Green Impact Reporting Criteria

October 2019

This document describes how the Green Investment Group (GIG) has calculated certain quantified environmental benefits, defined as "Green Impact", which either have been realised or are anticipated to be realised from its investments during the financial year ending 31 March 2019, and its total investments to date. These benefits are set out in the Green Impact Statements in GIG's Progress Report 2019 and include statements of greenhouse gas (GHG) emissions reduction, renewable energy generated, energy demand reduction, additional materials recycled, and waste-to-landfill avoided. This document should be read in conjunction with the Appendices, which set out sector-specific criteria, GHG emission factors and other technical details.

Calculation Methodology

Overall approach

The environmental benefit or Green Impact arising from a project is estimated by comparing the project's impact against an alternative outcome (scenario) if the project in question had not taken place. This alternative outcome is referred to as the 'baseline'. Green Impact is calculated using the equation below and can be applied to any of GHG savings (kilotonnes CO_2e), energy demand reduction (MWh), tonnes additional materials recycled (t) or tonnes waste to landfill (t) avoided, with a beneficial Green Impact (saving, reduction, etc.) expressed as a positive number:

Green Impact = (Baseline impact) less (Project impact)

Renewable energy generated (GWh) is reported as the project's net power generated.

Reference guidelines

These reporting criteria follow the guidance on appraisal and evaluation of GHG emissions prepared by the International Financial Institution (IFI) Framework for a Harmonised Approach to Greenhouse Gas Accounting[1], together with guidance from the GHG Protocol for Project Accounting[2]. GHG emissions reduction for non-domestic energy efficiency projects is determined in alignment with the International Performance Measurement and Verification Protocol (IPMVP)[3]. GHG emissions reduction and other Green Impacts arising from waste projects are determined using an appropriate life-cycle assessment (LCA) tool[4], applying the guidelines set out at Appendix 3 to this document.

Approach to calculating Green Impact

For each project, relevant project operating parameters are determined for the appropriate period in line with the sector-specific notes set out at Appendix 1 (e.g. feedstock consumed, energy generated or required). From this, the relevant project Green Impact is calculated. For calculating GHG emissions, the relevant project operating parameters are converted into CO_2e using the appropriate emission factors as set out at Appendix 2, unless more appropriate project-specific information is available.

Having determined the project's Green Impact, a similar methodology is applied to determine the Green Impact of the baseline. The baseline is determined in accordance with the relevant sector-specific notes set out at Appendix 1. Again, the baseline's operating parameters are converted into GHG emissions or other Green Impact metrics using the relevant emission factors set out at Appendix 2.

The relevant dimension of Green Impact of a project is estimated for reporting purposes for each of two relevant time-horizons, as follows:

- Prior year actual: Green Impact is estimated using the most recent available data for each project's actual performance as provided to GIG by a client or fund for the prior year and then applying the methodology outlined above. Actual Green Impact is calculated by projects annually in respect of the period January to December, in contrast to GIG's financial year of April to March.
- Estimated future lifetime Green Impact: For each project an estimate is made of the anticipated future operating parameters (e.g. feedstock

[1] https://unfccc.int/sites/default/files/resource/International%20Financial%20Institution%20Framework%20for%20a%20Harmonised_rev.pdf
[2] http://www.ghgprotocol.org/standards/project-protocol
[3] http://www.evo-world.org/
[4] An example of an appropriate LCA tool is the WRATE tool, an environmental assessment tool for waste projects originally developed by the Environment Agency

consumed, energy generated or required) for each year of the remaining life of the project. This is then compared to the appropriate baseline in accordance with the methodology set out above.

GIG calculates the future estimated Green Impact of all projects to which it has made a binding commitment to deploy its capital, and for which it does not have reason to believe that the project will not proceed.

GIG calculates the actual Green Impact of all projects which are operational and for which GIG's investment has achieved financial close. Financial close is defined as being the key date in respect to the financing documents on which GIG's commitment was realised.

The remaining time-horizon or lifetime of a project is the anticipated economic lifetime of the project. In calculating Green Impact, GIG includes an estimate of each of the elements which are expected to contribute individually to >5% of the total GHG emissions for a project. Where information is not readily available, GIG makes appropriately conservative estimates. GIG also seeks to ensure a consistent approach in calculating its GHG emissions to enable comparisons to be made between areas and over time.

