EMPOWER
Interreg Europe

Cork City Council
Comhairle Cathrach Chorcaí

EEMMR
(Energy Efficiency Measuring Monitoring and Reporting System)

Brian Cassidy

Senior Executive Engineer

Cork City Council

Local Authorities Role

- **Democratically elected body closest to the citizen**
  - Accountable to citizens
  - Deliver essential services
  - Design policies and programs that make the city attractive
  - Climate action at local level – community action plans
- **Ambition**: Make their administrative areas a better place to live in, Work in, invest in and visit.
- **Good quality housing essential to achieve this objective**
  - Spacious
  - Comfortable
  - Within 15 minutes of most amenities
  - **Energy efficient**
  - **Low carbon footprint => good air quality**

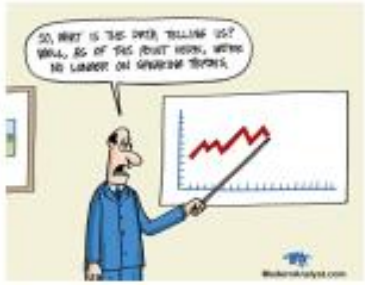
Population: 211,000
Area: 187 sq km
No. of Social Houses: 10,000

11000 social houses
50% built pre 1975.
10% apartments
Energy Ratings for 7700 properties

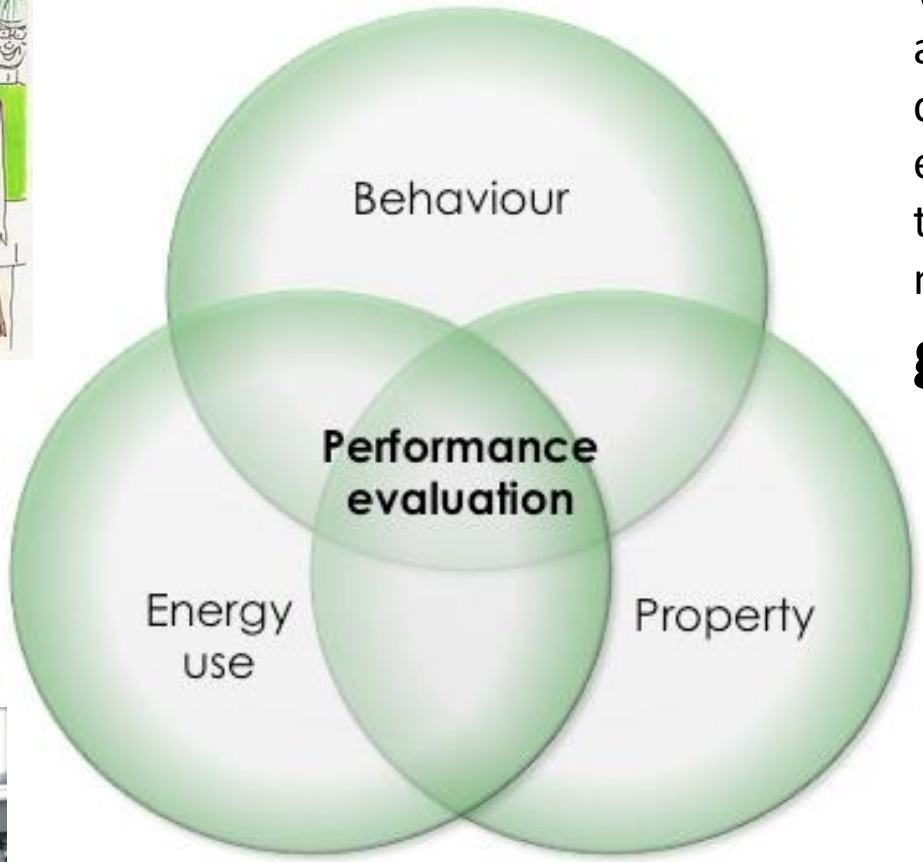
We are Cork.

We are Cork.

The Only rule



OPTIMISING ENERGY USE
THROUGH MONITORING AND MEASURING



We want to bring about behaviour change to optimise energy consumption to meet needs but not promote

gamification

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What is Monitored

Environment

- External Environment
- Internal Environment

Power consumption

- Electricity Consumption
- Heating Consumption

Behaviour

- Interaction with Energy systems in home.

