



## **Offsets for International Aviation Emissions**

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**International Civil Aviation Organization**

### ***Background/Context***

The ICAO Council has been considering a number of options for MBMs while exploring the feasibility of a global MBM scheme over the past triennium (2010 to 2013). One of the options under consideration is a global mandatory offsetting scheme.

Offsetting is the compensation for emissions through their reduction elsewhere. Greenhouse gases (GHGs) are reduced, for example, through a project installing energy efficient equipment, and the reductions achieved are recorded in a central registry and independently verified. A one tonne reduction of CO<sub>2</sub> (or CO<sub>2</sub> equivalent) is equal to one offset “credit”. Offset credits can then be used to meet obligations to reduce GHGs elsewhere. An offset credit is treated as a currency which can be bought, sold or traded.

A global mandatory offsetting scheme for international aviation would require participants to reduce emissions to a specific target, such as limiting annual emissions to the same level as those in 2020 (carbon neutral growth from 2020). For participants in a global aviation MBM scheme who are unable to meet the target by increasing efficiency, for example, offset credits could be surrendered to reduce their emission balance and meet the target.

During the review of the feasibility of a global MBM scheme for international aviation it was not clear whether there would be enough offset credits available at a reasonable cost for a global aviation scheme. The increased demand created for offset credits by international aviation could increase the market prices for offset credits and make it costly to meet emission reduction targets by the sector.

In addition, it was not clear if the supply of offset credits over time could keep up with a growing demand from international aviation and whether prices would climb to financially unsustainable levels as a result of a lack of capacity to generate offset credits in the long term.

Council Working Paper C-WP 13828 (Appendix B) lists a set of evaluation criteria by which MBM options should be assessed. Included in the criteria are:

- Stability of carbon price
- Availability of allowances and credits to international aviation in developed and developing countries
- Effects of international aviation’s demand on the carbon markets

For the purpose of assessing offsets, credits issued under the Kyoto Protocol are used for evaluation purposes; they were chosen because they have internationally recognized standards for certification, verification and enforcement. Through the mechanisms of the Kyoto Protocol, offset credits referred to as Certified Emission Reductions (CERs) are issued into the “carbon market” and can be purchased through third party traders such as banks or commodity exchanges. For the purposes of this study, other emission units, such as state-specific or voluntary emission reductions (VERs) will only be considered if the CER supply may be insufficient for the international aviation sector.

### ***Demand from International Aviation***

International aviation emissions have been estimated at roughly 390 Mt per year in 2010. Forecasted emissions in 2020 are 654 Mt. By 2030 this level could grow in excess of 1,050 Mt. This signifies a potential growth of 400 Mt for international aviation between 2020 and 2030. This figure does not take into account emissions from domestic aviation.

Given a target of carbon neutral growth from 2020, the forecasted quantity of CO<sub>2</sub> emissions from international aviation between 2020 and 2026 are estimated to be 180 MT. The international aviation sector is expected to emit 845 Mt of CO<sub>2</sub> emissions in 2026.

Annual growth in international aviation is predicted to be approximately 5% per annum. Despite the economic recession, data continues to support this level of growth and up to 16% in certain regions<sup>i</sup>. The implications of rising emissions are that each year more than 30 Mt are added to the amount CO<sub>2</sub> required to meet carbon neutral growth after 2020.

### ***2008 - 2012 Forecasted CER Supply***

The supply of CERs can be estimated by reviewing the existing projects producing them, the number of projects currently registered for approval in the CDM “pipeline” and the potential of current projects to renew for a second and third 7-year cycle of emissions credits. Under the current Kyoto Protocol rules for Clean Development Mechanisms (CDMs) each project is eligible to produce credits for a maximum of 21 years.

As of 7 August 2012, 977 million CERs have been issued<sup>ii</sup> by the CDM Executive Board.

The forecasted supply of CERs for the period of 2008 and 2012 has increased from 1,186 million in 2011 to 1,676 million this year<sup>iii</sup>. The vast majority of CERs are supplied by China, approximately 87% in 2011.<sup>iv</sup>

From January 2010 to March 2011, the inflow of projects entering the CDM pipeline averaged 112 new projects per month, since that time this number has grown to as high as 317 in April 2012.<sup>v</sup> This increase seems counter to the current over supply situation in the CER market. It is likely that project developers are responding to the European Union Emission Trading Scheme (EU ETS) deadline for project certification. In order to be eligible to supply credits into the third phase of the EU scheme (2013-2020), projects must be registered before the end of 2012.

