Final Report

Community Building Case Study

Project Overview

CREW's first Next Generation project wasthe installation of heat pumps at Devas Club, a youth centre in Battersea. Devas runs homework clubs, has dance and recording studios and a gymnasium. The centre also offers office space to local social enterprises and holds inclusion lunches for the elderly.

In May 2021, CREW installed 4 16kW Nibe F2040 air source heat pumps (ASHPs) to work in concert with a gas boiler that was installed in 2017. Running two heat sources like this is known as bivalency. The system was designed to optimise between the two heat sources based on cost but in theory this could also be based on carbon intensity.

This project was funded via a community share offer with a projected dividend of 3%. Income streams come from the now departed non-domestic RHI plus a heat charge to the Club on 1.5 pence per kWh consumed.

Origins of the Project

CREW started working with Devas Club in 2018 after an introduction from a local councillor. Devas already had Solar PV installed on the roof in 2011 and had a plan to reduce its carbon footprint by 5% p.a. and ultimately become zero carbon. The scoping for that plan was funded by a grant from LCEF. CREW and the Devas management teams identified several areas that needed to be addressed. Phase one saw CREW install LED lights funded by UKPN's Power Partners fund. Phase 2 was funded by the Wandsworth Local Fund and included a building management system for smart heating controls, a destratifier and the installation of secondary glazing. Buoyed by these two successes we moved to Phase 3 of the project in spring 2021 and the installation of heat pumps on the roof of the building. The Devas management team were supportive from the very start and the fact that this project would cut their carbon footprint by 17 tonnes further smoothed the process. Funding for this project came through our first community share offer for which we achieved the Standard Mark.

The project was led by CREW Energy and our supporting installer was the now defunct Greensquare Renewables. We requested quotes from two other companies ISO Energy and Ground Sun. Only Greensquare provided a quote that allowed the economics to stack up, so we proceeded with them.

The choice of installers in London was and remains very limited. Iso had an employee who volunteers for SELCE. The other two we found on the MCS register (https://mcscertified.com/find-an-installer/). Greensquare was the closest to us and we had seen their vans in SW London. Ground Sun was very helpful when we called to explain the project.

As more people are installing heat pumps all the time, we would recommend talking to local residents about their experience with installers in your area. We have been put off considering two firms thanks to feedback from CREW members.

Our community engagement for this project solely focussed on fundraising. We were confident there would be no local resistance to the project as the heat pumps were to be placed on the roof and would not be visible to local residents. And as they were to be placed 20 m from the nearest property, sound was very unlikely to be an issue.

The Building

Devas Club was purpose built in 1970 as a space for young people to learn new skills, build resilience and be the best they can be. The building is set over four floors with a gym and recording studios in the basement. The ground floor has a games area, function rooms, kitchen and an IT suite. The first floor hosts the main hall and on the second floor there are offices for social enterprises.

The building has a flat roof that houses a basketball court, a solar array and now 4 heat pumps. Each floor of the building is separated by 500mm of concrete slab flooring which provides excellent thermal mass to store and retain heat.

The total floor area of the building is 1800 sqm. While the building dates back to 1970 the rear of the ground floor was rebuilt in 2017 with greatly improved insulation and glazing. Secondary glazing was added to the offices on the 2nd floor and to the windows in the hall as preparation for this project. The latter was part of phase 2 of CREW's WLF project, which also included the installation of a destratifier in the main hall to bring heat back down from the two storey ceiling.

Table 1 shows the heat loss calculations for the ground floor rooms that were used for the design of the heat pump system. Note the power requirement rating of the rooms depending on if they were modernised or not, running from 62 W/m2 in the new build to 136 W/m2 in the old.

Table 1: Ground floor Heat loss calculation table

	Design Temp	Power (W/m2)	Area (m2)	Power (W)	Energy (kWh
Entrance Gallery	18	133	14.18	1886	5175
ICT Room	21	66	33.46	2194	2887
Reception/ Games Area Ground Floor	21	47	177.56	8374	15580
Kitchen	21	70	28.8	2025	4989
Sadie Hut Room	21	110	45.74	5019	11058
Devas Bar Room	21	63	46.97	2970	7622
Devas Bar Toilet	21	79	6.53	238	587
Devas Office	21	79	27.34	2172	4535
Classroom	21	67	59.62	3984	7932
Youth Workers Office	21	136	10.19	1401	3137

