CDM Methodology Booklet

Chapter III

# METHODOLOGIES FOR CDM PROJECT ACTIVITIES

# 3.1. INTRODUCTION TO METHODOLOGIES FOR CDM PROJECT ACTIVITIES

Methodologies provide the information that is required in order to determine the amount of Certified Emission Reductions (CERs) generated by a mitigation project activity. The following main sections can be found in a methodology:

- Definitions that are required to apply the methodology;
- Description of the applicability of the methodology;
- Description of the project boundary;
- Procedure to establish the baseline scenario;
- Procedure to demonstrate and assess additionality;
- Procedure to calculate emission reductions;
- Description of the monitoring procedure.

Further guidance to project developers is available in other CDM regulatory documents, such as standards (including methodological tools), procedures and guidelines (available through the CDM website).

Methodologies for large-scale project activities can be used for project activities of any size, whereas small-scale methodologies can only be applied if the project activity is within certain limits. Small-scale methodologies are grouped into three different types:

- *Type I:* Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent);
- *Type II:* Energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, with a maximum output (i.e. maximum savings) of 60 GWh per year (or an appropriate equivalent);
- *Type III:* Other project activities that result in emission reductions of less than or equal to 60 kt $CO_2$ equivalent per year.

More detailed information on specific limits can be found in each small-scale methodology.

# 3.2. METHODOLOGICAL TOOLS FOR CDM PROJECT ACTIVITIES

Methodological tools are generic modules that can be referenced in large-scale and small-scale methodologies in order to determine a specific condition (e.g. additionality of a CDM project activity) or to calculate particular emissions (e.g. emissions from electricity consumption). It is stated in the methodology if a methodology requires application of a certain methodological tool. A list and a short description of current methodological tools can be found below. These tools can be accessed from the CDM website.

Tools that apply to A/R methodologies are described in section 4.2.

### TOOL FOR THE DEMONSTRATION AND ASSESSMENT OF ADDITIONALITY

The tool provides a step-wise approach to demonstrate and assess the additionality of a CDM project activity. These steps are:

*Step 1* Identification of alternatives to the project activity;
*Step 2* Investment analysis;
*Step 3* Barriers analysis; and
*Step 4* Common practice analysis.

The tool is required by many methodologies.

### COMBINED TOOL TO IDENTIFY THE BASELINE SCENARIO AND DEMONSTRATE ADDITIONALITY

This tool provides a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality of a CDM project activity. Similar to the "Tool for the demonstration and assessment of additionality" the procedure is based on four steps, however in a different order:

*Step 1* Identification of alternative scenarios;
*Step 2* Barrier analysis;
*Step 3* Investment analysis (if applicable);
*Step 4* Common practice analysis.

Step 4 is not required if the project activity is first-of-its-kind. The tool is required by many methodologies.

### TOOL TO CALCULATE PROJECT OR LEAKAGE $CO_2$ EMISSIONS FROM FOSSIL FUEL COMBUSTION

This tool provides procedures to calculate project and/or leakage $CO_2$ emissions from the combustion of fossil fuels. It can be used in cases where $CO_2$ emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. This tool is required by methodologies whenever fossil fuel combustion is relevant in the project scenario or leakage.

### EMISSIONS FROM SOLID WASTE DISPOSAL SITES

This tool calculates emissions of methane from waste disposed of in a solid waste disposal sites (SWDS). Emission reductions are calculated with a first order decay model. The tool is applicable to calculating baseline, project and leakage emissions and to both situations that the solid waste disposal site can or cannot be clearly identified. The tool is required by landfill methodologies (e.g. ACM0001 or AMS-III.G.), alternative waste treatment methodologies (e.g. ACM0022 or AMS-III.F.) and biomass methodologies (e.g. ACM0006 or AMS-III.E.).

## TOOL TO CALCULATE BASELINE, PROJECT AND/OR LEAKAGE EMISSIONS FROM ELECTRICITY CONSUMPTION

This tool provides procedures to estimate the baseline, project and/or leakage emissions associated with the consumption of electricity. The tool may, for example, be required by methodologies where auxiliary electricity is consumed in the project and/or the baseline scenario.

## PROJECT EMISSIONS FROM FLARING

This tool provides procedures to calculate project emissions from flaring of a residual gas where methane is the component with the highest concentration in the flammable residual gas. Due to incomplete flaring of methane or even non-operation of the flare, methane emissions may occur in the project scenario. By determination of a flaring efficiency, such effects are taken into account.

## TOOL TO CALCULATE THE EMISSION FACTOR FOR AN ELECTRICITY SYSTEM

This methodological tool determines the $CO_2$ emission factor of electricity generated by power plants in an electricity system, by calculating the “combined margin” emission factor of the electricity system. The combined margin is the result of a weighted average of two emission factors of the electricity system: the “operating margin” and the “build margin”. The operating margin is the emission factor of the thermal power plants and all plants serving the grid. The build margin is the emission factor of a group of recently built power plants. This tool is required whenever electricity consumption or generation is relevant in the baseline and/or project scenario or in terms of leakage. It is particularly relevant for grid-connected electricity generation methodologies.

## TOOL TO DETERMINE THE MASS FLOW OF A GREENHOUSE GAS IN A GASEOUS STREAM

This tool provides procedures to determine the mass flow of a greenhouse gas in a gaseous stream, based on measurements of (a) the total volume or mass flow of the gas stream and (b) the volumetric fraction of the gas in the gas stream. The volume flow, mass flow and volumetric fraction may be measured on a dry basis or wet basis.

## TOOL TO DETERMINE THE BASELINE EFFICIENCY OF THERMAL OR ELECTRIC ENERGY GENERATION SYSTEMS

The tool describes various procedures to determine the baseline efficiency of an energy generation system such as a power plant or an industrial boiler, for the purpose of estimating baseline emissions. The tool is used in case of project activities that improve the energy efficiency of an existing system through retrofits or replacement of the existing system by a new system. This tool provides different procedures to determine the baseline efficiency of the system: either a) a load-efficiency function is determined which establishes the efficiency as a function of the operating load of the system or b) the efficiency is determined conservatively as a constant value.

## TOOL TO DETERMINE THE REMAINING LIFETIME OF EQUIPMENT

The tool provides guidance to determine the remaining lifetime of baseline or project equipment. An application of the tool would be for project activities which involve the replacement of existing equipment with new equipment or which retrofit existing equipment as part of energy efficiency improvement activities. Under this tool, impacts on the lifetime of the equipment due to policies and regulations (e.g. environmental regulations) or changes in the services needed (e.g. increased energy demand) are not considered.

## ASSESSMENT OF THE VALIDITY OF THE ORIGINAL/CURRENT BASELINE AND TO UPDATE OF THE BASELINE AT THE RENEWAL OF THE CREDITING PERIOD

This tool provides a procedure to assess the continued validity of the baseline and to update it at the renewal of a crediting period. The tool consists of two steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.

This tool is applicable in a situation where the crediting period needs to be renewed.

### PROJECT AND LEAKAGE EMISSIONS FROM TRANSPORTATION OF FREIGHT

This tool provides procedures to estimate project and/or leakage $CO_2$ emissions from road transportation of freight by vehicles. Two options are provided to determine these emissions:

- Option A: Monitoring fuel consumption; or
- Option B: Using conservative default values.

The tool also provides default conservative emission factors to estimate project and/or leakage $CO_2$ emissions from freight transportation by rail.

The tool is applicable to project activities which involve transportation of freight and where transportation is not the main project activity.

### PROJECT AND LEAKAGE EMISSIONS FROM COMPOSTING

This tool calculates project and leakage emissions from composting and co-composting. It accounts for methane and nitrous oxide emissions from the composting process, energy requirements to operate the composting plant, treatment of run-off wastewater and leakage emissions associated with the end-use of the compost product. Options are given in the tool to calculate emissions based on monitored parameters or conservative default values.

### PROJECT AND LEAKAGE EMISSIONS FROM ANAEROBIC DIGESTERS

This methodological tool provides procedures to calculate project and leakage emissions associated with anaerobic digestion in an anaerobic digester. The tool is not applicable to other systems where waste may be decomposed anaerobically, for instances stockpiles, SWDS or un-aerated lagoons. It is particularly relevant for waste management methodologies such as ACM0022.

### UPSTREAM LEAKAGE EMISSIONS ASSOCIATED WITH FOSSIL FUEL USE

This methodological tool provides a procedure to calculate leakage upstream emissions associated with the use of fossil fuels. Upstream emissions associated with fossil fuel use are emissions from fugitive emissions, combustion of fossil fuel and consumption of electricity. The fossil fuels applicable to this tool are those that can be categorized to be either based on natural gas, oil or coal. The tool is applicable to fossil fuel use in either or both the baseline scenario and project activity as well as fossil fuel consumption from leakage emissions. The tool provides two options to determine emissions: Option (A) provides simple default emission factors for different types of fossil fuels; and Option (B) calculation of emission factors based on emissions for each upstream emissions stage.

### PROJECT EMISSIONS FROM CULTIVATION OF BIOMASS

This tool provides a procedure to calculate project emissions from cultivation of biomass. It can be used for estimation of project emissions resulting from cultivation of biomass in a dedicated plantation of a CDM project activity that uses biomass as a source of energy. The tool is limited to types of land for which such emissions can be estimated with relative reliability, and therefore excludes wetlands and organic soils.

### BASELINE EMISSIONS FOR MODAL SHIFT MEASURES IN INTER-URBAN CARGO TRANSPORT

The tool provides step-wise methodological guidance to estimate baseline emissions for transport projects implementing modal shift measures in inter-urban cargo transport:

*Step 1* Determine relevant cargo types;
*Step 2* Determine the mode share for each relevant cargo type;
*Step 3* Determine the average specific emission factor per TKM for cargo type;
3.1 Rail; 3.2 Domestic water;
3.3 Pipeline; 3.4 Road;
*Step 4* Determine baseline emission factor;
*Step 5* Determine baseline emissions.

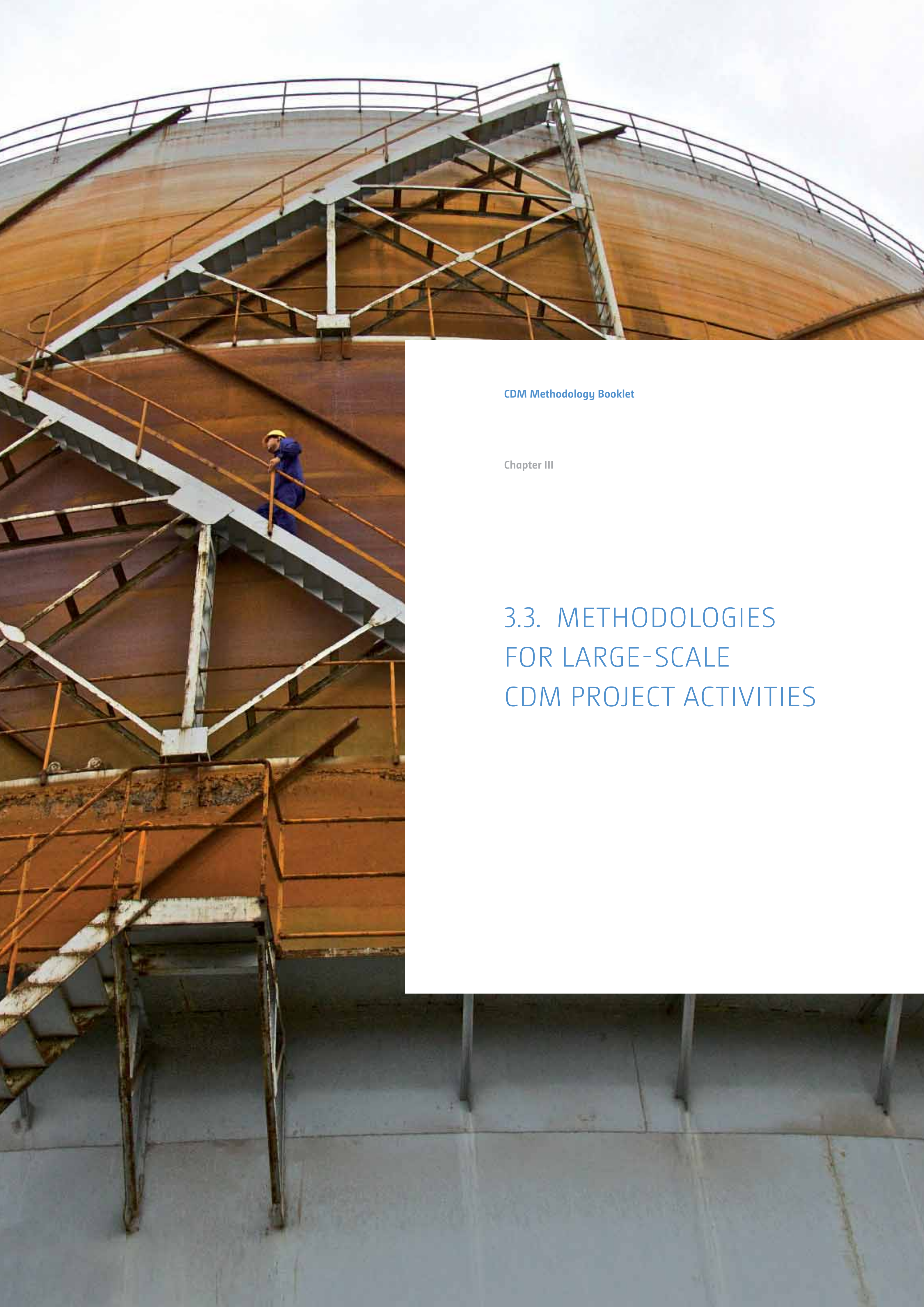
The tool is applicable for estimating baseline emissions for individual CDM project activities in inter-urban cargo transport that implement a measure or a group of measures aimed at modal shift from road to water-borne (using barges or domestic ships) or rail transportation. This tool can be used by designated national authorities (DNAs) for establishing standardized baselines for these measures.

### BASELINE EMISSIONS FOR MODAL SHIFT MEASURES IN URBAN PASSENGER TRANSPORT

The tool provides step-wise methodological guidance to estimate baseline emissions for transport projects implementing modal shift measures in urban passenger transport:

*Step 1* Determine relevant vehicle categories;
*Step 2* Determine the emission factor per kilometre for each relevant vehicle category;
*Step 3* Determine the emission factor per passenger-kilometre;
*Step 4* Determine baseline emissions.

The tool is applicable for estimating baseline emissions for individual CDM project activities in urban passenger transport that implement a measure or a group of measures aimed at modal shift to urban public transit such as metro, bus rapid transit, light rail and trams. This tool can be used by DNAs for establishing standardized baselines for these measures.





Chapter III

# 3.3. METHODOLOGIES FOR LARGE-SCALE CDM PROJECT ACTIVITIES

# **AM0001** Decomposition of fluoroform (HFC-23) waste streams

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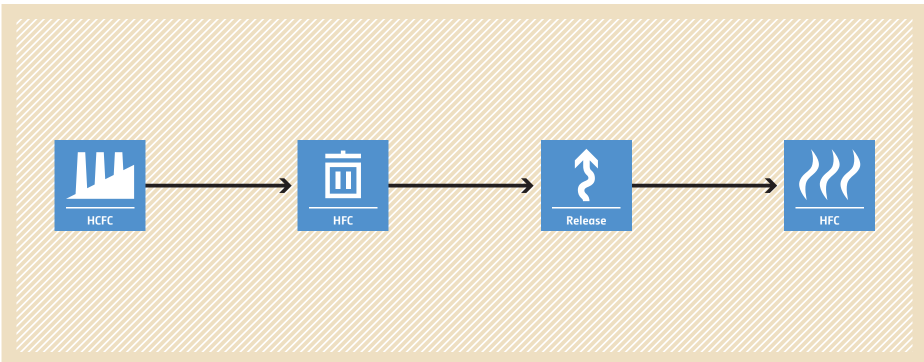
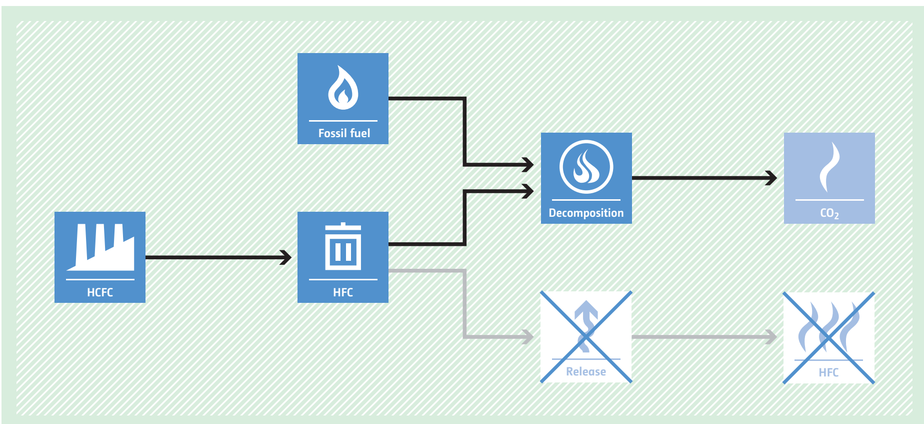
| **Typical project(s)** | Project activities which capture and decompose HFC-23 formed in the production of HCFC-22. |
| **Type of GHG emissions mitigation action** | • GHG destruction<br>Destruction of HFC-23 emissions. |
| **Important conditions under which the methodology is applicable** | • At least one HCFC-22 reaction unit at the project activity site has an operating history of at least three years between 1 January 2000 and 31 December 2004 and has been in operation from 2005 until the start of the project activity;<br>• The HFC-23 decomposition and, if applicable, any temporary storage of HFC-23, occurs only at the project activity site (i.e. no off-site transport occurs);<br>• No regulation requires the decomposition of the total amount of HFC-23 generated;<br>• No HFC-23 decomposition facility was installed prior to implementation of the project activity. |
| **Important parameters** | At validation:<br>• Average annual HCFC-22 equivalent production level in specific HCFC-22 production line in the historical three year period from 2002 to 2004.<br>• Quantities of carbon and fluorine contained in hydrogen fluoride fed into HCFC-22 reactor units and in the HCFC-22 produced by specific production line, required for fluorine and carbon mass balance to determine the HFC-23 waste generation rate for years prior to the implementation of the project activity. |
| | Monitored:<br>• Quantity of HFC-23 generated as a by-product in specific HCFC-22 production line in specific monitoring period;<br>• Quantity of HFC-23 that is generated as a by-product in HCFC-22 production lines that are eligible for crediting and that is supplied to the inlet of the HFC-23 decomposition facility(ies) d in specific monitoring period. |
| **BASELINE SCENARIO**<br>HFC-23 is released to the atmosphere from the production of HCFC-22. |  |
| **PROJECT SCENARIO**<br>HFC-23 emitted from the production of HCFC-22 is decomposed using fossil fuel in a decomposition facility, resulting into $CO_2$ emissions. |  |

# AM0007 Analysis of the least-cost fuel option for seasonally-operating biomass cogeneration plants

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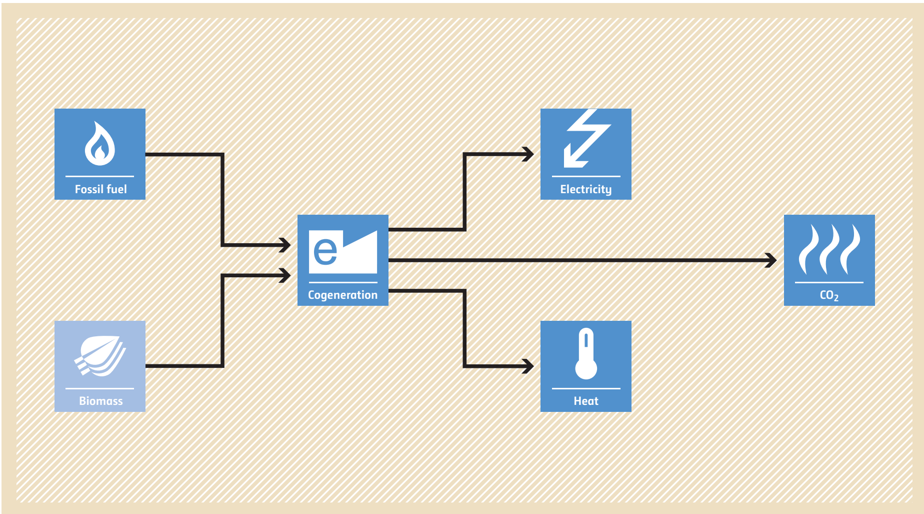
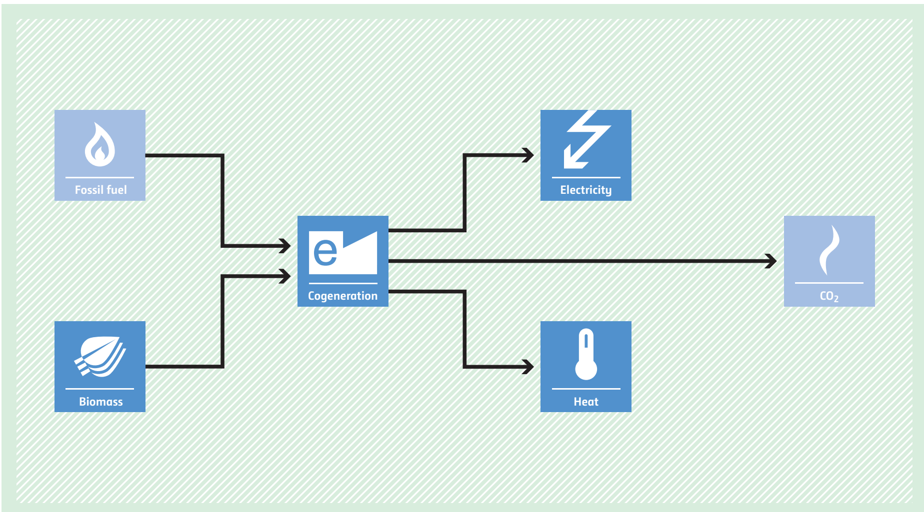
| **Typical project(s)** | Refurbishment and fuel switch of renewable biomass cogeneration projects connected to the grid which operate in seasonal mode and use other fuel during the off-season, when biomass – for instance bagasse in case of a sugar mill – is not being produced. |
| **Type of GHG emissions mitigation action** | • Renewable Energy.<br>Displacement of more-GHG-intensive power generation using fossil fuel. |
| **Important conditions under which the methodology is applicable** | • The proposed project has access to biomass that is not currently used for energy purposes. |
| **Important parameters** | At validation:<br>• Leakage emissions due to biomass transport and crowding out of biomass for other plants;<br>• Baseline emission factor of the cogeneration plant based on the use of the least-cost fuel available (usually fossil fuel). |
| | Monitored:<br>• Power generated by the project;<br>• Quantity of biomass used in the project;<br>• Electricity and fossil fuel consumption of the project. |
| **BASELINE SCENARIO**<br>Power would be produced with the least cost fuel (usually fossil fuels) in the absence of the project. |  |
| **PROJECT SCENARIO**<br>Use of renewable biomass for power generation avoids the use of fossil fuel. |  |

# AM0009 Recovery and utilization of gas from oil fields that would otherwise be flared or vented

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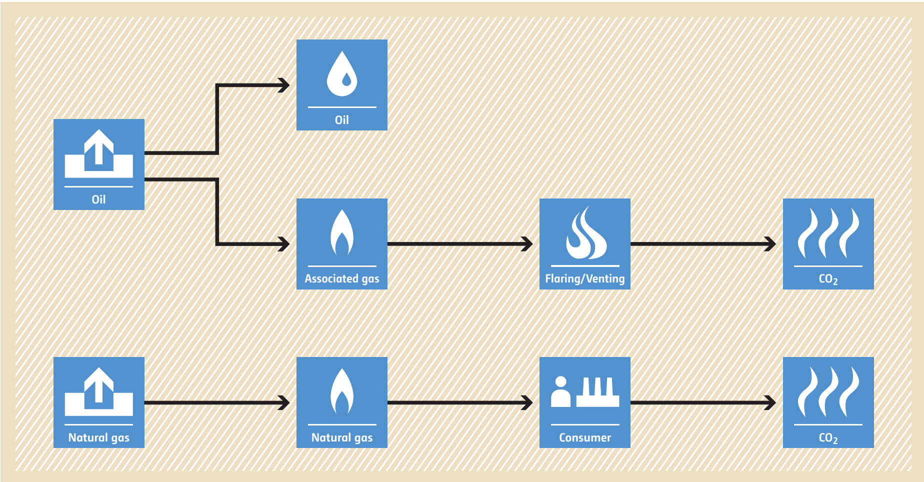
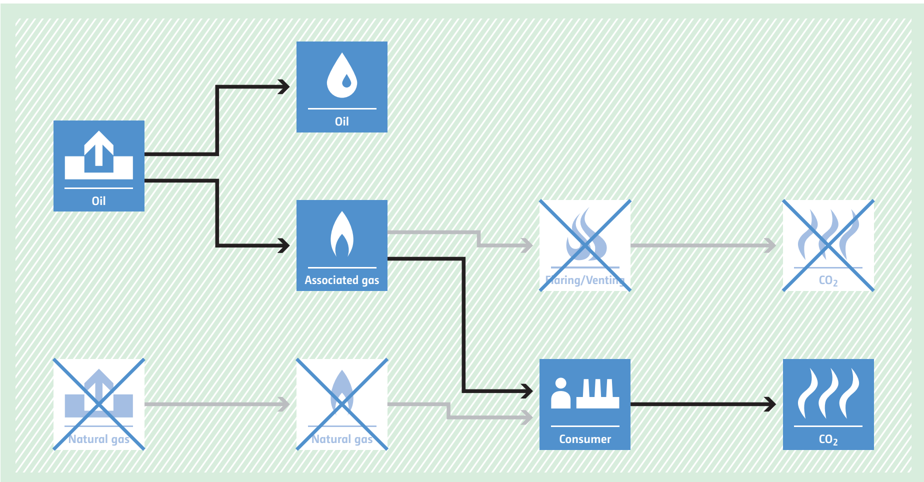
| **Typical project(s)** | Associated gas from oil fields (including gas-lift gas) that was previously flared or vented is recovered and utilized. |
| **Type of GHG emissions mitigation action** | • Fuel switch.<br>Displacement of use of other fossil fuel sources such as natural gas, dry gas, LPG, condensate etc. coming from non-associated gas by utilizing associated gas and/or gas-lift gas from oil fields. |
| **Important conditions under which the methodology is applicable** | • The recovered gas comes from oil wells that are in operation and are producing oil at the time of the recovery;<br>• The recovered gas is transported to a gas pipeline with or without prior processing. Prior processing may include transportation to a processing plant where the recovered gas is processed into hydrocarbon products (e.g. dry gas, liquefied petroleum gas (LPG)). The dry natural gas is either: (i) transported to a gas pipeline directly; or (ii) compressed to CNG first, then transported by trailers/trucks/carriers and then decompressed again. |
| **Important parameters** | Monitored:<br>• Quantity and net calorific value of the total recovered gas measured after pre-treatment and after the point where the recovered gas is directed for on-site use. |

**BASELINE SCENARIO**
Associated gas from oil wells is flared or vented and non-associated gas is extracted from other gas wells.




**PROJECT SCENARIO**
Associated gas from oil wells is recovered and utilized and non-associated gas is not extracted from other gas wells.



# AM0014 Natural gas-based package cogeneration

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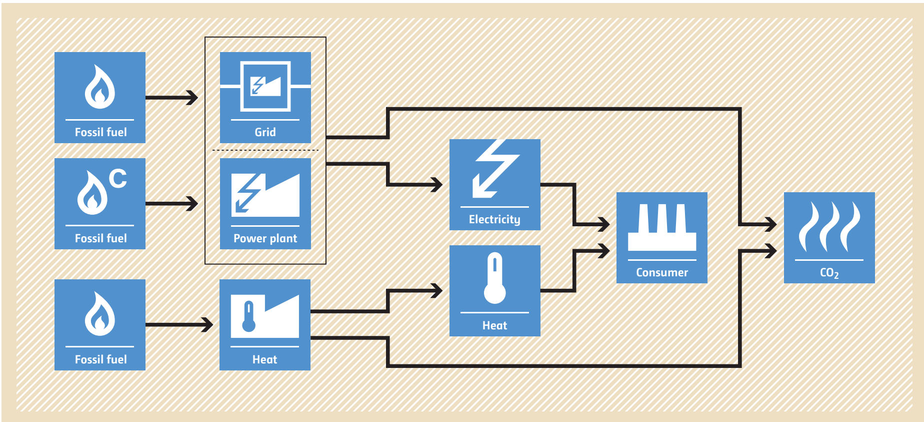
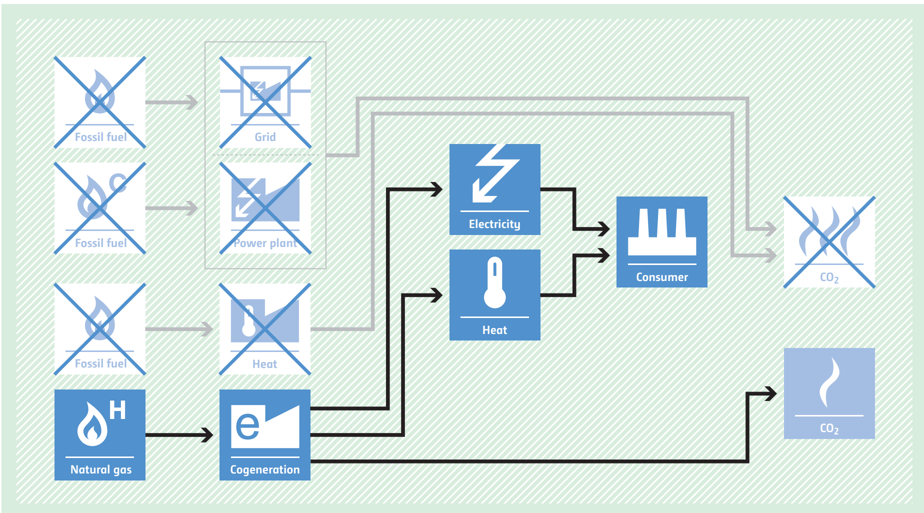
| **Typical project(s)** | Construction and operation of a natural-gas-fired cogeneration plant that supplies electricity and heat to an existing consuming facility. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Fuel savings through energy efficiency improvement. Optional use of a less-carbon-intensive fuel. |
| **Important conditions under which the methodology is applicable** | • The electricity and heat requirement of the facility that the project cogeneration plant supplies to (consuming facility) would be generated in separate systems in the absence of the project;<br>• No surplus electricity from the cogeneration plant is supplied to the grid;<br>• No surplus heat from the cogeneration plant is provided to users different from the consuming facility. |
| **Important parameters** | At validation:<br>• Fuel consumption for heat supply by the existing heat-only generation units;<br>• Electricity generation by the grid or the existing power-only generation units;<br>• Emission factor of the grid or the existing power-only generation units. |
| | Monitored:<br>• Natural gas consumption by the project cogeneration plant;<br>• Electricity supplied by the project cogeneration plant to the consuming facility;<br>• Heat supplied by the project cogeneration plant to the consuming facility. |

**BASELINE SCENARIO**
The electricity demand of a facility is meeting via either power-only generation units, or the grid and heat from heat-only generation units.




**PROJECT SCENARIO**
The consuming facility is supplied electricity and heat from a natural-gas-fired cogeneration plant.



# AM0017 Steam system efficiency improvements by replacing steam traps and returning condensate

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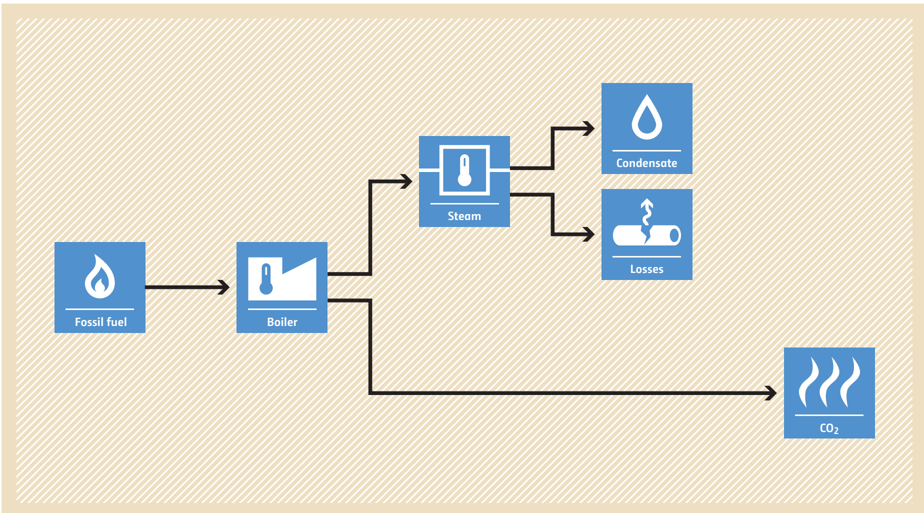
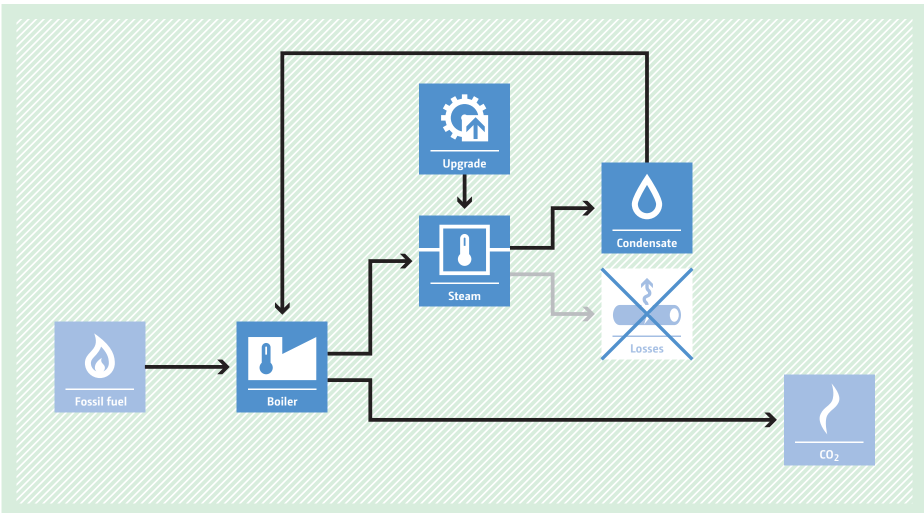
| **Typical project(s)** | Optimization of steam distribution, end-use and condensate return to increase the energy efficiency of a steam system. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Reduction of fossil fuel use and corresponding emissions through energy efficiency improvements. |
| **Important conditions under which the methodology is applicable** | • Steam is generated in a boiler fired with fossil fuel;<br>• The regular maintenance of steam traps or the return of condensate is not common practice or required under regulations in the respective country;<br>• Data on the condition of steam traps and the return of condensate is accessible in at least five other similar plants. |
| **Important parameters** | At validation:<br>• Steam trap failure rate and condensate return at plant and other similar plants. |
| | Monitored:<br>• Steam and condensate flow, temperature and pressure;<br>• Boiler efficiency;<br>• Electricity consumption of the project. |

**BASELINE SCENARIO**
Use of fossil fuel in a boiler to supply steam to a steam system with a low efficiency.




**PROJECT SCENARIO**
Use of less fossil fuel in a boiler as less steam is required for the steam system with improved efficiency.



# AM0018 Baseline methodology for steam optimization systems

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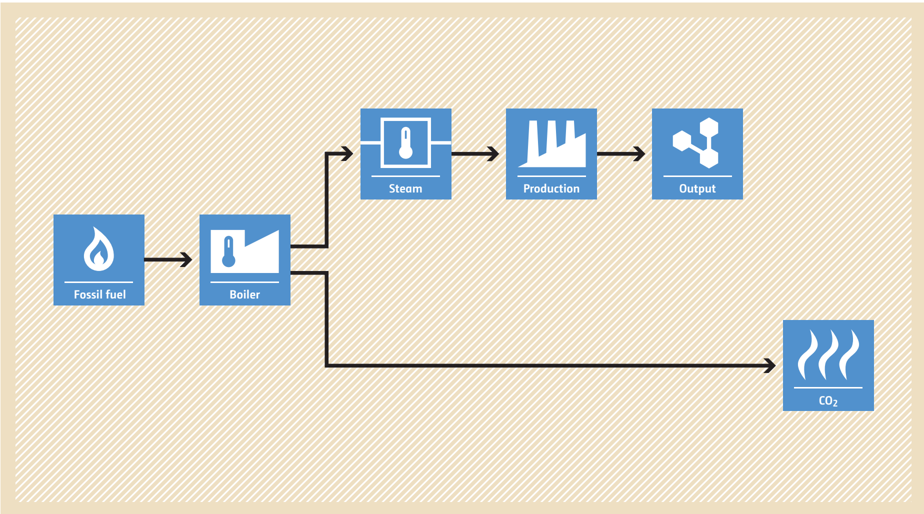
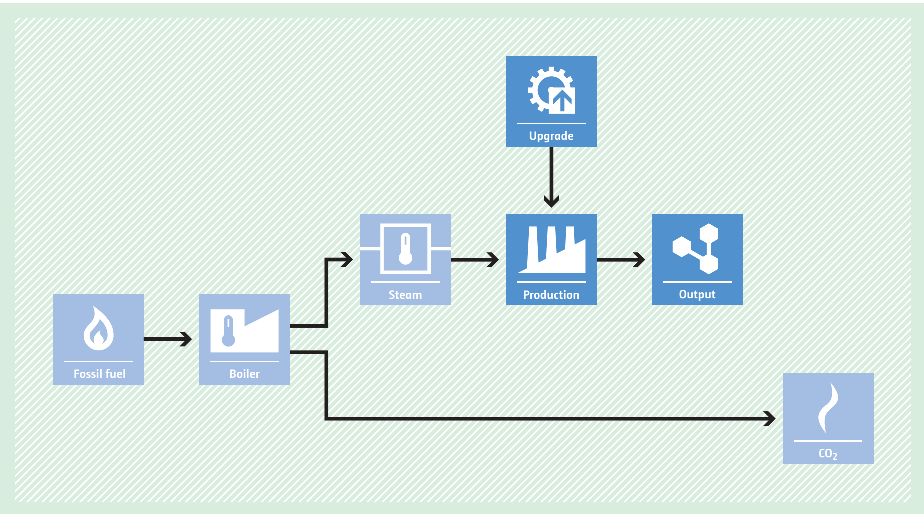
| **Typical project(s)** | More-efficient use of steam in a production process reduces steam consumption and thereby steam generation. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Reduction of fossil fuel use and corresponding emissions through energy efficiency improvements. |
| **Important conditions under which the methodology is applicable** | • The process supplied by the heat system produces a homogeneous output and its production volume is reasonably constant under steady state conditions;<br>• For cogeneration systems, steam generation at boiler decreases by the amount of steam saved;<br>• If the steam saved is further used, it shall be demonstrated it does not increase GHG emissions. |
| **Important parameters** | Monitored:<br>• Output of the main process involved in the project;<br>• Steam, feed water, blow down water flow, temperature and pressure;<br>• Boiler efficiency. |
| **BASELINE SCENARIO**<br>Use of fossil fuel in a boiler to supply steam to a process with high steam consumption. |  |
| **PROJECT SCENARIO**<br>Use of less fossil fuel in a boiler as less steam is required for the process with a higher efficiency. |  |

# AM0019 Renewable energy projects replacing part of the electricity production of one single fossil fuel fired power plant that stands alone or supplies to a grid, excluding biomass projects

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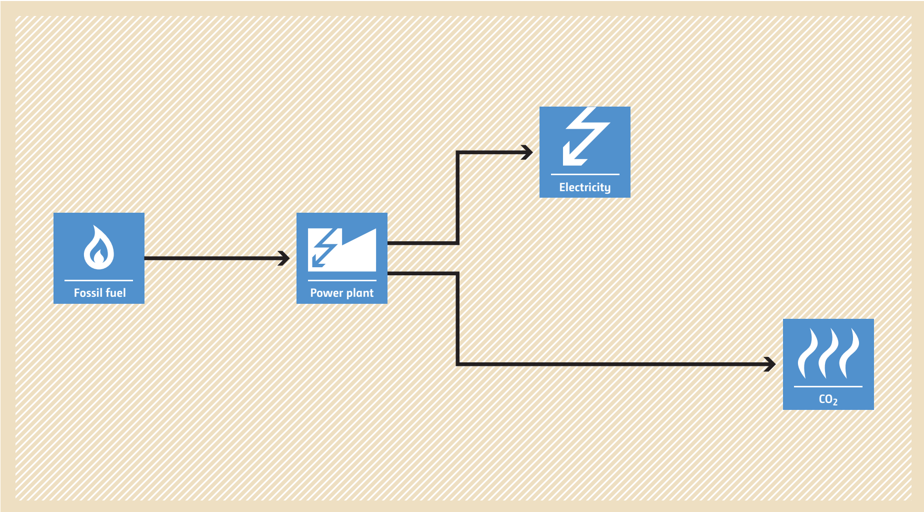
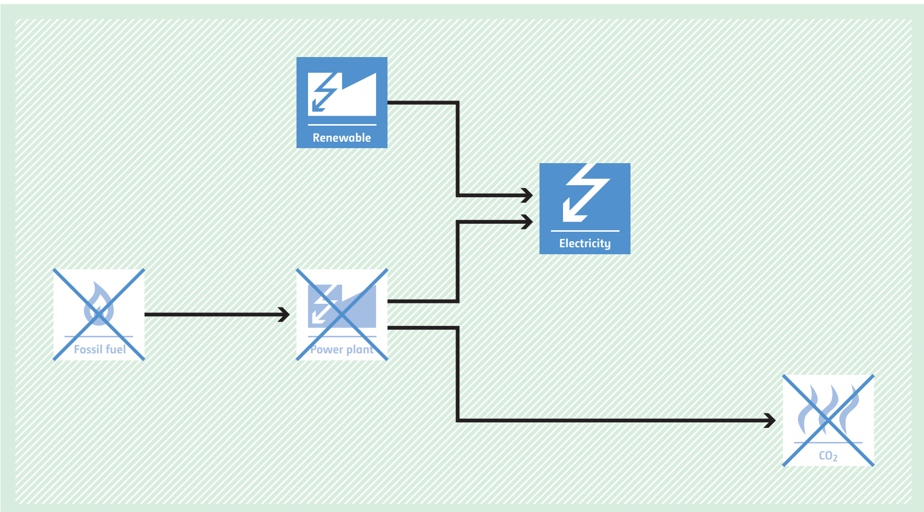
| **Typical project(s)** | Generation of electricity from the zero-emission renewable energy sources such as wind, geothermal, solar, hydro, wave and/or tidal projects that displaces electricity produced from a specific fossil fuel plant. |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Displacement of more-GHG-intensive generation of electricity by the use of renewable energy sources. |
| **Important conditions under which the methodology is applicable** | • Biomass projects are not eligible;<br>• The identified baseline plant is able to meet any possible increase of energy demand that occurs during the crediting period;<br>• Three years of historical data is required for the calculation of emissions reductions;<br>• Hydro power plants with reservoir require power densities greater than 4W/$m^2$. |
| **Important parameters** | At validation:<br>• Carbon emission factor of the baseline power plant |
| | Monitored:<br>• Quantity of electricity supplied to the grid by the project;<br>• If the project involves geothermal energy: fugitive $CO_2$ and $CH_4$ emissions due to release of non-condensable gases from the produced steam. |
| **BASELINE SCENARIO**<br>A specific fossil fuel plant generates electricity that is supplied to the grid. |  |
| **PROJECT SCENARIO**<br>A renewable energy plant partially or completely displaces the electricity that is generated by the specific fossil fuel power plant. |  |

# **AM0020** Baseline methodology for water pumping efficiency improvements

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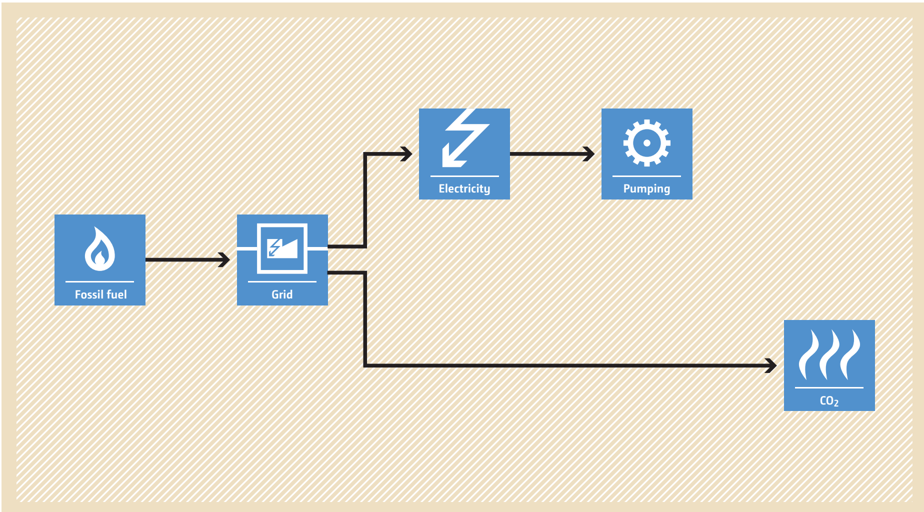
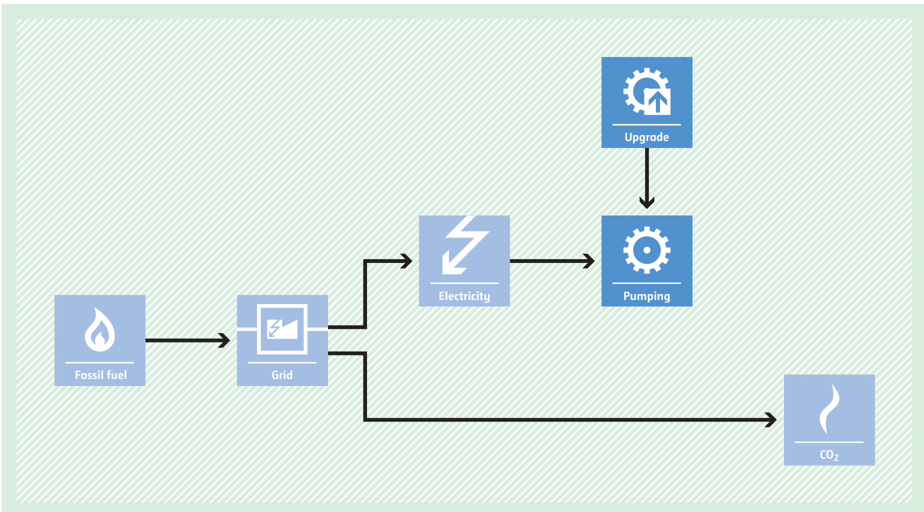
| **Typical project(s)** | Grid electricity savings by increasing the energy efficiency of a water pumping system through measures including reduction in technical losses, reduction in leaks and improvement in the energy efficiency of the pumping system/s (or scheme/s). |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Switch to more energy-efficient technology. |
| **Important conditions under which the methodology is applicable** | • The project pumping system is powered by grid electricity;<br>• No performance related contract or policies in place that would trigger improvements;<br>• New system/s developed to completely replace the old pumping system/s that will no longer be used, however the methodology applies to new system/s only up to the measured delivery capacity of the old system/s;<br>• This methodology is not applicable to projects where entirely new system/s is/are implemented to augment the existing capacity. |
| **Important parameters** | At validation:<br>• Water supplied and power consumption in the baseline situation. |
| | Monitored:<br>• Grid emission factor;<br>• Water volume supplied by the project;<br>• Electrical energy required to deliver water within the boundaries of the system. |

**BASELINE SCENARIO**
Delivery of water from an inefficient pumping system.




**PROJECT SCENARIO**
Delivery of water from a pumping system that has a lower energy demand due to reducing losses or leaks in the pumping system and/or by implementing measures to increase energy efficiency.