### ***Demand for CERs***

The largest portion of demand for CERs comes from the EU ETS. According to the 2012 World Bank report on the carbon market, there is a total potential demand of 1,644 Mt, 79% from Europe, 18% from Japan and 2% from other countries. Approximately, one third of the demand is estimated to come from governments, the remainder from the private sector.<sup>vi</sup>

Under the EU ETS, a certain proportion of the allowances that must be surrendered to account for CO<sub>2</sub> emissions can be met by CERs. Each Member State sets its own limit. The maximum is approximately 13%<sup>vii</sup> and the United Kingdom for example has limited CERs to 8% except for large electricity producers (9.3%).<sup>viii</sup> The lower price of CDM credits results in a demand relatively close to the maximum allowable limits under the scheme.

Other regulated schemes outside Europe also allow the use of CERs which accounts for the remaining demand. In July 2012, New Zealand announced that limits on the use of CERs within their scheme would be removed.<sup>ix</sup>

### ***Balance of CERs in the Carbon Market 2008 - 2012***

Point Carbon Analysts calculate that the carbon market is oversupplied by 632 Mt in the Kyoto Protocol’s first commitment phase, 2008-2012.<sup>x</sup> More than 80% of this oversupply is accounted for by CERs. The level of oversupply varies according to different Analysts in the carbon market; however, estimates are fairly consistent with those of Point Carbon and there is a general consensus that the range is in the hundreds of millions of tonnes. This was also confirmed by the 2012 World Bank analysis of the carbon market.

### ***EU ETS: CER Eligibility Changes***

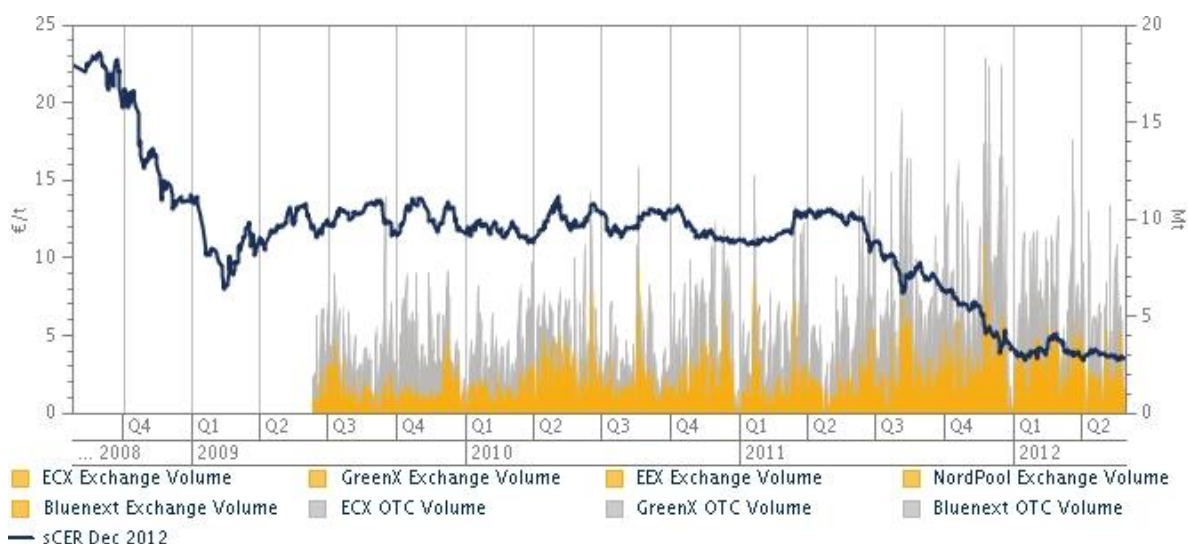
Because the European scheme represents such a significant portion of demand for CERs, changes in regulation have a profound effect of the market. Starting in May 2013, the EU ETS will ban offsets from hydrofluorocarbons (HFCs) and adipic acid N<sub>2</sub>O projects. A large portion of the CERs being issued in 2010 were from these project types—407 million out of the total 605 million CERs issued (67 per cent)<sup>xi</sup>.

As mentioned, credits from projects registered after 2012 will not be eligible for compliance in the EU carbon market unless they are located in the worlds least developed countries or have a bilateral agreement with the EU.<sup>xii</sup> African, Latin American and non-Chinese Asian countries represented 13% of the CER supply in 2011.<sup>xiii</sup>

### ***CER Price<sup>xiv</sup>***

Since the second quarter of 2011, CERs have had a steady and rapid decline in price. They have lost almost 70% of their value in the previous 12 months due to limited demand and growing supply. The oversupply of EU ETS allowances, CERs and other offset credits, in combination with a slowing of the European economy has combined to reduce the CER value.

