![SEAI - Sustainable Energy Authority of Ireland logo]

Public sector energy efficiency & greenhouse gas targets

Gap-to-target model

User guide

Ref: 469-19X0146 R5

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Contents

1   INTRODUCTION

1.1   Important

1.1.1   The gap-to-target model (GTT model) is a spreadsheet model for use by public bodies to evaluate their energy efficiency (EE) performance and energy-related greenhouse gas (GHG) emissions[1] over time, in accordance with SEAI's public sector energy monitoring and reporting framework for the period to 2030 (M&R-2030).

1.1.2   The principles, methodologies and rules for M&R-2030 are set out in the latest version of SEAI's *M&R-2030 methodology guidance* document, which is available from the SEAI website at https://www.seai.ie/business-and-public-sector/public-sector/monitoring-and-reporting/supports/ ('downloads' section).

1.1.3   The methodologies and calculations embedded in the GTT model are based on those developed for, and incorporated in, the M&R system. Like all calculation models, the results (outputs) generated by the model are entirely dependent on the inputs entered by the user, and on certain simplifying assumptions.

1.1.4   **Several key calculations, including the target configuration calculations for GHGs and the gap-to-target calculations for EE and GHGs are <u>very sensitive to forecasts</u> for future values of the <u>primary energy conversion factor</u> and the <u>CO2 emission factor</u> for Ireland's electricity system. SEAI prepares forecasts for both these factors, which are refined continually. The forecasts incorporate a large number of variables and assumptions. <u>You should carefully consider their appropriateness for use in your particular circumstances, particularly if using the forecast values for making investment decisions.</u>**

1.1.5   From time to time, SEAI will update the GTT model with appropriate forecast data. The date on which the forecasts were updated in the model is shown in the 'Setup' worksheet.

1.1.6   You can check if SEAI has made newer forecasts available for the model by reviewing Annex B in the *M&R-2030 methodology guidance* document (see §1.1.2). If the bottom row of the tables in Annex B that show <u>forecast values</u> for electricity[2] indicate a 'used for M&R' period that is later than the forecast update date shown in your version of the GTT model[3], then you can download the latest version of the GTT model from the M&R system, which will include the latest forecasts. Note that the redownloaded model will not contain any data inputs/edits that you have entered into the previously downloaded model.

1.1.7   Alternatively, you can download the latest version of the GTT model with the latest forecasts and copy the forecast values into your existing GTT model.

1.1.8   The model calculates the gap to the 50%-by-2030 EE target using the methodologies for this target. Aspects of these methodologies are still being refined by SEAI, so the final methodologies for 2030 may differ from those implemented in the model. These aspects may be incorporated into the model in due course.

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[1] All references to greenhouse gas emissions and GHGs in this document and in the GTT model relate to energy-related GHGs.

[2] Either forecast values for primary energy conversion factor for electricity or forecast values for CO2 emission factor for electricity.

[3] 'Setup' worksheet, row 13.

1.1.9   The model calculates the gap to the 51%-by-2030 GHG targets using the methodologies for this target. Aspects of these methodologies are still being refined by SEAI, so the final methodologies for 2030 may differ from those implemented in the model. Theses aspects may be incorporated into the model in due course.

1.1.10 The model incorporates several simplifying assumptions, many of which are described in this document. If the model indicates results that are different from those generated by the M&R system, then the latter should be deemed to take precedence.

1.1.11 As of the date of publication of this revision of the user guide (R5), the latest version of the GTT model was v3.09.

1.2   Purpose of GTT model

1.2.1   The GTT model can be used to:

- Model the impact of changes to historical values for your existing activity metrics on your organisation's historical energy performance.

- Create new simple activity metrics, enter historical values for same and model the impact on your historical energy performance.

- Create new composite activity metrics, enter historical values for same and model the impact on your historical energy performance.

- Model the impact of different activity metric choices on your organisation's future energy performance.

- Model your gap to the 2030 energy efficiency target on a business-as-usual (BAU) basis.

- Model the impact of implementing energy-saving projects on your gap to the 2030 energy efficiency target.

- Review your organisation's GHGs since its energy efficiency baseline and since its GHG baseline.

- Calculate your 2030 GHG targets.

- Model your gap to the 2030 GHG targets, from historical and current GHG levels.

- Model future GHG emissions pathways, incorporating decarbonisation initiatives and anticipated supply-side gains from electricity system decarbonisation and biofuel blending.

1.3   Accessing the model and latest M&R data

1.3.1   The GTT model is available from within the M&R system, i.e. you must login to the M&R system to download the model, which will be customised for your organisation. It can be downloaded from either the *Your Scorecard / Progress to 2030* or the *Detailed Energy Data* pages within the system – see Figure 1 & Figure 2. When you download the model, it automatically contains M&R data for your organisation.

Figure 1: download link for GTT model (circled) – *Progress to 2030* page
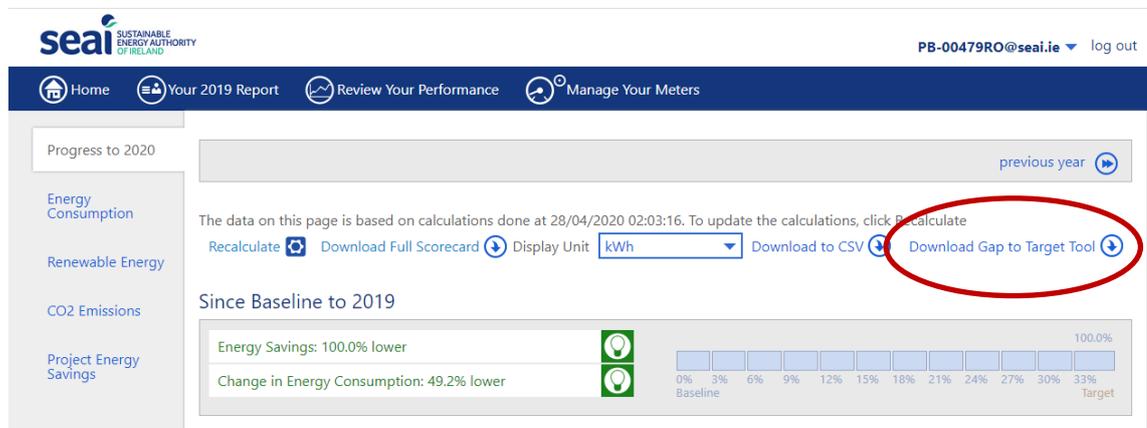
Figure 2: download link for GTT model (circled) – *Detailed Energy Data* page
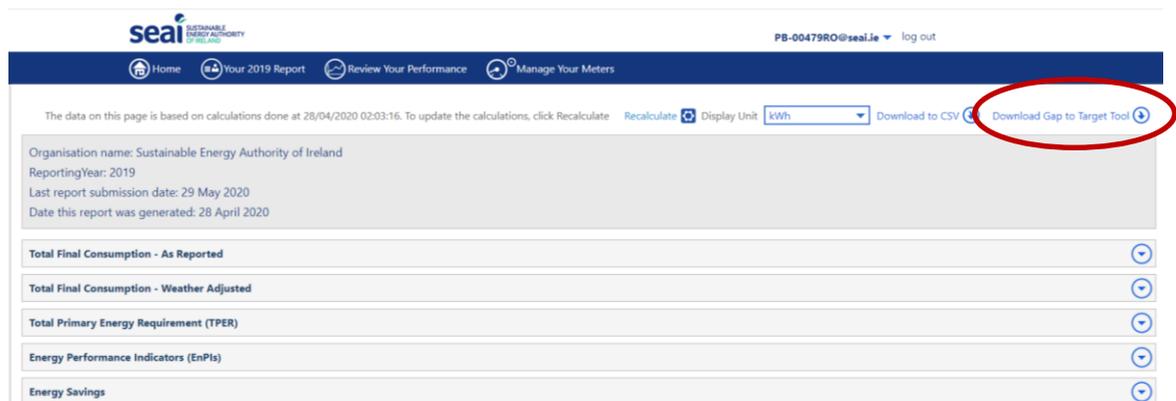
1.3.2   The status of the data downloaded with the GTT model depends on when you download the model:

- If you download the model between the post-DVA deadline and the subsequent provisional scorecard date, it will contain the *final* data as of the post-DVA deadline.

- If you download the model between the provisional scorecard date and the subsequent post-DVA deadline, it will contain *provisional* data as of the provisional scorecard date.

- The provisional scorecard date is typically in early April and the post-DVA deadline is typically around late August. The dates for the current reporting cycle are available here.

1.4   Excel & backward compatibility

1.4.1   When you first open the GTT model after downloading it, you may be prompted to 'Enable Editing', as shown in Figure 3. Click 'Enable Editing' to view your data and use the model.

