10,82	29	190,5	0	37,33	26,51	71%
TOTAL		436,55	234,00	1468,50	973,42	770,07	333,52	43%

APARTMENT 17 TOWER B (AR6-TB-A17)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 15	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/11/2018	30/11/2018	42,83	29	82	107	115,89	73,1	63%
01/12/2018	31/12/2018	81,90	30	111	293	292,52	210,6	72%
01/01/2019	31/01/2019	121,63	30	164,25	318	313,60	192,0	61%
01/02/2019	28/02/2019	77,72	27	129,5	266	263,61	185,9	71%
01/03/2019	31/03/2019	40,32	30	106	126	132,62	92,3	70%
01/04/2019	30/04/2019	12,92	29	102,25	2	13,77	0,9	6%
01/05/2019	31/05/2019	8,25	30	71	7	21,58	13,3	62%
01/06/2019	30/06/2019	1,82	29	78,5	0	13,33	11,5	86%
TOTAL		387,39	234,00	844,50	1118,28	1166,92	779,53	67%

APARTMENT 18 TOWER B (AR6-TB-A18)								
Initial period	Final period	Gas Reading (m ³)	Reading Days	Hours of use	HDD 12	Adjusted baseline consumption	Gas Energy Saving	Percentage of energy savings
01/04/2019	30/04/2019	12,92	29	359	0	43,01	30,1	70%
01/05/2019	31/05/2019	8,25	30	394,75	0	44,90	36,6	82%
01/06/2019	30/06/2019	1,82	29	373	0	43,26	41,4	96%
TOTAL		22,99	88,00	1126,75	0,00	131,17	108,18	82%

Table 29: Summary savings GAS consumption Tower B (m³)

m3 GAS SAVINGS TOWER B																		
Month	1 (AR1-TB-A01)	2 (AR1-TB-A02)	3 (AR1-TB-A03)	4 (AR2-TB-04)	5 (AR2-TB-05)	6 (AR2-TB-06)	8 (AR3-TB-08)	9 (AR3-TB-09)	10 (AR4-TB-A10)	11 (AR4-TB-A11)	12 (AR4-TB-A12)	13 (AR5-TB-A13)	14 (AR5-TB-A14)	15 (AR5-TB-A15)	16 (AR6-TB-A16)	17 (AR6-TB-A17)	18 (AR6-TB-A18)	TOTAL
nov-18	19,54	39,96	110,58	83,75	88,14	46,63	24,14	-2,37	27,30	30,24	57,02	0,00	37,25	90,00	19,17	73,06	0,00	744,42
dic-18	78,41	93,70	237,72	119,05	188,92	122,08	8,08	24,03	52,39	83,08	112,58	0,00	133,12	155,13	62,24	210,62	0,00	1681,15
ene-19	93,31	96,66	240,23	101,93	186,73	137,13	-40,39	2,02	51,38	57,87	110,14	0,00	129,46	154,18	69,51	191,97	0,00	1582,11
feb-19	120,19	134,71	226,65	119,32	198,95	144,82	-36,18	14,47	59,16	90,92	117,54	0,00	137,32	170,33	96,33	185,89	0,00	1780,42
mar-19	71,51	83,68	134,55	76,13	111,75	102,85	22,22	-23,43	27,32	35,54	75,25	0,00	65,99	57,74	36,30	92,30	0,00	969,70
abr-19	23,03	3,91	21,28	12,32	37,66	12,80	15,07	-25,15	5,09	-4,31	8,90	2,02	-23,21	0,00	5,07	0,85	30,09	125,40
may-19	41,05	9,24	26,80	60,50	50,48	22,19	12,95	3,53	15,05	5,48	11,34	31,89	12,55	0,00	18,39	13,33	36,65	371,42
jun-19	5,70	13,22	28,98	19,14	37,74	8,57	10,65	12,51	16,35	15,82	13,35	26,18	31,81	0,00	26,51	11,51	41,44	319,48
TOTAL	452,75	475,07	1026,79	592,13	900,38	597,07	16,54	5,59	254,04	314,64	506,12	60,08	524,29	627,38	333,52	779,53	108,18	7574,10

Table 30: Summary savings GAS consumption Tower B (%)

% GAS SAVINGS TOWER B																		
Month	1 (AR1-TB-A01)	2 (AR1-TB-A02)	3 (AR1-TB-A03)	4 (AR2-TB-04)	5 (AR2-TB-05)	6 (AR2-TB-06)	8 (AR3-TB-08)	9 (AR3-TB-09)	10 (AR4-TB-A10)	11 (AR4-TB-A11)	12 (AR4-TB-A12)	13 (AR5-TB-A13)	14 (AR5-TB-A14)	15 (AR5-TB-A15)	16 (AR6-TB-A16)	17 (AR6-TB-A17)	18 (AR6-TB-A18)	TOTAL
nov-18	20%	40%	78%	50%	66%	43%	73%	-3%	34%	26%	46%	0%	22%	56%	25%	63%	0%	
dic-18	36%	41%	81%	41%	64%	56%	16%	14%	35%	31%	49%	0%	40%	56%	38%	72%	0%	
ene-19	39%	39%	77%	34%	59%	59%	-79%	1%	33%	20%	45%	0%	36%	52%	39%	61%	0%	
feb-19	58%	64%	86%	46%	75%	73%	-83%	9%	44%	38%	56%	0%	45%	67%	64%	71%	0%	
mar-19	50%	74%	84%	45%	77%	82%	59%	-25%	31%	27%	48%	0%	34%	52%	42%	70%	0%	
abr-19	54%	16%	50%	26%	77%	42%	65%	-99%	16%	-13%	22%	5%	-45%	0%	13%	6%	70%	
may-19	79%	31%	54%	75%	85%	57%	51%	11%	44%	13%	22%	70%	19%	0%	45%	62%	82%	
jun-19	53%	56%	74%	67%	88%	72%	67%	54%	69%	56%	65%	72%	85%	0%	71%	86%	96%	
TOTAL	41%	48%	79%	44%	69%	62%	6%	1%	36%	27%	48%	50%	35%	57%	43%	67%	82%	50%

These savings are corresponding to the eight months that have been used as a demonstration period.

Table 31: Total gas savings Tower B (m³, kWh and %)

TOTAL GAS SAVINGS TOWER B	
TOTAL REFERENCE GAS CONSUMPTION (m ³)	15241,08
TOTAL GAS SAVING (m ³)	7479,13
TOTAL GAS SAVING (%)	49%
TOTAL REFERENCE GAS CONSUMPTION (kWh)	178.320,6
TOTAL GAS SAVING (kWh)	87.505,8
TOTAL GAS SAVING (%)	49%

*Conversion factor of natural gas used (from m³ to kWh)=11.7 kWh/m³

In Tower B, a 47% saving in gas consumption has been obtained. In this case, the demonstration period used covers winter months in which there is significant heating consumption. There is no apartment that stands out as having gas over-consumption.

The apartments where the lowest gas savings have been achieved are 8 and 9 (according to the SinCeO2 nomenclature). This may be because the tenants of these homes have used the heating system or the domestic hot water system more than the rest of the dwellings. This could be checked by analyzing the interior temperature of the dwellings, but in Tower B the monitoring of the interior temperature of the dwelling has not been carried out.

The savings shown above correspond to the two months that have been used as a demonstration period (from May 2019 to June 2019). It has been estimated how much would be saved annually:

Table 32: Estimated annual gas Savings in B Tower B

TOTAL GAS SAVINGS TOWER B	
TOTAL REFERENCE GAS CONSUMPTION (kWh)	217.235,4
TOTAL GAS SAVING (kWh)	118.463,1
TOTAL GAS SAVING (%)	55%

2.4.3 Communal Services Energy savings calculation

Table 33: Savings period for communal services Tower A in Treviso

Reporting period	
From May 2019	Till Jul 2019

Table 34: Savings results for communal services Tower A in Treviso

Date	Electric Consumption (kWh)	Daylight hours (h)	Adjusted baseline consumption (kWh)	Electric Energy Saving (kWh)	Percentage of energy savings (%)
may-19	112,6	14,88	82,97	-29,63	-36%
jun-19	91,2	15,62	76,40	-14,84	-19%
jul-19	104,0	15,30	79,24	-24,79	-31%
Total	307,9	45,8	238,6	-69,3	-29%

Table 35: Savings period for communal services Tower B in Treviso

Reporting period	
From Nov 018	Till Mar2019

Table 36: Savings results for communal services Tower B in Treviso

Date	Electric Consumption (kWh)	Daylight hours (h)	Adjusted baseline consumption (kWh)	Electric Energy Saving (kWh)	Percentage of energy savings (%)
nov-18	243,835	10	503,9	260,0	52%
dic-18	264,79	9	529,8	265,1	50%
ene-19	210,401	9	516,9	306,5	59%
feb-19	217,439	10	475,7	258,2	54%
TOTAL	936,5	37,7	2026,3	1089,8	54%

2.5 PHOTOVOLTAIC INSTALLATION ANALYSIS

To calculate the overall savings, we must also take into account photovoltaic generation. In Treviso, photovoltaic installations have an impact on the communal areas of each tower, not on the dwellings of the tenants directly.

Today, the installations carried out are still not operational.

In Treviso, the extra PV energy will not be sent to the grid either. As the procedures for the photovoltaic installation has been slow and, there is not enough time before the DREEM Project ends, the savings that will result from the photovoltaic generation have been theoretically calculated from the installation information.

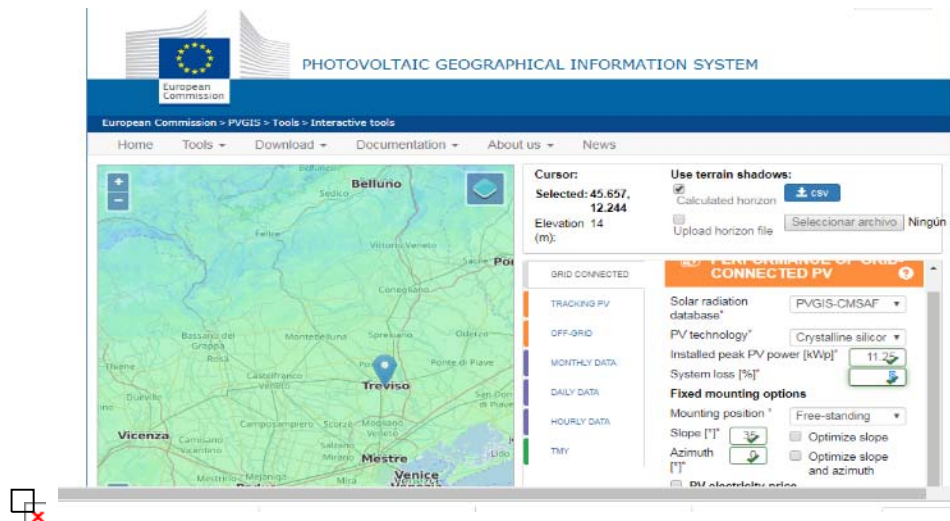


Figure 3: Photovoltaic geographical information system

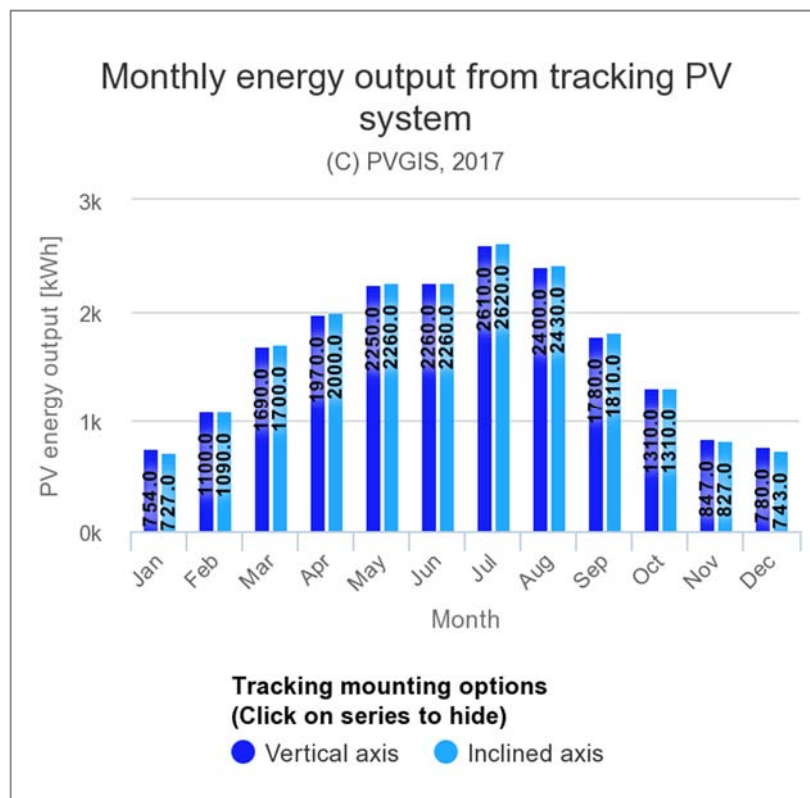


Figure 4: Monthly energy output from tracking PV system

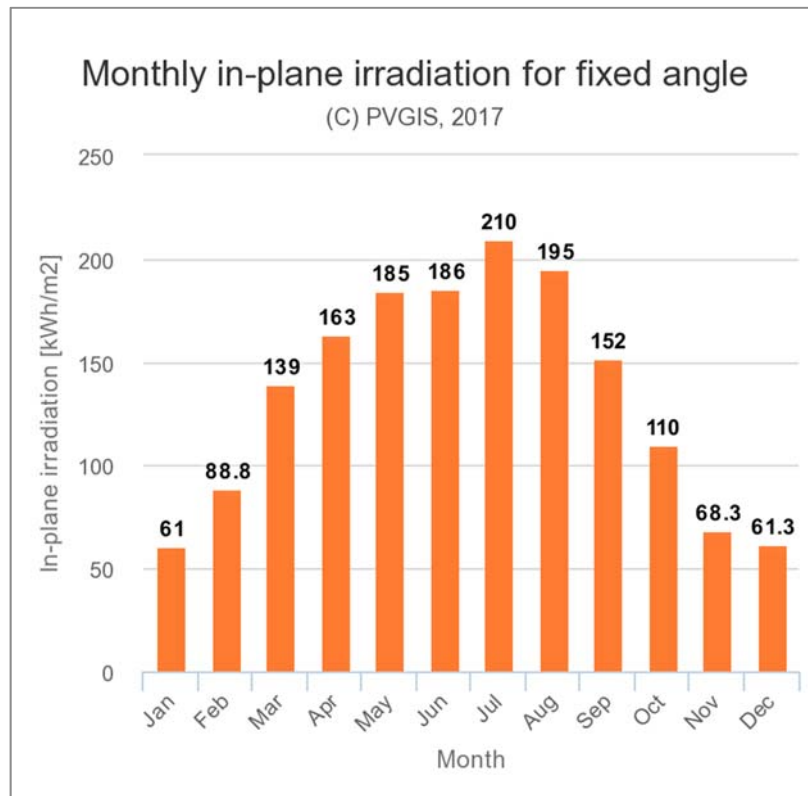


Figure 5: Monthly in-plane irradiation for fixed angle

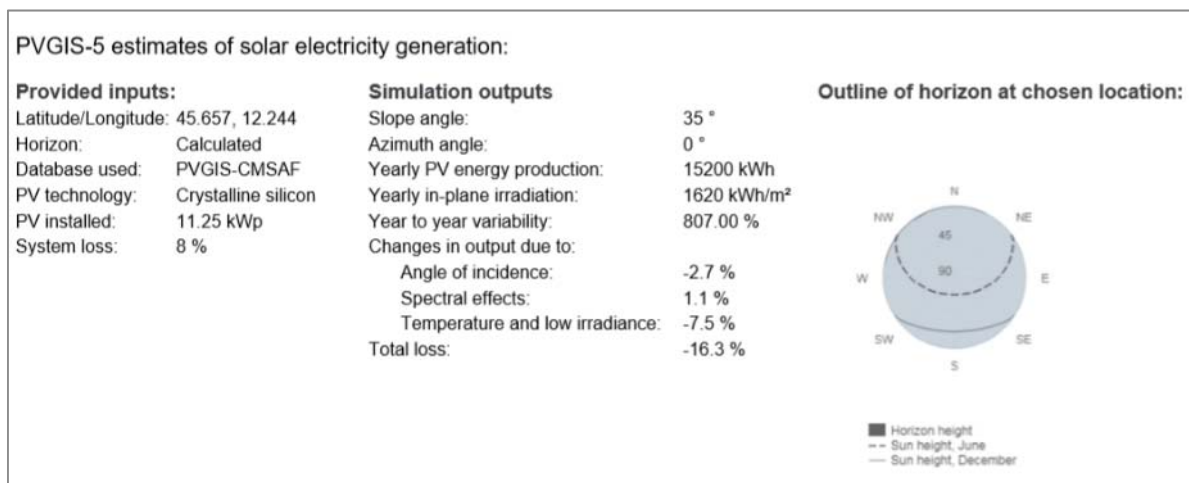


Figure 6: PV System estimates of solar electricity generation

It is estimated that the energy production from the photovoltaic generation will be 15,200 kWh per year.

2.6 ECONOMIC SAVINGS CALCULATION

For the calculation of the economic savings, since the updated invoices are not available, an estimate of the saving has been made using the official energy data of Italy (Eurostats database).

So the savings shown are not really those obtained by ATER Treviso, but an estimate. When the updated actual prices for Ater Treviso are available, the savings calculations will be updated.

The price of electricity in Italy in the domestic sector is 21.6 €/per 100 kWh.

The price of gas in Italy in the domestic sector is 9.5 € per 100 kWh.

Table 37: Economic gas and electricity savings in Treviso during the demonstrative period

TOWER A TREVISO			Electricity (kWh)	%	Gas (kWh)	%
REPORTING PERIOD	may-19	June 2019				
ADJUSTED BASELINE ENERGY (kWh)			9.814	39%	15.373	61%
REPORTING PERIOD MEASURED ENERGY (kWh)			9.155	48%	9.733	52%
SAVINGS OR AVOIDED ENERGY CONSUMPTION (kWh)			659		5.640	
ECONOMIC SAVINGS (€)			142,37 €		535,79 €	
TOTAL ELECTRIC SAVING (%)			7%		37%	
TOWER B TREVISO			Electricity (kWh)	%	Gas (kWh)	%
REPORTING PERIOD	November 2018	June 2019				
ADJUSTED BASELINE ENERGY (kWh)			22.491	11%	178.321	89%
REPORTING PERIOD MEASURED ENERGY (kWh)			21.413	19%	90.815	81%
SAVINGS OR AVOIDED ENERGY CONSUMPTION (kWh)			1.079		87.506	
ECONOMIC SAVINGS (€)			232,96 €		8.313,05 €	
TOTAL ELECTRIC SAVING (%)			5%		49%	

Table 38: Annual economic gas and electricity savings in Treviso

	A TOWER TREVISO	B TOWER TREVISO
ELECTRICITY ANUAL SAVING (kWh)	2.213	2.857
ELECTRICITY ANUAL SAVING (€)	478 €	617 €
GAS ANUAL SAVING (kWh)	89.543	118.463
GAS ANUAL SAVING (€)	8.507 €	11.254 €
TOTAL ANUAL SAVING (€)	8.985 €	11.871 €

2.7 ENERGY SAVINGS CALCULATION CONCLUSIONS

- In the dwellings of the tower A a saving of the electricity consumption of 7% and a saving in the consumption of gas of 37% has been achieved.
- In the dwellings of the tower B a saving of the electricity consumption of 5% and a saving in the consumption of gas of 49% has been achieved.
- It is important to note that in Tower A a sufficient demonstration period has not been used due to lack of data. Only the months of May, June and July of 2019 have been used since the renovations ended in the month of April 2019. According to the International Performance Measurement and Verification Protocol (IPMVP), the demonstration period must cover at least one normal operating cycle of the installation or of the equipment, to

achieve a complete characterization of the effectiveness of savings in all normal operating conditions. In the case of Tower B, there is a broader demonstration period that allows characterizing the behavior of household consumption. The demonstration time used spans November 1, 2018 to July 31, thus covering winter and summer months.