# **AM0021** Baseline methodology for decomposition of $N_2O$ from existing adipic acid production plants

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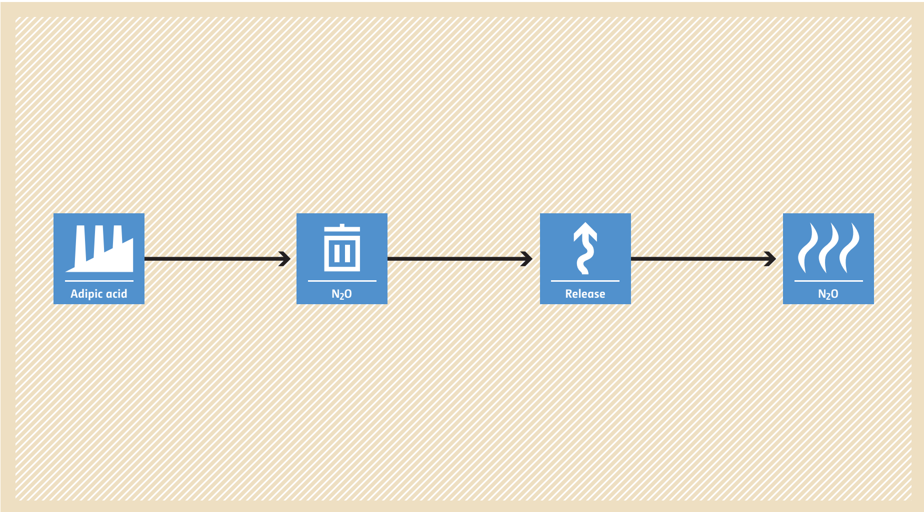
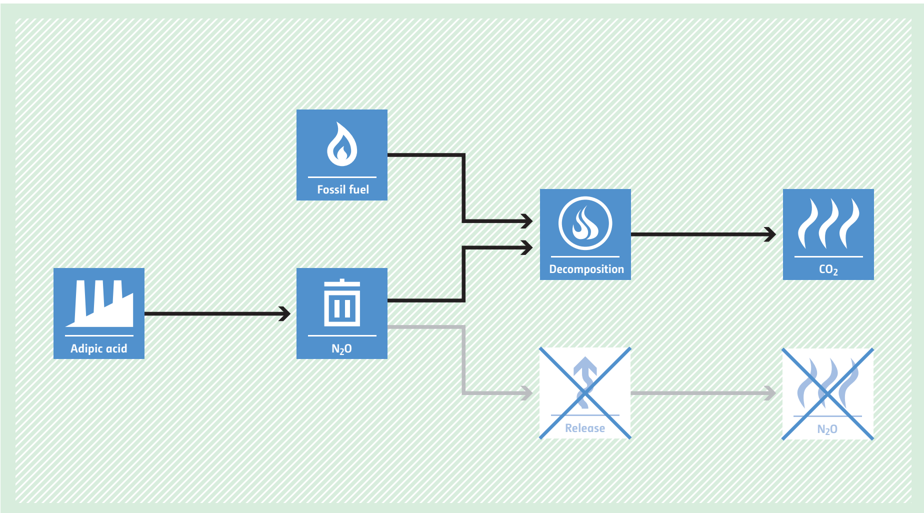
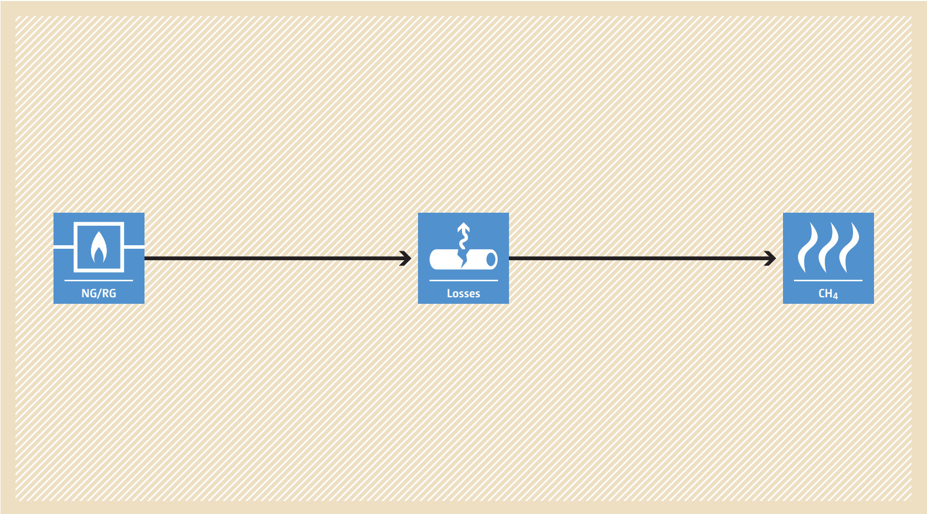
| **Typical project(s)** | Installation of a catalytic or thermal $N_2O$ destruction facility at an existing adipic acid production plant. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Catalytic or thermal destruction of $N_2O$ emissions. |
| **Important conditions under which the methodology is applicable** | • The adipic acid plant started the commercial production no later than December 31, 2004;<br>• European Norm 14181 must be followed for real-time measurement of $N_2O$ concentration and gas volume flow rate. |
| **Important parameters** | At validation:<br>• Maximum amount of adipic acid production in the most recent three years. |
| | Monitored:<br>• Production of adipic acid;<br>• Consumption of nitric acid;<br>• $N_2O$ concentration at the inlet and outlet of the destruction facility;<br>• Volume of gas flow at the inlet and outlet of the destruction facility. |
| **BASELINE SCENARIO**<br>$N_2O$ is emitted into the atmosphere during the production of adipic acid. |  |
| **PROJECT SCENARIO**<br>$N_2O$ is destroyed in a catalytic or thermal destruction unit. |  |

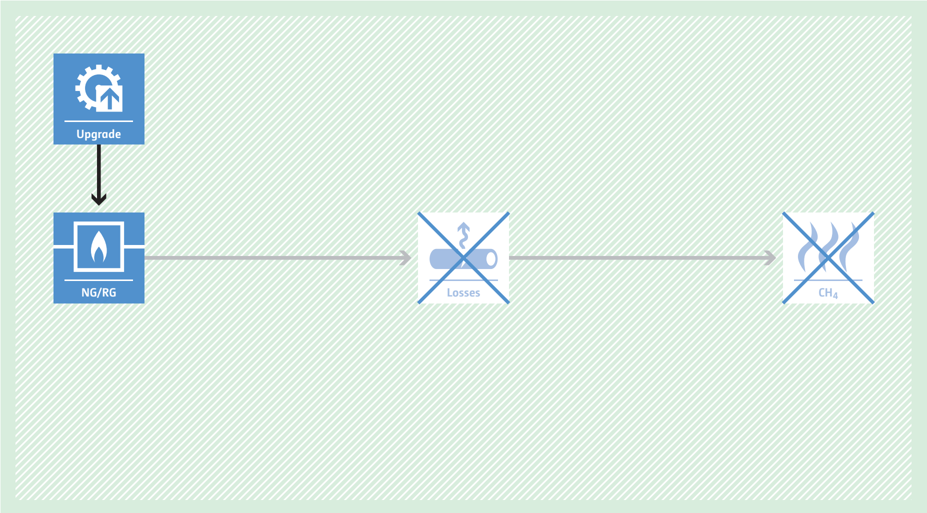
# **AM0023** Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities

| | |
|---|---|
| **Typical project(s)** | Identification and repair of natural gas (NG) and refinery gas (RG) leaks in above-ground process equipment in natural gas production, processing, transmission, storage, distribution systems and in refinery facilities. |
| **Type of GHG emissions mitigation action** | • GHG formation avoidance.<br>Avoidance of $CH_4$ emissions. |
| **Important conditions under which the methodology is applicable** | • No systems are in place to systematically identify and repair leaks in the transmission and distribution system;<br>• Leaks can be identified and accurately measured;<br>• A monitoring system ensures the permanence of the repairs. |
| **Important parameters** | Monitored:<br>• Leak flow;<br>• Methane concentration in the flow. |

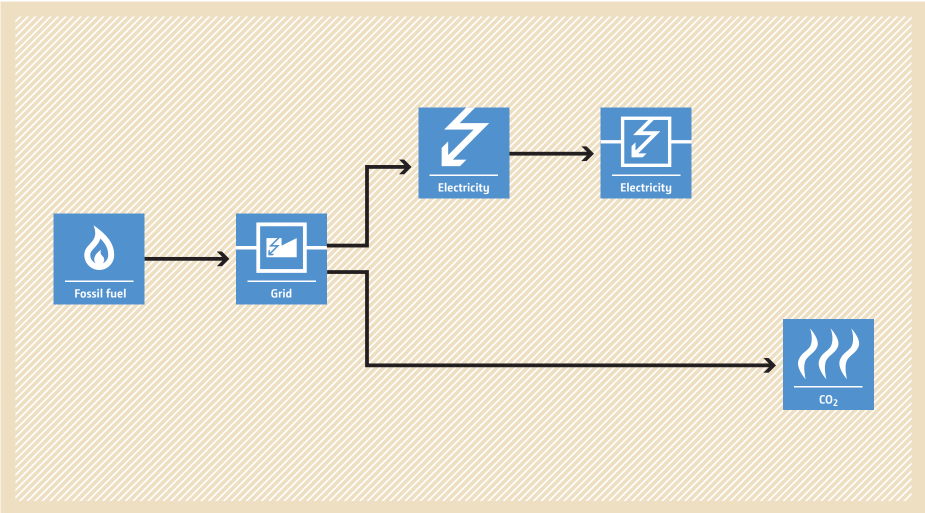
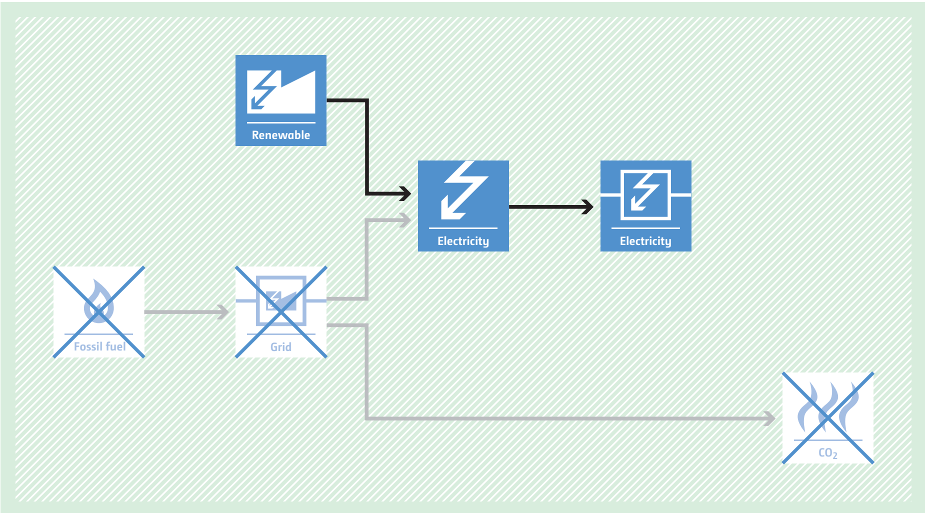
**BASELINE SCENARIO**
$CH_4$ leaks from a natural gas transmission distribution system.



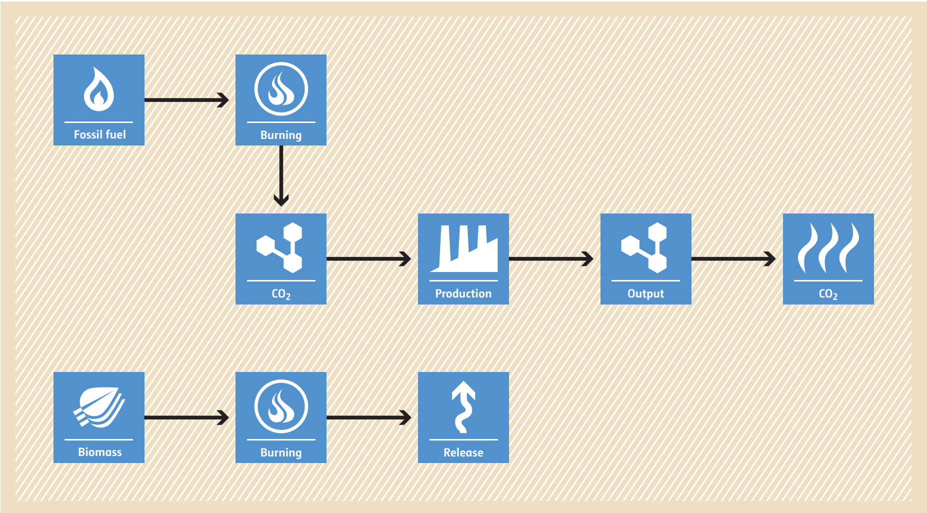
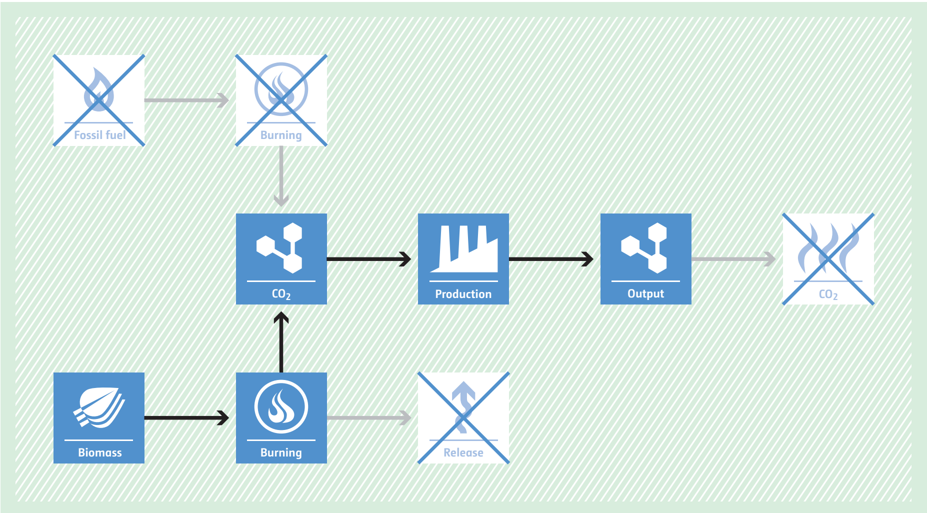

**PROJECT SCENARIO**
$CH_4$ leaks from the natural gas transmission systems have been repaired.



# **AM0026** Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid

| | |
|---|---|
| **Typical project(s)** | Electricity capacity additions (either through the installation of new, or the modification of existing, power plants) that supply electricity to the grid and use renewable energy sources such as hydro, wind, solar, geothermal, wave or tidal power. The capacity additions have to be connected to the Chilean interconnected grid or others countries' grids providing a similar merit order based framework. |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Displacement of electricity that would be provided to the grid by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • The project power plant must either be connected to the grid of Chile and fulfil the legal obligations under the Chilean Electricity Regulation, or be implemented in other countries if the country has a regulatory framework for electricity generation and dispatch that meets the conditions described in the methodology;<br>• New hydroelectric power projects with reservoirs require power densities greater than 4 $W/m^2$. |
| **Important parameters** | Monitored:<br>• Electricity supplied to the grid by the project;<br>• Hourly data for merit order based on marginal costs;<br>• Operational data of the power plants connected to the same grid as the project. |
| **BASELINE SCENARIO**<br>Power is provided to the grid using more-GHG-intensive power sources. | <br> |
| **PROJECT SCENARIO**<br>Installation of a new, or modification of an existing, renewable power plant that results in an increase of renewable power and displacement of electricity that would be provided to the grid by more-GHG-intensive means. | <br> |

# AM0027 Substitution of $CO_2$ from fossil or mineral origin by $CO_2$ from renewable sources in the production of inorganic compounds

| | |
|---|---|
| **Typical project(s)** | Biomass is used as a renewable source of $CO_2$ for the manufacturing of inorganic compounds instead of mineral or fossil $CO_2$. |
| **Type of GHG emissions mitigation action** | • Feedstock switch.<br>Switch from $CO_2$ of fossil or mineral origin to $CO_2$ from renewable sources. |
| **Important conditions under which the methodology is applicable** | • The $CO_2$ from the renewable source was already produced and is not diverted from another application;<br>• $CO_2$ from fossil or mineral sources used for the production of inorganic compounds in the baseline is from a production process whose only useful output is $CO_2$ and will not be emitted to the atmosphere in the project scenario. The $CO_2$ production process from fossil source does not produce any energy by-product;<br>• No additional significant energy quantities are required to prepare the renewable $CO_2$ for use in the project. |
| **Important parameters** | Monitored:<br>• Amount of inorganic compound produced;<br>• Carbon content and molecular weight of the inorganic compound;<br>• Amounts of non-renewable and renewable $CO_2$ used for the production of inorganic compounds. |
| **BASELINE SCENARIO**<br>Fossil or mineral sources are the source of $CO_2$ for the production of inorganic compounds. |  |
| **PROJECT SCENARIO**<br>Renewable sources of $CO_2$ are the source of $CO_2$ for the production of inorganic compounds. |  |

# AM0028 $N_2O$ destruction in the tail gas of caprolactam production plants

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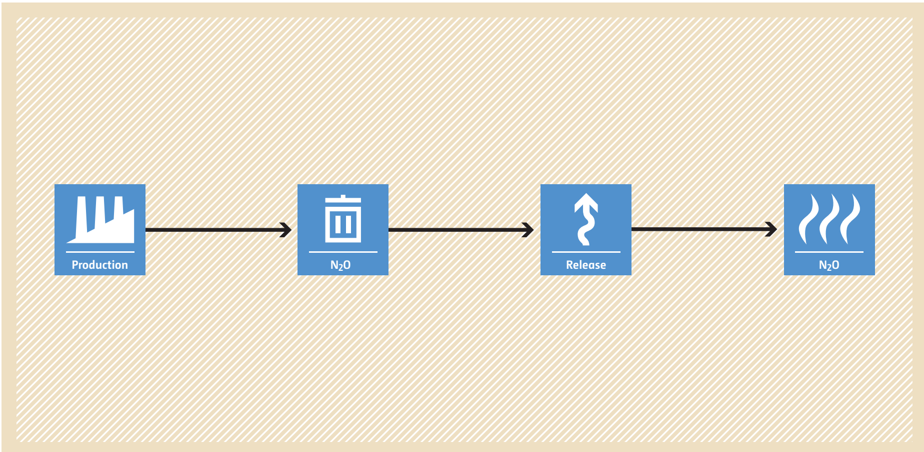
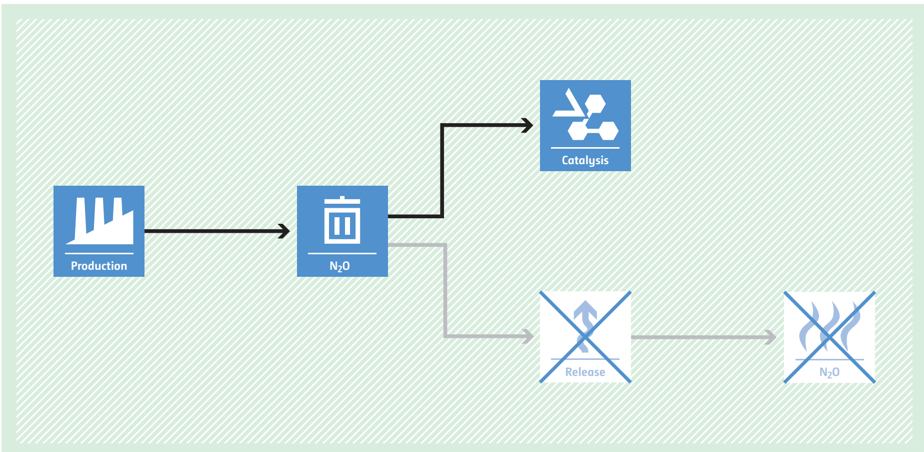
| **Typical project(s)** | Installation of a catalytic reduction unit to destroy $N_2O$ emissions in the tail gas of caprolactam production plants. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Catalytic destruction of $N_2O$ emissions. |
| **Important conditions under which the methodology is applicable** | • The caprolactam plant started the commercial production no later than December 31, 2005;<br>• Caprolactam plants are limited to those employing the Raschig or HPO® processes;<br>• European Norm 14181 or an equivalent standard must be followed for real-time measurement of $N_2O$ concentration and gas volume flow rate;<br>• The methodology allows thermal and catalytic destruction of $N_2O$. |
| **Important parameters** | At validation:<br>• Normal operating conditions of the plant (oxidation temperature and pressure, ammonia gas flow rate to AOR, and composition of ammonia oxidation catalyst). |
| | Monitored:<br>• Production of caprolactam;<br>• Volume of gas flow at the inlet and outlet of the destruction facility;<br>• $N_2O$ concentration at the inlet and outlet of the destruction facility;<br>• Update of the parameters for determining the normal operating conditions of the plant. |
| **BASELINE SCENARIO**<br>$N_2O$ is emitted into the atmosphere during the production of caprolactam. |  |
| **PROJECT SCENARIO**<br>$N_2O$ is destroyed in a catalytic destruction unit installed at the tail gas stream. |  |

# **AM0029** Baseline methodology for grid connected electricity generation plants using natural gas

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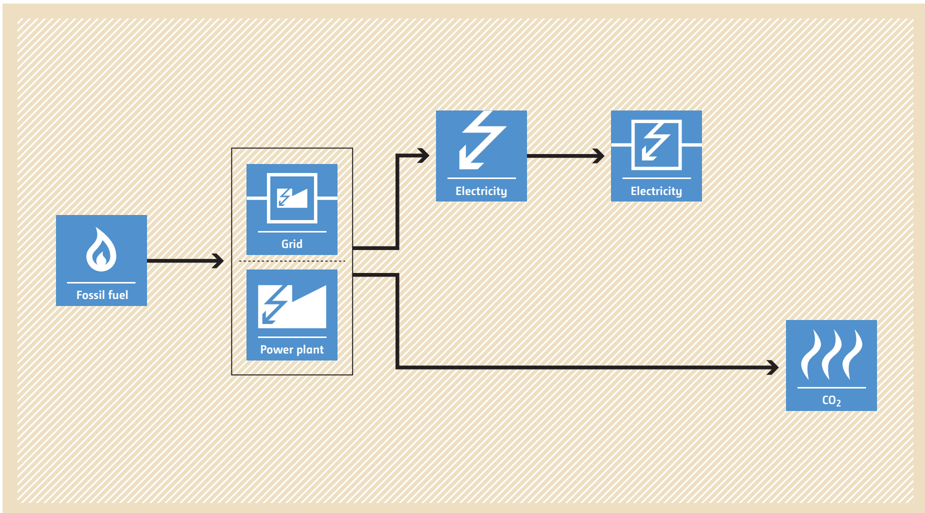
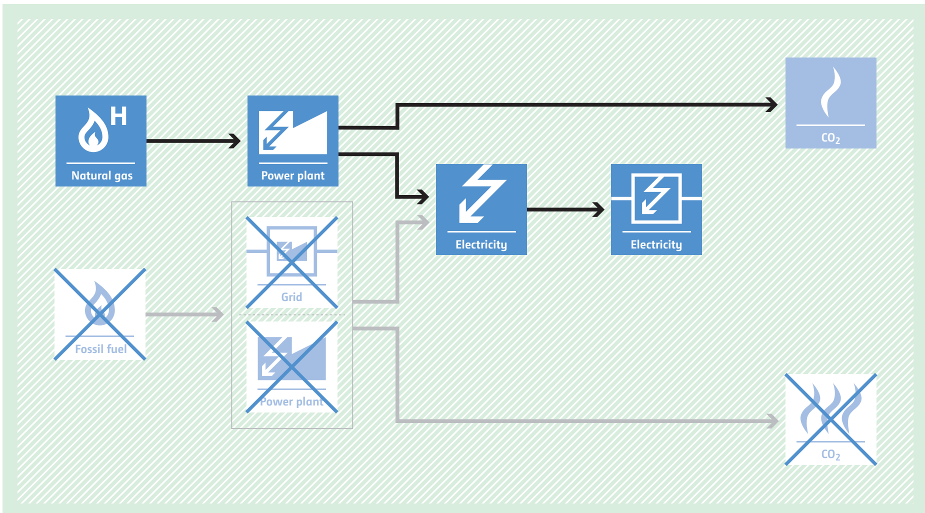
| **Typical project(s)** | The construction and operation of a new natural-gas-fired power plant that supplies electricity to the grid. |
| **Type of GHG emissions mitigation action** | • Low carbon electricity.<br>Displacement of electricity that would be provided by more-carbon-intensive means. |
| **Important conditions under which the methodology is applicable** | • Natural gas is sufficiently available in the region or country;<br>• Electricity generated by the project is exclusively supplied to a power grid. |
| **Important parameters** | At validation:<br>• Emission factor of baseline electricity generation, derived from an emission factor of the power grid, or the power generation technology that would most likely be used in the absence of the project. |
| | Monitored:<br>• Fuel consumption of the project power plant;<br>• Electricity generation of the project power plant. |
| **BASELINE SCENARIO**<br>• Power generation using natural gas, but based on less-efficient technologies than the project ones;<br>• Power generation using fossil fuels other than natural gas;<br>• Import of electricity from the electricity grid. |  |
| **PROJECT SCENARIO**<br>• Power supply to the electricity grid by a new natural-gas-fired power generation plant. |  |

# AM0030 PFC emission reductions from anode effect mitigation at primary aluminium smelting facilities

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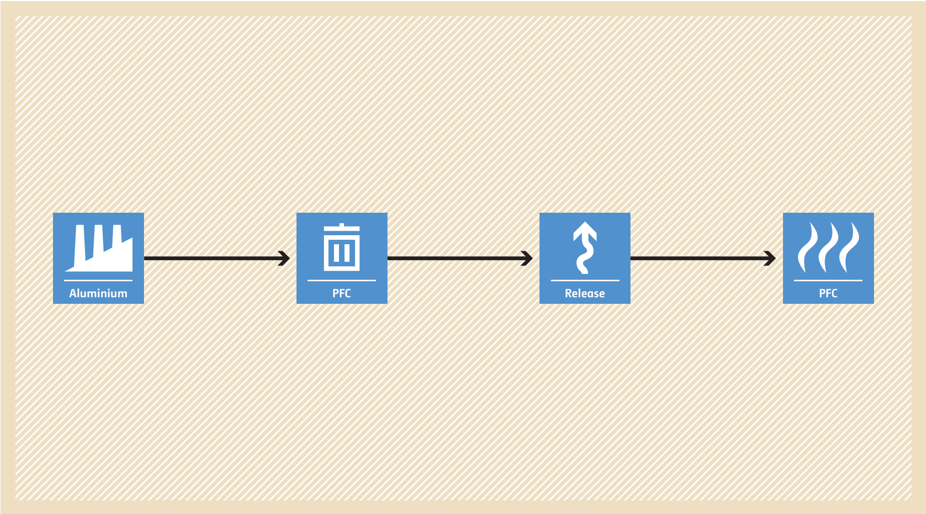
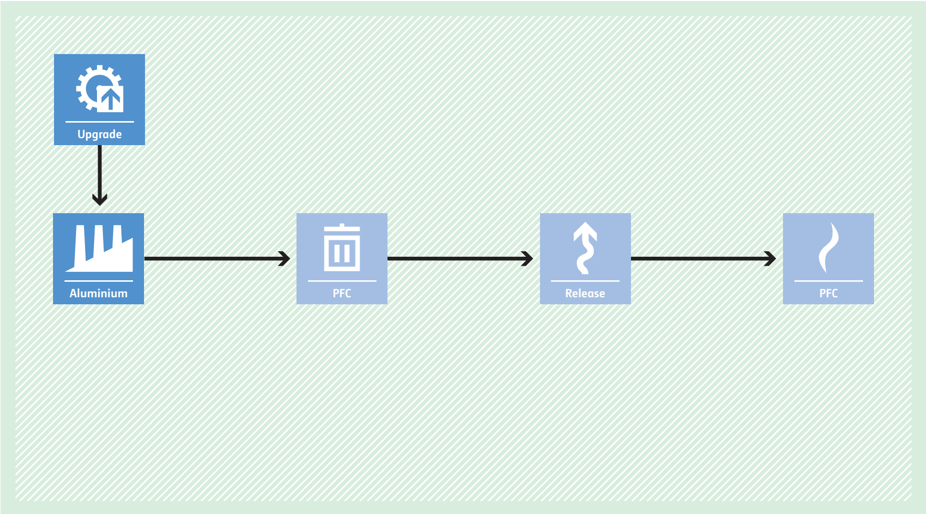
|---|---|
| **Typical project(s)** | Implementation of anode effect mitigation measures at a primary aluminium smelter (e.g. improving the algorithm of the automatic control system for smelting pots). |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance.<br>Avoidance of PFC emissions by anode effect mitigation. |
| **Important conditions under which the methodology is applicable** | • The aluminium smelting facility started the commercial operation before 1 January 2009;<br>• Minimum of three years of historical data is available on current efficiency, anode effect and aluminium production;<br>• The aluminium smelting facility uses centre work pre-bake cell technology with bar brake (CWPB) or point feeder systems (PFPB);<br>• The aluminium smelting facility has achieved an “operational stability associated to a PFC emissions level” that allows increasing the aluminium production by simply increasing the electric current in the pots. |
| **Important parameters** | Monitored:<br>• Quantity of aluminium produced by the aluminium smelting facility;<br>• Anode effect minutes per cell-day. |
| **BASELINE SCENARIO**<br>No mitigation of PFC emissions from anode effects at primary aluminium smelting facilities. |  |
| **PROJECT SCENARIO**<br>Implementation of anode effect mitigation measures to reduce PFC emissions from aluminium smelting. |  |

# AM0031 Baseline methodology for bus rapid transit projects

Women and children

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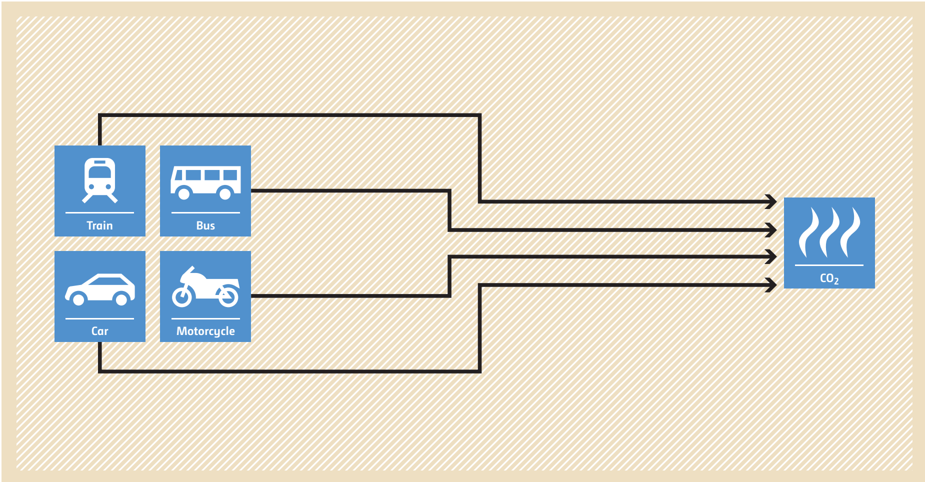
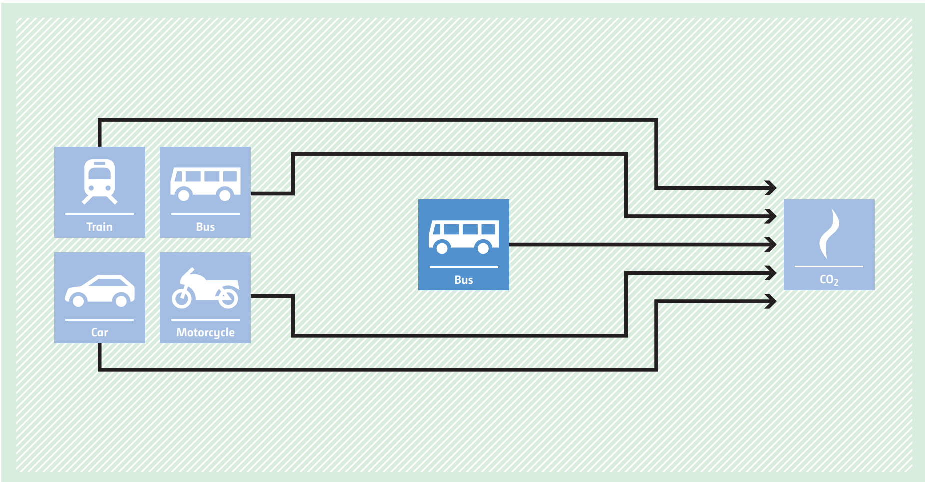
|---|---|
| **Typical project(s)** | Construction and operation of a new bus rapid transit system (BRT) for urban transport of passengers. Replacement, extensions or expansions of existing bus rapid transit systems (adding new routes and lines) are also allowed. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of more-GHG-intensive transportation modes by less-GHG-intensive ones. |
| **Important conditions under which the methodology is applicable** | • If biofuels are used, project buses must use the same biofuel blend (same percentage of biofuel) as commonly used by conventional comparable urban buses in the country. |
| **Important parameters** | At validation:<br>• Baseline distance and transport mode, which are obtained through a comprehensive survey involving the users of the project transport system;<br>• Specific fuel consumption, occupancy rates and travelled distances of different transport modes (including the project);<br>• Policies affecting the baseline (i.e. modal split of passengers, fuel usage of vehicles, maximum vehicle age). |
| | Monitored:<br>• Number of passengers transported in the project;<br>• Total consumption of fuel/electricity in the project. |
| **BASELINE SCENARIO**<br>Passengers are transported using a diverse transport system involving buses, trains, cars, non-motorized transport modes, etc. operating under mixed traffic conditions. | <br> |
| **PROJECT SCENARIO**<br>Passengers are transported using the newly developed bus rapid transit system that partially displaces the existing transport system operating under mixed traffic conditions. | <br> |

# AM0035 $SF_6$ emission reductions in electrical grids

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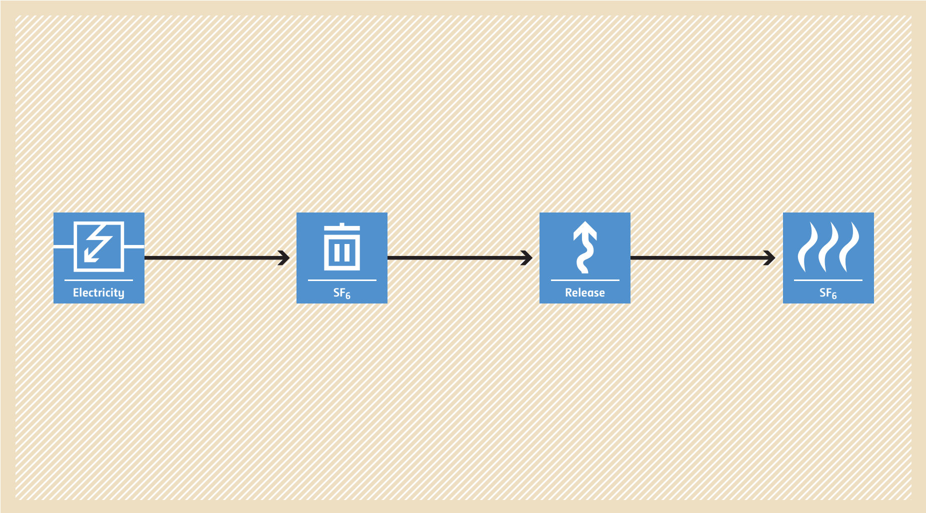
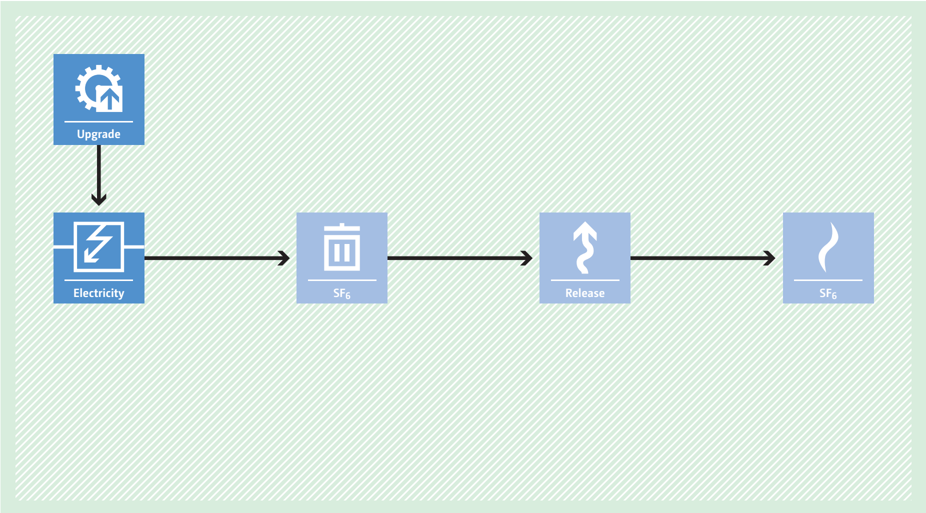
|---|---|
| **Typical project(s)** | Recycling and/or leak reduction of $SF_6$ in a electricity grid. |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance.<br>Avoidance of $SF_6$ emissions by recycling and/or leak reduction. |
| **Important conditions under which the methodology is applicable** | • The project is implemented either in the entire grid or a verifiable distinct geographic portion of a grid;<br>• Minimum of three years of historical data is available on the total $SF_6$ emissions from the grid. |
| **Important parameters** | At validation:<br>• Net reduction in an $SF_6$ inventory for the grid;<br>• Nameplate capacity (in kg $SF_6$) of equipment retired from and added to the grid. |
| | Monitored:<br>• Update of the above parameters necessary for validation. |
| **BASELINE SCENARIO**<br>$SF_6$ emitted from leaks and/or non-recycling of $SF_6$ during repair and maintenance of electricity transmission and distribution systems. |  |
| **PROJECT SCENARIO**<br>Recycling and/or leak-reduction of $SF_6$ during repair and maintenance of electricity transmission and distribution systems. |  |

# AM0036 Fuel switch from fossil fuels to biomass residues in heat generation equipment

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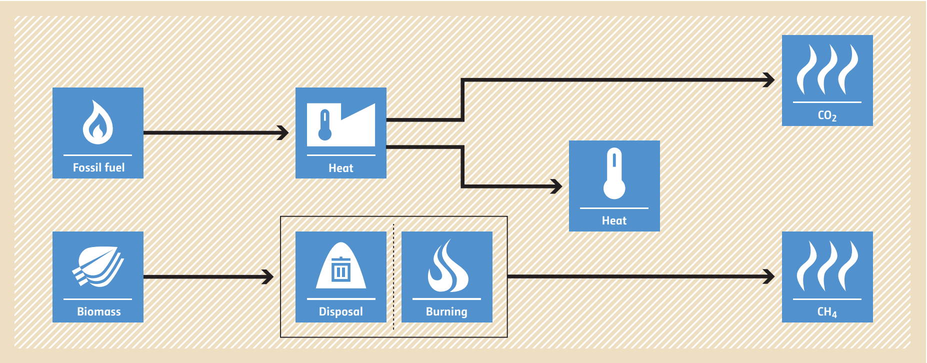
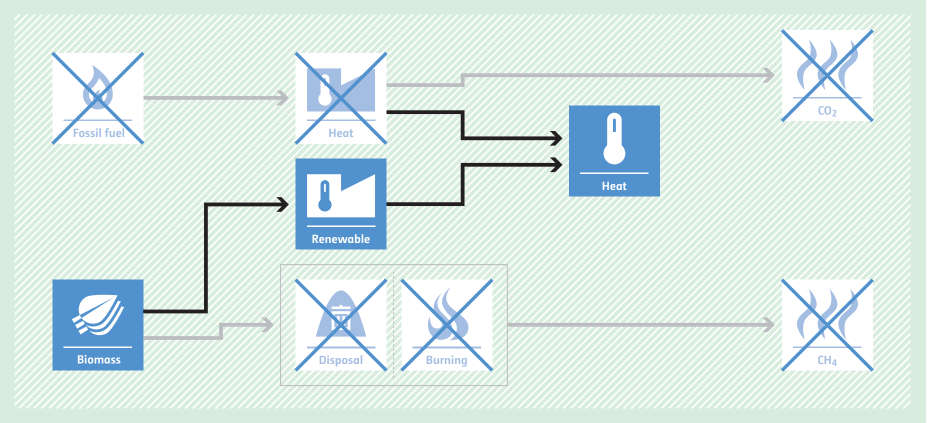
|---|---|
| **Typical project(s)** | Fuel switch from fossil fuels to biomass residues in the generation of heat. Applicable activities are retrofit or replacement of existing heat generation equipment and installation of new heat generation equipment. |
| **Type of GHG emissions mitigation action** | • Renewable energy;<br>Displacement of more-GHG-intensive heat generation using fossil fuel and avoidance of $CH_4$ emissions from anaerobic decay of biomass residues. |
| **Important conditions under which the methodology is applicable** | • Heat generated in the project can only be used for power generation if power generation equipment was previously installed and is maintained throughout the crediting period;<br>• Only biomass residues, not biomass in general, are eligible. No significant energy quantities except from transportation or mechanical treatment of the biomass residues should be required to prepare the biomass residues;<br>• Existing heat generation equipment at the project site has either not used any biomass or has used only biomass residues (but no other type of biomass) for heat generation during the most recent three years prior to the implementation of the project;<br>• In case of existing facilities, three years of historical data is required for the calculation of emissions reductions. |
| **Important parameters** | At validation:<br>• Leakage due to diversion of biomass residues. |
| | Monitored:<br>• Heat generated in the project;<br>• Quantity and moisture content of the biomass residues used in the project as well as electricity and fossil fuel consumption of the project;<br>• Project emissions from transport of biomass. |
| **BASELINE SCENARIO**<br>Heat would be produced by the use of fossil fuels. Biomass residues could partially decay under anaerobic conditions, bringing about $CH_4$ emissions. | <br> |
| **PROJECT SCENARIO**<br>Use of biomass residues for heat generation avoids fossil fuel use and thereby GHG emissions. Decay of biomass residues used as fuel is avoided. | <br> |

# AM0037 Flare (or vent) reduction and utilization of gas from oil wells as a feedstock

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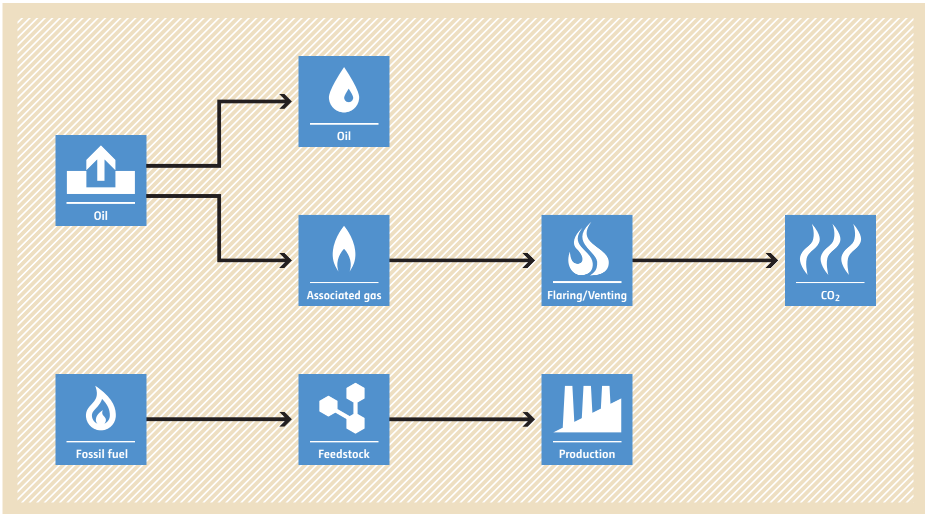
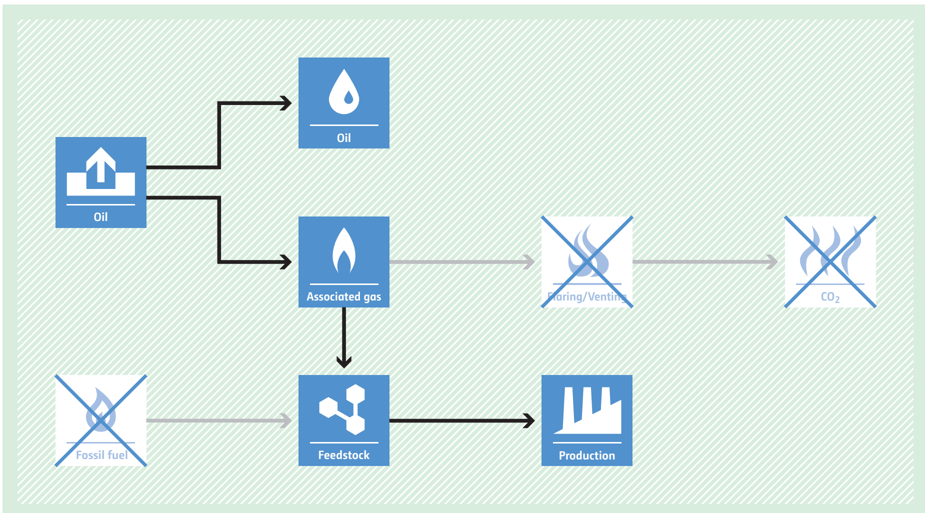
|---|---|
| **Typical project(s)** | Associated gas from oil wells that was previously flared or vented is recovered and utilized as a feedstock to produce a chemical product. |
| **Type of GHG emissions mitigation action** | • Feedstock switch.<br>Avoidance of GHG emissions that would have occurred by flaring/venting the associated gas. |
| **Important conditions under which the methodology is applicable** | • The associated gas from the oil well, which is used in the project, was flared or vented for the last three years prior to the start of the project;<br>• Under the project, the previously flared (or vented) associated gas is used as feedstock and, where applicable, partly as energy source in a chemical process to produce a useful product (e.g. methanol, ethylene or ammonia). |
| **Important parameters** | Monitored:<br>• Mass fraction of methane in the associated gas;<br>• Quantity of product(s) produced in the end-use facility in the project;<br>• Quantity and carbon content of associated gas utilized in the project, i.e. the quantity of associated gas entering the pipeline for transport to the end-use facility. |

**BASELINE SCENARIO**
Associated gas from oil wells is flared or vented and other feedstock is used to produce a chemical product.




