# AEE
# CLIMATE ACTION CERTIFICATE WORKBOOK


## Abstract: A Course for Climate Action Leaders (version 3.1)

Building on training materials used by SEAI and delivered to over 2,000 public service employees since 2020 this Climate Action Certificate course equips you with the practical structures and tools to develop climate action plans for your organisation.



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It is envisaged that this guide will be distributed as a PDF (online training) or in print format (in person training). If printing, please only print what you need and dispose of the paper to recycling when done.

# About this Course

**Want to be a leader in Climate Action?**

This Climate Action Certificate is a new professional development course offered by the Association of Energy Engineers (AEE) covering the potential impacts and opportunities facing Ireland and humanity globally, as well as an overview of policies and emissions profiles. It is open to all professionals and staff tasked with working on climate action and will provide the tools and guidance needed to get started on your organisation's climate action journey.

The course offers a **practical "how to" manual on climate action.** Learn how you can develop climate initiatives in your organisation, draft a plan of action, and access supports to implement your plan.

**Learning Outcomes**

1. Gain an overview of Global, Regional (EU) and National (Ireland) emissions, policy, and legislation
    - Terminology, concepts and jargon explained
2. Understand the potential impacts and opportunities facing businesses
    - Including carbon budgets for enterprise
3. Know what Climate Action means with particular regard to
    - Reducing emissions
    - Adapting to a changing climate, and
    - Raising awareness amongst suppliers, staff and customers
4. Learn how to prioritise opportunities for improvement
    - How to do carbon calculations
    - Templates provided
5. Know where to find the supports to start climate action planning for your business

**Course Details**

- **Open to all professionals** looking to develop Climate Action Plans for organisations, i.e. C-Suite executives, managers, legal, financial, HR, operations backgrounds, etc.
- No prior knowledge required.
- **Professional Development Certificate** issued from the Association of Energy Engineers (AEE), Atlanta.
- 15 hrs CPD + 1 hr assessment
- Registration form and more details at [https://www.aeecenter.org/event/climate-action-certificate-virtual-training-program/](https://www.aeecenter.org/event/climate-action-certificate-virtual-training-program/)

**Testimonials**

*"I really enjoyed the course, eye opening, very interesting. I found Conor and Raoul excellent, really made it interesting and enjoyable. I would be happy to recommend it to both colleagues and friends. The venue was excellent"*

David McCrone, Facilities Officer, National Transport Authority

*"Thanks to the presenters for a very comprehensive and engaging experience."*

Dr Anthony Farrell, Energy & Engineering Services Manager, Accent Solutions

# Contents (see accompanying pdf with slide deck)

# Exercise 1: Your Business Case

Enter your numbers and discuss your findings with the group.

| Example | € / $ | $tCO_2e$ |
|---|---|---|
| **Energy & fuel spend (approx.)** | | |
| Typical projected savings (10% over 3 years) | | |
| Potential annual saving over 1 year | | |
| **Net profit margin (%)**<br>(we assumed a low 3% in our example;<br>10% would be considered average) | | |
| Profit (or non-pay budget) last year?<br>(profit margin x turnover) | | |
| Energy savings as % of profit/budget per year | | |
| Sales or work needed to make same profit<br>(Annual energy cost savings ÷ margin) | | |

What are you currently paying in carbon taxes @ €56 per tonne (Ireland)?

What might your annual cost in carbon credits be if you chose to offset at €20 per tonne?

List known requirements your organisation must comply with (legal or voluntary signatory)

# Exercise 2: Global Warming Potential

Company ABC has some refrigeration equipment containing 132.5kg of R22 refrigerant with a global warming potential of 1,774 (UK DEFRA). In 2022, the equipment needed a top up of 4.5kg of R22 to replace leaked refrigerant. Express the carbon footprint of these 'fugitive' emissions in $tCO_2e$.

