



SOLAR SOLUTION ASSESSMENT LONDON BOROUGH OF HACKNEY

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Introduction

BACKGROUND

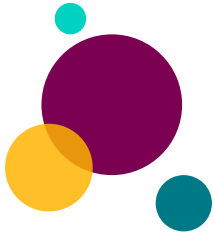
- 1.1. Hackney Council has set an ambitious goal to fully decarbonise its estate by 2040. As part of this, set out in the Council's Net Zero energy strategy, a major role has been identified for the deployment of solar PV. This deployment is envisaged to play a central role in enabling the council to eradicate emissions from the 50GWh of electricity it currently procures.
- 1.2. Solar PV can also play an essential role improving the energy performance of the homes owned by Hackney, plus the new homes Hackney expects to have constructed by 2040. The council's ability to deliver such improvements will be important as the UK continues the journey to Net Zero emissions and social homes are required to meet increasingly high energy performance standards. Similarly, for homes built from 2025, substantial performance standard increases will need to be met.
- 1.3. While the roof space of the Council's homes holds the potential for a sizeable overarching deployment of new solar PV, the council has yet to find a viable business case for the investment. Hackney does not need to make a profit from any PV deployed, however for installations to be viable is seeking to recover any investment it makes, and partially cover staff costs involved in the delivery.
- 1.4. A previous study undertaken for the council by Syzygy investigated the solar PV business case for Hackney's residential buildings, where the generated solar electricity would be used to power electrical loads that are the responsibility of the council – i.e. primarily communal electricity needs, like lighting and lifts. The resulting business cases indicated a low financial return on the investment required. However, the study and resulting business case, assumed that only a small proportion of the generated electricity would be used on a site, while the bulk is exported to the grid. This limits the financial return gained from the locally generated solar electricity. This is because the income that can be gained from exporting a unit of solar electricity, linked to the wholesale market price for electricity, is far lower than cost of buying electricity to be used on the estate. In other words, using a higher proportion of the solar electricity generated locally, rather than exporting it while at the same time paying for power for the Estate, through normal routes reduces the potential saving and would most likely result in a stronger case for investment. Reducing the amount of electricity that must be imported from the grid is preferential as retail costs of electricity are much higher than the export price that can be achieved (7p vs 35p). The Syzygy report suggests that on average just 30% of the generated solar electricity might be used on site.
- 1.5. The Council has become aware that some companies, such as Emergent, are promoting solutions that could improve the business case for residential solar by using the generated solar electricity to meet residents' electricity needs, thereby increasing the amount of solar electricity that is used on site. The Council has commissioned a new feasibility/business case assessment that will build on the outcomes of the Syzygy report and identify the preferred route for installing solar PV

on Hackney's housing estates.

- 1.6. DG Cities have been commissioned to conduct a market assessment on potential solutions that would increase on-site usage of electricity produced. DG Cities have previously conducted work similar to this for the Royal Borough of Greenwich where we appraised several approaches to increase on-site electricity usage of solar PV implemented on an estate in Greenwich. This report will draw heavily and build on this study, identifying and evaluating potential models which could strengthen the case for investment for residential solar on Hackney estates by using the generated solar electricity to power residents' electricity needs, thereby increasing the amount of solar electricity that is used on site.
- 1.7. Currently, if Hackney installed solar PV across its estates, this energy would only be used for communal spaces, with the remaining energy being exported back to the grid at low prices. This approach does not provide a strong or viable option for return on investment, nor does it benefit the residents of the estate.
- 1.8. If seeking to implement solar PV across its estates, Hackney Council would benefit from procuring a solar sharing solution to distribute energy produced between its residents. All models available would provide cost savings to residents; however, some models would also provide a return on investment for the Council, which is central to this market assessment, indicated by Hackney.

