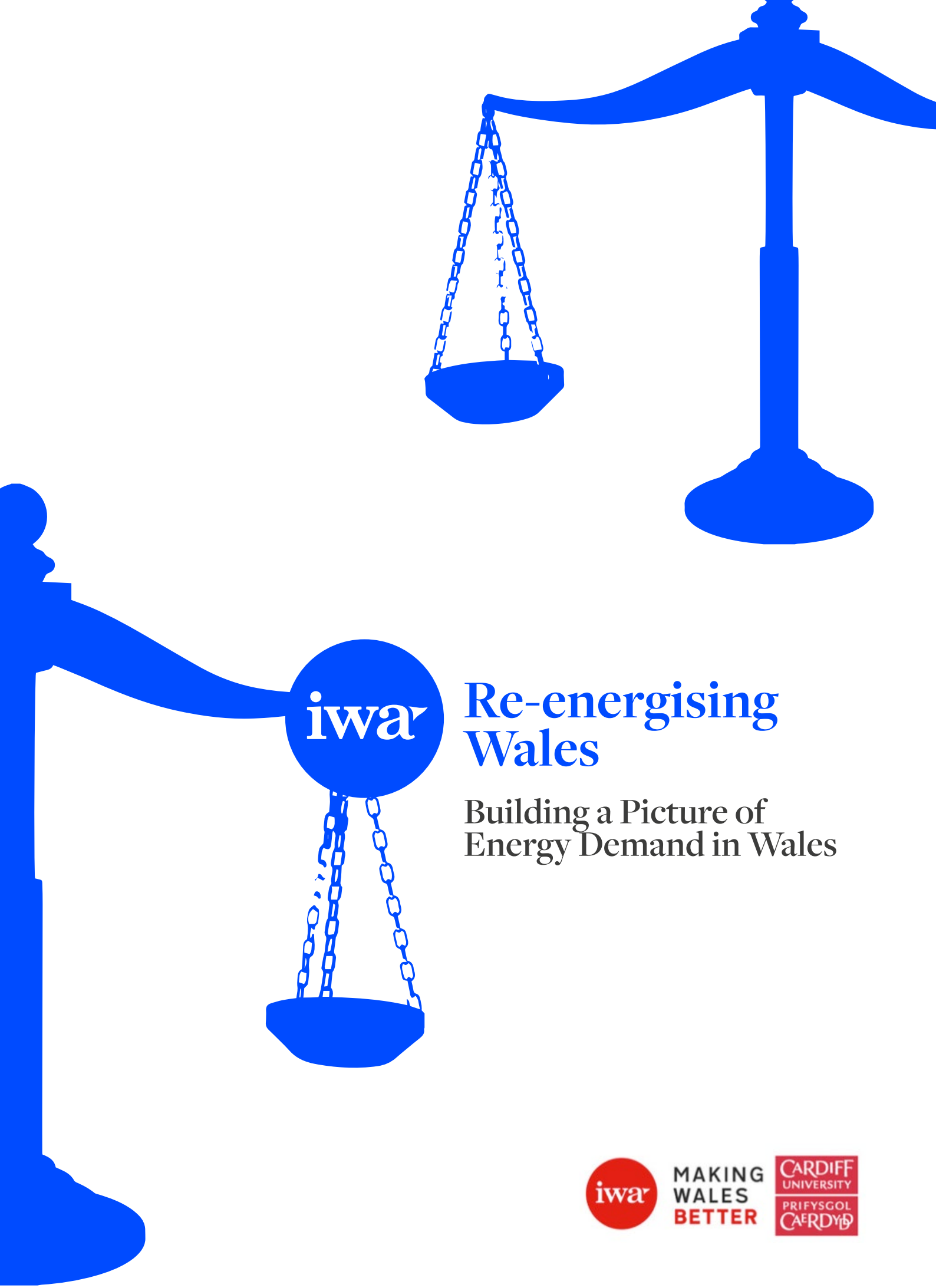

Re-energising Wales

Building a Picture of Energy Demand in Wales

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About us

The Institute of Welsh Affairs (IWA) is Wales's leading independent think tank, working to make Wales better. Our role is to act as a catalyst to generate intelligent debate about Wales' future. We are an independent charity with a broad membership base across the country. We aim to bring people together from across the spectrum in a safe space where ideas can collide and solutions can be forged.

We do this by:

Generating ideas

- Providing a platform for people to put forward innovative ideas to improve the well-being of Wales.
- Bringing together experts and practitioners to critically examine the evidence in key areas and to suggest improvements.

Discussing

- Convening a diverse series of events across Wales where ideas are explored and challenged.
- Providing a central 'meeting place' for networking - both digitally and through regular high quality events - and by bridging the worlds of politics, business, public service and academia.

Influencing

- Working with policy makers to translate new ideas into workable proposals
- Working with and through our extensive network of partners to share learning and spread best practice.

For more information about the IWA, its policy work, and how to join, as either an individual or corporate supporter, contact:

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Design: www.theundercard.co.uk

The Re-energising Wales project

'Re-energising Wales' will provide a worked out plan showing how Wales could meet its projected energy demands from renewable sources by 2035, resulting in an 80% reduction in energy-related greenhouse gas (GHG) emissions based on 1990 emission figures. 'Re-energising Wales' will provide the evidence to convince policy makers in Wales to adopt the ideas and set an example within the UK and internationally. The project has been split into six large scale programmes of work which will be published alongside a range of short papers:

1 Energy Demand

To establish a framework to collect and report on operational energy demand data, in order to help collate temporal and geographical data and better understand what drives/causes energy demand (this report).