Reported Green Impact

GIG reports the total estimated lifetime Green Impact, which is a summation of prior years' actual and estimated future lifetime Green Impact.

Green Impact is reported for new investments in the reporting period and for all investments to date, which comprise new, retained and exited projects.

Project eligibility for reporting

GIG only reports estimated Green Impact for projects where GIG has provided a binding commitment to make a principal investment at, or subsequent to, the project reaching final investment decision (FID).

For investments by GIG in projects that have not yet reached FID – e.g. where GIG has provided development funding – Green Impact is not reported, due to the relative uncertainty over potential future Green Impact.

Where GIG has ceased its involvement in a project, either through expiry or full repayment of a loan facility, or through sale of the entirety of GIG's equity interest, GIG includes the project's actual Green Impact up to the point of exit in the lifetime Green Impact.

For projects that were acquired by GIG as Pre-construction or Construction assets (see Allocation of Green Impact to GIG investment below), at the point of exit GIG will calculate the estimated future remaining lifetime Green Impact, and continue to include this figure in the estimated lifetime Green Impact of GIG transactions. The remaining lifetime Green Impact of exited transactions will not then be re-estimated at a later date, unless GIG determines that a project has been cancelled (see Cancellations overleaf).

If, at the point of exit, GIG is unable to obtain accurate information from the project on its actual Green Impact to date, or estimated future remaining lifetime Green Impact, GIG will estimate these metrics by using previously provided forecasts on a pro rata basis.

For projects that were acquired by GIG as Operating assets, the estimated future remaining lifetime Green Impact from the point of exit is no longer reported in the lifetime Green Impact.

Allocation of Green Impact to GIG investment

GIG attributes to its investment a proportion of the whole investments' Green Impact.

The application of this rule gives the following results by stage of development of project:

- Pre-construction assets: for investments by GIG in projects with assets which have not yet commenced construction, GIG attributes to its investment 100% of the Green Impact of the project.
- Construction assets: for projects part-way through construction at the time of GIG's investment, GIG estimates the extent of additional capital mobilised by GIG's financing, including whether or not the remaining capital of the project would have been committed. This will depend on the precise circumstances of each project.
- Operating assets: for investments by GIG in projects which are already operating, GIG only attributes to its investment the share of total capital refinanced at the time of GIG's investment, as a proportion of the enterprise value of the investment.

For capital managed by third party funds where GIG is a limited partner investor, GIG allocates only the Green Impact attributable to capital committed to or drawn-down in respect of identifiable projects and does not attribute Green Impact to capital committed to funds, but not yet committed or drawn-down to projects.

Review and re-estimation of Green Impact

Each year, GIG reviews the estimated remaining lifetime Green Impact data for each project in its portfolio. This will be based on the original anticipated lifetime Green Impact data made at the time of investment.

GIG may choose to revise forecast Green Impact if it believes the operating parameters of a project have changed in such a way as to affect future Green Impact predictably, reliably and permanently. Examples of such circumstances may include permanent changes to fundamental technical parameters (e.g. installed generation capacity), contractual terms (e.g. quantity of feedstock procured), or operational parameters (e.g. operating hours).

The need for such a reforecast would be triggered if the annual review of actual Green Impact performance provides reasonable evidence that the basis of previous estimates has materially and permanently changed, leading to >10% change in forecast remaining lifetime performance. We expect greater variability of performance as compared to forecast until a project has completed three years of operation at full capacity, and consequently would not expect to reforecast Green Impact for projects in their first three to five years unless actual performance variances could be attributed to permanent operating parameter changes.

Any re-estimate will be made using the same methodology as for a new investment, as set out in this document. Prior to the commencement of operation of a project, anticipated Green Impact is not reforecast, save in the case that the project is terminated.

Project cancellations and refinancing

Cancellations – for all investments to date, where a project is cancelled in such a way that GIG believes that it will either cease operating or will not become operational, the future estimated Green Impact will be removed permanently from GIG's reported Green Impact.

