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Kaylin Gaal

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# “SOARING” GAS PRICES: POLICY CONSIDERATIONS FOR THE EUROPEAN UNION EMISSIONS TRADING SYSTEM AND AVIATION

KAYLIN GAAL\*

## INTRODUCTION

In 2005 the European Union adopted the European Union Emissions Trading System (“EU ETS”) in response to the Kyoto Protocol.<sup>1</sup> Its purpose is to create a cost-effective and economically efficient system for reducing greenhouse gas emissions within the European community.<sup>2</sup> In 2008, the European Union amended the original Directive, “establishing . . . gas emission allowance trading within the Community,”<sup>3</sup> and, “amending Council Directive 2003/87/EC so as to include the aviation industry in the scheme.”<sup>4</sup> Under this Amended Directive, all flights that land at or take off from an EU airport are required to cap their carbon emissions.<sup>5</sup>

The inclusion of the airlines into the EU carbon-trading scheme has created tremendous backlash from the international community, especially

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\* J.D. Candidate, William & Mary Law School, 2014, B.A., Double Major in Classical Languages and History, The College of Wooster, 2011. The author would like to thank her family and friends for their support and encouragement during law school.

<sup>1</sup> Tom Mounteer et al., *Regulatory Regimes to Implement Kyoto Protocol*, in 3 L. ENVTL. PROT. § 22:8 (2013).

<sup>2</sup> *The EU Emissions Trading System (EU ETS)*, EUR. COMM’N, [http://ec.europa.eu/clima/policies/ets/index\\_en.htm](http://ec.europa.eu/clima/policies/ets/index_en.htm) (last updated July 1, 2013) [hereinafter *Emissions Trading System (EU ETS)*].

<sup>3</sup> Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, 2008 O.J. (L 8) 3 [hereinafter Directive 2008/101/EC], available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:008:0003:0003:EN:PDF>. See also AIR TRANSPORT ACTION GROUP, BEGINNER’S GUIDE TO AVIATION EFFICIENCY 2 (Nov. 2010) [hereinafter BEGINNER’S GUIDE TO AVIATION], available at <http://www.atag.org/component/downloads/downloads/59.html> (explaining the importance of aviation and its impact on greenhouse gas emissions: “[a]ir transport’s contribution to climate change represents 2% of man-made CO<sub>2</sub> emissions and this could reach 3% by 2050 . . . [t]his evolution is based on a growth in aviation CO<sub>2</sub> emissions of 2–3% per year, with an annual traffic growth of 5%.”).

<sup>4</sup> Directive 2008/101/EC, *supra* note 3.

<sup>5</sup> See *id.* See also *Reducing Emissions from the Aviation Sector*, EUR. COMM’N, [http://ec.europa.eu/clima/policies/transport/aviation/index\\_en.htm](http://ec.europa.eu/clima/policies/transport/aviation/index_en.htm) (last updated Feb. 10, 2013).

from the United States, because of its seeming threat to third states' sovereignty.<sup>6</sup> Despite the immense opposition to the EU ETS, the European Court of Justice has upheld the legality of the system,<sup>7</sup> and although the EU has delayed the implication of the Directive, it has not shown any sign of backing down without assurance that some alternative action "equivalent" to the ETS will be enacted.<sup>8</sup>

This Note will address the policy behind including the aviation industry in the ETS and how its inclusion fails to achieve those policy objectives. This Note will argue that the main goal of adding airlines to the EU ETS, reducing carbon emissions, can and will be accomplished by the airlines without being impelled to do so. Part I of this Note provides an overview of the ETS, the aviation industry in the ETS, and the effect of the ETS on the aviation industry. Part II will then provide a case study of the oil industry as an example of another oil-dependent industry that has taken substantial measures to reduce its carbon emissions without a push from a carbon tax or cap and trade system. This Note will examine, in Part III, the airline industry's push to create more efficient fuel, which in turn reduces carbon emissions. Part IV argues that even if airlines need the extra incentive to reduce their carbon emissions, the inclusion of the aviation industry in the EU ETS violates several international treaties. In addition, because of the immense amount of resistance to the ETS from the international community at large due to its illegality, the EU must drop the airline industry from the trading scheme.

## I. INTRODUCTION TO THE EU ETS

### A. *Overview of the ETS*

The EU ETS is the first and largest international cap and trade system.<sup>9</sup> The system functions by placing a cap or limit on the amount of

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<sup>6</sup> See Bob Adelman, *Senate Bill Overrides EU Emissions Mandates for Airlines*, THE NEW AM. (Sept. 25, 2012, 4:37 PM), <http://www.thenewamerican.com/usnews/congress/item/12975-senate-bill-overrides-eu-emissions-mandates-for-airlines>; *US Rallies Opponents of EU Carbon Tax on Airlines*, BBC NEWS EU., <http://www.bbc.co.uk/news/world-europe-19060872> (last updated July 31, 2012, 3:03 PM).

<sup>7</sup> Case C-366/10, *Air Transp. Ass'n Am. v. Sec'y of State for Energy & Climate Change*, 2011 (E.C.J.), available at <http://curia.europa.eu/juris/document/document.jsf?text=&docid=117193&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=7920>.

<sup>8</sup> *Id.* See also discussion *infra* Part IV.B.4 (explaining the delay in implementation and the demand for alternative action before any consideration of removing the airline industry from the ETS).

<sup>9</sup> *Emissions Trading System (EU ETS)*, *supra* note 2.

greenhouse gases emitted by the industries covered under the scheme.<sup>10</sup> Companies included under the scheme receive limited allowances, which they are permitted to buy from and sell to other companies in the trading scheme as needed.<sup>11</sup> At the end of the year, each company must be able to cover its emissions with its allowances or it will be subject to heavy fines.<sup>12</sup> A company may keep its extra allowances to use in future years or may sell them to other companies.<sup>13</sup> In order for the EU to reduce the total amount of emissions, the amount of allowances will be reduced periodically over time.<sup>14</sup>

### B. *Aviation Industry in the ETS*

As of now, the aviation industry only contributes about three percent of the total greenhouse gas emissions.<sup>15</sup> But this percentage can be deceiving; the fuel consumed by the U.S. aviation industry alone “releases more than 250 million tons of carbon dioxide (CO<sub>2</sub>) into the atmosphere each year.”<sup>16</sup> In addition, aviation is currently the largest growing source of emissions, with passenger airline traffic expected to increase one hundred percent from 2005 to 2025.<sup>17</sup> Therefore, the European Commission in charge of the ETS felt that not including the airline industry in the trading

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<sup>10</sup> *Id.* See also *Allowances and Caps*, EUR. COMM’N (Jan. 10, 2011), [http://ec.europa.eu/clima/policies/ets/cap/index\\_en.htm](http://ec.europa.eu/clima/policies/ets/cap/index_en.htm) (“The 2013 cap has been provisionally set at 2,039,152,882 allowances,” or just under 2.04 billion allowances. “[T]his cap will decrease by 1.74% of the average total quantity of allowances issued annually [by the Member States] in 2008–2012. In absolute terms this means the number of general allowances will be reduced annually by 37,435,387. The annual reduction . . . will continue beyond 2020, but may be revised no later than 2025.”).

<sup>11</sup> *Emissions Trading System (EU ETS)*, *supra* note 2.

<sup>12</sup> *Id.* See also Massimiliano Varrucchi & Carlo Ferrara, Power Sector Roundtable and Tutorial, Int’l Emissions Trading Ass’n (Apr. 24, 2012), *available at* [http://www.ieta.org/assets/EventDocs/ChinaSpring2012Workshop/ieta\\_workshop\\_power%20sector%20roundtable%20and%20tutorial.pdf](http://www.ieta.org/assets/EventDocs/ChinaSpring2012Workshop/ieta_workshop_power%20sector%20roundtable%20and%20tutorial.pdf) (unpublished tutorial) (showing that the fines for non-compliance were €40 per tonne in 2005 to 2008 of the EU ETS, and €100 per tonne from 2008 to 2013).

<sup>13</sup> *Emissions Trading System (EU ETS)*, *supra* note 2.

<sup>14</sup> *Id.*

<sup>15</sup> Lorand Bartels, *The WTO Legality of the Application of the EU’s Emission Trading System to Aviation*, 23 EUR. J. INT’L L. 429, 429 (2012).

<sup>16</sup> GREEN AVIATION: A BETTER WAY TO TREAT THE PLANET, NAT’L AERONAUTICS AND SPACE ADMIN. 2, *available at* [http://www.aeronautics.nasa.gov/pdf/green\\_aviation\\_fact\\_sheet\\_web.pdf](http://www.aeronautics.nasa.gov/pdf/green_aviation_fact_sheet_web.pdf).

<sup>17</sup> M. Vittoria Giugi Carminati, *Clean Air & Stormy Skies: The EU-ETS Imposing Carbon Credit Purchases on United States Airlines*, 37 SYRACUSE J. INT’L L. & COM. 127, 127–28 (2010).

scheme would negate the impact of the reduction in emissions by other industries that are included.<sup>18</sup>

Similar to the other industries included in the ETS, airlines receive tradable allowances with which to cover their emissions for the year.<sup>19</sup> Each airline must surrender enough allowances to cover its emissions from all of its flights to and from the European Union, Norway, Iceland, and Liechtenstein in that year.<sup>20</sup> If an airline cannot cover the amount of emissions produced by its flights, it will be fined €100 per allowance and will be required to make up the deficit in the following year.<sup>21</sup> If the airline carrier holds an operating license from an EU country, the ETS will be administered by that country.<sup>22</sup> If not, the carrier will be designated an administrator based on its primary EU routes.<sup>23</sup> In addition, airlines may also keep their extra allowances to use in the future or may sell them to other airlines.<sup>24</sup> The goal of including the airline industry in the ETS is that airlines will take further measures to decrease their carbon emissions, such as investing in creating more efficient technologies or operating practices, when they know that their emissions will exceed their allowances.<sup>25</sup>

### C. *Impact of the ETS on the Aviation Industry*

The compliance costs, based upon who provides the assessment of the economic impact of the ETS on the aviation industry, have been

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<sup>18</sup> See Mark Bisset & Georgina Crowhurst, *Is the EU's Application of its Emissions Trading Scheme to Aviation Illegal?*, 23 AIR & SPACE LAW, no. 3, 2011, at 1, 4. See also Directive 2008/101/EC, *supra* note 3 (stating that airlines may be exempt "from the EU ETS if the EU recognises that the country of origin is taking measures to limit aviation emissions from departing flights." The measures taken need to be at least equivalent to the measures taken in the Directive).

