

Appendix A - Background

Bristol City Council (BCC) gas supply and demand

BCC gas supply contracts

The current BCC gas supply is provided under a Laser Energy Public Sector framework¹ with TotalEnergies as the appointed gas supplier. This contract operates on a flexible procurement basis, ie the price is set from multiple gas buys over an extended period rather than being set by the market price on the contract renewal date (as would be the case with a fixed price contract).

The current BCC gas supply contract expires at the end of September 2024, but approval was given at the September 2023 Cabinet² to renew this supply by a further four years, including approval for green gas and Hydrogen options to be considered. This was confirmed as a four-year extension to the Laser/TotalEnergies arrangement in October 2023³.

Price stability

While UK production of natural gas is around 41% of UK gross supply, the remainder is imported, meaning that gas prices are still subject to volatility depending on international geopolitical events.

BCC gas demand

In 2023/24, BCC gas contracts provided 45 GWh of gas. For context, a 'typical' 2/3-bedroom house uses 11,500 kWh of gas per year⁴, so the BCC supply equates to the demand of around 3,845 average houses.

The majority of gas supplied to the BCC estate is used for heating and hot water, some is used for cooking (eg in schools), some for other purposes. The largest gas supply goes to the Housing Estate (recharged to the Housing Revenue Account HRA), where it is used in communal heating systems. BCC does not supply individual Council houses. The Corporate Estate includes the largest non-heating gas use in the two crematoria, which accounted for over 6% of total gas supplied in 2023/24. 'Internal Recharge' covers internal clients with their own funding, such as Filwood Green Business Park. The largest external client is the Avon Fire & Rescue Service (AFRS)⁵, whilst schools are supplied through the Schools' Energy Club (where the cost of supply is recharged to each school).

	Group	23/24 supply (kWh)	% of total
Areas within the 2025 target	Corporate	12,725,048 ⁶	28%
	Internal Recharge	1,009,211	2%
Areas within the 2030 target	HRA	21,990,832	48%
	Schools	8,374,733	18%
	Client	116,970	0.3%
	Avon Fire & Rescue Service	1,196,874	3%
		45,413,668	

Further detail of BCC gas supply in 2023/24 can be found at Appendices 1 & 2 below. BHNL/Vattenfall heat centres, which supply heat for the District Heat Network, are no longer on BCC gas supply contracts; Vattenfall have now made their own arrangements for these supplies.

¹ [Fixed & Flexible Electricity & Gas Frameworks - LASER Energy](#)

² September 2023 Cabinet - [ModernGov - bristol.gov.uk](#)

³ Gas OED October 2023 - [ModernGov - bristol.gov.uk](#)

⁴ [Average gas and electricity usage | Ofgem](#)

⁵ BCC provides a Bureau Service for AFRS, managing gas and electricity supplies on their behalf.

⁶ Including green gas supplies to the two crematoria and City Hall

Options for achieving carbon neutrality

If the carbon impact of some or all the BCC gas supply is to be neutralised, there are a number of solutions available:

Demand reduction measures

The September 2023 Cabinet approved a programme of decarbonisation measures, targeting the 'Top 30' largest corporate energy using buildings. Decarbonising the top 30 buildings will remove 88% of gas carbon emissions from the corporate estate (noting that some of these measures will displace existing green gas supplies, eg to City Hall).

Replace gas with another heat source

Gas is primarily used as a fuel for producing heat and hot water, but there are alternatives for achieving this. The leading options are heat pumps (electrification of heat) and district heat networks (DHN). BCC's long-term strategy should be to achieve zero-gas consumption across the whole BCC estate; realistically, this could take many years, with a long, difficult, and expensive 'tail' of smaller buildings to address. The DHN still has only a limited reach, even with the ongoing development of new heat networks, whilst heat pumps are expensive, and need a grant or subsidy to make them a viable option. The migration to alternative heating sources is a long-term commitment, and as BCC starts to electrify heating and connect more buildings to the DHN, this will displace BCC gas demand.

