



Add-on to report “Costs of EU ETS and CORSIA for European aviation” taking into account the impacts of the COVID-19 pandemic on aviation emissions

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1. Introduction

In 2019 TAKS, together with CE Delft, has done a study for T&E whereby two issues have been addressed.

1. What is the total cost for European aviation for complying with the ETS allowance surrender requirement and CORSIA offsetting requirement over the period 2021 - 2030.
2. Which other sectors covered by the EU ETS are also subject to other economic instruments

The end of 2019, the study has resulted in the report “Costs of EU ETS and CORSIA for European aviation”. In relation to the first issue two EU ETS and CORSIA co-existence scenarios have been taken into account. In the first scenario, the EU ETS is retained for both intra and domestic EEA flights, and CORSIA is applied to flights departing from EEA Member States (which all signed up for CORSIA) to other participating ICAO Member States (outbound flights). In the second scenario airlines have to comply for their intra EEA and domestic operations with the EU ETS in line with current regulations along with CORSIA for their intra and outbound EEA operations. The two scenarios are referred to as:

1. Retain EU ETS for aviation + CORSIA for outbound;
2. Retain EU ETS for aviation + CORSIA for intra and outbound.

The analysis of the total costs for European aviation for the 2 co-existence scenarios in the original study was based on the ICAO baseline scenario which was published in 2018. Due to the impacts of the COVID-19 pandemic on the airline industry, the ICAO baseline scenario is clearly not valid anymore. T&E has therefore requested TAKS to make an add-on to the original study. In this add-on, the results have been re-computed based on a revised baseline scenario which takes into account the fallout of the COVID-19 pandemic for the airline industry.

Apart from a revised baseline scenario, in this add-on it is taken into account that the CORSIA baseline has been changed by the ICAO council from the average of 2019/2020 to 2019 [1]. Also during the executing of the original study, 81 countries had signed up to voluntarily join CORSIA. At present 88 countries have signed up to CORSIA [2] which is taken into account in this add-on. Moreover, the RTK data for 2018 are now available which define the countries to join the mandatory phase of CORSIA [3]. This list implies that on top of the 88 countries which have voluntarily signed up to CORSIA, an additional 5 major aviation countries will have to join CORSIA from 2027 onwards¹.

The scope of flights covered under the EU ETS in this add-on is assumed to be the same as in the original study. This includes flights between the EU and the UK. This though the UK intends to set up their own ETS whereby the UK is open to considering a link between the UK ETS and the EU ETS [4]. In fact, one could say that the results regarding allowances demand in this add-on (and in the original study) reflect

¹ Brazil, China, India, Russia and Vietnam

the demand for allowances from aviation from both the EU ETS and the UK ETS. This in case both systems would be linked and the UK ETS would adopt a very similar regime for aviation compared to the EU ETS.

So far the pandemic has only limitedly affected EU allowances prices. In March 2020 there was a price drop, but prices have bounced back since then. Therefore, the same two price scenarios (see section 4 of original study report) have been considered in this add-on.

Chapter 2 of this add-on is involved with the assumptions underlying the revised aviation baseline scenario up to the year 2030. Chapter 3 describes the demand for EU ETS allowances and CORSIA international credits and the related costs for European aviation. Finally, a summary of the main conclusions is provided in chapter 4 of this add-on.

2. Revised aviation emissions baseline scenario for 2030

The impact of the COVID-19 pandemic on international aviation is unprecedented. Moreover the recovery path of the aviation industry is still very uncertain. In developing the revised aviation emissions baseline scenario three main questions have considered:

1. What will be the international aviation emissions in 2020 relative to 2019;
2. What will be the recovery path of international aviation emissions to rebound to 2019 levels;
3. What is the long-term growth of international aviation emissions after the rebound to 2019 levels.

As in the original study the impacts of the two EU ETS and CORSIA co-existence scenarios are computed for Intra EEA/UK² flights and EEA/UK outbound flights. CORSIA offset obligations however depend on the sectoral growth rate for global international aviation. Therefore, in order to assess the impacts of the two co-existence scenarios, one not only need a revised baseline scenario for the flights on the two EEA/UK related route groups, but also for global international aviation. Therefore in setting up the revised baseline scenario a distinction is made between: i) global international aviation; ii) emissions on intra EEA/UK flights presently covered by the EU ETS; and iii) outbound EEA/UK flights.

(1) International aviation emissions in 2020 relative to 2019

For global international aviation the most recent ICAO forecast for 2020 shows a reduction of seats offered by airlines between 54% to 64% relative to 2019 [5]. The ICAO document also indicates that between February and April the number of cargo flights surged. It is assumed this was only temporary, and that later in the year there might even be a fall in cargo flights because of the economic fallout of the pandemic. For the whole of 2020 it is assumed cargo flights and emissions will equal 2019. Based on the ICAO forecast, total global international aviation emissions (passenger plus cargo flights) is estimated to decrease by 50% in 2020 relative to 2019.

Flight data for June suggest that Intra European traffic is recovering earlier compared to global international aviation [6]. On the other hand, intra-European aviation traffic for a larger proportion is related to passenger flights which are generally hit much harder by COVID-19 compared to cargo flights. Also a limited part of the emissions on the intra EEA/UK routes covered by the EU ETS relates

² After Brexit, the UK is formally not part of the EEA anymore.

to domestic aviation. According to ICAO the reduction of seats offered on domestic flights will be between 33% and 39%, and is thereby more moderate compared to international aviation [5]. Taking all into account, the decrease in aviation emissions for intra EEA/UK flights in 2020 is estimated to 40% relative to 2019. So far the decrease in outbound flights from the EEA/UK (i.e. flights with destinations outside the EEA/UK) in 2020 is generally in line with overall global international traffic [6]. Hence also for these outbound flights, the decrease of aviation emissions in 2020 relative to 2019 is estimated to 50%.

(2) Recovery path of international aviation emissions to rebound to 2019 levels

The Environmental Defense Fund (EDF) has published an article taking into account various recovery paths [7]. Though clearly at present the recovery path is very much unknown, for this analysis scenario 3 (the “U”) is taken on board. This scenario can be regarded as the “medium” recovery scenario. In the “U” scenario it is assumed that over the period 2021-2024 international aviation gradually recovers, and that by 2024 aviation emissions are back to the level of 2019. The “U” scenario is both in line with an IATA outlook that global international passenger air travel may not recover to 2019 levels until 2024 [8] and with an ACI statement that a recovery in European passenger traffic to 2019 levels is only expected for 2024 [9].