<sup>19</sup> See *Allocation of Aviation Allowances in an EEA-Wide Emissions Trading System*, EUR. COMM'N (Oct. 27, 2011), [http://ec.europa.eu/clima/policies/transport/aviation/allowances/index\\_en.htm](http://ec.europa.eu/clima/policies/transport/aviation/allowances/index_en.htm) ("In 2013 to 2020 an airline will receive 0.6422 allowances per 1,000 tonne-kilometres, while in 2012 it will receive 0.6797 allowances.").

<sup>20</sup> See *Emissions Trading Systems (EU ETS)*, *supra* note 2. See also *UK Publishes Simple "Stop the Clock" Criteria for Applicable Flights*, UNIVERSAL WEATHER & AVIATION, INC., available at <http://d.universalweather.com/pdf/eu-ets/UK-publishes-simple-Stop-the-Clock-criteria-for-applicable-flights.pdf> (listing, via chart, the countries that are considered intra-European, extra-European, and not applicable/reportable).

<sup>21</sup> Bartels, *supra* note 15, at 430. See also *Currency Converter Widget*, XE UNIVERSAL CURRENCY CONVERTER, <http://www.xe.com/ucc/convert/?Amount=100&From=EUR&To=USD> (last visited Nov. 19, 2013) (showing that €100 is equivalent to approximately \$133.79).

<sup>22</sup> Bisset & Crowhurst, *supra* note 18, at 14.

<sup>23</sup> *Id.*

<sup>24</sup> *Emissions Trading Systems (EU ETS)*, *supra* note 2.

<sup>25</sup> See *id.*

somewhat uncertain.<sup>26</sup> Recent academic studies, however, have estimated that the total annual cost to the airline industry will be around €3–4 billion.<sup>27</sup> But even with these costs, the aviation industry is not expected to bear them alone.<sup>28</sup> It is assumed that the airlines will pass these costs on to the consumers, who will only see an increase of about four percent in ticket prices.<sup>29</sup> Although it is expected that demand will decrease because of this additional cost, the industry is expected to grow, so rather than suffer losses, the industry should continue to profit, but not as much as it would without the ETS.<sup>30</sup>

In fact, a study of the impact of the EU ETS on the aviation industry notes that, at worst, the effect would be small on both the airlines and emissions; the industry would continue to grow.<sup>31</sup> Chart I in the Appendix shows what the effects would be based on business as usual (“BaU”), passing on all costs to consumers (“Full”), passing on expenses, but not opportunity costs (“Expense”), and absorbing all costs (“Absorb”).<sup>32</sup>

Under the Full scenario, there is no incentive for airlines to invest in reducing further emissions because of increased profits, and the amount

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<sup>26</sup> See Bartels, *supra* note 15, at 431–32.

<sup>27</sup> *Id.* at 432. See also *Currency Converter Widget*, *supra* note 21 (showing that €3–4 billion is approximately \$4–5.3 billion).

<sup>28</sup> See Bartels, *supra* note 15, at 432.

<sup>29</sup> See *id.*

<sup>30</sup> *Id.* at 432–33.

<sup>31</sup> Robert Malina et al., *The Impact of the European Union Emissions Trading Scheme on US Aviation*, 19 J. AIR TRANSPORT MGMT. 36, 39 (2012), available at [http://globalchange.mit.edu/files/document/MITJPSPGC\\_Reprint\\_12-5.pdf](http://globalchange.mit.edu/files/document/MITJPSPGC_Reprint_12-5.pdf).

<sup>32</sup> *Id.* at 38–39. The study summarizes *infra* Appendix, Chart I by stating that: for all cost pass-through assumptions, traffic and CO<sub>2</sub> emissions continue to increase over time when aviation is included in the EU-ETS. When some CO<sub>2</sub> costs are passed on to consumers, there are small decreases in emissions relative to BaU. Unlike CO<sub>2</sub> emissions, the impact of the EU-ETS on airline profitability varies widely for alternative cost pass-through assumptions. If there is full cost pass-through, U.S. airlines will experience a windfall gain of \$2.6 billion between 2012 and 2020 from the granting of free allowances. On the other hand, if airlines are only able to pass on the costs of allowances purchased or are unable to pass on any costs, US airline profits will decrease.

See also *infra* Appendix, Chart I (demonstrating that carbon emission reduction is greatest under the Full scenario, yet it only represents a small proportional decrease of about 1.6 percent compared to the BaU scenario. In addition, while the emissions are down only minimally, the profit margin increases dramatically under the Full scenario. This is a result of a decrease in operating costs due to decreased air traffic. These decreases in cost exceed the cost of purchasing allowances).

of reduced emissions is minimal.<sup>33</sup> Additionally, under the other two scenarios where profits decrease, (scenarios in which we would expect airlines to invest more in reducing emissions in order to increase profits over time), the reduction in emissions is practically non-existent under the Expense, and exactly zero under the Absorb scenario.<sup>34</sup> Therefore, under all three scenarios, the EU is not accomplishing long-term emissions reductions by including airlines in the ETS.<sup>35</sup>

It is precisely this lack of an emissions reduction effect in the aviation industry that demonstrates that the policy is deficient.<sup>36</sup> As Part III will demonstrate, the key factors that will help achieve the goals the EU is looking for are the market factors, rather than a cap and trade system.<sup>37</sup>

Additionally, not only will the ETS fail with respect to the Union's goals for the aviation industry, but it also has not had the effect that it was hoping for in its entirety. The amount of permits that are released into the market "overfloods" the market by allowing polluters to continue to pollute "and the price of permits has slid to record lows."<sup>38</sup> Intensive lobbying by the industries largely affected by the ETS has led to many privileges for those companies, allowing the largest polluters to go mostly untaxed.<sup>39</sup> Due to this overflowing, the system has not functioned in a way the European Union had hoped, and has almost fallen off of "life support."<sup>40</sup> Because the system does not function the way intended in its entirety, the European Union must remove the aviation industry from the ETS if it hopes to achieve the effects of reduced greenhouse gas emissions.

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<sup>33</sup> Malina et al., *supra* note 31, at 38. *See also infra* Appendix, Chart I.

<sup>34</sup> Malina et al., *supra* note 31, at 38. *See also infra* Appendix, Chart I.

<sup>35</sup> *See* Malina et al., *supra* note 31, at 38. *See also infra* Appendix, Chart I.

<sup>36</sup> Malina et al., *supra* note 31, at 39 ("The results indicate that the EU-ETS will have a very small impact on aggregate traffic and CO<sub>2</sub> emissions.").

<sup>37</sup> *See* discussion *infra* Part III.

<sup>38</sup> Mat Hope, *EU Emissions Trading Scheme Saved—For Now*, THE CARBON BRIEF (Feb. 19, 2013, 9:30 AM), <http://www.carbonbrief.org/blog/2013/02/eu-emissions-trading-scheme-is-saved-for-now>.

<sup>39</sup> *See* Damian Carrington, *Carbon Fat Cats Are Killing the Emissions Trading Mouse*, GUARDIAN (Feb. 14, 2012, 3:00 PM), <http://www.guardian.co.uk/environment/damian-carrington-blog/2013/feb/14/carbon-emissions-carbon-tax>.

<sup>40</sup> Hope, *supra* note 38. ("Damien Morris from carbon market campaign group Sandbag says the approvals is a 'promising first signal that policymakers recognise the current threats to the EU ETS and are prepared to salvage it.'"). *See also* Damian Carrington, *EU Carbon Price Crashes to Record Low*, GUARDIAN (Jan. 24, 2013, 12:17 PM), <http://www.guardian.co.uk/environment/2013/jan/24/eu-carbon-price-crash-record-low> ("The price of a permit to emit a tonne of carbon dioxide fell 40% at one point to €2.81 today, far below its record high of €32, before recovering to more than €4 later in the day.").

## II. CASE STUDY

### A. *Oil Industry’s Efforts*

The oil industry itself is not only a producer of energy, but a consumer of energy as well.<sup>41</sup> In order for oil companies to “extract resources from the ground and process, transform, transport and deliver those resources to final users,”<sup>42</sup> they must use a high volume of energy.<sup>43</sup> This high volume of energy directly relates to not only the companies’ final output, but also to their economic efficiency.<sup>44</sup> For this reason, it has been necessary for the oil industry to invest in ways to become more efficient in their operations.<sup>45</sup> With these improvements in energy efficiency, the industry is not only reducing its operating costs, but also its general emissions.<sup>46</sup> Due to the similarity between the oil industry and the airline industry with respect to outside market factors creating a secondary effect of reducing carbon emissions, this part of the Note will examine the oil industry’s carbon reducing trends over the years without having an extra incentive from a carbon tax or cap and trade system. Part II will act as an example of what the airline industry can accomplish with regard to carbon emissions without a carbon tax.

#### 1. Effect of Energy Efficiency on Reducing Carbon Emissions

In 2004, the oil industry consumed about ten percent of its own gross production, which amounted to “about 600 million tonnes of oil equivalent (Mtoe) a year.”<sup>47</sup> Charts II,<sup>48</sup> III,<sup>49</sup> and IV<sup>50</sup> demonstrate the

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<sup>41</sup> IPIECA, SAVING ENERGY IN THE OIL AND GAS INDUSTRY 4 (2007), available at [http://www.ipieca.org/sites/default/files/publications/Saving\\_Energy.pdf](http://www.ipieca.org/sites/default/files/publications/Saving_Energy.pdf).

<sup>42</sup> *Id.*

<sup>43</sup> *Id.*

<sup>44</sup> *See id.*

<sup>45</sup> *See id.* at 5.

<sup>46</sup> ERNST WORRELL & CHRISTINA GALITSKY, ENERGY EFFICIENCY IMPROVEMENT AND COST SAVING OPPORTUNITIES FOR PETROLEUM REFINERIES: AN ENERGY STAR GUIDE FOR ENERGY AND PLANT MANAGERS 1 (Feb. 2005), available at [http://www.energystar.gov/ia/business/industry/ES\\_Petroleum\\_Energy\\_Guide.pdf](http://www.energystar.gov/ia/business/industry/ES_Petroleum_Energy_Guide.pdf).

