Bristol City Council – Electricity Sleeving Pool

Feasibility analysis

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Disclaimer: this report is a high-level feasibility assessment of a Sleeving Pool concept with the aim of identifying key issues to be further explored. The report is not intended to form part of a business case for investment. BCC should take commercial and legal advice prior to entering into power purchase agreements or contractual arrangements to establish an energy Sleeving Pool.

Overview

Bristol City Council (BCC) is looking to establish an innovative electricity ‘Sleeving Pool’ (the Pool) to secure zero carbon electricity supply for their operations and support new community renewable generation. BCC has received legal advice on the structure and design of the Sleeving Pool concept.

Figure 1 shows an outline of the Sleeving Pool concept with the main parties involved. The structure allows demand customers, such as a local authority, to sign Power Purchase Agreements (PPAs) **directly** with multiple generators and pay them for all electricity generated. All exported power from these sources of generation is then assigned to a Sleeving Pool that demand sites can draw from, either shared equally or on an agreed merit order.

The structure means that the Pool can be dynamic, with additional demand or new generation sites being added over time. The balance between the demand and generation would be managed by a licenced supplier acting as a Pool Manager.

The Pool Manager provides a key role in the Pool and they undertake two balancing processes. Firstly, generation within the Pool is shared between the different demand sites, taking account of which site has contracted and paid directly to which generator. Surplus from each PPA contract is then split between the other demand sites. The Pool Manager also meets the grid balancing and settlement obligations and uses the wholesale market to manage the imbalance within the Pool at each half hour and to sell surplus or buy shortfall.

The Pool Manager then bills the demand customers including surplus or shortfall payments and other charges and taxation.

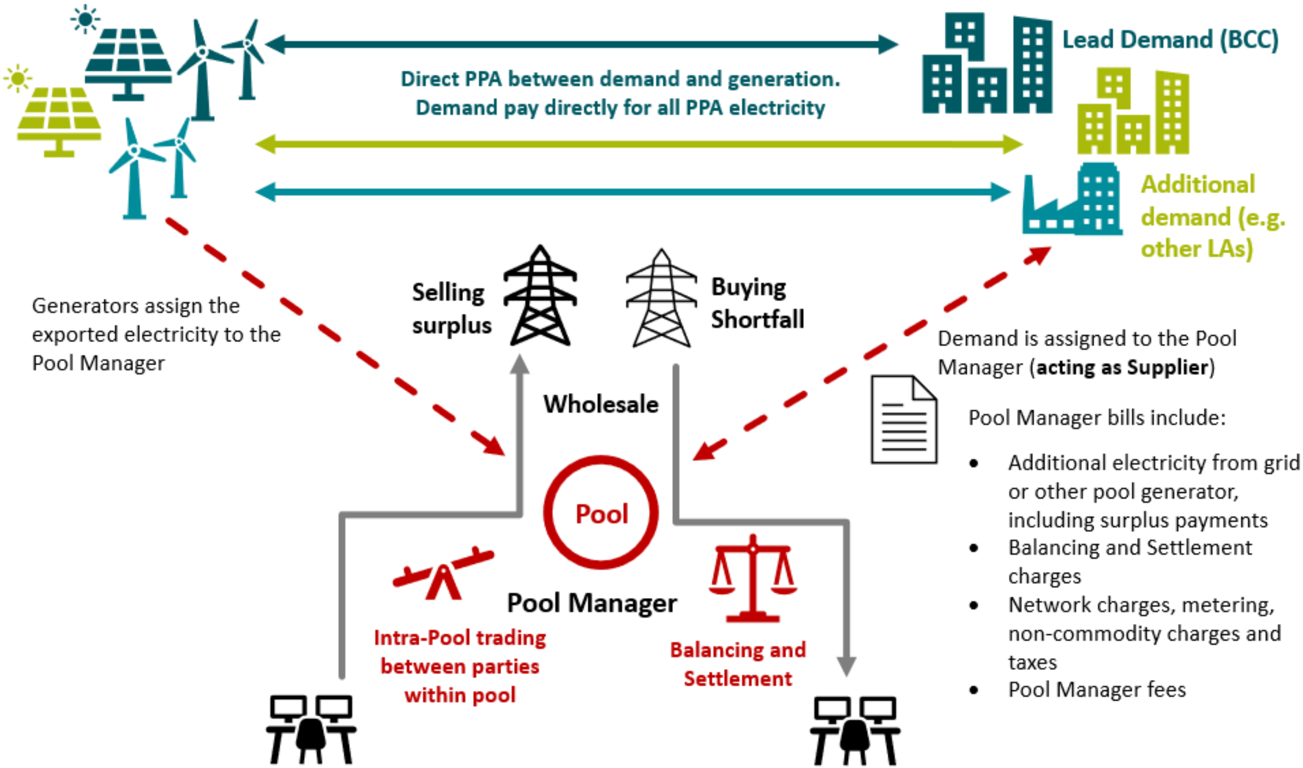


Figure 1: Example of sleeving pool operation and outline of main contractual relationships (figure produced from BCC internal documents)

Objectives for Bristol City Council

Through the Pool, BCC is aiming to simplify the process of contracting and matching renewable and low-carbon generation from a large number of generators with their many demand sites. It is anticipated that this structure could allow BCC to:

- Contract directly with renewable energy generators, including generation directly owned by BCC, to secure zero carbon electricity for their operations.
- Support the development of new community owned generation with long term PPAs (up to 20 years).
- Support a range of generation, including small domestic rooftop solar as well as larger commercial renewable energy sites.
- Achieve value for money by averaging the prices from different generation sources and including local social and economic benefit within electricity procurement.
- Allow other local authorities or demand customers to join and benefit from the Pool.

Regen has been asked to carry out a high-level assessment of the commercial and administrative feasibility of the concept and provide recommendations about viability and issues to consider in advance of BCC going out to tender for a pilot in 2021. Regen has not considered the legal or contractual feasibility of the concept which it is understood BCC have taken separate advice on.

This analysis has involved three main elements which are detailed in this report:

1. Developing the energy Sleeving Pool concept and make recommendations about governance and process.
2. Modelling the matching of demand and generation, analysing PPA costs and possible price structures.
3. Engaging with suppliers to explore the facets and scope of the Pool Manager role.

Executive summary

The research and modelling conducted for this study suggests that a Sleeving Pool could provide a viable solution to allow local authorities to directly procure and support new local energy as well as reporting net zero emissions. However, there are some key challenges and barriers that need to be addressed for this approach to work in practice.

Governance of the Sleeving Pool will be an important consideration and BCC will have a key role in signing off on the value for money of the structure, PPA prices offered and the identified projects. These decisions need to be informed both by additional social and economic benefit to communities as well as long term electricity price risk. Ahead of initiating this structure it will be important to get advice from procurement specialists about whether two stage and 'averaging' approaches to procurement discussed in this report are achievable within public sector procurement rules.

The Sleeving Pool could, in theory, be joined by more than one local authority, but this is likely to add complexity both to the governance arrangements (which will require joint local authority governance approval) and to the intra-pool trading and merit orders. It is recommended that BCC further consider how generation and demand might be matched within the Pool and implications of different approaches outlined in this report.