Refinancing – where GIG is instrumental in the refinancing of a project in which it already has made an investment, GIG shall report the refinancing as an additional transaction, with any additional mobilised capital resulting in additional Green Impact allocated to GIG as per the section above Allocation of Green Impact to GIG investment.

Reporting of aggregate Green Impact

In accordance with GIG's accounting convention, when reporting Green Impact in the Progress Report, numbers are rounded to the nearest integer value prior to being added up to the total.

Whilst all the Green Impact figures in GIG's Progress Report are determined in good faith, they are not subject to exact and certain measurement. In each case they are estimated on the basis of well-informed assumptions and projections, and necessarily require the application of reasonable interpretation and professional judgment. In the case of anticipated future performance, as with any predictions about the future, the actual result may differ to that which is forecast.

Exclusions

GHG emissions associated with the embedded energy of constructing or decommissioning green infrastructure projects are generally not considered to be material and are not included within GHG emissions reduction calculations, unless there is evidence to suggest these are likely to affect a calculation by more than 5%[5]. However, GHG emissions associated with the lifecycle process of preparing biomass feedstock (for example in the manufacture of biomass for power) are always considered. Further details are provided in the Appendices to this document.

[5] Note that in respect of waste project GHG emissions, LCA tools generally do include an estimate of the embedded GHG emissions associated with the construction of projects.

Appendices

Glossary

AD	Anaerobic digestion – an energy-from-waste technology by which biodegradable waste is broken down to produce methane and digestate.
Build margin	A concept defined in the GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-connected Electricity Projects[6] and referring to the marginal technology which is constructed to provide additional power capacity in an electricity grid based on prevailing economic conditions.
CO_2e	Carbon dioxide equivalent – a measure of the global warming potential of a range of greenhouse gases (see Appendix 2 for details), expressed in terms of the equivalent warming of one unit of carbon dioxide gas.
Government Conversion Factors	The latest UK Government conversion factors for company reporting[7].
ECM	Energy conservation measure – a measure taken to reduce energy demands typically in a building or industrial facility.
EfW	Energy-from-waste.
GHG	Greenhouse gas – a gas with material global warming potential.
GHG Protocols	Series of protocols for calculating the greenhouse gas emissions arising from a facility, developed by the Waste Resources Institute and the World Business Council for Sustainable Development.
IPMVP	International performance measurement and verification protocols developed by the Efficiency Valuation Organisation[8].
IVC	In-vessel composting – a type of infrastructure for composting biodegradable waste.
LCA	Life-cycle analysis – the analysis of the lifecycle effects of a process, frequently applied to greenhouse gas emissions analysis.
MRF	Materials recovery facility.
NDEE	Non-domestic energy efficiency.
Operating margin	A concept defined in the GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-connected Electricity Projects[9] and referring to the marginal technology operating to provide power in an electricity grid at any point in time, based on prevailing economic conditions.
RDF	Refuse-derived fuel – a fuel derived from waste and produced by a waste pre-treatment facility. Sometimes also referred to as SRF.
Scope 1	A term of reference used by the GHG Protocols to describe all direct GHG emissions arising from a site
Scope 2	A term of reference used by the GHG Protocols to describe all indirect GHG emissions arising at a site from consumption of purchased electricity, heat or steam.

[6] http://www.ghgprotocol.org/standards/project-protocol
[7] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[8] http://evo-world.org/
[9] http://www.ghgprotocol.org/standards/project-protocol

Scope 3	A term of reference used by the GHG Protocols to describe all indirect GHG emissions arising at a site and not classed as Scope 1 or Scope 2, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, outsourced activities, waste disposal, etc.
SRF	Solid recovered fuel – a fuel derived from waste produced by a waste pre-treatment facility. Sometimes also referred to as RDF.
WPTF	Waste pre-treatment facility.
WRATE	Waste and Resources Assessment Tool for the Environment[10], a lifecycle-based environmental assessment tool used to appraise waste projects.

[10] http://www.wrate.co.uk/

Appendix 1: Sector-specific criteria

1.1 Wind, solar and small-scale hydro power

Scope

This covers investment in all types of wind energy, solar energy and small-scale (<10 MW) hydro power projects.