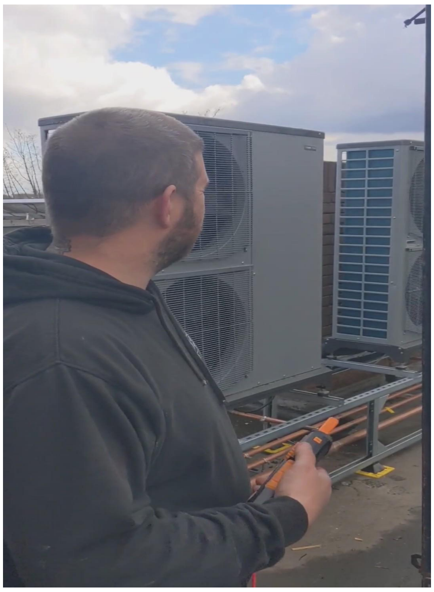
Devas Club had a relatively new boiler dating back to the refurb in 2017, so it was decided early on in the project to retain this system and develop a bivalent solution that would allow for back up heating. All of the hot water in the building was provided by direct electric systems and again it was decided to retain those systems to keep costs down. Table 2 shows the modelled heat supply between the heat pump and the gas boiler.

Table2: Annual Space heating demand and Supply

Space heating Annual Heat Demand		
Demand	kWh/yr	199311
Heat supplied by HP, excluding auxiliary heaters	kWh/yr	148896
Seasonal Coefficient of performance (SCOP)	SCOP	3.76

Electricity consumed by HP, excluding auxiliary heaters	kWh/yr	39600
Renewable heat supplied by HP	kWh/yr	109296

Interventions:



From the modelling above, the engineers decided that 4 16kW heat pumps would be able to provide heat down to 4 degrees and provide 75% of the space heating capacity. The calculations were based on the upgrading of the windows and the addition of the destratifier in the hall. No consideration was made to the upgrading of the fabric. Our reasonings for this were cost and the fact that the system was designed to be bivalent. When it gets cold the gas boiler can kick in and run at a cheaper rate than the heat pumps. The flow temperature of the heat pumps was designed to be 45º Celscius. And again as the system is being run in bivalency no upgrades were made to the heat emitters (radiators and coil fans) in the building

Above you can see an image of chief engineer Keith, with the heat pumps in the background. The four units run in cascade so as demand increases more units come online. This decision is determined currently by the Nibe control panel in the boiler house. We plan to change this so that the building's smart heating controls will ultimately take control of the decision making process. The benefits of this switch are that the building management system is taking more measurements across the building as it measures heat on a granular level and it has the ability to analyse more data sets to make the correct decisions.

To make the most economic decisions, the system has to consider the following parameters:

- ☐ The relative price of gas and power
- ☐ The efficiency of the boiler
- ☐ The efficiency of the heat pump, which depends on both the flow temperature and the outdoor temperature. The higher the flow temperature the less efficient the heat pump. The cooler the outdoor temperature the less efficient the heat pump
- ☐ The comfort of the people working and playing in the building is of prime importance. As temperature drops the heat pump, as measured by the return temperature, will start to struggle. At this point the Gas boiler needs to kick in and provide heat at a higher flow temperature (75º).

Table 3 shows the efficiency of the Nibe 2040 heat pump at varying flow temperatures. This number is based on an average winter season temperature of 7º. London’s average winter temperature is much warmer than this.

Table 3: SCOP of the Nibe 2040

NIBE F202-16kw Seasonal Coefficient Of Performance (SCOP)	
Flow Temperature (° C)	SCOP
35	4.29
40	4.02
45	3.76
50	3.53
55	3.29

Initially we had chosen the Vaillant Arotherm system due to its R32 refrigerant's low Global Warming Potential (GWP) of just 3. Unfortunately COVID had severely hampered supply and with the RHI March 2021 deadline looming we were forced to change to the Nibe F2040 system that uses an older R-410A refrigerant that has a GWP of 2088.

Another factor we built into our design of the system was the installation of two 1000 litre storage tanks. We calculated these units could provide 1 hour of space heating that would allow for heat shifting to reduce the peak demand burden. As you may recall, the building also has a lot of thermal mass with 500mm concrete floors between each level. This would also allow us to store heat and allow coasting through peak periods. More work needs to be done within the BMS software before we can really work with this element of the technology. Interestingly, these tanks only cost £2400 to install. To shift the equivalent heat using battery storage would cost around £11 000.

