



Cefic Proposal for an ETS Benchmark Methodology for Annex I Installations

Executive summary

Cefic has worked on the development of CO₂ benchmarks for seven large emitters in the chemical industry over the last year: Crackers, Ammonia, Soda Ash, Carbon Black, Adipic Acid, Nitric Acid and Chlorine. With this paper Cefic intends to give an overview on the methodology suggested for benchmarking, which takes into account the adopted ETS Directive and the special conditions of the chemical industry.

General Principles

Benchmarks need to be transparent and as simple as possible, homogenous within a sector and across industry sectors. The chemical industry agrees in principle on product related benchmarks, which are fuel neutral and without correction factors. However, working on benchmarks showed that reality differs from theory and therefore specific cases will require correction factors or process and fuel specific benchmarks.

Selection of explicitly benchmarked products/processes and treatment of heat

The major issue for the chemical industry is the treatment of combustion installations, which is highly interlinked with the number of benchmarks and the fall-back option for non benchmarked products. Heat which is needed for chemical processes should be considered an integral part of our production activity and thus receives the same quota of free allowances as the respective chemical sector, i.e. heat needed for a chemical process in an exposed sector must receive 100% free allowances either based on the product or on a heat benchmark.

We have identified three options to address these issues:

- A The first system focuses on simplicity and a low number of benchmarks. 80% of the chemical industry's emissions (direct plus steam) are covered by benchmarks for the direct process emissions. Steam would be considered a product on its own that would be benchmarked for its efficiency in production like all the others. For the remaining 20% direct emissions we propose as fall-back option a system of grandfathering. This system is very simple and guarantees equal treatment with the many other sectors which rely on process heat. However, it is acceptable only if both, the heat production benchmark and the grandfathering approach for the remaining 20% would remain without additional generic improvement factors.
- B The second proposal is a more complex and elaborated system which is again based on an 80% coverage of the chemical industry's total emissions (direct plus steam) through benchmarks. However, steam for this 80% share is not considered a product on its own, but benchmarks are done on direct process emissions and steam consumption. Thus, for these 80%, the efficiency of steam consumption is taken into account. For the remaining 20% emissions, the direct process emissions should be grandfathered and the remaining heat consumption is allocated based on a heat production benchmark. This approach is acceptable only, if it is consistently applied across all industry sectors to avoid that some sectors go for the simpler and higher allocated option A); and if for the remaining 20% both, the heat production benchmark and the grandfathering approach would remain without additional generic improvement factors.



- C The third option is very complex and covers basically all emissions from processes and steam consumption in explicit benchmarks. This would require several hundreds if not more benchmarks to cover all different uses of heat all across the EU industry (including all products which use distillation or drying processes for their production which would each need an own benchmark). This approach would become necessary if the fall-back options outlined under A) and B) for either the heat production factor and/or the grandfathering approach for the remaining 20% emissions would be combined with generic improvement factors. In this case, stringent improvement factors would lead to a lower allocation for good performers than would be achieved under explicit benchmarks. To avoid this option, the generic approaches under A) and B) must be performed without generic improvement factors.

In the systems B) or C), steam outflows need to be accounted as negative in the product benchmark. Emissions from steam and electricity production based on waste gases, must receive free allowances. In case of interchangeability of energy carriers and few electro-intensive installations within a sector, electricity should also be part of the benchmark for direct emitters to determine the compensation allocation at the level of a benchmark. This avoids the unintended promotion of electro-intensive processes.

Determination of benchmark values and allocation path

For the benchmark reference value, primary and secondary data can help determining the benchmark reference value, but primary data should be considered the better source. Literature data might need to be adapted. Three installations are the minimum to establish a benchmark reference value. Outliers should not be included in the calculation of the reference value and should have a correction factor on their allocation. We also propose an allocation path which gradually moves towards the benchmark reference value, starting at the 2005 sector average in 2013.