<sup>47</sup> IPIECA, *supra* note 41, at 4.

<sup>48</sup> *See infra* Appendix, Chart II.

<sup>49</sup> *See infra* Appendix, Chart III.

<sup>50</sup> *See infra* Appendix, Chart IV.

breakdown of the industry's energy consumption for 2004.<sup>51</sup> Chart II demonstrates the large amount of energy needed to operate the oil industry's facilities through a breakdown of type of energy needed with respect to production type.<sup>52</sup> The amount of energy used by the oil industry demonstrates that the industry has its own incentive for reducing the amount of energy used in order to reduce operating costs.<sup>53</sup> In addition, with the demand for oil increasing in the world market, the need to reduce operating costs by saving energy has become even more imperative.<sup>54</sup>

By reducing operating costs and saving energy, the oil industry will have a direct impact on environmental protection.<sup>55</sup> Moreover, recent studies have shown that investment in more efficient energy technologies in the oil industry is "the most cost-effective way of . . . cutting emissions of greenhouse gases and air pollutants."<sup>56</sup>

## 2. How the Oil Industry Is Reducing Greenhouse Gases

Energy efficiency is one of the least expensive ways to reduce greenhouse gases for the oil industry.<sup>57</sup> Using ExxonMobil as an example of large oil companies working to increase their own efficiency while in turn reducing greenhouse gas emissions, the company has a four-tier plan that

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<sup>51</sup> *Id.* This is an understatement of the actual amount of energy used by the oil industry worldwide.

Comprehensive data on energy consumption by oil and gas companies around the world is not available. The IEA compiles and publishes data, where available, on the own use of energy by country and fuel type in crude oil and natural gas production, oil refining, gas liquefaction/regasification, and pipeline transportation. In 2004, consumption for all these activities amounted to 513 Mtoe. However, this understates the total amount of energy used by the oil and gas industry worldwide, as data is not available for some countries, especially in the developing world. In addition, no breakdown of the use of transport fuels is at hand for any country, so it is not possible to estimate precisely how much of this energy consumption is used by the oil and gas industry for the distribution of oil products by tankers, barges, railcars and road trucks.

*Id.* at n.1. See also *infra* Appendix, Chart II.

<sup>52</sup> See *infra* Appendix, Chart II.

<sup>53</sup> See IPIECA, *supra* note 41, at 5.

<sup>54</sup> See *id.* at 8.

<sup>55</sup> See *id.* at 3.

<sup>56</sup> *Id.* (discussing a study by the McKinsey Global Institute. *Productivity of Growing Global Energy Demand: A Microeconomic Perspective*, Nov. 2006, McKinsey and Co., Inc., San Francisco).

<sup>57</sup> See *Saving Energy*, EXXONMOBIL, [http://www.exxonmobil.com/Corporate/energy\\_ops.aspx](http://www.exxonmobil.com/Corporate/energy_ops.aspx) (last visited Nov. 19, 2013).

“focuses on increasing [its] own energy efficiency in the short term, implementing current proven emission-reducing technologies in the medium term, and developing proven breakthrough, game-changing technologies in the long term.”<sup>58</sup> This plan aims at reducing greenhouse gas emissions by improving efficiency mainly through cogeneration, flare reduction, and carbon capture and storage.<sup>59</sup>

a. Energy Management

A top priority among oil companies is to invest in and develop “formal energy management systems, which seek to incorporate efficiency improvements and emissions reductions into the routine operations of every aspect of their businesses.”<sup>60</sup> For example, ExxonMobil has used a new system called Global Energy Management System (“GEMS”) since 2000.<sup>61</sup> This system helps the company recognize and assist itself in acting upon energy saving opportunities.<sup>62</sup> ExxonMobil also has an equivalent of GEMS for its upstream business, which is called the Production Operations Energy Management System (“POEMS”).<sup>63</sup> With these management systems, ExxonMobil is getting closer to meeting its energy efficiency target.<sup>64</sup>

Cogeneration is an example under energy management, in which the oil industry has worked to reduce waste.<sup>65</sup> The process of cogeneration is almost twice as efficient as using the traditional method.<sup>66</sup> Through this process, the oil industry “captures heat generated from the production of electricity to use in production, refining, and chemical processing operations.”<sup>67</sup> By building cogeneration plants, the oil industry is creating more energy efficient benefits.<sup>68</sup> ExxonMobil, for example, has a

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<sup>58</sup> *Mitigating Greenhouse Gas Emissions in Our Operations*, EXXONMOBIL, [http://www.exxonmobil.com/Corporate/safety\\_climate\\_action.aspx](http://www.exxonmobil.com/Corporate/safety_climate_action.aspx) (last visited Nov. 19, 2013).

<sup>59</sup> *Id.* See also discussion *infra* Parts II.A.2.a–b (explaining these terms in depth).

<sup>60</sup> See IPIECA, *supra* note 41, at 8.

<sup>61</sup> *Energy Efficiency*, EXXONMOBIL, [http://www.exxonmobil.com/Corporate/energy\\_ops\\_efficiency.aspx](http://www.exxonmobil.com/Corporate/energy_ops_efficiency.aspx) (last visited Nov. 19, 2013).

<sup>62</sup> *Id.*

<sup>63</sup> *Id.* For more information on Upstream and Downstream business operations and distinctions see *What We Do*, EXXONMOBIL, [http://www.exxonmobil.com/Corporate/about\\_what.aspx](http://www.exxonmobil.com/Corporate/about_what.aspx) (last visited Nov. 19, 2013).

<sup>64</sup> *Energy Efficiency*, *supra* note 61.

<sup>65</sup> *Cogeneration*, EXXONMOBIL, [http://www.exxonmobil.com/Corporate/energy\\_ops\\_cogeneration.aspx](http://www.exxonmobil.com/Corporate/energy_ops_cogeneration.aspx) (last visited Nov. 19, 2013).

<sup>66</sup> IPIECA, *supra* note 41, at 8.

<sup>67</sup> *Cogeneration*, *supra* note 65.

<sup>68</sup> See *Saving Energy*, *supra* note 57.

large amount of cogeneration capacity globally, and has continued to add more yearly.<sup>69</sup>

b. Oil Production

Improving efficiency in oil production is another area in which the oil industry can reduce waste and emissions.<sup>70</sup> The oil industry is working to find more efficient pumps, compressors, and motors that will reduce emissions in the short term.<sup>71</sup> In addition, energy savings from oil and gas exploration can be attributed to new advances in surveying, analysis, and drilling techniques because of higher rates of successful drillings.<sup>72</sup> These initiatives have improved energy efficiency within the oil industry.<sup>73</sup>

1) Flaring

Flaring is the process in which the oil industry vents the “blend of hydrocarbon gases [that] often accompan[y] oil to the surface” during the extraction process.<sup>74</sup> ExxonMobil conducts this practice in situations in which it believes there could be a safety issue or to dispose of it when there is no alternative economic means to capture and use it.<sup>75</sup> ExxonMobil has worked to create available markets in which it can avoid flaring.<sup>76</sup> Chart III in the Appendix demonstrates ExxonMobil’s progress for the past few years in reducing flaring from its upstream operations.<sup>77</sup> While ExxonMobil’s flaring increased from 2010 to 2011, its overall practice has decreased from 2008 to 2011 due to infrastructure investments and improving gas management.<sup>78</sup> Chart IV in the Appendix demonstrates the

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<sup>69</sup> See *Cogeneration*, *supra* note 65.

<sup>70</sup> See *Saving Energy*, *supra* note 57.

<sup>71</sup> See IPIECA, *supra* note 41, at 9.

<sup>72</sup> See *id.*

<sup>73</sup> *Id.*

<sup>74</sup> *Flaring and Venting*, EXXONMOBIL, [http://www.exxonmobil.com/Corporate/energy\\_ops\\_flaring.aspx](http://www.exxonmobil.com/Corporate/energy_ops_flaring.aspx) (last visited Nov. 19, 2013).

<sup>75</sup> *Id.*

<sup>76</sup> See *id.*

<sup>77</sup> See *infra* Appendix, Chart III.

<sup>78</sup> See *CDP 2012 Investor CDP 2012 Information Request*, EXXONMOBIL, [http://www.exxonmobil.com/corporate/files/cdp\\_investor\\_2012.pdf](http://www.exxonmobil.com/corporate/files/cdp_investor_2012.pdf) (last visited Nov. 19, 2013) (noting that operations in “Nigeria and Equatorial Guinea account for greatest percentage of flared gas, contributing about 68 percent of our total upstream flaring. We continue to make infrastructure investments to improve gas management in these countries.”).

total reductions in carbon emissions from ExxonMobil’s efforts in energy efficiency with respect to flare reduction and cogeneration.<sup>79</sup> Over the past few years, ExxonMobil has reduced 16 million metric tons of its greenhouse gas emissions on its own initiative in order to reduce its own operations costs.<sup>80</sup>

c. The Factor of Good Publicity

It has been noted that many big oil companies, including ExxonMobil, BP America, Chevron, and Shell, have been following the energy efficiency trend, and whether that is a sincere move or a move based on public relations has been questioned.<sup>81</sup> While these companies have discussed energy efficiency in terms of giving back to the community and giving more by using less,<sup>82</sup> an ExxonMobil spokesman also noted that “[e]fficiency is a key element in all of the advertising . . . that we do.”<sup>83</sup> Nevertheless, whether the switch to green technology is based on good publicity or sincere motives, the effect on the environment is same.

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<sup>79</sup> See *infra* Appendix, Chart IV. These numbers are based on a cumulative reduction since 2006.

<sup>80</sup> 2010 CORPORATE CITIZENSHIP REPORT, EXXONMOBIL 35, available at [http://www.exxonmobil.com/corporate/imports/ccr2010/pdf/community\\_ccr\\_2010.pdf](http://www.exxonmobil.com/corporate/imports/ccr2010/pdf/community_ccr_2010.pdf) (last visited Nov. 19, 2013). ExxonMobil’s efforts of reducing carbon emission include a process called Carbon Capture and Storage.