Figure 3: GTT model – enable editing button (circled)
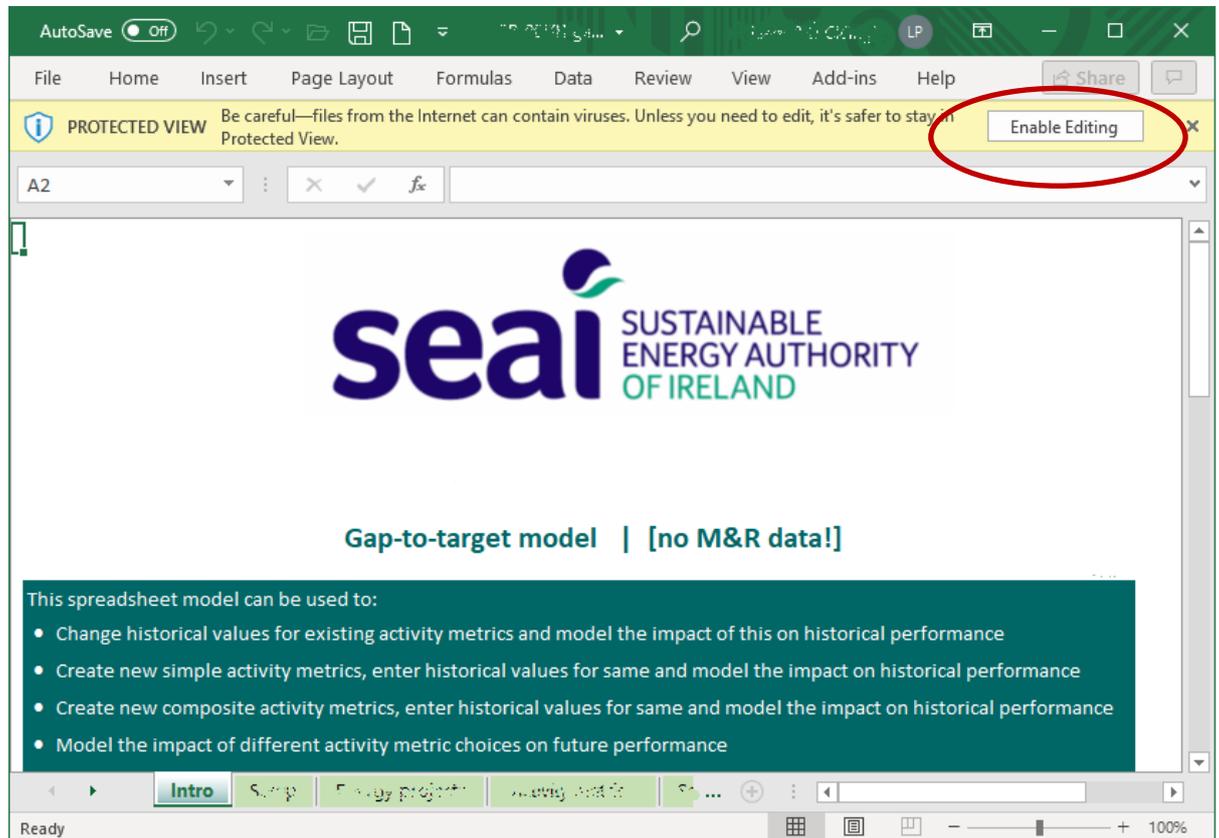
1.4.2   The GTT model has been designed to work on later versions of Excel. The core functionality should work on all versions from Excel 2007 onwards, subject to the following limitations:

•   Excel 2016 onwards: there are no known backward-compatibility issues with Excel 2016 onwards. All calculations, validation rules and other GTT model functionality should function as intended.

•   Excel 2013 & earlier: the waterfall charts in 'GHG | modelled scenario' worksheet do not function because this chart type was only introduced with Excel 2016.

•   Excel 2007: all calculations should function as intended. However, some validation rules (e.g. dropdown menus) may not function correctly, which may limit functionality of GTT for users of Excel 2007.

•   Excel 1993-2003: the GTT model does not work because relevant functions are not supported in these legacy versions of Excel.

1.5   High-level limitations

1.5.1   Changes made in the GTT model do not affect the data in the M&R system. If you want to update data in the M&R system based on modelling work using the GTT model, you will need to login to M&R and update your data in the usual manner.

1.5.2   The GTT model cannot be used to upload data into the M&R system.

1.5.3   The GTT model comprises <u>completely separate</u> functionality for EE and GHGs. It is important to note that:

- The EE and GHG functionality are split across different worksheets. The worksheets for EE functionality are labelled 'EE' and the worksheets for GHG functionality are labelled 'GHG'.

- Even though both aspects of functionality use the same M&R input data, they are completely independent from each other. You can download the GTT and use the EE functionality or the GHG functionality or both.

- No inputs or edits made by you to any of the EE worksheets carry forward to any of the GHG worksheets. Or *vice versa*.

2   USING THE GTT MODEL

2.1   Overview

2.1.1   To analyse your organisation's **energy efficiency (EE)**, you use the model to create one or more EE scenarios – see Figure 4. You can create an EE scenario by incorporating some or all of the following:

- Historical data, from the M&R system. All EE scenarios use this.

- Alternative values for activity metrics for past years and/or alternative activity metrics for past years. You can use this functionality if you are considering changing the basis for your activity metric.

- Your perspective on your organisation's future energy consumption and activity level. All scenarios must include this.

- Additional energy projects that your organisation may implement.

Figure 4: building blocks for EE scenarios
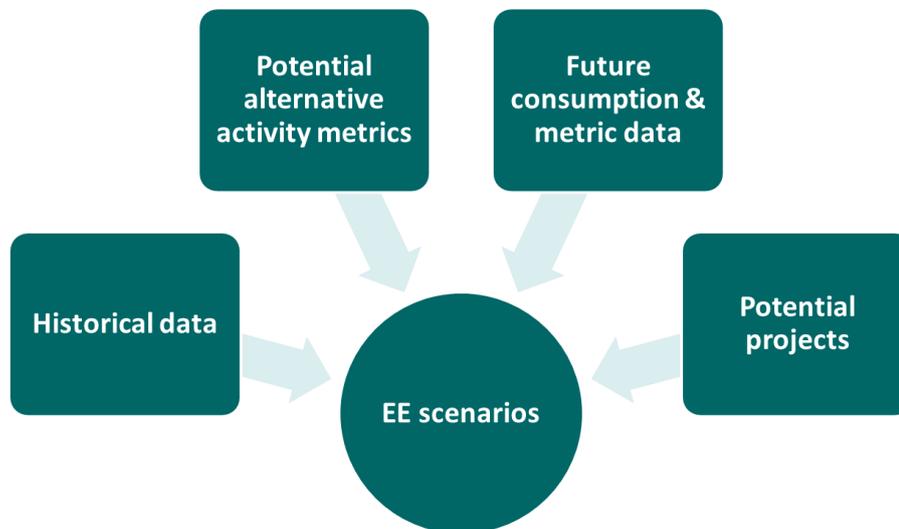
2.1.2   To analyse your organisation's **GHG emissions**, you use the model to configure a 2030 GHG target and calculate emissions pathways to 2030, including one that accounts for the impact of future decarbonisation initiatives. These calculations incorporate some or all of the following:

- Historical data, from the M&R system.

- Your configuration for a GHG target.

- Additional decarbonisation initiatives that your organisation may implement. Note that these decarbonisation initiatives are inputted separately to any energy projects that you may incorporate into your EE scenarios.

2.2   Structure of the GTT model

2.2.1   The GTT model comprises multiple worksheets:

- Worksheet titles that start with 'EE' are for the EE functionality only.

- Worksheet titles that start with 'GHG' are for the GHG functionality only.

- There are no calculation linkages whatsoever between any EE worksheets and any GHG worksheets.

2.2.2   The GTT model comprises the following worksheets:

- 'Intro' provides a brief introduction to the model.

- 'Setup': use this to specify the energy units used in the model (kWh, MWh or GWh) and to review the model and data download details.

- 'EE | energy projects': use this for generating a list of additional energy-saving projects that your organisation may undertake in the future. You can select projects previously reported via M&R. See §3 for detailed description and step-by-step guide.

- 'EE | activity metrics': use this to change historical values for existing activity metrics, create new activity metrics (simple & composite) and enter historical values for same. See §3 for description and step-by-step guide.

- 'EE | scenario 1': use this to create a unique EE scenario to model your organisation's energy performance from your EE baseline to 2030, using the activity metric(s) *that you are currently* using to track your performance via M&R.

- 'EE | scenario 2': use this to create a unique EE scenario to model your organisation's energy performance from your EE baseline to 2030, including the impact of *different activity metrics*.

- 'EE | scenario 3': use this to create a unique EE scenario to model your organisation's energy performance from your EE baseline to 2030, including the impact of *different activity metrics*.

- 'EE | EnPI' shows your organisation's normalised energy performance indicator (EnPI) from EE baseline to 2030 for each of the EE scenarios modelled.

- 'EE | primary energy' shows your organisation's primary energy consumption (total primary energy requirement or TPER) from EE baseline to 2030 for each of the EE scenarios modelled.

- 'EE | final energy' shows your organisation's final energy consumption (total final consumption or TFC) from EE baseline to 2030 for each of the EE scenarios modelled.

- 'GHG | decarbonisation model': use this to configure your 2030 emissions targets, analyse your gap to target, model emissions pathways to 2030 and model the impact of additional decarbonisation initiatives. See §6 for description and step-by-step guide.

- 'GHG | emissions pathways' shows your organisation's energy-related GHGs from your EE baseline to 2030. It shows the 2030 GHG targets (as configured by you) and future emissions pathways that you have modelled.

- 'GHG | modelled scenario': summarises the contribution of the modelled decarbonisation initiatives to closing your organisation's gap to its 2030 GHG targets. It includes two waterfall charts[4], one for each GHG target.

- 'EE | project categorisation' provides a detailed description of the categorisation options used in the 'EE | energy projects' worksheet. This worksheet cannot be edited.

- 'GHG | CO2 intensity elec' shows the CO2 emission factor for electricity from 2001 to date, and a forecast value for the emission factor to 2030. This worksheet cannot be edited.

- 'Conversion factors' shows the CO2 emission factors and other conversion factors used in the calculations. This worksheet cannot be edited.

- 'Version' summarises the version history of the GTT model.

