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Note Financial effects of ETS Set Aside

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1. Introduction

The EU ETS has a growing surplus of allowances built up over the last few years. The economic downturn is regarded to be a major cause of the oversupply and the low level of the CO_2 allowance price. From 2013 onwards, the ETS will enter its third phase in which a substantial part of the current allowances will be auctioned. In summer 2012, the European Commission proposed a draft Regulation to adjust the timing of auctions of emission allowances (EC 2012a). The Commission states that it is not wise to feed a market that is already oversupplied and wants to auction fewer allowances in the next years (Set Aside). These Set Aside allowances should then be auctioned in the later years of the 2013-2020 ETS period (backloading). The proposal document does not suggest permanent withdrawal of allowances, since this requires amending the ETS directive. However, permanent withdrawal (cancellation) is certainly considered as an option to reinforce the ETS.

The Netherlands Ministry of Finance is primarily interested in the economic effects of Set Aside scenarios. This paper focuses on the effects of Set Aside allowances on the government budget. Not just the auction revenues are considered, but also the indirect effect on funding renewable energy generation.

2. A brief discussion on the problem

The proposition to Set Aside allowances has raised discussions on the functioning of the ETS. Opponents argue that less CO_2 emissions and a low carbon price are among the few positive effects of the economic downturn. The emission targets are met under the ETS ceiling and there is no problem to be solved. Moreover, adjusting the ETS will cause investor uncertainty and comes at an already difficult time for European energy intensive industry.

Proponents of a Set Aside argue that the ETS has to be used as an instrument to achieve carbon reductions beyond 2020. According to the EU 2050 low carbon roadmap, a stronger price incentive is needed to decarbonise the energy system. Therefore, a low incentive in the coming decade may not optimally induce low carbon technology investment in long-lasting capital goods. Moreover, it may not optimally induce the dynamic effects of innovations needed to mitigate long-term costs and improve technology. A third drawback of the current low carbon price is the mismatch of the renewable energy and energy efficiency targets with the 2020 greenhouse gas target. Especially renewable energy generation has to be supported with public funding that is higher than expected to meet the

20% EU renewables target. This is due to the current low carbon costs of fossil fuel based generation.

3. Scope of the analysis

In this section, the analysis depicted in Figure 1 is followed. There are more effects of setting aside allowances than the two public spending items highlighted in the figure. These include the value of current privately held allowances and several power and carbon cost implications for industry and households. Only the two highlighted items are dealt with in this paper.

