

## Buildings Readiness Assessment

### Context of Readiness Assessment

The Decarbonisation Plan sets out our commitment to the ambition of the Welsh Public Sector achieving Net Zero organisational emissions by 2030. The plan identifies nine transitions: 1. Transport Direct; 2. Transport Commissioned; 3. Sequestration; 4. Procurement Goods; 5. Procurement Services; 6. Procurement Works; 7. Electricity; 8. Heat and 9. Waste. To progress the nine transitions, the Decarbonisation Board agreed to carry out readiness assessments to understand what is already being done and identify the key actions we need to take for each transition.

This report covers three transitions: Procurement Works, Electricity and Heat, which the Decarbonisation Board decided to combine into a single “buildings” readiness assessment. These three transitions collectively represent 21% of our gross emissions, a figure which is in line with Welsh Government’s Public Sector Net Zero Route map that identifies that buildings typically represent 20% of the public sector carbon footprint.

Emissions from buildings can be divided into two main types:

- Operational energy use (heating, lighting, computers etc.)
- Life-cycle embodied emissions (construction, (non-energy) use and maintenance, and demolition or disassembly etc.)

Both these types of emissions will ultimately be eliminated through the use of zero carbon energy. The difference is that the choice to use zero carbon energy is in our direct control for operational energy emissions, but is outside our direct organisational control for life-cycle emissions. However, we can address these life-cycle emissions by (i) using our (and collective public sector) purchasing power to encourage the market to move towards zero carbon energy based products and (ii) where possible by reducing are total consumption (e.g. product miles, material throughput (the total volume of materials used)).

Transition 6 Procurement Works (10% of carbon footprint) is the life-cycle embodied emissions from our buildings. Transition 8 Heat (6%) and Transition 7 Electricity (5%) include our operational energy use from our buildings. Electricity also includes some non-buildings emissions, mainly street lighting which is about a third of our electricity emissions, which have also been included in this readiness assessment.

### **Recent Trends**

- Over the last four years’ total carbon emissions from our electricity consumption have fallen by 39%. However, the majority of this reduction has been due to a fall in the carbon intensity (the amount of carbon produced per unit of energy) of the electricity grid. Our electric energy consumption has only fallen by 6.5% over the same period.
- Unlike the electricity grid there has been no real change in the carbon intensity of the gas grid, so our carbon emissions directly reflect our energy usage, which has risen 12% over last 4 years. Largely due to The Energy Centre at The Works, which makes up 35% of our total gas consumption.
- The 10 highest energy consuming buildings make up around half of total energy use by buildings for both electricity and gas. Six buildings appear in the top 10 for both electricity and gas: Energy Centre, Civic Centre, Ebbw Fawr Primary Campus, Abertillery Comprehensive, Tredegar Comprehensive and Central Depot.

- The majority of procurement works emissions are associated with capital expenditure with external contractors.

Heating accounts for the majority of our buildings emissions and represents a distinct transition with its own technologies and solutions. It is probably the most challenging element of our energy use to decarbonise as it is not currently possible to decarbonise the gas grid in the same way as the electricity grid is currently being decarbonised. Using zero carbon, rather than fossil fuel based, electricity has little, if any, direct impact on the operation of existing electrically powered council infrastructure such as lighting, computers etc. Whereas the most plausible alternative heating technology, heat pumps, in order to operate efficiently will also require significant changes to wider buildings infrastructure (insulation, radiators etc.), in addition to replacing existing gas boilers, in itself a substantial investment.

### Summary of Next Steps

The Buildings Readiness Assessment identified a number of high-level actions which represent the next steps in our transition to net zero in this transition. This list summarises these actions, the rest of the document provides a more detailed description of these transitions and the rationales for these proposed actions. For each action a service area(s) is identified so the action can be built into their business planning. The actions identified here will be developed with service areas into performance measures/targets, informed by both by the detailed information about specific actions in the readiness assessments and more good practise.

#### Energy Use -

1. Strategic Heating Decarbonisation Plan. Develop a plan for replacement of existing heating systems and associated retrofitting of buildings with zero carbon alternatives by 2030 (in line with Welsh Government policy), including the investment required. (Property Services)
2. Energy Policy- Review the existing policy to ensure energy demand reduction is aligned to the Council's Zero Carbon commitment. (Property Services)
3. Procurement (Energy-Use). Commit to using carbon data (energy standards and life-cycle costs) to inform procurement decisions. Review Procurement Strategy and arrangements to align to the Council's Zero Carbon commitment. (Commercial Services)
4. Street Lighting Strategy – Develop a plan and targets for future energy reductions including reaching 100% LED lighting no later than 2030. (Neighbourhood Services)
5. Zero Carbon Electricity. Develop a plan and targets for ensuring the Council maximises its use of renewable energy, through installing renewables and through procurement. (Regeneration)
6. District Heating Networks. Set date for future review of whether developments in technology allow for additional networks in Blaenau Gwent. (Regeneration)

#### Construction:

1. Commit that all new builds will be built to Net Zero Standards. How this will be achieved, and any barriers to delivery, will be set out in detail in the Strategic Outline Case and only in exceptional circumstances will projects proceed without these being fully addressed. (Property Services / Commissioning Departments)
2. Procurement (Works). Commit to take into account carbon costs (the emissions associated with undertaking works) in procurement of building and maintenance works, including setting appropriate carbon standards. Integrated into decision making as part of procurement review. (Property Services /Procurement)

## Overview of Transition

### *Energy Use*

The most visible element of buildings carbon impact is their operational energy use. These emissions are the result of energy consumption, both electricity and gas (and biomass in heating network). There are some similarities in how Net Zero will be achieved in both forms of energy use. Ultimately achieving Net Zero will be reliant on using zero emission energy source(s) for all our energy use. Also crucial will be reducing our total energy demand, the lower energy use is the easier it will be to secure sufficient Net Zero energy, as well as providing additional benefits in terms of both environmental impacts and reducing costs. Demand reduction requires long-term planning, using new technology and staff engagement.

There are, however, also very significant differences between electricity and gas in relation to Net Zero. Recent years have seen very substantial reductions in the carbon intensity (the amount of carbon emitted per unit of energy generated) of the electricity grid, leading to substantial reductions in the carbon footprint of our buildings. This trend is likely to continue, with a clear path towards total decarbonisation of the grid through renewables (largely solar and wind) being visible. In contrast there has been very little change in the carbon intensity of the gas grid and there is little prospect of that changing in at least the short to medium term. Biomass can play a role in replacing gas, as it does in The Works heating network, but it does not have the capacity to replace more than a small part of the total energy provided by the gas grid. There are some suggestions that hydrogen could be used as an alternative fuel in the existing national gas grid, however, there are substantial doubts about the viability of this even in the long-term. Although sufficient volume of hydrogen could be produced for the entire grid, producing Net Zero hydrogen is significantly more expensive currently (there are less expensive non-zero carbon ways of producing hydrogen). The extent to which the existing gas grid would have to be modified to run on hydrogen is not clear, but it would certainly require significant changes to both the network and boilers. There are also serious doubts that powering the existing gas grid would be the most efficient and climate friendly use of hydrogen. The recent advice of the Committee on Climate Change to Local Authorities was that they should not wait for a hydrogen grid, but treat hydrogen like district heating networks, as something that may have a part to play through specific local schemes with high heating loads (e.g. business parks and major public buildings) as one element of a wider local energy plan. It currently appears that the role of gas in heating our buildings is likely to be mainly filled by heat pumps. Heat pumps use electrical energy to redistribute heat from the environment (either the air or ground), meaning they require less energy than gas boilers, and can be net zero if run on zero carbon electricity. However, in order to operate efficiently they heat the water used in heating systems to a lower temperature than gas boilers, meaning they may well require improvements to buildings such as larger radiators and a higher standard of insulation to heat them effectively.

The large majority of our gas use is associated with heating our buildings, making heating our buildings a distinct net zero transition. Around two thirds of our current electricity use is associated with our buildings, with the main uses being lighting and powering appliances, most notably Information Technology. The other third of our current electricity use is for street lighting. In contrast to the changes required to heating infrastructure changing to Zero Carbon electricity will be far less disruptive. We are in an ongoing process of installing lower energy consumption lights, computers etc., which connect to the existing grid, usually with no need for any further changes. However, there are wider changes associated with the transition to zero carbon electricity. Heating

is just one example of how reaching zero carbon will require electrification of a major energy use that previously used a different fuel. Another example being our fleet transition from diesel and petrol to electric vehicles. This trend towards electrification may well require changes on a larger organisational scale. For example, the greater overall levels of electricity demand will place additional requirements on the grid, and require more load management by the Council including generating electricity on site, particularly where there is high demand, use of batteries and more automation to balance demand. This represents a switch from the current situation where the biggest challenge is ensuring peak demand for electricity is met, to balancing supply and demand 24/7/365. So although this assessment identifies a number of specific transitions relating to our existing electricity use: lighting and computing/appliances, electrification is a much larger theme that cuts across multiple transitions.

