ReFLEX ORKNEY

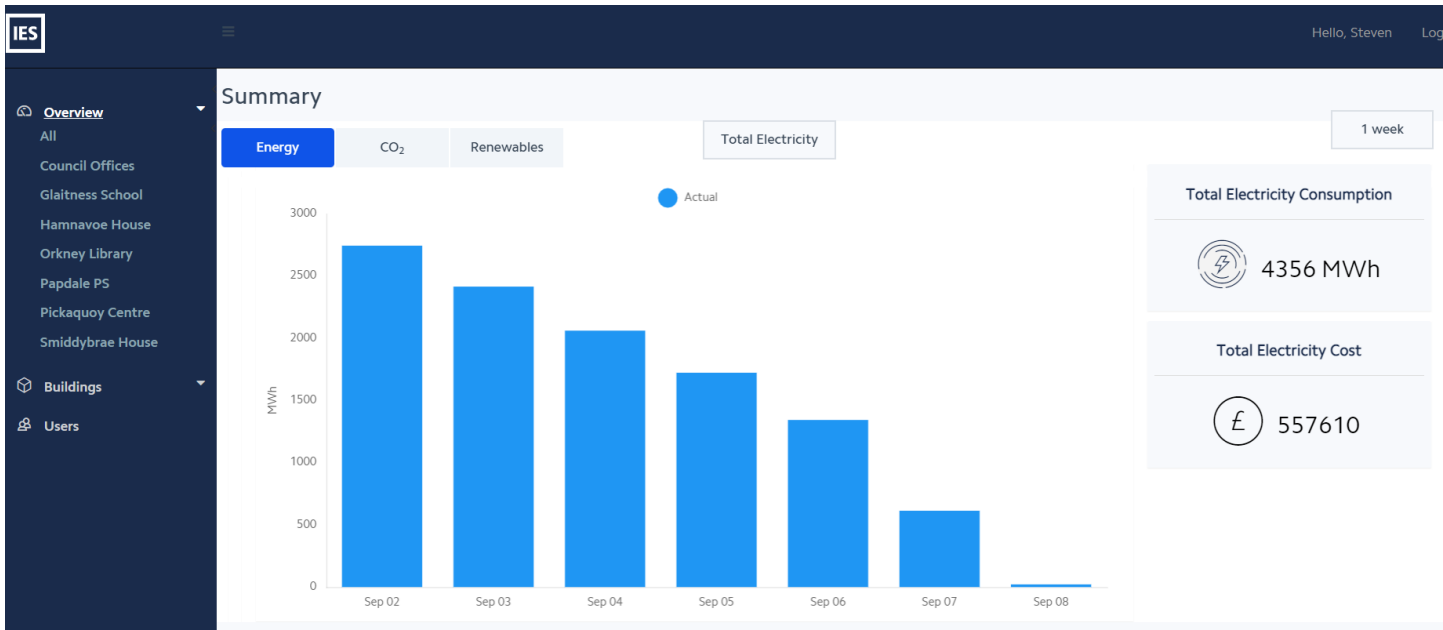
Orkney Islands Council - Building Energy Management System

ORKNEY ISLANDS COUNCIL

Concept

- Single point of access to multiple OIC sites for monitoring of building performance.
- Data used to forecast future performance and aid in the targeting of remedial actions to building fabric or heat sources.

- Faults monitored and reported in real time to allow swift repair or reset reducing downtime.



Summary

- Wireless data gathering worked well in the main.
- Data gathered offers useful insights into energy usage within buildings.
- Having large amounts of data doesn’t guarantee solving queries.
- Wide range of sensors and meters available.
- Web server data storage is prohibitively expensive unless used for business critical activities.
- When retrofitting some compromise may be required regarding ideal positioning of equipment.
- Alarm configuration is important but can be overwhelming.

Measurement systems

- Meters and sensors installed as part of ReFLEX project include:
  - External conditions monitoring (temperature, humidity, windspeed and direction).
  - Internal conditions monitoring (temperature, humidity, CO2)
  - Energy metering (Oil, Heat, Electricity, Water)

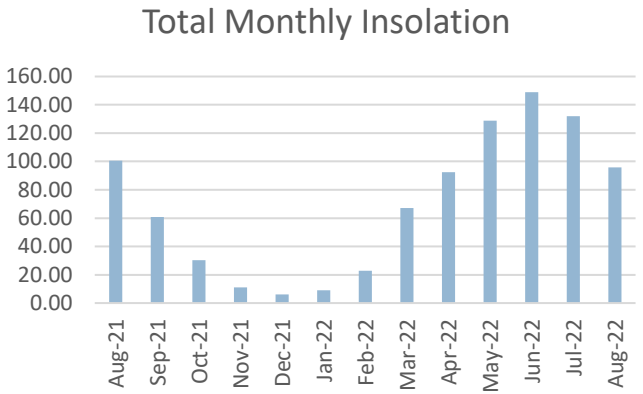
Heat Meters (and Electrical Meters)