Activity data

Cefic advocates an allocation system that limits emissions, but not growth. Therefore production increases should receive free allocation at the level of the benchmark, being it a gradual production expansion or a newly built installation. This can be either done by a rolling average production factor, or by a new entrants reserve that takes such expansion into account. However, we need to raise a specific problem for the years until 2011. The Directive does not explicitly address how to deal with capacity increases that take place between the base years and the beginning of the New Entrants Reserve (2011). Hence, this must be dealt with through the current ETS implementation work. We would suggest basing the allocation on the year with the highest production (2005/06/07), plus a correction for capacity increases in the following years until the New Entrants Reserve can be accessed. The new entrants reserve should be refilled by unused quota from significant production reduction or closure to enable growth of industry.

Miscellaneous

Last but not least, we have drawn up a list of issues from the Directive that seem to be unintended and lead to a wrongfully application of different aspects of the benchmarking system, such as the difference in allocation for electricity produced from waste gases for incumbents versus new entrants or the presumably non-intended application of 1.74% linear factor on allowances for heat from CHP.



1. Introduction

All EU manufacturing industries have been supporting the legislative decision taken in December 2008 to allocate free allowances to installations on performance-based benchmarks. The European chemical industry is highly energy efficient, energy-intensive and probably one of, if not the most complex EU industry sector. Accordingly, for our industry in particular, a consistent implementation of the spirit of the ETS Review Directive requires proper interpretation and implementation of the legal text resulting in fair, workable and transparent benchmarks. The technical solutions developed below could provide the key for solving complex issues also in other, less complex industry sectors.

Cefic offers full support and partnership during the Comitology procedure for the development of benchmarks for the EU chemical industry. In early anticipation of the political spirit and as constructive partner of the ECCP working group during the ETS Review process, Cefic has been working on CO₂ benchmarks for seven large emitters in the chemical industry over the last year: Crackers, Ammonia, Soda Ash, Carbon Black, Adipic Acid, Nitric Acid and Chlorine. Anti-trust rules have been fully obeyed. With the adoption of the ETS Directive in December 2008 the framework conditions for benchmarking have been put into more concrete terms. **With this paper Cefic intends to give an overview on the methodology and the data sourcing suggested for benchmarking, which takes into account the adopted ETS Directive and the special conditions of the chemical industry.**¹

2. Basic principles

a. Terminology

- Direct process emissions: process related emissions and fuel emissions, from fuel used in the process
- Emissions from steam or heat production
- Indirect emissions from electricity, where there is no free allocation but only compensation payments to the consumer

b. Transparency and simplicity

As a basic rule benchmarks should be transparent and as simple as possible. This also implies a homogenous approach to benchmarking across all industry sectors.

c. Stakeholder involvement

Stakeholders, including industry specialists, must be closely involved in the finalisation of the benchmarks during the Comitology process due to the technical expertise needed.

d. Product related benchmarks

As long as there are no market distorting effects, benchmarks should be product related and fuel or feedstock neutral. Starting from the base case, it needs to be analysed if a fuel or technology specification is necessary, for example to avoid carbon leakage or insure feedstock variety from a security of supply perspective, and if it is feasible to implement a feedstock differentiated benchmark. A second best option would be the usage of an average European fuel mix.

e. Correction factors

There should be neither differentiation nor correction factors for age of plant, quality of raw material or incumbents versus new entrants applied in the standard case.

¹ This paper focuses on Annex I installations; either specified products or products linked to combustion installations. It does not specifically cover the electro-intensive indirect emitters.



Correction factors could however be an option in very specific cases, for example to avoid multiple benchmarks. For example the energy intensity of the Soda Ash production depends highly from the geological formation of the limestone, the quality of the feedstock used.

f. Uniform perimeter

The perimeter of plants must be chosen in such a way that plants become comparable to each other. This principle needs to be applied on the different benchmarked products. For example, an ammonia plant which uses (partly) hydrogen as feed must be corrected to come at par with ammonia plants which produce their hydrogen from natural gas. The former plant causes emissions elsewhere in contrast with the latter one. This might also imply that two different benchmarks/allocation principles need to be established in order to get a uniform perimeter, as for example in the case of propylene and aromatics, which can be produced in a cracker or in a refinery.

g. Verification process

Data for the determination of each benchmark should be ready for scrutiny by an independent verifier. The scrutiny shall be focused on the data on direct and indirect emissions as well as production of those plants that are candidate for setting the benchmark.

