TEXAS ENVIRONMENTAL LAW JOURNAL

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ARTICLES

GREENHOUSE GAS PSD PERMITTING: THE YEAR IN REVIEW

Margaret E. Peloso & Matthew Dobbins

GROUNDWATER DISTRICT ENFORCEMENT Deborah Clarke Trejo

NOTES

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STATE BAR SECTION NEWS

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# TEXAS ENVIRONMENTAL

## LAW

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The purpose of the *Texas Environmental Law Journal* is to provide members of the Environmental and Natural Resources Law Section of the State Bar of Texas and the public with legal articles and recent development columns on relevant environmental and natural resources law issues. The *Journal* also provides news of Section activities and other events pertaining to this area of law. The *Journal* is the leading source for articles on Texas environmental and natural resources law.

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The Texas Environmental Law Journal is an official publication of the Environmental and Natural Resources Law Section of the State Bar of Texas and is published jointly with the University of Texas School of Law's Texas Environmental Law Journal. In 1990, the Environmental and Natural Resources Law Section reached an agreement with this student organization at the University of Texas School of Law to co-produce the Journal as the Texas Environmental Law Journal. The students' involvement began with the summer issue in 1990.

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With Volume 39, the *Journal* changed from a quarterly publication to a triannual publication (Fall, Winter, and Spring & Summer). Also, the *Journal* is no longer carrying the "Changes in the Environment" section. Those announcements can be found on the Section's website at www.texenrls.org.

### LETTER FROM THE EDITORS

Dear Readers,

In this issue's first Lead Article, "Greenhouse Gas PSD Permitting: The Year in Review," Margaret E. Peloso and Matthew Dobbins provide a detailed overview of the various permitting actions taken across the nation with regard to regulation of greenhouse gases (GHGs). Specifically, the Article provides a grounding in the Environmental Protection Agency's (EPA) Tailoring Rule, and the new Prevention of Significant Deterioration (PSD) permitting requirements. The authors focus on some specific case studies to evaluate how recent state and federal agency decisions related to coal gasification and carbon capture and sequestration (CCS) may impact future permitting options for facilities emitting GHGs. In addition, the article reviews the recently proposed new source performance standards (NSPS) and cautions readers on how these rules could also impact future CCS permit applications. Finally, the authors conclude that PSD permitting for GHGs and EPA's proposed NSPS are likely to pose significant challenges for future coal- and pet coke-fired generation projects.

In our second Lead Article, "Groundwater District Enforcement," Deborah Clark Trejo provides an overview of enforcement approaches for groundwater conservation districts (GCDs) and considers the mechanics of these approaches for the benefit of districts and regulated entities. In her Article, Ms. Trejo describes the enforcement authority provided to GCDs under Chapter 36 and Section 26.173 of the Texas Water Code. Next, Ms. Trejo discusses the civil lawsuit process for districts seeking to enforce their rules, and the process by which citizen suits may be filed. The author also reviews the additional enforcement tools provided to the Edwards Aquifer Authority. Ms. Trejo concludes by summarizing the various enforcement approaches districts are authorized to use, while noting that most districts prefer working with violators to settle matters over pursuing compliance by filing civil lawsuits.

In the first of two Student Notes, "Biodegradable Plastics: A Stopgap Solution for the Intractable Marine Debris Problem," **Olga Goldberg** examines the plastic marine debris problem ("the Great Pacific Garbage Patch"). This Note begins by discussing myths about the problem and associated industry backlash, and then moves to an explanation of current international attempts to resolve the problem. Following that explanation, Ms. Goldberg proposes a possible plan for developing international standards, and concludes her Note with a discussion of developments in biodegradable plastics and the potential consequences of the implementation of a biodegradable plastics regime. This Note proposes biodegradation standards for plastics using the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) as a temporary solution.

In our second Student Note, "Government Intervention in Clean Energy Technology during the Recession," **Aaron Tucker** analyzes the American Recovery and Reinvestment Act's (Recovery Act) effect on funding for sources of renewable energy—specifically, solar energy. Mr. Tucker observes that the government was slow to award appropriated funds to early-stage development of renewable energy sources, and opines that more Recovery Act funding should have been targeted for research, development, and commercialization of clean energy projects. However, the Article notes those companies able to attract a significant number of private investors are likely to be able to use their early-stage Recovery Act funding to scale up quickly and produce cost-saving results in the production of solar energy.

Lyn Clancy Editor-in-Chief

Sanja Muranovic Student Editor-in-Chief Texas Environmental Law Journal

# GREENHOUSE GAS PSD PERMITTING: THE YEAR IN REVIEW

## BY MARGARET E. PELOSO & MATTHEW DOBBINS

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#### I. INTRODUCTION<sup>1</sup>

According to the United States Environmental Protection Agency's (EPA) Tailoring Rule, regulation of greenhouse gases (GHGs) under the mobile source provisions of the Clean Air Act (CAA) triggered the requirement that all new major stationary sources of GHGs obtain permits under the CAA's New Source Review (NSR) permitting program as of January 2, 2011.<sup>2</sup> EPA's Tailoring Rule specifies higher

<sup>1</sup> The authors would like to thank Eric Groten of Vinson & Elkin's Austin office for his guidance and comments, which have greatly improved this article.

<sup>2</sup> Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514 (June 3, 2010) (codified at 40 C.F.R. pts. 51, 52, 70, & 71 (2010)) [hereinafter Tailoring Rule]. The Tailoring Rule was recently upheld by the D.C. Circuit. See Coalition

triggering thresholds than provided by statute, but EPA still expects 688 sources will be required to add GHG requirements to otherwise-required PSD permits each year, and additional sources will trigger PSD permitting requirements on the basis of GHG emissions alone.<sup>3</sup> To obtain a PSD permit, an applicant must demonstrate to the satisfaction of the permitting authority—typically an approved state agency—that its proposed facity will achieve an emission rate reflecting the use of Best Available Control Technology (BACT).<sup>4</sup>

In 2011 and the first quarter of 2012, EPA and various state permitting authorities issued at least 17 air quality permits reflecting BACT determinations for GHGs, and state agencies have issued at least three additional permits in 2012.<sup>5</sup> These 20 permits covered facilities in several different industries, including power generation, cement production, iron ore processing facilities, an oil refinery, and a mobile drilling platform.<sup>6</sup> Responsibility for these determinations was scattered among various federal and state permitting authorities.<sup>7</sup>

To assess potential emerging trends in GHG BACT determinations, this Article reviews the permits issued to date with GHG BACT limitations. To facilitate this analysis, we constructed a table summarizing information in available GHG BACT analyses, which is presented in Appendix A. Generally speaking, these determinations memorialize as GHG limits the energy efficiencies associated with the proposed facilities, ultimately not requiring alternative production technologies or any end-of-pipe controls.

However, these early decisions take nothing off the table: the recently finalized permit for Indiana Gasification's proposed coal gasification and enhanced oil recovery (EOR) project,<sup>8</sup> the reconsideration of the permit for Taylorville Energy Center's coal

for Responsible Regulation v. EPA, No. 09-1322, slip op. at 16 (D.C. Cir. June 26, 2012). The court concluded that none of the petitioners had standing because they suffered no injury as a result of the Tailoring Rule. *Id.* at 77. The Tailoring Rule does not directly obligate stationary sources to obtain PSD Permits for GHGs. The CAA itself triggers the permitting requirement, but the Tailoring Rule limits the application of the PSD program by raising the threshold for permitting with respect to GHGs. While EPA's 2009 endangerment finding determined that GHGs pose a threat to public health or welfare, the Agency declined to set National Ambient Air Quality Standards for GHGs. Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009) (to be codified at 40 C.F.R. ch. 1).

- 3 See 75 Fed. Reg. at 31537.
- 4 42 U.S.C. § 7475(a)(4).
- 5 See Appendix A.
- 6 Id.

<sup>7</sup> See EPA, COMMENT LETTERS ON GHG PERMITTING ACTIONS, http://www.epa.gov/nsr/ghgcomment.html (last updated Apr. 20, 2012) (providing links to EPA comment letters on the issued permits and additional proposed PSD permits with GHG BACT limitations) [hereinafter GHG Comment Letters]. The requirements of the final permits issued are detailed in Appendix A.

<sup>8</sup> Throughout this article, the terms CCS and EOR are used to distinguish between the geologic sequestration of  $CO_2$  solely for pollution control purposes (CCS) and the injection of  $CO_2$  for beneficial use in oil and gas production (EOR). Although EPA's proposed new source performance standards for GHG emissions from EGUs suggest that EPA views CCS

gasification and carbon capture and sequestration (CCS) project, and the recently proposed new source performance standards (NSPS) could limit the precedential value of these early case-by-case decisions. This article discusses how permits setting emission limits consistent with CCS or EOR and EPA's proposed NSPS for electric generating units (EGUs) may pose challenges for future project developers.

The NSPS and the precedent set by each PSD permit represent the most important factors shaping future BACT determinations. According to EPA's NSR Manual (NSR Manual), once a technology has been used in a particular application, it must be deemed "available" in subsequent BACT analyses.<sup>9</sup> Therefore, for example, the approval of PSD permits that require CCS will introduce substantial complications for permit applicants in the same industry who do not intend to pursue CCS. The permit for the Indiana Gasification project in Indiana, and potential modifications to the Taylorville Energy Center's permit under reconsideration, are examples of such a permit. Furthermore, once an NSPS has been set for a particular source, it serves as the BACT floor, meaning that no BACT analysis may adopt a control technology less stringent than that specified in the NSPS.<sup>10</sup> This Article examines these issues in detail and discusses how they may impact future PSD permit applicants.

#### **II. PSD PERMITTING AND THE BACT ANALYSIS**

### A. GHGs AND PSD PERMITTING

Beginning on January 2, 2011, PSD permitting requirements for GHGs went into effect for all new and modified stationary sources emitting more than 75,000 tons per year (tpy) of  $CO_2$  equivalent ( $CO_2e$ )<sup>11</sup> for projects otherwise subject to major source permitting requirements under the CAA.<sup>12</sup> Starting on July 1, 2011, any new or modified sources emitting 100,000 tpy  $CO_2e$  also became subject to the PSD permitting requirements, even if the CAA's requirements were not triggered by other pollutants emitted by the proposed project.<sup>13</sup>

The CAA requires that a PSD permit contain emissions limitations based on the BACT for each regulated pollutant. As discussed below, the BACT determination involves a case-by-case analysis by the permitting authority, with consideration given to the energy, economic, and environmental impacts of various pollution control technologies identified for the proposed facility.<sup>14</sup> Currently, all but seven states administer

- 12 See 40 C.F.R § 51.166(b)(48).
- 13 Id.
- 14 42 U.S.C. § 7479(3).

and EOR as the same thing, we feel that it is important to distinguish between EOR–the injection of  $CO_2$  for a subsequent, profitable use, typically by a third party–with geologic CCS employed solely as a GHG emissions control technology.

<sup>9</sup> EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, at B.5 (Draft Oct. 1990), *available at* http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf [hereinafter NSR Manual].

<sup>10 42</sup> U.S.C. § 7411.

<sup>11</sup> CO<sub>2</sub>e includes carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, weighted by global warming potential. 40 C.F.R. § 52.21(b)(49)(i).

their own PSD program. EPA handles GHG PSD permitting in Arkansas, Arizona, Florida, Idaho, Oregon and Wyoming–all of which submitted to a "voluntary" federal implementation plan for GHG permitting–but these states retain primacy with respect to other regulated pollutants.<sup>15</sup> In these instances, permit applicants make a submission for other pollutants regulated under the CAA to the state regulator and make a submission for GHGs directly to EPA. When EPA retains authority to issue PSD permits, the requirements of the Endangered Species Act (ESA)<sup>16</sup> and the National Historic Preservation Act (NHPA)<sup>17</sup> also become part of the permitting process.<sup>18</sup> Permit applicants must analyze their proposed projects for any potential impacts on endangered or threatened species and historical properties and submit those findings as part of their PSD permit application.

In Texas, because EPA partially disapproved Texas' state implementation plan, EPA directly administers GHG permitting.<sup>19</sup> As with those states that voluntarily submitted to the federal implementation plan for GHG permitting, Texas retains primacy with respect to other regulated pollutants.<sup>20</sup> EPA also retains permitting authority for activities on the Outer Continental Shelf and may comment on any draft permit prepared by any state agency before the final permit is issued.

As noted above, at least 20 final PSD permits with GHG limits have been issued to date, and more are on the way.<sup>21</sup> Michigan approved three permits,<sup>22</sup> while California, Iowa, Kansas, Louisiana, Minnesota, New York, North Carolina, Pennsylvania, Utah,<sup>23</sup> Wisconsin, Indiana and Illinois each issued one. EPA also issued permits for facilities in California and Texas, as well as one for an offshore drilling unit in the Gulf of Mexico. Although EPA deferred GHG permitting require-

<sup>15</sup> See EPA, CLEAN AIR ACT PERMITTING FOR GREENHOUSE GAS EMISSIONS-FINAL RULES FACT SHEET (2010), *available at* http://www.epa.gov/nst/ghgdocs/20101223factsheet.pdf.

<sup>16 16</sup> U.S.C. § 1531.

<sup>17 16</sup> U.S.C. § 470.

<sup>18</sup> See Sharon Mattox and Matthew Dobbins, The Federal Nexus in EPA GHG Permitting: Additional Burdens on Permit Applicants, Vinson & Elkins Climate Change Report, June 12, 2012, Issue 18. EPA also independently performs an Environmental Justice analysis. See Exec. Order 12,898, 3 C.F.R. 859 (1995), reprinted as amended in 42 U.S.C. § 4321 (1994 & Supp. VI 1998) [hereinafter E.J. Order]. The E.J. Order requires agencies to identify and address any disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Applicants should be aware of this requirement, however, the analysis associated with the E.J. Order fall on EPA and not directly on the permit applicant.

<sup>19 76</sup> Fed. Reg. 25,178 (May 3, 2011).

<sup>20</sup> Id.

<sup>21</sup> See GHG Comment Letters, *supra* note 7. The requirements of the final permits issued are detailed in Appendix A.

<sup>22</sup> A copy of the Michigan Department of Environmental Quality's BACT review was not available to the public.

<sup>23</sup> A copy of the Utah Department of Environmental Quality's BACT review was not available to the public.

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ments for biomass-fired facilities for the next three years,<sup>24</sup> at least three of the stateissued permits cover biomass facilities.<sup>25</sup>

## **B. OVERVIEW OF BACT ANALYSIS**

In 1977, Congress amended the CAA and added the PSD program.<sup>26</sup> Under the PSD program, major stationary sources<sup>27</sup> in attainment areas must obtain a permit prior to beginning construction or performing certain modifications.<sup>28</sup> PSD permitting for conventional pollutants includes a review of potential control technologies as well as an air quality impact review.<sup>29</sup> However, for GHGs, the air quality impact assessment is excluded.<sup>30</sup>

The CAA requires that a PSD permit contain emissions limitations based on the application of the BACT for each regulated pollutant. "BACT can be add-on control equipment or" a change in work practice.<sup>31</sup> BACT requires a case-by-case analysis to select emissions limitations based on the level of pollutant emissions reduction, feasibility of application, and the energy, economic, and environmental impacts associated with a certain control technology.<sup>32</sup> "EPA recommends that permitting authorities" use its "top-down' BACT process for determining BACT," and that states continue to follow this same process for determining BACT for GHG emissions.<sup>33</sup>

- 32 See 42 U.S.C. § 7479(3).
- 33 GHG Permitting Guidance, supra note 30, at 17.

<sup>24</sup> Deferral of CO<sub>2</sub> Emissions From Bioenergy and Other Biogenic Sources Under the PSD and Title V Programs, 76 Fed. Reg. 43,499 (July 20, 2011).

<sup>25</sup> See GHG Comment Letters, supra note 7, specifically: Letter from Becky Weber, Director Air & Waste Mgmt Div, U.S. EPA to John Mitchell, Director KS Dep't of Health & Env't, Re: Abengoa Bioenergy Biomass of Kansas, LLC PSD & 112(g) Permitting Comments (Apr. 1, 2011), available at http://epa.gov/nsr/ghgcomment.html; Letter from Terry Loughlin, Mngr.-Special Projects, Air Quaility, We Energies to Steven Dunn, Bur. of Air Mgmt. WI Dept. Natural Res., WI Electic Power Company Biomass Energy Project Comments on Draft Permit No. 10-SDD-058 (Mar. 2, 2011); Letter from Kathleen Cox, Assoc. Director, Office of Permits & Air Toxics, U.S. EPA to John Guth, Regional Manager, Air Quality Program, PA Dep't Envtl. Prot., Re: Proposed Plan Approval for Crawford Renewable Energy, LLC, Timederived Fuel to Energy Project PA-2035A (Aug. 10, 2011).

<sup>26</sup> 42 U.S.C. §§ 7401-7671 (2006).

<sup>27</sup> The CAA defines a "major stationary source" in the context of the PSD program as any source that emits or has the potential to emit 100 or more tpy of any pollutant and the source falls within one of 26 listed categories, or the source emits more than 250 tons per year of any pollutant. 42 U.S.C. § 7479(1). The listed categories include electric generating facilities and certain metal smelters. See 42 U.S.C. § 7479(1).

<sup>28</sup> 42 U.S.C. § 7475(a). A modification results when a significant increase in the emissions of any regulated pollutant occurs or when new pollutants are emitted. 42 U.S.C. § 7411(a)(4).

<sup>29</sup> 42 U.S.C. § 7475(a)(3), (4).

<sup>30</sup> Per EPA's guidance for GHG permitting, applicants are not required to conduct an air quality impact review for GHGs. See EPA, PSD and TITLE V PERMITTING GUIDANCE FOR GREENHOUSE GASES, 47-48 (Nov. 2010), available at http://www.epa.gov/nsr/ghgpermitting. html [hereinafter GHG Permitting Guidance]. See also Tailoring Rule, supra note 1 at 31,520.

<sup>31</sup> See EPA, Prevention of Significant Deterioration (PSD) Basic Information, http://www. epa.gov/NSR/psd.html#best (last updated Jul. 22, 2011).

EPA's top-down BACT process involves the following five steps:

- Step 1 Identify all available control technologies.
- Step 2 Eliminate technically infeasible options.
- Step 3 Rank remaining control technologies.
- Step 4 Evaluate most effective controls and document results.
- Step 5 Select the BACT.<sup>34</sup>

Under EPA's top-down BACT process, available control technologies are identified and ranked in order of descending control effectiveness. The top-ranked option is then required to be selected as BACT unless it is dismissed under Step 2 as technically infeasible or under Step 4 because energy, environmental, or economic impacts justify a conclusion that the top-ranked technology is not achievable for the proposed source or modification.

Typically, an applicant prepares its own BACT analysis<sup>35</sup> with the assistance of a consultant and then submits its analysis to the appropriate agency for an independent review. The applicant's BACT analysis will consider a range of potential control options and weigh them using the top-down BACT analysis described above. Upon submission, the reviewing agency will conduct its own BACT analysis and may reach different conclusions than those of the applicant. As a result, the state BACT analysis may raise different issues and conclude that control technologies not considered by the applicant are required. Of the publicly available state BACT analyses for the 17 issued permits with GHG BACT limits, only South Dakota differed significantly with the applicant's analysis, finding that terrestrial sequestration was technically feasible in its analysis of the proposed Hyperion facility.<sup>36</sup> However, the South Dakota Department of Environment and Natural Resources (DENR) ultimately reached the same conclusion as the applicant regarding the appropriate BACT because DENR eliminated terrestrial sequestration in Step 4 of the BACT analysis.<sup>37</sup>

### **III. MAJOR ISSUES IN GHG BACT DETERMINATIONS**

The two major issues raised by undertaking BACT reviews for GHG are: (1) whether the permitting authority may require the source owner to "redefine the source"; and (2) whether the BACT review may lead to compulsory use of CCS. EPA's comment letters on GHG permits stress that state agencies must carefully consider CCS as an option and that EPA expects the permitting authority to justify its rejection of CCS as BACT.<sup>38</sup> Since EPA administers PSD permitting for GHG in Texas, these

<sup>34</sup> Id. at 18.

<sup>35</sup> For example, a source must provide in its application: "A detailed description as to what system of continuous emission reduction is planned for the source or modification, emission estimates, and any other information necessary to determine that best available control technology would be applied." 40 C.F.R. § 52.21(n)(iii).

<sup>36</sup> S.D. Dep't of Env't & Natural Res., Statement of Basis Construction Deadline Extension Request for the Prevention of Significant Deterioration Permit #280701 36–37 (2011).

<sup>37</sup> Id. at 40.

<sup>38</sup> Letter Enclosure from Jeffery Robinson, Chief, Air Permits Section, U.S. EPA Region 6, to Tegan Treadway, Administrator, Office of Envtl. Services, La. Dep't of Envtl. Quality, 6 (Jan.

issues have even greater potential to affect projects subject to PSD permitting. This section begins with an examination of the issues of source redefinition and whether GHG BACT analysis has been used to require CCS. This section then provides an overview of the permit issued to the Lower Colorado River Authority (LCRA) for the Thomas C. Ferguson Plant in Texas. The LCRA permit was the first permit issued by EPA under the Federal Implementation Plan for GHG permitting in Texas.

### A. SOURCE REDEFINITION REMAINS AN OPEN ISSUE

BACT is defined as the maximum degree of emission limitation that the permitting authority "determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques . . . . "<sup>39</sup> Although the basis for a BACT analysis is to be the facility as proposed by the applicant, it is often contended that the BACT determination can be used to direct the means of production, and not just the emission controls that may be imposed upon a project as proposed by the permit applicant. As one EPA decision stated, BACT is "a review of which design elements [are] inherent to [the project] purpose and which design elements could be changed to achieve pollutants emissions reductions without disrupting the applicant's basic business purpose,"40 reflecting the view that BACT is simply a means to establish pollution controls for pre-determined projects. For example, under the former view, a power plant's "basic business purpose" would be to generate electricity, implying that the BACT analysis should consider a range of power generation technologies and fuel sources and force the adoption of that technology with the lowest emissions. This view would allow the permitting agency to redefine a source for emissions control purposes.

Since the 1988 decision in the PSD appeal of *Pennsauken County, New Jersey, Resource Recovery Facility*,<sup>41</sup> the prevailing view among both industry and EPA was that BACT determinations could not redefine the source. *Pennsauken* involved a local citizen who objected to the proposed facility itself as opposed to a specific control technology. The petitioner argued that the Administrator should reject a PSD permit for the construction of a municipal waste combustor in favor of a facility that would burn a mixture of 80% coal and 20% refuse.<sup>42</sup> EPA noted that "[t]he permit conditions that define these systems are imposed on the source as the applicant has defined it."<sup>43</sup> EPA

- 42 Id.
- 43 Id.

<sup>7, 2011),</sup> available at http://www.epa.gov/nsr/ghgdocs/20110107nucoriron.pdf. See also GHG Permitting Guidance, *supra* note 30 at 36–38.

<sup>39 42</sup> U.S.C. § 7479(3) (1990).

<sup>40</sup> American Electric Power Service, 2009 WL 7698416, 9 (EPA Dec. 15, 2009) (objecting to a state agency's determination that IGCC at a standard coal-fired power plant would "redefine the source). Compare with East Kentucky Power Coop., Inc., Petition from Sierra Club to Administrator of the U.S. E.P.A., 2008 WL 8415635 (Apr. 28, 2008) (denying environmental groups' petition to object to a state agency's determination that IGCC as an add-on control at a standard coal-fired power plant would "redefine the source).

<sup>41</sup> Pennsauken County, 2 E.A.D. 667 (EAB 1988).

further stated that the conditions in PSD permits, such as BACT determinations, are "not intended to redefine the source."<sup>44</sup>

The CAA states that BACT applies to the "proposed facility."<sup>45</sup> The plain meaning of the statute suggests that BACT involves determining add-on controls based on the applicant's proposal. The CAA does not provide EPA with the ability to fundamentally change the nature of the applicant's proposed facility. *Pennsauken* noted that, although the imposition of BACT controls might affect the viability of the applicant's proposal, BACT controls are not meant as a mechanism for redefining the proposed project.<sup>46</sup> EPA's decision in *Pennsauken* follows the plain meaning of the CAA, and recognizes that, although BACT determinations may affect the project owner's emission control designs, these determinations also have inherent limitations. In 1990, EPA reiterated in its NSR Manual that the agency has not used the BACT process to redefine a source.<sup>47</sup> However, the NSR Manual noted that states have discretion to "engage in a broader analysis if they so desire."<sup>48</sup>

Although an applicant initially defines the proposed facility's basic design and purpose, the permitting agency must take a "hard look" at the applicant's determination.<sup>49</sup> The appeal of *Prairie State Generating Company* involved a challenge to the Illinois EPA's (IEPA) rejection of the petitioner's proposal that the application be required to use low-sulfur coal at a mine-mouth coal plant<sup>50</sup> because it would redefine the source.<sup>51</sup> IEPA consistently argued that requiring the use of low-sulfur coal at the proposed facility redefined the source because the applicant designed the plant to burn local coal from the area immediately surrounding the proposed facility.<sup>52</sup> IEPA's BACT determination focused on "the appropriate control technology for SO<sub>2</sub> emissions associated with use of this coal at the proposed plant."<sup>53</sup> The petitioner argued that IEPA improperly excluded a "clean fuel" alternative that it was required to consider under the CAA's regulations.<sup>54</sup>

In evaluating the appeal, EPA found it significant that all the parties agreed "Congress intended the permit applicant to have the prerogative to define certain aspects of the proposed facility that may not be redesigned through application of BACT and that other aspects must remain open to redesign through the application of BACT."<sup>55</sup> EPA specifically rejected the petitioner's argument that "an electric gen-

- 47 NSR Manual, supra note 9, at B.13.
- 48 Id.
- 49 See Prairie State Generating Co., 13 E.A.D. 1, \*14-20 (EAB 2006) (noting that the NSR Manual's admonition not to redefine a source does not prevent the permitting agency from taking a "hard look" at the facility to determine if it may be improved to reduce pollution emissions).
- 50 A mine-mouth coal plant is sited at the location of the coal deposit.
- 51 Prairie State Generating Co., 13 E.A.D. at \*10.
- 52 Id. at \*13.
- 53 Id. at \*14.
- 54 Id.
- 55 Id. at \*17.

<sup>44</sup> Id.

<sup>45 42</sup> U.S.C. § 7475(a)(4).

<sup>46</sup> Pennsauken County, 2 E.A.D. 667.

erating facility's purpose must be viewed as broadly as 'the production of electricity, from coal'" and that it was EPA's long-standing policy that "certain fuel choices are integral to the electric power generating station's basic design."<sup>56</sup> EPA therefore concluded that IEPA properly rejected low-sulfur coal as BACT.<sup>57</sup>

On appeal to the Seventh Circuit, the court affirmed EPA's decision against the objections of the project's environmental group opponents.<sup>58</sup> The court noted that, although low sulfur coal was a "clean fuel" and so should normally be considered in a BACT determination, the use of such coal at this specific mine-mouth facility would require "significant modifications" to the facility.<sup>59</sup> Bringing in low-sulfur coal would require a rail spur and other facilities for the loading and unloading of coal.<sup>60</sup> The Seventh Circuit noted that requiring low-sulfur coal at this facility, even if it was designed to burn only high-sulfur coal, would not impermissibly redesign the facility.<sup>61</sup> Rather, consideration of low-sulfur coal was not appropriate "*because it necessarily involves a fuel source other than the co-located mine*, [that] would require Prairie State to redefine the fundamental purpose or basic design of its proposed Facility . . . . .<sup>62</sup> Several state courts have similarly held that a BACT analysis does not have to include options that require the permit applicant to redefine its basic design.<sup>63</sup>

Several recent Environmental Appeals Board (EAB) decisions appear to conflict with the long-standing notion that BACT is not intended to redefine a proposed source. Despite a history of rejecting Integrated Gasification Combined Cycle (IGCC) systems for proposed pulverized coal boilers,<sup>64</sup> EPA remanded a draft permit in the appeal of *Desert Rock Energy Co., LLC*, because the permitting agency failed to consider IGCC for a conventional coal-fired power plant.<sup>65</sup> EPA's remand found that the permit issuer failed to provide a rational explanation as to why it believed that IGCC redefined the source.<sup>66</sup> Importantly, the applicant's initial application indicated that IGCC could satisfy the applicant's business purpose. EPA felt that the permit issuer's

- 60 Id at 655.
- 61 Id. at 656.
- 62 Id. at 657.
- 63 See Powder River Basin Res. Council v. Wyo. Dep't of Envtl. Quality, 226 P.3d 809 (Wyo. 2010) (upholding the permitting agency's decision that requiring the proposed plant to adopt supercritical boiler technology would force it to make substantial changes to its proposed design). But see Utah Chapter of the Sierra Club v. Air Quality Bd., 226 P.3d 719 (Utah 2009) (finding that the permitting agency should have considered IGCC at coal plant as part of its BACT determination). See also Blue Skies Alliance v. Tex. Comm'n Envtl. Quality, 283 S.W.3d 525, 533-37 (Tex. App.—Amarillo 2008, no pet.) (finding that any technology that cannot be applied to the facility that the applicant proposes is outside the scope of the required BACT analysis).
- 64 See East Kentucky Power Coop., Inc., Petition No. IV-2006-4 at 40 (EPA Aug. 30, 2007) (finding that the IGCC process would redefine the source).
- 65 PSD Appeal Nos. 08-03, 08-04, 08-05, and 08-06, 2009 WL 3126170 (EAB Sept. 24, 2009).

<sup>56</sup> Id. at \*20.

<sup>57</sup> Prairie State Generating Co., 13 E.A.D. at \*20.

<sup>58</sup> See Sierra Club v. EPA, 499 F.3d 653 (7th Cir. 2007), reh'g denied, 2007 U.S. App. LEXIS 24419 (7th Cir. 2007).

<sup>59</sup> Id. at 654–55.

<sup>66</sup> Id. at 2.

lack of justification and the applicant's position on IGCC meant that the issuer could not eliminate IGCC at Step 1 of the BACT determination.<sup>67</sup>

Subsequent EAB decisions appear to follow a similar trend and push for the consideration of alternatives that EPA traditionally had viewed as redefining the source. In 2009, EPA again objected to a permit issuer's BACT analysis for its failure to consider IGCC as BACT for a conventional coal plant.<sup>68</sup> Similar to the decision in *Desert Rock*, EPA found that the Arkansas Department of Environmental Quality (ADEQ) failed to provide sufficient justification for its decision to exclude IGCC from the ADEQ's BACT analysis.<sup>69</sup> Arkansas based its decision to exclude IGCC on the grounds that IGCC involves "fundamental" equipment design differences from a pulverized coal boiler.<sup>70</sup> EPA found that the record did not support the state's conclusion regarding source redefinition. This decision and *Desert Rock* seem to establish the principle that a party must provide a detailed and thorough explanation for the argument that a potential control technology would redefine the source and calls for a "harder look" than previous EPA permit decisions.

Despite EPA's apparent affinity for IGCC, EPA also objected to Kentucky's BACT analysis for an IGCC plant due to the permit issuer's failure to consider natural gas an alternative primary fuel.<sup>71</sup> Similar to prior decisions, EPA found that the record failed to provide justification for the permit issuer's conclusion that natural gas could not serve as the primary fuel for the proposed facility.<sup>72</sup> Importantly, the permit record indicated that the facility planned to use natural gas in its turbines during its six month start-up period.<sup>73</sup> EPA questioned why natural gas was appropriate only as a start-up fuel and not as the primary fuel for the proposed facility.<sup>74</sup> EPA remanded the permit for a more thorough BACT analysis regarding the primary fuel for the proposed facility.<sup>75</sup>

What do these decisions mean? As one attorney for a national environmental group put it, these decisions signify that "[c]ontrol technology for conventional coal is IGCC and control technology for IGCC is natural gas."<sup>76</sup> At the very least, these decisions demonstrate the growing tension within the BACT process regarding source redefinition, and the resulting paralysis by analysis.

EPA continues to demand greater and greater justification for a permit issuer's decision that a potential control redefines the proposed source. For example, EPA

<sup>67</sup> Id.

<sup>68</sup> American Electric Power Service Corp., Petition No. VI-2008-01, 2009 WL 7698416 (EPA Dec. 15, 2009).

<sup>69</sup> Id.

<sup>70</sup> Id. at 7.

<sup>71</sup> See Cash Creek Generation, LLC, Permit No. V-07-017, 2009 WL 7513857 (EPA Dec. 15, 2009)

<sup>72</sup> Id. at 4.

<sup>73</sup> Id.

<sup>74</sup> Id.

<sup>75</sup> Id. at 7.

<sup>76</sup> Robin Bravender, Arkansas Must Consider Gasification Technology as Pollution Control-EPA, GREENWIRE (Jan. 14, 2010), available at http://www.eenews.net/Greenwire/2010/01/14/10 (quoting David Bookender, Sierra Club's chief climate counsel).

Region V recently required the Wisconsin Department of Natural Resources (WDNR) to revise a BACT analysis for a wastewater treatment facility.<sup>77</sup> The project involved replacing two existing simple-cycle turbines with five new simple-cycle turbines.<sup>78</sup> EPA's comment letter states that combined-cycle or combined heat and power systems provide for greater efficiency and lower GHG emissions and should therefore be considered in Step 1 of WDNR's BACT analysis.<sup>79</sup> Whether this action represents a mere comment or major policy shift to requiring the use of combined-cycle turbines is unclear. Additionally, EPA Region IX is considering whether to require a proposed simple-cycle 300-megawatt natural gas-fired peaking plant that will serve as a backup to a renewable power facility in California to upgrade to combined-cycle turbines.<sup>80</sup> Simple-cycle turbines allow for easy plant start-up and shut down to meet energy demands. A peaking plant, by definition, requires the ability to easily start up and shut down to meet power demands. Requiring turbines as BACT that make it more difficult for the proposed plant to fulfill its designed purpose would continue to push the boundaries of source redefinition and could test the statutory and regulatory reach of EPA's PSD permitting power.

The many proceedings in which the boundaries of source redefinition has been raised have not fully resolved the extent of EPA's authority, which takes on greater importance as GHGs (ubiquitous to almost every human activity) become integrated in to the PSD program and the BACT determination universe. EPA's GHG Permitting Guidance states that applicants need not identify control options that fundamentally redefine the source or the applicant's purpose.<sup>81</sup> Therefore, if the use of a lower emitting fuel or process change would require a complete redesign of source, the applicant's BACT analysis does not need to include the alternative. For example, under EPA's interpretation of source redefinition, a proposed coal-fired power plant would not be required to consider the alternative of building a natural gas-fired plant under the BACT analysis. However, as discussed in Part V, the proposed NSPS for EGUs combined with PSD permitting requirements may effectively require switching from coal to gas for new EGUs.

In practice, most GHG BACT analyses completed to date have not considered control options that would redefine the source.<sup>82</sup> Some GHG BACT analyses select inherently lower emitting processes and energy efficient design.<sup>83</sup> However, these analyses ratify the proposed facility's selected design on the grounds that its emissions

<sup>77</sup> See Dawn Reeves, EPA Requires Review of 'Combined-Cycle' Gas Turbine for GHG BACT, Clean Energy Report March 22, 2012).

<sup>78</sup> Letter from Genevieve Damico, Chief, Air Permit Section, U.S. EPA Region 5, to Andrew Stewart, Chief, Bureau of Air Mgmt., Wis. Dep't of Nat. Resources at 1 (Mar. 15, 2012).

<sup>79</sup> Id. at 2.

<sup>80</sup> Reeves, supra note 77.

<sup>81</sup> GHG Permitting Guidance, *supra* note 30, at 26.

<sup>82</sup> See generally Appendix A (detailing GHG BACT requirements at recently permitted facilities).

<sup>83</sup> EPA, PSD Permit for Greenhouse Gas Emissions PSD-TX-1244-GHG, 7, LCRA Thomas C. Ferguson Power Plant 2 (Nov. 11, 2011), *available at* http://www.epa.gov/region6/6pd/ air/pd-r/ghg/lcra\_final\_permit.pdf (establishing BACT as a combined cycle design for the Lower Colorado River Authority's natural gas-fired boilers) [hereinafter LCRA GHG Permit]; *see also* PSD-CA-SE-09-01, 30.

will be lower than other means of electricity generation.<sup>84</sup> In addition, there are three facilities at which GHG BACT options have been considered and rejected on the grounds that they would redefine the source. At the George Neal North and South facilities, the Iowa Department of Natural Resources considered and rejected IGCC as a control technology for coal-fired boilers because it would redefine the source.<sup>85</sup> At the We Energies (Wisconsin Electric Power Company) facility, the WDNR considered and rejected the use of renewable fuels as BACT for the natural gas-fired boiler at the facility, finding that it would redefine the source.<sup>86</sup>

### B. CCS HAS NOT YET BEEN REQUIRED AS BACT

EPA's GHG permitting guidance makes clear that applicants with high-purity CO<sub>2</sub> streams—including hydrogen production, ammonia production, natural gas processing, ethanol production, ethylene oxide production, cement production, and iron and steel manufacturing—should consider CCS. The GHG Permitting Guidance recognizes other factors, such as cost, may make CCS infeasible at this time.<sup>87</sup> However, the GHG Permitting Guidance expressly states that EPA expects that such obstacles will be lowered in the future.<sup>88</sup>

In nearly every GHG BACT analysis considered to date, the applicants have evaluated CCS as a control option. So far, no project has adopted CCS or other forms of carbon sequestration or beneficial reuse as BACT, but their reasons for rejecting these control technologies vary.<sup>89</sup> Most projects that consider CCS split the technical feasibility analysis, independently assessing the technical feasibility of CO<sub>2</sub> capture and geologic sequestration.<sup>90</sup> Many of these analyses find that neither capture nor sequestration is feasible. For processes in which the GHGs are not produced in a high purity stream, such as typical combustion processes, BACT analyses tend to conclude that technologies to purify the CO<sub>2</sub> stream, such as amine separation, are not feasible because they have not yet been demonstrated at the commercial scale.<sup>91</sup> The analysis of geologic sequestration tends to vary from site to site, but usually focuses on any assessments that have been conducted of the availability of nearby sequestration sites. In addition, in a few cases, applicants have concluded that CCS is not feasible because the legal and regulatory regime governing CCS activities is too poorly defined.<sup>92</sup> State and EPA reviews often eliminate CCS on technical feasibility grounds due to the need

<sup>84</sup> Id.

<sup>85</sup> PSD-IA-11-160, 15 (George Neal North); see also PSD-IA-10-658, 13 (George Neal South).

<sup>86</sup> PSD-WI-10-SDD-058, 27.

<sup>87</sup> GHG Permitting Guidance, *supra* note 30, 43-44.

<sup>88</sup> Id.

<sup>89</sup> See generally infra Appendix A (detailing GHG BACT requirements at recently permitted facilities).

<sup>90</sup> Id.

<sup>91</sup> Id.

<sup>92</sup> KAN. DEP'T OF HEALTH & ENVIRONMENT, DRAFT EVALUATION OF ABENGOA BIOENERGY BIOMASS OF KAN., LLC PROPOSED GHG BACT OPTIONS, PSD-KS-1890231, 18 (2011); see also PA. DEP'T OF ENVTL. PROT., REVIEW MEMO OF CRAWFORD RENEWABLE ENERGY, LLC'S APPLICATION, PSD-PA-2035A, 20 (2011).

to build pipelines,<sup>93</sup> lack of space to accommodate the footprint to build the unit,<sup>94</sup> or lack of a suitable sequestration reservoir.<sup>95</sup> Even sources with high-purity CO<sub>2</sub> streams eliminated CCS as BACT due to a lack of nearby enhanced oil recovery operations or other local sources with commercial CO<sub>2</sub> needs.<sup>96</sup>

Despite these technical obstacles, a few GHG BACT analyses have concluded that CCS is "available," but rejected it as BACT for both environmental and economic reasons. In some cases, GHG BACT analyses have found that the parasitic energy load of equipment required to dry and compress  $CO_2$  for capture is so great that it would actually increase the overall GHG emissions of the project.<sup>97</sup> Additionally, reviewing agencies have rejected CCS due to the increase of other criteria pollutants resulting from pipeline and compressor station construction.<sup>98</sup> However, in most instances, CCS was dismissed simply because of its significant costs.<sup>99</sup>

In addition to CCS, many GHG BACT analyses consider pre-combustion controls and energy efficient design and operation. Pre-combustion add-on controls for boilers were universally determined to be infeasible.<sup>100</sup> In reviews of potential add-on controls for coal and natural gas-fired boilers, state GHG BACT analyses found some pre-combustion controls, such as catalytic oxidation and thermal oxidation, infeasible because they would result in increased CO<sub>2</sub> emissions from other sources.<sup>101</sup>

#### C. OVERVIEW OF THE LCRA PERMIT

On November 11, 2011, EPA issued Texas' first GHG permit for the LCRA's Thomas C. Ferguson natural gas-fired power plant in Llano County.<sup>102</sup> The project involves the replacement of one 37-year-old, 440 MW steam boiler with two new, energy-efficient combined-cycle natural gas-fired turbines that use heat-recovery steam

- 95 N. Y. DEP'T ENVTL. CONSERV. STATE ENVTL. QUALITY REVIEW, 21 (2011).
- 96 LA. DEP'T OF ENVTL. QUALITY, PUBLIC COMMENTS RESPONSE SUMMARY, 62 (2011).
- 97 See infra Appendix A (listing GHG BACT Controls at Recently Permitted Facilities, in particular Russell City Energy Center, Palmdale Hybrid Energy Plant, and Abengoa Biomass).
- 98 S.D. DEP'T ENVIRONMENT & NAT. RESOURCES, STATEMENT OF BASIS CONSTRUCTION DEADLINE EXTENSION REQUEST FOR THE PREVENTION OF SIGNIFICANT DETERIORATION PERMIT #28.0701-PSD HYPERION ENERGY CENTER, 38 (2011).
- 99 KAN. DEP'T OF HEALTH & ENVIRONMENT, DRAFT EVALUATION OF ABENGOA BIOENERGY BIOMASS OF KAN., LLC PROPOSED GHG BACT OPTIONS, PSD-KS-1890231, 25 (2011) (discussing CCS for CO<sub>2</sub> from stoker boiler).
- 100 See, e.g., MINN. POLLUTION CONTROL AGENCY, DRAFT TECHNICAL SUPPORT DOCUMENT FOR PERMIT PSD-MN-13700063-004, 43 (2011).
- 101 S.D. DEP'T ENV'T & NAT. RES., STATEMENT OF BASIS CONSTRUCTION DEADLINE EXTENSION REQUEST FOR THE PREVENTION OF SIGNIFICANT DETERIORATION PERMIT #28.0701-PSD HYPERION ENERGY CENTER, 36 (2011); see also IOWA DEP'T OF NAT. RES. ENVTL. SVS. DIV. AIR QUALITY BUR., PREVENTION OF SIGNIFICANT DETERIORATION PERMIT REVIEW PSD-IA-PN-1160, 11 (2011).
- 102 Kate Gailbraith, EPA Issues First Texas Greenhouse Gas Permit, TEXAS TRIBUNE, Nov. 11, 2011, http://www.texastribune.org/texas-energy/energy/epa-issues-first-texas-greenhouse-gaspermit/.

<sup>93</sup> EPA REGION IX, FACT SHEET AND AMBIENT AIR QUALITY IMPACT REPORT, PSD-CA-SE-09-01, 28-29 (2011).

<sup>94</sup> EPA REGION IV, PRELIMINARY DETERMINATION AND STATEMENT OF BASIS, OCS-EPA-R4007, 32 (2011).

generators (HRSG) to generate up to 590 MW.<sup>103</sup> LCRA plans a two-year construction phase and hopes to bring the project online in 2014.<sup>104</sup> Overall, the project is expected to cost between \$520 million and \$550 million.<sup>105</sup>

The permit issued to the LCRA by EPA imposes GHG limits on a variety of sources. In particular, the permit imposes numerical GHG limits on the facility's turbines, a diesel-fired emergency generator, a diesel-fired water pump, and the facility's sulfur-hexafluoride circuit breakers. <sup>106</sup> The permit also limits fugitive GHG emissions from the facility's piping systems.<sup>107</sup>

As part of its BACT analysis, EPA examined two other GHG permits to review possible control technologies for the natural gas-fired turbines.<sup>108</sup> The first permit EPA examined was that issued for the Russell City Energy Center, which incorporated a General Electric Rapid Response System (GERRS) for reducing start-up times and imposed an annual heat-rate limit of 7,730 Btu/kWh on the facility's combustion turbine.<sup>109</sup> LCRA proposed a limit of 7,720 Btu/kWh on its turbine.<sup>110</sup> The second permit EPA examined was that issued for the Palmdale Hybrid Energy project, which included solar equipment in the design of its natural gas-fired combustion turbine.<sup>111</sup> Based on the controls and emission limits in these previously approved projects, EPA requested additional information from LCRA about the feasibility of such measures at the Ferguson facility.<sup>112</sup> LCRA responded with information demonstrating, first, that its facility included GERRS-equivalent equipment, and second, that the inclusion of solar equipment at its facility would actually increase GHG emissions, because it would require installation of an additional boiler and heater.<sup>113</sup>

With regard to CCS, LCRA included in its application an additional cost analysis demonstrating that CCS was not technically feasible for the proposed facility.<sup>114</sup> LCRA's application noted that CCS projects captured GHGs from the exhaust of natural gas-fired combustion turbines, but found that CCS was not commercially available, based on an assessment by its vendor and a literature review.<sup>115</sup> Thus, LCRA concluded that CCS was not the BACT for its proposed facility's combustion turbines.<sup>116</sup>

114 Id.

116 Id.

<sup>103</sup> LCRA GHG Permit, supra note 83.

<sup>104</sup> Lower Colorado River Authority, Ferguson Replacement Project, http://www.lcra.org/ energy/power/facilities/fergusonstudy.html (last visited Mar. 3, 2012).

<sup>105</sup> Id.

<sup>106</sup> LCRA GHG Permit, supra note 83, at 2.

<sup>107</sup> Id.

<sup>108</sup> See EPA, STATEMENT OF BASIS: GREENHOUSE GAS PSD PRECONSTRUCTION PERMIT FOT THE LCRA THOMAS C. GERGUSON PLANT (PSD-TX-1244-GHG), Section VII (Sept. 2011) (reviewing GHG emission limits at the Russell City Energy Center and the Palmdale Hybrid Power Project), *available at* http://www.epa.gov/region6/6pd/air/pd-r/ghg/lcra\_sob.pdf.

<sup>109</sup> Id.

<sup>110</sup> Id.

<sup>111</sup> Id.

<sup>112</sup> Id.

<sup>113</sup> LCRA GHG Permit, supra note 83.

<sup>115</sup> Id. at 6.

EPA agreed that there was no specific evidence that CCS was available for LCRA's proposed facility.<sup>117</sup> EPA then turned to LCRA's cost analysis: installation of the necessary carbon controls and the construction of a pipeline to transport the facility's GHGs to the nearest sequestration site would cost over \$230 million.<sup>118</sup> These construction activities would also result in an increased energy penalty, decreasing efficiency at the proposed facility.<sup>119</sup> EPA concluded that, even if CCS was technically feasible for the LCRA facility, the cost of CCS prohibited its selection as the BACT.<sup>120</sup> EPA found that energy efficiency, specifically a combined-cycle system with HRSG, was the BACT for LCRA's project.<sup>121</sup>

Texas' first experience with GHG permitting does not appear to have required any changes solely for GHG pollution control. The energy efficiency controls in LCRA's permit should result in 30-45% less fuel use than in a traditional natural gas-fired plant.<sup>122</sup> Thus, at least one environmental group feels that the LCRA permit proves that Texas' fears concerning the impact of GHG permitting were unwarranted.<sup>123</sup> However, LCRA is only the first of the new GHG permits. Permitting for GHGs still resulted in additional burdens and transactional costs as compared to traditional PSD permitting. Additionally, LCRA did not encounter any ESA or NHPA issues. Future projects may not be so fortunate and could face substantial costs and delays to comply with the additional federal statutes triggered by EPA's issuance of a PSD permit. As of July 2012, at least ten other Texas plants have applied to EPA for GHG PSD permits issued in other states and issuance of GHG NSPS may result in new standards for Texas GHG permits.

#### D. FOR NOW, BACT IS EFFICIENCY

Because both CCS and pre-combustion controls tend to prove infeasible, energy efficiency measures dominate the GHG BACT controls approved by the states and EPA.<sup>125</sup> Adopted energy efficiency measures consist primarily of co-generation, good

<sup>117</sup> Id. (citing an Interagency Task Force report on CCS).

<sup>118</sup> Id. (reviewing GHG emission limits at the Russell City Energy Center and the Palmdale Hybrid Power Project).

<sup>119</sup> Id.

<sup>120</sup> Id. at 7.

<sup>121</sup> Id.

<sup>122</sup> Cathy Cash, US EPA issues GHG permit to gas-fired power plant in Texas, PLATTS (Nov. 10, 2011) (quoting LCRA General Manager Becky Motal), available at http://www.platts.com/ RSSFeedDetailedNews/RSSFeed/ElectricPower/3782047.

<sup>123</sup> Jim Marston, Once Again, Texas Cries Wolf Over the Issuing of Permits, ENVTL. DEFENSE FUND (Nov. 14, 2011) http://blogs.edf.org/texascleanairmatters/2011/11/14/once-again-texas-crieswolf-over-the-issuing-of-permits.

<sup>124</sup> Kate Gailbraith, EPA Issues First Texas Greenhouse Gas Permit, TEXAS TRIBUNE, Nov. 11, 2011, http://www.texastribune.org/texas-energy/energy/epa-issues-first-texas-greenhouse-gaspermit/.

<sup>125</sup> See e.g., BAY AREA AIR QUALITY MGMT. DIST., DRAFT FEDERAL PSD PERMIT ADDITIONAL STATEMENT OF BASIS AND SOLICITATION OF FURTHER PUBLIC COMMENT FOR THE PROPOSED RUSSELL CITY ENERGY CENTER PSD-CA-15487, 16 (2009) (finding no feasible post construction or combustion add-on controls for GHG).

combustion practices, and strict operation and maintenance (O&M) plans. GHG BACT determinations for turbine generators favored a combined-cycle design with a HRSG.<sup>126</sup> Importantly, GHG BACT analyses examined and sought to reduce GHG emissions across entire facilities, from circuit breakers to emergency generators. Applicants must be prepared to address GHG emissions from all aspects of a proposed project, no matter how small the source.

EPA's comments on the recent permit applications stress GHG BACT numerical limitations on sources and a thorough analysis of the feasibility of CCS. In letters to the Louisiana Department of Environmental Quality (LDEQ) regarding the Nucor Steel plant and the Utah Department of Environmental Quality (UDEQ) concerning the PacifiCorp Energy natural gas-fired power plant, EPA requested that both states add numerical limitations for CO<sub>2</sub>e emissions or provide a more detailed explanation for why such limits were infeasible. EPA also asked LDEQ for a more detailed analysis of the potential for CCS as a control option. LDEQ submitted a revised CCS determination, but refused to add a GHG BACT numerical limit.<sup>127</sup> UDEQ added the limit only after the applicant voluntarily agreed to accept EPA's request.<sup>128</sup> Environmental groups have petitioned EPA to challenge LDEQ's permit on the grounds that the permit fails to properly account for the proposed projects' GHG emissions and that the permit fails to set a proper GHG BACT limitation.<sup>129</sup>

Another issue on the horizon for BACT determinations is whether biomass as a fuel source represents BACT. Only one of the three states that permitted a biomass facility declined to address the issue of whether certain types of biomass are themselves BACT for GHGs. Wisconsin specifically stated that its GHG BACT determination did not conclude that certain types of biomass themselves were BACT.<sup>130</sup> The state's analysis focused on improving combustion and efficiency in the biomass-fired boiler.<sup>131</sup> Kansas, on the other hand, found that low-carbon and carbon-neutral fuels were BACT for GHGs.<sup>132</sup> Similarly, Pennsylvania accepted an applicant's determination that burning low-moisture, 20% biomass composition tires represented BACT for GHGs in a tire-derived fuel power plant.<sup>133</sup>

<sup>126</sup> Many of the applications already proposed to build a combined cycle design. See Bay Area Air Quality Mgmt. Dist., Statement of Basis for Draft Amended Federal "Prevention of Significant Deterioration" Permit PSD-CA-15487 (2008).

<sup>127</sup> LA. DEP'T OF ENVTL. QUALITY, supra note 96 at 25.

<sup>128</sup> Utah Dep't of Envtl. Quality, Response to Comments Received on PacifiCorp's Lake Side 2 Power Plant 2 (2011).

<sup>129</sup> Consolidated Envtl. Mgmt., Inc., Petition to the Administrator of the Environmental Protection Agency re Permits Nos. 2560-00281-V1 and 3086-V0, http://www.eenews.net/assets/2011/05/04/document\_pm\_03.pdf.

<sup>130</sup> WISCONSIN DEP'T NAT. RES., BUR. AIR MGMT., ANALYSIS AND PRELIMINARY DETERMINATION FOR THE PROPOSED CONSTRUCTION OF BIOMASS FUELED BOILER, A NATURAL GAS FIRED BOILER, AND ASSOCIATED EQUIPMENT, PSD-WI-10-SDD-058, 25 (JAN. 28, 2011).

<sup>131</sup> Id. at 26.

<sup>132</sup> Kansas Dep't of Health & Envt., Draft Evaluation of Abengoa Bioenergy Biomass of Kansas, LLC Proposed GHG BACT Options, PSD-KS-1890231, 11 (2011).

<sup>133</sup> PENNSYLVANIA DEP'T OF ENVTL. PROT., REVIEW MEMO OF CRAWFORD RENEWABLE ENERGY, LLC'S APPLICATION, PSD-PA-2035A, 20 (2011).

## IV. NEW PERMITS RAISE NEW CHALLENGES: TAYLORVILLE AND INDIANA GASIFICATION

GHGs have added new analytical requirements into the permit process, with attendant transactional costs and delays. Although to date these process burdens have not led to fundamental changes in the projects as envisioned by their developers, past performance is no guarantee of future results. The recently finalized permit for the Taylorville Energy Center in Illinois raises a significant possibility of judicial challenge over the IEPA's decision not to include GHG limits based upon CCS, even after the applicant requested a modification to the permit to include them. In addition, there is one recently issued permit and one permit under reconsideration for two separate facilities that may create challenges for future permittees: the Indiana Gasification Facility in Indiana and the Taylorville Energy Center in Illinois. These permits raise the possibility of GHG limits that effectively require CCS. However, there are many potential issues with the permit structure that could raise implementation challenges and questions remain about how they might impact facilities that would require postcombustion capture of  $CO_2$ . This section will examine these permits and explore how they may impact future permittees.

### A. TAYLORVILLE ENERGY CENTER

The Taylorville Energy Center is a proposed facility that will make synthetic natural gas (SNG) from coal to be used either for onsite electricity generation or sold for offsite uses.<sup>134</sup> However, the projected costs of producing power at the facility are high, and the Taylorville Energy Center has struggled to obtain state approval of a bill that would guarantee the purchase of its power output.<sup>135</sup> Despite this difficulty, the project has begun the permitting process, including applying for a permit that will include GHG limitations based on a BACT analysis.