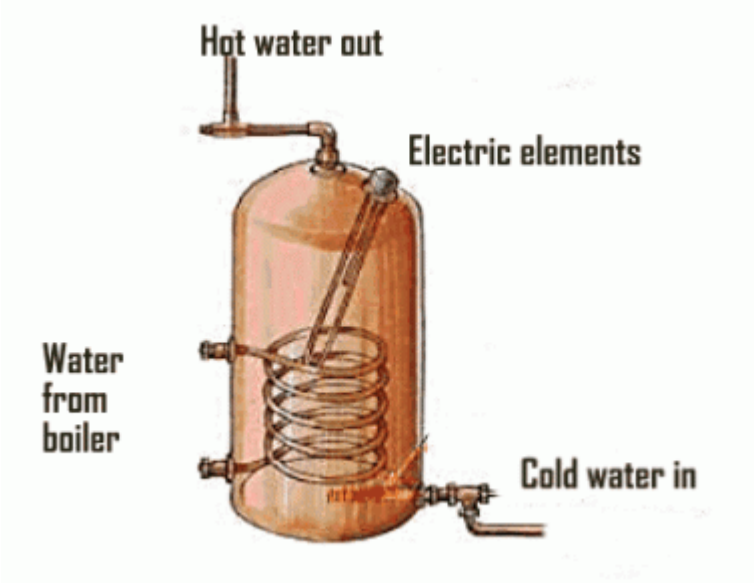
| | | 2022 | | | | |
|---|---|---|---|---|---|---|
| | Activities | Qty | Units | GWP | Source | tCO2e |
| **Scope 1** | **Direct Emissions** | | | | | |
| | S1: Refrigerants | | kg R22 | | UK DEFRA | |

What could Company ABC do to reduce this carbon footprint?

# Exercise 3: Energy Calculation

A 3kW electric immersion turns on and off subject to the thermostat setting and hot water demand. If on for 1,400hrs per year, what is the carbon footprint of running this device? The carbon intensity of the grid is assumed to be 347.8 gCO2e/kWh.

Hint: Work out the energy use in kWh first, and then multiply by the emission factor 347.8 gCO2e/kWh for electricity to get the associated carbon footprint.




What could you do to reduce the carbon footprint of providing hot water?

## Exercise 4: ROO & prioritise for annual Climate Action Plan

Thinking about your business, write down your ideas for what.

Write down some SMART Climate Actions your organisation could do.

Discuss with course participants.

## Exercise 5: Risk Assessment Exercise

Demonstration of Climate Action Planning tool.

Consider Exposures your business has to a changing climate and write them down below.

Discuss thoughts with course participants.

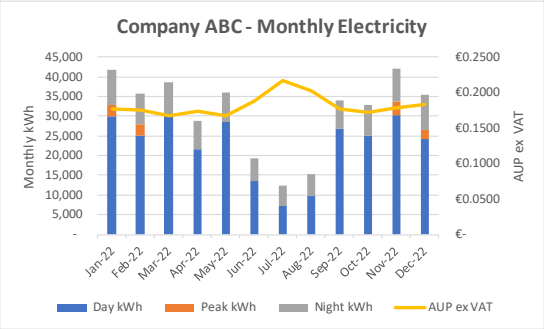
# Exercise 6: Scope 1 & 2 calculation

Company ABC has its annual energy consumption outlined below as provided by a recent energy audit. Based on this information, work out the Scope 1 and Scope 2 emissions for this company. Using the Location Based Method and the energy emissions factors at the back of this training manual, complete the table below to show your workings. Assume an emission factor of 347.8 gCO2e/kWh for electricity and 185 gCO2e/kWh for natural gas.

If the company purchases its electricity through a 100% green tariff, add the final line calculation using the Market Based Method.