Most importantly, although the Sleeving Pool structure is technically feasible, there are several elements that will need to be managed carefully to ensure that the Pool is commercially viable and delivers proven value for money for BCC. Aligning the interests of the Pool Manager with the objectives of BCC will be an important element of this.

The cost of electricity managed through a Sleeving Pool arrangement for a demand customer will involve three elements: the PPA cost (paying contracted generation directly), the imbalance cost managed through the Pool (covering excess or shortfall) and the Pool Manager fees. It is vital to the feasibility of a Sleeving Pool that the cost of each of these elements is optimised and minimised. The key issues to consider include:

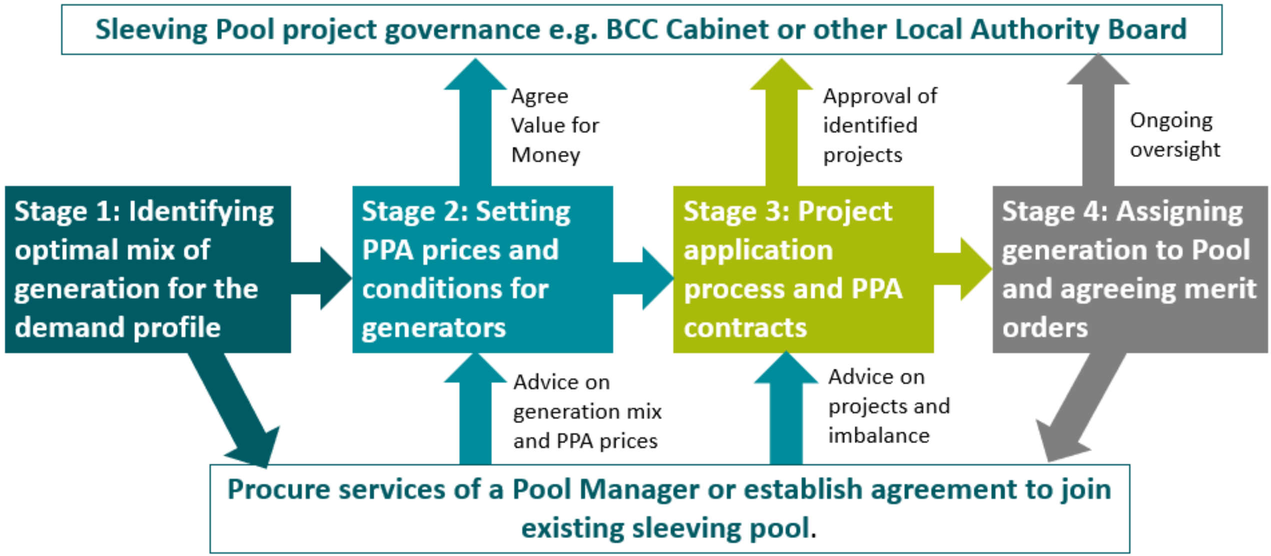
- **The PPA cost.** The Sleeving Pool structure creates potential for BCC to average PPA prices within the Pool between existing and new generation. The lower prices paid for generation from existing projects could allow generation from new projects to be procured at a higher price to support social objectives for BCC and local communities. This approach will need to be carefully designed to ensure that it is within public procurement rules.

- **The imbalance cost.** This can be reduced by designing an optimal portfolio of renewable generation technologies and flexibility (including demand side response (DSR)). The objective needs to be the optimum matching of sleeved generation to BCC demand. This should minimise over and under supply periods where BCC will face additional price risk and cost. The Pool Manager will also play a key role in helping BCC to manage the residual Pool imbalance.

- **The Pool Manager fees.** The Pool Manager is mainly an administrative role however the costs of this role could be reduced by a commercial contract which provides more 'upside' to the supplier in the Pool Manager arrangement potentially sharing elements of risk and reward with BCC. For example, the supplier could hedge the price risk for imbalance periods (potentially with revenue share). There could also be revenue share opportunities in areas such as battery operation or DSR.

Setting up a Sleeving Pool

The sections below outline the four stages that would be involved in initiating a Sleeving Pool around which this report has been structured. In each stage this report has explored potential processes, approaches and scenario modelling to highlight issues and questions related to feasibility. Feedback from suppliers and recommended next steps for BCC are outlined at the end of the report.



Stage 1: An optimal mix of renewable generation

An optimal mix of renewable generation will be important to achieve value for money in a Pool and reduce imbalance cost and risk.

The first step for BCC is to develop a good understanding of their existing half hourly electricity demand to establish the optimal mix of generation to match the demand. There are several ways to undertake this ‘matching’. The simplest option for a net zero objective is to match demand and generation across a full year. However, when comparing each half hour, there will still be significant periods of surplus and shortfall.

For a Sleeving Pool it is important **WHAT** type of generation and particularly **WHEN** the generator is generating and whether it is at the same time as demand.

Table 1 shows two generation portfolio scenarios modelled for this analysis that could meet 100% of BCC’s annual demand. Scenario 1 shows a portfolio of around 23 MW capacity with both new wind and solar projects. A higher capacity of generation (28 MW) is needed in Scenario 2 where the majority of new generation is solar. Both also have an associated shortfall and surplus of around 16 GWh in half hour periods when the demand and generation are not balanced. These scenarios are further illustrated in Figure 2 below.

The scenarios developed for this analysis are illustrative, if BCC decide to go ahead with a full Sleeving Pool, it is recommended that they take formal advice about the optimum generation portfolio to match their demand.

Table 1: Generation portfolios modelled for the feasibility study with associated matching with BCC annual and half hourly demand.

Scenarios modelled for the study (illustrated in Figure 2)	Total capacity of generation (MW)	Total annual output of generation (MWh)	% of annual BCC demand (c. 43 GWh) met	Calculated annual surplus (MWh)	Calculated annual shortfall (MWh)
Baseline – BCC's existing generation	7.4	16,029	c. 37%	993	29,533
Scenario 1 - a mixed generation portfolio of solar and wind	23.1	44,262	c. 102%	16,360	16,667
Scenario 2 – a portfolio with predominantly new solar	28.1	43,883	c. 101%	16,052	16,738