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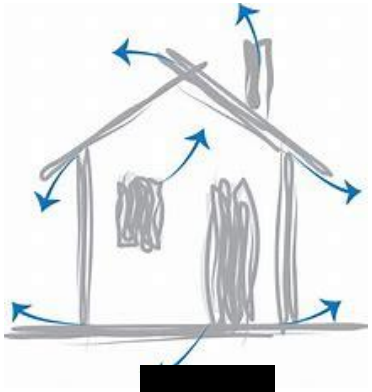
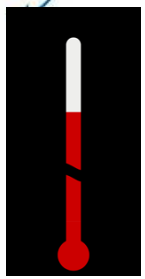
Internal Environment



Airtightness

Air Pressure



Temperature

CO and CO2 Per room/per zone

Humidity

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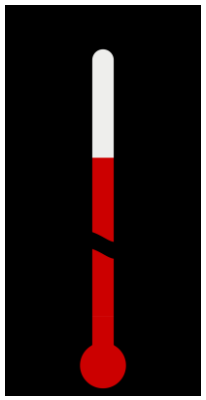
External Environment



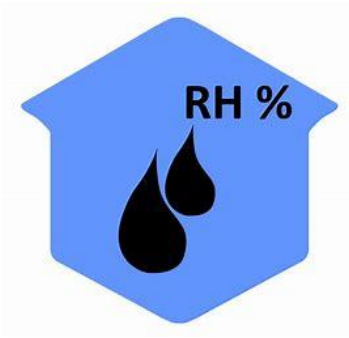
Temperature

Air Pressure

Windspeed

Humidity

Chill Factor



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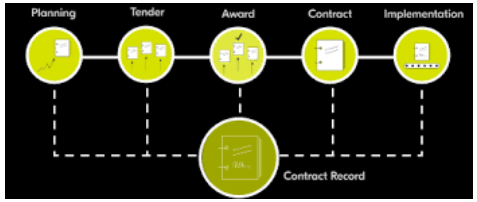
PROCUREMENT

- 1. Scope of Works
- 2. User requirements
- 3. Equipment Schedule
- 4. Project Schedule
- 5. Overall Schematic diagram
- 6. Schematic diagrams of installation
- 7. distribution board diagrams
- 8. Cable schedule
- 9. Preliminary Health and Safety Plan
- 10. Definition of contractor capacity and



The Brief (1)

- The energy monitoring software platform:
  - shall be deployed as a web browser based monitoring system
  - operate centrally from a server located within Cork City Council's offices.
  - All monitored parameters shall be displayed also locally, at every apartment,
  - an intent of notifying and advising users to change their energy regime.

- be able to collect and process data from all sensors, data loggers, gateways and routers using GSM/GPRS/3G, Ethernet, Wireless M-Bus and Modbus RS484 communication protocols:
- track and provide views for monitored data calculate wind chill factor and air frost on a sub-hourly basis
- store automatically on server at least 10 years of data, trended at intervals up to 15 minutes,
- data validation to detect quality issues such as gaps, spikes, and flat-lines, and will provide an option or service to automatically fill and/or correct data.

The Brief (2)

- calculate and provide visualization of real-time (and historic) energy cost using customized flat rates inserted by user.
- normalize the data according to factors that are known to affect energy consumption, such as floor area, number of occupants, heating degree days, and cooling degree days.
- convert, display and report energy use in equivalent environmental metrics such as CO2 equivalent, km driven in a car, hours of laptop use, etc.
- provide plots of at least 24-hour periods of interval energy usage versus longer periods such as weeks, months and years. This requirement shall be ensured for all parameters monitored.
- The software platform shall provide options to select the time period and data points that are plotted.
- The software platform shall allow multiple user-selected data points to be plotted on a single chart or graph

The Brief (3)