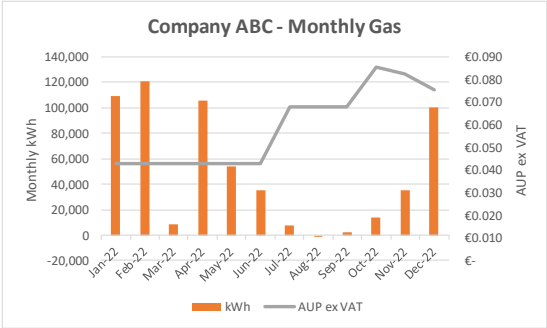
**Electricity**

| Month | Day kWh | Peak kWh | Night kWh | Total kWh | € ex VAT | AUP ex VAT |
|---|---|---|---|---|---|---|
| Jan-22 | 29,865 | 3,094 | 8,878 | 41,836 | € 7,426 | € 0.1775 |
| Feb-22 | 25,104 | 2,874 | 7,876 | 35,854 | € 6,291 | € 0.1755 |
| Mar-22 | 30,418 | - | 8,367 | 38,785 | € 6,520 | € 0.1681 |
| Apr-22 | 21,753 | - | 7,215 | 28,968 | € 5,042 | € 0.1741 |
| May-22 | 28,568 | - | 7,423 | 35,991 | € 6,024 | € 0.1674 |
| Jun-22 | 13,589 | - | 5,709 | 19,298 | € 3,626 | € 0.1879 |
| Jul-22 | 7,130 | - | 5,288 | 12,418 | € 2,697 | € 0.2171 |
| Aug-22 | 9,895 | - | 5,389 | 15,284 | € 3,096 | € 0.2025 |
| Sep-22 | 26,755 | - | 7,349 | 34,104 | € 6,046 | € 0.1773 |
| Oct-22 | 25,108 | - | 7,892 | 33,000 | € 5,668 | € 0.1718 |
| Nov-22 | 30,215 | 3,517 | 8,325 | 42,057 | € 7,500 | € 0.1783 |
| Dec-22 | 24,119 | 2,430 | 8,789 | 35,338 | € 6,469 | € 0.1831 |
| **Totals** | **166,321** | **5,968** | **56,145** | **228,434** | **€ 40,721** | **€ 0.1783** |




**Natural Gas**

| Month | Reading | m3 | kWh | € ex VAT | AUP ex VAT |
|---|---|---|---|---|---|
| Jan-22 | 180,293 | 9,498 | 108,837 | € 4,680 | € 0.043 |
| Feb-22 | 190,846 | 10,553 | 120,926 | € 5,200 | € 0.043 |
| Mar-22 | 191,546 | 700 | 8,041 | € 346 | € 0.043 |
| Apr-22 | 200,739 | 9,193 | 105,611 | € 4,541 | € 0.043 |
| May-22 | 205,481 | 4,742 | 53,814 | € 2,314 | € 0.043 |
| Jun-22 | 208,560 | 3,079 | 35,370 | € 1,521 | € 0.043 |
| Jul-22 | 209,207 | 647 | 7,413 | € 504 | € 0.068 |
| Aug-22 | 209,109 | -98 | -1,135 | -€ 77 | € 0.068 |
| Sep-22 | 209,300 | 191 | 2,150 | € 146 | € 0.068 |
| Oct-22 | 210,535 | 1,235 | 13,832 | € 1,182 | € 0.085 |
| Nov-22 | 213,658 | 3,123 | 35,426 | € 2,913 | € 0.082 |
| Dec-22 | 222,398 | 8,740 | 99,899 | € 7,515 | € 0.075 |
| **Totals** | | **51,603** | **590,185** | **€ 30,785** | **€ 0.0522** |




| | | 2022 | | | | |
|---|---|---|---|---|---|---|
| | **Activities** | **Qty** | **Units** | **EF** | **Source** | **tCO2e** |
| **Scope 1** | **Direct Emissions** | | | | | |
| | S1: Natural Gas | | | | | |
| **Scope 2** | **Indirect Emissions from Purchased Energy** | | | | | |
| | S2: Electricity (LBM*) | | | | | |
| | S2: Electricity (MBM*) | | | | | |

*LBM = Location Based Method; MBM = Market Based Method

Once you have an answer, discuss possible solutions to reduce these emissions.

