



# **Revisions to Ireland's National Energy Balance from 1990 to 2018 following incorporation of new survey data on business energy use**

November 2020

## **Sustainable Energy Authority of Ireland (SEAI)**

SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective and sustainable solutions to help Ireland's transition to a clean energy future. We work with Government, homeowners, businesses and communities to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies. SEAI is funded by the Government of Ireland through the Department of the Environment, Climate and Communications.

SEAI is the official source of energy data for Ireland. We develop and maintain comprehensive national and sectoral statistics for energy production, transformation and end-use. These data are a vital input in meeting international reporting obligations, for advising policymakers and informing investment decisions. SEAI's core statistics functions are to:

- Collect, process and publish energy statistics to support policy analysis and development in line with national needs and international obligations;
- Conduct statistical and economic analyses of energy services sectors and sustainable energy options;
- Contribute to the development and promulgation of appropriate sustainability indicators.

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## 1 Introduction

In December 2018 the Central Statistics Office (CSO) published for the first time the results of the Business Energy Use Survey (BEUS). This data source provides a new basis for the breakdown of energy use in the commercial services, public services and industrial sectors, at a level of detail not previously possible. SEAI have revised the National Energy Balances from 1991 to 2018 incorporating this new improved data. This document explains the background to the BEUS, describes the new data that is available, how this compares to previous estimates, and how the National Energy Balance has been revised to incorporate the new data.

Developing the National Energy Balance is a continuous and ongoing process, and revisions are made whenever improved data becomes available. We welcome any feedback, which can be sent to [epssu@seai.ie](mailto:epssu@seai.ie).

## 2 Background

### 2.1 Energy Balance

SEAI is responsible for compiling Ireland's energy statistics and preparing the National Energy Balance. The Energy Balance records all energy use in Ireland, in a given year, showing the quantity and type of energy used and the sectors in which it is used. The Energy Balance covers energy use at the national level and at an annual time resolution.

Final energy use is split into the following sectors:

- Industry
- Transport
- Residential
- Commercial/Public Services
- Agricultural
- Fisheries

Up until these revisions, the industry and services end-use sectors were further broken down into the following subsectors (NACE codes in brackets):

Industry:

- Non-Energy Mining (05-09)
- Food & beverages (10-11)
- Textiles and textile products (13-14)
- Wood and wood products (16)
- Pulp, paper, publishing and printing (7-18)
- Chemicals & man-made fibres (20-21)
- Rubber and plastic products (22)
- Other non-metallic mineral products (23)
- Basic metals and fabricated metal products (24-25)
- Machinery and equipment n.e.c. (28)
- Electrical and optical equipment (26-27)
- Transport equipment manufacture (29-30)
- Other manufacturing (31-33, 12 & 15)



## Commercial/Public Services

- Commercial Services
- Public Services

The industry sub sector split was based on data for selected years from the CSO Census of Industrial Production (CIP). The last time that the CIP requested detailed data on energy was in 2009. From 2009, the CSO BEUS was carried out, and this was designed to be a replacement for the energy data from the CIP from 2009 onwards. The results of the BEUS were first published in December 2018. From 2010 to 2018 the split of energy use between industry sub sectors continued to be based on the 2009 CIP, supplemented by data from the Emissions Trading Scheme, where available.

Now that the results of the BEUS are available, we are revising the methodology in the Energy Balance to incorporate this detailed data on the allocation of energy use in the industry and services sectors. In some cases, revisions to the data for industry and services have had knock on effects on the estimates for energy use in other sectors, in particular the residential sector.

## 2.2 The CSO Business Energy Use Survey

The Business Energy Use Survey (BEUS) is conducted by the CSO and is an annual survey collecting information about energy use by businesses in Ireland. The first survey covered the year 2009 and it has been conducted annually since then. Energy use by enterprises and family farms in NACE Divisions 01-03 (Agriculture, forestry and fishing) are not included in the results.

The results of the survey were first published in December 2018 for the years 2009-2015. The results for 2016 were published in September 2019 with 2017 results published in September 2020.

The primary purpose of the survey is to provide estimates of the quantities and spend on energy products used by enterprises in the industry and services sectors to operate their businesses. A description of the methodology is available on the CSO website:

<https://www.cso.ie/en/methods/surveybackgroundnotes/businessenergyuse/>

The BEUS is a sample survey. The results are weighted up to be nationally representative based using the CSO business register and administrative data. The survey returns are also boosted with the inclusion of data from non-CSO administrative data sources and CSO structural business surveys. These sources include:

- Emissions Trading Scheme (EPA)
- Large Industry Energy Network (SEAI)
- Public Sector Energy Programme (SEAI)
- Annual Services Inquiry
- Census of Industrial Production
- Overview of Returns by Data Source at Enterprise Level

### 3 BEUS Sub-sectoral and fuel splits

#### 3.1 BEUS Sub-sectoral split

The BEUS contains data on energy use split into the following NACE Rev. 2 levels:

- Mining and Quarrying (05-09)
- Manufacture of Food, and Beverages (10-11)
- Manufacture of Textiles and Wearing Apparel (13-14)
- Manufacture of Wood excl. Furniture (16)
- Manufacture and Printing of Paper Products (17-18)
- Manufacture of Chemicals (20)
- Manufacture of Pharmaceuticals (21)
- Manufacture of Rubber and Plastic Products (22)
- Manufacture of Other Non-metallic Mineral Products (23)
- Manufacture of Basic Metals and Metal Products (24-25)
- Manufacture of Computer, Electronic, and Optical Products (26-27)
- Manufacture of Machinery and Equipment (28)
- Manufacture of Transport Equipment (29-30)
- Other Manufacturing (12,15,31-33)
- Electricity, Gas and Refining (19,35)
- Water Supply, Sewerage, and Waste Management (36-39)
- Construction (41-43)
- Wholesale, Retail, and Vehicle Repair (45-47)
- Transportation and Storage (49-53)
- Accommodation and Food Services (55-56)
- Information and Communication (58-63)
- Financial, Insurance and Real Estate Activities (64-68)
- Public Administration (84)
- Education (85)
- Health, Residential Care and Social Work Activities (86-88)
- Other Services Sectors

Table 1 matches the BEUS NACE Rev 2 levels to the Energy Balance. Electricity, Gas and Refining (19,35) includes fuels used by power plants and in the Energy Balance is reported under 'Transformation Input' and not 'Total Final Consumption'. Therefore, it is excluded from the industry and services end use calculations defined in the remainder of this document.

**Table 1: Matching of BEUS NACE groupings to Energy Balance sub-sectors**

BEUS Category	Energy Balance Category	Sector
Mining and Quarrying (05-09)	Non-Energy Mining (05-09)	Industry
Manufacture of Food, and Beverages (10-11)	Food & beverages (10-11)	Industry
Manufacture of Textiles and Wearing Apparel (13-14)	Textiles and textile products (13-14)	Industry
Manufacture of Wood excl. Furniture (16)	Wood and wood products (16)	Industry
Manufacture and Printing of Paper Products (17-18)	Pulp, paper, publishing and printing (7-18)	Industry
Manufacture of Chemicals (20)	Chemicals & man-made fibres (20-21)	Industry
Manufacture of Pharmaceuticals (21)	Chemicals & man-made fibres (20-21)	Industry
Manufacture of Rubber and Plastic Products (22)	Rubber and plastic products (22)	Industry
Manufacture of Other Non-metallic Mineral Products (23)	Other non-metallic mineral products (23)	Industry
Manufacture of Basic Metals and Metal Products (24-25)	Basic metals and fabricated metal products (24-25)	Industry
Manufacture of Computer, Electronic, and Optical Products (26-27)	Electrical and optical equipment (26-27)	Industry
Manufacture of Machinery and Equipment (28)	Machinery and equipment n.e.c. (28)	Industry
Manufacture of Transport Equipment (29-30)	Transport equipment manufacture (29-30)	Industry
Other Manufacturing (12,15,31-33)	Other manufacturing (31-33, 12 & 15)	Industry
Electricity, Gas and Refining (19,35)	Oil Refineries & other energy sector	Transformation Input
Water Supply, Sewerage, and Waste Management (36-39)	New	Public Services
Construction (41-43)	New	Industry
Wholesale, Retail, and Vehicle Repair (45-47)	New	Commercial Services
Transportation and Storage (49-53)	New	Commercial Services
Accommodation and Food Services (55-56)	New	Commercial Services
Information and Communication (58-63)	New	Commercial Services
Financial, Insurance and Real Estate Activities (64-68)	New	Commercial Services
Public Administration (84)	New	Public Services
Education (85)	New	Public Services
Health, Residential Care and Social Work Activities (86-88)	New	Public Services
Other Services Sectors	New	Commercial Services

Table 2 shows the sub sectoral breakdown for the industry, commercial and public services sectors in the Energy Balance before and after incorporating the BEUS. NACE 20 and 21 are separate in the BEUS but added together in the Energy Balance, as per the previous layout. New sub-sector breakdowns are highlighted in purple.

**Table 2: Energy Balance industry and services sub-sector breakdown before and after BEUS**

Old Energy Balance layout:	NACE (Rev 2)	Revised Energy Balance layout	NACE (Rev 2)
<b>Total Final Energy Consumption</b>		<b>Total Final Energy Consumption</b>	
<b>Industry</b>		<b>Industry</b>	
Non-Energy Mining	05-09	Non-Energy Mining	05-09
Food & beverages	10-11	Food & beverages	10-11
Textiles and textile products	13-14	Textiles and textile products	13-14
Wood and wood products	16	Wood and wood products	16
Pulp, paper, publishing and printing	17-18	Pulp, paper, publishing and printing	17-18
Chemicals & man-made fibres	20-21	Chemicals & man-made fibres	20-21
Rubber and plastic products	22	Rubber and plastic products	22
Other non-metallic mineral products	23	Other non-metallic mineral products	23
Basic metals and fabricated metal products	24-25	Basic metals and fabricated metal products	24-25
Machinery and equipment n.e.c.	28	Machinery and equipment n.e.c.	28
Electrical and optical equipment	26-27	Electrical and optical equipment	26-27
Transport equipment manufacture	29-30	Transport equipment manufacture	29-30
Other manufacturing	31-33, 12 & 15	Other manufacturing	31-33, 12 & 15
		Construction	41-43
<b>Transport</b>		<b>Transport</b>	
Road Freight		Road Freight	
Road Light Goods Vehicle		Road Light Goods Vehicle	
Road Private Car		Road Private Car	
Public Passenger Services		Public Passenger Services	
Rail		Rail	
Domestic Aviation		Domestic Aviation	
International Aviation		International Aviation	
Fuel Tourism		Fuel Tourism	
Navigation		Navigation	
Unspecified		Unspecified	
<b>Residential</b>		<b>Residential</b>	
<b>Commercial/Public Services</b>		<b>Commercial/Public Services</b>	
<b>Commercial Services</b>		<b>Commercial Services</b>	
		Wholesale, Retail, and Vehicle Repair	45-47
		Transportation and Storage	49-53
		Accommodation and Food Services	55-56
		Information and Communication	58-63
		Financial, Insurance and Real Estate Activities	64-68
		Other Services Sectors	
<b>Public Services</b>		<b>Public Services</b>	
		Water Supply, Sewerage, and Waste Management	36-39
		Public Administration	84
		Education	85
		Health, Residential Care and Social Work Activities	86-88
<b>Agricultural</b>		<b>Agricultural</b>	
<b>Fisheries</b>		<b>Fisheries</b>	

### 3.2 BEUS fuel split

The BEUS also collects data on energy use split into the following fuels:

**Table 3: BEUS fuel split and corresponding Energy Balance fuels**

BEUS fuels	Corresponding Energy Balance fuels
Electricity	Electricity
Electricity self-generated own use	
Electricity self-generated sold	
Rail Transport Electricity*	
Road Transport Electricity*	Natural Gas
Natural Gas (excl. CHP)	
Natural Gas used in Combined Heat and Power Plants (CHP)	
Road Transport Natural Gas*	Gasoline
Road Transport Petrol*	
Aviation Petrol*	Kerosene
Kerosene	
Jet Kerosene*	Jet Kerosene
Heavy Fuel Oil	Fuel Oil
Liquid Petroleum Gas	LPG
Road Transport Liquid Petroleum Gas*	
Diesel/Gas Oil/Marked Gas Oil	Gasoil / Diesel /DERV
Road Transport Diesel*	
Rail Transport Diesel*	
Petroleum Coke	Petroleum Coke
Coal	Coal
Peat	Peat
Wind Turbines*	Wind
Wood Biomass	Biomass
Tallow*	
Solid Recovered Fuel*	Renewable Waste Non-renewable Waste
Landfill Gas*	Landfill Gas
Biogas*	Biogas
Road Transport Biodiesel*	Biodiesel
<i>*fuel has not been included in energy balance revisions</i>	

We have not used data on all of the fuel types collected by the BEUS. The BEUS requests data on transport fuels used by businesses, including road and rail transport fuels and jet fuel. In the Energy Balance energy used for transport is assigned under the transport sector, regardless of whether it is used for business or personal travel. Therefore, for this exercise we have not included transport fuel data from the BEUS. Some other fuels have also not been included as they are well covered by existing SEAI surveys, this is discussed more in section 4.12.

## **4 Methodology for incorporating CSO BEUS data into National Energy Balance**

This section examines each fuel in the Energy Balance that has been revised based on new data from the BEUS. For each fuel we present the following:

- How the fuel was apportioned by sector in the Energy Balance before BEUS data was available
- A comparison between the historical Energy Balance sectoral split with the new BEUS data;
- A description of how the new Energy Balance sectoral split is calculated, including a description of any adjustments carried out to pre 2009 data.
- A comparison of the old and revised Energy Balance data.

### **Construction energy use**

The BEUS provides data on energy use in construction for the first time, but only for 2009 to 2017. Because of the new methodology for estimating oil use in industry, it was necessary for us to estimate construction energy use by fuel from 1990 to 2019 in a bottom-up way. We did this based on the BEUS data and CSO data on construction sector activity. This is described in section 4.13.

The BEUS also provides data on commercial and public services subsectors data for the first time, but the services sectors are treated differently than industry pre 2009, and it was not necessary to carry out the same exercise for these subsectors.

### **Note on methodological differences underlying the BEUS and the Energy Balance**

There are some significant methodological differences between the BEUS and the National Energy Balances. In general, the Energy Balances use a top-down approach to distribute total fuel use across sectors and subsectors; whereas the BEUS uses a bottom-up approach, surveying a sample of individual business and weighting this up to the national level. Another difference is that the BEUS is based on the National Accounts residency principle. This means that energy used abroad by enterprises resident in Ireland is included, but energy used in Ireland by foreign resident enterprises is not included. The territory principle, which is used in Energy Balances and in the Greenhouse Gas Emission inventory, does not include energy used abroad by enterprises resident in Ireland but includes energy used in Ireland by enterprises that are not resident in Ireland. This difference in methodology is most relevant for transport fuels, in particular jet kerosene. We have not included transport fuels in this analysis, so the effect of this difference in methodology should be minimal.

The methodological differences mean that the BEUS and the National Energy Balance data are not always directly comparable. To make use of the BEUS, the data needs to be carefully examined and compared on a fuel by fuel and sector by sector basis, and expert judgement is required to assess the most appropriate use of the data.

### **Note on timing of publication of BEUS and National Energy Balance**

In 2018 the BEUS data for 2009-2015 was published for the first time and in 2019 the data for 2016 was published with 2017 results made available in September 2020. For this publication, in the absence of BEUS data for 2018 or 2019 the 2017 sub-sectoral shares were applied for 2018 and 2019. This will be revised when the later data becomes available.

It was intended that the survey results for 2018 will be published in 2020 and thereafter the results will be published each year for energy consumed two years previously, e.g. in 2021 the data for 2019 will be published. Therefore, the publication of the BEUS will lag one year behind the publication of the Energy Balance going forward. It will be standard practice that the Energy Balance for the latest year will be based on the sub-sectoral splits for the previous year, and these will then be revised the following year when the BEUS data becomes available.

## 4.1 Electricity

### 4.1.1 Old Energy Balance methodology

Prior to the publication of the BEUS, the Energy Balance sector and subsector totals for electricity were calculated as summarised in Table 4:

**Table 4: Basis for splitting electricity by sector in old Energy Balance**

Total final electricity use	
1990-2011	Survey of suppliers
2012-2018	CRU retail market report
Industry and services sector totals	
1990-2011	From survey of electricity suppliers, based on non-household tariff. Services is effectively the residual energy use when all other sectors are accounted for.
2012-2018	Sector totals from 2011 supplier survey applied to CRU data for [total non-residential electricity use] - [transport] + [onsite CHP electricity consumption from CHP survey].
Industry - sub-sector split	
1990-2018	Based on CIP and older ad hoc surveys of industrial energy use and spend.
Commercial services and public services split	
1990-2018	Simple sub-sectoral split based on 1990 estimate: <ul style="list-style-type: none"> <li>• Commercial Services 72%</li> <li>• Public Services 28%</li> </ul>
Residential	
1990-2011	Survey of electricity suppliers, based on household tariff.
2012-2018	Total estimated from CRU retail report - Residential sales less agriculture sales
Agriculture	
1990 -2009	From annual survey of electricity suppliers.
2009-2018	Based on 2009 survey of electricity suppliers

### 4.1.2 BEUS data

The BEUS requests data on electricity purchased and electricity self-generated from each survey participant. Figure 1 shows the BEUS questionnaire for electricity use.



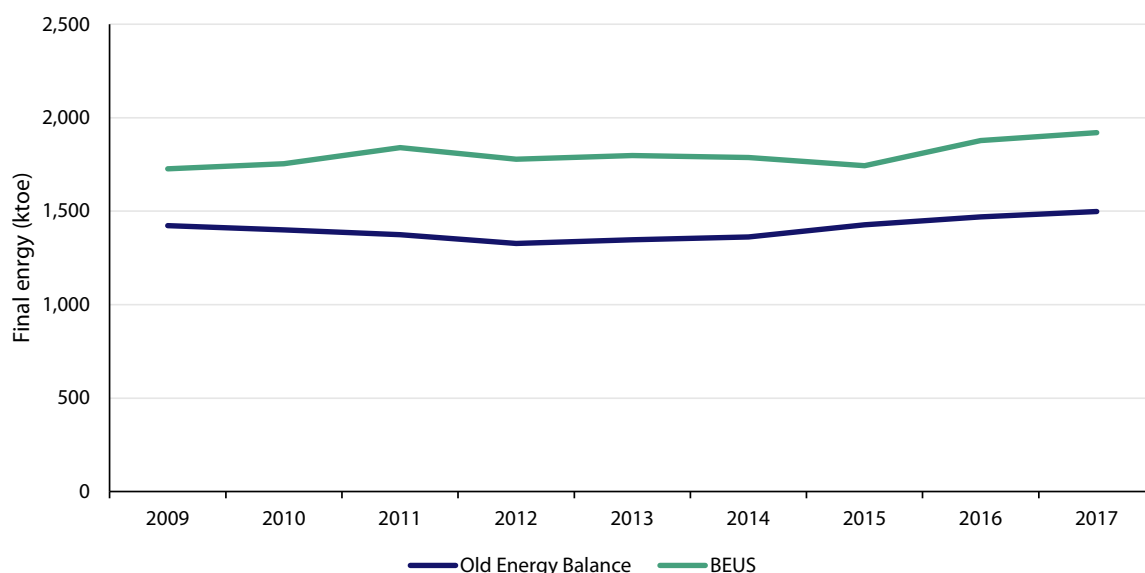
**Figure 1: BEUS question on electricity use**

1. Electricity - Purchased (to operate the business only – Include Standing Charge and PSO Levy)		
	Quantity kWh	Cost €
(a) Electricity purchased	<input type="text"/>	<input type="text"/> ,000
2. Electricity - Self Generated (if applicable) (including Combined Heat and Power (CHP) Plant)		
	Quantity kWh	Cost €
(a) Amount generated for own use	<input type="text"/>	<input type="text"/> ,000
	Quantity kWh	Value €
(b) Amount sold on the electricity grid	<input type="text"/>	<input type="text"/> ,000

Total business electricity from the BEUS is calculated as: electricity purchased + electricity self-generated own use. Below is a comparison of the total business electricity from the BEUS and from the Energy Balance. The BEUS values include all sectors except Electricity, Gas and Refining (19,35).

Figure 2 and Table 5 compare the BEUS data with the old Energy Balance estimate of business electricity use. The BEUS shows more electricity consumption for business in all years, varying from 21% to 34% more.

**Figure 2: Comparison of old Energy Balance and BEUS results for total business electricity use**



**Table 5: Comparison of old Energy Balance and BEUS results for total business electricity use**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Old Energy Balance (ktoe)	1,423	1,399	1,375	1,328	1,346	1,362	1,427	1,470	1,499
BEUS (ktoe)	1,727	1,753	1,840	1,778	1,797	1,787	1,744	1,878	1,920
Difference (ktoe)	304	354	465	450	451	426	317	408	422
Difference %	21%	25%	34%	34%	34%	31%	22%	28%	28%

#### 4.1.3 New Energy Balance methodology

As shown in Table 5, there are substantial differences between the BEUS estimate of total business electricity use and the estimate from the CRU retail report and previous data from suppliers.

The CRU and supplier data on residential electricity use is well founded because there is a separate tariff structure for households. Because of this, the supplier data for non-residential electricity use is also well founded. Therefore, we continue to use the existing supplier data for total residential and non-residential electricity use.

The BEUS data is used to calculate the sub-sectoral shares in industry and services. These shares are then applied to the total non-residential electricity use from CRU retail report. This results in a change in the relative shares of industry, commercial services and public services for the years 2009-2017. Residential, transport and agriculture are unchanged apart from minor revisions unrelated to BEUS.

Table 6 compares the sector shares as they were in the old Energy Balance and how they are using the new methodology when BEUS shares are used for 2009 to 2017.

**Table 6: Comparison of sectoral shares for electricity final energy use between old and new Energy Balance**

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Old Energy Balance shares</b>									
Industry	34%	36%	38%	38%	38%	39%	39%	40%	40%
Transport	0%	0%	0%	0%	0%	0%	0%	0%	0%
Residential	32%	34%	33%	34%	33%	32%	31%	31%	31%
Commercial	23%	20%	19%	19%	19%	19%	19%	19%	20%
Public Services	9%	8%	7%	7%	7%	8%	8%	8%	8%
Agricultural	2%	2%	2%	2%	2%	2%	2%	2%	2%
<b>New Energy Balance shares using BEUS</b>									
Industry	24%	22%	23%	22%	23%	27%	25%	26%	26%
Transport	0%	0%	0%	0%	0%	0%	0%	0%	0%
Residential	33%	34%	34%	33%	32%	31%	31%	30%	30%
Commercial	24%	24%	25%	25%	26%	26%	28%	28%	28%
Public Services	17%	18%	16%	17%	17%	14%	14%	15%	14%
Agricultural	2%	2%	2%	2%	2%	2%	2%	2%	2%

#### Adjustment to pre-2009 estimates.

Using the BEUS we now have more accurate data on the split between the sectors from 2009 onwards.

If we were to use the previous estimates for 2008 there would be a break in the time-series between 2008 and 2009. In order to avoid this, we decided to interpolate the sectoral shares between the

BEUS data for 2009 and the 2000 estimate. The year 2000 was chosen as it predates the deregulation of the electricity market in Ireland. At this time there was only one supplier, and they had a full view of the market, which gives more confidence to the estimates provided up to that point. Going back to 2000 also allows for a gradual smoothing of the estimates over a reasonable number of years to avoid any sharp breaks in series.

For the period 2000 to 2009 we will now use the sectoral splits for the years 2000 and 2009, and use linear interpolation to estimate the sectoral shares for industry and services for the intervening years. The CIP shares are applied to the new industry total to give the industry sub-sector split.

### Summary of changes

Table 7 summarises the changes in the revised methodology:

**Table 7: Summary of changes to Energy Balance electricity final energy use by sector**

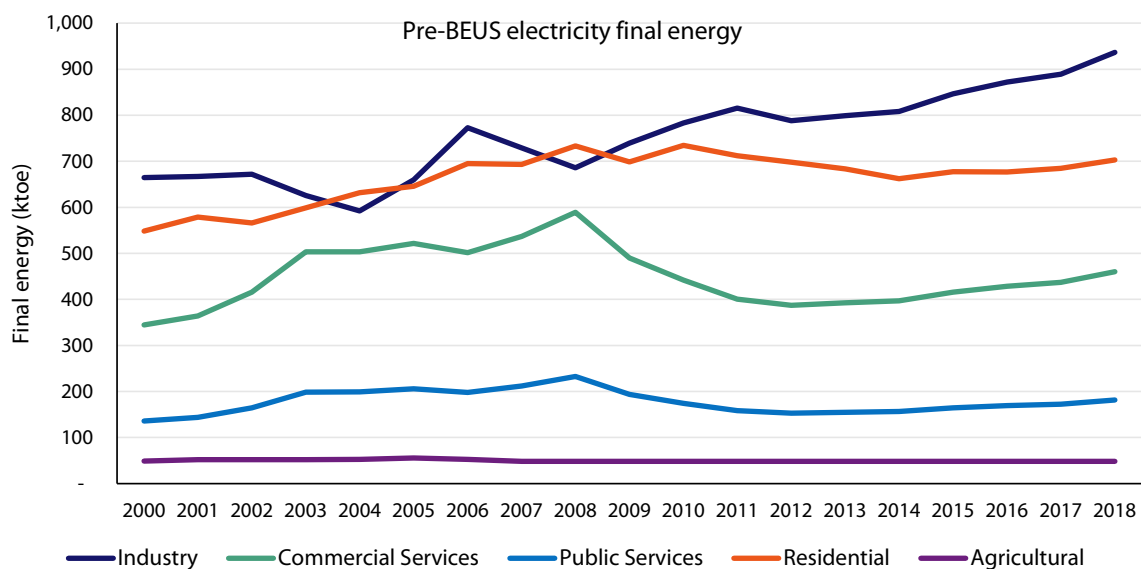
Total final electricity	
1990-2009	No change
2009-2018	Minor revisions unrelated to BEUS
Industry, commercial and public services	
1990-2000	No change
2001-2008	Sectoral share interpolated from 2000 and 2009 values. Sub-sectoral shares as before, based on CIP.
2009-2017	Sub-sectoral shares across industry, commercial and public services revised based on BEUS, with new subsectors added. Changes to sector totals reflecting the revisions to the sub-sector shares.
2018	Subsector shares based on 2017 BEUS, awaiting publication of BEUS data for later years, will be revised accordingly
Residential & Agriculture	
1990-2018	No change

#### 4.1.4 Comparison of old and revised Energy Balance data

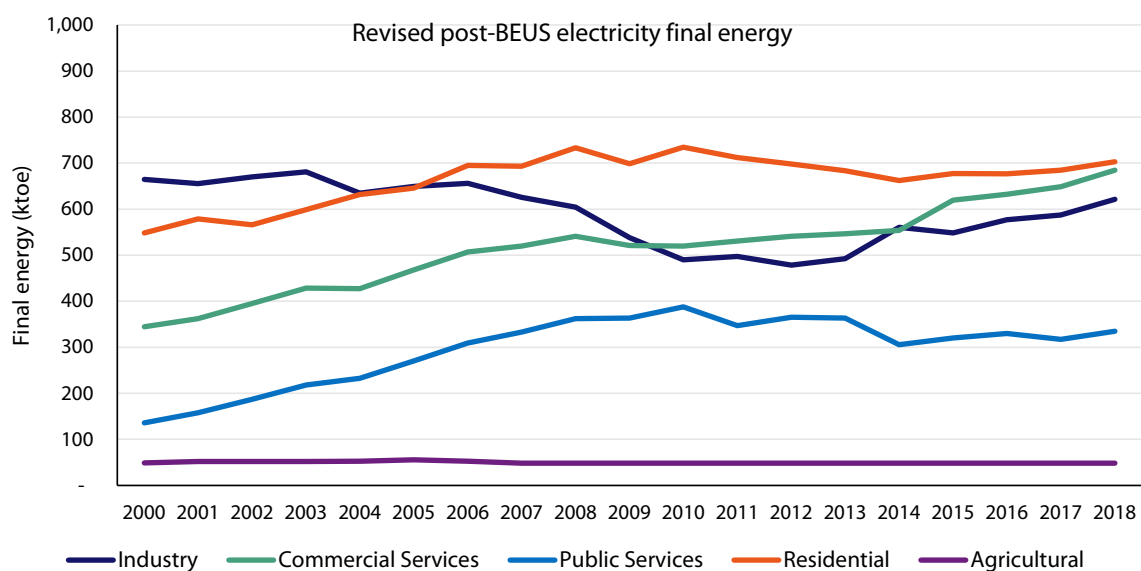
The following graphs illustrate the results of the data revisions for electricity.

Figure 3 and Figure 4 show the time series of electricity use by sector from 2000 to 2018 before and after the revision. Figure 5 highlights the breakdown of electricity use by sector in 2017 before and after the revisions side by side. The revised estimate shows electricity use more evenly distributed between the sectors in 2017, with the residential sector now the largest electricity consuming sector, replacing industry, which is now the third highest, behind commercial services.

**Figure 3: Old Energy Balance sectoral split for electricity final energy**



**Figure 4: Revised Energy Balance sectoral split for electricity final energy**



**Figure 5: 2017 electricity final energy by sector, old and revised Energy Balance estimates**

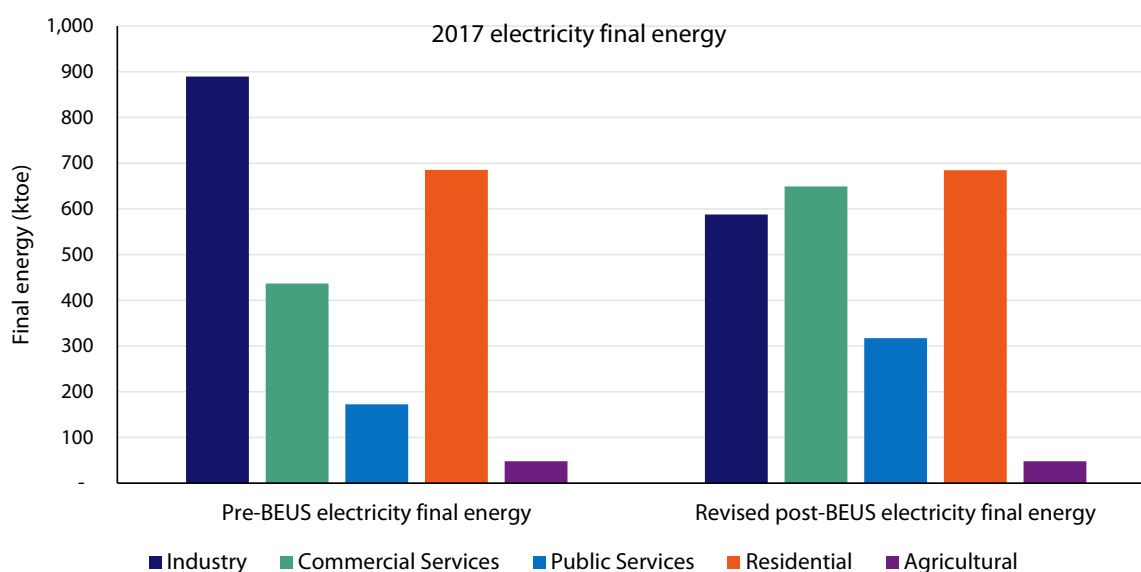


Figure 6 shows industry final energy electricity use before and after the revisions. In 2017, the revised Energy Balance data for industry final energy electricity use is 34% lower than the old pre-BEUS estimate.

**Figure 6: Industry electricity final energy, old and revised Energy Balance estimates.**

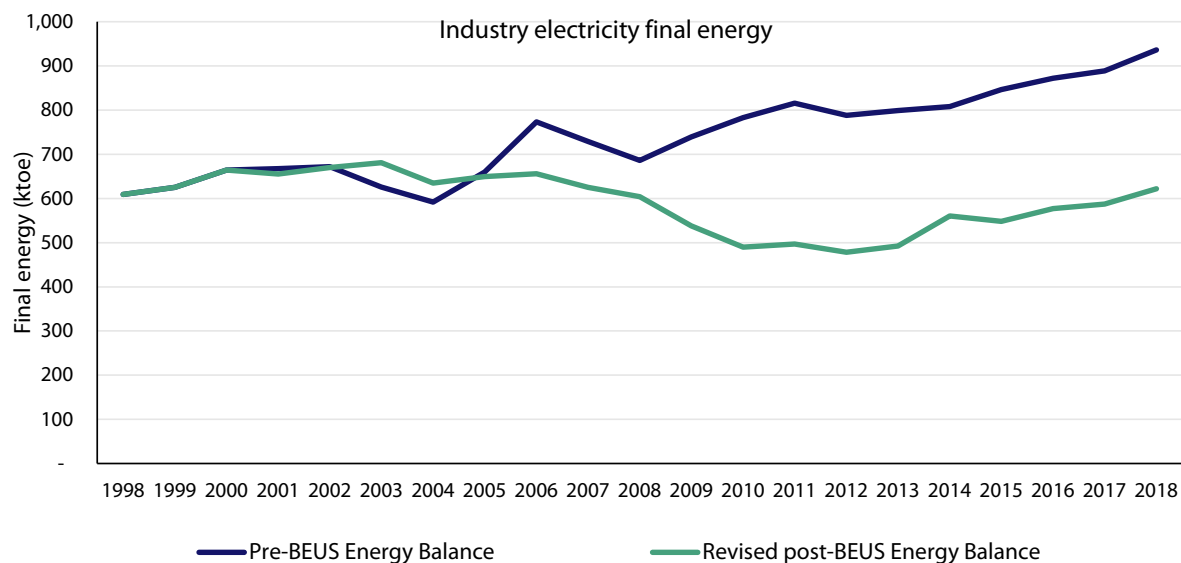


Figure 7 shows commercial services final electricity energy use before and after the revisions. In 2017, the revised Energy Balance data for commercial services final energy electricity use is 48% higher than the old pre-BEUS estimate.