2.2.3   The model also includes several hidden worksheets, which should not be edited by users.

2.3   Entering data

2.3.1   Only enter data in the pale green cells (like this colour), e.g. cell C4 in Figure 5 below. Some cells will change to pale green because you enter values in other cells.

Figure 5: screen shot illustrating colour coding

2.3.2   All rows in which you can enter data have bright green formatting on the extreme left (like this colour), , e.g. the very narrow cell A4 in Figure 5 above. On these rows, you *may* need to scroll off-screen to the right to find all of the pale green cell(s) in which you should enter data.

2.3.3   Some pale green cells are prepopulated with data using formulae. You can overwrite these values if you believe you have a better value.

2.3.4   Some rows are grouped together (hidden) to make it easier to review the data. You can expand (unhide) these rows by clicking on the '+' buttons immediately to the left of the row

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[4] The waterfall charts only work in versions of Microsoft Excel from Excel 2016 onwards. See §1.4.2 for description of known compatibility issues with legacy versions of Excel.

numbers, e.g. rows 41-43 are hidden in Figure 6 below, but have been expanded (unhidden) in Figure 7

Figure 6: screen shot illustrating hidden rows 41-43

		S1.3 Consumption & performance 2009-2018		Baseline	2009	2010	2011
	39	S1.3 Consumption & performance 2009-2018		Baseline	2009	2010	2011
	40	Primary energy (TPER) 2009-2018 - as per M&R					
[+]	44	Total consumption (TPER)	[kWh]	##########	96,253,867.0	97,751,008.0	94,510,438.0
	45	Adjustment to 2013 consumption (TPER)	[kWh]		0.0	0.0	0.0
	46	Final energy (TFC) 2009-2018 - as per M&R					

Figure 7: screen shot illustrating expanded (unhidden) rows 41-43

		S1.3 Consumption & performance 2009-2018		Baseline	2009	2010	2011
	39	S1.3 Consumption & performance 2009-2018		Baseline	2009	2010	2011
	40	Primary energy (TPER) 2009-2018 - as per M&R					
	41	Electricity consumption (TPER)	[kWh]	##########	60,359,351.0	62,721,159.0	59,409,060.0
	42	Thermal consumption (TPER)	[kWh]	8,167,862.0	8,167,862.0	8,648,941.0	8,504,944.0
	43	Transport consumption (TPER)	[kWh]	##########	27,726,654.0	26,380,909.0	26,596,434.0
[−]	44	Total consumption (TPER)	[kWh]	##########	96,253,867.0	97,751,008.0	94,510,438.0
	45	Adjustment to 2013 consumption (TPER)	[kWh]		0.0	0.0	0.0
	46	Final energy (TFC) 2009-2018 - as per M&R					

2.3.5   All the worksheets are protected to reduce the risk of inadvertently deleting or editing formulae. However, the worksheets can be unprotected without the requirement for a password.

3   EE | ENERGY PROJECTS

3.1   Overview

3.1.1   This worksheet is for generating a list of new projects for your organisation, i.e. projects that have not yet been implemented. Projects entered here can range from rough initial concepts to projects that are at an advanced stage of planning.

3.1.2   You can add projects that you previously reported in M&R as planned projects, or you can enter a project that you have not previously entered in M&R.

3.1.3   Entering a project in the 'EE | energy projects' worksheet does not automatically add it to an EE scenario. You need to include each project in an EE scenario from within the relevant EE scenario worksheet. You can then use the EE scenario worksheet to see the impact of your projects in terms of energy savings.

3.1.4   Row 4: select the level of readiness of the organisation to deliver energy projects - using the dropdown menu. Organisational readiness describes the organisation's capacity to deliver energy projects. Each category is described in the 'EE | project categorisation' worksheet.

3.1.5   Rows 10-59: these are for adding projects that you are planning. One project per row. The tool can accommodate up to 50 projects.

3.1.6   The projects entered in the 'EE | projects' sheet cannot currently be included in the GHG decarbonisation model. You should use the decarbonisation model to model the impact of decarbonisation initiatives on your future GHG emissions.

3.2   Adding & configuring projects

3.2.1   Go to the 'EE | energy projects' worksheet.

3.2.2   Go to the next available row in rows 10-59 and complete each row as follows.

3.2.3   Column E: use the dropdown to select a project from the M&R list. If your project has not been previously reported via M&R, then select 'Enter project details >>'.

3.2.4   Column F: if you selected a project from M&R in column E, the project name is automatically populated. If it is blank, or if you wish to change the project name, you can do so by editing the cell.

3.2.5   Column G: if you selected a project from M&R in column E, the project location is automatically populated. If it is blank, or if you wish to change the project location, you can do so by editing the cell.

3.2.6   Column H: if you selected a project from M&R in column E, the project type is automatically populated. If it is blank, or if you wish to change the project type, you can do so by selecting an alternative type from the dropdown.

3.2.7   Column I: if you selected a project from M&R in column E, the project sub-type is automatically populated. If it is blank, or if you wish to change the project sub-type, you can do so by selecting an alternative sub-type from the dropdown. Note that the list of sub-types available via the dropdown is dependent on the type you selected in column H.

3.2.8   Colum J: select the project scale using the dropdown menu. The dropdown options are described in the 'Project categorisation' worksheet.

3.2.9   Column K: select the project readiness using the dropdown menu. The dropdown options are described in the 'Project categorisation' worksheet.

3.2.10   Column L: select the category of project from the following dropdown options:

- Select 'EE' for energy efficiency projects, i.e. projects that reduce energy consumption.

- Select 'RE' for any of the following types of projects (only)[5]:

    – Projects that involve displacing grid electricity with electricity generated by non-fuel renewable generators within the meter boundaries of your energy consuming facilities, e.g. onsite wind turbines, onsite solar PV, onsite hydro plants.

    – Projects that involve displacing a conventional thermal fuel with a renewable alternative, e.g. replacing oil with wood chips or solar thermal.

    – Projects that involve displacing a conventional transport fuel with a renewable alternative, e.g. biofuel.

- Select 'CHP' if your project is the installation of a CHP plant.

> **Rules of thumb for project category**
>
> - If the project is not 'RE' or 'CHP' as defined above, select 'EE'.
>
> - If your project is an electrification project (e.g. switch to electric vehicles or switch to heat pump), select 'EE'[5].
>
> - If your project has renewable energy <u>and</u> energy efficiency elements, then you should enter the renewable and efficiency elements as separate 'RE' and 'EE' projects on separate rows[5].

3.2.11   Columns M-O: if you selected a project from M&R in column E, these cells are automatically populated in most circumstances (see §3.3.3 for limitations). If they are blank, or if you wish to change the savings figures, you can do so by editing the cells, as follows.

- For projects classified as 'EE' in column L: enter the energy savings in columns M-O <u>as positive values</u>.

- For electrification projects classified as 'EE' in column L (e.g. switch to electric vehicles or switch to heat pump)[5]:

    – Enter the new electricity consumption associated with the project (i.e. the consumption of the heat pump or electric vehicle) <u>as a negative value in column M and;</u>

    – Enter the thermal or transport consumption that will be displaced by the project (e.g. the old boiler's oil consumption or the old vehicle's diesel consumption) <u>as a positive value in column N or O</u>.

- For projects classified as 'RE' in column L: enter the expected output from the renewable energy supply in columns M-O <u>as positive values</u>:

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[5] The projects entered cannot currently be included in the GHG decarbonisation model. See §3.1.6.

– E.g. solar PV output in column M, biomass (for heating) consumption in column N, transport biofuel consumption in column O.

– If your renewable energy project will also deliver efficiency savings (e.g. by increasing boiler efficiency), then you should enter these efficiency savings as a separate 'EE' project on a separate row (selecting 'EE' in column L) and entering the 'pure' efficiency savings only in columns M-O of that row.

• For projects classified as 'CHP' in column L:

– Enter the reduction in grid electricity that is attributable to the CHP in column M, <u>as a positive value</u>, and;

– Enter the net increase in thermal fuel consumption attributable to the CHP in column N <u>as a negative value</u>.

• Important:

– Note the units shown in cells M8-O8 and enter your savings accordingly.

– All savings values entered in columns M-O must be expressed as final energy consumption, i.e. do not adjust the values for primary energy.

– You must provide a breakdown of savings between electricity, thermal and transport in columns M-O. You cannot enter a single total value.

– You can enter zero for any or all of the electricity, thermal and transport savings. The total savings value in column P is calculated by the model.

– You cannot leave any of columns M-O blank. You should enter zero instead of leaving these columns blank.

3.2.12 Column P: this shows the total final energy reduction from the project. Note that it shows zero for RE projects, but the benefits of these projects in terms of primary energy saving are accounted for. You cannot edit values in column P.

3.2.13 Column R: enter the estimated investment cost for the project, in euros.

3.2.14 Column S: if the project will seek to avail of external funding or support, select the relevant option from the dropdown.

3.2.15 Column T: if the project will seek to incorporate pay for performance, select the relevant option from the dropdown.

3.2.16 Columns U-W: these columns indicate whether you have selected the project for inclusion in a scenario. You select projects for inclusion in scenarios in the relevant scenario worksheets (see §5.2.12). You cannot edit values in columns U-W.

3.2.17 Column Z: enter any notes you may have on the project here (optional).

3.2.18 Once you have added a project to the 'EE | energy projects' worksheet, you can add it to a scenario – see §5.2.12.

3.2.19 Note that you need to complete <u>all of the following columns</u> for a project to be 'counted' properly in a scenario that it is added to: E, F, G, J, K, L, M, N, O & R.