**PROJECT SCENARIO**
Associated gas from oil wells is recovered and utilized as feedstock to produce a chemical product.



# AM0038 Methodology for improved electrical energy efficiency of an existing submerged electric arc furnace used for the production of silicon and ferry alloys

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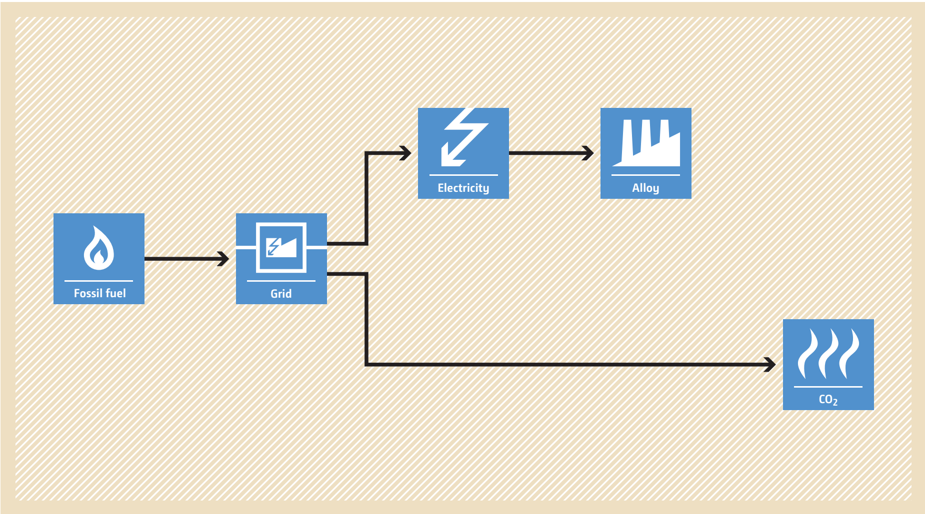
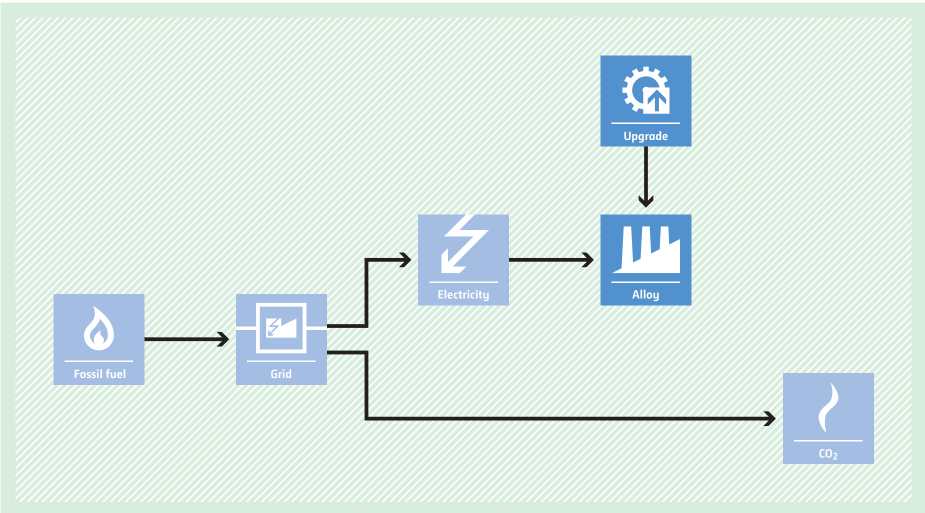
|---|---|
| **Typical project(s)** | Retrofitting of existing furnaces for the production of silicon and ferry alloys including control and peripheral systems with a more efficient system. |
| **Type of GHG emissions mitigation action** | • Energy efficiency;<br>Switch to more energy-efficient technology. |
| **Important conditions under which the methodology is applicable** | • The electricity consumed is supplied by the grid;<br>• The quality of the raw material and products remains unchanged;<br>• Data for at least three years preceding the implementing the project is available to estimate the baseline emission. |
| **Important parameters** | At validation:<br>• Grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Alloys production and consumption of electricity, reductants and electrode paste;<br>• Project-specific quality and emission factors for reductants and electrode paste. |
| **BASELINE SCENARIO**<br>Consumption of grid electricity in the submerged arc furnaces results in $CO_2$ emissions from the combustion of fossil fuel used to produce electricity. | <br> |
| **PROJECT SCENARIO**<br>The more-efficient submerged arc furnaces consume less electricity, and thereby, emissions from the combustion of fossil fuel used to produce electricity are reduced. | <br> |

# **AM0042** Grid-connected electricity generation using biomass from newly developed dedicated plantations

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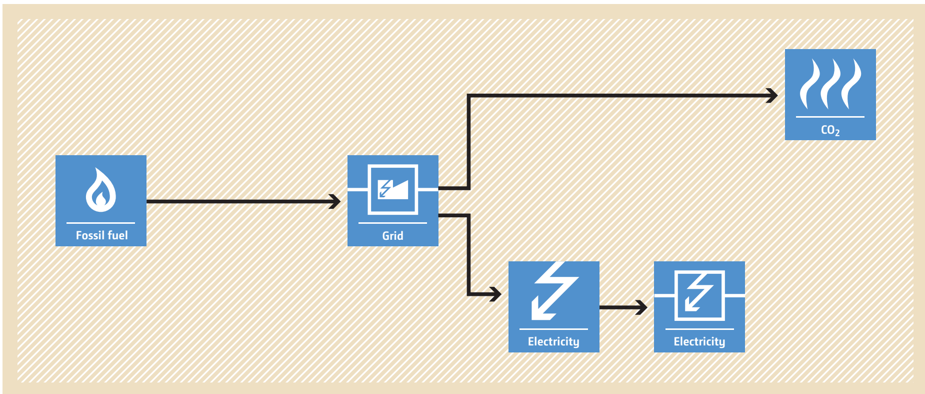
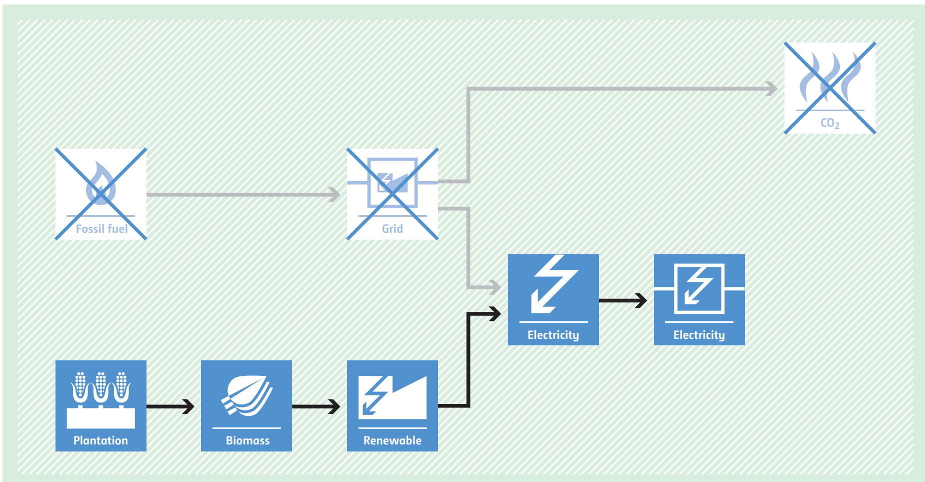
|---|---|
| **Typical project(s)** | Installation of a new grid-connected power plant that is mainly fired with renewable biomass from a dedicated plantation (fossil fuel or other types of biomass may be co-fired). |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Displacement of electricity that would be provided by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • Prior to the implementation of the project, no power was generated at the project site (i.e. the project plant does not substitute or affect the operation of any existing power generation at the project site);<br>• The dedicated plantation must be newly established as part of the project for the purpose of supplying biomass exclusively to the project;<br>• The biomass from the plantation is not chemically processed (e.g. no production of alcohols from biomass, etc.) prior to combustion in the project plant but it may be processed mechanically or be dried;<br>• Grazing or irrigation for the plantation is not allowed;<br>• The land area where the dedicated plantation will be established has not been used for any agricultural or forestry activity prior to the project implementation. |
| **Important parameters** | At validation:<br>• Grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Electricity generated in the project;<br>• Electricity and fossil fuel consumption of the project as well as quantity, net calorific value and moisture content of the biomass used in the project. |

**BASELINE SCENARIO**
Electricity produced by more-GHG-intensive power plants connected to the grid.




**PROJECT SCENARIO**
Electricity produced by a grid-connected biomass-fired power plant.



# **AM0043** Leak reduction from a natural gas distribution grid by replacing old cast iron pipes or steel pipes without cathodic protection with polyethylene pipes

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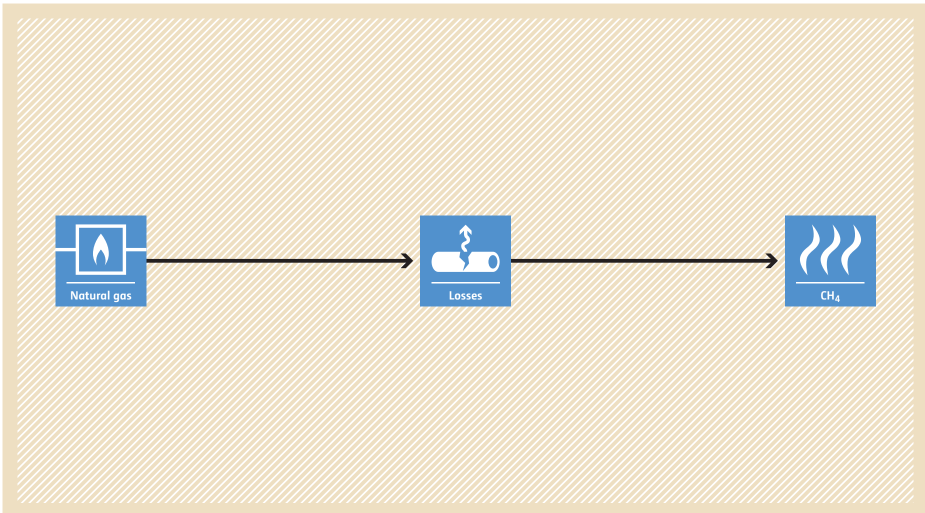
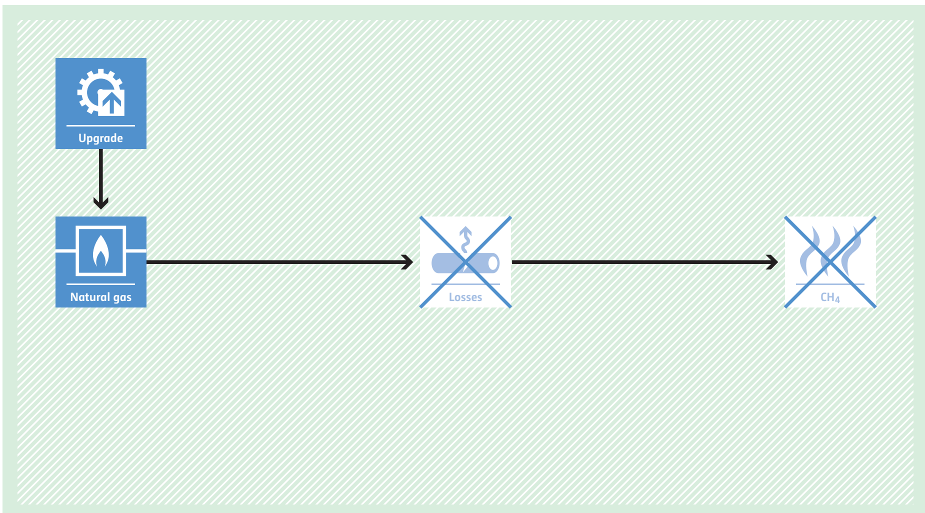
|---|---|
| **Typical project(s)** | Installation of polyethylene pipes for the early replacement of leaking cast iron pipes or steel pipes without cathodic protection in a natural gas distribution network. |
| **Type of GHG emissions mitigation action** | • GHG emissions avoidance.<br>Avoidance of $CH_4$ emissions from leaks in natural gas transportation. |
| **Important conditions under which the methodology is applicable** | • The project replaces either cast iron pipes or steel pipes without cathodic protection that have been in use for 30 years with polyethylene pipes without altering the pattern and supply capacity of the system;<br>• The replacement is not part of normal repair and maintenance, planned replacement, or due to interruptions or shortages or a switch from servicing other gases;<br>• The distribution system does not include gas transmission pipelines or storage facilities. |
| **Important parameters** | At validation:<br>• Length of pipes and number of leaks (alternative: leakage rate of the section). |
| | Monitored:<br>• Length of new pipeline due to both project and procedural replacement;<br>• Fraction of methane in the natural gas;<br>• Pressure of natural gas in the network. |
| **BASELINE SCENARIO**<br>Methane leaks from a natural gas network. |  |
| **PROJECT SCENARIO**<br>No leaks or fewer leaks in the natural gas network. |  |

# AM0044 Energy efficiency improvement projects: boiler rehabilitation or replacement in industrial and district heating sectors

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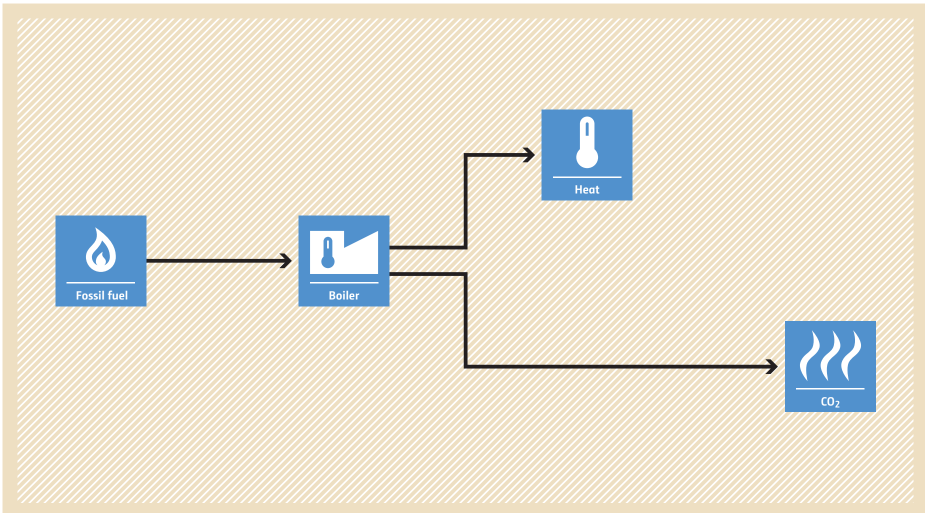
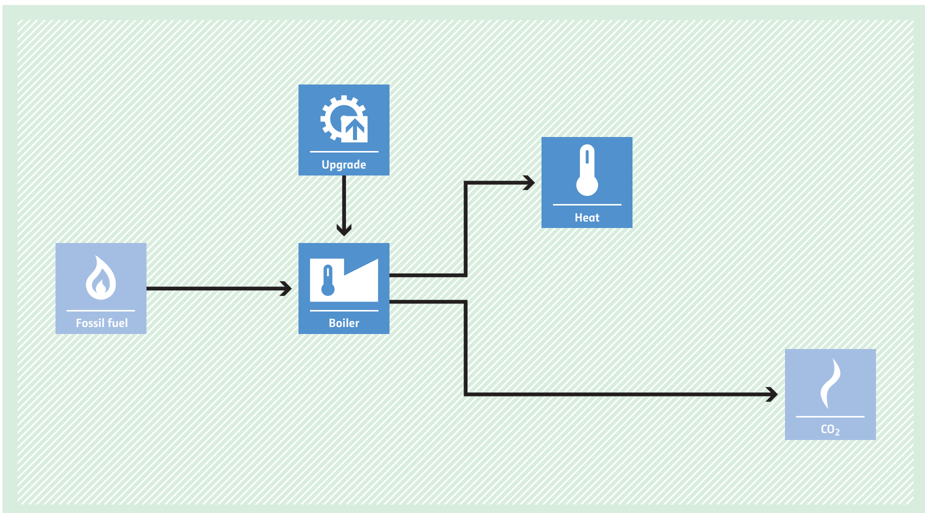
|---|---|
| **Typical project(s)** | Projects that results in thermal energy efficiency improvement of fossil-fuel-fired boilers, at multiple locations, through rehabilitation or replacement of the boilers implemented by the project participant, who may be the owner of boilers or owner of all the sites or part of the sites where the boilers are to be installed or a third party that owns all the project boilers during the project period. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Switch to more energy-efficient technology. |
| **Important conditions under which the methodology is applicable** | • The boilers that are rehabilitated or replaced under the project should have some remaining lifetime;<br>• Only one type of fuel is used by each of the boilers included in the project boundary and no fuel switching is undertaken within the project boundary, as a part of project;<br>• The installed capacity of each boiler shall be determined using a performance test in accordance with well-recognized international standards. |
| **Important parameters** | Monitored<br>• Amount of fossil fuel consumed, net calorific value of fossil fuel, emission factor of fossil fuel, oxidation factor of fossil fuel in each boiler in the project;<br>• Total thermal output of each boiler in the project. |
| **BASELINE SCENARIO**<br>Boiler(s) with lower efficiency will continue to operate at multiple locations, thereby consuming high amounts of fossil fuel. |  |
| **PROJECT SCENARIO**<br>The efficiency of boiler(s) is improved through their rehabilitation or replacement, resulting in a reduction of fossil fuel consumption and related $CO_2$ emissions. |  |

# **AM0045** Grid connection of isolated electricity systems

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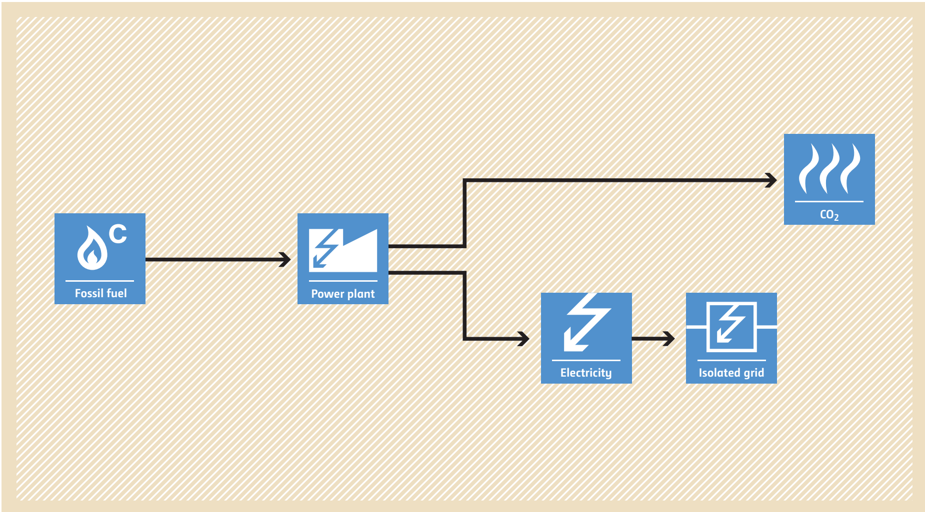
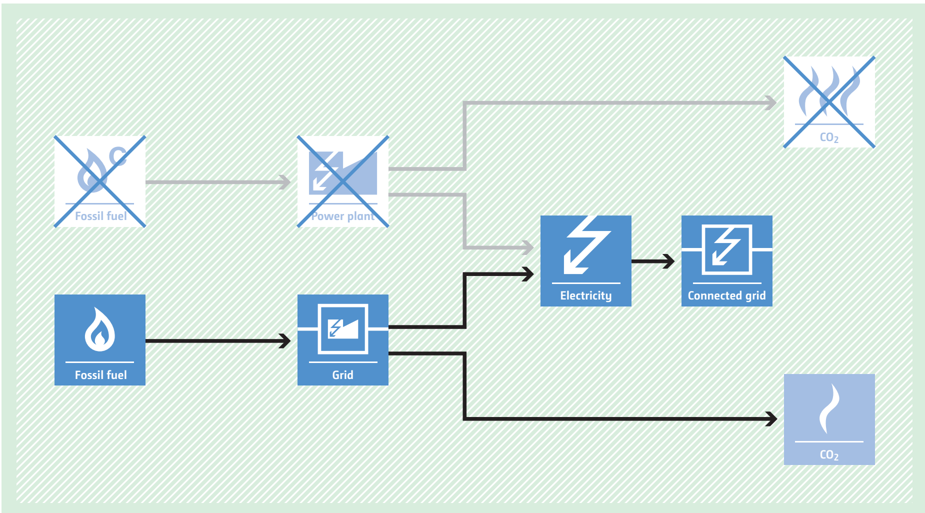
| **Typical project(s)** | Expansion of an interconnected grid to supply electricity generated by more-efficient, less-carbon-intensive means to an isolated electric power system. |
| **Type of GHG emissions mitigation action** | • Displacement of a more-GHG-intensive output.<br>Displacement of electricity that would be provided by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • Renewable energy based electricity generation in the isolated systems is not displaced and its operation is not significantly affected;<br>• All fossil-fuel-fired power plants in the isolated system are 100% displaced. |
| **Important parameters** | At validation:<br>• Grid emission factor of isolated system before start of the project;<br>• Electricity supplied to isolated system before start of the project (three years of historic data required). |
| | Monitored:<br>• Quantity of electricity supplied to the previously isolated system by the interconnected grid;<br>• Grid emission factor of the interconnected grid. |

**BASELINE SCENARIO**
Power generation based on fossil fuel applying less-efficient technologies in isolated electricity systems.




**PROJECT SCENARIO**
Displacement of fossil-fuel-fired power plants in the isolated grid by expansion of an interconnected grid to the isolated electricity system.



# AM0046 Distribution of efficient light bulbs to households

Women and children

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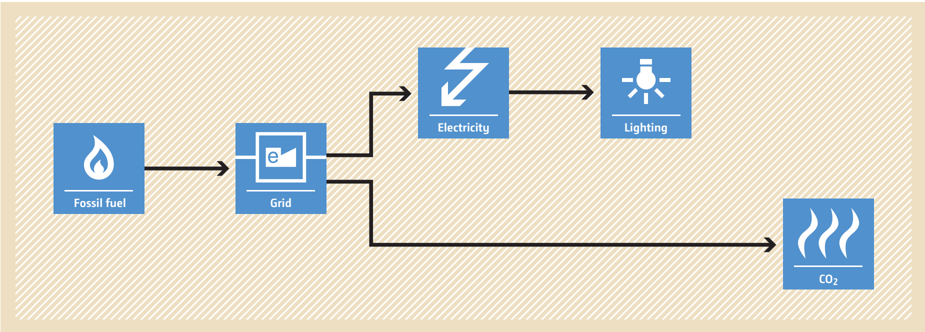
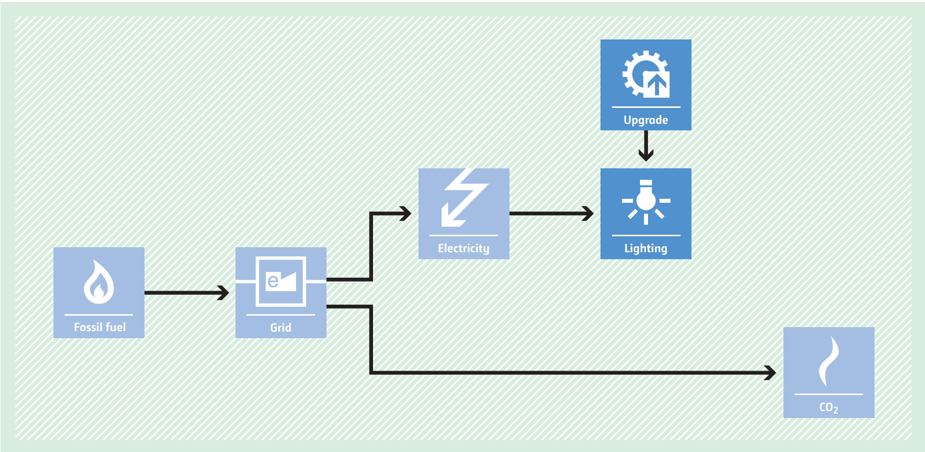
| **Typical project(s)** | Compact fluorescent lamps (CFLs) are sold at a reduced price, or donated to households to replace incandescent lamps (ICL). |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of less-efficient lighting by more-efficient technology. |
| **Important conditions under which the methodology is applicable** | • The households are within a distinct geographical area and are connected to the electricity grid and no other CDM project that may affect the energy efficiency of lighting in households located within the total project area has been registered;<br>• A maximum of four CFLs can be distributed or sold to each household and these CFLs have to be more efficient and have the same or a lower lumen output as the previously used ICL;<br>• The displaced light bulbs have a maximum rated power of 100 W and are returned to the project coordinator, who ensures destruction of the light bulbs;<br>• Electricity consumption from lighting has to be monitored in a baseline sample group (BSG) and a project sample group (PSG). The project coordinator implements a social lottery system as an incentive among all households included in the BSG and the PSG. |
| **Important parameters** | At validation:<br>• The average grid voltage in the low-voltage part of the grid, the power rating and the P-U characteristic curve of the distributed light are determined before the start of the project;<br>• Grid emission factor (alternatively monitored). |
| | Monitored:<br>• Electricity consumed to provide lighting (or utilization hours and power rating of lighting appliance) for household within the BSG and PSG;<br>• Number of project ICL and scrapped light bulbs;<br>• Technical distribution losses in the grid. |
| **BASELINE SCENARIO**<br>Less-energy-efficient light bulbs are used in households resulting in higher electricity demand. |  |
| **PROJECT SCENARIO**<br>More-energy-efficient CFLs are used in households saving electricity and thus reducing GHG emissions. |  |

# **AM0048** New cogeneration project activities supplying electricity and heat to multiple customers

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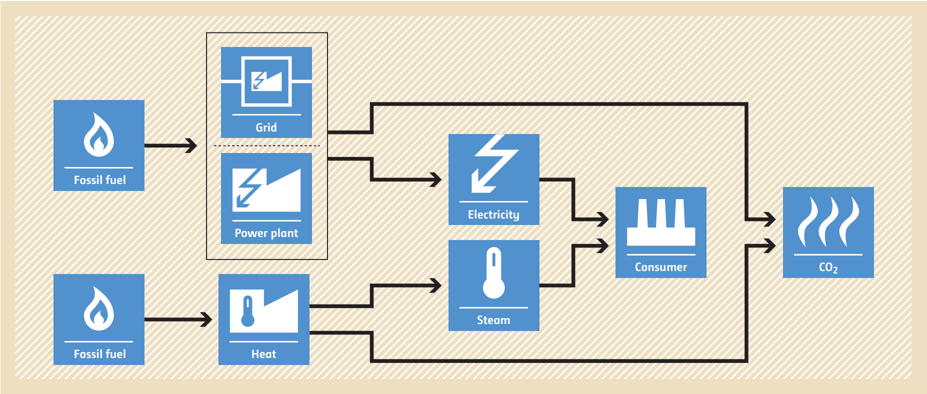
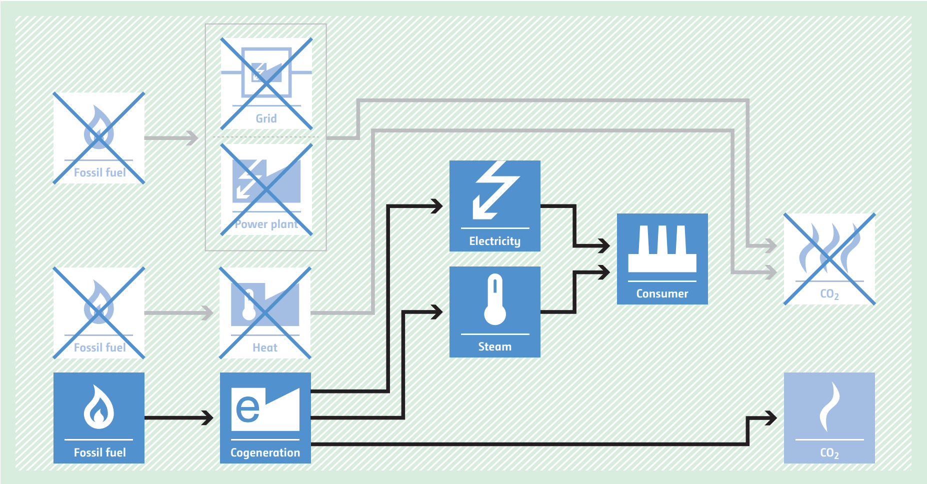
| **Typical project(s)** | Fossil-fuel-fired cogeneration project supplying heat and electricity to multiple project customers. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Switch to cogeneration of steam and electricity. |
| **Important conditions under which the methodology is applicable** | • Cogeneration of heat and electricity and supply to multiple users who did not previously co-generate;<br>• Minimum three years of historical data for estimating baseline emissions;<br>• Equipment displaced by the project is to be scrapped, unless it is kept as back-up to the project activity;<br>• Project customers should not demand electricity and/or heat from external sources, other than the project or the grid. |
| **Important parameters** | At validation:<br>• Historical fuel consumption and steam production/consumption. |
| | Monitored:<br>• Electricity emission factor;<br>• Quantity of electricity consumed by each project customer, from the project and from self-generation;<br>• Quantity, temperature, specific enthalpy and pressure of steam or energy of hot water, comsumed by each project customer, from the project and from self-generation;<br>• Quantity of electricity supplied to the grid;<br>• Quantity of fuel consumed by the project. |
| **BASELINE SCENARIO**<br>Separate heat and electricity production. |  |
| **PROJECT SCENARIO**<br>Cogeneration of electricity and heat. |  |

# AM0049 Methodology for gas based energy generation in an industrial facility

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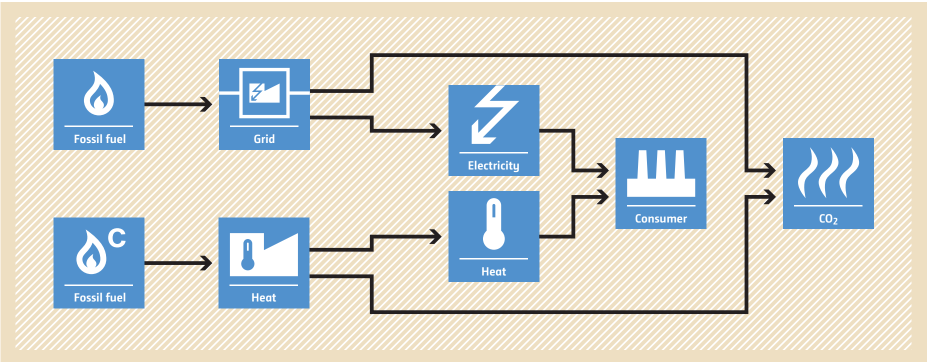
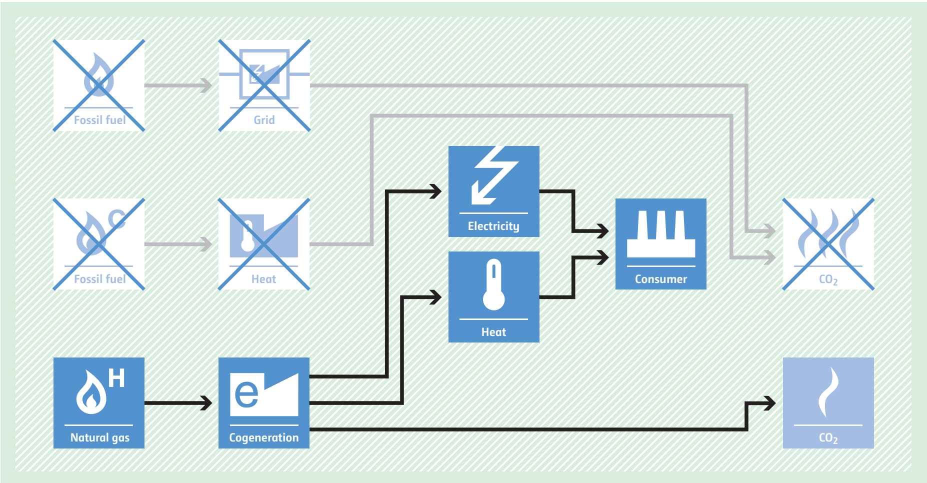
| **Typical project(s)** | Installation of gas-based energy generation systems, either separate or cogeneration, at an existing industrial facility to meet its own electricity and/or steam/heat demand. |
| **Type of GHG emissions mitigation action** | • Fuel switch;<br>• Energy efficiency.<br>Displacement of more-carbon-intensive fuel with less-carbon-intensive fuel. |
| **Important conditions under which the methodology is applicable** | • Prior to the project implementation, the existing industrial facility produces its own thermal energy and maybe electricity, but the electricity supply is not enough to meet its own demand;<br>• Coal or oil is replaced by natural gas or methane-rich gas, which shall be sufficiently available in the region or country;<br>• There are no regulatory requirements for fuel switch or technology upgrade;<br>• The project does not change the quality requirement of steam/heat;<br>• Electricity export to the power grid, if any, is on ad-hoc basis and consists of less than 10% of the total electricity produced by the project power plant. |
| **Important parameters** | At validation:<br>• Grid emission factor. |
| | Monitored:<br>• Electricity generation and export of the project power plant;<br>• Efficiency of the baseline and project fuel combustion systems;<br>• Flow rate, pressure and temperature of heat carrier at inlet and outlet of waste heat generation sources;<br>• Fuel consumption by the project plant. |
| **BASELINE SCENARIO**<br>On-site generation of heat using coal or oil and import of electricity from the grid. |  |
| **PROJECT SCENARIO**<br>Installation of energy generation systems, either separate or cogeneration, to supply electricity and/or steam/heat using natural gas or methane-rich gas. |  |

# AM0050 Feed switch in integrated ammonia-urea manufacturing industry

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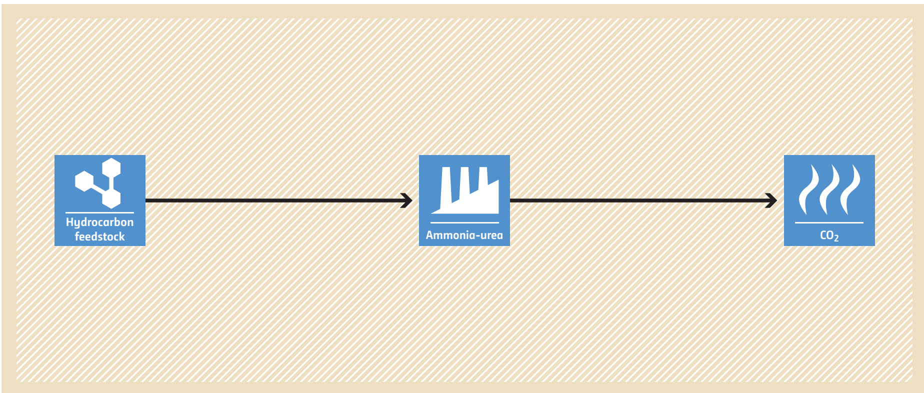
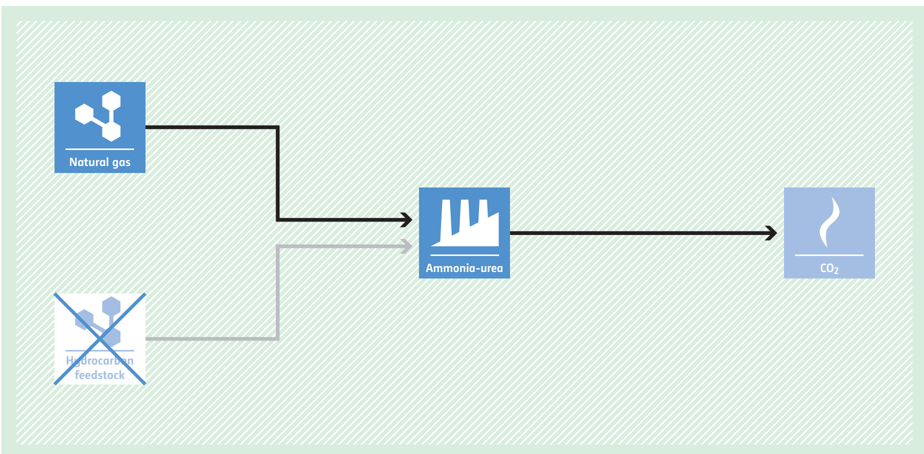
| **Typical project(s)** | Feed switch from existing hydrocarbon feedstock (i.e. naphtha, heavy oils, coal, lignite and coke) to natural gas, either completely or partially, in an existing integrated ammonia-urea manufacturing facility, with optional implementation of a $CO_2$ recovery plant within the manufacturing facility. |
| **Type of GHG emissions mitigation action** | • Feedstock switch.<br>Displacement of more-GHG-intensive feedstock (naphtha, heavy oils, coal, lignite and coke) with less-GHG-intensive feedstock (natural gas). |
| **Important conditions under which the methodology is applicable** | • The project activity should not result in the increase of the production capacity beyond 10% of the existing capacity, and change in production process;<br>• Natural gas is sufficiently available in the region or country;<br>• The integrated ammonia-urea manufacturing facility is an existing plant with a historical operation of at least three years prior to the implementation of the project;<br>• Prior to the implementation of the project, no natural gas has been used in the integrated ammonia-urea manufacturing facility. |
| **Important parameters** | At validation:<br>• Urea production in the most recent three years;<br>• Quantity of each existing feedstock used as feed in the most recent three years;<br>• Quantity of fuel consumed in furnaces in the most recent three years. |
| | Monitored:<br>• Urea production in the project;<br>• Quantity of natural gas used as feed in the project;<br>• Quantity of fuel consumed in furnaces in the project;<br>• Quantity and $CO_2$ emission factor of electricity consumed by the $CO_2$ recovery plant. |
| **BASELINE SCENARIO**<br>The integrated ammonia-urea manufacturing facility continues to use existing hydrocarbon feedstock as the feed emitting excess $CO_2$, not used by the urea plant, into atmosphere. |  |
| **PROJECT SCENARIO**<br>The feed to the integrated ammonia-urea manufacturing facility is switched from existing hydrocarbon feedstock to natural gas, if required in combination with the implementation of a $CO_2$ recovery, to reduce the emission of excess $CO_2$. |  |

# AM0052 Increased electricity generation from existing hydropower stations through decision support system optimization

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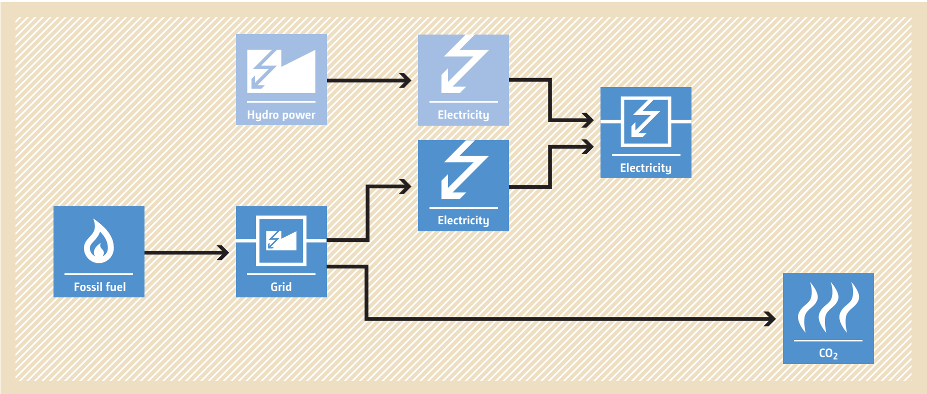
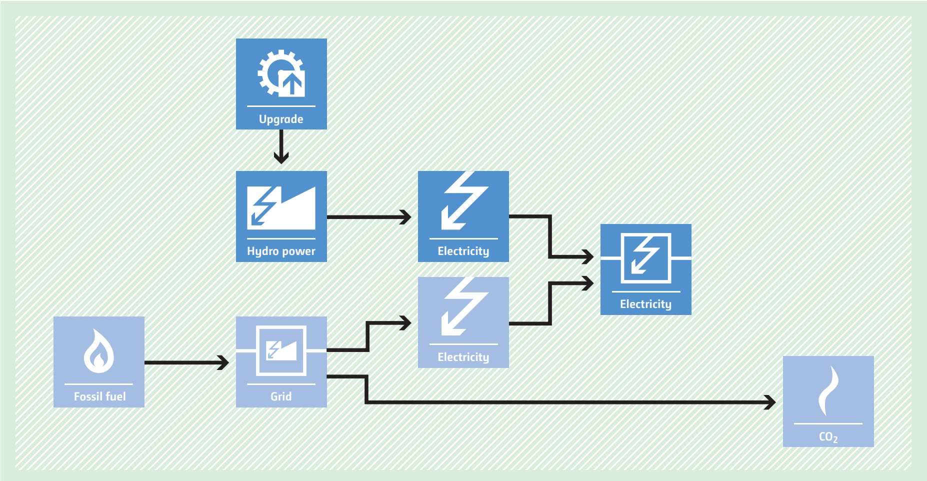
| **Typical project(s)** | Increased annual generation of electricity through the introduction of a Decision Support System (DSS) that optimizes the operation of the existing hydropower facility/ies, both run-of-the-river and reservoir-based type, connected to a grid. |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Displacement of electricity that would have been provided by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • Recorded data is available for a minimum of three years to establish the baseline relationship between water flow and power generation;<br>• Hydropower units, covered under the project, have not undergone and will not undergo significant upgrades beyond basic maintenance (e.g. replacement of runners) that affect the generation capacity and/or expected operational efficiency levels during the crediting period;<br>• No major changes in the reservoir size (e.g. increase of dam height) or to other key physical system elements (e.g. canals, spillways) that would affect water flows within the project boundary, have been implemented during the baseline data period or will be implemented during the crediting period. |
| **Important parameters** | At validation:<br>• Grid emission factor (can also be monitored ex post);<br>• Measurement data of headwater level, vertical opening of spillway, power output etc. from previous year before project implementation as well as power polynomial coefficients (hill diagram). |
| | Monitored:<br>• Quantity of electricity generated by each hydropower unit in the project. |
| **BASELINE SCENARIO**<br>Additional electricity would be produced by more-GHG-intensive power plants connected to the grid. |  |
| **PROJECT SCENARIO**<br>Introduction of a Decision Support System (DSS) increases the supply of electricity generated by existing hydropower units to the grid, thereby reducing the amount of more-GHG-intensive electricity in the grid. |  |

# AM0053 Biogenic methane injection to a natural gas distribution grid

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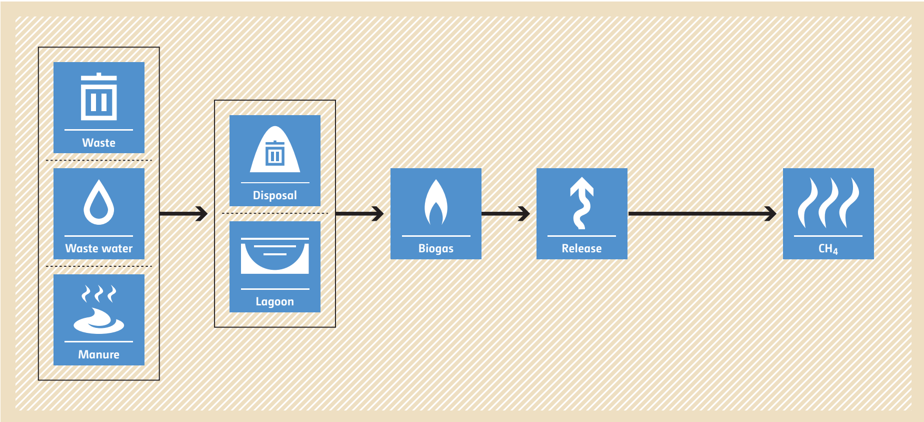
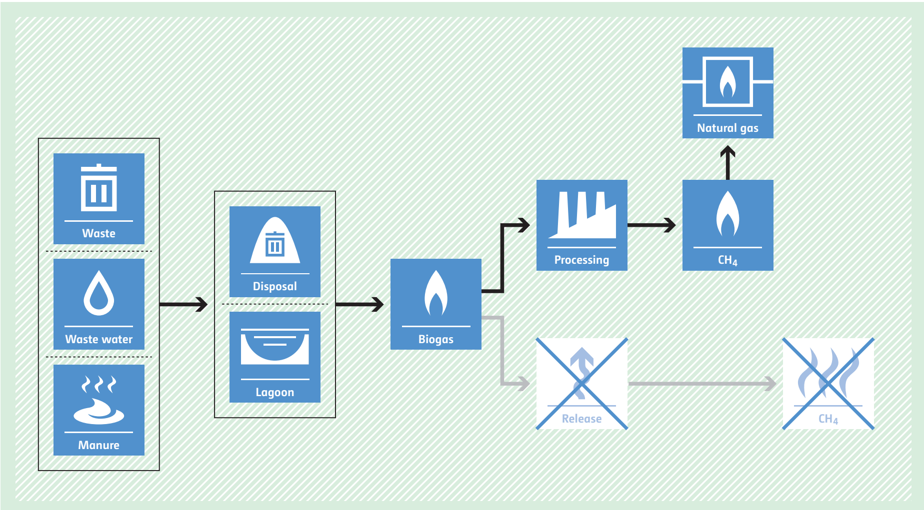
| **Typical project(s)** | Recovering of biogas generated by anaerobic decomposition of organic matter in wastewater treatment systems, animal waste management systems, etc., processing and upgrading the biogas to the quality of natural gas and distributing it as energy source via a natural gas distribution grid. |
| **Type of GHG emissions mitigation action** | • Renewable energy;<br>• GHG emission avoidance.<br>Avoidance of $CH_4$ emissions and displacement of use of natural gas in a natural gas distribution grid. |
| **Important conditions under which the methodology is applicable** | • The biogas was either vented or flared prior to implementation of the project activity and would continue to be either vented or flared in the absence of the project activity;<br>• The geographical extent of the natural gas distribution grid is within the host country;<br>• One or several of the following technologies are used to upgrade biogas to natural gas quality: pressure swing adsorption; absorption with/without water circulation; absorption with water, with or without water recirculation; membrane CO2 removal technology. |
| **Important parameters** | Monitored:<br>• Quantity and net calorific value of upgraded biogas injected to the natural gas distribution grid;<br>• Quantity of biogas captured at the source of biogas generation;<br>• Concentration of methane in biogas at the source of biogas generation. |
| **BASELINE SCENARIO**<br>Biogas is vented or flared and natural gas distribution grid is supplied by natural gas extracted from gas wells. |  |
| **PROJECT SCENARIO**<br>Biogas is recovered, processed, upgraded and supplied to the natural gas distribution grid and replaces additional natural gas from gas wells. |  |

# **AM0055** Recovery and utilization of waste gas in refinery or gas plant

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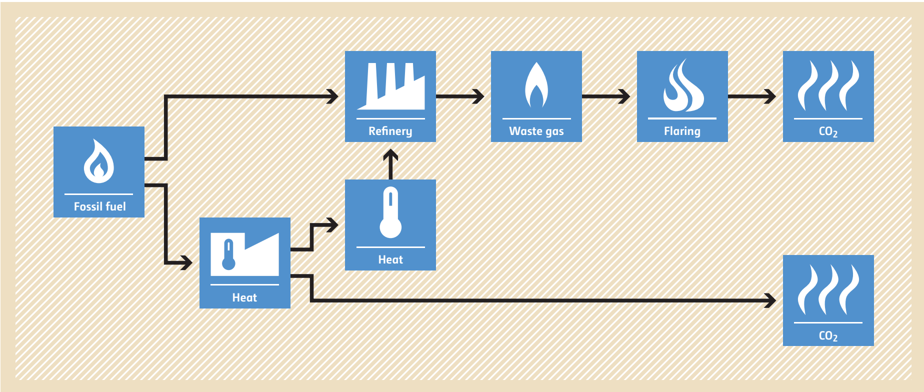
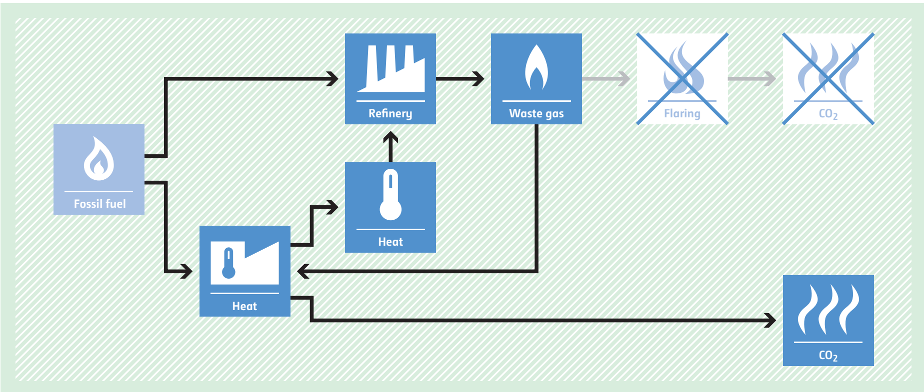
| **Typical project(s)** | The project activity is implemented in existing refinery facilities or gas plants to recover waste gas, which is characterized by its low pressure or a low heating value and that is currently being flared to generate process heat in element process(es) (e.g. for the purpose of steam generation by a boiler or hot air generation by a furnace). Recovered waste gas is a by-product generated in several processing units of the refinery or gas plant. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of fossil fuel used for heat production by recovered waste gas. |
| **Important conditions under which the methodology is applicable** | • Waste gases from the refinery or gas plant, used under the project activity, were flared (not vented) for the last three years prior to the implementation of the project activity;<br>• The waste gas recovery device is placed just before the flare header (with no possibility of diversions of the recovered gas flow) and after all the waste gas generation devices;<br>• The recovered waste gas replaces fossil fuel that is used for generating heat for processes within the same refinery or gas plant;<br>• The composition, density and flow of waste gas are measurable. |
| **Important parameters** | At validation:<br>• Historical annual average amount of waste gas sent to flares before the project implementation. |
| | Monitored:<br>• Parameters to calculate the emission factor for consumed electricity;<br>• Amount and composition of recovered waste gas (e.g. density, LHV) and data needed to calculate the emission factor of fossil fuel used for process heating and steam generation within the refinery or gas plant. |
| **BASELINE SCENARIO**<br>Use of fossil fuel to generate process heat. Waste gas is flared. |  |
| **PROJECT SCENARIO**<br>Use of recovered waste gas to generate process heat. Thereby, fossil fuel usage is reduced and waste gas is not flared anymore. |  |