### ***Embodied Emissions***

In addition to operational energy use buildings also produce life-cycle embodied emissions, which include the carbon used throughout each stage of a building's life: construction, (non-energy) use and maintenance, and demolition or disassembly. The life-time embodied energy in complex commercial buildings may be equivalent to 30 times their annual operational energy use. There are several different elements to these emissions including: embodied emissions (the emissions associated with the energy used in the manufacture of products), product miles and material throughput (total volume of material used). Actions which reduce emissions related to one element do not automatically reduce other elements or buildings direct energy use, in fact they may even increase emissions from another element. Which is why a whole life-cycle understanding of carbon impacts is important. However, from a wider point of view these emissions are not fundamentally different from the emissions associated with our direct energy use and will ultimately be eliminated in a similar way, by utilising zero carbon energy. The emissions appear more complex from an organisational point of view because the choice to use zero carbon energy for these activities is not within our direct operational control, unlike our energy use. There are two main ways we can address these life-cycle emissions. Firstly, we can use our (and collective public sector) purchasing power to encourage the market to move towards low carbon options (including as a first step making information about life-cycle emissions available to purchasers). Secondly, where possible to reduce our total consumption, this could be total material throughput or product miles.

### **Next Steps in More Detail**

(See Appendix for Full Details of Readiness Assessments)

#### ***1. Heating Decarbonisation Plan***

The development of the plan should be based on an understanding of our full estate in terms of building type, technology required and buildings (future) usage. Welsh Government Net Zero Wales suggests that local authorities should develop a strategic plan for decarbonising buildings by the end of 2023. This Heating Decarbonisation Plan will bring together a number of interlinked elements identified in the readiness assessment. Central to this plan is switching our estate from current gas boiler based heating infrastructure, to zero carbon energy alternatives, most likely predominantly heat pumps. Just developing this plan will require significant additional capacity, and delivering it will require a step change in resources as the 2030 target requires a rate of replacement of heating systems that far exceeds current rates of boiler replacement. The plan will also need to cover a

range of other actions to lower the total energy demand from heating (and cooling) our buildings, which are necessary to make zero carbon heating systems operate efficiently:

- Retrofitting to improve building energy efficiency as heat pumps operate at lower temperatures than gas boilers so require well insulated high-performing buildings.
- Optimise the use of buildings and space in them to reduce demand by integrating decarbonisation into estate strategy, agile working etc.
- Heating (and cooling) demand reduction. Technology/automation supported by staff engagement, including setting corporate standards for temperatures across estate.

Developing this plan will require additional resources, and significant corporate commitment/investment will be necessary, but likely not sufficient, to deliver it. A plan of this type may well not be deliverable within existing council resources, Welsh Government, or other external, investment is also likely to be needed. The next step for developing this plan is to develop detailed project scope for development of plan perhaps through a working group led by Property Services.

The plan should include the existing District Heating Network at The Works, but with the intention of decarbonising by 2035 rather than 2030. The network is one of our most significant emissions sources and provides energy to a number of our largest buildings. In this context, it is important to note that District Heating Networks are not strictly a distinct form of heating technology like heat pumps, gas or biomass boilers. Rather they are a way of delivering both heat and electricity (using 'waste' heat), potentially from any of these technologies, to a large number of buildings simultaneously, achieving increased efficiency and reduced carbon emissions via the resulting economies of scale. The rapid improvements to the carbon intensity of the national electricity grid in recent years means that the previously significant carbon emission benefits of common hybrid biomass/gas Combined Heat and Power (CHP) (as used at The Works) compared to standard grid based heat and power alternatives have largely disappeared. Welsh Government guidance has suggested a 2035 target, recognising the need to decarbonise existing heating networks, but also that changing the heating technology used in an existing heating network is a very significant challenge.

Reducing existing electricity demand:

2. **Energy Policy**, previous energy policies have set paper targets and policy statements that had little impact. Any new Energy Policy needs to be based on delivery mechanisms informed by data, automation and staff engagement.
3. **Procurement (Energy-use)**. Set energy efficiency and life-cycle standards for IT/appliances and lighting and incorporate carbon considerations and data into procurement processes, which are key moments in determining future energy demand.
4. **Street lighting**, around 8k out of 13k lights been converted to LED, leading to significant carbon and cost savings, replacement of remaining 5k is part of forthcoming Street Lighting Strategy. This needs to include actions and targets that achieve 100% LED lighting no later than 2030.
5. **Zero Carbon Electricity**. A plan will need to be developed with targets to ensure the council maximises its use of renewable energy through installing renewables and through procurement. Currently all the electricity we procure is certified as 100% through REGO (Renewable Energy Guarantees of Origin) scheme. However, the REGO scheme is based on purchasing certificates for renewable electricity that has already been generated, as a result our share of the grid average non-renewable electricity is effectively redistributed to other

electricity users who do not choose to purchase REGO certificates. As a result, there is no real mechanism in REGO schemes to generate a net increase in the total amount of zero carbon electricity generated.

There are two potential mechanisms for the council to create additional zero carbon capacity. Firstly, through generating our own renewable electricity, which has substantial benefits where supply and demand are well matched (e.g. generating electricity for fleet at Depot). Other organisations have found the carbon benefits of renewables projects have been disappointing where new capacity has not been well matched to demand. The total amount we can generate as an organisation is, therefore, limited by the physical constraints of our sites, local demand and grid capacity. Secondly, through procurement that ensures new renewable generation capacity is created (known as additionality). A PPA (Power Purchase Agreement) for a long term supply of a set amount of electricity, with the supplier committing to build new renewable capacity linked to the national grid equivalent to the contracted amount of energy. PPAs are an increasingly common way for large organisations to help to finance additional zero carbon electricity capacity while ensuring a stable long-term price for energy.

We also have a crucial role to play in setting ambitious borough wide territorial renewable generation targets through the LDP and Energy Prospectus as well as future local energy planning. Our total organisational electricity demand is a small fraction of these targets for territorial renewable capacity.

6. **District Heating Networks.** Set date for a review of effect of new technology on viability of additional networks in Blaenau Gwent.

Construction (Embodied Emissions):

7. **Net Zero New Build.** Council should make commitment to all new buildings to be net zero (including their operational energy use, a key consideration as this is the element that can lead to future retrofit requirements). This will require additional resources and a clearly defined standard.
8. **Procurement Works.** Considerable life-cycle emissions will be associated with continuing maintenance and improvement of our existing buildings, which will continue to make up the majority of our estate. Corporate commitment required to incorporate these carbon considerations into decision making in procurement process targeted at highest emitted areas. Again requires move away from cost being determining factor in these decisions.

### Emerging Cross-Cutting Themes

During Readiness Assessments several themes cutting across transitions have emerged:

- **Staff Engagement.** There are a number of areas where staff have role to play in reducing carbon emissions and/or incentives and support may be offered to staff. It does not make sense for different parts of council to run a number of different engagement or communication efforts. There was view in workshops that there should be a single point of contact for staff engagement across all the transitions. It was also identified the need to agree a corporate position on the limits of where council will attempt to monitor and/or influence staff actions, particularly with home working transferring a number of emissions from workplace into home.

- **Schools Engagement.** It is clear from assessments so far that schools are a major emissions source in many elements of our footprint. However, they have a high degree of decision making independence. As with staff engagement there was a feeling that we need to develop a single point of contact for decarbonisation, rather than having uncoordinated efforts to engage schools across different transitions. In this context, ideally schools would adopt same corporate standards for decarbonisation as rest of council (e.g. energy policy).
- **Electrification.** Solutions across several transitions involve increased electricity consumption. It is also clear that issues of grid capacity at both a borough wide and local level are going to be important, informed by an overview of total electricity demand across organisation. This may include other issues such as need for batteries for load management. This is a strategic issue that does not sit in any single transition.
- **What does achieving Net Zero mean?** With Scope 1 and 2 emissions it is clear what net zero would look like and how it could be achieved i.e. all energy used is zero carbon. But with Scope 3 emissions we will need common set of measures and agreed standards/targets to have a meaningful way of measuring progress. Something that will need to be done at WG level. It is not possible to reach zero energy use or material throughput, so aim is to reduce energy use and embodied emissions as far as possible and use zero carbon energy/electricity.
- **Territorial Emissions.** Readiness assessments only consider our organisational emissions, but it is clear from discussions that several of elements considered will also have wider impact on BG territorial emissions. Need to start considering corporate approach to territorial emissions as well and how it relates to Decarbonisation Plan and Board. The public may not be that clear on difference and without clear communication could cause confusion and or public dissatisfaction later if they are also not 'Net Zero' by 2030. Territorial emissions will also need own metrics and targets eventually, although again likely to be driven at WG level.
- **Regional Collaboration.** Already identified a number of areas where we are already, or it would make sense to collaborate regionally on actions. It might be beneficial to have greater corporate overview of what these collaborations are and how they contribute to overall decarbonisation goal.
- **Local Zero Carbon Capacity.** Identified that reducing product miles requires local suppliers. This is likely to be relevant across a range of our transitions and building capacity to deliver decarbonisation in local business is also relevant to reducing territorial emissions for Blaenau Gwent as well.