**Figure 7: Commercial services electricity final energy, old and revised Energy Balance estimates**

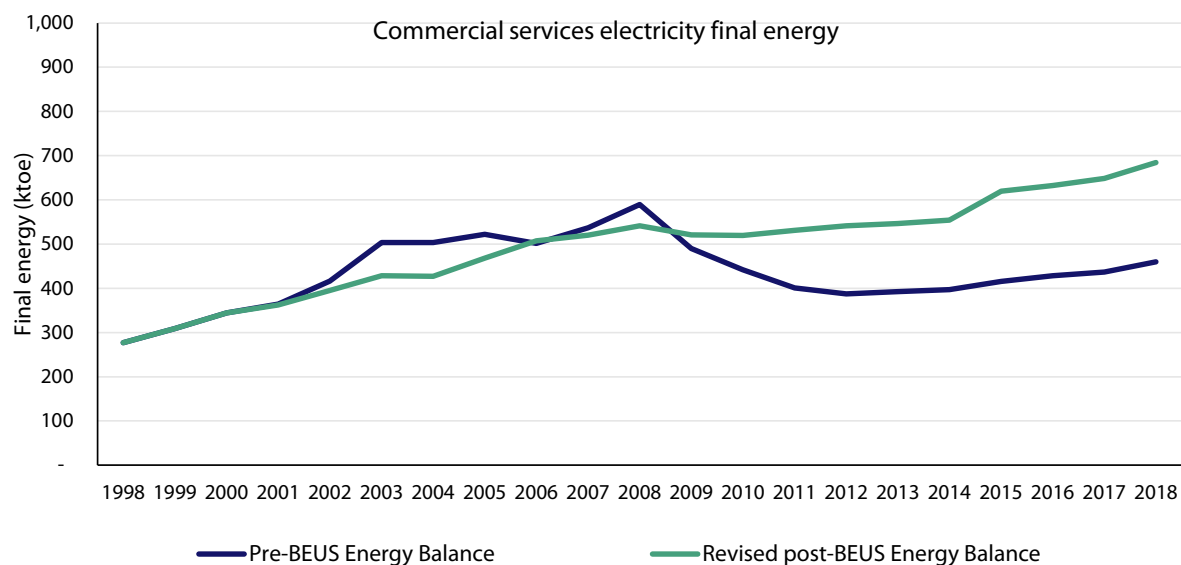


Figure 8 shows public services final electricity energy use before and after the revisions. In 2017, the revised Energy Balance data for public services final energy electricity use is 84% higher than the old pre-BEUS estimate.

**Figure 8: Public services electricity final energy, old and revised Energy Balance estimates**

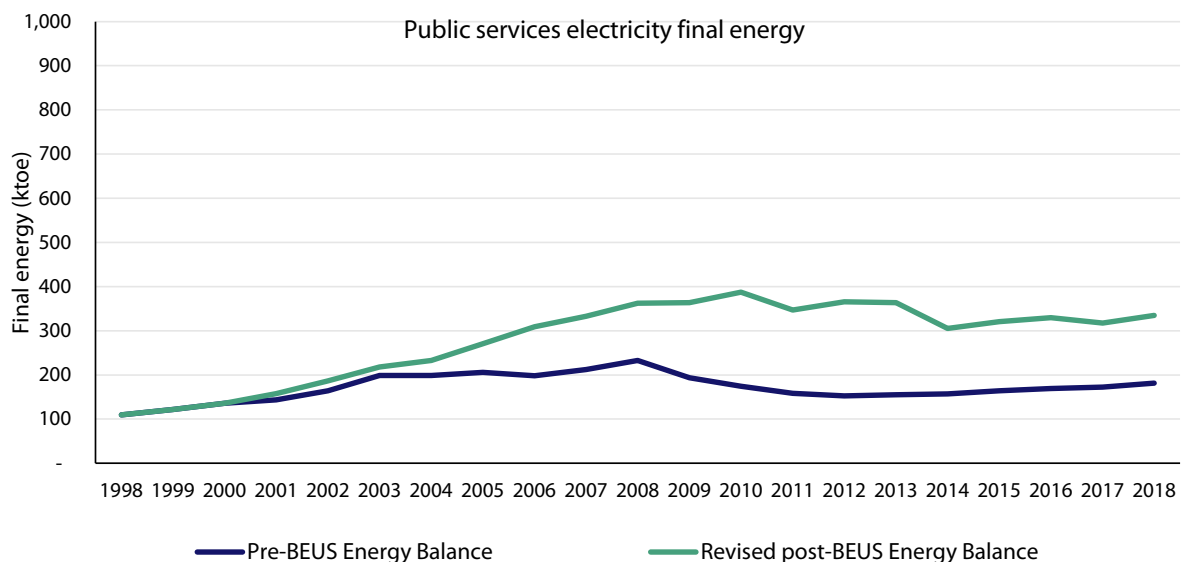
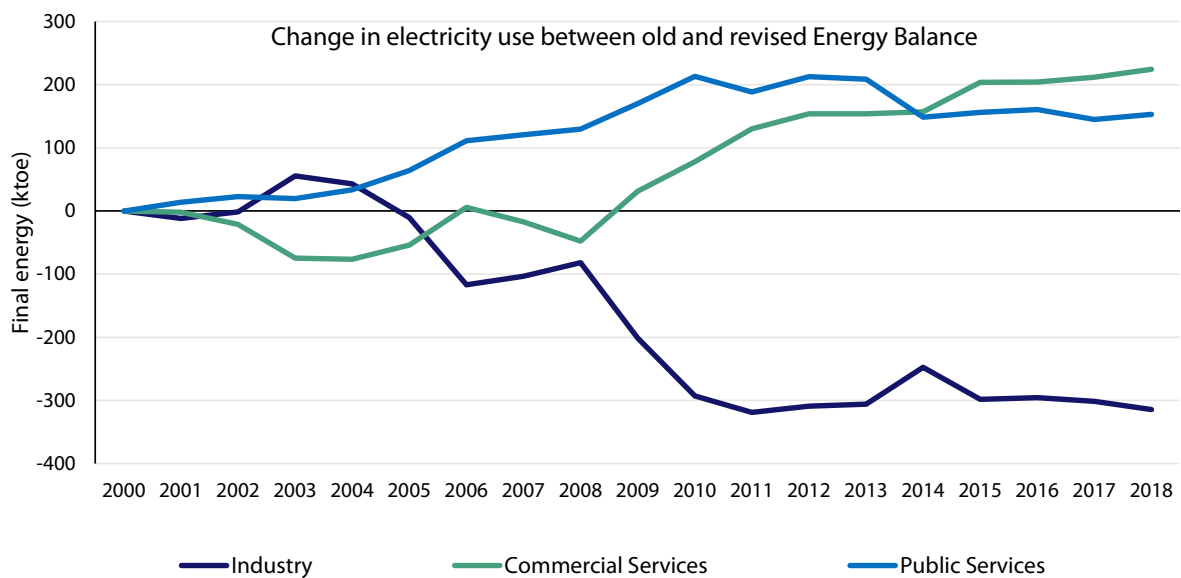


Figure 9 shows the change in electricity use by sector between the old and revised Energy Balance. The overall business electricity use is unchanged but since 2009 there has been a transfer from industry to commercial and public services.

**Figure 9: Change in electricity use by sector between old and revised Energy Balance estimates**



## 4.2 Natural Gas

### 4.2.1 Old Energy Balance methodology

Prior to the publication of the BEUS, the Energy Balance final energy sector and subsector totals for natural gas were calculated as summarised in Table 8:

**Table 8: Basis for splitting natural gas by sector in old Energy Balance**

Total final natural gas use	
1990-2018	Supplied by Gas Networks Ireland (GNI) formerly Bord Gais Eireann (BGE)
Industry, services and residential sector totals	
1990-2018	Supplied by Gas Networks Ireland (GNI) formerly Bord Gais Eireann (BGE). Based on household and non-household tariffs.
Industry - sub-sector split	
1990-2018	Based on CIP and older ad hoc surveys of industrial energy use and spend.
Commercial services and public services split	
1990-2018	Simple sub-sectoral split based on 1990 estimate: <ul style="list-style-type: none"> <li>Commercial Services 44%</li> <li>Public Services 56%</li> </ul>
Agriculture	
1990-2018	Assume equals zero

### 4.2.2 BEUS data

The BEUS requests data on the total amount of natural gas consumed on site (including in CHP) and separately the total amount used in CHP. Figure 10 shows the BEUS questionnaire for natural gas use. The BEUS reports the Gross Calorific Value (GCV) energy content of natural gas, which is the value given on gas bills.

**Figure 10: BEUS question on natural gas use**

3. Natural Gas (to operate the business only – include Standing Charge and Carbon Tax) ?

	Quantity kWh	Cost €
(a) Total Natural Gas <small>(Include amount used in Combined Heat and Power (CHP) Plant)</small>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/> ,000
(b) Amount used in Combined Heat and Power (CHP) Plant	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/> ,000

Figure 11 and Table 9 compare the BEUS data with the old Energy Balance estimate of business natural gas use.

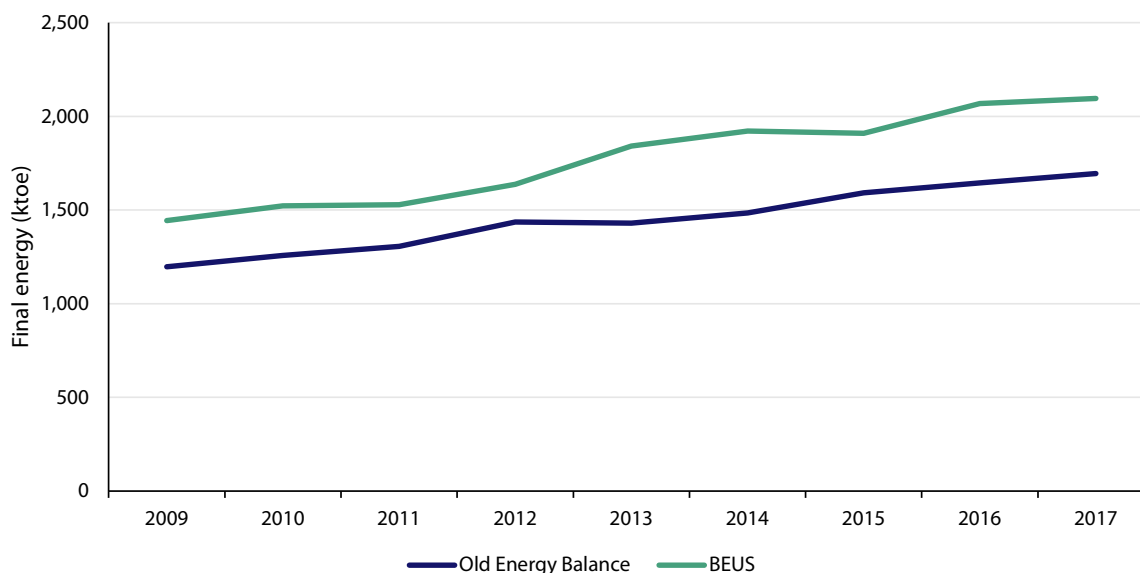
The Energy Balance reports the Net Calorific Value (NCV) energy content of all fuels, including natural gas. To compare like with like, for the purposes of this table we have converted the Energy Balance figures from NCV to GCV.

The BEUS figure also includes gas used for CHP. For this comparison therefore we have also included the portion of natural gas used for electricity generation in CHP in the Energy Balance figure. In the actual Energy Balance this is counted under transformation input rather than in business final energy use.

For these reasons the figures reported under Energy Balance in Table 9 do not match the figures in the old Energy Balance for industry and services final energy use of natural gas, but they are consistent with the old Energy Balance, and are directly comparable with the BEUS data.

The BEUS shows more natural gas consumption for business for all years, varying from 14% to 29% more.

**Figure 11: Comparison of old Energy Balance and BEUS results for total business natural gas use**



**Table 9: Comparison of old Energy Balance and BEUS results for total business natural gas use (including CHP)**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Old Energy Balance (including CHP input) (ktoe)	1,197	1,258	1,306	1,436	1,430	1,485	1,591	1,644	1,695
BEUS (ktoe)	1,443	1,522	1,528	1,637	1,841	1,921	1,909	2,069	2,095
Difference (ktoe)	246	264	222	201	411	436	317	425	400
Difference (%)	21%	21%	17%	14%	29%	29%	20%	26%	24%

#### 4.2.3 New Energy Balance methodology

As shown in Table 9, there are substantial differences between the BEUS estimate of total business natural gas use and the estimate from GNI.

The GNI data on total gas use and the split between residential and non-residential gas use is well founded because there is a separate tariff structure for households. Therefore, we continue to use the GNI data for total residential and non-residential natural gas use.

The BEUS data is used to calculate the sub-sectoral shares in industry and services. These shares are then applied to the total non-residential natural gas use from GNI. This results in a change in the relative shares of industry, commercial services and public services for the years 2009-2017. Residential, transport and agriculture are unchanged.

Table 10 shows the sector shares as they were in the old Energy Balance and the revised figures using the new methodology based on the BEUS shares for 2009 to 2017.



**Table 10: Comparison of sectoral shares for natural gas final energy use between old and new Energy Balance**

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Old Energy Balance shares</b>									
Industry	29%	28%	38%	38%	38%	42%	42%	42%	42%
Commercial Services	12%	12%	11%	11%	11%	11%	11%	11%	12%
Public Services	16%	16%	14%	14%	14%	14%	14%	14%	15%
Residential	43%	45%	38%	37%	37%	33%	32%	31%	30%
Agricultural	0%	0%	0%	0%	0%	0%	0%	0%	0%
Transport	0%	0%	0%	0%	0%	0%	0%	1%	1%
<b>New Energy Balance shares using BEUS</b>									
Industry	35%	34%	39%	39%	41%	46%	46%	47%	48%
Commercial Services	10%	10%	12%	12%	11%	10%	10%	10%	11%
Public Services	12%	12%	11%	12%	11%	11%	11%	10%	10%
Residential	43%	45%	38%	37%	37%	33%	32%	31%	31%
Agricultural	0%	0%	0%	0%	0%	0%	0%	0%	0%
Transport	0%	0%	0%	0%	0%	0%	0%	1%	1%

### Adjustment to pre-2009 estimates

Using the BEUS we now have more accurate data on the split between the sectors from 2009 onwards. Pre-2009 the only data available remains the GNI estimates. If we were to use the GNI estimates for 2008 there would be a break in the time-series between 2008 and 2009. In order to avoid this, we decided to interpolate the sectoral shares between the BEUS data for 2009 and the 2000 GNI estimate. The year 2000 was chosen as it predates the deregulation of the gas market in Ireland. This meant there was only one supplier who had a full view of the market and gives confidence to the data provided. Going back to 2000 also allows for a gradual smoothing of the estimates over a reasonable number of years to avoid any sharp breaks in series.

For the period 2000 to 2009 we will now use the sectoral splits for the years 2000 and 2009, and use linear interpolation to estimate the sectoral shares for industry and services for the intervening years. The CIP shares are applied to the new industry total to give the industry sub-sector split.

### Summary of changes

Table 11 summarises the changes in the revised methodology:

**Table 11: Summary of changes to Energy Balance natural gas final energy use by sector**

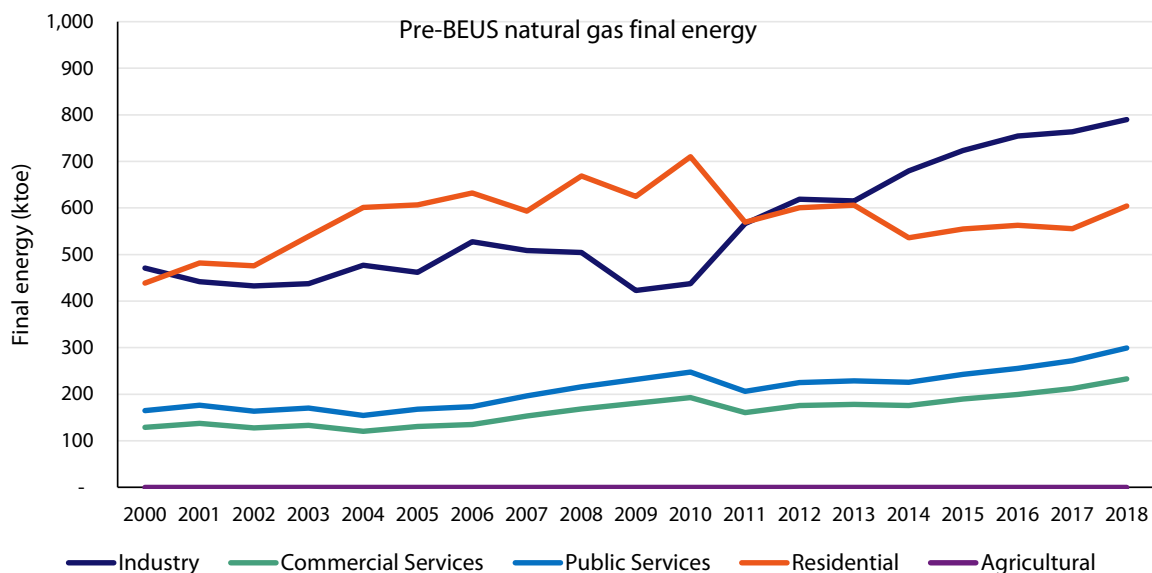
Total final natural gas energy use	
1990-2017	No change
2018	Minor revisions unrelated to BEUS
Industry, commercial and public services	
1990-2000	No change
2001-2008	Sectoral share interpolated from 2000 and 2009 values. Sub-sectoral shares as before, based on CIP for industry.
2009-2017	Sub-sectoral shares across industry, commercial and public services revised based on BEUS, with new subsectors added. Changes to sector totals reflecting the revisions to the sub-sector shares.
2018	Subsector shares based on 2017 BEUS, awaiting publication of BEUS data for later years, will be revised accordingly
Residential & Agriculture	
1990-2018	No change
Transport	
1990-2018	No change

#### 4.2.4 Comparison of old and revised Energy Balance data

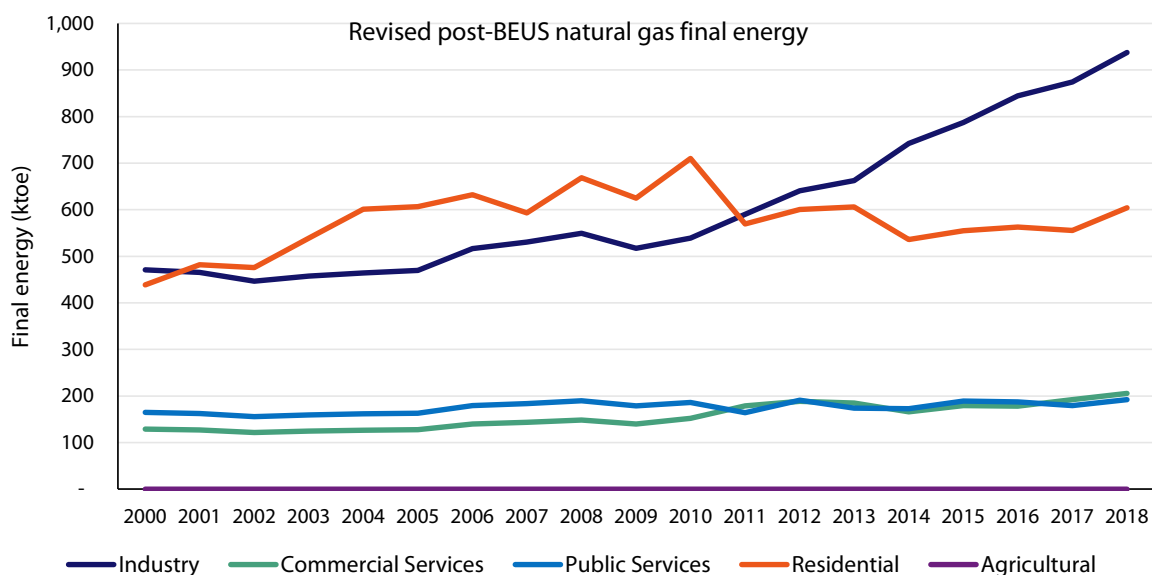
The following graphs illustrate the results of the data revisions for natural gas.

Figure 12 and Figure 13 show the time series of natural gas use by sector from 2000 to 2018 before and after the revision. Figure 14 highlights the breakdown of natural gas use by sector in 2017 before and after the revisions side by side.

**Figure 12: Old Energy Balance sectoral split for natural gas final energy**



**Figure 13: Revised Energy Balance sectoral split for natural gas final energy**



**Figure 14: 2017 natural gas final energy by sector, old and revised Energy Balance estimates**

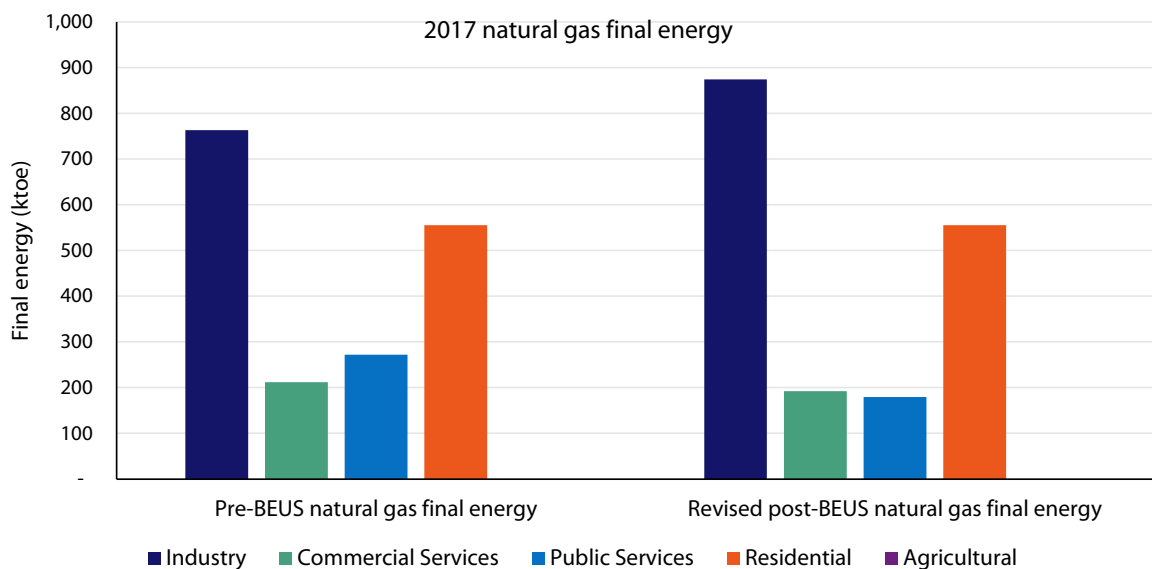


Figure 15 shows industry final natural gas energy use before and after the revisions. In 2017, the revised Energy Balance data for industry final energy natural gas use is 14% higher than the old pre-BEUS estimate.

**Figure 15: Industry natural gas final energy, old and revised Energy Balance estimates.**

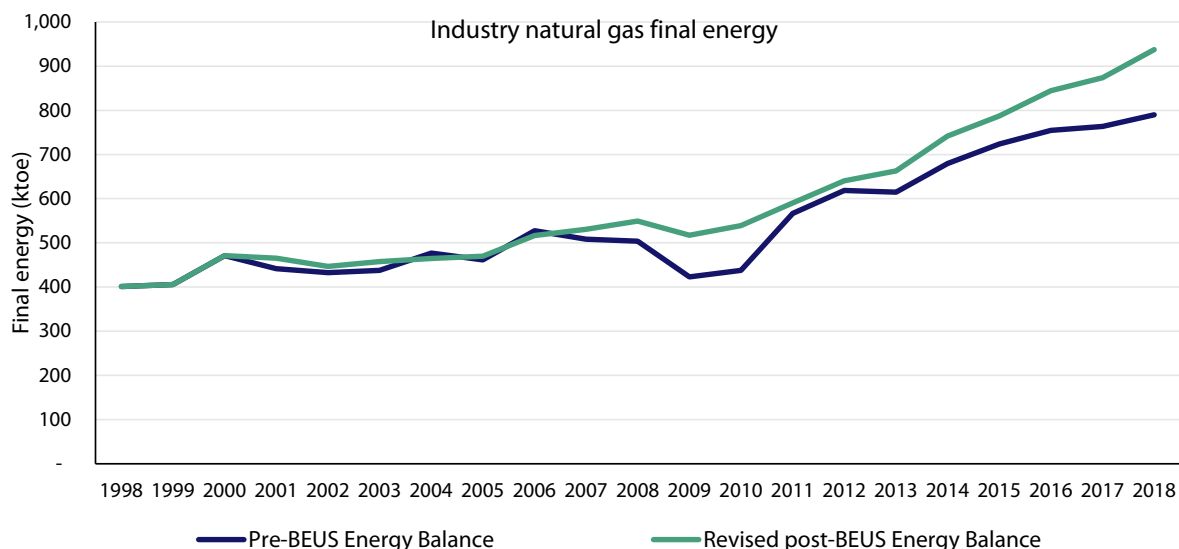


Figure 16 shows commercial services final energy natural gas use before and after the revisions. In 2017, the revised Energy Balance data for commercial services final energy natural gas use is 9% lower than the old pre-BEUS estimate.

**Figure 16: Commercial services natural gas final energy, old and revised Energy Balance estimates**

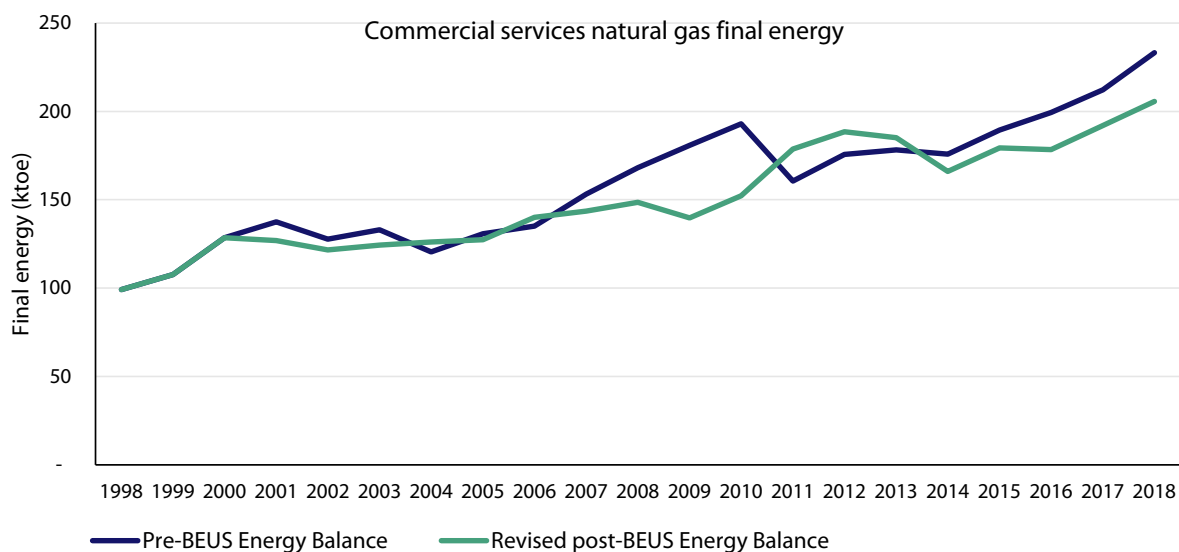


Figure 17 shows public services final energy natural gas energy use before and after the revisions. In 2017, the revised Energy Balance data for public services final energy natural gas use is 34% lower than the old pre-BEUS estimate.

**Figure 17: Public services natural gas final energy, old and revised Energy Balance estimates**

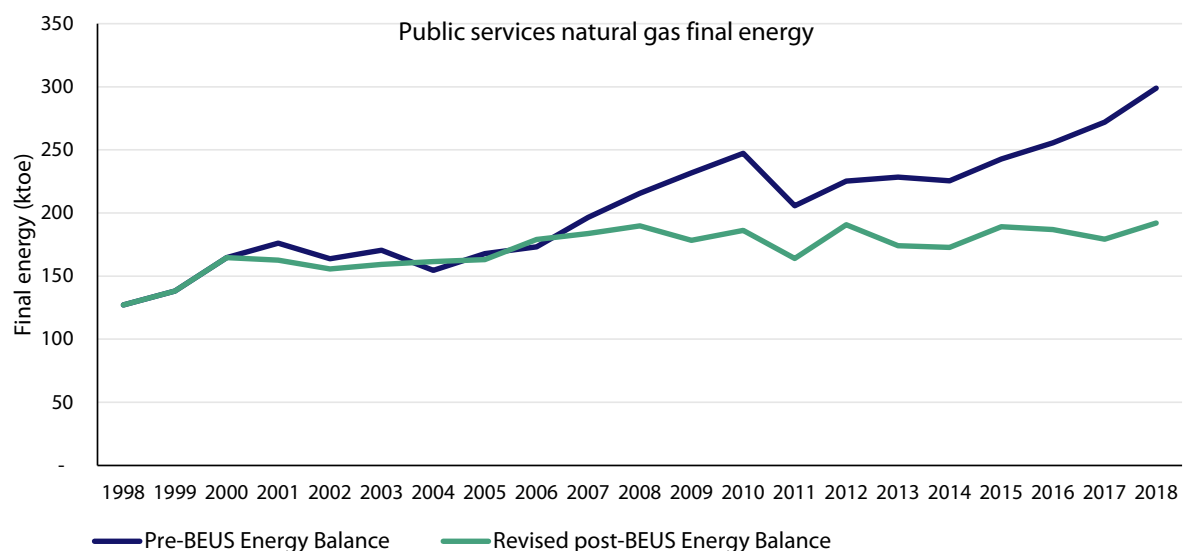
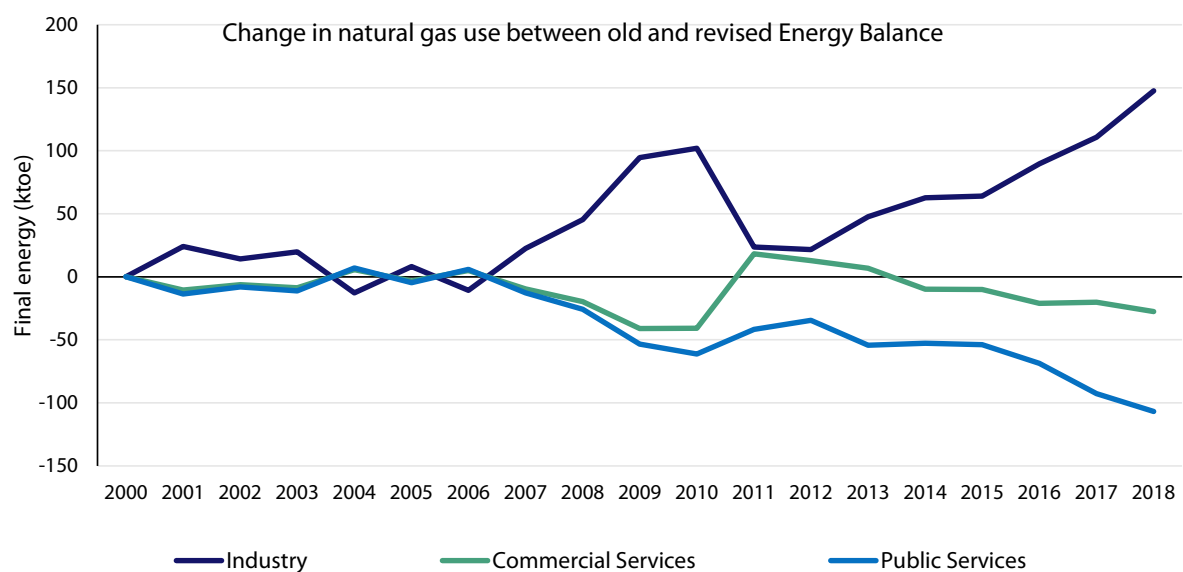


Figure 18 shows the change in natural gas use by sector between the old and revised Energy Balance. The overall business gas use is unchanged. Since 2012 there has been a transfer from commercial and public services to industry.

**Figure 18: Change in natural gas use by sector between old and revised Energy Balance estimates**



### 4.3 Fuel Oil

#### 4.3.1 Old Energy Balance methodology

Prior to the publication of the BEUS, the Energy Balance final energy sector and subsector totals for fuel oil were calculated as summarised in Table 12:

**Table 12: Basis for splitting fuel oil by sector in old Energy Balance**

Total final energy use	
1990-2016	Gross Inland Deliveries from DCCA data less amount used in power plants.
2017-2018	ETS data plus SEAI public sector survey data
Industry and public services sector totals	
1990-2008	Industry and services split based on supplier data.
2009-2016	Public sector from SEAI Public Sector Energy Programme
	Industry = [Total] - [Services]
2017-2018	Public sector from SEAI Public Sector Energy Programme
	Industry from ETS data
Other sector totals	
1990-2018	No use in other sectors
Industry subsector split	
1990-2016	Based on CIP supplemented by data from ETS
2017-2018	Based on ETS

#### 4.3.2 BEUS data

The BEUS requests data on petroleum products used on site, including the total amount of heavy fuel oil used. Figure 19 shows the BEUS questionnaire for use of Petroleum products, including fuel oil.

**Figure 19: BEUS question on heavy fuel oil use**

4. Petroleum products (to operate the business only, excluding fuel for vehicle transport on public roads (see section 5))

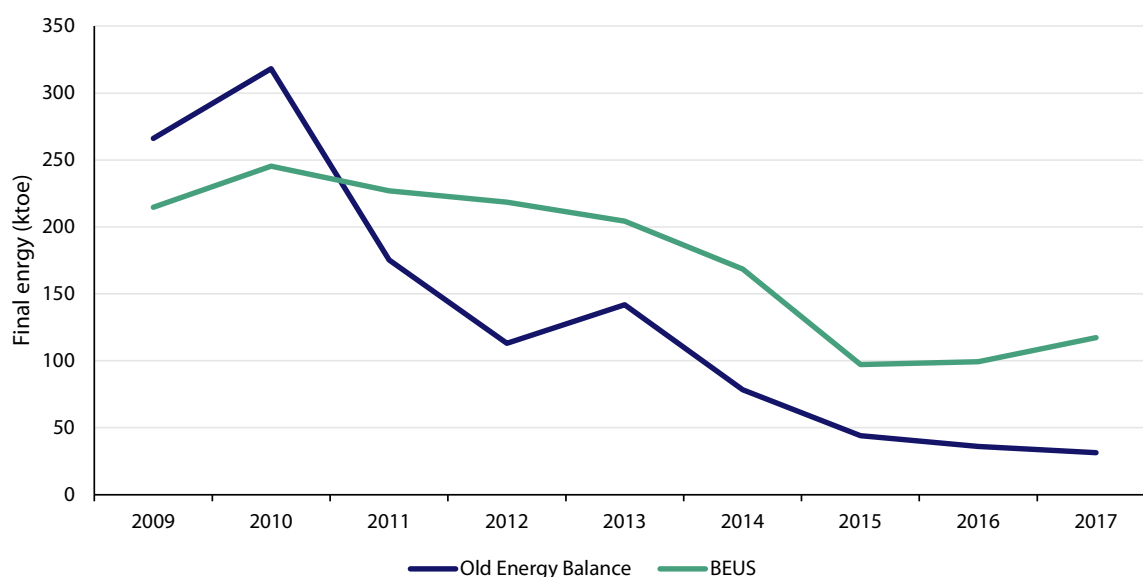
(a) Heavy Fuel Oil ⓘ	Quantity litres	Cost €
	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/> ,000
(b) Diesel/Gas Oil/Marked Gas Oil ⓘ <u>(exclude auto diesel and marine diesel)</u>	Quantity litres	Cost €
	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/> ,000
(c) Kerosene ⓘ <u>(exclude jet kerosene)</u>	Quantity litres	Cost €
	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/> ,000
(d) Liquid Petroleum Gas (LPG) ⓘ <u>(include LPG used in vehicles on-site e.g. forklifts; exclude LPG used in road vehicles)</u>	Quantity litres	Cost €
	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/> ,000
(e) Petroleum coke ⓘ	Quantity tonnes	Cost €
	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 100%; height: 20px;" type="text"/> ,000

Figure 20 and Table 13 compare the BEUS data with the old Energy Balance estimate of business fuel oil use<sup>1</sup>. Both sources show an overall reduction over the time period, but The BEUS showed less

<sup>1</sup> BEUS values include all sectors except Electricity, Gas and Refining (19,35).

consumption in 2009 and 2010 and significantly more consumption since then, almost four times more in 2017.