(3) Long-term growth of international aviation emissions after the rebound to 2019 levels

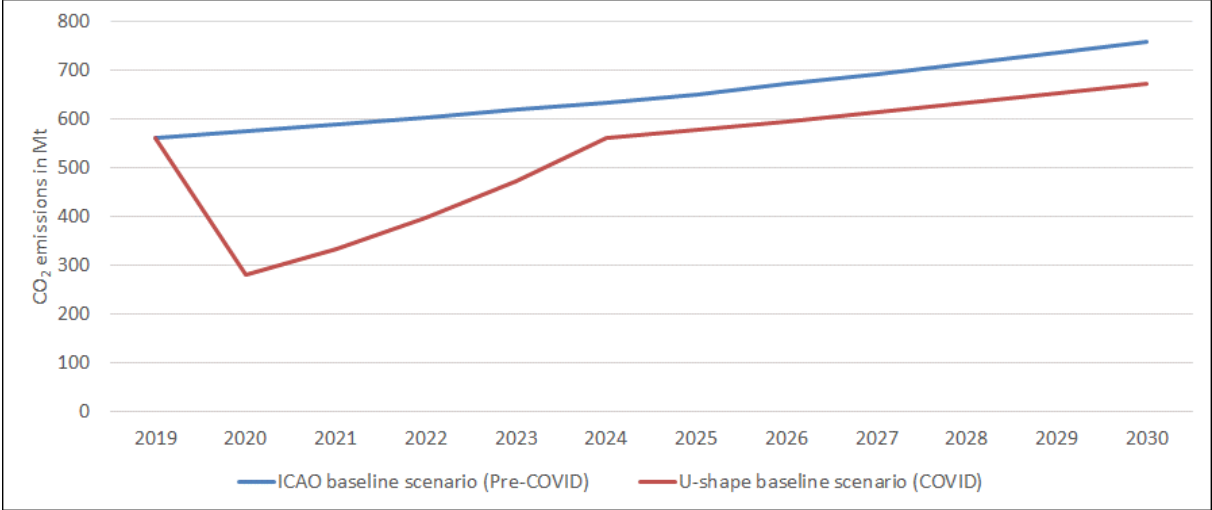
The aviation emissions baseline scenario underlying the original study was based on the long term forecast of ICAO from 2018 [10]. The long term growth for the period after the rebound to 2019 levels in the revised baseline scenario is also based on this ICAO forecast. For the period after 2024 this implies an annual growth of aviation emissions of:

- 3.1% for global international aviation;
- 1.7% for intra EEA/UK flights;
- 2.7% for outbound EEA/UK flights.

Aviation CO₂ emissions in 2021-2030 according to the revised aviation emissions baseline scenario

The revised aviation emissions baseline scenario is referred to as the “U-shape baseline scenario”. Figure 1 shows the global international aviation CO₂ emissions for the scenario together with the emission development for the pre-COVID ICAO baseline scenario (the latter was used in the analysis of the original study report).

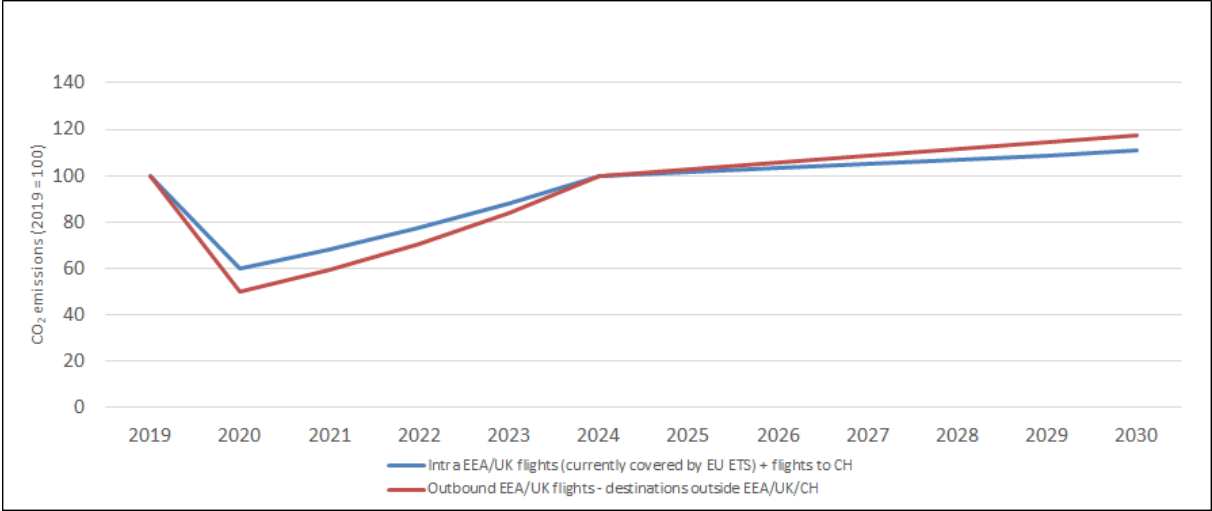
Figure 1. Global international aviation CO₂ emissions for U-shape baseline scenario.



Global international aviation CO₂ emissions for 2019 are computed by the AERO-MS³ to 560.7 Mt. This is within 1% of the approximately 555 Mt of CO₂ emissions for international aviation in 2019 according to the ICAO Council Global Environmental Trends document [11]. The development of CO₂ emissions from global international aviation over time for the U-shape baseline scenario includes the 50% reduction of emissions in 2020 and the recovery path over the period 2021-2024 to the 2019 emission level. From 2025 onwards the annual growth rate equals the growth rate of the pre-COVID ICAO baseline scenario.

Figure 2 shows the development of CO₂ emissions for both intra EEA/UK flights⁴ and outbound EEA/UK flights, whereby for both route groups the 2019 emissions levels are normalised to 100. Figure 2 shows the smaller reduction of CO₂ emissions in 2020 for intra EEA/UK flights. In absolute terms the starting point of emissions in 2019 is 68.1 Mt for intra EEA/UK flights (which is in line with the Union Registry data [12]), and 116.4 Mt for outbound EEA/UK flights.

Figure 2. Aviation emissions on flights departing from the EEA/UK for U-shape scenario (2019=100).