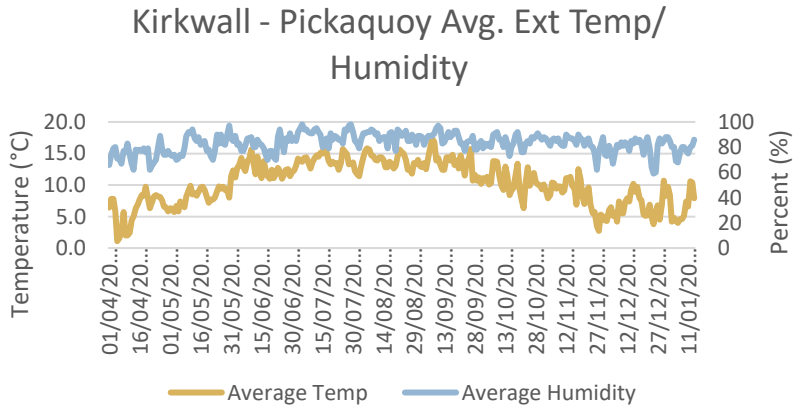
Room Sensors (Temperature, Humidity, CO2)

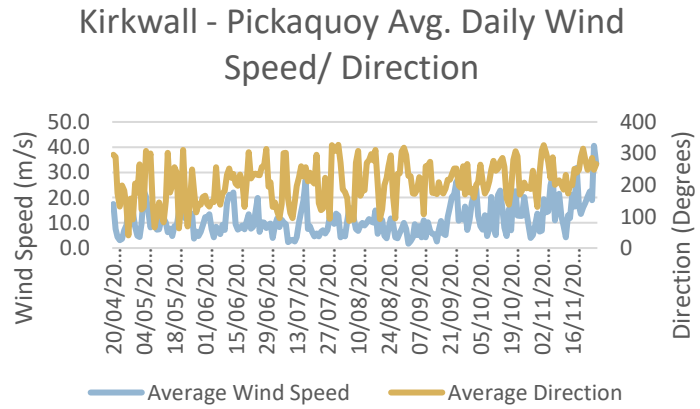
Wireless Gateway Devices

External Conditions Data

- As part of the system we gathered data on External Temperature, Humidity, Wind Speed, Wind Direction and Solar Intensity.
- The data is used to look for trends in energy usage which correspond to weather events such as low temperatures or high wind speeds.
- While it is obvious that these events will result in higher energy consumption the addition of direction data for wind and the full range of external conditions are aimed at allowing better analysis of building performance.