Permissions:

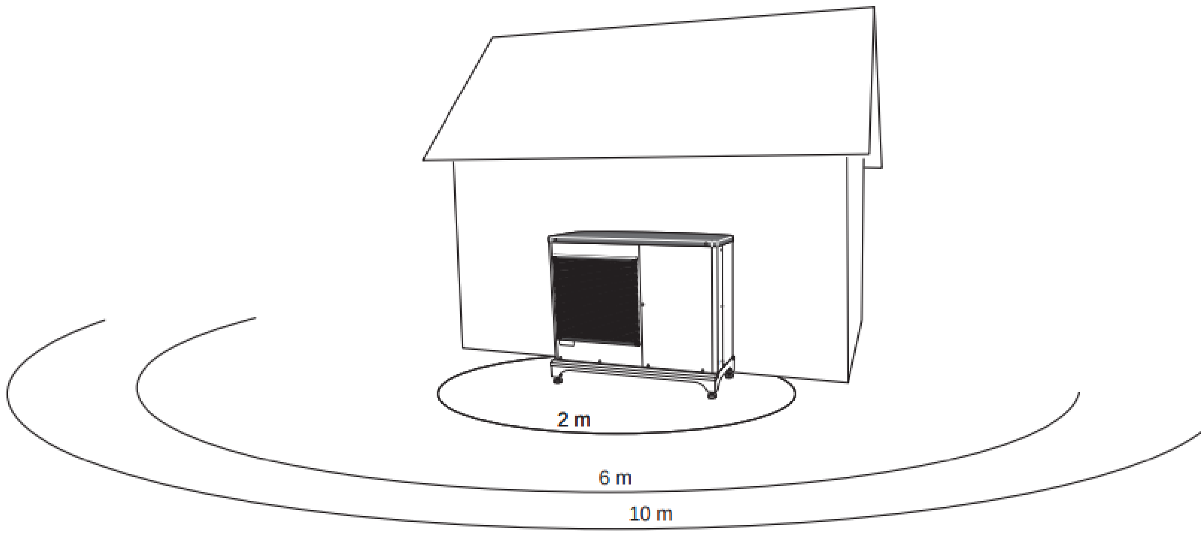
A single heat pump either, commercial or domestic, is considered permitted development. Once you go over one unit, planning permission is required. As this was our first heat pump installation we paid £260 for pre-planning advice. I would suggest that was not value for money as the planner had little knowledge of the technology. Interestingly when it came to making our planning application and in the subsequent response the planners describe our system as an air conditioning unit. Planners , please move with the times!

It is fairly straightforward what you need to provide. It really is just four factors:

- ☐ Can the system be seen from the road as this could raise objections
- ☐ Can neighbouring housing hear the unit?
- ☐ Does the system block a fire exit?
- ☐ Have you provided to scale drawings of the set up

As our system was roof mounted so it is not visible to the general public. And as it sits behind a locked fence it in no way inhibits a fire exit. Our biggest concern was noise and potential challenges from the local community. The Nibe units are 61 dB(A) nominally. The addition of 3 more units only increases that figure to 64 decibels. London background noise is 41 dB(A). Diagram 1 shows how noise falls with distance. The heat pumps are over 20m from local housing, so noise was not a consideration.

Diagram 1: Nibe Sound Pressure Levels



Air/water heat pump		*F2040-6*	*F2040-8*	*F2040-12*	*F2040-16*
Sound power level* According to EN12102 at 7/45 (nominal)	L_W(A)	50	54	57	61
Sound pressure level at 2 m free standing.*	dB(A)	36	40	43	47
Sound pressure level at 6 m free standing.*	dB(A)	26.5	30.5	33.5	37.5
Sound pressure level at 10 m free standing.*	dB(A)	22	26	29	33

Timing:

This project was partly funded through the Next Generation Fund. Our project launched in the spring of 2020. A combination of COVID lockdown, finding our first community building and then mobilising teams during lockdown meant that progress was slow for the first 4 months of this project.
We had an agreement in principle with Devas by June 2020 but to and throwing with the Trustees and lawyers took a further four months.

While those negotiations were proceeding, albeit slowly, CREW's comms team started work on planning the community share offer. Writing the share offer took a couple of months but achieving the Standard Mark extended this process greatly. We launched the share offer in December 2020 and raised just over £30k from the local community. Thanks to the Standard Mark we were able to apply for match funding from the Community Booster scheme. CREW closed our fundraise on Jan 31st 2021 and requested installation from our install partners, Green Square Renewables (GSR).

The next month was then spent chasing GSR for a start date with the end of the RHI (March 31st 2021) in mind. GSR finally came on site on March 15th with an ambition to complete the installation by the end of the Month. By this time, we had decided to request an RHI extension as a precaution as we were losing faith in GSR. We applied for the RHI extension in March 2021 and this was duly granted until September 2021 and subsequently extended until March 2022 and March 2023 by OFGEM.

The project hit delays due to the complexity of the installation. The system had to be designed to run in a bi-valence with the current gas boiler and the addition of the two 1000 litre storage tanks, which also added complexity. COVID and Brexit caused further delays in kit supply. The installation was eventually completed in June 2021. As the system does not provide hot water there was likely to be no demand over the summer.