AVAILABLE MODELS

- 1.9. An important element of the work has been to understand the different models available from providers that enable power to be used on site. DG Cities have engaged with several providers regarding different models that would implement a solution to bring financial benefit to residents from solar PV on site:
 - Energy local club (Energy Local)
 - Peer-to-peer energy exchange (Urban Chain)
 - Solar sharing microgrid (Joju Solar)
 - Solar microgrid (Allume SolShare)
 - Private wire microgrid (Emergent Energy)
- 1.10. Each model and provider offers a varied approach which is identified in the following sections of the report.



Energy Local Clubs (Energy Local)

APPROACH

- 2.1. Energy Local, a Community Interest Company, has designed a means for local people to benefit from local energy through Energy Local Clubs. This enables households to join together and use local, clean power when it is generated. A better price is agreed for local generators and residents reduce their bills.

HOW IT WORKS

- 2.2. Households and small-scale renewable generators would form an Energy Local Club (ELC) - legally a Co-op. Members (households and generators) would agree a price ("match tariff") that will be paid to the generator when they match their electricity use to where electricity is generated locally. This match tariff is lower than the standard tariff, but more than the generator would receive through their PPA (Power Purchase Agreement).
- 2.3. The Club chooses a partner energy supplier (Octopus or Green Energy UK) that sells the consumers the extra power they need when there is not enough local electricity generated, and buys excess locally generated power through a PPA. The supplier sends each household the bill for their total power use.
- 2.4. As an Energy Local Club member, electricity consumption is measured in half-hour blocks, and the amount used each half-hour is compared to the amount produced by the local generation in the same period. For example, between 2:30pm and 3pm, a resident might run the clothes dryer and listen to the radio, using 1-kilowatt hour (kWh) of electricity. Over that time the electricity generated by the local generation is shared between everyone consuming power. A resident's 'share' of the local generation will be different at different times, according to the amount being generated and the number of users. When a resident's electricity use (measured by the half-hour) is greater than their share of the electricity being generated by the solar, they will buy this extra electricity from the supplier. The price of this extra electricity will be different at different times of the day, and will be confirmed when switching suppliers alongside timings of the tariffs for the non-local electricity.
- 2.5. The site will need a half hourly, three phase import/export meter and to be connected at low voltage, plus the implementation of solar PV equipment.

RESIDENT REQUIREMENTS

- 2.6. Interested residents would need to complete an Expression of Interest on the Energy Local website and fill in all details to be considered for the scheme. Energy Local will then 'match' them to the local club and start the process of switching their electricity supplier.
- 2.7. Each resident that participates in the scheme will have a smart meter installed. The smart meter will show the resident when they are using power as well as how much. This means that they can see that their using power when the solar is producing it and match it together helping to reduce their electricity bills. Currently,

this solution does not work with pre-payment meters.

- 2.8. Energy Local have identified and provided potential costs for this project. At this stage, the costs identified are approximate and are subject to change.
- 2.9. It is estimated that this solution would cost an estimated £5,500 plus VAT for each estate, which includes the advisor initial training and all materials and resources be will required to facilitate the setting up process.



Solar Sharing Microgrid (Joju Solar)

APPROACH

- 3.1. This approach involves sharing the benefit of the solar panels between the residents. Instead of residents each having their own supplier, the landlord (or new group) would buy all of the electricity for the block and sell this, along with the solar energy, to residents as needed.

HOW IT WORKS

- 3.2. A new supplier would be set up, this could be the council, or a new group potentially run by a committee of residents. Alternatively, it could be a traditional supplier if they are willing to offer the service (which would make it similar to the Energy Local solution). This new group purchases all electricity on behalf of the block, and sells it to residents along with the solar energy produced on site. In terms of payments, this falls under exemptions and the Council will not face the issue of becoming an electricity provider. As long as the council does not make a profit on this then it is sufficient to fall under exemptions, however this eliminates the ability to deliver a strong investable business case.
- 3.3. A new distribution board would need to be installed in each block for residents wishing to switch to the scheme, plus the implementation of solar PV equipment. Residents wishing to sign up would also have to have a new meter installed.