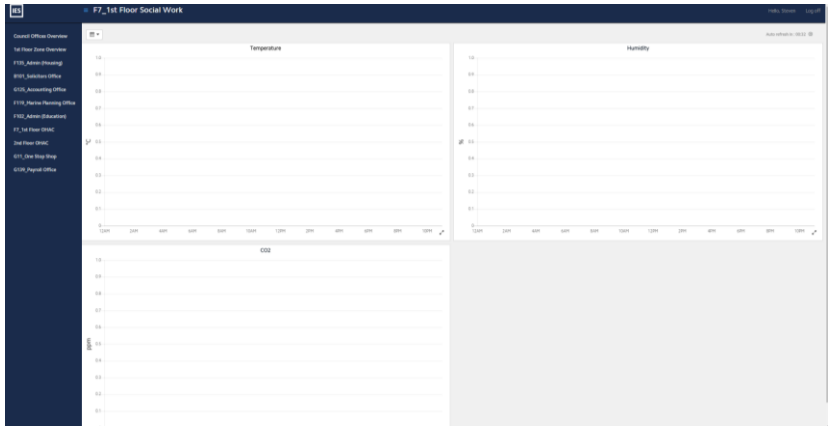


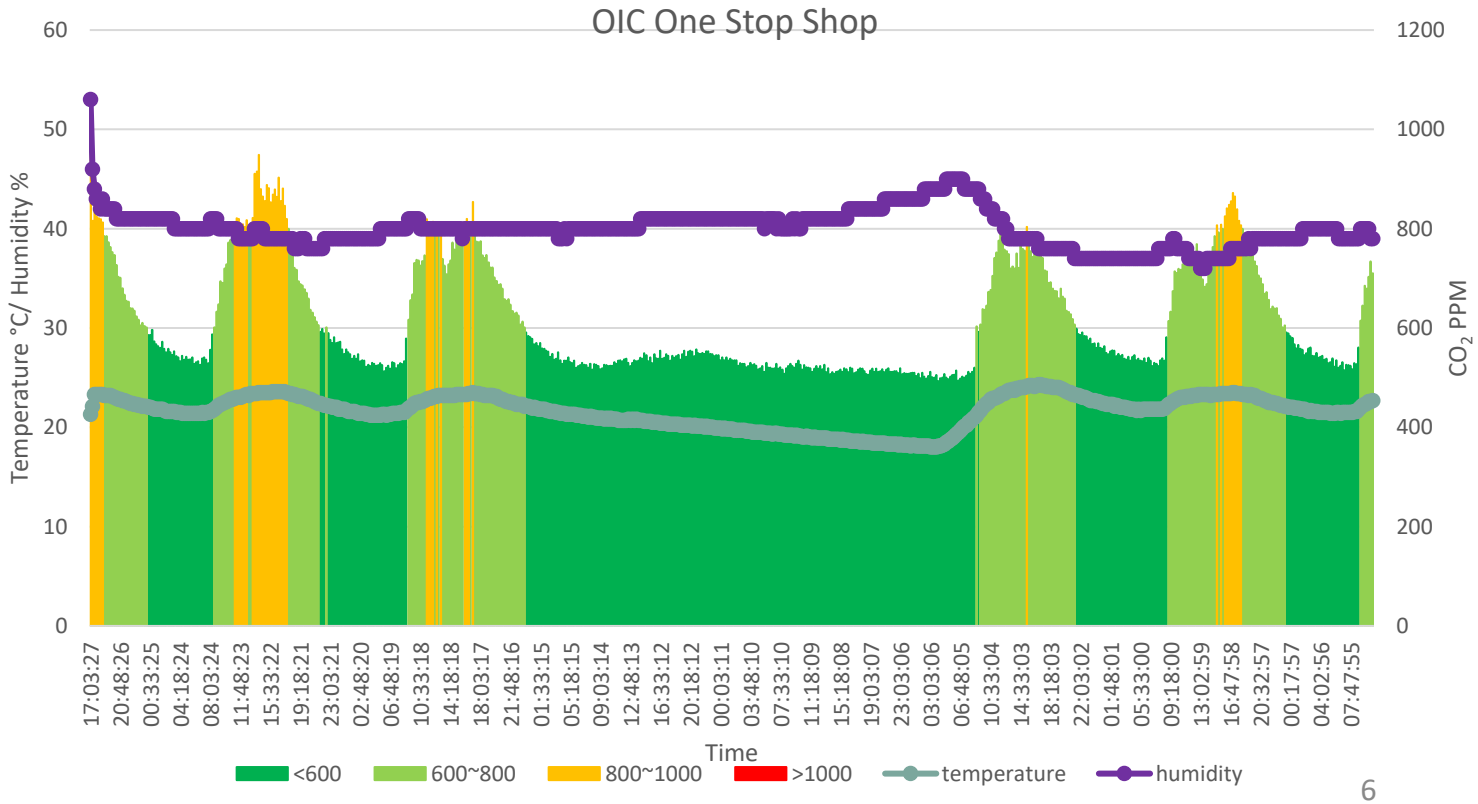




Internal Conditions Data

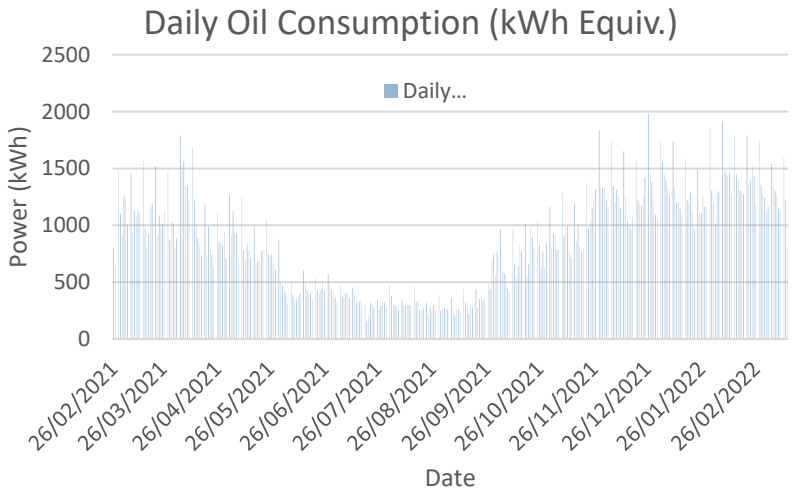
- We recorded internal temperature, humidity and CO2 concentration through a number of sensors spread throughout the buildings involved in the project.
- The data is used to assess the performance of the system and ensuring that the desired conditions are being achieved within the building.