- The percentage differences between the electricity and gas savings obtained in both towers are due to the fact that the renovations undertaken have a lower impact on the electricity consumption of the buildings. The generation of the photovoltaic system has an effect on the electricity savings of the common areas, but today, it is not in operation.
- The number of occupants and the surface of the dwellings are factors that affect the energy consumption of the dwellings. Factors such as the consumption habits of each tenant and their awareness of the use of resources also influence.
- In the case of electricity baselines, there is a calculation error due to regression calculations ranging from 0.11% to 9% of the adjusted reference consumption, so that your savings are within the uncertainty range. The error of saving calculations is that of the regression calculation performed to obtain each baseline. As an approximate reference, the coefficient of determination (r^2) value of each baseline calculation has been used.
- In the case of natural gas savings, they are within a range of uncertainty ranging from 0.1% to 10%, of the adjusted reference consumption. The value of R^2 has been used to calculate this error.
- In order to calculate the energy savings of the dwellings, a non-routine type adjustment (IPMVP methodology) should be included in the baseline equation. This type of adjustment is due to parameters that influence energy and are not expected to change over time: size of the installation, design and operation of existing equipment, number of work shifts or type of occupants. The possible changes experienced by these static variables have to be monitored throughout the demonstration period of savings.

3 ENERGY PERFORMANCE PADIHAM PILOT BEFORE RENOVATIONS

3.1 INITIAL INFORMATION

The initial information is based on the following:

- Characteristics of the dwellings according to the information provided by PFP and field visit.
- Heating systems installed.
- Line diagrams.
- Monitoring equipment installed.
- Data collected from the monitoring system through the Open Domo platform.

In the map below the layout of the dwellings is shown.



Figure 7 Pilot site map showing Dwellings with monitoring kit Installed

The table below shows the different types of dwelling the monitoring is based on.

Table 39: Dwelling characteristics

	Tipology	Supplies	Floors	Bedroom	Tenants	Auxiliary electric panel	Lighting
D1	Ground Floor flat	El. and Gas	1	1	1	-	Low consumpt.
D2	Mid Terrace	Electric	2	2	2	700 W (4)	-
D3	Mid Terrace	Electric	2	2	2	1	Low consumpt. And LED
D4	Ground Floor flat	Electric	1	1	1	2000 W (1)	Incandescence
D5	End terrace	El. and Gas	2	3	1	-	-
D6	First Floor Flat	Electric	1	1	1	2500 W (1)	Low consumpt. And LED
D7	End terrace	Electric	2	3	3	2000 W (1)	-
D8	End terrace	Electric	2	2	3	2000 W (1)	-
D9	Mid Terrace	Electric	2	3	2	-	-

3.2 ENERGY CONSUMPTION DESCRIPTION

In this section the calculation based on the data collected for the period from the installation date on September 22nd 2018 to February 14th 2019 is presented.

There are two dwellings (named as D1 and D5) that have gas supply for heating and domestic hot water. There is no gas consumption data up to now, however they are included on the report for analysing their electricity consumption. When their gas consumption data is available it will be taking into account in the calculations.

3.2.1 ENERGY CONSUMPTION DISTRIBUTION

This section is a summary of the different systems that contribute to the total energy consumption.

For the study, the consumptions have been divided in the following categories:

- Heating. It includes the heating system for off peak hours and heaters installed in the bathroom.
- Domestic Hot Water (DHW). It includes the immersion heater system and the shower heater system.
- Sockets. The consumption in sockets of different rooms of the dwellings has been measured. The reason behind these measurements is to check whether there are other heating systems that are being used such as electric heaters. According to the results of the analysis, when there is no relation between socket consumption and weather parameters, it is considered that this dwelling does not use auxiliary heating equipment.
- Appliances and Lighting “others”. This includes the rest of the consumption, and includes the lighting system, the kitchen appliances and other devices such as T.V and might include electric heaters as well.

In the following chart the distribution of energy for each category during the observation period is shown.

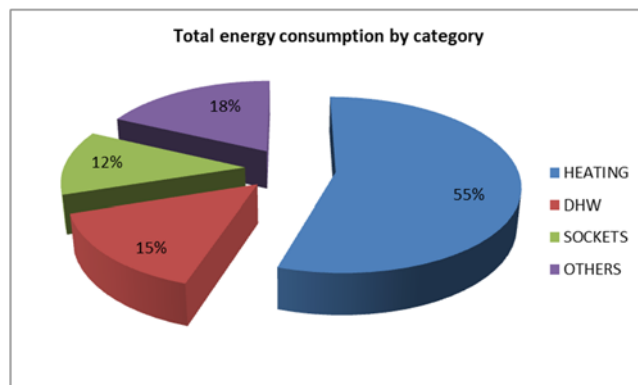


Figure 8: Total energy consumption by category

As it illustrated in the graft, the 'heating consumption' is 55%, the 'DHW' is 15%.

The following figure shows the total consumption per month (2018 to 2019).

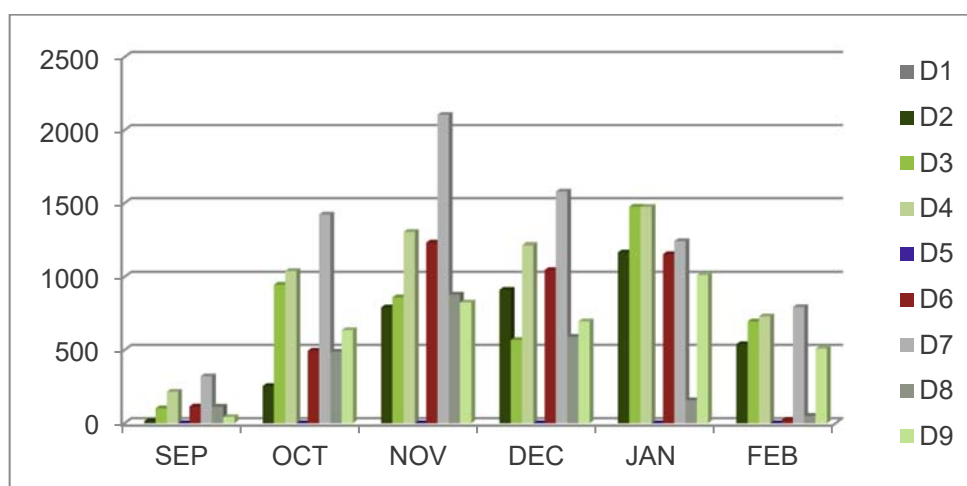


Figure 9: Monthly total consumption-Sept.2018 to Feb. 2019 (kWh)

It has to be taken into account that the observation period is mostly during the winter period when the heating systems are on.

The dwelling D8 does not have data in February since the tenants left and similar circumstance appears to happen in D6.

3.2.2 HEATING SYSTEM

This section describes the energy consumption related to the heating system. For all the electric dwellings the heating consumption is due to the electric storage heating systems and other heaters located in the bathroom.

The electric storage heating system is only charged during night-time (during off peak tariff hours) and it stores heat during the night in order to release it gradually during the rest of the day.

There is also an energy consumption due to the bathroom heater; however, this consumption is very low (c.1%) compared to the storage heater consumption. The next graph shows the consumption distribution for the storage heating system and the bathroom heating one. As mentioned, in these calculations data belonging to dwelling D1 and D5 are not included.

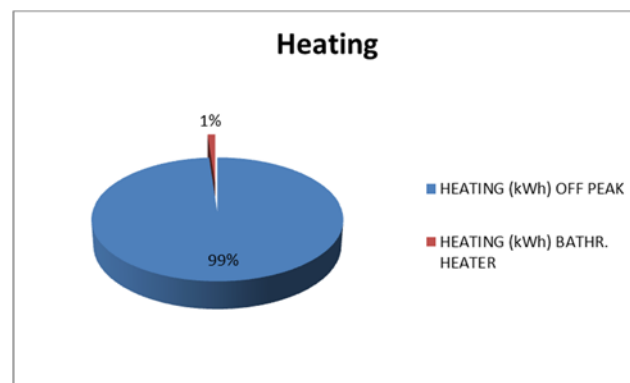


Figure 10: Heating system breakdown

In addition the following chart shows the difference in heating system consumption over the period for which data is available.

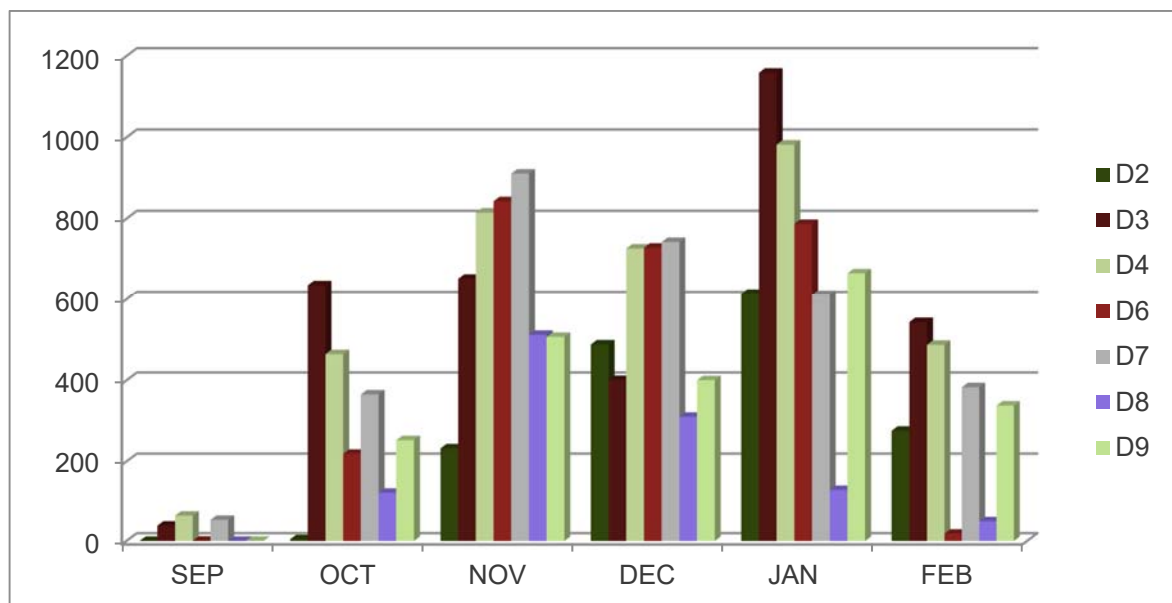


Figure 11: Monthly heating system consumption (kWh)-Sept.2018 to Feb.2019

Please note that the observation period in September 2018, is only 9 days and it is supposed that no heating system was being used, and the one for February 2019 is fifteen days.

3.2.3 DOMESTIC HOT WATER (DHW)

Domestic hot water is supplied by an immersion heater and a shower heater located in the bathroom. These systems are based on a resistance heating. A strong electrical current is passed through the heater and heats the water around it.

The immersion heater system operates generally during night time, using the off peak tariff, storing the heat and releasing it later during the day when domestic hot water is needed.

The immersion heater for DHW can be programmed by a timer which is shown in the next image.



Figure 12: DHW Off Peak Timer

The other energy consumer of the DHW system is the one related to the Shower heater.



Figure 13: Shower heater thermostat

However, taking a look at the available data, it is possible to observe that the consumption due to the shower is, in general terms, lower than the immersion heater consumption. Thus, the next graph shows the distribution for DHW consumption by the immersion and shower heater for all of the electric dwellings during October and November 2016.

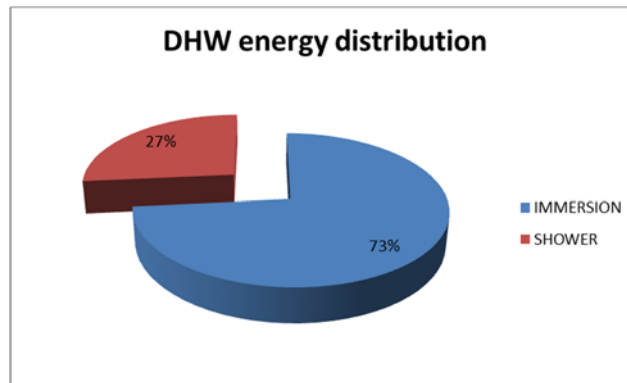


Figure 14: Domestic Hot Water distribution

The consumption of the immersion heater is much greater than the consumption of the shower heater.

In the following figure the DHW consumption for each dwelling from September 2016 to February 2017 is shown.

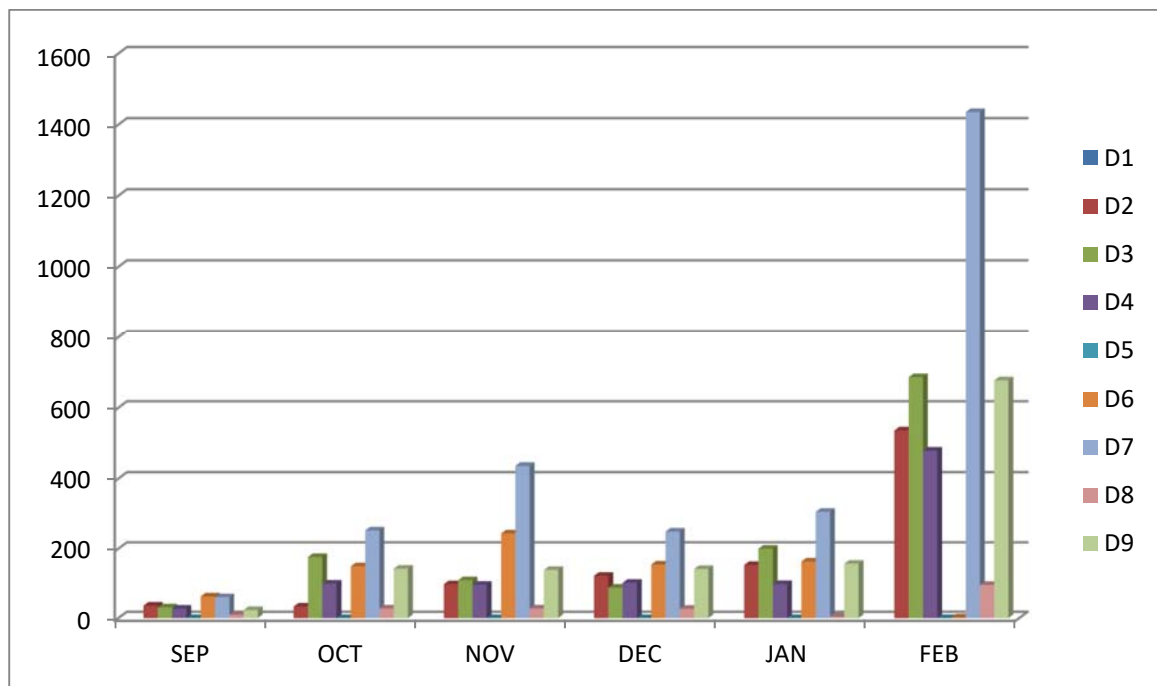


Figure 15: Monthly DHW consumption (kWh)

With the available data, it cannot be confirmed yet that there is any relation between the DHW consumption and ambient external temperatures.

3.2.4 Appliances and lighting (Others)

There is an important part of the energy consumption which corresponds directly to the electricity consumption that is not related to heating systems or DHW. This consumption includes the lighting system, kitchen appliances, electric stoves and other devices such as T.V and other devices.

Therefore, the 'Others' consumption will be analyzed separately, dwelling by dwelling, as it will be quite different depending on the number of tenants and their use of appliances.

In the next figure the consumption distribution over the relevant months is shown.

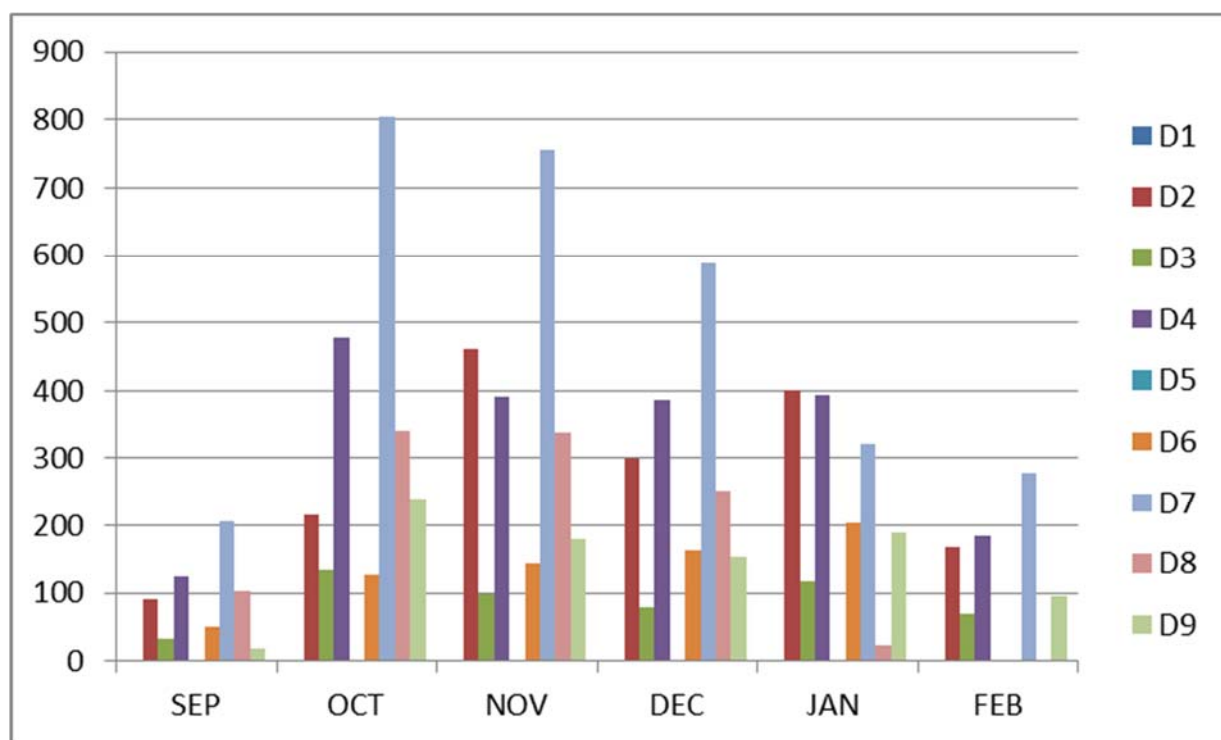


Figure 16: Monthly Appliances and Light consumption (kWh)

As it can be seen from the graph, the greatest consumption corresponds to dwelling D7 that has three tenants.

The consumption presented for appliances and light is not dependent on the external temperature.

3.3 BASELINE CALCULATION

For the calculation of the baseline of Padiham homes, the following variables have been used:

In the case of power supply:

- As a dependent variable, the monitored consumption data has been used.
- As independent variables, the heating day degrees, the hours of occupation and the measurement days have been used.

In the case of gas supply:

- As a dependent variable, the data received from gas readings has been used
- As independent variables the heating day degrees, the hours of occupation and the days of reading have been used.

3.4 SAVINGS CALCULATION

To calculate the saving, we must also take into account photovoltaic generation.

In Padiham, photovoltaic installations directly affect the savings of each home.

The meters that have been installed do not have a pulse port to be able to connect them to the platform, although they do have an optical port that could be compatible with the DEXgate 2.

PfP indicated that the general meters of each dwelling are not bidirectional, so the extra PV energy not used in the dwelling does not turn to the grid.

To calculate the photovoltaic energy that is used, given that our meters are measuring the general consumption of the house without distinguishing whether the electricity comes from the solar panels or the grid, by knowing the generated energy, we can know how much is being used inside the house.

Kathleen Zoonnekindt (SAVILLS sociologist) prepared an energy diary for the tenants so that tenants could collect the readings of the photovoltaic meters daily until the monitoring installation could be done. With the data collected by the tenants of two dwellings, the energy production of the photovoltaic installation has been estimated.

3.4.1 Analysis for dwelling D1

3.4.1.1 D1 ELECTRIC SUPPLY

For the calculation of Dwelling 1 electricity savings, the data from November 2018 to July 2019 has been used as a demonstration period.