ExxonMobil has been active in developing and applying CCS component technologies since the 1980s. CCS is a process to safely and effectively capture, transport, and store CO<sub>2</sub> in underground geologic formations such as saline reservoirs, depleted oil or gas reservoirs, or deep coal beds . . . . Our LaBarge Shute Creek facility . . . has the capacity to capture approximately 365 million cubic feet of CO<sub>2</sub> per day.

For information on what other big oil companies are doing to reduce carbon emissions, see *Sustainable Development*, SHELL GLOBAL, <http://www.shell.com/global/environment-society/s-development.html> (last visited Nov. 19, 2013); *Environment*, BP GLOBAL, <http://www.bp.com/sectionbodycopy.do?categoryId=3317&contentId=7073860> (last visited Nov. 19, 2013).

<sup>81</sup> *Major Oil Companies Going Green?*, MWE2 NEWS (Apr. 13, 2009, 2:43 PM), <http://mwe2.com/n-773-major-oil-companies-going-green.html>.

<sup>82</sup> 2010 CORPORATE CITIZENSHIP REPORT, *supra* note 80, at 25 (“As one of the leading petroleum and natural gas companies, ExxonMobil takes our environmental responsibilities very seriously . . . [t]o produce energy responsibly, we must understand and actively manage environmental risks and relentlessly focus on operational excellence.”).

<sup>83</sup> *Big Oil Goes Green*, REALTIME NEWS (Apr. 12, 2009), <http://newsblaze.com/story/20090412061940sop.nb/topstory.html>. See also *Environment & Society*, SHELL GLOBAL, <http://www.shell.com/global/environment-society.html> (last visited Nov. 19, 2013) (“At our operations we aim to address social concerns and work to benefit local communities, *protecting our reputation as we do business.*”) (emphasis added).

d. Why Does this Matter?

This case study on the oil industry's efforts to reduce carbon emissions without carbon taxes is directly relevant to the aviation industry's ability to do the same. Because the price of oil is a leading factor in the price of operation in both industries, the aviation industry will willingly follow the same initiatives as the oil industry in "going green" in order to reduce operations costs.<sup>84</sup> In this respect, the aviation industry can and will reduce carbon emissions without the pressures of a carbon tax or cap and trade system.<sup>85</sup> In addition, the effect of good publicity discussed above can also be equated to the airline industry, with the effect on the environment being the same regardless of the motive.<sup>86</sup>

### III. THE AVIATION INDUSTRY AND REDUCTION IN EMISSIONS

Some critics argue that the ETS is in place because the market factors that are said to reduce carbon emissions only work "in theory";<sup>87</sup> that is, this part of the Note does not actually work in practice. However, "fuel efficiency correlates directly to the distance an aircraft can fly, the amount of payload it can carry,"<sup>88</sup> and in turn, this leads to a better economic performance.<sup>89</sup> Therefore, in practice, airlines invest their time, money, and energy into creating new ways of reducing the amount of gas used in order to decrease costs and increase revenue for the long term.<sup>90</sup>

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<sup>84</sup> See discussion *infra* Part III.

<sup>85</sup> *Id.*

<sup>86</sup> See Dan Milmo, *Airlines Stage Fightback on Environmental Criticism*, GUARDIAN (June 3, 2008, 6:50 AM), <http://www.guardian.co.uk/environment/2008/jun/03/travelandtransport.carbonemissions> ("Walsh [British Airways chief executive] admitted that the aviation industry could not afford the lavish 'green' advertising campaigns that are now a signature marketing policy for oil giants including BP and Shell, but said the four-point IATA initiative pointed to one way forward for the industry.").

<sup>87</sup> See Renee Martin-Nagle, *Aviation Emissions: Equitable Measures Under the EU ETS*, 43 ENVTL. L. REP. NEWS & ANALYSIS 10047, 10052 (2013) ("Theoretically, the reduction could be achieved through voluntary actions by industry and individuals around the world. Unfortunately, recent trends have shown that humans have little to no appetite for reducing emissions voluntarily.").

<sup>88</sup> BEGINNER'S GUIDE TO AVIATION EFFICIENCY, *supra* note 3, at 1.

<sup>89</sup> See *id.*

<sup>90</sup> See Steve Hargreaves, *Airlines Seek to Slash Fuel Costs*, CNNMONEY (June 1, 2012, 10:46 AM), <http://money.cnn.com/2012/06/01/news/economy/airlines-fuel/index.htm> ("With jet fuel prices near record highs, the drive to conserve is stronger than ever.").

A. *The Key Market Factor Affecting Fuel Efficiency*

As discussed in Part I.C, the ETS will not have the effect on the aviation industry that the European Union desires.<sup>91</sup> Because of this, the ETS is unlikely to have a significant effect on the aviation industry’s carbon emissions. The more efficient driver of the aviation industry’s behavior is the high price of fuel, which directly accounts for anywhere from thirty to forty percent of an airline’s operating costs.<sup>92</sup> Within the industry, cost efficiency, which is directly affected by the cost of fuel, is the essential factor and “is a better imperative than any regulation could [achieve] . . . [b]ecause without cost efficiency, the industry cannot continue to survive.”<sup>93</sup>

But why does cost efficiency matter in relation to reducing carbon emissions? The amount of fuel an aircraft burns directly affects the amount of aircraft emissions because “[e]ach kilogram of fuel saved reduces carbon dioxide (CO<sub>2</sub>) emissions by 3.16 k[ilograms].”<sup>94</sup> Put in terms of how much this affects airline costs, “[e]ach dollar wasted on fuel burn takes up to \$20 dollars in additional revenue to achieve the same margin.”<sup>95</sup> With fuel prices increasing steadily every year, fuel efficiency has become a top priority for the aviation industry.<sup>96</sup>

B. *Steps the Aviation Industry Is Taking and Can Take to Reduce Emissions*

The aviation industry has been working hard to reduce carbon emissions for the past forty years,<sup>97</sup> and has improved fuel efficiency by

<sup>91</sup> See *infra* Part I.C and accompanying text.

<sup>92</sup> David Lesky, *Efficiency a Top Concern in the Aviation Industry*, MULTI SERVICE (July 16, 2012), <http://www.multiservice.com/newsroom/industry-news/efficiency-a-top-concern-in-the-aviation-industry.html>.

<sup>93</sup> *Id.* See also BEGINNER’S GUIDE TO AVIATION, *supra* note 3, at 1 (“We have seen some amazing advances, none more so perhaps than the improvement in fuel efficiency. We can now transport people distances . . . using relatively small amounts of energy. *But our drive for even greater fuel efficiency is pushing the industry further still.*”) (emphasis in original).

<sup>94</sup> *Operational Fuel Efficiency*, IATA, <http://www.iata.org/whatwedo/ops-infra/Pages/fuel-efficiency.aspx> (last visited Nov. 19, 2013).

<sup>95</sup> ALEJANDRO PINEDA & PIETER STAVERMAN, FLIGHT PLANNING AND FUEL EFFICIENCY 4 (2011), available at [http://gactaern.org/Unit%20Plan/Flight%20Operations/NavigationAndCommunication/ACCT\\_NC\\_5/ACCT\\_NC\\_5\\_FlightPlanningAndFuelEfficiencyReadingHandout.pdf](http://gactaern.org/Unit%20Plan/Flight%20Operations/NavigationAndCommunication/ACCT_NC_5/ACCT_NC_5_FlightPlanningAndFuelEfficiencyReadingHandout.pdf).

<sup>96</sup> *Id.* See also *FuelSmart*, AM. AIRLINES, <http://hub.aa.com/en/nr/media-kit/operations/fuel-smart> (last visited Nov. 19, 2013) (demonstrating the yearly rise in fuel cost’s direct relationship to American Airline’s annual rate of savings and equivalent fuel cost savings); Hargreaves, *supra* note 90.

<sup>97</sup> See *ecoDemonstrator Shows That the Path to a Sustainable Aviation Future Goes Through FAA’s CLEEN program*, FAST LANE: OFFICIAL BLOG OF U.S. SEC’Y OF TRANS. (Sept. 24,

seventy percent.<sup>98</sup> The industry even improved fuel efficiency by sixteen percent between 2001 and 2008 alone.<sup>99</sup> In fact, on its own initiative in 2009, the International Air Transport Association, which represents 240 airlines from over 115 countries,<sup>100</sup> made the decision to adopt targets to reduce carbon emissions.<sup>101</sup> These targets are comprised of a limit on carbon emissions from 2020, an average yearly improvement of one and one-half percent in fuel efficiency from 2009 to 2020, and a reduction of fifty percent in carbon emissions relative to 2005 emissions.<sup>102</sup> These goals were all agreed upon by the aviation industry and submitted to the International Civil Aviation Organization (“ICAO”).<sup>103</sup> These goals can be accomplished through technology, operations, and infrastructure.<sup>104</sup>

### 1. Technology

The aviation industry has been making great progress in technological advances.<sup>105</sup> Simply by purchasing new aircrafts, and replacing the older aircrafts by 2020, the airline industry will reduce carbon emissions by twenty-one percent.<sup>106</sup> As Chart V in the Appendix demonstrates, airlines overall have improved efficiency consistently over time,<sup>107</sup> with engine fuel consumption in newer aircrafts decreasing by almost fifty percent in comparison to the airplane models of the 1960s.<sup>108</sup> In addition to replacing older aircrafts, the airline industry is using technology to reduce carbon

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2012), <http://usdotblog.typepad.com/secretarysblog/2012/09/ecodemonstrator.html#UkuCvyhqhU4> (showing concrete progress in reducing aircraft emissions made by Boeing aircraft).

<sup>98</sup> A GLOBAL APPROACH TO REDUCING AVIATION EMISSIONS—FIRST STOP: CARBON NEUTRAL GROWTH BY 2020, IATA (2009), available at [http://corporate.airfrance.com/fileadmin/dossiers/img\\_rte\\_fr/IATA.pdf](http://corporate.airfrance.com/fileadmin/dossiers/img_rte_fr/IATA.pdf).

<sup>99</sup> *Id.*

<sup>100</sup> *Current Airline Members*, IATA, <http://www.iata.org/about/members/pages/airline-list.aspx> (last visited Nov. 19, 2013) (follow “See all IATA Member Airlines” hyperlink) (listing the airlines that are members and their country of origin).