2 Developing a future energy systems vision

To use the Swansea Bay City Region (SBCR) as a case study exemplar, which will showcase how the SBCR can maximise the size and location of its renewable energy resources in order to meet its projected energy demands by 2035. Lessons from this will be applied to Wales.

3 Setting the economic parameters

To assess the investment and economic impacts when developing a robust, fit-for purpose and sustainable renewable energy supply.

4 Social and Community Issues

To assess the values behind community engagement in energy saving and generation, and the barriers to increased local ownership of renewable energy assets.

5 Regulatory and political challenges

To assess what powers are required for a new renewable energy regime to be implemented well.

6 A delivery plan

To create a detailed, timed, and costed action plan for developing a credible renewable energy programme for Wales bringing together findings from the project

The 'Re-energising Wales' project is supported by the Hodge Foundation, the Friends Provident Charitable Foundation and the Polden-Puckham Charitable Foundation.

HODGE FOUNDATION

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Fair economy. Better world!

Polden·Puckham Charitable Foundation

Executive Summary

'Re-energising Wales' will provide a worked out plan which will show how Wales could meet its projected energy demands from renewable sources by 2035, resulting in an 80% reduction in energy-related greenhouse gas (GHG) emissions.

In order to understand how the Welsh energy supply system should evolve to meet Wales' projected energy demands through renewable sources, we first have to understand when, where and why we use energy currently consumed.

Our research provides a clear, data-based picture of the nature, timing and location of half-hourly energy demands of buildings in Wales over the period of a year. This research has produced estimates of energy demand for electricity and heating (space and domestic hot water) of Welsh domestic and non-domestic buildings in half-hourly intervals during 2016. This is the first time that information has been made publicly available at this level of detail.

This new information could be used in a number of ways. It could, for example, help calculate what is required in terms of reducing energy demand, increasing renewable supply or increasing energy storage systems, and then identify what is required for a 100% renewable energy supply system for buildings in a given area over a given time period.

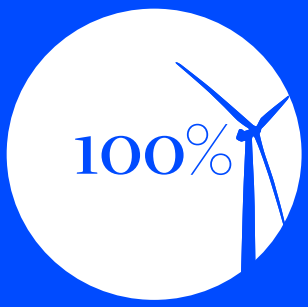
What we found

The headline figures for Wales show that buildings consume around 28 Terawatt-hour (TWh) of the approximately 89 TWh of energy used annually in Wales for all purposes, nearly a third of the total energy used in Wales.

The data suggests that the electricity supply system for Wales needs to supply a minimum of 200 MW and a maximum of just under 2,000 MW to meet the electrical demands of the domestic sector at present. Electrifying transport across Wales could be accommodated within this peak demand of 2,000 MW with controlled electric vehicle charging. It is anticipated that if every house had an electric vehicle then average domestic electricity use could increase from around 10kWh per day to 15 - 20kWh per day. However, lower emission vehicles (including electric vehicles) have a significant role to play in addressing issues such as emissions and air pollution, and so should be seen as a positive contribution to a low carbon future. There must be a concurrent emphasis on reducing transport energy demand through reducing the number of vehicles and promoting modal shifts towards active travel

At an individual level, non-domestic buildings consume more per building than domestic buildings. This situation reverses when considering energy use per square metre, with domestic buildings currently consuming more per square metre for both heating and electricity.

This research has produced estimates of energy demand for electricity and heating (space and domestic hot water) of Welsh domestic and non-domestic buildings in half-hourly intervals during 2016. This is the first time that information has been made publicly available at this level of detail.



This new information could be used in a number of ways. It could, for example, help calculate what is required in terms of reducing energy demand, increasing renewable supply or increasing energy storage systems, and then identify what is required for a 100% renewable energy supply system for buildings in a given area over a given time period.

The headline figures for Wales show that buildings consume around 28 Terawatt-hour (TWh) of the approximately 89 TWh of energy used annually in Wales for all purposes, nearly a third of the total energy used in Wales.

How the data can be used

The outputs of this work can be used to help understand, in more detail, when and where energy is consumed in Welsh buildings, along with predictions of the impact of future building developments on energy demand. The data can be used for comparing renewable energy supply profiles with the likely concurrent demand in different geographical areas across Wales over a full year, and this information can be used at different scales, from local through to national, to aid our transition to a low carbon future.

This data is primarily being used to inform a further piece of work conducted as part of the IWA project 'Re-energising Wales', informing an exemplar case study of the Swansea Bay City Region (SBCR). This will explore how the SBCR can optimize the size and location of its renewable energy resources in order to meet its projected energy demands by 2035.

This energy demand data is also publicly available for use and we hope that a range of organisations will use this data as a tool to understand energy demand better. It can support the development of local, tailor-made solutions to improve energy efficiency as well as opportunities for increasing the local renewable energy supply mix.

We believe this data will, in particular, support the following bodies to achieve their priorities:

1. Local Authorities and Registered Social Landlords

These organisations are responsible for delivering a range of existing energy initiatives. For example, Welsh Government have introduced a requirement for local authorities to establish targets for renewable energy generation in their local development plans. Registered Social Landlords have a number of responsibilities regarding energy use, including the energy requirements within the Welsh Housing Quality Standard and ambitions to tackle fuel poverty.