Table 40: Electric savings calculated in dwelling 1

D1	Main Switch Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ³	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	156,4	30	195,25	406,9	94,2	-62,2	-66%
dic-18	158,1	31	200,5	453,8	97,3	-60,8	-62%
ene-19	173,5	31	213,75	527,6	101,9	-71,6	-70%
feb-19	143,5	28	177,5	404,1	87,1	-56,4	-65%
mar-19	160,0	31	248,75	436,9	110,4	-49,6	-45%
abr-19	153,0	30	299,5	357,8	122,4	-30,7	-25%
may-19	126,7	31	234,5	296,4	104,7	-22,0	-21%
jun-19	130,5	30	241,75	217,2	104,7	-25,8	-25%
jul-19	76,2	21	130,5	138,1	63,3	-12,9	-20%
TOTAL	1277,83	263,00	1942,00	3238,70	885,99	-391,84	-44%

Below is the estimate of the annual savings that would be obtained:

Table 41: Estimated annual electricity savings

D1	Main Switch Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ³	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	156,4	30	195,25	406,9	94,2	-62,2	-66%
dic-18	158,1	31	200,5	453,8	97,3	-60,8	-62%
ene-19	173,5	31	213,75	527,6	101,9	-71,6	-70%
feb-19	143,5	28	177,5	404,1	87,1	-56,4	-65%
mar-19	160,0	31	248,75	436,9	110,4	-49,6	-45%
abr-19	153,0	30	299,5	357,8	122,4	-30,7	-25%
may-19	126,7	31	234,5	296,4	104,7	-22,0	-21%
jun-19	130,5	30	241,75	217,2	104,7	-25,8	-25%
jul-19	76,2	21	130,5	138,1	63,3	-12,9	-20%
ago-19	134,7	31	227,5	202	101,6	-33,0	-32%
sep-19	47,7	30	220,2	286	99,6	51,9	52%
oct-19	119,8	31	227,5	384	103,9	-15,9	-15%
TOTAL	1580,01	355,00	2617,23	4110,70	1191,10	-388,91	-33%

3.4.1.2 D1 GAS SUPPLY

In the case of gas savings, the only data available are two gas readings between 07/11/2018-13/12/2018 and 13/12/2018-28/03/2019. The subsequent gas readings are currently awaited, as it would be necessary to extend the demonstration period.

Table 42: Gas savings calculated in dwelling 1

Initial reading date	Final date reading	Consumption (m ³)	Reading days	Hours of use (h)	HDD INDOOR T	Adjusted baseline consumption (m3)	Gas Saving	Percentage of energy savings
07/11/2018	13/12/2018	541,4	36	236,25	499,4978921	216,74	-324,66	-150%
13/12/2018	28/03/2019	836,17	105	724,5	1595,734672	676,54	-159,63	-24%
TOTAL		1377,6	141,0	960,8	2095,2	893,3	-484,3	-54%

3.4.2 Analysis for dwelling D2

For the calculation of Dwelling 2 electricity savings, the data from November 2018 to July 2019 has been used as a demonstration period.

Table 43: Electricity savings calculated in dwelling 2

D2	TOTAL Consumption (kWh)	Hours of use	HDD INDOOR T ^a	MEASURED DAYS	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	946,1	122,8	336,7	30,0	1306,3	360,3	28%
dic-18	1132,8	130,0	381,3	31,0	1498,2	365,4	24%
ene-19	1260,3	163,5	455,1	31,0	1772,1	511,9	29%
feb-19	880,1	118,5	338,6	28,0	1325,7	445,6	34%
mar-19	806,4	114,5	364,3	31,0	1451,3	644,8	44%
abr-19	507,7	72,8	287,6	30,0	1181,4	673,7	57%
may-19	363,7	63,5	223,8	31,0	903,0	539,3	60%
jun-19	341,8	49,5	148,6	30,0	582,5	240,7	41%
jul-19	331,7	54,5	75,9	31,0	232,6	-99,1	-43%
TOTAL	6570,4	889,5	2611,9	273,0	10253,2	3682,7	35,92%

Below is the estimate of the annual savings that would be obtained:

Table 44: Estimated annual electricity savings in dwelling 2

D2	TOTAL Consumption (kWh)	Hours of use	HDD INDOOR T ^a	MEASURED DAYS	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	946,1	122,8	336,7	30,0	1306,3	360,3	28%
dic-18	1132,8	130,0	381,3	31,0	1498,2	365,4	24%
ene-19	1260,3	163,5	455,1	31,0	1772,1	511,9	29%
feb-19	880,1	118,5	338,6	28,0	1325,7	445,6	34%
mar-19	806,4	114,5	364,3	31,0	1451,3	644,8	44%
abr-19	507,7	72,8	287,6	30,0	1181,4	673,7	57%
may-19	363,7	63,5	223,8	31,0	903,0	539,3	60%
jun-19	341,8	49,5	148,6	30,0	582,5	240,7	41%
jul-19	331,7	54,5	75,9	31,0	232,6	-99,1	-43%
ago-19	352,2738324	101,151455	116	31	322,6	-29,7	-9%
sep-19	354,3166575	97,88850486	198,00	30	712,1	357,7	50%
oct-19	116,7956285	101,151455	292,00	31	1142,2	1025,4	90%
TOTAL	7393,8	1189,7	3217,9	365,0	12430,0	5036,2	40,52%

3.4.3 Analysis for dwelling D3

For the calculation of Dwelling 3 electricity savings, the data from November 2018 to July 2019 has been used as a demonstration period.

Table 45: Electricity savings calculated in dwelling 3

D3	TOTAL Consumption (kWh)	Hours of use	MEASURED DAYS	HDD INDOOR T ^º	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	1110,3	226,25	30	400,9	1438,8	328,5	23%
dic-18	1403,3	259,25	31	447,6	1623,2	219,9	14%
ene-19	1642,7	261,5	31	521,4	1871,3	228,6	12%
feb-19	1182,2	225,25	28	398,5	1444,0	261,9	18%
mar-19	1303,1	296,25	31	430,6	1606,9	303,8	19%
abr-19	870,0	237	30	351,7	1286,8	416,8	32%
may-19	661,0	223,25	31	290,1	1059,7	398,7	38%
jun-19	555,3	159,75	30	211,1	734,6	179,3	24%
jul-19	308,4	137,75	31	132,4	441,5	133,1	30%
TOTAL	9036,2	2026,3	273,0	3184,3	11506,7	2470,6	21%

Below is the estimate of the annual savings that would be obtained:

Table 46: Estimated annual electricity savings

D3	TOTAL Consumption (kWh)	Hours of use	MEASURED DAYS	HDD INDOOR T ^º	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	1110,3	226,25	30	400,9	1438,8	328,5	23%
dic-18	1403,3	259,25	31	447,6	1623,2	219,9	14%
ene-19	1642,7	261,5	31	521,4	1871,3	228,6	12%
feb-19	1182,2	225,25	28	398,5	1444,0	261,9	18%
mar-19	1303,1	296,25	31	430,6	1606,9	303,8	19%
abr-19	870,0	237	30	351,7	1286,8	416,8	32%
may-19	661,0	223,25	31	290,1	1059,7	398,7	38%
jun-19	555,3	159,75	30	211,1	734,6	179,3	24%
jul-19	308,4	137,75	31	132,4	441,5	133,1	30%
ago-19	398,3	230,1	31	172	673,9	275,6	41%
sep-19	221,6	222,7	30	256	952,6	731,0	77%
oct-19	985,3	230,1	31	353	1276,5	291,2	23%
TOTAL	10641,4	2709,2	365,0	3965,3	14409,7	3768,3	26%

3.4.4 Analysis for dwelling D4

For the calculation of Dwelling 4 electricity savings, the data from November 2018 to July 2019 has been used as a demonstration period.

Table 47: Electric savings calculated in dwelling 4

D4	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ^g	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	604,9	30,0	231,5	412,1	1127,2	522,3	46%
dic-18	721,9	31,0	290,0	459,2	1264,2	542,3	43%
ene-19	864,2	31,0	332,0	533,0	1464,9	600,8	41%
feb-19	644,7	28,0	244,3	409,0	1118,4	473,7	42%
mar-19	729,4	31,0	288,8	442,2	1219,9	490,5	40%
abr-19	519,7	30,0	253,8	363,0	1004,6	484,9	48%
may-19	401,3	31,0	175,5	301,7	830,2	428,9	52%
jun-19	303,6	30,0	161,5	222,4	619,4	315,8	51%
jul-19	160,3	31,0	139,3	142,9	410,1	249,8	61%
TOTAL	4949,9	273,0	2116,5	3285,5	9058,8	4108,9	45%

Below is the estimate of the annual savings that would be obtained:

Table 48: Estimated annual electricity savings

D4	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ^g	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	604,9	30,0	231,5	412,1	1127,2	522,3	46%
dic-18	721,9	31,0	290,0	459,2	1264,2	542,3	43%
ene-19	864,2	31,0	332,0	533,0	1464,9	600,8	41%
feb-19	644,7	28,0	244,3	409,0	1118,4	473,7	42%
mar-19	729,4	31,0	288,8	442,2	1219,9	490,5	40%
abr-19	519,7	30,0	253,8	363,0	1004,6	484,9	48%
may-19	401,3	31,0	175,5	301,7	830,2	428,9	52%
jun-19	303,6	30,0	161,5	222,4	619,4	315,8	51%
jul-19	160,3	31,0	139,3	142,9	410,1	249,8	61%
ago-19	245,9	31,0	240,5	202,0	585,9	340,0	58%
sep-19	89,4	30,0	232,7	286,0	800,3	710,9	89%
oct-19	225,0	31,0	240,5	384,0	1058,0	833,0	79%
TOTAL	5510,3	365,0	2830,2	4157,5	11503,1	5992,8	52%

3.4.5 Analysis for dwelling D5

3.4.5.1 D5 ELECTRIC SUPPLY

Due to the problems of the data that reach the platform, it has been used as a demonstration period in the calculation of electricity savings in dwelling 5, months from November 2018 to February 2019.

Table 49: Electricity savings calculated in dwelling 5

D5	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ^a	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	149,2	30,0	328,3	238,6	91,0	-58,2	-64%
dic-18	183,0	31,0	403,5	279,9	130,3	-52,7	-40%
ene-19	216,8	31,0	525,0	353,7	200,2	-16,5	-8%
feb-19	132,8	28,0	288,8	247,1	79,0	-53,8	-68%
mar-19	116,3	27,0	342,8	262,9	111,5	-4,8	-4%
TOTAL	798,1	147,0	1888,3	1382,2	612,1	-186,014257	-30%

Below is the estimate of the annual savings that would be obtained:

Table 50: Estimated annual electricity savings

D5	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ^a	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	149,2	30,0	328,3	238,6	91,0	-58,2	-64%
dic-18	183,0	31,0	403,5	279,9	130,3	-52,7	-40%
ene-19	216,8	31,0	525,0	353,7	200,2	-16,5	-8%
feb-19	132,8	28,0	288,8	247,1	79,0	-53,8	-68%
mar-19	116,3	27,0	342,8	262,9	111,5	-4,8	-4%
abr-19	125,2	30,0	383,4	240,0	118,8	-6,3	-5%
may-19	136,6	31,0	396,2	129,0	108,4	-28,2	-26%
jun-19	123,4	30,0	383,4	67,0	98,0	-25,4	-26%
jul-19	141,7	31,0	396,2	28,0	96,2	-45,5	-47%
ago-19	126,4	31,0	396,2	50,0	98,9	-27,5	-28%
sep-19	42,7	30,0	383,4	116,0	103,9	61,2	59%
oct-19	137,2	31,0	396,2	202,0	117,2	-20,0	-17%
TOTAL	1299,0	300,0	3891,4	1695,7	1132,2	-166,8	-15%

3.4.5.2 D5 GAS SUPPLY

In the case of gas savings, the only data available are four gas readings between 22/11/2018 and 21/03/2019. The following gas readings are currently awaiting, as it would be necessary to extend the demonstration period.

Table 51: Gas savings calculated in dwelling 5

Initial reading date	Final date reading	Consumption (m ³)	Reading days	Hours of use (h)	HDD INDOOR T	Adjusted baseline consumption (m3)	Gas Saving	Percentage of energy savings
22/11/2018	19/12/2018	46,56	27,00	267,75	264,74	93,58	47,02	50%
19/12/2018	18/01/2019	78,77	30,00	539,50	266,04	105,22	26,45	25%
18/01/2019	26/02/2019	93,17	39,00	470,00	375,98	138,36	45,19	33%
26/02/2019	21/03/2019	58,38	23,00	269,50	216,19	77,76	19,38	25%
TOTAL		276,88	119,00	1546,75	1122,95	414,92	138,05	33%

3.4.6 Analysis for dwelling D6

For the calculation of Dwelling 6 electricity savings, the data from November 2018 to February 2019 has been used as a demonstration period. Once the platform data is analyzed and corrected, the demonstrative savings period will be extended.

Table 52: Electricity savings calculated in dwelling 6

D6	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ³	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	627,592	30	397,25	355,0	1009,9	382,3	38%
dic-18	731,556	31	314,25	400,3	1157,0	425,5	37%
ene-19	847,83	31	357,25	474,0	1367,7	519,9	38%
feb-19	560,574	28	191	355,7	1043,2	482,6	46%
TOTAL	2767,552	120	1259,75	1585,1	4577,8	1810,3	40%

Below is the estimate of the annual savings that would be obtained:

Table 53: Estimated annual electricity savings

D6	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ³	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	627,59	30	397,25	355,0	1009,9	382,3	38%
dic-18	731,56	31	314,25	400,3	1157,0	425,5	37%
ene-19	847,83	31	357,25	474,0	1367,7	519,9	38%
feb-19	560,57	28	191,00	355,7	1043,2	482,6	46%
mar-19	695,84	31	323,36	517,0	1499,8	804,0	54%
abr-19	490,78	30	312,93	357,0	1029,0	538,2	52%
may-19	185,40	31	323,36	236,0	671,2	485,8	72%
jun-19	123,81	30	312,93	163,0	457,0	333,1	73%
jul-19	160,57	31	323,36	98,0	264,3	103,8	39%
ago-19	150,48	31	323,36	143,0	397,0	246,5	62%
sep-19	73,00	30	312,93	227,0	645,7	572,7	89%
oct-19	306,24	31	323,36	322,0	924,8	618,6	67%
TOTAL	4953,68	365	3815,37	3648,1	10466,6	5512,9	53%

3.4.7 Analysis for dwelling D7

The data collected in the DEXMA's platform are not coherent (for example, there are negative consumptions, etc.). There is some internal failure in some Opendomo's devices that Opendomo corrected when the data arrived at its platform. SinCeO2 is helping DEXMA solve this problem as soon as possible due to the importance of the data collected after the renovations for calculating the energy savings. DEXMA has indicated that once the problem solved, the data can be corrected and used in the calculation.

3.4.8 Analysis for dwelling D8

For the calculation of Dwelling 8 electricity savings, the data from November 2018 to July 2019 has been used as a demonstration period.

Table 54: Electricity savings calculated in dwelling 8

D8	ENERGY MEASURED (kWh)	MEASURED DAYS	Hours of use	HDD INDOOR T ³	EBL Consumption (kWh)	Electric Energy Saving	Percentage of energy savings
dic-18	696,6	19,0	210,5	386,1	1967,0	1270,4	65%
ene-19	1345,6	31,0	409,8	459,9	2233,3	887,7	40%
feb-19	1033,8	28,0	350,0	342,9	1620,9	587,1	36%
mar-19	1033,6	31,0	531,8	369,1	1644,8	611,1	37%
abr-19	615,3	30,0	442,3	292,2	1273,3	657,9	52%
may-19	505,3	31,0	405,3	228,6	939,4	434,1	46%
jun-19	489,0	30,0	267,0	153,1	607,4	118,4	19%
jul-19	256,8	21,0	175,8	79,9	269,5	12,7	5%
TOTAL	5976,1	221,0	2792,3	2311,7	10555,5	4579,4	43%

Below is the estimate of the annual savings that would be obtained:

Table 55: Estimated annual electricity savings

D8	ENERGY MEASURED (kWh)	MEASURED DAYS	Hours of use	HDD INDOOR T ³	EBL Consumption (kWh)	Electric Energy Saving	Percentage of energy savings
dic-18	696,6	19,0	210,5	386,1	1967,0	1270,4	65%
ene-19	1345,6	31,0	409,8	459,9	2233,3	887,7	40%
feb-19	1033,8	28,0	350,0	342,9	1620,9	587,1	36%
mar-19	1033,6	31,0	531,8	369,1	1644,8	611,1	37%
abr-19	615,3	30,0	442,3	292,2	1273,3	657,9	52%
may-19	505,3	31,0	405,3	228,6	939,4	434,1	46%
jun-19	489,0	30,0	267,0	153,1	607,4	118,4	19%
jul-19	256,8	21,0	175,8	79,9	269,5	12,7	5%
ago-19	467,2	31,0	383,8	129,0	394,8	-72,4	-18%
sep-19	227,7	30,0	371,4	213,0	875,4	647,7	74%
oct-19	70,5	31,0	383,8	307,0	1393,0	1322,6	95%
nov-19	1582,9	30,0	371,4	376,0	1789,5	206,5	12%
TOTAL	8324,3	343,0	4302,5	3336,7	15008,2	6683,9	45%

3.4.9 Analysis for dwelling D9

For the calculation of Dwelling 9 electricity savings, the data from November 2018 to February 2019 has been used as a demonstration period. Once the platform data is analyzed and corrected, the demonstrative savings period will be extended.

Table 56: Electricity savings calculated in dwelling 9

D9	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ^a	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	632,882	30	531,5	263,8	714,7	81,8	11%
dic-18	670,362	31	574	305,9	799,8	129,4	16%
ene-19	797,184	31	611,5	379,7	945,4	148,2	16%
feb-19	698,996	28	472,5	270,5	735,9	36,9	5%
TOTAL	2799,424	120	2189,5	1220,0	3195,8	396,4	12%

Below is the estimate of the annual savings that would be obtained:

Table 57: Estimated annual electricity savings

D9	TOTAL Consumption (kWh)	Measured Days	Hours of use	HDD INDOOR T ^a	Adjusted baseline consumption (kWh)	Electric Energy Saving	Percentage of energy savings
nov-18	632,88	30	531,5	263,8	714,7	81,8	11%
dic-18	670,36	31	574	305,9	799,8	129,4	16%
ene-19	797,18	31	611,5	379,7	945,4	148,2	16%
feb-19	699,00	28	472,5	270,5	735,9	36,9	5%
mar-19	866,65	31	564,46	424,0	1072,0	205,4	19%
abr-19	602,39	30	546,25	269,0	718,2	115,8	16%
may-19	403,00	31	564,46	154,0	461,7	58,7	13%
jun-19	368,71	30	546,25	88,0	309,1	-59,6	-19%
jul-19	365,97	31	564,46	42,0	208,5	-157,4	-75%
ago-19	336,93	31	564,46	68,0	267,3	-69,6	-26%
sep-19	103,51	30	546,25	142,0	431,2	327,6	76%
oct-19	462,99	31	564,46	231,0	635,8	172,8	27%
TOTAL	6309,57	365	6650,55813	2638,0	7299,6	990,0	14%

3.5 ECONOMIC SAVINGS

For the calculation of the economic savings, since the updated invoices are not available, an estimate of the saving has been made with the official energy data of United Kingdom (Eurostat database). So the savings shown are not really those obtained by Places for People, but an estimate. When the updated rates of Places for People are available, the savings calculations will be updated.

The tariff of electricity in United Kingdom in the domestic sector is 18 GBP per 100 kWh (Eurostat database).

The tariff of gas in United Kingdom in the domestic sector is 4,6 GBP per 100 kWh (Eurostat database).