3.2.20 Review the red warnings and error messages above the main table (row 5) and in column AH (if any) and take action as indicated.

3.3   Assumptions & limitations

3.3.1   When adding projects previously reported via the M&R system, you can only select projects that you classified as 'planned' when reporting them via M&R.

3.3.2   The implementation year reported for a project in M&R is ignored in the GTT tool. This is because the M&R system currently only looks ahead as far as 2020. You must specify the implementation year in a scenario worksheet even if you previously reported it via M&R (see §5.2.12).

3.3.3   If you add a planned project previously reported via M&R, the energy savings values will only be imported into the projects worksheet (columns M-P) if <u>both</u> of the following criteria are true:

•   You entered a breakdown of these energy savings in M&R, i.e. a breakdown of savings between electricity, thermal and transport. If you only entered a total savings amount in M&R, this will not be carried forward into the projects worksheet.

•   You specified an implementation year for the project in M&R.

If savings values have not been carried forward to the projects worksheet you must enter the savings in columns M-O (not column P) in the 'energy projects' worksheet.

3.3.4   The GTT calculates the timing of energy savings from each project as follows:

•   No savings are made in the year specified by you as the implementation year.

•   100% of the annual project savings are made in the year immediately after the implementation year and in every subsequent year.

•   For example, if you create a scenario in which you implement the project in 2021, then the project will be counted as making savings from 2022 onwards.

3.3.5   If you leave column L (project category) blank, the model assumes that the project is an energy efficiency (EE) project.

3.3.6   You cannot currently model the impact of these energy projects on future GHG emissions. However, you can model the GHG impacts of future decarbonisation initiatives using table GHG.4 in the 'GHG | decarbonisation model' worksheet – see §6.4.

4   EE | ACTIVITY METRICS

4.1   Overview

4.1.1   The 'EE | activity metrics' worksheet is for:

- Reviewing existing activity metrics that you have entered in M&R.

- Editing values for existing activity metrics for years from your EE baseline up to the most recent year for which you reported a value in M&R (<u>not for future years</u>).

- Creating new activity metrics (including new composite metrics).

- Entering values for new metrics for years from your EE baseline up to the most recent year for which you reported a value in M&R (<u>not for future years</u>).

4.1.2   Creating a new metric in the 'activity metrics' worksheet does not automatically include it in a scenario – you need to do this using a scenario worksheet (see §5.3). You can then use the relevant scenario worksheet to see the impact of your metric on your energy performance.

4.1.3   The tables in this worksheet are numbered AM.1, AM.2,…

- AM.1 lists all of the simple metrics and metric values entered in M&R. You can also use this table to edit metric values or add new metrics (in any blank rows).

- AM.2 lists the metric(s) that your organisation is currently using to track its performance in M&R. It provides a breakdown of any composite metrics currently in use. For local authorities, this table shows separate metrics for the pre-2014 and 2014-onwards periods. This table cannot be edited.

- AM.3-AM.7 are five identical tables for creating new composite metrics.

- AM.8 lists all the metrics currently in M&R and any that you have added in tables AM.1 or AM.3-AM.7.

4.2   Creating a new <u>simple</u> activity metric

4.2.1   Go to table AM.1 in the 'EE | activity metrics' worksheet.

4.2.2   Go to the next available row (i.e. next row for which column C is green/blank) and complete the row as follows.

4.2.3   Column C: enter the activity metric name.

4.2.4   Columns G onwards: enter annual values for the metric (pale green cells only):

- Non-local authorities: to use a specific metric, you must enter a non-zero value for all years from the start of your organisation's EE baseline to the last year for which you reported data to SEAI.

- Local authorities: to use a specific metric, you must enter a non-zero value for all years up to 2013 for your pre-2014 metrics and for all years from 2013 onwards for your 2014 onwards metrics.

4.2.5   To use the new metric in a scenario, see §5.2.3.

4.2.6   To enter values <u>for future years</u> for the new metric, see §5.2.4.

4.3 Creating a new <u>composite</u> activity metric

4.3.1 Go to the next available table from tables AM.3-AM.7 in the 'EE | activity metrics' worksheet (referred to as table 'AM.x' in the remainder of this section). Unused tables have no text adjacent to the table number. Tables that are already in use have the metric name adjacent to the table number.

4.3.2 Enter a name for the composite metric in the pale green cell at the bottom of table AM.x, i.e. overwrite '[Enter name for this composite metric!]'.

4.3.3 Local authorities: select the metric period from the pale green dropdown in the row immediately below the metric name (column D).

4.3.4 Table AM.x lists the existing subactivities in the GTT model. If you want to include one or more new subactivities that is not already in the model, complete the steps set out in §4.2.1-4.2.4 for each new subactivity. Then return to AM.x.

4.3.5 If you want to edit a historical value for one or more subactivities, complete the steps set out in §4.5.2-4.5.3 for each subactivity. Then return to AM.x.

4.3.6 To include a subactivity in your composite metric:

- Column D: select 'yes' in the dropdown menu in the row corresponding to the subactivity.

- Column E: enter a % weighting select 'yes' in the row corresponding to the subactivity.

4.3.7 Repeat steps 4.3.4-4.3.6 for all subactivities to be included in the metric.

4.3.8 Review the red warnings and error messages at the bottom table AM.x (if any) and take action as indicated.

4.3.9 To use the new composite metric in a scenario, see §5.2.3.

4.3.10 To enter values <u>for future years</u> for the new composite metric, see §5.2.5.

4.4 Editing values <u>for historical years</u> for a <u>simple</u> activity metric

4.4.1 Go to table AM.1 in the 'EE | activity metrics' worksheet.

4.4.2 Go to the relevant row and edit value(s) in columns G onwards (pale green cells only).

4.4.3 To use the updated metric in a scenario, see §5.2.3.

4.5 Editing values <u>for historical years</u> for <u>composite</u> metric subactivities

4.5.1 Go to the 'EE | activity metrics' worksheet.

4.5.2 Go to table AM.1 and identify the subactivities that are used in the relevant composite metric.

4.5.3   Go to the rows corresponding to the subactivities that are used for the composite metric and edit value(s) in columns G onwards (pale green cells only).

4.5.4   To use the updated metric in a scenario, see §5.2.3.

4.6   Editing values <u>for future years</u> for a <u>simple</u> activity metric

4.6.1   You do this in an EE scenario worksheet – see §5.2.4. You do not enter values for future years in the 'EE | activity metrics' worksheet.

4.7   Editing values <u>for future years</u> for <u>composite</u> metric subactivities

4.7.1   You do this in an EE scenario worksheet – see §5.2.5. You do not enter values for future years in the 'activity metrics' worksheet.

4.8   Assumptions & limitations

4.8.1   You can only enter historical data in the 'EE | activity metrics' worksheet; future values for activity metrics must be entered in scenario sheets.

4.8.2   You can create up to five new composite activity metrics using tables AM.3 to AM.7.

4.8.3   Local authorities only: if you wish to create a new composite metric that spans both the pre-2014 and 2014-onwards periods, you should create two separate composite metrics comprising the same subactivities for the two periods – using any two of tables AM.3 to AM.7. Give the two new composite activity metrics different names and select them as separate metrics in rows 13 & 14 of the relevant scenario worksheet.

4.8.4   A composite metric developed in any of tables AM.3 to AM.7 should only be used in a scenario when there are no red warnings or errors indicated in the relevant table.

4.8.5   You cannot currently model the impact of changes in your activity metric on future GHG emissions. However, you can model the GHG impacts of future changes to your energy consumption using table GHG.4 in the 'GHG | decarbonisation model' worksheet – see §6.4.

5 EE | SCENARIOS

5.1 Overview

5.1.1 There are three EE scenario worksheets.

5.1.2 The 'EE | scenario' worksheets are for:

- Modelling your organisation's energy performance to 2020 and 2030, including calculating its gap to the 2030 EE target – <u>on a business as usual (BAU) basis</u>.

- Modelling your organisation's energy performance to 2030, including calculating its gap to the 2030 EE target – <u>on the basis that you implement a pipeline of energy-saving projects (project pipeline)</u>.

- Modelling the impact of using different activity metrics on your energy performance to date (EE scenarios 2 and 3 only).

5.1.3 EE scenario 1 is always based on the activity metric(s) that your organisation currently uses to track performance via M&R. EE scenarios 2 and 3 can be used to model the current activity metric(s) or alternative metric(s).

5.1.4 The tables in the EE scenario worksheets all show time series data from your EE baseline to 2030.

5.1.5 The tables and sections in the EE scenario worksheets are numbered Sx.1, Sx.2, … (where 'x' is the scenario number):

- Sx.1 is for entering an EE scenario name. For EE scenarios 2 and 3, it is also used for choosing activity metrics for the scenario.

- Sx.2 is for reviewing the historical activity metric values used for the EE scenario and entering values for your activity metrics for future years.

- Sx.3 summarises your organisation's performance <u>to date</u> – as per M&R and as modelled in the EE scenario using the activity metric(s) selected for the scenario.

- Sx.4 calculates the target consumption and EnPI values for your organisation, out to 2030.

- Sx.5 calculates your business-as-usual (BAU) consumption and performance out to 2030. This is your organisation's consumption and performance assuming that you do <u>not</u> implement any of the energy-saving projects entered in the GTT model.

- Sx.6 is for including a project pipeline to your EE scenario and calculating its impact on your consumption and performance out to 2030.

- Sx.7 summarises your organisation's EnPI, performance (savings) and consumption from your EE baseline to 2030. For each parameter, it shows:

   - Annual values from the EE baseline to date as per the M&R system[6].