The price is expected to continue to decline until the end of 2012.



**Source:** Point Carbon

### ***The 2013 – 2020 Period***

A Reuter’s poll of 13 carbon market Analysts in early August 2012 forecasted an average CER price of 5.47 Euros/tonne between 2013 and 2020, a 19% decline from one month earlier.<sup>xv</sup>

Point Carbon Analyst forecasted CER prices of 3.31 Euros/tonne based on a predicted surplus of 900 Mt of credits in the European scheme by the first quarter of 2021.<sup>xvi</sup> Total CER oversupply is estimated to be 1,000 Mt.<sup>xvii</sup>

There is a concern that the oversupply of CERs is facing further challenges due to limits on the number of CERs that can be utilized in the EU ETS. The limit on the percentage of CERs that can be surrendered by participants results in an absolute limit on CERs over the entire third phase. Once this maximum is reached for the scheme as a whole, there will be “a virtually unavoidable extinction of

demand" in the EU ETS. According to some predictions this limit could be reached in 2013/14<sup>xviii</sup>. Given the huge portion of the demand for CERs accounted by the EU ETS, this could seriously compromise the offset mechanism.

The changes in eligibility criteria for CERs in the EU ETS is reflected in a decline in the supply of credits from China and a growth in Africa, particularly in Least Developed Countries<sup>xix</sup>. Prior to 2012 Africa represented 4% of the market, for the post 2012 market this figure has risen to 21%.

### ***The Period Beyond 2020: The Carbon Market***

It is important to note, predictions regarding the price or supply of CERs in the post 2020 period will be affected by the following considerations.

- New rules for the next phase of the Kyoto Mechanisms.
- Changes in the fourth phase of the EU ETS rules post 2020.
- Rules related to the use of CERs in state schemes (New Zealand, Australia, California).
- The implementation of new state or regional schemes (China, South Korea)
- The status of projects in the current 21-year cycle under the Kyoto Protocol; the majority of which will sunset prior to 2020 thereby making them ineligible to produce CERs.

For the most part, market forecasting in the post 2020 timeframe has focused on the price of carbon [refer to Appendix A]. Between 2020 and 2030 there are a range of prices. ECO Securities forecasts from \$10 - \$50 USD. Synapse Energy Economics estimates between \$15 – \$30 in a low case, \$20.83 - \$50 in a medium case and \$36.67 and \$80 in a high case. The International Energy Agency has done analysis around the where the price of carbon would need to be in order to support global targeted reductions considered in the United Nations Framework Convention on Climate Change. These forecasts reflect a price collar (a floor price and a cap price). In the low case, prices range between a floor of \$50 and a cap of \$150; under a more ambitious reduction objective prices range from \$80 to \$240.

### ***CERs Beyond 2020***

Bloomberg New Energy Finance has recently assessed post-2020 demand on CER prices.<sup>xx</sup> While the information is intended to inform financial markets in the 2013 to 2020 timeframe, the data used to calculate future demand provides some useful indicators of potential buyers in the CER market in the post 2020 period.

The table below estimates total CER demand between 2021 and 2030.

<b>State</b>	<b>Mt</b>
EU ETS International Offset Demand	1,500
Australia International Offset Demand	1,922
New Zealand International Offset Demand	458
South Korea International Offset Demand	592
Japan International Offset Demand	892
<b>TOTAL</b>	<b>5,364</b>

### ***Observations***

From the 2008-2012 trading period, one quarter of the current forecasted surplus in credits would cover all international aviation growth between 2020 and 2026.

The estimated oversupply of CERs in the 2013-2020 period is roughly equivalent to the total anticipated level of emissions by international aviation in 2030. To maintain emissions levels at carbon neutral growth between 2020 and 2030, international aviation would require less than half the surplus emission from the previous period.

In the 2020 to 2030 period, demand is expected to exceed 5,000 Mt. For international aviation, emissions are forecasted to grow 400 Mt from a 2020 target of carbon neutral growth. This is approximately 7% of the total forecasted demand for CERs.

Price volatility is a concern. A 70% fall in the value of CERs over a 12-month period could be viewed as a positive signal in terms of cost to the industry; however, this type of price instability could be devastating for the industry if prices rise at a similar rate.