The largest source of GHG emissions in the IGCC process proposed by the Taylorville Energy Center is the acid gas removal system in the production of SNG.<sup>136</sup> As proposed to the IEPA, the developer of the Taylorville Energy Center stated that it expects that, at some point during the lifetime of the project, the CO<sub>2</sub> emitted from the acid gas removal system will be captured and geologically sequestered.<sup>137</sup>

Although CCS is expected, on April 30, 2012, the IEPA issued the applicant a final permit that imposed numeric GHG emission limitations that did not account for CCS. As proposed, the Taylorville permit would establish a GHG emission limit

137 Id.

<sup>134</sup> Illinois Envtl. Prot. Agency, Construction Permit- PSD Approval Taylorville Energy Center 3 (Oct. 17, 2011).

<sup>135</sup> See Illinois Chamber of Commerce, Taylorville Energy Center Gets Green Light from Illinois Senate, Dec. 2, 2011, *available at* http://ilchamber.org/news/2905/taylorville-energy-centergets-green-light-from-illinois-senate/.

<sup>136</sup> ILLINOIS ENVTL. PROT. AGENCY, PROJECT SUMMARY FOR A CONSTRUCTION PERMIT APPLICATION FROM CHRISTIAN COUNTY GENERATION, LLC FOR THE TAYLORVILLE ENERGY CENTER 5 (2011), *available at* http://www.epa.state.il.us/public-notices/2011/christian-county-generation/ project-summary.pdf.

of 111.4 tons CO2e/million standard cubic feet of SNG produced.<sup>138</sup> In its analysis of the project, the IEPA noted that "capture or separation of CO<sub>2</sub> is inherent in coal gasification for production of SNG," and concluded that the critical issue for CCS was the geological sequestration of carbon.<sup>139</sup> The IEPA relied upon the findings of a 2010 report from the Federal Interagency Task Force on Carbon Capture and Storage to dismiss CCS in its BACT analysis.<sup>140</sup> According to the IEPA, there are four "fundamental" concerns for the commercial scale application of CCS: (1) market failures, including the lack of climate policy that sets a carbon price; (2) the need for a more robust legal and regulatory framework governing CCS; (3) the need for clarity regarding long-term liability for sequestered carbon; and (4) the need to foster public information and build trust between the community and project developers.<sup>141</sup> Citing these concerns, the IEPA concluded that CCS was technically infeasible at this time.<sup>142</sup> The analysis dismissed the injection of  $CO_2$  for enhanced oil recovery (EOR) on the grounds that CO2 is not used for EOR in Illinois.143 While Denbury Resources announced its plans to build a  $CO_2$  pipeline to transport  $CO_2$  from the Midwest to the Gulf Coast for use in EOR operations, the IEPA concluded that EOR could not be required as BACT for the Taylorville facility because it does not currently have access to a pipeline and the developer of the Taylorville facility has no control over CO<sub>2</sub> capture projects in Illinois or adjacent states.<sup>144</sup> It has also been reported that the facility initially sought a GHG limit that did not account for CCS because of concerns over potential penalties if the sequestration equipment does not work.<sup>145</sup>

EPA issued a letter questioning the BACT analysis in the draft permit and noting that it did not understand why CCS was not technically feasible at the site.<sup>146</sup> EPA requested that the BACT analysis be modified to show that CCS is technically infeasible or cannot be justified on other cost or environmental grounds.<sup>147</sup> In addition, environmental groups, including the Sierra Club and the Natural Resources Defense Council, filed public comments with the IEPA urging the agency to impose more stringent GHG limitations on the plant.<sup>148</sup>

Although it will qualify as a "transitional source" that is not subject to EPA's proposed New Source Performance Standards for EGUs,<sup>149</sup> Taylorville's developers commented on the proposed permit seeking modifications to incorporate permit limits

- 139 Illinois EPA, supra note 136, at 29.
- 140 Id. at 30-31.
- 141 Id.

143 Id.

- 147 Id.
- 148 Id.
- 149 See infra Part V.C.

<sup>138</sup> Illinois Envtl. Prot. Agency, Construction Permit- PSD Approval Taylorville Energy Center 14 (Oct. 17, 2011).

<sup>142</sup> Id. at 31.

<sup>144</sup> Id.

<sup>145</sup> Dawn Reeves, Draft Indiana GHG Permit Includes First-Ever Limit for Carbon Capture, Inside EPA, Jan. 27, 2012.

<sup>146</sup> Letter from Genevieve Damico, EPA Region 5, to Ed Bakowski, Illinois EPA at 1 (Dec. 29, 2011)

for CCS. Taylorville's developers asked IEPA to revise the draft permit to include a  $CO_2$  limit for the acid gas removal unit based on CCS and a limit for the combustion turbine consistent with the combined-cycle output method specified in the proposed NSPS.<sup>150</sup> The final permit rejected Taylorville's request for a  $CO_2$  limit based on CCS because IEPA found there were still "significant hurdles that must be overcome before CCS can be implemented" and it therefore could not find CCS to be BACT for the current permit.<sup>151</sup>

On May 30, 2012, the Natural Resources Defense Council and the Sierra Club filed a challenge to Taylorville's permit, arguing that IEPA's rejection of CCS at Step 2 of the agency's BACT analysis represents "a clearly erroneous conclusion of law or an important policy consideration that the board should review and reverse."<sup>152</sup> Subsequently, on June 12, 2012, EPA sent a letter to IEPA asking it to reconsider the Taylorville permit.<sup>153</sup> The letter states that EPA was taking the "extraordinary step" of asking IEPA to work with EPA to reconsider the Taylorville permit and avoid a lengthy permit appeal.<sup>154</sup> EPA further suggested that a revision the Taylorville permit could include a BACT limit based on CCS styled either as an adjustable limit based on the level of sequestration achieved or a fixed limit that could be adjusted "if CCS was not actually achieved at anticipated levels once operation commenced."<sup>155</sup> In response to EPA's letter, the IEPA announced that it was withdrawing Taylorville's permit to reconsider its decision rejecting CCS as BACT.<sup>156</sup>

Uncertainty surrounding the future of the Taylorville Energy Center's permit may result in the project switching to a natural gas-fired power plant.<sup>157</sup> High costs, opposition in the state legislature, and challenges to the permit by environmental groups have led the project's proponents to believe that a natural gas-fired power plant is the only way for the project to go forward.<sup>158</sup>

## **B. INDIANA GASIFICATION PROJECT**

The proposed Indiana Gasification project will convert local coal into SNG and  $CO_2$ . In addition to constructing the SNG facility, the developer proposes to construct

<sup>150</sup> Letter from Larry G. Carlson to Dean Studer, Hearing Officer, Illinois EPA (Apr. 23, 2012).

<sup>151</sup> Responsiveness Summary for Public Questions and Comments on the Construction Permit Application from Christian County Generation for the Taylorville Energy Center in Taylorville, Illinois EPA at 324 (Apr. 2012)

<sup>152</sup> Chrisitan County Generation, LLC, PSD Appeal No. 12-01 at 3 (May 30, 2012).

<sup>153</sup> Letter from Susan Hedman, Regional Administrator, EPA Region V, to John Kim, Interim Director, Illinois EPA (June 12, 2012).

<sup>154</sup> Id.

<sup>155</sup> Id.

<sup>156</sup> Dawn Reeves, Illinois Pulls Permit to Weigh Novel EPA Calls for CCS as GHG Control Option, INSIDE EPA, July 10, 2012.

<sup>157</sup> Contested Illinois Coal Plant With CCS Permit May Switch To Natural Gas, INSIDE EPA, May 9, 2012.

<sup>158</sup> Id.

a pipeline in cooperation with Denbury Resources that will transport liquefied  $CO_2$  to the Gulf Coast for use in enhanced oil recovery.<sup>159</sup>

The permit issued by the Indiana Department of Environmental Management (IDEM) sets stepped-down GHG limitations to account for pipeline construction and potential delays.<sup>160</sup> The permit imposes GHG limits of 4.69 million tpy in the first year, 6.43 million tpy in the second year, and 1.29 million tpy in the third year of operation.<sup>161</sup> In the BACT determination, IDEM noted that Indiana Gasification anticipated that  $CO_2$  emissions may be higher in the first two years because of logistical challenges of beginning operation of the  $CO_2$  pipeline.<sup>162</sup> IDEM dismissed geologic sequestration (as an alternative for  $CO_2$  capture), because it concluded that geological sequestration sites have not yet been proven and sustained federal government support will be necessary to develop CCS.<sup>163</sup> However, the permit limit for GHG emissions does not provide an exemption from the 1.29 million tpy limit in the event that  $CO_2$  cannot be sold for EOR or problems with the pipeline hinder delivery.<sup>164</sup> Therefore, in the third year of operation and beyond, it appears that the only alternatives available to comply with the GHG limits will be sale of liquefied  $CO_2$  in the pipelines or curtailing operations to lower GHG emissions.<sup>165</sup>

While the permit for Indiana Gasification contains a  $CO_2$  emissions limit that can be met only by sending  $CO_2$  to a pipeline or curtailing operations, the permit requires neither that the  $CO_2$  sent to the pipeline actually be injected in a producing formation nor that Indiana Gasification conduct any post-injection monitoring of injected  $CO_2$ .<sup>166</sup> In fact, several comments on the draft permit expressly highlighted these issues, suggesting that there was no guarantee the  $CO_2$  pipeline will ultimately be built and that BACT cannot be demonstrated without permit conditions sufficient to demonstrate that the captured  $CO_2$  will not ultimately be released into the air, including injection requirements and post-injection site monitoring.<sup>167</sup> The form of the Indiana Gasification GHG limitation thus raises a novel question regarding whether the PSD permitting program can be effectively applied to impose emission limitations based upon projects that cross state boundaries or involve the transfer of the title of  $CO_2$  before it is injected. Oil and gas production with enhanced oil recovery techniques is an entirely separate business from power generation, SNG production, and the other activities in which major producers of  $CO_2$  are involved. If these industries

- 161 Id., Draft Permit at 67.
- 162 Id., Appendix B BACT Analysis at 155.
- 163 Id. at 152-53.
- 164 Id., Draft Permit at 67.
- 165 See id.

<sup>159</sup> See Indiana DEP'T OF ENVT.L MGMT., DRAFT PSD/NEW SOURCE CONSTRUCTION AND PART 70 OPERATING PERMIT INDIANA GASIFICATION, LLC, APPENDIX B BACT ANALYSIS at 1 (2011) *available at* http://permits.air.idem.in.gov/30464d.pdf.

<sup>160</sup> Id. at 155.

<sup>166</sup> Nat. Res. Defense Council, Comments on Proposed Permit No. 147-30464-00060, PSD/New Source Review and Part 70 Operating Permit for Indiana Gasification (Jan. 30, 2012).

<sup>167</sup> See Indiana Dep't of Envt.l MGMT., Addendum to Technical Support Document (ATSD) for a PSD/New Source Construction and Part 70 Operating Permit, Permit No: T 147-30464-00060 at 17, 20 (2012).

are required to ensure that  $CO_2$  they produce is injected in EOR activities under their PSD permits, they are potentially subject to civil and criminal penalties under the CAA if such injection does not occur or is ineffective.<sup>168</sup> Regulated industries are thus faced with the choice of either entering an entirely new business in which they have no experience to inject their own  $CO_2$  or entering into contractual arrangements with third parties and trusting that those parties will carry out EOR activities in a manner that is sufficient to meet the generator's obligations under its PSD permit.

Furthermore, where states are delegated permitting authority under the CAA, as is the case with the IDEM, it is not clear that the PSD permit could go any further than what the proposed Indiana Gasification permit requires. As a state agency operating under EPA delegation, Indiana Gasification has the legal authority under federal and state statute to control sources of air pollution within the state.<sup>169</sup> However, there is no apparent authority under which the state of Indiana can require an entity to take actions outside of its jurisdiction. Thus, it may be that states with delegated permitting authority can do no better in cases involving interstate transport of CO<sub>2</sub> before injection than the kind of limitations in the proposed Indiana Gasification permit.

## C. POTENTIAL IMPLICATIONS OF THE TAYLORVILLE AND PROPOSED INDIANA GASIFICATION PERMITS

The issuance of the Indiana Gasification permit with the GHG emission limitations that require EOR and the potential reissuance of the Taylorville permit with GHG emission limits that require CCS, will make it more difficult for future applicants to dismiss CCS or EOR as BACT, as prior determinations form the basis for future ones. EPA's NSR Manual states that once a technology has been used in a particular application, it must be deemed available in subsequent BACT analyses.<sup>170</sup> Therefore, subsequent permit applicants will be unable to dismiss these technologies as technically infeasible under Step 2 of the BACT analysis.

In evaluating the impact of the Indiana Gasification permit and potential reissuance of the Taylorville permit with GHG limits that require EOR or CCS on future permit applicants, it is important to note that according to EPA there are three critical technologies to implementing EOR or CCS: (1) a technology to create a pure stream of CO<sub>2</sub> that may be injected; (2) a technology to transport captured CO<sub>2</sub> to the injection site; and (3) a technology to effectively sequester the CO<sub>2</sub>.<sup>171</sup> Both Indiana Gasification and Taylorville are coal gasification projects, which produce a nearly pure stream of CO<sub>2</sub> in the process of turning coal into synthetic natural gas. Neither plant requires post-combustion capture to sequester the CO<sub>2</sub> and, therefore, the principal impacts of their PSD permits will be to make transportation and sequestration technologies available to all applicants. In addition, the permits have the effect of making CCS and EOR technically feasible for similarly situated applicants whose processes result in a nearly pure stream of CO<sub>2</sub> emissions.

If CCS or EOR must be deemed technically feasible, subsequent permit applicants will be required to adopt these control technologies unless they can be eliminated in

<sup>168 42</sup> U.S.C. § 7413(b)(1).

<sup>169</sup> See 78 Fed. Reg. 59,899 (Sept. 28, 2011) (to be codified at 40 C.F.R. § 52 et seq.).

<sup>170</sup> NSR Manual, supra note 8, at B.11-B.12.

<sup>171</sup> GHG Permitting Guidance, supra note 30, at 35.

Step 4 of the BACT analysis. In Step 4 of the BACT analysis, control technologies can only be rejected if site-specific conditions result in unacceptable economic, environmental, or energy impacts. In general, the three cost justifications for rejecting a site-specific application of a control technology in use elsewhere in the industry are: (1) costs of control are disproportionately high compared to costs of control in recent permit decisions; (2) cost-effectiveness of the control is outside the range of what is being borne by other applicants in recent permit decisions; and (3) applicant shows costs of the control option will have an adverse economic effect on the facility.<sup>172</sup> Thus, it may be much more difficult to eliminate a control technology under Step 4.

On May 30, 2012, environmental groups filed a challenge to the Taylorville permit with the EAB, arguing that the  $CO_2$  limit must reflect that the plant will capture 90% of the  $CO_2$  emissions and that IEPA should identified CCS as BACT.<sup>173</sup> In response to the growing controversy and concerns voiced EPA Region 5, IEPA withdrew the Taylorville permit for further review of CCS in the agency's BACT analysis.<sup>174</sup> If IEPA ultimately decides to include CCS-based GHG emission limitations, the Taylorville permit could have the same impact on future BACT determinations.

## D. THE IMPACT OF JUDICIAL REVIEW

Some GHG PSD permits already have been subjected to judicial challenge, which may lead to early indications of how the courts will scrutinize GHG BACT determinations. LDEQ issued the first PSD permit in the nation, with GHG limits to Nucor Steel's planned direct reduced iron (DRI) facility, on January 27, 2011. As written, the permit requires that Nucor employ good combustion practices and does not establish numeric limitations on GHG emissions.<sup>175</sup> After reviewing the draft permit, EPA sent LDEQ a strongly worded letter stating that the permit should establish a numerical limitation for GHGs and finding LDEQ's GHG BACT analysis to be incomplete.<sup>176</sup> LDEQ finalized the Nucor permit without making the changes to the GHG BACT analysis requested by EPA: the final permit does not contain numerical limits for GHGs.<sup>177</sup> When EPA did not object sua sponte to the final permit issued by LDEQ, it received petitions from the Sierra Club and Zen-noh Corporation requesting that EPA object to various aspects of the permits issued to the Nucor facility. The Sierra Club asked EPA to object because it believed LDEQ should have specified a BACT limit for GHGs from the direct reduced iron manufacturing process associated with the Nucor plant.<sup>178</sup> As of July 2012, EPA had not yet responded to the Sierra Club's

<sup>172</sup> Alaska Dep't Envtl. Conservation v. EPA, 298 F.3d 814, 882 (9th Cir. 2002).

<sup>173</sup> Dawn Reeves, Activists' Permit Suit Challenges GHG BACT For Excluding Carbon Capture, Inside EPA, June 8, 2012.

<sup>174</sup> Reeves, supra note 156.

<sup>175</sup> La. Dep't of Envtl. Quality, Authorization to Construct and Operate a New Facility/Modified Major Source PSD-LA-751 (Jan. 27, 2011).

<sup>176</sup> Letter from Jeffery Robinson, Chief, Air Permits Section, U.S. EPA Region 6, to Tegan Treadway, Administrator, Office of Envtl. Services, La. Dep't of Envtl. Quality (Jan. 7, 2011).

<sup>177</sup> See La. Dep't of Envtl. Qual, Authorization to Construct and Operate a New Facility/ Modified Major Source PSD-LA-751 (Jan. 27, 2011) at 38-39, 47-49.

<sup>178</sup> Petition Requesting the Administrator to Object to Title V Operating Permits Nos. 2560-00281-V1 and 3086-V0 Issued to Consolidated Environmental Management, Inc. / Nucor

petition, but it has granted Zen-noh Corporation's challenge to LDEQ's decision to issue two separate permits for the Nucor plant.<sup>179</sup> This challenge focuses on whether LDEQ's decision to permit the pig iron manufacturing process and the direct reduced iron manufacturing process as two separate sources was proper under the CAA or whether it improperly allowed Nucor to avoid a full air quality impact analysis for the project. EPA has stated that it plans to address Sierra Club's objections concerning Nucor's GHG limits after it resolves Zen-noh's challenge, leaving open the possibility of a later direct challenge to the lack of numeric GHG emission limitations in the Nucor permit.<sup>180</sup>

Additionally, on September 15, 2011, the South Dakota Board of Minerals and the Environment approved a revised permit for the Hyperion Refinery that included GHG emission limits, and also extended the construction deadline for the refinery. Although EPA generally approved of the state's GHG BACT analysis,<sup>181</sup> several local environmental groups brought suit alleging a number of state law claims, and challenging Hyperion's plan to limit  $CO_2$  emissions as deficient.<sup>182</sup> Both sides of the dispute have stated they will appeal an unfavorable district court decision to the South Dakota Supreme Court.

Furthermore, the CAA allows third parties to seek judicial review of a PSD permit on the grounds that it does not meet the minimum requirements of the Act.<sup>183</sup> If the Taylorville or Indiana Gasification permits render CCS or EOR technically feasible under Step 2, subsequent permits that do not select these technologies may be subject to judicial challenge by environmental groups or EPA. In the context of conventional air pollutants regulated under the CAA, both EPA and environmental groups have initiated challenges to state-issued PSD permits dismissing control technologies on the grounds of site-specific costs.<sup>184</sup> Thus, even if a permit applicant were able to convince a state agency that site-specific conditions precluded the application of CCS or EOR as BACT, such a determination may be subject to challenge, creating further delays and uncertainty.

Steel Louisiana 2 (EPA, May 3, 2011).

<sup>179</sup> Order Granting Petitions for Objections to Permits, Nos. 2560-00281-V1 and 3086-V0 Issued to Consolidated Environmental Management, Inc. / Nucor Steel Louisiana. (EPA Mar. 23, 2012).

<sup>180</sup> See id. at 17 note 9.

<sup>181</sup> See Letter from Deborah Lebow Aal, Acting Director, Air Permits Section, U.S. EPA Region 8, to Brian Gustafson, Administrator, Air Quality Program, S.D. Dep't of Env't & Natural Resources (Apr. 1, 2011).

<sup>182</sup> Hyperion Energy Center Plant, Sierra Club, http://www.sierraclub.org/environmentallaw/ coal/getBlurb.aspx?case=SD-Hyperion percent20Energy percent20Center percent20Plant. aspx (last visited Mar. 17, 2012).

<sup>183 42</sup> U.S.C. § 7604, §7607(b).

<sup>184</sup> See, e.g., Alaska Dep't of Envtl. Conservation, 298 F.3d 814 (9th Cir. 2004) (EPA challenge to state dismissal of control technology on cost grounds); General Motors, Inc. Permit No. MI-209-00, 10 E.A.D. 360 (EAB 2002) (environmental group challenge).

## V. THE IMPACT OF EPA'S PROPOSED GHG NSPS FOR ELECTRIC GENERATING UNITS

On April 13, 2012, EPA published proposed NSPS for GHGs from EGUs in the Federal Register.<sup>185</sup> These proposed standards would establish an emission limitation of 1,000 lb/MWh for all new sources, but do not propose standards for modified or reconstructed sources.<sup>186</sup> This section briefly describes the key features of EPA's proposed NSPS and considers how they will interact with the BACT analysis.

## A. OVERVIEW OF THE PROPOSED NSPS

The proposed NSPS for EGUs follow a consent decree among EPA, several states, and environmental groups, under which EPA agreed to establish emissions standards for new and modified EGUs as well as "emission guidelines" for existing EGUs.<sup>187</sup> The proposed rule would create a new Subpart TTTT of the NSPS regulations setting  $CO_2$  emission limitations applicable to combined-cycle units that generate electricity for sale and to electric utility steam generating units with a baseload rating greater than 73MW.<sup>188</sup> The proposed Subpart TTTT would apply to new sources only, and sets a limit of 1,000 lb  $CO_2$ /MWh (twelve-month rolling average).<sup>189</sup> The proposal also provides an alternative compliance mechanism under which new units burning coal or pet coke may comply using a 30-year averaging period by meeting a higher standard of 1,800 lb/MWh in the first ten years of operation and then CCS to achieve an emissions limit of 600 lb/MWh for the remaining 20 years.<sup>190</sup>

The CAA requires EPA to establish NSPS by evaluating available technologies and determining the best system of emission reduction (BSER).<sup>191</sup> Rather than dictating that operators adopt the BSER technology, EPA is to set a rate of emissions equal to

<sup>185</sup> Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, 77 Fed. Reg. 22,392 (proposed Apr. 13, 2012) [hereinafter Proposed GHG NSPS]. The Utility Air Regulatory Group (UARG) and Las Brisas Energy Center, LLC (Las Brisas), recently filed separate lawsuits asking the U.S. Court of Appeals for the District of Columbia to review EPA's Proposed NSPS. See Brief of Petitioner, Utility Air Regulatory Group v. U.S. EPA, No. 12-1252 (D.C. Circuit June 12, 2012) (petitioning the court to declare that the standards in the NSPS apply only to natural gas-fired EGUs); see also Brief of Petitioner, Las Brisas Energy Center LLC v. U.S. EPA, No. 12-1248 (D.C. Circuit June 11, 2012) (arguing that filed to perform an adequate economic impacts analysis and that the agency failed to make the requisite "significant contribution" findings required under CAA § 111 for sources subject to the proposed rule when it combined coal-fired and natural gas-fired EGUs into a single source category).

<sup>186</sup> Proposed GHG NSPS, supra note 185, 77 Fed. Reg. at 22,394.

<sup>187</sup> See State of New York et al. v. EPA, No. 06-1322 (D.C. Circuit decree entered Sept. 24, 2007).

<sup>188</sup> Proposed GHG NSPS, *supra* note 185, 77 Fed. Reg. at 22,436 (to be codifed at 40 C.F.R. § 60.5509).

<sup>189</sup> Id. (to be codified at 40 C.F.R. §§ 60.5509, 60.5520(a)).

<sup>190</sup> Id. (to be codified at 40 C.F.R. § 60.5520(b)).

<sup>191 42</sup> U.S.C. § 7411(b)(1)(B); *see also* 42 U.S.C. § 7411(a)(1) (defining standard of performance as a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction).

that of the BSER.<sup>192</sup> EPA proposes a single emission rate for both coal- and natural gas-fired facilities under a new Subpart TTTT. EPA arrived at the proposed standard of 1,000 lb/MWh after determining that natural gas combined-cycle (NGCC) generation is the best system of emission reduction for base- and intermediate-load power generation.<sup>193</sup> EPA justified this determination on two grounds. First, EPA found that natural gas combustion emits 50% less CO<sub>2</sub> per unit of energy generated.<sup>194</sup> Second, EPA concluded that natural gas-fired EGUs are far less expensive than new coal-fired EGUs, and so anticipates that no coal-fired EGUs will be built for the foreseeable future.<sup>195</sup> Notably, EPA previously has distinguished between natural gas- and coal-based power when setting NSPS and undertaking other CAA rulemakings.

Specifically addressing coal-fired generation, EPA stated that it expects that new sources using CCS with 50% efficiency could meet the 1,000 lb/MWh standard.<sup>196</sup> Notably, the statute requires the NSPS to be based on the BSER that "the Administrator determines has been adequately demonstrated."<sup>197</sup> However, despite recognizing that CCS technology is not yet commercially demonstrated and involves significant costs, EPA proposed an alternative compliance option for coal-fired and pet-coke plants based on expected *future* evolution of CCS. Under the proposal, new coal-fired facilities would immediately have to comply with a performance standard of 1,800 lb/MWh,<sup>198</sup> which EPA concluded can be met through the installation of supercritical generation.<sup>199</sup> Generators could comply with this standard for their first ten years of operation, and then in the eleventh year, the rule would require the installation of CCS to achieve an emissions rate not greater than 600 lb/MWh.<sup>200</sup>

EPA provided two justifications for the use of the 30-year averaging period as an alternative means of compliance. First, EPA stated that the alternative standard will provide power companies with the option of building a coal plant without CCS in the near term and installing CCS in the future when costs are lower and experience with CCS demonstration projects has been gained.<sup>201</sup> In addition, EPA found that even sources that intend to operate CCS from the outset may face start-up issues.<sup>202</sup> EPA thus concluded that the 30-year averaging period is an important alternative for these sources.

<sup>192</sup> See 42 U.S.C. § 7411(b)(5).

<sup>193</sup> Proposed GHG NSPS, supra note 185, 77 Fed. Reg. at 22,394.

<sup>194</sup> Id. at 22,398.

<sup>195</sup> Id.

<sup>196</sup> Id. at 22,392.

<sup>197 42</sup> U.S.C. § 7411(a)(1).

<sup>198</sup> Proposed GHG NSPS, *supra* note 185, 77 Fed. Reg. at 22,436 (to be codifed at 40 C.F.R. § 60.5520(b)).

<sup>199</sup> Id. at 22,394.

<sup>200</sup> Id. at 22,436 (to be codifed at 40 C.F.R. § 60.5520(b)).

<sup>201</sup> Id. at 22,395.

<sup>202</sup> Id.
#### B. EPA DID NOT PROPOSE TO REGULATE EXISTING SOURCES, MODIFICATIONS, OR RECONSTRUCTION

Section 111(d) of the CAA requires EPA to promulgate guidelines for existing sources within NSPS-regulated categories, for implementation through the state implementation plan process.<sup>203</sup> In the settlement agreement that preceded the proposal of the GHG NSPS under Section 111(b), EPA agreed to proceed as well under Section 111(d). However, EPA has not yet proceeded with existing EGU regulation of GHGs under Section 111(d). Nor does EPA's proposal cover future modifications or reconstruction with respect to GHG emissions from EGUs. Under pre-existing EPA rules, a modification is defined as a physical or operational change to a source that increases its potential to emit and is not the result of pollution control projects.<sup>204</sup> Yet EPA's proposal includes language that would exempt EGU modifications because EPA says it does not have sufficient information to do otherwise, and EPA believes that few existing sources are likely to take actions that will constitute modifications.<sup>205</sup> Accordingly, EPA is seeking comments on the types of modifications that EGUs may make, and appropriate controls for them.<sup>206</sup> The preamble states that EPA may use this information to promulgate standards for modifications in the future.<sup>207</sup>

Similarly, EPA is not proposing that the NSPS would apply to otherwise covered units as a result of "reconstruction." EPA's rules define "reconstruction" as replacement of components or equipment in an existing facility such that capital costs exceed 50% of the projected costs of a new facility.<sup>208</sup> EPA's discussion of reconstruction notes that the information it currently has is derived primarily from past enforcement actions against power plants and is too limited to form the basis of a performance standard for CO<sub>2</sub> that would apply upon reconstruction.<sup>209</sup> The proposal solicits comments on how EPA should approach reconstructions, and leaves open the possibility that reconstruction standards will be proposed in the future.<sup>210</sup>

Importantly, EPA's decision not to propose NSPS for modifications and reconstructions does not change the requirement that these activities undergo PSD permitting if they will increase a facility's potential to emit GHG's by more than the thresholds specified in the Tailoring Rule. Thus, although there is no performance floor proposed by the NSPS at this time for reconstruction and modifications, the PSD permitting process, if triggered, would still require that reconstruction or modification of a facility adopt BACT for GHGs.

#### C. SPECIAL PROVISIONS FOR "TRANSITIONAL SOURCES"

The CAA defines a "new source" as one on which "the construction or modification . . . is commenced after the publication of regulations (or, if earlier, proposed regulations) prescribing a standard of performance under this section that will be ap-

<sup>203 42</sup> U.S.C. § 7411(d).

<sup>204 40</sup> C.F.R. § 60.2.

<sup>205</sup> Proposed GHG NSPS, supra note 185, 77 Fed. Reg. at 22,395.

<sup>206</sup> Id. at 22,400.

<sup>207</sup> Id.; see also id. at 22,421.

<sup>208 40</sup> C.F.R. § 60.15.

<sup>209</sup> Proposed GHG NSPS, supra note 185, 77 Fed. Reg. at 22,401.

<sup>210</sup> Id.; see also id. at 22,427.

plicable to such course."<sup>211</sup> However, EPA excludes from its proposed rule what it calls "transitional sources," which it defines to be those sources that have received a PSD permit prior to the date of proposal publication and that commence construction within one year *after* the proposal date.<sup>212</sup>

EPA held a series of "listening sessions" prior to its proposal of the NSPS, during which several commenters raised concerns over the effect of the proposed rule on sources that had already received their PSD preconstruction permits but had not yet commenced construction.<sup>213</sup> The sources at issue are coal-fired EGUs, which would face substantial redesign, construction costs, and delays if forced to meet EPA's proposed NSPS.<sup>214</sup> EPA acknowledged in the preamble that these sources may already have incurred substantial costs and progressed to the point in their preconstruction planning where commencing construction is imminent.<sup>215</sup> EPA aknowledged that applying the proposed standard to these sources would likely result in significant adverse consequences, such as the loss of previously incurred costs, multi-year delays, and possibly even project abandonment.<sup>216</sup> EPA concluded that applying the proposed rule to these sources would neither be equitable nor within the scope of BSER.<sup>217</sup>

EPA estimates that there are fifteen transitional sources, although it has specifically asked the developer of each identified source to provide details on its permitting and development status.<sup>218</sup> EPA estimates six of these sources plan to implement CCS to some degree with the support of financial assistance from the Department of Energy.<sup>219</sup> EPA says that when it adopts final rules, it will publish a specific list of sources eligible for "transitional" treatment.<sup>220</sup> According to EPA, market realities suggest that only a few of these proposed projects will ultimately be built.<sup>221</sup> EPA concluded that, although some transitional sources do plan to use CCS, there is not sufficient information to conclude that they could meet the 1,000 lb/MWh standard.<sup>222</sup> The preamble also concluded that the proposed standard, based upon NGCC generation, is not BSER for transitional sources because "[t]ransitional sources are a very small group of sources with a distinct profile of costs, preconstruction planning, overall business plans, technical and design concerns, and equitable concerns."<sup>223</sup>

The rules' preamble avers that EPA may define new sources to exclude those on which construction commences after proposal of the NSPS because EPA has chosen to

- 217 Id.
- 218 Id.

- 220 Id. at 22,423.
- 221 Id. at 22,422
- 222 Id. at 22,425.
- 223 Id. at 22,423-424.

<sup>211 42</sup> U.S.C. § 7411(a)(2); see also 40 C.F.R. § 60.2.

<sup>212</sup> Proposed GHG NSPS, *supra* note 185, 77 Fed. Reg. at 22,436 (to be codifed at 40 C.F.R. § 60.5510(b)).

<sup>213</sup> Id. at 22,400, n.26; see also id. at 22,401.

<sup>214</sup> Id. at 22,401.

<sup>215</sup> Id.

<sup>216</sup> Id. at 22,422.

<sup>219</sup> Id. at 22,339, n. 22.

define the sources to which the rule applies as excluding them. EPA has never before taken this view of what Section 111(a)(2) requires.

#### D. WILL THE NSPS ENCOURAGE THE DEVELOPMENT OF CCS?

EPA states that it intends for the NSPS to send a clear signal regarding the future of CCS.<sup>224</sup> EPA believes that "appropriate market conditions" and financial incentives from the Department of Energy will support the development and demonstration of CCS from coal-fired power plats on a commercial scale.<sup>225</sup> Questions then arise whether: (1) operators will choose to develop coal with CCS for new sources if natural gas remains a lower-cost alternative; and (2) government financial incentives for CCS will remain in place in the coming years and if they will be strong enough to support commercial-scale development of CCS.

EPA's proposal expressly recognizes that significant cost barriers remain and that, in the near-term, government subsidies will be needed to support the development of CCS.<sup>226</sup> However, EPA believes that the maturation of CCS technology will cause prices to decrease over time.<sup>227</sup> By EPA's estimation, there are a sufficient number of subsidy opportunities available to support the development of likely CCS projects in the near term.<sup>228</sup>

While this may be the case, the NSPS alone will not be a sufficient incentive for the development of CCS technology. In fact, the NSPS represents a major disincentive to build a coal-fired power plant: any entity that assumed the expense and risk of developing a coal-fired plant relying upon yet-to-be proven commercial scale CCS for Clean Air Act compliance runs the risk of civil penalties of up to \$37,500 per day if the CCS controls prove ineffective to meet the permit limits for GHGs.<sup>229</sup> Therefore, without significant funding to develop and deploy CCS on a commercial scale, it is unlikely that operators will assume the risk of relying upon CCS as a control method for EGUs. As of this writing, natural gas prices are hovering near historic lows, and are a more attractive option for power projects. Even with government subsidies for CCS, it remains a very expensive control option. Thus, in the absence of a price on carbon in the form of a cap-and-trade program or a tax, it is not clear that economic incentives exist to drive the commercialization of CCS based on the NSPS alone. However, as discussed in Part III, the approval of PSD permits with stringent GHG emissions limits could require CCS as BACT. Therefore, in combination, these factors may render new coal-fired generation essentially impossible to construct for the foreseeable future.

#### E. COAL-FIRED UNITS ATTEMPTING TO USE THE ALTERNATIVE COMPLIANCE OPTION MAY FACE CHALLENGES TO PSD PERMITS

Even if a facility were to elect EPA's proposed alternative compliance option to build a new coal-fired power plant or is exempted from the NSPS as a reconstruction

- 226 Id. at 22,399.
- 227 Id.
- 228 Id. at 22,414.

<sup>224</sup> Id. at 22,396.

<sup>225</sup> Id.

<sup>229 42</sup> U.S.C. § 7413(b)(1); 40 C.F.R. § 19.4 (setting current civil penalty amounts).

or modification, it may still be required to adopt CCS under the PSD permitting program. These plants will face many of the same risks and challenges described above for plants selecting immediate compliance under the proposed NSPS. In addition, as explained in Part II, PSD permitting will apply to all new stationary sources and major modifications. This is significant for two reasons. First, the BACT determination may ultimately cut off the 30-year compliance option for new coal and pet-coke plants proposed by EPA. Second, GHG BACT analysis raises the possibility that existing sources undergoing major modifications could be required to adopt CCS.

In PSD permitting, the NSPS serve as the floor, meaning that the permitting authority may not issue a permit with emission limitations less stringent that those outlined in the NSPS.<sup>230</sup> In the case of the alternative compliance option, this would mean that going forward, all PSD permits for new coal-fired generation must contain a  $CO_2$  emission limitation not greater than 1,800 lb/MWh for the first ten years of operation.<sup>231</sup> Major modifications would be subject to similar constraints. However, independent of the NSPS, the permitting authority must make a BACT determination, and apply this to set an emission limitation for source.<sup>232</sup>

As explained in Part III, once a technology has been selected in a BACT analysis for a particular application, it becomes far more difficult for future BACT analyses to conclude that the technology should not be employed. Thus, issuance of permit for Indiana Gasification with GHG emission limits that require EOR and the potential issuance of a revised permit for Taylorville with GHG limits requiring CCS could make it more difficult for proposed new coal and pet-coke plants to justify not employing these controls even though these limits are more stringent than what the proposed NSPS would require unless CCS can be eliminated in Step 4 of the BACT analysis. As explained in Part IV, neither the permit for Taylorville nor for Indiana Gasification employs a post-combustion control technology, which would be required to create a pure stream of  $CO_2$  from the emissions of a new coal or pet-coke plant. Therefore, new coal plants may still be able to argue that CCS or EOR is technically infeasible because sequestration technologies remain unproven. However, such an argument raises the possibility that a permitting authority could choose to redefine the source and require that new proposed coal facilities adopt gasification to produce a pure stream of CO<sub>2</sub>. While it appears that states may lack the legal authority to redefine the source and require coal gasification, there remains a possibility that environmental groups will raise this possibility in a challenge to future permits, creating further obstacles to permitting new coal plants.

Therefore, a proposed coal-fired facility that wishes to use EPA's proposed 30-year compliance option under the NSPS and defer installation of CCS may find this flexibility restricted by the terms of its PSD permit. Similarly, plants undertaking reconstructions or modifications that trigger PSD permitting under the Tailoring Rule will be subject to BACT determinations and may also be required to adopt stringent GHG emission controls. Furthermore, PSD permits can be subject to challenge by third parties.<sup>233</sup> If the permitting authority agrees with a proposal to build a capture-ready plant

<sup>230 42</sup> U.S.C. § 7479(3).

<sup>231</sup> Id.

<sup>232</sup> Id.

<sup>233 42</sup> U.S.C. § 7470(5).

but defer CCS consistent with the NSPS, there is a possibility that the PSD permit will be challenged

#### VI. CONCLUSIONS

GHG BACT determinations to date have recognized the limited availability of commercially viable and technically feasible control options. A carefully defined project is an important element of a BACT analysis and may shield applicants from agency demands for drastic and costly redesigns. Numerical limits on sources are an important aspect of GHG BACT determinations, and operators should take into account EPA's desire for a thorough review of all potential control options, such as CCS. No permitting authority to date has issued a permit that ultimately prohibited the applicant from building the facility as it intended, although most permit applicants, especially in the power sector, have been forced to undertake substantial analysis of alternative options to produce the desired end product. The threat of source redefinition hangs over every controversial project. And although no project has yet been compelled to use CCS as a consequence of a BACT determination, the Indiana Gasification project could change that: If the facility is required to or even if it simply accepts CCS as BACT, states everywhere will be forced to take a closer look at CCS.

If finalized as proposed, the NSPS for EGUs in combination with BACT analyses may effectively foreclose the construction of new coal-fired power generation. While the NSPS itself provides an alternative means of compliance for coal- and pet-coke-fired generation, it is not clear that proposals for new construction consistent with the NSPS will be determined to employ BACT and be able to survive potential judicial challenges from environmental groups. Thus, while BACT determinations to date do not appear to have derailed proposed projects, the continued evolution of PSD permitting for GHGs and EPA's proposed NSPS are likely to pose significant challenges in the future.

Margaret E. Peloso received her J.D. in 2009 from Stanford Law School and her Ph.D. in 2010 from Duke University. Ms. Peloso is an Associate with Vinson & Elkins, L.L.P. in Washington, D.C., where her primary area of practice is environmental law and climate change.

Matthew Dobbins received his J.D. from the University of North Carolina in 2011 and his B.A. from the University of Michigan in 2008. Mr. Dobbins is an Associate with Vinson & Elkins, L.L.P. in Houston, Texas, where his primary area of practice is environmental litigation and regulation.

	COMPLIANCE MONITORING	Calculate CO <sub>2</sub> e emissions using heat input as surrogate		Calculate CO <sub>2</sub> e emissions using fuel as a	surrogate
	BACT CONTROLS SELECTED	<ul> <li>Energy Efficiency (combined cycle turbine design with HRSG)</li> <li>O&amp;M schedule</li> </ul>		<ul> <li>Energy Efficiency</li> <li>(National Fire Protection Association rated engine)</li> </ul>	- O&M schedule
ILITIES <sup>1</sup>	BACT Assessment	Feasible (proven technology)	Technically feasible, but not chosen due to cost of transportation to sequestration sites	Feasible	Technically feasible, but not chosen due to cost of transportation to sequestration sites
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Pre-Combustion controls: Heat Recovery Steam Generator (HRSG)	PostCombustion Controls (CCS)	Pre-Combustion Controls (energy efficiency)	PostCombustion (CCS)
ECENTLY PE	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	2,038.6 MMBtu/ kWh		7.6 tpy CO <sub>2</sub> e	
ROLS AT R	SOURCE SUBJECT TO BACT	Combustion Turbine Generator		Fire Pump Diesel Engine	
ACT CONTF	FACILITY TYPE	600 MW natural gas-fired combined cycle power plant			
A. GHG B/	Permitting Authority	Bay Area Air Quality Management District	(California)		
APPENDIX	FACILITY	Russell City Energy, Hayward, CA (PSD-CA-15487)			

NCT CONTR	OLS	AT RE	CENTLY PER	RMITTED FACI	LITIES <sup>1</sup>		
SC FACILITY SU TYPE TO		JECT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
SF <sub>6</sub> Cirr Breaker		s s	9.3 tpy CO <sub>2</sub> e	Dielectric Oil Circuit Breaker	Not feasible due to size needed to obtain equivalent results as SF <sub>6</sub> Circuit Breaker	<ul> <li>Enclosed system with leak detection</li> <li>O&amp;M schedule</li> </ul>	Calculate CO <sub>2</sub> e emissions using breaker fluid as a surrogate
				Compressed Air (Air blast) Circuit Breaker	Not feasible due to size needed to obtain equivalent results as SF <sub>6</sub> Circuit Breaker		
				Enclosed System with Leak Detection	Feasible		
				Emerging Technologies	Not technically feasible for high voltage applications		

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	COMPLIANCE MONITORING	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate		Calculate CO <sub>2</sub> e emissions using fuel as a surrogate	
	BACT CONTROLS SELECTED	<ul> <li>Energy Efficiency</li> <li>O&amp;M schedule (annual boiler tune-ups)</li> </ul>		<ul> <li>Thermally efficient units</li> <li>O&amp;M Schedule (annual boiler tune-ups)</li> </ul>	
ILITIES <sup>1</sup>	BACT Assessment	Feasible	Technically feasible, but not chosen due to cost of transportation to sequestration sites	Feasible	Technically feasible, but not chosen due to cost of transportation to sequestration sites
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Thermally efficient combined cycle turbines (with HRSG)	PostCombustion (CCS)	Pre-Combustion (thermally efficient units and annual boiler tune-ups)	PostCombustion (CCS)
ECENTLY PE	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	<ul> <li>774 lb CO<sub>2</sub>/ MWh source- wide net output</li> <li>117 lb CO<sub>2</sub>/ MMBtu heat</li> </ul>	<ul><li>input, each at</li><li>ISO standard</li><li>day conditions</li><li>- 30 day rolling</li><li>Average</li></ul>	<ul> <li>Limit auxiliary boiler to heat input of 110 MMBtu/hr &amp;</li> </ul>	<ul> <li>&gt;000 hours of operation per year based on a 12-month rolling total</li> <li>Limit the heater to 40 MMBtu/hr and 1,000 hours of operation per year based on 12-month rolling total</li> </ul>
ROLS AT R	SOURCE SUBJECT TO BACT	Natural Gas- Fired Combined Turbine Generator		Natural Gas- Fired Auxiliary Boiler and	Heater
ACT CONTE	FACILITY TYPE	570 MW natural gas-fired power plant with integrated 50 MW solar-	thermal plant		
A. GHG B/	Permitting Authority	EPA Region IX			
APPENDIX	FACILITY	City of Palmdale, CA Hybrid Energy Project (PSD-SE- 09-01)			

APPENDIX	A. GHG B/	ACT CONTE	ROLS AT R	ECENTLY PE	RMITTED FACI	'LITIES <sup>1</sup>		
FACILITY	Permitting Authority	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
City of Palmdale, CA Hybrid Energy Project (cont'd.)			SF <sub>6</sub> Circuit Breaker	<ul> <li>9.56 tpy CO<sub>2</sub>e</li> <li>0.5% Annual leakage rate</li> </ul>	Dielectric Oil or Compressed Air Circuit Breakers	Technically feasible, but not selected due to size needed to obtain equivalent results as SF <sub>6</sub> Circuit Breaker	<ul> <li>Enclosed system with leak detection</li> <li>O&amp;M schedule</li> </ul>	Calculate CO <sub>2</sub> e emissions using breaker fluid as a surrogate
					Enclosed SF <sub>6</sub> Circuit Breakers with Leak Detection	Feasible		
Eni - Holy Gross Drilling Project (PSD- OCS-EPA- R4007)	EPA Region IV	Offshore Natural Gas Drilling Unit	Internal Combustion Engines - Main Propulsion	<ul> <li>776 g/ kW-hr over 24-hour averaging period</li> </ul>	Thermal Oxidation/ Oxidation Catalyst System (CH <sub>4</sub> emissions)	Rejected because technologies would not sufficiently reduce already low CH4 emissions	<ul> <li>Energy Efficiency</li> <li>EPA Tier 1 Engine</li> <li>8 hr/week operational limit</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate
			Engines		SCCS	Technically infeasible – space required for capture technology not practicable for drilling unit		

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APPENDIX	A. GHG B/	ACT CONTE	ROLS AT R	ECENTLY PE	RMITTED FAC	ILITIES <sup>1</sup>		
FACILITY	Permitting Authority	FACILITY ΤΥΡΕ	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Eni - Holy Gross Drilling Project (cont'd.)			Internal Combustion Engines - Main Propulstion Engines (cont'd.)		CSNO <sub>X</sub> Emission Abatement System	Technically infeasible – technology still experimental and not proven for engines operating at variable load		
					Biomass Fuel Sources	Technically infeasible – engines not designed to burn biomass fuel sources		
					Good Combustion and Operating Practices	Feasible		
					Transocean Diesel Engines with Turbochargers (DEWT) Measurement System on the Main Propulsion Generator Engines	Feasible		

APPENDIX /	A. GHG B/	ACT CONTF	ROLS AT R	ECENTLY PE	RMITTED FACI	ILITIES <sup>1</sup>		
FACILITY	Permitting Authority	FACILITY ΤΥΡΕ	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Eni - Holy Gross Drilling Project (cont'd.)			Internal Combustion Engines - Crane Engine (Type 1)	722 TPY CO <sub>2</sub> e	See Above	See Above	<ul> <li>EPA Certified Tier 1</li> <li>Engine</li> <li>Energy Efficiency (good combustion practices)</li> <li>S-hr per calendar day operational limit</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate
			Internal Combustion Engines - Crane Engine (Type II)	687 tpy CO <sub>2</sub> e	See Above	See Above	<ul> <li>Energy Efficiency (good combustion practices)</li> <li>8-hr per calendar day operational limit</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate
			Internal Combustion Engines - Emergency Generator	14.6 tpy CO <sub>z</sub> e <sup>2</sup>	See Above	See Above	<ul> <li>Energy Efficiency (good combustion practices)</li> <li>2 hr/week operational limit</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate
			Internal Combustion Engines - Fire Pump Engine	2.4 tpy CO <sub>2</sub> e <sup>3</sup>	See Above	See Above	<ul> <li>Energy efficiency (good combustion practices)</li> <li>20 min./week operational limit</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate

APPENDIX	A. GHG B/	ACT CONTR	ROLS AT R	ECENTLY PE	RMITTED FAC	LITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Eni - Holy Gross Drilling Project (cont'd.)			Diesel/Fired Boilers	565 tpy CO <sub>2</sub> e	Thermal Oxidation/ Oxidation Catalyst System (CH <sub>4</sub> emissions)	Rejected because technologies would not sufficiently reduce already low CH4 emissions	<ul> <li>Energy Efficiency (good combustion practices)</li> <li>Insulation/Insulation Jackets/Steam Line Maintenance</li> <li>Obserational limit of 720</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate
					New Burners/ Upgrades	Technically infeasible – inappropriate for a retrofit of this size	<ul> <li>OSM schedule</li> </ul>	
					Instrumentation and Control	Technically infeasible – limited space available		
					Economizers	Technically infeasible – limited space available		
					Air Preheater	Technically infeasible – limited space available		
					Create Turbulent Flows within Firetubes	Technically infeasible – limited space available		

APPENDIX .	A. GHG B/	ACT CONTF	ROLS AT R	ECENTLY PEI	RMITTED FAC	LITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT ASSESSMENT	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Eni - Holy Gross Drilling Project (cont'd)			Diesel-Fired Boilers (cont'd.)		Insulation/ Insulation Jackets/ Steam Line Maintenance	Feasible		
					Capture Energy From Boiler Blowdown	Technically infeasible – limited space available and safety concerns		
					Condensate Return System	Technically infeasible – limited space available		
					Minimizing of Gas- Side Heat Transfer Surface Deposits	Technically infeasible – limited space available		
					ccs	Technically infeasible – limited space available & mobile nature of source		
					Alternative Fuels - Biomass	Technically infeasible – Boiler not designed to burn biomass		

APPENDIX	A. GHG B/	ACT CONTE	ROLS AT R	ECENTLY PEI	RMITTED FACI	LITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Eni – Holy Gross Drilling Project (cont'd.)			Diesel/Fired Boilers (cont'd.)		Co-Firing and Fuel-Switching	Technically infeasible – not available in offshore drilling applications		
					Combined Heat and Power	Technically infeasible – boiler not sized for generating power		
					Good Combustion Practices (Tuning, Optimization, and Air Leak Reduction)	Feasible		
MidAmerican Energy George Neal North (PSDJA-11.160)	Iowa Depart. of Natural Resources	525 MW coal- fired boiler	Boiler	2,437 lb CO <sub>2</sub> / MWh	Catalytic and Thermal Oxidation (CH4)	Technically infeasible – results in additional CO <sub>2e</sub> emissions	Energy Efficiency	CO <sub>2</sub> CEMS
					Combustion of Biogenic Sources	Technically infeasible – boiler not designed for biomass fuel		

	COMPLIANCE MONITORING			
	BACT CONTROLS SELECTED			
ILITIES <sup>1</sup>	BACT Assessment	Technically infeasible – various methods (pre- combustion, oxygen-combustion) post-combustion) not shown to be commercially viable for a project this size & cost of CO <sub>2</sub> transportation prohibitive	Technically feasible – rejected because project is involves add on controls, not reconstruction (redefines sources)	Technically feasible – rejected because it would increase methane SO <sub>2</sub> emissions
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	CCS	Thermodynamic Cycle Design	Use of Higher- Ranked Coal
RECENTLY PE	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE			
ROLS AT F	SOURCE SUBJECT TO BACT	Boiler (cont'd.)		
ACT CONTE	FACILITY ΤΥΡΕ			
A. GHG B/	PERMITTING AUTHORITY			
APPENDIX .	FACILITY	MidAmerican Energy George Neal North (cont'd.)		

APPENDIX	A. GHG BA	ACT CONTF	ROLS AT F	ECENTLY PER	RMITTED FACI	ILITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY ΤΥΡΕ	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
MidAmerican Energy George Neal North (cont'd.)			Boiler (cont'd.)		Integrated Gasification Combined Cycle Combustion	Technically feasible – rejected because project involves add on controls, not reconstruction (redefines source)		
					Plant Efficiency Improvements	Technically feasible		
					Pollution Control Equipment	Redefines source – not feasible		
MidAmerican Energy George Neal South (PSD-IA-10-658)	Iowa Dept. of Natural Resources	644 MW coal fired boiler	Combined Cycle Turbine	2,588 lb CO <sub>2</sub> / MWh	Identical Analysis as George Neal North	Identical Analysis as George Neal North	Energy Efficiency	<ul> <li>CO2, CEMS</li> <li>Methane and Nitrous Stack Emission Rates</li> </ul>

NX A.	GHG B/	ACT CONTR	OLS AT R	ECENTLY PER	RMITTED FAC	LITIES <sup>1</sup>		
	ERMITTING UTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
	A Region VI	590 MW Natural Gas- Fired Combined Cycle Combustion Turbine	Natural Gas- Fired Combined Cycle Combustion Turbine	.459 tons of CO <sub>2</sub> / MWhr (net)	Inherently Low Emitting Processes, Practices, Designs	Feasible	<ul> <li>Combined Cycle Power</li> <li>Efficient turbine</li> <li>Efficient turbine</li> <li>Efficient turbine</li> <li>Efficient turbine blade</li> <li>design</li> <li>Turbine inlet air cooling</li> <li>Periodic turbine burner</li> <li>tuning</li> <li>Reduction in heat loss</li> <li>Instrumentation and</li> <li>controls</li> <li>Hydrogen cooled</li> <li>combustion turbine</li> </ul>	<ul> <li>Net hourly CO<sub>2</sub> emissions divided by net hourly energy output; and (1) Calculate CO<sub>2</sub>e on an hourly basis using CO2 emissions monitor; or</li> <li>(2) CO<sub>2</sub>e CEMS</li> </ul>
					HRSG Efficiency Processes, Practices and Designs	Feasible	<ul> <li>HRSG Energy Efficiency Processes, Practices, and Designs</li> </ul>	
					Steam Turbine Efficiency Processes, Practices, and Designs	Feasible	<ul> <li>Efficient heat exchanger design</li> <li>Insulation of HRSG</li> <li>Minimizing fouling of heat exchange surfaces</li> </ul>	

	ACE	
	OMPLIAI	
	ŬΣ	Es
	BACT CONTROLS SELECTED	<ul> <li>Minimizing vented steau and repair of steam leak</li> <li>Steam Turbine Energy Efficiency Processes, Practices, and Designs</li> <li>Use of Reheat Cycles</li> <li>Use of Exhaust Steam</li> <li>Condenser</li> <li>Efficient Blading Design</li> <li>Efficient Generator</li> <li>Design</li> <li>Plantwide Energy</li> <li>Efficiency Processes, Practices, and Designs</li> <li>Once-through cooling</li> <li>water design</li> <li>Multiple combustion</li> <li>Multiple combustion</li> <li>drive design</li> <li>Boiler feed pump fluid</li> <li>drive design</li> </ul>
ILITIES <sup>1</sup>	BACT Assessment	Feasible
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Plant-wide Efficiency Processes, Practices, and Designs
ECENTLY PER	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	
ROLS AT R	SOURCE SUBJECT TO BACT	Natural Gas-Fired Combined Cycle Combustion Turbine (cont'd.)
ACT CONT	FACILITY TYPE	
A. GHG BA	PERMITTING AUTHORITY	
APPENDIX .	FACILITY	Lower Colorado River Authority, TX (cont'd.)