The average change during the savings calculation period from GBP to euros has been excerpted from the ECB website: EUR 1 = GBP 0.8872 -0.00093 (-0.1%)

In addition, the generation of energy through the photovoltaic installation has been taken into account for the calculation of savings. (It has been calculated with the data collected by the tenant of dwelling 6, since those of dwelling 9 were not consistent)

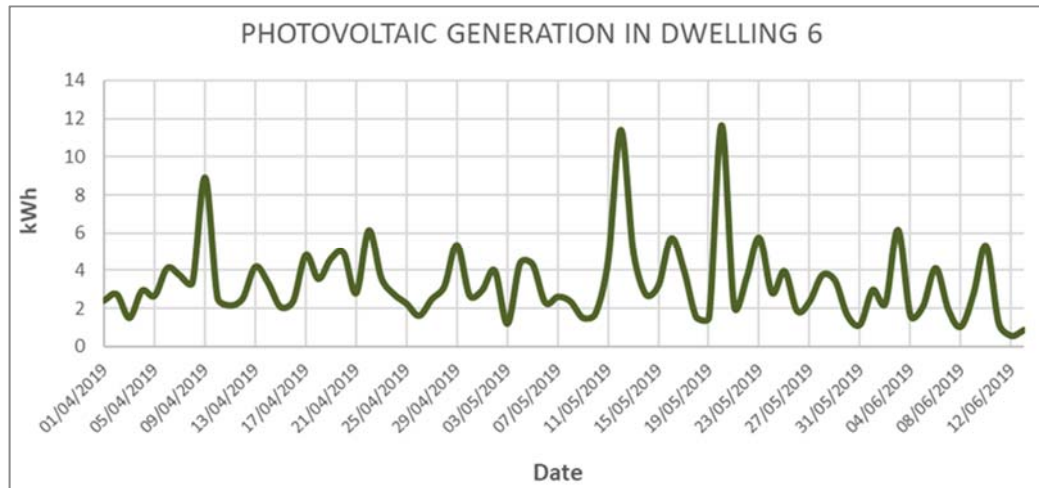


Figure 17: Photovoltaic generation in Dwelling 6 (kWh)

Table 58: Economic gas and electricity savings (GBP)

		ELECTRIC							GAS					
DWELLING	Supplies	Period	Adjusted Electric Baseline Energy (kWh)	Reporting period measured electric energy (kWh)	Electric savings or avoided energy consumption (kWh)	PV production	Electric savings (%)	Electrical Economic savings (GBP)	Period	Adjusted Gas Baseline Energy (kWh)	Reporting period measured Gas energy (kWh)	Gas savings or avoided energy consumption (kWh)	Gas (%)	Economic gas savings (GBP)
D1	Electric and gas	nov 18 - jul 19	886,0	1.277,8	-391,8	517,7	14%	£ 22,65	nov 18 - apr 19	10.451,5	16.117,6	-5.666,1	-54%	-£ 260,64
D2	Electric	nov 18 - jul 19	10.253,2	6.570,4	3.682,7	517,7	41%	£ 756,07		-	-	-		-
D3	Electric	nov 18 - jul 19	11.506,7	9.036,2	2.470,6	517,7	26%	£ 537,88		-	-	-		-
D4	Electric	nov 18 - jul 19	9.058,8	4.949,9	4.108,9	517,7	51%	£ 832,79		-	-	-		-
D5	Electric and gas	nov 18 - mar 19	612,1	798,1	-186,0	102,8	-14%	-£ 14,98	nov 18 - apr 19	4.854,6	3.239,5	1.615,1	33%	£ 74,30
D6	Electric	nov 18 - feb 19	4.577,8	2.767,6	1.810,3	50,0	41%	£ 334,85		-	-	-		-
D8	Electric	dec 18 - jul 19	10.555,5	5.976,1	4.579,4	504,6	48%	£ 915,13		-	-	-		-
D9	Electric	nov 18 - feb 19	3.195,8	2.799,4	396,4	50,0	14%	£ 80,34		-	-	-		-

*Photovoltaic production is taken into account

Table 59: Economic gas and electricity savings (€)

		ELECTRIC							GAS					
DWELLING	Supplies	Period	Adjusted Electric Baseline Energy (kWh)	Reporting period measured electric energy (kWh)	Electric savings or avoided energy consumption (kWh)	PV production	Electric savings (%)	Electrical Economic savings (€)	Period	Adjusted Gas Baseline Energy (kWh)	Reporting period measured Gas energy (kWh)	Gas savings or avoided energy consumption (kWh)	Gas (%)	Economic gas savings (€)
D1	Electric and gas	nov 18 - jul 19	886,0	1.277,8	-391,8	517,7	14%	25,42 €	nov 18 - apr 19	10.451,5	16.117,6	-5.666,1	-54%	- 294,64 €
D2	Electric	nov 18 - jul 19	10.253,2	6.570,4	3.682,7	517,7	41%	848,48 €		-	-	-		-
D3	Electric	nov 18 - jul 19	11.506,7	9.036,2	2.470,6	517,7	26%	603,63 €		-	-	-		-
D4	Electric	nov 18 - jul 19	9.058,8	4.949,9	4.108,9	517,7	51%	934,57 €		-	-	-		-
D5	Electric and gas	nov 18 - mar 19	612,1	798,1	-186,0	102,8	-14%	- 16,81 €	nov 18 - apr 19	4.854,6	3.239,5	1.615,1	33%	83,99 €
D6	Electric	nov 18 - feb 19	4.577,8	2.767,6	1.810,3	50,0	41%	375,77 €		-	-	-		-
D8	Electric	dec 18 - jul 19	10.555,5	5.976,1	4.579,4	504,6	48%	1.026,97 €		-	-	-		-
D9	Electric	nov 18 - feb 19	3.195,8	2.799,4	396,4	50,0	14%	90,16 €		-	-	-		-

*Photovoltaic production is taken into account

3.6 ENERGY SAVINGS CALCULATION CONCLUSIONS

The monitored dwellings in Padiham, show a saving in electricity consumption between 14% and 51%, except in D5 dwelling that has obtained an increase in consumption of 14%.

The electricity over consumption of dwelling D5 may be due to the so-called "rebound effect". The rebound effect occurs when an increase in energy efficiency does not translate into the expected energy savings. This is because there is a reduction in the cost of the energy service affected, which ends up resulting in a greater demand for it, compensating all or part of the savings derived from greater efficiency. This requires further investigation.

In the case of D1 there is an important over-consumption, but it has been verified that the interior conditions of use of the house have been modified, with an increase in the interior temperature. To this end, the monitored indoor temperature of dwelling 1 during the month of January 2017 (before the renovations) and the indoor temperature during the month of January 2019 (after the improvements) have been compared.

The graph shows how the indoor temperature has increased, which means that they have consumed more energy for heating.

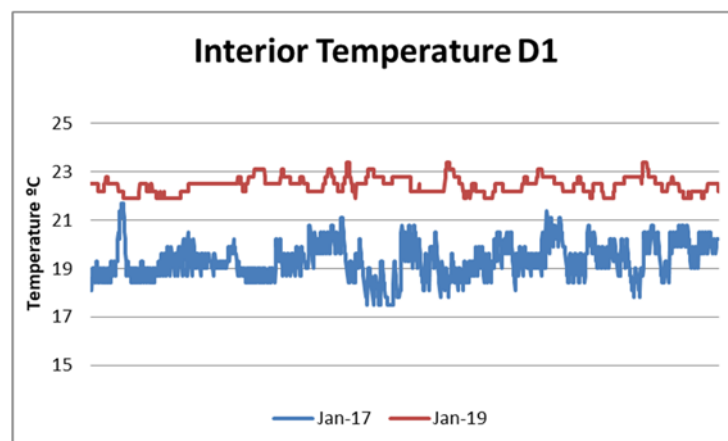


Figure 18: Comparison of indoor temperature D1 between January 2017 and January 2019

In the following graph, the same comparative of interior temperature in D4 housing is shown, where an electricity saving of 51% has been obtained. It is observed how the setpoint temperature of the interior of the house has decreased with respect to the year 2017.

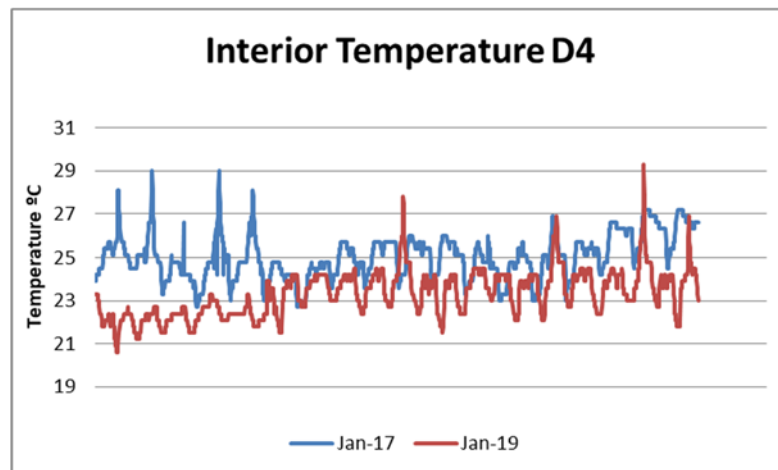


Figure 19: Comparison of indoor temperature D4 between January 2017 and January 2019

It is important to note that in dwellings D5, D6 and D9 a sufficient demonstration period has not been used due to lack of data. Only the months between November 2018 and February 2019 have been used. According to the IPMVP protocol, the demonstration period must cover at least one normal operating cycle of the installation or equipment, to achieve a complete characterization of the effectiveness of the savings in all normal operating conditions. In the rest of the dwellings, there is a broader demonstration period that allows characterizing the behavior of household consumption. The demonstration time used goes from November 1, 2018 to July 31, covering winter and summer months.

In the case of electricity baselines, there is a calculation error due to regression calculations ranging from 0,01% to 4% of the adjusted reference consumption, so that your savings are within the uncertainty range. The error of saving calculations is that of the regression calculation performed to obtain each baseline. As an approximate reference, the R^2 value of each baseline calculation has been used.

In the case of natural gas savings, they are within a range of uncertainty ranging from 0.5% to 9%, of the adjusted reference consumption. The value of R^2 has been used to calculate this error.

To establish the total Padiham Pilot savings, the annual savings obtained by the number of dwelling of each type have been calculated:

Table 60: Total Padiham Pilot savings (GPB)

	Number type dwelling	Annual gas savings (kWh)	Annual electricity savings (kWh)	Photovoltaic production (kWh)	Gas economic savings (GBP)	Electricity economic savings (GBP)	Photovoltaic production (GBP)	TOTAL ECONOMIC SAVING (GBP)
D1 (gas + electricity)	8	-45.328	-3.111	4.142	-£ 2.085,09	-£ 560,02	£ 745,49	-£ 1.899,62
D2 = D3 (electricity only)	34		149.677	17.602		£ 26.941,83	£ 3.168,32	£ 30.110,16
D4 (electricity only)	8		47.942	4.142		£ 8.629,57	£ 745,49	£ 9.375,05
D5 (gas + electricity)	5	8.075	-834	514	£ 371,45	-£ 150,15	£ 92,52	£ 313,82
D6 (electricity only)	4		22.052	200		£ 3.969,32	£ 36,00	£ 4.005,32
D7 = D8 (electricity only)	24		160.413	12.113		£ 28.874,42	£ 2.180,30	£ 31.054,73
D9 (electricity only)	6		5.940	300		£ 1.069,23	£ 54,00	£ 1.123,23
TOTAL		-37.253	382.079	39.012	-£ 1.713,64	£ 68.774,19	£ 7.022,12	£ 74.082,68

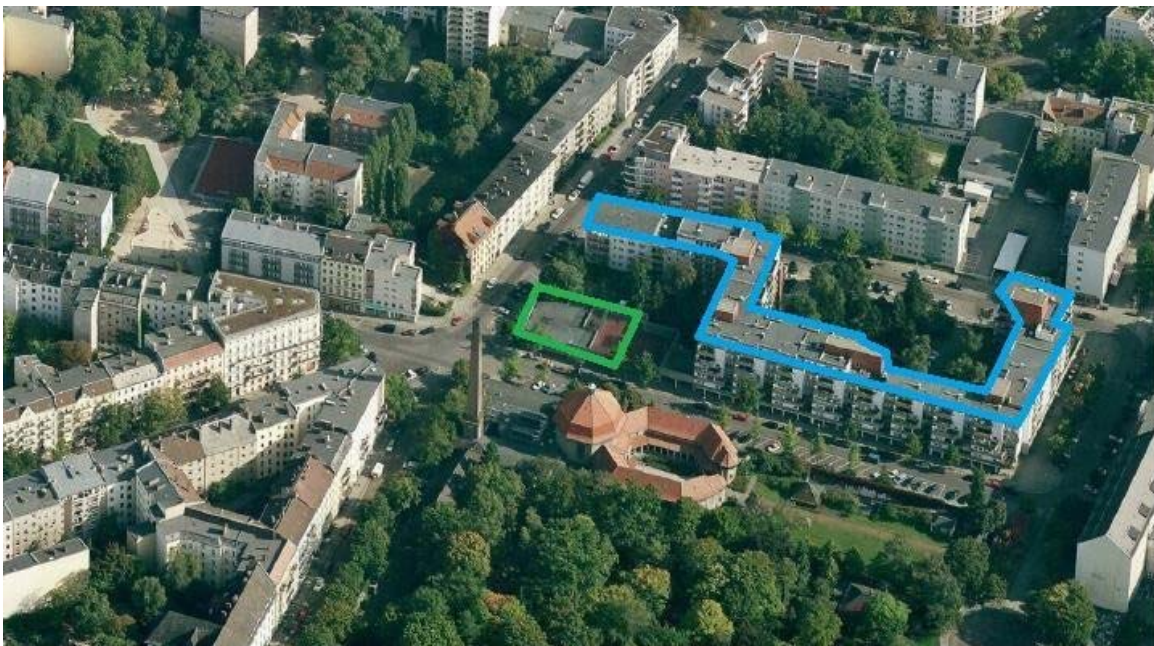
Table 61: Total Padiham Pilot savings (€)

	Number type dwelling	Annual gas savings (kWh)	Annual electricity savings (kWh)	Photovoltaic production (kWh)	Gas economic savings (€)	Electricity economic savings (€)	Photovoltaic production (€)	TOTAL ECONOMIC SAVING (€)
D1 (gas + electricity)	8	-45.328	-3.111	4.142	-2.357,06 €	- 628,47 €	836,60 €	- 2.148,92 €
D2 = D3 (electricity only)	34		149.677	17.602		30.234,72 €	3.555,56 €	33.790,29 €
D4 (electricity only)	8		47.942	4.142		9.684,29 €	836,60 €	10.520,89 €
D5 (gas + electricity)	5	8.075	-834	514	419,90 €	- 168,51 €	103,83 €	355,22 €
D6 (electricity only)	4		22.052	200		4.454,46 €	40,40 €	4.494,86 €
D7 = D8 (electricity only)	24		160.413	12.113		32.403,52 €	2.446,79 €	34.850,30 €
D9 (electricity only)	6		5.940	300		1.199,91 €	60,60 €	1.260,51 €
TOTAL		-37.253	382.079	39.012	-1.937,16 €	77.179,93 €	7.880,38 €	83.123,15 €

4 ENERGY PERFORMANCE NETTELBECKPLATZ-_ 1892 BUILDING BEFORE RENOVATION.

4.1 INITIAL INFORMATION.

The residential area of Nettelbeckplatz was developed as a result of a fundamental renewal of a former workers' area in the 1970s. Consequently, the traditional buildings with 7 nested backyards and the total of 300 flats were gradually demolished and the local residents could move to the newly build modern communal housing complex. The latter (marked blue on the below picture) is a meander-shaped and partly-terraced condominium with 7 floors and an open courtyard. The complex includes 164 social flats with 1-4 rooms and has a parking lot with 45 parking spaces. Thanks to numerous common rooms inside the house, as well as rest zones and playgrounds outside, the condominium offers free-time options for all age groups.



Aerial view

New building

Existing building

From demographic point of view, the residential area of Nettelbeckplatz is characterized by an ageing population. Although initially, there were mainly families with small children who moved in, today 40% of the residents are older people living alone, or couples in the age range of 65 and more. This quota of elderly people is much higher than in other communal housing complexes, or generally in Berlin as a

whole. This is also the reason to redesign the area in a way that will make it both more accessible and suitable for the needs of elderly people.

The buildings

The buildings were built with pre-fabricated parts that even by today's standards achieve relatively good U-values. Because of this and due to the disproportionately high costs that an additional façade insulation would add (c.a. 30% additional costs), the façade insulation will not be renewed as part of the renovation.

The open ground floors were typical for the time the building was built in – they are energetically efficient, but not optimal. The buildings are supplied with district heating – a secure and cost-wise predictable source of heat that will similarly not be affected by the renovation.

Apart from energy-efficiency oriented measures and the installation of photovoltaic system, the main objective of the renovation will be the improvement of the living standard for the elderly tenants. To this end, among others flat-sharing opportunities for elderly will be created, level-access showers are installed, and the (fire-proof)-doors are automated. The common spaces are re-created and equipped with new equipment.

The open-sided stories above the ground-floor will be extended and in combination with the ground-floor space they were converted into a shared flat for 10 elderly people and 8 student apartments. Thanks to a partial demolition of the parking garage and the accompanying construction of a new building (green in picture on page 72) additional 44 new flats were created.

It is to be pointed out that the additional 4,200 m² of living space that is generated through the re-design measures described above will not affect the size nor the quality of the green areas.

Motivated by the DREEAM project requirements, the installation of a photovoltaic system has been added to the initial re-design plans. The CO₂ neutral energy that will be generated will cover the electricity needs of the common areas, i.e. lighting, the elevator, parking lot and community facilities. What is more, the decentralized electricity generation will help to reduce the running costs for the building and, at the same time, the living costs for the tenants.