   - Annual values from the EE baseline to date[6] as modelled for this scenario.

   - Annual values from the current year[6] to 2030 on a business-as-usual basis (i.e. no project pipeline implemented).

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[6] The most recent year for which you reported data via M&R and subsequently downloaded data using the GTT model.

- – Annual values from the current year[6] to 2030 with a project pipeline.

- – Annual values from the current year[6] to 2030 indicating a glidepath to the 2030 EE target.

- • Sx.8 shows your organisation's normalised EnPI from EE baseline to 2030.

- • Sx.9 shows your organisation's primary energy consumption from EE baseline to 2030.

- • Sx.10 shows your organisation's final energy consumption from baseline to 2030.

- • Sx.11 is not in use.

- • Sx.12 shows your organisation's gap to target (as primary energy) and the contribution of your project pipeline to making up the gap to target.

- • Sx.13 shows your organisation's gap to target (as final energy) and the contribution of your project pipeline to making up the gap to target.

- • Sx.14 shows your organisation's investment timeline for its project pipeline.

- • Sx.15 shows your organisation's project pipeline status.

- • Sx.16 contains detailed sub-calculations of your organisation's BAU final energy consumption. *This section cannot be edited.*

- • Sx.17 is not in use.

- • Sx.18 is not in use.

- • Sx.19 contains detailed sub-calculations of your organisation's target final energy consumption. *This section cannot be edited.*

- • Sx.20 is not in use.

- • Sx.21 contains additional detailed sub-calculations. *This section cannot be edited.*

5.1.6 There are explanatory notes in column AJ of the scenario worksheets.

5.1.7 Each scenario worksheet is independent of the other scenario worksheets, i.e. none of the data you enter in one scenario worksheet is copied or linked to data in other scenarios.

5.2 Creating a new EE scenario

5.2.1 Choose a blank EE scenario worksheet.

5.2.2 Row 12: enter a scenario name.

5.2.3 For EE scenarios 2 & 3 only: select the activity metric(s) you want to use to track your performance <u>for this scenario</u>:

- • Non-local authorities: use the dropdown menu in row 13.

- • Local authorities: use the dropdown menus in rows 13 & 14.

You can choose between any of the metrics that you have previously entered into M&R, or from new simple or composite metrics created by you in the GTT model (see §4.2 & 4.3).

The metric(s) that is/are being used by the M&R system[7] to track your performance is/are prefaced with 'As per M&R' in the dropdown menu(s).

5.2.4   Row 25 (pale green cells only):

- If you are using a <u>simple activity</u> metric to track your performance <u>in this EE scenario</u> from now until 2030, enter values for your activity metric(s) for every year from the next reporting year ('now') until 2030. The default assumption is that these values remain constant from the last reporting year until 2030, but you can change this by overwriting the values in the pale green cells.

- If you are using a <u>composite activity</u> metric to track your performance <u>in this EE scenario</u> from now until 2030, row 25 will show the calculated value of your composite metric for the period from the next reporting year ('now') until 2030 based on the values that you enter in rows 26-35 (see below). In these circumstances, you should not edit anything in row 25.

5.2.5   Rows 26-35 (which can be revealed by clicking the '+' adjacent to row 36):

- If you are using a <u>simple activity</u> metric to track your performance <u>in this EE scenario</u>, you should ignore rows 26-35.

- If you are using a <u>composite activity</u> metric to track your performance <u>in this EE scenario</u> from now until 2030, enter values for your subactivities for every year from the next reporting year until 2030. The default assumption is that these values remain constant from the last reporting year until 2030, but you can change this by overwriting the values in the pale green cells.

> **Why are future values for your activity metric important?**
>
> Your gap to target in terms of the absolute amount of energy savings needed to meet the target depends on how your activity metric changes over the period to 2030.

5.2.6   Row 66 (pale green cells only): enter the % of your organisation's final energy consumption that will be made up by electricity for every year from now until 2030. The default assumption is that these values remain constant from the last reporting year until 2030, but you can change this by overwriting the values in the pale green cells.

5.2.7   Row 67 (pale green cells only): enter the % of your organisation's final energy consumption that will be made up by thermal fuels for every year from now until 2030. The default assumption is that these values remain constant from the last reporting year until 2030, but you can change this by overwriting the values in the pale green cells.

> **Why is the future fuel split important?**
>
> The values entered in rows 66 & 67 affect the calculation of the breakdown of your target energy reductions between electricity, thermal & transport, and the calculation of the level of savings required to meet your primary energy target.

5.2.8   Row 79 (pale green cells only): enter the primary energy conversion factor for electricity for every year from now until 2030. The default values shown are based on SEAI forecasts, but <u>you can edit the values in the pale green cells if you wish - see boxed text below for</u>

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[7] As of the date that you downloaded the GTT model.

explanation of these factors and §1.1.5-1.1.7 for details on how to access SEAI's latest forecast values.

5.2.9   Rows 80 & 81: enter the primary energy conversion factors for thermal and transport fuels for every year from now until 2030. The default assumption is that these values remain constant from the last reporting year until 2030. <u>This is a reasonable assumption and these values should not be changed unless you have a compelling reason to do so. See boxed text below.</u>

Why are the primary energy conversion factors important?

Energy consumption can be expressed as total final consumption (TFC) or total primary energy requirement (TPER). Primary energy accounts for the energy that is consumed and/or lost in transformation, transmission and distribution processes. It is calculated by applying conversion factors, which vary by fuel type, to final consumption values. Conversion factors for thermal and transport fuels typically remain unchanged from year to year. The current factors are available here.

The conversion factor for electricity changes from year to year as the efficiency of the electricity system changes. These changes can have a material impact on energy savings calculated via M&R. SEAI prepares forecasts for the primary energy conversion factor for electricity in future years – see §1.1.5-1.1.7 for details on how to access the latest forecast values.

5.2.10   Row 91: specify whether your energy performance indicator (EnPI) will be constant between now and 2030 or whether it will change over time. This is an important assumption for business-as-usual in this EE scenario – see boxed text below.

5.2.11   Rows 93-95 (pale green cells only): If you selected 'EnPI will NOT be constant as activity metric changes between now & 2030' in row 91, enter values here for % annual change in future final energy consumption only. If you selected 'EnPI will be constant as activity metric changes between now & 2030' in row 91, you can skip these rows. See boxed text below.

> **Will business-as-usual (BAU) efficiency change?**
>
> You already specified how the activity level of your organisation will fluctuate between now and 2030 (if at all) by entering values in rows 25-35.
>
> Consider that your organisation may increase or decrease its energy consumption on a business-as-usual (BAU) basis over time, as this activity level fluctuates. In this instance, BAU means the energy consumption before additional energy-saving projects (project pipeline) are considered, i.e. what your energy consumption would be in the period to 2030 before the project pipeline is accounted for. You can select one of two options for this model input (row 91), as follows.
>
> - 'EnPI will remain constant as activity metric changes between now & 2030': if you select this option, the model assumes that the *energy efficiency* of your organisation will remain constant at the level calculated for the last reporting year *on a final consumption basis*. The model assumes that this will be the case for every year up to 2030 before the project pipeline is considered. For example, if you specified a 5% increase in your activity metric by 2030, the model assumes that your organisation's final consumption will also increase by 5% over the same period, to maintain a constant efficiency level. Choosing this option requires no further inputs from you regarding BAU in your organisation. Therefore, it could be considered the more straightforward option if you are uncertain regarding your organisation's future energy profile.
>
> - 'EnPI will NOT remain constant as activity metric changes between now & 2030': If you select this option, you must tell the model how your future BAU consumption will change - by inputting values for the expected annual increase (or decrease) in final energy consumption (TFC) over time, in rows 93-95. Such increases or decreases are before the benefits of implementing the project pipeline are accounted for, i.e. it is the rate of increase/decrease in consumption that you believe will apply if the project pipeline is *not* implemented. If you wish, you can select this option and enter zero in rows 93-95 (or leave these rows blank). Doing so effectively means that you believe your future final energy consumption will remain constant, irrespective of any changes in activity level (metrics) specified.
>
> Note that both options involve consideration of BAU energy use on a *final consumption* basis. This means that the effect of the primary energy conversion factor is not considered when calculating the assumed change in BAU consumption as this is external to your organisation. Note, however, that the impact of changes in this factor is counted in all energy savings figures results shown.

5.2.12   Rows 135-184: select projects for inclusion in the project pipeline <u>for this EE scenario</u>:
   • Select each project from the dropdown in column C. Note that you must have previously entered a project in the 'EE | energy projects' worksheet to include it in your project pipeline for a scenario. See §3.2 for adding new projects.

- Enter the implementation year in column E, even if you previously reported this via M&R. See boxed text below.

Each EE scenario can accommodate up to 50 projects. To enter more than 5, click the '+' button adjacent to row 185 to reveal the hidden rows.

> **Project implementation year**
>
> The model assumes that no project savings are made during the implementation year, that 100% of the project savings are made in the year immediately after the implementation year and that 100% of the project savings are made in every subsequent year (see §3.3.4).

5.2.13   The EE scenario is now complete – you can review the results in table Sx.7 (by clicking on 'skip to summary ↓↓') and in the graphs in sections Sx.8-Sx.15 (by clicking on 'skip to graphs ↓↓↓').

5.3   Modelling the impact of using a different activity metric on historical performance

5.3.1   You can use either the 'EE | scenario 2' or the 'EE | scenario 3' worksheet to model the impact of using a different activity metric on your historical performance, i.e. to see the impact of changing metric on your performance to date. The following are the key steps.