<sup>101</sup> *A Global Approach to Reducing Aviation Emissions—First Stop: Carbon Neutral Growth from 2020*, *supra* note 98.

<sup>102</sup> *Id.*

<sup>103</sup> *Id.*

<sup>104</sup> *Id.*

<sup>105</sup> *See id.* (showing advances that include “revolutionary new plane designs; new composite lightweight materials; radical new engine advances; and the development of biofuels”).

<sup>106</sup> *Id.* *See also* BEGINNER’S GUIDE TO AVIATION, *supra* note 3, at 7 (explaining that higher drag and weight are directly proportional to the amount of fuel used, which is why newer, lighter aircraft designs that reshape aircrafts for reduced drag will result in improved efficiency).

<sup>107</sup> *See infra* Appendix, Chart V. *See also* BEGINNER’S GUIDE TO AVIATION, *supra* note 3, at 5.

<sup>108</sup> *See infra* Appendix, Chart V. *See also* BEGINNER’S GUIDE TO AVIATION, *supra* note 3, at 5.

emissions through advancing aircraft engine and systems technology,<sup>109</sup> which could reduce emissions anywhere from twenty to thirty-five percent per aircraft, and through sustainable biofuels, which could reduce emissions by eighty percent.<sup>110</sup> With advances in technology, reductions in carbon emissions increase dramatically,<sup>111</sup> and the airline industry is heavily investing its time and money to achieve its efficiency goals.<sup>112</sup>

## 2. Operations

A 1999 report noted a six percent inefficiency in aircraft operations and suggested that improved operational practices could reduce carbon emissions as much as three percent by 2020.<sup>113</sup> While this is a smaller category in terms of carbon emissions reductions, improved operational practices, “including reduced APU (auxiliary power unit usage), more efficient flight procedures, and weight reduction measures,”<sup>114</sup> nonetheless can save fuel and reduce emissions if managed more efficiently.<sup>115</sup>

## 3. Infrastructure

Infrastructure is another category that demonstrates an area in which there has been inefficiency in the past; a 1999 study noted twelve percent inefficiency in the infrastructure of air transportation.<sup>116</sup> Since the 1999 study, the inefficiencies have dropped by eighty percent and can be dropped by an additional four percent per annum once there is an implementation of more efficient air traffic management.<sup>117</sup> One basic method

<sup>109</sup> See *A Global Approach to Reducing Aviation Emissions—First Stop: Carbon Neutral Growth from 2020*, *supra* note 98, at 4, 5 (showing technology advances include evolving the architecture of the engine and the airplane itself to reduce drag. In terms of fuel, aircrafts use biofuels sourced from second or new generation biomass, and tests have demonstrated that using these sources as “drop-in” fuel is sound).

<sup>110</sup> *Id.*

<sup>111</sup> See BEGINNER’S GUIDE TO AVIATION, *supra* note 3, at 5 (“These efficiency levels have been achieved with step changes in design—such as the introduction of turbofan engines with increasingly high bypass ratios . . . —coupled with year-on-year ‘incremental’ improvements to engine design and operation.”).

<sup>112</sup> *Id.* (“Airbus spends \$265 million per annum on research and development in further improving the efficiency of the A320 family of aircraft.”).

<sup>113</sup> *A Global Approach to Reducing Aviation Emissions—First Stop: Carbon Neutral Growth from 2020*, *supra* note 98 (noting that IATA’s Green Team visited airlines to advise them on ways to reduce operational inefficiency and create better practices).

<sup>114</sup> *Id.*

<sup>115</sup> *Id.*

<sup>116</sup> *Id.*

<sup>117</sup> BEGINNER’S GUIDE TO AVIATION EFFICIENCY, *supra* note 3 (noting that advances in air traffic management alone will save 33.9 million tons of carbon emissions by 2030 in U.S.

of improving inefficiencies in infrastructure is through better management of air traffic control,<sup>118</sup> which currently results in about eight percent of aviation fuel waste.<sup>119</sup> As Chart V in the Appendix demonstrates, reducing “zigzag” will result in large emission reductions in the long term.<sup>120</sup> By 2030, the U.S. Next Generation Air Transportation (“NextGen”) program and the EU Single European Sky ATM Research Program (“SESAR”) will begin to save a total of 51.6 million tons of carbon per year.<sup>121</sup> The example on the far right of the chart demonstrates how the changes in air traffic management could take effect and shows how much travel can be reduced through the implementation of “flexible use of airspace concepts.”<sup>122</sup>

In addition, with the implementation of new airspace improvements at only 100 airports, there will be reductions of 500,000 tons of carbon emissions by the end of 2013.<sup>123</sup>

### C. *Comparison Between Market Factors and the ETS*

The effect of gas prices on operations costs is the leading driver of the airline industry’s push to reduce carbon emissions.<sup>124</sup> High operations

airspace and 17.7 million tons per year by 2030 in EU airspace. These results come from reductions in delays and allowing the aircrafts to fly at their most efficient profile possible. This is just one way in which airlines are working to improve fuel efficiency in terms of flight management).

<sup>118</sup> *See id.* at 15.

<sup>119</sup> *Id.*

<sup>120</sup> *Id.* at 17 (noting that these programs are the next generation of Air Traffic Management (“ATM”) network-enabled technologies created to produce more efficient technologies and procedures). *See also* Appendix, Chart V.

<sup>121</sup> BEGINNER’S GUIDE TO AVIATION EFFICIENCY, *supra* note 3, at 16.

<sup>122</sup> *Id.* at 17.

These [flexible uses of airspace concepts] will increase the capacity of the overall air traffic system by giving civil, military and private aircraft users access to previously restricted airspace, at the time when they need it, and access to a common analysis of the overall traffic situation. By sharing airspace, military can access areas previously reserved for civil flights and commercial aircraft can fly through formerly restricted military airspace; in the past having to avoid these areas has meant lengthy and expensive detours.

<sup>123</sup> *A Global Approach to Reducing Aviation Emissions—First Stop: Carbon Neutral Growth from 2020*, *supra* note 98. *See* BEGINNER’S GUIDE TO AVIATION, *supra* note 3, at 21 for information on how airports around the world are also providing efficient on-the-ground services to reduce greenhouse emissions, assisting airlines in their effort to become more efficient.

<sup>124</sup> SANDY LIU, AEE, ET AL., AIRE & SESAR JOINT UNDERTAKING: GREEN FLIGHT DATA GUIDANCE, 7 (2009) (draft), *available at* [http://www.faa.gov/nextgen/implementation/programs/aire/publications/media/AIRE\\_Metric\\_Wht-Paprr-5Mar09\\_srliu-DRAFT-V1+AE\\_AOC\\_dump.pdf](http://www.faa.gov/nextgen/implementation/programs/aire/publications/media/AIRE_Metric_Wht-Paprr-5Mar09_srliu-DRAFT-V1+AE_AOC_dump.pdf) (“Since the 2007–08 spiking of petroleum fuel prices and its impact on

costs will cause a demand in the industry to reduce its emissions, and this will be done more effectively than the EU ETS could ever hope to achieve.<sup>125</sup> And although some of the changes taken by the airline industry seem meager in outcome, it must be stressed that the reductions add up quickly when attached to each airline’s daily flights, which is why airlines are voluntarily willing to invest in gas reduction methodologies.<sup>126</sup> For example, switching navigation systems, as discussed in Part III.B.3,<sup>127</sup> will help planes eliminate close to two to three minutes of airtime, which ends up saving a few hundred dollars in fuel.<sup>128</sup> In comparison, however, Delta Airlines spent about twelve billion dollars on fuel in 2011,<sup>129</sup> making a few hundred dollars on a flight seem minuscule, but the amount adds up when the flights taken daily by Delta alone are taken into account.<sup>130</sup> Investing money early on in cost-cutting technologies with regard to gas consumption reduces costs in the long term, which is important for an industry that expends thirty to forty percent of its total costs on gas.<sup>131</sup> Cost cutting in the form of reducing fuel consumption is the greatest drive of the airline industry in times of rising fuel prices.<sup>132</sup>

But even if people believe that there needs to be an extra incentive or push to reduce carbon emissions,<sup>133</sup> or even believe that airlines should

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transportation, many aviation stakeholders have been in continuous pursuit of comprehensive energy efficiency for near- and long-term sustainability of aviation.”).

<sup>125</sup> See discussion *supra* Part I.C. This Note does not address alternative measures that the European Union or the United States could take in order to further reduce carbon emissions more than what has already been, and will be, accomplished by the airline industry, arguing instead that there is no need for extra incentives to reduce emissions because of strong incentive created by high fuel prices. However, for further readings on arguments regarding alternative measures, including a cap and trade system and carbon tax system, see BEGINNER’S GUIDE TO AVIATION EFFICIENCY, *supra* note 3; 2010 CORPORATE CITIZENSHIP REPORT, *supra* note 80. See also *infra* Part IV.B.4 for information on new attempts to create alternative measures to replace the EU ETS.

<sup>126</sup> See Hargreaves, *supra* note 90.

<sup>127</sup> See discussion *infra* Part III.B.3.

<sup>128</sup> See Hargreaves, *supra* note 90.

<sup>129</sup> *Id.*

<sup>130</sup> See *id.*

<sup>131</sup> Lesky, *supra* note 92.

<sup>132</sup> See Hargreaves, *supra* note 90.

<sup>133</sup> See generally IAN WAITZ ET AL., AVIATION AND THE ENVIRONMENT: A NATIONAL VISION STATEMENT, FRAMEWORK FOR GOALS AND RECOMMENDED ACTIONS (2004), available at [http://web.mit.edu/aeroastro/partner/reports/congrept\\_aviation\\_envirn.pdf](http://web.mit.edu/aeroastro/partner/reports/congrept_aviation_envirn.pdf) (stating that action by an outside federal agency to establish governmental action is necessary in the effort to reduce greenhouse gas emissions by the aviation industry). See also *A Global Approach to Reducing Aviation Emissions—First Stop: Carbon Neutral Growth from 2020*, *supra* note 98, at 5 (“While efforts from the first three pillars [technology, operational, infrastructure] will go

pay for the emission that they do produce,<sup>134</sup> the ETS violates third state sovereignty.<sup>135</sup> In addition, the immense international backlash toward the EU ETS should signal to the European Union that it must remove the airline industry from the ETS.