3. Selection of explicitly benchmarked products/processes and treatment of heat

The chemical industry is one of the most complex sectors for benchmarking, due to the high integration and many products or processes. The treatment of combustion installations remains a priority issue to be addressed. Heat which is needed for chemical processes should be considered an integral part of our production activity and thus receives the same quota of free allowances as the respective chemical sector, i.e. heat needed for a chemical process in an exposed sector must receive 100% free allowances. Moreover, many issues are interlinked, in particular the selection of which products are benchmarked with the treatment of steam and the fall-back option for non benchmarked products. Therefore it is necessary to evaluate in particular these three issues together. We have also taken note of the request for a transparent and simple benchmarking system and for a limited number of benchmarks and have developed two systems in line with these requirements (*A+B*), and a third option as a kind of bureaucratic worst case scenario (*C*).

A Heat for chemical processes is considered and treated like an additional chemical product and gets a heat production benchmark, without a generic improvement factor

80% of the chemical industry's total emissions can be covered by a benchmark. Product benchmarks are based on direct process emissions only and steam would be considered a product on its own that would be benchmarked for its efficiency in production like all the others. So, the production of one unit of heat – differentiating only for its exergetic contents, possibly also for the feedstock – would receive a simple benchmark.

The allocation percentage for steam should be determined by the exposure status of the heat consumer. Therefore, each site needs to divide its heat production in two groups:

- Heat consumed by exposed products
- Heat consumed by non exposed products



Heat delivered to exposed sectors should receive 100% free allocation, heat for non-exposed sectors should receive free allocation decreasing from 80% to 30% at the level of a heat production benchmark.

For products with direct process emissions which fall under the 20% non benchmarked emissions, we propose as the fall-back option grandfathering as allocation system.

This benchmarking system is not aiming at perfection from an engineering point of view, but implies a maximum simplification. It limits the number of benchmarked products to well below thirty and keeps the implementation feasible, especially in such a complex sector as the chemical industry and the many other sectors which rely on heat for many different purposes. However, this system is acceptable only, if both, the heat production benchmark and the grandfathering approach for the remaining 20% would not get any additional generic improvement factors.

B 80% of chemical emissions are allocated according to full product benchmarks, including their heat consumption

If there is no agreement on such a simple system as presented under A), the chemical industry proposes another option, which however is acceptable only if uniformly applied across all industrial sectors. This more complex approach is based on a sophisticated heat balance for each site, taking production and consumption of steam into account. Benchmarks are developed for 80% of the chemical industry's emissions. Product benchmarks would include emissions from steam and the allocation for steam would be determined by a benchmark for the efficient production and the efficiency of consumption of steam.

Heat delivered to exposed sectors should receive 100% free allocation, heat for non-exposed sectors should receive free allocation decreasing from 80% to 30% at the level of a benchmark. The heat consumption on a site needs to be divided in four groups:

- Heat consumed by exposed products with a product benchmark
- Heat consumed by exposed products which do not have a product benchmark
- Heat consumed by non exposed products with a product benchmark
- Heat consumed by non exposed products which do not have a product benchmark

For products which fall under the 20% non benchmarked emissions, we propose as the fall-back option

- for the direct emissions grandfathering as allocation system
- for steam which is consumed by non benchmarked products a steam production benchmark,

both without generic improvement factors.