5.3.2   You can use an EE scenario that you have already defined in either the either the 'EE | scenario 2' or 'EE | scenario 3' worksheet, or you can create a new scenario in one of these worksheets.

5.3.3   If you need to create a new EE scenario:

- Choose either 'EE | scenario 2' or 'EE | scenario 3'.

- Row 12: enter a scenario name.

5.3.4   Select the activity metric(s) you want to use to track your performance <u>for this EE scenario</u>:

- Non-local authorities: use the dropdown menu in row 13.

- Local authorities: use the dropdown menus in rows 13 & 14.

You can choose between any of the metrics that you have previously entered into M&R, or from new simple or composite metrics created by you in the GTT model (see §4.2 & 4.3). The metric(s) that is/are being used by the M&R system[8] to track your performance is/are prefaced with 'As per M&R' in the dropdown menu(s).

5.3.5   If you only want to compare your historical performance using the alternative metric, you can now go to section Sx.8 of the EE scenario worksheet to see the impact of the alternative metric (solid red line) compared to the as-reported metric (solid dark green line).

5.3.6   If you want to also analyse your future performance using the alternative metric, complete the remainder of the scenario worksheet as described in §5.2.4-5.2.13.

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[8] As of the date that you downloaded the GTT model.

5.4   Limitations & assumptions

5.4.1   All of the historical energy consumption data shown is taken from the M&R system. It cannot be edited in the model.

5.4.2   All of the historical thermal consumption data shown in the EE scenario sheets has been weather-adjusted by the M&R system.

5.4.3   If the organisation's future energy performance and/or energy consumption is calculated to be ahead of target, the model will return a 'negative gap' to target, i.e. it will indicate that the organisation's performance can deteriorate and still reach the target.

5.4.4   If the consumption split (ratio) for your organisation changes significantly from year to year, then the model can indicate that some aspects of consumption can increase, while overall consumption should decrease, in order to meet the target, or vice versa.

5.4.5   Reducing total primary energy consumption (TPER) by the amount shown for each scenario is the key to achieving the 2030 EE target. The breakdown of these total figures (in terms of electricity, thermal & transport split) and the final energy consumption (TFC) equivalent values shown for each scenario illustrate one way (among many) in which the total reduction can be apportioned between electricity, thermal and transport.

5.4.6   Local authorities only: if you wish to use the same composite metric for both the pre-2014 and 2014-onwards periods, you should create two separate composite metrics comprising the same subactivities for the two periods – using any two of tables AM.3 to AM.7. Give the two new composite activity metrics different names and select them as separate metrics in rows 13 & 14 of the relevant EE scenario worksheet.

5.4.7   You cannot currently model GHG emissions for your EE scenarios. However, you can model the GHG impacts of future changes to your energy consumption using table GHG.4 in the 'GHG | decarbonisation model' worksheet – see §6.4.

6 GHG | DECARBONISATION MODEL

6.1 Overview

6.1.1 The 'GHG | decarbonisation model' worksheet is for:

- Calculating GHG emissions targets for 2030 for your organisation.

- Calculating emissions pathways for the period to 2030 for your organisation, accounting for anticipated supply-side decarbonisation gains from electricity and biofuel blending.

- Modelling the impact of additional decarbonisation initiatives on your emissions pathway.

- Calculating the gap-to-target from current GHG levels and future emissions pathways.

6.1.2 The tables and sections in the 'GHG | decarbonisation model' worksheet are numbered GHG.1, GHG.2, …:, GHG.9.

- GHG.1 is for defining your GHG emissions targets for 2030 and for choosing whether to model a decarbonisation scenario for the period to 2030.

- GHG.2 is for reviewing your GHG emissions targets, the reductions required to reach the targets, your gap to target and the impact of your modelled scenario.

- GHG.3 summarises your organisation's GHG emissions pathways to 2030:
  - Annual values from your EE baseline to reporting year for actual GHG emissions;
  - Annual values from GHG baseline to 2030 for GHG emissions if your organisation's energy consumption remains as per GHG baseline for the years 2019-2030;
  - Annual values from the reporting year to 2030 for GHG emissions if your organisation's energy consumption remains as per the reporting year for the years to 2030;
  - Annual values from the year after the reporting year to 2030 for GHG emissions, incorporating the decarbonisation initiatives in your modelled scenario.

  GHG.3 cannot be edited.

- GHG.4 is for specifying the decarbonisation initiatives for inclusion in your modelled scenario.

- GHG.5 summarises the impacts of the decarbonisation initiatives on your organisation's future energy use and GHG emissions. *This section cannot be edited.*

- GHG.6 shows a detailed breakdown of your organisation's final energy consumption (non-weather-adjusted) from EE baseline to the reporting year. *This section cannot be edited.*

- GHG.7 shows a detailed breakdown of your organisation's GHG emissions from EE baseline to the reporting year. *This section cannot be edited.*

- GHG.8 contains additional calculations required for the decarbonisation model. *This section cannot be edited.*

- GHG.9 contains additional detailed calculations on biofuel blending with diesel and petrol. *This section cannot be edited.*

6.1.3 The 'GHG | decarbonisation model' is entirely independent of all 'EE' worksheets.

GHG emissions & targets – key terms & concepts used in decarbonisation model

Please refer to the latest version of SEAI's *M&R-2030 methodology guidance* document for a comprehensive explanation of the GHG emissions target methodology.

In-target emissions are emissions that are counted for the 2030 targets. The model aggregates in-target emissions as *non-electricity* emissions, *electricity* emissions and *total* emissions:

- Non-electricity emissions comprise thermal emissions and transport emissions. Thermal emissions are from using fossil fuels reported for thermal energy consumption, i.e. from using fossil fuels in buildings and equipment. Transport emissions are from using fossil fuels reported for thermal energy consumption, i.e. from using fossil fuels in vehicles, etc.

- Electricity emissions (or in-target electricity emissions) are from electricity use in buildings, vehicles, equipment, lighting etc.

- Total in-target emissions = in-target non-electricity emissions + in-target electricity emissions.

Supply-side decarbonisation - electricity

Ireland's electricity network will decarbonise significantly between 2016-18 and 2030, as fossil fuels are phased out of power generation, i.e. using the same amount of electricity in 2030 as your organisation did in 2016-18 (average) could produce significantly lower emissions. These anticipated reductions are referred to as *supply-side decarbonisation* or *supply-side gains*. They are calculated for all future emissions pathways shown in the model, using SEAI forecasts for the CO_2 emissions intensity of the electricity system out to 2030. SEAI updates these forecasts from time to time– see §1.1.5-1.1.7 for details on how to access the latest forecast values. The CO_2 intensity of Ireland's electricity system over time (actual & forecast) is shown in 'GHG | CO2 intensity elec'

Supply-side decarbonisation – biofuel blending in road transport fuels

Relatively small but increasing quantities of biofuels are blended into supplies of standard road diesel ('diesel (blend)') and petrol ('petrol (blend)') each year (*see glossary for explanation of terms*). This has the effect of reducing the GHG emissions from each litre of diesel and petrol used. It is anticipated that biofuel blend rates will increase over the period to 2030, resulting in additional supply-side GHG gains for diesel and petrol. By default, these supply-side gains are calculated for all future emissions pathways shown in the model, using forecasts for future blend rates out to 2030. You can exclude these supply-side gains from your emissions pathways using the dropdown menu on row 15 in GHG.1.

GHG emissions targets – configuration options

The decarbonisation model provides two options for configuring emissions targets for 2030:

- 'CAP 2021 (-51.0% non-electricity GHGs & electricity GHGs as per elec supply decarbonisation)' is the default option. It calculates targets in accordance with the 2021 Climate Action Plan target and the methodology described in SEAI's *M&R-2030 methodology guidance* document.

- 'Other (user-defined)' lets you specify targeted reductions in non-electricity and electricity emissions as % reductions from your GHG baseline levels. The targeted reduction in electricity emissions is inclusive of supply-side gains

Both options calculate two targets – a target for *non-electricity* emissions and a target for *total* emissions. All targets are expressed as maximum quantities of GHGs that can be emitted by your organisation in 2030 if the targets are to be achieved. All targets are calculated as reductions from a 2016-2018 (average) baseline period (GHG baseline).

6.2   Configuring GHG targets

6.2.1   Row 11: select a target configuration option from the dropdown (see boxed text on previous page for explanation).

6.2.2   Rows 12 & 13 (only if you selected '*Other (user-defined)*' in row 11):

- Row 12: enter the total % reduction in thermal and transport emissions (i.e. non-electricity emissions, in aggregate) targeted for the period between your GHG baseline and 2030.

- Row 12: enter the total % reduction in electricity emissions targeted for the period between your GHG baseline and 2030, including electricity supply-side gains.

6.2.3   The emissions targets for your organisation are shown on rows 19-21, in the adjacent graph (targets = right-most bar) and in the 'GHG | emissions pathways' worksheet.