The primary non-heating use of gas are the crematoria, and studies are under way in to options for replacing gas cremators with alternatives. This too is a long-term commitment, but will also significantly reduce BCC gas demand when implemented.

Use of alternative heating fuels

Hydrogen is being developed as an alternative to natural gas in the UK market, as much as a security of supply as an environmental measure⁷. The UK Government has made a strategic decision to allow hydrogen blending in the GB gas grid of up to 20% hydrogen, albeit without a specific timetable⁸.

The source of hydrogen is critical if it is to have an impact on carbon emissions. The early development of the hydrogen market is likely to be largely reliant on 'blue' hydrogen derived from fossil fuels. But only 'green' hydrogen, derived from renewable energy sources, would have an impact on BCC carbon emissions. However, at best, a green hydrogen blend would only dilute the level of BCC carbon emissions and this dilution would be minimal in the context of the cap on blending hydrogen; it is not practical to run BCC heating systems on pure hydrogen, from whatever source.

Use green gas

Green gas (see below) is gas derived from organic sources. Green gas cannot be bought for direct supply, but is injected in to the gas grid where it is blended with 'brown' (natural) gas, lowering the overall carbon load of the gas grid supply. Customers with a green gas supply will receive certificates to demonstrate that they have bought green gas from a reputable registered producer. Note that unlike with electricity, there is no centrally managed green gas certification scheme in the UK market, but there are a number of reputable certification schemes available.

⁷ [UK hydrogen strategy - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/uk-hydrogen-strategy)

⁸ [Hydrogen blending in GB distribution networks: strategic decision - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/hydrogen-blending-in-gb-distribution-networks-strategic-decision)

Green gas is in limited supply in the UK as compared with natural gas. UK production of biogas injected to the grid in 2022 was 6,798 GWh⁹. The bulk of this (91%) came from anaerobic digestion, the balance from sewerage gas. This contrasts with a natural gas supply of 784,708 GWh for the same year¹⁰; biogas production in 2022 was thus around 1% of the volume of natural gas supplies.

The volume of green gas produced is being supported and developed through the Green Gas Levy¹¹ (GGL - a charge applied on suppliers for each gas meter) and the Green Gas Support Scheme¹² (a Government support scheme to encourage greater green gas production funded by the GGL).

In past gas supply contracts, BCC mandated that 10% of the supply should be green gas, latterly 15% for new connections. Under the current gas supply contract, specific supply points need to be nominated for a green gas supply (technically, the purchase of RGGO certificates to an equivalent volume of the gas demand for the nominated sites), so BCC has adopted a strategy of nominating the three largest gas consuming sites (City Hall, Canford Crematorium, and South Bristol Crematorium). Together these sites account for 9.5% of BCC gas demand, but 39% of gas demand for sites within the scope of BCC's 2025 carbon neutrality commitments (2025 Target).

Buy Carbon offsets

Carbon offsets are a way of compensating for the emissions created from burning natural gas. These will typically be bought through accredited schemes on a tonne-for-tonne basis. These schemes will invest in measures to reduce carbon emissions or to capture carbon, such as re-forestation or renewable energy. A number of 'green gas' tariffs actually comprise a mixture of certificate-backed green gas (often a low % of the total supply) and a balance backed by carbon offsets, so should be treated with caution. The purchase of such credits would not actually reduce the councils own carbon emissions, but would support a compensating reduction in wider emissions.

Green Gas

Green gas production

Natural gas (aka 'Brown' gas) is a methane-rich gas produced as a result of the breakdown of organic material over geological time, which is mined in regions where it occurs naturally and transported (by pipeline or as a liquefied gas) to regions where it is consumed.

