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RESEARCH ARTICLE

ANALYSIS OF THE EUROPEAN CARBON MARKET: A COMPETITIVE MARKET APPROACH

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ABSTRACT

Changes in the climate and its adverse implications for the welfare of humans and economies have sparked debates and advocacies for the reduction in the emission of greenhouse gases. In Europe, a market for the training of greenhouse gas was established and remains the largest environmental market involving thousands of operators with obligations to minimize the emission of carbon dioxide from the planet earth. This paper reviews the European Union Emission Trade Scheme from a competitive market perspective, discusses the benefits of free allocation and auctioning and their economic implications. Although the use of free allowances was employed to address the exposure of EU-regulated firms/plants to international competition, it promotes the continual use of inefficient plants, as a plant closure would, in most schemes, mean the loss of the (over) compensation that these free allowances constitute. Auctioning offers the best option for enhancing transparency and competitiveness in the EU carbon market as it promotes optimal allocation of carbon emissions.

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INTRODUCTION

The emission of greenhouse gases and other dangerous gases into the atmosphere has damaging effects on the environment and the climate. Developed and industrial countries have contributed significantly to the emission of dangerous gases into the atmosphere due to their increasing industrialization and manufacturing activities which emit tons of dangerous gases into the atmosphere. A profound and widely recognized consequence of the emission of large volumes of dangerous gases into the atmosphere is the change in the climate. Changes in the climate have significant negative effects on the environment which in turn affects almost every aspect of life. Climatic changes also threaten the existence of life on earth and its perilous effects have been experienced across the globe. In order to address the underlying causes of climate change and save the environment, leaders across the world have called for reduction in the emission of dangerous gases into the atmosphere and have encouraged and supported responsible and clean production, including investing in new technologies and renewable energy solution projects.

In Europe, the European Union Emission Trading Scheme (EU-ETS) was established in 2005 and remains the largest greenhouse gas trading scheme in the world (1). It is the first environmental market established in the EU which included thousands of operators with obligations to minimize the emission of carbon dioxide from the planet earth. On average, more than 10 million allowances are traded, which has created a carbon market worth more than several billion Euros (2). The EU ETS is the major pillar of the European Union's (EU) energy policy and the mechanism through which, the European Union's climate change aspirations are anchored. The EU-ETS is also the foundation for the EU's strategy to reduce the emission of greenhouse gases (3). The EU-ETS is expected to ensure competitive pricing on carbon emissions, enhance reduction in greenhouse gas emission and stimulate investment in low-carbon technologies. The system will ensure the functioning of an internal energy market and promote the use of renewables and low-carbon and energy-efficient technologies. As of 2015, the EU-ETS covered 11 000 power plants and installations in the 28 EU Member States, including Iceland, Norway and Liechtenstein.

The system also covered emissions from over 600 airlines flying across the European Economic Area (EEA). Installations regulated by the EU ETS in 2008 collectively accounted for almost 50 per cent of the EU's anthropogenic emissions of carbon dioxide and 40 per cent of its total greenhouse gas emissions (4, 5). The EU hopes to reduce greenhouse gas emissions by 20% by 2020 compared with 1990 and to increase energy efficiency by 20% (6). The EU hopes to reduce greenhouse gas emissions from sectors covered by the EU-ETS by 43% by 2030 (7). The EU-ETS works on the 'cap and trade' principle. The cap is the maximum total amount of greenhouse gases that can be emitted participating installations covered by the system. The cap is reduced over time ensuring that the total emissions of greenhouse gases fall. As of phase 3, the EU-wide cap will be determined by the EU ETS Directive. The cap is expected to each year by an amount corresponding to 1.74% of the total allowances in 2010(8). Once the cap is established, allowances for emissions are auctioned off or allocated for free and can be traded subsequently. If an installation exceeds its allowances, it must purchase additional allowances from others. On the other hand, if an installation performs well at reducing its emissions, its surplus allowances can be traded to other installations in need of additional allowances. By so doing, the market functions and the system is able to identify cost-effective ways of reducing emissions without government's intervention. This paper explores the EU carbon market and specifically analyses the free allocation and auctioning undertaken under the EU-ETS from a competitive market perspective. The paper further discusses the benefits of free allocation and auctioning and their economic implications. Finally, the paper offers recommendations for improving the EU carbon market and making it more competitive.