We went back on site at the end of September to find that the heat meter had not been connected to the power supply. We chased GSR and finally they came back in late November to remedy the problem. We checked in on the site in the first week of December only to find the heat meter was still not connected. At this point we found out that GSR had gone bust. So we engaged with a third party heating company to help us resolve the outstanding issues. As the heat meter was not live we were unable to complete our RHI forms and missed valuable income from both the RHI and the heat charges to Devas Club. Thankfully we budgeted for issues such as these in our fundraise and have enough money to cover the first three years of debt repayment. The RHI application was made over the Christmas 2021 period. It seems pointless to spend too much time on the RHI application process as it now defunct but we will say that it was a difficult form to complete, the software was glitchy but the staff were helpful when issues arose. If you are going to tap into the RHI's replacement scheme, the Boiler Upgrade Scheme, budget plenty of time for the application.

Benefits:

The biggest driver for any heat pump project is carbon saving. It is hard to think of any other technology that gives as much bang for your buck. You are likely to save only half the amount of carbon, spending the same amount of money on solar PV. This is important when considering the great reduction of subsidies for commercial projects. Many community projects will be funded by grants in the coming years. Most of these grants will come from local authority CIL or S106 funding. As these councils start to panic about their lack of progress in hitting their zero carbon targets, their community investment will become more targeted on projects that cut carbon. Heat pump projects can offer large carbon savings and improve local air quality compared to other investments.

- Our project will save Devas 17 tonnes of carbon in year one.
- It was projected to save Devas £900 on its heating bills per year.
- It is projected to save 149 000 kWh of gas flue emissions including particulate matter, nitrous oxides and carbon monoxide.

- This was London's first community heat pump project and this has led to CREW supporting three other London groups as they start the journey into renewable heat. We are working with PUNL on a civic centre, Repowering on a school and a civic centre and One Stone Grove on their own building.

Cost and Funding:

The cost of the heat pump installation was £42 000 for 4 16 kW heat pumps. The storage tanks were a further £2400 but these were covered by the Next Generation budget as a piece of innovation work.

CREW raised £50 000 for this project via its community share offer, giving us a buffer for overruns and to cover the costs of interest payments for the first two years of the project.

For CREW to be able to afford the debt repayment and interest (which has been set at 3% in our share offer) we needed the RHI and a heat usage payment from Devas club. The heat payment is currently set at 1.5p per kWh and under the contract this price is index linked to CPI. You can see from the cash flow model below that despite these two payments the economics are still very marginal. Factors that improve this model are a period of higher inflation (as we are now experiencing) and if the centre starts to run its fan coils in cooling mode through the summer, so increasing demand.

With the RHI gone and the new BUS a small grant for installs up to 45 kw only, new projects will need to be chiefly funded with further grants and perhaps some pay as you save investment from the building owners. The economics of running a heat pump compared to gas should improve over time.

Table 4: Cash flow model

	RHI Income	Client charge	Repayment	Debt	Interest	O&M	Cashflow	Acc Cashflow
		0					-£43,268.20	
1	£3,741.39	£2,235.00	£0.00	£50,000.00	£1,500.00	£100.00	£4,376.39	-38,892
2	£3,816.22	£2,279.70	£0.00	£50,000.00	£1,500.00	£102.00	£4,493.92	-34,398
3	£3,892.54	£2,325.29	£2,777.78	£47,222.22	£1,416.67	£104.04	£1,919.35	-32,479
4	£3,970.39	£2,371.80	£2,777.78	£44,444.44	£1,333.33	£106.12	£2,124.96	-30,354
5	£4,049.80	£2,419.24	£2,777.78	£41,666.67	£1,250.00	£108.24	£2,333.02	-28,021