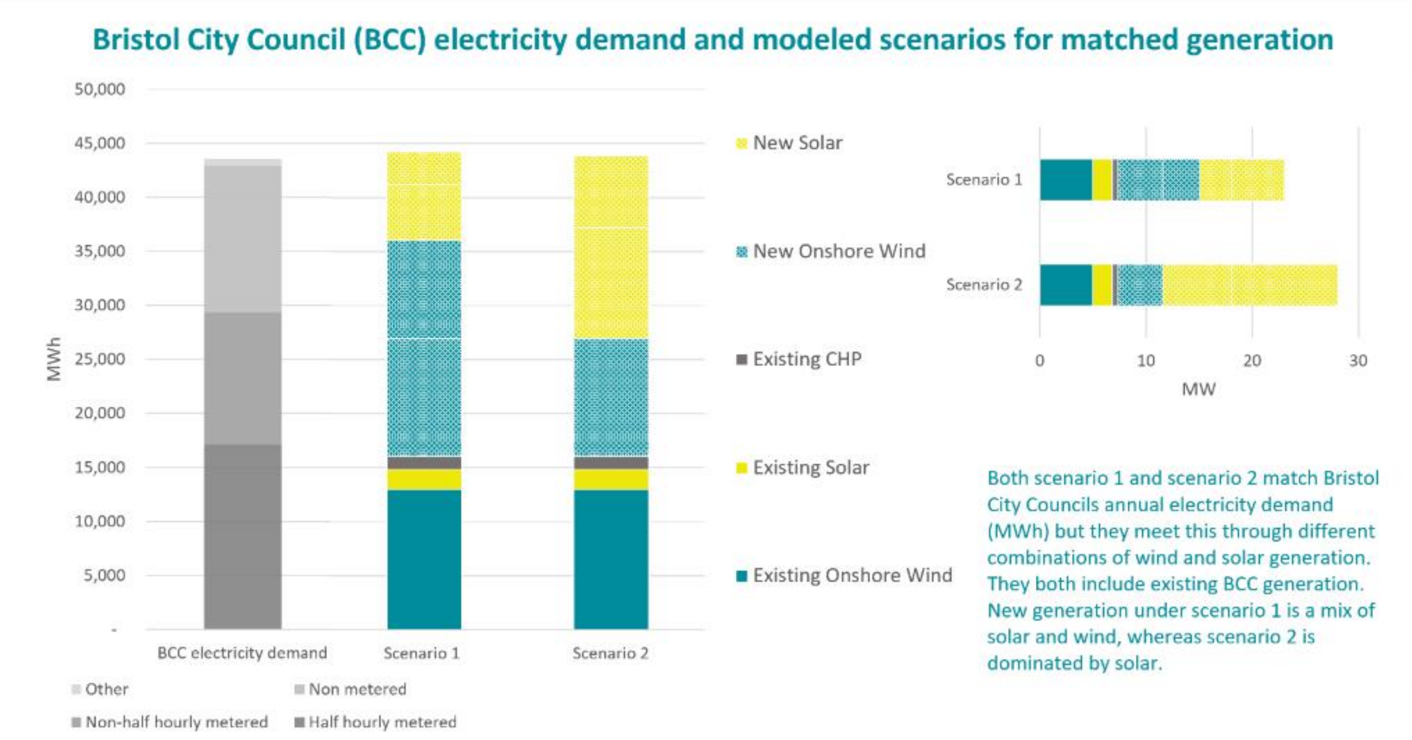


Figure 2: Different ways of matching BCC annual electricity demand with a generation portfolio

Managing imbalance periods

Whatever the generation portfolio within the Sleeving Pool there will always be periods of imbalance between supply and demand. The half hour imbalance periods in a typical summer and winter week from Scenario 1 are illustrated in Figure 3. This shows that the total generation and BCC demand in this scenario are rarely, if ever, perfectly matched.

In most half hour periods a surplus from a renewable energy portfolio such as in Scenario 1 is likely to be sold at a lower price than that paid to top up generation when there is a shortfall against BCC demand. The modelling for this analysis found that the average market index price in 2019 was £38.31/MWh in times of theoretical surplus under Scenario 1 and £44.20/MWh in times of shortfall.

As a result, a key part of managing the Sleeving Pool will be to minimise and manage these under and over supply periods where BCC will be facing price risk.

Optimisation of these imbalance periods and the associated price risk can be achieved by:

- **Using a mix of different technologies.** The best solution for BCC's generation portfolio is likely to be a combination of renewable technologies: onshore wind, solar, hydro, and anaerobic digestion. Small, combined heat and power plants could be considered but may have associated carbon emissions if natural gas-fired.

- **Investment in DSR** to match demand profiles to when there is additional generation. DSR requires significant 'controllable loads' that can be shifted without losing utility. This might include timings on hot water tanks, electric heating or cooling, timed electric vehicle (EV) charging etc.

- **Investment in a battery.** Saving excess energy to use in periods of shortfall. The potential of a simple price arbitrage battery to address some of the imbalance periods within the Sleeving Pool is explored in the next section.

- **Pool Manager managing imbalance risk.** A key role for the Pool Manager would be to manage the remaining imbalance for BCC related to the over and under supply periods. There may be potential to do this on a revenue share basis to reduce the cost of the Pool Manager administration.

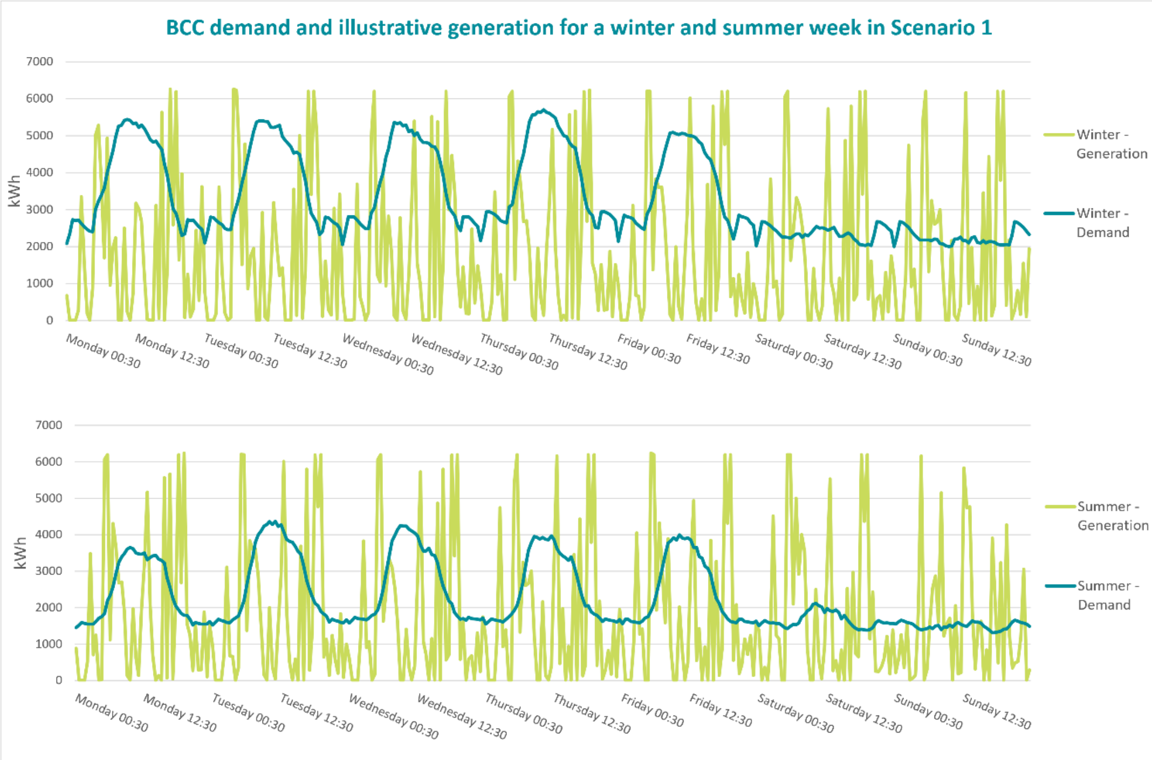


Figure 3: Example imbalance periods in summer and winter

Imbalance risk and operation of a battery

The analysis involved a high-level modelling exercise to understand the potential impact of a battery on reducing the imbalance periods in the Sleeving Pool. This was calculated using 2019 generation profiles and 2019 electricity market spot prices.