This system results in a steam balance and allocation for the entire site and is a solution for taking into account the integrated nature of the chemical industry. To avoid any double benefit, steam outflows from the processes are deducted from the benchmark. Steam flows across the perimeter of the product benchmark should be taken into account to determine the allocation, irrespective of the source of steam production (i.e. also steam from exothermic processes or any other heat producing product process).

This approach reflexes the complexity of the chemical industry, but it also limits the number of benchmarks in the chemical sector, remaining well below thirty products. However, this option is acceptable only, if it is consistently applied across all industry sectors to avoid that some sectors go for the simpler and higher allocated option A); and if for the remaining 20% both, the heat production benchmark and the grandfathering approach would remain without additional generic improvement factors.



C Benchmarks for all products and their direct and combustion related emissions

This system can be considered a bureaucratic worst case scenario, as it requires benchmarks for all direct emitters and all heat consuming products. This is the perfect system, but tough to implement as it would result in several hundreds, if not more benchmarks all across the EU industry (including all the products with distillations and drying processes which would each need an own benchmark). The Directive as such does not limit the number of products benchmarked and this approach would become necessary if the fall-back options outlined under *A*) and *B*) for either the heat production factor and/or the grandfathering approach for the remaining 20% emissions would be combined with generic improvement factors. In this case, stringent improvement factors would lead to a lower allocation for good performers than would be achieved under explicit benchmarks. This puts non benchmarked products in a very disadvantageous situation in comparison to benchmarked product and industry would thrive for as many benchmarks as possible.

To sum up, the chemical industry has carefully evaluated the different options on complexity, feasibility and systemic perfection and options *A*) and *B*) can be considered as valid alternatives. To avoid option *C*), the generic approaches under *A*) and *B*) must be performed without generic improvement factors. However, any system that is finally chosen should allow for a certain degree of flexibility. If the majority of installation operators of a given product really want to prepare a benchmark, they should be allocated according to that benchmark.

Cross-cutting issues concerning all options

The following issues are relevant for any of the systems proposed to determine the number of benchmarks and the allocation to combustion installations.

Electricity and steam from waste gases should not be part of the benchmark of the product producing the waste gas, as the waste gas combustion to produce electricity or steam is a separate production process.

The allocation can be given to the consumer or to the producer of heat in any of the systems. However allocation to the consumer simplifies complex allocation systems and is therefore preferred by the chemical industry, in particular for Option *B* and definitely for Option *C*. This avoids that steam consumers investing to reduce emissions might get only a partial reward. In any case, this approach avoids the possibility of windfall profits in case heat production is outsourced or in joint venture. Otherwise, the purpose of free allocation to exposed sectors would not be met

With regards to the fall-back approach in the system *A* and *B* for the remaining 20% of non benchmarked emissions, those products not eligible for a benchmark should not be punished. Hence, there should be no additional generic reduction factor. Remaining direct emissions should be allocated via grandfathering. In addition, companies with installations getting allocation under this fall-back option should be able to register the efficiency of their existing installation with the competent authority in case they will undertake a project to reduce emissions. The allocation in the next trading period should then not be adjusted downwards. In other words, when doing a project the company gets an own benchmark for that installation. Otherwise the economic calculation of a project to reduce emissions would be lowered, contrary to the environmental effectiveness required by the scheme.

4. Other technical considerations and refinements

Direct emitters and the interchangeability of energy carriers

Fuel, heat/steam and electricity are in principle interchangeable. As an example of the interchangeability, some energy intensive chemical processes can be run on furnaces or arc; process compressors can be driven by gas turbines (using natural gas), steam turbines (using steam) or electric motors; drying processes can be done with gas, steam or electricity. Even within a sub-sector there can be two production plants with the same overall efficiency, but one plant can use much fuel and steam and the other one can use relatively much electricity.

Especially in case of options B and C, when benchmarks are done on direct process emissions and steam, this interchangeability can cause problems. As a result, a benchmark for a direct process emitter with some electro-intensive installations within a sub-sector can result in an unrepresentative and unrealistic (too low) target for the allocation of allowances. This is a significant problem, as the chemical industry is a large consumer of electricity. CO₂ costs from electricity consumption almost match the CO₂ costs of direct and heat emissions. In addition, this would promote electro-intensive production roads.