6	£4,130.80	£2,467.62	£2,777.78	£38,888.89	£1,166.67	£110.41	£2,543.56	-25,477
7	£4,213.41	£2,516.97	£2,777.78	£36,111.11	£1,083.33	£112.62	£2,756.66	-22,720
8	£4,297.68	£2,567.31	£2,777.78	£33,333.33	£1,000.00	£114.87	£2,972.35	-19,748
9	£4,383.63	£2,618.66	£2,777.78	£30,555.56	£916.67	£117.17	£3,190.68	-16,557
10	£4,471.31	£2,671.03	£2,777.78	£27,777.78	£833.33	£119.51	£3,411.72	-13,146
11	£4,560.73	£2,724.45	£2,777.78	£25,000.00	£750.00	£121.90	£3,635.51	-9,510
12	£4,651.95	£2,778.94	£2,777.78	£22,222.22	£666.67	£124.34	£3,862.11	-5,648
13	£4,744.99	£2,834.52	£2,777.78	£19,444.44	£583.33	£126.82	£4,091.57	-1,556
14	£4,839.89	£2,891.21	£2,777.78	£16,666.67	£500.00	£129.36	£4,323.96	2,768
15	£4,936.68	£2,949.04	£2,777.78	£13,888.89	£416.67	£131.95	£4,559.33	7,327
16	£5,035.42	£3,008.02	£2,777.78	£11,111.11	£333.33	£134.59	£4,797.74	12,125
17	£5,136.13	£3,068.18	£2,777.78	£8,333.33	£250.00	£137.28	£5,039.25	17,164
18	£5,238.85	£3,129.54	£2,777.78	£5,555.56	£166.67	£140.02	£5,283.92	22,448
19	£5,343.63	£3,192.13	£2,777.78	£2,777.78	£83.33	£142.82	£5,531.82	27,980
20	£5,450.50	£3,255.97	£2,777.78	£0.00	£0.00	£145.68	£5,783.01	33,763

Factors that will start to make heat pumps cheaper than gas and that should be considered in an economic model:

- The ever improving efficiency of new heat pumps
- The decarbonisation of Asia from coal to gas will make gas prices increasingly volatile. The last price cap saw gas prices rise 66% compared to only 25% for electricity.
- Gas as we see currently has huge political risks attached.
- The current one way bet on carbon prices will also underpin the wholesale gas prices..
- The Government’s stated aim is to move legacy green levies from electricity to gas from 2023. This is 0.78p in total, so a 1.5p swing from electricity to gas
- The government has already moved the inflation factor on these levies from electricity to gas. That is currently 0.104p p.a.

- The public's dawning realisation that gas boilers are unreliable as they cost almost as much to maintain each year as they do to run. Which? suggests that the average household with boiler cover pays £278 p.a. Community buildings have to pay a few hundred pounds each year for gas safety checks alone.
- By exiting gas a building is not only saving on maintenance and safety checks but also a second standing charge which can be several hundred pounds per year. As more households and businesses move away from gas the cost burden on maintaining the network will fall on fewer and fewer customers. This will be reflected in higher standing charges.

Unexpected / Unplanned Events

- COVID caused all kinds of issues from building access, to staff absence through to equipment delivery delays. These delays led to the need for an extension to the RHI and the subsequent headache that caused.
- GSR being poor communicators certainly made the project more challenging and did not allow us to plan everything in the way we would have liked.
- GSR going bust, while not entirely unexpected, certainly caused headaches with hand over , finalising the install and teething issues.

Challenges

- Dealing with GSR was our biggest challenge. They were non-responsive to emails and calls. The more we discussed projects with consumers and commercial businesses, non-responsiveness seems a theme across the industry. The install took months not weeks and communication was poor from their management team. We also did not get the handover that we expected (probably because they were in the process of going bust). Saying that, the engineers were very good and managed an extremely neat job.
- The RHI extension was stressful as initially BEIS were inundated with requests and the budget was maxed out. On review many projects were unlikely to proceed and this budget was clawed back. Thankfully CREW was subsequently awarded an extension. Our advice in scenarios where a subsidy is ending is the following:
    - Never have a project that is six months from the end of a scheme.
    - If you do end up in such a crunch, request an extension at the earliest opportunity.
- Another issue we are still grappling with is how to integrate the heat pumps (4 x Nibe 16k 2040s) with the incumbent building management system. Currently, the heat pumps are deciding when to run and when to switch to the gas boiler. This has demoted the impact of the BMS to localised radiator controls only.
- Government vacalliation over energy policy and extensions certainly caused and continues to cause issues for the renewable heat sector

- The OFGEM RHI application process was convoluted and the software incredibly bug ridden. It was not uncommon for the software to crash on a page over and over again, to the point where you would give up for a day or two and then try again, Only to crash two pages on. Our guess is the BUS system will be no more robust, so be prepared.

Communal Heating Case Study

Finding a site

The second part of our next gen project was the aim to develop a communal heating solution for a block of flats. Finding a site, CREW started by approaching Islington (LBI), Wandsworth (LBW) and Merton (LBM) Councils about providing CREW with a site to install a communal heating system. Islington was initially favourable when we were dealing with the climate action team and we identified a potential site for either ground source or air source heat pumps at the Harry Western Estate.