6.3   Reviewing emissions pathways to 2030 & gap to target

6.3.1   The model shows different GHG emissions pathways for your organisation for the period to 2030.

6.3.2   The first emissions pathway is calculated on the basis that your organisation's final *energy consumption* remains unchanged between your GHG baseline (i.e. 2016-2018) and 2030. The changes to GHGs over this period are those made since 2018 and those arising from anticipated supply-side changes (electricity & biofuels). This emissions pathway is calculated automatically, i.e. it does not require any user inputs. The pathway data is shown:

- *In summary* in rows 23-26 in GHG.2

- *In detail* in rows 50-56 in GHG.3

- As a blue dashed line in the 'GHG | emissions pathways' graph

6.3.3   The second emissions pathway is calculated on the basis that your organisation's final *energy consumption* remains unchanged between *the reporting year* (i.e. the last year for which there is M&R consumption data in the model) and 2030. The changes to GHGs over this period are those arising from anticipated supply-side changes (electricity & biofuels). This emissions pathway is calculated automatically, i.e. it does not require any user inputs. The pathway data is shown:

- *In summary* in rows 28-32 in GHG.2

- *In detail* in rows 58-64 in GHG.3

- As a red dashed line in the 'GHG | emissions pathways' graph

6.3.4   The third emissions pathway is a modelled scenario incorporating additional decarbonisation initiatives with (modelled) implementation years over the period to 2030. This modelled scenario must be switched on (row 14) and the initiatives must be specified using table GHG.4 –see §6.4. The scenario accounts for changes to emissions arising from these initiatives as well as those already made and those arising from anticipated supply-side changes (electricity & biofuels). The pathway data (scenario) is shown:

- *In summary* in rows 34-36 in GHG.2 and in the adjacent graph.

- *In detail* in rows 66-72 in GHG.3 and in GHG.5.

- As the lighter bars for the years between the reporting year and 2030 in the 'GHG | emissions pathways' graph.

- As a summary table and waterfall charts in the 'GHG | modelled scenario' worksheet[9].

6.4 Accounting for supply-side savings (electricity & biofuel blending)

6.4.1 **Electricity** supply-side decarbonisation is discussed in the boxed text on p.26. The changes in your organisation's electricity emissions arising from the decarbonisation of Ireland's electricity system are calculated automatically by the model:

- All GHG emissions calculated for the use of grid electricity for any given year are based on the emission factor (actual or forecast) for that year.

- The gap-to-target calculations and the *total* emissions waterfall chart[9] ('GHG | modelled scenario') show the anticipated GHG reductions arising from the forecast changes to Ireland's electricity system by 2030. In the waterfall chart for *total* emissions, the data shown for 'supply-side reductions' includes supply-side reductions for electricity and biofuel blending (if enabled).

6.4.2 Supply-side decarbonisation arising from **blending biofuels** into standard road diesel and petrol is discussed in the boxed text on p.26. By default, these supply-side gains are calculated for all future emissions pathways shown in the model:

- All GHG emissions calculated for the use of standard road diesel ('diesel (blend)') and petrol ('petrol (blend)') each year are based on biofuel blend rates (actual or forecast) for that year.

- The gap-to-target calculations and both waterfall charts[9] ('GHG | modelled scenario') show the anticipated GHG reductions arising from the forecast changes in biofuel blend rates by 2030.

- You can choose to exclude these supply-side gains from your emissions pathways using the dropdown menu on row 15 in GHG.1.

6.5 Modelling additional decarbonisation initiatives (aka 2030 modelled scenario)

6.5.1 To model the impact of additional decarbonisation initiatives and/or other changes to your future energy use, you must first select 'yes' from the dropdown menu on row 14 in GHG.1. This 'switches on' the 2030 modelled scenario.

6.5.2 You can then add and configure different decarbonisation initiatives to your scenario using table GHG.4.

- Use a separate green row in GHG.4 for each initiative. An initiative could be a standalone project at one facility (e.g. replace boiler X with a heat pump) or it could be portfolio of projects (e.g. replace 30 boilers with heat pumps).

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[9] The waterfall charts only work in versions of Microsoft Excel from Excel 2016 onwards. See §1.4.2 for description of known compatibility issues with legacy versions of Excel.

- Different inputs are required (green cells) for different types of initiatives. The headings are shown in rows 74-75.

- Column C is for specifying the name of the initiative (optional).

- Column D indicates whether you have entered sufficient data for the initiative ('complete' or 'incomplete'), or whether you have excluded a previously entered initiative from the scenario ('excluded'). Column D must show 'complete' for the initiative to be counted in the modelled scenario.

- Column E allows you to exclude a previously entered initiative from the scenario, i.e. to easily 'switch off' the impact of a particular initiative. The default is that the initiative is included in the modelled scenario (cell value = 'yes').

- Column F is used to specify the implementation year for the initiative. Changes to GHGs are calculated for the year after the implementation year onwards – see §6.6.5.

- Columns G-I are for the energy use that will be displaced by the proposed initiative.

- Column J shows the % of existing energy consumption that will be displaced by the initiative. It will warn in red if you try to displace more than 100% of existing consumption.

- Columns K-S are for technical details of the initiative. Different details are required for different types of initiative.

- Columns T-V are for the additional energy use that will arise because of the initiative.

6.5.3 The model includes simple calculations for the following types of initiative:

- Energy efficiency gains from retrofits & other decreases in consumption – see §6.5.4.

- Fossil-fuel boilers → heat pumps – see §6.5.5.

- Fossil-fuel boilers → biomass boilers – see §6.5.6

- Other thermal (heat) fuel switching, e.g. changing from oil heating to gas heating – see §6.5.7.

- Fossil-fuel transport → electric vehicles – see §6.5.8.

- Fossil-fuel transport → high-blend biofuels – see §6.5.9.

- Fossil-fuel transport → compressed natural gas (CNG) – see §6.5.10.

- Grid electricity → 100% renewable electricity (onsite generation) – see §6.5.11.

- Other increases in energy consumption, e.g. arising from expansions, new facilities or growth in activity – see §6.5.12.

6.5.4 Use rows 77-102 to model the impact of **energy efficiency gains from retrofits & other decreases in consumption**. This is for modelling initiatives that result in <u>absolute reductions in energy consumption</u>, as opposed to fuel switching or electrification[10]. Examples include upgrades to building fabric, efficiency gains from improving control of heating systems, LED lighting retrofits, etc. You can also use this option to model the closure of an energy-using facility. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

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[10] If you wish to model an initiative that includes both fabric upgrade(s) and heat pump(s), then you should adopt the approach described in §6.5.15.

- Column G: select the existing energy type for which (some) consumption will be displaced, e.g. natural gas, gasoil.

- Column I: enter the amount of existing final energy consumption that will be displaced by the initiative, in the unit shown in cell I75.

6.5.5   Use rows 104-129 to model the impact of switching from fossil-fuel boilers to **heat pumps**. This is for modelling 'fuel switching' from fossil boilers to heat pumps and does not account for energy demand reduction arising from fabric upgrades that may be required as part of heat pump projects[10]. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column G: select the existing energy type for which (some) consumption will be displaced, e.g. natural gas, gasoil.

- Column I: enter the amount of existing final energy consumption that will be displaced by the heat pump, in the unit shown in cell I75.

- Columns K & L: specify the efficiency of the existing fossil-fuel boiler(s) that is/are being replaced. You can do this by either:

    – Selecting 'legacy' or 'recent' from the dropdown in column K, in which case the model assumes that the efficiency is 70% (legacy) or 90% (recent).

    – Entering the efficiency of the existing boiler(s) in column L.

- Column N: specify the seasonal coefficient of performance (SCOP) for the new heat pump(s). The SCOP is an engineering estimate of the ratio of the amount of heat delivered by a heat pump to the amount of electricity consumed in a year. In Ireland, SCOPs are typically between 2.5 and 4.0. The model uses a default value of 3.0, but this can be overwritten if you have a more appropriate value.

6.5.6   Use rows 130-156 to model the impact of switching from fossil-fuel boilers to **biomass boilers**. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column G: select the existing energy type for which (some) consumption will be displaced, e.g. natural gas, gasoil.

- Column I: enter the amount of existing final energy consumption that will be displaced by biomass, in the unit shown in cell I75.

- Columns K & L: specify the efficiency of the existing fossil-fuel boiler(s) that is/are being replaced. You can do this by either:

    – Selecting 'legacy' or 'recent' from the dropdown in column I, in which case the model assumes that the efficiency is 70% (legacy) or 90% (recent).

    – Entering the efficiency of the existing boiler(s) in column J.

- Column M: specify the efficiency of the new biomass boiler(s). The model uses a default value of 90%, but this can be overwritten if you have a more appropriate value.

6.5.7   Use rows 158-183 to model the impact of **other thermal (heat) fuel switching**, e.g. changing from an oil boiler to a gas. You can use this initiative for fuel-switching to bioLPG, biomass, biomethane, district heating, fuel oil, gasoil (thermal), kerosene, LPG & natural gas. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column G: select the existing energy type for which (some) consumption will be displaced, e.g. natural gas, gasoil.

- Column I: enter the amount of existing final energy consumption that will be displaced, in the unit shown in cell I75.

- Column O: specify the ratio of new energy use to displaced fuel use, e.g. if you wish to model a fuel switch from heating oil to gas as part of a boiler upgrade that will result in a 10% reduction in energy use (in kWh), then you would enter 90%. The model uses a default value of 100%.

- Column T: select the new energy type that will displace existing consumption.

6.5.8   Use rows 185-210 to model the impact of switching from fossil transport fuel to **electric vehicles**. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column G: select the existing energy type for which (some) consumption will be displaced, e.g. diesel (blend).

- Column I: enter the amount of existing final energy consumption that will be displaced, in the unit shown in cell I75.

- Column P: specify the ratio of electricity use to displaced fossil-fuel use. The model uses a default value of 40%[11], but this can be overwritten if you have a more appropriate value.

6.5.9   Use rows 212-237 to model the impact of switching from fossil transport fuel to a **high-blend biofuels** (see glossary). You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column G: select the existing energy type for which (some) consumption will be displaced, e.g. diesel (blend).

- Column I: enter the amount of existing final energy consumption that will be displaced, in the unit shown in cell I75.

- Column Q: specify the biofuel blend rate in the new energy type, i.e. % of new fuel that is biofuel (by volume).