3 Demand for EU ETS allowances and CORSIA international credits and related costs

Against the background of the U-shape baseline scenario, for the 2 co-existence scenarios the number of EU ETS allowances and CORSIA international credits have been re-computed. As in the original study the impacts for all flights departing from the EEA/UK in the period 2021-2030 are considered.

The computation of CORSIA related international credits for international aviation is based on the ICAO resolution [13], taking into account the recent decision of the ICAO council to take the year 2019 as the basis for the baseline emissions.

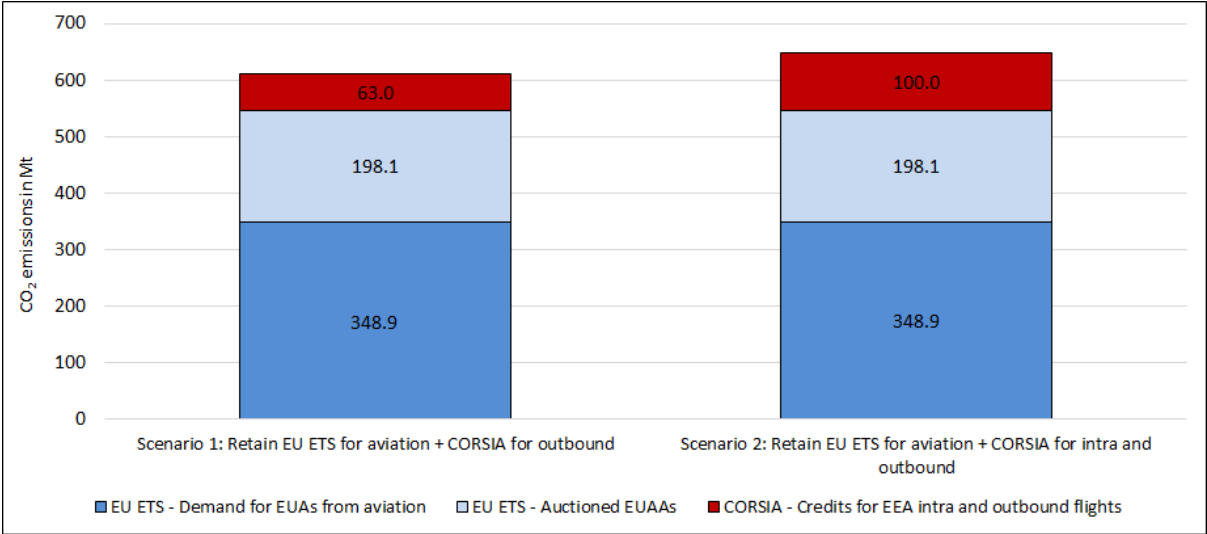
³ The AERO-MS is a model for which the IPR is with EASA. See also the original study report.

⁴ These flights are currently covered by the EU ETS. As in the original study we have also added the flights from the EEA/UK to Switzerland to this route group because according to the linking agreement between the EU ETS and the CH ETS these flights will be covered by the EU ETS.

The annual demand for allowances and international credits for co-existence scenario 1 and 2 are presented in respectively figures 8 and 9 in Annex A. For both scenarios the cumulative demand for allowances and international credits over the period 2021-2030 is presented in figure 3 below.

Because the EU ETS coverage is the same in scenario 1 and scenario 2 (see also table 1 of the original study report), the demand for EU ETS allowances, both EUAs and auctioned EUAAs, is also the same in both scenarios (see figure 3). As assumptions regarding the cap and the share of EUAAs auctioned over time have not changed, the demand for EUAAs is the same as computed in the original study (198.1 Mt for the period 2021-2030). Demand of EUAAs in the period 2021-2030 is not expected to change due to the COVID-19 pandemic because emissions are not expected to fall below the EU ETS cap for aviation which is based on 95% of emissions in 2005.

Figure 3. Demand for allowances and international credits for both scenarios (cumulative 2021-2030).



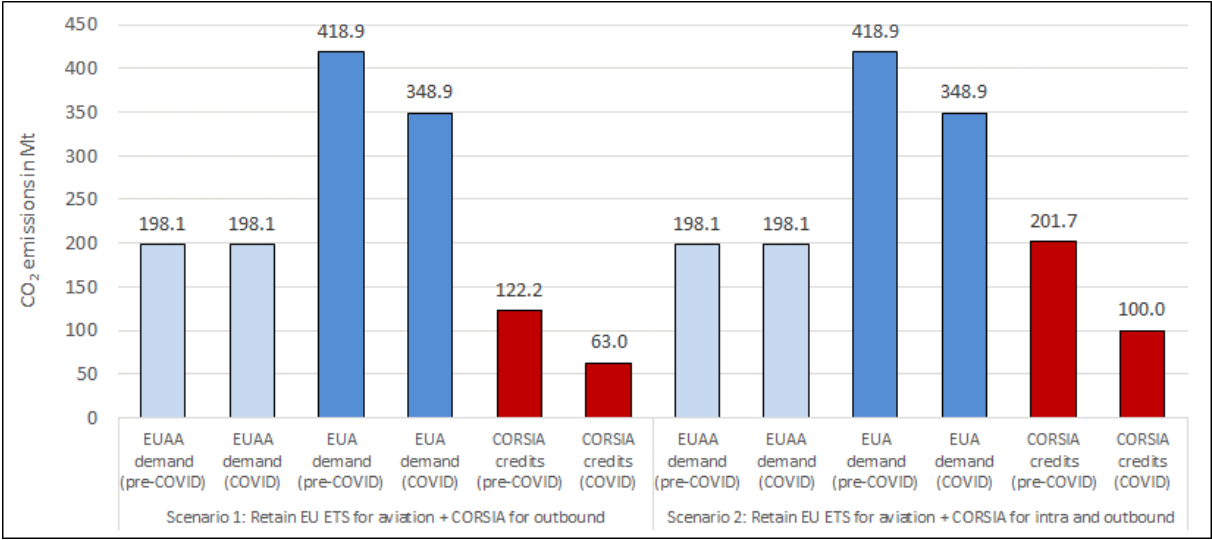
The demand for EUAs is lower compared to what was computed in the original study. This is especially true for the year 2020 (not reported) because according to the U-shape baseline scenario aviation emissions will be lowest in that year. Demand for EUAs from the aviation sector in 2020 are estimated to 5.2 Mt whereas in 2019 these were 32.4 Mt [12].