Project Green Purpose(s)

The purpose of a wind farm, solar farm or hydro power project is to produce renewable electricity. This, in turn, reduces GHG emissions and avoids fossil fuel usage, leading to increased efficiency in the use of natural resources.

Project Impact

The GHG emissions associated with production of electricity at a wind farm, solar farm or small-scale hydro power project are assumed to be zero.

Baseline Impact

The baseline is assumed to be the equivalent power produced by variable generation Combined Margin. The GHG emissions associated with the baseline are determined by using the appropriate emission factor for variable generation Combined Margin electricity as set out in Appendix 2.

Green Impact calculation

From the above, GHG savings are estimated either prior to investment using projected project operating parameters for any year of operations or on a lifetime basis or, following investment, using actual project data.

1.2 Waste – Materials Recovery Facility

Scope

This includes facilities that involve identifying and sorting waste, then extracting and preparing materials that can be either re-used or re-processed into new products.

Project Green Purpose(s)

The purpose of MRFs is to increase recycling rates, which avoid the production of virgin material. This reduces GHG emissions as well as improving the efficiency in the use of natural resources and protecting the natural environment by avoiding waste-to-landfill.

Project Impact

This is calculated using an LCA tool and involves a calculation for the MRF relevant GHG emissions arising including electricity used to power the machinery to sort the feedstock including transportation of waste to/ from the MRF, when compared to a zero baseline of no waste produced. This includes the benefit of avoided GHG emissions associated with the production of additional virgin materials which would otherwise need to be produced if recycling did not take place.

Baseline Green Impact

It is assumed (unless there is project specific evidence to the contrary) that waste treated by the MRF would otherwise go to landfill. The GHG emissions associated with this outcome are calculated using an LCA tool, compared to a zero baseline of no waste produced or treated.

Project Green Impact

GHG emissions reduction from the MRF is calculated by subtracting the project emissions from the baseline emissions (using projected project operating parameters for any year of operations or on a lifetime basis or, following investment, using actual project data). Using the same methodology, the additional materials recycled by key category (e.g. paper/ card, ferrous metals, non-ferrous metals etc.) is also calculated, together with the avoided waste-to- landfill.

1.3 Waste – Waste Pre-Treatment Facility

Scope

This includes investment in waste pre-treatment facilities which produce stabilised waste outputs such as refuse-derived fuel and includes technologies such as mechanical biological treatment, mechanical heat treatment and other waste autoclave technologies that apply pressure to treat waste.

Project Green Purpose(s)

The purpose of WPTF includes (i) stabilising and drying the waste into RDF, in order to enable increased energy recovery; (ii) stabilising waste prior to landfill to reduce GHG emissions; (iii) extracting increased recyclable materials to increase recycling rates. This reduces GHG emissions as well as improving the efficiency in the use of natural resources and protecting the natural environment by avoiding waste-to-landfill.

Project Impact

The project is defined as the treatment of waste using WPTF, together with subsequent treatment of the residual waste by the most likely technology destination. In the absence of project-specific information, this is assumed to be a mix of EfW and landfill in the ratio set out in Appendix 3. An LCA tool is then used to calculate the associated emissions, together with projected recycling of materials (which avoids the production of virgin materials) and residual waste to landfill, when compared to a zero baseline of no waste produced.

Baseline Impact

In the absence of project specific information, the Baseline is assumed to be a mix of EfW and landfill in the ratio set out in Appendix 3. An LCA tool is then used to calculate the associated emissions, together with projected recycling of materials and residual waste to landfill, when compared to a zero baseline of no waste produced.

Project Green Impact

GHG emissions reduction from the WPTF is calculated by subtracting the project emissions from the baseline emissions (using projected project operating parameters for any year of operations or on a lifetime basis or, following investment, using actual project data). Using the same methodology, any additional materials recycled by key category (e.g. paper/card, ferrous metals, non-ferrous metals etc.) is also calculated, together the avoided waste-to-landfill.

1.4 Waste – Thermal Treatment Energy from Waste

Scope

This includes investment in all types of thermal treatment of residual waste, although it excludes thermal treatment technologies which rely exclusively upon RDF or SRF produced to a required specification.