FREE ALLOCATION

Under the scheme, free allocation is provided to installations that are exposed to competition from outside the EU. The practice is that majority of the emission allowances are provided to firms free of charge. The free allocation of allowances to industrial installations hopes to address the potential risk of carbon leakage and ensure the competitiveness of industrial installations covered by the scheme. The provision of free allowances also significantly limits the costs of EU installations exposed to international competition. There are a number of reasons for this. One is political; initially distributing allowances free of charge is a way of introducing the costs gently and to there by gain political acceptance of the system before gradually moving into other modes of distribution, such as auctioning. The other primary reasons are related to concerns of carbon leakage and distortions in competitiveness. These concerns relate to the scenario where a carbon cost imposed domestically may undermine the competitive position of the domestic industry in such a way that market shares are lost to foreign firms, possibly through new investments. As a result, production, and its related emissions, move across the border. Carbon leakage is this increase of emissions in other regions due to the climate policy enacted domestically. In competitive markets, participants are treated equally and must follow the same rules and procedures, ensuring transparency and non-discrimination. In the EU, the carbon market regulations cover installations such as plants that produce metals, aluminium, and these plants must compete with its counterparts in other countries where regulations on greenhouse emissions are non-existent or enforced. This suggests that the production cost of plants in countries without greenhouse gas regulation is low as compared to plants in countries with stricter greenhouse regulations. Hence, greenhouse regulation put installations at a disadvantage thus making the market non-competitive. The free allocation of allowances helps to ensure installations exposed to international competition are competitive by reducing their costs of production. However, given that the free allowances form part of the total allowances allocated or the cap, installations subjected to the EU-ETS regulation but exposed to international competition must purchase additional allowances if the allocated free allowances are exhausted thus incurring additional costs. This puts installations within the EU at a disadvantage position in the market as compared to their competitors outside the EU.

Free allocation methods: There are different methods for distributing allowances free of charge. The choice of method influences the incentives created by the free allocation and offers different advantages and disadvantages. The key methods for determining the levels of allowances are grandfathering, benchmarking and output-based allocation (9). Grandfathering refers to the allocation of allowances based on past levels of emissions (10). The calculations are based on the average emissions of an installation over a specified period, possibly excluding the year with the lowest level of emissions, and the averages are used to determine the quantity of allowances the installation should receive. One critical issue with grandfathering is that it may reduce the incentives for individual plants to reduce emissions, assuming they expect that future allowances will be based on current levels of emissions. Benchmarking methodology on the other hand is designed to avoid the negative effects associated with grandfathering. The key rationale of benchmarking is to assess each installation's emissions' efficiency against a sector average using a mathematical formula. Allowances can then be distributed based on a benchmark, to create incentives to reduce emissions (11). One advantage with this method is that it is likely to ensure a non-distorted carbon price signal, rewarding carbon efficiency and early actions undertaken by installations. The preconditions for developing benchmarks are the availability of common definitions, reliable data, good measurement and verification systems. Good benchmarks require considerable efforts by all stakeholders and ultimately acceptability, as access to industry data is decisive. Output-based allocation method suggests that the quantity of allowances distributed is related to the output from an individual plant (12). Installations emitting exactly the sector benchmark emissions per unit of output produced will pay the same amount in emissions charges as they receive back as refunds on total output. In other words, plants performing worse than the sector benchmark will make a payment to the system while plants performing better will receive a positive net refund (13). A key advantage of out-put based method is that it is predictable and straightforward for producers. On the other hand, a major disadvantage is that allocating free allowances in proportion to current production could foster incentives to produce more, and consequently, to emit more in order to get additional freer allowances.

Trading of allowances: Trading of allowances can take place between installations.

The legal framework of the trading scheme does not regulate how or where the market in allowances takes place; plants with commitments may either trade allowances directly with each other or buy or sell via a broker, bank or other allowance market intermediary (14). The trading of allowances between union-covered installations is supplemented by the possibility of temporal trading, meaning that there is no restriction on banking or borrowing of allowances within any given multi-year trading period (15). Allowances are issued annually but are valid for covering emissions in any year within the trading period. Additionally, each year's issuance of allowances occurs at the end of February, two months before allowances must be surrendered for the preceding year. The institutional framework for emissions trading was established under phase I of the EU ETS (16). Several organized markets have begun to offer allowance trading services. In addition, markets have developed several derivatives of emission permits, especially options and futures, making it possible to buy or sell permits for delivery in December 2010, 2011, and 2012 (17).