The total cost of the imbalance between the low and high prices in Scenario 1, calculated a worst case £176,496[1] cost of imbalance, adding an additional £4.05/MWh onto BCC's cost of electricity[2]. Table 2 shows the results of the battery modelling that suggests that a 2 MW/ 2MWh battery operating on the spot market could avoid imbalance cost of around £16,000 or 8%, and with a 5 MW / 5MWh battery, the savings were nearer £32,000 (around 18% of the imbalance cost). The 5 MW battery theoretically delivered savings of around double of a 2 MW battery, despite having more than double the capacity.

As seen in Figure 4, the battery is modelled to charge and discharge frequently in the summer, providing opportunities to generate revenue. However, over a winter week, as shown in Figure 5, there were periods of around three days where the battery was theoretically idle due to lack of wind. With the cost of a 1.8 MW battery with 2 MWh estimated to be c.£900,000[3], it is clear that Sleeving Pool arbitrage income on its own would not generate sufficient payback to cover the capital cost of a battery.

[1] Calculated with Elexon 2019 market index prices, battery was calculated using spot prices
[2] In reality this would be managed by the Pool Manager and the cost is likely be lower than this due to hedging.
[3] https://www.cibsejournal.com/technical/cost-model-battery-storage/

It should be emphasised, however, that what has been modelled for this analysis is not a full battery business case for BCC. A battery could also stack revenues by exploiting further wholesale price arbitrage opportunities and providing ancillary services to the Electricity System Operator which may mean the revenue / savings could be higher than that calculated here. These additional opportunities have not been modelled and it is recommended that BCC follow up this study with a battery business case to explore the full revenue opportunities including network services.

It also needs to be noted that the battery was modelled with perfect foresight and was able to charge and discharge at optimum times which is unlikely to be the case, and so savings may be lower in reality. Further costs will be incurred in network charges if the battery is connected to the network rather than 'behind the meter'.

Table 2: Summary of findings for batteries and reducing imbalance cost.

Battery	kWh stored over a year	kWh discharged over a year	Projected imbalance savings
2 MW / 2 MWh	526,601	- 501,221	£16,043 (9% of imbalance cost)
5 MW / 5 MWh	1,043,471	- 993,673	£32,084 (18% of imbalance cost)