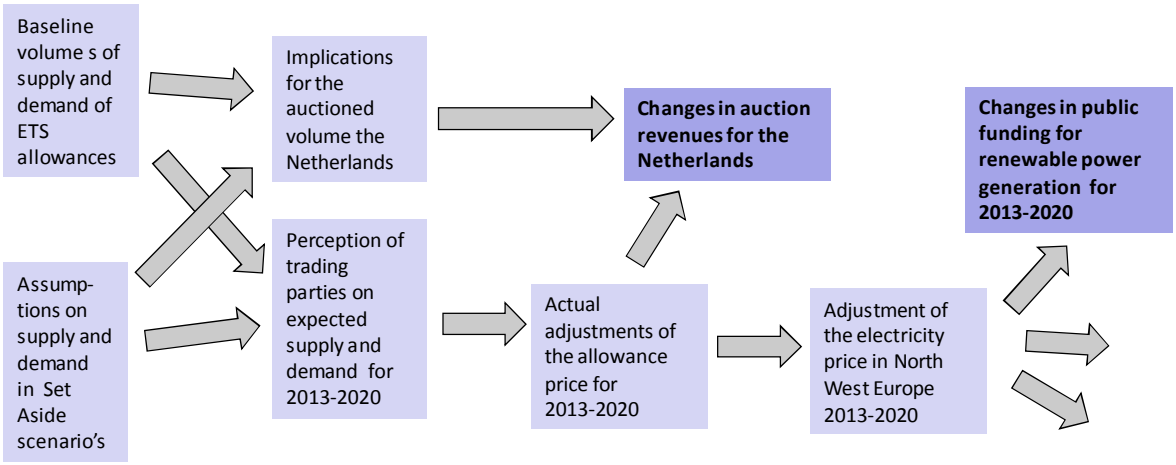

Figure 1 *Scope of the analysis*

3.1 Baseline supply and demand

The current market situation of EU allowances and the outlook for 2013-2020 are depicted in Figure 2. This is based on the working document (EC 2010) and includes projections adjusted to the economic downturn up to 2010. A large amount of allowances, potentially about 2300 Mton, is in the hands of market parties. This is due to a number of factors. Most important is the fact that emissions in the current 2008-2012 period stayed behind allocation due to the economic downturn. Since the allowances are transferable to the 2013-2020 period, the price has not dropped to near zero as in the final stage of the 2005-2008 period. The current price is probably determined by market expectations of a possible future shortage.

In Figure 2, the annual expected emissions under ETS are depicted against the annual allocation of allowances (ETS cap). In the baseline scenario, the emissions are based on existing policy instruments. Since the annual emissions exceed the annual cap, the surplus in this scenario will gradually decrease. However the surplus still amounts to 1500 Mton in 2020 in this scenario. Therefore, there will be no shortage of allowances during 2013-2020. The reference scenario on the right hand side assumes full achievement of the EU 2020 targets for renewables. Renewable power generation will replace fossil fuel based generation more than in the baseline. Annual emissions in the Reference scenario stay close to the annual cap. Therefore, in the Reference scenario the surplus hardly diminishes. For this analysis, both the EU baseline and reference scenario are used for comparison.

3.2 Set Aside scenarios

The proposed Set Aside scenarios of the Commission alter the timing of the allocation, represented by the red ETS-cap line in Figure 2. Part of this annual allocation is delivered for free and the other part is auctioned.