# Exercise 7: Scope 3 calc

The directors of Company ABC took the following flights in 2021.

| From | To | # of Pax | kms (one-way) | Class |
|---|---|---|---|---|
| Dublin | Leeds | 1 | 310 | Economy |
| Dublin | Birmingham | 5 | 307 | Economy |
| Dublin | LGW | 2 | 479 | Economy |
| Dublin | Chicago | 1 | 5,906 | Business |
| Cork | Prague | 3 | 1,617 | Economy |

Using the Well-to-Wheel (WTW) emissions factors provided by DEFRA for 2021 in the table below, calculate the emissions associated with air travel. Use the template below to show your workings. Note that the one-way flight distance determines whether the flight is 'domestic', 'short' or 'long' haul.

**Emissions Factors including Radiative Forcing**

| | WTT | TTW | | | WTW |
|---|---|---|---|---|---|
| Flight Activity* | $kgCO_2e$/p.km | $kgCO_2e$/p.km | kg $CO_2$/p.km | kg $CH_4$/p.km | kg $N_2O$/p.km | $kgCO_2e$/p.km |
| DEFRA 2021\|Domestic\|Economy | 0.027 | 0.246 | 0.245 | 0.000 | 0.001 | 0.273 |
| DEFRA 2021\|Short\|Economy | 0.017 | 0.151 | 0.150 | 0.000 | 0.001 | 0.168 |
| DEFRA 2021\|Long\|Business | 0.047 | 0.429 | 0.427 | 0.000 | 0.002 | 0.476 |

| | | |
|---|---|---|
| *Domestic | < 750 km | i.e. within Ireland & UK |
| Short | 750 km <= distance <= 3,700 km | i.e. within Europe |
| Long | > 3,700 km | i.e. Flights beyond Europe |

| From | To | # of Pax | kms (one-way) | Class | p.km (return) | EF | Source | tCO2e |
|---|---|---|---|---|---|---|---|---|
| Dublin | Leeds | 1 | 310 | Economy | | | | |
| Dublin | Birmingham | 5 | 307 | Economy | | | | |
| Dublin | LGW | 2 | 479 | Economy | | | | |
| Dublin | Chicago | 1 | 5,906 | Business | | | | |
| Cork | Prague | 3 | 1,617 | Economy | | | | |

Once you have an answer, discuss possible solutions to reduce these emissions.

# Exercise 8: Climate Action Plan Pitch

(subject to time)

Now that you have thought about Mitigation, Adaptation & Awareness, what are you going to put on your Climate Action Plan?

Pick 3 of your ideas and populate the Climate Action Plan template. Add $tCO_2e$ reduction if known.

| Ref | SMART Action | Estimated Annual Savings | | | | | |
|---|---|---|---|---|---|---|---|
| | | [€] | Resource Saving | Unit | Scope | [$tCO_2e$] | [€/tCO2e] |
| 001 | | | | | | | |
| 002 | | | | | | | |
| 003 | | | | | | | |

Pitch your plan to the class < 2min each. Try to include:

- **Call to action:** pain statement

- **Why this is important?** Objective / business case / risk management

- **Strategy:** Your overarching approach strategy

- **Tactics:**
  - What are you going to do?
  - What contribution it will make to reducing your organisation's carbon footprint?
  - What resources are required (time, €)
  - Who needs to sign off on resourcing?

**Tips for delivery:** 1. Keep it short; 2. Solve a problem; 3. Practice such that your thoughts are crystal clear; 4. Use an analogy if it helps relate a concept to the audience; 5. Read the audience; 6. Make it personal by bringing personality & passion!

# US Energy & Emissions Conversion Factors

**Energy:** The US uses:


- *Electricity:* The kWh (kilowatt-hour) is used for electricity which is a non-SI unit of energy equal to 3.6 megajoules (MJ) in SI units which is the energy delivered by one kilowatt of power for one hour. One kWh can be approximated as the electricity used by a single radiant bar heater switched on for one hour.
- *Heat:* The British thermal unit (BTU or Btu) is a measure of heat, which is a form of energy. It was originally defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. One BTU equals about 1,055 J. A Btu can be approximated as the heat produced by burning a single wooden kitchen match
- *Transport:* The energy content of different fuels can be compared using the gallon of gasoline equivalent (GGE), where the energy content of a specific amount of an alternative fuel is expressed in terms equivalent to the energy content of a gallon of gasoline.