— This data could be used by local authorities and Registered Social Landlords to develop local, tailor-made solutions at postcode, local authority or building level. Consideration of this data alongside factors such as levels of fuel poverty, energy efficiency measures and the local energy mix could help ensure these bodies deploy energy efficiency and renewable energy supply measures most effectively.

2. Welsh Government

The data set can be used to make more informed decisions during the policy making process such as matching demand with renewable supply, deciding where to target energy efficiency measures and where to tackle fuel poverty.

— Welsh Government will be making decisions on decarbonising the buildings sector as part of the process of setting carbon budgets within the Environment (Wales) Act 2016. This data could help decide where best to focus resources within decarbonisation plans, by generating a more accurate view of energy demand and therefore carbon emissions.

— This data could also be used to inform a range of further processes including Building Regulations, with potential requirements for new developments to have higher energy efficiency and renewable energy generation requirements. The data could also be used by Welsh Government to help set energy demand reduction targets for Wales, which would help in meeting climate change targets and the renewable energy target set by the Welsh Government for Wales to generate 70% of its electricity consumption from renewable energy by 2030.

3. Distribution Network Operators (DNOs)

A key role for DNOs is to show areas where there are constraints in meeting demand, and where microgeneration, energy efficiency, demand management and general flexibility could play a role in helping with energy system balancing.

— This data could therefore feed into DNOs' activities when they are considering the capacity of the grid network in different parts of Wales and how it compares to different geographic building consumption patterns.

— DNOs and other organisations could empower consumers to take action on their energy usage by sharing information about their current usage in comparison to different areas.

4. Public Service Boards

The purpose of Public Services Boards (PSBs) is to improve the economic, social, environmental and cultural well-being in their area by strengthening joint working across all public services in Wales.

— PSBs could use this data to assess the state of economic, social, environmental and cultural well-being in their area. This would be especially helpful if the energy demand data is twinned with renewable energy supply data in order to increase their understanding of how they could most effectively contribute to carbon reduction at a regional level.

— The data will help PSBs explain how their objectives will contribute to achieving the well-being goals and how they have considered their own assessment of local well-being in setting their objectives and steps to take.

This data provides energy demand data for buildings in 2016, so further collation of this data in future years, as energy demand changes, will be vitally important in order to ensure that the data is as up to date as possible. **We believe that Welsh Government are well placed to support the continued collation of this important data source.**

Purpose

In order to understand how the Welsh energy supply system should evolve to meet Wales' projected energy demands through renewable sources, we first have to understand when, where and why we use energy currently consumed.

The IWA commissioned Cardiff University's Welsh School of Architecture and Heledd Iorwerth to produce estimates of the energy demand for electricity and heating (space and domestic hot water) of Welsh domestic and non-domestic buildings in half-hourly intervals during a given period.

The purpose of the research is to provide a clear, data-based picture of the nature, timing and location of half-hourly energy demands of buildings in Wales over a year.

The outputs of this work can be used to understand, in more detail, when and where energy is consumed in Wales, along with predictions of the impact of future developments on energy demand. This information can be used at different scales, from local through to national, to aid the transition to a low carbon future.

The level of detailed data within this research means that we can compare half-hourly energy demand data with local renewable energy generation profiles to see where there is an over- or under-supply of energy compared to demand, and we can estimate the impact of future buildings and/or changes to existing buildings on local energy demands. As intermittent renewables are likely to provide a significant portion of demands in the future, then improving the understanding of when these demands occur should help to improve the efficiency of renewable energy and energy storage requirement.

The purpose of the research is to provide a clear, data-based picture of the nature, timing and location of half-hourly energy demands of buildings in Wales over a year.

This is the first time that this information has been made publicly available at this level of detail.

Data Overview

The detailed half-hourly datasets for each Output Area (OA) used by this report are available electronically and have been assembled for each Welsh Local Authority (LA) in excel spreadsheet format and are available at the Cardiff University ORCA repository at http://orca.cf.ac.uk/107222/

Information from within these detailed datasets is explored and presented further in the Cardiff University main work package 1 report.

The study uses 2016 Ordnance Survey data for Wales and the energy demand profiles for each of the 10,048 Census 2011 Output Areas (OA) in Wales includes estimated floor areas. OAs were chosen as they have been shown to meet the requirements for data privacy and could also be aggregated into Lower Layer Super Output Areas and Middle Layer Super Output Areas for larger geographical scale energy demand and supply analysis. The data has therefore been provided at as fine-grained a geographical level as possible, without compromising the privacy requirements of individual consumers.

This is the first time that this information has been made publicly available at this level of detail.

Industrial, transport and non-building commercial energy demands in Wales have not been considered in depth within this report as these were not available at the time of producing these energy profiles. Their annual use can be estimated from BEIS 2015 figures for Wales (Department for Business, Energy & Industrial Strategy, 2017), a graphical overview of which is shown in Figure 1 below.

Figure 1 shows that according to BEIS estimates in 2015, domestic buildings accounted for about 25% of the total annual Welsh energy consumption, with transport and industry/ commerce accounting for 25% and 50% respectively.