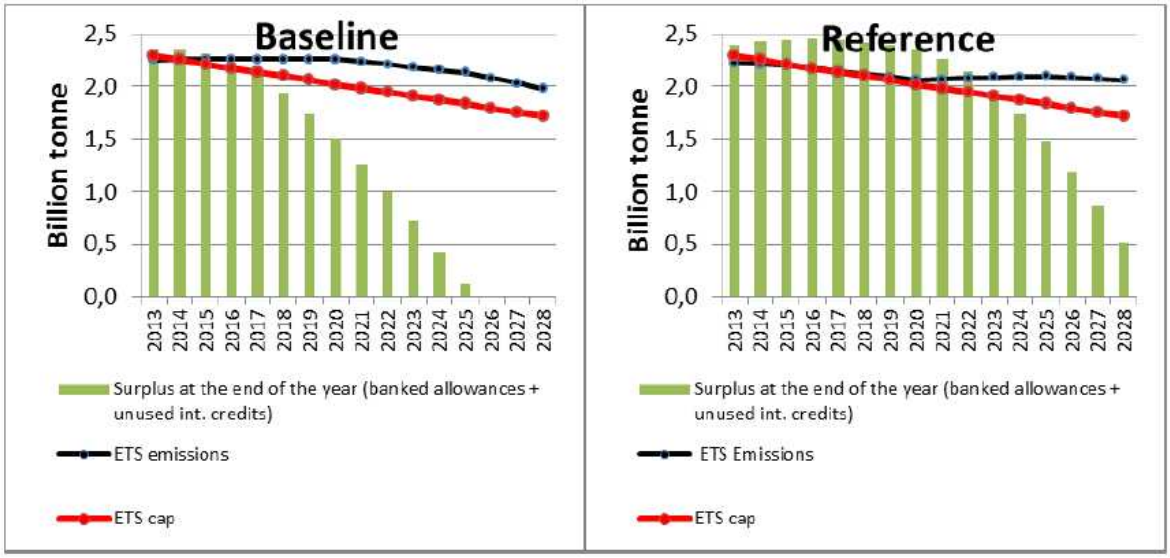

Figure 2 *Baseline and Reference scenarios (EC 2010)*

Set Aside focuses on the annual auctioned part of the allowances. Table 1 gives an overview of the scenarios and Set Aside alternatives (EC 2012a). An additional 'XL' scenario is included with a total Set Aside of 2000 Mton. The current estimates of the Commission on allocation are lower than in the 2010 document. Therefore, the estimated surplus at the end of 2020 is lower, but still has a positive value. This implies that over the whole period 2013-2020 there is no shortage, even without additional policies for renewables.

Table 1 *Baseline and reference supply and demand and Set Aside scenarios*

Supply and demand [Mtonne]	2012	2013	2014	2015	2016	2017	2018	2019	2020
annual allocation (excl. aviation)		2082	2044	2005	1967	1929	1891	1853	1814
of which to be auctioned		1116	1104	1092	1080	1067	1055	1043	1031
baseline emissions		2170	2170	2170	2170	2170	2170	2170	2170
reference emissions		2150	2140	2130	2100	2060	2020	2000	1980
surplus baseline (end of year)	2325	2237	2111	1946	1743	1502	1223	906	550
Surplus reference (end of year)	2325	2257	2161	2036	1903	1772	1643	1496	1330
Set Aside scenarios		withdrawal			backloading				
Large		-550	-400	-250	240	240	240	240	240
Medium		-400	-300	-200	180	180	180	180	180
Small		-200	-150	-50	80	80	80	80	80
Xlarge		-766	-766	-766	460	460	460	460	460

In the table, the Set Aside scenario values are mutations of the annual allocation. For the cancellation scenarios (Set Aside without backloading), the values for 2016-2020 are zero.

3.3 Auctioned volumes in the Netherlands

The Ministry of Finance has estimated the auctioned volumes and revenues for the Netherlands. When EU Set Aside scenarios are implemented, a proportional volume of less auctioned allowances is assumed for the Netherlands. This leads to the overview of auctioned volumes in the Netherlands in Table 2. With cancellation of allowances, the largest Set Aside is about 14% of the total planned volume for 2013-2020.

Table 2 *Baseline and Set Aside scenario volumes of auctioning in the Netherlands*

	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Planned auctioning [Mtonne]	5	29	28	30	29	29	28	28	27	233
with large Set Aside	5	15	18	23	35	36	34	34	33	234
with medium Set Aside	5	19	20	25	34	34	33	33	32	234
with small Set Aside	5	24	24	29	31	31	30	30	29	233
large, cancellation	5	15	18	23	29	29	28	28	27	202
medium, cancellation	5	19	20	25	29	29	28	28	27	210
small, cancellation	5	24	24	29	29	29	28	28	27	223
X large, cancellation	5	9	9	9	29	29	28	28	27	173

3.4 Expectations of market parties on supply and demand

The expectations of traders of emission allowances can diverge from EU scenarios. They make their own assessment of economic growth, fuel and power market development and future policies. For example, the discussion on a possible Set Aside already affects their perception of allowance supply and demand. For this specific issue, empirical research is not available. In this analysis pragmatic assumptions are made on ranges of trader expectations regarding supply and demand of allowances.

According to the current working document (EC 2012a) demand growth expectations are lower than in 2010. The oil price has risen more than expected. A new directive on energy efficiency was recently approved by the European Parliament. These factors could all implicate downward adjustments on the expected emissions in the scenarios. On the other hand, the movement away from nuclear energy following the Fukushima accident may raise fossil power generation. Moreover, the pressure on government budgets throughout Europe may make funding of renewables more difficult. For this analysis, the demand development for 2013-2020 expected by traders is assumed to be in the range between the EC baseline and Reference scenario, but closer to the latter.