For both scenario’s figure 4 compares the demand for EUAAs, EUAs and CORSIA credits between the original study (pre-COVID) and this add-on (COVID). For the period 2021-2030 the aviation demand for EUAs is now computed to 348.9 Mt whereas in the original study report this was 418.9 Mt. Clearly the reduction in demand will especially take place in the coming years which are expected to be mostly affected by the COVID-19 pandemic.

In case of both co-existence scenarios the demand for CORSIA related international credits is heavily affected by COVID-19. Compared to the original study for the full period 2021-2030 demand is reduced by about 50% (for scenario 1 from 122.2 Mt to 63.0 Mt and for scenario 2 from 201.7 Mt to 100.0 Mt). The reduction can be directly related to the much lower sectoral growth rate for global international aviation in case of the U-shape baseline scenario. Because in the first 4 years of CORISA (2021-2024) CO₂ emissions are below the 2019 baseline emission level, the sectoral growth rate is negative. This implies under the U shape baseline scenario there will be no offset obligations under CORSIA (see also figures 8 and 9) in this 4-year period. This will be the case for all international routes covered by

CORSIA. Interestingly the reduction in offset demand is not so much directly related to the lower levels of emission under the COVID-19 baseline scenario, but much more to the decision of the ICAO council to change the CORSIA baseline from the average of 2019/2020 to 2019. Actually in case the average of 2019/2020 would have remained the CORSIA baseline under the COVID-19 baseline scenario, the offset demand would have gone up relative to the pre-COVID situation. For scenario 1 it is estimated that the number of CORSIA credits would have gone up from 122.2 Mt (pre-COVID) to about 215 Mt (COVID with 2019/2020 baseline). For scenario 2 it is estimated that the number of CORSIA credits would have gone up from 201.7 Mt (pre-COVID) to about 350 Mt (COVID with 2019/2020 baseline).

Figure 4. Comparison in demand for EUAAs, EUAs and international credits between pre-COVID and COVID emissions baseline scenario (cumulative 2021-2030).



As stated above the U shape baseline scenario can be regarded as a medium recovery scenario. Hence it is also possible the recovery will take longer which would mean a longer period without offset obligations under CORSIA. To retain the EU ETS for aviation ensures that in the coming years there is at least some form of effective regulation for European aviation emissions.

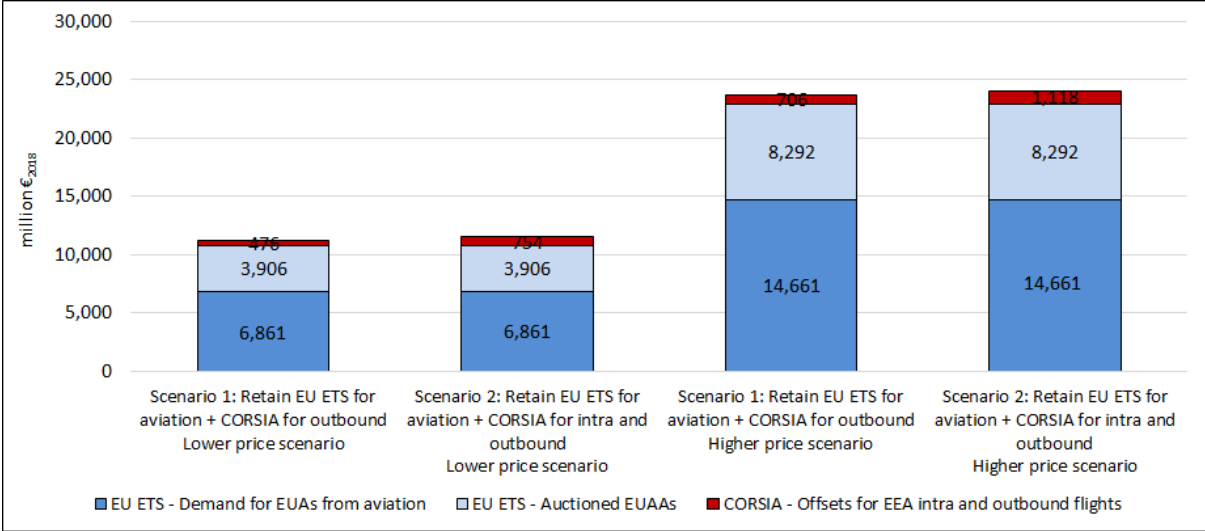
In general the EU ETS will result in emissions reductions which take place earlier compared to CORSIA. An earlier emission reduction is important from a climate perspective. According to the IPCC [14], if there are two pathways that show the same total mitigation over a certain period of time, but one mitigates earlier within that period, then there will be less climate overshoot. Climate overshoot is a period where global mean temperatures rise above warming targets before settling back down. Whereas the eventual equilibrium temperature will be the same for the two pathways with the same total mitigation, an earlier mitigation reduces the risk for overshoot.

In a next step the costs for airlines to purchase allowances and international credits have been re-computed. This is done for both the lower and higher price scenario (see chapter 4 of original study report). The annual costs for scenario 1 and 2, in case of the lower price scenario, are presented in respectively figures 10 and 11 in Annex A. For the higher price scenario the results are presented in figures 12 and 13. The extra costs in scenario 2 (relative to scenario 1), in case of the lower price scenario, go from 9 million € in 2025 to 85 million € in 2030 (compare figures 10 and 11). For the higher price scenario the extra costs go from 13 million € in 2025 to 127 million € in 2030 (compare figures 12 and 13). In the period 2021-2024 there are no CORSIA related costs, and as the 2 scenario only differ

with respect to applying CORSIA to Intra EEA/UK flights or not, there is also no cost difference between the 2 co-existence scenarios for this 4 year period.

For both policy scenarios and both price scenarios, the cumulative costs for allowances and international credits over the period 2021-2030 is presented in figure 5 below.

Figure 5. Costs for allowances and international credits for both scenarios (cumulative 2021-2030).



Total costs for European aviation over the 10-year period vary between 11.2 billion € (scenario 1 with lower price scenario) and 24.1 billion € (scenario 2 with higher price scenario). The figure also shows that for the 10-year period the extra costs in scenario 2, relative to scenario 1, is 278 million € for the lower price scenario and 412 million € for the higher price scenario.

Total costs over the 10-year period to purchase EUAAs are 3.9 billion € for the lower price scenario and 8.3 billion € for the higher price scenario. Because the demand for EUAAs has not changed, this is the same as in the original study report. The revenues are thus not expected to change due to the COVID-pandemic provided that allowances prices are also not affected. The costs to purchase auctioned EUAAs also reflect revenues for EEA Member States, which can be used by Member States to finance further climate policies. Moreover, in the European Parliament it is debated whether part of the auctioning revenues can be used to finance the EU’s COVID-19 recovery fund.