	COMPLIANCE MONITORING	
	BACT CONTROLS SELECTED	
ILITIES <sup>1</sup>	BACT Assessment	<ul> <li>CO2</li> <li>Compression technically feasible, but Amine Adsorption not commercially viable</li> <li>Lack of CO2</li> <li>Lack of suitable sequestration sites</li> </ul>
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Add-On Controls (CCS)
ECENTLY PER	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	
ROLS AT R	SOURCE SUBJECT TO BACT	Natural Gas-Fired Combined Cycle Combustion Turbine (cont'd.)
CT CONTE	FACILITY TYPE	
A. GHG BA	PERMITTING AUTHORITY	
APPENDIX	FACILITY	Lower Colorado River Authority, TX (cont'd.)

		r				
	COMPLIANCE MONITORING	Calculate COze emissions using fuel as a surrogate				Calculate CO <sub>2</sub> e emissions using fluid as a surrogate
	BACT CONTROLS SELECTED	<ul> <li>Diesel fuel must be no more than 0.5% sulfur by weight</li> <li>Limit non-emergency operation to 100 hours/ yr</li> <li>Energy Efficiency</li> <li>O&amp;M schedule</li> </ul>				<ul> <li>Enclosed system with leak detection</li> <li>O&amp;M schedule</li> </ul>
ILITIES <sup>1</sup>	BACT Assessment	Technically feasible	Technically feasible	Technically feasible	Technically feasible	Feasible
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Diesel fuel must be no more than 0.5% sulfur by weight	Limit non- emergency operation to 100 hours/yr	Energy Efficiency	O&M schedule	Enclosed System with leak detection
ECENTLY PE	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	Numerical BACT limit infeasible due to low emission rates				0.006 tpy CO <sub>2</sub> e
ROLS AT R	SOURCE SUBJECT TO BACT	Diesel-Fired Water Pump				SF <sub>6</sub> Circuit Breaker
ACT CONTE	FACILITY ΤΥΡΕ					
A. GHG B/	PERMITTING AUTHORITY					
APPENDIX	FACILITY	Lower Colorado River Authority, TX (cont'd.)				

APPENDIX	A. GHG B/	ACT CONTR	OLS AT R	ECENTLY PEI	RMITTED FACI	ILITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Lower Colorado River Authority (cont'd.)			SF <sub>6</sub> Circuit Breaker (cont'd.)		Non-GHG emitting Dielectric Fluid in Circuit Breakers	Technically feasible, but not selected due to size needed to obtain equivalent results as SF <sub>6</sub> Circuit Breaker		
Abengoa Biomass Plant,	Kansas Dept. Health &	Biomass to Ethanol Plant	Ethanol Processor	5.89 lb CO <sub>2</sub> e /gal of ethanol	Process Efficiency	Technically feasible	Process Efficiency (heat integration, water recycling)	CO <sub>2</sub> CEMS
Hugoton, KS (PSD-KS- 1890231)	Environment				ccs	Technically feasible, but economically infeasible due to cost		
					Carbon Capture for Beneficial Uses	Technically feasible, but not cost effective due to capture, compression, and transportation costs		
					Leak Detection and Repair (LDAR) Program	Technically feasible		
					Combination of control options	Technically feasible		

BACT Mission/ Erational Limit on Source BACT Analysis Assessment Selected Monitoring	o CO2e /lb of     Use of low carbon     Technically feasible     – Restriction of the fuel     CO2, CEMS       a averaged     and carbon neutral     type to biomass that is     type to biomass that is       30 day rolling     fuels     have low to no economic     thave low to no economic	Use of lower GHG Technically feasible residuals and waste emitting processes/ practices/ designs (HRSG, (HRSG, cogeneration, heat recovery, O&M) = Energy efficient design, incorporating	CCS     Technically feasible, but economically     cogeneration, process       but economically     of co-products, heat       infeasible due to     recovery       cost     –     O&M schedule	Carbon Capture Technically feasible, for Beneficial Uses but not cost effective due to capture, compression, and	transportation costs
	ow carbon   Technically feasible  - bon neutral	ower GHG Technically feasible g processes/ ss/ designs ation, heat i, O&M)	Technically feasible, but economically infeasible due to cost	Capture Technically feasible, eficial Uses but not cost effective due to capture, compression, and transportation costs	nation of Technically feasible Options
LIMIT ON CONSI SOURCE BACT	.34 lb CO <sub>2</sub> e /lb of Use of l steam averaged and carl over 30 day rolling fuels periods	Use of l emitting practice: (HRSG, cogeneri recovery	CCS	Carbon for Bene	Combin Control
SOURCE SUBJECT TO BACT	Biomass Fired Stoker/ Boiler				
FACILITY TYPE					
Permitting Authority					
FACILITY	Abengoa Biomass Plant, Hugoton, KS (cont'd.)				

APPENDIX	A. GHG B/	ACT CONTF	ROLS AT R	ECENTLY PER	RMITTED FAC	ILITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY ΤΥΡΕ	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Abengoa Biomass Plant, Hugoton, KS (cont'd.)			Diesel-Fired Water Pump	24.0 tons CO <sub>2</sub> e /yr during any 12 consecutive month period	Efficient Design	Technically feasible, no other effective control options available	<ul> <li>Energy Efficiency</li> <li>Meet National Fire Protection Association standards</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate
			Biogas Flares	- 10,170 lb CO <sub>2</sub> e /hr	Fuel Source/ Efficient Design	Technically feasible	<ul> <li>Energy Efficiency</li> <li>Biogas and pipeline grade</li> </ul>	Calculate CO <sub>2</sub> e emissions using
				<ul> <li>20,106 short tons CO<sub>2</sub>e /yr during any 12 consecutive month period</li> </ul>	LDAR Program	Technically feasible	natural gas for pilot light – LDAR Program	tuel as a surrogate
			SF <sub>6</sub> Circuit Breakers	4.9 short ton CO <sub>2</sub> e ⁄yr	Enclosed system with leak detection	Technically feasible	<ul> <li>Enclosed system with leak detection</li> </ul>	Calculate CO <sub>2</sub> e emissions using
					Non-SF <sub>6</sub> dielectric oil or compressed air/air blast breaker fluid	Technically feasible but eliminated due to size and safety concerns (environmental risks)	- LDAR System	fluid as a surrogate

	IANCE			ified				
	COMPL			Not Speci				
	BACT CONTROLS SELECTED			- Good Combustion Practices	– Energy Efficiency – Low-Carbon Fuel			
ILITIES <sup>1</sup>	BACT Assessment	Technically infeasible for high voltage operations	Technically feasible	Technically feasible	Technically feasible, but not environmentally feasible	Technically feasible	Technically feasible	Technically feasible, but not economically feasible
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Emerging technology that is comparable to properties of SF <sub>6</sub> but without the drawbacks of dielectric oil or air blast	Development and implementation of an LDAR Program.	Good Combustion Practices	Oxidation Catalyst	Low-Carbon Fuel	Energy Efficient Design	CCS
ECENTLY PE	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE			33 tons $CO_{2e}$ /1,000 bbl of oil	received			
ROLS AT F	SOURCE SUBJECT TO BACT	SF <sub>6</sub> Circuit Breaker (cont'd.)		Process Heaters				
ACT CONTE	FACILITY ΤΥΡΕ			Petroleum Refinery with	Integrated Coal Gasification Combined Cycle Power Plant			
A. GHG B/	PERMITTING AUTHORITY			South Dakota Dept.	Environmental and Natural Resources			
APPENDIX	FACILITY	Abengoa Biomass Plant, Hugoton, KS ( <i>cont'd.</i> )		Hyperion Refinery, SD	28.0701) <sup>4</sup>			

A. GHG BACT CONTROLS AT RECENTLY PERN	ACT CONTROLS AT RECENTLY PERN	COLS AT RECENTLY PERN	ECENTLY PERN BACT	≥	IITTED FACI	LITIES		
EMISSI       PERMITTING     FACILITY       SUBJECT     LIMIT       AUTHORITY     TYPE       TYPE     SOURCE	EMISSI SOURCE OPERATIO FACILITY SUBJECT LIMIT O TYPE TO BACT SOUR	EMISSI SOURCE OPERATIO SUBJECT LIMIT ( TO BACT SOUR	EMISSI OPERATIO LIMIT O SOURO	ON/ ONAL ON CE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Process Heaters (cont'd.)	Process Heaters (cont <sup>.</sup> d.)	Process Heaters (cont'd.)			Terrestrial CCS	Technically feasible, but not economically feasible		
					Eliminating Selective Catalytic Reduction (SCR) System	Technically feasible, but not environmentally feasible		
Combined 23.9 tons CC Cycle Gas 1,000 bbl of	Combined 23.9 tons CC Cycle Gas 1,000 bbl of	Combined23.9 tons CCCycle Gas1,000 bbl of 0	23.9 tons CC 1,000 bbl of (	)2e/ oil	Good Combustion Practices	Technically feasible	<ul> <li>Energy Efficiency (good combustion practices),</li> <li>LoweCarbon Finels</li> </ul>	Not Specified
Turbine received	Turbine received	Turbine received	received		Oxidation Catalyst	Technically feasible	- Oxidation Catalyst	
					Low-Carbon Fuel	Technically feasible		
					Energy Efficient Design	Technically feasible		
					ccs	Technically feasible, but not economically feasible		
					Terrestrial CCS	Technically feasible, but not economically feasible		

APPENDIX .	A. GHG B/	ACT CONTF	ROLS AT R	ECENTLY PEI	RMITTED FAC	ILITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY ТҮРЕ	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Hyperion Refinery, SD (cont'd.)			Combined Cycle Gas Turbine (cont'd.)		Eliminating SCR System	Technically feasible, but not environmentally feasible		
			Acid Gas	58.6 tons $CO_2e$	Efficient Design	Feasible	Efficient Design	Not Specified
			Kemoval System	/1,000 bbl of oil received	Thermal Oxidation	Technically feasible, but not environmentally feasible (would increase GHG emissions)		
					Catalytic Oxidation	Technically feasible, but not environmentally feasible (would increase GHG emissions)		
					CCS	Technically feasible, but not feasible due to energy, economic and environmental concerns		

XIDN	A. GHG BA	ACT CONTR	OLS AT R	ECENTLY PER	RMITTED FAC	LITIES <sup>1</sup>		
	Permitting Authority	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
			Acid Gas Removal System (cont d.)		Terrestrial CCS	Technically feasible, but not feasible due to energy, economic and environmental concerns		
			Small Combustion Sources (flares)	.2 tons of CO <sub>2</sub> e /1,000 bbl of oil received	Proper Design	Technically feasible	Proper Design	Not Specified
, WI	Wisconsin Dept. Natural	500 MW Biomass Fueled	Boiler - Biomass	185 lb $CO_2e$ / 1,000 lbs of steam	Efficient Boiler Operation	Technically feasible	Energy Efficiency	CEMS
	Resources	Cogeneration Facility	Boiler	produced Or 508 lb CO <sub>2</sub> e/Mwh of steam produced	ccs	Technically feasible, but not energy, economically, or environmentally feasible		
					Oxidation of Methane Emissions to CO <sub>2</sub>	Technically feasible, but not environmentally feasible (would increase GHG emissions)		

	OMPLIANCE			MS			
	3ACT CONTROLS CC			3y Efficiency CEI			
LITIES <sup>1</sup>	BACT Assessment	Technically feasible	Technically feasible, but no decision made that use of biomass represents BACT	Technically feasible Energ	Technically feasible, but not energy, economically, or environmentally feasible	Technically feasible, but not environmentally feasible (would increase GHG emissions)	Technically feasible
RMITTED FACI	CONTROLS CONSIDERED IN BACT ANALYSIS	Reduction of N <sub>2</sub> O (NOx emissions)	The Use of Renewable (biomass) Fuels	Efficient Boiler Operation	ccs	Oxidation of Methane Emissions to CO <sub>2</sub> of i	Reduction of N <sub>2</sub> O (NOx emissions)
ECENTLY PEF	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE			3,050 lbs CO $_{2}$ / Mwh			
ROLS AT R	SOURCE SUBJECT TO BACT	Boiler - Biomass	Boiler (cont'd.)	Boiler - Natural Gas-	Fired Boiler		
ACT CONTE	FACILITY TYPE						
A. GHG BA	PERMITTING						
<b>APPENDIX</b>	FACILITY	WE Energies, Rothschild, WI	(cont d.)				

A. GHG BACT	ACT	CONTR	OLS AT R	ECENTLY PEI	RMITTED FACI	LITIES		
PERMITTING FACILITY SUBJECT AUTHORITY TYPE TO BACT	SOURCE FACILITY SUBJECT TYPE TO BACT	SOURCE SUBJECT TO BACT	•	BACT EMISSION/ DPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Boiler – Natural Gas- Fired Boiler (cont'd.)	Boiler – Natural Gas- Fired Boiler (cont'd.)	Boiler – Natural Gas- Fired Boiler (cont'd.)			The Use of Renewable Fuels	Not technically feasible, redefines the source		
Minnesota Iron Ore Grate Kiln 1 Dept. Natural processing plant Resources	Iron Ore Grate Kiln 1 processing plant	Grate Kiln 1	1	14,000 tpy CO <sub>2</sub> e	CCS	Technically feasible, but not economically feasible	<ul> <li>Energy Efficiency</li> <li>Fuel Selection</li> </ul>	Not Specified
					Fuel Source (natural gas, renewable, coal with natural gas co- firing)	Technically feasible		
					Energy Efficiency	Technically feasible		
New York State Portland Preheater/ .9 Department of Cement Precalciner po Environmental Manufacturing Kiln System or	PortlandPreheater/.9CementPrecalcinerpoManufacturingKiln Systemoi	Preheater/ .9 Precalciner po Kiln System ou	6. 00	15 tons of CO <sub>2</sub> e er ton of clinker n rolling 12	Reducing Clinker Content of Cement	Technically feasible	<ul> <li>Energy Efficiency (heat recovery system, cogeneration)</li> </ul>	CO <sub>2</sub> CEMS
Conservation plant	plant	<u> </u>	ц ц	nonth avg.	Alternate Fuels	Technically feasible	<ul> <li>"Dty" Manutacturing process (Reducing Clinker Content)</li> </ul>	
					Plant Design Optimization	Technically feasible	<ul> <li>Coal as primary fuel, natural gas and low</li> </ul>	
					Electrical Systems Optimization	Technically feasible	emitting tuels for start-up	

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APPENDIX	A. GHG B/	ACT CONTR	OLS AT R	ECENTLY PEI	RMITTED FACI	LITIES <sup>1</sup>		
FACILITY	Permitting Authority	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Lafarge Manufacturing Plant, Ravenna, NY (cont'd.)			Preheater/ Precalciner Kiln System (cont'd.)		Low Carbonate Alternate Raw Materials	Technically feasible, but not selected due to economic impact		
					ccs	Technically feasible, but not selected due to energy, environmental and economic impact		
Nucor Steel, LA	Louisiana Dept.	Iron Ore	Flue Gas	None	Energy Efficiency	Technically feasible	– Energy Efficiency (good	Calculate CO <sub>2</sub> e
-1 CI-RJ-USA) (247)	Environmental Quality	Processing Plant	Stack		Acid Gas Separation System	Technically feasible	combustion practices) – Acid Gas Separation System	emissions using fuel as a surrogate
					Energy Integration (using self- generated gas as fuel)	Technically feasible	<ul> <li>Energy Integration (using self-generated gas as fuel</li> </ul>	1
			Boiler	None	Energy Efficiency	Technically feasible	Energy Efficiency (good combustion practices)	CO <sub>2</sub> CEMS

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APPENDIX	A. GHG BA	<b>VCT CONTR</b>	OLS AT R	ECENTLY PEN	RMITTED FAC	ILITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Crawford Renewable, Greenwood Township, PA (PSD-PA-2035A)	Pennsylvania Dept. Environmental Protection	Biomass tire burning facility	SF <sub>6</sub> Circuit Breaker	None	LDAR System	Technically feasible	LDAR System	Calculate CO <sub>2</sub> e emissions using fluid as a surrogate
			Boiler	0.99516 short tons/Mwh	Circulating Fluidized Bed combustion design	Technically feasible	<ul> <li>Energy Efficiency</li> <li>Circulating Fluidized Bed combustion design</li> </ul>	CO <sub>2</sub> CEMS
					CCS	Not technically feasible		
					Energy Efficiency	Technically feasible		
PacifiCorp Energy, Lakeside, UT (PSD-UT- 13031-0010)	Utah Dept. Environmental Quality	Natural gas- fired power plant	Combined Cycle Turbine	950 lbs. CO <sub>2</sub> e /Mwh	Energy Efficiency	Technically feasible	<ul> <li>Energy Efficiency (heat recovery system)</li> </ul>	Calculate CO <sub>2</sub> e emissions using fuel as a surrogate
Sumpter Energy Associates, Carleton Farms, MI (PSD-MI- 293-09A)	Michigan Dept. of Environmental Quality ("MDEQ")	Landfill	Combustion Engines for Landfill Gas	8278 tpy CO <sub>2</sub> e	Unknown <sup>5</sup>	Unknown <sup>5</sup>	Unknown <sup>5</sup>	Calculate CO <sub>2</sub> e emissions using landfill gas as a surrogate

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<b>APPENDIX</b>	A. GHG B/	ACT CONTR	OLS AT R	ECENTLY PEF	RMITTED FACI	ILITIES <sup>1</sup>		
Facility	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Wolverine Power Supply	MDEQ	Natural gas- fired power	Cycle Turbine	954 lb/MWh gross energy output	Unknown <sup>5</sup>	Unknown <sup>5</sup>	Unknown <sup>5</sup>	Unknown <sup>5</sup>
Cooperative, Belleville MI (PSD-MI-81-11)		plant	Diesel-fired Internal Combustion Engine	716.6 lb CO <sub>2</sub> e /hr	Unknown <sup>5</sup>	Unknown <sup>5</sup>	Unknown <sup>5</sup>	Unknown <sup>5</sup>
Wolverine Power Supply Cooperative, Rogers City, MI (PSD-ML317-07)	MDEQ	600 MW natural gas-fired power plant	Circulating Fluidized Bed combustion Boiler	2.1 lb CO <sub>2</sub> kWh gross energy output	ccs	Technically feasible, but selected due to energy, economic, and environmental concerns	<ul> <li>Energy Efficiency</li> <li>Use of 5% biomass in fuel</li> <li>O&amp;M Schedule</li> </ul>	CEMS
					Biogenic Fuel Augmentation	Technically feasible		
				·	Energy Efficiency	Technically feasible		
Titan America/ Carolina	NCDENR	Portland Cement	Preheater/ Precalciner	1,895,000 tons CO <sub>2</sub> e per	Reducing Clinker Content	Technically feasible	Plant Design Optimization & Electric System	Not Specified
Cement Company, Castle Hayne, NC (PSD-NC, 07300R09)		Manufacturing Plant	Kih	consecutive 12- month period	Alternate Fuels (Natural Gas, Biomass)	Not available as BACT, selection would fundamentally redefine the project	Optimization (Modern thermally efficient preheater/precalciner kiln design with in-line raw mill technology)	

PENDIX	A. GHG B/	ACT CONTE	ROLS AT R	ECENTLY PER	RMITTED FACI	LITIES <sup>1</sup>		
נורובא	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
America/ na nt uny, Castle			Preheater/ Precalciner Kiln (cont'd.)		Plant Design Optimization (Efficiency Measures)	Technically Feasible		
					Electrical System Optimization (Efficiency Measures)	Technically feasible		
					Low Carbonate Alternate Raw Materials	Not technically feasible. <sup>6</sup>		
					ccs	Not technically feasible		
ville 7 Center, ian y ation,	IEPA	630 MW Coal Gasification Facility	Acid Gas Recovery Unit	111.4 tons of CO <sub>2</sub> e per million scf of SNG produced	CCS (EOR and Geologic Sequestration)	Technically feasible, but selected due to energy, economic, and environmental concerns		Not Specified
ville, s (PSD-1L- 0ACB)					Process Efficiency of Gasification Block	Technically feasible		

	COMPLIANCE MONITORING		CEMS				Vot Specified		
	BACT CONTROLS SELECTED		Fuel Efficient Turbine Design; Fuel Selection; Good	Combustion Practices			Flare Minimization Planning; Neot Cause Analysis; Fuel	Selection; and Efficient Flare Design	
ILITIES <sup>1</sup>	BACT Assessment	Technically feasible	Not technically feasible	Technically feasible	Technically feasible	Technically feasible	Not technically feasible	Technically feasible	Technically feasible
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Good Combustion Practices (to reduce methane emissions)	CCS	Fuel Efficient Turbine Design	Fuel Selection	Good Combustion Practices	CCS	Flare Minimization Planning	Root Cause Analysis
ECENTLY PE	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE		2,307,107 tpy of CO <sub>2</sub> e on rolling 12	month avg.			26,387 tons of CO <sub>2</sub> e per year		
ROLS AT R	SOURCE SUBJECT TO BACT	Acid Gas Recovery Unit (cont'd.)	Combustion Turbine				Flare		
ACT CONTE	FACILITY TYPE								
A. GHG B∕	PERMITTING AUTHORITY								
APPENDIX .	FACILITY	Taylorville Energy Center, Christian County Generation,	LLC, Taylorville, IL ( <i>cont'd.</i> )						

	COMPLIANCE MONITORING			Not Specified			
	BACT CONTROLS SELECTED			Tailgas recycling; fuel selection; and energy	efficiency		
ILITIES <sup>1</sup>	BACT Assessment	Technically feasible	Technically feasible	Not technically feasible	Technically feasible	Technically feasible	Technically feasible
RMITTED FAC	CONTROLS CONSIDERED IN BACT ANALYSIS	Fuel Selection	Efficient Flare Design	CCS	Tailgas recycling (to Acid Gas Recovery Unit)	Fuel Selection	Managing fuel consumption and good operating practices (energy efficiency)
ECENTLY PE	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE			4,937 tons of CO <sub>2</sub> e per year			
ROLS AT R	SOURCE SUBJECT TO BACT	Flare (cont'd.)		Sulfur Recovery	Unit		
CT CONTI	FACILITY TYPE						
A. GHG BA	PERMITTING AUTHORITY						
APPENDIX ,	FACILITY	Taylorville Energy Center, Christian County Generation, LLC, Taylorville, IL (cont'd.)					

APPENDIX	A. GHG B/	ACT CONTR	OLS AT R	ECENTLY PEF	RMITTED FACI	LITIES <sup>1</sup>		
FACILITY	Permitting Authority	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Indiana Gasification, LLC, Rockport, Indiana (PSD- IN- 147.30464-	Indiana Department of Environmental Management	Coal- Gasification Plant	Acid Gas Recovery Unit	- 4.6 million tons of CO <sub>2</sub> for the first 12 months of operation	SS	Not technically feasible	– Efficient design	CEMS
00060)				-6.43 million tons of CO <sub>2</sub> for the second 12 months of operation				
				-1.29 million tons				
				or CO <sub>2</sub> on a monthly avg. thereafter	Efficient design	System is inherently efficient		
			Wet Sulfuric Acid ("WSA") Plants	474,000 tpy CO <sub>2</sub> per 12 consecutive month period	No control	System is inherently efficient	– Efficient design	CEMS
					Recycling the WSA stack gas back to the Acid Gas Recovery Unit	Not technically feasible		
					CCS	Not technically feasible		
X /	A. GHG B/	ACT CONTE	ROLS AT R	ECENTLY PER	RMITTED FACI	LITIES <sup>1</sup>		
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	Permitting Authority	FACILITY ΤΥΡΕ	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
			Auxiliary natural gas- fired boiler	88,167 tpy CO <sub>2</sub> per 12 consecutive month period	Low carbon gaseous fuel (natural gas or synthetic natural gas	Technically feasible	<ul> <li>Use of natural gas or SNG</li> <li>Energy efficient boiler design</li> </ul>	Not specified
					Energy efficient boiler design	Technically feasible	– 81% thermal efficiency design	
					Post-combustion CO <sub>2</sub> capture	Not technically feasible		
			Gasifier preheat burners	6,438 tons of CO <sub>2</sub> per 12 consecutive month period	Natural gas fuel	Technically feasible	<ul> <li>Use of efficient engineering design and good combustion practices</li> </ul>	Not specified
					Efficient engineering design and good combustion practices	Technically feasible	– Use of natural gas or SNG	
					Post-combustion capture	Technically feasible		

APPENDIX	A. GHG B/	ACT CONTE	ROLS AT R	ECENTLY PE	RMITTED FACI	ILITIES <sup>1</sup>		
FACILITY	PERMITTING AUTHORITY	FACILITY TYPE	SOURCE SUBJECT TO BACT	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	CONTROLS CONSIDERED IN BACT ANALYSIS	BACT Assessment	BACT CONTROLS SELECTED	COMPLIANCE MONITORING
Indiana Gasification LLC, Rockport, IN (cont'd.)			Zero Liquid Discharge Spray Dryer	2,884 tons of CO <sub>2</sub> per 12 consecutive month period	Use of good engineering design and good combustion practices	Technically feasible	<ul> <li>Use of good engineering design</li> <li>Use of natural gas and SNG</li> </ul>	Not specified
					Use of natural gas and SNG	Technically feasible		
					Post-combustion capture	Not technically feasible		
			Emergency diesel generators	84 tons CO <sub>2</sub> per 12 consecutive month period	Energy efficient design	Technically feasible	Energy efficient design	Not specified
					Post-combustion capture	Not technically feasible		

	OMPLIANCE	JAR		ot specified		
	BACT CONTROLS C	LI rully enclosed circuit circuit creakers with leak detection		e Flare Minimization Plan		
LITIES	BACT Assessment	Technically feasible	Not technically feasible	Technically feasible	Not technically feasible	Not technically feasible
RMITTED FACI	CONTROLS CONSIDERED IN BACT ANALYSIS	Fully enclosed and pressurized circuit breakers with leak detection	Use of circuit breakers without SF <sub>6</sub>	Flare Minimization Plan	Efficient design and operation	Flare gas recovery
ECENTLY PEI	BACT EMISSION/ OPERATIONAL LIMIT ON SOURCE	Not specified		Not specified		
TROLS AT F	SOURCE SUBJECT TO BACT	SF <sub>6</sub> Electrical circuit breakers		Synthetic and acid gas flares		
CT CONTE	FACILITY TYPE					
A. GHG BA	PERMITTING AUTHORITY					
APPENDIX ,	<b>Ε</b> ΑCILITY	Indiana Gasification LLC, Rockport, IN (cont'd.)				

 This table covers final permits issued by the states or EPA, but includes challenged permits.
 EPA determined that because the emergency generator would only operate for a short period of time per averaging period, showing compliance with a short term numeric limit would be too burdensome and costly. 3 Id.

4 Environmental groups have challenged SDENR's decision to issue the Hyperion Refinery permit.

5 Approval letters for these facilities have been issued, but copies of the permit and MDEQ's BACT analysis are not publicly available without a formal request under Michigan's Freedom of Information Act.

6 Product quality considerations, economics, and regulatory constraints on permissible raw materials at Portland Cement facilities prevent the operator from utilizing Low Carbonate Alternate Raw Materials to a certain extent. The operator noted in their own BACT analysis that it would incorporate these materials into its operations to the maximum extent practicable, taking into account the constraints described in the preceding sentence.

## GROUNDWATER DISTRICT ENFORCEMENT

#### BY DEBORAH CLARKE TREJO

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### I. INTRODUCTION

This Article provides an overview of enforcement approaches available to groundwater conservation districts (GCDs or districts), including the Edwards Aquifer Authority (EAA), and considers the mechanics of these approaches for the benefit of districts and regulated entities.

### **II. DISTRICT ENFORCEMENT**

Chapter 36 of the Texas Water Code (TWC) authorizes districts to enforce the chapter's provisions and their own rules.<sup>1</sup> Chapter 36 provides certain powers for districts to enforce their rules. Most notably, it authorizes district personnel to enter property to determine whether any violations of district rules have occurred,<sup>2</sup> authorizes districts to close open or abandoned wells,<sup>3</sup> and authorizes districts to file suit in state court for rules violations—with mandatory recovery of the district's attorney's fees and costs.<sup>4</sup>

Districts may adopt rules to reasonably implement the powers and duties they are granted under Chapter 36 and their enabling acts, and a district's enforcement program will depend on the scope of rules the district adopts.<sup>5</sup> Chapter 36 grants districts wide discretion, leaving it to districts to determine how best to carry out their obliga-

<sup>1</sup> See, e.g., Tex. Water Code Ann. §§ 36.101-.102 (West 2008 & Supp. 2011-12).

<sup>2</sup> Id. § 36.123(b).

<sup>3</sup> Id. § 36.118(c).

<sup>4</sup> Id. § 36.102.

<sup>5</sup> Id. § 36.101.

tions to regulate and protect groundwater, and those dependent upon it, within their jurisdiction.<sup>6</sup> Section 36.101(a) provides a broad-based grant of authority to districts, authorizing them to "make and enforce rules . . . to provide for conserving, preserving, protecting, and recharging of the groundwater . . . in order to control subsidence, prevent degradation of water quality, prevent waste of groundwater, and to carry out the powers and duties provided by this chapter."<sup>7</sup> District rules may cover a wide variety of topics, including metering and reporting requirements, prohibitions on waste, drought restrictions, and rules intended to protect water quality through the regulation of well spacing, well construction and plugging, and even surface activities that have the potential to contaminate groundwater.

Landowners are required to comply with environmental regulations affecting their property, including legal requirements found in general laws relating to wells that are also subject to GCD regulations. For example, the Texas Occupations Code requires landowners or other persons in possession of an abandoned or deteriorated well to plug or cap the well in accordance with Texas Department of Licensing and Regulation (TDLR) rules.<sup>8</sup> Landowners then should be aware of requirements related to their wells imposed by districts and by other law.

### A. INSPECTIONS

### 1. STATUTORY RIGHT TO ENTER LAND

Chapter 36 authorizes districts to inspect property for the purpose of conducting their enforcement and compliance programs.<sup>9</sup> These inspections are designed to collect information to assist the district in determining if the owner of the land is in compliance with Chapter 36 and the district's rules. In constitutional terms, these types of inspections are normally referred to as "administrative searches."<sup>10</sup>

Section 36.123(b) provides general authority for districts to conduct inspections: District employees and agents are entitled to enter any public or private property within the boundaries of the district . . . at any reasonable time for the purpose of inspecting and investigating conditions relating to the quality of water in the state or the compliance with any rule, regulation, permit, or other order of the district. District employees or agents acting under this authority who enter private property shall observe the establishment's rules and regulations concerning safety, internal security, and fire protection and shall notify any occupant or management of their presence and shall exhibit proper credentials.<sup>11</sup>

<sup>6</sup> See id.

<sup>7</sup> See Tex. Water Code Ann. § 36.101 (West Supp. 2011-12).

<sup>8</sup> TEX. OCC. CODE ANN. § 1901.255(c) (West 2003).

<sup>9</sup> TEX. WATER CODE ANN. § 36.123(b).

<sup>10</sup> See e.g., Camara v. Mun. Court of the City and Cnty. of San Francisco, 387 U.S. 523, 533–34 (1967).

<sup>11</sup> TEX. WATER CODE ANN. § 36.123(b). Section 36.123(a) vests districts with additional, though limited, powers to enter land. This section provides: "The directors, engineers, attorneys, agents, operators, and employees of a district . . . may go on any land to inspect, make surveys, or perform tests to determine the condition, value, and usability of the property, with reference to the proposed location of works, improvements, plants, facilities, equipment,

Section 26.173 of the Water Code provides some additional authority to GCDs to inspect property as follows:

(a) A local government has the same power as the commission has under Section 26.014<sup>[12]</sup> of this code to enter public and private property within its territorial jurisdiction to make inspections and investigations of conditions relating to water quality. The local government in exercising this power is subject to the same provisions and restrictions as the commission.

(b) When requested by the executive director, the result of any inspection or investigation made by the local government shall be transmitted to the commission for its consideration.<sup>13</sup>

GCDs, therefore, have the statutory right to enter property to conduct administrative searches for the purpose of inspecting and investigating the following: the quality of water in the state, compliance with Chapter 36, and compliance with any district rule.

# 2. Administrative Searches—Constitutional Search and Seizure Concerns

Although neither Chapter 26 nor Chapter 36 of the Water Code specifies any requirement that a district obtain a search warrant prior to entering property to conduct administrative inspections, the prohibitions against unreasonable searches and seizures in the Texas Constitution<sup>14</sup> and the United States Constitution<sup>15</sup> apply to administrative searches.<sup>16</sup> These prohibitions protect individuals from arbitrary invasions of their privacy and security by government officials.<sup>17</sup> In fact, a search of a private home is considered to be "presumptively unreasonable" if the government has not secured a warrant.<sup>18</sup> This presumption of unreasonableness of a warrantless search extends to the owners of commercial property as well; but an owner's "expectation of privacy in commercial premises . . . is different from, and indeed, less than a similar expectation of privacy in an individual's home."<sup>19</sup>

or appliances. The cost of restoration shall be borne by the district or the water supply corporation." Because the power to enter property created by this subsection relates solely to the ability to assess the suitability of land for specific projects, this provision is not discussed further. TEX. WATER CODE ANN. § 36.123(a).

- 12 Section 26.014 (referred to in § 26.173) contains language substantially similar to that contained in § 36.123 discussed above and authorizes the Texas Commission on Environmental Quality (TCEQ) to enter property at any reasonable time to inspect or investigate water quality or compliance with TCEQ rules, permits, or orders or to investigate or respond to an immediate public health threat. TEX. WATER CODE ANN. § 26.014.
- 13 Tex. Water Code Ann. § 26.173 (West 2008).
- 14 TEX. CONST. art. I, § 9.
- 15 U.S. CONST. amend. IV.
- 16 See, e.g., Camara v. Mun. Court of the City and Cnty. of San Francisco, 387 U.S. 523, 528 (1967).
- 17 Because the federal and state provisions are substantively alike, Texas courts analyze the state provision under federal search and seizure law. *See, e.g.*, Schade v. Tex. Workers Comp. Comm'n, 150 S.W.3d 542, 550 (Tex. App.–Austin 2004, pet. denied).
- 18 See v. City of Seattle, 387 U.S. 541, 543 (1967).
- 19 New York v. Burger, 482 U.S. 691, 699 (1987).

The United States Supreme Court applied the Fourth Amendment to administrative searches in two 1967 administrative search cases, and explained that, in such cases, privacy concerns should be balanced against the need for effective regulatory enforcement and within the reasonableness requirement of the Fourth Amendment.<sup>20</sup> This balancing test allows agency inspectors to use a lower standard of probable cause than the standard required in criminal cases.<sup>21</sup>

Three elements establish the reasonableness of an administrative search:

(1) whether the proposed search is authorized by statute;

(2) whether the proposed search is properly limited in scope; and

(3) how the agency designated the target of the search.<sup>22</sup>

With respect to the third element, a search is considered reasonable if it is based on either:

(1) specific evidence of an existing violation;

(2) a showing that reasonable legislative or administrative standards for conducting an inspection are satisfied with respect to a particular establishment; or
(3) a showing that the search is pursuant to an administrative plan containing specific neutral criteria.<sup>23</sup>

Courts instruct administrative agencies to keep a written record of the criteria used to designate an entity as the subject of a search, which allows a reviewing court to evaluate the reasonableness of the search.<sup>24</sup> The Fifth Circuit has stressed the importance of limiting the discretion of field inspectors through agency oversight of inspection decisions.<sup>25</sup> An administrative plan with neutral criteria for conducting inspections will support a finding that an administrative search was reasonable.<sup>26</sup>

A GCD's search will likely be considered reasonable if the following conditions are met: (1) it is conducted in accordance with the procedures specified in the Water Code; (2) it is limited to areas relevant to the GCD's regulatory jurisdiction; (3) it is either part of a regular program of inspections or based on specific evidence that a violation of Chapter 36 or district rules has occurred; and (4) inspectors comply with established internal procedures for conducting inspections.

There are a number of well-established exceptions to the requirement to obtain a warrant before conducting an administrative search, including consent,<sup>27</sup> the "open

- 24 Id. at 102.
- 25 Id. at 103; Mississippi, 638 F.2d at 907-08.
- 26 See, e.g., Harris Methodist Fort Worth, 970 F.2d at 103.
- 27 See, e.g., U.S. v. Thiftimart, Inc., 429 F.2d 1006, 1009 (9th Cir. 1970).

<sup>20</sup> JOHN WESLEY HALL, SEARCH AND SEIZURE, 365 (3d. ed. 2000) (citing Camara, 387 U.S. 523 and See, 387 U.S. 541).

<sup>21</sup> Id.

<sup>22</sup> U.S. v. Harris Methodist Fort Worth, 970 F.2d 94, 101 (5th Cir. 1992) (citing U.S. v. Mississippi Power & Light Co., 638 F.2d 899, 907 (5th Cir. 1981).

<sup>23</sup> See id. (citing Marshall v. Barlow's, Inc., 436 U.S. 307, 320-21 (1978) and Camara v. Mun. Court of the City and Cnty. of San Francisco, 387 U.S. 523, 538 (1967) (internal citations omitted)).

fields" doctrine,<sup>28</sup> and the closely regulated-business exception.<sup>29</sup> In all cases, administrative searches without a warrant must be carefully limited in time, place, and scope.<sup>30</sup>

In conducting inspections, GCDs may first attempt to obtain consent from the owner of the property to be inspected. In doing so, GCD staff may provide the owner with a copy of the provisions of the Water Code that authorize the GCD's entry. GCD staff does not have an obligation to affirmatively advise owners that they may refuse to consent. If questioned, district staff may advise the owner that, if consent is refused, the district will seek a search warrant. In any case, force-including the display of weapons or other show of force-should not be used to obtain entry, since it might create a coercive environment and negate consent. Where the district is unable to obtain consent and it cannot lawfully enter due to fencing, no trespass signs, or the presence of a crop, the district should seek to obtain an administrative search warrant from a magistrate with jurisdiction. To obtain such a warrant, the district should file a carefully drafted affidavit and search warrant setting out either specific evidence of a violation of Chapter 36 or the district's rules or information about the relevant inspection program, a legal brief in support of the district's right to an administrative search warrant, and an accompanying letter containing contact information for counsel to respond to questions the magistrate may have. The district may also file a lawsuit to enforce its right of entry to conduct inspections of conditions related to water quality and to determine whether any violations of Chapter 36 or the district's rules exists.

### **B.** CLOSING OPEN OR ABANDONED WELLS

If a landowner "fails or refuses to close or cap the well . . . in accordance with the district's rules," § 36.118 of the Water Code authorizes districts to enter property "to close or cap the well" and provides the district with a statutory lien to recover its costs.<sup>31</sup>

## C. PRE-CIVIL SUIT COMPLIANCE EFFORTS

Because the primary power districts have to enforce their rules is the right to file a civil law suit seeking civil penalties and injunctive relief, GCD enforcement programs largely involve pre-suit settlement efforts, whereby districts seek to bring persons into compliance with their rules, often requiring the violators to settle the violation and avoid a lawsuit by paying some money to the district. Often settlement agreements are drafted by a district's staff and attorneys, together with the violator, and then presented to the district's board for approval. Entering into a settlement agreement achieves the parties' desires to avoid litigation and costly civil penalties and attorney's fees.

### D. CIVIL SUITS

TWC § 36.102 authorizes districts to enforce Chapter 36 and their own rules by filing a suit for injunctive relief or civil penalties in state district court.<sup>32</sup> The civil penal-

Watts v. State, 56 S.W.3d 694, 699 (Tex. App.–Houston [14th Dist.] 2001, rev'd on other grounds, 99 S.W.3d 604 (Tex. Crim. App. 2003)) (citing Oliver v. U.S., 466 U.S. 170 (1984)).
 New York v. Burger 482 U.S. 601, 700 (1987)

<sup>29</sup> New York v. Burger, 482 U.S. 691, 700 (1987).

<sup>30</sup> Id. at 703.

<sup>31</sup> TEX. WATER CODE ANN. §§ 36.118(c)-(d) (West 2008).

<sup>32</sup> Id. §§ 36.102(a), (c).

ties must be set by district rule and then assessed by the court.<sup>33</sup> These penalties may not "exceed \$10,000 per day per violation, and each day of a continuing violation constitutes a separate violation."<sup>34</sup> Recovery of civil penalties is mandatory if the district prevails.<sup>35</sup> Moreover, a court must assess at least the minimum penalty applicable for each day the violation occurred.<sup>36</sup> Further, if a GCD "prevails in any suit to enforce its rules, the district may seek and the court shall grant . . . recovery for attorney's fees, costs for expert witnesses, and other costs incurred by the district."<sup>37</sup>

GCDs may have much more limited remedies against other governmental entities, however. The Texas Supreme Court recently indicated in *Rolling Plains Groundwater Conservation District v. City of Aspermont* that GCDs may be limited by the doctrine of governmental immunity from recovering past-due fees, civil penalties, and costs from other governmental entities.<sup>38</sup> *Aspermont* does not address whether 2009 amendments to § 36.102 may now waive immunity.<sup>39</sup>

Districts are also required to enforce state law and TDLR rules related to abandoned and deteriorated wells located within their boundaries. Section 1901.256 of the Texas Occupations Code requires GCDs to enforce § 1901.255 of the Code.<sup>40</sup> Section 1901.255 provides standards and requirements related to abandoned and deteriorated wells,<sup>41</sup> while § 1901.256 authorizes districts to file civil suit seeking injunctive relief and penalties in state court.<sup>42</sup> TDLR rules also allow GCDs to "enforce compliance with Occupations Code, § 1901.255 related to landowners that have an abandoned and/or deteriorated well located on their property."<sup>43</sup>

Districts are also authorized to enforce certain state environmental laws by filing suit in state district court for violations occurring within their jurisdiction of certain chapters of the Texas Water Code (Chapters 16 (water development), 26 (water quality), and 28 (water wells)), the Texas Occupations Code (Chapter 1903 (irrigators)), and the Texas Health and Safety Code (Chapters 361 (Solid Waste Disposal Act), 371 (Used Oil Collection, Management and Recycling Act), 372 (plumbing fixtures), 382 (Clean Air Act), and 401 (Radiation Control Act)), and rules adopted and permits issued thereunder.<sup>44</sup>

### E. CITIZEN SUITS

Section 36.119(b) of the Water Code provides:

- 36 State v. City of Greenville, 726 S.W.2d 162, 170 (Tex. App.–Dallas 1986, writ ref'd n.r.e.).
- 37 TEX. WATER CODE ANN. § 36.102(d) (West Supp. 2011–12).
- 38 353 S.W.3d 756, 760 (Tex. 2011) (per curiam) (noting that generally only prospective relief is available against governmental entities; retroactive relief is not).
- 39 See id.
- 40 TEX. OCC. CODE ANN. § 1901.256(b) (West 2012).
- 41 See id. § 1901.255.
- 42 Id. §§ 1901.256(c)-(e) (West 2012).
- 43 16 TEX. ADMIN. CODE § 76.1011 (Tex. Comm'n on Envtl. Quality).
- 44 Tex. Water Code Ann. § 7.351 (West 2008).

<sup>33</sup> Id. §§ 36.102(b), (d).

<sup>34</sup> Id. § (b).

<sup>35</sup> Id.

"A landowner or other person who has a right to produce groundwater from land that is adjacent to the land on which a well or wells are drilled or operated without a required permit or from which groundwater is produced in violation of a district rule adopted under Section 36.116(a)(2) of the Texas Water Code, or who owns or otherwise has a right to produce groundwater from land that lies within one-half mile of the well or wells, may sue the owner of the well or wells for damages or to restrain or enjoin the illegal drilling."<sup>45</sup>

The suit can be filed with or without joining the district.<sup>46</sup> Before such a suit is filed, however, a written complaint must be filed "with the district having jurisdiction over the well or wells drilled or operated without a required permit or in violation of a district rule."<sup>47</sup> The district must investigate the complaint within ninety days and determine whether the district rules have been violated.<sup>48</sup>

### **III. EDWARDS AQUIFER AUTHORITY ENFORCEMENT**

In addition to the authority given to GCDs generally to enforce Chapter 36 and their own rules, the Edwards Aquifer Authority Act ("EAA Act")<sup>49</sup> provides the EAA with some additional enforcement tools. First, the EAA Act directly imposes certain requirements on well owners and others within the EAA's jurisdiction; for example, the EAA Act prohibits withdrawals of groundwater without authorization, violating a term or condition in a permit, wasting water from the Aquifer, polluting or contributing to the pollution of the Edwards Aquifer, and violating the EAA Act or the EAA's rules.<sup>50</sup> The EAA Act authorizes the EAA to issue orders to enforce the EAA Act and the EAA's rules and to enforce the terms and conditions of EAA permits.<sup>51</sup> Under the EAA Act, the EAA may adopt rules to provide for the suspension of a permit for failing to pay a required fee or violating a permit condition, EAA to assess administra-

48 Id.

- 51 Id. §§ 1.11(c), 1.36(a).
- 52 Id. § 1.36(b).

<sup>45</sup> Id. § 36.119(b).

<sup>46</sup> Id.

<sup>47</sup> Id. § 36.119(g).

<sup>Act of May 30, 1993, 73rd Leg., R.S., ch. 626, 1993 Tex. Gen. Laws 2350; as amended by Act of May 16, 1995, 74th Leg., R.S., ch. 524, 1995 Tex. Gen. Laws 3280; Act of May 29, 1995, 74th Leg., R.S., ch. 261, 1995 Tex. Gen. Laws 2505; Act of May 6, 1999, 76th Leg., R.S., ch. 163, 1999 Tex. Gen. Laws 634; Act of May 25, 2001, 77th Leg., R.S., ch. 1192, 2001 Tex. Gen. Laws 2696; Act of May 28, 2001, 77th Leg., R.S., ch. 966, §§ 2.60–2.62 and 6.01–6.05, 2001 Tex. Gen. Laws 1991, 2021 and 2075; Act of June 1, 2003, 78th Leg., R.S., ch. 1112, § 6.01(4), 2003 Tex. Gen. Laws 3188, 3193; Act of May 23, 2007, 80th Leg., R.S., ch. 510, 2007 Tex. Gen. Laws 900; Act of May 28, 2007, 80th Leg., R.S., ch. 1430, §§ 12.01–2.12, 2007 Tex. Gen. Laws 5848, 5901; and Act of May 21, 2009, 81st Leg., R.S., ch. 1080, 2009 Tex. Gen. Laws 2818, available at http://www.edwardsaquifer.org/files/EAAact.pdf [hereinafter EAA Act].</sup> 

<sup>50</sup> EAA Act § 1.35.

tive penalties against persons who violate the EAA Act, the EAA rules, or an order issued by the EAA. To assess the penalties, the EAA must follow specific procedures ensuring alleged violators have notice and an opportunity to be heard.<sup>53</sup> Similar to Chapter 36, the EAA Act authorizes the EAA to file a civil suit for civil penalties and/ or injunctive relief but itself sets the range of recoverable civil penalties at between \$100 and \$10,000 per day per violation.<sup>54</sup> TCEQ is also authorized to file suit to recover civil penalties for a violation of the EAA Act, EAA rules, or an EAA permit or order.<sup>55</sup> In the event that the EAA fails to comply with the terms of the EAA Act or to enforce the EAA Act against a violator, TCEQ may file a civil suit for mandamus against the EAA and may recover its attorney's fees from the EAA.<sup>56</sup>

Given the extensive requirements of the EAA Act and the EAA rules, the EAA has developed a comprehensive enforcement program. Violations are tracked across program areas within the agency and attempts are made to resolve violations before they are referred to the EAA Compliance Team. The EAA's compliance program works to first bring violators into compliance with the regulatory regime and second, depending upon the violation and any guidance provided by the board regarding resolution of such matters, recover a settlement designed to recover the EAA's expenses in obtaining compliance and avoid future violations. Settlement agreements are generally developed by EAA staff, together with violators, reviewed by counsel, and approved by the EAA's Permits/Enforcement Committee and Board of Directors.

#### IV. CONCLUSION

Groundwater conservation districts, including the EAA, are authorized to enter and inspect property to determine whether violations of their rules and other applicable laws have occurred, subject to constitutional limitations, and to close or cap abandoned wells, file civil suits to obtain injunctive relief and mandatory civil penalties and attorney's fees and costs, with some possible limitations on such remedies against other governmental entities. Perhaps most importantly, districts will seek to avoid filing civil suits by working with violators to bring them into compliance with district requirements.

Deborah Clarke Trejo is an attorney in the Austin office of Kemp Smith LLP. She concentrates her practice on representing groundwater districts, municipalities, private companies, and individuals in environmental, water, and administrative matters, including representation of the Edwards Aquifer Authority and the Southern Trinity Groundwater Conservation District in enforcement matters. Notwithstanding, the comments and opinions expressed in this article are solely those of the author and do not reflect any position of any client of Ms. Trejo or Kemp Smith LLP.

<sup>53</sup> Id. § 1.37.

<sup>54</sup> Id. §§ 1.38, 1.40.

<sup>55</sup> Id. § 1.40.

<sup>56</sup> Id. § 1.39.

## BIODEGRADABLE PLASTICS: A STOPGAP SOLUTION FOR THE INTRACTABLE MARINE DEBRIS PROBLEM

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### I. INTRODUCTION

Over the past decade, the Great Pacific Garbage Patch ("Garbage Patch") has become a captivating yet intangible bogeyman in American popular culture. From television shows<sup>1</sup> to folk operas<sup>2</sup> to trendy magazines,<sup>3</sup> the Garbage Patch provided a screen on which to project collective fears about the unknown and anger with a consumerist society. As media attention grew around an elusive, yet enormous, floating plastic landfill somewhere in the middle of the Pacific Ocean, there followed the inevitable backlash from industry and skeptics, with claims that the Garbage Patch was just a myth. This Note closely examines what is actually known about plastic garbage in the ocean—what is termed the plastic marine debris problem.

Looking at the science, it is evident that, while land-based garbage is the source, the problem looks very different than an island of trash, conspicuously located. Instead, the problem exists on a simultaneously larger and smaller scale: microplastics, smaller than five millimeters across, are scattered throughout the world's oceans. While microplastics are certainly found in higher concentrations in the Garbage Patch, and in all subtropical gyres (oceanic surface currents), they are not limited to those areas.

At the same time, the international community only recently began to recognize the role of inadequate waste management as the source of the microplastics problem. It thus has not developed a successful, or even satisfactory, solution on an international scale. Current attempts are plagued with sovereignty problems, unenforceability, and vagueness, as well as an inability to address developing nations and their increasing contribution to the problem.

This Note proposes a temporary international solution: biodegradation standards for plastics. Using the Montreal Protocol on Substances that Deplete the Ozone Layer ("Montreal Protocol") and the steps leading to its implementation as a guide, this Note outlines specific steps that should be taken on a local, national, and international level to develop meaningful and effective global biodegradation regulation.

Part II of this Note discusses the myths perpetuated by the media and advocates about the plastic marine debris problem and the backlash from industry that often follows. It then attempts to discern the truth in the gray areas, where much is still unknown. Part III explains current international attempts at solving the plastic marine debris problem and points out their shortcomings. Part IV lays out a plan for developing international standards, compares the similarities between pelagic plastics and chlorofluorocarbons, and explains the lessons to be learned from the Montreal Protocol. Part V concludes with a discussion of current developments in biodegradable plastics and potential negative consequences of implementing a biodegradable plastics regime.

<sup>1</sup> How I Met Your Mother, Garbage Island (CBS television broadcast Feb. 21, 2011).

<sup>2</sup> Ben Lear, Lillian: A Folk Opera, available at http://benlearmusic.com.

<sup>3</sup> Thomas Morton, Oh This is Great: Humans Have Finally Ruined the Ocean, VICE MAG. (Feb. 1, 2008), http://www.vice.com/read/oh-this-is-great-v15n2.

### II. THE PROBLEM

## A. MYTH: THE PACIFIC GARBAGE PATCH IS (TWICE) THE SIZE OF TEXAS

Media reports have tried to place the Garbage Patch within neat geographic borders, describing the Garbage Patch as one or two times the size of Texas,<sup>4</sup> twice the size of France,<sup>5</sup> the size of Quebec,<sup>6</sup> or the size of the entire United States.<sup>7</sup> There is often confusion between the size of the Garbage Patch and the size of the gyre it inhabits. The North Pacific Subtropical Gyre spans 20 million square kilometers (km<sup>2</sup>), or about 7.7 million square miles,<sup>8</sup> and the five subtropical gyres together "comprise 40% of the sea surface."<sup>9</sup> However, plastic marine debris does not exist within such neat boundaries. Dr. Angelicque White, an outspoken critic of media sensationalism, reports that, in fact, the Garbage Patch is "actually less than 1 percent of the geographic size of Texas."<sup>10</sup> Because most of the plastic pieces are very small, and often very spread out, if these bits were grouped together into a cohesive island, even using "the highest concentrations ever reported by scientists," their surface area would be far smaller than the media has reported.<sup>11</sup>

In general, descriptions of the size of the plastic marine problem vary widely because a clear scientific methodology for measuring the debris has not been established. Estimates from the 1990s indicated that between 6.4 and 10 million metric tons of marine litter were added annually.<sup>12</sup> Captain Charles Moore, one of the first advocates

<sup>4</sup> Kenneth R. Weiss, Plague of Plastic Chokes the Seas, L.A. TIMES, Aug. 2, 2006, http://www. latimes.com/news/la-me-ocean2aug02,0,4917201.story.

<sup>5</sup> Richard Grant, Drowning in Plastic: The Great Pacific Garbage Patch is Twice the Size of France, THE TELEGRAPH, Apr. 29, 2009, http://www.telegraph.co.uk/earth/environment/5208645/ Drowning-in-plastic-The-Great-Pacific-Garbage-Patch-is-twice-the-size-of-France.html.

<sup>6</sup> Carl Bialik, How Big is That Widening Gyre of Floating Plastic?, WALL ST. J., Mar. 25, 2009, http://online.wsj.com/article/SB123793936249132307.html.

<sup>7</sup> Kathy Marks & Daniel Howden, The World's Rubbish Dump: A Tip That Stretches from Hawaii to Japan, THE INDEP., Feb. 5, 2008, http://www.independent.co.uk/environment/green-living/ the-worlds-rubbish-dump-a-tip-that-stretches-from-hawaii-to-japan-778016.html.

<sup>8</sup> David M. Karl, A Sea of Change: Biochemical Variability in the North Pacific Subtropical Gyre, 2 ECOSYSTEMS 181, 181 (1999); see also Marine Debris, NAT'L OCEANIC & ATMOSPHERIC ADMIN., http://marinedebris.noaa.gov/info/patch.html#4 (last revised Aug. 4, 2011) (estimating the North Pacific Subtropical Gyre to be between 7-9 million square miles).

<sup>9</sup> Charles James Moore, Synthetic Polymers in the Marine Environment: A Rapidly Increasing, Long-Term Threat, 180 ENVTL. RES. 131, 134 (2008).

<sup>10</sup> Press Release, Dr. Angelicque White, Or. St. U., Oceanic "Garbage Patch" Not Nearly as Big as Portrayed in Media (Jan. 4, 2011) (http://oregonstate.edu/ua/ncs/archives/2011/jan/ oceanic-%E2%80%9Cgarbage-patch%E2%80%9D-not-nearly-big-portrayed-media).

<sup>11</sup> Id. An area slightly less than 1% of Texas is equal to about the size of the state of Delaware.

