



Energy End-Use in Ireland

Study Summary Report

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in association with

AEA Energy & Environment



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Executive Summary

This report was prepared by Byrne Ó Cléirigh (BÓC) and AEA Energy & Environment (AEA) for Sustainable Energy Ireland (SEI) as part of an assignment to profile energy end-use in Ireland. The project team catalogued existing sources of data on energy end-use in the industrial, services and domestic (residential) sectors and developed a database that provides information on energy end-use to assist future policy formation. We populated the database with data from the catalogued sources to the extent possible with limited data and made estimates where there was no existing data. We also identified and developed recommendations for SEI to improve the collection and collation of future energy end-use data in order to provide more complete information over time.

BÓC / AEA were requested by SEI to focus exclusively on primary fuel and electricity consumption in the three listed sectors. Neither the transport nor the power generation sectors were included in the scope of this assignment. The principal output from the work is a database of energy end-use in Ireland.

This summary report describes the main data sources researched, outlines the structure of the database and presents a snapshot of energy end-use in Ireland – as captured in the database.

Data Confidentiality

Most of the data used was provided on a confidential basis to SEI. Therefore, all entity level data, i.e. all energy consumption data presented in the database for specific, named sites (organisations) is confidential to SEI and will not be published or revealed to other parties.

The project team derived summary data from the database for presentation in this summary report. This data consists of consumption sub-totals for different sub-sectors and it adheres to the data confidentiality standards used by EPSSU. Some of the graphs presented have been adjusted to ensure that the data shown is compliant with these standards.

Data Sources

The project team undertook a comprehensive literature review to collate a wide variety of data sources on energy end-use in Ireland. This exercise incorporated consultations with relevant bodies including energy suppliers, the Commission for Energy Regulation, regulated meter operators, Government departments, the Environmental Protection Agency and various other public sector authorities. As

the scope of the study was limited to existing data sources, the project team did not undertake any direct surveys of energy end-use.

The team catalogued the available data sources and assessed the quality of the data contained therein, including whether it was derived from independent surveys, self-reporting or estimation etc.

The project team held extensive consultations with the CER, the ESB Meter Registration System Operator (MRSO) and BGÉ's Gas Point Registration Operator (GPRO) regarding the provision of historical electricity and gas consumption data for inclusion in the database and on an ongoing basis to SEI / EPSSU to enhance Ireland's reporting obligations and to provide inputs for several of the Authority's programmes. Both the MRSO and GPRO provided useful datasets of non-residential energy consumption aggregated at sub-sector level. We also made several recommendations to SEI to further liaise with these organisations to improve the provision of useful consumption data over time.

Unfortunately, analogous data for coal, peat, oil and renewables consumption was not available; instead the team used the data set out in the National Energy Balance and developed a number of analysis methodologies to estimate the split of consumption between different sub-sectors (non-residential) and counties (residential).

Energy consumption data is collected through a wide variety of programmes within SEI's departments. Data collation and storage ranges from ad-hoc (in individual emails or audit-type reports) to the use of bespoke databases and spreadsheets. However, this data is often stored in 'silos', i.e. separate databases or sets of data files that are not integrated into an SEI-wide data administration system. Data can become lost in these 'silos' and as a result data integration can be very difficult to accomplish. This study has cleansed, reconciled and integrated data from several 'silos'; however, the 'silos' still exist and continue to be used to store existing and new data related to various programmes.

Database Structure

The database, which has been developed in Microsoft Excel, facilitates the top-down and bottom-up profiling of energy consumption by:

- Forty fuel types (including renewables and electricity);
- Two-digit NACE code, aggregated into twenty-six sub-sectors;
- Geography (county);
- Fifteen end-use classifications (six thermal, eight non-thermal, one dual thermal / non-thermal)

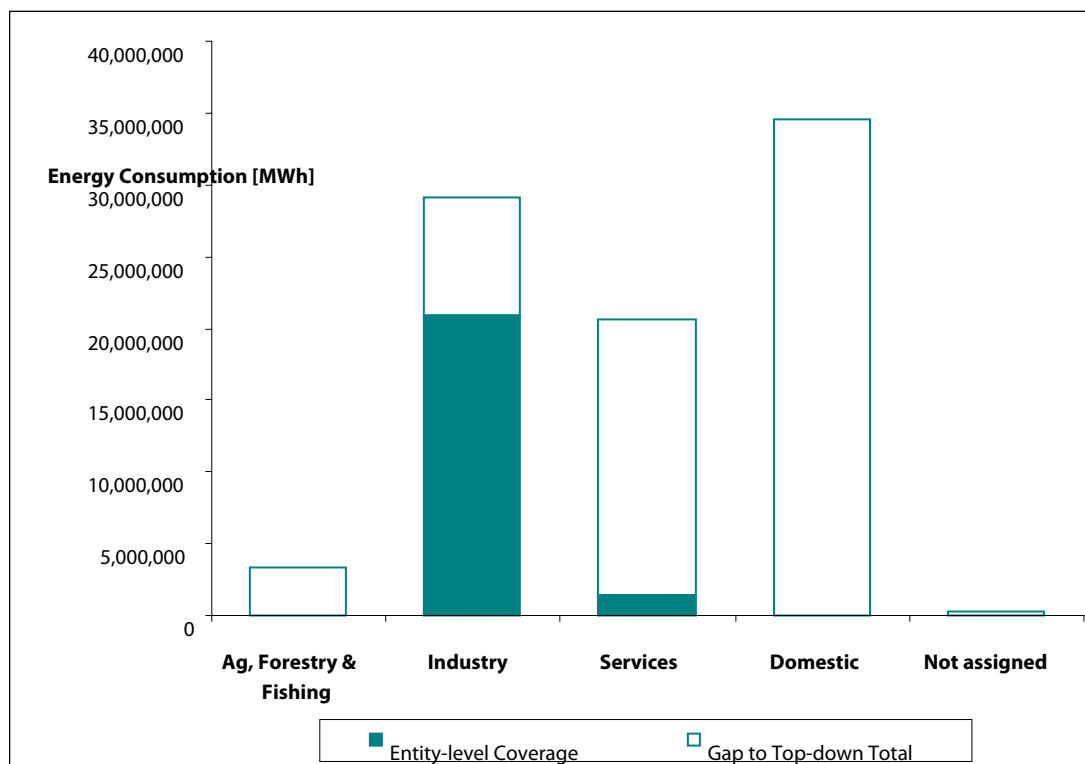
Each data item is labelled with a data year, is assigned a data quality (robustness) ranking depending on its source (e.g. metered, self-reported, estimated, etc.) and is

cross-referenced to a specific data source. Energy consumption data for additional sites can be added to the database.

Database Coverage

Entity-level data for 759 sites was entered into the database. Of these, 731 are in the industry and services sectors. Together these account for entity-level coverage rates of 72% of total energy consumption in the industry sector but just 7% in the services sector. The discrepancy in the coverage rates is unsurprising as energy consumption in the industry sector is dominated by a smaller number of large consumers while the services sector comprises a much more dispersed concentration of energy consumers. The entity-level coverage in each top-level sector is depicted in Figure A.

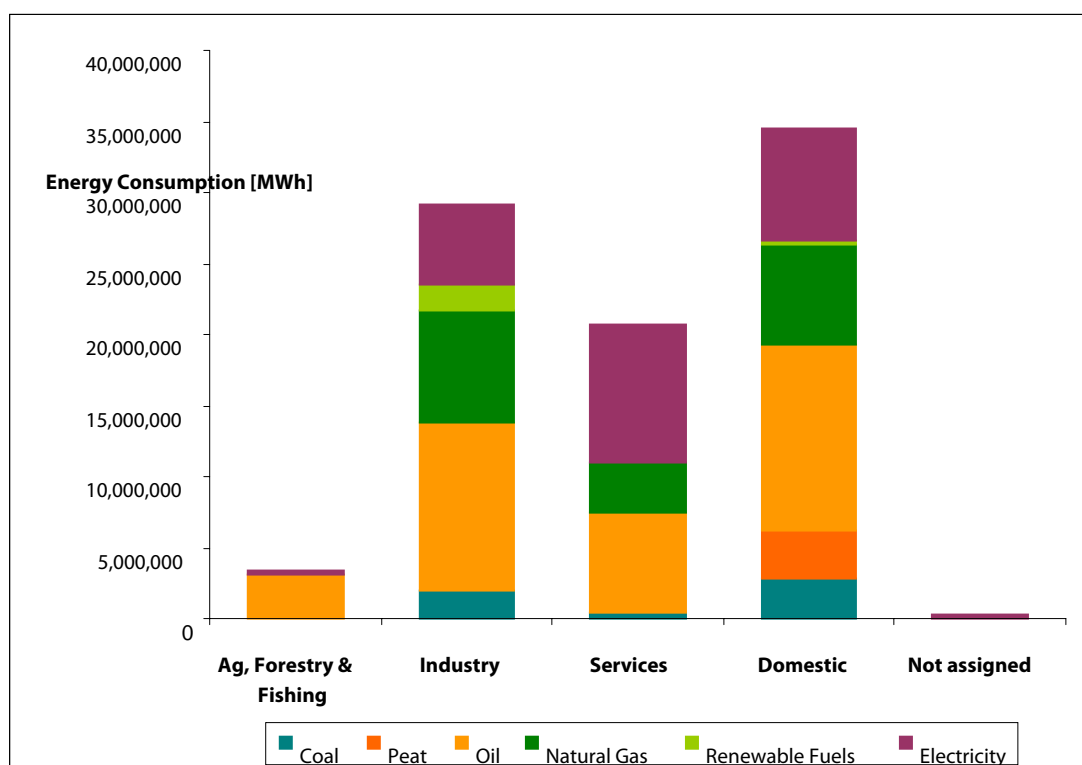
Figure A: Entity-level Coverage in each Sector



Energy End-use Profile

Figure B overleaf shows the fuel consumption totals in each sector. This data comprises entity-level consumption data plus the consultants' estimates of the shortfall to the aggregated sector totals.

Figure B: Fuel Split in each Sector



Originally, the project team’s intention was to use site-specific end-use split information for calculating the thermal / non-thermal end-use split. However, our research of the various data sources revealed that there is very little actual data available on end-use split. As a proxy for actual data, we applied ‘typical’ end-use split data for different end-use sectors. The majority of the typical data was sourced from the UK’s Carbon Trust programme. These data are typical of representative end-use splits for many of the industry and service sub-sectors addressed in this project, rather than actual splits for specific entities.

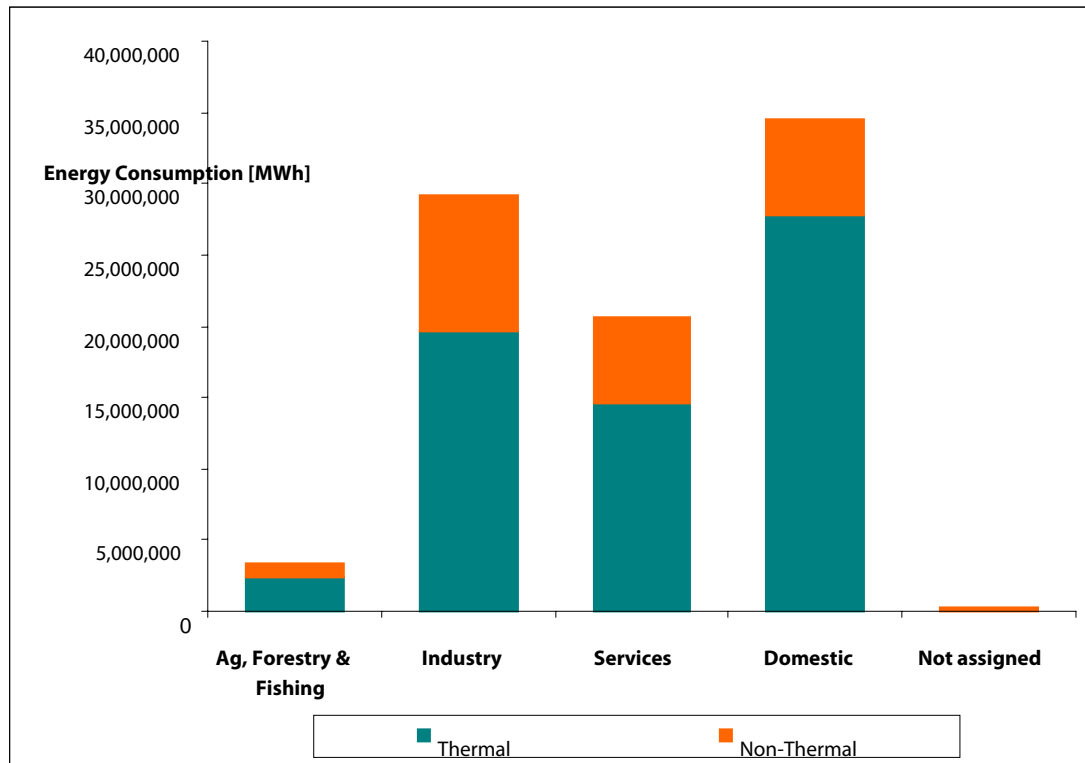
The split between thermal and non-thermal uses of energy is most relevant to the industry sector. Along with high-temperature and process-specific applications, there are considerable quantities of steam raised for technical applications, as well as space heating and hot-water generation. Non-thermal electrical uses are predominantly for motor applications, including pumps, fans, compressors (i.e. fluid handling, refrigeration) and motive power (e.g. drives, conveyors, etc).

In the services sector, thermal uses are predominantly for space heating and hot-water generation, although there is some process / low temperature technical applications and steam raising for technical applications in some hospitals, hotels, restaurants and catering. Non-thermal electrical uses are predominantly for lighting and office equipment. As with industry, HVAC can be considered to be part thermal, part non-thermal. This is recognised as an (increasingly) important energy centre for many offices and buildings, shops, hospitals and other sub-sectors. The majority of fossil fuel consumption in the domestic sector is for thermal use, predominantly for space and water heating. The remainder is used for cooking. Electricity accounts for all non-thermal uses including lighting, domestic /

kitchen appliances, home entertainment and other household goods as well as for some space / water heating.

The thermal / non-thermal fuel split of energy consumption in the top-level sectors is presented in Figure C.

Figure C: End-use Split in each Sector



Geographical Consumption Profile

The database facilitates the geographical classification of entity-level energy consumption data according to provinces, counties, local authority areas and Dublin postal districts. The database structure can also accommodate detailed locational data for individual entity records in the form of National Grid co-ordinates. Unfortunately, there were no datasets available to the project team that contain grid co-ordinate and energy consumption data for specific sites.

The ESB MRSO and BGÉ GPRO provided domestic (residential) electricity and natural gas consumption figures respectively for 2005 and 2006. In the absence of residence-level fuel consumption data in the domestic sector we developed and implemented a methodology to estimate the domestic level fuel consumption split on a geographic (county) basis in Ireland. This methodology incorporated census data returned at Local Electoral Area (LEA) level. The estimated fuel-consumption split is presented in Figure D overleaf.

Figure D: Fuel Split in each County (Domestic Sector)

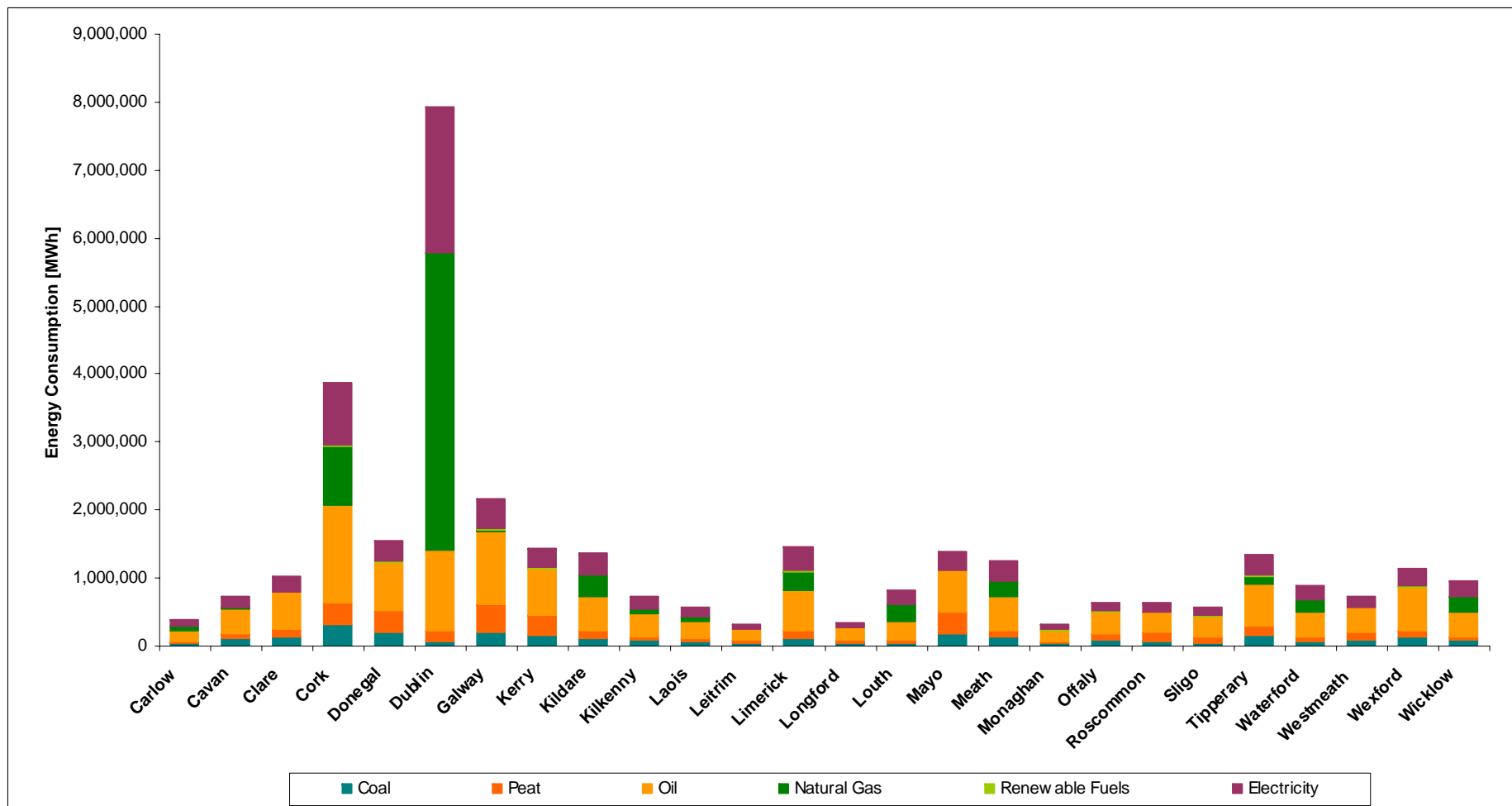


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Glossary of Acronyms

AEA	AEA Energy & Environment	GCV	Gross calorific value
AER	Annual Environmental Report	GPRO	Gas Point Registration Operator
AIER	Annual Installation Emissions Report	GPRN	Gas Point Registration Number
ASI	Annual Services Inquiry	HFO	Heavy fuel oil
BEMS	Building Energy Management System	HSE	Health Services Executive
BGE	Bord Gáis Éireann	HVAC	Heating, ventilation & air-conditioning
BÓC	Byrne Ó Cléirigh	IPPC	Integrated Pollution Prevention and Control
CCGT	Combined cycle gas turbine	KWh	Kilowatt hour
CER	Commission for Energy Regulation	LDM	Large Daily Metered (gas)
CHP	Combined Heat & power	LEA	Local Electoral Area
CIP	Census of Industrial Production	LIEN	Large Industry Energy Network
CPOR	Coal, peat, oil & renewable energy	LPG	Liquid Petroleum gas
CSO	Central Statistics Office	MPRN	Meter Point Registration Number
CT	Carbon Trust	MRSO	Meter Registration System Operator
DM	Daily Metered (gas)	MWh	Megawatt hour
DB	Database	NCV	Net calorific value
DE&S	Department of Education and Science	NDM	Non-Daily Metered (gas)
DUKES	Digest of UK Energy Statistics	NESS	National Energy Statistical System
ED	Electoral Division	OPW	Office of Public Works
EPA	Environmental Protection Agency	SAPS	Small Area Population Statistics
EPSSU	Energy Policy Statistical Support Unit	SEI	Sustainable Energy Ireland
ERG	Energy Research Group	SME	Small & Medium Enterprises
ETS	Emissions Trading scheme	UCD	University College Dublin
ESB	Electricity Supply Board		
FHE	Further & Higher Education		

1.0 Introduction

This summary report was prepared by Byrne Ó Cléirigh (BÓC) and AEA Energy & Environment (AEA) for Sustainable Energy Ireland (SEI) as part of an assignment to profile energy end-use in Ireland. The project team catalogued existing sources of data on energy end-use in the industrial, services and domestic (residential) sectors and developed a database that provides information on energy end-use to assist future policy formation. We populated the database with data from the catalogued sources to the extent possible with limited data and made estimates where there was no existing data. We also identified and developed recommendations for SEI to improve the collection and collation of future energy end-use data in order to provide more complete information over time.