We received indicative pricing for a ground array of £16 000 per flat from Kensa. At these prices we realised that the commercial RHI would not be enough to cover a community share offer. So we looked at pricing for ASHPs and received indicative pricing from Green Square of £7500 per flat. A level where RHI could cover a community share offer. Our research found that on average clients were being billed for 18 500 kWh of gas consumption p.a. from the incumbent communal system. This seemed very high when we compared to the deemed demand found on their EPCs, which was typically 8000 kWh. When we highlighted this to LBI, they decided to make the Harry Weston Estate a priority for their own team and took the project away from us.

We then approached Merton Council but they have sold their housing stock, so they introduced us to the two largest social housing providers in the Borough, Clarion and Moat. Alas, our attempts at engagement were unsuccessful and it was made clear that the HA's would not work with a community group on such projects.

Next, we tried Wandsworth Council and we had initial positive noises from the climate action team but once they approached the housing teams we hit a brick wall. I think for LBW, there were three factors they held them back:

- It was too early into the climate action plan for them to get on board.
- Mixed tenancy was also an issue for LBW with around 40% of their housing stock in the hands of leaseholders. This will be a major issue for many LA's when considering upgrading to renewable heat.
- Finally, the thorny issue of tendering raised it head and at the time and even know London councils generally seem to struggle with this issue

Eventually, we stumbled upon Bennets Courtyard, where the leaseholders were in the process of buying the freehold and they reached out to CREW about upgrading their lighting to LEDS. The conversation developed from there.

Bennets Courtyard Case Study

Bennets Courtyard is a site of three blocks containing a total of 52 flats. As stated, the tenants association was in the process of buying the leasehold. The property also had the benefit of being sited alongside the Wandle River, giving us the option of a water to water system. The building is currently electrically heated with storage units.

We arranged a meeting with the residents association made up of six of the leaseholders. They were all in favour of switching to heat pumps, although there was a debate about how to finance the project. We discussed two options, debt finance with the RHI or equity financed with the RHI. A community share offer was never considered as these are privately owned flats. The RA decided their preferred approach would be to finance the project themselves and for those that could not afford the investment, the RA would step in and finance their portion and clawback payments over time through maintenance charges. The cost of running the heat pumps would also be levied on the maintenance charge and this would be apportioned depending on the size of each property. At the time we were looking at replacing the lighting with LEDS. As the lights are all on 24 hours a day we worked out the combined measures would lead to only a very small increase in communal energy costs. Personal energy costs of each resident would fall dramatically from switching from 1:1 storage heating to renewable heat.

With the framework of a way to proceed in place we invited Iso Energy onsite to evaluate two systems: air to water and water to water. They came back with the following estimated heat load.

Block	Estimated Heated Internal Area of flats only (m^2)	Estimated Specific Heat Load (W/m^2)	Estimated Peak Heat Load (kW)	Estimated Total Annual Energy Usage for Spatial Heating & DHW (kWh)
1	1,445	50	73	160,000
2	570	50	29	63,000
3	1,150	50	58	127,000
Total	**3,165**		**160kW**	**350,000**

The proposed options

Option 1 Water Source Heat Pump: The heating and hot water loads of the property could be covered by 3 x 60 kW ground source heat pumps connected into 2 x 1,000 litre domestic hot water tanks and a 1,500 litre heating buffer tank. In this case, when considering a ground source heat pump solution, the availability of a water source on the property presents the opportunity to collect heat from the running water. This is the most cost and space efficient method of collecting heat. We proposed installing nine banks of EnergyBlade river heat exchangers in the river to the west of the property.

For those wondering what an energy blade looks like here is a photo:

Option 2: Air Source Heat Pump: The heating and hot water loads of the property could be covered by a 2 x 103kW air source heat pumps connected into 2 x 1,000 litre domestic hot water tanks and a 1,500 litre heating buffer tank.

The table below gives a relative breakdown of costs.

Cost breakdown

	WSHP	ASHP
Product Costs	£151 370	£115 600
Contracting services	£56 600	£37 100
Plant Room	£15 220	£15220
Estimated M&E costs	£256 000	£255 000
Total Install cost	£479 100	£422920
SPF	400%	300%

ISO gave CREW the M&E costs for the internal works purely as a guide. Further research suggested these costs would be closer to £150k after consulting with a local M&E company. We also expected ISO to sharpen their pencils when it can to tendering for the project so we modelled on costs of £350 000 for the WSHP and £300 000 for the ASHP.

The table below shows the energy savings based on an 18p power tariff. At the time we were modelling on 13p per kWh (wow, it was a different time). We were seeing savings of £40k and £36k at these lower prices for the WSHP and ASHP respectively.

Option	Total Heat Generated kWh	Fuel Cost saving p.a.
WSHP	350 000	£47 250
ASHP	350 00	£42 000

The project then hit a roadblock when the freeholder announced they were planning to add two floors to the building. This would inflate the cost of the freehold and create major upheaval for the residents. This brought the project to a halt as the RHI window closed.