Land allocation – renovation and new construction

Renovation plans

Overall renovation objectives

- creation of new living space in the ground floor of the existing building (800 m²) and a new building with 44 dwellings (3,400 m² living space)
- ground floor: shared apartment for ten elderly people, eight student apartments and new community rooms (minimize heat losses because optimizing outer shell)
- renovation of the existing buildings to save energy and reduce operating costs

Planned standard renovation measures (not to be financed via DREEAM)

- insulation of the basement ceiling
- new windows (thermal transmittance U-value)
- asbestos remediation (floor, sewer pipe)
- energy-saving new lifts with energy recovery and LED lightning

Planned innovative measures to be financed via DREEAM

- photovoltaic system with an energy storage device new roof insulation for the photovoltaic system

Summary of estimated energy performance after renovation (kWh/m²yr)

Source of energy demand	Planned measures (as part of renovation action)	Energy performance (kWh/m ² yr)*	
		Before renovation	After renovation
dwelling/trade	energetic revaluation of the building envelope (roof, terrace, basement	92	70
domestic lightning/ outdoor lightning	LED technology (-55%)	7,5	3,4
lift	energy-saving new lifts with energy recovery	1,4	0,8
student apartments, shared apartment for	creation of new living space	0	70
new building		0	56
	Planned measures (as part of renovation	Energy performance (kWh/m ² yr) *	

Source of energy supply	action)	Before renovation	After renovation
district heating	renovation of the pipework (improved insulation), improved efficient heating system	92	66,9

4.2 Energy consumption description

4.2.1 District Heating System (Heating Thermal Consumption)

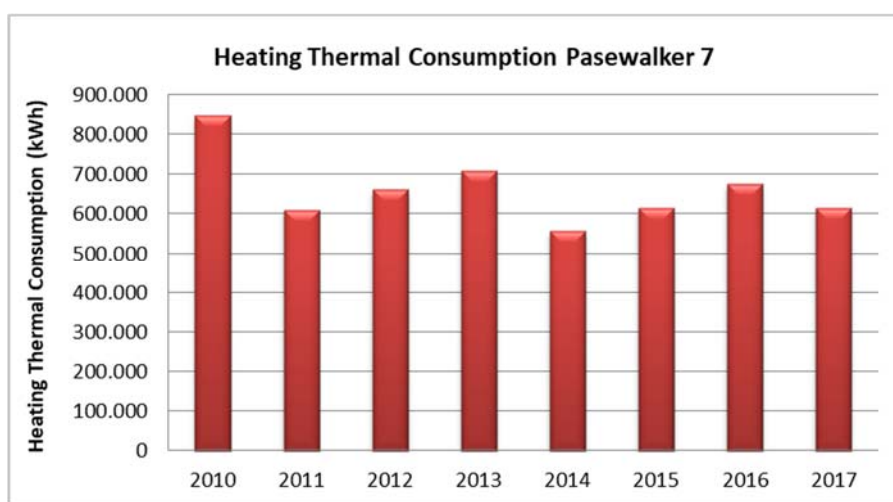


Figure 20: Heating Thermal Consumption Pasewalker 7 evolution (2010-2017)

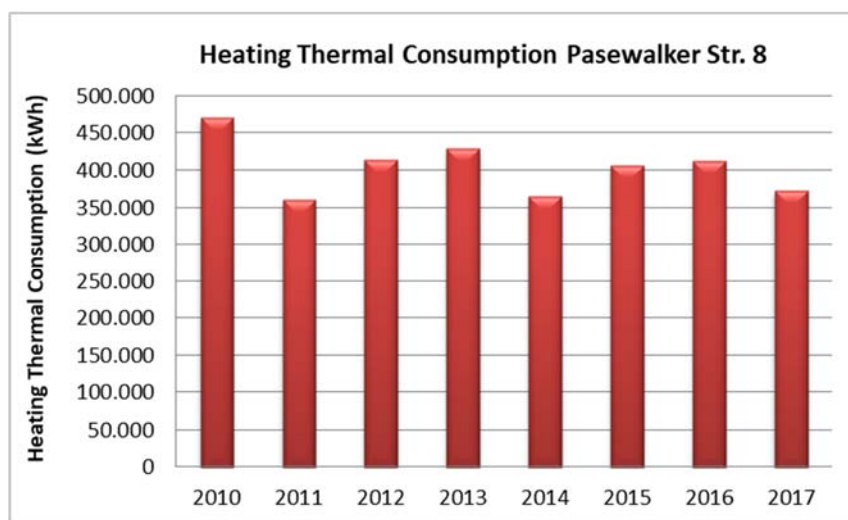


Figure 21: Heating Thermal Consumption Pasewalker 8 evolution (2010-2017)

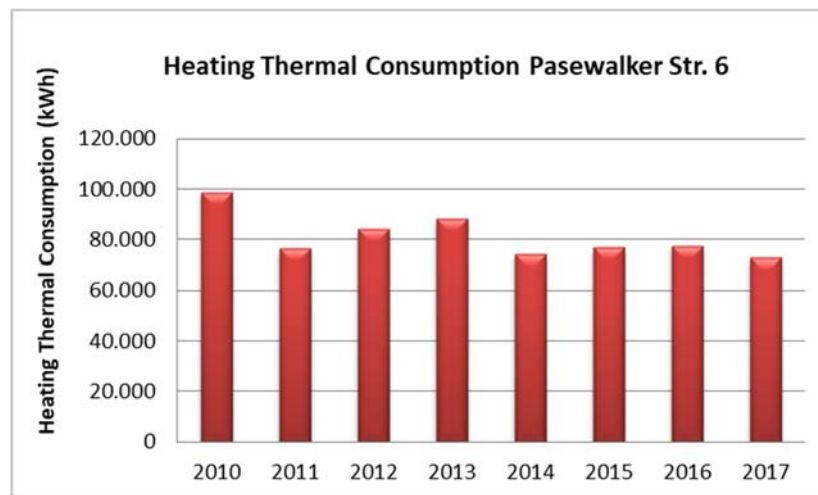


Figure 22: Heating Thermal Consumption Pasewalker 6 evolution (2010-2017)

4.2.2 District Heating System (Hot Water Thermal Consumption)

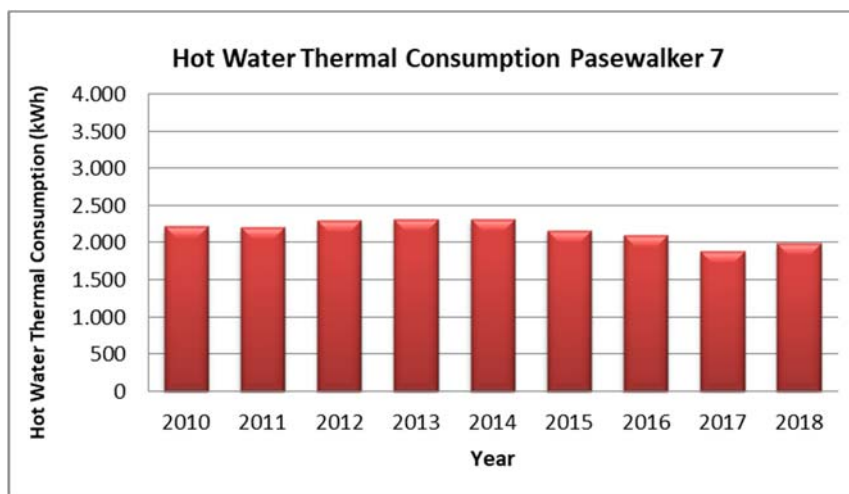


Figure 23: Hot water Thermal Consumption Pasewalker 7 evolution (2010-2018)

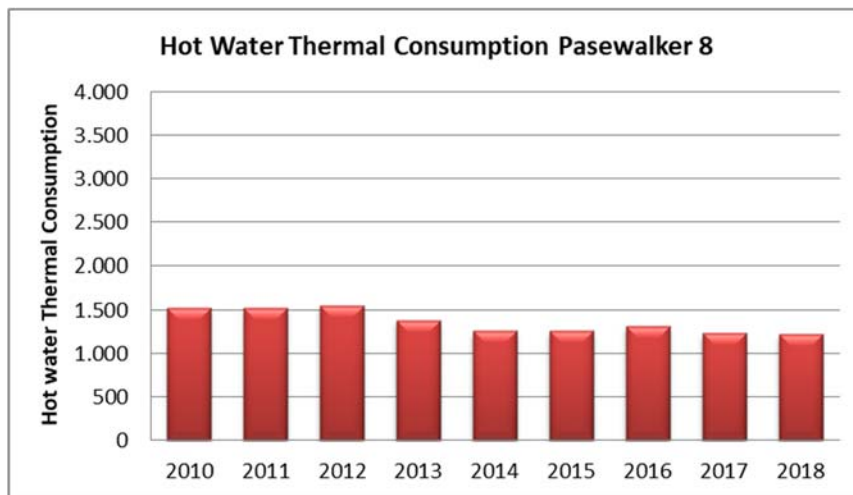


Figure 24: Hot water Thermal Consumption Pasewalker 8 evolution (2010-2018)

The previous graphs show how hot thermal water consumption remains more or less constant over the years.

4.2.3 Communal Electric Consumption

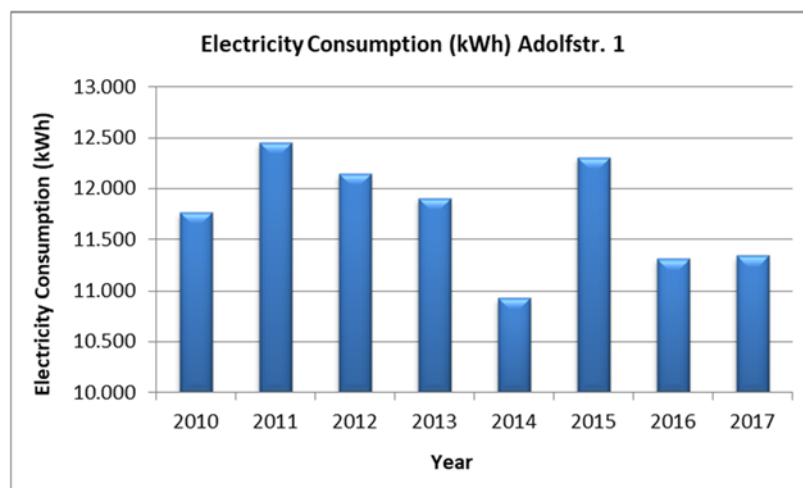


Figure 25: Electricity Consumption Adolfstr.1 evolution (2010-2017)

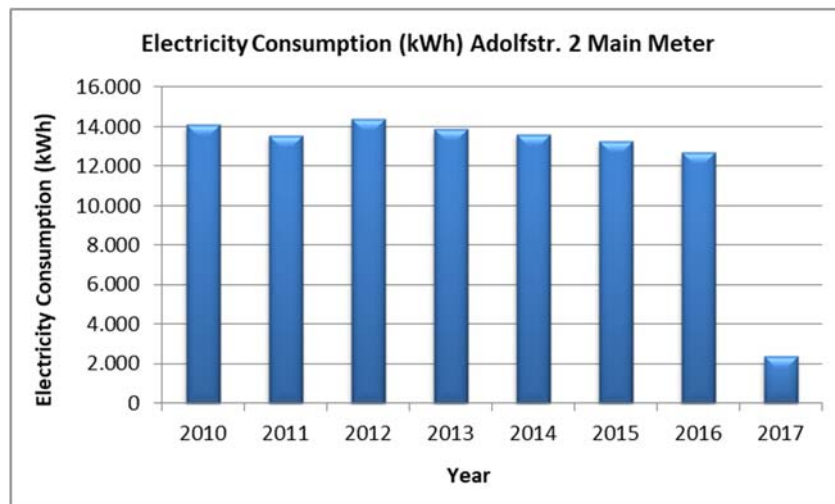


Figure 26: Electricity Consumption Adolfstr.2 Main Meter evolution (2010-2017)

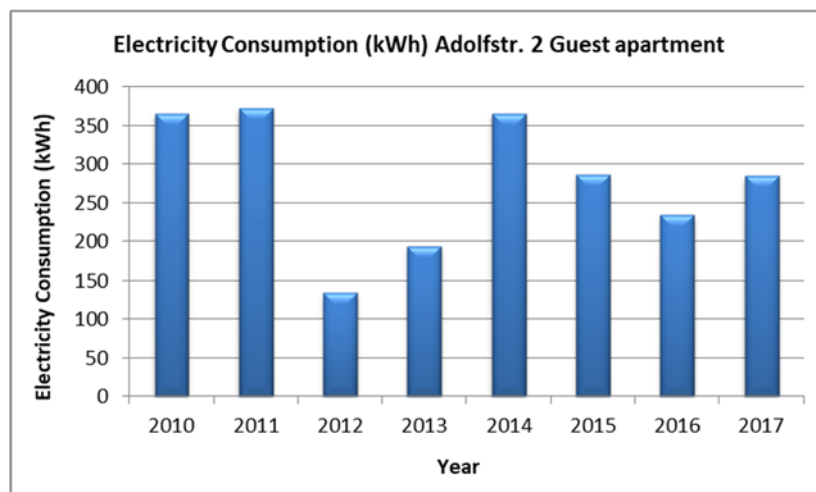


Figure 27: Electricity Consumption Adolfstr.2 Guest apartment evolution (2010-2017)

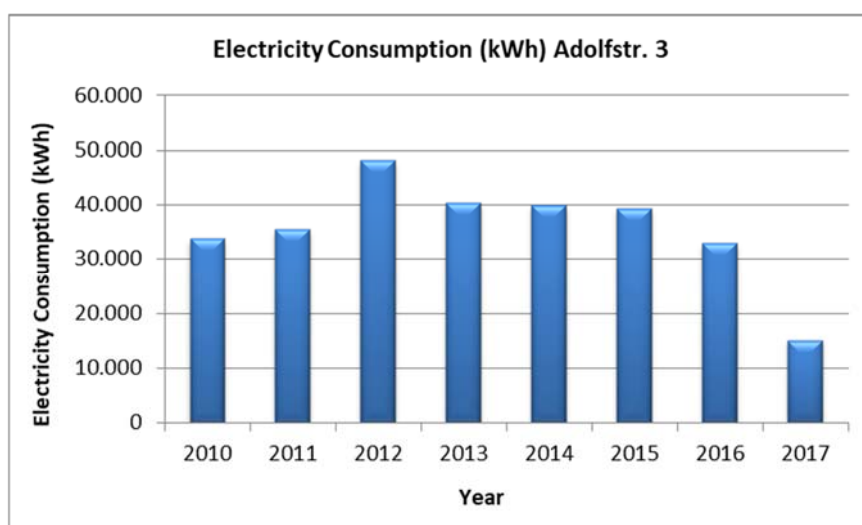


Figure 28: Electricity Consumption Adolfstr.3 evolution (2010-2017)

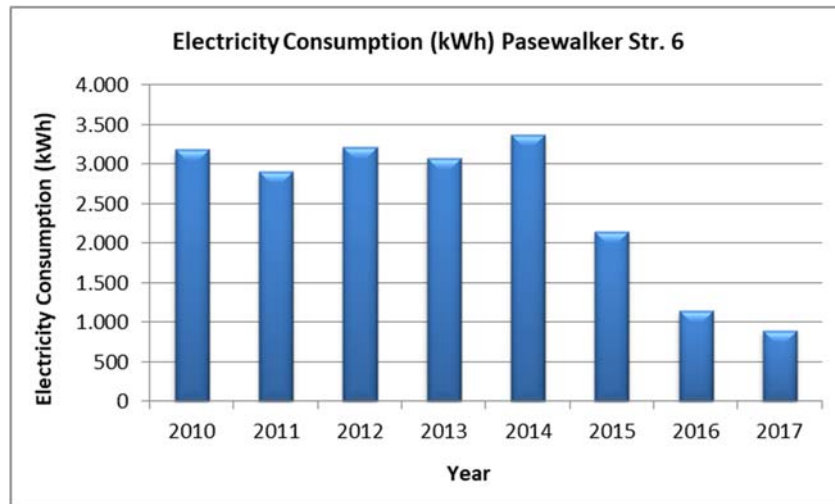


Figure 29: Electricity Consumption Pasewalker Str.6 evolution (2010-2017)

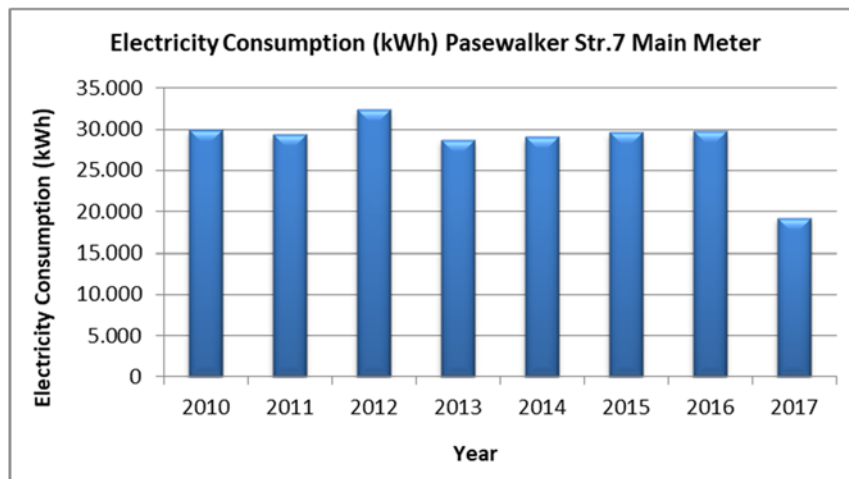


Figure 30: Electricity Consumption Pasewalker Str.7 Main Meter evolution (2010-2017)

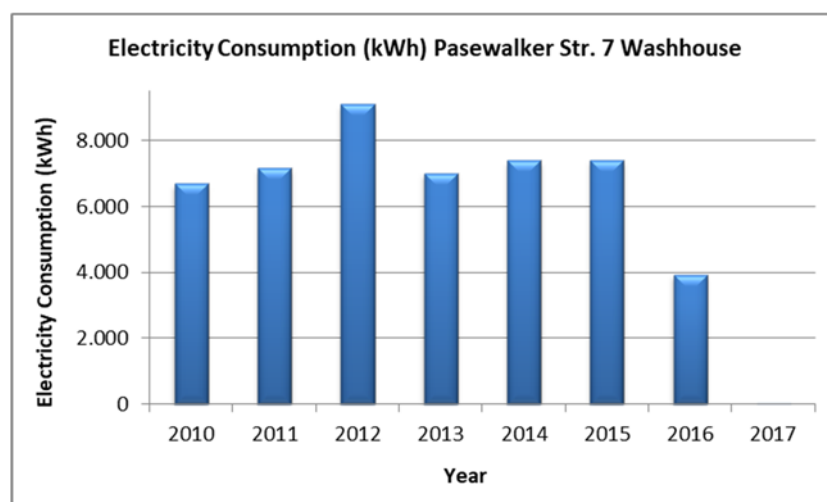


Figure 31: Electricity Consumption Pasewalker Str.7 Washhouse meter evolution (2010-2017)

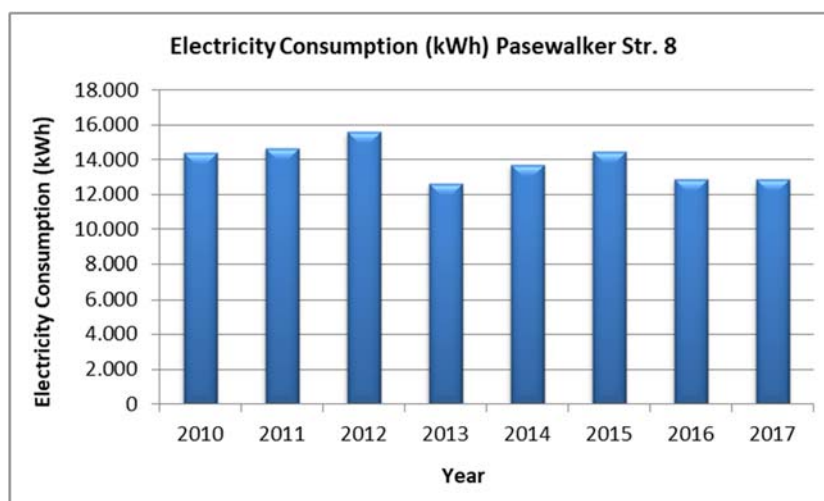


Figure 32: Electricity Consumption Pasewalker Str.8 evolution (2010-2017)

4.3 Baseline Calculation

4.3.1 District Heating System (Heating Thermal Consumption)

Table 62: Reference period for the calculation of the heating system baseline in Pasewalker 7

Baseline period	
Year 2010	Year 2016

Table 63: Data used baseline calculation Heating Pasewalker 7 (HDD 16)

	Thermal Consumption Heating (kWh)	HDD 16	EBL Consumption (kWh)	Desviation
2010	847.363	3.042	836.497	1%
2011	611.009	2.276	622.280	-2%
2012	662.852	2.519	690.226	-4%
2013	708.815	2.612	716.276	-1%
2014	557.236	2.041	556.572	0%
2015	615.498	2.193	599.213	3%
2016	676.383	2.404	658.036	3%

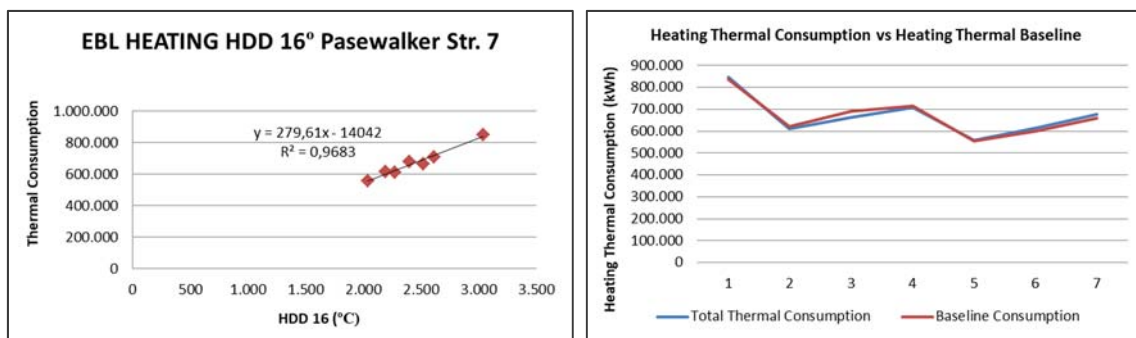


Figure 33: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 16)

Table 64: Data used baseline calculation Heating Pasewalker 7 (HDD 17)

	Thermal Consumption Heating (kWh)	HDD 17	EBL Consumption (kWh)	Desviation
2010	847.363	3325,25	838.980	1%
2011	611.009	2540	620.358	-2%
2012	662.852	2790	689.961	-4%
2013	708.815	2879,66667	714.925	-1%
2014	557.236	2318,25	558.621	0%
2015	615.498	2478,25	603.167	2%
2016	676.383	2657,5	653.072	4%