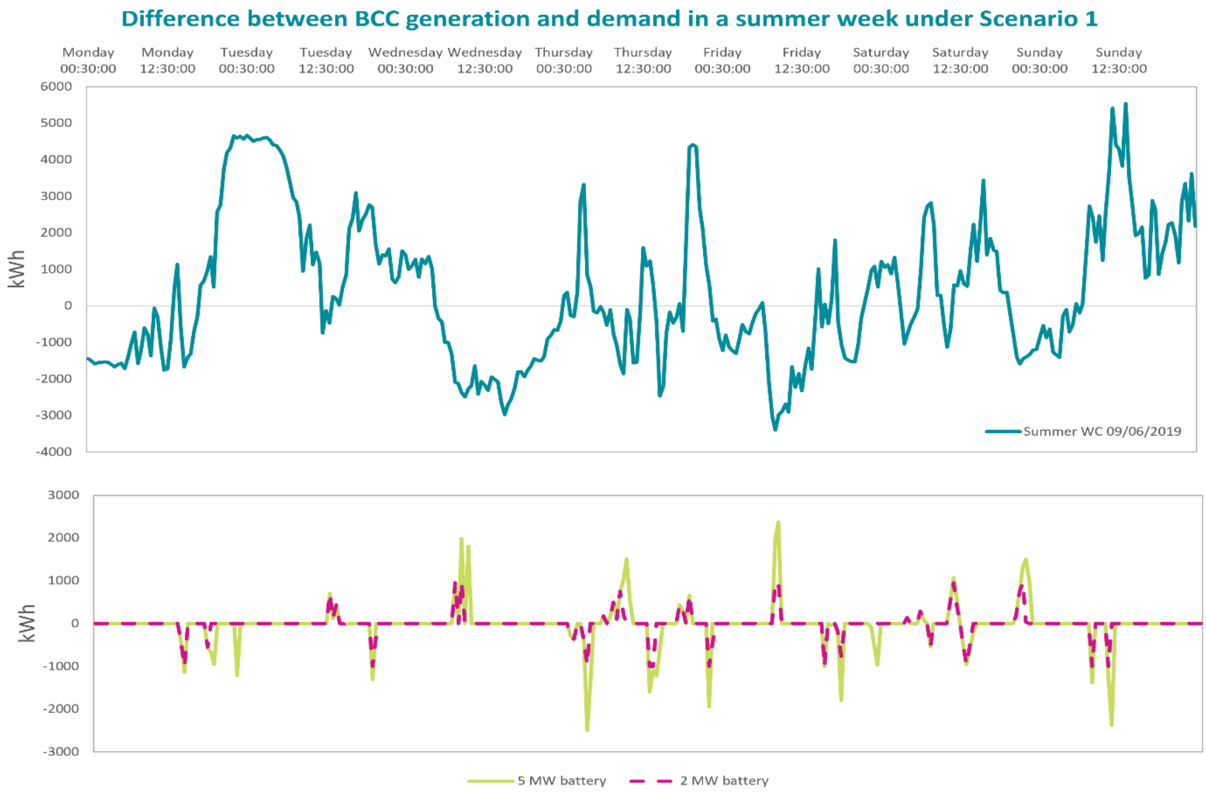


Figure 4: Imbalance and battery operation over summer week

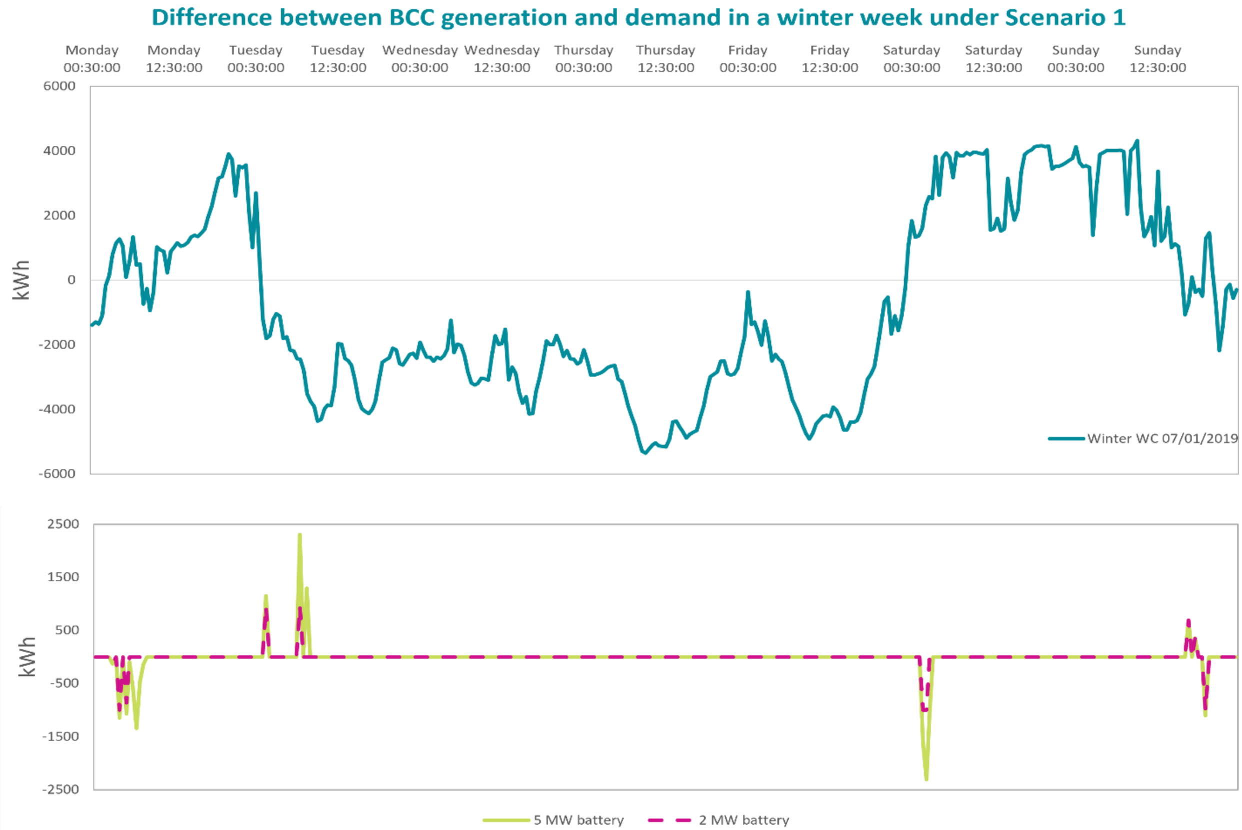


Figure 5: Imbalance and battery operation over a winter week

Stage 2: PPA Prices and conditions

Setting conditions for generators

Once the optimal mix or range of generation for the demand is identified, the next stage would be to set out the conditions under which the Local Authority wishes to procure. These conditions would include specifying:

- Type of technologies – for example, whether they are zero carbon.
- Location - for example, if required to be within a local authority area or region.
- The preferred level of new or existing sites (note this balance will also relate to the mix of PPA prices).

There would likely be additional requirements for new and existing sites such as:

Existing sites	New sites
• Whether they are in receipt of existing subsidies • Length of any existing PPA contract.	• Whether the project is fully consented or still requires planning permission or environmental licences. • Whether the project has secured a network connection and expected connection dates. • Whether the project has investment in place required to be built.

For new sites, some of the conditions may depend upon securing a viable PPA price. For example, the cost of planning permission for an onshore wind project can be high. As a result, BCC may want to consider an 'in principle' PPA agreement for some projects to enable them to secure investment to proceed. This will need to be considered on a 'case by case' basis with clear break clauses and timetables for progress.

Setting outline PPA prices or ranges

Once the range and conditions are set, BCC will need to establish what they are prepared to pay for the various generation. It would be recommended to do this with the advice of the Pool Manager who will be managing the associated imbalance and price risks. This agreement between the local authority and the Pool Manager will be particularly important if the Pool is used by more than one local authority.

Key to the success of the Sleeving Pool concept, and to achieve value for money for the local authority, is for BCC to consider the **average PPA price of generation within the Pool**, as well as the PPA price paid to a single project.

BCC would be asked to approve an average price range, which will allow the projects to be negotiated individually and then approved by BCC within that range. This approach would need careful design and legal advice to ensure it is acceptable under public sector procurement rules.

The PPA prices being paid by the local authority could, therefore, vary depending upon:

- **New or existing generator.** Power from new generation projects will most likely need to receive a premium over an existing generator to enable them to secure investment to be built. The PPA price of power from existing generators will be determined by the market, but a local authority may be able to secure a lower price if it is prepared to offer a long term PPA.

- **Technology.** Depending on the profiles of the generators and the profile of the demand, some projects and technologies may receive a premium due to the better matching of demand profiles and winter generation.

- **Length of contract.** This could be negotiated or kept at the standard length such as 20 years. To note that others such as domestic solar may prefer shorter contracts or include break clauses. The ability of a local authority to offer a long-term contract will be vital in enabling new generation projects to be built.

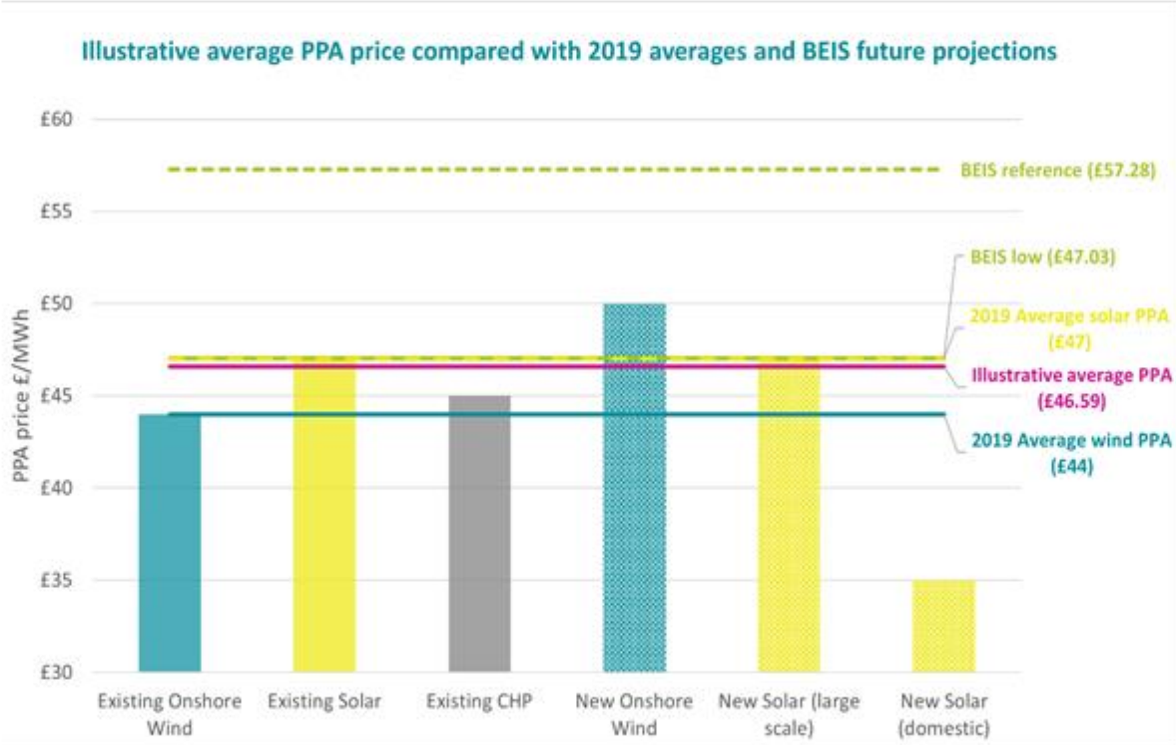
- **Community ownership.** Local authorities may wish to set a premium depending on the local ownership status of the project reflecting the higher social benefit of these schemes. For example, projects with majority community ownership or community control might receive a higher PPA price reflecting social and economic benefits.