RESIDENT REQUIREMENTS

- 3.4. In order to sign up, residents would need to switch supplier to a new 'community supplier/TMO' who would be responsible for buying the electricity on behalf of the estate. The cost will be less for residents, but they will no longer have direct dealings with a traditional supplier. Rather, they would liaise with the new 'supplier'. This could be the Council, or a new group perhaps run by a committee of residents. Alternatively, it could be a traditional supplier if they are willing to offer the service.
- 3.5. Joju Solar have identified and provided potential costs for a small residential block. At this stage, the costs identified are approximate and are subject to change. The cost for a new distribution board and connection would be approximately £2,500 per residential block, assuming they have not already been fitted. Also, new meters for each flat would approximately cost £200 to supply and fit.



Peer-to-Peer Exchange (UrbanChain)

APPROACH

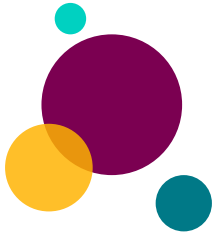
- 4.1. UrbanChain's approach involves a peer-to-peer energy exchange to increase the energy provision efficiency and divide the value between generators and consumers.
- 4.2. The concept of peer-to-peer is also known as a shared economy, and it is typically implemented in a local grid system. Peer-to-peer energy trading typically involves a group of participants, including generators, consumers, and prosumers. Peers buy or sell energy directly from each other without intermediating conventional energy suppliers.
- 4.3. UrbanChain's solution would allow for the energy generated by the solar PVs on residential buildings to be used by the residents (at a pre-determined cost) or if there is excess to be 'shared' with other users of the UrbanChain network (and be purchased by them). If there is a shortfall in generation, other generators within the network will share their supply with the Hackney residents. Energy would be purchased from the grid at time when there is no sufficient generation across the UrbanChain network and passed on to consumers at cost.
- 4.4. This solution would allow residents to see reductions in their energy bills, however would not act as a return in investment for the Council.

HOW IT WORKS

- 4.5. Urban Chain put the solar power generated into a Virtual Power Plant (VPP) and offer it to residents on the estate, other UrbanChain consumers, or alternatively trade the power to the market. Urban Chain access the half-hourly data from both generators and consumers, then profile and match them on HH basis.
- 4.6. Once registered, the generator (which in this case could be the council) become an active trading player with a half-hourly export meter(s). This would enable the council to provide energy to consumers.
- 4.7. The infrastructure required for this solution is the installation of half-hourly meters for each resident, plus the implementation of solar PV equipment.

RESIDENT REQUIREMENTS

- 4.8. For residents to access the network, they would need to switch to UC Energy, a supplier owned by Urban Chain, as their new electricity supplier. Once this has occurred, residents would receive their energy bills as normal and start to see any benefits from using cheaper solar energy generated on the estate.
- 4.9. Urban Chain have identified and provided potential costs for this solution At this stage, the costs identified are approximate and are subject to change. There is zero cost to install half-hourly meters at the site, plus the peer-to-peer agreement will not have any upfront cost. However, there will be a cost of £10/MWh on traded volume between generators and consumers.



Solar Microgrid (Allume SolShare)

APPROACH

- 5.1. This solar microgrid solution is able to supply residents and the landlord directly with energy produced from the solar PV on-site.

HOW IT WORKS

- 5.2. The solution uses a Power Division Control System (PDCS). The function of a PDCS is to share a single source of energy generation to multiple, separately connected units, behind the meter, while conforming to all safety and network regulations.
- 5.3. A PDCS is a device used to control the division of alternating current (AC) from a single supplementary power source to multiple loads, each of which have a parallel supply from the electricity grid. The most common usage for the SolShare is to be supplied power by a grid-connected inverter as part of a rooftop photovoltaic (PV) system on a multi-unit building like an apartment building or multi-office/retail building.
- 5.4. The SolShare delivers AC energy from this shared power source downstream of a unit's electricity meter, and monitors each unit's power draw from the electrical grid to inform the distribution of AC energy among the connected units.
- 5.5. When installed in conjunction with a PV system, a PDCS sits on the AC-side of a grid-tie inverter and connects to multiple, independent units on the load side of their retail electricity meter.