- The software platform shall allow user to create “peer groups” and shall rank the residential units by a performance index such as kW/occupant, kW/apartment, kW/sqm.
- provide the ability to compare the energy usage, costs and other parameters monitored in a fixed period (day/week/month/year) for an apartment, system or equipment component against past and/or predicted performance of the same period length.
- provide heat maps of energy consumption and for other parameters monitored, color coding the magnitude of the registered values for a user-selected time period of historic data.
- characterize and predict the typical or expected energy usage based on key drivers such as weather (degree days/outside temperature), occupancy, time of the day/week and other variables. The baseline will be used for energy saving calculations, near-future load predictions, energy usage comparisons, and energy anomaly detection.
- identify and flag unexpectedly high or low values for the monitored parameters.
- The software platform shall detect operational faults in the system or equipment,

The brief (4)

- detect operational faults in the system or equipment, with root cause information to guide investigation and resolution.
- provide customizable notifications schemes for the users (e-mail, phone, text message, pop-out screens) individually and group recipients, for anomaly and fault notification.
- provide the ability to track anomalies on parameters monitored and faults (duration, persistence, etc.) to facilitate response and resolution.
- provide a public-facing configurable display for apartment occupants to view owner-defined aspects of energy consumed, parameters monitored or other performance metrics such as energy use intensity, cumulative savings over time, etc.
- The software platform shall provide an operator-facing configurable display for the personnel operating the platform from Cork City Council's premises, to view aspects of energy consumed, parameters monitored or other performance metrics such as energy use intensity, cumulative savings over time, etc.
- The software platform shall provide the capability to upload utility billing data (electricity and gas) in formats such as csv and xlsx.