Project Green purpose(s)

The purpose of EfW facilities is two-fold: (i) to divert waste from going to landfill; and (ii) to recover energy from the waste. Together this reduces GHG emissions and protects the natural environment by avoiding waste-to-landfill.

Project Impact

This is calculated using an LCA tool and involves a calculation relevant GHG emissions including emissions arising on the conversion of waste to energy and transportation of waste to/from the EfW. It also includes the GHG saving of electricity generated by the EfW, which is assumed to displace the equivalent electricity generated by using firm generation Combined Margin electricity (as set out in Appendix 2) and any benefit from additional recycling of materials which avoids production of virgin materials. The GHG emissions arising for the waste plant are compared to a zero baseline of no waste produced.

Baseline Impact

In the absence of project-specific information, it is assumed that the destination of the residual waste is landfill. The associated GHG emissions are calculated using an LCA tool, compared to a zero baseline of no waste produced.

Project Green Impact

GHG emissions reduction from the EfW is calculated by subtracting the project emissions from the baseline emissions (using anticipated project operating parameters for any year of operations or on a lifetime basis or, following investment, using actual project data). Using the same methodology, the additional materials recycled by key category (e.g. ferrous metals, non-ferrous metals etc.) is also calculated, together with the avoided waste-to-landfill. The renewable energy generated (i.e. energy recovery from biogenic waste) is also reported.

The re-use of ashes (for example in aggregates) is included in materials recycled.

1.5 Waste – Composting Solutions

Scope

This section covers investment in all types of composting including in-vessel composting and open-composting.

Project Green Purpose(s)

The purpose of composting is to reduce GHG emissions arising on the breakdown of the organic matter, when compared to the alternative of landfill emissions, as well as to provide compost-like output which avoids the manufacture of compost. Together this reduces GHG emissions, protects the natural environment by avoiding waste-to-landfill and improves the efficient use of natural resource by increasing materials recycling.

Project Impact

This is calculated using an LCA tool and involves a calculation for the IVC plant of the relevant emissions arising on the conversion of waste to energy including transportation of waste to/from the IVC plant. The GHG emissions arising for the IVC plant are compared to a zero baseline of no waste produced.

Baseline Green Impact

In the absence of project-specific information, it is assumed that the destination of the residual waste is landfill. The associated GHG emissions are calculated using an LCA tool, compared to a zero baseline of no waste produced.

Project Green Impact

GHG emissions reduction from the IVC plant is calculated by subtracting the project emissions from the baseline emissions (using anticipated project operating parameters for any year of operations or on a lifetime basis or, following investment, using actual project data). Using the same methodology, the additional materials recycled by key category (e.g. compost-like output etc.) is also calculated, together with the avoided waste-to-landfill.

1.6 Non-Domestic Energy Efficiency

Scope

The scope for NDEE includes investments deployed at non-domestic sites (i.e. commercial and public sector properties) to reduce energy consumed, with a focus on the reduction in Scope 1 and 2 GHG emissions (but not Scope 3 emissions arising at other sites) through the retrofit of existing sites.

Project green purpose(s)

The project purpose is to reduce energy demand and associated GHG emissions through the implementation of Energy Conservation Measures (ECMs).

Project Impact

The project GHG emissions are those associated with the site(s) relating to the Project following the implementation of ECMs. This is calculated by following the IPMVP, which ensures a consistent application of the following key elements of energy demand reduction and associated GHG savings:

- Definition of range of ECMs
- Estimation of appropriate lifetime of the ECMs
- Identification of project boundaries
- Selection of appropriate monitoring and verification methodology

No energy saving is attributed to additional capacity added to a site through the project. The associated GHG emissions is calculated by taking the reduced energy demand and converting this into a GHG saving by applying the appropriate GIG emission factors in line with Appendix 2.

Baseline Impact

The project baseline is the assumed energy demand of the site(s) relating to the project prior to implementation of any additional ECMs. The associated GHG emissions is calculated by taking the baseline energy demand and converting this into a GHG saving by applying the appropriate GIG emission factors in line with Appendix 2.

Green Impact calculation

The relative GHG emissions saving is calculated by subtracting the Project GHG emissions from the baseline GHG emissions as calculated using projected project operating parameters for any year of operations or on a lifetime basis or, following investment, using actual project data. The reduction in energy demand and renewable energy generated are also reported.