Biogas¹³ is produced as a result of the breakdown of wastes or organic material under anaerobic conditions over much shorter timeframes, using an anaerobic digester (see below). It is also a by-product of sewerage treatment. Depending on how it is produced, biogas will typically comprise a mixture of around 60% methane and 40% CO₂. This can be burnt directly, eg in a Combined Heat and Power (CHP) unit to produce electricity and heat. Alternatively, the CO₂ can be removed and the resulting biomethane can be injected into the gas grid, enriched as necessary with propane to boost its calorific value to match grid gas. Because of this indirect injection into the gas grid, it is not possible to purchase green gas for direct use in BCC sites. It will instead be bought indirectly under an accredited green gas certification scheme, through which producers are paid to inject equivalent volumes of green gas into the GB gas grid.

⁹ [Digest of UK Energy Statistics \(DUKES\): renewable sources of energy - GOV.UK \(www.gov.uk\)](#) – 2022 is the latest year for which this data is available.

¹⁰ [Digest of UK Energy Statistics \(DUKES\): natural gas - GOV.UK \(www.gov.uk\)](#)

¹¹ [green gas Support Scheme and green gas Levy - Suppliers | Ofgem](#)

¹² [green gas Support Scheme guidance | Ofgem](#)

¹³ [Green Gas - Green Gas Certification Scheme](#)

Anaerobic Digestion and Fuel Crops

Anaerobic digestion (AD)¹⁴ involves the breakdown of organic material under low oxygen conditions. This is placed in a digester (essentially a large, sealed tank) along with cultured micro-organisms which help in the breakdown of the organic material. The result is a methane-rich gas, and a nutrient rich digestate (the solid remnants of the organic material digested) which can be used as an agricultural fertiliser.

The organic material used in AD includes farm manure/slurry, silage, food waste, crop waste (eg straw), other organic waste, or purpose-grown crops. For small farm-sized operations, the organic material will typically be produced on site, larger commercial digesters will require bulk delivery of material (eg food waste) with associated storage and processing before digestion.

Crops can be grown specifically for use as a primary fuel for AD, or can be used to enrich or stabilise other feedstocks. Crops purpose grown as a fuel for AD include wheat, maize, grass, oilseeds, beet, and a range of other crops¹⁵. In 2023, an estimated 4.2 million tonnes (25% of total feedstocks) was crops purpose grown for AD. It is estimated that this required a cropping area of 93,000 thousand hectares¹⁶.

If the whole of BCC's green gas requirement for the sites within the scope of the 2025 decarbonisation target was to be produced by fuel crops alone, this would require 347 ha (857 acres), or just over 500 football fields. If this supply was based on the UK average of 25% of green gas sourced from fuel crops, this would require 87 ha (214 acres), or 127 football fields.

Carbon impact

BCC's gas supply in 2023/24 generated 7,388 tonnes of CO_{2e}¹⁷. A breakdown of BCC's contracted gas supply CO_{2e} emissions is shown at Appendix 3 below.

The current BCC gas supply is a mix of natural gas and green gas. Although green gas has a lower carbon load in comparison to its fossil fuel equivalent¹⁸, it will still produce CO₂ when it is burnt, but this is largely offset by the CO₂ captured by the organic materials used in the manufacture of green gas.

The Government conversion factors for company reporting of greenhouse gas emissions¹⁹ give carbon loadings for natural gas and green gas as:

Fuel	Unit	kg CO _{2e}	g CO _{2e}
Biogas	kWh	0.00022	0.22
Natural gas ²⁰	kWh (Gross CV)	0.18	180.00

So green gas is not a zero-carbon fuel, but has a substantially lower carbon impact than natural gas.

¹⁴ [Anaerobic Digestion: How does it work? - YouTube](#)

¹⁵ [Feedstocks | Anaerobic Digestion \(biogas-info.co.uk\)](#)

¹⁶ [Bioenergy Crops in England and the UK: 2008-2023 - GOV.UK \(www.gov.uk\)](#)

¹⁷ Note that this is the carbon impact of the total BCC contracted gas supply to all parts of BCC and BCC clients, this is a different scope from that included in BCC's annual environmental reports which can be found here: [BCC Environmental Performance Summary 22-23 \(bristol.gov.uk\)](#)