- 5.6. The solution allows the energy produced by the on-site solar PV to be distributed behind the meter to separately metered units. The system monitors everyone's

energy usage and distributes solar energy evenly over the course of a month. The distributor connects to each circuit behind their own existing smart meter. Its installation requires no change to the existing electricity metering infrastructure or energy providers.

- 5.7. The solution measures the quantity of solar that's been delivered to each apartment and over the course of each month, ensures that the connected units receive the same amount of solar as the others. This means that even if one resident is a high-energy user, everyone will still receive the same solar benefit as them.
- 5.8. This approach means PV on-site consumption will be higher which would limit the amount of solar that is not used and exported at a lower value.

RESIDENT REQUIREMENTS

- 5.9. Residents would not be required to switch energy supplier to sign up to the solution. Every connected unit must have a smart electricity meter. If a apartment doesn't have a smart metes, Allume will be able to guide residents through upgrading. Residents can also contact their energy retailer directly and upgrade the meters in advance.
- 5.10. This solution requires significant investment and additional hardware installation at the implementation site. Furthermore, this solution does not provide the option of a return on the solar investment.



Private Wire Microgrid (Emergent Energy)

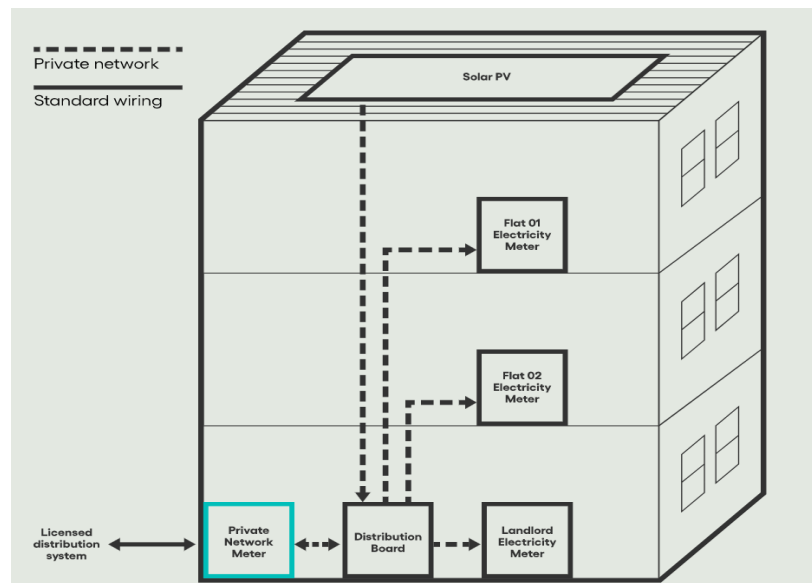
APPROACH

- 6.1. Emergent Energy's approach is to supply locally generated solar PV directly to residents using a private wire based microgrid. This solution has been successfully demonstrated across nine sites with three councils, including Gateshead Borough Council, Brighton & Hove City Council and Nottingham City Council. Emergent Energy's solution is focused on turning solar PV into a commercially viable investment for homes.
- 6.2. Emergent Energy's approach is based on the development and operation of private wire based microgrid schemes, in which electricity generated from solar panels installed on residential properties is sold directly to residents of those properties. This maximises the amount of solar electricity used on site, thus significantly improving the business case versus the export-heavy approach examined through the Syzygy study. For example, Syzygy assumes average on-site usage for each tier of residential buildings in a range of 14-29%. Emergent Energy claims their current projects deliver on-site usage rates of 65%+, with the potential for this to be significantly higher on well-designed new projects.
- 6.3. The outcome of this model is the opportunity for residents to have part of their electricity supply covered by the solar panels, reducing their monthly costs. Most importantly for Hackney, the council can set the exact cost at which it sells electricity to residents, so it can be used either as a revenue generation option or as a financial support to residents. For example, if the Council set a low cost for selling electricity to residents, this reduces the revenue generated. However, if the Council set a higher price to sell electricity (but still lower than the standard electricity price), the Council could generate more revenue and receive a quicker return on investment.
- 6.4. Emergent's solution is supported by two 'Sandbox Derogation Awards' from the energy regulator Ofgem. The Sandbox is a regulatory process that allows innovators to bring new products, services, business models and methodologies to market. Emergent's Sandbox was awarded in May 2021 and will be in place for a 3-year period. This means that within this period, no other provider is able to replicate the Emergent solution and that Emergent is capped at being able to offer their solution to only 2000 customers.