1.7 Biomass Power

Scope

This section covers investment in large scale biomass heat/ power plants of >1 MWe capacity using a variety of biomass feedstock. It includes plants which are the result of a conversion of part or all of their capacity from coal power to biomass, as well as dedicated new build biomass plants.

Project Green purpose(s)

The project purpose is the production of renewable electricity and, potentially, heat. This, in turn, reduces GHG emissions and avoids fossil fuel usage (efficiency in the use of natural resources).

Project impact

The emissions associated with combusting biomass are calculated using the Ofgem approved biomass power life-cycle emissions calculator tool as set out in the Ofgem guidelines[11], or an international equivalent calculator, which estimates the secondary emissions associated with the biomass lifecycle. Primary emissions from the combustion of sustainably sourced biomass are assumed to be zero. Where any non-biomass fuel is also combusted (e.g. fossil fuel mitigant), the associated GHG emissions should be calculated using the appropriate emission factor in Appendix 2, unless project specific information is available.

Baseline impact

For dedicated new build biomass plants, the baseline is assumed to be the equivalent power produced by firm generation Combined Margin. The GHG emissions associated with the baseline are determined by using the appropriate emission factor for firm generation Combined Margin electricity (as set out in Appendix 2).

For biomass power produced at plants converted from coal, the baseline is regarded as coal-fired power production, based on a conservative estimate of the anticipated future coal operation that would occur if the conversion project did not take place and using the appropriate emission factor for coal in Appendix 2, unless project-specific information is available. To the extent that biomass power production upon conversion is greater than the anticipated coal- fired power production, it is then assumed that the converted biomass plant displaces firm generation Combined Margin electricity, using the appropriate emission factor (as set out in Appendix 2). Where heat is also generated and exported, the GHG intensity of the heat that is displaced is calculated. Unless there is project specific information available, this is assumed to be gas heat using a boiler with 80% efficiency.

Green Impact calculation

From the above, GHG savings are estimated either prior to investment using projected project operating parameters for any year of operations or on a lifetime basis or following investment using actual project data for each of the project and the baseline and the Green Impact calculated accordingly. The renewable energy generated is also reported.

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[11] https://www.ofgem.gov.uk/publications-and-updates/uk-solid-and-gaseous-biomass-carbon-calculator

Appendix 2: Emission Factors

Fuel source related emission factors:

- For most fuels, GIG uses the ‘Fuels’ figures set out in the latest Government Conversion Factors for Company Reporting, using the data relevant to Scope 1 (excluding Scope 3 ‘Well To Tank’ emissions).
- For biofuels, GIG uses the ‘Bioenergy’ figures set out in the latest Government Conversion Factors for Company Reporting, including both the Scope 1 emissions (zero CO_2 emissions for biomass and biogas) and Scope 3 ‘Well To Tank’ emissions.

Electricity-related emission factors:

- The emission factors used to determine the GHG emissions associated with baseline grid electricity are derived from the IFI approach to GHG accounting for renewable energy projects[12] and the IFI approach to GHG accounting for energy efficiency projects[13].
- The IFI approach documents determine baseline emission factors by calculating a ‘Combined Margin’ emission factor that is a blend of ‘Build Margin’ and ‘Operating Margin’. This approach is based on the UNFCCC Clean Development Mechanism Tool to calculate the emission factor for an electricity system[14], which is aligned with the GHG Protocol for Project Accounting[15].
- Operating Margin represents the marginal existing generating capacity, and its generated output, that will most likely be displaced by the project.
- Build Margin represents the prospective new generating capacity, and its generated output, that would be affected by the project.
- The IFI approach documents set out two different Combined Margin emission factors per country or grid, which are determined as follows:
  - For variable generation (e.g. wind energy, solar PV, small-scale hydropower) the Combined Margin is determined as 75% Operating Margin: 25% Build Margin
  - For firm generation (e.g. energy from waste, combined heat and power, biomass, large hydropower) and reduced electricity consumption (i.e. energy efficiency), the Combined Margin is 50% Operating Margin: 50% Build Margin
- The IFI Working Group on GHG Accounting has agreed on The IFI (Interim) Dataset of Harmonized Grid Factors v.1.0[16], which forms the basis of GIG's GHG emission factors until such time as the next version of the dataset is agreed.
- From this dataset, the emission factors for the UK for use in the year to 31 March 2019 are as follows:
  - For variable generation the Combined Margin is 433 kg CO_2e/MWh
  - For firm generation the Combined Margin is 417 kg CO_2e/MWh