6.5.10   Use rows 239-264 to model the impact of switching from fossil transport fuel to **compressed natural gas (CNG)**. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column G: select the existing energy type for which (some) consumption will be displaced, e.g. diesel (blend).

- Column I: enter the amount of existing final energy consumption that will be displaced, in the unit shown in cell I75.

- Column S: specify the ratio of CNG use to displaced fossil-fuel use.

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[11] Source: EU Council Directive 2015/652, Annex I, Part 1 (f)

6.5.11   Use rows 266-291 to model the impact of switching from grid electricity to **onsite renewable electricity**[12], e.g. onsite solar PV, onsite wind, onsite hydro. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column I: enter the amount of existing grid electricity consumption that will be displaced, in the unit shown in cell I75.

- Column T: select the type of onsite renewable electricity generation that will displace existing consumption.

6.5.12   Use rows 293-318 to model the impact of **increases in energy consumption**. This is for accounting for changes to your organisation that will give rise to increased in consumption between now and 2030, e.g. arising from expansions, new facilities or growth in activity. You can enter an initiative as follows:

- Column F: enter the year in which the initiative will be implemented (in the model).

- Column T: select the energy type for which there will be additional consumption.

- Column V: enter the amount of additional final energy consumption, in the unit shown in cell V75.

6.5.13   If you wish to model an initiative that will be implemented over several years, then you should use separate rows to model different phases of the initiative. For example, for a multi-phase energy efficiency renovation programme across a portfolio of buildings, you would model the anticipated reductions for each phase on separate rows (e.g. X MWh reduction in 2023, another Y MWh reduction in 2025 & another Z MWh reduction in 2027).

6.5.14   If you wish to model an initiative that will result in the displacement of different energy types, then you should use separate rows to model different elements of the initiative. For example, for a renovation programme across a portfolio of buildings that will reduce consumption of electricity, oil and gas, you would model the anticipated reductions for each energy type on a separate row.

6.5.15   If you wish to model an initiative that includes both fabric upgrade(s) and heat pump(s), then you should adopt the following approach:

- Use the functionality for modelling *energy efficiency gains from retrofits* described in §6.5.4 to back-out the fossil fuel consumption that will be displaced (avoided) arising from the fabric upgrade.

- Use the functionality for modelling *heat pumps* described in §6.5.5 to replace the fossil fuel consumption that would hypothetically remain after the fabric upgrade with a heat pump.

- Importantly the *sum of the values* entered across both rows in column I must equal the *total amount* of fossil fuel displaced by the initiative.

6.5.16   Row 37 in GHG.2 will show an error message (in red) if you have configured your decarbonisation initiatives in such a way that they will displace more consumption of any energy type than you are currently using, e.g. if you consumed 100 units of natural gas in your reporting year and you configured multiple decarbonisation initiatives that will displace

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[12] No emissions benefit is given for purchasing 'green' electricity products. Please refer to the latest version of SEAI's *M&R-2030 methodology guidance* document for additional information.

120 units of gas between then and 2030, an error message will be generated. The message will indicate which energy type(s) triggered the error.

6.6 Limitations & assumptions

6.6.1 The calculation of the GHG target, future emissions pathways, the gap-to-target and the impact of decarbonisation initiatives over time are very sensitive to forecasts for future values of the CO2 emission factor for Ireland's electricity system. See §1.1.4-1.1.7 for further information.

6.6.2 All of the historical energy consumption data shown is taken from the M&R system. It cannot be edited in the model.

6.6.3 All of the historical GHG emissions shown have been calculated from non-weather-adjusted final energy consumption.

6.6.4 The model assumes that diesel (blend) will contain 12% biodiesel (B12[13]) by 2030 and that the level of blending will increase linearly between the reporting year and 2030. It also assumes that petrol (blend) will contain 10% bioethanol (E10[14]) from 2023 onwards.

6.6.5 The decarbonisation model assumes that all initiatives are implemented *at the end* of the implementation year, so the GHG changes arising from initiatives are calculated for the year immediately after the implementation year and for every subsequent year. For example, if you model an initiative that will implemented in 2023, the impact on GHGs will be calculated as taking effect from 2024 onwards.

6.6.6 If your organisation's future GHG emissions are calculated to be ahead of target, the model will return a 'negative gap' to target, i.e. it will indicate that the organisation's GHGs can increase and still reach the target(s).

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[13] Diesel blend containing 12% biodiesel, by volume.

[14] Petrol blend containing 10% bioethanol, by volume.

ABBREVIATIONS

CO₂: carbon dioxide

COP: coefficient of performance

CHP: combined heat & power

CNG: compressed natural gas

DERV: diesel engine road vehicle

DVA: data verification assessment

EE: energy efficiency

EU: European Union

EV: electric vehicle

GHG: greenhouse gas (emissions)

GTT: gap to target

ICE: internal combustion engine

LPG: liquefied petroleum gas

M&R: monitoring & reporting

NCV: net calorific value

PV: photovoltaic

RES-E: renewable energy supply - electricity

SCOP: seasonal coefficient of performance

SEAI: Sustainable Energy Authority of Ireland

TFC: total final consumption

TPER: total primary energy requirement

GLOSSARY

Bioethanol or **pure bioethanol** is a biofuel that is typically blended with petrol (fossil) by fuel suppliers. The blended product is referred to as 'petrol (blend)' in the GTT model. The bioethanol blend rate is increasing over time (additional information <u>here</u>); this blend rate is shown in row 77 in the 'conversion factors' worksheet.

Biodiesel or **pure biodiesel** is a biofuel that is typically blended with diesel (fossil) by fuel suppliers. The blended product is referred to as 'diesel (blend)' in the GTT model. Some forms of biodiesel can also be used as standalone (unblended) fuels. The biodiesel blend rate is increasing over time (additional information <u>here</u>); this blend rate is shown in row 76 in the 'conversion factors' worksheet.

Biogas is a mixture of methane (50-75%), carbon dioxide (25-45%) and small amounts of water (2-7%), as well as trace gases such as hydrogen sulphide, oxygen, nitrogen, ammonia and hydrogen. Anaerobic digestion plants convert feedstocks into biogas. Typical feedstocks include agricultural waste, municipal waste, industrial waste and energy crops. After some purification biogas can be combusted in boilers or CHP plants to provide heat and electricity. It can also be upgraded to natural gas quality, known as biomethane.

Biojet or **sustainable aviation fuel** is a biofuel that can be used as an alternative to jet kerosene for aviation.

Biofuels are liquid or gaseous transport fuels made from biomass. They are renewable alternatives to fossil fuels in the transport sector. They include biodiesel, bioethanol and biojet.

BioLPG is propane manufactured from renewable feedstocks. It is a renewable form of LPG that can be used for heat and transport.

Biomethane is biogas that has been upgraded to natural gas quality. It can be injected into the gas network at appropriate points and transported to customers.

Diesel (blend) or **road diesel (DERV)** refers to standard-specification road diesel, which is a blended mixture of fossil diesel and biofuel (biodiesel). The biofuel blend rate is increasing over time (additional information <u>here</u>); this blend rate is shown in row 76 in the 'conversion factors' worksheet. This is the diesel used by the vast majority of road-transport diesel users in Ireland, including almost all public bodies and private diesel vehicles, i.e. it is the diesel available through forecourts etc. It is typically marketed as 'diesel'.

Diesel (fossil) refers to the portion of 'diesel (blend)' that is a fossil fuel. A very small number of public bodies use this 100% fossil-fuel diesel as fuel in their vehicles, i.e. they use diesel with no biofuel component. Diesel (fossil) is not widely used as a standalone fuel and would typically be sourced via a dedicated procurement.

Final energy consumption or **total final consumption (TFC)** is the energy used by public bodies and other final consuming sectors of the economy, e.g. industry, transport, residential, etc. It excludes the energy used in the energy sector, e.g. for electricity generation, oil refining, etc.

High-blend biofuels are liquid transport fuels that contain higher percentages of biofuel than is blended into 'standard' specification road diesel or petrol, i.e. than is blended into the diesel (blend) or petrol (blend) available from forecourts. These high blends are not as widely available as standard blends. Typically, high-blend biofuels would be sourced via a dedicated procurement.

Petrol (blend) or **petrol** refers to standard-specification petrol, which is a blended mixture of fossil petrol and biofuel (bioethanol). The biofuel blend rate is increasing over time (additional information here); this blend rate is shown in row 77 in the 'conversion factors' worksheet. This is the petrol used by the vast majority of petrol users in Ireland, including almost all public bodies and private petrol vehicles, i.e. it is the petrol available through forecourts etc. It is typically marketed as 'petrol'.

Petrol (fossil) refers to the portion of 'petrol (blend)' that is a fossil fuel. Petrol (fossil) is not widely used as a standalone fuel and would typically be sourced via a dedicated procurement.

Primary energy or **total primary energy requirement (TPER)** accounts for energy that is consumed and/or lost in transformation, transmission and distribution processes. It is calculated by applying primary energy conversion factors, which vary by fuel type, to final energy consumption values. Conversion factors for thermal and transport fuels typically remain unchanged over time. The conversion factor for electricity changes from year to year as the efficiency of the electricity system changes. These changes can have a material impact on energy savings calculated via M&R. SEAI prepares forecasts for the primary energy conversion factor for electricity in future years – see §1.1.5-1.1.7 for details on how to access the latest forecast values.

Please refer to the latest version of SEAI's *M&R-2030 methodology guidance* document for additional explanation of terminology and concepts relevant to the 2030 energy efficiency and emissions targets.