For both policy scenarios and both price scenarios, figure 6 compares the costs for EUAAs, EUAs and CORSIA credits between the original study (pre-COVID) and this add-on (COVID).

Also similar to the original study the costs of allowances and international credits are expressed as a percentage of total airline operating costs. The results are presented in table 1 below.

Though the costs for allowances and international credits are lower compared to the original study, the costs as a percentage of total airline operating costs in 2030 they are very similar to the results of the original study. This because total operating costs of airlines will also be reduced as a result of lower demand levels under the U-shape baseline scenario. However, costs as a percentage of total airline operating costs in 2021 are somewhat lower compared to the original study.

Figure 6. Comparison in costs for EUAAs, EUAs and international credits between pre-COVID and COVID emissions baseline scenario (cumulative 2021-2030).

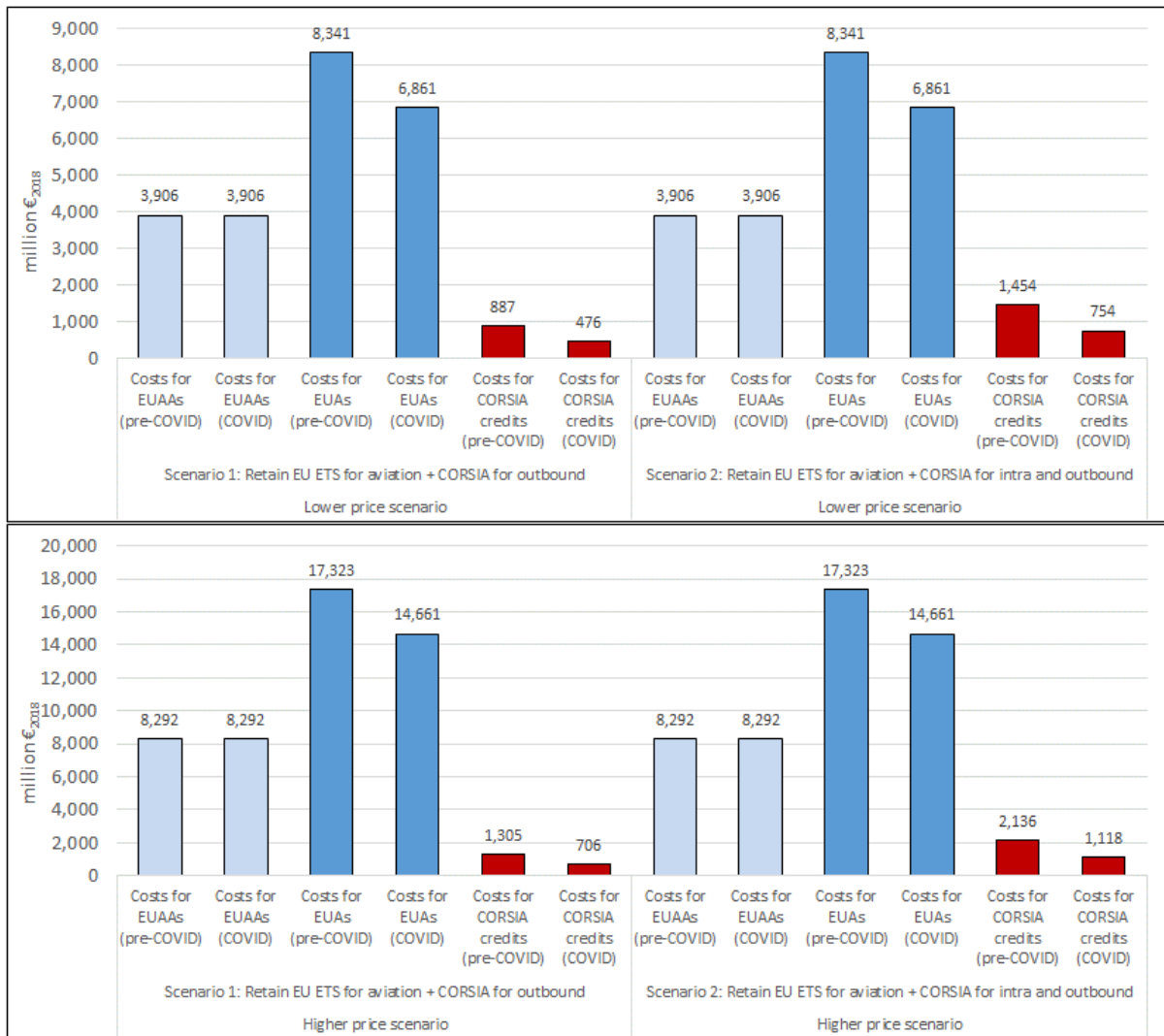


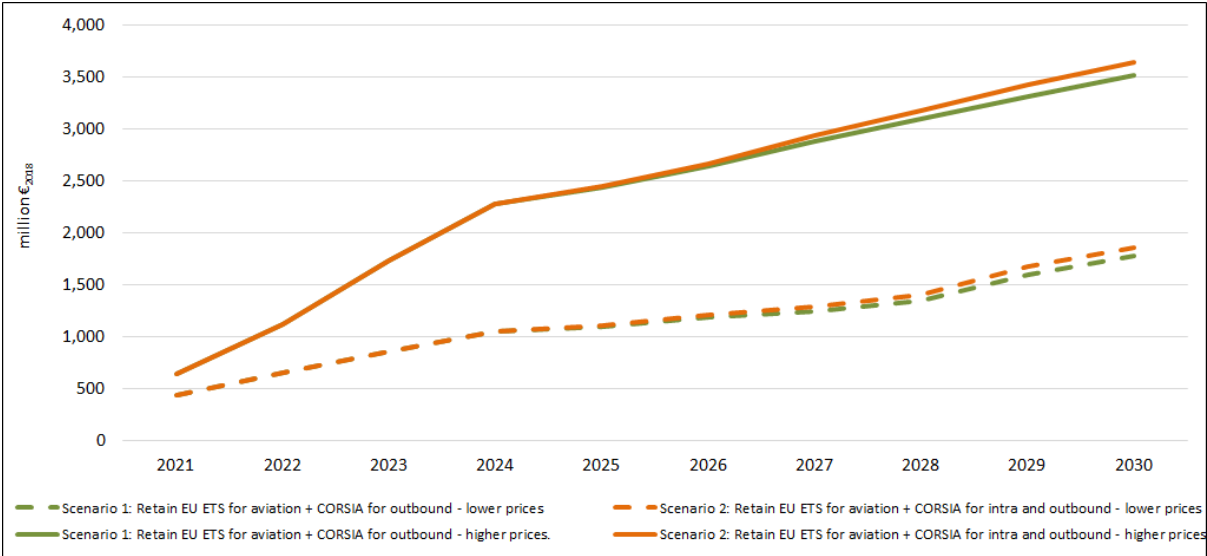
Table 1. Costs for allowances and international credits as a percentage of total airline operating costs.