BÓC / AEA were requested by SEI to focus exclusively on primary fuel and electricity consumption in the three sectors. Neither the transport nor the power generation sectors were included in the scope of this assignment. The principal output from the work is a database of energy end-use in Ireland.

Our main objectives were to:

1. Identify and catalogue relevant sources of data on energy end-use in Ireland;
2. Assess and comment on the robustness of the different data sources;
3. Complete an initial inventory from existing data where possible;
4. Develop estimates of energy consumption – that are clearly flagged as such – to bridge the gap between data drawn from existing sources and the known total energy consumption in different sectors in order to develop a comprehensive, robust and up-to-date snapshot of energy consumption in Ireland;
5. Profile the energy consumption by sector, by geography and by end-use, with particular emphasis on the thermal / non-thermal split;
6. Identify missing information that would be required to complete a full inventory, and to recommend actions for obtaining such information;

This information can be used by SEI to shape policies and programmes to reduce energy consumption and carbon dioxide emissions.

This summary report describes the main data sources researched, outlines the structure of the database and presents a snapshot of energy end-use in Ireland – as captured in the database.

2.0 Database Structure

2.1 Overview

The database¹ facilitates the top-down and bottom-up profiling of energy consumption by fuel type, end-use and geography (county) in the industrial, services and domestic (residential) sectors in Ireland, and in various sub-sectoral divisions of these sectors (NACE codes). Each data item is labelled with a data year, is assigned a data quality (robustness) ranking depending on its source (e.g. metered, self-reported, estimated, etc.) and is cross-referenced to a specific data source. Energy consumption data for additional sites can be easily added to the database.

2.2 Sectoral Classification

The database includes the sectoral classification of entity-level data, generally using two digit NACE Codes. The full breakdown of the NACE Codes that is incorporated into the database is set out in Annex A1. A significant proportion of large energy users fall into a small number of NACE sectors, viz.: food & drink, pharma-chemical, non-metallic mineral products, electronic components and metals.

The database aggregates consumption into the twenty-six sub-sectors set out in Table 1. This breakdown is broadly consistent with, but not identical to, the approach used by EPSSU for the preparation of the National Energy Balance and the *Energy in Ireland* publication. These sub-sectors are aggregated into five sectors, viz.: industry, services, domestic, electricity generation² and agriculture².

Table 1: Sub-sectors Classified in Database			
Sector	NACE Code(s)	Sub-sector	Comments
Agriculture ²	01, 02, 05	Agriculture, Forestry & Fisheries	
Industry	10 - 14	Mining	Includes crude oil, natural gas
Industry	15, 16	Food, Drink & Tobacco	
Industry	17 - 19	Textiles	Includes leather
Industry	20, 36	Wood & Furniture	

¹ Upon request from SEI, it was agreed that the database would be developed in MS Excel format.

² The electricity generation and agriculture sectors are not technically within the scope of this study; however, some relevant data has been included in the database for completeness.

Table 1: Sub-sectors Classified in Database			
Sector	NACE Code(s)	Sub-sector	Comments
Industry	21, 22	Pulp, Paper & Printing	
Industry	23	Refining	Oil refining - while this is treated as a standalone sub-sector in the database, it is included with the Chemicals sub-sector in the results charts presented in this report (see §3.1)
Industry	24	Chemicals	
Industry	25	Rubber & Plastics	
Industry	26	Non-metallic Minerals	Includes cement, glass, building materials
Industry	27, 28	Metals	Includes alumina refining
Industry	29 – 35	Machinery, Equipment & Other Manufacturing	Includes some unclassified 'large industry', 'small industry'
Industry	37, 41, 60, 90	Utilities	Includes recycling, water supply, waste water treatment, pipelines
Electricity ²	40	Electricity	Including fuel consumption attributable to the electricity exported from the Aughinish Alumina CHP plant
Industry	45	Construction	
Services	50, 51, 71	Wholesale	Includes motor vehicle sales & repair, distribution
Services	52	Retail	
Services	55	Hotels & Catering	Includes hotels, restaurants, public houses, catering, take-aways
Services	60 – 63	Transport Support	Includes airports
Services	64 - 67, 70, 72 - 74, 91, 93, 99	Offices & Services	Includes post & telecoms, insurance & pensions, finance (auxiliary), real estate, computer & related activities, R&D, other business activities, membership organisations, other service activities and extra-territorial organisations
Services	75	Public Administration	Includes central & local government, related agencies, defence, police, prisons, courts

Table 1: Sub-sectors Classified in Database			
Sector	NACE Code(s)	Sub-sector	Comments
Services	80	Education	
Services	85	Health & Social Work	
Services	92	Sport & Culture	
Domestic	95, 96, 97, 98	Residential	
-	-	Not Assigned (-)	

2.3 Fuel Classification

The database structure facilitates an assessment of the breakdown of fuel use by fuel type on both an entity-level and an aggregated basis. Energy consumption may be entered for the following fuel types:

- Coal fuels (5 fuel sub-types);
- Peat fuels (4 fuel sub-types);
- Oil fuels (14 fuel sub-types);
- Natural gas;
- Renewable fuels (fuel sub-types as per IEA / Eurostat publications);
- Non-thermal Onsite Electricity Generation (6 'fuel' sub-types, e.g. wind);
- Electricity.

The full list of fuel types and sub-types for which data can be entered into the database is set out in Annex A2. This breakdown is consistent with that used by EPSSU in for the National Energy Balance calculations³.

Notwithstanding the inclusion of renewable energy fuel classifications, there are several renewable energy 'fuels' that are not captured in the database, viz.:

- Wood and other thermal waste materials used for heating, where neither the energy-input nor the energy-output is recorded, such as: wood waste used for residential heating or in hospitality sector (e.g. pub fires); industrial or commercial wastes used for waste-heat boilers (e.g. paper, furniture, food &

³ *Energy in Ireland 1990 – 2006: 2007 Report*, SEI EPSSU (2006)

drink sectors, hospital waste boilers, etc). There is little systematic gathering of the raw material data or heat data.

- ‘Intangible’ renewable energy sources not used to generate electricity, such as: wind energy for driving machinery (e.g. mechanical windmills) or drying (e.g. clothes lines); solar energy for radiant heating / drying (e.g. pre-drying of foodstuffs, minerals or biomass); passive solar heating of hot water, washing lines; solar energy for lighting – both direct (e.g. natural lighting through windows or light-pipes) and indirect (e.g. PV cells for charging batteries); geothermal energy used to reduce thermal heating requirements.

For all of these, neither the energy-in nor the energy generated is recorded (after all, it is regarded as a ‘free’ source or even a convenient way of getting rid of a potential liability, such as waste).

These typically non-quantified energy consumptions all represent an important - but largely unseen – element of Ireland’s energy consumption profile.

2.4 Geographical Location

2.4.1 Area Classification

Addresses are included for entity-level data records in the database. The database facilitates the geographical classification of the data according to the geographical areas set out below in descending order of magnitude (area):

- 4 provinces (Leinster, Munster, Ulster & Connacht);
- 26 counties in the Republic of Ireland;
- 34 local authority jurisdictions in the Republic of Ireland (county and city council areas; see full list in Annex A3);
- 22 Dublin postal districts (Dublin 1 – 18, 6W, 20, 22 & 24).

2.4.2 Geographical Classification of Domestic Sector Fuel Consumption

The database contains aggregated energy consumption for the domestic sector at the Local Electoral Area (LEA) level. Local Electoral Areas are geographical and electoral subdivisions of the 34 local authority jurisdictions. There are 180 LEAs in total (see Annex A4).

The methodology implemented to classify the fuel consumption into LEAs is described in §3.9.

2.4.3 Compatibility with Geographical Information Systems (GIS)

The database structure can accommodate detailed locational data for individual entity records in the form of National Grid co-ordinates⁴. This will facilitate the importation of records into GIS packages.

2.5 Energy End-Uses & Applications

2.5.1 Thermal Versus Non-Thermal End-Use

The database structure enables the classification of energy consumption (entity-level or clustered) by end-use. For example, natural gas is used for thermal end-uses only, with the exception of CHP (both electricity and heat) and natural gas transmission (compression). Gas is by far the biggest primary fuel source for CHP in Ireland, albeit gas-fired CHP plants account for only 4.6% of total gas consumption⁵. The treatment of CHP is discussed in §2.7.

Coal, peat and oil are all used for thermal applications only, with the exception of a very small amount of CHP (174,910 MWh_{TH}). Electricity is used for both thermal and non-thermal applications and as such is the most difficult to categorise.

Renewable energy sources are used for thermal only applications (e.g. biomass boilers), electricity generation (e.g. auto-generating wind turbine at Dundalk Institute of Technology) and CHP.

2.5.2 Thermal

The database categorises the thermal energy end-use split using the following five sub-categories:

- High-temperature processes, which generally exist in the industrial sector, including glass / metals melting, cement making, etc. We have classified high-temperature processes as processes with temperatures > 500 °C.
- Low-temperature technical processes, which are also typically in industry, including technical steam applications, chemical processing and food processing. We have classified low-temperature processes as processes with temperatures ≤ 500 °C.

⁴ Integrated Pollution Prevention and Control (IPPC) Licence holders are required to submit the National Grid reference co-ordinates (4 digits) of their sites in their Annual Environmental Reports to the Environmental Protection Agency (see §3.4.5)

⁵ National Energy Balance 2006, EPSSU

- Specialist thermal applications, which may be present in the industrial or services sectors and which include thermal oxidation and waste incineration.
- Space / water heating, including direct heating and hot water boilers.
- Cooking.

2.5.3 Non-Thermal

The database categorises the non-thermal energy end-use split using the following seven sub-categories:

- Motors & drives;
- Compressed air;
- Non-thermal industry processing;
- Lighting;
- Refrigeration;
- Office equipment;
- Household domestic appliances, including audio video equipment, kitchen appliances etc.

2.5.4 Dual Thermal / Non-Thermal

HVAC is a separate end-use category in the database. As it can comprise elements both thermal and non-thermal usage, any HVAC element of end-use is split evenly when calculating an overall thermal / non-thermal breakdown.

2.6 Data Classification

2.6.1 Data Year

Where possible, the database has been populated with 2006 data. Where 2006 data is unavailable or insufficient and where relevant data for other years is available, we have incorporated same into the database. All data entries are labelled with the appropriate data year.

2.6.2 Data References

All data entered into the database is explicitly referenced with respect to the data sources catalogued in Annex A5.

2.6.3 Estimates

Most data sources researched do not include the energy end-use split corresponding to given energy consumption. In these cases, the project team estimated the end-use split for specific entities. These estimates are clearly identified as such.

The methodologies used for estimating the end-use splits in the industrial / services and domestic sectors are discussed in §3.6 & 3.10 respectively.

2.6.4 Units of Energy Consumption

The unit of energy consumption used throughout the database is the megawatt-hour (MWh). Energy values are based on Net Calorific Value (NCV), which is consistent with the approach used by EPSSU in the National Energy Balance. All units are clearly identified in the column headings of the database.

The energy consumption data set out in EPSSU publications is presented in kilotonnes of oil equivalent (ktoe) calculated on an NCV basis. The conversion factor used is 1 ktoe = 11,630 MWh.

2.6.5 Data Robustness

The database incorporates a data classification system whereby all energy consumption and end-use split data entered is assigned a robustness classification. The data robustness classifications are defined in Table 2. Classifications are applied to individual data items (e.g. the robustness of the gas consumption data in MWh for site xyz) and to the overall data quality for an entity (e.g. the overall robustness of the data entered – potentially from different sources – for site xyz).

Table 2: Data Robustness		
Classification	Interpretation for Individual Data Item	Interpretation for Overall Data Quality Classification
A - Excellent	Fully metered data, e.g. provided directly by energy suppliers, taken from meter readings or taken from invoices (bills). Verified energy consumption data submitted to EPA for EU ETS.	High capture of recent data for all fuel sources.
B - Very Good	Actual (non-verified) consumption reported for a site, e.g. energy surveys, audit reports, self-reported questionnaires (e.g. LIEN, IS 393)	Good capture of recent data for most / all major fuel sources.
C – Good	Estimation calculated from related data, e.g. EU ETS CO ₂ emissions. Questionable assignment of sectoral classification (top-down data). Estimation based on recent actual consumption data but modified for known changes.	Reasonable capture of most important fuel sources, but with some gaps, estimations and / or bottom-up calculations.
D – Moderate	Calculation based on typical energy consumption data scaled to known activity level, e.g. tonnes, units, pupils, beds etc. Top-down energy value derived from energy spend data.	Reasonable capture of some important fuel sources, but with several gaps, estimations and / or bottom-up calculations.
E – Poor	Estimation based on average or typical consumption.	Predominantly estimations or bottom-up calculations for all fuel sources.

2.7 Onsite Thermal Electricity Generation (including CHP)

CHP and other thermal onsite electricity generation units are considered to be energy conversion facilities at the industrial (or services) sites at which they operate. They are not considered as end-uses in themselves.

The CHP power generation station at Aughinish Alumina is treated as a special case because of its large electricity export capacity. The fuel consumption attributable to the electricity exported from the CHP plant is classified in the Electricity sector.

2.8 Onsite Non-thermal Electricity Generation

The electrical output from non-thermal onsite electricity generation such as auto-producing wind turbines and run of the river hydro-electric schemes can also be recorded in the database.

3.0 Data Sources

3.1 Data Confidentiality

The project team catalogued data from a wide variety of sources, including data provided on a confidential basis to SEI. All entity level data, i.e. all energy consumption data reported for specific, named sites (organisations) is confidential to SEI and will not be published or revealed to other parties.

The project team derived summary data from the database for presentation in §4.0 of this report. This data consists of consumption sub-totals for different sub-sectors and it adheres to the data confidentiality standards used by EPSSU⁶, viz.:

- All energy consumption sub-totals presented represent at least three entities;
- No single constituent entity accounts for more than 80% of a consumption sub-total;
- No two constituent entities combined account for more than 90% of a consumption sub-total.

Some of the graphs presented in this report have been adjusted to ensure that the data presented is compliant with these standards. Such data appears as blank (white) bars on the charts.

3.2 Literature & Data Source Review

The project team undertook a comprehensive literature review to collate and a wide variety of data sources on energy end-use in Ireland. This exercise included consultations with relevant bodies including energy suppliers, the Commission for Energy Regulation, regulated meter operators, Government departments, the Environmental Protection Agency and various other public sector authorities. As the scope of the study was limited to existing data sources, the project team did not undertake any direct surveys of energy end-use.

The team catalogued the available data sources and assessed the quality of the data contained therein, including whether it was derived from independent surveys, self-reporting or estimation etc. The key sources of data identified by the study team are:

1. Energy audit reports prepared for/by SEI, including through *inter alia* the Negotiated Agreements Pilot Programme;
2. Reports of energy consumption submitted to SEI by participants in various SEI programmes, e.g. the Large Industry Energy Network; in some cases, the

⁶ Based on the standards used by the Central Statistics Office.

relevant data from these reports has been collated into spreadsheets / databases;

3. EPSSU’s National Energy Balance, which is based on *inter alia* CSO derived data on energy spend
4. Reports on top-down energy consumption published by SEI, e.g. the *Energy in Ireland* series of publications;
5. Site-level greenhouse gas emissions data published by the EPA for participants in the EU Emissions Trading Scheme;
6. Detailed, site-level greenhouse gas emissions and fuel consumption data set out in the Annual Installation Emissions Reports submitted by participant sites in the EU Emissions Trading Scheme to the EPA and made available by the EPA for inspection by the general public;
7. Results from a survey of energy consumption in some service sub-sectors compiled by a third level research organisation (UCD Energy Research Group);
8. Databases of energy consumption compiled by public sector organisations for their own facilities, e.g. universities, Health Service Executive;
9. Electricity and natural gas consumption data from the regulated electricity and natural gas meter operators (see §3.3.1 & 3.3.2).

The project team complemented these catalogued energy consumption data sources with sources of other relevant data, e.g. housing statistics from Department of Environment Heritage & Local Government, census data from the CSO and various guidance documents published by the UK Carbon Trust on typical energy end-use patterns in different sectors.

Annex A5 sets out the full list of primary data sources that were identified. They are catalogued by source, relevant sector and confidentiality of data. The most important data sources are described in more detail below. The sources described in each sub-section are summarised as follows.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-xxx	xxx	Xxx	✓ or ✗

‘Ref’ refers to the source reference number in the full list of primary sources. The data robustness refers to the robustness of the energy consumption data set out in the source (see §2.6.5); if the source does not contain consumption data it is classified as {N/a} under robustness. Some data sources could not be made available to the project team – these sources are clearly identified with an ‘✗’ under ‘Available’

3.3 Industry & Services Sectors: Top-down Fuel Consumption Data

3.3.1 ESB MRSO Non-domestic Customer Data

There are approximately 200,000 non-domestic electricity customers and about 1.8 million domestic customers in Ireland. The project team held consultations with the CER and the ESB Meter Registration System Operator (MRSO), which is a fully regulated ring-fenced business unit within ESB Networks, regarding the provision of historical electricity consumption data for inclusion in the database and on an ongoing basis to SEI / EPSSU to enhance Ireland’s reporting obligations and to provide inputs for several of the Authority’s programmes.

ESB MRSO provided electricity consumption totals (in kWh) aggregated by two-digit NACE code for 2006 from their database of consumption, which is built up from entity-level Meter Point Registration Number (MPRN) consumption. Only 1.2% of the 22,762,881 MWh total consumption in 2006 was not classified by NACE code. However, the accuracy of the NACE-code classification applied to each meter is unknown; hence the accuracy of the NACE totals is also unknown. MRSO acknowledged that the classification could be improved. Preliminary discussions were held with CER, MRSO, EPSSU and the CSO about passing the full dataset of electricity meters, business names and consumption data could to the CSO, which could then assess the quality of the NACE classifications by comparison with its own databases and, if appropriate, ‘cleanse’ the data by updating the NACE classifications.