- **Commercial ownership.** Larger sites may prefer a market-based contract rather than a fixed PPA price. This could involve a floor price, or a cap and floor price (for example £40/MWh floor and a £60/MWh cap where the Local Authority could receive revenue if the electricity prices went over £60/MWh). The differences in these PPA structures are explored in Table 3.

Question for consideration: Would the PPA price BCC is willing to pay for one type of project be different to a similar project or will these prices vary over time? Under what situations might these differences occur?

Figure 6 illustrates the averaging concept using illustrative prices for different technologies which together achieve an average price that could be competitive with some of the lower BEIS projections of future wholesale prices. New wind in this scenario receives a PPA of £50/MWh and domestic solar receives £35/MWh. The lower cost PPAs (such as rooftop solar under a Smart Export Guarantee (SEG)) are important to bring down the average price.

It should be noted that the illustrative average PPA does not include the additional imbalance cost or Pool Manager fees. As a result, the total energy cost per MWh would be higher than illustrated here.



BEIS Low Prices and Reference
The 2019 - 2029 average of BEIS wholesale electricity price projections. Calculated from https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2019. Annex M
Illustrative average PPA
Modeled fixed PPA prices under scenario 1. Note these **should not be used as a guide** and are only illustrative of the averaging concept.
Solar and Wind 2019 average PPAs
Prices for existing projects taken from BloombergNEF report referenced in:https://www.greenrecruitmentcompany.com/blog/2020/08/are-renewable-energy-prices-about-to-rise-in-europe-a-ppa-perspective

Figure 6:Illustrative average PPA prices in scenario 1 compared with historic PPA prices and BEIS wholesale future projections.

Modelling of different PPA price structures

It is likely that different types of generators applying to the pool may request different PPA price structures. This analysis has also modelled some potential approaches and explored the implications within the model.

- **A fixed PPA price** – By providing a fixed price PPA, both parties are protected from volatility in the market and are committed to this price for the duration of the PPA, regardless of trends in the market. This structure is likely to be attractive to small and community owned generation that are focused on environmental or social outcomes and to minimise risk. It also protects BCC from significant price rises.

- **A floor price** – generators are paid in accordance with current market price, but they are protected from drops in trading prices by a BCC guarantee to pay them at least the floor price. This has been modelled as £40/MWh for this analysis. This structure does not protect BCC against spikes in market prices which could result in paying more.

- **A cap and floor price** - introducing a cap price alongside the floor price provides a range guarantee for generators and reduces the risk of market fluctuations to the BCC, protecting them for spikes in electricity prices. The cap price has been modelled as £60/MWh.

Table 3 shows that replacing a fixed price as modelled in Scenario 1 with a floor price of £40/MWh would have resulted in savings in 2019 and that the cap and floor model would have made further savings. It should be noted that the modelling is **only illustrative** and outcome for BCC will depend upon the various PPA prices agreed with generators, the year of operation and the reference prices used for the calculation (e.g. daily average, or half hour).

Although adding some additional complexity, different PPA price structures including floor price models within the Sleeving Pool could provide a benefit to BCC and help reduce price risk through diversity. If BCC is open to different approaches within the PPA structures, this is likely to attract more generators (including commercial generators) and help manage BCC's exposure to price risk.

Table 3: Calculated total PPA and imbalance cost of scenarios and different PPA price structures.

	Example fixed PPA cost (example prices as per Figure 6)	Average PPA price per MWh generation	Projected imbalance cost and per MWh demand	Total cost for PPA example (not inc. fees)	PPA and imbalance cost £/MWh demand	Difference between cost of fixed PPA and floor price tariff (£40/MWh)	Difference between cost of fixed and cap & floor tariff (£40/MWh - £60/MWh)
BEIS Low Prices				£2,048,284	£47.03		
BEIS Reference				£2,494,476	£57.28		
Baseline	£712,018	£44.42	£1,302,122	£2,014,140	£46.25	-£44,829	- £53,319
Scenario 1 (102% of demand)	£2,062,085	£46.59	£176,496 (£4.05/MWh)	£2,238,581	£51.40	- £143,792	- £168,356
Scenario 2 (101% of demand)	£1,973,862	£44.98	£188,518 (£4.33/MWh)	£2,162,380	£49.65	- £79,179	- £104,070

BEIS Low Prices and Reference calculated from https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2019 Annex M

Stage 3: New project applications and process

Once the mix of generation technologies required is set, along with the prices and conditions for PPAs, BCC will need to develop a transparent process for managing applications from generators to receive the PPAs, particularly new sites. BCC should be prepared for some administrative cost and resource cost related to this process. In addition, given this process will not have been conducted before, it is important the process is also built to be flexible as need arises.

There are two broad ways to run the project application process for new sites: a ‘deadline’ based application process over a number of months, or an open rolling process that closes when the opportunities are filled or fully contracted. The choice or combination of choices will be dependent on how much emphasis the local authority wants to place on the conditions for each new project, particularly how close they are to construction.

For example, some new sites such as onshore wind and hydro could take several years to develop and start generating. Under a ‘deadline’ based application, it is important to ensure that technologies with longer lead-in times and potentially beneficial generation profiles are not excluded from the process.

This application process will need to be managed transparently with oversight from BCC or joint local authority governance boards. It will also need clear criteria on which to judge such as:

- How soon the site might start generating.
- What level of community ownership and benefits are anticipated.

It is very likely that there will be trade-offs that will need to be justified through this process. For example, when agreeing a PPA with a project that has not yet been built, a community controlled project may score higher on social benefits but take longer to secure financing and be constructed. Another issue could be the size of the projects and the difference between contracting with one big project or supporting a number of smaller ones. As a result, it is important that these trade-off decisions are made against clear criteria and signed off by BCC along with legal advice to ensure BCC complies with its statutory responsibilities.

	Deadline based application	Open rolling process
Pros	Ability to judge applications at the same time against specified criteria.	Allows projects to come forward over time once projects have met all conditions and are ready to build.
Cons	Projects may be at different stages of development meaning there may be a requirement to contract with less developed projects and manage the risk that these may not go ahead.	Harder to judge applications against others. Better projects arriving later may miss out to earlier projects.

Once the set mix of generation has been contracted, the Pool will essentially be closed to new entrants, but it will require ongoing governance and oversight. In addition, it is likely that the Pool will need to be reopened periodically, for example if:

- Additional generation is needed to cover new demand such as an EV fleet.
- A new generation project that was expected is not built.
- A contract ends and a site or existing generator leaves the Pool.