#### IV. ETS IN THE INTERNATIONAL CONTEXT

Several nations around the world have demonstrated a strong disdain for the Union's cap and trade system by calling on their nations' airlines to refuse participation in the trading scheme, and even going so far as to take legal action against the European Union.<sup>136</sup> In light of this backlash, the European Court of Justice has upheld the legality of the trading scheme under all international agreements, treaties, and international common law.<sup>137</sup> Nevertheless, these nations have found points of dissent and continue to resist participation,<sup>138</sup> most basing their issues with the ETS on its effect on their sovereign rights.<sup>139</sup> As a result of this continued resistance, the European Union has delayed applying the ETS to the aviation industry.<sup>140</sup>

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a long way to achieving the goal of carbon-neutral growth from 2012 . . . [t]o close the gap, we will need to deploy the fourth pillar—economic measures.”)

<sup>134</sup> See, e.g., Kevin Doran & Alaine Ginnochio, *United States Climate Policy: Using Market-Based Strategies to Achieve Greenhouse Gas Emission Reductions*, 3 ENVTL ENERGY L. & POL'Y J. 31, 33 (“Carbon pricing through measures such as a cap and trade program or a tax on emissions is thought to be one of the most effective and efficient mechanisms for reducing GHG emissions.”); Kathryn Kisska-Schulze & Gregory P. Tapis, *Projections for Reducing Aircraft Emissions*, 77 J. AIR L. & COM. 701, 745.

One proposal to work simultaneously with those implementations already in place, both domestically and globally, is to implement an emissions fuel/carbon tax on U.S. domestic flights with specific targeted rates based upon the distance aircraft fly. A lower carbon tax rate should be imposed on short-duration flights, while a higher carbon tax rate should be imposed on long-haul flights.

Reuven S. Avi-Yonah & David M. Uhlmann, *Combating Global Climate Change: Why a Carbon Tax Is a Better Response to Global Warming than Cap and Trade*, 28 STAN. ENVTL. L.J. 3, 50 (2009).

<sup>135</sup> See discussion *infra* Part IV.A.

<sup>136</sup> Alison Leung & Harry Suhartono, *China Airlines Won't Pay EU Carbon Tax: Industry Body*, REUTERS (Jan. 4, 2012, 6:22 AM), <http://www.reuters.com/article/2012/01/04/us-air-lines-carbon-tax-asia-idUSTRE8030MC20120104>.

<sup>137</sup> See Case C-366/10 *Air Trans. Ass'n Am.*, *supra* note 7. See also Patrick Secor, *European Union Law—EU Emissions Standards May be Applied to Third-State Airlines Departing from Member States*, 35 SUFFOLK TRANSNAT'L L. REV. 505, 511, 12 (2012).

<sup>138</sup> See Leung & Suhartono, *supra* note 136.

<sup>139</sup> See Martin-Nagle, *supra* note 87, at 10047.

<sup>140</sup> See Kathryn A. Wolfe & Burgess Everett, *EU Postpones Airline Emissions Rule*, POLITICO (Nov. 13, 2012, 4:25 AM), <http://www.politico.com/news/stories/1112/83731.html>.

A. *Illegality*

While The European Court of Justice held that the ETS was legal with regard to all international agreements,<sup>141</sup> there have been points of contention. The biggest points of contention arise from the Kyoto Protocol, which came into force in 2005,<sup>142</sup> and the U.S.-EU Air Transport Agreement of 2007.<sup>143</sup> Many people against the ETS have looked first to the Kyoto Protocol, an international agreement that set binding targets to reduce greenhouse gas emissions for all the nations involved.<sup>144</sup> While the agreement allows the nations to fulfill the agreement jointly and distribute reduction levels among themselves,<sup>145</sup> many have argued that the Kyoto Protocol explicitly did not include aviation in the regulation, leaving that kind of regulation in the hands of the ICAO only.<sup>146</sup>

Another point of contention is the U.S.-EU Air Transport Agreement of 2007, which helped liberalize aviation between the two territories.<sup>147</sup> While the agreement allows each party to decide the frequency and capacity of transportation,<sup>148</sup> it specifically exempts those parties' right to tax on fuel.<sup>149</sup> The Union contends that there is a difference between taxes on fuel and charges on an emissions trading scheme,<sup>150</sup> but many countering nations look to the *Braathens* case,<sup>151</sup> which held that a tax on emissions that was based on fuel consumption amounted to a tax.<sup>152</sup> While this case may not be binding authority, its reasoning is nonetheless applicable to the facts of the ETS.

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<sup>141</sup> See Case C-366/10 *Air Trans. Ass'n Am.*, *supra* note 7.

<sup>142</sup> Kyoto Protocol to the Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22 [hereinafter Kyoto Protocol], *available at* <http://unfccc.int/kyoto-protocol/items/2830.php>.

<sup>143</sup> Air Transport Agreement, U.S.-EU, Apr. 30, 2007, 46 I.L.M. 470 [hereinafter U.S.-EU Air Transport Agreement], *available at* <http://www.state.gov/documents/organization/114872.pdf>.

<sup>144</sup> Kyoto Protocol, *supra* note 142.

<sup>145</sup> See *id.* at art. 3.

<sup>146</sup> Giugi Carminati, *supra* note 17, at 132.

<sup>147</sup> See OPEN SKIES: THE EU-US AIR TRANSPORT AGREEMENT, ASSOC. EUR. AIRLINES 1, *available at* <http://files.aea.be/News/News020408.pdf>.

<sup>148</sup> U.S.-EU Air Transport Agreement, *supra* note 143, at art. 3(4).

<sup>149</sup> *Id.* at art. 11(2).

<sup>150</sup> See Bisset & Crowhurst, *supra* note 18, at 16–17.

<sup>151</sup> Case C-346/97, *Braathens Sverige AB v. Riksskatteverket*, 1999 E.C.R. I-3433 (holding that a Swedish emissions tax calculated by fuel consumption amounted to a tax on fuel), *available at* <http://curia.europa.eu/juris/document/document.jsf?docid=44245&doclang=EN&mode=&part=1>.

<sup>152</sup> *Id.*

These international agreements have provisions giving force to the argument that the European Union does not have the authority to tax international airlines arriving to and departing from any nation within the European Union.<sup>153</sup> It is from these points of dissent that many nations have taken actions to keep their airlines from participating in the Union's emissions scheme.<sup>154</sup>

## B. *International Backlash*

### 1. The Chinese Example

China has been a consistent force against the ETS; in response to the ETS, China warned the European Union to abandon the scheme or risk a global trade war.<sup>155</sup> In addition, the Civil Aviation Administration of China instructed its airlines not to participate in the scheme without first receiving governmental approval.<sup>156</sup> The Chinese Aviation Authority has stated that "China hopes that Europe will directly address our concerns, in light of the overall situation of global climate change, the sustainable development of international aviation and Chinese-European relations;"<sup>157</sup> however, it "will consider additional measures to protect the interests of [its] citizens and [its] companies."<sup>158</sup> While China has not taken any steps to pursue legal action, possibly hoping to pursue a negotiated outcome, it has nonetheless continued to fight back against the scheme, by pursuing a move that blocked Chinese firms from buying planes made by European manufacturer Airbus.<sup>159</sup> Even though Europe contends that the ETS will be put into implementation in the near future, China remains headstrong in its dispute with the European Union, which could negatively affect trade between the two.<sup>160</sup>

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<sup>153</sup> Kyoto Protocol, *supra* note 142; U.S.-EU Air Transport Agreement, *supra* note 143, at art.11(2). See also Case C-366/10, *Air Trans. Ass'n Am.*, *supra* note 7.

<sup>154</sup> Case C-366/10, *Air Trans. Ass'n Am.*, *supra* note 7.

<sup>155</sup> See Simon Rabinovitch, *China Warns EU of Carbon Tax 'Trade War'*, FINANCIAL TIMES (Dec. 22, 2011, 12:12 PM), <http://www.ft.com/intl/cms/s/0/49ab64c8-2c92-11e1-aaf5-00144feabdc0.html#axzz2IXuRVsrH>.

<sup>156</sup> Joshua Chaffin & Simon Rabinovitch, *China Bars Airlines from EU Carbon Tax*, FINANCIAL TIMES (Feb. 6, 2012, 4:56 AM), <http://www.ft.com/intl/cms/s/0/b33cdd2a-507a-11e1-a3ac-00144feabdc0.html#axzz2IXuRVsrH>.

<sup>157</sup> *Id.* (internal citations omitted).

<sup>158</sup> *Id.* (internal citations omitted).

<sup>159</sup> *China 'Blocks Airbus Deals' in EU Carbon Levy Spat*, BBCNEWS (Mar. 8, 2012, 1:25 PM), <http://www.bbc.co.uk/news/world-europe-17298117>.

<sup>160</sup> Lai Chenxi & Tao Wang, *Exploding the Myths of the EU-China Aviation Row*, CHINA-DIALOGUE (Nov. 14, 2012), <http://www.chinadialogue.net/article/show/single/en/5327-Exploding-the-myths-of-the-EU-China-aviation-row>.

## 2. Airlines of the United States and the European Court of Justice

In 2009, Continental Airlines, American Airlines, and United Airlines, as well as the Air Transport Association (“ATA”), sued the United Kingdom,<sup>161</sup> arguing that by implementing the ETS with regard to the aviation industry in the United Kingdom violated several international agreements.<sup>162</sup> By the end of 2011, the European Court of Justice had ruled that the inclusion of the international aviation industry in the ETS is legal.<sup>163</sup> While these U.S. airlines argued that the ETS violated several international agreements by taxing carbon emissions, the European Court of Justice took a different view of the ETS.<sup>164</sup> The Court held that the ETS was “a regulation imposing certain conditions on aircraft operators solely upon takeoff and landing, rather than a direct regulation of emissions.”<sup>165</sup> The Court also held that because the “tax” does not occur unless and until an international airline physically arrives within the European Union territory, the ETS “does not infringe the principle of territoriality or the sovereignty” of other nations.<sup>166</sup> The Court also held that the ETS is not a tax on fuel consumption, although based on fuel consumption, because “there is no direct and inseverable link between the quantity of fuel held or consumed by an aircraft and the pecuniary burden on the aircraft’s operator.”<sup>167</sup> With this holding, the Court reaffirmed one of the basic understandings of international aviation law: “each State has complete and exclusive sovereignty over its airspace.”<sup>168</sup>

## 3. Nations Further Unite Against the ETS

In response to the European Court of Justice’s decision, twenty-one countries met in New Delhi, India in late September of 2011 to sign the Delhi Declaration,<sup>169</sup> which reaffirmed their opposition the European Union’s ETS.<sup>170</sup> The ICAO later adopted the Delhi Declaration and further recommended to the European Union to refrain from including aviation

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<sup>161</sup> Case C-366/10, *Air Transp. Ass’n Am.*, *supra* note 7.