We understand from our consultations with ESB that MRSO should be capable of reporting electricity consumption data that has been aggregated to each substation. This data could be manipulated to form a useful proxy for county-level consumption.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-068	Aggregated Electricity Consumption - Uncleansed Data (ESB MRSO)	B – Very Good	✓

3.3.2 BGÉ GPRO Non-domestic Customer Data

There are approximately 18,000 non-domestic natural gas customers and about 550,000 domestic customers in Ireland. The project team consulted with the CER and BGÉ’s Gas Point Registration Operator (GPRO), which is part of the Bord Gáis Transportation business unit, about the provision of historical, entity-level gas consumption data for inclusion in the database and on an ongoing basis to SEI / EPSSU.

BGÉ GPRO provided non-domestic natural gas consumption totals (in GCV kWh) aggregated by industry descriptor each for 2005 and 2006. This data was aggregated up from gas consumption recorded by BGÉ for each entity-level Gas Point Registration Number (GPRN). The aggregated totals were provided in two data sets. The first set of consumption data is for the ~54 Large Daily Metered (LDM) customers who consume more than 57,500 MWh per annum and the ~181 Daily Metered (DM) customers who consume between 5,550 MWh and 57,500

MWh per annum. The data is aggregated into forty-two industry descriptors, which do not directly correspond to NACE classifications. The total 2006 consumption for the LDM and DM customers is 35,935,211 MWh.

The second set of data is for the ~17,750 Non Daily Metered (NDM) non-domestic customers who consume less than 5,550 MWh per annum and is aggregated into ninety-one industry descriptors (total 2006 consumption = 4,284,911 MWh). Unfortunately, these descriptors neither correspond directly to the LDM / DM descriptors nor to NACE classifications. BGÉ GPRO expressed reservations about the quality (accuracy) of the gas customer industry classifications.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-058	Aggregated LDM, DM & NDM Gas Consumption - Uncleansed Data (BGÉ GPRO)	C – Good	✓

3.3.3 Industry Sector – Coal, Peat, Oil & Renewables (CPOR)

EPSSU operates a National Energy Statistical System (NESS) to collect and analyse energy data that is then used for a variety of purposes including *inter alia* preparation of National Energy Balance, submissions to EPA, IEA and EU and for the development of EPSSU’s own publications. As part of this process EPSSU gathers energy supply data directly from energy and fuel importers, suppliers and distributors. Typically these sources provide data with only limited breakdown between the major sub-sectors, i.e. between industry, services (commercial) and domestic.

EPSSU provided the study team with the expanded National Energy Balances from 1990 – 2006. These balances provide top-down energy consumption by fuel type for the following industrial sub-sectors relevant to this study:

- Oil refineries & other energy sector;
- Non-energy mining (NACE 13 – 14);
- Food, beverages and tobacco (NACE 15 – 16);
- Textiles and textile products (NACE 17 – 18);
- Wood and wood products (NACE 20);
- Pulp, paper, publishing and printing (NACE 21 – 22);
- Chemicals & man-made fibres (NACE 24);
- Rubber and plastic products (NACE 25);
- Other non-metallic mineral products (NACE 26);
- Basic metals and fabricated metal products (NACE 27 – 28);
- Machinery and equipment n.e.c. (NACE 29);

- Electrical and optical equipment (NACE 30 – 33);
- Transport equipment manufacture (NACE 34 – 35);
- Other manufacturing (NACE 36 - 37, 19);
- Public Thermal Power Plants⁷;
- Combined Heat & Power⁷;
- Agricultural⁷.

The National Energy Balance data for coal, peat, oil and renewables is used as the top-down data for all industrial sectors in the database. For reasons of data confidentiality, EPSSU could not provide the study team with any further breakdown of the consumption data.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-002	Energy Balances 1990-2006 (EPSSU)	D – Moderate	✓

3.3.4 Services Sector – Coal, Peat, Oil & Renewables (CPOR)

There is no readily accessible source of consumption data for coal, peat, oil and renewables⁸ (CPOR) in Ireland because the distribution of these fuels is significantly less regulated than the distribution of gas and electricity. The best source of data on CPOR consumption is the National Energy Balance. Unfortunately, the National Energy Balance data does not disaggregate consumption data for the services sector beyond a high level commercial services / public services split.

The project team developed a methodology to estimate the break down of the services sector CPOR consumption – as taken from the National Energy Balance – into the nine services sub-sectors used in the database, viz.: wholesale, retail, hotels & catering, transport support, offices & services, public administration, education, health & social work and sport & culture (see Table 1 in §2.2). The key steps in this methodology are outlined below:

1. National energy balance CPOR data for commercial services and public services was converted from ktoe to MWh.
2. The MRSO and GPRO electricity and natural gas consumption figures for the services sector were extracted from the sources outlined in §3.3.1 & 3.3.2 and aggregated into commercial services and public services.

⁷ These sub-sectors are not typically classified as part of the industrial sector; they are included in the database for completeness and are clearly identified as separate sectors.

⁸ 95% of the total CPOR energy consumption in the Services sector comprises various oil products, with Gasoil / Diesel making up 96% of the oil products total (2006 data).

3. The National Energy Balance gas and electricity consumption data (converted to MWh) for commercial services and public services was compared to the MRSO and GPRO data. This comparison revealed that:

- For commercial services, the National Energy Balance figures are 70-75% of the suppliers' figures for gas and electricity;
- For public services, the National Energy Balance figures are 120-140% of the suppliers' figures for gas and electricity;

As a result of these disparities it was necessary to make adjustments to the National Energy Balance data for CPOR before including it in the database⁹.

4. The CPOR consumption figures were recalculated for the commercial services and public services by:

- Multiplying the National Energy Balance commercial services values by 1.27, which corrects for the average underestimation in the energy balance compared to the MRSO and GPRO data for electricity and natural gas in commercial services;
- Multiplying the National Energy Balance commercial services values by 0.73, which corrects for the average overestimation in the energy balance compared to the MRSO and GPRO data for electricity and natural gas in public services.

5. It was recognised that, as well as the total energy, the fuel split varies from sub-sector to sub-sector, particularly the ratio of electricity v fossil fuel. Unfortunately, there is no readily available information on typical fuel splits for these sub-sectors in Ireland. As a proxy for this data, DUKES¹⁰ data for UK service sub-sectors was used to:

- Confirm the relative sizes of the nine sub-sectors. The DUKES figures harmonised well with the relative sizes estimated from the MRSO and GPRO figures. The latter were used as the basis for estimating the overall fuel and electricity consumption split between the nine sub-sectors.
- Estimate the 'typical' electricity: fossil fuels split for each of the nine services sub-sectors.

6. The individual CPOR energy consumption for each of the nine sub-sectors was estimated, by:

- Adjusting the electricity : fossil fuel ratio for each sub-sector, based on DUKES-derived electricity : fossil fuel split for these sub-sectors;

⁹ One reason for the discrepancy could be that the suppliers' definitions of commercial and public services are different to those used by EPSSU / CSO.

¹⁰ DUKES (Digest of United Kingdom Energy Statistics) provides essential energy consumption and fuel split information. The Digest contains extensive tables, charts and commentary that provide a detailed and comprehensive picture of energy production and use over recent years in the UK.

- Splitting-out the adjusted CPOR totals (as per point 4 above) into coal, peat, oil and renewables consumption in accordance with the consumption split set out for public services / commercial services (as appropriate) in the National Energy Balance.

We believe that the final CPOR data as presented in the database represents a better estimate than one using unadjusted figures from the National Energy Balance because the electricity and gas totals and split better match the MRSO and GPRO data.

3.4 Industry & Services Sectors: Entity Level Fuel Consumption Data

3.4.1 SEI's Large Industry Energy Network (LIEN)

The Large Industry Energy Network (LIEN) is a voluntary network, facilitated by SEI, of companies working to maintain strong energy management and environmental protection practices. In 2006, there were 76 members who consumed a total of 2,836,891 MWh of electricity and 8,515,370 MWh of fuel.

The annual LIEN Report published by SEI includes the latest Energy Performance Indicator for each member company. However, these indicators cannot be converted back to actual energy consumption. The actual 2006 energy consumption by fuel type for each member company is self-reported to SEI. This data is considered to be commercially sensitive and is not published. It is included in the database.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-019	LIEN 2006 Primary Energy Breakdown (SEI)	B - Very Good	✓

3.4.2 SEI Energy Agreements (IS 393)

SEI's Energy Agreements programme provides support to firms to apply a structured approach to reducing costs through an agreed schedule of energy efficiency measures over a three year period. It is based on the Irish Energy Management Standard, IS 393.

Programme participants self-report their annual consumption to SEI; this information is commercially sensitive and is not published. The 2006 annual energy consumption for thirteen participants in the Agreements Programme is included in the database. All thirteen sites are also members of the LIEN.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-078	IS 393 Impact Assessment Spreadsheets (SEI)	B - Very Good	✓

3.4.3 SEI's SME Programme

SEI's SME Programme (also referred to as the *Advice, Mentoring & Assessments Programme* since 2008) provides small and medium enterprises (SMEs) with *inter alia* energy assessments from independent energy advisors, which can take the form of site visits or telephone support.

As part of their energy assessments, the energy advisors record the actual energy consumption at the participants' sites for the most recent year. This information is then extracted from the energy advisors' reports and recorded in an SME database.

The project team interrogated the SME database and extracted the energy consumption data for all 411 SMEs for which reports had been submitted by the energy advisors (as of September 2008). These SMEs are from various industrial and services sub-sectors. A small number (< 5) of the sites are also in the LIEN.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-079	SME Programme - Energy Advisor Reports (SEI)	B - Very Good	✓

3.4.4 EU Emissions Trading Scheme – EU ETS

The first phase of the EU Emissions Trading Scheme (ETS) commenced in January 2005 and comprised of 106 installations in Ireland. Since then, four of the installations participating in the ETS have closed down or moved and eleven new installations have entered the ETS.

Of the 113 EU ETS sites operating in 2006, eighty-eight are in the industrial sector, nine are in the services sector and sixteen are power generators. Forty-four of the sites are also in the LIEN.

Community Transaction Log

The participants must submit verified CO₂ emissions on an annual basis to the EPA; these emissions values (in tonnes) are then published in the Community Transaction Log on the EU ETS website¹¹. This log does not differentiate energy emissions from process emissions (e.g. in the cement sector) and does not identify the fuel type(s) that correspond to the emissions.

¹¹ www.ec.europa.eu/environment/ets

The project team back-calculated the energy consumption from the CO₂ emissions data for twelve establishments for which the team knows (from experience / other sources) the fuel type used on the sites and for which there are no non-energy (process) greenhouse gas emissions. The back calculation methodology involved the division of the CO₂ emissions (tonnes) from the EU ETS Community Transaction Log for 2006 by EPSSU’s published emission factors for the relevant fuels.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-028	EU ETS 2006 CO ₂ emissions data (Community Transaction Log)	C - Good	✓

Annual Installation Emissions Reports (AIERs)

Under the EU ETS all participants in Ireland must submit an Annual Installation Emissions Report (AIER) to the EPA by 31st March of each year. The AIERs contain independently verified annual fuel usage data for the previous calendar year. The reports are not published, but they are available for public inspection at the EPA’s offices in Richview, Dublin.

The project team identified forty-six ETS participants for which the published Community Transaction Log data is insufficient to back-calculate fuel consumption and requested the EPA make the corresponding AIERs available for inspection. Each AIER identifies the mass (or volume) of each fuel combusted onsite (including biofuels) and the weighted net calorific value of the fuel. The project team converted this data to MWh and entered it into the database.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-097	Annual Installation Emissions Reports for EU ETS	A - Excellent	✓

3.4.5 Annual Environmental Reports (AERs)

Every year holders of Integrated Pollution Prevention and Control (IPPC) Licences and Waste Management Licences must submit an Annual Environmental Report (AER) to the EPA. The licensees must include a breakdown of fuel consumption at their sites in the AERs. At present, AERs are submitted in hard copy and summary sheets – including fuel consumption – are submitted electronically. The Agency is in the process of transitioning to a fully electronic submission system.

AERs may be viewed by the public; however, they are available for inspection in hard copy only at the EPA’s five regional offices. The EPA does not collate the energy consumption data from the reports and the quality of the energy consumption data submitted is variable (often poor).

There are approximately 530 sites licensed under the IPPC system and over 150 sites with Waste Licences. Together, these sites' AERs form a relatively large dataset of annual industrial energy use¹². The project team agreed with the Steering Committee that collecting all of this data to populate the database with 2006 data would be impractical, especially as the quality of the data is variable (at best). Therefore, these data sources were not included in the database.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-032	Annual Environmental Reports (AERs) - submitted to EPA under Waste Management Licences	D - Moderate	✓
R-033	Annual Environmental Reports (AERs) - submitted to EPA under IPPC Licences	D – Moderate	✓

3.4.6 Energy Audits Undertaken for Environmental Compliance

The transition to IPPC Licensing (from Integrated Pollution Control (IPC) Licensing) is almost complete. As part of the changeover, licensed sites must typically undertake energy audits within one year of being granted a new IPPC licence¹³ and thereafter "at intervals as required by the Agency." The EPA also includes similar obligations in new and amended Waste Management Licences.

Licensees are *not* typically required to submit the energy audit reports to the EPA; instead the site operators must include only the recommendations from the audits in the sites' *Schedules of Environmental Objectives and Targets*, which are submitted to the EPA. The EPA does not collate any energy consumption data from the energy audit reports.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-034	Energy Audit Reports – prepared in compliance with Waste Licences	B – Very Good	✗
R-035	Energy Audit Reports - prepared in compliance with IPPC Licences	B – Very Good	✗

¹² For example, in comparison with the EU ETS (113 sites) or LIEN (76 sites)

¹³ Or within one year of being issued with an amendment to an existing IPC Licence

3.4.7 EPSSU Energy Consumption Surveys

EPSSU undertakes a number of periodic surveys of energy consumption among sites incorporating sustainable energy conversion systems, e.g. CHP plants, biomass plants, biogas plants and rendering (tallow) plants. However, the entity-level data recorded in these surveys is confidential to EPSSU and cannot be shared with other parts of SEI. Therefore, it was not available to the project team and is not included in the database.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-011	Survey of CHP Plants	B – Very Good	✗
R-012	Survey of Biomass Plants	B – Very Good	✗
R-013	Survey of Biogas Plants	B – Very Good	✗
R-014	Survey of Rendering (Tallow) Plants	B – Very Good	✗

3.4.8 Negotiated Energy Agreements Pilot Project

Energy audits were conducted at twenty-six sites as part of a pilot project on negotiated energy agreements undertaken by SEI in 2002 / 2003 (total 2002 energy consumption = 559,985 MWh). The participant sites were classified as follows:

- 15 companies from different sectors in a Technology Agreement (thermal energy), five of which are in the EU ETS and eight of which are in the LIEN;
- 10 companies in a sector-specific Collective Agreement (pharmachem), six of which are in the EU ETS and eight of which are in the LIEN;
- One company (Aughinish Alumina Ltd) in an Individual Firm Agreement – Aughinish Alumina is in the ETS, LIEN and IS 393.

A final report on this project was published by SEI with summary (aggregated) consumption data, while the entity-level data is contained in the individual audit reports. The project team extracted the energy consumption data (for 2002) from the individual reports and included it in the database, except where data had been superseded by more recent data from other sources.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-022	Negotiated Energy Agreements Pilot Project - Final Report	E – Poor	✓
R-023	Negotiated Agreements Pilot Project - Technology Agreement Energy Audits	B – Very Good	✓
R-024	Negotiated Agreements Pilot Project - Collective Agreement Energy Audits	B – Very Good	✓
R-025	Negotiated Energy Agreements Pilot Project - Individual Firm Energy Audits	B – Very Good	✓

3.4.9 HSE Hospital Survey

The Health Services Executive (HSE) has established an energy sub-group with at least one representative from each of its four constituent regions. This sub-group is co-ordinating the gathering of energy consumption data from the HSE’s larger facilities (the ‘HSE Hospital Survey’).

The HSE provided a spreadsheet with a breakdown of energy consumption data by fuel type for ~50 HSE hospitals and related buildings in the HSE South region (counties Cork and Kerry). The spreadsheet also includes bed numbers and building areas for most of the sites. The project team did not receive equivalent data for the other regions; we understand that the collation of this data is still ongoing within HSE.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-040	HSE Hospital Survey	{Unknown}	✘
R-069	HSE South Energy Report 2005	B – Very Good	✓

3.4.10 E3 Energy Efficiency in Dublin Universities

E3 is an SEI supported collaboration project between the four Dublin-based universities – Dublin Institute of Technology (DIT), Trinity College Dublin (TCD), Dublin City University (DCU) and University College Dublin (UCD). The aim of the project is to reduce energy usage and improve energy efficiency at the universities. The project website¹⁴ provides direct reports from the Building Energy Management Systems (BEMS), including the annual electricity and gas usage for the buildings using the system.

Not all of the buildings at the universities are included in the system (thirty of the key buildings across the various campuses are included) and there are some other data gaps where energy readings are not recorded. Under phase two of the project an additional 36 buildings will be included in the BEMS.

The energy managers at TCD and UCD also provided additional energy consumption data directly to the project team. The UCD energy manager provided a detailed annual report for the energy usage on campus for the year October 2005 – September 2006.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-075	E3 Energy Efficiency in Dublin Universities Database	B – Very Good	✓
R-076	UCD Buildings & Services Department Energy Report 2006	B – Very Good	✓
R-098	Correspondence with TCD energy manager	C - Good	✓

¹⁴ www.e3.ie

3.4.11 Office of Public Works

The Office of Public Works (OPW) manages the largest property portfolio in the State, consisting of more than 1 million square metres of buildings. This includes approximately 2,100 individual buildings at over 1,700 locations throughout the country.

The OPW is undertaking a two year project to reduce CO₂ emissions from its largest buildings. This involves collecting and analysing data from BEMS in approximately 170 selected large (>1,000 m²) buildings, which are occupied by Government Departments and authorities. The project team consulted with the OPW to source potential data inputs for the database. However, at the time of the consultation, the project was at an early stage and useful consumption data was not provided.

3.4.12 University College Dublin Energy Research Group (UCD ERG)

University College Dublin's Energy Research Group (UCD ERG) has carried out several surveys / reports relating to energy use in Ireland, predominantly on buildings within the services and domestic sectors. Much of their work has been for SEI and / or is published and the project team already had access to these outputs – as indicated in Annex A5.

UCD ERG provided the project team with a dataset that has not been published. This dataset was collated from a number of direct surveys undertaken by UCD ERG; however, for confidentiality reasons, the energy data received did not identify individual sites. The dataset includes:

- Building sizes and breakdown between electricity and thermal energy for 25 university buildings;
- Building sizes, number of beds and breakdown between electricity and direct fossil fuel use for 22 geriatric homes;
- Building sizes, number of beds and breakdown between electricity and direct fossil fuel use for 11 psychiatric homes;
- Building sizes, number of beds and breakdown between electricity and direct fossil fuel use for 21 district hospitals;
- Building sizes, number of beds and breakdown between electricity and direct fossil fuel use for 11 acute hospitals;
- Electrical energy use on a floor area basis for 57 retail units;
- Building sizes and breakdown between electricity and direct fossil fuel use for 9 warehouses;
- Building sizes and breakdown between electricity and direct fossil fuel use for 89 secondary schools.

