Allocation in phase 3 of EU ETS

Presentation of allocation rules

2 May 2011

Scope of the workshop

- This workshop is about free allocation
- The following topics will **not** be addressed in this workshop
  - Auctioning
  - Monitoring and Reporting issues
  - Aviation
  - Exclusion of small installations
  - Transitional free allocation for modernisation of electricity generation (Article 10c)

Disclaimer and copyright

- This workshop is conducted in the framework of a project for DG Climate Action. However, the Commission is not responsible for the correctness, completeness or quality of the information provided.
- The contents of these slides are based on the guidance documents as endorsed by the Climate Change Committee on 14 April 2011 and by no means substitute the legal text
- Any values used in examples do not necessarily reflect existing situations and are only meant for illustrative purposes.
- Ecofys makes no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability with respect to the information in this presentation. Any reliance you place on such information is therefore strictly at your own risk and Ecofys is not liable for any damage whatsoever arising from the use of this information
- The copyright of this presentation is reserved. It may therefore not be used for any purpose without the explicit permission of Ecofys

Agenda

- Introduction by DG CLIMA
- The 'road' to allocation
- Allocation rules
- Data collection template
- Case studies
  - Pulp and paper mill
  - Iron and steel plant
  - Heat network
  - Chemical site
  - Nitric acid plant

The 'road' to allocation

1. Operators apply for free allocation by providing
   - Verified data (data collection template)
   - The way the data has been obtained (methodology report)
2. CA prepares NIMs
3. Commission evaluates NIMs and determines the need for a cross-sectoral correction factor
4. CA determines final allocation

The Commission provides
- Guidance Documents
- A helpdesk for CA
- A data collection template
- A template for the methodology report
- A template for the NIMs

The data collection template applies the allocation methodology using the provided data. So the calculations in this presentation, are in principle performed automatically.

The following documents describe the allocation methodology

- Commission Decision provides the Community Implementation Measures (CIMs) = legal context for application of allocation rules
- Guidance documents provide further guidance for correct and harmonized application:
  1. General guidance
  2. Guidance on allocation methodologies
  3. Guidance on data collection
  4. Guidance on verification
  5. Guidance on carbon leakage
  6. Guidance on cross-boundary heat flows
  7. Guidance on new entrants/closures
  8. Guidance on waste gases and process emissions
  9. Sector specific guidance

Allocation to an installation

Allocation
=
Benchmark
X
Historical activity level
X
Carbon leakage exposure factor
X
Cross-sectoral correction factor OR linear factor

Allocation to an installation

Allocation
=
Benchmark
X
Historical activity level
X
Carbon leakage exposure factor
X
Cross-sectoral correction factor OR linear factor

Allocation is based on four methodologies which should be applied in hierarchical order

1. Product benchmarking (allowances/unit of production)
2. Heat benchmarking (62.3 allowances/TJ heat consumption or export)
3. Fuel benchmarking (56.1 allowances/TJ fuel consumption)
4. Process emissions approach(0.97 allowances/tCO_2 process emissions)

- No free allocation for electricity production and consumption and flaring (except for safety flaring)
- Emissions can only be covered by one methodology!

Allocation to an installation

Allocation
=
Benchmark
X
Historical activity level
X
Carbon leakage exposure factor
X
Cross-sectoral correction factor OR linear factor

The allocation is multiplied by a carbon leakage exposure factor (CLEF)

	2013	2014	2015	2016	2017	2018	2019	2020
Exposed activities	1	1	1	1	1	1	1	1
Not exposed activities	0.8000	0.7286	0.6571	0.5857	0.5143	0.4429	0.3714	0.3000

- The carbon leakage status of each activity (NACE 1.1 or PRODCOM 2007) is defined in a Commission Decision
- CIMs give CLEF related to each product benchmark
- The carbon leakage status of a sector may be revised in the future

Allocation to an installation

Allocation
=
Benchmark
X
Historical activity level
X
Carbon leakage exposure factor
X
Cross-sectoral correction factor OR linear factor

Possibly needed for installations not identified as electricity generators (Art. 10a5 of the revised ETS Directive

For installations identified as electricity generators pursuant to Art 3(u)

Different allocation methods may apply to the same installation..

- The installation is therefore divided in sub-installations…
  - Product benchmark sub-installations
  - Heat benchmark sub-installations
  - Fuel benchmark sub-installations
  - Process emissions sub-installations
- A sub-installation means all inputs, outputs and corresponding emissions related to a specific allocation regime
- To avoid double counting, sub-installations should never overlap!

There are..

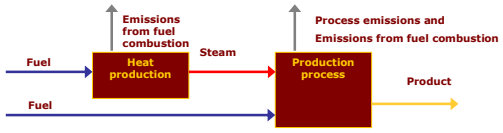
- 52 types of **product benchmark sub-installations**
  Since there are 52 product benchmarks
- 2 types of **heat benchmark sub-installations**
  1 exposed to carbon leakage and 1 not exposed
- 2 types of **fuel benchmark sub-installations**
  1 exposed to carbon leakage and 1 not exposed
- 2 types of **Process emissions sub-installations**
  1 exposed to carbon leakage and 1 not exposed
- The maximum number of sub-installations per installation is

  N + 6
- Where N = Number of product benchmark sub-installations

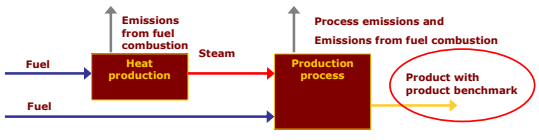
Stepwise approach to determine allocation

1. **a) Define relevant sub-installations**
   b) attribute relevant inputs /outputs (to prevent omissions or overlaps)
2. **Determine historical activity level per sub-installation**
3. **Determine preliminary allocation**
4. **Determine total final allocation (not part of NIMs)**