The oversupply of CERs is growing despite the collapse in price and a lack of demand for credits. This is partly due to banking rules under the EU ETS. Inexpensive CERs acquired in the current phase may be used in future phases. The ability to bank credits is helping to avoid an even greater decline in price. Market Analysts speculate that the current oversupply of CERs and policy changes which are encouraging production of CERs, despite low prices, should be forcing prices much lower. The ability to bank credits is helping to avoid an even steeper decline in CER price because buyers are purchasing low priced CERs for future periods<sup>xxi</sup>. This demonstrates that well designed banking rules could help encourage price stability in an international aviation scheme.

The production of CERs has been dominated by China; however, based on 2011 contracted future sales, the position of China will decline significantly in the 2013-2020 period. This is an indication of the responsiveness of the market to policy changes, i.e. the shift to LDC in the EU ETS. In designing a scheme for aviation, it will be important to appreciate the correlation between policy decisions such as eligibility rules and market stability.

Research by Carbon Analysts indicate that financial and commodity markets responded quickly to the creation of the carbon market. "Investment banks (financial services) have been quick to move into the carbon markets and offer a wide range of services, particularly for smaller players... The experience of the EU emissions trading scheme and the Clean Development Mechanism demonstrates that financial institutions are quick to enter such new markets and offer solutions .... they benefit by aggregating demand in order to achieve economies of scale and/or by charging risk management fees to their clients."<sup>xxii</sup>

Useful lessons are available from the development of MBMs, such as the Kyoto mechanism; they provide important indications of how the market has responded to new mechanisms, policies and regulations. The CDM infrastructure that has been developed and adopted in the initial Kyoto commitment period will benefit a potential MBM in the international aviation sector – trading platforms, international trading rules, state regulations for carbon trading, accepted methodologies for additionality and CER creation and the international trading log. The financial, intellectual and regulatory infrastructure will be a significant advantage for a sectoral-based offset mechanism which will be able to build on these tools and avoid the cost developing its own infrastructure.

Long term forecasts for carbon price reflect global economic forecasts that the world is facing a long slow recovery from the current economic trends. The positive overall sign for offsetting credits is that there seems to be no indication that the lack of clarity regarding UNFCCC rules will undermine them entirely.

## APPENDIX

Despite the broad range of potential changes in the carbon market prior to 2020 a number of predictions have been made on the price of carbon after 2020.

### SYNAPSE'S FORECAST OF CO<sub>2</sub> PRICES

#### The high bound on CO<sub>2</sub> Price Forecast

\$36.67/t in 2020

\$80/t in 2030.

#### The low boundary on CO<sub>2</sub> price forecast

\$15/t in 2020

\$30/t in 2030

Year	Low case	Mid case	High case
2020	\$15.00	\$20.83	\$36.67
2021	\$16.50	\$23.75	\$41.00
2022	\$18.00	\$26.67	\$45.33
2023	\$19.50	\$29.58	\$49.67
2024	\$21.00	\$32.50	\$54.00
2025	\$22.50	\$35.42	\$58.33
2026	\$24.00	\$38.33	\$62.67
2027	\$25.50	\$41.25	\$67.00
2028	\$27.00	\$44.17	\$71.33
2029	\$28.50	\$47.08	\$75.67
2030	\$30.00	\$50.00	\$80.00

Source: <http://www.synapse-energy.com/Downloads/SynapsePaper.2011-02.0.2011-Carbon-Paper.A0029.pdf> P17

### ECO SECURITIES' FORECAST OF CO<sub>2</sub> PRICES

Eco Securities Group has used policy scenarios to forecast carbon price between 2020 and 2030.

Scenario	Description	Price
1. "Regional Initiatives Dominate" (Pessimistic) Scenario	No significant policy measures being implemented	\$10-\$20/tonne CO <sub>2</sub>
2. "1990 Emissions by 2030" (Base Case) Scenario	Mandated reductions to 1990 levels – offsets supply half of reductions	\$20-\$50/tonne CO <sub>2</sub>
3. "Atmospheric Stabilization" (Optimistic) Scenario	90% reduction from the business as usual baseline	\$30-\$50/tonne CO <sub>2</sub>

Source : [www.nwcouncil.org/energy/.../NWPCCEcoSecuritiesSeminar\\_004](http://www.nwcouncil.org/energy/.../NWPCCEcoSecuritiesSeminar_004)

### IEA'S FORECAST OF CO<sub>2</sub> PRICES

In order to assess the impact of price floors and price caps on the ability to meet emission targets the IEA conducted a study on the impact of using such a pricing strategy. In doing so, IEA calculated a potential floor and cap (or ceiling) price of carbon up to 2050.