While we were waiting for planning to decide the fate of the extension, CREW looked into the possibility of using the Green Homes Grant to cover some of the costs of the project. We approached BEIS about using the GHG for a communal system and they said no. When we pointed out that they were treating single dwelling and multi dwelling differently they still said no. We got tremendous support lobbying the Government from the CSE and CAG but it was still not enough to move the dial.

Beyond the inequity of treatment, this approach creates major issues. Firstly, flats are unlikely to be permitted to install 52 individual heat pumps on the sides of a building from both noise and aesthetics perspective.

Secondly, the cost would rise dramatically. We estimated installing 52 individual heat pumps would cost £416 000. M&E cost would fall slightly to £ 125 000 but overall cost would be 80% higher and certainly not economic.

Thirdly, the design would be building in massive over capacity with a peak supply of 312 kW. Virtually double the peak demand of 160 kW required. This approach could also have implications for grid connections.

With rising energy prices the economics of converting electrically heated flats to heat pumps becomes ever more attractive despite the lack of support from the new Boiler Upgrade Scheme. Based on a flat rate of 28p, residents could now be saving between £65-73.5k depending on technology. Based on our £300k estimate that could be as little as four year payback. We know we can expect a further 40% hike in prices in October 2022 and this will only further support the uptake of renewable heat.

Option	Total Heat Generated kWh	Fuel Cost saving p.a.
WSHP	350 000	£73 500
ASHP	350 000	£65 310

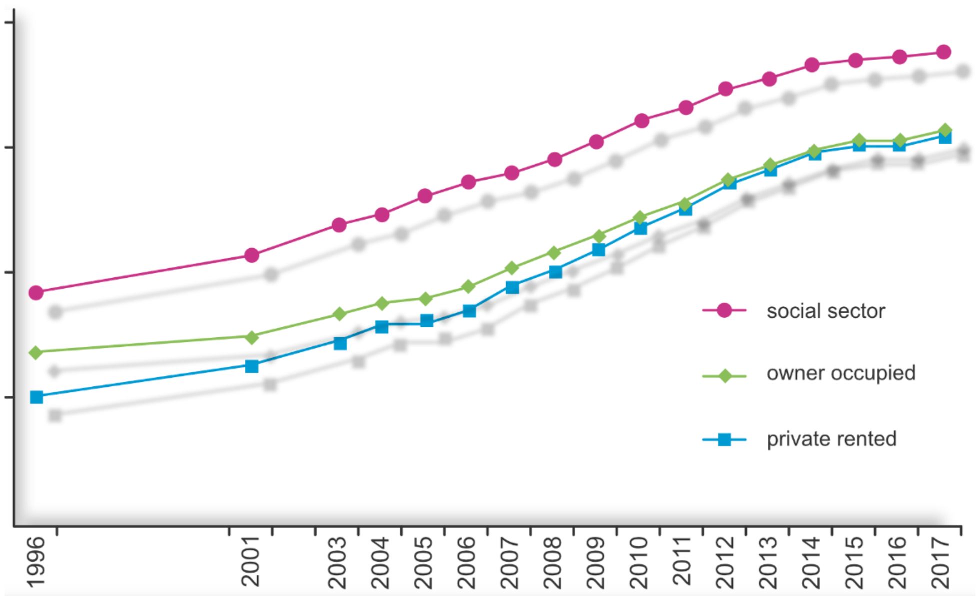
Conclusions

CREW believes community energy is well suited to these communal heat projects either as project lead or as community engagement officers. There is a lot of engagement needed to sign up multiple householders to a scheme. Then there is the EPC assessment work required for potential grants (BUS will offer £5k for projects up to 45kw) and heat loss analysis for the design work. That is a large amount of admin that landlords do not have the skill sets for and heat pump installers do not have the time for. CEGs have the skills, the engagement expertise and the resources to develop these projects.

Funding remains a challenge. If only BEIS saw sense and offered even reduced BUS support to smaller communal schemes a lot of people could be lifted out of fuel poverty.

Something else that CEGs should consider, that is on the near horizon, is the likely change in regulations for all commercially rented properties to be SAP C by 2025. While this does not include social housing it will be hard for them to ignore these regulations. The Chart below shows how the social sector has always led the way in improving home standards.

Most properties that are electrically heated will not be able to achieve SAP C without a move to heat pumps. This could be an excellent opportunity for CEGs to support LA's, social landlords and the private rental sector in the development of these retrofit projects.