Let's consider the following generic production process

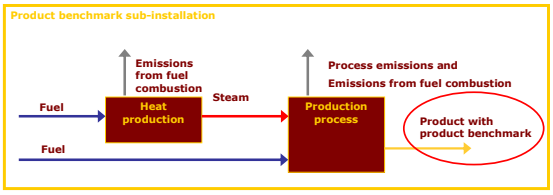


Allocation in case of production of benchmarked product



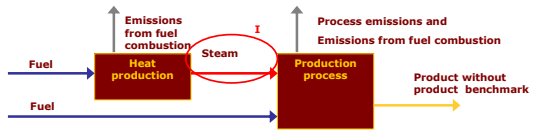
Product bench-mark	Measurable heat consump-tion	Fuel consump-tion	Process emissions	Allocation (not considering application if needed of carbon leakage exposure, linear reduction or cross sectoral correction factor)
Yes	-	-	-	Product benchmark x Production
No	Yes	-	-	Heat benchmark x Measurable heat consumption
No	-	Yes	-	Fuel benchmark x Fuel combustion
No	-	-	Yes	0.97 x Process emissions

Sub-installation in case of production of benchmarked product



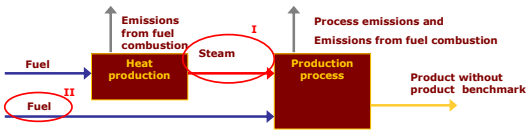
The system boundaries of the product benchmarks in many cases include all processes directly or indirectly linked to the production of a product. In those cases, there will only be one product benchmark sub-installation covering all processes regardless of the existence and magnitude of heat/fuel consumption and process emissions.

Allocation in case of production of not benchmarked products



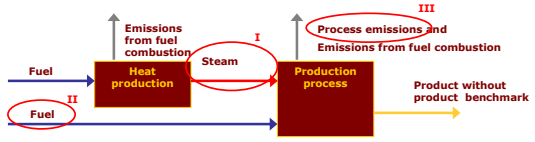
	Product bench-mark	Measurable heat consump-tion	Fuel consump-tion	Process emissions	Allocation (not considering application if needed of carbon leakage exposure, linear reduction or cross sectoral correction factor)
	Yes	-	-	-	Product benchmark x Production
I	No	Yes	-	-	Heat benchmark x Measurable heat consumption
	No	-	Yes	-	Fuel benchmark x Fuel combustion
	No	-	-	Yes	0.97 x Process emissions

Allocation in case of production of not benchmarked products



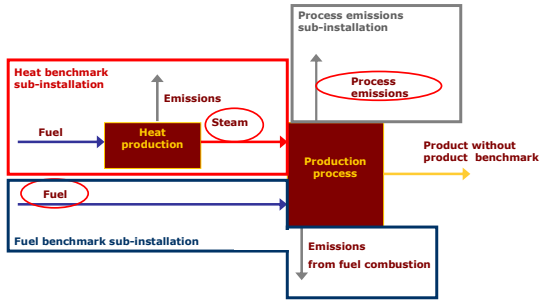
	Product bench-mark	Measurable heat consump-tion	Fuel consump-tion	Process emissions	Allocation (not considering application if needed of carbon leakage exposure, linear reduction or cross sectoral correction factor)
	Yes	-	-	-	Product benchmark x Production
I	No	Yes	-	-	Heat benchmark x Measurable heat consumption
II	No	-	Yes	-	Fuel benchmark x Fuel combustion
	No	-	-	Yes	0.97 x Process emissions

Allocation in case of production of not benchmarked products



	Product bench-mark	Measurable heat consump-tion	Fuel consump-tion	Process emissions	Allocation (not considering application if needed of carbon leakage exposure, linear reduction or cross sectoral correction factor)
	Yes	-	-	-	Product benchmark x Production
I	No	Yes	-	-	Heat benchmark x Measurable heat consumption
II	No	-	Yes	-	Fuel benchmark x Fuel combustion
III	No	-	-	Yes	0.97 x Process emissions

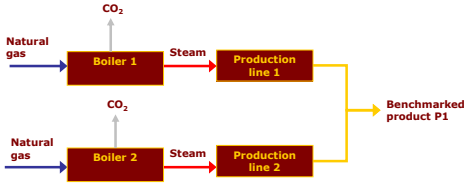
Sub-installations in case of production of non-benchmarked products



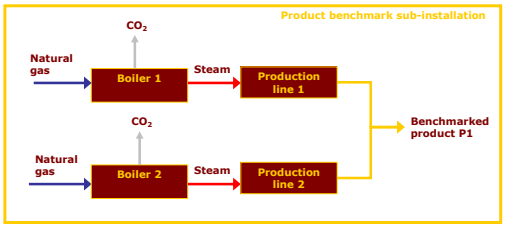
There is not necessarily a one-to-one relation between sub-installations and physical units

- 1 physical unit can be part of multiple sub-installations
- 1 sub-installation can contain multiple physical units

One sub-installation can cover multiple production lines and process units

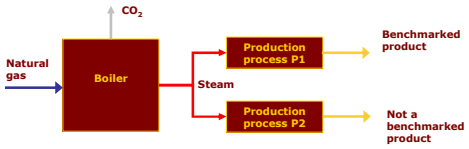


One sub-installation can cover multiple production line and process units

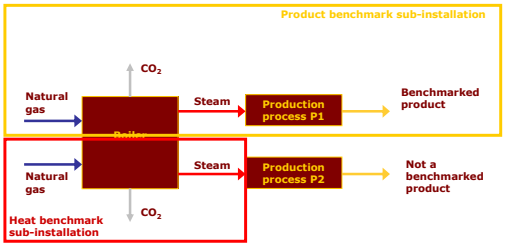


One product benchmark sub-installation since only production of one benchmarked product

One unit can be part of multiple sub-installations



One unit can be part of multiple sub-installations



Attribution to sub-installations of inputs, outputs and corresponding emissions can be based on… (Art. 7(6))

- Usage time per year for each sub-installation.
- Mass or volume of individual products
- Estimates based on the ration of free reaction enthalpies
- **Another suitable distribution key corraborated by a scientifically sound methodology**

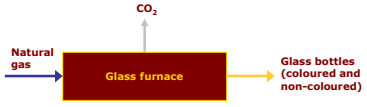
Aim is that 'highest achievable accuracy' is reached

In some cases, the attribution has no effect on the historical activity level and allocation, in others it has.