<sup>12</sup> Daud Hassan, PROTECTING THE MARINE ENVIRONMENT FROM LAND-BASED SOURCES OF POLLUTION: TOWARDS EFFECTIVE INTERNATIONAL COOPERATION 24 (2006) (1993 figures estimating 10 million metric tons added each year, with plastic "comprising a significant percentage of this calculation"); U.N. ENV'T PROGRAMME, *Distribution of Litter* [hereinafter *Distribution of Litter*], http://www.unep.org/regionalseas/marinelitter/about/distribution/default.asp (last visited

to draw mass attention to the Garbage Patch through his Algalita Foundation,<sup>13</sup> estimates that just the area around the Garbage Patch contains over 200 billion pounds of debris.<sup>14</sup> On average, approximately 60-80% of debris is plastic waste, though some studies have found plastic to comprise up to 95%.<sup>15</sup>

There have been three obstacles to rigorously quantifying the plastic debris in the oceans. First, it is hard to measure something that is hard to see. For a variety of reasons, the National Oceanic & Atmospheric Administration (NOAA) has not been able to take satellite photographs of the Garbage Patch.<sup>16</sup> These include the following: the small size of the vast majority of the debris; the inability to distinguish larger pieces of plastic from marine animals, such as whales; the translucence of much of the plastic; and the fact that most of the debris is suspended between one inch and 300 feet below the surface.<sup>17</sup> The methodologies of beach cleanup surveys, a large source of information, are another problem. Methods are not standardized across participants, which makes drawing conclusions about the accumulation rate of litter on beaches or the amount annually added to the marine environment a rough estimate at best.<sup>18</sup> These surveys are often performed by volunteers who may not thoroughly collect

Apr. 4, 2012).(1997 figures estimating 6.4 million metric tons added per year and other estimates at 8 million metric tons).

- 13 See ALGALITA MARINE RESEARCH FOUNDATION, www.algalita.org (last visited Apr. 14, 2012). Capt. Moore has been widely criticized by the scientific community, as well as the plastics industry, for using methods that may embellish his results. Often, his findings are more useful as anecdotal rather than scientific evidence. This Note will address when that is the case.
- 14 Marks & Howden, *supra* note 7. Another estimate measured 1,100 metric tons (or 2.43 million pounds) of plastic in about one-third of the North Atlantic Gyre. Kara Lavender Law & Miriam C. Goldstein, *The Ocean's "Garbage Patches": What They are and How they Impact the Ocean Ecosystem*, CENGAGE LEARNING ENRICHMENT MODULE 12 (2011), *available at* http://cengagesites.com/academic/assets/sites/4004/life/1111989206\_The\_Ocean%27s\_Garbage\_Patches\_WM.pdf. Yet another estimate calculated 3.5 billion pounds of just microplastics on just the surface of, and 315 billion pounds total in the world's oceans. Stiv Wilson, *The Fallacy of Gyre Cleanup: Part One, Scale*, 5GYRES (July 5, 2010), http://5gyres.org/posts/2010/07/05/the\_fallacy\_of\_gyre\_cleanup\_part\_one\_scale.
- Moore, supra note 9, at 131 ("marine litter is now 60-80% plastic, reaching 90-95% in some areas"); Donovan Hohn, Sea of Trash, N.Y. TIMES, June 22, 2008, http://www.nytimes.com/2008/06/22/magazine/22Plastics-t.html?pagewanted=all (depending on where oceanographers sample, approximately 60%-95% of marine debris is plastic); Murray R. Gregory & Anthony L. Andrady, Plastics in the Marine Environment, PLASTICS & THE ENV'T 380 (Andrady, ed., 2003) ("numerous surveys at widely separated localities around the world have consistently demonstrated that on an item-by-item basis, plastic materials typically comprise 60-80% of marine debris litter accumulating in the wrack of sandy shores"); Distribution of Litter, supra note 12 (in 1998, a study found that plastic comprise 89% of all litter observed floating in the North Pacific).
- 16 Marine Debris, supra note 8.
- 17 Id.; Frequently Asked Questions, ALGALITA MARINE RES. FOUNDATION, http://www.algalita.org/ AlgalitaFAQs.htm#satellite (last updated Jun 3, 2009); Justin Berton, Feds Want to Survey, Possibly Clean Up Vast Garbage Pit in Pacific Ocean, S.F. CHRON., October 30, 2007, http:// www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/10/30/MNT5T1NER.DTL.
- 18 Gregory & Andrady, *supra* note 15, at 383.

or measure beach litter.<sup>19</sup> Also, much of the smallest plastic debris is either buried beneath the sand or simply difficult to spot and so is not counted.<sup>20</sup> Finally, there have been no metadata comparing or combining the various studies about debris in the various seas. Most scientific studies focus on marine debris in a specific marine environment, such as a particular harbor, sea, or section of ocean. Some studies are conducted from passing ships, which are necessarily limited to macro- and megalitter<sup>21</sup> visible from afar to the naked eye.<sup>22</sup> Others are focused on microdebris, which are gathered by "surface-towed neuston<sup>23</sup> . . . nets."<sup>24</sup> These studies necessarily miss plastic debris that lingers below the surface.<sup>25</sup> Until these studies are analyzed, there will be no comprehensive understanding of global plastic marine pollution.

Although there is much uncertainty about the quantity of plastic marine debris, there is little doubt about how plastic finds its way into the ocean and the paths it takes once it is at sea. About 77% of all marine pollution comes from land-based sources.<sup>26</sup> These sources are clustered around urban and industrial areas and reach the ocean through "natural water courses, storm water drainage outlets, and sewage

- Plastic debris can be divided into four categories, based on size and function. Gregory & Andrady, *supra* note 15, at 381. First, microlitter is the "inconspicuous, fine plastic detritus with a size range of very fine sand to course silt usually found in the marine sediment." *Id.* at 381. This type of plastic is often found in facial scrubs and air blast paint strippers. *Id.* Second, "mesolitter" is plastic between less than 5 and 10 millimeters (mm). *Id.* Mesolitter describes the typical virgin plastic pellet as well as partially degraded plastic fragments. *Id.* at 381-82. Microdebris—as they are often combined in the literature, this paper will refer to microlitter and mesolitter together as "microdebris" or "microplastics"—is increasingly generating concern in the international community because of their global distribution. Third, "macrolitter" is comprised of plastic between 10-15 centimeters across and easily seen by the naked eye from passing ships. *Id.* at 382. This includes straws, bottle caps, styrofoam, and food packaging. Finally, "megalitter" consists of floats, crates, boxes, and nets and other fishing gear. *Id.* As described, *infra*, each type of plastic litter presents unique environmental challenges.
- 22 Gregory & Andrady *supra* note 15, at 383.
- 23 Neuston nets "are designed to sample the neuston layer of the ocean, or the air-sea interface." Law & Goldstein, *supra* note 14, at 8.
- 24 Gregory & Andrady supra note 15, at 383.
- 25 Law & Goldstein, *supra* note 14, at 13.
- 26 Hassan, *supra* note 12, at 15 (77% is the 1990 global assessment). In 1991, the Group of Experts on the Scientific Aspects of Marine Environmental Protection, a U.N. advisory group, estimated 70-80% of marine pollution has a land-based source. Gregory & Andrady, *supra* note 15, at 382.

<sup>19</sup> Id.

<sup>20</sup> Henry S. Carson, et al., *Small Plastic Debris Changes Water Movement and Heat Transfer Through Beach Sediments*, 62 MARINE POLLUTION BULL. 1708 ("Larger plastic items readily fragment in beach environments, and these fragments have been incorporated in coastal sediment around the world. These fragments may remain on beaches longer than larger items because coastal cleanup operations seldom remove them due to the extraordinary effort that would be needed to do so.").

outfalls."<sup>27</sup> Other common sources are tourism and recreation.<sup>28</sup> Unsurprisingly, plastic marine debris (other than fishing gear) has a similar composition to plastic litter on land.<sup>29</sup>

Tracing the path of plastic through the earth's oceans is somewhat more complex. Though much of the publicity around plastic marine debris has focused on the now infamous Garbage Patch, there are in fact five major subtropical gyres.<sup>30</sup> The same circulation patterns that create the Garbage Patch draw marine pollutants to the other four convergence zones as well.<sup>31</sup> The gyres are formed through a combination of wind and surface currents that move in a clockwise or counterclockwise direction (in gyres north or south of the equator, respectively) because of perpetually heating and cooling air masses and the earth's rotation.<sup>32</sup> "The rotating air mass creates a high-pressure system throughout the region,"<sup>33</sup> which "force[s] the sea level lower near their centers."<sup>34</sup> Swifter ocean currents outside the gyre, combined with the slow, circular currents within it, entrap debris and move it to the convergence zone.<sup>35</sup> Both scientists and the plastics industry agree that plastic marine debris tends to be more concentrated in the convergence zones of the gyres than on the outer perimeters.<sup>36</sup>

In the North Pacific Ocean, there are many variables that affect whether a particular piece of plastic litter will reach the convergence zone, such as wind, buoyancy, and

- 33 Id.
- 34 Moore, *supra* note 9, at 134.
- 35 Trashed, supra note 32; William G. Pichel, Marine Debris Collects Within the North Pacific Subtropical Convergence Zone, 54 MARINE POLLUTION BULL. 1207, 1208 (2007).
- 36 See, e.g., Pichel, *supra* note 35; Berton, *supra* note 17 (National Oceanic and Atmospheric Administration oceanographer, Holly Bamford, stating that "[t]here's no doubt that a stew of marine debris exists in the convergence zone of the [North Pacific] gyre); John Kalkowski, SPC Tackles the Global Problem of Packaging and Marine Debris, PACKAGING DIG. (June 3, 2011), http://www.packagingdigest.com/article/518411-SPC\_tackles\_the\_global\_problem\_of\_ packaging\_and\_marine\_debris\_.php (a plastics packaging industry writer states, "The circulation of the gyres causes the debris to swirl in a deep vortex with most of it below the surface . . . [D]ebris in the gyres is serious because the concentration areas move and change throughout the year, they are typically very large and, in most areas where marine debris concentrates, so does marine life.").

<sup>27</sup> Id.

<sup>28</sup> Isaac Rodrigues Santos, et al., Influence of Socio-Economic Characteristics of Beach Users on Litter Generation, 48 OCEAN & COASTAL MGMT. 742, 743 (2005).

<sup>29</sup> Gregory & Andrady, *supra* note 15, at 390.

<sup>30 5</sup> GYRES, http://www.5gyres.org (lasted visited Apr. 24, 2012) (the five subtropical gyres are found in the North Pacific, South Pacific, North Atlantic, South Atlantic, and Indian Oceans).

<sup>31</sup> See, e.g., Elodie Martinez, et al., Floating Marine Debris Surface Drifts: Convergence and Accumulation Toward the South Pacific Subtropical Gyre, 58 MARINE POLLUTION BULL. 1347 (2009) (describing drift toward the center of the South Pacific Gyre in three steps: (1) for two years, debris drifts toward the convergence zone; (2) debris is forced eastward by geostrophic currents; (3) debris reaches the eastern center of the South Pacific Gyre and cannot escape).

<sup>32</sup> Charles Moore, Trashed: Across the Pacific Ocean, Plastics, Plastics, Everywhere, 112 NAT. HISTORY 46, 48 (2003) [hereinafter Trashed].

time of year.<sup>37</sup> Scientists often use devices called "drifters" to track the path of a piece of flotsam in the ocean currents. A 2000 study of the Northern Pacific Gyre used computer modeling to evenly distribute 113 drifters between the California and China coasts.<sup>38</sup> After two cycles of 12 years, 73% of the drifters were gathered into an area of the Central Gyre equal to 28% of the area seeded.<sup>39</sup> The drifters' paths support the idea of two Garbage Patches in the North Pacific Gyre, the Western Garbage Patch east of Japan and a larger Eastern Garbage Patch to the north of the Hawaiian Islands, with extensive circulation between the two.<sup>40</sup> Moreover, studies show that the convergence zone moves from the northwest to the southeast seasonally, and debris tends to be most concentrated in the spring when the "surface convergence is strongest" and the zone is furthest south (and closest to the Hawaiian Islands).<sup>41</sup>

In a landmark study on the North Atlantic Subtropical Gyre, Dr. Kara Lavender Law and her colleagues dispersed 1,666 drifters throughout the North Atlantic Ocean.<sup>42</sup> After ten years, a tracing model based on the drifter statistics found that concentration in the North Atlantic subtropical gyre was up to 15 times that of the starting point.<sup>43</sup> The location of this convergence "directly corresponds to the observed high plastic accumulation region."<sup>44</sup> The model also indicates that debris from the U.S. eastern seaboard reaches the gyre with surprising speed, in some cases just 40 days, but it remains there for a long time, from 10 to 100 years.<sup>45</sup>

<sup>37</sup> Moore, supra 9, at 134; Pichel, supra note 35, at 1208.

<sup>38</sup> W. James Ingraham & Curtis C. Ebbesmeyer, Surface Current Concentration of Floating Marine Debris in the North Pacific Ocean: 12-Year OSCURS Model Experiments, PROCEEDINGS OF THE INT'L MARINE DEBRIS CONF. ON DERELICT FISHING GEAR AND THE OCEAN ENV'T 91 (2000), available at http://hawaiihumpbackwhale.noaa.gov/documents/pdfs\_conferences/proceedings.pdf

<sup>39</sup> Id.

<sup>40</sup> *Id.* at 97, fig.3(a); *see also* Capt. Charles Moore, Founder, Algalita Foundation, Ten Years Later, the Gyre is All Around, Speech at TEDxGreatPacificGarbagePatch (Dec. 20, 2010) (http://plasticpollutioncoalition.org/2010/12/tedxgreatpacificgarbagepatch-captain-charlesmoore) (stating that garbage from the U.S. west coast moves to the Western Garbage Patch, while garbage from the east coast of Asia moves to the convergence zone and populates the Eastern Garbage Patch).

<sup>41</sup> Pichel, *supra* note 35, at 1208, 1211. There is some cause for concern, as the North Pacific Transition Zone Chlorophyll Front, which is followed by a variety of marine animals, including birds, turtles, whales, dolphins, and fish, moves south to the Hawaiian Islands in winter and early spring, thus bringing these animals into contact with the highest density of marine debris. *Id.* at 1210–11.

<sup>42</sup> Kara Lavender Law, Plastic Accumulation in the North Atlantic Subtropical Gyre, 329 SCIENCE 1185, 1186 (2010).

<sup>43</sup> Id.

<sup>44</sup> Id.

<sup>45</sup> Id. at 186–87. The Gulf Stream propels debris from the East Coast to the gyre in less than 60 days, with 40 day travel times for Washington, D.C. and Miami, Florida. Travel times from Europe and Africa are at least double this. Id. at 187. By comparison, Capt. Moore asserts that "it takes a year for material to reach the Eastern [Pacific] Garbage Patch from Asia and several years for it to get there from the [west coast of] the United States." Thomas M. Kostigen, *The World's Largest Dump: The Pacific Garbage Patch*, DISCOVER MAG. (July 10, 2008), http://discovermagazine.com/2008/jul/10-the-worlds-largest-dump.

## B. MYTH: THE GREAT PACIFIC GARBAGE PATCH IS A SOLID, FLOATING ISLAND OF WASTE

The media has characterized the Garbage Patch using words that connote a solid mass: garbage dump,<sup>46</sup> flotilla,<sup>47</sup> and island,<sup>48</sup> to name a few. Dr. White pointed out that "[m]ost plastics either sink or float . . . . Plastic isn't likely to be evenly distributed through the top 100 feet of the water column."<sup>49</sup> Scientists agree that, though plastic marine debris is more highly concentrated in a gyre's convergence zone, the relative abundance of water compared to plastic is far more comparable to a soup<sup>50</sup> than a solid mass.<sup>51</sup> Further, critics from the plastics industry assert that, while the number of individual plastic pieces within the Garbage Patch seems large, the vast majority of the plastic debris in the gyres is very small.<sup>52</sup> Indeed, Dr. Law's study found that 88%<sup>53</sup> of a subset of samples in the North Atlantic was smaller than 10 mm across.<sup>54</sup>

Instead of islands of trash, these tiny fragments of plastics, or microplastics, are found in nearly every sea and ocean on Earth. Dr. Law observed that the small pieces "had characteristics suggesting physical deterioration such as brittleness, rough edges, or cracks."<sup>55</sup> She further noted that 99% of the samples collected at the ocean's surface were less dense than water, and on further analysis were bits of high and low density polyethylene and polypropylene.<sup>56</sup> This degraded flotsam has been found distributed along shorelines, "adjacent to polluted and industrialized areas of both Northern

- 49 White, supra note 10.
- 50 Capt. Moore described the Garbage Patch as "an alphabet soup." Berton, *supra* note 17.
- 51 See White, supra note 10; Marcus Eriksen, Beyond the Absurdity of a "Texas-sized Garbage Patch" Lies a Larger Menace of Plastic Pollution in the World's Oceans, PLASTIC POLLUTION COAL. (Jan. 7, 2011), http://plasticpollutioncoalition.org/2011/01/beyond-the-absurdity-of-a-%E2%80%9Ctexas-sized-garbage-patch%E2%80%9D-lies-a-larger-menace-of-plastic-pollutionin-the-world%E2%80%99s-oceans.
- 52 Kalkowski, *supra* note 36.
- 53 Miriam Goldstein, a scientist at the Scripps Institution of Oceanography, says this number is around 90% for the North Pacific Gyre. Miriam Goldstein, *Does the "Great Pacific Garbage Patch" Exist*?, SEAPLEX (Jan. 10, 2011), http://seaplexscience.com/2011/01/10/does-the-greatpacific-garbage-patch-exist.
- 54 Law, supra note 42, at 1187.
- 55 Id.
- 56 Id. at 1186–87. Low-density polyethylene is most commonly used in plastic bags; high-density polyethylene is used in hollow containers such as milk jugs and a PVC substitute in piping; polypropylene has a wide variety of uses including reusable containers, plastic disposable diapers, plastic moldings such as bottle caps and chairs, cold-weather base layers, and some medical supplies.

<sup>46</sup> Colin Sullivan, Recycler, Scientists Probe Great Pacific Garbage Patch, N.Y. TIMES, Aug. 5, 2009, http://www.nytimes.com/gwire/2009/08/05/05greenwire-recyclers-scientists-probe-greatpacific-garba-57979.html?pagewanted=all ("the planet's largest known floating garbage dump").

<sup>47</sup> Bialik, *supra* note 6 ("In the Pacific, ocean flows sweep liter into a flotilla that could be the size of Quebec or maybe the U.S.—no one knows").

<sup>48</sup> Lindsey Hoshaw, Afloat in the Ocean, Expanding Islands of Trash, N.Y. TIMES, Nov. 9, 2009, http://www.nytimes.com/2009/11/10/science/10patch.html (this article also claims that the Garbage Patch "doubles in size every decade.").

and Southern Hemispheres," and in the Mediterranean Sea, Western North Atlantic, North Atlantic, Sargasso Sea, Cape Basin in the South Atlantic, South African coastal waters, New Zealand in-shore waters, South Pacific, Western North Pacific, and the North Pacific Gyre.<sup>57</sup> Even for microlitter the size of a grain of sand, smaller than most mesh nets used to study marine debris, "there can be little doubt that its distribution in surface waters has become global like that of virgin plastic pellets."<sup>58</sup> Plastics denser than seawater, such as polyethylene terephthalate (PET)<sup>59</sup> and polyvinyl chloride (PVC), will sink to the ocean floor, where little is known about the quantity and extent of plastic debris.<sup>60</sup>

It is important to understand the history and science of microplastics. Initially, the alarm over microplastics was caused by the increasing abundance of plastic resin pellets<sup>61</sup> in the ocean. In 1990, scientists reported that the number of virgin pellets in the North Atlantic Ocean increased between 200%-400% from 1972 to 1987.<sup>62</sup> In 1992, the United States Environmental Protection Agency (EPA) released a report expressing its concern that plastic pellets were entering the marine environment through combined sewer overflow (CSO), stormwater discharges, and direct spillage.<sup>63</sup> After a study found raw pellets in 13 of 14 harbors nationwide, EPA undertook a case study of the three stages of plastics manufacture: pellet production, transport and packaging, and pellet processing.<sup>64</sup> It determined that opportunities for pellet release existed because of a lack of education, awareness, and caution at both the employee and management levels; the inadequacy or nonexistence of filters and water containment systems to prevent "discharge[] into municipal storm and sanitary sewers or into natural drainage systems"; poorly designed storage and shipping containers; and the lack of recycling procedures for spilled pellets.<sup>65</sup> The report pointed out that pellet discharge through CSO or storm-water was a violation of the Clean Water Act (CWA).<sup>66</sup>

In response to EPA findings and its own scientific findings, the plastics industry began a widespread education campaign, aimed at reducing pellet discharge. In the U.S., the two industry groups, the Society of the Plastics Industry and the American Chemistry Council, launched Operation Clean Sweep in 1991, which strongly encour-

<sup>57</sup> Gregory & Andrady, supra note 15, at 384.

<sup>58</sup> Id. at 383.

<sup>59</sup> The stuff of plastic water bottles.

<sup>60</sup> Law & Goldstein, *supra* note 14, at 5; White, *supra* note 10 ("A recent survey from the state of California found that 3 percent of the southern California Bight's ocean floor was covered with plastic – roughly half . . . by lost fishing gear in the same location.").

<sup>61</sup> Plastic resin pellets "are the raw materials that are melted and molded to create plastic products." Virgin pellets are those that have never been transformed into end-use plastic products. U.S. ENVTL. PROT. AGENCY, PLASTIC PELLETS IN THE AQUATIC ENVIRONMENT: SOURCES AND RECOMMENDATIONS 1 (1992), *available at* http://www.epa.gov/owow/oceans/debris/plasticpellets/plastic\_pellets\_final\_report.pdf.

<sup>62</sup> Distribution of Litter, supra note 12.

Plastic Pellets in the Aquatic Environment: Sources and Recommendations, *supra* note 61, at 2.

<sup>64</sup> *Id.* Over 250,000 pellets were collected in just one sample in Houston, which has one of the nation's highest concentrations of plastics manufacturers. *Id.* 

<sup>65</sup> Id. 3–4.

<sup>66</sup> Id. at 66, 90.

aged managerial commitment to "zero pellet loss."<sup>67</sup> Internationally, these efforts led to representatives from 47 national trade organizations from 30 countries signing on to the Declaration of the Global Plastics Association for Solutions on Marine Litter in 2011.<sup>68</sup> Among the goals of the Declaration is the responsible transportation and distribution of plastic pellets. Other goals include increased research into the plastic marine debris problem, greater enforcement of regulations, and more widespread recycling. These efforts, however, "are more relevant to highly developed nations with economic resources and economies of scale to make the programs cost-effective."<sup>69</sup> Notably, industry has never publicly listed addressing the persistence of existing plastic chemical structures in the environment as a solution.

Recent studies indicate that these industry education programs are working. Dr. Law and her colleagues found that there was a "statistically significant decrease in the average concentration of resin pellets" throughout the western North Atlantic Ocean and the Caribbean Sea.<sup>70</sup> However, pellet concentration was never a large portion of the total amount of plastic collected, making up at most 16% of all pieces annually.<sup>71</sup> Studies analyzing the types of plastics ingested by seabirds support this finding.<sup>72</sup> A 2008 study found that, although "there were no changes in the total amount of ingested plastic," the proportion of ingested pellets decreased by 40%-80%, depending on the species, between the 1980s and the early 2000s.<sup>73</sup> The habitats of the species studied ranged from the Pacific to the Atlantic to the southern Indian Oceans.<sup>74</sup> The study points out that, while the "plastic loads" the birds carry have stabilized, there is the concern that inert plastic pellets are being replaced with "fragments of user plastics," which could expose the birds to higher levels of toxicity.<sup>75</sup>

71 Id.

Id. at 5; OPERATION CLEAN SWEEP, http://www.opcleansweep.org/Overview (last visited Apr. 14, 2012).

<sup>68</sup> PLASTICS EUROPE, DECLARATION OF THE GLOBAL PLASTICS ASSOCIATIONS FOR SOLUTIONS ON MARINE LITTER, at \*2 (2011), http://www.plasticseurope.org/documents/ document/20111025174543-20110421105711-2011\_04\_20\_\_updated\_joint\_declaration\_no\_ actionsx.pdf; John Kalkowski, *supra* note 36.

<sup>69</sup> RICHARD C. THOMPSON ET. AL., SCI. & TECH. ADVISORY PANEL, MARINE DEBRIS AS A GLOBAL ENVIRONMENTAL PROBLEM: INTRODUCING A SOLUTIONS BASED FRAMEWORK FOCUSED ON PLASTIC 17 (2011) [hereinafter THOMPSON], available at http://www.thegef.org/gef/sites/thegef.org/files/ publication/STAP%20MarineDebris%20-%20website.pdf.

<sup>70</sup> Law, supra note 42, at 1187.

<sup>72</sup> Peter G. Ryan, Seabirds Indicate Changes in the Composition of Plastic Litter in the Atlantic and Southwestern Indian Oceans, 56 MARINE POLLUTION BULL. 1406 (2008).

<sup>73</sup> Id. at 1408. An earlier study corroborates this finding for the short-tailed shearwater, noting that although the incidence of birds with plastic in their stomachs has not increased since around 1976, the type of plastic has shifted from resin pellets to user plastics. Lucy S. Vlietstra & Joyce A. Parga, Long-Term Changes in the Type, But Not Amount, of Ingested Plastic Particles in Short-Tailed Shearwaters in the Southeastern Bering Sea, 44 MARINE POLLUTION BULL. 945 (2002).

<sup>74</sup> Ryan, supra note 72, at 1408.

<sup>75</sup> Id. at 1408-09; see infra Part II.D.

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Plastic user products are intentionally designed for durability.<sup>76</sup> The polymers that make up plastic chemical structure are remarkably bioinert,<sup>77</sup> causing plastic debris to persist in the environment for decades, if not centuries, before either mineralizing<sup>78</sup> or biodegrading.<sup>79</sup> The marine environment in particular slows the breakdown of polymer structures and all but halts biodegradation once the plastic structure is fully degraded. Unlike plastics in a landfill, whose degradation is aided by "heat buildup" from absorbed infrared solar radiation, the ocean efficiently dissipates heat away from the polymers, further slowing the degradation process.<sup>80</sup>

Two main processes break down plastics in the ocean: solar radiation and slow thermal oxidation.<sup>81</sup> Plastics below the ocean's surface only break down through oxidation, as the surrounding water absorbs UV rays.<sup>82</sup> Photodegradation, degradation caused by sunlight, "can significantly reduce the mechanical strength" of floating plastics.<sup>83</sup> This process, too, is inhibited when "marine life, such as algae and barnacles," attaches to the plastic and blocks sunlight from reaching its surface.<sup>84</sup> Photodegraded plastics slowly "become embrittled, and break into smaller and smaller pieces, eventually becoming individual polymer molecules, which must undergo further degradation before becoming bioavailable."<sup>85</sup> The persistence of these molecules in the marine environmental is unknown and can only be estimated to be centuries long.<sup>86</sup>

### C. MYTH: THE GARBAGE PATCH IS GROWING EXPONENTIALLY

Captain Moore often expresses his concern that the Great Pacific Garbage Patch is expanding exponentially or "at an alarming rate."<sup>87</sup> Although global production, consumption, and disposal of plastic are on the rise, the amount of plastic in the

<sup>76</sup> Fishing gear, for example is specifically designed to withstand weathering conditions. Gregory & Andrady, *supra* note 15, at 389.

<sup>77</sup> While virgin plastic pellets are completely bioinert, many end-use plastic products contain bioactive monomer additives, chemicals "such as UV stabilizers, softeners, flame retardants, non-stick compounds, and colorants," which may interact with the surrounding marine environment. Moore, *supra* note 9, at 132.

<sup>78</sup> Mineralization is defined as "[t]he full conversion of all breakdown products into carbon dioxide, water, and small inorganic molecules, through continued photo- and biodegradation." Gregory & Andrady, *supra* note 15, at 391.

<sup>79</sup> Moore, supra note 9, at 132. A plastic bag remains in the marine environment for 1-20 years, a styrofoam cup remains for 50 years, a six-pack carrier ring remains for an estimated 400 years, and a disposable diaper and a plastic bottle remain for an estimated 450 years each. Marine Debris is Everyone's Problem, WOODS HOLE OCEANOGRAPHIC INST., http://www.whoi. edu/fileserver.do?id=107364&pt=2&p=88817 (lasted visited Apr. 14, 2012).

<sup>80</sup> Gregory & Andrady, *supra* note 15, at 392. The one exception to this rule seems to be polystyrene, which actually degrades faster in water. *Id.* at 393-94.

<sup>81</sup> Id. at 390–91.

<sup>82</sup> Id. at 391.

<sup>83</sup> Id.

<sup>84</sup> Lavendar & Goldstein, *supra* note 7, at 18.

<sup>85</sup> Moore, *supra* note 9, at 132.

<sup>86</sup> Id.

<sup>87</sup> Capt. Charles Moore, TED: Ideas Worth Spreading, On the Seas of Plastic (Feb. 2009), available at https://www.ted.com/talks/capt\_charles\_moore\_on\_the\_seas\_of\_plastic.html.

ocean, once increasing exponentially, seems to have stabilized. Dr. Law's study found that, in the North Atlantic Ocean from 1986 to 2008, 62% "of all net tows contained detectible amounts of plastic debris."<sup>88</sup> The concentrations of plastic were highest in the convergence zone, where 83% of the total plastic debris was collected, and lowest near the U.S. east coast. Dr. Law further found that, while samples in the 1970s ranged from 12,000 to 167,000 pieces per square kilometer, the largest sample, collected in 1997, was 580,000 pieces per square kilometer.<sup>89</sup> However, "[d]espite a strong increase in discarded plastic, no trend was observed in plastic marine debris in the [1986–2008] data set."<sup>90</sup> Other experts corroborate this conclusion.<sup>91</sup>

There are many theories about this disparity, but no conclusive scientific data to explain it. Some of these theories include the following: the plastics are sinking as they adsorb surrounding toxins or as biofouling organisms aggregate; plastics are washing up on shores in greater quantities; plastics are breaking down into pieces too small to be caught by mesh netting; and plastics are being removed from the ocean by marine animals. Some suggest that better waste management practices have helped, though as discussed later in this note, this seems unlikely.

While the amount of marine plastic debris no longer appears to be growing in a clear trajectory, plastic production and consumption rates have grown at a staggering rate since its invention in 1907.<sup>92</sup> In just the U.S., plastic manufacturers produced 5.8 billion pounds in 1960,<sup>93</sup> 43.4 billion pounds in 1985, and 120 billion pounds in 2007.<sup>94</sup> While manufacturing slowed slightly during the recent economic recession, rates appear to be back on track with 6.2 billion pounds produced and sold in February 2012 alone.<sup>95</sup> The American Chemistry Council describes the falling cost of resin production due to expanding supplies of shale natural gas as "game-changing."<sup>96</sup> European plastics manufacturers boast a similarly high production rate, with 126.8 bil-

- 92 Law & Goldstein, *supra* note 14, at 17.
- 93 Pruter, A.T., Sources, Quantities, and Distribution of Persistent Plastics in the Marine Environment, 18 MARINE POLLUTION BULL. 305, 307 (1987).
- 94 Berton, supra note 17 (citing American Chemistry Council figures).
- 95 Press Release, American Chemistry Council, ACC Releases February 2012 Resin Production and Sales Stats (Mar. 28 2012) (http://www.americanchemistry.com/Media/ PressReleasesTranscripts/ACC-news-releases/ACC-Releases-February-2012-Resin-Productionand-Sales-Stats.html).
- 96 U.S. Plastic Resins Industry Grows Steadily in 2011, AM. CHEM. COUNCIL 3 (Mar. 2012), http:// www.americanchemistry.com/Jobs/EconomicStatistics/Plastics-Statistics/Year-in-Review.pdf.

<sup>88</sup> Law, supra note 42, at 1186.

<sup>89</sup> Id.

<sup>90</sup> Id. at 1187, fig.3.

<sup>91</sup> Richard C. Thompson, et al., *Lost at Sea: Where is All the Plastic?*, 304 SCIENCE 838 (2004); Goldstein, *supra* note 53. Both Thompson and Goldstein find that "there is evidence that plastic debris increased from the 1960s and 1970s to the 1980s and 1990s . . . . [a]fter the mid-1980s, the trend becomes unclear." Goldstein, *supra* note 53.

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lion pounds produced in 2005. $^{97}$  In 2005, over 507.15 billion pounds of plastic were produced globally. $^{98}$ 

Sales trends of most common types of plastic reflect the intentionally disposable nature of most plastic products.<sup>99</sup> In 2011, U.S. production and domestic sales of polyethylene, polystyrene, and certain uses of polypropylene all rose in response to increased demand from the packaging films, plastic bags, and food containers industries.<sup>100</sup> In fact, packaging, the most intentionally disposable plastic product, comprises over one-third of plastic resin sales in both the U.S. and Europe.<sup>101</sup> In contrast, 2011 domestic sales of polyvinyl chloride (PVC), used for durable products such as pipes, windows, doors, and siding, decreased 3.7%, reflecting the stalled U.S. housing and construction markets.<sup>102</sup>

Mass production of throwaway plastic products translates into mass disposal of plastic waste, which at 62 billion pounds, makes up over 12% of the U.S. municipal waste stream.<sup>103</sup> Mirroring production rates, packaging products comprised the largest category of disposed plastic, with 28 billion pounds thrown out.<sup>104</sup> Only 8% of all discarded plastic was recycled,<sup>105</sup> and most disturbingly, only 29.1% of 5.35 billion pounds of discarded PET, the quintessential recyclable plastic, was recycled.<sup>106</sup> Of the PET that was recycled, domestic recycling facilities purchased about half, while the

- 100 U.S. Plastic Resins Industry Grows Steadily in 2011, supra note 96, at 3-4. In 2011, polyethylene sales rose 1.6% to 37.6 billion pounds. Id. at 3. Of this low-density polyethylene sales fell 0.4% to 6.7 billion pounds (though caps and closures and stretch film domestic sales rose 32% and 24.5%, respectively), linear low-density polyethylene sales rose 0.5% to 13.6 billion pounds, and high-density polyethylene sales rose 3.3% to 17.2 billion pounds. Id. at 4. Polypropylene sales throughout the NAFTA region were down by 4.8% to 16.4 billion pounds, but sales in the cups and containers industry increased 12.5%. Id. U.S. polystyrene sales were 4.7 billion bounds, with sales of expandable polystyrene, used in packing peanuts, increasing 4.9%. Id.
- 101 2011 Percentage Distribution of Thermoplastic Resins, AM. CHEM. COUNCIL (2012), http://www.americanchemistry.com/Jobs/EconomicStatistics/Plastics-Statistics/Major-Market-Chart.pdf (34% of plastic resin produced in the U.S. is used for packaging); PLASTICS EUROPE, *supra* note 97, at 11 (37% of plastic resin produced in the European Union, Norway, and Switzerland is used for packaging). In Europe, 40% of all plastic produced in 2005 was intended for short-use products. *Id.* at 3.
- 102 U.S. Plastic Resins Industry Grows Steadily in 2011, supra note 96, at 5. Loss in domestic sales was compensated by exports, which rose 16.1% to 5.6 billion pounds. *Id.*
- 103 Plastics, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/epawaste/conserve/materials/ plastics.htm (last updated Mar. 22, 2012).

106 Nat'l Ass'n for PET Container Resources, 2010 Report on Post Consumer PET Container Recycling Activity 3 (2011), *available at* http://www.napcor.com/pdf/2010\_Report.pdf.

<sup>97</sup> PLASTICS EUROPE, THE COMPELLING FACTS ABOUT PLASTICS 3 (Spring 2007), http://www.plasticseurope.org/Documents/Document/20100309151634-Statistics2005FINALWebsiteVersionwithoutBackgroundColour080507-20070508-008-EN-v1.pdf (57.5 million tons produced by 25 European Union nations, Norway, and Switzerland).

<sup>98</sup> Id.

<sup>99</sup> Pruter, *supra* note 93, at 307 (the most common types of plastic are polyethylene, polystyrene, polyvinyl chloride, and polypropylene).

<sup>104</sup> Id.

<sup>105</sup> Id.

other half was exported, primarily to China.<sup>107</sup> Overall, only 20.8% of the recycled PET was actually repurposed.<sup>108</sup>

Even if the recycling rate increased significantly,<sup>109</sup> there would be three obstacles keeping used soda bottles from becoming new soda bottles. First, U.S. recyclers have an annual capacity of only 1.465 billion pounds; this is not enough to domestically recycle the 1.557 billion pounds collected for recycling.<sup>110</sup> Second, only 10 of 19 PET recycling facilities have Federal Drug Administration approval to recycle plastic into "direct contact recyclate suitable for food and beverage contact."<sup>111</sup> Finally, PET cannot be recycled indefinitely; the polymers begin to break down after one or two cycles.<sup>112</sup>

Historically, developed countries produced and consumed the vast majority of plastic products, but a shift in demand for plastic is driving increased production and consumption in developing countries, especially in Asia and Eastern Europe.<sup>113</sup> The U.S., Europe, and Japan still account for about 55.5% of global plastic production<sup>114</sup> and have the highest per capita consumption rates at about 220–287 pounds per year.<sup>115</sup> However, Asian nations (excluding Japan) now produce about 30% of all plastic.<sup>116</sup> The increase in developing nations' consumption rate is reflected in high U.S. exports of plastic products to China. For example, in 2011, the U.S. sold \$1.2 billion of "rubber and plastic goods" to China, including \$726 million in plastic bottles.<sup>117</sup> Exports continued to grow–9.6% in 2011–despite both the ongoing recession in Europe and slowed economic growth in China.<sup>118</sup> It is worrisome that the growth of plastic consumption in developing nations has not been accompanied by a corresponding growth in waste disposal infrastructure, discussed *infra*.

- 113 Thompson, supra note 69, at 15.
- 114 PLASTICS EUROPE, *supra* note 97.
- 115 Thompson, supra note 69, at 15.
- 116 PLASTICS EUROPE, *supra* note 97. In 2011, the U.S. imported a staggering \$12 billion in "rubber and plastic goods" from China, including \$201 million in plastic bottles. U.S. International Trade Statistics, U.S. CENSUS BUREAU, http://censtats.census.gov/cgi-bin/naic3\_6/naicMonth. pl (last visited Apr. 17, 2012).
- 117 U.S. International Trade Statistics, supra note 116; cf. \$171.8 million of "rubber and plastic goods" and \$5.4 million of plastic bottles exported to China in 2000.
- 118 U.S. Plastic Resins Industry Grows Steadily in 2011, supra note 96, at 1, 3.

<sup>107</sup> Id.

<sup>108</sup> *Id.* at 7 (the highest percentage ever recycled was 20.9%, indicating a ceiling on re-utilization capacity).

<sup>109</sup> Many brands have committed to producing bottles containing post-consumer recycled PET. The National Association for PET Container Resources estimates that recycling rates would need to reach 48% (or more than double current rates) by 2013 in order to meet these promises. *Id.* at 9.

<sup>110</sup> Id. at 3-4.

<sup>111</sup> Id. at 4.

<sup>112</sup> Mike Williams, *How Many Times Can Something be Recycled?*, NAT'L GEOGRAPHIC (Feb. 9, 2011), http://greenliving.nationalgeographic.com/many-times-can-something-recycled-2911.html. Instead, PET is often recycled.

## D. MYTH: PLASTIC OUTWEIGHS PLANKTON IN THE PACIFIC GARBAGE PATCH

Captain Charles Moore often asserts that there are 6 kilograms of plastic for every 1 kilogram of zooplankton in the convergence zone of the Central North Pacific Gyre.<sup>119</sup> Dr. White and much of the scientific community have criticized this measurement,<sup>120</sup> stating that "[g]iven the observed concentration of plastic in the North Pacific, it is simply inaccurate to state that plastic outweighs plankton."<sup>121</sup> Indeed, Dr. Marcus Eriksen, Director of Project Development at Moore's Algalita Foundation, has backed away from the scientific weight of Moore's position, instead focusing on the anecdotal value of the plastic to plankton ratio "for relative abundance of plastic to available food for scavenging fish and filter feeders."<sup>122</sup>

Dr. Erikson's approach has some support in studies on marine animal plastic ingestion. A recent study found that about 9.2% of mesopelagic fish,<sup>123</sup> which feed primarily on zooplankton, had plastic in their stomachs.<sup>124</sup> Based on the non-migratory fish alone, "it can be estimated that "3.5 to 7.1 million tons of mesopelagic fishes contain 12,000 to 24,000 tons of plastic in the North Pacific Subtropical Gyre."<sup>125</sup> These fish may then pass the plastic debris up the food chain as they are eaten by squid, piscivorous fish, seabirds, and marine mammals.<sup>126</sup> Fur seals and Hooker Sea lions were found to have microplastics in their scat, which indicated that the pinnipeds had eaten pelagic fish that had consumed pieces of plastic in the ocean.<sup>127</sup> Other

- 121 White, supra note 10.
- 122 Eriksen, *supra* note 51 ("It is true that plankton is extremely variable, and can bloom and dissipate with the season, temperature, moonlight, and a dozen other variables, therefore the margin of error is huge.").
- 123 Mesopelagic fish live between 200 and 1000 meters below sea level. They migrate vertically each night to feed on zooplankton, and are the most abundant fish, in terms of mass, in all subtropical gyres. Press Release, Scripps Institute of Oceanography, Scripps Study Finds Plastic in Nine Percent of "Garbage Patch" Fishes (June 30, 2011) (http://scrippsnews.ucsd. edu/Releases/?releaseID=1174).
- 124 Peter Davison & Rebecca G. Asch, *Plastic Ingestion by Mesopelagic Fish in the North Pacific Subtropical Gyre*, 432 MARINE ECO. PROG. SERIES 173, 175 (2011). Of the non-migratory North Pacific Gyre fish, only 4.8% had plastic in their stomachs, while 11.6% of migratory fish contained plastic debris. "The lower incidence of plastic in non-migratory fishes may reflect a decreased concentration of plastic at depths where feeding occurs." *Id.* at 176. However, this may also indicate "a potential subsurface concentration of suspended debris." *Id.* at 179.
- 125 *Id.* at 178. This is a conservative estimate that assumes plastic does not increase mortality and no plastic is regurgitated or passed. *Id.*

127 Cecilia Eriksson & Henry Burton, Origins and Biological Accumulation of Small Plastic Particles in Fur Seals from Macquarie Island, 32 J. OF THE HUMAN ENV'T 380, 380 (2003).

<sup>119</sup> Moore, supra note 9, at 133.

<sup>120</sup> Dr. Miriam Goldstein states, "Most oceanographers, including myself, do not think that comparing the dry weight of plankton and plastic is a helpful way of understanding what is going on in the ocean. I believe that this method is no longer used much." Goldstein, *supra* note 53.

<sup>126</sup> Id. at 173.

large marine animals, such as turtles,<sup>128</sup> whales,<sup>129</sup> and seabirds,<sup>130</sup> ingest pelagic plastic debris. It has also been hypothesized that the tiny invertebrates that make up much of ocean life will ingest plastic as well, although the process has only been witnessed in a laboratory setting.<sup>131</sup>

Despite the vast evidence demonstrating that marine animals ingest plastic, there is lingering doubt, and a dearth of research, about the harmful effects this ingestion has on the animals' health. It was originally thought that "eating plastic can fill the animal's stomach, leading to a feeling of fullness and decreasing room available for food," as well as blocking and damaging its digestive tract.<sup>132</sup> However, even in the very well-publicized instance of seabirds,<sup>133</sup> this may not be the case. While some studies find that the more plastics a bird consumes, the less fit it is and the less it can assimilate food into fat,<sup>134</sup> others find no correlation between the number of plastic particles in a bird's stomach and its body mass.<sup>135</sup> Skeptics argue that seabirds often prey on animals with indigestible parts, such as sharp fish bones or squid beaks, so the mere presence of plastic is inconclusive.<sup>136</sup> Sea turtle studies have been equally inconclusive.<sup>137</sup>

A more worrisome concern about marine animals ingesting pelagic plastics, which primarily consist of tiny fragments of user plastics, is their toxicity. Plastic debris may be toxic in two ways. First, the toxins may be part of the discarded plastic product and

- 129 Gregory & Andrady, *supra* note 15, at 368 (stating that many turtles and some whales may mistake discarded plastic bags and sheeting for jellyfish).
- 130 Ryan, supra note 72, at 1408; Vlietstra & Parga, supra note 73, at 945.
- 131 Law & Goldstein, *supra* note 14, at 22. Zooplankton ingest plastic in a lab, but will pass it through without observed negative effects. This also occurs with lugworms, amphipods, barnacles, and sea cucumbers. Mussels, on the other hand, show lingering traces of plastic residue for 48 days after ingestion. *Id.* Presumably, the same behavior occurs in the ocean, where "[m]ost feeding . . . is accomplished by indiscriminate feeders with mucus bodies or appendages, which trap anything of an appropriate size with which the organism comes in contact." Moore, *supra* note 9, at 134.
- 132 Law & Goldstein, supra note 14, at 20.
- 133 Laysan albatrosses have become somewhat of a mascot for seabird plastic ingestion from the Pacific Garbage Patch. Hohn, *supra* note 15 (describing the Laysan albatross, after a Greenpeace ad campaign as the "poster bird" for plastic pollution victims); *see Albatross*, GREENPEACE, http://www.greenpeace.org/usa/en/campaigns/oceans/wildlife-facts/albatross/ (last visited Apr. 17, 2012).
- 134 P.G. Ryan, Effects of Ingested Plastic on Seabird Feeding: Evidence from Chickens, 19 MARINE POLLUTION BULL. 125, 125 (1988).
- 135 Vlietstra & Parga, supra note 73, at 945.
- 136 See Gregory & Andrady, supra note 15, at 386; Hohn, supra note 15 (quoting U.S. Fish & Wildlife Service wildlife biologist Beth Flint).
- 137 See Barreiros & Barcelos, *supra* note 128; Bjorndal, *supra* note 128 (neither study finding a causal connection between plastic debris consumed and turtle mortality).

<sup>128</sup> João P. Barreiros & João Barcelos, Plastic Ingestion by a Leatherback Turtle Dermochelys Coriacea from the Azores (NE Atlantic), 42 MARINE POLLUTION BULL. 1196 (2001); Karen A. Bjorndal, et al. Ingestion of Marine Debris by Juvenile Sea Turtles in Coastal Florida Habitats, 28 MARINE POLLUTION BULL. 154 (2001) (finding over half the turtles studied contained marine debris, including plastic).

leach out as the item degrades.<sup>138</sup> In the manufacturing process, plastic resin pellets are often combined with plasticizers, such as BPA and phthalates, which have been linked to genetic and reproductive abnormalities.<sup>139</sup> Second, microplastics act remarkably like sponges for toxins in the ocean through a process called "adsorption."<sup>140</sup> Within a few weeks at sea, these plastic bits "can adsorb pollutants at concentrations up to a million times higher than those found in the surrounding seawater."<sup>141</sup> These pollutants include pesticides like DDT, flame retardants like PBDEs, industrial chemicals like PCBs, and other persistent organic pollutants (POPs).<sup>142</sup> Again, the extent to which toxic leaching is harmful to marine animals is uncertain, and whether the toxicity can make its way up the food chain to affect human health is unknown.<sup>143</sup>

Macro- and megaplastics, the intact consumer goods and fishing gear easily seen by the naked eye, present their own concerns. Members of over 267 species have been affected by entanglement, most often in "ghost" fishing nets, six-pack rings, and packing straps.<sup>144</sup> Entangled animals can drown, suffocate, die of infection, or starve as the debris they drag along prevents them from catching prey.<sup>145</sup> Like most negative effects of pelagic plastics, the degree of harm caused by entanglement is unknown, needs to be investigated further, and has been sensationalized.<sup>146</sup>

Larger plastic debris also has negative economic effects. The costs of beach cleanups, recreational impairment, and overall harm to tourism from debris that washes up or is discarded on beaches<sup>147</sup> takes an economic toll at the local and national level.<sup>148</sup> Fisheries lose money when time must be "spent cleaning debris from nets, propellers,

141 Id.

- 143 Thompson, *supra* note 69, at 11 ("While exposure pathways have not been determined, chemicals used in plastics such as phthalates and flame retardants have been found in fish, sea mammals, mollusks, and other forms of marine life."). *Id.* at 10.
- 144 Law & Goldstein, supra note 14, at 19.
- 145 Id.
- 146 Harold Johnson, a blogger and activist against plastic marine debris, discovered that a statistic used consistently by non-profits, scientists, and even the United Nations Environment Programme, appears to have been made up. The phrase "100,000 sea mammals are killed by plastic marine pollution every year," has been repeated for about 27 years without any scientific basis. Johnson's discovery was quickly picked up by industry publications. Harold Johnson, *Too Good to be True: Sea Mammals, Plastic Pollution and a Modern Chimera*, SCI. AM. BLOGS (Oct. 13, 2011), http://blogs.scientificamerican.com/guest-blog/2011/10/13/too-good-to-be-true-sea-mammals-plastic-pollution-and-a-modern-chimera; Don Loepp, *Hunting Down Origin of Oft-Cited Statistic*, PLASTIC NEWS (Oct. 24, 2011).
- 147 A study of beachgoers at Cassino Beach in Brazil found that, though most visitors did not admit to littering, they believed that litter on the beach was left there by other beach users. Santos, *supra* note 28, at 743. Further, the amount of litter increased as the number of people on the beach increased. *Id.*
- 148 Moore, supra note 9, at 133.

<sup>138</sup> Law & Goldstein, supra note 14, at 22.

<sup>139</sup> Id.

<sup>140</sup> Id. at 23.

<sup>142</sup> Thompson, supra note 69, at 11; see Yukie Mato, Plastic Resin Pellets as a Transport Medium for Toxic Chemicals in the Marine Environment, 35 ENVT'L SCI. & TECH. 318, 322–23 (2001).

and blocked water intakes."<sup>149</sup> The losses are particularly severe for subsistence fishermen.<sup>150</sup>

A new concern has emerged within the scientific community: plastics as rafting communities. Because there are very few hard surfaces in the ocean, most species have adapted to life in seawater.<sup>151</sup> Certain species, such as barnacles, anemones, mollusks, and tubeworms, are specialized to life on the few naturally occurring "rafts" in the ocean and have found pelagic plastic debris an ideal habitat.<sup>152</sup> Whereas rafting communities have previously been limited by the scarcity of rafts in the ocean, these communities have been found to expand as the concentration of plastic increases and provides more dwelling surfaces.<sup>153</sup> A forthcoming study found that the massive increase in microplastics in the North Pacific Subtropical Gyre from 1972 to 2010 was positively correlated with an increase in the abundance of eggs from Halobates sericeus, a pelagic insect that "belongs to both the surface-associated pelagic community . . . and to the substrate-associated rafting community."<sup>154</sup> Scientists are worried that plastics may carry invasive species into sensitive ecosystems, which may interfere with development of native species, alter water quality, and damage fisheries.<sup>155</sup> And, as mentioned supra Part II.B., plastics encrusted with these organisms take far longer to degrade.

### E. MYTH: LET'S JUST CLEAN IT UP

Both scientists and government agencies agree that simply removing plastic debris from the ocean is not practical and likely not feasible. There are two major obstacles to this. First, the ocean is vast and the plastic, for the most part, is diffuse. Dr. White

- 149 Thompson, *supra* note 69, at 12. In Scotland, fisheries lose about \$16 million, or 5% of total revenue, annually. In the Asia-Pacific Economic Cooperation (APEC) Region, losses to fishing, shipping, and tourism average about \$1.265 million each year. *Id.*
- 150 Id. Subsistence fishermen operate in "local, non-commercial fisheries, oriented not primarily for recreation but for the procurement of fish for consumption of the fishers, their, families, and community." Sarah Schumann & Seth Macinko, Subsistence in Coastal Fisheries Policy: What's in a Word?, 31 MARINE POL. 706, 707 (2007) (quoting Fikret Berkes, Subsistence Fishing in Canada: A Note on Terminology, 41 ARCTIC 319, 319 (1988)). It should be noted that there is continuing disagreement about the meaning of "subsistence" in political and legal discourse. Id.
- 151 Law & Goldstein, supra note 14, at 23.
- 152 *Id.* The Atlantic Ocean has a higher concentration of these natural rafts, such as pumice, driftwood, and algae, than the Pacific, which has almost none. *Id.* "Pelagic plastic debris is ideally suited for rafting due to its abundance, buoyancy, and persistence, and has rapidly become a common substrate." *Id.* at 24.
- 153 See, e.g., David K.A. Barnes & Keiron P. P. Fraser, *Rafting by Five Phyla on Man-Made Flotsam in the Southern Ocean*, 262 MARINE ECO. PROG. SERIES 289, 289–291 (2003) (finding rafting species on plastic debris in the Southern Ocean, near Antarctica, which had previously been believed to be too cold and too choppy to sustain many of these organisms).
- 154 Miriam Goldstein, et al., Increased Oceanic Microplastic Debris Enhances Oviposition in an Endemic Pelagic Insect, 8 BIO. LETTERS \_\_\_ (published ahead of print May 9, 2012), available at http://rsbl.royalsocietypublishing.org/content/early/2012/04/26/rsbl.2012.0298.
- 155 See Law & Goldstein, supra note 14, at 24; White, supra note 10; Gregory & Andrady, supra note 15, at 384; Thompson, supra note 69, at 10.

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calculates that "the amount of energy it would take to remove plastics from the ocean is roughly 250 times the mass of the plastic itself."<sup>156</sup> NOAA estimates that it would take 68 ships one year to skim just 1% of the North Pacific Ocean.<sup>157</sup> Second, because so much of the plastic is tiny, any net used to scoop up the plastic would necessarily also remove phytoplankton, zooplankton, and other tiny organisms, which tend to concentrate in the same areas.<sup>158</sup> These organisms are the base of the marine food chain and are responsible for about 50% of the photosynthesis on Earth.<sup>159</sup> Thus, cleaning up the ocean would undoubtedly do more harm than good.<sup>160</sup>

### F. CONCLUSION

Media sensationalism and subsequent backlash from industry has been a distraction from the very real plastic marine debris problem. The Garbage Patch is not a solid, visible island of trash in the Pacific Ocean that might simply be able to be lifted out with enough monetary commitment or a big enough boat. It is now clear that pelagic plastics are global, nearly invisible, and persistent. As the scientific data emerges from the fictional bogeyman, the biggest cause for concern is microplastics, those tiny fragments of plastic products that keep breaking down but never biodegrade. These fragments have real potential to affect human health and welfare by spreading invasive species, leaching toxins into the animals that consume them, and moving these toxins up the food chain to humans. Though concentrations of microplastics within the subtropical gyres do not seem to be increasing, which is potentially another cause for concern, consumption of disposal plastic products is on the rise globally. Next, this Note will explore current international attempts at solving the marine plastic debris problem and their shortcomings.

### **III. CURRENT SOLUTIONS**

International attempts to solve the land-based marine plastic debris problem have failed to reduce or control plastic litter in the ocean. Currently, only one international treaty, UNCLOS, addresses marine pollution from land-based sources, and the United States has not ratified it. Eighteen Regional Seas Agreements, which are inconsistently legally binding and effective, aspire to localized solutions. There are also three significant "soft law" frameworks that further develop voluntary standards and goals for national, regional, and global cooperation on marine litter as a type of land-based source. Plastic marine debris, which constitutes about 80% of all marine debris, has only very recently entered the international discussion. Because these international ap-

<sup>156</sup> White, supra note 10.