	Scenario 1. Retain EU ETS for aviation + CORSIA for outbound		Scenario 2. Retain EU ETS for aviation + CORSIA for intra and outbound	
	2021	2030	2021	2030
Lower price scenario				
Intra EEA flights	0.8%	1.7%	0.8%	1.8%
Outbound EEA flights ⁵	0.0%	0.1%	0.0%	0.1%
Higher price scenario				
Intra EEA flights	1.2%	3.4%	1.2%	3.5%
Outbound EEA flights ⁶	0.0%	0.2%	0.0%	0.2%

⁵ Only flights subject to CORSIA

Figure 7 shows total annual cost for allowances and international credits for both co-existence scenarios and both price scenarios. Similar to the original study, the cost difference between the 2 co-existence scenarios is relatively small, and in any case much smaller compared to the cost difference related to the uncertainty in prices for allowances and international credits. Hence also under the U-shape baseline scenario applying both CORSIA and the EU ETS to intra EEA/UK flights will still only have a limited additional cost burden on airlines.

Figure 7. Annual costs for allowances and international credits for both scenarios.



4 Summary and conclusions

1. This is an add on to the study “Costs of EU ETS and CORSIA for European aviation”, which was completed the end of 2019. In the original study the total costs for European aviation for complying with the EU ETS allowance surrender requirement and CORSIA offsetting requirement over the period 2021 – 2030 have been computed. Hereby two EU ETS and CORSIA policy scenarios were considered:
 1. Retain EU ETS for aviation + CORSIA for outbound.
 2. Retain EU ETS for aviation + CORSIA for intra and outbound.

2. The analysis of the total costs for European aviation for the 2 co-existence scenarios in the original study was based on the ICAO baseline scenario which was published in 2018. Due to the impacts of the COVID-19 pandemic on the airline industry, the ICAO baseline scenario is clearly not valid anymore. Therefore in this add-on, the results have been re-computed based on a revised baseline scenario which takes into account the fallout of the COVID-19 pandemic for the airline industry.

3. This add-on also takes into account the revised CORSIA baseline (from average of 2019/2020 to 2019), the latest overview of countries which have voluntary signed up to CORSIA (presently 88 countries) and the final identification of the 5 countries which have to join the mandatory phase of CORSIA from 2027 onwards.

4. The revised aviation emissions baseline scenario can be regarded as a medium recovery scenario and is referred to as the “U-shape baseline scenario”. The scenario is based on the following assumptions:
 - Based on an ICAO forecast, total global international aviation emissions is estimated to decrease by 50% in 2020 relative to 2019. Because Intra European traffic is recovering earlier compared to global international aviation, the decrease in aviation emissions for intra EEA/UK flights in 2020 is estimated to be lower (40% relative to 2019). For outbound EEA/UK flights the decrease of aviation emissions in 2020 is estimated to be the same as for global international aviation emissions (50% reduction).
 - Over the period 2021-2024 international aviation gradually recovers, and in 2024 aviation emissions are back to the level of 2019.
 - For the period after 2024 the annual growth in aviation emissions is in line with the long term ICAO forecast of 2018.
5. The demand for EUAs is lower compared to what was computed in the original study. This is especially true for the year 2020 because according to the U-shape baseline scenario aviation emissions will be lowest in that year. For the period 2021-2030 the aviation demand for EUAs is now computed to 348.9 Mt whereas in the original study report this was 418.9 Mt. The reduction in demand will especially take place in the coming years which are expected to be mostly affected by the COVID-19 pandemic.
6. The demand for CORSIA related international credits is heavily affected by COVID-19. Compared to the original study for the full period 2021-2030 demand is reduced by about 50%. Also in the first 4 years of CORSIA (2021-2024) according to the U-shape baseline scenario there will be no offset obligations under CORSIA. This will be the case for all international routes covered by CORSIA.
7. Because the U shape baseline scenario can be regarded as a medium recovery scenario, it is also possible the recovery of international aviation from the COVID-19 pandemic will take longer. This would mean a longer period without offset obligations under CORSIA. To retain the EU ETS for aviation ensures that in the coming years there is at least some form of effective regulation for European aviation emissions.
8. In general the EU ETS will result in emissions reductions which take place earlier compared to CORSIA. An earlier emission reduction is important from a climate perspective, because it reduces the risk for climate overshoot.
9. Similar to the original study, the difference in costs for European aviation between the 2 co-existence scenarios is relatively small, and in any case much small compared to the cost difference related to the uncertainty in prices for allowances and international credits. Hence also under the U-shape baseline scenario applying both CORSIA and the EU ETS to intra EEA/UK flights will still only have a limited additional cost burden on airlines.

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Annex A. Annual results 2021-2030 for policy scenarios

Figure 8. Scenario 1: Retain EU ETS for aviation + CORSIA for outbound - demand for allowances and international credits.

