The use of electricity from renewable energy to reduce local carbon emissions

Regional / District level

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Executive Summary

The purpose of this paper is to provide an overview of how electricity generated using local renewable energy can help to reduce the carbon footprint of a geographic region or district, in particular the Winchester District. It is intended to support greater use of renewable energy by helping to ensure that its impact on the local carbon footprint, alongside its other benefits, is clearly understood. In particular, it looks at the options available for reporting the carbon footprint using a number of methods, so that an approach can be chosen that best reflects the contribution that local renewables make to reducing carbon emissions.

There are a number of possible approaches to measuring carbon emissions for a region. These include the 'GHG Global Protocol for Community-Scale Greenhouse Gas Emission Inventories' (the 'GPC'), and the approach used by the Department for Business, Energy and Industrial Strategy ('BEIS'), which is largely based upon the GPC. The GPC provides a widely recognised standard for measuring carbon emissions for a city or district, and is extensively used both within the UK and around the world. This includes guidance regarding the impact of electricity consumption on carbon footprint, including additional disclosures that can be made if considered appropriate in the circumstances (see further below).

Historic carbon emissions for the Winchester District have been summarised and analysed in a series of annual reports by Winacc based upon data and reports published by BEIS, most recently for 2017. The BEIS reports calculate carbon emissions for electricity by taking metered data for consumption from the National Grid (the 'Grid') and multiplying it by a conversion factor that reflects the average carbon intensity for the UK as a whole.

Within the Winacc reports, it has repeatedly been noted that local carbon emissions from electricity consumed have been steadily declining, but that this has arisen solely from the decarbonisation of the Grid as a whole. In effect, this decarbonisation has been 'imported' into the District, as renewable energy generated outside the District was imported and is not due to decarbonisation measures taken within the District.

Applying the BEIS method, the impact of renewable generation within the District on the local carbon footprint is as follows:

- Commercial scale projects (e.g. solar parks): Output from these installations is exported to the Grid; there is a very small reduction in local carbon emissions for electricity consumed within the District, due to the impact of these exports on the average carbon intensity of the UK Grid as a whole, but no other impact. In effect, any other carbon benefit from these installations is 'exported' from the District as the electricity is sold.
- Auto-generation projects (where some or all of the electricity generated is used on-site, with any unused electricity being exported): Regardless of whether the output from these installations is used on site or exported, there is a reduction in the electricity consumed from the Grid, and therefore a reduction in local carbon emissions. However, the extent of this reduction will depend on the current carbon conversion factor, and will therefore fall over time as the Grid continues to decarbonise.

Applying the BEIS method, local renewables therefore have only a limited impact on the carbon footprint for the District.

Comparing the BEIS method with the GPC Standard, in order to better understand the available methods for reporting carbon emissions, we note that:

- The BEIS method is broadly consistent with the GPC Standard
- In particular, neither the BEIS method nor the GPC Standard allow for adjustment to local carbon emissions in relation to commercial scale local renewable energy generation. This does not result in any form of 'carbon credit' that can be offset or netted against emissions arising from local electricity consumption.
- The GPC Standard would, however, permit the use of a local Grid average carbon intensity in place of the national Grid intensity currently being used by BEIS. Such a factor would be more sensitive to changes in the local energy generation mix, and in particular to the development of local renewables. However, the feasibility of this approach would need to be investigated further.
- Alongside the reported emissions from electricity consumed, the GPC Standard also permits additional disclosures. These could include a market-based calculation for electricity consumed, and potentially also other information, such as details of the electricity generated from local renewables, and the contribution this local renewable generation makes to reducing carbon emissions at a national level.

It is in some ways unfortunate that the BEIS method allows for only limited recognition of the benefits of local renewables. However, this is understandable, due to the relationship between local measures and initiatives, and national measures and initiatives.

Based upon the work that we have done, our recommendations are:

- That Winchester City Council ('WCC') and Hampshire County Council ('HCC') conduct their own assessments of the relevant standards, and in particular their implications for the impact of local renewables on carbon footprints at District / County level (if they have not already done so)
- That their assessment includes consideration of additional disclosures that could be made to ensure that the benefits of local renewables are recognised appropriately as part of the local carbon footprint reporting
- That WCC and HCC liaise with other cities and regions, to understand how they recognise the impact of local renewables when measuring and reporting their own carbon footprints
- That WCC and HCC consider setting targets for local renewables based upon local resource, monitoring progress against these targets, and reporting results as an additional disclosure within their carbon footprint reporting. Section 6 of this paper contains a number of suggestions, for consideration
- In particular, that local carbon footprint reporting should state the reduction in national level emissions due to local renewables, whilst making it clear that this is only a reduction at national level, and not a reduction in the carbon footprint of the Winchester district.