On the supply side, the focus is on possible policy adjustments. Traders have already perceived the possibility of less supply, due the Commission proposal for setting aside with backloading. There is also the possibility of permanent adjustments of the ETS directive emission ceiling in a later stage. This analysis assumes that traders can expect anything between no Set Aside and a large Set Aside without backloading.

Traders may expect continuous demand for allowances beyond 2020. On the supply side, the ETS directive determines a 1.74% annual reduction of the cap beyond 2020. The European low carbon roadmap (EC 2011) requires an even higher reduction rate. The ETS is seen as an important instrument to achieve low carbon goals, so post-2020 demand can be substantially higher than supply. Traders are aware of the post-2020 ambitions, and assume that banking of current allowances beyond 2020 is possible. But they consider continuation of EU climate policies with a reinforced ETS to be uncertain. A range between no ETS cap reduction beyond 2020 and full implementation of the low carbon scenarios is assumed.

3.5 Expectations on the allowance price

The market price of CO_2 allowances is determined in transactions between traders. In this section the expectations range of traders is translated into pricing, assuming rational behaviour. This includes that traders do not just evaluate day-to-day supply and demand, but also assess the entire trading period. First, the period 2013-2020 is addressed.

According to the supply and demand values in Table 1, a surplus remains for both the Baseline and the Reference scenarios. If the allowances could only be used until 2020, their expected value within the expectation range would be zero. Traders would sell at any price, being certain of a structural oversupply appearing towards 2020. Cancellation of allowances could possibly avoid this situation. However, when demand of allowances would follow the Reference scenario, the 1330 Mton surplus in 2020 still exceeds the large cancellation scenario of 1200 Mton. Only when Baseline scenario demand is assumed will a large or medium cancellation consume the 550 Mton surplus. Only in this case some pressure in the market could occur that would raise the allowance price, thus incurring additional demand response.

Part of the actual surplus on the market may be inflexible due to the risk aversion of emitters. Power companies explicitly buy allowances to match forward contracts, to hedge emission costs of future power deliveries. Industry is also expected to maintain a quantity of allowances in accordance with their production planning. Starting from the third trading period, the hedged amount of the power sector is expected to be substantial since free allocation for them is abandoned. In the coming years, trading platforms expect a hedged amount of 700-1300 Mton (Bloomberg; Point Carbon 2012). Neuhoff (2012) estimates this to be 500-1800 Mton. However, the inflow and outflow of hedged allowances at energy companies will depend on:

- The planned technology of contracted future power supply. At first hand, this will be based on the production of actual and built capacity. When a tighter ETS cap and higher carbon prices incentivise lower carbon technology, the hedged amounts can be lower by 2020. Moreover, keeping allowances in store is more expensive when carbon prices are higher.
- The extent to which power companies want to hedge or are able to pass allowance price uncertainty to their clients or intermediates. Major transactions of power producers and distribution companies are not standardized. They could be made more adjustable, allowing the actual purchase of allowances to be postponed to the year of production. Market intermediates or distribution companies and their customers could share part of the allowances price risk. Carbon futures are currently traded (EEX 2012). To what extent this will develop towards 2020 is not known. It is assumed that markets will develop more flexibility.
- Power company traders may respond to allowance price adjustments and expectations. They may cash in profits they perceive and thus increase market liquidity.

For this analysis, some remaining surplus inflexibility due to hedging is estimated for 2020, but not to the extent estimated by trading platforms for 2013-2015.

What will happen when the surplus for 2013-2020 is more than consumed and real shortage is expected by traders? If this is expected, the allowance price will in theory rise until enough extra reduction measures are achieved. The price will equal marginal costs of reduction and the market clears. A simple reduction supply curve concept is used here.