# AM0056 Efficiency improvement by boiler replacement or rehabilitation and optional fuel switch in fossil fuel-fired steam boiler systems

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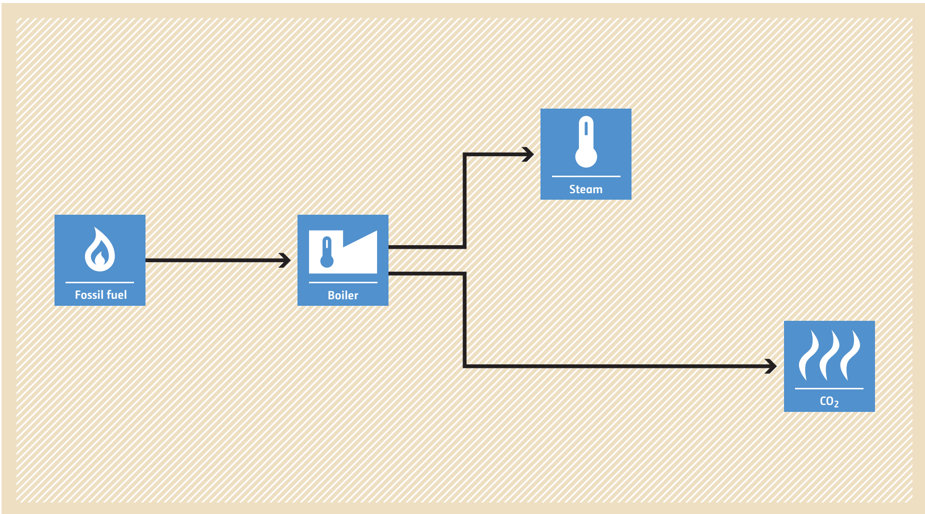
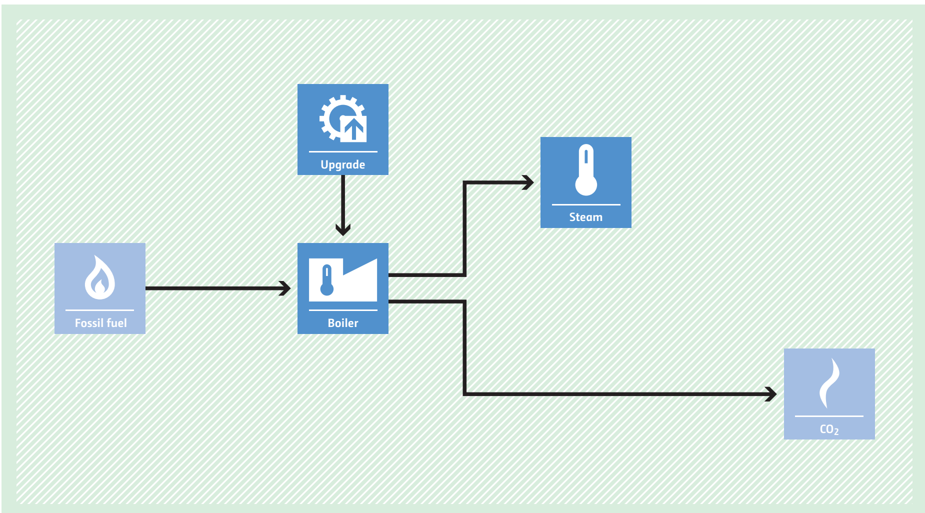
| **Typical project(s)** | Complete replacement of existing boilers by new boilers with a higher efficiency in an existing facility with steam demands or retrofitting of existing boilers in order to increase their efficiency; or a combination with one or both activities described above and a switch in the type of fossil fuel used to fuel boilers. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Technology switch resulting in an increase in energy efficiency. |
| **Important conditions under which the methodology is applicable** | • The project boilers utilize fossil fuels to produce steam;<br>• The compliance with national/local regulations are not the cause of the development of the project;<br>• Steam quality (i.e. steam pressure and temperature) is the same prior and after the implementation of the project;<br>• Only one type of fossil fuel is used in all boilers included in the project boundary. |
| **Important parameters** | Monitored:<br>• Quantity of fuel used in the boilers;<br>• Quantity of steam produced;<br>• Temperature and pressure of the steam produced. |
| **BASELINE SCENARIO**<br>Continuation of the current situation; i.e. use of the existing boilers without fossil fuel switch, replacement of retrofit of the boilers. |  |
| **PROJECT SCENARIO**<br>Complete replacement of boilers, and/or retrofitting of an existing steam generating system results in higher efficiency and less consumption of fossil fuel (fuel switch may also be an element of the project scenario). |  |

# AM0057 Avoided emissions from biomass wastes through use as feed stock in pulp and paper, cardboard, fibreboard or bio-oil production

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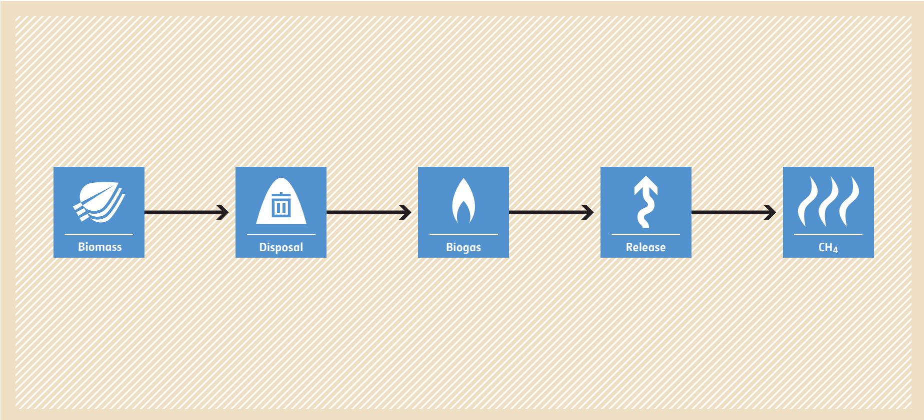
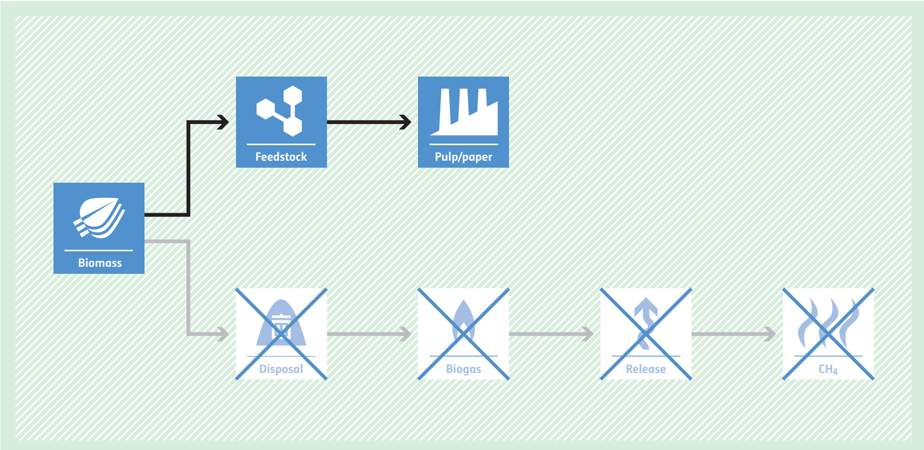
| **Typical project(s)** | Agricultural wastes are used as feed stock for pulp, paper, cardboard, fibreboard or bio-oil production in a new facility, where the end product is similar in characteristics and quality to existing high quality products in the market and does not require special use or disposal methods. |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance.<br>Avoidance of $CH_4$ emissions. |
| **Important conditions under which the methodology is applicable** | • A new production facility is being constructed;<br>• Waste is not stored in conditions that would generate methane;<br>• Production does not involve processes that emit significant additional greenhouse gas emissions except from those arising directly from pyrolysis (bio-oil only) processes that were also used in the baseline or associated with electricity or fossil fuel consumption;<br>• If biomass is combusted for the purpose of providing heat or electricity to the plant, then the biomass fuel is derived from biomass residues;<br>• In the case of bio-oil, the pyrolyzed residues (char) will be further combusted and the energy derived thereof used in the project. |
| **Important parameters** | Monitored:<br>• Quantity of waste used as feedstock;<br>• Fossil fuel and electricity consumption;<br>• Transportation parameter – distance, fuel type and load details;<br>• Agricultural waste residues – produced in the region, used in and outside the project and surplus. |
| **BASELINE SCENARIO**<br>Agricultural residues are left to decay anaerobically. |  |
| **PROJECT SCENARIO**<br>Agricultural residues are used as feedstock in a new facility for producing paper, pulp, cardboard, fibreboard or bio-oil. |  |

# AM0058 Introduction of a new primary district heating system

Women and children

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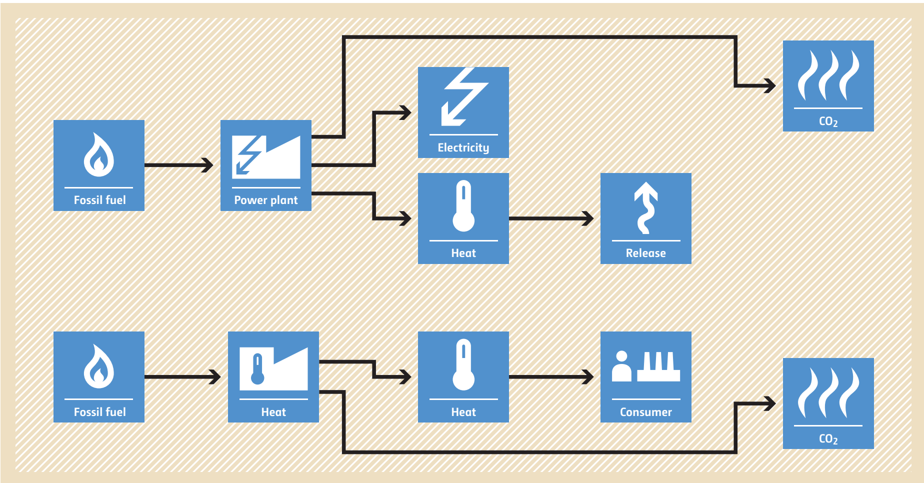
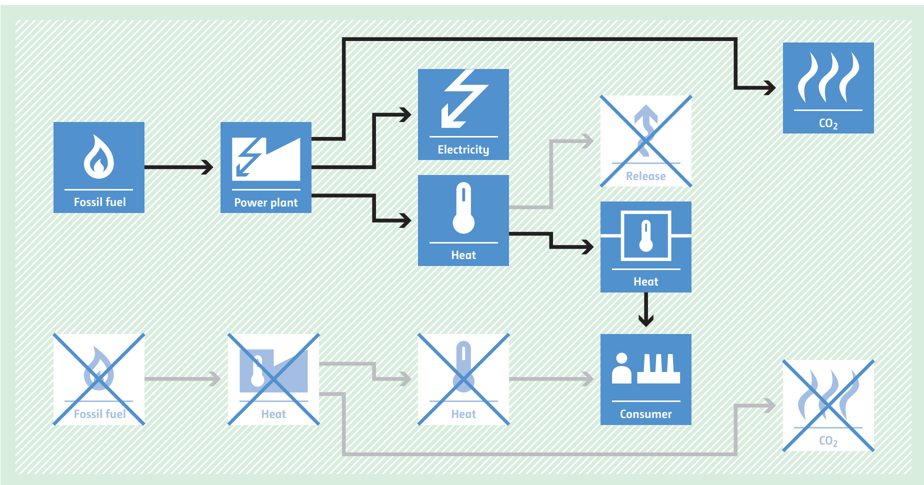
| **Typical project(s)** | A new primary district heating system supplied by previously unused heat from a fossil-fuel-fired power plant is introduced. It replaces fossil-fuel-fired heat only boilers. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of fossil-fuel-based heat generation by utilization of waste heat. |
| **Important conditions under which the methodology is applicable** | • The heat supplied by the project is predominantly from a grid connected power plant with three years of operation history and no use of waste heat and can be supplemented by new heat-only boilers;<br>• Both power plant and boilers use only one type of fuel;<br>• The heat is used for heating and/or tap water supply in the residential and/or commercial buildings, but not for industrial production processes. |
| **Important parameters** | At validation:<br>• Efficiency of the heat supply and fuel types in the baseline;<br>• Minimum and maximum power generation during the last three years. |
| | Monitored:<br>• Quantity of heat from the cogeneration plant and from all heat only/peak load boilers in the project;<br>• Total area of all the buildings in the project;<br>• Quantity of heat supplied from each sub-station to the buildings;<br>• Quantity of electricity supplied to the grid by the project. |

**BASELINE SCENARIO**
Fossil fuel is used in a power plant that only supplies grid electricity; fossil fuel is used in individual boilers that supply heat to users.




**PROJECT SCENARIO**
Fossil fuel is used in a power plant that supplies both electricity to the grid and heat to individual users. Fossil fuel previously used in individual boilers is no longer used.



# **AM0059** Reduction in GHGs emission from primary aluminium smelters

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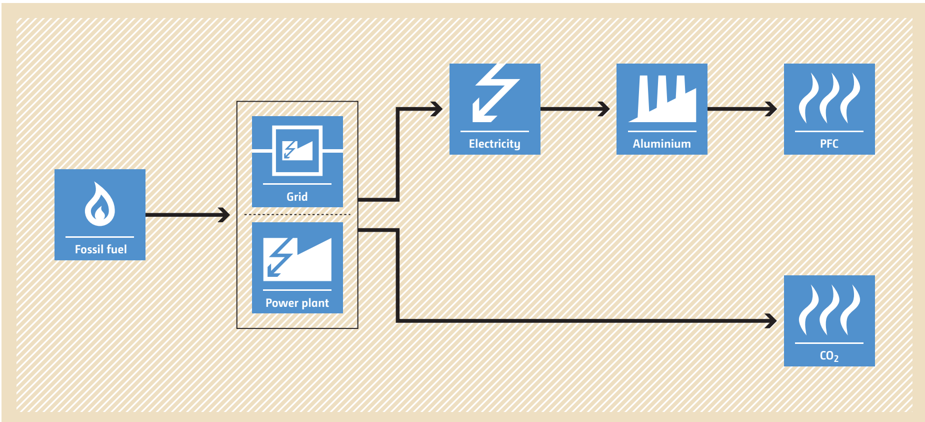
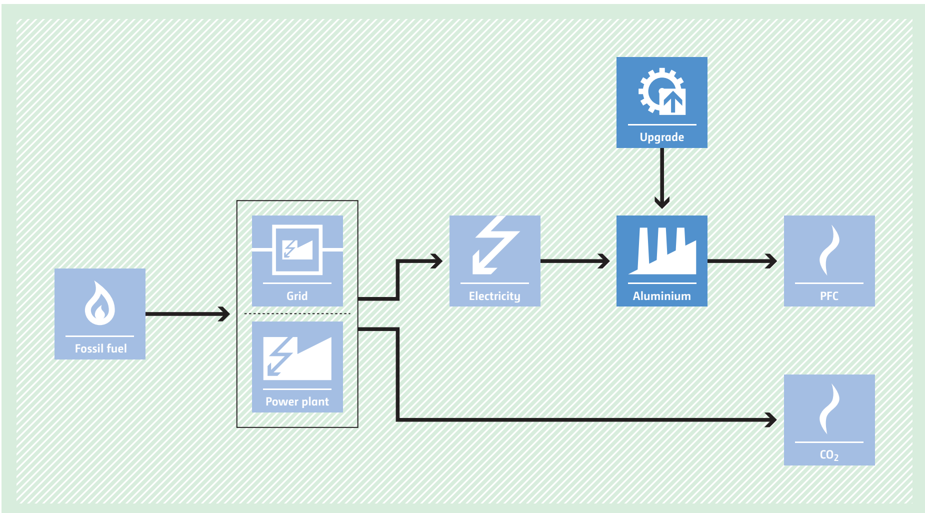
| **Typical project(s)** | Technology improvement at a primary aluminium smelter (PFPB, CWPB, SWPB, VSS or HSS) using computerized controls or improved operating practices, to reduce PFC emissions and/or to improve electrical energy efficiency. |
| **Type of GHG emissions mitigation action** | • Energy efficiency;<br>• GHG emission avoidance.<br>Avoidance of PFC emissions and electricity savings leading to less GHG emissions. |
| **Important conditions under which the methodology is applicable** | • The project is limited to changes of the smelting technology;<br>• At least three years of historical data for estimating baseline emissions are available. |
| **Important parameters** | At validation:<br>• If less than 95% of the anode effects are manually terminated, number and duration of anode effect or anode effect over-voltage, and current efficiency;<br>• PFC emissions;<br>• If applicable: grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Quantity of aluminium produced in the project;<br>• Quantity of electricity imported from captive plants and the grid;<br>• PFC emissions;<br>• If applicable: electricity factor for captive generated electricity. |

**BASELINE SCENARIO**
Electricity is consumed to produce aluminium and the production process leads to PFC emissions.




**PROJECT SCENARIO**
Less electricity is consumed to produce aluminium and the production process leads to less PFC emissions.



# AM0060 Power saving through replacement by energy efficient chillers

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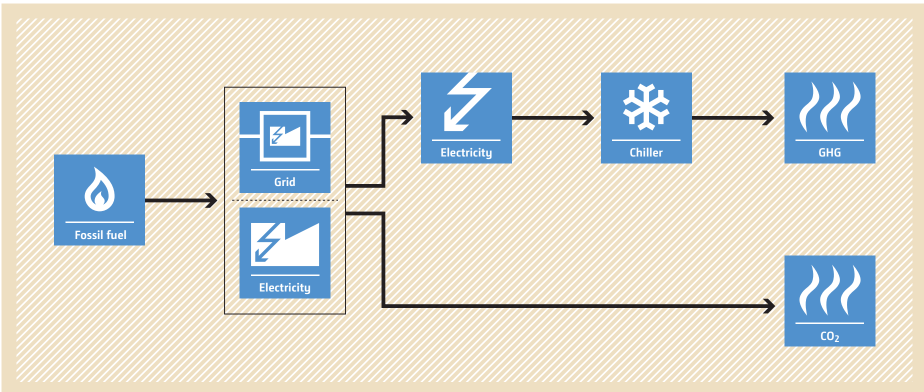
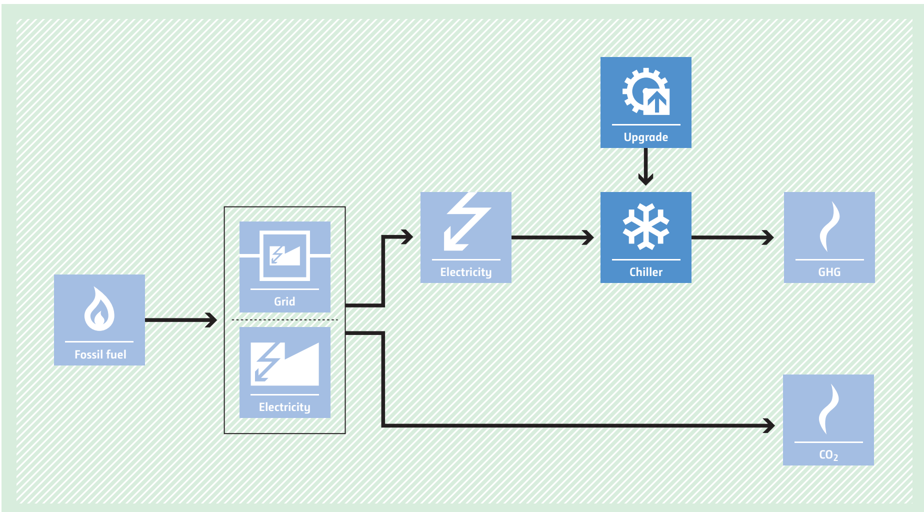
| **Typical project(s)** | The one-to-one replacement of existing electricity-driven chillers by more-energy-efficient new chillers with similar rated output capacity to the existing ones. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Electricity savings through energy efficiency improvement. |
| **Important conditions under which the methodology is applicable** | • For each chiller replacement, the rated output capacity of the new chiller is not significantly larger or smaller (maximum ±5%) than the existing chiller;<br>• The chiller is used to generate chilled water or a water/antifreeze mixture (e.g. water with addition of glycol) for process cooling or air conditioning;<br>• The existing and new chillers are driven by electrical energy;<br>• The existing chillers are functioning and fully operational and can continue to operate for several years if regular maintenance is undertaken;<br>• The existing chillers are destroyed, and the refrigerant contained in the existing chiller will be recovered and destroyed, or stored in suitable containers. |
| **Important parameters** | At validation:<br>• Power consumption function of the existing chillers;<br>• Grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Average chiller output of the new chillers;<br>• Average inlet temperature of condensing water of the new chillers;<br>• Average inlet and outlet temperature of chilled water supplied by the new chillers. |
| **BASELINE SCENARIO**<br>Continued operation of the existing, less-energy-efficient chillers. |  |
| **PROJECT SCENARIO**<br>Operation of energy-efficient chillers, resulting in lower $CO_2$ emissions. |  |

# AM0061 Methodology for rehabilitation and/or energy efficiency improvement in existing power plants

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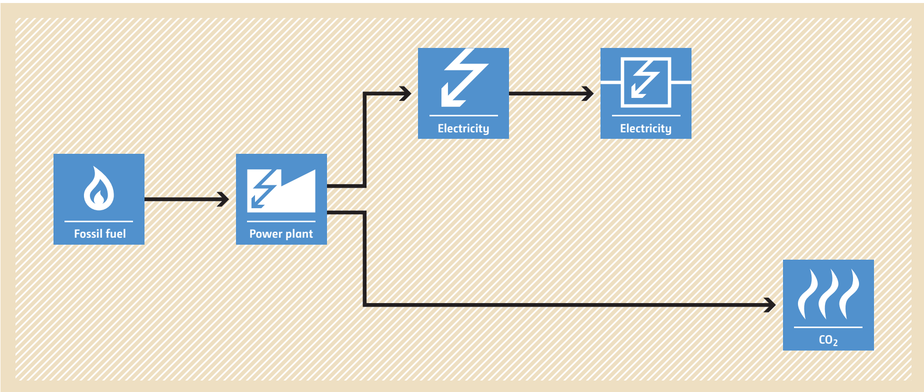
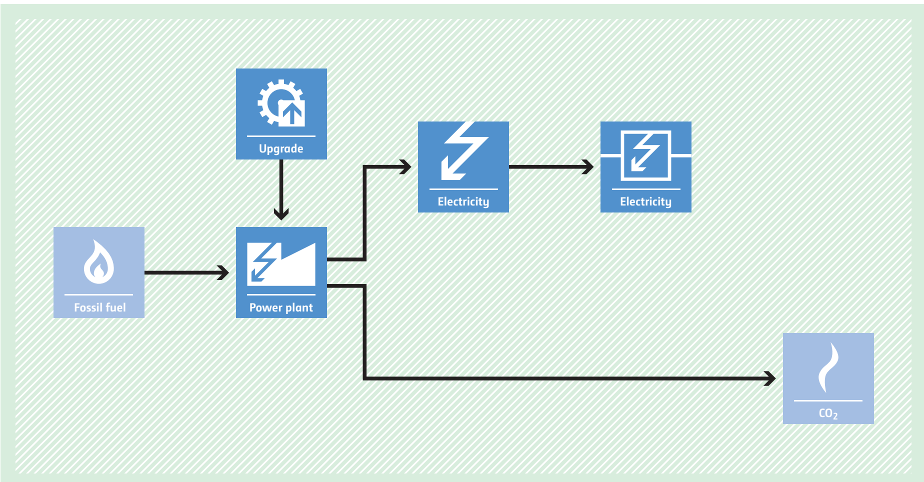
| **Typical project(s)** | Implementation of measures to increase the energy efficiency of existing power plants that supply electricity to the grid. Examples of these measures are: the replacement of worn blades of a turbine by new ones; the implementation of new control systems; replacement of deficient heat exchangers in a boiler by new ones, or the installation of additional heat recovery units in an existing boiler. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Technology switch resulting in an increase in energy efficiency in an existing power plant. |
| **Important conditions under which the methodology is applicable** | • The project does not involve the installation and commissioning of new electricity generation units;<br>• The designed power generation capacity of each unit may increase as a result of the project but this increase is limited to 15% of the former design power generation capacity of the whole plant;<br>• The existing power plant has an operation history of at least 10 years and data on fuel consumption and electricity generation for the most recent five years prior to the implementation of the project are available;<br>• Only measures that require capital investment can be included. Consequently, regular maintenance and housekeeping measures cannot be included in the project. |
| **Important parameters** | Monitored:<br>• Energy efficiency of the project power plant;<br>• Quantity of fuel used in the project power plant;<br>• Calorific value and emission factor of the fuel used in the project power plant;<br>• Electricity supplied to the grid by the project power plant. |
| **BASELINE SCENARIO**<br>Continuation of the operation of the power plant, using all power generation equipment already used prior to the implementation of the project, and undertaking business as usual maintenance. |  |
| **PROJECT SCENARIO**<br>Implementation of energy efficiency improvement measures or the rehabilitation of an existing fossil-fuel-fired power plant. As a result, less fossil fuel is consumed to generate electricity. |  |

# AM0062 Energy efficiency improvements of a power plant through retrofitting turbines

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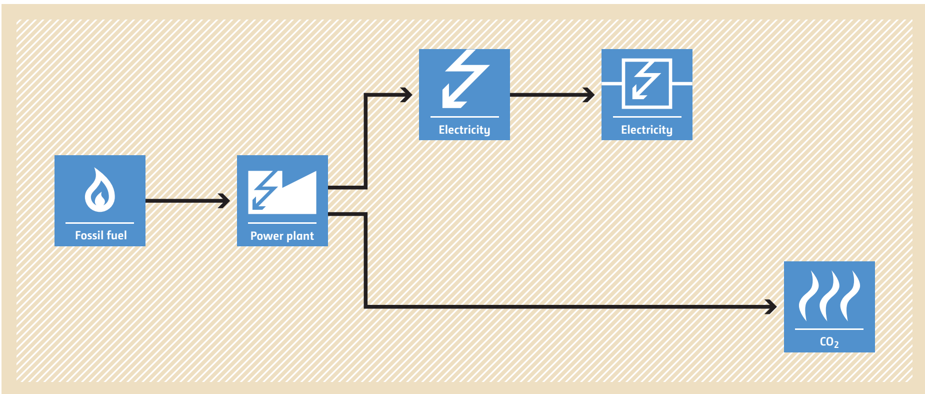
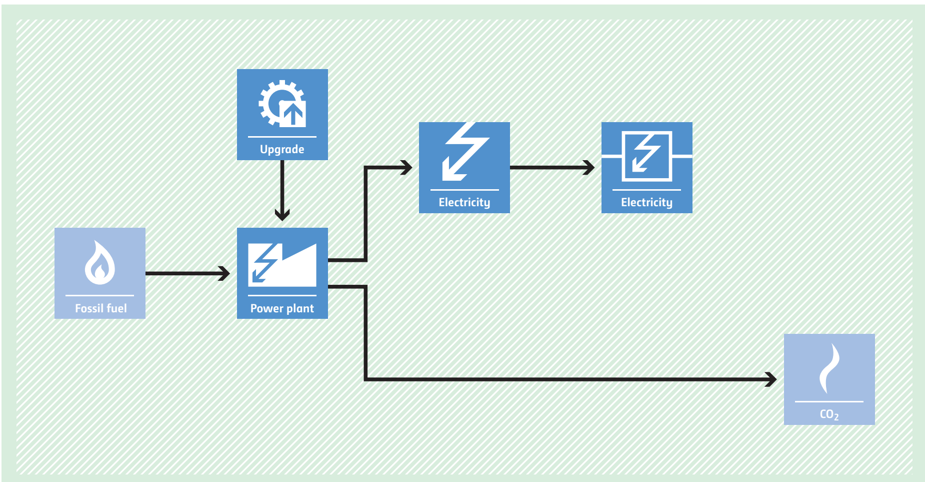
| **Typical project(s)** | Implementation of measures to increase the energy efficiency of steam or gas turbines in existing power plants that supply electricity to the grid. Examples of these measures are: replacement of worn blades of a turbine by new ones; implementation of refined sealing to reduce leakage; replacement of complete inner blocks (steam path, rotor, inner casing, inlet nozzles). |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Technology switch resulting in an increase in energy efficiency at an existing power plant. |
| **Important conditions under which the methodology is applicable** | • The project power plant utilizes fossil fuel to operate;<br>• Measures related to recommended regular or preventive maintenance activities (including replacements and overhauling) as provided by the manufacturer of turbine, or superior practices of preventive maintenance (e.g. sophisticated cleaning systems resulting in improved efficiency) are not applicable;<br>• The operational parameters that affect the energy efficiency of the turbine (e.g. steam pressure and temperature, quality of steam in the case of a saturated steam turbine; condenser vacuum, and combustion temperature for gas turbine) remain the same, subject to a variation of +/- 5%, in the baseline and the project scenario;<br>• The methodology is applicable up to the end of the lifetime of the existing turbine, if shorter than the crediting period. |
| **Important parameters** | Monitored:<br>• Quantity, calorific value and emission factor of fuel used in the project power plant;<br>• Electricity supplied to the grid by the project power plant;<br>• Enthalpy of the steam supplied to the turbine, in case of steam turbines. |
| **BASELINE SCENARIO**<br>Continuation of the current practice; i.e. the turbine continues to be operated without retrofitting. |  |
| **PROJECT SCENARIO**<br>Retrofitting of steam turbines and gas turbines with components of improved design to increase the energy efficiency in an existing fossil fuel power plant. Thus, fossil fuel consumption is reduced. |  |

# AM0063 Recovery of $CO_2$ from tail gas in industrial facilities to substitute the use of fossil fuels for production of $CO_2$

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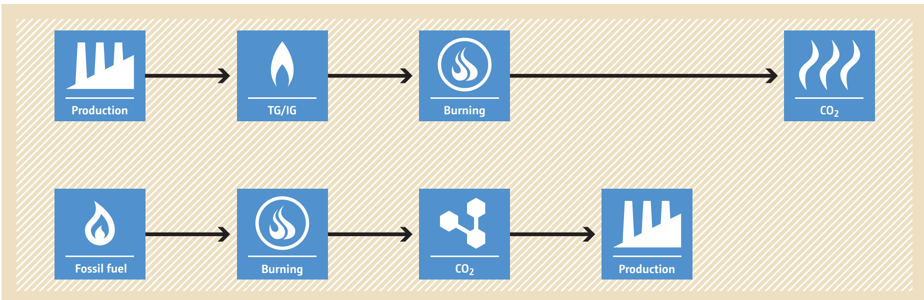
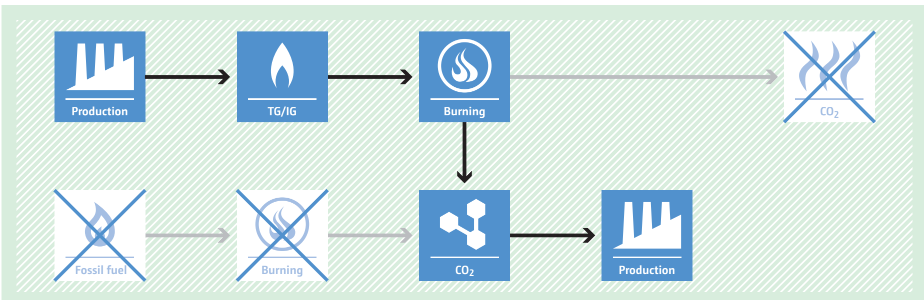
| **Typical project(s)** | Paragraph will include two parts, accordingly:<br>(1) Recovery of $CO_2$ from the tail gas (TG) generated by an existing industrial facility to substitute the combustion of fossil fuels at an existing conventional $CO_2$ production facility or a new $CO_2$ production plant;<br>(2) Use of intermediate gas (IG) of a new production facility, for recovery of $CO_2$ in a new $CO_2$ production plant, established as part of the project activity. |
| **Type of GHG emissions mitigation action** | • Feedstock switch.<br>Displacement of more-GHG-intensive feedstock with $CO_2$ recovered from the tail gas or intermediate gas. |
| **Important conditions under which the methodology is applicable** | • The tail gas from the existing industrial facility has been produced for as long as the industrial facility has been in operation;<br>• There exist at least three years of historical records related to the operation of the industrial facility from which the tail gas is extracted;<br>• Prior to the project implementation, the tail gas has either been used as fuel in the industrial facility without extraction of the $CO_2$ or has been flared;<br>• The total amount of $CO_2$ produced at the project facility shall not be consumed at the project facility (e.g. for manufacturing of chemicals) and has to be sold within the host country;<br>• The industrial facility does not utilize $CO_2$ in the intermediate gas for any other purpose in the production process. |
| **Important parameters** | At validation:<br>• Quantity of $CO_2$ produced at the existing $CO_2$ production facility;<br>• Electricity and fuel consumption at the existing $CO_2$ production facility. |
| | Monitored:<br>• Average carbon content and volume of the tail gas and/or intermediate gas delivered to the project $CO_2$ production facility;<br>• Quantity of $CO_2$ produced at the project $CO_2$ production facility;<br>• Average carbon content and volume of the off gas combusted at the industrial facility;<br>• Amount and end use of $CO_2$ purchased by customers and date of delivery;<br>• Quantity or volume of main product actually produced in year;<br>• Quantity or volume of main product actually sold and delivered to customers. |
| **BASELINE SCENARIO**<br>Combustion of fossil fuel at a conventional $CO_2$ production facility. | <br> |
| **PROJECT SCENARIO**<br>Recovery of $CO_2$ from the tail gas/ intermediate gas generated by an existing industrial facility for use at the project $CO_2$ production facility. | <br> |

# AM0064 Capture and utilisation or destruction of mine methane (excluding coal mines) or non mine methane

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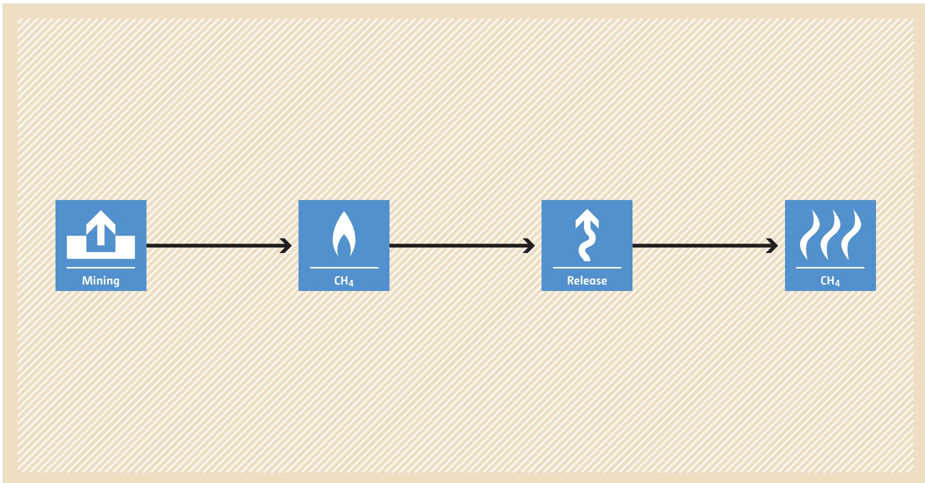
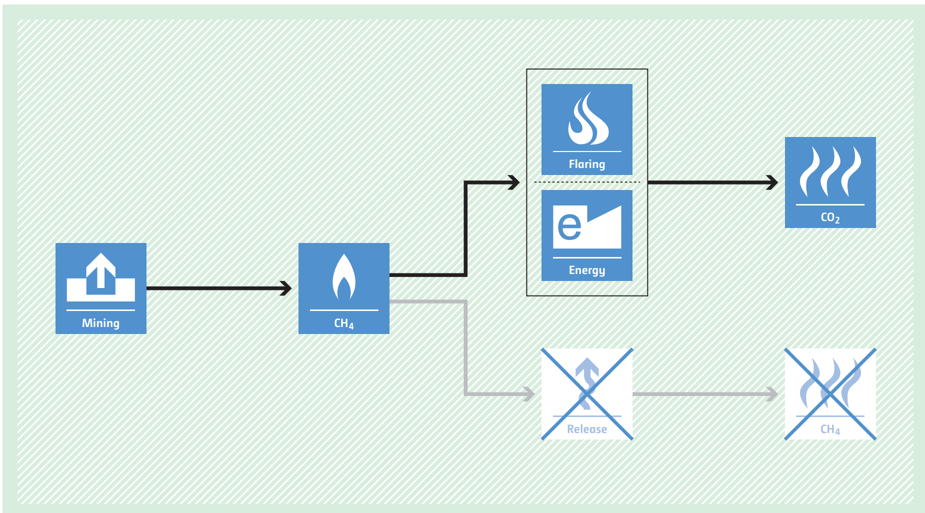
| **Typical project(s)** | Capture and utilization or destruction of methane from an operating mine, excluding mines where coal is extracted; capture and utilization or destruction of methane released from geological structures, e.g. methane released directly from holes drilled in geological formations specifically for mineral exploration and prospecting activities. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Avoidance of GHG emissions from underground, hard rock, precious and base metal mines. |
| **Important conditions under which the methodology is applicable** | • In case the project is capture and utilization or destruction of methane from an operating mine, the captured methane is utilized to produce electricity, motive power and/or thermal energy and/or destroyed through flaring. Prior to the start of the project all methane was released into the atmosphere or partially used for heat generation;<br>• In case the project is capture and utilization or destruction of methane released from geological structures, abandoned or decommissioned mines, as well as open cast mines are excluded. Coal extraction mines or oil shale, as well as boreholes or wells opened for gas/oil exploration or extraction do not qualify;<br>• Maximum outside diameter of the boreholes should not exceed 134 mm. |
| **Important parameters** | Monitored:<br>• Concentration of methane in extracted gas;<br>• Quantity of methane sent to power plant, boiler and gas grid for end users;<br>• Quantity of electricity and heat generated by the project. |
| **BASELINE SCENARIO**<br>Methane is emitted from operating mines and geological structures into the atmosphere. |  |
| **PROJECT SCENARIO**<br>Methane is captured and destroyed or utilized for energy generation. |  |

# **AM0065** Replacement of $SF_6$ with alternate cover gas in the magnesium industry

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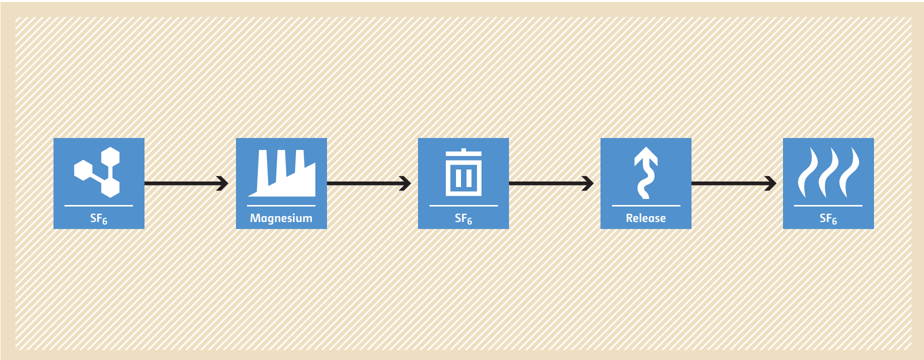
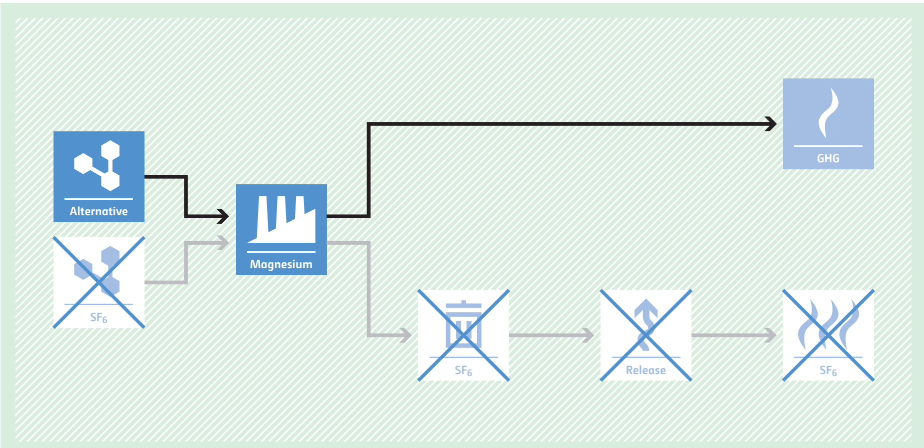
| **Typical project(s)** | Full or partial replacement of the use of cover gas $SF_6$, an inert gas used to avoid oxidation of molten magnesium in casting and alloying processes, by alternate cover gas (HFC134a, Perfluoro-2-methyl-3-pentanone ($CF_3CF_2C(O)CF(CF_3)_2$) or $SO_2$ using lean $SO_2$ technology), in existing facilities of magnesium metal cast industry. |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance.<br>Avoidance of $SF_6$ emissions by the use of alternate cover gas. |
| **Important conditions under which the methodology is applicable** | • Project of $SF_6$ replacement can be implemented in all segments of the magnesium metal cast industry, as defined in the methodology;<br>• The magnesium metal cast facility has an operating history of at least three years prior to the project implementation;<br>• If $SO_2$ is used as cover gas in the project, only “dilute $SO_2$” technology is used that meets the specifications provided in methodology;<br>• Local regulations in the host country regarding $SO_2$ emissions in the exhausting system should be complied with. If such regulations are not in place, the values of $SO_2$ emissions given in the methodology should be complied with. |
| **Important parameters** | At validation:<br>• Amount of magnesium manufactured in the most recent three years;<br>• $SF_6$ consumption in the magnesium cast facility in the most recent three years prior to the project implementation. |
| | Monitored:<br>• Amount of magnesium manufactured in the project;<br>• Consumption of alternate cover gas in the project;<br>• Consumption of SF6 or $CO_2$ in the project, if any. |
| **BASELINE SCENARIO**<br>$SF_6$ continues to be used as cover gas in magnesium metal cast industry, leading to its emission from the processes. |  |
| **PROJECT SCENARIO**<br>$SF_6$ is replaced with alternate cover gas, resulting in avoidance of $SF_6$ emissions. |  |

# AM0066 GHG emission reductions through waste heat utilisation for pre-heating of raw materials in sponge iron manufacturing process

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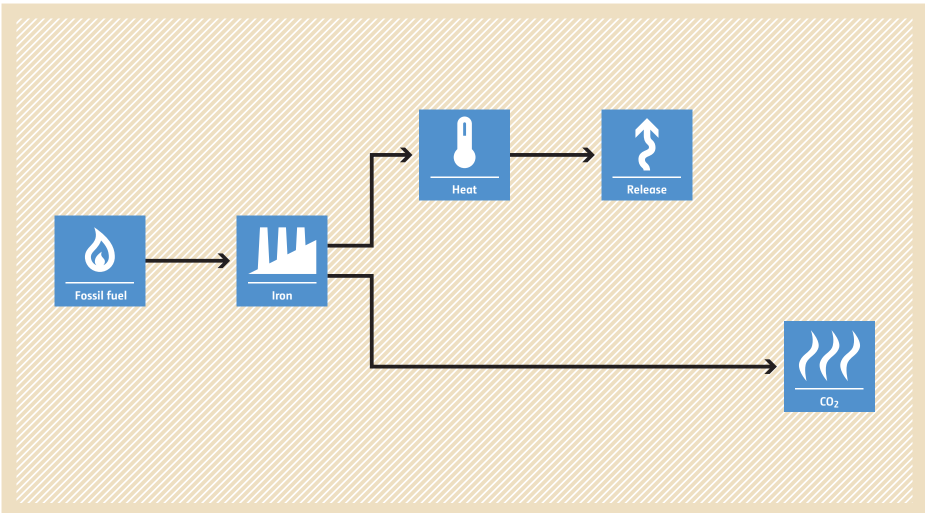
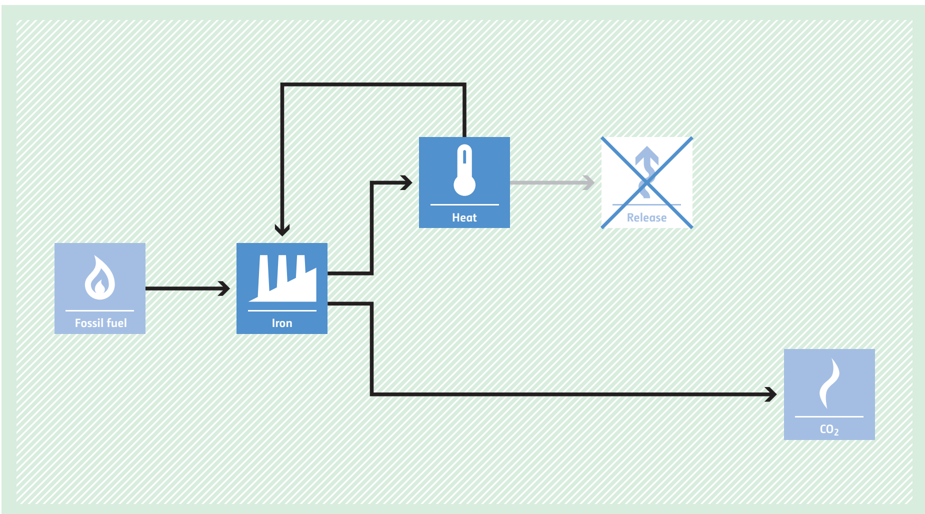
| **Typical project(s)** | Waste heat released from furnace(s)/kiln(s) is utilized to preheat raw material(s) in an existing or greenfield sponge iron manufacturing facility. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Energy efficiency improvement leading to reduced specific heat consumption. |
| **Important conditions under which the methodology is applicable** | • The project is implemented either for an individual furnace/kiln or a group of furnaces/kilns producing the same type of output;<br>• Waste heat to be utilized is generated in the project furnace(s)/kiln(s);<br>• Only solid matter without scrap/product rejects is used as raw material;<br>• In the project, the raw material is fed directly from the preheater to the furnace/kiln. However, the possibility to bypass the preheater equipment remains. |
| **Important parameters** | At validation:<br>• Historical production and fossil fuel consumption. |
| | Monitored:<br>• Quantity, chemical composition and physical state (including the percentage of the metallization) of raw materials and final product;<br>• Type and quantities of fossil fuel;<br>• Quantity of thermal and electrical (from the grid and from the captive power plant, respectively) energy consumed. |

**BASELINE SCENARIO**
Fossil fuel is fired for the process. The resulting heat from furnace(s)/kiln(s) is not utilized and instead vented.




**PROJECT SCENARIO**
Less fossil fuel is fired in the process. The heat from furnace(s)/kiln(s) is used to preheat raw material(s) before feeding it into the furnace(s)/kiln(s).