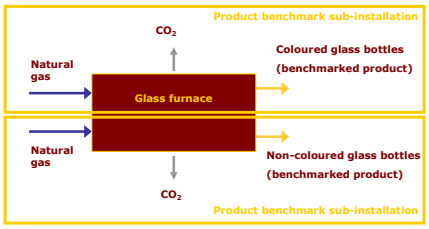
Only relevant fuels and emissions should be attributed

- Only source streams as monitored according to the MRGs and listed within the monitoring plan, if any.
- Source stream means a fuel type, raw material and process emissions giving rise to emissions of relevant greenhouse gases at one or more emission sources as a result of its consumption or production.

A single unit produces different benchmarked products in time

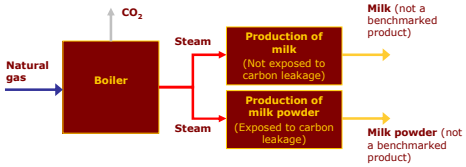


Fuel input and emissions are split...

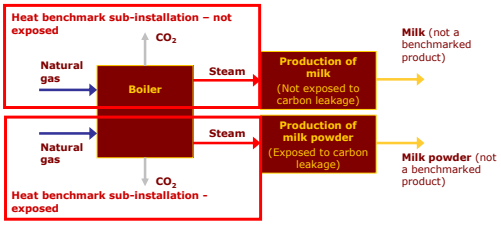


Note: apart from the furnace, the product benchmark sub-installations cover more production units not shown here

Two heat benchmark sub-installations because of different carbon leakage status of the products produced



Two heat benchmark sub-installations because of different carbon leakage status of the products produced



Step 1 for product benchmark sub-installations

Step 1

- Define a product benchmark sub-installation for each benchmarked product
- Attribute relevant inputs (= fuels, heat, and electricity) and outputs (= production, heat, process emissions)

Definitions of products and system boundaries of product benchmarks are needed in this step:

- Definitions are given in the CIMs
- Additional explanations are provided by guidance document 9.

Step 1 for heat benchmark sub-installations

Step 1

- (If applicable) Define one or two heat benchmark sub-installations (dependent on one or two CL-status)
- Attribute relevant inputs (= fuels for heat production, heat) and outputs (= heat, emissions from heat production)

Heat benchmark sub-installations cover:

- Measurable heat consumption in the installation outside boundaries of product benchmark sub-installations

AND

- Measurable heat exported to non-ETS installations,

PROVIDED THAT

- The heat is used for the production of products, heating and cooling, production of mechanical energy, which is not used for the production of electricity
- The heat is not used for the production of electricity
- The heat is produced by the installation itself or another ETS installation (except for production in electric boilers and nitric acid product benchmark sub-installation)

Heat benchmark sub-installations only cover measurable heat

Measurable heat flows have all of the following characteristics:

- They are **net** meaning that the heat content in the condensate or transfer medium returning to the heat supplier is subtracted
- The heat flows **are transported through identifiable pipelines or ducts**

AND

- The heat flows **are transported using a heat transfer medium**, e.g. steam, hot air, water, oil, liquid metals or salts

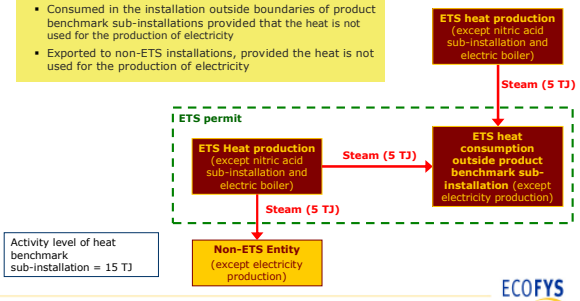
AND

- The heat flows **are or could in principle be measured by a heat meter** (where a heat meter is any device that can measure the amount of energy produced based upon flow volumes and temperatures)

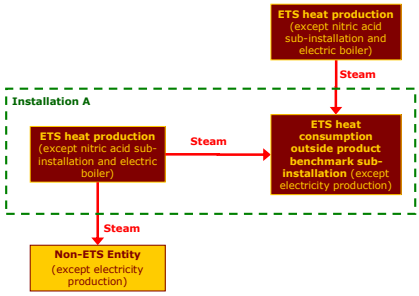
Heat flows covered by a heat benchmark sub-installation

Heat produced by the installation itself or another ETS installation (except for production in electric boilers and nitric acid product benchmark sub-installation) and:

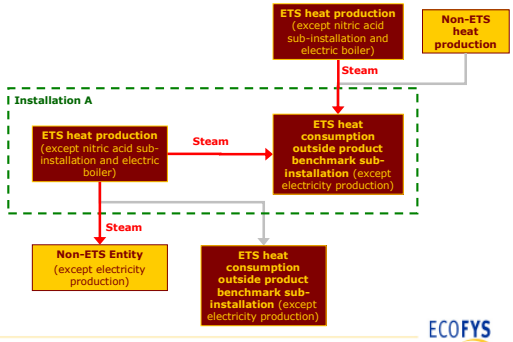
- Consumed in the installation outside boundaries of product benchmark sub-installations provided that the heat is not used for the production of electricity
- Exported to non-ETS installations, provided the heat is not used for the production of electricity