We included all of this data in the database except for the university buildings consumption data because we believe that this is substantially duplicated (superseded) by the E3 Energy Efficiency in Dublin Universities data (see S0).

As the names of the individual entities are unknown, there could be some overlap between these anonymous entity-level records and some of the records entered from other sources (e.g. HSE); however, we believe that the potential magnitude of such double counting is small and the potential error is more than offset by the value of incorporating this dataset.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-037	Dataset of Energy Consumption in Services Sector (UCD ERG)	B – Very Good	✓

3.4.13 Central Statistics Office (CSO)

The Central Statistics Office (CSO) collects limited data relating to energy consumption via the Annual Services Inquiry (ASI) and the Census of Industrial Production (CIP). As an agent of the CSO, EPSSU collects the data relevant to determining energy consumption from these CSO sources. This data is used to prepare *inter alia* the annual National Energy Balance.

3.5 Industry & Services Sectors: Other Entity-level Data (Non-energy Data)

The project team also collated a variety of lists of energy consumers within specific sectors for which there is no energy consumption data available.

3.5.1 Schools

There are over 3,290 primary schools and 730 post-primary schools in Ireland (2006). These are managed by the Department of Education and Science (DE&S). No central source of energy usage in schools currently exists. However, work is underway at DE&S to develop an energy database and a detailed breakdown of energy usage characterised by the age of school buildings (pre-building regulations, post-building regulations, etc.).

The names, county locations and student numbers of all schools in the State are included in the database; however, there is no corresponding energy consumption data.

3.5.2 The Irish Times Top 1,000 Companies

The Irish Times / Business World produced a list of the top 1,000 Irish companies classified by NACE code. The names of, and activities undertaken by, these companies have been entered into the database.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-118	The Irish Times Top 1,000 Companies	{N/a}	✓

3.5.3 Lists of CHP Installations

There are several lists of small-scale CHP installations in Ireland available from various CHP system operators and the Irish CHP Association. Unfortunately, these datasets do not include the energy consumption or energy output data for the plants; simply capacity data (i.e. in KW or MW) is provided instead.

The names, addresses and capacities of these CHP plants were included in relevant sub-sector worksheets in the database.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-041	List of CHP Plants (BG COGEN)	{N/a}	✓
R-042	List of CHP plants (Temp Tech)	{N/a}	✓
R-053	List CHP Plants (Fingleton White)	{N/a}	✓
R-119	List of CHP plants (Irish CHP Association)	{N/a}	✓

3.5.4 Miscellaneous Public Sector Buildings

The project team consulted with a wide variety of public sector bodies to try to source energy consumption data for the database. Where relevant data was unavailable, the team researched location data for several public sector organisations. The names and addresses of the following sites are included in the database¹⁵:

- 704 Garda stations operated by An Garda Síochána. We understand that data on aggregated energy cost data is collated by An Garda Síochána’s Strategic and Resource Management offices;
- 948 post offices operated by An Post;
- 97 courts operated by Courts Service Ireland;

¹⁵ In addition there are 143 waste water treatment plants, 640 pumping stations and 109 water treatment plants operated by local authorities and 130 health centres, 569 health clinics and 445 nursing homes operated by the Health Service Executive that are not identified individually in the database.

- 14 prisons operated by the Irish Prison Service;
- 114 local authority offices operated by various local authorities.

3.6 Industry & Services Sectors: Energy End-use Split

3.6.1 Reliance on Non Site-specific Data Sources

Originally, the project team’s intention was to use site-specific end-use split information for calculating the thermal / non-thermal end-use split as per the breakdown discussed in §2.5. However, our research of the various data sources revealed that there is very little actual data available on end-use split.

Instead, we were obliged to apply ‘typical’ end-use split data for different end-use sectors. The majority of the typical data was sourced from the UK’s Carbon Trust programme. A full list of the sources used is given below. These data are typical or representative end-use splits for many of the industrial and services sub-sectors addressed in this project, rather than actual splits for specific entities. They have been developed from benchmarking exercises and/or best-estimates by sector experts.

<i>Ref</i>	<i>Data Source Title</i>	<i>Data Robustness</i>	<i>Available</i>
R-083	CT website: Agriculture & Horticulture	E – Poor ¹⁶	✓
R-084	CT website: Mining & Quarrying	E – Poor ¹⁶	✓
R-085	CT website: Food & Drink	E – Poor ¹⁶	✓
R-086	CT website: Textiles	E – Poor ¹⁶	✓
R-087	CT website: Paper	E – Poor ¹⁶	✓
R-088	CT website: Paper	E – Poor ¹⁶	✓
R-089	CT website: Plastics & Rubber	E – Poor ¹⁶	✓
R-090	CT website: High temp non-metal minerals	E – Poor ¹⁶	✓
R-091	CT website: Metals	E – Poor ¹⁶	✓
R-092	CT website: Engineering	E – Poor ¹⁶	✓
R-093	CT website: Construction	E – Poor ¹⁶	✓
R-099	CT website: Chemicals	E – Poor ¹⁶	✓

¹⁶ This source is classified as being of ‘Poor’ robustness in the context of its use for the population of the end-use database only, i.e. because it contains generic industry-level data developed for the UK and not bespoke data specific to an individual Irish site. This classification should not be interpreted as the project team’s assessment of the quality of the very useful Carbon Trust publications.

<i>Ref</i>	<i>Data Source Title</i>	<i>Data Robustness</i>	<i>Available</i>
R-100	CT website: Utilities	E – Poor ¹⁶	✓
R-101	CT website: Retail & Wholesale	E – Poor ¹⁶	✓
R-102	CT website: Hotels & Restaurants	E – Poor ¹⁶	✓
R-103	CT website: Sport & Leisure	E – Poor ¹⁶	✓
R-104	CT website: Offices	E – Poor ¹⁶	✓
R-105	CT website: Central Government	E – Poor ¹⁶	✓
R-106	CT website: Local Government	E – Poor ¹⁶	✓
R-107	CT website: Education: Schools	E – Poor ¹⁶	✓
R-108	CT website: Education: Universities & Higher Education	E – Poor ¹⁶	✓
R-109	CT website: Healthcare & Hospitals	E – Poor ¹⁶	✓
R-110	CT Overview: Sports & Leisure	E – Poor ¹⁶	✓
R-111	CT Overview: Retail	E – Poor ¹⁶	✓
R-112	CT Overview: Hospitality	E – Poor ¹⁶	✓
R-113	CT Guide: Energy Use in Offices	E – Poor ¹⁶	✓
R-114	CT Overview: Office Based Companies	E – Poor ¹⁶	✓
R-115	CT Guide: Energy Use in Local Authority Buildings	E – Poor ¹⁶	✓
R-116	CT Overview: Schools	E – Poor ¹⁶	✓
R-117	CT Overview: Universities and Higher Education	E – Poor ¹⁶	✓

3.6.2 Applicability of this Data to Specific Irish Sub-sectors

For some energy-intensive sub-sectors (e.g. cement), the majority of the energy is process heating and the split is unlikely to vary significantly from site to site within sub-sectors, although there may be variability, depending on the size of the enterprise, the age of the main energy centres, the raw materials and the range of final products. The same is true for sub-sectors that operate broadly similar processes, for instance plastic moulders.

Site-to-site variability is greater for more diverse sub-sectors that contain large numbers of SMEs, e.g. food and drink, where the end-use split for, say, a distillery would be totally different to that for a meat preparation factory, a dairy, a cereal manufacturer or a frozen-food manufacturer. As such, for some sectors, the end-use split cannot be considered robust but, until better site-specific data is made available, it represents the best information we have.

3.7 Electricity Generation Sector

Electricity generation is not part of the industry sector. However, we have included the primary energy consumption data for all of the generating stations. The fuel consumption data is derived from the generating stations’ verified EU ETS consumption reports.

We have also included a list of eighty-three 110 kV, 220 kV and 400 kV substations operated by Eirgrid and four hundred and fifty-eight 38 kV stations operated by ESB Networks. The substation configurations and grid co-ordinates are included for each station. The substation data was provided to SEI through the Renewable Energy Development Group.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-055	List of 38 kV Substations (ESB Networks)	{N/a}	✓
R-096	List of 110 kV, 220 kV & 400 kV substations (Eirgrid)	{N/a}	✓

3.8 Domestic Sector: Energy Suppliers Consumption Data

3.8.1 ESB MRSO Domestic Customer Data

The ESB MRSO provided the total number of domestic customers in each of four tariff categories and the total combined consumption in each category for 2005 and 2006. The four tariff categories are:

1. Urban domestic – single tariff
2. Urban domestic – double tariff (day / night)
3. Rural domestic – single tariff
4. Rural domestic – double tariff (day / night)

Unfortunately, neither county level data nor more detailed statistical breakdown of domestic consumption could be made available to the project team.

<u>Ref</u>	<u>Data Source Title</u>	<u>Data Robustness</u>	<u>Available</u>
R-057	Domestic Electricity Consumption Demand Profiles (ESB MRSO)	B – Very Good	✓

3.8.2 BGÉ GPRO Non-Eligible Customer Data

BGÉ GPRO provided the total number of small (domestic) customers in each of the eighteen counties that it serves. Until 1st July 2007, these >½ million customers were referred to as ‘non-eligible customers’. They included some very small commercial customers. Since then, the retail gas market has been open to competition and all gas customers are now eligible to switch their gas supplier.

GPRO also provided the total consumption (kWh) in each county and the average consumption in each decile of customers in each county. This data was provided for 2005 and 2006.

<i>Ref</i>	<i>Data Source Title</i>	<i>Data Robustness</i>	<i>Available</i>
R-094	Aggregated Domestic-level Natural Gas Consumption (BGÉ GPRO)	B – Very Good	✓

3.8.3 Coal, Peat, Oil & Renewables (CPOR)

The National Energy Balance was the primary source of consumption data for coal, peat, oil and renewables for the domestic sector. The other sources listed below were used to cross-reference relevant data and as a basis for our estimate of the geographical split of fuel consumption (see §3.9) for different fuel types.

<i>Ref</i>	<i>Data Source Title</i>	<i>Data Robustness</i>	<i>Available</i>
R-002	Energy Balances 1990-2006 (EPSSU)	D – Moderate	✓
R-122	Household Budget Survey (HBS) 2004-2005 Preliminary Results (CSO, 2007)	D – Moderate	✓
R-123	Census 2006 Volume 1 – Population classified by area (CSO)	{N/a}	✓
R-124	Census 2006 Volume 6 – Housing (CSO)	{N/a}	✓
R-125	Notice to Owners of Raised Bog and Turbary Rights Holders (Department of Environment, Heritage & Local Government, 2002)	D – Moderate	✓
R-126	Statistical Yearbook of Ireland (CSO, 2004)	D – Moderate	✓

3.9 Domestic Sector: Estimate of Fuel Consumption by Geographic Area

3.9.1 Overview

In the absence of entity-level fuel consumption data in the domestic sector we developed and implemented a methodology to estimate the domestic level fuel consumption split on a geographic basis in Ireland.

3.9.2 Basis for Geographic Classification of Domestic Consumption

The database contains aggregated energy consumption for the domestic sector at the Local Electoral Area (LEA) level. Local Electoral Areas are geographical and electoral subdivisions of the 34 county and city-level local authorities in Ireland. LEAs were also matched to the 4 Provinces, 8 Regions and to the 43 Dáil Éireann Constituencies, as set out in the *Electoral (Amendment) Act 2005*.

There are 180 LEAs, as determined from the *1998 Local Electoral Areas Orders*. Each LEA is made up of a number of lower-level units called Electoral Divisions (EDs) (formerly known as 'District Electoral Divisions'), which are the principal geographical aggregation units used by the Census – Small Area Population Statistics are the lowest level unit. The 2002 and 2006 Census data indicates a total of 3,474 EDs, which is slightly higher than the 3,440 that are legally defined. This is because some EDs have been split as Census boundary areas have been re-defined.

Hence, the dataset combines data on Province, Region, County, Dáil Constituency, Local Electoral Area with the ED name – and where appropriate includes the ED number, ED type (city, suburb, environ, borough, town and rural area).

3.9.3 The Rural / Urban Split

Domestic energy consumption was calculated separately for urban and rural households by ED. Energy data was then totalled for each Electoral Division and then aggregated across a number of EDs at the LEA level.

The basis for this segmentation approach is that there are some important differences between populations living in urban and rural areas, viz.:

- Rural households are not affected by smoke-free coal control zones and so are free to burn bituminous coal;
- A higher proportion of rural households have solid fuel central heating systems - 26% compared to just 7% in urban areas (Household Budget Survey);
- Rural populations are not typically connected to the natural gas distribution network; as a result, a higher proportion of rural households have oil-fired central heating.

As the populations reported in the Census have been aggregated by ED, it was necessary to disaggregate the urban from the rural populations. We did this by classifying the population living in all sizes of town/city within each ED – as reported by the Census – as the urban population and classifying the balance as the rural population.

We then converted the urban and rural populations in each ED to an appropriate number of households using Small Area Population Statistics (SAPS) published for the 2006 Census by the CSO for each ED. The overall number of households in each ED corresponds to the recorded presence / absence of central heating by ED for SAPS in the 2006 Census.

3.9.4 Identification of Dublin Postal Codes

Dublin city, its suburbs and its related towns and environs were treated separately in order to integrate the Dublin postal codes into the dataset. The Dublin region comprises a total of 316 urban EDs. In terms of post codes, 162 of these fall within Dublin City and a further 131 are categorised as suburbs of Dublin City. These may be aggregated and split into:

- 12 Dáil Éireann Constituencies (Dublin Central, Dublin Mid-West, Dublin North, Dublin North-Central, Dublin North-East, Dublin North-West, Dublin South, Dublin South-Central, Dublin South-East, Dublin South-West, Dublin West and Dún Laoghaire), or;
- Some 30 LEAs (including the City LEAs of North Inner City, Cabra/Glasnevin, Donaghmede, Finglas, Ballymun/Whitehall, Artane, Clontarf, South West Inner City, Ballyfermot, Crumlin/Kimmage, South East Inner City, Pembroke, and Rathmines).

Each urban ED was matched, where appropriate, to postal codes Dublin 1 to 17 for Dublin City and to postal codes Dublin 6W and 11 to 24 for the suburbs in South Dublin (County Council area), Fingal and Dún Laoghaire-Rathdown. The postal codes were assigned on the basis of An Post Delivery Zones and Higher Education Authority data on admission rates by postal code. However, it should be noted that the postal codes cover a number of different urban subsets – city, suburb, environ, towns as well as some rural areas surrounding Dublin – and are not fully consistent with either Electoral Divisions or with Local Electoral Areas.

3.9.5 Segmentation of Rural Households

We segmented rural households into ‘farm rural’ and ‘other rural’ households, using the Census of Agriculture (2000), which detailed the number of farm households by ED. This was done in order to make the household data comparable with the 2004-2005 Household Budget Survey (published in 2007), which separately analyses household energy expenditure by farm and other households in rural areas. Farm households are also slightly larger at an average of 3.56 persons per household compared to 3.16 persons for other rural households.

We also inferred that farm households are the main consumers of sod peat. Agricultural returns for farm production for 2004 give an approximate figure of 457,000 tonnes of turf per annum (79% of total for sod peat). Hence, by identifying farm households separately in the dataset it was possible to develop a scenario for peat consumption by farms in areas where they would have access to this resource.

3.9.6 Combined Data Set of Households

The combined data set comprised 1.464 million households across 3,440 legally defined EDs. This can be broken down between 1,008,858 urban households, 140,500 farm households and 315,354 other rural households.

These households were then categorised as being located in either natural gas supply areas or non-supply areas, and in bituminous coal ban areas or non-ban areas. A further category for peat land areas was used as a proxy for the inferred geographical distribution of sod peat consumption by households.

Based on these categories and on fuel consumption splits derived from the Household Budget Survey 2004-2005 a number of different area sub-classifications were developed as follows:

- Urban households – ‘gas area’, ‘non-gas area/smokeless-zone’ and ‘all fuels’. Within the ‘gas areas’, gas users were separated out from non-gas users – for example households with oil-fired central heating or solid-fuel central heating / no central heating.
- Farm households – ‘peat area’ and ‘non-peat area’;
- Other rural households – ‘gas area’, ‘non-gas area/peat area’, and ‘non-gas/non-peat area’.

3.9.7 Geographic Breakdown of Natural Gas Consumption

The GPRO domestic gas consumption data provided by BGÉ for 2006 is at the county level only (see §3.8.2). We identified the EDs on the natural gas distribution network by reference to the current gas distribution list published by BGÉ, which lists locations connected to the network, i.e. cities, boroughs, towns and townlands. For urban populations with a natural gas supply typical penetration rates quoted by BGÉ are 80% - 85%, increasing with time. The county-level consumption data was disaggregated to an ED level on the basis of the number of households in each ED¹⁷. The number of households using gas in each ED was then adjusted at a county level using scaling factors to match the total number of gas connections by county.

¹⁷ 31,000 new domestic gas connections were added in 2006.

Some apparent anomalies were noticed in the BGÉ data. The number of households on the gas distribution network in Westmeath was unexpectedly low compared to the population size of the main towns (Athlone (East & West) and Mullingar). To adjust for this, the counties of Meath and Westmeath were combined and averaged. Furthermore, the number of gas connections in Galway is low (1,896) given Galway City was joined the gas distribution network in 2006. The BGÉ data also included 218 connections not classified by county; these were included in Dublin.

3.9.8 Geographic Breakdown of Electricity Consumption

The MPRN domestic consumption data provided by ESB was split between urban and rural tariffs only; it did not include a geographical split (see §3.8.1). We allocated the rural tariff consumption between farm and other rural households using a weighting derived from the Household Budget Survey data, which indicates that farms use 20% more electricity on average than other rural households. The urban tariff consumption was allocated evenly to urban households. We assumed that all households are on the electricity supply network.

3.9.9 Geographic Breakdown of Peat Consumption

The geographical extent of peat lands used for peat extraction by turbary rights holders were identified by townland using data published by Department of Environment, Heritage & Local Government for owners of raised bog and for turbary rights holders in designated conservation areas and Commonage Framework Plan (CFP) areas. Each townland listed in relation to turbary rights within a designated area was matched to a corresponding ED and was used as the basis for classifying EDs as peat areas. In total 989 EDs were identified as falling within peat areas.

Of the designated conservation areas in Ireland – Natural Heritage Areas (NHA), Special Areas of Conservation (SAC) and Candidate SAC (cSAC) areas – circa 72% were identified as being the subject of having active peat extraction, either by ‘Difco’ cutting (sausage) machine or by hand. This peat extraction is inferred to be for small-scale commercial use or domestic own-use only and is not the same as the large-scale extraction by Bord na Móna in the central peat lands. Sod peat is a bulk fuel requiring extended air drying and cannot be transported economically over long distances. The maximum economic transportation distance for bulk biofuels is typically no further than 80 km. Therefore, given the widespread but localised nature of peat extraction described above, the distribution of peat land areas by ED identified by the above method is considered to be a reasonable proxy data source for the actual geographical consumption patterns of sod-peat.

The Household Budget Survey reports average weekly turf (sod peat) and peat briquette expenditure and consumption by mass for average urban, farm and other rural households. Average weekly consumption data in the HBS 2004-2005 was converted to annual equivalents (in kWh and in % terms) by household category and by area sub-classification. Top-down supply data from the National Energy Balance for sod peat and peat briquettes was then scaled to the identified rural and urban households within the sub-area classifications for peat land and non-peat land areas.