Mode of allowance allocation under the EU-ETS: Under the EU-ETS, emission allowances are allocated to covered installations without a charge. Grandfathering has been the predominant method employed in the determination of the quantity of allowances each institution should be provided. This suggests that the quantity of allowances granted to each installation is based on the history of the emissions from each installation under the EU-ETS. Challenges abound with respect to allocating the right amount of emission allowances to installations despite the use of grandfathering. (18) noted that during phase II, the manufacturing sector was generally prioritized, at the expense of the power-generating sector. This over-allocation was not uniform across member states as Germany and Spain prioritized their steel industries. Spain also favoured its brick and ceramics sector, together with the UK and Italy, whereas France prioritized its pulp and paper sector. (19) indicated that the over-allocation was possible as the European Commission focused more on the totals when reviewing the national allocation plans than on the distribution of permits across industries. During the first phase, member countries were allowed to auction up to 5% of allowances, rising to 10%during the second phase. During phase 1, just four member countries made use of this possibility, and only one country, Denmark, auctioned the full 5%. During the second phase, auctioning remains limited; no country proposed auctioning the maximum percentage allowed, while most countries did not auction(20).

Benefits of free allocation of allowances: There are several benefits associated with the use of free allocation of emission allowances. Firstly, free allocation of allowances can create the incentives for firms to reduce emissions. The basic idea with free allocation of allowances is that, irrespective of the means of allocation, emission allowances carry an opportunity cost. Thus, a firm using an allowance to account for its emissions loses the opportunity to sell the allowance at the current market price. This, in theory, creates an incentive for producers to reduce emissions, allowing them to sell their allowances. Secondly, free allocation of allowances can help curtail carbon leakage. If the incentives from free allowances to cut emissions are unclear, this intuitively has an effect for the ability of free allowances to reduce the risks for leakage. Indeed, if firms do not make as large efforts to curb their emissions as intended, a consequence must be that the risks of leakage are reduced. However, experience has shown that free allocation of allowances provides firms with the incentive to participate in the EU-ETS scheme thus reducing carbon leakage. Thirdly, free allocation of allowances ensures environmental effectiveness. The use of free allocation encourages emissions reduction, investment in renewable energy technologies and climate change projects and reduces carbon leakage thereby contributing to environmental sustainability. EU-ETS free allocation has led to abatement of significant magnitudes in each of the first three years (21). This finding is based on an observed emissions-intensity improvement above historical trend. When looking at the two first years of the second phase, the Center for Policy Studies finds an even greater intensity improvement. Regression analysis used to try to determine to how large extent this has its roots in the EU-ETS, rather than in other developments, shows that the EU-ETS has effects on large but not small investments.

Economic analysis of free allocation: An essential characteristic of the free allocation of allowances is to improve the financial position of the recipients compared to a situation where they would have had to buy the allowances and compared to firms not receiving the allowances free of charge. As a consequence, recipient firms will be in a better position to invest, and a stronger financial position will also tend to result in secondary benefits, such as lower costs of capital. In addition to this general effect, there are certain ways in which the free allocation can be designed or implemented that can confer additional benefits to the producers, thus rendering the free allowances a subsidy. Many of these are in practice difficult to avoid. If free allocation is considered a subsidy, then it is more problematic. Often, subsidies are inefficient, expensive, socially inequitable and environmentally harmful, and impose a burden on government budgets and taxpayers. Moreover, they are able to distort any market in which the subsidized firm operates. Distortions in international trade will reduce the opportunity of trade to contribute to economic growth and sustainable development. Therefore, it is crucial that policy measures intervening on the international level be well-designed and targeted, so as to address the aims in an efficient manner while reducing adverse effects.

It should be noted that the EU Carbon Market contributes to market failure in other international markets such as the market for steel, aluminium and aviation. The emissions regulation of steel plants and installations that produce aluminium in the EU increases the costs of these industries as compared to their competitors in other countries without regulations. Therefore, installations in countries without regulations incur low costs and can sell their products at a lower price as compared to installations in countries with strong regulations, thus leading to imperfect competition. However, free allocation of allowances to industries like steel, aluminium and aviation might balance competition in the international market. On the other hand, free allocation might distort market competition under the circumstance where one group of competitors obtained free allocation of allowances while others have to purchase allowances.