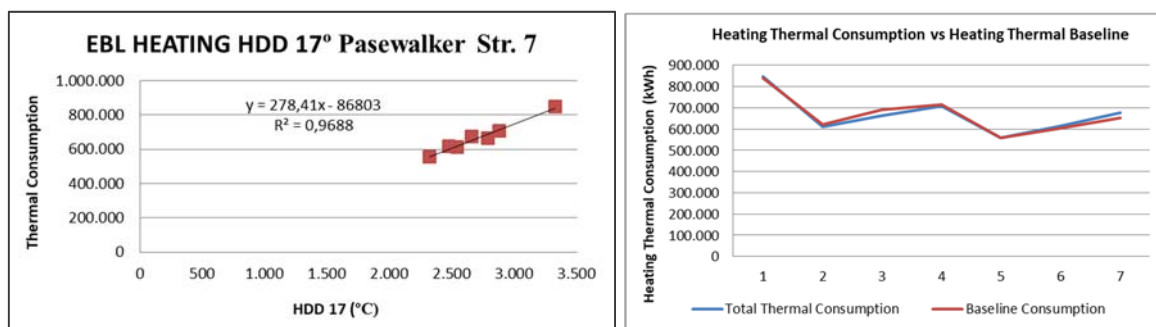


Figure 34: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 17)

Table 65: Data used baseline calculation Heating Pasewalker 7 (HDD 18)

	Thermal Consumption Heating (kWh)	HDD 18	EBL Consumption (kWh)	Desviation
2010	847.363	3.618	839.674	1%
2011	611.009	2.827	619.935	-1%
2012	662.852	3.085	691.585	-4%
2013	708.815	3.165	713.942	-1%
2014	557.236	2.613	560.532	-1%
2015	615.498	2.775	605.500	2%
2016	676.383	2.928	648.040	4%

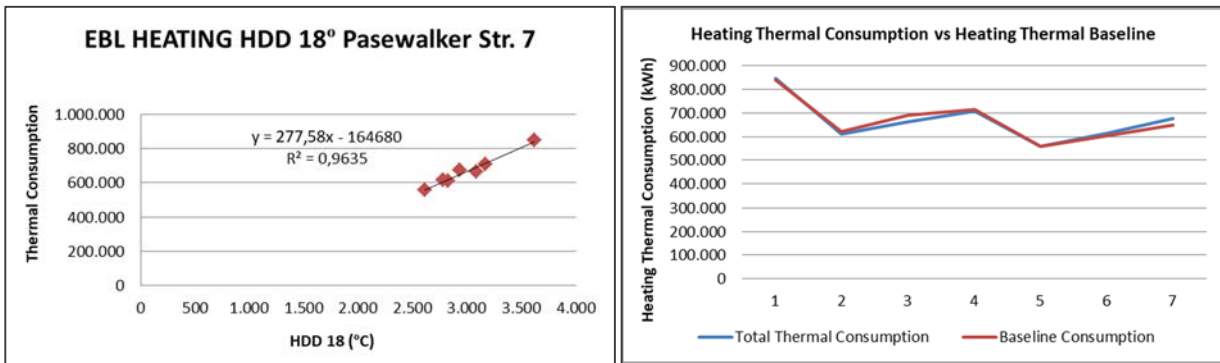


Figure 35: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 18)

Table 66: Data used baseline calculation Heating Pasewalker 7 (HDD 19)

	Thermal Consumption Heating (kWh)	HDD 19	EBL Consumption (kWh)	Desviation
2010	847.363	3.925	838.813	1%
2011	611.009	3.133	620.936	-2%
2012	662.852	3.399	694.158	-5%
2013	708.815	3.470	713.704	-1%
2014	557.236	2.919	561.987	-1%
2015	615.498	3.081	606.595	1%
2016	676.383	3.213	642.879	5%

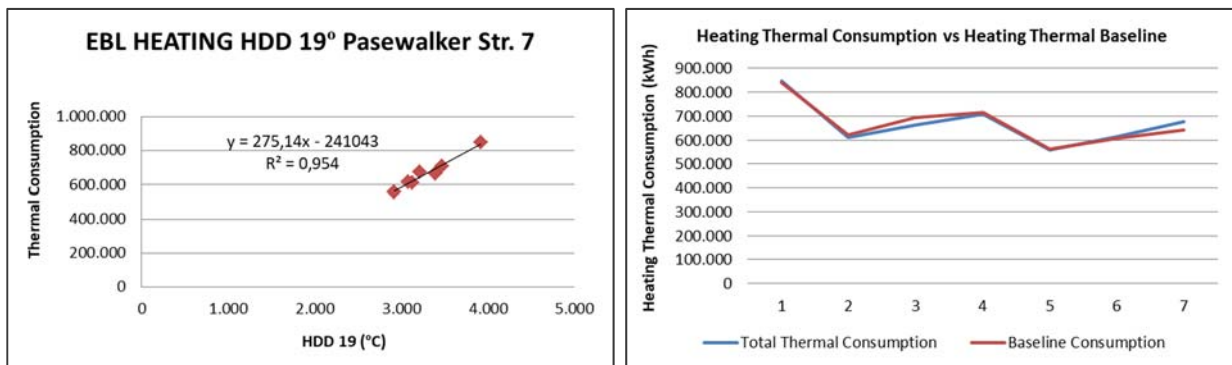


Figure 36: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 19)

Table 67: Data used baseline calculation Heating Pasewalker 7 (HDD 20)

	Thermal Consumption Heating (kWh)	HDD 20	EBL Consumption (kWh)	Desviation
2010	847.363	4.243	837.453	1%
2011	611.009	3.457	623.092	-2%
2012	662.852	3.725	696.205	-5%
2013	708.815	3.789	713.804	-1%
2014	557.236	3.233	562.148	-1%
2015	615.498	3.397	606.902	1%
2016	676.383	3.517	639.555	6%

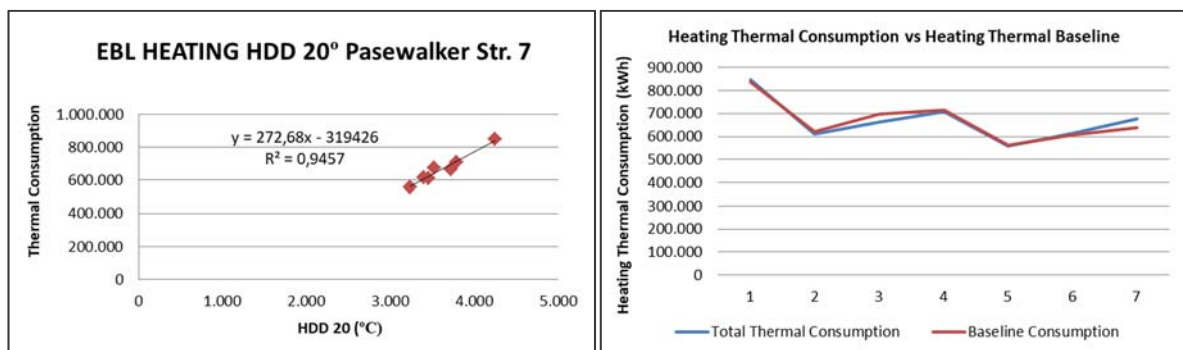


Figure 37: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 7 (HDD 20)

From the analysis of the baseline based on the temperature with which the Degree Days are calculated, it is determined that the calculation of savings is made using Degree Days calculated from a base temperature of 17 ° C. The resulting equation is as follows:

Annual Thermal Consumption Heating (kWh)= 278,41*Annual Heating Degree Days (17°C)—86.803

Table 68: Reference period for the calculation of the heating system baseline in Pasewalker 8

Baseline period	
Year 2010	Year 2016

Table 69: Data used baseline calculation Heating Pasewalker 8 (HDD 16)

	Thermal Consumption Heating (kWh)	HDD 16	EBL Consumption (kWh)	Desviation
2010	470.915	3.042	470.663	0%
2011	360.367	2.276	391.629	-8%
2012	413.907	2.519	416.697	-1%
2013	429.401	2.612	426.308	1%
2014	365.628	2.041	367.387	0%
2015	407.460	2.193	383.119	6%
2016	412.934	2.404	404.821	2%

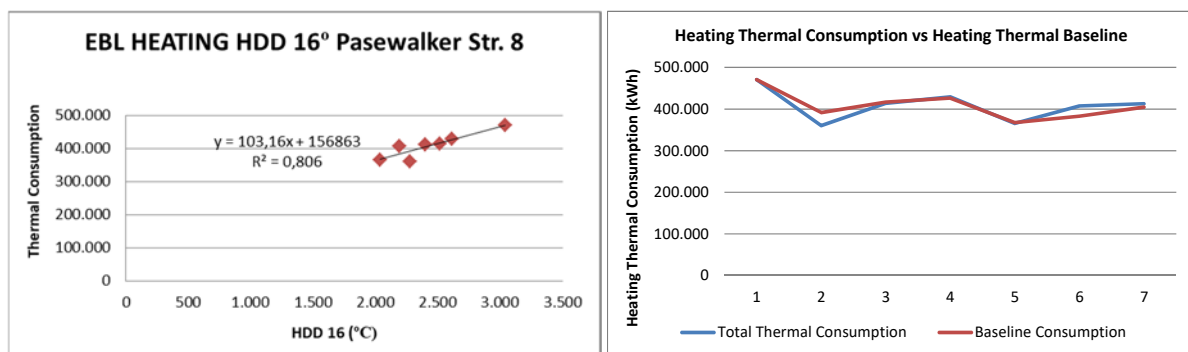


Figure 38: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 16)

Table 70: Data used baseline calculation Heating Pasewalker 8 (HDD 17)

	Thermal Consumption Heating (kWh)	HDD 17	EBL Consumption (kWh)	Desviation
2010	470.915	3325,25	471.905	0%
2011	360.367	2540	390.836	-8%
2012	413.907	2790	416.646	-1%
2013	429.401	2879,66667	425.903	1%
2014	365.628	2318,25	367.942	-1%
2015	407.460	2478,25	384.461	6%
2016	412.934	2657,5	402.966	2%

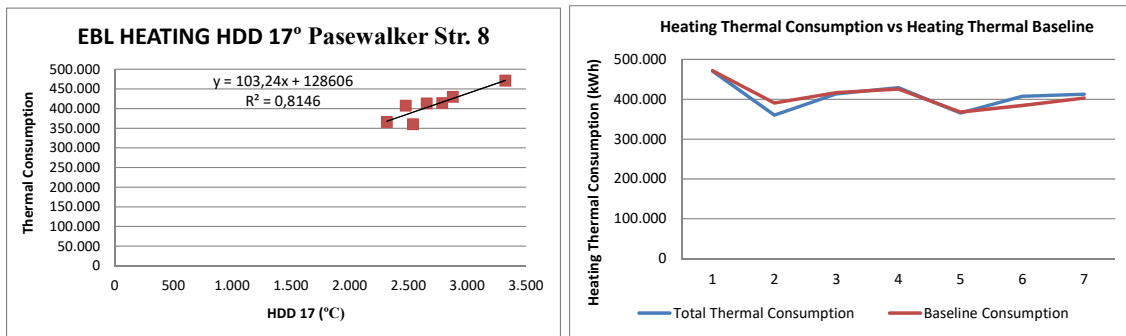


Figure 39: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 17)

Table 71: Data used baseline calculation Heating Pasewalker 8 (HDD 18)

	Thermal Consumption Heating (kWh)	HDD 18	EBL Consumption (kWh)	Desviation
2010	470.915	3.618	472.306	0%
2011	360.367	2.827	390.618	-8%
2012	413.907	3.085	417.254	-1%
2013	429.401	3.165	425.565	1%
2014	365.628	2.613	368.536	-1%
2015	407.460	2.775	385.253	6%
2016	412.934	2.928	401.066	3%

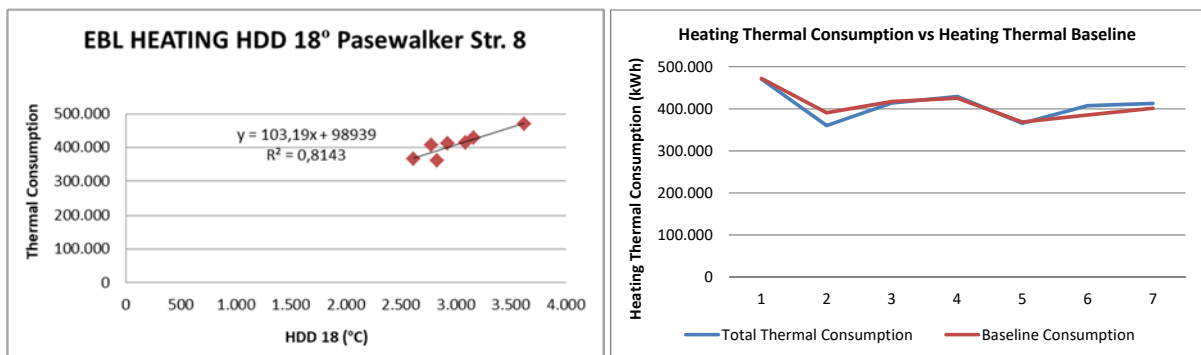


Figure 40: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 18)

Table 72: Data used baseline calculation Heating Pasewalker 8 (HDD 19)

	Thermal Consumption Heating (kWh)	HDD 19	EBL Consumption (kWh)	Desviation
2010	470.915	3.925	471.998	0%
2011	360.367	3.133	390.981	-8%
2012	413.907	3.399	418.209	-1%
2013	429.401	3.470	425.477	1%
2014	365.628	2.919	369.062	-1%
2015	407.460	3.081	385.649	6%
2016	412.934	3.213	399.141	3%

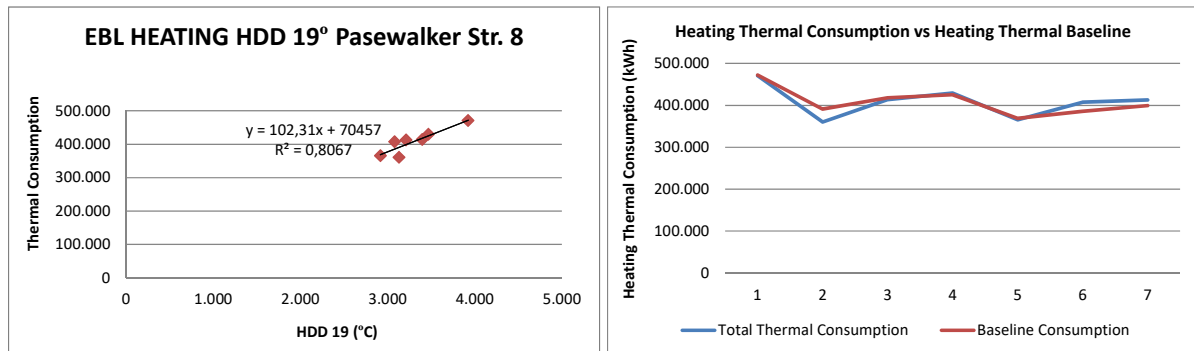


Figure 41: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 19)

Table 73: Data used baseline calculation Heating Pasewalker 8 (HDD 20)

	Thermal Consumption Heating (kWh)	HDD 20	EBL Consumption (kWh)	Desviation
2010	470.915	4.243	471.378	0%
2011	360.367	3.457	391.822	-8%
2012	413.907	3.725	418.956	-1%
2013	429.401	3.789	425.488	1%
2014	365.628	3.233	369.204	-1%
2015	407.460	3.397	385.813	6%
2016	412.934	3.517	397.932	4%

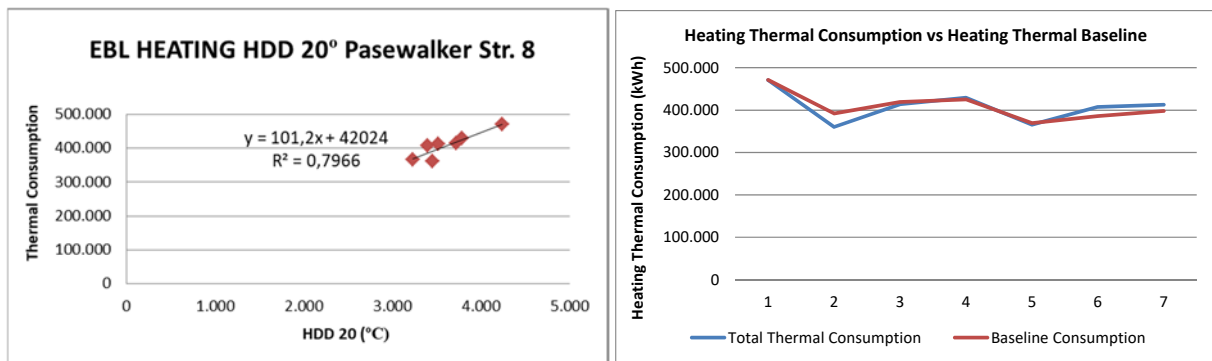


Figure 42: Baseline and heating thermal consumption vs heating thermal baseline for Pasewalker 8 (HDD 20)

From the analysis of the baseline based on the temperature with which the Degree Days are calculated, it is determined that the calculation of savings is made using Degree Days calculated from a base temperature of 17 ° C. The resulting equation is as follows:

$$\text{Annual Thermal Consumption Heating (kWh)} = 103,24 \cdot \text{Annual Heating Degree Days (17°C)} + 128.606$$

4.3.2 District Heating System (Hot Water Thermal Consumption)

As shown in the following graphs of domestic hot water consumption, consumption remains practically constant over the years, so that the consumption cannot be correlated with any variable. In this case, an average of the last three years available has been taken as a reference to calculate savings. This consumption will be compared with that obtained through the measurements of the thermal analysis (From the thermal measurement equipment installed in the district heating). .

The estimated savings are not absolute real savings since static factors such as the number of users are not taken into account. That is, it may be that the consumption of domestic hot water has remained constant over the years because the number of users has been maintained, but if in 2019 the consumption decreases, it may be due to the result of the reforms or a decrease in the number of users. It would be necessary to know the number of users to obtain more representative savings.

The information available regarding the occupancy of the buildings is the number of unoccupied homes, but not the number of users. There is only data of the rental contract partner, but not of other people who live there (for example, children).

Table 74: Number of unoccupied dwellings

Year	Number of unoccupied dwellings
2010-12-31	3
2011-12-31	1
2012-12-31	3
2013-12-31	1
2014-12-31	0
2015-12-31	2
2016-12-31	1
2017-12-31	8

To calculate the real savings, it would be necessary to know the number of users of each building per year, from 2010 to 2016, which is not available.