For the purposes of our analysis we assumed that sod peat extracted from peat lands is consumed primarily within the ED/LEA. We also assumed that briquettes are burned predominantly in non-peat land areas.

3.9.10 Geographic Breakdown of Coal Consumption

The Household Budget Survey reports average weekly anthracite and bituminous coal expenditure and consumption by mass (kg) for average urban, farm and other rural households. Average weekly consumption data in the HBS 2004-2005 was converted to annual equivalents (in kWh and in % terms) by household category and by area sub-classification. Top down supply data the National Energy Balance – including 314 GWh of petroleum coke – was then scaled to the identified rural and urban households in bituminous coal-ban and non-coal ban areas (excluding those for gas).

Bituminous coal was excluded from the 12 designated urban bituminous coal ban zones, which together encompass approximately 1.8 million people or 70% of the total urban population. These areas are:

- Dublin (since 1990);
- Cork (since 1995);
- Arklow, Drogheda, Dundalk, Limerick, Wexford (since 1998);
- Celbridge, Galway, Leixlip, Naas and Waterford (since 2000); and
- Athlone, Carlow, Clonmel and Ennis (since 2004).

Within the area sub-classifications, gas users were separately identified by ED and were separated out from non-gas users by ED; for example, households with solid fuel central heating/no central heating. The latter were then re-assigned to the other sub-area classifications. Household energy consumption was then calculated separately by area sub-classification and then aggregated for all households at the ED level.

3.9.11 Geographic Breakdown of Oil Consumption

The Household Budget Survey reports average weekly oil fuel expenditure and consumption by volume and mass (litres and kg) for average urban, farm and other rural households. Average weekly consumption data in the HBS 2004-2005 was converted to annual equivalents (in kWh and in % terms) by household category and by area sub-classification. Top down supply data from the National Energy Balance – for Kerosene (Burning oil), LPG, Gasoil/DERV, but excluding 314 GWh of petroleum coke already included under coal/solid fuels above – was then scaled to the identified rural and urban households within the area sub-classifications (excluding those for gas).

Within the area sub-classifications gas users were separately identified by ED and were separated out from non-gas users – for example, households with oil fired central heating. The latter were then re-assigned to the other sub-area classifications. Household energy consumption was then calculated separately by area sub-classification and then aggregated for all households at the ED level.

3.9.12 Geographic Breakdown of Renewables Consumption

Wood is the only significant source of renewable energy consumed by the domestic sector. The Household Budget Survey reports average weekly wood fuel expenditure and consumption by mass (kg) for average urban, farm and other rural households. Average weekly consumption data for the HBS 2004-2005 was converted to annual equivalents (in kWh and in % terms) by household category and by area sub-classification. Top down consumption data from the National Energy Balance (195.114 GWh) was then scaled to the identified rural and urban households within the area sub-classifications (excluding those for gas). This probably underestimates wood consumption by rural households as this data does not cover own supply (e.g. farms), waste-wood combustion or 'grey' market purchases.

3.10 Domestic Sector: Energy End-use Split

In the absence of actual end-use split data for the domestic sector, we applied 'typical' split data reported for the UK in the DTI's Energy Consumption in the United Kingdom¹⁸.

The energy end-use split for fossil fuels was based upon the thermal / non-thermal residential usages given in Table 3.7 of this document: domestic energy consumption by end use and fuel, 1990 to 2005. Approximately 74% is used for space heating, 25% is used for water heating and 1% for cooking purposes.

¹⁸ The UK's DTI is now known as the Department for Business, Enterprise & Regulatory Reform (BERR).

The split for electricity users was based on analogous data from Table 3.10: Total electricity consumption by household domestic appliances 1970 to 2005. Approximately 15.6% of electricity consumed is used for cooking, 21.6% for lighting, and 62.8% for domestic appliances.

<i>Ref</i>	<i>Data Source Title</i>	<i>Data Robustness</i>	<i>Available</i>
R-121	Energy Consumption in the United Kingdom (BERR)	D – Moderate ¹⁹	✓

¹⁹ This source is classified as being of 'Poor' robustness in the context of its use for the population of the end-use database only, i.e. because it contains generic industry-level data developed for the UK and not bespoke data specific to the individual Irish domestic sector. This classification should not be interpreted as the project team's assessment of the quality of this data source.

4.0 Profile of Energy End Use

This section provides a summary of the data currently captured in the database, subject to the data confidentiality standards set out in §3.1. Most of the energy consumption data presented is for 2006.

4.1 Energy Consumption by Sector

4.1.1 Fuel Split

Figure 1 shows the fuel consumption totals, comprising the entity-level data entered into the database plus estimates of the 'tails' between the bottom-up entity-level data and the top-down data, for each top-level sector.

Figure 1: Fuel Split in each Sector

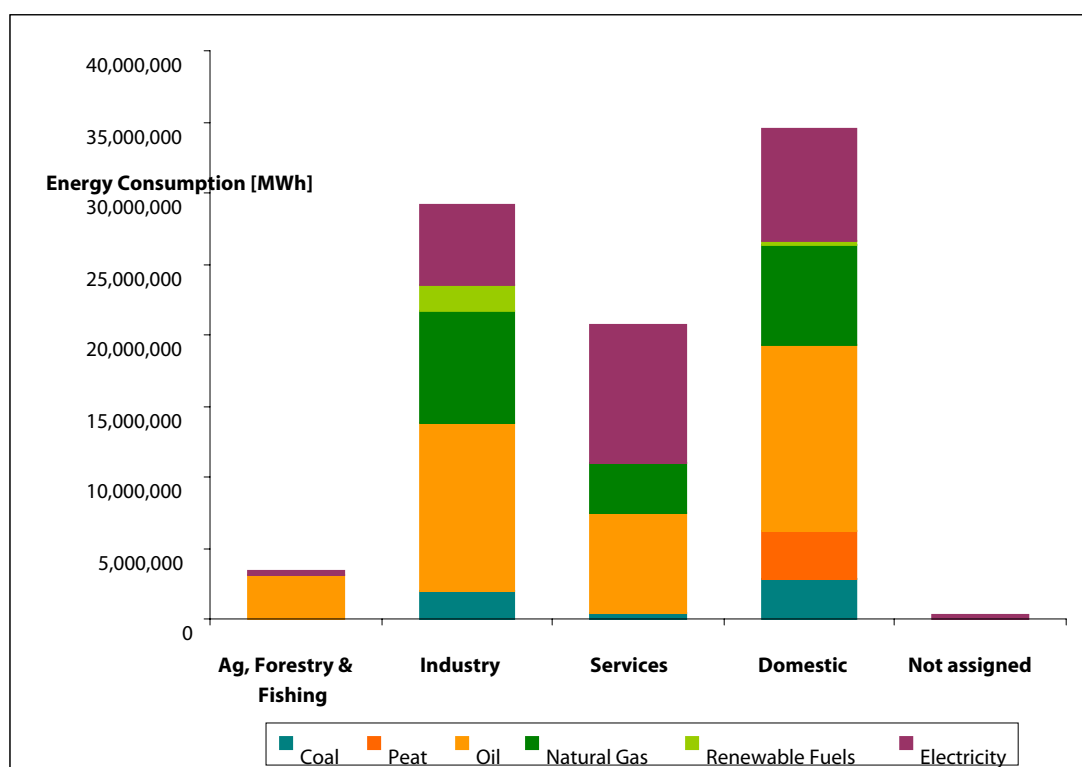
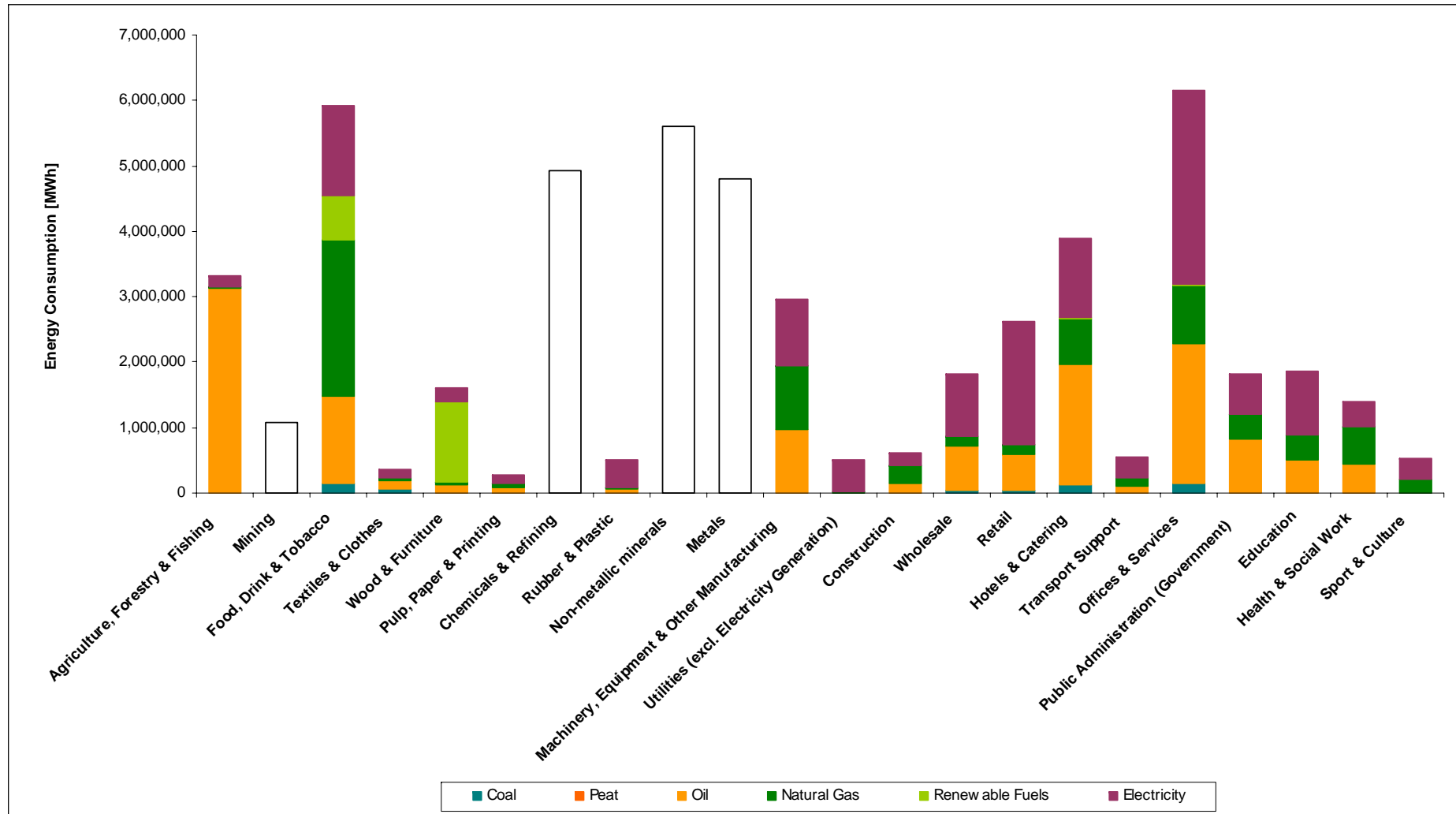


Figure 2 overleaf shows the fuel consumption totals, comprising the entity-level data plus bespoke estimates of the 'tail' for each sub-sector in the industry and services sectors.

Figure 7: Fuel Split in each Industry and Services Sub-sector

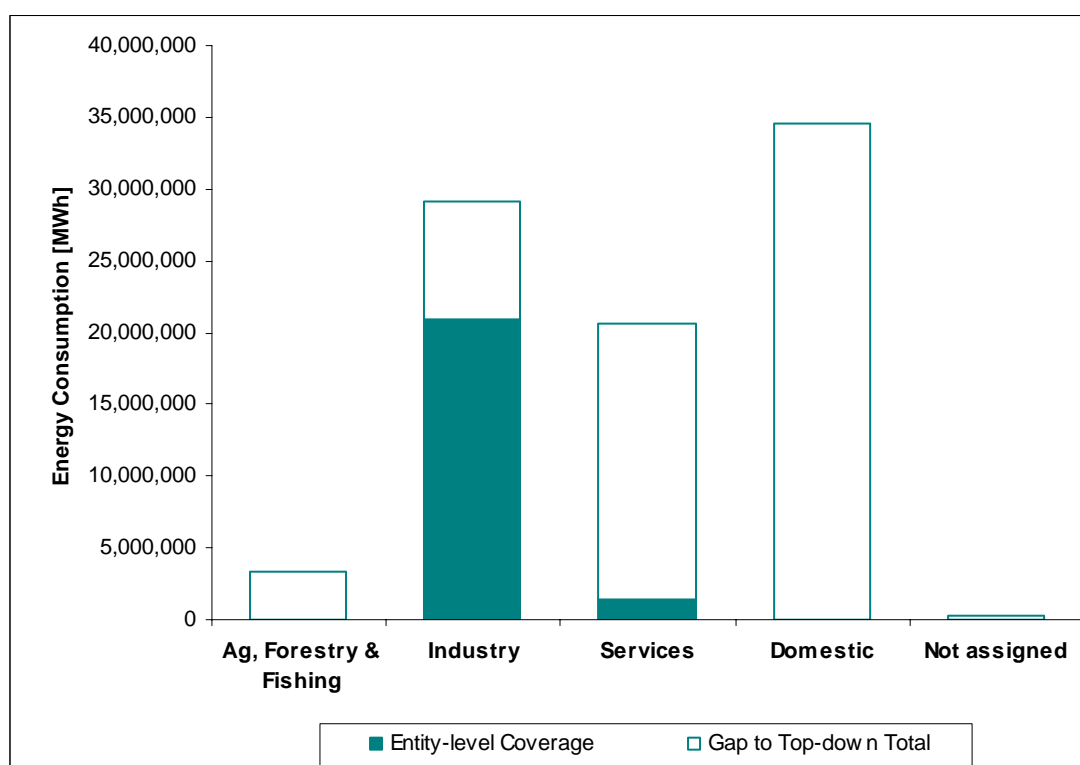


4.1.2 Entity-level Coverage (%)

Entity-level data for 759 sites was entered into the database. Of these, 731 are in the industry and services sectors²⁰. Together these account for entity-level coverage rates of 72% of total energy consumption in the industry sector but just 7% in the services sector. The discrepancy in the coverage rates is unsurprising as energy consumption in the industry sector is dominated by a smaller number of large consumers while the services sector comprises a much more dispersed concentration of energy consumers.

The entity-level coverage in each top-level sector is depicted in Figure 3.

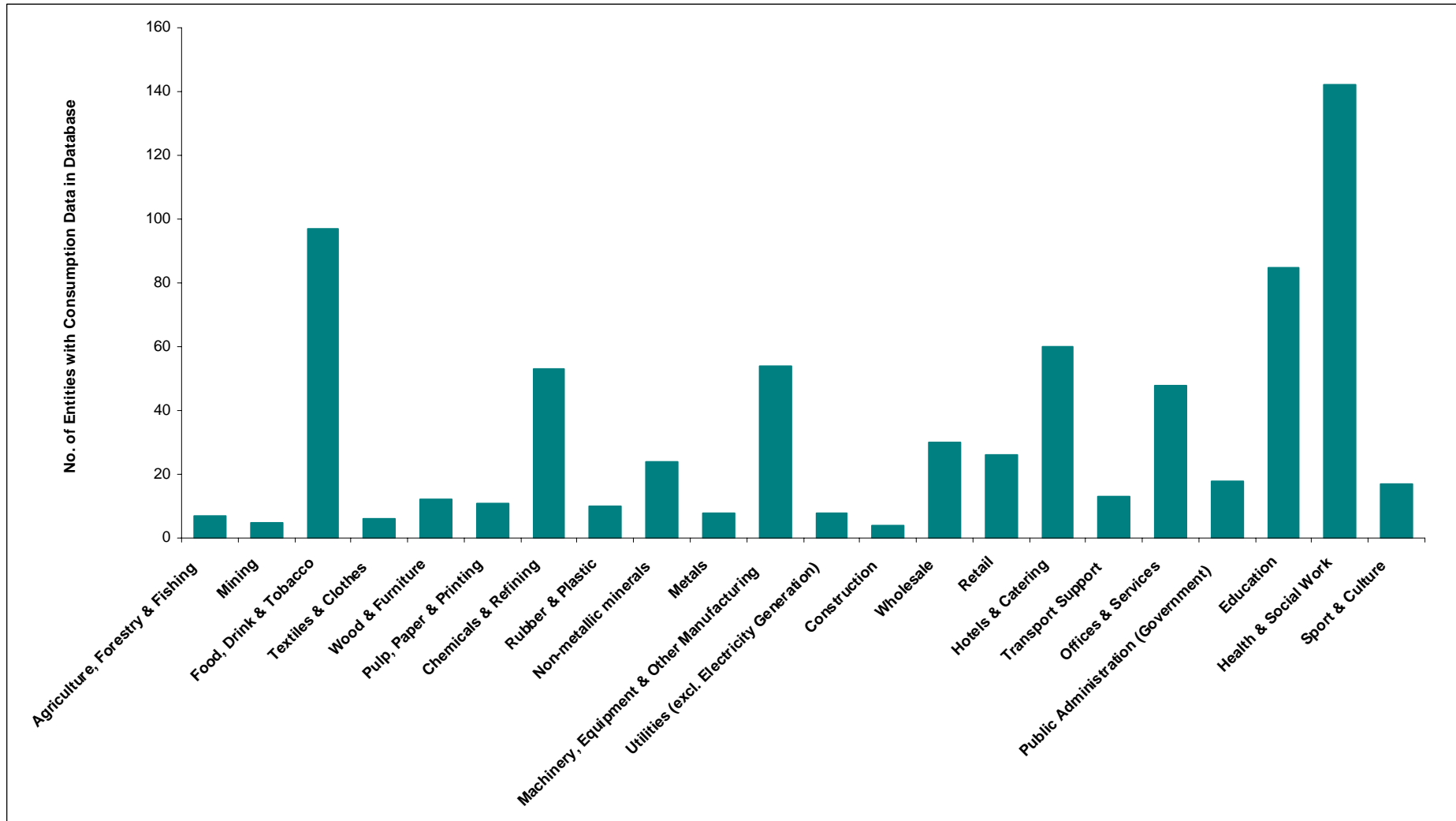
Figure 3: Entity-level Coverage in each Sector



The number of entities recorded in the database for each sub-sector in the industry and services (and agriculture) sectors is illustrated Figure 4 overleaf.

²⁰ The other 28 entities (sites) are in the power generation sector (21) and the agricultural sector (7).

Figure 4: No. of Entities Recorded in Database in each Sub-sector (total = 738)



4.1.3 End-use Split

The thermal / non-thermal split of energy consumption in the top-level sectors is presented in Figure 5. The corresponding breakdown for all sub-sectors in the industry and services sectors is illustrated in Figure 6.

The detailed end-use splits broken down into the fifteen thermal and non-thermal categories described in §2.5 are shown for all sectors in Figure 7 and for the nine sub-sectors in the services sector in Figure 8.