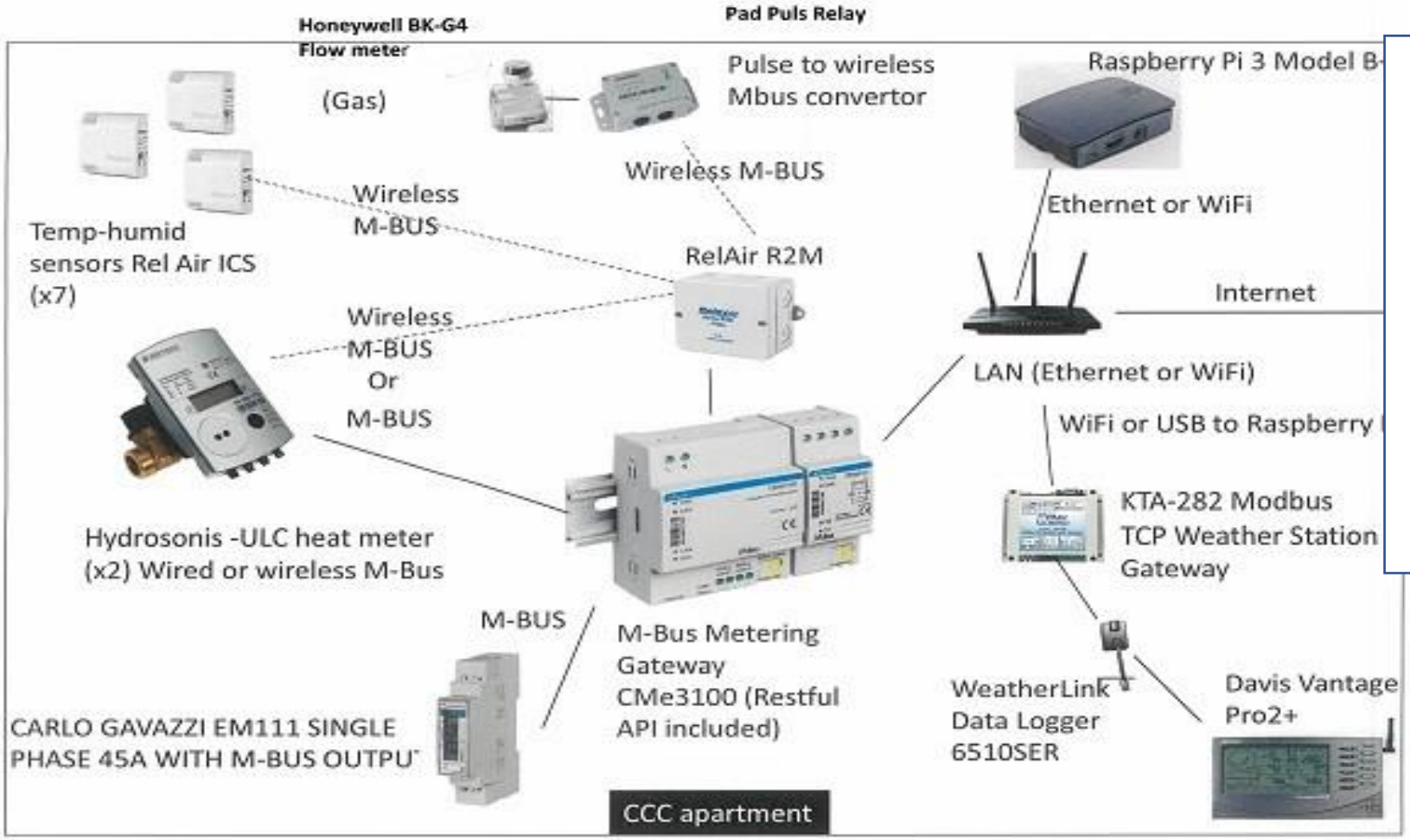
Equipment selected for project

Device	Connection type	Manufacturer	Model	Type number
Electrical Energy Meters	Modbus RTU	Schneider	IEM	IEM3150
Ambient Temperature Sensors	Wireless MBus	Endress	TX-TEMP	TX-TEMP
Multipurpose Sensors	Wireless MBus	GMP251/	MBS	MBS-122
Hot/Cold Water meters	Wireless MBus	Kamstrup	Multical	Multical 603
Weather Station	Modbus RTU	Vaisala	WXT530	WXT536 + SOLAR
Carbon Monoxide Sensor	Hardwired	Vaisala	Indigo 200	Indigo 202 + GMP251

Weather Station Data

- Outside Temperature
- Wind Speed
- 10 minute average wind speed
- Wind Direction
- Barometer (Air Pressure)
- Outside humidity
- Rain Rate mm/hr
- Day Rain
- Chill temp
- UN Index
- Solar Radiation