1 Introduction

The purpose of this paper is to provide an overview of how electricity generated using renewable energy can help to reduce the carbon footprint of a geographic region or district. In particular, it is intended to provide a framework that could be used or adapted for the Winchester District. It does not cover the impact of electricity generated using renewable energy on the carbon footprints of individuals or local businesses (including the use of 'green tariffs' for electricity bought) and government or private organisations, for which different methods may be appropriate[1].

The impact of renewable energy on the carbon footprint of the District could potentially be quantified in a number of different ways. The standards and guidelines which set out the available options are complex, and the outcome of applying them in practice is not always what might have been expected. This is confusing, and might discourage the use of renewable energy as a carbon reduction measure. This paper therefore summarises the alternative approaches that could be used, based upon our understanding of these documents, and explains their impact upon the carbon footprint of the District. It is intended to support greater use of renewable energy by helping to ensure that its impact on the local carbon footprint, alongside its other benefits, is clearly understood. Readers are referred to the standards themselves for further detail, where this is required.

This paper deals mainly with local renewable installations of medium size (such as roof-top solar PV panels on commercial or local government properties) whose output could either be used on-site ('auto-generation'), or exported to the Grid. However, it also includes consideration of electricity generated by larger commercial scale local projects, such as wind farms and solar PV parks.

This paper deals only with carbon emissions that arise when the renewable energy installation in question is operational, and output is being generated and used. It does not include any consideration of the 'embedded emissions' that arise when renewable energy plant is first built (or decommissioned, at the end of its operating life). It focuses solely upon electricity generated by renewable energy installations, so does not consider the measurement of carbon emissions from other sources.

This paper deals only with the use of renewable energy to reduce carbon footprints. However, it should be recognised that the use of local renewable energy also brings a number of other benefits, including:

- Demonstrating a public commitment to taking action on the climate emergency
- Engaging local communities in climate emergency action (including community energy projects)
- Promoting investment and growth within the local economy
- Local economic benefit, through subsidies received for renewable energy generation
- Making use of energy sources that are renewable, rather than finite (such as coal, oil and gas)
- Their low level of ongoing operating and maintenance costs, once constructed
- The low levels of pollutants they emit (in most cases, no pollutants)
- Reducing energy losses that arise from transmission, when electricity is imported via the Grid

[1] Note: Winacc is considering preparing a separate paper on the methods that can be used by individuals, local businesses, and government or private organisations at a later date

It should also be recognised that, in addition to reducing local carbon emissions, there are a range of other factors that need to be considered when making investments in renewable energy. These include:

- The economics of investment in renewables, including both initial capital cost (and related finance costs) and recurring operating costs, revenues and subsidies
- How to allocate available funding between a range of possible carbon reduction initiatives, and how to prioritise initiatives
- The use of energy efficiency programmes to reduce overall energy consumption
- The use of medium and long-term targets for renewable generation, as a means of stimulating new investment
- The use of renewable energy programmes to engage the public in action on the climate emergency, e.g. by investing in community energy schemes, or by switching to a renewable electricity supplier

This paper consists of an Executive Summary, together with six other sections:

1. This introduction
2. Overview of the relevant standards for measuring carbon emissions from electricity
3. Overview of the BEIS method, as used to generate historic emissions for Winchester District
4. Application of the BEIS method to electricity generated by renewables
5. Comparison of the BEIS method with relevant standards
6. Conclusions, discussion, and recommendations

2 Relevant standards for measuring carbon emissions from electricity

A number of different approaches have been used to measure carbon footprints, both in the UK and internationally. Some of these have evolved over time, as experience develops and issues are identified that need clarification, and standardisation. Some standards apply only to particular situations, such as online carbon footprint websites for individual use, but others may have a wider scope, and contain principles that have a broader application (e.g. to both for corporate entities and geographic regions).

An international standard setting body whose work is widely used throughout the UK and the world is the GHG Protocol[2], a collaboration between the World Resources Institute ('WRI') and the World Business Council for Sustainable Development ('WBCSD'). Their publications include:

- The GHG Protocol Corporate Accounting and Reporting Standard ('GHGP')[3]: this is intended for use by corporate entities, in particular for preparing reports as part their involvement in the Carbon Disclosure Project ('CDP'), but applies equally to NGOs and government agencies. It also has some content relevant for reporting by cities and regional organisations, in particular on some aspects of emissions relating to electricity consumed from the Grid
- The GHG Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, developed jointly by the WRI, the C40 Cities Climate Leadership Group and Local Governments for Sustainability (ICLEI), for which both a full document[4] and an Executive

[2] https://ghgprotocol.org/about-us
[3] https://ghgprotocol.org/corporate-standard
[4] https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities

Summary ('GPC ES')[5] have been published: this is described as a guide for use by 'cities', but is intended for wider use including by local governments, or any defined geographical area[6]

- The GHG Protocol for Project Accounting ('GPPA')[7]: this is intended for use on individual projects, in particular for measuring the GHG reductions arising from carbon offsetting programmes, and has no direct relevance to the calculation of District level emissions

In addition to this guidance, the International Organisation for Standardisation has published ISO 14064, which covers greenhouse gas accounting and verification for governments, businesses and regions. Although there are a number of differences between ISO 14064 and the GHG Protocols, these are relatively minor, and it is the GHG Protocol which is recognised for use by the UK Government.