Figure 5: End-use Split (Estimations) in each Sector

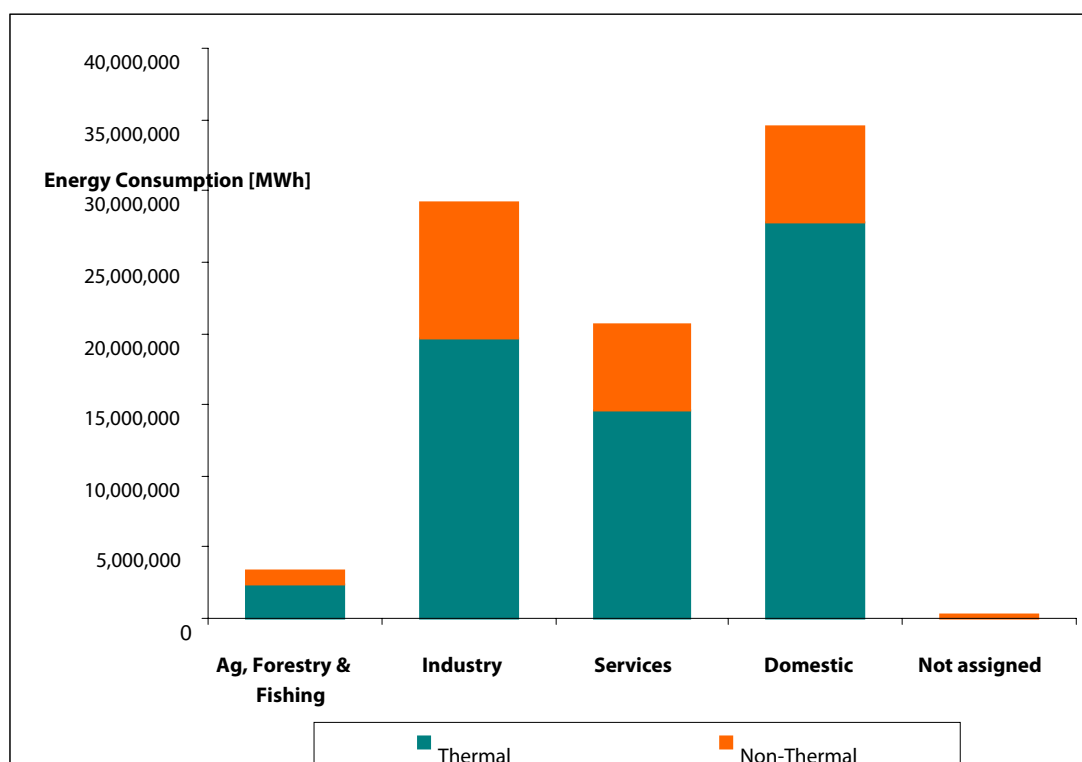


Figure 6: End-use Split (Estimations) in each Industry and Services Sub-sector

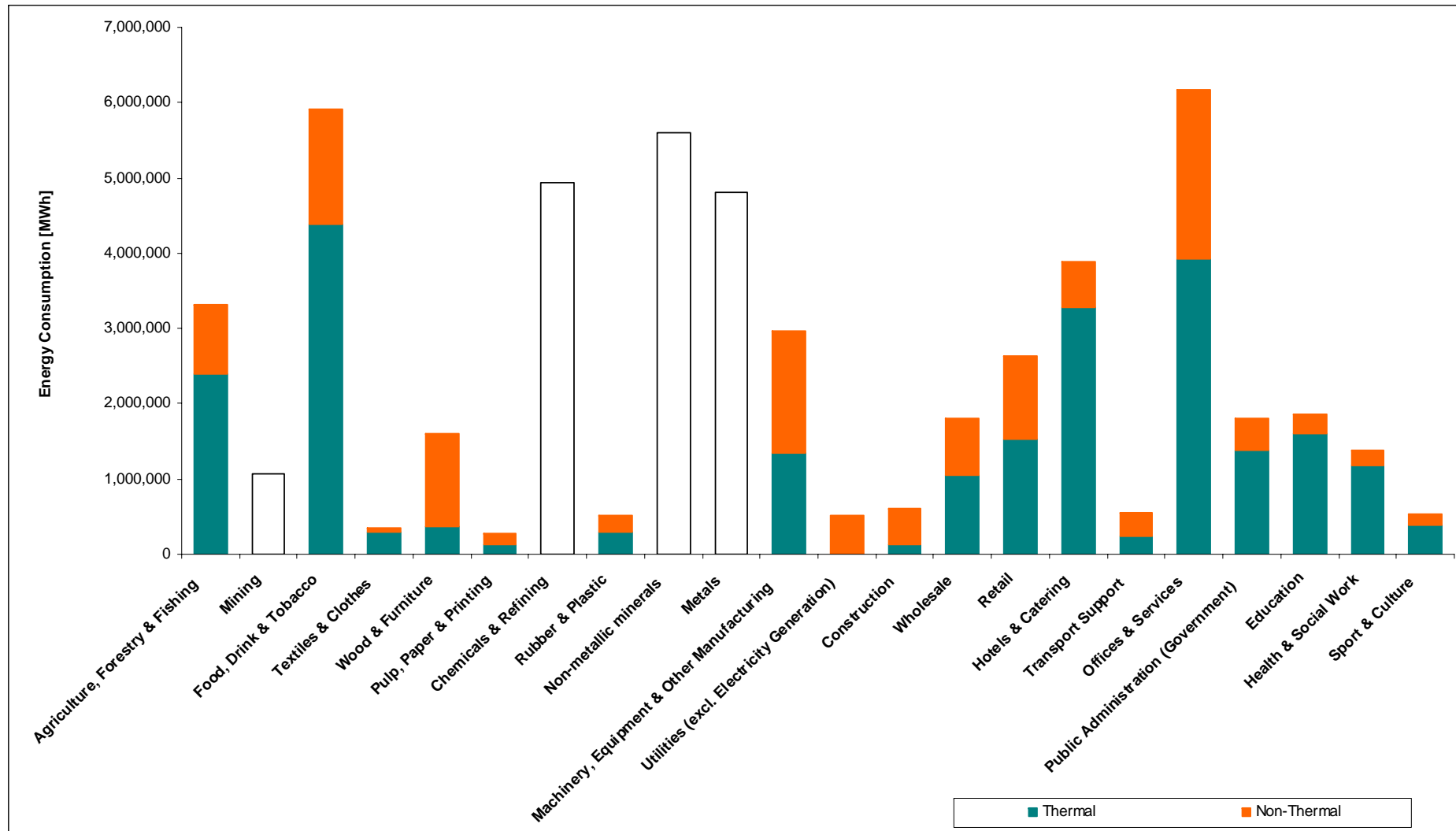


Figure 7: Detailed End-use Split (Estimations) in each Sector

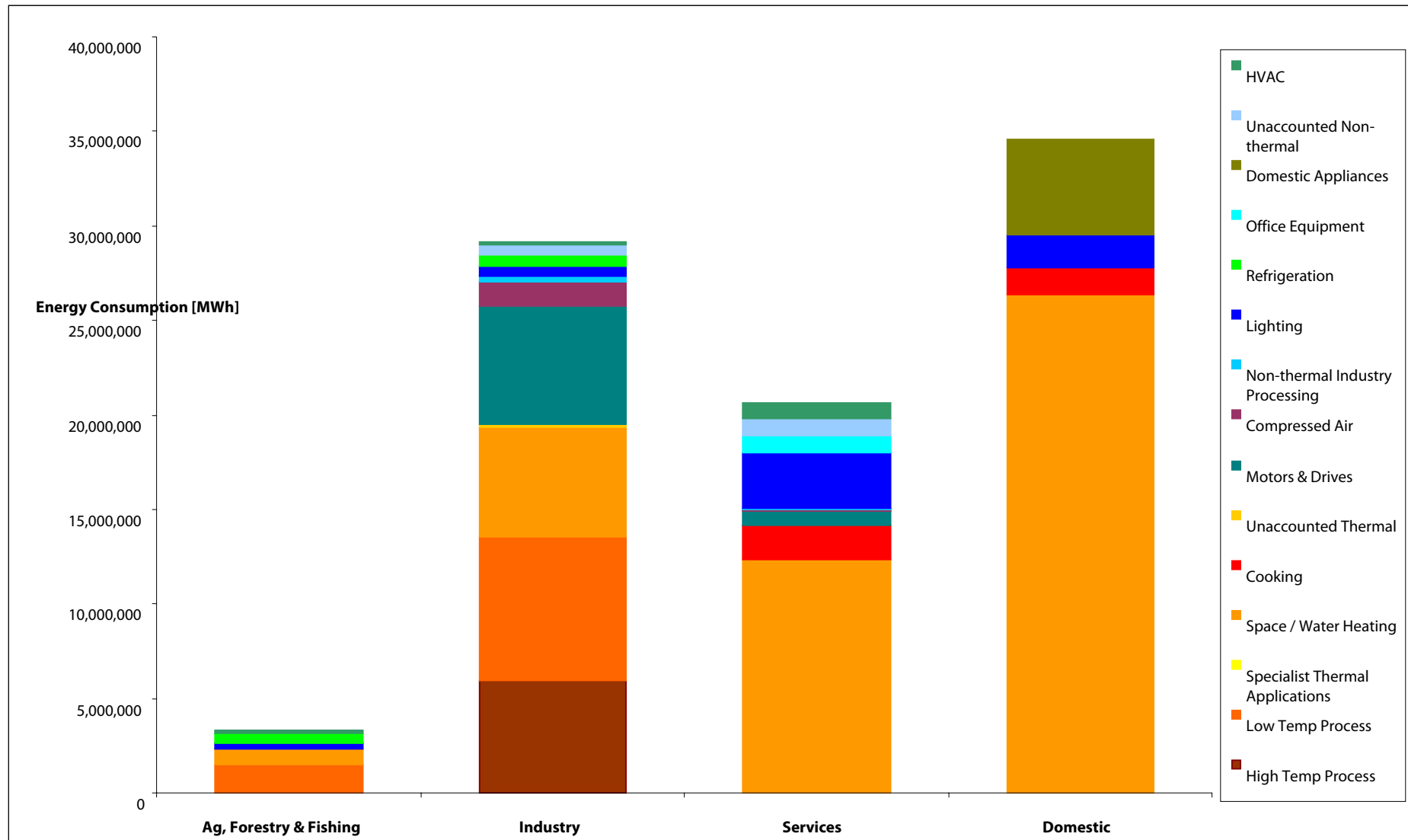
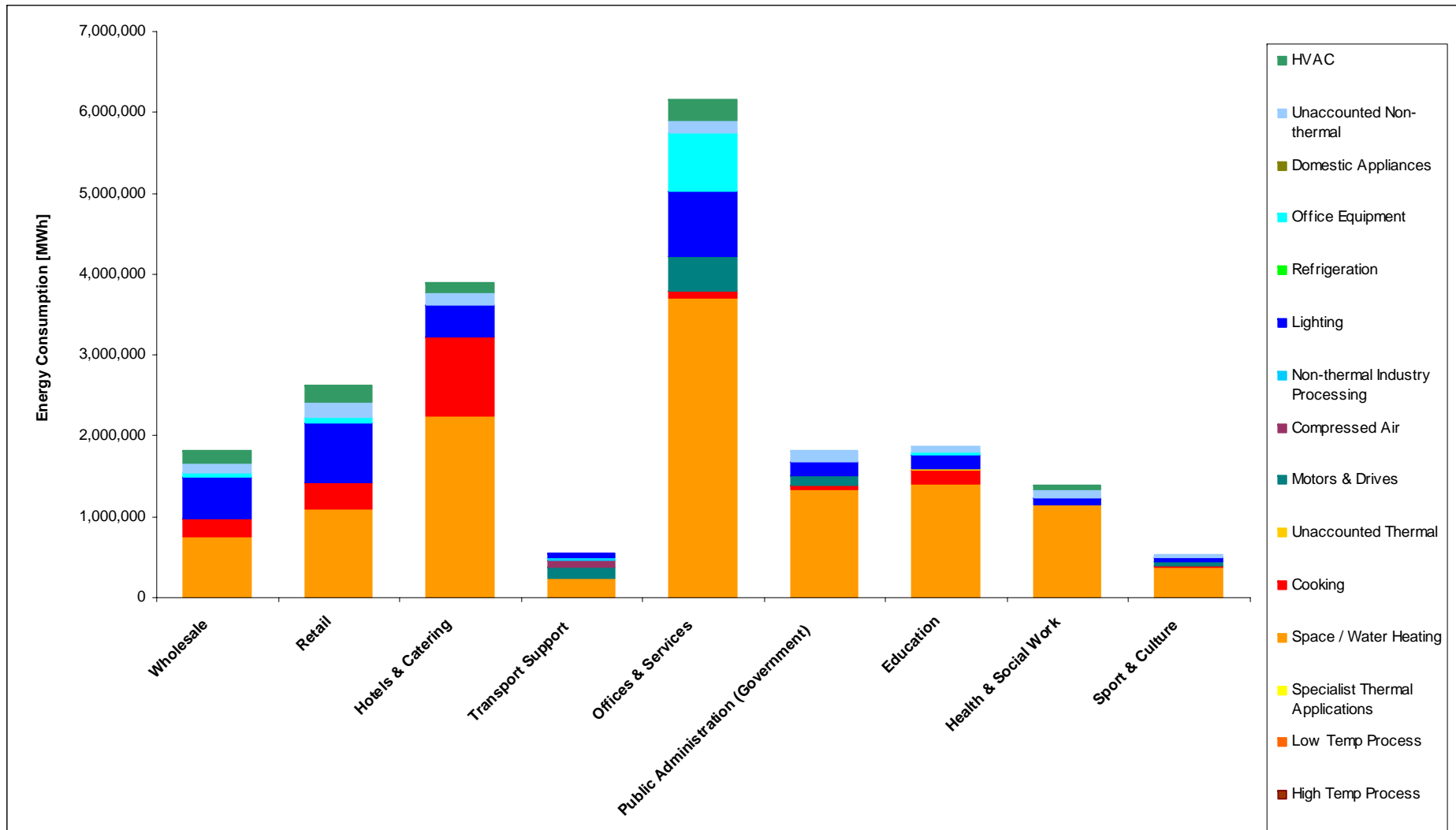


Figure 8: Detailed End-use Split (Estimations) in each Services Sub-sector



Industry Sector

The split between thermal and non-thermal uses of energy, as described in § 2.5, is most relevant to the industry sector. Along with the high-temperature and process-specific applications, there are considerable quantities of steam raised for technical applications, as well as space heating and hot-water generation.

Non-thermal electrical uses are predominantly for motor applications, including pumps, fans, compressors (i.e. fluid handling, refrigeration) and motive power (e.g. drives, conveyors, etc). There is also considerable non-thermal electrical consumption for lighting, office equipment and sector-specific applications.

Heating, ventilation and air-conditioning (HVAC) can be considered to be part thermal, part non-thermal. This is recognised as particularly important energy end-use for the chemicals, pharmaceuticals and electronic / optical and telecommunication (high-tech engineering) sectors.

Services Sector

Thermal uses are predominantly for space heating and hot-water generation, although there is some process / low temperature technical applications and steam raising for technical applications in some hospitals, hotels, restaurants and catering.

Non-thermal electrical uses are predominantly for lighting and office equipment. As with industry, HVAC can be considered to be part thermal, part non-thermal. This is recognised as an (increasingly) important energy centre for many offices and buildings, shops, hospitals and other sub-sectors.

Domestic Sector

The majority of fossil fuel consumption in the domestic sector is for thermal use, predominantly for space and water heating. The remainder is used for cooking. Electricity accounts for all non-thermal uses including lighting, domestic / kitchen appliances, TV / DVD / video and other household goods as well as for some space / water heating. Electricity is consumed for space / water heating predominately in:

- Apartments and maisonettes, predominantly in larger urban areas, where the cost and complexities of linking all dwellings to the gas mains, combined with safety considerations, make this a traditionally unattractive proposition for builders;
- Some older builds during periods when electricity was relatively cheap;
- Some regions where other fuels, particularly gas, is not a viable option.

HVAC can be considered to be part thermal, part non-thermal, although it is not a significant consumption load in the Irish domestic sector.

4.2 Energy Consumption by County

None of the top-down energy consumption data available to the project team is aggregated by county. County breakdown energy consumption data can only be derived from entity-level data. Therefore, it is not possible to determine the percentage coverage of entity-level consumption data in each county.

The domestic sector consumption, which has been completely apportioned between the 180 Local Electoral Areas (see §3.9) is presented on a county-by-county basis in Figure 9 and Table 3.

Figure 9: Fuel Split in each County (Domestic Sector)

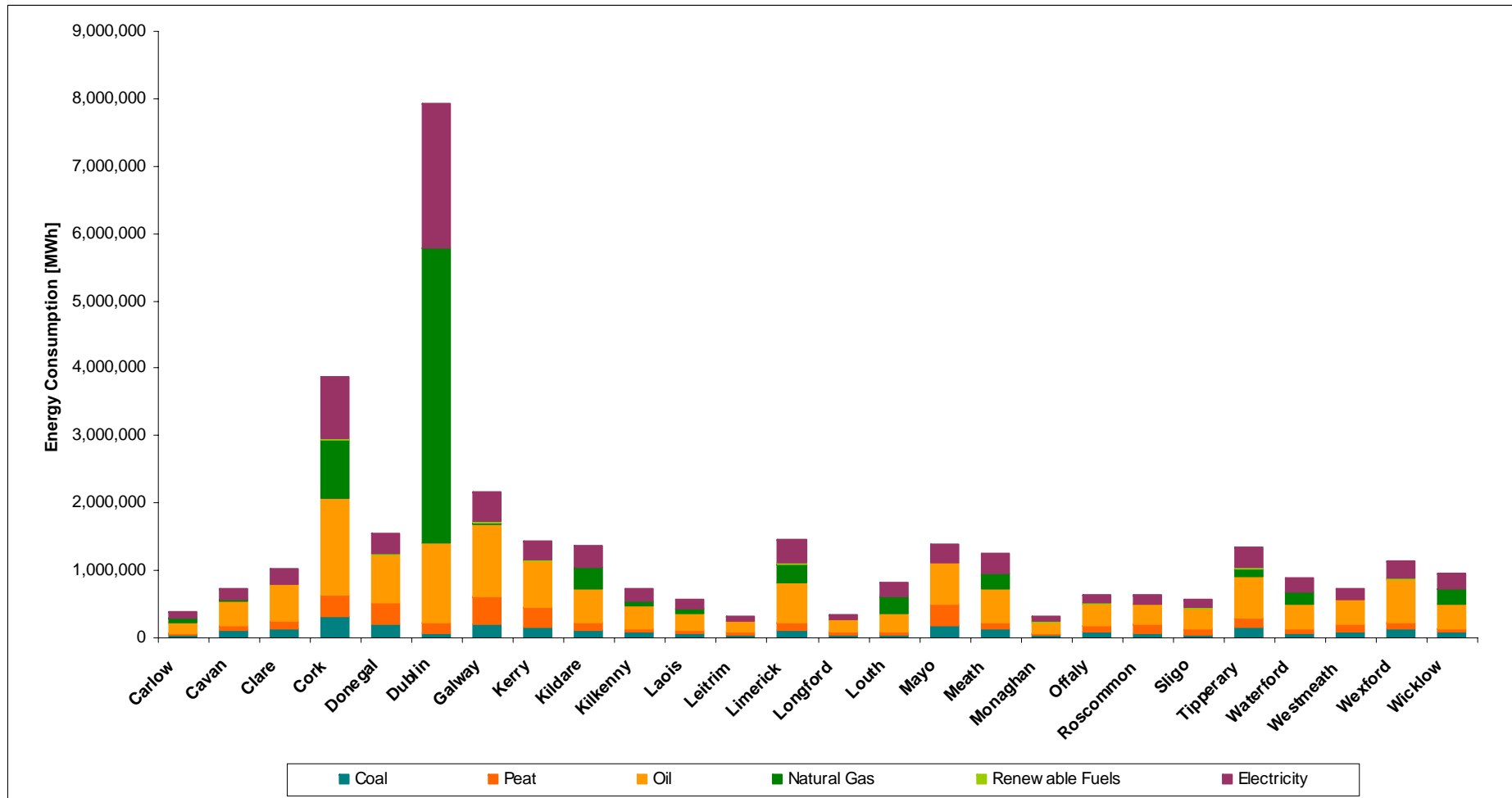


Table 3: Fuel Split in each County (Domestic Sector Only) (see Figure 9 above)							
County	Consumption Summary						
	Coal	Peat	Oil	Natural Gas	Renewable Fuels	Electricity	Total Energy
	[MWh]	[MWh]	[MWh]	[MWh]	[MWh]	[MWh]	[MWh]
Carlow	39,603	21,438	162,886	73,625	2,366	94,469	394,386
Cavan	105,282	69,050	380,710	13,787	6,042	165,540	740,411
Clare	126,520	128,702	535,306	589	11,899	217,433	1,020,450
Cork	319,053	308,667	1,437,190	870,351	26,337	911,333	3,872,930
Donegal	196,316	336,669	708,776	0	12,708	288,621	1,543,091
Dublin	65,944	168,935	1,175,205	4,383,663	2,140	2,121,970	7,917,857
Galway	198,339	412,771	1,078,213	24,825	13,996	447,743	2,175,887
Kerry	154,580	298,020	691,160	0	9,643	281,345	1,434,748
Kildare	121,632	98,659	497,651	332,562	4,195	321,900	1,376,598
Kilkenny	86,798	52,096	341,451	71,700	4,914	165,978	722,936
Laois	67,099	54,965	244,930	67,445	7,654	126,742	568,835
Leitrim	41,505	56,004	148,763	0	5,229	65,217	316,718
Limerick	117,336	100,347	605,029	277,896	4,982	350,086	1,455,677
Longford	45,739	52,932	163,773	0	2,197	68,474	333,115
Louth	50,000	38,352	278,786	247,821	2,121	204,898	821,977
Mayo	172,106	332,871	608,341	0	11,909	259,932	1,385,160
Meath	134,497	87,429	498,300	242,583	3,154	293,401	1,259,364
Monaghan	45,143	19,677	163,958	9,925	2,075	74,201	314,979