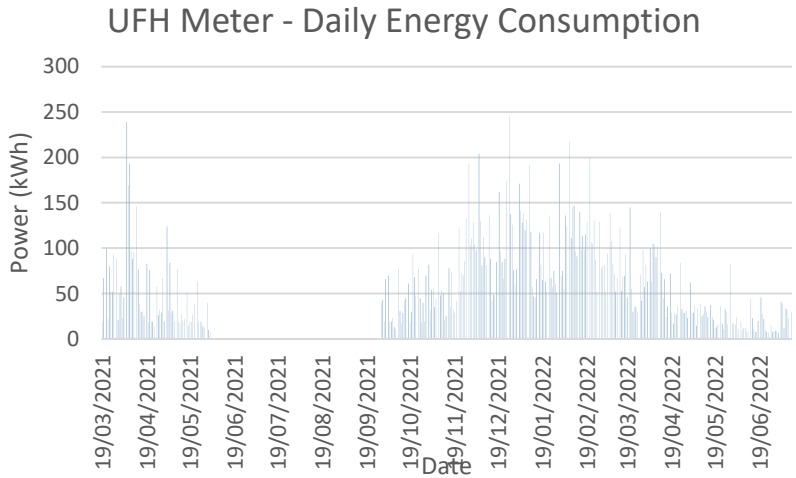


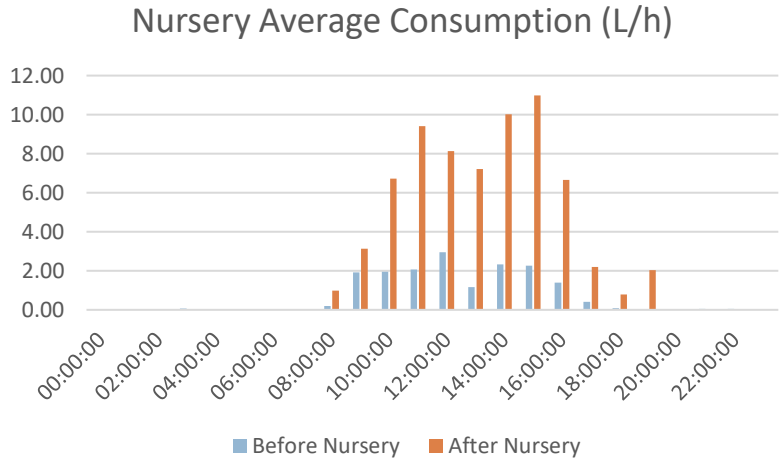


Consumption Data

- Energy input to the system in the form of Oil, Electricity or resultant Heat is gathered through metering installed as part of the project.
- Where available the energy input and output of the heating plant is measured to assess efficiency of the system.
- Comparing energy input to the building to the internal condition data allows us to see if the heating system is performing satisfactorily.