GHGP is used extensively for reporting by corporates, and GPC for reporting cities. We are not aware of any other standards with a similar level of use, and widespread credibility. For the purposes of this paper, these documents will therefore be taken to represent standard practice in carbon emissions reporting.

3 Overview of the BEIS method

Data for carbon emissions for the UK are published each year by the Department for Business, Energy & Industrial Strategy ('BEIS')[8]. These reports include analysis of emissions at local and regional level, including data for the District. The related carbon emissions, including those arising from electricity consumption, are generated on behalf of BEIS by Ricardo Energy and Environment[9], using the UK Greenhouse Gas Inventory ('GHGI'), which is one part of the National Atmospheric Emissions Inventory ('NAEI').

The emissions calculations broadly follow the approach set out in the GPC standard, subject to a number of matters which are discussed further in Section 4 below. In summary, emissions for electricity consumed are calculated as follows:

- Electricity consumption data are compiled by BEIS, based upon metered data for electricity consumed from the Grid provided by the UK electricity supply companies
- The carbon emissions for this electricity consumed are calculated for BEIS by Ricardo, using appropriate conversion factors

The conversion factors used to calculate carbon emissions reflect the average carbon intensity of power generation across the UK as a whole. This includes a mix of nuclear, coal, gas-fired and renewable energy sources. These conversion factors have been steadily declining in recent years, as the proportion of renewable energy across the UK increases, and the Grid decarbonises. However, the conversion factors used only reflect the average carbon intensity for the Grid as a whole. This

[5] https://ghgprotocol.org/sites/default/files/standards_supporting/GPC_Executive_Summary_1.pdf
[6] GPC ES page 4
[7] https://ghgprotocol.org/standards/project-protocol
[8] https://www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics
[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/812146/Local_authority_C02_technical_report_2017.pdf

means that the data for carbon emissions for electricity consumed in the District only reflect the national power generation mix, and not the mix of power generation within the District itself.

Historic carbon emissions for the District have been summarised and analysed in a series of annual reports by Winacc based upon the data and reports published by BEIS, most recently for 2017[10]. Emissions by sector for the period to 2017 from this report are summarised in the figure below. Within these reports, it has repeatedly been noted that the decline that has occurred in emissions related to electricity consumption has arisen solely from the decarbonisation of the Grid as a whole, and does not reflect local action, or the development of local renewable energy sources.

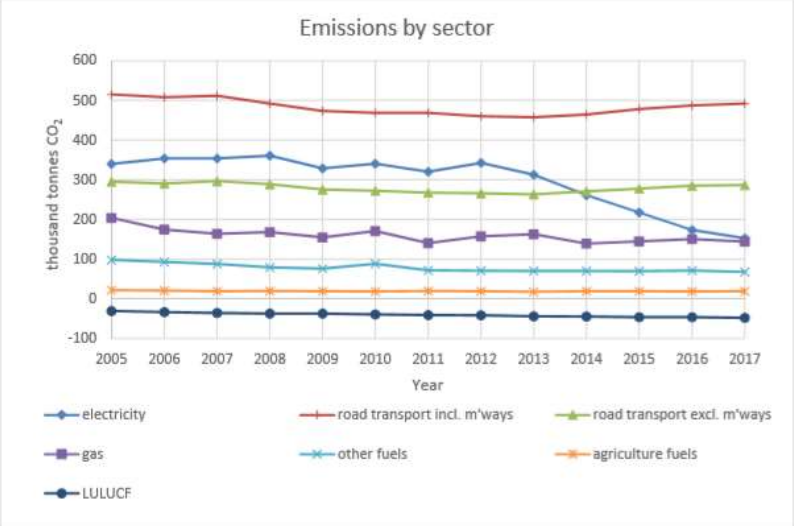


Figure 14. Carbon dioxide emissions in Winchester District from 2005 (gas from 2006) until 2017 illustrating the relative contributions of different sectors. Today road transport (even excluding motorways) makes by far the largest contribution. Gas has remained approximately constant whereas electricity is declining rapidly and is expected to have been less than gas by 2018.