Figure 1: Total Wales consumption GWh by sector - BEIS 2015

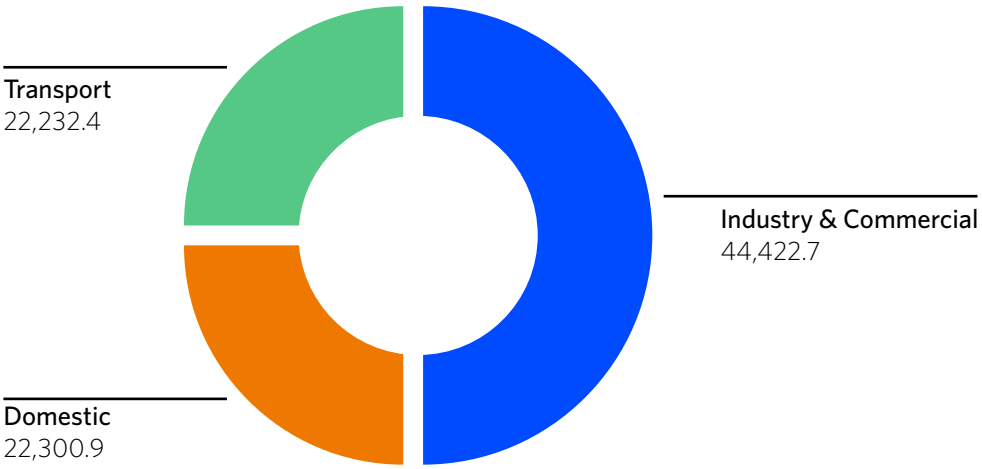
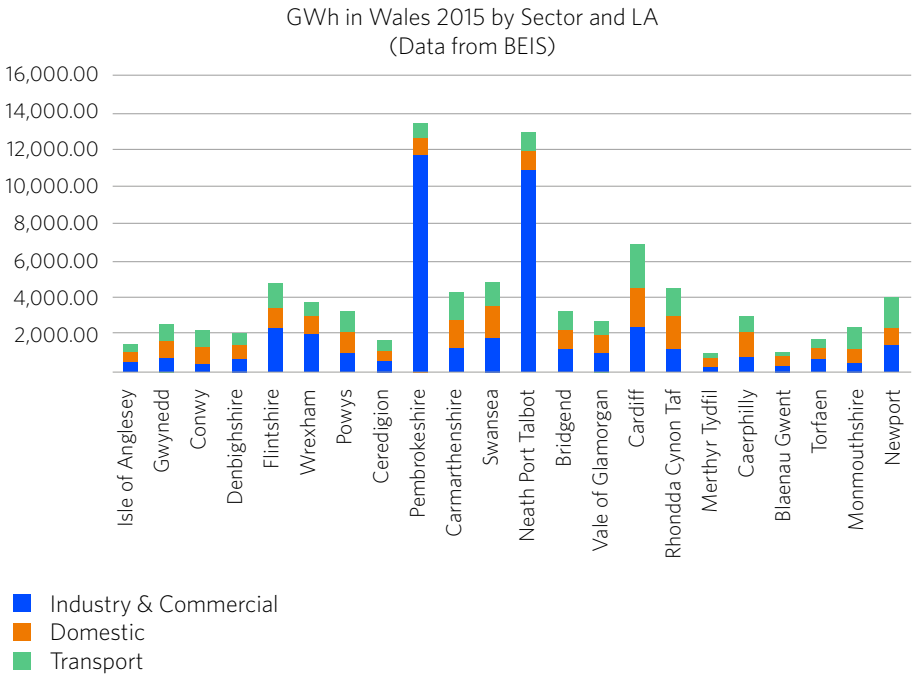


Figure 2 below shows BEIS consumption estimates for Welsh local authorities for the industrial and commercial, domestic and transport sectors in 2015.

Figure 2: BEIS consumption estimates for Wales and Welsh local authorities for 2015.



Half-hourly data for some of the industrial consumers would have been possible to produce, but for data privacy reasons this has not been done, although the major industrial energy consumers in Neath Port Talbot and Flintshire shown in Figure 1 are clearly identifiable.

The overall annual energy demands estimated within this research have been tested against BEIS published experimental data for OAs (UK Government Department for Business, Energy & Industrial Strategy, 2017). Overall, these comparisons generally provide confidence in the methodology used in this research for assessing the energy consumption of the domestic sector in Wales. For the non-domestic sector the lack of equivalent published figures from BEIS for the non-domestic buildings sector means we can have less certainty in the estimates produced in this research, so they should be used as indicative figures only at present. For both the IWA and BEIS estimates there are a few anomalous figures, which would benefit from further study to establish the reason for the variations.

The initial intention for the profiles was to use the actual recorded annual energy use data by 'Meter Point Reference Number' (MPRN) for gas and 'Meter Point Administration Number' (MPAN) for electricity where this was available and apply measured half hourly profiles by building typology to apportion this consumption over the full year. At the time of writing, Cardiff University had not been able to obtain the actual annual energy use data but efforts will continue to be made to obtain these before the end of the IWA Re-energising Wales project. This actual annual energy consumption data can be used to confirm and/or amend these profiles before the project end.

Key Variables

Household size

It is well documented that occupants have a significant effect on the amount of energy used and usage patterns in dwellings. Therefore household size, a key variable associated with occupants and energy use, is represented within the data model. Data on the number of occupants and households at postcode level and OA level counts of household sizes was used to approximate the distribution of households of various sizes within each postcode. The actual household/dwelling count per postcode from the 'Geographic Information Systems' (GIS) address database within the Ordnance Survey was used to approximate the number of various household sizes in each postcode.