<sup>162</sup> *See id.* *See also* Bisset & Crowhurst, *supra* note 18, at 127.

<sup>163</sup> *See* C-366/10, *Air Transp. Ass’n of Am.*, *supra* note 7.

<sup>164</sup> *Id.*

<sup>165</sup> Katherine B. Andrus, *Beyond Aircraft Emissions: The European Court of Justice’s Decision May Have Far-Reaching Implications*, 24 AIR & SPACE LAW, no. 4, 2012, 15.

<sup>166</sup> C-366/10, *Air Transp. Ass’n of Am.*, *supra* note 7, ¶ 125.

<sup>167</sup> *Id.* ¶ 142.

<sup>168</sup> *See* Martin-Nagle, *supra* note 87, at 10047.

<sup>169</sup> *Id.* at 10048.

<sup>170</sup> *Id.*

in its ETS.<sup>171</sup> The Union did not back down on its determination to tax emissions on airplanes arriving to and departing from any nation within the European Union.<sup>172</sup> As a result, twenty-three nations met in Moscow, Russia in February of 2012 and signed the Moscow Declaration, again reaffirming their opposition to the ETS,<sup>173</sup> but also:

agreeing to consider enacting a 'basket of actions/measures' that included initiating litigation in ICAO under Article 84 of the 1944 International Convention on Civil Aviation (known as the Chicago Convention) that governs international aviation, using 'existing or new' domestic legislation to prohibit a nation's airlines and operators from participating in the EU ETS, and penalizing EU carriers as a 'form of countermeasure.'<sup>174</sup>

Even though the U.S. airlines lost the suit in the European Court of Justice,<sup>175</sup> the United States government has not backed down from its discontent with the EU ETS. In September 2012, the United States Senate took a further step toward refusal of the ETS with regard to airlines by unanimously passing Senate Bill 1956.<sup>176</sup> This bill effectively forbids U.S. airlines from participating in the ETS.<sup>177</sup> It was also noted that "U.S. airlines should not be subjected to this illegal scheme that amounts to little more than a cash grab for the European Union as none of the funds collected are required to be used for environmental purposes."<sup>178</sup> By the end of November, President Barack Obama signed the legislation into law, sending a signal to the European Union that the United States viewed the regulation as both illegal and unilaterally imposed, and that the Union

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<sup>171</sup> *Id.*

<sup>172</sup> *Id.*

<sup>173</sup> *Id.*

<sup>174</sup> See Martin-Nagle, *supra* note 87, at 10048–49.

<sup>175</sup> Case C-366/10, *Air Trans. Ass'n Am.*, *supra* note 7.

<sup>176</sup> See European Union Emissions Trading Scheme Prohibition Act of 2011, 49 U.S.C. § 40101 (2012). See also Linda Blachly, *US Senate Passes Bill Exempting US Airlines from Participating in EU ETS*, AIR TRANSPORT WORLD (Sept. 24, 2012), <http://atwonline.com/international-aviation-regulation/news/us-senate-passes-bill-exempting-us-airlines-participating-eu-ets>.

<sup>177</sup> See Chad Trautvetter, *Senate Bill Blocks U.S. Participation in EU-ETS*, AINONLINE (Sept. 25, 2012, 4:00 PM), <http://www.ainonline.com/aviation-news/ainalerts/2012-09-25/senate-bill-blocks-us-participation-eu-ets>.

<sup>178</sup> *Senate Unanimously Passes Bill to Protect US Airlines from EU ETS but Elections Will Slow down Progress*, GREENAIRONLINE.COM (Sept. 24, 2012), <http://www.greenaironline.com/news.php?viewStory=1594>.

should reconsider its regulation.<sup>179</sup> Around that same time, the European Union agreed to suspend the ETS with regard to airlines,<sup>180</sup> “on the condition that the 2013 Assembly of the International Civil Aviation Organization agrees [sic] a global alternative to ETS at its meeting in September and October.”<sup>181</sup>

For now, the immense international backlash and the results of the 2013 Assemble of the International Civil Aviation Organization have persuaded the European Union to amend the ETS “so that emissions would be covered for the part of flights that take place in European regional airspace.”<sup>182</sup> According to Connie Hedegaard, the European Union and Climate Commissioner:

[i]n light of the recent progress made at ICAO, not least thanks to Europe’s hard work and determination, the European Commission today has proposed to adjust the EU ETS so that emissions from the aviation sector would be covered for the part of flights that takes place in European regional airspace. The European Union has reduced greenhouse gas emissions considerably, and all the economic sectors are contributing to these efforts. The aviation sector has also to contribute, as aviation emissions are increasing fast—doubling since 1990. I am confident that the European Parliament and the Council will move swiftly and approve this proposal

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<sup>179</sup> 48 U.S.C. § 40101. See also Aaron Karp, *Obama Signs Bill Enabling US Airlines to Skirt EU ETS*, AIR TRANSPORT WORLD (Nov. 27, 2012), <http://atwonline.com/international-aviation-regulation/news/obama-signs-bill-enabling-us-airlines-skirt-eu-ets-1127>.

<sup>180</sup> See Connie Hedegaard: “EU Willing to ‘Stop the Clock’ on Aviation in the EU ETS for Flights into and out of Europe Until After the ICAO General Assembly next Autumn,” EUR. COMM’N, [http://ec.europa.eu/commission\\_2010-2014/hedegaard/headlines/news/2012-11-12\\_01\\_en.htm](http://ec.europa.eu/commission_2010-2014/hedegaard/headlines/news/2012-11-12_01_en.htm) (last updated June 28, 2013) [hereinafter *EU Willing to ‘Stop the Clock’*] (announcing the decision to suspend the ETS, Commissioner Connie Hedegaard stated: “[o]ur regulatory scheme was adopted after having waited many years for ICAO to progress. Now it seems that because of some countries dislike of our scheme many countries are prepared to move in ICAO, and even to move toward a Market Based Mechanism at global level.” Hedegaard cautioned that, “if this exercise does not deliver . . . then needless to say we are back to where we are today with the EU ETS. Automatically.”).

<sup>181</sup> Paul Lowe, *U.S. Officially Prohibits ETS Participation*, AINONLINE (Jan. 3, 2013, 2:50 AM), <http://www.ainonline.com/aviation-news/aviation-international-news/2013-01-03/us-officially-prohibits-ets-participation>. See also *EU Willing to ‘Stop the Clock,’ supra* note 180.

<sup>182</sup> *Aviation Emissions: Commission Proposes Applying EU ETS to European Regional Airspace from 1 January 2014*, EUROPA PRESS RELEASE DATABASE, available at [http://europa.eu/rapid/press-release\\_MEMO-13-906\\_en.htm](http://europa.eu/rapid/press-release_MEMO-13-906_en.htm).

without delay. With this proposal, Europe is taking the responsibility to reduce emissions within its own airspace until the global measure begins.<sup>183</sup>

#### 4. Argument for Alternative Measures

The European Union has reportedly stated that it would be willing to remove the aviation industry from the ETS if the International Civil Aviation Organization came up with an alternative solution that met the following criteria: "it must deliver more emissions reductions than the EU ETS on its own; it must have targets and measures; and any action must be non-discriminatory and apply to all airlines."<sup>184</sup> With these criteria in mind, several scholarly authors have come up with alternatives of their own that will not infringe on each nation's sovereignty but will also reduce carbon through some version of a cap and trade system.<sup>185</sup>

However, as this Note has argued, rising gas prices are enough of an incentive for the airline industry to greatly reduce greenhouse emissions, and there really is no need for any cap and trade or carbon taxation system as extra incentives.

#### CONCLUSION

When the European Union amended its original ETS in 2008 to include the aviation industry within the carbon-trading scheme, it created a tremendous backlash among international nations, which recognized this tax as a threat to third states' sovereignty.<sup>186</sup> Despite the backlash and the legal action taken against the European Union, the European Court

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<sup>183</sup> *Id.* Stating that key features include:

[1] all emissions from flights between airports in the European Economic Area (EEA, covering the 28 EU Member States plus Norway and Iceland) would continue to be covered . . . [2] [f]rom 2014 to 2020, flights to and from countries outside the EEA would benefit from a general exemption from those emissions that take place outside EEA airspace. Only emissions from the part of flights taking place within EEA airspace would be covered . . . [3] [t]o accommodate the special circumstances of developing countries, flights to and from third countries which are not developed countries and which emit less than 1% of global aviation emissions would benefit from a full exemption.

<sup>184</sup> Martin-Nagle, *supra* note 87, at 10049.

<sup>185</sup> Jane A. Leggett, et al., CONG. RESEARCH SERV., R42392, AVIATION AND THE EUROPEAN UNION'S EMISSION TRADING SCHEME SUMMARY (2012).

<sup>186</sup> *US Rallies Opponents of EU Carbon Tax on Airlines*, *supra* note 6.

of Justice has upheld the ETS's inclusion of the aviation industry as a legal tax that does not infringe upon territoriality because it only affects those airlines that arrive to and depart from the European Union.<sup>187</sup> While the European Union has backed down slightly by delaying the tax system on the aviation industry, and by slightly amending the ETS, it has insisted that it will not remove the industry from the ETS unless some equal alternative measure is taken.<sup>188</sup>

However, as this Note demonstrates, the inclusion of the airline industry within the ETS will have the opposite effect of what the European Union desires. The European Union hopes that by decreasing the yearly allowance of how much each airline may emit over time, that those airlines will take initiatives to avoid being taxed; however, most, if not all, of those taxes would likely be pushed upon passengers and, at best, carbon emissions will only be reduced by meager percentages.