HOW IT WORKS

- 6.5. All operations, commercial and regulatory risks are outsourced by the council to a platform-based solution, while the council retains control on the price at which solar is sold to residents.
- 6.6. In addition to any solar infrastructure required, a single boundary meter, plus new customers meters must be installed.

- 6.7. The addition of a single meter enables solar electricity generated on-site to be sold to residents. Small wiring alterations will be needed where the electrical supply enters the building to enable a new 'boundary' MPAN meter to be installed. This meter will meter the electrical imports and exports from the microgrid.



- 6.8. Once the microgrid is live, residents can be onboarded to the solution and supplied with locally generated solar electricity. To do so, the residents' existing MPAN electricity meters must be removed and replaced with a new smart electricity meter. Since the meters are essentially a like for like replacement there is no additional infrastructure work that needs to be undertaken except swapping the meters.

RESIDENT REQUIREMENTS

- 6.9. Firstly, the Council would engage with residents to introduce the scheme, and interested residents would be required to sign up. There is no obligation for residents to sign up. Projects conducted by Emergent Energy typically see a 70-75% sign up rate. Once a customer signs up, they need to enable a new electricity meter to be installed in place of their existing meter. The service provided to resident is 'smart pay as you go', meaning they prepay for their electricity, and can do so via a website, app, or automated phone line.
- 6.10. Emergent Energy has identified and provided estimated costs for this solution. At this stage, the costs identified are approximate and are subject to change. Emergent Energy would estimate the cost to set up the private cables would be approximately £3,000 per residential block. Plus, an estimated £200 per resident to install their new meter and onboard them to the system. Emergent Energy would also charge £100-£200/kWp to onboard the projects to their platform.
- 6.11. An alternative option to be aware of is that Emergent Energy is currently putting in place a capital financing arrangement so they can buy existing solar assets from councils. They would do so in return for the ability to retain the profits from operating schemes. This could be a potential attractive option if the Council wants to avoid any additional capital outlay, generate some income, and deliver bill savings to residents.

Solution Comparison

	Emergent Energy	Energy Local	Joju Solar	Urban Chain	Allume SolShare
Council role	Facilitating the installation of solar PV. Procuring Emergent Energy and setting the price for energy to be sold to residents	Facilitating the installation of solar PV. Any other role of the Council is unclear at this stage.	Facilitating the installation of solar PV. Procuring Joju Solar to install and set up technology	Facilitating the installation of solar PV. Any other role of the Council is unclear at this stage.	Facilitating the installation of solar PV. Procuring Allume to install and set up technology
Procurement/set-up process	Once solar PV is installed, the Council can procure Emergent Energy to begin the installation of technology and sign-up residents	Unclear at this stage	Unclear at this stage	Unclear at this stage	Once solar PV is installed, the Council can procure Allume to begin the installation of infrastructure and sign-up residents
Required partners	Energy provider	Energy provider	A new supplier	N/A	N/A
Complexity	Low complexity as hardware installation	Complex solution as households and generators would need to form a co-op	Fairly complex as a new supplier/group would need to be set up to buy all energy on behalf of the residents	Complex solution as the council would become an active trading player in a virtual power plant	Low complexity but requires disruptive hardware installation
Financial value delivered	Cost savings for residents plus a return in investment for the Council	Cost savings for residents	Cost savings for residents	Cost savings for residents	Cost savings for residents
Non-financial benefit	Implementation is not invasive	Implementation is not invasive	Implementation is not invasive	Implementation is not invasive	There is no need to switch energy supplier for residents
Risk profile	Low risk of residents unhappy with a prepay meter	This potential solution does not display enough progression and does not provide a return on investment	This potential solution does not display enough progression and does not provide a return on investment	This solution does not provide a return on investment	High risk. Large capital investment with a lack of return on investment for the Council