The next section of this paper will consider in more detail the implications of this method for electricity generated using renewable energy. The following section will then compare this method with the approach set out in the GPC Standard, and discuss possible alternative methods.

4 Application of the BEIS method to electricity generated by renewables

As set out in the previous section, the method used to calculate carbon emissions in the Winchester District from the consumption of electricity is to:

1. Take metered data for electricity consumed from the Grid; and then
2. Apply a carbon conversion factor

For each type of local renewable energy project, both of these factors will need to be considered. However, before this is done, further information regarding the calculation of metered consumption is needed.

[10] https://www.winacc.org.uk/wp-content/uploads/2019/09/greenhouse-gas-emissions-in-winchester-district-2019-final.pdf

Calculation of local metered electricity consumption and generation

Detailed notes on the calculation of metered consumption and generation are set out in Appendix A. The key points for the purposes of this paper are as follows:

- When using data for electricity consumption and generation, it is important to distinguish between:
    - Electricity consumed that is taken from the Grid
    - Electricity that is generated on-site by auto-generators but exported to the Grid (usually because it cannot be immediately used on-site)
    - Electricity that is generated on-site by auto-generators and immediately used on-site; and
    - Electricity that is generated and exported to the Grid by commercial scale renewables
- It is also necessary to distinguish between two types of meter:
    - Non-Half-Hourly ('NHH'): used for small premises, with consumption reported when meters are read manually (for traditional meters) or automatically (for smart meters)
    - Half-Hourly ('HH'): used for larger premises, with consumption reported every half hour

For the purposes of this paper, the main implications of the way that the electricity statistics are collected are that (for both NHH and HH metered sites):

- The data provided to BEIS for auto-generators relating to their electricity consumption from the Grid are stated after deducting any electricity they generate and export back to the Grid; they are therefore stated on a 'net' basis (as opposed to a 'gross' basis, which would instead use the total electricity taken from the Grid)
- BEIS do not have data regarding auto-generation used on-site; however, the fact that this electricity is generated and used locally by them will mean that less electricity is consumed from the Grid, and therefore results in a reduction in the BEIS electricity consumption data

It should also be noted that the BEIS data only covers sites which consume electricity. It therefore does not include sites such as commercial scale renewables, which only export to the Grid.

Application to renewable energy – local commercial scale projects

As noted above, the consumption data do not reflect the export of electricity to the Grid from local commercial scale sites such as solar PV parks. Such sites do affect the emissions of District via carbon conversion factors, but only to the extent that they cause a change in the national average conversion factor. As noted in Section 1, previous Winacc reports have highlighted the reduction in District emissions over the past ten years due to the increase in renewables in the UK as a whole, although there have been relatively few local projects. In effect, this is because emissions reductions have been 'imported' into the District when the electricity from UK-wide renewables was 'imported' via the Grid.

For any existing or new build commercial scale renewables projects within the District, the converse applies. As their output is exported to the Grid, the benefit (in terms of carbon emissions reductions) is also 'exported', and shared throughout the UK as a whole. This will lead to some reduction in the reported emissions for the District, due to the resulting decrease in the average carbon intensity of the Grid, but it will be extremely small.

In summary, then:

- The District's carbon emissions as currently calculated by BEIS only reflect the impact of local renewable generation via their impact on the carbon conversion factor for the UK Grid as a whole
- No adjustment to the BEIS figures is made to reflect commercial scale renewables within the District, as the carbon benefit is shared across the UK as a whole, and already reflected in the BEIS statistics
- The impact of any future commercial scale projects on the District's carbon footprint will only occur via their impact on the carbon conversion factor for the UK as a whole, and will be extremely small

Application to renewable energy – auto-generation exported

As set out above, for both NHH and HH sites, auto-generation from local renewables that is exported is automatically deducted in calculating the BEIS data for net consumption from the Grid. Meanwhile, the impact of these exports on the carbon conversion factors for the UK will either be zero, or negligible.

The impact of auto-generation that is exported is therefore that:

- No adjustment is made to the BEIS figures to reflect electricity exported by auto-generators, as it is already netted off in calculating the consumption data for the District
- This exported electricity reduces the net consumption of the District. There is therefore a saving in District carbon emissions, based upon the current carbon conversion factor. However, this benefit will fall over time as the UK Grid continues to decarbonise

Application to renewable energy – auto-generation used on-site

For both NHH and HH sites, auto-generation from local renewables that is used on-site is not taken into account in calculating the BEIS data for net consumption.