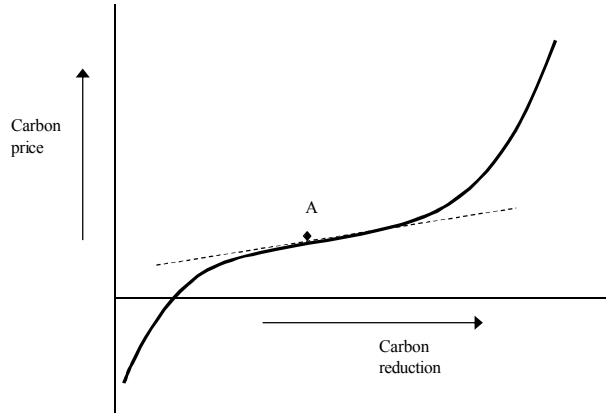

Figure 3 *Reduction curve concept*

The curve connects points where the marginal carbon reduction cost equals the price of carbon. At a price level of A, carbon is reduced up to this point. When at that point a Set Aside turns the surplus into a shortage, extra reduction is required, driving point A along the curve and raising the carbon price. The tangent in point A determines the amount of euros the carbon price goes up when a certain volume of allowances is Set Aside. From several studies and models (IER 2012; Ecofys 2009; EC 2010) a ratio is derived in the range of €10-20 per 100 Mton extra annual reduction. This ratio is used for further analysis of scenarios in which the surplus is expected to have been consumed by the end of the trading period.

Since this is currently not the case, the current (September 2012) price of CO_2 of about € 7 is more likely to be explained by valuation of post-2020 demand. Traders may withhold allowances from the market and bank them, in order to sell them at a profit later. They may expect climate policies to be more strict in the future. The EU low carbon scenario allowance prices in the long run range from € 25 to more than € 100 per tonne. Table 3 gives an overview.

Table 3 *CO_2 prices in EU low carbon policy scenarios (EC 2011)*

	2020	2030	2040	2050
upper price	25	62	100	370
lower price	25	42	50	104

Continuing current allowances beyond 2020 comes at a cost. The expected value in 2020 needs to be corrected with discounting to the present and there is the risk that EU policies are inadequate by 2020. The current price of € 7 can be made plausible, e.g. based on the projected € 25 in 2020, a 50% policy inadequacy risk and a 7-8% required return on capital. The analysis on how policy success or failure is perceived and estimated by market parties is complicated. Policy inadequacy here represents the risk that a low carbon strategy as envisaged by the Commission's analysis is not implemented. The above calculation has no empirical value. However, this factor is relevant since it may produce self-enforcing effects. Specifically, if a substantial Set Aside policy is implemented in the coming years, this will influence the perception of traders on future success.

4. Calculation of Set Aside effects

Based on the mechanisms described in the previous chapter, the effects of Set Aside scenarios are calculated and summarized in Table 4. Year on year results are included in the Annex. For this calculation, a simple spreadsheet model is used that allows for sensitivity analysis. In the model the current (September 2012) situation is tentatively approximated with the following assumptions:

- Demand is closer to EU reference, less close to EU baseline. An 80%-20% weighting on demand values is applied.
- Traders on average estimate a medium Set Aside with a 25% chance of cancellation.
- Traders estimate a 25% chance of full post-2020 low carbon roadmap scenario.
- The carbon price will remain at the present € 7 level until 2020.
- The amount of inflexibility (extra shortage) due to power company hedging for 2020 is 500 Mton in moderate price scenarios and down to 250 Mton in shortage situations.
- For 2013-2020, traders foresee only direct pressure on the carbon price if shortage is expected.
- If shortage is expected to occur due to Set Aside, for every 10 Mton average annual shortage the carbon price will go up with € 1,3 (based on IER 2012).
- Some upward pressure will also occur in case of cancellation, even if a surplus remains over 2013-2020.

As these assumptions are mostly arbitrary, the conclusions are mainly based on the sensitivity analysis.