<sup>157</sup> Karl, *supra* note 8. The 5 Gyres Institute calculated that to remove their estimate of 315 billion pounds of plastic from the ocean would require 630 oil supertankers, which can carry up to 500 million pounds each, and cost about \$13 billion a year. Wilson, *supra* note 14.

<sup>158</sup> White, supra note 10.

<sup>159</sup> Karl, supra note 8.

<sup>160</sup> An apt comparison is that "going to the ocean to remove floating plastic particles is like standing on top of a skyscraper with a vacuum cleaner to remove air pollution." Eriksen, *supra* note 51.

proaches have not been designed to address how and why plastic fouls the ocean, they have collectively failed to address the unique features of the plastic debris problem.

Because between 70% and 80% of marine pollution originates from land-based sources, this Note focuses on just those international agreements and frameworks that specifically address land-based sources. It is striking, however, that the United States has thus far only ratified those treaties that deal with marine pollution from ocean dumping, which accounts for 10% or less of marine debris.<sup>161</sup> The two international ocean dumping treaties that address plastic marine litter are the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter ("London Convention:)<sup>162</sup> and the 1978 Annex V to the 1973 International Convention for the Prevention of Marine Pollution from Ships (MARPOL).<sup>163</sup> The London Convention, ratified in 1975,<sup>164</sup> regulates the purposeful dumping of waste into the ocean, including "persistent plastics . . . which may float or may remain in suspension in the sea in such a manner as to interfere materially with fishing, navigation or other legitimates uses of the sea."165 MARPOL Annex V, ratified in 1980,166 prohibits dumping ship-generated garbage, specifically including plastics such as "synthetic ropes, synthetic fishing nets and plastic garbage bags."<sup>167</sup> These two treaties are not particularly helpful for eliminating the flow of plastics from land to sea and suffer from the same enforcement, compliance, and stringency problems as other international marine frameworks, discussed infra.

- 166 H.R. REP. NO. 96-1224 (1980), reprinted in 1980 U.S.C.C.A.N. 4849.
- 167 MARPOL Annex V, supra note 163, at reg. 3(1)(a), 5(2)(a)(1), 1340 U.N.T.S. 263-64.

<sup>161</sup> Alan Sielen, The New International Rules on Ocean Dumping: Promise and Performance, 20 GEO. INT'L ENVTL. L. REV. 295, 296 (2009); see also U.N. Conference on Environment and Development, June 3-14, 1992, Agenda 21, Chapter 17, ¶ 17.18, U.N. Doc. A/CONF.151/4 (1992) [hereinafter Agenda 21, Chapter 17], available at http://www.un.org/esa/dsd/agenda21/res\_agenda21\_17.shtml (estimating that dumping-at-sea contributes 10% and maritime transport contributes 10% of marine pollution).

<sup>162</sup> Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 29, 1972, 26 U.S.T. 2403, 1046 U.N.T.S. 138 [hereinafter London Convention] (implemented by the Marine Protection, Research, and Sanctuaries Act of 1972 (Ocean Dumping Act), 33 U.S.C. §§ 1401-45 (2011)). The London Convention permits dumping unless explicitly prohibited, in which case a party that wishes to dump in the ocean is required to obtain a permit. The London Convention was modified in 1996 by the London Protocol, which prohibited all dumping unless otherwise explicitly permitted. The United States has not ratified the London Protocol.

<sup>163</sup> International Convention for the Prevention of Marine Pollution from Ships, Nov. 2, 1973, 1340 U.N.T.S. 184, 12 I.L.M., and Protocol of 1978 relating to the International Convention for the Prevention of Marine Pollution from Ships, Feb. 17, 1978, 1340 U.N.T.S. 62, 17 I.L.M. 546 [hereinafter MARPOL Annex V] (implemented by the Act to Prevent Pollution from Ships, 33 U.S.C. §§ 1901–15 (2011)).

<sup>164</sup> London Convention, U.S. ENVTL. PROT. AGENCY, http://water.epa.gov/type/oceb/ oceandumping/dredgedmaterial/londonconvention.cfm (last updated Mar. 8, 2012).

<sup>165</sup> London Convention, *supra* note 162, at art. 4, § 1(a), Annex I, § 4, 26 U.S.T. at 2408, 2465, 1340 U.N.T.S. at 141, 203.

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### A. UNITED NATIONS LAW OF THE SEA

The only international treaty that specifically addresses land-based sources of marine pollution is the 1982 United Nations Convention on the Law of the Sea (UNCLOS).<sup>168</sup> While 162 nations have ratified this treaty, the United States has not.<sup>169</sup> To date, U.S. concerns over the treaty's effect on national sovereignty have not been overcome.<sup>170</sup> At the time UNCLOS entered into force, November 1994, scholars believed that UNLCOS was the turning point for protecting the marine environment through progressive international law that balanced conservation with economic interests.<sup>171</sup> Unlike MARPOL Annex V and the London Convention, UNCLOS asserts that all nations have a general "obligation to protect and preserve the marine environment."<sup>172</sup>

Part XII contains the UNCLOS provisions on "Protection and Preservation of the Marine Environment." Article 194 contains the general marine protection mandate: "States shall take . . . all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment<sup>173</sup> from any source, using for this purpose the best practicable means at their disposal and in ac-

- 169 Chronological Lists of Ratifications of, Accessions and Successions to the Convention and the Related Agreements as at 03 June 2011, U.N. DIV. FOR OCEAN AFF. & THE LAW OF THE SEA, http://www. un.org/depts/los/reference\_files/chronological\_lists\_of\_ratifications.htm (last updated June 3, 2011).
- 170 After UNCLOS was completed in 1982, newly-elected President Ronald Reagan refused to sign because of provisions on seabed mining that called for shared technology and complex licensing procedures. Reagan believed turning seabed mining disputes over to the International Seabed Authority was an impermissible delegation of national sovereignty, stating that "no nat[ional] interest of ours could justify handing sovereign control of two-thirds of the earth's surface over to the Third World." See Sarah Ashfaq, Something For Everyone: Why the United States Should Ratify the Law of the Sea Treaty, 19 J. TRANSNAT'L L. & POL'Y 357, 361 (2010). The remainder of UNCLOS, according the Reagan, was merely codification of customary international law with which the U.S. already complied (such as the 200-mile EEZ). See id.; Elizabeth M. Hudzik; A Treaty on Thin Ice: Debunking the Arguments Against U.S. Ratification of the U.N. Convention on the Law of the Sea in a Time of Global Climate Crisis, 9 WASH. U. GLOBAL. STUD. L. REV. 353, 359–360 (2010); Comment, Patricia C. Bauerlein, The United Nations Convention on the Law of the Sea & U.S. Ocean Environmental Practice: Are We Complying with International Law?, 17 LOY. L.A. INT'L & COMP. L.J. 899, 903–04 (1995).
- 171 See, e.g., J.I. Charney, The Marine Environment and the 1982 United Nations Convention on the Law of the Sea, 28 INT'L LAWYER 879, 882 (1994).
- 172 UNCLOS, *supra* note 168, at art. 192. Additionally, "States have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment." *Id.* at art. 193.
- 173 "'Pollution of the marine environment' means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities." *Id.* at art. 1, § 4.

<sup>168</sup> United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397, 21 I.L.M. 1261 [hereinafter UNCLOS].

cordance with their capabilities, and they shall endeavor to harmonize their policies in this connection."<sup>174</sup> This section also details the sources of marine pollution about which nations should be most concerned, urges nations to protect fragile ecosystems and endangered species, and directs nations not to interfere with others' carrying out of the treaty.<sup>175</sup>

Articles 194(2), 195, and 196 prohibit nations from polluting or damaging other states' environments, turning one form of pollution into another, and aiding the spread of invasive species, respectively.<sup>176</sup> A nation may be in violation of these three articles if it contributes to the plastic marine debris problem. For example, microplastics cross transnational boundaries as they drift on ocean currents, often providing a "raft" for small, potentially invasive, marine organisms. A piece of plastic debris leaving the coast of California could easily find its way to Japan's coast and vice versa.

Article 207 specifically pertains to the prevention of land-based marine pollution.<sup>177</sup> Notably, it acknowledges that inland waterways and sewers are common pathways to the ocean and emphasizes the need to protect against "toxic, harmful or noxious substances, especially those which are *persistent*."<sup>178</sup> Article 207 serves three important functions: (1) it "provides stimulus for national legislatures to develop or improve their laws;" (2) it "serves to encourage cooperation to this end on the part

- 176 Id. at art. 194, §2, 195, 196.
- 177 Id. at art. 207.

"Article 207 Pollution from and-based sources.

- States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources, including rivers, estuaries, pipelines and outfall structures, taking into account internationally agreed rules, standards and recommended practices and procedures.
- 2. States shall take other measures as may be necessary to prevent, reduce and control such pollution.
- 3. States shall endeavour to harmonize their policies in this connection at the appropriate regional level.
- 4. States, acting especially through competent international organizations or diplomatic conference, shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment from land-based sources, taking into account characteristic regional features, the economic capacity of developing States and their need for economic development. Such rules, standards and recommended practices and procedures shall be re-examined from time to time as necessary.
- 5. Laws, regulations, measures, rules, standards and recommended practices and procedures referred to in paragraphs 1, 2 and 4 shall include those designed to minimize, to the fullest extent possible, the release of toxic, harmful or noxious substances, especially those which are persistent, into the marine environment."
- 178 UNCLOS, supra note 168, at art. 207, §§ 1, 5 (emphasis added).

<sup>174</sup> Id. at art. 194, § 1.

<sup>175</sup> *Id.* at art. 194, §§ 3–5 (the sources include land-based sources, dumping, atmospheric releases, pollution from vessels, pollution from installations and devices used in seabed mineral exploitation and exploration or for other purposes).

of neighboring states; and (3) it provides a legal basis for the integration of pollution control policy, and relevant institutional arrangements, especially in coastal areas."<sup>179</sup>

The remainder of UNCLOS, Part XII, relies on national, regional, and international cooperation for monitoring compliance and environmental conditions, enforcing rules and regulations under the treaty, and sharing technologies with developing states.<sup>180</sup> Article 213 simply mandates nations to follow their own laws, which should be consistent with the terms of the treaty, against land-based sources.<sup>181</sup> Articles 217, 218, and 220 confer jurisdiction upon states to enforce the provisions of Part XII.<sup>182</sup> These enforcement provisions apply primarily when a nation has "clear ground for believing" that another nation's ship is dumping within its exclusive economic zone (EEZ).<sup>183</sup> However, it is almost always impossible to determine the geographic origin of plastic debris, even with full knowledge of ocean current patterns, especially if its source is a moving vessel such as a ship.<sup>184</sup>

Despite early enthusiasm from scholars, if not elected officials, the UNCLOS environmental provisions are inadequate to control the plastic marine debris problem. Article 207 on regulating land-based sources is one of the weakest provisions in Part XII.<sup>185</sup> The provision is far too general. There is no explanation of existing international standards or how a nation should develop "other measures" that are sufficiently stringent to meet these standards.<sup>186</sup> There are no minimum compliance requirements. For other sources of pollution, such as pollution from dumping or from vessels, "States are under the obligation to adopt laws and regulations which shall be no less effective than international rules and standards."187 For land-based sources, on the other hand, nations can use their own judgment while merely "taking into account" these rules and standards.<sup>188</sup> This problem is amplified in the case of developing nations, which are given a so-called "license of reluctance" under article 194, § 1.189 The phrases "best practicable means at their disposal" and "in accordance with their capabilities" in that section permit developing nations to implement proportionally weaker constraints on land-based sources, such as waste management systems.<sup>190</sup> Thus, article 207 is essentially a bare framework that outlines ambitious goals, but it sets no standards to reach them.

- 180 See UNCLOS, supra note 168, at art. 197-206, 213-233.
- 181 Id. at art. 213.
- 182 Id. at art. 217, 218, 220.
- 183 Id. at art. 220.
- 184 Law, supra note 42, at 1186.
- 185 Hassan, supra note 12, at 83; Yoshifumi Tanaka, Regulation of Land-Based Marine Pollution in International Law: A Comparative Analysis Between Global and Regional Legal Frameworks, 66 HEIDELBERG J. OF INT'L L. 535, 543 (2006), available at http://www.zaoerv. de/66\_2006/66\_2006\_3\_a\_535\_574.pdf.
- 186 Hassan, supra note 12, at 82; UNCLOS, supra note 168, at art. 207, §§ 1, 2.
- 187 Tanaka, *supra* note 185, at 543.
- 188 UNCLOS, supra note 168, at art. 207 § 1; see Tanaka, supra note 185, at 543.
- 189 Hassan, supra note 12, at 84.
- 190 UNCLOS, *supra* note 168, at art. 194, § 1. Article 207 urges special consideration for the needs and economic capacity of developing nations.

<sup>179</sup> Hassan, supra note 12, at 82.
## **B. SOFT LAW**

In response to the United Nations Convention Law of the Sea mandate and the increasing concern about the quantity of marine pollution originating from land, between 1985 and 1995, the United Nations Environment Programme developed three non-binding frameworks to address this issue. These "soft law" paradigms all suffer from the obvious lack of enforcement authority and from inconsistent participation in and adherence to their guidelines. They have also failed, until very recently, to address plastic as a growing, persistent source of problems in the marine environment.

The first of these, the Montreal Guideline for the Protection of the Marine Environment from Land Based Sources ("Montreal Guidelines"), was drafted in May 1985.<sup>191</sup> The Montreal Guidelines were essentially a restatement of UNCLOS, with the same lack of prescribed technical standards and no clarity on applicable international rules. The Montreal Guidelines did, however, expand the definition of marine pollution from damage to "marine life" to "harm to . . . marine ecosystems," indicating that non-living factors were a valid concern in marine environmental pollution prevention. Further, the Montreal Guidelines created a "black list" of substances that should be completely eliminated from the marine environment.<sup>192</sup> Although plastic is not specifically mentioned, blacklisted items include "[p]ersistent synthetic materials which may seriously interfere with legitimate uses of the sea."<sup>193</sup>

Seven years later, in 1992, the United Nations Conference on Environment and Development in Rio de Janeiro adopted Agenda 21, Chapter 17, dealing with the protection of the seas, oceans, and coastal areas, and the "rational use & development of their living resources."<sup>194</sup> Chapter 17 was a huge step forward from the Montreal Guidelines. First, it explicitly listed plastic as a "contaminant[] that pose[s] the greatest threat to the marine environment." Chapter 17 points out that, while land-based sources contribute 70% of marine pollution and should be "of particular concern . . . since they exhibit at the same time toxicity, persistence and bioaccumulation in the food chain," there is still no "global scheme to address marine pollution from land-based sources."<sup>195</sup> Second, Chapter 17 first advocated, in an international forum, the precautionary principle as an approach to land-based sources. As it applies to

<sup>191</sup> Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-Based Sources, Decision of the UNEP Governing Council (May 24, 1985), available at http://hqweb. unep.org/law/PDF/UNEPEnv-LawGuide&PrincN07.pdf. The stated goal of the Montreal Guidelines was "to assist[ governments] in the process of developing appropriate bilateral, regional and multilateral agreements and national legislation for the protection of the marine environment against pollution from land-based sources." Id. at \*2.

<sup>192</sup> Criteria for a black list substance: (a) substances that "are not readily degradable or rendered harmless by natural processes; and" (b) substances that either: (i) "give rise to dangerous accumulation of harmful material in the food chain; or (ii) endanger the welfare of living organisms causing undesirable changes in the marine ecosystems; or (iii) interfere seriously with the harvesting of sea foods or with other legitimate uses of the sea; and" (c) "pollution by these substances necessitates urgent action." *Id.* at \*20.

<sup>193</sup> Id.

<sup>194</sup> Agenda 21, Chapter 17, supra note 161 (178 nations, including the United States, voted in favor of Agenda 21 at the 1992 Conference).

<sup>195</sup> Id.

plastic pollution, the precautionary principle advises an "anticipatory, rather than reactive, approach . . . [including] clean production techniques, recycling, waste audits and minimization, [and] construction and/or improvement of sewage treatment facilities."<sup>196</sup> Finally, Chapter 17 placed a heavy emphasis on national and regional cooperation.<sup>197</sup>

Regional cooperation advanced by Agenda 21, Chapter 17 has been implemented in part by the United Nations Environmental Programme's (UNEP) Regional Seas Program.<sup>198</sup> UNEP analyzed 12 Regional Sea Action Plans (RSAP) and found that these smaller-scale, presumably more manageable, agreements have failed to help the marine plastic debris problem.<sup>199</sup> Most of RSAP nations do not have legislation specifically addressing marine litter.<sup>200</sup> Instead, litter falls into the larger "solid waste" regulatory category, which most regions acknowledge is inadequately implemented and enforced.<sup>201</sup> Further, funding remains a major issue for a majority of regions, both in coordinating "the diversity of government structures" and in "sustaining basic systems and infrastructure for effective waste management at the national level."<sup>202</sup> It appears that the itinerant nature of marine litter makes inter- and even intra-governmental coordination even more difficult.<sup>203</sup> A lack of political visibility, especially compared to other environmental issues, keeps marine litter and waste management infrastructure at a low priority for government participants.<sup>204</sup>

The Global Programme of Action for the Protection of the Marine Environment from Land-Based Sources (GPA) resulted from the Washington Conference, held in late 1995 as a follow-up mandated under Agenda 21.<sup>205</sup> The GPA went even further

- 201 Id.
- 202 Id. at 10.
- 203 Id.

<sup>196</sup> Id. at ¶ 17.21.

<sup>197</sup> See id. at ¶ 17.6-17.17, 17.116-17.123.

<sup>198</sup> Ljubomir Jeftic, et. al., U.N. ENV'T PROGRAMME, MARINE LITTER: A GLOBAL CHALLENGE 15-16 (Nikki Meith, ed., 2009), *available at* http://www.unep.org/regionalseas/marinelitter/ publications/docs/Marine\_Litter\_A\_Global\_Challenge.pdf. There are 18 Regional Seas Programs: UNEP directly administers six, seven other programs are independently administered but still under the auspices of UNEP, and five are regional partner programs). *Id.* at 16. Over 140 nations participate in at least one Regional Seas Action Plan (RSAP), with 12 of these Action Plans legally binding their member nations. A map depicting all 18 regions show that most populated coastal regions are covered by a Regional Seas Agreement. *Id.* 

<sup>199</sup> Id. at 9.

<sup>200</sup> *Id.* (only nations in the Wider Caribbean, which includes 28 nations, and North Pacific, which includes Japan, South Korea, China, and Russia, have specific litter laws).

<sup>204</sup> Lucien Chabason, Regional Seas: Addressing Emerging Issues and Challenges, GLOBAL PROGRAMME OF ACTION FOR THE PROT. OF THE MARINE ENV'T FROM LAND-BASED ACTIVITIES (Jan. 24, 2012), http://www.gpa.depiweb.org/docman/doc\_view/203-regional-seas.html.

<sup>205</sup> Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, Washington D.C., Oct. 23-Nov. 3, 1995, Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, UNEP(OCA)/LBA/IG.2/7 (Dec. 5, 1995) [hereinafter GPA], available at http://coralreef.noaa.gov/threats/pollution/resources/unep\_lbsp\_prgrm.pdf. "The Global Programme of Action aims at preventing the degradation of the marine environment from

than Chapter 17 in recognizing "litter," particularly plastics, as its own category of marine pollution with recommended action at the national, regional, and global levels.<sup>206</sup> Paragraphs 141 and 142 describe how land-based litter enters the oceans, that about 80% of "persistent wastes originate from land," and flotsam's broad oceanic travel patterns.<sup>207</sup> In the most recent Intergovernmental Review Meeting on the Implementation of the GPA (IGR) in January 2012, participants discussed why the GPA and Regional Seas Programs had not been more effective at reducing global marine litter.<sup>208</sup> Again, a lack of proper waste management practices and especially national enforcement of regulations were the biggest problems.<sup>209</sup> The IGR pointed to ever-increasing populations, as well as consumption and urbanization in developing nations as increasing contributors to marine litter.<sup>210</sup> Importantly, this meeting was the first time that plastic, and especially microplastic, marine debris was singled out as a growing global concern.<sup>211</sup>

In response to repeated recognition that a lack of proper waste management infrastructure is a major contributor to marine pollution, especially in developing nations, the UNEP developed a final draft of the Global Partnership on Waste Management framework (GPWM) in late 2011.<sup>212</sup> Anticipating that, by 2015, more than half the world's population will live in urban centers, and that, even now, many developing nations generate a per capita rate of over 800 pounds of waste per year (nearly equal to developed nations), the GPWM seeks to raise awareness and build partnerships to

- 207 Id. at 54, ¶¶ 141-42 ("141. Litter entering the marine and coastal environment has multiple sources. Sources include poorly managed or illegal waste dumps adjacent to rivers and coastal areas, windblown litter from coastal communities, resin pellets used as industrial feedstocks, and litter that is channeled to the marine and coastal environment through municipal stormwater systems and rivers. Marine litter is also caused by dumping of garbage into the marine and coastal environment by municipal authorities as well as recreational and commercial vessels. 142. While international action has been taken to prevent the discharge of plastics and other persistent wastes from vessels, it has been estimated that approximately 80 per cent of persistent wastes originate from land. Floatable litter is known to travel considerable distances with regional and sometimes broader implications. Resin pellets used as industrial feedstock circulate and deposit on oceanic scales.")
- 208 Intergovernmental Review Meeting on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, Third Session, Manila, Philippines, Jan. 25-27, 2012, Progress in the Implementation of UNEP's Marine Litter Activities 2007-2011 and the Way Forward from 2012 to 2016, at 2, UNEP/GPA/IGR.3/ INF/6 (Jan. 12, 2012).

land-based activities by facilitating the realization of duty of States to preserve and protect the marine environment." *Id.* at 7, ¶ 3. This is the same mandate espoused in UNCLOS, *supra* 168, at art. 194.

<sup>206</sup> GPA, supra note 205, at 54–55, ¶¶ 140–43.

<sup>209</sup> Id.

<sup>210</sup> Id.

<sup>211</sup> *Id.* at 6. The Thompson report, *supra* note 69, is discussed as a step toward a global framework focused on plastic marine debris. *Id.* 

<sup>212</sup> United Nations Environmental Programme, Framework of Global Partnership on Waste Management, Osaka, Japan, Nov. 18-19, 2010, UNEP (DTIE IETC)/GPWM/1/3 (Oct. 28, 2011).

expand existing waste infrastructure to meet rapidly increasing demand.<sup>213</sup> GPWM further aims to educate developing nations on conservation and recycling practices, which were unheard of when populations were small because "scavengers and rag pickers" gathered most recyclable trash for income.<sup>214</sup> There is increasing understanding that "marine degradation generates poverty by depleting the very basis for social and economic development," most often, tourism.<sup>215</sup> The GPWM's broad goals are to help developing nations upgrade (or create) systems for "waste prevention, integrated solid waste management, hazardous waste including e-waste, 3R [reduce, reuse, recycle] for waste management, waste agricultural biomass, and capacity building on waste management."<sup>216</sup>

# C. CONCLUSION

Even as it increasingly recognizes the role of inadequate waste management systems in creating the microplastic marine debris problem, current international law falls short in four ways. First, UNLCOS is not enforceable in the plastic debris context. By the time plastic washes up on a nation's beach, its source is utterly unidentifiable, oftentimes because it has degraded into tiny pieces. Further, plastic litter tends to gather in the center of gyres, far from the EEZ of any nation. Thus, even if the plastic's origin could be traced, no nation would have jurisdiction to enforce UNCLOS, which limits a state's enforcement authority to activities within its EEZ. Second, the international frameworks are far too general to expect uniform international compliance in enacting land-based prevention infrastructure and regulation; there is simply no minimum standard for nations to meet. There is also no guarantee that complying will prevent other nations' plastic waste from washing ashore, as ocean currents vary the degree to which plastic marine debris affects each nation. Third, because control of land-based plastic pollution is often a question of national, or more likely local, law, any international regulation has a real possibility of encroaching on a nation's sovereignty. Fourth, none of these frameworks realistically addresses developing countries, which are increasing sources of marine plastic debris and may lack the economic ability or the willingness to implement responsible waste management infrastructures to the potential detriment of their industrial development.<sup>217</sup>

International law, in its focus on sovereign nations' responsibility for the protection of the sea and waste management systems, fails to diminish the plastic marine debris problem. The next section proposes an alternative, though necessarily short-term, solution: biodegradable plastics.

<sup>213</sup> Id. at 7.

<sup>214</sup> Id.

<sup>215</sup> Tanaka, supra note 185, at 548.

<sup>216</sup> Id. at 8.

<sup>217</sup> Hassan, supra note 12, at 40.

#### IV. BIODEGRADABLE PLASTICS: A FUTURE, SHORT-TERM SOLUTION

# A. THE PLAN

As described in detail in the previous two sections, the two primary causes of the plastic marine debris problem are failures in waste management infrastructure and in enforcement of national pollution regulations. These are magnified in developing nations. Current international solutions have been unable to address these issues in a successful, or even satisfactory, manner. Though the marine debris problem must ultimately be solved by nations seriously addressing these two causes, present-day uncertainties, such as the global economy and accurate scientific characterization of pelagic plastics, prevent waste management from emerging as a priority, either nationally or internationally.

As a stop-gap solution, since plastic consumption continues to grow, this Note proposes a framework, at both the national and international levels, that would require nations to set biodegradability standards for plastic goods. These standards would establish the maximum amount of time that plastic could persist in ocean water. While technology for polymers that fully degrade in water does not currently exist, there are many scientists and small companies working on this issue today.<sup>218</sup> The standards should gradually implement biodegradability goals for each type of plastic polymer, focusing on the most-disposed-of plastics first. These goals will then drive technological innovation. Ideally, this framework would be enacted as a binding international treaty.

Though legislating biodegradability standards does not address the waste management issue, it will address some of the more troublesome plastic marine debris problems that accompany plastic persistence. For example, it could prevent further accumulation of plastics in the subtropical "patches."<sup>219</sup> It could also eliminate plastic as an abundant surface for rafting communities<sup>220</sup> and decrease its availability for marine animals mistaking it for food.<sup>221</sup> This would keep plastic out of the human food chain.<sup>222</sup>

The Montreal Protocol on Substances That Deplete the Ozone Layer and the steps leading to its passage provide an excellent model for developing and implementing an international biodegradable plastic standards regime. This section will explore the similarities between the ozone/chlorofluorocarbon and plastic marine debris problems. It will then describe the essential elements of the Montreal Protocol's success—reliable scientific data, strong grassroots support, a ban on the worst offender (aerosols), and industry's development of alternative products—as well as important lessons learned from the only successful international environmental treaty.

<sup>218</sup> See infra text accompanying notes 293–98.

<sup>219</sup> See supra Part II.A.

<sup>220</sup> See supra notes 151–55 and accompanying text.

<sup>221</sup> See supra notes 119-143 and accompanying text.

<sup>222</sup> See supra Part II.D.

Plastic consumption and its effect on the marine environment today are closely analogous to chlorofluorocarbon (CFC) consumption and its effect on the ozone layer in the 1970s.<sup>223</sup>

## 1. TRAGEDY OF THE COMMONS

Both problems are created by a "tragedy of the commons" where "multiple individuals acting independently in their own short-term self-interest ultimately destroy[] a shared resource against the long-term interest of all."<sup>224</sup> Both the ocean and the ozone layer are a commons. The ocean was long considered to be an inexhaustible resource, capable of supplying food and absorbing limitless quantities of waste.<sup>225</sup> The ozone layer, as part of the atmosphere, was taken for granted as an inextricable quality of the earth's existence.<sup>226</sup>

Users and producers of both plastics and CFCs externalize their costs to the environment. The two would-be pollutants pass through a long chain of manufacturers, producers, and consumers before either enters the commons. Further, it is often years, if not longer, before the actions of all actors aggregate into a serious environmental problem. Even then, both plastics and CFCs seem to affect a faraway locale: the middle of the Pacific Ocean and the stratosphere above Antarctica, respectively. Thus, an individual using a can of aerosol hairspray or leaving a plastic bottle on a beach does not feel or see the negative effects of her actions immediately, or possibly even during her lifetime.

As Garrett Hardin, who first described the tragedy of the commons, observed, "The rational man finds that his share of the cost of the wastes he discharges into the commons is less than the cost of purifying his wastes before releasing them. Since this is true for everyone, we are locked into a system of 'fouling our own nest,' so long as we behave only as independent, rational, free-enterprises."<sup>227</sup> Because this cycle—and its resultant environmental problems—will persist in the default free-market scheme, it must be solved by national and international regulation.

<sup>223</sup> Earlier law journal articles have drawn similar analogies between CFCs, the ozone layer, and the Montreal Protocol and greenhouse gas, global warming, and the Kyoto Protocol. See Chris Peloso, Crafting an International Climate Change Protocol Applying the Lessons Learned from the Success of the Montreal Protocol and the Ozone Depletion Program, 25 J. LAND USE & ENVTL. L. 305 (2010); Cass R. Sunstein, Of Montreal and Kyoto: A Tale of Two Protocols, 31 HARV. ENVTL. L. REV. 1, 2 (2007).

<sup>224</sup> Peloso, supra note 223, at 307; Garrett Hardin, The Tragedy of the Commons, 162 SCIENCE 1243, 1245 (1968).

<sup>225</sup> NAT'L RES. COUNCIL, TACKLING MARINE DEBRIS IN THE 21ST CENTURY \*1 (2008), available at http://www.nationalacademies.org/includes/marinedebris.pdf.

<sup>226</sup> See U.N. ENV'T PROGRAMME, MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER 2007: A SUCCESS IN THE MAKING 1 (2007), available at http://ozone.unep.org/ Publications/MP\_A\_Success\_in\_the\_making-E.pdf.

<sup>227</sup> Hardin, supra note 224, at 1245.

# 2. LONG-LASTING GLOBAL EFFECTS

Both plastics and CFCs continue to have global effects long after the source of the pollutant is eliminated. The ozone layer has required an extended amount of time to recover. Though there has been a 95% reduction in worldwide consumption and production of ozone-depleting chemicals since the late 1980s,<sup>228</sup> the ozone layer is not expected to fully recover until after 2050.<sup>229</sup> Plastics, as described in Part II.B., *supra*, do not biodegrade once they reach the ocean. Instead, they break into increasingly smaller fragments.<sup>230</sup> Those polymers that float swirl along ocean currents, often congregating in the centers of subtropical gyres.<sup>231</sup> Even if all nations could effectively control their plastic input, it is not known how long the plastic would persist in the ocean before it either sank to the ocean floor or was deposited on land by ocean currents.<sup>232</sup>

The lag time between implementing a change and seeing positive results raises questions of intergenerational equity.<sup>233</sup> Given the lack of immediate results, effectively solving the problem likely requires gradual implementation to disburse the burden of regulation and positive feedback through scientific measurement of improvement.

#### 3. INDIRECT EFFECTS, ATTENUATED POLITICAL VISIBILITY

Plastics and CFCs affect human health and welfare only indirectly, making political visibility a challenge. If most people thought of air pollutants as black clouds of putrid smoke, the presence of CFCs alone, found in everyday household products, may not have been a compelling reason to act.<sup>234</sup> Similarly, though plastic is found in most every part of the ocean, it is unlikely to generate widespread concern until studies find unacceptably high levels of polymers in seafood or until invasive rafting species harm fragile, but treasured, reef habitats. Plastic debris is also known to cause financial harm to coastal communities by soiling beaches, interfering with fisheries, and damaging tourist and recreational businesses,<sup>235</sup> which should be emphasized. A lack of political will could be solved through grassroots, media, and government

231 See supra text accompanying notes 30-45.

234 Peloso, supra note 223, at 308.

<sup>228</sup> Edward A. Parson, Protecting the Ozone Layer 242 (2003).

<sup>229</sup> David W. Fahey & Michael I. Hegglin, *Twenty Questions and Answers About the Ozone Layer:* 2010 Update, WORLD METEOROLOGICAL ORG. 65 (2010). "The annual averages of global total ozone are projected to return to 1960 levels around the middle of the century (2040 to 2080) while ESC [equivalent stratospheric chlorine] returns to 1960 values near century's end. The comparable return dates for 1980 values are substantially earlier." *Id.* at 67. It took until 1996, almost a decade after the Montreal Protocol became effective, for ozone levels to stop declining. SCIENTIFIC ASSESSMENT PANEL OF THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE, WMO/UNEP SCIENTIFIC ASSESSMENT OF OZONE DEPLETION: 2010, at 19 (2010), *available at* http://www.wmo.int/pages/mediacentre/press\_releases/documents/898\_ ExecutiveSummary.pdf.

<sup>230</sup> Moore, supra note 9, at 132.

<sup>232</sup> See supra Part II.B.

<sup>233</sup> Sunstein, *supra* note 223, at 2 ("Future generations are likely to face greater risks than the current generation, and a key question is how much the present should be willing to sacrifice for the benefit of the future").

<sup>235</sup> See supra text accompanying notes 147–150.

# 4. INDUSTRY RESISTANCE TO SCIENTIFIC DEVELOPMENT

Regulation of both pollutants is based on recent science,<sup>236</sup> heavily questioned by industry lobbies. When science was first emerging on the link between CFCs and stratospheric ozone depletion, industry emphasized differences between scientific findings to underscore "uncertainty in knowledge about the ozone layer and potential harm that may come from destroying it."<sup>237</sup> The CFC industry also formed a powerful alliance to launch a political campaign "claiming that regulation of non-aerosol uses of CFC would be detrimental to small businesses and lead to energy shortages."<sup>238</sup>

Plastic industry group the American Chemistry Council (ACC) has actively participated in education about spilled resin pellets, in beach cleanups, and in promoting recycling efforts.<sup>239</sup> ACC and other lobbies insist that "there is a place for every type of plastic," and actively resist local plastic bag bans and extended producer responsibility laws, such as "polluter pays."<sup>240</sup> ACC also warns of the "'major unintended consequences'" of alternatives to traditional, petroleum-based plastics.<sup>241</sup> Sensationalized media reporting on the Great Pacific Garbage Patch has only provided the industry with ammunition for its efforts to minimize the plastics problem.<sup>242</sup> Questions about the reliability of scientific findings must be solved through stronger, more conclusive findings.

# 5. WIDESPREAD USE

Plastics are and CFCs were used in an extremely wide variety of consumer and industrial products. CFCs were used primarily as propellants in aerosol spray cans, but were also found in air conditioners, refrigerators, furniture, auto parts, insulation, dry cleaning, and fire suppressants.<sup>243</sup> Plastics are found in everything from disposable packaging to auto parts, medical equipment, and furniture; in the U.S., it is virtually impossible to avoid using plastic on a daily basis.<sup>244</sup> There are some differences between the plastic and CFC industries. On one hand, the majority of CFCs were both

<sup>236</sup> Sunstein, supra note 223, at 2.

<sup>237</sup> PARSON, supra note 228, at 58.

<sup>238</sup> Id.

<sup>239</sup> See supra text accompanying notes 67-69.

<sup>240</sup> Mike Verespej, *Plastics Banks*, EPR Laws Not Going Away, PLASTICS NEWS (Apr. 3, 2012), http://business.highbeam.com/5780/article-1G1-286097435/plastic-bans-epr-laws-not-going-away.

<sup>241</sup> Ben Schiller, After Carbon and Water, The Drive is on to Reduce the World's Plastic Footprint, THE GUARDIAN, Mar. 23, 2012, http://www.guardian.co.uk/sustainable-business/blog/plastic-disclosure-project-waste-reduction (quoting Keith Christman, managing director of plastics and markets for ACC).

<sup>242</sup> See, e.g., Loepp, *supra* note 146 (citing Harold Johnson's finding that an often-quoted statistic about plastic harm to marine life had no factual basis to describe marine debris as "a magnet for hyperbole" and that there are often "exaggerated reports on the threats to marine life.").

<sup>243</sup> Id. at 20–21.

<sup>244</sup> See Plastics, supra note 103.

produced and consumed in western democracies.<sup>245</sup> On the other hand, while the majority of plastic is still produced in developed nations, plastic consumption is increasingly global.<sup>246</sup> Plastic production is also becoming a global industry.<sup>247</sup> Nevertheless, the solution to the seeming ubiquity of both pollutants, regardless of where they are produced and consumed, hinges both on finding commercially viable substitutes and altering consumer habits.

## 6. INTERNATIONAL INEQUITIES

Solving the hole in the ozone layer and the plastic marine debris problem undoubtedly requires cooperation from developing nations, which raises questions of international equity.<sup>248</sup> In both cases, the environmental problems, though globally problematic, were caused by developed nations' consumption habits. Developing nations may be unwilling to participate in a scheme under which they limit their economic progress to solve a problem they did not create. The solution to this resistence may involve a delayed timeline for developing nations' participation and should mandate technology sharing to assist their transition to cleaner infrastructure.

# C. ELEMENTS OF MONTREAL PROTOCOL'S SUCCESS

## 1. SCIENTIFIC FINDINGS

A major reason ozone legislation succeeded on a national and international level was the strong scientific support linking CFCs to the hole in the ozone layer. In 1974, scientists for the first time published a study linking CFCs with the destruction of ozone in the stratosphere, which they further connected to increased skin cancer diagnoses.<sup>249</sup> This study provoked an immediate response from other scientists, the federal government, and industry. Industry tried, unsuccessfully, to dispute the CFC-ozone layer connection using "scientific claims that appear foolish even in view of the knowledge at the time."250 The federal government, on the other hand, created a task force that, in 1975, found that CFC releases were "a legitimate cause for concern" and that, unless credible evidence proved otherwise, atmospheric emissions of CFC needed to be eliminated.<sup>251</sup> Scientists continued to investigate the causal link for the next decade, and, in 1986, a report co-authored by NASA and the World Meteorological Organization (WMO) definitively stated that "substantial growth in CFCs will bring large ozone depletion, regardless of the trends in other pollutants."252 The report further stated that an 85% cut in CFC emissions was needed to stabilize atmospheric ozone concentrations and formed the basis for serious international negotiations.<sup>253</sup>

253 Id. at 143.

<sup>245</sup> Peloso, supra note 223, at 312.

<sup>246</sup> Thompson, *supra* note 69, at 3.

<sup>247</sup> See supra text accompanying notes 113-18.

<sup>248</sup> Sunstein, supra note 223, at 2.

<sup>249</sup> See Mario J. Molina & F.S. Rowland, Stratospheric Sink for Chlorofluoromethanes: Chlorine Atom-Catalysed Destruction of Ozone, 249 NATURE 810 (1974).

<sup>250</sup> PARSON, supra note 228, at 32.

<sup>251</sup> Id. at 35.

<sup>252</sup> Id. at 142.

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A lack of a definitive scientific study is one of the biggest drawbacks of the plastic marine debris problem. Any national and especially any international plastic biodegradability law must have its foundation in sound science. Current studies focus on specific affected species or specific portions of oceans, but do not combine these findings into a cohesive theory explaining how plastic marine debris damages the oceans.<sup>254</sup> The most promising avenues of research deal with invasive species, toxic leaching, and microplastics migration up the food chain into the human diet.<sup>255</sup> However, until these subjects are studied with precise methodology, claims about the dangers of marine plastics will be prone to exaggeration and ensuing industry backlash.

## 2. GRASSROOTS MOVEMENT

The media immediately picked up on the CFC-ozone-skin cancer connection and began warning the public about the impact of aerosol sprays on the environment.<sup>256</sup> Public response was staggering: By 1975 U.S. demand for aerosol sprays decreased over 50%.<sup>257</sup> Professor Sunstein gives two reasons for the widespread public reaction, beyond the usual environmentalist activism. First, the link to skin cancer was frightening and a physical hole in the atmosphere was readily imaginable.<sup>258</sup> Second, because aerosol sprays were a non-essential consumer good, convenient but easily-substituted, a change in consumer behavior was not burdensome.<sup>259</sup>

A key to galvanizing support, locally, nationally, and internationally, for biodegradable plastic legislation will likewise be a clear, simple message that is equally easy to implement. A good starting point for action may be targeted biodegradability of plastic grocery and shopping bags. Consumers will simply replace these with reusable bags if there is clear motivation from a human health and welfare perspective. As mentioned, this is currently an essential missing piece.

# 3. AEROSOL BAN

By 1976, the federal government task force, working closely with the National Academy of Sciences, recommended a complete ban on aerosol sprays cans.<sup>260</sup> The ban was enacted by three different agencies. First, Congress amended the Clean Air Act in 1977 to permit the U.S. Environmental Protection Agency (EPA) to regulate "any substance . . . which . . . may be reasonably be anticipated to affect the

- 259 Id.
- 260 PARSON, supra note 228, at 40.

<sup>254</sup> Dr. Law's publication in SCIENCE, *supra* note 42, has thus far been the most scientifically significant study, but it, too, is narrowly focused.

<sup>255</sup> See supra Part II.D.

<sup>256</sup> Sunstein, supra note 223, at 11.

<sup>257</sup> RICHARD ELLIOT BENEDICK, OZONE DIPLOMACY 27–28 (1991). It should be noted that European nations had the opposite reaction. Whereas the U.S. CFC industry was caught off-guard in the 1970s, causing it to respond in a disorganized, incoherent manner, the European industry, especially producers in France, Italy, and the UK, organized a sophisticated attack on ozone science, leading to widely-held skepticism throughout the region. As U.S. CFC producers' share of the market fell from 46% in 1974 to 40% in 1976, European producers increased their share from 38% in 1974 to 43% in 1976. *Id.* at 26.

<sup>258</sup> Sunstein, supra note 223, at 11.

stratosphere, especially ozone in the stratosphere, if such effect may reasonably be anticipated to endanger public health or welfare."<sup>261</sup> Congress then passed the Toxic Substances Control Act (TSCA), which took effect in 1978. Under TSCA,<sup>262</sup> EPA, the Food and Drug Administration, and the Consumer Product Safety Commission all took action to ban aerosols in non-essential uses and carved out special exceptions for "essential uses."<sup>263</sup>

The government, public, and media focus on banning aerosol sprays, which only constituted 50% of CFC emissions,<sup>264</sup> was the most successful way to begin the process of eliminating CFCs. Aerosol sprays were the single largest emitters of CFCs;<sup>265</sup> by eliminating aerosols, the U.S.'s emissions were instantly cut in half. Also, as mentioned earlier, aerosols were a non-essential, replaceable consumer good. By the time the 1974 study was released, aggressive marketing from aerosol manufacturers had succeeded in placing 40–50 aerosol sprays in the average American household.<sup>266</sup> However, the equally powerful media war on aerosols in the mid-1970s quickly portrayed aerosol sprays as frivolous, easily replaced, and contributing to a literal hole in the sky.<sup>267</sup> In the end, CFC manufacturers could not credibly refute the mounting scientific evidence, nor organize in time to lobby against the ban.<sup>268</sup>

In the U.S., biodegradation standards should be implemented in stages, beginning with plastic bags, the most visible disposable plastic marine debris. Next, regulation should target other user products made from high- and low-density polyethylene and polypropylene. As the most common types of plastic found floating in the ocean,<sup>269</sup> these polymers make the ideal target for regulation. As in the case of aerosol, a media campaign could successfully depict these goods as unnecessary conveniences used in alarmingly high quantities, which are causing serious health concerns. Placing a primary focus on plastic bags would likely generate international support even from developing nations, which often face the biggest waste management problems. For example, China prohibited the manufacture of bags thinner than .025 mm and mandates that supermarkets charge a fee for disposable plastic grocery bags.<sup>270</sup> In India, Delhi has banned the use, sales, manufacture, and storage of all plastic bags for most purposes.<sup>271</sup> Other nations and cities have banned non-biodegradable plastic bags, <sup>272</sup>

262 15 U.S.C. § 2605(a)(6) (2011).

- 265 PARSON, supra note 228, at 41.
- 266 Id. at 21.
- 267 Id. at 41; Sunstein, supra note 223, at 11.
- 268 PARSON, supra note 228, at 41.
- 269 See Law, supra note 42, at 1186-87.
- 270 China Bans Plastic Shopping Bags, N.Y. TIMES, Jan. 1, 2009, http://www.nytimes. com/2008/01/09/world/asia/09iht-plastic.1.9097939.html?\_r=1.
- 271 Total Ban on Plastic Bags in Delhi, HINDU TIMES, Apr. 5, 2011, http://www.thehindu.com/ todays-paper/tp-national/tp-newdelhi/article1600906.ece.
- 272 See Elisabeth Malkin, Unveiling a Plastic Bag Ban in Mexico City, N.Y. TIMES, Aug. 21, 2009, http://green.blogs.nytimes.com/2009/08/21/unveiling-a-platic-bag-ban-in-mexico-city/ (Mexico City requires all stores to switch to biodegradable bags; other places with bans include San Francisco, District of Columbia, South Africa, and Belgium).

<sup>261 42</sup> U.S.C. § 7457(b) (1977) (repealed and recodified at 42 U.S.C. § 7671n (2005)).

<sup>263 43</sup> Fed. Reg. 11,301 (Mar. 17, 1978) (codified at 21 C.F.R. § 2.125).

<sup>264</sup> BENEDICK, supra note 257, at 26.

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but the piecemeal approach and varied enforcement only underscores a need for cohesive international standards.

### 4. INDUSTRY ALTERNATIVES

As the science behind ozone-depleting substances grew stronger, and especially after the aerosol ban, CFC producers began experimenting with alternative chemicals. Initially, DuPont, the world's largest CFC manufacturer, and other large CFC producers concluded that "even the most promising substitutes would cost two to five times more than CFCs."<sup>273</sup> After forming an alliance that, among other objectives, tried somewhat successfully to convince policymakers that no realistic alternatives to CFCs existed for their non-aerosol purposes, the industry reversed its position and agreed to domestic and international regulation.<sup>274</sup> There were several reasons for this. First, the 1986 NASA/WMO report found that, despite the aerosol ban, emissions of CFCs from other uses continued to increase.<sup>275</sup> At this point, not much doubt remained about what this meant for the ozone layer. Second, the cost of alternative chemicals no longer outweighed the moral judgment of several senior industry officers.<sup>276</sup> Third, the National Cooperative Research Act (NCRA, now NCRPA)277 "allowed competitors to collaborate on research serving the public interest," which allowed producers to fully test potential substitute chemicals.<sup>278</sup> Finally, DuPont was particularly interested in promoting an international agreement that could expand sales to new international markets of the substitutes it had developed.<sup>279</sup> Immediately after ratification of the Montreal Protocol, "both producer and user industry responded . . . with an intense burst of research and technological innovation that within two years persuaded nearly all actors that not just 50 percent, but total elimination of CFCs . . . was feasible."<sup>280</sup>

Undoubtedly there will be industry resistance, at both the manufacturer and producer levels, to implementing biodegradation standards in plastics. However, as described further *infra*, there are already many promising materials and formulas for biodegradable plastics, though none specifically designed to biodegrade in the sea environment. Most of the research on alternative bioplastics is done at a small scale, with small grants from either private or government sources.<sup>281</sup> If large plastic manufacturers took advantage of the NCRPA to develop industry-scale substitutes, costs of such research could be spread across larger players, making these alternatives more economically plausible. A national law gradually implementing biodegradation standards would give the domestic plastics industry time to create new alternatives, providing it with an edge in the international market.

273 PARSON, supra note 228, at 54.

- 278 Id. at 175–76.
- 279 Sunstein, supra 223, at 14-15, 21.
- 280 PARSON, supra note 228, at 143.
- 281 See infra text accompanying notes 294-29.

<sup>274</sup> Id. at 58, 126-27.

<sup>275</sup> Id. at 142.

<sup>276</sup> Id. at 127.

<sup>277</sup> National Cooperative Research Act, 15 U.S.C. §§ 4301-05 (amended by National Cooperative Research and Production Act, 15 U.S.C. §§ 4301-06 (2011)).

#### 5. MONTREAL PROTOCOL

The Montreal Protocol on Substances That Deplete the Ozone Layer ("Montreal Protocol") opened for signatures in 1987, took effect in 1989,<sup>282</sup> and has to date been ratified by 197 countries.<sup>283</sup> It is widely considered one of the few successful international environmental treaties.<sup>284</sup> There are four major lessons that the Montreal Protocol can teach about enacting international law concerning biodegradable plastics. An international biodegradable plastic regime should follow these four lessons.

The U.S. must be a major driver behind any treaty.<sup>285</sup> During the 1987 negotiations, U.S. delegates took an extreme position, asking for an 85% reduction in emissions while most European nations were only willing to agree to a freeze in 1986 emissions levels.<sup>286</sup> Part of the U.S.'s aggressive stance was driven by previously agreed-to domestic regulations based on a cost-benefit analysis finding that the cost of increased skin cancer far outweighed that of industry regulation.<sup>287</sup> The U.S. was not asking for more stringent regulation than it was already willing to impose domestically.<sup>288</sup> If the U.S. implements biodegradation regulation at the national level first, it will likely be eager to participate in expanding these rules to other countries. Like ozone degradation, the unilateral action of the U.S. will not solve the marine plastic problem, nor will it isolate the U.S. from its effects. This should make the U.S. a willing participant, even an advocate, in the international process.

Second, there must be credible sanctions for non-participation or non-compliance. The Montreal Protocol imposed trade sanctions on any non-party nation and punished non-complying party nations by treating them as non-parties.<sup>289</sup> The sanctions prohibit parties from importing CFCs from non-parties, exporting CFCs to non-parties, or providing technological or financial assistance for projects involving CFCs to non-parties.<sup>290</sup> Plastic manufacture and consumer goods production are two industries that lend themselves to imposing trade sanctions for failure to comply. Ideally, party states would be prohibited from importing or exporting plastic resin pellets or user products from non-party states or states not in compliance with the treaty. While this

284 See, e.g., Sunstein, supra note 223, at 4.

<sup>282</sup> Montreal Protocol on Substances That Deplete the Ozone Layer, Sept. 16, 1987, S. Treaty Doc. No. 100-10 (1987), 1522 U.N.T.S. 3 [hereinafter Montreal Protocol], available at http:// ozone.unep.org/pdfs/Montreal-Protocol2000.pdf.

<sup>283</sup> Status of Ratification, U.N. ENV'T PROGRAMME, http://ozone.unep.org/new\_site/en/treaty\_ ratification\_status.php (last updated Mar. 1, 2012).

<sup>285</sup> Id. at 46-47.

<sup>286</sup> PARSON, *supra* note 228, at 143. This position was compromised to a 50% reduction, partially because Europe would never agree to 85% and partially to avoid backlash back in the U.S. *Id.* The Montreal Protocol required parties to reduce their CFC emissions to 25% of 1986 levels by 1994 and to 0% by 1996. Montreal Protocol, *supra* note 282, at art. 2A, ¶¶ 3–4.

<sup>287</sup> Sunstein, *supra* 223, at 15–16. Sunstein further theorizes that, because skin cancer was such a salient harm, "[t]he association between skin cancer and cherished leisure activities, such as sunbathing, undoubtedly helped spur the sense that the [skin cancer] problem needed to be addressed in aggressive terms." *Id.* at 16. Thus the "cost" of skin cancer may have been exaggerated.

<sup>288</sup> Id. at 13.

<sup>289</sup> Montreal Protocol, supra note 282, at art. 4

<sup>290</sup> Id. at art. 4, ¶¶ 1-3, 5-6.

type of sanction may seem extreme, as plastic is found in a seemingly endless variety of goods, it is important to remember that CFCs were also found in many products in the 1970s<sup>291</sup> and that an international sanction must have teeth to ensure compliance.

Third, there must be a technology transfer mechanism. The Montreal Protocol technology transfer provisions are executed by the Technology and Economic Assessment Panel, which provides "technical information related to the alternative technologies that have been investigated and employed to make it possible to virtually elimination the use of . . . CFCs."<sup>292</sup> To spread the costs of investigating new biode-gradable plastic formulas and to aid developing countries as they adjust to the new standards, any international biodegradable plastic treaty must provide for technology transfer, ideally through an organized committee of experts.

Finally, there must be a middle ground for including developing nations. In the Montreal Protocol, the key was to allow developing countries to meet their increasing CFC needs without simply moving the emissions problem to a different location.<sup>293</sup> The treaty allowed developing nations to produce and consume CFCs to meet their "basic domestic needs" for 10 years and phased out emissions to 0% in 2010.<sup>294</sup>

Plastic is playing a key role in the increasingly urban, consumer lifestyle of developing nations; it is unlikely that consumption will decrease in the future. Because these nations should have the opportunity to continue their growth, but not at the expense of the world's oceans, an international treaty should delay their compliance schedule while promoting education about responsible plastic use and disposal. There must be a balance between exporting non-biodegradable plastic technologies to the developing world and imposing the costs of new technology on it.

## V. CONCLUSION

In the current economic and political environment and the present level of understanding of the plastic marine debris problem, national legislation and an international treaty setting biodegradation standards for plastic goods is a feasible, though temporary solution to pelagic plastics. The analogous relationship between plastics and CFCs means that there is already a framework for implementing biodegradation rules at both the national and international levels. Two crucial criteria must be met before any regulation will be possible. There must be some hope of finding a polymer that can biodegrade in water. There must also be a definitive scientific link between marine microplastics and human health and welfare. Part II of this Note described the current state of scientific research on marine plastics. This understanding is developing rapidly but has not yet been able to draw a compelling link to negative effects on human life.

There have been many avenues for scientific development of biodegradable polymers. One major development has been in the use of "bioplastics," or polymers cre-

<sup>291</sup> PARSON, supra note 228, at 20-21.

<sup>292</sup> Technology & Economic Assessment Panel (TEAP), U.N. ENV'T PROGRAMME, http://ozone.unep. org/teap/ (last visited Apr. 22, 2012).

<sup>293</sup> Peloso, supra note 223, at 325.

<sup>294</sup> Montreal Protocol, *supra* note 282, at art. 5.

ated from plants instead of petroleum-based products.<sup>295</sup> In the early 1990s, starch, extracted from potatoes, wheat, or corn, was one of the first plant materials used to make plastic.<sup>296</sup> However, starch monomers alone begin to degrade and deform easily when moistened, so they are often combined with other chemicals to increase their stability.<sup>297</sup> This leads to a corresponding decrease in biodegradability. This has been an issue with most bioplastics: the stronger the polymer, the more resistant to biodegradation. However, many grants continue to fund research in hopes of finally finding the perfect polymer. A National Science Foundation grant recently funded research into a promising new formula for a yeast-based polymer.<sup>298</sup> EPA also routinely funds research efforts into new materials through its Green Chemistry Program.<sup>299</sup> Though biodegradable plastics are still two to ten times more expensive than traditional plastics,<sup>300</sup> this is likely to change if large plastics manufacturers enter the market.

A final point on biodegradable plastics as a stop-gap solution: It is likely that there will be unintended consequences from drastically changing the chemical structure of a ubiquitous material. Some consequences may be positive, such as if the new material biodegraded more easily in landfills as well as in oceans. Others, however, may be quite negative. If bioplastics are necessary to make plastic biodegradable, then there will be impacts from having to grow the food products needed to manufacture bioplastic. This could, for example, mean an increase in corn or soybean production, which may have negative impacts such as increased pollution from pesticides and nutrient runoff, decreased water quality and soil fertility, and decreased farmland available for food production. Another potential problem is that, when something biodegrades, it produces a byproduct. If there is a large increase of a certain chemical in the ocean as a result of plastic biodegrading, this may be harmful to marine life. Finally, biodegradable plastics will not be able to be recycled in the same manner as ordinary plastics. There will need to be additional education and investment in infrastructure to ensure goods made from biodegradable plastics do not interfere with existing recycling regimes. Because of these potentially negative consequences, biodegradable plastic is not ideal as a permanent solution to the marine debris problem.

