

# EU taxonomy and the principle of proportionality: Will increased costs of borrowing lead to more derogations from emission limits?

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## Summary

The European Union has introduced a new taxonomy, which prohibits banking institutions from financing coal-related projects, even when they are aimed at emission abatement. This fact could significantly increase the costs of compliance with the latest emission limits for large combustion plants. Considering that plants may be granted a derogation from achieving the emission limits due to disproportionate costs, the new taxonomy could unintentionally contribute to a higher number of derogations in Europe. With the least expensive option of external funding being unavailable, facilities would have to rely on other options. This paper examines the sensitivity of costs of compliance to changes in several loan attributes such as the interest rate, the length of the payback period and the share of the funds that needs to be borrowed. Czech data were used to make a case study on a hypothetical power plant that needs to retrofit its current technology. The results show that in some cases even a slight change to the interest rate or other parameters may change the outcome of a proportionality assessment. With sources of external financing uncertain, the costs of borrowing could easily prove to be prohibitive, leading to disproportionate costs compared to environmental effects of the regulation.

**Keywords:** EU taxonomy; large combustion plants; best available techniques; principle of proportionality; emission limits

## Introduction

The newly established EU taxonomy<sup>1</sup> shows that the EU is serious about the fight against climate change. Only “environmentally sustainable” activities that contribute to at least one of the set goals and do “no significant harm” should be allowed to receive external financing from European banking institutions. The taxonomy should be initially introduced to sectors such as energy, forestry, the productive sector and transport, with planned future extension to other sectors. Naturally, this represents yet another obstacle for companies that utilize fossil fuels. In recent years, a lot of effort has been put into emission reduction and many new regulations across various sectors have set stricter emission limits that both contribute to cleaner air in the EU member states and pressure on individual companies to comply with the stricter regulation. Gradual tightening has also been ever-present in the sector of large combustion plants (LCP). An important step in the regulation was the Industrial Emissions Directive<sup>2</sup>, which consolidated previous regulation into a single directive and built on the goals of previous regulation such as the IPPC Directive<sup>3</sup> later codified as Directive 2008/1/EC<sup>4</sup>.

The Industrial Emissions Directive (IED) focused on the emission limits for LCP and on Best Available Techniques (BAT) by strengthening the BAT Reference Documents (BREFs) concept. The regulation

covers approximately 50,000 installations with extensive permit requirements, but does not introduce criteria that would allow setting “emission levels associated with the best available techniques” for the individual sectors<sup>5</sup>. Whether a result of this omission or not, the latest emission limits set for LCP in the updated BREFs<sup>6</sup> have been criticised by power plants as well as scholars<sup>7,8</sup>, who point out that many installations will choose to finish their operation rather than undergo a modernization. This article shows that the newly established EU taxonomy may complicate things even further.

Installations point out that achieving the new emission limits with currently installed technologies is nearly impossible and conforming with the regulation proves to be quite difficult for many LCP<sup>8</sup>. However, the regulation offers a way out for installations for which the emission reduction would be too costly. Article 15 of the IED states that a derogation may be granted if “an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits”. Specifically, the disproportionate costs must be caused by either geographical location, local environmental conditions or the technical characteristics of the installation. If a derogation is granted, the installation may continue its production under less stringent emission limits for a specified period of time.

A notable feature of the regulation is that there are no unified guidelines on how to make the proportionality assessment. Each member state sets up its own rules and therefore the procedure differs significantly across Europe<sup>9</sup> with national states having been left with a great deal of discretion<sup>10</sup>. Indeed, the procedure is anything but homogenous. In 2018 only 14 out of 22 countries that responded to the questionnaire indicated that they had developed guidelines on implementation of Article 15 of the IED<sup>11</sup>.

Another factor that contributes to such heterogeneous conclusions is the assessment of proportionality itself. Again, only five of the respondents had a clear definition of disproportionality in 2018<sup>11</sup>. Poland and Wales use a specific benefit/cost ratio, meaning that if benefits are lower than 0.7 or 0.75 of costs, respectively, the assessment recommends granting a derogation<sup>12,13</sup>. In France, the methodology requires a comparison of three scenarios: business as usual, technically feasible techniques, alternative solution<sup>14</sup>. Comparison of various scenarios together with assessment of additional emission reduction is the basis of the Czech methodology<sup>15</sup>, while in Slovakia a point system has been introduced, which takes into account selected key indicators<sup>16</sup>.