The future of free allocation: The free allocation of emissions in the future might be limited and heavily restricted to certain industries and sectors. In the interest of fairness and market competitiveness, allocating allowances freely will be accorded to industries that are heavily exposed to international competition and that show signs of shifting to the use of green technology in the near future. Provisions for free allocation of allowances might target only new industries with significant potential to develop and use green technology. The New Entrant Reserve (NER), developed by the EU, might direct the future path of free allocation. The NER Programme reserves emissions allowances for new installations that enter the market or installations that have increasing capacity and in need for additional allowances. The NER Programme has been very effective thus far, reserving a significant quantity of allowances to supply new installations or installations with increasing capacity. The NER300 Programme has the potential to shape the direction of free allocation in the future and increase investment in green technology.

AUCTIONING OF ALLOWANCES

Unlike the free allocation of allowances, auctioning of allowances under phase three of the EU-ETS is the default method of allocating allowances. Auctioning ensures the trading of allowances in an open, transparent, harmonized and non-discriminatory manner. The auctioning of allowances is conducted on a common platform selected through a competitive procurement process. The platform is used for the trading of allowances and operates like a trading exchange. Under the EU Regulation 26, Member States may opt out of the joint common platform and appoint their own platform. Thus far, Germany, Poland and the United Kingdom have opted out of the common platform and have appointed their own platform following a competitive and transparent tender process. Through auctioning, emissions allowances are priced and sold, accruing billions in revenue. Consistent with the EU-ETS Directive, 50% of the revenue generated from auctioning is expected to be used by Member States for investments in climate and renewable energy technologies and projects.

The mechanisms of auctioning: Auctioning a fixed supply of identical items such as emission allowances is easy to understand. The buyers submit bids at the auction to express their willingness to buy various quantities at various price levels. A trading market exists under the EU-ETS scheme and buyers are not entirely dependent on the auction to purchase allowances. The existence of a trading platform and a known market price will thus influence bidding behaviour. An auction is efficient if allowances are assigned to the bidders who value them most. Since a secondary market already exists, the marginal value of bidders that are also active in this secondary market will be related closely to the market price of allowances. For companies that do not have easy access to the trading platforms, their marginal value will be more related to their marginal costs of emission reductions. Other requirements are that auctions should not damage confidence in the existing market system and remain within the European rules of state aid and internal market regulation (22). As of June 30, 2015, more than 650 auctions have been conducted for phase three of the EU ETS. The European Energy Exchange(EEX) auctioned on behalf of 27 EU member states 88% of the total volume of allowances between 2012 to 2014, while the Intercontinental Commodity Exchange(ICE) auctioned 12% of the total allowances on behalf of the United Kingdom. In 2015, for example, the total volume of general allowances auctioned amounted to 632725500 while the total volume of aviation allowances auctioned amounted to 16390 500 (23).

Methods of auctioning: There are several approaches to conducting auctions. The auction can be designed so that all successful bidders pay the same price or each pay the price they bid. Several bidding options exist for conducting the auctions and the most common ones are briefly discussed here. Static auction is one of the common methods of auctioning emission allowances. With static auction, there is only one round of bidding. The bidders simultaneously submit their individual demand schedules, that is, the number of allowances they aim to purchase at different prices. The auctioneer adds these demand schedules to form an aggregate demand curve. All demands at or above the clearing price are accepted and those below are rejected. The price to be paid by the winners depends on which pricing method is used. The two most common pricing methods are uniform pricing (all winners pay the clearing price) and pay-your bid pricing (all winners pay the price they bid). The two approaches lead to quite different bidding behaviour. Uniform pricing auction is the most common approach in sealed-bid auctions for a homogeneous, divisible good such as emission allowances (24). Under uniform pricing, each winner pays the clearing price for each allowance. Thus, all bidders pay the same price (the market clearing price) on all of the allowances they win. This simple pricing rule has many advantages. In particular, if no individual bidder is able to influence the market price, this pricing mechanism is efficient and the bidders who place the highest value on allowances get the allowances. The uniform pricing approach can also be used in two-sided markets, that is, one in which both suppliers and demanders bid. This is an important feature as it potentially allows more than one country to offer allowances in the auction. Each participating country would offer its supply, possibly at differing prices.