This Note has presented a thorough discussion of what is known to be true, what is fiction, and what is still unknown about the marine debris problem. It is known that a lack of land-based waste management infrastructure and regulation enforcement is the largest cause of the problem. It is also known that microplastics present the

<sup>295</sup> JANE HEATHERINGTON, ET AL., THE MARINE DEBRIS RESEARCH, PREVENTION AND REDUCTION ACT: A POLICY ANALYSIS 32 (2005), available at http://mpaenvironment.ei.columbia.edu/news/ projects/sum2005/Marine%20Debris%20Final%20Report%20Sum2005.pdf.

<sup>296</sup> *Id.* ("Microorganisms are used to transform the starch into lactic acid monomers, or small molecules, to produce a more stable substance.").

<sup>297</sup> Id. Interestingly, this property might be ideal for one-use items like grocery bags.

<sup>298</sup> NYU Professor Developing Bioplastic That Acts Like Regular Plastic, PHysOrg (Dec. 2, 2011), http://phys.org/news/2011-12-nyu-poly-professor-bioplastic-regular-plastic.html.

<sup>299</sup> Green Chemistry, ENVTL. PROT. AGENCY, http://www.epa.gov/greenchemistry/ (last updated May 1, 2012); see Award Winners by Technology, ENVTL. PROT. AGENCY, http://www.epa.gov/ greenchemistry/pubs/pgcc/technology.html (last updated Oct. 31, 2011) (listing Presidential Green Chemistry Challenge Award winners).

<sup>300</sup> HEATHERINGTON, supra note 295, at 32.

most worrisome aspects of persistent plastics in the ocean. While current international attempts at addressing these issues have come up short, a national and international standard for biodegradability of plastic materials cannot be the permanent solution.<sup>301</sup> Ultimately, it will be up to individual nations to take responsibility for their contribution to the plastic marine debris problem. Until then, the legend of the Great Pacific Garbage Patch will likely endure.

Olga Goldberg is recent graduate of The University of Texas School of Law. Ms. Goldberg served as the Student Notes Editor for Volume 42 of the Texas Environmental Law Journal.

<sup>301 (</sup>In the unlikely chance it is even feasible in the current political climate.)

# GOVERNMENT INTERVENTION IN CLEAN ENERGY TECHNOLOGY DURING THE RECESSION

#### BY AARON TUCKER

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# I. INTRODUCTION

On February 17, 2009, President Barack Obama signed the American Recovery and Reinvestment Act ("Recovery Act"), the \$787-billion economic stimulus package to help jump-start the U.S. economy.<sup>1</sup> The Recovery Act contained billions of dollars in spending and tax credits for projects designed to expand the production of clean and renewable energy.<sup>2</sup> At the signing ceremony held to tout the provisions for science and technology, the top executive of Namaste Solar introduced President Obama.<sup>3</sup> During his speech, President Obama extolled the virtues of the stimulus on renewable energy, claiming that it was "laying the groundwork for new green energy economies" that would "double the amount of renewable energy produced over the next three years" by "[p]rovid[ing] tax credits and loan guarantees to companies like Namaste."<sup>4</sup>

<sup>1</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009); Sheryl Gay Stolberg, Signing Stimulus, Obama Doesn't Rule Out More, N.Y. TIMES, Feb. 17, 2009, http://www.nytimes.com/2009/02/18/us/politics/18web-stim.html.

<sup>2</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009).

<sup>3</sup> Blake Jones, Pres. Namaste Solar, Remarks by the President and the Vice President at the Signing of the American Recovery and Reinvestment Act (Feb. 17, 2009), *available at* http://www.whitehouse.gov/the-press-office/remarks-president-and-vice-president-signing-american-recovery-and-reinvestment-act.

<sup>4</sup> President Barack Obama, Remarks by the President and the Vice President at the Signing of the American Recovery and Reinvestment Act (Feb. 17, 2009), *available at* http://www.whitehouse.gov/the-press-office/remarks-president-and-vice-president-signing-american-recovery-and-reinvestment-act.

Less than two years later, Solyndra, the first recipient of the federal loan guarantee program authorized by the stimulus, declared bankruptcy—raising concerns about the viability of the government's effort to accelerate the development and commercialization of green technology.<sup>5</sup> House Republicans have since launched a series of hearings to investigate the program and determine if political cronyism played a role in Solyndra's selection.<sup>6</sup> While many question the government's intervention into the energy market and the manner in which it has occurred, the current political environment obscures a true understanding of the effort. The Recovery Act represents the government's largest single investment in green technology and highlights a shift toward greater government intervention in the market.<sup>7</sup> Despite its ambitious nature, the renewable energy provisions of the Recovery Act, for all intents and purposes, are an expansion of prior federal renewable energy policy, which is not as new a course as many claim. Nevertheless, the controversy surrounding Solyndra provides an opportunity to take a clear look at the progress so far.

Rather than delivering a silver bullet to one program or technology, the stimulus delivered a "buckshot," spreading funding across a variety of programs and renewable energy sources.<sup>8</sup> An analysis of the Recovery Act's effect on every source of renewable energy is beyond the scope of this paper and therefore this paper will focus on funding for a single renewable energy source—solar. Solar energy provides a useful lens through which to analyze the stimulus because the technology has yet to achieve widespread price parity with conventional energy sources<sup>9</sup> and therefore is ripe for government intervention to advance technological research, spur commercialization, and incentivize development. Additionally, solar power was the major beneficiary of the loan guarantee program,<sup>10</sup> perhaps the most famous and controversial of all the provisions.<sup>11</sup>

While it may be too soon to analyze all of the effects of the stimulus, the combination of tax breaks and grants appears to have jumpstarted U.S. investment in

<sup>5</sup> Matthew L. Wald, Solar Firm Aided by U.S. Shuts Doors, N.Y. TIMES, Aug. 31, 2011 [hereinafter Solar Firm], http://www.nytimes.com/2011/09/01/business/energy-environment/solyndrasolar-firm-aided-by-federal-loans-shuts-doors.html?nl=todaysheadlines&emc=globasasa24.

<sup>6</sup> Matthew L. Wald, Energy Secretary to Defend Solyndra Loan to Congress, N.Y. TIMES, Nov. 16, 2011 [hereinafter Energy Secretary], http://www.nytimes.com/2011/11/17/us/politics/energy-secretary-stephen-chu-to-defend-solyndra-loan-to-congress.html.

<sup>7</sup> See Memorandum from Vice President Joseph Biden for President Barack Obama, Progress Report: The Transformation to A Clean Energy Economy (Dec. 15, 2009) (http://www. whitehouse.gov/sites/default/files/administration-official/vice\_president\_memo\_on\_clean\_ energy\_economy.pdf).

<sup>8</sup> Vice President Joseph Biden, Remarks by the Vice President on the 200 Days of the American Recovery and Reinvestment Act (Sept. 3, 2009), *available at* http://www.whitehouse.gov/the-press-office/remarks-vice-president-200-days-american-recovery-amd-reinvestment-act.

<sup>9</sup> See U.S. DEP'T OF ENERGY, SUNSHOT VISION STUDY 1 (2012), http://www1.eere.energy.gov/ solar/pdfs/47927\_chapter1.pdf.

<sup>10</sup> See Our Projects, LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo.energy.gov/?page\_ id=45 (last visited Mar. 31, 2012).

<sup>11</sup> Matthew L. Wald, Republicans Attack on Handling of Stimulus Money and Green Jobs, N.Y. TIMES, Sept. 22, 2011 [hereinafter Republicans Attack], http://www.nytimes.com/2011/09/23/ science/earth/23energy.html.

renewable energy after a precipitous drop in 2009.<sup>12</sup> Nevertheless, the small percentage of funding for research and development of renewable energy technologies in the Recovery Act<sup>13</sup>—to compensate for the drop in private-sector, early-stage investment<sup>14</sup> appears to have been a key oversight that may imperil future innovation in the sector.

#### II. RENEWABLE ENERGY PRIOR TO THE STIMULUS

Prior to the economic crisis, renewable energy was booming. While renewable energy continued to make up a relatively small proportion of total energy supply in the U.S. (3.8% of installed electricity capacity and 3.1% of generation in 2008), installations and investments increased dramatically over the past decade.<sup>15</sup> From 2000 to 2008, installations in the U.S. nearly tripled to 42 gigawatts, and in 2008, "cumulative wind capacity increased by 51% and cumulative solar PV capacity grew 44% from the previous year."<sup>16</sup> The private sector was also taking renewable energy seriously as investments reached more than \$23 billion in 2008, with U.S. venture capital and private equity investments accounting for \$3.9 billion–up from less than \$30 million in 2001.<sup>17</sup> Venture capital and private equity are forms of high-risk, high-reward investing that tend to focus on the earliest stages of the technology pipeline to achieve market breakthroughs in the near future.<sup>18</sup> Major funding from this type of early-stage investment is often a good indicator of future developments and growth.<sup>19</sup>

Solar power was a major beneficiary of private investment in renewable energy over the past decade. After three decades of research and development in solar power, a suite of commercially viable technologies was finally entering the market.<sup>20</sup> The private sector flocked to these technologies as capital investment in solar energy soared from \$215 million in 2004 to almost \$3.2 billion by 2007.<sup>21</sup> While government spending on research and development remained fairly constant, government spending as a percentage of total investment in solar dropped from approximately 50% in 2003 to

- 12 THE WHITE HOUSE, THE RECOVERY ACT: TRANSFORMING THE AMERICAN ECONOMY THROUGH INNOVATION 18–26 (2010) [hereinafter TRANSFORMING THE AMERICAN ECONOMY], available at http://www.whitehouse.gov/sites/default/files/microsites/Recovery\_Act.PDF.
- 13 American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 5, 123 Stat. 115, 138-40 (2009).
- 14 See Rachel Gelman, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, 2010 RENEWABLE ENERGY DATA BOOK 116–17 (Scott Gossett ed., 2011), available at http://www. nrel.gov/analysis/pdfs/51680.pdf.
- 15 Rachel Gelman & Steve Hockett, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, 2008 RENEWABLE ENERGY DATA BOOK 10, 17, 109 (Michelle Kubik ed., 2009), available at http://www1.eere.energy.gov/geothermal/pdfs/data\_book.pdf.
- 16 Id. at 3.
- 17 Id. at 109.
- 18 See Charles E. Jennings et. al., NAT'L RENEWABLE ENERGY LAB., A HISTORICAL ANALYSIS OF INVESTMENT IN SOLAR ENERGY TECHNOLOGIES (2000-2007), at 5 (2008), available at http://www. nrel.gov/docs/fy09osti/43602.pdf.
- 19 Id. at 14.
- 20 Id. at 2.
- 21 Id. at 1.

4% by 2007.<sup>22</sup> Private investment in the U.S. wasn't just gravitating to one promising solar technology. Contrary to private investment in Europe and Asia, which tended to focus on a single technology, private investment in U.S. was "broadly diversified, with investments in nearly all areas of the solar industry and increasing interest in CPV, next-generation PV, concentrating solar."<sup>23</sup>

The U.S. solar industry was a major recipient of venture capital between 2004 and 2007.<sup>24</sup> For every ten investments by venture capital, usually only one or two companies achieve major success.<sup>25</sup> Of the 99 solar companies that received venture capital between 2000 and 2007, the Department of Energy (DOE) predicted that only "10–20 sizeable and influential solar companies [would] emerge during the next few years."<sup>26</sup> Venture capital flocked to U.S. solar companies with novel technologies since "relatively low electricity prices and current solar energy costs [made] significant market penetration in the U.S. presently out of reach, but attainable with technological development."<sup>27</sup> Venture capital in solar expanded from \$35 million in 2000 to \$902 million in 2007 across a broad spectrum of solar technologies.<sup>28</sup> The rash of venture capital spending on solar power "suggest[ed] that significant innovation across many areas of solar energy [would] occur in the near future."<sup>29</sup>

As the economic crisis worsened in 2008, the renewable energy industry was hit hard as credit dried up and prices for natural gas and oil declined.<sup>30</sup> In the last quarter of 2008, U.S. investment in renewable energy declined by more than 30% from the previous quarter.<sup>31</sup> By February 2009, the number of major banks lending to large wind and solar installation dropped from eighteen to only four.<sup>32</sup> Since credit was difficult to obtain, renewable energy projects across the country became more difficult to finance and the installation of wind and solar projects dropped significantly.<sup>33</sup> Orders for equipment dried up and prices for solar panels fell.<sup>34</sup> As business stalled, many solar and wind companies laid off workers to survive.<sup>35</sup> As development projects stalled, so did venture capital financing for research and commercialization of advanced renewable energy technologies.<sup>36</sup> Prior to the passage of the stimulus, trade groups predicted that renewable energy installations would be down 30%–50% in 2009.<sup>37</sup> To

- 27 Id. at 13.
- 28 Id. at 20.
- 29 Id. at 20.

31 Gelman & Hockett supra note 15, at 109.

- 35 Id.
- 36 Kraus, supra note 30.
- 37 Dark Days, supra note 32.

<sup>22</sup> Id.

<sup>23</sup> Id. at 19.

<sup>24</sup> Jennings, *supra* note 18, at 1.

<sup>25</sup> Id. at 16.

<sup>26</sup> Id.

<sup>30</sup> See Clifford Kraus, Alternative Energy Suddenly Faces Headwinds, N.Y. TIMES, Oct. 21, 2008, http://www.nytimes.com/2008/10/21/business/21energy.html?pagewanted=all.

<sup>32</sup> Kate Galbraith, *Dark Days for Green Energy*, N.Y. TIMES, Feb. 4, 2009 [hereinafter *Dark Days*], http://www.nytimes.com/2009/02/04/business/04windsolar.html.

<sup>33</sup> See id.

<sup>34</sup> Id.

facilitate the recovery and expansion of this industry, the Obama administration attempted to shape a stimulus that would provide significant funding and tax credits to renewable energy technologies. At stake were the hard-earned gains of the past decade and beyond as the nascent industry had finally taken off.

#### III. WRITING THE STIMULUS

Candidate Obama made energy independence and renewable energy a major part of his campaign.<sup>38</sup> During the election, he extolled the virtues of "green collar jobs" that were not just good for the economy, but the environment as well.<sup>39</sup> According to Obama, clean energy was the next great growth industry and it was essential that the U.S. began investing in it significantly so that it didn't fall behind China and Europe.<sup>40</sup> With the threat of climate change looming, it was also time for the U.S. to finally enact a law regulating greenhouse gas emissions.<sup>41</sup> Renewable energy was the key to reducing the nation's dependence on fossil fuels and production of greenhouse gases.<sup>42</sup> The stimulus provided a vehicle to push the President's green energy agenda prior to passage of a climate change bill.<sup>43</sup>

During the post-election transition period, President-elect Obama and his advisors worked with officials from energy and technology companies to craft a stimulus bill that would direct a significant amount of funding toward initiatives to spur the creation of a smart electric grid and the expansion of renewable energy.<sup>44</sup> Many executives whose companies stood to benefit from the stimulus provisions were big campaign contributors.<sup>45</sup> Many parts of the stimulus took shape during the campaign, as advisors reached out to "high-tech and alternative energy interests, including General Motors, IBM, Google, the Information Technology Industry Council and the electric utilities' Edison Institute."<sup>46</sup>

<sup>38</sup> See Amy Chozick and Elizabeth Holmes, Obama Backs Using Oil Reserve, WALL ST. J., Aug. 5, 2008, http://online.wsj.com/article/SB121785204474109713.html.

<sup>39</sup> Obama Proposes \$210 Billion for New Jobs, ASSOCIATED PRESS, Feb. 13, 2008, http://www.msnbc.msn.com/id/23148959/ns/politics-decision\_08/t/obama-proposes-billion-new-jobs/#. T1bocpeXTgo.

<sup>40</sup> Senator Barack Obama, Remarks at Keetering University in Flint, Michigan (June 16, 2008), *available at* http://www.presidency.ucsb.edu/ws/?pid=77478.

<sup>41</sup> See John M. Broder, Obama Affirms Climate Change Goals, N.Y. TIMES, Nov. 18, 2009, http:// www.nytimes.com/2008/11/19/us/politics/19climate.html.

<sup>42</sup> See id.

<sup>43</sup> John M. Broder, Proposal Ties Economic Stimulus to Energy Plan, N.Y. TIMES, Dec. 3, 2008 [hereinafter Proposal Ties], http://www.nytimes.com/2008/12/04/us/politics/04green. html?pagewanted=all.

<sup>44</sup> Charlie Savage & David D. Kirkpatrick, Technology's Fingerprints on the Stimulus Package, N.Y. TIMES, Feb. 11, 2009, http://www.nytimes.com/2009/02/10/business/worldbusiness/10iht-10corporate.20062866.html?pagewanted=all.

<sup>45</sup> Id.

<sup>46</sup> Id.

The stated purpose of the renewable energy provision in the Recovery Act was to create "[s]ynergies between our [nation's] short-term goals and our long-term goals."<sup>47</sup> In the short-term, the renewable energy provisions would promote immediate job creation and ensure financing for renewable energy projects.<sup>48</sup> In the long-term, the renewable energy provisions would increase renewable energy production, reduce carbon dioxide emissions, and facilitate the U.S. becoming the center of renewable energy technology.<sup>49</sup>

While all renewable sources needed access to financing and tax incentives, each source had unique problems that necessitated a tailored response. For solar power, the main problem continued to be the high price per kilowatt/hour, which made it non-competitive with fossil fuels.<sup>50</sup> Additionally, no commercial-scale concentrated solar power plants—a promising form of generation—had come online in the U.S.<sup>51</sup> While wind power had achieved price competiveness with fossil fuel sources, many of the best sources remained untapped due to their remote location and lack of transmission infrastructure.<sup>52</sup>

When Obama took office on January 20, 2009, he hoped to have a stimulus act signed within the next month.<sup>53</sup> Over the next three weeks, Congress debated the size and scope of the stimulus, ultimately settling on a package with \$787 billion in spending.<sup>54</sup> Of that amount, over \$40 billion was designated for programs and tax incentives that specifically focused on energy and the environment.<sup>55</sup> One major flaw of the legislation, according to many critics, was that it sacrificed an opportunity to "change *how* the government spends its money" for the sake of expediency.<sup>56</sup> Ultimately, the stimulus mostly consisted of additional spending on existing programs and did not "have

<sup>47</sup> Id.

<sup>48</sup> TRANSFORMING THE AMERICAN ECONOMY, *supra* note 12, at 5.

<sup>49</sup> See id.

<sup>50</sup> Keith Johnson, *The Shining: Solar Power*, *Grid Parity, and the Cost of Power*, WALL ST. J., July 7, 2009, http://blogs.wsj.com/environmentalcapital/2009/07/07/the-shining-solar-power-grid-parity-and-the-cost-of-power.

<sup>51</sup> See Silvio Marcacci, World's Largest Concentrating Solar Power Plant Hits Milestone, CLEANTECHNICA (Feb. 10, 2012) http://cleantechnica.com/2012/02/10/worlds-largestconcentrating-solar-power-plant-hits-milestone/ (stating that "America's first commercial-scale concentrating solar power (CSP) facility [currently under construction] took a major step forward... with completion of the project's 540-foot tower.").

<sup>52</sup> Jeffrey Logan & Stan Mark Kaplan, Congressional Research Service, Wind Power in the United States: Technology, Economic, and Policy Issues 4, 20 (2008), *available at* http://www.fas.org/sgp/crs/misc/RL34546.pdf.

<sup>53</sup> Robert Schroeder, House Begins Work on Economic Stimulus Package, MARKET WATCH (Jan. 21, 2009) http://articles.marketwatch.com/2009-01-21/news/30752368\_1\_stimulus-package-tax-cuts-president-barack-obama.

<sup>54</sup> Track the Money, RECOVERY.GOV, http://www.recovery.gov/Transparency/fundingoverview/ Pages/fundingbreakdown.aspx (last visited Mar. 26, 2012); see David M. Herszenhorn, Two Senators Seek to Strip \$200 billion from Stimulus Fund, N.Y. TIMES, Feb. 5, 2009 http://www. nytimes.com/2009/02/05/world/americas/05iht-06stimulus.19962108.html.

<sup>55</sup> Track the Money, supra note 54.

<sup>56</sup> David Leonhardt, A Stimulus With Merit, And Misses, N.Y. TIMES, Jan. 27, 2009, http://www. nytimes.com/2009/01/28/business/economy/28leonhardt.html (emphasis in original).

nearly the amount of the fresh, reformist thinking as Mr. Obama's campaign speeches and proposals did."<sup>57</sup> This was particularly true for the program designed to incentivize renewable energy. Many of the programs that the stimulus funded to encourage renewable energy were already in place.<sup>58</sup> While Obama promoted the idea of a renewable portfolio standard during his campaign, this key piece of legislation to accelerate renewable energy did not make it into the legislation.<sup>59</sup> With a bill aimed at tackling climate legislation looming in the wings, many of the more innovative programs to finance renewable energy development were to be placed into that legislation.<sup>60</sup>

Despite its limited nature, the stimulus still contained billions of dollars to invest in renewable energy.<sup>61</sup> Hoping to spur job creation, technologic development, and the expansion of domestic production, the stimulus contained a mix of tax incentives, grants, and loans.<sup>62</sup> The key provisions included:

- \$16.8 billion for DOE's Office of Energy Efficiency and Renewable Energy (EERE), spread across all program areas;<sup>63</sup>
- \$1.6 billion for Clean Renewable Energy Bonds to provide 0% interest bonds to finance public sector renewable energy projects;<sup>64</sup>
- An extension of the Renewable Energy Production Tax Credit (PTC) and a provision that allowed those facilities that qualified for the PTC an alternative to taking the federal business energy Investment Tax Credit or Renewable Energy Grants;<sup>65</sup>
- Renewable Energy Grants from the Department of Treasury to provide grants equal to 30% of the basis of the property for solar, fuel cells, small wind turbines, and other qualified facilities;<sup>66</sup>
- \$400 million for the Advanced Research Projects Agency-Energy (ARPA-E); and<sup>67</sup>
- \$6 billion for DOE Loan Guarantee Program to guarantee loans for renewable energy, energy efficiency, and advanced transmission projects.<sup>68</sup>

Together these programs accounted for billions of dollars to jumpstart the renewable energy industry as investment dried up in 2009, put Americans back to work, and double the amount of renewable energy within three years.<sup>69</sup> Within almost all of

- 61 RENEWABLE ENERGY REPORT, supra note 58.
- 62 Id.
- 63 American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115, 138 (2009).
- 64 Id. § 1111, 123 Stat. at 322.
- 65 Id. § 1101, 1102, 123 Stat. at 319–20.
- 66 Id. § 1603, 123 Stat. at 364.
- 67 Id., 123 Stat. at 140.
- 68 Id.
- 69 TRANSFORMING THE AMERICAN ECONOMY, supra note 12, at 1, 17.

<sup>57</sup> Id.

<sup>58</sup> US Stimulus Bill Would Provide Billions for Renewable Energy, RENEWABLE ENERGY REPORT, 2009 WLNR 3498789 (Feb. 9, 2009) [hereinafter RENEWABLE ENERGY REPORT].

<sup>59</sup> See Kate Galbraith, Next Up: A Renewable Portfolio Standard?, N.Y. TIMES, Feb. 20, 2009, http:// green.blogs.nytimes.com/2009/02/20/next-up-a-renewable-portfolio-standard.

<sup>60</sup> See Proposal Ties, supra note 43.

these provisions were funding or tax credits for solar energy. To understand their collective impact, it is necessary to look at each of the programs individually and assess where the funds ultimately went.

Analysts within the Administration were optimistic that the Recovery Act would accelerate renewable energy in spite of the recession. Just two months after the passage of the bill, DOE's Energy Information Agency (EIA) updated its *Annual Energy Update* publication to reflect the effect of the stimulus.<sup>70</sup> The report concluded that, as a result of the stimulus, the U.S. was on track to generate over 300 billion-kilowatt hours of renewable energy, as compared to 200 billion without the Recovery Act.<sup>71</sup> With respect to solar, the EIA estimated that there would be a 15% increase in commercial solar installations, resulting in 121 megawatts by 2011.<sup>772</sup>

## IV. THE STIMULUS AT WORK

# A. OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Recovery Act appropriated \$16.8 billion to DOE's EERE, spread across various existing programs.<sup>73</sup> The stimulus specified that \$3.2 billion was designated for Energy Efficiency and Conservation Block Grants, \$5 billion for the Weatherization Assistance Program, \$3.1 billion for State Energy Programs, and \$2 billion for the manufacturing of advanced batteries and components<sup>74</sup> With a majority of the funding specifically appropriated for efficiency programs, approximately \$3.5 billion was left over to be directed at the discretion of the Secretary of Energy to, among other things, the applied research, development, demonstration, and deployment of renewable energy technologies.<sup>75</sup>

EERE is DOE's primary office for the support of clean energy and is organized around ten program areas, including solar energy technologies, designed to leverage partnerships with the private sector, state and local governments, DOE national laboratories, and universities.<sup>76</sup> The \$16.8 billion appropriated by the stimulus dwarfed

<sup>70</sup> EIA Projects Faster Clean Energy Growth with Recovery Act Funds, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY (Apr. 22, 2009), http://apps1.eere.energy.gov/ news/news\_detail.cfm/news\_id=12469; see ENERGY INFO. ADMIN., AN UPDATED ANNUAL ENERGY OUTLOOK 2009 REFERENCE CASE REFLECTING PROVISIONS OF THE AMERICAN RECOVERY AND REINVESTMENT ACT AND RECENT CHANGES IN THE ECONOMIC OUTLOOK (2009) [hereinafter UPDATED ANNUAL ENERGY OUTLOOK], available at http://www.eia.gov/oiaf/servicerpt/stimulus/pdf/sroiaf(2009)03.pdf.

<sup>71</sup> UPDATED ANNUAL ENERGY OUTLOOK, *supra* note 70, at 5, fig.1.

<sup>72</sup> Id. at 6.

<sup>73</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 5, 123 Stat. 115, 138 (2009).

<sup>74</sup> Id.

<sup>75</sup> See id.

<sup>76</sup> About the Office of EERE, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/office\_eere/organization.html (last updated Jan. 5, 2012).

EERE's annual budget of \$1.8 billion (FY 2011) and was a major boost to the office's programmatic efforts.<sup>77</sup> The provisions within the stimulus to fund EERE were designed "to accelerate existing EERE program goals, expand programmatic activities, and create new activities in innovative transformational R&D."<sup>78</sup> For instance, stimulus funds would be used to support two goals related to solar energy: (1) "[f]ulfill a critical need of the existing solar industry—the ability to independently test and validate performance of the advanced technologies in development"; and (2) "[a]ccelerate specific development efforts for critical path photovoltaic technologies."<sup>79</sup>

Approximately \$1.4 billion of \$16.8 billion appropriated to EERE was actually designated for the research, development, and deployment of renewable energy across a broad array of programs and renewable energy sources:<sup>80</sup> Biomass and geothermal were the primary recipients of the money appropriated to renewable energy—receiving close to \$700 million and \$370 million respectively.<sup>81</sup> Only \$117.6 million was assigned to EERE's Solar Energy Technologies Program<sup>82</sup>—an amount on par with wind power.<sup>83</sup>

EERE's Solar Energy Technologies Program (SETP) is organized around four subprograms: (1) photovoltaics; (2) concentrating solar power; (3) systems integration; and (4) market transformations.<sup>84</sup> Driving the SETP is the Obama administration's Sunshot Initiative, which set a goal to "decrease the total costs of solar energy systems by 75% before the end of the decade."<sup>85</sup> Meeting this goal would drive down the cost of solar energy to around \$0.06 per kilowatt and "enable solar-generated power to account for 15–18% of America's electricity generation by 2030."<sup>86</sup> To accomplish this goal, DOE is funding "selective research and loan guarantees for high risk, high payoff concepts–technologies that promise genuine transformation in the ways we generate, store, and utilize solar energy projects."<sup>87</sup>

In May 2009 the Obama Administration announced that SEPT would spend \$117.6 million of the stimulus on solar energy across three areas: (1) Photovoltaic

81 Id.

<sup>77</sup> Economic Stimulus Act Provides \$16.8 Billion for EERE Programs, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY (Feb. 18, 2009), http://apps1.eere.energy.gov/news/ news\_detail.cfm/news\_id=12243.

<sup>78</sup> Revised DOE Recovery Act Plan, RECOVERY.GOV \*170 (June 2010), http://www.recovery.gov/ Transparency/agency/Recovery%20Plans/Revised%20DOE%20Recovery%20Act%20 Plan%20-%20June%202010.pdf.

<sup>79</sup> Id. at \*176.

See Recovery Act-Funded Projects, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/recovery/ (last updated Feb. 10, 2011).

<sup>82</sup> Recovery Act Funding for Solar Technologies, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY [hereinafter Recovery Act Funding], http://www1.eere.energy.gov/solar/ recovery.html (last updated Apr. 9, 2010).

<sup>83</sup> See Recovery Act-Funded Projects, supra note 80.

<sup>84</sup> About the Program, Solar Energy Technologies Program, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/solar/about.html.

<sup>85</sup> About SunShot, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/solar/sunshot/about.html (last updated Nov. 16, 2011).

<sup>86</sup> Id.

<sup>87</sup> Id.

Technology Development; (2) Solar Energy Deployment and (3) Concentrating Solar Power Research and Development.<sup>88</sup> \$51.5 million would be spent on Photovoltaic Technology Development to "expand investment in advanced photovoltaic concepts and high impact technologies, with the aim of making solar energy cost-competitive with conventional sources of electricity and to strengthen the competitiveness and capabilities of domestic manufacturers."<sup>89</sup> Solar Energy Deployment would receive \$40.5 million to "focus on non-technical barriers to solar energy deployment, including grid connection, market barriers to solar energy adoption in cities, and the shortage of trained solar energy installers."<sup>90</sup> \$25.6 million would go to Concentrating Solar Power Research and Development to "focus on improving the reliability of concentrating solar power technologies and enhancing the capabilities of DOE National Laboratories to provide test and evaluation support to the solar industry."<sup>91</sup>

In October 2009, at the opening of the Solar Decathlon, Secretary of Energy Steven Chu announced up to \$87 million in funding for solar energy, made possible in large part by \$50 million from the stimulus.<sup>92</sup> Up to \$17 million was awarded to 15 projects at the six national laboratories for advanced research and development in photovoltaics and concentrating solar power,<sup>93</sup> \$4.7 million of which was directed toward projects focusing on concentrating solar power.<sup>94</sup> Another \$15.9 million, with \$10 million from the stimulus, was awarded to 40 special projects in 16 "solar" cities to accelerate the adoption of solar energy in urban areas.<sup>95</sup> \$27 million, including \$10 million from the stimulus, was awarded to support a network of nine regional resource and training providers to better educate solar installers.<sup>96</sup> Finally, up to \$24.7

<sup>88</sup> Recovery Act Announcement: President Obama Announces Over \$467 Million in Recovery Act Funding for Geothermal and Solar Energy Projects, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY (May 27, 2009) [hereinafter Funding for Geothermal and Solar], http://apps1.eere.energy.gov/news/progress\_alerts.cfm/pa\_id=173.

<sup>89</sup> Id.

<sup>90</sup> Id.

<sup>91</sup> Id.

<sup>92</sup> DOE Announces \$87 Million in Funding to Support Solar Energy Technologies, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY (Oct. 08, 2009), http://apps1. eere.energy.gov/news/news\_detail.cfm/news\_id=15540.

<sup>93</sup> National Laboratory Call for Research and Development Projects, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/solar/national\_lab\_ projects.html (last updated Oct. 8, 2009).

<sup>94</sup> Concentrating Solar Power, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY \*2 (Sept. 2010), http://www1.eere.energy.gov/solar/pdfs/47281.pdf.

<sup>95</sup> Solar America Cities Special Projects, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://solaramericacommunities.energy.gov/SpecialProjects.aspx (last updated Dec. 5, 2011); see List of 2009 ARRA Awardees from the Solar Energy Technologies Program, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY [hereinafter ARRA Awardees], http://www1.eere.energy.gov/solar/pdfs/arra\_selections\_2009. pdf (last visited Mar. 27, 2012).

<sup>96</sup> Solar Instructor Training Network, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/solar/instructor\_training\_network.html (last updated July 28, 2011); see ARRA Awardees, supra note 95.

million was awarded to six high penetration solar deployment projects to improve modeling, monitoring, and performance of grid-connected photovoltaic systems.<sup>97</sup>

Over the next few months, the remainder of the funds for solar energy at EERE were awarded. In November, DOE announced \$2.7 million to fund 12 advanced solar research, development, and deployment projects by small advanced technology firms, with each company receiving a grant of up to \$150,000.98 The grants to solar power were part of a total of more than \$18 million in grants to funding small business clean energy innovation projects.<sup>99</sup> In January 2010, four U.S. companies (three from California and one from North Carolina) received a total of \$10 million as part of the Incubator Project to work with the National Renewable Energy Laboratory "to transition prototype and pre-commercial PV technologies into pilot and full-scale manufacturing."100 Another \$6 million was made available to 13 U.S. companies for the Photovoltaic Pre-Incubator Project to "bridg[e] the gap between the concept verification stage of a technology and the development of a commercially viable prototype."101 In February, DOE awarded a total of \$20 million to 5 U.S. companies for supply chain and manufacturing improvements.<sup>102</sup> Finally, \$22.7 million was award by the Concentrating Solar Program to upgrade facilities at the Sandia National Laboratory and the National Renewable Energy Laboratory, including the National Solar Thermal Test Facility at Sandia.<sup>103</sup>

Less than a year after enactment of the Recovery Act, the SETP awarded all of the funds appropriated to it.<sup>104</sup> The \$117 million from the Recovery Act went to solar projects at all stages of the technology development pipeline—from basic research and development to deployment and installation.<sup>105</sup> In between, the incubator, pre-incubator, and supply chain projects helped private companies to achieve commercialization.<sup>106</sup>

<sup>97</sup> High Penetration Solar Deployment Projects, U.S. DEP'T OF ENERGY, OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/solar/high\_penetration.html (last updated Dec. 7, 2010).

<sup>98</sup> Recovery Act Announcement: DOE to Invest \$18 Million in Small Business Clean Energy Innovation Projects, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY (Nov. 23, 2009), http://apps1.eere.energy.gov/news/progress\_alerts.cfm/pa\_id=273.

<sup>99</sup> Id.

<sup>100</sup> Solar Incubator Program, U.S. DEP'T OF ENERGY, http://www1.eere.energy.gov/solar/sunshot/ incubator.html (last updated Nov. 17, 2011); Press Release, Nat. Renewable Energy Lab., DOE to Provide Up to \$12 Million to Support Early Stage Solar Technologies (Jan. 20, 2010) (http://www.nrel.gov/news/press/2010/802.html); Press Release, NAT. RENEWABLE ENERGY LAB., NREL Seeks Proposals, Announces Awards for Photovoltaic Technology Incubator Program (June 9, 2009) (http://www.nrel.gov/news/press/2009/696.html).

<sup>101</sup> Solar Incubator Program, supra note 100; Photovoltaic Technology Pre-Incubator, U.S. DEP'T OF ENERGY, OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/ solar/pv\_preincubator.html (last updated Dec. 22, 2009).

<sup>102</sup> Photovoltaic Supply Chain and Cross-Cutting Technologies, U.S. DEP'T OF ENERGY, OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/solar/pv\_supply\_chain.html (last updated Feb. 4, 2011).

<sup>103</sup> Concentrating Solar Power, supra note 94; see Recovery Act Funding, supra note 82.

<sup>104</sup> Recovery Act Funding, supra note 82.

<sup>105</sup> See id.

<sup>106</sup> See id.

-perhaps the most difficult stage for new technologies. Grants also went to a variety of organizations outside of the private sector, including universities, local governments, non-profits, and the national laboratories.<sup>107</sup>

Although the Solar Energy Technologies Program was quick to award funding to recipients,<sup>108</sup> EERE has been slow to get the approximately \$1.5 billion it has designated for research and development out the door.<sup>109</sup> EERE awarded funding to 287 renewable energy projects in 43 states,<sup>110</sup> but as of April 2011 recipients have only received \$665 million.<sup>111</sup> Some of the projects are multi-year undertakings and funding has been awarded in stages, but several months after the three-year anniversary of the Recovery Act, less than 50% of the funding has made it to recipients.<sup>112</sup> DOE has been among the slowest departments to spend recovery funding,<sup>113</sup> but Secretary Chu insists that the blame lies with recipients rather than the Department.<sup>114</sup>

#### **B. CLEAN RENEWABLE ENERGY BONDS**

The stimulus also appropriated \$1.6 billion to the Clean Renewable Energy Bonds (CREBs) program, which provides 0% interest bonds to finance public sector renewable energy projects.<sup>115</sup> Congress created the CREBs program in 2005 to incentivize renewable energy projects by the public sector.<sup>116</sup> The U.S. government gives bondholders a tax credit in lieu of an interest payment, thereby providing borrowers with

<sup>107</sup> See ARRA Awardees, supra note 95.

<sup>108</sup> See Recovery Act Funding, supra note 82.

<sup>109</sup> Funds Awarded for Renewable Energy Research And Development Programs, RECOVERY.GOV, http://www.recovery.gov (follow "Recovery Explorer" hyperlink under "Where is the Money Going?"; then follow "Agencies by Funds Awarded" hyperlink under "Top 10"; then select "Energy, Department of" under Awarding Agency Name"; then select "81.087 - Renewable Energy Research and Development" under "CDMA").

<sup>110</sup> Funds Awarded for Renewable Energy Research And Development Programs, RECOVERY. GOV, http://www.recovery.gov (follow "Recovery Explorer" hyperlink under "Where is the Money Going?"; then follow "Agencies by Funds Awarded" hyperlink under "Top 10"; then select "Number of Projects (SUM)" under "Measures"; then select "Energy, Department of" under Awarding Agency Name"; then select "81.087 - Renewable Energy Research and Development" under "CDMA").

<sup>111</sup> Funds Awarded for Renewable Energy Research And Development Programs, RECOVERY. GOV, http://www.recovery.gov (follow "Recovery Explorer" hyperlink under "Where is the Money Going?"; then follow "Agencies by Funds Awarded" hyperlink under "Top 10"; then select "Funds Received (SUM)" under "Measures", then select "Energy, Department of" under Awarding Agency Name"; then select "81.087 - Renewable Energy Research and Development" under "CDMA").

<sup>112</sup> Id.

<sup>113</sup> See Stimulus Speed Chart, PROPUBLICA (June 30, 2010), http://projects.propublica.org/stimulusspeed-chart/ (click on the "Department of Energy" box).

<sup>114</sup> Id; Ian Talley & Stephen Power, Spending Backlog Vexes Energy Chief, WALL ST. J., Feb. 5, 2010, http://online.wsj.com/article/SB10001424052748703357104575045711444560770.html.

<sup>115</sup> Clean Renewable Energy Bonds (CREBs), U.S. DEP'T OF ENERGY, http://energy.gov/savings/ clean-renewable-energy-bonds-crebs (last visited Mar. 27, 2012); see 26 U.S.C. § 54C (2011).

<sup>116</sup> See Financing Public Sector Projects with Clean Renewable Energy Bonds (CREBs), NAT'L RENEWABLE ENERGY LAB. 1, http://www.nrel.gov/docs/fy10osti/46605.pdf (last visited Mar. 27, 2012).

the ability to borrow at 0% interest.<sup>117</sup> The Recovery Act increased the total funds available in the program to \$2.4 billion.<sup>118</sup> The Internal Revenue Service (IRS) administered the program and was responsible for allocating \$800 million to three different categories of applicants: "governmental bodies, cooperative electric utilities, and public power providers."<sup>119</sup> The program favored small projects and awarded bonds to government bodies and cooperative electric companies' projects from smallest to largest until the \$800 million was exhausted or all applications were granted.<sup>120</sup>

Applications were due by August 4, 2009, and the IRS announced the allocations shortly thereafter on October 27, 2009.<sup>121</sup> The Treasury Department ultimately allocated \$2.2 billion to 805 recipients across the country.<sup>122</sup> The IRS received 997 applications from government bodies requesting a total of \$3.07 billion in volume cap, 31 applications from cooperative electric companies requesting \$609 million in volume cap, and 38 applications from public power providers requesting \$1.45 billion in volume cap.<sup>123</sup> Since cooperative electric companies requested less than \$800 million, not all of the funds were allocated.<sup>124</sup> The IRS will consider another round of applications to award the unallocated volume cap.<sup>125</sup>

The \$2.2 billion went to projects designed to produce power from solar, wind, hydropower, and biomass.<sup>126</sup> Of the \$800 million for public power producers, \$55 million went to thirteen solar projects in California and Massachusetts.<sup>127</sup> \$69.4 million went to four solar projects by cooperative electric companies.<sup>128</sup> While solar made up a minority of the bonds allocated for public power producers and cooperative electric, solar projects dominated the bonds allocated to government entities.<sup>129</sup> Of the 739 government-owned projects receiving Clean Renewable Energy Bonds, 94% were for solar power.<sup>130</sup> The 694 solar projects received a total of \$713.5 million.<sup>131</sup> California and San Diego were the major recipients of the bonds for government entities, receiving a total of \$640 million and \$154 million, respectively.<sup>132</sup> The San Diego region was a major recipient under the bond program due to the work of a local non-profit

130 See id.

<sup>117</sup> See id.

<sup>118</sup> Id.

<sup>119</sup> Id.

<sup>120</sup> Id. at 1-2.

<sup>121</sup> Press Release, Dep't of Treasury, Treasury Allocates \$2.2 Billion in Bonds for Renewable Energy Development (Oct. 27, 2009) (http://www.treasury.gov/press-center/press-releases/ Pages/tg333.aspx).

<sup>122</sup> Id.

<sup>123</sup> IRS Announces New Clean Renewable Energy Bonds Allocations, INT. REV. SERV., http://www.irs. gov/taxexemptbond/article/0,,id=214748,00.html (last updated June 13, 2011).

<sup>124</sup> Id.

<sup>125</sup> Id.

<sup>126</sup> See New Clean Renewable Energy Bonds - 2009 Allocations, INT. REV. SERV., http://www.irs.gov/ pub/irs-tege/ncrebs\_2009\_allocations\_v1.1.pdf (last visited Mar. 27, 2012).

<sup>127</sup> See id. at 1.

<sup>128</sup> See id. at 2-3.

<sup>129</sup> See id. at 4-15.

<sup>131</sup> See id.

<sup>132</sup> New Clean Renewable Energy Bonds - 2009 Allocations, supra note 126, at 4-12.

as well as engineering students at the University of California San Diego, who helped local municipalities, school districts, universities, and a water district submit over 190 applications.<sup>133</sup> The California Solar Initiative, which is the state's rebate program, estimated that allocations to California alone could add as much as 100 MW of solar energy over the next few years.<sup>134</sup>

## C. RENEWABLE ENERGY TAX CREDITS

The Recovery Act also extended the production tax credit for wind to December 31, 2012, and to December 31, 2013, for certain eligible renewable energy sources, such as biomass, geothermal, landfill gas, municipal solid waste, qualified hydroelectric, marine, and hydrokinetic power.<sup>135</sup> Rules governing the production tax credit vary by renewable energy source and facility type, but electricity producers receive a tax credit between 1.1 and 2.2 cents for every kilowatt-hour produced from a new installation.<sup>136</sup> The production tax credit is one of the most important tax incentives the government provides for renewable energy, and the industry's success has risen and fallen based on the enactment and lapse of the credit.<sup>137</sup>

While the extension was helpful to most renewable energy sources, the production tax credit does not apply to the installation of solar energy<sup>138</sup> and thus the extension of the tax credit by the Recovery Act had no direct effect on the solar industry. It is worth noting that solar power was an eligible resource for roughly a one-year period between the passage of the American Jobs Creation Act of 2004 and the Energy Policy Act of 2005.<sup>139</sup> Although Congress missed an opportunity to add solar back to the list of renewable energy sources eligible for the production tax credit, it did revise it by allowing those facilities that qualified for the production tax credit the option to take either the federal business energy investment tax credit or an equivalent cash grant from the Department of Treasury instead.<sup>140</sup>

The Recovery Act also revised the rules for the investment tax credit, for which solar is eligible, so that recipients also had the option of receiving an equivalent

139 Id.

<sup>133</sup> Press Release, UCSD Jacobs Sch. of Eng'g, Engineering Students Help San Diego Secure \$154 Million in Solar Bonds (Nov. 3, 2009) (http://www.jacobsschool.ucsd.edu/news/ news\_releases/release.sfe?id=898).

<sup>134</sup> California Solar Initiative Newsletter - November 2009, GO SOLAR CAL., http://www.gosolarcalifornia.ca.gov/news\_media/newsletter/gosolar\_newsletter/2009-11.html (last visited Mar. 27, 2012).

<sup>135</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 1101, 123 Stat. 115, 319 (2009) (codified at 26 U.S.C. § 45 (2011)); Renewable Electricity Production Tax Credit (PTC), DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://dsireusa.org/ incentives/incentive.cfm?Incentive\_Code=US13F (last updated May 5, 2011).

<sup>136</sup> Renewable Electricity Production Tax Credit (PTC), supra note 135.

<sup>137</sup> See Kate Galbraith, Future of Solar and Wind Power May Hinge on Federal Aid, N.Y. TIMES, Oct. 25, 2011, http://www.nytimes.com/2011/10/26/business/energy-environment/future-ofsolar-and-wind-power-may-hinge-on-federal-aid.html?pagewanted=all.

<sup>138</sup> See Renewable Electricity Production Tax Credit (PTC), supra note 135.

<sup>140</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 5, 123 Stat. 115, 319–21 (2009) (codified at 26 U.S.C. § 45 (2011)).

cash grant from the Department of Treasury.<sup>141</sup> The investment tax credit provides a tax credit equal to 30% of the expenditures for new solar, fuel cell, and small wind installations and a tax credit equal to 10% of the expenditures for new geothermal, micoturbine, and combined heat and power installations.<sup>142</sup> Maximum incentives and size limitations apply to certain technologies and the installations must be operational within one year of receiving the credit.<sup>143</sup>

# **D. RENEWABLE ENERGY GRANTS**

To incentivize the installation of new renewable energy projects, the Recovery Act allowed projects eligible for either the production or the investment tax credit the option to receive a cash grant, known as a Section 1603 grant, from the Department of Treasury.<sup>144</sup> Solar, fuel cells, small wind turbines, and other qualified facilities are eligible to receive a cash grant equal to 30% of the project's total cost.<sup>145</sup> The program was intended to run until the end of 2010, but Congress extended it for an additional year as part of the Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010.<sup>146</sup> As of October 31, 2011, a total of 22,747 projects had received grants worth \$9.6 billion.<sup>147</sup> These grants represent a total of \$32.9 billion in private and federal investment and 14.3 gigawatts of installed capacity.<sup>148</sup> Although wind power received a majority of the grant money (\$7.647 billion), solar was a major beneficiary of the program, receiving a total of \$1.447 billion in grants for 22,060 projects representing a total of 870 megawatts of generation capacity.<sup>149</sup>

# E. ADVANCED RESEARCH PROJECTS AGENCY-ENERGY (ARPA-E)

Modeled after the Department of Defense's Advanced Research Projects Agency, DOE's Advanced Research Projects Agency–Energy (ARPA-E) was created to provide funding for groundbreaking research in energy matters.<sup>150</sup> Although Congress authorized the creation of ARPA-E in 2007, it wasn't until the Recovery Act appropriated \$400 million to the program that it received its first funding.<sup>151</sup> ARPA-E "funds concepts that industry alone cannot support, but whose success would dramatically

- 145 Id. § 1603(a), (d).
- 146 Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, Pub. L. No. 111-312, § 707, 124 Stat. 3266, 3312 (2010).
- 147 Overview and Status Update of the §1603 Program, DEP'T OF TREAS., 1 (Oct. 31, 2011), http://www.treasury.gov/initiatives/recovery/Documents/Status%20overview.pdf.
- 148 Id.

<sup>141</sup> Id.; Business Energy Investment Tax Credit (ITC), DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\_Code=US02 F&State=federal%C2%A4tpageid=1=1=1 (last updated Nov. 11, 2011).

<sup>142 26</sup> U.S.C. § 48(a) (2011).

<sup>143</sup> Id. § 48.

<sup>144</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 1603, 123 Stat. 115, 364 (2009).

<sup>149</sup> Id. at 2 figs.1, 2 & 3.

<sup>150</sup> About, ADVANCED RES. PROJECTS AGENCY-ENERGY, U.S. DEP'T OF ENERGY, http://arpa-e.energy.gov/About/About.aspx (last visited Mar. 31, 2012).

<sup>151</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115, 140 (2009).

benefit the nation."<sup>152</sup> ARPA-E is structured around 12 programs, including the Solar ADEPT program, which is part of the Sunshot Initiative, and it aims to reduce the cost of solar by 75% by the end of the decade.<sup>153</sup>

With \$400 million from the stimulus, ARPA-E received funding to organize the agency, hire staff and distribute approximately \$363 million to 121 projects in 30 states.<sup>154</sup> The funds were split between universities (40%), small and large businesses (31% and 22%, respectively), DOE national laboratories (5%), and non-profits (2%).<sup>155</sup> ARPA-E announced its first funding opportunity in April 2009, which "was open to all potentially disruptive energy technologies."<sup>156</sup> Expecting to receive between 500 to 800 concept papers, ARPA-E was flooded with close to 3,700 entries.<sup>157</sup> Six months later, ARPA-E announced the 37 winners of the first round of awards from the stimulus, who would receive a total of \$151 million.<sup>158</sup> The projects ranged across all energy sources, including one solar energy project.<sup>159</sup> 1366 Technologies, a Massachusetts-based solar company, received a grant of \$4 million to develop an innovative solar wafer manufacturing process that could cut the price of solar nearly in half.<sup>160</sup>

Over the next year, ARPA-E announced three rounds of funding opportunities and awards based on its specific program areas.<sup>161</sup> The second round of funding, announced in December 2009, focused on three programs designed to improve battery storage, carbon capture and storage, and non-photosynthetic biofuels.<sup>162</sup> The 38 project winners of that round were announced in April 2010 and received a total of \$113 million.<sup>163</sup> The third round of funding in March 2010 focused on three programs designed to improve building cooling, power electronics, and grid energy storage.<sup>164</sup> The 42 project winners were announced in July 2010 and received a total of \$94 million.<sup>165</sup> The final round of funding opportunities in August 2010 focused on four programs designed to improve "[b]uilding [e]fficiency[,] [v]ehicle [t]echnologies[,] [r]enewable [p]

- 163 Id.
- 164 Id.
- 165 Id. at 5.

<sup>152</sup> Programs Main Overview, ADVANCED RES. PROJECTS AGENCY-ENERGY, U.S. DEP'T OF ENERGY, http://arpa-e.energy.gov/ProgramsProjects/Programs.aspx (last visited Mar. 31, 2012).

<sup>153</sup> Press Release, Advanced Res. Projects Agency-Energy, U.S. Dep't of Energy, Secretary Chu Announces \$130 Million for Advanced Research Projects (Apr. 20, 2011) (http://arpa-e. energy.gov/ProgramsProjects/SolarADEPT.aspx).

<sup>154</sup> Advanced Res. Projects Agency-Energy, U.S. Dep't of Energy, FY2010 Annual Report iii, 61–65 (2011) [hereinafter FY2010 Annual Report], *available at* http://arpa-e.energy.gov/LinkClick.aspx?fileticket=JPgM-ETf-00%3d&tabid=438.

<sup>155</sup> Id. at 6, fig.5.

<sup>156</sup> Id. at 4.

<sup>157</sup> Id.

<sup>158</sup> Press Release, Advanced Res. Projects Agency-Energy, U.S. DEP'T OF ENERGY, Bold Transformational Energy Research Projects Win \$151 Million in Funding (Oct. 26, 2009) (http://apps1.eere.energy.gov/news/progress\_alerts.cfm/pa\_id=258).

<sup>159</sup> FY2010 ANNUAL REPORT, supra note 154, at 4-5, 8.

<sup>160</sup> Id. at 8.

<sup>161</sup> Id. at 5.

<sup>162</sup> Id.

ower[,] and [e]nergy [s]torage."<sup>166</sup> ARPA-E awarded a total \$9.6 million in September 2010 to six projects, two of which were for solar energy.<sup>167</sup> California-based Teledyne Scientific & Imaging received \$500,000 for a project to develop an electrowetting-based dynamic liquid prism to track solar radiation for concentrating photovoltaics.<sup>168</sup> The University of California Los Angeles received \$2.4 million to develop a state-of-the art thermal energy storage system for solar thermal power plants.<sup>169</sup>

## F. RENEWABLE ENERGY LOAN GUARANTEE PROGRAM

The stimulus also authorized \$6 billion to expand an innovative technology loan guarantee program created by Title XVII of the Energy Policy Act of 2005.<sup>170</sup> The Energy Policy Act of 2005 established a loan guarantee program known as Section 1703 to incentivize innovate energy technologies that "(1) avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and (2) employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued."<sup>171</sup> Section 1703 provided loan guarantees for 10 categories of innovative energy technologies.<sup>172</sup>

The stimulus authorized DOE to make loan guarantees available under a temporary program for renewable energy systems (the Section 1705 Program), electric power transmission systems, and leading-edge biofuels projects that commenced before September 30, 2011.<sup>173</sup> The program's goal was to "to ensure energy security, mitigate climate change, jumpstart the alternative energy sector, and create jobs."<sup>174</sup> Additionally, the program was "intended to support the 'early commercial production

<sup>166</sup> Id.

<sup>167</sup> Press Release, Advanced Res. Projects Agency-Energy, U.S. Dep't of Energy, Secretary Chu Awards \$9.6 Million for Transformational Energy Research Projects (Sept. 10, 2010) (http:// arpa-e.energy.gov/media/news/tabid/83/vw/1/itemid/23/secretary-chu-awards-%2496million-for-transformational-energy-research-projects.aspx).

<sup>168</sup> Id.

<sup>169</sup> Id.

<sup>170</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 1603, 123 Stat. 115, 364 (2009).

<sup>171</sup> Energy Policy Act of 2005, Pub. L. No. 109-58, § 1703, 119 Stat. 594, 1120 (2005) (codified at 42 U.S.C. § 16513(a) (2011)).

<sup>172</sup> The ten categories are: "(1) Renewable energy systems. (2) Advanced fossil energy technology . . . . (3) Hydrogen fuel cell technology for residential, industrial, or transportation applications (4) Advanced nuclear energy facilities. (5) Carbon capture and sequestration practices and technologies, including agricultural and forestry practices that store and sequester carbon. (6) Efficient electrical generation, transmission, and distribution technologies. (7) Efficient enduse energy technologies. (8) Production facilities for the manufacture of fuel efficient vehicles or parties of those vehicles, including electric drive vehicles and advanced diesel vehicles. (9) Pollution control equipment. (10) Refineries, meaning facilities at which crude oil is refined into gasoline. *Id.* (codified at 42 U.S.C. § 16513(b)).