To comply with the new emission limits, most of the LCP need to invest in new abatement technologies. Considering that most of the installations invested not so long ago to comply with the emission limits introduced in the IED, the costs are significant. The plants will be forced to write off their existing technologies prematurely and invest in new ones. To obtain required funds, installations will most likely need to use external financing. However, the recently introduced EU taxonomy has created a guideline on financing projects based on their impact on the environment. As a result, it becomes highly unlikely to receive external funding from the banking sector to finance a coal-related project, even if the investment is aimed at emission reduction. Naturally, the costs of borrowing will increase for LCP, which raises an interesting question regarding the proportionality assessment. Such costs raise the total costs of conforming to the required emission limits, which should in theory make the derogation application more likely to succeed. With thresholds remaining constant (whether it is costs of conforming to older regulation or prevented external damage), an increase in the costs of compliance might just tip the scales.

The goal of this paper is to model several scenarios using mostly data from the Czech Republic's LCP and indicate the potential impacts that the new EU taxonomy may have on the results of future proportionality assessments. The paper compares the costs of compliance with the thresholds set by the most common methodologies described above and determines how much the costs of borrowing need to increase in order to alter the results of a proportionality analysis.

## **Data and methods**

To estimate the potential effects of the EU taxonomy on proportionality analysis, it is important to understand how the process works in general. The proportionality assessment usually compares the costs of achieving the required emission limits and environmental benefits caused by lower air pollution

and subsequent effects. However, the Czech methodology<sup>15</sup> makes two comparisons. One is a standard comparison of costs of compliance with the emission limits with environmental benefits and the latter is a comparison of two compliance costs – costs needed to comply with the previous regulation and with the most recent regulation. Such comparison allows one to discover whether achieving the new regulation is comparatively costly to previous rounds of emission limit tightening. If an installation applies for a derogation, it also proposes an alternative scenario, which decreases the overall emissions but is acceptable in terms of costs. Several additional criteria are used to determine proportionality and derogation application, each having a different weight in the assessment, which is based not only on the criteria themselves but also on whether other indicators are mostly positive/negative. Therefore, two categories of cost-related data and an estimate of the effect of the taxonomy are required for determining proportionality of meeting the new emission limits and the influence of the newly established EU taxonomy on the results.

First, data on costs of achieving the set emission limits are needed. Unfortunately, data on costs of emission abatement are quite inconsistent and estimates<sup>17-32</sup> often differ by an order of magnitude. The main reasons for low validity of these results are<sup>33</sup>:

- (i) The situation at individual plants is often modelled and not based on microeconomic data.
- (ii) Analyses use unrealistic assumptions such as no previously implemented abatement technologies.
- (iii) Analyses use data from macro models and estimate nation-wide effects as opposed to microeconomic effects on specific plants.

However, a recent study investigated the costs of complying with the new emission limits set in the latest BREFs for Czech LCP<sup>33</sup>. The authors surveyed approximately half of the installed capacity of the Czech LCP and determined per unit costs of achieving both the new emission limits introduced in BREFs and the older limits set in the IED. These values were used by the Czech Ministry of the Environment in the update to the official methodology for assessing cost proportionality of emission abatement<sup>34</sup> and these data are used in this paper as one of the thresholds. A summary is shown in Table 1. If the costs of compliance are below the lower threshold, then there is no room for a derogation. If the costs exceed the higher threshold, then a derogation is recommended. If the costs fall in between those numbers, other criteria (such as length of derogation, significance for air pollution in absolute terms, additional cost indicators) will decide whether a derogation is recommended or not. The difference between the costs of achieving the new emission limits and costs of the alternative scenario is important in such cases.

**Table 1: Overview of costs of achieving various levels of emission limits<sup>34</sup>**

Pollutant	Costs of achieving IED emission limits (EUR/t)	Costs of achieving BREFs emission limits (EUR/t)
SO <sub>2</sub>	2,150	11,800
NO <sub>x</sub>	9,850	35,400
PM	7,900	59,000

Then, data on the costs caused by emitted pollutants on human health and property are needed. Data from the European Environment Agency present such damage for several pollutants calculated for individual member states. However, as Table 2 shows, the spread of the values (rounded for simplification) is quite large and strongly depends on the methodology used for the calculation (such as VOLY – value of a life year, and VSL – value of statistical life).