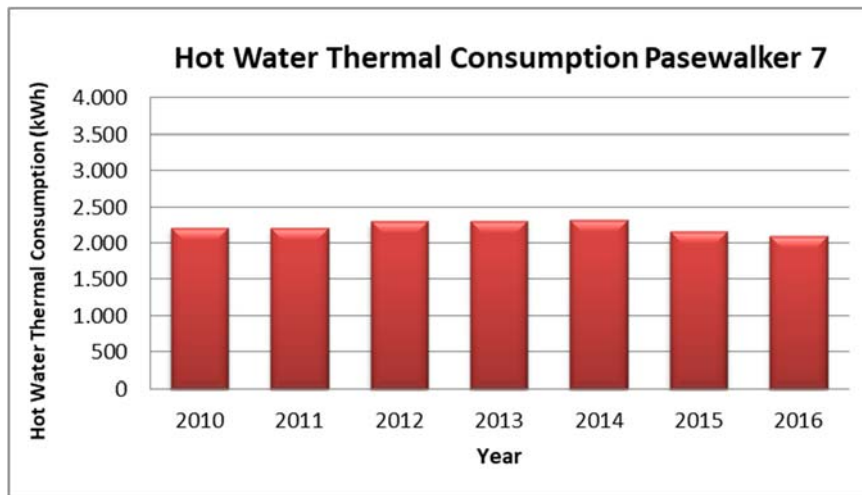


Figure 43: Hot water Thermal Consumption Pasewalker 7 evolution (2010-2016)

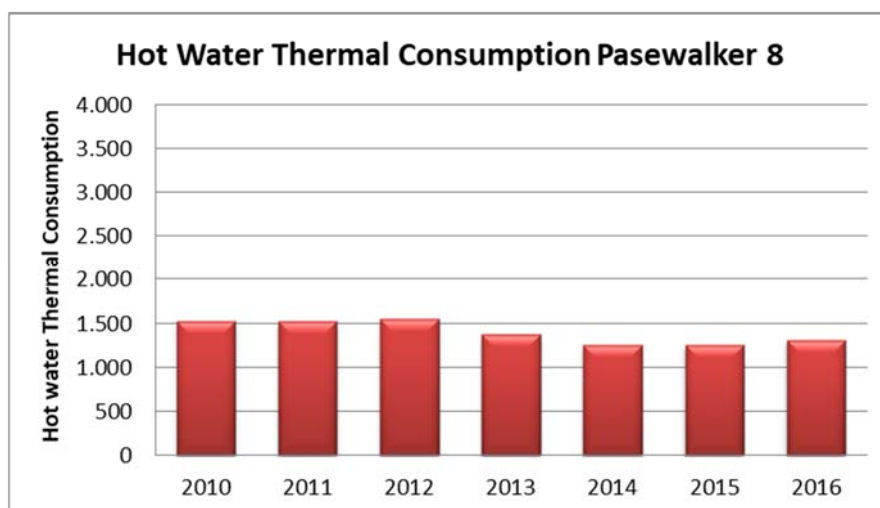


Figure 44: Hot water Thermal Consumption Pasewalker 8 evolution (2010-2016)

4.3.3 Communal Electric Consumption

The data available for the calculation of the baseline are annual consumption values. The analyzed electricity consumption includes the common areas of the buildings, basically it is the consumption derived from the lighting system. This variable depends on the number of tenants and the frequency with which they pass through the common areas, as this information is not available, the baseline calculation cannot be performed. The latest available data on electricity consumption in each of the buildings will be used as a reference for the calculation of electricity savings.

4.4 Savings Calculation

4.4.1 District Heating System (Heating Thermal Consumption)

To calculate the thermal savings in heating, a baseline has been established with the consumption provided by 1892 (from 2010 to 2016) as a dependent variable. As an independent variable that affects consumption, the annual heating day grades from 2010 to 2016 have been used.

Table 75: Thermal Consumption Heating Pasewalker 7 (HDD 17) savings calculation

PASEWALKER 7 SAVINGS CALCULATION					
	Thermal Consumption Heating (kWh)	HDD 17	Adjusted baseline consumption (kWh)	Thermal Consumption Heating (kWh) Saving	Percentage of energy savings
2019	525.499	2.589	634.000	108.501	17%

Table 76: Thermal Consumption Heating Pasewalker 8 (HDD 17) savings calculation

PASEWALKER 8 SAVINGS CALCULATION					
	Thermal Consumption Heating (kWh)	HDD 17	Adjusted baseline consumption (kWh)	Thermal Consumption Heating (kWh) Saving	Percentage of energy savings
2019	228.805	2589	395.894	167.089	42%

4.4.2 District Heating System (Hot Water Thermal Consumption)

The following table shows the thermal savings of domestic hot water. It cannot be guaranteed that they are real savings since with the available data it has not been possible to establish a baseline of energy behaviour. Savings have been calculated by comparing the consumption of 2019 with the reference consumption (year 2016).

The static factor that affects the consumption of domestic hot water is the level of occupation or number of users. To calculate the real savings, it would be necessary to know the occupancy of each building per year from 2010 to 2016. This data is not available.

Table 77: Hot water Thermal Consumption Pasewalker 6 and 7 savings calculation

Hot Water Thermal Pasewalker 6 y 7	
Annual hot water thermal consumption Pasewalker 8 reporting period (m ³)	2.546
Reference hot water thermal consumption 2016 (m ³)	2.102
Savings calculation (m ³)	-444
Savings calculation (%)	-21%

Table 78: Hot water Thermal Consumption Pasewalker 8 savings calculation

Hot Water Thermal Pasewalker 8	
Annual hot water thermal consumption Pasewalker 8 reporting period (m ³)	683
Reference hot water thermal consumption 2016 (m ³)	1.311
Savings calculation (m ³)	628
Savings calculation (%)	48%

4.4.3 Communal Electric Consumption

Only three months of measurement are available, as mentioned above, the consumption reference values that are available are annual, so it is necessary to extrapolate the measure to one year. It has been proven that consumption remains constant throughout the months, so it is possible to extrapolate the consumption to a year in this simple way.

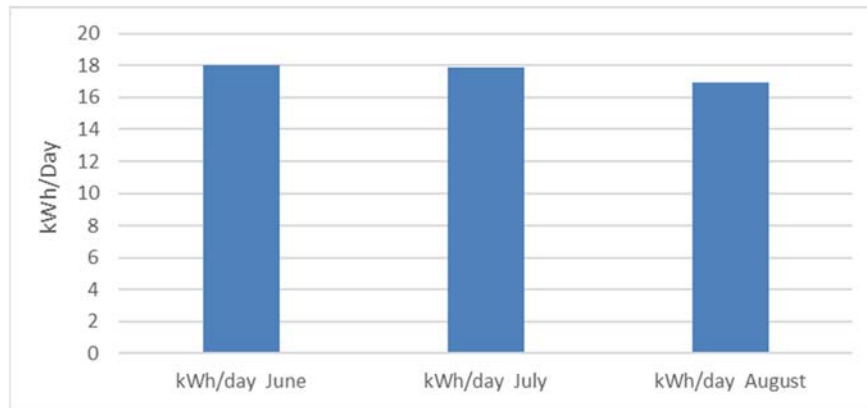


Figure 45: kWh / day obtained in each of the measurement months in Adolfstr.3

Table 79: Electric Consumption Adolfstrase 3 savings calculation

Adolfstase 3	
Annual electric consumption Adolfstase 3 reporting period (kWh)	6.423
Reference electric consumption 2016 (kWh)	32.862
Savings calculation (kWh)	26.439
Savings calculation (%)	80%

Table 80: Electric Consumption Adolfstrase 2 savings calculation

Adolfstase 2	
Annual electric consumption reporting period (kWh)	6.744
Reference electric consumption 2016 (kWh)	12.687
Savings calculation (kWh)	5.943
Savings calculation (%)	47%

Table 81: Electric Consumption Pasewalker Str 7 (Main Meter) savings calculation

	Pasewalker Str 7 Main Meter
Annual electric consumption reporting period (kWh)	9.254
Reference electric consumption 2016 (kWh)	29.733
Savings calculation (kWh)	20.479
Savings calculation (%)	69%

Table 82: Electric Consumption Pasewalker Str 7 (Meeting Room Meter) savings calculation

	Meeting Room Meter Pasewalker Str 7
Annual electric consumption reporting period (kWh)	3.241
Reference electric consumption 2016 (kWh)	3.937
Savings calculation (kWh)	696
Savings calculation (%)	18%

The electricity consumption data monitored in the Pasewalker 8 building, were downloaded on site on September 3, 2019. Therefore, the demonstrative saving period of this building includes the months of June, July, August and two days of September.

Table 83: Electricity Consumption Pasewalker Str 8 (Main Meter) savings calculation

	Pasewalker Str 8 Main Meter
Annual electric consumption reporting period (kWh)	6.624
Reference electric consumption 2016 (kWh)	12.894
Savings calculation (kWh)	6.270
Savings calculation (%)	49%

In the case of the Adolfstrasse 1 building, data are only available from September 4, the day on which the transformers were connected to the main switch lines.

Table 84: Electric Consumption Adolfstrasse 1 (Main Meter) savings calculation

	Adolfstrasse 1 Main Meter
Annual electric consumption reporting period (kWh)	5.256
Reference electric consumption 2016 (kWh)	11.313
Savings calculation (kWh)	6.057
Savings calculation (%)	54%

To calculate the savings, we must also take into account photovoltaic generation. In Berlin there are 4 photovoltaic installations with different set-ups: 2 impact on the common areas of 2 buildings and the extra PV energy is sent to the grid; another affects the common areas of the building but before it is stored in a battery, if there were extra PV energy it would also go to the grid; and the last one affects the common areas, the extra PV energy is shared among the tenants who want this service, and if there is still more, the extra PV energy is sent to the grid.

These installations have been operational since 05 June 2019. During the last installation in June, SinCeO2 decided not to measure the PV generation because due to the current disposition of the general meters (common areas of each building) and the photovoltaic meters, technical difficulties were observed to be able to measure the photovoltaic generation with our own meters. Solarimo told us that we could connect directly to the generation cable that arrives at the photovoltaic counter, but 1892 did not want us to make the connection out of the electric panel. For this reason, it was determined that Solarimo gives us access to its platform in order to obtain the photovoltaic generation data in the 4 buildings.

The platform is not yet functional. Solarimo must change the communication unit for the photovoltaic system. Therefore, photovoltaic production has been estimated.

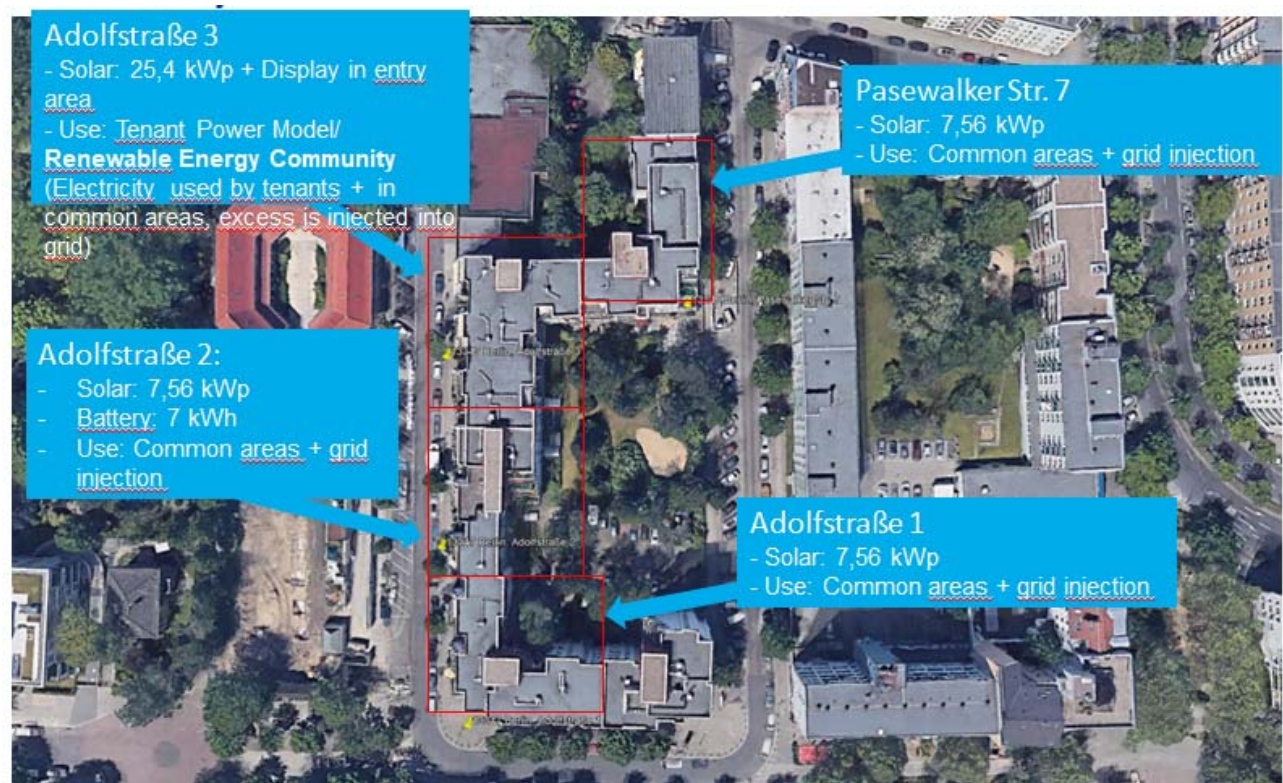


Figure 46: 4 separate PV systems are built, including one Renewable Energy Community

The photovoltaic installation of the buildings of Adolftrase 1, 2 and Pasewalker 7, has the same technical characteristics, from which a photovoltaic generation of 7.780 kWh / year has been estimated.

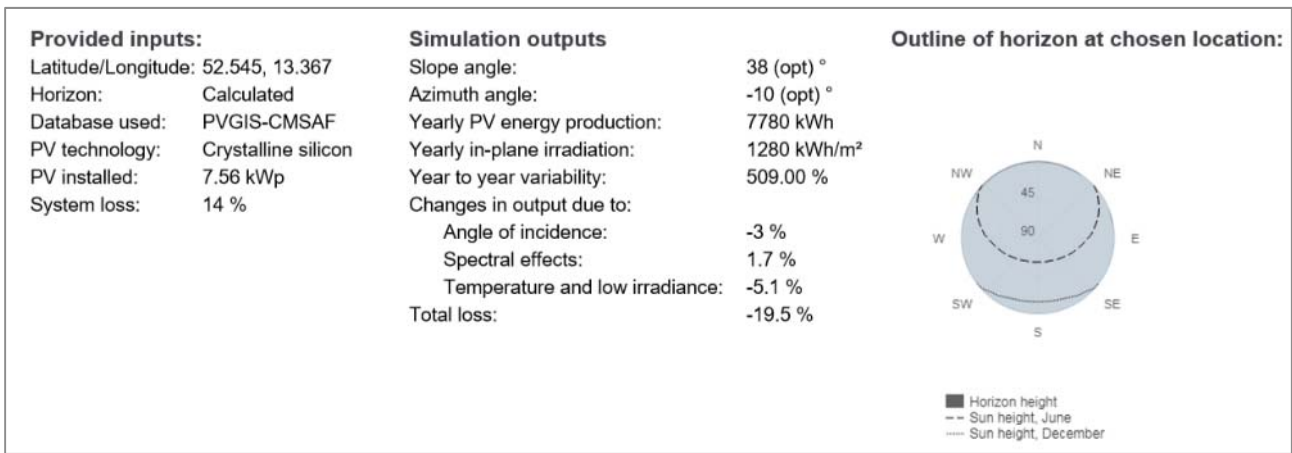


Figure 47: PV System estimates of solar electricity generation (Adolftrase 1, 2 and Pasewalker 7)

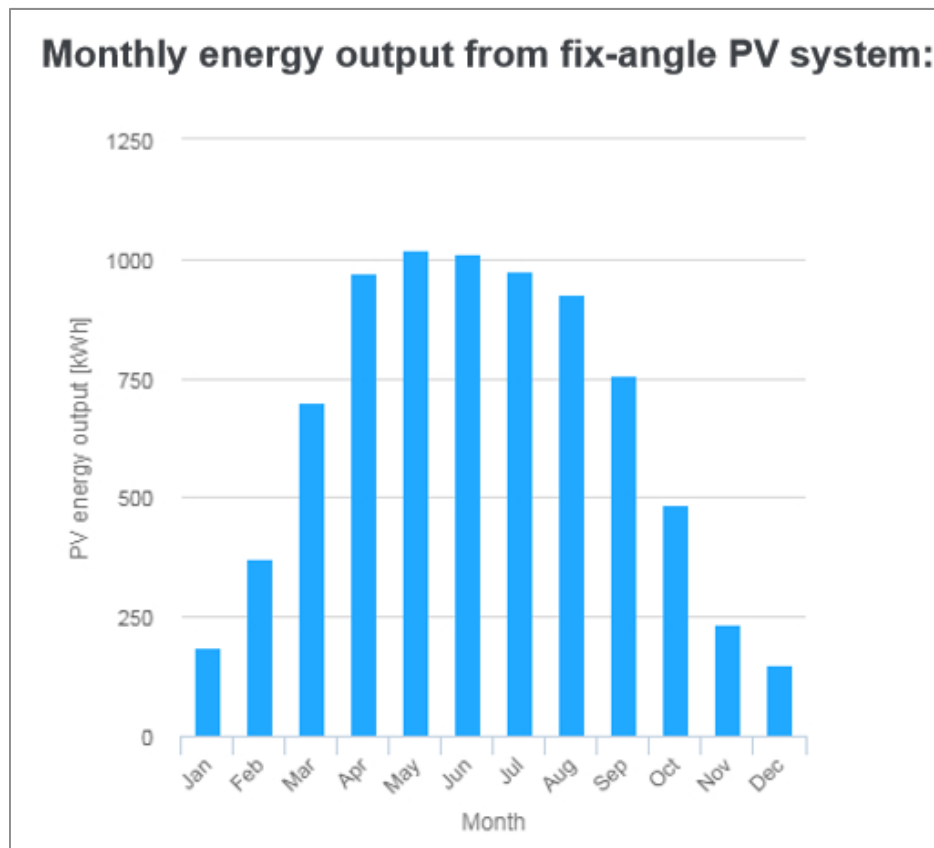


Figure 48: Monthly energy output from fix-angle PV system (Adolftrase 1, 2 and Pasewalker 7)

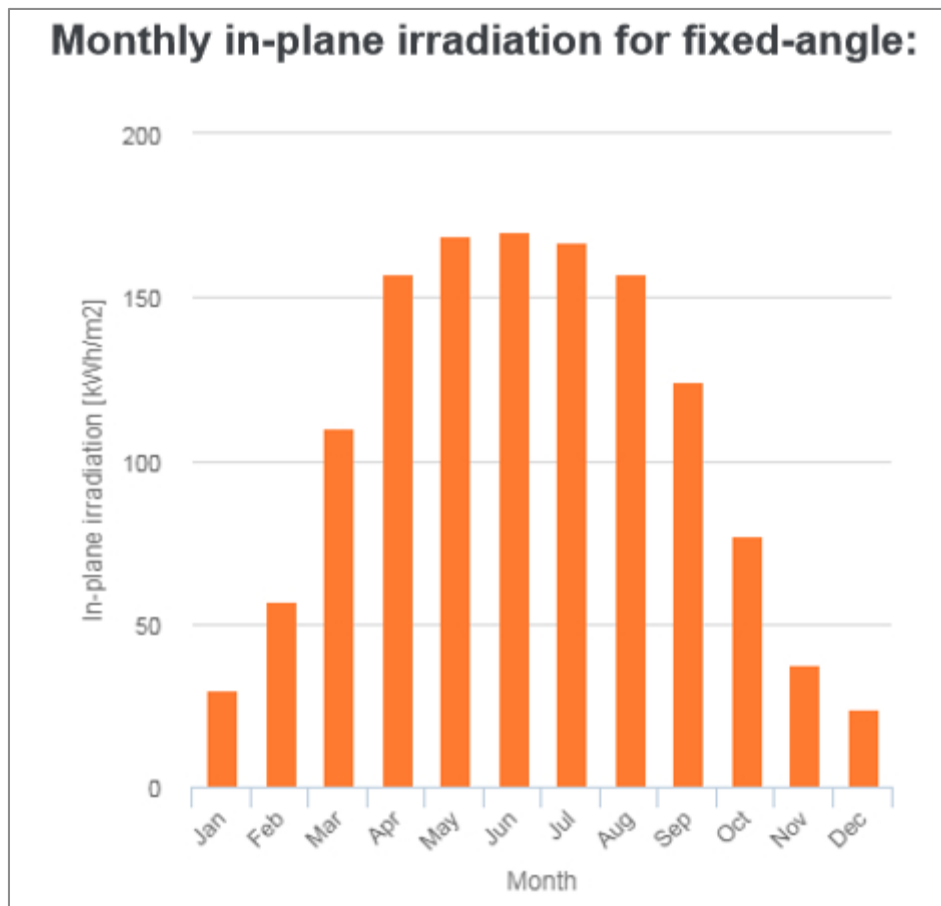


Figure 49: Monthly in-plane irradiation for fixed-angle(Adolfstrase 1, 2 and Pasewalker 7)

The production of the photovoltaic installation of the Adolfstrase 3 building, which has different technical characteristics from the rest of the buildings, has been estimated at 26.100 kWh / year.