The impact of auto-generation that is used on-site is therefore that:

- No adjustment is made to the BEIS figures to reflect electricity used on-site by auto-generators
- As for auto-generation exported, this electricity reduces the net consumption of the District. There is therefore a saving in District carbon emissions, based upon the current carbon conversion factor. However, this benefit will also fall over time as the UK Grid continues to decarbonise

Application to renewable energy - summary

From the above, it is clear that, using the BEIS method:

- Commercial scale renewable projects in the District have only an extremely small impact on the District's carbon footprint (via their impact on the carbon conversion factor for the UK as a whole)
- Auto-generation projects in the District do reduce the District's carbon footprint, regardless of whether their output is exported or used on-site. However, the extent of this reduction will depend on the current carbon conversion factor, and will therefore fall over time as the UK as a whole continues to decarbonise its electricity supply

- Carbon emissions obtained using the BEIS method are not adjusted to reflect generation from local renewables, as their impact has already been recognised in the standard calculation (to the extent appropriate)

The impact of local renewables on the District's carbon footprint is therefore potentially limited, if only the BEIS method is used. Given the importance of renewables in tackling the climate emergency, it is therefore worth considering the use of other methods, which could potentially be used alongside the BEIS method, and which might better reflect the contribution made by local initiatives.

5 Comparison of the BEIS method with relevant standards

As stated in Section 2 above, the BEIS method is based upon the GPC Standard. However, the GPC Standard contains a number of areas where alternative options are available, and there are also a few areas where the BEIS method appears slightly different to the GPC Standard (these are discussed further below). This section will therefore outline in more detail the approach set out within the GPC standard, before comparing this with the BEIS method, and finally summarising the options available for District reporting.

GPC method – general framework

It should firstly be noted that the GPC Standard only aims to provide the principles which should be followed. It recognises that other guidance may be used for specifying detailed methodologies, recommending in particular the 2006 IPCC 'Guidelines for National Greenhouse Inventories'[11]. It is therefore accepted that some variation in the application of the GPC Standard may result in practice, from one city (or district) to another.

The first requirement of the GPC Standard is to define the boundary of the region for which a GHG inventory is to be generated. The inventory could take the form of a bespoke Monitoring, Reporting and Verification ('MRV') system, that gathers data bottom-up based upon activity data for each source, but it can also be generated in other ways (e.g. by disaggregating national level data to a regional or city level).

Emissions within the selected boundary are divided between the following six sectors[12]:

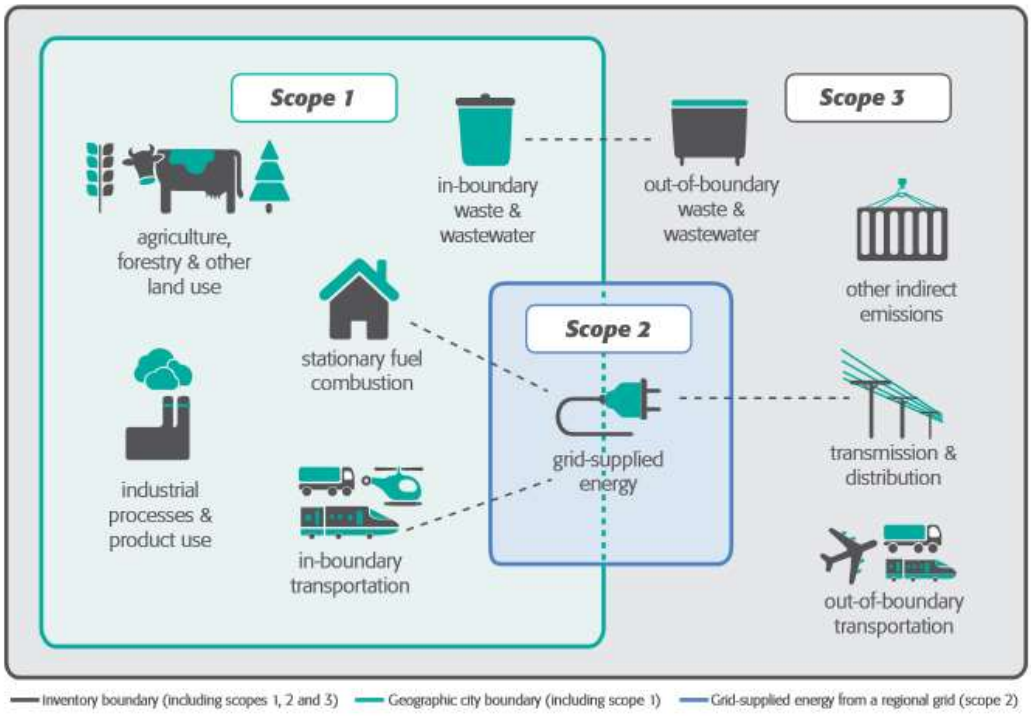
- Stationary energy (the only sector relevant for this paper, including its various sub-sectors)
- Transportation
- Waste
- Industrial Processes and Product Use ('IPPU')
- Agriculture, Forestry and Other Land Use ('AFOLU')
- Any other emissions not covered above