## Building Readiness Assessment Appendix

### 1. Next Steps

This section provides full details of the readiness assessment and the 13 potential next steps identified.

#### 1. Heating Systems

**Net Zero:** All public buildings supplied with low carbon heat by 2030

**Readiness:** This is a very challenging ambition which will require major investment replacing gas boilers as the method of heating space (and water) in our buildings, with no guarantee that the financial rate of return will be positive. For example, the payback on a conventional gas boiler is around 40 years. The currently leading alternative technology are heat pumps. Currently the upfront costs of heat pumps are several times those of an equivalent gas boiler (400k compared to 50-60k for typical primary school). There are also other significant costs associated with heat pumps. Heat pumps are most efficient (and therefore deliver carbon benefit) when heating the water in the heating system to lower temperatures (55 rather than 80), which may often require changes to the heating system and building fabric to deliver the same performance, in some existing buildings these changes may be prohibitively expensive or even physically impossible (asbestos a common issue). Currently the cost of energy per kwh from electricity is around 4.4 times higher than gas (because heat pumps are more efficient breakeven point around 3.2 times higher cost), meaning ongoing energy costs will be higher (issue WG recognised in recent announcement). The ongoing maintenance costs of heat pumps are also typically higher than gas boilers at the moment.

Timing of schemes has to be considered. As we have seen technology will improve and lower costs. There is also issue about whether we want to be the guinea pig for these types of systems changes? They need to be fitted to the specific buildings. Costs will be higher and greater potential for systems to not work as well as planned. Conversely, also still a space where limited number of experienced suppliers, and demand is likely to be high.

The main alternative heating technology appears to be hydrogen boilers, but the technological viability of converting the gas grid to hydrogen is not yet demonstrated, hydrogen is also not automatically a zero carbon fuel depending on how it is produced, there are also strong arguments that even if hydrogen is produced in a zero carbon way that using it in the heating grid is not the most efficient use of it due to energy loss. Even if all these problems can be overcome we are a number of years away from grid hydrogen being available, the Climate Change Committee Advice Report: The path to a Net Zero Wales is that LAs cannot wait for grid hydrogen to decarbonise heating.

District Heating Networks may provide a solution in some areas (see below)

The cost of these works will likely far exceed what LAs own budgets, a significant intervention rate from WG (or other funders) to close viability gap, of type provided in other areas such as solar PV, will be needed to deliver.

Currently gas boilers are run past their recommended working life (many are 30, 40 plus years old) to the point of failure, and the cost of replacement gas boiler(s) in a one of our big energy using building exceeds annual maintenance budgets. Acting at the point of failure also makes it very difficult to make the significant changes required by heat pumps. The implementation of this type of strategic plan will require corporate commitment to the investment levels required, including across the school estate (see schools cross-cutting theme).

**Difficulty Level:** Medium to High difficulty. The technology exists, but the costs are far beyond existing budgets and may not be compatible with some of our buildings.

**Next Steps:** Corporate commitment to strategic Heating Decarbonisation Plan. WG Net Zero Wales suggests that LAs should develop a strategic plan for decarbonising building by the end of 2023. A plan of this type will only be meaningful with corporate commitment including a



step change in resources in this area as the rate of replacement of heating systems required far exceeds current rates.

### **Reduce heating energy use by raising performance.**

**Net Zero:** Achieving Net Zero will be driven by using low carbon heating sources, but less energy need to heat buildings easier this will be to achieve. Several elements to this:

- **2. Existing Building Performance DEC/Retrofit**

**Readiness:** Retrofit is particularly important as outline above, heat pumps are more efficient at low temperatures in well insulated high-performing buildings. Our 68 eligible buildings have recently been assessed for Display Energy Certificates (DECs), 85% reached D or above.

Workshop suggested all buildings achieving C would be a good minimum starting point. In the context of resources available, we need to seriously ask, what level of performance are we ultimately aiming for.

There is no one size fits all solution to this area, each building is unique and comes with its own challenges, with limits to the level of performance that existing buildings can achieve given their basic design. Even seemingly obvious improvement such as insulation may be challenging because of a combination of the additional costs of changes needed to the fabric of the building, and the long payback period of works. Currently 8-year payback is requirement of many funders, alternative funding arrangements needed to close this viability gap. The buildings that most need this work and also the most challenging for same reasons: age and size.

Programme of retrofits needs to be informed by understanding of estate as whole. Makes sense to start with the highest energy using buildings. Any strategy should look at building type first, then look at technology type, finally look at usage.

**Difficulty Level:** High difficulty because of the specific nature of retrofits requires bespoke solutions for individual buildings

**Next Steps:** Set corporate ambitions for building performance standards. Identify priorities for achieving these standards based on understanding of building types and current performance/energy use.

- **3. Building Usage/Estate Strategy**

**Readiness:** The financial viability of retrofits can only be assessed in the context of understanding future usage and life-span of building. There may be cases where it does not make sense to undertake works given the remaining life span of the building (both for financial and carbon reasons), but this can only be determined if this life span is known. We have substantially reduced number of buildings, with closure of Civic Centre feel getting close to minimum space needed to deliver services.

Beyond number of buildings also have to consider how they are used, our core buildings are open 7-7. More people are working from home since lockdown and this is going to continue. Therefore, lots of energy is potentially being used even though the building is not being utilised. A booking system where staff can book day slots only is being put in place. There will be peak occupancy times. Heating (and lighting) can be potentially targeted at specific areas and times to reduce energy use, although this may require retrofitting system with controls and valves. But only if these times and places are known, and staff are made aware of them and systems facilitates them following them, and more fundamentally if it is physically possible to create separately heated spaces, e.g. Anvil Court does not lend itself to this without construction of new dividing walls.

Sharing space with other (public sector) organisations is another potential method of optimising space use and therefore reducing energy.

**Next Step:** Carbon implications need to be integral part of relevant strategies/documents such as Estates Strategy, Agile Working Systems and Public Sector Facility Sharing.

- **4. Heating Demand Reduction**

**Readiness:** Building design determines maximum not actual performance. Just a couple of staff members can be enough to significantly decrease performance through their behaviour. The effectiveness of heating improvements also depends on a good control system. Otherwise people will find they are getting hot and open the windows for example. Increasing automation of control systems reduces reliance on staff to manage use.

A consistent corporate approach to what temperature work environments should be would reduce energy use across the estate, it was highlighted that some schools choose to heat to higher temperatures. There also needs to be a recognition that people do have different preferences about the temperature of work environment, and this also touches on office dress as well.

Think that significant savings could be realised via better use of existing BMS (Building Management System) control to optimise actual performance of heating systems, but this requires sufficient staff time from staff with the correct skills.

Staff engagement via Energy Champions took place prior to COVID, potential to return to this, as part of wider staff engagement (see cross-cutting theme). Staff engagement of this type does have potential for real impact, but requires consistent resourcing, energy is very small team covering a large organisation.

**Difficulty Level:** Medium, technically possible, but significant costs.

**Next Steps:** Set corporate standards for temperature in different work spaces. Scope programme to optimise use of automation and BMS and identify potential savings/business case for investment (potentially as part of larger strategy)

- **5. Space Cooling**

**Readiness:** We know this is likely to be increasing issue in future as hot days get more frequent, although starting from a low base. In terms of understanding impact on future demand will affect lots of organisations in Gwent, does not make sense for BGCBC to investigate on own. Currently if temperature reach 27 then system brings it down to 24. New ventilation is currently being installed at Anvil Court. You can have an A/C system without it being on, but of course there are the embodied emissions associated with installation.

Staff can play in keeping self at comfortable temperature in ways that not wasteful of energy. Desk Fans are emblematic in this issue, COVID has impact in leading to successful ban in Anvil Court and Schools. This felt to be something that should be continued, noted that previous attempts to ban fans at Civic Centre failed.

**Difficulty Level:** Medium, cost implications

**Next Steps:** Include considerations in corporate standards for temperature in work space (see above) and staff engagement work. Keep future demand under active review to inform planning (possible regional collaboration).

### **Building Embodied Emissions**

This involves consideration of the Scope 3 carbon impact of our buildings, beyond scope 1 and 2 direct energy use associated with heating, cooling, lighting and power of any appliances. Life-cycle embodied emissions include the carbon used throughout each stage of a building's life: construction, use and maintenance, and demolition or disassembly. The life-time embodied energy in complex commercial buildings may be equivalent to 30 times annual operational energy use.

More complex what net zero means in this context as these elements can't be decarbonised in the same straight forward way as direct energy use. There are several different elements including embodied emissions, product miles and material throughput, which, along with

direct energy use, do not automatically reduce together. In fact, actions which reduce emissions related to one element may well increase emissions from another. So complex balancing act to work out lowest life-cycle impact. Also more complex to measure than direct energy-use. BGCBC will not resolve these questions our self, national guidance will lead. (see cross-cutting theme.)