# AM0067 Methodology for installation of energy efficient transformers in a power distribution grid

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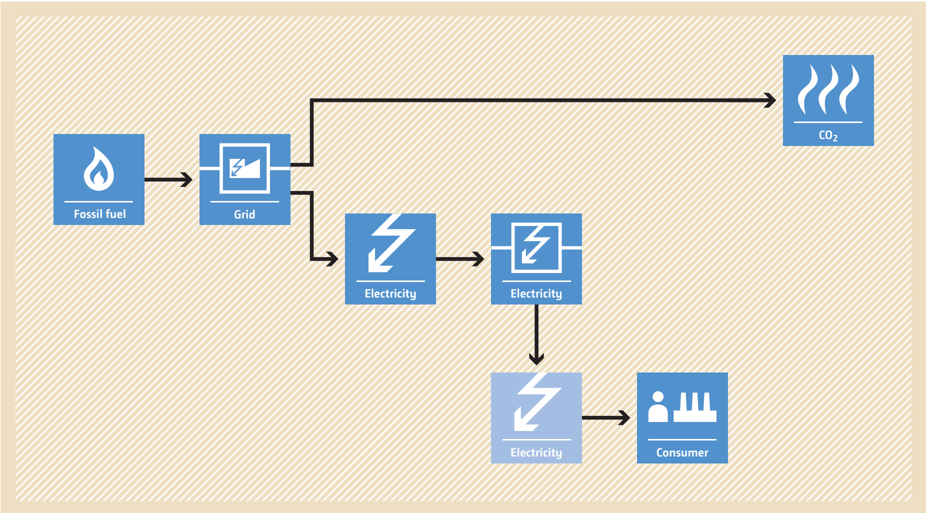
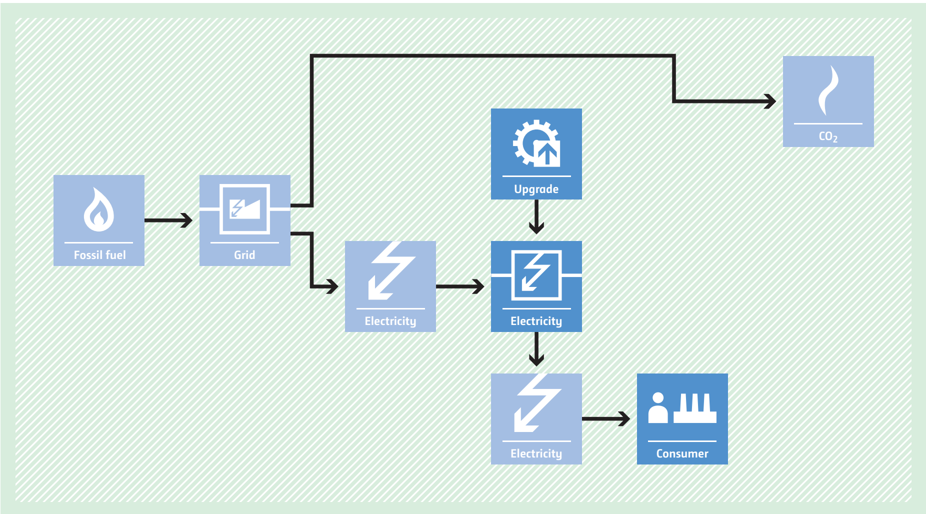
| **Typical project(s)** | Replacement of existing less-efficient transformers with more-efficient transformers in an existing distribution grid or the installation of new high-efficient transformers in new areas that are currently not connected to a distribution grid. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Implementation of high-efficient transformers reduces losses in the grid and thereby GHG emissions. |
| **Important conditions under which the methodology is applicable** | • Emission reductions due to reduction in no-load losses alone are claimed;<br>• Load losses, at rated load, of the transformers implemented under the project are demonstrated to be equal or lower than the load losses in transformers that would have been installed in absence of the project;<br>• Project proponent implements a scrapping system to ensure that the replaced transformers are not used in other parts of the distribution grid or in another distribution grid. |
| **Important parameters** | At validation:<br>• Average of no-load loss rate provided by the manufacturers of all type of transformers;<br>• Grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Cumulative number of transformers installed by the project as well as related load-loss rates and the black out rate. |

**BASELINE SCENARIO**
Less-efficient transformers are installed in existing distribution grids or will be installed in new distribution grids.




**PROJECT SCENARIO**
High-efficient transformers are installed in existing distribution grids or will be installed in new distribution grids resulting in lower electricity generation requirements and thereby a reduction of GHG emissions.



# **AM0068** Methodology for improved energy efficiency by modifying ferroalloy production facility

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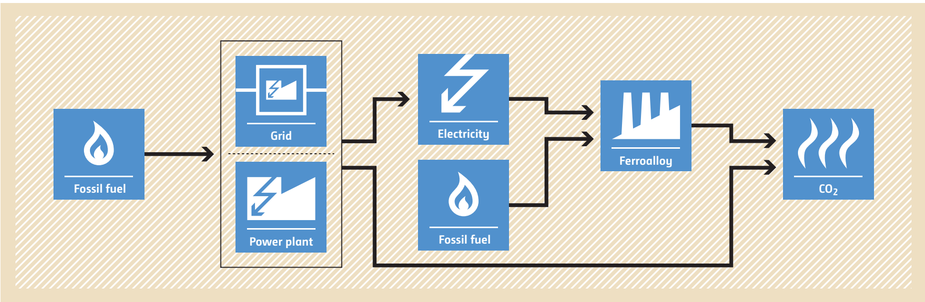
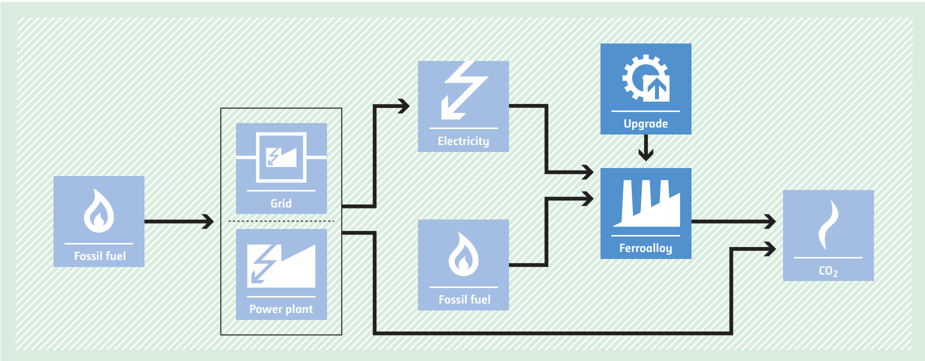
| **Typical project(s)** | The project is implemented to improve energy efficiency of an existing ferroalloy production facility. Improvement includes modification of existing submerged electric arc smelting furnace(s) into open slag bath smelting furnace(s) or modification of existing co-current rotary kilns into counter-current rotary kilns.<br><br>The existing facility is limited to the submerged electric arc smelting furnace(s) and rotary kilns producing only one type of ferroalloy, as defined by the composition of its ingredients. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Switch to more-efficient technology. |
| **Important conditions under which the methodology is applicable** | • The project includes at least the modification of "submerged bath electric furnaces" to "open slag bath melting furnaces" and can also include a modification of "co-current rotary kilns" to "counter-current rotary kilns";<br>• Only one type of ferroalloy is produced at the facility and its type and quality is not affected by the project and remains unchanged throughout the crediting period;<br>• Data for at least the three years preceding the implementation of the project is available to estimate the baseline emissions. |
| **Important parameters** | At validation:<br>• Quantity and quality of ferroalloys produced;<br>• Consumption of electricity and fossil fuels in rotary kilns and smelting furnaces;<br>• Grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Quantity and quality of ferroalloy produced;<br>• Consumption of electricity and fossil fuels in rotary kilns and smelting furnaces;<br>• Non energy-related carbon streams (quantities and carbon content of reducing agents and its volatiles, ore, slag forming material, non product stream, etc.). |
| **BASELINE SCENARIO**<br>Energy (fossil fuel and electricity) is used in a ferroalloy production facility, leading to $CO_2$ emissions. | <br> |
| **PROJECT SCENARIO**<br>Less energy (fossil fuel and electricity) is used in a ferroalloy production process, leading to lower $CO_2$ emissions. | <br> |

# AM0069 Biogenic methane use as feedstock and fuel for town gas production

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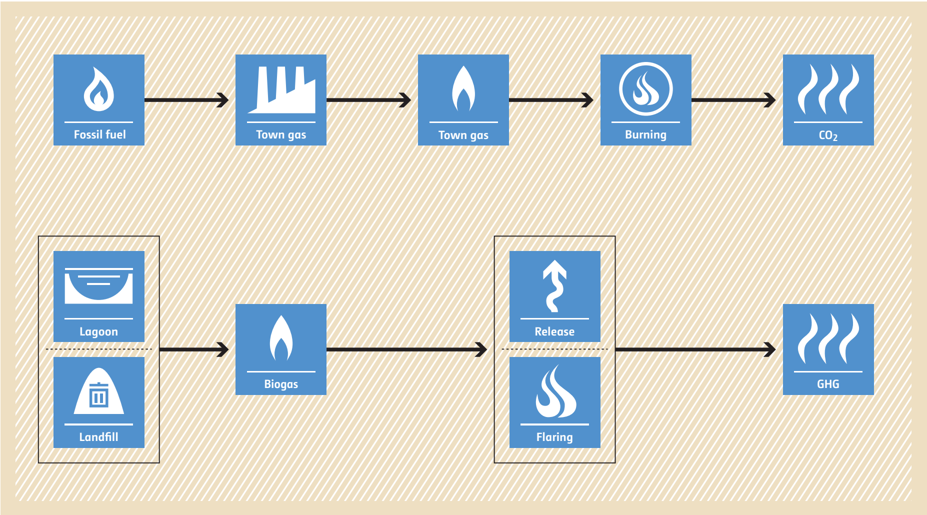
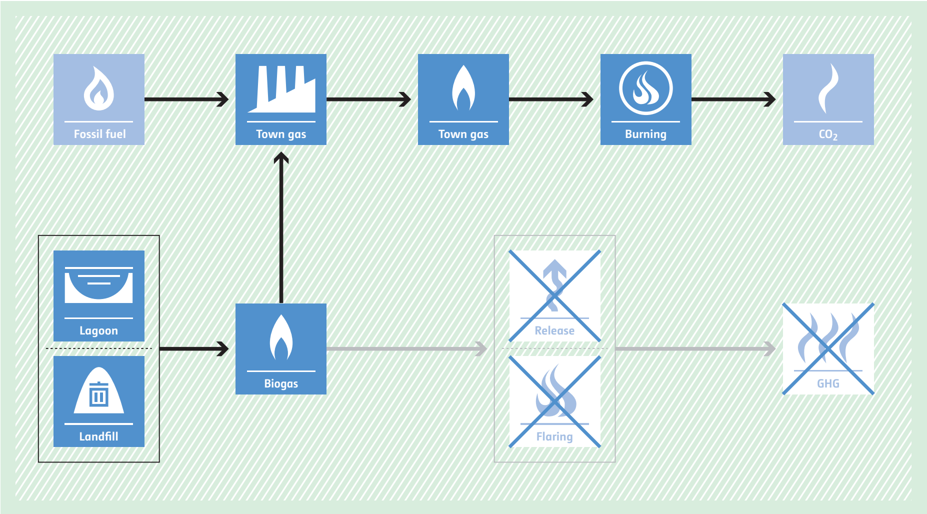
| **Typical project(s)** | Capture of biogas at a wastewater treatment facility or a landfill and use of the biogas to fully or partially substitute natural gas or other fossil fuels as feedstock and fuel for the production of town gas. |
| **Type of GHG emissions mitigation action** | • GHG destruction;<br>• Renewable energy;<br>• Feedstock switch.<br>$CH_4$ emissions are avoided and fossil fuel is replaced. |
| **Important conditions under which the methodology is applicable** | • There is no change in the quality of the produced town gas;<br>• Town gas consumer and/ or distribution grid are within the host country boundaries;<br>• Biogas is captured at an existing landfill site or wastewater treatment facility that has at least a three-year record of venting or flaring of biogas. Biogas would continue to be vented or flared in the absence of the project;<br>• Project is implemented in an existing town gas factory that used only fossil fuels, no biogas, for at least three years prior to the start of the project. |
| **Important parameters** | Monitored:<br>• Quantity and calorific value of town gas produced;<br>• Quantity and calorific value of the biogas and fossil fuel used as feedstock. |
| **BASELINE SCENARIO**<br>Venting or flaring of biogas at the site where it is captured and use of fossil fuel as feedstock for town gas production. | <br> |
| **PROJECT SCENARIO**<br>Capture of biogas from landfills and/or waste treatment plants and use of it to replace fossil fuel. | <br> |

# AM0070 Manufacturing of energy efficient domestic refrigerators

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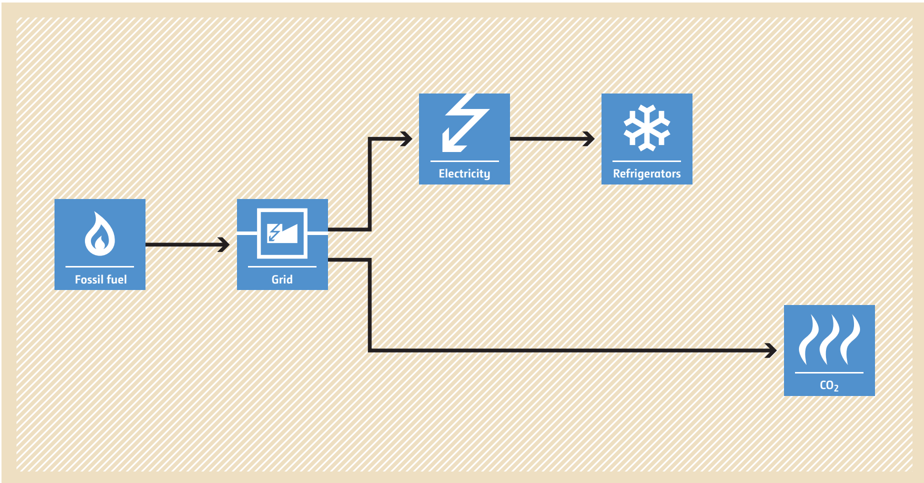
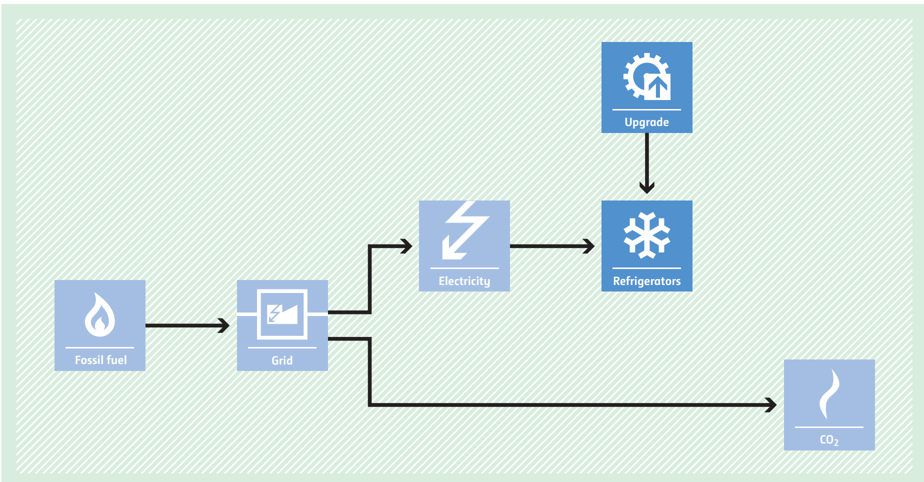
| **Typical project(s)** | Increase in the energy efficiency of manufactured refrigerators. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Increase in energy efficiency to reduce electricity consumed per unit of service provided. |
| **Important conditions under which the methodology is applicable** | • Refrigerators are used by households on a continuous basis;<br>• No increase in the GWP of refrigerants and foam blowing agents used;<br>• No change in the general type of refrigerators;<br>• If a labelling scheme is used to determine the rated electricity consumption of refrigerators, then it must cover 30% of the market share and include the most efficient refrigerators in the host country. |
| **Important parameters** | At validation:<br>• Autonomous improvement ratio;<br>• Information on historical sales (quantity, storage volumes, rated electricity consumption);<br>• Grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Quantity of refrigerators sold;<br>• Specifications (model, design type and volume class) of refrigerators sold;<br>• Electricity consumption of refrigerators in the monitoring sample group. |
| **BASELINE SCENARIO**<br>High electricity consumption by inefficient domestic refrigerators results in high $CO_2$ emissions from generation of electricity. |   |
| **PROJECT SCENARIO**<br>Lower electricity consumption by more-efficient domestic refrigerators results in less $CO_2$ emissions from generation of electricity. |   |

# AM0071 Manufacturing and servicing of domestic and/or small commercial refrigeration appliances using a low GWP refrigerant

Women and children

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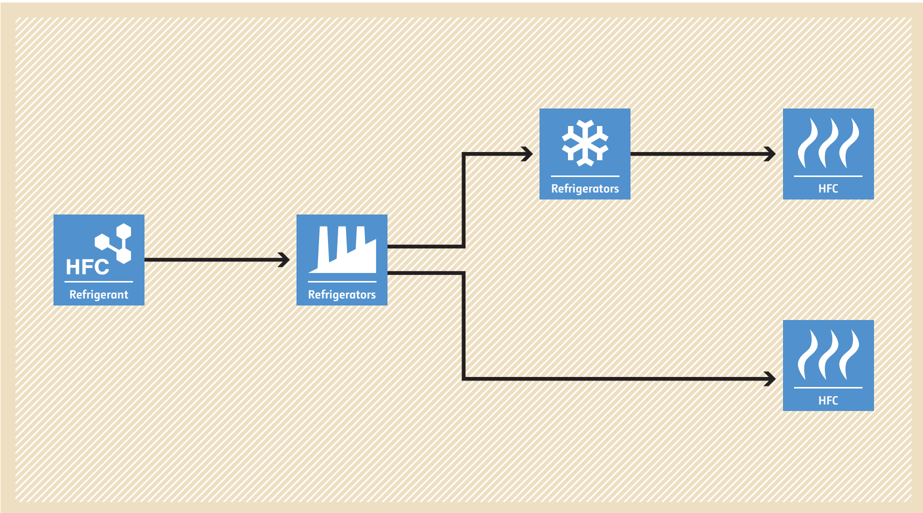
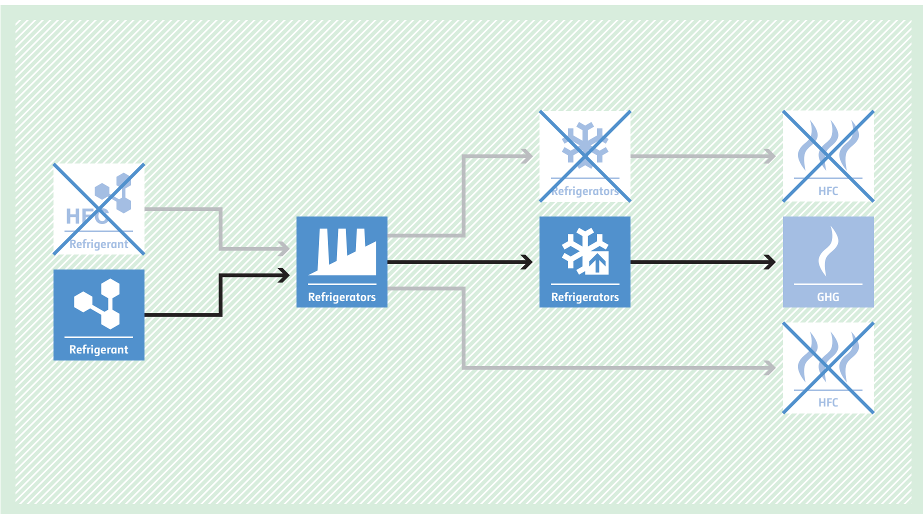
| **Typical project(s)** | Switching from a high GWP to low GWP refrigerant while manufacturing and refilling domestic and/or small commercial refrigeration appliances. |
| **Type of GHG emissions mitigation action** | • Feedstock switch.<br>Avoidance of GHG emission by switching from high-GWP refrigerant to low-GWP refrigerant. |
| **Important conditions under which the methodology is applicable** | • The manufacturer has been producing refrigeration appliances using HFC-134a for at least three years and has not been using low-GWP refrigerants prior to the start of the project;<br>• Only one low-GWP refrigerant is used in manufacturing and refilling of refrigeration appliances;<br>• The project does not lead to a decrease in energy efficiency;<br>• Imported refrigeration appliances shall not be included in the project;<br>• Less than 50% of the domestic refrigerant production use low GWP refrigerants. |
| **Important parameters** | At validation:<br>• Historical production of refrigerators sold in host country with initial charge. |
| | Monitored:<br>• Initial refrigerant charge in the project and its distribution losses;<br>• Quantities and models of appliances manufactured and exported;<br>• Number of reject units of refrigeration appliance model;<br>• Failure rate involving refrigerant recharge. |

**BASELINE SCENARIO**
Production of refrigeration appliances with high-GWP refrigerant.




**PROJECT SCENARIO**
Production of refrigeration appliances with low-GWP refrigerant.



# AM0072 Fossil fuel displacement by geothermal resources for space heating

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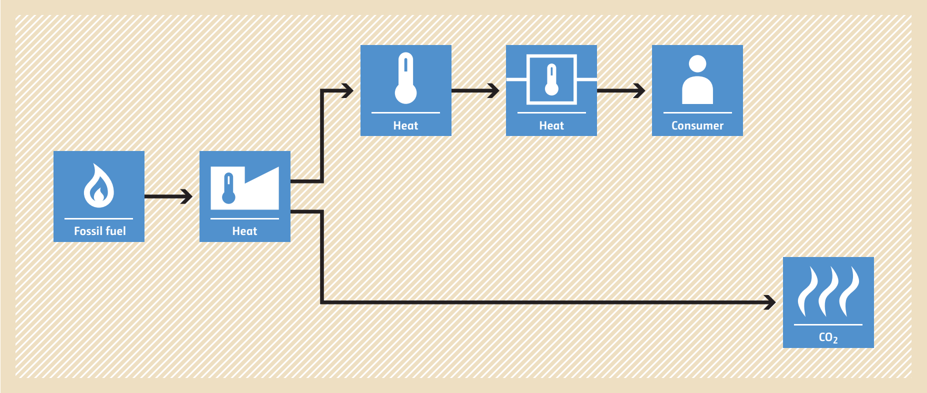
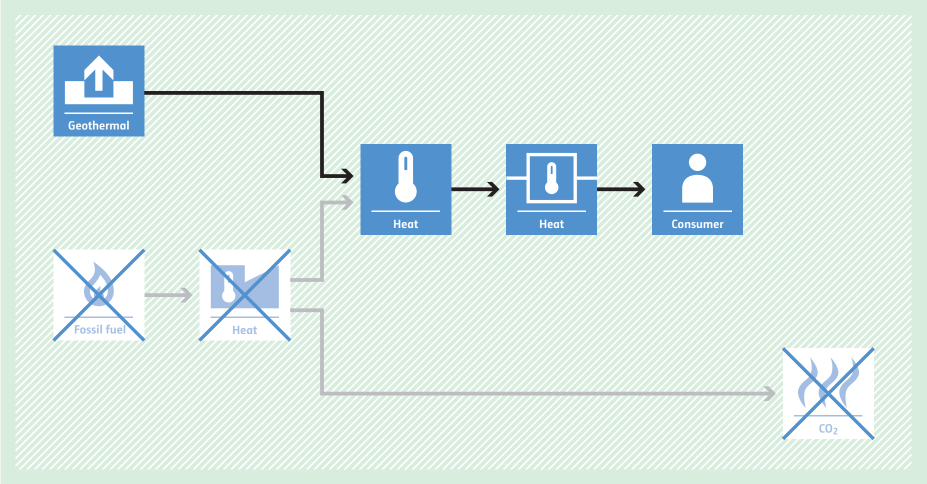
| **Typical project(s)** | Introduction of a centralized geothermal heat supply system for space heating in buildings. The geothermal heat supply system can be a new system in new buildings, the replacement of existing fossil fuel systems or the addition of extra geothermal wells to an existing system. |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Displacement of more-GHG-intensive thermal energy generation. |
| **Important conditions under which the methodology is applicable** | • Use geothermal resources for centralized space-heating system in residential, commercial and/or industrial areas;<br>• Use of GHG-emitting refrigerants is not permitted;<br>• The heat drawn from the geothermal water replaces, partially or completely, the use of fossil fuel in the baseline situation whereas a maximum increase of the previous capacity of 10% is eligible (otherwise a new baseline scenario has to be developed). |
| **Important parameters** | At validation:<br>• If applicable: three years of historical data for fossil fuel system, e.g. average thermal energy output or fuel consumption. |
| | Monitored:<br>• Temperature difference between inlet and outlet temperatures as well as flow rate at the downstream of the geothermal heat exchanger and the net heating area of the buildings included in the project boundary;<br>• Geothermal non-condensable gas ($CO_2$ and $CH_4$) produced after the implementation of the project. |
| **BASELINE SCENARIO**<br>Fossil fuel is used as energy source for space heating |  |
| **PROJECT SCENARIO**<br>Installation of a new geothermal system in new building(s), replacement of existing fossil fuel heating systems or expansion of capacity of an existing geothermal system instead of using fossil fuel. |  |

# AM0073 GHG emission reductions through multi-site manure collection and treatment in a central plant

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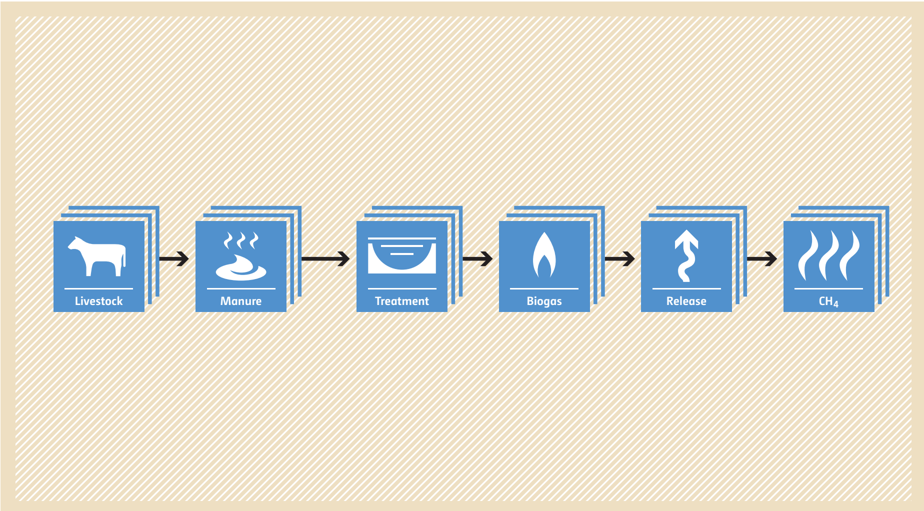
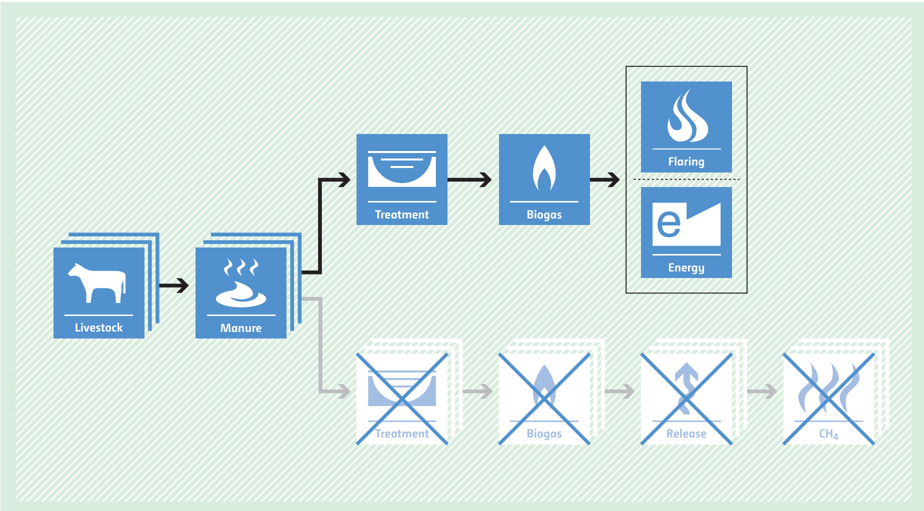
| **Typical project(s)** | Manure is collected by tank trucks, canalized and/or pumped from multiple livestock farms and then treated in a single central treatment plant. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Release of $CH_4$ emissions is avoided by combustion of methane. |
| **Important conditions under which the methodology is applicable** | • Livestock farm populations are managed under confined conditions;<br>• Manure is not discharged into natural water resources (e.g. rivers or estuaries);<br>• Animal residues are treated under anaerobic conditions in the baseline situation (conditions for this treatment process are specified);<br>• If treated residue is used as fertilizer in the baseline, then this end use continues under the project;<br>• Sludge produced during the project is stabilized through thermal drying or composting, prior to its final disposition/application. |
| **Important parameters** | Monitored:<br>• Volume, volatile solids and total nitrogen of the effluent and residues being treated or produced at the central treatment plant;<br>• Auxiliary energy used to run project treatment steps;<br>• Electricity or heat generated by the use of biogas. |

**BASELINE SCENARIO**
Anaerobic manure treatment systems without methane recovery result in $CH_4$ emissions.




**PROJECT SCENARIO**
Manure from farms is collected and processes in a central treatment plant. Methane is captured and flared or used. In case of energetic use of biogas, displacement of more-GHG-intensive energy generation.



# AM0074 New grid connected power plants using permeate gas previously flared and/or vented

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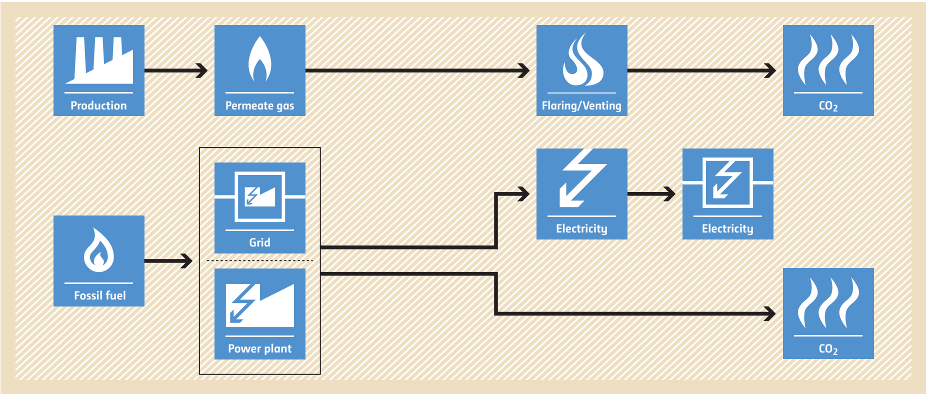
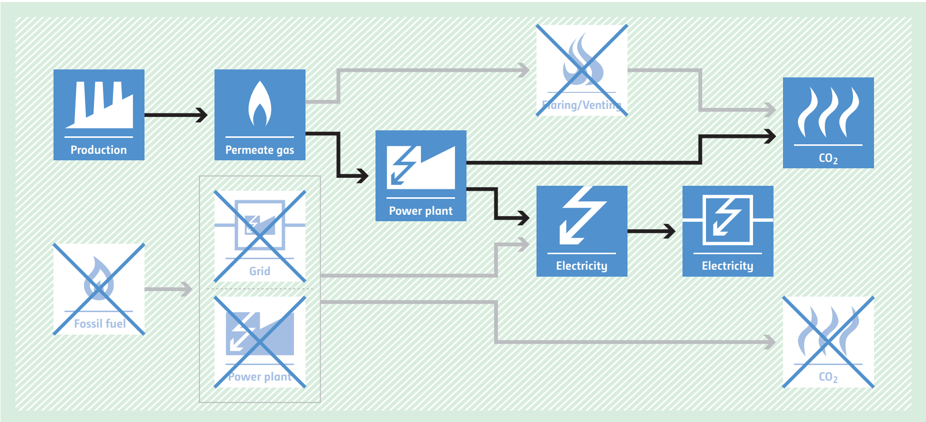
| **Typical project(s)** | Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant. |
| **Type of GHG emissions mitigation action** | • Low carbon electricity.<br>Displacement of electricity that would be provided by more-carbon-intensive means. |
| **Important conditions under which the methodology is applicable** | • The total amount of permeate gas from the gas processing facility was flared and/or vented for at least three years prior to the start of the project;<br>• The transportation of the permeate gas from the natural gas processing facility to the new power plant occurs through a dedicated pipeline that is established as part of the project and not used for the transportation of any other gases;<br>• All power produced by the project power plant is exported to the grid. |
| **Important parameters** | At validation:<br>• Fugitive $CH_4$ emission factor of all relevant equipment types used to transport the permeate gas;<br>• Low heating value of permeate gas;<br>• Annual average quantity of permeate gas flared and/or vented in three years prior to the start of the project activity. |
| | Monitored:<br>• Electricity supplied to the grid by the project power plant;<br>• Average mass fraction of methane in the permeate gas;<br>• Operation time of equipment used to transport the permeate gas;<br>• Baseline emission factor for project electricity system;<br>• Quantity of permeate gas used for electricity generation. |
| **BASELINE SCENARIO**<br>Permeate gas is flared and/or vented. Electricity is generated using processed natural gas or other energy sources than permeate gas, or electricity is provided by the grid. |  |
| **PROJECT SCENARIO**<br>Permeate gas, previously flared and/or vented at the existing natural gas processing facility, is used as fuel in a new grid-connected power plant. |  |

# AM0075 Methodology for collection, processing and supply of biogas to end-users for production of heat

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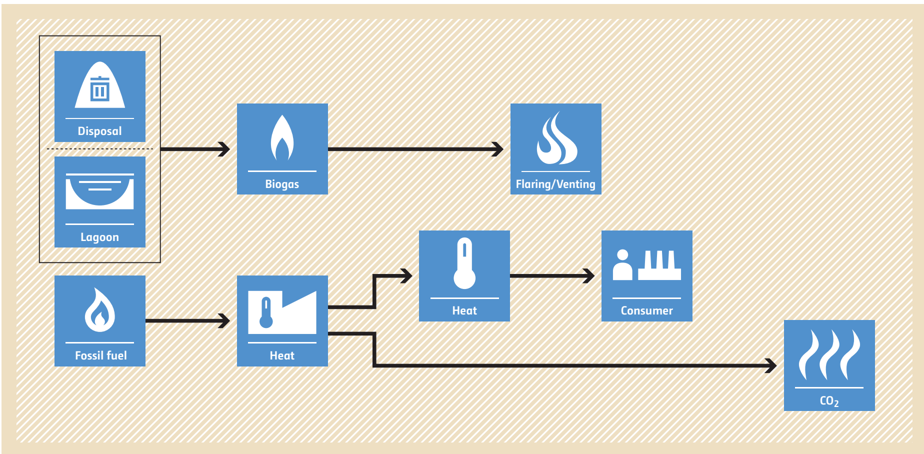
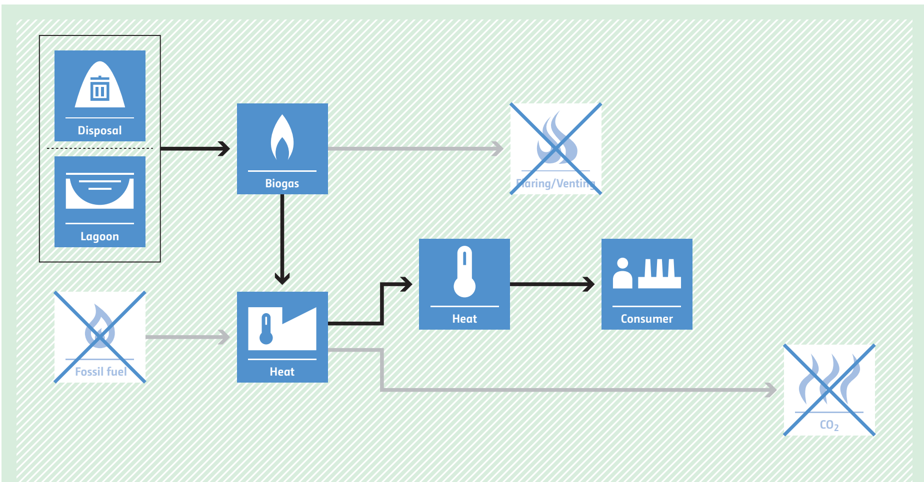
| **Typical project(s)** | Processing and upgrading the biogas collected from biogas producing site(s) in a new biogas processing facility and supplying it to existing end-user(s) to produce heat in heat generation equipments for on-site use. |
| **Type of GHG emissions mitigation action** | • GHG destruction;<br>• Renewable energy.<br>Switching from more-carbon-intensive fuel to biogas that was previously flared or vented. |
| **Important conditions under which the methodology is applicable** | • The biogas is obtained from one or several existing biogas producing site(s) that have to be identified ex ante;<br>• The biogas was either vented or flared prior to implementation of the project;<br>• All heat generation equipments included in the project have to be identified ex ante, and it has to be demonstrated that these were using only fossil fuel prior to implementation of the project;<br>• Any transportation of biogas or processed biogas occurs only through dedicated pipelines or by road vehicles. |
| **Important parameters** | Monitored:<br>• Amount and net calorific value of processed biogas supplied to the boiler or heat generation equipment(s);<br>• Amount of the steam or heat produced in the boiler or heat generation equipment(s);<br>• Amount and net calorific value of fossil fuel used in the boiler or heat generation equipment. |

**BASELINE SCENARIO**
Use of fossil fuel in heat generation equipments and biogas is flared or vented.




**PROJECT SCENARIO**
Upgraded biogas burned in the heat generation equipments avoiding the use of fossil fuel.



# AM0076 Methodology for implementation of fossil fuel trigeneration systems in existing industrial facilities

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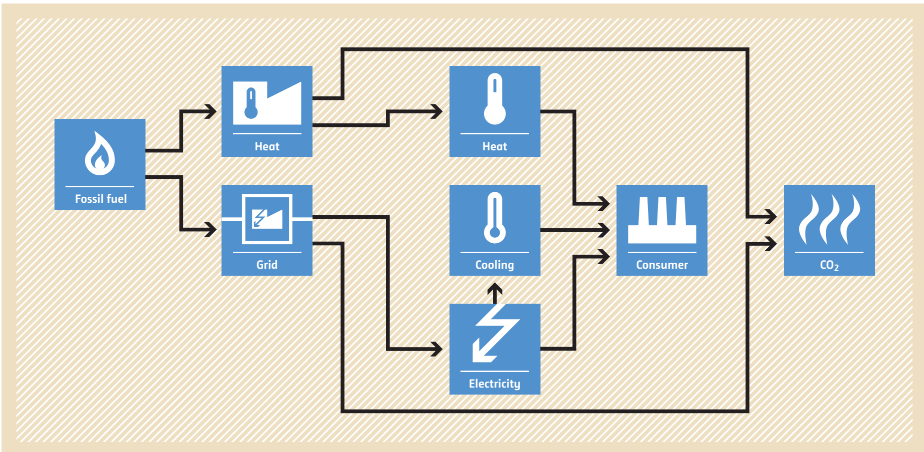
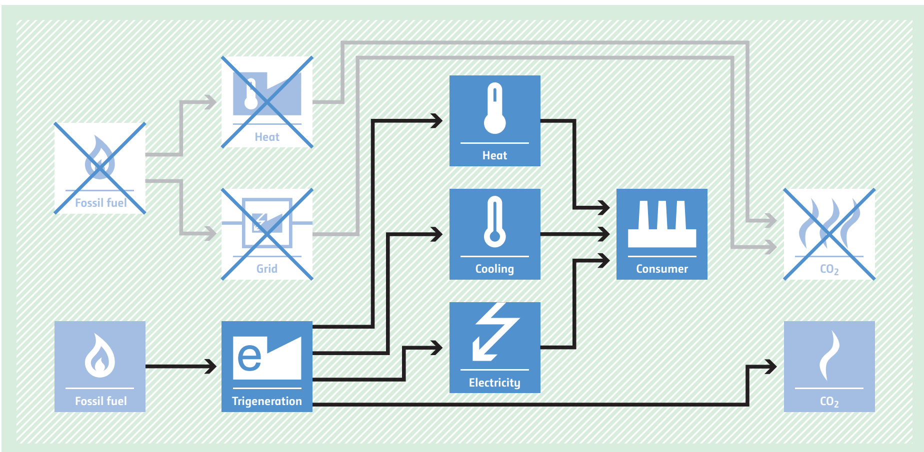
| **Typical project(s)** | Installation of an on-site fossil-fuel-based trigeneration plant to supply electricity, steam and chilled water to an industrial facility. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of electricity, heat and cooling that would be provided by more-carbon-intensive means. |
| **Important conditions under which the methodology is applicable** | • The baseline is the separate supply of electricity from the grid, heat supplied by an on-site fossil fuel fired boiler and chilled water from on-site electrical compression chillers;<br>• There have been no cogeneration (CHP) or trigeneration (CCHP) systems operating in the industrial facility prior to the project;<br>• No steam or chilled water is exported in the project;<br>• Chillers in the project are heat driven (absorption chillers). |
| **Important parameters** | At validation:<br>• Output efficiency of the baseline boiler;<br>• Power consumption function of the baseline chiller. |
| | Monitored:<br>• Electricity produced/purchased/sold by the trigeneration plant;<br>• Quantity of fuels used in the trigeneration plant;<br>• Quantity, temperature and pressure of steam produced by the trigeneration plant;<br>• Quantity and temperature of chilled water produced by the trigeneration plant. |

**BASELINE SCENARIO**
Separate supply of electricity from the grid, chilled water using grid electricity and steam by a fossil-fuel-fired boiler.




**PROJECT SCENARIO**
A fossil fuel-fired trigeneration plant generates directly at the industrial facility electricity, steam and chilled water resulting in overall lower $CO_2$ emissions.