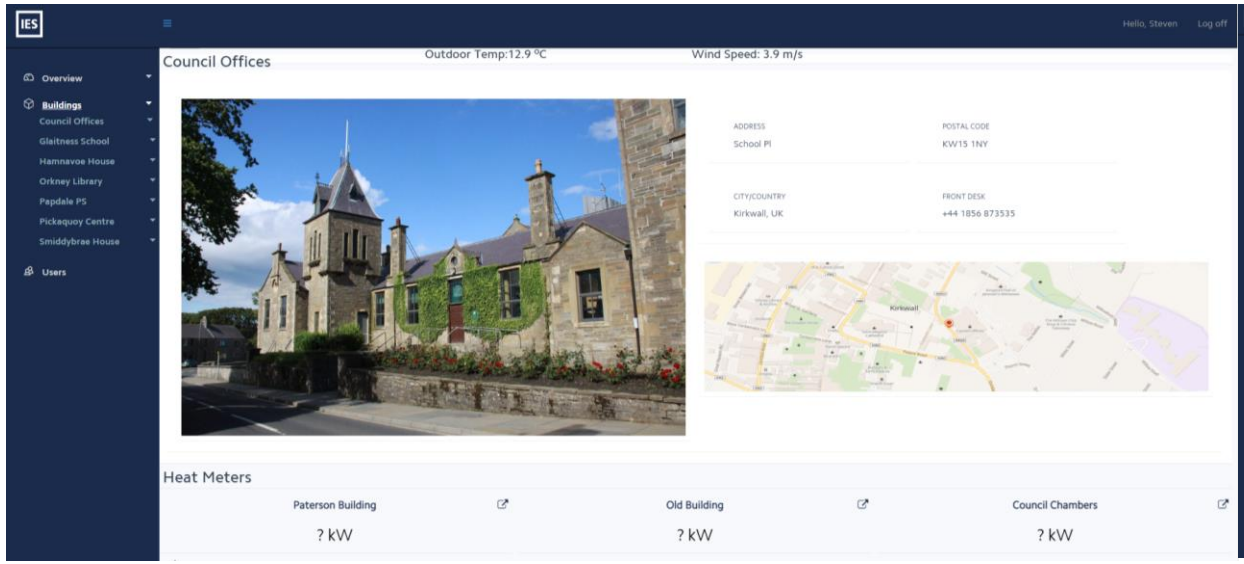


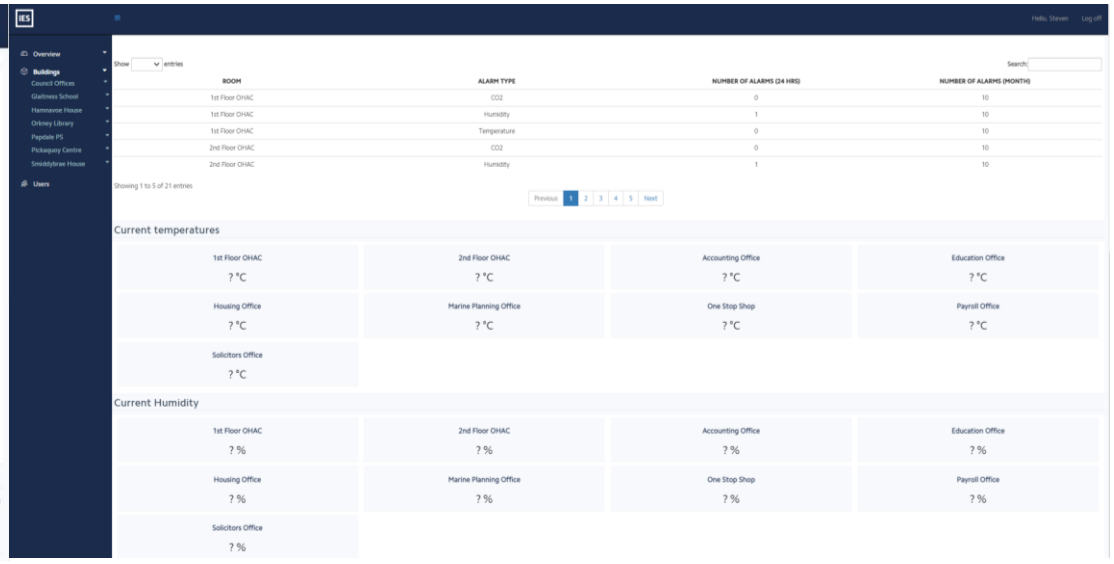
Data Analysis

- Using the data gathered we can compare sites on an energy used per square meter basis.
- We can then look at where buildings are performing less well than others using the internal and external condition data to see if there is an obvious cause.
- With the range of data available we can dig beyond the basic data to see whether certain conditions cause poor building performance and then investigate potential causes and solutions.
- The lessons from these exercises can be used to both improve existing buildings of a similar type or to aid in the design and specification of new build projects on the islands.

Digital Twin

- Overview of energy use and internal conditions at each building and across the estate.
- Out of range faults shown on summary page with more detail behind this on a second page.
- Different buildings types included Offices, Schools, Care Homes and a Library.
- Heating Types were Oil Boilers and Ground Source Heat Pump (Either Retrofit or with New Build)





Lessons Learned

- Local servers are more cost effective for gathering and storing energy data.
- The data can throw up more questions than it answers.
- Comparing sites on a like for like basis can assist in selecting replacement heating plant*
- If using a LoRaWAN network consult with other departments to see if there are other applications such as recording Roads data or Housing data.
- Assess whether existing sensors can gather data to avoid doubling up coverage in buildings.
- Consider what really warrants an Alarm signal to avoid developing alarm numbness.

Questions?