**Figure 20: Comparison of old Energy Balance and BEUS results for total business fuel oil use**



**Table 13: Comparison of old Energy Balance and BEUS results for total business fuel oil use**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Energy Balance (ktoe)	266	318	175	113	142	78	44	36	31
BEUS (ktoe)	215	245	227	219	204	168	97	99	117
Difference (ktoe)	-52	-73	52	105	62	90	53	63	86
Difference (%)	-19%	-23%	29%	93%	44%	115%	121%	176%	275%

#### 4.3.3 New Energy Balance methodology

Fuel oil would typically only be suitable in installations with a large energy demand, and we can see from the ETS data that even in large industry fuel oil use has been steadily reducing in recent years. It is now unlikely that there is significant quantities of fuel oil being consumed outside of sites that are in the ETS.

Assessing the quality of the available data, we have decided to keep the existing methodology that relies on ETS data combined with SEAI public sector survey data. This means there have been no revisions to the overall sectoral shares for fuel oil.

#### Adjustment to pre-2009 estimates

There have been no adjustments to pre-2009 estimates.

#### Summary of changes

Table 14 summarises the changes in the revised methodology.

**Table 14: Summary of changes to Energy Balance fuel oil final energy use by sector**

Total final energy use	
1990-2018	No change
Sectoral shares	
1990-2018	No change
Industry subsector shares	
1990-2018	No change
Public services subsector shares	
2009-2018	BEUS shares applied to public sector total from 2009

#### **4.3.4 Comparison of old and revised Energy Balance data**

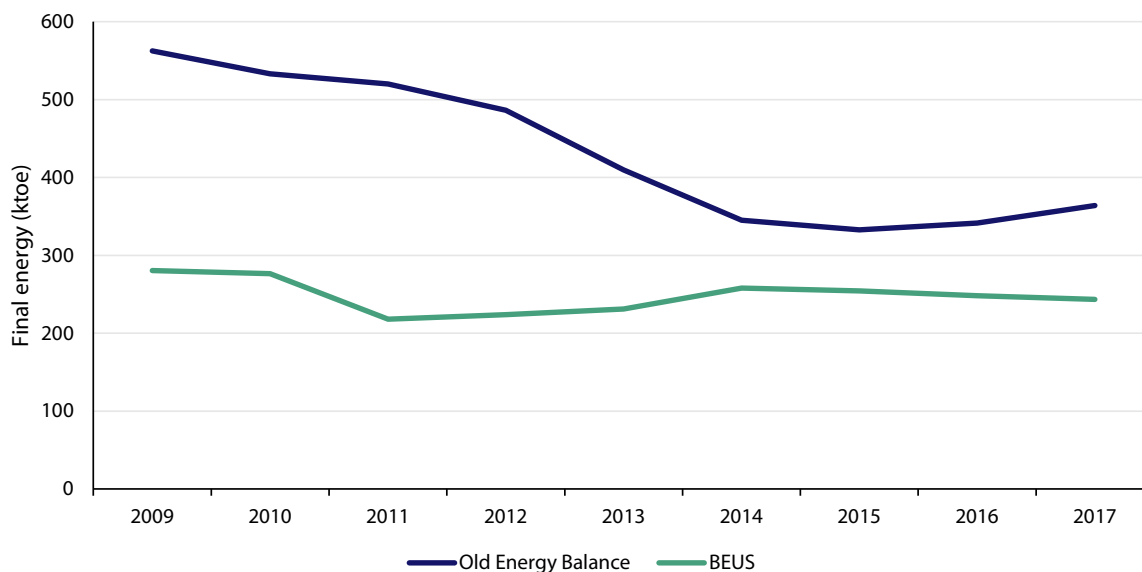
Note there are no changes to sector totals.





Figure 23 and Table 16 compare the BEUS data with the old Energy Balance estimate of business marked gasoil use<sup>2</sup>. The BEUS data shows less marked gasoil consumption for all years, ranging from 58% to 24% less.

**Figure 22: Comparison of old Energy Balance and BEUS results for total business marked gasoil use**



**Table 16: Comparison of old Energy Balance and BEUS results for total business marked gasoil use**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Energy Balance (ktoe)	562	533	520	486	410	345	333	341	364
BEUS (ktoe)	280	276	218	224	231	258	254	248	244
Difference (ktoe)	-282	-257	-302	-262	-179	-87	-78	-93	-121
Difference (%)	-50%	-48%	-58%	-54%	-44%	-25%	-24%	-27%	-33%

#### 4.4.3 New Energy Balance methodology

For electricity, natural gas, and fuel oil there is robust data on total business energy use from alternative sources, and so only the sub-sectoral shares are based on the BEUS data. This is not the case for marked gasoil, where we judge that the BEUS is the best available data source on overall business gasoil use. Therefore, we now use the BEUS data to give the total amount of marked gasoil use in industry and services, as well as the sub-sectoral shares. The exception is for the construction sector, which is estimated based on a combination of BEUS data and CSO construction sector activity data, as is discussed further in Section 4.13. In the new methodology, the residential sector is taken as the residual amount when all other uses are accounted for.

As shown in Table 16, there are substantial differences between the BEUS estimate of total business marked gasoil use and the old Energy Balance estimate. Table 17 shows the sector shares as they were in the old Energy Balance and the revised figures using the new methodology based on the BEUS data for 2009 to 2017.

<sup>2</sup> BEUS values include all sectors except Electricity, Gas and Refining (19,35)

**Table 17: Comparison of sectoral shares for marked gasoil final energy use (excluding transport) between old and new Energy Balance**

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Old Energy Balance shares</b>									
Industry	16%	16%	16%	16%	16%	17%	17%	17%	17%
Commercial Services	25%	25%	26%	25%	24%	23%	23%	23%	23%
Public Services	13%	13%	13%	13%	13%	12%	12%	12%	12%
Residential	21%	21%	20%	21%	21%	21%	21%	22%	21%
Agricultural	23%	23%	22%	23%	23%	23%	24%	24%	23%
Fisheries	3%	3%	2%	3%	3%	4%	3%	3%	3%
<b>New Energy Balance shares using BEUS</b>									
Industry	15%	12%	11%	12%	15%	20%	19%	19%	19%
Commercial Services	5%	6%	5%	5%	7%	7%	9%	8%	6%
Public Services	9%	9%	8%	7%	10%	12%	11%	12%	10%
Residential	46%	48%	51%	50%	42%	34%	35%	35%	39%
Agricultural	23%	23%	22%	23%	23%	23%	24%	24%	23%
Fisheries	3%	3%	2%	3%	3%	4%	3%	3%	3%

**Adjustment to pre-2009 estimates.**

Using the BEUS we now have more accurate data on the split between the sectors from 2009 onwards. Pre-2009 the only data available remains the estimated split in 1990 that has been applied each year since then. In the absence better data on the sectoral split for marked gasoil between 1990 and 2009, we decided to interpolate the sectoral shares between the BEUS data for 2009 and the 1990 estimate.

The exception is for the construction sector, which is estimated based on a combination of BEUS data and CSO construction sector activity data, as is discussed further in Section 4.13. Construction was not included in the old Energy Balance estimate of industry energy use. In the old Energy Balance methodology, services was the least understood sector, and effectively acted as a residual when all other sectors were estimated. Therefore we assumed that because it was not included under industry, its energy use was in effect subsumed into services. On this basis, in the new methodology the new estimate of construction gasoil use is subtracted from the old 1990 figure for commercial and public services and added on to the old 1990 figure for industry. This results in a change to the 1990 figures for gasoil.

**Summary of changes**

Table 18 summarises the changes in the revised methodology:

**Table 18: Summary of changes to Energy Balance marked gasoil final energy use by sector**

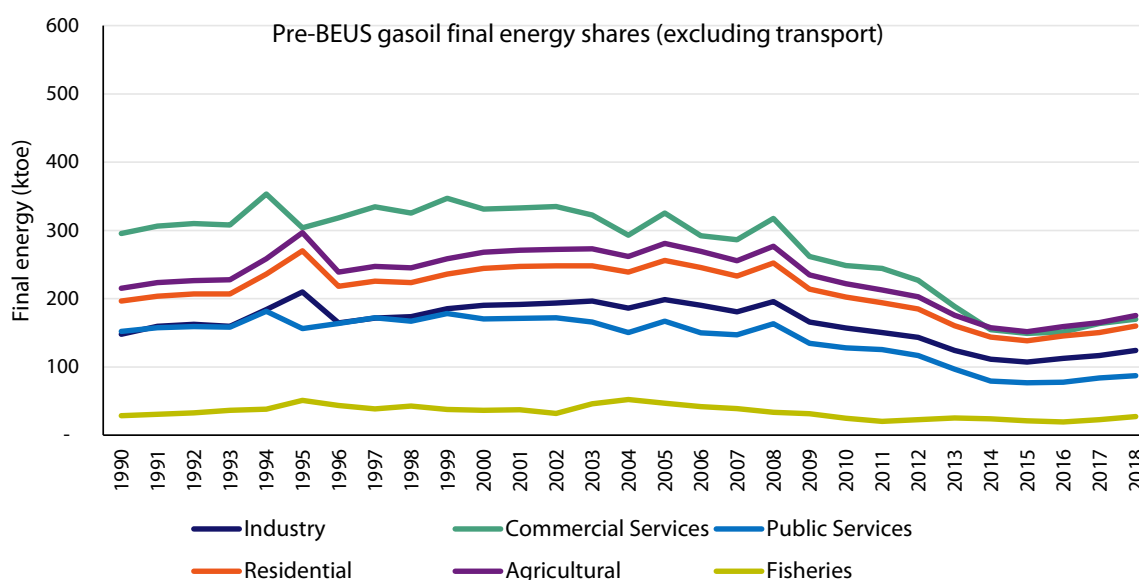
Total final energy use	
1990-2018	No change
Industry, commercial and public services	
1990	Construction gasoil use for 1990 is estimated. This is subtracted from services and added onto industry gasoil use for 1990.
1991-2008	Sector shares interpolated from 1990 and 2009 values and applied to known total unmarked gasoil use.
2009-2017	Based on BEUS data. New subsectors added.
2018	Based on 2017 BEUS, awaiting publication of BEUS data for later years
Agriculture, Fisheries, Transport	
1990-2018	No change
Residential	
1990-2018	Residential is now equal to the total less all other sectors

#### 4.4.4 Comparison of old and revised Energy Balance data

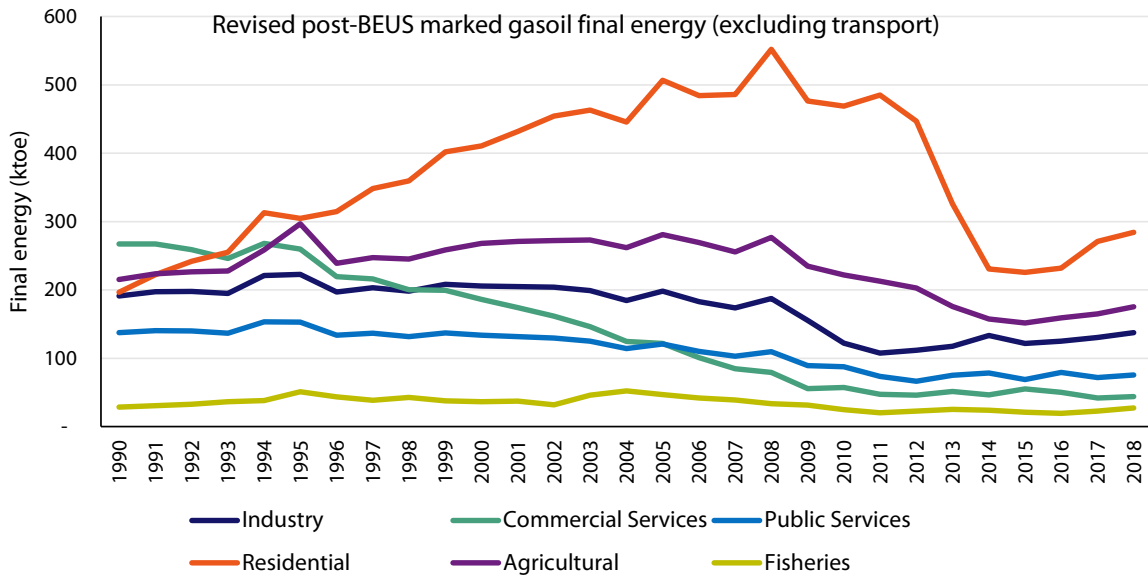
The following graphs illustrate the results of the data revisions for marked gasoil.

Figure 23 and Figure 24 show the time series of marked gasoil use by sector from 1990 to 2018 before and after the revision. Figure 25 highlights the breakdown of marked gasoil use by sector in 2017 before and after the revisions side by side. As shown in Table 16, the BEUS shows much less marked gasoil use in industry and services than the old Energy Balance estimate for 2009 to 2013. Because in the new methodology residential marked gasoil use is taken as the residual amount when all other uses are accounted for, the revised estimate of residential marked gasoil use for 2009 to 2013 is higher to compensate for the lower business use. Because the sector split for 1991 to 2008 is now interpolated between the 1990 and 2009 data, the low share of marked gasoil use in industry and services in 2009 affects the shares back to 1990, resulting in a higher share of residential gasoil use from 1991-2008.

**Figure 23: Old Energy Balance sectoral split for marked gasoil final energy**



**Figure 24: Revised Energy Balance sectoral split for marked gasoil final energy**



**Figure 25: 2017 marked gasoil final energy by sector, old and revised Energy Balance estimates**

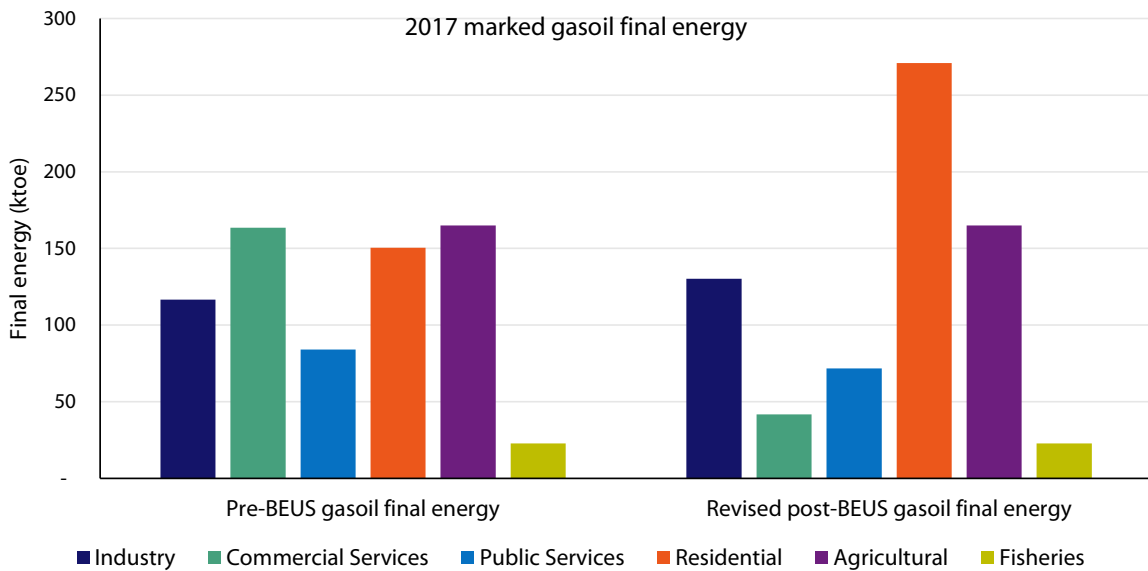


Figure 26 shows industry marked gasoil final energy use before and after the revisions. Revised industry marked gasoil use is higher from 1990 to 2003 inclusive, lower from 2004 to 2013, and higher again for 2014 to 2018 (note that the 2018 split is based on the 2017 BEUS, until newer data becomes available). The 1990 figure has increased because the estimate for construction gasoil use for 1990 has been subtracted from services and added on to industry.

**Figure 26: Industry marked gasoil final energy, old and revised Energy Balance estimates.**

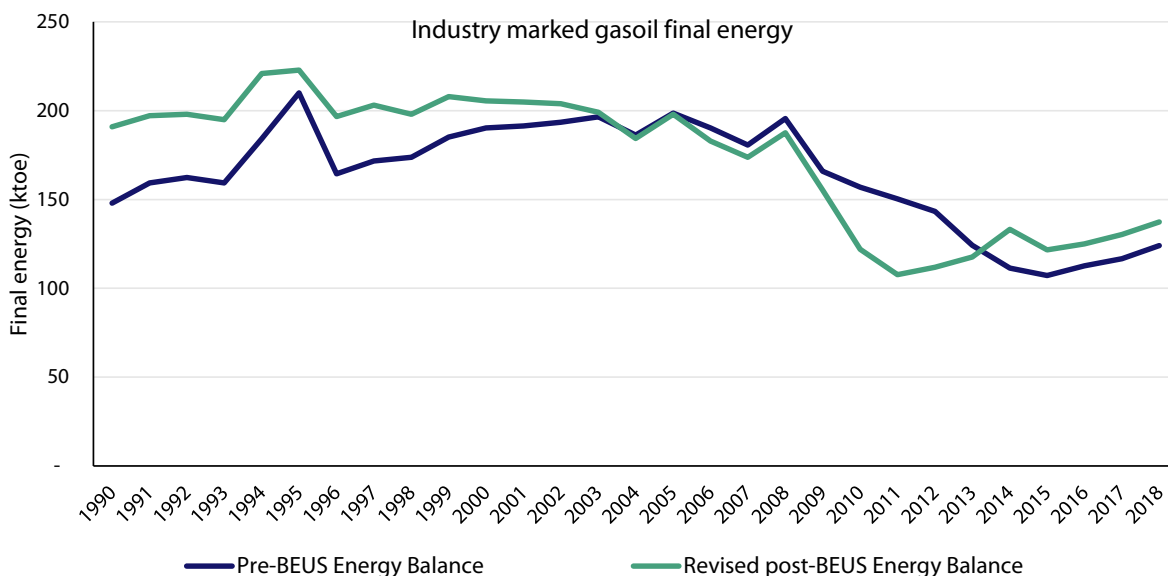


Figure 27 shows commercial services marked gasoil final energy use before and after the revisions. For 2009, the revised Energy Balance data for commercial services final energy marked gasoil use is 79% lower than the old pre-BEUS estimate, for 2017 it is 75% lower. The 1990 figure has decreased because the estimate for construction gasoil use for 1990 has been subtracted from services and added on to industry, which can also be seen on the graph for public sector gasoil use below.

**Figure 27: Commercial services marked gasoil final energy, old and revised Energy Balance estimates**

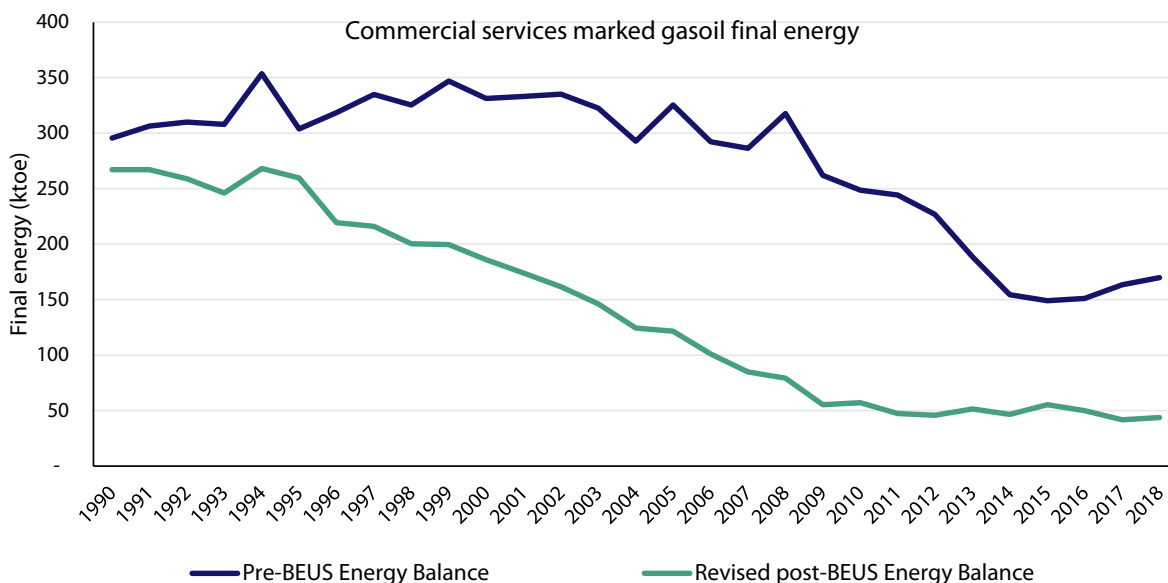


Figure 28 shows public services marked gasoil final energy use before and after the revisions. For 2009, the revised Energy Balance data for public services final energy marked gasoil use is 33% lower than the old pre-BEUS estimate, for 2017 it is 15% lower.

**Figure 28: Public services marked gasoil final energy, old and revised Energy Balance estimates**

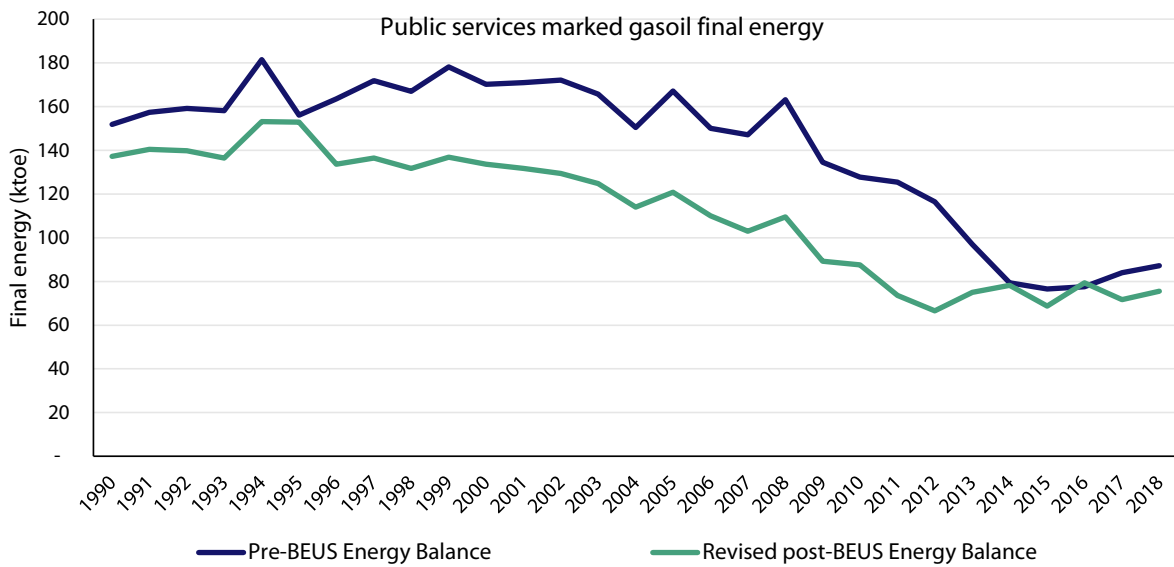


Figure 29 shows residential marked gasoil final energy use before and after the revisions. In the new methodology, the residential sector is taken as the residual amount when all other uses are accounted for. Because of the reduction in the estimate of use in business, especially commercial services, the estimate of residential use is now substantially higher. Between 2000 and 2013 the new estimate is more than double the previous. The largest difference is in 2011 where the revised estimate is 150% higher. For 2017 it is 80% higher.

**Figure 29: Residential marked gasoil final energy, old and revised Energy Balance estimates**

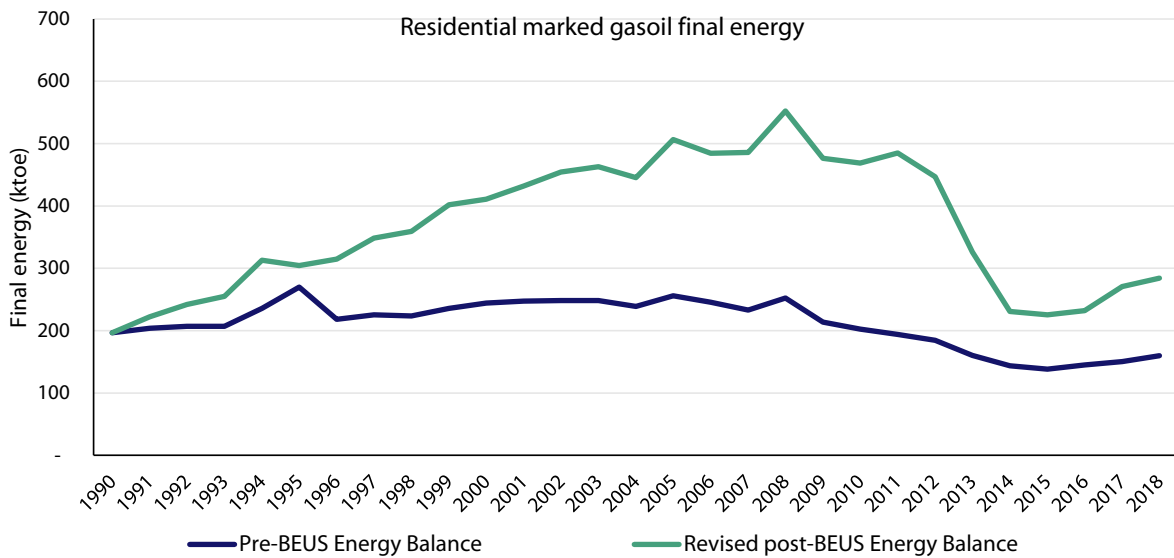
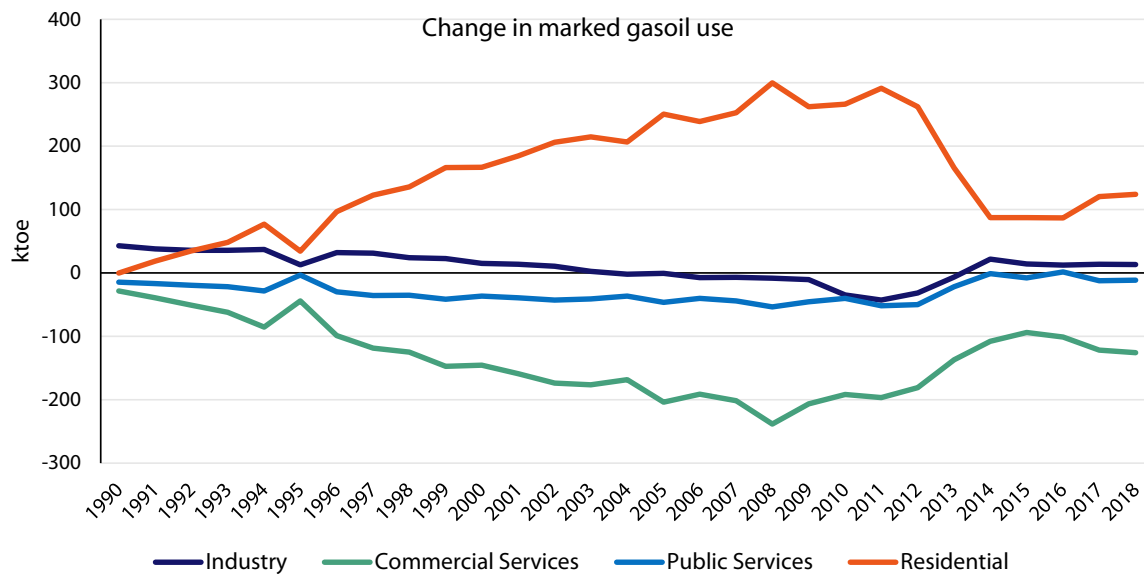


Figure 30 shows the change in marked gasoil use by sector between the old and revised Energy Balance. Total marked gasoil use is unchanged, but total business gasoil use is reduced. This results in a corresponding increase in the estimated residential gasoil use.

**Figure 30: Change in marked gasoil final energy use between old and revised Energy Balance estimates.**





## 4.5 Kerosene

### 4.5.1 Old Energy Balance methodology

Prior to the publication of the BEUS, the Energy Balance final energy sector and subsector totals for kerosene were calculated as summarised in Table 19:

**Table 19: Basis for splitting kerosene by sector in old Energy Balance**

Total final energy use	
1990-2008	Gross Inland Deliveries from DCCAE data
2009-2012	Revenue Excise Clearances
2013-2018	Gross Inland Deliveries from DCCAE data
Sector totals	
1990-2010	Simple sub-sectoral split based on 1990 estimate: -Industry 14% -Residential 86%
2010-2018	Simple sub-sectoral split based on review of 1990 split: -Industry 10% -Residential 90%
Industry - sub-sector split	
1990-2018	Based on CIP data for fuel oil as there is no data on kerosene

### 4.5.2 BEUS data

The BEUS requests data on petroleum products used on site, including the total amount of kerosene used. Figure 31 shows the BEUS questionnaire for use of Petroleum products:

**Figure 31: BEUS question on kerosene use**

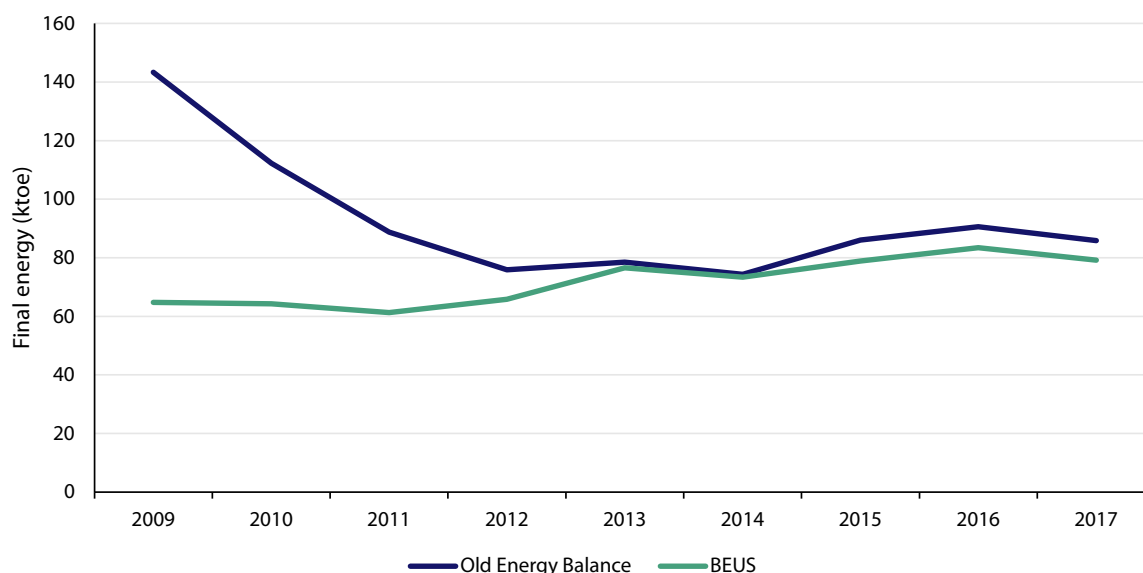
4. Petroleum products (to operate the business only, excluding fuel for vehicle transport on public roads (see section 5))

(a) Heavy Fuel Oil ⓘ	Quantity litres <input style="width: 100%;" type="text"/>	Cost € <input style="width: 100%;" type="text"/> ,000
(b) Diesel/Gas Oil/Marked Gas Oil ⓘ <u>(exclude auto diesel and marine diesel)</u>	Quantity litres <input style="width: 100%;" type="text"/>	Cost € <input style="width: 100%;" type="text"/> ,000
(c) Kerosene ⓘ <u>(exclude jet kerosene)</u>	Quantity litres <input style="width: 100%;" type="text"/>	Cost € <input style="width: 100%;" type="text"/> ,000
(d) Liquid Petroleum Gas (LPG) ⓘ <u>(include LPG used in vehicles on-site e.g. forklifts: exclude LPG used in road vehicles)</u>	Quantity litres <input style="width: 100%;" type="text"/>	Cost € <input style="width: 100%;" type="text"/> ,000
(e) Petroleum coke ⓘ	Quantity tonnes <input style="width: 100%;" type="text"/>	Cost € <input style="width: 100%;" type="text"/> ,000

Figure 32 and Table 20 compare the BEUS data with the old Energy Balance estimate of business kerosene use <sup>3</sup>. The BEUS data shows less kerosene consumption for all years, but especially from 2009 to 2012.

<sup>3</sup> BEUS values include all sectors except Electricity, Gas and Refining (19,35)

**Figure 32: Comparison of old Energy Balance and BEUS results for total business kerosene use**



**Table 20: Comparison of old Energy Balance and BEUS results for total business kerosene use**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Energy Balance (ktoe)	143	112	89	76	78	74	86	91	86
BEUS (ktoe)	65	64	61	66	77	73	79	83	79
Difference (ktoe)	-79	-48	-28	-10	-2	-1	-7	-7	-7
Difference (%)	-55%	-43%	-31%	-13%	-2%	-1%	-8%	-8%	-8%

#### 4.5.3 New Energy Balance methodology

The BEUS data is the best available data on total business kerosene use. Therefore, we now use the BEUS data to give the total amount of kerosene used in industry and services, as well as the sub-sectoral shares. In the new methodology, the residential sector is taken as the residual amount when all other uses are accounted for.

Table 21 shows the sector shares as they were in the old Energy Balance and the revised figures using the new methodology based on the BEUS data for 2009 to 2017.

**Table 21: Comparison of sectoral shares for kerosene between old and new Energy Balance**

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Old Energy Balance shares</b>									
Industry	14%	10%	10%	10%	10%	10%	10%	10%	10%
Commercial Services	0%	0%	0%	0%	0%	0%	0%	0%	0%
Public Services	0%	0%	0%	0%	0%	0%	0%	0%	0%
Residential	86%	90%	90%	90%	90%	90%	90%	90%	90%
Agricultural	0%	0%	0%	0%	0%	0%	0%	0%	0%
<b>New Energy Balance shares using BEUS</b>									
Industry	1%	1%	1%	1%	1%	1%	1%	1%	1%
Commercial Services	3%	2%	3%	3%	3%	3%	3%	3%	3%
Public Services	3%	3%	3%	4%	6%	6%	5%	5%	5%
Residential	94%	94%	93%	91%	90%	90%	91%	91%	91%
Agricultural	0%	0%	0%	0%	0%	0%	0%	0%	0%

**Adjustment to pre-2009 estimates.**

Using the BEUS we now have more accurate data on the split between the sectors from 2009 onwards. Pre-2009 the only data available remains the estimated split in 1990 that has been applied each year since then. In the absence better data on the sectoral split for kerosene between 1990 and 2009, we decided to interpolate the sectoral shares between the BEUS data for 2009 and the 1990 estimate. The CIP shares are applied to the new industry total to give the industry sub-sector split.