# **AM0077** Recovery of gas from oil wells that would otherwise be vented or flared and its delivery to specific end-users

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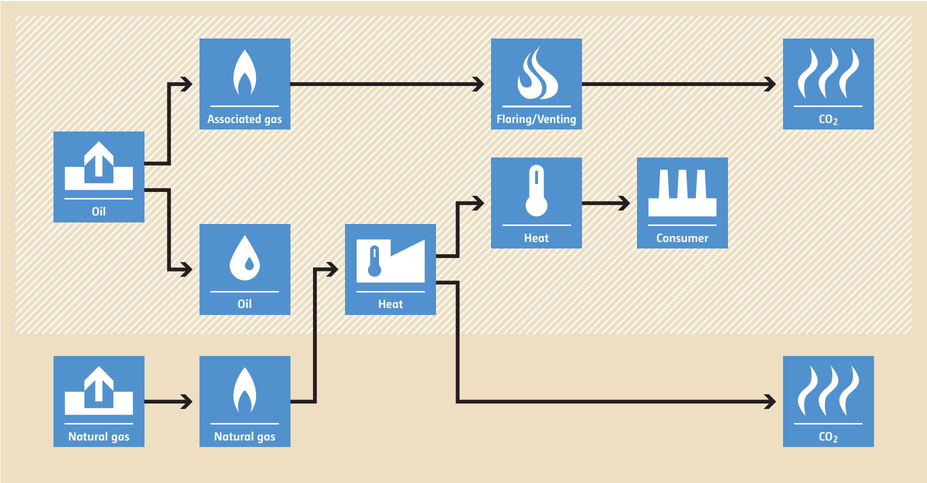
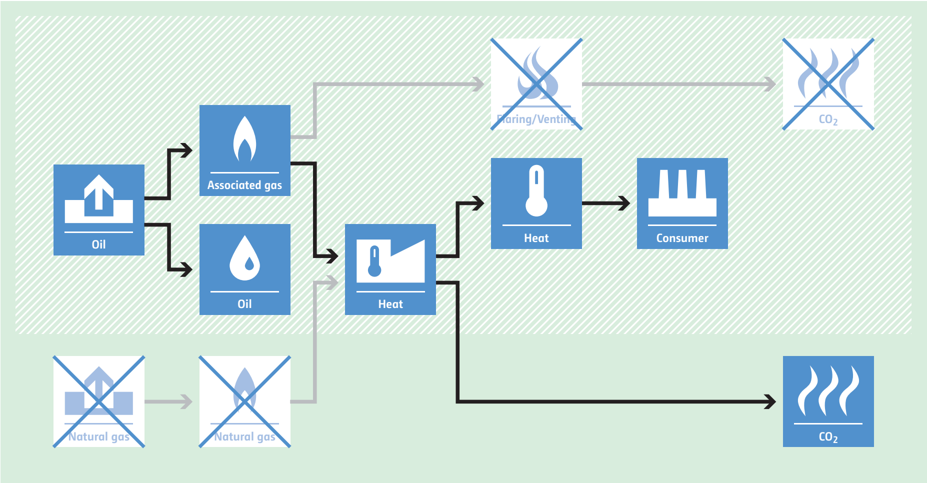
| **Typical project(s)** | Associated gas from oil wells that was previously flared or vented, is recovered and processed in a new gas processing plant along with, optionally, non-associated gas. The processed gas is delivered to clearly identifiable specific end-user(s) by means of CNG mobile units and/or delivered into an existing natural gas pipeline. |
| **Type of GHG emissions mitigation action** | • Fuel switch;<br>Recovery of associated gas from oil wells that would otherwise be flared or vented for displacement of non-associated gas in a new gas processing plant. |
| **Important conditions under which the methodology is applicable** | • The recovered gas comes from oil wells that are in operation and producing oil at the time. Records of flaring or venting of the associated gas are available for at least three years;<br>• The processed gas is consumed in the host country(ies) only;<br>• If the project oil wells include gas-lift systems, the gas-lift gas has to be associated gas from the oil wells within the project boundary;<br>• The natural gas can be used only in heat generating equipment. |
| **Important parameters** | Monitored:<br>• Quantity and carbon content of gas measured at various points, i.e. recovered associated gas, non-associated gas from natural gas wells, gas or other fossil fuel consumed on site, gas delivered to end-user(s), gas delivered to natural gas pipeline;<br>• If applicable: quantity and net calorific value of fuel consumed in vehicles for transportation of CNG. |
| **BASELINE SCENARIO**<br>Associated gas from oil wells is flared or vented and end users meet their energy demand using other fossil fuel. |  |
| **PROJECT SCENARIO**<br>Associated gas from oil wells is recovered instead of flared or vented and displaces the use of other fossil fuel by the end-users. |  |

# **AM0078** Point of use abatement device to reduce $SF_6$ emissions in LCD manufacturing operations

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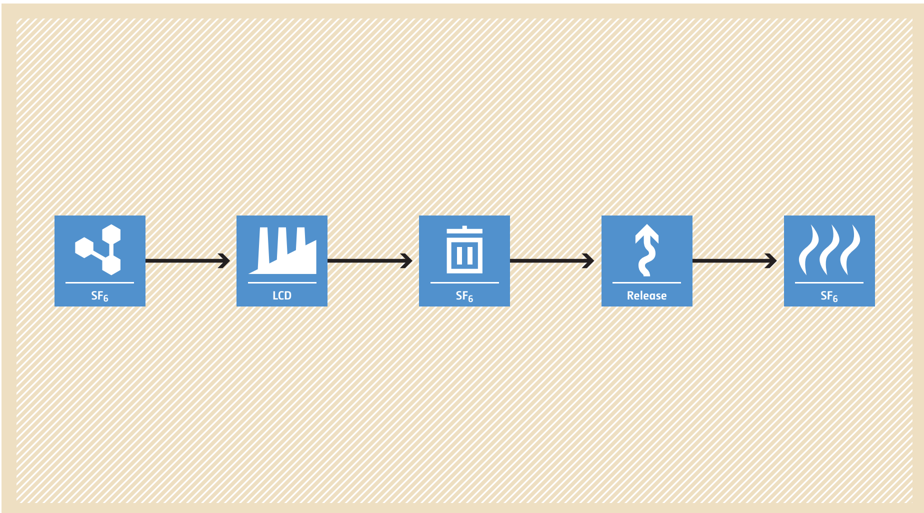
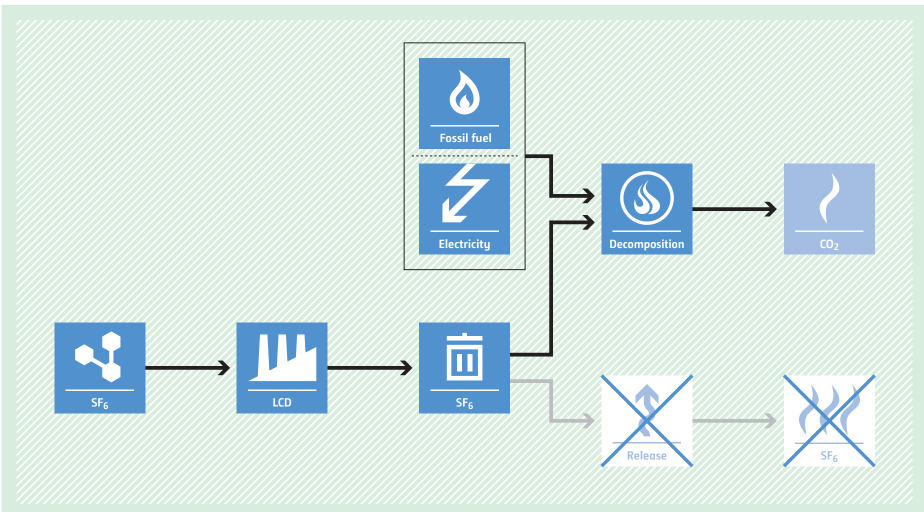
| **Typical project(s)** | Installation of a combustion or thermal abatement device to destroy $SF_6$ emissions from an LCD etching plant. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Combustion or thermal destruction of $SF_6$ emissions. |
| **Important conditions under which the methodology is applicable** | • Production lines with at least three years of information about $SF_6$ purchase and consumption and production of LCD substrate by January 31, 2009;<br>• There is no local law or regulation that mandates decomposition, destruction, recycling or substitution of $SF_6$ or any component of exhaust gases containing $SF_6$;<br>• The $SF_6$ destruction should occur at the same industrial site where $SF_6$ is used, and the $SF_6$ destroyed is not imported from other facilities. |
| **Important parameters** | At validation:<br>• $SF_6$ consumption in the most recent three years;<br>• Production of LCD substrate in the most recent three years. |
| | Monitored:<br>• Mass of $SF_6$ gas entering and existing the abatement device;<br>• $SF_6$ consumption in the project;<br>• Production of LCD substrate;<br>• Electricity and/or fuel consumption for the operation of the abatement device. |

**BASELINE SCENARIO**
$SF_6$ is released to the atmosphere after being used in the etching of LCD units.




**PROJECT SCENARIO**
$SF_6$ is recovered and destroyed in an abatement unit located after the etching unit.



# AM0079 Recovery of SF6 from gas insulated electrical equipment in testing facilities

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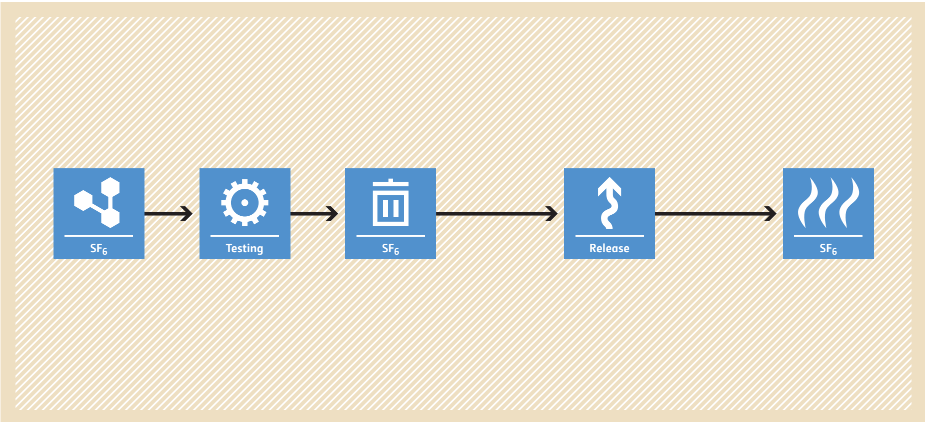
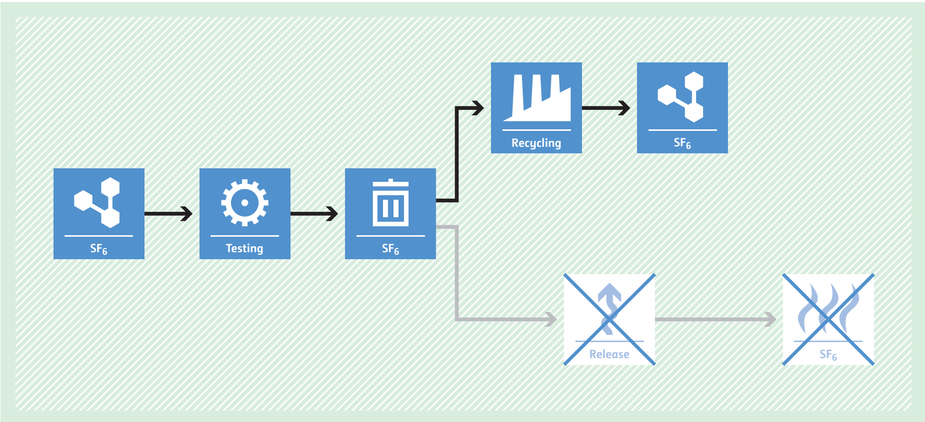
| **Typical project(s)** | Installation of a recovery system for used $SF_6$ gas that would be vented after the testing of gas-insulated electrical equipment at a testing facility, and then reclamation of the recovered $SF_6$ gas at an $SF_6$ production facility. |
| **Type of GHG emissions mitigation action** | • GHG formation avoidance.<br>Avoidance of $SF_6$ emissions by recovery and reclamation of the $SF_6$ emissions. |
| **Important conditions under which the methodology is applicable** | • The $SF_6$ recovery site uses $SF_6$ in the testing of gas-insulated electrical equipment, which are performed as part of a rating process, or during development or production of new electrical equipment;<br>• The recovered gas is reclaimed by using it as a feedstock in the production of new $SF_6$ on the premises of an existing $SF_6$ production facility;<br>• The testing considered for the project is electrical tests of medium and high voltage rated equipment (>1 kV);<br>• Before the project implementation, $SF_6$ gas used in the equipment for the tests is vented after testing. |
| **Important parameters** | At validation:<br>• Mass of $SF_6$ that is vented during testing for at least one year of historical data;<br>• Concentration of $SF_6$ in a recovery cylinder for at least one year of historical data. |
| | Monitored:<br>• Mass of $SF_6$ that is filled into each gas-insulated electrical equipment;<br>• Mass of $SF_6$ recovered at the recovery site and used as feedstock at the reclamation site;<br>• Concentration of $SF_6$ in a recovery cylinder. |
| **BASELINE SCENARIO**<br>$SF_6$ is released to the atmosphere after the completion of the test of a gas-insulated electrical equipment. |  |
| **PROJECT SCENARIO**<br>$SF_6$ used during the test is recovered and transported to a reclamation facility where the recovered gas will be re-injected in the stream to produce new $SF_6$. |  |

# AM0080 Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater treatment plants

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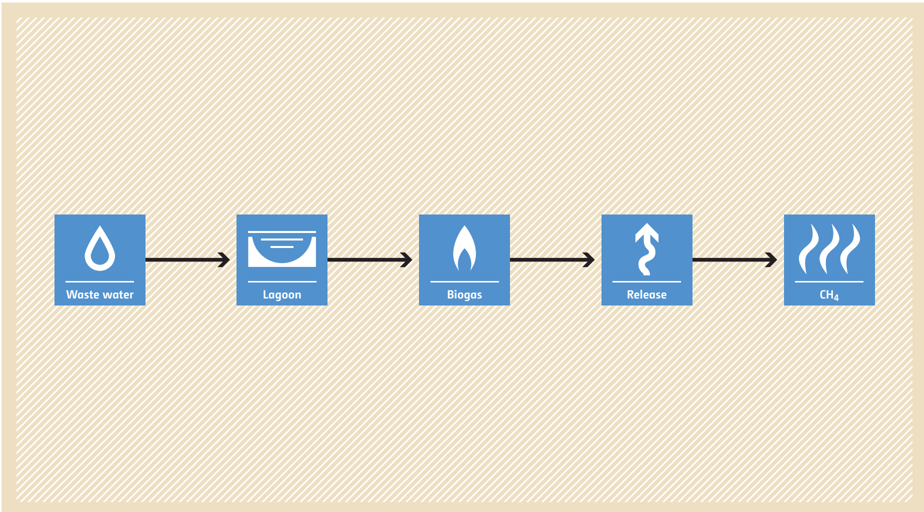
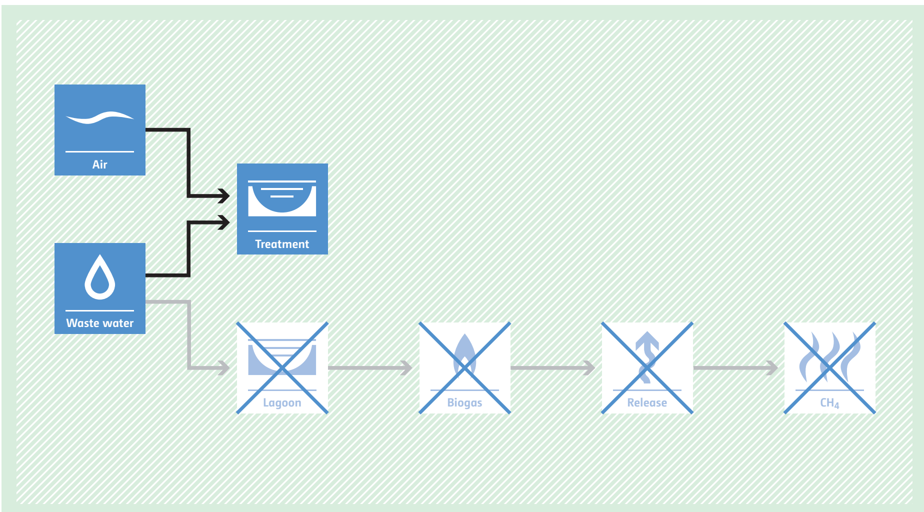
| **Typical project(s)** | Implementing a new aerobic wastewater treatment plant for the treatment of domestic and/or industrial wastewater, with sludge treated either in the same manner as the baseline, or in a new anaerobic digester with biogas capture. The biogas is either flared and/or used to generate electricity and/or heat. |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance.<br>Avoidance of $CH_4$ emissions from wastewater treatment. |
| **Important conditions under which the methodology is applicable** | • The project either replaces an existing anaerobic open lagoon system, with or without conversion of the sludge treatment system, or is an alternative to a new to be built anaerobic open lagoon system;<br>• Loading in the wastewater streams has to be high enough to ensure that algal oxygen production can be ruled out in the baseline;<br>• The average depth of the existing or new to be built anaerobic open lagoons system is at least one metre and residence time of the organic matter is at least 30 days. |
| **Important parameters** | Monitored:<br>• Quantity and average chemical oxygen demand of the wastewater that is treated;<br>• Electricity and heat generated with biogas from the new anaerobic digester, if applicable;<br>• Quantity of produced sludge;<br>• Fossil fuel, electricity and transportation needed to operate the project. |

**BASELINE SCENARIO**
Wastewater would have been treated in an anaerobic open lagoon system without methane recovery and flaring. Sludge would have been dumped or left to decay, or dried under controlled and aerobic conditions and then disposed to a landfill with methane recovery or used in soil application.




**PROJECT SCENARIO**
Installation of a new aerobic wastewater treatment plant. Sludge is treated either the same way as the baseline or in a new anaerobic digester with the biogas capture.



# AM0081 Flare or vent reduction at coke plants through the conversion of their waste gas into dimethyl ether for use as a fuel

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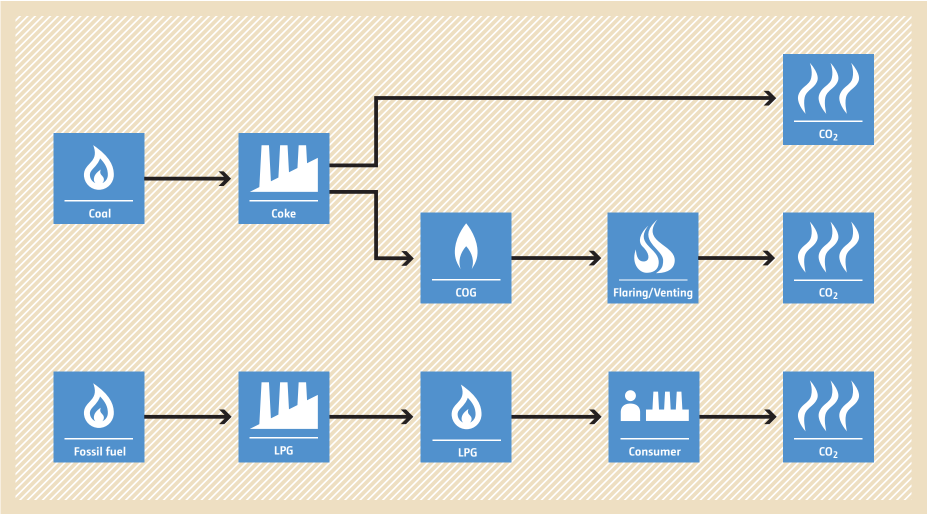
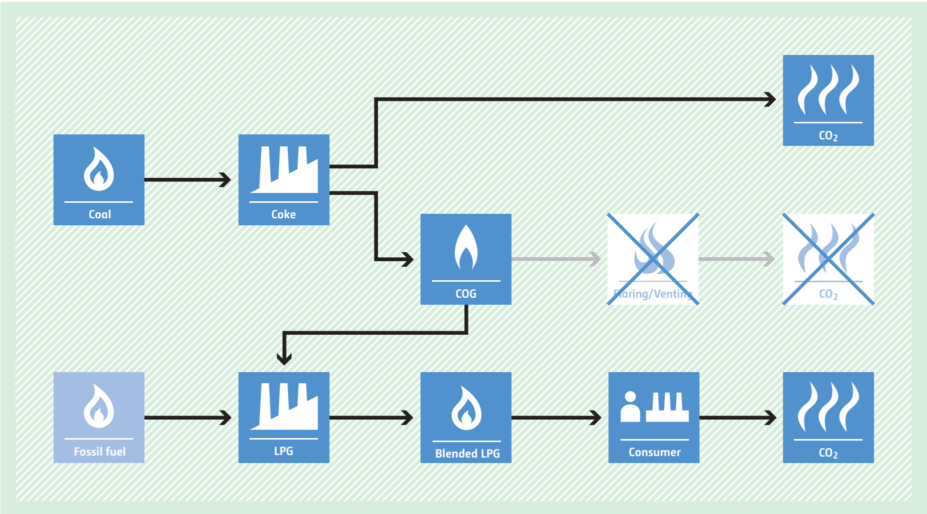
| **Typical project(s)** | Construction of a new dimethyl ether (DME) facility to utilize a previously vented or flared stream of Coke Oven Gas (COG). |
| **Type of GHG emissions mitigation action** | • Fuel switch.<br>Use of a previously vented source of carbon for the production of DME and use of DME for LPG blending. |
| **Important conditions under which the methodology is applicable** | • The project is a newly built DME plant which will supply DME to LPG processing facilities for blending purposes;<br>• The history of the coke plant is the venting or flaring of COG for at least three years;<br>• Bituminous coal remains the sole coking coal for the coke plant;<br>• COG is the only carbon source used for DME production. |
| **Important parameters** | At validation:<br>• Historical coal consumption and coke production in coke plants. |
| | Monitored:<br>• The type and amount of coal consumed in each coke plant (for process and fuel);<br>• The quantity of fossil fuels combusted as a result of the project (i.e. in the operation of the DME production facility or power plant);<br>• Electricity consumption in DMR plant. |
| **BASELINE SCENARIO**<br>Venting or flaring of COG. Use of unblended LPG fuel resulting in high $CO_2$ emissions. |  |
| **PROJECT SCENARIO**<br>Use of all or part of the wasted COG to produce DME. This DME is supplied to LPG processing facilities for blending purpose. Thus, use of LPG is reduced. |  |

# AM0082 Use of charcoal from planted renewable biomass in the iron ore reduction process through the establishment of a new iron ore reduction system

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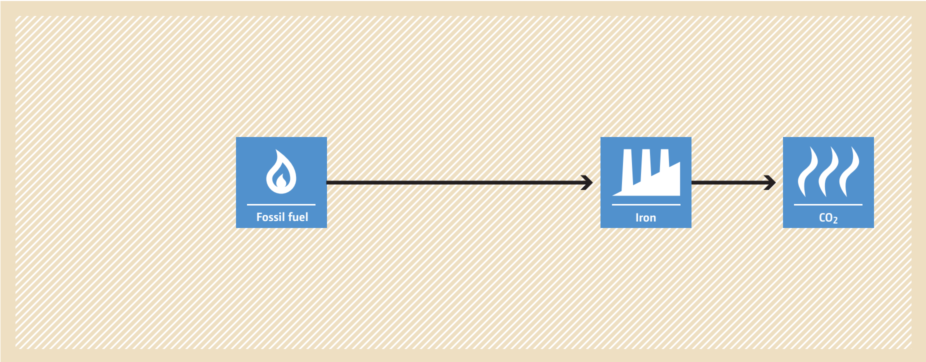
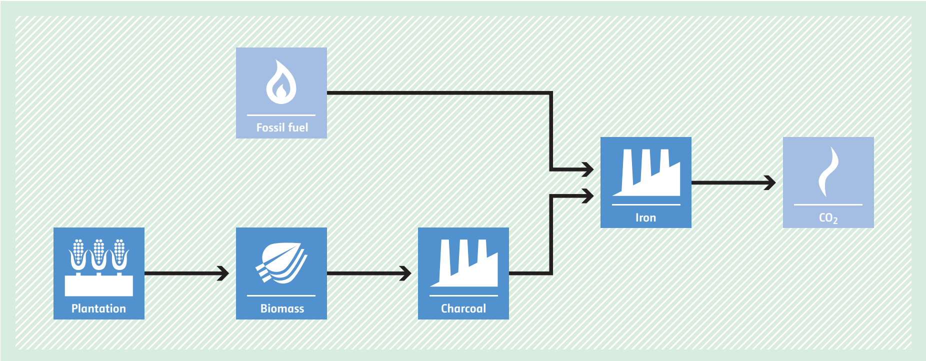
| **Typical project(s)** | Use renewable reducing agents such as charcoal produced from dedicated plantations instead of fossil fuel based reducing agents, in the iron ore reduction process using blast furnace technology. The project should include one or combination of the following new investment types: investment in dedicated plantations for the supply of reducing agents; or establishment of specific long-term binding contracts for the supply of reducing agents; or refurbishment/replacement of blast furnace; or establishment/acquisition of blast furnace; or adaptation of existing blast furnace to the use of charcoal. |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Switch to a renewable source of carbon for the reduction of iron in blast furnaces. |
| **Important conditions under which the methodology is applicable** | • The renewable biomass used for charcoal production originates from a dedicated plantation in a tropical location of the host country where flood irrigation is not expected to take place;<br>• The dedicated plantations should be located in the host country and under the control of project participants either directly owned or controlled through a long term contract;<br>• Evidence should be available to demonstrate that the land of dedicated plantation falls into one of the following categories: grasslands; forest plantation after its last rotation or degraded areas;<br>• The project does not use imported mineral coke or acquire biomass from the market. |
| **Important parameters** | At validation:<br>• Carbonization yield. |
| | Monitored:<br>• Parameters related to emissions from reducing agents production (carbonization and coal distillation);<br>• Parameters related to iron ore reduction facility such as fuel/ reducing agent consumption, their emission factors, hot metal produced and its carbon content etc. |
| **BASELINE SCENARIO**<br>The hot metal in iron and steel plant is produced using reducing agents of fossil fuel origin, resulting into high amount of $CO_2$ emissions. | <br> |
| **PROJECT SCENARIO**<br>The new iron ore reduction system partially or fully replaces fossil-fuel-based reducing agent with charcoal of renewable origin, resulting into reduction of $CO_2$ emissions. | <br> |

# AM0083 Avoidance of landfill gas emissions by in-situ aeration of landfills

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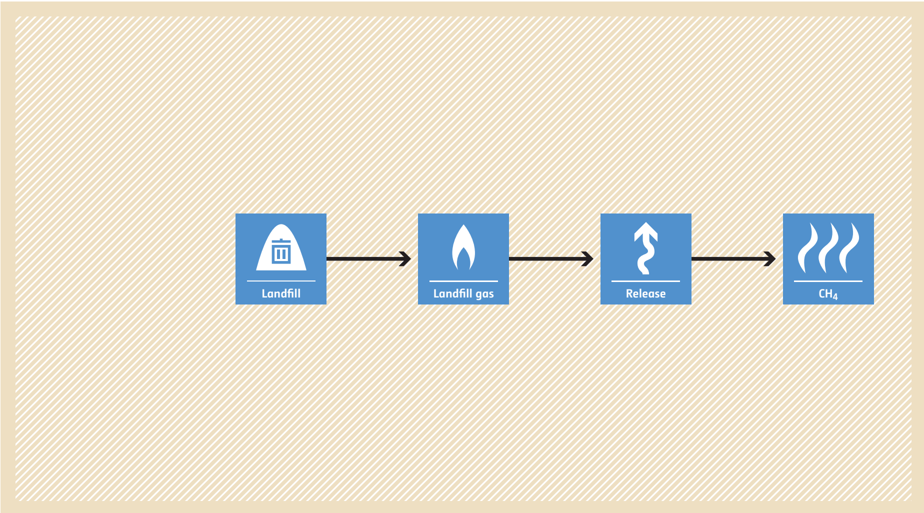
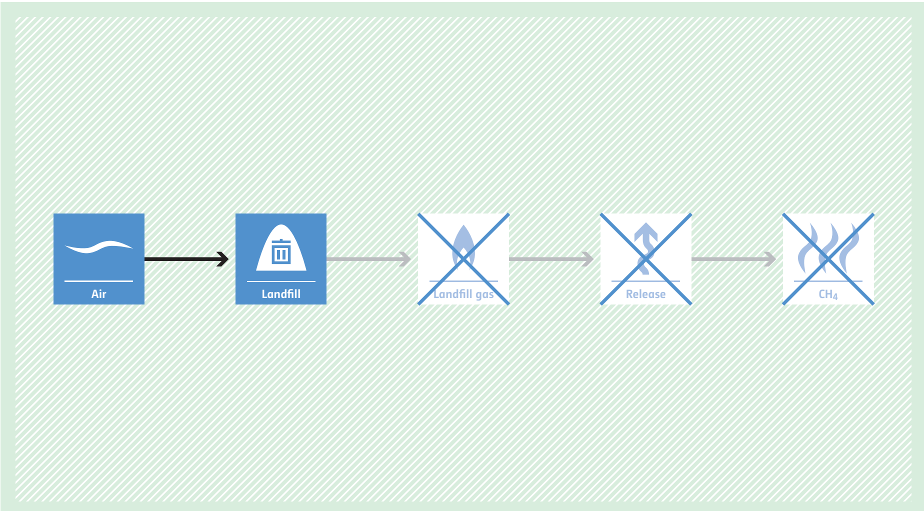
| **Typical project(s)** | Landfilled waste is treated aerobically on-site by means of air venting (overdrawing) or low pressure aeration with the objective of avoiding anaerobic degradation processes. |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance.<br>The project avoids $CH_4$ emissions from landfills. |
| **Important conditions under which the methodology is applicable** | • Aeration techniques used are either air venting (overdrawing) or low pressure aeration;<br>• Treatment of landfilled waste is in closed landfills or closed landfill cells;<br>• If mandatory environmental regulations require the collection and flaring of landfill gas, the corresponding compliance rate is below 50% in the host country;<br>• Closed cells of operating or closed landfills might be eligible as long as they are physically distinct from the remaining parts of the landfill. |
| **Important parameters** | Monitored:<br>• Amount of degradable waste disposed in the landfill;<br>• Potential methane generation capacity;<br>• Vented and surface emissions: volume and methane and nitrous oxide content. |
| **BASELINE SCENARIO**<br>Partial or total release of landfill gas from the closed landfill or the closed landfill cell. |  |
| **PROJECT SCENARIO**<br>In-situ aeration of the closed landfill or the closed landfill cell reduces GHG emissions. |  |

# AM0084 Installation of cogeneration system supplying electricity and chilled water to new and existing consumers

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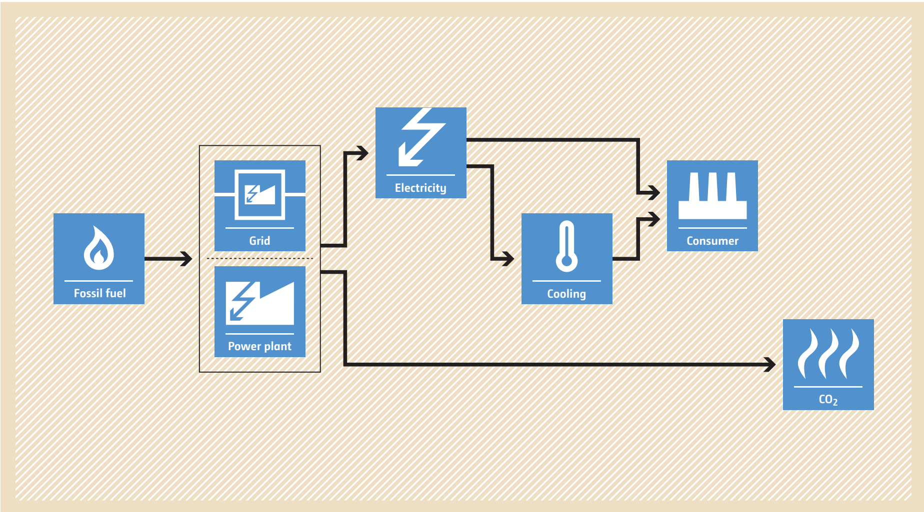
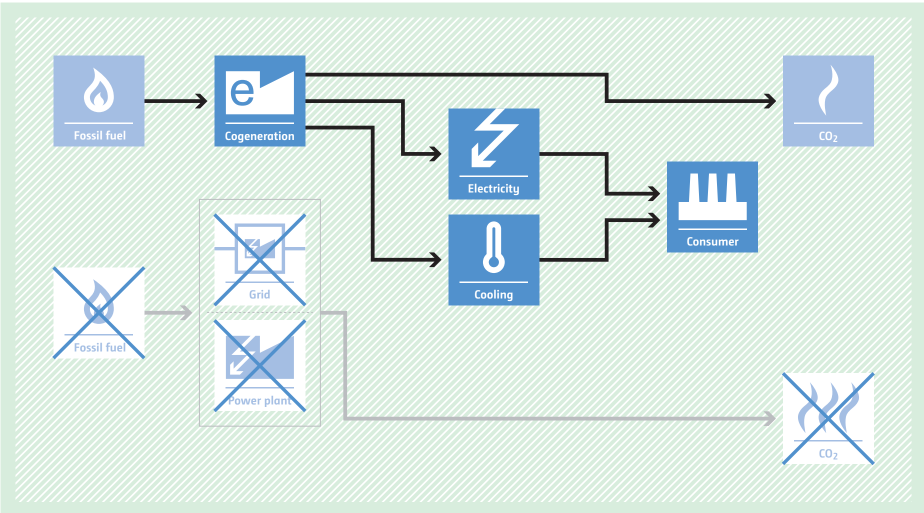
| **Typical project(s)** | Installation of a new cogeneration plant producing chilled water and electricity. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of electricity and cooling that would be provided by more-carbon-intensive means. |
| **Important conditions under which the methodology is applicable** | • The chilled water is supplied by vapour compression chillers in the baseline and in the case of existing baseline facilities only used on-site by customers;<br>• After the implementation of the project, the cogeneration facility cannot supply services to facilities that are outside the project boundary;<br>• The demand of electricity and water at a consumer cannot exceed 110% of its historical level for a cumulative period longer than three months. |
| **Important parameters** | At validation:<br>• Power consumption of the baseline vapour compression chiller(s). |
| | Monitored:<br>• Electricity generated and consumed by the project;<br>• Chilled water generated by the project. |
| **BASELINE SCENARIO**<br>Consumers use electricity provided by an on-site power plant or by the grid. Consumption of electricity for the production of chilled water by the use of electrical chillers (vapour compression chillers). |  |
| **PROJECT SCENARIO**<br>Consumers use electricity provided by a fossil-fuel-fired cogeneration system. The cogeneration system provides electricity and chilled water. |  |

# AM0086 Installation of zero energy water purifier for safe drinking water application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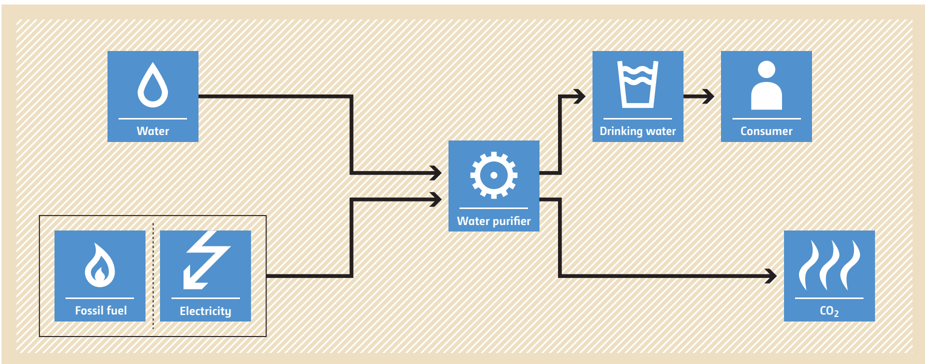
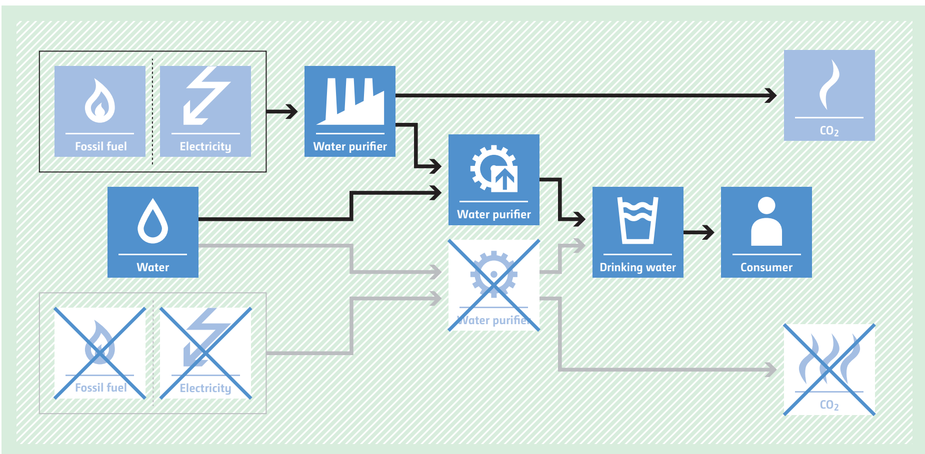
| **Typical project(s)** | Zero-energy water purification systems are distributed to consumers to provide safe drinking water (SDW). |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of more GHG intensive technologies to provide SDW. |
| **Important conditions under which the methodology is applicable** | • No public distribution network supplying SDW exists within the project boundary;<br>• Project technology/equipment provides SDW based on laboratory testing or official notifications;<br>• End users must have access to replacement purification systems;<br>• Only for water purifiers sold or distributed within the first crediting period are eligible for claiming emissions reductions. |
| **Important parameters** | At validation:<br>• Fraction of population served by zero-energy water purification technologies;<br>• Population serviced by one project water purification system;<br>• Volume of drinking water per person;<br>• Fraction of population which would use electricity or fuel type i to boil water. |
| | Monitored:<br>• Quantity of purified water consumed;<br>• Failure rate of the project water purification systems;<br>• Number of project water purification systems. |
| **BASELINE SCENARIO**<br>Energy consuming applications to produce safe drinking water will continue to be used in the households of a specific geographical area. |  |
| **PROJECT SCENARIO**<br>The zero-energy purifier displaces the current technologies/ techniques for generation of safe drinking water in the households of a specific geographical area. |  |

# AM0087 Construction of a new natural gas power plant supplying electricity to the grid or a single consumer

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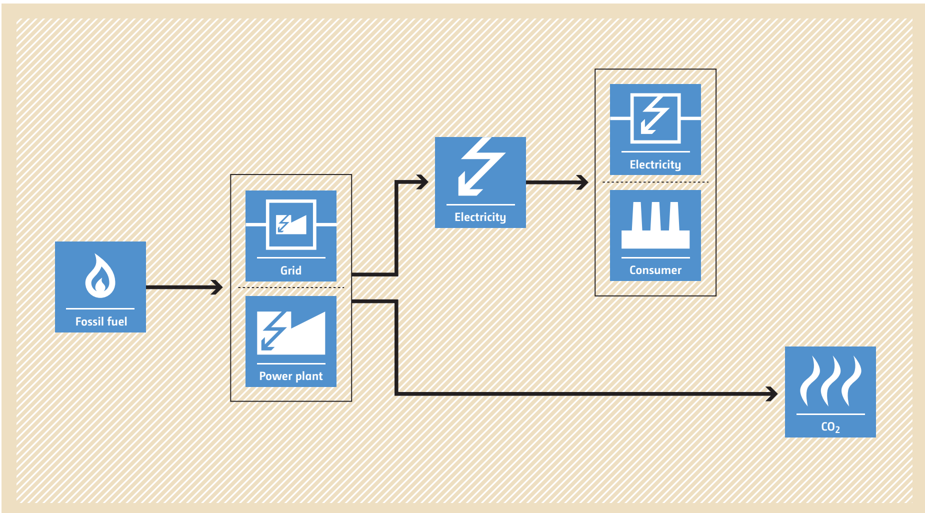
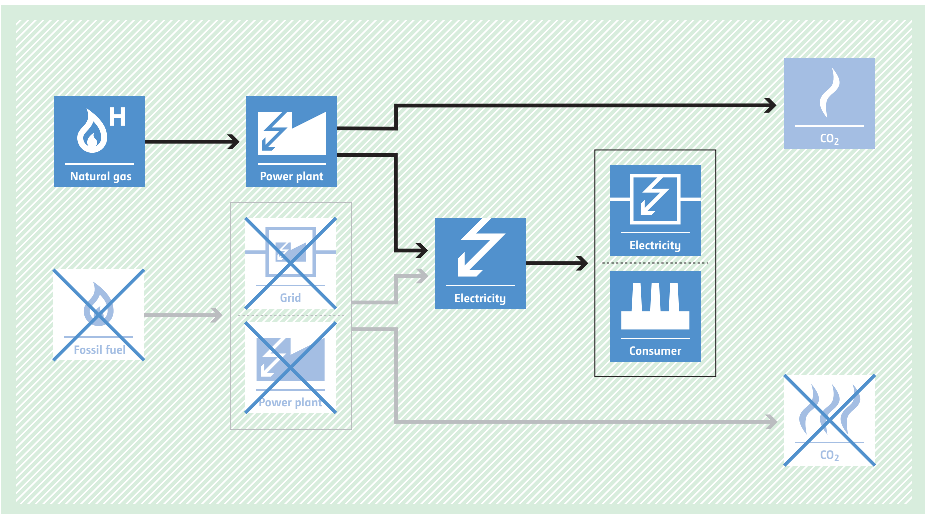
| **Typical project(s)** | Installation of a natural-gas-fired power plant that supplies electricity to a grid and/or an existing facility that is also connected to the grid. |
| **Type of GHG emissions mitigation action** | • Low carbon electricity.<br>Displacement of electricity that would be provided by more-carbon-intensive means. |
| **Important conditions under which the methodology is applicable** | • The project power plant generates only electricity and does not cogenerate heat;<br>• No power was generated at the site of the new power plant prior to the project implementation;<br>• Natural gas is sufficiently available in the region or country;<br>• In case electricity is supplied to an existing facility: the facility has an operational history of at least three years, and the electricity is supplied through a dedicated electric line. |
| **Important parameters** | At validation:<br>• Emission factor of baseline electricity, derived from an emission factor of the power grid, the power generation technology that would most likely be used in the absence of the project, or the one currently used at the existing facility.<br><br>Monitored:<br>• Fuel consumption of the project power plant;<br>• Electricity supplied to the electric power grid and/or an existing facility. |
| **BASELINE SCENARIO**<br>Power generation using<br>1) natural gas, but with different technologies than the project,<br>2) fossil fuels other than natural gas or renewable energy, or<br>3) new or existing captive power plants at the existing facility or import of electricity from the grid. |  |
| **PROJECT SCENARIO**<br>Power supply to the grid and/or an existing facility by a new natural-gas-fired power plant. |  |

# **AM0088** Air separation using cryogenic energy recovered from the vaporization of LNG

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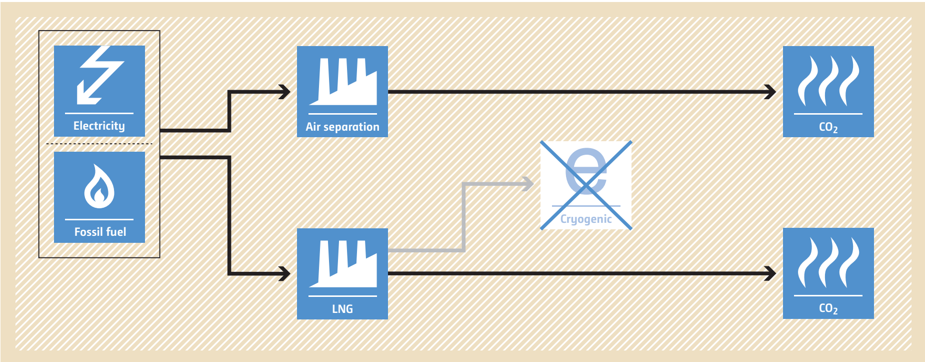
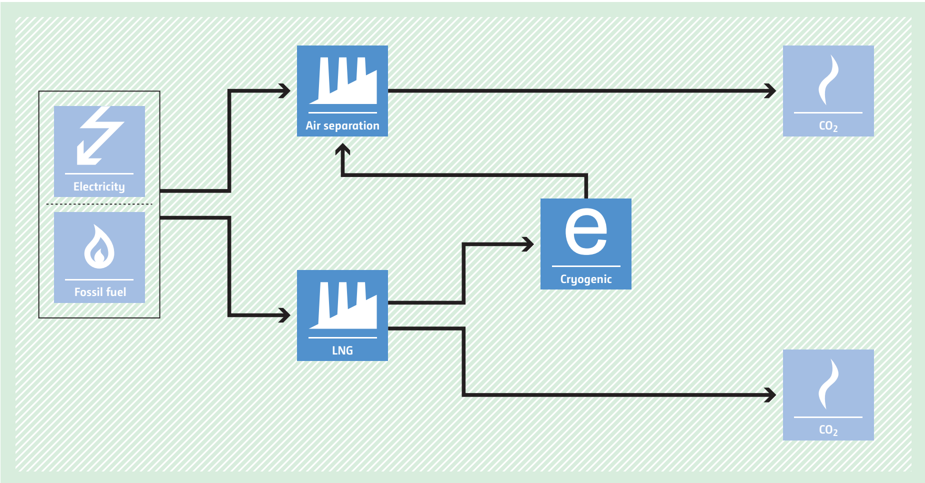
| **Typical project(s)** | The construction and operation of a new air separation plant that utilizes the cryogenic energy recovered from a new or existing LNG vaporization plant for the air separation process. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Reduction in heat consumption for LNG vaporization and fuels/electricity use in air separation plants. |
| **Important conditions under which the methodology is applicable** | • The purity of the oxygen and nitrogen produced by the new air separation plant is equal to or higher than 99.5%;<br>• The new air separation plant is located at the same site as the LNG vaporization plant;<br>• The cryogenic energy from existing LNG vaporization plant was not utilized for useful purposes and was being wasted prior to the implementation of the project. |
| **Important parameters** | At validation:<br>• Electricity emission factor (can also be monitored ex post);<br>• Quantity of fossil fuels and electricity consumed by the air separation and the LNG Vaporization facilities;<br>• Amount and physical properties of LNG vaporized. |
| | Monitored:<br>• Quantity of fossil fuels and electricity consumed by the Air Separation and the LNG Vaporization facilities;<br>• Amount and physical properties of LNG vaporized and gas produced at the separation plant. |
| **BASELINE SCENARIO**<br>The air separation process would use fossil fuels or electricity for cooling. |  |
| **PROJECT SCENARIO**<br>The air separation process use cryogenic energy recovered from a LNG vaporization plant for cooling. |  |

# AM0089 Production of diesel using a mixed feedstock of gasoil and vegetable oil

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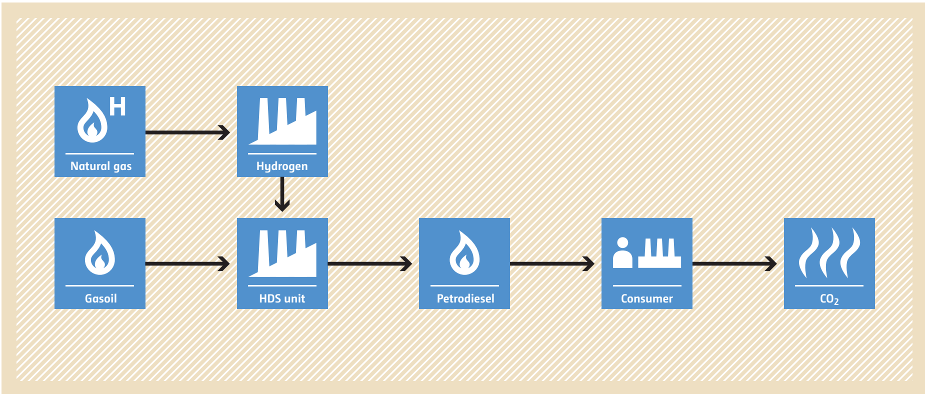
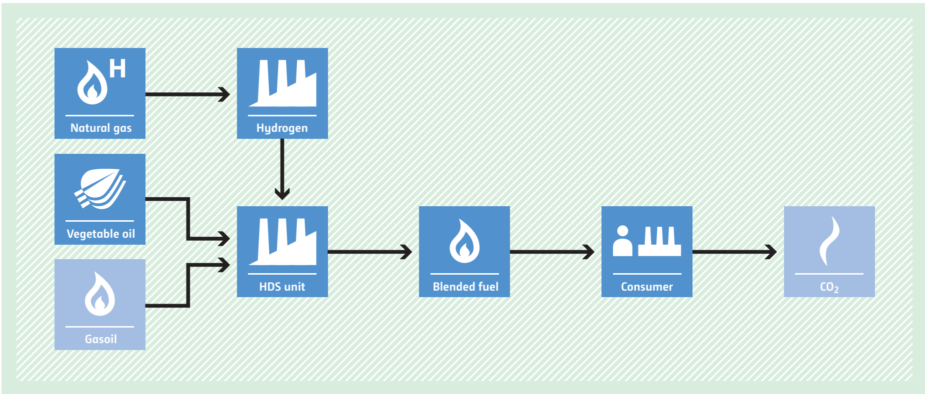
| **Typical project(s)** | Production of petro/renewable diesel by switching the feedstock of hydrodesulphurization process (HDS) unit from 100% gasoil to a mixture of gasoil and vegetable oil in an existing refinery, where the vegetable oil comes from oilseeds from plants that are cultivated on dedicated plantations established on lands that are degraded or degrading at the start of the project. |
| **Type of GHG emissions mitigation action** | • Renewable energy;<br>• Feedstock switch.<br>Displacement of more-GHG-intensive feedstock for the production of diesel. |
| **Important conditions under which the methodology is applicable** | • Three years of historical data are required for the HDS unit;<br>• Energy consumption in the HDS unit under the project is lower or equal to the baseline scenario and any combustible gases and off-gases formed during the hydrogenation of vegetable oil have to be flared or used in the refinery as fuel;<br>• The petro/renewable diesel is not exported to an Annex I country. |
| **Important parameters** | At validation:<br>• Ratio between the amount of renewable diesel produced and vegetable oil fed into HDS unit, density of renewable diesel. |
| | Monitored:<br>• Amount of vegetable oil fed to HDS unit, volume of $H_2$ consumed in the HDS unit and amount of petro/renewable diesel produced by the project;<br>• Project emissions from transport of oilseeds and/or vegetable oil if distances more than 50 km are covered; fossil fuel and electricity consumption of the vegetable oil production plant;<br>• Leakage emissions related to the upstream emissions of excess natural gas and positive leakage associated with the avoided production of petrodiesel;<br>• Destination of exported petro/renewable diesel produced by the project. |

**BASELINE SCENARIO**
Diesel is produced from gasoil.




**PROJECT SCENARIO**
Diesel is produced from mixture of gasoil and vegetable oil.



# AM0090 Modal shift in transportation of cargo from road transportation to water or rail transportation

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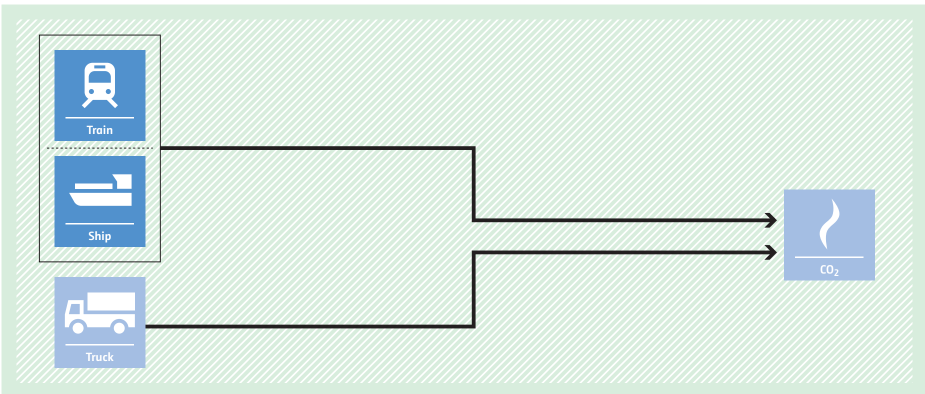
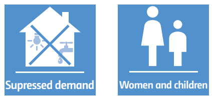
| **Typical project(s)** | Transportation of cargo using barges, ships or trains. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of a more-carbon-intensive transportation mode. |
| **Important conditions under which the methodology is applicable** | • The owner of the cargo is one of the project participants. If the entity investing in the project is not the owner of the cargo, it should also be a project participant;<br>• The project should have made at least one of the following new investments: direct investment in new infrastructure for water transportation or for rail transportation, or refurbishment/replacement of existing water and rail transportation infrastructure or equipments, with transport capacity expansion;<br>• The cargo type, transportation mode, and transportation routes of the project are defined at the validation of the project and no change is allowed thereafter;<br>• Both in the baseline and project, only one type of cargo is transported and no mix of cargo is permitted. |
| **Important parameters** | At validation:<br>• Distance of the baseline trip route (both forward and return trips).<br><br>Monitored:<br>• Fuel and/or electricity consumption by the project transportation mode;<br>• Amount of cargo transported by the project transportation mode (both forward and return trips). |
| **BASELINE SCENARIO**<br>The cargo is transported using trucks. |  |
| **PROJECT SCENARIO**<br>The cargo is transported using barges, ships or trains. |  |

# **AM0091** Energy efficiency technologies and fuel switching in new and existing buildings

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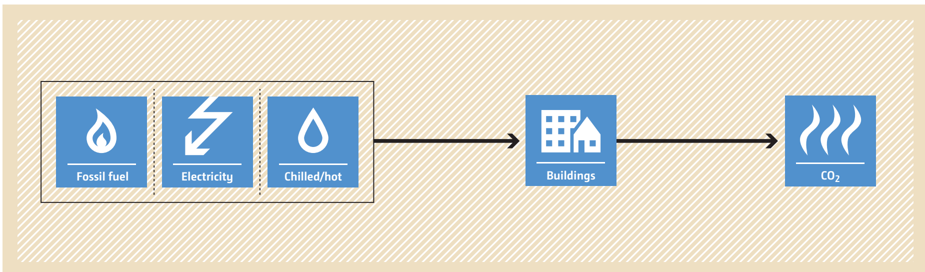
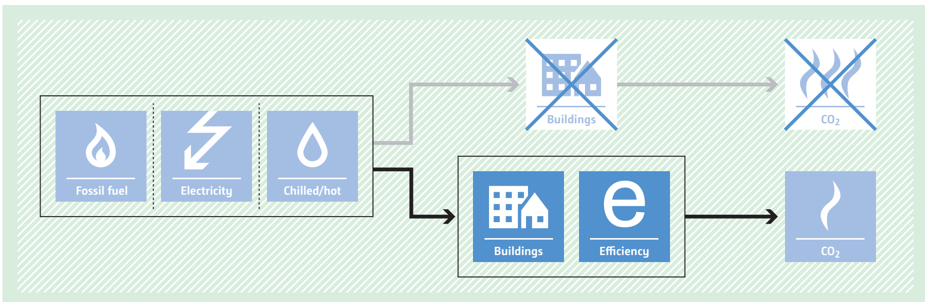
| **Typical project(s)** | Project activities implementing energy efficiency measures and/or fuel switching in new and existing building units (residential, commercial, and/or institutional building units). Examples of the measures include efficient appliances, efficient thermal envelope, efficient lighting systems, efficient heating, ventilation and air conditioning (HVAC) systems, passive solar design, optimal shading, building energy management systems (BEMS), and intelligent energy metering. |
| **Type of GHG emissions mitigation action** | • Energy Efficiency.<br>Electricity and/or fuel savings through energy efficiency improvement. Use of less-carbon-intensive fuel. |
| **Important conditions under which the methodology is applicable** | • Building units should belong to residential, commercial and institutional categories as defined in methodology;<br>• Eligible sources of emissions include consumption of electricity, fossil fuel, and chilled water as well as leakage of refrigerant used in the building units;<br>• Biogas, biomass or cogeneration systems should not be the source of thermal or electrical energy for project building units and chilled/hot water systems used for project building units;<br>• All the project building units must comply with all applicable national energy standards (e.g. building codes) if they exist and are enforced. |
| **Important parameters** | At validation:<br>• Emission factors of fuel used in baseline buildings;<br>• Historical average retail price of the fuel most commonly used in the baseline building units. |
| | Monitored:<br>• Total number of efficient appliances of type n that are used in registered CDM project(s) in the host country;<br>• Gross floor area of project buildings;<br>• Fuel consumption, quantity and energy content of hot/chilled water consumed and electricity consumption in project buildings;<br>• Emission factors and calorific values of fuels. |

**BASELINE SCENARIO**
Residential, commercial and institutional building units (similar to those constructed and then occupied in the project activity) will result in higher emissions due to fuel, electricity and chilled/hot water consumption.