**Emissions:** There are three units of mass (weight):

1. The short ton aka US ton is 2,000/lbs.
2. The long ton aka Imperial (British) ton is 2,240 lbs.
3. The metric tonne which is, equal to 1000 kilograms, or approximately 2,204 pounds.

While you may see lbs $CO_2e$ as a unit for GHG emissions (e.g. 1,562.4 lbs $CO_2$/MWh for US national weighted average $CO_2$ marginal emission rate for electricity in 2019), we normally **use the metric tonne** ($tCO_2e$ = 1,000 $kgCO_2e$) when reporting on organisation-level or country-level emissions.

| Energy Type | Purchasing Units | Energy Factors[1] | | | Emission Factors[2] | |
|---|---|---|---|---|---|---|
| | | Heat BTU/unit | Electricity kWh/unit | Transport GGE/unit | $kgCO_2$/ Unit | Source |
| Electricity Consumed (2019 eGrid) | kWh | 3,414 | 1 | 0.03 | 0.433 | eGrid 2019 |
| Electricity Reductions (2019 AVERT) | kWh | 3,414 | 1 | 0.03 | 0.709 | AVERT 2019 |
| Electricity (on-site renewables, e.g. solar, wind) | kWh | 3,414 | 1 | 0.03 | - | |
| Offsite Electric Vehicle Charging (2019 eGrid) | kWh | 3,414 | 1 | 0.03 | 0.433 | eGrid 2019 |
| Natural Gas (therm) | therm | 100,000 | 29.29 | 0.83 | 5.291 | US EPA |
| Natural Gas (cubic foot) | cubic foot | 1,036 | 0.30 | 0.01 | 0.055 | US EPA |
| LPG (gallon) | gallon | 91,452 | 26.78 | 0.76 | 5.894 | DEFRA 2023 |
| LPG (lbs)* | lbs | 21,300 | 6.24 | 0.18 | 1.360 | US EPA |
| Heating Oil - Kerosene* | gallon | 135,000 | 39.54 | 1.12 | 9.616 | DEFRA 2023 |
| Heating Oil - Gasoil | gallon | 138,500 | 40.56 | 1.15 | 10.430 | DEFRA 2023 |
| Residual Oil / Fuel Oil | barrel | 6,287,000 | 1,841 | 52.30 | 35.227 | DEFRA 2023 |
| Coal | ton | 18,820,000 | 5,512 | 156.55 | 3,202.161 | DEFRA 2023 |
| Diesel | gallon | 137,381 | 40.24 | 1.14 | 10.180 | US EPA |
| Gasoline | gallon | 120,214 | 35.21 | 1.00 | 8.887 | US EPA |
| Off-road/dyed diesel (non-thermal use) | gallon | 137,381 | 40.24 | 1.14 | 10.180 | US EPA |
| Crude Oil (1 barrel = 42 U.S. gallons) | barrel | 5,684,000 | 1,665 | 47.28 | 423.704 | US EPA |

[1]**Energy Conversion factors** for Heat (BTU/unit) from US Energy Information Administration (https://www.eia.gov/energyexplained/units-and-calculators/) unless noted by *
- LPG (lbs) https://www.exothink.com/Pages/btu.html
- Kerosene https://www3.uwsp.edu/cnr-ap/KEEP/nres633/Pages/Unit1/Supplementary%20Pages/Energy-Conversion-and-Resource-Tables.aspx
For Electricity convert from BTU to kWh per unit by dividing by 3,414 BTU/kWh
For Transport convert from BTU to Gallon Gasoline Equivalent (GGE) by dividing by 120,214 BTU/gallon

[2]**Emission factors** from US EPA (https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references) and calculated from UK DEFRA (https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023)