**Summary of changes**

Table 22 summarises the changes in the revised methodology:

**Table 22: Summary of changes to Energy Balance kerosene final energy use by sector**

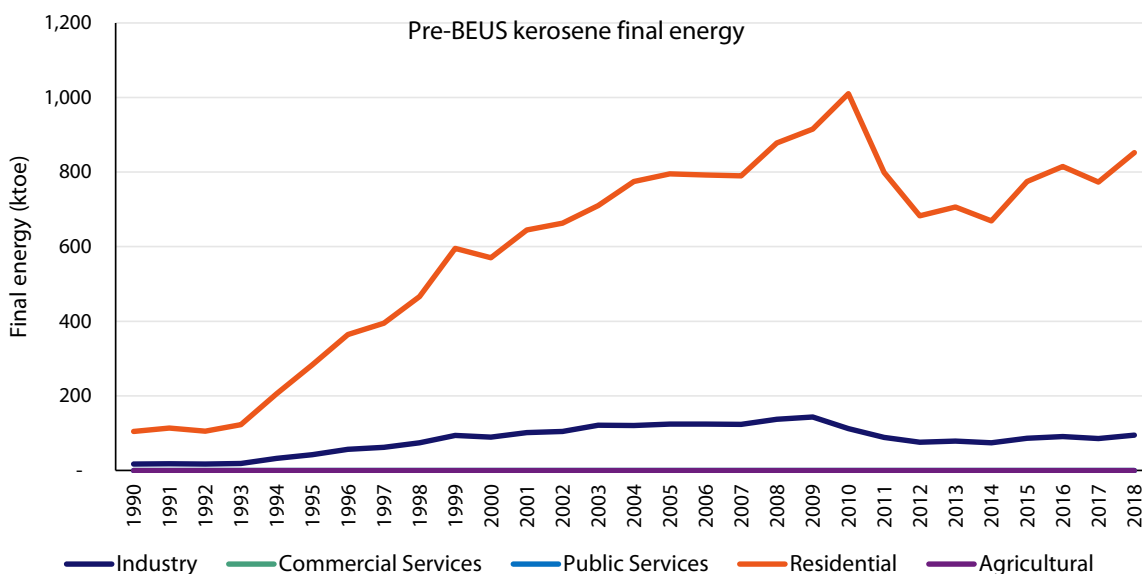
<b>Total final energy use</b>	
1990-2018	No change
<b>Industry, commercial and public services</b>	
1990	Construction gasoil use for 1990 is estimated. This is subtracted from residential and added onto industry gasoil use for 1990, as previously we assumed no kerosene use in services
1991-2008	Sector shares interpolated from 1990 and 2009 values
2009-2017	Based on BEUS sector totals and subsectoral split, with new subsectors added
2018	Based on 2017 BEUS sector totals and subsectoral split, awaiting publication of BEUS data for later years, will be revised accordingly
<b>Agriculture</b>	
1990-2018	No change
<b>Residential</b>	
1990-2018	Residential is now equal to the total less all other sectors

#### 4.5.4 Comparison of old and revised Energy Balance data

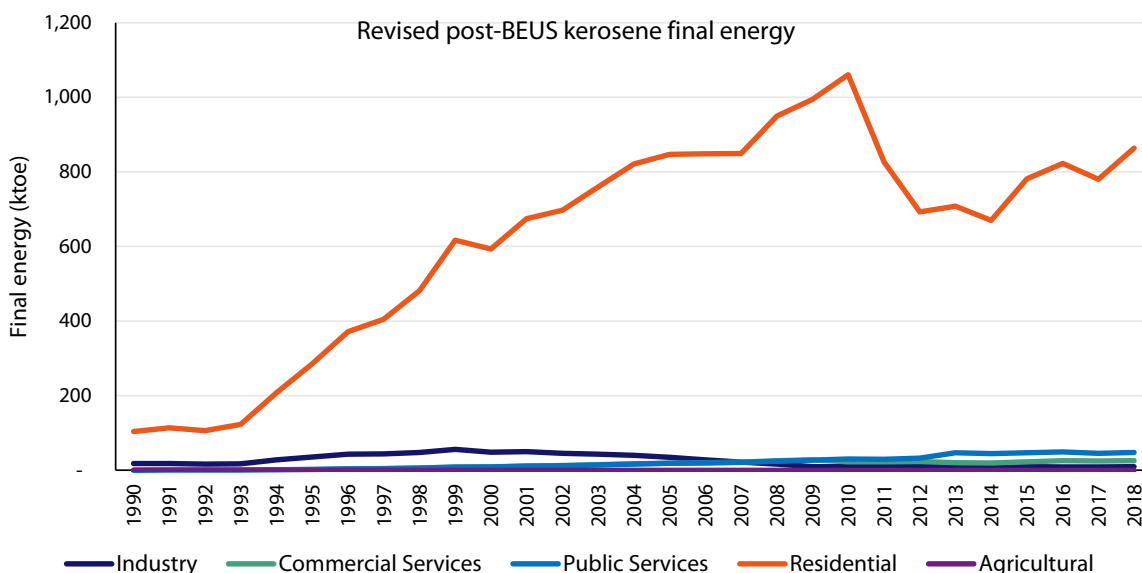
The following graphs illustrate the results of the data revisions for kerosene.

Figure 33 and Figure 34 show the time series of kerosene use by sector from 1990 to 2018 before and after the revision. Figure 35 highlights the breakdown of kerosene use by sector in 2017 before and after the revisions side by side. Previously, we assumed that all non-residential use of kerosene was in industry. Based on the BEUS data, we now see that in fact there is little kerosene use in industry, and there is some use in the public sector and commercial services sectors.

**Figure 33: Old Energy Balance sectoral split for kerosene final energy**



**Figure 34: Revised Energy Balance sectoral split for kerosene final energy**



**Figure 35: 2017 kerosene final energy by sector, old and revised Energy Balance estimates**

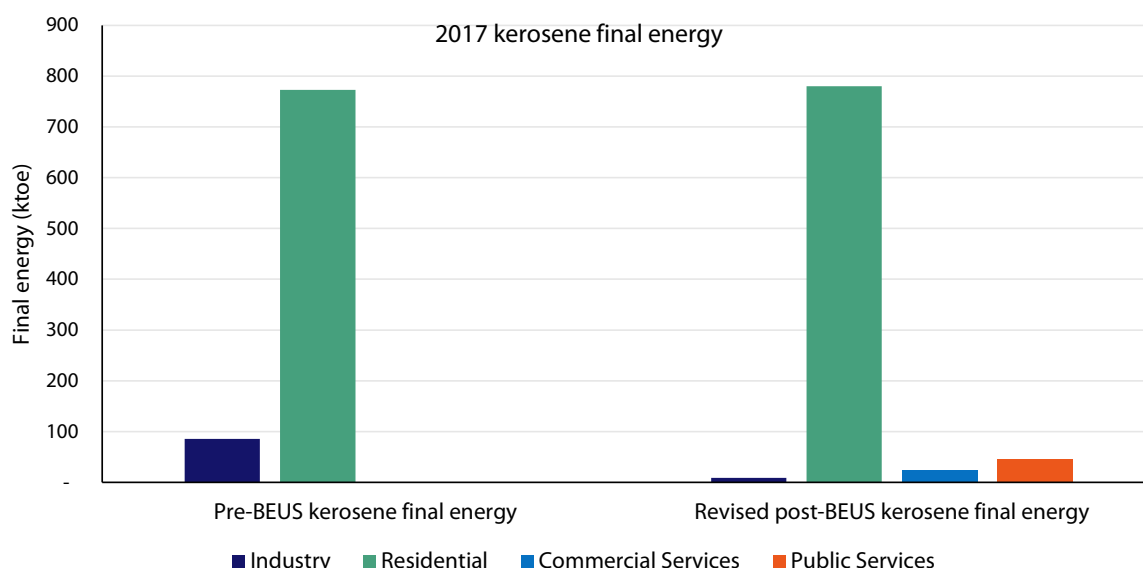


Figure 36 shows industry kerosene final energy use before and after the revisions. The BEUS shows significantly less kerosene use in industry than we had previously assumed. The share of kerosene of overall industry energy use for 2017 is reduced from 3.5% in the old Energy Balance to 0.4% in the revised Energy Balance.

**Figure 36: Industry kerosene final energy, old and revised Energy Balance estimates.**

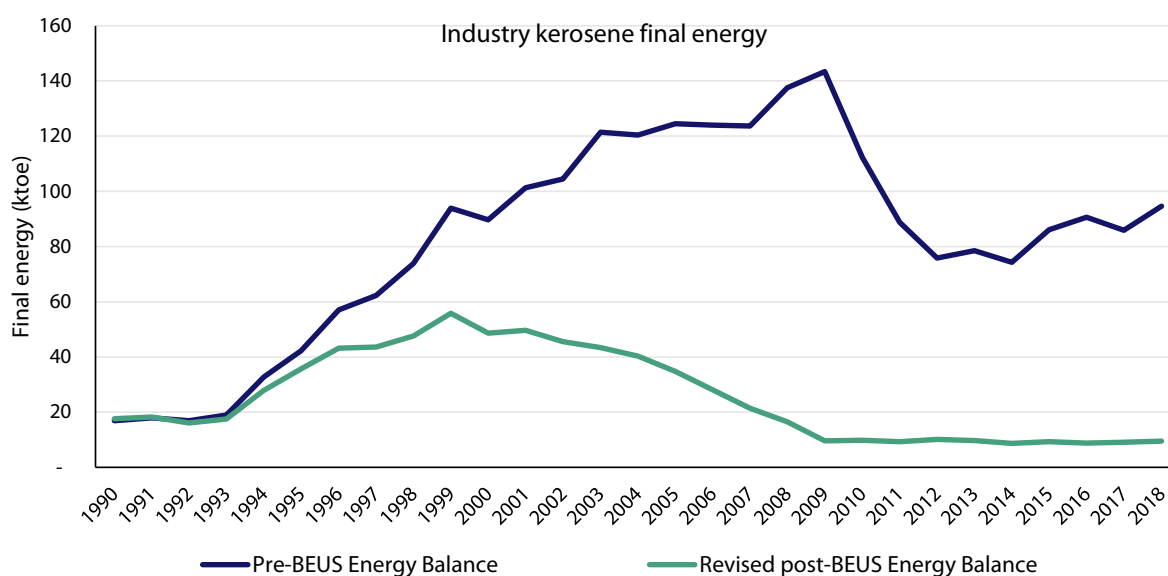


Figure 37 shows commercial services kerosene final energy use before and after the revisions. In the old Energy Balance, we assumed no kerosene use in the commercial sector. The revised Energy Balance shows a small amount of kerosene use in the sector, accounting for 2.5% of total commercial sector energy use in 2017.

**Figure 37: Commercial services kerosene final energy, old and revised Energy Balance estimates**

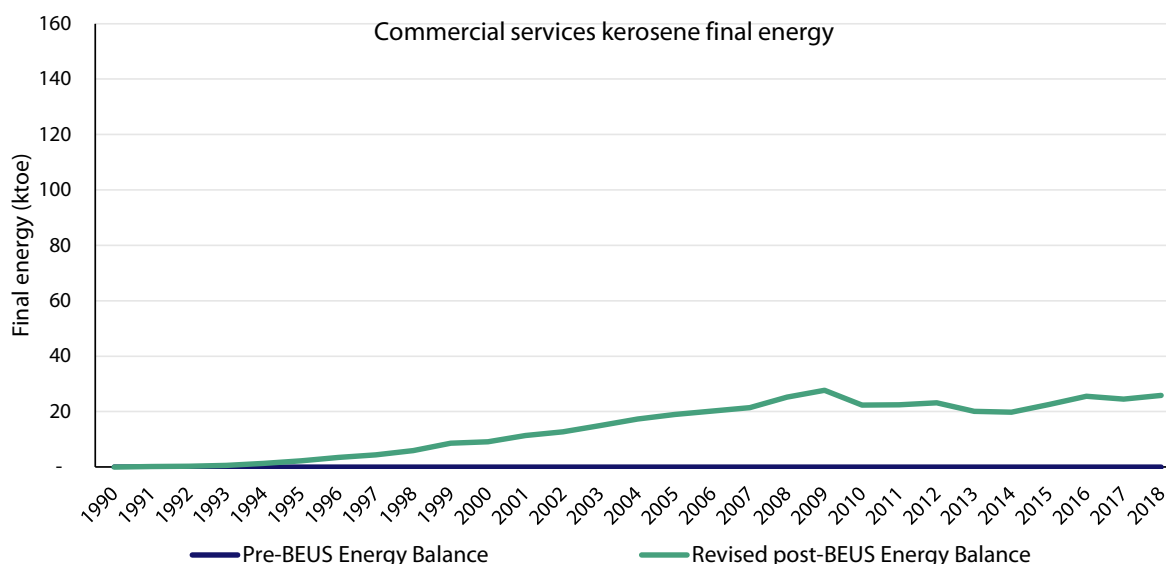


Figure 38 shows public services kerosene final energy use before and after the revisions. In the old Energy Balance, we assumed no kerosene use in the public sector. The new BEUS data shows a growing amount of kerosene use in the sector, growing from 3.9% of total public services energy use in 2009 to 7.0% in 2017.

**Figure 38: Public services kerosene final energy, old and revised Energy Balance estimates**

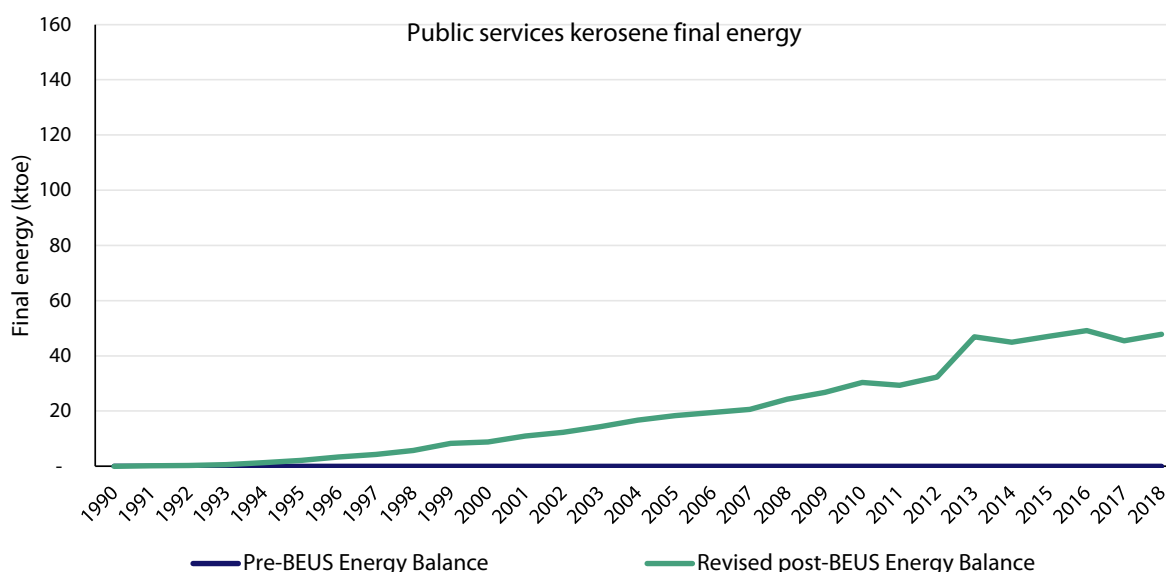


Figure 39 shows residential kerosene final energy use before and after the revisions. In the new methodology, the residential sector is taken as the residual amount when all other uses are accounted for.

The new methodology results in slightly lower residential kerosene use in 1990 as the estimated kerosene used in construction has been subtracted from residential and added to industry for that year. This is different from gasoil where construction use is taken from services, but for kerosene we assumed no use in services in 1990, so it was taken from residential instead.

The revised estimate is higher from 1992 onwards, up to a maximum of 9% higher in 2009 and is 1% higher in 2017.

**Figure 39: Residential kerosene final energy, old and revised Energy Balance estimates**

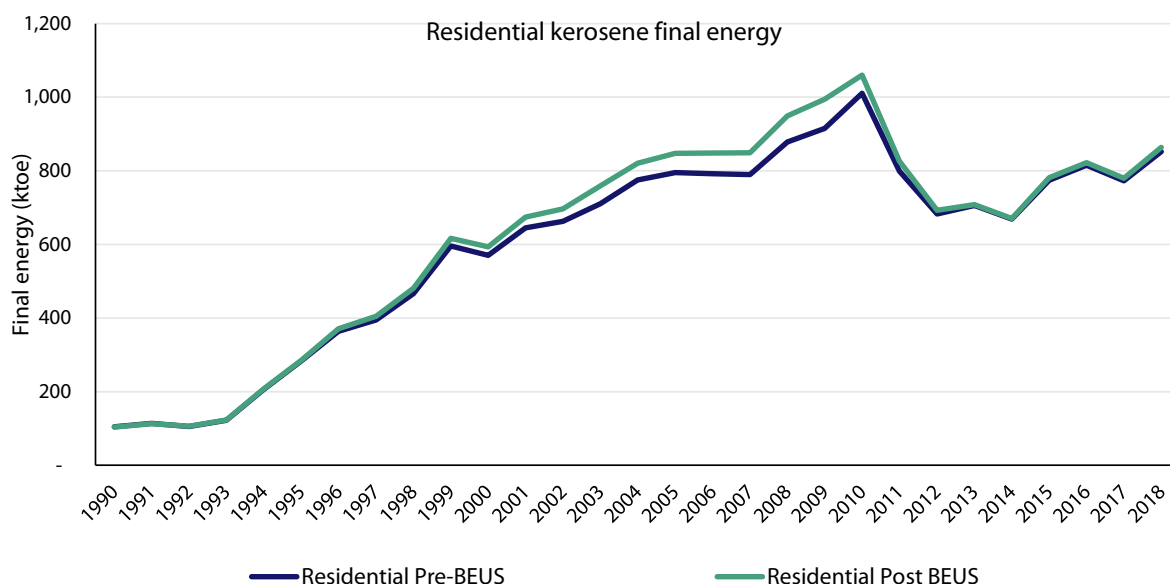
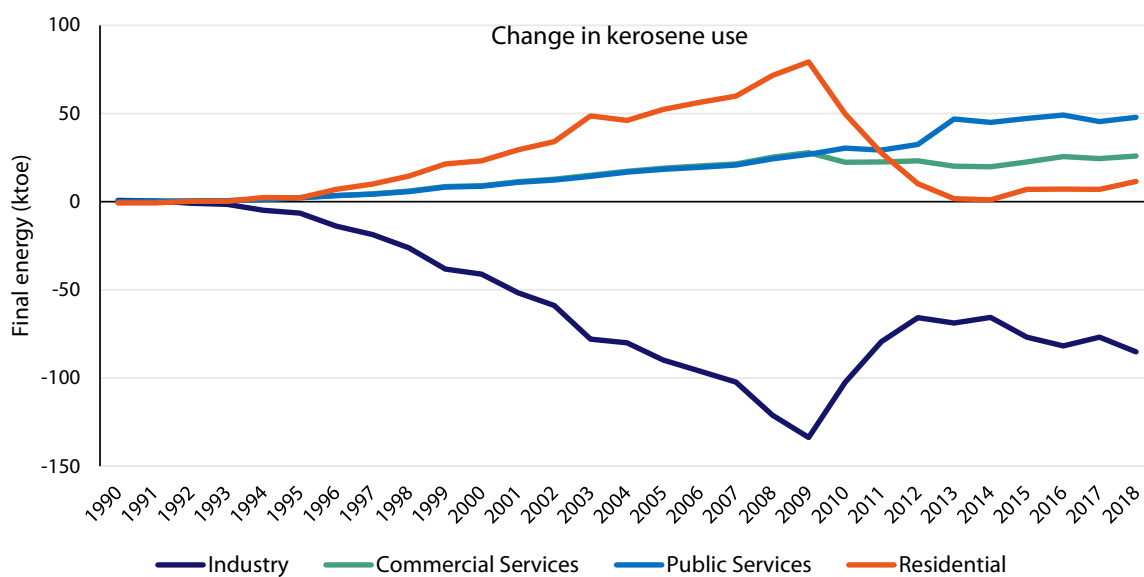


Figure 40 shows the change in kerosene use by sector between the old and revised Energy Balance. Industry kerosene use is down and commercial and public services kerosene use is up, but overall business kerosene use is down in most years. Total kerosene use is unchanged, therefore, there is an increase in the estimated residential gasoil use.

**Figure 40: Change in kerosene final energy use between old and revised Energy Balance estimates.**



## 4.6 Liquid Petroleum Gas (LPG)

### 4.6.1 Old Energy Balance methodology

Prior to the publication of the BEUS, the Energy Balance final energy sector and subsector totals for LPG were calculated as summarised in Table 23.

**Table 23: Basis for splitting LPG by sector in old Energy Balance**

Total final energy use	
1990-2018	Gross Inland Deliveries from DCCAE data
Sector totals	
1990-2011	-Transport based on Revenue data -Industry, services and residential based on supplier split in DCCAE data.
2012-2018	-Transport based on Revenue data -Industry, services and residential based on 2011 DCCAE data.
Industry - sub-sector split	
1990-2018	Based on CIP data.

### 4.6.2 BEUS data

The BEUS requests data on petroleum products used on site, including the total amount of LPG used. Figure 41 shows the BEUS questionnaire for use of Petroleum products:

**Figure 41: BEUS question on LPG use**

4. Petroleum products (to operate the business only, excluding fuel for vehicle transport on public roads (see section 5))

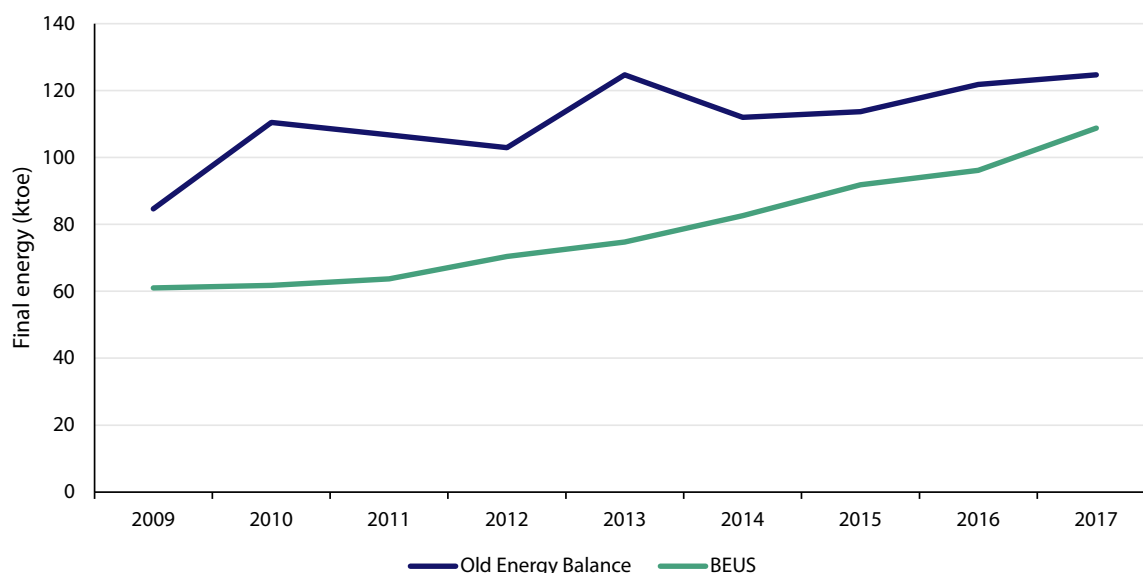
(a) Heavy Fuel Oil ⓘ	Quantity litres □□□□□□□□	Cost € □□□□□□,000
(b) Diesel/Gas Oil/Marked Gas Oil ⓘ <u>(exclude auto diesel and marine diesel)</u>	Quantity litres □□□□□□□□	Cost € □□□□□□,000
(c) Kerosene ⓘ <u>(exclude jet kerosene)</u>	Quantity litres □□□□□□□□	Cost € □□□□□□,000
(d) Liquid Petroleum Gas (LPG) ⓘ <u>(include LPG used in vehicles on-site e.g. forklifts; exclude LPG used in road vehicles)</u>	Quantity litres □□□□□□□□	Cost € □□□□□□,000
(e) Petroleum coke ⓘ	Quantity tonnes □□□□□□□□	Cost € □□□□□□,000

Figure 42 and Table 24 compare the BEUS data with the old Energy Balance estimate of business LPG use<sup>4</sup>. The BEUS data shows less LPG consumption for all years, ranging from 44% less in 2010 to 13% less in 2017.

<sup>4</sup> BEUS values include all sectors except Electricity, Gas and Refining (19,35)



**Figure 42: Comparison of old Energy Balance and BEUS results for total business kerosene use**



**Table 24: Comparison of old Energy Balance and BEUS results for total business LPG use**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Energy Balance (ktoe)	85	110	107	103	125	112	114	122	125
BEUS (ktoe)	61	62	64	70	75	83	92	96	109
Difference (ktoe)	-24	-49	-43	-33	-50	-29	-22	-26	-16
Difference (%)	-28%	-44%	-40%	-32%	-40%	-26%	-19%	-21%	-13%

#### 4.6.3 New Energy Balance methodology

The BEUS shows significantly less LPG use per annum by business than the previous estimates provided by LPG suppliers. Using the BEUS data for business LPG use and assigning the remainder to residential would result in an increase in the estimated residential LPG use of up to 55%.

SEAI contacted LPG suppliers to discuss these potential changes and in response the suppliers provided an updated estimate of the share of residential LPG use. This updated estimate was for a slightly higher share of residential LPG use than previously, but less than the change that would have resulted from using the BEUS data.

Having considered the available data and the market for LPG we have decided to use the supplier shares for total residential and business LPG use, and to apply the BEUS sub-sector shares to the business LPG use to give the subsector total for industry and services. A small amount of LPG is also used for transport and this has remained unchanged.

Table 25 shows the sector shares as they were in the old Energy Balance and the revised figures using the new methodology based on updated supplier estimates and BEUS data for 2009 to 2017

**Table 25: Comparison of sectoral shares for LPG between old and new Energy Balance**

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Old Energy Balance shares</b>									
Industry	70%	69%	70%	70%	70%	69%	69%	69%	69%
Commercial Services	3%	4%	4%	4%	4%	4%	4%	4%	4%
Public Services	1%	1%	1%	1%	1%	1%	1%	1%	1%
Residential	26%	25%	24%	24%	24%	24%	24%	24%	24%
Agricultural	0%	0%	0%	0%	0%	0%	0%	0%	0%
Transport	1%	0%	0%	1%	1%	1%	2%	2%	1%
<b>New Energy Balance shares using BEUS</b>									
Industry	23%	23%	22%	22%	24%	29%	27%	29%	31%
Commercial Services	39%	37%	41%	41%	39%	35%	38%	29%	30%
Public Services	11%	15%	13%	12%	11%	11%	10%	11%	9%
Residential	26%	25%	24%	24%	24%	24%	24%	30%	29%
Agricultural	0%	0%	0%	0%	0%	0%	0%	0%	0%
Transport	1%	0%	0%	1%	1%	1%	2%	2%	1%

**Adjustment to pre-2009 estimates.**

Using the BEUS we now have more accurate data on the split between the industry and services sectors from 2009 onwards. If we were to use the previous estimates for 2008 there would be a break in the time-series between 2008 and 2009. In order to avoid this we decided to interpolate the sectoral shares for industry and services between the BEUS data for 2009 and the year 1990 estimate.

The CIP shares for LPG are applied to the new industry total to give the industry sub-sector split.

**Summary of changes**

Table 26 summarises the changes in the revised methodology:

**Table 26: Summary of changes to Energy Balance LPG final energy use by sector**

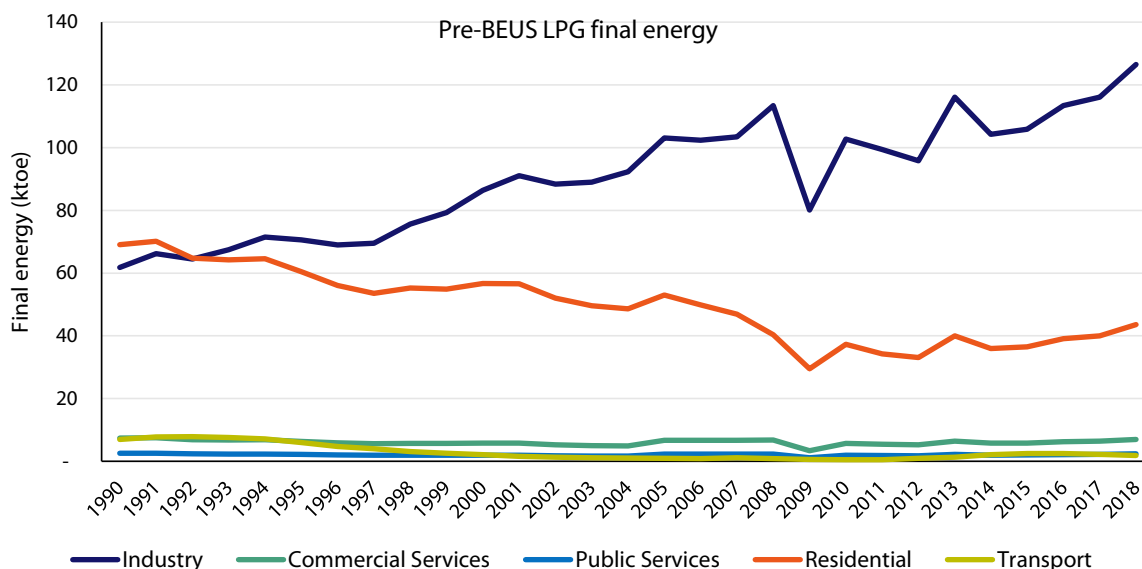
<b>Total final energy use</b>	
1990-2018	Minor revisions unrelated to BEUS
<b>Residential</b>	
1990-2015	No change
2016-2018	Revised based on updated supplier data
<b>Transport</b>	
1990-2018	No change
<b>Industry, commercial and public services</b>	
1990-2000	No change
2001-2008	Total business LPG based on supplier split. Industry, commercial and public services sector shares interpolated from 2000 and 2009 values.
2009-2017	Total business LPG based on supplier split. Sector and sub-sector shares based on BEUS, with new subsectors added.
2018	Total business LPG based on supplier split. Sector and sub-sector shares based on 2017 BEUS.

#### 4.6.4 Comparison of old and revised Energy Balance data

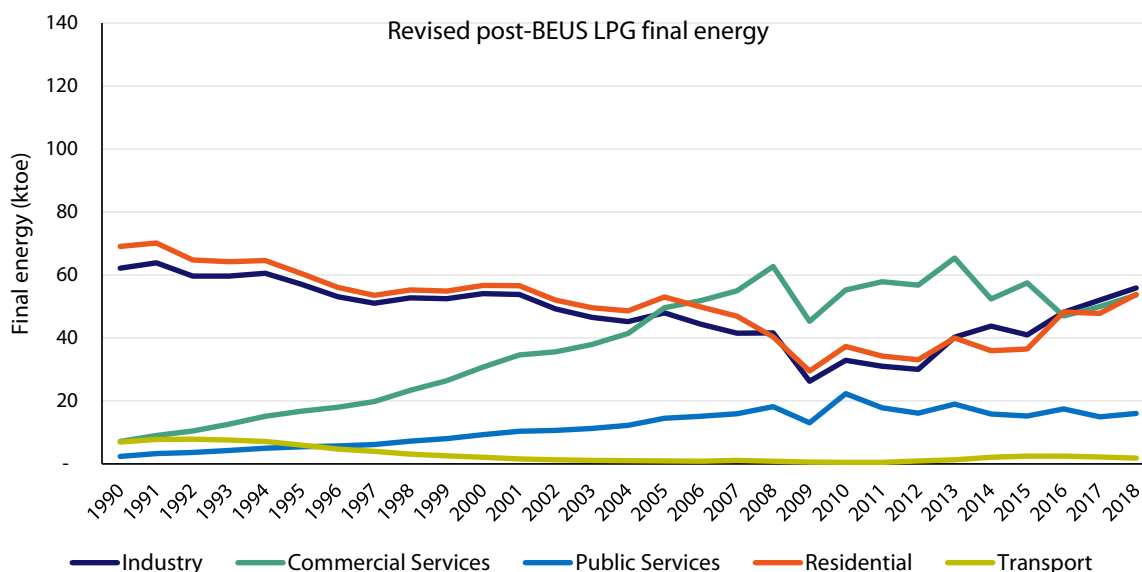
The following graphs illustrate the results of the data revisions for LPG.

Figure 43 and Figure 44 show the time series of LPG use by sector from 2000 to 2018 before and after the revision. Figure 45 highlights the breakdown of LPG use by sector in 2017 before and after the revisions side by side. Based on the BEUS data there has been a switch of LPG use from industry to commercial and public services.

**Figure 43: Old Energy Balance sectoral split for LPG final energy**



**Figure 44: Revised post –BEUS Energy Balance sectoral split for LPG final energy**



**Figure 45: 2017 LPG final energy by sector, old and revised Energy Balance estimates**

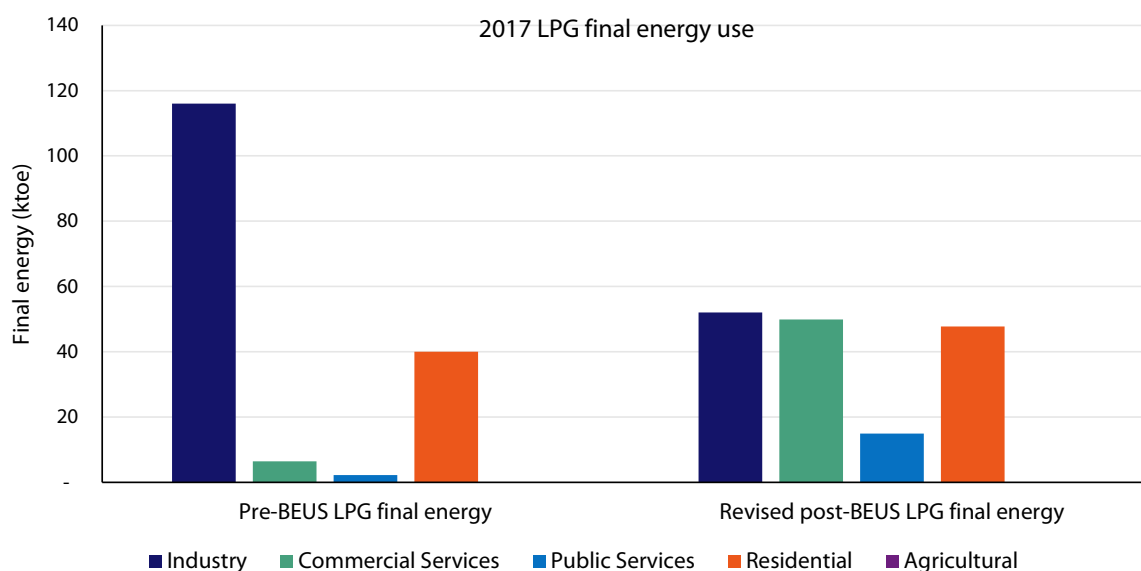


Figure 46 shows industry LPG final energy use before and after the revisions. The revised estimate of LPG use in industry is 67% lower than the previous estimate for 2009 and 55% lower for 2017. The share of LPG of overall industry energy use in 2017 is reduced from 4.7% in the old Energy Balance to 2.4% in the revised Energy Balance.