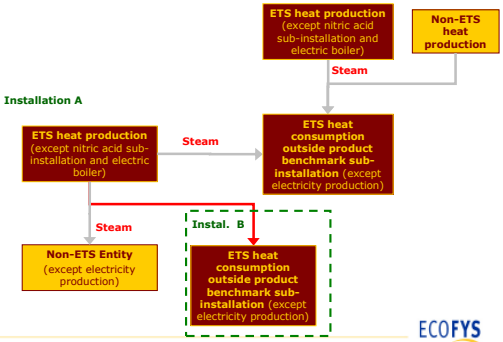
Heat flows covered by the heat benchmark sub-installation of installation A



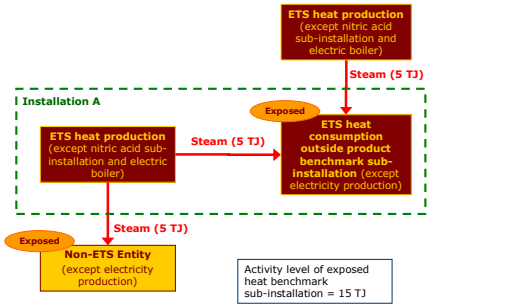
And heat flows not covered by a heat benchmark sub-installation of installation A



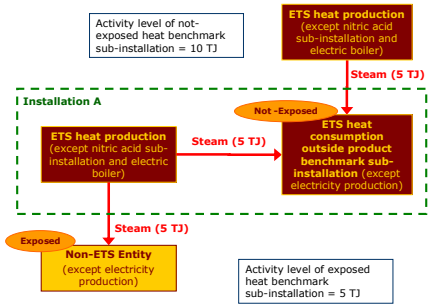
Heat flows covered by a heat benchmark sub-installation of installation B



Taking into account carbon leakage exposure status



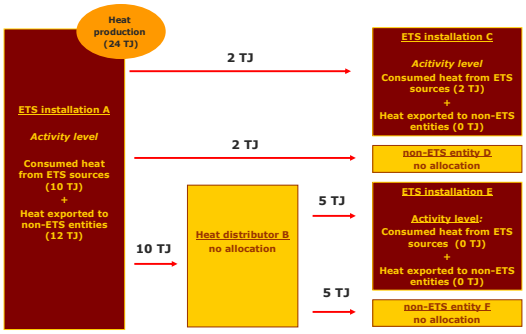
Taking into account carbon leakage exposure status



Heat distributors

- A **heat distributor** is regarded as a non-ETS entity even if it is a ETS installation.
  - A heat distributor does neither consume or produce heat
  - In case of a heat distributor there is no direct relation between heat producer and heat consumer

Heat covered by heat benchmark sub-installation assuming there are no product benchmarks and all activities are exposed to carbon leakage

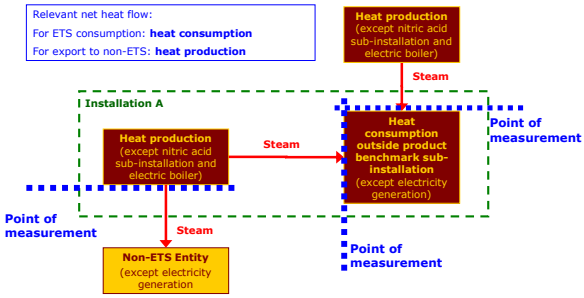


Intermezzo

Determination of measurable heat flows

(see Annex II of Guidance Document 3)

Point of measurement



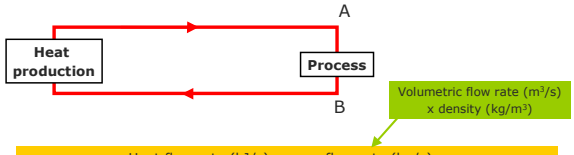
Four methods exist to determine net measurable heat flows

1. Use of **measured data** (temperature, pressure and flow rates)
2. Use of **documentation** (invoices, company internal accounting, any documentation that report heat flows determined according to a sound and transparent methodologies)
3. Use of **proxy** based on fuel consumption and measured efficiency
4. Use of **proxy** based on fuel consumption and reference efficiency

Use approach that:

- Leads to the *highest achievable accuracy*
- Avoids any overestimations/overallocation

Method 1: Use for of measured data



Heat flow rate (kJ/s)= mass flow rate (kg/s) x specific enthalpy difference over A and B (kJ/kg)

Or, $\dot{Q} = \dot{m} \cdot (h_A - h_B)$

Enthalpy (h) is a measure for the total energy and is a function of temperature (T) and pressure (p): *h(T,p)*

Methods 3 and 4: Use of proxy

Heat flow (TJ) = Energy input (TJ) x Conversion efficiency

Or, $Q = E_{in} \cdot \eta$

Method 3: The efficiency is the measured efficiency for heat production based on suitable measurements carried out under the supervision of the verifier which should refer to technical documentation of the installation, specifically the specific part load curve of the devices concerned.

Method 4: The efficiency is a reference efficiency ($\eta_{reference}$)

General guidance on determination of net measurable heat flows

- **Net heat flows are calculated as if all condensate is returned even if this not the case.**
  - In case condensate is not returned a reference temperature of 90°C is assumed for returned condensate.
  - The leads to same result in case all condensate is returned and in case not all condensate is returned. However, in case not all condensate is returned, the efficiency will be lower, so a smaller share of the emissions are allocated for free.
- **Steam that is vented to the atmosphere should not be part of the heat benchmark sub-installation;** if included in the calculated heat flow, it should be deducted.