**PROJECT SCENARIO**
Energy efficient residential, commercial and institutional project building units will result in lower emissions due to lower consumption of fuel, electricity and chilled/hot water.



# AM0092 Substitution of PFC gases for cleaning Chemical Vapour Deposition (CVD) reactors in the semiconductor industry

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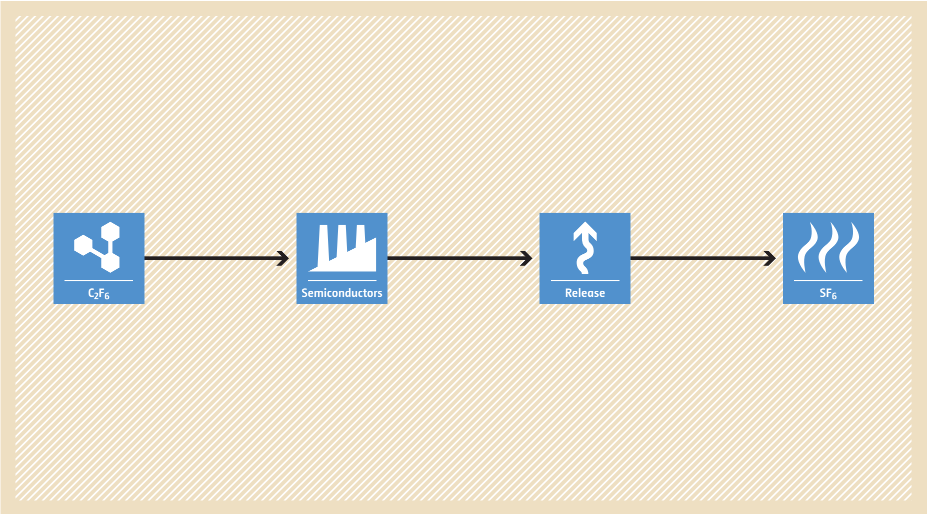
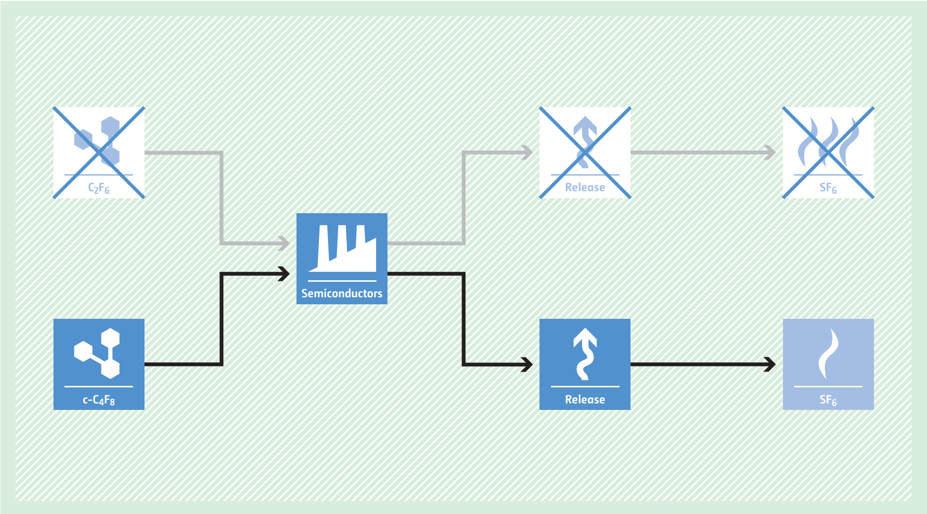
| **Typical project(s)** | Projects activities that reduce PFC emissions through replacement of $C_2F_6$ with c-$C_4F_8$ (octa-fluoro-cyclo-butane) as a gas for in-situ cleaning of CVD reactors in the semiconductor industry. |
| **Type of GHG emissions mitigation action** | • Fuel or feedstock switch.<br>Displacement of $C_2F_6$ with c-$C_4F_8$. |
| **Important conditions under which the methodology is applicable** | • Production lines included in the project boundary started commercial operation before 1 January 2010 and have an operational history of at least three years prior to the implementation of the project activity, during which the original PFC gas was $C_2F_6$;<br>• The substitute PFC gas is not temporarily stored for subsequent destruction. |
| **Important parameters** | At validation:<br>• Consumption of $C_2F_6$ in the baseline;<br>• Production of substrate in the baseline.<br><br>Monitored:<br>• Consumption of c-$C_4F_8$;<br>• Production of substrate. |
| **BASELINE SCENARIO**<br>The baseline scenario is the continuation of the current situation, i.e. the continuation of the same baseline feedstock (i.e. CVD reactors cleaned with $C_2F_6$) | <br> |
| **PROJECT SCENARIO**<br>The project scenario is CVD reactors cleaned with c-$C_4F_8$. | <br> |

# **AM0093** Avoidance of landfill gas emissions by passive aeration of landfills

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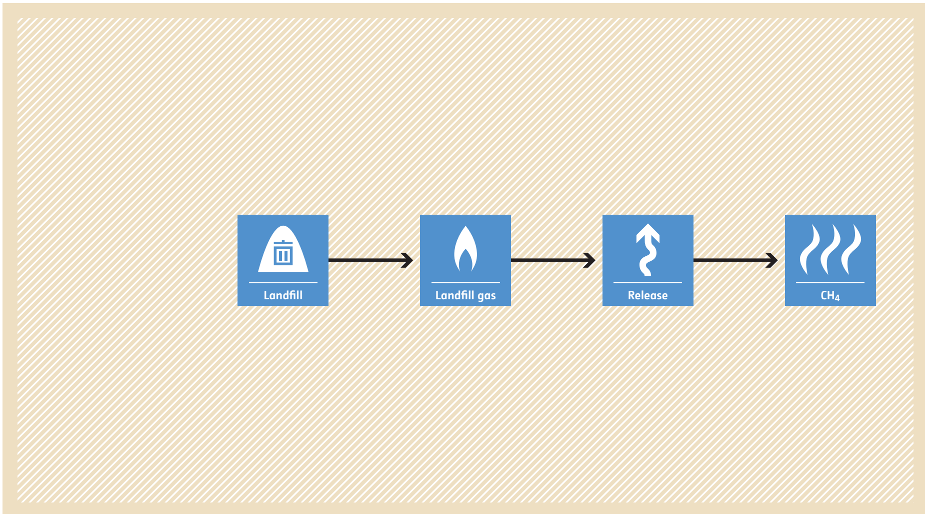
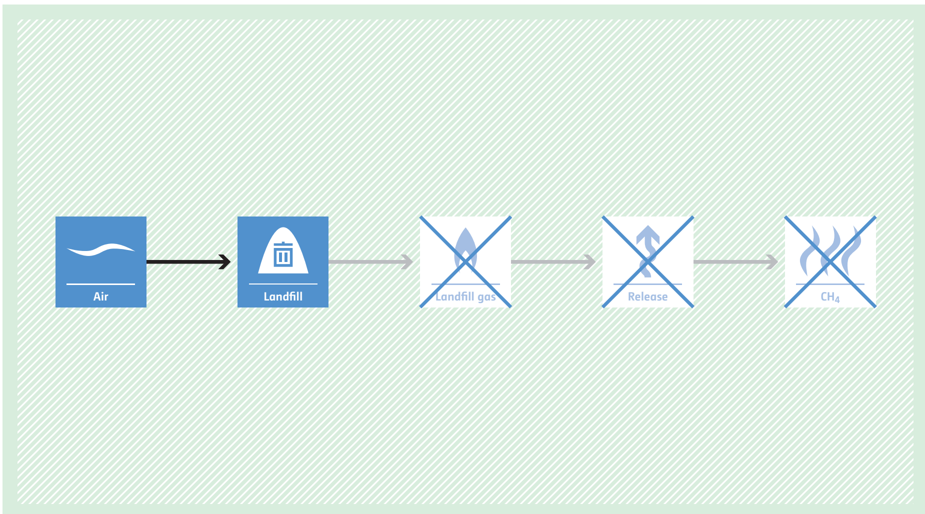
| **Typical project(s)** | Landfilled waste is treated aerobically on-site by means of passive aeration with the objective of avoiding anaerobic degradation processes. |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance.<br>The project avoids $CH_4$ emissions from landfills. |
| **Important conditions under which the methodology is applicable** | • Treatment of landfilled waste is in closed landfills or closed landfill cells;<br>• If mandatory environmental regulations require the collection and flaring of landfill gas, the corresponding compliance rate is below 50% in the host country;<br>• Closed cells of operating landfills might be eligible as long as they are physically distinct from the remaining parts of the landfill;<br>• Distance between vertical venting wells should not be more than 40m. |
| **Important parameters** | At validation:<br>• Amount of biodegradable waste disposed in the landfill.<br><br>Monitored:<br>• Potential methane generation capacity;<br>• Vented and surface emissions: volume and methane and nitrous oxide content. |
| **BASELINE SCENARIO**<br>Partial or total release of landfill gas from the closed landfill or the closed landfill cell. |  |
| **PROJECT SCENARIO**<br>In-situ passive aeration of the closed landfill or the closed landfill cell reduces GHG emissions. |  |

# **AM0094** Distribution of biomass based stove and/or heater for household or institutional use

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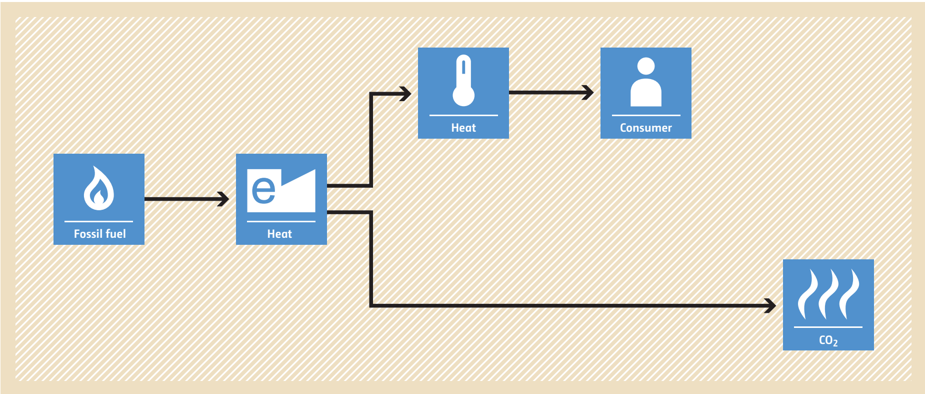
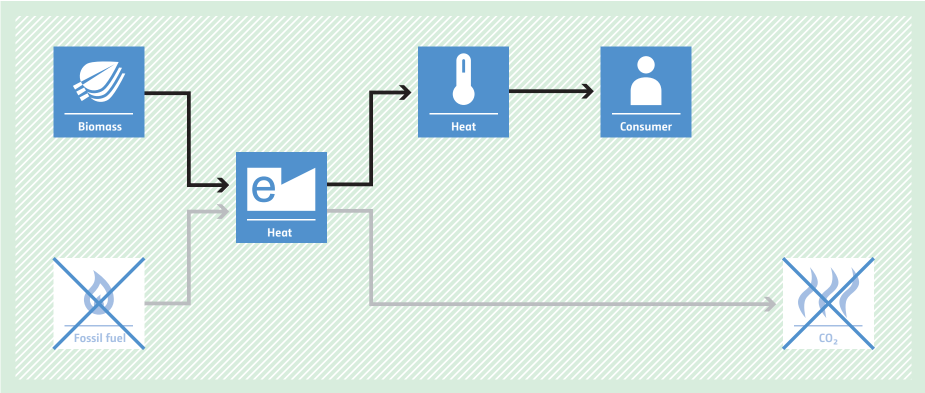
| **Typical project(s)** | Distribution of biomass based stoves and/or heaters and the supply of biomass briquettes for household or institutional use. |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Displacement of more-GHG-intensive thermal energy production by introducing renewable energy technologies. |
| **Important conditions under which the methodology is applicable** | • The total project area (TPA) is defined prior to the start of the project activity and will not be changed later;<br>• Biomass penetration rate in the TPA is ≤10%;<br>• The biomass based stove or heater shall have a rated capacity of not more than 150 kW thermal;<br>• A contractual agreement between the project consumers and the project participants shall ensure that the project consumers do not claim any CERs from the use of stove and/or heater and biomass briquettes. |
| **Important parameters** | At validation:<br>• Percentage of biomass used as a fuel for cooking purposes or heating purposes, on energy basis, in project area(s);<br>• Proportion of fuel(s) used in the stoves or heaters in project area(s) in the baseline;<br>• Proportion of stove or heater type(s) used in project area(s) in the baseline. |
| | Monitored:<br>• Dry weight of biomass briquettes consumed by project consumer(s) in project area(s);<br>• NCV of biomass briquettes;<br>• Proportion of project stove or heater type(s) in use in project area(s). |

**BASELINE SCENARIO**
Continuation of the use of existing stove or heater technologies and fossil fuels for thermal application.




**PROJECT SCENARIO**
Use of biomass based stoves and/or heaters and the supply of biomass briquettes for thermal application.



# AM0095 Waste gas based combined cycle power plant in a Greenfield iron and steel plant

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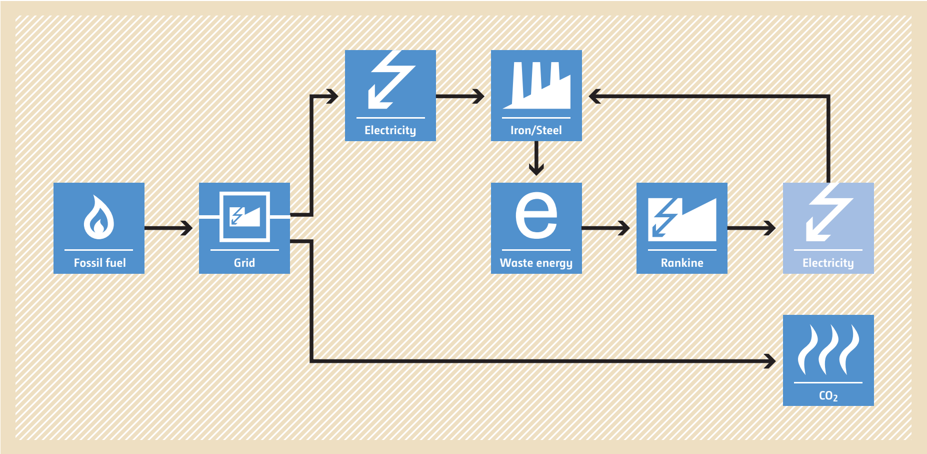
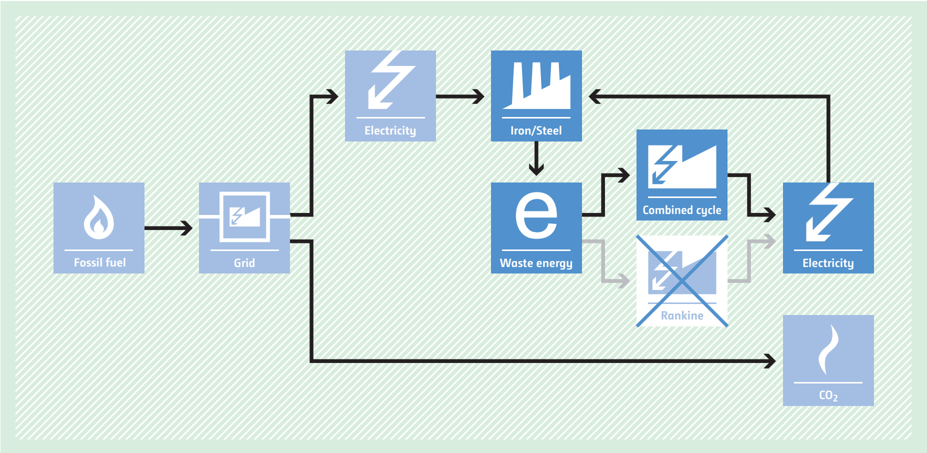
| **Typical project(s)** | Project activities that construct and operate a captive or grid-connected combined cycle electricity generation power plant in a greenfield iron and steel plant, using waste gas such as blast furnace gas, coke oven gas, and converter gas sourced from the same facility. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Waste energy recovery in order to displace more-carbon-intensive source of energy. |
| **Important conditions under which the methodology is applicable** | • Specifications of coke oven and iron and steel plant has been determined before the project activity is considered;<br>• The project participants have to demonstrate that the level of use of waste gas for power production in the iron and steel plant is the same in absence of and after the implementation of the CDM project activity. |
| **Important parameters** | At validation:<br>• Data on waste gas based electricity generation in top 20% Rankine cycle based power plant in other iron and steel plants;<br>• Energy Efficiency of waste gas based Rankine cycle based power plants in iron & steel plant using manufacturer's data. |
| | Monitored:<br>• Data required to calculate grid emission factor;<br>• Net Calorific Value of waste gas, and supplementary and auxiliary fuels;<br>• Quantity of supplementary and auxiliary fuel fired and quantity of waste gas consumed by project power plant;<br>• Net electricity generated by project power plant. |
| **BASELINE SCENARIO**<br>Construction of Rankine cycle based power plant using the same waste gas type and quantity as used in the project power plant. |  |
| **PROJECT SCENARIO**<br>Energy efficient combined cycle based power plant recovering energy from waste gas in greenfield iron and steel plant. |  |

# **AM0096** $CF_4$ emission reduction from installation of an abatement system in a semiconductor manufacturing facility

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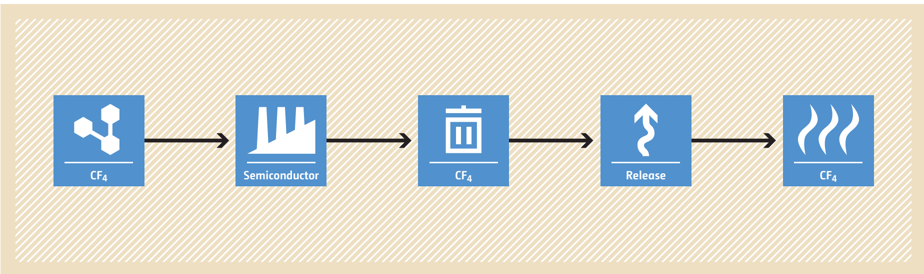
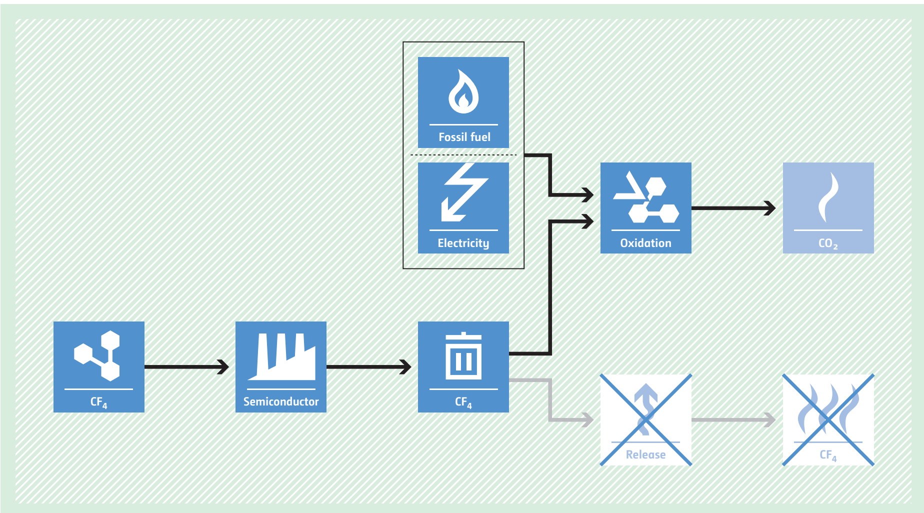
| **Typical project(s)** | Installation of an abatement system in an existing semiconductor manufacturing facility for the abatement of $CF_4$ from the semiconductor etching process. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Destruction of $CF_4$ emissions. |
| **Important conditions under which the methodology is applicable** | • Applicable to existing production lines without $CF_4$ abatement device installed and where $CF_4$ was being vented in the last three years;<br>• $CF_4$ is not temporarily stored or consumed for subsequent abatement;<br>• $CF_4$ abatement at the same industrial site where the $CF_4$ is used; and $CF_4$ to be abated is not imported from other facilities;<br>• Not applicable to project activities which reduce emissions of PFCs from Chemical Vapour Deposition (CVD) processes. |
| **Important parameters** | At validation:<br>• Amount of $CF_4$ consumed in years prior to the implementation of the project activity;<br>• Amount of semiconductor substrate produced in years prior to the implementation of the project activity. |
| | Monitored:<br>• Amount of $CF_4$ consumed;<br>• Amount of semiconductor substrate produced;<br>• Calibrated flow rate of Helium (He) gas added to duct before entering to the abatement system during a monitoring interval;<br>• He concentration entering the abatement system and out of the abatement system;<br>• Concentration of $CF_4$ in the gas entering the abatement system and in the gas leaving the abatement system;<br>• Temperature at mass flow controller. |

**BASELINE SCENARIO**
$CF_4$ is vented to the atmosphere after being used in the semiconductor etching process.




**PROJECT SCENARIO**
$CF_4$ is recovered and destroyed in a catalytic oxidation unit (abatement system) located after the etching unit.



# **AM0097** Installation of high voltage direct current power transmission line

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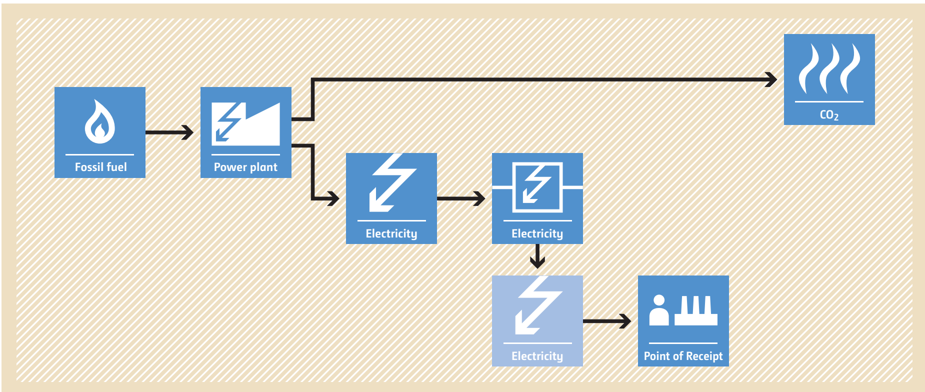
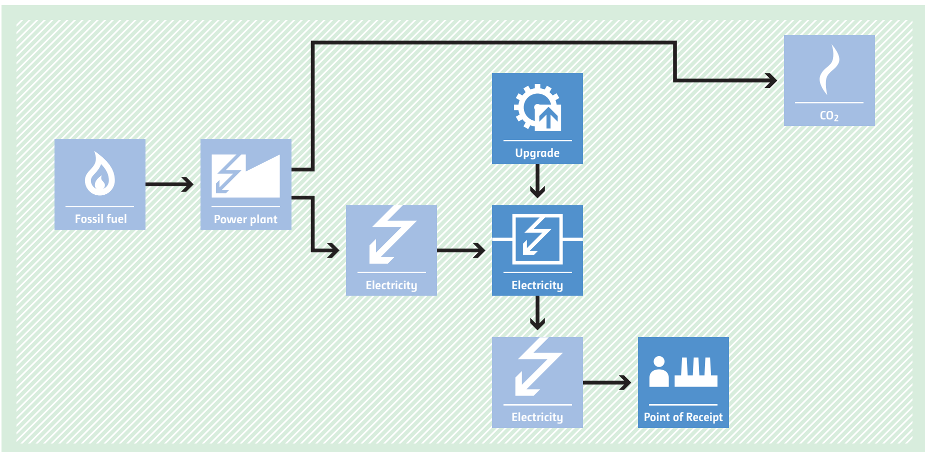
| **Typical project(s)** | • Installation of Greenfield High Voltage Direct Current (HVDC) power transmission line/s for transmission of power from point of origin/supply to the point of receipt; or<br>• Replacement of existing alternating current power transmission line by a new HVDC power transmission line. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Energy efficient electricity transmission line instead of inefficient electricity transmission line. |
| **Important conditions under which the methodology is applicable** | • Project participants shall invest in setting up a HVDC power transmission line and utilize it;<br>• Project participant shall demonstrate through verifiable data that the right-of-way requirement for the project activity is less than for the baseline scenario;<br>• This methodology is not applicable to project activities that seek to expand or retrofit existing grids by the construction of a new piece of HVDC transmission line. |
| **Important parameters** | At validation:<br>• Data required for simulation software to calculate technical losses of baseline transmission line. This includes voltage, length, inductance, capacitance, and sub-station spacing of baseline transmission line. |
| | Monitored:<br>• Gross electricity evacuated from the point of supply in project year using project transmission line;<br>• Net electricity received at the point of receipt;<br>• Right-of-way requirement for the transmission line under the project as well as under baseline. |

**BASELINE SCENARIO**
Implementation or continuation of inefficient power transmission line.




**PROJECT SCENARIO**
Energy efficient HVDC transmission line.



# AM0098 Utilization of ammonia-plant off gas for steam generation

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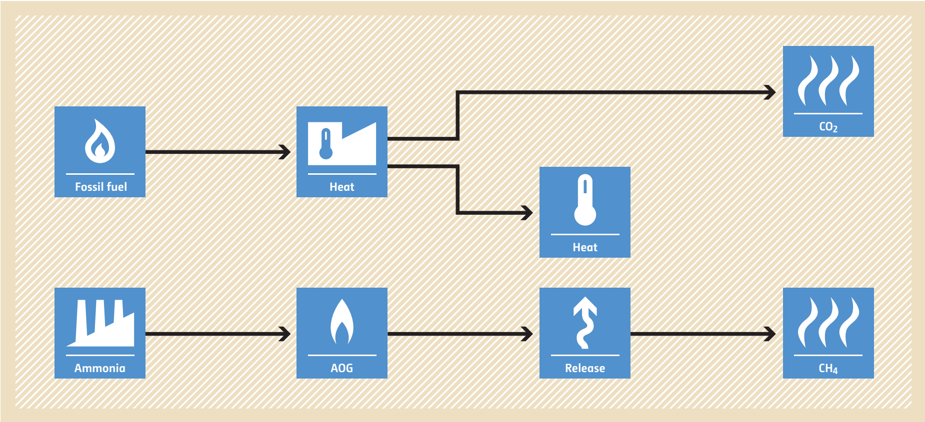
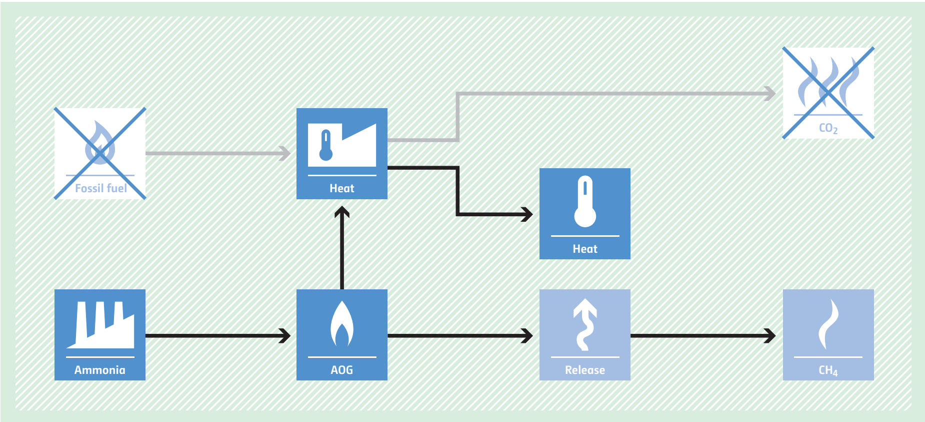
| **Typical project(s)** | Utilization of ammonia-plant off gas (AOG), which was being vented, for heat generation at an existing ammonia production plant. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Destruction of methane emissions and displacement of a more-GHG-intensive service. |
| **Important conditions under which the methodology is applicable** | • AOG is only used to generate steam to meet heat demands in the existing ammonia production plant and/or in nearby facilities in the same project site;<br>• Amount of AOG vented from the start of operations at the existing ammonia production plant until the implementation of the project activity shall be demonstrated;<br>• Regulations of the host country do not prohibit the venting of gases with the physical and chemical characteristics of the AOG. |
| **Important parameters** | At validation:<br>• Volume of AOG vented by the existing ammonia production facility in historical years;<br>• Total production of ammonia in historical years;<br>• Average volume fraction of methane in the AOG in historical years. |
| | Monitored:<br>• Volume of AOG recovered and used for steam generation by the project activity;<br>• Total production of ammonia;<br>• Average volume fraction of methane in the AOG recovered in the project activity;<br>• Carbon density of AOG;<br>• Net quantity of heat generated from AOG combustion;<br>• Volume fraction of methane in the exhaust out of ammonia recovery section;<br>• Volume of gaseous stream vented to the atmosphere out of the ammonia recovery section of AOG. |
| **BASELINE SCENARIO**<br>AOG is vented to the atmosphere. | <br> |
| **PROJECT SCENARIO**<br>AOG is collected and utilized to generate heat. | <br> |

# AM0099 Installation of a new natural gas fired gas turbine to an existing CHP plant

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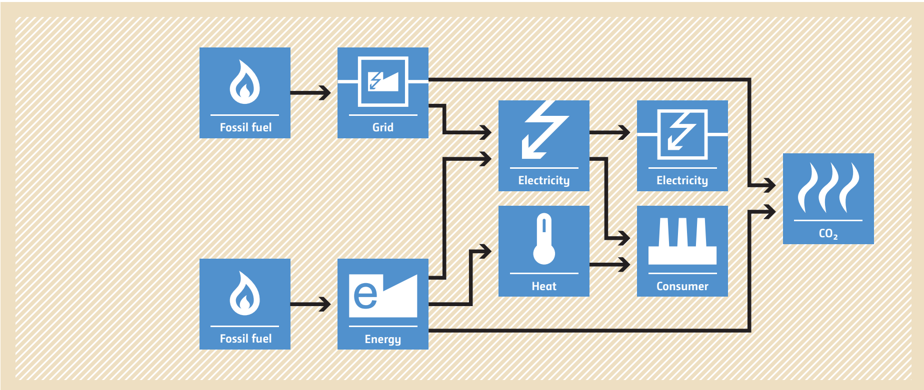
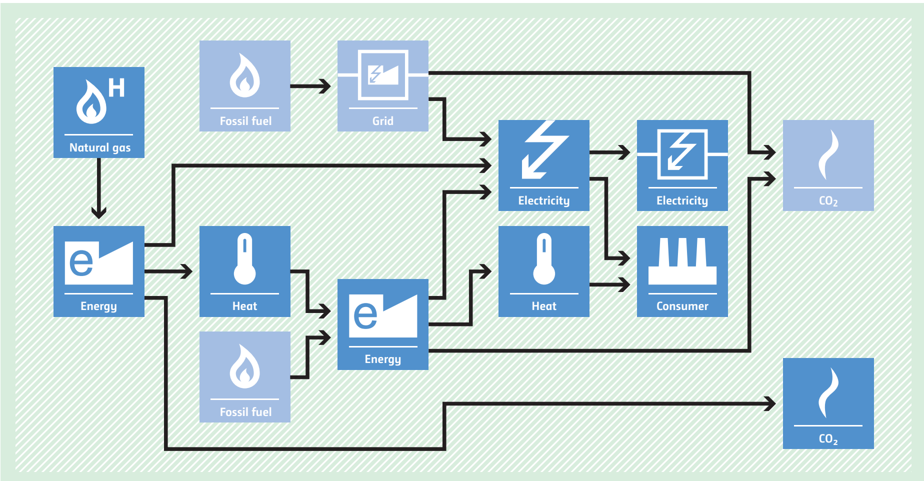
| **Typical project(s)** | Installation a new natural-gas-fired gas turbine at a site where there is an existing combined heat and power (CHP) plant and supply of the electricity to the grid or an existing electricity consuming facility and waste heat to the existing CHP plant. |
| **Type of GHG emissions mitigation action** | • Low carbon electricity;<br>• Energy efficiency.<br>Displacement of more-GHG-intensive electricity generation in a grid or captive power plant and supply of heat. |
| **Important conditions under which the methodology is applicable** | • The steam from the heat recovery steam generator (HRSG) is not directly supplied to final users/consumers;<br>• The existing CHP plant produced electricity and steam for at least three years prior to the implementation of the project activity. |
| **Important parameters** | At validation:<br>• Amount of historical steam generation of the existing CHP;<br>• Amount, emission factor and net calorific value (NCV) of fuel historically used to generate steam at the existing CHP plant. |
| | Monitored:<br>• Electricity generated by the gas turbine that is fed into the grid and/or supplied to the electricity consuming facility;<br>• Total electricity supplied to the grid by the existing steam turbine generator (STG) at the project site;<br>• Steam generated by the project facility from heat recovery steam generator (HRSG);<br>• Steam generated by the existing steam boilers. |

**BASELINE SCENARIO**
Electricity is generated in the grid or captive power plant using more-carbon-intensive fuel and steam/heat is generated in existing steam boilers.




**PROJECT SCENARIO**
Electricity is generated using natural gas and heat/steam is generated from waste heat from the gas turbine.



# **AM0100** Integrated Solar Combined Cycle (ISCC) projects

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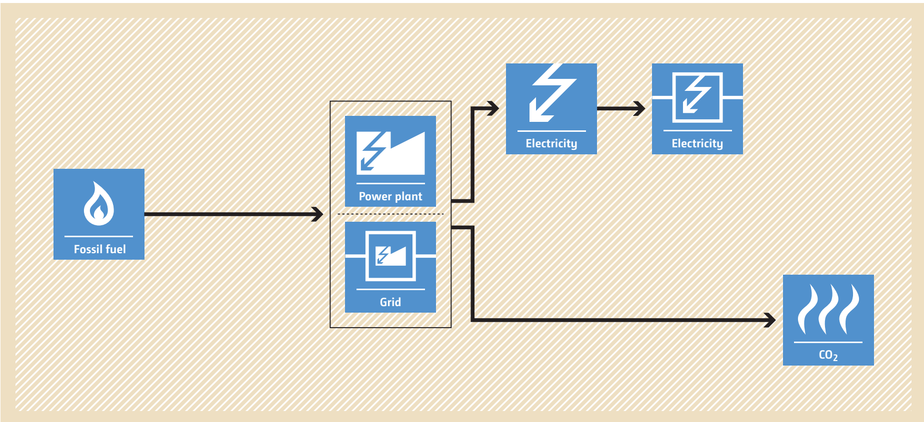
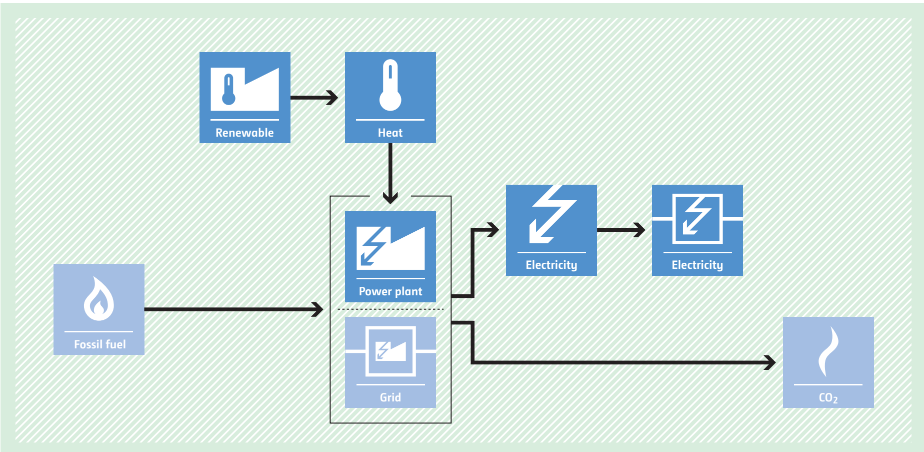
| **Typical project(s)** | Implementation of Integrated Solar Combined Cycle (ISCC) projects. |
| **Type of GHG emissions mitigation action** | • Renewable Energy.<br>Displacement of electricity that would be provided to the grid by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • Applicable to:<br>– Conversion of an existing Combined Cycle Power Plant into an ISCC; or<br>– Conversion of an existing single cycle gas turbine power plant into an ISCC, where the project activity comprises exclusively the Solar Field and Supplementary Firing; or<br>– Construction of a new ISCC, where the project activity comprises exclusively the Solar Field and Supplementary Firing;<br>• Electric Solar Capacity does not account for more than 15 % of the Electric Steam Turbine Capacity of the ISCC. |
| **Important parameters** | Monitored:<br>• Average temperature, pressure and mass flow of steam leaving the solar steam generator;<br>• Average temperature, pressure and mass flow of high pressure and low pressure steam entering the steam turbine and at the condenser outlet;<br>• Gross electricity generation from gas turbine;<br>• Net electricity generation from the ISCC;<br>• Mass or volume, net calorific value (NCV), and emission factor of supplementary fuel;<br>• Grid emission factor and/or emission factor of supplementary firing. |

**BASELINE SCENARIO**
Electricity is generated in the grid using more-carbon-intensive fuel.




**PROJECT SCENARIO**
Electricity is generated using steam generated from solar collectors and reducing the use of fossil fuel.



# AM0101 High speed passenger rail system

Women and children

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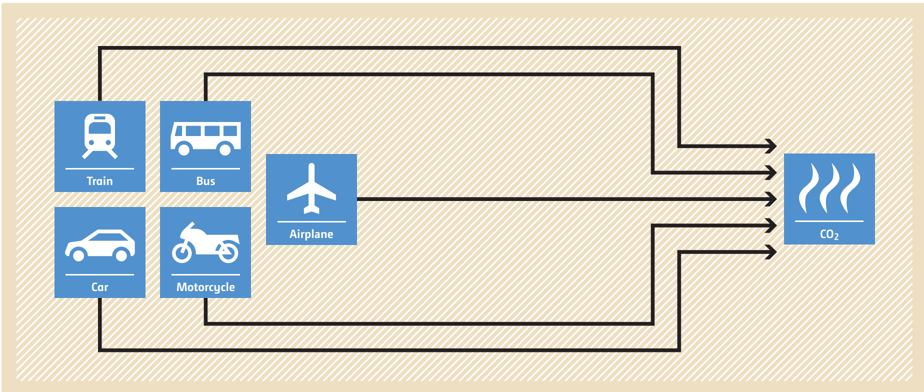
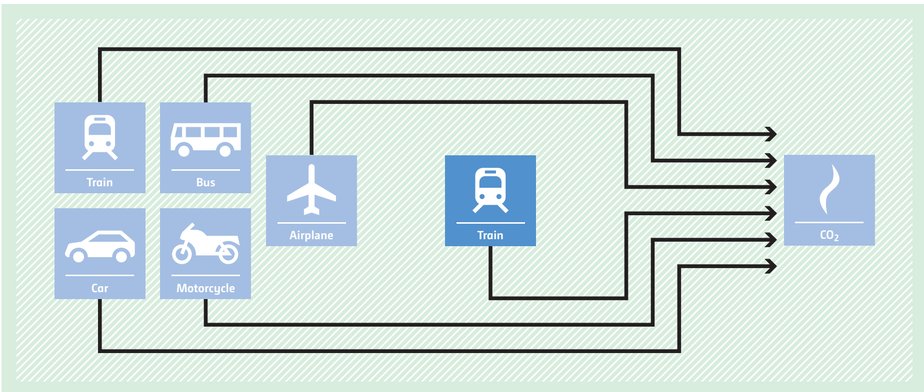
|---|---|
| **Typical project(s)** | Establishment and operation of a new high speed rail system. Extension of an existing high speed rail system. Replacement or upgrading of a conventional rail system to the high speed rail system. |
| **Type of GHG emissions mitigation action** | • Energy efficiency<br>Displacement of more GHG-intensive transport modes (airplanes, buses, conventional rail, motorcycles and personal cars) by less-GHG intensive one (high speed rail). |
| **Important conditions under which the methodology is applicable** | • The project establishes a new rail-based infrastructure for high speed rail. The new rail infrastructure can be the extension of an existing high speed rail system. It can also be the replacement or upgrading of an existing conventional rail system to high speed rail system;<br>• The methodology is applicable to inter-urban passenger transport only;<br>• The entire high speed rail system must be located in the same host country; The average distance between all stations served by the project high speed rail system is at least 20 km. |
| **Important parameters** | At validation:<br>• Data on parameters necessary to determine the baseline emission factors per passenger-kilometre of the relevant modes of transport and total trip distance travelled by passengers per baseline mode of transport. |
| | Monitored:<br>• Total number of passengers travelled by the project high speed rail system;<br>• Share of the project passengers or the number of passengers who would have travelled by the relevant modes of transport in absence of the project activity;<br>• Passenger trip distances. |
| **BASELINE SCENARIO**<br>Passengers transported between cities using a conventional transport system including buses, trains, cars, motorcycles and airplanes. | <br> |
| **PROJECT SCENARIO**<br>Passengers are transported between cities by the high-speed passenger rail-based system that partially displaces the existing modes of inter-urban transport. | <br> |

# AM0102 Greenfield cogeneration facility supplying electricity and steam to a Greenfield Industrial Consumer and exporting excess electricity to a grid and/or project customer(s)

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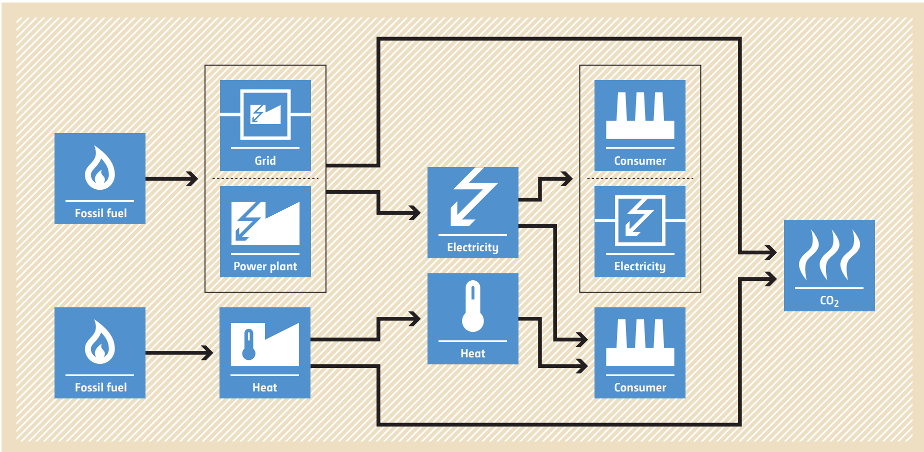
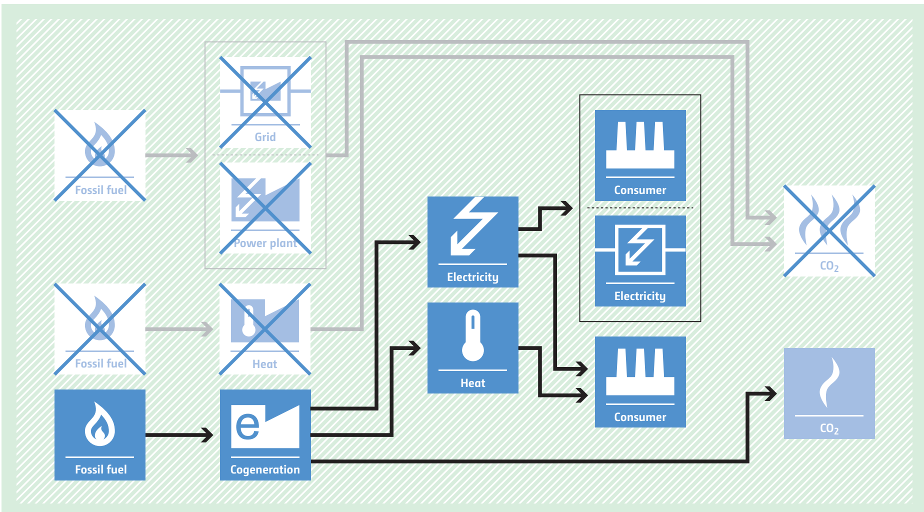
| **Typical project(s)** | Installation of an onsite Greenfield cogeneration plant for electricity and heat production supplied to a Greenfield industrial consumer. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of electricity and steam that would be provided by more-carbon-intensive means. |
| **Important conditions under which the methodology is applicable** | • The fuels used at the project facility must be gaseous or liquid;<br>• The heat-to-power ratio of the project cogeneration facility shall be higher than 1;<br>• The project facility must provide all of the electricity and heat/steam demand of the Greenfield industrial consumer;<br>• The owner of the project facility is also the owner of the Greenfield industrial heat consuming facility. |
| **Important parameters** | At validation:<br>• Historical power generation and fossil fuel consumption for captive power plants of project customers. |
| | Monitored:<br>• Electricity generated by the project and consumed by the industrial consumer, the grid and project customers;<br>• Steam/heat generated by the project and consumed by the industrial consumer. |

**BASELINE SCENARIO**
Greenfield industrial consumer and project customers use electricity provided by captive power plants or by the grid. Greenfield industrial consumer uses fossil-fuel-fired boiler for steam production.




**PROJECT SCENARIO**
Greenfield industrial consumer uses only electricity and steam provided by the fossil-fuel-fired cogeneration system. Project customers use electricity provided by the fossil-fuel-fired cogeneration system.