- **6. Existing Buildings**

**Net Zero:** Reduce Life-Cycle Emissions

**Readiness Assessment:**

Life cycle costing is important. There are several elements to this, all of which represent measurement challenges to inform decision making as new areas for all organisations, not just BGCBC. Will require corporate commitment to incorporating these life-cycle factors into decision making as will have financial implications. There is a strong downward pressure on costs, and would require a culture change, especially after 10 years of austerity. Improving any of these elements will cost significant money, even when there are long-term savings.

Life-cycle elements:

- Material Throughput. Product durability plays a big role. But reality is that the shorter lasting option is often cheaper and that is the default choice. Another element is the waste outcome of works. How much results and what do with it?
- Product Miles. This is area that are making significant effort to procure locally, including using local engineers etc. to service buildings. But this is reliant on products being available locally. The more we move towards specialist low carbon products the more challenging it will be as local skills and supply chains are limited at the moment. Currently no doubt Germany and Scandinavia are dominant in this space. There are some Welsh companies in this space, for example, get building block from Newbridge company. But we have to accept that risks in working with companies with limited delivery history. There are also issues that these new/local companies not confident in tendering, may have issues with cost of achieving certification (Example that BG LED companies have not bid for work).
- Embodied Emissions. There is data out there about embodied emissions from products associated with production of used in fabric of building, but it is not perfect, and the extent to which this information has been integrated into the market and product information is even more limited.

**Difficulty Level:** High difficulty due to number of elements where solutions not clear and are outside of our direct control.

**Next Steps:** Create corporate procurement priorities based on identifying high carbon impact elements of procurement for existing building (likely using existing national data).

- **7. New Buildings**

**Net Zero:** WG 'All new buildings to be built to net zero standard (build and use)'

**Readiness:** Feel doing good work in this area. BREAM Excellent can give false idea. Does contain carbon elements but it is possible to get excellent without reducing carbon at all by scoring other points. Some of these are important to other environmental issues such as ecology which key elements. But feel that criteria could be streamlined. Also raise issue of how cost effective BREAM is, the costs of certification can run to five figures, money that could be spent on other ways of reducing carbon.

Funding requirements have impact. Funders have negative reactions about higher costs of zero carbon build. Tight deadlines significantly constrain innovation. Both short lead in and tight spend profiles mean that often condensing design processes more than would like at moment. Also speculated that WG and other funders may make these considerations a requirement in the future, if do so this needs to be recognised in funding levels.

Key stat is only 20% of life cycle carbon emissions from new building are the construction phase. Need to look at life time use of building. There are also potential costs to occupiers in long term. New tech requires maintenance, especially as these are often also new systems. Design and build contracts for new building make it difficult to specify local product, as contractor can select lower cost equivalent performance alternative, perhaps this will change post Brexit?

Making new buildings Zero Carbon easier than existing buildings, but only make up small element of total estate.

As with several of these building related actions there is a concern about the number of companies and people with the skills to carry out this work. If large number of organisations start to carry out similar decarbonisation work at the same time, then costs will rise and capacity may not meet demand. May not just be other public sector organisations who are decarbonising, private sector already pays higher and could outbid public for limited supply of skilled engineers etc.

**Difficulty Level:** High, solutions not yet fully clear, particularly for full life zero carbon.

**Next Steps:** Corporate commitment to defined net zero standard for new build. WG and UK government definitions will play a big role here. Also could be that BGCBC does not want to wait/wants to go further, but if this is the case needs to have clear definition of ambitions.

## 8. District Heating Network(s)

**Net Zero:** WG 'Existing district heating networks will switch to low-carbon sources (electric heat pumps/hydrogen) in the 2030s. Heat networks will be developed in areas of dense heat demand, cities and towns.' Large Public Sector buildings are potential anchor loads for heating networks.

**Readiness:** Existing Works Network has 990kwh biomass capacity. Biomass comes from Carmarthen firm woodchip, no information of what original source(s) is. CHP runs 24/7. Able to heat site for 8 months of a year. Gas boilers kick in the winter when demand is higher. As more buildings link into network inevitable they will need to run more. Not just replacing the biomass system but all the buildings are designed to work with 90o heat so no way heat pumps could take over currently unless very significant investment.

We are looking at Rassau network but would have little impact on council footprint as have few, if any, buildings on potential network.

Past investigations showed Abertillery topography prevented a network, while in Brynmawr was not enough load to make workable. In both cases this was with technology available at time so worth keeping under review.

**Difficulty Level:** High, technology not yet available.

**Next Steps:** Limited actions that can take now, but important to keep technology under review both for existing network and potential additional networks. Could identify formal review dates/periods?

## Electricity

### 9. Renewable Generation

Decarbonisation Plan only covers renewable generation that would be directly operated by BGCBC, council has important role in wider renewable capacity in BG via LDP and Energy Prospectus.

**Net Zero:** Own generation can contribute to larger target of using zero carbon electricity

**Readiness:** Currently have around 350kwh of installed capacity, plus work with Leisure Trust including Sports Centre. Building mounted renewables can play a role, good for demonstrating public leadership, Phase 1 Re: Fit has shown the potential viability issues, as have to deliver 8-year return. Things like asbestos and roof strength add costs apply to a

significant number of our buildings, we have absorbed them in some cases in Estates budget. Can also be more fundamental issues where roof alignment not suitable.

We are also working on industrial stock and business units. This work is not directly impacting on our footprint much at the moment because we do not have operations control, although they might potentially come back into our ownership. This may also be relevant consideration for Community Asset Transfer buildings also.

Potentially large amounts could be generated from non-building mounted renewables.

However, grid capacity means until Western Power upgrade that limited what can put in grid, but anyway we would ideally want to generate power where it will be consumed. Silent Valley good example of where this possible. The council owns limited land suitable for wind farms, lot of our land is urban so free standing solar would be very vulnerable to vandalism.

**Difficulty Level:** Medium (Some sites high)

**Next Steps:** BGCBC could set target for own renewable generation, based on assessment of potential capacity. Important that this target should be informed by larger context of total electricity needs and relative carbon benefit compared to other forms of decarbonisation investment.

## 10. Electricity Procurement

**Net Zero:** WG currently requires use renewable supply. However, Climate Change Committee notes that most forms of procurement do not actually lead to increased renewable electricity generation within the wider UK system (considered as 'additionality'), as the majority of renewable electricity being purchased either already exists or is being supported through Government mechanisms including Contracts for Difference. Suggest move towards Power Purchase Agreements (PPA) which are long-term contracts creating specific renewable capacity rather than a green tariff. As building renewable infrastructure is very capital intensive, a long-term contract will give developers long-term revenue certainty to create additional renewable capacity.

**Readiness:** Electricity procurement done not just on all Wales but all UK basis. Smooths costs over 18 months, have to wait for contracts to end. Can choose from range of options. Have split to individual contracts for different buildings. Difficulty of procurement contracts not high if know what we want.

Data is available. Upload to Team Sigma. Not using the full capability of system, similar issues to gas data above that need suitable staff time and skills. But are assessing impact of schemes such as Re:Fit.

Making use of right data in timely way when decisions being made is the challenge. For example, investigating system that will allow schools greater access to their data.

**Difficulty Level:**

**Next Steps:** Investigate and set corporate position on additionality of electricity procurement (unlikely to be area where BGCBC acts alone).

## Electricity Demand

Decarbonising heating like decarbonising transport is likely to increase demand for electricity. Electrification has been identified as a cross-cutting theme that needs to be considered separately, rather than potentially merging multiple transitions into electricity. The readiness assessment considered the areas that are already being powered by electricity.

- **11. Demand Reduction from Buildings**

**Net Zero:**

**Readiness:** Big problem here is making policy meaningful. We have had Energy Policy covering this area before, but it just sat on the shelf having little or no impact on demand. Need to make sure that any new policy is meaningful, key to this is corporate culture change. It is not a

policy that single person or small team can roll out on own, 1.1k staff involved in this demand. Also need to recognise that not just on staff, automation big part of this and trying to roll out across estate.

Also need to be supported by increased visibility of data, want all buildings to be on performance system. Big issue across all these areas is use of data and performance. Aware that can potentially do a lot more, but need to make associated with impact. Also need to understand how to evaluate against relevant benchmarks such as past performance and other organisations.

**Difficulty Level:** Medium, the technology exists, challenges around rolling out across all buildings and staff.

**Next Steps:** Any new Energy Policy need to have basis in delivery mechanisms around data, automation and staff engagement, not just paper targets and policy statements. Also understand place in larger context of electrification.