Table 4 *Results for the Netherlands of the Set Aside scenarios combined with the stated assumptions (the "no Set Aside" case is reference for extra auction revenues)*

	Cumulative extra auction revenues, 2013-2020 [mln euro]	2020 CO_2 allowance price [euro/tonne]	Average electricity price increase [euro/MWh]	Cumulative savings on renewable funding, 2013-2020 [mln euro]
Planned auctioning, no Set Aside	0	6.4	-0.4	-39
with large Set Aside	-6	6.4	-0.4	-39
with medium Set Aside	-4	6.4	-0.4	-39
with small Set Aside	-2	6.4	-0.4	-39
large, cancellation	331	9.6	1.6	177
medium, cancellation	253	8.8	1.1	122
small, cancellation	119	7.5	0.3	33
X large, cancellation	1963	21.8	9.3	1004

The scenarios without Set Aside or backloading have negligible effects. Compared to the assumed current situation, they turn out slightly negative since the cumulative surplus is not affected, whereas a small risk of cancellation is currently priced in by traders. Scenarios with cancellation deliver upward prices and positive auction revenue effects. The results show that larger effects occur outside the range of Set Aside volumes the EC proposed. With the XL scenario, a real market shortage is incurred, leading to a more substantial carbon price effect. Increased auction revenues due to this price effect outweigh missed revenues due to cancellation. The sooner cancellation is implemented, the faster the positive net price effect will occur. A positive net balance is expected to occur already in the first year after cancellation is implemented. According to the assumptions in the calculation this is 2016 (see Table A1 in the Annex). Positive effects on renewables funding occur immediately when the allowance price increases.

The sensitivity analysis is based on the Large EU Set Aside scenario with cancellation. The following variants are analysed:

- Demand is closer to the EU Baseline scenario, implying that renewable power generation does not meet the foreseen targets. Weighting for reference and baseline demand is 20/80%.

- Estimates on post-2020 carbon prices remain less influenced by proposed 2013-2020 policies. The carbon price based on post-2020 expected value is set € 1.3 lower.
- Power generators continue rigid hedging practises for futures of at least 500 Mton until 2020 in shortage scenarios.

Table 5 *Results of the sensitivity analysis for the Large cancellation scenario*

Sensitivity, Large cancellation scenario	Cumulative extra auction revenues, 2013-2020 [mln euro]	2020 CO_2 allowance price [euro/tonne]	Average electricity price increase [euro/MWh]	Cumulative savings on renewable funding, 2013-2020 [mln euro]
Central assumptions (Large cancellation)	331	9.6	1.6	177
Demand closer to EU Baseline	707	11.8	3.0	326
Low policy sensitivity post-2020 carbon price	110	8.3	0.8	89
Rigid power sector hedging up to 2020	481	10.5	2.2	235

The sensitivity analysis maintains that the price level of carbon stays strongly related to the financial results. In the analysed carbon price range of €8-12, typical financial effects are +/- 70% for auction revenues and +/- 50% for renewable funding. In all the analysed alternatives, the missed revenue due to smaller auctioning volumes is more than compensated with higher prices in later years. The mechanisms to increase the carbon price are therefore crucial. Creating a real shortage over 2013-2020 is the most robust recipe for increasing auction revenues. But also the indirect effect of an implemented permanent Set Aside on trader perception of long-term prices could be positive for auction revenues.

5. Effects on the electricity price and funding for renewable power generation

To determine the effect on the electricity price of Set Aside scenarios, the Northwestern European power market is relevant. To identify marginal capacity, a mix of generation mix is assumed based on gas and coal-fired power generation (Seebregts 2009). The CO_2 price sensitivity of the electricity price is found to be € 0.6 per MWh for € 1 increase in the carbon price. Based on the range of the CO_2 price in the analysis, there is no substantial adjustment of the power generation mix.

In the Dutch renewables stimulation approach, the funding is adapted to the actual market gap for renewables. Therefore, an increased wholesale market price will require less funding for renewable power generation. The funding effects are calculated with the ECN models for the Dutch SDE-subsidy scheme. The effect of 1 €/MWh increase of the electricity price in the current Dutch Reference Projections (PBL/ECN 2012) implies cumulative budget savings for 2013-2020 of about € 100 mln. This depends on the marginal funded renewable option; in this case offshore wind is used.