[11] GPC ES page 8
[12] GPC ES page 4

Emissions both inside and outside the boundary are also categorised into one of three Scopes[13]:

Scope	Definition
Scope 1	GHG emissions from sources located within the city boundary
Scope 2	GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary
Scope 3	All other GHG emissions that occur outside the city boundary as a result of activities taking places within the city boundary

The combination of sectors and Scopes is summarised in the following diagram[14]:



[13] GPC ES page 5, copyright 2014 World Resources Institute, reproduced here under the terms of the Creative Commons Attribution-NonCommercial-NoDerivative Works 3.0 Licence, available online at http://creativecommons.org/licences/by-nc-nd/3.0/

[14] GPC ES page 5, copyright 2014 World Resources Institute, reproduced here under the terms of the Creative Commons Attribution-NonCommercial-NoDerivative Works 3.0 Licence, available online at http://creativecommons.org/licences/by-nc-nd/3.0/

Two possible reporting frameworks are then set out[15]:

- Scopes framework: this is used mainly for national level reporting, and takes the combined total emissions for Scope 1, 2 and 3. But only the Scope 1 emissions should be used when results from multiple regions are being combined into national level reporting (to avoid double-counting across regions)
- City-induced framework: this is used for city-level reporting, and takes the total from only selected Scope 1,2 and 3 emissions attributable to activities within the boundary, using one of the following two reporting levels:
    - BASIC: Scope 1 and 2 emissions from stationary energy and transportation, as well as Scope emissions from waste
    - BASIC+: As for BASIC level, but also includes emissions from IPPU and AFOLU. This level aligns with the sources required for international reporting in IPCC guidelines

In addition, cities may also report emissions based on any specific local requirements.

It is therefore clear that, for reporting emissions relating to renewable energy for the District, we need to focus upon Scope 1 emissions (for local energy generation, including renewables), Scope 2 emissions (for energy consumed from the Grid), and city-level reporting (which combines Scope 1 and Scope 2 emissions).

GPC method – application to electricity generated

Regarding energy generation, and in particular electricity generated from renewables, the following points should be noted:

- Emissions arising from energy generation exported to the Grid are included within Scope 1, but only for the purpose of generating national statistics[16]; they should <u>not</u> be included within the BASIC or BASIC+ statistics that are used for city-level reporting.
- There is no explicit mention of electricity from renewables; in particular, there is nothing to allow any 'reduction to emissions' within the calculations (either from renewables, or any other activity). The sole focus of GPCES and GPC is to calculate and total the relevant emissions for the city – it therefore deals only with 'positive emissions' – not with any reduction that might be deemed to arise, for example from low carbon energy sources.
- It is instead explicitly stated that it cannot be assumed that the consumption within the city is fully or partially met from generation that occurs within the city boundary[17]. Any cities which choose to report emissions on a 'net' basis for their own purposes should do this separately to the Scope 2 emissions, as just an item of additional information[18].

The GPC Standard therefore either implicitly or explicitly rules out any use of local renewable energy to reduce the overall emissions of a city (e.g. by 'netting' it against consumption within the city, or allowing any form of 'carbon credit' for it[19]).

[15] GPC ES page 6
[16] GPC page 55, GPC ES pages 6, 7
[17] GPC page 67
[18] GPC page 56
[19] As noted in Section 2 above, there is a separate GHG standard, the GPPA, that deals with the use carbon offsets. Topic is beyond the scope of the current paper.

GPC method – application to electricity consumed from the Grid

The following points are important regarding electricity consumed from the Grid:

- Emissions are to be calculated as the amount of electricity consumed, multiplied by an appropriate emission factor[20]
- It is considered preferable to base calculated emissions on real consumption data from utility providers, but if this is not possible then alternatives (in order of preference) are the use of representative sample sets of real data, modelled energy consumption data, or regional (or national) consumption data

However, for electricity taken from the Grid, the GPC recognises two possible approaches:

1. Location-based approach: this makes use of average emission factors for the energy produced within a given region of the Grid[21] (which would not necessarily be the same as the city boundary); and
2. Market-based approach[22]: this is based upon the specific contracts in place between consumers within the boundary and their electricity suppliers (and would therefore recognise the lower carbon emissions for any 'green tariffs' that consumers have contracted for)

The location-based approach is to be used for calculating Scope 2 emissions, but emissions based upon the market-based approach may be provided as an additional disclosure.