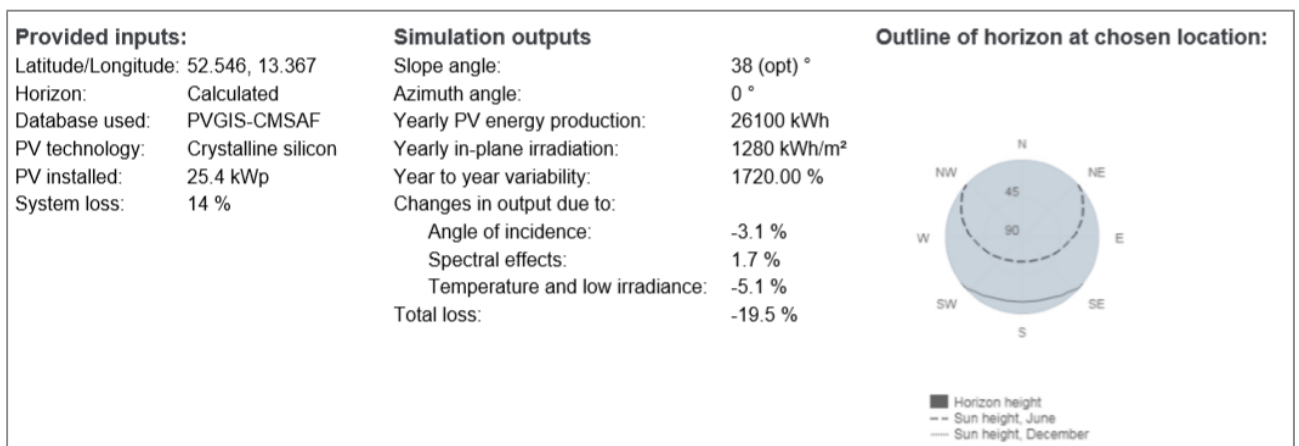


Figure 50: PV System estimates of solar electricity generation (Adolfstrase 3)

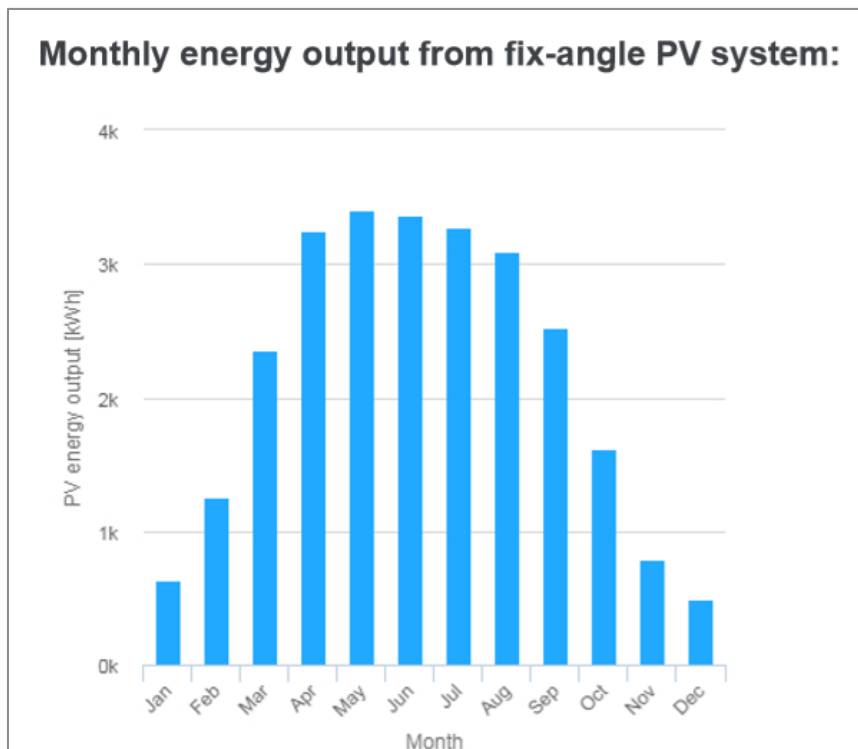


Figure 51: Monthly energy output from fix-angle PV system (Adolftrase 3)

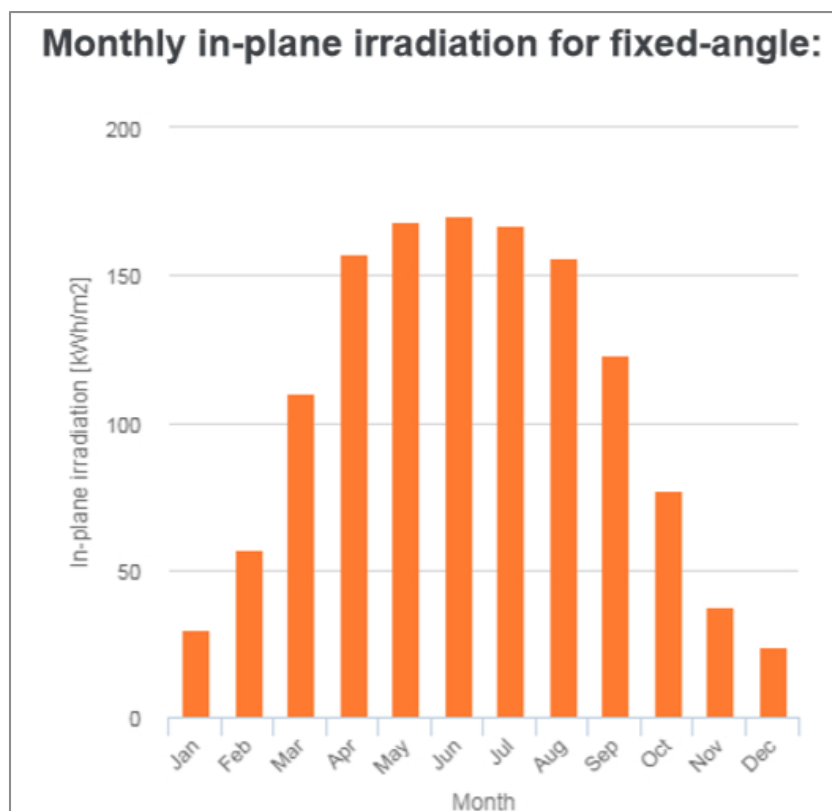


Figure 52: Monthly in-plane irradiation for fixed-angle (Adolftrase 3)

4.5 ECONOMIC SAVINGS

As a price to calculate the economic savings, 21,042 Cent / kWh net was used, data provided by 1892. This is the electricity bill of one meter in the Nettelbeckplatz in 2018. The electricity rate is the same for all meters. The price is always the same regardless of time or consumption.

A price of 6.13 euros / m³ has been estimated to calculate the economic savings of domestic hot water consumption. It has been established from the data provided by 1892 (excel with all consumptions from 2009 to 2016), dividing the cost of consumption in 2016 by the consumption of domestic hot water (m³). To calculate the economic savings of the heating system, a price of 0.08 euros / kWh has been estimated, in the same way as for the thermal price of domestic hot water.

Table 85: Economic savings Berlin pilot

Typology (*)	Measured electric power	Reference electric consumption (kWh)	Annual electric consumption reporting period (kWh)	Electric savings or avoided energy consumption (kWh)	Electric savings (%)	Economic savings (€)	Measured thermal power	Reference thermal consumption	Annual thermal consumption reporting period	Thermal savings or avoided energy consumption	Thermal savings (%)	Economic savings (€)
PWS7	AR1-PWS7-Main Meter	29.733	9.254	20.479	69%	4.309,09 €	Heating Thermal Consumption (kWh)	634.000	525.499	108.501	17%	8.245,88 €
	AR2-PWS7-Meeting Room	3.937	3.241	696	18%	146,42 €	Domestic Hot Water (PSW 6 and 7) (m ³)	2.102	2.546	-444	-21%	- 2.724,12 €
ADS3	AR1-ADS3-Main Meter	32.862	6.423	26.439	80%	5.563,30 €						
ADS2	AR1-ADS2-Main Meter	12.687	6.744	5.943	47%	1.250,52 €						
ADS 1	AR1-ADS1-Main Meter	11.313	5.256	6.057	54%	1.274,47 €						
PWS8	AR1-PWS8-Main Meter	12.894	6.624	6.270	49%	1.319,31 €	Heating Thermal Consumption (kWh)	395.894	228.805	167.089	42%	12.698,44 €
						- €	Domestic Hot Water (m3)	1.311	683	628	48%	3.849,98 €

*In the calculation of savings the photovoltaic generation is not included

4.6 ENERGY SAVINGS CALCULATION CONCLUSIONS

Significant savings in electricity supply are obtained, (in one case, up to 80% savings). This is because the savings are calculated in the common areas of the buildings, where all the lighting has been changed to LEDs and elevators. That is, the energy efficiency improvements made in the Berlin pilot directly affect the consumption that has been measured.

It is important to note that in the case of electricity consumption and domestic hot water consumption, the calculated energy saving should not be considered as a real saving.

As previously mentioned, there is no annual information (from 2010 to 2016) of variables that affect these consumptions, such as the number of inhabitants. So it was not possible to calculate a baseline. The savings have been calculated based on the reference consumption (electricity consumption and domestic hot water in 2016).

With the reforms that have been carried out on the district heating has achieved a thermal saving in heating of 17% and 42% in Pasewalker 7 and Pasewalker 8, respectively.

5 GENERAL CONCLUSIONS

5.1 MONITORING INSTALLATION

The conclusions drawn from the installation carried out in the three pilots of the DREEAM project are:

- Field visits are absolutely necessary to have a complete understanding of buildings and tenants.
- Key success factor for implementing a monitoring kit:
 - Well-prepared information for tenants
 - Involvement of building manager
 - Collaboration with local electrician for the installation of the equipment
 - Tenant engagement
- In anticipation of possible failures in the communication due to the lack of 3G coverage in a location, as has happened in Padiham and Berlin, the following actions must be carried out:
 - Configure the communications router with a 'reconnect' option automatically every time they lose the connection. This way it won't be necessary to ask the BO to restart the monitoring equipment manually.
 - Provide enough internal memory into the equipment to not lose data during periods of lack of communication.
- To avoid possible damage to installed monitoring equipment, it is recommended to carry out the installation always one year before the renovations, or if this can be possible, once all the

renovations work are finished. And always the BOs should inform the contracted companies for the renovations that the equipment should not touch.

- The process of installation has been discussed and designed by Savills & SinCeO2 in a real empathetic and human centred approach. The conclusion is that with the right approach and comprehensive interactions with tenants, tenants are willing to participate in such procedures as the installation of monitoring equipment.
- If well explained by the experts, tenants understand very well why the data monitoring is so important for the quality of the methodology to estimate the efficiency of the technical interventions during renovations. Some tenants are experts themselves and are very interested to receive the results of both the energy consumption monitoring and the energy efficiency assessment.

5.2 BASELINE CALCULATION AND ENERGY SAVINGS.

Regarding the calculation of energy savings, during this project it has been considered:

- To obtain a baseline that is as close to reality as possible, must have as much data as possible, which is why we monitor and not only perform the calculation based on the bills.
- To minimize errors in the calculation of savings, we have to make sure that the measured data is correct. For this we ask for the corresponding bills for the same period. This also helps us to complete the lack of data.
- If a test group is selected to measure energy taking into account the occupancy level of dwellings, it is important that the number of tenants is not altered in that test group during the whole project. If it altered, notify it as soon as possible to be able to take it into account in the calculation of the baselines.
- Try to collect the greatest number of changes in the factors that can affect the consumption of a dwelling in the qualitative interviews after the renovations to make the corresponding adjustments in the calculated savings.
- Help solve possible incidents in the monitoring of comfort conditions of dwellings, as these data will also help us make adjustments in the calculated savings.
- In order to calculate the energy savings of the dwellings, a non-routine type adjustment (IPMVP methodology) should be included in the baseline equation. This type of adjustment is due to parameters that influence energy and are not expected to change over time: size of the installation, design and operation of existing equipment, number of work shifts or type of occupants. The possible changes experienced by these static variables have to be monitored throughout the demonstration period of savings.
- The number of occupants and the floor areas of the dwellings are factors that affect their energy consumption. Factors such as the consumption habits of each tenant and their awareness of the use of resources also have an influence.

5.3 RESULTS OF SAVINGS OBTAINED

In the Treviso pilot the following results have been obtained:

Table 86: Economic gas and electricity savings in Treviso

TOWER A TREVISO			Electricity (kWh)	%	Gas (kWh)	%
REPORTING PERIOD	may-19	June 2019				
ADJUSTED BASELINE ENERGY (kWh)			9.814	39%	15.373	61%
REPORTING PERIOD MEASURED ENERGY (kWh)			9.155	48%	9.733	52%
SAVINGS OR AVOIDED ENERGY CONSUMPTION (kWh)			659		5.640	
ECONOMIC SAVINGS (€)			142,37 €		535,79 €	
TOTAL ELECTRIC SAVING (%)			7%		37%	
TOWER B TREVISO			Electricity (kWh)	%	Gas (kWh)	%
REPORTING PERIOD	November 2018	June 2019				
ADJUSTED BASELINE ENERGY (kWh)			22.491	11%	178.321	89%
REPORTING PERIOD MEASURED ENERGY (kWh)			21.413	19%	90.815	81%
SAVINGS OR AVOIDED ENERGY CONSUMPTION (kWh)			1.079		87.506	
ECONOMIC SAVINGS (€)			232,96 €		8.313,05 €	
TOTAL ELECTRIC SAVING (%)			5%		49%	

- A saving of the electricity consumption of 7% and a saving in the consumption of gas of 37% has been obtained in the dwellings in tower A.
- A saving of the electricity consumption of 5% and a saving in the consumption of gas of 49% had been obtained in the dwellings in tower B.
- It is important to note that in Tower A a sufficient demonstration period has not been used due to lack of data. Only the months of May, June and July of 2019 have been used since the renovations ended in the month of April 2019. According to the International Performance Measurement and Verification Protocol (IPMVP), the demonstration period must cover at least one normal operating cycle of the installation or of the equipment, to achieve a complete characterization of the effectiveness of savings in all normal operating conditions. In the case of Tower B, there is a broader demonstration period that allows characterizing the behaviour of household consumption. The demonstration time used goes from November 1, 2018 to July 31, covering winter and summer months.
- In homes where savings are not achieved and there is an overconsumption, it may be due to the so-called "rebound effect" or because they have such low consumption compared to other homes, that any change in the activity of the tenants can mean An important consumption.
- The percentage differences between the electricity and gas savings obtained in both towers are due to the fact that the renovations undertaken have a lower impact on the electricity consumption of the buildings. The generation of the photovoltaic system has an effect on the electricity savings of the common areas, but today, it is not in operation.

- In the case of electricity baselines, there is a calculation error due to regression calculations ranging from 0.11% to 9% of the adjusted reference consumption, so that the savings are within the uncertainty range. The error of saving calculations is that of the regression calculation performed to obtain each baseline. As an approximate reference, the R^2 value of each baseline calculation has been used.
- In the case of natural gas savings, they are within a range of uncertainty ranging from 0.1% to 10%, of the adjusted reference consumption. The value of R^2 has been used to calculate this error.

In the Padiham pilot the following results have been obtained:

- The monitored dwellings in Padiham, show a saving in electricity consumption between 14% and 51%, except in dwelling D5 where there was an increase in consumption of 14%.
- The electricity over-consumption of dwelling D5 may be due to the so-called "rebound effect". The rebound effect occurs when an increase in energy efficiency does not translate into the expected energy savings because there is a reduction in the cost of the energy service affected, which ends up resulting in a greater demand for it, compensating for all or part of the savings derived from greater efficiency
- In the case of D1 there is an important overconsumption, but it has been verified that the interior conditions of use of the house have been modified, with an increase in the interior temperature. To this end, the monitored indoor temperature of dwelling 1 during the month of January 2017 (before the renovations) and the indoor temperature during the month of January 2019 (after the improvements) have been compared.
- It is important to note that in dwellings D5, D6 and D9 a sufficient demonstration period has not been used due to lack of data. Only the months between November 2018 and February 2019 have been used. According to the IPMVP protocol, the demonstration period must cover at least one normal operating cycle of the installation or equipment, to achieve a complete characterization of the effectiveness of the savings in all normal operating conditions. In the rest of the dwellings, there is a broader demonstration period that allows characterizing the behaviour of household consumption. The demonstration time used ran from November 1, 2018 to July 31, covering winter and summer months.
- In the case of electricity baselines, there is a calculation error due to regression calculations ranging from 0.01% to 4% of the adjusted reference consumption, so that the savings are within the uncertainty range. The error of saving calculations is that of the regression calculation performed to obtain each baseline. As an approximate reference, the R^2 value of each baseline calculation has been used.
- In the case of natural gas savings, they are within a range of uncertainty ranging from 0,5% to 9%, of the adjusted reference consumption. The value of R^2 has been used to calculate this error.

Table 87: Economic gas and electricity savings in Padiham

		ELECTRIC							GAS					
DWELLING	Supplies	Period	Adjusted Electric Baseline Energy (kWh)	Reporting period measured electric energy (kWh)	Electric savings or avoided energy consumption (kWh)	PV production	Electric savings (%)	Electrical Economic savings (€)	Period	Adjusted Gas Baseline Energy (kWh)	Reporting period measured Gas energy (kWh)	Gas savings or avoided energy consumption (kWh)	Gas (%)	Economic gas savings (€)
D1	Electric and gas	nov 18 - jul 19	886,0	1.277,8	-391,8	517,7	14%	25,42 €	nov 18 - apr 19	10.451,5	16.117,6	-5.666,1	-54%	- 294,64 €
D2	Electric	nov 18 - jul 19	10.253,2	6.570,4	3.682,7	517,7	41%	848,48 €		-	-	-		-
D3	Electric	nov 18 - jul 19	11.506,7	9.036,2	2.470,6	517,7	26%	603,63 €		-	-	-		-
D4	Electric	nov 18 - jul 19	9.058,8	4.949,9	4.108,9	517,7	51%	934,57 €		-	-	-		-
D5	Electric and gas	nov 18 - mar 19	612,1	798,1	-186,0	102,8	-14%	- 16,81 €	nov 18 - apr 19	4.854,6	3.239,5	1.615,1	33%	83,99 €
D6	Electric	nov 18 - feb 19	4.577,8	2.767,6	1.810,3	50,0	41%	375,77 €		-	-	-		-
D8	Electric	dec 18 - jul 19	10.555,5	5.976,1	4.579,4	504,6	48%	1.026,97 €		-	-	-		-
D9	Electric	nov 18 - feb 19	3.195,8	2.799,4	396,4	50,0	14%	90,16 €		-	-	-		-

In the Berlin pilot the following results have been obtained:

Table 88: Summary energy and economic savings in Berlin

Typology (*)	Measured electric power	Reference electric consumption (kWh)	Annual electric consumption reporting period (kWh)	Electric savings or avoided energy consumption (kWh)	Electric savings (%)	Economic savings (€)	Measured thermal power	Reference thermal consumption	Annual thermal consumption reporting period	Thermal savings or avoided energy consumption	Thermal savings (%)	Economic savings (€)
PWS7	AR1-PWS7-Main Meter	29.733	9.254	20.479	69%	4.309,09 €	Heating Thermal Consumption (kWh)	634.000	525.499	108.501	17%	8.245,88 €
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						- €	Domestic Hot Water (m3)	1.311	683	628	48%	3.849,98 €

*In the calculation of savings the photovoltaic generation is not included

Significant savings in electricity supply were obtained, (in one case, up to 80% savings). This is because the savings are calculated in the common areas of the buildings, where all the lighting has been changed to LEDs. The elevators have also been replaced. That is, the energy efficiency improvements made in the Berlin pilot directly affect the consumption that has been measured.

It is important to note that in the case of electricity consumption and domestic hot water consumption, the calculated energy saving is not real.

As previously mentioned, there is no annual information (from 2010 to 2016) of variables that affect these consumptions, such as the number of inhabitants. So it was not possible to calculate a baseline. The savings have been calculated based on the reference consumption (electricity consumption and domestic hot water in 2016).

With the works that have been carried out the district heating has achieved a thermal saving in heating of 17% and 42% in Pasewalker 7 and Pasewalker 8, respectively.