Building type

Building type is also an important variable. To assess that Energy Performance Certificate (EPC) data (from the Department For Communities and Local Government, 2017) was used and matched to a 'Unique Property Reference Number' (UPRN) database, as well as an occupancy model for approximating the number of occupants in dwellings. Data from the EPC's was simplified and grouped (e.g. wall types grouped into solid uninsulated, solid insulated, cavity insulated, cavity uninsulated). Display Energy Certificate data for non domestic buildings was also analysed.

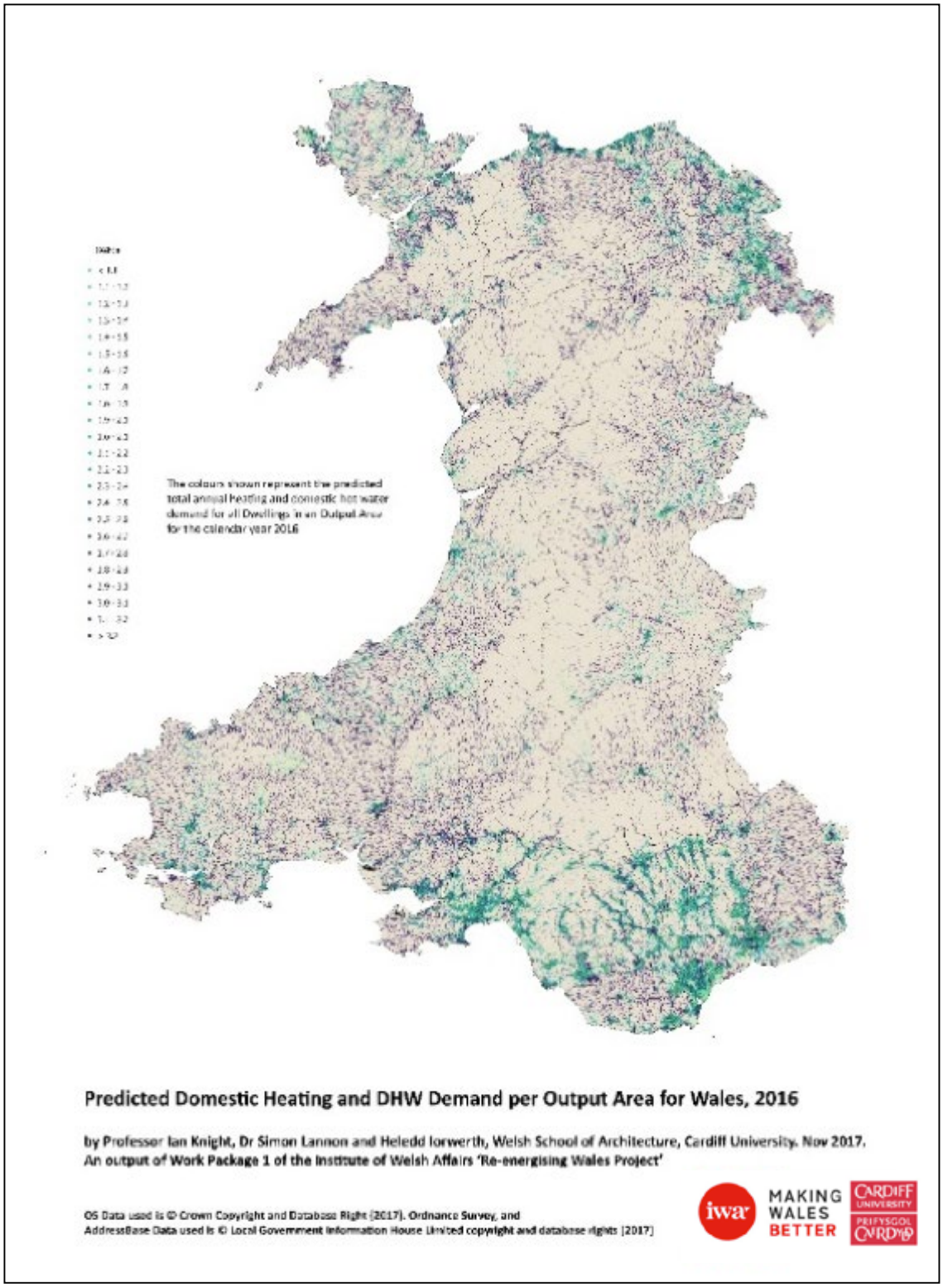
What we found

Figure 3 is an example of the GIS based presentation of aspects of this Re-energising Wales data. The map below highlights the predicted total annual domestic hot water and heating demands for all dwellings in different OAs in Wales during 2016: the darker patches represent higher energy demand. A full set of maps from Wales down to LA level are available in high resolution in the ORCA repository.

The variation of demand around Wales can be clearly seen, reinforcing the importance of considering the future energy supply system at a local as well as whole country basis.

The headline figures for Wales are shown in Figure 4. The figures show that buildings consume around 28 TWh of the approximately 89 TWh of energy used annually in Wales for all purposes.