Stage 4: Assign generation and agree merit orders

The Role of a Pool Manager

The Pool Manager would be expected to provide advice to BCC ahead of the launch of the Sleeving Pool. This might involve helping to define an optimal portfolio for BCC's demand (in anticipation of them managing imbalance risk) as well as advice on PPA prices and structures. However, the core role of a Pool Manager once the Sleeving Pool is established will be administrative.

Once the projects are contracted and generating, the Pool Manager will oversee the process of bringing the generation into the Pool. This involves the participants in the Pool assigning their demand along with their directly procured generation to the Pool Manager (acting as supplier). The Pool Manager then leads on balancing and settlement.

The Pool Manager will meet the collective demand from the assigned generation and then source additional generation needed to balance the Pool from the wholesale market. This additional procurement would be on a basis agreed with the demand customer who may specify for example, the need to source renewable generation.

The Pool Manager therefore conducts two balancing processes:

1. **Wholesale trading** at each half hour where any total Pool surplus will be exported to, or shortfall purchased from, the wholesale market.
2. **Intra-Pool trading** where the available generation is assigned to each demand site by the chosen methodology. This Intra-Pool trading does not need to take place at each half hour, it could be done daily, weekly, monthly, or annually.

Acting as a supplier, the Pool Manager bills each demand site periodically, including:

- **Balancing and settling on the wholesale market.** Payments or billing for selling of the surplus and purchasing shortfall on the wholesale market.
- **Settling of Intra-Pool trading.** To demand sites for their owned generation which is used at other demand sites (as per the agreed Pool structure or merit orders). This is explored further in the following section.
- Network charges associated with demand (generation would pay these via the Pool Manager or third party).
- National Grid Balancing and Settlement charges.
- Non-commodity charges and taxes associated with demand.
- Any metering and data collection charges included in the electricity supply contract.
- The Pool Manager's own fees.

The Pool Manager would be expected to incorporate new participants during the term of their contract including both new demand customers and generation coming into the Pool. New generators could include small domestic rooftop sites as well as larger commercial sites.

Intra-Pool trading and prices for generation settled within the Pool

The Sleeving Pool structure means that the demand customer (such as BCC) has a PPA with the generator directly and therefore pays for all that electricity directly as per that PPA contract. The Pool Manager then deals with the balancing of that generation with demand, but not that process of direct payment for the generator's electricity.

Once the Pool is set up there are different models for assigning generation to demand within the Pool. With one demand customer, such as BCC, a relatively simple model could be used to total generation into a Pool and assign that to demand. A system of merit orders is shown in Figure 9 where some sources of demand are prioritised ahead of others. Another model is illustrated in Figure 8 where the demand is assigned equally.

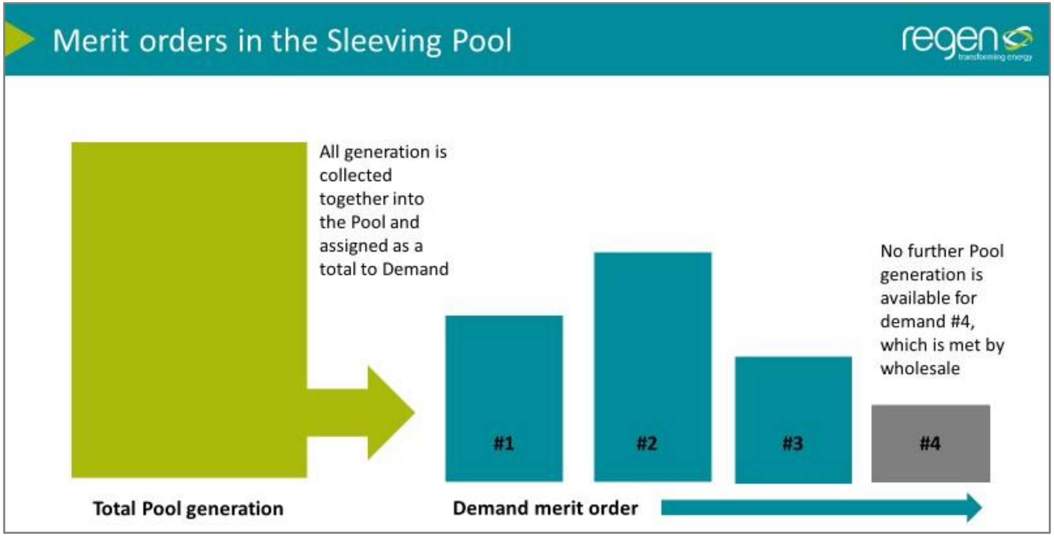


Figure 7: Merit orders for demand in the Sleeving Pool

This best model for assigning the generation should be explored in the pilot phase. Within this BCC will need to consider carbon reporting including the Pool carbon footprint relative to electricity purchased from the wholesale market.

BCC will need to agree an internal approach to the initial payment of the PPAs (e.g. where in the organisation this is paid and how / if the funds are recovered from separate budgets) as well as the treatment of any funds resulting from surplus or shortfall, for example whether they are assigned to a particular site or across all the sites under the contract.

Figure 8: Equal distribution of generation to Pool demand

A more complex approach to Intra-Pool trading will be needed if the Pool includes several different demand customers such as separate local authorities, as each are likely to have contracted directly with their own generation. This could then require the Pool Manager to assign a different demand merit order to the different sources of generation. This is illustrated in

Figure *9*.

A key question for the more complex structure is agreeing the price that is paid for the generation that is settled 'within' the pool. There are two broad options for this:

- The simplest option would be to use the **average Pool PPA price**. This should be similar to the average annual wholesale price (given the averaging process described in Figure 6). However, the demand participants should be clear that the price for generation settled **within** the Pool, will not be the market price at that point in time. It could be significantly higher or lower.
- Another option would be that **generation matched within the Pool would pay the wholesale price at that half hour.** This means that the demand customer who has contracted the generation directly could be making a profit or loss during each settlement period, depending on how the wholesale price differs from the PPA average. However, the aligning of prices within and outside the Pool may make it easier for the Pool Manager to hedge prices or operate a battery.

This analysis provides only a first look at the approach required for intra-pool trading and balancing. The approach and design would need to be further refined during the pilot phase and will depend on BCC reporting requirements for various types of demand and whether separate sources of demand are anticipated within the Sleeving Pool.