Therefore we propose to differentiate the perimeter for the purposes of defining the benchmark and the allocation for direct emitters in the case of products and processes with some electro-intensive installations: While allocation would lead to free allowances for direct and steam emissions and financial compensation for electricity, the benchmark would be based on one comprehensive (direct + steam + indirect (electricity)) uniform community-wide benchmark.

Cefic requests that for any product with direct emissions for which there is a problem of interchangeability of energy carriers, indirect emissions from electricity consumption should be included in the benchmark analysis and receive financial compensation at the level of a specific benchmark for indirect emissions from electricity. Without correction of the benchmark for electricity, electro-intensive process routes will be over stimulated, which could lead to carbon leakage for the other installations.

Benchmark reference value

The discussion on the benchmark reference value should start at the average 10% best, as long as primary data has been collected from a significant number of companies in the sector. This is however considered a very ambitious approach for the chemical sector and the stakeholder consultation process shall therefore give room for discussing an upwards correction of the reference value, in case there are thoroughly based arguments. A potential technology development not yet applied at industrial scale should not lead to a benchmark more stringent than the average 10% best. The capital intensity of the chemical sector needs to be taken into account to test the viability of the chosen target. Allocation remains at 100% of the benchmark over the entire 3rd trading period.

Results from primary (industry performance) data are better suited than publicly available data and reports. However, if the number of benchmarks is too high, collecting primary data will not be feasible for all products. Therefore other sources of benchmarks – further referred to as reference values – should be considered for products with smaller emission compared to the total emission of the chemical industry. A field check is advisable in this case. Best Practice Technology (BPT) data from IEA could be one additional source for reference values. In this case a correction factor might be necessary, for example the benchmark could be BPT + X%. The reason is that BPT is



by definition the very best technology as applied by industry. The 10% best installations in the EU might be above that level.

In addition, the following points need to be considered when establishing the benchmark reference value:

- There are many products with relatively many installations in the EU. But there are also many relevant products with relatively few installations in the EU. Cefic therefore proposes: In case of less than 30 installations, the benchmark of the 10% best shall be based on the 3 or 4 best installations. This approach is fair and avoids problems with anti trust rules and confidentiality of company data.
- Outliers (on the upper or lower side) with unique production conditions should not be included when calculating the reference value and should receive free allocation at the level of the benchmark reference value, adjusted by a correction factor.
- Following the legal text, primary data should refer to 2007-2008 for the calculation of the benchmark reference value.

Benchmark allocation path

As a starting principle allocation in 2013 should start at the average level of 2005, and gradually aim at the benchmark reference value. This starting point could be further adjusted to ensure compatibility with the overall cap reduction.

There is already an example for avoiding a cash shock to industry in the Directive. Non exposed sectors, not subject to international competition will see a gradual reduction of their free allowances from 80% to 30% in 2020, with a view of reaching no free allocations in 2027.

While it is clear that industry needs to aim at best in class performance, a radical step change in costs for the laggards of each sector would strongly affect the ability to invest in reducing the performance gap. Carbon leakage would be a clear result of an immediate shift to best in class allocation levels.

Activity data

Cefic advocates a benchmark that limits emissions, but not growth. Therefore a production increase should receive free allocation at the level of the benchmark, being it a gradual production expansion or a newly built installation. This can be either done by a rolling average production factor or by the new entrant reserve with a reasonable access, i.e. low threshold and no bureaucratic problems, to provide allowances for debottlenecking.

However, we need to raise a specific problem for the years until 2011. The Directive does not explicitly address how to deal with capacity increases that take place between the base years and the beginning of the New Entrants Reserve (2011). Hence, this must be dealt with through the current ETS implementation work. We would suggest basing the allocation on the year with the highest production (2005/06/07), plus a correction for capacity increases in the following years until the New Entrants Reserve can be accessed.