Pricing strategies followed the follow to scenarios:

**Case 1:** The same environmental results as halving 2050 global energy-related CO<sub>2</sub> emissions from 2005 levels, for about half the expected costs.

**Case 2:** Better environmental results than halving 2050 global energy-related CO<sub>2</sub> emissions from 1990 levels, for similar expected costs as halving emissions from 2005 levels.

Price Caps*		Price floors*		By year
Case 1	Case 2	Case 1	Case 2	
150	240	50	80	2021-2030
240	360	80	120	2031-2040
360	600	120	200	2041-2050

\*in US dollars

These numbers depend on the assumptions used in quantitative modeling; however, they are indicative of what could be necessary to reach ambitious global reduction targets.

Source: IEA. *Price Caps and Price Floors in Climate Policy: A Quantitative Assessment* (IEA Information paper). December 2008, pg.7.

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<sup>i</sup> IATA Air Transport Market Analysis May 2012.

<sup>ii</sup> www.cdm.unfccc.int

<sup>iii</sup> Point Carbon Report on Supply May 3, 2012

<sup>iv</sup> State and Trends of the Carbon Market 2012. Carbon Finance at the World Bank. Washington, DC, May 2012, p. 52

<sup>v</sup> CDM Bazaar Newsletter. UNEP RISO Centre. [www.cdmpipeline.org](http://www.cdmpipeline.org) August 1, 2012.

<sup>vi</sup> State and Trends of the Carbon Market 2012. Carbon Finance at the World Bank. Washington, DC, May 2012, p. 68

<sup>vii</sup> A. Denny Ellerman, Paul L. Joskow. The European Union's Emission Trading Scheme in perspective. Massachusetts Institute of Technology. P.44

<sup>viii</sup> "A Guide to Using Kyoto Units in the European Union Emissions Trading Scheme (EU ETS)". Department of Energy and Climate Change. 12 November 2008.

<sup>ix</sup> CDM and JI Monitor, Point Carbon Newsletter. 12 July, 2012 Volume 9. Issue 14. P.3

<sup>x</sup> Point Carbon Report on Supply May 3, 2012

<sup>xi</sup> State and Trends of the Carbon Market 2011. Carbon Finance at the World Bank. Washington, DC, June 2011, page 48.

<sup>xii</sup> CDM and JI Monitor, Point Carbon Newsletter. 12 July, 2012 Volume 9. Issue 14. P.4

<sup>xiii</sup> State and Trends of the Carbon Market 2011. Carbon Finance at the World Bank. Washington, DC, June 2011, page 52.

<sup>xiv</sup> Point Carbon News, 30 May 2012 00:35:18 CEST ([www.pointcarbon.com/news/marketdata/cdmandji/forward/scer/](http://www.pointcarbon.com/news/marketdata/cdmandji/forward/scer/))

<sup>xv</sup> Point Carbon News. 3 August, 2012. [www.pointcarbon.com/news](http://www.pointcarbon.com/news).

<sup>xvi</sup> Twidale, Susanna. "Analysts slash CER price forecast 59%". Reuters Point Carbon. 18 June 2012. [www.pointcarbon.com/news](http://www.pointcarbon.com/news)

<sup>xvii</sup> Du Rietz, Andrea. "Can post-2020 demand revitalize the CER price?". Bloomberg New Energy Finance. Carbon Markets – Global – Research Note. 16 July 2012.

<sup>xviii</sup> "Will there be a market price for CERs and EURs in two years time?". ClimateBrief. cdc climat research. No. 13, May 2012.

<sup>xix</sup> State and Trends of the Carbon Market 2012. Carbon Finance at the World Bank. Washington, DC, May 2012, p. 53

<sup>xx</sup> Du Rietz, Andrea. "Can post-2020 demand revitalize the CER price?". Bloomberg New Energy Finance. Carbon Markets – Global – Research Note. 16 July 2012.

<sup>xxi</sup> Twidale, Susanna. "Analysts slash CER price forecast 59%". Reuters Point Carbon. 18 June 2012. [www.pointcarbon.com/news](http://www.pointcarbon.com/news)

<sup>xxii</sup> Issues in the international carbon market, 2008-2012 and beyond. A study by Point Carbon Advisory Services. For New Zealand Emissions Trading Group. October 2007.