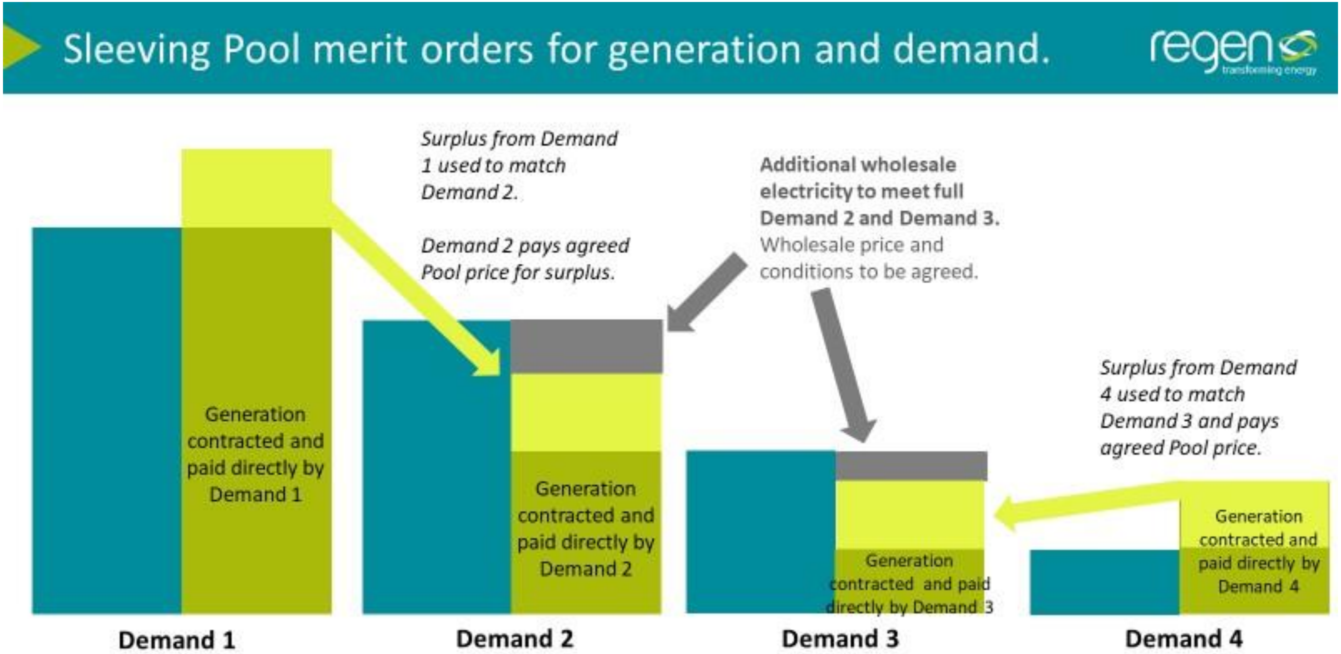


Figure 9: Example of generation and demand sleeving pool merit orders

Summary of supplier feedback

The analysis explored the role of a Pool Manager with four energy suppliers. These conversations covered the initial scope and facets of the Pool Manager role to understand whether the structure was feasible from their perspective and raise any issues or challenges to the idea. This was intended to inform the pilot tendering process.

Overview of supplier feedback

- All suppliers felt that the structure was innovative and could provide value to BCC to achieve its objectives.
- All suggested that the role of the Pool Manager was achievable for a fee.
- When asked about contract length, most would be looking for a contract of up to five years. This was the maximum period of price risk the supplier would be willing to manage. The innovative structure and potential for significant set-up administration costs meant there was also a viable minimum. One felt a three year term was minimum, another felt this would be four.
- It was noted that though there was nominally no price ‘risk’ for the supplier within the core role (not including imbalance management), there was some ‘administration’ risk, with the number of meter points, that could have implications for the fee.
- Fee structures were discussed, and it was noted that the fees would need to be structured to reflect that the Pool could be expected to expand and include more participants over time. Options for fees discussed included a cost per site, a cost per MWh (generation or demand) or the cost of an employee needed to manage the account.

Important to the success of the Sleeving Pool structure will be to align the interests of BCC with the contract given to the Pool Manager. As a result, there are likely to be benefits in having additional facets to the Pool Manager role. These might include:

- **Advisory on Sleeving Pool set up.** This would include input into designing the best generation portfolio for BCC, generation profiles of different technologies and PPA structures that might minimise imbalance.
- **Commercial price agreement for imbalance periods.** A key part of the Pool Manager would be the commercial agreements around the imbalance risk and the prices received for surplus or paid for shortfall and what conditions demand would have on the purchased wholesale electricity (e.g. whether it would be renewable).
- **Sub-contracting of data aggregation and metering.** All suppliers felt that they would be able to sub-contract the data aggregation and metering work, for one supplier it would be optimal to do so. This option might be considered within the tender to help BCC manage administrative risk.
- **Additional revenue opportunities for role.** A number of suppliers noted they would be looking for additional opportunities for revenue share to optimise the value of the Pool Manager role for the supplier (and reduce cost of administration for BCC). Some of these opportunities might be included as a separate contract:
    - Optimisation of non-commodity costs and network charges. The Pool Manager can help manage non-commodity costs for the demand portfolio (in this analysis generation network and commodity costs are assumed to be managed separately).
    - The Pool Manager managing battery operation for the Pool and optimising the asset with additional revenue streams, such as frequency response services or price arbitrage opportunities.

- Pool Manager to invest in, or manage other flexibility assets for BCC, including Demand Side Response.
- Consider whether supplier could offer a local Smart Export Tariff (SEG) to domestic customers in the BCC area looking to install rooftop solar which could be sourced by them to supply the Pool.
- Sourcing new projects or PPAs for the Pool.

Recommendation: As part of the tender process or Expression of Interest, BCC request suppliers provide suggestions on further revenue or revenue share opportunities that that may work to reduce the Pool Manager fees.

Next steps for Bristol City Council

BCC is currently planning to initiate a pilot scheme of a Sleeving Pool with a small number of generators and BCC half hourly demand during 2021. The intention would be to prove the feasibility of concept and finalise the contractual structures and operation of a Pool.

If this is proven, then BCC would initiate a full Sleeving Pool, recruiting further generation and BCC demand.

This feasibility analysis suggests that there are several issues that will need careful analysis as the Sleeving Pool is developed to establish its commercial feasibility. As a next step BCC should consider:

1. Starting to explore the optimal mix of generators for BCC demand and identifying potential generation projects.
2. Running an expression of interest (EOI) process for licenced suppliers to act as Pool Manager to understand what approach they might take to a pilot and future roll out, as well as other revenue opportunities they would be looking for as part of the role.
3. A review of public procurement rules and implications of the averaging approach to generation PPAs procured directly by BCC as outlined in this document.
4. Developing both strategic and operational governance structures for the sleeving pool covering both initial processes and ongoing overview and scrutiny.
5. Further consideration of merit orders and intra-pool trading arrangements including the different implications and outcomes of the approaches for BCC demand sites and carbon reporting.

6. Look to develop a full business case for flexibility (DSR) and battery operation within BCC's portfolio.

7. Further consideration of how to approach the tendering process of the Pilot project. It was noted in the interviews that there are potentially two approaches to this which are outlined below:

	Two stage process	**One stage process with break period**
	• Tendering for a one year contract to provide the Sleeving Pool which matches BCC's owned generation with their half hourly demand. • A full tender after the pilot to procure a Pool Manager of the full portfolio and additional sites.	• Tendering for a supplier for 4 – 5 years to provide the pilot and then to expand into a full Sleeving Pool following proof of concept. • A break period at one year following the pilot.
Pros	Ability to use the pilot to learn and then use that learning to inform the full tender.	Allows BCC to have only one tender process but with a break clause if the pilot is unsuccessful.
Cons	May be more costing as the intellectual property related to the pilot will be partly assigned to the pilot supplier. A new supplier may need to 'start from scratch' to deliver the full sleeving pool.	Requires development of the full tender document before pilot is completed. Would need contract flexibility to reflect learning from pilot phase, adding uncertainty.