<sup>173</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 1705, 123 Stat. 115, 145 (2009) (codified at 42 U.S.C. § 16516).

<sup>174</sup> U.S. GOV'T ACCOUNTABILITY OFFICE, FURTHER ACTIONS ARE NEEDED TO IMPROVE DOE'S ABILITY TO EVALUATE AND IMPLEMENT THE LOAN GUARANTEE PROGRAM 6 (2010) [hereinafter FURTHER ACTIONS ARE NEEDED], *available at* http://www.gao.gov/new.items/d10627.pdf.

and use of new or significantly improved technologies in energy projects' that 'avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases, and have a reasonable prospect of repaying the principal and interest on their debt obligations."<sup>175</sup>

While the Section 1703 loan program was authorized in 2005, bureaucratic difficulties related to the lengthy application process delayed the first disbursements from the loan program for almost four years.<sup>176</sup> Upon his appointment as Secretary of Energy, Steven Chu made the releasing of the loans one of his top priorities and, in March of 2009, DOE awarded the first loan guarantee to the solar manufacturer Solyndra.<sup>177</sup>

Audits by the Inspector General noted problems with the program from the very beginning. Among the numerous problems were a lack of professional staffing as well as a failure to implement certain practices and procedures. This was not the first loan guarantee program managed by DOE, which had managed loan guarantee programs in the 1970s and 1980s related to synthetic fuel, alcohol production facilities, and geothermal.<sup>178</sup> Unfortunately, those programs were not considered a success as numerous project guarantees defaulted and the projects were abandoned.<sup>179</sup> A review of prior loan guarantee programs noted problems with due diligence at critical phases of the loan guarantee process, particularly during origination, monitoring, and performance.<sup>180</sup>

To ensure that the loan guarantee program avoided the pitfalls of the past, the Inspector General in 2007 recommended that the program "finaliz[e] a staffing plan, develop[] risk mitigation strategies, implement[] and execut[e] a monitoring system and promulgat[e] liquidation procedures."<sup>181</sup> To help ensure that the program successfully met the outlined policy goals, DOE outlined nine performance measures for the program, including the loss rate of loans, cost per megawatt hour, amount of generation capacity, and reductions in emissions.<sup>182</sup> Despite some initial problems, the

- 179 Id.
- 180 Id. at 1-2.
- 181 Id. at 2.

<sup>175</sup> Id.

<sup>176</sup> John M. Broder, Aid for Solar Firm Is First From 4-Year-Old Program, N.Y. TIMES, Mar. 21, 2009, http://www.nytimes.com/2009/03/21/business/energy-environment/21energy.html?\_r=1.

<sup>177</sup> Id.

<sup>178</sup> U.S. DEP'T OF ENERGY, SPECIAL REPORT: LOAN GUARANTEES FOR INNOVATIVE ENERGY TECHNOLOGIES 1 (2007), *available at* http://energy.gov/sites/prod/files/igprod/documents/ IG-0777.pdf.

<sup>182</sup> FURTHER ACTIONS ARE NEEDED, *supra* note 174, at 17. The nine performance measures are: 1) "percentage of projects receiving DOE loan guarantees that have achieved and maintained commercial operations;" (2) "contain the loss rate of guaranteed loans to less than 4 percent;" (3) "contain the loss rate of guaranteed loans to less than 11.81 percent in fiscal year 2009 (11.85 percent for fiscal years 2010 and 2011) on a long-term portfolio basis;" (4) "newly installed generation capacity from power generation projects receiving DOE loan guarantees;" (5) "average cost per megawatt hour for projects receiving DOE loan guarantees;" (6) "forecasted greenhouse gas emissions reductions from projects receiving loan guarantees compared to 'business as usual' energy generation;" (7) "forecasted air pollutant emissions (nitrogen oxides, sulfur oxides, and particulates) reductions from projects receiving loan

program could report some good news after its first audit. It had developed a highlevel Credit Review Board "to develop program policies and procedures and to make recommendations to the Secretary of Energy on the final approval of loan guarantees" and was "developing guidelines for both the technical and financial evaluations of loan applications."<sup>183</sup>

The loan guarantee program faced not only bureaucratic problems as it attempted to get off the ground, but also flagging support from Congress and the Administration shortly after enacting the Section 1705 Program. In August 2009, \$2 billion in funding appropriated by the stimulus was redirected from the loan guarantee program to the popular Cash for Clunkers program.<sup>184</sup> Citing a study that found the loan guarantee program generated \$28 dollars in economic return for every \$1 dollar in loans, supporters of the loan guarantee program complained that Congress was taking money away from a program with more economic promise.<sup>185</sup> Congress pledged to restore funding but did not do so.<sup>186</sup> One year later, the program was raided again when \$1.5 billion was reassigned to fund Medicaid.<sup>187</sup> With \$3.5 billion removed, the loan guarantee program was left with only \$2.5 billion to help finance clean energy.

Despite these pitfalls, the Section 1705 Program has guaranteed loans for 26 projects worth over \$10 billion dollars across eight different categories, including biofuels, energy storage, solar generation, solar manufacturing, transmission, and wind generation.<sup>188</sup> Together, the projects created nearly 2,400 permanent jobs and over 15,000 construction jobs.<sup>189</sup> The loans have enabled some impressive projects to move forward, including the world's largest wind farm, one of the nation's first cellulosic ethanol power plants, the largest rooftop solar project in the nation, and several of the world's largest concentrating solar power (CSP) generation facilities.<sup>190</sup> While the

190 Id.

guarantees compared to 'business as usual' energy generation;" (8) "average review time of applications for Section 1705 guarantees; and" (9) "percentage of conditional commitments issued to qualified applicants relative to plan." *Id.* 

<sup>183</sup> SPECIAL REPORT: LOAN GUARANTEES FOR INNOVATIVE ENERGY TECHNOLOGIES, supra note 178, at 2.

<sup>184</sup> Act of Aug. 7, 2009, Pub. L. No. 111-47, 123 Stat. 1972, 1972 (2009); see Sam Jaffe, Robbing Renewable Energy to Pay for Clunkers, GREEN TECH MEDIA (Aug. 4, 2009), http://www.greentechmedia.com/articles/read/robbing-renewable-energy-to-pay-for-clunkers; see Kirsten Korosec, Cash for Clunkers Pilfers Renewable Energy Loan Program, CBS NEWS (Aug. 7, 2009), http://www. bnet.com/blog/clean-energy/cash-for-clunkers-pilfers-renewable-energy-loan-program/636.

<sup>185</sup> See Jaffe, supra note 184.

<sup>186</sup> See Korosec, supra note 184; Elizabeth McGowan, U.S. Renewables Industry Wary of Gov't Pledges to Restore 'Borrowed' Billions, INSIDECLIMATE NEWS (Aug. 12, 2010), http://insideclimatenews. org/news/20100812/us-renewables-industry-wary-govt-pledges-restore-borrowed-billions.

<sup>187</sup> Graham Noyes, Good News and Bad News for DOE's Loan Guarantee Program, RENEWABLE + LAW (Aug. 9, 2010), http://www.lawofrenewableenergy.com/2010/08/articles/biofuels/good-news-and-bad-news-for-does-loan-guarantee-program/; see Act of Aug. 10, 2010, Pub. L. No. 111-226, §§ 201, 308, 124 Stat. 2389, 2393–94, 2405.

<sup>188</sup> Our Projects, supra note 10.

<sup>189</sup> Id.
loans are spread out across multiple categories, almost 90% of the funding has been spent on solar power, with the majority spent on solar generation.<sup>191</sup>

The Section 1705 Program supported four solar manufacturing projects with over \$1 billion in loan guarantees.<sup>192</sup> The first loan guarantee was to Solyndra for \$535 million to finance construction of the first phase of the company's new manufacturing facility in Freemont, California.<sup>193</sup> In December 2010, Abound Solar Manufacturing received a loan guarantee for \$400 million to manufacture thin-film solar panels at facilities in Colorado and Indiana.<sup>194</sup> The loan is expected to create 1,200 permanent jobs and result in an annual generation output of 1.9 million megawatts per hour.<sup>195</sup> Oregon-based Solopower received a loan guarantee for \$197 million in August 2011 to retrofit an existing building to manufacture thin-film solar panels.<sup>196</sup> The loan is expected to create 450 permanent jobs and result in an annual generation output of 794,000 megawatts per hour.<sup>197</sup> Finally, in September 2011, 1366 Technologies received a loan guarantee for \$150 million to scale up its direct wafer manufacturing capabilities in Massachusetts and construction a second U.S. manufacturing facility to produce silicon wafers.<sup>198</sup>

Solar generation was the major recipient of the Section 1705 Program, with thirteen projects in Arizona, California, Colorado, and Nevada receiving either full or partial loan guarantees.<sup>199</sup> Several projects were for loans over \$1 billion, including two by Abengoa Solar.<sup>200</sup> The loan guarantees to solar generation projects generated a string of accomplishments, such as the first utility-scale deployment of a solar collector assembly,<sup>201</sup> the world's largest high-concentration photovoltaic energy generation facility,<sup>202</sup> the first molten-salt concentrated solar power tower in the U.S.,<sup>203</sup> and a solar project that would double the generation capacity of concentrated solar in the

194 Abound Solar, LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo.energy.gov/?projects=abound-solar (last visited Mar. 31, 2012).

199 Our Projects, supra note 10.

<sup>191</sup> Id.

<sup>192</sup> Id.

<sup>193</sup> Solyndra Inc., LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo.energy.gov/?projects=solyndra-inc (last visited Mar. 31, 2012).

<sup>195</sup> Id.

<sup>196</sup> SoloPower, LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo.energy.gov/?projects=solopower (last visited Mar. 31, 2012).

<sup>197</sup> Id.

<sup>198 1366</sup> Technologies, Inc., LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo.energy. gov/?projects=1366-technologies-inc (last visited Mar. 31, 2012); 1366 Offered \$150 Million Conditional Commitment for DOE Loan Guarantee, 1366 TECHNOLGIES (June 17, 2011) [hereinafter 1366 TECHNOLOGIES], http://www.1366tech.com/1366-offered-150-millionconditional-commitment-for-doe-loan-guarantee/.

<sup>200</sup> Id.

<sup>201</sup> Abengoa Solar, Inc. (Mojave Solar), LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo. energy.gov/?projects=abengoa-solar-inc-mojave-solar (last visited Mar. 31, 2012).

<sup>202</sup> Cogentrix of Alamosa, LLC., LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo.energy. gov/?projects=cogentrix-of-alamosa-llc (last visited Mar. 31, 2012).

<sup>203</sup> SolarReserve, LLC (Crescent Dunes), LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo. energy.gov/?projects=solarreserve-llc-crescent-dunes (last visited Mar. 31, 2012).

U.S.  $^{204}$  In total, the thirteen solar projects will add 3,015 megawatts of solar generation capacity in the U.S.  $^{205}$ 

While the loan guarantee program helped finance some impressive projects, initial results haven't been entirely positive. In August 2011, Solyndra, the first recipient of the loan guarantee program, declared bankruptcy.<sup>206</sup> Solyndra was the beneficiary of a loan guarantee for \$535 million to expand its manufacturing of solar power.<sup>207</sup> Since the bankruptcy, critics have accused the Obama administration of political favoritism in the loan decision process.<sup>208</sup> House Republicans have held a series of hearings to investigate the program and have subpoenaed the White House for records related to Solyndra.<sup>209</sup>

While it is too early to uncover all the details of the Solyndra scandal, several things have become clear since the initial hysteria following the company's bankruptcy declaration. Despite accusations of political favoritism, the Obama administration maintains the decision to approve the loan to Solyndra in 2009 was based entirely on merit.<sup>210</sup> Nonetheless, the administration appears to have ignored changing market dynamics that led to a collapse in the price of solar and ultimately made Solyndra's solar panels unprofitable.<sup>211</sup> Although the bankruptcy of Solyndra represents a very public failure of the loan guarantee program, only one other company, Beacon Power, has declared bankruptcy.<sup>212</sup> Beacon Power, a manufacturer of flywheels, received a loan guarantee of \$39 million before declaring bankruptcy in October 2011.<sup>213</sup> Both Solyndra and Beacon Power appear to be victims of changing market conditions whose technologies were rendered non-competitive by a sharp and sudden drop in prices.<sup>214</sup> In the case of Solyndra, prices for solar panels declined significantly as China heavily subsidized the manufacturing of panels and demand softened in Europe.<sup>215</sup> While the Solyndra scandal has been politically costly, it is important to remember the defaults represent just 1.3% of the \$37.6 billion the loan program has guaranteed.<sup>216</sup>

208 Republicans Attack, supra note 11.

<sup>204</sup> BrightSource Energy, Inc., LOAN PROGRAMS OFFICE, U.S. DEP'T OF ENERGY, https://lpo.energy. gov/?projects=brightsource-energy-inc (last visited Mar. 31, 2012).

<sup>205</sup> Our Projects, supra note 10.

<sup>206</sup> Solar Firm, supra note 5.

<sup>207</sup> Id.

<sup>209</sup> Energy Secretary, supra note 6.

<sup>210</sup> See id.

<sup>211</sup> Editorial, The Solyndra Mess, N.Y. TIMES, Nov. 23, 2011[hereinafter The Solyndra Mess], http://www.nytimes.com/2011/11/25/opinion/the-solyndra-mess.html.

<sup>212</sup> Matthew L. Wald, Solyndra Has a Cousin in the Poorhouse, N.Y. TIMES, Nov. 16, 2011, http://green.blogs.nytimes.com/2011/11/17/solyndra-has-a-cousin-in-the-poorhouse.

<sup>213</sup> Id.

<sup>214</sup> Id.

<sup>215</sup> Id.

<sup>216</sup> The Solyndra Mess, supra note 211.

#### V. EFFECTS AND CONCLUSION

Almost two years after the passage of the Recovery Act, and with all of the contracts and grants for clean energy awarded, it is necessary to begin to analyze the effect and effectiveness of this massive piece of legislation. A survey of the Recovery Act's investment in solar demonstrates the breadth of policy mechanisms—at all levels of the technology development pipeline—that the government was able to harness to support renewable energy during the recession. EERE supported almost all stages of the technology development pipeline from basic research and development to commercialization and deployment.<sup>217</sup> ARAP-E bet on high-risk technologies at the earliest stages of development.<sup>218</sup> Finally, the production tax credit extension, renewable energy grants, clean renewable energy bonds, and the loan guarantee program incentivized billions of dollars worth of public and private investment towards the installation of renewable energy.<sup>219</sup> Since the recession, total U.S. investments in renewable energy have recovered and exceeded the previous high of 2008.<sup>220</sup> Without the stimulus, investments would have likely remained in the trough much longer.

While total U.S. investments recovered quickly, one effect of the recession was a dramatic and persistent drop in venture capital and private equity investment in renewable energy as early-stage investment fell from \$5.7 billion in 2008 to \$2.9 billion in 2009.<sup>221</sup> Contrary to the pace of recovery for total investments in renewable energy, venture capital and private equity investments have been slow to rebound, as early-stage investments in 2010 (\$3.9 billion) were still 31% lower than they were in 2008.<sup>222</sup> Venture capital and private equity investment are important because this financing is a critical driver and indicator of future technological innovation and development.<sup>223</sup> The U.S. currently remains the leader in early-stage renewable energy financing, accounting for over three-quarters of global investment by G20 nations,<sup>224</sup> but the slow recovery of early-stage investments may signal a failure of the Recovery Act and ultimately hurt America's effort to win the global clean energy race.

The stimulus funds dedicated for or appropriated to the early-stage development of renewable energy appears to have been inadequate in both size and the speed with which they were disbursed. While billions of dollars were spent on encouraging installations, only a small fraction of the money for clean energy was spent on research, development and commercialization. As noted earlier, ARPA-E and specific programs within EERE directly supported early-stage development with funding from the stimulus. The stimulus authorized \$400 million directly to ARPA-E—providing the first funding for the recently-authorized program—and a small portion of the \$16 billion

<sup>217</sup> See supra text accompanying notes 73–114.

<sup>218</sup> See supra text accompanying notes 150–169.

<sup>219</sup> See supra text accompanying notes 115-149, 170-216.

<sup>220</sup> See Gelman, supra note 14, at 114; see Gelman & Hockett, supra note 15, at 114.

<sup>221</sup> Gelman, *supra* note 14, at 116.

<sup>222</sup> Id.

<sup>223</sup> See supra text accompanying notes 18–19.

<sup>224</sup> THE PEW CHARITABLE TRUSTS, WHO'S WINNING THE CLEAN ENERGY RACE? 15 (2010), available at http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/G-20Report-LOWRes-FINAL.pdf.

EERE received from the stimulus also supported early-stage development of renewable energy, such as the solar incubator program.<sup>225</sup> Despite private equity and venture capital funding to solar dropping by over \$1.7 billion from 2008 to 2009, EERE allocated only \$117 million to the whole solar program, with less than \$40 million going to early-stage investment.<sup>226</sup> This discrepancy between lost private sector spending and additional public sector stimulus spending raises questions about the adequacy of the stimulus and may explain why early-stage investments in solar failed to recover in 2010–remaining \$1 billion dollars below their peak in 2008.<sup>227</sup>

At its core, the stimulus was meant to replace and spur private sector investment. Unfortunately, the stimulus fell short in regard to early-stage investments of renewable energy. In the five years before the recession, early-stage investment by the private sector exploded as a suite of promising technologies finally emerged after billions of dollars in public research and development. However, the recession caused investors to become risk-adverse and pull back from the sector. This loss of capital threatens to set back the many hard-won gains of the previous decades as promising ideas may never receive funding and skilled, but unemployed industry personnel leave the field.

Innovation (primarily indicated by private research and development and patent filing) always suffers during a recession as the cash flow of companies and investors dries up.<sup>228</sup> This recession was no different. Total investment by venture capital firms in the first quarter of 2009 was down 60% compared with the first quarter of 2008.<sup>229</sup> This recession was unique in one sense, as the OECD pointed out in a recent report, because "[t]he current crisis is the first of this severity to hit OECD countries, since they have shifted to knowledge-based service economies where investment in intangible assets is of equal importance as investment in machinery, equipment and buildings."<sup>230</sup> Bolstered by this realization and successful examples of stimulus spending on research and development during previous recessions in Finland and South Korea, governments spent billions in stimulus money during the recession to protect research and development in critical industries and retain human capital.<sup>231</sup> In the rush to get a stimulus passed, however, the U.S. appears to have ignored its position as the leader in early-stage renewable energy investment and as a result has done less than it should have to bolster innovative research and development in renewable energy.

<sup>225</sup> See supra text accompanying notes 73-114, 150-169.

<sup>226</sup> Gelman, supra note 14, at 117; Recovery Act Funding, supra note 82; Funding for Geothermal and Solar, supra note 88.

<sup>227</sup> Gelman, *supra* note 14, at 117.

<sup>228</sup> Org. for Econ. Co-operation and Dev, Policy Responses to the Economic Crisis: Investing in Innovation for Long-Term Growth 6 (2009), *available at* http://www.oecd.org/ dataoecd/59/45/42983414.pdf.

<sup>229</sup> Id. at 7.

<sup>230</sup> Id. at 3. "The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States." Id. at 2.

<sup>231</sup> Id. at 11.

It is tough to fault the stimulus since it provided the program with its first funding. Rather, blame may instead lie with Congress and the previous administration for failing to provide initial funding and staff for the agency it authorized two years earlier. Had ARPA-E been up and running at the end of 2008, it likey would have had staff and procedures in place to ensure the swift selection of promising projects as well as the capacity to handle a more substantial amount of money. The fact that the agency received close to 3,700 entries for only 36 awards during its first open call for proposals demonstrates that ideas were desperately in search of capital in 2009.<sup>232</sup> Ultimately, only 121 projects were funded over a series of four rounds of funding opportunities by ARPA-E.<sup>233</sup> While we do not know how many of the submissions were potentially viable, it is likely that many promising technologies may not have received funding because there wasn't enough money appropriated.

To incentivize private innovation, the stimulus should have specifically appropriated more money to the technology program offices within EERE, such as the Solar Energy Technologies Program, with an instruction that a majority of the funds should be allocated to the earliest stages of the technology development pipeline. Programs such as the Solar PV Pre-Incubator and Incubator Program, which help businesses transition from concept to full-scale production, should have been appropriated much more than the paltry \$16 million they ultimately received.<sup>234</sup> To supplement the budgets of almost every program and effort within EERE, DOE spread funding too thin and failed to provide enough to research and development at private companies.

Not only did the stimulus not provide enough funding to research and development, but DOE has also been slow to get money out the door. As already mentioned, award recipients have received less than 50% of the \$1.5 billion appropriated to renewable energy at EERE.<sup>235</sup> A better-engineered stimulus would have required that money was spent in a faster timeframe to jumpstart the recovery of venture capital and private equity investment. One innovative proposal would have been to harness the financial acumen of private investors by partnering with venture capital and private equity firms.

Ultimately, it will take years to see the full effect of the stimulus on clean energy. Quantifying the success of research and development efforts can be difficult. For instance, the seeds of future breakthrough technologies or pioneering energy companies may very well have been planted through critical grants or contracts made available by the Recovery Act. While Solyndra may represent the current failure of the Recovery Act, another solar company–1366 Technologies– may represent its success. 1366 Technologies, a Massachusetts-based silicon wafer manufacturer, has been a major recipient of early-stage recovery funding, allowing it to scale up quickly since its found-ing in 2008.<sup>236</sup> 1366 Technologies was awarded a \$4 million grant from ARPA-E in

<sup>232</sup> See supra text accompanying note 157.

<sup>233</sup> FY2010 ANNUAL REPORT, supra note 154, at 4-5.

<sup>234</sup> See supra text accompanying notes 100–01.

<sup>235</sup> See supra text accompanying notes 109–112.

<sup>236</sup> Matthew L Wald, Maker of Silicon Wafers Wins Millions in U.S. Loan Support, N.Y. TIMES, June 17, 2011, http://www.nytimes.com/2011/06/17/business/energy-environment/17guarantee. html?\_r=1&scp=1&sq=1366&st=cse.

created a stronger renewable energy industry in America.

December 2009,<sup>237</sup> a \$500,000 grant from EERE's Pre-Incubator program in May 2009,<sup>238</sup> a \$3 million grant from EERE's supply chain program in February 2011,<sup>239</sup> and a loan guarantee of \$143 million in September 2011.<sup>240</sup> The loan guarantee will allow it to expand its current manufacturing capabilities in Massachusetts as well as build a second, larger manufacturing facility.<sup>241</sup> If successful, 1366 Technologies' direct wafer technology could reduce the cost of silicon wafers by 80% and the cost of installed solar by more than half.<sup>242</sup> One indication that 1366 Technologies could be successful is the amount of private investment it has attracted. Following the ARPA-E award, 1366 Technologies received \$28.4 million from GE Energy Financial Services and venture capital firm VantagePoint.<sup>243</sup> If the stimulus had focused more on attracting this type of early-stage investment, it would have been much better legislation and

Aaron Tucker is a third-year student at The University of Texas School of Law. For Volume 43 of the Texas Environmental Law Journal, he will serve as the Lead Articles Editor.

<sup>237</sup> Grants – Award Summary: 1366 Technologies Inc., RECOVERY.GOV, http://www.recovery. gov/Transparency/RecipientReportedData/pages/RecipientProjectSummary508. aspx?AwardIdSur=74981 (last visited Mar. 31, 2012).

<sup>238</sup> Photovoltaic Technology Pre-Incubator, supra note 101.

<sup>239</sup> DOE Invests \$20 Million in U.S. Solar Manufacturing and Advanced Photovoltaic Technologies, U.S. DEP'T OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY (Feb. 4, 2011), http://apps1.eere.energy.gov/news/news\_detail.cfm/news\_id=16699.

<sup>240</sup> Loan – Award Summary: 1366 Technologies Inc., RECOVERY.GOV, http://www.recovery. gov/Transparency/RecipientReportedData/pages/RecipientProjectSummary508. aspx?AwardIdSur=128926 (last visited Mar. 31, 2012).

<sup>241 1366</sup> TECHNOLOGIES, supra note 198.

<sup>242</sup> Katie Fehrenbacher, GE, VantagePoint Back Solar Tech Startup 1366, EARTH2TECH (Mar. 1, 2011), http://gigaom.com/cleantech/ge-vantagepoint-back-solar-tech-startup-1366/; 1366 TECHNOLOGIES, http://www.1366tech.com/ (last visited Apr. 4, 2012).

<sup>243</sup> Id.

## **RECENT DEVELOPMENTS**

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#### AIR QUALITY

## UPDATE ON NEW FEDERAL STANDARDS FOR MERCURY AND TOXIC AIR EMISSIONS FROM POWER PLANTS AND RECENT EXPEDITED PERMIT AMENDMENT PROCESSES AT TCEQ

#### MERCURY STANDARDS UPDATE

On December 16, 2011, the Environmental Protection Agency (EPA) issued a final rule requiring the reduction of mercury and other toxic air emissions from power plants. Fact Sheet: Mercury and Air Toxics Standards for Power Plants, U.S. ENVTL. PROT. AGENCY, 1 (Dec. 2011), available at http://www.epa.gov/mats/ pdfs/20111221MATSsummaryfs.pdf. The new mercury and air toxics standards (MATS) will affect both new and existing power plants that maintain coal- or oil-fired electric utility steam generating units. Office of Air Quality Planning & Standards, U.S. ENTVL. PROT. AGENCY, EPA-452/R-11-011, REGULATORY IMPACT ANALYSIS FOR THE FINAL MERCURY AND AIR TOXICS STANDARDS, 3-2 (2011), available at http://www.epa. gov/ttn/ecas/regdata/RIAs/matsriafinal.pdf. The term "electric utility steam generating unit" (EGU) specifically refers to those fossil fuel-burning units that create electricity for sale and distribution to the public through the national electric grid. 42 U.S.C. § 7412(a)(8) (2011). Furthermore, the term "EGU" is limited to units with a capacity exceeding 25 megawatts electrical output. Id. EPA anticipates that the new MATS will affect roughly 1,400 EGUs at approximately 600 power plants nationwide. U.S. ENVTL. PROT. AGENCY, REDUCING TOXIC POLLUTION FROM POWER PLANTS: FINAL MATS, 11 (2011), available at http://www.epa.gov/mats/pdfs/20111216MATSpresentation. pdf.

The new MATS represent the culmination of a process that began in the early 1990s, following a series of settlements that required EPA, under the federal Clean Air Act (CAA), to move toward regulating mercury emissions from power plants. *Mercury and Air Toxic Standards (MATS): History of This Regulation*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/mats/actions.html (last updated Jan. 30, 2012). In 1998, EPA completed a study of toxic air pollutants emitted by power plants, and in 2000, EPA found that it was "appropriate and necessary" to regulate coal- and oil-fired power plants under 42 U.S.C. § 7412. Regulatory Finding on the Emissions of Hazardous

Air Pollutants From Electric Utility Steam Generating Units, 65 Fed. Reg. 79825, 79825-79826 (Dec. 14, 2000). This finding triggered a provision in the CAA that required EPA to regulate toxic air emissions, including mercury, from EGUs. See 42 U.S.C. § 7412(n)(1)(A). In response, in 2004 EPA proposed the Clean Air Mercury Rule under 42 U.S.C. § 7411. Mercury and Air Toxic Standards, supra. This rule would have required power plants to either: (1) meet maximum achievable control technology (MACT) standards for mercury emissions; or (2) engage in cap and trade with other utilities for mercury emissions credits. *Id*. However, the final Clean Air Mercury Rule was vacated in 2008 by the D.C. Circuit Court, which held that EPA was required to regulate mercury emissions from EGUs under § 7412 rather than § 7411. New Jersey v. EPA, 517 F.3d 574, 578 (D.C. Cir. 2008). The new MATS rules promulgated by EPA were designed in accordance with the D.C. Circuit Court's opinion and will regulate mercury emissions under § 7412. Mercury and Air Toxic Standards, supra.

Since the 1990s, EPA has conducted numerous studies regarding the impact of mercury emissions from power plants on human health and the environment. See e.g., Office of Air Quality Planning & Standards, U.S. Envtl. Prot. Agency, EPA-452/R-11-009, Revised Technical Support Document: National-Scale Assessment of MERCURY RISK TO POPULATIONS WITH HIGH CONSUMPTION OF SELF-CAUGHT FRESHWATER FISH (Dec. 2011), available at http://www.epa.gov/mats/pdfs/20111216MercuryRis kAssessment.pdf. Through these studies, scientists found that mercury from EGUs can negatively impact public health, particularly the health of those who consume large quantities of fish from affected bodies of water. Id. at x. When deposited in water, mercury (Hg) is easily transformed by microorganisms into methylmercury (MeHg), a toxic substance that bioaccumulates in organisms. Revised Technical Support Document, supra, at vii. Methylmercury is particularly damaging because it can cross the blood-brain and placental barriers. Thomas W. Clarkson, Mercury: Major Issues in Environmental Health, 100 ENV. HEALTH PERSPECTIVES 31, 31 (1992), available at http:// www.ncbi.nlm.nih.gov/pmc/articles/PMC1519577/pdf/envhper00370-0035.pdf. Furthermore, because MeHg bioaccumulates, fish that are higher on the food chain contain correspondingly higher concentrations of methylmercury in their tissues. Id. Thus, humans (especially women of child-bearing age) who consume large quantities of fish from mercury-impaired water bodies are at risk for contracting mercury poisoning and exposing children to the toxin in utero. Revised Technical Support Document, supra, at 9. Prenatal exposure to methylmercury has been linked to significant neurological damage. Id. at 7.

EPA anticipates that the MATS, once implemented, will prevent 90% of the mercury contained in coal burned at power plants from being emitted into the air. *Reducing Toxic Pollution from Power Plants: Final MATS* at 14. EPA assured the public that the new rules will not affect the reliable supply of electricity to consumers via the national electric grid. *Id.* at 17.

## NEW TCEQ RULES GOVERNING POWER PLANT PERMITS

The Texas Commission on Environmental Quality (TCEQ) underwent sunset review during the most recent legislative session. In advance of the new federal rules for EGUs, the Commission's sunset bill (HB 2694) requires TCEQ to propose rules to accelerate the review and approval of certain applications for amendments to air permits. Tex. COMM'N ON ENVTL. QUALITY, Rule Project NO. 2011-029-116-AI, CHAPTER 116—CONTROL OF AIR POLLUTION BY PERMITS FOR NEW CONSTRUCTION OR MODIFICATION: BACKGROUND AND SUMMARY OF FACTUAL BASIS FOR ADOPTED RULE, 1, *available at* http://www.tceq.texas.gov/assets/public/legal/rules/rule\_lib/adoptions/11029116\_ado.pdf [hereinafter CHAPTER 116]. In particular, HB 2694 requires TCEQ to expedite the application process for certain electricity-generating facilities (excluding those with natural gas-fired EGUs), seeking amendments of existing air permits to comply with the CAA's maximum achievable control technology (MACT) standards. TEX. HEALTH & SAFETY CODE § 382.059(a); 36 Tex. Reg. 7128 (2011) (to be codified at 30 Tex. ADMIN. CODE § 116.128) (proposed Oct. 21, 2011) (Tex. Comm. on Envtl. Quality).

In response to HB 2694, TCEQ proposed a rule that, if adopted, would require the Commission to issue a draft permit within 45 days of receiving a technically and administratively complete air permit amendment application from an electricity generating facility seeking to comply with federal MACTs. 36 Tex. Reg. at 7129. TCEQ would then have to decide whether to grant the final permit within 120 days of issuing the draft permit. *Id.* at 7131. The accelerated schedule proposed by the rule would also include the opportunity to request a contested case hearing on the amendment application; however, in the interest of an expedited process, contested case hearings would have to be requested within 30 days of the first publication of notice of the draft permit. 36 Tex. Reg. at 7129. TCEQ acknowledges that the deadline for requesting a contested case hearing could pass before the end of the public comment period. CHAPTER 116, *supra*, at 13.

In addition, the rule would limit the subject of a contested case hearing to the question of whether the control technology proposed by the application meets MACT standards. 36 Tex. Reg. at 7131. Finally, the rule would allow facilities to request authorization for "collateral increases in emissions" associated with implementing the MACTs. *Id.* at 7129. In its response to public comments, TCEQ clarified that collateral emissions increases may include the emission of new contaminants or an increase in previously-emitted pollutants. CHAPTER 116, *supra*, at 26.

In light of the compressed schedule and the restricted scope of a contested case hearing for these types of applications, there has been some concern that the proposed rules do not allow for sufficient public participation in the permitting process. See Steve Hagle, P.E., Deputy Director, Office of Air. TCEQ Interoffice Memorandum: Commission Approval for Rulemaking Adoption, Chapter 116, Control of Air Pollution by Permits for New Construction of Modification, 3 (Jan. 20, 2012), available at http://www. tceq.texas.gov/assets/public/legal/rules/rule\_lib/adoptions/11029116\_aex.pdf. Specifically, TCEQ's Office of Public Interest Council (OPIC) is concerned that the accelerated and constrained scope of the contested case process would not allow for an adequate hearing if collateral emissions increases associated with proposed MACTs cause a facility to exceed other emissions standards, including potential for significant deterioration or new source review thresholds. CHAPTER 116, supra, at 39-40. Responding to these concerns, TCEQ reiterated that amendment applications must be technically complete before the application would qualify for expedited review. Id. at 41-42. To be considered technically complete, an application would have to include results of any necessary evaluations to address the impact of emissions increases on human health or national ambient air quality standards. *Id.* 

TCEQ sought, received, and responded to public comment on the proposed rule in late 2011 and the beginning of 2012. The revised rule is scheduled for review and approval by TCEQ Commissioners at the TCEQ Agenda meeting on February 8, 2012. *Pending Rule Adoptions*, TEX. COMM'N ON ENVTL. QUALITY, http://www.tceq.texas. gov/rules/pendadopt.html (last updated Jan. 27, 2012). If adopted, portions of the rule would be submitted to EPA for incorporation into the State Implementation Plan (SIP). CHAPTER 116, *supra*, at 1.

John B. Turney is an environmental attorney at Richards, Rodriguez & Skeith, L.L.P.

Samia Rogers is a third-year law student at The University of Texas School of Law and is a staff member of the Texas Environmental Law Journal.

#### NATURAL RESOURCES

## TEXAS RAILROAD COMMISSION ADOPTS ONE OF THE NATION'S STRONGEST CHEMICAL DISCLOSURE REGULATIONS FOR HYDRAULIC FRACTURING

On December 30, 2011, the Texas Railroad Commission ("Commission") finalized regulations that require public disclosure of chemicals used in the hydraulic fracturing process. R.R. Comm'n of Tex., 36 Tex. Reg. 9307 (Dec. 30, 2011) (to be codified at 16 Tex. ADMIN. CODE § 3.29) (eff. Jan. 2, 2012). Hydraulic fracturing, also known as fracking, is a method of oil and gas extraction by which huge volumes of water and sand, along with chemical additives, are pumped under high pressure into a well bore to create cracks in dense geological formations, which then allow the oil and gas to flow to the surface. Jack Smith, *Texas agency OKs rule requiring drillers to disclose chemicals used in fracking*, FORT WORTH STAR-TELEGRAM (Dec. 14, 2011), http://www. star-telegram.com/2011/12/13/3592981/texas-agency-oks-rule-requiring.html.

Fracking is significant for Texas, which drilled more than 40% of new U.S. wells in 2011 and leads the nation in oil and gas production. *Id.* The North Texas Barnett Shale is the second highest gas-producing area in the nation. *Id.* According to the Commission, 15,466 drilling permits were issued in 2010, 85% of which used fracking techniques. 36 Tex. Reg. 5765, 5767 (Sept. 9, 2011) (prop. to be codified at 16 Tex. ADMIN. CODE § 3.29). This means about 13,000 wells could undergo fracking on an annual basis. *Id.* 

The environmental implications of fracking cause much tension between the oil and gas industry and the environmental community. Mella McEwen, *Hydraulic Fracturing Expected to be Significant Issue for Oil and Gas Operators*, MIDLAND REPORTER-TELEGRAM (Dec. 14, 2011), http://www.mywesttexas.com/business/oil/ article\_1eb747ec-14de-5692-985c-8658065c4e55.html. One of the primary environmental concerns stemming from this increasingly employed technique is the possible effect fracking fluid chemicals have on underground and surface water. Smith, *supra*. This has caused environmental groups and residents in areas with oil and natural gas operations to push for mandatory disclosure of the chemicals used in fracking fluid. *Id.* 

The Commission's new rule attempts to reconcile views of the oil and gas industry with that of the environmentalists. Commissioner David Porter stated that the new rule provides a balance between protecting legitimate business information and the public's right to know. Press Release, R.R. Comm'n of Tex., Railroad Commissioners Adopt One of Nation's Most Comprehensive Hydraulic Fracturing Chemical Disclosure Requirements (Dec. 13, 2011), *available at* http://www.rrc.state.tx.us/press-releases/2011/121311.php. Chairman Elizabeth Ames Jones said, "Once again the Railroad Commission is taking a lead in helping the public understand the safety of hydraulic fracturing with this rule's adoption. In fact, with this new rule, Texans will know more about what is going in the ground for energy production than about the ingredients that go into their sodas." *Id.* The Commission hopes that this rule will be the new national benchmark for disclosure. *Id.* 

The regulations will apply only to hydraulic fracturing wells that obtain drilling permits from the Commission after February 1, 2012. 36 Tex. Reg. at 9318. However, many Texas oil and gas operators have been voluntarily disclosing this information for some time. Smith, *supra*. Under the new rules, operators must disclose general information about the well, the total volume of water used in the well, each additive used in the hydraulic fracturing fluid, each chemical ingredient listed on OSHA's Material Safety Data sheet (MSDS), as well as all other chemical ingredients intentionally used for hydraulic fracturing. 36 Tex. Reg. at 9320-9321. The actual or maximum concentration of the additives or chemical ingredients listed on the MSDS must also be included. *Id.* at 9321. Supplier and service companies of these fluids and chemicals must provide the operator with this information. *Id.* at 9320. Disclosures must be added to the Chemical Disclosure Registry found at FracFocus.org. *Id.* at 9320-9321.

There are some exceptions to the disclosure requirement. Ingredients that are not purposely added, or occur incidentally need not be disclosed. Id. at 9321. Also, chemicals subject to trade secret protection need not be disclosed unless the Office of the Attorney General or a court of proper jurisdiction determines that the information is not entitled to trade secret protection under Chapter 552 of the Texas Government Code. Id. Only certain parties may submit a challenge to a claim of trade secret protection, including: (1) the landowner of the property where the well is located; (2) a landowner on adjacent property; or (3) a state department or agency with jurisdiction over a matter relevant to the claimed trade secret protection. 36 Tex. Reg. at 9322. Importantly, all information must be disclosed to health professionals and emergency personnel if necessary though these personnel have a duty to retain confidentiality. Id. at 9321. Parties are also not responsible for failure to disclose where information provided to them was inaccurate. Id. For example, a supplier is not responsible for inaccurate information provided by a third party manufacturer of the chemicals, and an operator is not responsible for inaccurate information provided by the supplier or service company. Id.

This regulation represents a concession to local and environmental interests and could have many effects. This rule could serve as a model for other states. Press Release, R.R. Comm'n of Tex., *supra*. Other states, like Colorado, have adopted similar rules and many states may follow suit. Smith, *supra*. Oil and gas producers will need to have an increased awareness of the changing requirements, state-by-state, and possibly need to seek increased legal advice to ensure compliance.

Another significant part of this rule is that it allows Texans to see how much state water is being devoted to fracking, which could lead to increased local interest in tighter regulations. This new rule could also result in more litigation, especially regarding claims for trade secret protection. Pioneer Natural Resources expressed this concern in its comment on the proposed rule. 36 Tex. Reg. at 9309. Pioneer stated that there was possibly too much discretion to suppliers, service companies, and operators to claim trade secret protection. *Id.* They worry that, while the filing burden falls mostly on well operators, it is the suppliers and service companies that provide most of the information on the chemicals in the fracturing treatment, creating a possible disconnect between information and ultimate disclosure. *Id.* Pioneer commented that the goal of full disclosure would be undermined by a rule that allows for too easy a claim of trade secret protection while making the ability to challenge these claims too difficult. *Id.* 

Numerous entities commented on the need to define "adjacent properties" for those who could challenge these trade secret claims. *Id.* at 9310-9311. The Commission ultimately chose a traditional definition of "a tract of property next to the tract of property on which the wellhead is located, including a tract that meets only at a corner point." *Id.* As one commenter highlighted, this definition raises some concern that the rule does not allow for situations like those witnessed in the Barnett Shale area where a well is drilled in a city park, and residents within 1,000 to 5,000 feet would have strong interest, but not be considered adjacent or able to bring a trade secret challenge. 36 Tex. Reg. at 9310.

The Commission received 19 comments on the proposal from the oil and gas industry and the local and environmental community alike. *Id.* at 9307. These comments overwhelmingly support this rule and the ability of states and oil and gas producers to work together to balance industry, local, and environmental interests. *Id.* 

Aileen M. Hooks is a partner at Baker Botts, L.L.P. Her work is primarily concentrated in environmental, health, safety compliance, permitting and risk assessment and resolution, Superfund and contaminated site issues, and commercial real estate transactions.

David Munden is a third-year law student at The University of Texas School of Law and is a staff editor of the Texas Environmental Law Journal.

## SOLID WASTE

## EPA REVISES SOLID WASTE RULES TO PROMOTE THE USE OF ALTERNATIVE FUELS

In March 2011, the U.S. Environmental Protection Agency (EPA) finalized the Non-Hazardous Secondary Material (NHSM) rule that identified NHSM as materials that, when used in combustion units, are excluded from the definition of "solid waste" in the Resource Conservation and Recovery Act (RCRA). 40 C.F.R. § 241.3 (2011). The purpose of this rule is to clarify the types of alternative fuels that can be burned for energy recovery without subjecting them to the same restrictions as solid wastes, which are subject to more stringent regulations. *See Id.* § 241.1 (2011). On December 2, 2011, EPA proposed amendments to the NHSM rule to address concerns from the regulated community that the rule excluded some categories of alternative fuels. NHSM Proposed Revisions, 76 Fed. Reg. 80452, 80469 (proposed Dec. 23, 2011) (to be codified at 40 C.F.R. § 241 pt. 3).

The proposed amendments clarify the definitions of "clean cellulosic biomass," "contaminants," and "established tire program" to broaden the scope of materials that are eligible to be classified as a NHSM. *Id.* at 80470. Additionally, EPA has revised the process for determining whether a NHSM contains contaminants, which makes it more like a waste and less like a fuel. *Id.* at 80471. The proposed rules provide an opportunity for users of alternative fuels to obtain a determination from EPA that certain materials are not solid wastes when they are combusted for energy recovery. *Id.* at 80473. These changes would likely broaden the scope of materials that can be used for energy recovery and promote the use of biomass and other nonfossil fuels.

## CURRENT NHSM REGULATIONS

Under the Clean Air Act (CAA), a boiler is considered a solid waste incineration unit if it uses solid waste as fuel. 42 U.S.C. § 7429(a)(1) (2011). The solid waste definition includes recycled materials used for energy recovery, so under current EPA regulations, alternative fuel boilers are regulated as solid waste incineration units. *See* 40 C.F.R. § 258.2 (2011). This posed a problem for EPA because it limited the agency's ability to promote nonfossil fuels such as biomass and other alternative fuels. To overcome this hurdle, in 2005, EPA proposed that industrial boilers used for energy recovery not be considered solid waste incineration units. Standards of Performance for CISWI Units, 70 Fed. Reg. 55568, 55572 (Sept. 22, 2005). However, the D.C. Circuit Court of Appeals struck down this approach, ruling that EPA ignored language in the CAA that requires facilities that burn solid waste to be regulated as solid waste incineration units. *Natural Res. Def. Council v. EPA*, 489 F. 3d 1250, 1258 (D.C. Cir. 2007).

Following Natural Res. Def. Council, EPA proposed rules that exclude a category of Non-Hazardous Secondary Materials from the solid waste definition, reasoning that some materials used as fuels are more similar to "traditional fuels" than solid waste because of their utility. See Identification of NHSM Summary, 76 Fed. Reg 15456 (Mar. 21, 2011). To determine whether a material should be considered a NHSM that is excluded from the solid waste definition, EPA developed legitimacy criteria to measure whether the material was being used and handled as a fuel. 40 C.F.R. § 241.3(d) (2011). Additionally, the legitimacy criteria compares the contaminant levels of the NHSM to the contaminant levels of the traditional fuel itself. *Id.* § 241.3(d)(1)(iii). This criteria was proposed on March 21, 2011, and was met with resistance from users of both traditional and alternative fuels for drawing a fine line between what materials would be considered excluded from the solid waste definition. *See* D. Cameron Prell & David L. Rieser, *On a Tightrope Over Sludge: EPA Re-Revises Its Waste Rules Regarding Biomass and Other Alternative Fuels*, MCGUIRE WOODS (Dec. 19 2011), http://www.mcguirewoods.com/news-resources/item.asp?item=6327.

## EPA'S PROPOSED CHANGES FOR NHSM REGULATIONS

To address concerns from the regulated community, on December 2, 2011, EPA proposed expanded definitions of "clean cellulosic biomass," "contaminants," and "established tire collection programs." 76 Fed. Reg. at 80470. Other changes to the current regulations include expanding the legitimacy criteria that a NHSM must meet to be considered a fuel. *Id.* at 80476. These changes are meant to clarify how contaminants are evaluated by the NHSM rule to determine whether they will be excluded from being regulated as a solid waste.

The clean cellulosic biomass definition would be expanded to add more examples of biomass. *Id.* at 80470. The proposed definition lists additional materials such as corn stover, agricultural-derived biomass, wood pellets, hogged fuel, and clean biomass from land clearing operations. *Id.* This broad list includes many products typically used for biomass production, making it easier to determine if a product should be regulated as a traditional fuel. *Id.* 

The definition of "contaminants" would be revised to clarify what will be considered a contaminant when applying the legitimacy criteria. *Id.* The current definition specifically lists pollutants that would be considered contaminants if found in the NHSM. *See* 40 C.F.R. § 241.1. EPA acknowledged that this approach does not identify all potential pollutants because certain CAA pollutants form during combustion. 76 Fed. Reg. at 80470. The proposed contaminants definition addresses this problem by listing elemental precursors to pollutants instead of listing specific pollutants. *Id.* Additionally, in response to concerns from producers of fuels about applying the legitimacy criteria to determine when contaminant levels should be measured, EPA has clarified that the NHSM itself is to be evaluated and not the emissions from the combustion unit. *Id.* The proposed definition would not affect any previous decisions on whether NHSM are solid wastes when burned as a fuel, but it would provide a clearer way to identify potential contaminants in a NHSM. *Id.* 

The tire collection program definition would be amended to expand the types of tires that will not be considered discarded when combusted for fuel. *Id.* at 80476. Under the current definition, tires are not considered discarded if removed from a vehicle and then sent to a combustion facility through a tire collection program. *Id.* This rule does not include off-specification tires, such as factory scrap tires. 76 Fed. Reg. at 80476. The new definition of "established tire collection program" would clarify that scrap tires from either vehicles or factory scrap tires will not be considered discarded when combusted. *Id.* 

In addition to expanding the definitions for what is considered a NHSM, EPA is clarifying its legitimacy criteria used to evaluate whether a NHSM is considered a fuel. *Id.* The expanded legitimacy criteria would evaluate whether the NHSM contains

contaminants. *Id.* Under the current approach, the material needs a lower level of contaminants than a comparable fuel, showing that the material is more like a fuel and less like a waste. *See* 40 C.F.R. § 241.3(d)(1)(iii). The new proposed rules permit contaminant comparisons based on groups of contaminants. 76 Fed. Reg. at 80476. This would allow a material's particular volatile organic compound (VOC) to be compared to the total VOC content of a fuel, rather than comparing it to an individual VOC. *Id.* at 80477. Additionally, this new legitimacy criteria would provide greater flexibility by allowing the person evaluating the material to compare it to any other fuel that the combustion unit was designed to burn, not limiting the evaluation to the type of fuel it was permitted to burn. *Id.* at 80476.

If finalized, the proposed changes to the NHSM rule will likely increase the probability that a material can be classified as a fuel if burned for energy recovery. Prell & Rieser, *supra*. By adding additional materials to its definition of biomass, and revising the process to determine if contaminants exist in a material, EPA is responding to concerns from the regulated community and expanding the scope of the NHSM rule.

Ali Abazari is a senior counsel in the regulatory and legislative section of Jackson Walker, L.L.P. Mr. Abazari specializes in solid waste, remediation, surface mining, and industrial wastewater permitting and compliance counseling. He previously served as a regulatory specialist at URS Corporation and as an attorney in the Litigation Division of the Texas Commission on Environmental Quality.

Colleen Lenahan is a third-year law student at The University of Texas School of Law. Ms. Lenahan will be the Student Notes Editor for Volume 43 of the Texas Environmental Law Journal.

## WATER QUALITY AND UTILITIES

## CORSICANA, TEXAS WATER RATE CASE SETTLED: TWO YEARS LATER, TCEQ APPROVES CORSICANA'S WHOLESALE WATER RATE INCREASE.

#### BACKGROUND

On August 4, 2009, the Corsicana City Council ("City") ruled to increase its water and sewer rates for all customers. Chuck McClanahan, *Water Rate Case Settled*, CORSICANA DAILY SUN, Nov. 5, 2011, *available at* http://corsicanadailysun.com/opinion/x57158208/Water-rate-case-settled. Following several years of lost profits for the City's Utility Fund, the ruling slightly increased the base and wastewater rates. *Id.* The decision also established an inclining block rate for water that sets up a tiered structure for water rates based on volumetric usage. *Id.* 

Unhappy with the water rate increases, a group of wholesale customers formed a coalition called the Navarro County Wholesale Ratepayers (NCWR or "Ratepayers") and appealed the City's decision to the Texas Commission on Environental Quality (TCEQ) pursuant to TEX. WATER CODE § 13.043. *Id.* At the State Office of Administrative Hearings (SOAH), NCWR argued that the new rate structure was an abuse of the City's monopoly power and adversely affected the public interest. *Id.* 

An appeal of a rate that is charged pursuant to a written contract, which was the case in this appeal, is subject to a "public interest" review to determine whether the protested rate adversely affects the public interest. See TEX. ADMIN. CODE §§ 291.131(b), 291.132. To determine whether the protested rate adversely affects the public interest, the commission must determine that at least one of the following public interest criteria have been violated:

- (1) the protested rate impairs the seller's ability to continue to provide service, based on the sellers's financial integrity and operational capability;
- (2) the protested rate impairs the purchaser's ability to continue to provide service to its retail customers, based on the purchaser's financial integrity and operational capability;
- (3) the protested rate evidences the seller's abuse of monopoly power in its provision of water or sewer service to the purchaser. In making this inquiry, the commission shall weigh all relevant factors. The factors may include:
  - (A) the disparate bargaining power of the parties, including the purchaser's alternative means, alternative costs, environmental impact, regulatory issues, and problems of obtaining alternative water or sewer service;
  - (B) the seller's failure to reasonably demonstrate the changed conditions that are the basis for a change in rates;
  - (C) the seller changed the computation of the revenue requirement or rate from one methodology to another;
  - (D) where the seller demands the protested rate pursuant to a contract, other valuable consideration received by a party incident to the contract;
  - (E) incentives necessary to encourage regional projects or water conservation measures;
  - (F) the seller's obligation to meet federal and state wastewater discharge and drinking water standards;
  - (G) the rates charged in Texas by other sellers of water or sewer service for resale;
  - (H) the seller's rates for water or sewer service charged to its retail customers, compared to the retail rates the purchaser charges its retail customers as a result of the wholesale rate the seller demands from the purchaser;
- (4) the protested rate is unreasonably preferential, prejudicial, or discriminatory, compared to the wholesale rates the seller charges other wholesale customers.
- Id. § 291.133.

#### WHOLESALE RATEPAYERS' ARGUMENTS

Public Interest Argument

NCWR argued that SOAH's administrative law judge (ALJ) should engage in a broad inquiry when deciding whether Corsicana's rate change adversely affected the public interest. Navarro County Wholesale Ratepayers, SOAH Docket No. 582-10-1944, 13 (proposal for decision) (Aug. 17, 2011), *available at* http://www.soah. state.tx.us/pfdsearch/pfds/582%5C10%5C582-10-1944-pfd1.pdf [hereinafter PFD]. However, the ALJ held that the inquiry should be limited to the statutorily defined factors set out in 30 TEX. ADMIN. CODE § 291.133(a). *Id.* The ALJ also rejected NCWR's argument that the public-interest inquiry should include a comparison of the protested rates' impacts on wholesale and retail customers, and concluded instead

that the disparate impact argument is not relevant under 30 Tex. Admin. Code § 291.133(a)(3)(A). Id. at 14-15.

Additionally, NCWR claimed that the protested rates were not based on Corsicana's cost of service. *Id.* at 16. However, the ALJ concluded that this argument is irrelevant to the determination of whether Corsicana's rates adversely affect the public interest because 30 Tex. ADMIN. CODE § 291.133(b) states, "The commission shall not determine whether the protested rate adversely affects the public interest based on an analysis of the seller's cost of service." *Id.* at 16. Thus, the ALJ held that NCWR failed to show that the new rates were not in the public interest. *Id.* at 70.

## Abuse of Monopoly Power Argument

NCWR also argued that Corsicana effectively acted as a monopoly by preventing Ratepayers from obtaining water from Tarrant Regional Water District (TRWD), the only other viable water service source. PFD, *supra*, at 28. To support this argument, NCWR claimed that existing contracts that many wholesale ratepayers signed (the "Standard Contract") with Corsicana gave the city a monopoly that it abused because the contracts' sole source and penalty provisions ensured that Ratepayers could not obtain water from alternative sources. *Id.* at 34. However, the ALJ found that TRWD's decision not to supply water to Corsicana ratepayers was not connected to the Corsicana City Council, and the contracts did not evidence monopoly abuse because the Standard Contract was developed with the input of wholesale customers and contained provisions beneficial to the Ratepayers. *Id.* at 28-29, 45.

Further, the ALJ found that the City made a reasonable decision to change its water rates based on the changed financial condition of its Utility Fund. See *id.* at 50. The court found no evidence to contradict the City's claim that, at the time, the Utility Fund faced a \$1 million shortfall. *Id.* at 49.

Finally, NCRW argued that the new rate structure was a change in methodology that was "deliberately set so that average in-city, residential customers would not pay any of the rate increase, while out-of-city wholesale customers would always pay the highest rates due to their consistent, high volume usage." *Id.* at 50. Based on a broad interpretation of 30 TEX. ADMIN. CODE § 291.133(a)(3)(C), the ALJ agreed that Corsicana's new rate structure was indeed a change in methodology. PFD, *supra*, at 56. However, the ALJ concluded that the new rate structure was not abusive and would not result in disparate price burdens on out-of-city versus in-city customers. *Id.* at 58. The ALJ noted that, although many residential retail customers were exempted from the highest tier water rates, 31 of the top 50 highest consuming customers are residential retail customers. *Id.* 

## PROPOSAL FOR DECISION AND ORDER ADOPTED BY THE COMMISSION

In light of its findings, the ALJ recommended that TCEQ adopt the Proposed Order, deny NCWR's petition to review Corsicana's wholesale water rates, and order the City and each of the Ratepayers to pay 1/11th of the cost of the transcript of the hearing and the copies provided to TCEQ and the ALJ. *Id.* at 73.