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[12] http://documents.worldbank.org/curated/en/758831468197412195/IFI-approach-to-GHG-accounting-for-renewable-energy-projects
[13] http://documents.worldbank.org/curated/en/893531467991051828/IFI-approach-to-GHG-accounting-for-energy-efficiency-projects
[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf/history_view
[15] http://www.ghgprotocol.org/standards/project-protocol
[16] http://greeninvestmentgroup.com/media/185865/ifi_interim_dataset_of_harmonized_grid_factors_v1-0-with-cover.xlsx

Appendix 3: Guidelines on use of emissions calculator for waste plants

1. In order to determine the Green Impact of Waste sector projects, GIG requires use of an appropriate life-cycle assessment (LCA) tool, adjusted to use GIG's prescribed emission factors and other requirements as set out below. If the LCA tool does not provide the required functionality to appraise a particular type of technology or scenario, then a similar alternative life-cycle assessment methodology should be proposed for GIG approval in line with the wider principles set out in these guidelines and in accordance with good industry practice.
2. In addition to the guidelines for waste already set out in this document, to ensure consistency of GHG appraisal both across different waste projects and also between waste projects and those of other sectors, the following assumptions should be used when calculating the GHG saving of a waste project, unless otherwise agreed or recommended as appropriate by an independent consultant:
   - Electricity grid mix should be set to ensure an emission factor equal to the GIG's firm generation Combined Margin electricity as set out at Appendix 2 for the life of the project.
   - Where heat is displaced, the baseline emissions displaced should be determined by using a default setting: Heat, natural gas, industrial furnace low-NO_X>100 kW or such other setting as may be more appropriate in the particular circumstances of the case.
   - Landfill gas capture rate should remain at a default capture rate of 75% for landfill gas and combustion in gas engines to generate electricity to export to the national grid and should not be altered save in the case of good evidence of an alternative benchmark.
   - The quantity of waste analysed should be equal to that used in GIG's investment financing appraisal base case, or a lower amount as may be conservatively estimated.
   - In the absence of project specific data, it should be assumed that waste travels the same distance and using the same type of transport in the baseline example as in the project scenario.
   - User-defined, rather than default, data should be used so far as possible for inputs relating to the project, including for the anticipated efficiency of the plant, waste composition profile, journey distances and mode of transport of waste.
   - Where a waste pre-treatment facility is being assessed, in the absence of project-specific information, it should be assumed that each of the RDF produced (in the project scenario) and the residual waste (in the baseline scenario) would have gone to a mix of landfill and conventional moving grate EfW in accordance with the following ratios over time – see table below. These ratios have been developed based on the assumption that over time, residual municipal waste to landfill will decline from 77.5% in 2010 to 7.5% in 2026 and remain at the level thereafter. The average ratio over the life of the plant should be used to determine average annual emissions and then the particular mix in each year when determining actual emissions. Note that the conventional moving grate EfW should be set in the LCA tool as the NSP Flexible EfW Process with net efficiency of 23.5%.
3. For any waste type or treatment not otherwise provided for in the LCA tool, a user-defined life-cycle analysis process is applied in line with the principles of this document.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
EfW	22.5%	26.9%	31.2%	35.6%	40.0%	44.4%	48.7%	53.1%	57.5%
Landfill	77.5%	73.1%	68.8%	64.4%	60.0%	55.6%	51.3%	46.9%	42.5%

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	
EfW	61.9%	66.2%	70.6%	75.0%	79.4%	83.7%	88.1%	92.5%	92.5%	Assume 92.5% thereafter
Landfill	38.1%	33.8%	29.4%	25.0%	20.6%	16.3%	11.9%	7.5%	7.5%	Assume 7.5% thereafter

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