**Figure 46: Industry LPG final energy, old and revised Energy Balance estimates.**

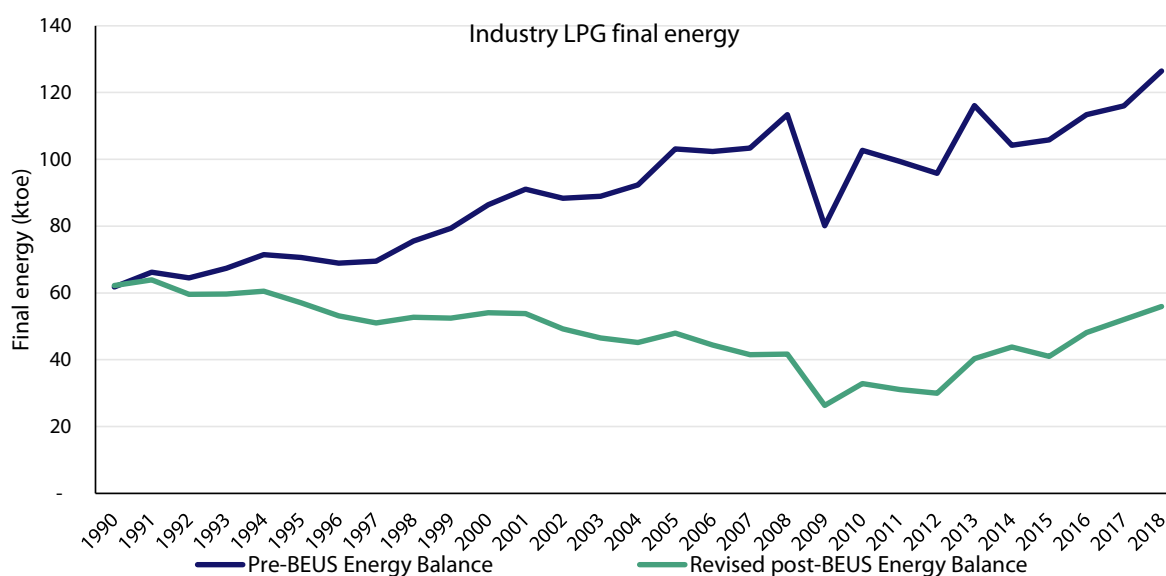


Figure 47 shows commercial services LPG final energy use before and after the revisions. From 2009 onwards there is approximately 10 times more LPG in the commercial sector using the revised methodology compared to the old Energy Balance, but the overall amounts are relatively small. In 2017, using the revised methodology, LPG accounted for 5.1% of commercial energy use, compared to 0.8% using the old methodology.

**Figure 47: Commercial services LPG final energy, old and revised Energy Balance estimates**

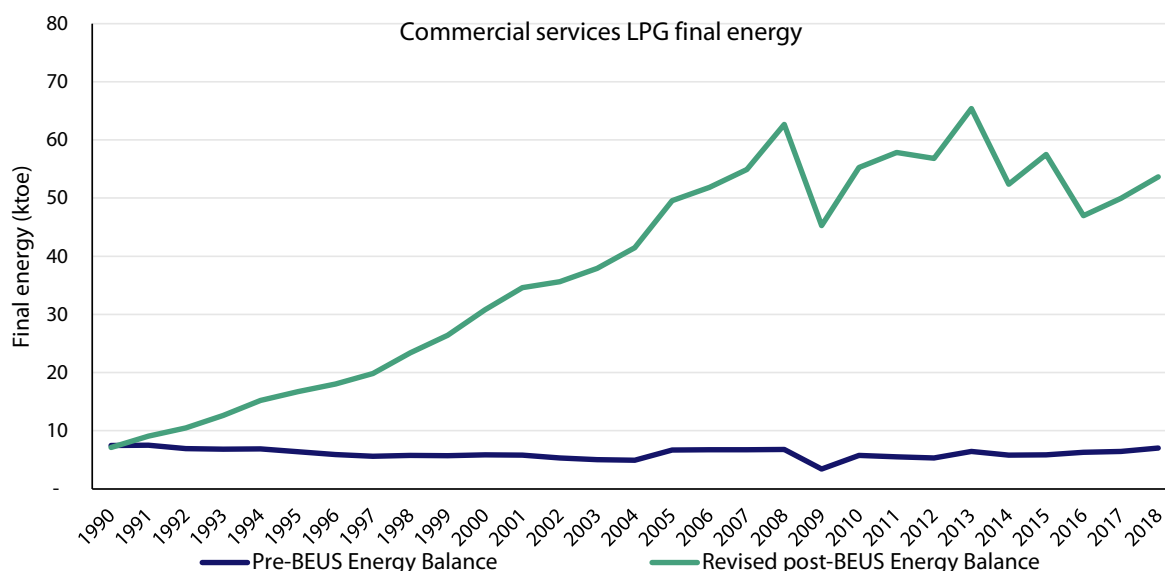


Figure 48 shows public services LPG final energy use before and after the revisions. As for the commercial sector, from 2009 onwards there is roughly 10 times more LPG in the public services sector using the revised methodology compared to the old Energy Balance, but again the overall amounts are relatively small. In 2017, using the revised methodology, LPG accounted for 2.3% of public services energy use, compared to 0.4% using the old methodology.

**Figure 48: Public services LPG final energy, old and revised Energy Balance estimates**

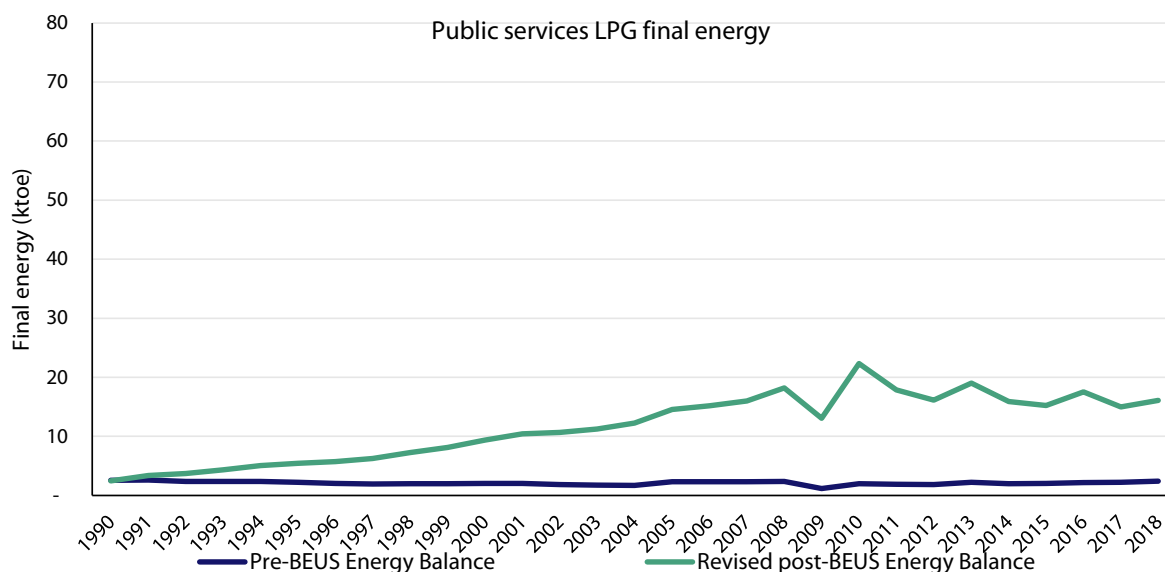


Figure 49 shows residential LPG final energy use before and after the revisions. Prior to 2016 there are some minor revisions to total LPG unrelated to the BEUS. From 2016 the residential share of total LPG has increased following the revised estimate provided by the suppliers. For 2018 residential LPG use is 23% higher in the revised estimate compared to the old energy balance. In 2018, using the revised methodology, LPG accounted for 1.8% of total residential energy use, compared to 1.6% using the old methodology.

**Figure 49: Residential LPG final energy, old and revised Energy Balance estimates**

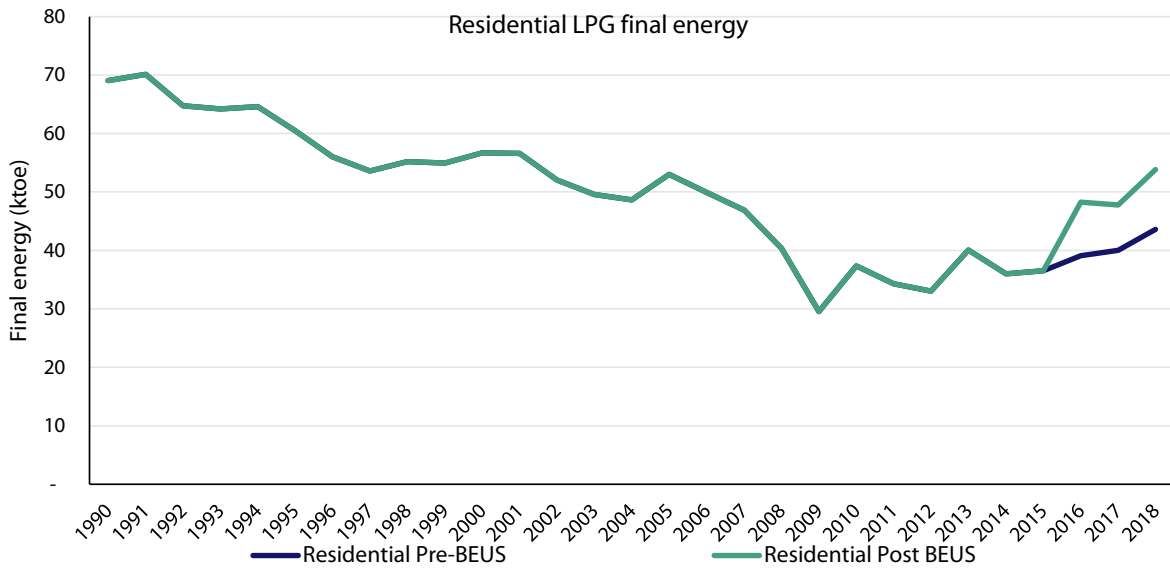
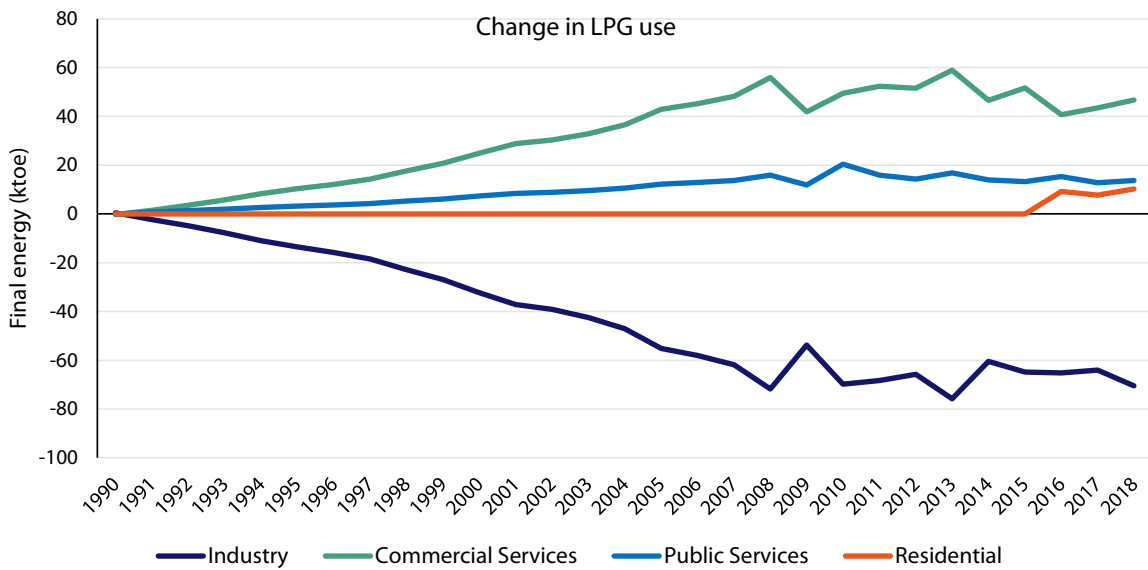


Figure 50 shows the change in kerosene use by sector between the old and revised Energy Balance. From 1990 to 2015 there is no change in total business LPG use. In that time Industry LPG use is down but this is balanced by increased LPG use in commercial and public services. In 2017 and 2018 there is a small reduction in overall business LPG use and a corresponding increase in residential LPG use.

**Figure 50: Change in LPG final energy use between old and revised Energy Balance estimates.**



## 4.7 Petroleum Coke

### 4.7.1 Old Energy Balance methodology

Prior to the publication of the BEUS, the Energy Balance final energy sectoral totals for were calculated as summarised in Table 27:

**Table 27: Basis for splitting petroleum coke by sector in old Energy Balance**

Residential and Services	
1990-2018	Survey of solid fuel suppliers supplemented by data from industry experts
Industry -sector total	
1990-2004	Survey of pet coke importers supplemented by data from industry expert
2005-2018	Survey of pet coke importers supplemented by ETS data
Industry - sub-sector split	
1990-2004	Sub-sector split based on CIP shares applied to total
2005-2018	Sub-sector split based on ETS data

### 4.7.2 BEUS data

The BEUS requests data on petroleum coke used to operate the business. Figure 51 shows the BEUS questionnaire for petroleum coke, included under Petroleum products.

**Figure 51: BEUS question on petroleum coke use**

4. Petroleum products (to operate the business only, excluding fuel for vehicle transport on public roads (see section 5))

(a) Heavy Fuel Oil ⓘ	Quantity litres	Cost €
	<input type="text"/>	<input type="text"/> ,000
(b) Diesel/Gas Oil/Marked Gas Oil ⓘ <u>(exclude auto diesel and marine diesel)</u>	Quantity litres	Cost €
	<input type="text"/>	<input type="text"/> ,000
(c) Kerosene ⓘ <u>(exclude jet kerosene)</u>	Quantity litres	Cost €
	<input type="text"/>	<input type="text"/> ,000
(d) Liquid Petroleum Gas (LPG) ⓘ <u>(include LPG used in vehicles on-site e.g. forklifts; exclude LPG used in road vehicles)</u>	Quantity litres	Cost €
	<input type="text"/>	<input type="text"/> ,000
(e) Petroleum coke ⓘ	Quantity tonnes	Cost €
	<input type="text"/>	<input type="text"/> ,000

Below is a comparison of the total business petroleum coke consumption from BEUS and that from the Energy Balance. The values match, because both data sources are based on ETS data.

**Table 28: Comparison of old Energy Balance and BEUS results for total business pet coke use**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Energy Balance (ktoe)	115	73	68	91	88	113	124	133	132
BEUS (ktoe)	115	73	68	91	88	113	124	133	132
Difference (ktoe)	0	0	0	0	0	0	0	0	0
Difference (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%

BEUS data on pet coke shows consumption in industry only, with zero consumption reported for services. The Energy Balance does show consumption in services since 2010, based on the monthly solid fuel survey. However, the amounts are negligible with a value between 0.0002 ktoe and 0.0005 ktoe annually.

#### 4.7.3 New Energy Balance methodology

Although the total pet coke consumption for industry corresponds in BEUS and the Energy Balance, the sub sectoral split does not. The Energy Balance reports consumption of pet coke in one sub sector only:

- Manufacture of Other Non-metallic Mineral Products (23)

BEUS reports consumption of pet coke in two sub sectors:

- Manufacture of Chemicals (20)
- Manufacture of Other Non-metallic Mineral Products (23)

The Energy Balance sub sectors were therefore revised to reflect consumption in the two sectors reported by BEUS. The total was not amended.

#### Adjustment to pre-2009 estimates.

The industry subsector split from 2005 to 2008 has also been revised based on ETS data.

#### Summary of changes

Table 29 summarises the changes in the revised methodology:

**Table 29: Summary of changes to Energy Balance petroleum coke final energy use by sector**

Total final energy use	
1990-2018	No change
Sectoral totals	
1990-2018	No change
Industry sub-sector split	
1990-2004	No change
2005-2018	Revised based on ETS and BEUS data

#### 4.7.4 Comparison of old and revised Energy Balance data

There are no changes to the sectoral totals for petroleum coke in the revised energy balance.



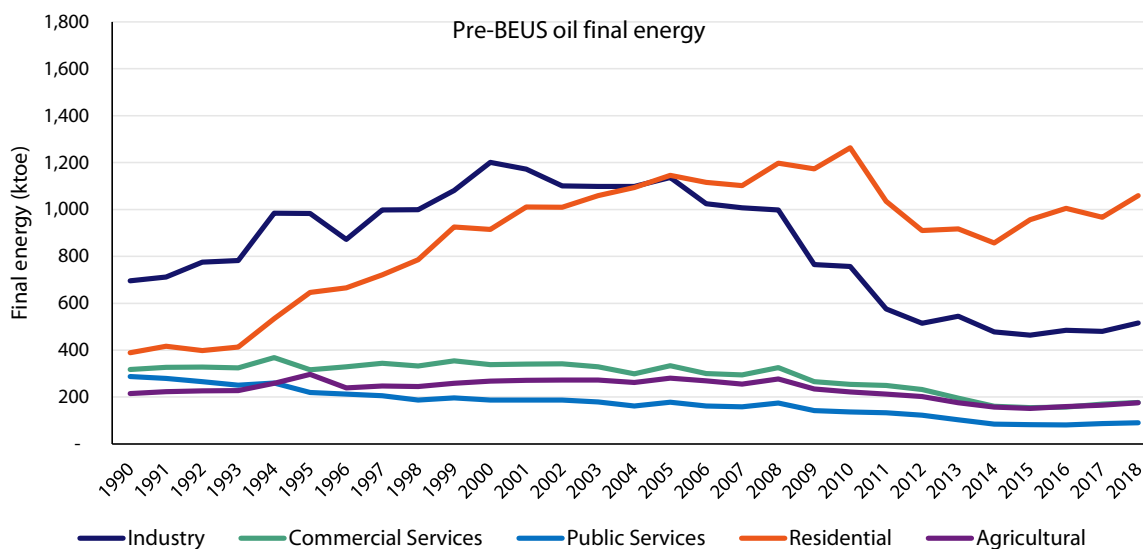
## 4.8 Oil Products

Fuel oil, marked gasoil, kerosene, LPG and petroleum coke are all oil products. Other oil products include gasoline, unmarked gasoil, and jet kerosene, all of which are used exclusively in transport. When looking at overall energy use at the sectoral level, we typically group these oil products together as “oil”. This section shows the results of the changes presented in the previous five sections on total final energy use of oil in the industry, commercial services, public services, and residential sectors.

### 4.8.1 Comparison of old and revised Energy Balance data

The following graphs illustrate the results of the data revisions for oil. Figure 52 and Figure 53 show the time series of oil use by sector from 1990 to 2018 before and after the revision. The biggest change has been the reduction in oil use in industry and commercial services, and a corresponding reallocation of oil use to the residential sector.

**Figure 52: Old Energy Balance sectoral split for oil final energy (excluding transport)**



**Figure 53: Revised Energy Balance sectoral split for oil final energy (excluding transport)**

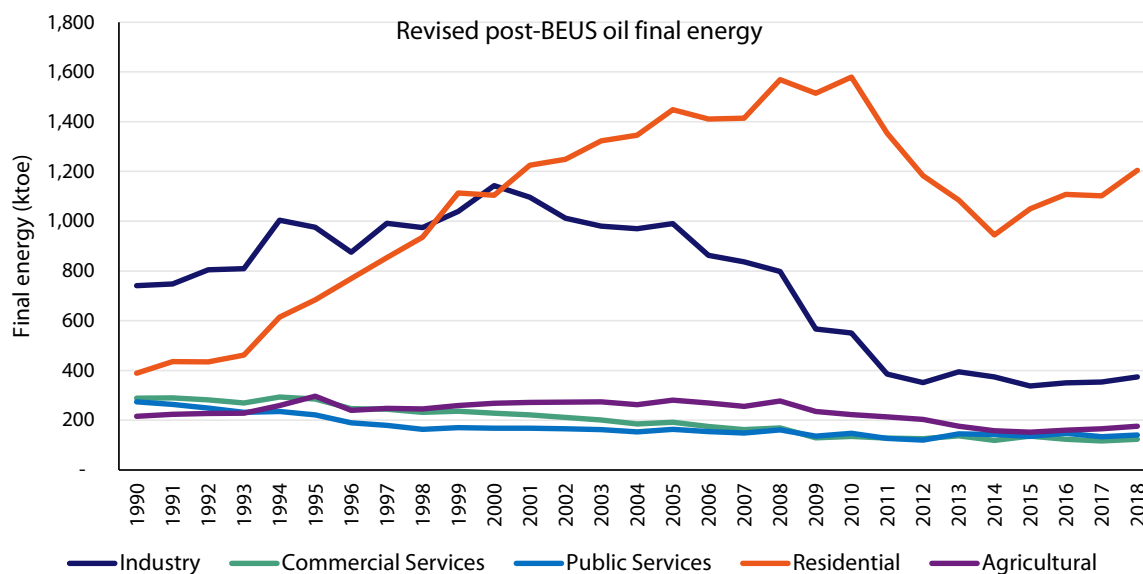


Figure 54 highlights the breakdown of marked oil use by sector in 2017 before and after the revisions side by side.

**Figure 54: 2017 marked gasoil final energy by sector, old and revised Energy Balance estimates**

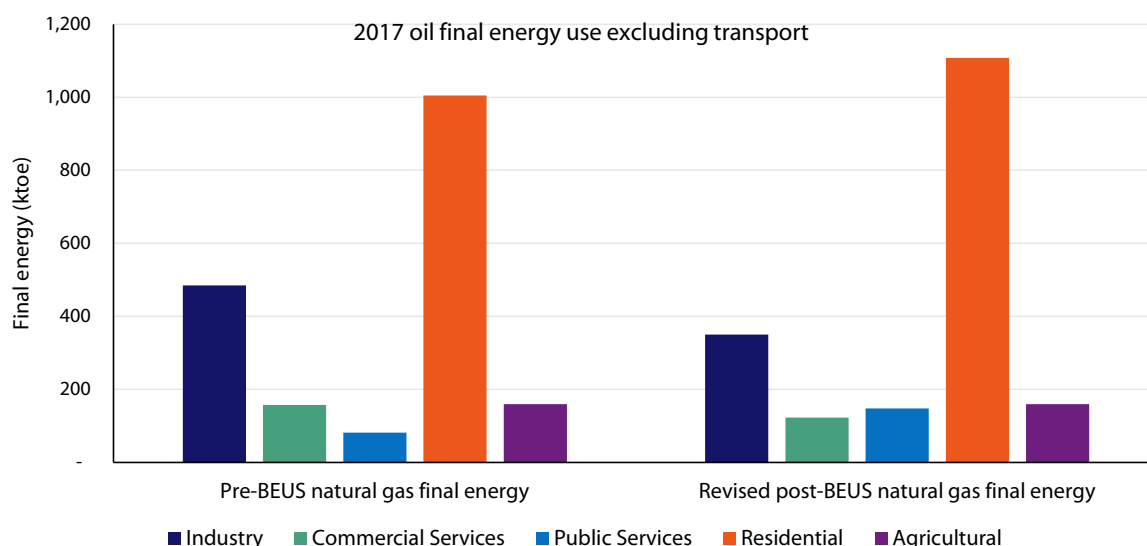


Figure 55 shows industry oil final energy use before and after the revisions. Revised industry oil use is higher initially due to the addition of construction oil use, but is lower for all years from 1997 onwards. For 2009, the revised Energy Balance data is 26% lower than the old estimate, for 2017 it is also 26% lower.

**Figure 55: Industry oil final energy, old and revised Energy Balance estimates.**

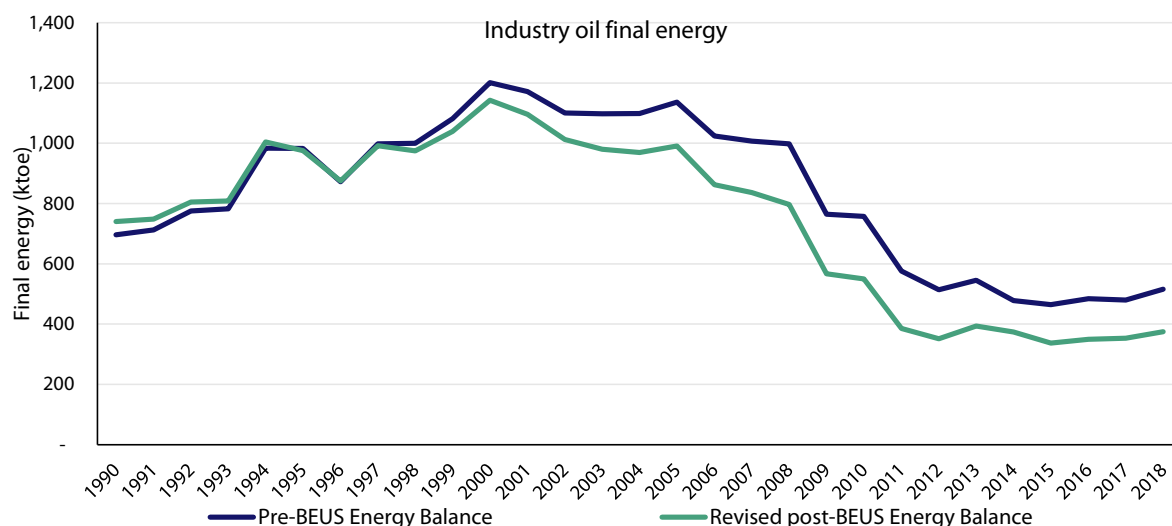


Figure 56 shows commercial services oil final energy use before and after the revisions. In 1990 it is now 9% lower than in the old methodology due to the transfer of oil for construction from services to industry. For 2009, the revised Energy Balance data is 52% lower than the old estimate, for 2017 it is 32% lower.

**Figure 56: Commercial services oil final energy, old and revised Energy Balance estimates**

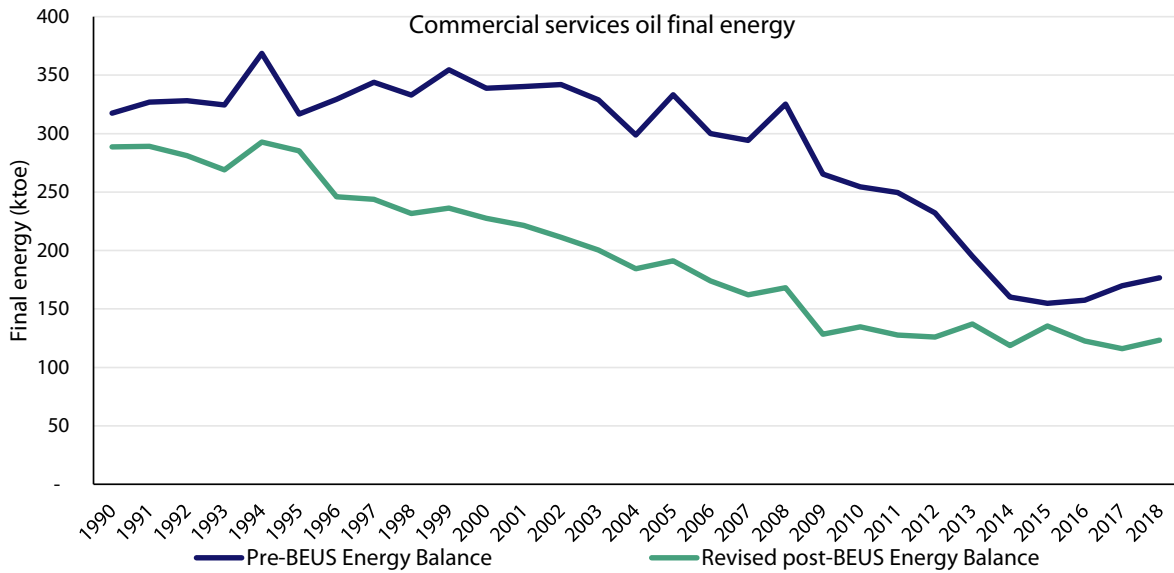


Figure 57 shows public services oil final energy use before and after the revisions. For 2009, the revised Energy Balance data is 5% lower than the old estimate, for 2017 it is 52% higher.

**Figure 57: Public services oil final energy, old and revised Energy Balance estimates**

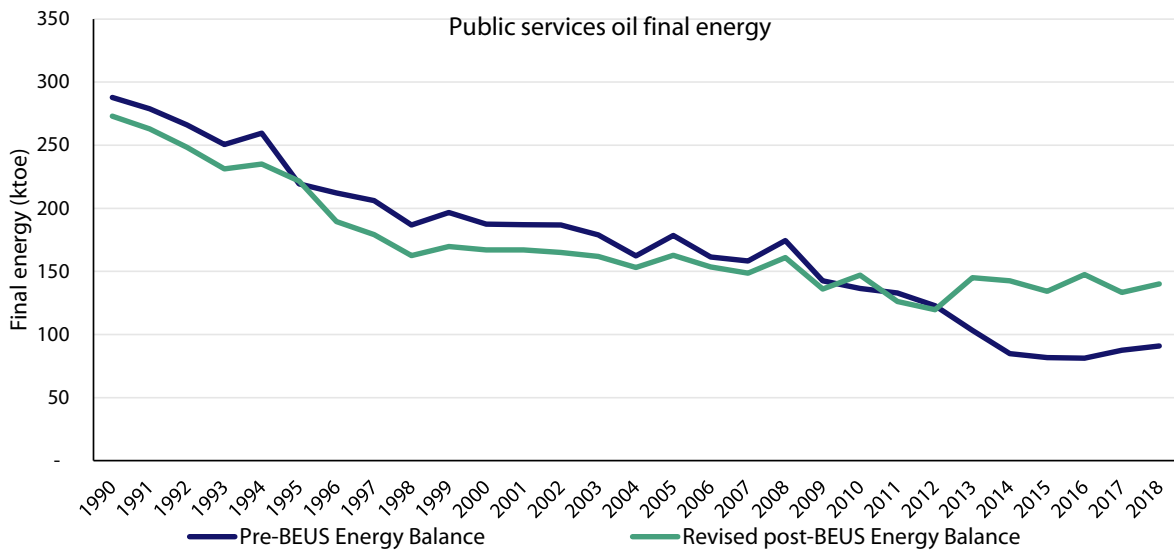


Figure 58 shows residential oil final energy use before and after the revisions. The revised Energy Balance data for 2009 is 29% higher than the old estimate, for 2017 it is 14% higher. One impact of these changes is that the decline in residential oil use after the 2009 recession is now even more pronounced than before. Previously, we estimated that residential oil use fell by 32% from a peak in 2010 to a low in 2014. Now we estimate that residential oil use declined by 40% from the a peak in 2010 to a low in 2014.

**Figure 58: Residential oil final energy, old and revised Energy Balance estimates**

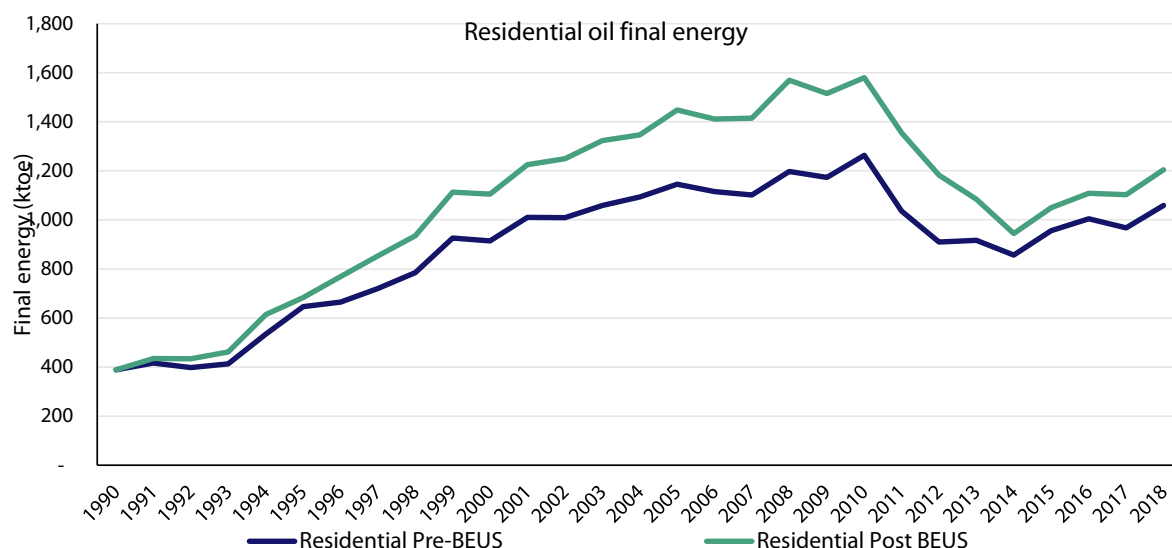
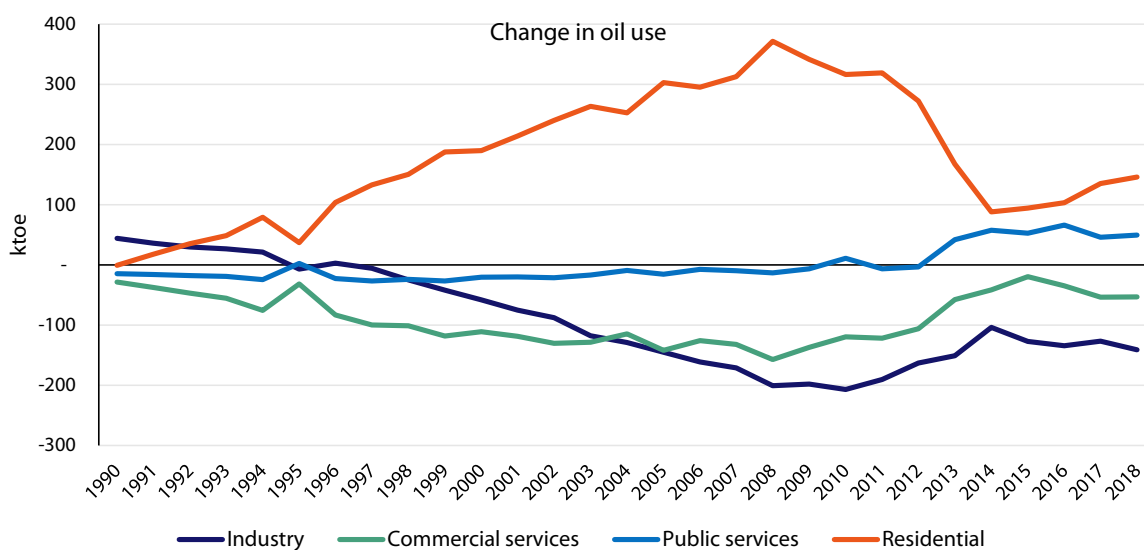


Figure 59 shows the change in use of oil products (fuel oil, marked gasoil, kerosene, LPG and pet coke) by sector between the old and revised Energy Balance. Overall there has been a reduction in business oil use, especially in industry and commercial services. This results in a reallocation of oil to the residential sector, particularly between 1995 and 2014.