Step 1 for fuel benchmark sub-installations

Step 1

- (If applicable) Define one or two fuel benchmark sub-installations (dependent on one or two CL-status)
- Attribute relevant inputs (= fuels) and outputs (= emissions from fuel combustion)

Fuel benchmark sub-installations cover fuel consumption outside the boundaries of a product benchmark sub-installation:

PROVIDED THAT

- The fuel is used for direct heating or cooling *without* heat transfer medium, the production products or mechanical energy, which is not used for the production of electricity
- The fuel is not used for the production measurable heat or electricity (directly of indirectly via production of mechanical energy)
- The fuel is not flared (unless it is for safety flaring)

Step 1 for process emissions benchmark sub-installations

Step 1

- (If applicable) Define one or two process emissions sub-installations (dependent on one or two CL-status)
- Attribute relevant inputs and outputs (= process emissions)

Process emission sub-installations cover:

- Process emissions outside the boundaries of product benchmark sub-installations.

Process emissions sub-installations cover three types of emissions

a. non-CO_2 greenhouse gas emissions covered by the ETS outside the boundaries of product benchmark sub-installations

b. CO_2 emissions produced by any of the activities below

c. Part of the emissions from the combustion of incompletely oxidized carbon emitted by any of the activities below

Definition of activity	Example
Chemical or electrolytic reduction of metal compounds in ores, concentrates and secondary materials	Production of copper from copper carbonate minerals
Removal of impurities from metals and metal compounds	Emissions from the oxidation of impurities of scrap emitted as part of a recycling process
Thermal decomposition of carbonates, excluding those for the flue gas scrubbing	Production of magnesia.
Chemical synthesis where the carbon bearing material participates in the reaction, for a primary purpose other than the generation of heat	Acrylic acid production, acetylene production (partial oxidation), acrylonitrile production (ammoxidation), formaldehyde production (partial oxidation/dehydrogenation)
Use of carbon containing additives or raw materials for a primary purpose other than the generation of heat	Emissions from the oxidation of organic additives to increase the porosity of ceramics products
Chemical or electrolytic reduction of metalloid oxides or non-metal oxides such as silicon oxides and phosphates	Production of silicium, reduction of phosphate ore

Process emissions sub-installations cover three types of emissions

Process emissions

≠

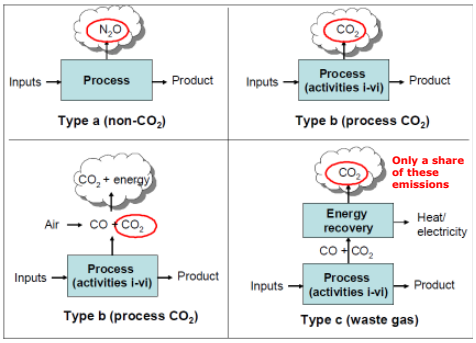
process emissions as defined in MRGs

Intermezzo

A bit more on process emissions and waste gases

(see Guidance Document 8)

Process emissions sub-installations cover



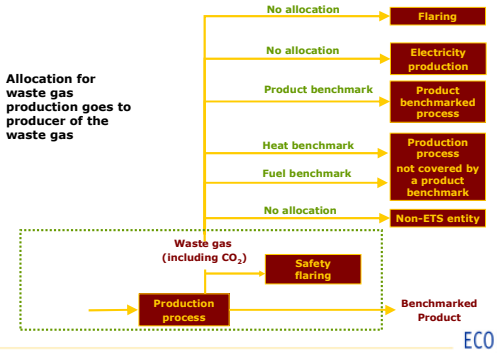
For waste gases, the process emissions are not all emissions from the combustion of the waste gas, but…

$$Energy_{WG} \times EF_{WG} - Energy_{WG} \times EF_{NG} \times Correction_{\eta}$$

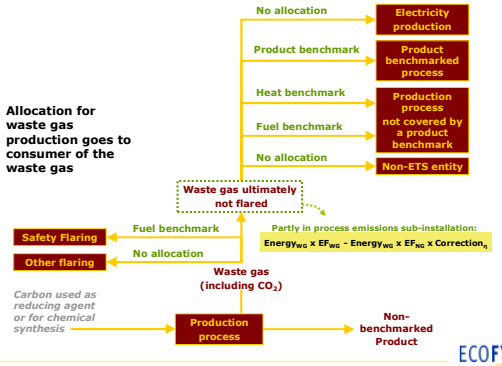
Emissions from the combustion of waste gas — MINUS — Emissions from the combustion of an equivalent amount of natural gas taking into account difference in efficiency of use

$Energy_{WG}$	=	Energy content of waste gas that is not flared (TJ)
EF_{WG}	=	Emission factor of waste gas (tCO_2/TJ)
EF_{NG}	=	Emission factor of natural gas (tCO_2/TJ)
$Correction_{\eta}$	=	Correction for difference in efficiency of use of waste gas and natural gas; by default 0.667

Allocation in relation to waste gases produced <u>within</u> product benchmark sub-installations



Allocation in relation to waste gases produced <u>outside</u> product benchmark sub-installations



Stepwise approach to determine allocation

1. a) Define sub-installations and
   b) attribute relevant inputs /outputs
2. Determine historical activity level per sub-installation
3. Determine preliminary allocation
4. Determine total final allocation (not part of NIMs)

Sub-installations have different units of historical activity level

- Product benchmarks -> Unit of production (e.g. tonne)
- Heat benchmark -> TJ heat consumption or export
- Fuel benchmark -> TJ fuel consumption
- Process emissions -> tCO_2 process emissions

But the way to determine the historical activity level is the same for all.