Another method of auctioning is pay-your-bid. With this method, each winner pays the price of its bids. Each bidder attempts to guess what the clearing price will be and then bids slightly above it. While it might at first sight be thought that the pay-your-bid auction would result in higher revenues to the seller than the uniform-price auction, bidders will tend to bid lower prices in a pay-your-bid auction than in a uniform-price auction so there may not be much difference in the total revenue (25). A key disadvantage of pay-your-bid method is that it exposes small bidders to strategic risks, since they may be less able to gauge the probable level of the clearing price. Large bidders not only have greater resources for market analysis to estimate the clearing price, but also have better information about the clearing price as a result of knowledge of their own bids, which strongly influences the clearing price. The combination of market knowledge on other bidders and their own influence on the bidding price allows them to estimate which bid will be from the marginal bidder and thus estimate the clearing price. Thus, pay-your-bid pricing tends to favour larger bidders, and the exercise of market power tends to be at the expense of smaller bidders.

The dynamic auction method allows more than one round of bidding and bidders have an opportunity to revise their bids based on the information revealed in the previous rounds of bids (26). Both price and allocation are determined through a process of open competition. In the end, all buyers have good information about price and those willing to pay the most win the allowances. A primary advantage of ascending auctions is that it has a reliable process of price discovery. An ascending process is essential when bidders' valuations depend on market information held by others. As such, the bidding process reveals information, which improves the bidders' valuation estimates. Dynamic auctions can be conducted in two main ways: with an ascending clock or with demand schedules. In the context of selling a divisible good, an ascending clock auction is widely viewed as the best design because it is simple, both for the bidders and for the auctioneer, and it is most effective at promoting price discovery. The demand schedule approach can be thought of as a multiple-round version of the static sealed-bid auctions. In each round, bidders submit a demand schedule. The process repeats until no bidder is willing to improve or raise the value of the bids.

The benefits of auctioning: There are several benefits of auctioning. Full auctioning leads to a more efficient distribution of allowances compared to an allocation free of charge. Individual allocation requires complex allocation methodologies to distribute allowances to individual plants, involving thorough assessments of expected growth on a sector level, structural developments in the sector and a critical assessment of company growth expectations. Member States' preparation of National Action Plan (NAPs) for the first trading period showed that the allocation process involves intensive discussions with industrial organisations and individual companies (27). Another benefit of auctioning is that auctioning ensures environmental effectiveness. Whether auctioning would lead to an increase in environmental effectiveness of the scheme depends on the effect of auctioning on the market price of the allowances. It is therefore assumed that a higher market price will lead to a stronger incentive to implement emission reduction measures. Auctioning also generates revenue for member states that can be used toward renewable energy technologies and climate change projects. The EU Directive provides that 50% of the revenue generated from auctioning should be used by member states on renewable energy and climate change initiatives. An auction that takes place at the beginning of a trading period provides an immediate reliable price signal in the allowance market. This increases market confidence, especially for the smaller participants, and will stimulate market participation. Without an auction at the start of a trading period, the prices of the first trades in a relatively illiquid market and speculation by market specialists deliver rather unreliable price signals, thus requiring a longer period of uncertainty about the 'real' market price than in the situation with such an auction. Moreover, it is likely that market players will not obtain full details of these price signals since many transactions are bilateral trades, which are often not disclosed. Auctions, on the other hand, give clearer price signals since those prices are made public.

A critical analysis of auctioning: The auctioning regulation provides that the same rules of auctioning of allowances apply to installations of the same type regardless of the country in which the installations are located. This rule therefore ensures fairness and competitiveness in the markets across industries participating in the auctioning process. It also ensures that prices are competitive and that no country or industry benefits in the market at the expense of another country or industry. Hence, auctioning ensures competitiveness in the internal EU Carbon Market. On the other hand, auctioning put firms that are exposed to international competition at a disadvantage position in the international market. Firms that have exhausted their free allowances are faced with the challenge of participating in the auctioning process to procure additional allowances at additional costs. The additional costs incurred by firms have significant bearing on the prices of goods produced, which could lead to an increase in prices of goods, as compared to the prices of goods produced by their rival firms in countries without greenhouse gas emissions regulation. Without government's intervention, prices of commodities will be distorted in the markets and beneficial to firms from countries without regulation. This creates imperfect competition in the market undermining the tenets of a competitive economy.