The implications of the above regarding electricity generated by local renewables are that:

- As the location-based method is to be used for Scope 2 reporting, and emission factors are to be calculated using the Grid average for the region, local emissions arising from electricity consumption will be reduced only to the extent that local renewable generation brings down the average Grid factor. If this Grid average is calculated for the UK as a whole, this effect will be very small. However, if it were to be calculated for a smaller region (such as the District, or the local part of the distribution network) then it could potentially be more significant.
- It would be possible to present emissions using the market-based method if desired, but this would only be an additional statistic, provided alongside the Scope 2 emissions reported. Some form of MRV system would be required, to generate this data.

GPC method – comparison with BEIS

Comparing the BEIS method set out in Section 3 with the summary of the GPC Standard above, the following points are noted:

- As expected, the BEIS approach is broadly consistent with the GPC Standard
- Both the BEIS method and the GPC Standard allow for no adjustment to local carbon emissions in relation to commercial scale local renewable energy generation. This does not result in any form of 'carbon credit' that can be offset or netted against local consumption.
- However, the BEIS method does involve netting electricity from local auto-generation against local consumption. This appears to be partly because BEIS do not have the data that

[20] GPC ES page 8
[21] GPC page 67
[22] The market-based approach is covered in detail within the GHGP; the GPC contains only a brief summary of it, on page 67, and then a cross reference to the GHGP

would be needed to 'gross up' the auto-generation consumption data (that are currently reported 'net'), but may also partly be a consequence of using disaggregated national data.

- In addition, while the BEIS method makes use of the national Grid average emission factor when dealing with electricity consumed, it would also be permissible to use a local Grid average, if this could be obtained. Such a factor would be more sensitive to changes in the local energy generation mix, and in particular to emission reductions from local renewables. The feasibility of this approach would need to be investigated further, but it is possible that only a few calculations would be needed to adjust the BEIS method to use a local Grid average, and that a full MRV system would not be required.

Implications for local renewable energy generation

As set out in Section 3, using the BEIS method, renewable energy generated within the District has only very limited impact on the District emissions. While this is consistent with the guidance in the GPC Standard, some or all of the following steps could be taken, to adapt the BEIS approach to reflect the contribution of local renewables to action on the climate emergency:

1. When calculating emissions from electricity consumed, an emissions factor for a local part of the Grid could be used, instead of the national average factor (so that the reduced emissions from local renewables are incorporated in this factor)
2. Alongside the reported Scope 2 emissions from electricity consumed, additional information could be reported. As set out in the GPC, this could include a market-based calculation, if the necessary data could be obtained, and processed using an MRV system. It could potentially also include other information, such as details of the electricity generated from local renewables

6 Conclusions, discussion and recommendations

Conclusions

The BEIS method, which has previously been used to generate historic emissions data, has resulted in a steady reduction in emissions for the District each year. As set out in previous Winacc reports, this is not due to local actions (and in particular not to local renewables) – it is instead due to the increase in low carbon generation across the Grid as a whole. In effect, the emission reductions from UK-wide renewables have been 'imported' into the District when electricity was imported from the Grid.

For any commercial scale renewable projects in the District, whose output is exported to the Grid, the opposite will apply. Application of the BEIS method will result in no reduction in emissions for the District. In effect, the emission reductions from such renewables are 'exported' out of the District when the electricity is sold.

For auto-generation projects in the District, regardless of whether the output is used on site or exported to the Grid, there is a reduction in electricity consumed from the Grid, and therefore a reduction in emissions for the District. However, this reduction will depend on the current carbon conversion factor, which is expected to fall over time.

The BEIS method therefore only allows for limited recognition of the carbon reduction benefits from local renewables, in calculating the emissions for the District.

The BEIS method is consistent with standard practice in emissions reporting, which is based upon the GPC standard. However, the GPC standard does include a number of alternative options, including the use of additional disclosures, alongside the reported emissions, where these are considered appropriate. Use of these options could help to ensure that the contribution local renewables make to action on the climate emergency is more fully recognised. The available options include:

- When calculating emissions from electricity consumed, an emissions factor for a local part of the Grid could be used, instead of the national average factor (so that the reduced emissions from local renewables are incorporated in this factor). Further investigation would be needed, to confirm whether this option is feasible.
- As set out in the GPC, an additional disclosure could be made involving a market-based calculation. This would depend on the necessary data being made available, and processed using an MRV system.
- Additional disclosures could potentially also include other information that was considered appropriate, such as details of the electricity generated from local renewables, and the contribution this local renewable generation makes to reducing carbon emissions at a national level. Again, this would depend on the necessary data being available, collated and summarised.