# AM0103 Renewable energy power generation in isolated grids

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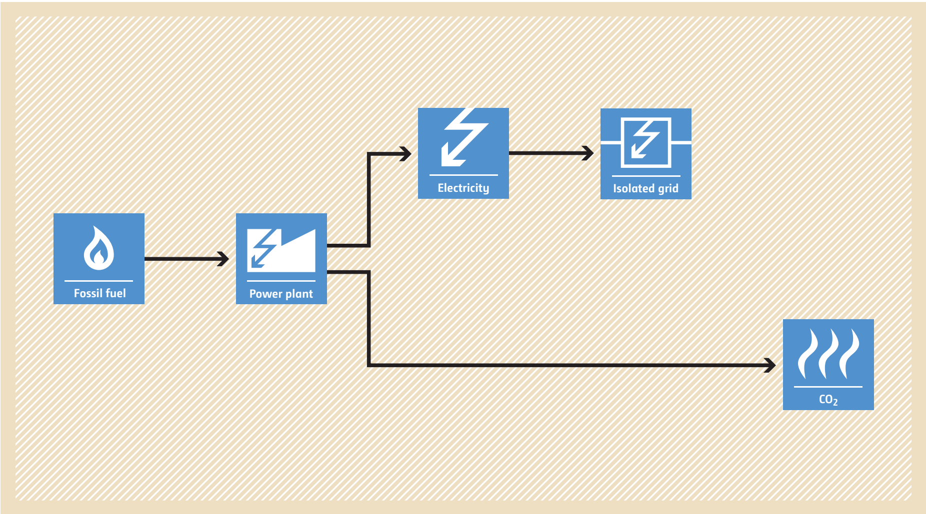
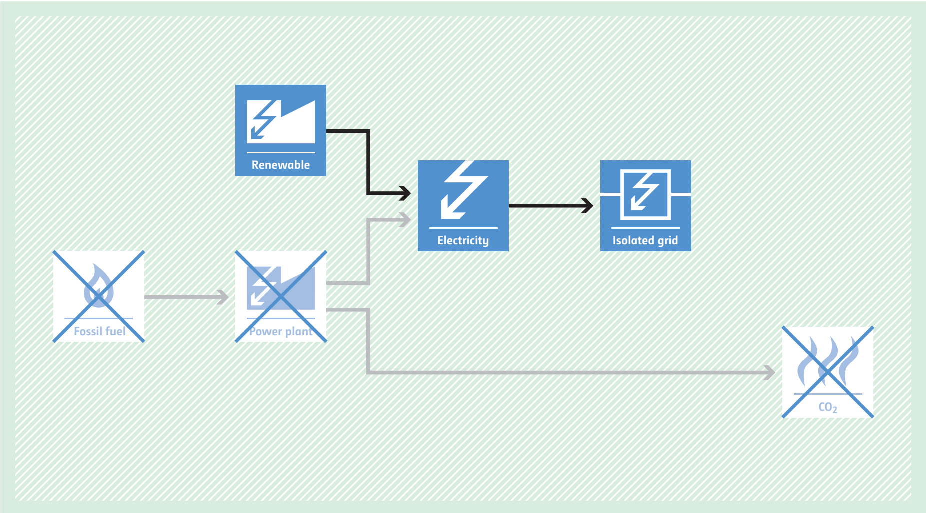
| **Typical project(s)** | Power generation using renewable energy sources connected to a new or an existing isolated grid. |
| **Type of GHG emissions mitigation action** | • Renewable energy.<br>Displacement of electricity that would be provided to the isolated grid by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • The project power plant is using one of the following sources: hydro, wind, geothermal, solar, wave or tidal power. Biomass-fired power plants are not applicable;<br>• In case of hydro power, specific applicability conditions apply. |
| **Important parameters** | At validation:<br>• Emission factor of the isolated grid.<br><br>Monitored:<br>• Electricity supplied to the isolated grid by the project. |
| **BASELINE SCENARIO**<br>Generation of electricity with fossil-fuel-fired generators (e.g. diesel generators). |  |
| **PROJECT SCENARIO**<br>A renewable energy power plant displaces the energy that was generated by fossil fuel sources. |  |

# **AM0104** Interconnection of electricity grids in countries with economic merit order dispatch

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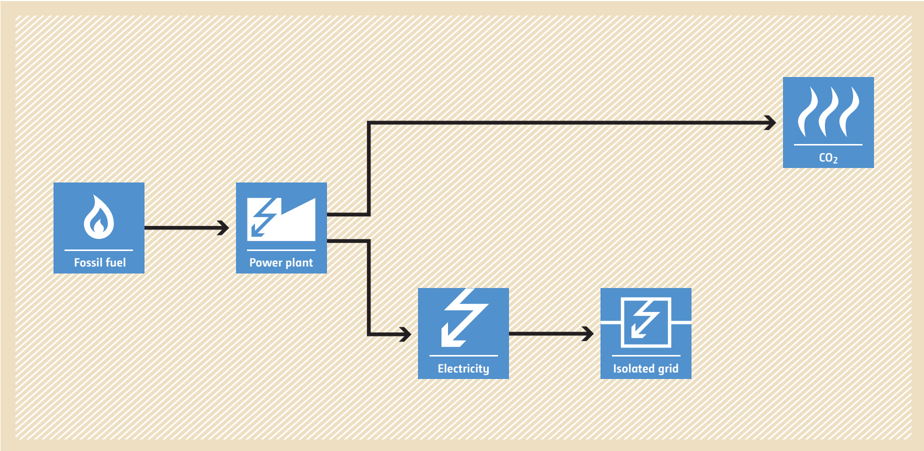
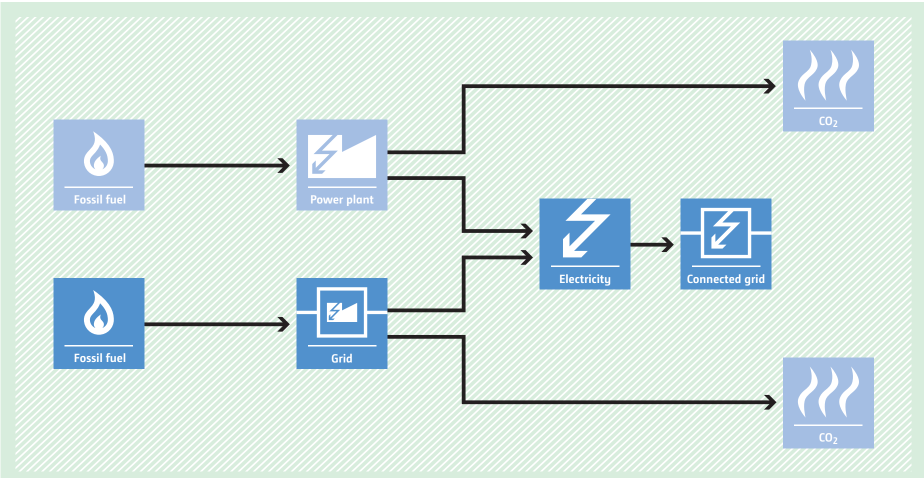
| **Typical project(s)** | Construction of one or multiple new interconnection lines to connect two grids (i.e. connection of a main grid and a previously isolated grid). |
| **Type of GHG emissions mitigation action** | • Displacement of a more-GHG-intensive output<br>Displacement of electricity that would be provided by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • The total installed power capacity in the previously isolated grid is less than 10% of the total installed power capacity in the main grid in the year prior to the implementation of the project activity;<br>• Previously isolated grid is a grid that has no interconnection with any grid prior to the implementation of the project activity;<br>• After the implementation of the project activity, there will be only one dispatch centre responsible for the operation of the resulting grid (previously isolated and main grid). |
| **Important parameters** | At validation:<br>• Grid emission factor of the previously isolated grid. |
| | Monitored:<br>• Quantity of electricity delivered to the previously isolated grid;<br>• The average quantity of SF6 emitted from equipment installed under the project activity;<br>• Amount of electricity transferred from the previously isolated grid to the grid(s) other than the main grid. |
| **BASELINE SCENARIO**<br>No interconnection is constructed, and electricity demand of the isolated grid is met by power units connected to the isolated grid. |  |
| **PROJECT SCENARIO**<br>Interconnection is constructed and electricity demand of the isolated grid is partially met by power units from the main grid. |  |

# AM0105 Energy efficiency in data centres through dynamic power management

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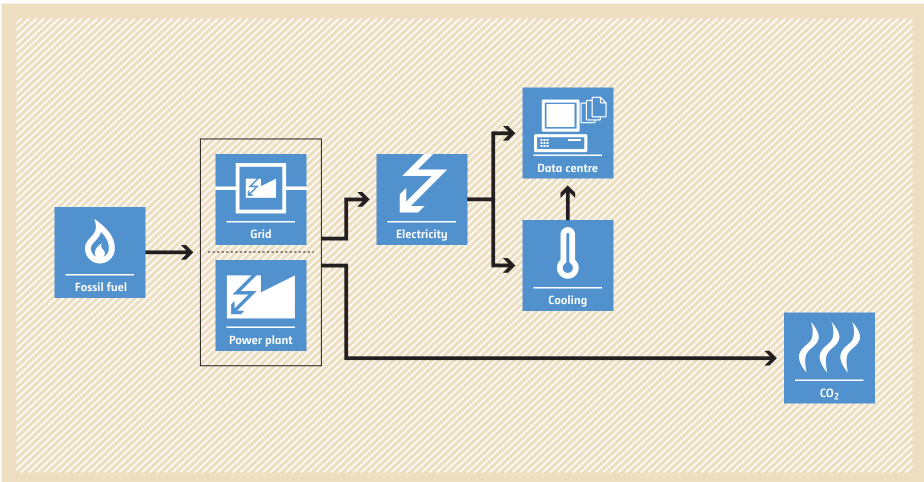
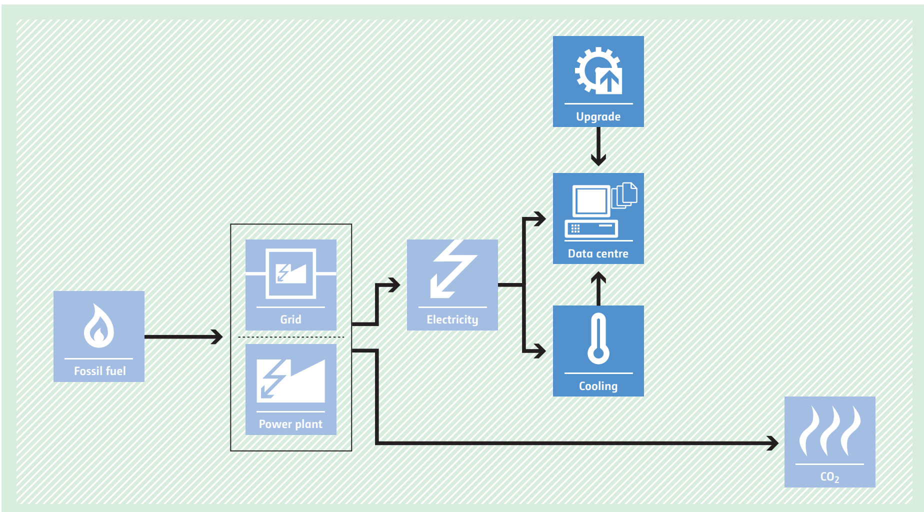
| **Typical project(s)** | Introduction of dynamic power management (DPM) in an existing data centre. |
| **Type of GHG emissions mitigation action** | • Energy efficiency<br>The data centre will consume less electricity for the operation and cooling of its servers. |
| **Important conditions under which the methodology is applicable** | • The project activity must be implemented in data centres that, prior to the implementation of the project activity, have no DPM system, no systematic method to adjust the data centre's total server capacity to actual demand, and no manual adjustment of server's operation mode to reduce electricity consumption. |
| **Important parameters** | At validation:<br>• Three years of historical load and operation hours information;<br>• Power consumption of the existing servers in idle mode and off mode;<br>• Transaction capacity of the existing servers;<br>• Grid emission factor (can also be monitored ex post). |
| | Monitored:<br>• Turn off time of the servers;<br>• Load of the servers;<br>• Market share of the technology. |
| **BASELINE SCENARIO**<br>Servers of the data centre operate at "Always On" mode independent of demand. |  |
| **PROJECT SCENARIO**<br>Servers of the data centre are switched to "Off Mode" when not required to process transaction load. |  |

# AM0106 Energy efficiency improvements of a lime production facility through installation of new kilns

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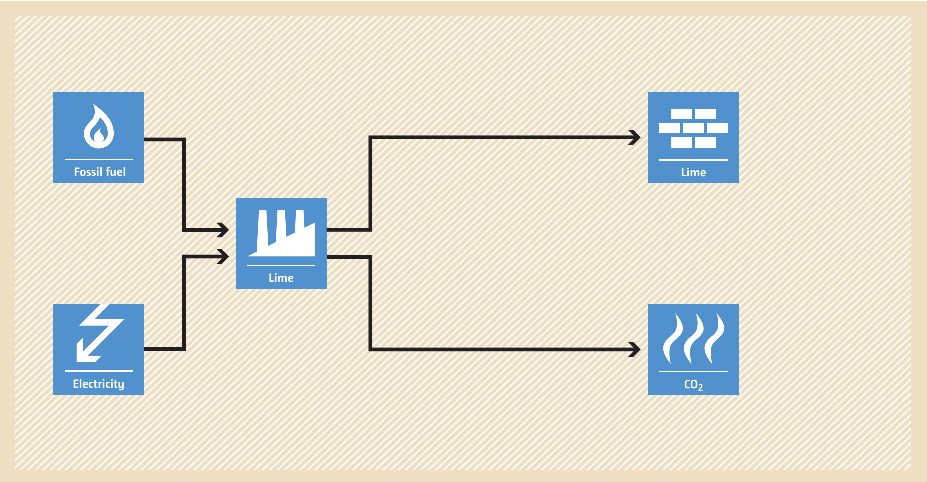
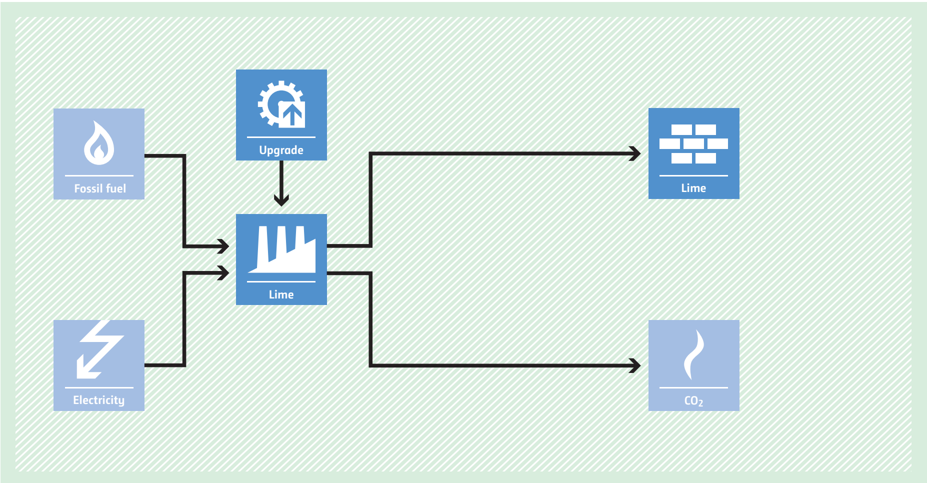
| **Typical project(s)** | Replacement of existing kilns by new and more energy-efficient kilns in an existing lime production facility. |
| **Type of GHG emissions mitigation action** | • Energy efficiency<br>Production of lime using more energy-efficient technology. |
| **Important conditions under which the methodology is applicable** | • The lime production facility is an existing facility and has operational history of at least three years prior to the start of the project activity;<br>• The existing kilns and the new kilns use same fossil fuel;<br>• The new kilns shall improve energy efficiency and not combustion efficiency;<br>• The replaced kilns shall be decommissioned and not be used in another facility. |
| **Important parameters** | At validation:<br>• Amount and net calorific value of the fuel consumed prior to the start of the project activity;<br>• Amount of electricity consumed prior to the start of the project activity;<br>• Amount of lime produced prior to the start of the project activity. |
| | Monitored:<br>• Quantity of used limestone;<br>• Amount of produced lime;<br>• Amount and $CO_2$ emission factor of fuel and electricity. |
| **BASELINE SCENARIO**<br>Lime production using inefficient kilns. |  |
| **PROJECT SCENARIO**<br>Lime production using more energy-efficient kilns. |  |

# AM0107 New natural gas based cogeneration plant

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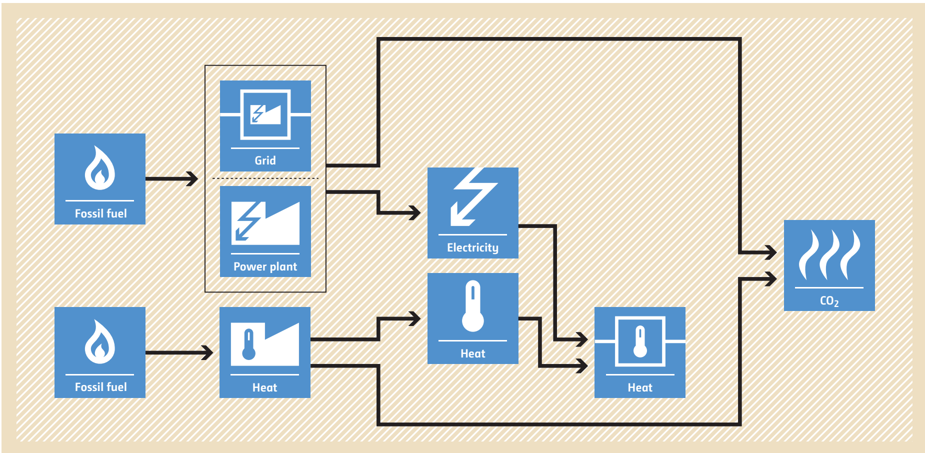
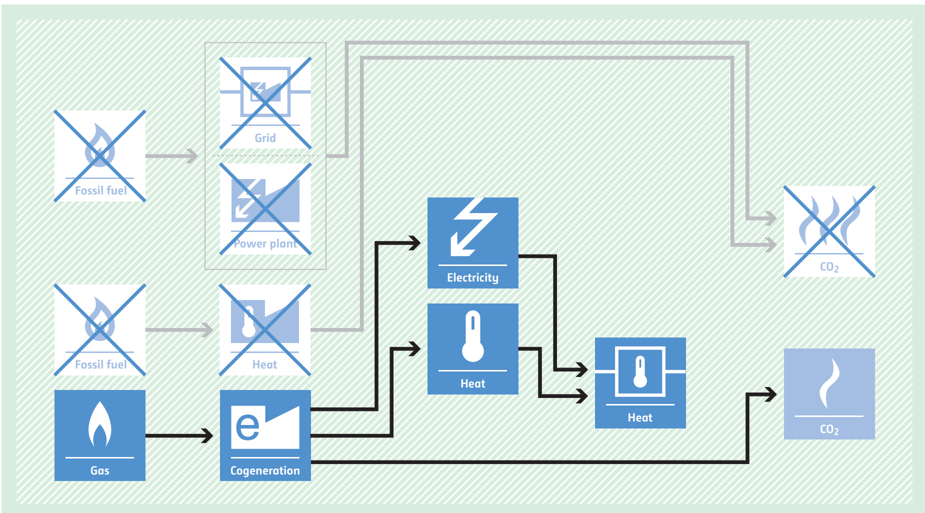
| **Typical project(s)** | Installation of a new cogeneration plant that use natural gas as fuel, supplies electricity to an electricity grid, and supplies heat to an existing or newly created heat network. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of electricity in the grid and/or heat that would be provided by more-carbon-intensive means. |
| **Important conditions under which the methodology is applicable** | • Natural gas is used as main fuel in the project cogeneration plant;<br>• Natural gas and baseline fuel are sufficiently available in the region or country;<br>• The customers within the heat network do not co-generate heat and electricity currently. |
| **Important parameters** | At validation:<br>• Average heat loss of the heat network;<br>• Baseline emission factors for electricity and heat generation;<br>• Net calorific value of fossil fuel fired in the cogeneration plant. |
| | Monitored:<br>• Quantity of electricity generated in the project cogeneration plant that is fed into the electricity grid;<br>• Quantity of heat supplied by the project activity;<br>• Heat supplied by the heat generation facilities within the heat network;<br>• Heat-to-electricity ratio of the cogeneration plant. |

**BASELINE SCENARIO**
Electricity and heat would be produced by more-carbon-intensive technologies due to combustion of fossil fuels in power plants and heat plants.




**PROJECT SCENARIO**
Electricity and heat are produced by natural gas based cogeneration plant.



# AM0108 Interconnection between electricity systems for energy exchange

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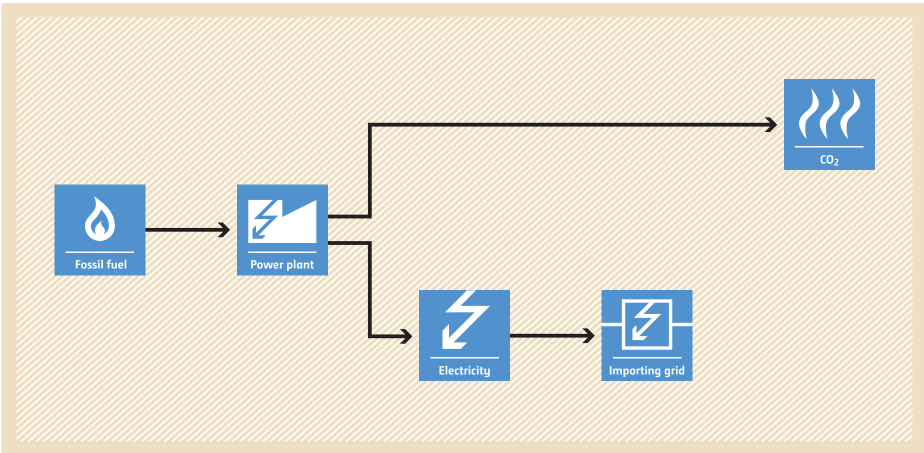
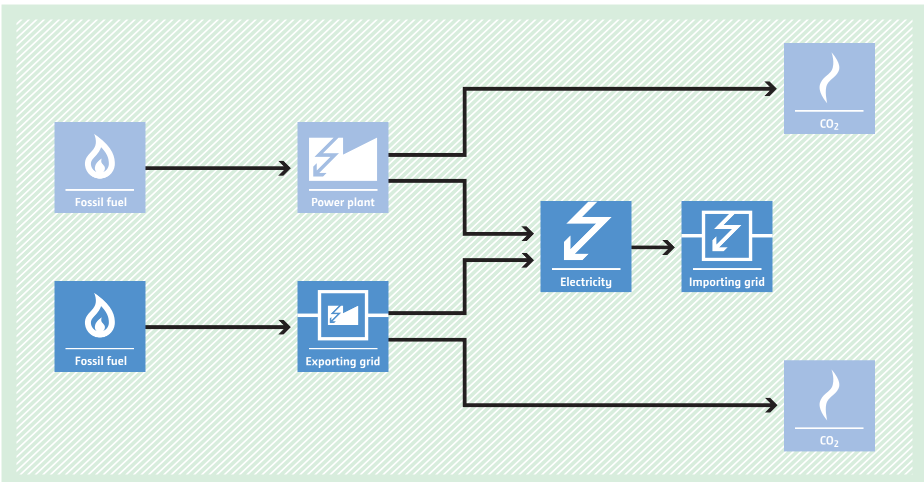
| **Typical project(s)** | Construction of one or multiple new interconnection lines to connect two systems (grids), i.e. connection of an exporting system and an importing system. |
| **Type of GHG emissions mitigation action** | • Displacement of a more-GHG-intensive output.<br>Displacement of electricity that would be provided by more-GHG-intensive means. |
| **Important conditions under which the methodology is applicable** | • The interconnection is through the construction of new transmission lines;<br>• The relation between annual electricity flow from the exporting system to the importing system and vice versa shall not fall below 80/20;<br>• The exporting system has more than 15 % of reserve capacity during the most recent year prior to the start of the crediting period. |
| **Important parameters** | At validation:<br>• Historical electricity transfers between exporting, importing and third party systems (if any). |
| | Monitored:<br>• Emission factor of the exporting and importing grids;<br>• Amount of electricity transferred between exporting and importing systems;<br>• Amount of electricity imported from the third party system to the exporting system;<br>• Amount of electricity exported from the importing system to the third party system;<br>• The average quantity of $SF_6$ emitted from equipment installed under the project activity. |
| **BASELINE SCENARIO**<br>No interconnection is constructed, and electricity demand of the importing system is met by power units in the importing system. |  |
| **PROJECT SCENARIO**<br>Interconnection is constructed and electricity demand of the importing system is partially met by power units from the exporting system. |  |

# **AM0109** Introduction of hot supply of direct reduced iron in electric arc furnaces

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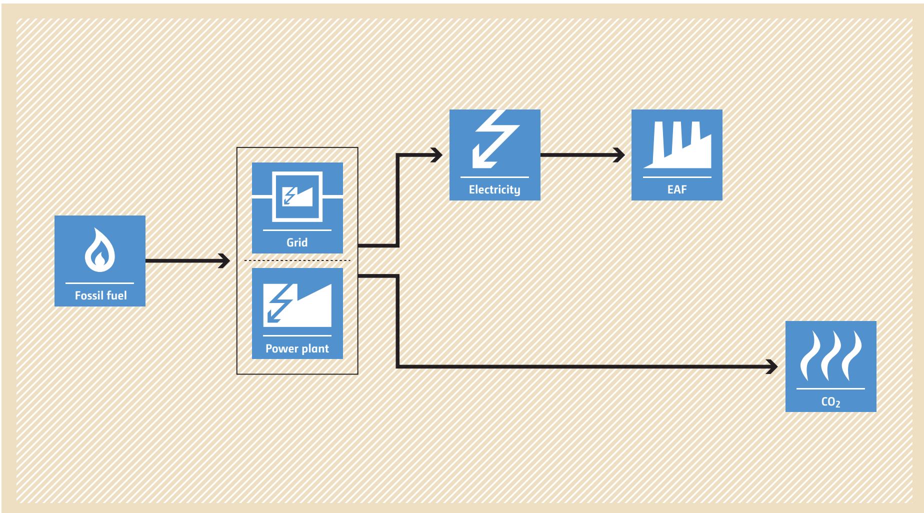
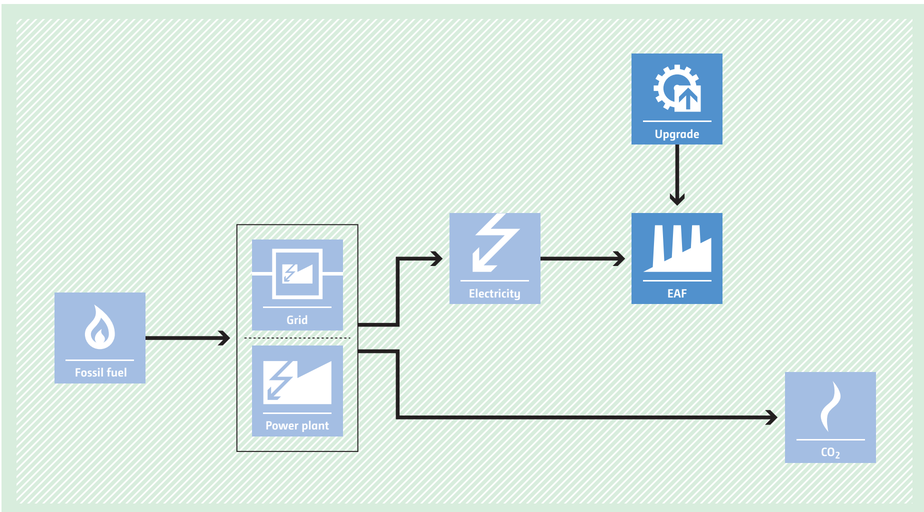
| **Typical project(s)** | Utilizing hot direct reduced iron (HDRI) instead of cold direct reduced iron (CDRI) as raw material in existing or new electric arc furnace/s (EAFs). |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Switch to more energy-efficient technology. |
| **Important conditions under which the methodology is applicable** | • The baseline is retrievable for the project activity;<br>• The quality of output from EAF in hot DRI charging can vary by ±5% from the quality of output from EAF in cold DRI charging;<br>• The project EAF unit(s) uses DRI from an on-site direct reduced plant (DRP) as source of iron during the crediting period. |
| **Important parameters** | At validation:<br>• Metal production capacity of EAF. |
| | Monitored:<br>• Electricity consumption in EAF and emission factors;<br>• Electricity and fuel consumption in EAF charging system. |
| **BASELINE SCENARIO**<br>Due to cold DRI charging, high consumption of electricity in the electric arc furnaces results in high $CO_2$ emissions from the combustion of fossil fuel used to produce electricity. |  |
| **PROJECT SCENARIO**<br>Due to hot DRI charging, electric arc furnaces consume less electricity, and thereby, CO2 emissions from the combustion of fossil fuel used to produce electricity are reduced. |  |

# AM0110 Modal shift in transportation of liquid fuels

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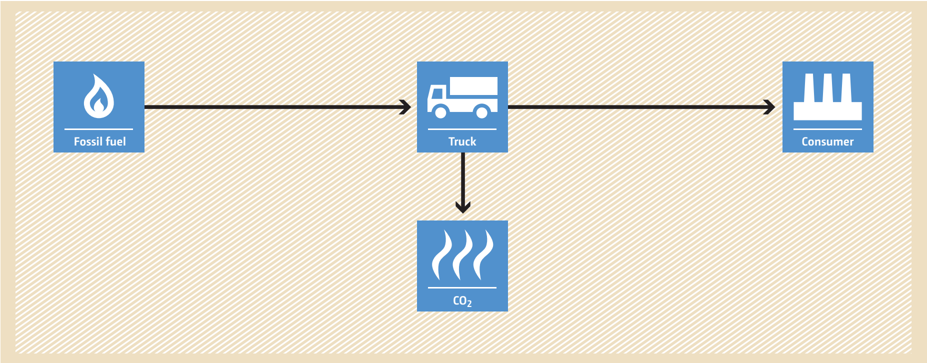
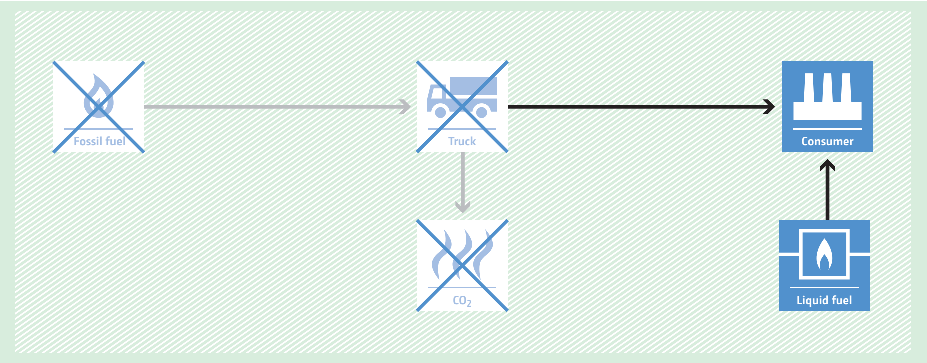
| **Typical project(s)** | Transportation of liquid fuels using newly constructed pipeline. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of a more-carbon-intensive transportation mode. |
| **Important conditions under which the methodology is applicable** | • The pipeline network operator is the project participant;<br>• The liquid fuel is transported using two or multiple pre-identified nodes of pipeline network;<br>• The type of liquid fuel to be transported under the project activity is defined in the CDM-PDD at the validation of the project activity and no change of type of liquid fuel is allowed thereafter;<br>• Operational improvements of an existing pipeline that is in operation are not applicable;<br>• The geographic conditions of the project site permit the use of different transportation means (e.g. pipeline, trucks, etc.);<br>• There is sufficient road transportation capacity to transport the liquid fuel by trucks at the time of implementing the CDM project activity and for the duration of the crediting period. |
| **Important parameters** | At validation:<br>• Amount of fuel consumed by the trucks for transportation of liquid fuel in route;<br>• Distance of the baseline route;<br>• Amount of liquid fuel transported in trucks. |
| | Monitored:<br>• Amount of liquid fuel transported by the pipeline. |
| **BASELINE SCENARIO**<br>Liquid fuels are transported by trucks. |  |
| **PROJECT SCENARIO**<br>Liquid fuels are transported using a newly constructed pipeline. |  |

# AM0111 Abatement of fluorinated greenhouse gases in semiconductor manufacturing

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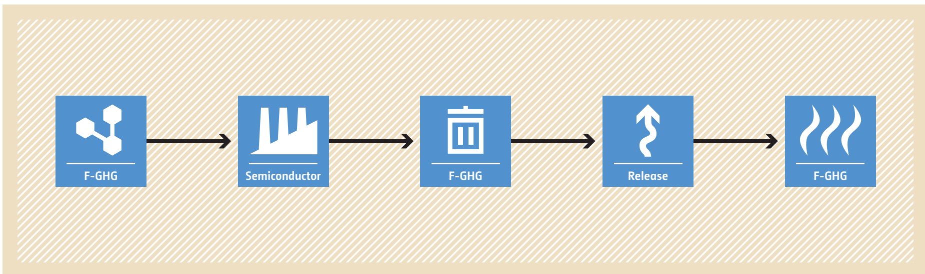
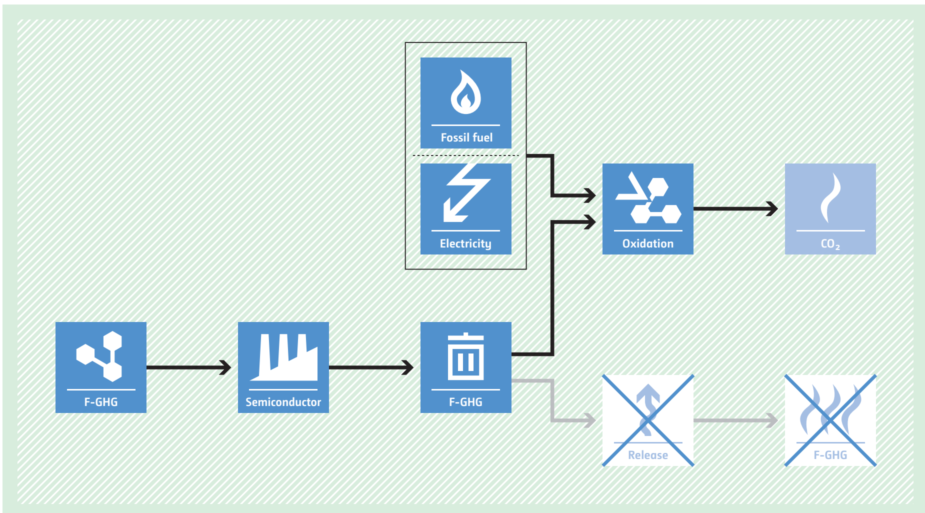
| **Typical project(s)** | Installation of an abatement system in an existing semiconductor manufacturing facility for the abatement of fluorinated GHGs (F-GHGs) from the semiconductor etching process. |
| **Type of GHG emissions mitigation action** | • GHG destruction.<br>Destruction of various fluorinated GHGs ($CF_4$, $C_2F_6$, $CHF_3$, $CH_3F$, $CH_2F_2$, $C_3F8$, c-$C_4F_8$, and $SF_6$). |
| **Important conditions under which the methodology is applicable** | • Existing production lines are those that do not have F-GHG-specific abatement devices before January 2012;<br>• At least three years of historical information;<br>• F-GHGs have been vented in the three years prior to the project activity;<br>• No regulations mandate abatement, recycling or substitution of the project gases. |
| **Important parameters** | At validation:<br>• Operation conditions prior to implementation of the project activity;<br>• Historical semiconductor production. |
| | Monitored:<br>• Concentration of F-GHG at the inlet and outlet of the abatement system;<br>• Flow of the gas stream at the inlet and outlet of the abatement system;<br>• Operation conditions;<br>• Semiconductor production;<br>• Market share of baseline technology;<br>• Mass of F-GHG at the inlet and outlet of the abatement system. |

**BASELINE SCENARIO**
F-GHG is vented to the atmosphere after being used in the semiconductor etching process.




**PROJECT SCENARIO**
F-GHG is recovered and destroyed in a catalytic oxidation unit (abatement system) located after the etching unit.



# AM0112 Less carbon intensive power generation through continuous reductive distillation of waste

Women and children

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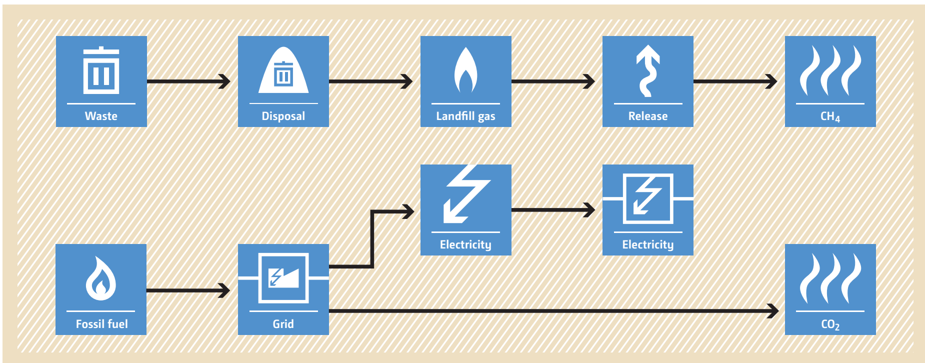
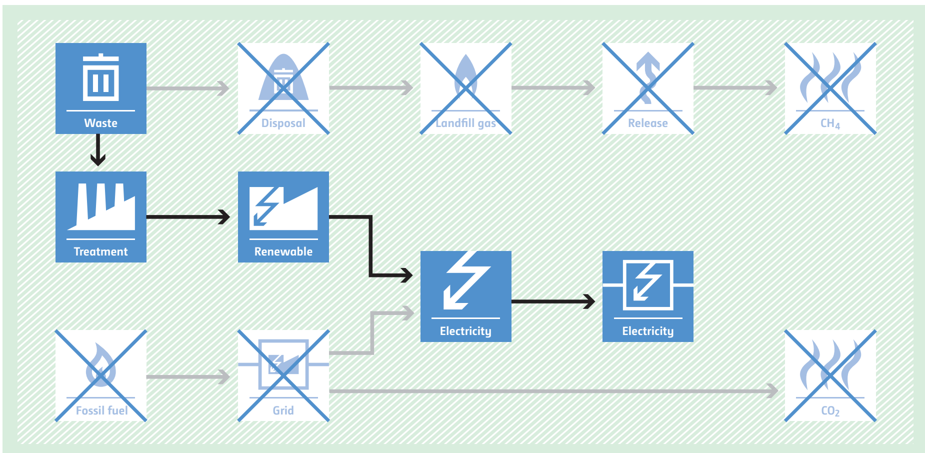
| **Typical project(s)** | Project activities where waste is treated by applying continuous reductive distillation (CRD) technology and resultant output gases is used for power generation. The wastes covered under this methodology are municipal solid waste (MSW), biomass residues and tyres. |
| **Type of GHG emissions mitigation action** | • GHG emission avoidance<br>• Renewable energy<br>CH4 emissions due to anaerobic decay of MSW and biomass residues are avoided by alternative waste treatment process.<br>Tyres, biomass residues and MSW account for renewable energy. |
| **Important conditions under which the methodology is applicable** | • The project activity involves the construction of a new plant to implement CRD technology for waste treatment;<br>• The co-products (e.g. syn gas, carbon char, emulsion fuel, fuel oil grade 2-4 etc.) of the CRD technology should be used within the project boundary;<br>• When tyres are used as waste, only End of Life Tyres (ELT) should be used;<br>• Neither waste nor products and by-products from the waste treatment plant established under the project activity are stored on-site under anaerobic conditions;<br>• The project does not reduce the amount of waste that would be recycled in the absence of the project activity. |
| **Important parameters** | At validation:<br>• Source of end of life tyres;<br>• Source of MSW. |
| | Monitored:<br>• Weight fraction of the different waste types in a sample and total amount of organic waste prevented from disposal;<br>• Stack gas analysis;<br>• Electricity and fossil fuel consumption in the project site;<br>• Electricity generated by the project activity. |

**BASELINE SCENARIO**
Disposal of the waste in a landfill site without capturing landfill gas, electricity is generated by the grid.




**PROJECT SCENARIO**
Continuous reductive distillation technology is used to treat the waste. Electricity is generated as final product.



# AM0113 Distribution of compact fluorescent lamps (CFL) and light-emitting diode (LED) lamps to households

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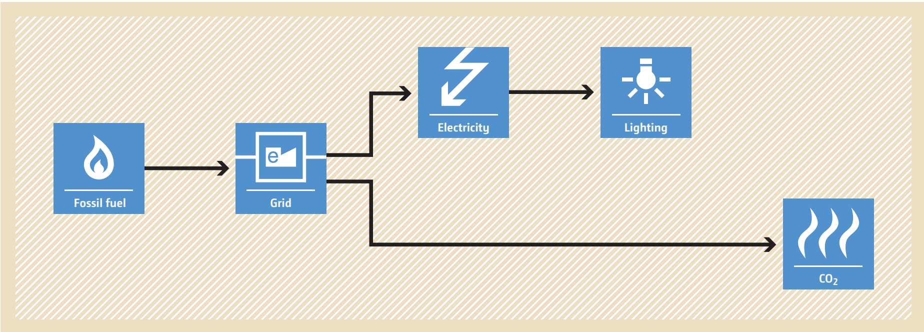
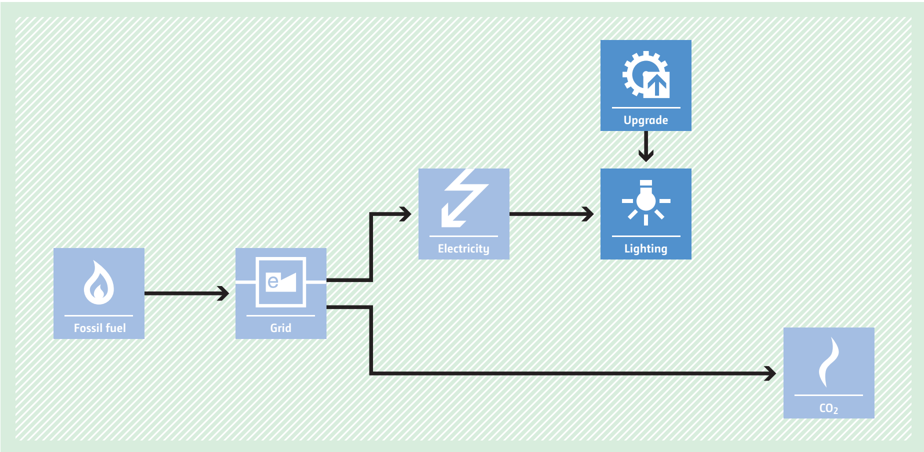
| **Typical project(s)** | Self-ballasted compact fluorescent lamps (CFLs) and light-emitting diode (LED) lamps are sold or distributed to households to replace less efficient lamps (e.g. incandescent lamps) in households. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Displacement of less-efficient lighting by a more-efficient technology. |
| **Important conditions under which the methodology is applicable** | • Baseline lamps replaced by the project meet the national/local lighting performance standards;<br>• Lumen output of a project lamp shall be equal to or more than that of the baseline lamp being replaced;<br>• Project lamps shall be marked. |
| **Important parameters** | At validation:<br>• Rated average life of each type of project lamp. |
| | Monitored:<br>• Failure rate of each type of lamp;<br>• Scrapping/destruction of replaced baseline lamps. |
| **BASELINE SCENARIO**<br>Less-energy-efficient light bulbs are used in households resulting in higher electricity demand. | <br> |
| **PROJECT SCENARIO**<br>More-energy-efficient lamps are used in households saving electricity and thus reducing GHG emissions. | <br> |

# AM0114 Shift from electrolytic to catalytic process for recycling of chlorine from hydrogen chloride gas in isocyanate plants

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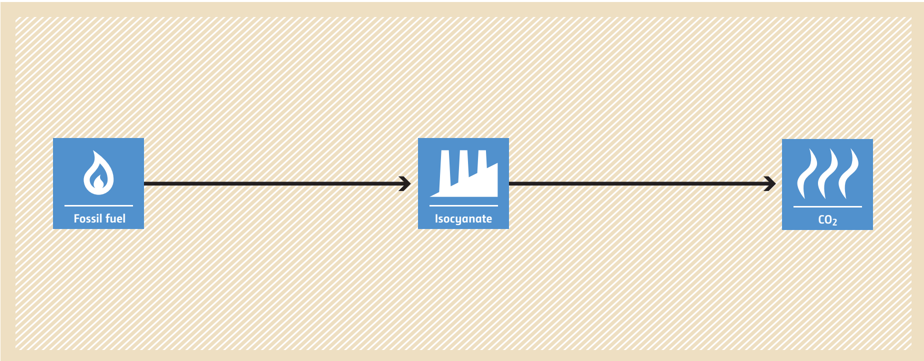
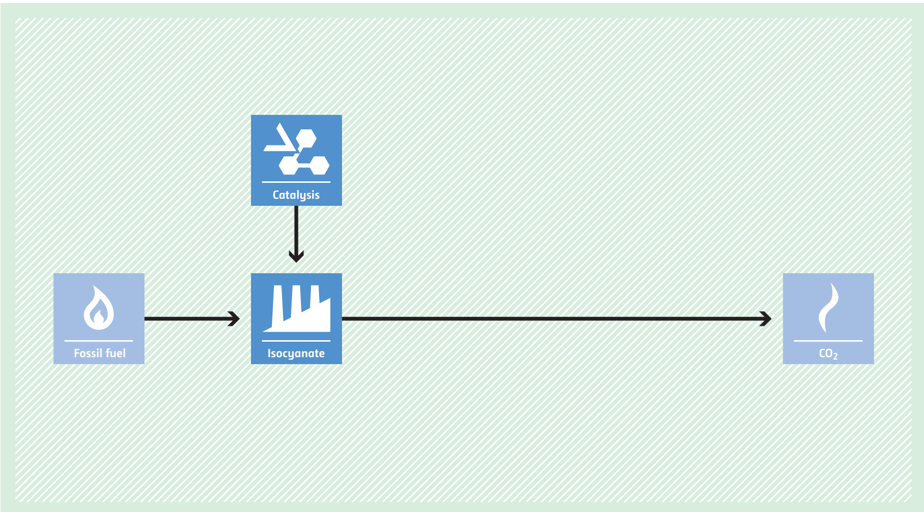
| **Typical project(s)** | Project activities where electrolytic process is replaced by catalytic process for the recycling of chlorine ($Cl_2$) from hydrogen chloride (HCl) gas in isocyanate plant. |
| **Type of GHG emissions mitigation action** | • Energy efficiency.<br>Reduction in electricity consumption and displacement of production of electricity by fossil fuel. |
| **Important conditions under which the methodology is applicable** | • Not applicable to project activities taking place in Greenfield isocyanate plants;<br>• The isocyanate plant, the $Cl_2$ plant and the electrolytic recycling facilities have operational history of at least three years prior to the starting date of the CDM project activity;<br>• Project activities where the production ratio of HCl to isocyanate in the crediting period shall not change by more than +/-10 per cent compared to the maximum ratio of the three years of the baseline. |
| **Important parameters** | At validation:<br>• Amount and quality of HCl and isocyanate used in the baseline;<br>• Amount of electricity consumed for the production of recycled $Cl_2$ in baseline.<br><br>Monitored:<br>• Amount and quality of HCl, $Cl_2$ and isocyanate in the project scenario. |
| **BASELINE SCENARIO**<br>Continuation of current practices, i.e. continued use of electrolytic process to recycle $Cl_2$ from the HCl gas in isocyanate plant. | <br> |
| **PROJECT SCENARIO**<br>Catalytic process for the recycling of $Cl_2$ from HCl gas in isocyanate plant. | <br> |