The future of auctioning: In future, auctioning may be established for certain sectors by the EU while free allocation may be used for other sectors. This might be a solution for sectors that can easily shift the additional costs to their customers, such as power and the aviation industry. The revenues generated from auctioning can be used to compensate customers the increased costs. The volume of allowances available for auctioning may reduce in the future thus making sale of allowances a preferred option over auctioning as sale becomes more cost-effective than auctioning.

CONCLUSION

There are several conditions that are assumed to prevail in a competitive market including perfect information, homogenous products, well-defined property rights, profit maximization, no externalities, zero transaction costs and anti-competitive regulation (28). A perfect market ensures both allocative efficiency and productive efficiency, stimulates competition and discourages unfairness, price-takers and monopoly. Overall, perfect market economy stimulates growth and development. In the case of the EU Carbon Market, emissions regulation put installations that are exposed to international competition at a disadvantage position in the market with their rivals from outside the EU where emissions regulation is non-existent. The emissions regulation can be considered as an anti-competitive regulation for EU's firms exposed to international competition. The use of free allowances is not enough to address the problems faced by EU's firms exposed to international competition and more efforts are needed to level the competition faced by EU's firms exposed to international competition. There are several problems associated with the use of free allowances. Most importantly, the free allocation of allowances represents a one-time transfer of wealth from the government issuing them to the entities receiving them. Except for the fact that this represents a cost to society, as resources that could have been used to fulfil other political goals are being transferred to the

domestic industry, this may give rise to windfall profits, possibly distorting competition and trade. Free allowances can encourage the continual use of inefficient plants, as a plant closure would, in most schemes, mean the loss of the compensation that these free allowances constitute. In parallel with the challenge of how to handle plant closures, there are issues related to new entrants into the EU-ETS; creating new entrant reserves in proportion to the carbon intensity of new plants can bias the incentive towards more carbon-intensive investments (29). When projected forward, such distortions are amplified by the multi-period nature of the EU-ETS. There is a more general risk that if free allocations continue and industries expect future allocations to reflect recent emissions, incentives to reduce emissions will now be undermined (30).

The main alternative to free allocation is auctioning. Undeniably, there are number of arguments in favour of auctioning, and it would likely resolve many of the issues arising under free allocation. First, it is a straightforward way of implementing the 'polluter pays principle'. Second, it would reduce the distributional distortions and accompanying windfall profits that free allocation can create. An example of such distortions was an excess allocation of allowances to the manufacturing industry in the EU under phase two, at the expense of the power-generating sector. Third, it creates a level playing field for existing and new covered entities. Fourth, auctioning provides the potential for reducing the impact of compliance on the economy as a whole if auction revenues are used to reduce more distorting taxes on investment or other taxes like labour income. Lastly, auctioning can improve liquidity and transparency of the emissions market.

Arguments against auctioning include its difficulty to rally support among industry, especially if it has initially been granted allowances for free. The risks for leakage and distortions are also obviously more important. Auctioning has been accepted as the default method for the allocation of allowances under phase three of the EU-ETS. However, there are concerns for carbon leakage and reduced competitiveness brought forth by auctioning (31). In spite of the arguments against auctioning, auctioning provides the best option for enhancing transparency and competitiveness in the EU carbon market. Auctioning also fosters optimal allocation of carbon emissions and should be at the forefront of the EU carbon market mechanism for distribution and allocation of carbon emissions allowances. While auctioning should be pursued as the preferred method for carbon emissions distribution, it is advisable to reserve emissions allowances and provide same free of charge to new entrants or installations that are disproportionately affected and heavily expose to international competition.

GLOSSARY OF ABBREVIATIONS

Acronym	Description
EC	European Commission
EEA	European Economic Area
EEX	European Energy Exchange
EU	European Union
EU-ETS	European Union Emission Trade Scheme
ICE	Intercontinental Commodity Exchange
NAP	National Action Plan
NER	New Entrant Reserve
OECD	Organization for Economic Cooperation and Development

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