**Table 2: Marginal damage costs on health, crops and forests and material damage by major air pollutants<sup>35,36</sup>**

Pollutant	EEA (2014)		EEA (2020)	
	Marginal cost EUR/t (VOLY)	Marginal cost EUR/t (VSL)	Marginal cost EUR/t (VOLY)	Marginal cost EUR/t (VSL)
SO <sub>2</sub>	12,500	36,500	22,500	71,300
NO <sub>x</sub>	6,400	17,650	15,000	49,100
Dust (PM <sub>2.5</sub> )	39,900	115,150	88,100	282,450
Dust (PM <sub>10</sub> )	25,900	74,750	57,200	183,400

The table shows a significant increase in the most recent costs associated with air pollution compared to the report that was in place when the new emission limits were set.

And finally, we identify the effect of the newly established EU taxonomy on the costs of financing the steps that need to be taken in order to conform with the new regulation. European banks are expected not to finance any coal-related projects in the future, which will most likely include investments in more effective abatement technologies. As a result, the affected LCP will need to search for an alternative source of financing, meaning the costs of complying with the regulation will inevitably increase with the least expensive option becoming unavailable. Other options represented by non-bank loans, issuance of corporate bonds or savings may increase the total costs by a negligible amount as well as by a prohibitive amount. In this paper, different scenarios will be used to show how large a change would have a significant effect on the overall outcome.

To discover the severity of the effect caused by the EU taxonomy, it is necessary to perform a brief calculation for a hypothetical power plant that needs to retrofit its old technology with a more powerful selective catalytic reduction (SCR) unit. Let us assume that the power plant has an installed capacity of 360 MW<sub>e</sub> and barely conforms with the NO<sub>x</sub> emission limit set in the IED. Based on EPA<sup>37</sup> and the EPA's SCR cost calculation spreadsheet<sup>38</sup>, it is possible to estimate costs of retrofitting a plant with an SCR unit, a technology necessary for the plant to comply with the current emission limits. Using the formulas suggested by the EPA<sup>38</sup> gives an estimation of roughly 86.3 million EUR. Assuming that we live in a pre-taxonomy world in which bank loans are available, let us say that the company will need to borrow 80% of this sum (69 million EUR) at an interest rate of 4% with a payback period of 10 years. The total costs for the company would be around 101.2 million EUR in such a case.

A hypothetical power plant of the chosen installed capacity going from, say, 200 mg/Nm<sup>3</sup> of NO<sub>x</sub> emissions to 175 mg/Nm<sup>3</sup> (to be slightly below the limit set by BREFs) can realistically capture approximately an additional 200 tonnes of NO<sub>x</sub> per year<sup>33</sup>. A critical decision must be made about the lifetime of the installed SCR. Although the equipment itself can easily remain functional for over 30 years<sup>38</sup>, there are several reasons against using such a value:

- (i) Companies usually write off a technology during a much shorter period of time.
- (ii) The EU lowers emission limits frequently and requires the use of best available techniques, which means it is unlikely that the SCR unit will still be considered best available in 30 years.
- (iii) With pressures to move towards non-fossil fuels and abandon coal no later than in 2038, it would be naïve to expect that the SCR unit will still be in use in the 2050s even if it is best available as coal will most likely be abolished by then.

For the reasons described above, a lifetime of 15 years was selected for the calculation. A simple division of the total costs by the number of abated tonnes and years in operation gives a final value of 33,721 EUR, which is significantly above both the old estimate of the damage caused by a tonne of emitted NO<sub>x</sub><sup>36</sup> and the estimated costs of conforming with the IED<sup>33</sup>, slightly below the referenced costs of achieving the emission limits set in BREFs<sup>33</sup> and below the new estimate for externalities<sup>35</sup> as shown in Tables 1 and 2. The majority of countries use the estimate of caused external damage<sup>11</sup> but some have different conditions in place. The Czech methodology would lean towards granting a derogation although the estimated costs are slightly below the upper threshold. Other methodologies might be

weakly against based on such a result as the benefit/cost ratios used in Wales and Poland to determine proportionality are 0.75 and 0.7 respectively<sup>12,13</sup>. This means that, at least in some cases, costs must significantly outweigh benefits for a case to be deemed disproportional.