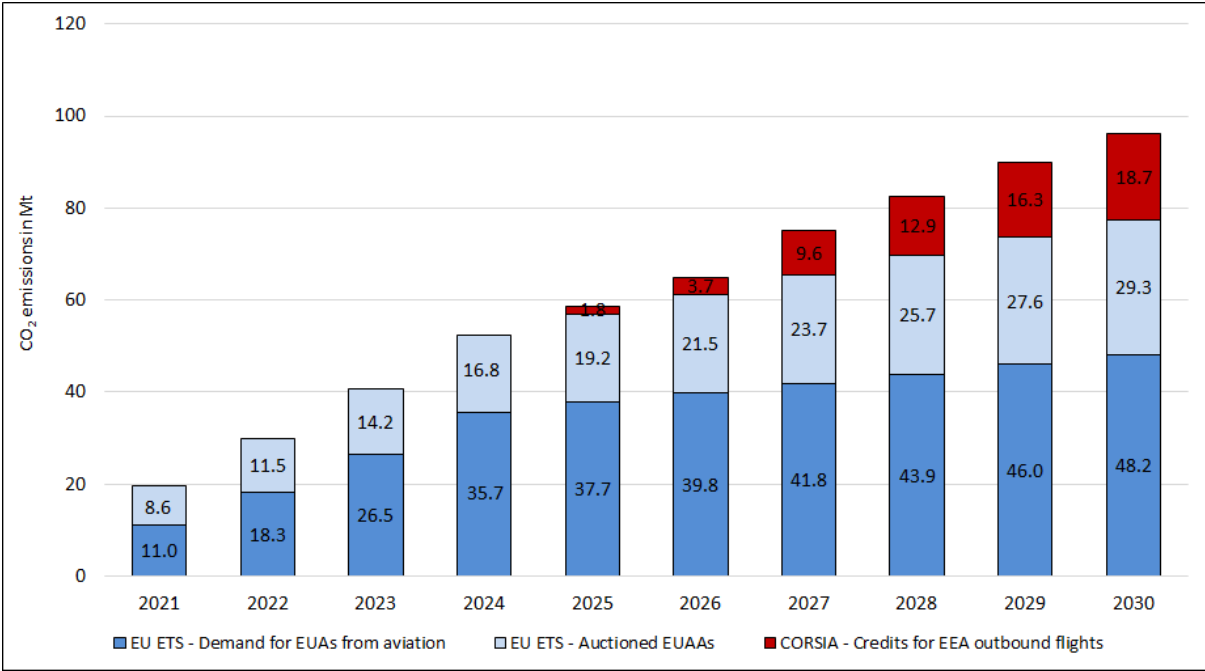


Figure 9. Scenario 2: Retain EU ETS for aviation + CORSIA for intra and outbound – demand for allowances and international credits.

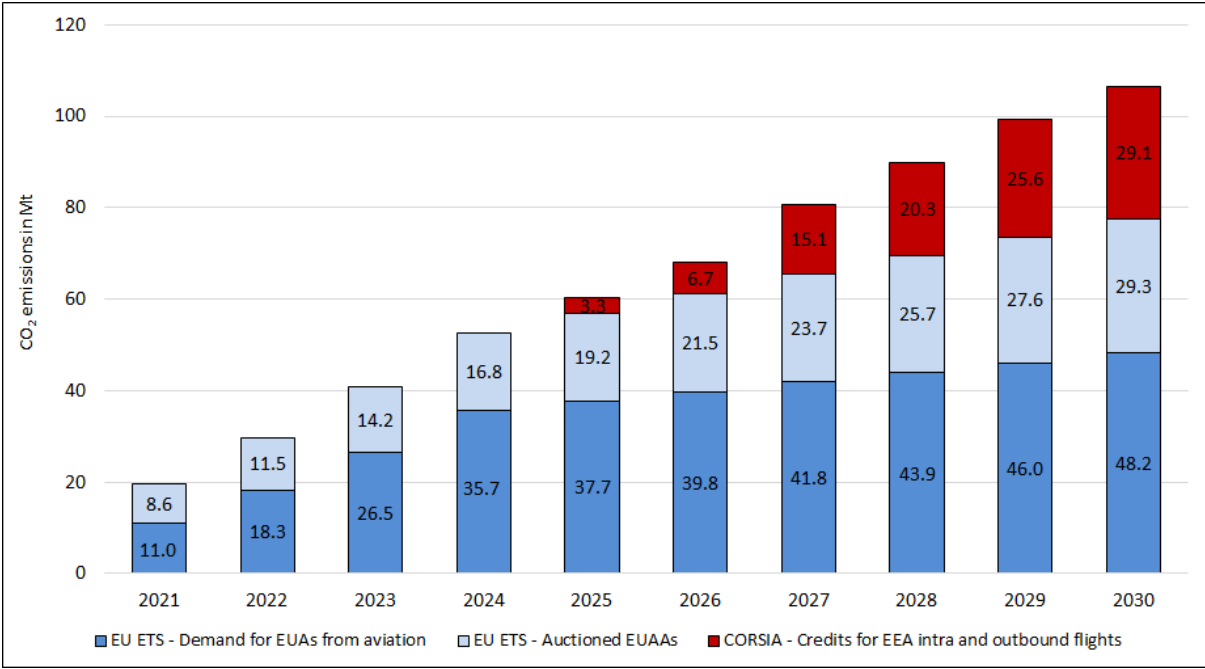


Figure 10. Scenario 1: Retain EU ETS for aviation + CORSIA for intra and outbound - costs with lower prices.

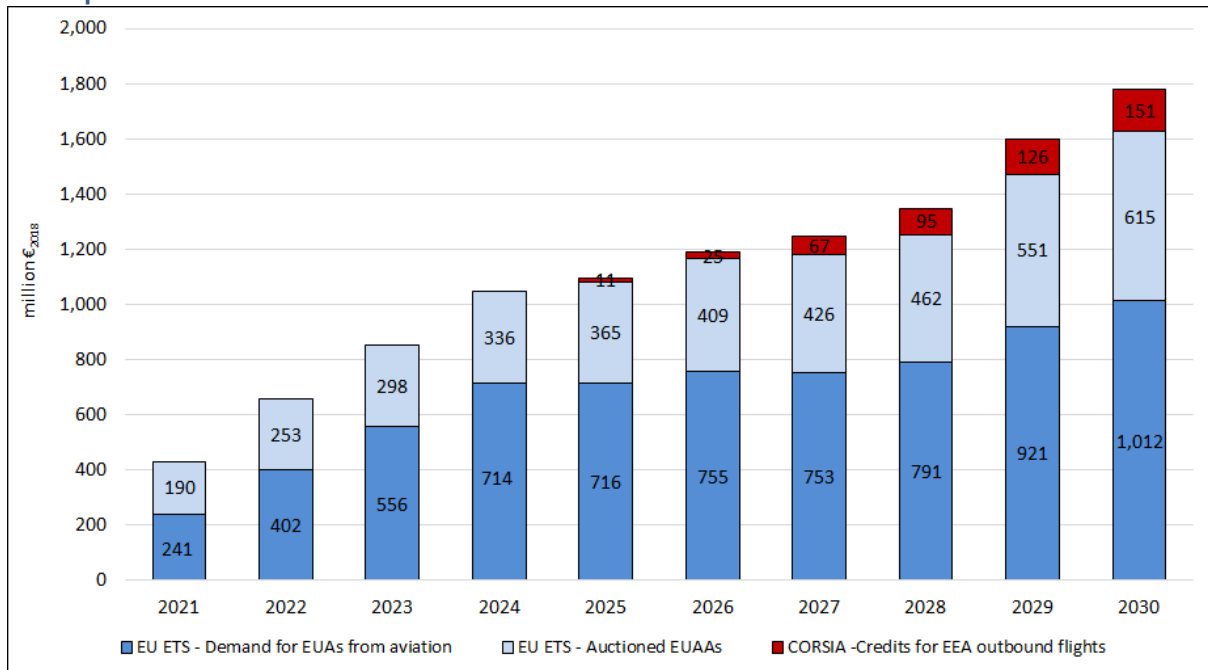


Figure 11. Scenario 2: Retain EU ETS for aviation + CORSIA for outbound - costs with lower prices.