New entrant reserve

The new entrant reserve is an instrument for growth. Therefore it could also be used to accommodate a rolling average production factor. Additionally it should of course serve for the allocation to greenfield investment. Unused quota from production reduction or closure should be used to refill the new entrant reserve. In case the new entrant reserve is depleted, allowances need to come fully from the auctioning pot.



Harmonization of permitting system

Homogenous boundaries for the benchmarks across Europe do not only depend on the benchmark design, but also on the permitting system. Therefore we strongly request a harmonization of the permit system across Europe, which fits to the system chosen for benchmarking.

Other legal issues

- a. New entrants: application of 1.74% linear factor
Art. 10a 7 suggests that the allocation to new entrants, done via the “best 10%” benchmark, shall be decreased with 1.74% per year. But art.10a 1 stipulates that the same benchmark shall be used for incumbents (10a 1) and new entrants, while the total quantity will already be adjusted by a uniform cross sectoral correction factor if needed, i.e. if the best 10% benchmarks give a higher allocation than the maximum quantity for industry (10a 5). The approach of art. 10a 7 would be inconsistent and must be regarded as unintended. The intention must be that the best 10% benchmark shall be used for incumbents and new entrants (art. 10a 1), which shall be adjusted with the uniform cross-sectoral correction factor, if needed. Therefore, the 1.74% factor of art. 10a 7 shall not be taken into account.
- b. The allocation of allowances for electricity produced from waste gases
Article 10a 1 determines that free allocation of allowances will be granted for electricity produced from waste gases. In an apparent inconsistent manner, article 10a 7 stipulates: “No free allocation shall be made in respect of any electricity production by new entrants”. However, if a site had already applied cogeneration with waste gases the corresponding allowances would be granted. This would be a distortion between existing installations and new entrants, which is in contradiction with article 10a 1 in which it is mentioned that the same benchmark must be applied for incumbents and new entrants. The differentiation of article 10a 7 between incumbents and new entrants in the case of allocation for electricity produced from waste gases must be unintended. Any electricity produced from waste gases should receive free allocation.
- c. Combined Heat and Power (CHP): application of 1.74% linear factor
Art. 10a 4 provides for the allocation of allowances for heat from CHP and district heating while the allocation would be decreased with 1.74% per year. Nevertheless, as explained above, the allocation to industry is already regulated via the benchmarks (10a 1 and 10a 2) and the maximum quantity providing for the uniform cross sectoral correction factor, if needed (10a 5). Accordingly, an approach that reduces free allocation for CHP further below the benchmark must be regarded as unintended. Additionally, boilers would be better off than CHP and district heating. Therefore, the 1.74% factor of art. 10a 4 shall not be taken into account.
- d. Combined Heat and Power (CHP): requirement of high efficiency cogeneration as defined by Directive 2004/8/EC
Art. 10a 4 suggests that CHP should meet or exceed the threshold of Directive 2004/8/EC, which is at least a saving of 10% compared to the separate generation of heat and electricity. This must be regarded as unintended. Again here boilers would be better off than CHP. A CHP plant which saves for example 9% is still better than a boiler. Therefore, this requirement shall not be taken into account.



5. Conclusions

As has been underlined, it is most important for the chemical industry to solve the issue of combustion installations, which is intrinsically linked to the number of products to be benchmarked and how to deal with the remaining non benchmarked products. In a coherent benchmarking system, all pieces have to fit together. Option A and B as presented in this paper both address these issues in a satisfying way. Ultimately this is an issue which concerns not only the chemical industry and any solution should treat all industry sectors equal.

On top of these priority issues, we have put together a number of points which together add up to a solid methodology for benchmarking of Annex I installations in the chemical industry. The outlined principles for benchmarks in the chemical industry will enable implementation of the ETS Directive and greenhouse gas reductions at the same time as allowing the industry to grow and to satisfy the needs of society.

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