The system within the House



Remote Computer

In the Office

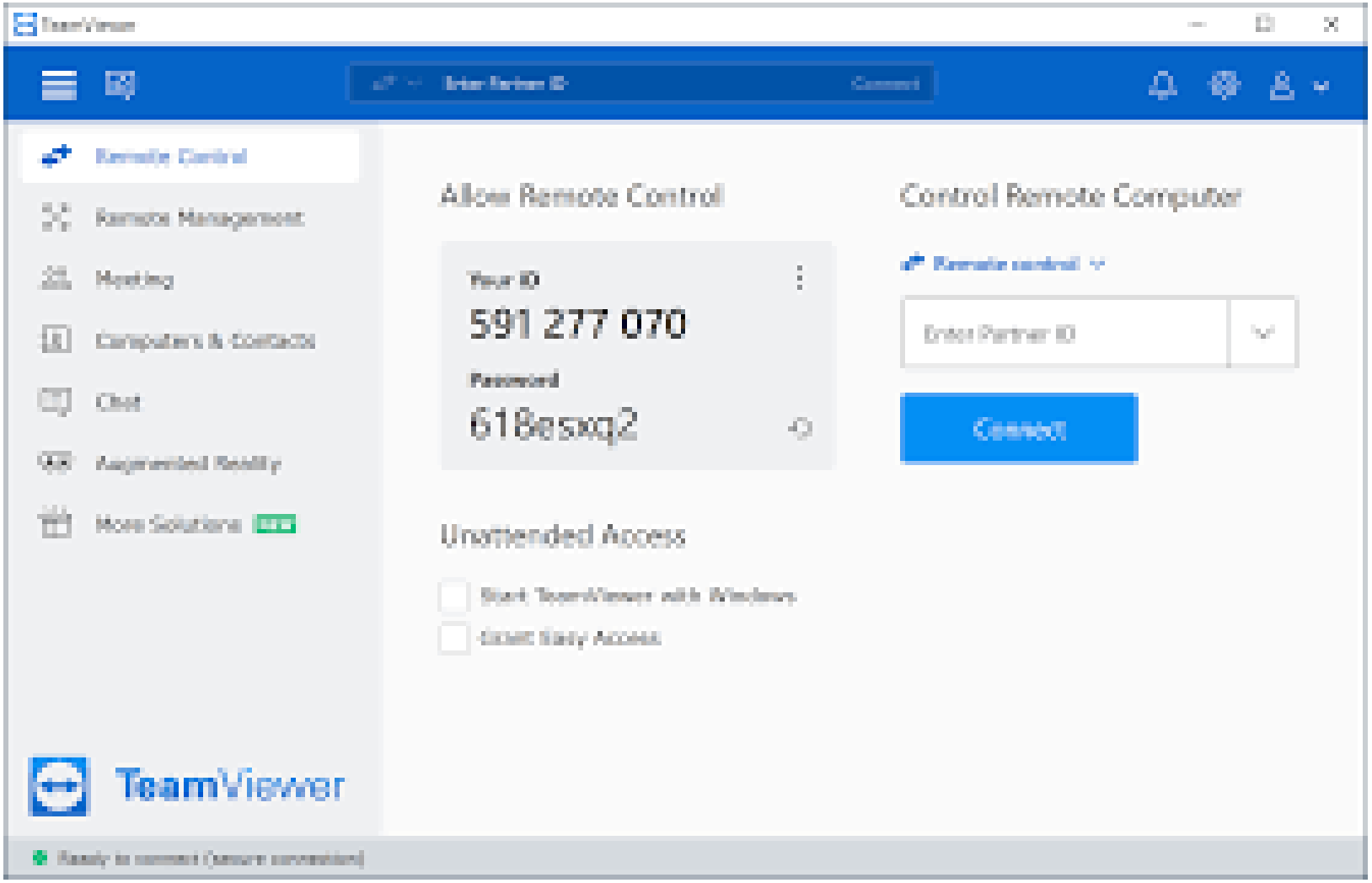
Data Receiver
TP Link TL MR 6400

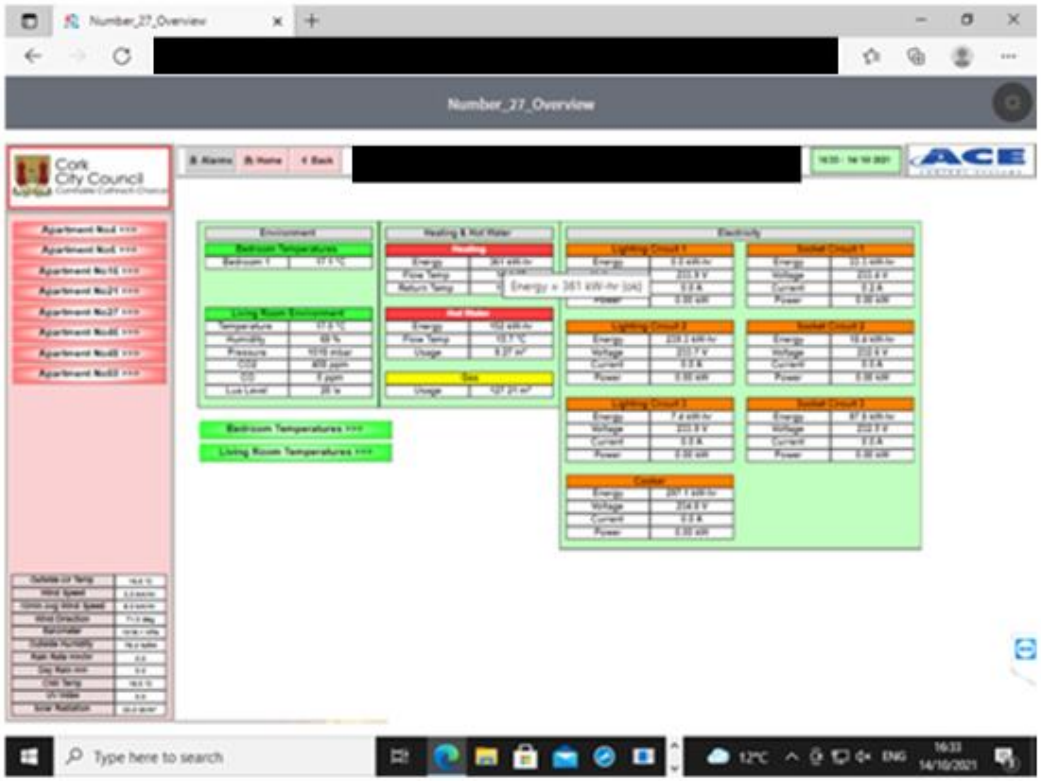
UPS Netpower WPN 800

Dell Optiplex 3070
Micro form Factor
PC PC

Fire wall
EWON Efive 25

Remote Access – Team Viewer

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Number_27_Overview
Cork City Council
Environment
Heating & Hot Water
Electricity
Bedroom Temperatures
Living Room Temperatures
Type here to search

Cork City Council
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Alarms | Home | Back