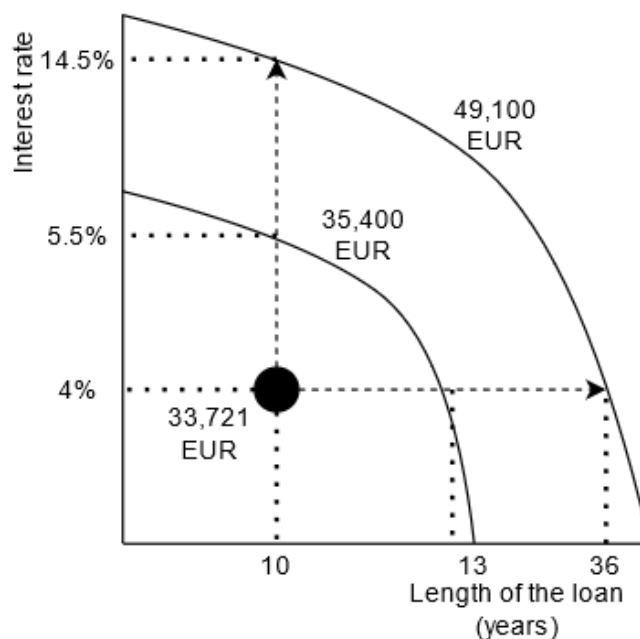
In the following section, several parameters of the hypothetical loan are altered to see how much they need to be changed for the costs of compliance to rise above the proportionality threshold. Specifically, values of the interest rate and the length of the loan that would increase the costs of compliance above the two study thresholds are computed.

## Results

Let us focus on how much more expensive the external financing needs to become in order to increase the costs of compliance above the respective thresholds of 35,400 and 49,100 EUR. Specifically, it is interesting to know how much the interest rate needs to increase to get to these thresholds, holding other things constant. It turns out that raising the interest rate on the 69 million EUR loan from 4% to 5.5% will do the trick and will increase the annual cost per tonne to 35,730 EUR. As for the latter threshold, a much higher increase to the interest rate is required, specifically a rate of 14.5% leads to the cost of 49,480 EUR per abated tonne.

The final value will also strongly depend on the length of the loan. If the loan is to be repaid in 15 years instead of 10, the interest rate plays a larger role as the interest is accumulated over a longer period of time. It is clear from the calculations that the interest rate on the 69 million EUR loan would actually have to decrease from the original value of 4% below 3.5% in order to stay under the proportionality threshold used in the Czech Republic. If the original interest rate stays in place, then any length of the loan above 13 years breaks this threshold. In a similar fashion, a comparison to the external damage costs shows that an interest rate of 9.6% is enough to raise the costs per abated tonne to 49,271 EUR if the money is to be repaid in 15 years. Alternatively, holding the interest rate constant at 4%, the length of the loan would have to increase to unrealistic 36 years. Figure 1 indicates the results. The starting point represents the original conditions in the example – a payback time of 10 years and a 4% interest rate. Moving along the dashed arrows indicates the change needed in one parameter (holding the other constant) that needs to happen in order to reach one of the cost thresholds. Holding the interest rate at 4%, the lower threshold will be reached when the length of the loan increases from 10 to 13 years, while the upper threshold would be reached in the case of a 36-year loan.

**Figure 1: Effect of interest rate and length of loan on costs of compliance**



Source: Own construction

Another factor that plays a major role is the share of the funds that need to be collected externally. It is interesting to note that under the original scenario of a 10-year loan and 4% interest rate, the threshold would not be broken even if the whole sum needed to be borrowed. Alternatively, it is possible to change the original setting to 90% of the sum being loaned and interact with the interest rate just as in the case above. Under such circumstances, the lower threshold would be reached at a 4.7% interest rate if the borrowed amount increases to 90% of the total investment, while the higher threshold would be broken at 13%. Comparing these numbers to the scenario in which only 80% of the sum is loaned, lower interest rates are necessary to break the thresholds. An interest rate of 5.5% was needed in the original setting as opposed to 4.7% in this example and a similar story can be told about the upper threshold (14.5% compared to 13%).