Four situations and ways to determine the historical activity level for a sub-installation

1. Normal situation: continuous activity
2. Interrupted activity
3. Start of operation during the baseline period such that <2 years of operation
4. Significant capacity changes

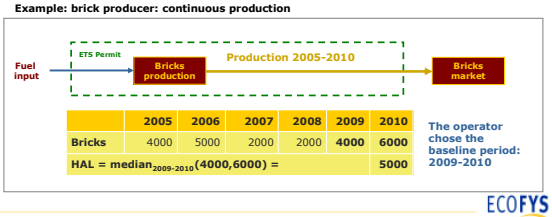
Standard situation: continuous activity

- The operator selects the baseline period *for the complete installation*:
  - 2005 – 2008 OR 2009 – 2010

Median (1,2,5)=2
Median (1,2,4,10) = 3

HAL = $median_{baseline}$(annual activity levels)

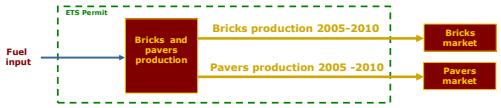
Example: brick producer: continuous production



	2005	2006	2007	2008	2009	2010
Bricks	4000	5000	2000	2000	4000	6000
HAL = $median_{2009-2010}$(4000,6000) =						5000

The operator chose the baseline period: 2009-2010

The rules apply to the entire installation, including all sub-installations



	2005	2006	2007	2008	2009	2010
Bricks sub-installation	7000	6500	6000	8000	10000	13000
Pavers sub-installation	1000	1500	1700	2000	1500	1500
HAL bricks = $median_{2009-2010}$(10000, 13000) =						11500
HAL pavers = $median_{2009-2010}$(1500, 1500) =						1500

The operator chose the baseline period: 2009-2010

Four situations and ways to determine the historical activity level for a sub-installation

1. Normal situation: continuous activity
2. Interrupted activity
3. Start of operation during the baseline period such that <2 years of operation
4. Significant capacity changes

Interrupted activity

- The operator selects the baseline period *for the complete installation*:
  - 2005 – 2008 OR 2009 – 2010

Median (1,2,5)=2
Median (1,2,4,10) = 3

HAL = $median_{baseline}$(annual activity levels)

- Skip years in which the installation has not operated at least one day. *Note: this rule is not applicable for installations that by their nature operate only occasionally (e.g. installation kept in reserve or stand-by)*

Example: interrupted operation from 5 December 2006 to 2 January 2008

HAL= Median(x,x,x) OR Median (x,x)

Year	2005	2006	2007	2008	2009	2010
>1 day of operation	x	x		x	x	x

Four situations and ways to determine the historical activity level for a sub-installation

1. Normal situation: continuous activity
2. Interrupted activity
3. Start of operation during the baseline period such that <2 years of operation
4. Significant capacity changes

Approach for sub-installations that are part of an installation that started operation within the baseline period such that there are no two calendar years of operation in the chosen baseline period.

HAL = Initial capacity x Relevant Capacity Utilisation Factor

Example: start of operation: 6 May 2009

HAL= $C_{initial}$ x RCUF OR $C_{initial}$ x RCUF

Year	2005	2006	2007	2008	2009	2010
>2 years of normal operation	No				No	

- Note: for installations that by their nature operate only occasionally (e.g. installation kept in reserve or stand-by), the start of operation meant, is the first time that the installation operated.
- So if such an installation operated in 2004, stopped operation from 2005 to 2007, than the start of operation would not be in 2007.

The relevant capacity utilisation factor will be estimated by the operator but eventually set be the CA

Based on:

- The installations intended normal operation
- The maintenance cycle
- Common production cycle
- Energy efficient techniques (for fuel and heat benchmark sub-installations)
- Greenhouse Gas efficient techniques (for process emissions sub-installations)

Data quality requirements:

- Plausibility: Should be checked against typical utilisation rates in the sector concerned
- Values > 100% should not be accepted
- Should be independently verified

More examples..

Start of operation on 3 March 2007

HAL= $C_{initial}$ x RCUF OR Median (x,x)

Year	2005	2006	2007	2008	2009	2010
>1 day of operation			x	x	x	x
>2 years of normal operation	No				Yes	

Start of operation on 3 March 2006

HAL= Median (x,x,x) OR Median (x,x)

Year	2005	2006	2007	2008	2009	2010
>1 day of operation		x	x	x	x	x
>2 years of normal operation	Yes				Yes	

The rules apply to the entire installation

Example: a paper mill consisting of two product benchmark sub-installations: coated and uncoated fine paper

Year	2005	2006	2007	2008	2009	2010
Activity level (Adt/year)						
Uncoated fine paper product benchmark sub-installation	400	450	0	500	800	700
Coated fine paper product benchmark sub-installation	0	600	1000	500	0	100
HAL						
Uncoated fine paper product benchmark sub-installation	Median (400,450,0,500) = 425				Median (800,700) = 750	
Coated fine paper product benchmark sub-installation	Median (0,600,1000,500) = 550				Median (0, 100) = 50	

- Even though a sub-installation interrupted activity and had <2 years normal operation in 2009 and 10, the installation as a whole did not.
- There is one baseline period for the entire installation (either 2005 – 2008 OR 2009-2010)

This table gives an overview of possible situations

	Year	'05	'06	'07	'08		'09	'10
At least one day of operation in each year	HAL = median	x	x	x	x	OR median	x	x
No operation in 2006	HAL = median	x		x	x	OR median	x	x
Operation started on 1 January 2007 or before	HAL = median			x	x	OR median	x	x
Operation started between 2 Jan. '07 and 1 Jan. '09	HAL = Initial capacity x RCUF					OR median	x	x
Operation started on 2 January 2009 or later	HAL = Initial capacity x RCUF							

* 1st day of operation is included in the baseline period

Four situations and ways to determine the historical activity level for a sub-installation

1. Normal situation: continuous activity
2. Interrupted activity
3. Start of operation during the baseline period such that <2 years of operation
4. Significant capacity changes

In case of significant capacity changes..

$$HAL = HAL_{initial} + HAL_{change}$$

$HAL_{initial}$ = HAL related to capacity before change
HAL_{change} = HAL related to changed capacity

- How to determine capacity?
- What is a significant change in capacity?
- How to determine $HAL_{initial}$ and HAL_{change}?