- **12. Information Technology (Appliances)**

**Net Zero:** Reducing energy use and embodied emissions.

**Readiness:** Legacy laptops have been replaced. Likely that this had beneficial carbon impact, it would be possible to go back and calculate the carbon impact, but wasn't considered at the time. Highlights that need to bring these considerations upstream to point of procurement, this is the point where big impact can be made. Not just energy efficiency standards, but whole life costings etc. There is larger issue that we have tended to just go with what SRS recommend, starting to be more proactive in recognizing that we make decisions and taking lead as client on procurement.

Similar situation with end of life disposal, tendency for equipment to mothball on 2nd floor at Civic. Bridging the Gap has looked to take more proactive approach, should have financial benefits, worst case people will strip for metal.

This is another area which highlights that we hold performance data that has carbon implications that we are not considering. We need to make these carbon calculations routine practise, and most importantly insert the data into decision making processes at right moment.

Software change programme will also have impact. Firstly, moving to avoid systems that rely on printing, access work orders etc. via smart device (already highlighted for transport will reduce travel). Secondly move to cloud and servers in Newport Data Centre. Economies of scale not just about cost, will save carbon by not having separate cooling etc.

Apart from IT suspect biggest use is kitchen appliances, mainly in schools. Most if not all have these school kitchens have transitioned from gas to electric.

**Difficulty Level:** Medium

**Next Steps:** Set standards and incorporate carbon considerations and data into procurement processes.

### 13. Street Lighting

- **Net Zero:** Reduce Energy Demand
- **Readiness:** 1.5k LED lights installed through first Salix. Another 6-6.5k being converted at moment. In total we have around 13k columns. Selection was based on E. ON report about where biggest (financial) savings would be made. Have also made savings because able to dim bulbs, this was initially in response to public feedback that much brighter than old bulbs. Similarly timing and alternate lights being on has reduced energy consumption, seeing savings. Question of length of time that remaining 5k will take and if need further funding will be addressed through assessment of existing programme and development of operational policy for street lighting which not something had previously. Replacement costs roughly £150 each. At moment use any spare maintenance budget to continue making replacement, some money is available because less replacement need to be made with so many LEDs now in operation.

The main challenge is now town centre ornamental lighting, often installed as part of improvement projects, so in most cases straight replacement with LED bulb will not be possible, more expensive replacement of entire lighting fixture will be needed.

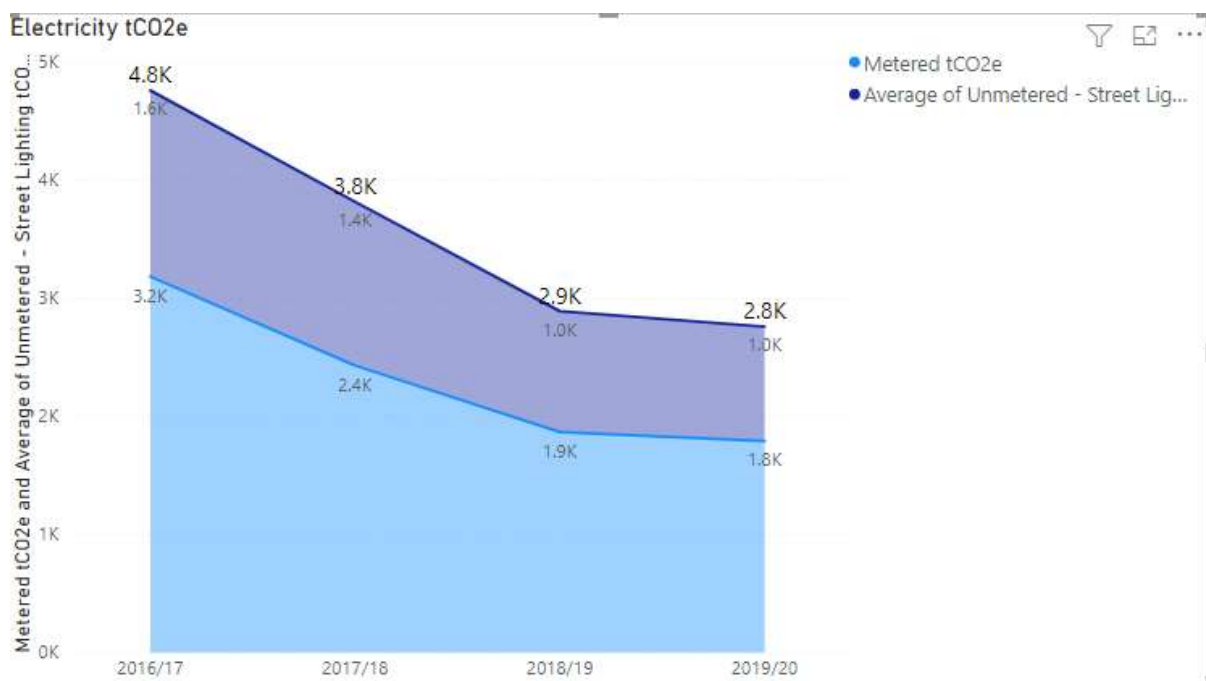
**Difficulty Level:** Medium (due to town centre lighting)

**Next Steps:** Carbon implications part of new Street Lighting Policy, possibly including target(s) for replacements.

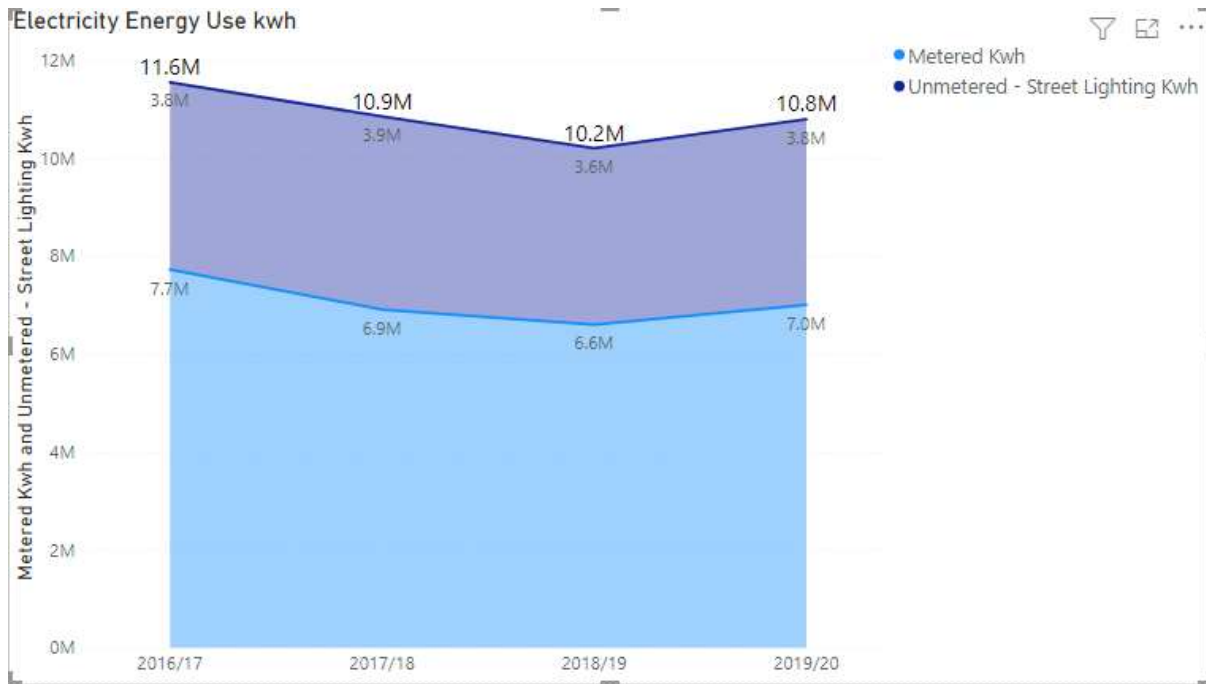
## 2. Footprint Data

### Transition 7 Electricity

Over the last four years' total carbon emissions from our electricity consumption have fallen 39%, with similar falls for both our metered (buildings) and unmetered (street lighting) emissions.