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ACE CONTROL SYSTEMS

- Apartment No4 >>>
- Apartment No6 >>>
- Apartment No16 >>>
- Apartment No21 >>>
- Apartment No27 >>>
- Apartment No46 >>>
- Apartment No48 >>>
- Apartment No60 >>>

Environment	
Bedroom Temperatures	
Bedroom 1	17.1 °C

Living Room Environment	
Temperature	17.0 °C
Humidity	69 %
Pressure	1019 mbar
CO2	408 ppm
CO	0 ppm
Lux Level	28 lx

Heating & Hot Water	
Heating	
Energy	361 kW-hr
Flow Temp	1
Return Temp	1

Energy = 361 kW-hr {ok}

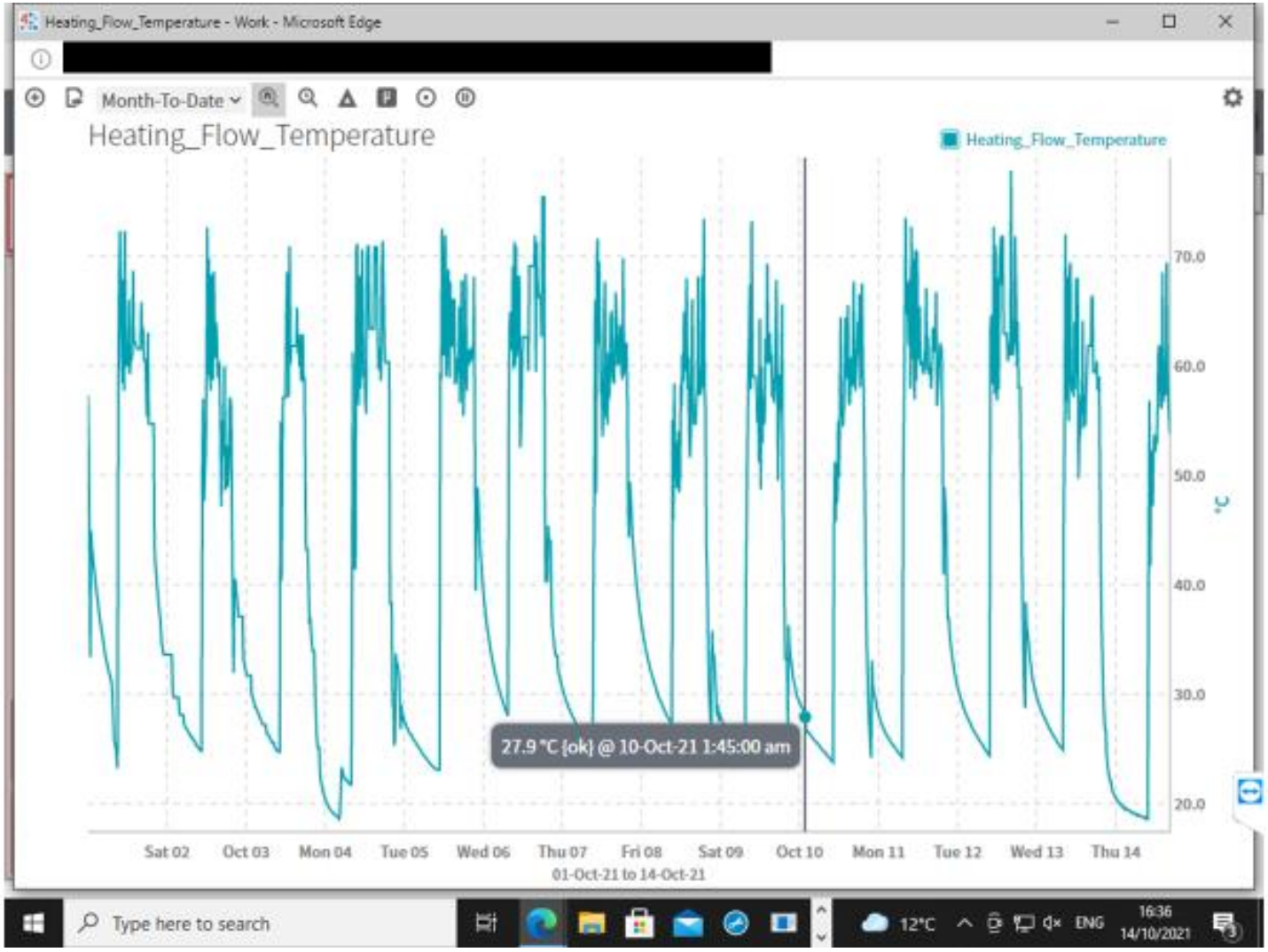
Hot Water	
Energy	152 kW-hr
Flow Temp	15.7 °C
Usage	9.27 m³