Figure 3: Predicted Domestic Heating and DHW Demand per Output Area for Wales, 2016

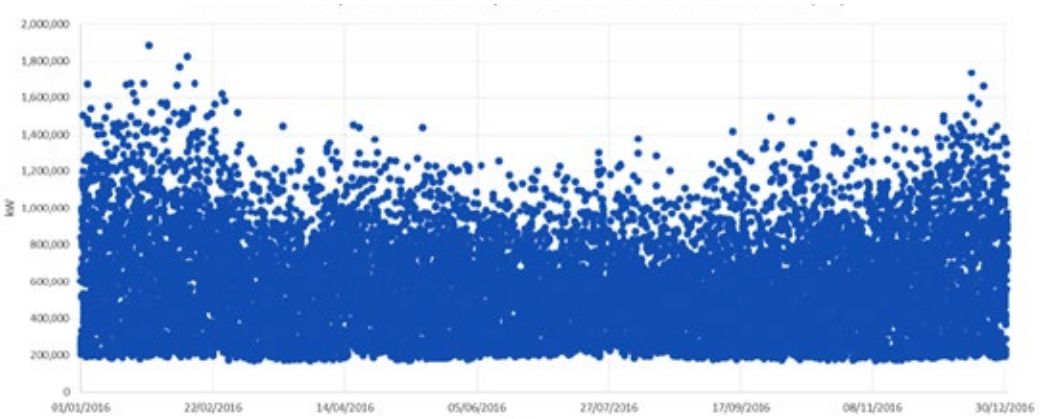


The data suggests that the electricity supply system for Wales needs to supply a minimum of 200 MW and a maximum of just under 2,000 MW (albeit a few days of the year) to meet the electrical demands of the domestic sector at present.

Size and Timing of Demands

Figure 4 shows the size and timing of predicted half-hourly domestic electricity peak demands for the whole of Wales throughout 2016. Similar figures can be produced by local authority and output area for from the excel spreadsheets provided from this work.

Figure 4: Predicted half hourly Domestic Electricity Power Demands for the whole of Wales (kW)

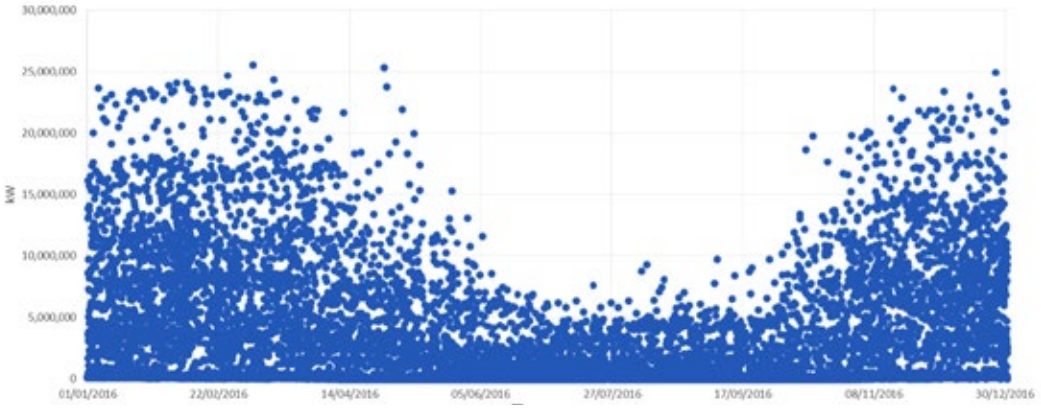


The data suggests that the electricity supply system for Wales needs to supply a minimum of 200 MW and a maximum of just under 2,000 MW (albeit a few days of the year) to meet the electrical demands of the domestic sector at present.

Electrifying transport across Wales could potentially be accommodated within this peak demand of 2,000 MW with controlled electric vehicle charging; while it is anticipated that if every house had an electric vehicle then average domestic electricity use could increase from around 10kWh per day to 15 - 20kWh per day. However, lower emission vehicles (including electric vehicles) have a significant role to play in addressing issues such as emissions and air pollution, and so should be seen as a positive contribution to a low carbon future. There must be a concurrent emphasis on reducing transport energy demand through reducing the number of vehicles and promoting modal shifts towards active travel.

Figure 5 shows the size and timing of predicted half hourly domestic heating and domestic hot water peak demands for the whole of Wales throughout 2016. Similar figures can be produced by LA and OA from the excel spreadsheets provided from this work.

Figure 5: Predicted half hourly Domestic Heating and Domestic Hot Water Power Demands for the whole of Wales (kW)



The data suggests that the energy supply system for Wales needs to supply a maximum of about 25,000 MW to meet the heating and domestic hot water demands of the domestic sector at present. However, these profiles are based on a very limited dataset and do not statistically represent the wider population half-hourly profiles. This data should therefore be considered as overestimating these peak demands.

A peak demand of between 10,000 to 15,000 MW, according to Cardiff University, is a more accurate estimate of the domestic sectors likely heating and domestic hot water requirements, based on normal installed heating capacity per m2. However the shape of the demand profile in the figure does provide a reasonable insight into the variation of this supply requirement over the year. The heating demand is significantly greater than the electricity demand, which has implications for any degree of the electrification of heat.

It is anticipated that if every house had an electric vehicle then average domestic electricity use could increase from around 10kWh per day to 15 - 20kWh per day.

Figure 6 presents the annual non-domestic buildings electricity demand profile for Wales. This suggests a peak power demand of between 300 to 450 MW could be expected from this sector. It is felt that the demand for this sector is underestimated and this figure could be higher in practice, perhaps around double the current figures shown. The reason for the underestimation is that the non-domestic building figures do not know the process, activity or building services within individual buildings as this information was not available to the project. These figures were lower than were expected and should be treated as 'for information only' at present.