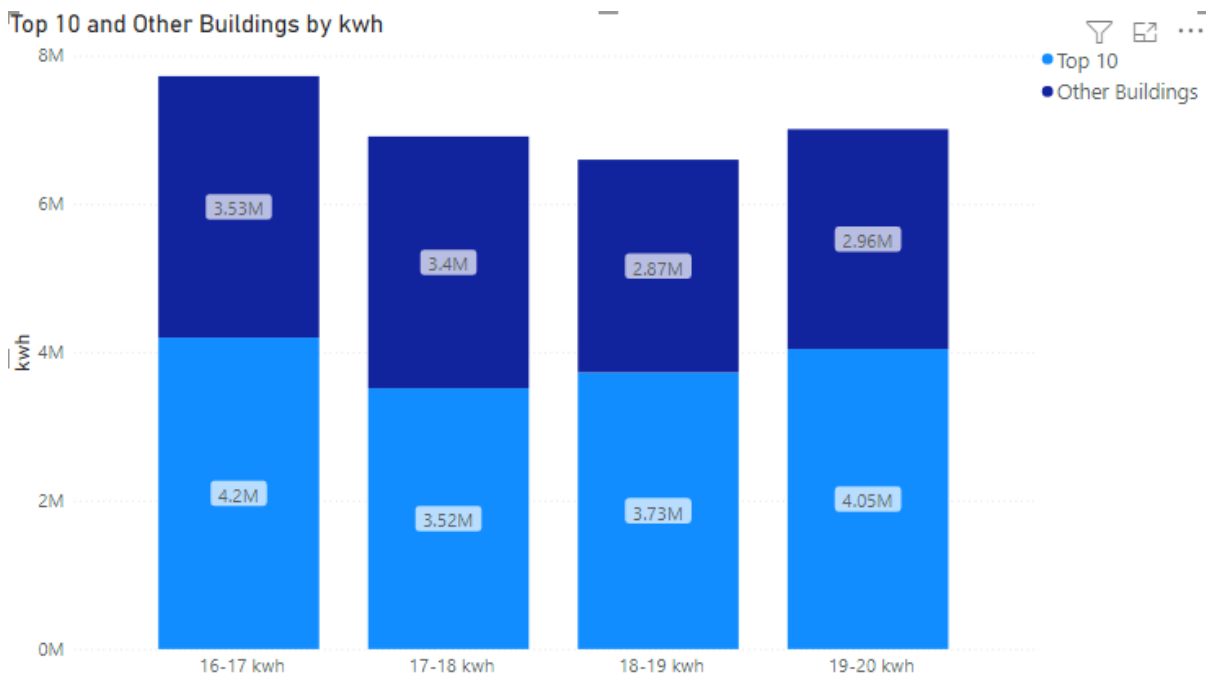


However, the majority of this reduction has been due to a fall in the carbon intensity of the electricity grid, our electric energy consumption has only fallen by 6.5% over the same period.



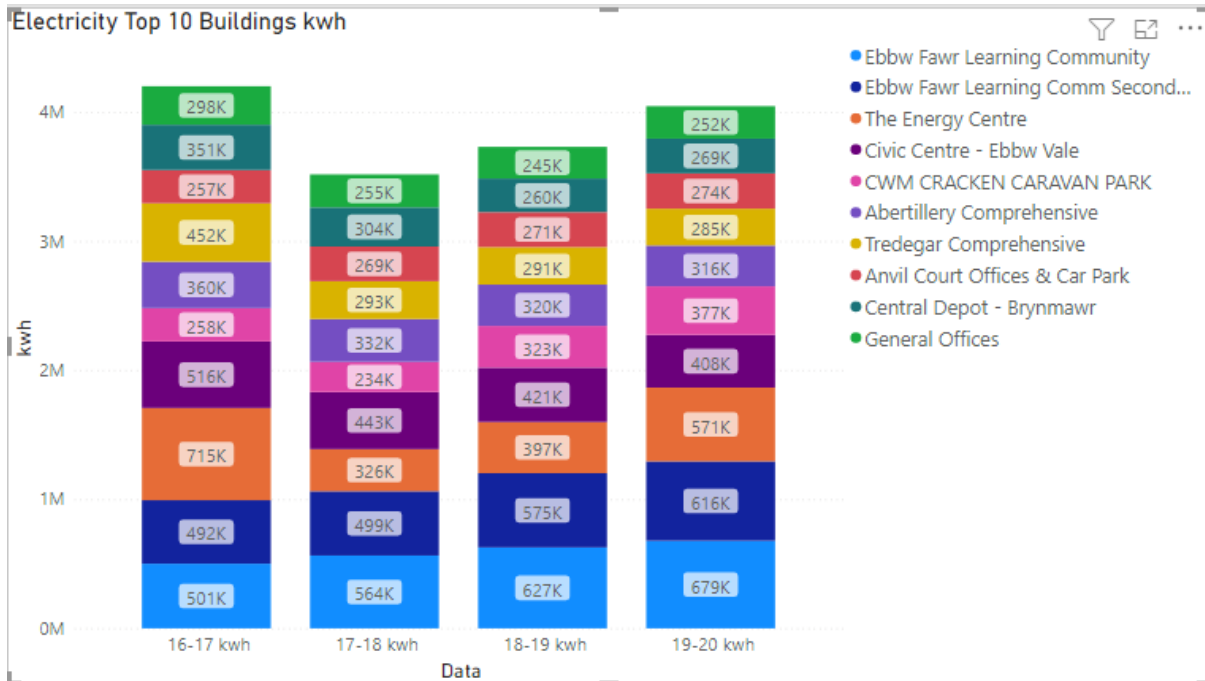
Our buildings make up two thirds of our electricity consumption, with unmetered supply to street lighting making up the other third. Over half of our electricity use in buildings takes place in our top 10 electricity consuming buildings

(Figures for buildings are kwh to reflect our energy usage rather than grid decarbonisation.)