Gas	
Usage	127.21 m³

Electricity			
Lighting Circuit 1		**Socket Circuit 1**	
Energy	0.0 kW-hr	Energy	33.3 kW-hr
Voltage	233.9 V	Voltage	233.4 V
Current	0.0 A	Current	0.2 A
Power	0.00 kW	Power	0.00 kW
Lighting Circuit 2		**Socket Circuit 2**	
Energy	239.3 kW-hr	Energy	18.4 kW-hr
Voltage	233.7 V	Voltage	232.6 V
Current	0.0 A	Current	0.0 A
Power	0.00 kW	Power	0.00 kW
Lighting Circuit 3		**Socket Circuit 3**	
Energy	7.4 kW-hr	Energy	97.8 kW-hr
Voltage	233.9 V	Voltage	232.5 V
Current	0.0 A	Current	0.0 A
Power	0.00 kW	Power	0.00 kW
Cooker			
Energy	297.1 kW-hr		
Voltage	234.8 V		
Current	0.0 A		
Power	0.00 kW		

- Bedroom Temperatures >>>
- Living Room Temperatures >>>

Outside Air Temp	16.2 °C
Wind Speed	3.0 km/hr
10min Avg Wind Speed	6.0 km/hr
Wind Direction	71.0 deg
Barometer	1019.1 hPa
Outside Humidity	79.0 %RH
Rain Rate mm/hr	0.0
Day Rain mm	0.0
Chill Temp	16.0 °C
UV Index	0.0
Solar Radiation	30.0 W/m²