Figure 6: Predicted half hourly Non-Domestic Electricity Power Demands for the whole of Wales (kW)

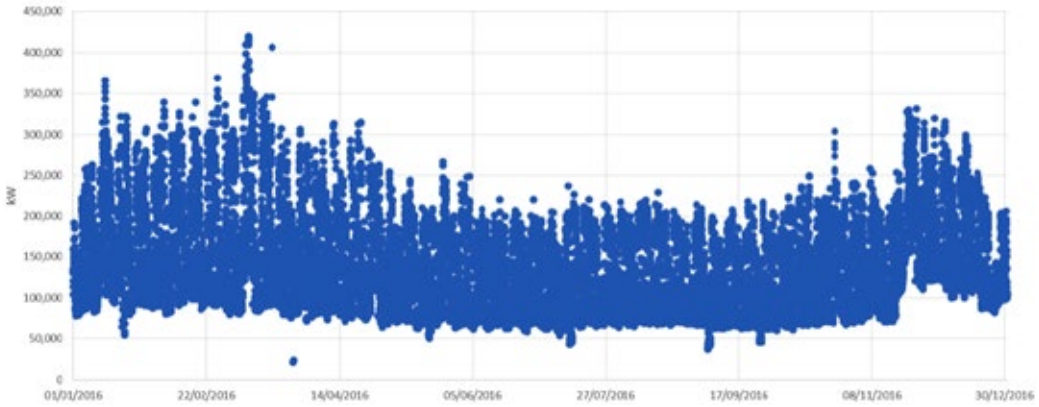
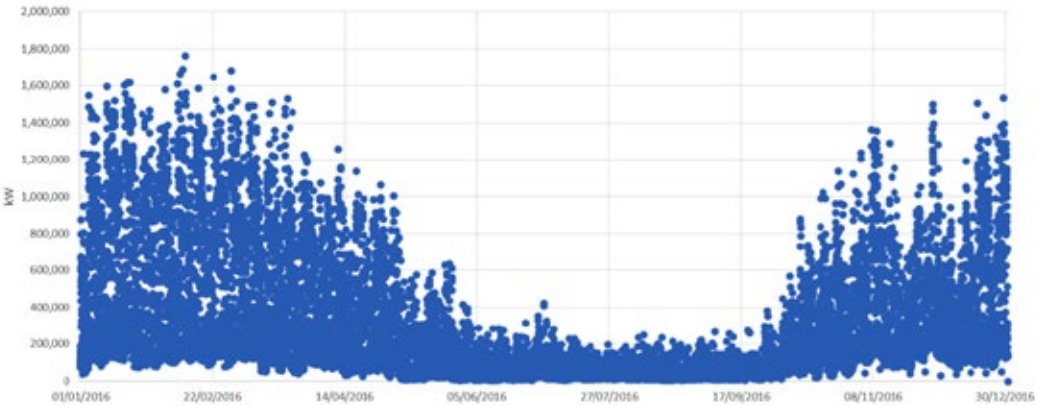


Figure 7 shows the non-domestic heating demands follow a similar annual profile to the domestic heating demands (Figure 5) but with a far lower predicted peak demand of around 1,500 MW. Even if this demand is also underestimated it is still significantly lower than the scale of the domestic demand shown earlier.

Figure 7: Predicted half hourly Non-Domestic Heating and Domestic Hot Water Power Demands for the whole of Wales (kW)



The data can be used for comparing renewable energy supply profiles with the likely concurrent demand in different geographical areas across Wales over a full year.

How the data can be used

The data can be used for comparing renewable energy supply profiles with the likely concurrent demand in different geographical areas across Wales over a full year to enable, for example, the identification of what is required for a 100% renewable supply system for buildings in a given area - made up of a the calculation of what is required in terms of reducing energy demand, increasing renewable supply or increasing energy storage systems.

This data has been used to inform an Re-energising Wales exemplar case study of the Swansea Bay City Region (SBCR). This will explore how the SBCR can maximise the size and location of its renewable energy resources in order to meet its projected energy demands by 2035. The SBCR study also includes projections for changes in future energy demand use through to 2035. This data will enable initial estimates of over or under-generation capacity from renewable energy supply at hourly intervals of the day along with the amount and type of energy storage that might be required to maximise the use of specific renewable generation technologies in SBCR.

Below we consider potential ways in which the data could be used, whilst identifying a number of potential organisations who could work with the data.

The energy demand map could be overlaid with areas in fuel poverty or areas of deprivation to check if there are similarities or differences in energy demand across these different geographical areas.

Local Authorities/Registered Social Landlords

Local Authorities (LAs) provide a range of public services and are responsible for delivering some existing national energy initiatives. For example, Welsh Government have introduced a requirement for LAs to establish targets for renewable energy generation in their local development plans.

Registered Social Landlords (RSLs) provide a wide range of services to people in housing need and also assist the government in implementing initiatives. RSLs have a number of responsibilities regarding energy use, including the energy requirements within the Welsh Housing Quality Standard and ambitions to tackle fuel poverty.

Identifying local tailor made solutions

These organisations could use this data set as a tool to focus attention on particular areas, so that local, tailor made solutions can be developed at postcode, local authority or building level by considering factors such as local energy demand, where energy efficiency has or has not been targeted to date and what the local energy supply mix looks like. This in turn could influence where to deploy energy efficiency and renewable energy supply measures. It could be a tool for a bottom up approach working with communities requiring engagement, or as a top down tool in designing investment programmes.