But then the argument comes down to "so what?" Even if the airlines do not bear the majority of the costs associated with the tax, it still has the effect of reducing some carbon emissions and could be viewed as that extra push the aviation industry needs to further reduce emissions. Nevertheless, the ETS infringes upon sovereign states' rights to be free from the infringement on their territoriality. This infringement could create an imbalance in the international community that would affect future relationships and understandings.

In addition, this Note has shown that the airline industry has been consistently working to reduce carbon emissions for the last few decades, and continues to make great strides toward a green industry without any incentives from carbon tax systems or cap and trade systems. The oil industry has been a useful case study, demonstrating what the airline industry can accomplish without taxes. As the oil industry has shown, the biggest factor leading to an efficient industry is the price of oil. As oil prices have increased dramatically over the past few years, industries that rely heavily on it have invested much time, effort, and money in becoming more fuel efficient, which in turn reduces greenhouse gas emissions. And, as prices continue to soar, both the oil and airline industries will continue to invest their energies in reducing their oil consumption.

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<sup>187</sup> Case C-366/10, *Air Transp. Ass'n Am.*, *supra* note 7.

<sup>188</sup> *Id.*

## APPENDIX

CHART I: CUMULATIVE US CARRIER OUTCOMES ON THE NORTH ATLANTIC (2012–2020)<sup>189</sup>

	BaU	Full	Expense	Absorb
RTKs (CAGR, %)	3.35	3.11	3.25	3.35
CO <sub>2</sub> emissions (CAGR, %)	1.72	1.49	1.63	1.72
CO <sub>2</sub> emissions (tonnes, million)	210.10	206.74	208.93	210.10
Allowances purchased (million)	—	71.13	73.31	74.48
Share of allowances purchased (%)	—	34.40	35.09	35.45
NPV of purchased allowances (\$ billion)	—	1.37	1.41	1.43
Operating costs, NPV (\$ billion)	143.02	141.76	143.50	144.45
Operating costs, NPV (\$ billion)	147.37	148.62	147.81	147.37
Operating revenue per RTK, NPV (\$/RTK)	0.87	0.89	.88	.87
Profit margin (%)	2.95	4.62	2.92	1.98
Net US to EU transfer, NPV (\$ billion)	—	-1.24	1.41	1.43

<sup>189</sup> Robert Malina et al., *The Impact of the European Union Emissions Trading Scheme on US Aviation*, 19 J. AIR TRANSPORT MGMT. 36, 39 (2012), available at [http://globalchange.mit.edu/files/document/MITJPSPGC\\_Reprint\\_12-5.pdf](http://globalchange.mit.edu/files/document/MITJPSPGC_Reprint_12-5.pdf).

CHART II<sup>190</sup>

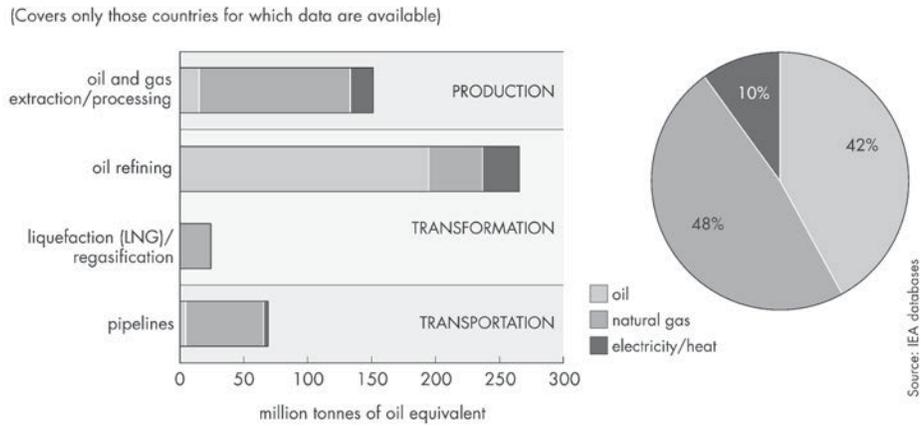
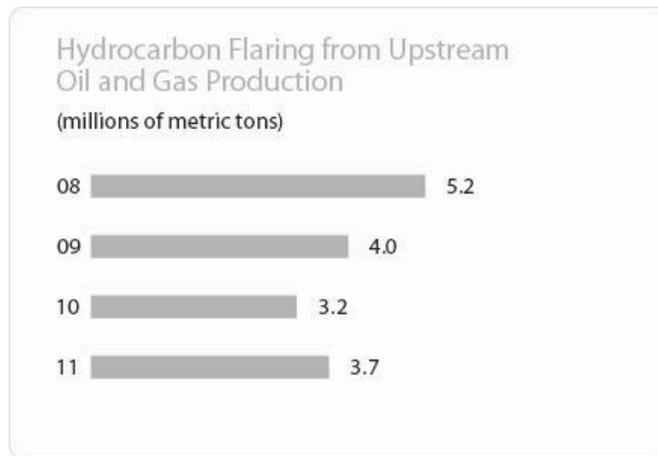
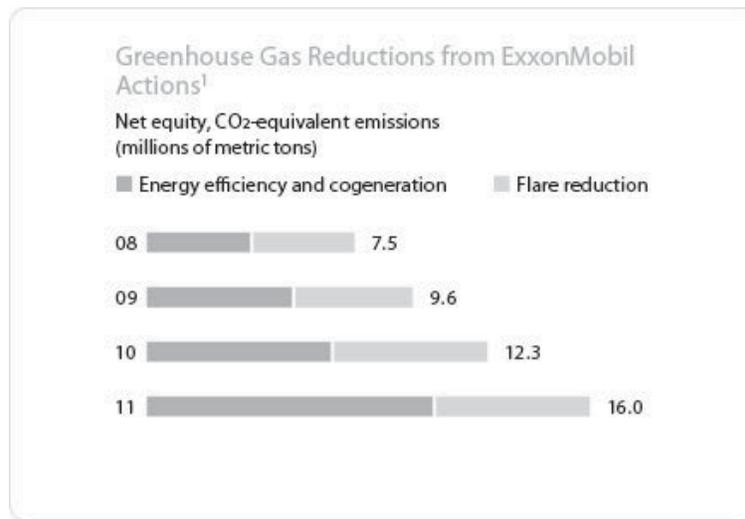


CHART III<sup>191</sup>

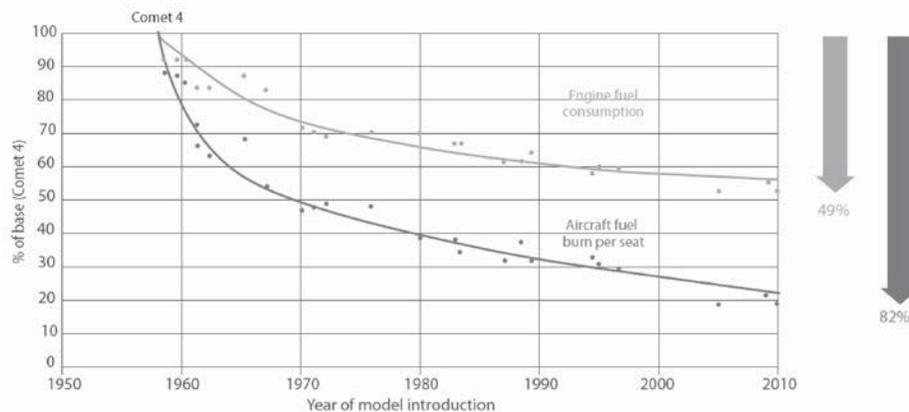


<sup>190</sup> IPIECA, SAVING ENERGY IN THE OIL AND GAS INDUSTRY 4 (2007), available at [http://www.ipieca.org/sites/default/files/publications/Saving\\_Energy.pdf](http://www.ipieca.org/sites/default/files/publications/Saving_Energy.pdf).

<sup>191</sup> 2011 CORPORATE CITIZENSHIP REPORT, EXXONMOBIL 24, available at [http://www.exxonmobil.com/Corporate/Files/news\\_pub\\_ccr2011.pdf](http://www.exxonmobil.com/Corporate/Files/news_pub_ccr2011.pdf) (last visited Nov. 19, 2013).

CHART IV<sup>192</sup>CHART V<sup>193</sup>

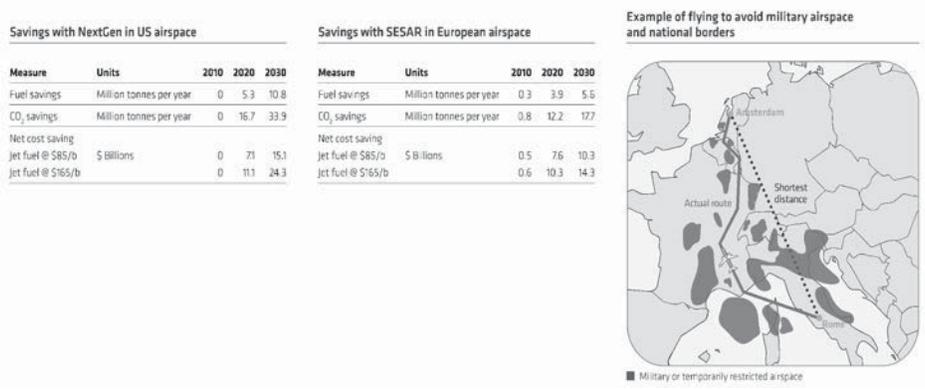
Fuel efficiency gains since the early jet age



<sup>192</sup> 2011 CORPORATE CITIZENSHIP REPORT, EXXONMOBIL 24, available at [http://www.exxonmobil.com/Corporate/Files/news\\_pub\\_ccr2011.pdf](http://www.exxonmobil.com/Corporate/Files/news_pub_ccr2011.pdf) (last visited Nov. 19, 2013).

<sup>193</sup> AIR TRANSPORT ACTION GROUP, BEGINNER'S GUIDE TO AVIATION EFFICIENCY 2 (Nov. 2010), available at <http://www.atag.org/component/downloads/downloads/59.html>.

CHART VI<sup>194</sup>



<sup>194</sup> AIR TRANSPORT ACTION GROUP, BEGINNER’S GUIDE TO AVIATION EFFICIENCY 2 (Nov. 2010), available at <http://www.atag.org/component/downloads/downloads/59.html>.