## **Discussion and conclusion**

First of all, it needs to be emphasized that the paper describes an example, although it is largely based on the real-world situation in the Czech Republic<sup>33</sup> and the cost estimates based on EPA<sup>38</sup> are close to scenarios considered by many installations in practice. The main purpose of the paper was to illustrate the effect the new EU taxonomy can have on the current scheme of derogations based on proportionality and the sensitivity of such analysis to the interest rate and other factors. To give an example, nobody can be sure how long European LCPs will remain active. While Germany will shut down its last coal-burning power plants in 2038, the Czech Republic, on whose plants this paper is based, is yet to give the final verdict with both 2033 and 2038 being discussed. This is something that needs to be considered in the calculation because it has a potentially huge impact on the result.

As indicated above, the effects of the EU taxonomy could be significant. In several cases even relatively small changes to the interest rate or the length of the loan are sufficient to make a significant impact on the result of the proportionality assessment. Some of the suggested interest rates seem to be unrealistic in today's world of nearly negative interest rates. However, with standard banking products becoming unavailable, it is not unreasonable to see the costs of borrowing for LCP skyrocket and reach values that were considered impossible not long ago. With only unconventional options remaining, the interest rates could go up and, in an extreme case where a source of financing cannot be found, the total

costs of achieving emission limits would essentially become infinite, making the investment costs prohibitive and the application for a derogation would therefore be easily justified.

The analysis was carried out for NO<sub>x</sub>, which seems to be causing a lot of troubles to (at least Czech) facilities. However, similar issues may arise when it comes to SO<sub>2</sub> emission abatement. The new limit also seems to be quite challenging for the current setups. We do not expect this situation to occur in the case of PM as such a situation is usually not a question of a large one-time investment.

The main point of this article is that with the EU taxonomy in place, the new regulation could easily backfire if derogations based on cost proportionality remain available. Since LCPs nowadays use bank loans to finance their investments, it is without a doubt the least expensive money available on the market. With the costs of borrowing increased, the costs of compliance will increase as well, making it more likely that the conditions required for granting a derogation are met.

Considering how vigorously the EU fights against air pollution, such a state would certainly be undesirable. However, the EU taxonomy does increase costs of compliance and in the current situation may even be helping thermal power plants in their tough situation as it makes derogations achievable more easily. In the long term, though, the future of the principle of proportionality in the field is uncertain. If the EU is taking its fight against air pollution seriously, significant changes need to happen to make the principle of proportionality and the EU taxonomy compatible. Alternatively, the principle of proportionality needs to be abandoned completely, which could have some serious consequences on the energy markets in Europe.

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## **Evropská taxonomie a princip přiměřenosti: Povedou vyšší náklady na úvěr k většímu množství výjimek z plnění emisních limitů?**

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### **Souhrn**

Nově implementovaná taxonomie fakticky zakazuje bankovním institucím v Evropské Unii financovat projekty spojené s uhlím. A to i přesto, že mohou být zaměřené na snížení množství vypouštěných emisí. Tato skutečnost by mohla velkým spalovacím zařízením značně prodražit plnění nově stanovených emisních limitů. Právě nepřiměřená výše nákladů může být jedním z důvodů, pro které může zařízení obdržet výjimku z plnění emisních limitů. Nová taxonomie by tak mohla nezáměrně přispět k vyššímu množství takových výjimek v Evropě. Taxonomie znemožňuje využití nejdostupnějšího zdroje externího financování, zařízení by se tak musela spolehnout na alternativní možnosti.

Tento článek zkoumá citlivost nákladů na plnění emisních limitů na některé atributy případného úvěru – konkrétně na úrokovou míru, dobu trvání půjčky a podíl půjčených prostředků na celkové výši investice. Na základě českých dat byla provedena případová studie na hypotetické elektrárně, která ke splnění emisních limitů potřebuje instalovat novou účinnější technologii. Výsledky naznačují, že v některých případech stačí i mírná změna výše zmíněných parametrů, aby náklady plnění emisních limitů vzrostly nad hranici přiměřenosti. Vzhledem k nejistým zdrojům externího financování mohou náklady na náhradu současné technologie snadno vzrůst na prohibitivní hodnoty, které nebudou odpovídat environmentálnímu efektu dané regulace.

**Klíčová slova:** Evropská taxonomie; velká spalovací zařízení; nejlepší dostupné technologie; princip přiměřenosti; emisní limity