This data could outline whether people are getting the savings that they could achieve and are being achieved elsewhere in similar property types that have similar levels of insulation for example. An example could include mapping two different areas that have the same property types, with the properties in one of these areas having already received high levels of energy efficiency investment and the other area receiving low levels of energy efficiency investment. This could help calculate the differences in energy demand and the potential impacts of the energy efficiency measures installed. It is important to factor in characteristics that impact energy demand such as the age of the buildings, or the levels of energy efficiency measures installed.

Tackling fuel poverty

The energy demand map could be overlaid with areas in fuel poverty or areas of deprivation to check if there are similarities or differences in energy demand across these different geographical areas. This can inform action, especially if further analysis is carried out to understand why these areas might have very different energy demand profiles.

Welsh Government

Welsh Government has a number of roles including the development and implementation of policies and developing proposals for Welsh laws (Assembly Bills) and making subordinate legislation. Welsh Government have committed to a range of positive actions to reduce energy demand and increase renewable energy.

Environment (Wales) Act 2016

Welsh Government will be making decisions on decarbonisation as part of requirements under the Environment (Wales) Act 2016 for Welsh Ministers to put in place statutory emission reduction targets, including at least an 80% reduction in emissions by 2050 and carbon budgeting to support their delivery. Welsh Government have also set a number of renewable energy targets. One of these is for Wales to generate 70 per cent of its electricity consumption from renewable energy by 2030. This target will therefore be impacted by the way energy demand develops in Wales towards 2030. The data set can be used to make more informed decisions during the policy making process such as matching demand with renewable supply, deciding where to target energy efficiency measures (taking into account previous research on energy efficiency) and tackling fuel poverty.

Welsh Government also will be making decisions on decarbonising the buildings sector as part of the process of setting carbon budgets within the Environment (Wales) Act 2016. This data could help decide where best to focus resources within decarbonisation plans, by generating a more accurate view of energy demand and therefore carbon emissions.

This data provides energy demand data for buildings in 2016, so further collation of this data in future years, as energy demand changes, will be vitally important in order to ensure that the data is as up to date as possible. **We believe that Welsh Government are well placed to support the continued collation of this important data source.**

This data could help decide where best to focus resources within decarbonisation plans, by generating a more accurate view of energy demand and therefore carbon emissions.

Building regulations

This data could also be used to inform a range of further processes including the Part L Building Regulations review, with potential requirements for new developments to have higher energy efficiency and renewable energy generation requirements.

Further energy targets

The data could also be used by Welsh Government to help set energy demand reduction targets for Wales, which would help in meeting climate change targets and the renewable energy target set by the Welsh Government for Wales to generate 70% of its electricity consumption from renewable energy by 2030.

Distribution Network Operators

Distribution Network Operators (DNOs) own and operate the infrastructure that distributes power and gas to industrial, commercial and domestic users.

A key role for DNOs is to understand and act where there are constraints in meeting demand, and where microgeneration, energy efficiency, demand management and general flexibility could play a role in helping with energy system balancing. This data could therefore feed into DNOs activities when they are considering the capacity of the grid network in different parts of Wales and how it compares to different geographic consumption patterns.

In comparing this energy demand data against the data that the DNOs hold, it may be possible to compare data sets to understand ranges of energy demand by building type in different areas. Better understanding the intensity of energy use in places is important before taking a judgement on whether an area is performing well or poorly relative to its expected energy demand. DNOs or other organisations could inform people to take individual or collective action on their energy usage by sharing information about their current usage and potential savings.

Public Service Boards

The purpose of Public Services Boards (PSBs) is to improve the economic, social, environmental and cultural well-being in its area by strengthening joint working across all public services in Wales. The Well-being of Future Generations (Wales) Act 2015 established statutory PSBs to replace the voluntary Local Service Boards in each local authority area.

PSBs could use this data to assess the state of economic, social, environmental and cultural well-being in its area. This would especially be helpful if the energy demand data is twinned with renewable energy supply data in order to increase their understanding of how they could most effectively contribute to carbon reduction at a regional level. PSBs set objectives that are designed to maximise the PSBs contribution to the well-being goals. Each PSB must prepare and publish a Local Well-being Plan setting out its objectives and the steps it will take to meet them. Within this, the data will help the PSB explain how their objectives will contribute within their local area to achieving the well being goals and how it has had regard to the assessment of Local Well-being in setting its objectives and steps to take.

This data provides energy demand data for buildings in 2016, so further collation of this data in future years, as energy demand changes, will be vitally important in order to ensure that the data is as up to date as possible.

Conclusion

This is the first time that a clear, data-based picture of the nature, timing and location of half-hourly energy demands of buildings in Wales over a period of a year has been made publicly available at this level of detail. It should be viewed as a step towards a better understanding of when, where and why we use energy currently consumed in Wales. Understanding this is particularly vital as we need to understand how the Welsh energy supply system should evolve to meet Wales' projected energy demands through renewable sources.

This work shows the potential of understanding energy at the right scale of use; an understanding that can inform and empower a variety of actors, in Wales and beyond. As householders, communities, public servants and others gain greater understanding of energy use through this work, and all that follows, many organisations and people will now have the information they need to act for a lower cost, more energy efficient future.

There are a number of ways in which the data could be used by a whole range of potential organisations. Further collation of this data and other data in future years will be vitally important in order to ensure that the data is comprehensive and paints as full a picture as possible. We believe that Welsh Government are well placed to support the continued collation of this important data source.

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