Capacity

- Capacity is needed for
  - Product benchmark sub-installations (for determination of SCUF)
  - Sub-installations of on installation that operated <2 years in the baseline period
  - Sub-installation before and after a significant capacity change
- **There are two ways to determine capacity:**

Average of 2 highest monthly activity levels in a period x 12 months per year

OR

Experimental verification (48 hours continuous test)

Overview of when to use what method

	Based on avg. of two highest monthly activity levels in…	Exp. verification
Initial capacity of product benchmark sub-installations to determine SCUF	**1 Jan. 2005 – 31 Dec. 2008**	Never
Initial capacity of sub-installations of on installation that operated <2 years in the baseline period	**Start of operation – 30 June 2011** In case no 2 months are available, but start of normal operation is before 30 June 2011 then period can be extended to 30 Sept. 2011	If start of changed operation is after 30 June 2011
Initial capacity of sub-installation to assess whether a capacity change is significant	**1 Jan. 2005 (or last capacity change) – physical change leading to the change in capacity**	Never
Initial capacity of sub-installation to determine added capacity	**1 Jan. 2005 (or last capacity change) – start of changed operation**	Never
Capacity of sub-installation after a significant capacity change	**Six months after start of changed operation** In case no 2 months are available, but start of changed operation is before 30 June 2011 then period can be extended to 30 Sept. 2011	Never

The start of changed operation should be determined following a stepwise appoach

Significant capacity extensions

1. Determine added design capacity ($C_{added,design}$)
2. Determine activity level related to added capacity ($AL_{added,design}$)
   - Based on actual activity level of extension
   - In case not feasible;

$$AL_{added,design} = AL_{Total} - AL_{average}$$

3. Start of changed operation is the first day of a 90 day continuous period in which:

$$AL_{added,design} \geq 0.4 \times C_{added,design}$$

Significant capacity reductions

1. Determine remaining design capacity ($C_{remaining,design}$)
2. Determine activity level related to remaining design capacity ($AL_{remaining,design}$)

$$AL_{remaining,design} = AL_{Total}$$

3. Start of changed operation is the first day of a 90 day continuous period in which:

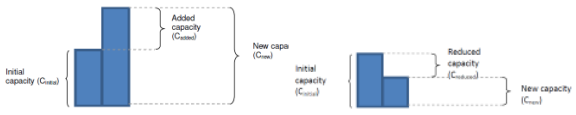
$$AL_{Total} \geq 0.4 \times C_{remaining,design}$$

A significant capacity change is a change in the period 1-1-'05 and 30-6-'11 consisting of:

A. Physical change at the installation concerned AND changed capacity at least 10% of initial capacity (determined prior to physical change)

OR

B. Physical change at the installation concerned AND a changed activity level that would lead to a change in allocation of at least 50 000 allowances per year representing at least 5% of original allocation

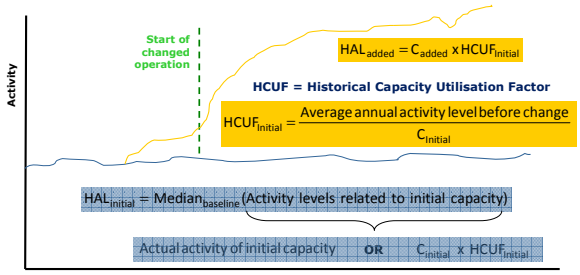


Relation between the physical change and the capacity change

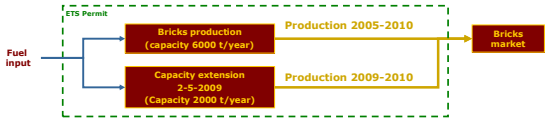
- There should be a causal relation between physical changes and capacity changes
- A physical change can only lead to one capacity change per sub-installation
- One significant change in capacity can be the result of multiple physical changes
- There can be a long time between the physical change and the significant change in capacity
- Physical change *in* the baseline period could lead to capacity change *after* the baseline period.
- Measures that exclusively aim at increasing efficiency and not increasing output should not be regarded as physical changes.

HAL in case of significant capacity changes is:

$$HAL = HAL_{initial} + HAL_{added}$$



Significant capacity change of bricks production

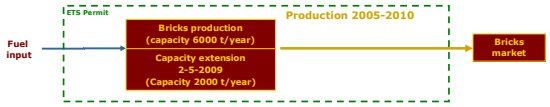


	2005	2006	2007	2008	2009	2010
Production related to initial capacity	4000	4000	4500	4500	**4000**	**4500**
Production related to capacity extension					**500**	**1000**

The operator chose the baseline period: 2009-2010

$HAL_{initial}$ = $median_{2009-2010}$ (4000,4500) =	**4250**
HAL_{added} = C_{added} x HCUF = 2000 x 0.71 = With HCUF = (average production in years before changes /initial capacity (4000+4000+4500+4500)/4)/ 6000 = 0.71	**1417**
HAL_{total} = $HAL_{initial}$ + HAL_{added}	**5667**

Significant capacity change of bricks production

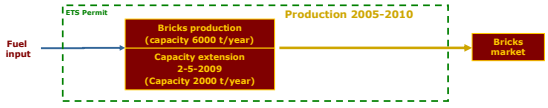


	2005	2006	2007	2008	2009	2010
Total production	4000	4000	4500	4500	**4500**	**5500**
Production related to initial capacity	4000	4000	4500	4500	**?**	**?**

The operator chose the baseline period: 2009-2010

$HAL_{initial}$ = $median_{2009-2010}$ (?,?) =	**?**
HAL_{added} = C_{added} x HCUF = 2000 x 0.71 = With HCUF = (average production in years before changes /initial capacity (4000+4000+4500+4500)/4)/ 6000 = 0.71	**1417**
HAL_{total} = $HAL_{initial}$ + HAL_{added}	**?**