On November 2, 2011, TCEQ approved the ALJ's Proposal for Decision and Order, denying NCWR's petition to review Corsicana's wholesale rate increase. TEX. COMM'N ON ENVTL. QUALITY, AGENDA, Proposal for Decision TCEQ Docket No. 2009-1925-UCR, SOAH Docket No. 582-10-1944 (November 2, 2011), available at http://m.tceq.

texas.gov/assets/public/comm\_exec/agendas/comm/marked/2011/111102.Mrk.pdf. TCEQ agreed that "[t]he public-interest inquiry set out in 30 TAC Section 291.133(a) (1)-(4) does not include a comparison of the protested rate's impacts on wholesale and retail customers," and the new rate structure did not adversely affect the public interest. *Id.* 

Emily Rogers is a partner practicing environmental law and water and wastewater utility law at Bickerstaff Heath Delgado Acosta LLP in Austin. Ms. Rogers is a graduate of the University of Houston Law Center and formerly served as an attorney for the Texas Natural Resource Conservation Commission.

Shelby Gutierrez is a third-year law student at The University of Texas School of Law and is a staff member of the Texas Environmental Law Journal.

## WATER RIGHTS

## TCEQ APPROVES NEW RULE TO ALTER TEXANS' WATER RIGHTS DURING DROUGHTS

While winter rains have provided a measure of relief to many parts of Texas, the state still remains in the depths of an extended drought with no end in sight as forecasters predict another hot and dry spring and summer this year. Andrew Freedman, Rains Ease Texas Drought, Long-Range Outlook Still Pessimistic, WASHINGTON POST, Feb. 6, 2012, http://www.washingtonpost.com/blogs/capital-weather-gang/post/rains-easetexas-drought-long-range-outlook-still-pessimistic/2012/02/05/gIQArm2TuQ\_blog. html. With a growing urban population, a warming climate, and increasingly stressed water resources, the State of Texas has begun to reconsider the traditional water rights it assigns to citizens. Although much of the previous legislative session's debate on water rights revolved around giving landowners a "vested" property right to groundwater, another bill may have much more far-reaching implications. See Joe Nick Patoski, Water Policy in Texas Legislature Rode on One Word, TEXAS TRIBUNE, JUNE 10, 2011, http://www.texastribune.org/texas-environmental-news/water-supply/water-policy-intexas-legislature-rode-on-one-word/. During the most recent sunset review of the Texas Commission on Environmental Quality (TCEQ), the state legislature formalized the agency's enforcement authority over water rights. Act of June 17, 2011, 82nd Leg. R.S., ch. 1021, § 5.03, sec. 11.053 (codified as amended at Tex. Water Code Ann. § 11.053 (West 2011)). Specifically, HB 2694 added § 11.053 to the Texas Water Code, which permits the Executive Director of TCEQ to temporarily alter or suspend the water rights of Texans during future droughts or water shortages. Id.

On November 4, 2011, TCEQ published proposed rules in the Texas Register regarding § 11.053. Tex. Comm'n Envtl. Quality, 36 Tex. Reg. 7463 (Nov. 4, 2011) (prop. to be codified at 30 Tex. ADMIN. CODE §§ 36.1 - 36.8) (earliest date of adopt. Dec. 4, 2011). In accordance with state law, TCEQ held a month-long comment period as well as a formal public hearing on December 1, 2011. *Id.* TCEQ received dozens of comments on the rule on behalf of various corporate, industrial, and agricultural

interests as well as state agencies, local water authorities, environmental groups, and private citizens. Comments on the proposed rule regarding the Executive Director's suspension or adjustment of water rights during drought or emergency water shortage, TEXAS COMM'N ON ENVTL. QUALITY, *available at* http://www.tceq.texas.gov/assets/public/legal/sep/comments-rule-proposal-dec2011.pdf [hereinafter Comments on the proposed rule]. TCEQ adopted a final rule this spring on April 11, 2012, which became effective on May 3, 2012. Rule Adoptions, TEXAS COMM'N ON ENVTL. QUALITY, http://www.tceq.texas.gov/rules/adopt.html (last visited Apr. 21, 2012).

To understand how this rule affects water rights in Texas, it is important to review the current water rights system. Texas's surface waters are held in trust for the public by the state, which may appropriate water rights to different users. TEX. WATER CODE ANN. §§ 11.021-11.022, 11.0235. A person wishing to take, divert, or store unappropriated state waters must first obtain a permit from TCEQ, unless the suggested use falls within one of several permitted exceptions, such as water for domestic and livestock use. Id. §§ 11.124, 11.142-11.1422. Permits come in a variety of forms and may confer water rights to a user for either a perpetual or limited term. Tex. COMM'N ON ENVTL. QUALITY, GI-228, RIGHTS TO SURFACE WATER IN TEXAS, 3-4 (2009), available at http:// www.tceq.texas.gov/publications/gi/gi-228.html/at download/file. Obtaining a permit does not guarantee a user access to water, but rather priority before later permit holders who possess less senior rights. Tex. WATER CODE ANN. § 11.141. When water is plentiful, a user may take the permitted amount and few disputes arise. When water resources are constrained, water is allocated first to domestic and livestock users and then by seniority to permit holders along a basin. Id. § 11.024(1)-(2). The recent drought has tested the "first in time, first in right" system in Texas like never before, where some water rights date back to the 18th century. Kate Galbraith, Texas' Water Rights System Gets Tested in Drought, TEXAS TRIBUNE, Jan. 19, 2012, http://www.texastribune.org/texas-environmental-news/water-supply/texas-water-rights-system-gets-testeddrought/.

At present, Texas relies on one of two different methods, based on the location of the user, to ensure the protection of water rights: (1) an honor system and (2) the watermaster program. TEX. COMM'N ON ENVTL. QUALITY, *supra*, at 11. The honor system governs most of the state and relies on self-enforcement to ensure that users take only the permitted amount of water. *Id.* at 12. In certain areas designated by TCEQ, a watermaster monitors usages and ensure compliance through enforcement. *Id.* at 13. At present, the watermaster program consists of three programs in South and West Texas—one along the Rio Grande River, another covering the Concho River basin, and finally the South Texas program, which covers a fifty-county area containing the Guadalupe, Lavaca, Nueces, and San Antonio River basins as well as adjacent coastal areas. *Id.* at 14. Currently, Texas water law only permits the state to suspend or alter water rights in these designated watermaster areas during droughts or periods of water shortages. *See* 36 Tex. Reg. at 7464.

The new rule expands TCEQ's ability to enforce water rights during future droughts or emergency water shortages to the entire state. *See generally* Tex. Comm'n Envtl. Quality, 37 Tex. Reg. 3096 (April 27 2012) (Suspension or Adjustment of Water Rights During Drought or Emergency Water Shortage, to be codified at 30 Tex. ADMIN. CODE §§ 36.1-36.8) The new rules would not apply to water users in areas of the state already under the supervision of the watermaster program nor to certain

permit-exempt activities found in §§ 11.142(b) through 11.1422 of the Texas Water Code. 30 TEX. ADMIN. CODE § 36.1(b)-(c). These permit-exempt activities include, under certain circumstances, the construction of small dams or reservoirs, offshore oil drilling, surface coal mining, mariculture, and the irrigation of historic cemeteries. TEX. WATER CODE ANN. §§ 11.142(b) -11.1422. Orders to temporarily suspend or adjust water rights may not last longer than 180 days "unless otherwise specifed in a Suspension or Adjustment Order" and can only be issued under explicitly defined "drought" and "emergency shortage of water" conditions. 30 TEX. ADMIN. CODE § 36.6.(3)(A). Additionally, a Suspension or Adjustment Order may only be extended once for up to 90 days. *Id.* § 36.6.(3)(B).

The new rule provides three specific conditions under which a drought may occur: (1) the National Drought Mitigation Center classifies drought conditions in the watershed as at least moderate; (2) gaging stations operated by United States Geological Survey record streamflows in the drainage area below the 33rd percentile of the period of record; or (3) below-normal precipitation in the watershed is reported for the last three months in the Texas Climatic Bulletin, a senior call is made, and demand exceeds the available supply of surface water. § *Id.* 36.2(3). Several commenters to the proposed rule expressed concerns that the definition of drought was either overbroad or unclear. Comments on the proposed rule, *supra*. In response to these comments, TCEQ modified the definition of drought by adding that a "drought occurs when at least one of the following criteria are met" as well as by slightly amending the three drought condition in order to establish a "'bright line" test. Tex. Comm'n Envtl. Quality, 37 Tex. Reg. 3096, 3097 (April 27 2012).

The Executive Director may also act outside of a drought when an emergency shortage of water occurs. 30 Tex. ADMIN. CODE § 36.3(a). An emergency shortage of water is less concretely defined than a drought but arises when senior water rights holders are unable to take surface water during either: "(A) emergency periods posing a hazard to public health or safety; or (B) conditions affecting hydraulic systems which impair or interfere with conveyance or delivery of water for authorized users." *Id.*§ 36.2(4).

When a drought or an emergency water shortage occurs, the Executive Director must follow the priority doctrine outlined in § 11.027 of the Texas Water Code as well as confine temporary suspensions or adjustments to the smallest area practicable. *Id.*§ 36.3(a), (b). Complicating the directive to follow the priority doctrine, however, are six conditions that the Executive Director must meet when issuing an order to suspend or adjust water rights. These conditions require the Executive Director to ensure each order "(1) maximizes the beneficial use of water; (2) minimizes the impact on water rights holders; (3) prevents the waste of water; (4) considers the efforts of the affected water right holders to develop and implement the water conservation plans and drought contingency plans required by Texas Water Code, Chapter 11; (5) to the greatest extent practicable, conforms to the order of preferences established by Texas Water Code, §11.024; and (6) does not require the release of water rights associated with that reservoir." *Id.* § 36.5(b).

As many commentators have noted, condition five-requiring it to conform to the order of preference-presents the most conflict. Comments on the proposed rule, *supra*. Section 11.024 of the Texas Water Code outlines the order of preference for appropriating state water—with domestic and municipal use afforded the highest priority followed by agricultural and industrial use. Tex. WATER CODE ANN. §§ 11.024(1)-(2). Some Texans worry that the new rule upsets the priority doctrine, which has historically favored agricultural interests, in favor of a system that places designated use above the seniority of rights. Comments on proposed rule, *supra*. Many believe that, under certain circumstances, a senior water rights holder engaged in agriculture could have their water rights suspended in order to ensure a sufficient amount for a municipality with junior rights. *Id*.

According to the proposed rule's taking analysis, such a situation could very well arise, "but this consideration of preferences would generally be ...as needed for human health and safety concerns such as drinking water." 36 Tex. Reg. at 7466; *see also* 37 Tex. Reg. 3099. Rather than upending the priority doctrine, TCEQ believes the new rules reflect a recognition that the State has "public welfare responsibilities to fulfill" that may require it to make difficult decisions from time to time. Erika Aguilar, *TCEQ Suspends Some Water Use Over Drought Worries*, KUT, Aug. 12, 2011, http://kut.org/2011/08/tceq-suspends-some-water-use-over-drought-worries/. Although some senior water rights holders complain that the rule only hurts them, these decisions will go both ways. On occasion, senior water rights holders may be forced to give up some of their allotted water, but overall, the new rules provide additional protections when water resources are scarce by bringing to bear the enforcement authority of TCEQ.

While Texans can hope and pray for more rain, TCEQ is working to clarify the legal framework governing future droughts and water shortages. *E.g.* Joshunda Sanders, *Governor Perry Issues Proclamation for Days of Prayer for Rain*, AUSTIN AMERICAN-STATESMAN, Apr. 21, 2011, http://www.statesman.com/blogs/content/shared-gen/ blogs/austin/faith/entries/2011/04/21/governor\_perry\_issues\_proclama.html. The new rule helps move Texas in this direction by strengthening the ability of TCEQ to manage water. As a larger population continues to demand more from a finite resource, Texas may very well be forced to further reassess the current water rights and resource management system in the state. Difficult policy changes may be necessary to help ensure that Texas is well-prepared for the next drought.

Robin Smith is an attorney with the Texas Commission on Environmental Quality. Ms. Smith handles water rights, municipal solid waste, water quality and hazardous waste area matters. She has also worked with the Texas Water Commission, the Texas Supreme Court, and the Dallas Court of Appeals.

Aaron Tucker was a second-year law student at The University of Texas School of Law and a staff member of Texas Environmental Law Journal for Volume 42. He will serve as the Lead Articles Editor of the Journal for Volume 43.

## CASENOTES: FEDERAL

## NATIONAL SOLID WASTES MANAGEMENT ASSOCIATION V. CITY OF DALLAS, NO. 3:11-CV-3200 (N.D. TEX. 2011).

#### INTRODUCTION

On January 31, 2012, the U.S. District Court for the Northern District of Texas awarded a preliminary injunction to a coalition of solid waste handling companies, led by the National Solid Wastes Management Association (NSWMA), enjoining the City of Dallas ("Dallas") from enforcing a recently-passed flow control ordinance. Order at 1-2, *Nat'l Solid Wastes Mgmt. Ass'n v. The City of Dallas*, No. 3:11-CV-3200 (N.D. Tex. Nov. 18, 2011). The flow control ordinance would require solid waste haulers to dump their solid waste exclusively at landfills owned or operated by the City of Dallas. *Id.* at 13. The issue raised in the case is whether the flow control ordinance violates the Contract Clause of the U.S. Constitution. *Id.* at 4.

The flow control ordinance was scheduled to take effect on January 2, 2012, but enforcement was postponed for 30 days pending the court's decision on the preliminary injunction. Id. at 2. The Dallas City Council passed the flow control ordinance as part of its plan to recycle and reuse waste in accordance with ideals of environmental sustainability. City of Dallas, Why Flow Control?, THE FUTURE OF DALLAS WASTE ..., http://www.thefutureofdallaswaste.com/whyFlowControl.html (last visited Mar. 17, 2012). Dallas plans to collect all of the city's waste at one city landfill and thereby streamline recycling and recovery activities. Id. According to one of NSWMA's attorneys, the ordinance's "sole purpose is to generate revenue," and it "will actually decrease recycling and even endanger the city's residential recycling program." Press Release, National Solid Wastes Management Association, NSWMA Files Suit Against the City of Dallas Over Flow Control Ordinance (Nov. 18, 2011), available at http://www.fightcityofdallasflowcontrol.com/Fight City Of Dallas Flow Control/ Welcome\_files/Press%20Release%20-%20Flow%20Control%20Suit.pdf. Further, the NSWMA claims that the ordinance destroys their previously negotiated franchise agreements that allow them to haul waste to landfills in various jurisdictions. Id.

#### THE COURT'S ANALYSIS

The Contract Clause proclaims that no state shall pass any law that impairs the "Obligation of Contracts." U.S. CONST. art. I, § 10. In its preliminary injunction order, the court recognized that the Contract Clause has long been held to limit the "power of the States to modify their own contracts as well as to regulate those between private parties." Order, *supra*, at 4 (quoting U.S. *Trust Co. of N.Y. v. New Jersey*, 431 U.S. 1, 17 (1977)). The Contract Clause, however, is not absolute, and any Contract Clause inquiry requires a three-step analysis. *See United Healthcare Ins. Co. v. Davis*, 602 F.3d 618, 627 (5th Cir. 2010). The first prong of the test is whether the state law is a substantial impairment of the contract, which requires: (1) a contractual relationship; (2) a change in the law that impairs the relationship; and (3) substantial impairment. Order, *supra*, at 5. The second prong requires that the state have a significant, legitimate, public purpose for the regulation. *Id.* at 6. The third prong requires that the law be reasonably necessary to achieve its purpose. *Id.* at 7. In cases where the impaired

contract is between the state and a private organization, the analysis changes slightly. First, the state must have had the power to contract in the first place; and second, the court again looks to the reasonableness of the impairment, but this time with a stricter analysis. *Id.* 

In granting the preliminary injunction, the court found that the NSWMA had a substantial likelihood of winning the case on the merits, that it would suffer a substantial threat of irreparable injury if the injunction was not granted, that the damage to Dallas was less than the possible damage to the NSWMA, and that granting the injunction did not conflict with the public interest. See *id.* at 3. In support of its holding, the court found that the previously executed "franchise agreements" between the City of Dallas and the plaintiff solid waste haulers, which allowed the waste haulers to dump and process their waste at a variety of facilities, were very likely interfered with by the new flow control ordinance. See *id.* at 11-14. The court then determined this interference would be substantial because the previous "franchise agreements" regulated the waste haulers' dumping much less than the new flow control ordinance, and the new ordinance would likely have a substantial, negative financial impact on the waste haulers. Order, *supra*, at 14, 16.

The court also found that there was no substantial public purpose for the flow control ordinance and that it was instead passed largely as a way to raise money, which the court said was not a public purpose. *Id.* at 19. The court noted comments by the mayor and several city council members, emphasizing the revenue-raising effects of the ordinance, at the city council meeting in which the ordinance was adopted. *Id.* at 18. Also, at the same meeting, the city council considered a resolution to establish a fund authorizing the city's controller to annually deposit up to \$1,000,000 in funds generated by the flow control ordinance. *Id.* at 18-19.

These findings meant the court was not required to consider the last prong of the Contract Clause test. *Id.* at 23. However, the court nevertheless proceeded "to find that the flow control ordinance was not necessary for Dallas to achieve its 'non-financial goals." *Id.* at 26. The court cited the statements of Dallas's Director of Sanitation Services that the ordinance is not necessary to fight illegal dumping or increase the rate of recycling in the city. Order, *supra*, at 26. Likewise, a consultant hired by Dallas admitted that flow control is not necessary to increase awareness of recycling on the part of waste generators. *Id.* 

The court also found that the NSWMA established the threat of irreparable injury from the flow control ordinance. Specifically, the court pointed to the criminal penalties facing trash haulers who do not comply with the ordinance in finding that the haulers would "be forced to choose between forgoing their rights under the Franchise Agreements and facing serious criminal sanctions for noncompliance." *Id.* at 30.

Finally, the court balanced the equities between the Dallas and the NSWMA. Dallas argued that the haulers would suffer only "speculative and insubstantial pecuniary harm" under the flow control ordinance and that it would provide the city with revenue and help to manage its future waste disposal needs. *Id.* at 31. However, the court found that NSWMA would suffer substantial financial harm from the ordinance, which outweighs any negative impacts experienced by Dallas. *Id.* at 30. For all of the above-mentioned reasons, the court concluded it was likely that the plaintiffs would succeed on the merits of their Contract Clause claim and granted them a preliminary injunction. *Id.* at 33.

David J. Klein is a member of the Lloyd Gosselink Rochelle & Townsend, P.C.'s Water and Districts Practice Groups in Austin, where he focuses on representing water utilities, municipalities, water districts, water authorities and landowners with their water supply, water quality, and water and sewer utility service interests. Mr. Klein earned his J.D. from The John Marshall Law School in Chicago, Illinois.

Matt Parks is a recent graduate of The University of Texas School of Law and is a recent staff member of the Texas Environmental Law Journal.

## CASENOTES: STATE

## CITY OF JACKSBORO V. TWO BUSH COMMUNITY ACTION GROUP, NO. 03-10-00860-CV, 2012 WL 413967 (Tex. App.—Austin Feb. 10, 2012, NO PET.)(MEM.OP.).

In a recent decision, the Third Court of Appeals in Texas confirmed the Texas Commission on Environmental Quality's (TCEQ) authority to revise proposed findings of fact from an administrative law judge if it finds the proposed findings are "not supported by a great weight of the evidence." *City of Jacksboro v. Two Bush Community Action Group*, No. 03-10-00860-CV, 2012 WL 413967 (Tex. App.–Austin Feb. 10, 2012, no pet.)(mem.op.). The court reversed the district's court order and affirmed the TCEQ's decision. *Id.* at \*1.

The City of Jacksboro (Jacksboro) first applied to TCEQ for a permit to build a municipal solid-waste landfill in 2005. Id. The application was later assumed by IESI TX Landfill, LP, a waste-disposal company that owned the land for the proposed site. Id. After TCEQ issued a preliminary decision to grant the permit, Two Bush Community Action Group ("Two Bush") requested and was granted a contested case hearing. Id. In 2008, after the contested case hearing, the Administrative Law Judge (ALJ) recommended that TCEQ deny the permit because IESI "did not properly characterize the landfill's potential impact to groundwater resources in the landfill area." Id. at \*2. After reviewing the parties' exceptions and replies, the ALJ issued an amended recommendation that TCEQ approve the permit with the addition of the Special Provision agreed to by IESI adding extra groundwater monitoring wells. City of Jacksboro, 2012 WL 413967, at \*2. TCEQ issued the modified permit on November 2, 2009. Id. Two Bush sought judicial review of the TCEQ's decision in Travis County District Court in January 2010. Id. Jacksboro and IESI intervened to defend the permit. Id. "The district court found that there was no evidence in the record regarding the Special Provision, reversed TCEQ's order granting the permit, and remanded the matter to TCEQ." Id.

Under TCEQ's rules, any party seeking to build a solid-waste landfill must submit a detailed application and notify all effected parties. See 30 TEX. ADMIN. CODE § 330.57 (2012) (Tex. Comm'n on Envtl. Quality, Permit and Registration Application for Municipal Solid Waste Facilities). The permit application requires a site development plan, including information on "all known wells within 500 feet of the site," and "a description of regional aquifers in the vicinity of the facility based upon published and open-file sources." *See id.* §§ 330.61, 330.63(e)(3). This information is used to develop a groundwater monitoring system with a sufficient number of monitoring wells to yield samples from the uppermost aquifer. *City of Jacksboro*, 2012 WL 413967, at \*8. Two Bush argued that the entire order was flawed because IESI did not provide all the needed information and their monitoring system is inadequate. *Id.* IESI, Jacksboro, and TCEQ contended that the court erred when it reversed the Special Provision. *Id.* at \*6.

The court of appeals sided with IESI, TCEQ, and Jacksboro on whether the record contained evidence regarding the Special Provision. *Id.* at \*10. The court cited the exceptions to the original Proposal for Decision (PFD), in which IESI mentioned the possibility of the Special Provision and the amended PFD in which the ALJ considered the Special Provision. *Id.* at \*11. The court further concluded that, even if no evidence existed in the record as a whole, it would not follow, as Two Bush argued, that the order must be reversed for lack of substantial evidence. *Id.* Two Bush must prove that its "substantial rights...have been prejudiced." *See* TEX. GOV'T CODE ANN. § 2001.174(2)(E) (2012). Finding that IESI's original groundwater monitoring plan conforms to TCEQ rules, the court found that the additional monitoring under the Special Provision would not cause harm to Two Bush. *City of Jacksboro*, 2012 WL 413967, at \*12-13. Further, the court also rejected Two Bush's arguments that: (1) it is impossible to ensure the monitoring system conforms to TCEQ rules without evidence of the Special Provision; and (2) it had no time to scrutinize the new plan. *Id.* at \*13.

In its cross appeal, Two Bush argued that TCEQ's grant of the permit was arbitrary and capricious based on three assertions: "(1) TCEQ failed to follow its own rules [] requiring specific and accurate information regarding groundwater; (2) TCEQ's findings of fact are not rationally connected to its decision [to grant the permit]; and (3) several of TCEQ's findings are not supported by evidence." *Id.* at \*14. The court rejected all three assertions. *Id.* 

On the first issue, Two Bush argued that TCEQ failed to identify the Pennsylvanian system as an aquifer after its finding that the "Pennsylvanian formation is a critically important source of usable groundwater in the vicinity of the landfill." *Id.* Identifying the Pennsylvanian as an aquifer would have compelled IESI to develop a groundwater monitoring plan for it. The court first noted that TCEQ rules define an aquifer "as a geologic formation 'capable of yielding significant quantities of groundwater." *Id.* at \*13 (quoting 30 TEX. ADMIN. CODE § 330.3(8). Therefore, a geologic formation, such as the Pennsylvanian, that yields less than significant levels of groundwater is not an aquifer. Based on this definition, the court rejected all of Two Bush's arguments arising from the claim. *City of Jacksboro*, 2012 WL 413967, at \*14.

Two Bush also pointed to TCEQ's inconsistent findings of fact as evidence that its grant of the permit was arbitrary and capricious. TCEQ found that IESI had not identified all the wells in the area or recognized the evidence that Two Bush had collected from a door-to-door search, and that IESI had met the rule requirements. *Id.* at \*17. The court did not find these facts inconsistent because, "Where the public sources are not complete but where a party goes beyond the rule's requirements in garnering site information, TCEQ could reasonably find both that IESI submitted a regional-aquifer plan that met the requirements of the rules and that IESI failed to identify all the wells within the vicinity." *Id.* 

Two Bush's second issue on appeal objected to TCEQ's modifications of the ALJ's findings and conclusions. The court noted that TCEQ "may overturn a conclusion of law in a contested case only on the grounds that the conclusion was clearly erroneous in light of precedent and applicable rules." *Id.* at \*20 (quoting TEX. HEALTH & SAFETY CODE ANN. § 361.0832(d)). Two Bush argued that the modified findings were not supported by the greater weight of the evidence, that the ALJ's conclusions were not clearly erroneous, that TCEQ failed to provide a reasonable explanation, and that TCEQ arbitrarily announced a new policy. *Id.*. The court disagreed. The first disputed revision was to finding of fact number 78, concerning groundwater flow directions. *Id.* The finding of fact was amended to avoid contradicting an earlier finding that "[g] roundwater generally flows to the north-northeast in Stratum II at about 15 feet per year." *City of Jacksboro*, 2012 WL 413967, at \*21. The court found substantial evidence in the record supporting this finding in IESI's application and expert testimony and therefore disagreed that the ALJ's original findings were supported by a great weight of evidence. *Id.* 

The other disputed revisions concerned the identification of local water wells. TCEQ amended several findings to convey that IESI complied with the regulatory standard of care for identifying water wells despite the fact that it did not identify all the water wells within one mile of the proposed landfill. *Id.* Two Bush complained that these revisions were arbitrary and capricious because they were not based on evidence in the record and "amount to the expression of a new TCEQ policy regarding identification of water wells." *Id.* at \*22. The court found that TCEQ properly revised the findings of fact to reflect that IESI followed the proper standard of care based on evidence that IESI "relied on a review of records and maps at TCEQ and TWDB, including TWDB's publication *Aquifers of Texas*, and on evidence from both sides' experts." *Id.* 

In their final issue on appeal, Two Bush objected to the exclusion of evidence during the rebuttal phase of testimony at the contested case hearing. *Id.* Two Bush sought to admit a "notice of deficiency" from TCEQ to IESI concerning their interpretation of groundwater flow data. *City of Jacksboro*, 2012 WL 413967, at \*23. The ALJ sustained IESI's objection to the notice's admission because the letter was not proper evidence under the pretrial scheduling order, which stated that, "All parties shall prefile their direct case evidence by the indicated date on the procedural schedule." *Id.* at \*24. IESI argued that the evidence was offered to support Two Bush's direct case that their groundwater analysis was incorrect. *Id.* While the court agreed with Two Bush that this provision could also be read to allow the evidence to be used during crossexamination, they concluded the ALJ's judgment was not an unreasonable interpretation of the provision and, therefore, TCEQ's adoption of the ALJ's decision in this regard was not an abuse of discretion. *Id.* 

For the above reasons, the Third Court of Appeals reversed the district court's judgment and affirmed TCEQ's original order, supporting TCEQ's discretionary power in its permitting process.

Howard Slobodin is General Counsel and Secretary, Board of Directors, of the Trinity River Authority. Mr. Slobodin received his B.A. from the University of Oregon in 1998 (cum laude) and his J.D. from The University of Texas School of Law in 2001 (with honors).

Mayson Pearson is a recent graduate of The University of Texas School of Law and was a staff member of the Texas Environmental Law Journal.

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# EDWARDS AQUIFER AUTHORITY V. DAY, 369 S.W.3D 814 (TEX. 2012).

On February 24, on the heels of the worst single-year drought in state history, the Texas Supreme Court handed down its decision in *Edwards Aquifer Authority v. Day*. 369 S.W.3d 814 (Tex. 2012). Justice Hecht, writing for a unanimous court, held that "[i]n our state the landowner is regarded as having absolute title in severalty to the [water] in place beneath his land....The only qualification of that rule of ownership is that it must be considered in connection with the law of capture and is subject to police regulations." *Id.* at 831-32. (quoting *Elliff v. Texon Drilling Co.*, 210 S.W.2d 558, 561 (Tex. 1948)). In so holding, the court rejected the Edwards Aquifer Authority's (EAA) argument that the rule of capture divests landowners of any possessory right in subsurface groundwater sufficient to demand compensation under the Takings Clause when the state seeks to regulate the landowners' withdrawal of groundwater for conservation purposes. *Id.* at 832.

The decision made headlines and stirred political debate. On the one hand, the director of the Sierra Club's Lone Star Chapter, Ken Kramer, argued that "[t]he court has done a huge disservice to everyone who has been working for proper management of the groundwater resources needed for our state's people and our environment." Chuck Lindell, *State Supreme Court: Landowners own water beneath land*, STATESMAN. COM (Feb. 24, 2012), *available at*, http://www.statesman.com/news/texas-politics/ state-supreme-court-landowners-own-water-beneath-land-2198247.html. On the other hand, a water law attorney with the law firm of McGinnis, Lochridge, & Kilgore, Mr. Russell Johnson, argued that "[i]t's kind of like zoning ordinances, and what the court is saying is – you can zone people's property, but it has to be reasonable." Kate Galbraith, *Texas Supreme Court Rules For Landowners in Water Case*, THE TEXAS TRIBUNE (Feb. 24, 2012), *available at* http://www.texastribune.org/texas-environmental-news/water-supply/texas-supreme-court-rules-landowners-water-case/.

The EAA argued that a landowner cannot exclude others from draining groundwater because the landowner "is not entitled to any specific molecules of groundwater or even any specific amount." *Day*, 369 S.W.3d at 830. The Texas Supreme Court rejected essentially the same argument in *Texas Co. v. Daugherty*, which dealt with underground natural gas, so the EAA argued that water is treated different from natural gas. *Id.* at 829 (citing *Texas Co. v. Daugherty*, 176 S.W. 717, 719 (Tex. 1915)). To distinguish the two, the EAA argued that water should be treated differently because correlative rights—the right to sue for damages for subsurface drainage by another user—exist for natural gas and not water. *Id.* at 830 (citing *Hous. & T.C. Ry. v. East*, 81 S.W. 279. 280 (Tex. 1904)). The court found that the correlative rights for both resources are based in regulations, rather than in common law and that the EAA's argument therefore fails. *Id.* Further, the court found that the regulations governing natural gas and water are different because the two resources are different, but that both sets of regulations share a common purpose: to protect a shared resource that must be protected under the state constitution. *Id.* at 831.

Day addressed a question that had been left open repeatedly by the court: whether a landowner had a property right in groundwater in place that could form the basis of a regulatory takings claim if its withdrawal was limited. *Id.* at 835-836. In *Barshop* v. *Medina County Underground Water Conservation District*, the Texas Supreme Court avoided the issue by rejecting facial takings claims against the EAA because the Authority's regulations on their face constituted "a valid exercise of the police power necessary to safeguard the public safety and welfare." 925 S.W.2d 618 (Tex. 1996). Day was different. The case confronted the court with an as-applied challenge, where two San Antonio-area farmers argued that the EAA's tethering of allowed water usage for a given property to that property's historical water usage was a regulatory taking. In remanding the case to the trial court to more fully develop the record, the Court held that "a landowner cannot be deprived of all beneficial use of the groundwater below his property merely because he did not use it during an historical period." Day, 369 S.W.3d at 843.

The EAA also argued that (1) "[a] great majority of landowners in its area. . . cannot show the historical use necessary for a permit, [] therefore the potential number of takings claims is enormous," (2) "the financial burden of such claims could make regulation impossible," and (3) uncertainties in this area of the law would further "increase the expense and risk of liability." Id. at 843. The court acknowledged that takings litigation is quite costly but pointed out that "groundwater regulation need not result in takings liability," and that "the burden of the Takings Clause on government is no reason to excuse its applicability." Id. While the EAA seemed to argue that the Takings Clause should yield to the Conservation Amendment (mandating the conservation of public waters) because the two are mutually exclusive regarding underground water, the court saw these two clauses as mutually limiting: "the Takings Clause ensures that the problems of a limited public resource-the water supply-are shared by the public, not foisted onto a few." Id. Thus, "[w]hile Day should certainly have understood that the Edwards Aquifer could not supply landowners' unlimited demands for water, we cannot say that he should necessarily have expected that his access to groundwater would be severely restricted." Id. at 840.

The court also discussed policy issues in its opinion. The EAA argued that permitting decisions based on historical use-the "use-it-or-lose-it limitation"-is not only a pragmatic necessity, but also "sound policy because it recognizes the investment landowners have made in developing groundwater resources." Day, 369 S.W.3d at 841. In response, however, the court opined that "non-use of groundwater conserves the resource, 'whereas[] the non-use of appropriated waters is equivalent to waste." Id. (quoting Tex. Water Rights Comm'n v. Wright, 464 S.W.2d, 642, 647 (Tex. 1971)). Thus, the court reasoned, forcing landowners to give up their rights to groundwater would encourage them to pump and use it, perhaps wastefully. The court pointed out that Jacob Alford is a third-year student at The University of Texas School of Law, and a staff member of the Texas Environmental Law Journal.

## PUBLICATIONS

## ILAN W. GUTHERZ, CAP AND TRADE MEETS THE INTERSTATE COMMERCE CLAUSE: ARE GREENHOUSE GAS REGULATIONS CONSTITUTIONAL AFTER LOPEZ AND MORRISON?, 29 PACE ENVTL. L. REV. 289 (2011).

## INTRODUCTION

Ilan Gutherz's recent article, Cap and Trade Meets the Interstate Commerce Clause: Are Greenhouse Gas Regulations Constitutional after Lopez and Morrison?, explores how United States v. Lopez and United States v. Morrison could affect the fate of federal greenhouse gas (GHG) regulations. Ilan W. Gutherz, Cap and Trade Meets the Interstate Commerce Clause: Are Greenhouse Gas Regulations Constitutional after Lopez and Morrison?, 29 PACE ENVTL. L. REV. 289 (2011); see United States v. Lopez, 514 U.S. 549 (1995), United States v. Morrison, 529 U.S. 598 (2000). Gutherz's article examines how the Lopez and Morrison decisions have "opened several new lines of attack for opponents" of GHG regulations. Id. at 314. Gutherz notes that these new lines of attack raise the possibility that the Supreme Court might rule that comprehensive GHG regulations can improve the likelihood that the regulations will be upheld as constitutional and outlines some recommendations for doing so. Id.

Gutherz begins with a short explanation of the three new approaches to regulating GHGs: (1) cap and trade, (2) command and control, and (3) carbon taxation. *Id.* at 292-93. The article focuses on the first two approaches. Gutherz then quickly overviews the Commerce Clause, focusing on the *Lopez-Morrison* framework. Citing *Lopez*, Gutherz writes, "Congress may regulate "the 'channels of interstate commerce' and 'instrumentalities of interstate commerce, or persons or things in interstate commerce', even if the object of regulation is found or takes place within a single state." *Id.* at 295-96. Additionally, "Congress may.... regulate interstate activities that 'substantially affect' interstate commerce." Gutherz, *supra*, at 296. As Gutherz notes, this category "is subject to limitations: the regulated activities must be economic; noneconomic activities may not be regulated based on their aggregate impact on interstate commerce; and the relationship between the regulated activity and its effect on interstate commerce must not be indirect or attenuated." *Id.* 

The crux of Gutherz article comes from his examination of the effect of *Lopez* and *Morrison* on federal proposals for GHG regulations. Gutherz posits that:

...the constitutional fate of federal GHG regulations will depend in large part on four factors: (1) how the Court characterizes the challenged regulations; (2) whether the present Court continues to extend the "economic endeavor" litmus test to further challenges of environmental laws; (3) how rigorously the Court adheres to its more constrained interpretation of *Wickard's* aggregation principle; and (4) how stringently the Court applies its requirement that the regulated activities have direct, rather than attenuated effects on commerce. *Id.* at 303.

#### CHARACTERIZATION

Defining the object of regulation is an important part in a constitutional challenge. *Id* at 303. Gutherz sketches two possible approaches the Court might use to characterize the challenged regulations. *Id*. In one approach, the Court would characterize the emission of GHGs as the regulated activity. *Id*. at 305. Another approach and one that Gutherz believes would be easier to argue is constitutional—is if the Court "treat[s] GHG regulations as if their object of regulation was 'the use of energy in the production of electricity, energy-intensive goods and locomotion' or, more simply, the production of energy for residential and industrial uses." *Id*. at 306.

#### ECONOMIC ENDEAVOR

Assuming the Court characterizes the regulation as the first approach, the Court will then have to decide if emitting GHGs is an "economic endeavor." Without offering his opinion on who has the better argument, Gutherz explores different arguments that opponents and supporters of climate regulation could argue and provides examples of counterarguments. Gutherz, *supra*, at 307-10. For instance, supporters of climate change regulations could argue that GHG emissions lead to climate change and ocean acidification, which will have economic ramifications. *Id.* at 310. Gutherz points out that, "[e]ven if the Court determines that the activities regulated by capand-trade or command-and-control regulations are not 'economic,' it may yet uphold these laws if they comprise 'essential part[s] of a larger regulation of economic activity,' such that the otherwise constitutional regulatory scheme would be undercut if the activities at issue were not regulated." *Id.* at 309.

## AGGREGATION & ATTENUATION

Gutherz quickly outlines the arguments that supporters and opponents could use to argue whether activity, in the aggregate, substantially affects interstate commerce in a way that is not too attenuated, presuming the Court finds the activity economic in nature. *Id.* at 311. Gutherz believes that, instead of arguing about aggregation, supporters should argue on the basis of Congress's ability to regulate with foreign nations since global effects are "more dependable and less speculative" than regional effects. *Id.* at 313.

Next, Gutherz outlines recommendations he thinks supporters of GHG regulation should keep in mind. These recommendations range from making detailed findings to pushing "for the greatest possible scope of regulation." *Id.* at 315-16. As a last resort, Gutherz thinks supporters could argue that environmental laws "should be exempted from the *Lopez-Morrison* framework" and that the economic-noneconomic distinction is too narrow and unworkable. Gutherz, *supra*, at 317-18.

Gutherz concludes that there is a possibility that the Court could find comprehensive GHG regulations to be unconstitutional under the *Lopez-Morrison* framework. *Id.* at 290. He thinks the answer will likely depend on how the Court answers the four issues of characterization, economic activity, aggregation, and attenuation. *Id.*  Joshua D. Katz is an attorney with Bickerstaff Heath Delgado Acosta LLP in Austin. Mr. Katz practices environmental law, administrative law, water law, electric utility regulation, and related litigation. He received his law degree from the University of Houston Law Center.

Gabriella Gutierrez is a second-year law student at The University of Texas School of Law and is a staff member of the Texas Environmental Law Journal.

## WASHINGTON UPDATE

## "HAPS AND MACTS AND CISWI, OH MY!"–FOLLOWING THE CONVOLUTED ROAD TOWARD EMISSION STANDARDS UNDER THE CLEAN AIR ACT

#### INTRODUCTION

Federal regulations governing hazardous air pollutants (HAPs) have endured a lengthy promulgation process that can be conservatively described as "complicated." Although the undertaking remains incomplete, this article presents a chronological review of the developments thus far. In doing so, this Recent Development traces, in chronological order, several distinct yet intertwined issues that have been the subject of litigation over the last several years, including the U.S. Environmental Protection Agency's (EPA) failure to meet statutory deadlines in setting emission standards and EPA's proposed emission standards for industrial boilers and relayed issues.

## CLEAN AIR ACT & HAPS REGULATION OVERVIEW

Enacted in 1955, the Clean Air Act (CAA) has been subject to numerous amendments. See Clean Air Act, 42 U.S.C.A. §§ 7401-7671q (2007). In 1970, the CAA was amended to include regulation of HAPs. See Clean Air Amendments of 1970, Pub. L. No. 91-604, 84 Stat. 1676 (1970) (codified at 42 U.S.C.A. § 7412). HAPs, sometimes referred to as "air toxics," are "pollutants that can have significant short and long-term impacts when emitted in even relatively small quantities." CLEAN AIR ACT HANDBOOK § 6:1 (2011). The 1970 CAA amendments established the National Emission Standards for Hazardous Air Pollutants (NESHAP) program to regulate HAPs. *Id.* The NESHAP program required EPA to identify and list HAPs and to develop risk-based emission standards. *Id.* 

#### **1990 CAA AMENDMENTS**

Unfortunately, the NESHAP program's original incarnation proved inadequate to effectively regulate HAPs. See, e.g., S. REP. NO. 101-228, at 128 (1989); see also CLEAN AIR ACT HANDBOOK § 6:1 ("The original NESHAP program, although well-intentioned, was largely a failure."). Consequently, Congress "completely overhauled" the NESHAP program on November 15, 1990. CLEAN AIR ACT HANDBOOK § 6:1; see also Sierra Club v. Johnson [hereinafter Failure to Discharge I], 444 F. Supp. 2d 47, 48 (2007) (describing 1990 amendments as "sweeping revisions"). Title III of the revised CAA replaced the previous risk-based approach with a "technology-based emission control scheme that limited EPA's discretion and that set strict requirements and deadlines

for the promulgation of emission standards." Sierra Club v. Jackson [hereinafter Failure to Discharge II], No. 01-1537, 2011 WL 181097, at \*1 (D.D.C. Jan. 20, 2011); see 42 U.S.C.A. § 7412.

The revised CAA requires EPA to regulate the sources responsible for 90% of particularly dangerous HAPs through emission control standards. *Sierra Club v. Jackson* [hereinafter *Boiler MACT Review*], 813 F.Supp.2d 149, 152 (D.D.C. Sept. 27, 2911) (citing 42 U.S.C.A. § 7412(c)(6)). Specifically, the mandatory duties imposed on EPA by the 1990 CAA amendments include regulation of area sources of the 30 most dangerous HAPs and 7 other statutorily specified HAPs. 42 U.S.C.A. §§ 7412(c)(3), (6), (k) (3)(B).

The statutory deadline or promulgating these emission standards was set for November 15, 2000. *Id.* § 7412(c)(6).

## FAILURE TO DISCHARGE—INITIAL ALLEGATIONS

The emission standards deadline came and went, and EPA had not fulfilled its statutory duties. *Failure to Discharge II*, 2011 WL 181097, at \*3. As a result, in 2001, Sierra Club filed seven complaints against EPA, each of which addressed a distinct facet of EPA's alleged failure to discharge its duties under the CAA. *Failure to Discharge I*, 444 F. Supp.2d at 51. The cases were consolidated on June 20, 2002, and the consolidated action was stayed while the parties attempted to resolve their dispute through mediation. *Id*.

## BOILER MACT—ORIGINAL REGULATIONS

The CAA requires EPA to promulgate emission standards for all listed HAP source categories. 42 U.S.C.A. § 7412(d)(1). The CAA identifies the basis for these standards as the "maximum achievable control technology" (MACT). 42 U.S.C.A. § 7412(e). On July 16, 1992, EPA listed industrial boilers, commercial/institutional boilers, and process heaters as major HAPs sources. Initial List of Categories of Sources Under Section 112(c)(1) of the Clean Air Amendments of 1990, 57 Fed. Reg. 31576, 31591 (July 16, 1992). Over 12 years later, EPA adopted a MACT standard for these sources. National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Industrial Boilers and Process Heaters, 69 Fed. Reg. 55218, 55218 (Sept. 13, 2004).

## FAILURE TO DISCHARGE—RESCHEDULING (PART I)

In 2005, EPA and Sierra Club filed cross-motions for summary judgment in the consolidated *Failure to Discharge* cases. *Failure to Discharge I*, 444 F. Supp.2d at 51. EPA did not contest its failure to discharge its statutory duty, so the only issue before the court was when EPA would be required to promulgate the regulations. *Id.* at 52.

On March 31, 2006, the court of appeals denied EPA's motion and granted summary judgment for Sierra Club. Sierra Club v. Johnson, No. 01-1537, 2006 WL 889801, at \*1 (D.D.C. Mar. 31, 2006), amended in part sub nom, No. 01-1537, 2011 WL 181097 (D.D.C. Jan. 20, 2011). The court required EPA to fully discharge its statutory duties by June 15, 2009. *Id.* The court reasoned that this timetable would "best preserve the intent of Congress in enacting the 1990 Clean Air Act amendments, without calling upon defendants to do the impossible." *Failure to Discharge I*, 444 F.Supp.2d at 61.

## BOILER MACT-2007 LITIGATION (COURT OF APPEALS)

In 2007, the D.C. Circuit Court of Appeals decided three cases concerning HAPs regulations. Most relevant to the present discussion was NRDC v. EPA, in which the court vacated and remanded a rule defining commercial and institutional solid waste incineration (CISWI) units. 489 F.3d 1250, 1257-1261 (D.C. Cir. 2007). The court determined that the boiler MACT would also need to be vacated as a result, reasoning that "many boilers currently subject to the boiler MACT would be covered by the CISWI rule once EPA revised it." CLEAN AIR ACT HANDBOOK § 6.14.

## FAILURE TO DISCHARGE—RESCHEDULING (PART II)

EPA requested and was granted multiple extensions of its original deadline in the *Failure to Discharge* litigation. *Failure to Discharge II*, 2011 WL 181097, at \*4. The deadline was eventually extended to January 21, 2011. *Id.* at \*1.

## BOILER MACT—PROPOSED REGULATIONS

On April 29, 2010, EPA signed proposed emission standards for "(1) certain area source boilers, (2) major source boilers, and (3) ... CISWI ... units (collectively, 'the Three Air Rules')." *Id.* at \*5. The proposal occurred only nine months before the court-ordered deadline then in force (December 16, 2010). *Id.* at \*8. EPA attempted to explain the delay by claiming that the 2007 court of appeals decisions had prompted it to undertake a lengthy process of collecting additional information, which had to be completed before the proposal was signed. *Id.* 

The proposed rules were published in the Federal Register on June 4, 2010. *Id.* at \*5. EPA extended the public comment period for the rules, originally set to end on July 19, 2010, until August 23, 2010, due to "significant public interest." *Failure to Discharge II*, 2011 WL 181097, at \*5. During the public comment period, EPA received over 4,800 individual comments. *Id.* These comments included "extensive new data" provided by boiler owners and operators. CLEAN AIR ACT HANDBOOK § 6.14.

## FAILURE TO DISCHARGE—RESCHEDULING (PART III)

In December 2010, EPA requested yet another extension of its deadline for promulgating the final boiler rule. EPA asserted that the comments it received could "materially affect important decisions relating to source categorizations and coverage for the final emission standards," and consequently requested that the deadline be extended to April 13, 2012, to allow EPA to review the data and amend the proposed rules. *Failure to Discharge II*, 2011 WL 181097, at \*5. The court denied the request on the grounds that EPA had not demonstrated impossibility in complying with the deadline. *Id*. The court also noted that the original deadline set by Congress in the CAA had not only lapsed but had been expired for over a decade. *Id*. at \*6. It stressed that, "[i]n light of Congress' express directive on the deadline for the promulgation of HAP regulations, the focus must be on 'substantively adequate regulations' – *not* perfect regulations." *Id*. at \*7 (emphasis in original). Nonetheless, the court extended the deadline "slightly," to February 21, 2011, on the grounds that there was "no reasonable possibility" that EPA would be able to complete its mandatory responses to every significant comment by January 21. *Id*. at \*14.

## BOILER MACT—FINAL RULES & RECONSIDERATIONS

On February 21, 2011, EPA signed a final rule establishing MACT standards for industrial, commercial, and institutional boilers and process heaters located at major HAPs sources. National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, 76 Fed. Reg. 15608, 15662 (Mar. 21, 2011) [hereinafter *Major Source Boiler MACT*]. The standards were published in the Federal Register on March 21, 2011, with an effective date of May 20, 2011. *Id*.

Also on March 21, 2011, EPA announced that it would reconsider the *Major Source Boiler* MACT under 42 U.S.C. § 7607(d)(7)(B). National Emission Standards for Hazardous Air Pollutants; Notice of Reconsideration, 76 Fed. Reg. 15266, 15267 (Mar. 21, 2011).

#### BOILER RULE REVIEW—PETITIONS FILED & CONSOLIDATED

Over the following months, numerous petitions were filed in the D.C. Circuit Court of Appeals for review of the *Major Source Boiler MACT* standard. *Boiler MACT Review*, 2011 WL 4448610, at \*2. The petitions presented "substantive challenges to the legal sufficiency" of the standard under the CAA. *Id.* The petitions were consolidated into a single proceeding, *U.S. Sugar Corp v. EPA*, No. 11-1108. *Id.* 

## DELAY NOTICE—ISSUANCE OF ADMINISTRATIVE STAY

While the petitions for review were still pending in the court of appeals, on May 18, 2011–two days before the *Major Source Boiler MACT* was scheduled to take effect– EPA placed an administrative stay on the effective date. Industrial, Commercial, and Institutional Boilers and Process Heaters and Commercial and Industrial Solid Waste Incineration Units, 76 Fed. Reg. 28662, 28662 (May 18, 2011) [hereinafter *Delay Notice*]. EPA determined that "the public did not have a sufficient opportunity to comment on certain revisions ... to the proposed rules," so it decided to stay the effective date "until the proceedings for judicial review of these rules [in the court of appeals] are complete or EPA completes its reconsideration of the rules, whichever is earlier." *Id.* at 28663, 28664. EPA explicitly stated that it was acting pursuant to its authority under the Administrative Procedure Act (5 U.S.C. § 705), as opposed to the CAA. *Id.* at 28663.

## DELAY NOTICE—VALIDITY CHALLENGED

On July 14, 2011, Sierra Club filed a lawsuit in the district court, challenging the *Delay Notice*'s validity. *Boiler MACT Review*, 813 F.Supp.2d at 152. Sierra Club alleged three independent grounds for challenging the *Delay Notice*: "(1) EPA failed to provide notice or an opportunity for comment before issuing the delay notice; (2) EPA lacked the authority to issue the Delay Notice; and (3) EPA failed to provide adequate justification for the issuance of the Delay Notice." *Id.* at 153.

On July 15, 2011, Sierra Club filed an identical petition in the court of appeals. *Id.* at 154. Sierra Club filed the duplicate petition, seeking protection in the event the district court ultimately decided that it lacked subject matter jurisdiction over the issue. *Id.* The court of appeals granted Sierra Club's unopposed motion to hold the *Delay Notice* proceedings in abeyance on August 30, 2011. *Id.* 

As anticipated, EPA moved to dismiss the district court complaint for lack of subject matter jurisdiction on August 11, 2011. *Id.* at 154. The motion to dismiss was denied on September 27, 2011. *Boiler MACT Review*, 813 F.Supp.2d at 162. The court held that it had subject matter jurisdiction under the federal question statute (28 U.S.C. § 1331) for cases arising under the APA. *Id.* at 155.

## BOILER RULE REVIEW—ABEYANCE GRANTED

On August 3, 2011, the court of appeals granted EPA's motion to hold U.S. Sugar Corp in abeyance pending further order of the court. Sierra Club v. Jackson (Delay Notice Review), No. 11-1278, 2012 WL 34509, at \*2.

## DELAY NOTICE—SUPPLEMENTAL BRIEFING

On October 13, 2011, the district court ordered supplemental briefing on the issue of EPA's alleged failure to give notice and an opportunity to comment on the *Delay Notice* before it was issued. *Sierra Club v. Jackson*, No. 11-1278, 2011 WL 4852208, at \*1 (D.D.C. Oct. 13, 2011). Although neither side raised the issue, the court determined that case law "suggest[ed] that the suspension or delayed implementation of a final regulation normally constitutes substantive rulemaking that requires notice and an opportunity for comment." *Delay Notice Review*, 2012 WL 34509, at \*4 (citing *Sierra Club v. Jackson*, 2011 WL 4852208, at \*2). The court was concerned that such a substantive characterization could render the challenge to the rule subject to the jurisdiction of the court of appeals. *Id.* However, once the supplemental briefing had been completed, the court concluded that "nothing in the parties' supplemental briefing requires the Court to revisit its determination that it has jurisdiction over Sierra Club's complaint." *Id.* at \*3. The parties both characterized the *Delay Notice* as a "temporary stay that makes no change to the substantive requirements" of the *Major Source Boiler MACT*, and the court agreed. *Id.* at \*4 (internal citations omitted).

## BOILER MACT—PROPOSED REVISIONS

On December 23, 2011, EPA published proposed changes to the *Major Source Boiler* MACT based on its reconsideration, and announced that it would accept comments on the reconsideration proposal until February 21, 2012. National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, 76 Fed. Reg. 80598, 80598 (Dec. 23, 2011). The final revised rules are expected in spring of 2012. Letter from Cynthia Giles, Assistant Administrator for Enforcement and Compliance Assurance, Envtl. Prot. Agency (Feb. 7, 2012), *available at* http://epa.gov/ttn/atw/boiler/boiler\_ciswino\_action\_2012-02-07.pdf.

## DELAY NOTICE—VACATED AND REMANDED

On January 9, 2012, the court of appeals declared the *Delay Notice* unlawful and thus vacated and remanded to EPA. *Delay Notice Review*, 2012 WL 34509, at \*1. The court held that EPA had the authority to issue the *Delay Notice* under the APA, and that the *Delay Notice* ("as both sides agree, a temporary stay under 5 U.S.C. § 705 to preserve the status quo") was not subject to notice and comment requirements. *Id.* at \*6. However, the court concluded that EPA's issuance of the *Delay Notice* was "arbitrary and capricious," and therefore vacated and remanded it. *Id.* at \*6.
## NO ACTION ASSURANCE LETTERS

On February 7, 2012, EPA issued a "No Action Assurance Letter" stating that it would "exercise its discretion not to pursue enforcement [of certain notification deadlines] that were established in the Major Source Boiler MACT Rule ... ." Letter from Cynthia Giles (Feb. 7, 2012), *supra*. On March 13, 2012, EPA issued another No Action Assurance Letter, this one concerning "violations of the initial tune-up deadlines in the final Area Source Boiler rule." *Industrial/Commercial/Institutional Boilers and Process Heaters*, ENVTL. PROT. AGENCY, http://epa.gov/ttn/atw/boiler/boilerg. html (last visited Mar. 17, 2012); Letter from Cynthia Giles, Assistant Administrator for Enforcement and Compliance Assurance, EPA (Mar. 13, 2012), *available at* http:// epa.gov/ttn/atw/boiler/area\_source\_nna\_2012-03-13.pdf.

## CONCLUSION (OR, TO BE CONTINUED...)

Over two decades have elapsed since EPA was charged with imposing HAPs emission standards, and the original deadline for their promulgation passed nearly twelve years ago. The ultimate resolution of this extended saga remains to be seen.

John B. Turney is an environmental attorney at Richards, Rodriguez & Skeith, L.L.P.

Rachael K. Jones is a third-year student at The University of Texas School of Law. Ms. Jones will serve as the Recent Developments Editor of Volune 43 for the Texas Environmental Law Journal.



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