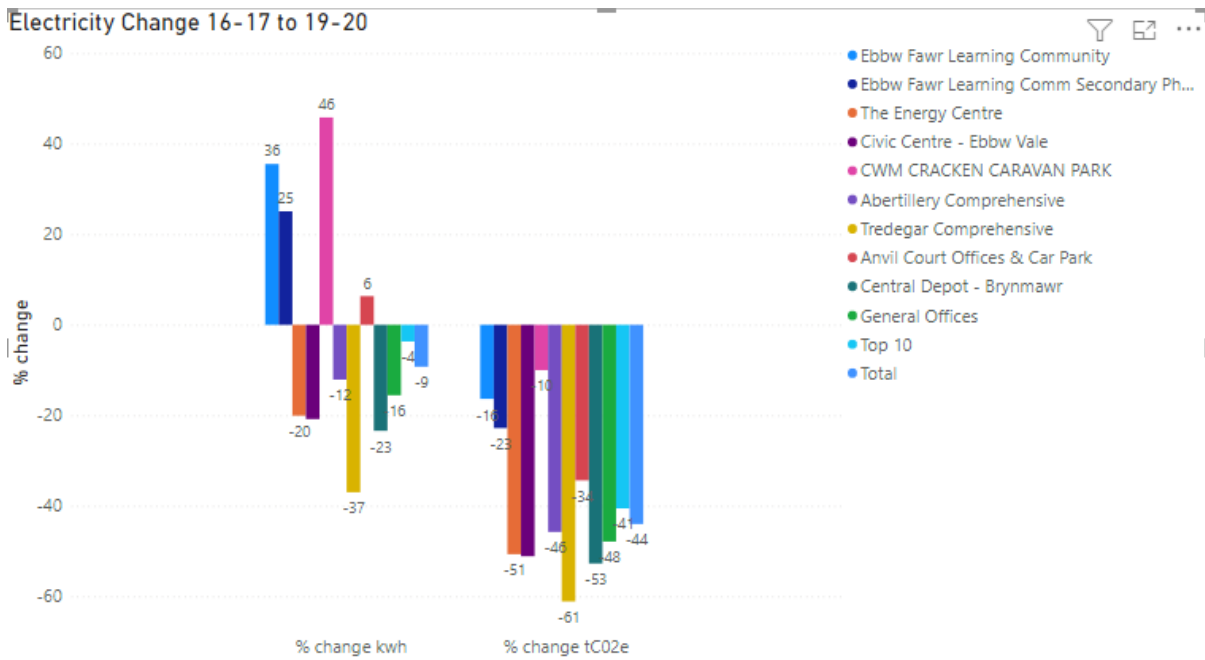


The top ten buildings for electricity consumption are shown below



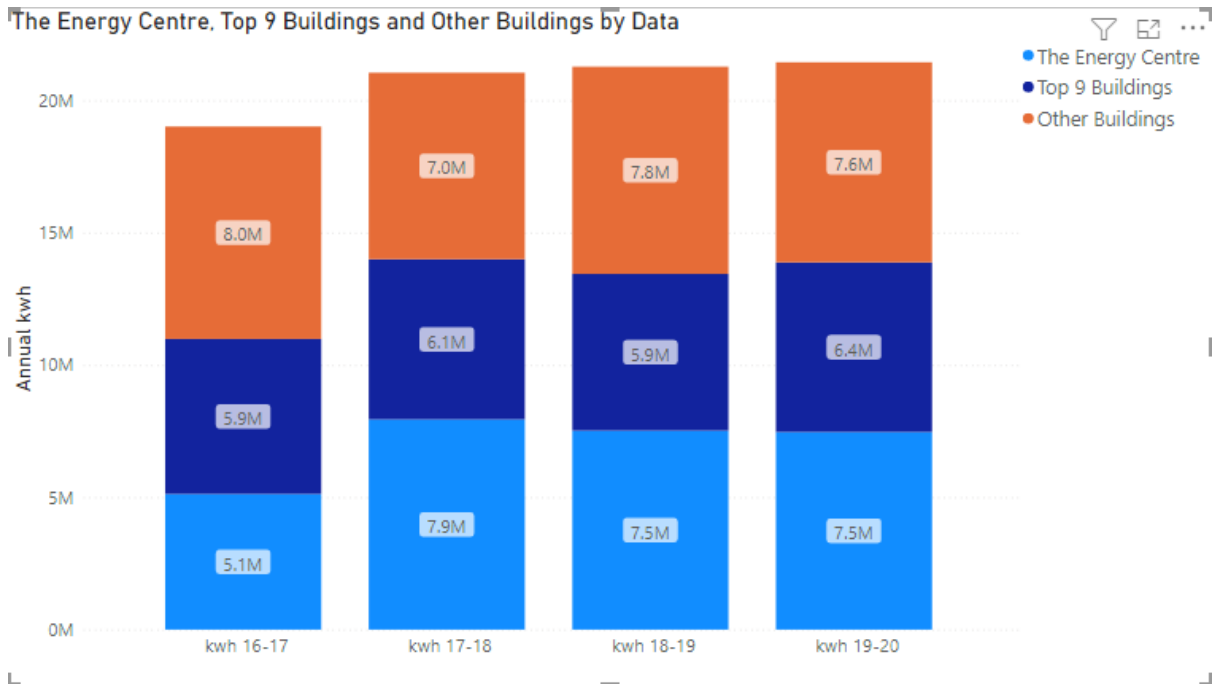


There is considerable variation in the trends of electricity consumption across these top 10 sites over the last four years. Although once grid decarbonisation is taken into account the carbon impact of all these buildings has fallen.



### Transition 8 Heating

The Energy Centre at The Works makes up 35% of our gas consumption, the next 9 largest consuming buildings make up another 30% of gas use, and all other buildings the remaining 35%. Unlike the electricity grid there has been no real change in the carbon intensity of the gas grid, so our carbon emissions directly reflect our energy usage. Which has risen 12% over last 4 years.

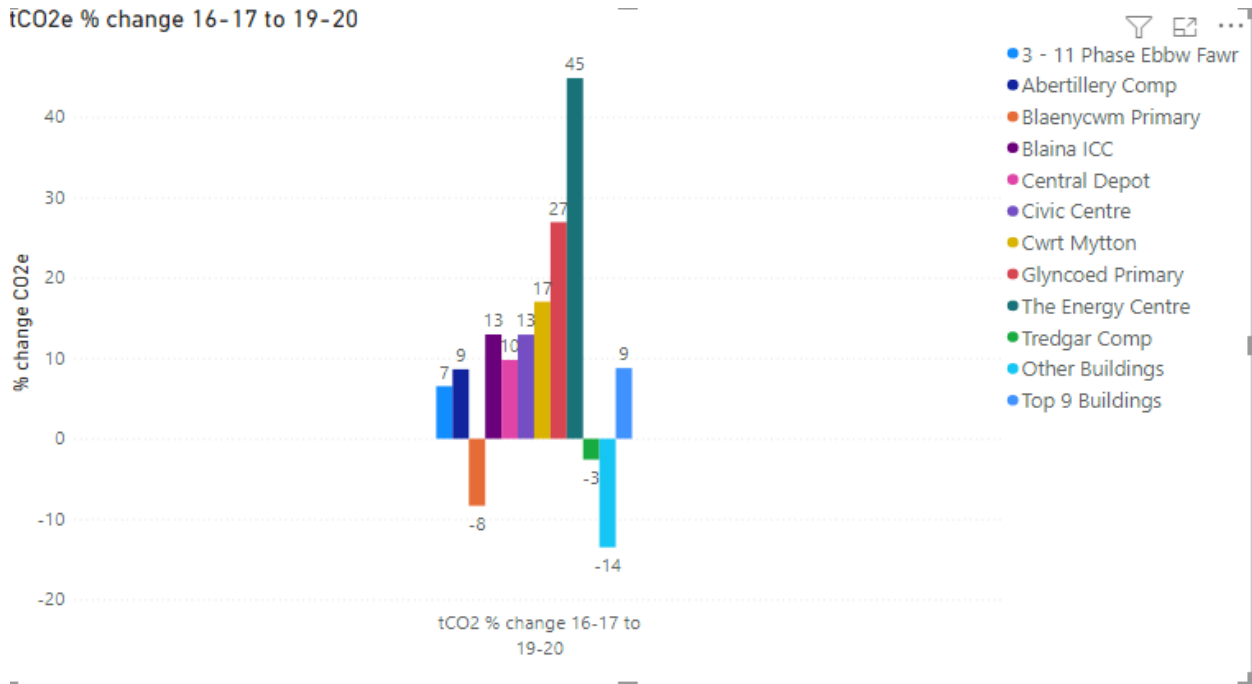


Six buildings appear in the top 10 for both electricity and gas: Energy Centre, Civic Centre, Ebbw Fawr Primary Campus, Abertillery Comprehensive, Tredegar Comprehensive and Central Depot.



There is considerable variation in change in energy use over last four years, the Energy Centre has driven much of the rise.

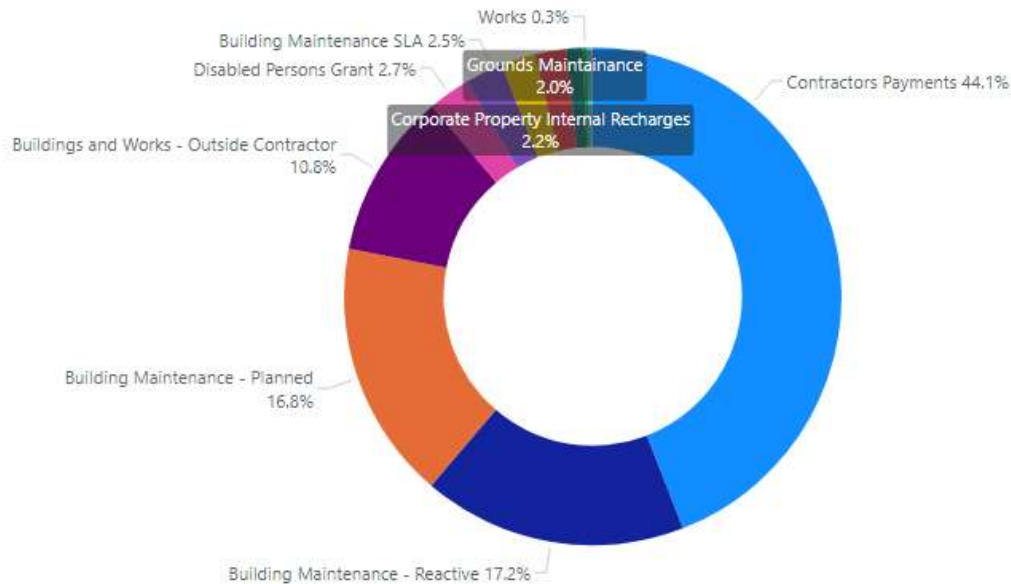
tCO2e % change 16-17 to 19-20



### Transition 6 Procurement Works

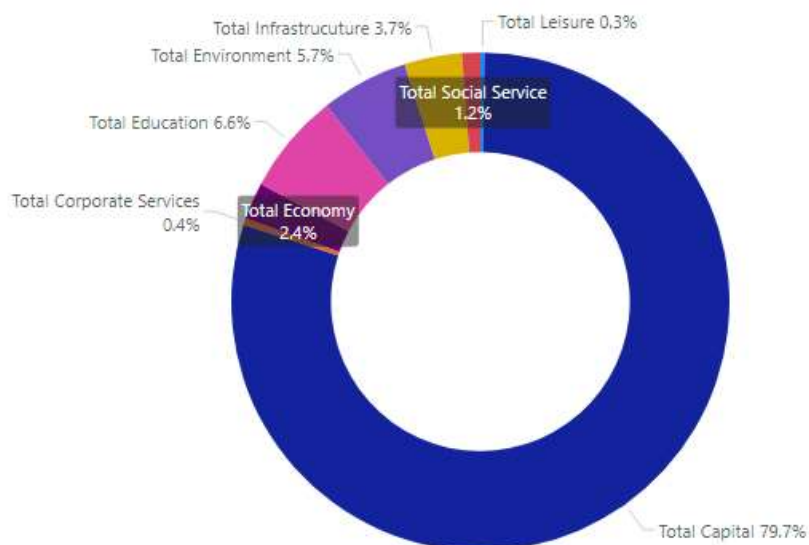
Breakdown of procurement works spending by detail code

Procurement Works by Category



## Breakdown of spending by department

Procurement Works By Department



### 3. Policy Context

Welsh Government Buildings Route map to 2030

#### ***Moving up a gear – 2021-2022***

- ***Our construction programmes include mandatory net zero objectives.***
- ***Develop plan for hard to decarbonise building types***
- ***Scoping for Low Carbon Heat pilot projects and significant progress on remaining energy efficiency opportunities.***

#### ***Well on our way – 2022 – 2026***

- ***Transition to all new schools, colleges and offices built to net zero (and associated reduction in supply chain impacts).***
- ***All remaining existing buildings will be highly energy efficient OR scheduled for replacement & renewable heat schemes will be rolled out.***
  - Develop and deliver a strategic plan for the **local authority estate** decarbonising existing (retained) buildings, moving to renewable energy sources for electricity and heating, and ensuring any new build is to net zero standards (in construction and operation)
- Ystadau Cymru as strategic lead for the public sector will work with LA estate managers to identify and shape what the estate will look like longer term (following recovery from the pandemic) ensuring decarbonisation is at the forefront of this agenda, and help drive the next three commitments:
- Develop a strategic plan for **hard to decarbonise building** types within 18 months
- All public buildings are supplied with **low carbon heat** by 2030 and generate their own electricity where feasible.