Home Carbon Audit

Next Generation also provided CREW with funding to train two people to become domestic energy assessors and retrofit assessors. Our plan was to develop a B2C offering for the able to pay market. CREW often runs stalls at community events or pop up energy cafes and we are always approached by people looking for support in retrofitting their homes. This could be insulation, solar PV, smart heating controls and increasingly heat pumps.

Next Gen provided us with funding for training, developing an offering and marketing budget to promote the service. We came up with what we called CREW's Home Carbon Audit (HCA). A 15 page document that assesses your home for retrofitting and also includes data on lifestyle including diet and travel. The screenshot below gives an illustration of the report

Your Annual Energy Summary

Your house currently consumes: **9,344 kWh** of electricity; **23043 kWh** of gas

This is equivalent to: **5.47** tonnes CO2; **~133** trees

	Energy Used (kWh)	Annual Spending (£)	Carbon Footprint (Tonnes of CO_2)
Space Heating	20163	£603	4.4 Tonnes
Hot water	2880	£94	0.6 Tonnes
Electricity	9344	£1565	0.47 Tonnes (Green Tariff)
TOTAL	32,387	£2262	5.47 Tonnes

By implementing energy efficiency measures and moving to renewables you could get down to **0.23 Tonnes of CO2**

CREW sees the HCA report as a lead generator for our other services. So far, we have picked up two domestic heat pumps projects from this service. In total we have assessed 12 private homes and 40 properties for a private landlord who wants to get to SAP C this year. We are speaking to two residents associations and have a pipeline of 20 private clients. We have also branched out into the commercial sector and we are working with a doctor's surgery and a rugby club.

SW London has around 900k properties that will also need to be assessed on route to 2025, 2030 and 2050 targets. Products like CREW's HCA will be a vital part of achieving those targets.

CREW's Domestic Heat Pump Service

After our Bennets Courtyard project ran aground, Next Generation allowed us to pivot (NG are very flexible in this regard) to research developing an offering for the domestic market. CREW ran a webinar for local residents extolling the virtues of heat pumps and myth busting some of the concerns about these products. We were amazed by the interest in this subject and 100 people signed up to the event. At that point we knew we were onto something.

We already had the two HCA staff trained up as retrofit assessors, so we decided to up-skill them to be able to carry out heat loss calcs. So we could offer new EPCs and heat loss analysis to potential clients.

The next step was for us to find a MCS accredited installer who would be willing to manage the design work and MCS accredit the system but allow us to manage the installs.

We approached three companies. Your Energy Your Way is CIC with an excellent reputation. Alas, they only do end to end projects. We also spoke to Optimum Energy Solutions, who managed the heat loss training for one of our RAs. We felt their South Wales location would create issues and lead to delays in accreditation. Polar Planet are based in Goring-On-Sea just 75 mins from SW London and they were willing to offer a design and MCS accreditation service for between £800- £1000 depending on the work they are required to do and how much we can optimise their visits to London.

With the MCS component covered, we then started looking for local heating engineers that we could train up. This proved surprisingly difficult. The majority of heating engineers we approached said they were so busy they did not have time to consider our proposal. Others fell by the wayside when we met them or after we checked out their TrustPilot and Google ratings. Finally we found Switched On, a local firm based in SW18 who have a 4.9 rating with Google and 100% rating on Trust pilot. They went on a training course with Polar Planet's preferred supplier, Mitsubishi and are now ready to start installing.

CREW will earn fees from assessment work and a portion of the discount on the heat pumps (19% is a typical supplier discount).

We have our first two projects in the pipeline and have interest from 4 more local residents.

CREW is also looking at offering a service to installers who may be short of resources and would prefer to outsource heat loss assessments and EPC work to a third party. We see this as a way to keep our assessors utilised, generating additional income and broadening our client base for our other services.

Our view is that the domestic heat pump market will remain in the early adopter phase for some time, especially in towns and cities where space and noise are major considerations. People have certainly become aware of heat pumps in the two years we have been in the Next Generation programme but most remain sceptical.

Residents have grown to accept unreliable gas boilers and accept their high maintenance cost (the average household on a maintenance contract pays £278 p.a. For boiler servicing) and the fact they break down every time it gets cold. There is still a lack of knowledge about the environmental impact that boilers have on climate and local air quality.

BEIS' decision to load all of the utility bail out costs and increased warm homes budget onto the electricity standing charging is damaging. As is their delay in moving historical carbon charges from power to gas. CREW estimates that this 0.75p shift (a 1.5p swing) over time plus the inflation factor moving from power to gas could result in heat pumps being £350 relatively cheaper by 2030.

Clearly the spike in gas prices through 2022 is favouring heat pumps. In the April price cap rise , power prices rose 25% while gas went up a whopping 66%. We can expect something similar in the October 22 round.