**Figure 59: Change in oil final energy use between old and revised Energy Balance estimates.**



## 4.9 Coal

### 4.9.1 Old Energy Balance methodology

There are four solid fuels included under Coal in the Energy Balance:

- Bituminous Coal
- Anthracite + Manufactured Ovoids
- Coke (zero consumption reported for all years)
- Lignite \ Brown Coal

Prior to the publication of the BEUS, the Energy Balance final energy sectoral totals were calculated as follows:

**Table 30: Basis for splitting coal by sector in old Energy Balance**

Residential & services sector total	
1990-2018	Survey of solid fuel suppliers, supplemented with data from industry experts
Industry sector total	
1990-2004	Survey of solid fuel suppliers and importers supplemented by data from industry experts
2005-2018	Survey of solid suppliers and importers supplemented by ETS data
Industry sub-sector split	
1990-2004	Sub-sector split based on CIP shares applied to total
2005-2018	Sub-sector split based on CIP shares applied to total, supplemented by ETS split

### 4.9.2 BEUS data

The BEUS requests data on coal used to operate the business. Figure 60 shows the BEUS questionnaire for coal.

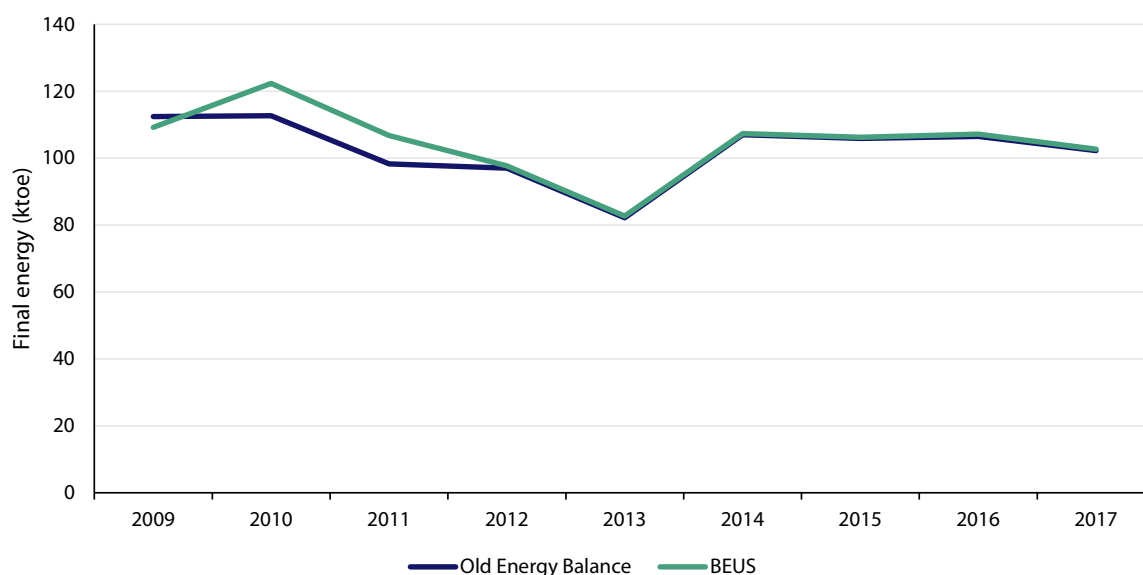
**Figure 60: BEUS question on coal use**

#### 6. Coal (to operate the business only)

(a) Coal <span style="color: blue;">i</span>	Please specify Select	Quantity tonnes <input type="text"/>	Value € (000) Ex VAT <input type="text"/>
(b) Peat <span style="color: blue;">i</span>	Please specify Select	Quantity tonnes <input type="text"/>	Value € (000) Ex VAT <input type="text"/>
(c) Ovoids/Nuggets <span style="color: blue;">i</span>		Quantity tonnes <input type="text"/>	Value € (000) Ex VAT <input type="text"/>
(d) Other (specify)	Please specify <input type="text"/>	Quantity tonnes <input type="text"/>	Value € (000) Ex VAT <input type="text"/>

Figure 61 and Table 31 compare the BEUS data with the old Energy Balance estimate of business coal use<sup>5</sup>. The data closely matches from 2012 with larger differences from 2009 to 2011.

**Figure 61: Comparison of old Energy Balance and BEUS results for total business coal use**



**Table 31: Comparison of old Energy Balance and BEUS results for total business coal use**

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Energy Balance (ktoe)	112	113	98	97	82	107	106	106	102
BEUS (ktoe)	109	122	107	98	83	107	106	107	103
Difference (ktoe)	-3	10	9	1	0	0	0	1	0
Difference (%)	-3%	9%	9%	1%	1%	0%	0%	1%	0%

In BEUS and the Energy Balance almost all coal consumption is reported in the following industry sub sectors:

- Manufacture of Food, and Beverages (10-11)
- Manufacture of Other Non-metallic Mineral Products (23)

Coal use in these sectors is also reported under the ETS. Upon investigation it was discovered that the Energy Balance did not match the reported ETS consumption of coal in these sectors for the years 2009 to 2011. The Energy Balance has been revised to match the ETS data for these years, which also brings it into line with the BEUS data.

The Energy Balance also shows small amounts in other industry sub sectors based on CIP data for all years. The BEUS reports some consumption in the following industry sub sectors from 2009 to 2012:

- Mining and Quarrying (05-09) (2009-2010 only)
- Manufacture of Basic Metals and Metal Products (24-25) (2009 only)
- Manufacture of Machinery and Equipment (28) (2010 only)
- Manufacture of Transport Equipment (29-30) (2009 only)
- Construction (41-43) (2009,2011,2012 only)

The Energy Balance shows zero consumption of coal in services from 2009 however BEUS does show consumption in a number of services sub sectors.

<sup>5</sup> BEUS values include all sectors except Electricity, Gas and Refining (19,35)

#### 4.9.3 New Energy Balance methodology

BEUS actual values will be used for the services sector. For industry actual ETS consumption is reported, supplemented by BEUS consumption in other industry sub sectors. The amount of coal used in the residential sector for the years 2013 to 2018 has been revised based on CSO trade statistics, unrelated to the BEUS.

Table 32 shows the sector shares as they were in the old Energy Balance and how they are using the new methodology when BEUS shares are used and data revised.

**Table 32: Comparison of sectoral shares for coal final energy use between old and new Energy Balance**

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Old Energy Balance shares</b>									
Industry	30%	31%	30%	29%	23%	33%	34%	37%	41%
Commercial Services	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Public Services	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Residential	70%	69%	70%	71%	77%	67%	66%	63%	59%
<b>New Energy Balance shares using BEUS</b>									
Industry	30%	33%	32%	28%	22%	30%	31%	34%	33%
Commercial Services	0.10%	0.03%	0.12%	0.12%	0.10%	0.10%	0.10%	0.21%	0.17%
Public Services	0.01%	0.02%	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%
Residential	70%	67%	68%	72%	78%	70%	69%	66%	67%

#### Adjustment to pre-2009 estimates.

The industry subsector split from 2005 to 2008 has also been revised based on ETS data.

#### Summary of changes

Table 33 summarises the changes in the revised methodology:

**Table 33: Summary of changes to Energy Balance coal final energy use by sector**

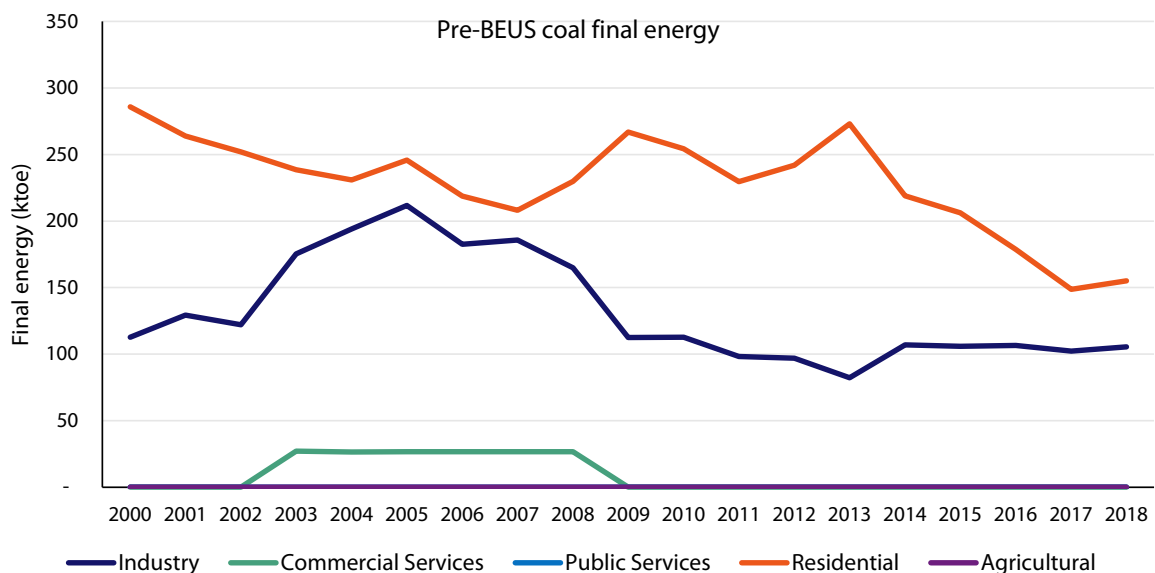
Total final energy use	
1990-2009	No change
2010-2018	Changes due to using BEUS data for business and due to revisions to residential coal use based on CSO trade stats
Industry total	
2010-2011	Revised to match ETS data.
All other years	No change
Industry sub-sector split	
1990-2004	No change
2005-2008	Revised based on ETS data
2009-2017	Revised based on ETS and BEUS data
2018	Revised based on 2017 BEUS data
Commercial and public services	
1990-2008	No change
2009-2017	Revised based on BEUS data
2018	Revised based on 2017 BEUS data
Residential	
1990-2010	No change
2011-2018	Revisions unrelated to BEUS

#### 4.9.4 Comparison of old and revised Energy Balance data

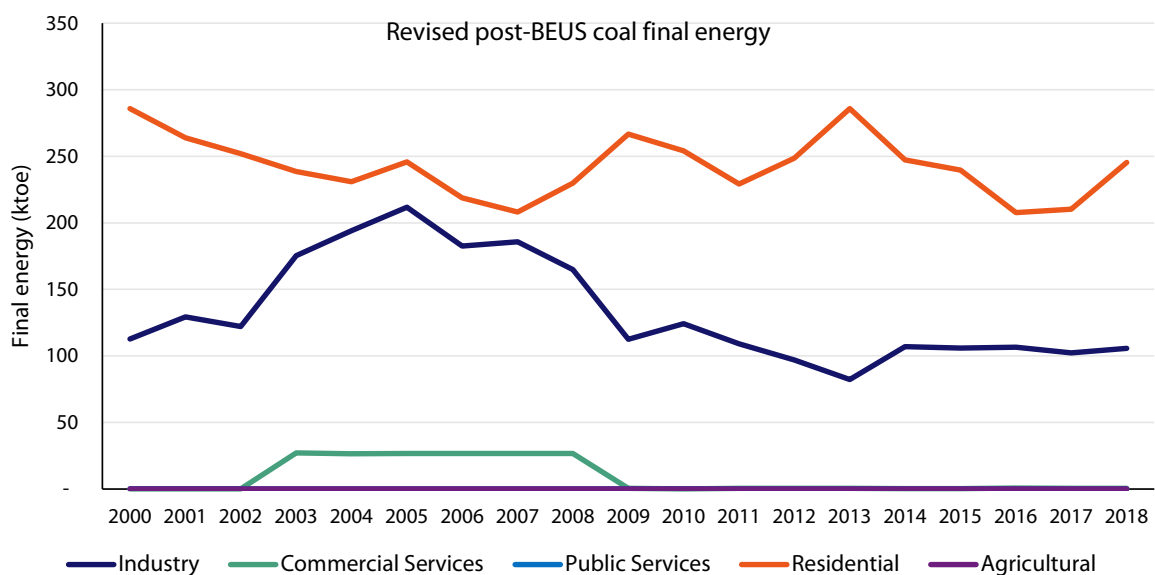
The following graphs illustrate the results of the data revisions for coal final energy. Figure 62 and Figure 63 show the time series of coal use by sector from 2000 to 2018 before and after the revision. Figure 64 highlights the breakdown of coal use by sector in 2017 before and after the revisions side by side. There are minor changes to industry coal use for 2010 and 2011 based on ETS data and also changes to residential coal use after 2011 unrelated to the BEUS.



**Figure 62: Old Energy Balance sectoral split for coal final energy**



**Figure 63: Revised Energy Balance sectoral split for coal final energy**



**Figure 64: 2017 coal final energy by sector, old and revised Energy Balance estimates**

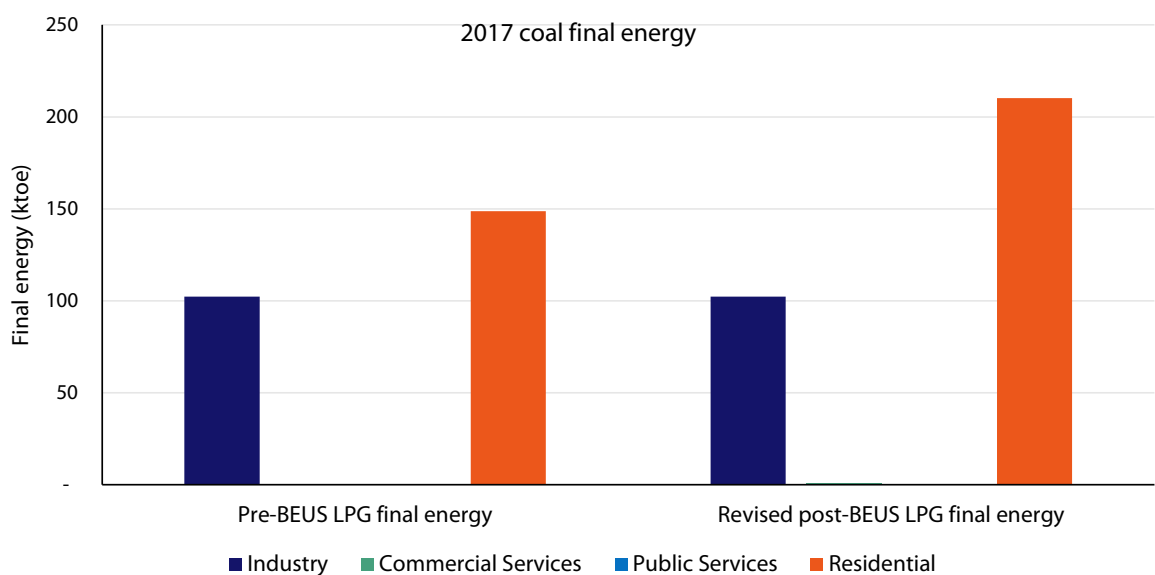


Figure 65 shows industry coal final energy use before and after the revisions. The sectoral total is unchanged, apart from 2010 and 2011 where it has been revised to match ETS data.

**Figure 65: Industry coal final energy, old and revised Energy Balance estimates.**

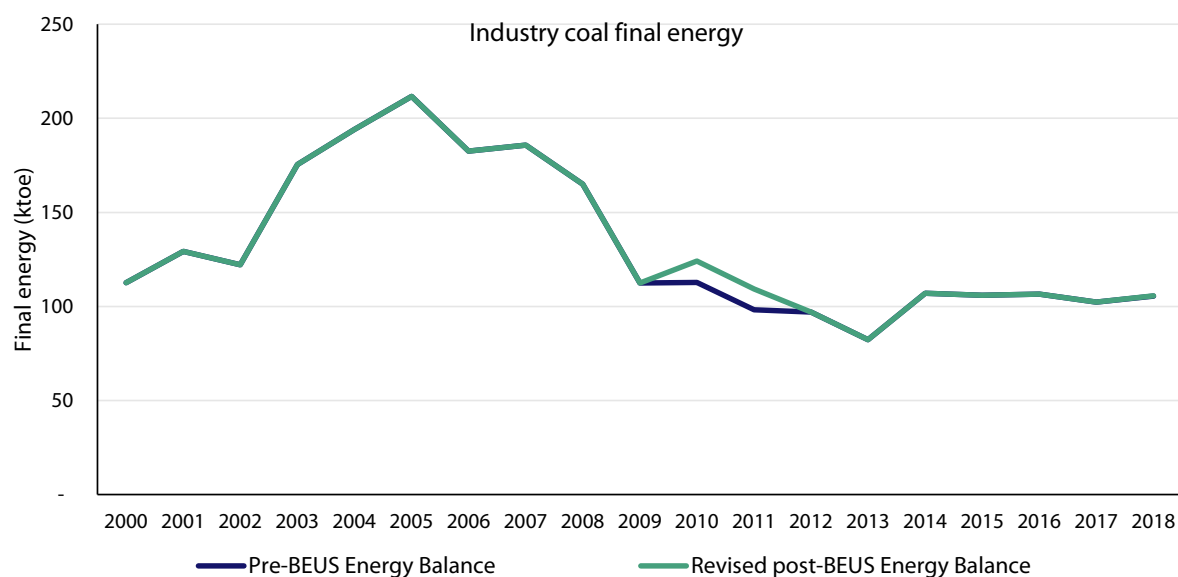


Figure 66 shows public services coal final energy use before and after the revisions. As for the commercial sector, from 2009 onwards there are very minor changes to public services coal use based on BEUS data. Note also that coal use in the public sector is almost negligible.

**Figure 66: Public services coal final energy, old and revised Energy Balance estimates**

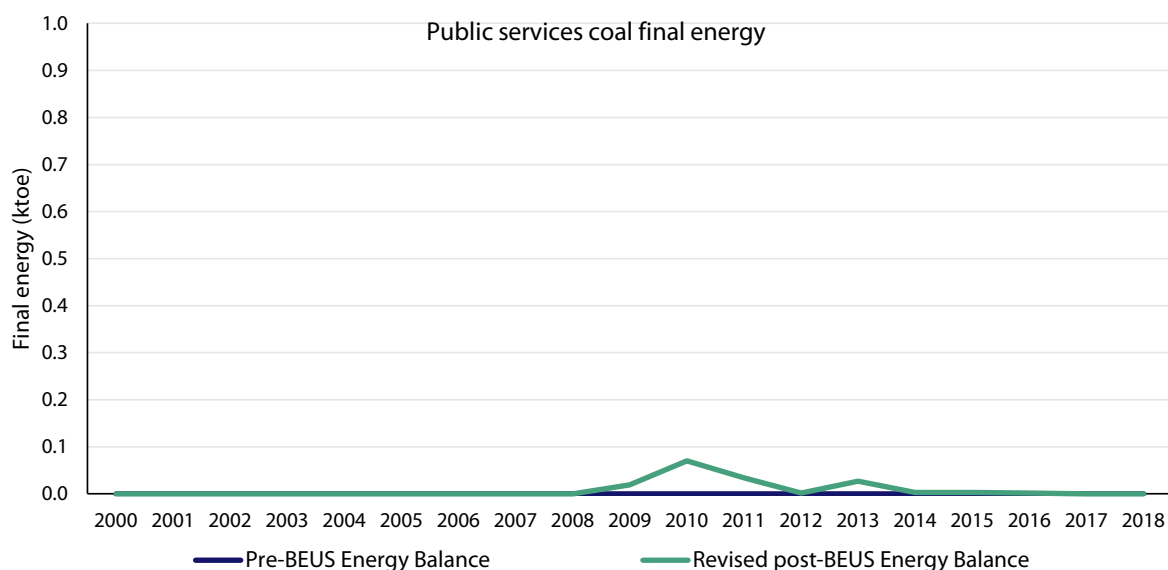
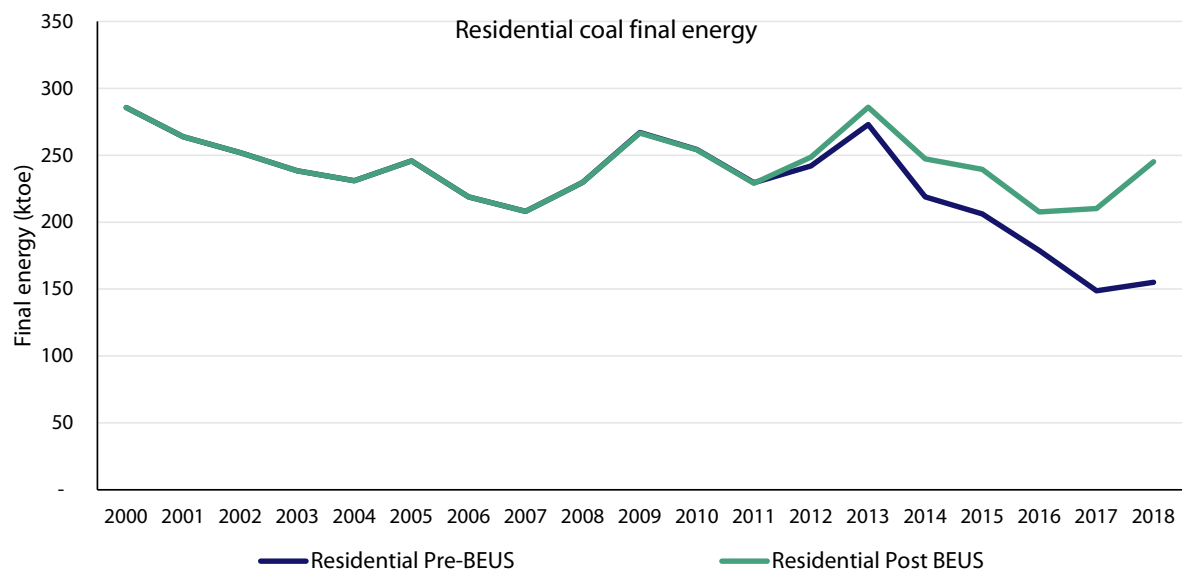


Figure 49 shows residential coal final energy use before and after the revisions. Total residential coal use has been revised upwards based on CSO trade statistics, unrelated to the BEUS. The revised residential coal use for 2018 is 58% higher than the previous estimate.

**Figure 67: Residential coal final energy, old and revised Energy Balance estimates**



## 4.10 Biomass

### 4.10.1 Old Energy Balance methodology

In the old energy balance methodology, biomass and renewable wastes were grouped together. In the new methodology we have split out this out into two separate fuel columns, one for biomass and another for renewable wastes. This change is unrelated to the BEUS analysis. Due to confidentiality rules, it is not possible to publish the Energy Balance data for wood chip or wood pellets as individual fuels.

Prior to the publication of the BEUS, the Energy Balance final energy sector and subsector totals for biomass were calculated as summarised in Table 34.

**Table 34: Basis for splitting biomass by sector in old Energy Balance**

Residential	
1990-2018	Survey of wood suppliers.
Commercial and public services sector totals	
1990-2018	Survey of wood suppliers for total services biomass use. All services biomass assumed to be in commercial services, no use in public services
Industry sector total	
1990-2018	Survey of solid suppliers and ETS data
Industry sub-sector split	
1990-2018	Survey of solid suppliers and ETS data

### 4.10.2 BEUS data

The BEUS requests data on wood chip, wood pellets and wood waste used to operate the business.

**Figure 68: BEUS question on renewable energy use**

#### 7. Renewable Energy and Energy from Waste

(a) Wind Turbines	Quantity kWh <input style="width: 100px; height: 20px;" type="text"/>	Cost € <input style="width: 100px; height: 20px;" type="text"/> ,000
(b) Wood Chip	Quantity tonnes <input style="width: 100px; height: 20px;" type="text"/>	Cost € <input style="width: 100px; height: 20px;" type="text"/> ,000
(c) Wood Pellets	Quantity tonnes <input style="width: 100px; height: 20px;" type="text"/>	Cost € <input style="width: 100px; height: 20px;" type="text"/> ,000
(d) Wood Logs	Quantity tonnes <input style="width: 100px; height: 20px;" type="text"/>	Cost € <input style="width: 100px; height: 20px;" type="text"/> ,000
(e) Wood Waste	Quantity tonnes <input style="width: 100px; height: 20px;" type="text"/>	Cost € <input style="width: 100px; height: 20px;" type="text"/> ,000

### 4.10.3 New Energy Balance methodology

In the revised Energy Balance methodology, we will continue to use the supplier data to give us the sectoral totals for residential and services. Previously we had no data on the sub-sectoral split of biomass use in services, we will now use the BEUS data to give this split. This results in a reallocation of some biomass from commercial services to public services. There is also a revision to the estimate of untraded wood use in the residential sector, unrelated to the BEUS. Table 35 summarises the changes in the revised methodology.

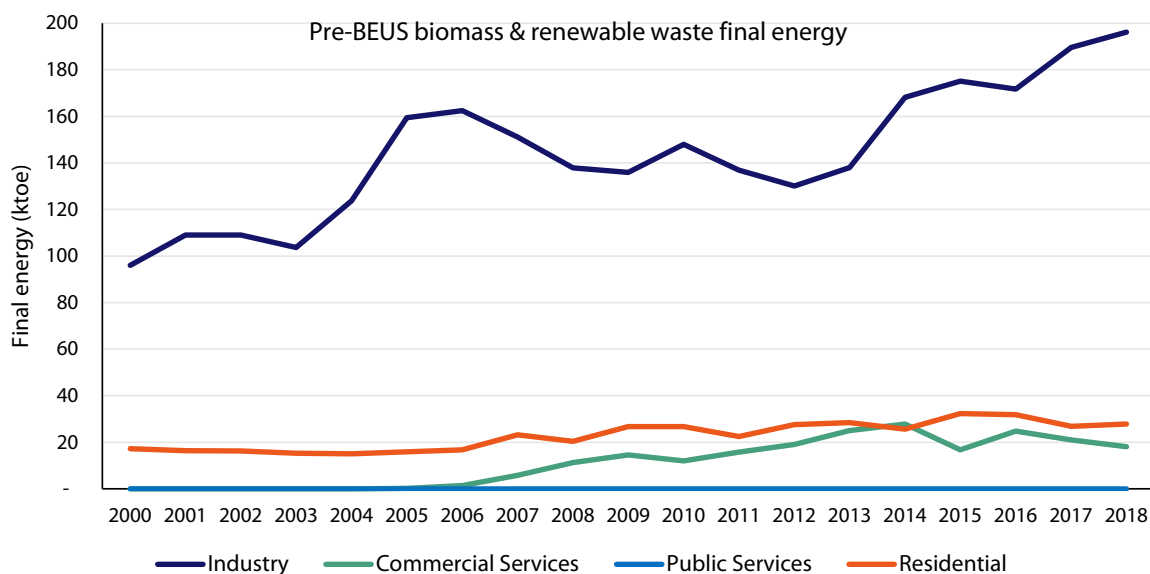
**Table 35: Summary of changes to Energy Balance biomass final energy use by sector**

Residential	
1990-2011	No change
2012-2018	Small change in estimate of untraded wood, unrelated to BEUS.
Commercial and public services sector totals	
1990-2018	No change to total services biomass use. BEUS used for services subsector split.
Industry sector total	
1990-2018	No change
Industry sub-sector split	
1990-2018	No change

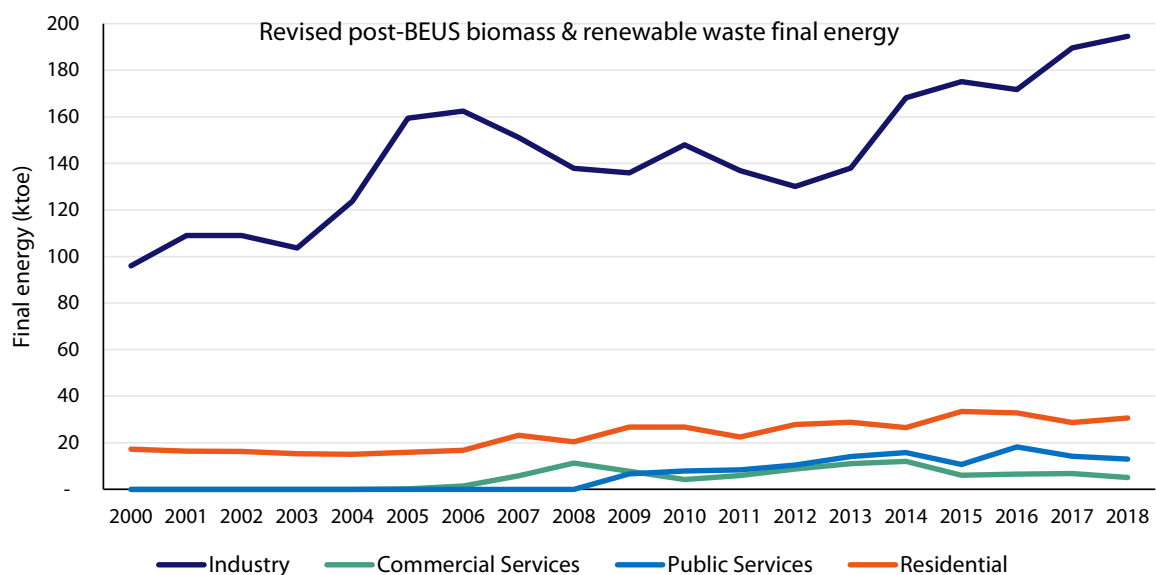
### 4.10.4 Comparison of old and revised Energy Balance data

The following graphs illustrate the results of the data revisions for biomass and renewable waste final energy. Figure 69 and Figure 70 show the time series of biomass and renewable waste use by sector from 2000 to 2018 before and after the revision. Industry is unchanged and remains the dominant sector for use of bioenergy and renewable wastes. Figure 71 highlights the breakdown of biomass and renewable waste use by sector in 2017 before and after the revisions side by side.

**Figure 69: Old Energy Balance sectoral split for biomass and renewable waste final energy**



**Figure 70: Revised Energy Balance sectoral split for biomass and renewable waste final energy**



**Figure 71: 2017 biomass and renewable waste final energy by sector, old and revised Energy Balance estimates**

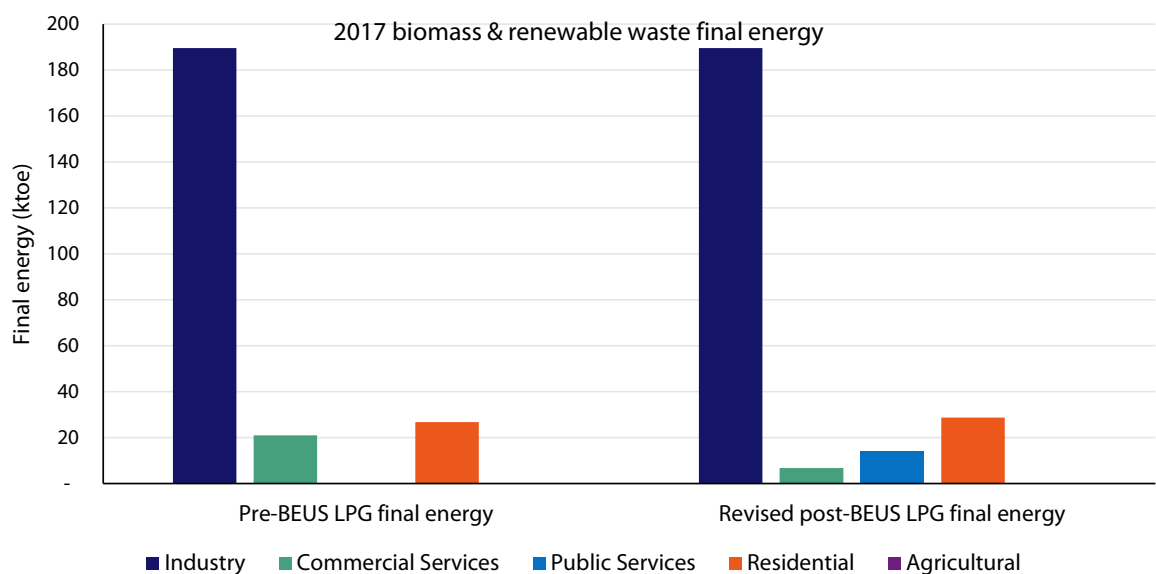
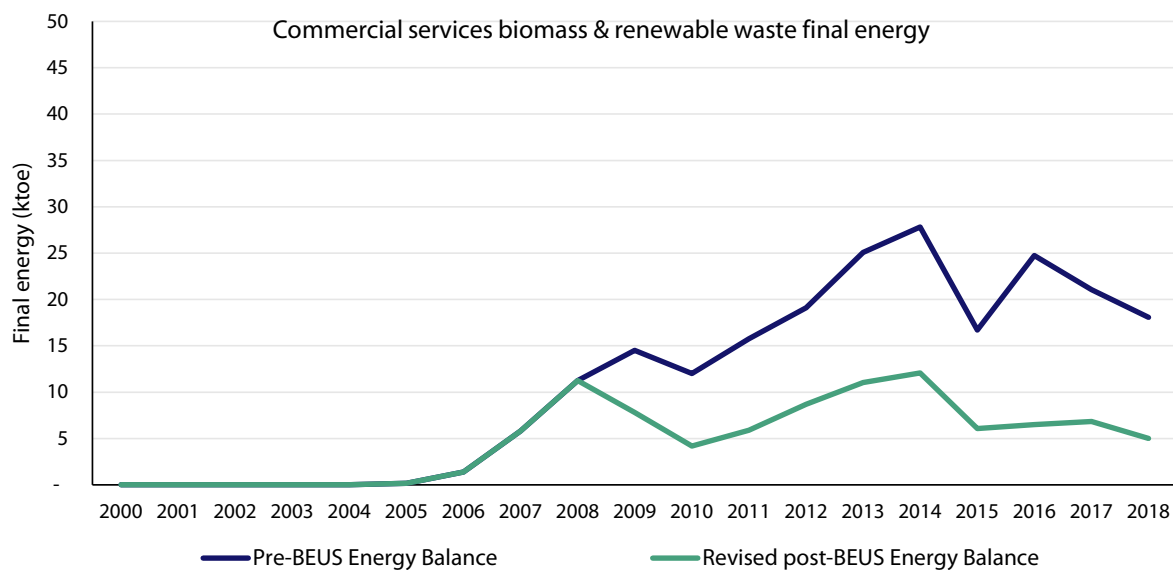


Figure 72 and Figure 73 show biomass and renewable waste final energy use in the commercial and public services sectors before and after the revisions. Based on the BEUS data there has been a reallocation of biomass from commercial services to public services.