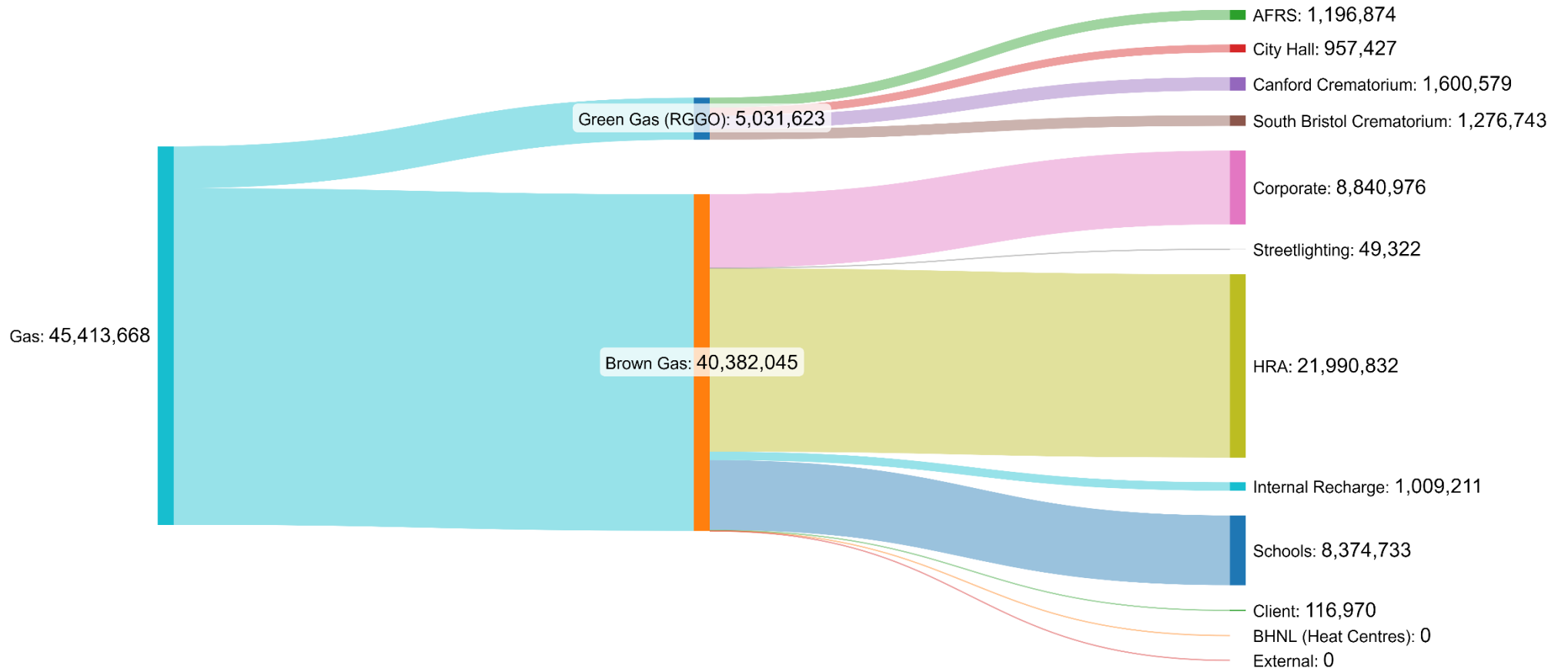
¹⁸ [Scheme Rules - Governance - green gas Certification Scheme](#)

¹⁹ [Government conversion factors for company reporting of greenhouse gas emissions - GOV.UK \(www.gov.uk\)](#)

²⁰ This figure makes allowance for the volume of natural gas injected in to the UK gas grid, see Guidance notes on the 'Fuels' tab @ <https://assets.publishing.service.gov.uk/media/649c5358bb13dc0012b2e2b7/ghg-conversion-factors-2023-full-file-update.xlsx>

