Communal Energy Partners

Communal Energy Partners (CEP) were called in to review the operational energy efficiency of a district heating system in an urban quarter of London.

With residential and commercial space in one place, the complex is home to over a thousand residents and an eclectic collection of businesses, all of which are managed off the same communal heating system.

CEP's role was to compare the operational energy efficiency of the communal heating system with the original design parameters, some 7 years on from original construction. This was done in order to ascertain whether the installed system is over engineered and not reflecting the actual load usage or profile.

There are several reasons why heating systems can be over engineered, from a reluctance of the system designers to work to peak loads based on existing profiled systems which could result in significantly lower peak heating load (kWp), along with planning and building regulations et al. It is after all a lot easier to turn a boiler off than to install a new one in a completed development. If over engineering occurs it would result in higher capital costs for the developer and potential have an impact on the thermal efficiency of the scheme. By undergoing a range of checks, CEP could identify the actual load profile, looking at how future systems could be improved.

## The Customer

A well-respected developer undertaking regeneration projects in complex urban settings both new and old. They specialise in mixed-use developments and sensitive modernisation, especially in historical cities like London.

## The Challange

The challenge was to work through the original design parameters, measure the actual performance of the system and compare, establishing areas for improvement in future schemes.

## How did CEP help?

CEP carried out a thorough analysis of the system and using historic data, measuring load throughout the day in different seasons in order to determine the ideal daily load. Following the assessment, CEP delivered a report detailing their findings, and advising the client on potential future capital savings on new schemes.

The findings identified that the maximum combined residential and commercial load for winter was 1100kW (including potential thermal loss in distribution system) and there was 7300kW of heat output plant, leaving the complex with 3650kW at 50% redundancy – three times the 1100kW maximum profiled load. The complex averaged 45% load outside of peak times. CEP recommend some changes to the existing systems such as altering set points and improving the efficiency of the system to reduce the delta t.

In terms of future developments, a number of recommendations were made:

- Base plant loads to be reviewed and interrogated with designers based on actual load profiles of existing schemes.
- When designing new systems use new best practice guidance, such as CIBSE AM12 2013 (as amended 2016). This guidance recommends lower supply and return temps and greater delta t, i.e., 70/40 30 delta t.
- The most efficient way to achieve low return temperatures is to reduce flow rates through the heat emitters, thereby allowing more time for the heat to be transferred through the heat exchanger. Ideally incorporating variable flow volume rates. This will ensure that pumping energy is minimised through reducing the volume of water to be pumped and the pressure drops to be met, and also reduces heat losses through ensuring that return temperatures remain low under part load conditions.
- When specifying the CHP plant, size the units to meet peak and low load demand so there are 2 or 3 pieces of equipment, rather than one large unit. This allows more diversity during the peak and off-peak loads during the day and programming of fluctuating set points to account for seasonal weather changes.
- On phased developments implement a two-part commissioning period or soft landing over 2 years so construction and building managers can review the system design and temperature sensor and BMS control settings so the BMS system is designed and commissioned based on maximising an energy efficient system and provides a reliable monitoring tool for return commissioning checks.
- On modern apartment schemes, without radiators, underfloor heating should be used to maximise demand.

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## The outcome

Some of the implications of an overdesigned system are increased pipe, pump and boiler plant sizes as well as a requirement for additional boiler plant room space.

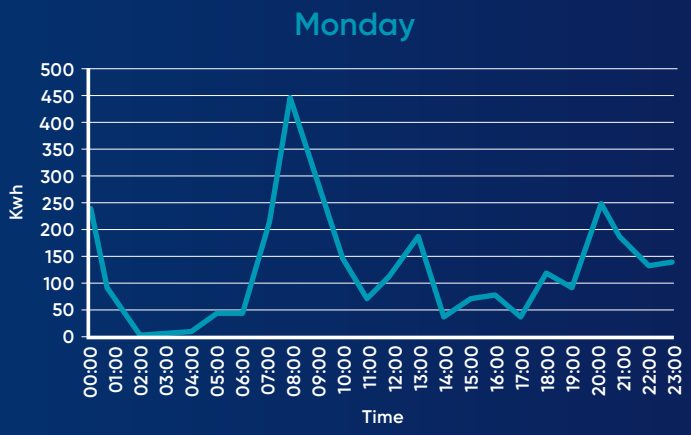
On a new scheme capital cost savings, based on inflation adjusted figures would be:

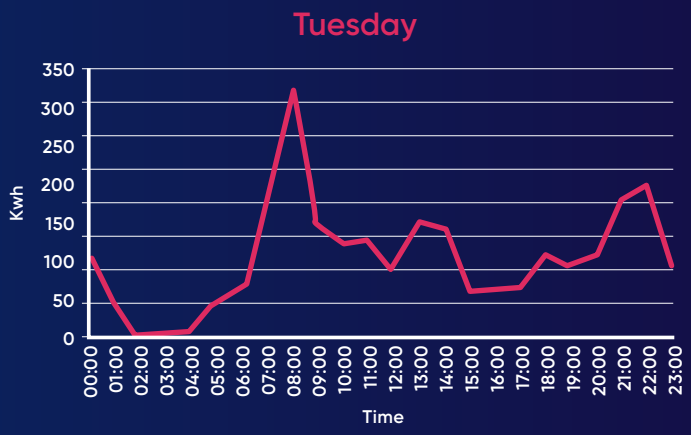
- Plant equipment 20% reduction of circa £2m - £400k
- Infrastructure 5-10% of circa £1.35m - £67.5k/£135k

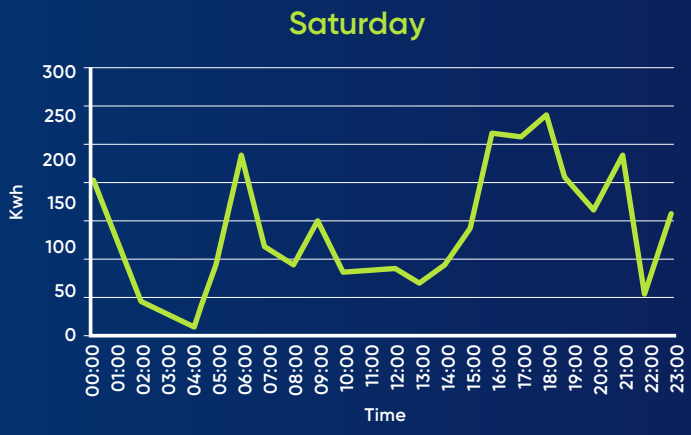
The client was happy with the results and took a number of recommendations forward in future design briefs

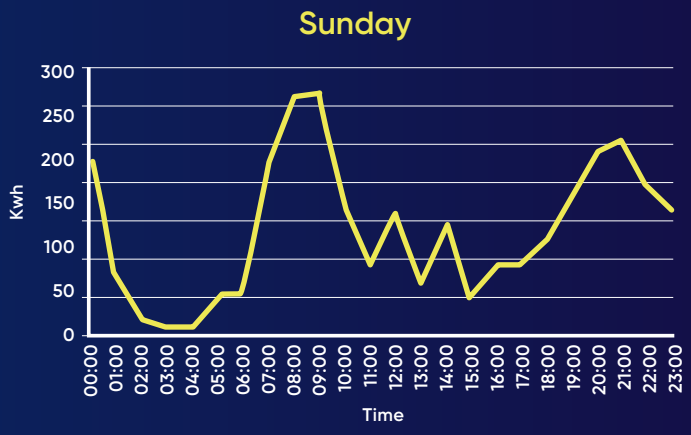
## Measured Energy Consumption

- Residential Only –Load Data (thermal losses not added)




In the review CEP were fully supported by the developer and a range of the contracting teams involved in the original install of the system.

Whilst the Future Homes Standard 2025 will see the move away from fossil fuel powered boilers to alternative systems such as heat pumps, many of the lessons learnt in this case study will still be highly relevant.

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