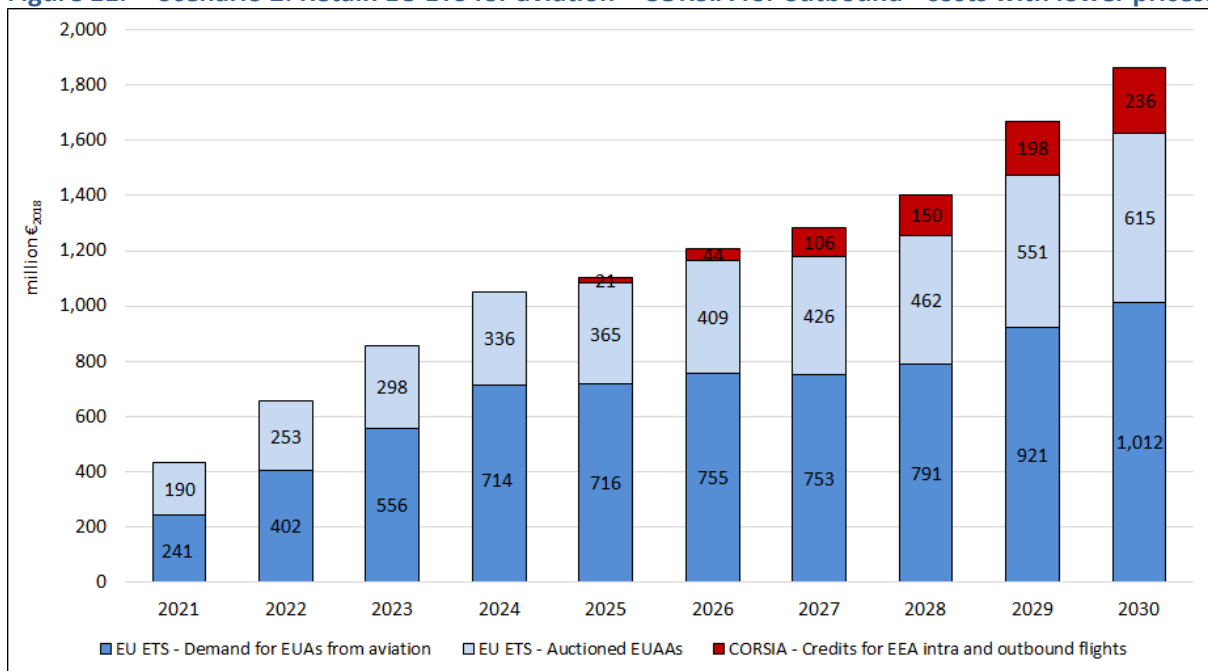


Figure 12. Scenario 1: Retain EU ETS for aviation + CORSIA for outbound - costs with higher prices.

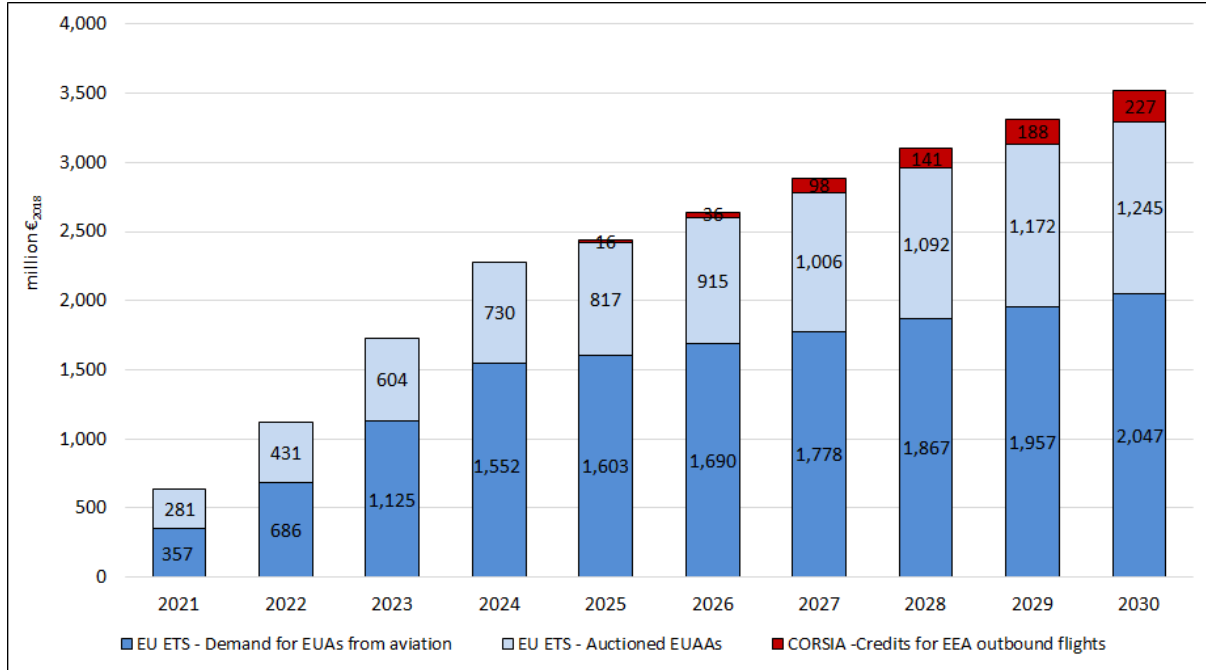


Figure 13. Scenario 2: Retain EU ETS for aviation + CORSIA for intra and outbound - costs with higher prices.