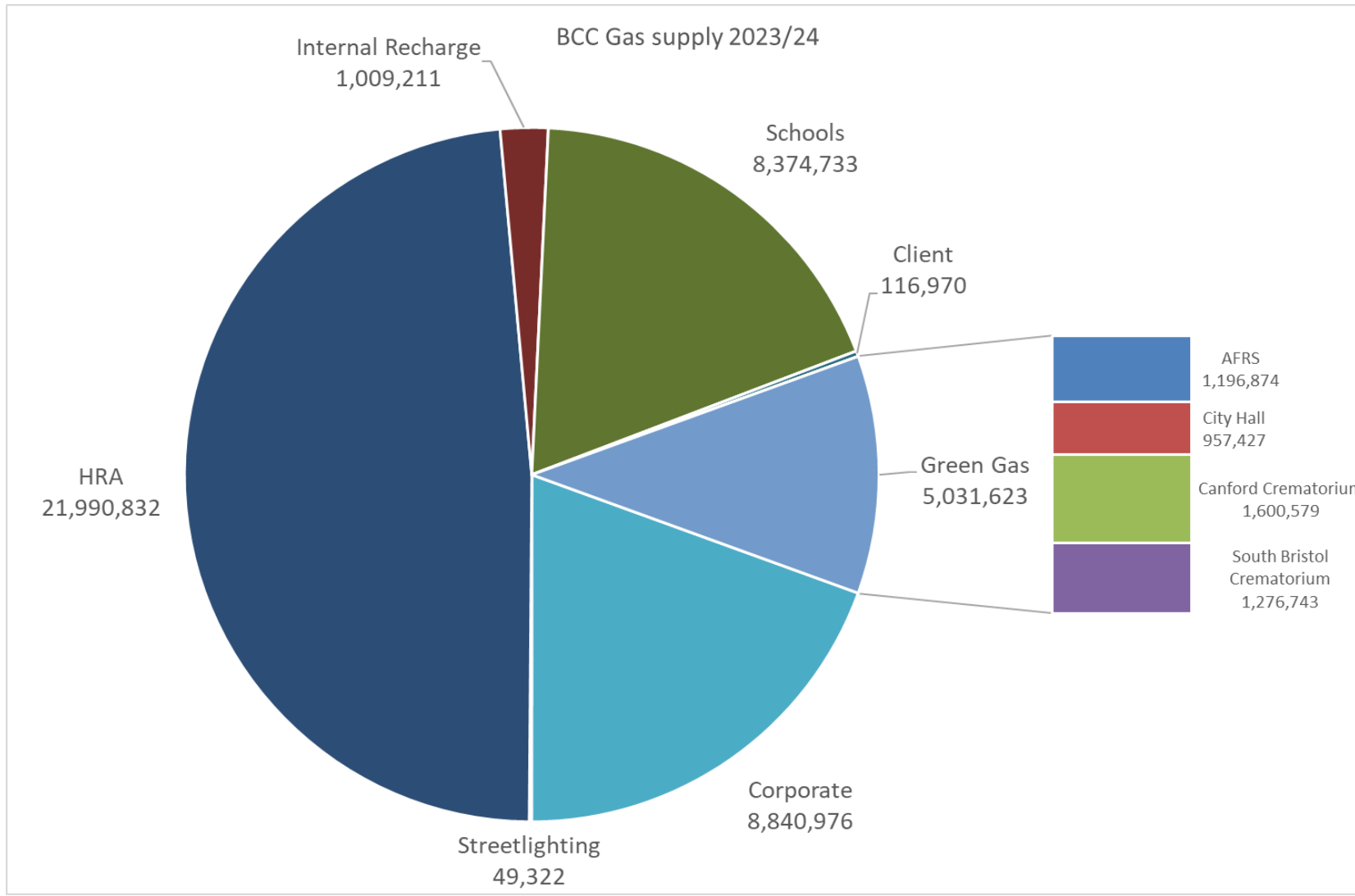
Appendix 1 – BCC Gas demand 2023/24

kWh/year



Appendix 2 – breakdown of BCC gas supply 2023/24

kWh/yr



Appendix 3 – Carbon impact of total BCC gas supply contract volumes

kg CO_{2e}/yr