Heating_Flow_Temperature - Work - Microsoft Edge
Month-To-Date
Heating_Flow_Temperature
Heating_Flow_Temperature
70.0
60.0
50.0
40.0
30.0
20.0
°C
27.9 °C {ok} @ 10-Oct-21 1:45:00 am
Sat 02
Oct 03
Mon 04
Tue 05
Wed 06
Thu 07
Fri 08
Sat 09
Oct 10
Mon 11
Tue 12
Wed 13
Thu 14
01-Oct-21 to 14-Oct-21
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12°C
ENG
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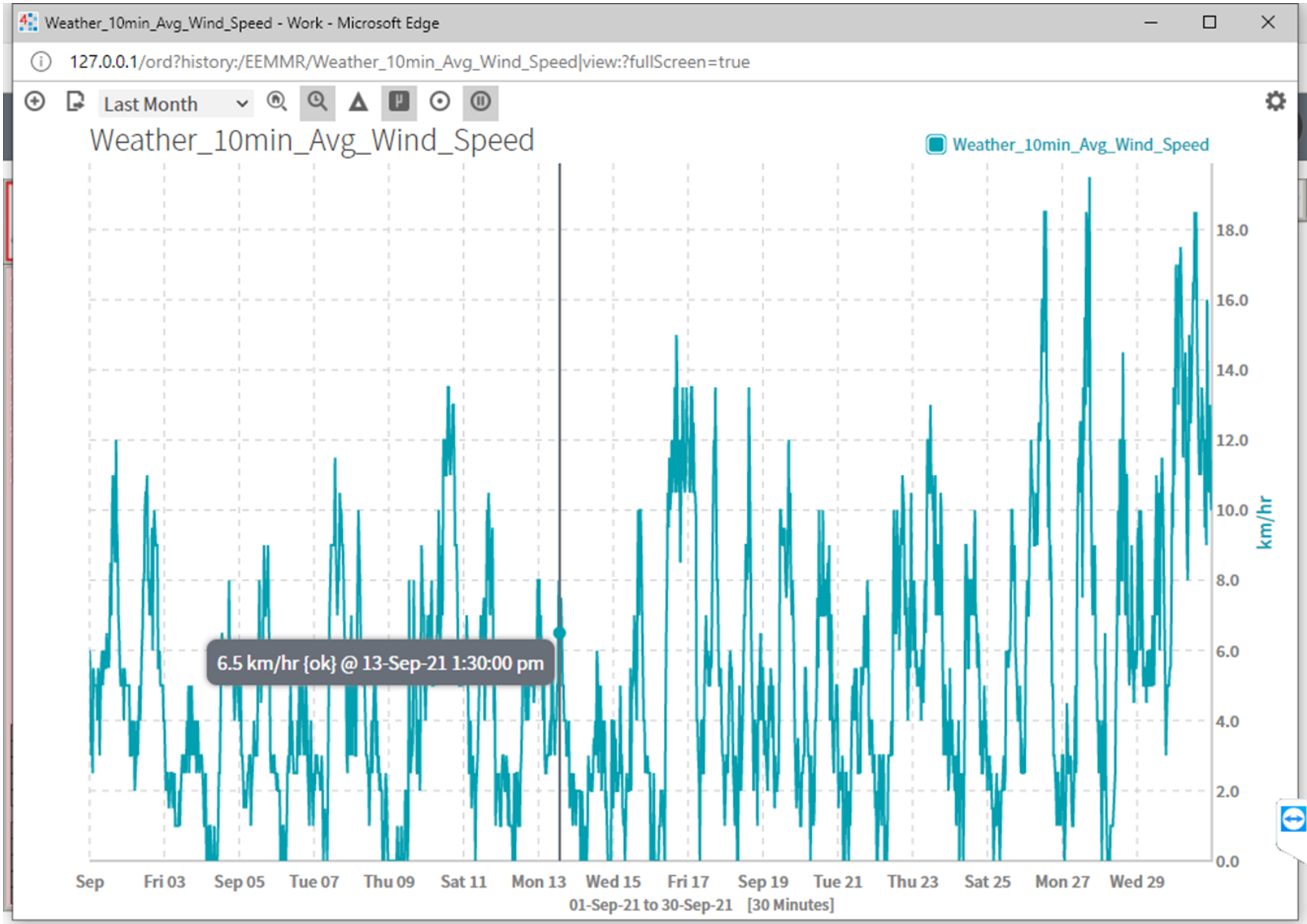
14/10/2021


Weather_10min_Avg_Wind_Speed - Work - Microsoft Edge
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Last Month
Weather_10min_Avg_Wind_Speed
Weather_10min_Avg_Wind_Speed
6.5 km/hr {ok} @ 13-Sep-21 1:30:00 pm
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
km/hr
Sep
Fri 03
Sep 05
Tue 07
Thu 09
Sat 11
Mon 13
Wed 15
Fri 17
Sep 19
Tue 21
Thu 23
Sat 25
Mon 27
Wed 29
01-Sep-21 to 30-Sep-21 [30 Minutes]
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14/10/2021

Go raibh maith agat !!

As Éisteacht