**Figure 72: Commercial services biomass and renewable waste final energy, old and revised Energy Balance estimates**



**Figure 73: Public services biomass and renewable waste final energy, old and revised Energy Balance estimates**

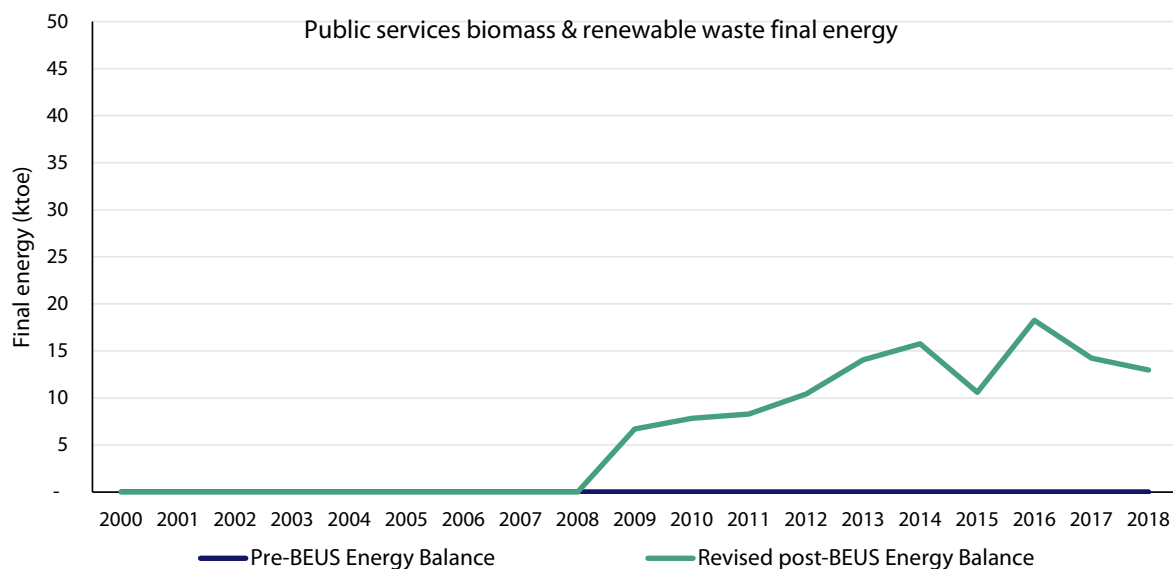
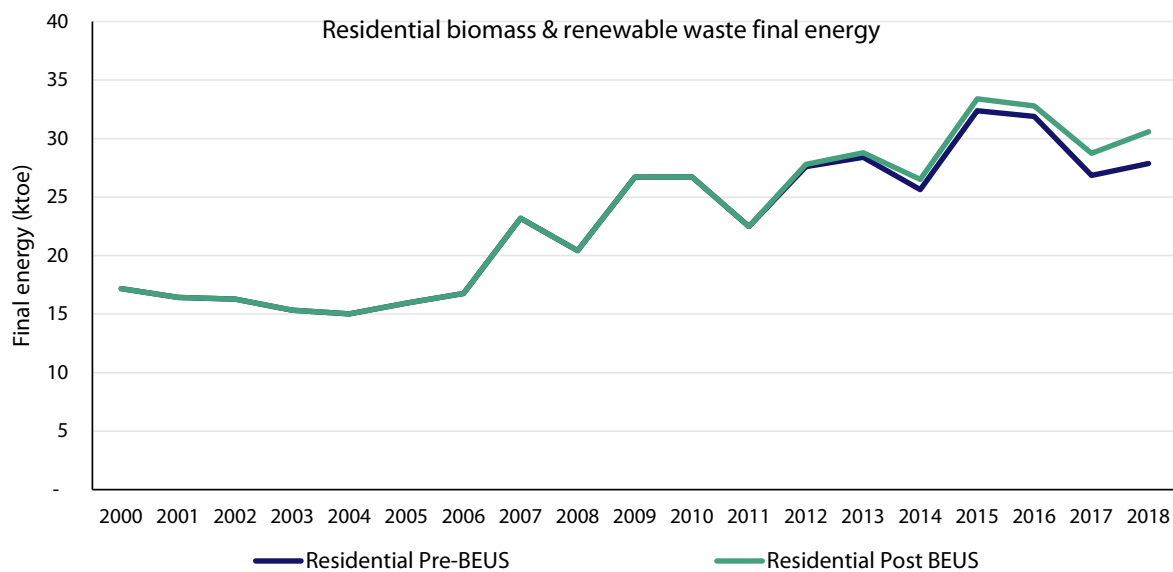


Figure 74 shows residential biomass and renewable waste final energy use before and after the revisions. Total residential biomass and renewable waste use has been revised upwards based on revisions to the estimated untraded wood use, unrelated to the BEUS. The revised residential biomass and renewable waste use for 2018 is 10% higher than the previous estimate.

**Figure 74: Residential biomass and renewable waste final energy, old and revised Energy Balance estimates**





#### **4.11 Peat**

The BEUS requests data on peat used to operate the business, and the results show peat use in a number of industry subsectors. Virtually all peat is used in either electricity generation or in households. Business peat use is typically of the order of magnitude of 0.1% of total peat use. At this time, we have not revised the Energy Balance estimates of peat use based on the BEUS data.

#### **4.12 Other Fuels**

The BEUS requests data on a number of other renewable energy sources used by businesses. We have not revised the Energy Balance data on these energy sources at this time, as these are well covered by existing surveys. These include:

- Landfill Gas – covered by SEAI survey and EPA data
- Biogas – covered by SEAI survey
- Tallow – covered by Department of Agriculture, Food and the Marine survey
- Wind Turbines – covered by SEAI survey
- Solid Recovered Fuel – covered by ETS
- Wood Waste – covered by ETS and SEAI survey

The BEUS also requests data on transport fuels used by businesses, including road transport fuels and jet fuel. In the Energy Balance energy used for transport is assigned under the transport sector, regardless of whether it is used for business or personal travel. Therefore we have not revised the Energy Balance transport data based on the BEUS.

## 4.13 Construction energy use

### 4.13.1 Old energy balance

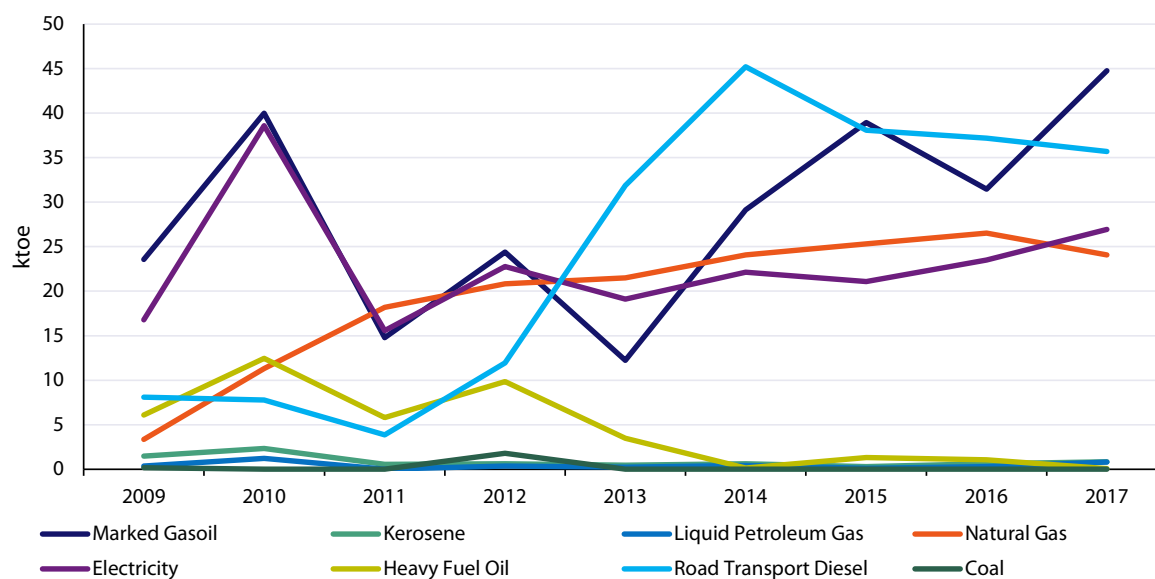
There was no estimation of construction energy use in the old energy balance. It was not included in the estimate of total industry use, and was not included in the CSO Census of Industrial Production survey that was used to split industry energy use by subsector.

The Energy Balance starts with the total quantities of energy used, which are well founded, and then breaks this down into subsectors. The fact that construction was not explicitly estimated means that the energy used in construction was effectively allocated across other sectors, rather than not being counted at all. The services sector was the sector about which least was understood and typically acted as a residual when all other sectors were estimated, so we can assume that in effect construction was subsumed into services.

### 4.13.2 BEUS data

Figure 75 and Table 4 show the BEUS data for energy use in construction by fuel type. The BEUS includes data on road transport fuels and shows significant road transport diesel (unmarked gasoil) use in construction. However for the energy balance, road transport diesel is included under the transport sector, rather than construction, and so this is ignored for this analysis. The BEUS also shows some small use of solid fuels, coal and biomass in 2012. This appears to be an anomaly and again we ignore solid fuels in construction for this analysis.

**Figure 75: BEUS data on construction energy use by fuel type**



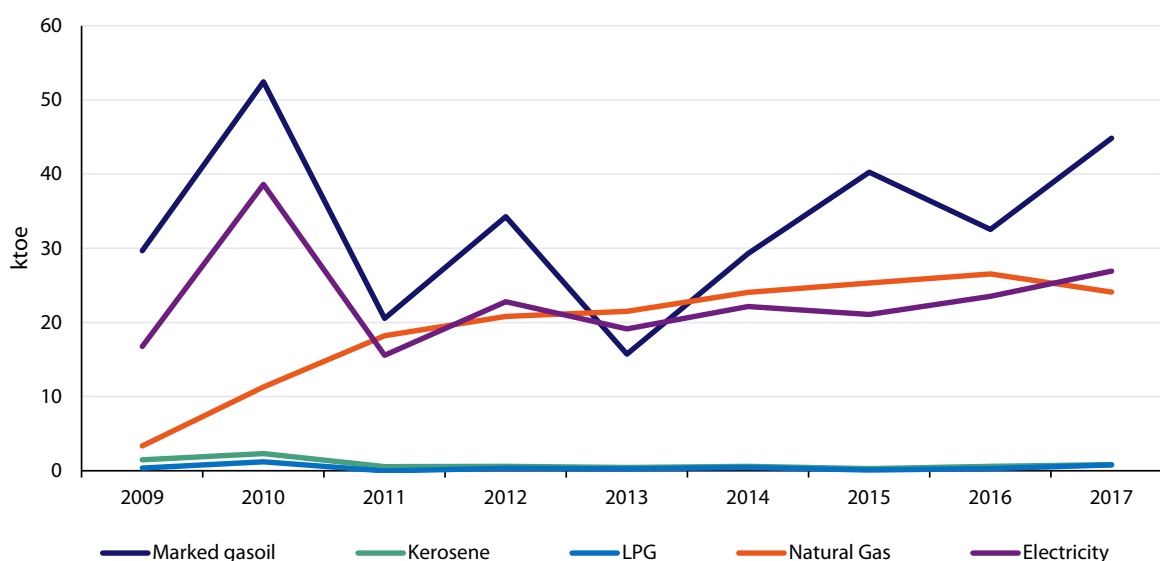
**Table 36: BEUS data on construction energy use by fuel type**

BEUS construction data (including transport fuels) (ktoe)	2009	2010	2011	2012	2013	2014	2015	2016	2017
Marked Gas Oil	24	40	15	24	12	29	39	31	45
Kerosene	1	2	1	1	0	1	0	1	1
Liquid Petroleum Gas	0	1	0	0	0	0	0	0	1
Total Natural Gas	3	11	18	21	21	24	25	27	24
Electricity	17	39	16	23	19	22	21	24	27
Heavy Fuel Oil	6	12	6	10	3	0	1	1	0
Road Transport Diesel	8	8	4	12	32	45	38	37	36
Road Transport Petrol	0	0	0	0	1	1	0	0	1
Coal	0	0	0	2	0	0	0	0	0
Wood Biomass	0	0	0	1	0	0	0	0	0

The BEUS also shows some heavy fuel oil use in construction. Fuel oil would typically only be suitable in installations with a large energy demand, and we can see from the ETS data that even in large-industry, fuel oil use has been steadily reducing in recent years. It is unlikely that there is significant quantities of fuel oil being consumed outside of sites that are in the ETS. Based on this we judge that it is unlikely that heavy fuel oil is actually being used in construction, and, as we discuss in section 4.3, for fuel oil we rely on our existing estimate based on ETS and public sector data, rather than on the BEUS. This results in us making the assumption that there is no fuel oil use in construction.

It is likely that what is being reported as fuel oil in construction in the BEUS is in fact another grade of oil product, most likely marked gasoil. This may be because gasoil is sometimes commonly referred to as fuel oil, or because “Heavy Fuel Oil” is simply the first option on the list, and may be considered the default option by someone who is unsure. On this basis, we decided to reallocate the fuel oil reported in construction in the BEUS as marked gasoil. The results of this adjustment are shown in Figure 76 and Table 37 below. Here we have also taken out transport fuels and solid fuels, as discussed above.

**Figure 76: Adjusted BEUS data on construction energy use by fuel type, excluding road transport fuels and solid fuels**



**Table 37: Adjusted BEUS data on construction energy use by fuel type, excluding road transport fuels and solid fuels**

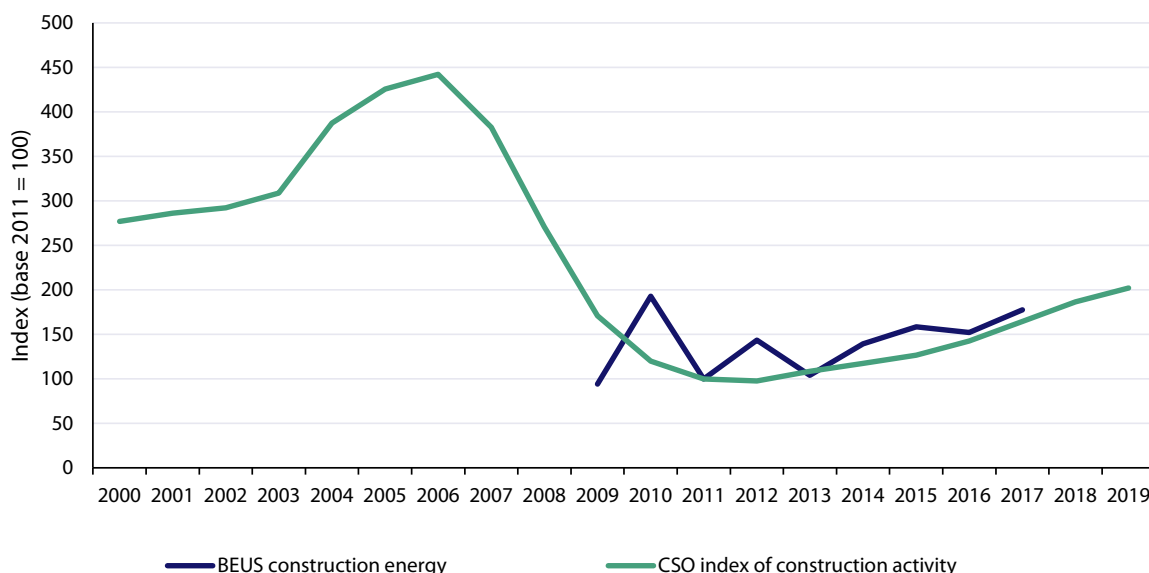
BEUS data on construction with fuel oil reallocated to gasoil & excluding transport fuels and solid fuels (ktoe)	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoil	30	52	21	34	16	29	40	33	45
Kerosene	1	2	1	1	0	1	0	1	1
LPG	0	1	0	0	0	0	0	0	1
Natural gas	3	11	18	21	21	24	25	27	24
Electricity	17	39	16	23	19	22	21	24	27

#### 4.13.3 New energy balance methodology

The BEUS only provides data from 2009 onwards. In the new Energy Balance methodology, for oil products, the BEUS data is used directly to give energy use in industry and services, with residential now being taken as the residual. If we do not make an estimate for the energy use of oil products for construction pre-2009, it would in effect be allocated to the residential sector, so to avoid this we are required to make an estimate. Note that for electricity, because the sector totals are based on supplier data, if we were not to make an estimate of construction electricity use it would in effect be distributed across all other business subsectors, not residential.

In order to back-cast the construction energy use pre-2009, we use the CSO Volume of Production Index in Building and Construction which provides data on activity in the construction sector expressed as an index. Figure 77 shows the CSO construction data expressed as an index relative to 2011, together with the BEUS construction energy use data, also expressed as an index relative to 2011 for comparison purposes. The CSO construction index only goes back to the year 2000, so for the purposes of this exercise we extrapolated it back to 1990.

**Figure 77: CSO construction activity and BEUS construction energy as index relative to 2011**



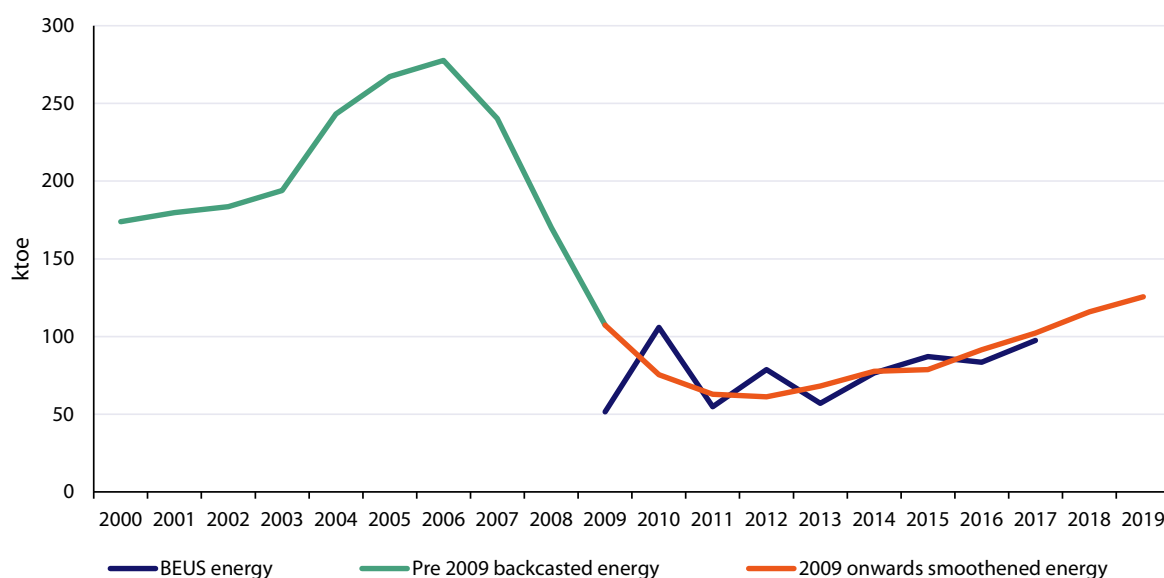
Energy use was back-casted by estimating the average energy intensity per unit of construction activity, and multiplying this by the activity in each year.

The BEUS shows a large increase in energy use in construction between 2009 and 2010, which is unexpected as activity was falling sharply in the sector in that period. We put this down to issues with reporting in the early years of the survey, and we disregard the BEUS construction data for

2009 and 2010. The average energy intensity of construction activity between 2011 and 2017 is used to estimate the construction energy use from 1990 to 2012. This approach provides an alternative estimate of energy use in 2009 and 2010 that better fits with the observed activity in the sector and smooths the early variability in the reported energy use. From 2013 to onwards, we use the average energy intensity of the previous three years, multiplied by the activity in that year. We will use this approach of using the average intensity of the previous three years going forward, which smooths out some of the variability in the BEUS reported energy use. This also allows us to estimate the energy use for 2018 and 2019 based on the average energy intensity of 2015 to 2017, as the BEUS data is only available to 2017. The results of this exercise for total construction energy use are shown in Figure 78.

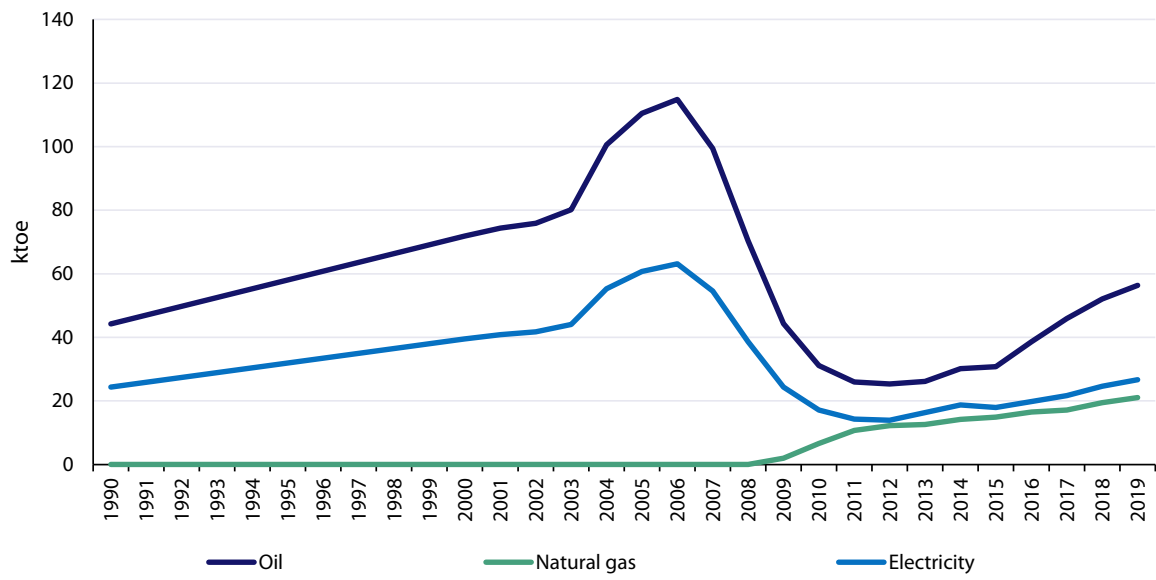
One potential weakness of this approach is that there were major changes in construction sector activity between 2006 and 2011, and the energy intensity and fuel mix of the sector in 2011 may not be representative of that in 2006, or back further still to 1990.

**Figure 78: Smoothed and back-casted construction energy use profile and BEUS construction energy use.**



This back-casting, soothing and forecasting exercise is done on a fuel by fuel basis. For natural gas and electricity, the BEUS data is calibrated to match the total estimate from the energy suppliers, so there is an extra step in the estimation. The final results of this exercise showing construction energy use split by fuel type from 1990 to 2019 are shown in Figure 79 below.

Figure 79: New Energy Balance construction energy use by fuel.

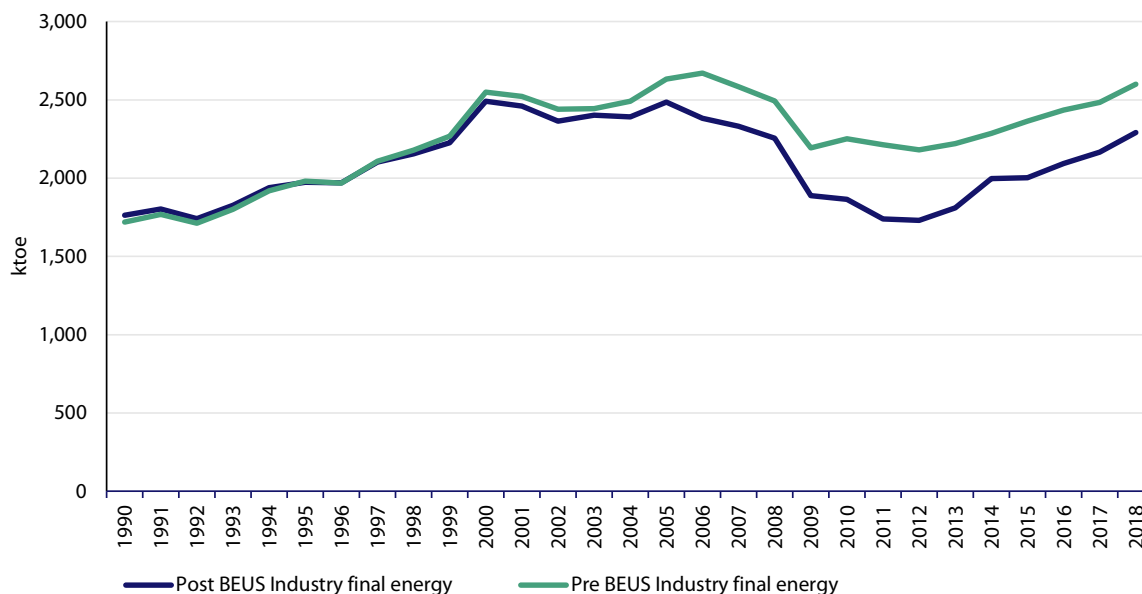


## 5 Energy use by Sector

### 5.1 Industry

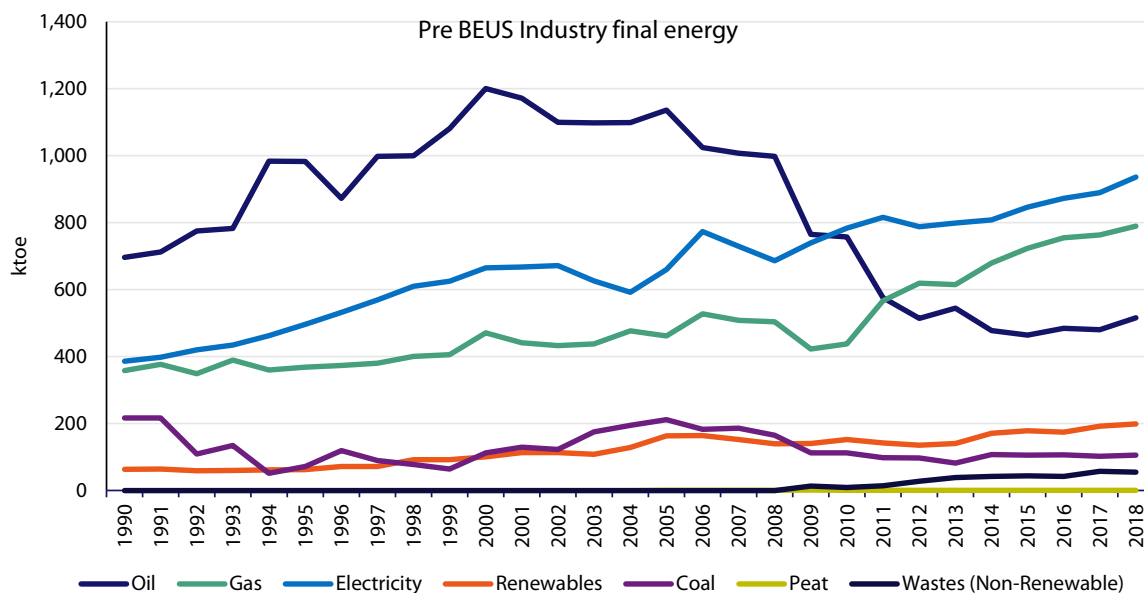
Figure 80 shows the change in overall industry energy use resulting from the revisions. Industry energy use is higher initially due to the addition of construction, but lower in all years from 1997 on. The largest difference is in 2011 where the revised energy balance figure for industry final energy use is 21% lower than the previous estimate. For 2018 the revised figure is 12% lower.

**Figure 80: Industry final energy, old and revised Energy Balance estimates.**

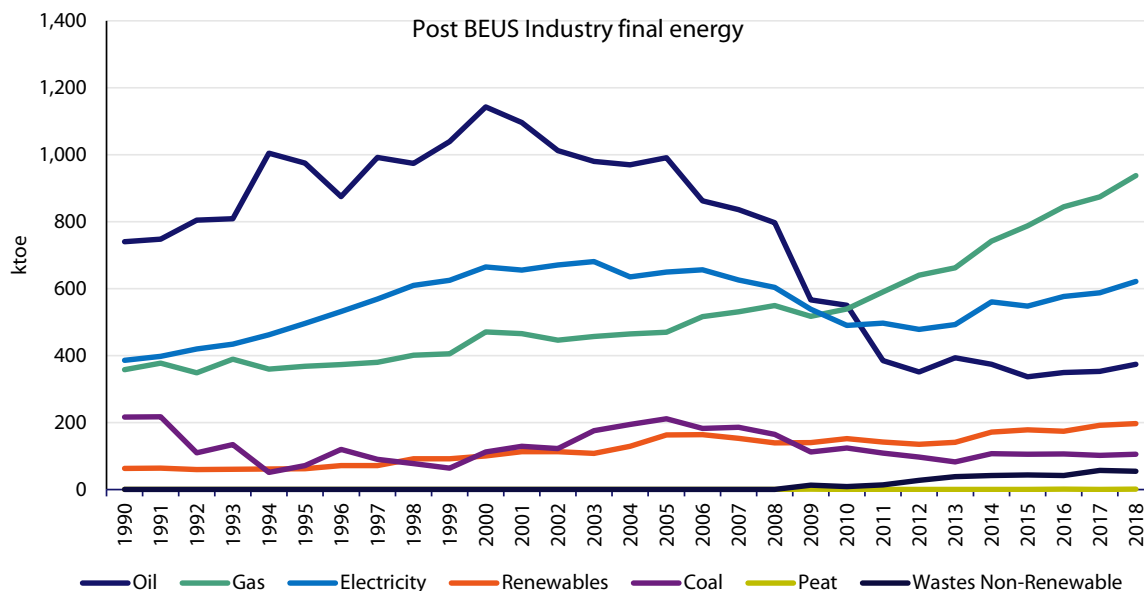


The before and after breakdown of industry final energy use by fuel type is given in Figure 81 and Figure 82, and the year to year difference in energy by fuel type between the old and new estimates are shown in Figure 83. The lower overall energy use is as a result of lower oil and electricity use in the revised estimates, offset somewhat by an increase in the estimate of gas use. Figure 84 highlights the breakdown of industry energy use by fuel in 2018 before and after the revisions side by side. Gas is now the dominant fuel in industry accounting for 41% of industry energy use in 2018, compared to 30% in the old estimate. The share of electricity of industry final energy use in 2018 is now 27%, compared to 36% in the old estimate.

**Figure 81: Old Energy Balance industry final energy by fuel**

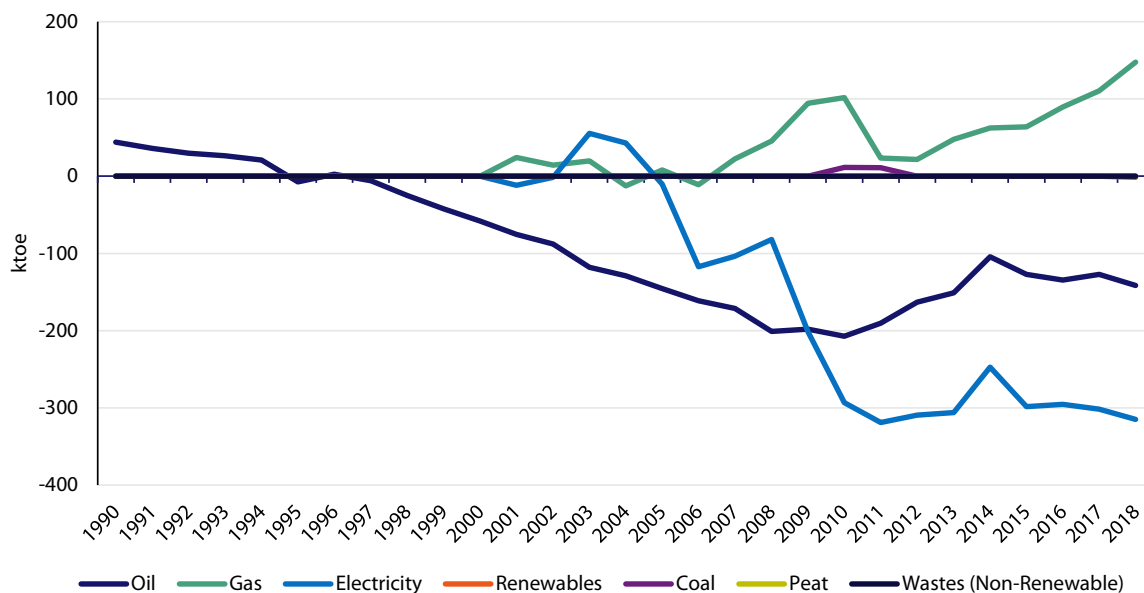


**Figure 82: Revised post –BEUS Energy Balance industry final energy by fuel**

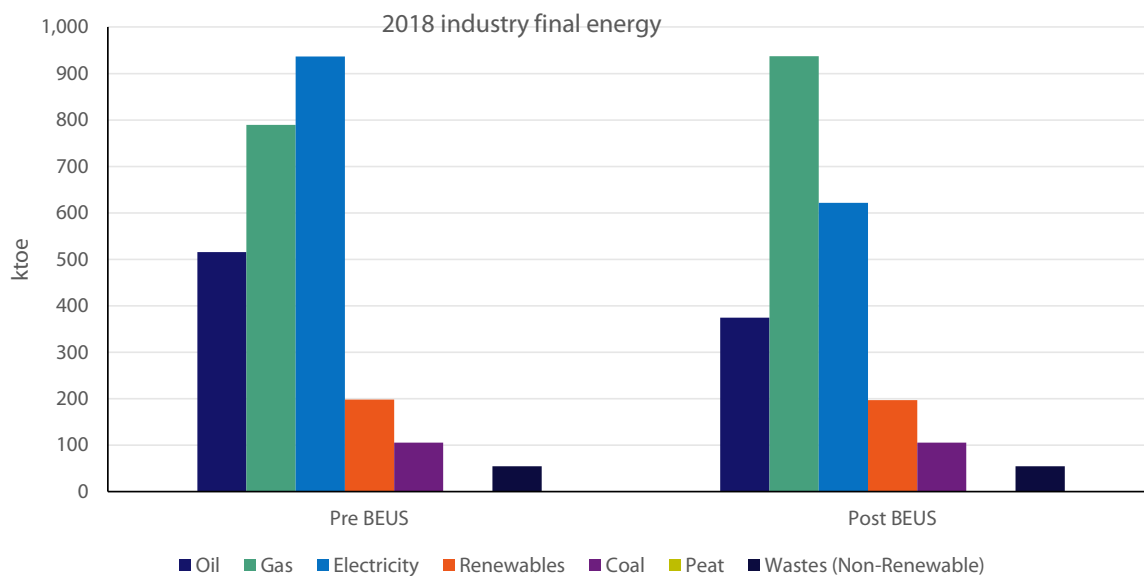




**Figure 83: Change in industry final energy use by fuel type resulting from revisions**



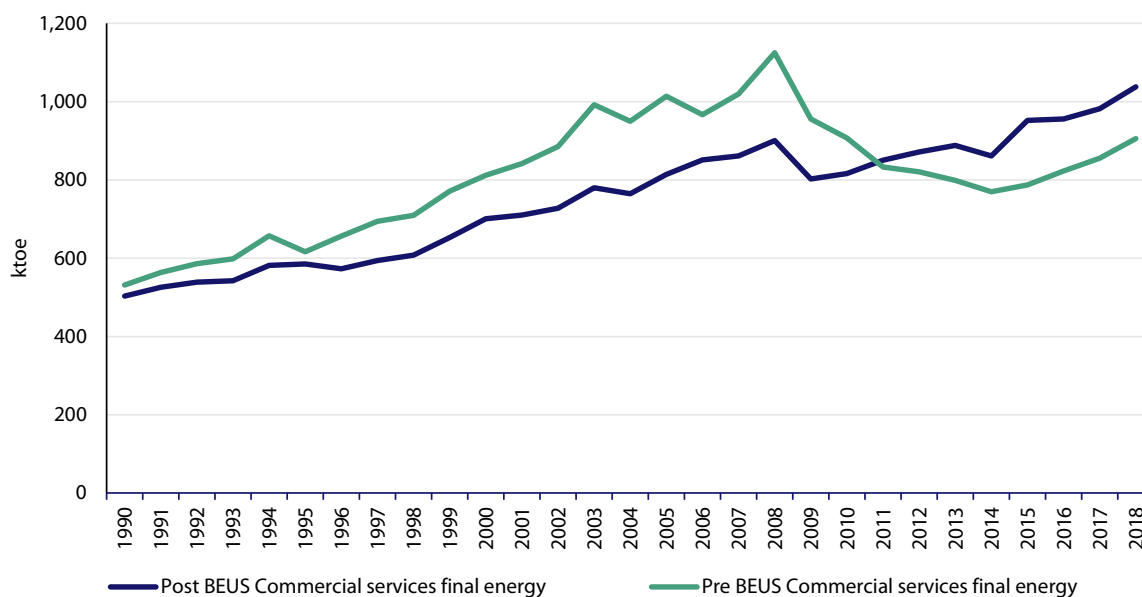
**Figure 84: 2018 industry final energy by fuel, old and revised Energy Balance estimates**



## 5.2 Commercial services

Figure 85 shows the change in overall commercial services energy use resulting from the revisions. The revised commercial services energy use is lower from 1990 to 2010 and higher from 2011 to 2018. For 2018 the revised figure is 15% higher.