Recommendations

SOLUTION REVIEW AND RECOMMENDATION

- 7.1. All solutions offer financial benefits to residents, but only the solution provided by Emergent Energy creates the option for a return in investment for the Council.
- 7.2. For all solutions except Allume Solshare, there is a requirement for residents to change electricity providers, to one that is able to take advantage of the solar panels installed on the estate. The way the contractual arrangement is set up between residents and the electricity suppliers will be different for each option, but there will need to be a period of consultation with residents to understand their views on the solution and their willingness to get involved. As there will be direct financial benefits for all, it is expected that with a good messaging it will be possible to convince the majority of households to switch.
- 7.3. Between the five solutions outlined in this report, we recommend pursuing Emergent Energy further as their solution is the most off-the-shelf and hands-off solutions, and most importantly is the only solution that would allow a return on investment for the Council. Receiving a return on investment would be an essential element for Hackney Council, meaning that the solution offered by Emergent Energy is the only viable option.
- 7.4. Emergent Energy offers a technological solution of a microgrid with proven examples demonstrating savings to residents from existing pilots. It is an innovative solution being supported by the Ofgem sandbox process that currently has a cap on the number of customers who can benefit, and which has not yet been promoted in the open market. The Emergent solution is not limited to PV but instead is applicable to any residential property with on-site energy technologies including heat pumps or EV charging.
- 7.5. The solution outline by Allume SolShare can achieve a similar end result and would provide residents financial benefit, however this solution would require more hardwiring, causing more disruption and cost. Also, this solution does not offer a return in investment for the Council.
- 7.6. The solution outlined by UrbanChain is an attractive offer, using a slightly different technology focusing on energy trading across their network. From a customer standpoint, their solution would likely offer a similar resident experience and benefits as Emergent Energy. However, this solution also does not offer a return on investment as the council would have to sell the electricity at cost.
- 7.7. The solutions outlined by Joju and Energy Local are less innovative and work as a combination of either more hardware install (Joju) or more focus on building an interested community of residents (Energy Local). Whilst they offer practical solutions, they'd need more council involvement and provide less opportunity for scaling. They would also rely on the interest and support of energy providers, or the council acting in that role, adding additional complexity. Both Joju and Energy Local

would need a significant early sign-up of residents, whilst the solutions by Emergent Energy instead can be scaled from 1 to 100 users without no more than an installation of a new smart meter at a tenant's home. Both of these solutions by Joju and Energy Local would also not provide a return on investment as the council would not be allowed to make a profit due to current legislation

- 7.8. For installations to be viable, Hackney Council need to recover any investment it makes. The only model that makes this possible is the solution provided by Emergent Energy which allows the Council to distribute produced energy between the residents, and set the prices which the energy is to be sold. The Council can sell to residents substantially below the market price for electricity, saving them money, while generating a relatively high price for generated solar PV.

NEXT STEPS

- 7.9. Our recommendation is to pursue with Emergent Energy's solution, either through commissioning the organisation to undertake a costed business case for estate(s) or through a standard procurement exercise.
- 7.10. We would also recommend an early engagement to take place with residents to understand willingness to participate in such a scheme. As the success of all solutions will depend on positive resident response, this will be necessary to ensure the right proposition can be made to residents.