Significant capacity change of bricks production



	2005	2006	2007	2008	2009	2010
Total production	4000	4000	4500	4500	**4500**	**5500**
Production related to initial capacity	4000	4000	4500	4500	**4250**	**4250**

The operator chose the baseline period: 2009-2010

$$AL_{initial} = C_{initial} \times HCUF_{initial} = 6000 \times 0.71$$

$HAL_{initial}$ = $median_{2009-2010}$ (4250,4250) =	**4250**
HAL_{added} = C_{added} x HCUF = 2000 x 0.71 = With HCUF = (average production in years before changes /initial capacity (4000+4000+4500+4500)/4) / 6000 = 0.71	**1417**
HAL_{total} = $HAL_{initial}$ + HAL_{added}	**5667**

Stepwise approach to determine allocation

1. **a) Define sub-installations and**
   b) attribute relevant inputs /outputs
2. **Determine historical activity level per sub-installation**
3. **Determine preliminary allocation**
4. **Determine total final allocation (not part of NIMs)**

Determine preliminary total allocation
Not considering carbon leakage (CL) status

The allocation without considering CL-status is the same for each year

The allocation without considering CL-status is needed for the Commission to determine the need for a **cross-sectoral correction factor**

Product benchmark sub-installations: (a correction applies for consumption of heat from non-ETS sources or nitric acid sub-installations)	BM_P *[EUA/t product]* x HAL_P *[t product]** - BM_H [EUA/TJ heat] x $HAL_{Non\ eligible\ heat}$ [TJ heat]
Heat benchmark sub-installations:	BM_H *[EUA/TJ heat]* x HAL_H *[TJ heat]*
Fuel benchmark sub-installations:	BM_F *[EUA/TJ fuel]* x HAL_F *[TJ fuel]*
Process emissions sub-installations:	0.97 *[EUA/tCO_2]* x HAL_E *[tCO_2]*
Preliminary total allocation: *(not considering CL-status)*	**Sum for all sub-installations**

BM: Benchmark
HAL: Historical activity level
EUA: Allowances

* In specific cases (listed in the CIMs) the allocation to a product benchmark sub-installation is corrected e.g. for exchangeability of fuel and electricity, see next slides and Guidance Doc. 9

Determine preliminary total allocation
Considering carbon leakage status

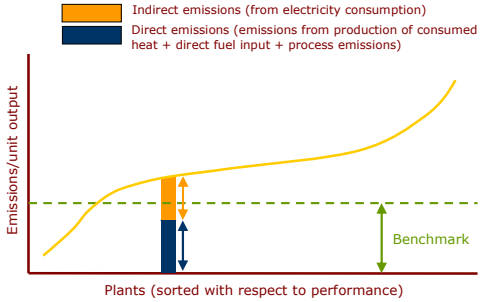
The allocation with consideration of CL-status can differ from year to year

The CL-status may change in the future

Product benchmark sub-installations: (a correction applies for consumption of heat from non-ETS sources or nitric acid sub-installations)	(BM_P *[EUA/t product]* x HAL_P *[t product]** - BM_H [EUA/TJ heat] x $HAL_{non\text{-}eligible\ Heat}$ [TJ heat]) x CLEF
Heat benchmark sub-installations:	BM_H *[EUA/TJ heat]* x HAL_H *[TJ heat]* x CLEF
Fuel benchmark sub-installations:	BM_F *[EUA/TJ fuel]* x HAL_F *[TJ fuel]* x CLEF
Process emissions sub-installations:	0.97 *[EUA/tCO_2]* x HAL_E *[tCO_2]* x CLEF
Preliminary total allocation: *(considering CL-status)*	**Sum for all sub-installations**

BM: Benchmark
HAL: Historical activity level
EUA: Allowances
CLEF: Carbon leakage exposure factor

Some product benchmarks take into account the emissions for the production of consumed electricity



The allocation in case of such benchmarks is corrected for this

$$Allocation_{preliminary} = \frac{Em_{direct} + Em_{NetHeatImport}}{Em_{direct} + Em_{NetHeatImport} + Em_{Elec}} \cdot BM_P \cdot HAL_P$$

Ratio of direct and total emissions

'uncorrected allocation'

Em_{direct}	direct emissions of the product benchmark sub-installation
$Em_{NetHeatImport}$	Emissions from imported heat (62.3 tCO_2/TJ heat)
Em_{Elec}	Emissions from consumed electricity (0.465 tCO_2/MWh)
BM_p	Relevant product benchmark
HAL_p	Historical activity level

The emissions are not annual emissions, but the emissions during the baseline period (2005-2008 or 2009-2010)

Stepwise approach to determine allocation

1. **a) Define sub-installations and**
   b) attribute relevant inputs /outputs
2. **Determine historical activity level per sub-installation**
3. **Determine preliminary allocation**
4. **Determine total final allocation (not part of NIMs)**

Determine final total allocation (not in NIMs)

Cross-sectoral correction for installations that are not "electricity generators" (pursuant to Art 3(u)):

Final allocation = $F_{instal,prel.}$ (k) x CSF (k)

$F_{instal,prel.}$(k): Preliminary allocation considering CL-status in year k
CSF (k): Cross-sectoral correction factor in year k

Linear reduction for "Electricity generators" (pursuant to Art 3(u)):

Final allocation = $F_{instal.prel}$(k) – 0.0174 x $F_{instal.prel}$(2013) x (k – 2013)

$F_{instal,prel.}$(k): Preliminary allocation considering CL-status in year k
0.0174 Linear reduction factor

Note: electricity generators do not receive allocation for electricity generation, but could receive allocation for other activities.