According to the Reference Projections, the Netherlands achieves only 11% renewables in 2020, whereas the EU target for the Netherlands is 14%. The new government (November 2012) has set a 16% target. A sensitivity analysis is made on the saved renewables funding for the Large cancellation scenario. The renewable capacity is increased with wind at sea to a 14%-16% renewables share

in 2020. This requires substantial extra funding, cumulatively in the range of € 5-10 bln. The cumulative saved funding due to Large cancellation then increases from € 177 mln to € 400 mln.

6. Conclusions

Setting aside allowances with backloading will have a neglible effect on auctioning revenues over the total period 2013-2020. During the first years (2013-2015), the cumulative impact is negative (€-70 to -200 million), whereas in the subsequent years the cumulative impact is positive in the same range. The carbon price is not substantially affected by setting aside allowances when they are backloaded.

However, a cancellation of allowances can have a substantial impact on cumulative auctioning revenues. When the amounts proposed by the EC are Set Aside and cancelled, a moderate rise of the allowance price will occur. For the Dutch treasury, this will incur cumulative auction revenue increases of €100-700 million and savings on renewables funding up to €30-300 million over 2013-2020. A large impact occurs with a cancellation of more than the 400 to 1200 Mton the EC has proposed. In that case, the carbon price will more than double and the cumulative impact on the government budget will be several billions of euros.

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Annex

Table A.1 *Extra revenues from auctioning*

Extra revenue [Million euros]	2013	2014	2015	2016	2017	2018	2019	2020	Total
Planned auctioning, no Set Aside	0	0	0	0	0	0	0	0	0
with large Set Aside	-98	-68	-45	41	42	41	41	40	-6
with medium Set Aside	-71	-51	-36	31	31	31	31	30	-4
with small Set Aside	-36	-25	-9	14	14	14	14	13	-2
large, cancellation	-86	-40	10	92	92	89	89	86	331
medium, cancellation	-60	-27	7	68	68	66	66	64	253
small, cancellation	-29	-13	14	30	39	29	29	28	119
X large, cancellation	-101	-64	-35	445	445	430	430	414	1963

Table A.2 *CO_2 allowance price development*

CO_2 price [euro/tonne CO_2]	2013	2014	2015	2016	2017	2018	2019	2020
Planned auctioning, no Set Aside	7.0	6.9	6.7	6.6	6.4	6.4	6.4	6.4
with large Set Aside	7.0	6.9	6.7	6.6	6.4	6.4	6.4	6.4
with medium Set Aside	7.0	6.9	6.7	6.6	6.4	6.4	6.4	6.4
with small Set Aside	7.0	6.9	6.7	6.6	6.4	6.4	6.4	6.4
large, cancellation	7.0	7.6	8.3	8.9	9.6	9.6	9.6	9.6
medium, cancellation	7.0	7.4	7.9	8.3	8.8	8.8	8.8	8.8
small, cancellation	7.0	7.1	7.2	7.3	7.5	7.5	7.5	7.5
X large, cancellation	7.0	10.7	14.4	18.1	21.8	21.8	21.8	21.8

Table A.3 *Saved funding for renewable energy generation*

SDE-effect [Million euros]	2013	2014	2015	2016	2017	2018	2019	2020	Total
Planned auctioning, no Set Aside	0	-1	-3	-5	-6	-7	-8	-9	-39
with large Set Aside	0	-1	-3	-5	-6	-7	-8	-9	-39
with medium Set Aside	0	-1	-3	-5	-6	-7	-8	-9	-39
with small Set Aside	0	-1	-3	-5	-6	-7	-8	-9	-39
large, cancellation	2	6	14	21	25	31	37	41	177
medium, cancellation	2	5	10	14	17	21	25	28	122
small, cancellation	1	2	3	4	4	5	6	7	33
X large, cancellation	9	33	76	120	143	178	211	234	1004