Table 3: Fuel Split in each County (Domestic Sector Only) (see Figure 9 above)							
County	Consumption Summary						
	Coal	Peat	Oil	Natural Gas	Renewable Fuels	Electricity	Total Energy
	[MWh]	[MWh]	[MWh]	[MWh]	[MWh]	[MWh]	[MWh]
Offaly	91,595	83,553	315,984	16,498	5,997	133,359	646,986
Roscommon	76,538	129,276	292,021	0	3,667	126,184	627,685
Sligo	55,843	86,390	300,973	0	4,599	124,017	571,822
Tipperary	154,807	147,752	598,826	131,288	12,248	296,076	1,340,997
Waterford	77,667	65,437	362,955	166,536	7,748	206,805	887,148
Westmeath	85,848	109,131	375,147	4,884	4,580	150,522	730,111
Wexford	147,368	87,506	640,908	0	6,027	252,985	1,134,794
Wicklow	82,142	54,617	365,540	216,737	16,687	226,371	962,094
TOTAL	2,859,302	3,401,245	12,972,782	7,152,714	195,114	7,975,601	34,556,758
% of DOMESTIC GRAND TOTAL	100%	100%	100%	100%	100%	100%	100%

Annex A1 – NACE Codes

The table below lists the NACE codes used to classify the data in the database.

Table A1.1: NACE Codes		
NACE Code	Description	Sector
1	Agriculture, hunting and related service activities	Agriculture, Forestry & Fisheries ²¹
2	Forestry, logging and related service activities	Agriculture, Forestry & Fisheries ²²
5	Fishing, fish farming and related service activities	Agriculture, Forestry & Fisheries ²²
10	Mining of coal and lignite; extraction of peat	Industry
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying	Industry
12	Mining of uranium and thorium ores	Industry
13	Mining of metal ores	Industry
14	Other mining and quarrying	Industry
15	Manufacture of food products and beverages	Industry
16	Manufacture of tobacco products	Industry
17	Manufacture of textiles	Industry
18	Manufacture of wearing apparel; dressing and dyeing of fur	Industry
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	Industry
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Industry

²¹ Energy consumption in the agricultural sector is beyond the scope of this study.

²² Some entities within this sub-sector will fall within Industry and are within the scope of this assignment (fish processing, timber processing); others are not (forestry management, fishing fleets).

Table A1.1: NACE Codes		
NACE Code	Description	Sector
21	Manufacture of pulp, paper and paper products	Industry
22	Publishing, printing and reproduction of recorded media	Industry
23	Manufacture of coke, refined petroleum products and nuclear fuel	Industry
24	Manufacture of chemicals and chemical products	Industry
25	Manufacture of rubber and plastic products	Industry
26	Manufacture of other non-metallic mineral products	Industry
27	Manufacture of basic metals	Industry
28	Manufacture of fabricated metal products, except machinery and equipment	Industry
29	Manufacture of machinery and equipment n.e.c.	Industry
30	Manufacture of office machinery and computers	Industry
31	Manufacture of electrical machinery and apparatus n.e.c.	Industry
32	Manufacture of radio, television and communication equipment and apparatus	Industry
33	Manufacture of medical, precision and optical instruments, watches and clocks	Industry
34	Manufacture of motor vehicles, trailers and semi-trailers	Industry
35	Manufacture of other transport equipment	Industry
36	Manufacture of furniture; manufacturing n.e.c.	Industry
37	Recycling	Industry
40	Electricity, gas, steam and hot water supply	Electricity ²³
41	Collection, purification and distribution of water	Industry
45	Construction	Industry
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	Services
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	Services
52	Retail	Services

²³ Energy consumption in the power generation (Electricity) sector is technically beyond the scope of this study; however, primary fuel consumption data for the main thermal power stations has been included in the database.

Table A1.1: NACE Codes		
NACE Code	Description	Sector
55	Hotels & Catering	Services
60	Land transport; transport via pipelines	Services
61	Water transport	Services
62	Air transport	Services
63	Supporting and auxiliary transport activities; activities of travel agencies	Services
64	Post and telecommunications	Services
65	Financial intermediation, except insurance and pension funding	Services
66	Insurance and pension funding, except compulsory social security	Services
67	Activities auxiliary to financial intermediation	Services
70	Real estate activities	Services
71	Renting of machinery and equipment without operator and of personal and household goods	Services
72	Computer and related activities	Services
73	Research and development	Services
74	Other business activities	Services
75	Public administration and defence; compulsory social security	Services
80	Education	Services
85	Health and social work	Services
90	Sewage and refuse disposal, sanitation and similar activities	Services
91	Activities of membership organizations n.e.c.	Services
92	Recreational, cultural and sporting activities	Services
93	Other service activities	Services
95	Activities of households as employers of domestic staff	Domestic
96	Undifferentiated goods producing activities of private households for own use	Domestic
97	Undifferentiated services producing activities of private households for own use	Domestic
98	Domestic	Domestic
99	Extra-territorial organizations and bodies	Services

Annex A2 – Fuel Types

The following are the fuel type classifications used in the database.

Coal

Bituminous Coal
Anthracite & Manufactured
Ovoids
Coke
Lignite
Non-classified Coal

Peat

Milled Peat
Sod Peat
Briquettes
Non-classified Peat

Oil

Crude
Refinery Gas
Gasoline
Kerosene
Jet Kerosene
Fuel Oil
LPG
Gasoil (Diesel / DERV)

Petroleum Coke

Naphtha

Bitumen

White Spirit

Lubricants

Non-classified Oil

Natural Gas

Renewable Fuels

Hydro

Wind

Biomass

Landfill Gas

Biogas

Wastes

Solar

Geothermal

Non-thermal Onsite Electricity Generation

Hydro

Geothermal

Solar Photovoltaic (PV)

Solar Thermal Electric

Tide, Wave, Ocean

Wind

Net Imported Electricity

Annex A3 – County & City Councils

County Councils (29)

Carlow County Council
Cavan County Council
Clare County Council
Cork County Council
Donegal County Council
Dún Laoghaire-Rathdown
County Council
Fingal County Council
Galway County Council
Kerry County Council
Kildare County Council
Kilkenny County Council
Laois County Council
Leitrim County Council
Limerick County Council
Longford County Council
Louth County Council
Mayo County Council
Meath County Council

Monaghan County Council
North Tipperary County Council
Offaly County Council
Roscommon County Council
Sligo County Council
South Dublin County Council
South Tipperary County Council
Waterford County Council
Westmeath County Council
Wexford County Council
Wicklow County Council

City Councils (5)

Cork City Council
Dublin City Council
Galway City Council
Waterford City Council
Limerick City Council

Annex A4 – Local Electoral Areas

The following are the 180 Local Electoral Areas used in the geographic classification of fuel usage in the domestic sector.

Ballinasloe, Co. Galway	Castlereaugh, Co. Roscommon
Connamara, Co. Galway	Roscommon, Co. Roscommon
Loughrea, Co. Galway	Strokestown, Co. Roscommon
Oranmore, Co. Galway	Ballymote, Co. Sligo
Tuam, Co. Galway	Dromore , Co. Sligo
Galway No.1, Co. Galway	Sligo Drumcliff, Co. Sligo
Galway No.2, Co. Galway	Sligo Strandhill, Co. Sligo
Galway No.3, Co. Galway	Tobercurry, Co. Sligo
Ballinamore, Co. Leitrim	Borris, Co. Carlow
Carrick-on-Shannon, Co. Leitrim	Carlow No.1, Co. Carlow
Dromahair, Co. Leitrim	Carlow No.2, Co. Carlow
Manorhamilton, Co. Leitrim	Muinebeag, Co. Carlow
Ballina, Co. Mayo	Tullow, Co. Carlow
Ballinrobe, Co. Mayo	Artane, Co. Dublin
Belmullet, Co. Mayo	Ballyfermot, Co. Dublin
Castlebar, Co. Mayo	Ballymun/Whitehall, Co. Dublin
Claremorris, Co. Mayo	Cabra/Glasnevin, Co. Dublin
Swineford, Co. Mayo	Clontarf, Co. Dublin
Westport, Co. Mayo	Crumlin/Kimmage, Co. Dublin
Athlone, Co. Roscommon	Donaghmede, Co. Dublin
Ballaghaderreen, Co. Roscommon	Finglas, Co. Dublin
Boyle, Co. Roscommon	North Inner City, Co. Dublin

Pembroke, Co. Dublin	Borris-in-Ossory, Co. Laois
Rathmines, Co. Dublin	Emo, Co. Laois
South East Inner City, Co. Dublin	Luggacurren, Co. Laois
South West Inner City, Co. Dublin	Mountmellick, Co. Laois
Ballybrack, Co. Dublin	Portlaoise, Co. Laois
Blackrock, Co. Dublin	Ballymahon, Co. Longford
Dún Laoghaire, Co. Dublin	Drumlish, Co. Longford
Dundrum, Co. Dublin	Granard, Co. Longford
Glencullen, Co. Dublin	Longford, Co. Longford
Stillorgan, Co. Dublin	Ardee, Co. Louth
Balbriggan, Co. Dublin	Drogheda East, Co. Louth
Castleknock, Co. Dublin	Drogheda West, Co. Louth
Howth, Co. Dublin	Dundalk Carlingford, Co. Louth
Malahide, Co. Dublin	Dundalk South, Co. Louth
Mulhuddart, Co. Dublin	Dunshaughlin, Co. Meath
Swords, Co. Dublin	Kells, Co. Meath
Athy, Co. Kildare	Navan, Co. Meath
Celbridge, Co. Kildare	Slane, Co. Meath
Clane, Co. Kildare	Trim, Co. Meath
Kildare, Co. Kildare	Birr, Co. Offaly
Leixlip, Co. Kildare	Edenderry, Co. Offaly
Naas, Co. Kildare	Ferbane, Co. Offaly
Ballyragget, Co. Kilkenny	Tullamore, Co. Offaly
Callan, Co. Kilkenny	Clondalkin, Co. Dublin
Kilkenny, Co. Kilkenny	Lucan, Co. Dublin
Piltown, Co. Kilkenny	Tallaght Central, Co. Dublin
Thomastown, Co. Kilkenny	Tallaght South, Co. Dublin

Terenure-Rathfarnham, Co. Dublin	Kanturk, Co. Cork
Athlone, Co. Westmeath	Macroom, Co. Cork
Coole, Co. Westmeath	Mallow, Co. Cork
Kilbeggan, Co. Westmeath	Midleton, Co. Cork
Mullingar East, Co. Westmeath	Skibbereen, Co. Cork
Mullingar West, Co. Westmeath	Cork North-Central, Co. Cork
Enniscorthy, Co. Wexford	Cork North-East, Co. Cork
Gorey, Co. Wexford	Cork North-West, Co. Cork
New Ross, Co. Wexford	Cork South-Central, Co. Cork
Wexford, Co. Wexford	Cork South-East, Co. Cork
Arklow, Co. Wicklow	Cork South-West, Co. Cork
Baltinglass, Co. Wicklow	Dingle, Co. Kerry
Bray, Co. Wicklow	Killarney, Co. Kerry
Greystones, Co. Wicklow	Killorglin, Co. Kerry
Wicklow, Co. Wicklow	Listowel, Co. Kerry
Ennis, Co. Clare	Tralee, Co. Kerry
Ennistimon, Co. Clare	Bruff, Co. Limerick
Killaloe, Co. Clare	Castleconnell, Co. Limerick
Kilrush, Co. Clare	Kilmallock, Co. Limerick
Scarriff, Co. Clare	Newcastle, Co. Limerick
Shannon, Co. Clare	Rathkeale, Co. Limerick
Bandon, Co. Cork	Limerick No.1, Co. Limerick
Bantry, Co. Cork	Limerick No.2, Co. Limerick
Blarney, Co. Cork	Limerick No.3, Co. Limerick
Carrigaline, Co. Cork	Limerick No.4, Co. Limerick
Fermoy, Co. Cork	Borrisokane, Co. Tipperary
	Nenagh, Co. Tipperary

Templemore, Co. Tipperary	Bailieborough, Co. Cavan
Thurles, Co. Tipperary	Balljamesduff, Co. Cavan
Cahir, Co. Tipperary	Belturbet, Co. Cavan
Cashel, Co. Tipperary	Cavan, Co. Cavan
Clonmel, Co. Tipperary	Donegal, Co. Donegal
Fethard, Co. Tipperary	Glenties, Co. Donegal
Tipperary, Co. Tipperary	Inishowen, Co. Donegal
Dungarvan, Co. Waterford	Letterkenny, Co. Donegal
Kilmacthomas, Co. Waterford	Milford, Co. Donegal
Lismore, Co. Waterford	Stranorlar, Co. Donegal
Suir, Co. Waterford	Carrickmacross, Co. Monaghan
Tramore, Co. Waterford	Castleblayney, Co. Monaghan
Waterford No.1, Co. Waterford	Clones, Co. Monaghan
Waterford No.2, Co. Waterford	Monaghan, Co. Monaghan
Waterford No.3, Co. Waterford	

Annex A5 – Primary Data Sources

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality ²⁴	Available to BÓC / AEA	Sector	Data
R-001	Energy in Ireland 1990-2006 - Trends, Issues, Forecasts and Indicators	2006	2005	EPSSU	Unrestricted	Yes	All	Total sectoral demand and breakdown of fuel types
R-002	Energy Balances 1990-2006	2005	1990 - 2006	EPSSU	Restricted (most included in R-001)	Yes	All	Breakdown of fuel consumption by fuel type from fuel importers, distributors & suppliers. Breakdown of fuel consumption by sector (NACE code groupings) based on expenditure data submitted to CSO via Census of Industrial Production and Annual Services Inquiry

²⁴ See §3.1

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-003	Profiling Energy Consumption and CO2 Emissions in Industry - Sensitivity to Carbon Taxation and Emissions Trading	2003		EPSSU	Unrestricted	Yes	Industry	
R-004	Profiling Energy Consumption and CO2 Emissions in Industry - 2004 Update - Sensitivity to Energy Price Changes	2004	2004	EPSSU	Unrestricted	Yes	Industry	Energy use and type in Industry
R-005	Combined Heat & Power in Ireland - Trends and Issues 1991-2002	2004	1991 - 2002	EPSSU	Unrestricted	Yes	CHP	Total installed capacity and sub-sector use
R-006	Combined Heat & Power in Ireland - Trends and Issues - 2004 Data Update	2005	2004	EPSSU	Unrestricted	Yes	CHP	No entity-level energy data.
R-007	Energy Consumption and CO2 Emissions in the Residential Sector 1990-2004	2005	2004	EPSSU	Unrestricted	Yes	Residential	No entity-level energy data.
R-008	Renewable Energy in Ireland - 2005 Update	2006	2005	EPSSU	Unrestricted	Yes	Electricity	Primarily focussed on energy supply side.
R-009	Profiling Energy and CO2 Emissions in the Services Sector	2005	2003	EPSSU	Unrestricted	Yes	Services	
R-010	<i>Deleted</i>							

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-011	Survey of CHP Plants	2005	2004	EPSSU	Restricted	No	CHP	Fuel consumption and electricity and (useful) thermal output for each plant (~50% response rate to survey in 2004)
R-012	Survey of Biomass Plants	2005	2004	EPSSU	Restricted	No	Industry	Fuel consumption and electricity and (useful) thermal output for each plant
R-013	Survey of Biogas Plants	2005	2004	EPSSU	Restricted	No	Industry	Fuel consumption and electricity and (useful) thermal output for each plant
R-014	Survey of Rendering (Tallow) Plants	2005	2004	EPSSU	Restricted	No	Industry	Fuel consumption and electricity and (useful) thermal output for each plant
R-015	LIEN Annual Report 2002	2003	2002	SEI	Unrestricted	Yes	Industry	Dimensionless Energy Performance Indices (EPIs) for 80 participant companies. Case studies for 12 LIEN Members

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-016	LIEN Annual Report 2003	2004	2003	SEI	Unrestricted	Yes	Industry	Dimensionless Energy Performance Indices (EPIs) for 78 participant companies. Case studies for 10 LIEN Members
R-017	LIEN Annual Report 2004	2005	2004	SEI	Unrestricted	Yes	Industry	Dimensionless Energy Performance Indices (EPIs) for 77 of 80 participant companies
R-018	LIEN Energy Successes 2004	2005	2004	SEI	Unrestricted	Yes	Industry	Case studies for 8 LIEN Members
R-019	LIEN 2006 Primary Energy Breakdown	2007	2006	SEI	Restricted	Yes	Industry	Metered electricity, gas, gasoil, LPG, Light Fuel Oil, Medium Fuel Oil & Heavy Fuel Oil use (GWh) for 76 sites.
R-020	Data tables used for <i>Profiling Energy and CO2 Emissions in the Services Sector</i> (R-009)	2005		EPSSU	Restricted	Yes	Services	
R-021	LIEN 2005 Primary Energy Breakdown	2006	2005	SEI	Restricted	Yes	Industry	Energy consumption breakdown by end use (electrical & thermal) for up to 76 LIEN participants
R-022	Negotiated Energy Agreements Pilot Project - Final Report	2003	2002	SEI	Unrestricted	Yes	Industry	More detailed data available in R-023 - R025

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-023	Negotiated Agreements Pilot Project - Technology Agreement Energy Audits	2003	2002	SEI	Restricted	Yes	Industry	Energy consumption for thermal systems in 15 companies (multi-sector). 5 of these sites are in EU ETS & 8 of them are in LIEN
R-024	Negotiated Agreements Pilot Project - Collective Agreement Energy Audits	2003	2002	SEI	Restricted	Yes	Industry	Energy consumption breakdown (all uses) for 10 pharmachem sector companies. 6 of these sites are in EU ETS & 8 of them are in LIEN
R-025	Negotiated Energy Agreements Pilot Project - Individual Firm Energy Audits	2003	2002	SEI	Restricted	Yes	Industry	Energy consumption breakdown (all uses) for Aughinish Alumina Ltd. Aughinish Alumina Ltd. is also in LIEN & EU ETS.
R-026	Energy Awards 2004- Completed Questionnaires		2003	SEI	Restricted	Yes	Various	Energy consumption data & energy cost data for variety of discrete sites from several sectors
R-027	Energy Awards - 2005 Completed Questionnaires		2004	SEI	Restricted	Yes	Various	Energy consumption data & energy cost data for variety of discrete sites from several sectors

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-028	EU ETS 2006 CO2 emissions data (Community Transaction Log)	2007	2006	EU ETS	Unrestricted	Yes	Industry	CO2 emissions for 109 sites in Ireland including 16 power stations, 3 energy conversion sites, 1 oil refinery, 4 hospitals, 1 airport, 4 universities & 80 industrial sites.
R-029	Annual Housing Statistics Bulletin 2004	2005	2004	DEH&LG	Unrestricted	Yes	Residential	House completions (by county) & estimate for total housing stock
R-030	Irish National Survey of Housing Quality 2001-2002	2003	2001 - 2002	DEH&LG	Unrestricted	Yes	Residential	Very limited energy-related data
R-031	Homes for the 21st Century - The Costs and benefits of Comfortable Housing for Ireland	1999		Energy Action	Unrestricted	Yes	Residential	Estimated split between thermal and non-thermal consumption in residential sector

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-032	Annual Environmental Reports (AERs) - submitted to EPA under Waste Management Licences	2005	2004	EPA	Unrestricted	Yes	Industry	Site fuel consumption broken down by fuel types (HFO, LFO, natural gas, coal & electricity only) for ~530 industrial sites. National Grid reference for ~530 industrial sites. AERs are available for inspection in hard copy only & located in EPA's 5 regional offices. Energy data is not collated from AERs by EPA, though EPA is transitioning to an electronic submission system. Data quality is variable.