- All **new** [*new build and new acquisitions, e.g. hubs and lease arrangements*] public sector buildings are **built to net zero standard**, including supply chain impacts. (net zero build and net zero operation)
- Work with the 21st Century schools programme to establish and address cost differential and barriers to building net zero/carbon positive schools [note there will be a separate 21<sup>st</sup> Century Schools programme contribution in the NZW]
- Plan ahead for a coordinated programme of boiler replacement in council-owned properties
- Work with colleges to develop a ‘pipeline’ of skilled workers, through apprenticeships and training, to support LA retrofit work.

#### ***‘Achieving our goal’ 2026-2030***

- ***All new public sector buildings are built to net zero standard, including supply chain impacts***
- ***All public buildings are supplied with low carbon heat by 2030 and generate their own electricity where feasible***
- ***The focus is no longer on buildings but healthy environments to live, work and visit.***

#### Heating

- Welsh Government Targets
  - No new fossil-fuel boilers: No new gas boilers installed in public buildings from 2030. No new oil boilers in 2025/26. From 2028 onwards, no new fossil-fuel boilers should be installed in off-gas grid areas.
  - Existing district heating networks will switch to low-carbon sources (electric heat pumps/hydrogen) in the 2030s. Heat networks will be developed in areas of dense heat demand, cities and towns.
  - A significant increase in installed energy efficiency measures: By 2028 public buildings and social rented homes need to achieve EPC C rating where practical and affordable.
  - Specify high standards for new buildings on the council’s own land. Local authorities can require that new homes or commercial buildings are built to Passivhaus or equivalent low emissions standards, or BREEAM Excellent.
- UK Climate Change Commission Advice
  - Waiting for hydrogen / gas grid decarbonisation is not acceptable in the context of a net zero public sector by 2030. Renewable energy is more efficiently used to generate heat by a heat pump than through hydrogen generation and there is uncertainty if existing gas grid infrastructure could be used for hydrogen distribution.
  - Fossil fuel CHP – no new units, no replacement of failed, and no major maintenance spend. Fossil fuel CHP plants are shown to increase emissions as the electricity grid decarbonises, and even now more carbon intensive than a gas boiler.
  - Whole System Optimised Retrofit. Although higher temperature heat pumps and hybrid solutions are available; the operational costs, electrical requirements, and carbon emissions will be reduced by lowering building temperature and heat demand first. This can be achieved by first considering fabric upgrades which also provide the benefits of building comfort improvements.

## Electricity

- UK Climate Change Commission Advice
  - Most forms of procurement do not actually lead to increased renewable electricity generation within the wider UK system (considered as 'additionality'), as the majority of renewable electricity being purchased either already exists or is being supported through Government mechanisms including Contracts for Difference. Alternative is the long-term contractual nature of the PPA compared to green tariffs. As building renewable infrastructure is very capital intensive, a long-term contract will give developers long-term revenue certainty which in turn provides them with bankability.

**WG Net Zero Wales Proposed LA Commitments**

<b>Buildings</b>
<p>Commitment # - Develop and deliver a strategic plan for the <b>local authority estate</b> decarbonising existing (retained) buildings including retained council housing, moving to renewable energy sources for electricity and heating, and ensuring any new build is to net zero standards (in construction and operation)</p>
<p>Commitment # - Ystadau Cymru as strategic lead for the public sector will work with LA estate managers to identify and shape what the estate will look like longer term (following recovery from the pandemic) ensuring decarbonisation is at the forefront of this agenda, and help drive the next three commitments:</p> <ul style="list-style-type: none"> <li>• Develop a strategic plan for <b>decarbonising buildings</b> by the end of 2023</li> <li>• All public buildings are supplied with <b>low carbon heat</b> by 2030 and generate their own electricity where feasible.</li> <li>• All <b>new</b> [<i>new build and new acquisitions, e.g. hubs and lease arrangements</i>] public sector buildings are <b>built to net zero standard</b>, including supply chain impacts as soon as practicable/dates to be confirmed as part of strategic plan. (net zero build and net zero operation)</li> </ul>
<p>Commitment # - Work with the 21st Century schools programme to establish and address cost differential and barriers to building net zero/carbon positive schools [<b>note assuming a a separate 21st C Schools programme contribution in the NZW – this could come out?</b>]</p>
<p>Commitment # - Plan ahead for a coordinated programme of boiler replacement in council-owned properties</p>
<p>Commitment # - Work with colleges to develop a ‘pipeline’ of skilled workers, through apprenticeships and training, to support LA retrofit work.</p>

**LG Decarbonisation Strategy Panel (DSP)**

**Proposed actions/commitments from DSP Buildings deep dive -**

Note this is a working living document. Allocated leads and dates are indicative only and are being discussed and developed with the relevant networks as well as feeding into planning for the WLGA support programme and with the DSP.

<b>No.</b>	<b>Proposed Action/Commitment</b>	<b>Lead?</b>	<b>E</b>
	<b>TIERS - not yet determined</b>		<b>V</b>

1	Help and support LAs, collaboratively and with the wider Welsh Public Sector review their current office estate from a staff point of view (given the majority are still working remotely)	Ystadau Cymru / LAs
2	Identify and shape what the estate will look like longer term (following recovery from the Pandemic) - ensure decarbonisation is at the forefront of this agenda	Ystadau Cymru / LAs
3	Recommend that if a building is still in place by 2025 and therefore secure for the short-term, that activity such as PV / LED lighting should progress and meet any target (e.g. all sites held in 2025 will be fully LED lit).	Ystadau Cymru / LAs
4	Share knowledge between estate managers on decarbonisation	Ystadau Cymru / LAs
5	Develop a decarb skills and training framework for estate managers.	Ystadau Cymru / LAs
6	Build up a bank of decarb estate case studies (change of use etc.)	Ystadau Cymru / LAs
7	Identify and gain a strong LA Chief Exec mandate for the described YC work to be undertaken.	Everyone
8	Provide a template report and guidance for LAs to map their current estates and enable them to have a good understanding of the climate impacts of their built estate by the end of the year.	WG / WLGA
9	Identify and align with an industry best practice standard and update and communicate this as it evolves. Communicate to LAs what "good" looks like – what is the standard LAs should be aiming for?	WG
10	Communicate a proposed Net Zero definition for buildings.	WG / WLGA
11	Create one demonstrator Project in each Region. These can be learned from. Risks can be taken. Engage with CLAW group - try and identify what the cost of change is going to be.	Everyone
12	A joint approach is needed on the grid capacity and distribution issues for the whole of the Welsh Public Sector.	WG / UKG
13	Investigate the merits of and potential ways an aggregated net zero building target could be identified and implemented across Regions as opposed to an individual buildings net zero target.	WG / UKG
14	Consider ways to build on the Refit programme and make an offer of energy service expertise to LAs.	WG
15	Brief Ministers' of carbon emission effects of office buildings and the wider estate to highlight its importance.	WG
16	Support Ystadau Cymru to coordinate review of current estate.	WG
17	Highlight Ystadau Cymru work; effective joint working between LAs and an effective delivery mechanism such as the WG Energy Service in a business case to ministers requesting funding for energy changes of offices.	WG
18	Continue to undertake formal review of the grid with operators.	WG
19	Set up a 21st schools LA decarb group? Or LAs engage in one of Neal O'Leary's current working groups. - A net zero school group.	Everyone



20	Build net zero construction objectives into construction programmes.	LAs
21	Provide guidance on appropriate and achievable net zero objectives for LAs to build into construction programmes.	WG / WLGA
22	Identify 5 big things in this area that we could be procuring together as a LA - or as a public sector	WLGA / LAs
23	Develop a plan for hard to decarbonise buildings within their estate, using advice and support from WGES or similar services.	LAs
24	Provide a list of 'easy wins' what should be achieved quickly by the end of the year.	WG / WLGA / WGES
25	Scope potential regional and possible collaborative low carbon heat projects.	WLGA / LAs
26	Organise an extraordinary Strategy Panel to focus on housing and decarbonisation.	WG / WLGA
27	Share research and knowledge on decarbonising listed or historic buildings e.g. work being done by CADW and the National Trust.	WG / WLGA