Discussion

It is in some ways unfortunate that the BEIS method, although based on the accepted international standard of the GPC guidance, allows for only limited recognition of the benefits of local renewables within the local carbon footprint. However, to some extent, this approach is understandable, due to the relationship between local measures and initiatives, and national measures and initiatives. For example, it needs to be borne in mind that:

- It is at the national level that leadership for the UK's climate change response is appropriate and necessary, and that action is required
- It is also at the national level that many key policies affecting local decisions, such as subsidies for renewables, are made
- Some regions are of the UK are better endowed with the natural resources needed to support renewables, and therefore better placed to develop them
- If some form of 'regional carbon accounting' were used which allowed for a 'carbon credit' for local renewable production exported to the Grid, then some regions could achieve carbon neutrality relatively

easily (which might disincentivise them from pursuing other possible carbon reduction measures) while others could face an excessively large challenge

Bearing these considerations in mind, we consider that it is worth considering further the range of ways in which local measures and initiatives could potentially be linked to national ones. Possible options include:

- Setting a target for local renewables based upon local resource, monitoring progress against this target, and reporting results as an additional disclosure, alongside the carbon footprint reporting. Useful metrics that could be used at local administrative unit (e.g. Local Authority) level potentially include:
    - MW of installed capacity, split by technology type
    - GWh of annual electricity production, split by technology type
    - MW or GWh per capita of population, or per unit area within the Local Authority
    - GWh produced as a fraction of GWh consumed
- In combination with the above, setting a target for local renewables based upon comparison with similar or neighbouring regions
- Extrapolating such a local target to national level: assessing and reporting on the impact at national level, if all UK regions made similar progress. This could include calculating the impact there would be on local emissions from the reduced overall UK Grid intensity, if all UK regions made similar progress
- As set out above, stating the contribution local renewable generation makes to reducing carbon emissions at a national level, as part of local carbon footprint reporting.

Recommendations

Based upon the work that we have done, our recommendations are as follows:

- That WCC and HCC conduct their own assessments of the impact of the GPC (and any other relevant standards and guidance) on their climate emergency plans, especially the calculation of carbon footprints at District / County level (if they have not already done so)
- In particular, that WCC and HCC ensure that their plans take account of the extent to which local renewables do and do not affect these carbon footprints
- That their assessment includes consideration of whether the BEIS method, or an alternative method, or a variation of the BEIS method, is most appropriate to their circumstances
- That their assessment also includes consideration of additional disclosures that could be made to ensure that the benefits of local renewables are recognised appropriately as part of their carbon footprint reporting
- That WCC and HCC liaise with other cities and regions, to understand how they recognise the impact of local renewables when measuring and reporting their own carbon footprints
- In particular, that local carbon footprint reporting should state the reduction in national level emissions due to local renewables, whilst making it clear that this is only a reduction at national level, and not a reduction in the carbon footprint of the Winchester district.

Appendix A: Calculation of metered electricity consumption and generation[23]

When using electricity consumption and generation data, it is important to distinguish between the following:

- Electricity consumed that is taken from the Grid
- Electricity that is generated on-site by auto-generators but exported to the Grid (usually because it cannot be immediately used on-site)
- Electricity that is generated on-site by auto-generators and immediately used on-site
- Electricity that is generated and exported to the Grid by commercial scale renewables (e.g. solar parks)

It is also necessary to recognise that, for electricity consumed from the Grid or exported to it by auto-generators, there are two types of meter:

- Non-Half-Hourly (NHH): these are domestic and small non-domestic meters similar household meters. Consumption is reported when meters are read manually (for traditional meters) or automatically (for smart meters),
- Half-Hourly (HH): these are found in larger non-domestic premises. Consumption is reported every half hour.

Meter data is collected by Data Aggregators (DA's) on behalf of electricity suppliers, who compile and aggregate the data annualised figures, which are then reported to BEIS.

Electricity generated by on-site renewables and exported to the Grid is also metered. This is done using a separate Meter Point Administration Number (MPAN) from the MPAN that reflects the imports for the site, but the import and export MPANs can be linked, to generate the combined net electricity consumed (or exported). The electricity supplier collates the metered export data in order to pay the owner of the site for the electricity produced.

For NHH properties:

- Electricity consumed from the Grid and electricity exported to the Grid are automatically netted against each other within the data BEIS receive, to generate a net consumption figure
- BEIS therefore do not have visibility of any on-site generation that was exported, and such generation is not taken into account when the carbon footprint is calculated
- BEIS are not provided with any data regarding auto-generation, as there is no obligation for consumers to report this

For HH properties:

- Electricity consumed from the Grid when a site is not generating are metered, and included in the data BEIS receive
- When a site is generating electricity and exporting it to the Grid, this is also metered and included in the data BEIS receive
- When a site is generating electricity and using it on-site, BEIS is not provided with any data regarding the electricity generated, but there will be a reduction in any electricity consumed from the Grid

[23] These notes are based upon email correspondence with BEIS regarding how metering of auto-generation is reflected within BEIS electricity consumption and generation statistics