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-033	Annual Environmental Reports (AERs) - submitted to EPA under IPPC Licences	2005	2004	EPA	Unrestricted	Yes	Industry	Site fuel consumption broken down by fuel types (HFO, LFO, natural gas, coal & electricity only) for ~180 waste management operators. AERs are available for inspection in hard copy only & located in EPA's 5 regional offices. Energy data is not collated from AERs by EPA, though EPA is transitioning to an electronic submission system. Data quality is variable.
R-034	Energy Audit Reports – prepared in compliance with Waste Licences	Various	Various	EPA		No	Industry	Licensees are typically not obliged to submit the Audit Report to the EPA.
R-035	Energy Audit Reports - prepared in compliance with IPPC Licences	Various	Various	EPA		No	Industry	Licensees are typically not obliged to submit the Audit Report to the EPA.
R-036	Potential for Energy Savings in the Service Sector in Ireland – A Market Characterisation	2004	2002	SEI		Yes	Services	Estimates of energy consumption by sub sector, fuel type & end use
R-037	Dataset of Energy Consumption in Services Sector		2005	UCD ERG	Restricted		Services	~400-500 records from 16 sub-sectors, including many records from schools.

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-038	Profile of Housing Stock		1997 & 2002	UCD ERG	Restricted		Residential	
R-039	Hotel Energy Audit Reports			SEI	Restricted	Yes	Services	Electricity consumption data (only) for 3 hotel sites. Electricity & fossil fuel consumption data for 2 hotel sites.
R-040	HSE Hospital Survey		2005	HSE	Restricted	No	Services	Energy consumption data (electricity & fuel use) for 100+ hospital & related sites in Ireland
R-041	List of BG COGEN CHP Plants in Ireland	2006		BG COGEN	Unrestricted	Yes	CHP	List of ~6 CHP plants with electrical outputs (kW)
R-042	List of Temp Tech CHP Plants in Ireland	2006		Temp Tech	Unrestricted	Yes	CHP	List of ~66 small scale CHP plants with electrical and heat outputs (kW)
R-043	Environmental Accounts for Ireland 1997-2004	2006	1997 - 2004	CSO	Unrestricted	Yes	All	CO2 and GHG emissions broken down by NACE code
R-044	Energy Database			OPW Engineering Department	Restricted	No	Services	Energy information on 150+ Public Sector sites

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-045	Energy Surveys	Various	Various	SEI	Restricted	Yes	Services	'Building' type studies containing energy consumption data for sites in Commercial & Public Sectors
R-046	Report on Energy Consumption in Dublin Universities	2005		SEI	Restricted	Yes	Services	Energy consumption data for 4 Dublin universities
R-047	Review of Fuel Poverty and Low Income Housing	2003		SEI	Unrestricted	Yes	Residential	
R-048	GeoDirectory	2006	Continuously Updated	An Post	Restricted	No	All	Postal address & X-Y coordinates for every building in Ireland. Classification of building groups by type (28 types). Classification of domestic residences by type - 'detached', 'semi-detached', 'terraced' and 'holiday home'. Classification of commercial by activity (incomplete & potentially inaccurate)
R-049	<i>Deleted</i>							
R-050	<i>Deleted</i>							
R-051	Assessment of Non-Industry Sites Likely to Have Paid Carbon Tax	2001 / 2002		SEI		Yes	Services	

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-052	Assessment of Industry Sites Likely to Have Paid Carbon Tax	2001 / 2002		SEI		Yes	Services	
R-053	List of Fingleton White CHP Plants in Ireland	2006		Fingleton White	Unrestricted	Yes	CHP	List of 8 CHP plants with electrical and heat outputs (capacities only, i.e. kW not kWh)
R-054	Development of Irish Building Energy Performance Indicators	2005		UCD		Yes	Services	
R-055	List of 38 kV Substations		2001	ESB Networks	Restricted	Yes	Electricity	List of all 458 x 38 kV substations on network including National Grid co-ordinates. No energy data.
R-056	Ireland Energy Map - Electricity Generation and Transmission, Gas Fields, Gas Pipelines		2002	La Tene Maps	Unrestricted	Yes	Electricity	Approximate (county) location of 110 kV, 220 kV & 400 kV substations. No energy data.
R-057	Domestic Electricity Consumption Demand Profiles	2007	2006	ESB MRSO via CER	Restricted	Yes	Residential	Total number of domestic customers in each of four tariff categories and the total combined consumption in each category for 2005 and 2006.

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-058	Aggregated LDM, DM & NDM Natural Gas Consumption - Uncleansed Data	2007	2006	BGÉ GPRO via CER	Restricted	Yes	All	Consumption data for ~54 Large Daily Metered (LDM) customers and ~181 Daily Metered (DM) customers aggregated into forty-two industry descriptors (do not directly correspond to NACE classifications).
R-059	Renewable Energy in Ireland, 2007 UPDATE	2007	2006	EPSSU	Unrestricted	Yes	Electricity	Total energy from each type of renewables. Focussed on supply side.
R-060	Energy in Industry 2007 Report	2007	2006	EPSSU	Unrestricted	Yes	Industry	Energy consumption in each sub-sector.
R-061	LIEN Annual Report 2005	2006	2005	SEI	Unrestricted	Yes	Industry	Dimensionless EPI data only. Consumption data available in R-021.
R-062	LIEN Annual Report 2006	2007	2006	SEI	Unrestricted	Yes	Industry	Dimensionless EPI data only. Consumption data available in R-019.
R-063	Energy Awards - 2006 Completed Questionnaires	2006	2005	SEI	Restricted	Yes	Industry	Mainly spend data (incomplete)
R-064	Energy Awards - 2007 Completed Questionnaires	2007	2006	SEI	Restricted	Yes	Industry	Mainly spend data (incomplete)
R-065	Annual Housing Statistics Bulletin 2005		2005	DEH&LG	Unrestricted	Yes	Residential	Housing statistics only; no energy data.

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-066	Annual Housing Statistics Bulletin 2006		2006	DEH&LG	Unrestricted	Yes	Residential	Housing statistics only; no energy data.
R-067	Housing Statistics Excel Workbook	2007	2006	DEH&LG	Restricted	Yes	Residential	Number of houses and apartments added annually and total residential units up to 2006.
R-068	Aggregated Electricity Consumption - Uncleansed Data	2007	2006	ESB MRSO via CER	Restricted	Yes	All	Electricity consumption totals (in kWh) aggregated by two-digit NACE code for 2006.
R-069	HSE South Energy Report 2005	2006	2005	HSE	Restricted	Yes	Services	Energy Consumption data by fuel type for ~50 HSE hospitals & other buildings in the HSE South region. Also includes bed nos. & building areas.
R-070	List of Post Primary Schools	2007	2006	DE&S	Unrestricted	Yes	Services	List of all 732 post primary schools in the State, including enrolment numbers & address. No energy data.
R-071	List of Primary Schools	2007	2006	DE&S	Unrestricted	Yes	Services	List of all 3,292 primary schools in the State, including enrolment numbers & address. No energy data.

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-072	Environmental Accounts for Ireland 1997-2004	2007	1997 - 2005	CSO	Unrestricted	Yes	All	CO2 and GHG emissions broken down by NACE code.
R-073	List of Garda Stations	2007	2006	Garda Síochána	Unrestricted	Yes	Services	Addresses of all 704 Garda Stations in Ireland. No energy data.
R-074	List of Post Offices	2007	2006	An Post	Unrestricted	Yes	Services	Addresses of all 995 Post Offices in Ireland. No energy data.
R-075	E3 Energy Efficiency in Dublin Universities Database	2007	2006	E3	Unrestricted	Yes	Services	Energy consumption for selected buildings at UCD, TCD, DIT & DCU.
R-076	UCD Buildings & Services Department Energy Report 2006	2007	2006	UCD	Restricted	Yes	Services	Energy consumption for 2005/2006 financial year at different campuses within UCD (electricity & fuel).
R-077	<i>Deleted</i>							
R-078	IS 393 Impact Assessment Spreadsheets	2007	2006	SEI	Restricted	Yes	Industry	Energy Consumption broken down by fuel type for 13 x IS 393 organisations (2004-2007).
R-079	SME Programme - Energy Advisor Reports	2008	2006 – 2007	SEI	Restricted	Yes	Industry / Services	Energy Advisor Reports including breakdown of site energy consumption for 411 sites in programme.

Table A5.1: Primary Data Sources								
Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-080	<i>Deleted</i>							
R-081	<i>Deleted</i>							
R-082	HEA (3rd Level) Names, locations and Student Numbers for 2005/2006	2007	2005	HEA	Unrestricted	Yes	Services	Statistics on 3rd level institutions student numbers (no energy data).
R-083	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/agricultureandhorticulture_2.htm	2007		Carbon Trust	Unrestricted	Yes	Agriculture	Covering "typical" small farms through to large, multi-site businesses.
R-084	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/miningandquarrying_17.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Diverse non-energy products - for road building, building construction and raw materials for chemicals and non-metals sector.
R-085	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/fooddrinkandtobacco_11.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Covering soft and alcoholic drink, milk, cheese, eggs, bread, cereals, ready meals, frozen meals, processed meats and animal feeds
R-086	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/textiles_23.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Mainly treating, dyeing and other processes to do with clothes and textiles
R-087	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/paperproductsandprinting_18.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Very little paper and pulp in Ireland; mostly paper & board products and printing.

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Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-088	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/chemicalsandchemicalproducts_5_2.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Covering pharmaceuticals, resins, fertilisers, ammonia products and other speciality chemicals
R-089	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/plasticsandrubber_19.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Low value packaging, protective clothing, healthcare products, transport components, domestic appliances, general rubber goods & tyres
R-090	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/ceramicsglasscement_4.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Cement and cement products, ceramics (bricks, tiles & whitewares), glass (mainly crystal and insulating fibre glass)
R-091	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/metalsandmetalproducts_16.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Includes Aughinish Alumina - which dominates sector in Ireland. More typically: steel, aluminium, non-ferrous, batteries, galvanisers, foundries - all of which are small in Ireland.

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Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-092	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/engineering_10_2.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Broad "catch-all" sector of non-energy-intense operators: metal fabricators, plating, motor vehicles, computers, electrical and optical equipment, cooker/washer/ TV manufacture, etc
R-093	http://www.carbontrust.co.uk/energy/startsaving/sectorselector/construction_6.htm	2007		Carbon Trust	Unrestricted	Yes	Industry	Building/ civil engineering projects: industry & commercial, residential , public sector.
R-094	Aggregated Domestic-level Natural Gas Consumption (by county)	2007	2006	BGÉ GPRO via CER	Restricted	Yes	Residential	Total number of small (domestic) customers in 18 counties. Total consumption (kWh) in each county & average consumption in each decile of customers in each county.
R-095	Domestic Electricity Consumption Demand Profiles - Decile Analysis	2007	2006	ESB MRSO via CER	Restricted	Yes	Residential	Breakdown of domestic consumption on a county-by-county basis and a breakdown of consumption by decile
R-096	List of 110 kV, 220 kV & 400 kV substations (Eirgrid)		2001	Eirgrid	Restricted	Yes	Electricity	List of all 83 400kV, 220kV & 110kV substations on network including National Grid co-ordinates

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Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-097	Annual Installation Emissions Reports for EU ETS	2007	2006	EPA	Unrestricted	Yes	Industry	Emission data, fuel types and fuel quantities from facilities in the EU ETS.
R-098	TCD Correspondence with energy manager	2007	2006	Energy Manager	Restricted	Yes	Services	Energy use for the campus and for Trinity Hall, Goldsmith Hall and Santry.
R-099	Carbon Trust website: Construction	2007		Carbon Trust	Unrestricted	Yes	Industry	Building/ civil engineering projects: industry & commercial, residential, public sector.
R-100	Carbon Trust website: Utilities	2007		Carbon Trust	Unrestricted	Yes	Industry	Utility suppliers - predominantly electricity got pumping the fluids
R-101	Carbon Trust website: Retail & Wholesale	2007		Carbon Trust	Unrestricted	Yes	Services	Shops, retail services (banks, estate agents, etc), department stores and supermarkets
R-102	Carbon Trust website: Hotels & Restaurants	2007		Carbon Trust	Unrestricted	Yes	Services	Hotels, guest houses, B&B. Pubs & restaurants. Catering outlets for offices, hospitals, schools and other businesses
R-103	Carbon Trust website: Sport & Leisure	2007		Carbon Trust	Unrestricted	Yes	Services	Health clubs, Leisure facilities, changing rooms, gyms, swimming pools and combinations of the above.

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Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-104	Carbon Trust website: Offices	2007		Carbon Trust	Unrestricted	Yes	Services	Predominantly offices - split into 4 main categories.
R-105	Carbon Trust website: Central Government	2007		Carbon Trust	Unrestricted	Yes	Services	Primarily Government and Defence estates, including prisons.
R-106	Carbon Trust website: Local Government	2007		Carbon Trust	Unrestricted	Yes	Services	Admin offices, local estate offices, community centres, sports centres, libraries and museums.
R-107	Carbon Trust website: Schools	2007		Carbon Trust	Unrestricted	Yes	Services	Pre-school, Primary and secondary education (up to 19 year-olds)
R-108	Carbon Trust website: Universities & HE	2007		Carbon Trust	Unrestricted	Yes	Services	Tertiary education: Universities and Colleges, including peripheral accommodation blocks, labs, halls, offices and sport facilities
R-109	Carbon Trust website: Healthcare & Hospitals	2007		Carbon Trust	Unrestricted	Yes	Services	GP practices and clinics, general and specialist hospitals and related services

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Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-110	CTV006-Sector Overview: Sports & Leisure	2006		Carbon Trust	Unrestricted	Yes	Services	overview for the Sports & Leisure industry - looks at ways of improving EE in everyday operation in gyms, swimming pools, etc
R-111	CTV001-Sector Overview: Retail	2006		Carbon Trust	Unrestricted	Yes	Services	Overview: focus on low and no-cost energy saving measures for retail sector
R-112	CTV013-Sector Overview: Hospitality	2007		Carbon Trust	Unrestricted	Yes	Services	Overview: focus on low and no-cost energy saving measures for hospitality sector
R-113	ECG019-Energy Use in Offices	2003		Carbon Trust	Unrestricted	Yes	Services	Guide describing the energy performance of four generic types of office building
R-114	CTV007-Sector Overview: Office Based Companies	2006		Carbon Trust	Unrestricted	Yes	Services	Covers main energy consuming areas within office based companies including lighting, HVAC, office equipment and building fabric.
R-115	ECG087-Energy Use In Local Authority Buildings	2004		Carbon Trust	Unrestricted	Yes	Services	Guide to assists Energy/ Facilities Managers for building energy consumption within Local Authority buildings

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Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-116	CTV019-Sector Overview: Schools	2007		Carbon Trust	Unrestricted	Yes	Services	Overview of the main energy saving opportunities for schools and offers low and no-cost measures to reduce costs
R-117	CTV020-Universities and Higher Education Overview	2007		Carbon Trust	Unrestricted	Yes	Services	Overview of the main energy saving opportunities for Higher education establishments
R-118	The Irish Times Top 1,000 Companies (www.businessworld.ie/cd/Top1000/Nace)	2006	2006	The Irish Times	Unrestricted	Yes	All	Names, address & sectors of top 1,000 Irish companies (no energy data)
R-119	CHP plants from Irish CHP Association	2007	2006	Irish CHP Association	Unrestricted	Yes	CHP	Names, address and some details of CHP plant sizes. Plant capacities only; no consumption data.
R-120	SEI Case Studies			SEI	Unrestricted	Yes	All	Various case studies highlighting energy efficiency projects, CHP etc. at specific sites.
R-121	Energy Consumption in the United Kingdom			BERR	Unrestricted	Yes	All	Typical end-use split data for different sectors in the UK

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Ref	Full Title	Date	Data Year	Source	Data Confidentiality²⁴	Available to BÓC / AEA	Sector	Data
R-122	Household Budget Survey 2004-2005	2007	2004-2005	CSO	Unrestricted	Yes	Residential	Average weekly expenditure and consumption rates for different fuel types for urban, farm and other rural households
R-123	Census 2006 Volume 1 – Population classified by area	2007	2006	CSO	Unrestricted	Yes	Residential	Classification of population by area
R-124	Census 2006 Volume 6 – Housing (CSO)	2007	2006	CSO	Unrestricted	Yes	Residential	Classification of population by household type
R-125	Notice to Owners of Raised Bog and Turbary Rights Holders	2002		DEH&LG	Unrestricted	Yes	Residential	
R-126	Statistical Yearbook of Ireland	2004		CSO	Unrestricted	Yes	All	



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