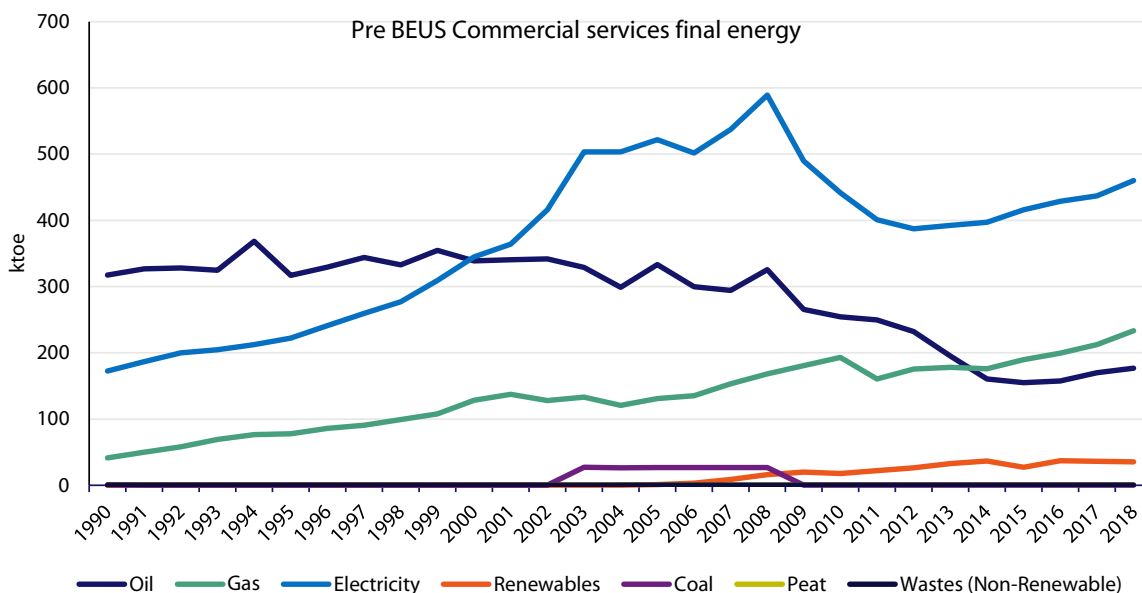
**Figure 85: Commercial services final energy, old and revised Energy Balance estimates.**



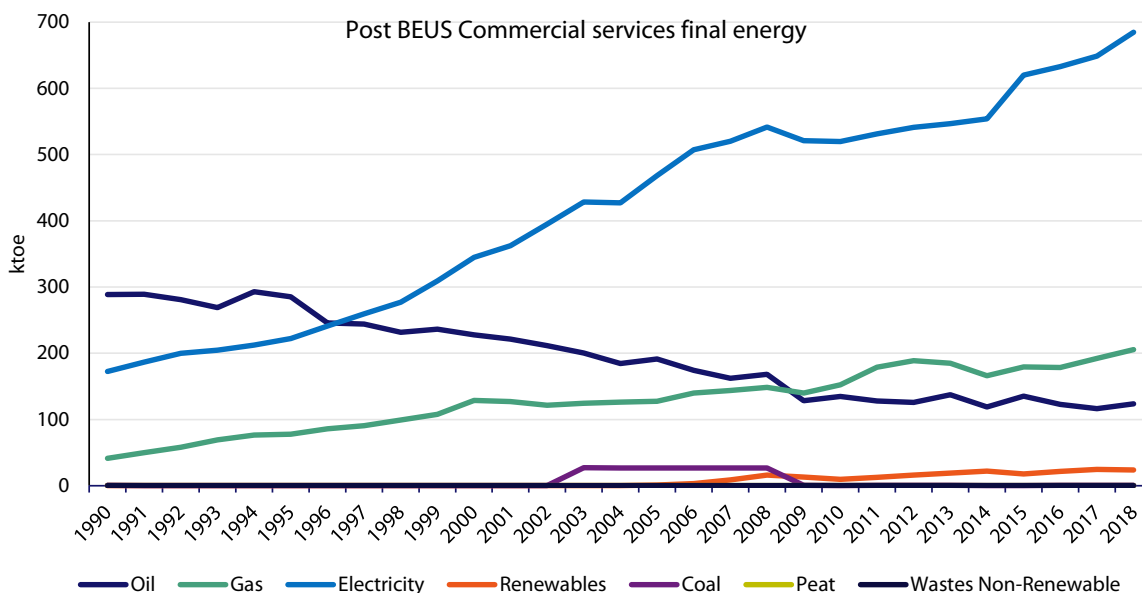
The before and after breakdown of commercial services final energy use by fuel type is given in Figure 86 and Figure 87, and the year to year difference in energy by fuel type between the old and new estimates are shown in Figure 88. The lower overall energy use from 1990 to 2010 is as a result of lower oil use, in particular gasoil. From 2009 onwards the revised data shows higher electricity use in commercial services, and the difference in oil use reduces, leading to overall higher energy use for the sector from 2011 in the revised estimates. In 2018 revised electricity use in the sector is 49% higher than the previous estimate, and overall energy use in the sector is 15% higher.

Figure 89 highlights the breakdown of commercial services energy use by fuel in 2018 before and after the revisions side by side. The share of electricity in commercial services energy use in 2018 is now 66%, compared to 51% in the old estimate. Gas remains the second largest fuel in the sector, but its share is reduced to 20% in 2018, compared to 26% in the old estimate.

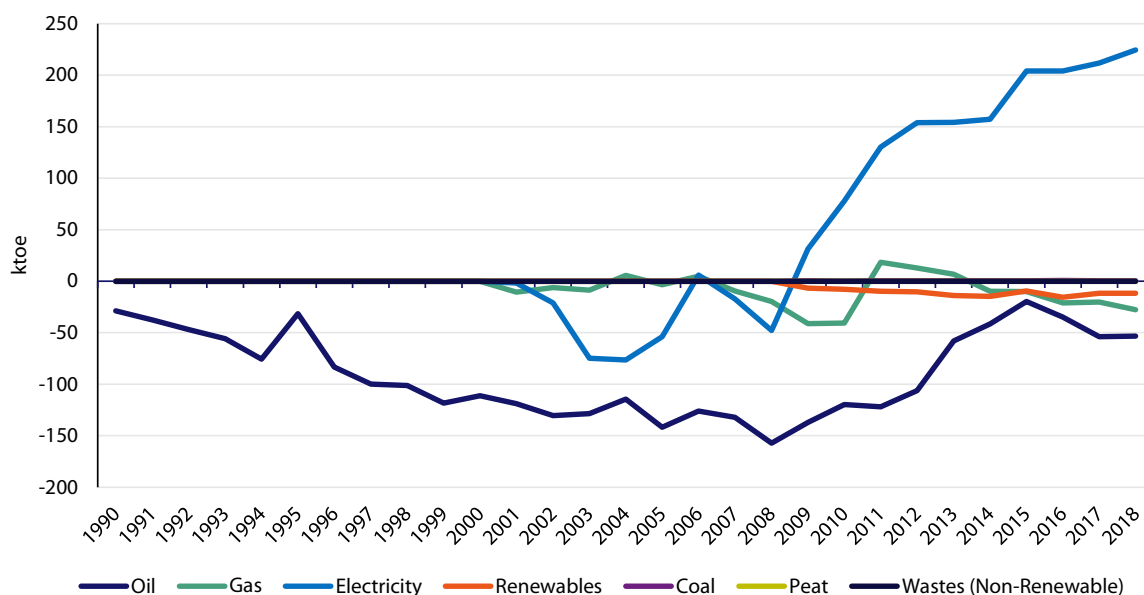
**Figure 86: Old Energy Balance commercial services final energy by fuel**



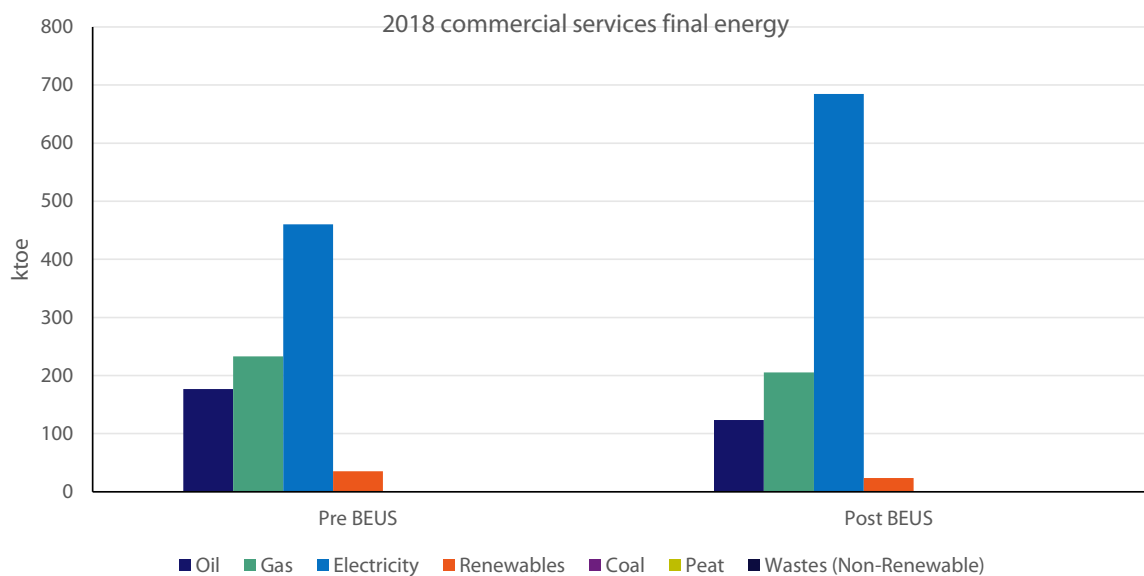
**Figure 87: Revised post –BEUS Energy Balance commercial services final energy by fuel**



**Figure 88: Change in commercial services final energy use by fuel type resulting from revisions**



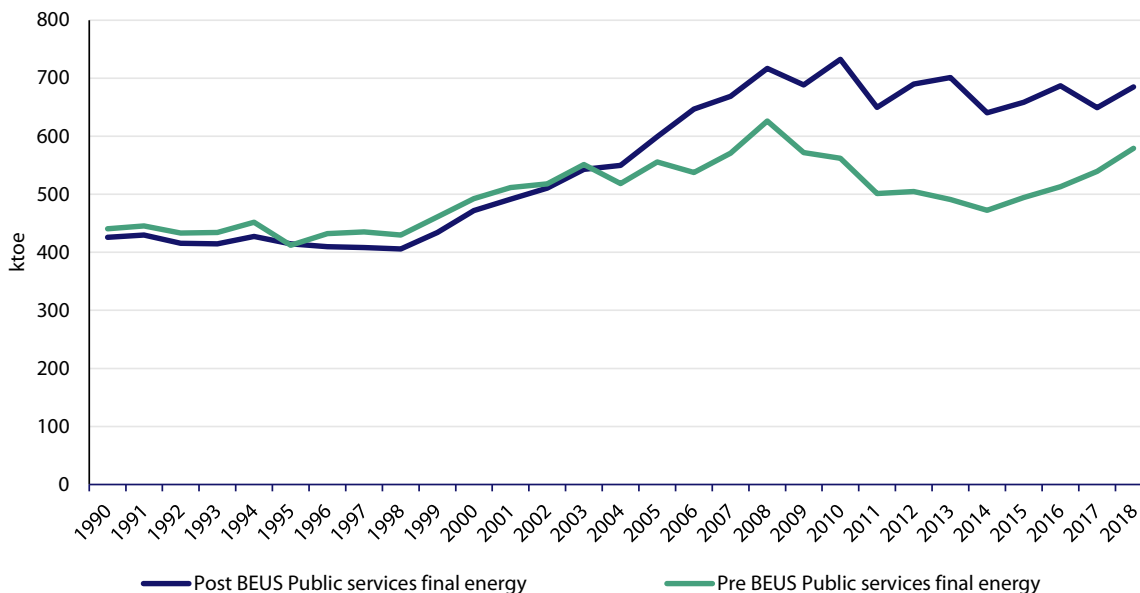
**Figure 89: 2018 commercial services final energy by fuel, old and revised Energy Balance estimates**



### 5.3 Public services

Figure 90 shows the change in overall public sector energy use resulting from the revisions. The revised public services energy use shows only minor differences up to 2003, but is higher from 2004 on. The largest difference is in 2013 where the revised estimate is 40% higher than the old estimate. In 2018 the revised estimate is 16% higher.

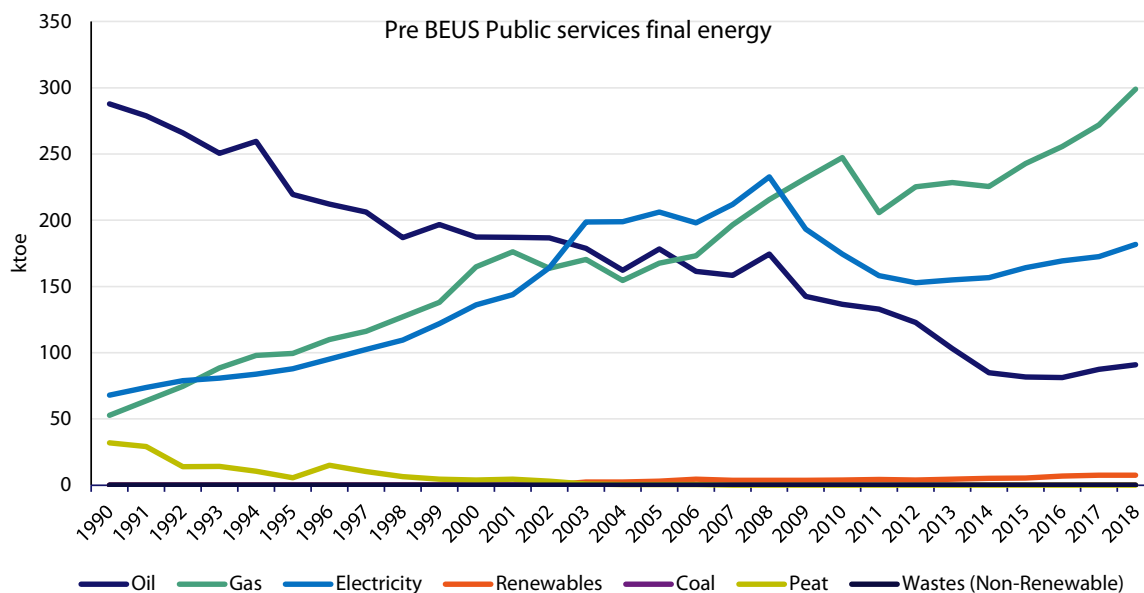
**Figure 90: Public services final energy, old and revised Energy Balance estimates.**



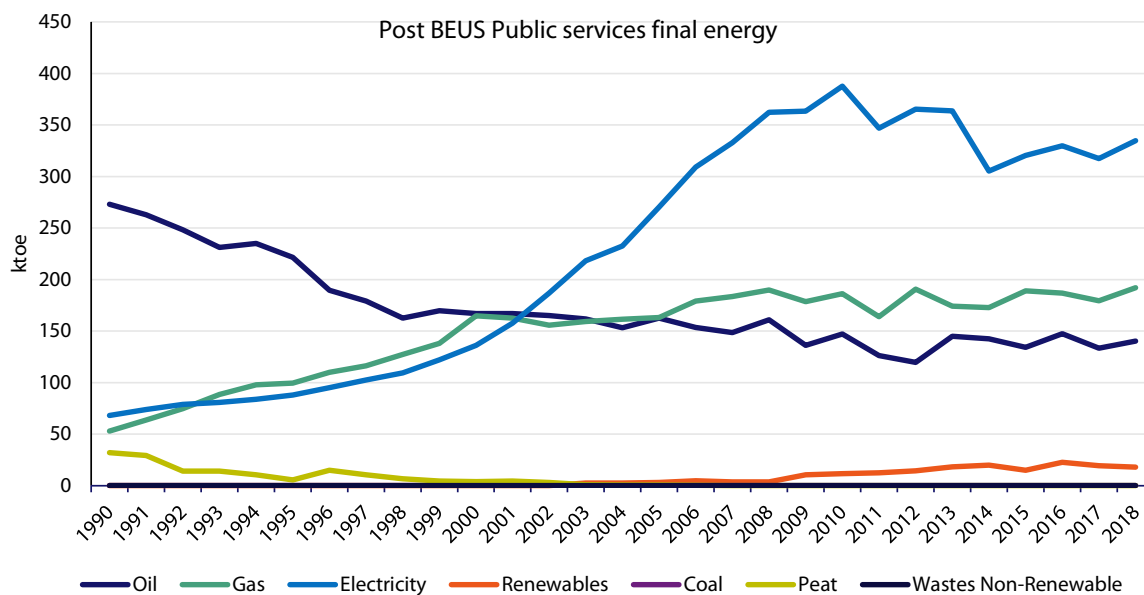
The before and after breakdown of public services final energy use by fuel type is given in Figure 91 and Figure 92, and the year to year difference in energy by fuel type between the old and new estimates are shown in Figure 93. The increase in energy use from 2004 onwards is mostly due to increased electricity use, though oil use also increases after 2013. Gas use in the sector is lower from 2007 on in the revised estimate. In 2018 revised electricity use in the sector is 85% higher than the previous estimate, oil use is 55% higher, and gas use is 36% lower.

Figure 94 highlights the breakdown of public services energy use by fuel in 2018 before and after the revisions side by side. The share of electricity in public services energy use in 2018 is now 50%, compared to 31% in the old estimate. The share of gas has fallen to 29% in 2018, compared to 52% in the old estimate.

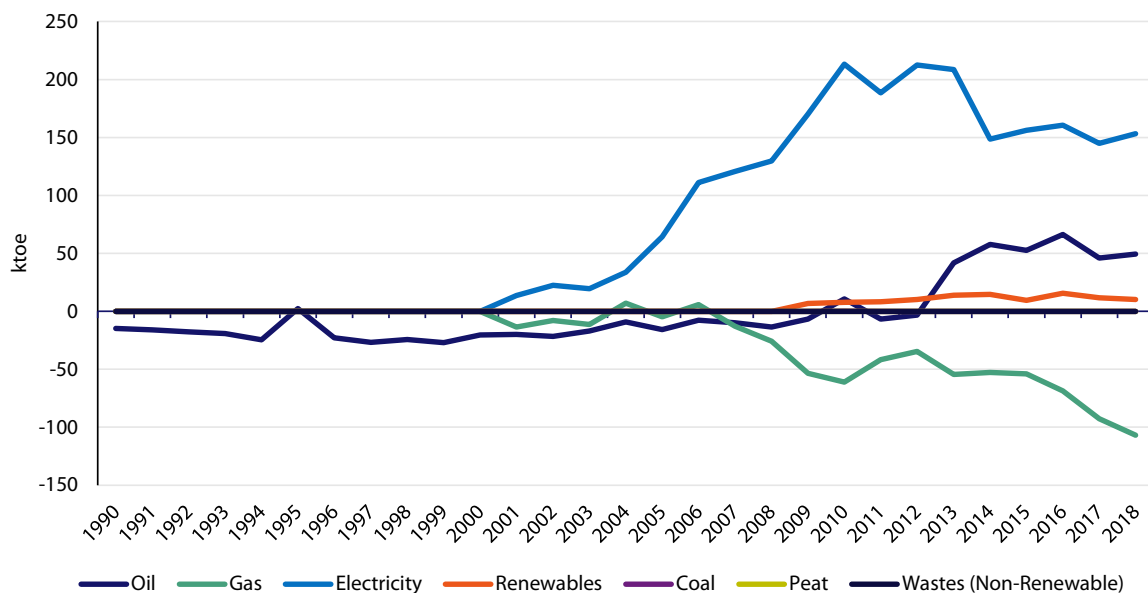
**Figure 91: Old Energy Balance public services final energy by fuel**



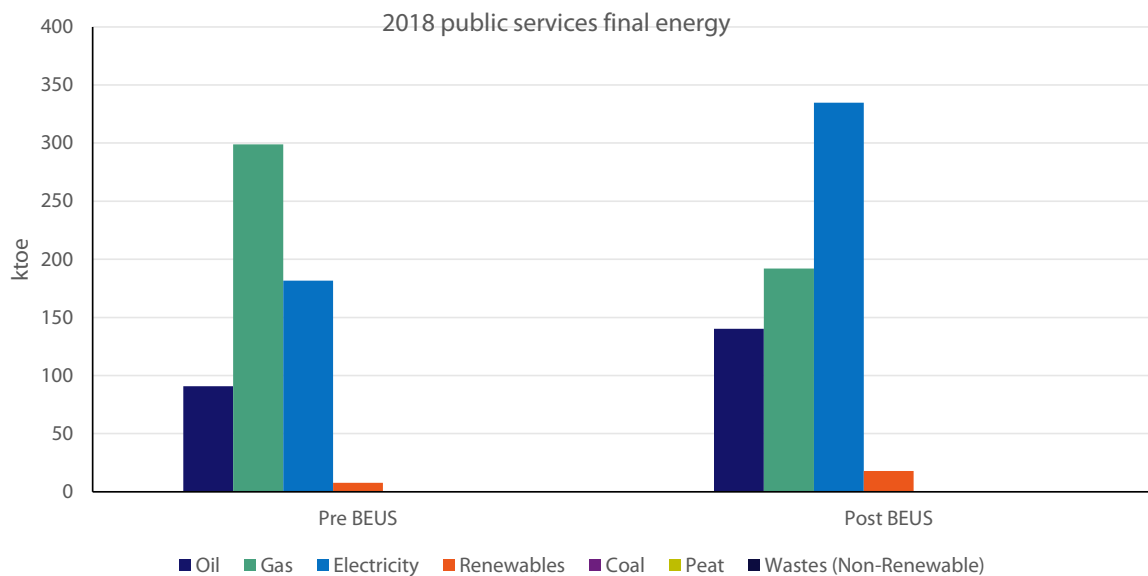
**Figure 92: Revised post –BEUS Energy Balance public services final energy by fuel**



**Figure 93: Change in public services final energy use by fuel type resulting from revisions**



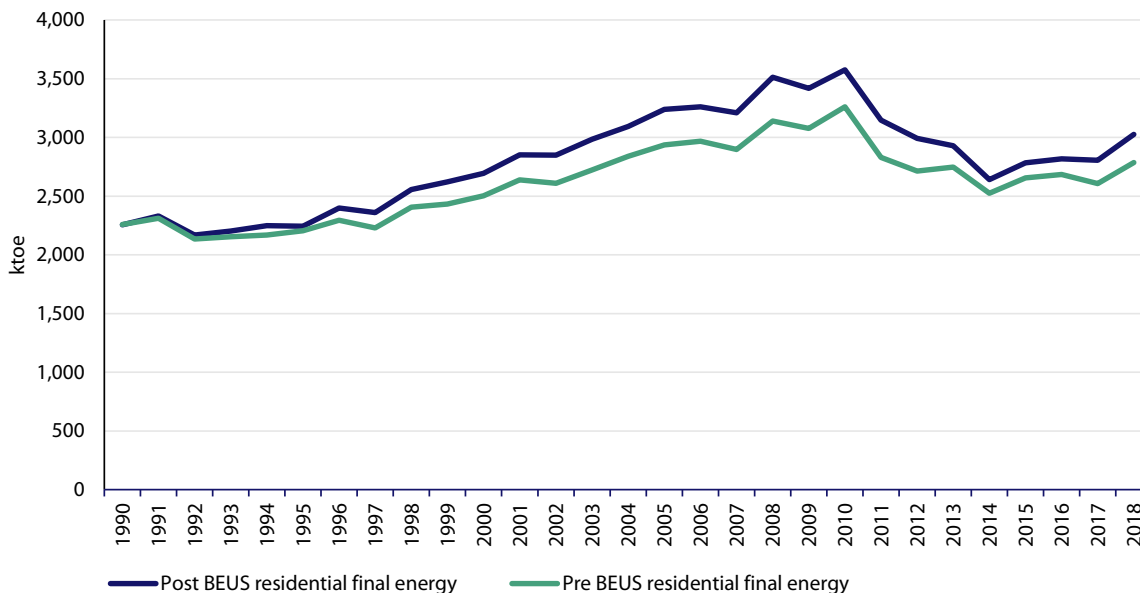
**Figure 94: 2018 public services final energy by fuel, old and revised Energy Balance estimates**



## 5.4 Residential

Figure 95 shows the change in overall residential energy use resulting from the revisions. The revised residential energy use is higher in almost all years, with the exception of 2014 and 2015 where it is marginally lower. The greatest difference is for 2008 where the revised figure is 12% higher than the previous estimate. In 2018 the revised estimate is 9% higher.

**Figure 95: Residential final energy, old and revised Energy Balance estimates.**



The before and after breakdown of residential final energy use by fuel type is given in Figure 96 and Figure 97, and the year to year difference in energy by fuel type between the old and new estimates are shown in Figure 98. The increase in energy use from 1991 to 2013 is due to an increase in oil use, in particular gasoil. This gasoil use has been reallocated to residential from industry and services based on the BEUS data. The largest difference is for 2008 when the revised estimate of residential oil use is 31% higher than previous.

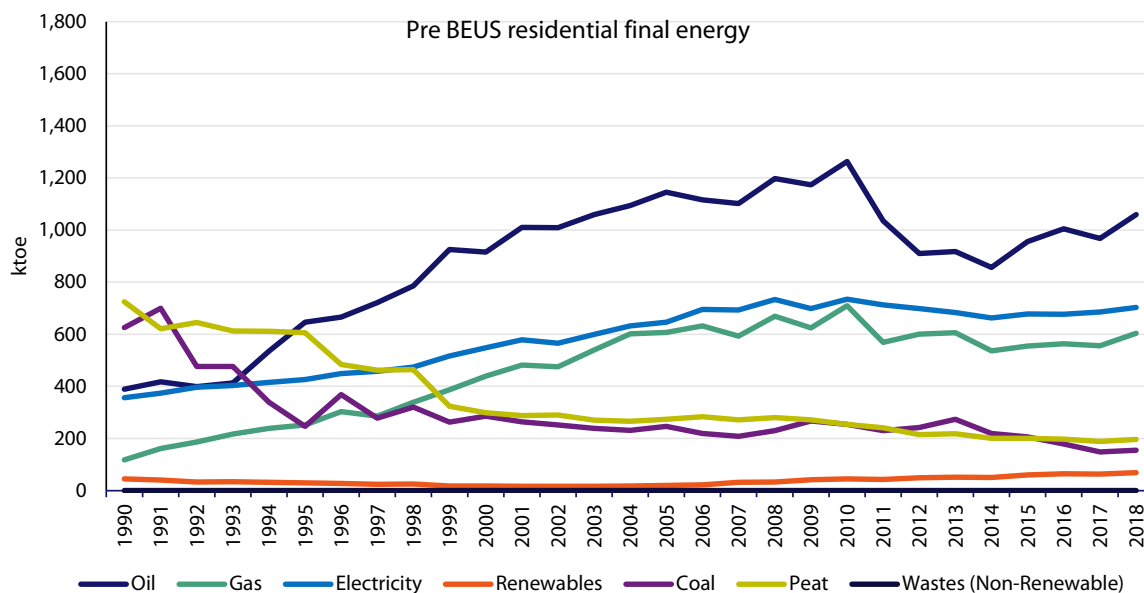
The old estimate of residential oil use showed a fall of 32% between the peak in 2010 and the low in 2014. The effect of reallocating oil use to the residential sector following revisions to industry and services oil use has been to amplify this trend. Residential oil use is now estimated to have reduced by 40% between 2010 and 2014.

There other notable change to residential energy use is a revision to residential coal use from 2014. This is unrelated to the BEUS and is due to making use of CSO trade statistics. There has also been a minor change in the estimate of renewable energy use, due to a change in the estimate of untraded wood, unlinked to the BEUS.

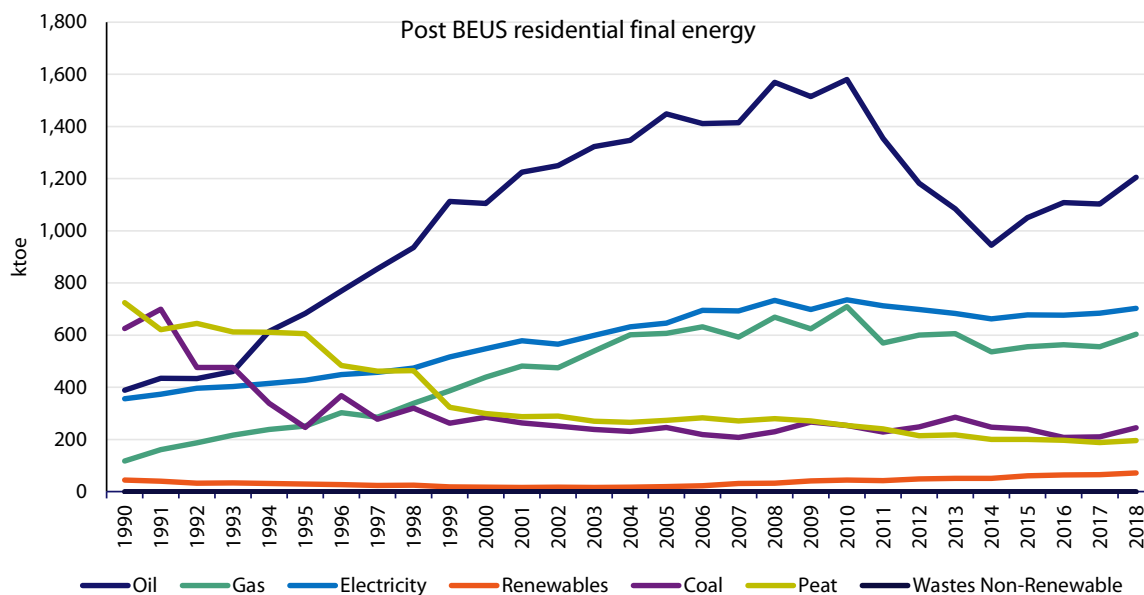
Figure 99 highlights the breakdown of residential energy use by fuel in 2018 before and after the revisions side by side.



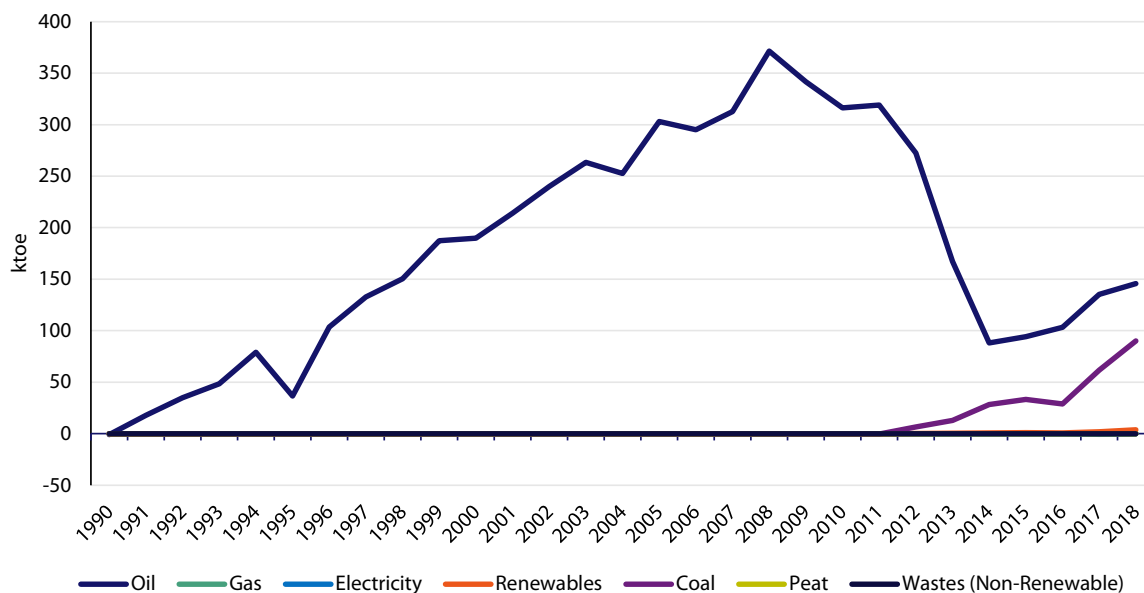
**Figure 96: Old Energy Balance residential final energy by fuel**



**Figure 97: Revised post –BEUS Energy Balance residential final energy by fuel**



**Figure 98: Change in residential final energy use by fuel type resulting from revisions**



**Figure 99: 2018 residential final energy by fuel, old and revised Energy Balance estimates**

